Rosemary Ainslie Circuit COP Test Plan – Poynt99 2009-OCT

Testing with the Rosemary Ainslie device under test (DUT) will be performed in an effort to obtain operating sourced (supplied) and sunk (used) powers and temperature rise. The DUT circuit will be used as the reference, and later a CONTROL will be adjusted to determine an equivalent DC source output power to obtain the same temperature rise above ambient (TRAA) on the load resistor. From the two resulting source powers, the DUT COP will be calculated.

TRAA will be determined by using a dedicated thermistor-based thermometer fixed in place directly to the load resistor. This way the measurement point will be consistent throughout the testing. The final TRAA value itself is not critical, but the relative values between tests are, especially when comparing the DUT results to the CONTROL results. The ambient temperature will be monitored with an identical meter.

In the DUT circuit, the physical source of power supplying heating energy to the load resistor is 1) the DC lab supply (or battery). The oscillator is powered from a separate 12V supply and its total power consumption, although monitored, is not required to determine the DUT COP in this experiment.

Conversely, there are three power sinks; 2) the load resistor (10 Ohm wire-wound, 29uH), 3) the MOSFET switch (IRFPG50), and 4) the shunt resistor in series with the MOSFET Source (0.25 Ohms).

Nomenclature for the aforementioned power source and sinks are as follows:

1) the DC lab supply (or battery) = **POS** (power output from source)
2) the load resistor = **PIL** (power in to load resistor)
3) the MOSFET = **PIM** (power in to MOSFET
4) the shunt resistor = **PIS** (power in to shunt)

The DUT Power Balance Equations

POS = PIL + PIM + PIS (mainstream/classical)

If there is some unknown source of power entering the circuit and manifesting as unaccounted-for excess power in the load as heat, then we can label and denote it as POU (power output unknown). The power balance equation then becomes:

POS + POU = PIL + PIM + PIS

Since the load resistor power (in heat) is the metric, and the load temperature (and hence load power) will be made equal (by measurement and adjustment) for the Ainslie circuit (DUT) and CONTROL tests, we can solve for PIL in each case. Ultimately, the main goal is to determine how much source power is required in the load resistor in each case (DUT and CONTROL) to achieve the same final TRAA therein.

* PIL(C) will be made equal to PIL(D) by adjusting TRAA(C) to the same value as TRAA(D). The CONTROL circuit will consist of a lab DC power supply connected directly across the load resistor. The DC voltage will be adjusted for equal TRAA, and the CONTROL “power output from source total to load” POSTL(C) calculated from the final measured DC voltage and current.

DUT LOAD POWER EQUATION: **PIL(D)* = (POS - PIM - PIS) + POU = POSTL(D) + POU**

CONTROL LOAD POWER EQUATION: **PIL(C)* = POS = POSTL(C)**

If in the final analysis POSTL(D) is lower than POSTL(C) for the same final TRAA, then POU>0, and is calculated as: POU = POSTL(C) - POSTL(D), and the Ainslie circuit is COP>1, and is calculated as: COP = POSTL(C)/POSTL(D).

See Figures 1 and 2 for diagrams and power measurement protocols.

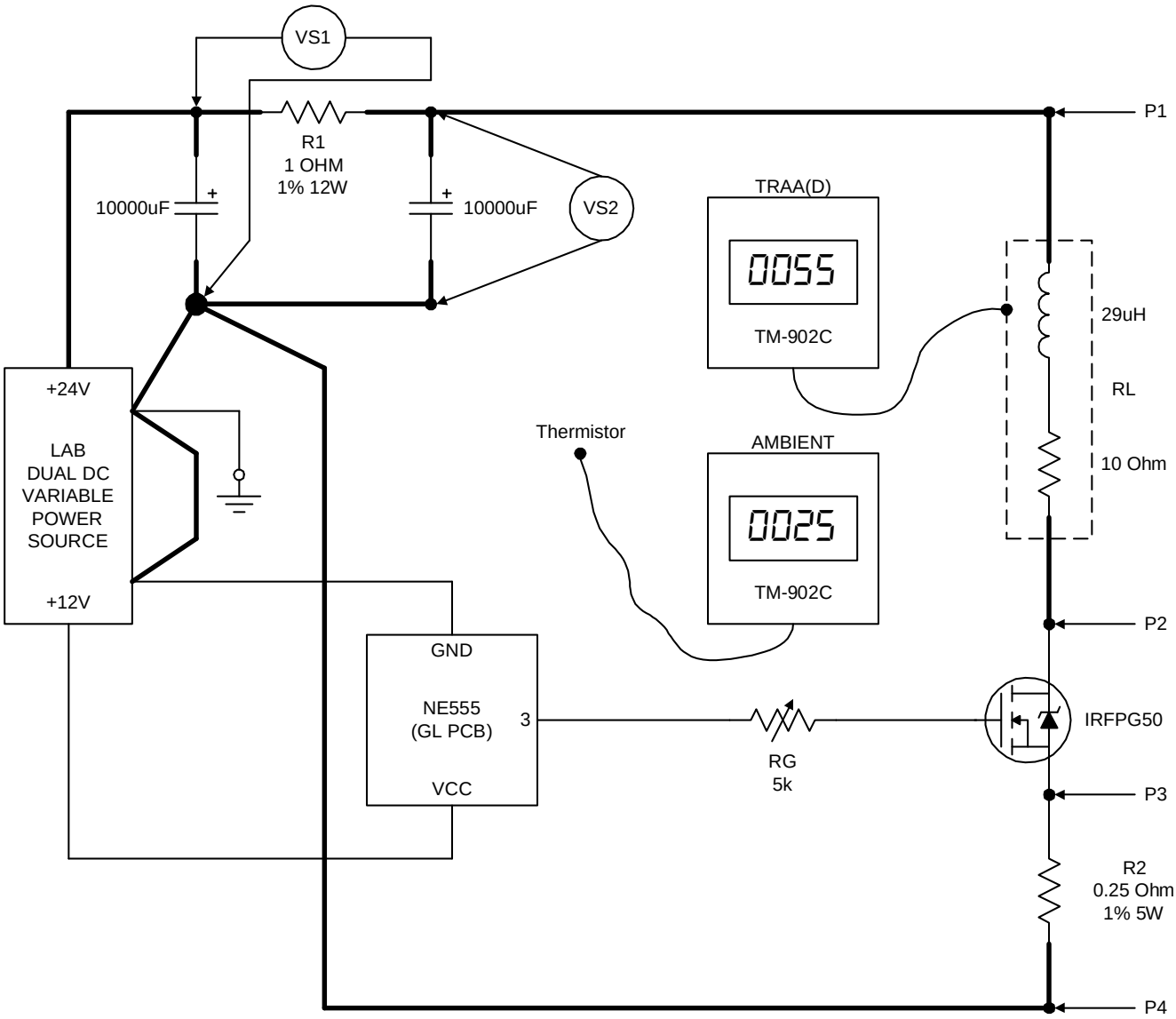


Figure 1 - DUT Circuit

DUT Power Measurements

POS (Average Power Output from Source)
With a DC voltage meter, measure VS1 and VS2. Verify with oscilloscope measurement of VP1 and VP3 with post-proc essing:
(VS1 - VS2) * VS2 = POS AND/OR **AVE[VP1*(VP3/0.25)] = POS**

PIL (RMS Power in to Load Resistor)
Oscilloscope measurements of VP1, VP2 and VP3. Scope ground lead at P4. Create math function in post-process ing to perform:
AVE[(VP1-VP2) * (VP3)/0.25] = PIL

PIM (RMS Power in to MOSFET)
Oscilloscope measurements of VP1, VP2 and VP3. Scope ground lead at P4. Create math function in post-process ing to perform:
AVE[(VP2-VP3) * (VP3)/0.25] = PIM

PIS (RMS Power in to Shunt)
Create math function in post-processing to per form:
$VP3^2/0.25 = PIS$

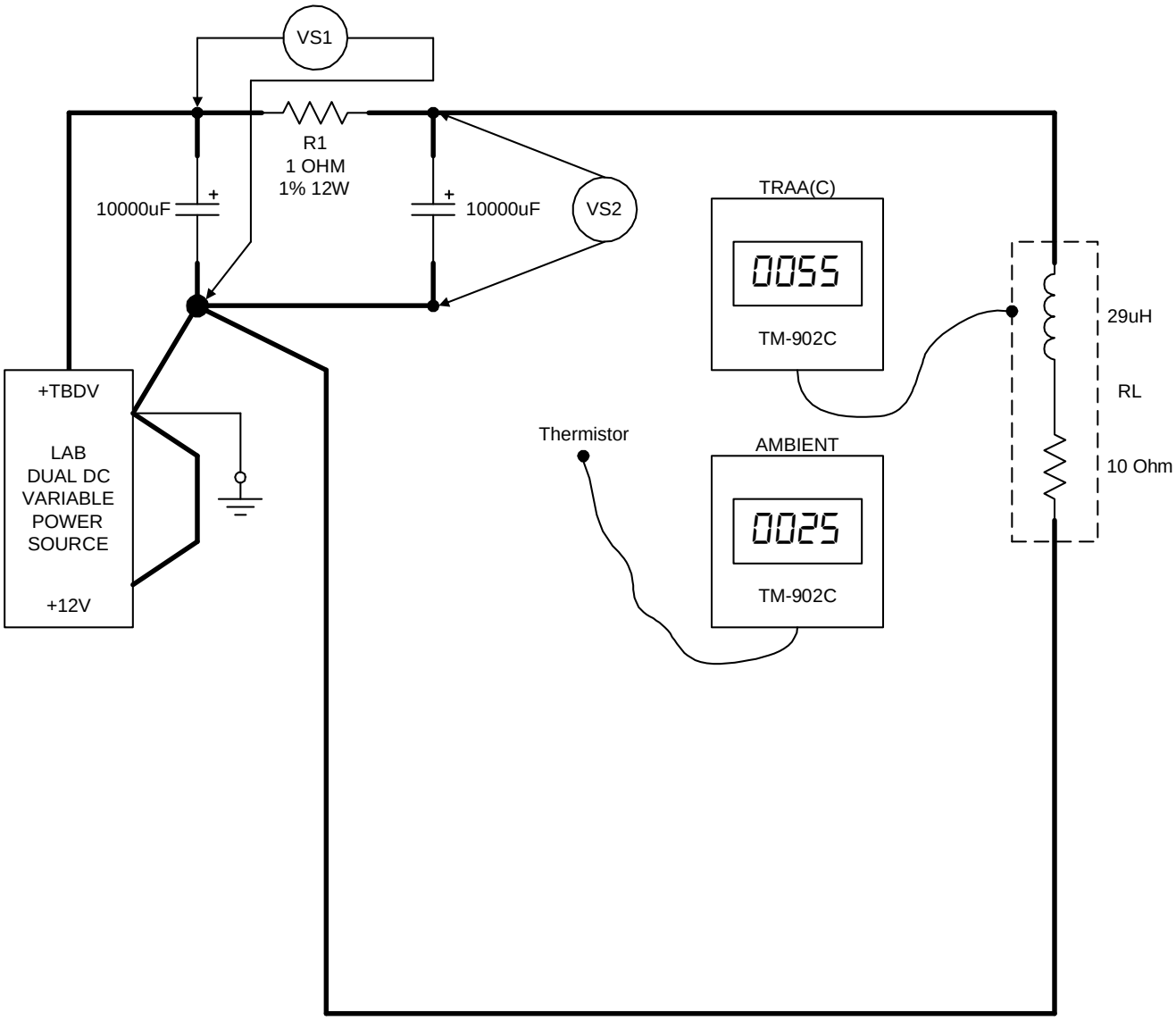


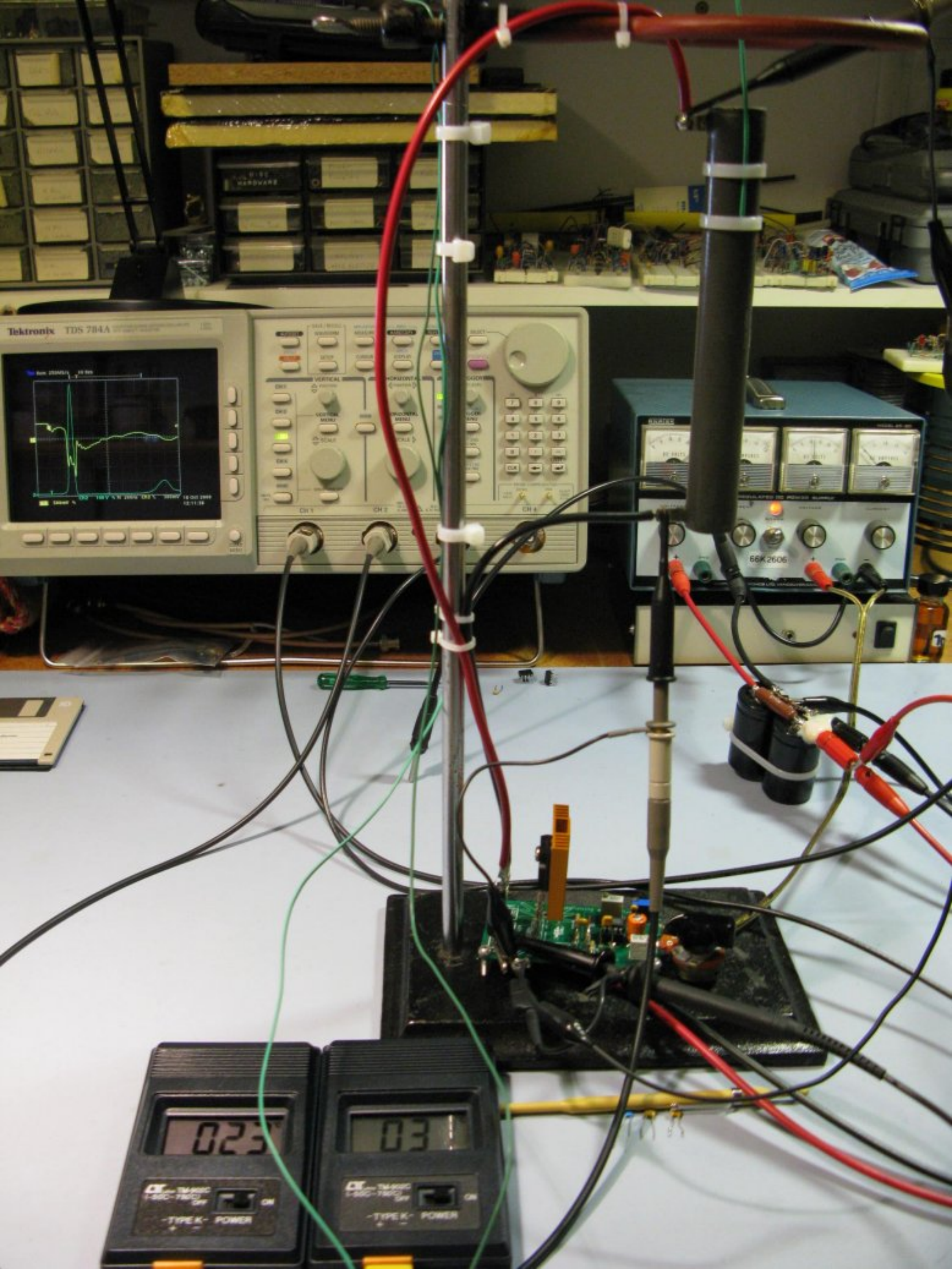
Figure 2 - CONTROL Circuit

CONTROL Power Measurement

POS (Average Power Output from Source)
With a DC voltage meter, measure VS1 and V S2.
(VS1 - VS2) * VS2 = POS = PIL(C) = POSTL(C)

Procedure:

Start with a "TBDV" voltage setting based on previous PIL measurement (if performed). If PIL was not measured, use t he DUT LOAD POWER EQUATION in test plan to obtain starting value. Finely adjust voltage while monitoring TRAA(C) to obt ain same final value as TRAA(D) from the DUT test. Allow sufficient settling time between adjust ments.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