



## Lesson Plan

**Course:** CNC Machining Course

**Instructor:**

**Lesson Title:** Manual Mill Setup & Operation

**Date:**

**Time Needed for Lesson:** 4 hours

### Objectives:

- - Prepare and safely set up a manual mill for basic operations.
- - Mount and secure a workpiece using a milling vise and parallels.
- - Set tool height using edge finders or paper method.
- - Perform facing, slotting, and drilling operations.
- - Measure and inspect machined features for accuracy.
- - Document setup parameters and cutting data.

### Materials Needed:

- - Manual Knee Mill (Bridgeport or similar)
- - Sample Block Workpieces
- - End Mills (various sizes)
- - Center Drills and Twist Drills
- - Milling Vise with Parallels
- - Edge Finder or Center Finder
- - Micrometers and Calipers
- - Safety Glasses and Face Shields
- - Handouts / Whiteboard / TV

### Hook/Lesson Opener:

Ask students:

- - Why is setup just as important as the machining itself?
- - What could happen if you don't properly secure your part?

Demonstrate examples of good vs poor setup.

### Presentation:

- - Safety inspection and cleaning of machine.
- - Install milling vise and indicate flat.

- - Mount sample block workpiece using parallels.
- - Find part edges using edge finder.
- - Zero X, Y, and Z axes correctly.
- - Perform a facing operation across the top.
- - Perform a simple slot across the workpiece.
- - Spot and drill holes using layout lines or DRO.

### **Video Presentations:**

- Manual Milling Setup and Techniques – Suburban Tool:

<https://www.youtube.com/watch?v=1h2H3VNhWPU>

- How to Square and Indicate a Vise on Your CNC Mill – Haas Automation Tip of the Day:

<https://www.youtube.com/watch?v=cPvOKX5PeBo>

- How to Use an Edge Finder – Haas Automation Tip of the Day:

<https://www.youtube.com/watch?v=P4QkO-m3t9w&pp=0gcJCYQJAYcqIYzv>

- Tramming a Mill Head – Haas Automation Tip of the Day:

<https://www.youtube.com/watch?v=FelgkWIXKr0&pp=0gcJCYQJAYcqIYzv>

- How to Use a Dial Indicator – Haas Automation Tip of the Day:

<https://www.youtube.com/watch?v=Gd-UqQksN3I>

### **Exercise:**

- - Perform machine and vise setup.
- - Mount and indicate workpiece.
- - Set X, Y, Z zeros.
- - Face the top surface of the part.
- - Machine a centered slot.
- - Drill two holes accurately placed.
- - Measure dimensions and record results.
- - Log settings: RPM, feed rate, depth of cut, tool sizes.

### **Recap & Connector to Next Lesson:**

- - Group discussion: What made some setups better than others?
- - Introduce next lesson: Basic Part Projects Using Manual Mill Techniques.

### **Assignment(s):**

- Watch all videos listed under "Video Presentations."
- Write down the 3 most critical lessons learned during setup today.

### **Assessments:**

- - Instructor observation of setup and operation.
- - Dimensional accuracy of finished part.

- - Completion of cutting data logs and setup sheets.
- - Reflection paragraph submission.

**Notes:**

- - Ensure proper chip evacuation during machining.
- - Emphasize double-checking vise tightness and parallel use.
- - Encourage slow, careful, and consistent hand movements.