Discrete I/O
12 Inputs, 8 Relay Outputs
SAE J1939
with Axiomatic Electronic Assistant
P/N: AX031800

Description:

The Discrete I/O Module reads 12 discrete inputs and sets 8 Form C relay outputs while networking with other CAN devices (SAE J1939) in a machine control system. The unit is a battery powered device with the ability to withstand engine cranking, reverse polarity, and transient power conditions. In engine applications, information is provided to the engine control system using single-frame J1939 application-specific PDU2 type messages. Outputs can be controlled by any input or CAN message. A bi-color LED indicates operational status.

AX031800 has a number of setpoints that allow the user to configure it for their application. The Windows-based Axiomatic Electronic Assistant can be used to configure the module over the CAN line. The setpoints can also be saved to a file and flashed into other AX031800 modules over the CAN bus. Settings are saved to non-volatile memory upon command.

It features a rugged enclosure, gasketing and watertight connectors for an IP67 rating.

Applications:

- Power Generator Sets
- Diesel Engine Control Systems
- Modules are designed for mounting on power generator sets or remotely up to 30 ft.
- Multiple AX031800 modules can be used on a CAN network.

Ordering Part Number:

SAE J1939 Discrete I/O Controller, 250 kbps: **AX031800**
SAE J1939 Discrete I/O Controller, 500 kbps: **AX031800-01**
SAE J1939 Discrete I/O Controller, 1 Mbps: **AX031800-02**

Accessories:
Axiomatic Electronic Assistant Configuration KIT P/N: **AX070502**, or **AX070506K**

Mating Plug KIT P/N: **AX070200**. This kit includes 1 plug DT06-08SA, 1 plug DRC16-40S, 1 wedgelock W8S, 48 contact sockets 0462-201-16141, and 24 sealing plugs 114017. These items are also available from a local TE Deutsch distributor.

Notes:
A crimping tool from TE Deutsch is required to connect wiring to the sockets, P/N: HDT 48-00 or equivalent (not supplied).

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 Approvals/Limitations and Return Materials Process as described on https://www.axiomatic.com/service/.

Input

Power Supply Input	12 or 24 VDC nominal (9 to 32 VDC range)
Supply Current	42 mA @ 12 VDC; 23 mA @ 24 VDC typical
Protection	Reverse polarity protection is provided. Power supply input section protects against transient surges and short circuits.
Inputs	Reads twelve discrete inputs (active low with pull-up resistors) Input level characteristics: - Low-Level input voltage: 0 to 0.8 V - High-Level input voltage: 3.75 V to +BAT - Inputs have internal pull-up resistors. - Input resistance: more than 5 kΩ The inputs have internal over and under voltage protection.
Digital GNDs	Four digital GND pins are provided.
PGNs	- AX031800 is an Arbitrary Address Capable ECU. It can dynamically change its network address in real time. - Supports Address Claimed Messages (PGN 60928); Requests for Address Claimed Messages (PGN 59904); and Commanded Address Messages (PGN 65240). - Supports Transport Protocol for Commanded Address messages (PGN 65240). It also supports responses on PGN Requests (PGN 59904). - Transmits Software ID PGN65242 (-SOFT) only on request. - Can constantly transmit the state of digital inputs in a user defined PDU2 or PDU1 PGN, set to proprietary B PGN 65440 by default. - Can receive user defined PDU2 or PDU1 PGN controlling any configurable source, set to 65448 by default. - Can receive mode select commands or send mode status feedback in a user defined PDU2 or PDU1 PGN and is set to proprietary B PGN 65456 by default.

Output

Outputs	Sets 8 Form C relay outputs. Resistive load: 2A NO)/2 A (NC) at 277 VAC 2 A (NO)/2 A (NC) at 125 VAC 2 A (NO)/2 A (NC) at 30 VDC Dielectric strength: 4,000 VAC, 50/60 Hz for 1 min between coil and contacts 750 VAC, 50/60 Hz for 1 min between contacts of same polarity There is no special overcurrent/overvoltage protection on the relay outputs. The user is advised to provide a fast-acting 3 A fuse or an adequate external protection if necessary.

Communication

CAN	1 CAN 2.0B port, protocol SAE J1939 Model AX031800 Baud Rate: 250 bit/sec. Model AX031800-01 Baud Rate: 500 kbit/sec. Model AX031800-02 Baud Rate: 1 Mbit/sec. Digital isolation is provided for the CAN line. Other features of the CAN communications interface include: - In the case of a higher baud rate than 250 bit/sec, the slew rate will be automatically set to "high". - Node address is auto configurable as per J1939-81 or per customer request. - A watchdog timer to require a reboot when the microcontroller locks The AX031800 is designed to remain powered during engine cranking.
Network Termination	According to the CAN standard, it is necessary to terminate the network with external termination resistors. The resistors are 120 Ω, 0.25 W minimum, metal film or similar type. They should be placed between CAN_H and CAN_L terminals at both ends of the network.

RS-232	For Axiomatic use only.

## General Specifications

Microcontroller	STM32F405RG
Control Logic	AX031800 is designed to work either as a stand-alone module, or on J1939 CAN network. When connected to the network, it automatically recognizes network connection, claims a network address and can be configured to perform the following application tasks. • Converts between physical I/O and CAN (SAE J1939) single frame commands • Converts between physical I/O and CAN (SAE J1939) single frame commands • Continuously broadcast any configurable sources using a proprietary Input-PGN • Receive and process Output-PGNs to control DIO sources It has nine different Sources (No Source, Digital Input, Relay Output, CAN Receive Message, CAN Transmit Message, Diagnostic Trouble Code, CAN Status Reports, Global VPS, Global Temperature), which are able to communicate to each other. Depending on the Output Source (Relay Output, CAN Transmit), a specific number of sources can be selected. • The Relay Outputs have six different configurations to interchange information with their control sources. These configurations are Normal Logic, Inverse Logic, Latched Logic (changes state every time the control input transitions from OFF to ON), Inverse Latched Logic, and Toggle Logic (The output toggles in an adjustable time). • The Digital Input states are configurable to Normal Logic, Inverse Logic, and Latched Logic. • It is possible to set eight status bits into one byte by using a CAN Status Report source. These sources allow the CAN Transmit messages to send all Input and Output states. For a more detailed description of the configurable sources, refer to the user manual. It uses Memory Access Protocol (MAP) for setpoint programming from the Axiomatic Electronic Assistant.
Indicator	LED indicator blinks Green/Red when a network error occurs, remains Red in case of a temperature fault being detected, and blinks Red if it indicates a power supply fault by default. Furthermore, it blinks Green when the LED indicator is operating normally and is powered. These settings are adjustable and can be configured afterwards through the Axiomatic Electronic Assistant.
SAE J1939 Profile	For J1939 compliance (SAE, Recommended Practice for a Serial Control and Communications Vehicle Network, October 2007) all modules comply with the applicable portions of the following: • SAE J1939-21, Dec 2006, Data Link Layer • SAE J1939-71, Sep 2013, Application Layer • SAE J1939-73, Feb 2010, Application Layer – Diagnostic • SAE J1939-81, March 2017, Network Management *Customer specific proprietary extensions can also be included in the SAE J1939 profile on request.*
User Interface	Axiomatic Electronic Assistant KIT, P/Ns: AX070502, or AX070506K Updates for the Axiomatic EA are found on www.axiomatic.com under the log-in tab.
Operating Temperature	-40 to 85 ºC (-40 to 185 ºF)
Storage Temperature	-50 to 120 ºC (-58 to 248 ºF)
UL and cUL Compliance	Standard for Controllers for Use in Power Production, CAN/ULC 6200, 1st edition
CE/UKCA Compliance	2004/108/EC (EMC Directive) 2011/65/EU (RoHS Directive)
Marine Type Approval	ABS, CCS, LR, RINA
Humidity	Protected against 95% humidity non-condensing, 30 ºC to 60 ºC
Protection	IP67
Weight	2.73 lbs. (1.24 kg)
Vibration	4.3 G for off-engine mounting
Enclosure	Rugged aluminum enclosure, stainless steel end plates, neoprene gaskets Conformal coated PCB assemblies and partially encapsulated 5.72 in x 5.86 in x 2.87 in (145.30 mm x 149.00 mm x 73.00 mm) L x W x H

Electrical Connections	Power and CAN:

Power and CAN:
1 8-pin TE Deutsch equivalent connector, P/N: DT13-08PA

Pin #	Function
1	Power+
2	CAN_H
3	CAN_L
4	Power -
5	SHIELD
6	RS-232 GND
7	RS-232 TXD
8	RS-232 RXD
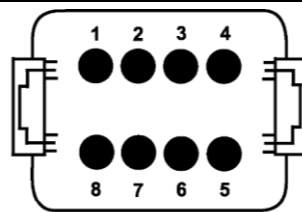
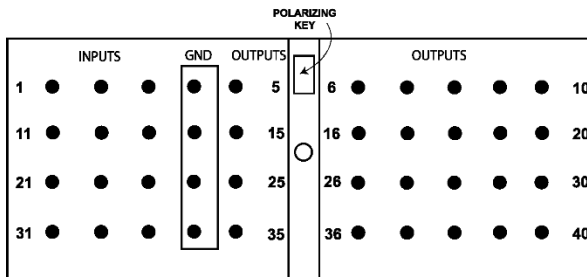
FRONT VIEW
MODULE MOUNTED CONNECTOR
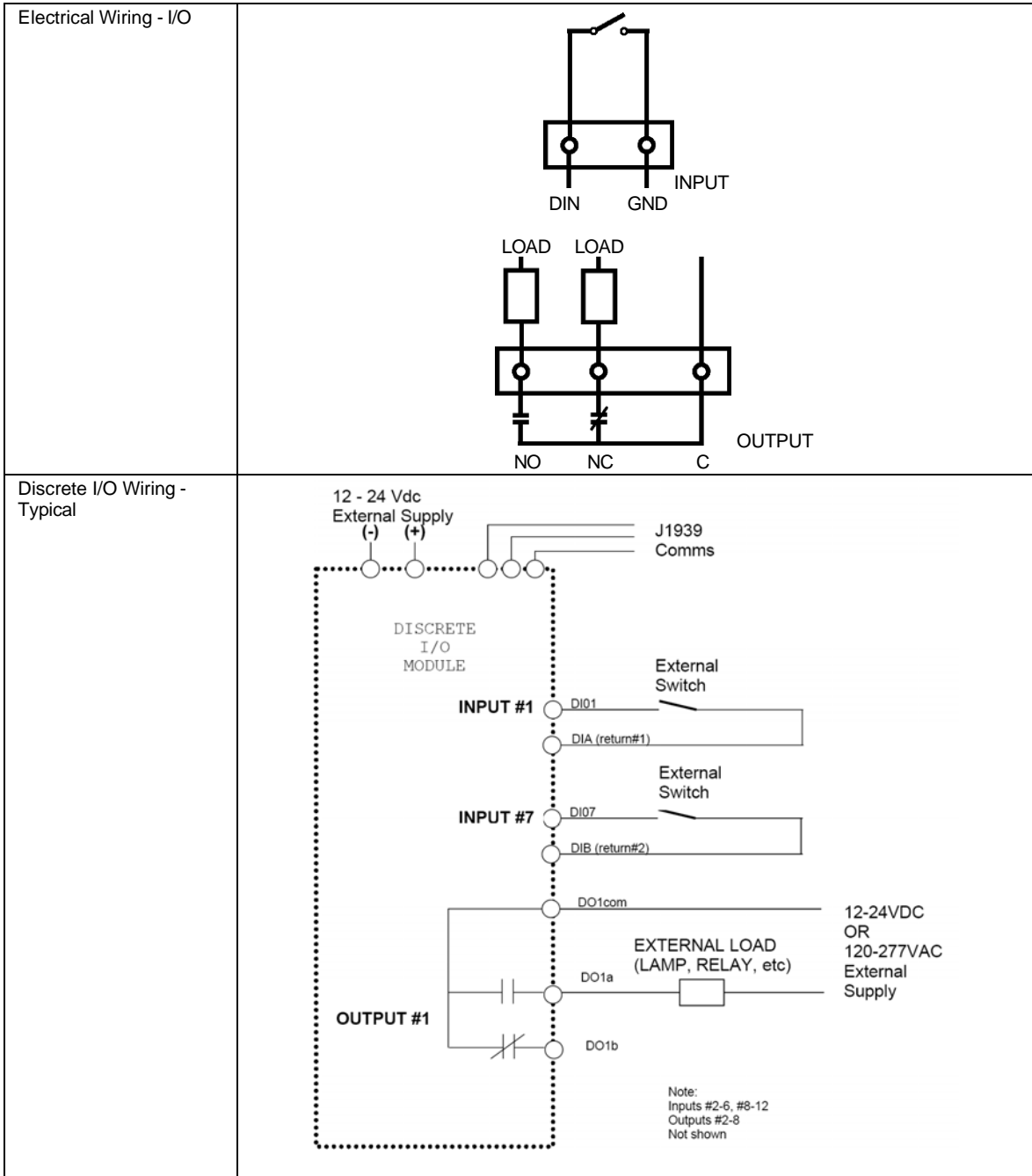DEUTSCH P/N: DT13-08PA

I/O Interface:
1 40-pin TE Deutsch equivalent connector, P/N: DRC13-40PA

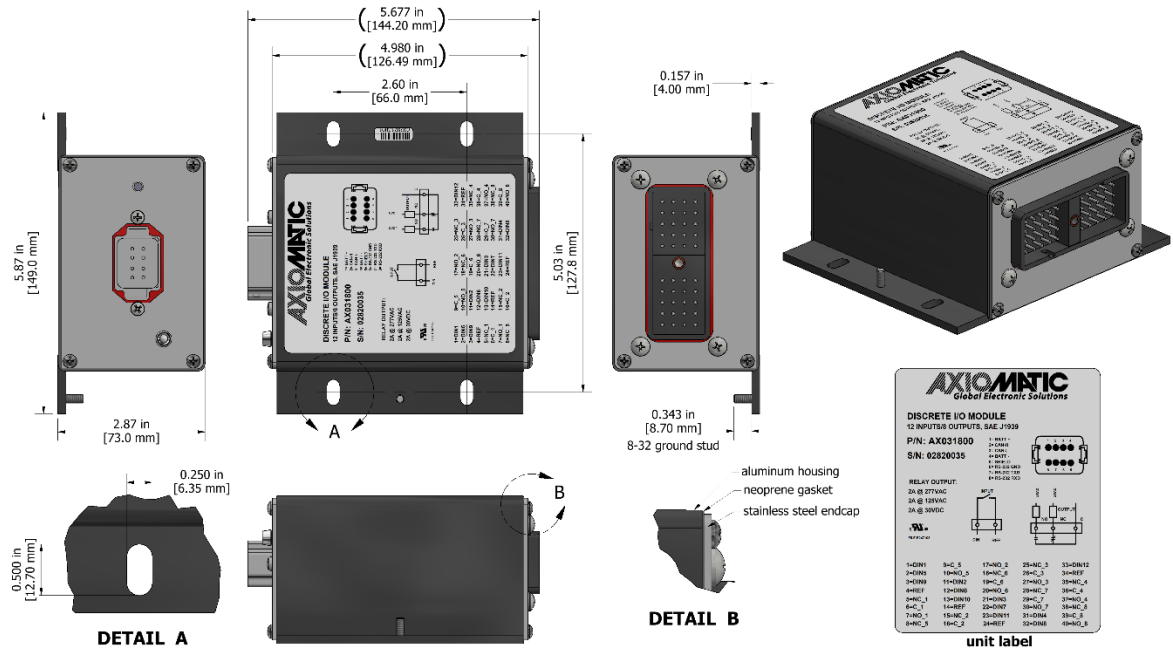FRONT VIEW OF
MODULE MOUNTED CONNECTOR
DEUTSCH P/N: DRC13-40PB

NO - Normally Open
NC - Normally Closed
C - Common

INPUTS	Pin	OUTPUTS	Pin
DIN1	1	NC_1	5
DIN2	11	C_1	6
DIN3	21	NO_1	7
DIN4	31	NC_2	15
DIN5	2	C_2	16
DIN6	12	NO_2	17
DIN7	22	NC_3	25
DIN8	32	C_3	26
DIN9	3	NO_3	27
DIN10	13	NC_4	35
DIN11	23	C_4	36
DIN12	33	NO_4	37
GND	4	NC_5	8
GND	14	C_5	9
GND	24	NO_5	10
GND	34	NC_6	18
		C_6	19
		NO_6	20
		NC_7	28
		C_7	29
		NO_7	30
		NC_8	38
		C_8	39
		NO_8	40

Electrical Wiring - I/O	
Discrete I/O Wiring - Typical	

Mating Connectors	Use the following TE-Deutsch-equivalent mating plugs to connect to the integral receptacles. Wiring to these mating plugs must be in accordance with all applicable local codes. Suitable field wiring for the rated voltage and current must be used. The rating of the connecting cables must be at least 70°C. Use field wiring suitable for both minimum and maximum ambient temperature.
	Power and CAN: TE Deutsch equivalent connector, P/N: DT06-08SA, wedgelock W8S and sockets 0462-201-16141
	I/O Interface: TE Deutsch equivalent connector, P/N: DRC16-40SE-A, or DRC18-40SA, or DRC16-40S with sockets 0462-201-16141
	(Refer to www.laddinc.com for more information on the wedgelock and contacts for the mating plug.)
	Axiomatic offers a mating connector plug kit, P/N **AX070200**. This kit includes 1 plug DT06-08SA, 1 plug DRC16-40S, 1 wedgelock W8S, 48 contact sockets 0462-201-16141, and 24 sealing plugs 114017. These items are also available from a local TE Deutsch distributor.

Dimensional Drawing

Form: TDAX031800-07/21/23