



REAL TIME AUTOMATION



AS-Interface

In Thirty Days



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Introduction

Replacing simple sensors and actuators with AS-Interface (AS-i) sensors and actuators is one of the hottest trends in automation today, and for good reason. AS-i, already a worldwide de facto standard for simple I/O networking, is quickly becoming a US standard too. Its potential to cost-effectively replace the rat's nest of wires that permeates most industrial sites is tremendously appealing across many industries. Of the available low-level sensor/actuator replacement networks, AS-i offers the highest performance at the least cost.

Due to its roots as a Siemens network, AS-i already enjoys the enthusiastic support of the Industrial Automation community in Europe. Now many automation vendors in the US are becoming attracted to its high speed, power on bus, simplicity of operation, and insulation displacement wiring system. With Control Engineers increasingly more comfortable with a stratified networking system, AS-i is the perfect solution for the lowest level in the network architecture, those simple, low-level sensors and actuators that consume the majority of installation, startup, and ongoing troubleshooting expenses. Quite frankly, with the growth of AS-i networking, for many automation vendors it is now a mistake to *not* support AS-i.

Important Questions

Once you decide that your products must support AS-i, the big question becomes “how can I get it done and get it done quickly”?

Do you have excess Engineering resources to commit to the project? Can your existing opportunities and customers for AS-i be put off until next year? Is your engineering staff intimately familiar with the technology? Are they experienced in the somewhat complex minefield of device-id selection? Do you have the PLCs, tools and physical resources to thoroughly test an AS-i solution?

If you're having difficulty with any of these issues, then this paper is written for you. It details the technical information you need to know and gives you practical steps for adding AS-i to your existing product in the next 30 Days.

Overview

AS-interface is an intelligent cabling system designed to replace the discrete wires that link a Programmable Controller with sensors and actuators. AS-i provides a single cable system that is fast, easy-to-wire, and easy-to-operate. Built for the simplest types of devices, AS-i is a Master-Slave system where a single AS-i Master can exchange I/O data with up to 62 AS-i Slave devices. Each Slave can transfer up to four inputs and four outputs on a bus cycle.

AS-i is a standard hardware and software bus system that brings the reality of truly open systems to the lowest level of the automation business. Your customers are not just asking for connectivity at all levels of the control system, they absolutely expect and require it. *Over 11,000,000 AS-i devices are now deployed worldwide.* If you aren't already in this game, your competitors may already be a step ahead of you.

For specific information about AS-i, see Table 1.



Table 1 — A Technical Summary of AS-i

Maximum Number of Nodes	31 in traditional systems, 62 in V2.1
Number of I/O Points	248 I/O points (4In, 4Out per node) in V1.0, 434 (8In, 3Out per node) in V2.1
Maximum Cable Length	100m without repeaters, 300m with repeaters
Power	24VDC
Medium	Unshielded 2 wire cable for both power and data
Wiring Technology	Insulation displacement for speed and ease of installation.
Topology	Tree Structure
Typical Data Rate	All 31 nodes can be interrogated in 5msec. 10 msec for 62 node systems.
Error Detection	The AS-i master automatically detects invalid slave transmissions and schedules repeats
Configuration	Slaves are automatically configured with a Slave Address by the Master or a Programming Tool. Masters can interrogate the network to identify connected slaves or receive an external list of slave addresses.
Addressing	Each slave gets a specific address set by the AS-i Master or Programming Tool
Master-Slave Operation	A Master polls each slave sequentially and awaits a response.
Hot Swap of Slave Devices	Supported
Multiple Master Operation	Not Supported
Troubleshooting	AS-i Masters automatically monitor system voltage levels and slave operation and report this data to the controller.
PLC Programming	No special knowledge of AS-i bus or device structure is required to program a PLC to use AS-i bus data. AS-i data is simply remote IO data to the PLC.
Discrete Device Support	Supported
Analog Device Support	Limited support in V1 and V2.1 using multiple bus cycles (12-bit analog across five bus cycles)



Advantages

The first attraction to AS-i is its low cost. Cost savings are typically 15% to 40% of other bus systems using traditional cabling methods. Plus, the ongoing additional benefits of a bus system ensure enhanced operation and improved maintenance which reduce life cycle costs while improving product quality because of better performance and less downtime.

Second, the speed of AS-i attracts a lot of attention. Connected slaves are polled in turn by the AS-i Master. A V1 network (31 devices) provides a maximum response time of 5mS per I/O point. In practice, most systems have fewer than 31 devices and the cycle times can be significantly shorter. The newer, extended AS-i bus with 62 devices provides a maximum response time of 10msec per I/O point, still much faster than the data acquisition and logic scans of most Programmable Controller systems.

Third, AS-i is inherently deterministic and repeatable. Transmissions between the master and slave are predefined and cyclic. The time to set an output is calculable with great accuracy.

And there are other attractions to AS-i including a simplicity not found in any other industrial network, device power right on the network cable, and no need for Master or Slave Programming. There are no system parameters to set and devices are configured simply by identifying their device ID to the AS-i Master.

AS-i is a very important technology, not only because it addresses the lowest level of a control system architecture, but also because it is backed by Siemens, the worldwide leader in Industrial Control. This gives it an automatic advantage in the marketplace. AS-i will be successful for many of the same reasons that systems like DeviceNet have been successful; strong momentum and the backing of a vendor with a huge installed base.

Competition

AS-i cannot be compared to Sensor bus networks like DeviceNet, Profibus, and Interbus-s. All these bus systems are more costly, support more generic communications, provide advanced diagnostic functionality, and are highly configurable. These systems support very sophisticated, intelligent devices with tremendous data capabilities. Devices like drive systems, HMIs, barcode readers and the like couldn't find a home on AS-Interface.

How to implement AS-i quickly & effectively

Once you've made a decision to add AS-i connectivity, you have a number of ways to proceed. The choices vary in time-to-market, supportability, resource requirements and price.

1. Use an off-the-shelf Serial Gateway

An off-the-shelf serial gateway is the least economical approach with the fastest time-to-market. To implement a serial gateway, your product must support a common serial communication protocol like Modbus, DF/1, or even dumb ASCII. Data from your product will transfer to the gateway at serial baud rates (1200-19200).

Other than time-to-market (typically a week or two), there are few real advantages to this approach and many negatives. Gateways require an additional footprint, they can be costly, they are generally overkill for a simple device, and the gateway vendor appears as the AS-i device owner. This option is only attractive if you expect low volume requests for AS-i connectivity.

2. Use an AS-i PCB

If your device uses standard signals, an AS-i PCB that accepts your signals and places them on the bus is an alternative solution for quick time-to-market projects. Built to your exact footprint and I/O requirements, a custom solution is relatively fast and requires almost none of your resources. Custom solutions offer you the latest in capabilities while giving you absolute control of your development, network presentation, and implementation. This approach is great for medium volume applications (i.e. a few hundred units per year). Real Time Automation supplies PCBs of this kind. The advantages to this approach are relative low cost and tight system operation. Disadvantages include the cost of one-time tooling and NRE.



3. Do-It-Yourself

The most costly, lengthy, and risky approach is to form an internal effort to build it yourself. While this is admittedly what you'd expect to hear from a company whose business is selling custom networking hardware and software, the facts still speak for themselves. Like most bus implementations there are nuances to the AS-i specification that are not readily discernable. For example, the specification provides some very ambiguous language describing how to pick the device ID.

A Few More Considerations

Another important consideration is testing and certification. Do you have the tools and resources to test, troubleshoot and, certify your AS-i implementation? A key to selecting a vendor to get "AS-i in 30 days" is to make sure that your vendor has all the right tools and can assist you with troubleshooting, locating adequate test tools, and the certifying your device.

You must consider documentation.

There are standard documentation formats for network devices. Your customers will expect your products to follow these standards. To get to market in 30 days, documentation issues need to be addressed early in the process.

You must consider certification.

Many customers simply will not purchase products unless they have passed a certification test. It's not uncommon for products to be sent back to the lab a second or third time before they finally pass. If RTA does an AS-I implementation for your product, you are guaranteed first time success.

You must consider Maintenance and Support.

There are keys to success for any new technology. There will be inevitable corrections and revisions to the initial specifications. How you deal with these changes matters a great deal.

Real Time Automation Guarantees Your Success.

Few people in the automation have the guts to guarantee anything, but Real Time Automation guarantees that your product will be ready for AS-i in 30 days or less, or you only pay half.

What to do next

Call or Email John Rinaldi, OEM Sales Manager, at (414) 453-5100 / jsr@rtaautomation.com and ask for an AS-i Project Application. John will be happy to discuss your specific requirements and deadlines, and discuss any aspect of AS-i that you may still be unclear about. The RTA team looks forward to serving you as you tackle one of the most important new technologies in today's automation business.

Don't let a shaky economy, protocol confusion, or fear of the unknown keep you from participating in new project opportunities! AS-i can be an important part of your product success story.