4x Gigabit Automotive Ethernet / 1x 10 Gigabit Ethernet Switch

10/100/1000 Mbps or 10 Gbps Ethernet
100/1000 Mbps (Single Pair Ethernet) Automotive Ethernet
RS-232 Interface

P/N: AX141590

Features

- 12 or 24 Vdc input power (nominal) for connection to a battery
- 4x gigabit Automotive Ethernet / Single Pair Ethernet (SPE) ports (100 Mbps or 1 Gbps)
- 1x 10 gigabit Ethernet ports (10/100 Mbps or 1/10 Gbps)
- Master or Slave functionality configuration for Automotive Ethernet
- Operates as an unmanaged switch
- Configuration via RS-232 interface
- Surge, reverse polarity, overvoltage, and undervoltage protection
- 5x LED indicators; 1 for each communication port and 1 for power
- 4x 2-pin female, 1x 8-pin female, and 1x 4-pin male M12 connectors
- Compact
- IP67

Applications

- Off-highway equipment
- Industrial automation

Ordering Part Number

4x Gigabit Automotive Ethernet / 1x 10 Gigabit Ethernet Switch - P/N: **AX141590**

Photo for illustration purpose only. The actual unit features different connectors. See electrical pin out for details.
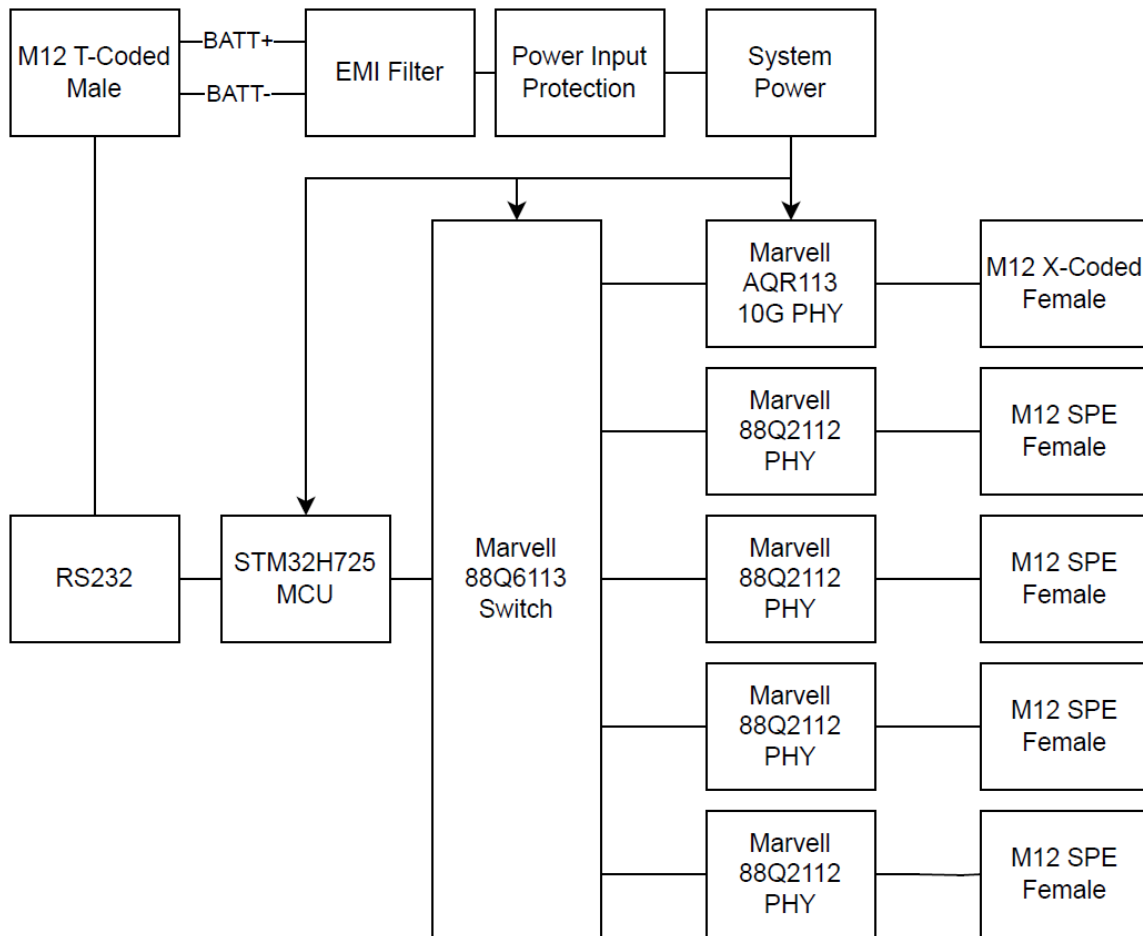
Description

The AX141590 operates as an unmanaged switch. It enables communication between 4x Gigabit Automotive Ethernet ports (1000BASE-T1) and 1x 10 Gigabit Ethernet port (10GBASE-T). Status LEDs provide information on power and communication link and activity. The converter is designed for the harsh environments of off-highway or industrial equipment.

The unit is configured via web interface 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, twisted pair cable.

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/.

Power Input

Power Supply Input	12 Vdc, 24 Vdc nominal (9 Vdc to 36 Vdc power supply range)
Quiescent Current	TBD mA @ 12 Vdc; TBD mA @ 24 Vdc
Protections	Surge protection is provided. Reverse polarity protection up to 36 V is provided. Undervoltage protection provided. Shutdown at 6.5 V. Overvoltage protection provided. Shutdown at 60 V.

Automotive Ethernet

Port	4 gigabit Automotive Ethernet / Single Pair Ethernet (SPE) ports 100 or 1000 BASE-T1 (IEEE 802.3bp compliant) Automatic Polarity Correction (for 1000 Mbps mode) Note: For 100 Mbps mode, polarity correction is not functional. Default configuration: Master (Slave mode is configurable)
PHY	Marvell 88Q2112 (100BASE-T1 / 1000BASE-T1)
Protection	ESD protection for signal lines
Protocol	Automotive Ethernet IEEE 802.3bw for 100BASE-T1 (previously known as BroadR-Reach) Automotive Ethernet IEEE 802.3bp for 1000BASE-T1

Ethernet

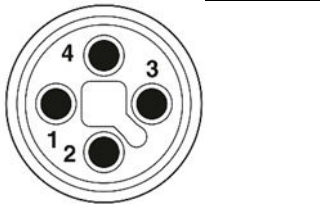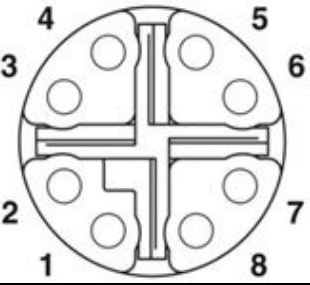| Port	1 gigabit Ethernet port 10, 100, or 1000BASE-T or 10GBASE-T Auto-Negotiation Automatic Polarity Correction
MDIX	Auto-MDI/MDIX (crossover)
PHY	Marvell AQR113-B1-I
Protocol	Ethernet IEEE 802.3
Protection	ESD protection for signal lines

RS-232 Interface

Port	1x port Baud rate: 115200 bit/s User interface for configuration ESD and EFT protection for signal lines
User Interface	Any terminal emulator that supports serial communication.

LED Indicators

LEDs	4 bicolour (red/green) LEDs for Automotive Ethernet 1 tricolour (red/green/blue) LED for Ethernet 1 green LED for Power
Functionality	TBD

General Specifications

Microcontroller	STM32H725IGK3
Switch	Marvell 88Q6113
User Interface	RS-232
Compliance	RoHS
Operating Conditions	-40 to 65 °C (-40 to 149 °F)
Storage Temperature	-40 to 85 °C (-40 to 185 °F)
Protection	IP67
Enclosure	Preliminary information: Cast aluminum, anodized enclosure Lexan overlay 7.25 in. x 3.75 in. x 2.19 in. (184.2 mm x 95.3 mm x 55.7 mm) L x W x H excluding mating connectors. See dimensional drawing.
Weight	0.276 lb. (0.125 kg) preliminary
Installation	The typical maximum wire harness length for Automotive Ethernet cabling is 15 m.
Electrical Connections	**Power + RS-232 Connector** 1x 4-pin M12 connector (T-coded), male, Phoenix Contact P/N: **1412017**

Power + RS-232 Connector

Pin	Description
1	RS-232 TX
2	RS-232 RX
3	Power +
4	Power -

Automotive Ethernet Connectors
4x 2-pin M12 connector, female, Phoenix Contact P/N: **1553006**

Pin	Description
1	TRD +
2	TRD -

<table>
<tr><td rowspan="9"></td><td colspan="3">Ethernet Connector
1x 8-pin M12 connector (X-coded), female, Phoenix Contact P/N: 1411964</td></tr>
<tr><td>Pin #</td><td>Description</td><td rowspan="9"></td></tr>
<tr><td>1</td><td>DA +</td></tr>
<tr><td>2</td><td>DA -</td></tr>
<tr><td>3</td><td>DB +</td></tr>
<tr><td>4</td><td>DB -</td></tr>
<tr><td>5</td><td>DD +</td></tr>
<tr><td>6</td><td>DD -</td></tr>
<tr><td>7</td><td>DC -</td></tr>
<tr><td>8</td><td>DC +</td></tr>
<tr><td>Mating Connectors</td><td colspan="3">Mating connectors should meet the following standard for M12 Connectors, IEC 61076-2-101:2012. The mating connectors should have the same coding.</td></tr>
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Dimensional Drawing

Form: AX141590-OV-04/04/2025