

Free Download from Website

Animatics' SMI™ software provides an easy-to-use Microsoft Windows compatible interface to your Animatics SmartMotor™. Using SMI, you can define multi-axis motion control for 1 to 100 SmartMotors. SMI includes a terminal program, program editor, and source level debugger.

Standard SMI features include a Tools menu to set PID tuning parameters and plot the step response, motor info and dynamic status tracking, and online help and documentation. The latest release of SMI can open multiple windows for program editing, instantly address multiple motors, and upload programs from

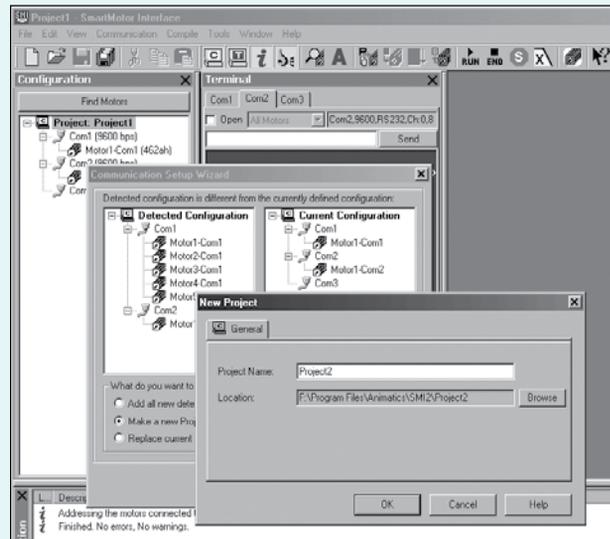
motors. Simply write and download your application to the configured SmartMotor and reboot the motor to start your application working.

Download SMI at no cost from the Animatics web site ([www.animatics.com](http://www.animatics.com)) or from the product CD-ROM, and use the installation wizard to install SMI, SMIEngine™, and Coordinated Motion.

## Features in SMI

The latest release of SMI adds extensive user interface improvements, functional enhancements, and new utilities that help you develop, test, run, and deploy your Animatics SmartMotor applications.

**Projects Feature.** Do you need to put an SMI project on hold? You can save your communications, configuration, and preferences settings with the new Project option. The Project menu option allows you to manage and save your workspace settings and applications configuration settings.



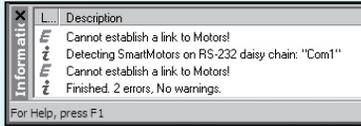
**Communications with Ethernet, CANopen, RS-232 and RS-485 SmartMotors**



**The Polling Window**  
Interface has special user-defined polling features to help you monitor important functions conveniently. Monitor different status bits, variables, and I/O from any motor in a chain, even during application execution.



The **Information window** displays error and information messages and allows you to go directly to the message's source location.



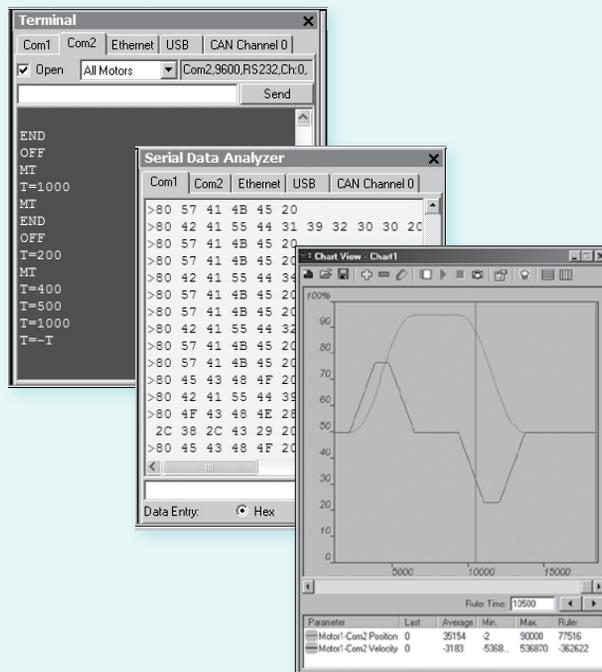
**Editor Window**  
Uses different colors for different code elements, such as keywords or comments

```
UCI      'set port C as input
V=100000 'set speed
A=100    'set accel
MV       'set to velocity mode
G
WHILE Bt
  IF Bo
    BREAK
  ENDF
LOOP
END
```

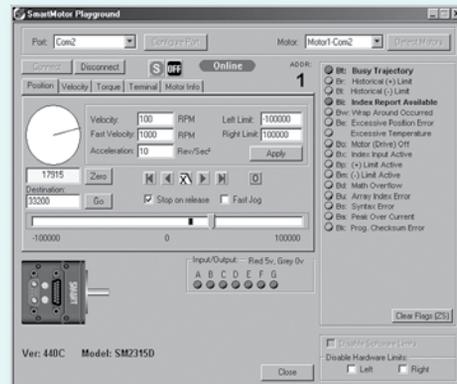
The **Terminal** window creates a tabbed page for each port so you can communicate with individual or multiple SmartMotors.

The **Serial Data Analyzer** displays data transfers between your computer and Animatics SmartMotor™. You can filter the data to display only the information you want; for example, choose to display transmitted data, received data, or echoed data.

The **Chart View** is a collection of user-defined motor parameters (Chart Items) that you can select to monitor during motor operation in a dynamic graphical display.



**SmartMotor Playground.** Would you like to be able to see and modify your motion control settings on-the-fly? With SMI you can. The Playground automatically detects connected motors and gathers data in the Motor Info tab. In the SMI Playground you can modify Torque, Velocity, and Position settings in real-time. Using numerical values for input or the interactive interface with drag and drop, sliders, and radio buttons, you can see the results immediately.



## Smart Select INTERFACE™

Free Download from Website

### Animatics Smart Select Interface is a Point-And-Click Approach to programming Animatics SmartMotors™.

This interface is a configuration tool allowing the user to program the motor for pre-set motion profiles such as:

- Absolute Position Moves
- Relative Position Moves
- Constant Velocity Move
- Reduce Torque Limited Velocity Moves
- Open Loop Torque Mode
- Dynamic Braking

In this simple approach, the user can predefine all moves and then simply connect the I/O to a PLC and allow the PLC to trigger motion as needed.

#### I/O is assigned as follows:

- Ports A, B, C, and D: 4-bit binary 1-of-16 selection
- Port G: "GO" input
- Port E: "Busy Moving" Output
- Port F: "Fault" Output

The user can set scale factors and choose units in

- inches
- millimeters
- microns
- degrees
- revolutions

There are several built-in Home routine methods as well as manual homing. A graphical representation aids the user in Home Method Selection.

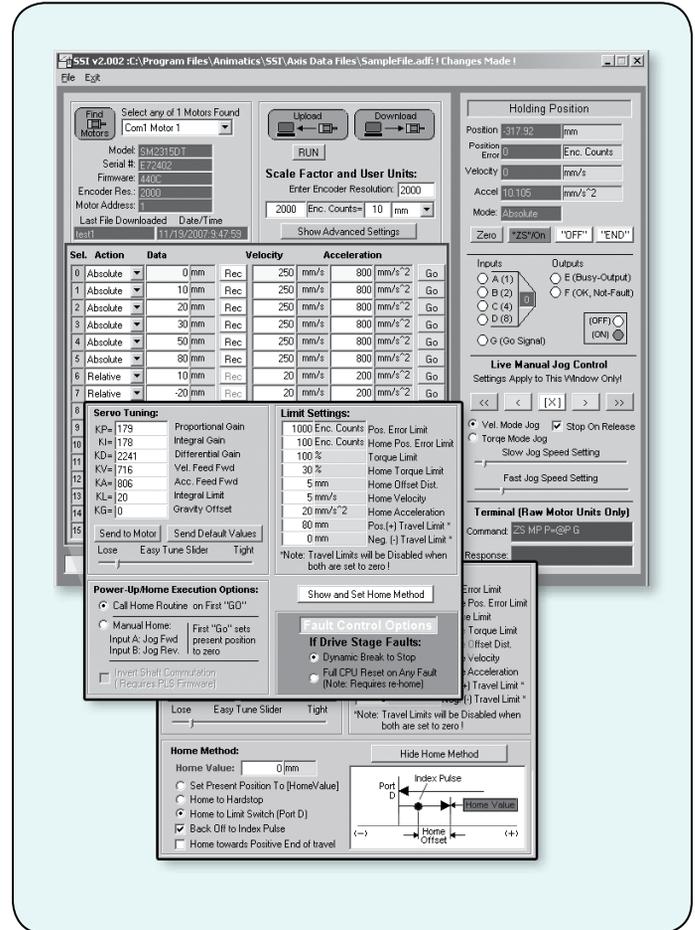
On-line diagnostics section includes:

- Manual Jogging
- Direct Terminal Window
- I/O Status
- Direct Drive and Control Command Buttons

Tuning made simple with the "Easy Tune Slider"

Simple slide-action Servo tuning to take the hassle out of guesswork.

All data is saved to both the motor and hard drive. Multiple "axis data files" can be saved, edited and recalled for later transfer to other SmartMotors.



The SmartBoxBCD™ is a compliment to the SSI software. It is designed to emulate I/O hand shaking from a PLC as would be used with the SSI Software.



See page: 83 for more details.

# SMIEngine

Free Download from Website

Animatics' SMIEngine™ is a source code module library created as a software tool for the Windows Operating System environment. It comes free with the installation of the SMI software.

The installation includes source code examples written in: Borland C++, Microsoft C++, Visual C, VB and VBA (Excel).

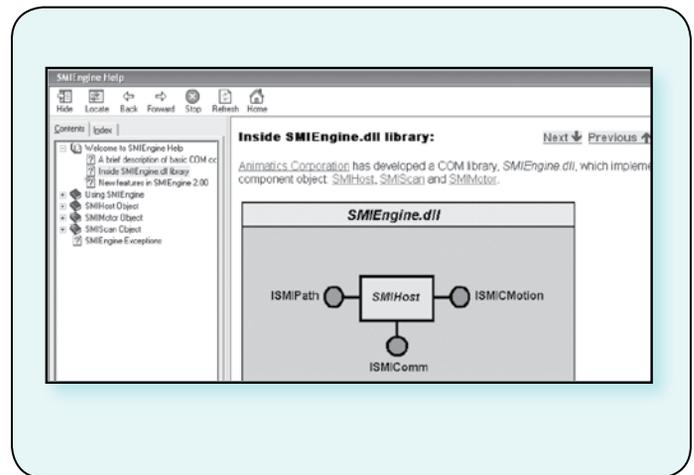
SMIEngine is based on the Windows Component Object Model (COM) and works with:

- Microsoft C++
- Borland C++
- Microsoft Visual Basic (VB)
- VBA (Visual Basic for Applications)
- MS.Net environment
- Borland Delphi
- Pascal
- Python
- LabView (when installed as an Active-X component)

**Note about Windows Vista:** With the release of Microsoft Vista, the name of the dll file changes from SMEEngine.dll to IntegMotorInterface.dll. Other than the name change, all internal definitions have remained the same and are fully backwards compatible to existing applications with no need to change the body of the source code.

Using SMIEngine, you can perform the following tasks:

- Configure PC serial ports
- Address Animatics SmartMotors™ through selected serial ports
- Send commands to the motors and receive motor responses that allow you to:
  - Control and change modes of operation
  - Update or change motion parameters and variables
  - Gather real-time data from motors for online diagnostics
  - Control the motors using Coordinated Motion (Contouring or Host Mode)
  - Create circular and linear path coordinates used for Coordinated Motion
- Work with downloadable SmartMotor code to:
  - Scan user program source files (.sms) for errors
  - Create an executable SmartMotor compiled user program file (.smx)
  - Download and upload compiled user programs to and from motors
  - Create a list of errors in a user program and provide an interface for navigating through errors



## Optimizing the SMIEngine for Multi-Axis coordinated Motion Control:

Multiple Instances of the SMIEngine can be run at the same time for each communications port that is open. In doing so, the application can maximize usage of communications bandwidth to each motor or each set of motors. Highly effective and efficient applications can be created to control CNC machines via a PC.

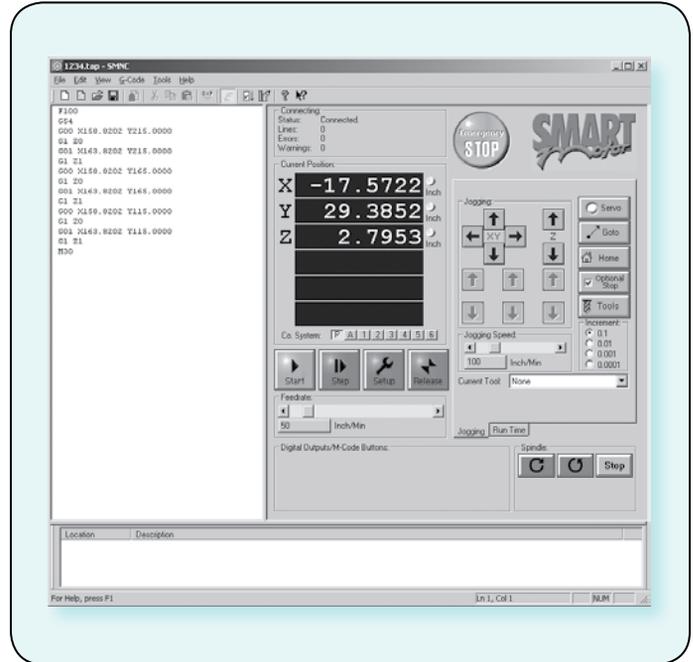
### Example Application using SMIEngine:

The Animatics JenCNC software package was created in Borland C++ using the SMIEngine exclusively to handle all Motor communications. The result was a stable and proven CNC platform for controlling up to 4 axis machines via a standard RS-232 serial port.



SMNC™, Animatics' G-Code based servo motion control software, uses numeric control to deliver multi-axis contouring for your Animatics SmartMotor™ applications. SMNC provides a set of features that are comparable to any CNC system, including a user interface that is similar in appearance to a traditional CNC system. Review the table in this section to see the G and M Codes that are supported by SMNC software.

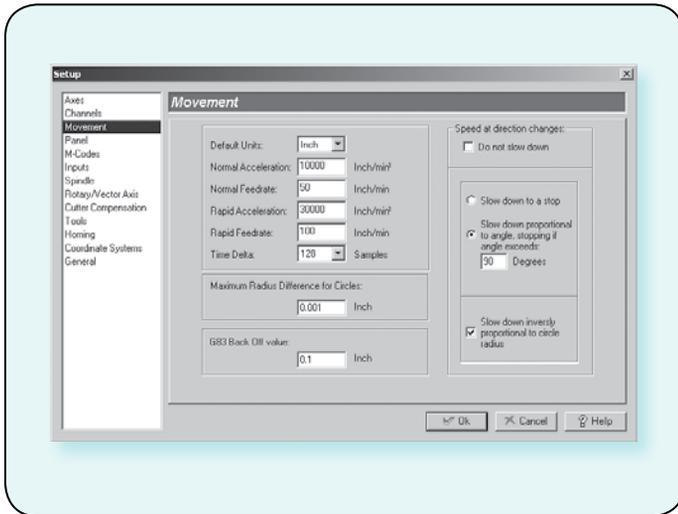
SMNC Communicates with SmartMotors via RS-232, RS-485, and CANopen.



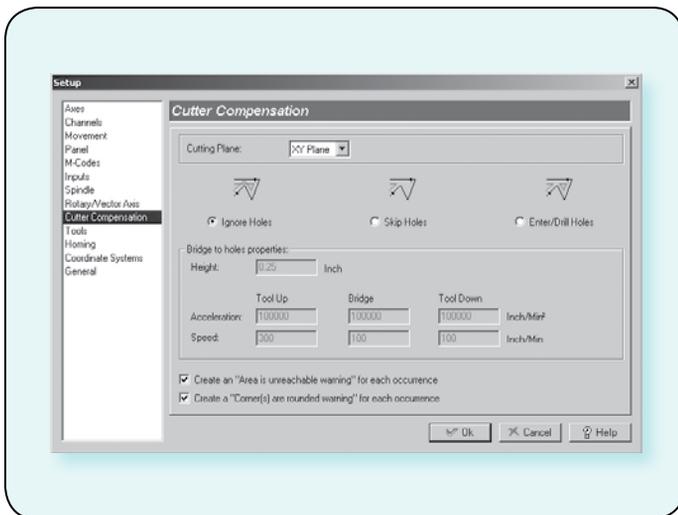
## SMNC standard features include:

- Linear and circular motion control of multiple axes
- Configures SmartMotors across multiple serial ports
- Converts CAD-DXF files into motion control G and M Codes
- Duplication of axis motion for gantry systems
- Smooth control of acceleration and deceleration for sensitive curvilinear motion
- Large numerical display
- 6 axis control, includes axis Mimic and Spindle
- User-definable M-Codes for digital output
- Displays source code during execution
- Writes and edits any G-Code program in the source view, with added support for:
  - 3D linear movements
  - CW and CCW Circular movements
  - CW and CCW Helical Movements
  - Wait, Pause, definable M-Codes, Spindle Commands and more
- Defines up to 40 M-Code commands and views their status during execution
- Imports graphic files with DXF format and converts them to G-Code programs
- Exports G-Code programs to Coordinated Motion Files
- Checks and runs a G-Code program or Coordinated Motion file
- Checks features during G-Code program execution:
  - Feed Hold
  - Single step
  - Reset (End)
  - Emergency stop
- Jogs the device using the Jog Buttons, and moves it to any location using the Go To utility on the Panel view
- Controls the Spindle using related buttons on the Panel View. The Spindle can be a SmartMotor or any other type of motor controlled by M-Codes and digital outputs
- Sets any connected SmartMotor in Coordinated Motion Mode, Spindle Mode, Mimic Mode, Rotary/Vector Mode, or Uncoordinated Mode

SMNC™ provides full user control over standard motion parameters and table (work area) dimensions. Additional control includes the ability to custom tailor how motion responds through tight corners and small arcs and circles allowing for smooth transition through the entire path.



Cutter compensation has options to either ignore holes, skip holes or enter holes as shown below. Additional parameters allow for automatic Z axis control through the holes and the ability to warn the end user when regions are adversely affected.



## New features:

- Define up to 30 Inputs to perform SMNC functions, such as Start, Reset, and Feed Hold, or as interlocks.
- Define up to 10 different tools. The current tool can be changed in a G-Code program.
- Password protection to control user access for many features.
- Define up to 7 different coordinate systems (G56-G59, G154)
- Customizable homing methods.

## G and M codes supported by SMNC

Codes	Description
G0	Rapid Linear movement
G1	Normal Linear movement
G2	Clockwise circular movement
G3	Counterclockwise circular movement
G4	Wait
G17	Select the X-Y plane for circular movements
G18	Select the X-Z plane for circular movements
G19	Select the Y-Z plane for circular movements
G20	Change units to inch
G21	Change units to Millimeter
G28	Return to the 1st Reference point
G30	Return to the 2nd Reference point
G40	Cancel cutter compensation
G41	Start cutter compensation left
G42	Start cutter compensation right
G43	Start tool length compensation
G49	Cancel tool length compensation
G54	Use preset coordinate system 1
G55	Use preset coordinate system 2
G56	Use preset coordinate system 3
G57	Use preset coordinate system 4
G58	Use preset coordinate system 5
G59	Use preset coordinate system 6
G80	Cancel Modal Motion (Used with canned cycles)
G81	Canned cycle: drilling
G82	Canned cycle: drilling with dwell
G83	Canned cycle: peck drilling
G85	Canned cycle: boring, no dwell, feed out
G89	Canned cycle: boring dwell feed out
G90	Change coordinate system to absolute
G91	Change coordinate system to incremental
G92	Change the logical origin
G98	Initial level return mode in Canned cycle
G99	Retract-point level return mode in Canned cycle
G101	Move the rotary axis
G154	Use preset coordinate system 7
D	Change the tool index for cutter compensation (G40, G41, G42)
F	Change the Feed rate (Normal Speed)
H	Change the tool index for tool length compensation (G43, G49)
S	Change the Spindle Speed
T	Current tool index (M6)
M0	Pause
M1	Optional Stop
M2	End of program
M3	Turn on Spindle Clockwise
M4	Turn on Spindle Counterclockwise
M5	Turn off Spindle
M6	Change current Tool
M8	Turn on the Coolant
M9	Turn off the Coolant
M30	End of program and force turning off all of digital outputs
M99	End the program and restart it



JenCNC combines features of both a CAD/CAM and a motion-control software package into a unique graphical user interface for controlling two to four SmartMotors™ in true 3-D coordinated motion. With real time 2-D and 3-D plotting to the screen, DXF-to-G-Code conversion, and conversational G-Code building, your CNC machine will be up and running in no time. JenCNC utilizes a simple serial interface to communicate and control SmartMotors. Using custom algorithms, motion is optimized for smooth control and continuous operation for all your machining needs. Due to its ability to run in a constant tangential velocity, regardless of changes in direction, the software is ideal where dispensing or flow rate of glue or adhesives is critical to the process.

JenCNC is built on many years of in-field testing and customer feedback in real-world applications, including:

- Routers (gantry machining of aluminum, foam, vinyl, and wood)
- Hot-wire EPS foam cutting
- Plasma (oxy-fuel) cutting with torch height control
- Machining forms for vacuum-form molding of plastics
- Milling machine retrofits
- Sign making
- Engraving
- CNC drilling
- Gasket cutting
- Adhesive applicators

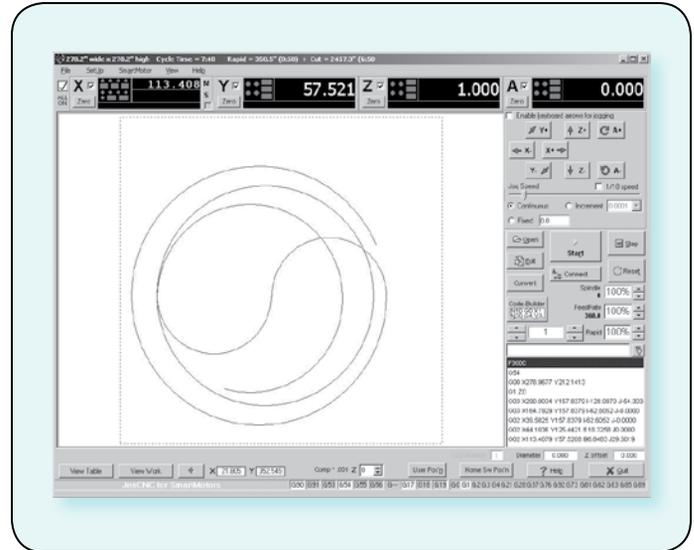
### DXF to G-code converter:

JenCNC's built-in DXF-to-G-Code converter allows you to open and view DXF files. Once in view, you can select entities in the order you wish to have the SmartMotors move. The converter includes a set-up for the Z-Axis. If you left click from one entity to the next, the Z-Axis motion G-Code is automatically generated.

All entities connected end-point to end-point will produce a continuous path until the need of the selection is reached. If the interpreter comes to a "Y" in the path, it will choose the path of least resistance (angular displacement).

There is an additional "Join" tolerance set-up. You can set the distance tolerance from one entity to the next in case the entities are not actually connected at their end-points.

If within that tolerance, the interpreter assumes connection and continues the path through the entities as one continuous motion. This can be very useful if the original DXF file was created freehand, as part of an artist rendering where O-Snaps may not have been used.



### JenCNC features

- Upon start-up, JenCNC automatically detects motors and does a system update if any Animatics SmartMotor™ was changed out. This allows you to place the shortcut in the start-up directory to allow automatic restart on loss of power
- Machine tolerance levels can be set to ensure that no product damage occurs in the event of motor drop-out or path divergence
- Slow-down proportional-to-angle can be tailored to minimize machining time while providing the best surface finish through sharp turns
- Customizable G-Codes for user-defined tooling positions
- Customizable M-Codes for I/O control and SmartMotor commands or subroutine calls
- Ability to call G-Code subroutines
- Ability to repeat a section of G-code any number of times
- Z-Axis (tool length) offsets
- SAE or metric scaling
- On-screen and keyboard real-time jogging
- Auto-detection of Windows-compatible joystick for jog control
- CMM probing for setting tool offset
- User-selectable homing routines with configurable offsets
- Advanced settings screen includes events set-up for E-Stop conditions and fault recovery

## JenCNC G-Codes Implementation

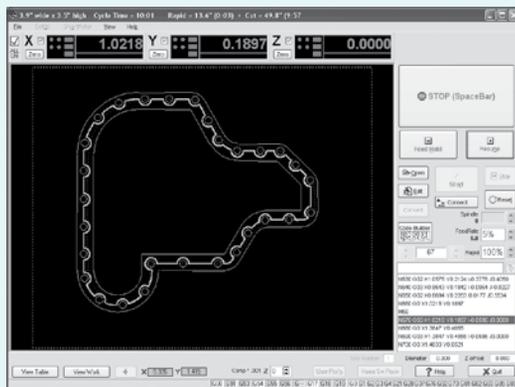
G-Codes not listed below are ignored by the interpreter.

### JenCNC G-Codes:

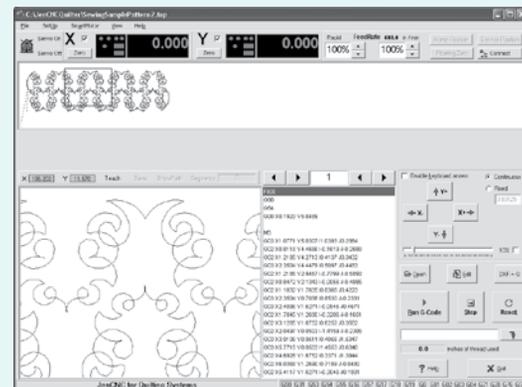
Codes	Description
G00	Rapid Motion
G01	Linear Motion
G02	Clockwise Circular Arc
G03	Counterclockwise Circular Arc
G04	Dwell
G10	Coordinate System Reset
G12	Rewind the Rotary Axis
G17	X-Y Plane Selection (This is the normal plane of operation)
G18	Z-X Plane Selection
G19	Y-Z Plane Selection
G20 and G70	Inch Mode
G21 and G71	Metric Mode
G28	Go to Tooling Position
G37	Probing
G41	Left side Tool Compensation
G42	Right side Tool Compensation
G43	Tool Length Compensation
G53 - G59, G110.- G120	Coordinate offsets
G64	Turn On Outputs (On the Fly)
G65	Turn Off Outputs (On the Fly)
G76	Repeat a section of the program
G80	Clear any G8x modal mode
G81, G82, G83, G85, G86	Canned Drill cycle Routines
G90	Absolute Mode
G91	Relative Mode
G92	Set Coordinate System Offset

### JenCNC M-Codes:

Codes	Description
M01	Program Pause
M02	End Program (See M30 below)
M03, M04	Turns on User Defined Input
M05	Turns off M03 selected Output
M06	Tool Change
M08	User Defined
M09	Turns M08 OFF
M14	Turn ON any single or multiple outputs
M15	Turn OFF any single or multiple outputs
M20	Send Torch to the Home Value position
M21	Continuous Path
M210	Set Maximum Angle Amount
M22	Continuous Path Off
M23	Slow at Vertex On
M24	Slow at Vertex Off
M25	Px.xxx Sets the pierce delay time with the P Word.
M30 & M02	Program End and Reset
M41, M42, M43	Turns on selected output as soon as motion starts
M45, M46, M47	Turns off selected output(s) immediately
M50 - M57	Waiting for Inputs from the real world
M60 - M79	Outputs to the real world
M80 - M85	User Programmable SmartMotor Command String Calls
M86 - M91	User Programmable Sound File Player Functions
M95	Dwell (exactly the same as a G04)
M98	Go To a Subroutine
M99	Return from a Subroutine



Proportional Glue Feed Control through Entire Path



Automatic Sewing Head Motor control for Quilting Applications



Automatic Detection of X-Master and X-Slave motors