

# Semiconductor Cleanroom Operation

## LAB ACTIVITY: PARTICLE COUNTERS

Name	Class/Period	Date

### 1. Introduction

Cleanrooms are designed to control the amount of dust, fibers, and other tiny particles in the air. Even a single speck of dust can ruin a semiconductor wafer or contaminate a sensitive experiment. To check that the air meets strict standards, cleanroom technicians use a device called a particle counter.

A particle counter draws in a sample of air and uses a laser or light-scattering method to count the number of particles of different sizes. Results are displayed as particle counts per cubic foot (ft<sup>3</sup>) or per liter (L) of air. These measurements help ensure that the cleanroom is operating within its required ISO class.

In this lab, you will learn how to properly set up, operate, and record measurements using a portable particle counter. Although models vary, the basic operation is very similar across most particle counters..

### 2. Performance Objectives

After completing this lab activity, you will be able to:

- Understand the purpose of particle counting in cleanrooms.
- Learn how to safely set up and operate a particle counter.
- Collect and record data on particle levels in different areas of a classroom or cleanroom simulation.
- Analyze the results and discuss what they reveal about contamination control.

### 3. Required Materials

The following materials are required to complete this lab activity:

- Portable particle counter (any standard model)
- Sampling probe/tubing (if included with the instrument)
- Lab notebook or worksheet for recording results
- Alcohol wipes or lint-free cloth for cleaning the probe (if required by instructor)

### 4. Safety Note

Particle counters are safe to use. However, if operating in an actual cleanroom environment, students must follow gowning and entry procedures. Never touch the particle counter's optical window or block airflow. Handle the equipment carefully—these devices are sensitive and expensive.

## 5. Lab Activity – Part 1 – Gowning and Entering

Perform the following steps:

### 5.1. Instrument Familiarization

1. Examine the particle counter with your group. Identify the display screen, the air intake or sampling probe, and the exhaust vent.
2. Review the user manual or instructor demonstration to understand the model-specific buttons and menus.

### 5.2. Powering On

3. Place the particle counter on a stable surface.
4. Turn on the instrument using the power button. Wait for it to complete its self-test or warm-up sequence.

### 5.3. Setting Parameters

5. Use the menu to set the sample volume (often measured in liters or cubic feet). A common setting is 1 liter or 1 cubic foot per sample.
6. Choose the particle size channels to measure. Many counters display particle counts at 0.3  $\mu\text{m}$ , 0.5  $\mu\text{m}$ , 1.0  $\mu\text{m}$ , and larger.

### 5.4. Taking a Sample

7. Hold the sampling probe upright in the area you are testing. Do not cover or obstruct the intake.
8. Press the “Start” or “Run” button to begin sampling. The counter will automatically draw in the set volume of air.
9. When the sample is complete, read the results displayed on the screen. Note the counts for each particle size range.

### 5.5. Recording Results

10. Write down the location, date, time, and particle counts in your lab notebook or worksheet.
11. If sampling multiple locations (for example, near a door, in the middle of the room, near equipment), repeat steps 4–5 for each site.

### 5.6. Shutting Down

12. After finishing, power off the counter.
13. Clean the sampling probe if instructed.
14. Return the equipment neatly.

## 6. Analysis and Discussion

Answer the following questions in your notebook. Discuss them with a partner.

1. Which location had the highest particle counts? Why do you think that area had more contamination?
2. Were particle levels consistent across all size ranges?
3. How might human activity (movement, speaking, clothing) affect the results?
4. Compare your group's results with the expected cleanroom ISO standards provided by your instructor.

## 7. Authentic Skill Assessment

Have your instructor verify that you have met the requirements for the performance objectives and sign below. Keep this lab activity sheet for future reference.

Instructor Signature	Date