



# ELECTROTHON

ANALOG



# **MISSION BRIEF:**

# **PULSE DURATION DETECTOR**



## MISSION BRIEF: PULSE DURATION DETECTOR

You have been assigned a critical mission in a cutting-edge research lab. Your objective is to design and build an electronic circuit that monitors a non-periodic digital pulse signal from a specialized sensor. The circuit must turn ON an LED indicator only if the input pulse stays HIGH continuously for a predefined minimum duration. Any pulse shorter than this duration should be ignored to prevent false triggering.

There is no need to hold the output — the LED must automatically turn OFF when the input pulse goes LOW, ensuring the circuit is ready to detect the next incoming pulse at any moment.

Power is limited to the provided  $\pm 12$  V dual supplies only — no other power sources may be used. Using additional supplies will incur a penalty of 15 points.



You may only use basic analog components: op-amps, resistors, capacitors, diodes, and transistors.

No special-purpose ICs (e.g., timers, logic gates, microcontrollers, comparators other than op-amps) are allowed.

Your design should combine key analog concepts, including operational amplifiers, RC timing networks, and diode circuits, to accurately detect the duration of the non-periodic pulse and control the LED output. The LED should switch ON exactly when the pulse exceeds the threshold and reset immediately after the pulse ends.

**Important:** If your circuit does not automatically reset itself after the pulse ends, the maximum score you can earn is 90 points.



Total points for this task are 100.

To challenge your skills further, a **bonus of 40** points will be awarded if your circuit can detect and respond to variable pulse durations, allowing the threshold time to be adjusted dynamically (e.g., with a potentiometer).

This project requires **precision timing** and **effective integration** of multiple analog components under real-world constraints.

*Good luck!*



## **RESOURCES:**

**LTSpice Simulation YT Playlist:**

[https://youtube.com/playlist?](https://youtube.com/playlist?list=PLGtyXSn57qnKRilqfpVK3ZtzOD8eb_2ro&si=lkWIIRtSJQ08fAiy)

[list=PLGtyXSn57qnKRilqfpVK3ZtzOD8eb\\_2ro&si=lkWIIRtSJQ08fAiy](https://youtube.com/playlist?list=PLGtyXSn57qnKRilqfpVK3ZtzOD8eb_2ro&si=lkWIIRtSJQ08fAiy)

**Op-amp circuits:**

[https://www.youtube.com/playlist?list=PLwjK\\_eyJ4LLDBB1E9MFbxGCEnmMMOAXOH](https://www.youtube.com/playlist?list=PLwjK_eyJ4LLDBB1E9MFbxGCEnmMMOAXOH)