

Fieldbus 303

Segment hardware

- Overview
- Required and application-dependent components
- Power supply
- Power conditioners
- Terminators
- Repeaters
- Intrinsic safety barriers

Overview

What are the other pieces of a network?

The previous two courses focused on network wiring — first the fundamentals, then the options.

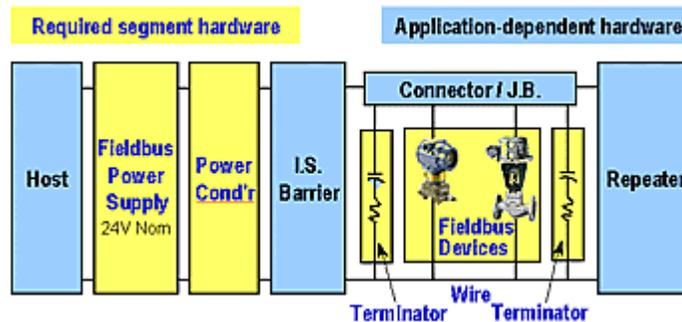
This course covers other pieces of the physical network.

Hint: As you go through the topics in this course, watch for answers to these questions:

- *What hardware is required on a fieldbus segment?*
- *What is the primary purpose of a power conditioner in a fieldbus network?*
- *Why are terminators needed?*

Required and application-dependent components

As the diagram shows, a typical FOUNDATION fieldbus segment consists of both required and application-dependent hardware.



Fieldbus devices are intelligent nodes on the network, providing sensing, actuation, process control, and diagnostic information. In this sense, a host system — usually a fieldbus engineering tool or a control system such as a DCS, PLC, or PC — is one type of fieldbus device.

The rest of the fieldbus network hardware links and supports these devices.

- The fieldbus **power supply** is normally a redundant, 24-volt bulk unit that provides power for multiple fieldbus segments.
- The fieldbus **power conditioner** provides communication isolation between multiple segments that are connected to a common power supply.
- **Intrinsic safety barriers** provide intrinsically safe power for one to six fieldbus devices.
- **Terminators** help provide a high quality communications signal and prevent signal reflection on the bus.
- **Connectors** and **junction boxes** provide places to terminate field wiring on the segment.
- A **repeater** electrically isolates one part of a segment from another. It also provides longer distance communications and can increase the total segment device count.

The rest of this course describes these supporting hardware elements in more detail.

Power supply

Power is one of the areas in which FOUNDATION fieldbus is quite similar to conventional analog networks.

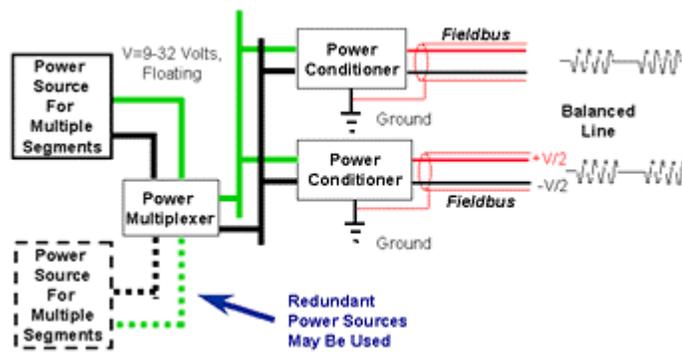
For example, both device power and communications occur on the same two wires designed to run at 9 to 32 VDC. And FOUNDATION fieldbus is fairly tolerant of power quality.

In general, FOUNDATION fieldbus power is

- Shared across many devices and segments
- Quite often redundant
- Multiplexed either through a separate power multiplexer or through multiplexers integrated with the supplies.
- Listed as 9-32 volts floating (24 volts is most common)

Most existing analog bulk power supplies will work with FOUNDATION fieldbus and are good sources for FOUNDATION fieldbus bulk power. Some plants like to have a UPS or battery backup as one of the power sources.

The diagram below shows an example power source configuration for multiple segments.



Practical pointer

Make sure the voltage at the farthest point of the segments powered is at least 9 vdc when the batteries are at their lowest expected operating voltage.

To ensure this, higher voltage is required at the power supply. Some plants have backup batteries that float on a 24 vdc bus. These batteries take over if the AC/DC power supplies are lost. A margin of several volts is recommended.

The PlantWeb advantage

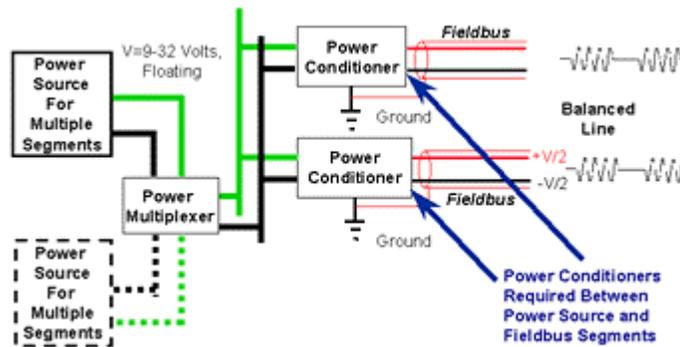
The Emerson field devices used in PlantWeb architecture are polarity insensitive. This means the plus and minus wires can be reversed at a field device, and the device and segment will both work normally. This simplifies segment checkout and eliminates many wiring "mistakes."



Power conditioners

It's critical that communications on a segment not cross to other segments through the power supplies. Power conditioners prevent this "cross-talk" between multiple segments using the same power supply.

The power conditioner limits maximum segment power. A typical value is 400 mA.. If a typical device draws 15-20 mA, a power conditioner could supply about 20 devices and still have some reserve capacity.



Power conditioners also current-limit the segment, so that grounding of one segment won't affect other segments attached to the same bulk power source.

Practical pointer

Cable shields can be grounded to the power conditioner. But make sure the shield doesn't touch a field device housing; letting it do so can create a second grounding point and thus cause a ground loop.

Also, FOUNDATION fieldbus signaling uses a balanced line to provide more robust communications than a signal and ground. Balanced lines require that the individual signal wires NOT be grounded.

Terminators

Terminators are simple resistor-capacitor circuits used to prevent problems like signal reflection from the end of the wires. They're installed in pairs, with one terminator as close as practical to each end of a fieldbus segment.



Fieldbus segments have been known to work with terminators incorrectly installed or missing, but this situation dramatically increases the chances of segment problems.

Power conditioners frequently include a terminator, eliminating the need for a separate external terminator on that end of the segment. However, terminators are usually NOT built into or installed in field devices. That's because the segment could be left without proper termination if the device that contains the terminator is removed from service.

Practical pointer

Put a terminator in the junction box that's closest to the far end of a segment. Even if there are individual devices farther out, the junction box is usually close enough to the end of the segment for the terminator to function properly.

Because terminators are very simple circuits, it's tempting to make your own. But homemade units frequently fail in installation, checkout, or service. Whatever you saved by making the terminators will be spent many times over fixing or retrofitting them.

Repeaters

Repeaters are optional components used either to extend the length of a fieldbus segment or to increase the number of devices on a segment. They provide power and a clean communication signal for the extended part of the segment.

A segment can have as many as four repeaters dividing the segment into five pieces. Electrically, each piece acts as a separate segment -- but devices can communicate with each other as though they were on the same segment, even if there are up to two repeaters between the devices.

Although a fieldbus segment can have up to 32 devices without repeaters, H1 segments typically don't have more than 12-16 devices even if repeaters are used.

Intrinsic safety barriers

FOUNDATION fieldbus was designed to support intrinsic safety — and to do so with more flexibility and lower cost than traditional analog intrinsic safety.

In the analog world, each input and output has a dedicated barrier. But in the fieldbus world — with its single cable supporting multiple devices — one barrier can serve several devices. That's a tremendous saving in barrier and installation costs.

Depending on your needs, you have the option to put several barriers on a single fieldbus segment. You can also have both intrinsically safe and conventional points on the same segment.

Intrinsic safety requirements and practices are covered in more detail in Fieldbus 203.

Practical pointer

Although you can re-use existing analog wiring in a fieldbus network, DON'T use existing analog barriers for FOUNDATION fieldbus. Existing barriers aren't certified for FOUNDATION fieldbus and won't work in this application.

Here's another tip: You can achieve two goals at once by using FOUNDATION fieldbus repeater barriers, which combine the functions of a repeater and an intrinsic safety barrier.