

User manual

ADA-1044H

RS-232 to 4xRS-485 / 2xRS-422 Converter



Contents

1. GENERAL INFORMATION.....	3
1.1. WARRANTED INFORMATION.....	3
1.2. GENERAL CONDITIONS FOR SAFE USE.....	3
1.3. CE LABEL.....	3
1.4. ENVIRONMENTAL PRESERVATION.....	3
1.5. SERVICE AND MAINTENANCE.....	3
1.6. PACK CONTENTS.....	3
2. PRODUCT INFORMATION.....	3
2.1. PROPERTIES.....	3
2.2. DESCRIPTION.....	4
2.3. CONVERSION OF TX, RX SIGNALS.....	4
2.4. ISOLATION.....	5
3. INSTALLATION.....	5
3.1. ASSEMBLING.....	5
3.2. CONNECTION OF DEVICES WITH RS232 INTERFACE.....	5
3.2.1. CONNECTION OF DEVICES WITH RS232 PORT - DTE TYPE (COMPUTER).....	5
3.2.2. CONNECTION OF DEVICES WITH RS232 PORT - DCE TYPE (MODEM).....	6
3.3. CONNECTION TO RS485/RS422 BUS.....	6
3.3.1. STAR-TYPE CONNECTION FOR 4-WIRE RS485 BUS.....	7
3.3.2. STAR-TYPE CONNECTION FOR 2-WIRE RS485 BUS.....	8
3.3.3. STAR-TYPE CONNECTION FOR DEVICES WITH RS422 INTERFACE.....	9
3.4. GND TERMINAL CONNECTION.....	9
3.5. LINE TERMINATION.....	9
3.6. POWER SUPPLY CONNECTION.....	9
4. CONFIGURATION.....	9
4.1. SETTING THE OPERATING MODE.....	9
4.2. SETTING OF TYPE AND NUMBERS OF PORTS RS485 IN.....	10
4.3. FACTORY DEFAULT.....	10
5. ACTIVATION.....	10
5.1. LEDS DESCRIPTION.....	10
5.2. TROUBLESHOOTING.....	10
6. RS232 INTERFACE – PIN DESCRIPTION OF DSUB-9F.....	11
7. VERSIONS.....	11
8. SPECIFICATION.....	11

1. GENERAL INFORMATION

Thank you for your purchase of **CEL-MAR Company** product. This product has been completely tested and is covered by a two year warranty on parts and operation from date of sale.

If any questions or problems arise during installation or use of this product, please do not hesitate to contact Technical Support at +48 41 362-12-46 or e-mail support@cel-mar.pl.

1.1. WARRANTED INFORMATION

ADA-1044H converter is covered by a two year warranty from date of sale. In case of being damaged it will be repair or the damaged component will be replace. The warranty does not cover damage caused from improper use, materials consumption or any unauthorized changes. If the product does not function (is damaged), or not operate in accordance with the instructions, will be repaired or replaced.

All warranty and no warranty repairs must be returned with paid transport and insuring to the **CEL-MAR Company**.

CEL-MAR Company under no circumstances won't be responsible for ensuing damage from improper using the product or as a result of random causes: the lightning discharge, the flood, the fire and the like.

CEL-MAR Company is not be held responsible for damages and loss including: loss of profits, loss of data, pecuniary losses ensuing from using or the impossibility of using this product.

In specific cases **CEL-MAR Company** discontinue all warranties and in particular do not follow the user manual and do not accept terms of warranty by the user.

1.2. GENERAL CONDITIONS FOR SAFE USE

The device should be installed in a safe and stable places (eg, electroinstallation cabinet), the powering cable should be arranged so as not to be exposed to trampling, attaching, or pulling out of the circuit.

Do not put device on the wet surface.

Do not connect devices for nondescript powering sources,

Do not damage or crush powering wires.

Do not make connection with wet hands.

Do not adapt, open or make holes in casings of the device!

Do not immerse device in water or no other liquid.

Do not put the fire opened on device sources: candles, an oil lamps and the like.

Complete disable from the supply network is only after disconnecting the power supply circuit voltage.

Do not carry out the assembly or dis-assembly of the device if it is enabled. This may result to short circuit and damage the device.

The device can not be used for applications that determine human life and health (eg. Medical).

1.3. CE LABEL



The CE symbol on the device **CEL-MAR** means compatibility with electromagnetic compatibility Electromagnetic Compatibility Directive **EMC 2014/30/WE**.

Declaration of Conformity is delivered with purchased converter.

1.4. ENVIRONMENTAL PRESERVATION



This sign on the device inform about putting expended device with other waste materials. Device should send to the recycling. (In accordance with the act about the Electronic Appliance Expended from day 29 of July 2005)

1.5. SERVICE AND MAINTENANCE

ADA-1044H does not require the servicing and maintenance.

Technical support is available at number +48 41 362-12-46 in 8.00-16.00, from Monday to Friday or e-mail support@cel-mar.pl.

1.6. PACK CONTENTS

ADA-1044H converter, user manual, CE declaration, terminators $R_t=120\Omega$, 4 pcs.

2. PRODUCT INFORMATION

2.1. PROPERTIES

- Operating on 2 or 4-wire network in Point-to-Point and Multi-Point mode,
- Possibility of star topology on RS485 bus,
- Conversion TX, RX signals to RS485/RS422 standard,
- 4 ports of RS485(2W) 2-wire or 2 ports RS485(4W) 4 wire – configured by microswitch,
- Operating of up to 128 devices on RS485 network,
- Baud rate up to 230,4 kbps,
- Automatic data flow control on RS485 network,
- Transparent for all protocols: MODBUS, DNP, PROFIBUS and other,
- Any format of bit defined with the specification of RS232 interface,
- Power supply 10 - 30 VDC stable min. 2W,
- 3kV= optoisolation in signal channel between RS232 and RS485/RS422 interface,
- 1kV= or 3kV= galvanic insulation between RS232 interface and power supply,
- Integrated short circuit protection and over-voltage protection on RS485/RS422 lines,
- Protection against power supply reverse connection,
- DIN 43880 standard - mounting in typical electro-installation unit,

- Rail mounting according to DIN35 / TS35 standard,
- Dimensions (W x D x H) 53mm x 62mm x 90mm.

2.2. DESCRIPTION

The ADA-1044H changes RS232 standard to RS485/RS422 and can be used for creation star-topology on RS485 Bus. To one converter it is possible to connect two or four segments (1200m) of RS485 Bus without interfering with the format of transmitted data. This converter has one RS232 port for connection Master device (PC, PLC-MASTER) and four separate RS485-ports for 2-wire bus or two RS485/422 for 4-wire bus. The setting of port type is by 'RS-485 PORTS' switch on the front panel. ADA-1044H can be used also for communication with devices in star topology located in different places where RS485 chain topology is impossible.

To the RS485-ports can be connected 64 devices for 4-wire RS485 bus, 128 devices for 2-wire RS485 bus or 2 addressable devices with RS422 interface. The converter does not require powering from RS232 port, supports asynchronous baud rate up to 230.4 kbps by one or two pairs of twisted-pair RS485/422 interface.

ADA-1044H has female DB-9 socket for connection of RS232 interface and screw terminal block for power supply and twisted-pair connections of RS485/422 network. Connector DB-9F is made like DCE, it lets connect converter to other device using the extension cable RS232 (typical cable for modem connection) without crossing TX with RX, RTS with CTS, DTR with DSR. The converter uses signals Rx, Tx and GND of RS232 interface (looped signals in the connector RS232 DB-9F: DTR-DSR-DCD, RTS-CTS), entered by DB-9F socket.

Overvoltage protection on each line of RS485 / RS422 is made on the basis of surge suppressor diodes and fuses.

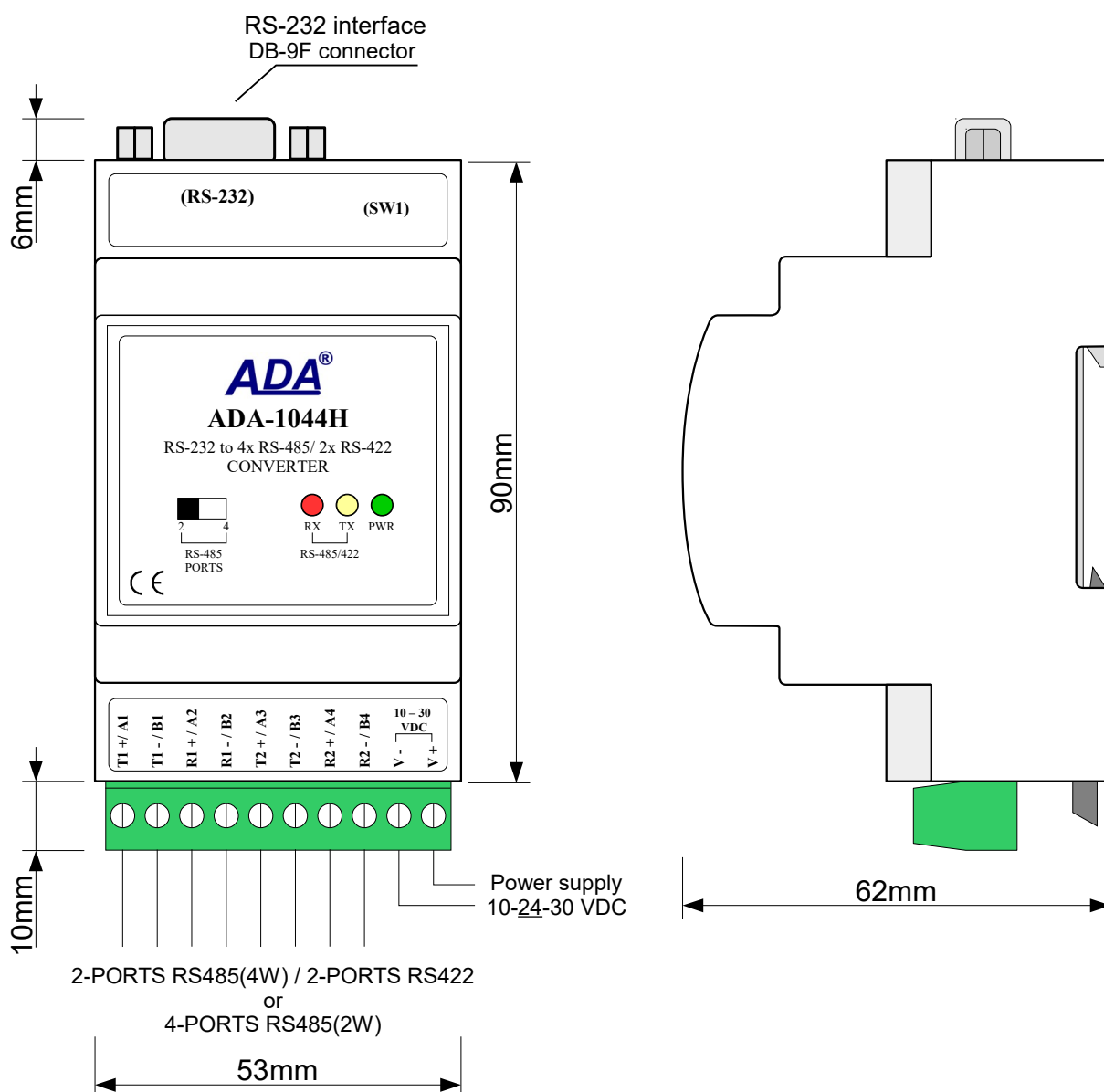


Fig 1. View of ADA-1044H and location of SW1 switch

2.3. CONVERSION OF TX, RX SIGNALS

Tx and Rx signals of RS232 interface are converted to RS485/422 standard. RS485/RS422 bus built on the ADA-1044H can be connected:

- up to 128 devices, functioning in half duplex mode (request / response) on 2 wires, multipoint network.
- up to 64 devices, functioning in full duplex mode on 4 wires network.

2.4. ISOLATION

Converter ADA-1044H has 2-way or 3-way and 1kV= or 3kV= galvanic isolation (depend on version, described in section VERSIONS).

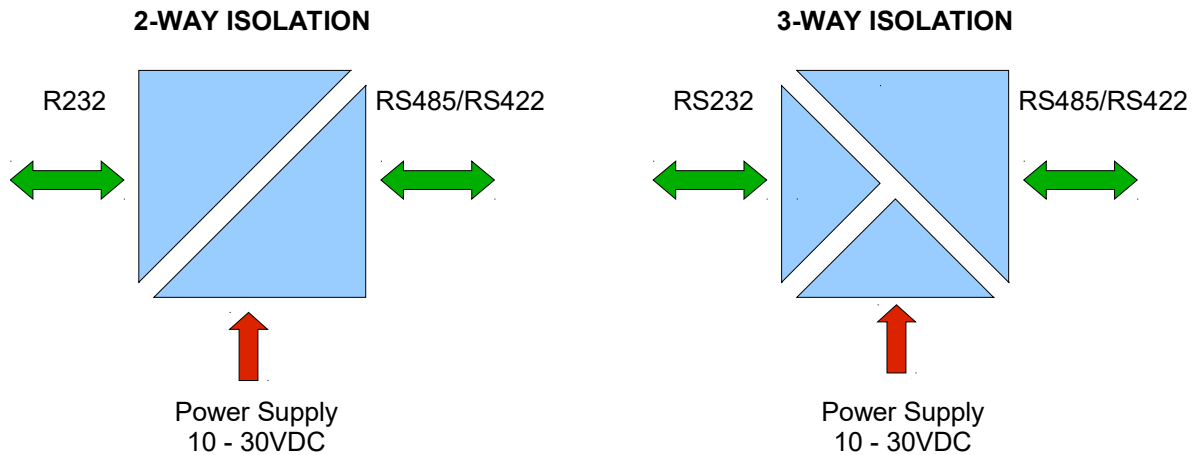


Fig 2. Isolation structure

3. INSTALLATION

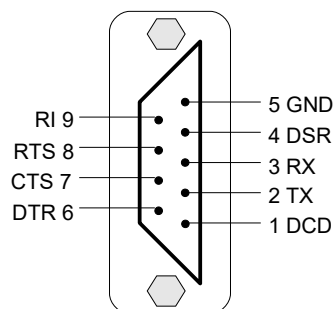
This chapter will show you how to connect ADA-1044H to PC or controller with RS232 port, RS485/422 network and power supply. In the purpose of minimization of disruptions from environment is being recommended to:

- apply multipair type shielded cables, which shield can be connected to the earthing on one end of the cable,
- arrange signal cables in the distance not shorter than 25 cm from powering cables,
- apply cable of adequate cross-section due to voltage drops for converter powering,
- use Interference suppression filters for power supply converters that are installed within a single object.
- not supply converter from power circuit device that generates large impulse interference such as transmitters, contactors,
-

3.1. ASSEMBLING

The ADA-1044H enclosure is adapted to assembly on TS-35 (DIN35) rail. To install repeater you should mount device on the rail upper part of the enclosure then press bottom part to to hear characteristic „Click” sound.

3.2. CONNECTION OF DEVICES WITH RS232 INTERFACE



In the converter are connected together signals:

1. DTR – DSR – DCD
2. RTS – CTS

Fig 3. RS232 interface signals of DB-9F (female) connector.

3.2.1. CONNECTION OF DEVICES WITH RS232 PORT - DTE TYPE (COMPUTER)

To connect the ADA-1044H to RS232 computer port, is required RS232 extension cable, for example CAB-DB9F/DB9M-S-1,8m available in our offer. Connection example is shown below.

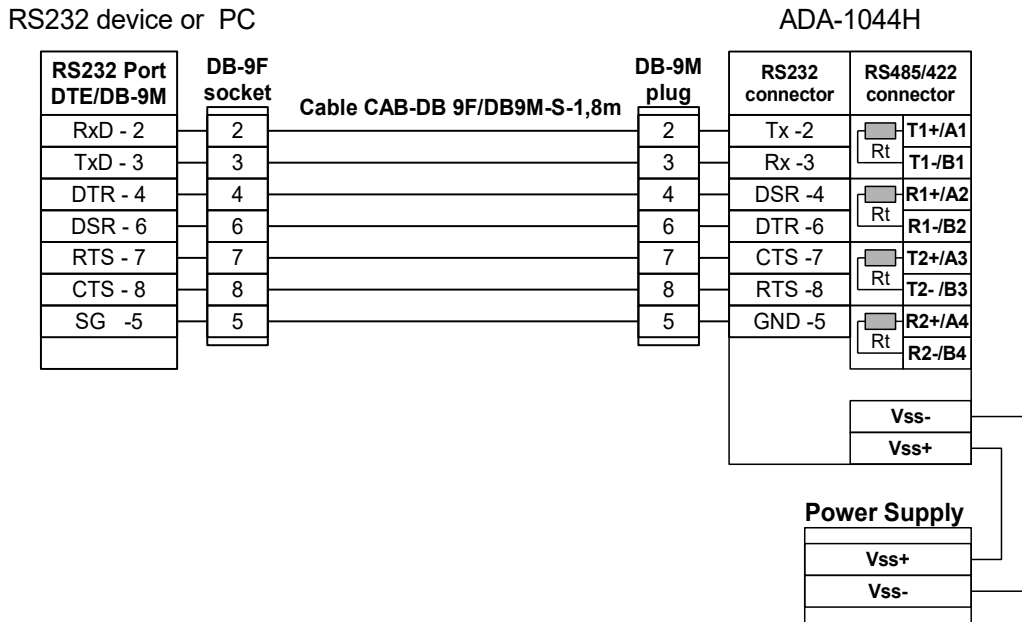


Fig 4. ADA-1044H connection to RS-232 port of computer

3.2.2. CONNECTION OF DEVICES WITH RS232 PORT - DCE TYPE (MODEM)

To connect the ADA-1044H to device with DCE (eg Modem) RS232 port type, is required RS232 cable CAB-DB9M/DB9M-C-1,8m available in our offer. Connection example is shown below.

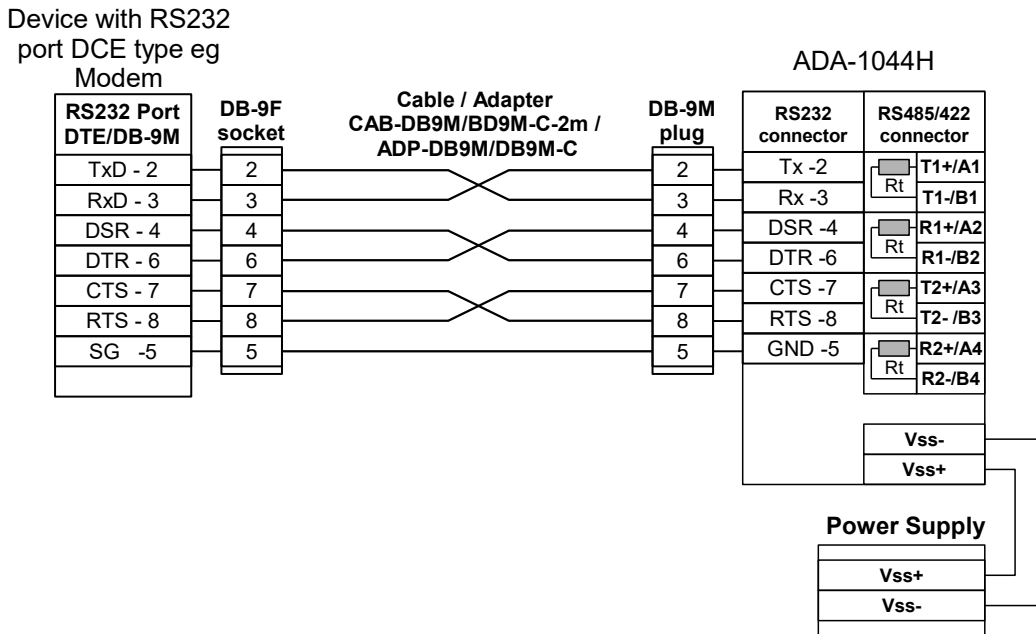


Fig 5. DCE type connection of ADA-1044H to device with RS232 interface (eg. modem)

3.3. CONNECTION TO RS485/RS422 BUS

RS485/RS422 interface at ADA-1044H is available on terminal block described as: Tx+/A, Tx-/B, Rx+, Rx- (IN) and T1+/A1, T1-/B1, R1+/A2, R1-/B2, T2+/A3, T2-/B3, R2+/A4, R2-/B4. RS485/422 bus need proper cabling. Connection the GND terminals of RS485/422 interfaces devices connected to RS485/422 bus, should be done in case of potential difference, which makes data transmission is improper .

3.3.1. STAR-TYPE CONNECTION FOR 4-WIRE RS485 BUS

Using the ADA-1044H, configured for operating with 2-ports, 4-wire RS485 (the 'RS-485 PORTS' switch should be set in 4W position and 'SW1' switch should be set in RS485 position), it is possible to make :

- star-type connection of up to 64 devices with 4-wire RS485 interface,
- galvanic separation of RS232 port from RS485 Bus.

During the connecting, pay attention to the proper implementation of the connection according to the following drawings.

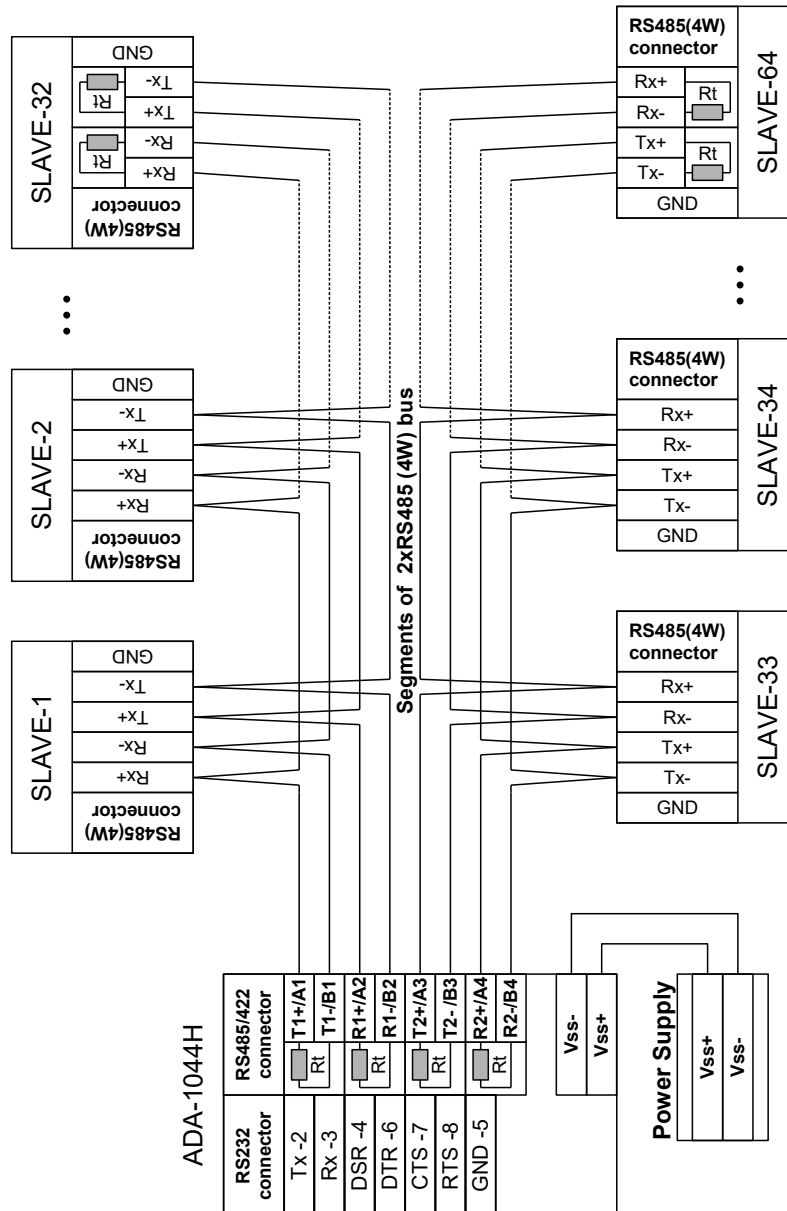


Fig 6. Star-type connection of devices with 4-wire RS485 interface to ADA-1044H, separation of RS232 port, possibility of connection 64 devices with RS485(4W) interface

3.3.2. STAR-TYPE CONNECTION FOR 2-WIRE RS485 BUS

Using the ADA-1044H, configured for operating with 4-ports, 2-wire RS485 (the 'RS-485 PORTS' switch should be set in 2W position and 'SW1' switch should be set in RS485 position), it is possible to make :

- star-type connection of up to 128 devices with 2-wire RS485 interface,
- galvanic separation of RS232 port from RS485 Bus.

During the connecting, pay attention to the proper implementation of the connection according to the following drawings.

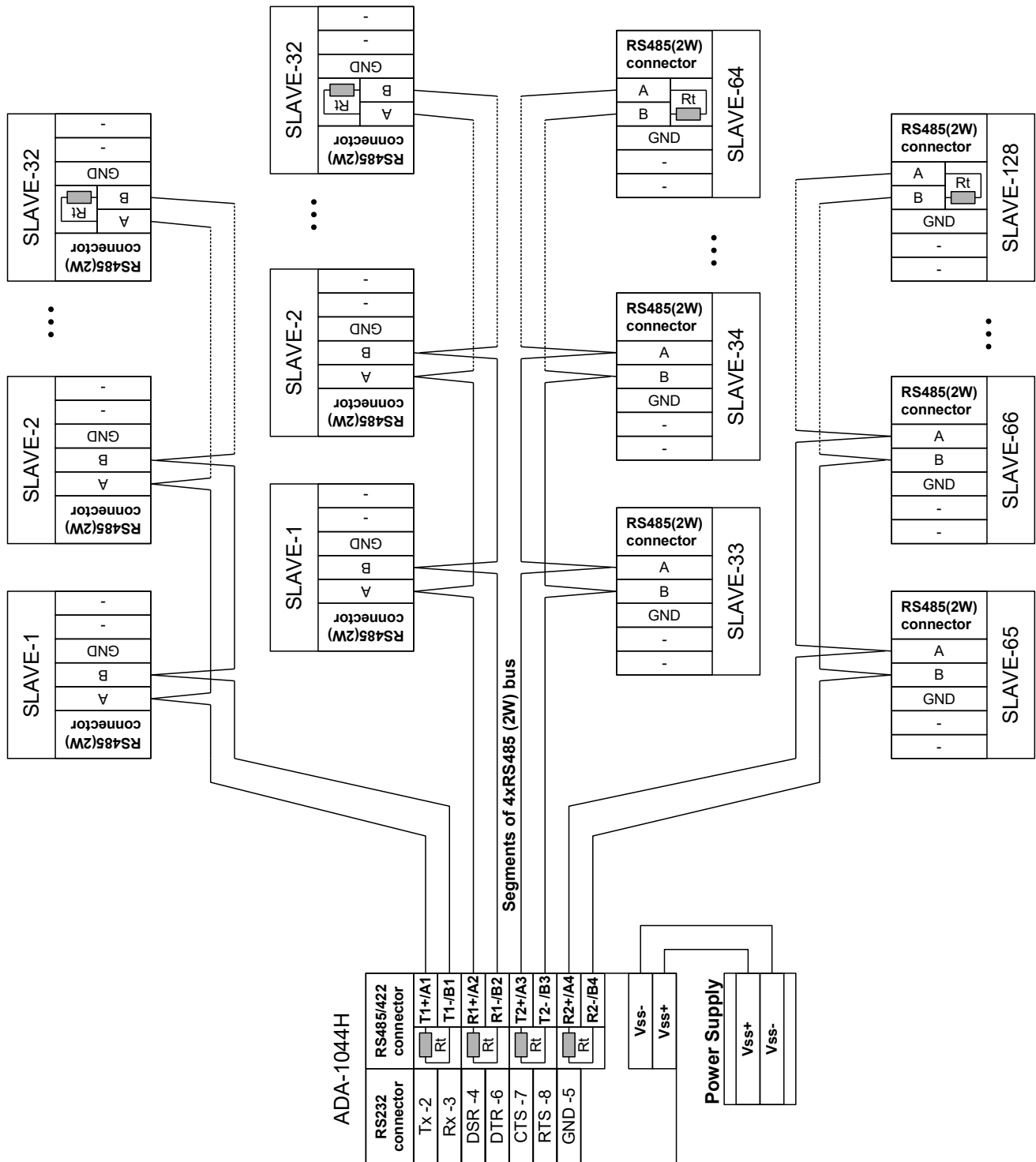


Fig 7. Star-type connection of devices with 2-wire RS485 interface

3.3.3. STAR-TYPE CONNECTION FOR DEVICES WITH RS422 INTERFACE

Using the ADA-1044H, configured for operating with 2-ports, 4-wire RS422 (the 'RS-485 PORTS' switch should be set in 4W position and 'SW1' switch should be set in RS422 position), it is possible to make :

- star-type connection of up to 2 devices with 4-wire RS422 interface,
- galvanic separation of RS232 port from RS422 Bus.

During the connecting, pay attention to the proper implementation of the connection according to the following drawings.

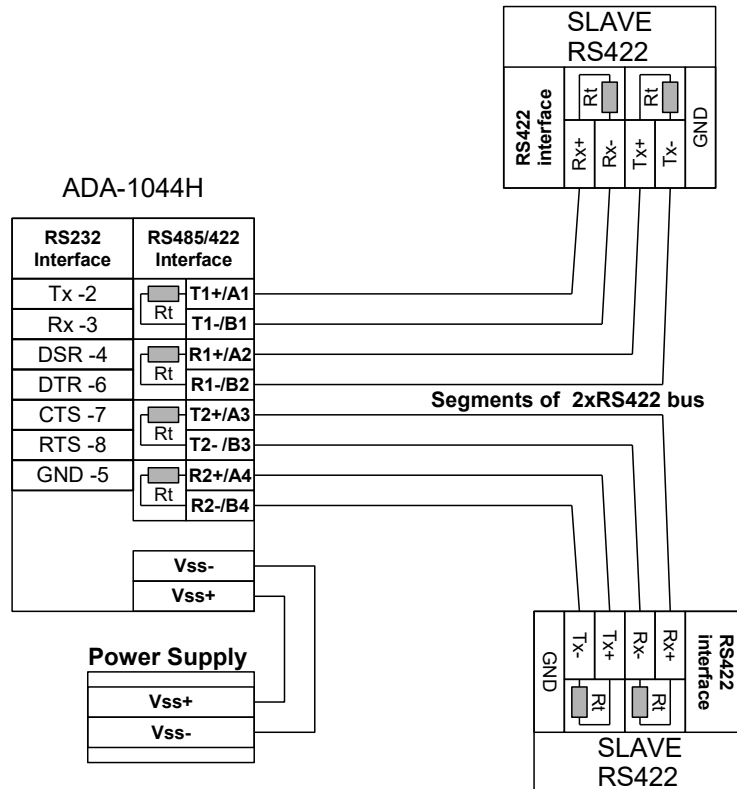


Fig 8. Star-type connection of devices with 4-wire RS422 interface

3.4. GND TERMINAL CONNECTION

Connection of GND terminals of RS485/422 interfaces, devices connected to RS485/422 bus, should be done in the case of a potential difference of the signals grounds on interfaces RS485 / RS422, which prevents proper data transmission.

Cannot connect to the GND terminal - cables screens, PE circuit of electrical installation, signals grounds of other devices.

3.5. LINE TERMINATION

The application of Line Termination (terminator) $R_t = 120 \Omega$ will reduce electrical reflection in data line at high baud rate. It is not needed below 9600Bd. You should use the Line Termination resistor if the distance is over 1000m @ 9600Bd or 700m @ 19200Bd transmission. Example connection of the terminator are shown on figures: 6, 7, 8. Resistor $R_t = 120 \Omega$, 5%, 0.25 W at 6 pieces are included with the device.

3.6. POWER SUPPLY CONNECTION

The power supply to ADA-1044H should be DC (regulated) from the scope 10 V= to 30V= and nominal power more than 2W e.g. HDR-15-24. The power cable from DC power supplies to the device must not be longer than 3m.

Observe the polarity, connect positive (+) of DC power supplies to V+ and negative (-) end to V- terminal. ADA-1044H has the protection from opposite connection power supply. If after power, on the front panel is not lit green LED PWR, check the power connection (polarity).

4. CONFIGURATION

The operating mode of the ADA-1044H is set by the use of 6-position SW1 switch. This switch is located near the screw terminal block (see Fig.1). The RS485-PORTS switch is use for setting of ports type: 4x2W – four ports 2-wire or 2x4W – two ports 4-wire. To set the SW1, remove the terminal cover and using small, flat screwdriver make correct setting.

4.1. SETTING THE OPERATING MODE

All available operating modes are shows in table below.

If there are any additional questions, please contact with technical support: support@cel-mar.pl or on the phone: +48 41 362-12-46.

Table 1. Setting the operating mode: RS422 or RS485

SW1-1	SW1-2	SW1-3	SW1-4	SW1-5	SW1-6	Description	Operating mode
ON	ON	ON	ON	ON	ON	RS-485 network, automatic data flow control	2-wire and 4-wire RS485 network. Full duplex or half duplex transmission.
OFF	OFF	OFF	OFF	OFF	OFF	RS-422 network	4-wire RS422 network. Full duplex or half duplex transmission.

4.2. SETTING OF TYPE AND NUMBERS OF PORTS RS485 IN

Converter ADA-1044H has on front panel the switch *RS-485 PORTS* (see fig.1), which is use for selection of type and numbers of RS485 ports. Available ports type: 4W – four-wire, 2W – two-wire.

Setting the switch in position '4W' there are available 2 ports 4-wire (full duplex transmission) labeled as:

- port-1, signals: T1+, T1-, R1+, R1-,
- port-2, signals: T2+, T2-, R2+, R2-.

Setting the switch in position '2W' there are available 4 ports 2-wire (half duplex transmission) labeled as:

- port-1, signals: A1, B1,
- port-2, signals: A2, B2,
- port-3, signals: A3, B3,
- port-4, signals: A4, B4.

Table 2. Settings of RS-485 PORTS switch

Switch position	Port type	Numbers of ports	Maximum numbers of connected device
2W	2-wire RS485 port	4	128
4W	4-wire RS485(4W) / RS422 port	2	64 - RS485 / 2 - RS422

4.3. FACTORY DEFAULT

Factory default of ADA-1044H is shown in table below - operating in rs485 mode and 4 ports of rs485.

Table 3. SW1 setting of operating mode RS422 or RS485.

SW1-1	SW1-2	SW1-3	SW1-4	SW1-5	SW1-6
ON	ON	ON	ON	ON	ON

Table 4. Setting of RS-485 PORTS switch.

Switch position	Port type	Numbers of ports	Maximum numbers of connected device
2W	2-wire RS485 port	4	128

5. ACTIVATION

Converter can be power on after proper connection according to steps above.

If connection was made properly green LED PWR on front panel of converter should light, if not check polarization of power connection. When data is present the LEDs Tx and Rx should blink

5.1. LEDS DESCRIPTION

LED	Opis
PWR	Signalling of Power Supply
RX	Signalling of data receiving through ADA-1044H converter from RS485/422 port.
TX	Signalling of data transmitting from ADA-1040 converter through RS485/22 port.

ATTENTION!

At baud rate above 38.4 kbps the LED's Tx, Rx will light weakly during data transmission

5.2. TROUBLESHOOTING

Problem	Solutions
PWR LED is not lights	Check polarization and parameters of connected power supply.
Rx LED lights continuously	RS485(4W) /RS422 Bus. Wrong polarization on R1+ /R1-, R2+ /R2- terminals. Change polarization.
	RS485(2W) Bus. Wrong polarization on A1/B1, A2/B2, A3/B3, A4/B4 terminals. Change polarization.
No transmission, Tx LED is blinking	RS485(4W) / RS422 Bus. Check the correctness of connection according to paragraph <i>INSTALLATION</i> .
	RS485(2W) Bus. Check the correctness of setting according to paragraph <i>CONFIGURATION</i> .

6. RS232 INTERFACE – PIN DESCRIPTION OF DSUB-9F

Pin	Signal	Description	ADA-1044H
1	(DCD)	Level of receiver signal	Connected with DSR
2	(TxD)	ADA-1044H data transmission	Transmitter
3	(RxD)	ADA-1044H data receiving	Receiver
4	(DSR)	Readiness of device to data receiving/ transmission	Connection possibility of DTR
5	(SG)	Signal ground	GND
6	(DTR)	Readiness of ADA-1044H to data receiving/ transmission	Connection possibility of DSR
7	(CTS)	Device confirm of receiving RTS signal from ADA-1044H	Connection possibility of RTS
8	(RTS)	ADA-1044H reports to device readiness to receiving data	Connection possibility of CTS
9	(RI)	Ring Indicator	Not connected

7. VERSIONS

ADA-1044H - [] - [] - []	
Electronic version:	
Basic	1
Special edition	2
Galvanic isolation:	
1kV= - 2-way	2
1kV= - 3-way	23
3kV= - 2-way	3
3kV= - 3-way	33
Terminal & Terminal Cover:	
Cover without inlets, screw terminal block	1
Cover with inlets, screw terminal block	2
Cover without inlets, plug-in screw terminal block	3

Order example:

Product Symbol: **ADA-1044H-1-23-3**

1 – basic electronics version,

23 – 1kV= galvanic isolation 3-way,

3 – cover without inlets, plug-in screw terminal block

8. SPECIFICATION

TECHNICAL DATA		
Transmission Parameters		
Interface	RS-232	RS-485/422 (4xRS485-OUT)
Connector	DSUB-9 Female socked	Screw terminal, wire max. Ø 2,5mm ²
Line length	up to 15 m	1200 m
Maximum number of connected device	1	up to 2 for RS422 Bus up to 64 for 4-wire RS485 Bus up to 128 for 2-wire RS485 Bus
Transmission line	Cable DB9F/DB9M multi-core 9x0,34 shielded (up to 15m) or twisted cable 9-pairs UTP 9x2x0,5(24AWG) shield inside large interferences (STP 9x2x0,5(24AWG)).	Twisted cable 1-pair, 2- pair or 4-pair UTP Nx2x0,5(24AWG), shield inside large interferences (STP Nx2x0,5 (24AWG)).
Standards	EIA-232, CCITT V.24,	EIA-485, CCITT V.11
Maximum baud rate	230,4 kbps	
Transmission type	Asynchronism half duplex or full duplex,	
Optical signalisation	<ul style="list-style-type: none"> • PWR – green LED power supply, • RX - red LED data receiving through RS485/422 interface, • TX - yellow LED data transmission through RS485/422 interface. 	
Electrical Parameters		
Power requirements	10 - 24 – 30 V DC	
Power cable	Recommended length of power cable <3m	
Power	<2W	
Protection from reverse power polarization	Yes	
Galvanic Isolation	2-way, 1kV DC or 3kV DC between power circuit and signal line RS232,	

	3-way , 1kV DC or 3kV DC between power circuit and signal lines RS232 and RS485/422
Optoisolation	3kV= - between signal lines RS485 and RS-232.
Electromagnetic compatibility	Resistance to disruptions according to the standard PN-EN 55024. Emission of disruptions according to the standard PN-EN 55022.
Safety requiring	According to the PN-EN60950 norm.
Environment	Commercial and light industrial.
Environmental Parameters	
Operating temperature	-30 ÷ 60°C
Humidity	5 ÷ 95% - non-condensing
Storage temperature	-40 ÷ 70°C
Casing	
Dimensions	53 x 90 x 62 mm
Material	PC/ABS
Degree of casing protection	IP40
Degree of terminal protection	IP20
Weight	0,10 kg
According to standard	DIN EN50022, DIN EN43880
Location during work	Free
Mounting method	On the rail compliant with DIN35 / TS35 standard.

Dear Customer,

Thank you for purchasing **CEL-MAR Company** products.

We hope that this user manual helped connect and start up the **ADA-1044H converter**. We also wish to inform you that we are a manufacturer of the widest selections of data communications products in the world such as: data transmission converters with interface RS232, RS485, RS422, USB, Current Loop, Fibre-Optic Converters and other.

Please contact us to tell how you like our products and how we can satisfy you present and future expectation.

CEL-MAR sp.j.

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