One Week : Oscilloscope

Course Name: Electrical Circuits

Stage: One

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Alternating circuits

The term *alternating* refers to a waveform that oscillates or changes between two defined levels over a specific period of time.

Alternating Current (AC) is defined as an electric current in which the direction of charge flow periodically reverses. It starts from zero, increases to a maximum, returns to zero, reverses direction to reach a maximum in the opposite direction, and then returns to its original state.

Key characteristics of AC:

- It is easy to generate, and its voltage can be stepped up or down using transformers.
- It can be transmitted over long distances with minimal energy loss.

The Oscilloscope Device

The **oscilloscope**, also known as a **signal analyzer** or **waveform analyzer**, is one of the most essential instruments in the field of electronics. It allows for the observation of signals at various times and points, enabling testing of all components and electronic circuits. It displays the waveform along with its frequency and voltage characteristics.

Components of the Oscilloscope

- **Screen**:

The screen displays the waveform or signal and related circuit/electronic component data such as voltage, current, and time.

The screen has two axes:

•**Horizontal axis**: represents time.

•**Vertical axis**: represents voltage as a function of time.

Each axis contains ten divisions, with each division measuring 1 cm.

Components of the Oscilloscope

- **Keys and Buttons**:

The oscilloscope includes several buttons and switches, each serving a specific function, as shown in the accompanying image. These include:

- **Power Switch**:

Used to turn the device and screen on/off. It is accompanied by a brightness adjustment knob, a focus control, and an LED indicator that shows whether the device is operational.

- **Channel Selection Buttons**:

These buttons are used to choose which signal is displayed on the screen. There are three options:

- First button: Channel 1 signal.
- Second button: Channel 2 signal.
- Third button: Both channels simultaneously.

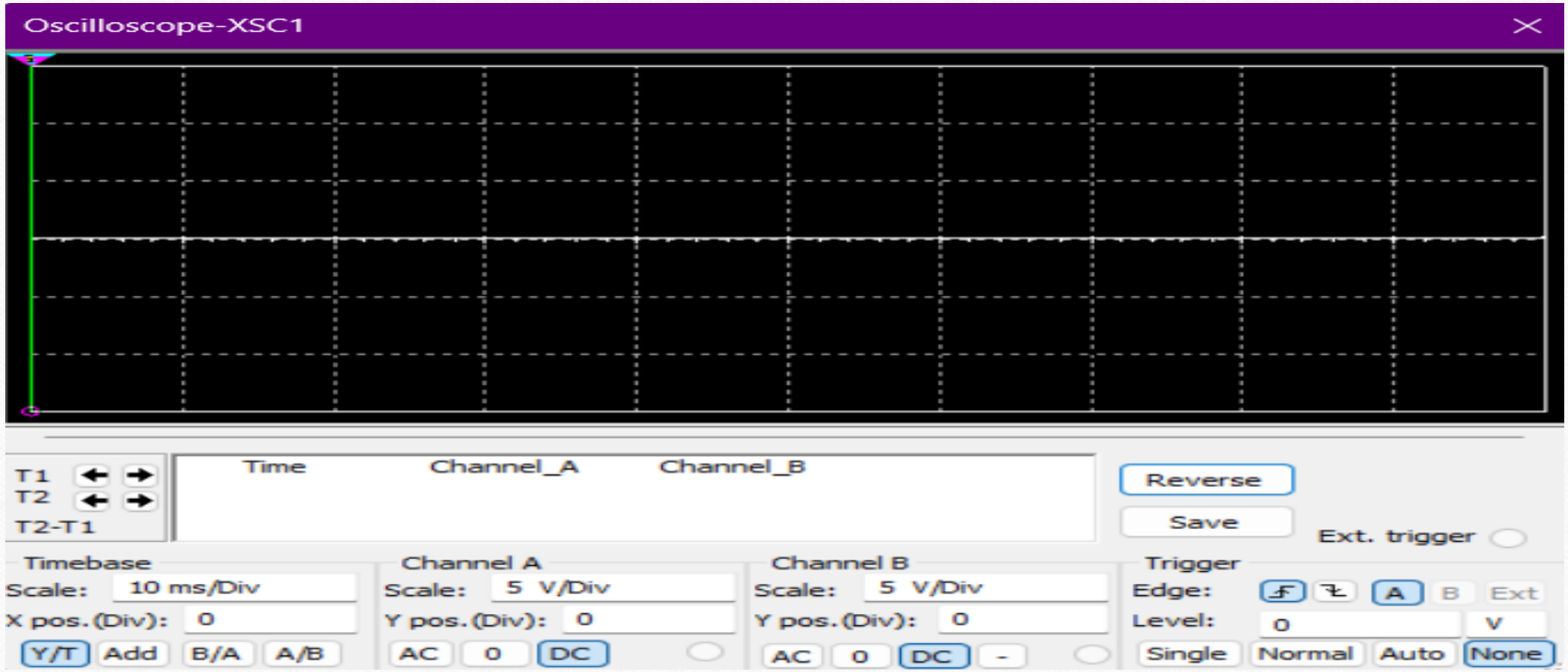

Fig 1: Illustrates the front panel of the oscilloscope.

Measuring Voltage with the Oscilloscope

To measure voltage using the oscilloscope, each available channel on the device should be connected in parallel across the resistor terminals. After setup and execution, the waveform will be displayed on the screen.

As shown in **Figure 2**, the oscilloscope allows adjustment of the time base and number of waveforms appearing within a specific time interval.

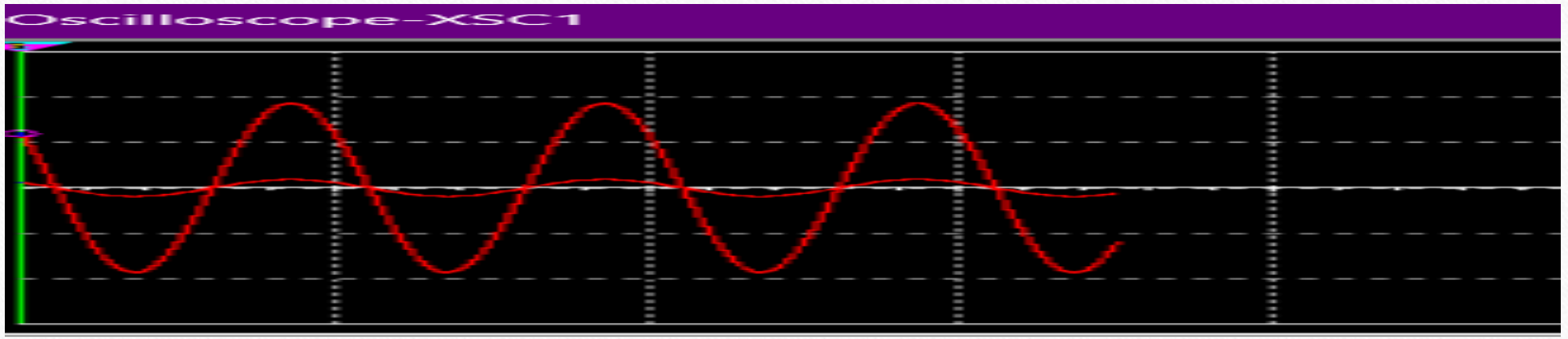

Fig2: Represents the operational setup of the oscilloscope.

Measuring Voltage with the Oscilloscope

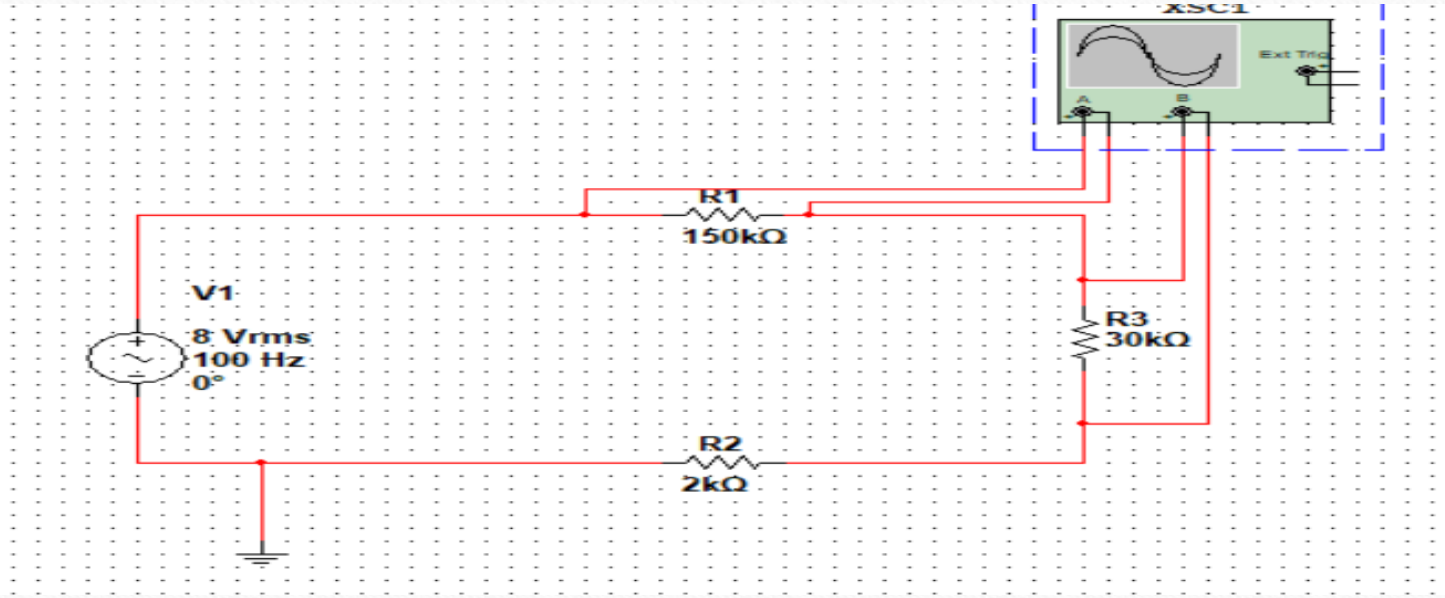

Fig 3:Show diagrams for connecting the oscilloscope to measure voltage.

Measuring Voltage with the Oscilloscope

Distinguishing Between Oscilloscope Channels and Waveforms

To differentiate between oscilloscope channels and the waveform of each channel, the following is recommended:

1.Right-click the mouse.
2.Select the option **"Color Segment"**.

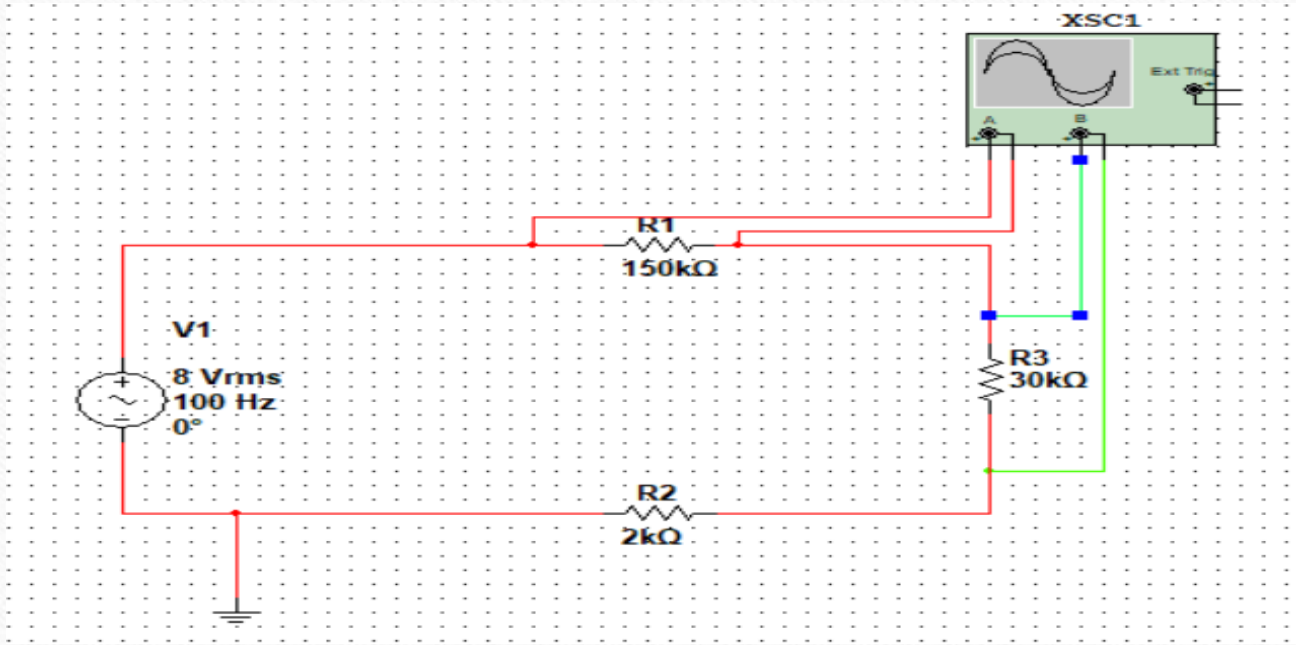

Fig 4:Show diagrams for connecting the oscilloscope to measure voltage.

Measuring Voltage with the Oscilloscope

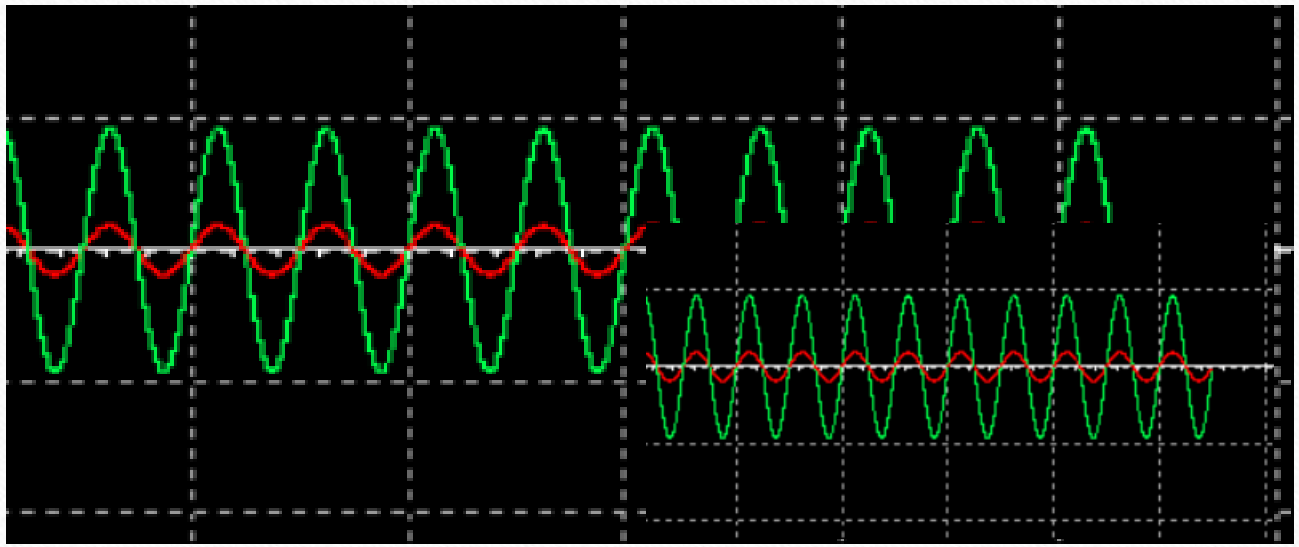

Fig 5: an example of oscilloscope execution.

Thank you