

Gigabit Ethernet / Gigabit Automotive Ethernet Converter

12-Pin Connector (Automotive Ethernet/ RS-232 / CAN/ Power)

8-Pin Connector (Ethernet)

P/N: AX141520

Features

- 12V, 24Vdc input power (nominal) for connection to a battery
- 1 gigabit/standard Ethernet port (100 Mbps or 1000 Mbps)
- 1 gigabit/standard Automotive Ethernet port (100 Mbps or 1000 Mbps)
- Master or Slave functionality configuration via RS-232 interface
- Surge, reverse polarity, overvoltage, and undervoltage protection
- Power, Link and Activity LED indicators
- Compact, 2 M12 connectors
- IP67
- Suitable for high vibration and shock environments
- CE / UKCA marking

Applications

- Off-highway equipment
- Mining equipment
- Industrial trucks



Ordering Part Number

Gigabit Ethernet / Gigabit Automotive Ethernet Converter, P/N: **AX141520**

The converter with its two accessory cables is also available as a kit. P/N: **AX141520K**

Accessories:

AX070535: Ethernet Cable 2 m (6.5 ft.), 8-pin M12 A-coded, Ethernet Jack

AX070533: Cable 1.5 m (5 ft.), 12-pin M12 A-coded, Unterminated Leads

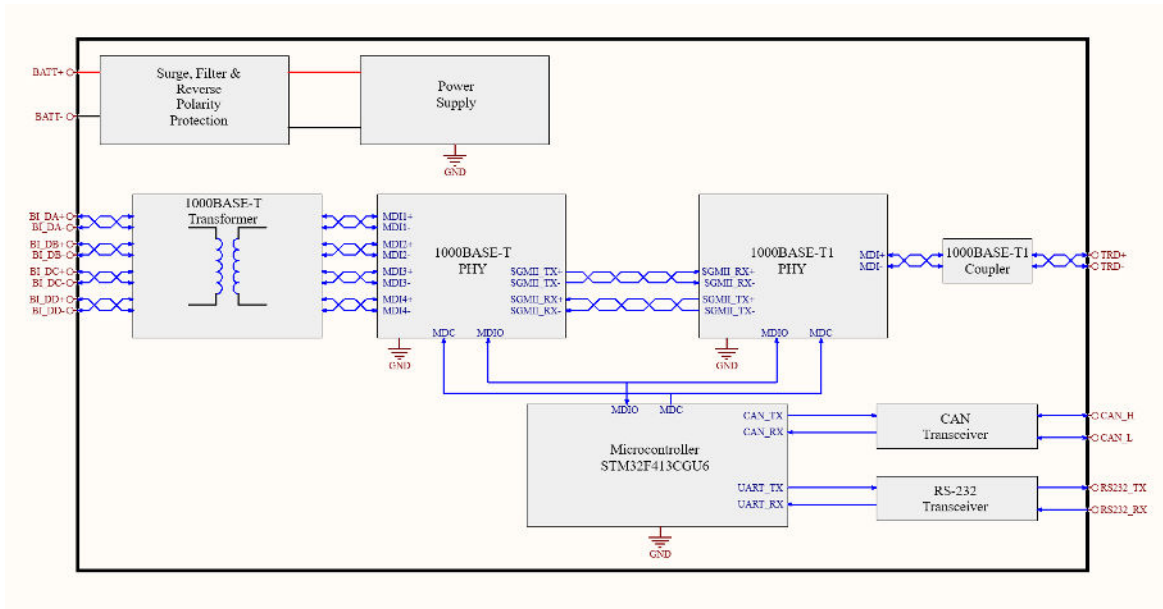
Description

This Gigabit Ethernet/Gigabit Automotive Ethernet Converter provides a purely physical, bi-directional conversion between Automotive Ethernet (1000BASE-T1) and Ethernet (1000BASE-TX) via PHY transceivers. No packets are stored or modified in this device. The converter supports a baud rate of 100 and 1,000 Mbit/s. Status LEDs provide information on connection link, and communication. The converter is designed for the harsh environments of off-highway or industrial equipment.

The unit will be configured via the RS-232 port to act as a Master or Slave for Automotive Ethernet. The Master mode works if the connected device has its transceiver set to slave mode. The Slave mode works when the connected device has its transceiver set to master mode. Hard setting the master/slave relationship saves on setup-time costs and ensures that the Automotive Ethernet link is established quickly. As a comparison, regular Ethernet converters rely on auto-negotiation to determine master and slave.

The Institute of Electrical and Electronic Engineers (IEEE) 802.3bp standard (also known as 1000BASE-T1) is a 1000 Mbps Automotive Ethernet standard aimed at increasing data throughput, meeting strong automotive emissions standards, and reducing cabling weight and cost in automotive networking. Automotive Ethernet networks use a 2 wire, unshielded, twisted pair (UTP) cable.

Functional Block Diagram



Technical Specifications

Specifications are indicative and subject to change. Actual performance will vary depending on the application and operating conditions. Users should satisfy themselves that the product is suitable for use in the intended application. All our products carry a limited warranty against defects in material and workmanship. Please refer to our Warranty, Application Limitations & Return Materials Process as described on <https://www.axiomatic.com/service/>.

Input Power Supply

Input Power Supply	12 or 24 Vdc nominal (9...30Vdc power supply range)
Protections	Surge protection is provided. Reverse polarity protection up to -30V is provided. Input overvoltage (45V) and input undervoltage (6V) protection are provided. The unit is designed for 12Vdc based load dump.
Power Consumption	135 mA @ 12 V; 70 mA @ 24V typical
Power LED	GREEN= Power ON

Ethernet Port

Port Type	1 port (1000 Mbps) Auto-Negotiation Automatic Polarity Correction																	
MDIX	Auto-MDI/MDIX (crossover)																	
PHY	Marvell 88EA1512 (1000BASE-T, 100BASE-TX)																	
Connections	<table border="1"> <thead> <tr> <th>Connector Pins</th> <th>MDI</th> <th>MDIX (Crossover)</th> </tr> </thead> <tbody> <tr> <td>6/4</td> <td>BI_DA±</td> <td>BI_DB±</td> </tr> <tr> <td>5/8</td> <td>BI_DB±</td> <td>BI_DA±</td> </tr> <tr> <td>1/7</td> <td>BI_DC±</td> <td>BI_DD±</td> </tr> <tr> <td>2/3</td> <td>BI_DD±</td> <td>BI_DC±</td> </tr> </tbody> </table>	Connector Pins	MDI	MDIX (Crossover)	6/4	BI_DA±	BI_DB±	5/8	BI_DB±	BI_DA±	1/7	BI_DC±	BI_DD±	2/3	BI_DD±	BI_DC±		
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2/3	BI_DD±	BI_DC±																
Protocol	Ethernet IEEE 802.3ab for 1000BASE-T																	
Protection	ESD protection for signal lines																	

Automotive Ethernet

Port Type	1 port (1000 and 100 Mbps) Automatic Polarity Correction for 1000 Mbps mode (Polarity correction is not available for 100 Mbps mode) Default configuration: Slave (Master mode is configurable via web interface)												
PHY	Marvell 88Q2112 (100BASE-T1/1000BASE-T1)												
LED's	2 GREEN LEDs for Automotive Ethernet Automotive Ethernet LEDs: <table border="1"> <thead> <tr> <th>LED</th> <th>On</th> <th>Blink</th> <th>Off</th> </tr> </thead> <tbody> <tr> <td>Link</td> <td>Full Link, AutoEth <-> Eth</td> <td></td> <td>No Link</td> </tr> <tr> <td>Activity*</td> <td>AutoEth Link</td> <td>Activity</td> <td>No Activity</td> </tr> </tbody> </table> <p>*Activity = Receive/Transmit</p>	LED	On	Blink	Off	Link	Full Link, AutoEth <-> Eth		No Link	Activity*	AutoEth Link	Activity	No Activity
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Protection	ESD protection for signal lines												
Protocol	Automotive Ethernet Ethernet IEEE 802.3bw for 100BASE-T1 (previously known as BroadR-Reach) Ethernet IEEE 802.3bp for 1000BASE-T1												

Interfaces

CAN	1 CAN (SAE J1939) port – Not Used
User Interface for Reflashing	RS-232
RS-232	1 3-wire RS-232 port Maximum Baud Rate: 400 kbit/s ESD and EFT protection for signal lines
RS-232 User Interface	Any terminal emulator that supports serial communication. For Axiomatic use only

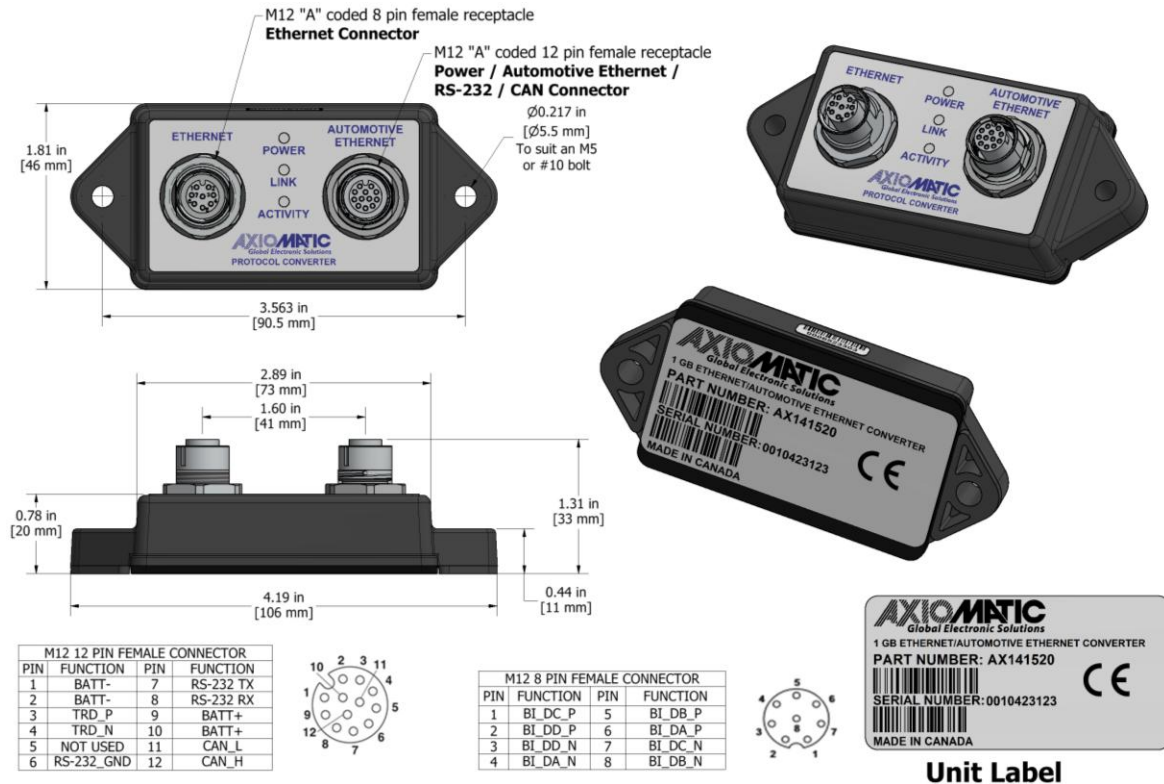
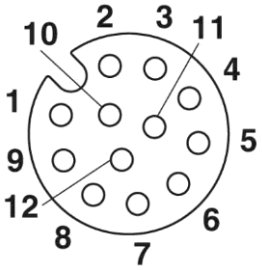
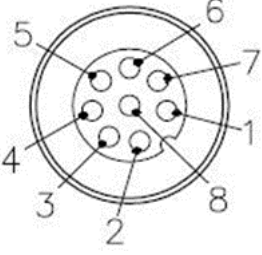


Fig. Dimensional Drawing of AX141520

General Specifications

Functionality	Can be configured to acts as a master or a slave.																																												
Microcontroller	STM32F413CGU6																																												
Compliance	ISO 13766-1:2018 CE / UKCA marking																																												
Vibration	MIL-STD-202H, method 214A, test condition I/B Random Vibration: 7.56 Grms (8 hr/axis in X, Y axes) MIL-STD-202H, method 204D, test condition C Sinusoidal Component: 10 g Sine sweep (8 hr/axis in X, Y axes)																																												
Shock	MIL-STD-202H, method 213B, test condition A 50 g, 8 impacts per test, 9 ms impact duration																																												
Operating Conditions	-40 to 60°C (-40 to 140°F) Please see temperature ratings of cables under Mating Wire Harnesses.																																												
Storage Temperature	-40 to 85°C (-40 to 185°F)																																												
Protection	IP67																																												
Weight	0.20 lb. (0.091 kg)																																												
Installation	The typical maximum wire harness length for Automotive Ethernet cabling is 15 m.																																												
Enclosure and Dimensions	See dimensional drawing. Nylon 6/6, 30% glass fill Ultrasonically welded Flammability rating: UL 94V-0																																												
Electrical Connections	<p>Power/ Automotive Ethernet/ RS-232 / CAN Connector 1 Phoenix Contact M12 12-pin connector (A-coded), Female P/N: 1441833</p> <table border="1"> <thead> <tr> <th>PIN</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>1</td><td>BATT-</td></tr> <tr><td>2</td><td>BATT-</td></tr> <tr><td>3</td><td>TRD_P</td></tr> <tr><td>4</td><td>TRD_N</td></tr> <tr><td>5</td><td>Not Used</td></tr> <tr><td>6</td><td>RS-232_GND</td></tr> <tr><td>7</td><td>RS-232 TX</td></tr> <tr><td>8</td><td>RS-232 RX</td></tr> <tr><td>9</td><td>BATT+</td></tr> <tr><td>10</td><td>BATT+</td></tr> <tr><td>11</td><td>CAN_L</td></tr> <tr><td>12</td><td>CAN_H</td></tr> </tbody> </table>  <p>Ethernet Connector 1 Phoenix Contact M12 8-pin connector (A-coded), Female, P/N: 1406117</p> <table border="1"> <thead> <tr> <th>PIN</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>1</td><td>BI_DC_P</td></tr> <tr><td>2</td><td>BI_DD_P</td></tr> <tr><td>3</td><td>BI_DD_N</td></tr> <tr><td>4</td><td>BI_DA_N</td></tr> <tr><td>5</td><td>BI_DB_P</td></tr> <tr><td>6</td><td>BI_DA_P</td></tr> <tr><td>7</td><td>BI_DC_N</td></tr> <tr><td>8</td><td>BI_DB_N</td></tr> </tbody> </table> 	PIN	Description	1	BATT-	2	BATT-	3	TRD_P	4	TRD_N	5	Not Used	6	RS-232_GND	7	RS-232 TX	8	RS-232 RX	9	BATT+	10	BATT+	11	CAN_L	12	CAN_H	PIN	Description	1	BI_DC_P	2	BI_DD_P	3	BI_DD_N	4	BI_DA_N	5	BI_DB_P	6	BI_DA_P	7	BI_DC_N	8	BI_DB_N
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Mating Connectors	Mating connectors should meet the following standard for M12 Connectors, IEC 61076-2-101:2012. They should be A-coded.																																												
Mating Wire Harnesses	<p>The following part numbers are available from Axiomatic.</p> <p>AX070535: Ethernet Cable 2 m (6.5 ft.), 8-pin M12 A-coded, Ethernet Jack Cable supplier is Phoenix Contact Network cable NBC-M12MR/2,0-94B/R4AC US – 1406112. The M12 connector on the harness assembly is rated for -20 to +85°C and the RJ45 ethernet jack is rated as -20 to +60°C.</p> <p>AX070533: Cable 1.5 m (5 ft.), 12-pin M12 A-coded, Unterminated Leads Cable supplier is CNC Tech cable 1072M12-12-1-1-RA-00150. The assembly is rated for -40 to +80°C.</p>																																												

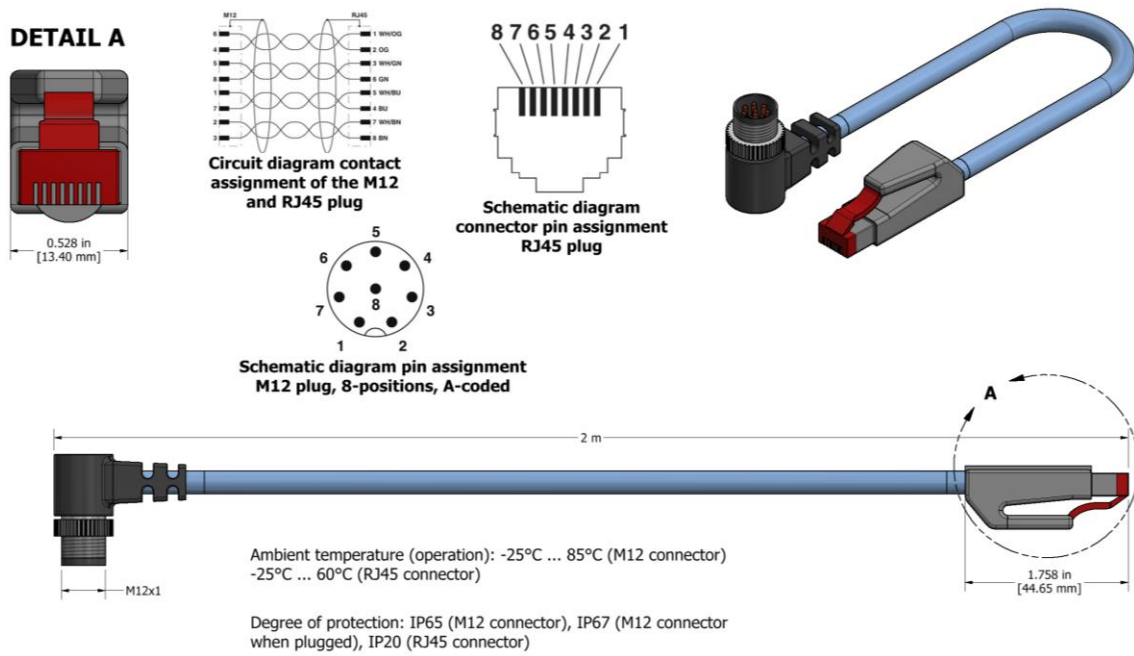


Fig. Dimensional Drawing of AX070535 Mating Cable

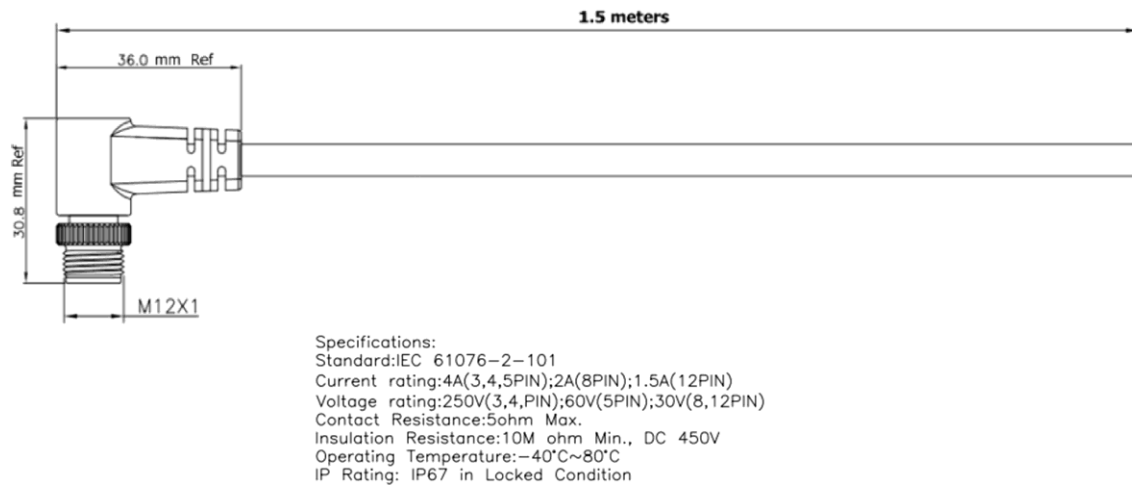


Fig. Dimensional Drawing of AX070533 Mating Cable

Form: TDAX141520-01/09/2025