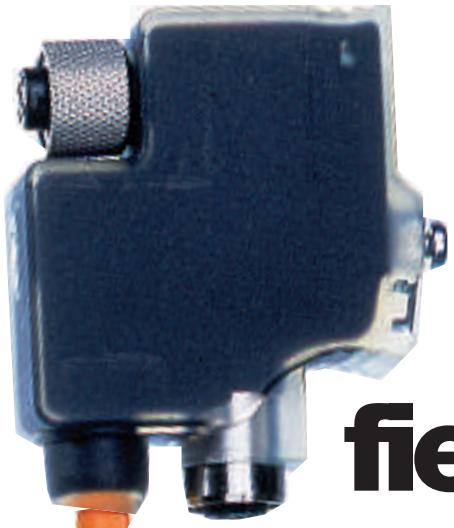


Plugging the hole in the fieldbus market

ABB FieldBusPlug brings simplicity to fieldbus applications

Staff Report

An industrial controller starts up a motor somewhere in a plant. Or speeds up a conveyor belt. Or interrogates a sensor. Before this kind of control can be exercised, data – sometimes huge quantities of it – have to be quickly and reliably transferred. The channel of choice for this is often the fieldbus.

In recent years, as the number of devices hooked up to such buses has exploded, a bewildering array of standards has emerged. Manufacturers must therefore offer many product variants, one for each bus type.

The ABB FieldBusPlug (FBP) is about to do away with this complexity, allowing a product to be simply and quickly connected to any bus. The first ABB products to feature this unique plug have already been presented to the market, and many more – to serve an ever-wider range of fieldbuses – are on the way.

Automation requires not just intelligent products; it also requires communication. And the communication channel of choice today is the fieldbus. Walk into any manufacturing, processing or power facility and you can see hundreds of actuators and sensors communicating with their controllers over just such a bus. But which one to choose? The list is seemingly endless. National preferences play a big part: DeviceNet (well over 300 companies worldwide develop DeviceNet compatible products) and Foundation Fieldbus H1 have become dominant, especially in the USA. DeviceNet is used widely in automotive applications, materials handling and manufacturing, Foundation Fieldbus in process control. Profibus, also a strong contender in these areas, is the dominant bus in Europe. In addition, certain buses tend to dominate in certain industries, eg Profibus DP in car factories; however, just to make it interesting, CAN is used in the cars themselves. The market, though, can be broadly split into process and manufacturing industries.

With industry constantly investing in faster, more efficient production and operation, the number of intelligent devices being attached to these buses is increasing rapidly. Using them makes life, and business, a lot easier for the customer, but it causes a major headache for the device suppliers. This is because they have to make provisions in their design for the multitude of fieldbuses onto which the device may be hung.

In addition, fieldbuses involve control wiring that is time-consuming and prone to failure during installation.

Such complexity contrasts directly with today's trend towards simplicity. System integrators want to plug and produce; any supplier providing endless pages of product variants will get short shrift.

Something much more flexible and simpler is needed.

The FieldBusPlug concept

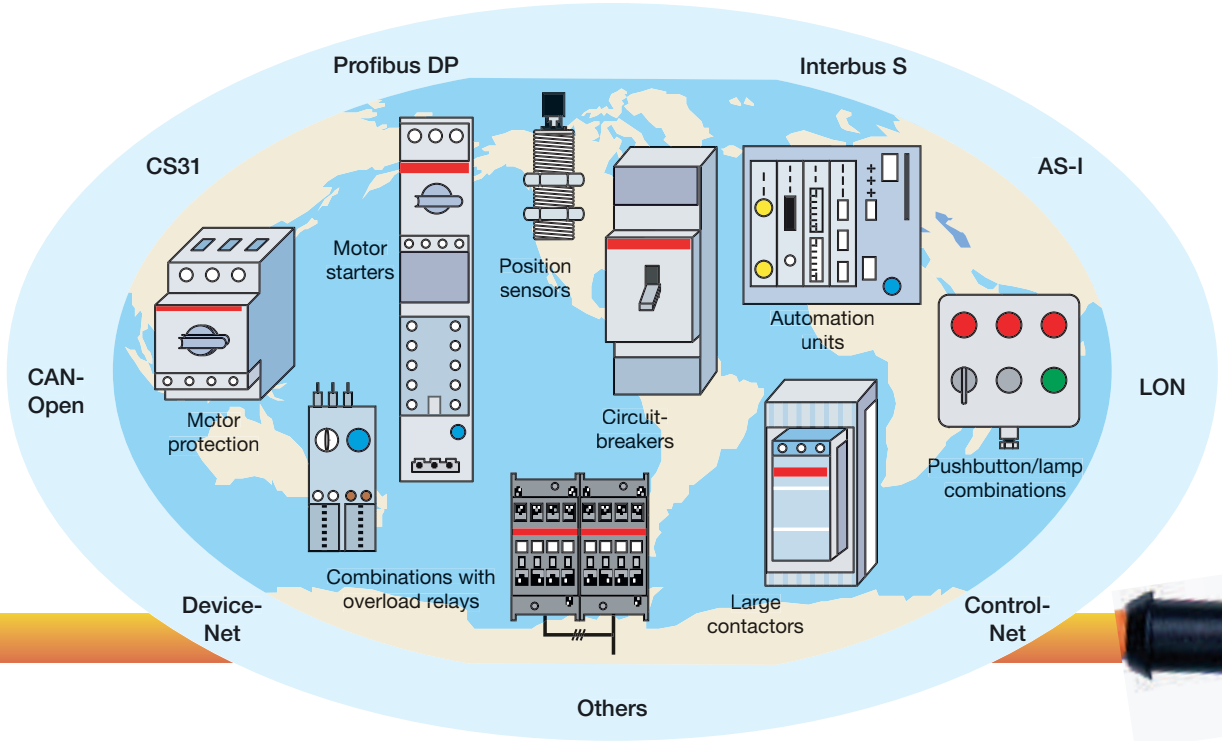
The new ABB FieldBusPlug (FBP) concept vastly simplifies life in the bus world. ABB products can now be offered in one variant only – and with a 'neutral', fieldbus-independent interface. Re-engineering of products for different target fieldbus markets is a thing of the past. Just attach the appropriate FBP for the fieldbus involved to the product and it is ready for connecting to the bus. The respective fieldbus coupling consists of a neutral interface for the attachment of the devices and a cable and connector to the fieldbus.

The FBP is suitable for all kinds of manufacturing machines (eg, assembly and packaging) as well as other factory equipment that requires large numbers of binary sensor signals or other actuators to be connected via a fieldbus.

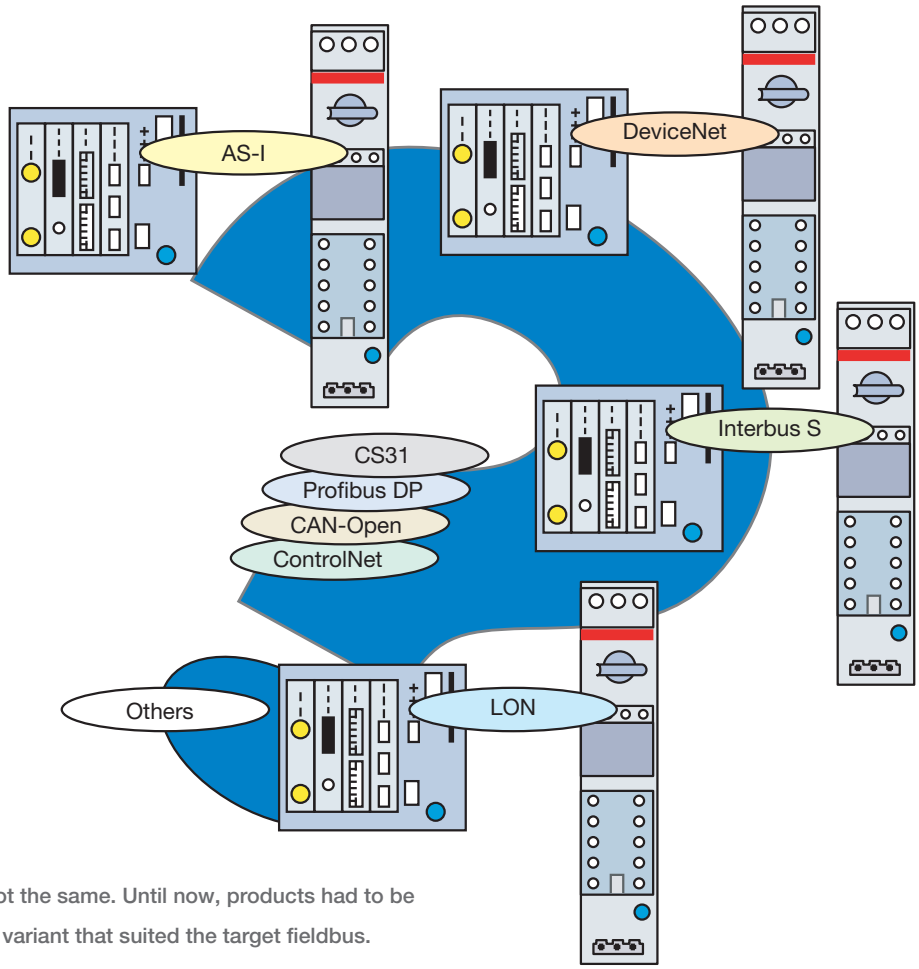
The FBP contains all the electronics necessary to connect to one of several fieldbuses (eg, AS-i, DeviceNet). Plugs will be offered for the major fieldbuses on the market.

One huge advantage of the approach is that ABB is not inventing its *own* bus. Instead, the powerful market presence of existing buses is exploited. Also, being an open system, the FBP can embrace any PLC system the customer uses; it is not restricted to certain vendors. In the case of some important PLCs (ABB, Siemens, Allen Bradley), ABB can help the customer by providing ready-made function blocks to facilitate implementation.

The FBP is also scalable; either one simple sensor or a more complex device, incorporating several input/output signals, can be connected. During start-up, the device and the plug negotiate the necessary parameters for communication, so there is no need for



The number of fieldbuses confronting product manufacturers leads to unnecessarily high product complexity.



Similar, but not the same. Until now, products had to be delivered in a variant that suited the target fieldbus.

device-specific hardware or software for each device.

Because plug-in connectors are used to attach the product to the fieldbus and the supply voltage, there is no need to cut, isolate and prepare cables. Productivity is also aided in other ways: using standards means shorter project times; ready-to-use units facilitate faster installation and commissioning, fewer sources of failure and shorter service and maintenance downtime; having only one product variant means fewer need to be stocked and devices in the field can be easily replaced. As a further enhancement, the FBP is produced to protection class IP65 for direct connection to devices mounted in the field (eg, proximity sensors).

Previously, other vendors have attempted to cut a way through the fieldbus jungle by offering a sub-assembly which could be integrated in the device. But this solution suffers from the disadvantage that, while it makes life somewhat easier for the manufacturer, it does not help the customer, for example an OEM, who might want to ship some AS-i units to Germany and some DeviceNet units to the USA.

Innovation for the fieldbus world

The essence of the innovation lies in the miniaturization and special packaging of the electronics. Although such technologies are well known in the consumer industries, they are new to industrial environments.

ABB has trimmed the fieldbus electronics to match the requirements of a harsh IP65 environment. This includes size restrictions, thermal considerations, shock-proof mounting, and much more.

In the software area, ABB mapped the functionality of the different fieldbuses to a common device communication scheme. This scheme also has to provide some ‘scalability’, as complex devices make greater demands on communication than do simple sensors.

Last but not least, the connectors for the fieldbus side had to be squeezed into the design, making it easier for customers to wire the fieldbus and the supply voltage.

The basic principles of the FieldBusPlug and the communication have been patented, and ABB invites other device manufacturers to adopt the idea for their products.

First products on the market

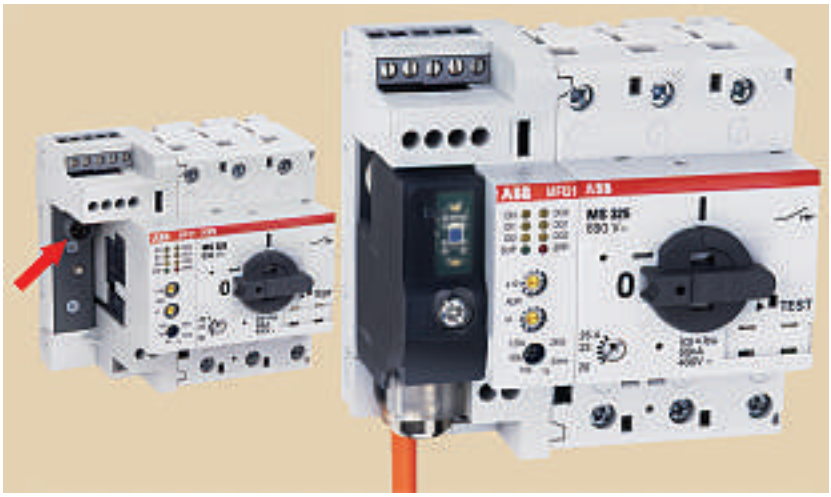
The first family of ABB products to benefit from the FBP will be controllers and starters.

The MSD11-FBP motor starter for example, has been designed with the FieldBusPlug in mind. This type of device, used for switching and protecting three-phase motors, communicates command and status data via a fieldbus. Now, instead of supplying an MSD11-FBP variant for each fieldbus market, only one has to be produced, and supplied with the appropriate FBP.

At the moment, the Actuator-Sensor-Interface (AS-i) and DeviceNet are supported; ABB is currently working on Profibus-DP, and will start technical pre-studies for Ethernet and CAN-Open in the near future.

Simplicity for the fieldbus

As our technology world becomes ever more complex, demand for simpler solutions and interfaces will grow significantly. ABB is fully committed to uniting technical excellence with maximum simplicity. The FBP makes a significant contribution to this goal. The first ABB products to feature the FBP have already been presented to the market and more are set to follow. All major fieldbuses will be catered for as quickly as possible. With the help of the FBP, industrial 'plug and produce' is made even easier, enabling customers to concentrate on the business of manufacturing. *(ab)*



Left: The MFI21-FBP, showing the FBP interface (arrowed)
Right: With the FBP connected to an AS-Interface bus

ABB starters so far equipped for the FieldBusPlug are the MSD11-FBP (far left), MSR22-FBP (not shown), both of which use MS 116, the UMC22-FBP (second from left) and the MFI21-FBP (right, with FBP installed), seen here connected to an MS 325. The arrows show the location of the FBP interface.

Fieldbus alphabet soup

A bus is just a collection of wires which transfer electrical signals, usually data, between devices. To save running separate cables to each device, many devices can share the same set of cables and, to avoid a free-for-all on the bus, one device is usually made the 'master', the rest being 'slaves'. Fieldbus is the name given to serial buses optimized for response time and predictable data transmission between field devices, sensors and actuators.

The fieldbus world is an acronym lover's dream; organizations and PLC manufacturers have been busy creating hundreds of buses, and associated acronyms, over the years.

At the lowest level are the actuator/sensor networks, which were originally designed primarily for digital (on/off) interfaces. Examples are the *AS-i* (Actuator-Sensor-Interface), *Bitbus* and *Seriplex*. Although fast and effective, they are only suitable for simple machine control. AS-i, perhaps the simplest and least expensive, is common in Europe, while Seriplex is popular in the USA. AS-i is often used for proximity sensors, limit switches, valves and pilot devices.

At the next higher level are the device buses. *Profibus* is designed for communication between field devices and PLCs. Nearly universal in Europe and also popular in other continents, its high throughput (up to 12 Mbit/s) using just a two-wire RS485 link makes it ideal for large installations. *Interbus*, fast and with diagnostic and auto-addressing capabilities, is one of the early popular fieldbuses.

Controller Area Network (CAN) is a fast serial bus using a twisted pair cable running at up to 1 Mbit/s with up to 40 devices. Originally developed by Bosch as a replacement for car wiring harnesses, it is intended to simplify car wiring (its error detection and correction features are ideal for the harsh car environment) and has found other uses in machinery and automation. It is also the basis of several other buses, such as *DeviceNet* (Allen-Bradley's adaptation) or Honeywell's *SDS*.

At the next level are the 'control' networks, which include *ControlNet*, conceived as the ultimate high-level fieldbus network. *LONWorks* operates over greater distances and, despite being rather slow, can include thousands of nodes. *Profibus PA* is a Profibus for intrinsically safe applications. *HART* was originally designed for transmitter calibration and diagnostics.

Foundation Fieldbus is a sophisticated bus that, amongst its other features, allows a controller to acquire configuration and parameter information from devices plugged into the bus. Also, a scheduler guarantees message delivery, so worst-case response times are known with 100% certainty ('determinism').

No discussion of buses would, however, be complete without mentioning *Ethernet*, developed over 20 years ago as a high-speed data-transfer link. With over 85% of all installed network connections being Ethernet-based, it is the most prolific Local Area Network. In the past few years, Ethernet's deterministic and speed deficiencies have been addressed by standard enhancements and new technology, making it now much more suitable for the rough industrial environment and enabling it to be used widely in both the process and manufacturing sectors.

In addition, Ethernet's Internet-friendly TCP/IP protocol is ideally suited to accommodate the proliferation of smart low-level industrial devices, all making increasing demands on the available bandwidth.

As Ethernet expertise in companies is more readily found than DeviceNet or Profibus know-how, these latter buses will come under increasing pressure from Ethernet.