

Precision Digital Presents

Reducing Signal Noise in Process Environments

Webinar Organizers



Joe Ryan

Product Manager

Precision Digital
Corporation



Ryan Shea

Applications Specialist

Precision Digital
Corporation



Bruce McDuffee

Webinar Moderator

Precision Digital
Corporation

Agenda

1

What is signal noise?

2

What causes signal noise?

3

What problems does high signal noise cause?

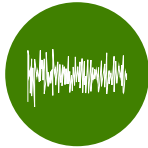
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Best practices to reduce noise

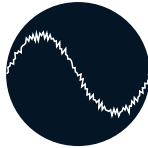
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What about isolators/conditioners?

Takeaways



Learn what environmental issues can cause signal noise so you can identify potential problems and take corrective action.



Learn what to look for in process signals to determine if noise is an issue.



Learn how to install signal process infrastructure to minimize noise problems.



Learn how to mitigate signal noise issues with isolators and conditioners.

Getting to know you

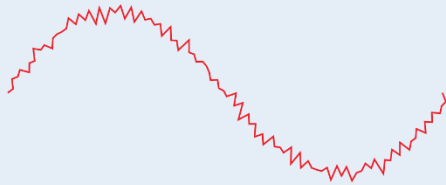
- Where are you located?
- What is your industry?
- What is your experience with noise?



What is signal noise?

Analog Signal Noise

Signal + Noise



Noise



Digital Signal Noise

Signal + Noise



Noise



- Noise is any unwanted modification or interference that degrades the desired communication signal.
- Noise can happen during capture, storage, transmission, processing or conversion of the signal.
- All process signals have some type or level of noise at all times.

What causes signal noise?



Ground loops



Poor wiring practices



Improper grounding



Close proximity to other equipment

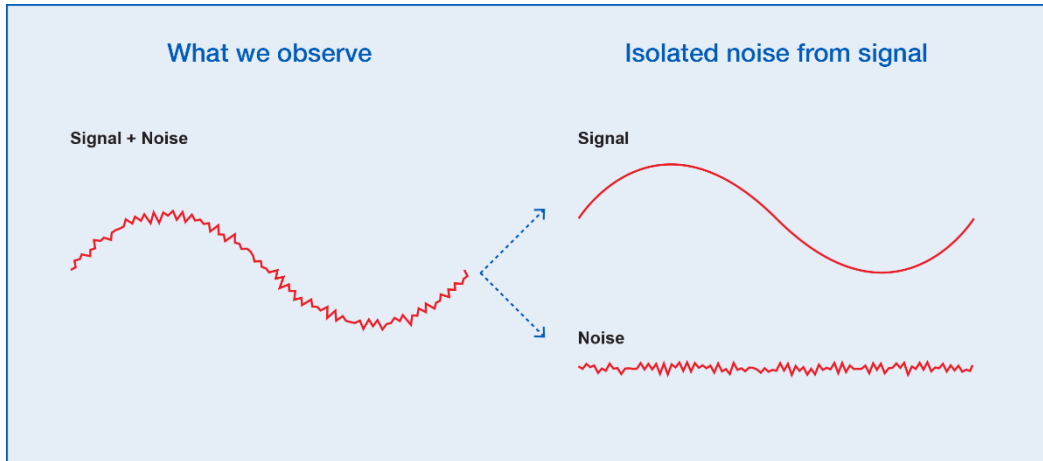


Long wire leads picking up RF



Poorly design product circuitry

What problems does signal noise cause?



- Apparent loss of signal
- Distorted signal causing wrong interpretation or display of a process condition
- Improper control of an industrial process

Questions?

- Please enter your questions in the 'Questions' window



Best practices - installation



- Avoid running signal wires near power wires
- Keep signal leads away from AC magnetic field sources
 - Motors
 - Transformers
 - Large relays
 - Wire at 90 degree angles if necessary – parallel lines cause noise
- Use twisted pair wiring
 - Wire to avoid ground loops

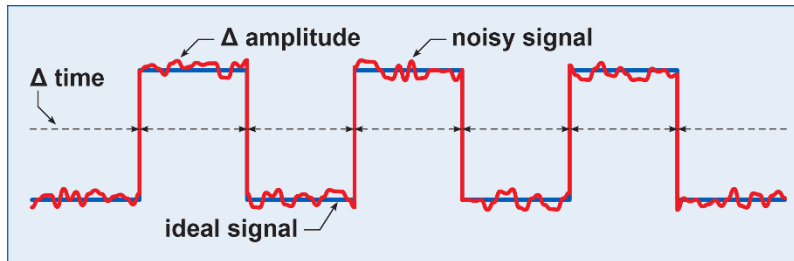
Best practices - installation



- Use shorter wire runs when possible
- Use shielded cable with proper grounding (one end only)
- Continuous grounding through all enclosures, conduits, etc.

Best practices – planning & design

- Choose the best type of analog signal
 - Low level voltage are more susceptible to noise than current signals
- Convert analog signals to digital signals as close to the process as possible
- Use a software filter
- Use a hardware filter



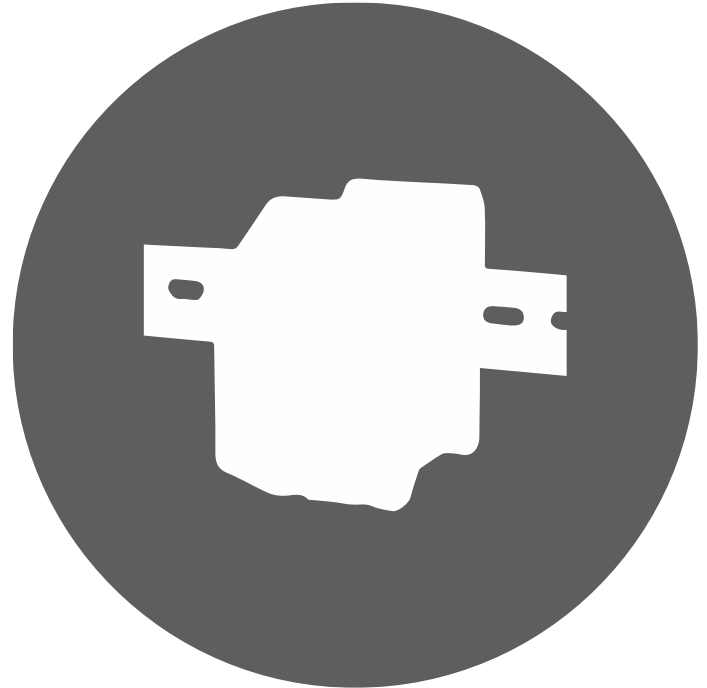
Isolators



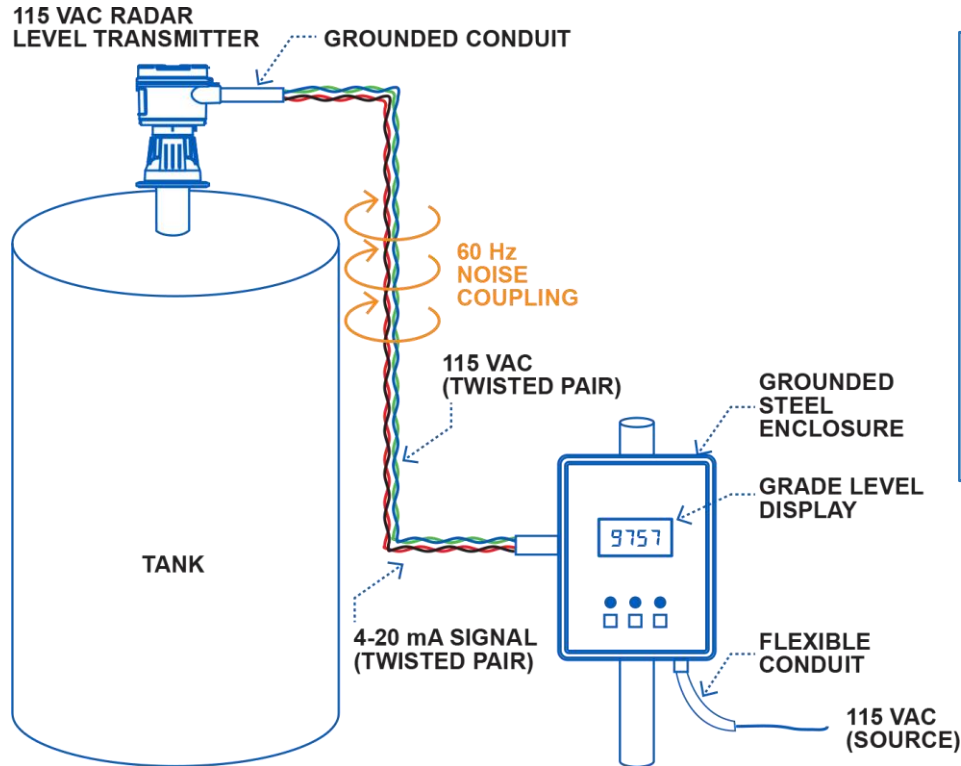
- Isolators
 - Isolate the input and output circuits
 - Solves the ground loop issue
 - Prevents the further transmission of large voltage/current transients
- When to use isolators
 - Ground loops are a problem
 - High noise could potential damage the system
- When to avoid isolators
 - Noise is due to an installation problem that a signal isolator can not solve

Conditioners

- Conditioners
 - Convert signal from analog to digital
 - Convert signal from voltage to current
 - Signal amplification
- Pros
 - Changes signal for less susceptible signal
 - Relatively low cost
 - Easy to use
- Cons
 - Complexity



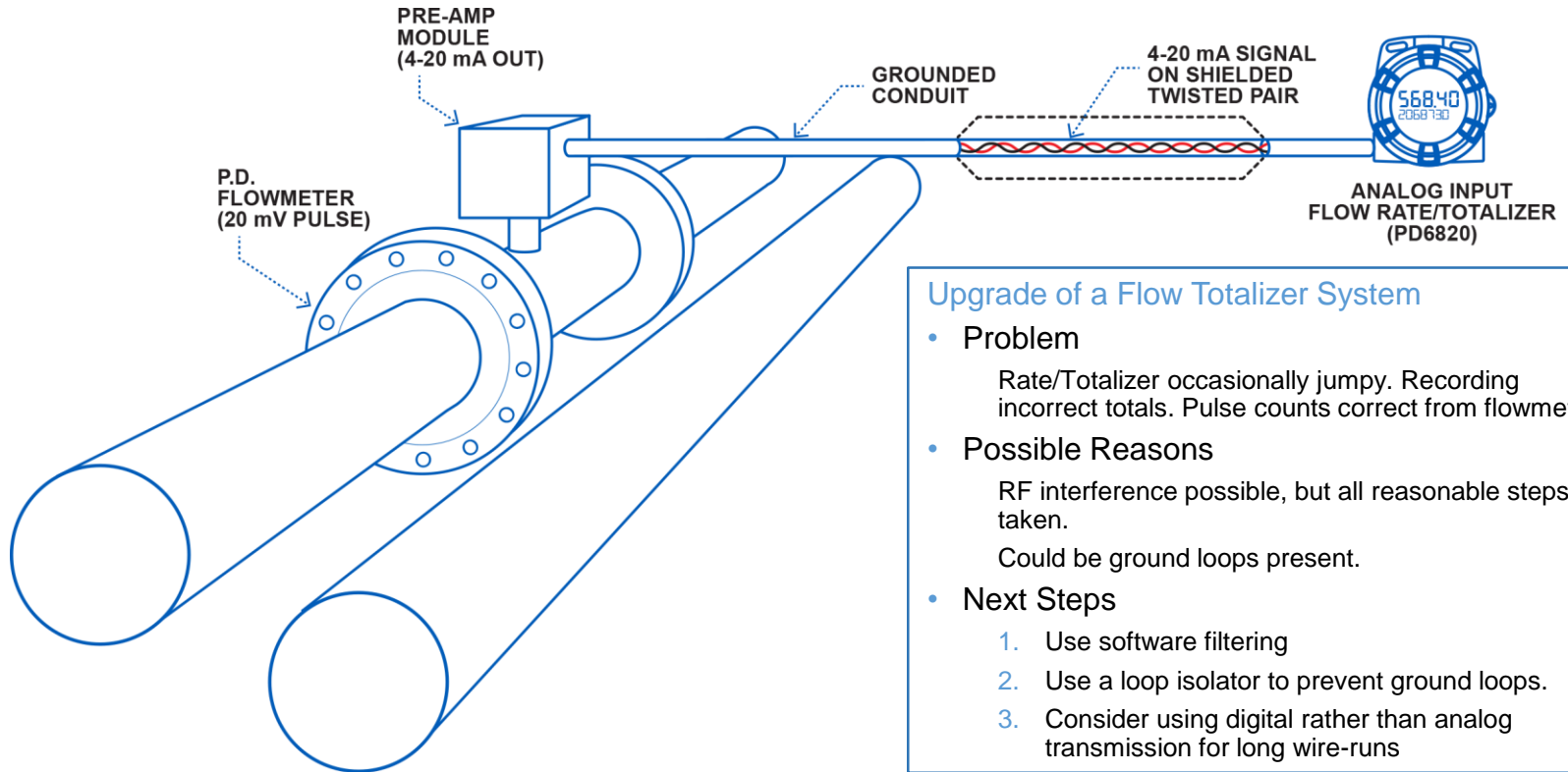
Practical Case 1



Grade Level Display and Control

- **Problem**
Erratic display causing false alarms.
Grounding properly installed. No nearby noise sources.
- **Possible Reason**
4-20 mA level signal and AC power share the same conduit.
- **Next Steps**
 1. Use shielded cable
 2. Separate field wiring

Practical Case 2



Upgrade of a Flow Totalizer System

- **Problem**
Rate/Totalizer occasionally jumpy. Recording incorrect totals. Pulse counts correct from flowmeter.
- **Possible Reasons**
RF interference possible, but all reasonable steps taken.
Could be ground loops present.
- **Next Steps**
 1. Use software filtering
 2. Use a loop isolator to prevent ground loops.
 3. Consider using digital rather than analog transmission for long wire-runs

Summary

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Best practices to reduce noise

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What about isolators/conditioners?

Q & A

- Please enter your questions in the 'Questions' window
- Apologies if we do not get to your question today. We'll contact you offline with a response as soon as possible.



Next Webinar – April 21st

An Introduction to Modbus®

- This webinar is a back-to-basics review of Modbus communications. Topics covered include:
 - What is Modbus?
 - What are the advantages of Modbus?
 - What key information do you need to work with a Modbus device or system?



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- And more



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