

Ensemble[®] QLAB

Stand-Alone, 1-4 Axes Piezo Motion Controller

Control 1 to 4 axes of piezo nanopositioning stages in open- or closed-loop operation

Configurable open-loop and closed-loop control in one controller platform

High-precision 20-bit sensor resolution for capacitive sensor feedback in closed-loop operation

Configurable, high-resolution analog input for external feedback sensor integration or command generation

Advanced control features such as learning control, harmonic cancellation and command shaping improve tracking error and overall process throughput

Touch screen with intuitive menu-driven interface for quick and easy access to system functionality

Ethernet and USB 2.0 communication interfaces

Advanced Windows[®]-based remote diagnostics, tuning and programming interface software

Program in AeroBasic using Aerotech's IDE or create custom remote interfaces with Microsoft .NET including C#, VB.NET, Managed C++, LabVIEW[®], MATLAB[®], EPICS, or TANGO

The Ensemble QLAB is a high-performance nanopositioning piezo stage controller for 1 to 4 axes of motion. The flexible controller platform allows user-configurable open-loop and closed-loop operation on a per axis basis. Simple software commands allow the user to switch between open-loop and closed-loop if an axis is configured for closed-loop mode.



The Ensemble QLAB controls up to four axes of piezo stages in open-loop or closed-loop mode.

Using the processing power of a dual-core 456 MHz, double precision, floating-point DSP, the QLAB provides exceptional performance for a wide variety of applications. The front panel interface allows an operator to quickly execute simple operations such as jogging and moving to fixed positions. For more complex operations, the Ensemble QLAB has onboard memory for storing programs that can be accessed from the front panel or through remote control.

High-Resolution and Optional Ultra-Precise Feedback

Using the latest technology and high-resolution A/D and D/A converters, the QLAB enables sub-nanometer positioning resolution at high bandwidths. With the optional integrated capacitance sensor, the QLAB provides low-noise performance over the full-travel range. In closed-loop mode, linearity better than 0.01% over the full-travel range is achieved using a proprietary linearization scheme.

Precision I/O

In addition to the four optically-isolated digital inputs, two high-speed digital inputs and four optically-isolated digital outputs, the Ensemble QLAB is equipped with four analog inputs and four analog outputs. The analog inputs can be programmatically configured to accept an external feedback sensor or position command. The analog outputs can be used for monitoring position or voltage output.

Advanced Software and Control Features

The Ensemble QLAB uses advanced PID servo loops with advanced feedforward and multiple integrators coupled with eight programmable filters to supply the user with all necessary tools needed to optimize motion performance.

QLAB DESCRIPTION

Additional software options such as the Dynamic Controls Toolbox and Motion Designer packages make available a host of advanced, yet easy-to-use, tools such as Learning Control, Harmonic Cancellation, Command Shaping, and Cross-Axis Feedforward to improve tracking errors and provide faster step-and-settle times.

Touch Screen Interface

In addition to the front key-panel, the Ensemble QLAB comes equipped with a full color, touch-enabled LCD display. An intuitive tabbed interface provides single-press access to all setup and operation screens.

Powerful Programming Functionality

The Ensemble QLAB is programmed in an easily readable BASIC-like syntax, off-line, with a graphical user interface in Windows®, featuring an intuitive Program Editor, Variable Output window, Compiler Output window and Task State monitor. After the programs are developed and tested they can be downloaded and stored on the controller for future use. Alternatively, the user can continue to program and operate the QLAB from a host PC, if so desired.

Multitasking Capability

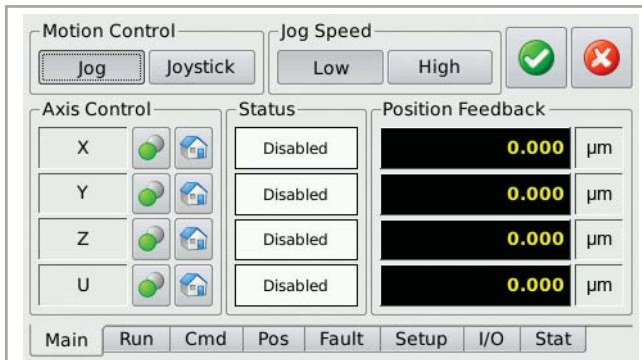
Up to four programs can run simultaneously on the Ensemble QLAB, allowing for easy partitioning of complex operations. One task could be used for motion while the remaining tasks are used for process control, or the controller could be configured to operate four separate programs controlling four piezo stages.

Software Drivers

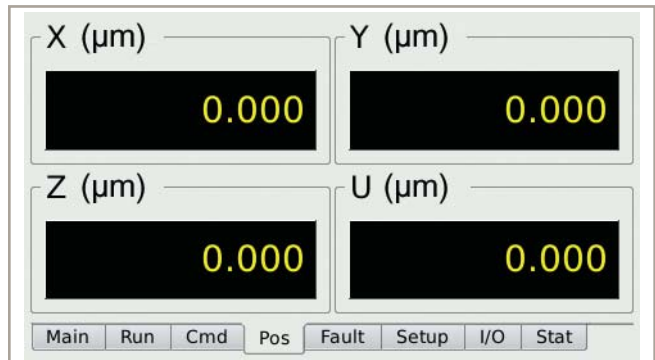
The Ensemble QLAB includes full compatibility with both EPICS and TANGO distributed control protocols. Pre-coded LabVIEW® VIs, AeroBasic™ programming functionality, MATLAB® library, .NET tools for C#, VB.NET, and managed C++ or C make the Ensemble even easier to use. See the [Ensemble Control](#) home page for detailed information on software capabilities and ordering options.

Automatic Parameter Configuration

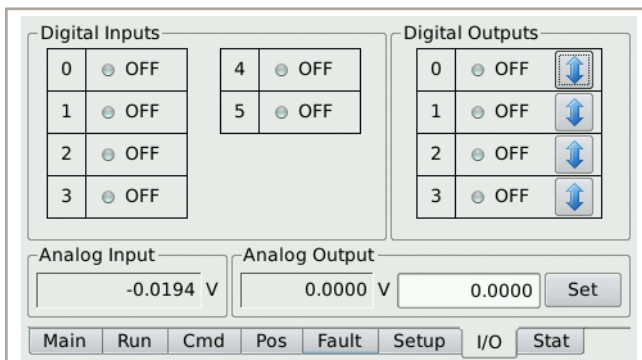
Aerotech's piezo stages all include a “FlashConfig” feature that stores all of the parametric information required to operate the stage. The stage is automatically identified and all operational parameters including axis calibration data are uploaded into the Ensemble QLAB, ensuring safe, accurate and true “plug-and-play” operation.



Ensemble QLAB “Main” screen.



Ensemble QLAB “Position” screen.



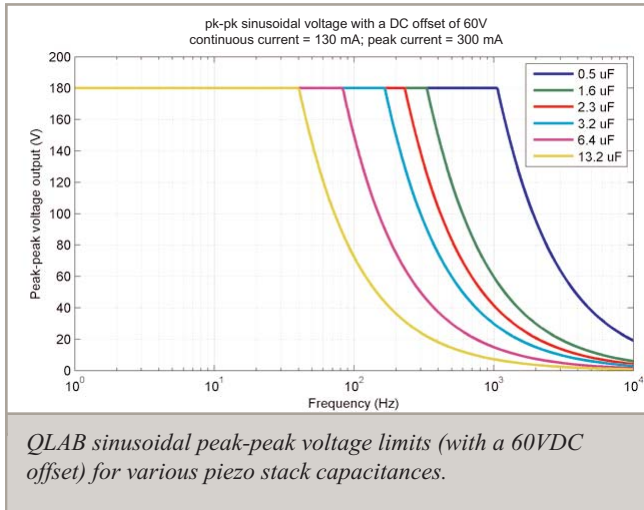
Ensemble QLAB “I/O” screen.



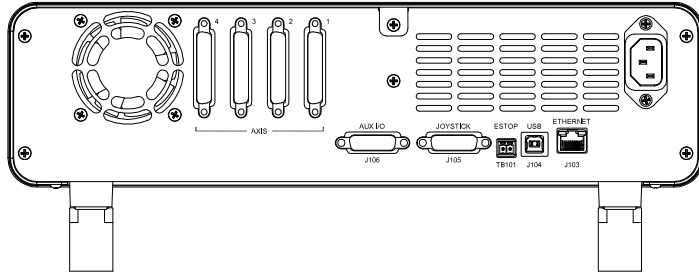
Ensemble QLAB “Command” screen.

Ensemble QLAB SPECIFICATIONS

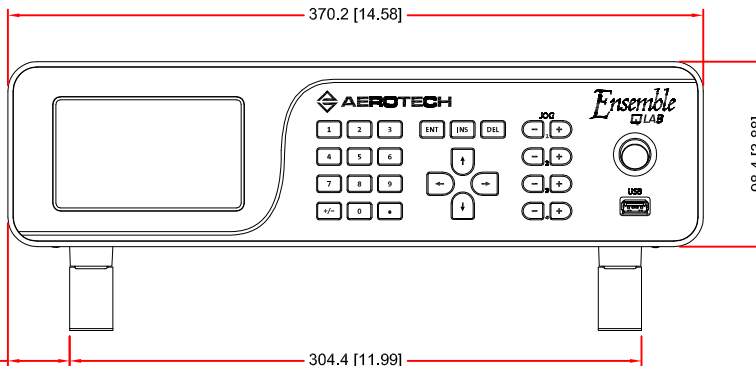
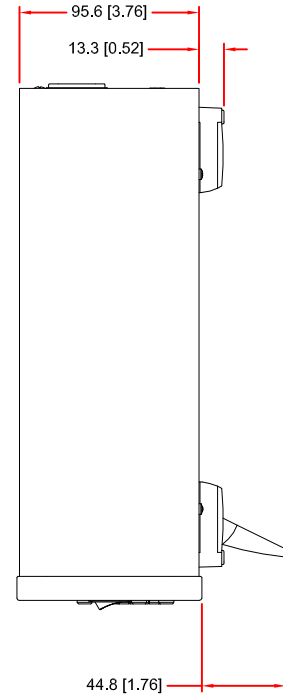
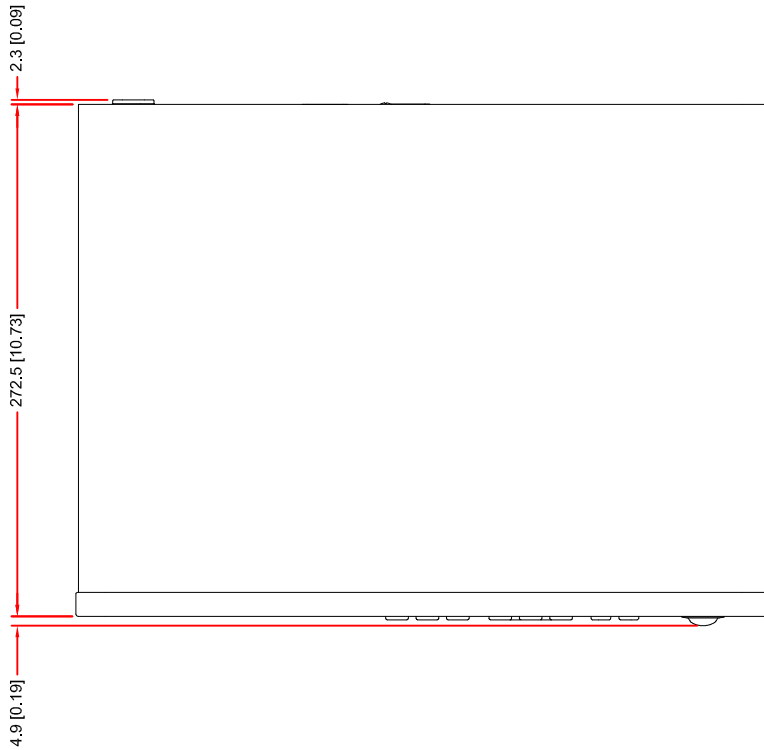
Feature	Description
Number of Axes	1 to 4
Processor	Dual-core 456 MHz, Double Precision, Floating Point DSP
Power Supply	100-240 VAC; 50/60 Hz
Voltage Output	-30 to +150 V
Sensor Type	Open-Loop or Capacitive Sensor (Closed Loop)
Sensor Resolution	20 Bit
Continuous Power Output	20 Watts per Channel; 80 Watts Total
Peak Current Output	300 mA per Channel
Continuous Current Output	130 mA per Channel
Digital Inputs	Four Optically Isolated; Two High-Speed; One ESTOP
Digital Outputs	Four Optically Isolated
Analog Inputs	Four 18-Bit Effective; Configurable for External Feedback or External Command Input
Analog Outputs	Four 16-Bit; Configurable for Position or Voltage Monitoring
Communication Interfaces	10/100 Base T Ethernet; USB 2.0
Expansion Interface	USB 1.1
Servo Loop Update	20 kHz
Programming Environment	Multi-Tasking AeroBasic
Operating System Requirements for Remote Programming and Diagnostic Tools	Windows 7



Ensemble QLAB DIMENSIONS



REAR VIEW ROTATED 180°



ENSEMBLE QLAB CONTROLLER FRONT VIEW

620E1415B

Ensemble QLAB ORDERING INFORMATION

Ordering Example

Ensemble QLAB	-A	-1AX	-MXC1	-PSO	-US115VAC
Series	Line Voltage	Number of Axes	Feedback Type	PSO Output	Line Cord
Ensemble QLAB	-A -B -C -D	-1AX -2AX -3AX -4AX	-MXC1 -MXC2 -MXC3 -MXC4	-PSO	-ENGLAND -GERMANY -ISRAEL -INDIA -AUSTRALIA -US115VAC -US230VAC -NOLINECORD

Ensemble QLAB Multi-Axis Piezo Motion Controller

- Ensemble QLAB 1-4 axis desktop, stand-alone, piezo nanopositioning stage motion controller. Features include:
- Open loop or closed-loop operation.
 - High-precision 20-bit sensor resolution for capacitance sensor feedback in closed-loop.
 - Configurable input/outputs; four opto-isolated inputs, two high-speed digital inputs, four opto-isolated outputs, four 18-bit effective analog inputs, and four 16-bit analog outputs.
 - 10/100 base T Ethernet port; one USB 2.0 port; one USB 1.1 port

Line Voltage (Required)

-A	115 VAC input
-B	230 VAC input
-C	100 VAC input
-D	200/208 VAC input

Number of Axes (Required)

-1AX	Configured for 1 axis
-2AX	Configured for 2 axes
-3AX	Configured for 3 axes
-4AX	Configured for 4 axes

Note: If the Feedback Type is not selected, all axes will operate in open-loop mode.

Feedback Type (Optional)

-MXC1	Configured for 1 axis of capacitance sensor feedback
-MXC2	Configured for 2 axes of capacitance sensor feedback
-MXC3	Configured for 3 axes of capacitance sensor feedback
-MXC4	Configured for 4 axes of capacitance sensor feedback

Note: All closed-loop channels must occur on the controller axis count before the open-loop channels. For example, if two axes of closed-loop and one axis of open-loop are desired, three axes are selected (-3AX) and -MXC2 is selected, which will give channels 1 and 2 as cap feedback and channel 3 as open-loop.

PSO Output (Optional)

-PSO	Single-axis Position Synchronized Output
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Line Cord (required)

-ENGLAND	UK compatible line cord
-GERMANY	German compatible line cord
-ISRAEL	Israel compatible line cord
-INDIA	India compatible line cord
-AUSTRALIA	Australia compatible line cord
-US115VAC	US 115 VAC line cord
-US230VAC	US 230 VAC line cord
-NOLINECORD	No line cord

Ensemble QLAB ORDERING INFORMATION

Ensemble Software Options

-DYNAMIC CONTROLS TOOLBOX	The Dynamic Controls Toolbox provides control algorithms that increase system performance such as settle time, accuracy, in-position stability and/or velocity stability.
-MOTION DESIGNER	Motion Designer is used to graphically generate and edit motion profiles that execute on the controller, providing the ability to import, run and evaluate motion profiles (trajectories). Included in the Motion Designer software is learning control that reduces tracking errors by as much as 1000 times.
-LABVIEW	LabVIEW® VI samples