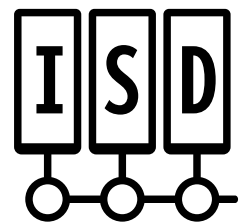




## The 5-Step Guide to Designing a Better Machine Safety System

Using In-Series Diagnostics from Banner

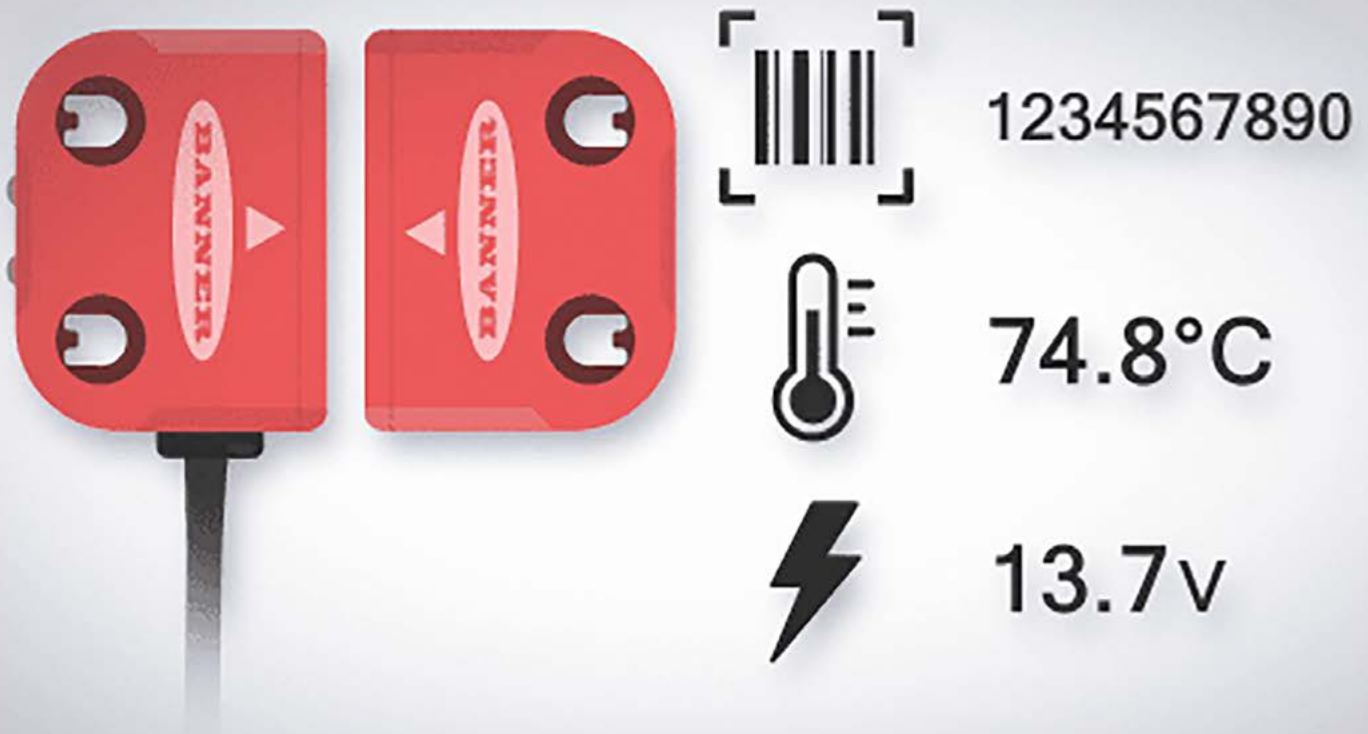


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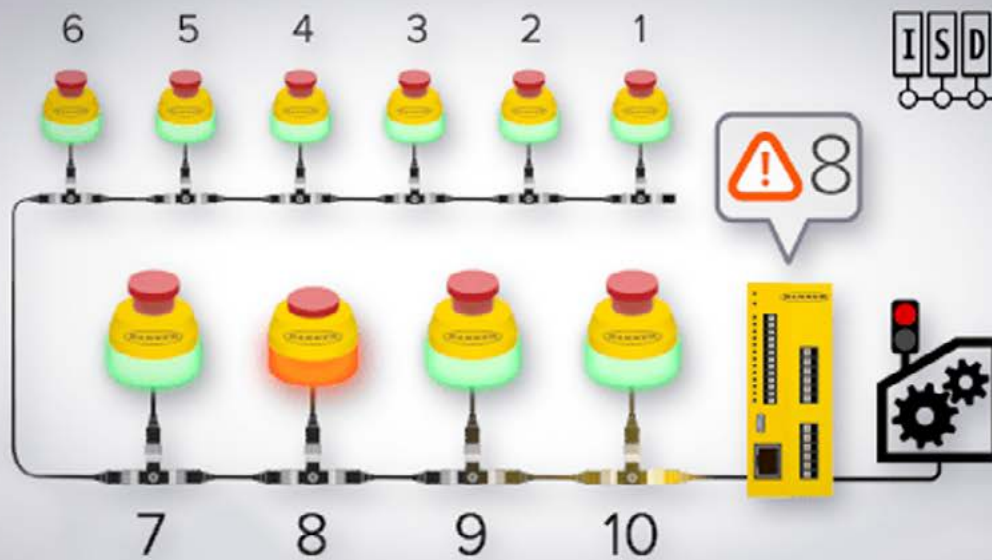
Whether you are trying to get better diagnostics from your equipment, simplify wiring, reduce control hardware, or streamline inventory, this guide will help you through the process. Follow these five steps to get started, and when you are ready, a Machine Safety expert from Banner can answer any questions you have.

- 1** Start with More Intelligence at the Device Level
- 2** Create Networks Instead of Cable Runs
- 3** Consolidate I/O Points on the Safety Controller
- 4** Use a Free and Simple Programming Tool to Simulate and Deploy Your Safety Logic
- 5** Provide Machine Operators, Maintenance Staff, and Supervisors with Actionable Data



## 1 Start with More Intelligence at the Device Level

Typical automation safety devices, like emergency stops (E-stops) and door switches, do not tell you much more than whether they are pressed or not pressed, or opened or closed. Banner has solved this by creating a technology called In-Series Diagnostics (ISD). ISD gathers intelligence at the device level, which can include the device ID, device health, voltage, and temperature. Additionally, ISD safety switches will provide a notification if they are not aligned properly. These devices require no extra setup to use. Non-ISD devices can be incorporated into the ISD chain using the convenient ISD Connect product, which provides a tee connection for wiring the device.



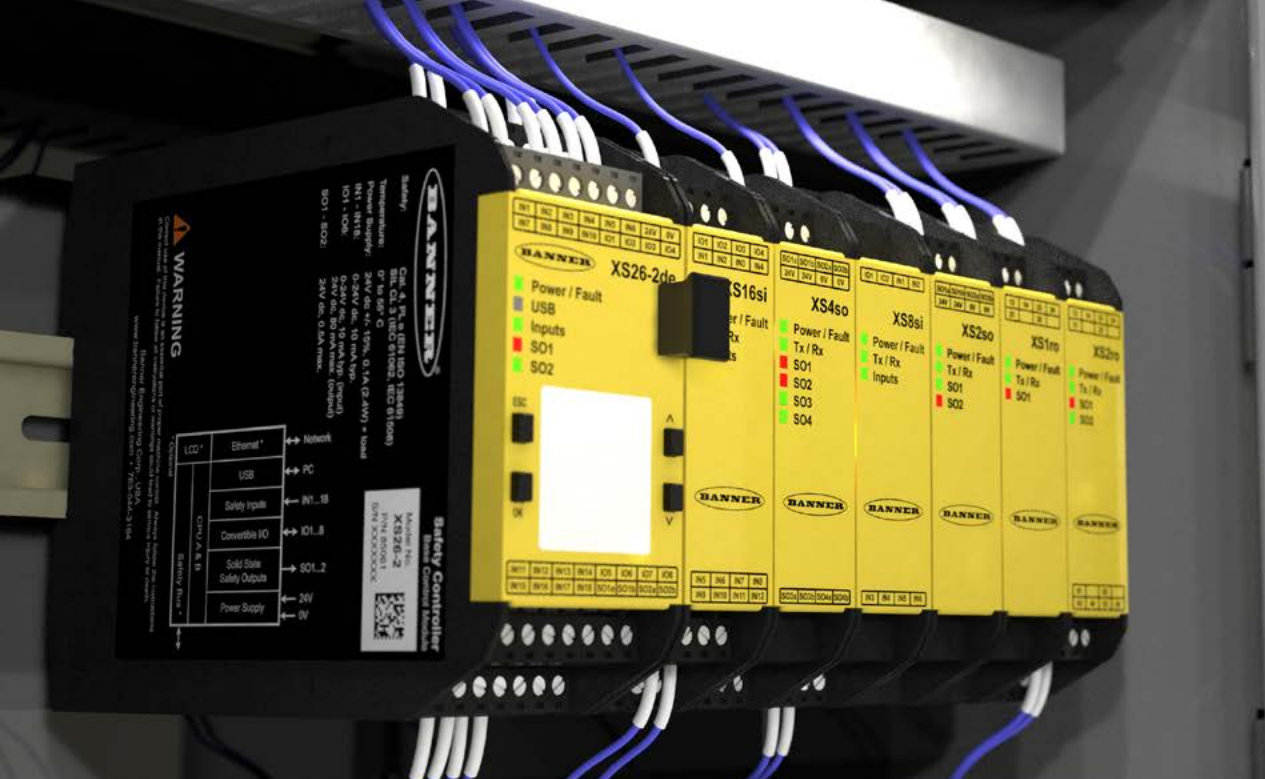
## 2 Create Networks Instead of Cable Runs

Now that you have intelligent safety devices throughout the automated production environment, you can simplify how they are connected. This is a key step, as it reduces the amount of wiring you will need when you build your equipment; it will also reduce the amount of I/O you need on your safety controller.

When you design a machine safety system without ISD, you generally make the following decision: will you run individual cables back to your safety controller to have diagnostics on each device, or will you simplify the wiring by daisy-chaining cables together? Running individual cables from each device adds complexity, cost, materials, and time to your build, and traditional daisy-chaining sacrifices your ability to determine which device is stopping your machine.

With ISD, you can have the best of both worlds, without the disadvantages. Because you now have intelligent devices that each have a unique ID, you can daisy-chain them together and still know which device is actuated, both preserving a simple wiring layout and improving the diagnostics of your machine safety devices. You can link up to 32 devices on one ISD chain, using standard 4-pin serial cables.





### 3 Consolidate I/O Points on the Safety Controller

To monitor the status of a non-ISD device, you need to assign it a unique I/O point on your controller. Having this information is highly valuable, as it can simplify troubleshooting to know which exact device is causing the machine stoppage. However, this generally requires an excessive number of I/O connections. You have probably seen scenarios where safety controllers and/or PLCs require additional expansion modules to accommodate this extra I/O. However, with ISD, you are consolidating I/O, because you can monitor 32 devices on one chain with only two wires connected to the safety controller. This has the benefit of reducing the amount of hardware in your control cabinet, but reducing I/O also simplifies inventory, requiring fewer part numbers to build a machine safety system.

Banner's SC10 Safety Controller/Relay Hybrid can support two independent ISD networks (64 devices total), while the XS26 Expandable Safety Controller can support eight independent ISD networks (256 devices total). This is possible because intelligent safety devices provide detailed, uniquely identifiable information over a simplified network of cabling, compared to traditional machine safety systems.



## 4 Use a Free and Simple Programming Tool to Simulate and Deploy Your Safety Logic

If you want an easy-to-use, full-feature programming tool for your machine safety system, without software license fees, then you have come to the right place. Banner's safety controller programming tool provides an intuitive function-block method of developing the logic for your system. Simply drop in the devices you want to use in your system (e.g., ISD chains, safety light curtains, virtual reset buttons from an HMI), add the logic blocks (e.g., and, or), and then connect the outputs to complete the system. Banner includes a simulation tool that makes it easy to pre-test the logic you have developed. (Download the free [Banner Safety Controller software](#) to try it out.)

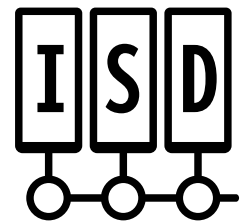
The XS26 includes a new feature called AutoDetect ISD, which reduces system setup to just a few mouse clicks. At system power-up, the XS26 identifies all ISD devices connected as a baseline and reports any changes to the PLC. This feature also supports dynamic safety applications such as AGVs with removable carts/trailers or temporary subassembly stations on a production line. An export-tag feature creates a file for all tag values that can be imported to the PLC.

Data from your ISD devices and other elements of the safety controller can be sent over a variety of industrial Ethernet protocols (Ethernet/IP, ProfiNet, Modbus TCP), so the controller can interact with other parts of the machines. Once you finalize your machine safety program, Banner makes it easy to upload the file to many devices. Simply use the SC-XM3 external memory drive to create a copy of the file, and then load it into as many controllers as you need. This is highly beneficial for OEMs that build large runs of similar equipment.



## 5 Provide Machine Operators, Maintenance Staff, and Supervisors with Actionable Data

While ISD can greatly simplify your machine safety system, this technology also provides continual value for the life of your equipment. When you have data on which E-stop is pressed, which door is open, or which door switch might not be properly aligned, you can share this insight with machine operators, maintenance staff, and supervisors. This data can be transmitted over industrial Ethernet to an HMI display, helping machine operators easily troubleshoot reasons why a machine may not be starting. Maintenance teams in a central area can get automated notifications about the potential issues and receive precise information about which part of the machine to look at first. Lastly, supervisors can add diagnostics to online dashboards that help reflect the number of stoppages, the specific parts of a machine or factory floor that require more attention to prevent downtime, and other useful metrics.



## Actively Monitoring Device Data Improves Safety and Productivity

Ensuring your team's safety is a top priority. That's why Banner's In-Series Diagnostics technology operates at the highest level of safety, with interconnected ISD devices achieving Category 4, PL e, and SIL CL 3 ratings. But ISD also adds considerable value. It provides device-level intelligence for keeping your machine safety system running smoothly, with precise data for troubleshooting if stoppages occur. The system also saves time by simplifying cabling into branching networks that reduce I/O points on ISD-enabled safety controllers. Setup time is further reduced with easy-to-use drag-and-drop programming software. Real-time system diagnostics information enables timely maintenance and data analytics for insight-driven decision making. All of this adds up to keep machines running safely, efficiently, and with reduced downtime.

For more information about ISD, please visit [bannerengineering.com](https://www.bannerengineering.com).



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