Preliminary
TECHNICAL DATASHEET #TDAX141570

6 Port Gigabit Automotive Ethernet Switch

100 Mbps or 1 Gbps (Single Pair) Automotive Ethernet
Remote Web Server or RS-232 Interface
P/N: AX141570

Features

- 12V, 24Vdc input power (nominal) for connection to a battery
- 6 gigabit/standard Automotive Ethernet ports (100 Mbps or 1000 Mbps)
- Power Enable signal to power up the device (when it is constantly connected to the battery)
- Configuration via remote web server or RS-232 interface
- Power, Link, Activity, and Speed LED indicators
- Surge/transient and reverse polarity protection
- 1 M12 5-pin and 6 M12 4-pin connectors
- IP67

Applications

- Off-highway equipment
- Mining equipment
- Industrial trucks

Ordering Part Number

6 Port Gigabit Automotive Ethernet Switch - P/N: **AX141570**

NOTE: *The device is shipped with a default password for access. It can be customized and managed by the user for secure access.*

The switch can be purchased together with its mating cables under P/N: **AX141570K** (includes AX141570 converter, one AX070169 cable, and six AX070168 cables).

Accessories:

- 1x Cable 5 m (16.4 ft.), 5-Pin M12 A-Coded Connector, Unterminated Leads - P/N: **AX070169**
- 6x Cable 2 m (6.5 ft.), 4-Pin M12 D-Coded Connector, Unterminated Leads - P/N: **AX070168**
- Software Support Package - P/N: **AX140910**
- Discovery Application (`AxioDisc.exe`)

Description

The AX141570 is designed for industrial and automotive applications requiring high performance 100/1000BASE-T1 Automotive Ethernet connectivity.

Each switch port can be individually configured to support Master or Slave mode with 1 Gbit/s or 100 Mbit/s communication speed according to IEEE 802.3bp and IEEE 802.3bw standards. The switch internal logic is not configurable, resulting in unmanaged switch functionality.

An embedded web server on Port #1 allows users to configure switch ports, monitor the device performance, download and upload configuration parameters, and update application firmware. In addition, the web server interface contains a virtual cable tester that allows users to check integrity of the switch cabling and to perform basic Automotive Ethernet cable troubleshooting.

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An auxiliary RS-232 port can be used as a local alternative to the remote web server interface.

A separate Power Enable digital signal is used to power-up the device in applications where the switch is constantly connected to the battery.

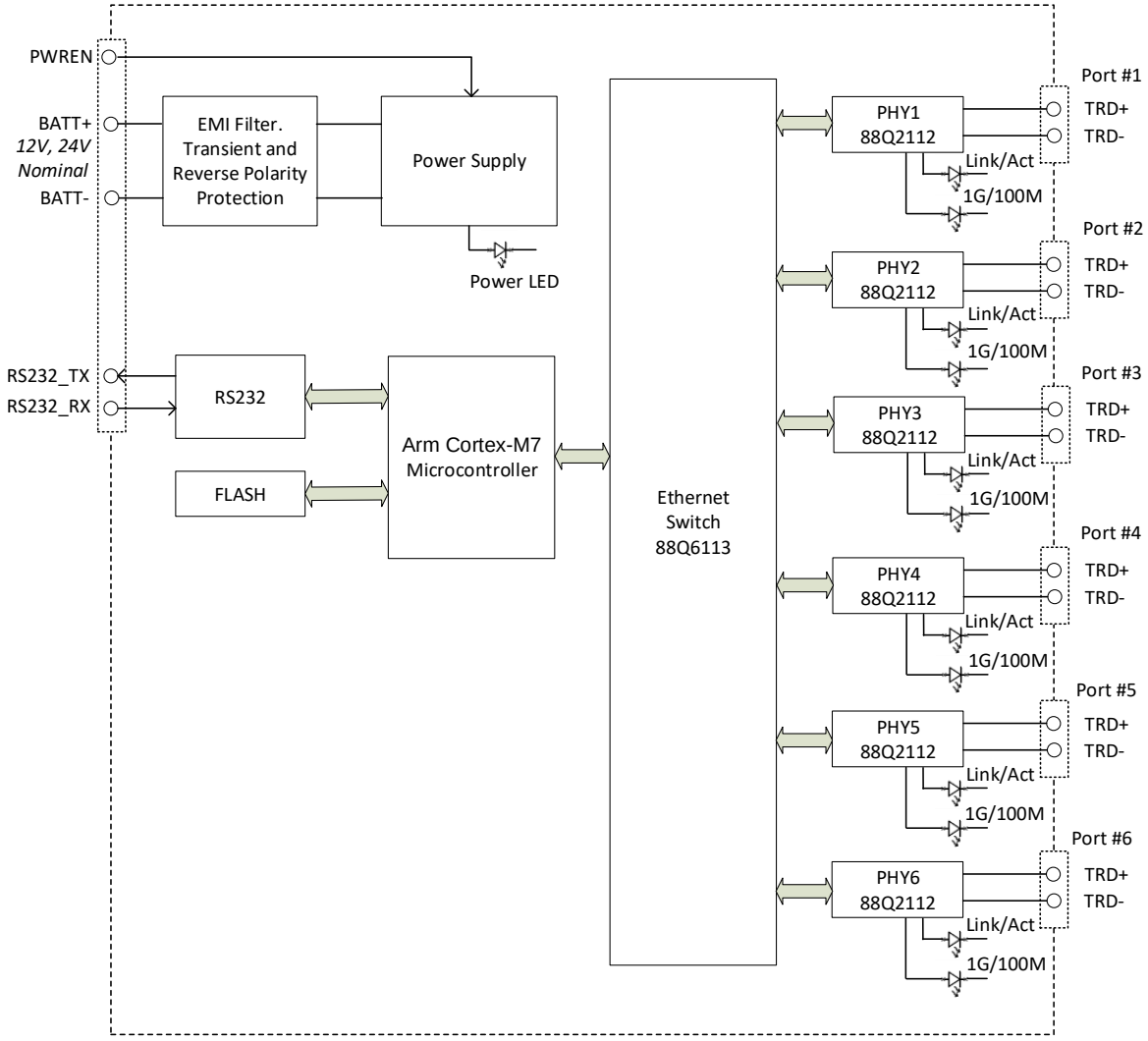
An internal state of the switch is displayed by LEDs on the front panel of the housing.

NOTES:

- *The device is shipped with a default password for access. It can be customized and managed by the user for secure access.*

- *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 single 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 Supply

Parameter	Value	Remarks
Supply Voltage	9 to 36 Vdc	12 V, 24 V – nominal
Standby Supply Current[1]	400 mA	12 V – typical[4]
	200 mA	24 V – typical[4]
Maximum Supply Current[2]	440 mA	12 V – typical[4]
	220 mA	24 V – typical[4]
Shutdown Supply Current[3]	0.1 mA	12 V – typical[4]
	0.2 mA	24 V – typical[4]
Power Enable Input (PWREN)	On, if V_{PWREN} > 6 V	Can be connected to Battery +
	Off, if V_{PWREN} < 0.5 V	Can be left open or connected to Battery -
	R_{PWREN} >> 10 kΩ	High impedance input
LED Indicator	Power ON	Green LED
Protection	Overvoltage, Reverse Polarity, Transients/Surge	

[1] All Automotive Ethernet ports are set at maximum speed and disconnected.
[2] All Automotive Ethernet ports are set at maximum speed and connected.
[3] Power supply is disabled. Power Enable Input is left open.
[4] At room temperature (25 °C).

Automotive Ethernet Switch

Parameter	Value	Remarks
Number of Ports	6	Individually configurable
Switch Type	Unmanaged	Based on Marvell 88Q6113, with individually configurable PHYs, based on Marvell 88Q2112
Switching Capacity	12 Gbps	
Forwarding Rate	8.93 Mpps	
MAC Address Table	16k Entries	16384 address database entries
Packet Buffer Memory	2 Mbit	
Jumbo Frame	10236/10240 bit	Tagged/Untagged frames
QoS	8 Priority Queues	
	802.1p/DSCP QoS	
Port Type	1000BASE-T1	IEEE 802.3bp-2016
	100BASE-T1	IEEE 802.3bw-2015
Port Speed	1 Gbps / 100 Mbps	Individually configurable per port
Port Mode	Master/Slave	Individually configurable per port
Port LED Indicators	Yellow - Link/Activity	One set per port
	Green - Speed	
Virtual Cable Tester	Provided	Uses Marvell 88Q2112 PHYs
Communication Protocols	Ethernet IEEE 802.3, IP, ICMP, ARP, UDP, TCP, DHCP, HTTP, Proprietary[1]	For internal web server and proprietary discovery protocol on Port #1. Communication with the switch over Ethernet can be disabled for security reasons.
Web server	On Port #1 only	Used for configuration, diagnostics, and flashing application firmware. Supports configuration files[2]. Password protected[2]. Can be disabled
Internal Diagnostics	Health Status	Available from the web server or RS-232 port user interface
RS-232 Port	3-wire	Local alternative to the web server. Menu based text user interface[2]. YMODEM for upload/ download configuration files[3].

[1] Proprietary discovery protocol is supported by Axiomatic Ethernet to CAN Converter Discovery Application (`AxioDisc.exe`) Windows console application and *CAN-ENET Software Support Package* (SSP), P/N: AX140910 v3.0.0+.
[2] Use any terminal emulation software, TeraTerm is preferred (download from: https://teratermproject.github.io/index-en.html).
[3] Added in v2.00 firmware.

LED Indicators

Name	Status	Description
Link/Activity (LINK/ACT)	Off	No link
	Yellow	Link on
	Blinking Yellow	Link on. Transmit or receive activity on the link
Speed (1G/100M)	Off	Link on at 100 Mbps or no link
	Green	Link on at 1 Gbps

RS-232 Port

Parameter	Value	Remarks
Bit Rate	115200 bps	
Data	8-bit	
Parity	None	
Stop	1 bit	
Flow Control	Xon/Xoff	For flashing new application firmware only

Automotive Ethernet Cable Requirements

Automotive Ethernet utilizes a single balanced twisted pair with 100 Ω characteristic impedance. The cable characteristics should meet or exceed the appropriate Automotive Ethernet standard.

Cable Requirements						
Port Speed	**Cable Type**	**Segment Type**	**Frequency Range**	**Maximum Cable Insertion Loss[1]**	**Maximum Distance**	**Automotive Ethernet Standard**
1 Gbps	UTP, STP	B (Optional Segment)	1-600 MHz	8.5 dB @ 100 MHz	40m	IEEE 802.3bp-2016
				13.8 dB @ 250 MHz		
				22.3 dB @ 600 MHz		
	UTP	A (Automotive Segment)	1-600 MHz	6.1 dB @ 100 MHz	15m	
				9.9 dB @ 250 MHz		
				15.9 dB @ 600 MHz		
100 Mbps	UTP	-	1-66 MHz	2.6 dB @ 10 MHz	15m	IEEE 802.3bw-2015
				4.9 dB @ 33 MHz		
				7.2 dB @ 66 MHz		

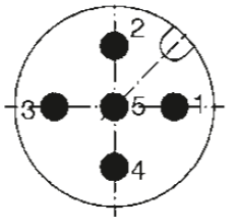
[1] At maximum cable length. For other cable characteristics see the appropriate Automotive Ethernet standard. Depending on the application, the following cable standards can be used for selecting the Ethernet cable.

Application	Cable Standard
Automotive	OPEN Alliance TC9, Channel and Components Requirements for 1000BASE-T1 Link Segment Type A (STP). OPEN Alliance TC9, Channel and Components Requirements for 1000BASE-T1 Link Segment Type A (UTP).
Commercial and Industrial	IEC 61156-12 (for segment type B) IEC 61156-11 (T1-C type cable or better)
Commercial	ANSI/TIA-568.5 (SP3 for segment type B, SP4 for segment type A)
Industrial	ANSI/TIA-568.7 (draft)

Power Connector

M12 socket, 5-pin, A coded, male connector, BINDER, P/N: 09-3441-126-05.
Use A-coded mating connectors compliant with IEC 61076-2-101:2012.
A mating cable is available from Axiomatic under P/N: AX070169 (Cable 5 m (16.4 ft.), 5-pin M12 A-coded, Unterminated Leads).

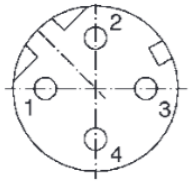
PIN #	Description
1	Power Enable[1]
2	Battery +
3	Battery - (RS-232 Ground[2])
4	RS-232 TX
5	RS-232 RX



[1] Connect to Battery +, if not used.
[2] RS-232 Ground is connected to Battery -.

Automotive Ethernet Connector

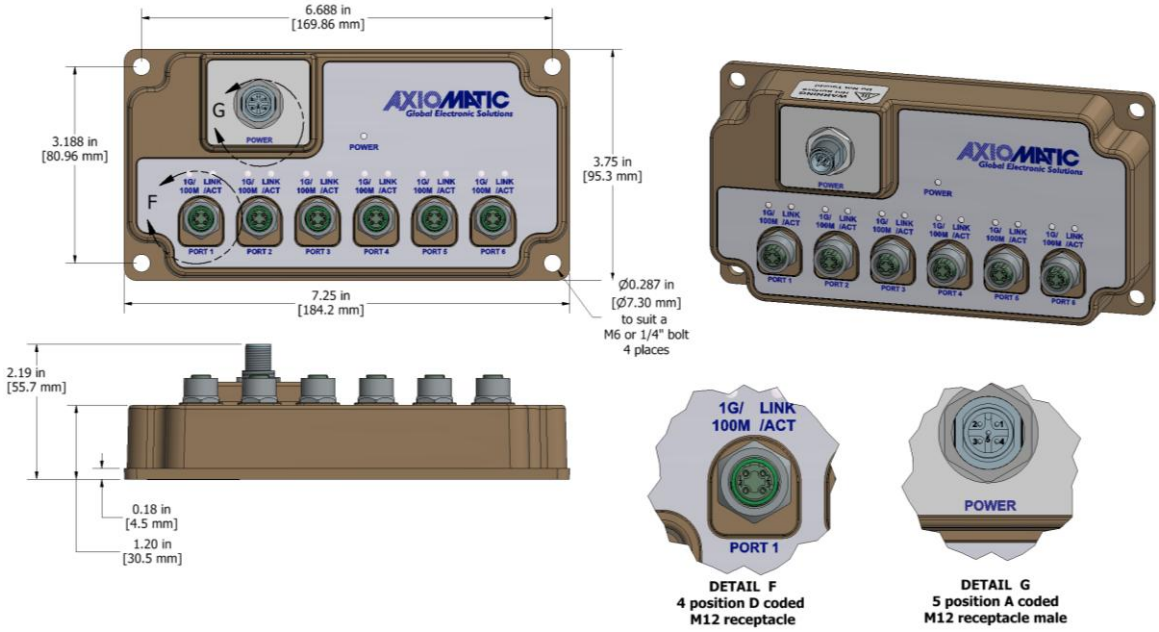
M12 socket, 4-pin, D-coded, female connector, BINDER, P/N: 99-3732-201-04.
Use D-coded mating connectors compliant with IEC 61076-2-101:2012.
A mating cable is available from Axiomatic under P/N: AX070168 (Cable 2 m (6.5 ft.), 4-pin M12 D-coded, Unterminated Leads). 6 sets are required.

PIN #	Description	
1	TRD +	
2	Not Used	
3	TRD -	
4	Not Used	

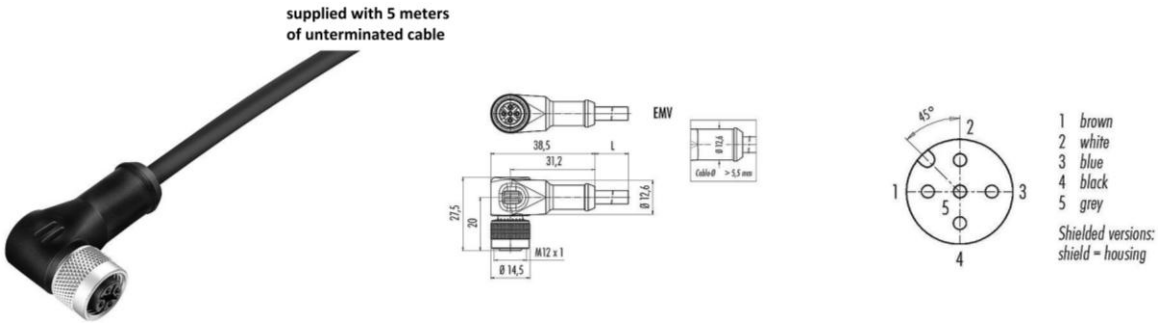
General Specifications

Parameter	Value	Remarks
Password Protection	See User Manual UMAX141570	The device is shipped with a default password for access. It can be customized and managed by the user for secure access.
Operating Temperature	-40 to 75 °C (-40 to 167 °F)	
Storage Temperature	-40 to 85 °C (-40 to 185 °F)	
Protection	IP67	IEC 60529. With mated connectors
Enclosure	Cast aluminum, anodized enclosure	Lexan overlay
Size	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 connectors See dimensional drawing
Weight	1.41 lbs. (0.64 kg)	
Compliance	RoHS	

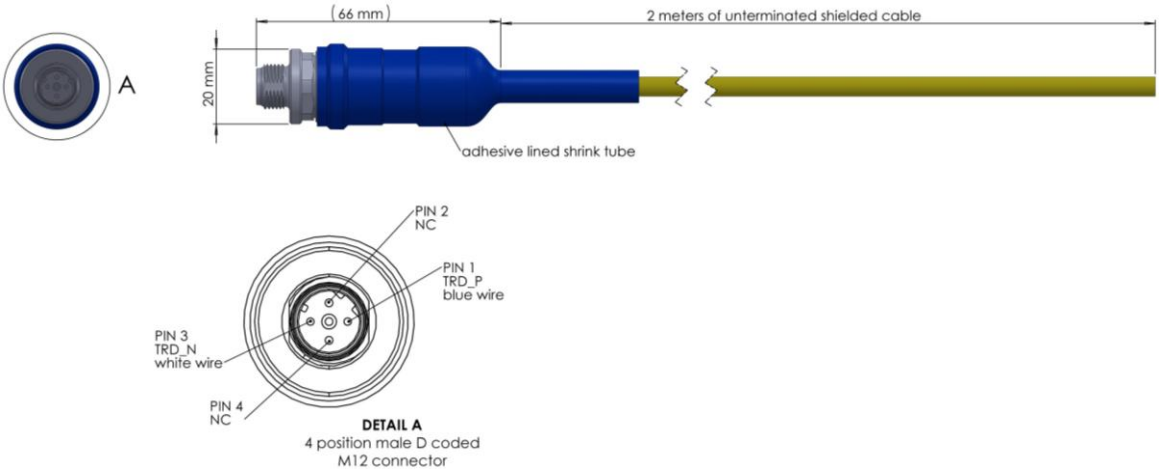
Dimensional Drawing



Dimensional Drawing of AX141570



Dimensional Drawing of AX070169



Dimensional Drawing of AX070168

Form: TDAX141570-03/12/2025