

Microprocessor One Axis CNC

A manual machinist's entry into
Computer Numerical Control

by Dick Kostelnicek 02-11-2017

Why Numerically Control a Manual Machine Tool



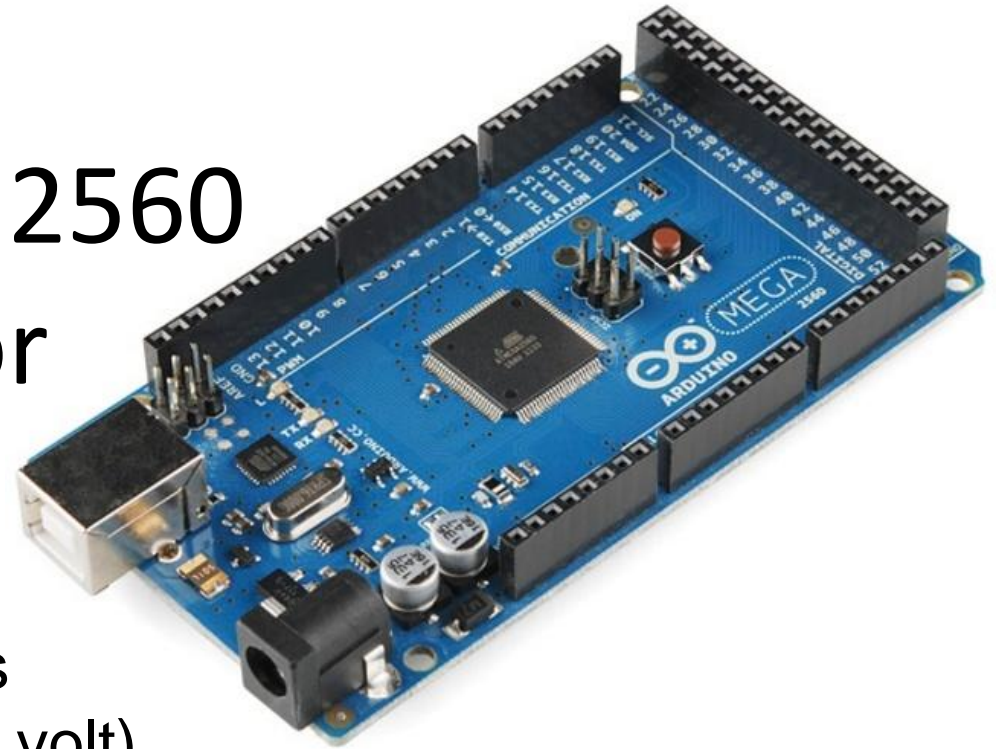
- Automate repetitive, tedious manual operations
- Maintain accuracy and uniformity
- Make manual machines more versatile
- Make parts impossible by manual operations
- Increase production rate
- Something to do beside getting more machines

Features of One Axis CNC

- Replace hand wheel with motor
- Multiple step single axis motion
- Repeatability of motion
- Storage of motion programs
- No provision for CAD and CAM



Capabilities of Arduino Mega 2560 Microprocessor



- Operates on 5 – 20 volts
- 54 Digital I/O pins (0 – 5 volt)
- 40 ma output per pin
- Clock Speed 16 MHz
- Programming memory 256K bytes
- EEPROM memory 4K bytes
- Cost \$11 +

4 Line 20 Character LCD

- 4 Text lines
- 20 columns (ASCII characters)
- 8 user defined characters (5X8)
- 5 volt power
- Requires 6 I/O pins
- Cost \$5 +



Rotary Encoder



- Scrolling direction of LCD
- Auxiliary push button
- Uses 2-bit Gray code
- Cost \$1 +

Motion Controller

Converts a single digital pulse and a directional signal level into a sequence of high current pulses for a two phase stepper motor \$13 +

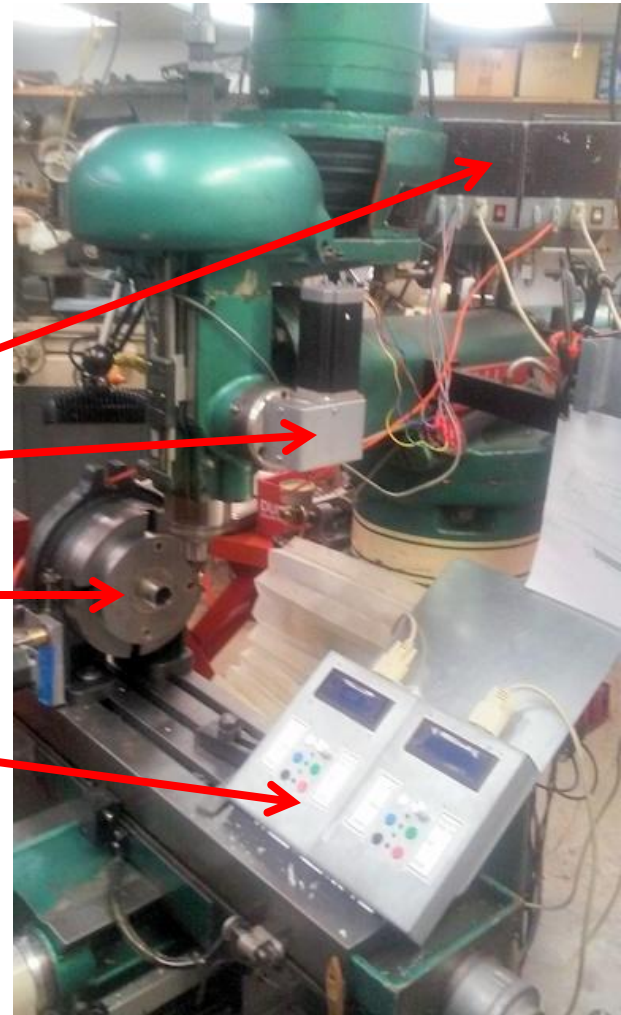


DC Power Supply

Powers the stepper motor via the motion controller and the microprocessor with display \$15 +

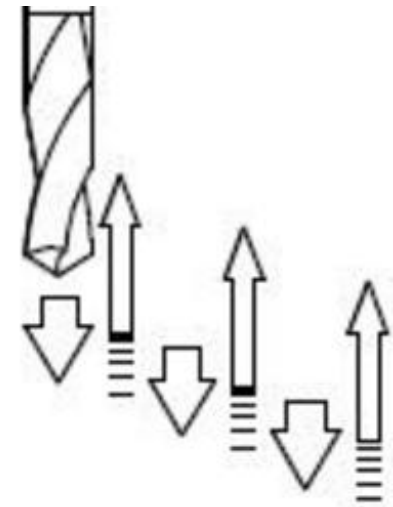
Two Machines Controlled by an Arduino Microprocessor

- Power Supply Controller
- Mill Pecker-Slotter
- Rotary Table
- Microprocessor



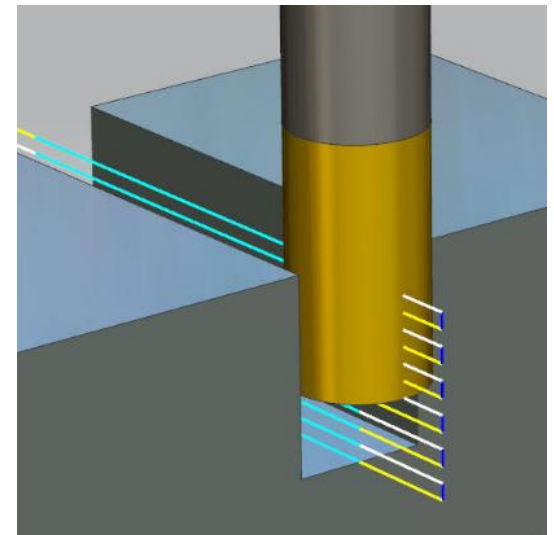
Pecking

Interrupted drilling of deep holes prevents swarf from clogging the flutes of the drill bit, allowing accurate holes



Slotting

Milling progressively deeper layers to prevent swarf from clogging the cut, allowing flood cooling, and reduced tool load



Milling Machine Pecker-Slotter

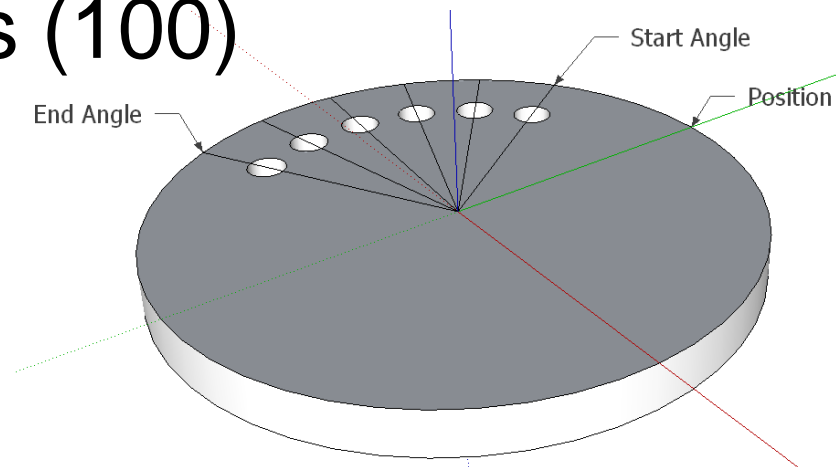
- Move the vertical quill by pressing buttons
- Position tool bit and set depth of cut
- Select number of pecks or slots
- Set dwell time for pecking
- Set down and retract feed rates
- Ramp acceleration before and after feeding
- Provide for emergency feed and retract
- Store commands for multiple jobs (100)



Rotary Table Controller



- Drill equally spaced holes around a sector
- Move to any angle (resolution 0.01 deg.)
- Automatic backlash correction
- Store multiple programs (100)
- Cut gears by milling



END

next: Stepper Motor Basics