Sales Bulletin - Planning Successful GFCI Dimmer Installations

ETC manufactures a unique UL-Listed dimmer that includes an integral Ground Fault Circuit Interrupter for personnel protection in wet or submersible applications. A successful GFCI Dimmer installation relies on a number of factors that must be planned well in advance.

Keep Branch Circuit Length Below 125 Feet when using Standard Wiring

The length of the branch circuit between the dimmer rack and the lighting fixture is one of the most critical issues in a GFCI dimmer application. Long branch circuits create leakage current between conductors and ground, resulting in nuisance tripping of the GFCI device. Generally, the longest branch circuit using "normal" wiring and conduit should not exceed 125' between the dimmer and the load. Often, this dictates the use of smaller dimmer racks located close to the actual load positions.

When it is not possible to keep branch circuit length at or below 125', there are a number of techniques that can be used to increase the length of the circuit while keeping nuisance tripping to a minimum.

Use Type XHHW Low-Leakage Wire for Longer Branch Circuits

Type XHHW wire uses cross-linked polyethylene insulation that provides lower leakage current than a typical THHN conductor. This allows extension of branch circuits to the range of 250'.

Use Twisted-Pair Shielded Cables for Very Long Branch Circuits

Twisted-Pair Shielded cables can be used to further extend branch circuit length to over 400'. This application relies on special wiring of the cable shield to route leakage current back through the neutral of the GFCI sense transformer, thus preventing nuisance tripping. These cables are available for both conduit and directly submersible applications. Consult ETC for details of correct installation of Twisted-Pair Shielded cables.

Calculating Branch Circuit Length—add up all the wire lengths

For GFCI applications, it's important to remember that the total footage of wire to all loads on a branch circuit must be included in the calculation, not just the longest run. This includes any submersible cord between the underwater junction box and the fixture.

Where Conduits Will be Flooded or Wet With Condensation, Use Type XHHW wire

The low-leakage characteristics of Type XHHW help prevent nuisance tripping in installations with wet conduits.

Avoid Junction Boxes or Splices on Branch Circuits

Junction boxes and splices can be a source of moisture incursion and leakage current that can cause nuisance tripping. Where possible, branch circuit runs should be continuous from GFCI Dimmer Rack to load. One unavoidable junction box is the submersible unit located near submersible fixtures, typically used to transition from conduit to flexible cord attached to the fixture. However, the NEC requires this box to be potted with a special compound, which all but eliminates water incursion.

Avoid Branch Circuit Conductors Larger than #10 AWG on 20 Amp Circuits

When using long branch circuits with XHHW or Twisted-Pair Shielded Cables, avoid conductors larger than #10AWG. Larger conductors have more surface area, and are subject to higher leakage currents. This will require planning loads on branch circuits to maintain acceptable voltage drop without increasing conductors above #10 AWG.

Consider Outboard Listed "Dimmer-Rated" GFCI's

For some circuits where the dimmers cannot be located near the loads, and there are only a few GFCI circuits, it may be desirable to use an outboard, listed dimmer-rated GFCI on a *standard* (non-GFCI) ETC dimmer. This allows the GFCI device itself to be located close to the load, but any distance from the dimmer racks. Note that standard GFCI circuit breakers cannot be used on the output of dimmers. Consult ETC for applications of outboard Dimmer GFCI's.

Test Unusual Loads

If the load contains anything other than a lamp, such as a transformer or other electronic components, the load must be tested to make sure that its inherent leakage current is not too high for a GFCI application. Some loads may not be usable with GFCI's, and will cause nuisance tripping.

Watch Out for Sources of Electrical Noise in the System

Common-mode electrical noise between neutral and ground produced by Variable Frequency Drives and other power control systems can create nuisance tripping. For best immunity to these noise sources, plan to isolate the GFCI dimming system on its own delta-wye transformer.

When in doubt, consult ETC when laying out the system

Successful dimmer GFCI systems require precise adherence to a number of installation and layout rules. If you have doubts about the specifics of your particular installation, please consult ETC for guidance when laying out your system.