# Multiplexers

4

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√ OptoHub
√ MUX8
√ Communication Diagram

RS-485 communication multiplexers provide a star topology wiring scheme to easily install and troubleshoot downstream devices. Please note that the MUX8 was previously refered to as the CI-8 in older versions of this manual.

OptoHub

The OptoHub is the ideal solution for almost any application. In addition to providing a star topology wiring scheme, it also optically isolates each communication port, thereby adding an extra layer of protection and safeguarding the overall integrity of the entire system. The isolation eliminates common problems associated with ground potential that often exist in retrofit applications.

By incorporating star topology, the OptoHub expands a single RS-485 communication channel into 8 separate 2-wire RS-485 channels.
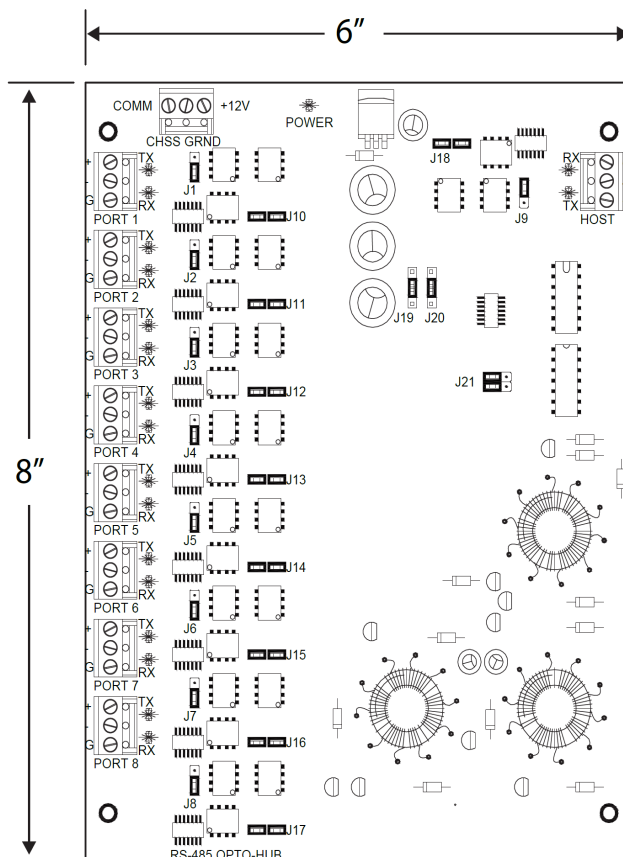
Installation

To install the OptoHub:

1. If required, **mount** the OptoHub in an Open Options or Life Safety Power enclosure.

2. **Wire** the upstream host communication.

3. **Wire** the downstream communication.

Default Settings

Each OptoHub board ships with the following default configuration:
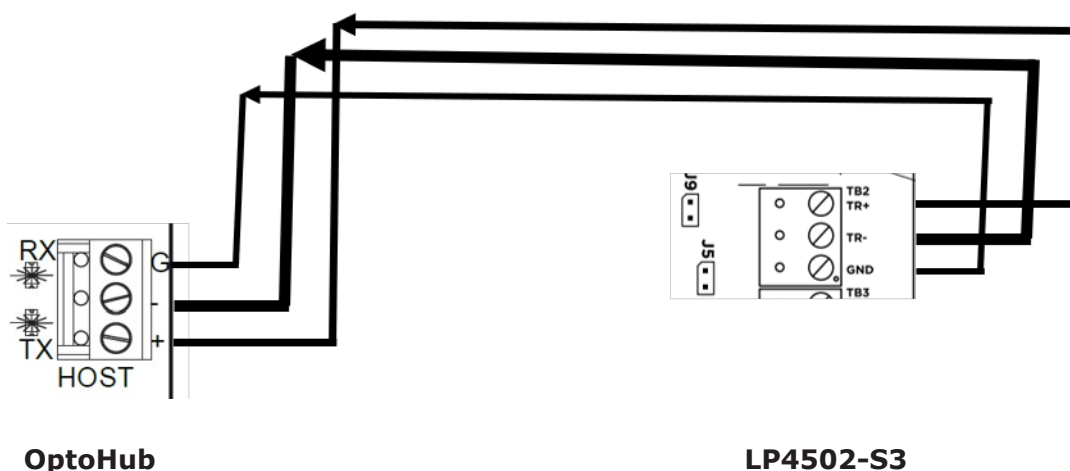
- Termination: None
- Baud Rate: 38400

Power Supply

The OptoHub accepts a 12 Vdc ± 15% power source for its power input. The power source should be installed as close to the OptoHub as possible.

Wire the power input at the top of the OptoHub board by connecting the +DC, NC, and GND ports with a minimum 18 AWG twisted-pair cable.

Host Communication Wiring

The upstream host port, located on the right side of the OptoHub board, can be configured as RS-232 or RS-485 by installing the corresponding jumpers (refer to the Jumper Settings table on page 4-4).

Connect the TR+, TR-, and GND ports on the terminal block labeled HOST. The diagram below illustrates the wiring scheme from the SIO port on the LP controller to the host port on the OptoHub.

OptoHub   **LP4502-S3**

Downstream Communication Wiring

The downstream ports (Port 1 through Port 8) are individually isolated for power and data communication. Each port has an option for termination as well as a jumper for disabling the receiving leg of the communication channel to preserve the integrity of the bus. All downstream ports are 2-wire RS-485 (+, -) with a connection for signal ground (G).

Connect the TR+, TR-, and GND wires on Ports 1-8. The diagram below illustrates the wiring scheme from Port 1 on the OptoHub to the communication port on an MR52-S3 subcontroller. This wiring scheme is consistent for all downstream ports on the OptoHub and all Open Options subcontrollers.

OptoHub   **MR52-S3**
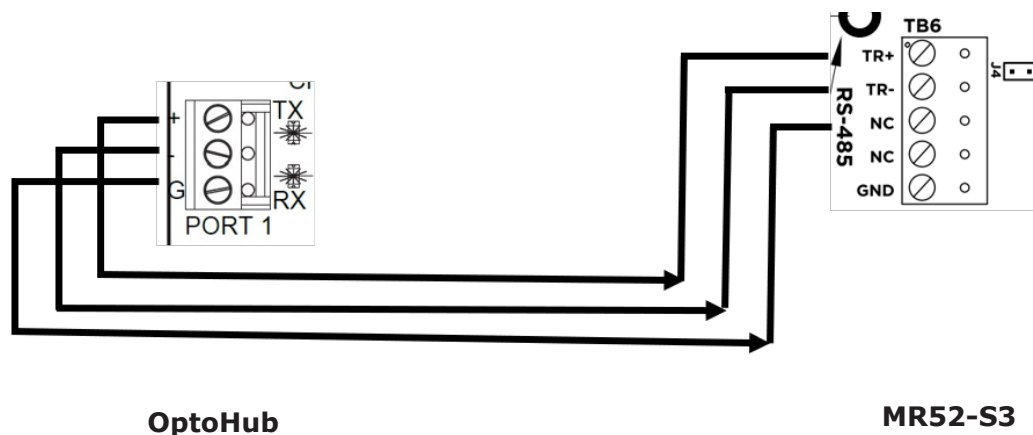
Jumper Settings

Use the jumpers on the OptoHub to configure various options on the board. These jumpers enable or disable RX on each port, set RS-485 termination on ports, adjust the baud rate (timing), and configure the host port for RS-232 or RS-485. A physical address is not associated with the OptoHub.

The jumper settings for the OptoHub are described in the table below, and page 4-1 illustrates the physical location of the jumpers in relation to the board.

Jumper(s)	Set At	Selected
J1-J9	TOP	Port RX is Enabled (Factory Default)
	BOTTOM	Port RX is Disabled
J10-J18	ON	RS-485 Termination is ON
	OFF	RS-485 Termination is OFF
J19, J20	TOP	9.6 Kbps
	CENTER	115 Kbps
	BOTTOM	38.4 Kbps
	OFF	230 Kbps
J21	RIGHT	Host Port is RS-232* (J18 must be OFF)
	LEFT	Host Port is RS-485

*Recommended setting (even when communicating to SIO devices at 38.4 Kbps)

Terminal Block Connections

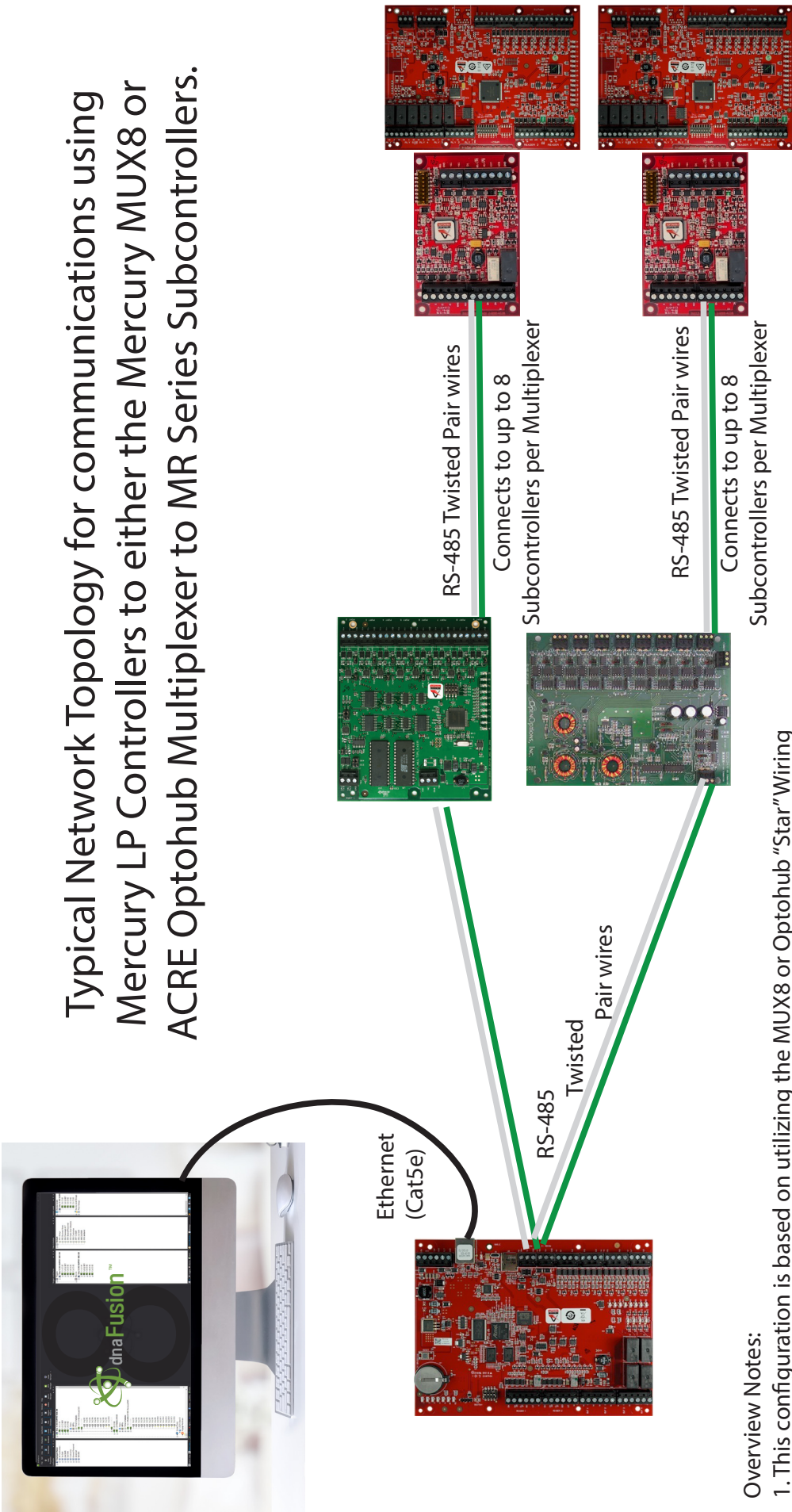The table below describes the terminal blocks for the OptoHub.

Terminal Block	Description	Connections
Host	Host Communication Port	GND
		TR-
		TR+
Common	Power Input	CHSS
		GRND
Port 1-8	Downstream Communication Ports	TR+
		TR-
		GND

Specifications

Primary Power:	*Voltage:*	12 Vdc ± 15%
	Current:	300 mA max.
Interfaces:	*Host Port:*	RS-232*/RS-485, jumper selectable
	Ports 1-8:	RS-485, transmit/receive
Wire Requirements:	*Power:*	1 twisted pair, 18 AWG min.
	RS-485:	4,000' (1,200 m) max., 24 AWG min.
	RS-232:	**25' (7.6 m) max., 24 AWG min.**
Mechanical:	*Dimensions:*	6" (152 mm) W x 8" (203 mm) L x 1" (25 mm) H
	Weight:	10 oz. (290 g) nominal
Environmental:	*Temperature:*	0 to 70 °C, operating / -55 to +85 °C, storage
	Humidity:	0 to 95% RHNC

Specifications are subject to change without notice.

*The RS-232 functionality has NOT been evaluated by UL.

Typical Network Topology for communications using Mercury LP Controllers to either the Mercury MUX8 or ACRE Optohub Multiplexer to MR Series Subcontrollers.

RS-485 Twisted Pair wires

Connects to up to 8 Subcontrollers per Multiplexer

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RS-485 Twisted Pair wires

Ethernet (Cat5e)

Overview Notes:

1. This configuration is based on utilizing the MUX8 or Optohub "Star" Wiring configuration with each subcontroller terminated to its own 2-Wire RS-485 line to the Optohub or the Mercury MUX8 Multiplexer.

2. Subcontrollers can be multi-dropped off the Controller on any downstream RS-485 Path.

3. Each of the 4 2-wire RS-485 ports off the Controller should not exceed a distance of 4,000' of wire at termination. Voltage line drop should always be assessed when using a Multiplexer out to 4,000'.

4. The controller supports Ethernet 10/100 connections to the host computer. Please see each controllers specifications for specifics on network limitations.

MUX8 Multiplexer

The MUX8 multiplexer provides a star topology and is an excellent choice for distributing RS-485 communication to downstream devices where there is little to no danger of ground potential. It allows an LP to expand a single communication port to eight 2-wire or four 4-wire RS-485 channels. All nine 2-wire channels on the multiplexer are universal in regard to master/slave devices.

The MUX8 interfaces upstream with the LP controller via RS-232 or RS-485; it interfaces downstream with RS-485 devices (MR50-S3, MR52-S3, MR16OUT, MR16IN) on Ports 2 through 9. Each downstream port can connect to a maximum of eight devices.
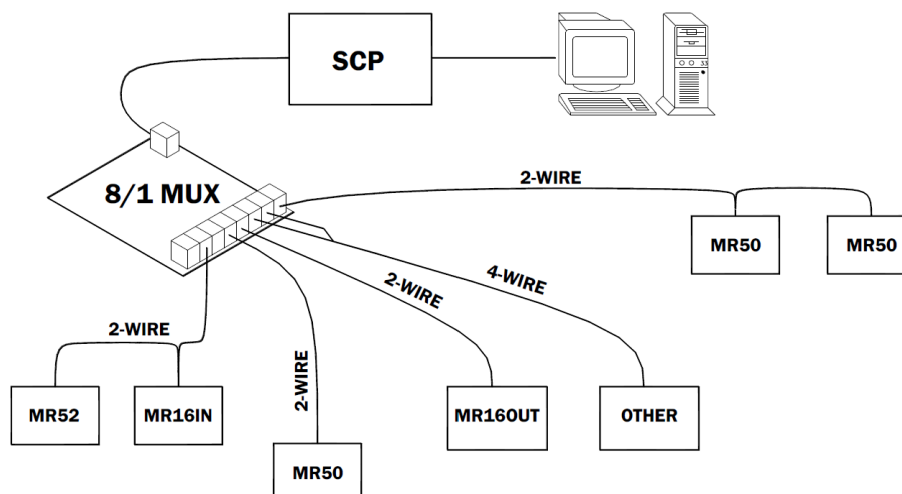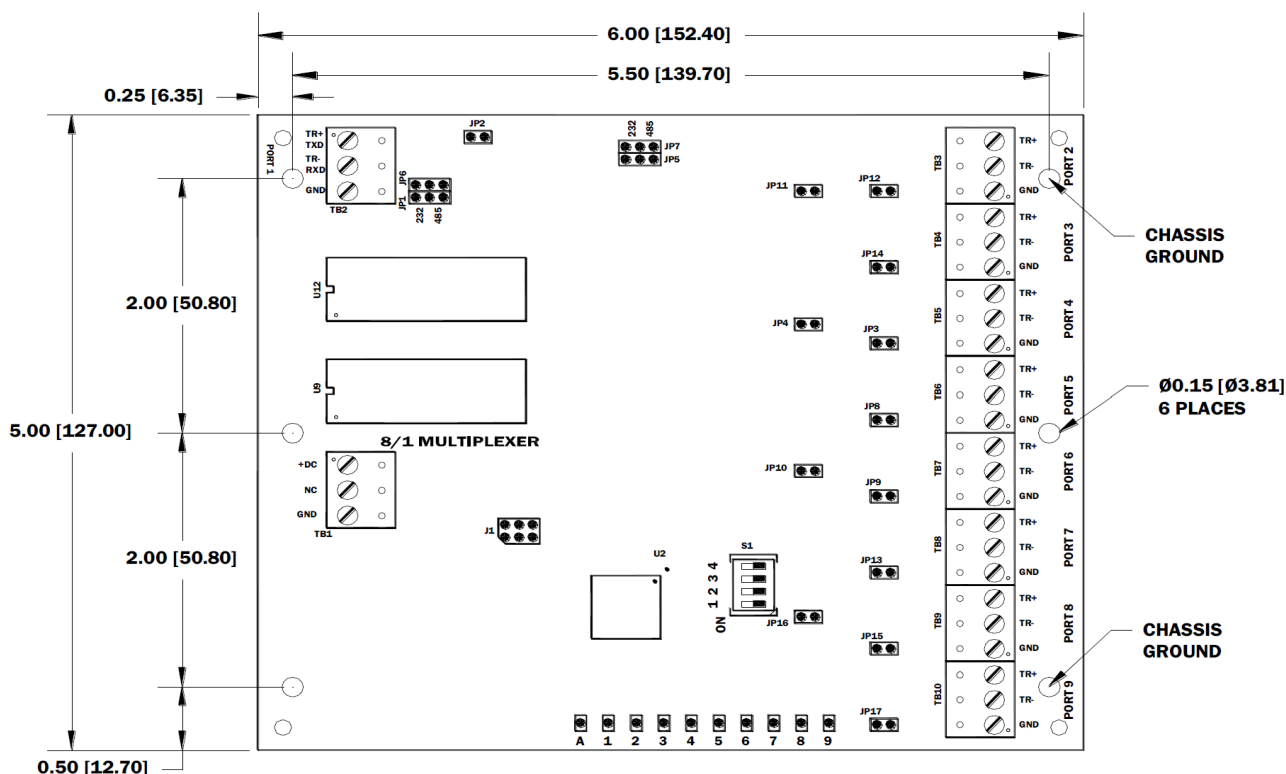
Installation

1. If required, **mount** the MUX8 in an Open Options or Life Safety Power enclosure.

2. **Wire** the upstream host communication.

3. **Wire** the downstream communication ports.

4. **Wire** the power input.

Default Settings

Each MUX8 board ships with the following default configuration:

- Termination: None
- Baud Rate: 38400

Power Supply

The MUX8 accepts a 12 Vdc ± 15% power source for its power input. The power source should be installed as close to the MUX8 unit as possible.

Wire the power input on TB1 by connecting the +DC, NC, and GND ports with a minimum 18 AWG twisted-pair cable.

Host Communication Wiring

The electrical interface for Port 1 is jumper selectable as RS-232 or RS-485. The MUX8 multiplexer can communicate to one of the LP controller's downstream ports using 2-wire RS-485 (recommended) or RS-232 to RS-485 converters.

Each downstream port on the host controller can support up to 4 MUX8 multiplexers within a 1000-ft radius. The controllers are capable of supporting other addressable devices (such as the MR16IN, MR16OUT, MR50-S3, and MR52-S3) on the same port as the MUX8; however, the same distance limitation applies.
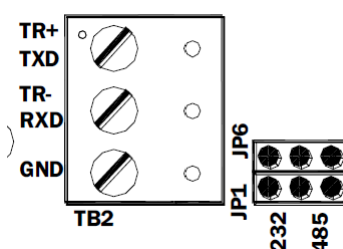

> ⓘ *If the MUX8 is located at the end of the RS-485 line, an RS-485 terminator is required.*

Downstream Communication Wiring

The MUX8 multiplexer implements star topology that is capable of 8 downstream directions in a 2-wire RS-485 interface or 4 downstream directions in a 4-wire RS-485 interface. Each configuration supports up to 8 RS-485 devices (MR50-S3, MR52-S3, MR16IN, or MR16OUT) at a maximum wire distance of 4,000 feet.

Ports 2, 4, 6, and 8 can be individually configured as receive-only channels. To set a port as receive-only, remove the corresponding jumper (see Jumper Settings on page 4-11). A 4-wire RS-485 channel can be created by pairing a receive-only channel with another channel.

The following diagram illustrates the typical wiring scheme for a 2-wire and 4-wire RS-485 configuration.

2-WIRE   **4-WIRE**

NOTES:
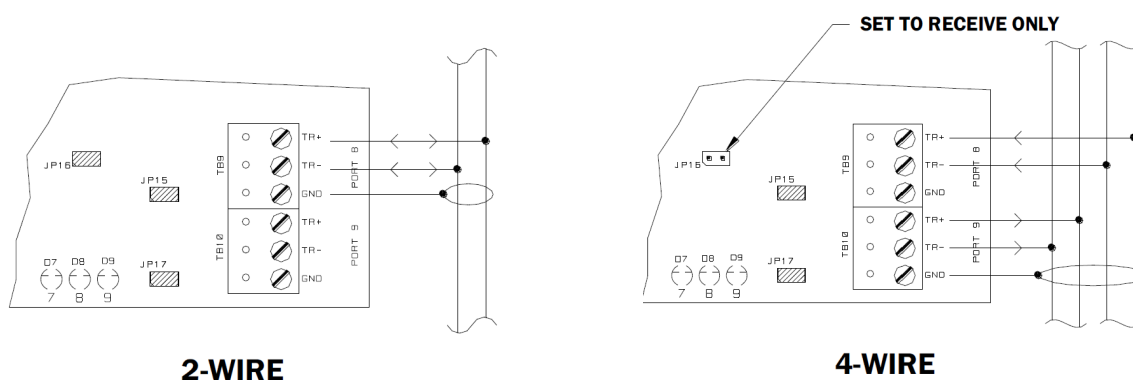
DIP Switch Settings

Switches 1 through 4 determine the communication baud rate. A physical address is not associated with the MUX8.

Selection	S1	S2	S3	S4
300 bps	OFF	OFF	OFF	OFF
1,200 bps	ON	OFF	OFF	OFF
2,400 bps	OFF	ON	OFF	OFF
4,800 bps	ON	ON	OFF	OFF
9,600 bps	OFF	OFF	ON	OFF
19,200 bps	ON	OFF	ON	OFF
19,200/38,400 bps	ON	OFF	ON	OFF
34,800 bps	ON	ON	ON	OFF

Jumper Settings

The jumpers on the MUX8 are used to configure various settings on the board.

Jumper(s)	Set At	Selection
JP1, JP5-JP7	232	Port 1 is RS-232
	485	Port 1 is RS-485
JP11	OFF	Port 2 is Receive Only for 4-wire RS-485
	ON	Port 2 is 2-wire RS-485
JP4	OFF	Port 4 is Receive Only for 4-wire RS-485
	ON	Port 4 is 2-wire RS-485
JP10	OFF	Port 6 is Receive Only for 4-wire RS-485
	ON	Port 6 is 2-wire RS-485
JP16	OFF	Port 8 is Receive Only for 4-wire RS-485
	ON	Port 8 is 2-wire RS-485
JP2	ON/OFF	Port 1 RS-485 Termination - DO NOT USE
JP12	ON/OFF	Port 2 RS-485 Termination
JP14	ON/OFF	Port 3 RS-485 Termination
JP3	ON/OFF	Port 4 RS-485 Termination
JP8	ON/OFF	Port 5 RS-485 Termination
JP9	ON/OFF	Port 6 RS-485 Termination
JP13	ON/OFF	Port 7 RS-485 Termination
JP15	ON/OFF	Port 8 RS-485 Termination
JP17	ON/OFF	Port 9 RS-485 Termination

Install the termination jumpers ONLY on panels at each end of the RS-485 bus. Failure to do so will compromise the proper operation of the communication channel.

It is recommended that the JP2 termination jumper not be installed; remove all other termination jumpers on the boards connected to this communication bus.

Terminal Block Connections

The table below describes the terminal blocks for the MUX8.

Terminal Block	Description	Connections
TB1	Power Input	+DC
		NC
		GND
TB2	Host Port 1	TR+ (TXD)
		TR- (RXD)
		GND
TB3-TB10	Downstream Ports 2-9	TR+
		TR-
		GND

Status LEDs

The status LEDs on the MUX8 board indicate the following information:

LED	Indicator	State
A	Power/CPU (Heartbeat)	Flashing = Normal Steady On = Firmware Problem (Reset Panel) Off = No Power
1	Host Communication Activity (Port 1)	Flashing = Host Activity
2-9	Downstream Communication Activity (Ports 2-9)	Flashing = Port Activity

Specifications

Primary Power:	*Voltage:*	12 to 24 Vdc ± 10%
	Current:	200 mA max.
Interfaces:	*Host Port 1:*	RS-232/RS-485, jumper selectable
	Port 3, 5, 7, 9:	RS-485, transmit/receive
	Port 2, 4, 6, 8:	RS-485, transmit/receive or receive only
Wire Requirements:	*Power:*	1 twisted pair, 18 AWG min.
	RS-485:	24 AWG, 4,000 ft (1,200 m) max., twisted pair(s) with shield
	RS-232:	**24 AWG, 50 ft (15 m) max.**
Mechanical:	*Dimensions:*	5" (127 mm) L x 6" (15.2 mm) W x 1" (25 mm) H
	Weight:	4 oz. (180 g) nominal
Environmental:	*Temperature:*	0 to 70 °C, operating / -55 to +85 °C, storage
	Humidity:	0 to 95% RHNC

Specifications are subject to change without notice.

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