

RC MASTER (1.0.1)

How the program works...

RC Master program is designed to simulate and analyze the behavior of an RC (resistor-capacitor) circuit during its charging phase, providing a detailed visualization of how voltage varies across both the capacitor and the resistor over time. It serves as both an educational tool and a practical aid for students and electronics enthusiasts.

Upon execution, the program displays a welcome screen and then prompts the user to input the essential parameters of the circuit through an interactive form. The required values are:

- **R**: Resistance in ohms (Ω)
- **C**: Capacitance in farads (F)
- **Vmax**: Maximum voltage from the source (V)
- **t₀**: Initial observation time (s)
- **tMax**: Final time (s)
- **dt**: Time step between each data point (s)

Each input is validated to ensure the values are physically meaningful (for example, resistance and capacitance must be greater than zero, and *tMax* must be greater than *t₀*).

Once the data is validated, the program calculates the **time constant** of the circuit ($\tau = R \cdot C$), a key value that determines how quickly the capacitor charges.

The program then generates a table with three columns: time (*t*), voltage across the capacitor (*V_c*), and voltage across the resistor (*V_r*), using the standard charging formulas for an RC circuit:

- **$V_c(t) = V_{max} \cdot (1 - e^{(-t/\tau)})$**
- **$V_r(t) = V_{max} \cdot e^{(-t/\tau)}$**

It loops through the time values from *t₀* to *tMax* in steps defined by *dt*, calculating *V_c* and *V_r* for each moment. The results are printed in a clear and organized format on the calculator's console, allowing the user to easily observe how the circuit evolves over time.

At the end of the simulation, the program displays a closing message and waits for a key press to exit. The entire design is optimized for the HP Prime calculator, featuring a clean interface, visual feedback, and automated calculations to save time and improve learning efficiency.

Example:

