

Preliminary  
Application Platform  
TECHNICAL DATASHEET #TDAX022950  
**4 On/Off Valve Machine Controller**

*7 Digital Inputs for Switches and Proximity Sensors*  
*4 Outputs for On/Off Hydraulic Valves (up to 4A)*  
*3 Sourcing LED Outputs*  
*1 Sinking 50 mA Output*  
*1 CAN (SAE J1939)*  
*12VDC or 24VDC nominal*  
*Rugged Packaging*  
*Designed for SIL 2*

*Programmable with Electronic Assistant*

**P/N: AX022950**

**Features:**

- 12VDC or 24VDC nominal power input
- 7 Digital Inputs for Switches and Proximity Sensors
- 4 Outputs up to 4A for On/Off Hydraulic Valves
- 3 Sourcing LED Outputs (up to 50 mA)
- 1 Sinking 50 mA Output
- 1 CAN (SAE J1939)
- Rugged IP67 packaging and connectors
- Designed for SIL 2, Performance Level D (PLd) Functional Safety applications per ISO 13849
- Full diagnostic coverage (DC) on all inputs, outputs and logic
- Rugged design for EMC
- Suitable for the environmental and vibration requirements of off-highway equipment applications
- **Electronic Assistant** together with an Axiomatic USB-CAN converter links the PC to the CAN bus for user configuration.
- Flexible user programming for application-specific control logic via the CAN based Electronic Assistant.



**Applications:**

The controller is designed to meet the rugged demands of mobile off-highway equipment applications. Its compliance with ISO 13849 to meet Performance Level D (PLd) Functional Safety makes it suitable for safety-critical applications.

**Ordering Part Numbers:**

SAE J1939 version Controller: **AX022950**

**Accessories:**

**PL-DTM06-12SA-12SB** Mating Plug Kit (no DB-9)

(The KIT is comprised of: DTM06-12S, DTM06-12SB, 2 W12S and 24 contacts.)

**Electronic Assistant: AX070502**

Technical Specifications:

**Inputs**

Power Supply Input - Nominal	12VDC or 24VDC nominal (8...32 VDC power supply range)
Protection	Reverse polarity protection is provided. Overvoltage protection up to 200V is provided.

CAN	SAE J1939 Commands CANopen® is available on request.
-----	---

Digital Signal Inputs	7 ACTIVE HIGH Digital inputs 5V CMOS, +Vps (12VDC or 24VDC) Inputs 4 and 5 can interface with a NO relay. Inputs 6 and 7 can interface with a NC relay. All inputs have a 2kΩ pull-down resistor. Input functionality is user selectable. Inputs are sampled multiple times per millisecond. Protected against shorts to GND or +Vcc
GND Reference	One provided

**Outputs**

CAN	SAE J1939 Messages
Valve Outputs	4 independent software controlled outputs: On/Off Digital types Current sensing, grounded load High side sourcing up to 4A
Return Outputs	Two independent software controlled outputs: On/Off Digital types Low side sinking up to 4A
Signal Outputs	3 Sourcing Outputs (50 mA) for LED's 1 Sinking Output (50 mA)
Protection	FULL FAULT DETECTION to achieve SIL 2 compliance in a system. Fully protected against short circuit to ground or +Vcc Grounded short circuit protection will engage at 4.5A +/- 0.5A. Unit will fail safe in the case of a short-circuit condition and is self-recovering when the short is removed.

**General Specifications**

Quiescent Current	90 mA @ 24V; 140 mA @ 12V Typical
Microprocessor	32-bit, 768 KByte of flash memory Safety (SIL 3) Microcontroller TMS570LS0714
Safety	Designed for SIL 2, Performance Level D (PLd)
Diagnostics	Software and hardware architectures provide full Diagnostic Coverage (DC) of all of its inputs and outputs and logic functions. Each input and output channel can be configured to send diagnostic messages to the J1939 CAN network if the I/O goes out of range. Diagnostic data is stored in a non-volatile log. Refer to the User Manual for details.
Additional Fault Feedback	There are several types of faults that the controller will detect and provide a response: unit power supply undervoltage and overvoltage, microprocessor over temperature and lost communication. They can be sent to the J1939 CAN bus.
Compliance	Designed for EMC compliance Designed for the environmental and vibration requirements of off-highway equipment applications Functional Safety ISO 13849 compliance
Control Logic	User programmable functionality using Electronic Assistant® service tool  The controller consists of a set of internal functional blocks, which can be individually programmed and arbitrarily connected together to achieve the required system functionality.  Each functional block is absolutely independent and has its own set of parameters, or setpoints, used to control its functionality. The setpoints are accessible through CAN using Axiomatic Electronic Assistant® (EA) software.
Communications	1 CAN port (SAE J1939) CANopen® is available on request.

User Interface	Electronic Assistant AX070502 for <i>Windows</i> operating systems It comes with a royalty-free license for use.																																																																																																																																																																																																																
Packaging	<p>High Temperature Nylon housing - Deutsch IPD PCB Enclosure (EEC-325X4B) Other packaging is available on request, including a metal enclosure.</p> <p>4.63 x 5.25 x 1.42 inches 117.60 x 133.45 x 35.98 mm (W x L x H excluding mating plugs)</p>  <p>Gray receptacle keyed "A" mates with DTM06-12SA plug Black receptacle keyed "B" mates with DTM06-12SB plug</p> <table border="1" data-bbox="1201 588 1356 819"> <thead> <tr> <th>Grey Receptacle Pin #</th> <th>Black Receptacle Pin #</th> </tr> </thead> <tbody> <tr><td>LED Output 1</td><td>50 mA Sink Output 1</td></tr> <tr><td>0V0 Reference</td><td>0V0</td></tr> <tr><td>0V1 Reference</td><td>0V1</td></tr> <tr><td>5V1</td><td>5V1</td></tr> <tr><td>5V2</td><td>5V2</td></tr> <tr><td>5V3</td><td>5V3</td></tr> <tr><td>5V4</td><td>5V4</td></tr> <tr><td>5V5</td><td>5V5</td></tr> <tr><td>5V6</td><td>5V6</td></tr> <tr><td>5V7</td><td>5V7</td></tr> <tr><td>5V8</td><td>5V8</td></tr> <tr><td>5V9</td><td>5V9</td></tr> <tr><td>5V10</td><td>5V10</td></tr> <tr><td>5V11</td><td>5V11</td></tr> <tr><td>5V12</td><td>5V12</td></tr> <tr><td>5V13</td><td>5V13</td></tr> <tr><td>5V14</td><td>5V14</td></tr> <tr><td>5V15</td><td>5V15</td></tr> <tr><td>5V16</td><td>5V16</td></tr> <tr><td>5V17</td><td>5V17</td></tr> <tr><td>5V18</td><td>5V18</td></tr> <tr><td>5V19</td><td>5V19</td></tr> <tr><td>5V20</td><td>5V20</td></tr> <tr><td>5V21</td><td>5V21</td></tr> <tr><td>5V22</td><td>5V22</td></tr> <tr><td>5V23</td><td>5V23</td></tr> <tr><td>5V24</td><td>5V24</td></tr> <tr><td>5V25</td><td>5V25</td></tr> <tr><td>5V26</td><td>5V26</td></tr> <tr><td>5V27</td><td>5V27</td></tr> <tr><td>5V28</td><td>5V28</td></tr> <tr><td>5V29</td><td>5V29</td></tr> <tr><td>5V30</td><td>5V30</td></tr> <tr><td>5V31</td><td>5V31</td></tr> <tr><td>5V32</td><td>5V32</td></tr> <tr><td>5V33</td><td>5V33</td></tr> <tr><td>5V34</td><td>5V34</td></tr> <tr><td>5V35</td><td>5V35</td></tr> <tr><td>5V36</td><td>5V36</td></tr> <tr><td>5V37</td><td>5V37</td></tr> <tr><td>5V38</td><td>5V38</td></tr> <tr><td>5V39</td><td>5V39</td></tr> <tr><td>5V40</td><td>5V40</td></tr> <tr><td>5V41</td><td>5V41</td></tr> <tr><td>5V42</td><td>5V42</td></tr> <tr><td>5V43</td><td>5V43</td></tr> <tr><td>5V44</td><td>5V44</td></tr> <tr><td>5V45</td><td>5V45</td></tr> <tr><td>5V46</td><td>5V46</td></tr> <tr><td>5V47</td><td>5V47</td></tr> <tr><td>5V48</td><td>5V48</td></tr> <tr><td>5V49</td><td>5V49</td></tr> <tr><td>5V50</td><td>5V50</td></tr> <tr><td>5V51</td><td>5V51</td></tr> <tr><td>5V52</td><td>5V52</td></tr> <tr><td>5V53</td><td>5V53</td></tr> <tr><td>5V54</td><td>5V54</td></tr> <tr><td>5V55</td><td>5V55</td></tr> <tr><td>5V56</td><td>5V56</td></tr> <tr><td>5V57</td><td>5V57</td></tr> <tr><td>5V58</td><td>5V58</td></tr> <tr><td>5V59</td><td>5V59</td></tr> <tr><td>5V60</td><td>5V60</td></tr> <tr><td>5V61</td><td>5V61</td></tr> <tr><td>5V62</td><td>5V62</td></tr> <tr><td>5V63</td><td>5V63</td></tr> <tr><td>5V64</td><td>5V64</td></tr> <tr><td>5V65</td><td>5V65</td></tr> <tr><td>5V66</td><td>5V66</td></tr> <tr><td>5V67</td><td>5V67</td></tr> <tr><td>5V68</td><td>5V68</td></tr> <tr><td>5V69</td><td>5V69</td></tr> <tr><td>5V70</td><td>5V70</td></tr> <tr><td>5V71</td><td>5V71</td></tr> <tr><td>5V72</td><td>5V72</td></tr> <tr><td>5V73</td><td>5V73</td></tr> <tr><td>5V74</td><td>5V74</td></tr> <tr><td>5V75</td><td>5V75</td></tr> <tr><td>5V76</td><td>5V76</td></tr> <tr><td>5V77</td><td>5V77</td></tr> <tr><td>5V78</td><td>5V78</td></tr> <tr><td>5V79</td><td>5V79</td></tr> <tr><td>5V80</td><td>5V80</td></tr> <tr><td>5V81</td><td>5V81</td></tr> <tr><td>5V82</td><td>5V82</td></tr> <tr><td>5V83</td><td>5V83</td></tr> <tr><td>5V84</td><td>5V84</td></tr> <tr><td>5V85</td><td>5V85</td></tr> <tr><td>5V86</td><td>5V86</td></tr> <tr><td>5V87</td><td>5V87</td></tr> <tr><td>5V88</td><td>5V88</td></tr> <tr><td>5V89</td><td>5V89</td></tr> <tr><td>5V90</td><td>5V90</td></tr> <tr><td>5V91</td><td>5V91</td></tr> <tr><td>5V92</td><td>5V92</td></tr> <tr><td>5V93</td><td>5V93</td></tr> <tr><td>5V94</td><td>5V94</td></tr> <tr><td>5V95</td><td>5V95</td></tr> <tr><td>5V96</td><td>5V96</td></tr> <tr><td>5V97</td><td>5V97</td></tr> <tr><td>5V98</td><td>5V98</td></tr> <tr><td>5V99</td><td>5V99</td></tr> <tr><td>5V100</td><td>5V100</td></tr> </tbody> </table>	Grey Receptacle Pin #	Black Receptacle Pin #	LED Output 1	50 mA Sink Output 1	0V0 Reference	0V0	0V1 Reference	0V1	5V1	5V1	5V2	5V2	5V3	5V3	5V4	5V4	5V5	5V5	5V6	5V6	5V7	5V7	5V8	5V8	5V9	5V9	5V10	5V10	5V11	5V11	5V12	5V12	5V13	5V13	5V14	5V14	5V15	5V15	5V16	5V16	5V17	5V17	5V18	5V18	5V19	5V19	5V20	5V20	5V21	5V21	5V22	5V22	5V23	5V23	5V24	5V24	5V25	5V25	5V26	5V26	5V27	5V27	5V28	5V28	5V29	5V29	5V30	5V30	5V31	5V31	5V32	5V32	5V33	5V33	5V34	5V34	5V35	5V35	5V36	5V36	5V37	5V37	5V38	5V38	5V39	5V39	5V40	5V40	5V41	5V41	5V42	5V42	5V43	5V43	5V44	5V44	5V45	5V45	5V46	5V46	5V47	5V47	5V48	5V48	5V49	5V49	5V50	5V50	5V51	5V51	5V52	5V52	5V53	5V53	5V54	5V54	5V55	5V55	5V56	5V56	5V57	5V57	5V58	5V58	5V59	5V59	5V60	5V60	5V61	5V61	5V62	5V62	5V63	5V63	5V64	5V64	5V65	5V65	5V66	5V66	5V67	5V67	5V68	5V68	5V69	5V69	5V70	5V70	5V71	5V71	5V72	5V72	5V73	5V73	5V74	5V74	5V75	5V75	5V76	5V76	5V77	5V77	5V78	5V78	5V79	5V79	5V80	5V80	5V81	5V81	5V82	5V82	5V83	5V83	5V84	5V84	5V85	5V85	5V86	5V86	5V87	5V87	5V88	5V88	5V89	5V89	5V90	5V90	5V91	5V91	5V92	5V92	5V93	5V93	5V94	5V94	5V95	5V95	5V96	5V96	5V97	5V97	5V98	5V98	5V99	5V99	5V100	5V100
Grey Receptacle Pin #	Black Receptacle Pin #																																																																																																																																																																																																																
LED Output 1	50 mA Sink Output 1																																																																																																																																																																																																																
0V0 Reference	0V0																																																																																																																																																																																																																
0V1 Reference	0V1																																																																																																																																																																																																																
5V1	5V1																																																																																																																																																																																																																
5V2	5V2																																																																																																																																																																																																																
5V3	5V3																																																																																																																																																																																																																
5V4	5V4																																																																																																																																																																																																																
5V5	5V5																																																																																																																																																																																																																
5V6	5V6																																																																																																																																																																																																																
5V7	5V7																																																																																																																																																																																																																
5V8	5V8																																																																																																																																																																																																																
5V9	5V9																																																																																																																																																																																																																
5V10	5V10																																																																																																																																																																																																																
5V11	5V11																																																																																																																																																																																																																
5V12	5V12																																																																																																																																																																																																																
5V13	5V13																																																																																																																																																																																																																
5V14	5V14																																																																																																																																																																																																																
5V15	5V15																																																																																																																																																																																																																
5V16	5V16																																																																																																																																																																																																																
5V17	5V17																																																																																																																																																																																																																
5V18	5V18																																																																																																																																																																																																																
5V19	5V19																																																																																																																																																																																																																
5V20	5V20																																																																																																																																																																																																																
5V21	5V21																																																																																																																																																																																																																
5V22	5V22																																																																																																																																																																																																																
5V23	5V23																																																																																																																																																																																																																
5V24	5V24																																																																																																																																																																																																																
5V25	5V25																																																																																																																																																																																																																
5V26	5V26																																																																																																																																																																																																																
5V27	5V27																																																																																																																																																																																																																
5V28	5V28																																																																																																																																																																																																																
5V29	5V29																																																																																																																																																																																																																
5V30	5V30																																																																																																																																																																																																																
5V31	5V31																																																																																																																																																																																																																
5V32	5V32																																																																																																																																																																																																																
5V33	5V33																																																																																																																																																																																																																
5V34	5V34																																																																																																																																																																																																																
5V35	5V35																																																																																																																																																																																																																
5V36	5V36																																																																																																																																																																																																																
5V37	5V37																																																																																																																																																																																																																
5V38	5V38																																																																																																																																																																																																																
5V39	5V39																																																																																																																																																																																																																
5V40	5V40																																																																																																																																																																																																																
5V41	5V41																																																																																																																																																																																																																
5V42	5V42																																																																																																																																																																																																																
5V43	5V43																																																																																																																																																																																																																
5V44	5V44																																																																																																																																																																																																																
5V45	5V45																																																																																																																																																																																																																
5V46	5V46																																																																																																																																																																																																																
5V47	5V47																																																																																																																																																																																																																
5V48	5V48																																																																																																																																																																																																																
5V49	5V49																																																																																																																																																																																																																
5V50	5V50																																																																																																																																																																																																																
5V51	5V51																																																																																																																																																																																																																
5V52	5V52																																																																																																																																																																																																																
5V53	5V53																																																																																																																																																																																																																
5V54	5V54																																																																																																																																																																																																																
5V55	5V55																																																																																																																																																																																																																
5V56	5V56																																																																																																																																																																																																																
5V57	5V57																																																																																																																																																																																																																
5V58	5V58																																																																																																																																																																																																																
5V59	5V59																																																																																																																																																																																																																
5V60	5V60																																																																																																																																																																																																																
5V61	5V61																																																																																																																																																																																																																
5V62	5V62																																																																																																																																																																																																																
5V63	5V63																																																																																																																																																																																																																
5V64	5V64																																																																																																																																																																																																																
5V65	5V65																																																																																																																																																																																																																
5V66	5V66																																																																																																																																																																																																																
5V67	5V67																																																																																																																																																																																																																
5V68	5V68																																																																																																																																																																																																																
5V69	5V69																																																																																																																																																																																																																
5V70	5V70																																																																																																																																																																																																																
5V71	5V71																																																																																																																																																																																																																
5V72	5V72																																																																																																																																																																																																																
5V73	5V73																																																																																																																																																																																																																
5V74	5V74																																																																																																																																																																																																																
5V75	5V75																																																																																																																																																																																																																
5V76	5V76																																																																																																																																																																																																																
5V77	5V77																																																																																																																																																																																																																
5V78	5V78																																																																																																																																																																																																																
5V79	5V79																																																																																																																																																																																																																
5V80	5V80																																																																																																																																																																																																																
5V81	5V81																																																																																																																																																																																																																
5V82	5V82																																																																																																																																																																																																																
5V83	5V83																																																																																																																																																																																																																
5V84	5V84																																																																																																																																																																																																																
5V85	5V85																																																																																																																																																																																																																
5V86	5V86																																																																																																																																																																																																																
5V87	5V87																																																																																																																																																																																																																
5V88	5V88																																																																																																																																																																																																																
5V89	5V89																																																																																																																																																																																																																
5V90	5V90																																																																																																																																																																																																																
5V91	5V91																																																																																																																																																																																																																
5V92	5V92																																																																																																																																																																																																																
5V93	5V93																																																																																																																																																																																																																
5V94	5V94																																																																																																																																																																																																																
5V95	5V95																																																																																																																																																																																																																
5V96	5V96																																																																																																																																																																																																																
5V97	5V97																																																																																																																																																																																																																
5V98	5V98																																																																																																																																																																																																																
5V99	5V99																																																																																																																																																																																																																
5V100	5V100																																																																																																																																																																																																																
Protection	IP67 rating for the product assembly																																																																																																																																																																																																																
Weight	0.55 lbs. (0.250 kg)																																																																																																																																																																																																																
Temperature Rating	Operating: -40 to 85°C (-40 to 185°F) Storage: -50 to 105°C (-58 to 221°F)																																																																																																																																																																																																																
Electrical Connections	<p>Deutsch DTM series 24 pin receptacle (DTM13-12PA-12PB-R008) Mating plug: Deutsch DTM06-12SA and DTM06-12SB with 2 wedgelocks (WM12S) and 24 contacts (0462-201-20141). 20 AWG wire is recommended for use with contacts 0462-201-20141. <b>Use dielectric grease on the pins when installing the controller.</b></p> <p style="text-align: center;"><b>Key Arrangement B (black)</b></p>  <p style="text-align: center;"><b>Key Arrangement A (grey)</b></p> <p style="text-align: center;"><b>FRONT VIEW 24 PIN RECEPTACLE</b></p>																																																																																																																																																																																																																

Grey Connector		Black Connector	
Pin #	Function	Pin #	Function
1	50 mA Sourcing Output 1 (LED)	1	50 mA Sinking Output
2	GND Reference	2	CAN_L
3	Solenoid 1 +	3	CAN_H
4	Solenoid 1/2 Return	4	Digital Input 1
5	Solenoid 3 +	5	Digital Input 4 (NO)
6	Battery -	6	Digital Input 5 (NO)
7	Battery +	7	Digital Input 6 (NC)
8	Solenoid 4 +	8	Digital Input 7 (NC)
9	Solenoid 3/4 Return	9	Digital Input 2
10	Solenoid 2 +	10	Digital Input 3
11	50 mA Sourcing Output 2 (LED)	11	CAN_Shield
12	50 mA Sourcing Output 3 (LED)	12	GND Reference

Installation	<p>Mounting holes sized for ¼ inch or M6 bolts. The bolt length will be determined by the end-user's mounting plate thickness. The mounting flange of the controller is 0.63 inches (16 mm) thick.</p> <p>If the module is mounted without an enclosure, it should be mounted to reduce the likelihood of moisture entry.</p> <p>Install the unit with appropriate space available for servicing and for adequate wire harness access (6 inches or 15 cm) and strain relief (12 inches or 30 cm).</p> <p>The CAN wiring is considered intrinsically safe. The power wires are not considered intrinsically safe and so in hazardous locations, they need to be located in conduit or conduit trays at all times. The module must be mounted in an enclosure in hazardous locations for this purpose.</p> <p>All field wiring should be suitable for the operating temperature range of the module.</p> <p>All chassis grounding should go to a single ground point designated for the machine and all related equipment.</p>
Network Termination	<p>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.</p>

**Notes:**

CANopen® is a registered community trade mark of CAN in Automation e.V.

Electronic Assistant® is a registered US trade mark of Axiomatic Technologies Corporation.

*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).*

Form: TDAX022950-04/03/19