



CONTROLLER ELECTRICAL PHASING

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Recently a good friend of mine, who also happens to run one the most successful irrigation service companies in the state, informed me of a recurring problem that has been showing up on his service calls—the problem of failing transformers on digital solid-state controllers. All products are subject to failure over a certain period of time, but two to three years of use from a transformer clearly points to premature failure due to a manufacturer's defect (unlikely, if you ask them) or something directly related to poor installation techniques.

In many cases these transformers are failing due to either the installer's indifference to proper wiring of the transformer, or the electrician's indifference to observance of proper color-coding of the 110 VAC wiring.

Today's digital solid-state controllers are much more susceptible to failure due to incorrect wiring than were the old war-horse electro-mechanical controllers of the past. The wiring of the controller's primary must be in phase if the controller's transformer is going to provide ten or fifteen years of operation.

The 120 VAC electrical service that originates at the circuit panel consists of two wires—a POWER leg (black wire or L-1) and a NEUTRAL leg (white wire or L-2).

Since we are using Alternating Current, the power is rapidly turning on and off in a sine wave pattern (60 times per second or 60 Hz). Sometimes, the wavelength of the two wires is not the same and the sine waves cross the zero reference line at different times, canceling each other out. The circuit is considered out-of-phase. An out-of-phase circuit heat stresses the transformer and associated circuitry and will eventually cause premature failure.

In order to ensure the long-term reliability of the solid-state controllers you install, take a few minutes to check the proper phasing of the incoming and outgoing wiring. Don't assume that the electrician did his job correctly either. Many times the electrician is careless or hurried and does not take the time to ensure that the color-coding on the primary wiring is correct.

A simple way to check for proper phasing using a standard voltmeter is as follows:

1. Set the meter for 120 VAC or greater.
2. Check the voltage between the black wire (L-1) and earth ground.
3. Check the voltage between the white wire (L-2) and earth ground.

If the voltage reading between the black wire (L-1) and earth ground reads 110 VAC, and the voltage between the white wire (L-2) and earth ground reads 0 VAC, the wiring from the circuit panel is in-phase. If the voltage between the black wire and earth ground reads 0 VAC, and the voltage between the white wire and earth ground reads 110 VAC, the wiring is out-of-phase—reverse the leads to the transformer primary.

Now check the phasing on the secondary side of the transformer (24 VAC) as follows:

1. Set the meter for 24 VAC or greater.
2. Check the voltage between the black wire and ground.

If the voltage between the black wire and ground reads 24 VAC, the secondary side of the transformer is wired in-phase with respect to the primary side. If the voltage between the black wire and ground reads 0 VAC, the secondary is wired out-of-phase—reverse the black and white wires.

Taking a few extra minutes to ensure the controller is wired properly at the time of installation could also save wasted time due to callbacks and "warranty" service calls in the future.