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Electronic Cash Registers (ECR) and Point-of-Sale Systems (POS) Interfaced with Scales

Part 1 - Background

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This article is the first part of a two-part article intended to provide weights and measures officials background information on the reason electronic cash registers (ECR) and point-of-sale (POS) systems interfaced with scales are regulated by weights and measures.

For those of you who may not remember black and white televisions or vinyl records, at one time the supermarket industry used mechanical price computing scales at customer checkout stands to determine the money value of items sold from bulk. The weight and price for the items were determined on the scale. The price of the weighed items were then manually entered into the cash register where the prices of all weighed and non-weighed items were totalized and summed on the cash register receipt. Therefore, weights and measures officials only examined the price computing scales and not the cash registers since weights and total prices of items were determined at the scales. Some of the problems associated with using mechanical price computing scales included lack of a tare capability in many scales, limited price computing capabilities and readability problems such as parallax, burned out lights on optical indicating scales, and selecting a computed price graduation in a series of graduations that came closest to the index wire for the weight graduation.

The introduction of ECRs interfaced with electronic scales (also known as automated checkout stands) occurred in the late 1960s and early 1970s and provided many advantages over mechanical price computing scales and cash registers for both the supermarket and the customer. These systems had greater price computing and tare capabilities. Additionally, weights determined on electronic or electromechanical scales were electronically transmitted to the ECR where the total price was automatically calculated by entering a unit price from the ECR product look-up (PLU) memory or manually entered product codes, and receipts from ECRs had the capability of providing customers with more information than receipts from mechanical cash registers. Manual entries of total price were no longer required thus increasing cashier efficiency and decreasing the number of keyboard errors by the cashier.

During the 58th Annual Meeting of the National Conference on Weights and Measures (NCWM) in 1973, weights and measures officials studied these new systems and held discussions with ECR and scale manufacturers. The NCWM agreed that ECRs interfaced with scales were subject to the applicable requirements in NIST Handbook 44 since they had a metrological impact on the accuracy of net weight and total price of commercial transactions and were separable components of a weighing system. The Specifications & Tolerances Committee of the NCWM developed a list of several requirements in Handbook 44 that are applicable to these systems including: tare capability; zero indication when the scale was in a zero-balance condition that is visible to the customer

and operator; printing of net weight; unit prices; and total prices; indicated and printed values be adequately defined; position of equipment so that scale indications were in clear view of the customer; and price calculations of weighed items rounding to the nearest one cent.

The definition for "point-of-sale system" was added to Handbook 44 Appendix D in 1986 to clarify the terminology already used in Handbook 44. A POS system is currently defined as an "assembly of elements including a weighing or measuring element, an indicating element, and a recording element (and may also be equipped with a "scanner") used to complete a direct sales transaction." The POS system typically includes a scale, an ECR, additional computers, customer displays, video monitors, and controllers. The POS ECR is designed to read the gross weight output of a small-capacity scale which is commonly called a "point-of-sale scale." The POS scale may have a built-in or pedestal-mounted display of the gross weight. The POS ECR takes the weight information from the scale and

- determines that the weight is stable and valid, is not below zero, and does not exceed the scale capacity;
- calculates the net weight using a tare value from either a preprogrammed or manual entry;
- multiplies the net weight by a unit price, either entered manually or entered through a product database via product look-up codes or by using the UPC (Universal Product Code) scanner;
- rounds the results of the unit price times the net weight to the nearest cent; and
- prints the net weight and other information required in Scales Code paragraph S.1.8.4. Recorded Information, Point of Sale Systems on a customer receipt.

It should be noted that the definition of "point-of-sale systems" does not apply to some ECRs interfaced with retail price computing scales since direct sale transactions can be completed without the use of the ECR, provided the ECR does not metrologically impact the accuracy of the weighing and pricing transactions. NTEP established evaluation criteria for POS systems in the early 1980s and listed the conditions under which ECRs are not considered "point-of-sale systems." These conditions are outlined in the 2006 edition of NCWM Publication 14 and will be discussed in Part 2 of this article in this newsletter titled "Examination of Electronic Cash Registers (ECR) and Point-of-Sale Systems (POS) Interfaced with Scales."

Up to this point, this article has discussed several of the events related to POS systems that took place in the 1970s and 1980s. The marketplace continues to utilize improvements in computer technology and introduce new marketing practices. Some of the more recent developments in POS systems include:

- **Scanners incorporated into the POS scale.** These devices are also commonly referred to as scanner/scales and are evaluated by NTEP to verify that the scanner has no metrological impact on weight determinations and related functions. POS scales with a built-in scanner feature will have the scanner feature listed on the National Type Evaluation Program (NTEP) Certificate of Conformance (CC).

- **Cash-acceptors and card readers.** These devices may be used with POS systems to authorize or initiate sales to the customer and are also known as "self-service POS systems." These systems are nearly identical to cashier operated systems except the system prompts the customer through the checkout process using visible (and sometimes audible) instructions and graphics on an interactive customer operated display. These systems are frequently attended by cashiers who oversee the operation of several checkout lanes and are available to assist customers if necessary. NTEP evaluates these systems to verify the following in order for the self-checkout feature to be listed on an NTEP CC:
 - The zero-balance condition of the POS scale and the net weight of the object are provided to the customer.
 - The amount billed against bank or credit cards is printed on the customer receipt.
 - The amount of cash tendered is displayed and printed on the customer receipt, and the denominations of the cash tendered are documented with a journal or other printer.
 - Correct change with the amount of change is displayed and printed on the customer receipt.
 - The customer can discontinue or cancel the checkout process without tendering cash or having the transaction billed against the debit/credit card.
 - The customer can retrieve cash tendered in the event of a malfunction or power failure.
 - The clear instructions (e.g., "see attendant for . . .") in the event there is insufficient paper to print a receipt or insufficient change.
- **Card readers.** These devices may be used with POS systems that do not authorize or initiate sales to the customer. These devices have no metrological effect on weight or money determinations. They may also be used to enter loyalty card member information that, among other things, instructs the POS system to apply member discounts to the transaction. These devices are not evaluated by NTEP and are not regulated by weights and measures officials.
- **Customer loyalty programs/member discount programs.** These types of programs offer its "members" discounts applicable to items in the stores. To receive the discount(s), a customer must present a loyalty or membership card or provide other means of member identification before the total sales transaction is completed. Because of the potential for inaccurate calculations and fraud, NTEP reviews the discount feature against the minimum requirements during type evaluation by verifying that the discount program: 1) is not capable of altering net weights, 2) rounds all price calculations involving weighed items to the nearest one cent, and 3) clearly prints the original unit price and total price of the weighed item on the customer receipt (or on the label of prepackaged random weight items). The inspector should be aware that NTEP is unable to anticipate all possible discount programs and scenarios and cannot guarantee the software used in these discount programs will not be altered; therefore, the three requirements listed above should be verified during initial and subsequent inspections.
- **Not-built-for-purpose, software-based POS systems.** In addition to the type evaluation requirements in NCWM Publication 14, NTEP evaluates the marking requirements unique to these devices (e.g., on-line display of required information).

- Screen saver or advertising modes. These modes of operation replace the primary weight indications (and other information) on ECR customer displays during a period of non-activity. NTEP evaluates these features to verify the POS system inhibits the weighing operation or returns to a continuous indication when the POS scale is in an out-of-balance condition according to Scales Code paragraph S.1.1. (c). Zero Indication.

As you can see, the same Handbook 44 requirements for POS systems that were first considered by the 58th NCWM in 1973 discussed earlier in this article are still valid considering the recent advancements in technology and new marketing practices. That is, the ECR is a metrologically significant part of the weighing system and customers are given the information and documentation necessary to make informed decisions regarding the validity of weighing transactions over the POS system.

For information and guidelines that can be used to inspect these systems, please see the accompanying article "Examination of Electronic Cash Registers (ECR) and Point-of-Sale Systems (POS) Interfaced with Scales" in this newsletter.