OpenCNC® V6.6

OpenCNC® software is a production-proven, unbundled, software CNC that has logged millions of hours since 1993. Unlike traditional CNC controls, OpenCNC® software requires no proprietary hardware or motion control cards. Combining a soft CNC, soft PLC and HMI in one application, OpenCNC's open, modular, all-software architecture provides robust CNC control, connectivity to MAXIMUM Factory and easy integration of third-party software. MDSI customers have increased productivity, streamlined manufacturing processes, reduced machine tool control costs, and extended the productive life of their machine tools.

PERFORMANCE

OpenCNC provides high-speed machining through its innovative software architecture that combines multi-axis interpolation and servo update in one process. This process, invented by MDSI, is unique in the control industry and results in higher cutting speeds and higher-quality surface finishes:

- **CNC block processing:** 1,500 blocks/second or 670 μsec/block

- **Axis interpolation/servo update rate:** 500 μsec

- **Part program size:** 4 gigabytes (limited only by available memory in PC)

- **Max. spindle speed:** Practically unlimited (limited only by hardware)

- **Max. feedrate:** Practically unlimited (limited only by hardware)

- Interpolation and servo update combined in same process increases efficiency, increases speed and improves part quality.

- Bottlenecks eliminated. By handling motion entirely in software, OpenCNC eliminates the lag times that occur when messaging to a hard motion card. This improves efficiency and performance, especially in 5-axis aerospace machining and other critical, close-tolerance high-speed applications.

- Adaptive Look-Ahead dynamically adapts acceleration and deceleration rates based on part program tolerance requirements and machine dynamics.

- Blocks are not skipped at high speeds. Many CNCs skip program blocks to maintain speeds, which diminishes part quality. OpenCNC does not skip blocks at high speeds.

FEATURES

- Common control technology across a full range of machine tools: single– and dual-turret lathes, single– and multi-spindle precision drills, routers, mills, grinders, gear hobs, dial index machines, and gantry machines

- Servo loops closed entirely in software running on a standard PC with a single processor and a single operating system. No proprietary hardware. No motion control cards.

- Revolutionary NC macro programming leveraging Microsoft® Visual Basic® Scripting Edition (VBScript)

- 10,000 (#) pound variables for macro programming

- Yaskawa Mechatrolink™ digital drive interface for Yaskawa servo and digital/analog I/O products

- Hard real-time performance on standard Microsoft Windows 2000®/ Windows XP® and Ardence RTX®

- Soft logic development in all five IEC-61131-3 programming languages, plus flowcharting

- Automatic machine tool data collection—including maintenance, production, and quality information—in real time, without specialty hardware

- Remote machine maintenance and process diagnostics via the Internet, factory network or Intranet

- Improved efficiency in programming, export of data, and integration of CAD/CAM with CNC

- Squareness and straightness compensation for large machines

- Real-time deterministic Ethernet I/O

PACKAGES

OpenCNC Plus—2, 3, 4 axes; 4 handwheels

OpenCNC Pro—5-16 axes, 8 handwheels

Both Packages

- 8 spindles, 8 jobstreams, 8 parsers

- Gantry support

- High speed machining

- 9999 tool offsets, 9999 fixture offsets

- Up to 800 I/O (digital and analog)

- RTX real-time software

- OpenCNC VBScript macro

- OpenCNC documentation

- Comprehensive API

FUNCTIONS

User Interface

- Real-time program execution display
- Real-time display: absolute, machine, endpoint, distance-to-go, actual federate and spindle speed displays
- Real-time I/O status reporting, alarm notification, and messaging
- User interface password protection to secure or limit access to specific functions
- Ability to run standard Windows applications from the MDSI button
- PLC Monitoring tool—debug soft logic online

NC Programming Functions

- Rapid (G00), linear (G01), circular/helical (G02/G03) interpolation
- Dwell: time in seconds or revolutions (G04)
- Active Probe (G07)
- Exact stop: decelerate to zero velocity (G09)
- Cutter/tool nose radius compensation (G40, G41, G42)
- 9,999 tool length (H codes), radius (D codes), and fixture offsets (E codes)
- Plane specification for circular interpolation and cutter compensation (G17, G18, G19)
- Inch/millimeter selection (G20/G21)
- Work-piece coordinate system (G92) and cancel G92 offset (G59)
- Machine coordinate system, one-shot move (G53)
- Automatic threading on lathe (G33)
- Multi-pass threading cycle, IO, OD, face, taper (G78)
- Diameter/Radius programming on lathes (G07/G08)
- Programmable machining cycles: boring, drilling, peck drill, peck drill with chip break, and tapping (G73, G74, G76, G80-G85, G89)
- Rigid tapping
- Absolute, incremental programming (G90, G91)
- Return after canned cycle: R Plane or Initial Plane(G98, G99)
- Feed per minute, feed per revolution, inverse time (G93, G94, G95)
- Rotary axis programming—linear or degrees, continuous 360 degrees or travel limit bounded
- Spindle control: constant RPM (G97) or constant surface speed (G96)
- Practically unlimited spindle speed command (limited only by hardware)
- Multiple spindle control (up to 8 independent spindles)
- Automatic withdraw (G58) - move can be programmed in absolute, incremental, or machine coordinates
- Gantry support with cross-error coupling
- Customer defined G code to call user macro
- Mirror G56 and G57
- Scaling G50 and G51
- Probe cycles for 3- & 5-axis mills and 2- & 4-axis lathes (G37-G39)
- 5X features—RTCP for common machine configurations
- Lathe roughing, finishing, grooving, profile and tool definition macros

Control Functions

- Choice of digital SERCOS, Yaskawa Mechatrolink or conventional analog ($\pm$10 volt) servo interfaces.
- Support for Opto-22, Profibus, DeviceNet, and Ethernet digital and analog systems.
- High speed machining with Adaptive Look-ahead Logic™
- Simultaneous 16-axis interpolation
- Velocity and Torque mode command signal
- Incremental encoder feedback for resolvers and linear scales
- Backlash and bi-directional leadscrew pitch error compensation (up to 100,000 compensation points per axis)
- Graphical servo tuning oscilloscope
- Excess following error protection—following error band based on command voltage and instantaneous acceleration
- S-Curve acceleration/deceleration control for axes
- Spindle creep function
- Multiple handwheel capability
- Handwheel feed capability
- Electronic gearing capability
- Dual servo feedback

M-Codes

- Standard M-Codes (M00—M09, M30)
- User defined M-Codes
- Jobstream synchronization M-Codes (M100-M199)
- Block delete synchronization–Code (M200)
- Multiple spindle command and control M-Codes (M201, M202)

Machine Operation Functions

- Manual jog mode (incremental, absolute, jog absolute, jog home)
- Manual Data Input (MDI) mode
- Overrides: jog, feederate, rapid, spindle RPM
- Operation Modes: automatic, single block, dry run, MDI
- Automatic tool and fixture calibration
- Automatic retract from drill cycles
- Integrated retrace, withdraw and recover operation
- Automatic withdraw on feedhold feature
- Stored percent feed and spindle speed override values for each tool
- Block Delete (10 levels)

Part Programming

- Unlimited part program length
- Part program scan to detect part program statement errors
- Load/Save part programs from hard/Floppy drive, USB device, or Network
- Job Loader—loads NC program, tool offsets and fixtures offsets in a single step
- Subroutine capability (subroutines can be in a part program or in a separate file)
- Advanced user macros—develop macros with Visual Basic or C/C++

Significant Events

- Collects real-time machining event data
- Includes standard CNC and customer defined PLC events
- Provides input to production tracking or plant maintenance systems
- Microsoft Windows DNA for Manufacturing Compliant