

ADiS

Modular control system

Technical manual

Version 1.00



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History of revisions

Document name: adis_m_en_100.pdf

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Revision	Date	Changes
100	03. 01. 2012	New document

Related documentation

1. **AD-CPUW2** – ADiS Modular system central unit – Operation manual
file: ad-cpuw2_g_en_xxx.pdf
2. ADiS control system modules – datasheets
file: ad-xxxxx_d_en_xxx.pdf
3. Application Note AP0007 – DIOCAN Network Communication
file: ap0007_en_xx.pdf
4. Application Note AP0016 – Principles of RS485 usage
file: ap0016_en_xx.pdf
5. Application Note AP0025 – ARION Network Communication
file: ap0025_en_xx.pdf
6. Application Note AP0029 – Principles of CAN network usage
file: ap0029_en_xx.pdf
7. Application Note AP0037 – Principles of Ethernet network usage
file: ap0037_en_xx.pdf
8. Application Note AP0046 – Web server setting
file: ap0046_en_xx.pdf
9. DetStudio development environment help
file: DetStudioHelp_en.chm

1 Introduction

Control system ADiS basis is formed of central processor unit **AD-CPUW2** (eventually of older type **AD-CPU167**) that includes control core, operating memory, power supply, serial line circuits and Ethernet interface (central processor unit **AD-CPU167** does not include Ethernet interface). Specific configuration of ADiS is given by specialized I/O modules that are connected to a side of central processor unit.

- Basic features**
- Up to 16 I/O modules can be attached
 - 8-bit modules – up to 128 I/O digital signals
 - 16-bit modules – up to 256 I/O digital signals
 - An extension by DIOCAN system expansion modules
 - up to 1024 I/O digital signals
 - An extension by I/O expansion modules – ARION (MODBUS) communication
 - RS485 communication network
 - (maximum of 32 stations, operating system property)
 - Ethernet communication network
 - practically unlimited number of stations

ADiS is suitable for both small and relatively demanding applications with an emphasis on communication skills because of its modularity and flexibility. The most common usage is controlling of large technological complexes, heating systems controlling, machines controlling and in special applications (monitoring, optimization).

Processor core **AD-CPUW2** is designed as DualCPU architecture. This DualCPU architecture represents a separation on communication and processing part, each handled by a separate processor. Communication between processors is through SPI bus.

2 CPU modules

Technical parameters are given by central processor unit **AD-CPUxxx** and I/O modules connected to **AD-CPUxxx**. More information about technical parameters of individual modules can be found in datasheets, eventually in **AD-CPUW2** operation manual.

ADiS control system can be built on **AD-CPU167** (older version) or **AD-CPUW2** (newer version).

ADC-CAN is a special CPU type that only serves for I/O digital signals extension by system-bus driven modules through CAN interface (see chapter 2.4).

2.1 AD-CPU167

Central processor unit **AD-CPU167** and its technical parameters can be found in datasheet `ad-cpu167_d_en_xxx.pdf`. Module contains:

- RS232 interface
- RS485 interface

Module **AD-ETHxxx** from AMiT production can also extend the central processor unit with Ethernet interface.

Module **AD-CAN** from AMiT production can also extend the central processor unit with CAN interface.

Product **AWEB** can be also used for web server extension. **AWEB** can be connected to control system ADiS through RS232/RS485 that is located directly on **AD-CPU167**, eventually through Ethernet (**AD-ETHxxx** module connection).

2.2 AD-CPUW2

Detailed description of central processor unit **AD-CPUW2** and its technical parameters can be found in datasheet `ad-cpu167_d_en_xxx.pdf` or operation manual `ad-cpuw2_g_en_xxx.pdf`. Module contains:

- RS232 interface
- RS485 interface
- Ethernet interface
- MicroSD card slot
- Web server

Module **AD-CAN** from AMiT production can also extend the central processor unit with CAN interface.

AD-CPUW2 can be extended by other Ethernet interface using module **AD-ETHxxx**. Each Ethernet interface must have its IP configuration in different network. Only one of these Ethernet interfaces can be used for communication

outside of local network. More Ethernet interfaces are redundant for most applications.

Note MicroSD card usage depends on used operating system and communication processor program. SD card usage is described in software documentation.

2.3 ADC-CAN

ADC-CAN is a special CPU type that only serves for I/O digital signals extension by system-bus driven modules through CAN interface (see chapter 2.4). **ADC-CAN** has only system bus and therefore extended-bus driven modules cannot be connected. Module contains:

- CAN interface

2.4 Internal bus

Internal bus serves for I/O or communication modules connection and it is divided into system bus and extended bus.

System bus 16 chip-select signals for maximum of 16 modules addressing, data bus and one interrupt signal are brought out on system bus. All modules use system bus, therefore maximum of 16 modules in ADiS set.

Extended bus Some modules use extended bus beside the system one. Special processor pins are brought out on extended bus.

- 16 digital signals CPU port P2
- 10 analogue signals CPU port P5

Modules with extended bus have installed bus connector. Therefore other ADiS modules can also use the extended bus. Modules without extended bus do not have installed bus connector. Consequently other modules placed behind this module cannot use the extended bus. Modules with extended bus must be placed as first behind **AD-CPUxxx**. Modules with system bus only must be placed on other positions.

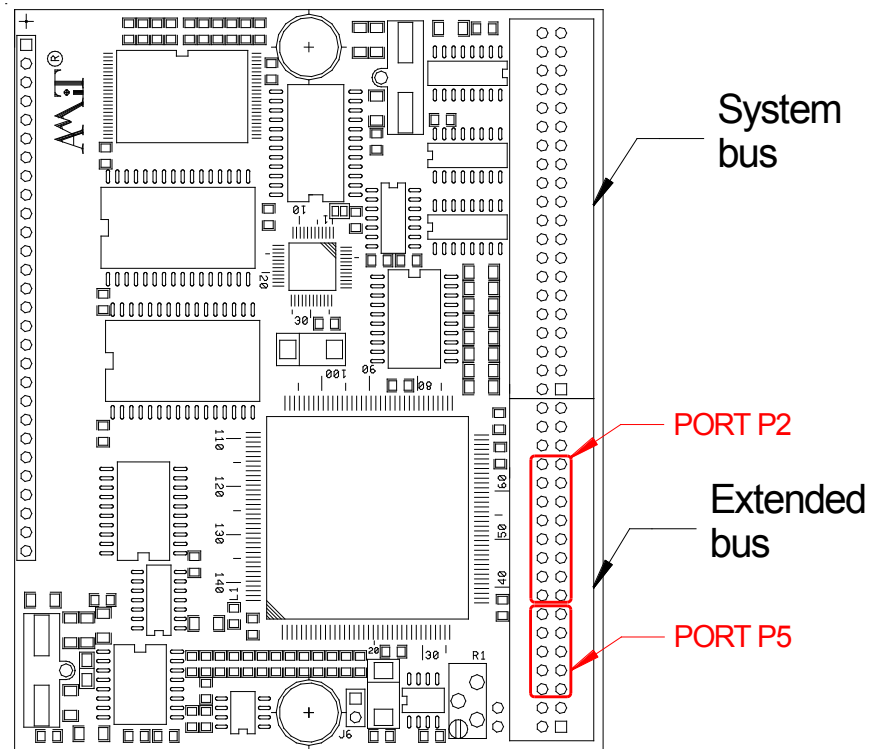


Fig. 1 – Location and description of **AD-CPUxxx** internal bus

3 Input/output modules

Any **AD-xxx** I/O modules from AMiT production can be connected to central processor unit **AD-CPUxxx**. Specific module types and their detailed description can be found at www.amitotion.com. Generally they are:

- Input/output digital modules
- Input/output analogue modules
- Communication modules
- Special modules

3.1.1 Input/output digital modules

These modules can extend control system ADiS with:

- Digital inputs
- Digital outputs – tranzistor/relay

3.1.2 Input/output analogue modules

These modules can extend ADiS with:

- Analogue inputs – voltage / current
- Analogue inputs – connection of resistance temperature sensors
- Analogue outputs – voltage / current

3.1.3 Communication modules

These modules can extend ADiS with other communication interface:

- RS232
- RS485
- CAN
- Ethernet

Communication modules for ADiS expansion with RS232/RS485 interface cannot be used for communication through system communication protocol DB-Net. These modules can be used in advantage for terminal connection, expansion with I/O ARION modules or user communication. They contain two serial interfaces that share system resources. Therefore their communication is affecting each other. These interface communications must be programmed with appropriate timing to avoid this affecting. One communication interface can be used only by one communication protocol.

More information about CAN interface modules usage can be found in application note AP0007 – DIOCAN network communication.

Ethernet interface modules (same as **AD-CPUW2** Ethernet interface) can be used for communication through system communication protocol DB-Net/IP and protocol SNMP. Communication through DB-Net/IP and SNMP can be run simultaneously on a single Ethernet interface.

3.1.4 Special modules

They are input/output modules for special signals connection and modules with improved properties:

- Tenzometric inputs
- IRC inputs

4 Modules connection to AD-CPUxxx

Number of connectable **AD-xxx** modules with a same type is determined by **AD-xxx** module type as well as **AD-xxx** module sequence connected to **AD-CPUxxx**.

All ADiS modules have one common signal that can generate interruption. Global interruption may be caused by the following modules:

- **AD-CAN**
- **AD-ETH10**
- **AD-ETH100**
- **AD-GAI8**
- **AD-UART**
- **AD-UART4**

Modules **AD-FDI8** and **AD-AO8** can also cause interruption, however their operation is rather different. They do not use a common signal for interruption, but perform this through extended bus port P2 (see Fig. 1). Generally, extended bus driven modules have limited control system position – they must be placed directly behind **AD-CPUxxx** or other extended-bus driven modules. Corresponding modules produced by AMiT (at the creation time of this document) are **AD-AI5**, **AD-AI8**, **AD-FAI8**, **AD-NI8**, **AD-FDI8** and **AD-AO8x**.

The aforesaid modules use port P2 (see Fig. 1) or selected PINs of port P5 (see Fig. 1) for their operation. Port P2 consists of 16 PINs from extended bus, port P5 provides 10 PINs. If some module occupies some of P2 or P5 PINs, same PIN cannot be used by other modules at the same time. Therefore the amount of the aforesaid extended bus driven modules is limited in set.

Information about connectable modules amount and position to **AD-CPUxxx** can be found in individual modules datasheets or in the table below. AD-xxx modules produced by AMiT at the creation time of this document are shown in the table below.

Module	Control system module position	Max. number of modules in set	Extended bus port usage	Used PINs number
AD-AI5	Behind AD-CPUxxx or extended bus driven module.	2	P5	5
AD-AI8	Behind AD-CPUxxx or extended bus driven module.	10	P5	1
AD-AO8U	Behind AD-CPUxxx or extended bus driven module.	2	P2	8
AD-AO8I	Behind AD-CPUxxx or extended bus driven module.	2	P2	8
AD-CAN	Without limitations	1	-	-
AD-DI8A	Without limitations	16	-	-
AD-DI16A	Without limitations	16	-	-
AD-DO16	Without limitations	16	-	-
AD-ETH100	Without limitations	4	-	-
AD-FDI8	Behind AD-CPUxxx or extended bus driven module.	2 ¹⁾	P2	8
AD-FAI8-A	Behind AD-CPUxxx or extended bus driven module.	1	P5	8
AD-GAI8	Without limitations	5	-	-
AD-GAO4U	Without limitations	16	-	-
AD-GAO4I	Without limitations	16	-	-
AD-IRC2	Without limitations	8	-	-
AD-NI8	Behind AD-CPUxxx or extended bus driven module.	10	P5	1
AD-PDO8	Without limitations	16	-	-
AD-RDO5S	Without limitations	16	-	-
AD-TM2	Without limitations	16	-	-
AD-UART	Without limitations	16	-	-
AD-UART4	Without limitations	7	-	-

¹⁾ It is possible to use more modules. The interruption can be generated only from modules that can access PINs of extended bus port P2!

5 Modules connection to ADC-CAN

Module **ADC-CAN** serves only for I/O expansion using CAN interface. Only digital I/O modules can be connected. These modules use only system bus and can be connected in any sequence.

Information about module types that can be connected to **ADC-CAN** can be found in application note AP0007 – DIOCAN network communication. **AD-xxx** modules produced by AMiT at the creation time of this document are shown in the table below.

Module	Control system module position	Max. number of modules in set
AD-DI8A	Without limitations	16
AD-DI16A		
AD-DO16		
AD-FDI8 1)		
AD-PDO8		
AD-RDO5S		

¹⁾ Without interrupt processes generation.

6 AD-xxx module LED significations

6.1 AD-CPUxxx LEDs

AD-CPUxxx LED significations depend on used operating system and communication processor program.

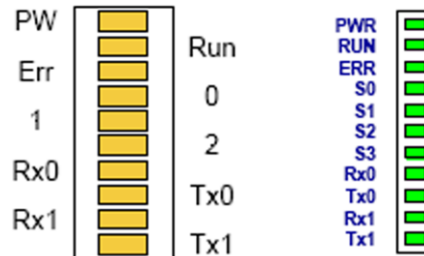


Fig. 2 – AD-CPU167 and AD-CPUW2 LEDs

In case that operating system NOS and DetStudio development environment program are used, signification is described in DetStudio development environment documentation.

6.2 AD-xxx input/output module LEDs

4, 10 or 18 LEDs are available on AD-xxx input/output module depending on the number of available inputs/outputs.

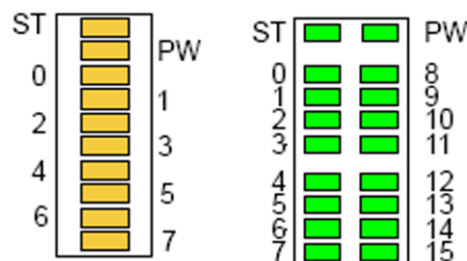


Fig. 3 – Input/output module LEDs

LED	Status	
	ON	OFF
ST	Operated by AD-CPUxxx.	Not operated by AD-CPUxxx.
PW	Module power supplying (from internal bus).	Module without power supplying (from internal bus).
0 to 15	Voltage / current is on corresponding input / output.	Voltage / current is not on corresponding input / output.

Note LED ST is not used on AD-FAI module.

6.3 Communication module LEDs

Communication module LEDs number is given by module type.

UARTx 10 LEDs for UART modules.

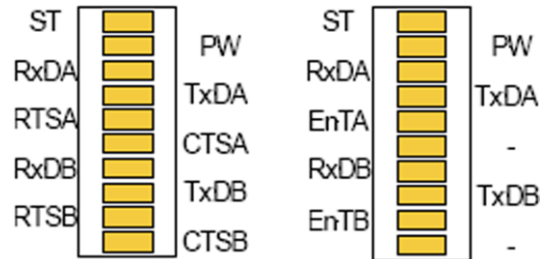


Fig. 4 – UART module LEDs

LED	Status	
	ON	OFF
ST	Operated by AD-CPUxxx .	Not operated by AD-CPUxxx .
PW	Module power supplying (from internal bus).	Module without power supplying (from internal bus).
RxD A	Interface A data receiving.	Module does not received data on interface A.
TxD A	Interface A data at log. 0.	Interface A data at log. 1, or not transmitting.
RxD B	Interface B data receiving.	Module does not received data on interface B.
TxD B	Interface B data at log. 0.	interface B data at log.1, or not transmitting.
RTSA	RTS signal is set on interface A.	RTS signal is not set on interface A.
CTSA	CTS signal is set on interface A.	CTS signal is not set on interface A.
RTSB	RTS signal is set on interface B.	RTS signal is not set on interface B.
CTSB	CTS signal is set on interface B.	CTS signal is not set on interface B.
EnTA	Data are transmitted to interface A (transmitter driven).	Data are not transmitted to interface A (transmitter not driven).
EnTB	Data are transmitted to interface B (transmitter driven).	Data are not transmitted to interface B (transmitter not driven).

CAN LED significations of CAN interface modules are described in separate documentation. This is an application note AP0007 – DIOCAN network communication.



Fig. 5 – CAN interface module LEDs

Ethernet 4 LEDs are available on Ethernet interface modules.



Fig. 6 – Ethernet interface module LEDs

Following table describes the signification of individual LEDs:

LED	Status	
	ON	OFF
ST	Operated by AD-CPUxxx .	Not operated by AD-CPUxxx .
PW	Module power supplying (from internal bus).	Module without power supplying (from internal bus).
LNK	Ethernet network connection.	Without connection to the Ethernet network
ACT	Data receiving / transmitting.	Module is not receiving / transmitting data.

Note LED ACT is permanently switched ON even when module is not connected to Ethernet network. This is a status when LED LNK is switched OFF.

6.4 Special module LEDs

Special-module LEDs number is given by module type. Some module LEDs have the same signification as input/output modules.

AD-IRC2 10 LEDs for module **AD-IRC2**.

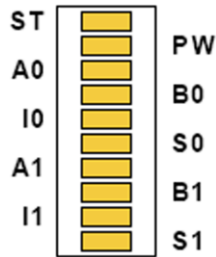


Fig. 7 – **AD-IRC2** LEDs

Following table describes signification of the individual LEDs:

LED	Status	
	ON	OFF
ST	Operated by AD-CPUxxx .	Not operated by AD-CPUxxx .
PW	Module power supplying (from internal bus).	Module without power supplying (from internal bus).
A0	Active signal A on connector 0.	Inactive signal A on connector 0.
B0	Active signal B on connector 0.	Inactive signal B on connector 0.
I0	Active signal I (index) on connector 0.	Inactive signal I (index) on connector 0.
S0	Zero position reached on connector 0.	Position out of zero value on connector 0.
A1	Active signal A on connector 1.	Inactive signal A on connector 1.
B1	Active signal B on connector 1.	Inactive signal B on connector 1.
I1	Active signal I (index) on connector 1.	Inactive signal I (index) on connector 1.
S1	Zero position reached on connector 1.	Position out of zero value on connector 1.