



Multispectral Imaging (MSI) Fingerprint Technology

What It Is. How It Works. Why It's Critical.
Where It's Used.

In today's connected world, organizations increasingly rely on digital technologies to validate identities for secure interactions and services — banking transactions, medication dispensing, physical and digital access control, government benefits distribution — to name just a few. These are critical transactions, and the organizations behind each one must accurately and reliably authenticate people over and over (and over) with precision to ensure they are who they say they are before services are provided.

To prevent errors, missteps, fraud, financial loss and other looming risks that can lead to damaging personal, company and brand reputation, organizations are turning to a single, secure technology to navigate this identity obstacle course: **biometrics**.

By using fingerprints or faces — conveniently always available and unique identifiers for each one of us — biometrics deliver the highest level of identity assurance.

Multispectral Imaging (MSI): Engineered for Performance

Fingerprint authentication continues to represent one of the most common forms of biometrics as it offers fast, precise confirmation when it comes to proving a person's identity. Yet not all fingerprint readers are created equal. Some are unable to read dry or dirty prints. Some cannot detect fake prints. And some don't provide endpoint security and encryption to protect data passed between the sensor itself and the equipment it is embedded in, such as an ATM. These shortcomings can cause user authentication errors that damage customer satisfaction, company/brand reputation and customer retention — even triggering a PR crisis that's preventable.

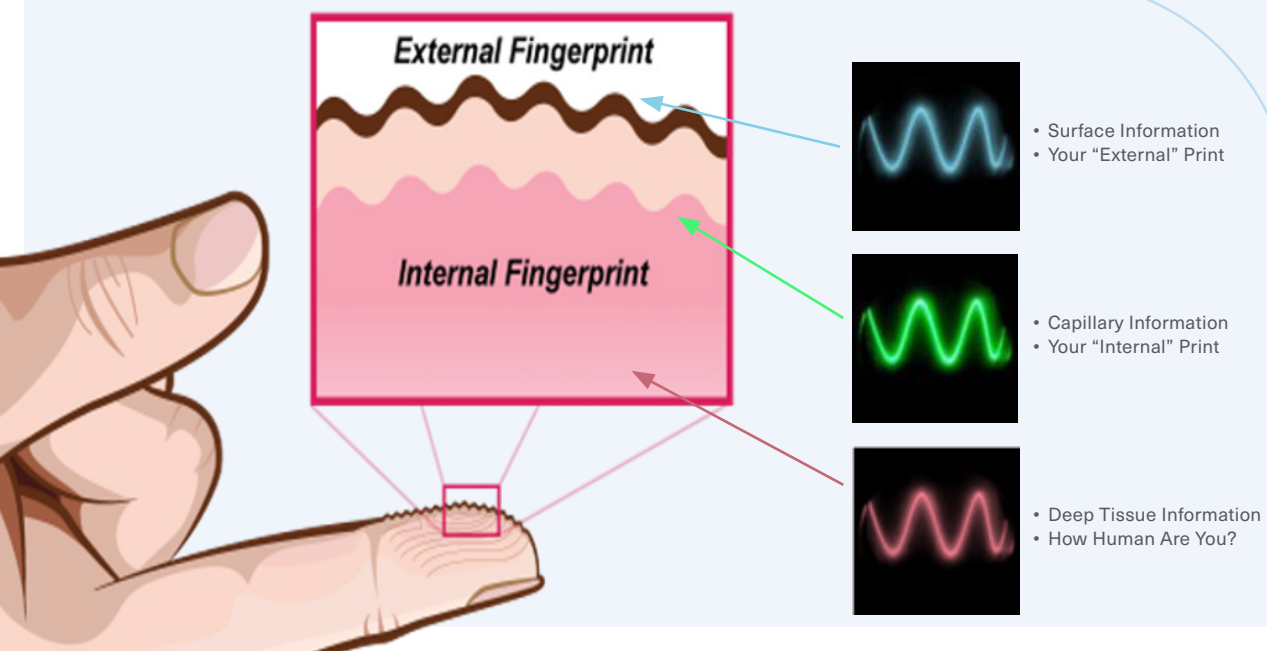
Multispectral imaging (MSI) fingerprint readers excel as the best-in-class capture technology of choice providing utmost levels of usability, security and durability for mission-critical environments. This advanced fingerprint technology not only is backed by rigorous testing and global standards, but also already has a proven track record worldwide in handling billions of transactions each year.

This white paper will discuss MSI fingerprint technology: what it is, how it works, why it's critical for some organizations to deploy this type of elite biometric authentication technology, and where it is used to help solve business needs while strengthening a company's trusted reputation.

What Is MSI?

Multispectral imaging (MSI) is a patented HID technology that **collects fingerprint surface and subsurface data**. It uses advanced optical technology to reliably capture fingerprint images using multiple colors of light projected into the finger from different angles. This unique approach consistently captures high-quality images better than other fingerprint devices in "real-world" conditions.

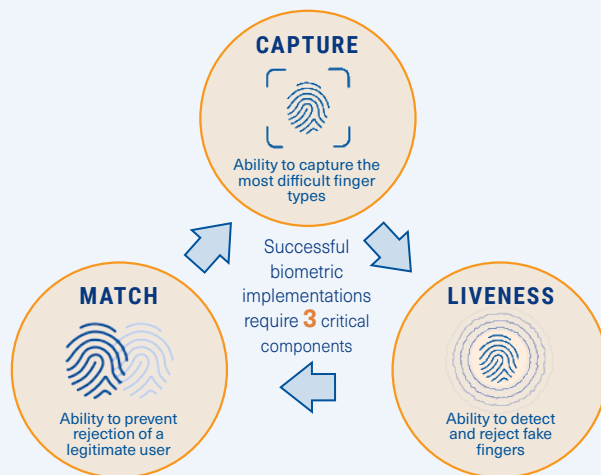
By capturing both the "external print" on the skin's surface and the "internal print" or subsurface capillary information, MSI significantly improves usability and confirms liveness of the person and their unique fingerprint.



How It Works: Let's "Point" Out Three Factors

To see if a fingerprint authentication system measures up to your risk tolerance, look at the options through this lens: does it authenticate a person with convenience, reliability and security? And, quite simply, can the technology do the following three things successfully?

1. **Capture** biometric details reliably from difficult finger types and in harsh environments.
2. **Detect liveness** to identify and reject fake finger attempts.
3. **Match** legitimate users with accuracy while rejecting fake or illegitimate users.



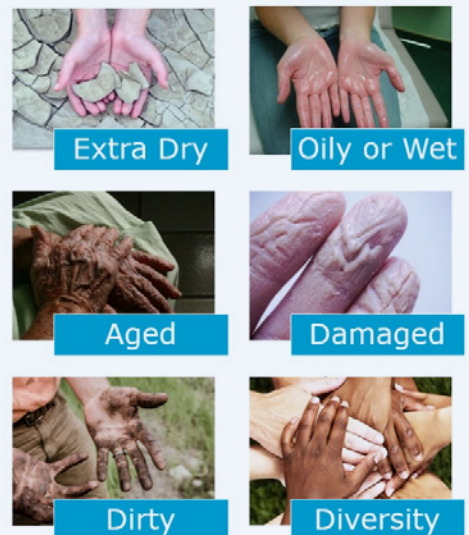
CAPTURE: ACCEPTING ALL FORMS OF LIVE FINGERS!

Like traditional optical fingerprint sensors, MSI readers use light as part of the fingerprint image capture system. However, the physics of how light is used in MSI technology is far more advanced, enabling more reliable fingerprint image capture when compared to other sensors.

First, MSI uses different wavelengths (colors) of light whereas optical fingerprint sensors use only one wavelength to read only at the skin surface level. With MSI, images from different light colors taken at different angles and different depths within the finger are combined into a single, high-quality fingerprint image.

This is done in normal and difficult environments, for instance when water or dirt are on the sensor, strong external light such as direct sunlight is involved, or when working with dry, damaged or wrinkled fingertips. In these conditions, MSI delivers a clear, usable fingerprint image substantially better than other technologies.

The different colors of light from MSI sensors penetrate human skin to different depths. This enables an MSI sensor to capture data not only on the surface of the finger, but also at the subsurface details.



What lies below the surface is important for usability and security. A fingerprint's surface is made up of ridges and valleys, like waves in water. Each person has a unique pattern to their fingerprint ridges, and what sits on the top layer is mirrored by the internal capillaries below the surface. Collecting and combining surface and subsurface fingerprint images deliver a more reliable and effective fingerprint capture system.

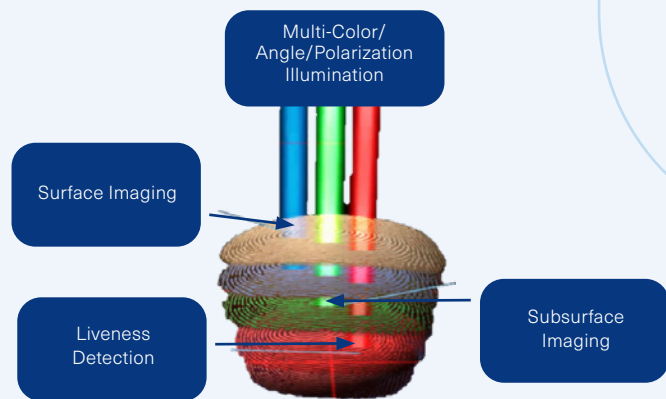


LIVENESS DETECTION: IS IT REAL OR FAKE?

The second important criteria for an effective fingerprint biometric system is to determine if captured fingerprint data is real or fake. This is known as liveness detection or presentation attack detection (PAD).

The ability to capture both surface and subsurface details of a finger is what sets MSI apart from other fingerprint sensor technologies, because it offers the highest level of liveness detection, and has achieved the highest level of ISO PAD validation of any fingerprint technology on the market today.

MSI uses multiple light colors to collect surface and subsurface images. Blue light collects the surface data. Red and green lights collect the subsurface data. By adding this additional “below-the-surface” fingerprint data, MSI devices can confidently confirm liveness.



A good demonstration is when you take a light and hold your finger over it. You can see the red light penetrate deep inside the fingertip — reminiscent of E.T. and his glowing extraterrestrial finger!

MSI technology takes a similar approach to confirm liveness by sending light into the finger's surface at different angles, using different colors to detect whether the finger is real or fake. These multiple raw images are converted into a single grayscale image for enrollment and matching purposes. This allows MSI solutions to stop illegitimate users from trying to trick the system — using materials from gelatin to latex to prosthetics.

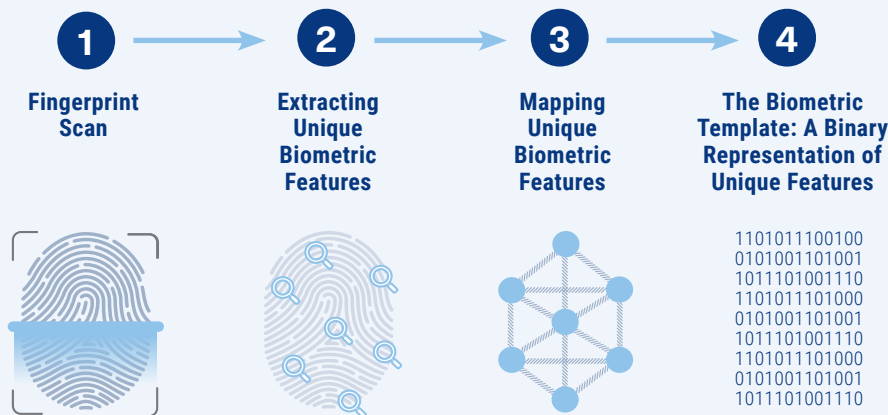


A fake fingerprint spool created at Michigan State University to test fingerprint scanners.
Image Credit: Michigan State University.

MATCHING: THE PROOF IS IN THE MINUTIAE

The third important criteria for fingerprint biometrics is to ensure the collected data matches the data provided when a person is enrolled or registered into a system/program. There are several different types of fingerprint algorithms available today.

One method with extensive independent testing by NIST (National Institute of Standards and Technology) is the minutiae standard and NIST's MINEX or Minutiae Interoperability Exchange. For this fingerprint matching method, a carefully defined set of specifications delineates what data is captured from a fingerprint image and stored into a fingerprint template for later matching to validate that a person is who they claim to be. MSI technology uses a top-ranked MINEX algorithm, ensuring high accuracy and strong interoperability with other fingerprint devices and systems. The diagram below shows this basic flow, where the mapping of unique biometric features is where the minutiae data is extracted from the fingerprint data.



Why It's Critical: Have a Secure System on Hand

In addition to the capture, liveness and matching requirements of a fingerprint biometric system, security is also vital. HID's MSI sensors incorporate sophisticated endpoint security technology to encrypt data to and from the device using FBI-certified encryption algorithms.

If a hacker gains access to these MSI devices, the technology contains tamper-detection features that erase the on-device encryption keys to prevent fraudsters from capturing and decoding protected data. With endpoint security, MSI reduces the risk of enterprise-wide ransomware and malware attacks.

HID's MSI fingerprint readers are also thoroughly tested and certified by third-party [ISO PAD testing](#) to the ISO 30107-3 standard, and proven to detect and reject presentation attacks with results unmatched by other fingerprint technologies.



Where It's Used: Keeping the Upper Hand

There are many well-documented use cases where MSI fingerprint readers have been successfully deployed to solve real-world challenges and protect businesses. A handful to highlight include:

BANKING — ATM SECURITY



MSI fingerprint technology has been widely deployed in public-facing ATMs, with Brazilian banks leading the way. Over the past decade, more than 85 million banking customers across Brazil have enrolled in bank ATM security offerings. The country relies on MSI readers to authenticate users and conducts over 4 billion ATM transactions each year with MSI technology that truly works!

Banks in Brazil compete for customers by offering services that are quick and secure — including fast and simple ATM access.

Banks also require a highly secure solution to prevent fraud. Many fingerprint authentication technologies were tested for their ability to capture the user data easily and reliably, to ensure fake fingers were rejected, and to confirm that the captured data matched the enrolled user. After extensive testing, HID's MSI fingerprint readers were selected and deployed.

The project was a success, and customer acceptance was so high, that MSI readers were selected by all but one major bank across the country, making it the standard for convenient and secure customer authentication at ATMs throughout Brazil.

GOVERNMENT — BENEFITS DISTRIBUTION



Fingerprint readers from HID power some of the world's largest biometric identification systems to support governments in identifying citizens, and to enable those citizens to easily prove who they are in order to collect their rightful government benefits and services. A simple press of a finger is all that's required to confirm identity and provide aid.

MSI sensors work reliably across a range of outdoor circumstances to reach civilians living in urban or rural, remote areas — and they perform in challenging environments

including dust, sunlight, heat and moisture — capturing fingerprints for people of all backgrounds and under diverse usage conditions.

Many countries need solutions to authenticate large populations that cannot read or write, and individuals who are unaccustomed to working with computers and technology. In Argentina, banks leverage HID MSI readers to authenticate fingerprints from elderly citizens to distribute pension payments — confidently and securely administering more than one million government-issued pensions each month to registered citizens.

HEALTHCARE – MEDICAL DISPENSING



Biometrics is a solid remedy for many applications across the healthcare spectrum, and MSI fingerprint technology has strong traction particularly in the area of medical dispensing. Given the shift to telehealth and the Great Resignation over recent years, this field is experiencing a lot of employment changes — from new hires, transfers, temps, contractors, consultants and more. Many different people have access to controlled substances.

To prevent theft and seamlessly comply with regulatory requirements (HIPAA, JCO, DEA-compliant EPCS, FDA regulations and more), healthcare needs accurate authentication and an audit trail to confidently capture and record prescriber/clinician identity. In addition, MSI is extremely important for proper patient identification to ensure absolute patient safety. Dispensing drugs to the wrong patient could result in fraud or even a life-threatening situation.

ENTERPRISE – TIME & ATTENDANCE



Another successful use case for MSI fingerprint technology is time and attendance applications, where workers clock into and out of work.

Many of these systems are deployed in harsh environments such as factories or outdoor sites including mining or construction. At these locations, sensors often get dirty and must endure rain or strong sunlight, while staff often have gritty or damaged fingers. MSI fingerprint readers can authenticate employee

identities and ensure accurate time and attendance tracking, thereby delivering significant savings by preventing payroll fraud tactics such as “buddy punching.”

GOVERNMENT – BORDER SECURITY



Areas handling high human throughput must have extraordinary security tools to best protect the homeland and patriots working to fortify its borders.

Having top-notch biometrics tools, like MSI fingerprint readers, drives efficiencies not only for those overseeing important boundaries, but also for the citizens and visitors moving back and forth across them.

For example, one country in the Asia-Pacific region deployed HID’s MSI fingerprint technology to oversee more than 650,000 people who cross their borders daily. MSI provides best-in-class authentication accuracy that’s essential to manage the good, the bad and the ugly when it comes to monitoring large numbers of people transitioning between countries.

Shining a Light on Remarkable Readers

Decision-makers will need to strike the right balance between investing in high-end fingerprint reader technology like MSI versus relying on less robust devices that are more appropriate for less critical circumstances. MSI readers are designed to deliver supreme security and fingerprint capture capabilities to support use cases where accurate ID confirmation and authentication are a must.

Another factor to consider is the physical size of multispectral fingerprint sensors: they are ideal for ATM machines but perhaps too big for laptops or mobile phones, for example. If size and cost are obstacles, users can choose from the many other HID fingerprint and card readers to suit their authentication needs.

Advanced MSI biometric readers continue to evolve and deliver new possibilities to protect and support businesses. In summary, some of the benefits include:

- ✓ Authenticate with ease and high accuracy
- ✓ Read both surface and subsurface fingerprint data
- ✓ Able to capture prints from fingers in the most challenging conditions (dirty, dry, wet, damaged, wrinkled, etc.)
- ✓ Perform in harsh environments (direct sunlight, darkness, cold/hot temperatures, rain, etc.)
- ✓ Detect liveness and reject fake fingers, preventing identity fraud and theft
- ✓ Offer endpoint security, reducing the risk of enterprise-wide cyber attacks
- ✓ Safeguard premises, systems, networks, user data and valuable goods or substances
- ✓ Protect corporate reputation and mitigate financial losses

Interested in learning more about HID's patented MSI technology and how it can fortify your business? [Reach out](#) to one of our experts.

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