radICS

RadICS B Digital Instrumentation and Control Platform

The RadICS B Platform is robust, flexible, and scalable. It delivers state-of-the-art functions, services, and safeguards for industrial applications. The RadICS B Platform components are designed to the latest IEC standards for non-safety service in industrial systems. The RadICS B Platform consists of a Logic Module, basic input/output modules, and specialty modules, all housed in a seismically qualified chassis.

- Inherent on-board diverse watchdog technological and self-diagnostic functional diversity which eliminates common cause failure vulnerabilities
- Flexible and scalable system design architecture for any size and type of I&C system
- Fast and deterministic performance using modern FPGA technology. Response time as fast as 5 milliseconds
- IEC 61508 SIL 2 compliant FPGA-based platform designed for industrial applications.
  SIL 2 in a single channel configuration
- Comprehensive self-diagnostics that ensures system functions with fail safe design features
- Testing optimization and maintenance cost reductions achieved via the use of overlapping automatic and semi-automatic surveillance capabilities
- Quality built-in from day one through design, manufacturing, verification and testing processes
- Delivering high reliability required for non-safety applications

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30+ Years of Proven Innovation for the Global Nuclear Industry

For more than 30 years Radiy has provided advanced instrumentation and control (I&C) solutions for nuclear power plant modernization and new build projects in the global market. Radiy's I&C product, the RadICS B I&C Platform, was developed specifically for use in industrial applications, including nuclear and thermal power plants. Radiy also offers industrial control systems, electrical equipment, and reverse engineering services.

Radics, a wholly owned LLC, provides delivery services for the RadICS B I&C Platform for international markets to meet local regulatory requirements.

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Platform Equipment

Logic Module (LM)

Analog Inputs Module (AIM)

Discrete Inputs Module (DIM)

Analog Outputs Module (AOM)

Discrete Outputs Module (DOM)

Optical Communication Module (OCM)

Thermocouple Inputs Module (TIM)

Resistance Temperature Detector Inputs Module (RIM)

Chassis

RadICS B - based Non-Safety System Applications

Conventional Island I&C System

Nuclear Island I&C System

v.06.0 (September 2025)

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The RadICS B product line consists of a Logic Module, basic input/ output modules, and specialty modules all housed in a chassis.

The Logic Module serves as the brain for the entire platform. In addition to executing the application logics, the Logic Module communicates with all other modules installed in the chassis, performs and monitors self-diagnostics, and controls communications with external chassis and systems.

Logic Module (LM)

- Fast and deterministic performance using modern FPGA technology. Response times as low as 5 milli-seconds!
- IEC 61508 SIL 2 certification in single and multiple channel configurations.
- Robust self-diagnostics ensure higher reliability and early fault detection with safety-focused fault management.
- Segregation of application logic, self-diagnostics, and watchdog functions assures safety-critical functionality.
- Galvanic isolation for inputs and outputs with robust error checking for digital communications independence.
- Inherent on-board diversity features eliminate common cause failure vulnerabilities.
- FPGA technology and design strategies eliminate cyber security threat vectors common in micropro-cessor-based systems.
- FPGA technology ensures resilience to obsolescence.

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Logic Module
Technical Specifications

FPGA Capacity	capacity to handle > 500 application blocks
Memory	11 megabit (FPGA internal) 4*2 megabit (4 external EEPROMs)
Discrete Inputs	24 VDC, 10 milliamps maximum, Form A “dry” contact with galvanic isolation (5 available, 1 reserved)
Discrete Inputs Overvoltage Protection	up to 48 VDC continuous
Access Key Signal Input	discrete signal (24 VDC, 0 to 10 milliamps) receiver with galvanic isolation
Discrete Outputs	“dry” contact: up to 48 V, 50 mA (AC/DC), galvanic-isolated by optic-relays (6 discrete outputs)
Discrete Outputs Overvoltage Protection	up to +60 VDC/VAC continuous
Application Logic Processing Cycle	up to 3.5 milliseconds for application logic up to 1.5 milliseconds for input/output signals/data processing
Access Key Signal Input	discrete signal (24 VDC, 0 to 10 milliamps) receiver with galvanic isolation
Diagnostic Package Exchange Cycle	5 milliseconds
Ethernet / Protocol	100 BASE-FX IP/UDP
LVDS Line Speed	100 megabit/second
LVDS Line Protocol	proprietary protocol with integrity checking (CRC), galvanic-isolated Tx / Rx
Fiber Optical Lines Speed	100 megabit/second
Self-Diagnostic Functions	diverse watchdog unit, checksum analysis, active diagnostics with internal fault detection, hardware error detection, functionally diverse continuous self-diagnostic tests, power supply fault detection
Power Supply / Consumption	2 independent inputs – 24 (18 – 36) VDC / 0.8 amp
Indications	Bicolour status LED indicator (STATUS); 64x48 graphical OLED indicator for providing current operational mode, service information, and error codes
Operating Temperature	4.4 to 60 °C (32 to 140 °F)
Operating Humidity	10 to 90% relative humidity, non-condensing

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The RadICS B product line consists of a Logic Module, basic input/ output modules, and specialty modules all housed in a chassis.

The Analog Inputs Module (AIM) serves as a high-density analog field sensor acquisition module. It provides for 32 independent, highly reliable, and galvanically isolated inputs with built- in filtering and calibration to be used by the Logic Module. The AIM also performs robust and continuous self-diagnostics to ensure the safety and integrity of each output and module function.

Analog Inputs Module
(AIM)

- High density 32 channel analog inputs with built-in hardware redundancy and self-diagnostics for highly reliable operation, filtering, calibration, and random hardware failure detection.
- Independent FPGA for analog input processing, self-diagnostics and microcontroller for power control and fail-safe functional behavior.
- IEC 61508 SIL 2 certification in single and multiple channel configurations.
- Segregation of output processing, self-diagnostics, and watchdog functions assures safety-critical functionality.
- Galvanic isolation for signal inputs with robust and-dedicated communication links to Logic Module for secure data transfer.
- Inherent on-board diversity features eliminate common cause failure vulnerabilities.
- FPGA technology ensures resilience to obsolescence.

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Analog Inputs Module
Technical Specifications

Input Analog Signal Range	0 to ±5.1 V 0 to ±10.2V Differential input impedance: not less than 1 megohm
A/D Conversion Resolution	18 bit
Overall Accuracy	0.05% of full scale for all ranges (at 25 °C)
Input Channel Isolation	all input channels are galvanic-isolated up to 250 V RMS AC or 250 VDC field-to-Chassis and channel-to-channel
Overvoltage Protection	up to ±30 VDC/VAC continuous
Information Package Exchange Cycle	5 milliseconds
Diagnostic Package Exchange Cycle	5 milliseconds
LVDS Line Speed	100 megabit/second
LVDS Line Protocol	proprietary protocol with integrity checking (CRC), galvanic-isolated Tx / Rx
Self-Diagnostic Functions	diverse watchdog unit, checksum analysis, active diagnostics with internal fault detection, hardware error detection, functionally diverse continuous self-diagnostic tests, power supply fault detection
Power Supply / Consumption	2 independent inputs – 24 (18 – 36) VDC / 0.4 amp
Indications	Bicolour status LED indicator (STATUS); 64x48 graphical OLED indicator for providing current operational mode, service information, and error codes
Operating Temperature	4.4 to 60 °C (32 to 140 °F)
Operating Humidity	10 to 90% relative humidity, non-condensing

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The Analog Outputs Module (AOM) serves as a high-density output conditioning module providing for 32 independent, highly reliable, and galvanically isolated analog outputs. The Logic Module uses the AOM to drive field devices, indicators, and other functions. The AOM also performs robust and continuous self-diagnostics to ensure the safety and integrity of each output and module function.

Analog Outputs Module
(AOM)

- High density 32 channel analog outputs.
- Independent FPGA for analog input processing, self-diagnostics and microcontroller for power control and fail-safe functional behavior.
- IEC 61508 SIL 2 certification in single and multiple channel configurations.
- Segregation of output processing, self-diagnostics, and watchdog functions assures safety-critical functionality.
- Galvanic isolation for signal outputs with robust and dedicated communication links to Logic Module for secure data transfer.
- Inherent on-board diversity features eliminate common cause failure vulnerabilities.
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Analog Outputs Module
Technical Specifications

Output Range	0 to +5 V / 4 to 20 milliamp / ± 10 V / 0 to 5 milliamps
D/A Conversion Resolution	16 bit
Output Signal Value Accuracy	0.05% of full scale (at 25 °C)
Maximum Output Load	up to 1 kilo ohm (kΩ) for current output Minimum of 1 kΩ for voltage output
Output Channel Isolation	all output channels are galvanic-isolated up to 250V RMS AC or 250 VDC field- to-Chassis and channel-to-channel
Output Overvoltage Protection	up to ±30 VDC/VAC continuous
Information Package Exchange Cycle	5 milliseconds
Diagnostic Package Exchange Cycle	5 milliseconds
LVDS Line Speed	100 megabit/second
LVDS Line Protocol	proprietary protocol with integrity checking (CRC), galvanic-isolated Tx / Rx
Self-Diagnostic Functions	diverse watchdog unit, checksum analysis, active diagnostics with internal fault detection, hardware error detection, functionally diverse continuous self-diagnostic tests, power supply fault detection
Power Supply / Consumption	2 independent inputs – 24 (18 – 36) VDC / 0.4 amp
Indications	Bicolour status LED indicator (STATUS); 64x48 graphical OLED indicator for providing current operational mode, service information, and error codes
Operating Temperature	4.4 to 60 °C (32 to 140 °F)
Operating Humidity	

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The RadICS B product line consists of a Logic Module, basic input/ output modules, and specialty modules all housed in a chassis.

The Discrete Inputs Module (DIM) serves as a high-density discrete dry contact module providing for 64 independent inputs for use by the Logic Module. The DIM also performs robust and continuous self-diagnostics to ensure the safety and integrity of each input and module function.

Discrete Inputs Module
(DIM)

- High density 64 discrete dry-contact inputs with line integrity check.
- Built-in hardware redundancy for hardware failure detection.
- Independent FPGA for analog input processing, self-diagnostics and microcontroller for power control and fail-safe functional behavior.
- IEC 61508 SIL 2 certification in single and multiple channel configurations.
- Robust self-diagnostics ensure higher reliability and early fault detection.
- Segregation of input processing, self-diagnostics, and watchdog functions assures safety-critical functionality.
- Robust and dedicated communication links to Logic Module for secure data transfer.
- Inherent on-board diversity features eliminate common cause failure vulnerabilities.
- FPGA technology ensures resilience to obsolescence.

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Discrete Inputs Module
Technical Specifications

Wetting Current For Each Independent Discrete Input	2 milliamps (Form A "dry" contacts)
Input Channel Isolation	all input channels are galvanic-isolated up to 250V DC field- to-Chassis
Input Channel Isolation Method	electric transformers
Overvoltage Protection	up to ±30 VDC/VAC continuous
Information Package Exchange Cycle	5 milliseconds
Diagnostic Package Exchange Cycle	5 milliseconds
LVDS Line Speed	100 megabit/second
LVDS Line Protocol	proprietary protocol with integrity checking (CRC), galvanic-isolated Tx / Rx
Self-Diagnostic Functions	diverse watchdog unit, checksum analysis, active diagnostics with internal fault detection, hardware error detection, functionally diverse continuous self-diagnostic tests, power supply fault detection
Power Supply / Consumption	2 independent inputs – 24 (18 – 36) VDC / 0.4 amp
Indications	Bicolour status LED indicator (STATUS); 64x48 graphical OLED indicator for providing current operational mode, service information, and error codes
Operating Temperature	4.4 to 60 °C (32 to 140 °F)
Operating Humidity	10 to 90% relative humidity, non-condensing

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The RadICS B product line consists of a Logic Module, basic input/ output modules, and specialty modules all housed in a chassis.

The Discrete Outputs Module (DOM) serves as a high-density module providing for 32 independent, highly reliable, and galvanic isolated discrete outputs. The Logic Module uses the DOM to drive field devices, indicators, and other functions. The DOM also performs robust and continuous self-diagnostics to ensure the safety and integrity of each output and module function.

Discrete Outputs Module (DOM)

- High density 32 channel isolated Form-A, fuse and overvoltage protected, discrete outputs.
- Independent FPGA for discrete output processing and self-diagnostics.
- IEC 61508 SIL 2 certification in single channel configurations.
- Segregation of output processing, self-diagnostics and microcontroller for power control and fail-safe functional behavior.
- Galvanic isolation for signal outputs with robust and dedicated communication links to Logic Module forsecure data transfer.
- Inherent on-board diversity features eliminate common cause failure vulnerabilities.
- FPGA technology ensures resilience to obsoles-cence.

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Discrete Outputs Module
Technical Specifications

Output Channel Load Voltage / Current (maximum switching voltage / current)	up to 24 VDC, 0.1 amp, Form A contact
Output Channel Isolation	all output channels are galvanic-isolated up to 250V RMS AC or 250 VDC field- to-Chassis and channel-to-channel
Output Channel Isolation Method	optical relay
Output Overvoltage Protection	up to ±30 VDC/VAC continuous
Information Package Exchange Cycle	5 milliseconds
Diagnostic Package Exchange Cycle	5 milliseconds
LVDS Line Speed	100 megabit/second
LVDS Line Protocol	proprietary protocol with integrity checking (CRC), galvanic-isolated Tx / Rx
Self-Diagnostic Functions	diverse watchdog unit, checksum analysis, active diagnostics with internal fault detection, hardware error detection, functionally diverse continuous self-diagnostic tests, power supply fault detection
Power Supply / Consumption	2 independent inputs – 24 (18 – 36) VDC / 0.4 amp
Indications	Bicolour status LED indicator (STATUS); 64x48 graphical OLED indicator for providing current operational mode, service information, and error codes
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The RadICS B product line consists of a Logic Module, basic input/ output modules, and specialty modules all housed in a chassis.

The Thermocouple Input Module (TIM) serves as a high-density thermocouple sensor acquisition module.
It provides for 32 independent, highly reliable, and galvanically isolated inputs with built-in filtering and calibration to be used
by the Logic Module. The TIM also performs robust and continuous self-diagnostics to ensure the safety and integrity of each input and module function.

Thermocouple Input Module (TIM)

- High density 32 channel thermocouple inputs with built-in hardware redundancy and self-diagnostics for highly reliable operation, filtering, calibration, and random hardware failure detection.
- FPGA for analog input processing, self- diagnostics and microcontroller for power control and fail-safe functional behavior as a watchdog.
- IEC 61508 SIL 2 certification in single and multiple channel configurations.
- Robust self-diagnostics ensure higher reliability and early fault detection with safety-focused fault management.
- Segregation of input processing, self-diagnostics, and watchdog functions assure safety-critical functionality.
- Galvanic isolation for signal inputs with robust and-dedicated communication links to Logic Module for secure data transfer.
- Inherent on-board diversity features eliminate commoncause failure vulnerabilities.
- FPGA technology ensures resilience to obsolescence.

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Thermocouple Input Module
Technical Specifications

Supported Sensor Types	Type B, E, J, K, N, R, S, T with internal conversion mV→t °C. Also supports raw millivolts (mV) acquisition (to support any other sensor type with external conversion into temperature performed in Logic Module)
Overall Accuracy	Type B: 0.15% of full scale (@ 25 °C) Type R, S, T: 0.1% of full scale (@ 25 °C) others - 0.04% of full scale (@ 25 °C)
Input Channel Isolation	all input channels are galvanic-isolated up to 250 V RMS AC or 250 VDC field-to-Chassis and channel-to-channel
Overvoltage Protection	±24 VAC/VDC continuous
Information Package Exchange Cycle	5 milliseconds
Diagnostic Package Exchange Cycle	5 milliseconds
LVDS Line Speed	100 megabit/second
LVDS Line Protocol	proprietary protocol with integrity checking (CRC), galvanic-isolated Tx / Rx
Self-Diagnostic Functions	diverse watchdog unit, checksum analysis, active diagnostics with internal fault detection, hardware error detection, functionally diverse continuous self-diagnostic tests, power supply fault detection
Power Supply / Consumption	2 independent inputs – 24 (18 – 36) VDC / 0.85 amp
Indications	bicolour status LED indicator (STATUS) OLED indicator for providing current operational mode, service information, and error codes
Operating Temperature	4.4 to 60 °C (32 to 140 °F)
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The RadICS B product line consists of a Logic Module, basic input/ output modules, and specialty modules all housed in a chassis.

The Resistance Input Module (RIM) serves as a high-density resistance sensor acquisition module. It provides for 16 independent, highly reliable, and galvanically isolated inputs with built-in filtering and calibration to be used
by the Logic Module. The RIM also performs robust and continuous self-diagnostics to ensure the safety and integrity of each input and module function.

Resistance Input Module
(RIM)

- High density 16 channel resistance inputs with built-in hardware redundancy and self-diagnostics for highly reliable operation, filtering, calibration, and random hardware failure detection.
- FPGA for analog input processing, self-Diagnostics and microcontroller for power control and fail-safe functional behavior as a watchdog.
- IEC 61508 SIL 2 certification in single and multiple channel configurations.
- Robust self-diagnostics ensure higher reliability and early fault detection with safety-focused fault management.
- Segregation of input processing, self-diagnostics, and watchdog functions assure safety-critical functionality.
- Galvanic isolation for signal inputs with robust and dedicated communication links to Logic Module for secure data transfer.
- Inherent on-board diversity features eliminate common cause failure vulnerabilities.
- FPGA technology ensures resilience to obsolescence.

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Resistance Input Module Technical Specifications

Input Signal Range	0 to 400 Ohm
Supported Sensor Types	**1.** 2-, 3- and 4-wire connection schemes support. **2.** Raw resistance (Ohms) measurement (to support any specific sensor type with external conversion into temperature performed in Logic Module). **3.** 5 pre-defined RTD sensor types support with adjustable R0 (up to 100 Ohms) and R -> t conversion performed internally by module. **Supported RTD types:** - Platinum (α=0.00385 per °C) – corresponds to IEC 751 - Platinum (α=0.00391 per °C) - Copper (α=0.00428 per °C) - Copper (α=0.00426 per °C) - Nickel (α=0.00617 per °C)
Overall Accuracy	0.1% of full scale
Input Channel Isolation	all input channels are galvanic-isolated up to 250 V RMS AC or 250 VDC field-to-Chassis and channel-to-channel
Overvoltage Protection	±24 VAC/VDC continuous
Information Package Exchange Cycle	5 milliseconds
Diagnostic Package Exchange Cycle	5 milliseconds
LVDS Line Speed	100 megabit/second
LVDS Line Protocol	proprietary protocol with integrity checking (CRC), galvanic-isolated Tx / Rx
Self-Diagnostic Functions	diverse watchdog unit, checksum analysis, active diagnostics with internal fault detection, hardware error detection, functionally diverse continuous self-diagnostic tests, power supply fault detection
Power Supply / Consumption	2 independent inputs – 24 (18 – 36) VDC / 0.85 amp
Indications	bicolour status LED indicator (STATUS) OLED indicator for providing current operational mode, service information, and error codes
Operating Temperature	4.4 to 60 °C (32 to 140 °F)
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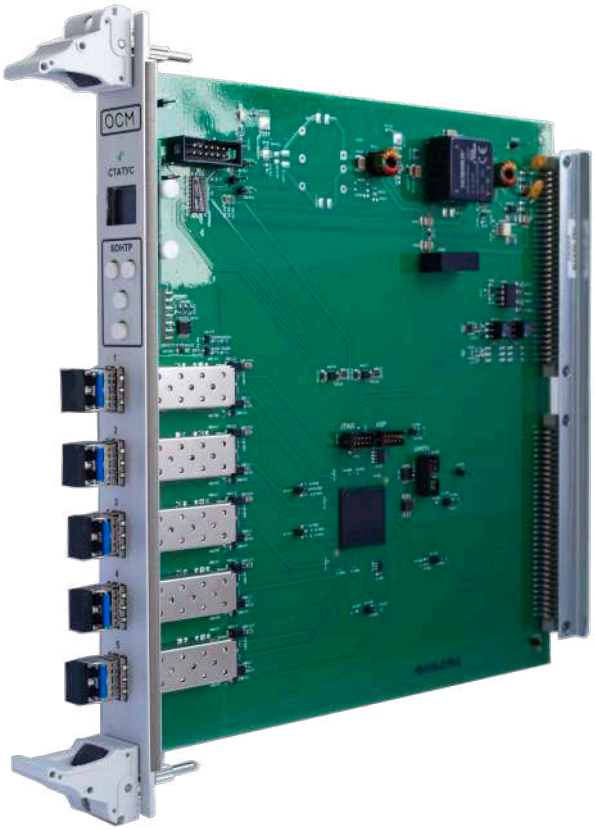
The Optical Communication Module (OCM) receives and transmits data via up to five independent safety qualified point to point fiber optic interfaces that are used to extend the RadICS Platform to additional chassis (OCM to OCM or OCM to LM). The OCM also performs robust and continuous self-diagnostics to ensure the safety and integrity of data transfer and module function.



Optical Communication Module (OCM)

- Five independent fiber optic communication ports with pluggable transievers for full duplex communications between channels or expansion racks.
- Independent FPGA for analog input processing, self-Diagnostics and microcontroller for power control and fail-safe functional behavior.
- IEC 61508 SIL 2 certification in single and multiple channel configurations.
- Robust self-diagnostics ensure higher reliability and early fault detection.
- Segregation of communication processing, self-diagnostics, and watchdog functions assures safety-critical functionality.
- Robust and dedicated communication links to Logic Module for secure data transfer.
- Inherent on-board diversity features eliminate common cause failure vulnerabilities.
- FPGA technology ensures resilience to obsolescence.

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Optical Communication Module
Technical Specifications

Fiber Optical Lines Type	optical full duplex
Fiber Optical Lines Speed	100 megabit/second
Information Package Exchange Cycle	5 milliseconds
Diagnostic Package Exchange Cycle	5 milliseconds
Diagnostic Data Exchange Cycle	up to 5 milliseconds
LVDS Line Speed	100 megabit/second
Fiber Optical Line Protocol	proprietary protocol with integrity checking (CRC), galvanic-isolated Tx / Rx
LVDS Line Protocol	proprietary protocol with integrity checking (CRC), galvanic-isolated Tx / Rx
Self-Diagnostic Functions	diverse watchdog unit, checksum analysis, active diagnostics with internal fault detection, hardware error detection, functionally diverse continuous self-diagnostic tests, power supply fault detection
Power Supply / Consumption	2 independent inputs – 24 (18 – 36) VDC / 0.4 amp
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