HOW TO CHOOSE A PASSIVE UHF HANDHELD READER

Ergonomics, read range and battery life lead the list of issues that must be considered when selecting the proper reader for your deployment.

By John Edwards

Mar 30, 2014 - Passive ultrahigh-frequency RFID handheld readers enable companies to track a wide variety of tagged items in locations where it is impractical or impossible to use fixed readers. Some common uses include tracking apparel and jewelry items in stores, performing inventory counts at data centers and storage facilities, improving patient safety at hospitals, locating files in offices, managing assets in the field and monitoring livestock on farms.

As the use cases for passive UHF handheld readers increase, so do the number of different devices being offered by RFID providers. That’s good news for end users, but it means adopters have many factors to consider when choosing a handheld.

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Before you begin considering product features and capabilities, you must first
determine your business objectives and requirements. "Everything depends on
what you’re doing inside of the application, who's doing it and what the
circumstances are," says Steve Halliday, president of RFID systems integrator
High Tech Aid.

Knowing the environment in which the device will be used, as well as the
application involved, will help you narrow down your choices to broad categories
of handheld readers. "Will the readers be used in an industrial setting on a
manufacturing floor or in a distribution center?" asks P.V. Subramanian, Motorola
Solutions’ senior product manager of RFID product management. "Will they be
used for field mobility or by a knowledge worker engaged in a point-of-sale retail
environment?" All of these environments drive very different product
requirements, he notes.

Here are six important issues to consider that will help you evaluate products and
features, so you can make a knowledgeable decision.

**Form Factor, Ergonomics and Usability**

Handhelds come in a wide range of shapes and sizes. Some readers are small
enough to resemble a mobile phone, while others look like a small tablet
computer and still others are shaped like wands or Star Trek phasers. User
controls may consist of a keypad and a display, a touch-screen alone, or no
control mechanism other than an on/off switch.

A growing trend is the UHF RFID "sled," which transforms a smartphone or small
tablet computer into a handheld reader, according to Jonathan Gregory, RFID
program manager at systems integrator OATSystems, a division of Checkpoint
Systems.

Some handheld readers can perform double-duty by serving as ad hoc fixed
interrogators. Such units can be quickly and securely attached to mobile carts,
pallet jacks, skatewheel conveyors and other types of facility assets. This
approach allows a company to use its handhelds for a variety of tasks, as the
need arises. Adaptable readers also provide an easy and cost-effective way to
begin, or expand, an RFID system deployment, Motorola's Subramanian says.

Most industrial and outdoor RFID applications require the use of rugged readers.
"In an industrial environment, you typically want a much heavier duty device,"
Gregory explains. "Some companies even guarantee that their device can
withstand an x-foot drop onto a concrete floor." Many rugged handheld readers
have an Ingress Protection (IP) rating that shows how resistant they are to water,
oil and other potentially damaging substances.
"A unit that has to go outdoors is probably going to live its entire shift period either inside a vehicle or on the belt of the driver or the delivery person," Subramanian states, "so portability and cold weather tolerance are extremely important."

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It is essential to choose a model that is right for the task and appropriate for those who will use it. Give an employee a reader that is the wrong size or weight, or is difficult to use, and productivity will suffer as a result. In fact, portability is one of the most important criteria for selecting a handheld reader. "If you can't carry it around easily, then you won't be very successful at doing what you do," Subramanian says.

"When you start talking about ergonomics," Halliday adds, "it's obvious that holding a lighter, smaller, phone-shaped model is a lot easier for some people than the larger, heavier gun-shaped readers." Retail inventory management, one of the most popular handheld RFID applications, benefits greatly from the use of small, light interrogators.

Handheld reader buyers also should examine the devices for their overall ease of use and practicality, Gregory says. "How many buttons are on the keyboard? Is the keyboard intimidating? How do you control basic functions, such as turning the device on and off, or the display on and off, or making the reader sleep?"

Some handhe olds incorporate touch-screens that feature intuitive menus and icons to support easy-to-use applications. Such devices speed up work and require little training, Gregory says.
**Performance**

Obtaining fast and accurate reads is a goal most handheld reader buyers strive to reach. The read rate any handheld achieves ultimately depends on many different factors, including the type of tags being read, the distance involved, operator skill and the presence of nearby obstacles that can block or reflect signals.

In virtually all situations, however, the type of antenna a handheld reader employs plays a major role in achieving optimal (or even acceptable) performance. Antennas can be linearly or circularly polarized.

Linear polarization provides a longer read range when the tag being read is oriented with the reader’s antenna. "For example, a tag that is aligned in orientation to the reader may [be] read at 10 feet, whereas the same tag turned 90 degrees may only be readable at six feet," Gregory explains. "A series of stacked boxes, or files with papers, may all have the tags aligned in a particular orientation and thus allow a linear-polarized handheld reader to suffice."

A circularly polarized antenna is more effective at reading tags positioned in various orientations, Gregory says. "Applications could span from tool tracking to item-level tagging in retail stores," he states. "There are dual antennas available in some handheld reader models that either combine two linear antennas oriented perpendicularly, or a linear- and a circular-polarized antenna, that offer the best of both worlds."

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—KURT MENSCH
Tag design also plays a role in performance. "Some tags are designed to be orientation-independent, meaning they are optimized for various angles of reading," Gregory notes. "This may be more appropriate for a closed-loop application, given the likely increased cost and size of such a tag."

In general, handheld readers can be organized into two basic categories: short- or long-range devices. Not surprisingly, lower-powered handhelds are usually short-range devices, while higher-powered models are generally long-range units.

Sales floors, loading docks, production lines and other venues where different types of tagged objects exist in relatively close proximity require the use of handheld units specifically designed for short read ranges. "If you're talking about item-level inventory, a read-range within a three-foot span of the item is probably what you're looking for," says Kurt Mensch, Intermec by Honeywell's principle product strategist. "Many customers don't want a range to be much greater, because they don't want to pick up any unrelated tagged items that might be sitting nearby," he notes.

"There's a lot of research and product design going into RFID to create very predictable read ranges," Subramanian says. "If a customer specifies that the read range should be 6 to 12 inches, we work pretty hard to make sure that read percentages drop off sharply beyond that point."

Some handheld readers are designed to support much longer read ranges, Subramanian adds. "If you are in a warehouse with tagged pallets stacked high, for example, it's great to have 15, 20 or even 25 feet of read range."

**Applications**

For frustration-free compatibility with business databases, enterprise resource planning (ERP) and other types of business software, it is important to look for a handheld reader model that is supported with software development kits (SDKs) and application development platforms (APIs). Such tools allow readers to be used with many different types of software from a wide range of vendors.

Many handheld reader vendors, such as Motorola, work closely with application developers to provide seamless integration between software and hardware. "Ultimately, we provide an application development platform, and we have a partner community that has expertise not just in their verticals, but also the back-end software applications that are typical," Subramanian says. "They do the job of connecting the information pipes together."
Battery Life

A handheld reader with a poor battery life leads to downtime and lost productivity. "UHF RFID tends to be very power-hungry, especially when it's performing intensively, so the readers need to be battery-efficient," Subramanian says. "If they aren't efficient, then the user has to go back to fetch another battery, or carry an extra battery in their pocket—these things complicate the entire operation." Battery life is an especially important concern for organizations equipping field workers with handheld readers, he notes, since fresh battery packs or replacement readers may not be readily available.

In all situations, a reader’s battery life must be sufficient to prevent task interruption. "Batteries are typically designed to accommodate a full shift," Mensch states. "In a typical work shift, somebody is going to work eight to 10 hours a day. That person should be responsible after their shift to make sure the reader is dropped into its charging station so it will be ready for its next user." It may take up to two or three hours to charge a battery pack, he notes.

Yet, shift lengths vary greatly, with full shifts in some industries running for as long as 24 hours. Some handheld readers are capable of running for a full day. Wireless Networking Capabilities Wireless capabilities are necessary to rapidly and conveniently feed data into host systems. "Wi-Fi is pretty much baseline for any mobile reader," Mensch says. "Bluetooth is used as well, to support peripherals, but most of the time you're going to connect to your main application via Wi-Fi."
Don Ertel, senior VP of operations at systems integrator CDO Technologies, says, "A Bluetooth connection to a hip printer is something we often see. We're also seeing Bluetooth connectivity to security devices for user authentication." In addition, Bluetooth is sometimes used to connect simple handheld readers to nearby computers.

In the field, where the nearest available Wi-Fi network may be miles away, another wireless approach may be necessary. "If you're far out in the field, then a cellular connection becomes important," Mensch says. If no cellular or Wi-Fi link is available, data uploads will need to wait until a worker moves into an area with some type of network service, or returns to the company's home base.

**Internal Memory**

Depending on the work setting, the amount of memory contained inside a handheld reader can either be an important consideration or a relatively trivial concern. On company property, it is usually faster and easier to send collected data to its host application via a Wi-Fi connection. In the field, however, where Wi-Fi or cellular connections may be either slow or unavailable, it might be essential to equip workers with handheld readers that contain sufficient onboard memory to store an entire shift's worth of collected data.

Most vendors pack their handheld readers with enough memory to meet most users' needs, Halliday says. If a device does not come equipped with enough onboard memory to meet a particular need, extra capacity can often be added quite inexpensively.

"You often have the ability to expand the amount of memory with an SD [Secure Digital] card," Gregory says. "Remember, however, that if you do go with an off-network solution—meaning not Wi-Fi-connected—you could have a risk of compliance issues, such as people forgetting to dock their device [or stealing the SD card], so the favored approach is to have a Wi-Fi-enabled device."

**Cost**

Total handheld reader cost can be tricky to calculate, since the final amount paid will hinge on several factors, including the reader model selected, the number of units being acquired, and the charging stations and other accessories used. Infrastructure improvements, such as network expansions or upgrades, and vendor support services may also play a role in the determining the final price. "There are a wide variety of reasons that can affect the cost of ownership beyond the price tag," Gregory observes.
Still, for most handheld reader adopters, cost is usually a secondary consideration. "Tag costs are the more dominant aspect of any RFID expense," Subramanian says. "If a tag costs 15 cents, and you're doing a million items a quarter, that will very quickly overshadow whatever you may have spent on infrastructure."

Mensch agrees. "Cost, overall, is not as important as having a way to do the task effectively and efficiently," he says. "Cost becomes important only if you're going to deploy thousands of devices."

It's always a bad idea to sacrifice capabilities simply to save money, Halliday says. "In the end, when you're picking a handheld, you're much more likely to be looking at things like form factor, read distance and battery life than cost," he adds. "That's the bottom line."