

Installation of Fieldbus



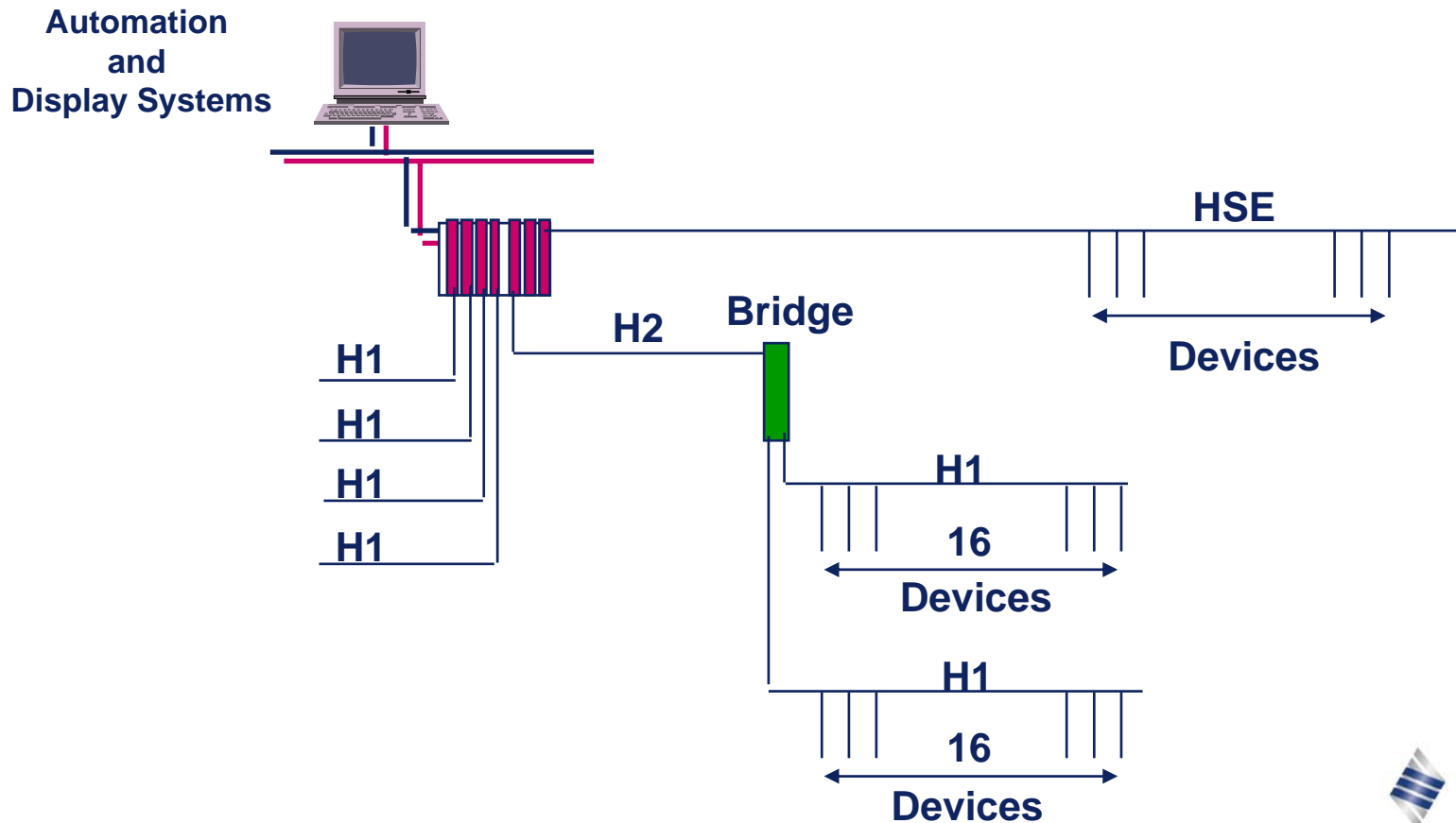
EMERSON™
Process Management

Agenda

- **Foundation Physical Layer**
- **Choosing Components and Layout**
- **System Design**
- **Field Checkout and Commissioning**
- **Trouble Shooting a Fieldbus System**

Fieldbus Technology

General Fieldbus Topology





*Foundation Fieldbus was designed by
the Process Industry for the Process
Industry*

Agressive environment



Typical installation



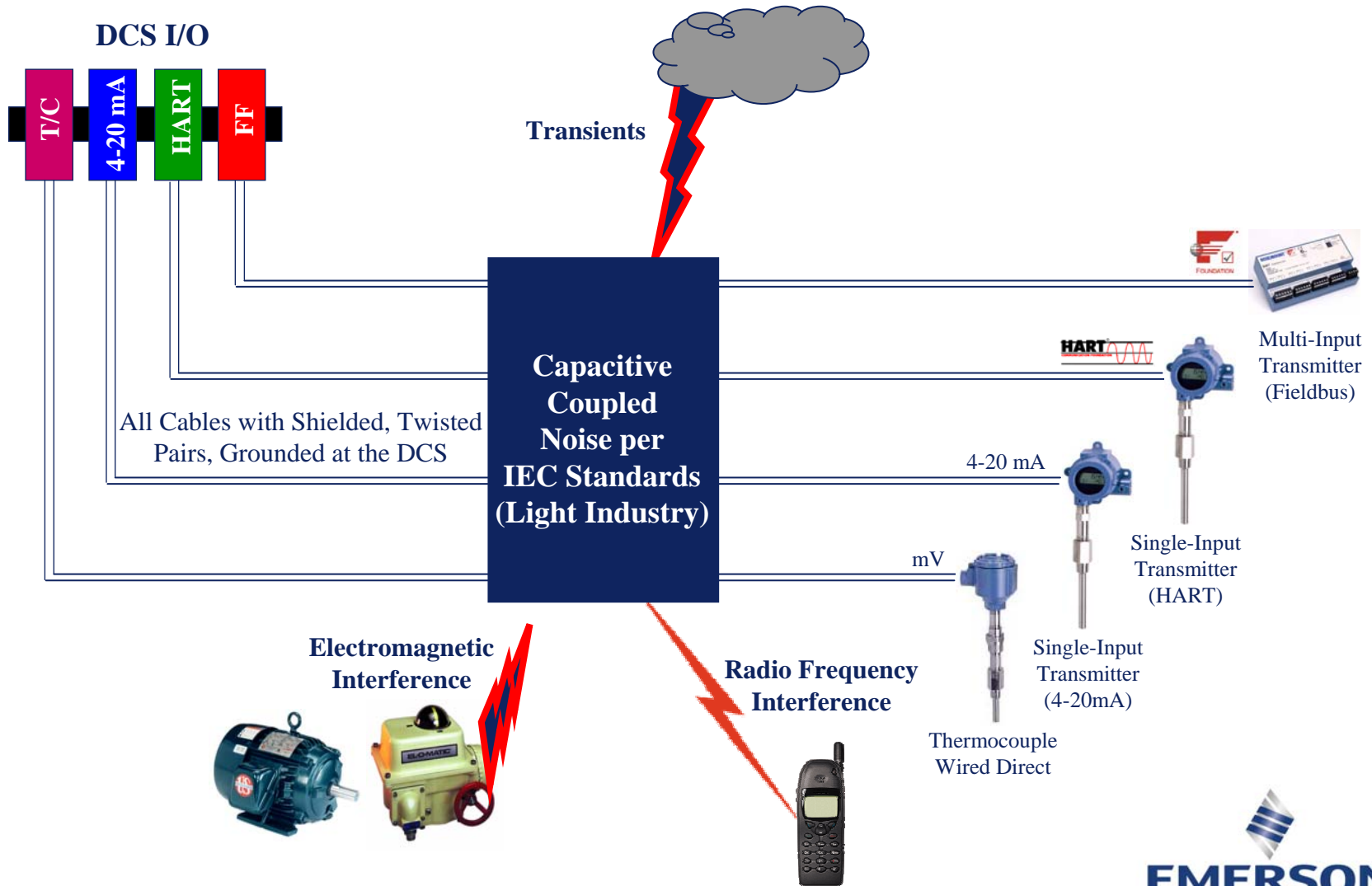
Instruments are spread over large areas



Hazardous Areas



Electromagnetic Interference

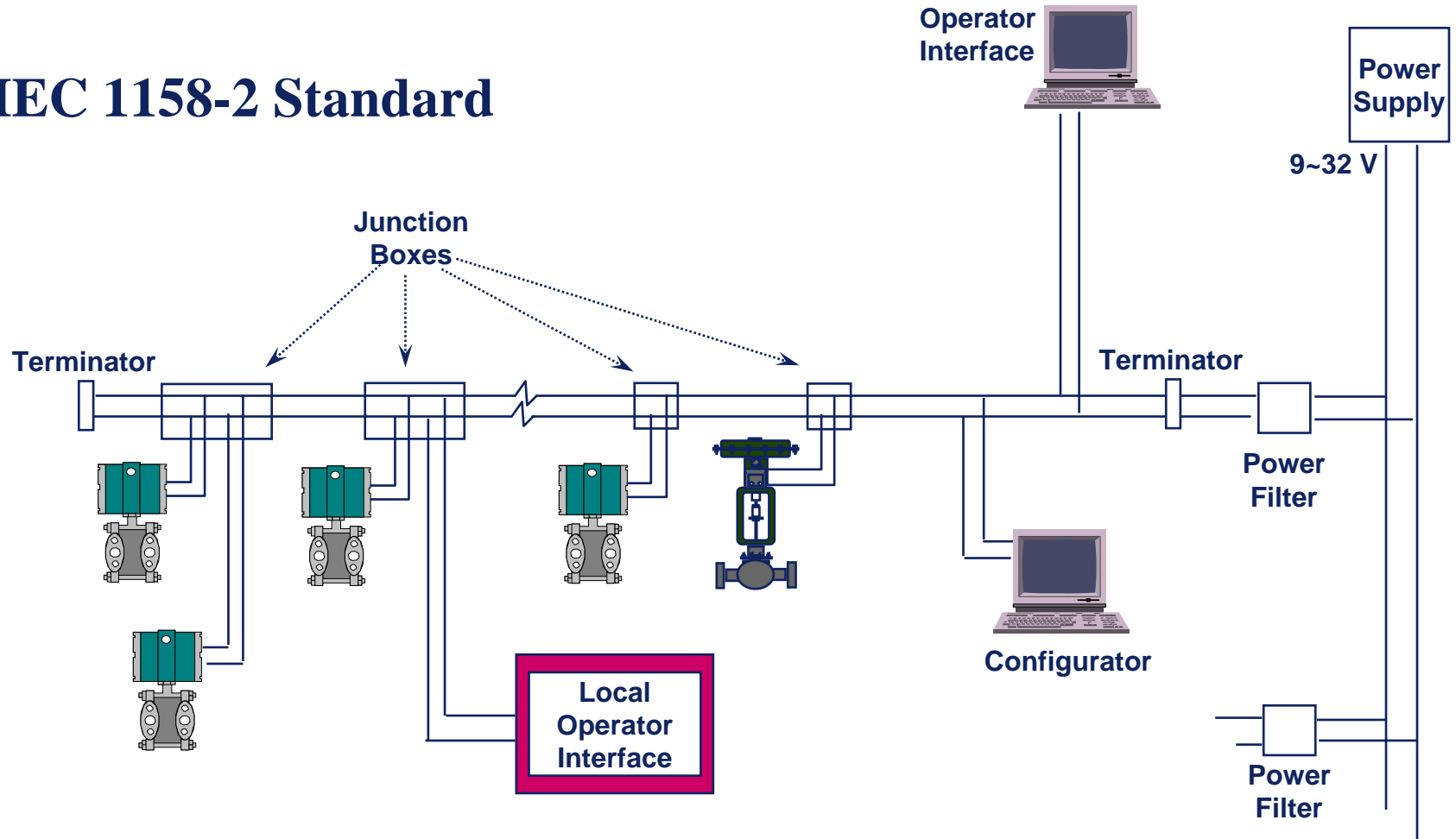


Electromagnetic Interference



Fieldbus Foundation Fieldbus

IEC 1158-2 Standard



Number of devices per segment

- Based on **present** device power consumption, Power conditioner current limitation and resistance of wires, experience demonstrates that up to

16 Devices per segment

can be used.

Fieldbus Cable Types

<u>Cable Type and Description</u>	<u>Size</u>	<u>Length</u>
–Type A (New) Shielded, twisted-pair – H1: 31.25 Kbps	#18 AWG	1900* m
–Type B (Existing) Multi-twisted-pair, w/shield – H1: 31.25 Kbps	#22 AWG	1200* m
–Type C Multi-twisted-pair, w/o shield – H1: 31.25 Kbps	#26 AWG	400* m
–Type D Multi-core, w/o shield – H1: 31.25 Kbps	#16 AWG	200* m

* Spurs count in overall length

Cable Length

- Total cable length should be less than 1900 m (shielded, 18 AWG, Type B)
- Connecting up to 12 devices in a powered bus, the Spur length limit should be:
 - * 120 m with one device
 - * 90 m with two devices
 - * 60 m with three devices
 - * 30 m with four devices
- Length reduces with more devices in the network

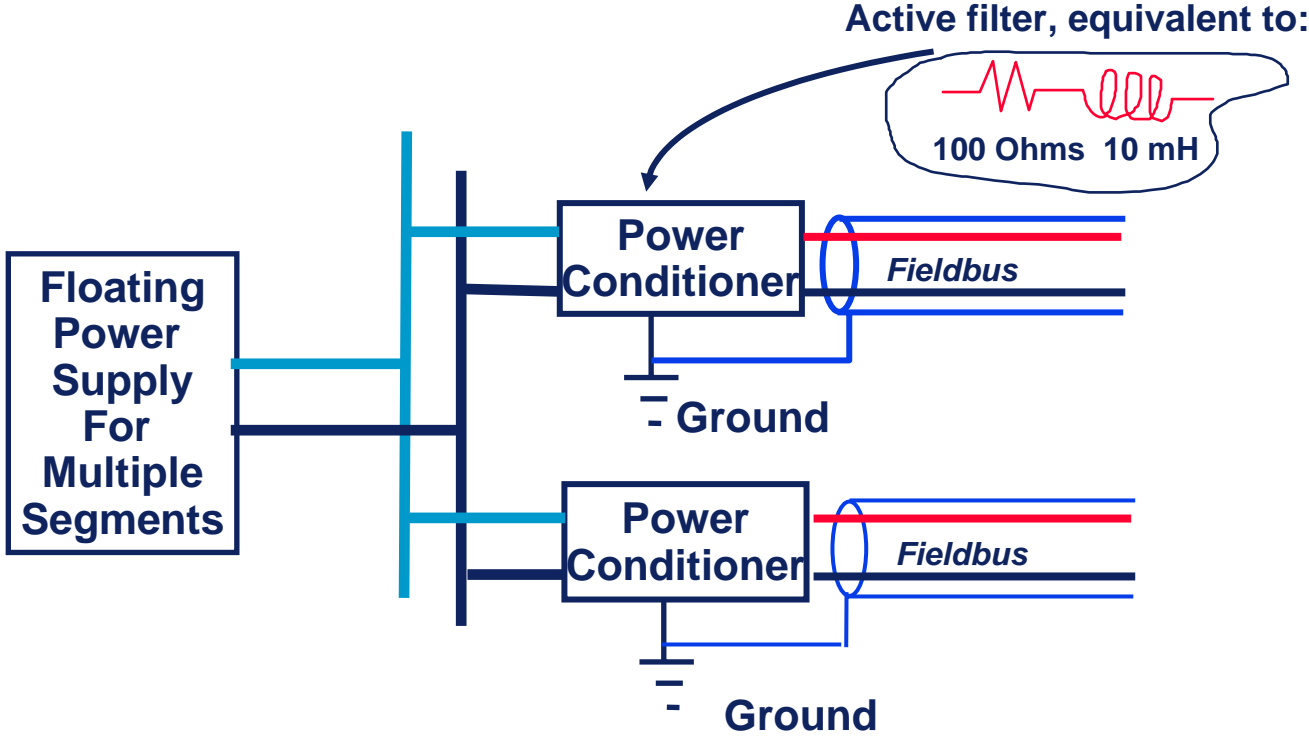
Standard is Conservative!

Installation Procedures

- Fieldbus requires standard wiring practices

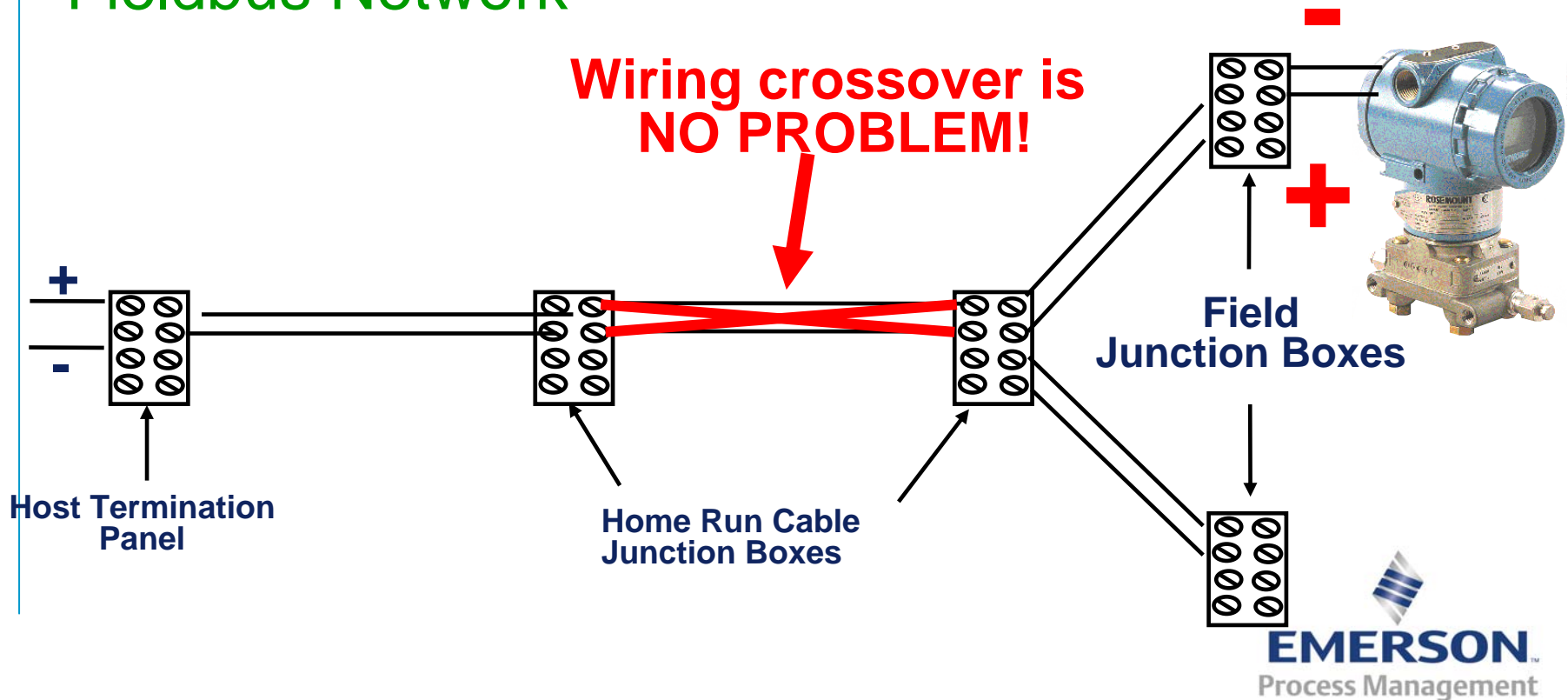


Fieldbus Segment Power

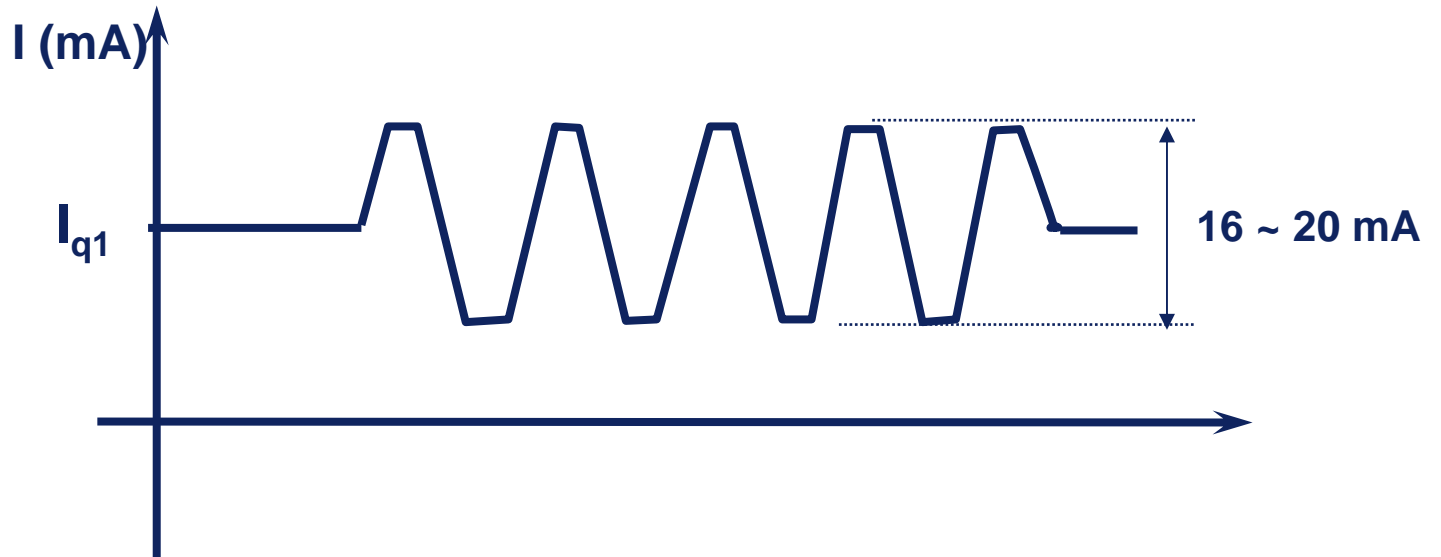
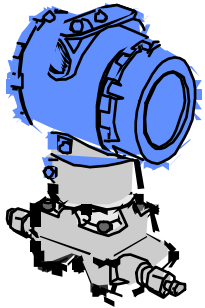


Polarity Insensitive Devices

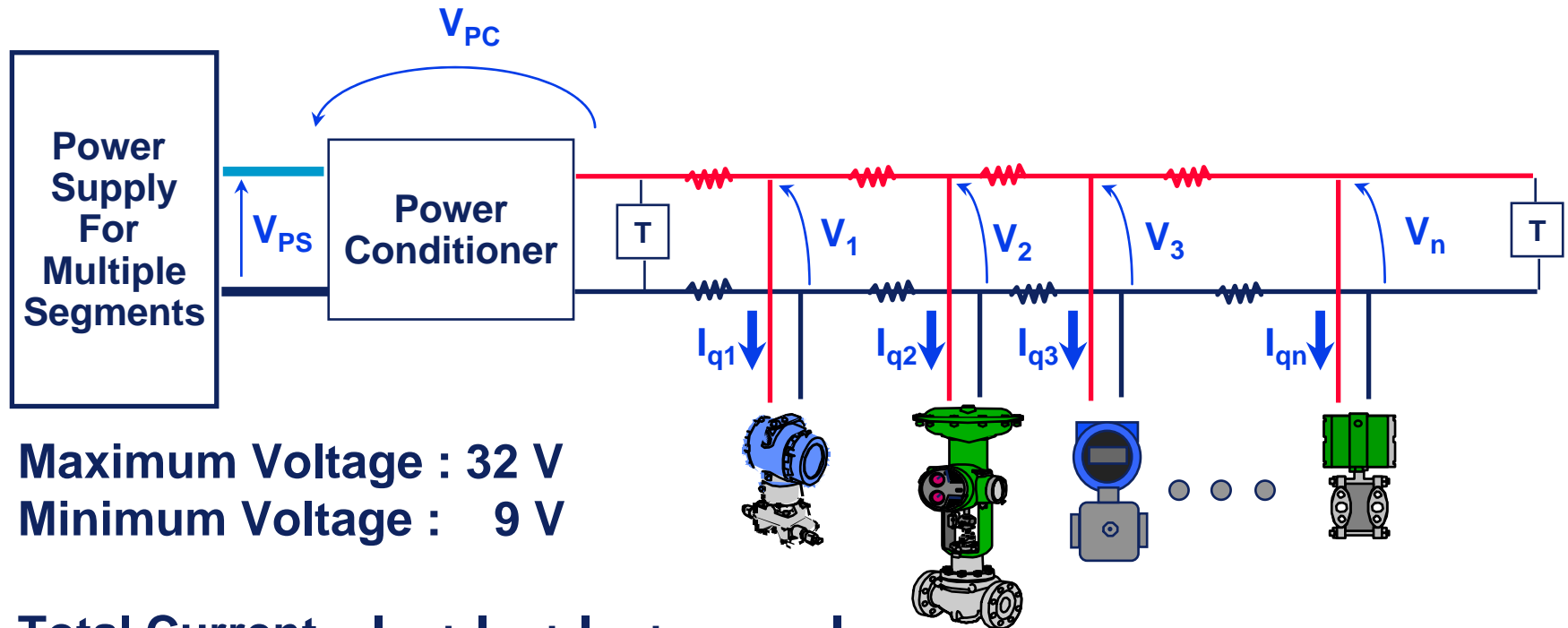
- Some suppliers provide Polarity Insensitive Fieldbus Devices
- This enables fast and safe commissioning of the Fieldbus Network



Current Consumption And Signal Shape



Voltage and Current

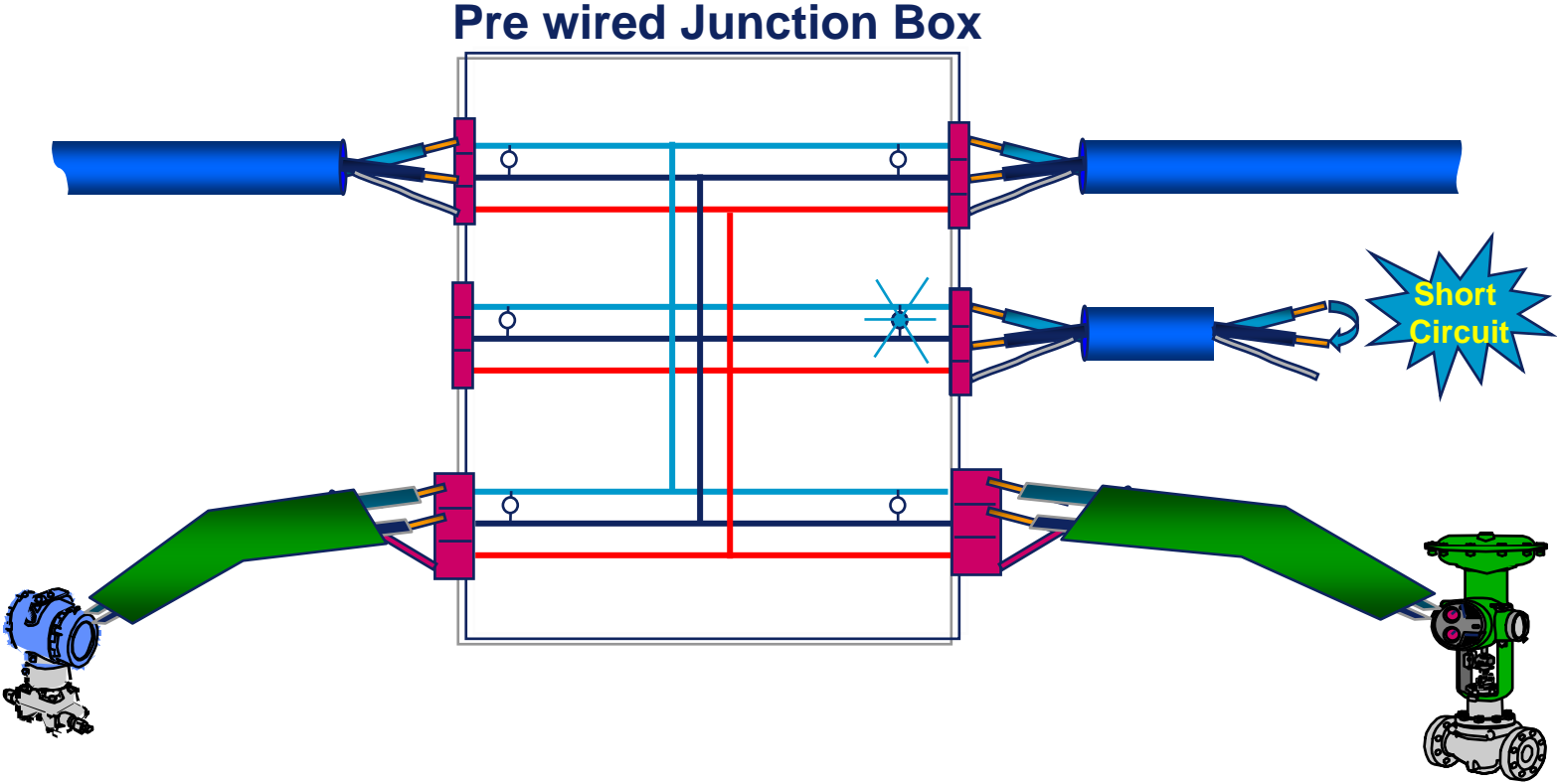


Maximum Voltage : 32 V
Minimum Voltage : 9 V

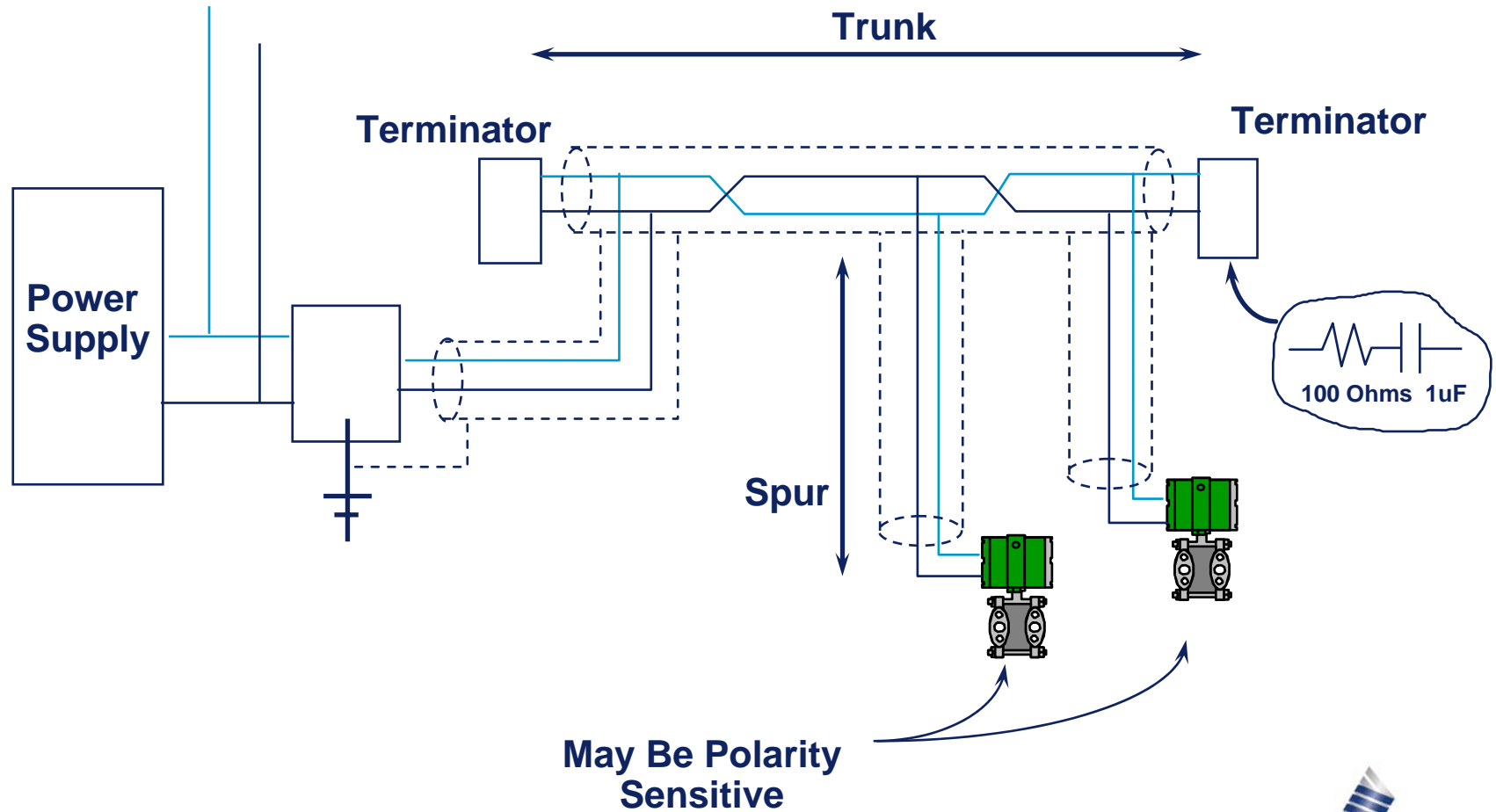
Total Current = $I_{q1} + I_{q2} + I_{q3} + \dots + I_{qn}$

Maximum current limited by the power conditioner.
Example: 400 mA

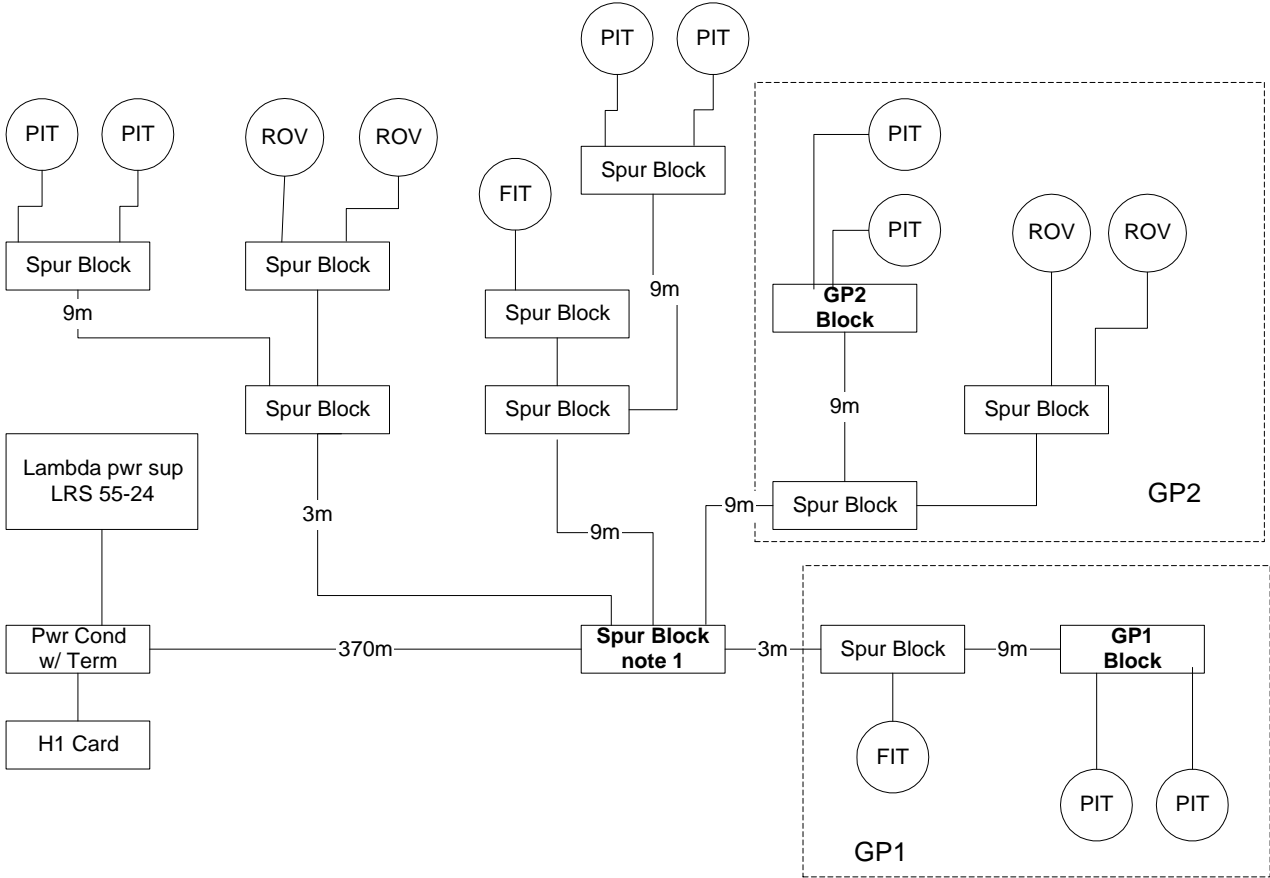
Short Circuit Protection



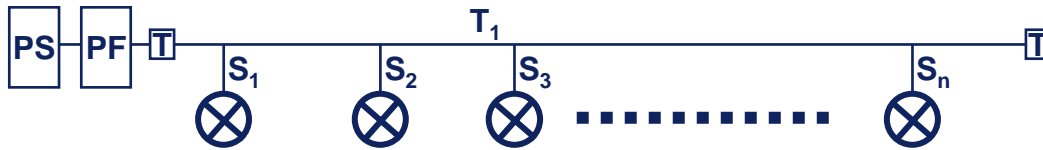
Termination and Twisted Pair Shielding



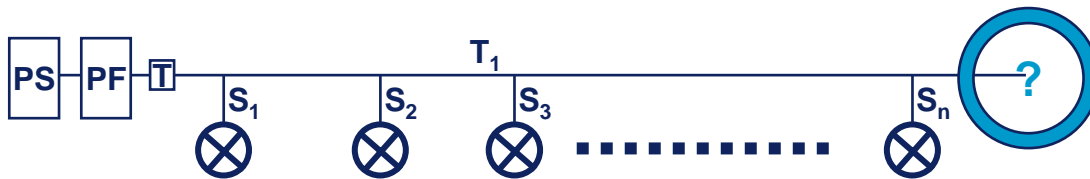
Terminator Located at Far Ends of Main Segment Trunk



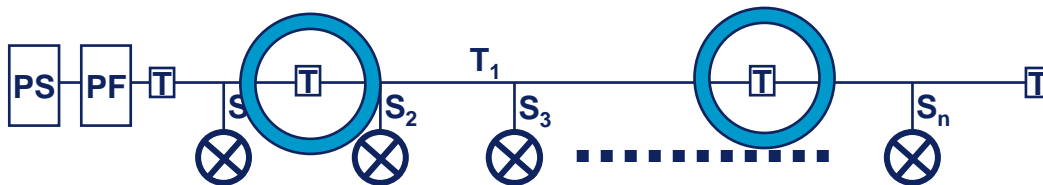
Communications under abnormal conditions



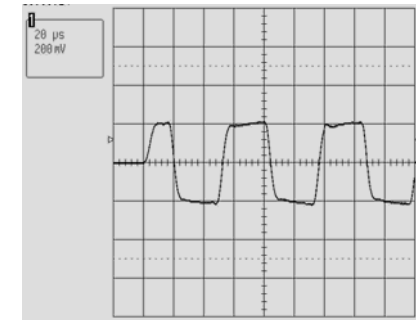
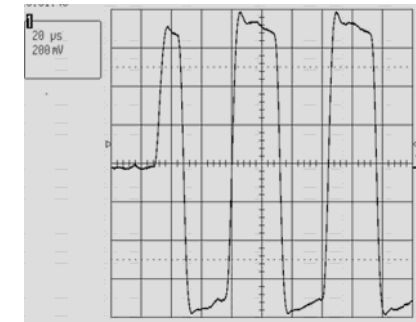
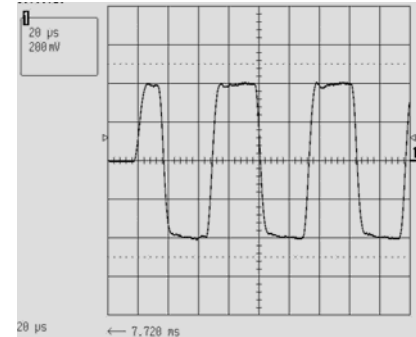
Normal



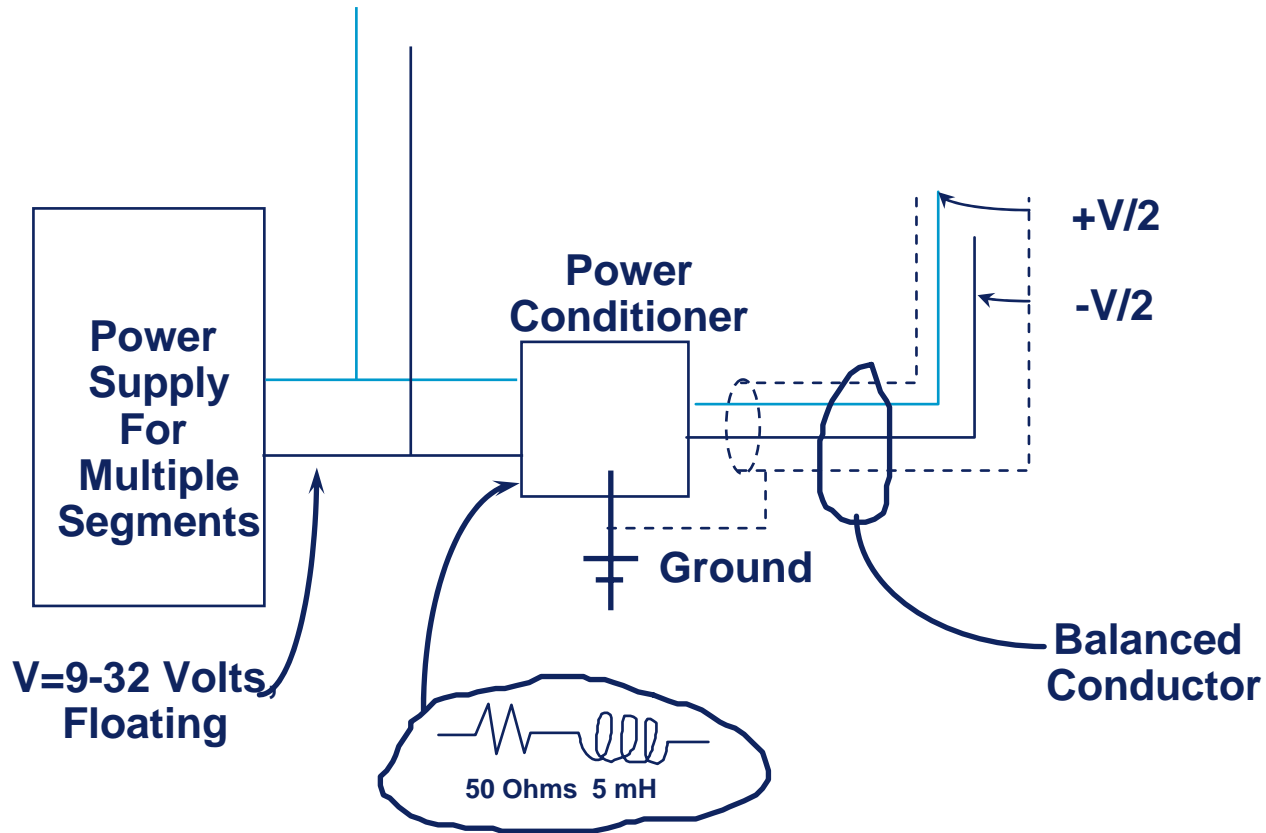
One terminator missing



Too many terminators



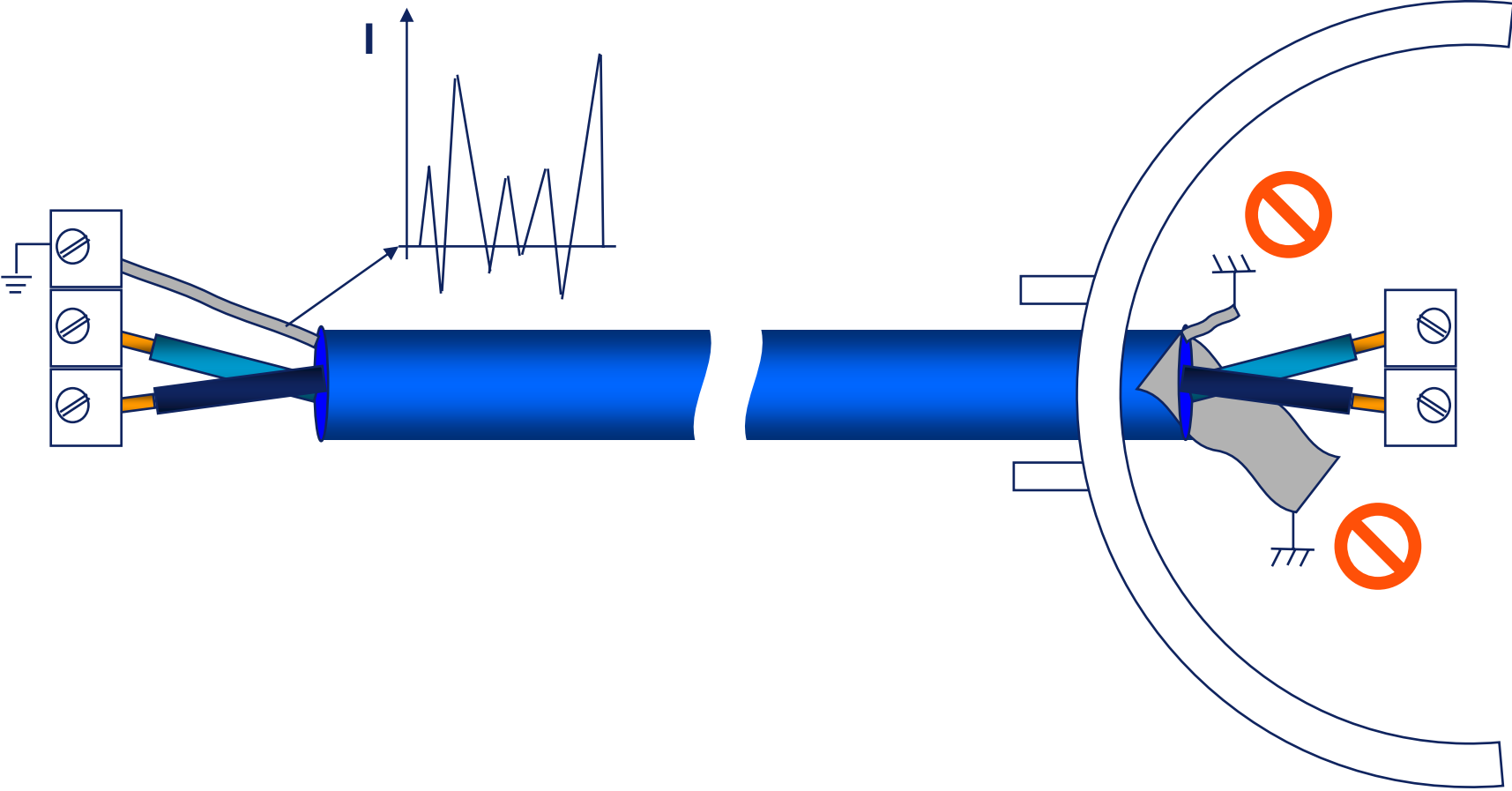
Power Conditioning For Fieldbus Segments



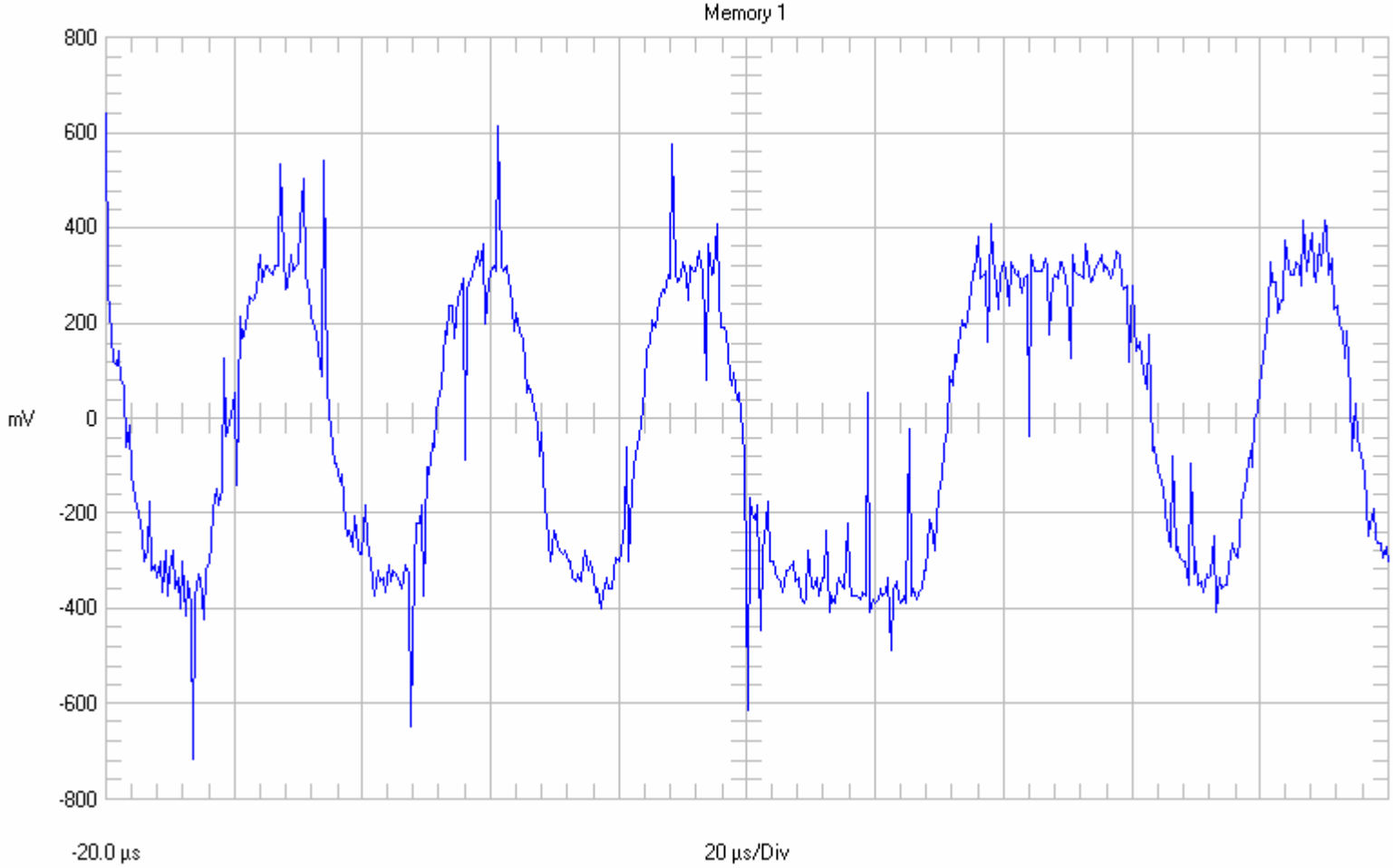
Important rules

- Shield should be grounded at a single point!
- Do not ground signal wires
- Observe terminator location

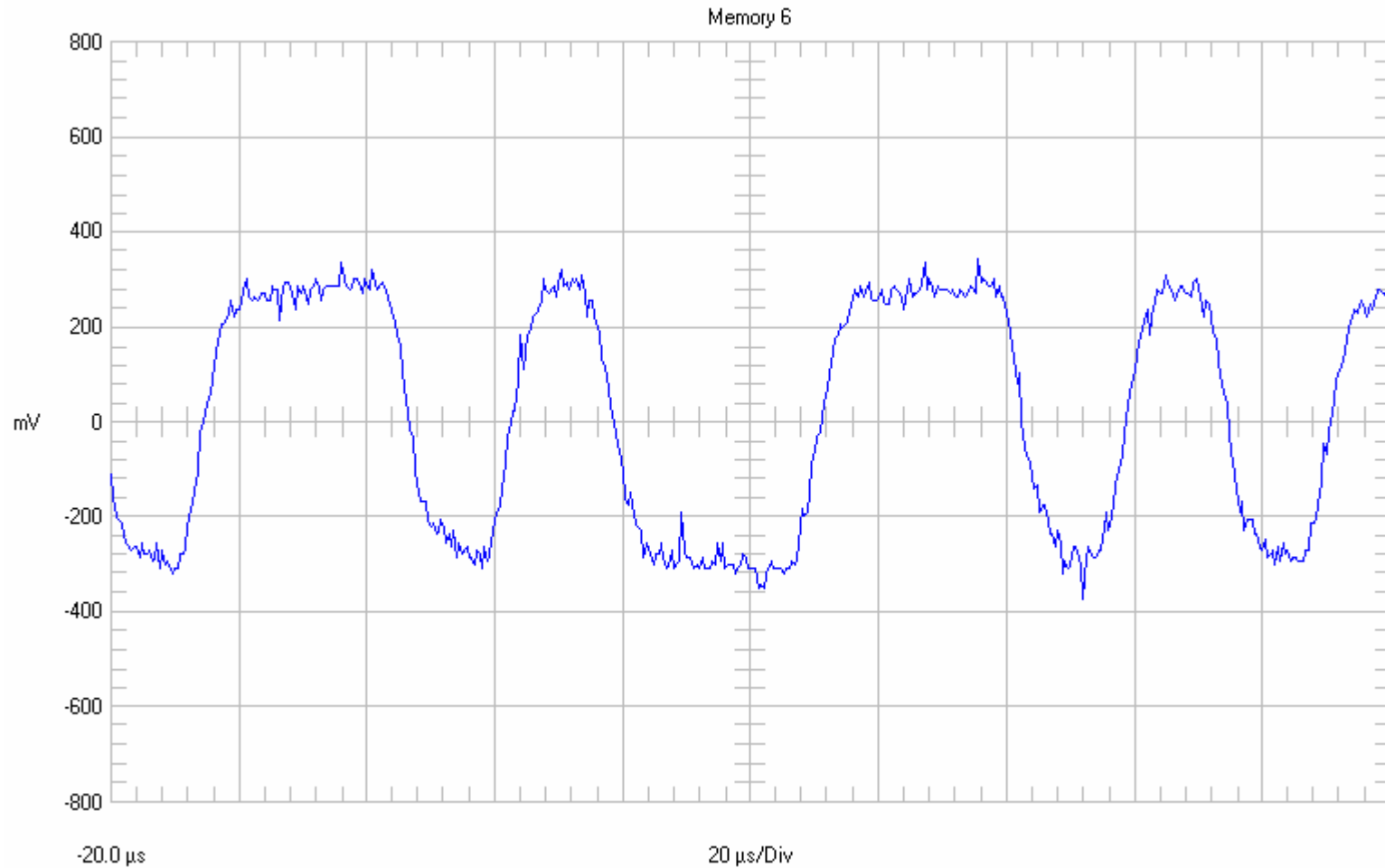
Shield should be grounded at a single point



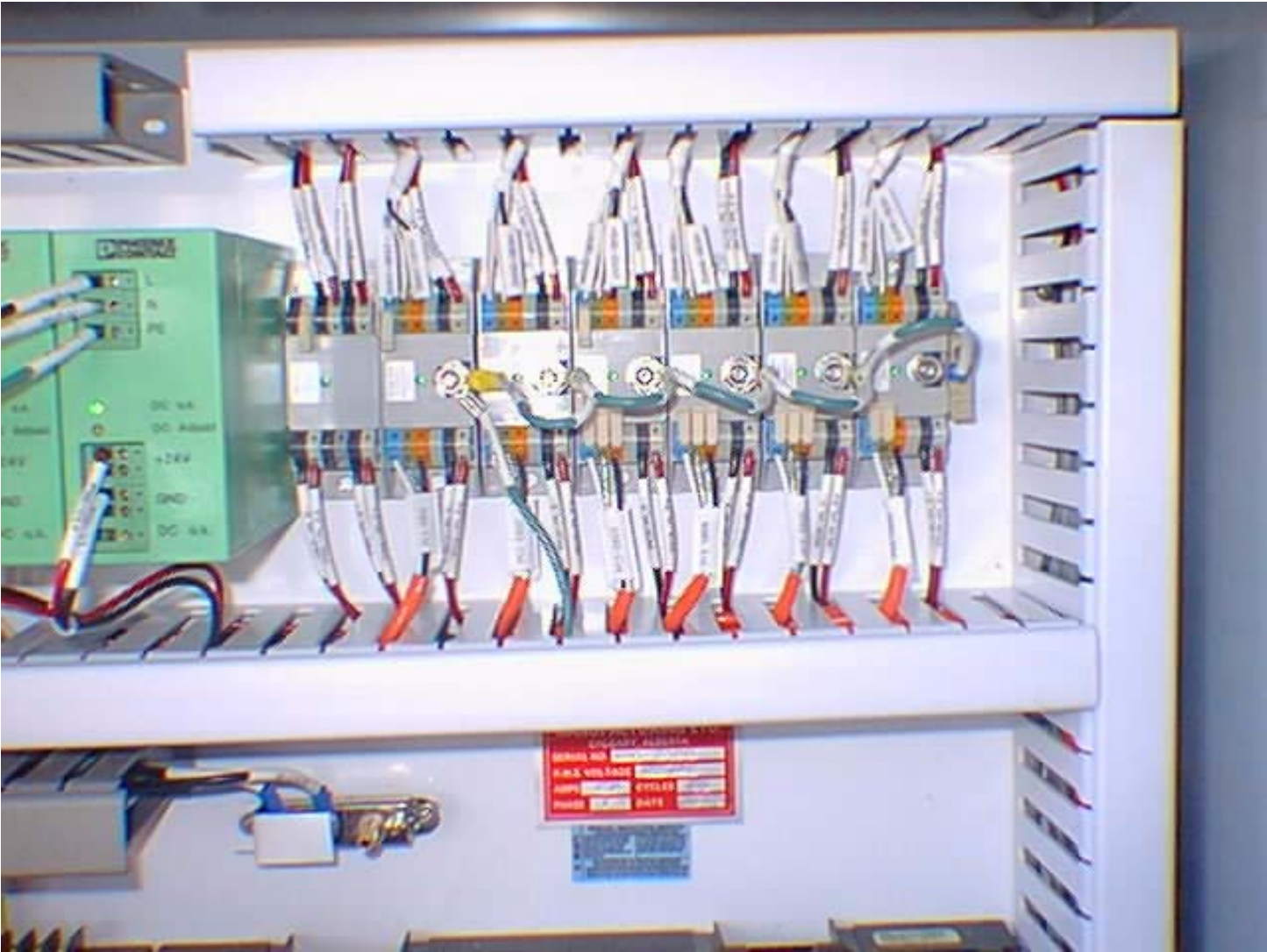
Signal form in a bad installation



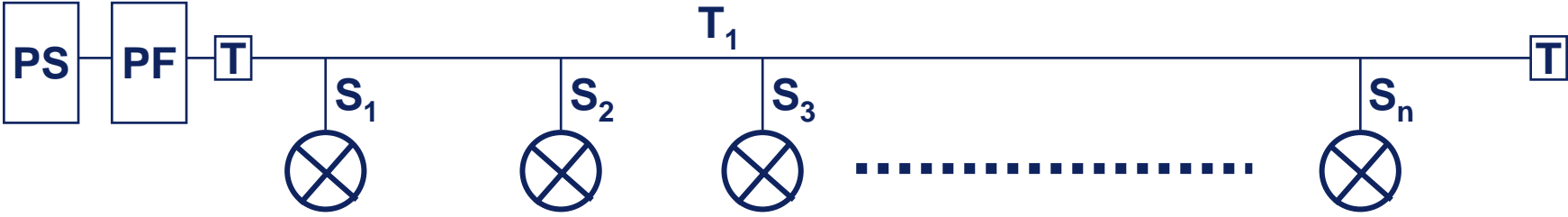
Same location after fixing the installation



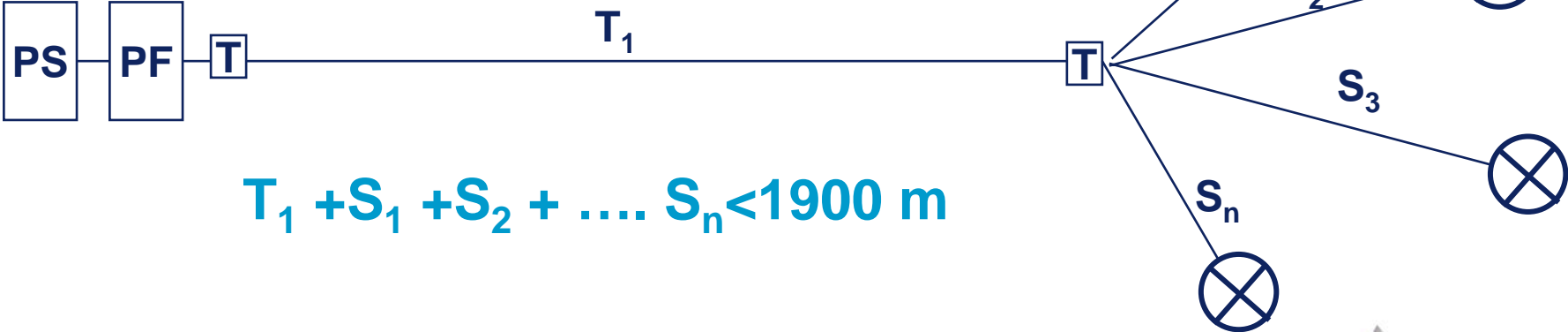
Example Power Supply – One per Segment



Fieldbus Supports Multiple Topologies



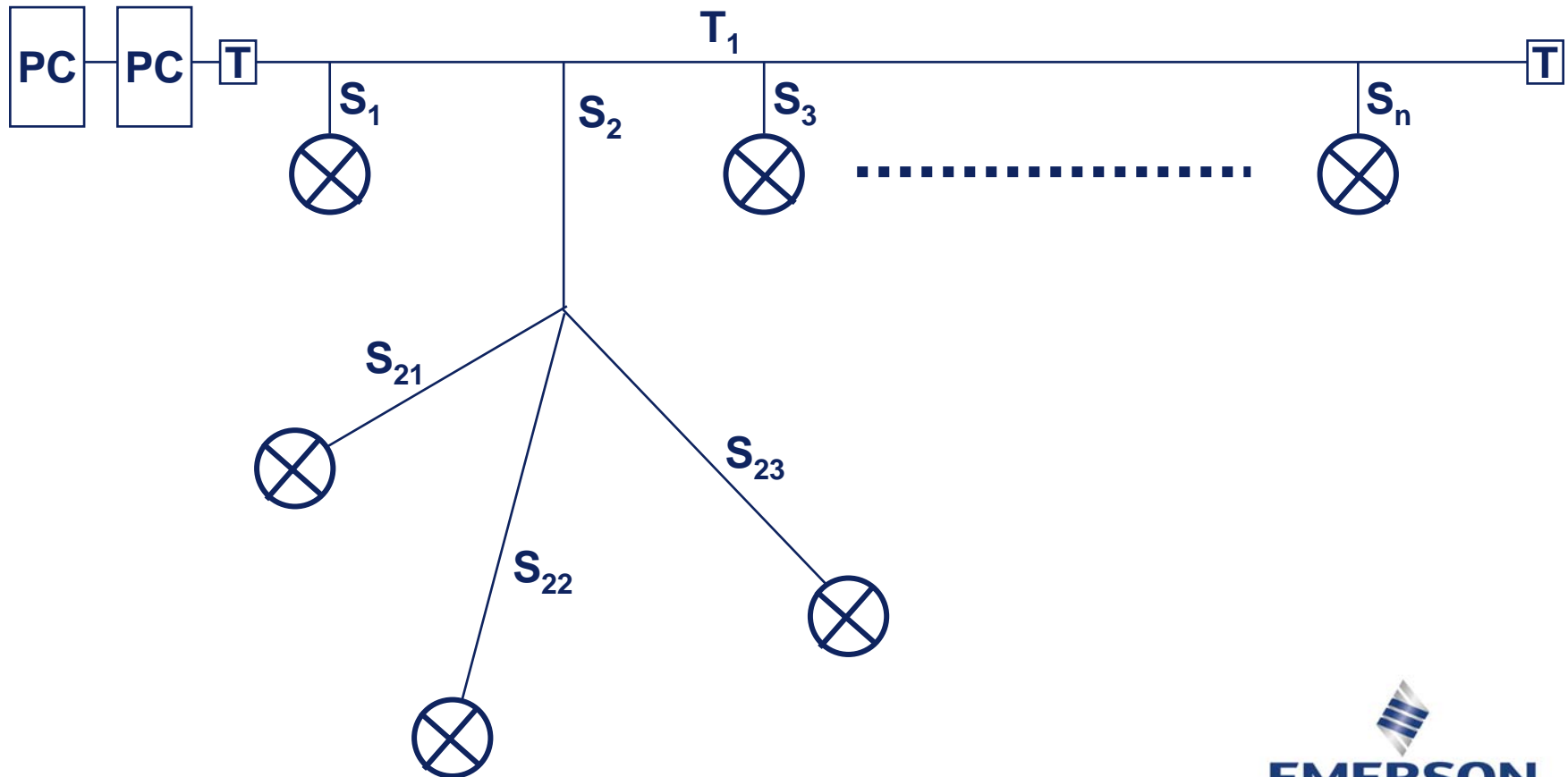
T_1 - TRUNK
 S_1 - SPUR



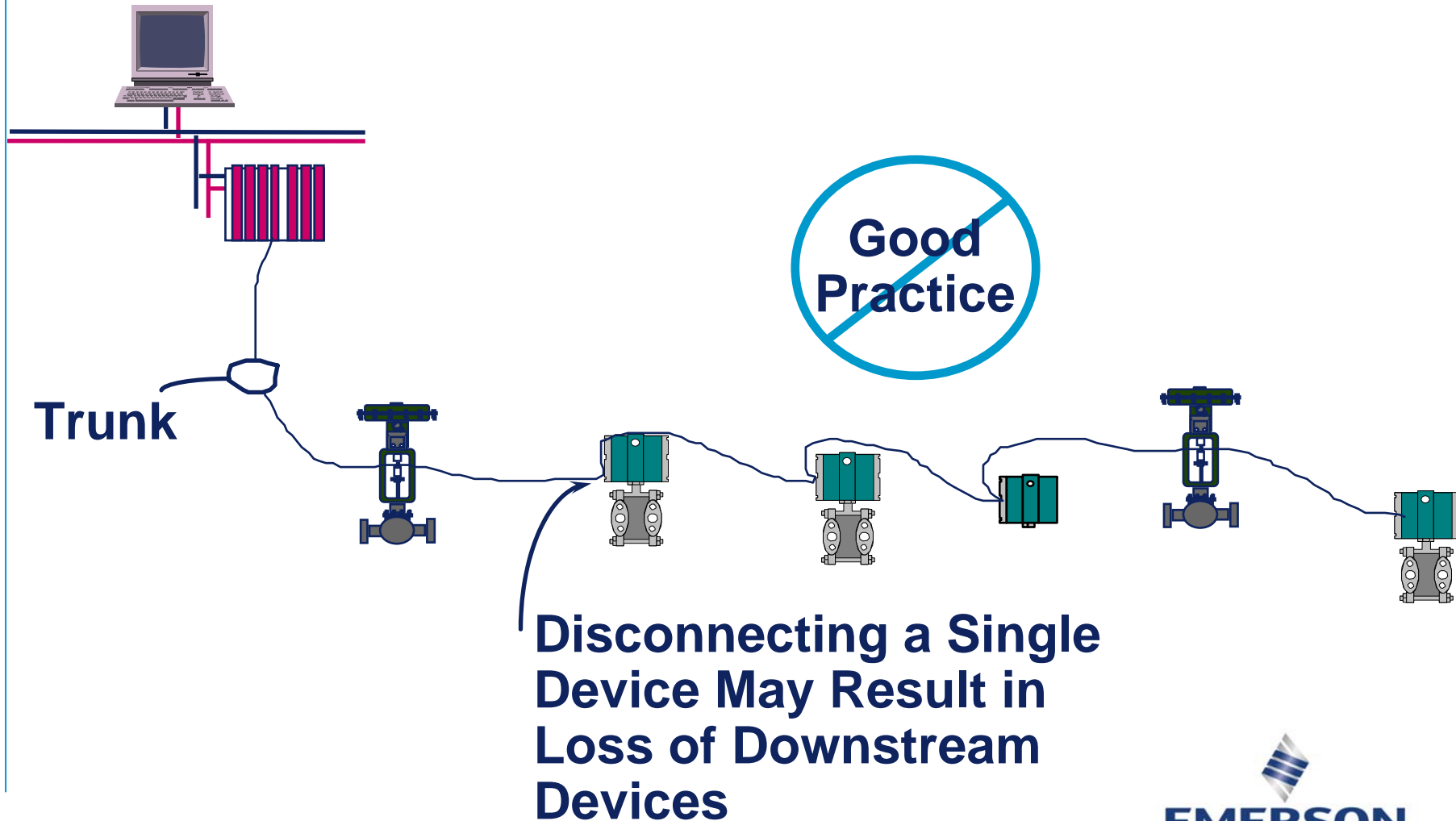
$T_1 + S_1 + S_2 + \dots + S_n < 1900 \text{ m}$

Fieldbus Supports Multiple Topologies

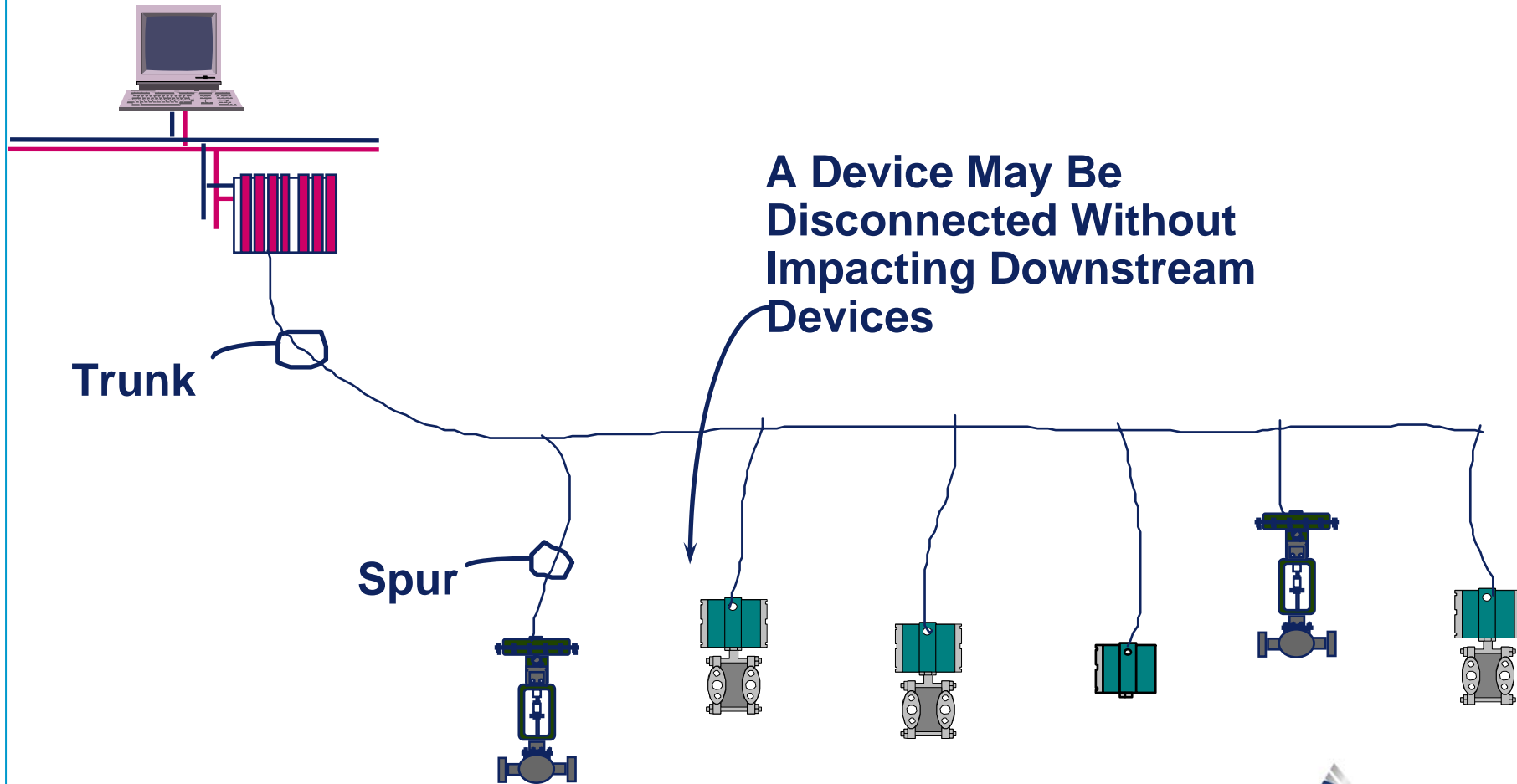
$$T_1 + S_1 + S_2 + S_{21} + S_{22} + S_{23} \dots + S_n < 1900 \text{ m}$$



Daisy-Chain Topology

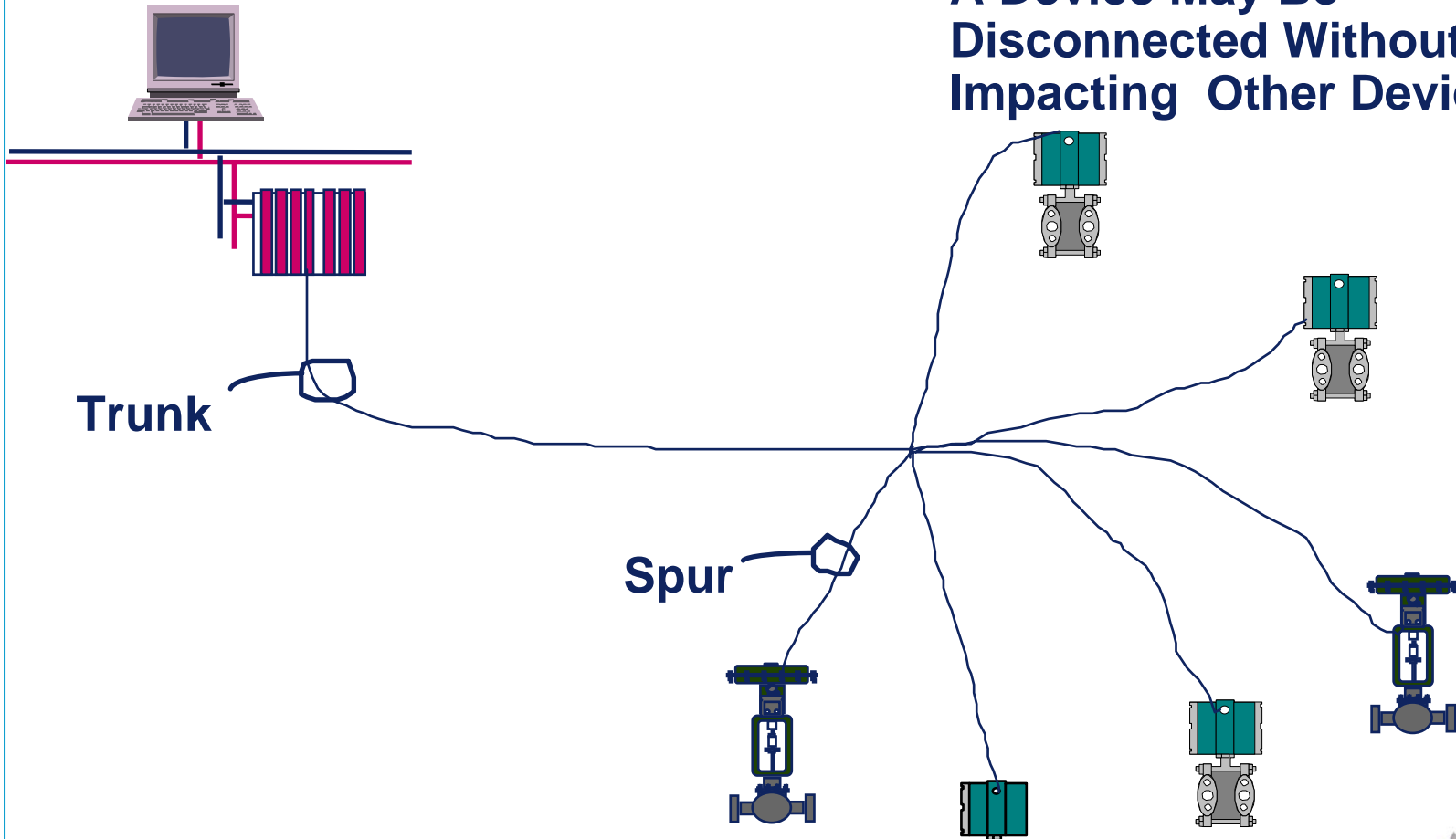


Branch Topology

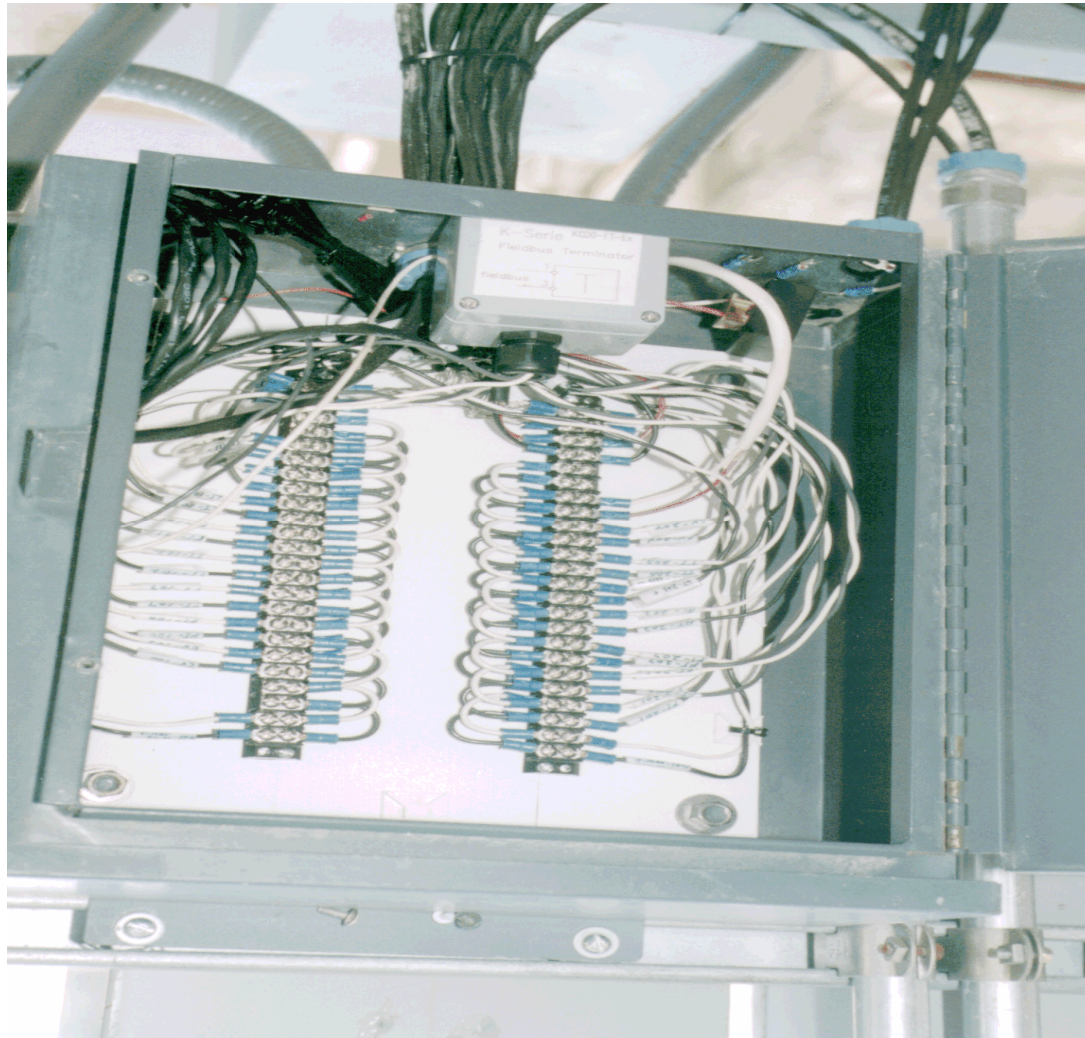


Tree Topology

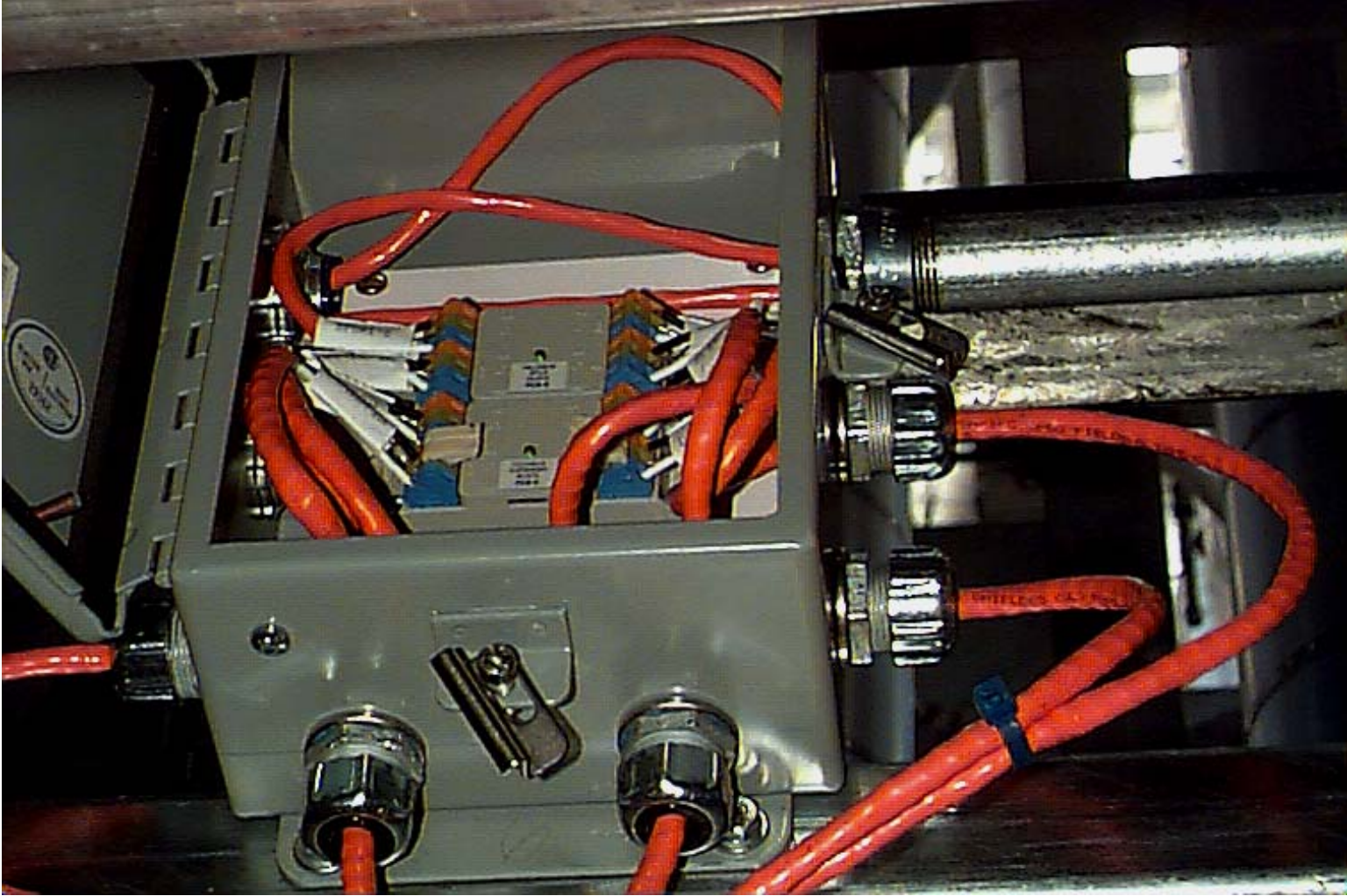
A Device May Be Disconnected Without Impacting Other Devices



Example - Field Junction Box



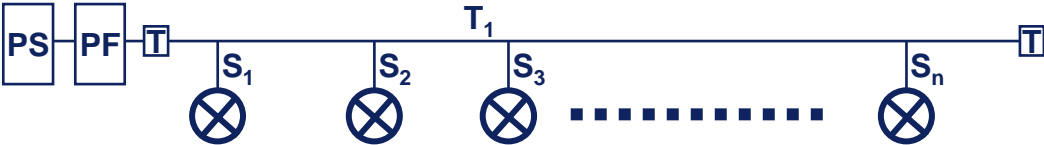
Example - Field Junction Box



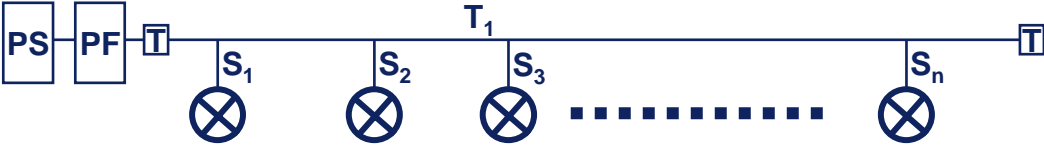
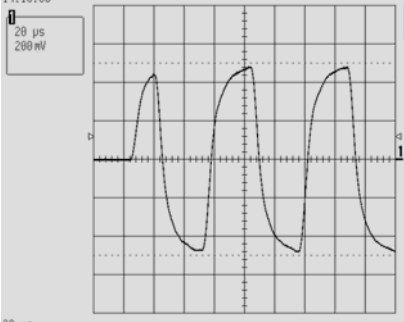
Standard is conservative

- Total length of cable should be less than 1900 m (shielded, 18 AWG, Type B)
- When connecting up to 12 devices in a powered bus, the Spur length limit should be:
 - * 120 m with one device
 - * 90 m with two devices
 - * 60 m with three devices
 - * 30 m with four devices.
- More devices in the network reduce the lengths given above

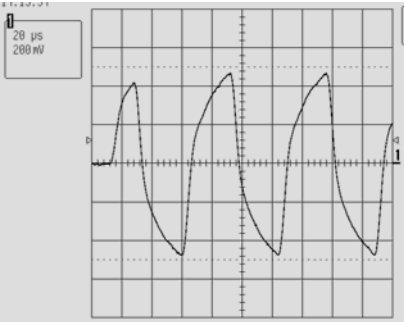
Communications under abnormal conditions



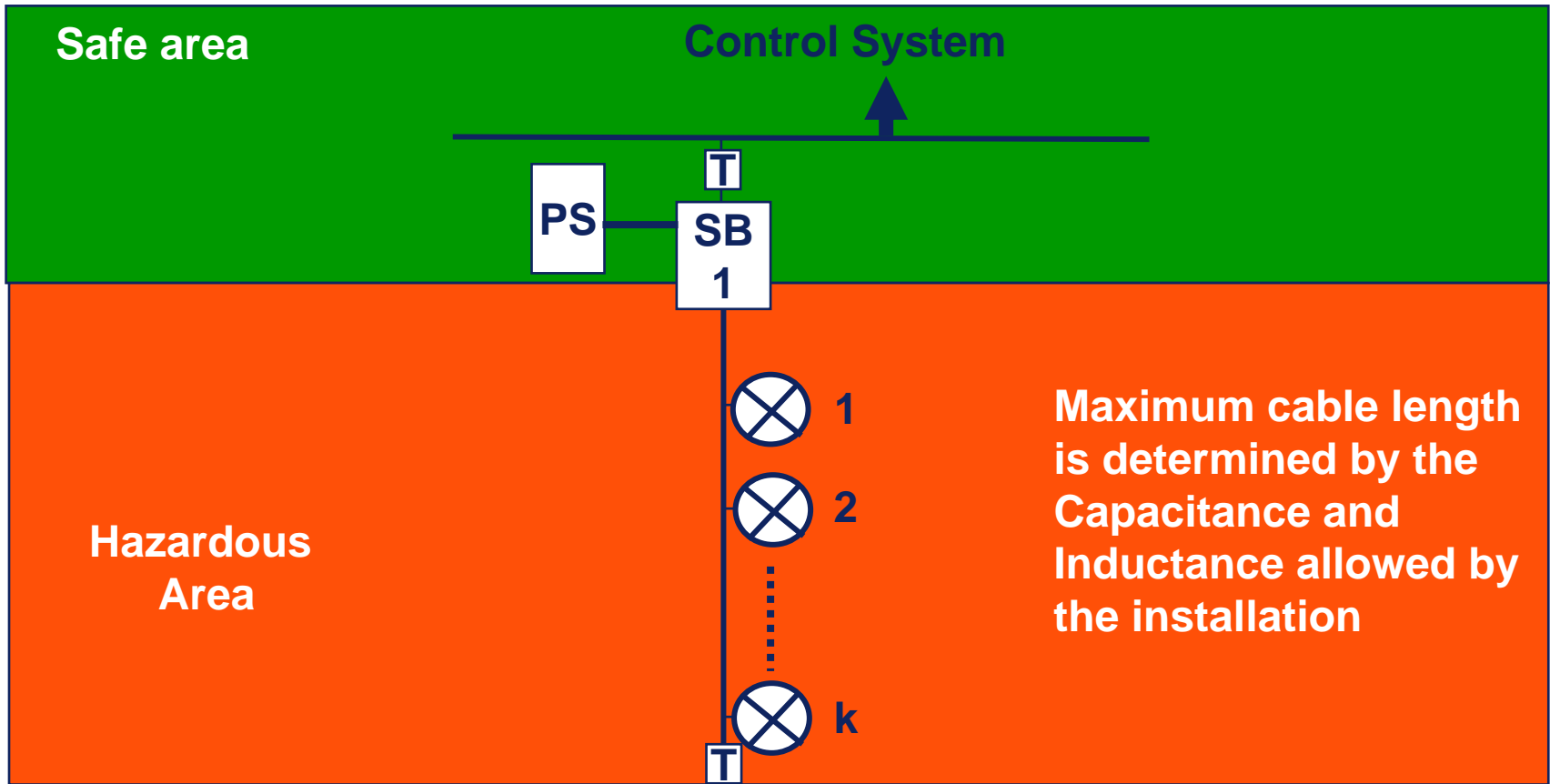
Long spurs (240 m)



Long Trunk (4000 m)

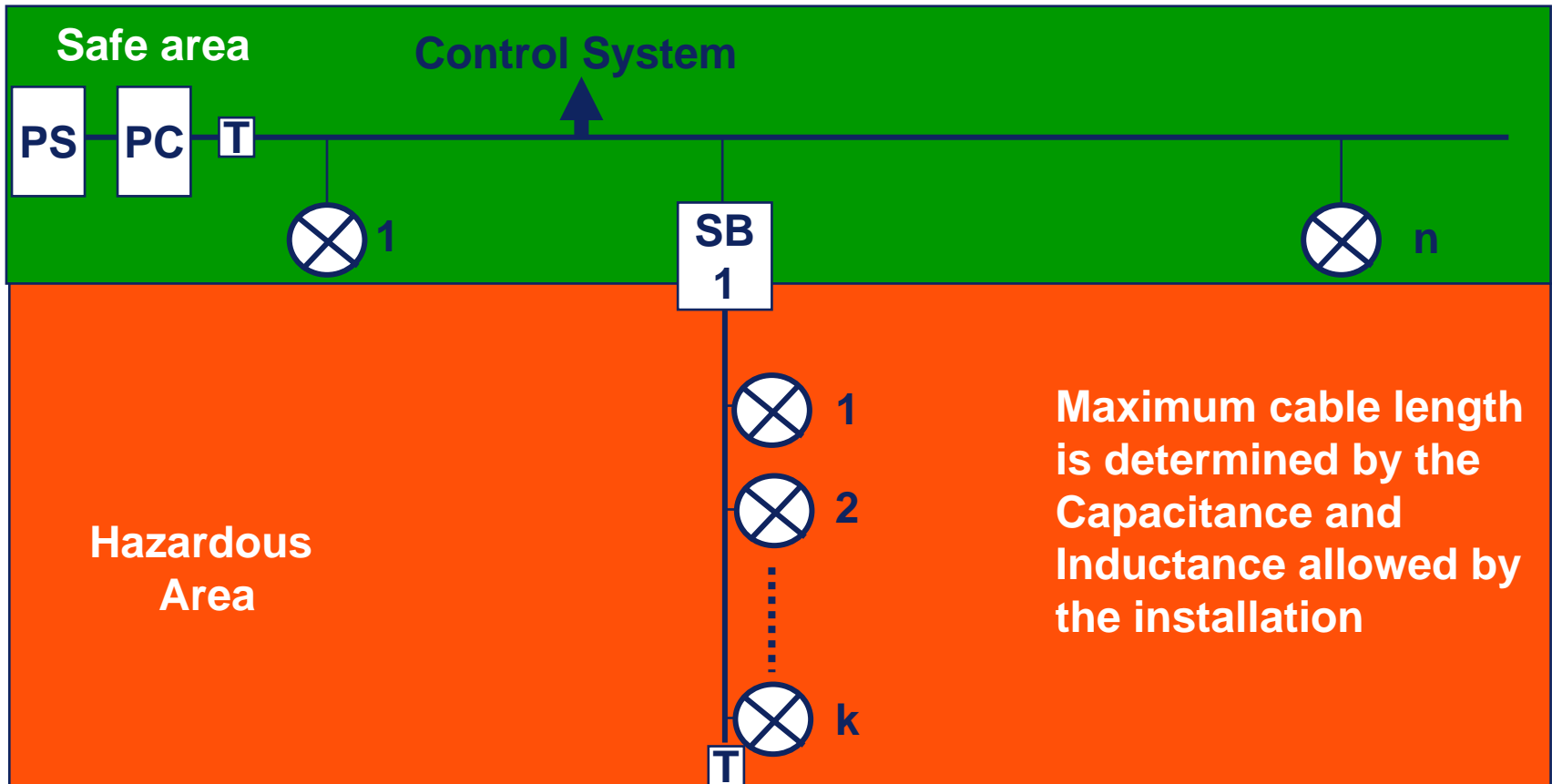


Intrinsic Safety Installations



k - depends on the power consumption of the devices, Entity parameters and barrier

Intrinsic Safety Installations

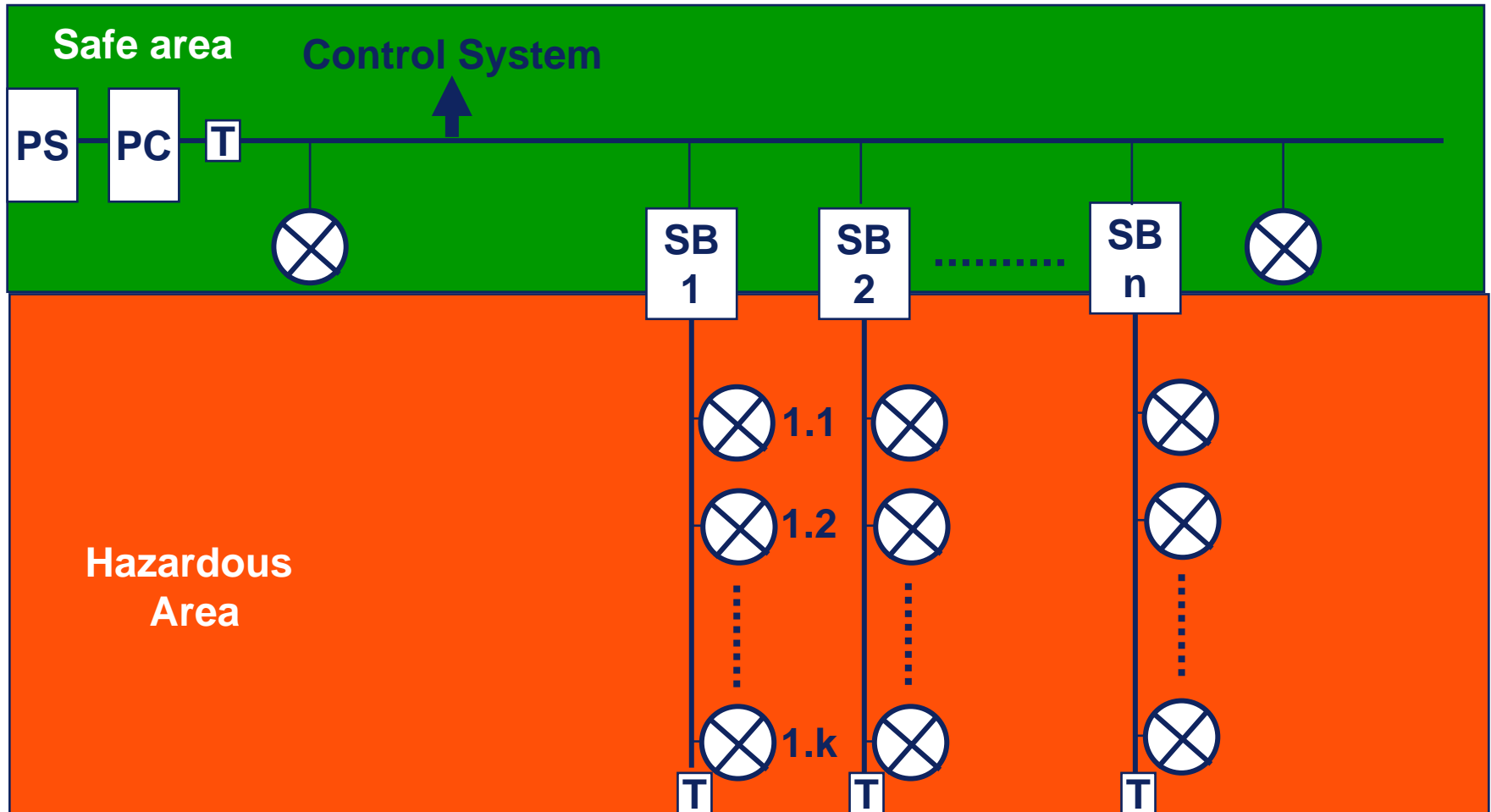


k - depends on the power consumption of the devices, Entity parameters and barrier

$$k+n < 16$$

Total cable length < 1900 m

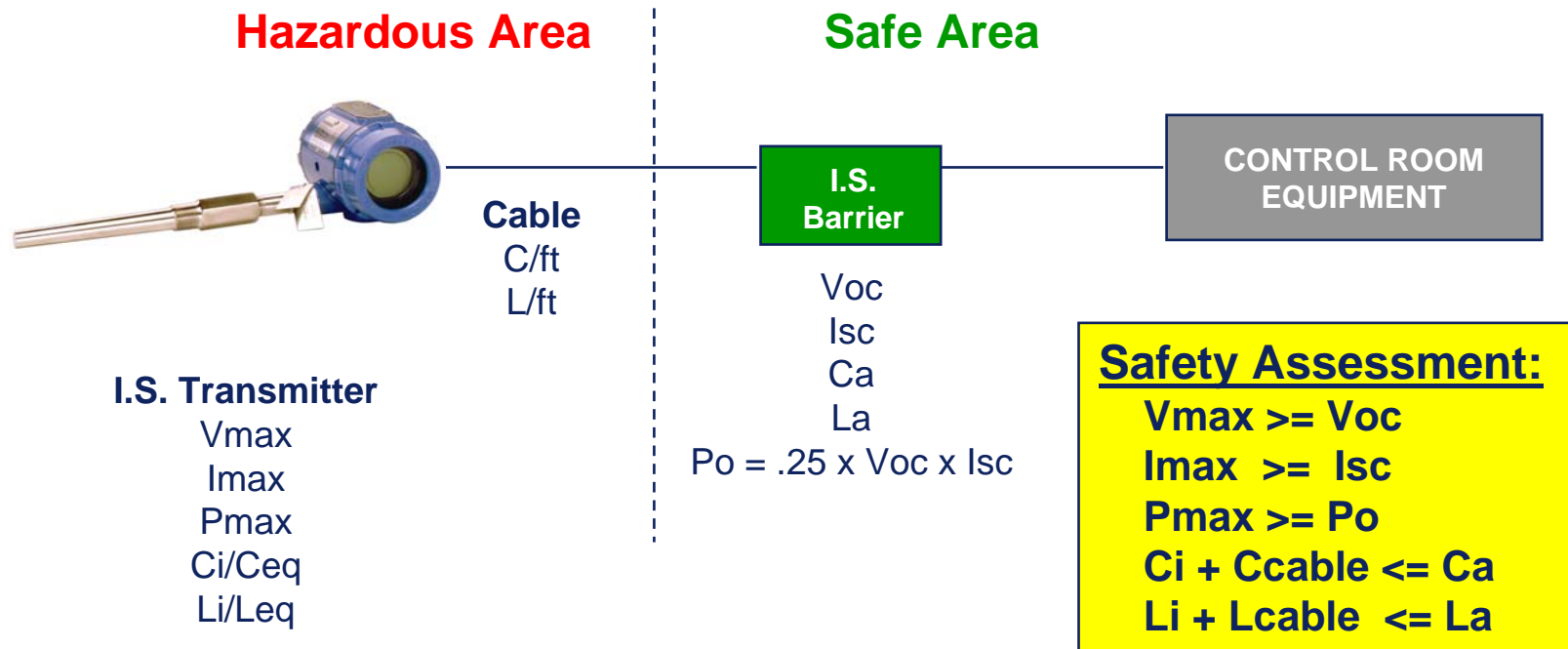
Intrinsic Safety Installations



k - depends on the power consumption of the devices and cable length
n - depends on the barrier type and cable length

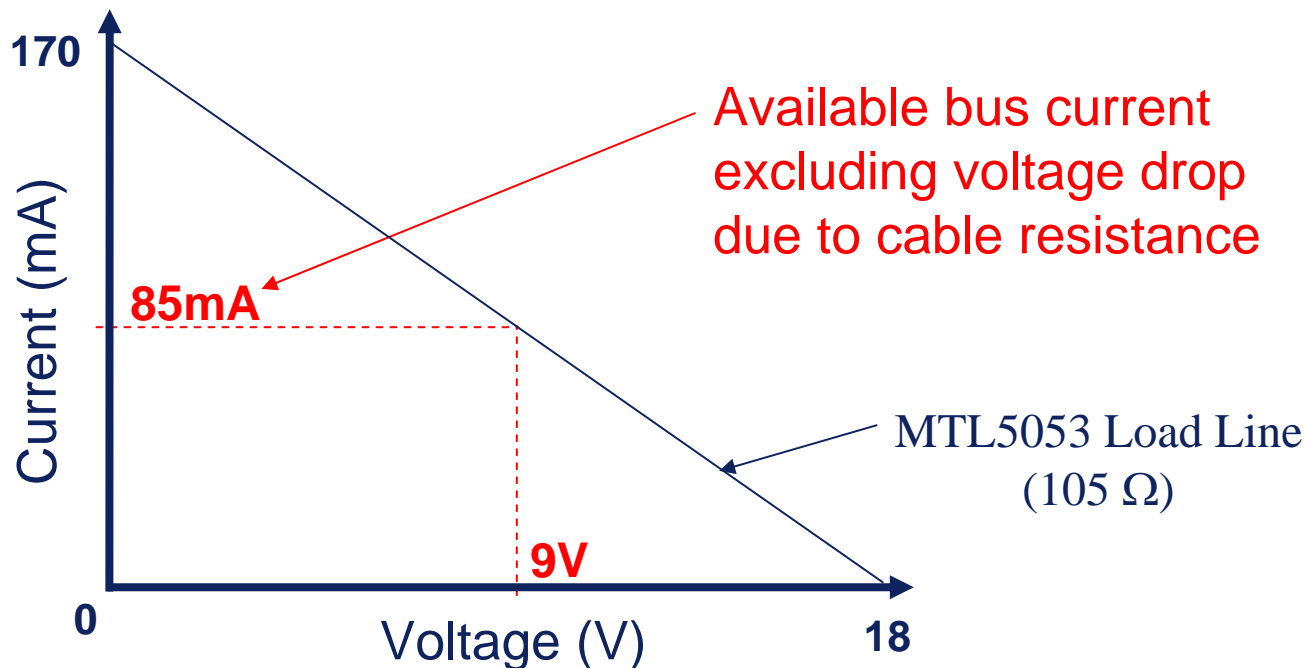
Traditional Intrinsic Safety Installation (4-20 mA Analog / HART)

1 Measurement per I.S. Barrier



Intrinsic Safety - Conventional Approach (Entity Model)

- What does it Mean ?
 - Using an MTL Barrier as an Example
 - More current = Less Volts



Intrinsic Safety - Conventional Approach (Entity Model)

- So How Much Current do the devices need ?

- 3051

- 17mA



$$\times 2 = 34\text{mA}$$

- 3244

- 17mA



$$\times 2 = 34\text{mA}$$

- Communication Current Required

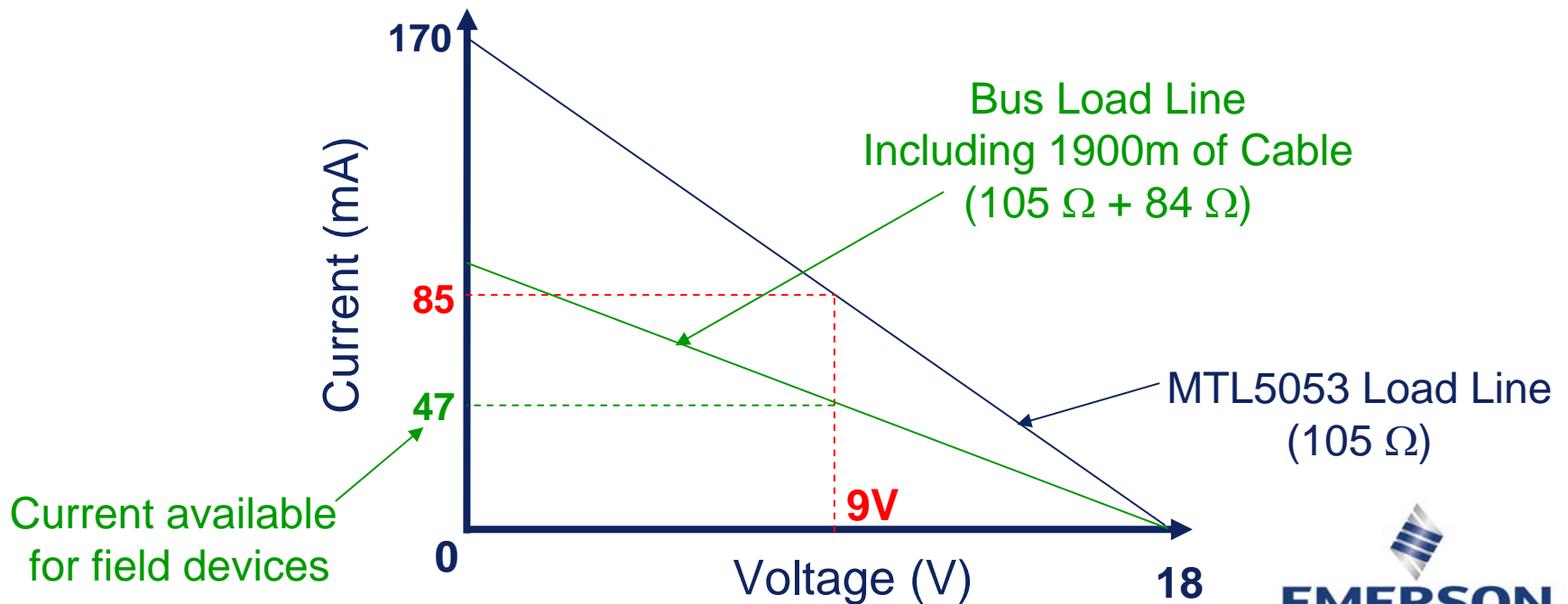
- 10mA

$$= 10\text{mA}$$

78mA

Intrinsic Safety - Conventional Approach (Entity Model)

- What does it Mean ?
 - Using an MTL I.S. Fieldbus Power Supply as an Example
 - More current = Less Volts



The Entity Model

- Cable Length and Quality

- The Calculation.
 - Current available =

MTL5053 = 18V

Tx Minimum Lift
off voltage

(Open Circuit Output Voltage of the Power Supply) - 9Volts

(Source Resistance of the Barrier) + (Fieldbus Cable Loop Resistance)

MTL5053 = 105 Ohms

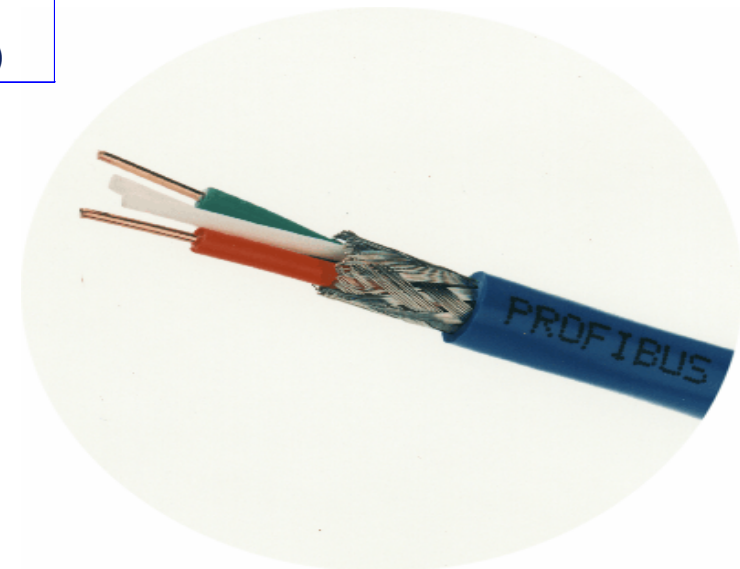
1900m = 84 Ω

The Main Issue

What types of Wire

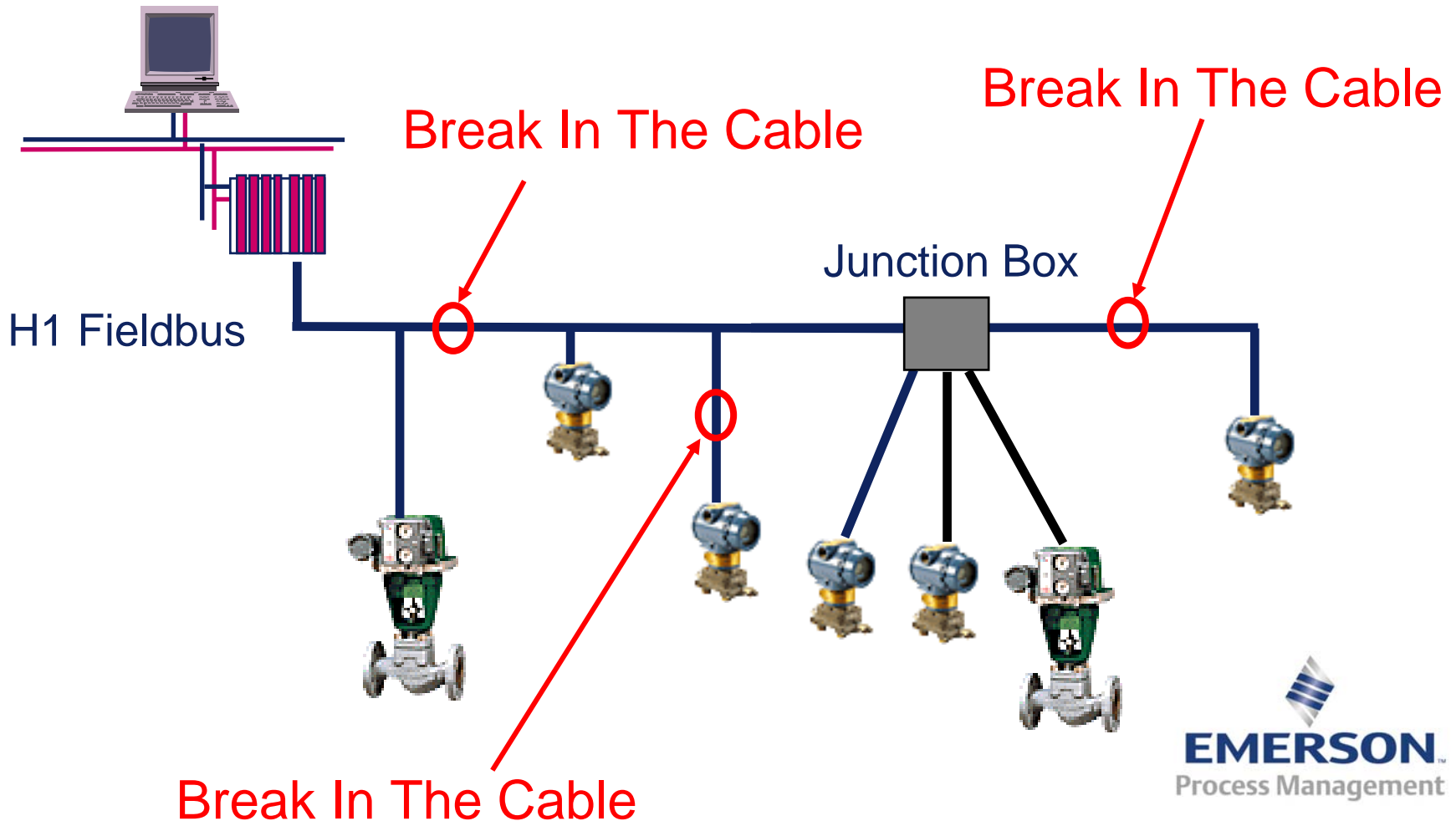
“Typical” Length Restrictions With Existing Wire

Type	Description	Size	Max Length
A	Shielded, Twisted Pair	#18 AWG (.8 mm ²)	1900 m (6232 ft.)
B	Multiple-Twisted-Pair with Shield	#22 AWG (.32 mm ²)	1200 m (3963 ft.)
C	Multi-Twisted-Pair Without Shield	#26 AWG (.13 mm ²)	400 m (1312 ft.)
D	Multi-core, w/o Twisted Pairs and Having Overall Shield	#16 AWG (1.25 mm ²)	200 m (656 ft.)

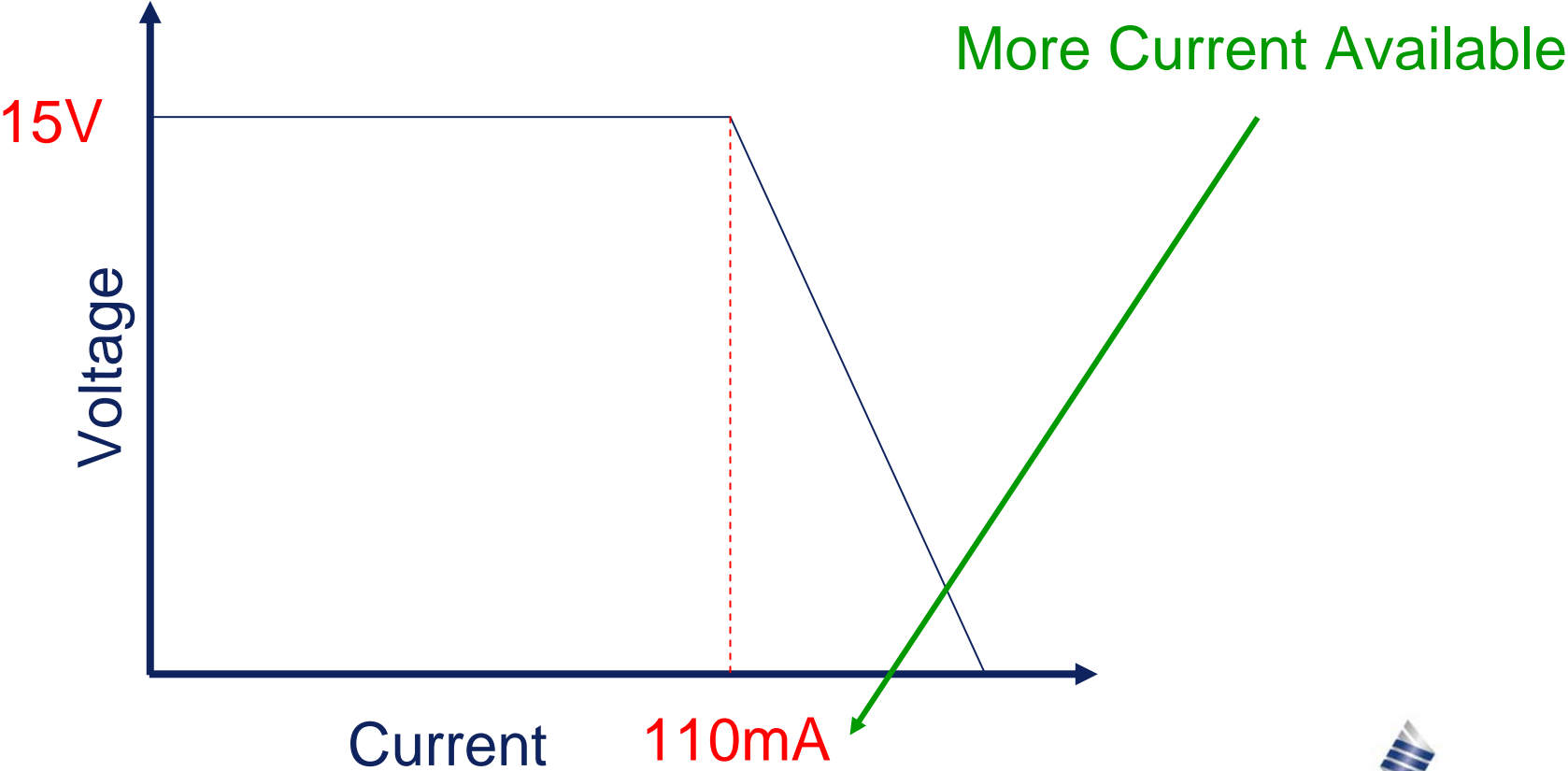


Entity Model Point Failure

Assumes that ALL the Electrical Characteristics Manifest themselves at the Cable Break



Intrinsic Safety - FISCO Approach



Intrinsic Safety - FISCO Approach

- So How Much Current do the devices need ?

- 3051

- 17mA



X 3 = 51mA

- 3244

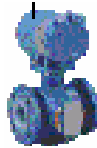
- 17mA



X 2 = 34mA

- 8742C

- 12mA



- Communication Current Required

- 10mA

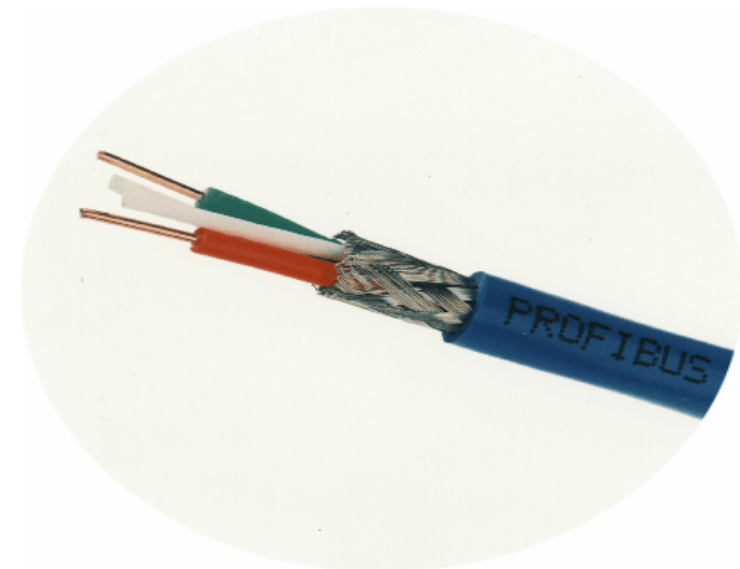
X 1 = 12mA

= 10mA

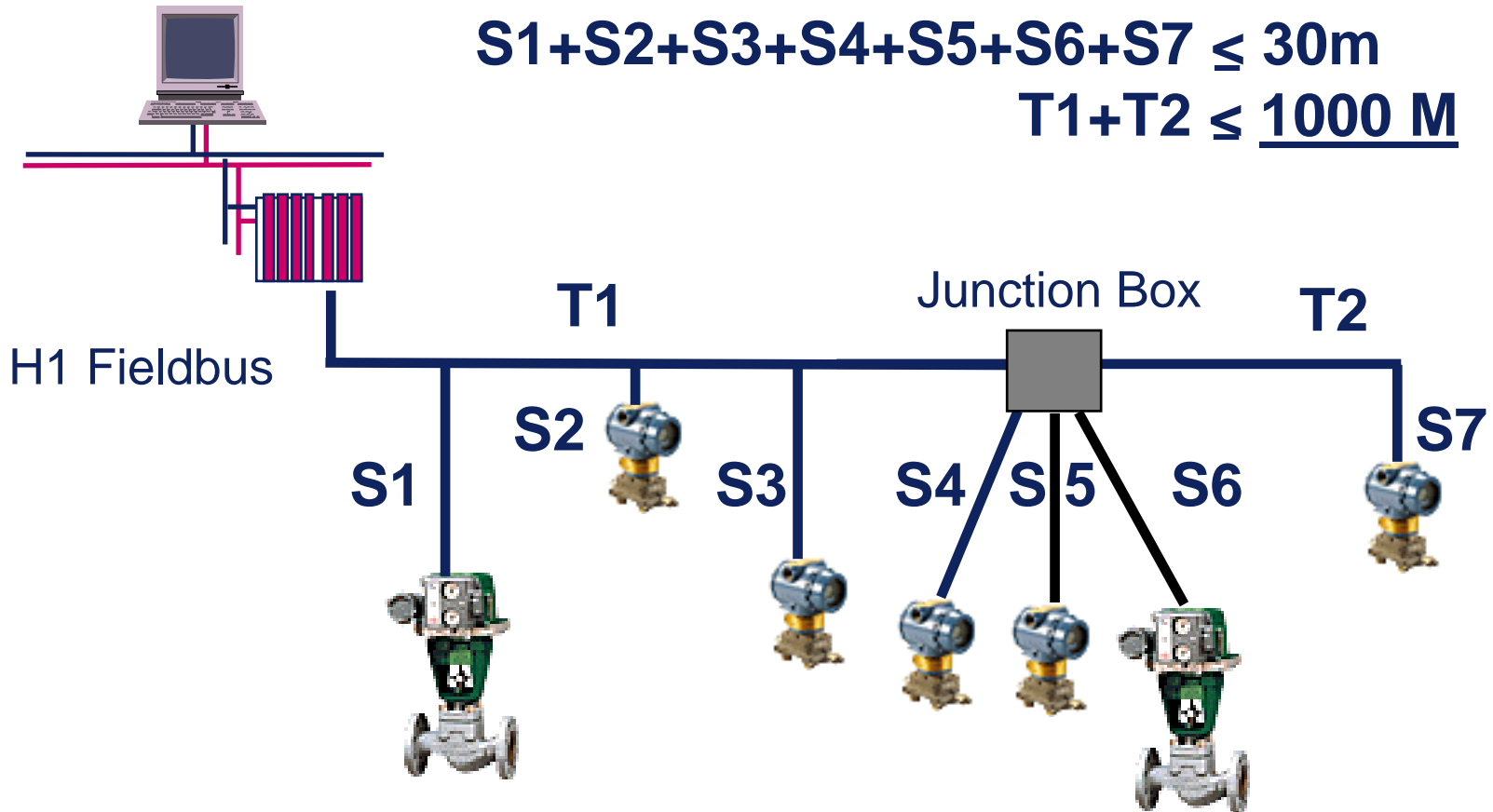
107mA

FISCO - What types of Wire

- Cable parameters
 - Loop resistance 15 to 150 ohms / km
 - Inductance per unit length 0.4 to 1mH / km
 - Capacitance per unit length 80 to 200nF
- Length of cable
 - Trunk up to 1000 m
 - Spur up to 30m
 - Splice up to 1m

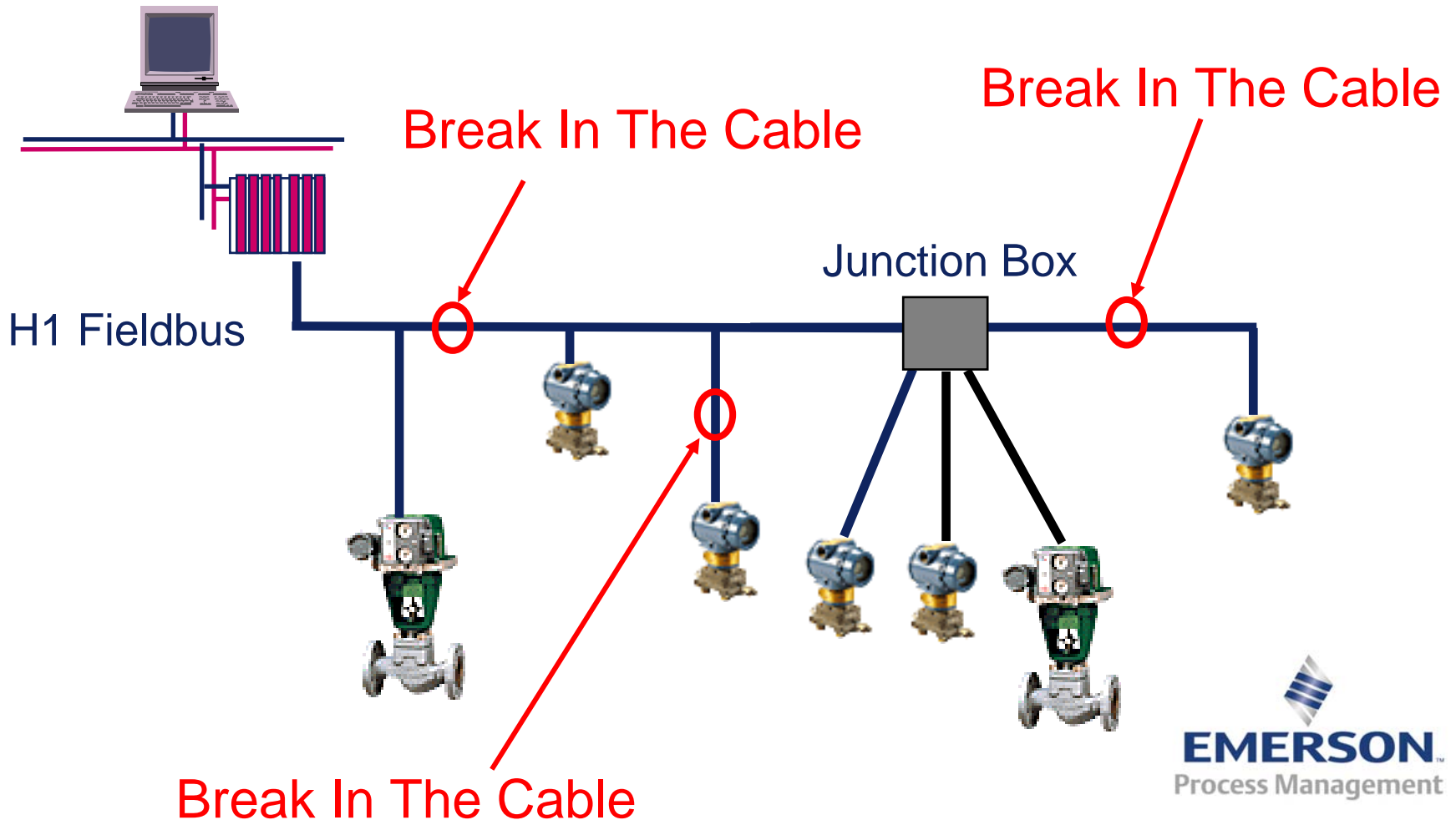


FISCO - Rules and Capacities



FISCO - Point Failure

Assumes that the Electrical Characteristics are Distributed around the Segment



Summary - What do they have in Common ?

- Only one source of power applied to the fieldbus segment
- Field devices designed to contribute no energy to the bus (whether transmitting or receiving)
- Each device has small permitted effective internal inductance and capacitance (similar maximum values defined in both approaches)
- Bus segment terminated at both ends (terminator is resistor-capacitor series combination)

Summary - What are the Differences ?

- **Entity Model**

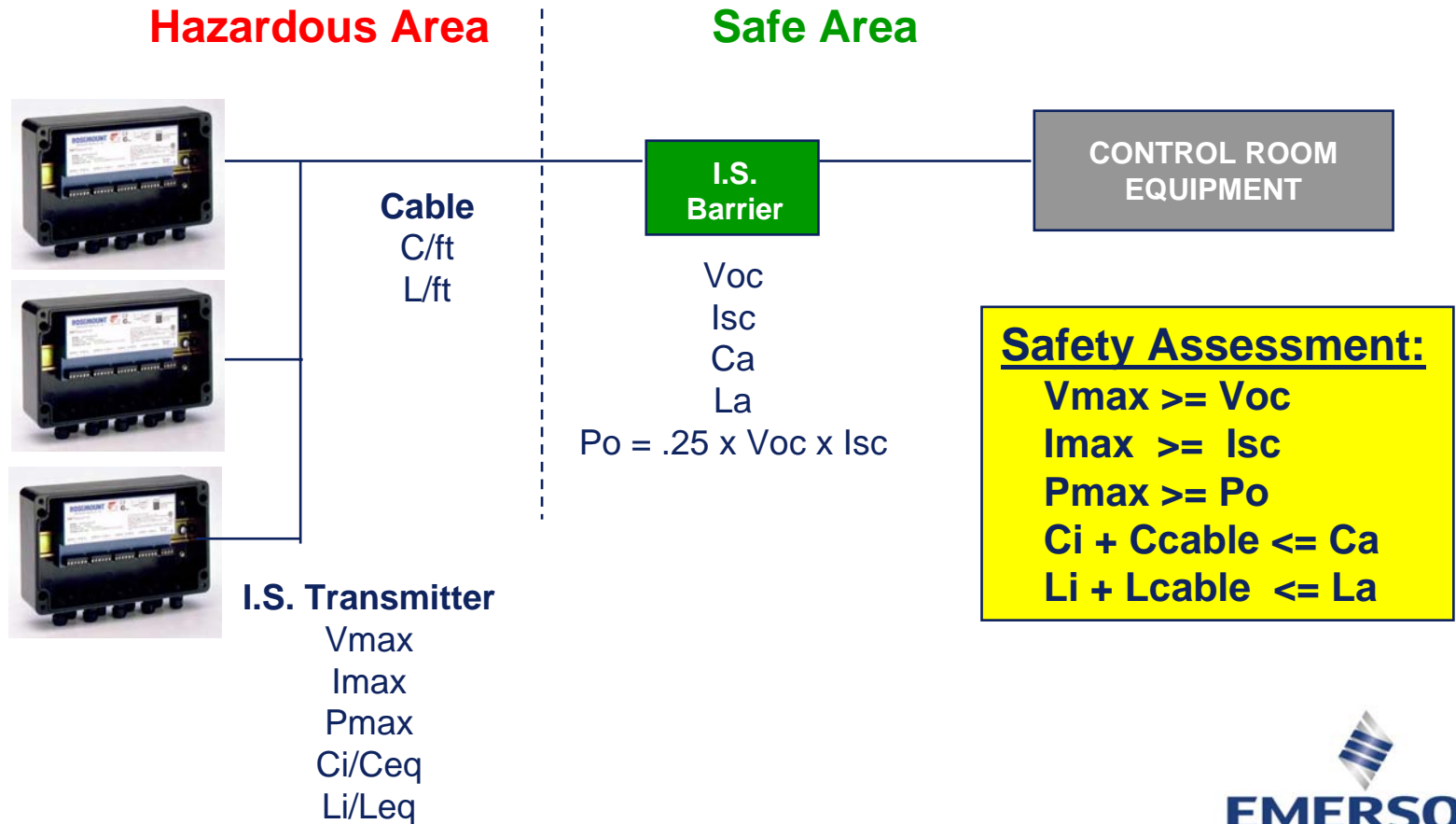
- Linear (resistively limited) power supply characteristic
- Power supply approval defines max. system C and L values, and therefore bus cable limitations
- Bus power defined as 1.2W max. at 60°C, to simplify device approval
- Current available for devices: 60mA on 1900m bus, 90mA on short bus (using Type 'A' cable) on IIC or IIB systems
- Typically 4 (20mA) devices on IS bus segment - in any gas group

- **FISCO**

- Square or trapezoidal power supply characteristic
- Power supply approved without max. C and L values, allowing bus length up to 1km with a variety of cable types
- Higher power supplied to bus: up to 1.9W in IIC (Groups A & B) and 4.9W in IIB (Group C) systems. Each device must be approved compatible with this power.
- Current available for devices: 110mA for IIC, greater for IIB systems
- Typically 6 (20mA) devices on IS bus in IIC, 10 devices in IIB gas group

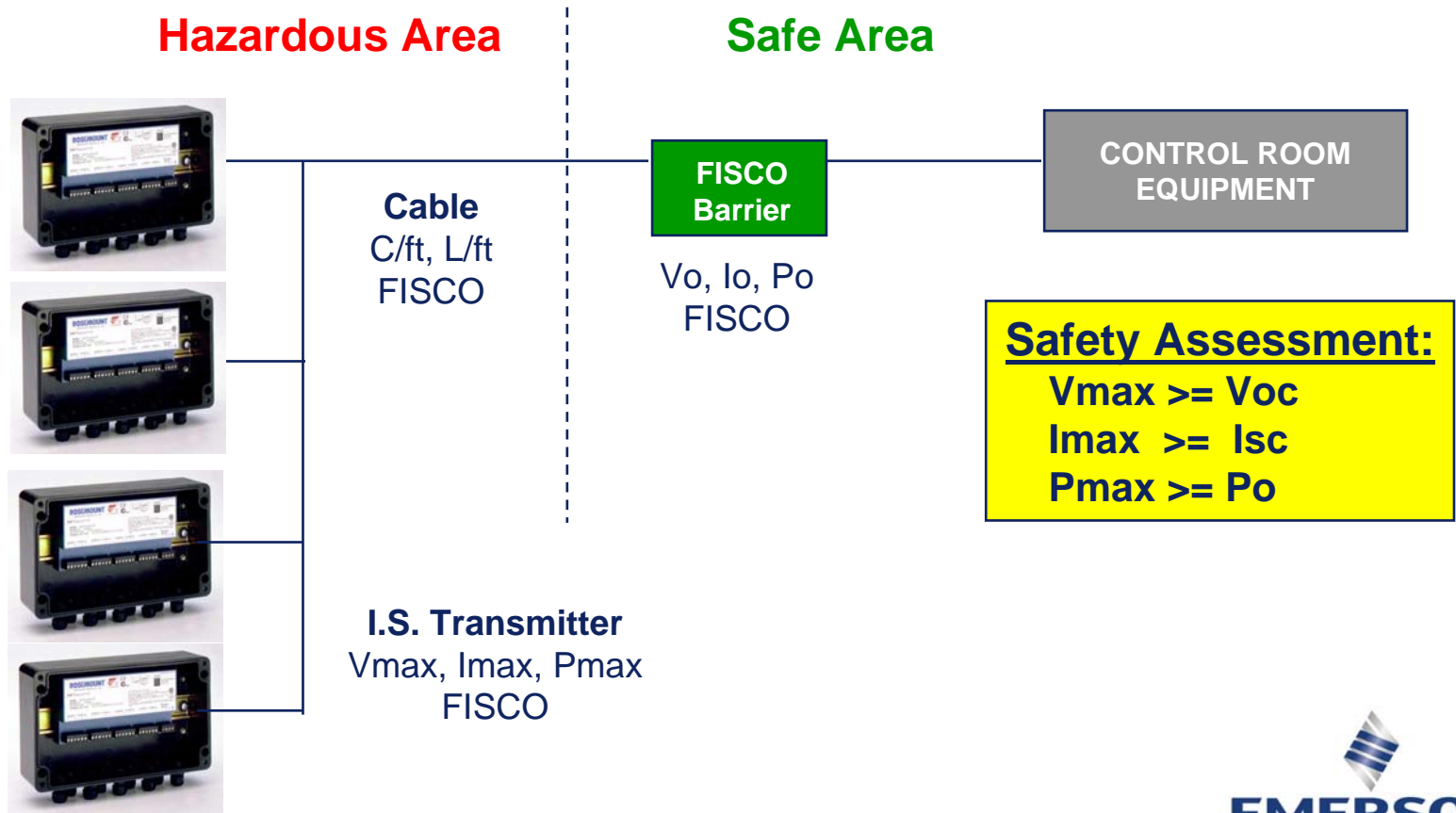
Intrinsic Safety - Conventional Approach (Entity Model)

24 Measurements per I.S. Barrier

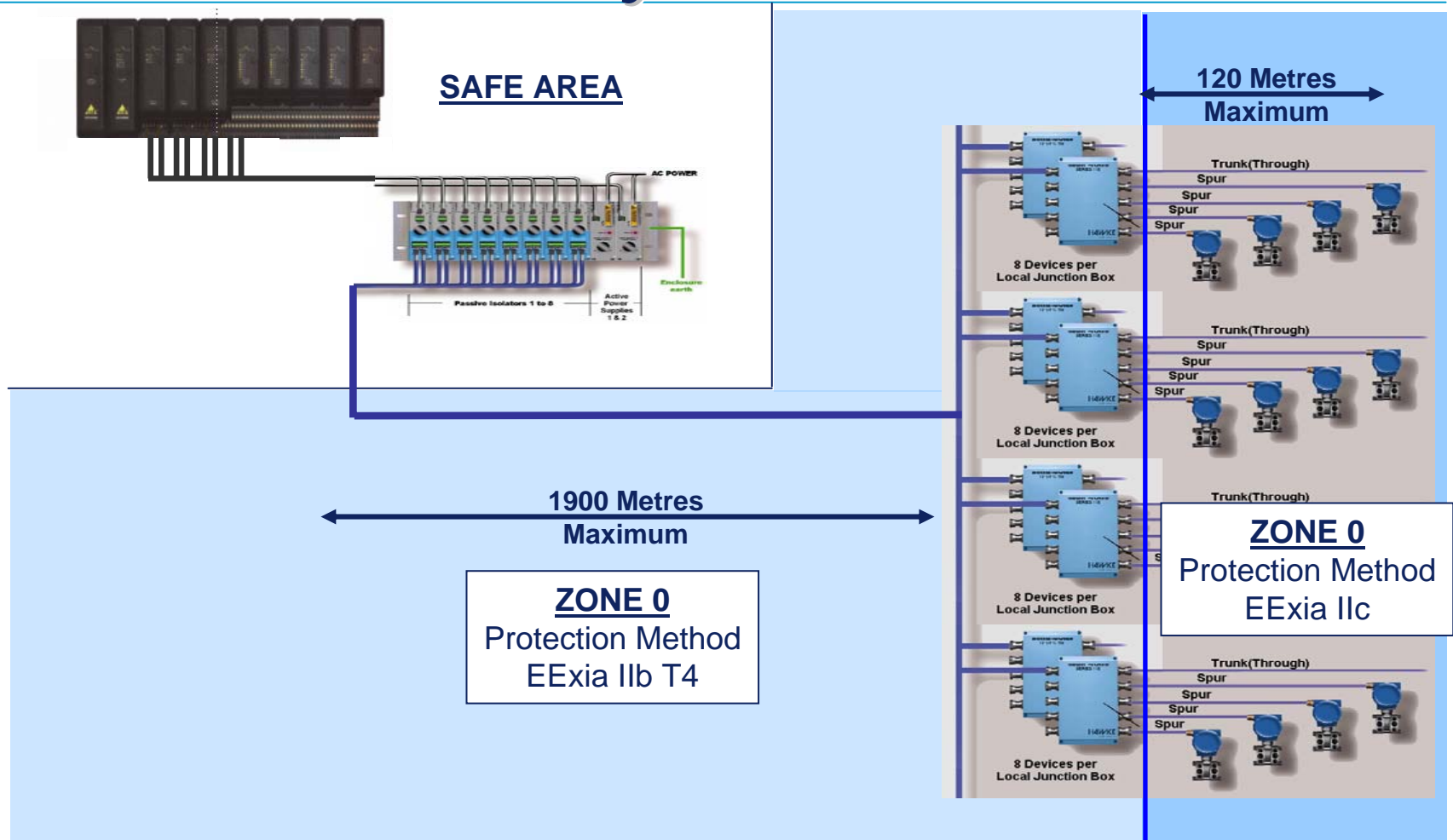


Intrinsic Safety - FISCO Approach

32 Measurements per FISCO Barrier



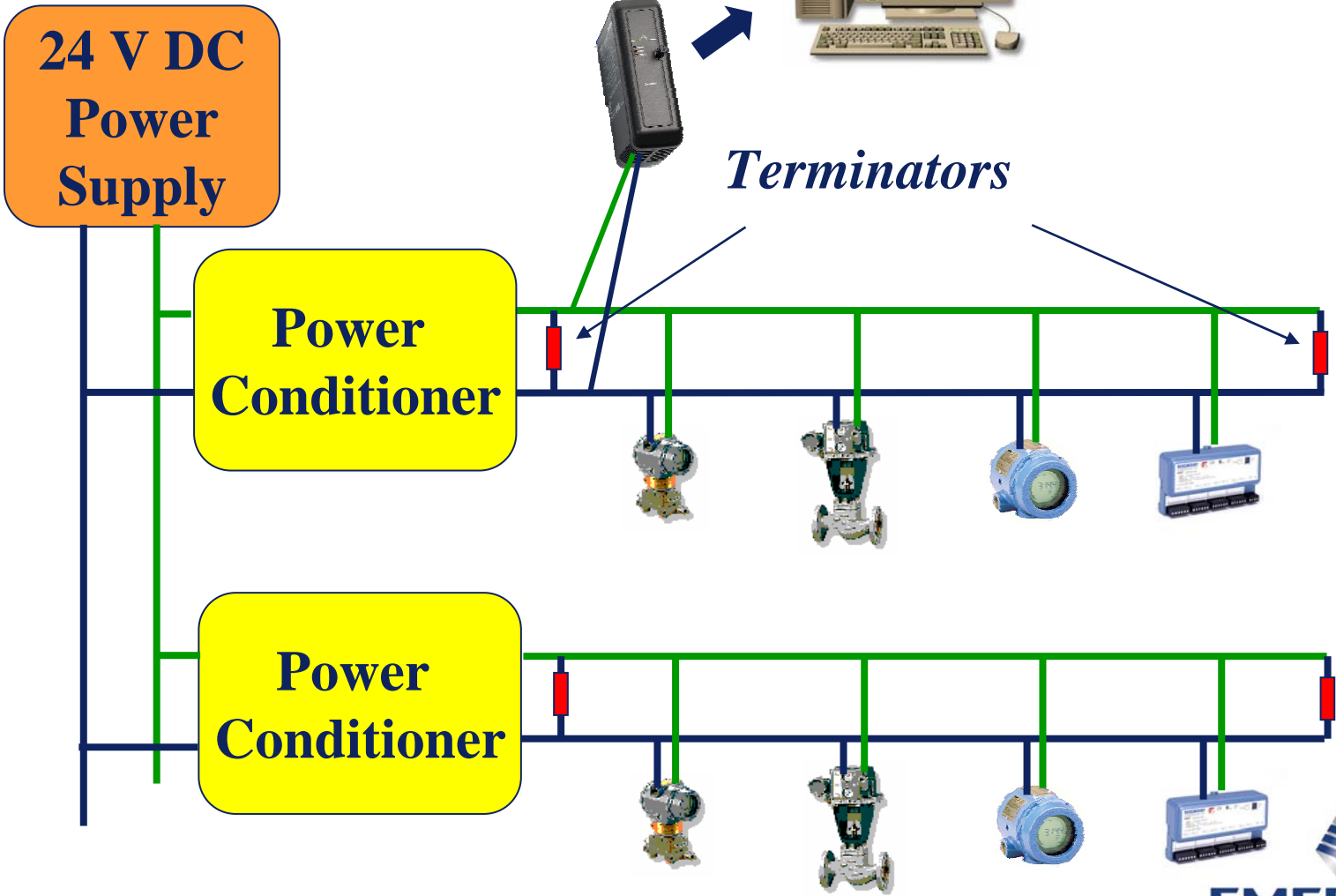
Hawke Intrinsically Safe Installation



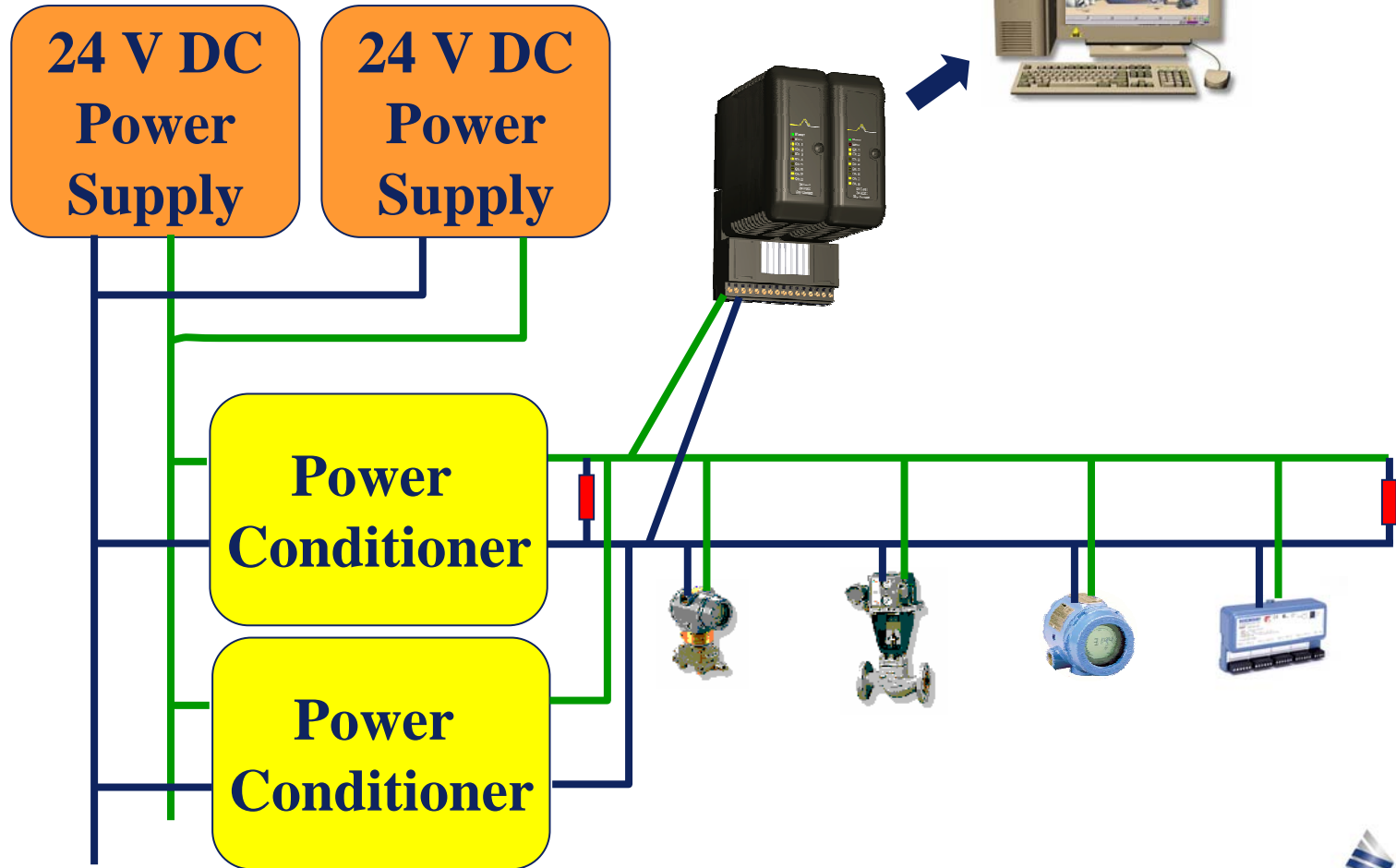
Choose Components For Reliability

- Physical Installation – Wiring, connectors, grounding, shielding
 - Short Circuit Protection
- Power for Fieldbus
 - Redundant Power Conditioners
 - Isolated Power
- Control System Interface
 - Redundant H1 Cards
 - Diagnostics, communication statistics
- Devices Design and Functionality
 - Watchdog timer, Anti-jabber
 - Diagnostics and Mode Shedding
 - Failsafe mode
 - Backup Link Active Scheduling Capability

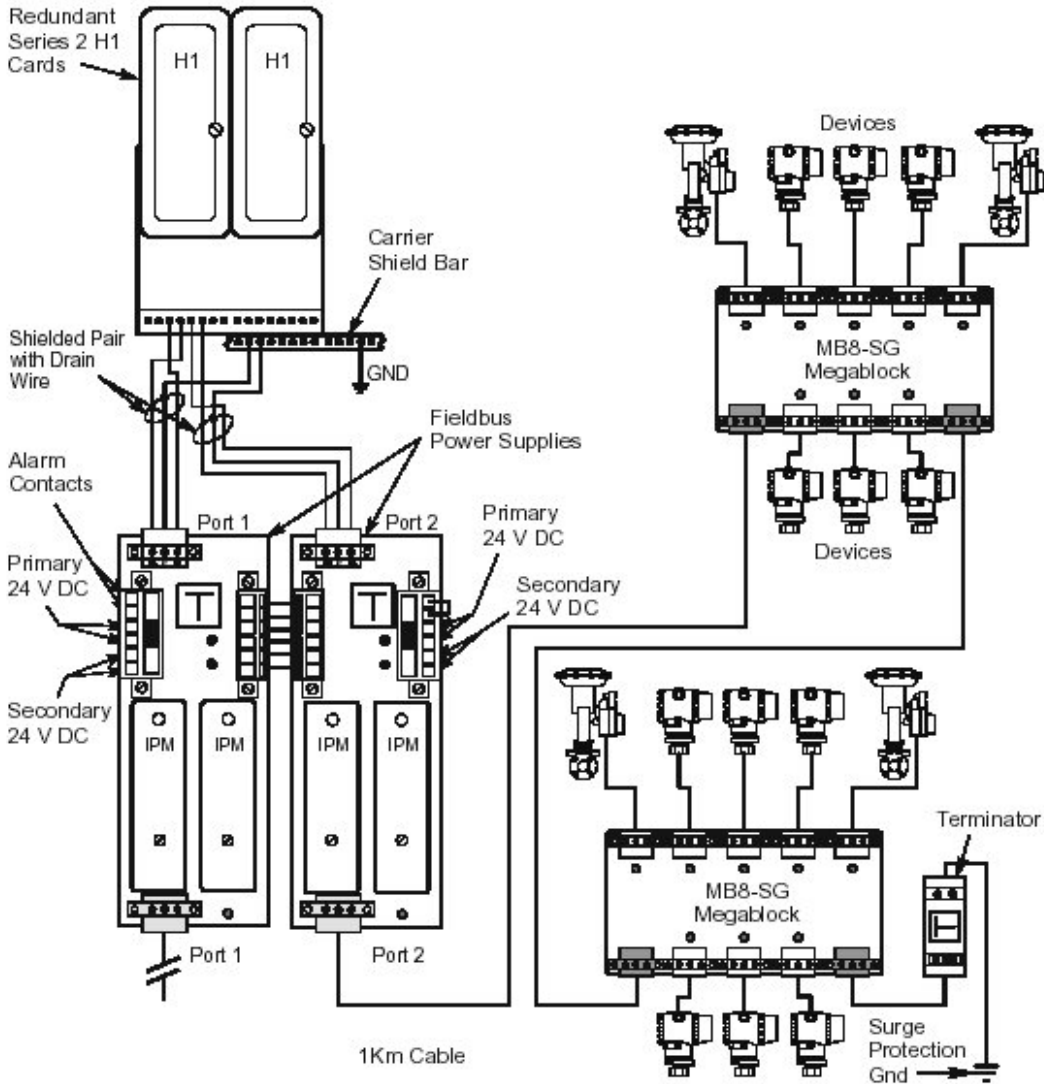
Installation



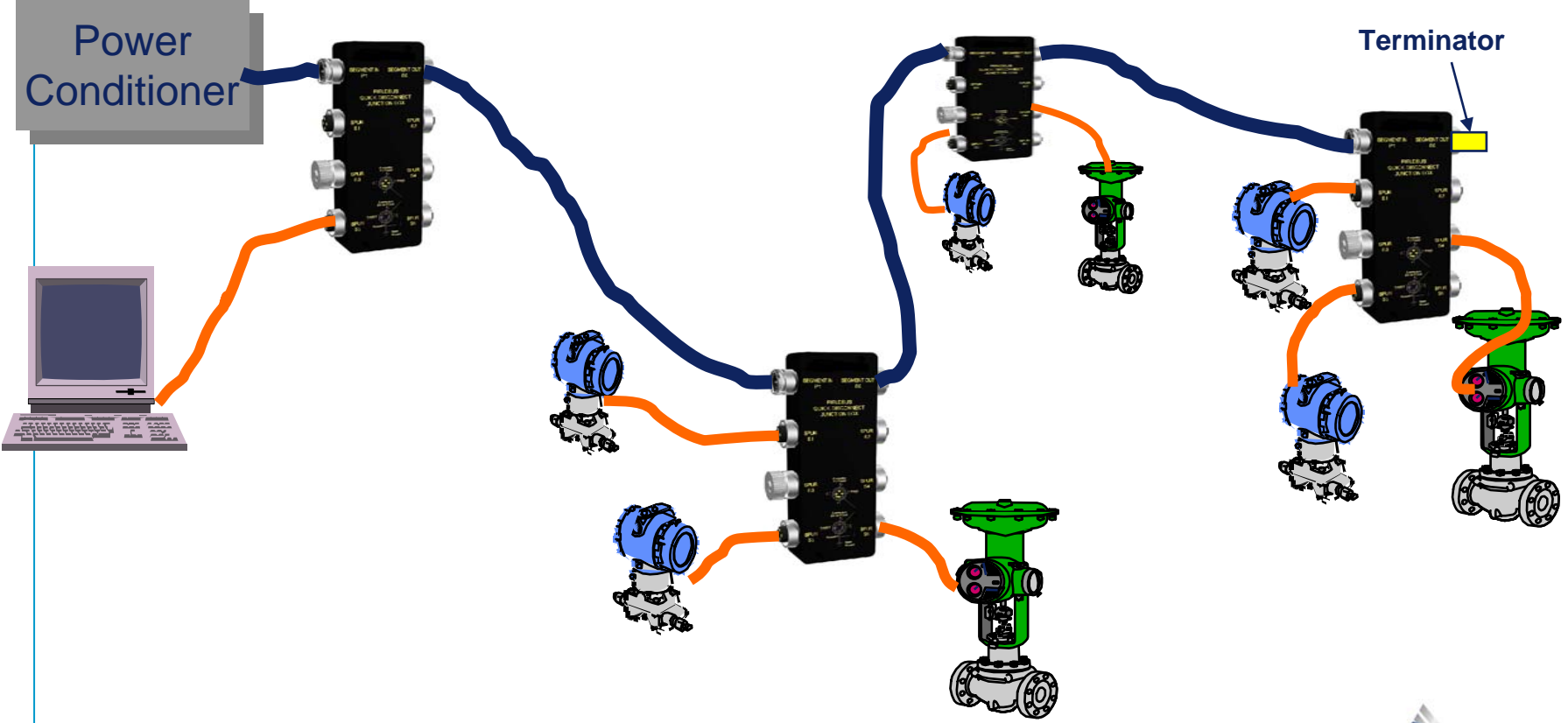
Safer Installation



High Availability System Design



Installation Cost Reduced By Brick and T's



Quick connection Junction Boxes



The Components



Terminator

Cap

Gland



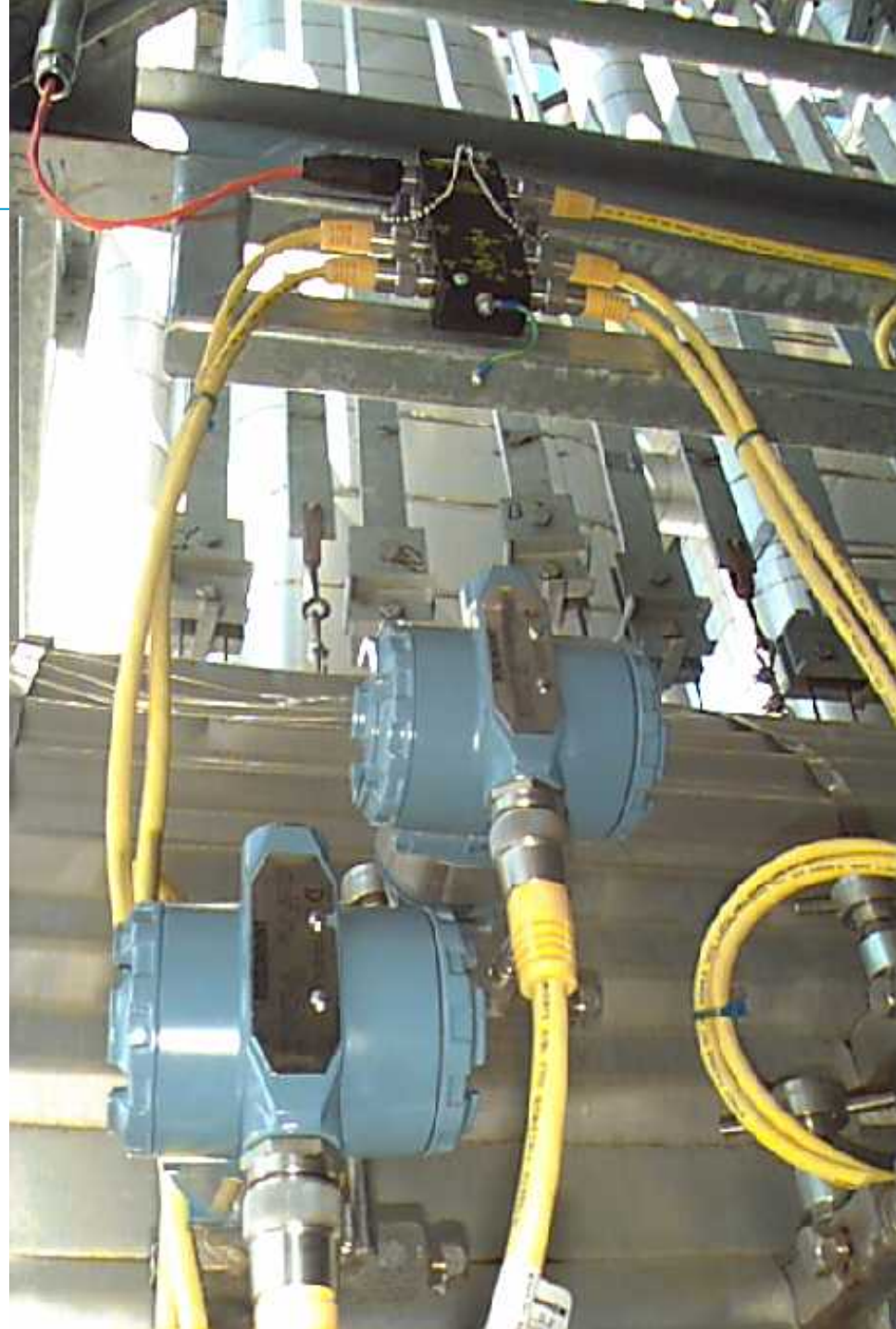
“T” Connector

Terminator

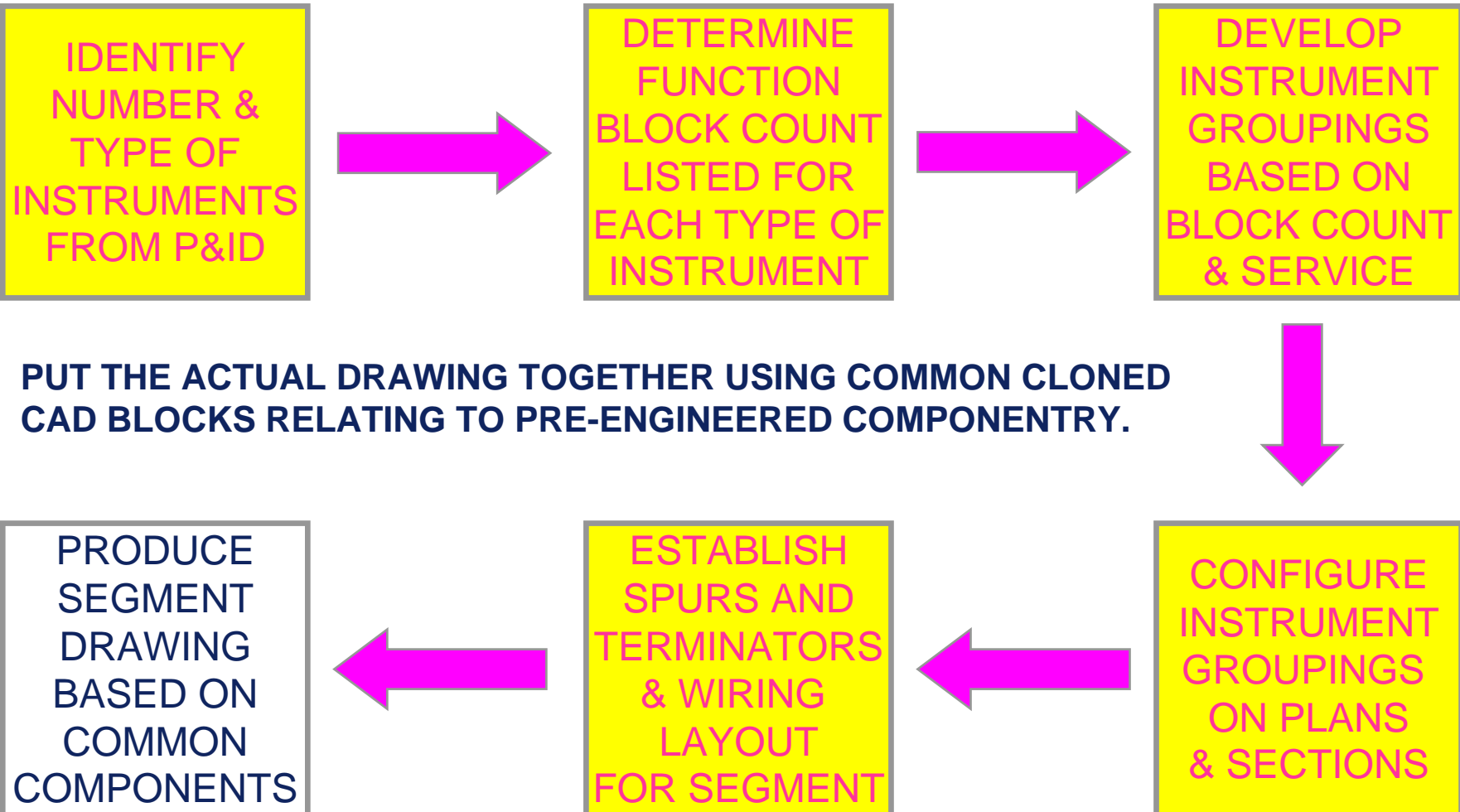
Typical Installation



Typical Installation



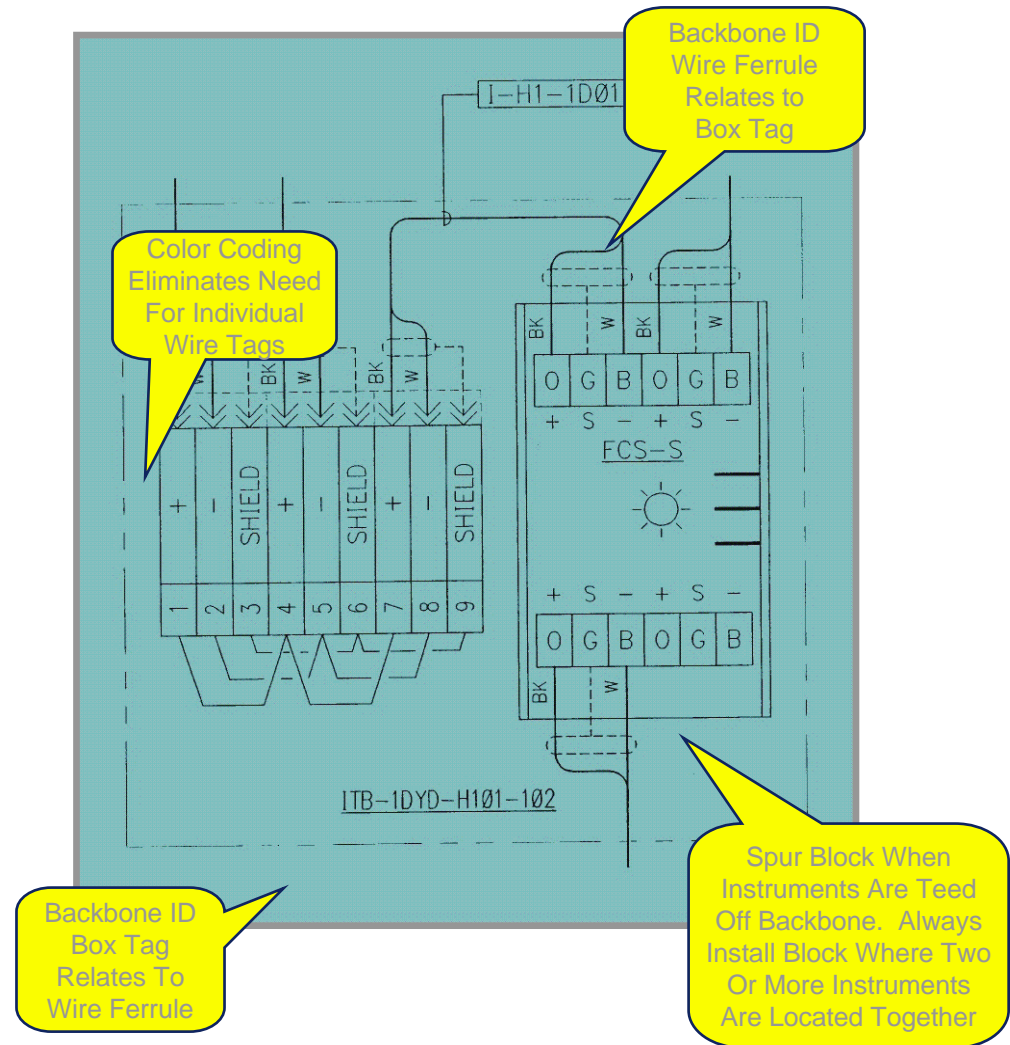
SIX STEPS TO A SUCCESSFUL DESIGN



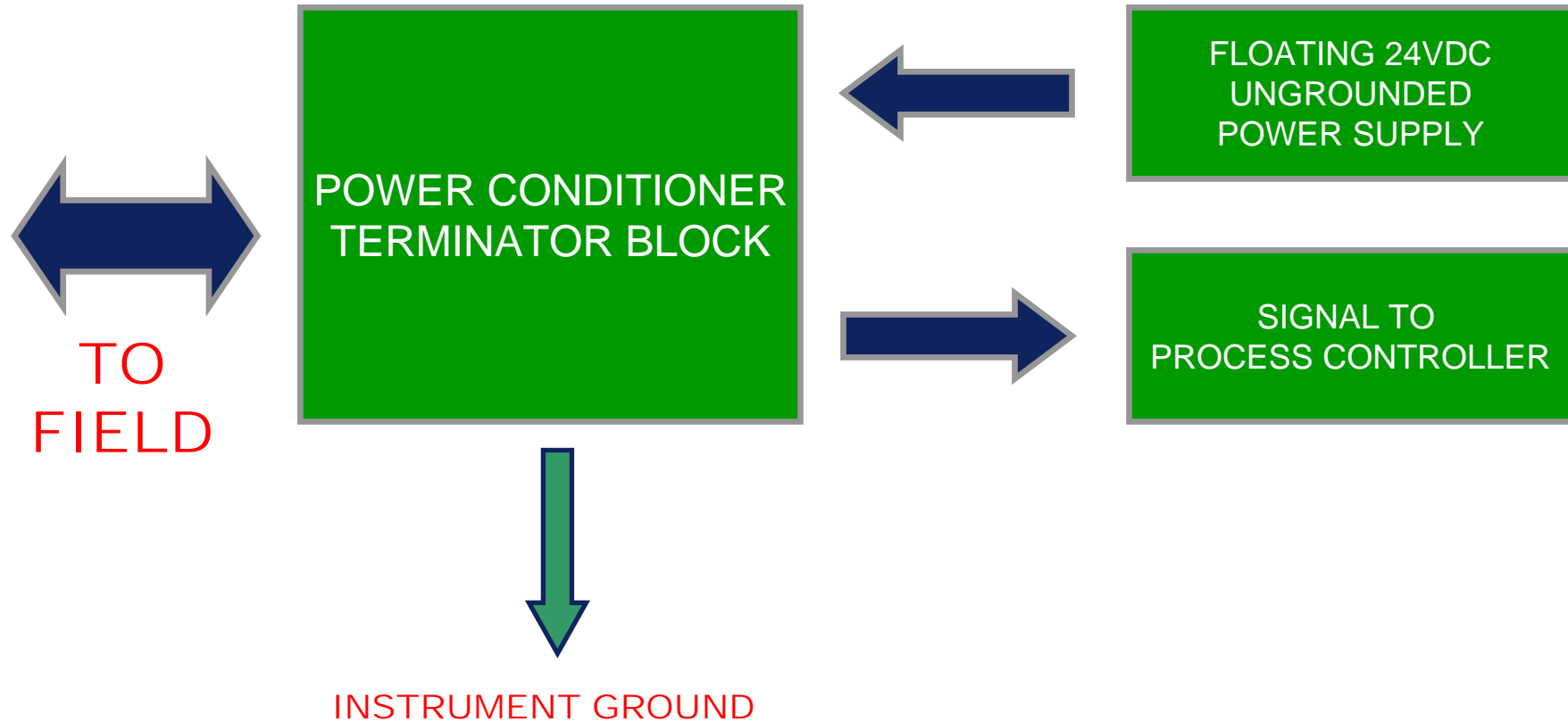
A SEGMENT DRAWING CAN DOCUMENT AN ENTIRE SECTION OF PLANT

Cloned CAD Blocks
Cobbled Together
Allow Segment
Drawings To Be
Assembled Quickly
and Easily

(BOTH LOOPS AND
CONNECTION DRAWINGS
REPLACED BY ONE
SEGMENT DRAWING)



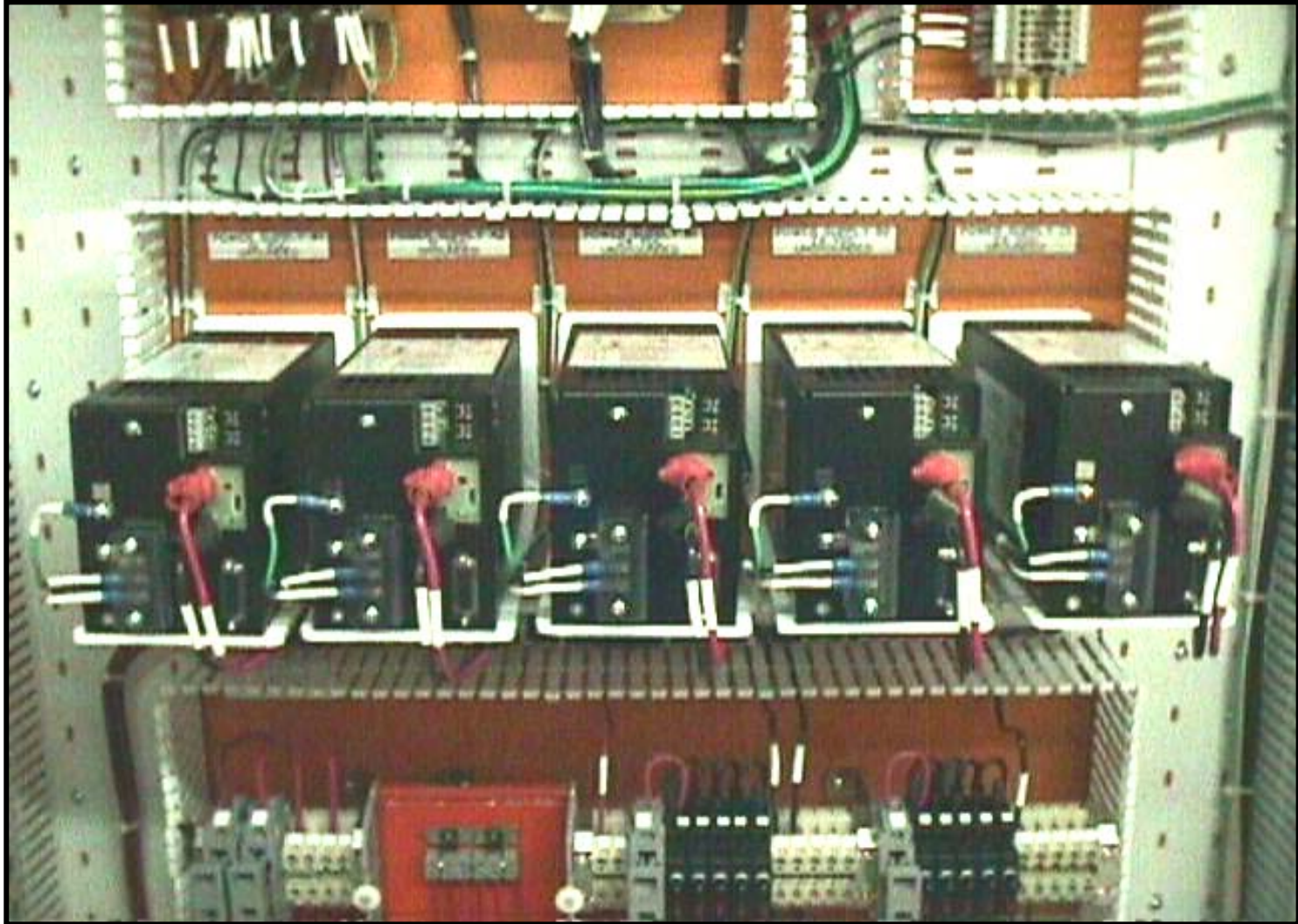
INSTRUMENT PANEL “FRONT END”



“FRONT END” POWER CONDITIONERS

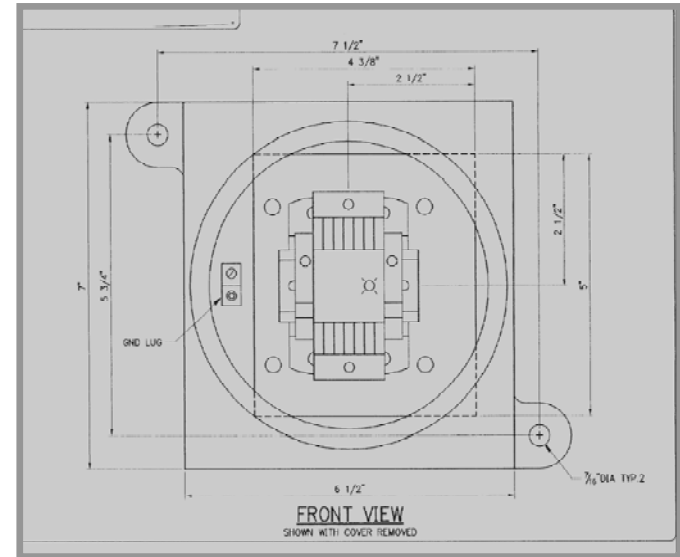
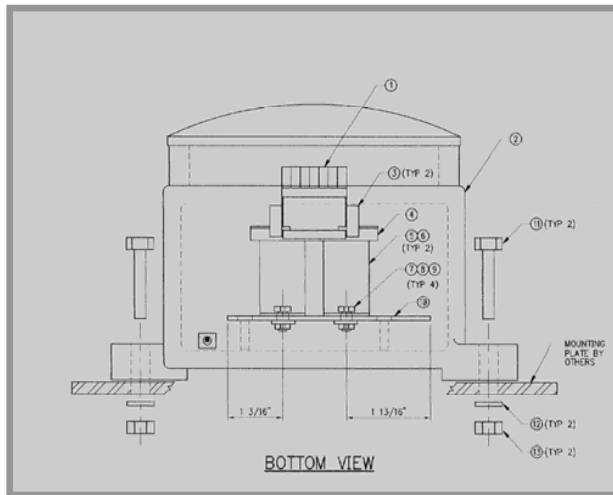


“FRONT END” FLOATING SEGMENT POWER SUPPLY



SUPPORTING DRAWINGS

A FEW PRE-ENGINEERED ELEMENTS THAT RELATE TO THE PHYSICAL INSTALLATION SUPPORT THE SEGMENT DRAWING

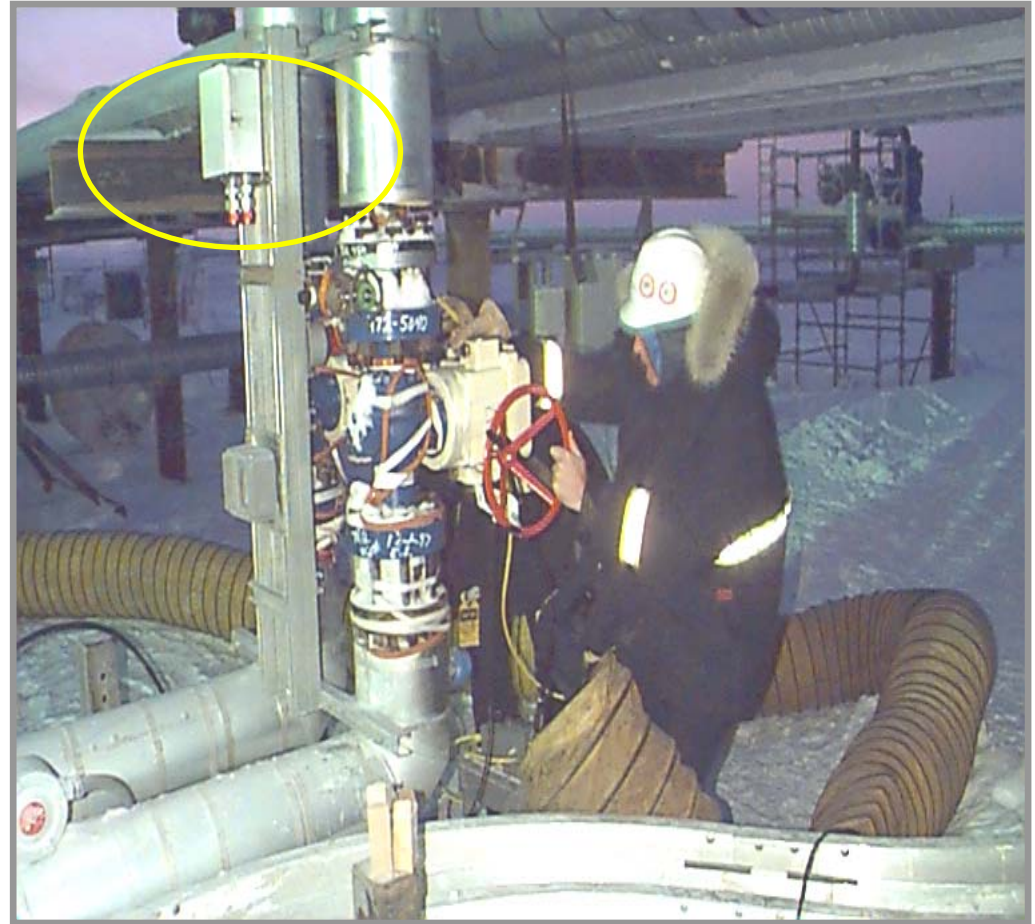


TYPICAL SPUR ITB

FIELD INSTALLATION MADE UP OF PRE-ASSEMBLED ELEMENTS

Prefabricated
Components
Allow For
Minimal
Documentation

WE USED "MC-HL"
FIELDBUS CABLE



FASTER ENGINEERING, FASTER DESIGN AND -- MUCH FASTER INSTALLATION



Automatic Address Assignment

- Devices may be connected to the bus with the same permanent default address.
- A configuration utility in the host assigns an unused valid address to each device.
- This feature allows fast and safe commissioning of the Fieldbus Network!
- No dip switches, no pre-configuration.

Checkout of Fieldbus Wiring



Required Equipment

- Battery Powered Digital Volt-Ohm Meter
- Battery Powered Scope
- Signal Generator

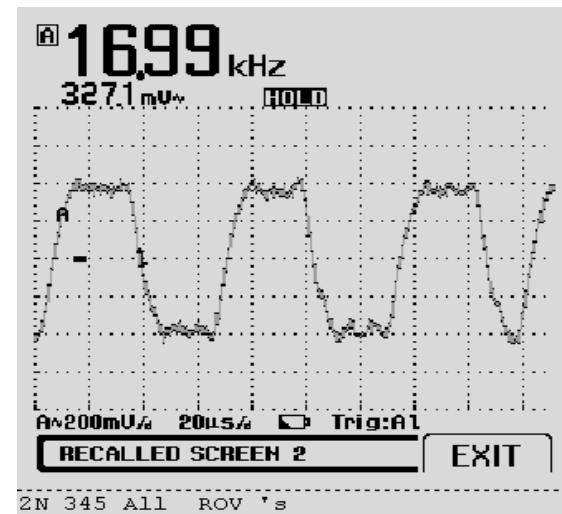
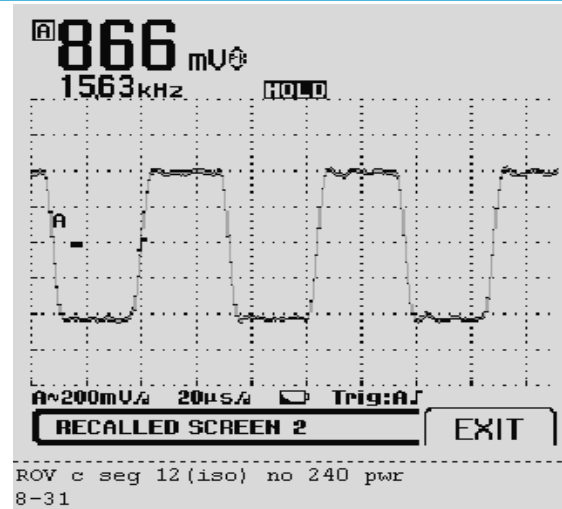
Systematic Approach

- Don't Rush

- Follow Procedures
 - Grounding Checks
 - Proper Voltages
 - Terminators Functioning

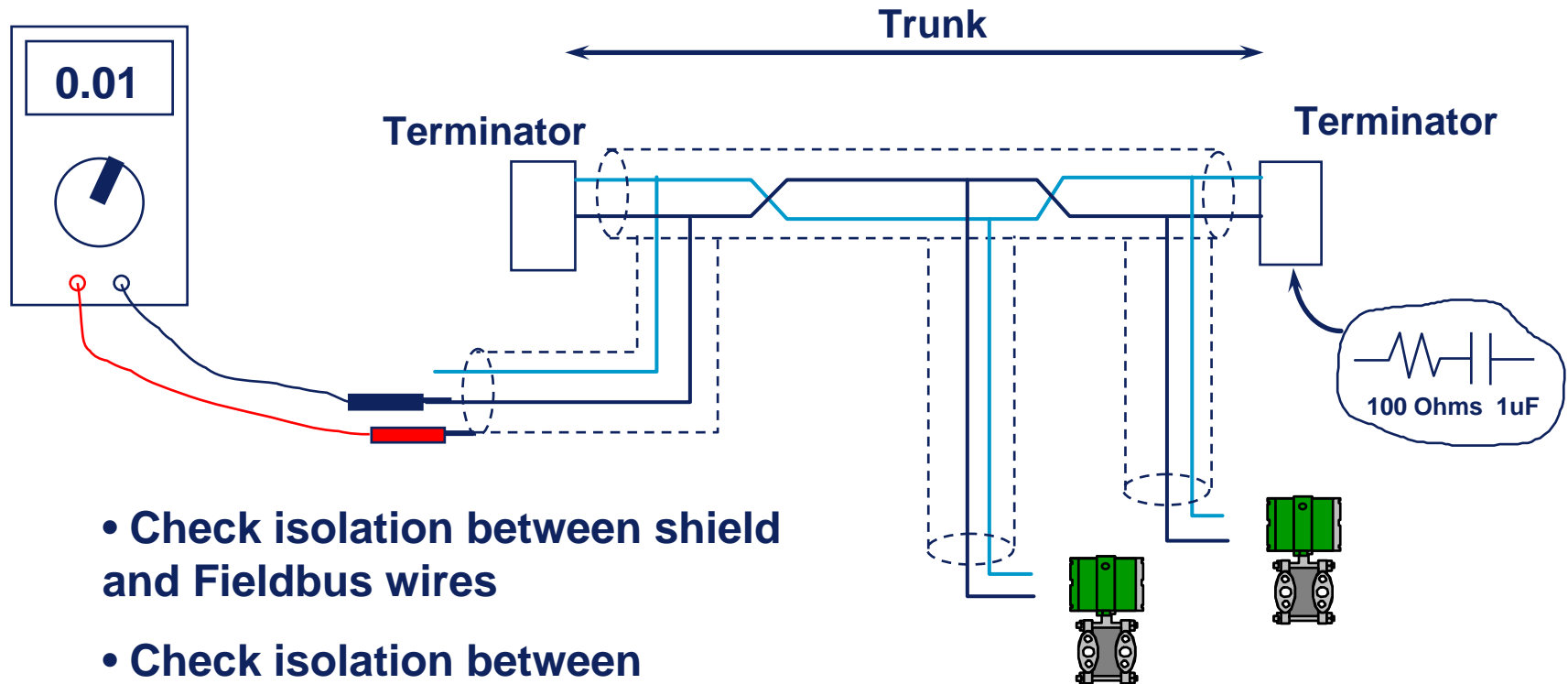
Verify Results

- Don't Rush!
- Be Consistent
 - Terminology
 - Procedures
 - Troubleshooting
 - Initial Checkout
 - Training



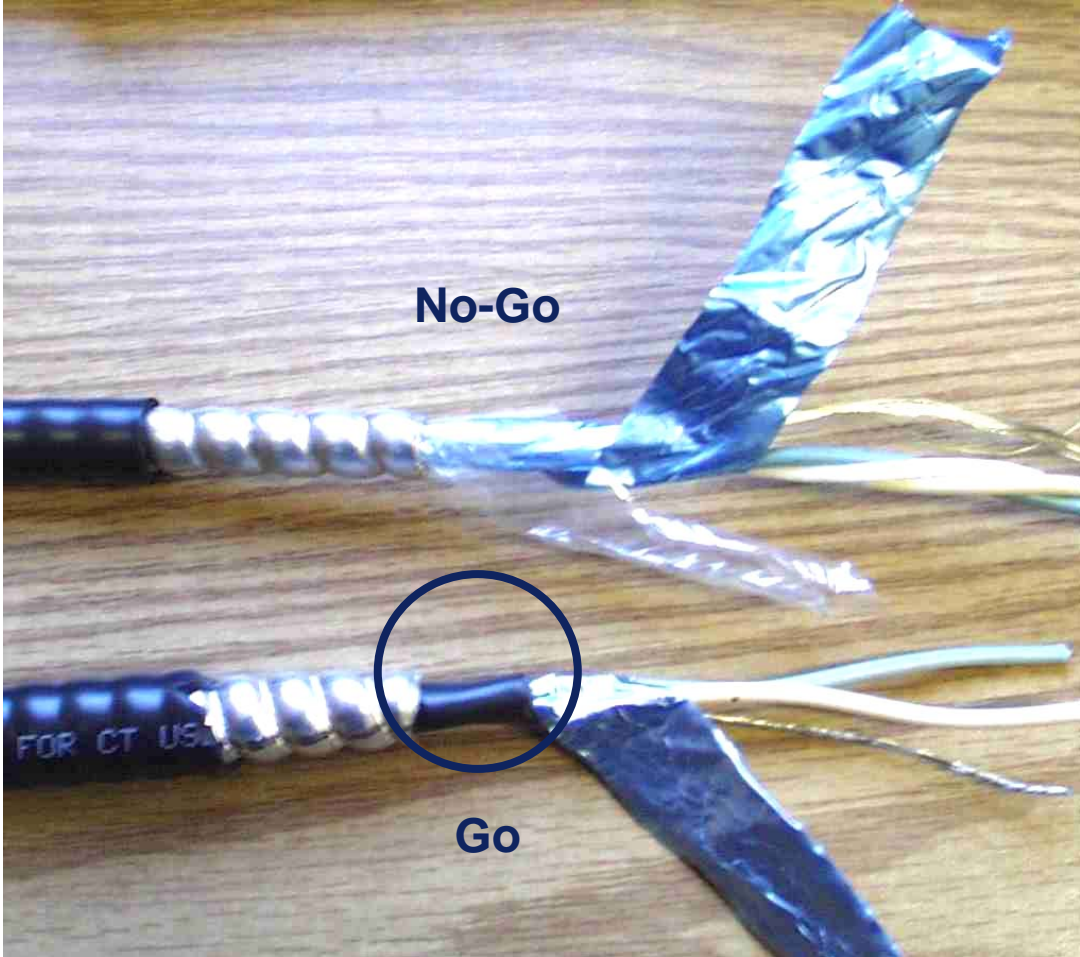
FIELDBUS WIRING CHECKOUT BEFORE CONNECTING POWER TO THE SEGMENT

Volt/Ohm Meter



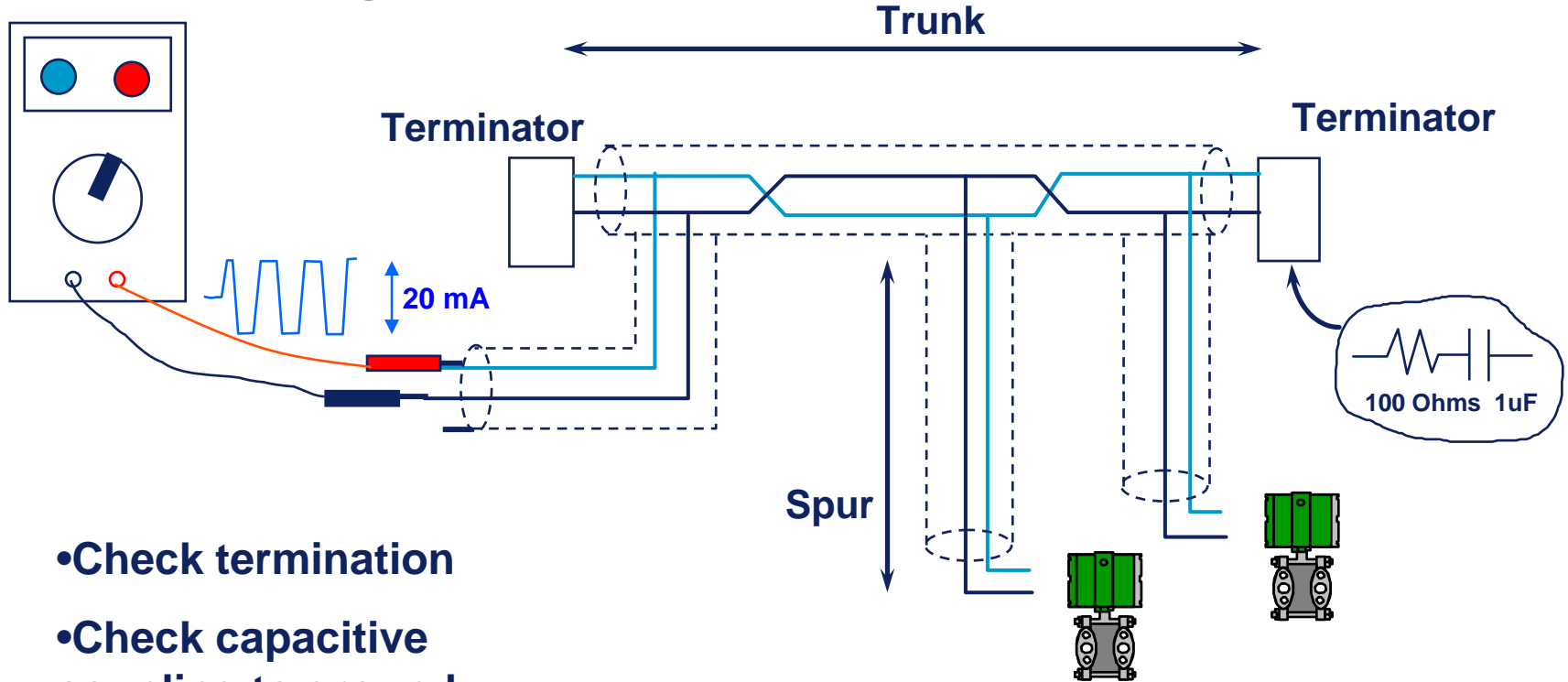
- Check isolation between shield and Fieldbus wires
- Check isolation between Fieldbus wires
- Lift shield from Ground and Check isolation between shield and Ground

Cable Example



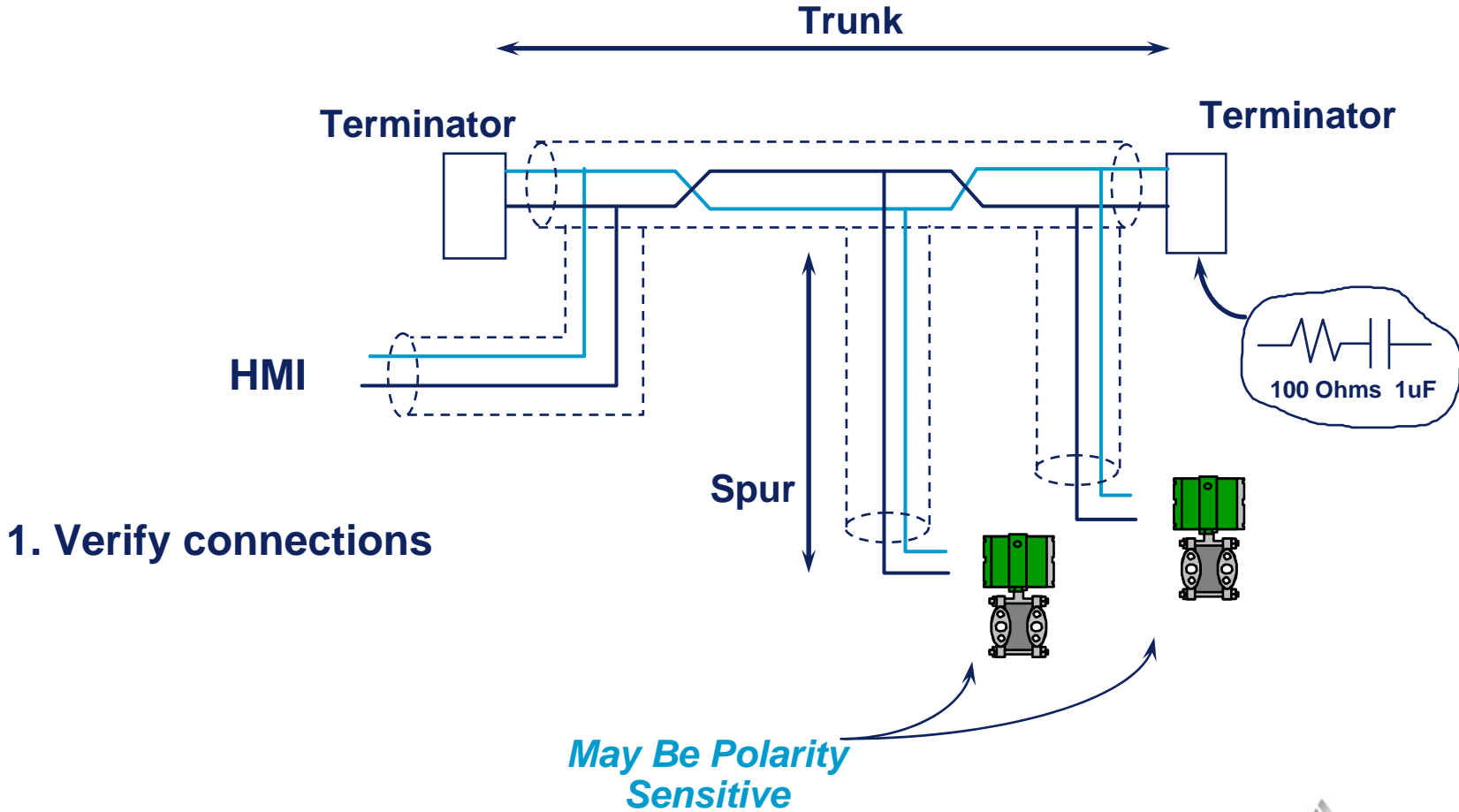
FIELDBUS WIRING CHECKOUT BEFORE CONNECTING POWER TO THE SEGMENT

Fieldbus checking tool



- Check termination
- Check capacitive coupling to ground

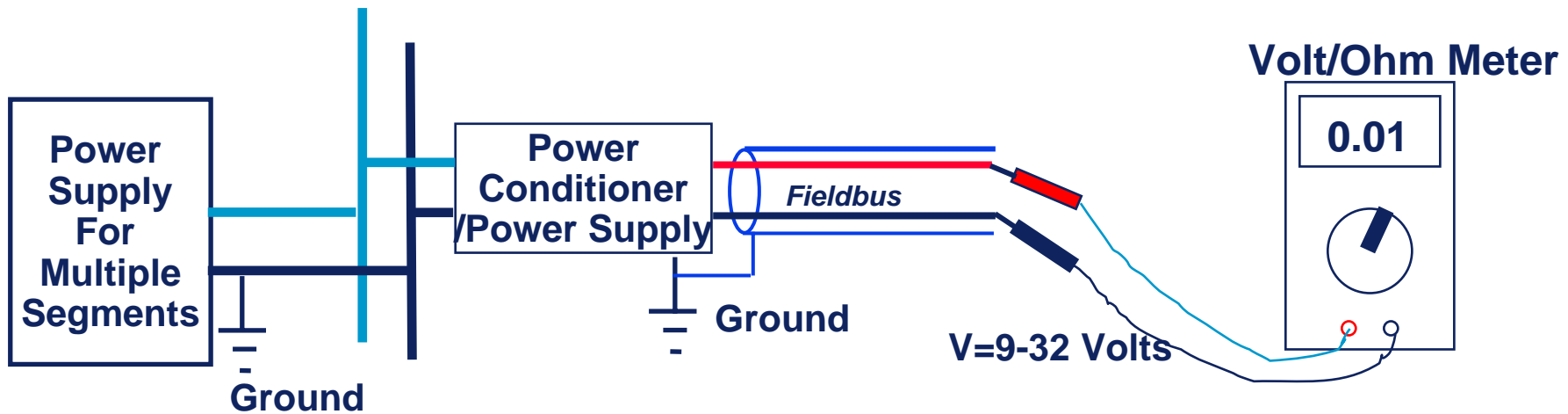
FIELD BUS WIRING CHECKOUT BEFORE CONNECTING POWER TO THE SEGMENT



1. Verify connections

Fieldbus Segment Power

Fieldbus power, grounding installation and checkout may vary with the components selected.



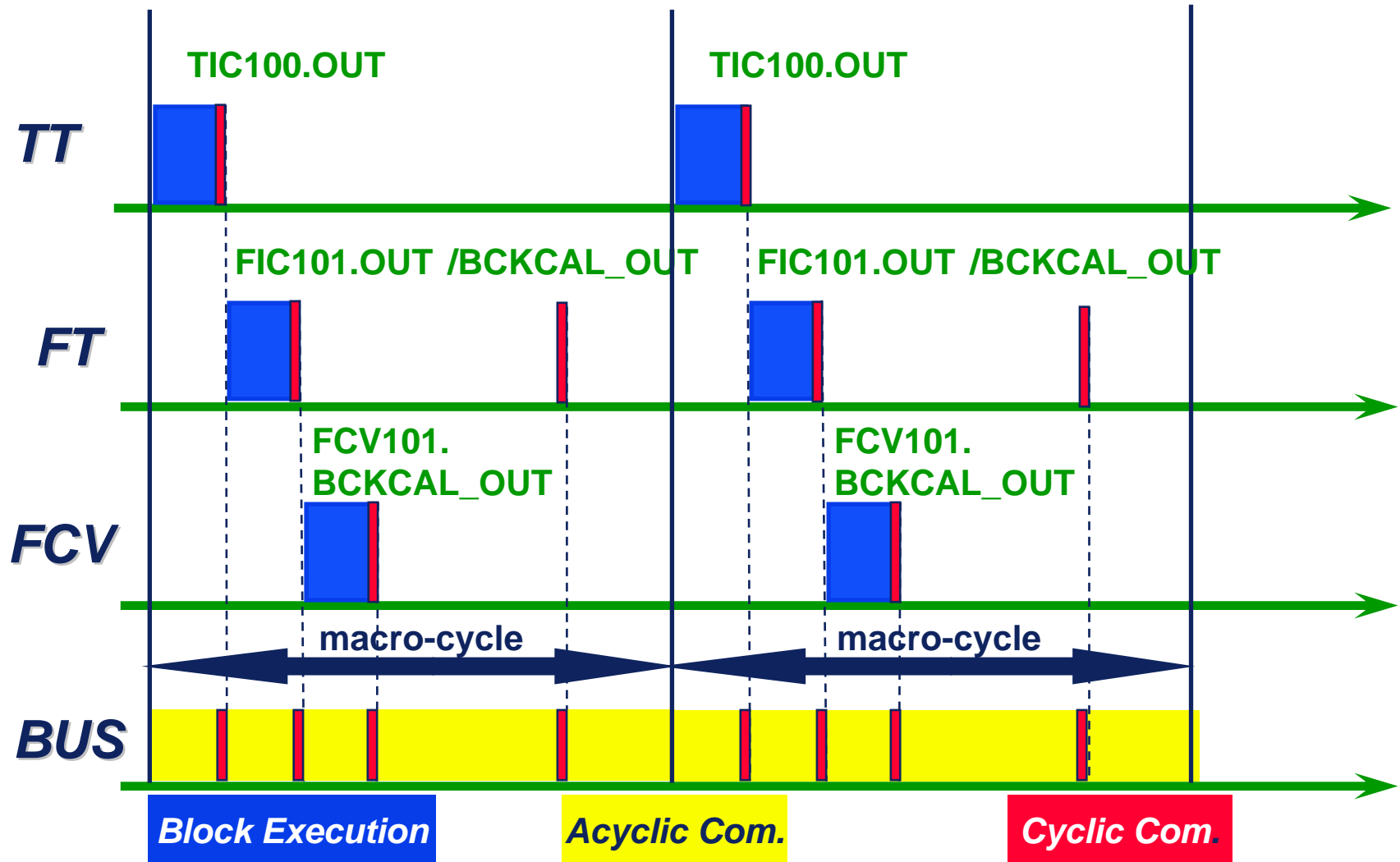
Device Parameter Values, Links and Order of Execution Must be Loaded

The screenshot displays the DeltaV Control Studio interface for a control loop. The main diagram shows a PID1 controller block connected to an AO1 output block. The PID1 block has inputs for BKCAL_IN, CAS_IN, FF_VAL, and IN, and outputs for BKCAL_OUT and OUT. The AO1 block has inputs for CAS_IN and BKCAL_OUT, and an output labeled #2. The AO1 block is identified as PCV101.FFA01. A track selection pane on the left lists AI1, PID1, AO1, and AI2. A parameter list at the bottom left shows various process parameters such as ABNORM_AC, ALARM_HYS, ALERT_KEY, BAD_ACTIVE, BAD_MASK, BLOCK_ERR, CHANNEL, FIELD_VAL, HI_ACT, HI_HI_ACT, HI_HI_LIM, HI_LIM, IO_OPTS, L_TYPE, LO_ACT, LO_LIM, LO_LO_ACT, and LO_LO_LIM. Two dialog boxes are open: 'Assign To Fieldbus' and 'Browse'. The 'Assign To Fieldbus' dialog shows the fieldbus device function block 'FFAI1'. The 'Browse' dialog shows a table of fieldbus devices:

Name	Ref Module	Index	Descriptic
FFAI1	AIR_TANK	1000	AI1
FFAI2	AIR_TANK	1100	AI2

The 'Browse' dialog also shows the 'Look in' field set to 'PT101' and an 'Object Name' field. The status bar at the bottom indicates 'Assigned to: CTRL-1' and the system time is 2:43 PM.

Foundation Fieldbus Devices Support Deterministic Scheduling of Control and Communications



MACROCYCLE MAY BE SET BASED ON CONTROL EXECUTION REQUIRMENT

The screenshot displays the Exploring DeltaV interface. On the left, a tree view shows the hierarchy of controllers and modules, with P01 selected under C01. A yellow arrow points from P01 in the tree to the P01 Properties dialog box. The dialog box has two tabs: 'General' and 'Advanced'. The 'General' tab is active, showing the following information:

- Object type: Fieldbus Port
- Created: Sat Oct 10 15:40:14 1998
- Created by: ADMINISTRATOR
- Enabled
- Description: Fieldbus Interface Port
- Schedule macrocycle: 1 sec (selected from a dropdown menu with options: 500 ms, 250 ms, 500 ms, 1 sec, 2 sec)

At the bottom of the dialog box are buttons for 'OK', 'Cancel', and 'Help'. The status bar at the bottom of the window shows 'User: ADMINISTRATOR', '29 object(s)', and buttons for 'CAN-CONFIGURE' and 'CAN-DOWNLOAD'. The taskbar at the very bottom shows the Start button, Exploring DeltaV, and other open applications.

Commissioning Fieldbus Devices - Automatic Address Assignment

- Devices may be connected to the bus with the same default address.
- A configuration utility in the host assigns an unused valid address to each device.

This feature allows fast and safe commissioning of the Fieldbus Network!

No dip switches, no pre-configuration.

As New Devices Are Attached, They may be Identified and Moved to Permanent Addresses

The screenshot displays the Exploring DeltaV software interface. On the left, a tree view shows the system hierarchy under 'Decommissioned Controllers' and 'Control Network'. A yellow arrow points from the 'PT101' device in the tree to the 'Fieldbus device properties' dialog box. The dialog box contains the following information:

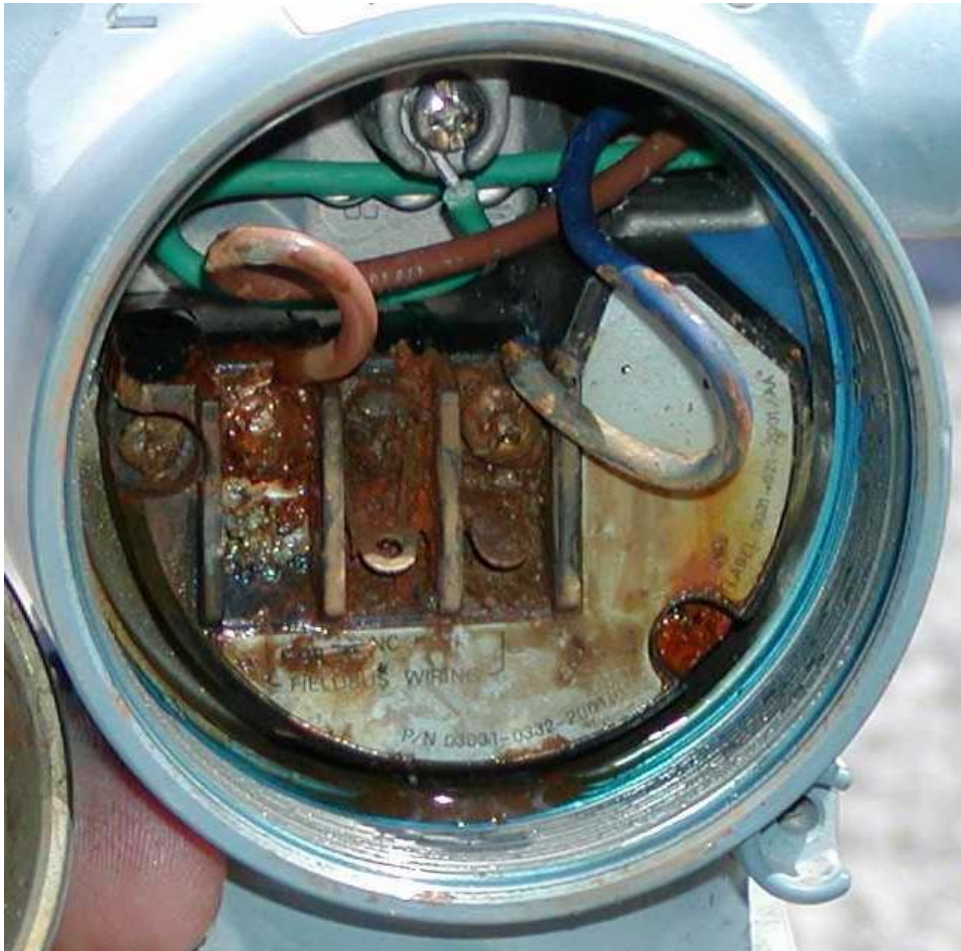
Name	Type	Device ID	Address	Manufacturer	Device Type	Revision
PT101	Standby Device	0011513051DVT70861539287135941	236	Rosemount Inc.	3051 Fieldbus Pressure Transmitter	2

The 'Fieldbus device properties' dialog box includes the following fields and controls:

- Object type: Standby Device (with OK and Cancel buttons)
- Modified: --
- Modified by: --
- Device tag: PT101
- Description: (empty text box)
- Device ID: 0011513051DVT70861539287135941
- Address: 236 (dropdown menu)
- Manufacturer: Rosemount Inc. (dropdown menu)
- Device type: 3051 Fieldbus Pressure Transmitter (dropdown menu)
- Device revision: 2 (dropdown menu)

The status bar at the bottom indicates 'User: ADMINISTRATOR', '1 object(s) selected', and 'Assigned to: CTRL-1'. The taskbar shows the Start button and several open applications, including 'Exploring DeltaV', 'DeltaV Operator Interface', and 'Diagnostics - DeltaV'.

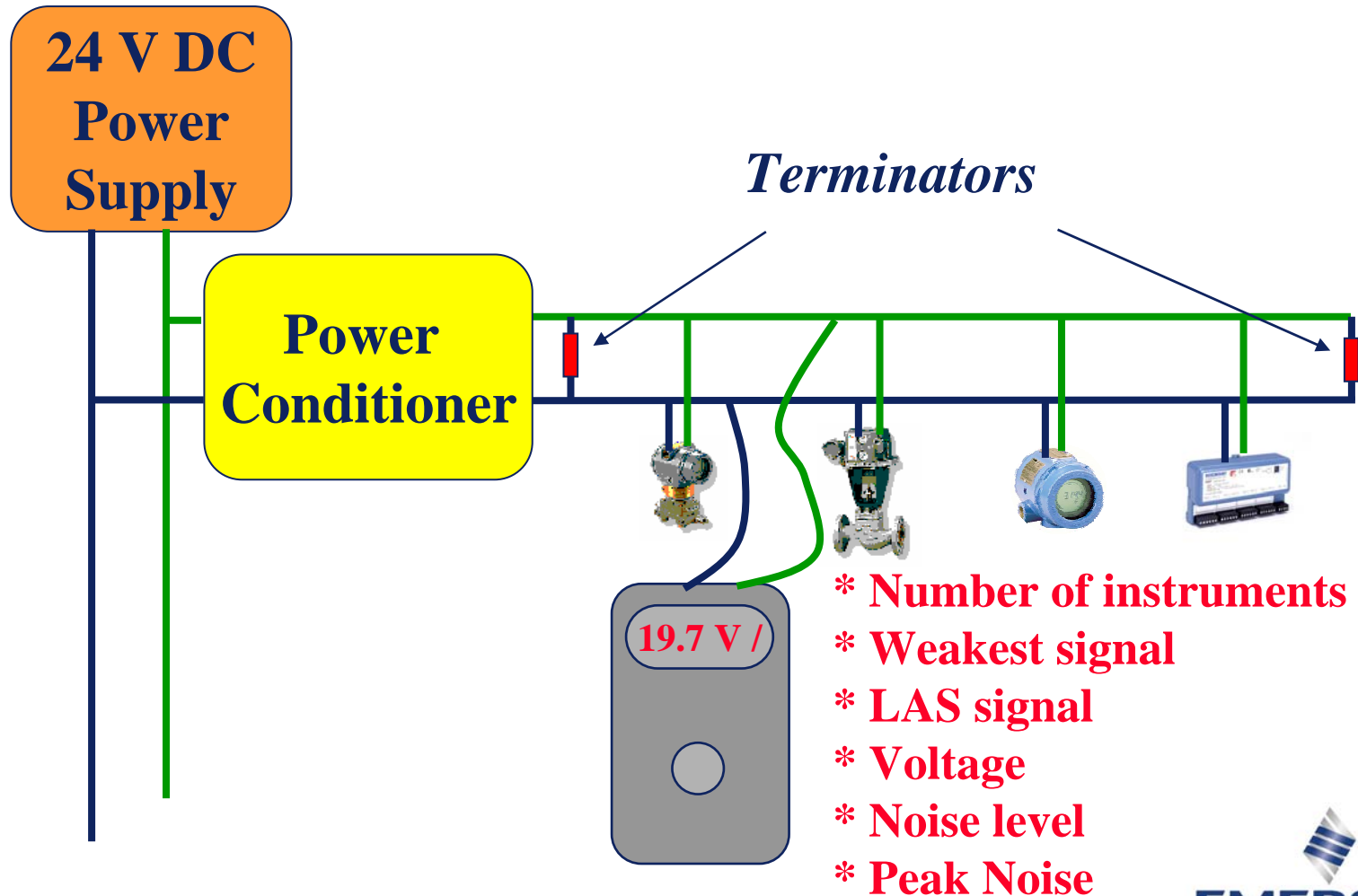
What Happens When Things Don't Go Right?



COMMON REASON FOUND FOR COMMUNICATION ERRORS ON A NEW FIELDBUS INSTALLATION

- 1. Missing or defective terminator at far end of the main segment**
- 2. Shield or conductor has ground reference in the field - causing ground loop.**
- 3. Faulty or overloaded power conditioner and/or power supply**
- 4. Loose wiring connections**
- 5. Defective cable from manufacturer**
- 6. Use of uncertified component or devices.**

Troubleshooting made easy



Fieldbus Diagnostic can easily indicate a faulty installation!

Server Status: Running

DeltaV System

- Control Network
 - PC58
 - CTLR-1
 - Communications
 - I/O
 - C01 Fieldbus H1 Card, 2 Ports
 - P01 (auto-sense when selected)
 - PT101
 - PVC101
 - TI101
 - P02 (auto-sense when selected)
 - C02 AI Card, 8 Ch., 4-20 mA
 - C03 AI Card, 8 Ch., 4-20 mA
 - C04 AO Card, 8 Ch., 4-20 mA
 - C05 AO Card, 8 Ch., 4-20 mA
 - Control

Port Statistics

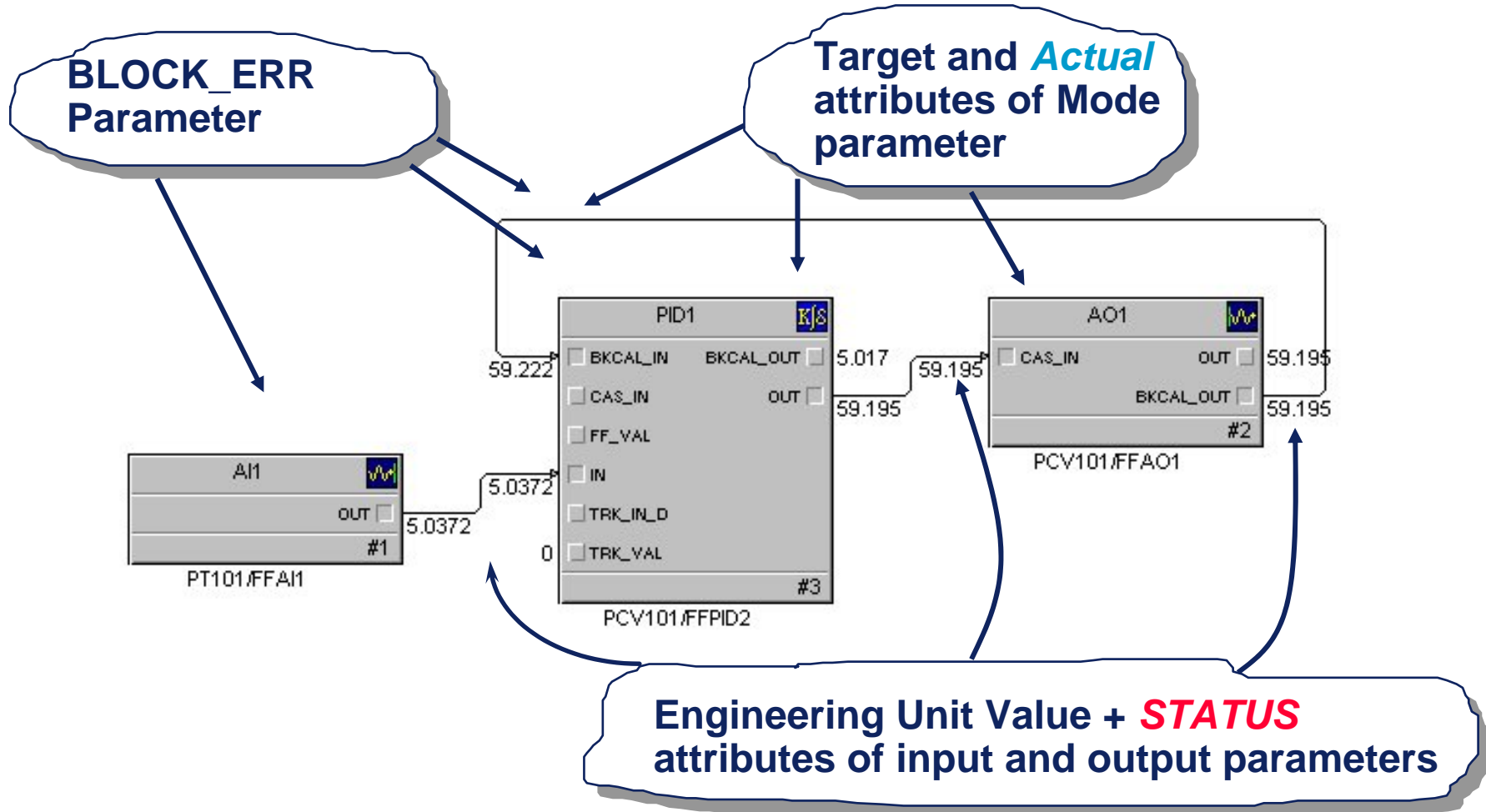
Card 1 - Port 1

Statistic :	Value :
Total Request Sent	4983
Total Valid Responses	4983
Total Invalid Response	0
Total Indications	1398
Total Stack Rejected Request	0
Total Local Stack Errors	0
Total Request TimeOut	0
Total Publish Retry Failed	0
Total DII Pcus Transmitted	51357
Total DII Good Pcus Received	44676
Total DII Fragments Received	0
Total DII Fcs Failures	0
Total DII Time Disc Changes	0
Total DII Retries	1
Total DII Receive Q Full	0

Close
Reset Stats
Help

For Help, press F1

DIAGNOSTIC SUPPORT AVAILABLE FOR FOUNDATION FIELDBUS BLOCKS



BLOCK_ERR - PROVIDES INSIGHT INTO DEVICE HEALTH AND STATE of DEVICE CONFIGURATION

Example

BLOCK_ERR ATTRIBUTES

Other

Block Configuration Error

Link Configuration Error

Simulation Active

Local Override

Device Fault State Set

Device Needs Maintenance Soon

Input Failure/PV Bad Status

Output Failure

Memory Failure

Lost Static Data

Lost NV Data

Readback Check Failed

Device Needs Maintenance Now

Power-up

Out-of-Service

The screenshot displays a control system interface. A red circle highlights an alarm icon labeled 'A11' with a value of '-0.071659' and a unit of '#1'. Below the alarm icon, the text 'PT101/FFA11' is visible. In the center, a 'Track Selection' window shows a table of parameters with their on-line values:

Parameters	On-line value
ALERT_KEY	0
BAD_ACTIVE	
BAD_MASK	
BLOCK_ERR	Non-zero
CHANNEL	1
FIELD_VAL	-0.79621
HI_ACT	0
HI_HI_ACT	0
HI_HI_LIM	100
HI_LIM	95
IO_OPTS	
L_TYPE	Direct
LO_ACT	0

At the bottom right, the 'BLOCK_ERR Properties' dialog box is open, showing the parameter name 'BLOCK_ERR' and the parameter type 'Option bitstring'. The 'Properties' section lists several options, with 'Input Failure/Bad PV' and 'Simulate Active' checked.

For Help, press F1

Start Exploring DeltaV JAREA_A/AIR_TANK ... DeltaV

STATUS ATTRIBUTE OF INPUT AND OUTPUT PARAMETERS - INDICATES QUALITY OF VALUE

Example

STATUS ATTRIBUTE

GOOD

UNCERTAIN

Non-specific
Substitute/Manual
entry
Initial Value
Sensor Conversion
not Accurate
Engineering Units
Range Violation
Sub-normal
BAD
Non-specific
Configuration Error
Not connected
Device Failure
Sensor Failure
No Communication
Out of Service

LIMIT

+ Not Limited
Low Limited
High Limited
Constant

The screenshot displays the DeltaV software interface. On the left, a 'Parameters' table lists various input and output parameters with their current values and status attributes. The 'BKCAL_IN' parameter is highlighted, showing a value of 100 and a status of 'GoodCascade HighLimited'. On the right, a 'PID1' control block is shown with its 'BKCAL_IN' input parameter selected. Below this, the 'BKCAL_IN Properties' dialog box is open, showing the parameter name 'BKCAL_IN', its type as 'Floating point with status', and its current value of 100. The status attribute is set to 'GoodCascade HighLimited'. The status attribute is circled in orange in the original image.

Parameters	On-line value	On Line Status Value
ABNORM_AC...		
ALARM_HYS	0.5	
ALERT_KEY	0	
BAD_ACTIVE		
BAD_MASK		
BKCAL_IN	100	GoodCascade HighLimited
BKCAL_OUT	5.017	GoodCascade NotInvited ..
BLOCK_ERR		
BYPASS	Off	
CAS_IN	0	Bad NotConnected
CONTROL_D...	Non-zero	
DV_HI_ACT	0	
DV_HI_LIM	1.#INF	
DV_LO_ACT	1	
DV_LO_LIM	0	
FF_GAIN	1	
FF_SCALE	0.0 to 100.0...	
FF_VAL	0	Bad NotConnected
GAIN	1.2	
HI_ACT	0	
HI_HI_ACT	0	
HI_HI_LIM	9	
HI_LIM	8	
IN	-0.0064232	GoodNonCascade
LO_ACT	1	
LO_LIM	0	
LO_LO_ACT	1	

“ACTUAL” ATTRIBUTE OF MODE - REFLECTS DOWNSTREAM CONDITION AND INPUT STATUS

Example

TARGET/ACTUAL CONDITION

(Target/Actual
Match)

NORMAL

() / OS

Device is OS

Auto, Cas / Man

PV BAD

Rcas / Cas, Auto
Rout / Cas, Auto

Host is Not
Communicating

() / Iman

No Path to Process
(Downstream)

() / LO

Fault State Active
(Output Block)
Input Track Active
(Control Block)

The screenshot shows the DeltaV software interface. The main window displays a table of parameters for PID1. The 'MODE' parameter is highlighted in blue, showing a value of 'Auto/Initializing Manual'. A 'MODE Properties' dialog box is open, showing the 'MODE' parameter set to 'Mode'. The 'Permitted Modes' section has checkboxes for 'Out of service', 'Manual', 'Auto', 'Cascade', 'Remote Cascade', and 'Remote Out'. The 'Normal mode' is set to 'Auto' and the 'Actual mode' is 'Initializing Manual'. The 'Target' is set to 'Auto'. A blue circle highlights the 'MODE' parameter in the main window and the 'MODE Properties' dialog.

Parameters	On-line value	On Line Status Value
BAD_MASK		
BKCAL_IN	100	GoodCascade NotInv
BKCAL_OUT	5.017	GoodCascade NotInv
BLOCK_ERR		
BYPASS	Off	
CAS_IN	0	Bad No...
CONTROL_D...	Non-zero	
DV_HI_ACT	0	
DV_HI_LIM	1.#INF	
DV_LO_ACT	1	
DV_LO_LIM	0	
FF_GAIN	1	
FF_SCALE	0.0 to 100.0	
FF_VAL	0	Bad No...
GAIN	1.2	
HI_ACT	0	
HI_HI_ACT	0	
HI_HI_LIM	9	
HI_LIM	8	
IN	-0.0066687	GoodN...
LO_ACT	1	
LO_LIM	0	
LO_LO_ACT	1	
LO_LO_LIM	0	
MODE	Auto/Initializing Manual	
OUT	100	GoodC...
OUT_HI_LIM	100	
OUT_LO_LIM	0	

TRANSDUCER BLOCKS PROVIDE DEVICE SPECIFIC INFORMATION WHICH MAY BE HELPFUL

The screenshot displays the 'Exploring DeltaV' interface. On the left, a tree view shows the hierarchy of controllers and modules. The main window shows the 'Contents of PT101' table, which lists various blocks. A yellow arrow points from the 'TRANSDUCER400' block in the table to the 'Properties of block TRANSDUCER400 for 00115130511.12.4' dialog box.

Name	Type	Description	Referencing module	Execution...	Object ...	Modified B...
RESOURCE	Fieldbus Resource				300	ADMINIS..
TRANSDUCER400	Fieldbus Transducer	Flow Pressure ...			400	ADMINIS..
FFAI1	Fieldbus Function Block	AI1	AIR_TANK	40 ms	1000	ADMINIS..
FFAI2	Fieldbus Function Block	AI2		40 ms	1100	ADMINIS..
FFPID1	Fieldbus Function Block	PID		70 ms	10000	ADMINIS..

Properties of block TRANSDUCER400 for 00115130511.12.4

Control | Mode | **Sensor** | PV | SV

Transducer Type: Standard Pressure With Ca

Snsr Type: Capacitance

Snsr S/N: 818785

Snsr Cal Meth: user trim standard calibratic

Sensor Isolator ...: 316 SST

Sensor Fill Fluid: Silicone oil

Sensor Range:

- EU at 100%: 27.499733 inH2O (...)
- EU at 0%: -27.499733 inH2O (...)

Snsr Cal Date: 10/14/1998 08:23:52

Snsr Cal Loc: Eden Prairie

Sensor Calibratio...: Marcos Peluso

Buttons: OK, Cancel, Apply, Help

COMMUNICATION STATISTICS PROVIDE INSIGHT INTO THE INTEGRITY OF THE FIELDBUS SEGMENT

The screenshot shows the DeltaV Diagnostics interface. On the left, a tree view displays the system hierarchy: DeltaV System > Control Network > CTLR-1 > Communications > I/O > C01 Fieldbus H1 Card, 2 Ports > P01 (auto-sense when selected). A yellow arrow points from this node to the Port Statistics window.

The Port Statistics window displays the following data:

Statistic	Value
Total Request Sent	4983
Total Valid Responses	4983
Total Invalid Response	0
Total Indications	1398
Total Stack Rejected Request	0
Total Local Stack Errors	0
Total Request Timeout	0
Total Publish Retry Failed	0
Total DII Pbus Transmitted	51357
Total DII Good Pbus Received	44676
Total DII Fragments Received	0
Total DII Fcs Failures	0
Total DII Time Disc Changes	0
Total DII Retries	1
Total DII Receive Q Full	0

Buttons: Close, Reset Stats, Help

For Help, press F1

Summary

- Observe trunk and spur lengths.
- Locate the two terminators in the opposite far ends of the trunk.
- Check installation according to standard wiring practices.
- Limit the number of the devices on the segment according to power consumption and wire length.
- Set Network Parameters based on the “slowest” device in both Primary and Backup Link Masters.
- Calibrate in the Transducer Block and compensate off sets in the Analog Input Block.
- For Macro cycles shorter than 250 ms, restrict the number of devices based on desired Operator Interface update.