

Introduction to CNC Lathe Operations

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Designed as a quick-reference guide for students, trainees, and hobbyists.

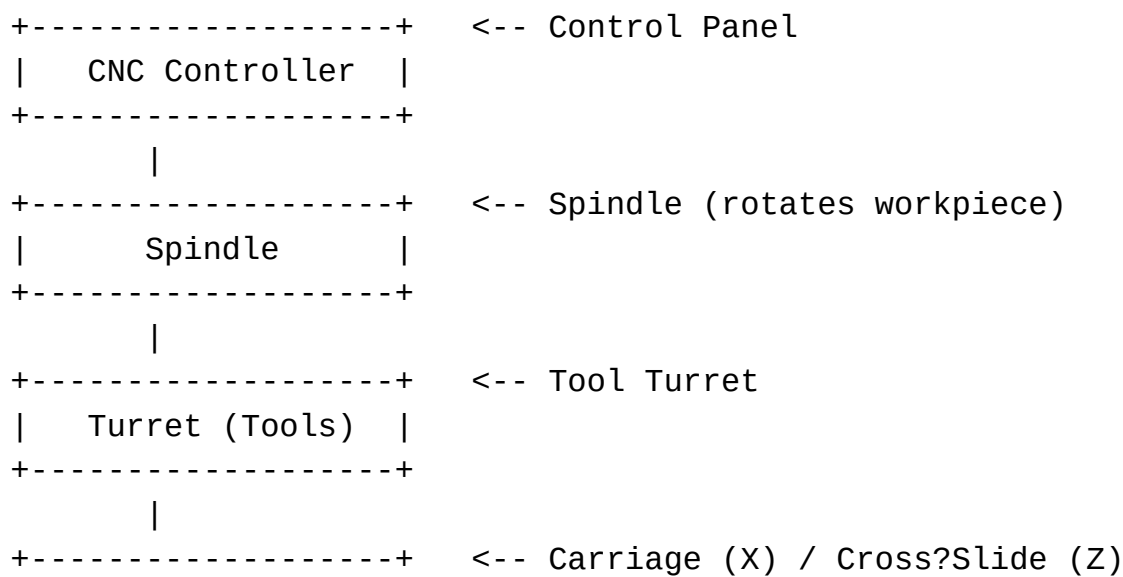
1. What Is a CNC Lathe?

Feature	Description
CNC	Computer Numerical Control – the machine follows a programmed set of instructions (G-code/M-code).
Lathe	A rotating work-holding spindle that enables cutting, drilling, threading, and shaping of cylindrical parts.
Key Advantage	High repeatability, reduced manual labor, and the ability to produce complex geometries in a single setup.

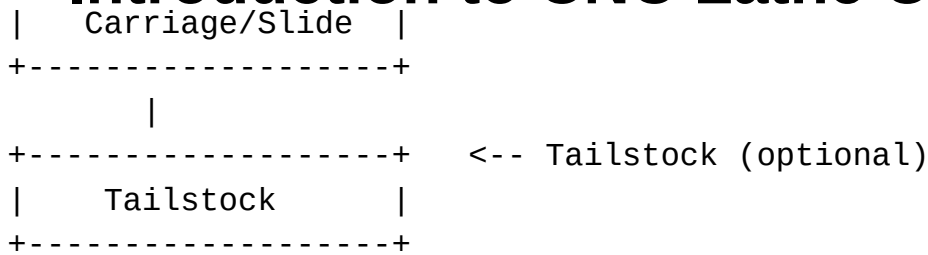
2. Basic Machine Architecture

- Spindle** – Rotates the workpiece (speed range 30–6000rpm typical).
- Tool Turret** – Holds 6–12 tools; rotates to bring the selected tool into the cutting position.
- Carriage & Cross-Slide** – Provide X-axis (diameter) and Z-axis (length) motion.
- Tailstock** – Supports long workpieces, holds drills, reamers, or live centers.
- Control Panel** – Displays the program, status, and allows manual overrides.

Diagram (optional):



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3. Coordinate System & Axes

Axis	Motion	Typical Use
X	Tool moves radially toward/away from the workpiece centerline.	Cutting diameter, turning, profiling.
Z	Tool moves parallel to the spindle axis (lengthwise).	Facing, parting, drilling, threading.
C (optional)	Rotational index of the spindle (used for multi-start threads, indexing).	Chamfering, gear cutting, angular drilling.

Note: The origin (0,0) is usually set at the **part reference point** (e.g., part center or face) using a **work offset (G54-G59)**.

4. Common CNC Lathe G-Codes (ISO standard)

Code	Meaning	Example
G00	Rapid linear positioning (non-cutting).	G00 X50 Z10
G01	Linear interpolation at programmed feed rate.	G01 X20 Z0 F0.15
G02 / G03	Clockwise / Counter-clockwise circular interpolation (arc).	G02 X30 Z-10 R5
G04	Dwell – pause for a specified time.	G04 P2 (2 seconds)
G20 / G21	Unit selection – inches / millimeters.	G21 (mm)
G40	Cancel cutter radius compensation.	G40
G41 / G42	Cutter radius compensation left / right.	`G