

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

Thermally-stable feedback circuit design

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

CE approved and NRTL safety certification; follows the 2011/65/EU RoHS 2 Directive

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, C++/CLI, LabVIEW®, MATLAB®, EPICS, or TANGO



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

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.

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. An Aerotech-developed linearization method achieves linearity better than 0.01% over the full travel range in closed-loop mode. The QLAB employs a proprietary capacitive sensor feedback circuit results in industry-leading thermal stability and exceptional long-term holding stability.

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.

QLAB DESCRIPTION

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. 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

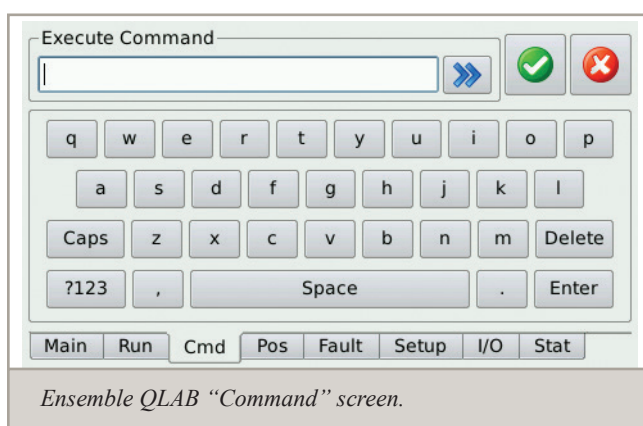
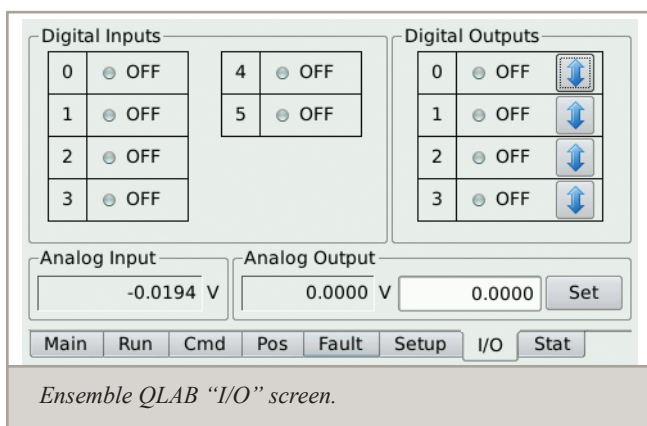
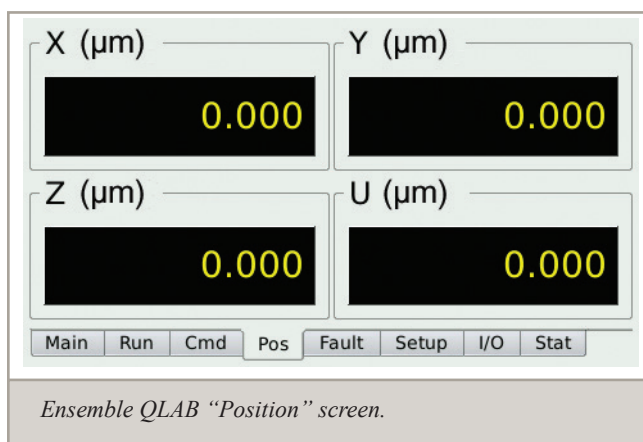
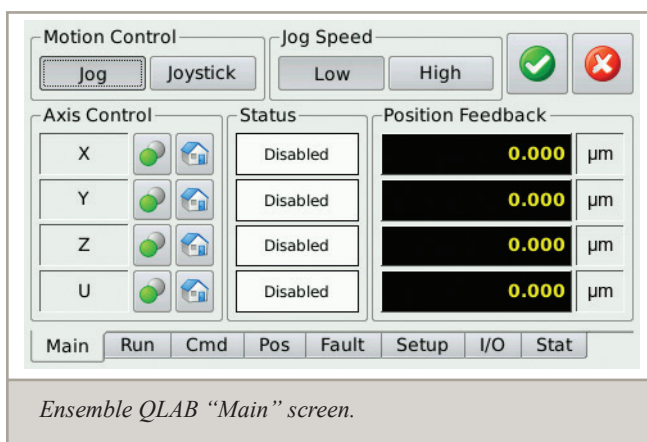
Up to four programs can run simultaneously on the Ensemble QLAB, allowing for easy partitioning of complex operations. One task could be used for motion while the remaining tasks are used for process control, or the controller could be configured to operate four separate programs controlling four piezo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

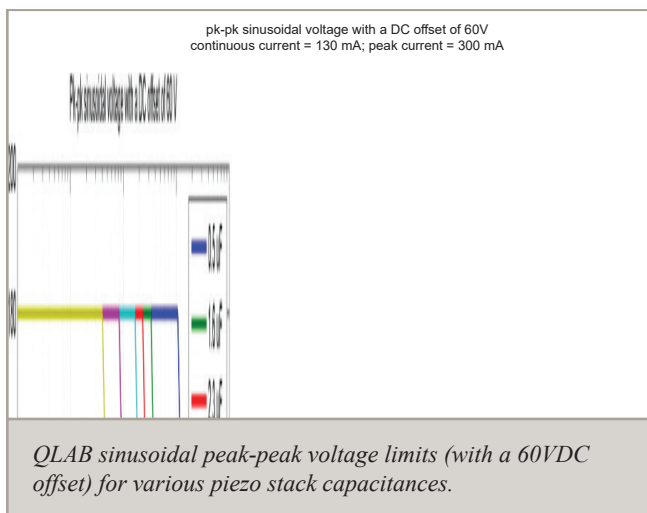


Ensemble QLAB SPECIFICATIONS

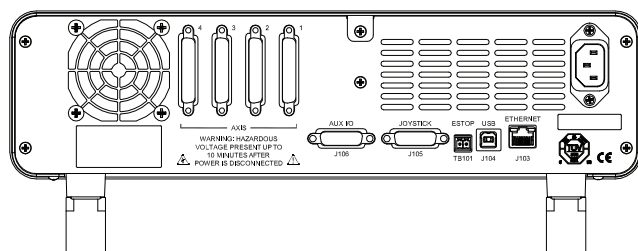
| Feature | Description |
|---|---|
| Number of Axes | 1 to 4 |
| Processor | Dual-core 456 MHz, Double Precision, Floating Point DSP |
| Power Supply | 100-240 VAC; 50/60 Hz |
| Voltage Output | -30 to +150 V |
| Sensor Type | Open-Loop or Capacitive Sensor (Closed Loop) |
| Sensor Resolution | 20 Bit |
| Continuous Power Output | 20 Watts per Channel; 80 Watts Total |
| Peak Current Output ⁽¹⁾ | 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 |
| Position Synchronized Output (PSO) | Single-Axis |
| 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 |
| Standards | CE approved, NRTL safety certification, EU 2015/863 RoHS 3 directive |

Notes:

1. Peak current can be applied for a maximum of 10 ms.

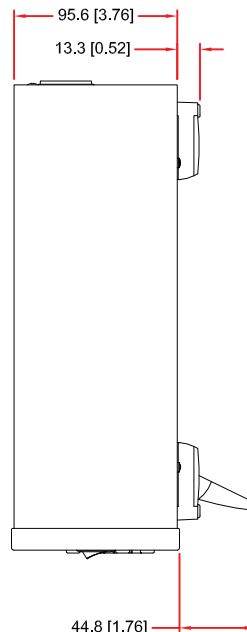


Ensemble QLAB DIMENSIONS

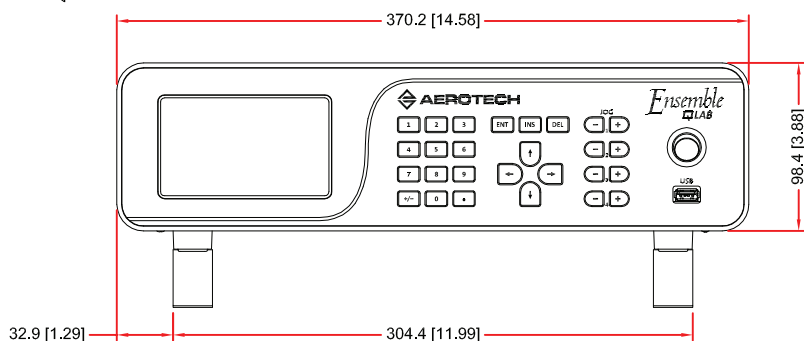


REAR VIEW ROTATED 180°

2.3 [0.09]
272.5 [10.73]
4.9 [0.19]



44.8 [1.76]



620E1415F

ENSEMBLE QLAB CONTROLLER FRONT VIEW

Ensemble QLAB ORDERING INFORMATION

Ensemble QLAB Multi-Axis Piezo Motion Controller

| | |
|---------------|---|
| Ensemble QLAB | <p>1-4 axis desktop, stand-alone, piezo nanopositioning stage motion controller. Features include:</p> <ul style="list-style-type: none"> • 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 • Motion Designer software 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. |
|---------------|---|

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 |
|------|--|

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 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. . |
| -LABVIEW | LabVIEW® VI samples |

Ensemble QLAB ORDERING INFORMATION

Integration (Required)

Aerotech offers both standard and custom integration services to help you get your system fully operational as quickly as possible. The following standard integration options are available for this system. Please consult Aerotech if you are unsure what level of integration is required, or if you desire custom integration support with your system.

| | |
|------|---|
| -TAS | Integration - Test as system Testing, integration, and documentation of a group of components as a complete system that will be used together (ex: drive, controller, and stage). This includes parameter file generation, system tuning, and documentation of the system configuration. |
| -TAC | Integration - Test as components Testing and integration of individual items as discrete components that ship together. This is typically used for spare parts, replacement parts, or items that will not be used together. These components may or may not be part of a larger system. |