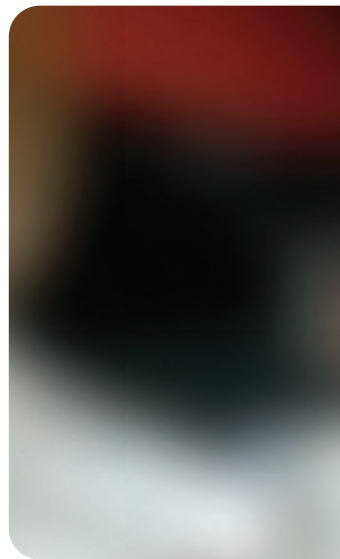
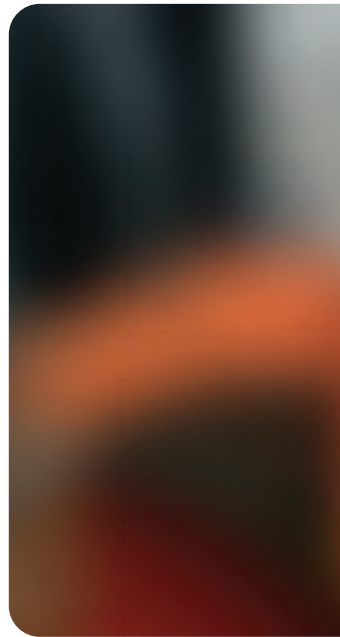




Ultra-Precise CNC Technologies for Superior Optics

PMDI's CNC Technology



PMDI's CNC Technology

Polaris CNC Library

Polaris CNC Library is a high performance CNC G-Code software library optimized for high precision machines, which has been developed over the last decade. By using Polaris CNC Library and our newly released Polaris motion control system, your machine will have the best form and finish on the market, at the fastest throughputs possible.



PRECITECH IS A LEADING MANUFACTURER OF NANOMETER PRECISION, SINGLE POINT, MULTI AXIS DIAMOND TURNING MACHINES FOR ROTATIONALLY SYMMETRIC AND FREEFORM APPLICATIONS.

PHOTO – COURTESY PRECITECH

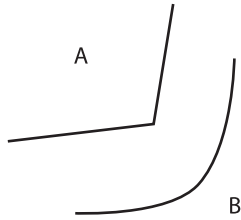
Polaris CNC Library provides a wealth of functions for parsing files, issuing immediate commands, merging short lines, path look ahead, cutter compensation, tool compensation, velocity override, pause and resume, line number retrieval, threading.

There are additional library functions for axes homing, setting PID filter gains, configuring sinusoidal commutation, detecting software and hardware limits, data acquisition, and more.

The high speed tasks such as sinusoidal commutation, PID, and fast tool servo run on PMDi's Polaris amplifiers at very high frequencies.

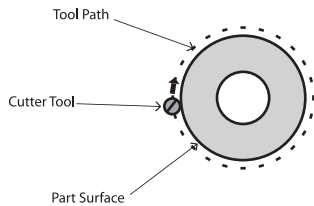
The G-code parser and path planner run on the Polaris controller. The path planner generates smooth limited jerk paths. Polaris controllers, amplifiers and auxiliary I/O modules provide real time data acquisition for systematic profiling.

CNC Features



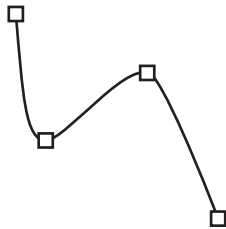
MERGING SHORT LINES

Many CAD programs approximate curves with short line segments. PMDi's control process analyses these line segments and joins them with curves for smoother motion. If a series of short connected paths are issued at high speed, the velocity increases over as many segments as are necessary. The system looks ahead in the path segment buffer to stop the machine by the end of the path, maintaining a velocity that can be stopped in that distance. The search also detects lower velocity segments and decelerates to meet them.



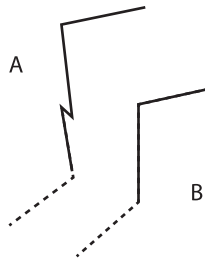
CUTTING COMPENSATION

Cutter compensation adjusts the path described in the G-code file by the radius of the cutting tool. It is also used to make path adjustments due to tool change or tool wear. Both left and right cutter compensation is supported. Excellent performance is preserved over short lines and sharp corners.



POSITION VELOCITY TIME (PVT) SPLINES

For the smoothest lens finish possible, Polaris CNC Library provides functions for Position-Velocity-Time spline curve generation. All computations are performed using double precision math.



FILTERING DEGENERATE LINES

CAD programs may insert small degenerate lines in the output. PMDi's control process evaluates all line segments and eliminates unnecessary segments that may interfere with acceptable machine tool behavior.

PAUSE AND RESUME MOTION

Machine motion can be paused during a move. Motion stops as soon as possible at the commanded acceleration rate. If the acceleration is not sufficient to stop during the current path segment, the pause happens over the following segments, taking as many as required to stop. Then it is possible to resume the motion. If the machine is jogged away from the paused point, it will be moved back into place.

FAST TOOL SERVO

Fast tool servo functions that run as high as 100,000 set-points per second are tightly integrated both in software and hardware with the slow axes for total system integration.

PARAMACRO OPTICS SURFACE DESIGN

Operators are free to design any optics surface they can imagine using inline math paramacros. See the enclosed table for a list of all the math functions supported



POLARIS CONTROL
SYSTEM FOR HIGH PRECISION
CNC APPLICATIONS

G Code Function Calls

The following list of CNC functions are supported in the Polaris CNC Library:

Initialize & Execute	Position Functions	Status	Tool Compensation	Offsets
Feed Rates	Feedrate Selection	Accelerations	Left Handed Coordinate	Callback
Unit Conversion	Parsing	Path Commands	Pause	Velocity Scaling: Ratiometric
Velocity Override: Absolute	Line Merging	Arc Merging	Line Filtering Motion	Offsets
Line Numbers	Kinematic Limits	Acceleration Override	Path Preview	Error Recovery
Blocking Mode	Velocity Look Ahead	Threading Axis		

G and M Codes

The following table is a list of G and M codes that are supported:

G00	• Rapid Traverse Positioning
G01	• Linear Interpolation
G02	• Arc Clockwise (2D)
G03	• Arc Counter Clockwise (2D)
G04	• Dwell
G17	• XY Plane Selection
G18	• ZX Plane Selection
G19	• YZ Plane Selection
G33	• Threading
G40	• Cutter Compensation Cancel
G41	• Cutter Compensation – Left
G42	• Cutter Compensation – Right
G54	• Select Coordinate System
G70	• Inch Programming
G71	• Metric Programming (mm)
G72	• Circular Interpolation Clockwise (3D)
G73	• Circular Interpolation Counter Clockwise (3D)
G74	• Cancel Multi quadrant Circular Interpolation
G75	• Multi quadrant Circular Interpolation
G90	• Absolute Dimension Input
G91	• Relative Dimension Input
G92	• Preset Position
G94	• Inches (mm) per Minute Feedrate
M02	• End of Program
M30	• End of Data

Paramacro Math Support

Operators may write their part programs using paramacros.

The following math functions are supported:

[]	• Grouping - () is supported via .ini file switch
*/	• Multiply Divide
+ -	• Add Subtract
& ^	• Bitwise And, Or, Xor
AND	• Logical And
OR	• Logical Or
XOR	• Logical Xor
SIN	• Sine, in degrees
COS	• Cosine, in degrees
TAN	• Tangent, in degrees
ASIN	• Arc Sine, returns degrees
ACOS	• Arc Cosine, returns degrees
ATAN	• Arc Tangent, returns degrees
LN	• Natural Logarithm
EXP	• e^x
SQRT	• Square Root
ABS	• Absolute Value
INT	• Integer Part, rounds to nearest integer
ROUND	• Integer Part, rounds to nearest integer
FIX	• Rounds to next lower integer. $3.5 \leq 3$, $-2.5 \geq -3$
FUP	• Rounds to next higher integer. $3.5 \geq 4$, $-2.5 \geq -2$



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