I/O BOARD SPECIFICATIONS

GUARDIAN SERIES ADVANTAGE On-Board I/O Monitoring System

Open/Broken Sensor Detection • Channel Self-Test without Field Wiring Disconnection • Current/Voltage Monitoring • Circuit Breaker Functionality

COMPLETE SELF-CHECK
From the Chassis to the Board to the Channel

ELIMINATE HEADACHES
Save Time • Reduce Monitoring Complexity • Lower Costs (No External Test Equipment)

ANALOG INPUT

Board Type	Part Number (DNx-)	Number of Channels	Resolution (Bits)	Maximum Sample Rate (Channel) kS/sec	Maximum Sample Rate (Board) kS/sec	Simultaneous Sampling (No MUX)	Maximum Input Range	Minimum Input Range	Channel-to-Channel Isolation	MTBF
General Purpose, Low Noise	AI-207	16	18	16	16	-	±10 V	±12.5 mV	-	>600,000
High Speed, Simultaneous Sampling	AI-217	16	24	120	1600	✓	±10 V	±156 mV	-	275,000
High Density	AI-248-230	24	18	0.25	6	-	+32/-2 V	±32 mV	-	550,000
High Density, High Speed	AI-201-100	24/12	16	100	100	-	±15 V	±1.5 V	-	600,000
High Speed, High Voltage	AI-205	4	18	250	1000	✓	±100 V	±100 mV	✓	>600,000
High Speed, Fully Isolated	AI-218	8	24	120	480	✓	±10 V	±156 mV	✓	290,000
High Voltage, Fully Isolated	AI-228-300	8	24	120	480	✓	±300 V	±37.5 V	✓	290,000
Current Input	AI-202	12	16	16	16	-	±150 mA	±1.5 mA	-	>600,000
0-20/4-20 mA Input	AI-204	24	18	1	24	-	0–20 mA	0–0.2 mA	-	>500,000
Thermocouple, Fully Isolated	AI-212	12	24	1.5	18	✓	±2.048 V	±32 mV	✓	230,000
Thermocouple, High Resolution, High Density	AI-225	25	24	1	25	✓	±1.25 V	-	-	520,000
RTD/Resistance	AI-222	12	24	0.150	1.8	✓	40k Ω	100 Ω	✓	230,000
Strain/Bridge Input, Low Cost	AI-208	8	18	8	8	-	±10 V	±12.5 mV	-	>600,000
Strain/Bridge Input, High Performance	AI-224	4	18	100	400	✓	±10 V	±78 mV	✓	260,000
ICP/IEPE Accelerometers	AI-211	4	24	125	500	✓	+25/-13 V	± 2.5 V	✓	250,000
LVDT/RVDT	AI-254*	4	16	5	20	✓	28 Vrms	2 Vrms	✓	275,000
Synchro/Resolver	AI-255*	2	16	4	8	✓	28 Vrms	2 Vrms	✓	275,000
Synchro/Resolver	AI-255-815*	2	16	4	8	✓	115 Vrms	5 Vrms	✓	275,000
LVDT/RVDT, Synchro/ Resolver, High Drive	AI-256*	2	16	10	20	✓	28 Vrms	5 Vrms	✓	275,000
Digital Multimeter (DMM)	DMM-261	1	6.5 digit	Range Dependent	Range Dependent	n/a	300 VDC 3 ADC 100 MΩ	30 mVDC 1.5 mADC 10 Ω	✓	300,000
Mutifunction I/O	MF-101, MF-102	16/8	18	2	16	-	±80 V	±0.156 V	✓	140,000

Guardian Series – Includes a variety of powerful diagnostic and BIT functionality.

*Also functions as simulated output

ANALOG OUTPUT–GENERAL PURPOSE

Board Type	Part Number (DNx-)	Number of Channels	Update Rate (Channel) kS/sec	Update Rate (Board) kS/sec	Output Range (Volts)	Output Current Drive (mA)	Channel-to-Channel Isolation	MTBF
General Purpose	AO-308	8	100	500	+/-10	+/-5	-	480,000
Fully Isolated With Readback	AO-318	8	10	80	+/-10	+/-10	✓	480,000
High Current	AO-308-350	8	100	800	+/-10	+/-50	-	480,000
High Density	AO-332	32	10	320	+/-10	+/-10	-	400,000
High Density	AO-332-828	28	10	280	+/-10	+/-10	-	400,000
High Density With Readback	AO-333	32	10	320	+/-10	+/-10	-	400,000
Medium Voltage/Current	AO-308-352	8	100	800	+/-13.5	+/-13.5	-	480,000
High Voltage	AO-308-353	8	100	800	+/-40	+/-5	-	480,000
High Voltage	AO-308-354	4	50	200	+/-60	+/-5	-	480,000
Current Output (0–20 mA)	AO-308-020	8	100	800	-	0–20	-	480,000
Current Output (Sourcing) Isolated with Readback	AO-318-020	8	10	80	-	0–20	✓	480,000
Current Output (Sourcing) Isolated with Readback	AO-318-024	8	10	80	-	0–24	✓	480,000
Bipolar Current Output (Sourcing) Isolated with Readback	AO-318-210	8	10	80	-	+/-10	✓	480,000
Current Output (Sinking) Isolated with Readback	AO-319-420	8	10	80	-	4–20	✓	480,000
Current Output (4–20 mA)	AO-308-420	8	100	800	-	4–20	-	480,000
Function Generator/AWFG	AO-364	4	150	600	+/-12	+/-10	✓	290,000
Multifunction I/O	MF-101, MF-102	2	2	2	±10, ± 5	0-20, 4-20, -1-22	✓	140,000
High Current Buffer (External)	UEI-STP-AO-200	8	-	-	+/-10	+/- 250	-	200,000
High Current, High Voltage (External)	DNA-STP-AO-250	4	-	-	0–35	+/- 250	-	200,000
High Voltage Amplifier (External)	PD-AO-AMP-115	16	-	-	+/-115	+/-10	-	100,000

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ANALOG OUTPUT–SIMULATION

Board Type	Part Number (DNx-)	Number of Channels	Update Rate (Channel) kS/sec	Update Rate (Board) kS/sec	Output Range (Volts)	Output Current Drive (mA)	Channel-to-Channel Isolation	MTBF
SIMULATED DEVICE/SENSOR								
Strain Gage Simulator, 350 Ω	AO-358-350	8 Bridges	5	40	N/A	N/A	-	300,000
Strain Gage Simulator, 1 kΩ	AO-358-102	8 Bridges	5	40	N/A	N/A	-	300,000
Simulated LVDT/RVDT	AI-254	4	5 kHz exc	-	0–6.7 Vrms	65 mA	✓	275,000
Simulated Synchro / Resolver	AI-255	2	4 kHz exc	-	0–28 Vrms	1.2 VA	✓	275,000
Simulated S/R & LVDT/RVDT, High Drive	AI-256	2	10 kHz exc	-	0–19.8 Vrms	2.4 VA	✓	275,000
Transformer Coupler for AI-254	TRF-254-447	4	5 kHz	-	4.47:1 ratio	4.47:1 ratio	-	-
Transformer Coupler for AI-254	TRF-254-122	4	5 kHz	-	1.22:1 ratio	1.22:1 ratio	-	-
Simulated Thermocouple with CJC	TC-378	8	1 kHz	8 kHz	+/-100 mV 16 bits	+/-10 mA	✓	250,000
Simulated RTD 100 Ω	RTD-388-100	8	200 Hz	200 Hz	23–390 Ω, 7500 steps	+/-4 mA Input	✓	>400,000
Simulated RTD 1 kΩ	RTD-388	8	200 Hz	200 Hz	180–3900 Ω, 7500 steps	+/-4 mA Input	✓	>400,000

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I/O BOARD SPECIFICATIONS CONTINUED

DIGITAL I/O

Board Type	Part Number (DNx-)	Number of Channels	Input (kHz)	Output kS/sec	Drive Capacity (Continuous/ Peak)	Range (Min V)	Range (Max V)	Change of State	MTBF
DISCRETE I/O									
Logic Level	DIO-403	48	10	20	16 mA	2.5	5.5	✓	>600,000
Sourcing Outputs, 3.3–36 VDC Inputs	DIO-404	12 in/12 out	100	100	350 mA/500 mA	3.3	36	✓	375,000
Sourcing Darlington Outputs, 5–36 VDC Inputs	DIO-405	12 in/12 out	1	1	80 mA/200 mA	5	36	✓	>600,000
Sinking Outputs, 3.3–36 VDC Inputs	DIO-406	12 in/12 out	100	100	1 A/1.5 A	3.3	36	✓	375,000
Universal Sink/Source, In/Out	DIO-480	32 in/32 out	100	1	500 mA/1 A	3.3	55	✓	140,000
Universal Sink/Source, In/Out	MF-101, MF-102	16 in/16 out	1	1	500 mA	3.3	55	✓	140,000
DISCRETE INPUTS									
5–36 VDC Inputs	DIO-401	24	1	-	-	5	36	✓	>600,000
0–32 VDC Inputs	DIO-448	48	1	-	-	-1	32	-	550,000
0–150 V AC/DC Inputs	DIO-449	48	1	-	-	-150	150	✓	500,000

Board Type	Part Number (DNx-)	Number of Channels	Input (kHz)	Output (kS/sec)	Drive Capacity (Continuous/ Peak)	Range (Min V)	Range (Max V)	PWM	MTBF
DISCRETE OUTPUTS									
Sourcing Darlington Outputs	DIO-402	24	-	1	80 mA/200 mA	7	36	-	>600,000
Solenoid Drive (Source/Sink), 3.3–36 VDC	DIO-416-32	32	-	0.125	500 mA/3.5 A	3.3	48	-	130,000
Sinking Outputs, 3–36 VDC	DIO-432	32	-	1	600 mA/3.5 A	3.3	36	✓	260,000
Low-leakage, Sinking Outputs, 3–36 VDC	DIO-432-800	32	-	1	600 mA/3.5 A	3.3	36	✓	260,000
Sourcing Outputs, 3–36 VDC	DIO-433	32	-	1	600 mA/3.5 A	3.3	36	✓	260,000
Low-leakage, Sourcing Outputs, 3–36 VDC	DIO-433-800	32	-	1	600 mA/3.5 A	3.3	36	✓	260,000
RELAY OUTPUTS									
Solid State Relay Outputs, Form A	DIO-430	30	-	1	400 mA/2 A	0	55 VDC/55 VAC	-	600,000
Relay Outputs, Form C	DIO-452	12	-	0.125	2 A	0	220 VDC/250 VAC	-	275,000
Relay Outputs, Form C	DIO-462	12	-	0 .125	2 A	0	220 VDC/250 VAC	-	260,000
Solid State Relay Outputs, Form A (NO)	DIO-463	12	-	0.125	2 A	0	51 VDC/51 VAC	-	260,000
High Current Relay Outputs, Form C	DIO-470	10	-	0.125	5 A	0	140 VDC/150 VAC	-	275,000

Board Type	Part Number (DNx-)	Number of Channels	Relay Type	Output	Drive Capacity Continuous / Peak	Maximum On/Off Resistance	Range (Max V)	Chan-nel-to-Channel Isolation	MTBF
MULTIPLEXERS									
3 to 1 Routing Board	MUX-414/418	14/18	SSR	300 Hz	2 A/3 A	200 mΩ/10^8 Ω	60 VDC	✓	>400,000
Multiplexer for the DMM-261	MUX-461	26/13–2/4 wire	Reed	500 Hz	0.5 A	500 mΩ/10^10 Ω	170 Vrms	✓	180,000
High Voltage Multiplexer for the DMM-261	MUX-461-350	24/12–2/4 wire	SSR	500 Hz	0.5 A	4 Ω/10^6 Ω	+/- 350 V	✓	180,000

Guardian Series – Includes a variety of powerful diagnostic and BIT functionality.

MULTIFUNCTION I/O MultiFunction Analog and Digital Boards (DNX-MF-101 & DNX-MF-102)

ANALOG INPUT

Type	Number of Channels	Resolution (Bits)	Maximum Sample Rate (Channel) kS/sec	Maximum Sample Rate (Board) kS/sec	Maximum Input Range	Minimum Input Range	MTBF
General Purpose, Medium Voltage	16 SE, 8 diff	18	2	16	80 V	0.156 V	140,000

ANALOG OUTPUT

Type	Number of Channels	Resolution (Bits)	Update Rate (Channel) kS/sec	Update Rate (Board) kS/sec	Voltage Output Mode Range	Current Output Mode Range (mA)	MTBF
General Purpose Voltage or Current	2	16	2	4	+/- 10 V, +/- 5 V @ 5 mA	0–20, 4–20, -1–22	140,000

DIGITAL I/O

Type	Number of Channels	Input (kHz)	Output (kS/sec)	Drive Capacity	Range (Min V)	Range (Max V)	Notes	MTBF
Industrial Voltage	16	1	1	500 mA	3.3	55	Inputs: Programmable PU/PD, thresholds Outputs: Sink or Source, PWM control	140,000
Logic Level	4	1	1	5 mA	3.3	5	Direction set in groups of 2	140,000

SERIAL/CAN BUS

Type	Number of Channels	Transfer Rate	Notes	MTBF
RS-232/422/485	1	2 Mbaud	2048 word FIFO, Interrogation Scheduler	140,000
I^2C (DNx-MF-101 Only)	1	100k, 400k, 1 Mbit	Master, Slave, Bus Monitor	140,000
CAN 2.0 (DNx-MF-102 Only)	2	1 Mbps	Supports standard, fast and fast+ baud rates	140,000

COUNTER/TIMER

Type	Number of Channels	Clock Rate	Notes	MTBF
32 Bit	2	66 MHz	Counter In/Out can be connected to any Digital In/Out	140,000

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I/O BOARD SPECIFICATIONS CONTINUED

PIO-1010 40-Channel, Fully Integrated I/O System

ANALOG INPUT

Type	Number of Channels	Resolution (Bits)	Maximum Sample Rate (Channel) kS/sec	Maximum Sample Rate (Board) kS/sec	Maximum Input Range	Minimum Input Range	MTBF
General Purpose, Medium Voltage	16 SE, 8 diff	18	2	16	80 V	0.156 V	140,000

ANALOG OUTPUT

Type	Number of Channels	Resolution (Bits)	Update Rate (Channel) ks/sec	Update Rate (Board) ks/sec	Voltage Output Mode Range	Current Output Mode Range (mA)	MTBF
General Purpose Voltage or Current	2	16	2	4	+/-10 V, +/-5 V @ 5 mA	0–20, 4–20, -1–22	140,000

DIGITAL I/O

Type	Number of Channels	Input (kHz)	Output (kS/sec)	Drive Capacity	Range (Min V)	Range (Max V)	Notes	MTBF
Industrial Voltage	16	1	1	500 mA	3.3	55	Inputs: Programmable PU/PD, thresholds Outputs: Sink or Source, PWM control	140,000
Logic Level	4	1	1	5 mA	3.3	5	Direction set in groups of 2	140,000

SERIAL/CAN BUS

Type	Number of Channels	Transfer Rate	Notes	MTBF
RS-232/422/485	1	2 Mbaud	2048 word FIFO, Interrogation Scheduler	140,000
I^2C	1	100k, 400k, 1 Mbit	Master, Slave, Bus Monitor	140,000

COUNTER/TIMER

Type	Number of Channels	Clock Rate	Notes	MTBF
32 Bit	2	66 MHz	Counter In/Out can be connected to any Digital In/Out	140,000

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SERIAL/CAN BUS

Communications Bus Protocol	Part Number (DNx-)	Physical Interface	Number of Channels	Transfer Rate	Notes	Channel-to-Channel Isolation	MTBF
High Speed CAN	CAN-503	CAN 2.0	4	1 Mbit	J1939 and CAN .DBC support	✓	350,000
I²C/SMBus	I2C-534	I²C	4	100k, 400k, 1 Mbit	Guardian read-back of master transmissions confirms validity of transmit data	✓	350,000
CAN 2.0	MF-102	CAN 2.0	2	1 Mbps	Supports standard, fast and fast+ baud rates	✓	140,000
4-port Serial	SL-501	RS-232/422/485	4	4 Mbaud	J1587/J1708, Interrogation Scheduler	✓	350,000
4-port High Speed Serial	SL-501-804	RS-232/422/485	4	4 Mbaud	J1587/J1708, Interrogation Scheduler	✓	350,000
8-port Serial	SL-508	RS-232/422/485	8	4 Mbaud	J1587/J1708, Interrogation Scheduler	✓	290,000
HDLC/SDLC Synchronous	SL-504	RS-232/422/423/485	4	4 Mbaud	HDLC/SDLC TX/RX Synch.	✓	350,000
Synchronous Serial Interface (SSI)	SL-514	RS-485/422	4	2.5 MHz	Master, Slave 3-32 bits, FIFO onboard	✓	350,000
GP Synchronous Serial Communications	CT-602-804	RS-485/422	4	16 Mbaud	General Purpose	✓	350,000

Guardian Series – Includes a variety of powerful diagnostic and BIT functionality.

Remote Serial Server available for all RS232/422/485 boards on Linux & Windows.

COUNTER / TIMERS

Counter/Timer Function	Part Number (DNx-)	Type	Number of Channels	Clock Rate	Notes	Channel -to-Channel Isolation	MTBF
High Speed Counter/Timer	CT-601	32 Bits	8	66 MHz	Debouncing on Clock & Gate Inputs	-	350,000
Differential Counter/Timer	CT-602	32 Bits	4	66 MHz	RS-422/485 Logic Levels	✓	350,000
Quadrature Encoder Input	QUAD-604	A,B, & Z inputs	4	16.5 MHz	Buffered or Single Point Readings	-	350,000
Universal Speed Input	VR-608	50 mV–250 V p-p	8	300 kHz	4 Freq Out, Double/Low Tooth	✓	180,000
IRIG Timing Generation and Synchronization	IRIG-650	A/B/E/G type	1	1, 5, 10 MHz	On-board GPS Receiver	✓	240,000
Precision Timing Interface	CT-651	ICD-GPS-060	4	1 PPS	Slaved or Free Run/Fix Wheel	✓	350,000

INSTRUMENTS

Board Type	Part Number (DNx-)	Number of Channels	Update Rate (Channel)	Ranges	Type	Current	Channel-to-Channel Isolation	MTBF
6.5 Digit DMM	DMM-261	1	100 Hz	+/- 300 VDC, +/- 30 mVDC, +/- 300 Vrms, +/-500 mVrms, 100 MΩ to 10 Ω	VDC, VAC, IDC, IAC and Resistance	+/- 3 A AC/DC +/- 1.5 mA AC/DC	✓	300,000
Multiplexer for the DMM-261	MUX-461	26/13–2/4 wire	500 Hz	170 Vrms	2-wire voltage 2-wire current 2 or 4-wire resistance	+/- 0.5 A	✓	180,000
High Voltage Multiplexer for the DMM-261	MUX-461-350	24/12–2/4 wire	500 Hz	+/- 350 V	2-wire voltage 2-wire current 2 or 4-wire resistance	+/- 0.5 A	✓	180,000
Function/Arbitrary Waveform Generator	AO-364	4	150 kHz	+/-12 V	Sine, Square, Triangle, Trapezoid, AWFG	+/-10 mA	✓	290,000

Board Type	Part Number (DNx-)	Number of Channels	Relay Type	Output	Drive Capacity Continuous/ Peak	Maximum On/Off Resistance	Range (Max V)	Channel-to-Channel Isolation	MTBF
3 to 1 Routing Board	MUX-414/418	14/18	SSR	300 Hz	2 A/3 A	200 mΩ/10^8 Ω	60 VDC	✓	>400,000

I/O BOARD SPECIFICATIONS CONTINUED

AVIONICS I/O

Protocol	Part Number (DNx-)	Type	Number of Channels	Transfer Rate	Notes	Channel-to-Channel Isolation	MTBF
1553 (Dual Redundant)	1553-553	2 Ports	2	1 Mbaud	Bus Cont, Remote Term, or BM	✓	275,000
ARINC-429	429-566	6 TX/6 RX	12	12.5/100 kb	Williamsburg V1 Support	-	470,000
ARINC-429	429-512	12 RX	12	12.5/100 kb	Williamsburg V1 Support	-	470,000
ARINC-429	429-516	16 TX/24 RX	24	12.5/100 kb	256 labels/ch on-board scheduler, 2k I/O FIFO/Channel	✓	470,000
ARINC-615	429-XXX	Up to 16	16	12.5/100k baud	Williamsburg for Airborne & Portable Data Loader	✓	470,000
ARINC-708/453	708-453	2 TX/2 RX	4	1 Mbaud	Weather or Ground Prox Radar, WXPD	✓	275,000
ARINC-825	CAN-503	4 Ports	4	83.3–1000 kb	Sensors, Actuators, Software Timing – Transport Only	✓	350,000
ARINC-664 Part 7	ARINC-664	2 Ports	2	100 Mbaud	Dual Redundant or Independent	-	130,000
ARINC-615A	ARINC-664	2 Ports	2	100 Mbaud	Airborne & Portable Data Loader for Ethernet	-	130,000
CSDB	CSDB-509	8 TX/8 RX	8	12.5/100 kHz	11 bit, Character and Frame Clocks	✓	290,000

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POWER SUPPLIES

Output Voltage	Part Number (DNx-)	Number of Channels	Output V	Current (Max)	Notes	Fully Isolated	MTBF
5 V	PC-910-805	1	+5	3 A	Isolation Current/Voltage Feedback	✓	150,000
10 V	PC-910	1	±10	1.5 A	Isolation Current/Voltage Feedback	✓	150,000
15 V	PC-911	1	±15	1.2 A	Isolation Current/Voltage Feedback	✓	150,000
24 V	PC-912	1	+24	1.6 A	Isolation Current/Voltage Feedback	✓	150,000
28 V	PC-911-828	1	+28	1.3 A	Isolation Current/Voltage Feedback	✓	150,000
45 V	PC-913	1	± 45	0.4 A	Isolation Current/Voltage Feedback	✓	150,000
63 V	PC-914	1	± 63	0.4 A	Isolation Current/Voltage Feedback	✓	150,000
MIL-704/1275	PC-921-D	Internal	-	-	MIL-STD-704/1275/461 Power Conditioner	✓	150,000

RECONFIGURABLE

Board Type	Part Number (DNx-)	Connection	Notes	FPGA
Reconfigurable FPGA	PL-820	2x 62 Pin	104 DIO Pins, JTAG Connections	MAX10 / Cyclone II