DECOUPLING ELECTRICAL EQUIPMENT TO IMPROVE YOUR CP SYSTEM

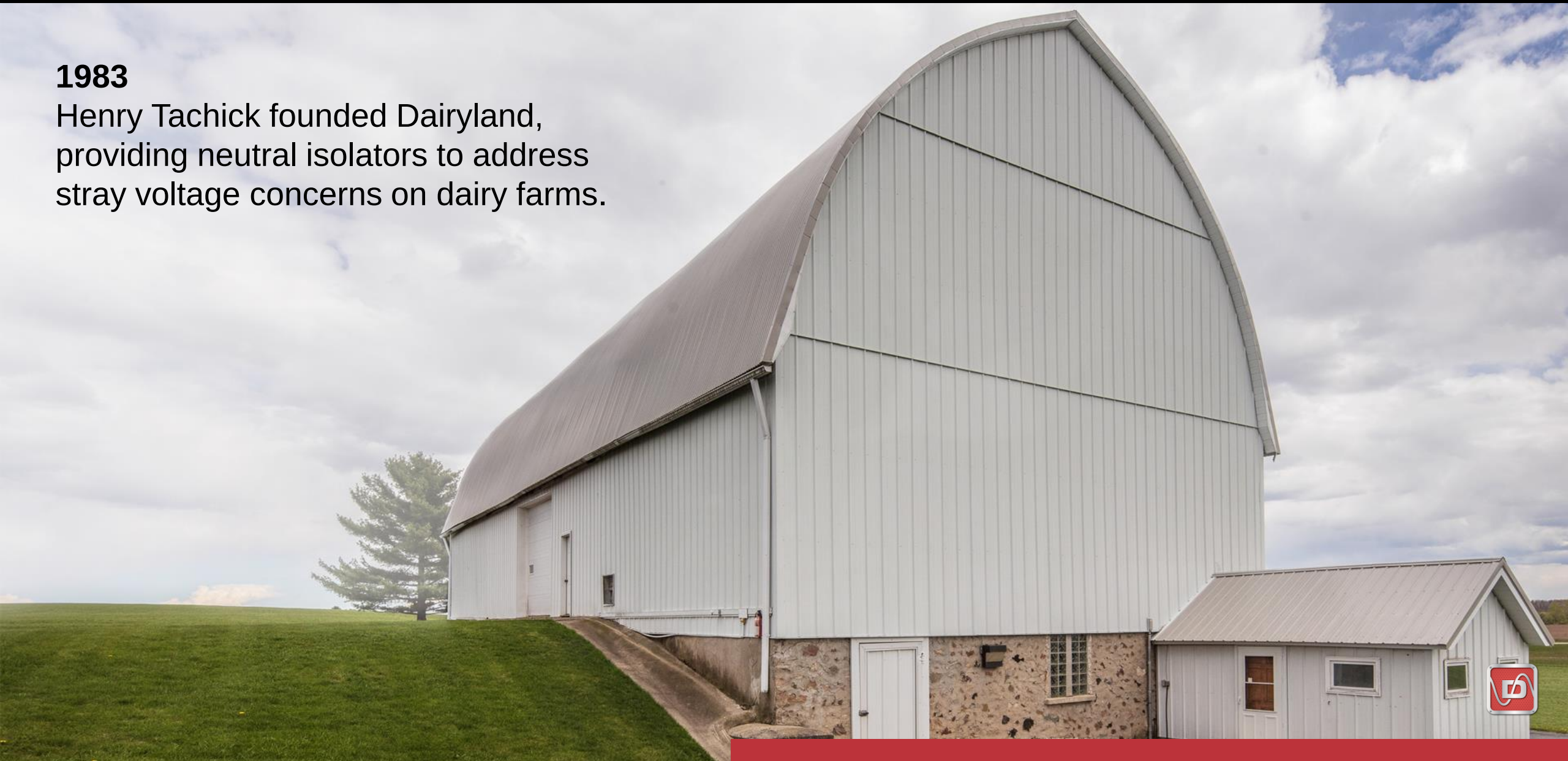
DAIRYLAND
ELECTRICAL INDUSTRIES
ALWAYS RUGGED. ALWAYS RELIABLE.

OUTLINE

- ✓ Why is Decoupling for Electrical Equipment Needed?
- ✓ Installing Decouplers in Electrical Equipment Grounding

DAIRYLAND

1983
Henry Tachick founded Dairyland, providing neutral isolators to address stray voltage concerns on dairy farms.



DAIRYLAND

1990 — ISP
Dairyland created the first solid-state device for high-power utility decoupling.

1994 — PCR
Dairyland introduced the first solid-state decoupling device for the corrosion industry.

DAIRYLAND

Today
Dairyland is the world's leading manufacturer of solid-state decouplers, with products installed in over 90 countries around the world.

ELECTRICAL EQUIPMENT GROUNDING

Electrical equipment must be grounded for safety.

National electric codes require grounding to be:

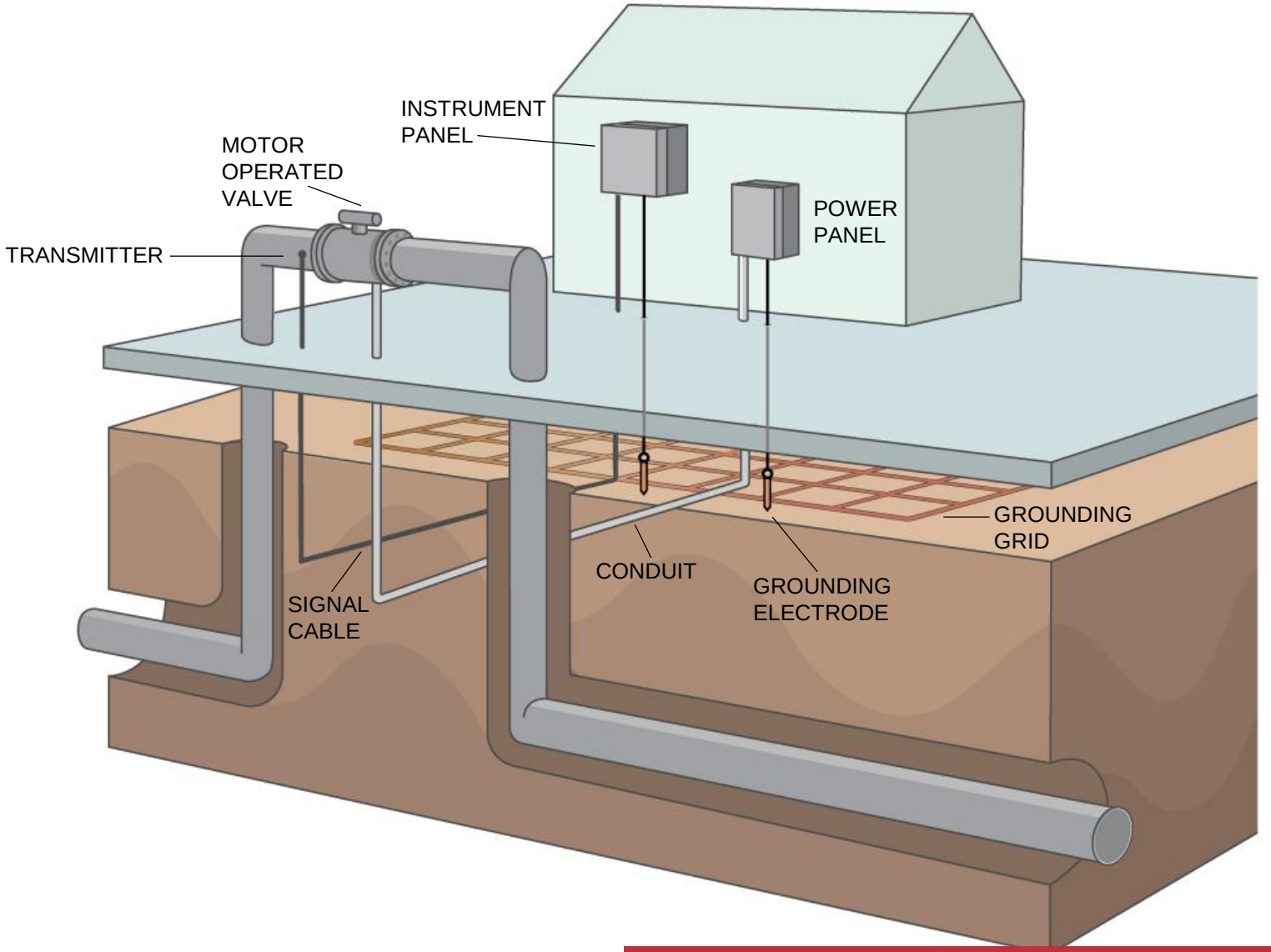
- Permanent and continuous
- Rated for anticipated fault current
- Low impedance

ELECTRICAL EQUIPMENT GROUNDING

Even low-voltage instrumentation must be grounded.

- Protective grounding: Safety
- Functional grounding: Signal conditioning

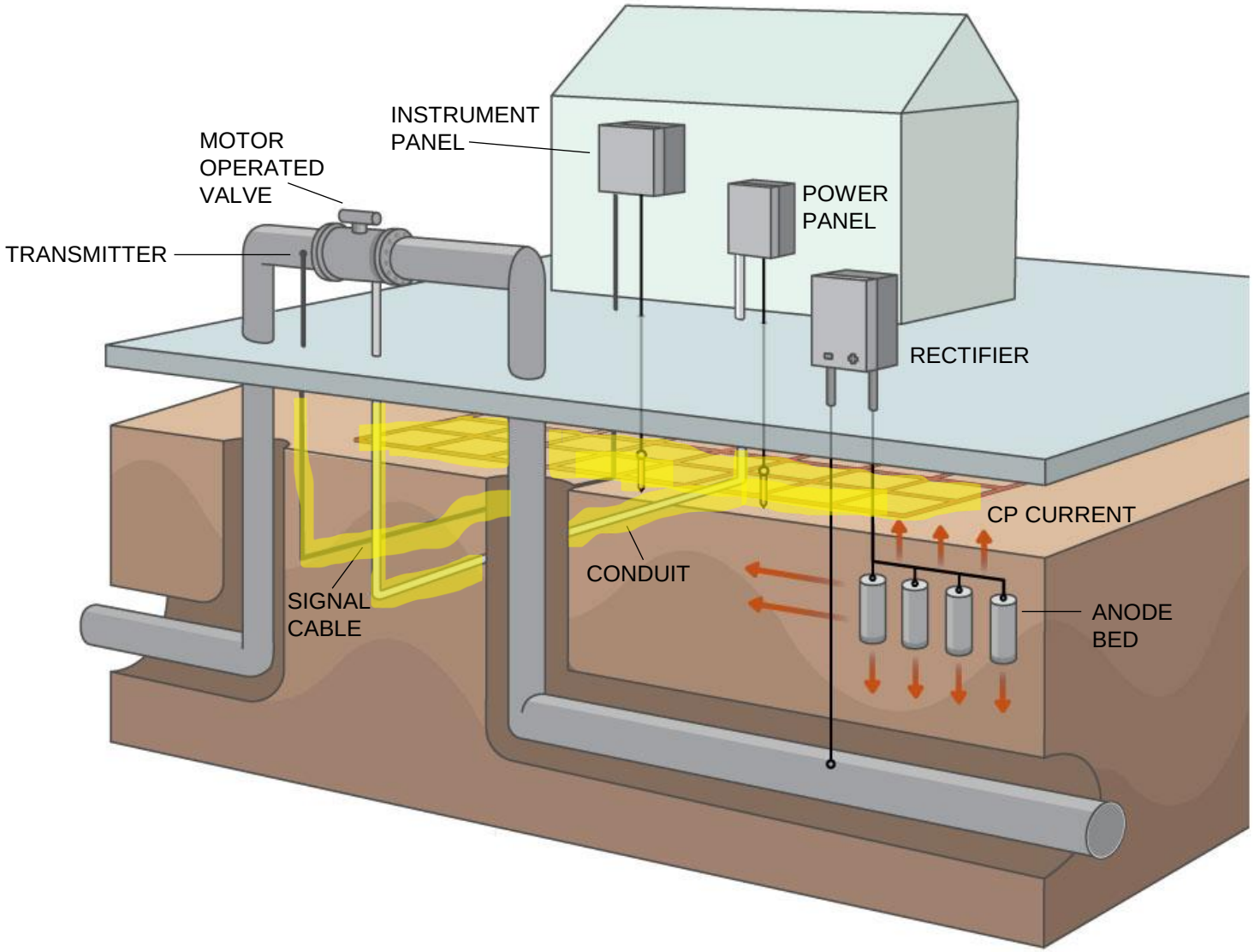
ELECTRICAL EQUIPMENT GROUNDING



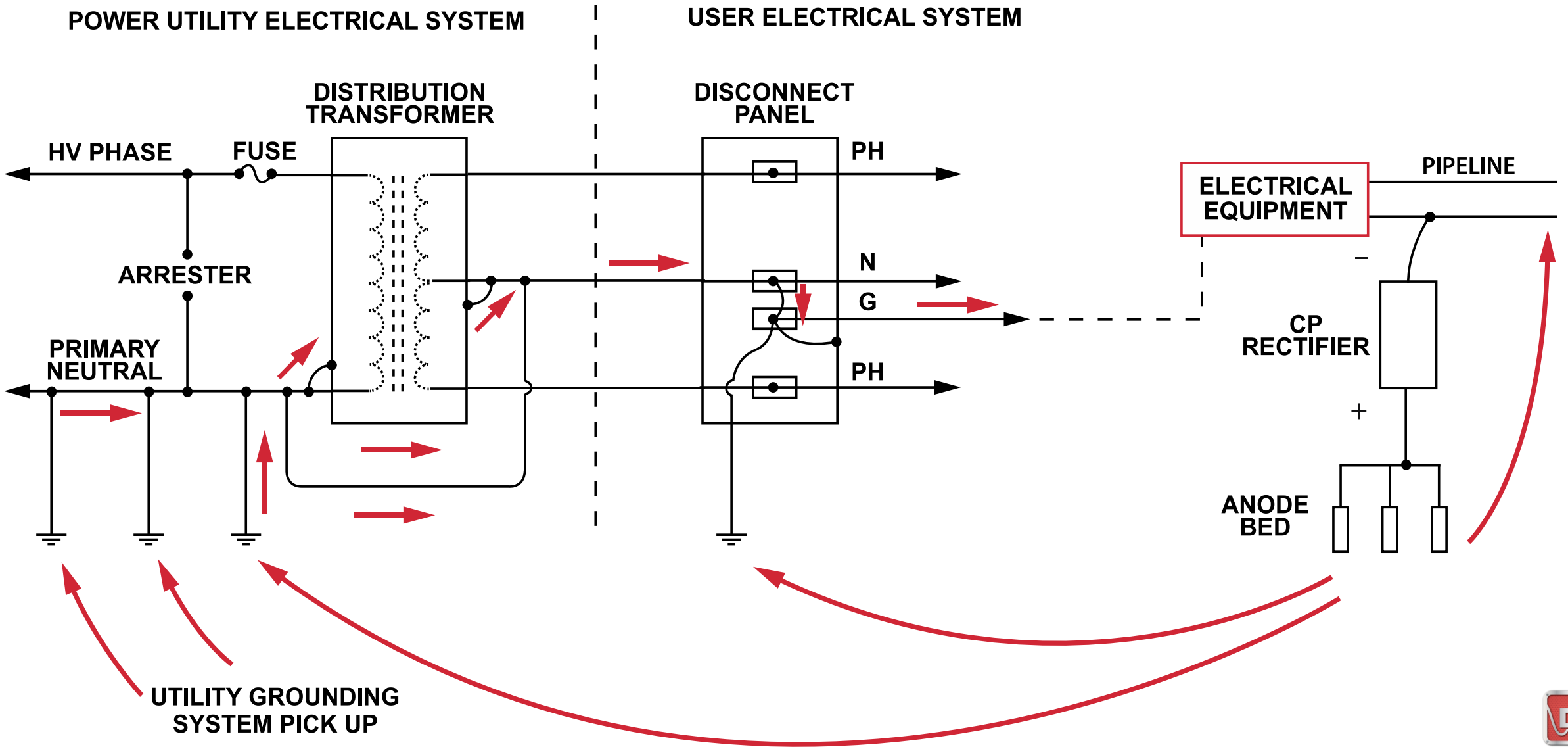
STATION CP WITHOUT ISOLATION

Without isolation, the CP system must protect the entire grounding system.

Effective cathodic protection requires isolation.



STATION CP WITHOUT ISOLATION



DC ISOLATION USING ISOLATION JOINTS

Isolation Joints:

- Commonly used to isolate electrical equipment and instrumentation
- Expensive
- Should be protected from over-voltage

DC ISOLATION USING ISOLATION JOINTS

DC ISOLATION USING DECOUPLERS

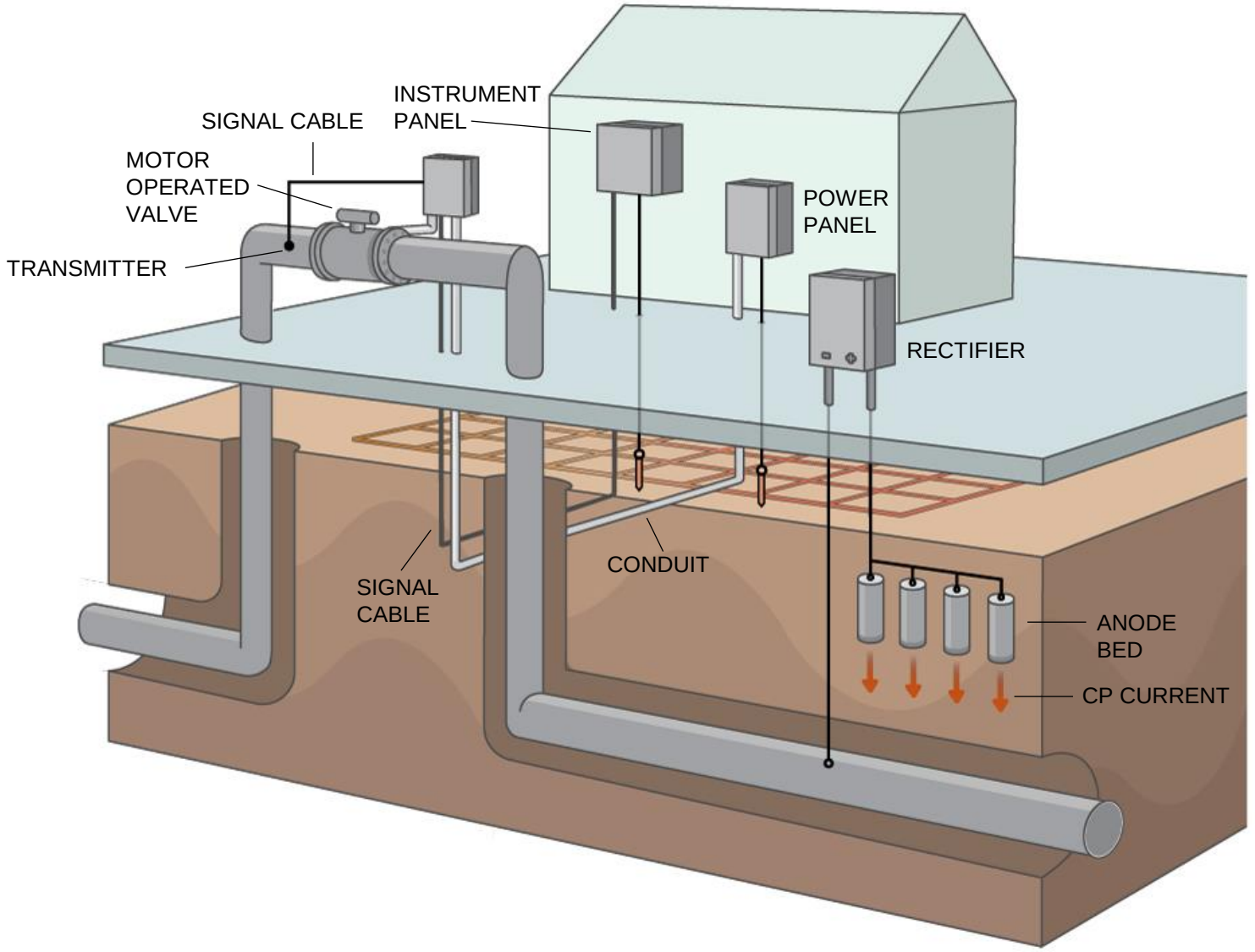
An alternative to isolation using isolation joints:
Install decoupler in series with the grounding circuit.

- Relatively simple and economical
- Effective and reliable isolation
- Safe and allowable by most electrical codes

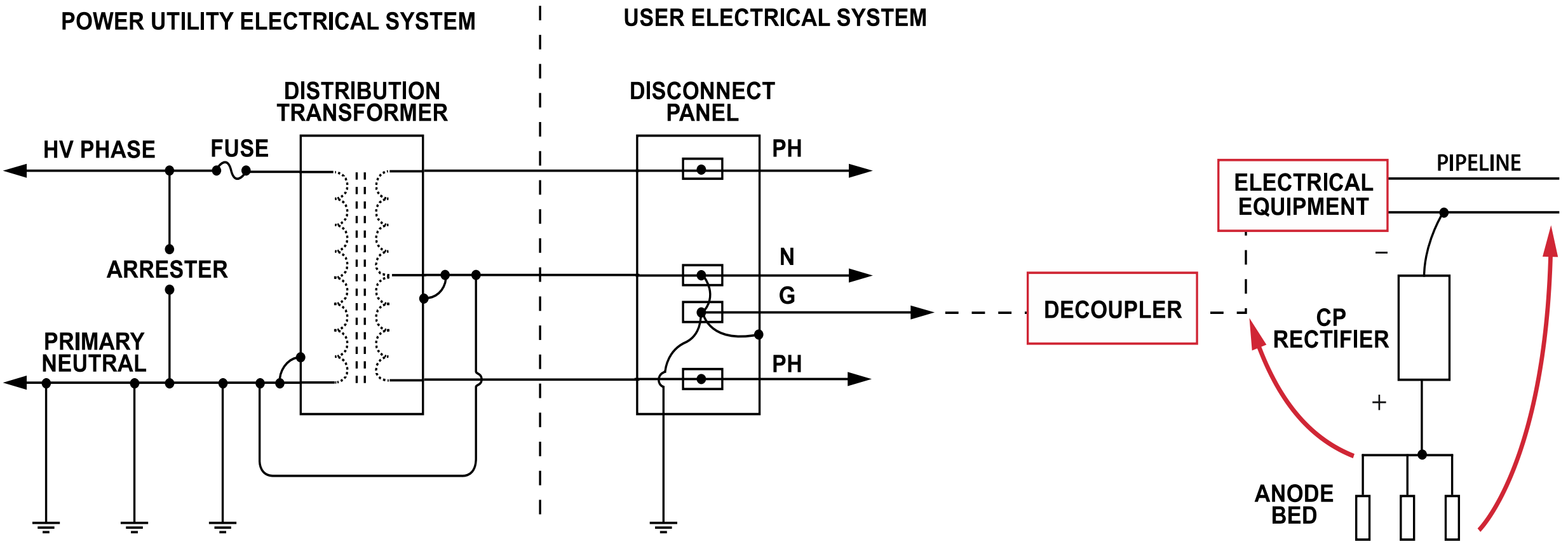
DC ISOLATION USING DECOUPLERS

Install decoupler in series with grounding circuit.

Sensors can also be isolated using the same decoupler.



DC ISOLATION USING DECOUPLERS



DC ISOLATION USING DECOUPLERS

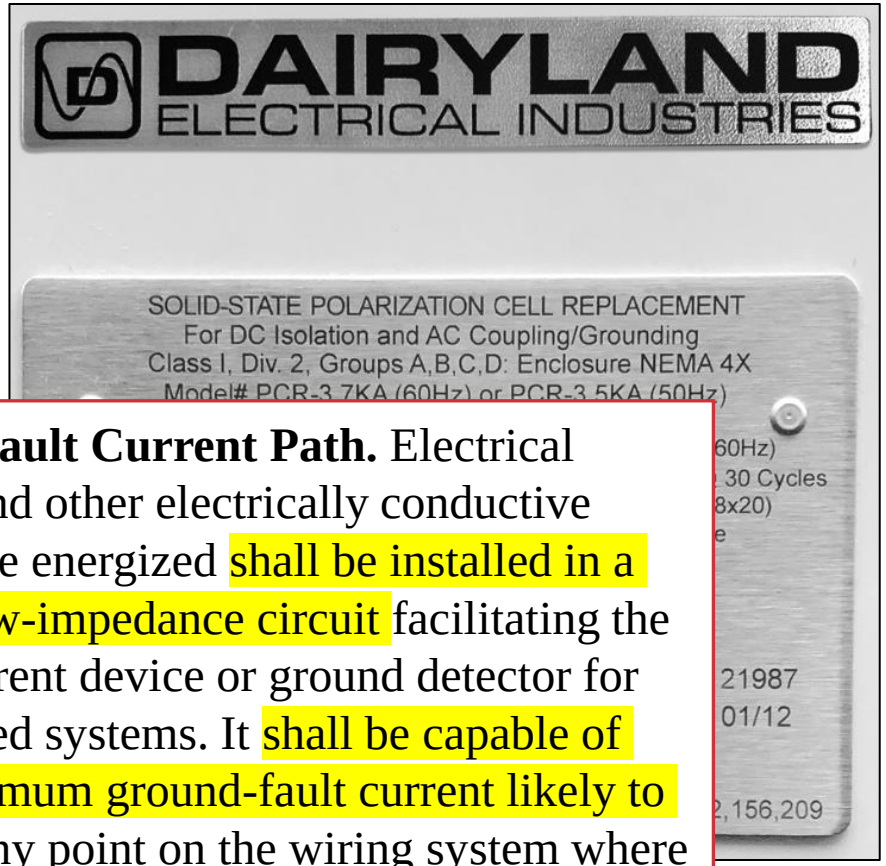
- Decoupler blocks DC current from CP system, dramatically reducing CP current required

- Maintains AC continuity and an effective ground fault current path for safety

DC ISOLATION USING DECOUPLERS

Electrical Code Compliance

- Dairyland decouplers are listed with UL for this use
- NFPA 70 250.4(A)(5)
- NFPA 70 250.6(E)
- CSA C22.1 article 10-806(1)



(5) Effective Ground-Fault Current Path. Electrical equipment and wiring and other electrically conductive material likely to become energized shall be installed in a manner that creates a low-impedance circuit facilitating the operation of the overcurrent device or ground detector for high-impedance grounded systems. It shall be capable of safely carrying the maximum ground-fault current likely to be imposed on it from any point on the wiring system where a ground fault may occur to the electrical supply source. The earth shall not be considered as an effective ground-fault current path.

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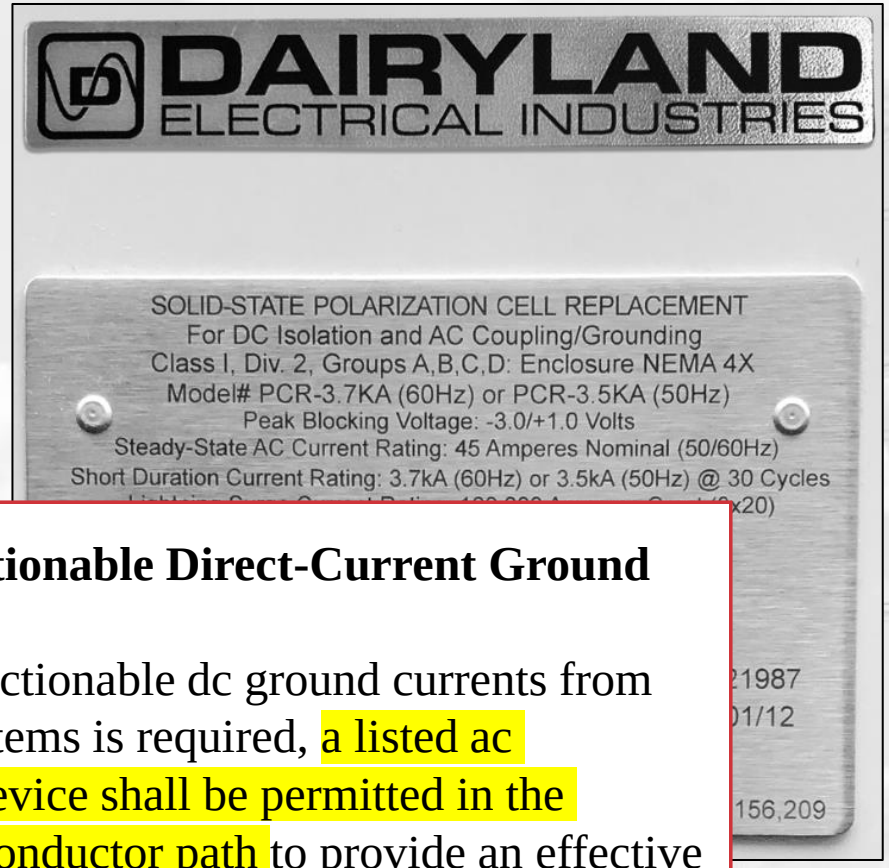


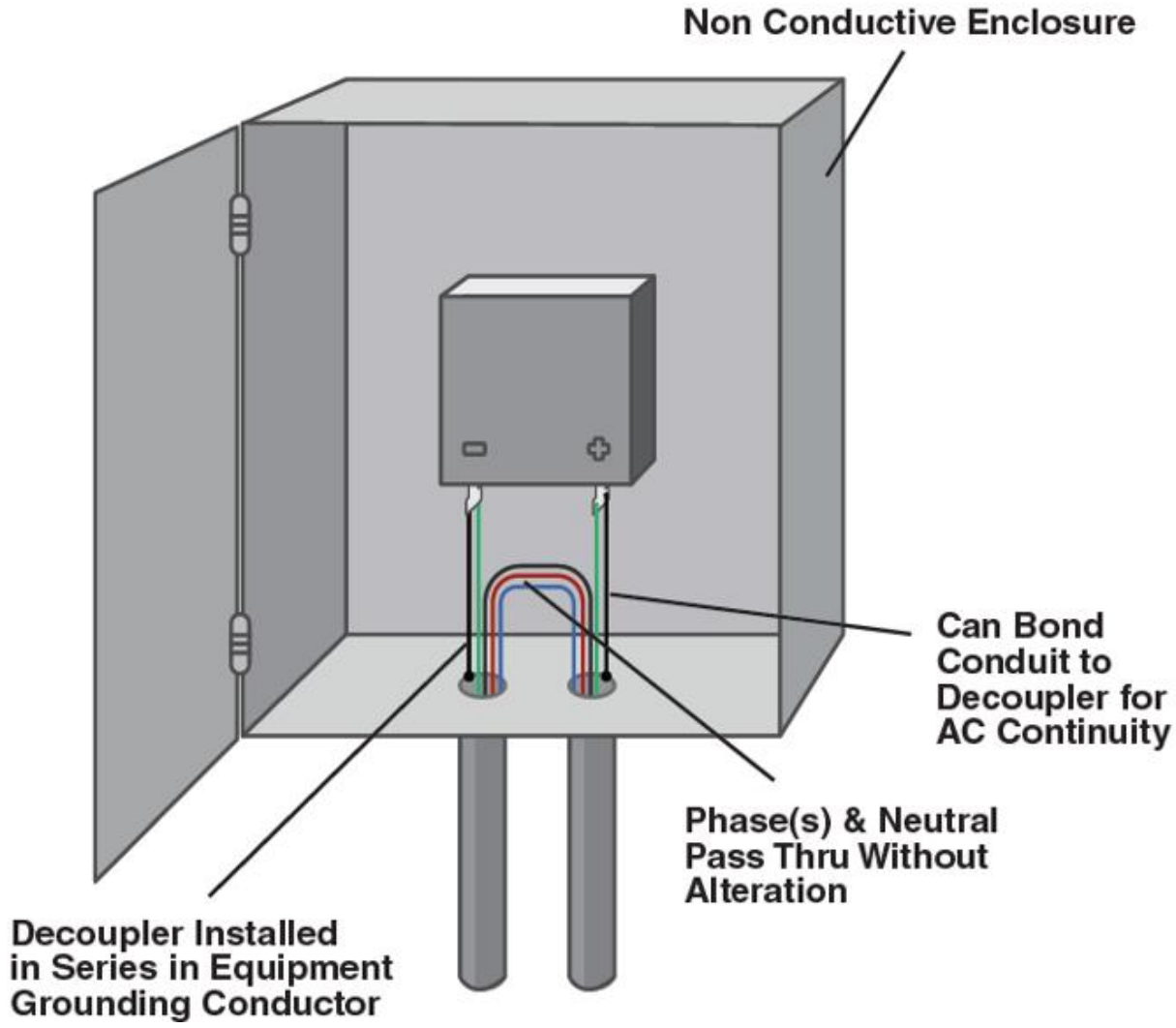
(E) Isolation of Objectionable Direct-Current Ground Currents.

Where isolation of objectionable dc ground currents from cathodic protection systems is required, a listed ac coupling/dc isolating device shall be permitted in the equipment grounding conductor path to provide an effective return path for ac ground fault current while blocking dc current.

DECOUPLER INSTALLATION

Be Sure to Decouple Conduit

Can use the same decoupler as for equipment ground wire

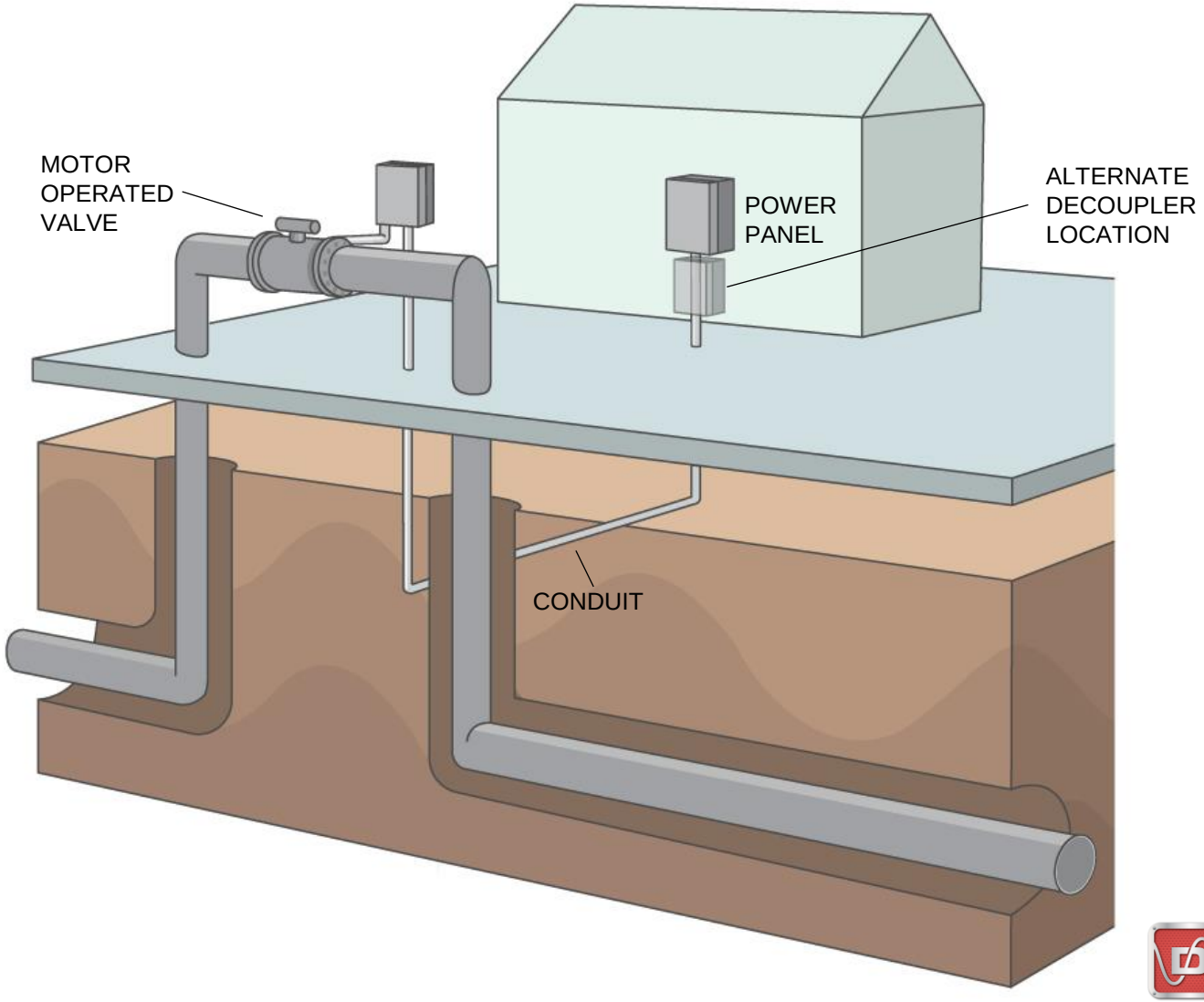



WARNING

DECOUPLER INSTALLATION

Consider Alternate Decoupler Locations

- Hazardous location zones
- Access to the conduit
- Length of conduit to point of isolation/decoupling
- Number of conduit runs



DECOUPLER INSTALLATION

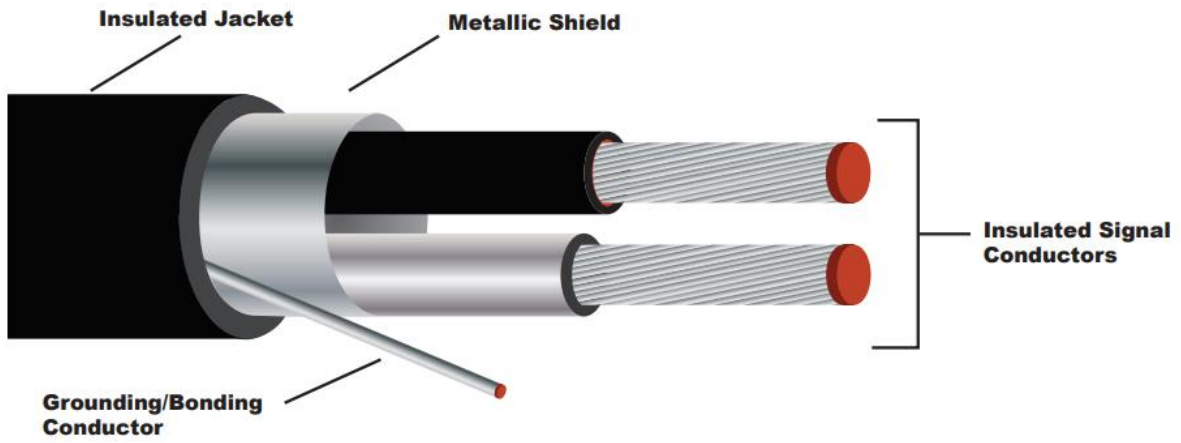
Near the electrical equipment

At the service panel

DECOUPLER INSTALLATION

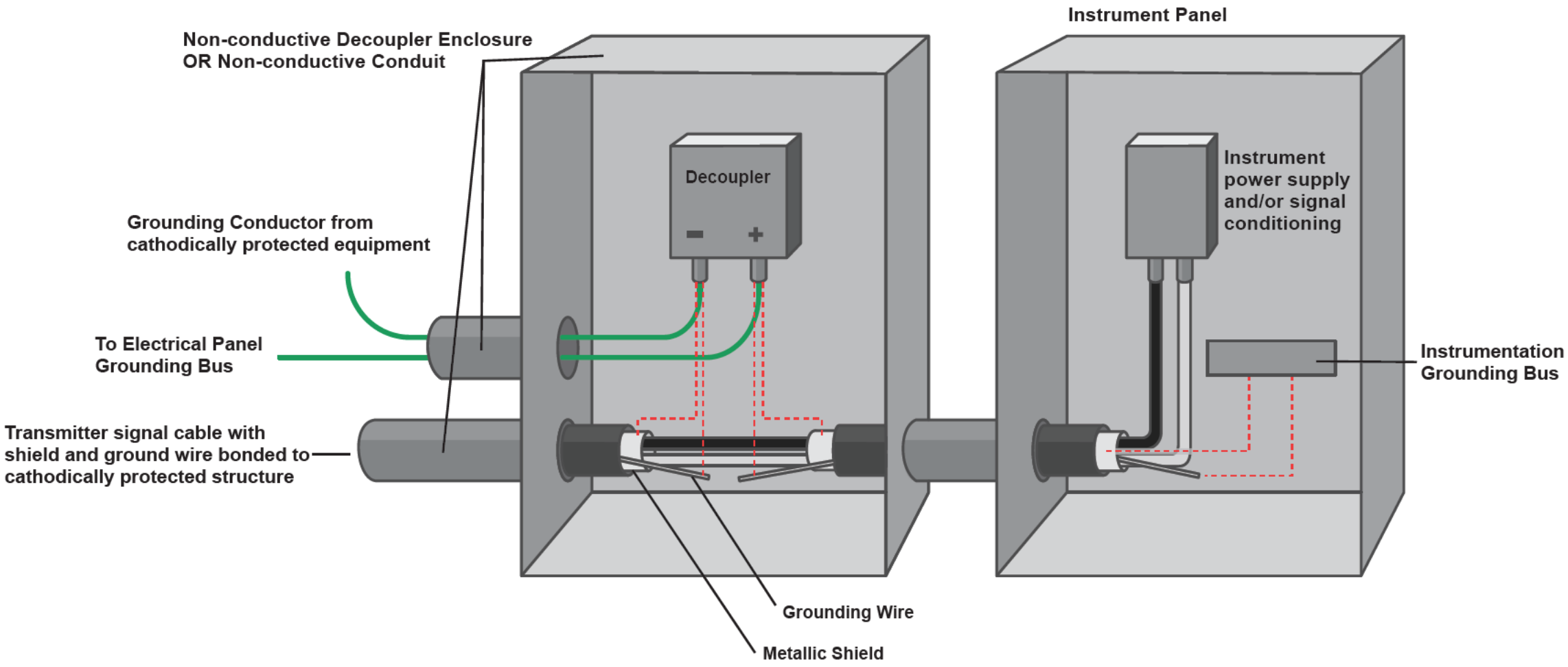
Don’t Forget to Decouple Sensor Grounding

- If bonded to the pipe, signal ground and shield wires can be a bypass path for CP current.
- Evaluate if DC decoupling signal ground will affect signal integrity.



Signal Cable

DECOUPLER INSTALLATION



DECOUPLER INSTALLATION

What NOT do to

- Decouplers should never be installed in-series with neutral wires
- Isolation switches must never be installed in the grounding circuit

WARNING

Isolation Switches or any type of device that can take the grounding wire out of the circuit cannot be used in grounding isolation scenarios.

KEY DECOUPLER RATINGS

AC FAULT CURRENT

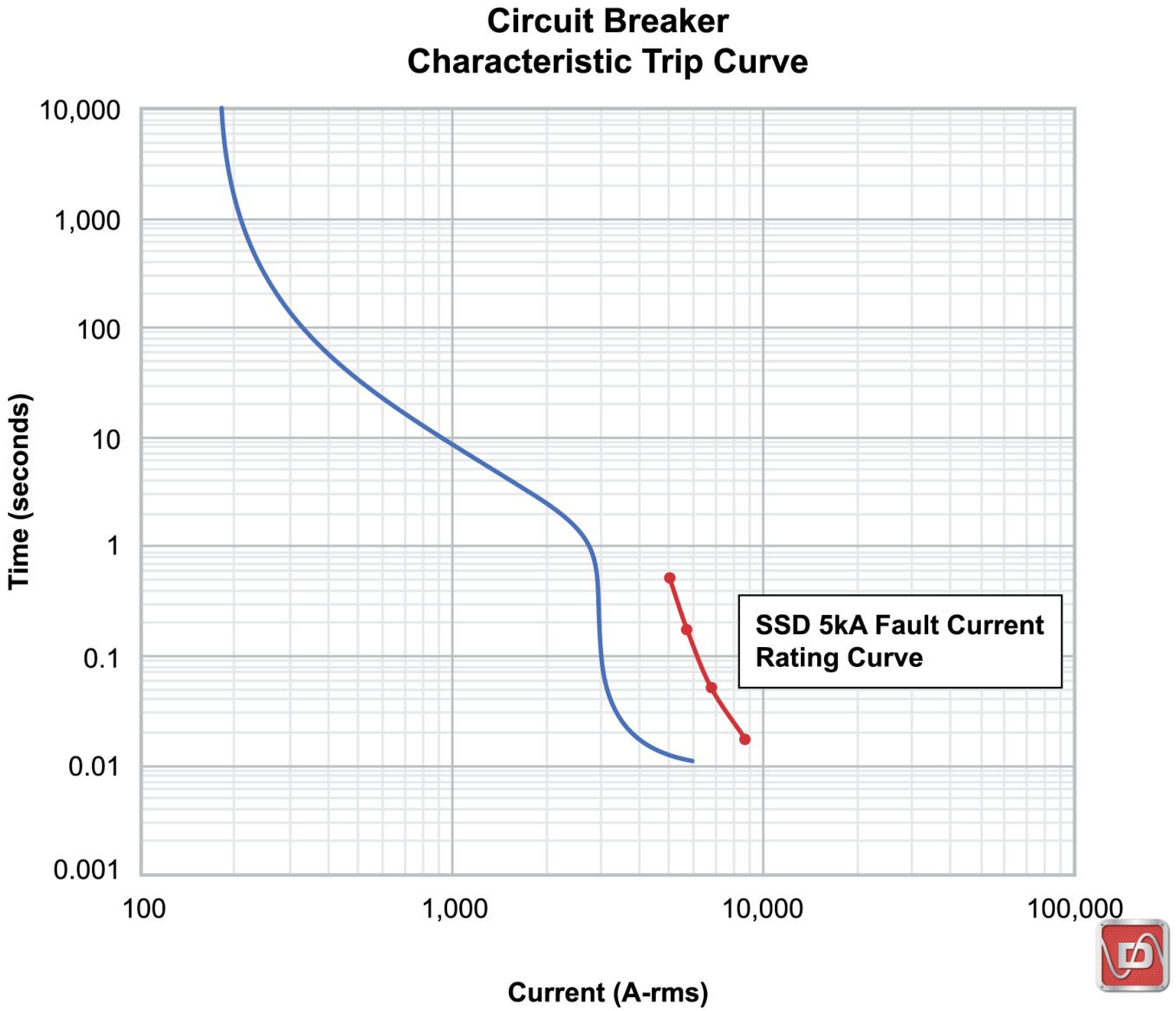
- All decouplers and over-voltage protectors have a time limit as to the amount of current they pass
- Rating of the decoupler must exceed the maximum current produced by the fault
- Typical AC fault rating is given at 30 cycles
- Common fault ratings are 3.7kA – 15kA

AC Fault Current (Amps AC-RMS Symmetrical 50/60 Hz)				
Model	**1 cycle**	**3 cycles**	**10 cycles**	**30 cycles**
PCR-3.7kA	6500	5000	4200	3700
PCR-5kA	8800	6800	5700	5000
PCR-10kA	20000	15000	12000	10000
PCR-15kA	35000	27000	21000	15000

KEY DECOUPLER RATINGS

AC FAULT CURRENT

- Conductors, connectors, safety products must withstand AC fault current magnitude and duration
- Device ratings should exceed breaker clearing curve



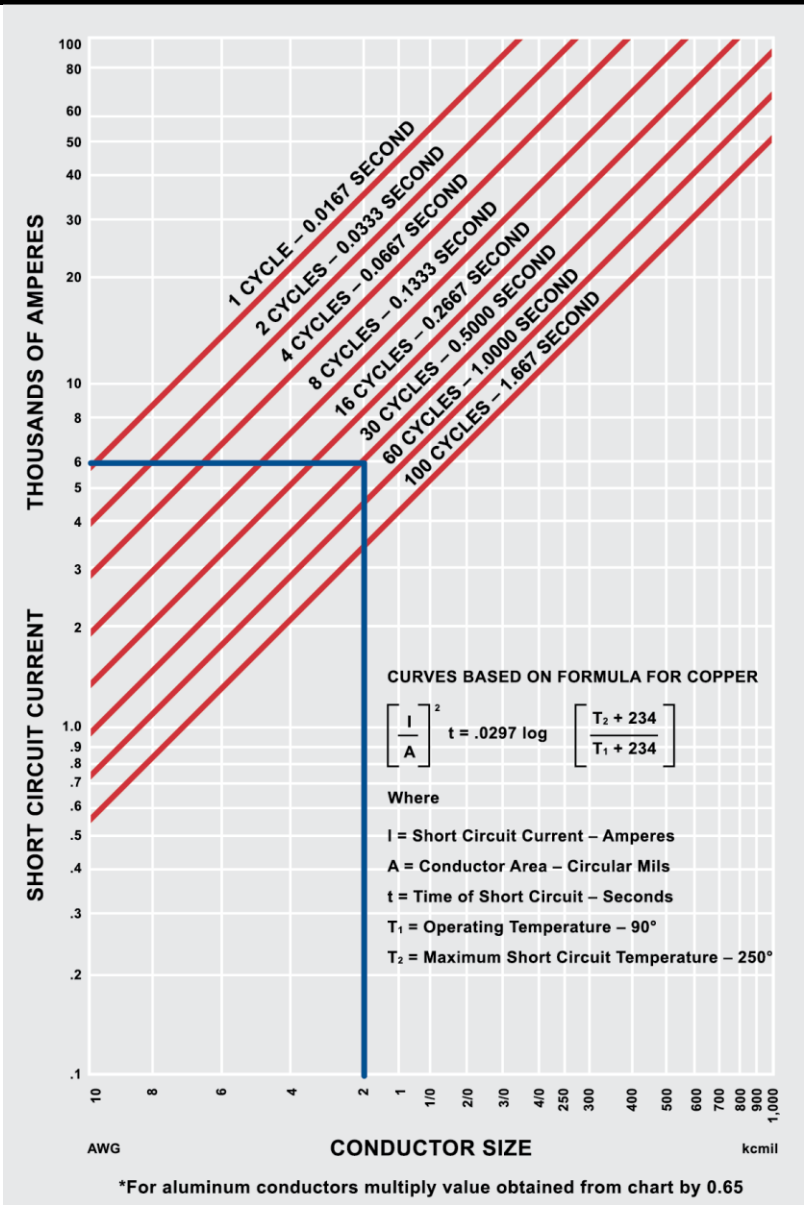
KEY DECOUPLER RATINGS

AC FAULT CURRENT

An alternate method to estimate AC fault current rating: Compare existing conductors to ampacity charts

EXAMPLE:

- What decoupler fault rating should be used in a grounding circuit having #2AWG copper wire?
- #2AWG copper conductor is rated for ~6kA at 0.5s
- Select a decoupler with 10kA (@ 0.5s) or greater fault rating.

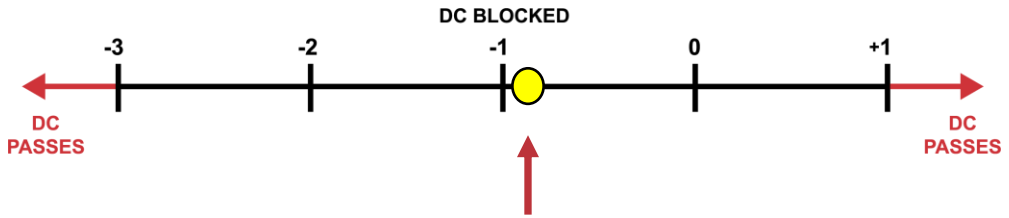


KEY DECOUPLER RATINGS

THRESHOLD VOLTAGE

Typically -3/+1 V for copper grounding grids

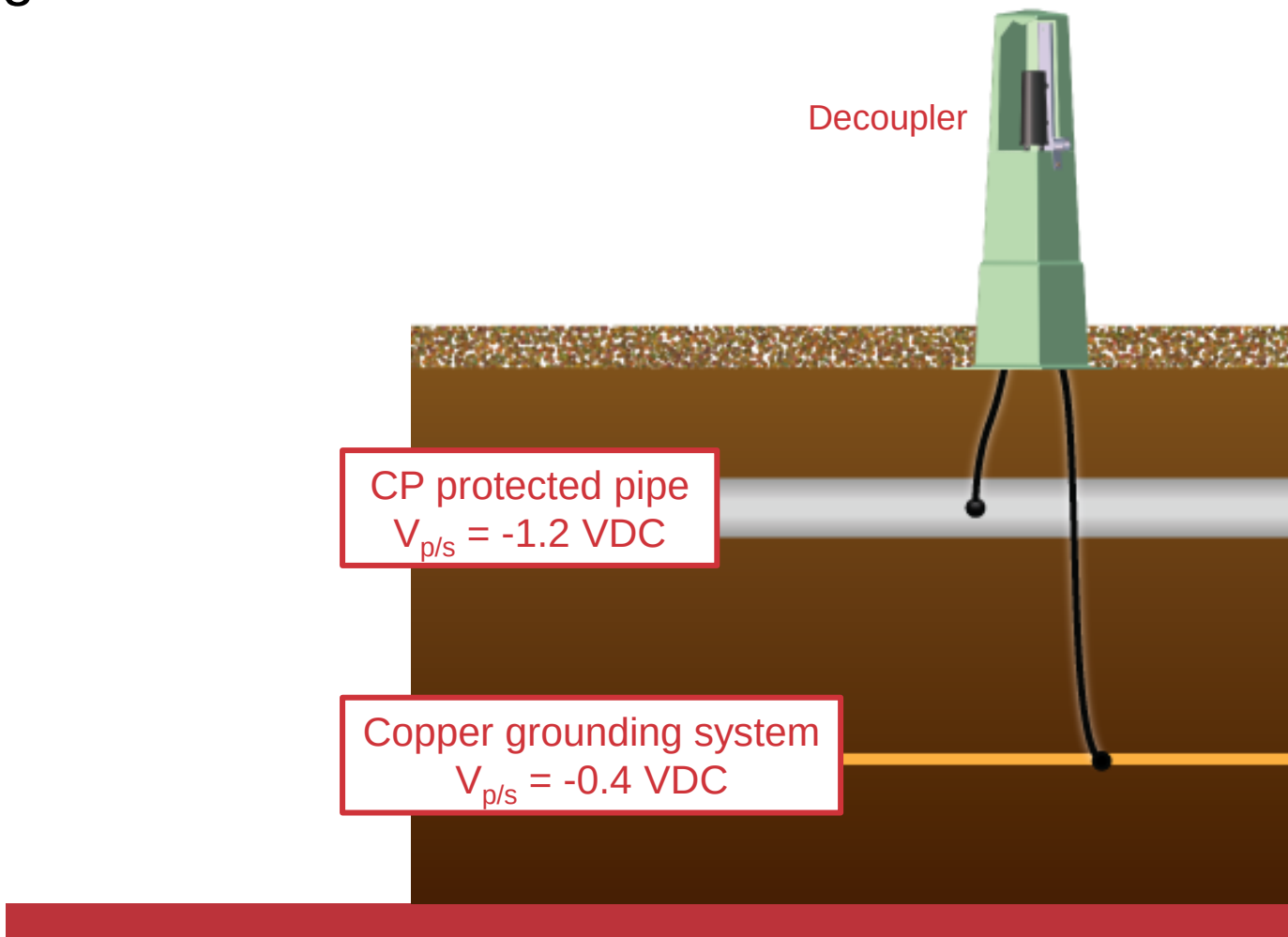
$V_{pipe\text{-}to\text{-}Cu\ Wire}$ = -1.2 – (-0.4)
= -0.8 VDC



Voltage across decoupler terminals under normal operating conditions.

Centered within threshold range

EXAMPLE:



DAIRYLAND FEATURES & BENEFITS

Fail-Safe
Rugged product design assures safety grounding under all product conditions.

Maintenance-Free
Dairyland decouplers require no ongoing maintenance.

Rugged Performance
Proven product designs resulting in a low failure rate of less than .01 percent.

Third-Party Certification
Extensive certification to industry required standards provide assurances to our product claims.

ISO Certified Company
Dairyland's manufacturing processes are overseen by robust standards ensuring consistent quality.

Reliable Service & Support
Trained and trusted staff emphasize providing prompt, high quality service and application support.

QUESTIONS?
CONTACT DAIRYLAND

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