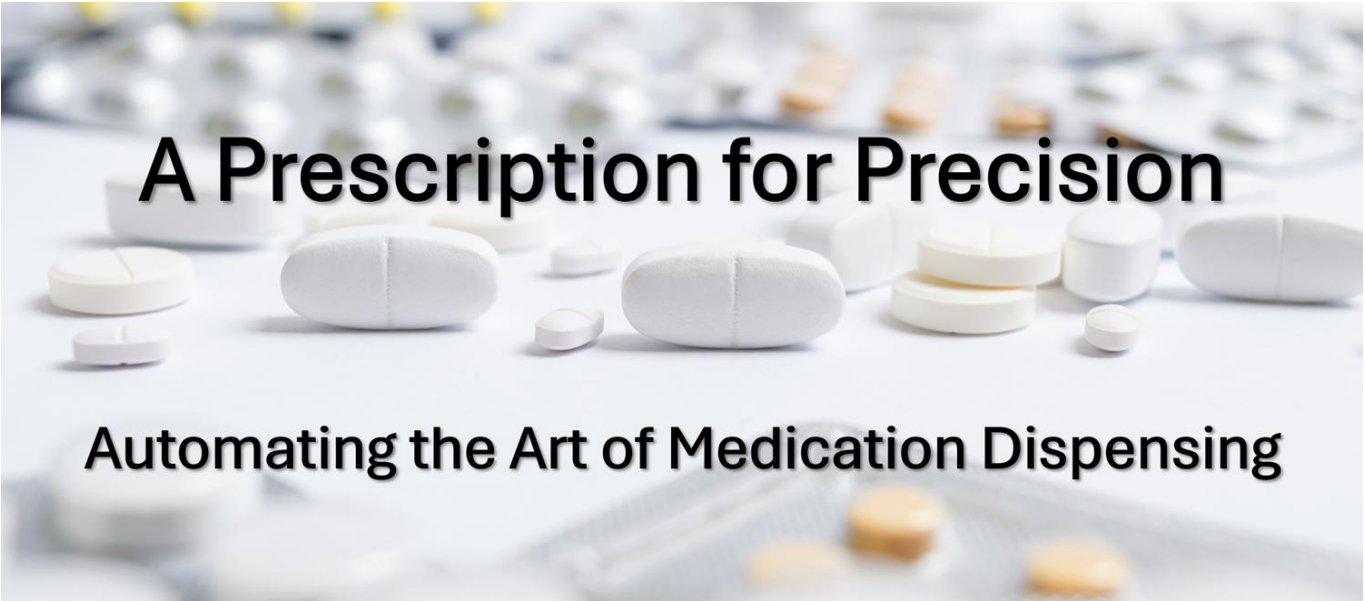




A Prescription for Precision

Automating the Art of Medication Dispensing

Executive Summary

Pharmacies are expected to maintain efficient and accurate dispensing workflows, even as the services they provide broaden in scope. For example, far from simply being a place where medications are dispensed, pharmacies offer patient-facing services such as administering seasonal vaccines, conducting preventive health screenings, and medication management support. This expansion places additional demands on pharmacy staff, making automation increasingly useful as a way to reduce time spent on repetitive tasks.

One healthcare automation provider wanted to find and treat operational pain points through an automated medication dispensing system equipped with universal, self-calibrating cassettes. Leveraging digital image processing to measure tablet dimensions and determine the correct cassette configuration, the system automated cassette calibration, a task that otherwise requires time-consuming manual intervention.

To achieve this, the provider used AAEON's [BOXER-6647-MTH](#) as the central computing hub, connecting and coordinating the multiple subsystems required for automated medication dispensing.

Existing System Constraints



Pharmacies are increasingly tasked with meeting the same dispensing volumes while also providing value-added programs. Without a proportional increase in time and resources however, balancing repetitive production-focused tasks with

patient-facing service provision can prove challenging.

In this instance, the automation provider's primary goal was not to simply automate pill counting, but to reduce repetitive tasks within medication dispensing workflows while ensuring pharmacies could maintain the consistency and control required for accurate dispensing.

Overall, they identified four key challenges, and shaped their project around how best to solve them:

- **Staffing Pressure:** Repetitive dispensing tasks place time constraints on both technicians and pharmacists.
- **Medication Counting:** Manual pill counting presents opportunities for human error, resulting in dispensing inaccuracies.
- **Medication Changes:** New medications and drug code changes can require changes to dispensing hardware, or reconfiguration of existing machinery.

- **Cassette Calibration:** Manually adjusting and recalibrating medication-specific cassettes is a complex maintenance task that demands precise processes be followed, further increasing maintenance and technician workload.

Recalibrating Dispensing Architectures

The primary value proposition of the customer's proposed system was its use of digital image processing to move cassette calibration from a manual configuration task to a software and vision-guided workflow.

Traditionally, cassettes must be manually configured according to the precise physical characteristics of each medication. When new drugs are introduced, their corresponding cassettes need to be adjusted, calibrated, and tested.

The customer's system instead used digital image processing technology to measure the dimensions of each medication and determine the appropriate cassette configuration. Using this data, the customer's system could automatically adjust universal cassettes to accommodate different medication sizes.

The BOXER-6647-MTH as a Central Computing Hub

Having established a blueprint for how their solution should operate, the customer set about identifying suitable platforms. They engaged with AAEON's engineering team to discuss minimum platform requirements and identify any issues that may arise when integrating the system with their existing peripheral hardware and control subsystems.

Based on these discussions, the [BOXER-6647-MTH](#) met the project's requirements, while also offering practical benefits such as externally accessible storage drive trays.

Crucially, the [BOXER-6647-MTH](#) could run the application's image processing software while serving as a central hub between cameras, cassette motor controllers, user authentication hardware, and pharmacy network infrastructure.



To this end, a number of the platform's features stood out: its computing performance, peripheral support, subsystem communication interfaces, and industrial-grade reliability.

Intel Core Ultra Compute Foundation

Equipped with an Intel® Core™ Ultra 5 processor 125H and 16GB DDR5 SODIMM memory, the [BOXER-6647-MTH's](#) processing performance was more than capable of the parallel task execution required.

With 14 cores, 18 threads, and combined 33 TOPS at a relatively conservative 28W, the system's SoC could simultaneously run the customer's image-processing software, process image data, and communicate with the cassette's motor-control hardware.

Image Acquisition Channels

The first stage of the automated calibration process was acquiring the necessary image data. For this, [BOXER-6647-MTH's](#) four USB 3.2 Gen 2 ports were used to connect cameras responsible for capturing images of medications for measurement and analysis.

Once this image data had been captured, it could then be sent to the BOXER-6647-MTH for the customer's software to analyze the physical characteristics and dimensions of each medication. These measurements could then be used as a reference for configuring the dispensing mechanism.

Mechanical Control

Once the captured image data was analyzed, the system needed a method to communicate the calculated parameters to the automated dispensing robot's control subsystems. This is where the platform's serial ports came into the equation.

Two DB-9 ports offering BIOS-configurable RS-232/422/485 interfaces were used to send control commands to the cassette's motor-control hardware through RS-485. Based on the parameters received, the relevant mechanisms could then adjust the cassette configuration accordingly.

This linear path from visual data capture and analysis to electromechanical control reduced the need for manual mechanical adjustment, as it established a logical chain through which the cassette configuration process could be automated.

Single-Platform Connection Hub

The BOXER-6647-MTH provided a number of auxiliary interfaces conducive for use as a multipurpose hub.

For example, one of the system's USB 2.0 ports was used to connect a biometric fingerprint reader for user authentication, while its Ethernet ports provided wired connectivity for integrating the unit into pharmacy network infrastructure.

To maintain adequate local storage for the application's software, operating system, medication records, and system data, the [BOXER-6647-MTH's](#) quick-access tray design was particularly useful.



Accessible from the PC's front panel via a single screw, the BOXER-6647-MTH could accommodate both SATA and NVMe SSDs, making data retrieval and storage replacement more convenient.

With these interfaces consolidated into a single industrial computing platform, the BOXER-6647-MTH was able to act as a central point for coordinating the system's vision, control, authentication, and networking functions.

Industrial Reliability for Long-Term Operation

Because the automated dispensing systems would need to operate continuously within pharmacy environments, both reliability and longevity were important. The [BOXER-6647-MTH's](#) reliance on fanless thermal management also eliminated the need for a mechanical cooling fan, reducing the maintenance burden on end users.

Meanwhile, the system's -20°C to 60°C operating temperature and 9V to 36V power input ranges granted additional tolerance for operating condition variations. These characteristics made the [BOXER-6647-MTH](#) a durable option for long-term embedded deployment.

Outside of its hardware specifications, the platform's support for Windows 11 IoT Enterprise LTSC 2024 aligned with the customer's minimum operating lifecycle requirement, given the LTSC release will receive support through the end of 2034.

Business Impact



By combining machine vision with automated mechanical adjustment, the healthcare automation provider implemented an automated dispensing architecture that did not rely on the use of medication-specific cassettes.

With the [BOXER-6647-MTH](#) acting as the central hub between the customer's digital image processing software, the unit's mechanical control

hardware, and central pharmacy-management infrastructure, the customer was able to automate and streamline what was once a repetitive and time-consuming process.

The resulting system offered a number of benefits to the pharmacies in which it was deployed. The first of these was that medication SKU changes no longer meant an increase in repetitive tasks such as manual cassette recalibration.

With respect to medication dispensing itself, the customer's solution proved remarkably efficient, being able to label, count, and dispense prescriptions within an approximate 30-second timeframe.

The unit, able to store over 100 universal cassettes, has also allowed pharmacies to automate calibration for high-volume medication SKUs instead of maintaining a separate cassette for each. In doing so, the customer noted that over 50% of daily prescriptions in community pharmacies can be automated, freeing up an estimated 5 to 10 hours of staff time per week. For pharmacy staff, this meant less time spent managing repetitive dispensing processes and more time delivering patient-facing clinical care.

About AAEON

Established in 1992, AAEON is one of the leading designers and manufacturers of industrial IoT and AI Edge solutions. With continual innovation as a core value, AAEON provides reliable, high-quality computing platforms including industrial motherboards and systems, rugged tablets, embedded AI Edge systems, uCPE network appliances, and LoRaWAN/WWAN solutions. AAEON also provides industry-leading experience and knowledge to provide OEM/ODM services worldwide. AAEON works closely with premier chip designers to deliver stable, reliable platforms. For an introduction to AAEON's expansive line of products and services, visit www.aaeon.com.



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