

Lab 5: Polarity in a Transformer and
Autotransformer Circuits

EEET 242

1 Objective

The objective of this lab is to experimentally look at the polarity of the wiring of a single phase autotransformer.

2 Specifications

120/60 volts, 60 Hz, single phase transformer. The rated current is 0.5 A in the high side coil and 0.5 A in each of the secondary windings (60 VA and 30 VA respectively). For this experiment, you will be using terminals 1 and 2 as the high side (120V) and terminals 9 and 5 as the low side (60V).

3 Pre-Lab Work

Read the text on practical transformer and do the following:

- a Prepare circuit diagrams for the polarity tests, complete with the ratings of the voltmeters and ammeters to be used. Use the variable AC supply.
- b Prepare circuit diagrams for the autotransformer circuits, complete with the ratings of the voltmeters and ammeters to be used. Use the variable AC supply.

4 Procedure

4.1 Polarity Tests:

- a Connect **120VAC** on the 120V (terminals 1 & 2) coil of the transformer. Leave all secondary coils open circuited. Place a jumper between terminal 2 & 9.
- b Make sure that the power supply is set at 120VAC.
- c Measure the voltage between terminals 1 & 5
- d Remove the jumper and reconnect between terminals 2 & 5.
- e Measure the voltage between terminals 1 & 9.
- f Determine the polarity arrangement of the two coils to determine the coil and flux arrangements.
- g Leave the 120VAC on the 120V coil (terminals 1 & 2) and repeat the above tests for the 104VAC coil (terminals 3 & 7).
- h Determine the polarity arrangement of the two coils to determine the coil and flux arrangements.

4.2 Autotransformer (step up) circuits on a single coil.

- a Connect **60VAC** to the 104VAC coil (terminals 3 & 7).
- b Place a 600 ohm resistor load between terminals 3 & 8 (secondary).
- c Measure the voltage between terminals 3 & 8. Verify this is a step up transformer.
- d Measure the current for the primary coil (into terminal 7), the secondary coil (out of terminal 8) and the common coil current (into terminal 3).
- e Repeat the above steps for the common coil for terminals 5/9/6 (Primary between 5 & 9).

4.3 Autotransformer (step down) circuits on a single coil.

- a** Connect **60VAC** to the middle coil (terminals 3 & 8).
- b** Place a 600 ohm resistor load between terminals 3 & 7 (secondary).
- c** Measure the voltage between terminals 3 & 7. Verify this is a step down transformer.
- d** Measure the current for the primary coil (into terminal 8), the secondary coil (out of terminal 7) and the common coil current (into terminal 3).
- e** Repeat the above steps for the common coil for terminals 5/9/6 (Primary between 5 & 6).

4.4 Autotransformer (step up) circuits on multiple coils of a single core.

- a** Connect **120VAC** on the 120V (terminals 1 & 2) coil of the transformer. Place a jumper between terminal 2 & 9 or 2 & 5 based on the previous tests to insure we have additive coils.
- b** Place a 600 ohm resistor load between terminals 1 & 9 (secondary).
- c** Measure the voltage between terminals 11 & 5 and 1 & 9. Verify this is a step up transformer
- d** Measure the current for the primary coil (into terminal 2), the secondary coil (out of terminal 9) and the common coil current (into terminal 1).

4.5 Autotransformer (step down) circuits on multiple coils of a single core.

- a** Rearrange the voltage source and load for the previous circuit to create a step down transformer using the top and bottom coils.
- b** You should have 120VAC on the primary and a 600 ohm resistor load on the secondary.
- c** Measure the voltage between terminals 1 & 2, 1 & 5 and 1 & 9. Verify this is a step down transformer.
- d** Measure the current for the primary coil, the secondary coil and the common coil current.

5 Report Suggestions

- a** Verify the circuits and confirm the transformer arrangements.