

Multichannel web-enabled smart I/O device

Key features

- Eight fully parallel multi-range +/-10 V analog inputs
- Eight fully parallel +/-10 V analog outputs
- Eight digital inputs and eight outputs
- Interlock relay outputs
- Expansion port
- Fiber optic digital I/O and communication
- Configurable application-specific functions
- Ethernet interface with web server UI and APIs for http and EPICS data distribution



Applications	<ul style="list-style-type: none"> • Multipurpose control and monitoring • Power supply control • Logging • System integration
Options	<ul style="list-style-type: none"> • Customer application specific software

Features and specifications

Analog inputs	
Number of channels	Eight
Range	+/- 10 V
Digitization	16 bit successive approximation, eight channels fully parallel
Sampling rate	1 Hz to 100,000 Hz, user selectable
Noise	< 10 μ V rms ripple, < 50 μ V pk-pk unloaded at 10 Hz sampling
Offset drift	< 10 μ V per hour at 25 C

Analog outputs	
Number of channels	Eight
Range	+/- 10 V
Output refresh rate	1 kHz
Slewing rate	> 5.0 V / μ sec User-selectable lower rates stepped at 33 kHz
Noise	< 500 μ V rms ripple, < 2 mV pk-pk (DC to 500 kHz)
Output impedance	100 Ω



Features and specifications (continued)

Digital inputs	
Number of channels	Eight
Logic levels	TTL (0 < logic low < 0.8 V; 2.0 < logic high < 5.0 V)
Input impedance	1 M Ω
Sampling rate	1 kHz

Digital outputs	
Number of channels	Eight
Logic levels	TTL (0 < logic low < 0.5 V; 2.7 < logic high < 5.0 V)
Output impedance	110 Ω
Refresh rate	1 kHz

Relays	
Number and type	Two independent solid state relay outputs normally open, each comprising two contacts in series for reliability. 1.0 A maximum current, 24 V logic.
On resistance	< 0.5 ohm
Open/close time	Close: 0.6 sec typical. Open: 0.06 sec typical
Output function	User controlled
Watchdog	Watchdog timeout latches to prevent relay closed state (both relays).

Fiber optics	
Number of channels	Three transmitters, three receivers
Type	850 nm light (near infra-red) suitable for 200 μ m step index or 62.5 μ m HCS fiber, ST bayonet connectors.
Transmission distance	Transmission distance up to 1 km
Functions	One tx/rx pair factory configurable as a peer to peer communication channel Digital input and outputs available for user control and synchronization functions



Features and specifications - (continued)

Expansion port	
Functions	Four configurable general purpose digital I/O lines, 3.3 V logic One I2C communication channel
Applications	General purpose digital I/O. Connection to external expansion boards (example - environmental pressure, temperature and humidity sensor)

Features and specifications - physical

Case material	Stainless steel sheet
Protection rating	IP32 (higher rating enclosure option available as custom build)
Dimensions	197 x 137 x 50 mm overall . (see figures)
Weight	0.86 kg (1.9 lb).
Operating environment	10 to 40 C (15 to 30 C recommended to reduce drift and offset) , < 70% humidity, non-condensing, vibration < 0.1g all axes (1 to 100Hz) Vibration and temperature variation must be as low as possible to measure at the lower limit of the dynamic range.
Shipping and storage environment	-10 to 50C, < 80% humidity, non-condensing, vibration < 2g all axes, 1 to 100Hz

Features and specifications - diagnostic display

Type	240 x 240 pixel colour TFT
Functions	Display of user-assigned device name Display of network connection details Firmware version Display of relay states

**Features and specifications - embedded software**

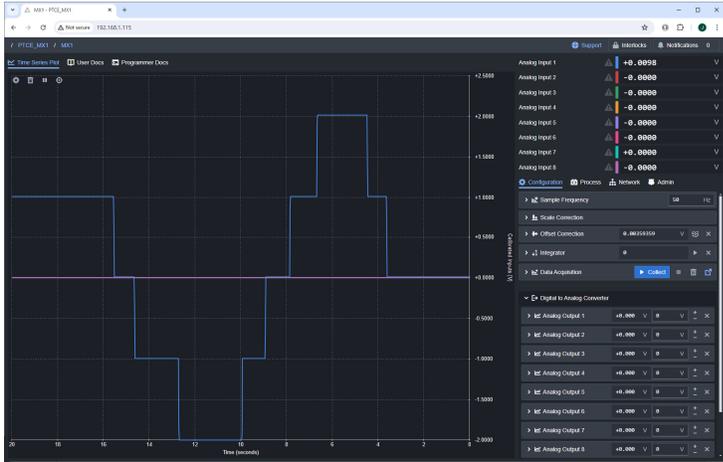
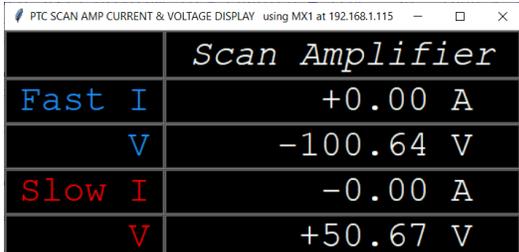
Functions	Adjustable sampling rate for analog inputs Arbitrary scaling of analog inputs Offset zero on analog inputs Numeric integration of analog inputs User-configurable digital I/O (expansion connector and fiber optics) Data logging and export to csv Mouse click access to parameter http urls and EPICS pvs
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Features and specifications - processor, interface, operating system

Processors	AM335x ARM Cortex A8 1 GHz primary processor Floating point accelerator Two 32-bit PRU microcontrollers
Memory	512 MB DDR3 RAM 4 GB eMMC flash NVR 32 GB SD card for application software
Operating system	BlackBerry QNX real-time operating system. Pre-certified version to IEC 62304 medical safety purchase option.
Host computer interface	Ethernet 10/100, TCP/IP

User interface

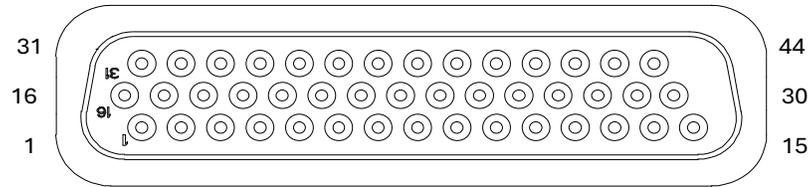
Types	<p>Embedded web server Accessible from any web browser software running on any platform. Windows network discovery using Universal Plug and Play (UPnP)</p> 
User APIs	REST API: JSON HTTP, WebSockets, or EPICS. Compatible with most popular programming languages.
EPICS	Built-in EPICS IOC function
Python example	<p>Power supply display</p> 



Connectors

I/O & power

One 44-way high-density D-sub female connector



1	g Analog In 7	16	h Analog In 8	31	Screen
2	e Analog In 5	17	f Analog In 6	32	+24 V rtn
3	c Analog In 3	18	d Analog In 4	33	+24 VDC
4	a Analog In 1	19	b Analog In 2	34	a Digital In 1
5	Ground	20	b Digital In 2	35	c Digital In 3
6	Ground	21	d Digital In 4	36	d Digital In 5
7	Ground	22	f Digital In 6	37	f Digital In 7
8	Ground	23	h Digital In 8	38	a Digital Out 1
9	Ground	24	b Digital Out 2	39	c Digital Out 3
10	Ground	25	d Digital Out 4	40	e Digital Out 5
11	Ground	26	f Digital Out 6	41	g Digital Out 7
12	g Analog Out 7	27	h Analog Out 8	42	h Digital Out 8
13	e Analog Out 5	28	f Analog Out 6	43	Ground
14	c Analog Out 3	29	d Analog Out 4	44	+5 VDC
15	a Analog Out 1	30	b Analog Out 2		

24 VDC fused output on pin 33 relative to pin 32 can be used to route the MX1 24 V supply out to other devices.

It may also be used to power the MX1 via the HD44 connector as an alternative to the Switchcraft 2.1mm threaded connector.

24 VDC is also available on the Phoenix relay connector.

The 5 VDC on pin 44 relative to ground can be used for low power external circuits.

5 VDC is also available on the DSub 9 pin expansion connector.

I/O

Two BNC jacks.

Upper connector: Analog Out 1 (parallel connection to HD44 pin 15)

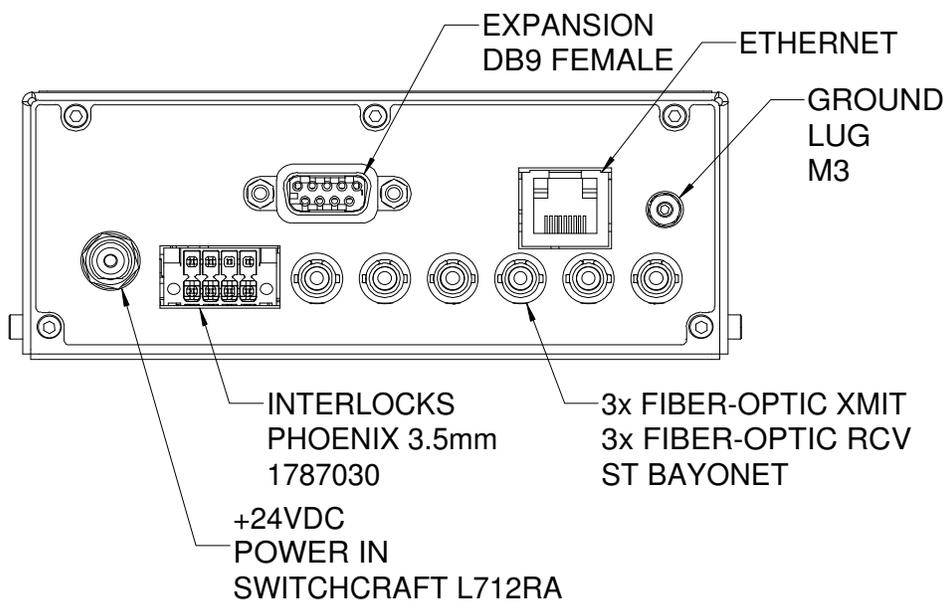
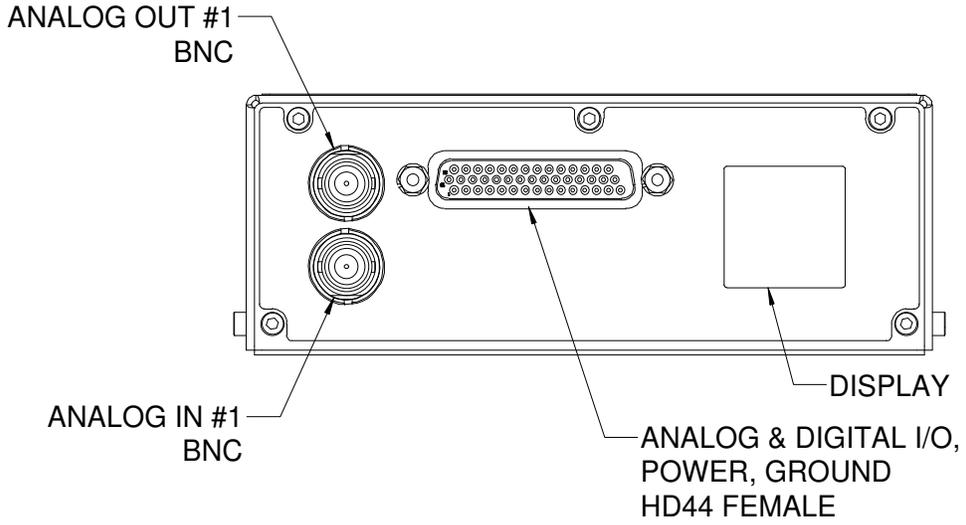
Lower connector: Analog In 1 (parallel connection to HD44 pin 4)



Connectors

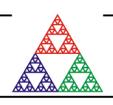
Expansion port	<p>DSub 9 pin female</p> <table border="1" data-bbox="511 342 1390 590"> <tr> <td>1</td> <td>Digital out 1 GPIO</td> <td>6</td> <td>I2C SCL clock out</td> </tr> <tr> <td>2</td> <td>Digital out 2 GPIO</td> <td>7</td> <td>I2C SDA data bidirectional</td> </tr> <tr> <td>3</td> <td>Digital out 3 GPIO</td> <td>8</td> <td>3.3 VDC out</td> </tr> <tr> <td>4</td> <td>Digital out 4 GPIO</td> <td>9</td> <td>Gnd rtn for 5.0, 3.3 V</td> </tr> <tr> <td>5</td> <td>5.0 VDC out</td> <td>Scrn</td> <td>Chassis ground</td> </tr> </table> <p>Digitals 1-4 are bidirectional, usable for PRU, GPIO, UART, CAN, encoders, PWM. D1: UART 1 RX, CAN TX, Enc A, PWM 1A D2: UART 1 TX, CAN RX, Enc B, PWM 1B D3: UART 2 RX, Enc index, PWM 2A D2: UART 2 TX, PWM 2B</p>	1	Digital out 1 GPIO	6	I2C SCL clock out	2	Digital out 2 GPIO	7	I2C SDA data bidirectional	3	Digital out 3 GPIO	8	3.3 VDC out	4	Digital out 4 GPIO	9	Gnd rtn for 5.0, 3.3 V	5	5.0 VDC out	Scrn	Chassis ground
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Relay outputs	<p>Phoenix Combicon DMC8 pin header 1787030 3.5 mm</p> <table border="1" data-bbox="537 793 1401 982"> <tr> <td>1</td> <td>+24 V fused</td> <td>5</td> <td>+24 V fused</td> </tr> <tr> <td>2</td> <td>24 V rtn</td> <td>6</td> <td>24 V rtn</td> </tr> <tr> <td>3</td> <td>Relay 1 contact A</td> <td>7</td> <td>Relay 2 contact A</td> </tr> <tr> <td>4</td> <td>Relay 1 contact B</td> <td>8</td> <td>Relay 2 contact B</td> </tr> </table> <p>Mating connector is included 24 V outputs pins 1,5 have combined fuse rating 200 mA.</p>	1	+24 V fused	5	+24 V fused	2	24 V rtn	6	24 V rtn	3	Relay 1 contact A	7	Relay 2 contact A	4	Relay 1 contact B	8	Relay 2 contact B				
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Fiber optics	<p>Three fiber optic transmitters ST bayonet connectors light grey (HFBR-1414) Three fiber optic receivers ST bayonet connectors dark grey (HFBR-2418) Recommended cable: hard-clad silica 200 µm core, 230 µm cladding, 2.2 mm jacket (OFS BC035597-10 BL or OFS BC04265-10). 62.5 µm Recommended connectors: crimp connector (OFS BP05065-12 using termination kit OFS DT03732-32).</p>																				
Ethernet	<p>RJ-45 jack</p>																				
Power	<p>Switchcraft 2.1 mm threaded jack LR722RA, +24 V on central conductor, 24 V return on sleeve. Mating connector Switchcraft 768K</p>																				
Ground lug	<p>M3 threaded stud.</p>																				

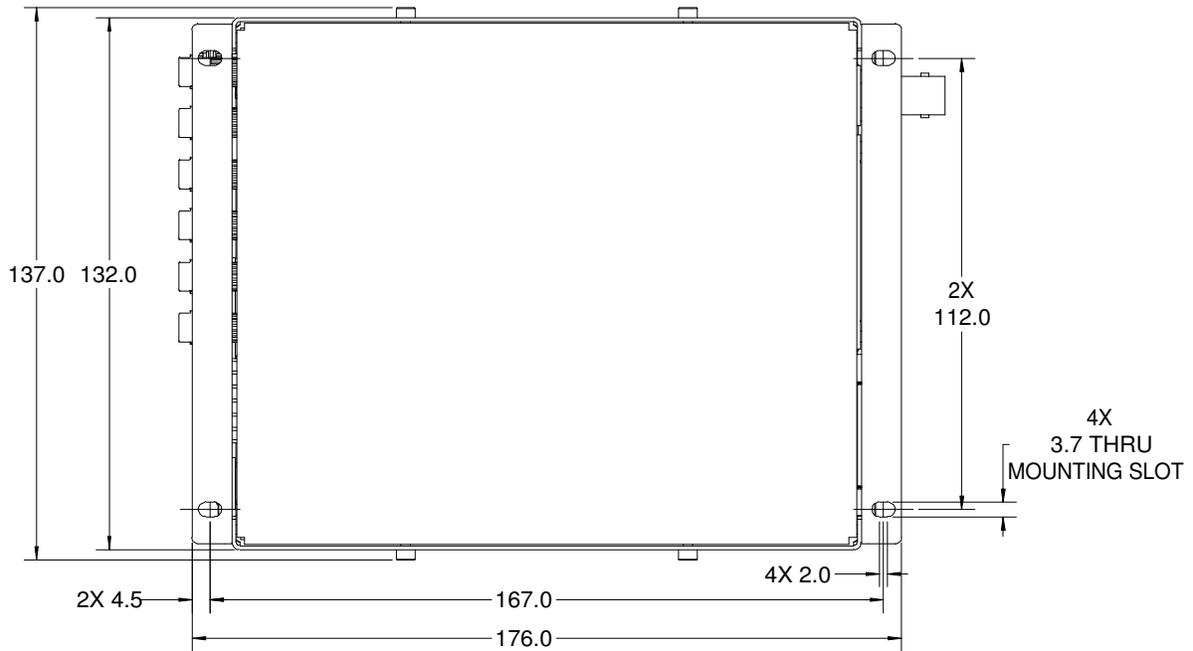
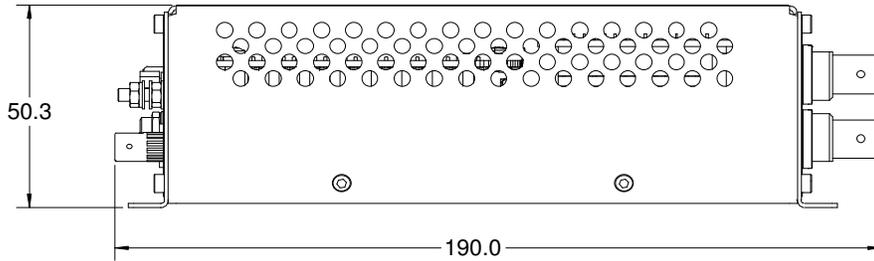




Ordering information

MX1	Multichannel I/O device.
PSU24-25-1	Power supply (included in end-user sales)
CONN-APX-RLY	Relay mating connector (included in end-user sales)





Dims mm

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