



MLMux4

User's Guide

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Revision History

Date	Rev.	Comments
2/3/2022	A	Initial Release

How To Use This Guide

*Notes and Hints appear in boxes like this. **Notes** contain information you need to know to ensure that you use certain features correctly, minimizing any errors. **Hints** indicate tips on how to use certain features more effectively, such as any shortcuts to certain functions.*

When you see a keyboard key's name in bold angle brackets (< >), this indicates a particular keystroke you must make in order to perform certain functions.

When you see two bolded locations separated by a vertical bar character (**Location 1 | Location 2**), this indicates that the second location can be accessed only after the first. For example, an Import option that is available in a File drop-down menu in a toolbar would be denoted with **File | Import**.

References to other Canary Systems® user guides, third-party documentation or other external sources will appear bolder and italicized. For example: For more information, see the ***MultiLogger User's Guide***.

Related Documentation

Visit the User's Guide page on the Canary System's website to view and download the most current versions of our technical documentation and user's guides at (<https://canarysystems.com/support/users-guides/>).

The following documents contain information that may be useful throughout the course of this manual:

- ***MLWebHardware User's Guide*** for additional information on data collection and import.
- ***MultiLogger Installation Guide*** for information on installation of MLSuite®.
- ***MLRemote User's Guide*** for information on connecting to an MLRemote® controller.
- ***MLWeb User's Guide*** for additional information on data visualization and presentation.
- The ***Canary Systems End-Users License Agreement*** can be found on the Canary Systems website under Software Downloads at (<https://canarysystems.com/support/software-downloads/>).

Technical Support

Canary Systems may be contacted directly via phone or email. Ongoing support via phone, email, and virtual meeting platforms such as Microsoft Teams® and Zoom is available through the purchase of a support contract. Please contact Canary Systems® directly for more information.

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Our website also provides numerous Application Notes, the latest versions of our software components, and all the latest User's Guides. Click the **Support** menu at www.canarysystems.com to access these resources.

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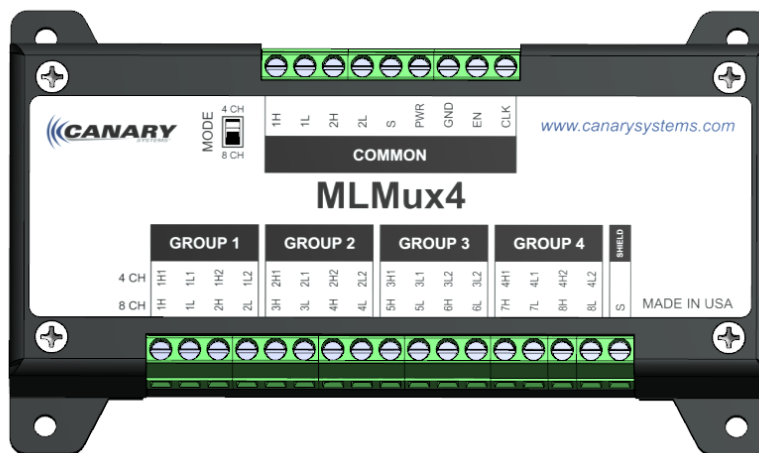
Section 1 – Introduction

1.1 Overview

The Canary Systems® MLMux4 expands the number of instruments that may be read by a compatible Automatic Data Acquisition System (ADAS). It supports two switching modes, 4-channels by four wire, or 8-channels by two wire. A switch on the face of the module configures the switching between 4/8 channel mode.

The MLMux4 utilizes advanced high-reliability components such as industrial grade screw clamp terminal blocks, solid state relays and a flash microcontroller from Microchip Devices to help ensure years of reliable and trouble-free operation in most environments (components are rated to standard long term temp range of at least -40°C to +85°C). The use of low contact resistance relays means almost universal instrument support, a degree of lightning protection on the control lines, and virtually infinite channel isolation.

A view of the MLMux4 is shown below.



Warranty for the MLMux4 is applicable for one year from the date of shipment. The warranty does not cover failure by improper installation, misuse, or by nature including, but not limited to; flood, lightning, fire, or other catastrophe. Should you encounter problems with your MLMux4, contact Canary Systems at the address listed in the front of this manual.

1.2 Specifications

General

Power requirements: 4-20 VDC
 Active Current with one Channel Active: 2mA @ 12VDC
 Standby Current: 1.2mA @ 12VDC
 Quiescent Current: 0.6 μ A
 Control Line Input Levels: 3.3 - 12V (16V Max)
 Contact Resistance: 0.8 Ω
 Maximum Switched Current: 2.5 A @60 VCD
 Operating temperature: -40 to +85° C (-40 to +185° F)

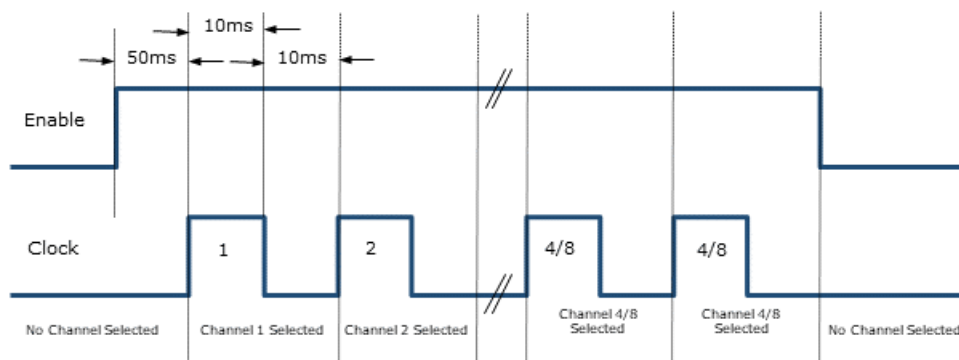
Section 2 – Operation and Installation

2.1 Operation Details

The MLMux4 is controlled by an MLRemote Module or other Datalogger Controller. This is done using either a single digital signal or two digital control signals. The operation of the MLMux4 is simple enough that virtually any device capable of controlling one or two 5V digital TTL/CMOS type signals can be used to control the multiplexer.

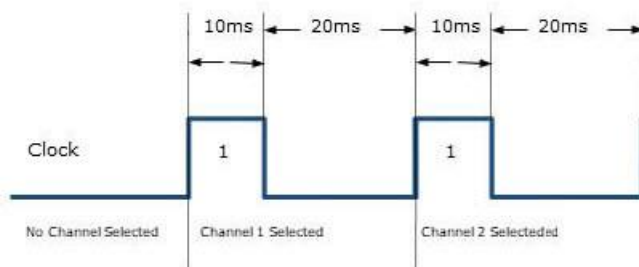
Two Digital Control Signals

The timing diagram depicted below describes how the two digital signals are used to control the MLMux4.



Single Digital Control Signal

In the case of a single control line, only the Clock terminal is used. The Enable signal is not required, and the Enable terminal must remain unconnected. The device control differs only in the increased channels turn-on time. The timing diagram below depicts how a single digital control signal is used.



Note - Number of pulses depends on switch configuration.

In the case of the 4 or 8-channel modes, the maximum number of pulses to advance through all the channels is 4 and 8, respectively.

The channel switching mode is selected using the switch located on the front of the MLMux4 module.

The table shown below describes the 2 possible configurations:

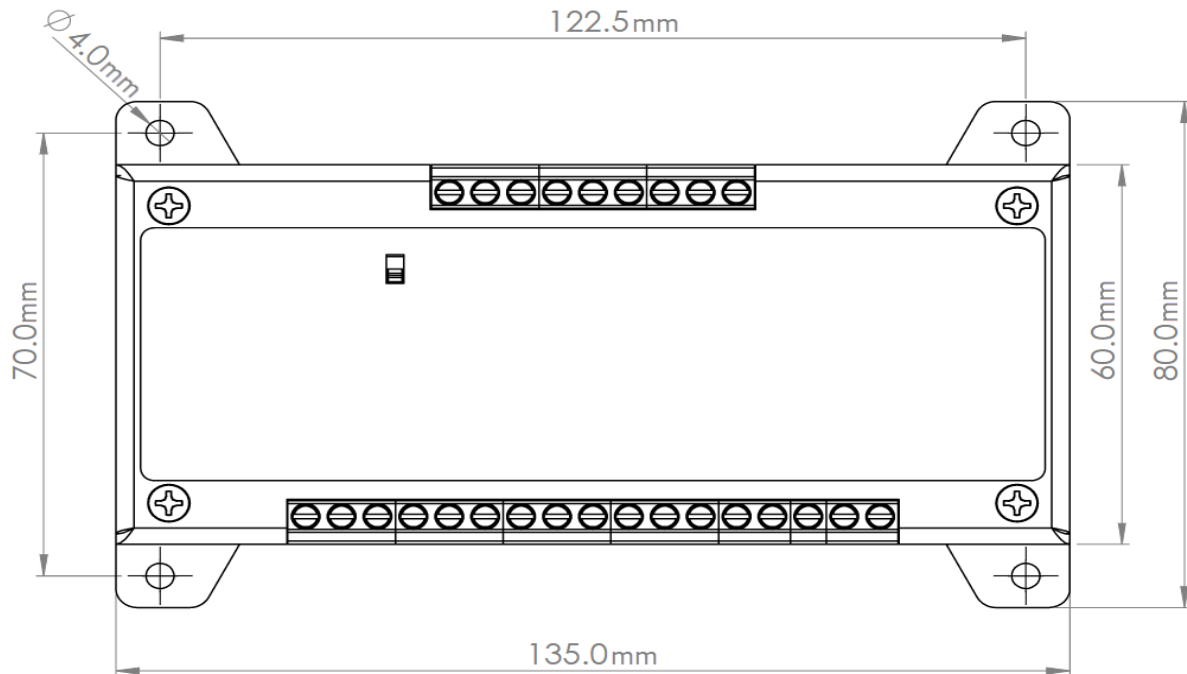
Settings	Mode	Description
4 CH  8 CH	4-Channel (Default)	Standard 4-channel mode for switching: 4-wire instruments
4 CH  8 CH	8-Channel	Alternate 8-channel mode for switching: 2-wire instruments

2.2 Enclosure Installation

The MLMux4 can be mounted to any surface with (4) 6-32 mounting screws.

Hint - The MLMux4 comes pre-installed when ordered with the MLRemote.

The placement of the mounting holes is depicted in the illustration below.



2.3 Input Protection

The MLMux4 is equipped with lightning protection components on the control signals. As a result, care must be exercised in the installation to maximize their effectiveness. Specifically, an effective earth ground must be attached to the MLMux4 shield (S) for proper protection. Most vibrating wire instruments also have lightning protection components.

The Enable and Clock inputs can be connected to 12 volts directly without damaging the MLMux4. The connections to the MLRemote module or datalogger should be disconnected and insulated from contacting other electrical connections.

Hint - The MLRemote module comes in two different power options. One option is a 6V alkaline battery pack and the second option is a 12V lithium battery pack.

The 12V tolerant inputs allow the MLMux4 to be field tested without the need for a datalogger connection. The enable can be wired to the 12V input while the clock input can be carefully touched to 12V. This action will cause the MLMux4 to step channels for each touch to 12 volts.

2.4 Controller Connections

The MLMux4 is connected to the controller using the common terminals at the top of the device.

The table below lists typical connections:

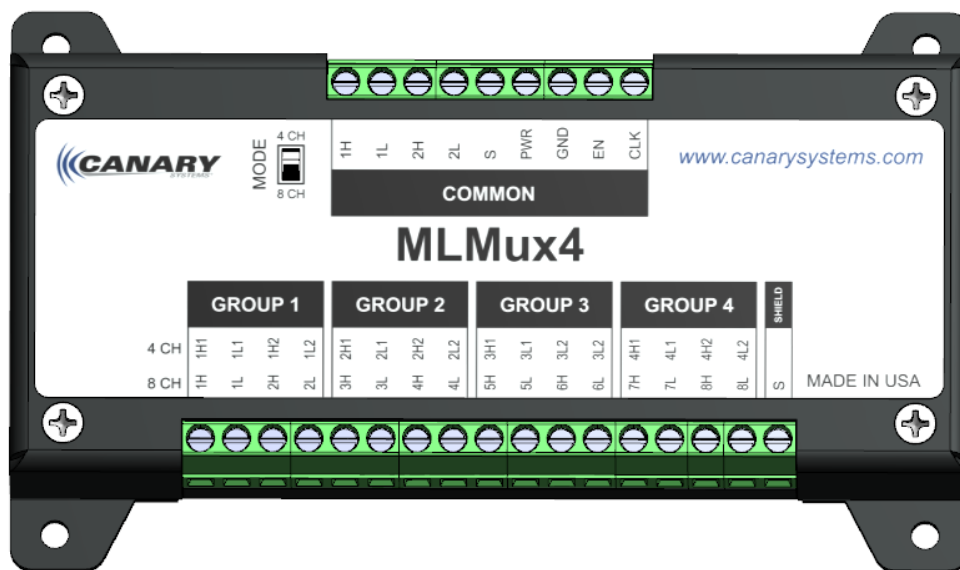
MLMux4 4-Channel	MLMux4 8-Channel	Description
H1	H1	High side of CH1
L1	L1	Low side of CH1
H2	Not Used	High side of CH2
L2	Not Used	Low side of CH2
S	S	Cable Shield
PWR	PWR	12V Power
GND	GND	Ground
EN	EN	Enable
CLK	CLK	Clock

The figure below shows an MLMux4 wired to an MLRemote using the four-channel mode using an MLMux4 harness. The MLMux4 harness includes nine multi colored wires that are precut and zip tied to fit the MLRemote / MLMux4 connection. By default, the MLMux4 ships in 4-channel mode.



2.5 Instrument Connection

Instruments are connected to the MLMux4 using the connectors in Group 1, Group 2, Group 3, and Group 4 at the bottom of the MLMux4. The wiring will vary depending on the Mode selection.



The following table illustrates typical connection techniques for each of the operating modes.

4 Channel (4-wire)	
8 Channel (2-wire)	

Connecting Vibrating Wire Instruments to the MLMux4

Each VW sensor typically has four wires and a shield. The wires are inserted into the terminal on the MLMux4. Record the serial number of the sensor so that the gage factor is known for each channel. The gage factor is taken from the calibration sheet for each sensor.

The typical colors are as follows:

- Red** – H1 Coil +
- Black** – L1 Coil -
- White** – H2 Thermistor +
- Green** – L2 Thermistor -

The shields should be twisted together and connected to the S terminal of the MLMux4.

Other Sensor Connections

For information on connecting other types of sensors, contact Canary Systems.

2.6 MLWebHardware Configuration

To configure MLWebHardware to use the MLMux4 navigate to the Configure Multiplexer form of the device containing the MLMux4 to be configured and **Add** a new Multiplexer.

See the ***MLWebHardware Users Guide*** for details on access MLWebHardware and configuring new device programs.

The screenshot displays the MLWebHardware web interface. The top header shows the CANARY logo, version 2019.11.0.45, and a user profile for 'admin'. A left sidebar contains navigation links: HOME, Server, SUPPORT, MLDAQ, MCLOG, MLTDR, MLBase, NH_MLBASE_1 (selected), and MLSAA. The main content area is titled 'MULTIPLEXER #1' and includes 'Save', 'Cancel', and 'Configure Channels' buttons. The configuration form for 'MULTIPLEXER #1' contains the following fields:

MULTIPLEXER #1	
Active	☒
Mux Type	CAN MLMux4
Channels	4 (4 wires)
Enable	DOut1
Clock	DOut2

1. Select **CAN MLMux4** as the Mux Type on the **Multiplexer** form.
2. Select either **4 (4wires)** or **8 (2 wires)** from the Channels dropdown. This should match the switch settings of the MLMux4.
3. Be sure to match the **Enable** and **Clock** settings of the form with the physical wiring.
4. **Save** the new Multiplexer.

Channels are then configured by pressing the **Configure Channels** button. See the ***MLWebHardware Users Guide*** or the MLRemote Users guide for details on channel configuration.

Section 3 – Troubleshooting

3.1 Troubleshooting Flowchart

If you cannot obtain readings using the MLMux4 or the readings are unstable then see the troubleshooting flowchart below for help in determining the nature of the problem.

