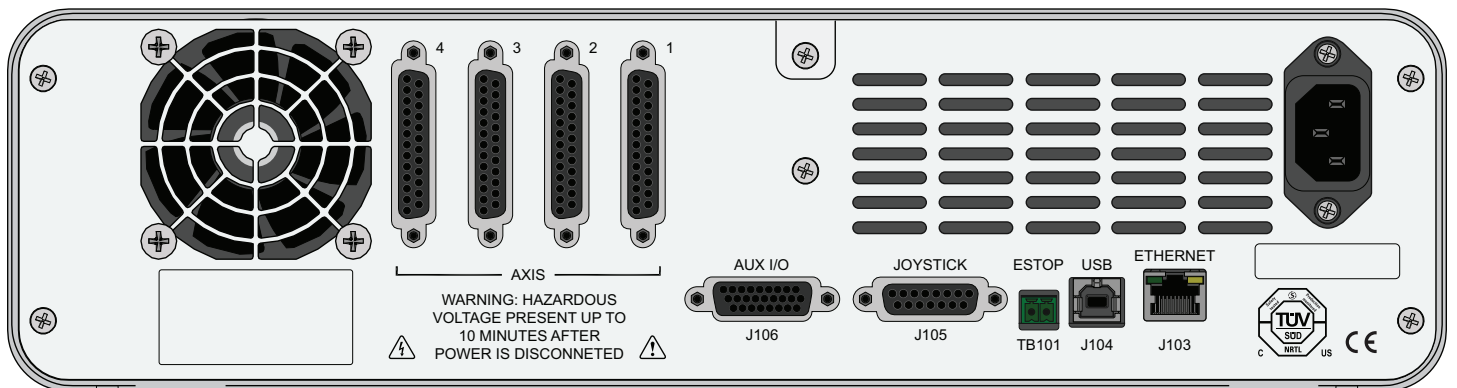




Ensemble QLAB Hardware Manual

Revision: 1.01.00



Global Technical Support

Go to www.aerotech.com/global-technical-support for information and support about your Aerotech products. The website provides downloadable resources (such as up-to-date software, product manuals, and Help files), training schedules, and PC-to-PC remote technical support. You can also complete Product Return (RMA) forms and get information about repairs and spare or replacement parts. For immediate help, contact a service office or your sales representative. Have your customer order number available before you call or include it in your email.

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Table of Contents

Table of Contents iii

List of Figures iv

List of Tables v

EC Declaration of Conformity vii

Agency Approvals viii

Safety Procedures and Warnings ix

Quick Installation Guide xi

Chapter 1: Introduction 1

 1.1. Electrical Specifications 4

 1.2. Mechanical Specifications 5

 1.3. Environmental Specifications 6

 1.4. Drive and Software Compatibility 7

Chapter 2: Installation and Configuration 9

 2.1. Unpacking the Chassis 9

 2.2. Electrical Installation 10

 2.2.1. AC Power Connection 11

 2.2.2. IO and Signal Wiring Requirements 11

 2.2.3. Minimizing Conducted, Radiated, and System Noise 12

 2.3. Motor and Feedback Connections 13

 2.4. Emergency Stop Sense Input (TB101) 14

 2.5. Auxiliary I/O Connector (J106) 15

 2.5.1. Position Synchronized Output (PSO) 16

 2.5.2. Opto-Isolated Outputs 0-3 18

 2.5.3. Opto-Isolated Inputs 0-3 20

 2.5.4. High-Speed User Inputs 4-5 22

 2.5.5. Analog Output 4 23

 2.6. Joystick Interface (J105) 24

 2.6.1. Analog Outputs (0-3) (J105) 26

 2.6.2. Analog Inputs (0-3) (J105) 27

 2.7. Communication (Ethernet and USB) 28

 2.7.1. USB Interface 28

 2.7.2. Ethernet Interface 29

 2.8. PC Configuration and Operation Information 30

Chapter 3: Maintenance 31

 3.1. Preventative Maintenance 31

Appendix A: Warranty and Field Service 33

Appendix B: Revision History 35

Index 37

List of Figures

Figure 1-1: Ensemble QLAB Controller	1
Figure 1-2: Functional Diagram	3
Figure 1-3: Dimensions	5
Figure 2-1: Power and Control Connections	10
Figure 2-2: Power Switch	10
Figure 2-3: ESTOP Sense Input (TB102)	14
Figure 2-4: PSO Interface	17
Figure 2-5: Outputs Connected in Current Sinking Mode (J106)	18
Figure 2-6: Outputs Connected in Current Sourcing Mode (J106)	19
Figure 2-7: Inputs Connected in Current Sinking Mode (J106)	21
Figure 2-8: Inputs Connected in Current Sourcing Mode (J106)	21
Figure 2-9: High Speed User Inputs (J106)	22
Figure 2-10: Analog Output 4 (J106)	23
Figure 2-11: Joystick Interface	24
Figure 2-12: Analog Outputs 0-3 (J105)	26
Figure 2-13: Analog Input (J105)	27
Figure 2-14: USB Connection Location (for PC Communication)	28
Figure 2-15: Ethernet Connection Location	29

List of Tables

Table 1-1: Ordering Options 2

Table 1-2: Electrical Specifications 4

Table 1-3: Physical Specifications 5

Table 1-4: Ensemble Drive and Software Compatibility 7

Table 2-1: Main AC Power Input Voltages and Current Requirements 11

Table 2-2: Ferrite Bead Part Numbers 12

Table 2-3: Motor Power and Feedback Connector 13

Table 2-4: TB101 ESTOP Pin Assignment 14

Table 2-5: Electrical Noise Suppression Devices 14

Table 2-6: Auxiliary I/O Interface Pin Assignment (J106) 15

Table 2-7: PSO Specifications 16

Table 2-8: PSO Pin Assignment 16

Table 2-9: Port 0 Digital Output Connector Pin Assignment 18

Table 2-10: Digital Output Specifications 18

Table 2-11: Port 0 Digital Input Connector Pin Assignment (J106) 20

Table 2-12: PS2815-4 Opto-Device Specifications 20

Table 2-13: Port 0 High Speed Digital Input Connector Pin Assignment (J106) 22

Table 2-14: Analog Output Connector Pin Assignment (J106) 23

Table 2-15: Joystick Connector Pin Assignment (J105) 25

Table 2-16: Analog Output Connector Pin Assignment (J105) 26

Table 2-17: Analog Input Connector Pin Assignment (J105) 27

Table 3-1: Preventative Maintenance 31

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EC Declaration of Conformity

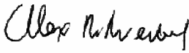
Manufacturer Aerotech, Inc.
Address 101 Zeta Drive
 Pittsburgh, PA 15238-2897
 USA
Product Ensemble QLAB
Model/Types All

This is to certify that the aforementioned product is in accordance with the applicable requirements of the following Directive(s):

2006/95/EC	Low Voltage Directive
2011/65/EU	RoHS 2 Directive

and has been designed to be in conformity with the applicable requirements of the following documents when installed and used in accordance with the manufacturer’s supplied installation instructions.

EN 61010-1	Safety requirements for electrical equipment
------------	--

Name  / Alex Weibel
Position Engineer Verifying Compliance
Location Pittsburgh, PA
Date June 30, 2015

Agency Approvals

Aerotech, Inc. Model Ensemble QLAB Motion Controllers have been tested and found to be in accordance to the following listed Agency Approvals:

Approval / Certification:	CUS NRTL
Approving Agency:	TUV SUD America Inc.
Certificate #:	U8 14 08 68995
File / Report #:	NI1405756_101
Standards:	UL 61010-1; CAN/CSA-C22.2 No. 61010-1

Safety Procedures and Warnings

The following statements apply wherever the Warning or Danger symbol appears within this manual. Failure to observe these precautions could result in serious injury to those individuals performing the procedures and/or damage to the equipment.

NOTE: Aerotech continually improves its product offerings; listed options may be superseded at any time. All drawings and illustrations are for reference only and were complete and accurate as of this manual's release. Refer to www.aerotech.com for the most up-to-date information.

WARNING:

To minimize the possibility of electrical shock, bodily injury or death the following precautions must be followed.



1. Operators must be trained before allowing them to operate the equipment.
2. All service and maintenance must be performed by qualified personnel.
3. Modification or use of this product in an unspecified manner may result in equipment damage or bodily injury (shock or death).
4. The user must read this manual, Ensemble Help file, and related documentation thoroughly before operating the equipment.
5. Cables can pose a tripping hazard. Securely mount and position all system cables to avoid potential hazards.
6. This product must be mounted securely. Improper mounting can result in injury and damage to the equipment.

DANGER:

This product contains potentially lethal voltages. To reduce the possibility of electrical shock, bodily injury or death the following precautions must be followed.

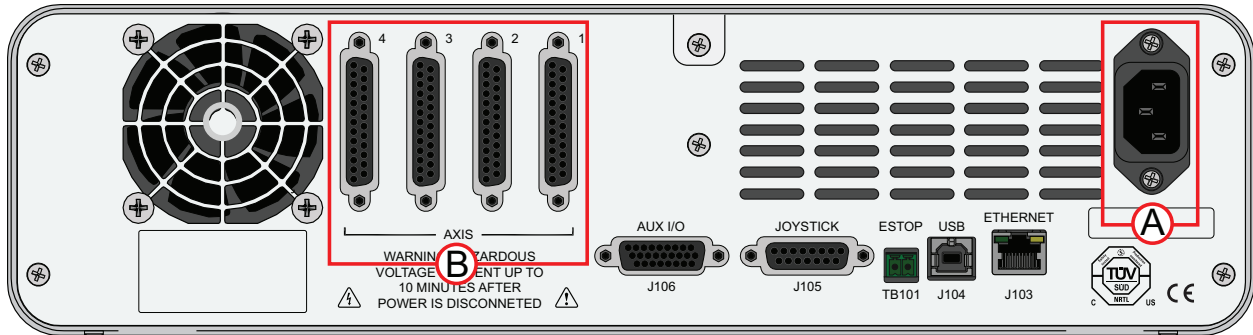


1. Do not connect or disconnect any electrical components or connecting cables while connected to a power source.
2. Disconnect electrical power before making any mechanical adjustments or performing maintenance.
3. Make sure the system is properly grounded in accordance with local electrical safety requirements.
4. Operator safeguarding requirements must be addressed during final integration of the product.

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Quick Installation Guide

This chapter describes the order in which connections and settings should typically be made to the Ensemble QLAB. If a custom interconnection drawing was created for your system (look for a line item on your Sales Order under the heading “Integration”), that drawing can be found on your software or documentation disc.



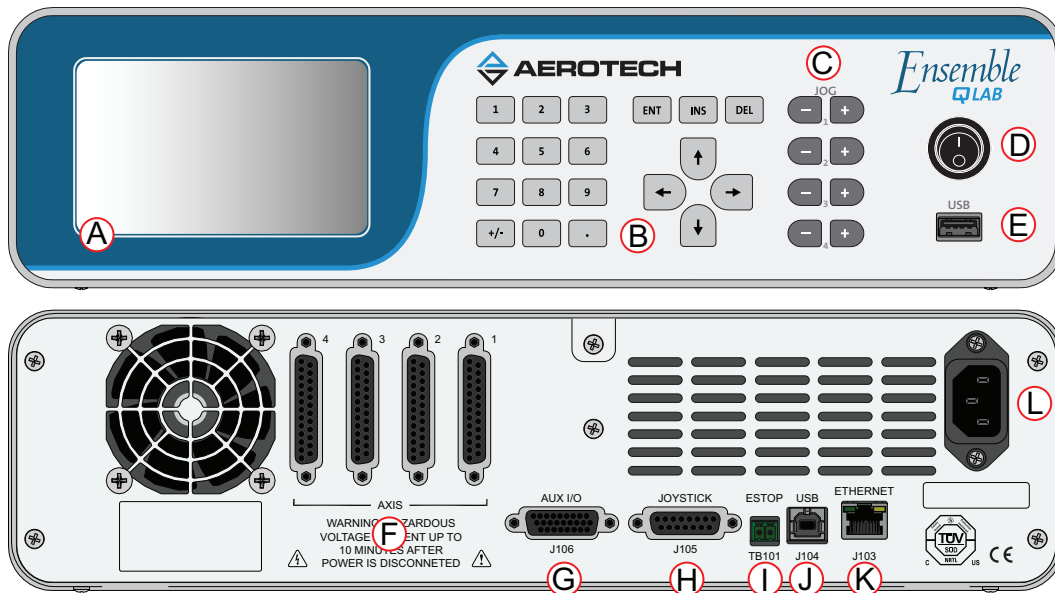
	Topic	Section
(A)	Connect the AC Power	Section 2.2.
(B)	Connect the Motor Power and Feedback	Section 2.3.

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Chapter 1: Introduction

Aerotech's Ensemble QLAB is a one to four axis desktop standalone motion controller with an integrated power supply. The Ensemble QLAB is designed for applications where ease of operation is desired without sacrificing overall system capability.

Number of Axes	4 Maximum
Digital Inputs	Four Optically Isolated; Two High Speed; One ESTOP
Digital Outputs	Four Optically Isolated
Analog Inputs	Four 16-Bit analog inputs (± 10 V; configurable for external feedback or external command input)
Analog Outputs	Five 16-Bit differential analog outputs (± 10 V; 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
Host Operating System	Windows 7 (for Remote Programming and Diagnostic Tools)



(A) Touch Screen	(D) Power Switch	(G) Auxiliary I/O port (J106)	(J) USB (host) port (J104)
(B) Keypad	(E) USB (device) port	(H) Joystick port (J105)	(K) Ethernet port (J103)
(C) Jog Buttons	(F) Motor / Feedback Connector (1-4)	(I) ESTOP port (TB101)	(L) AC Power

Figure 1-1: Ensemble QLAB Controller

Table 1-1: Ordering Options

Number of Axes (required)	
-2AX	Configured for 2 axis motor operation
-3AX	Configured for 3 axis motor operation
-4AX	Configured for 4 axis motor operation
Line Voltage (required)	
-A	115 VAC input
-B	230 VAC input
-C	100 VAC input
-D	200/208 VAC input
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 2 axes of closed-loop and 1 axis of open-loop are desired, 3 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	U.K. compatible line cord
-GERMANY	German compatible line cord
-ISRAEL	Israel compatible line cord
-INDIA	India compatible line cord
-AUSTRALIA	Australia compatible line cord
-US-115VAC	US 115 VAC compatible line cord
-US-230VAC	US 230 VAC compatible line cord
-NO-LINECORD	No line cord

The following block diagram shows a connection summary (refer to Chapter 2 for more detailed connection information).

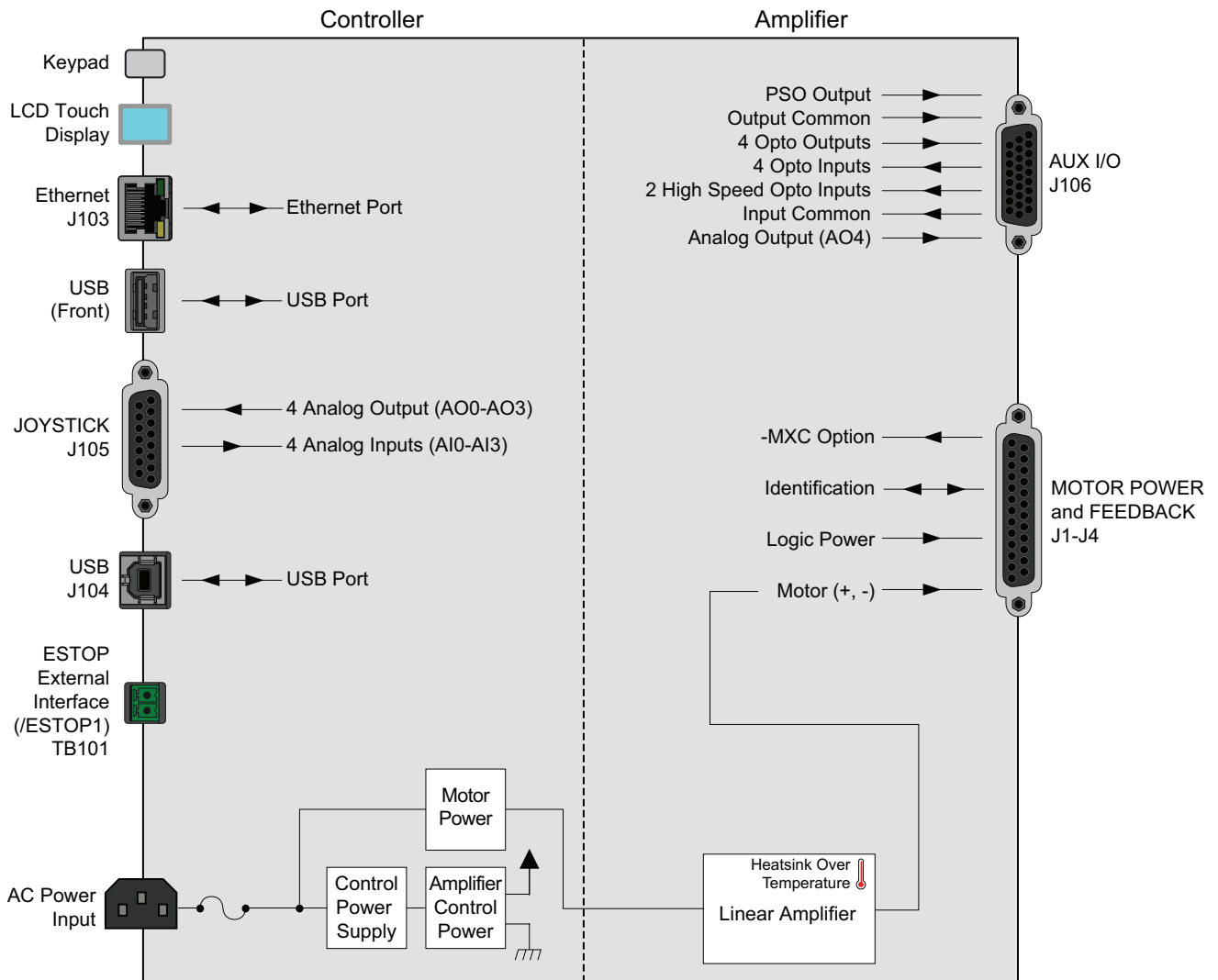


Figure 1-2: Functional Diagram

1.1. Electrical Specifications

The electrical specifications for the Ensemble QLAB are listed below.

Table 1-2: Electrical Specifications

Description		Ensemble QLAB			
Power Supply	Input Voltage	100 VAC	115 VAC	200 VAC	230 VAC
	Input Frequency	50-60 Hz			
	Inrush Current	7 A	8 A	13 A	15 A
	Maximum Continuous Input Current	2 A	2 A	1 A	1 A
Output Voltage ⁽¹⁾		-30 to +150 V			
Peak Output Current ⁽¹⁾		300 mA/channel			
Continuous Output Current ⁽¹⁾		130 mA/channel			
Warm Up Time (for optimum positioning performance and accuracy)		15 Minutes			
Continuous Power Output		20 Watts/channel (80 Watts total)			
Sensor Resolution		20-Bit (open loop or capacitive sensor (closed-loop))			
Power Amplifier Bandwidth ⁽¹⁾		2500 Hz Maximum (software selectable)			
User Power Supply Output		5 VDC (@ 500 mA)			
(1) Load Dependent					

1.2. Mechanical Specifications

The following figure shows the Ensemble QLAB package dimensions.

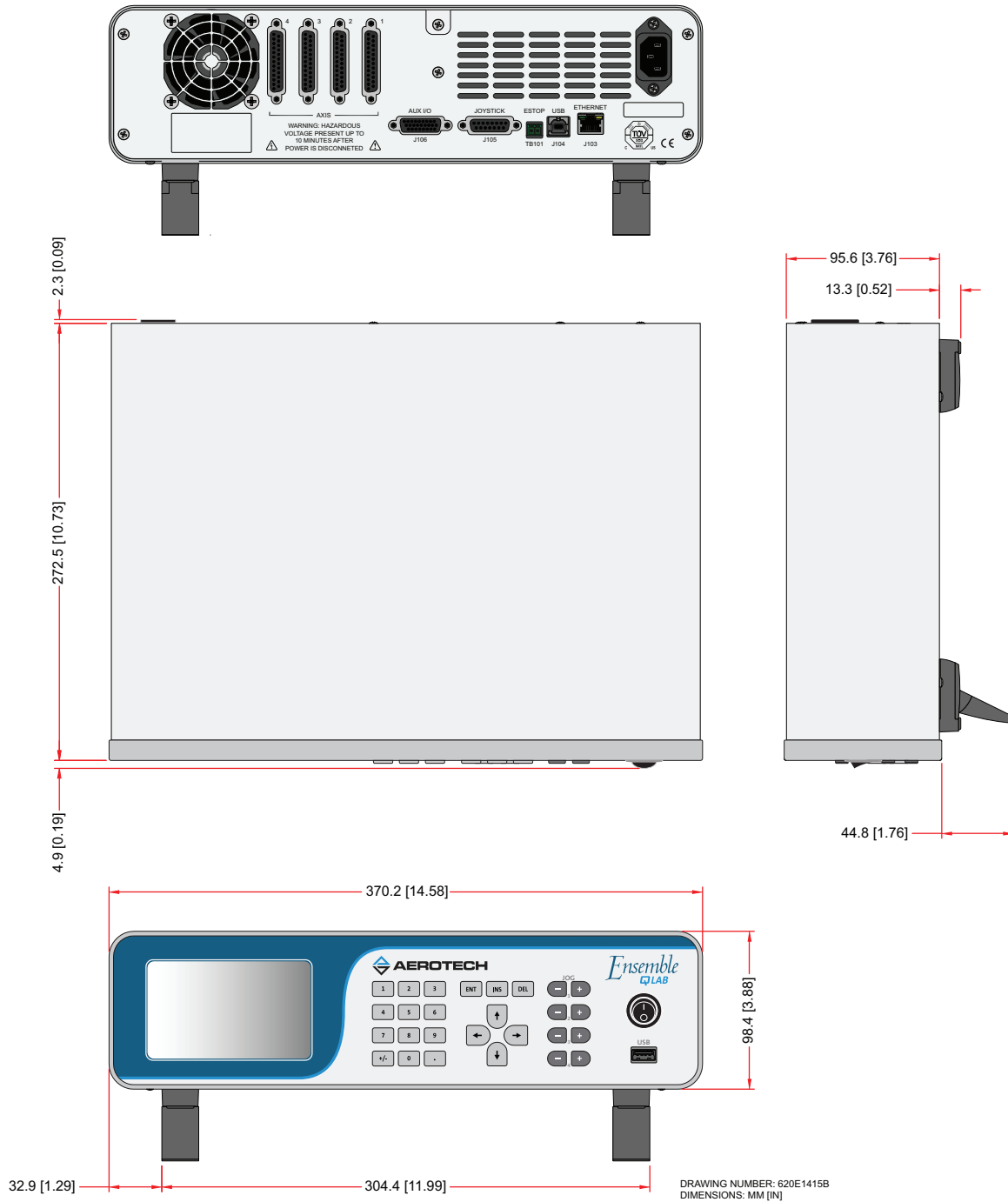


Figure 1-3: Dimensions

Table 1-3: Physical Specifications

Weight
5.7 kg [12.6 lbs]

1.3. Environmental Specifications

The environmental specifications for the Ensemble QLAB are listed below.

Ambient Temperature	Operating: 0° to 50°C (32° to 122° F)
	Storage: -30° to 85°C (-22° to 185° F)
Humidity	Maximum relative humidity is 80% for temperatures up to 31°C. Decreasing linearly to 50% relative humidity at 40°C. Non condensing.
Altitude	Up to 2000 meters.
Pollution	Pollution degree 2 (normally only non-conductive pollution).
Use	Indoor use only.

1.4. Drive and Software Compatibility

The following table lists the available Ensemble drives and which version of the Ensemble software first provided support for a given drive. Drives that list a specific version number in the **Last Software Version** column will not be supported after the listed version.

Table 1-4: Ensemble Drive and Software Compatibility

Drive Type	Firmware Revision	First Software Version	Last Software Version
CL	-	1.01	Current
	A	2.55	Current
CP	A	1.00	Current
	B	2.54	Current
Epaq ⁽¹⁾	-	1.00	Current
	A	2.55	Current
HLe	-	2.51	Current
HPe	-	2.51	Current
LAB	-	4.04	Current
ML	-	3.00	Current
MP	-	1.00	Current
	A	2.55	Current
QDe/QL/QLe	-	5.01	Current
QLAB	-	4.07	Current

(1) This section does not apply to the Epaq MR. The Epaq MR contains multiple ML or MP drives. Refer to either the ML or MP drive type to determine the value for your Epaq MR.

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Chapter 2: Installation and Configuration

This section describes the minimum hardware installation and configuration requirements for the Ensemble QLAB. This installation will provide information on AC power connections and motor wiring.



DANGER: To minimize the possibility of bodily injury or death, disconnect all electrical power prior to performing any maintenance or making adjustments to the equipment.

2.1. Unpacking the Chassis



DANGER: All electronic equipment and instrumentation are wrapped in antistatic material and packaged with desiccant. Ensure that the antistatic material is not damaged during unpacking.



DANGER: Cables should not be connected to or disconnected from the Ensemble QLAB drive chassis while power is applied, nor should any drive modules be removed or inserted into it with power applied. Doing so may cause damage to the system or its components.

Visually inspect the container of the Ensemble QLAB for any evidence of shipping damage. If any such damage exists, notify the shipping carrier immediately.

Remove the packing list from the Ensemble QLAB container. Make sure that all the items specified on the packing list are contained within the package.

All of the documentation provided with the Ensemble QLAB should be saved for future reference. Additional information about the Ensemble QLAB system is provided on the Serial and Power labels that are placed on the Ensemble QLAB chassis.

The system serial number label contains important information such as the:

- Customer order number (please provide this number when requesting product support)
- Drawing number
- System part number

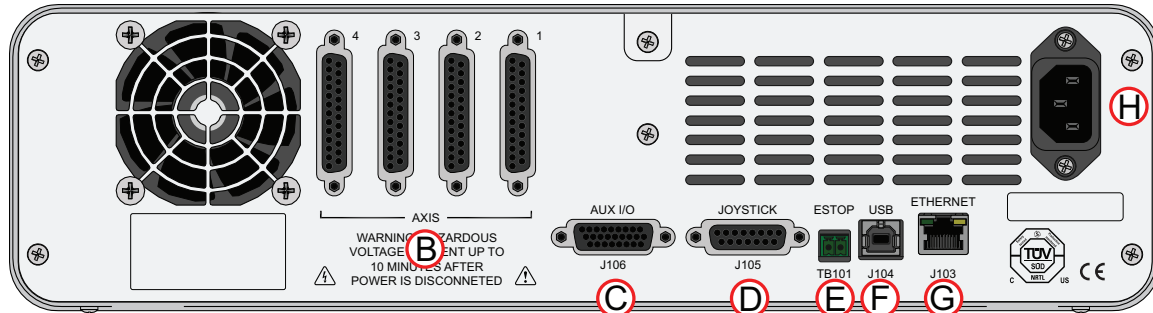
The Ensemble QLAB power label contains the factory configured AC power requirements.



DANGER: The AC power label must be changed if the AC Input Voltage is reconfigured.

2.2. Electrical Installation

Motor, power, control, and position feedback cable connections are made to the rear of the Ensemble QLAB. For a complete list of electrical specifications, refer to [Section 1.1. Electrical Specifications](#).



B	Motor Power / Feedback Connector	E	ESTOP Terminal Block
C	Aux I/O Connector	F	USB Port
D	Joystick Connector	G	Ethernet Port

Figure 2-1: Power and Control Connections



A	Power Switch
----------	--------------

Figure 2-2: Power Switch

All low voltage connections must be made using cables/wires sized for the maximum currents that will be carried. Insulation on these cables/wires must be rated at 300 V if this wiring can come into contact with wiring operating above 100 V (AC & Motor wiring). Low voltage wiring should not be bundled with AC and motor wiring to minimize signal disturbances due to EMI interference and coupling.

NOTE: The machine integrator, OEM or end user is responsible for meeting the final protective grounding requirements of the system.

NOTE: Confirm that the AC power is the correct voltage before turning on power to the Ensemble QLAB.

2.2.1. AC Power Connection

AC input power to the Ensemble QLAB is applied to the AC power receptacle that is located on the rear panel. The power cord connected to this receptacle also provides the protective earth ground connection and may serve as a Mains disconnect. The main power switch is located on the front panel of the Ensemble QLAB. Refer to [Section 1.1](#) for the electrical specifications.



WARNING: The AC power cord is the Mains disconnect.

Table 2-1: Main AC Power Input Voltages and Current Requirements

AC Input Voltage	Input Amps (maximum continuous)	Connector Port
100 VAC 50/60 Hz	2 A	
115 VAC 50/60 Hz	2 A	
200 VAC 50/60 Hz	1 A	
230 VAC 50/60 Hz	1 A	

The AC power cord to the Ensemble QLAB must be rated for the line voltage being used and have a minimum current capacity of 5 A. The insulation for the AC power wiring must be appropriately rated for the environment. The temperature rating of the insulation must be at least 80°C. Environmental conditions may necessitate the need to meet additional AC wiring requirements or specifications. AC wiring should not be bundled with signal wiring to minimize EMI coupling and interference.

2.2.2. IO and Signal Wiring Requirements

The I/O, communication, and position feedback connections are typically low amplitude signals. Wire and connectors used for signal wiring must be rated for at least 30 V and have a current capacity of at least .25 A. Wires and connectors used for low voltage power connections such as +5 V must have a current capacity of at least 1 A. In applications where there are significant wire distances, a larger wire size is required to reduce the voltage drops that occur along the wires. This increase is necessary to keep the voltage within tolerance at a remote point.

When signal wiring is in close proximity to wiring operating at voltages above 60 V, the insulation rating of the signal wiring must be rated for the higher voltage. Use signal wiring with a voltage rating of at least 300 V when it is in proximity to AC power or motor power wiring.

2.2.3. Minimizing Conducted, Radiated, and System Noise

To reduce electrical noise, observe the following motor and input power wiring techniques.

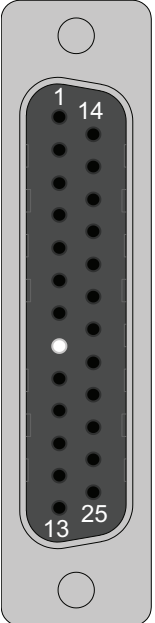
1. Use shielded cable to carry the motor current and tie the shield to earth ground.
2. Use a cable with sufficient insulation. This reduces the capacitive coupling between the leads that, in turn, reduces the current generated in the shield wire.
3. Provide strong earth ground connections to the amplifier and the motor. Offering electrical noise a low impedance path to earth ground not only reduces radiated emissions, but also improves system performance.
4. User connections to the product must be made using shielded cables with metal D-style connectors and back shells. The shield of the cables must be connected to the metal back shell in order for the product to conform to the radiated emission standards.
5. The Ensemble QLAB is a component designed to be integrated with other electronics. EMC testing must be conducted on the final product configuration.
6. Ferrite beads or Aerotech's FBF-1 or FBF-2 filter adapters, may be used on the motor leads to reduce the effects of amplifier EMI/RFI, produced by PWM (pulse width modulation) amplifiers.

Table 2-2: Ferrite Bead Part Numbers

Wire Size	Aerotech P/N	Third Party P/N
2.0 mm ² (#14 AWG)	EIZ01027	#2643002402 Elna-Fair-Rite Products
1.3 mm ² (#16 AWG)	EIZ01025	#2643250402 Elna-Fair-Rite Products
0.8 mm ² (#18 AWG)	EIZ01001	#2673000801 Elna-Fair-Rite Products
0.5 mm ² (#20 AWG)	EIZ01001	#2673000801 Elna-Fair-Rite Products

2.3. Motor and Feedback Connections

Table 2-3: Motor Power and Feedback Connector

Pin	Description	Connector
CASE	Outer Shield	
8	Connector key (to prevent improper connection)	
12	Frame ground for piezo stage	
13	Piezo Actuator High Voltage +	
25	Piezo Actuator Return -	
22	Position Feedback	
1	Signal Common	
2	Signal Common	
3	Signal Common	
7	Signal Common	
9	Signal Common	
10	Signal Common	
11	Signal Common	
15	Signal Common	
21	Signal Common	
23	Signal Common	
24	Signal Common	
4	Reserved	
5	Reserved	
6	Reserved	
14	Reserved	
16	Reserved	
17	Reserved	
18	Reserved	
19	Reserved	
20	Reserved	

Mating Connector	Aerotech P/N	Third Party P/N
25-Pin D-Connector	ECK00101	FCI DB25P064TXLF
Backshell	ECK00656	Amphenol 17E-1726-2

2.4. Emergency Stop Sense Input (TB101)

The ESTOP sense input is used to monitor the state of an external safety circuit only. This state is indicated by the software and may be used to facilitate system restart. This ESTOP sense input is not intended to be a complete safety system.



WARNING: The user is responsible for assessing operator risk levels and designing the external safety circuits appropriately.

The ESTOP input is scaled for an input voltage of 5-24 volts. Using a higher input voltage requires adding an external series resistor to limit the current to 10 milliamps.

If the ESTOP bit is enabled in the FaultMask axis parameter, the ESTOP input must be driven to prevent the ESTOP fault condition.

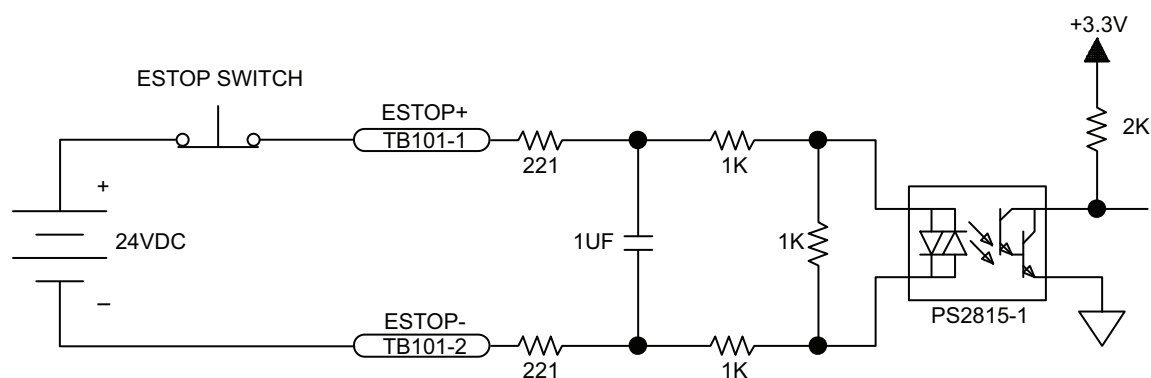


Figure 2-3: ESTOP Sense Input (TB102)

Table 2-4: TB101 ESTOP Pin Assignment

Pin	Description	In/Out/Bi	Connector Port
1	Emergency Stop Opto-Isolated Input +	Input	
2	Emergency Stop Opto-Isolated Input -	Input	

NOTE: Connecting the ESTOP input to a relay or other noise producing device requires the use of noise suppression devices such as those in Table 2-5. These devices are applied across the switched coil to suppress transient voltages.

Table 2-5: Electrical Noise Suppression Devices

Device	Aerotech P/N	Third Party P/N
RC (.1uf / 200 ohm) Network	EIC240	Electrocube RG1782-8
Varistor	EID160	Littelfuse V250LA40A

2.5. Auxiliary I/O Connector (J106)

The Auxiliary I/O connector provides 6 digital inputs, 1 analog and 4 digital outputs, and PSO outputs.

Table 2-6: Auxiliary I/O Interface Pin Assignment (J106)

Pin	Description	Connector
1	AUX Sine +	
2	AUX Sine -	
3	High Speed Input 4 +	
4	High Speed Input 4 -	
5	High Speed Input 5 +	
6	High Speed Input 5 -	
7	Opto-Isolated Output 0	
8	Opto-Isolated Output 1	
9	Opto-Isolated Output 2	
10	AUX Cosine +	
11	AUX Cosine -	
12	+5 Volt (500 mA max)	
13	Analog Input 0 + (Differential)	
14	Analog Input 0 - (Differential)	
15	Common for Opto-Isolated Outputs 0-3	
16	Opto-Isolated Output 3	
17	Opto-Isolated Input 0	
18	Opto-Isolated Input 1	
19	Aux Marker - / PSO ⁽²⁾	
20	Aux Marker + / PSO ⁽²⁾	
21	Common	
22	Analog Output 0	
23	Analog Common	
24	Common for Opto-Isolated Inputs 0-3	
25	Opto-Isolated Input 2	
26	Opto-Isolated Input 3	

1. Pins not shown are reserved.
 2. For PSO, see [Section 2.5.1](#).

Mating Connector	Aerotech P/N	Third Party P/N
Connector	ECK01259	Kycon K86-AA-26P
Backshell	ECK01022	Amphenol 17-1725-2

NOTE: These items are provided as a set under the Aerotech P/N: MCK-26HDD.

2.5.1. Position Synchronized Output (PSO)

The Ensemble QLAB includes a Position Synchronized Output (PSO) feature. The PSO output is available on the dual function Laser Output 1 signal lines (optically-isolated open drain/open source format or as RS-422 differential signals). Issuing any PSOCNTROL command automatically enables the auxiliary marker as the PSO output.

The PSO can be programmed to generate an output synchronized to the feedback position, typically used to fire a laser or sequence an external device. Trigger signals may be derived from the standard feedback channel, auxiliary feedback channel, or a software trigger. The synchronized output pulse is generated using high-speed hardware, allowing minimal latency (200 nanoseconds) between the trigger condition and the output.

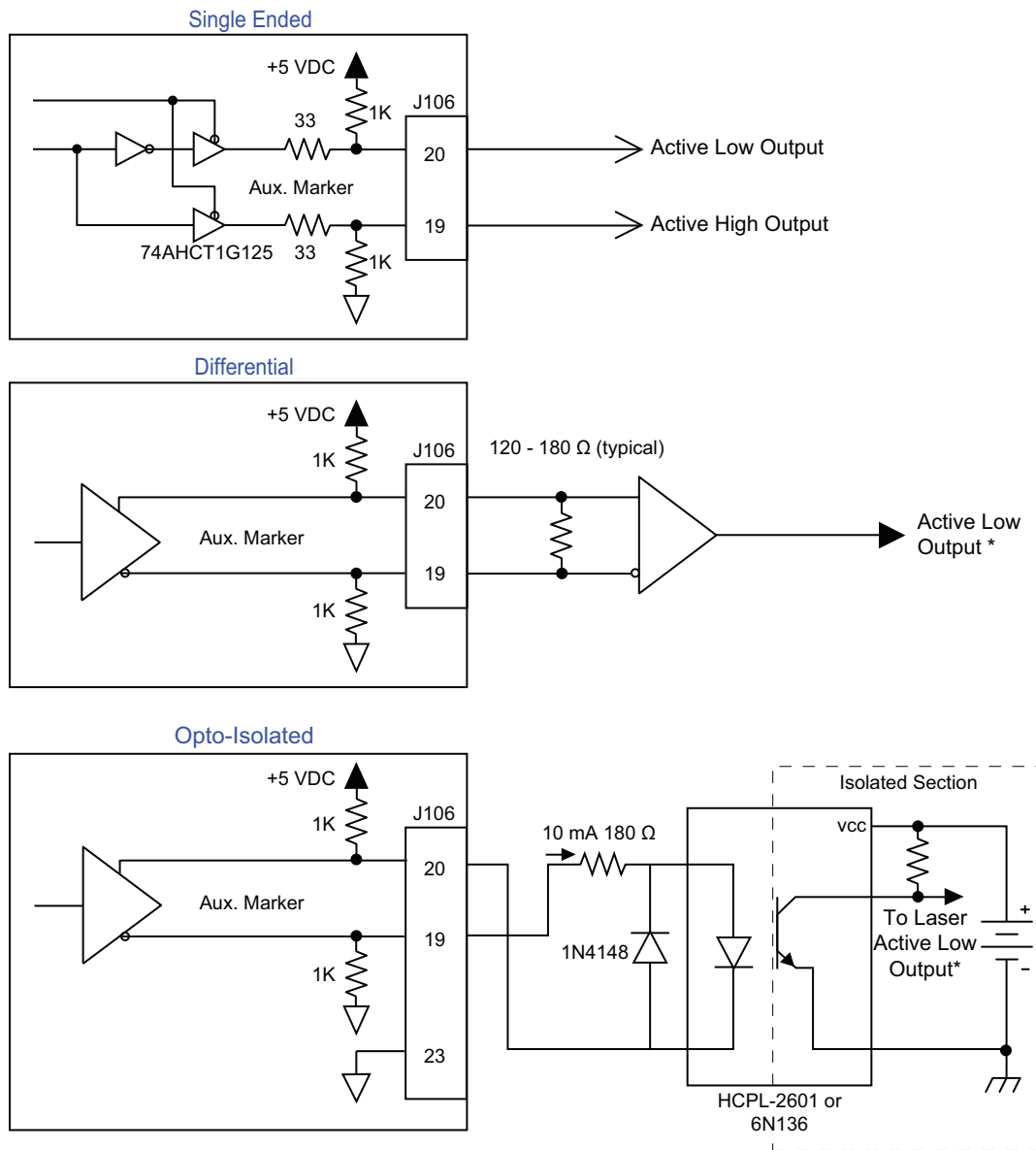
The PSO can track feedback with a maximum data (count) rate of 33 MHz.

Table 2-7: PSO Specifications

Specification	Value
Maximum Frequency	12.5 MHz

Table 2-8: PSO Pin Assignment

Pin	Description
19	Aux Marker - / PSO -
20	Aux Marker + / PSO +
23	Analog Common



* Active low output shown. Opposite polarity available by reversing connections to Pins 19 and 20.

Figure 2-4: PSO Interface

2.5.2. Opto-Isolated Outputs 0-3

All outputs are rated for 24 VDC and 80 mA per output and can be connected as current sinking (Figure 2-5) or current sourcing (Figure 2-6).

Table 2-9: Port 0 Digital Output Connector Pin Assignment

Pin	Description
7	Opto-Isolated Output 0
8	Opto-Isolated Output 1
9	Opto-Isolated Output 2
15	Common for Opto-Isolated Outputs 0-3
16	Opto-Isolated Output 3

Table 2-10: Digital Output Specifications

PS7214-1A Opto Device Specifications	Value
Maximum Voltage	24 V maximum
Maximum Sink/Source Current	80 mA/output @ 20 °C; 60 mA/output @ 50 °C
Output Saturation Voltage	2.75 V at maximum current
Output Resistance	33 Ω
Rise / Fall Time	250 usec (2K pull up to 24V)
Maximum Output Frequency	1 kHz

NOTE: Outputs must be connected as all sourcing or all sinking.

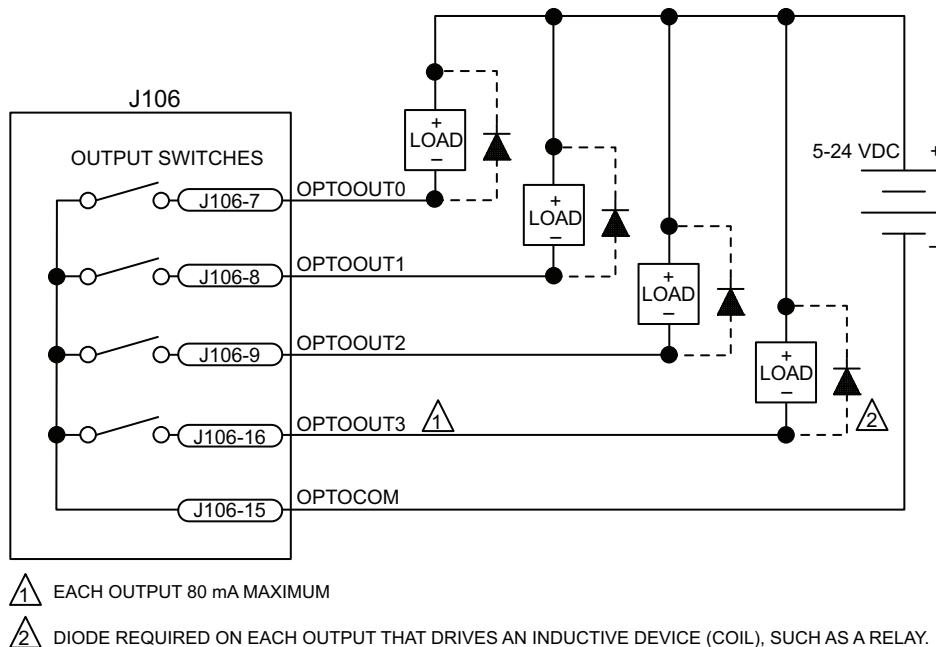


Figure 2-5: Outputs Connected in Current Sinking Mode (J106)

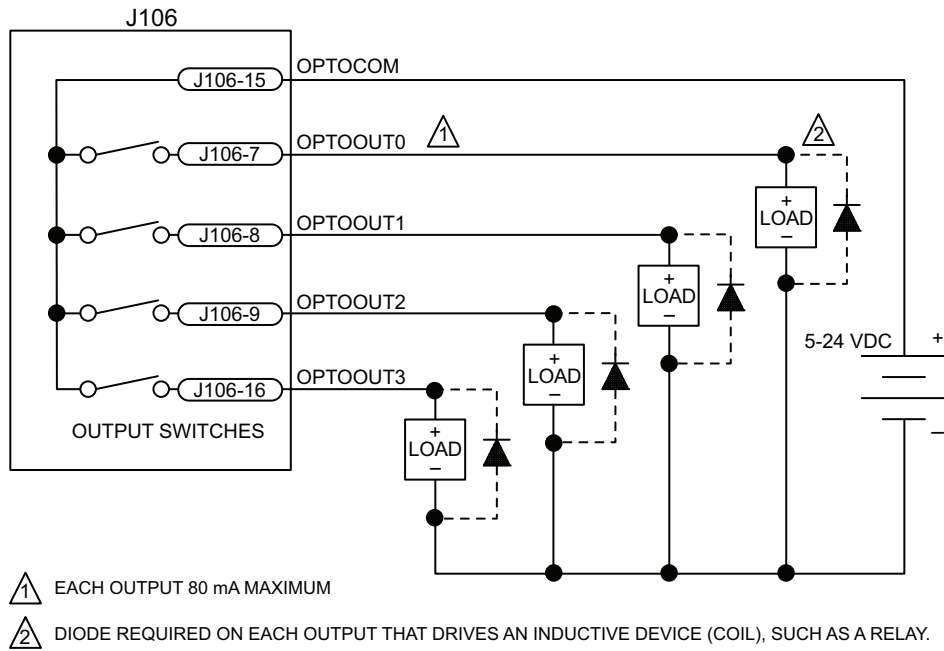


Figure 2-6: Outputs Connected in Current Sourcing Mode (J106)

2.5.3. Opto-Isolated Inputs 0-3

User inputs 0-3 are scaled for an input voltage of 5-24 VDC.

Figure 2-7 and Figure 2-8, respectively, illustrate how to connect a device in current sinking and sourcing current modes.

Table 2-11: Port 0 Digital Input Connector Pin Assignment (J106)

Pin	Description
17	Opto-Isolated Input 0
18	Opto-Isolated Input 1
24	Common for Opto-Isolated Inputs 0-3
25	Opto-Isolated Input 2
26	Opto-Isolated Input 3
1. Pins not shown are reserved.	

Table 2-12: PS2815-4 Opto-Device Specifications

Input Voltage	Approximate Input Current	Turn On Time	Turn Off Time
+5 V	1 mA	200 usec	2000 usec
+24 V	6 mA	4 usec	1500 usec

NOTE: Inputs must be connected in the all sourcing or all sinking configuration.

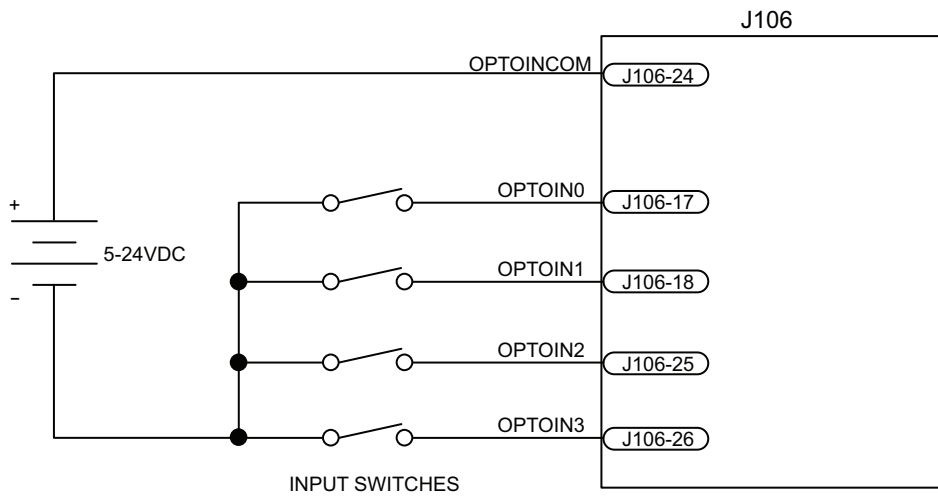


Figure 2-7: Inputs Connected in Current Sinking Mode (J106)

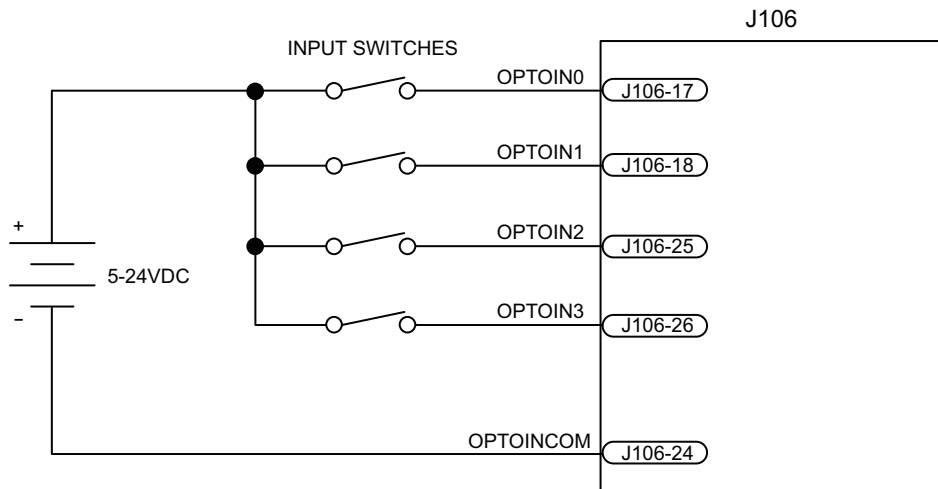


Figure 2-8: Inputs Connected in Current Sourcing Mode (J106)

2.5.4. High-Speed User Inputs 4-5

The high-speed inputs are scaled for an input voltage of 5- 24 VDC. The high-speed inputs are isolated by an HCPL-0630 and have a typical delay of 50 ns.

Table 2-13: Port 0 High Speed Digital Input Connector Pin Assignment (J106)

Pin	Description
3	High Speed Input 4 +
4	High Speed Input 4 -
5	High Speed Input 5 +
6	High Speed Input 5 -

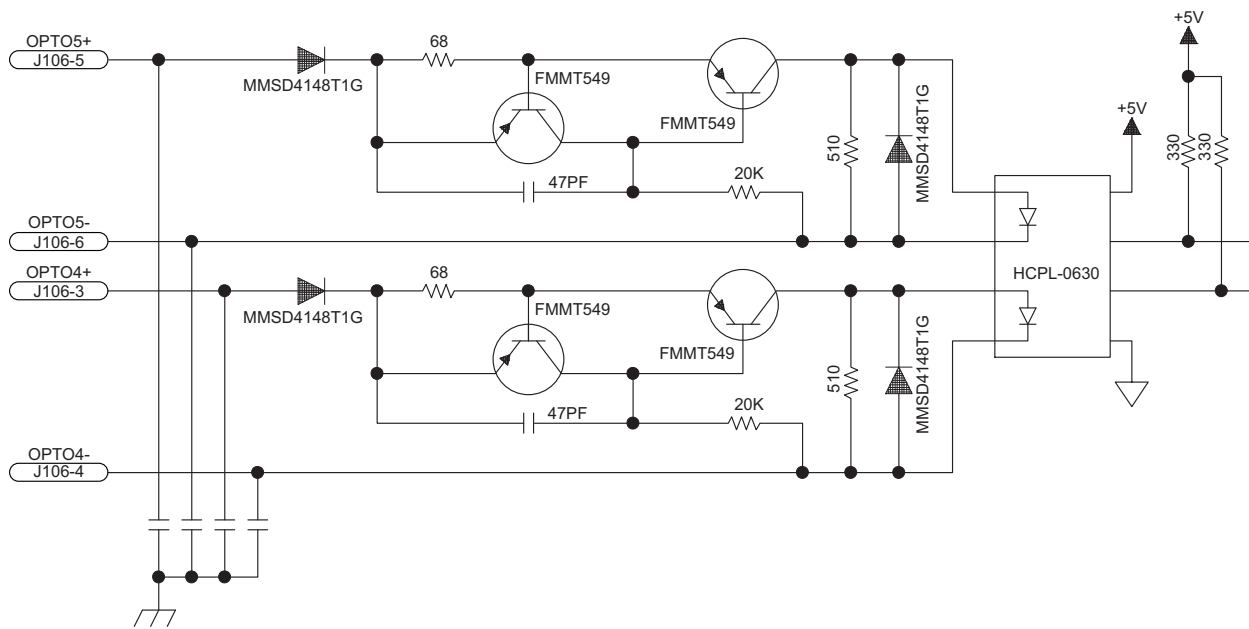


Figure 2-9: High Speed User Inputs (J106)

2.5.5. Analog Output 4

Analog Output 4 produces a single-ended output in the range of ± 10 volts with a resolution of $305 \mu\text{V}$ (16-bit). The maximum recommended output current is 5 mA (2 k Ohm load). The analog output voltage is referenced to J106-23.

Refer to [Section 2.6.1.](#) for Analog Outputs 0-3.

Table 2-14: Analog Output Connector Pin Assignment (J106)

Pin	Description
22	Analog Output 0
23	Analog Common

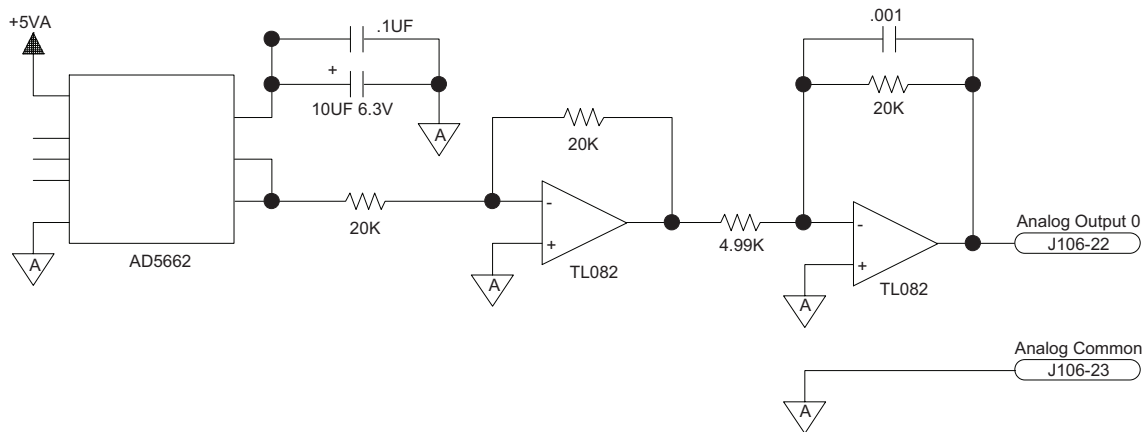


Figure 2-10: Analog Output 4 (J106)

2.6. Joystick Interface (J105)

Aerotech joysticks J1 (NEMA12 (IP54) rated) and JBV are powered from 5V and have a nominal 2.5V output in the center detent position. Three buttons are used to select axis pairs and speed ranges. An optional interlock signal is used to indicate to the controller that the joystick is present. Joystick control will not activate unless the joystick is in the center location. Third party devices can be used provided they produce a symmetric output voltage within the range of 0V to +5V.

Refer to the Ensemble Help File for programming information about how to change joystick parameters.

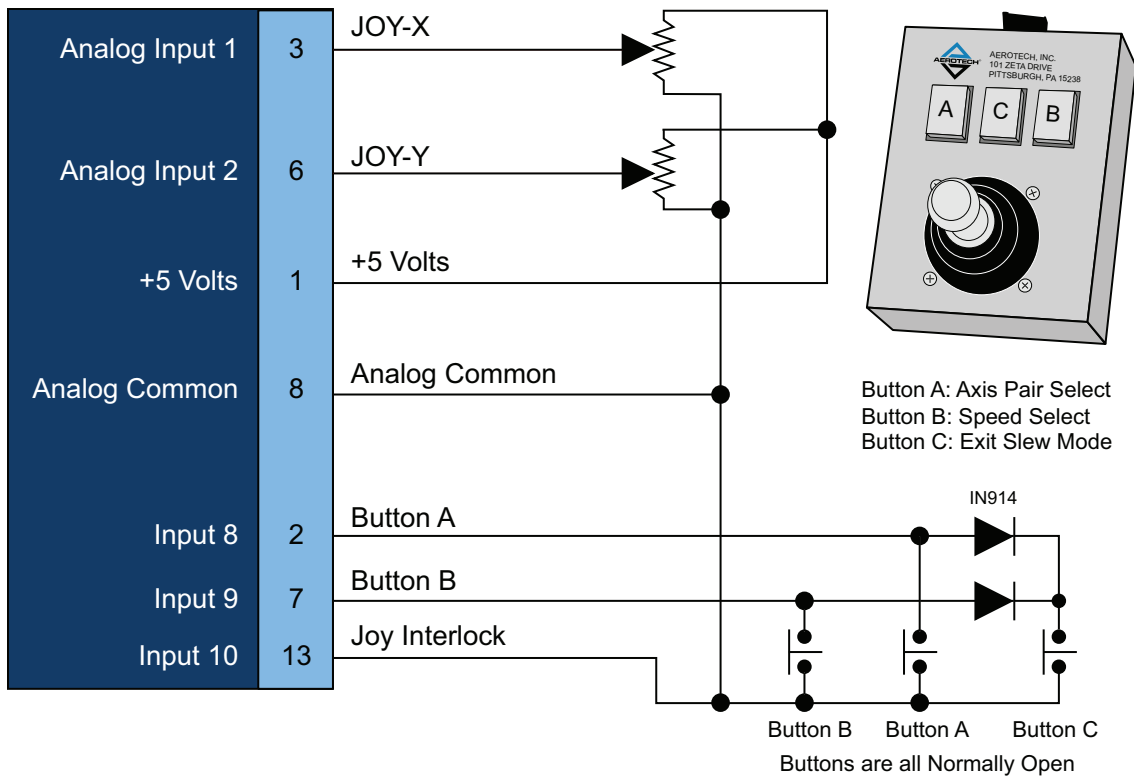
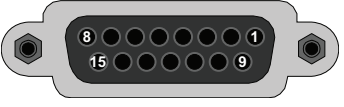


Figure 2-11: Joystick Interface

Table 2-15: Joystick Connector Pin Assignment (J105)

Pin	Description	In/Out/Bi	Connector
1	+5 Volt Power to joystick	Output	
2	Button A (Axis Select)	Input	
3	Analog Input 1 [Joystick X]	Input	
4	Analog Common	--	
5	Analog Input 0	Input	
6	Analog Input 2 [Joystick Y]	Input	
7	Button B (Speed Select)	Input	
8	Analog Common	--	
9	Analog Output 0	Output	
10	Analog Output 1	Output	
11	Analog Input 3	Input	
12	Analog Common	--	
13	Joystick Interlock Input	Input	
14	Analog Output 2	Output	
15	Analog Output 3	Output	

Mating Connector	Aerotech P/N	Third Party P/N
15-Pin D-Connector	ECK00100	FCI DA15P064TXLF
Backshell	ECK01022	Amphenol 17E-1725-2

2.6.1. Analog Outputs (0-3) (J105)

Analog Outputs 0-3 produce a single-ended output in the range of ± 10 V with a resolution of $305 \mu\text{V}$ (16-bit). The maximum recommended output current is 5 mA (2 k Ohm load). The analog output voltage is referenced to an Analog Common pin.

Refer to [Section 2.5.5](#) for Analog Output 4.

Table 2-16: Analog Output Connector Pin Assignment (J105)

Pin	Description	In/Out/Bi
4	Analog Common	--
8	Analog Common	--
9	Analog Output 0	Output
10	Analog Output 1	Output
12	Analog Common	--
14	Analog Output 2	Output
15	Analog Output 3	Output

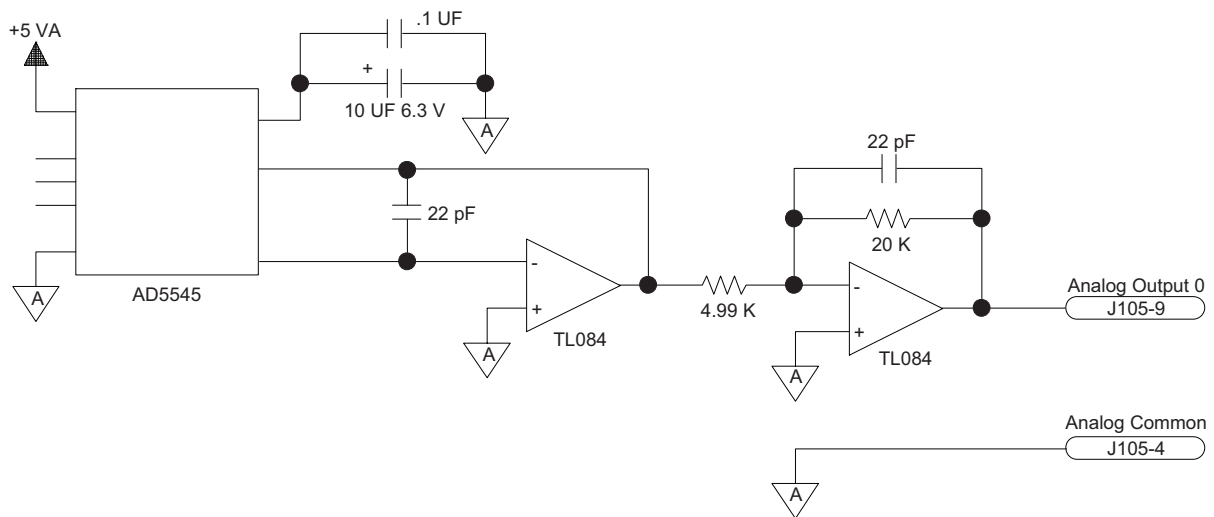


Figure 2-12: Analog Outputs 0-3 (J105)

2.6.2. Analog Inputs (0-3) (J105)

Analog Inputs 0-3 are 16-bit single-ended (non-differential) inputs that accept a voltage in the range of +/-10V with a resolution of 305uV. Signals outside of this range may damage the input. To read a signal from channel 0, connect the signal common of the source to analog common (pin 8, Analog Common) and the analog source signal to analog input 0 (pin 5, Analog Input 0).

Table 2-17: Analog Input Connector Pin Assignment (J105)

Pin	Description	In/Out/Bi
3	Analog Input 1 [Joystick X]	Input
4	Analog Common	--
5	Analog Input 0	Input
6	Analog Input 2 [Joystick Y]	Input
8	Analog Common	--
11	Analog Input 3	Input
12	Analog Common	--

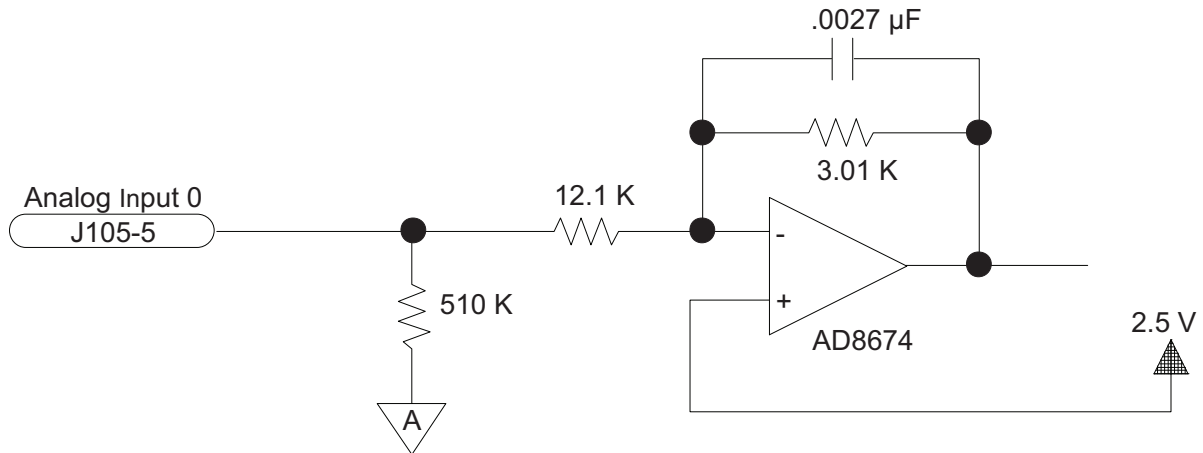


Figure 2-13: Analog Input (J105)

2.7. Communication (Ethernet and USB)

Either USB or Ethernet can be used to connect any of the supplied software applications or a custom application built with the supplied .NET library to the controller. Ethernet sockets are also available for general ASCII communication with another hardware device. Refer to the Help for more information about the ASCII interface.

2.7.1. USB Interface

The USB connection is established through a Type B female connector labeled USB on the Ensemble QLAB (refer to [Figure 2-14](#)). This can be accomplished by one of these two methods:

Method 1: Directly connect to the PC with a standard USB cable. The cable connector type must be Type A or Type B male depending on the PC, and Type B male on the Ensemble QLAB.

Method 2: Connect through a USB hub. The cable connector type must be Type A or Type B male depending on the hub, and Type B male on the Ensemble QLAB.

Method 1 is the most commonly used. Method 2 is necessary only when the number of Ensemble QLABs to be connected is larger than the number of available USB ports on the PC.

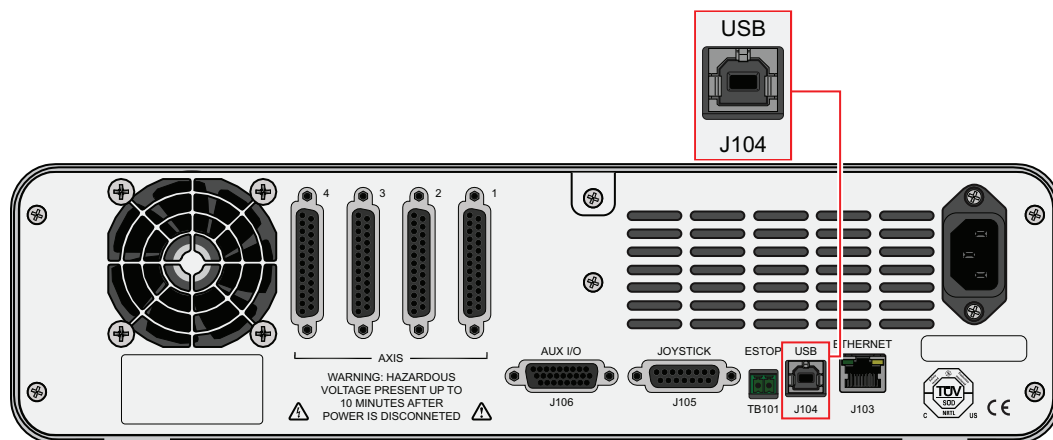


Figure 2-14: USB Connection Location (for PC Communication)

2.7.2. Ethernet Interface

The Ethernet interface is the high-speed communications media to the Ensemble QLAB. Command and configuration information is sent through this interface.

The Ethernet connection is established through the RJ-45 connector labeled ETHERNET on the Ensemble QLAB (refer to [Figure 2-15](#)). Connection is accomplished by one of these two methods:

Method 1: Directly connect to the PC with an RJ-45 crossover cable.

Method 2: Connect through a network with a standard RJ-45 cable.

Method 1 is the most secure because it guarantees that the only members of the network are the Ensemble QLAB and the PC. This type of connection is not feasible unless the PC has two Ethernet cards. If the PC cannot be connected to an external network, Aerotech recommends Method 2.

Method 2 is a more typical configuration. The network can be a local network (the PC and Ensemble QLAB are connected through a hub or switch) or remote (the devices are connected through a router). When connecting to a remote network, a crossover cable cannot be used; instead, there must be a hub, switch, or router interface between the PC and the Ensemble QLAB.

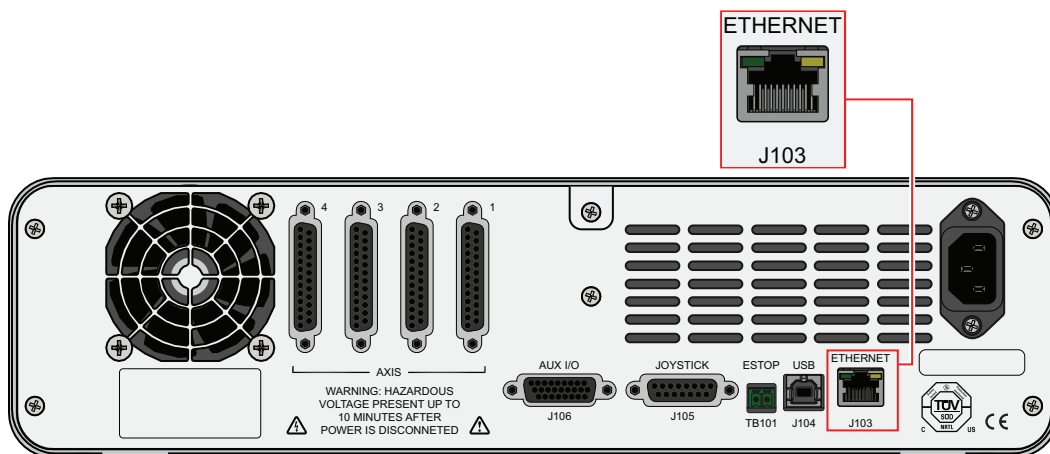


Figure 2-15: Ethernet Connection Location

2.8. PC Configuration and Operation Information

For additional information about Ensemble QLAB and PC configuration, hardware requirements, programming, utilities and system operation refer to the Ensemble Help file.

Chapter 3: Maintenance



DANGER: For your own safety and for the safety of the equipment, do not remove the cover of the Ensemble QLAB or attempt to access its internal components.

There is no reason to remove the cover or access the internal components. The Ensemble QLAB does not have any user-configurable switches or jumpers. Internal fuses are not user-replaceable.

NOTE: Having to replace a fuse indicates a more serious problem with the system or setup; consult Aerotech for assistance.

3.1. Preventative Maintenance

The Ensemble QLAB and external wiring should be inspected monthly. Inspections may be required at more frequent intervals, depending on the environment and use of the system.



DANGER: Always disconnect the Mains power connection before opening the Ensemble QLAB chassis.

Table 3-1: Preventative Maintenance

Check	Action to be Taken
Visually Check chassis for loose or damaged parts / hardware. Note: Internal inspection is not required.	Parts should be repaired as required. If internal damage is suspected, these parts should be checked and repairs made if necessary.
Inspect cooling vents.	Remove any accumulated material from vents.
Check for fluids or electrically conductive material exposure.	Any fluids or electrically conductive material must not be permitted to enter the Ensemble QLAB.
Visually inspect all cables and connections.	Tighten or re-secure any loose connections. Replace worn or frayed cables. Replace broken connectors.

Cleaning

The Ensemble QLAB chassis can be wiped with a clean, dry, soft cloth. The cloth may be slightly moistened if required with water or isopropyl alcohol to aid in cleaning if necessary. In this case, be careful not to allow moisture to enter the Ensemble QLAB or onto exposed connectors / components. Fluids and sprays are not recommended because of the chance for internal contamination, which may result in electrical shorts and/or corrosion. The electrical power must be disconnected from the Ensemble QLAB while cleaning. Do not allow cleaning substances or other fluids to enter the Ensemble QLAB or to get on to any of the connectors. Avoid cleaning labels to prevent removing the label information.

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Appendix A: Warranty and Field Service

Aerotech, Inc. warrants its products to be free from harmful defects caused by faulty materials or poor workmanship for a minimum period of one year from date of shipment from Aerotech. Aerotech's liability is limited to replacing, repairing or issuing credit, at its option, for any products that are returned by the original purchaser during the warranty period. Aerotech makes no warranty that its products are fit for the use or purpose to which they may be put by the buyer, whether or not such use or purpose has been disclosed to Aerotech in specifications or drawings previously or subsequently provided, or whether or not Aerotech's products are specifically designed and/or manufactured for buyer's use or purpose. Aerotech's liability on any claim for loss or damage arising out of the sale, resale, or use of any of its products shall in no event exceed the selling price of the unit.

THE EXPRESS WARRANTY SET FORTH HEREIN IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, BY OPERATION OF LAW OR OTHERWISE. IN NO EVENT SHALL AEROTECH BE LIABLE FOR CONSEQUENTIAL OR SPECIAL DAMAGES.

Return Products Procedure

Claims for shipment damage (evident or concealed) must be filed with the carrier by the buyer. Aerotech must be notified within thirty (30) days of shipment of incorrect material. No product may be returned, whether in warranty or out of warranty, without first obtaining approval from Aerotech. No credit will be given nor repairs made for products returned without such approval. A "Return Materials Authorization (RMA)" number must accompany any returned product(s). The RMA number may be obtained by calling an Aerotech service center or by submitting the appropriate request available on our website (www.aerotech.com). Products must be returned, prepaid, to an Aerotech service center (no C.O.D. or Collect Freight accepted). The status of any product returned later than thirty (30) days after the issuance of a return authorization number will be subject to review.

Visit <http://www.aerotech.com/service-and-support.aspx> for the location of your nearest Aerotech Service center.

Returned Product Warranty Determination

After Aerotech's examination, warranty or out-of-warranty status will be determined. If upon Aerotech's examination a warranted defect exists, then the product(s) will be repaired at no charge and shipped, prepaid, back to the buyer. If the buyer desires an expedited method of return, the product(s) will be shipped collect. Warranty repairs do not extend the original warranty period.

Fixed Fee Repairs - Products having fixed-fee pricing will require a valid purchase order or credit card particulars before any service work can begin.

All Other Repairs - After Aerotech's evaluation, the buyer shall be notified of the repair cost. At such time the buyer must issue a valid purchase order to cover the cost of the repair and freight, or authorize the product(s) to be shipped back as is, at the buyer's expense. Failure to obtain a purchase order number or approval within thirty (30) days of notification will result in the product(s) being returned as is, at the buyer's expense.

Repair work is warranted for ninety (90) days from date of shipment. Replacement components are warranted for one year from date of shipment.

Rush Service

At times, the buyer may desire to expedite a repair. Regardless of warranty or out-of-warranty status, the buyer must issue a valid purchase order to cover the added rush service cost. Rush service is subject to Aerotech's approval.

On-site Warranty Repair

If an Aerotech product cannot be made functional by telephone assistance or by sending and having the customer install replacement parts, and cannot be returned to the Aerotech service center for repair, and if Aerotech determines the problem could be warranty-related, then the following policy applies:

Aerotech will provide an on-site Field Service Representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs. For warranty field repairs, the customer will not be charged for the cost of labor and material. If service is rendered at times other than normal work periods, then special rates apply.

If during the on-site repair it is determined the problem is not warranty related, then the terms and conditions stated in the following "On-Site Non-Warranty Repair" section apply.

On-site Non-Warranty Repair

If any Aerotech product cannot be made functional by telephone assistance or purchased replacement parts, and cannot be returned to the Aerotech service center for repair, then the following field service policy applies:

Aerotech will provide an on-site Field Service Representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs and the prevailing labor cost, including travel time, necessary to complete the repair.

Service Locations

<http://www.aerotech.com/contact-sales.aspx?mapState=showMap>

USA, CANADA, MEXICO	CHINA	GERMANY
Aerotech, Inc. Global Headquarters Phone: +1-412-967-6440 Fax: +1-412-967-6870	Aerotech China Full-Service Subsidiary Phone: +86 (21) 3319 7715	Aerotech Germany Full-Service Subsidiary Phone: +49 (0)911 967 9370 Fax: +49 (0)911 967 93720
JAPAN	TAIWAN	UNITED KINGDOM
Aerotech Japan Full-Service Subsidiary Phone: +81 (0)50 5830 6814 Fax: +81 (0)43 306 3773	Aerotech Taiwan Full-Service Subsidiary Phone: +886 (0)2 8751 6690	Aerotech United Kingdom Full-Service Subsidiary Phone: +44 (0)1256 855055 Fax: +44 (0)1256 855649

Have your customer order number ready before calling.

Appendix B: Revision History

Rev #	Date	Description
1.01.00	June 30, 2015	<ul style="list-style-type: none">• Added RoHS statement to the EC Declaration of Conformity• Added Agency Approvals section• Updated Motor and Feedback connector pin definitions: Section 2.3.• Updated PSO section: Section 2.5.1.• Updated Joystick Interface: Section 2.6.
1.00.00	November 8, 2013	New Manual

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Index

	2			
2006/95/EC		vii		
	A			
AC Power Connection		11		
Altitude		6		
Ambient Temperature		6		
Analog Input 0		27		
Analog Output 4		23		
Auxiliary I/O Connector (J106)		15		
	C			
Check chassis for loose or damaged parts / hardware		31		
Check for fluids or electrically conductive material exposure		31		
Cleaning		31		
Continuous Output Current		4		
Continuous Power Output		4		
	D			
Digital Output Specifications		18		
dimensions		5		
Drive and Software Compatibility		7		
	E			
Electrical Specifications		4		
Emergency Stop Sense Input (TB101)		14		
EN 61010-1		vii		
Environmental Specifications		6		
ESTOP		14		
Ethernet Interface		29		
	F			
Feedback Connections		13		
Functional Diagram		3		
fuse		31		
			H	
			High-Speed User Inputs 4-5	22
			Humidity	6
			I	
			inspect	9
			inspect all cables and connections	31
			Inspect cooling vents	31
			Inspection	31
			Installation and Configuration	9
			Introduction	1
			J	
			J106	15
			Joystick Interface	24
			M	
			Maintenance	31
			Mechanical Design	5
			Motor and Feedback Connections	13
			O	
			optional joysticks	24
			Opto-Isolated Inputs 0-3	20
			Opto-Isolated Outputs 0-3	18
			Order Options	2
			Output Voltage	4
			Overview	1
			P	
			Peak Output Current	4
			Pollution	6
			Position Synchronized Output	16
			Power Amplifier Bandwidth	4
			Power Supply	4
			Preventative Maintenance	31
			PS2815-4 Opto-Device Specifications	20

PS7214-1A Opto Device Specifications	18
PSO	16
Q	
Quick Installation Guide	xi
S	
Sensor Resolution	4
shipping damage	9
T	
TB101	14
U	
USB Interface	28
Use	6
User Power Supply Output	4