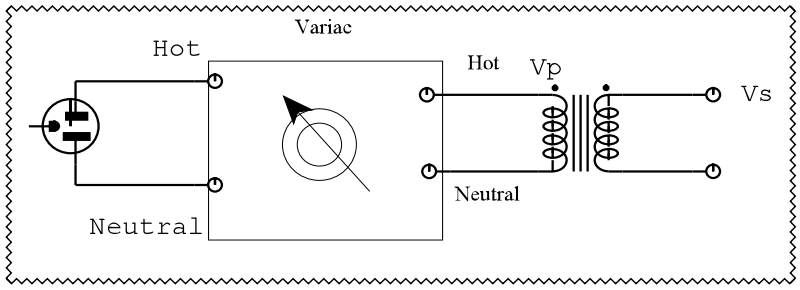
ET-350/350L
Lab 1 Transformer Characteristics

Part 1 Connect the transformer to the Variac as shown.



Set the dial of the Variac to the percent setting indicated on the chart. Use a voltmeter to measure the RMS voltage of the Variac output.

RMS Voltage output of the Variac at 25% dial setting	
RMS Voltage output of the Variac at 50% dial setting	
RMS Voltage output of the Variac at 75% dial setting	
RMS Voltage output of the Variac at 100% dial setting	

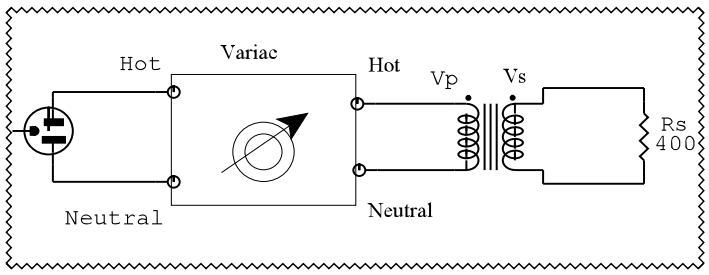
Part II. Set the Variac to 100 per cent output.
Use a Voltmeter to measure V_P (in RMS) and record the value. Likewise measure V_S (in RMS) and record its value.

Primary Voltage V_P	
Secondary Voltage V_S	

Based upon these measurements calculate the turns ratio N of the transformer.

The calculated turns ratio N of the transformer	

Part III. Connect a load to the secondary of the transformer as shown.



Measure the secondary voltage Vs, which is the voltage across Rs. Use Ohm's law to calculate the current in the load, which is also the current in the secondary winding, Is.

V_S, the voltage across R_S.	
Calculation of I_S, using Ohm's Law.	

Measure the current in the primary. Use your digital voltmeter and set it to measure current.

Measurement of I_P, the current in the primary.	

After making this current measurement, be sure to return the meter to the normal voltage measuring mode.
(Including changing the probe connections on the voltmeter). Otherwise you will blow the fuse in the meter if you forget and attempt to use the meter to measure a voltage.

Calculation of N based upon primary and secondary current.	

Using your values of I_P and I_S, calculate the turns ratio N of the transformer, by dividing I_S by I_P.

Summary:

Here you have a "step-down" transformer. The secondary voltage is smaller than the primary voltage by the turns ratio N. At the same time the primary current is smaller than the secondary current by the same ratio N.

If you have a "step-up" transformer, then the secondary voltage will be larger than the primary voltage by the turns ratio N. Likewise the primary current will be larger than the secondary current by this same turns ratio N.

All this can be understood by making the assumption that the power going into the transformer is equal to the power coming out of the transformer. (Minus any small power losses due to heating effects.) In electronics, for any pair of leads P = V x I. The power into the transformer is V_P x I_P. The power out is Vs x Is.

Or. Vp x Ip = Vs x Is. If Vs is smaller, then Is has to be larger,

Questions:

1. For a sine wave, describe how you convert RMS voltage to peak voltage.

2. For a sine wave, describe how you convert peak voltage to RMS voltage.

3. For a Variac one lead of the output is connected directly to one lead of the input. Which lead is this?

4. For a Variac, when is the voltage of the output "hot" lead the same as the input "hot" lead?

5. Draw a 60 Hz sine wave having a 100V amplitude. Show clearly what is meant by the peak voltage, the peak-to-peak voltage, and the RMS value of this sine wave. On the time scale show the time for one cycle and one half cycle of the waveform.