

DC Decoupling Power Company Ground from User Facility Ground



Application Note 3A

Introduction

There are many existing facilities that have various items of electrical equipment integral to a cathodically protected system. Typical facilities include metering, regulator, and compressor stations, to mention a few. Electrical equipment in these facilities must be grounded to comply with electric codes, but this can have a very adverse effect on cathodic protection (CP) voltage levels because the CP system is then attempting to cathodically protect both the user's grounding system and the power utility grounding system since these two systems are normally interconnected.

Whereas the ideal solution would be to ground all electrical equipment through a listed solid-state decoupler, this is often not feasible due to multiple connections to ground. In many cases, a simple and effective alternative is to provide DC decoupling from the power utility grounding system. It is often feasible for a user to cathodically protect their grounding system but not the power utility grounding system, which is considerably more extensive.

Decoupling these two grounding systems is non-standard but permissible by power companies. Where DC decoupling between grounding systems is desired, the user must make the request to the power utility explaining the reason for requesting DC decoupling. The power utility must approve and install the decoupling device as illustrated in Figure 1. The user will normally be requested to pay for the device plus an installation fee. Utilities are generally receptive to the user accepting responsibility for monitoring the decoupling device. Monitoring simply involves taking CP voltage measurements that are already part of a user's routine.

DC decoupling from the power utility grounding system is simple and independent of the complexity of the facility being provided with electric power. A unique aspect of this approach is that its effectiveness can readily be evaluated without initially purchasing a decoupling device. Most utilities are receptive to momentary isolation of the primary and secondary grounding systems so that a user can take cathodic voltage measurements to determine the effectiveness of decoupling. The results are immediate. If favorable, permanent isolation can be pursued with the power utility. During this test, it is essential to recognize that there may be other interconnections between the utility and user grounding systems. If the facility has telephone service, one should either have the telephone company present to isolate the sheath on their telephone cable or confirm that it does not have an interconnection between grounding systems. Fortunately, telephone companies can readily provide this isolation on a permanent basis upon request.

When the two grounding systems are DC decoupled, using the Dairyland model PCR, the steady-state AC impedance between grounding systems will nominally be 9.8 milliohms at 60 Hz (11.8 milliohms at 50 Hz) under normal system conditions. Under an AC fault or lightning surge condition, the decoupler impedance momentarily transitions to a virtual short circuit. From a power utility standpoint, there is no measurable effect when using a DEI decoupler to provide DC isolation between grounding systems because the two systems are still AC connected.

A key design feature of all DEI decouplers is that if subject to current sufficiently in excess of rating such that failure results, failure occurs in the short-circuit mode. In this mode, the product can carry current in

excess of any of its current ratings, thereby assuring the same level of safety that existed when the two grounding systems were solidly interconnected. In the unlikely event of failure, safety is provided but CP voltage levels will be affected.

Products

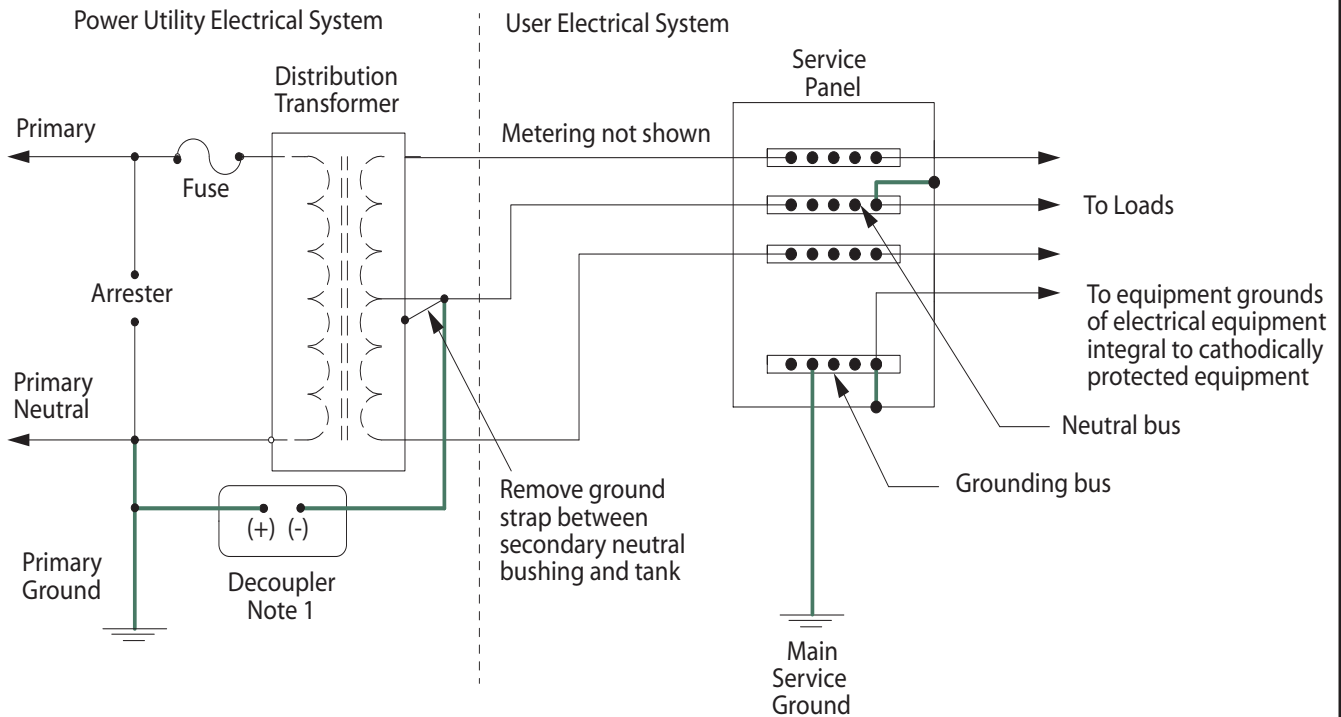
The product predominantly used in this application is DEI's model PCR (solid-state Polarization Cell Replacement). The PCR is UL and C-UL listed by Underwriters Laboratories as "meeting the requirements of an effective grounding path" as defined in the 2005 National Electric Code Sections 250.2, 250.4(A)(5) and Canadian Electrical Code section 10-500. Complete product details are available in the product literature sections.

The key rating that must be selected is the AC fault current rating. This rating must be equal to or greater than the fault current available from the power utility system on the primary side of the transformer at which the product is to be installed. The power utility can provide the fault current magnitude and duration for the location at which decoupling is planned. Select a model number with a fault current rating that encompasses this current magnitude and duration. If applications assistance is required, contact DEI. (This application may not be suitable in all countries due to different electrical codes and practices.)

See Figure 1 for detailed information.

FIGURE 1 DC Decoupling Between Power Utility Grounding System and User Grounding System

This application requires approval from and installation by the electric power utility or their designated contractor.



Notes:

1. Decoupler = PCR models by DEI. Select a decoupler rated for the fault current (and for the time duration) available on the primary side of the transformer (obtainable from the local power utility). Decouplers are UL listed per NFPA 70, Article 250.2, 250.4(A)(5), 250.6(E).
2. If the user facility has telephone service, there will likely be a by-pass path between the user and utility grounding systems. Contact the telephone company and request them to interrupt their cable shield at the facility. (A common practice in the U.S.)
3. Do not install the decoupler in series with the secondary neutral. This is not allowed per electric codes.
4. Observe polarity marks when installing the decoupler if the decoupler has polarity marks.
5. For pole mount transformers, mount the decoupler on the pole. For pad mount transformers, suggest mounting the decoupler in a secondary pedestal/enclosure, available at most power utilities or from DEI.
6. After installation, and with the cathodic protection system ON, confirm that the expected cathodic protection voltage exists across the decoupler terminals. If this is not the case, the decoupler is likely by-passed. Find and eliminate any by-pass path and retest.
7. If there is any question as to proper installation procedures, call DEI for assistance.

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