

Simple

Imagine one controller for every conceivable application and size of control task...Imagine Ladder, Batch, Continuous, or Multivariable control from one device supporting as little as ten, or as many as thousands of IO...Imagine the first truly open platform that runs Bedrock's advanced Integrated Development Environment, proprietary OEM, or IEC61131 control languages. Imagine a controller with military and aerospace levels of physical and software crypto technologies layered, embedded and transparent to the user. One device for the ages...security just happens. Simple.

Introducing Bedrock's SCC

Bedrock Automation's Secure Control and Communication Module (SCC) uses layers of embedded technology to deliver a new paradigm of control performance and cyber security. Single or Dual Redundant SCCs mount on the revolutionary Bedrock magnetic backplane interconnection (BMI) adjacent to the Secure Power and Secure IO Modules. With embedded gigabit Ethernet, the SCCs can be distributed in star topologies up to 20 kilometers for maximum installation flexibility.

Scalable

Designed from a clean sheet of paper, Bedrock delivers a revolutionary automation architecture with unlimited scalability from tens to tens of thousands of IO using fewer than a dozen system part numbers.

The SCC occupies single or dual positions on the patented Bedrock magnetic backplane (BMI). This revolutionary pin-less 4Gbit electromagnetic backplane supports SCC, SPM (Secure Power Module) and SIO (Secure IO) Modules with scalable single/dual/triple IO redundancy. Regardless of application or size, the SCC scales to the control task.

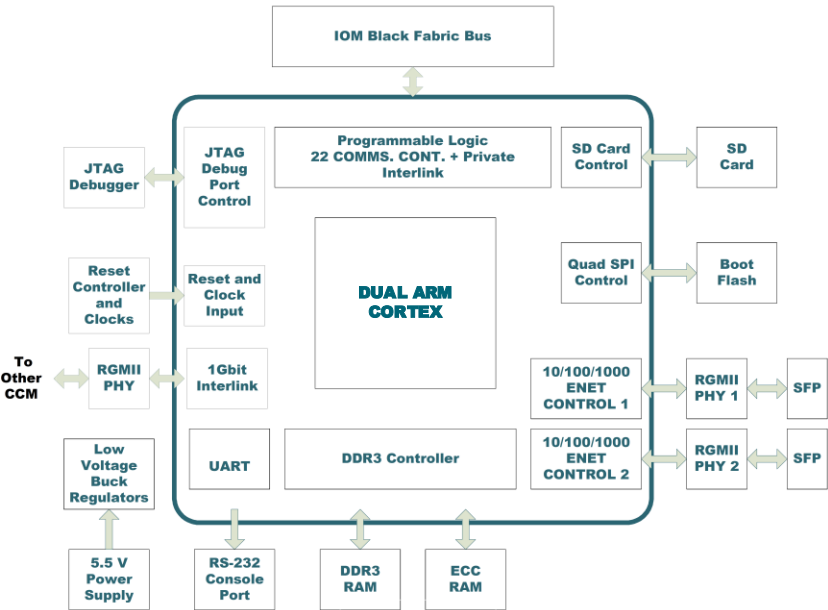
Secure

All traditional industrial control systems are vulnerable to multiple forms of cyber-attack, IP and counterfeiting theft. **Black Fabric™** is Bedrock's **embedded deep trust** cyber defense using patented processor, memory, communications, interconnections, backplane and packaging technologies to integrate cyber security into every module at birth. Embedded deep trust also means **Black Fabric™** comes at no additional cost or compromise to performance. **Black Fabric™** works transparently and instantly upon startup to manage transistor-encased authentication keys that protect the hardware, firmware, software and application transactions of the SCC throughout its entire life cycle. The SCC is born with **Black Fabric™ Cybershield**, fortified for users against the threats of today and tomorrow.

Secure Control and Communication Platform

“Starting from a blank sheet of paper”, is a term often used but seldom realized. In the case of the SCC, everything is new driven by an obsession for ultra-performance and deeply embedded security. To achieve this, custom deep submicron and analog silicon was developed for the communications, backplane, computation and redundancy tasks. Bedrock’s patented parallel BMI switch fabric and redundancy interlink processors are examples of silicon technologies custom designed and built specifically for the SCC.

The latest ARM multicore processors are married to an EAL6+ certified RTOS. 512Mbytes of DDR3 RAM and 32Gbytes of onboard flash is available to the user. Physical cryptolocks are coupled directly to the computing and communication engines alongside true random number generators, line-speed authentication and key management. This is how Bedrock filled a blank sheet of paper with things that matter.

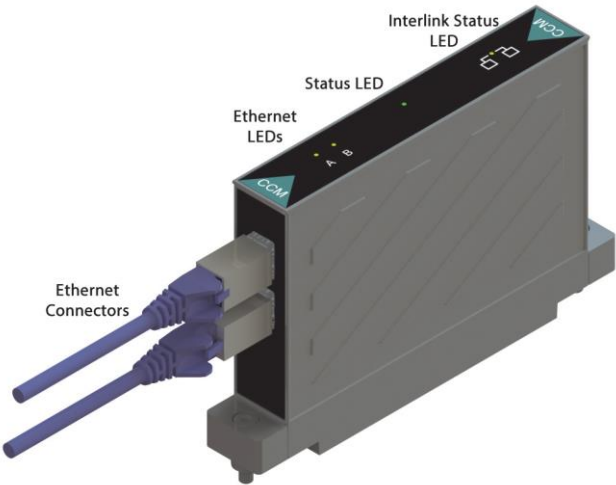


Status

Status LED Indicator	Description
Off	No Power
Red	Power on; operating system not running or failed
Orange	Operating system running; loading control software
Green	SCC is operating as master of a redundant pair or operating single
Blue	SCC is slave member of redundant pair

Interlink LED Indicator	Description
Off	No redundant pair installed
On	Operating system not running
Blink	Redundant Interlink good
	Interlink traffic

Ethernet Link Status/Activity LED Indicator	Description
Off	During initial boot phase - Link Good
Red	During initial boot phase - Link Bad
Green	Boot completed - Link Good
Green Blink	Ethernet traffic



SCC LEDs Locations

SCC as shown using dual copper SPF transceivers. The SPF transceivers slots will accept 10/100/1000 Mbits Copper or Fiber, in either MM or SM SPF variants.

Processor	Dual-Core ARM Cortex™ processor	
Memory		
RAM	512 Mbytes DDR3 RAM at 1066 MHz	
Flash	32 Gbytes	
Controller Redundancy	Full redundancy via dedicated proprietary interlink	
Module Location	Magnetic Induction Backplanes; BMI 5, BMI 10 or BMI 20	
IOM Bus Speed	4 Gbit Proprietary	
BMI Supported	1 local + 9 remote	
IO Capacity	400 local IO + 3600 remote IO	
RTOS	Green Hills INTEGRITY™	
Open Control Package Support	Bedrock Integrated Development Environment, Proprietary OEM, or IEEE 61131-3 Compliant	
Ethernet Communication	1 Gbit Dual SFP (Fiber or Copper) transceiver slots	
IP Stack	Green Hills Software™ Dual-mode IPv4/IPv6	
Power Requirement	24 Volts at ±20% 0.5 amps	
Power Consumption	7 to 10 watts	
Power Dissipation	7 to 10 watts	
Operating Temperature	See Table Below	
Storage Temperature	-40°C to 85°C	
Relative Humidity	5% to 95% non-condensing	
Shock	IEC 60068-2-27	Operating 30 g, Non-operating 50 g
Vibration	IEC 60068-2-6	2 g @ 10-500 Hz
Emissions	IEC 61000-6-4	30 MHz to 230 MHz 40 db uV/m Quasi-peak at 10 meters 230 MHz to 1 GHz 47 db uV/m Quasi-peak at 10 meters
ESD Immunity	IEC 61000-4-2	6kV contact discharges, 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3	1 kHz sine-wave 80% AM 10 V/m (80 MHz to 1000 MHz) 3V/m (1.4 GHz to 2.0 GHz), 1V/m (2.0 GHz to 2.7 GHz)
EFT/B Immunity	IEC 61000-4-4	±2 kV at 5 kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5	±2 kV line-earth (CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6	10 Vrms with 1 kHz sine-wave 80% AM from 150 kHz to 80 MHz
Height	167.894 mm (6.61 inches)	
Width	25.4 mm (1.0 inches)	
Depth	106.426 mm (4.19 inches)	
Weight	~428 g (15.10 ounces)	

Certifications:

This product meets or exceeds all of the applicable product safety requirements contained in UL and CENELEC standards.

The product design meets the following electrical certification requirements:

- UL (US and Canadian Certification) ordinary locations and Class 1, Division 2, Groups A-D locations.
- CENELEC Group IIC, Zone 2 locations.



Operating Temperature

Type of Power	BMI.5	BMI.10	BMI.20
24 V DC Power	-40°C to 80°C	-40°C to 80°C	-40°C to 70°C
90-240 V AC/125 V DC Power	-40°C to 70°C	-40°C to 60°C	-40°C to 50°C

Simple

Bedrock Automation's Secure Power Module (SPM) uses layers of advanced technology to deliver high performance single and dual redundant, cyber secure power for the control platform. The SPM provides inductive, fused and regulated power through Bedrock's patented electro-magnetic backplane (BMI), to the Secure Control and Communications Module (SCC) and up to 20 Secure IO modules (SIO). A pair of SPMs may be used to provide redundant power.

Introducing Bedrock's SPM.U: The SPM.U is Bedrock's definitive power supply which offers:

- Single or redundant option
- Either 90-264 V AC mains voltage 50/60 Hz input or a 125 V DC bus system voltage input or 24 V DC input from UPS
- Regulated, current limited, filtered 24 V DC isolated field power
- Individual current limited inductive sources up to 20 IOM modules
- Bi-directional communication for control, diagnostics and status reporting between the SPM and SCC

Scalable

Designed from a clean sheet of paper, Bedrock delivers a revolutionary automation architecture with unlimited scalability from tens to tens of thousands of IO using fewer than a dozen system part numbers.

Bedrock's SPM occupies single or dual positions on the patented Bedrock magnetic backplane (BMI). This revolutionary pin-less 4Gbit backplane supports SCC (Secure Control and Communication Module), SPM (Secure Power Module) and SIO (Secure IO Modules) with scalable single/dual/triple IO redundancy. Regardless of application or size, the SPM scales to the control task.

Secure

Traditional industrial control systems are vulnerable to multiple forms of cyber attack and IP and counterfeiting theft. **Black Fabric™** is Bedrock's **embedded deep trust** cyber defense using patented processor, memory, communications, interconnections, backplane and packaging technologies to integrate cyber security into every module at birth. Embedded deep trust also means **Black Fabric™** comes at no additional cost or compromise to performance. **Black Fabric™** works transparently and instantly upon startup to manage transistor-encased authentication keys that protect the hardware, firmware, software and application transactions of the SPM throughout its entire life cycle. The SPM is born with **Black Fabric™**, fortified for users against the threats of today and tomorrow.



Pinouts

The SPM.U can be powered from either 90-264 V AC or 125 V DC or 24 V dc sources. The SPM.U uses COTS pin pluggable terminals for interconnection, a 3-Pin Mate-N-Lock for the AC and 5-Pin Mate-N-Lock for the DC, connector pinouts are as follows:

AC Connector Pinout	Label	Function
1	L	Line voltage (90-260 V ac)
2	N	Neutral Return for ac
3	EARTH_GND	Safety Ground for System

DC Connector Pinout	Label	Function
1	V IN	Power Input for external 24 V dc system power (+)
2	V RET	Common Return line for 24 V dc (-)
3	EARTH_GND	Safety Ground for System
4	V OUT	Power Input for external 24 V dc system power (+)
5	V RET	Common Return line for 24 V dc (-)
6	EARTH_GND	Safety Ground for System

DC Connector Pinout	Label	Function
1	V OUT	Power Output for external 24 V dc system power (+)
2	V RET	Common Return line for external 24 V dc (-)

Status

The SPM.U tri-colored LED provides visual status and diagnostics information.

Item No.	LED Color	LED Status	Description
1	Green	Solid	Status OK
2	Green	3 Blinks	Black Fabric COMM warning
3	Green	4 Blinks	ADC test warning
4	Red	Solid	FATAL Error
5	Red	1 Blink	FATAL: RAM test failed
6	Red	4 Blinks	FATAL: PWM test failed
7	Red	5 Blinks	FATAL: FPGA test failed
8	Red	6 Blinks	FATAL: Loopback test failed
9	Red	7 Blinks	Check core voltage test failed
10	Blue	Solid	Power sharing on
11	Blue	1 Blink	Low 24 V input power
12	None	Off	No power

Input Voltage Ranges		
AC	90 to 264 V AC RMS 47 to 63 Hz or 125 to 330 V DC	
DC	24 V DC	
Current Consumption	1 A (120 V AC) Load dependent	
	0.5 A (220 V AC) Load dependent	
Inrush Surge Current	< 30 amps for 16.6 msec	
Input Fuse	5A (fast-blow, internal)	
Choice of Suitable Fuses	10 A ... 16 A (AC :Characteristics B, C, D, K)	
Input Protection	Transient surge protection	
Type	Metal Oxide Varistor	
Output Voltages		
DC to SCC	24 V, fused	
AC for SIO	24 V, fused	
DC for External Use	24 V, user selectable	
Output Current		
DC to SCC	340 mA per SCC	
DC for SIO	60 mA to 400 mA per SIO	
DC for External Use	1 - 5 amps, software configurable	
Redundancy	Dual redundant via BMI	
Efficiency	91% peak	
Module Location	Magnetic Induction Backplanes; BMI 5, BMI 10 or BMI 20	
Operating Temperature	See Table Below	
Storage Temperature	-40°C to 85°C	
Relative Humidity	5% to 95% non-condensing	
Protection Rating / Airborne Contaminants	IP20, NEMA 1	
Shock	IEC 60068-2-27	Operating 30 g, Non-operating 50 g
Vibration	IEC 60068-2-6	2 g @ 10-500 Hz
Emissions	IEC 61000-6-4	30 MHz to 230 MHz 40 db uV/m Quasi-peak at 10 meters 230 MHz to 1 GHz 47 db uV/m Quasi-peak at 10 meters
ESD Immunity	IEC 61000-4-2	6 kV contact discharge, 8 kV air discharge
Radiated RF Immunity	IEC 61000-4-3	1 kHz sine-wave 80% AM, 10 V/m (80 MHz to 1000 MHz) 3 V/m (1.4 GHz to 2.0 GHz), 1 V/m (2.0 GHz to 2.7 GHz)
EFT/B Immunity	IEC 61000-4-4	±2 kV at 5 kHz on signal and power ports
Surge Transient Immunity	IEC 61000-4-5	±2 kV line-earth (CM) and 1kV line-line (DM) on power ports
Conducted RF Immunity	IEC 61000-4-6	10 Vrms with 1 kHz sine-wave 80% AM from 150 kHz to 80 MHz
Height	167.9 mm (6.61 inches)	
Width	25.4 mm (1.00 inches)	
Depth	106.4 mm (4.19 inches)	
Weight	~483 g (17.25 ounces)	

Certifications:

This product meets or exceeds all of the applicable product safety requirements contained in UL and CENELEC standards.

The product design meets the following electrical certification requirements:

- UL (US and Canadian Certification) ordinary locations and Class 1, Division 2, Groups A-D locations.
- CENELEC Group IIC, Zone 2 locations.



Operating Temperature

Type of Power	BMI.5	BMI.10	BMI.20
24 V DC Power	-40°C to 80°C	-40°C to 80°C	-40°C to 70°C
90-240 V AC/125 V DC Power	-40°C to 70°C	-40°C to 60°C	-40°C to 50°C

Introducing Bedrock Automation SIO Module Series. Designed to be Simple Scalable and Secure™. The reduced set of SIO modules can address most automation applications by taking advantage of the latest silicon technology. With Black Fabric™, an unprecedented level of security is built into every module.

Simple

Bedrock Automation's Secure IO Modules, SIO series, use layers of advanced technology to deliver a software defined IO platform. This results in an 80% reduction in module types for typical users, and perpetual life cycle cost saving. Built using patented electromagnetic technology these pin-less SIO modules sets a new standard for reliability, flexibility and security.

Each module communicates asynchronously with the SCC module allowing for an unprecedented deterministic update rate independent of the number of IO channels. UL approved for operation in Class 1, Division 2 locations, designed to operate in extreme temperature, shock and vibration environments, the all metal construction sets a new standard in reliability.

When used with Bedrock's Integrated Development Environment, the channel by channel software configuration simplifies programming and reduces installation and commissioning time when compared to traditional industrial IO.

Scalable

Designed from a clean sheet of paper, Bedrock delivers a revolutionary automation architecture with unlimited scalability from tens to tens of thousands of IO using fewer than a dozen system part numbers.

The SIO modules occupy a single position on the patented electromagnetic backplane. This revolutionary pin-less 4Gbit electromagnetic backplane supports advanced Controller, Power Supply and IO Modules with scalable single/dual/triple IO redundancy. Regardless of application or size, the universal cyber secure controller, secure power supply, and virtual IO are the solution.

Secure

Traditional industrial control systems are vulnerable to multiple forms of cyber attack and IP and counterfeiting theft. **Black Fabric™** is Bedrock's **embedded deep trust** cyber defense using patented processor, memory, communications, interconnections, backplane and packaging technologies to integrate cyber security into every module at birth. Embedded deep trust also means *Black Fabric™* comes at no additional cost or compromise to performance. *Black Fabric™* works transparently and instantly upon startup to manage transistor-encased authentication keys that protect the hardware firmware software and application transactions of every module throughout its entire life cycle. The SIO modules are born with *Black Fabric™* fortified for the user against the threats of today and tomorrow.

Introducing SIO1.5: SIO1.5 is Bedrock's 5 channel software configurable analog IO module with per channel configured signal types, galvanic isolation and loop power. Signal type options include:

Analog Inputs

- 2-Wire And 4-Wire 4-20 mA Internally and Externally Powered Loop Transmitters
- 4-Wire RTDs (platinum, nickel and copper)
- Thermocouples (J, K, B, E, N, R, S and T) complete with CJC terminal block and mV source

Analog Output

- 4-20 mA with Read Back

Open Digital Protocols

- HART Master Device, supporting HART Revision 7

Number of Channels	5 Software Configurable Analog IO Channels	
Open Digital Protocols	HART Master Device, supporting HART Revision 7	
<i>HART Scan Time</i>	0.5 seconds	
Loop Compliance Voltage	18 V dc minimum at 24mA	
Current Inputs Sense Resistor	240 Ω software selectable	
Input Thermocouple Impedance	10 M Ω	
RTD, Resistance Inputs	0 to 450 Ω maximum	
CJC Accuracy	+/- 0.8 °C	
Analog Output Load Resistance	750 Ω , maximum	
Power Consumption	9.5 watts	
Power Dissipation	4 watts	
Excitation	Programmable: <ul style="list-style-type: none"> • Loop Voltage Mode: 21.6 V @ 24 mA • Resistance Sense Current: 500 microamps 	
Temperature Coefficient	45 ppm per °C	
Module Conversion Method	Sigma-Delta	
Input Resolution	19 plus sign bit	
Output Resolution	16 bits	
Analog Input Accuracy	$\pm 0.015\%$ of full-scale @ 23°C	
Analog Output Accuracy	$\pm 0.03\%$ of full-scale @ 23°C	
Update Rate	User configurable between 8 and 100 mSec	
Non-linearity	Included in accuracy	
Isolation	1200 VAC Channel to Channel 1500 VAC Channel to Ground	
Operating Temperature	-40°C to 80°C	
Storage Temperature	-40°C to 85°C	
Relative Humidity	5% to 95% non-condensing	
Protection Rating / Airborne Contaminants	IP20, NEMA 1	
Shock	IEC 60068-2-27	Operating 30 g, Non-operating 50 g
Vibration	IEC 60068-2-6	2 g @ 10-500 Hz
Emissions	IEC 61000-6-4	30 MHz to 230 MHz 40 db uV/m Quasi-peak at 10 meters 230 MHz to 1 GHz 47 db uV/m Quasi-peak at 10 meters
ESD Immunity	IEC 61000-4-2	6 kV contact discharges, 8 kV air discharges
Radiated RF Immunity	IEC 61000-4-3	1 kHz sine-wave 80% AM, 10 V/m (80 MHz to 1000 MHz), 3 V/m (1.4 GHz to 2.0 GHz), 1 V/m (2.0 GHz to 2.7 GHz)
EFT/B Immunity	IEC 61000-4-4	± 2 kV at 5 kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5	± 2 kV line-earth (CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6	10 Vrms with 1 kHz sine-wave 80% AM from 150 kHz to 80 MHz
Height	167.894 mm (6.61 inches)	
Width	18.034 mm (0.71 inches)	
Depth	106.426 mm (4.19 inches)	
Weight	~290 g (10.2 ounces)	

Certifications:

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The product design meets the following electrical certification requirements:

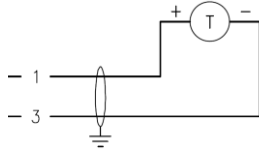
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- CENELEC Group IIC, Zone 2 locations.



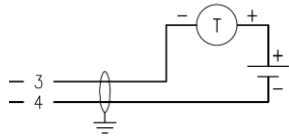
Pinouts

SIO1.5 uses COTS 20 pin pluggable terminals for interconnection between the module and the field wiring terminals. Bedrock's patented universal interconnect cable provides a pre-wired solution, reducing signal cable routing, control cabinet and panel size requirements.

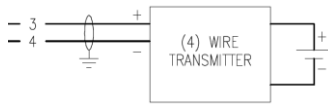
Input Options



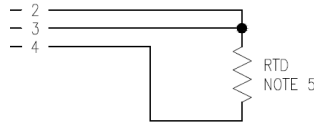
2-Wire Internally Powered Loop Transmitter



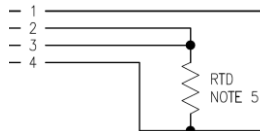
2-Wire Externally Powered Loop Transmitter



4-Wire Externally Powered Loop Transmitter

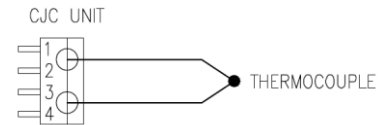


3-Wire RTD



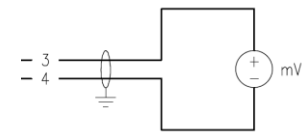
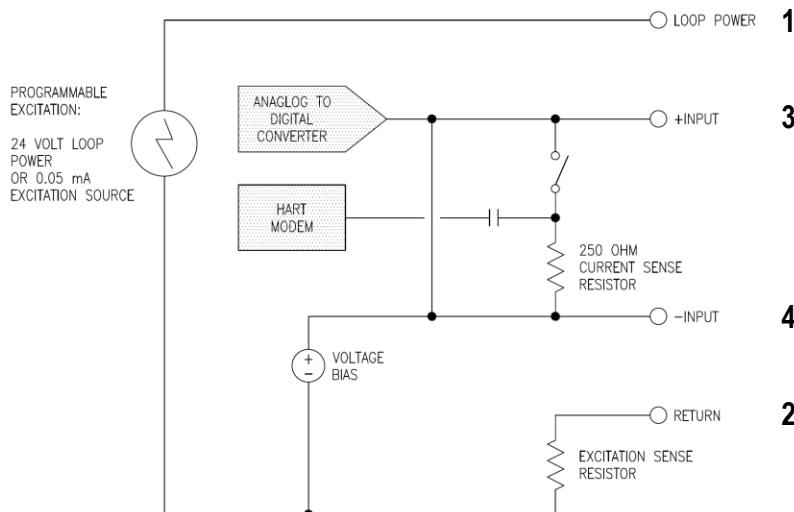
4-Wire RTD

PAIR 1	BLACK	1	CHAN. 1 EXCITATION/LOOP POWER
PAIR 1	RED	2	CHAN. 1 EXCITATION RETURN
PAIR 2	BLACK	3	CHAN. 1 ANALOG PLUS
PAIR 2	WHITE	4	CHAN. 1 ANALOG MINUS
PAIR 3	BLACK	5	CHAN. 2 EXCITATION/LOOP POWER
PAIR 3	GREEN	6	CHAN. 2 EXCITATION RETURN
PAIR 4	BLACK	7	CHAN. 2 ANALOG PLUS
PAIR 4	BLUE	8	CHAN. 2 ANALOG MINUS
PAIR 5	BLACK	9	CHAN. 3 EXCITATION/LOOP POWER
PAIR 5	BROWN	10	CHAN. 3 EXCITATION RETURN
PAIR 6	BLACK	11	CHAN. 3 ANALOG PLUS
PAIR 6	YELLOW	12	CHAN. 3 ANALOG MINUS
PAIR 7	BLACK	13	CHAN. 4 EXCITATION/LOOP POWER
PAIR 7	ORANGE	14	CHAN. 4 EXCITATION RETURN
PAIR 8	RED	15	CHAN. 4 ANALOG PLUS
PAIR 8	GREEN	16	CHAN. 4 ANALOG MINUS
PAIR 9	RED	17	CHAN. 5 EXCITATION/LOOP POWER
PAIR 9	WHITE	18	CHAN. 5 EXCITATION RETURN
PAIR 10	RED	19	CHAN. 5 ANALOG PLUS
PAIR 10	BLUE	20	CHAN. 5 ANALOG MINUS



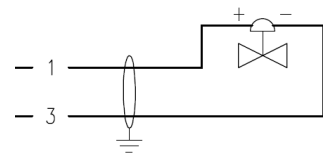
Thermocouple with CJC Unit

Simplified Circuit Diagram



mV Source

Output Option



4-20 mA Output with Read Back

Introducing SIO2.10: The SIO2.10 is Bedrock's 10 channel secure software configurable discrete input module which offers:

- Soft-selectable 24 -240 VAC/DC thresholds
- Soft-selectable AC digital filtering and debounce
- Galvanic isolation per channel
- Deterministic backplane communications
- ± 0.5 msec SOE and time stamp

Number of Channels 10 software configurable discrete input channels

Input Types Soft-selectable 24 – 240 V ac/dc threshold

Update Rate 3.0 msec

Filter/Debounce Time Soft selectable on/off, programmable 1 -255 msec

Isolation 1200 VAC Channel to Channel

1500 VAC Channel to Ground

Programmable Thresholds

Setting	Default	
	Off Voltage	On Voltage
24 V ac/dc	8	20
28 V ac/dc	20	40
120 V ac/dc	45	90
240 V ac/dc	90	150

Input Impedance 79 K Ω

Power Consumption 2.5 watts

Power Dissipation 4.0 watts

Input Type Voltage Monitor

Operating Temperature -40°C to 80°C

Storage Temperature -40°C to 85°C

Relative humidity 5% to 95% non-condensing

Protection Rating / Airborne Contaminants IP20, NEMA 1

Shock IEC60068-2-27 Operating 30 g, Non-operating 50 g

Vibration IEC 60068-2-6 2g @ 10-500 Hz

Emissions IEC 61000-6-4 30 MHz to 230 MHz 40 db μ V/m Quasi-peak at 10 meters
230 MHz to 1 GHz 47 db μ V/m Quasi-peak at 10 meters

ESD Immunity IEC 61000-4-2 6 kV contact discharges, 8 kV air discharges

Radiated RF Immunity IEC 61000-4-3 1 kHz sine-wave 80% AM, 10 V/m (30 MHz to 1000 MHz)
3 V/m (1.4 GHz to 2.0 GHz), 1 V/m (2.0 GHz to 2.7 GHz)

EFT/B Immunity IEC 61000-4-4 ± 2 kV at 5 kHz on signal ports

Surge Transient Immunity IEC 61000-4-5 ± 2 kV line-earth (CM) on shielded ports

Conducted RF Immunity IEC 61000-4-6 10 Vrms with 1 kHz sine-wave 80% AM from 150 kHz to 80 MHz

Height 167.894 mm (6.61 inches)

Width 18.034 mm (0.71 inches)

Depth 106.426 mm (4.19 inches)

Weight ~290 g (10.2 ounces)

Certifications:

This product meets or exceeds all of the applicable product safety requirements contained in UL and CENELEC standards.

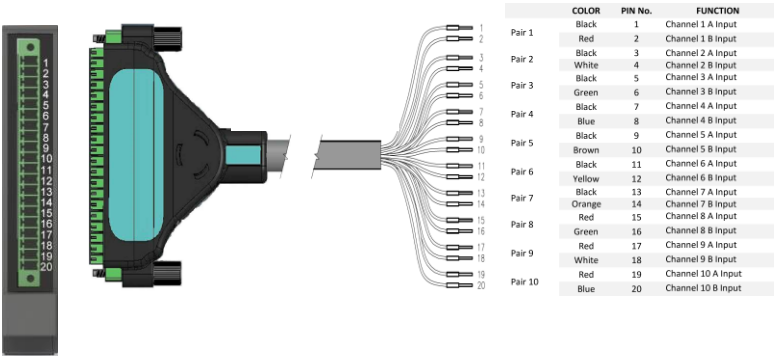
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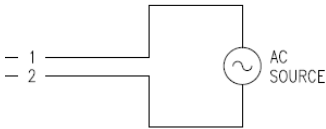


Pinouts

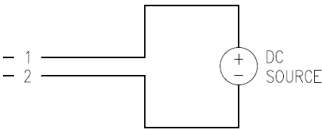
The SIO2.10 uses COTS 20 pin pluggable terminals for interconnection to the field wiring terminals. The Bedrock patented universal interconnect cable provides a pre-wired solution, reducing signal cable routing, control cabinet and panel size requirements.



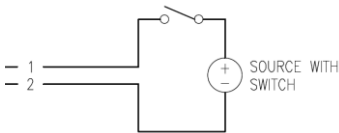
Input Options



0 - 240 Vac Voltage Monitor

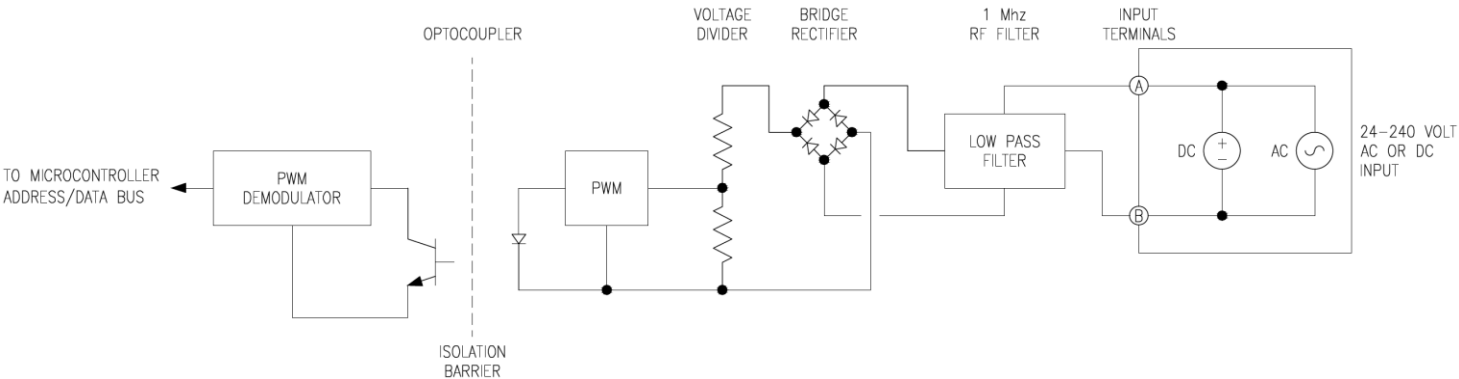


0 - 240 Vdc Voltage Monitor



Contact Closure
(with external AC or DC source)

Simplified Circuit Diagram



Introducing SIO3.10: The SIO3.10 is Bedrock's 10 channel Secure software configurable discrete output Module which offers:

- Channels switchable from ac to dc up to 240 Vac
- Galvanic isolation per channel
- Channels electronically fused at 3 amps
- Configurable overcurrent latch-off or auto retry
- Deterministic backplane communications
- ± 0.5 msec SOE and time stamp

Number of Channels	10 software configurable discrete outputs
Output Types	0 – 240V AC or DC
Update Rate	3.0 msec
Programmable Overcurrent Shutoff	Latch-off or Back-off retry
Overcurrent Delay	User defined (0 – 255 msec) <ul style="list-style-type: none"> • Back-off versus latch-off • Back-off and retry count setting <p>After an overcurrent occurs, each channel can either stay latched off or back-off and retry. If back-off and retry is chosen, the number of retries can be selected</p>
Inductive Loads	Outputs require protective diodes or metal-oxide varistors when connected to an inductive load
Electronic Fusing	3.0 A max
Power Consumption	5.5 watts
Power Dissipation	7.0 watts
On-state Resistance	< 0.25 Ω
Off-state Resistance	>100 K Ω
Maximum Off Voltage	240 V AC or DC
Maximum On Current	2 amps 3 channels MAX, 0.6 amps 10 channels
Overcurrent Limit	2.8 amps (peak)
Isolation	1200 VAC Channel to Channel 1500 VAC Channel to Ground
Operating Temperature	-40°C to 80°C
Storage Temperature	-40°C to 85°C
Relative humidity	5% to 95% non-condensing
Shock	IEC60068-2-27 Operating 30 g, Non-operating 50 g
Vibration	IEC 60068-2-6 2 g @ 10-500 Hz
Emissions	IEC 61000-6-4 30 MHz to 230 MHz 40 db μ V/m Quasi-peak at 10 meters 230 MHz to 1 GHz 47 db μ V/m Quasi-peak at 10 meters
ESD Immunity	IEC 61000-4-2 6 kV contact discharges, 8 kV air discharges
Radiated RF Immunity	IEC 61000-4-3 1 kHz sine-wave 80% AM, 10 V/m (80 MHz to 1000 MHz) 3 V/m (1.4 GHz to 2.0 GHz), 1 V/m (2.0 GHz to 2.7 GHz)
EFT/B Immunity	IEC 61000-4-4 ± 2 kV at 5 kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5 ± 2 kV line-earth (CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6 10 Vrms with 1 Hz sine-wave 80% AM from 150 kHz to 80 MHz
Height	167.894 mm (6.61 inches)
Width	18.034 mm (.71 inches)
Depth	106.426 mm (4.19 inches)
Weight	~290 g (10.2 ounces)

Certifications:

This product meets or exceeds all of the applicable product safety requirements contained in UL and CENELEC standards.

The product design meets the following electrical certification requirements:

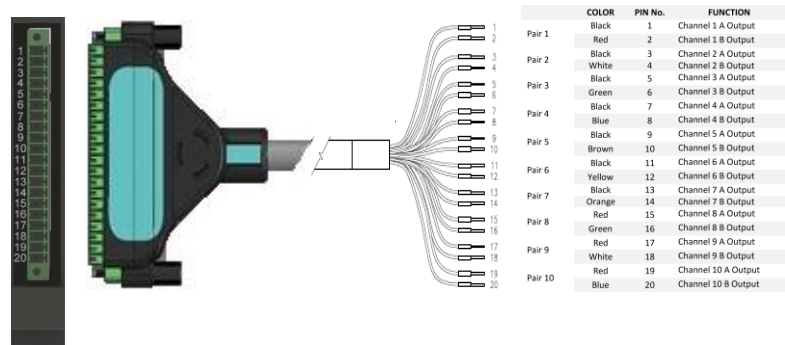
- UL (US and Canadian Certification) ordinary locations and Class 1, Division 2, Groups A-D locations.
- CENELEC Group IIC, Zone 2 locations.



May 2015
Preliminary

Pinouts

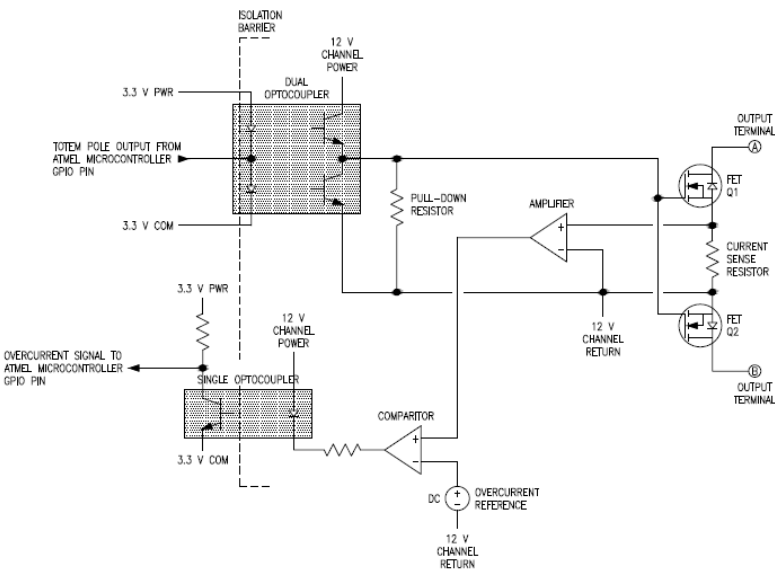
The SIO3.10 uses COTS 20 pin pluggable terminals for interconnection to the field wiring terminals. The Bedrock patented universal interconnect cable provides a pre-wired solution, reducing signal cable routing, control cabinet and panel size requirements.



Output Options



Simplified Circuit Diagram



Introducing the SIO5.10: The SIO5.10 is Bedrock's 10 channel secure high speed discrete input module which offers:

- Soft-selectable 5 - 24 V DC thresholds
- Voltage Monitor or Contact Sense (with 24 V DC wetting voltage)
- Soft-selectable filter/debounce time
- Soft-selectable inputs for frequency, period, pulse rate and pulse accumulation
- Deterministic backplane communications

Number of Channels	10 - High Speed Discrete Inputs
Filter/Debounce Time	Soft selectable 0-255 msec
Input Type	Soft selectable Voltage monitor or Contact closure (wetting voltage from module)
Input Threshold	Soft selectable 5, 12, 24 V dc
Update Rate	3.0 msec
Isolation	1500 VAC Channel to Ground
Input Impedance	12 K Ω
Power Consumption	4.5 watts
Power Dissipation	4.0 watts
Wetting Voltage	24 V dc \pm 10%
Input Frequency Range	10 Hz to 100 kHz
Accuracy	0.03% of full scale
Operating Temperature	-40°C to 80°C
Storage Temperature	-40°C to 85°C
Relative Humidity	5% to 95% non -condensing
Protection Rating / Airborne Contaminants	IP20, NEMA 1
Shock	IEC60068 -2-27 Operating 30 g, Non-operating 50 g
Vibration	IEC 60068 -2-6 2 g @ 10 -500Hz
Emissions	IEC 61000 -6-4 30 MHz to 230 MHz 40 db μ V/m Quasi -peak at 10 meters 230 MHz to 1 GHz 47 db μ V/m Quasi -peak at 10 meters
ESD Immunity	IEC 61000 -4-2 6 kV contact discharges, 8 kV air discharges
Radiated RF Immunity	IEC 61000 -4-3 1 kHz sine -wave 80% AM, 10 V/m (80 MHz to 1000 MHz), 3 V/m (1.4 GHz to 2.0 GHz), 1 V/m (2.0 GHz to 2.7 GHz)
EFT/B Immunity	IEC 61000 -4-4 \pm 2 kV at 5 kHz on signal ports
Surge Transient Immunity	IEC 61000 -4-5 \pm 2 kV line -earth (CM) on shielded ports
Conducted RF Immunity	IEC 61000 -4-6 10 Vrms with 1 kHz sine -wave 80% AM from 150 kHz to 80 MHz
Height	167.894 mm (6.61 inches)
Width	18.034 mm (.71 inches)
Depth	106.426 mm (4.19 inches)
Weight	~290 g (10.2 ounces)

Certifications:

This product meets or exceeds all of the applicable product safety requirements contained in UL and CENELEC standards.

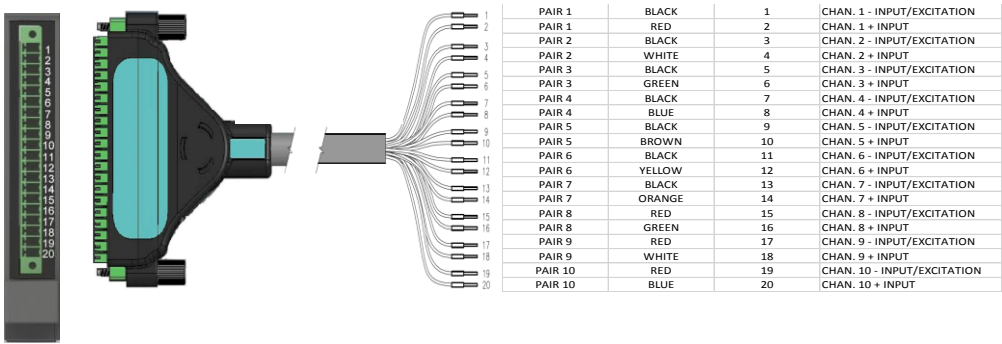
The product design meets the following electrical certification requirements:

- UL (US and Canadian Certification) ordinary locations and Class 1, Division 2, Groups A -D locations.
- CENELEC Group IIC, Zone 2 locations.

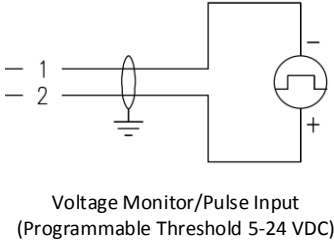
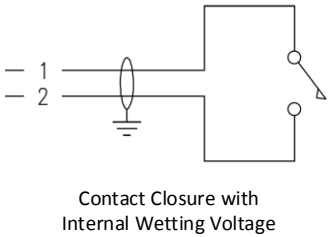


Pinouts

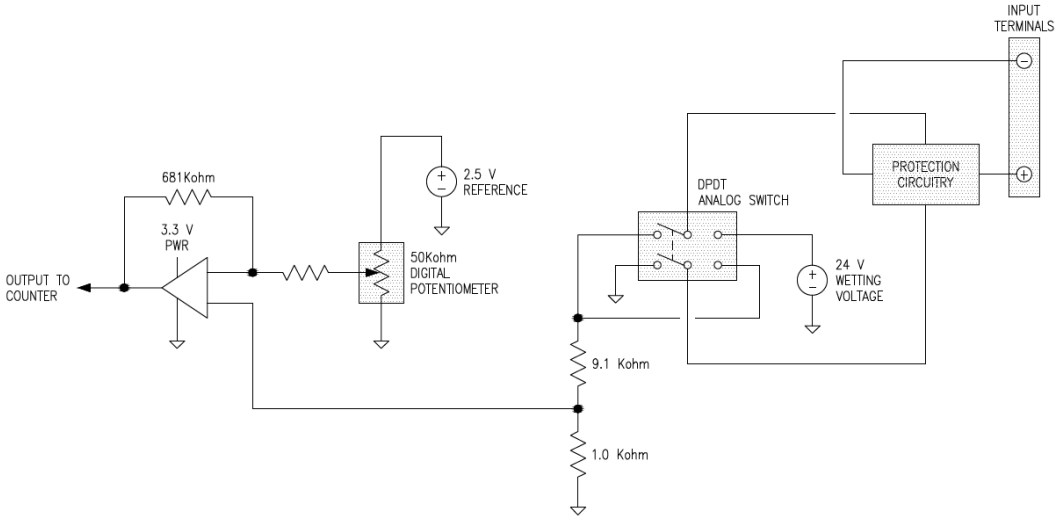
The SIO5.10 uses COTS 20 pin pluggable terminals for interconnection between the field wiring terminals. The Bedrock patented universal interconnect cable provides a pre-wired solution, reducing signal cable routing, control cabinet and panel size requirements.



Input Options



Simplified Circuit Diagram



Introducing the SIO6.20: The SIO6.20 is a 20 channel group isolated 4-20 mA input module that supports HART. Signal type options include:

Analog Input

- 2-Wire 4-20 mA Externally Powered Loop Transmitters

Open Digital Protocols

- HART Master Device, supporting HART Revision 7

Number of Channels	20 Channel Group Isolated Analog Inputs
Input Type	2-Wire 4-20 mA Externally Powered Loop Transmitters
Open Digital Protocols	HART Master Device, supporting HART Revision 7
<i>HART Scan Time</i>	0.5 seconds per channel
Module Location	Bedrock's Magnetic Backplane
Input Impedance	250 ohms per channel
Power Consumption	3.5 watts
Power Dissipation	3 watts
Temperature Coefficient	45 ppm per °C
Module Conversion Method	Sigma-Delta
Input Resolution	19 plus sign bit
Analog Input Accuracy	± 0.015% of full-scale (between 4 mA and 20 mA) @23°C
Update Rate	Configurable between 8 and 100 mSec
Non-linearity	Included in Accuracy
Isolation	1500 VAC Bank to Ground 1200 VAC Bank to Bank (Module consists of 2 Banks of 10 channels each)
Operating Temperature	-40°C to 80°C
Storage Temperature	-40°C to 85°C
Relative Humidity	5% to 95% non-condensing
Shock	IEC 60068-2-27 Operating 30 g, Non-operating 50 g
Vibration	IEC 60068-2-6 2 g @ 10-500 Hz
Emissions	IEC 61000-6-4 30 MHz to 230 MHz 40 db uV/m Quasi-peak at 10 meters 230 MHz to 1 GHz 47 db uV/m Quasi-peak at 10 meters
ESD Immunity	IEC 61000-4-2 6 kV contact discharge, 8 kV air discharge
Radiated RF Immunity	IEC 61000-4-3 1 kHz sine-wave 80% AM, 10 V/m (80 MHz to 1000 MHz), 3 V/m (1.4GHz to 2 GHz), 1 V/m (2.0 GHz to 2.7 GHz)
EFT/B Immunity	IEC 61000-4-4 ±2 kV at 5 kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5 ±2 kV line-earth (CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6 10 Vrms with 1 kHz sine-wave 80% AM from 150 kHz to 80 MHz
Height	167.894 mm (6.61 inches)
Width	18.034 mm (0.71 inches)
Depth	106.426 mm (4.19 inches)
Weight	~290 g (10.2 ounces)

Certifications:

This product meets or exceeds all of the applicable product safety requirements contained in UL and CENELEC standards.

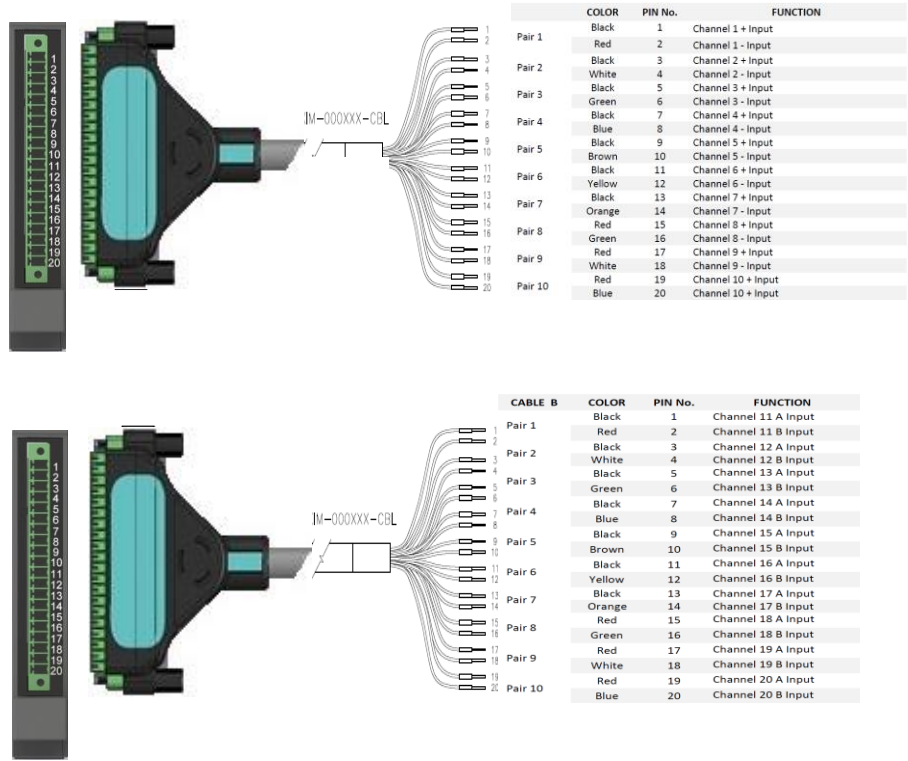
The product design meets the following electrical certification requirements:

- UL (US and Canadian Certification) ordinary locations and Class 1, Division 2, Groups A-D locations.
- CENELEC Group IIC, Zone 2 locations.

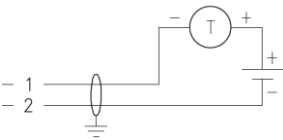


Pinouts

The SIO6.20 uses COTS 20 pin pluggable terminals for interconnection between the field wiring terminals. The Bedrock patented universal interconnect cable provides a pre-wired solution, reducing signal cable routing, control cabinet and panel size requirements.

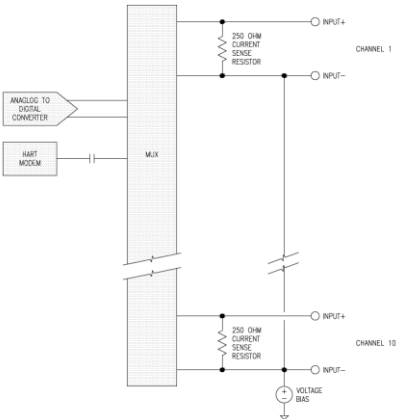


Input Option



2-Wire Externally Powered Loop Transmitter

Simplified Circuit Diagram



Introducing the SIO7.20: The SIO7.20 is Bedrock's 20 channel low voltage discrete input module which offers:

- Soft-selectable 0 -60 V ac/dc thresholds, Voltage Monitor
- Soft-selectable AC digital filtering and debounce
- Galvanic isolation per channel
- Deterministic backplane communications
- ± 0.5 msec SOE and time stamp

Number of Channels	20 - Low Voltage Discrete Inputs								
Input Types	Soft-selectable 0 – 60 VAC/DC threshold, Voltage Monitor								
Update Rate	3 msec								
Filter/Debounce Time	Soft selectable on/off, programmable 1 -255 msec								
Isolation	1200 VAC Channel to Channel 1500 VAC Channel to Ground								
Thresholds	<table><tr><td>Setting</td><td>Off Voltage</td><td>On Voltage</td></tr><tr><td>24 ac/dc</td><td>7</td><td>20</td></tr></table>			Setting	Off Voltage	On Voltage	24 ac/dc	7	20
Setting	Off Voltage	On Voltage							
24 ac/dc	7	20							
Input Impedance	12 K Ω minimum								
Power Consumption	1.5 watts								
Power Dissipation	3.0 watts								
Input Type	Voltage Monitor								
Operating Temperature	-40°C to 80°C								
Storage Temperature	-40°C to 85°C								
Relative Humidity	5% to 95% non-condensing								
Shock	IEC60068-2-27	Operating 30 g, Non-operating 50 g							
Vibration	IEC 60068-2-6	2g @ 10-500 Hz							
Emissions	IEC 61000-6-4	30 MHz to 230 MHz 40 db μ V/m Quasi-peak at 10 meters 230 MHz to 1 GHz 47 db μ V/m Quasi-peak at 10 meters							
ESD Immunity	IEC 61000-4-2	6kV contact discharges, 8kV air discharges							
Radiated RF Immunity	IEC 61000-4-3	1 kHz sine-wave 80% AM10V/m (80 MHz to 1000 MHz) 3V/m (1.4 GHz to 2.0 GHz), 1V/m (2.0 GHz to 2.7 GHz)							
EFT/B Immunity	IEC 61000-4-4	\pm 2 kV at 5 kHz on signal ports							
Surge Transient Immunity	IEC 61000-4-5	\pm 2 kV line-earth (CM) on shielded ports							
Conducted RF Immunity	IEC 61000-4-6	10 Vrms with 1 kHz sine-wave 80% AM from 150 kHz to 80 MHz							
Height	167.894 mm (6.61 inches)								
Width	18.034 mm (.71 inches)								
Depth	106.426 mm (4.19 inches)								
Weight	~290 g (10.2 ounces)								

Certifications:

This product meets or exceeds all of the applicable product safety requirements contained in UL and CENELEC standards.

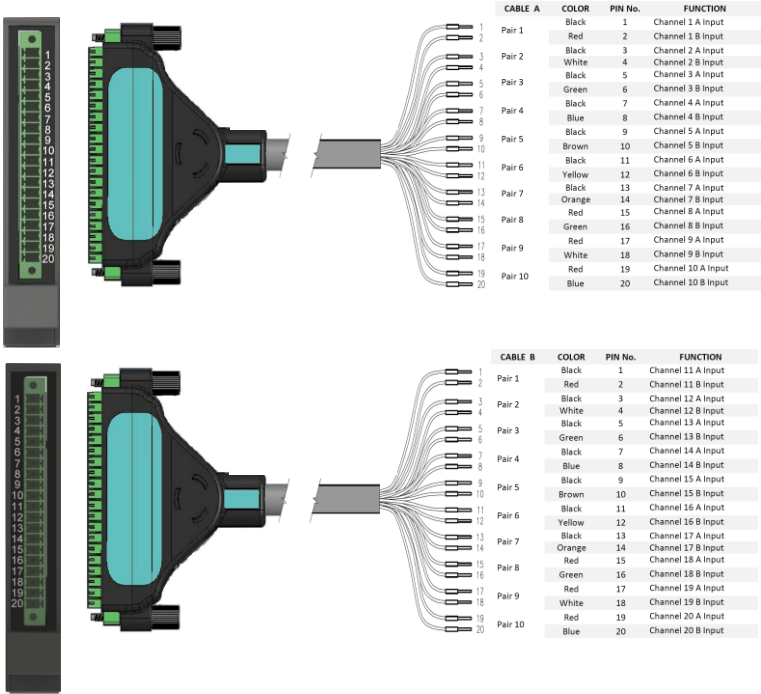
The product design meets the following electrical certification requirements:

- UL (US and Canadian Certification) ordinary locations and Class 1, Division 2, Groups A-D locations.
- CENELEC Group IIC, Zone 2 locations.

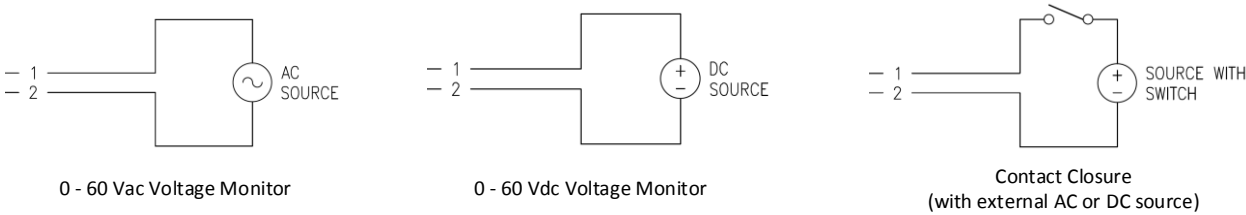


Pinouts

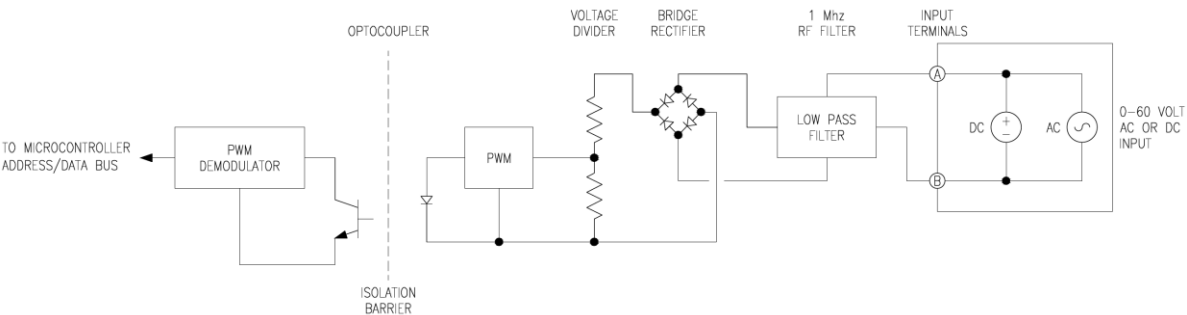
The SIO7.20 uses COTS 20 pin pluggable terminals for interconnection between the field wiring terminals. The Bedrock patented universal interconnect cable provides a pre-wired solution, reducing signal cable routing, control cabinet and panel size requirements.



Input Options



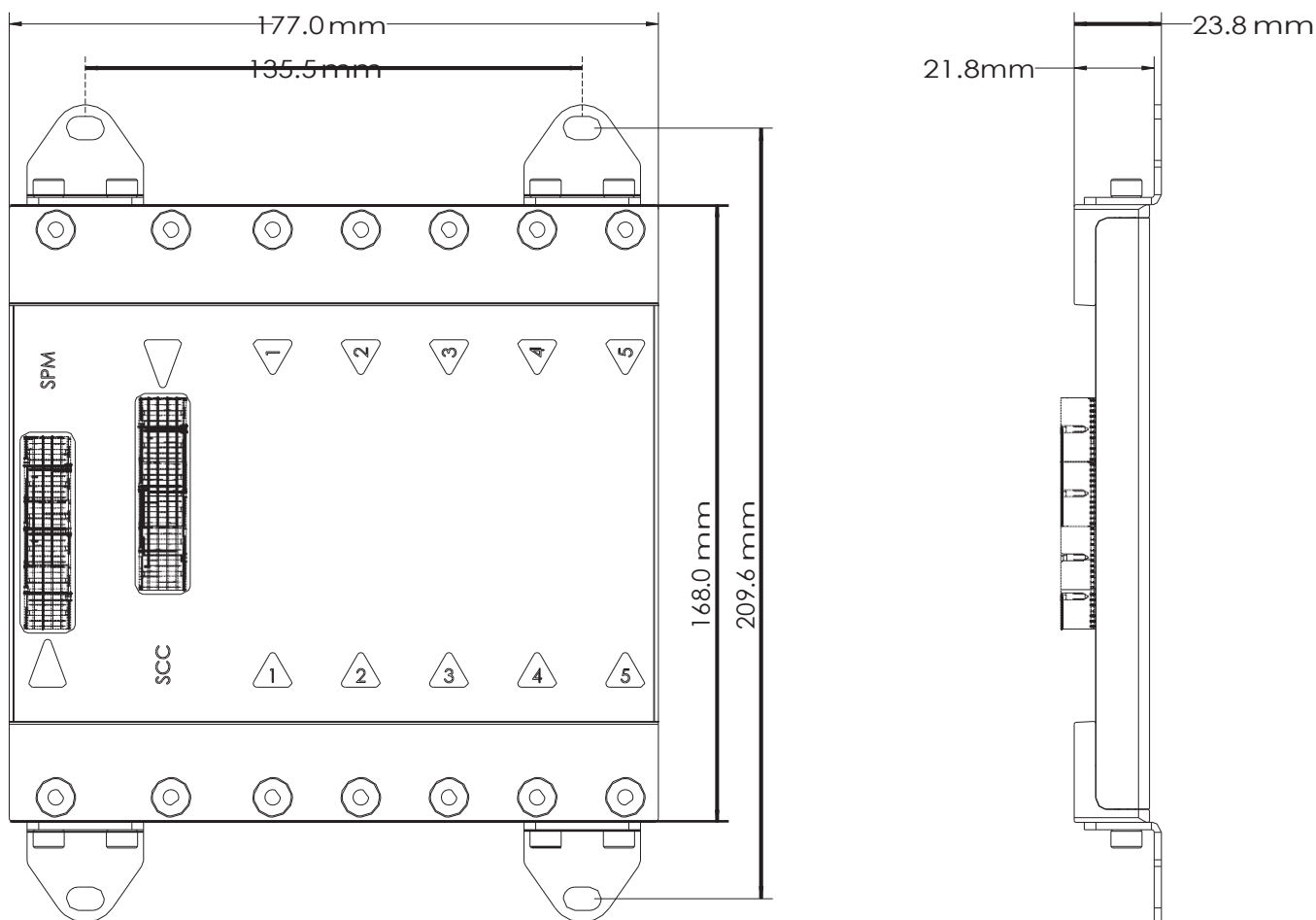
Simplified Circuit Diagram

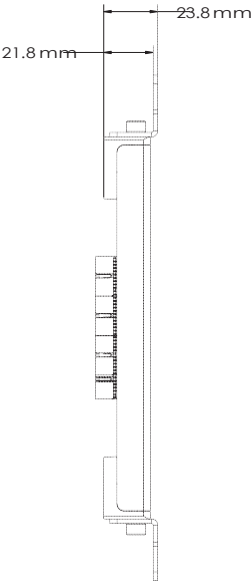
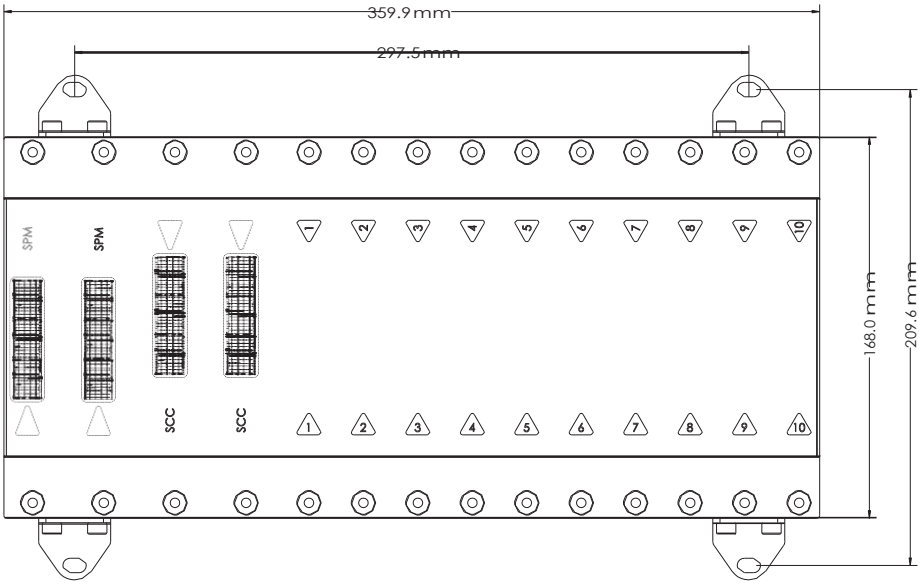


Introducing BMI: The BMI family is Bedrock's unique electromagnetic backplane that secures SIO, SCC and SPM modules. There are 3 sizes available, a 5, 10 or 20 module backplane. The 10 and 20 module backplanes also provide connections for redundant SPM modules and redundant SCC modules. Benefits of the unique electromagnetic backplane include

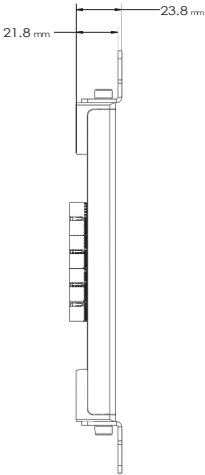
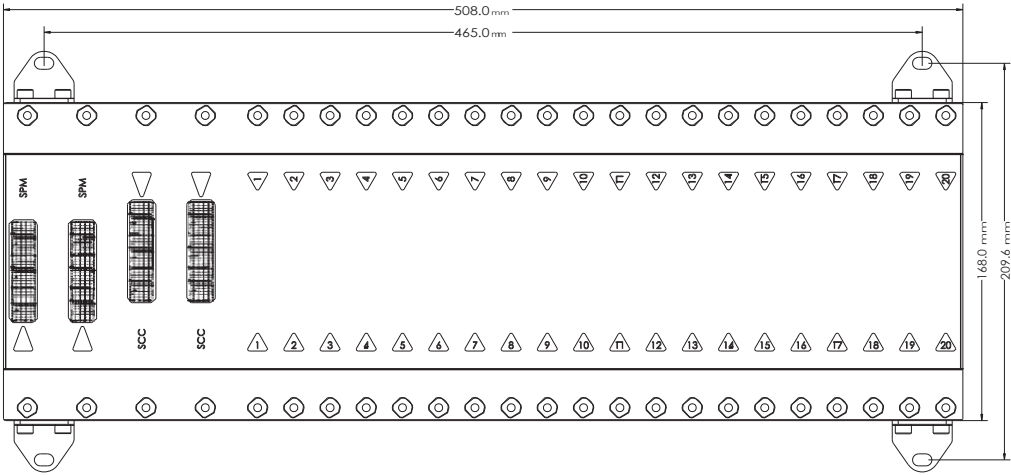
- Elimination of possibility of bending, breaking or corrosion of SIO module pins
- Native Galvanic isolation on all IO modules
- Support for redundant, asynchronous data and power bus
- Implementation of Bedrock's patented Black Fabric™ cyber secure interconnect
- Deterministic backplane communications
- Symmetrical Design provides enhanced Cable Management

Mounting Dimensions





10-Slot BMI



20-Slot BMI