Primary side control loop Gain/Phase measurement technique

Below is a diagram of how to make a gain phase plot for open loop using current **injection method.**

This is an advantage with TOPSwitch because the output of the opto coupler, which is a current source, is the only place where the total feedback is through a single path. The feedback on the secondary is commonly two paths or more, that creates difficulties in measuring the total loop response.

The X signal represents the error input to the loop and the Y signal is the response so gain is Y/X. Generally, the excitation signal must be larger at lower frequency because of the small X signal due to higher loop gain and smaller at higher frequency to avoid small signal distortion. One should experiment with different signal levels and find a reasonable band of amplitudes that gives a constant result for given frequency selections. Also longer integration time with more sampling is usually required at low frequency (below 200 HZ) to get consistent results. It is difficult to measure gain above 50db with any consistency. Since the loop is broken on the primary side be sure to isolate the analyzer from the AC input to avoid noise coupling which will give significant errors.
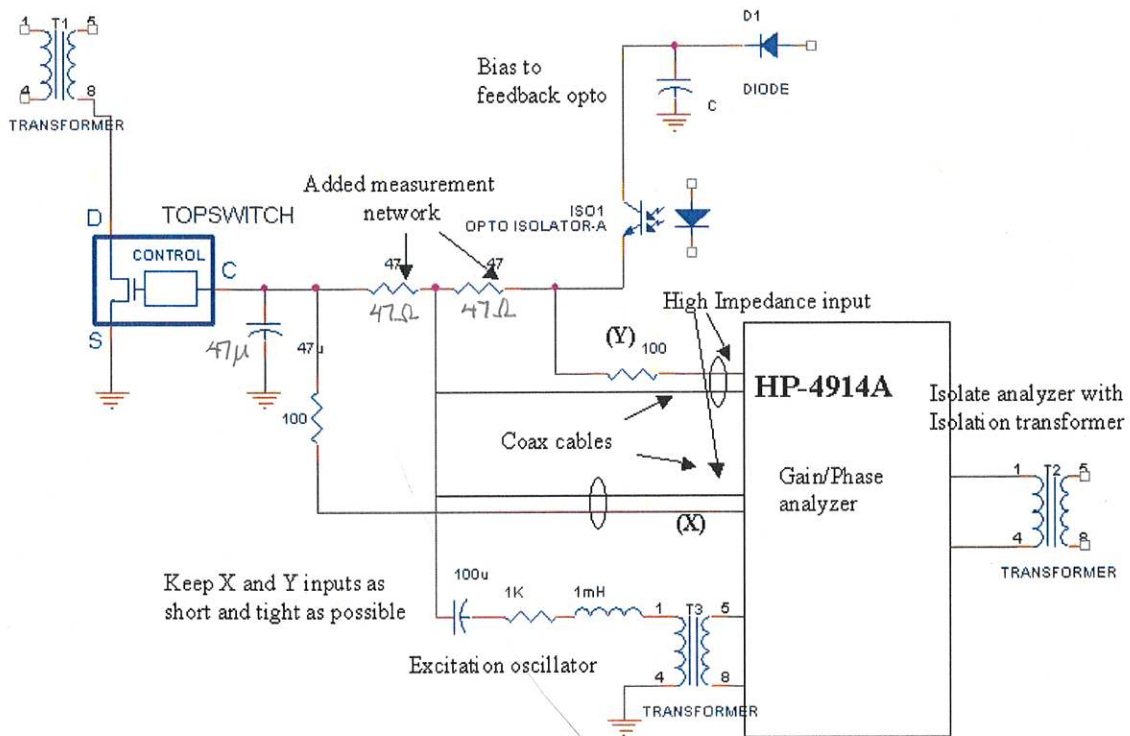

Fig 1: Connection diagram of the set-up to measure gain/phase response for TOPSwitch circuits.

Suggested injection transformer – Cine Mag CMOQ – 1H