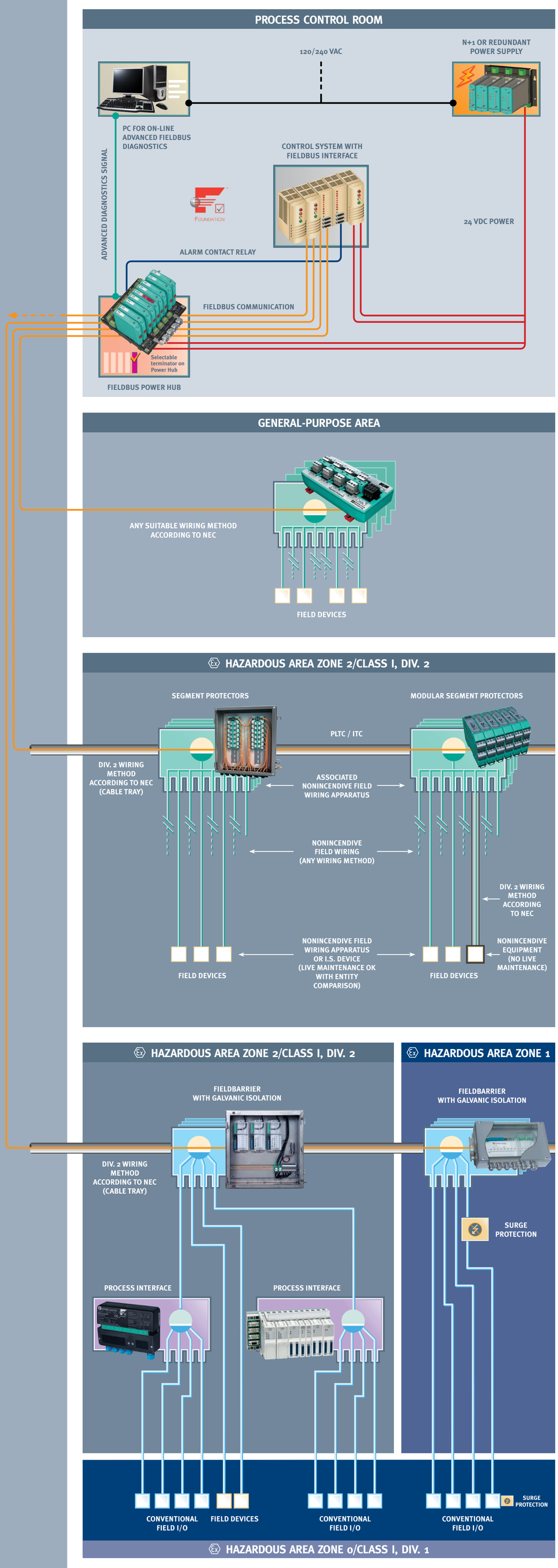
FieldConnex®

SIMPLIFY PROCESSES

HIGH-POWER TRUNK CONCEPT



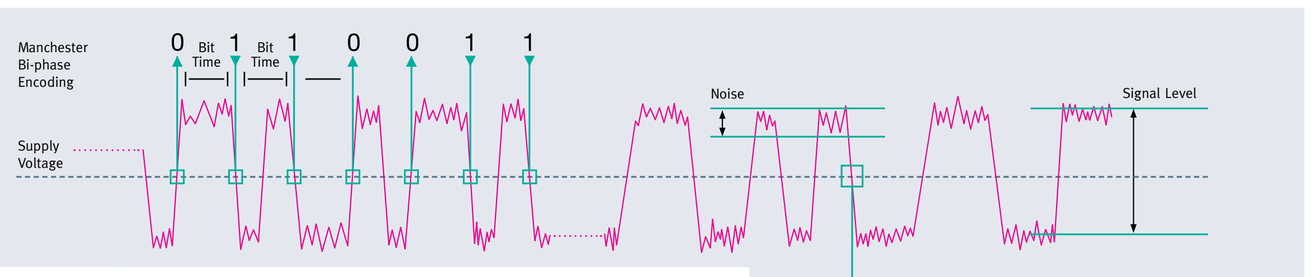
THE HIGH-POWER TRUNK CONCEPT

The High-Power Trunk concept (HPT) limits the energy on the trunk to 500 mA. This concept increases the amount of energy available for field instruments and facilitates a consistent installation design regardless of the area classification. By limiting the energy in the field rather than in the control room, power is more efficiently distributed to the instruments where it is required. As a result, segment protection devices are similarly installed for either hazardous or ordinary location applications. Consistency, available energy, longer cable runs, and cost savings are all increased with HPT.

Another benefit of the HPT concept allows the user to standardize on one power conditioning system with optional redundant modules for all areas of the plant. Supplying 30 V/500 mA allows the user to achieve maximum cable lengths and maximum loading without using repeaters. If desired, live maintenance without gas clearance on the instruments is possible in combination with segment protectors (for safe area or Zone 2 applications) and FieldBarriers (for Zone 1 applications) when using instruments with the appropriate certifications (I.S. Entity or FISCO).

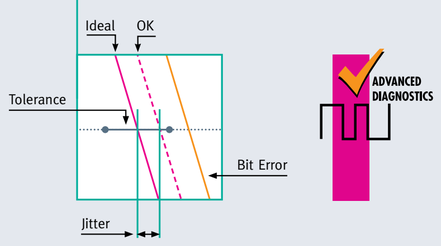
FIELDBUS PHYSICAL LAYER

Physical layer diagnostics bridge the gap between instrument diagnostic information and plant asset management. The physical layer (the fieldbus backbone) monitoring is critical to assure error-free operation and eliminate unnecessary shut downs. It can assist users during commissioning by significantly reducing time during testing and wiring check outs. A wizard automatically tests the segment, produces documentation, and sets the system up for online monitoring. Signal degradation or other unintended changes in the fieldbus infrastructure can be managed proactively as part of the plant asset management. A detailed case study is documented in a Pepperl+Fuchs White Paper entitled "Fieldbus Testing Using Advanced Diagnostics" and can be downloaded at www.pepperl-fuchs.com.



TYPICAL PHYSICAL LAYER MEASUREMENTS

Value	Description
Signal Level	The voltage level of the data signal. Measured per device.
Noise	Unwanted disturbance. Measured per device or per segment.
Unbalance	Difference in isolation levels between each of the two leads and the shield. Ground fault.
Jitter	Deviation of the actual from the optimal zero crossing. Measured per device and per segment.
CRC Error	Cyclic Redundancy Check Error: A telegram where the checksum is invalid, i.e., one or more bits were detected as invalid.
Framing Error	A fault or an inconsistency in the telegram structure, i.e., caused by an interruption in the middle of a transmission. Part of the telegram is lost.



CABLE TYPE AND TRUNK LENGTH

Pair	Shield	Twisted	Cable Cross Section	Max. Trunk Length	Type
Single	Yes	Yes	0.8 mm² (AWG 18)	1900 m (6200 ft)	A
Multi	Yes	Yes	0.32 mm² (AWG 22)	1200 m (3900 ft)	B
Multi	No	Yes	0.13 mm² (AWG 26)	400 m (1300 ft)	C
Multi-core	Yes	Yes	0.8 mm² (AWG 18)	1900 m (6200 ft)	A

SPUR LENGTH

Number of nodes	Spur length
25–32	1 m (3.28 ft)
19–24	30 m (100 ft)
15–18	60 m (200 ft)

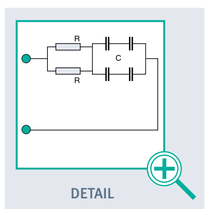
BUS TERMINATION

THE FIELDBUS TERMINATOR SERVES TWO PURPOSES

- It removes signal reflections at the end of the cable.
- It provides the impedance that translates the signal transmission as current change into a detectable voltage change.

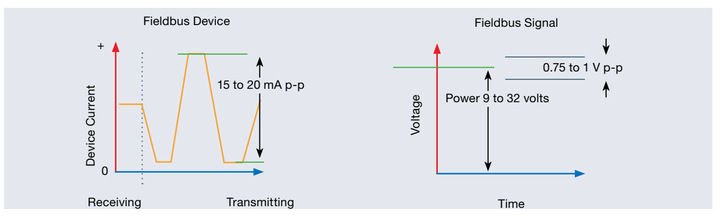
One terminator consisting of a resistor and capacitor is applied at each end of the trunk cable. High-availability design of FieldConnex terminators applies a matrix of capacitors.

The fieldbus terminator is an important component for the overall quality of the physical layer. The Advanced Diagnostic Module is capable of detecting bad or faulty termination.



FIELDBUS SIGNALS

The transmitting device delivers 10 mA at 31.25 kbit/s into a 50 ohm equivalent load terminator to create a 1.0 V peak-to-peak voltage modulated on top of the direct current (DC) supply voltage. The DC supply voltage can range from 9 to 32 VDC.



DIVISION 2 INSTALLATION

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The following terms are taken from the 2005 NEC (paraphrased):

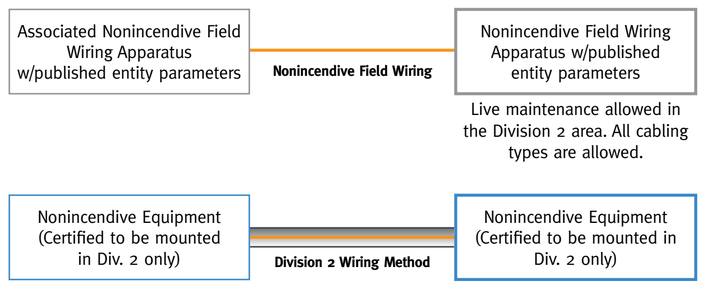
Associated Nonincendive Field Wiring Apparatus — Apparatus that is relied upon to maintain nonincendive energy levels.

Nonincendive Equipment — Equipment that is incapable of causing ignition in a hazardous location under normal operating conditions.

Nonincendive Field Wiring — Wiring from an equipment enclosure that is incapable of igniting a hazardous location under normal operating conditions. Normal operation includes opening, shorting, or grounding of the field wiring.

Nonincendive Field Wiring Apparatus — Apparatus intended to be connected to nonincendive field wiring.

Connection/disconnection of equipment within a Division 2 location is possible only when a Nonincendive Field Wiring Apparatus is attached to an appropriately-rated Associated Nonincendive Field Wiring Apparatus. In order to connect/disconnect instruments in a Division 2 location, ***both devices must have published nonincendive entity parameters that match one another.***



THE ENTITY MODEL

The following comparisons are necessary when evaluating the safety of an intrinsically safe or nonincendive fieldbus application.

U_i/V_{max} (field device) ≥ U_o/V_{oc} (Segment Protector or FieldBarrier)

I_i/I_{max} (field device) ≥ I_o/I_{sc} (FieldBarrier)

P_i/P_{max} (field device) ≥ P_o (FieldBarrier)

$L_{cable} + L_i$ (field device) ≤ L_o/L_a (Segment Protector or FieldBarrier)

$C_{cable} + C_i$ (field device) ≤ C_o/C_a (Segment Protector or FieldBarrier)

By definition, the I_{max}/I_{sc} and P_{max}/P_o comparisons are not necessary for Div. 2 nonincendive installations. Furthermore, the $L_{cable} + L_i/L_a$ and $C_{cable} + C_i/C_a$ comparison is usually simplified since the short spur length is generally so small as to not affect the overall comparison.

THE FISCO MODEL/THE FNICO MODEL

The **FISCO** (**F**ieldbus **I**ntrinsically **S**afe **CO**ncept) and **FNICO** (**F**ieldbus **N**on **I**ncendive **CO**ncept) models were originally created to simplify the parameter comparison of an entity-approved system in Division 1 and Division 2 areas and to allow more power into these areas.

With the advent of a more distributed power approach (High-Power Trunk) and field-mounted safety barriers, **FISCO** and **FNICO** are not as critical to the fieldbus industry. Plus, **FISCO** and **FNICO** instruments are not readily available.

BENEFITS OF THE HIGH-POWER TRUNK

- **SIMPLE ENGINEERING AND PLANNING:**
  - Same topology regardless of application
  - Mix and match instruments (Entity, FISCO) on the same trunk
  - Up to 31 devices per segment even in hazardous areas
  - Maximum cable length
- **EFFICIENT COMMISSIONING AND PLANT START-UP**
- **MAXIMUM PLANT PERFORMANCE AND REDUCED PREDICTIVE MAINTENANCE**
  - Highly reliable fieldbus power with redundancy
  - Integrated Advanced Diagnostic Module

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Download our fieldbus segment design tool at www.segmentchecker.com

FOUNDATION

PROFIBUS PROCESS FIELD BUS

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