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ADAM-4000 RS-485 I/O Modules

Introduction

ADAM-4000 series modules provide ideal industrial automation, control and measurement solutions. Like ADAM-6000 series modules, ADAM-4000 modules provide rich I/O flexibility to satisfy a variety of applications. However, the main difference between ADAM-4000 and ADAM-6000 modules is the communication interface: ADAM-6000 modules leverage Ethernet while ADAM-4000 modules adapt RS-485.

Features

Supports Two Communication Protocols

Most ADAM-4000 modules support two communication protocols , ASCII and Modbus/RTU , for customers to choose from. With these two widely-used industrial communication protocols, ADAM-4000 RS-485-based I/O modules can be easily integrated with other devices and software.

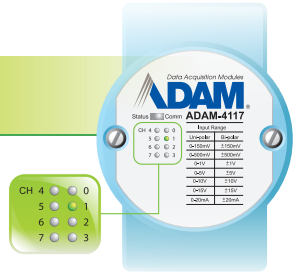
Easy to Diagnose and Maintain

There is a switch on the side of some ADAM-4100/4000 modules, helping users switch between 'Normal' and 'Init' (abbr. of Initialization) modes easily. Furthermore, with the LED indicators on the front of ADAM modules, the status of each channel can be identified instantly and greatly help engineers to troubleshoot the module in the field.

Display Channel Status and Node Address by LED

When the switch is set to "Normal", the LED will display the channel status.

For the analog module, the LED will be lit when the related channel is active. For the digital module, the LED will be lit when the related channel value is high. In this example of an analog input module, only channel 1 is active since only the LED of channel 1 is lit.





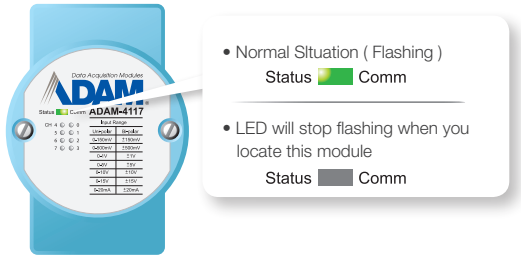
When the switch is set to "Init", the LED will display the node address.

If the switch is set to "Init", the LEDs will display the node address. In this example, the node address is 19 since LED's 0, 1, and 4 are lit.



Module Locate Function

When multiple ADAM-4100 series I/O modules are within the same RS-485 network, it is hard to find one specific module. With the Module Locate function, users can choose a specific module in Adam/Apax .NET Utility, and the LED on that module will stop flashing. So users can easily identify the module location. This helps users easily maintain the system.



ADAM-4100 Robust RS-485 I/O Modules

Introduction

The robust RS-485-based family includes the ADAM-4100 series I/O modules, ADAM-4510I and ADAM-4520I, which are designed to endure more severe and adverse environments. Not only does the ADAM-4100 series support a wider operating temperature range making it suitable for more widespread applications, but also features anti-noise functions which empower the ADAM-4000 robust family to confront harsh environments in many industrial automation applications.

Features



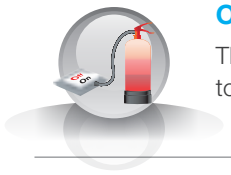
Wide Temperature & Power Input Range

The ADAM-4100 series can work under severe environments. The operating temperature range is -40~85ºC (-40~185ºF) and the power input is 10~48 V_{DC}, which allows it to be used in more demanding applications.



Dual Watchdog Timer

All ADAM-4100 modules provide two watchdog timers. The system watchdog will reboot the system when the module hangs, and the communication watchdog will re-initialize the RS-485 network if there is no communication for a specific time.



Over Current and Temperature Shutdown

This protection is for robust digital I/O modules. When the current is too big or the temperature is too high, that channel will automatically shutdown to prevent the whole system from damages.



Surge, EFT and ESD Protection

In order to prevent noise from affecting the system, ADAM-4100 robust family has been designed with advanced noise interference protection. Features included 1 kV surge protection on power inputs, 3 kV EFT, and 8 kV ESD protections.



Flexible Filter

For robust analog input modules such as ADAM-4117 and ADAM-4118, two filter options are available. Users can choose traditional 50/60 Hz hardware filter to remove the noise or choose the software filter, which will automatically decide the optimized working frequency to filter the noise.



Multiple Mounting Mechanisms

All Advantech's ADAM modules provide versatile mounting methods to fit various demands in the field. All ADAM modules support DIN-rail mounting, wall mounting and piggybacking. Customers can make signal connections through plug-in screw-terminal blocks, ensuring simple installation, modification, and maintenance.



ADAM-4000 Series Comparison Table

Repeaters / Converters







Model	ADAM-4510 ADAM-4510S	ADAM-4520	ADAM-4521	ADAM-4541 ADAM-4542+	ADAM-4561 ADAM-4562
Description	RS-422/485 Repeater / Isolated RS-422/485 Repeater	Isolated RS-232 to RS-422/485 Converter	Addressable RS-422/485 to RS-232 Converter	Multi-mode Fiber Optic to RS-232/422/485 Converter / Single-mode Fiber Optic to RS-232/422/485 Converter	1-port Isolated USB to RS-232/422/485 Converter / 1-port Isolated USB to RS-232 Converter
Network	RS-422 RS-485	RS-232 to RS-422/485		Fiber Optic to RS-232/422/485	USB to RS-232/485/422
Comm. Protocol	-				
Comm. Speed (bps)	Serial: from 1,200 to 115.2 k				
Comm. Distance	Serial: 1.2 km	Serial: 1.2 km	Serial: 1.2 km	ADAM-4541: 2.5 km ADAM-4542+: 15 km	Serial: 1.2 km
Interface Connectors	RS-422/485: plug-in screw terminal	RS-232: female DB9 RS-422/485: plug-in screw terminal	RS-232: female DB9 RS-422/485: plug-in screw terminal	RS-232/422/485: plug-in screw terminal Fiber: ADAM-4541: ST connector ADAM-4542+: SC connector	USB: type A client connector Serial: ADAM-4561: plug-in screw terminal (RS-232/422/485) ADAM-4562: DB9 (RS-232)
LED Indicators	Communication & Power				
Data Flow Control	-	Yes	Yes	-	Yes
Watchdog Timer	-	-	Yes	-	Yes
Isolation Voltage	ADAM-4510: - ADAM-4510S: 3,000 V_{DC}	3,000 V_{DC}	1,000 V_{DC}	-	ADAM-4561: 3,000 V_{DC} ADAM-4562: 2,500 V_{DC}
Power Requirement	10 ~ 30 V_{DC}				
Operating Temperature	-10 ~ 70°C (14 ~ 158°F)				0 ~ 70°C (32 ~ 158°F)
Humidity	5 ~ 95% RH	5 ~ 95% RH			
Power Consumption	1.4 W @ 24 V_{DC}	1.2 W @ 24 V_{DC}	1 W @ 24 V_{DC}	ADAM-4541: 1.5 W @ 24 V_{DC} ADAM-4542+: 3 W @ 24 V_{DC}	ADAM-4561: 1.5 W @ 5 V_{DC} ADAM-4562: 1.1 W @ 5 V_{DC}

ADAM-4000 Series Comparison Table

Analog Input Modules



Model		ADAM-4011	ADAM-4012	ADAM-4013	ADAM-4015/T	ADAM-4016
Description		1-ch Thermocouple Input Module	1-ch Analog Input Module	1-ch RTD Input Module	6-ch RTD Module with Modbus / 6-ch Thermistor Module with Modbus	1-ch Analog Input/ Output Module
Resolution		16 bit				
Analog Input	Channels	1 differential	1 differential	1 differential	6 differential	1 differential
	Sampling Rate	10 Hz (total)				
	Voltage Input	±15 mV ±50 mV ±100 mV ±500 mV ±1 V ±2.5 V	±150 mV ±500 mV ±1 V ±5 V ±10 V	-	-	±15 mV ±50 mV ±100 mV ±500 mV
	Current Input	±20 mA	±20 mA	-	-	±20 mA
	Direct Sensor Input	J, K, T, E, R, S, B Thermocouple	-	RTD	ADAM-4015: RTD ADAM-4015T: Thermistor	-
	Burn-out Detection	Yes	-	-	Yes	-
	Channel Independent Configuration	-	-	-	Yes	-
Analog Output	Channels	-	-	-	-	1
	Voltage Output	-	-	-	-	0 - 10 V
	Current Output	-	-	-	-	30 mA
Digital Input and Output	Input Channels	1	1	-	-	-
	Output Channels	2	2	-	-	4
	Alarm Settings	Yes	Yes	-	-	-
Counter (32-bit)	Channels	-	-	-	-	-
	Input Frequency	-	-	-	-	-
Isolation Voltage		3,000 V_{DC}				
Digital LED Indicator		-	-	-	-	-
Watchdog Timer		System	System	System	System & Comm.	System
DO Fail Safe Value (FSV) *		-	-	-	-	-
Modbus Support **		-	-	-	Yes	-

*: If there is no command received by DO channels after the preset period, the DO channels will be set to its FSV.

**: All ADAM-4000 I/O Modules support ASCII Commands.

ADAM-4000 Series Comparison Table

Analog Input / Output Modules



Model		ADAM-4017+	ADAM-4018+	ADAM-4019+	ADAM-4022/T	ADAM-4021	ADAM-4024
Description		8-ch Analog Input Module with Modbus	8-ch Thermocouple Input Module with Modbus	8-ch Universal Analog Input Module with Modbus	2-ch Serial Based Dual Loop PID Controller with Modbus	1-ch Analog Output Module	4-ch Analog Output Module with Modbus
Resolution		16 bit				12 bit	
Analog Input	Channels	8 differential			4 differential	-	-
	Sampling Rate	10 Hz (total)				-	-
	Voltage Input	±150 mV ±500 mV ±1 V ±5 V ±10 V	-	± 100 mV ± 500 mV ± 1 V ± 2.5 V ± 5 V ± 10 V	0 ~ 10 V	-	-
	Current Input	4 ~ 20 mA ±20 mA	4 ~ 20 mA ±20 mA	4 ~ 20 mA ±20 mA	0 ~ 20 mA 4 ~ 20 mA	-	-
	Direct Sensor Input	-	J, K, T, E, R, S, B Thermocouple	J, K, T, E, R, S, B Thermocouple	Thermistor, RTD	-	-
	Burn-out Detection	-	Yes	Yes (4 ~ 20 mA & All T/C)	-	-	-
	Channel Independent Configuration	Yes	Yes	Yes	Yes	-	-
Analog Output	Channels	-	-	-	2	1	4
	Voltage Output	-	-	-	0 ~ 10 V	0 ~ 10 V	±10 V
	Current Output	-	-	-	-	0 ~ 20 mA 4 ~ 20 mA	0 ~ 20 mA 4 ~ 20 mA
Digital Input and Output	Input Channels	-	-	-	2	-	4
	Output Channels	-	-	-	2	-	-
	Alarm Settings	-	-	-	-	-	Yes
Counter (32-bit)	Channels	-	-	-	-	-	-
	Input Frequency	-	-	-	-	-	-
Isolation Voltage		3,000 VDC	3,000 VDC	3,000 VDC	3,000 VDC	3,000 VDC	3,000 VDC
Digital LED Indicator		-	-	-	-	-	-
Watchdog Timer		System & Comm.	System & Comm.	System & Comm.	System	System	System & Comm.
DO Fail Safe Value (FSV) *		-	-	-	-	-	-
Modbus Support **		Yes	Yes	Yes	Yes	-	Yes

*: If there is no command received by DO channels after the preset period, the DO channels will be set to its FSV.

**: All ADAM-4000 I/O Modules support ASCII Commands.

ADAM-4000 Series Comparison Table

Digital Input / Output Modules



Model		ADAM-4050	ADAM-4051	ADAM-4052	ADAM-4053	ADAM-4055	ADAM-4056S ADAM-4056SO
Description		15-ch Digital I/O Module	16-ch Isolated Digital Input Module with Modbus	8-ch Isolated Digital Input Module	16-ch Digital Input Module	16-ch Isolated Digital I/O Module with Modbus	12-ch Sink/ Source Type Isolated Digital Output Module with Modbus
Digital Input	Channels	7	16	8	16	8	-
	Dry Contact	-	Yes	-	Yes	Yes	-
	Wet Contact	Logic level 0: 1 V max. Logic level 1: 3.5 ~ 30 V	Logic level 0: 3 V max. Logic level 1: 10 ~ 50 V	Logic level 0: 1 V max. Logic level 1: 3 ~ 30 V	Logic level 0: 2 V max. Logic level 1: 4 ~ 30 V	Logic level 0: 3 V max. Logic level 1: 10 ~ 50 V	-
Digital Output	Counter Input	-	-	-	-	-	-
	Frequency Input	-	-	-	-	-	-
	Invert DI Status	-	Yes	-	-	-	-
	Channels	8	-	-	-	8	12
	Type	Sink	-	-	-	Sink	ADAM-4056S: Sink ADAM-4056SO: Source
	Mode	Open collector to 30 V	-	-	-	Open collector to 40 V	ADAM-4056S: Open collector to 40 V ADAM-4056SO: 10 ~ 35V
	Max. Current Load	30 mA	-	-	-	200 mA	ADAM-4056S: 200 mA ADAM-4056SO: 1 A
	Pulse Output	-	-	-	-	-	-
	Over Current Protection	-	-	-	-	-	Yes
Isolation Voltage		-	2,500 VDC	5,000 VRMS	-	2,500 VDC	5,000 VDC
Digital LED Indicator		-	Yes	-	-	Yes	Yes
Watchdog Timer		System	System & Comm.	System	System	System & Comm.	System & Comm.
DO Fail Safe Value (FSV) *		Yes	-	-	-	Yes	Yes
Modbus Support **		-	Yes	-	-	Yes	Yes

*: If there is no command received by DO channels after the preset period, the DO channels will be set to its FSV.

**: All ADAM-4000 I/O Modules support ASCII Commands.

ADAM-4000 Series Comparison Table

Relay Output / Counter Modules






Model		ADAM-4060	ADAM-4068	ADAM-4069	ADAM-4080
Description		4-ch Relay Output Module	8-ch Relay Output Module with Modbus	8-ch Power Relay Output Module with Modbus	2-ch Counter/Frequency Module
Relay Output	Channels	2 x Form A 2 x Form C	4 x Form A 4 x Form C	4 x Form A 4 x Form C	-
	Breakdown Voltage	500 VAC (50/60 Hz)	500 VAC (50/60 Hz)	1,000 VAC (50/60 Hz)	-
	Contact Rating (Resistive)	0.6 A @ 125 V_{AC} 0.3 A @ 250 V_{AC} 2 A @ 30 V_{DC} 0.6 A @ 110 V_{DC}	0.5 A @ 120 V_{AC} 0.25 A @ 240 V_{AC} 1 A @ 30 V_{DC} 0.3 A @ 110 V_{DC}	5 A @ 250 V_{AC} 5 A @ 30 V_{DC}	-
	Initial Insulation Resistance	1 G Ω min. @ 500 V_{DC}	1 G Ω min. @ 500 V_{DC}	1 G Ω min. @ 500 V_{DC}	-
	Relay On Time (Typical)	2 ms	4 ms	5.6 ms	-
	Relay Off Time (Typical)	3 ms	3 ms	5 ms	-
	Max. Operating Speed	20 operations/min (at related load)	50 operations/min (at related load)	6 operations/min (at related load)	-
Digital Output	Channels	-	-	-	2 (Sink)
	Type	4-ch relay	8-ch relay	8-ch power relay	Sink
	Mode	-	-	-	Open collector to 40 V (30 mA max. load)
Counter Input	Channels	-	-	-	2 (indipendent)
	Resolution	-	-	-	32-bit + 1-bit overflow
	Input Frequency	-	-	-	50 kHz max.
	Input Pulse Width	-	-	-	>10 μs
	Isolated Input Level	-	-	-	Logic level 0: 1 V max. Logic level 1: 3.5~30 V
	Maximum Count	-	-	-	4,294,967,295 (32 bits)
	Preset Type	-	-	-	Absolute or relative
	Programmable Digital Noise Filter	-	-	-	2 μs ~ 65 ms
	Measurement Range	-	-	-	5 Hz ~ 50 kHz
Isolation Voltage		-	-	-	2,500 V_{RMS}
Digital LED Indicator		-	Yes	-	-
Watchdog Timer		System	System & Comm.	System & Comm.	System
DO Fail Safe Value (FSV) *		Yes	Yes	Yes	-
Modbus Support **		-	Yes	Yes	-

*: If there is no command received by DO channels after the preset period, the DO channels will be set to its FSV.
**: All ADAM-4000 I/O Modules support ASCII Commands.

ADAM-4100 Series Comparison Table

Robust RS-485 I/O Modules






Model		ADAM-4117	ADAM-4118	ADAM-4150	ADAM-4168
Description		Robust 8-ch Analog Input Module with Modbus	Robust 8-ch Thermocouple Input Module with Modbus	Robust 15-ch Digital I/O Module with Modbus	Robust 8-ch Relay Output Module with Modbus
Resolution		16 bit		-	-
Analog Input	Channels	8 differential		-	-
	Sampling Rate	10/100 Hz (total)		-	-
	Voltage Input	0 ~ 150 mV, 0 ~ 500 mV, 0 ~ 1 V, 0 ~ 5 V, 0 ~ 10 V, 0 ~ 15 V, ±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V, ±15V	±15 mV, ±50 mV, ±100 mV, ±500 mV, ±1 V, ±2.5V	-	-
	Current Input	0 ~ 20 mA, ±20 mA, 4 ~ 20 mA	±20 mA, 4 ~ 20 mA	-	-
	Direct Sensor Input	-	J, K, T, E, R, S, B Thermocouple	-	-
	Burn-out Detection	Yes (mA)	Yes (mA and All T/C)	-	-
	Channel Independent Configuration	Yes		-	-
Digital Input and Output	Input Channels	-	-	7	-
	Output Channels	-	-	8	8-ch relay
Counter	Channels	-	-	7	-
	Input Frequency	-	-	3 kHz	-
Isolation Voltage		3,000 V_{DC}			
Digital LED Indicator		Communication and Power			
Watchdog Timer		System & Communication			
DO Fail Safe Value (FSV) *		-	-	Yes	Yes
Communication Protocol		ASCII Command/Modbus			
Power Requirement		10 ~ 48 V_{DC}			
Operating Temperature		-40 ~ 85°C (-40 ~ 185°F)			
Storage Temperature		-40 ~ 85°C (-40 ~ 185°F)			
Humidity		5 ~ 95% RH			
Power Consumption		1.2 W @ 24 V_{DC}	0.5 W @ 24 V_{DC}	0.7 W @ 24 V_{DC}	1.8 W @ 24 V_{DC}

*: If there is no command received by DO channels after the preset period, the DO channels will be set to its FSV.




Model	ADAM-4510I	ADAM-4520I
Description	Robust RS-422/485 Repeater	Robust RS-232 to RS-422/485 Converter
Network	RS-422/485	RS-232 to RS-422/485
Communication Speed (bps)	From 1,200 to 115.2k	
Communication Distance	Serial: 1.2 km	
Interface Connectors	RS-422/485: plug-in screw terminal	RS-232: female DB9 RS-422/485: plug-in screw terminal
Digital LED Indicators	Communication and Power	
Auto Data Flow Control	Yes	
Isolation Voltage	3,000 V_{DC}	
Power Requirement	10 ~ 48 V_{DC}	
Operating Temperature	-40 ~ 85°C (-40 ~ 185°F)	
Storage Temperature	-40 ~ 85°C (-40 ~ 185°F)	
Humidity	5 ~ 95%	
Power Consumption	1.4 W @ 24 V_{DC}	1.2 W @ 24 V_{DC}

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