# Experiment 1: Introduction to Power Electronics Equipment and Voltmeter, Ammeter and Isolator Connection of a Simple Half Wave Rectifier Circuit.

## Objectives:

1. Become familiar with different power electronics equipment.
2. Learn how to operate different equipment.
3. Learn about the function of voltage and current isolator.
4. Learn how to connect voltage and current isolator in a particular circuit.

## Theory:

Power electronics is the application of solid-state electronics for control and conversion of electric power. It also refers to a subject of research in electronic and electrical engineering which deals with the design, control, computation and integration of nonlinear, time- varying energy-processing electronic systems with fast dynamics.

The solid-state electronic devices are- Diode, Silicon-controlled rectifier (SCR) or Thyristor, Triac, Bipolar junction transistor (BJT), Power MOSFET etc. These devices are mostly use in Power electronics.

The power conversion systems can be classified according to the type of the input and output power

- AC to DC (rectifier)
- DC to AC (inverter)
- DC to DC (DC-to-DC converter)
- AC to AC (AC-to-AC converter)

## Equipment:

1. Power supply module
2. Single phase wattmeter
3. Resistive load module
4. AC ammeter and voltmeter
5. DC ammeter and voltmeter
6. Current and Voltage isolator

**Power Supply Module Details:**

1. 1-N / 2-N / 3-N : 1 phase fixed AC 240V
2. 4-N / 5-N / 6-N : 1 phase variable AC 0-240V
3. 1-2/ 2-1/ 2-3/ 3-2/ 1-3/ 3-1 : 3 phase AC 415V (line to line) fixed
4. 4-5/ 5-4/ 5-6/ 6-5/ 4-6/ 6-4 : 3 phase AC 0-415V (line to line) variable
5. 7-N : DC variable 0-240 V
6. 8-N: DC fixed 240V

## Procedure:

**CAUTION**

**High voltages are present in this laboratory exercise! Do not make or modify any banana jack connections with the power on unless otherwise specified.**

**Setting up the equipment:**

1. Install the Power supply, the Enclosure/ Power Supply, the Resistive Loads, the DC Voltmeter/Ammeter, the AC Voltmeter/Ammeter and the Wattmeter/Varmeter modules in the Mobile Workstation.
2. Install the Current/Voltage Isolators in the Enclosure/Power Supply.
3. Make sure that the main power switch of the Power Supply is set to the O (OFF) position. Set the voltage control knob to 0. Connect the Power Supply to a three-phase wall receptacle.
4. Plug the Enclosure/Power Supply line cord into a wall receptacle. Set the rocker switch of the Enclosure/Power Supply to the I (ON) position.
5. Make sure that toggle switches on the Resistive Load are all set to the O (open) position.
6. Set up the circuit of Figure-1 using the resistive load.

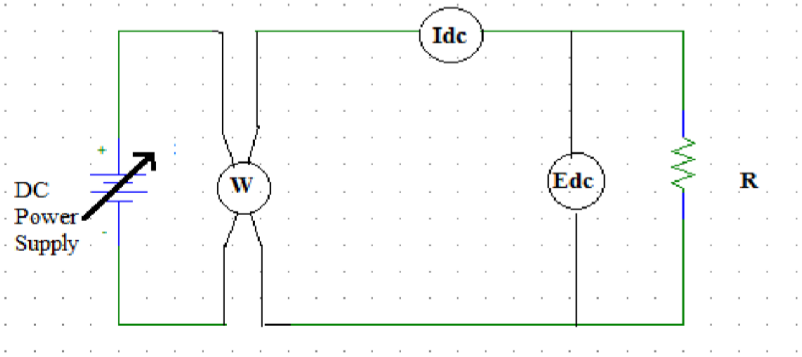


**Figure 1: Power Measurement for DC Circuit**

| Line Voltage (V) | I dc (A) | E dc (V) | R (Ω) |
|---|---|---|---|
| 0-240 V | 1.5 | 300 | 2400/4800 |

7. On the Power supply, make sure that the voltage control knob is set to the 0 position then set the main power switch to I (ON). Set the voltage control knob so that the voltage indicated by the Power Supply voltmeter is equal to 90% of the nominal line to line voltage.
8. Record the output voltage, current and power of the circuit in the following Table.

| Load R | Output Voltage Edc (V) | Output Current Idc (A) | Theoretical Output Power P= E×I (W) | Practical Output Power P= E×I (W) |
|---|---|---|---|---|
| | | | | |

9. Set up the circuit of Figure-2 using the resistive load.

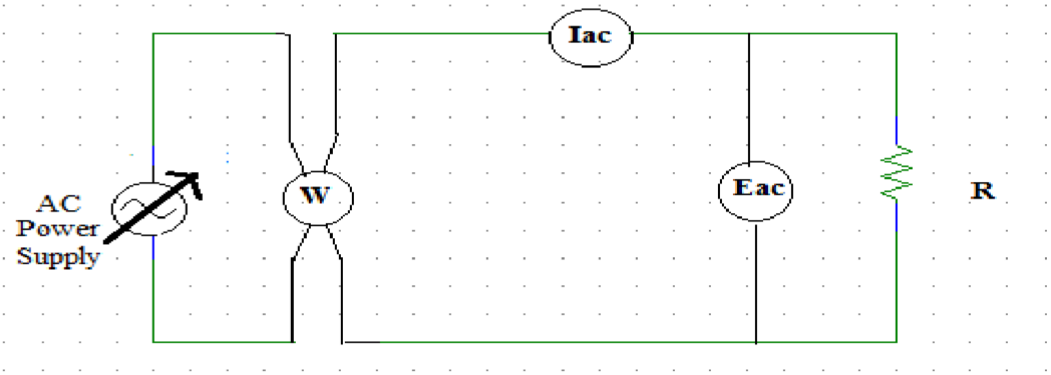


**Figure 2: Power Measurement for AC Circuit**

| Line Voltage (V) | I ac (A) | E ac (V) | R (Ω) |
|---|---|---|---|
| 0-240 V | 1.5 | 250 | 2400/4800 |

10. On the Power supply, make sure that the voltage control knob is set to the 0 position then set the main power switch to I (ON). Set the voltage control knob so that the voltage indicated by the Power Supply voltmeter is equal to 90% of the nominal line to line voltage.
11. Record the output voltage, current and power of the circuit in the following Table.

| Load R | Output Voltage Eac (V) | Output Current Iac (A) | Theoretical Output Power P= E×I (W) | Practical Output Power P= E×I (W) |
|---|---|---|---|---|
| | | | | |

12. Set up the circuit of Figure-4 using the resistive load. Mark the terminal no. and then construct the circuit. On the Power supply, make sure that the voltage control knob is set to the 0 position then set the main power switch to I (ON). Set the voltage control knob so that the voltage indicated by the Power Supply voltmeter is equal to 90% of the nominal line to line voltage. Observe the rectified output on Oscilloscope.

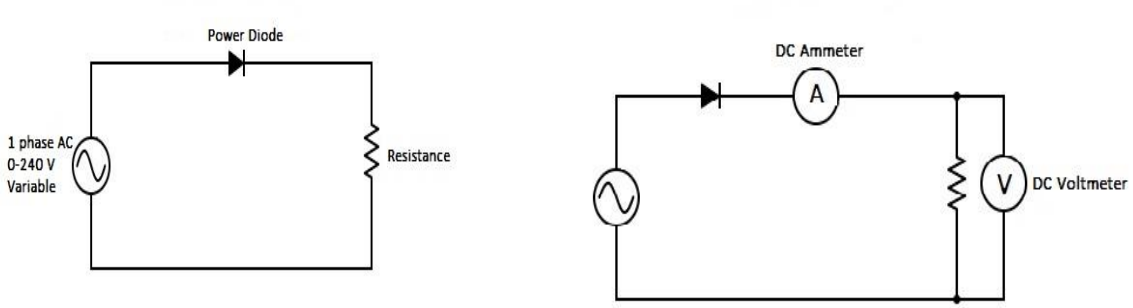


**Figure 3: Connection for half wave rectification**

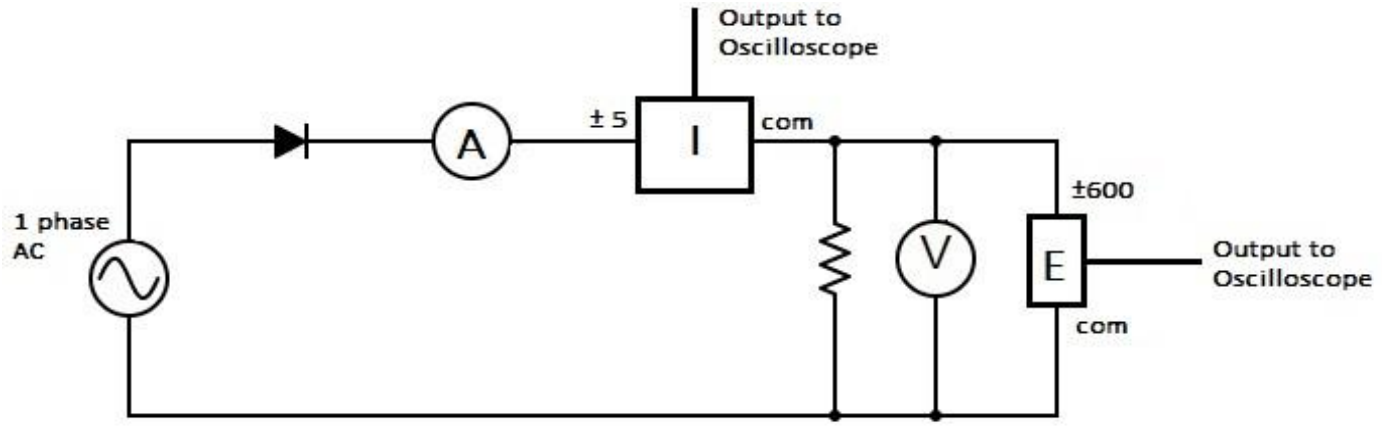


**Figure 4: Connection to Oscilloscope through Isolator.**

## Review Questions:

1. Write briefly about all the equipment's function which were discussed in the class.

2. By stating the working procedure, briefly explain how a DC wattmeter, ammeter & voltmeter varies from the AC wattmeter, ammeter & voltmeter.

3. During output power measurement DC gives a deflection whereas AC gives proper output. Why? Explain it.

4. What is the function of Voltage and Current Isolator?

5. Draw the Voltmeter, Ammeter and Isolator connection for showing o/p voltage and current in oscilloscope of the following circuit.