

**Preliminary**  
**Technical Datasheet #TDAX185000**  
**Thermocouple Scanner**  
**20 Thermocouple Channels**  
**CAN, SAE J1939**  
**with Electronic Assistant**  
**P/N: AX185000**

**Description:** The Thermocouple Scanner monitors up to 20 thermocouples and provides the temperature information to the engine control system over SAE J1939 CAN bus. The channels are independently configurable as Type J, K, B, E, N, R, S or T thermocouples. Temperature information can include exhaust temperature, winding temperature, and fluid temperature monitoring. All 20 channels of temperature data are automatically sent over the CAN bus when power is applied with no additional programming or configuration required. Integral diagnostics determine thermocouple integrity. All inputs are fully isolated from the CAN line, and from the power supply. During set-up, using a USB-CAN converter and a PC, the operator can configure the controller via the Axiomatic Electronic Assistant® to suit a wide variety of applications. Settings are saved to non-volatile memory upon command.



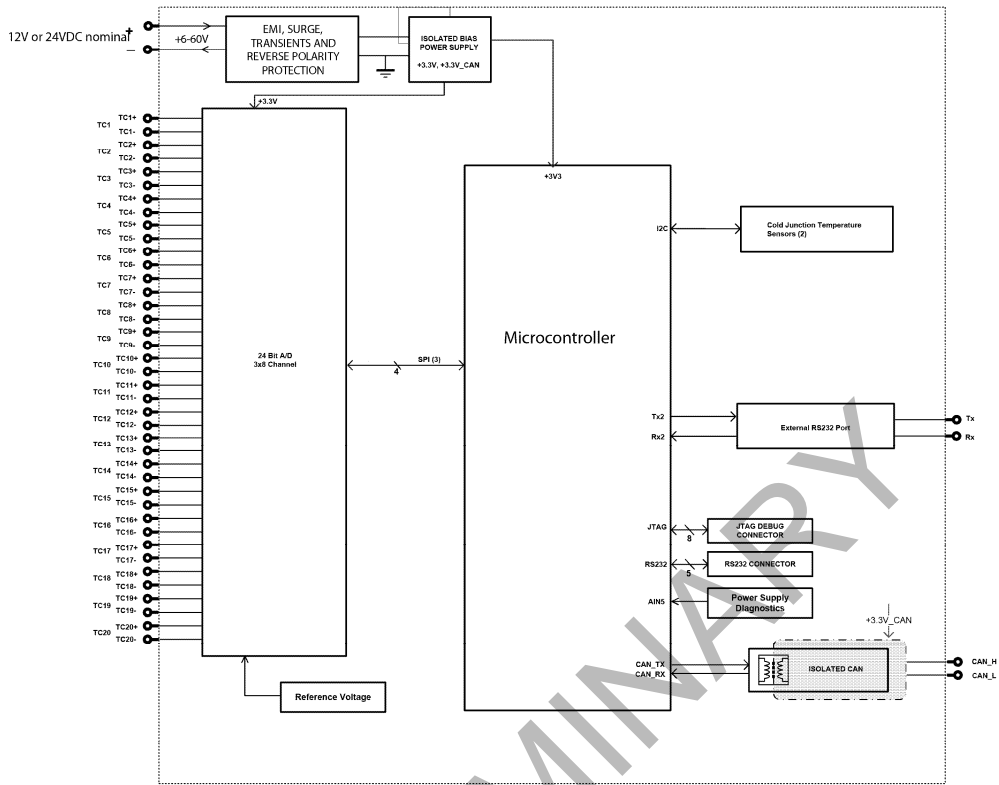
The Thermocouple Scanner features rugged packaging and watertight TE Deutsch connectors for an IP67 rating.

**Applications:** Control systems for industrial and marine power generator sets (stationary or portable)

**Ordering Part Numbers:**

20 Channel Thermocouple Module, SAE J1939 P/N: <b>AX181500</b>	
20 Channel Thermocouple Module, SAE J1939 500 kbps P/N: <b>AX185000-01</b>	
20 Channel Thermocouple Module, SAE J1939 1 Mbps P/N: <b>AX185000-02</b>	
<i>A CANopen® model is available on request.</i>	
Electronic Assistant Service Tool P/N: <b>AX070502</b>	
Mating Plug Kit P/N: <b>AX070200</b>	
This kit includes the following items. These items are also available from a local TE Deutsch distributor.	
NB. The sealing plugs are only needed in cases where less than 20 thermocouple channels are installed.	
A crimping tool from TE Deutsch is required to connect wiring to the sockets, P/N: HDT 48-00 or equivalent (not supplied).	
<b>TE Deutsch P/N:</b>	<b>Description:</b>
0462-201-16141	48 16AWG SOCKETS SOLID 16-20AWG WIRE 6mm
114017	24 SEALING PLUGS SIZE 12-16 CAVITIES 12-18 AWG
DRC16-40S	40-PIN PLUG, No Key
DT06-08SA	DT SERIES PLUG 8 CONTACT
W8S	WEDGELOCK FOR DT 8 PIN PLUG

# Block Diagram



PRELIMINARY

## Technical Specifications

### Inputs

Power Supply Input	12V or 24VDC nominal (9...60 VDC power supply range)
Supply Current	TBD mA at 12 V Typical TBD mA at 24 V Typical
Protection	Reverse polarity protection is provided. Power supply input section protects against transient surges and short circuits and is isolated from thermocouple inputs
Thermocouple Types	Up to 20 channels, independently configurable for B, E, J, K, N, R, S or T
Thermocouple Inputs	The device reads mV signals from the supported Thermocouples. B = 0 to 13.82 mV E = -9.835 to 76.373 mV J = -8.095 to 69.553 mV K = -6.458 to 54.886 mV N = -4.345 to 47.513 mV R = -0.226 to 21.101 mV S = -0.236 to 18.693 mV T = -6.258 to 20.872 mV  Temperatures are configured to indicate the SAE J1939 SPN to be transmitted by that temperature input.  Accuracy: +/- 1°C typical with cold junction compensation at ambient temperature Resolution: 0.001°C
Scan Rate	100ms per channel, total sweep time maximum 2.2 seconds
Common Mode Readings	Input range +/- 2.5V maximum Rejection is 120db (maximum) at 2.5Vp-p (50-60Hz)
Thermal Drift	4 ppm/°C of span (maximum)
Isolation	Digital isolation is 500VDC from input to ground. Three-way isolation is provided for the CAN line, inputs and power supply.
SPNs and PGNs	The SPN drop list includes all temperature SPNs from the J1939-71 standard published up to January of 2009. If an SPN is not supported by the drop list, the user can select a zero SPN, which then allows them to define the SPN and PGN per the application requirements.  One-byte parameters have a resolution of 1 °C / bit and a range of -40 °C to 210 °C. Two-byte parameters have resolution of 0.03125 °C / bit and a range of -273 °C to 1735 °C (per SAE J1939).  The Parameter Group Number (PGN) that will be used to send a temperature to the J1939 network will be entirely dependent on the Suspect Parameter Number (SPN) that was selected for that channel. In all cases, the PGN is a PDU2 type. Each PGN has a predefined priority and repetition rate associate with it.
Averaging	The average temperature of all the active channels can be broadcasted to the network using the default "Engine Average Information" PGN, or on a Proprietary B message.
Protection	Open circuit detection Frozen data detection Over or under temperature detection High temperature shutdown detection

### Communication

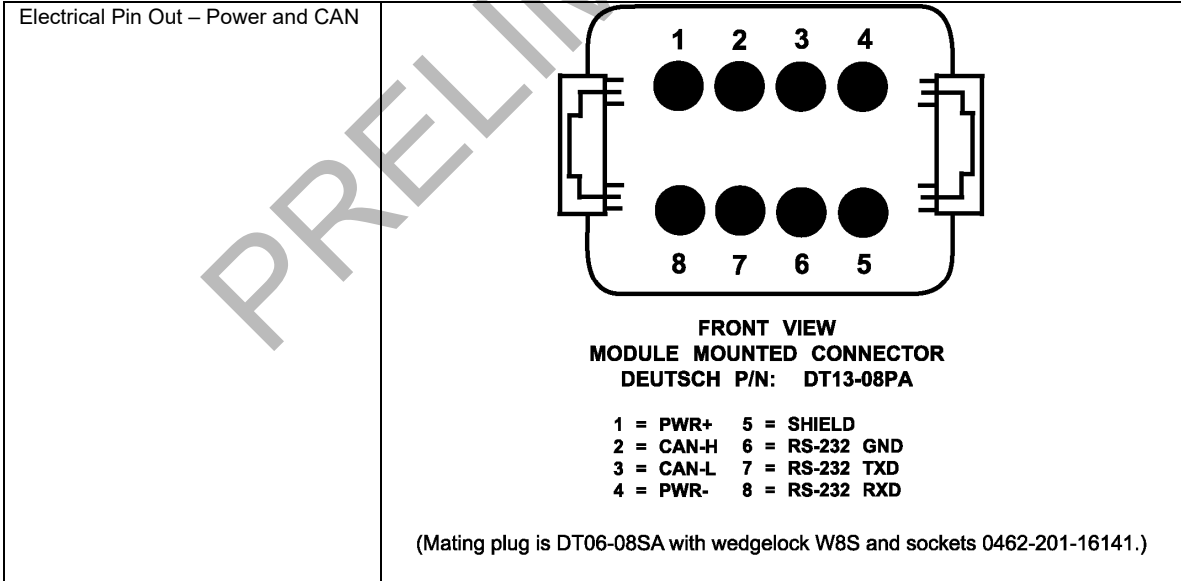
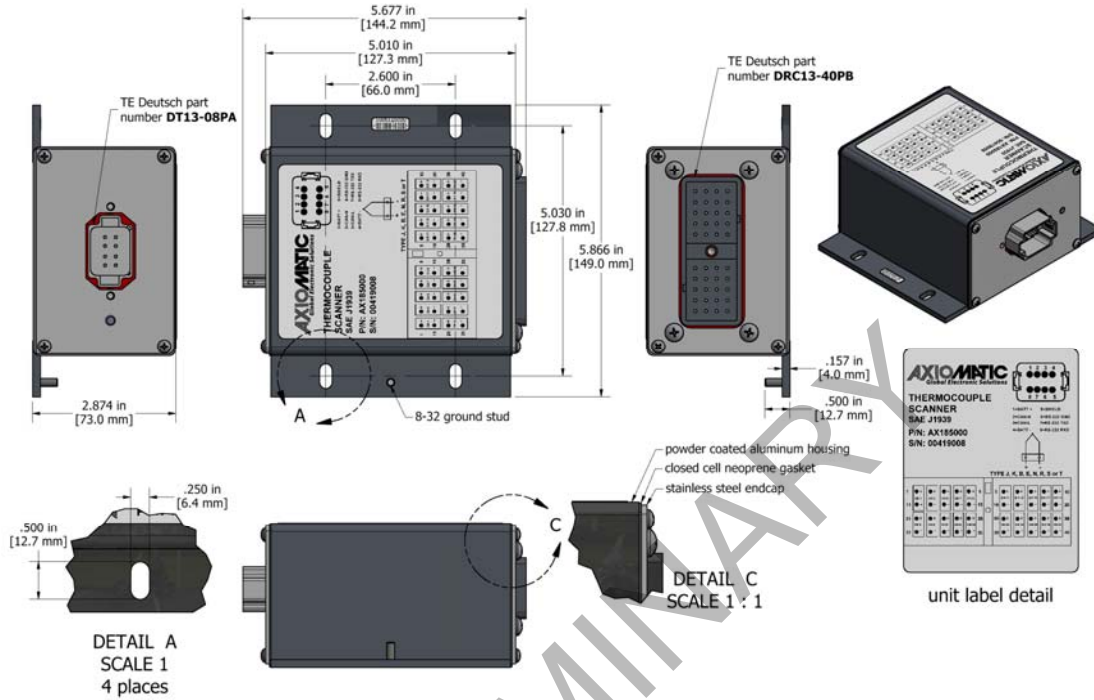
CAN	1 CAN 2.0B port, protocol SAE J1939 Digital isolation is provided for the CAN line. Model AX185000: 250 kbps Baud Rate Model AX185000-01: 500 kbps Baud Rate Model AX185000-02: 1 Mbps Baud Rate
Network Termination	According to the CAN standard, it is necessary to terminate the network with external termination resistors. The resistors are 120 Ohm, 0.25W 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	1 RS-232 port is available for debugging purposes. ASCII Text Format, 115200 Baud Rate Data – 8-bit, Parity – None, Stop – 1 bit. Flow Control – Xon/Xoff. Short circuit protection to ground.

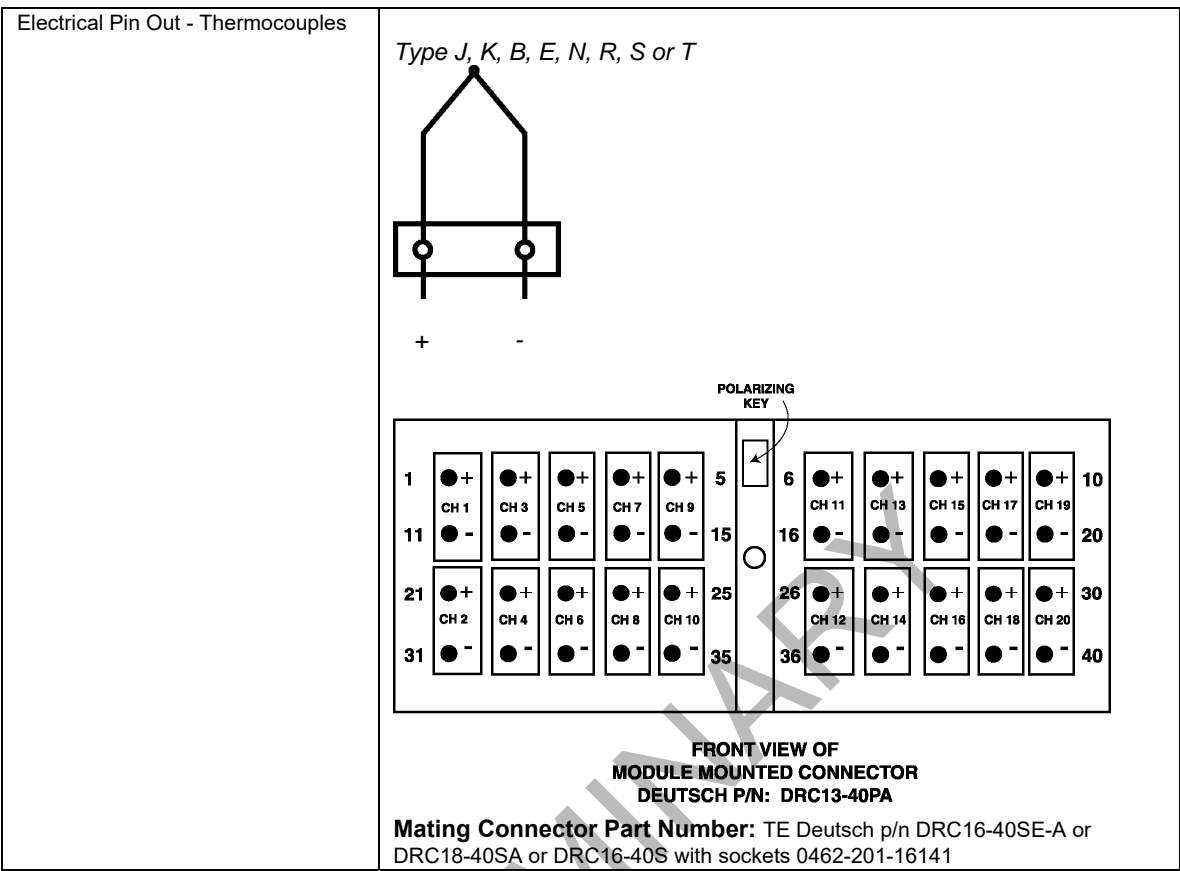
## General Specifications

Microprocessor	STM32F205VG, 12-bit, 1 Mbyte Flash Memory
Control Logic	<p>User programmable functionality with the Electronic Assistant®</p> <ul style="list-style-type: none"> <li>• Node address is auto configurable as per J1939-81 and/or via customer configuration.</li> <li>• Monitored parameters and diagnostics are user selectable from a drop down list in the EA.</li> <li>• Monitored parameters and diagnostics are read-only over the network</li> <li>• Units are pre-configured with default values at the factory. Refer to the user manual.</li> <li>• The bit-rate is 250 kbit/s. Other bit-rates (125 kbit/s, 500 kbit/s or 1 Mbit/s) can be factory programmed on request. Contact Axiomatic for an ordering p/n.</li> <li>• All parameter locations have default values that do not conflict.</li> <li>• Module is fully functional during configuration and communications.</li> <li>• Parameter values and diagnostic error codes are retained when the modules are de-energized.</li> <li>• Easily selectable SPNs from a drop down list of the temperature SPNs supported by SAE J1939.</li> <li>• User defined SPN and PGN's configurable with Electronic Assistant® to suit the application.</li> <li>• Configurable ECU Instance in the NAME to allow for multiple ECU's on the same network</li> </ul>
SAE J1939 Profile	<p>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:</p> <p>SAE J1939-21, December 2006, Data Link Layer  SAE J1939-71, January 2009, Vehicle Application Layer  SAE J1939-73, September 2006, Application Layer – Diagnostics  SAE J1939-81, May 2003, Network Management</p> <p><i>Customer specific proprietary extensions can also be included in the SAE J1939 profile on request.</i></p>
Diagnostics	<p>Configurable Diagnostic Messaging parameters</p> <p>Diagnostic Log is maintained in non-volatile memory.</p> <p>Each thermocouple channel could be configured to send diagnostic messages to the network if the temperature goes out of range.</p> <p>When sending an "Active Diagnostic Trouble Code" (DM1) or a "Previously Active Diagnostic Trouble Codes" (DM2) message, the controller will use the appropriate Diagnostic Trouble Code (DTC). As defined by the standard, this is a combination of the Suspect Parameter Number (SPN), the Failure Mode Indicator (FMI), Occurrence Count (OC) and the SPN Conversion Method (CM).</p>
RS-232	<p>1 RS-232 port is available for debugging purposes.</p> <p>ASCII Text Format, 115200 Baud Rate  Data – 8 bit, Parity – None, Stop – 1 bit. Flow Control – Xon/Xoff.  Short circuit protection to ground.</p>
User Interface	<p>Electronic Assistant®, P/N: AX070502  Updates for the EA are found on <a href="http://www.axiomatic.com">www.axiomatic.com</a> under the log-in tab.</p>
UL and cUL Compliance	Pending
CE Compliance	<p>2004/108/EC (EMC Directive) pending  2011/65/EU (RoHS Directive)</p>
Vibration	Pending
Shock	Pending
Operating Temperature Range	-40 to 85 °C (-40 to 185 °F)
Storage Temperature Range	-50 to 120 °C (-58 to 248 °F)
Humidity	Protected against 95% humidity non-condensing, 30 °C to 60 °C
Protection	<p>IP67  Pollution Degree 3 per UL508  <i>The marine type approval process tested to IP56.</i></p>
Weight	2.2 lbs. (1.00 kg)

Enclosure	Rugged aluminum housing, stainless steel end plates, neoprene gaskets 145.30 x 149.00 x 73.00 mm (5.72 x 5.86 x 2.87") L x W x H Connectors, TE Deutsch P/N: 1 8-pin DT13-08PA, 1 40-pin DRC13-40PA It can be mounted directly on the power generator set or remotely.
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**Dimensional Drawing**





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 [www.axiomatic.com/service.html](http://www.axiomatic.com/service.html).

TDAX185000-11/25/20