



## Back Feeding Transformers

Back-feeding involves wiring a standard step-down transformer in reverse and using it as a step-up transformer. The best solution when a step-up transformer is needed is to have it designed for the application. While a standard transformer can be back-fed, several problems can occur.

1. All transformers have winding resistance that causes a voltage drop. A standard transformer has about a 3-5% voltage drop caused by winding resistance at full load. Transformer designers compensate the windings ratios to account for the voltage drop. When a transformer is back-fed, the compensated winding ratio will work against the user. Not only does the 3-5% voltage drop occur, the compensated windings ratio also adds a 3-5% voltage drop. As a result, back-fed transformers can have a 6-10% voltage drop at full load. While this can be somewhat adjusted by using the taps if available, the total effect may still be a lower voltage.
2. All transformers have inrush current when energized lasting for a few cycles until the electrical fields establishes itself. Manufactures design transformers to limit inrush but this will work against the user when it is back-fed. As a result, back-fed transformers can have large inrushes. The inrush can cause many problems including nuisance tripping of circuit breakers and fuses and voltage drops. The inrush problem can increase if the transformer is k-rated, low temperature rise or high efficiency. This high inrush can also stress the insulation system since it is encountering high currents.
3. A neutral can not be derived from a back-fed transformer since standard transformers typically do not have a four wire primary. Back-fed transformers may also develop large fault currents in the event of a catastrophic fault. The larger the transformer, the larger the potential fault current. When back-feeding a delta-wye transformer, the ground strap normally provided between the XO terminal and the case ground must be removed, only the case can be grounded.
4. 5 kV class transformers are never recommended to be back-fed.
5. Back-fed transformers may void the standard warranty and Hammond does not recommend back-feeding a transformer. Due to the higher fault current that could occur during a fault with a back-fed transformer, the mechanical stresses that could occur during a fault may cause mechanical damage. Back-fed transformers may not meet local and national electrical codes.

A step-up transformer, while not readily available as a standard transformer, can be designed to limit the problems that would occur back-feeding a standard transformer. The user needs to weigh the risk and liability when back-feeding a transformer.