



Bring Semiconductor Tools to Modern SECS/GEM Communication Standards

Strategies for addressing future
challenges with practical expansion
and modification

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WHITE paper

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Obsolete middleware can bring a modern fabrication line to its knees

Fast, reliable equipment-to-host communication is a critical part of the modern manufacturing process. For companies in the semiconductor, flat panel display (FPD), photovoltaic, and light emitting diode (LED) industries, this communication is often based on two protocols that define equipment behavior and capabilities: the SEMI equipment communication standard (SECS) and the generic equipment model (GEM).


Since programmable logic controllers (PLCs) had limited computing resources, manufacturers have typically installed the software, recipe libraries, and tools they use to communicate with SECS/GEM-compliant equipment on a middleware gateway platform (normally a stand-alone personal computer or “black-box” device running some version of the Microsoft Windows or Linux operating systems).





Contents

- 4** SECS/GEM-compliant equipment
- 6** Replacing old tech with solid-state
- 8** Controlling processes without complex programming
- 10** Summary

A close-up, angled view of a silicon microchip, showing its intricate circuitry and various components. The image is partially obscured by a white overlay on the right side.

SECS/GEM-compliant equipment

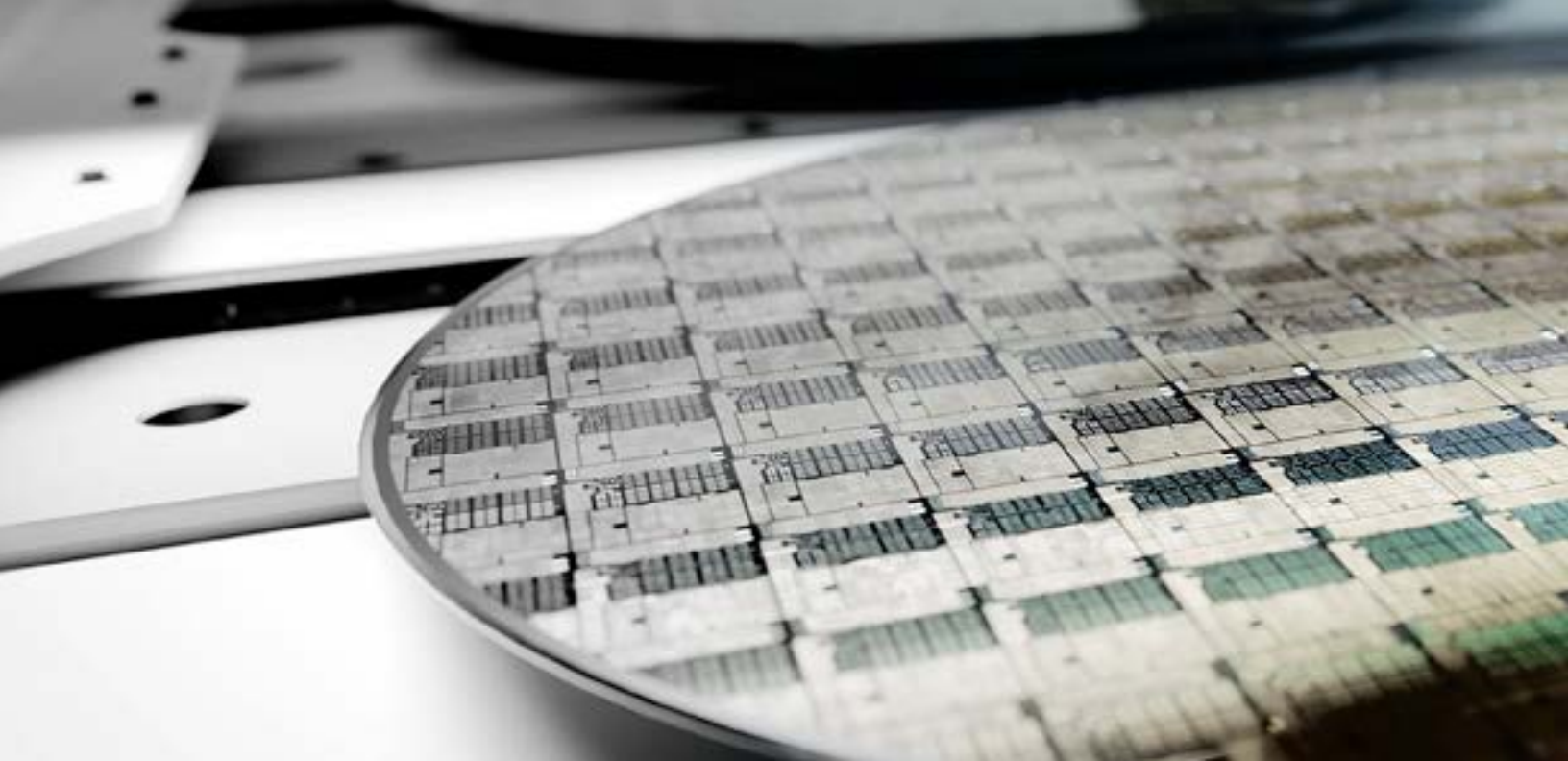
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Fast, reliable equipment-to-host communication is a critical part of the modern manufacturing process

If PCs are used, these are usually off-the shelf units that are not designed for production environments. While black boxes may be more robust, they often have to be returned to the provider for service. Both types of middleware are generally custom solutions that require extensive knowledge of the SECS/GEM protocols as well as require regular anti-virus and operating system updates.

When this middleware fails and shuts down production, a manufacturer can experience an

extended outage and lose thousands to millions of dollars of revenue. Service often is complicated because the device's components, operating system, and onboard software will become obsolete long before the life of the machine. Only specialized programmers with a unique combination of knowledge and automation experience can repair or replace the device and its program to bring production back online. In extreme cases, solving this type of problem can take days or weeks.



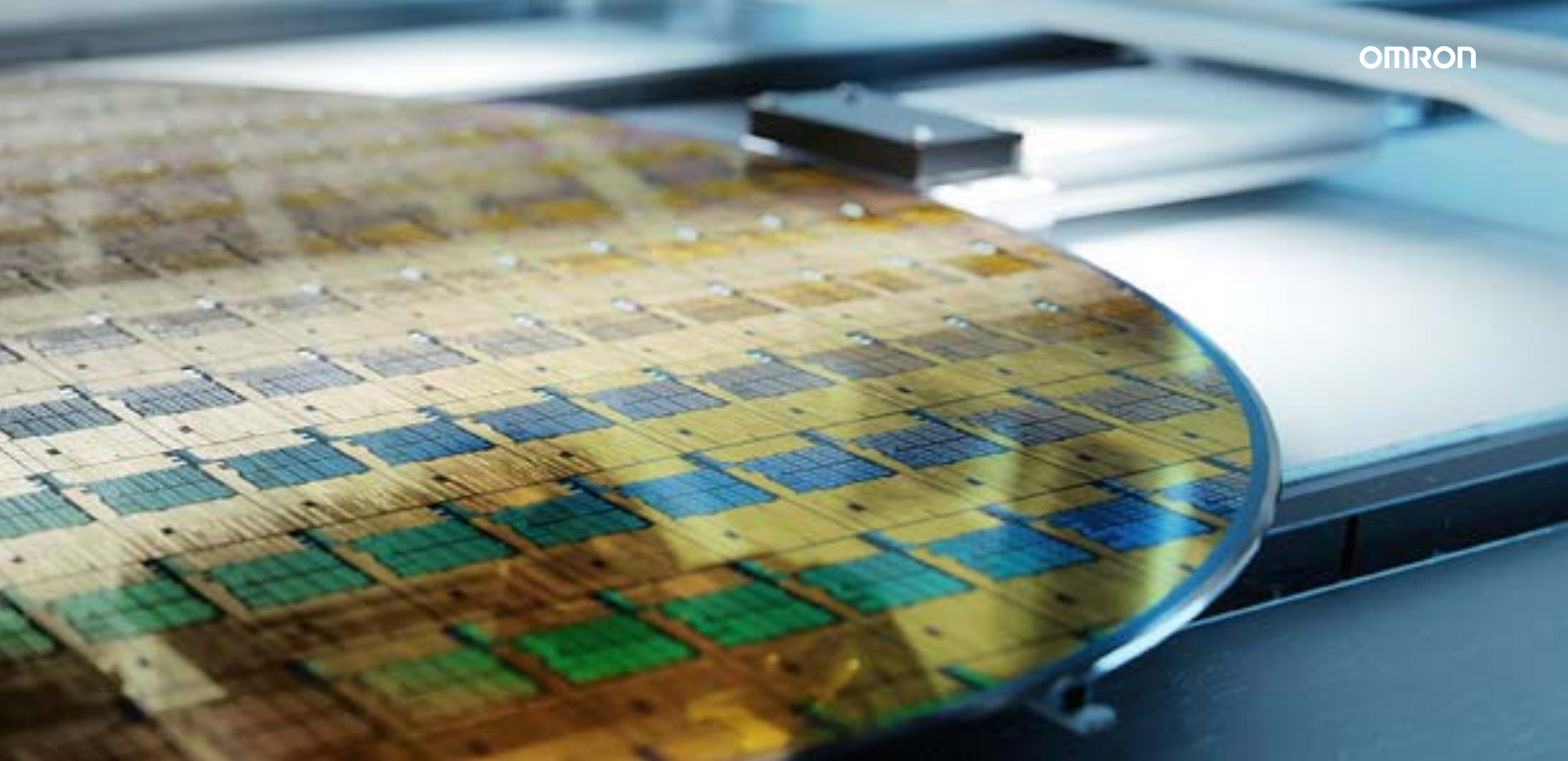
Replacing old tech with reliable and industrial controls



“Old middleware is the Achilles heel of many otherwise state-of-the-art manufacturing environments,” says Nick Infelise, Omron’s in-house semiconductor expert. “Omron developed the Sysmac NJ series SECS/GEM automation controller because our customers needed a simple, fast, and affordable way to ensure that the factory machines can communicate with their host systems.”

The NJ SECS/GEM machine automation controller is designed to last as long as the machine it is supporting. It uses an industrially hardened processor and a solid-state drive to integrate

machine control and SECS/GEM communication functions. The processor is powerful enough to interface over Ethernet (or EtherCAT with up to 192 peripherals), including servos, input/output modules, vision sensors, and inverters. The entire device is housed in a compact enclosure that contains no cooling fans, spinning hard drives, or other moving parts. By combining these qualities with superior heat dissipation and vibration resistance, Omron has created a hardware controller that is extremely reliable even under harsh production conditions.



“Old middleware is the Achilles heel of many otherwise state-of-the-art manufacturing environments”

Business Need Many semiconductor, FPD, and LED plants use obsolete middleware to enable SECS/GEM communication. Middleware failure potentially can disable a production line for days, weeks, or months. Omron’s NJ SECS/GEM solution provides a more reliable, easy-to-configure solution for connecting backend equipment to host systems.

Unique Solution Omron’s NJ501 SECS/GEM machine automation controllers are designed for production environments. Without needing to be SECS/GEM experts, onsite process engineers can commission the device up to 60 percent faster than comparable middleware systems.

Customer Benefits With our extensive product portfolio, Omron is able to provide a complete solution from sensing through to logic control and communication. With Omron’s NJ SECS/GEM solution, customers are able to implement a compact solid-state control device that is designed for harsh production environments and the life of the machine. Omron’s intuitive SECS/GEM Configurator tool within the Sysmac Studio environment allows on-site staff to set up the device using libraries of standard variables and symbols.



Controlling processes without complex programming

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Making the transition a step at a time

Omron's NJ SECS/GEM solution is suitable for a wide range of manufacturing applications. Eliminating handshakes and other intermediate steps between multiple systems improves efficiency and performance. Just as important, process engineers do not need to be SECS/GEM experts to commission or modify automation programs. Omron's SECS/GEM Configurator software enables these operators to quickly enter parameters for the controller using a database of common variables and symbols. The full Omron Sysmac Studio software suite also is available and provides an integrated development environment (IDE) for writing and inserting structured text directly into ladder programs.

"Creating an automation program in a traditional environment can be a six-month process even when you have experienced SECS/GEM consultants," says Infelise. "With the SECS/GEM Configurator, setting up the NJ controller is intuitive. A factory's own staff can set up a new device 60 percent faster since they do not have to enter complex address settings, management parameters, or complex C programs."

The software's ease of use means that workers on the plant floor can make small changes to an NJ controller's program when needed with little or no impact on production.

The Omron's NJ SECS/GEM solution supports all three GEM control states: offline, online/local, and online/remote. This flexibility makes it ideal for applications ranging from simple data collection to monitoring and control. It also enables plant operators to gradually transition from old middleware while integrating the new devices as production schedules and budgets allow.

"Production environments are very complex," says Infelise. "Plant operators will ideally begin replacing old middleware before it fails. With the NJ controller, they often choose to begin realigning their production lines by using the device for system monitoring." Because setting up the controller for monitoring is so easy, the plant only needs to install an economical digital I/O to create connectivity between the controller and associated plant equipment.

"The NJ controller offers an affordable way to remove the weak link in modern production environments," says Infelise. "Building the SECS/GEM protocols into the controller creates an elegant solution for saving engineering time while improving efficiency."

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Summary

Learn more about Omron Solutions

Omron Automation is a leading global provider of machine safety and automation solutions with more than 90 years of service experience in the controls and sensing business. Our customers can rest assured the automation strategy developed will meet the needs of today and include pathways for practical expansion and modification to address the many challenges of the future. Learn more at automation.omron.com.

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Empowering people through automation

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