Analog Meters

Air Washington Electronics ~ Direct Current Lab

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Analog Meters

Overview

Students will build an analog voltmeter and an analog current meter using specifications given. Test circuits will allow students to analyze their designs.

Requirements

To meet all requirements for this lab, you must complete all activities, questions, critical thinking activities and questions, and observations and conclusions.

Course Objectives

- Understand the loading effect of various types of test equipment.
- Understand the limitations of the various test equipment.
- Demonstrate acceptable techniques to construct circuits from schematic drawings on solderless and/or solder type breadboards.
- Demonstrate proper decoupling methods for work on breadboard proto-type circuits.
- Demonstrate ability to document a breadboard circuit, schematic, or pictorial layout.
- Demonstrate ability to predict circuit operation
- Demonstrate ability to test circuit operation

Module Objectives

- Calculate the required shunt resistances for an analog voltmeter.
- Construct and analyze an analog voltmeter
- Calculate the required shunt resistances for an analog current meter.
- Construct and analyze an analog current meter.
- Explain the purpose of the fuse in the analog current meter.

Activities & Assessments

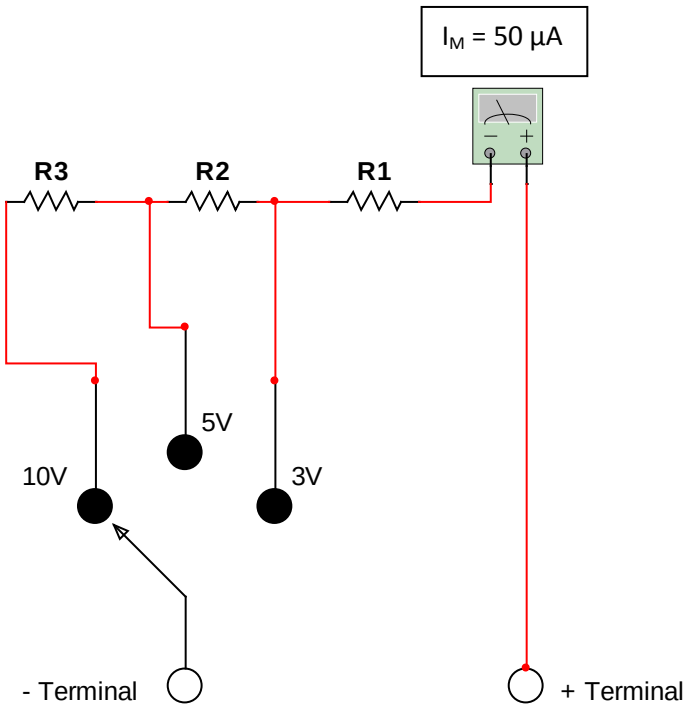
1. Analog Voltmeter
2. Analog Current Meter

1: Analog Voltmeter

Components

- 50µA meter movement
- 3-position rotary switch
- ½ Watt Standard ±5% Resistors (TBD)

Schematic



Procedure

Step 1: **Design the Meter:** Using the specifications shown in the schematic, design an analog voltmeter. Support your design with calculations

Step 2: **Build the Meter:** Using only Standard ±5 % Resistors, build the design on a breadboard. Select resistors that are as close to your calculated values as possible.

Rotary Switch: There are 4 pins on a 3-position rotary switch. You will need to use a continuity checker to determine which pin is common. That pin will be connected to the negative terminal of your analog meter.

Step 3: **Test the Meter:** You will need to perform three (3) sets of tests on your voltmeter. Follow the directions for each test. The results to be included in your report are the actual voltage in number form and a simple drawing (or photograph) of the meter face indicating the voltage.

Test 1 – Apply **2.5 V** and test at each of the three ranges.

Test 2 – Apply **4.0 V** and test at ONLY the 5 V and the 10 V ranges.

Test 3 – Apply **8.0 V** and test at ONLY the 10V range.

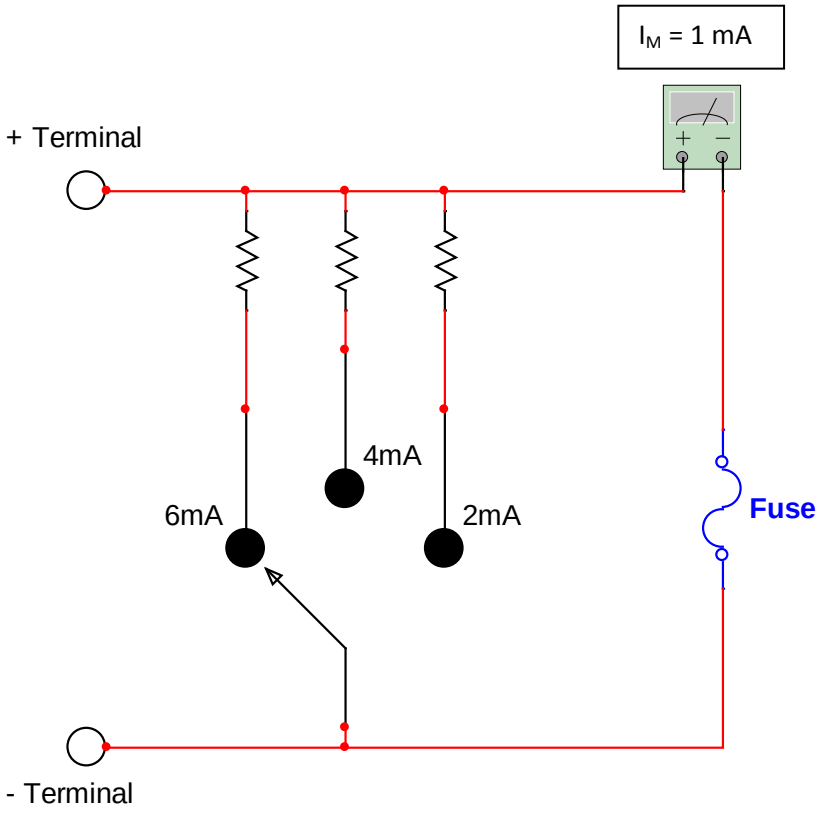
FAILURE TO FOLLOW DIRECTIONS for testing may result in the meter being irreparably damaged.

2: Analog Current Meter

Components

- 1mA meter movement
- 3-position rotary switch
- ½ Watt Standard ±5% Resistors (TBD)
- Fuse assembly (1/10th amp fuse)

Schematic



Procedure

Step 1: **Design the Meter:** Using the specifications shown in the schematic, design an analog current meter. Support your design with calculations

Step 2: **Build the Meter:** Using only Standard ±5 % Resistors, build the design on a breadboard. Select resistors that are as close to your calculated values as possible**. The fuse assembly has been provided.** ***Be sure it is installed before you test your meter.***

Step 3: **Test the Meter:** You will need to perform three (3) sets of tests on your current meter. Follow the directions for each test. The results to be included in your report are the actual voltage in number form and a simple drawing (or photograph) of the meter face indicating the current.

For the tests, you will need a simple resistive circuit. The easiest method to obtain the required test currents is to use a 2 kΩ resistor and vary the voltage of the power supply.

Test 1 – With **I = 1.5 mA** test at each of the three ranges.

Test 2 – With **I = 3.5 mA** test at ONLY the 5 V and the 10 V ranges.

Test 3 – With **I = 5.5 mA** test at ONLY the 10V range.