

## ADAM-4510/4510S

### RS-422/485 Repeater

#### Introduction

Most industrial computer systems come with RS-232 serial ports as standard. Though widely accepted, RS-232 has limited transmission speed, range and networking capabilities. The RS-422 and RS-485 standards overcome these limitations by using differential voltage lines for data and control signals. The ADAM-4520/4522 converter lets you take advantage of RS-422 and RS-485 on systems originally equipped with RS-232. It transparently converts RS-232 signals into isolated RS-422 or RS-485 signals. You don't need to change your PC's hardware or your software. The ADAM-4520/4522 lets you easily build an industrial grade, long distance communication system with standard PC hardware.

The ADAM-4510/4510S repeater simply amplifies, or boosts, existing RS-485 signals to enable them to cover longer distances. It extends the communication distance by 4000 ft (1200 m) or extends the number of connected nodes by 32.

#### Intelligent RS-485 control

The RS-485 standard supports half-duplex communication. This means that just two wires are needed to both transmit and receive data. Handshaking signals (such as RTS, Request To Send) are normally used to control the direction of the data flow. A special I/O circuit in the ADAM-4510/4510S and ADAM-4520/4522 automatically senses the direction of the data flow and switches the transmission direction. No handshaking signals are necessary—you can build an RS-485 network with just two wires. This RS-485 control is completely transparent to the user. Software written for half-duplex RS-232 works without modification.

#### Isolation (ADAM-4510S/4520 only)

The ADAM-4510S/4520's Opto-isolators provide 3000  $V_{DC}$  of isolation to protect the host computer from ground loops and destructive voltage spikes on the RS-422/485 data lines.

#### Surge protection (RS-485 only)

ADAM-4510/4510S and ADAM-4520/4522 offer internal surge-protection on their data lines. Internal high speed transient suppressors on each data line protect the modules from dangerous voltages levels or spikes.

## ADAM-4520/4522

### RS-232 to RS-422/485 Converter

#### Tough industrial design

You can power the ADAM-4510/4510S and ADAM-4520/4522 with any unregulated power source between +10 and +30  $V_{DC}$ .

Their industrial-grade plastic shells can be mounted on a DIN-rail, panel or in a piggybacked stack. You make signal connections through plug-in screw terminal blocks, guaranteeing easy installation, maintenance and modification

#### Features

- Automatic internal RS-485 bus supervision
- No external flow control signals required for RS-485
- Minimum 3000  $V_{DC}$  isolation protection (ADAM-4510S/4520 only)
- Transient suppression on RS-485 data lines
- Baudrate up to 115.2 Kbps
- Networking up to 4000 feet
- Reserved space for termination resistors
- Power and data flow indicator for troubleshooting
- Power requirement: +10 to +30  $V_{DC}$
- Mounts easily on DIN-rail or panel

#### Specifications

##### Common

- **Power requirement:**  
Unregulated +10 to +30  $V_{DC}$  with protection from power reversals
- **Case:** ABS with captive mounting hardware
- **Accessories (Supplied):**  
NYLON DIN-rail Mounting Adapter  
SECC Panel Mounting Bracket
- **Plug-in screw terminal wiring:**  
Accepts AWG 1-#12 to #22 (0.5 to 2.5 mm) wires

##### ADAM-4510/4510S specifications

- **Baudrate (bps):** 1200, 2400, 4800, 9600, 19.2 K, 38.4 K, 57.6 K, 115.2 K, RS-422 (switchable)
- **Isolation Voltage:** 3000  $V_{DC}$  (4510S only)

- **RS-422/RS-485 interface connector:** plug-in screw terminal
- **Power consumption:** 1 W maximum

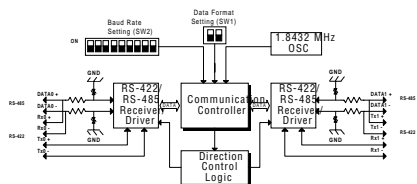
### ADAM-4520/4522 specifications

- **Baudrate (bps):** 1200, 2400, 4800, 9600, 19.2 K, 38.4 K, 57.6 K, 115.2 K, RTS control and RS-422 mode (switchable)
- **Isolation voltage:** 3000 V<sub>DC</sub> (4520 only)
- **RS-232 interface connector:** Female DB-9
- **RS-422/RS-485 interface connector:** plug-in screw terminal
- **Power consumption:** 1.2 W maximum

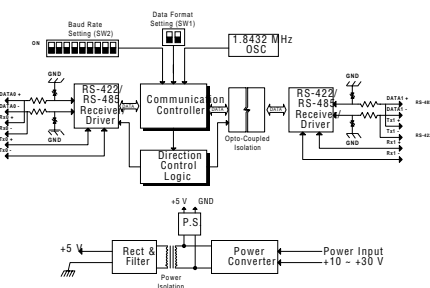
### Operating environment

- **Operating temperature:**  
-10 ~ 70° C (14 ~ 158° F)
- **Storage temperature:**  
-25 ~ 85° C (-13 ~ 185° F)
- **Humidity:** 5 ~ 95%, non-condensing

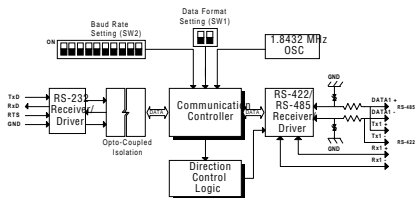
### Function diagrams



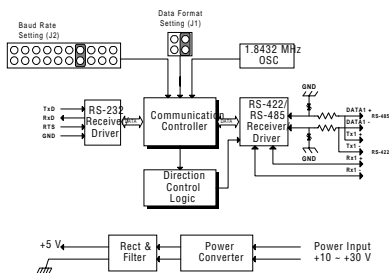
ADAM-4510 Repeater Function Diagram



ADAM-4510S Repeater Function Diagram



ADAM-4520 Converter Function Diagram



ADAM-4522 Converter Function Diagram

## Installation

### Initial inspection

We carefully inspected the ADAM-4510/4510S and 4520/4522 Modules both mechanically and electrically before we shipped them. They should be free of marks and scratches and in perfect order on receipt.

As you unpack the modules, check them for signs of shipping damage (damaged box, scratches, dents, etc.). If it is damaged or fails to meet our specifications, notify our service department or your local sales representative immediately. Also, call the carrier immediately and retain the shipping carton and packing material for inspection by the carrier. We will then make arrangements to repair or replace the unit.

### Switch and jumper settings

#### Switch settings

DIP switches or jumpers (4522 only) in the ADAM

converter and repeater modules set the data format (number of bits) and baudrate for the ADAM network. You can configure the other modules in the network via software commands. Your program and the PC's serial port should match the settings of the converter and repeater modules.

### SW1

Switch 1 controls the data format. Data can be 9, 10, 11 or 12 bits. The factory default is 10 bits: one start bit, eight data bits, no parity bit and one stop bit.

When using the converter in combination with other ADAM modules, do not change the default setting as ADAM modules have a fixed data format of ten data bits. The option of changing to 9, 11 or 12 bits is for use with other modules (other than ADAM modules) that have different data formats. Should you change the data format, be aware that you will have to change the data format settings on all the other modules in the network.

### SW2

Switch 2 sets the baudrate. The options range from 1200 bps to 115.2 Kbps. The factory default is 9600 bps. Be aware that when you change the baudrate, you have to change the baudrate for all the connected modules accordingly. If the RS-422 mode is ON, the baudrate doesn't need to be set.

#### Default settings

Since neither module is addressable by the host computer, the baud rate and data format must be set using SW1 and SW2 located inside the module. The default settings are:

#### \* Default settings for both modules

Function	Setting
Baud rate	9600 bps
Data format	10 bits

#### ADAM-4510/4510S RS-422/RS-485 Repeater Module

The following tables illustrate the switch settings for the Repeater Module.

#### ADAM-4510/4510S Data format settings (SW1)

Data Format	1	2
9 bits	<input type="radio"/>	<input type="radio"/>
* 10 bits	<input checked="" type="radio"/>	<input type="radio"/>
11 bits	<input type="radio"/>	<input checked="" type="radio"/>
12 bits	<input checked="" type="radio"/>	<input checked="" type="radio"/>

= Open     = Closed    \* = Default

#### ADAM-4510/4510S Baud rate settings (SW2)

Baud Rate	1	2	3	4	5	6	7	8	9
1200 bps	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2400 bps	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4800 bps	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
* 9600 bps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19.2 Kbps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
38.4 Kbps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
57.6 Kbps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
115.2 Kbps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
RS-422	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

= Open     = Closed    \* = Default

#### ADAM-4520/4522 RS-232/RS-485 Converter Module

The following tables illustrate the switch settings for the Converter Module.

#### ADAM-4520/4522 Data format settings (SW1)

Data Format	1	2
9 bits	<input type="radio"/>	<input type="radio"/>
* 10 bits	<input checked="" type="radio"/>	<input type="radio"/>
11 bits	<input type="radio"/>	<input checked="" type="radio"/>
12 bits	<input checked="" type="radio"/>	<input checked="" type="radio"/>

= Open     = Closed    \* = Default

#### ADAM-4520/4522 Baud rate settings (SW2)

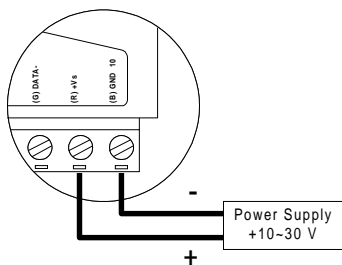
Baud Rate	1	2	3	4	5	6	7	8	9	10
RTS control	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1200 bps	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2400 bps	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4800 bps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
* 9600 bps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19.2 Kbps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
38.4 Kbps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
57.6 Kbps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
115.2 Kbps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
RS-422	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

= Open     = Closed    \* = Default

## Power supply

For the ease of use in industrial environments the ADAM modules are designed to accept industry standard +24 V<sub>DC</sub> unregulated power. Operation is guaranteed when using any power supply between +10 and +30 V<sub>DC</sub>. Power ripples must be limited to 200 mV peak to peak while the voltage in all cases must be maintained between +10 and +30 V<sub>DC</sub>. All power supply specifications are referenced at module connector.

The power cables should be selected according to the number of modules connected and the length of the power lines. When using a network with long cables, we advise the use of thicker wire to limit the line voltage drop. In addition to serious voltage drops, long voltage lines can also cause interference with communication wires.



We advise that the following standard colors (as indicated on the modules) be used for power lines:

+Vs → (R) Red  
GND → (B) Black

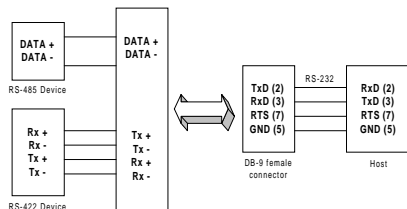
## Communication wiring

We recommend that shielded-twisted-pair cables that comply with the EIA RS-485 standard be used with the ADAM network to reduce interference. Only one set of twisted-pair cables is required to transmit both Data and RTS signals. We advise that the following standard colors (as indicated on the modules) be used for the communication lines:

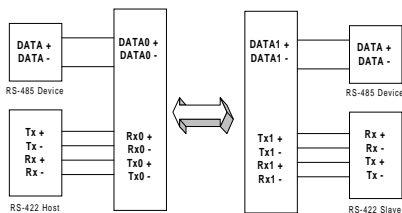
DATA + (Y) → Yellow  
DATA - (G) → Green

### Basic configuration hook-up

Before placing a module in an existing network, the module should be properly configured. The two following diagrams show typical layouts for both modules.



### ADAM-4520/4522 Converter Connection Diagram



### ADAM-4510/4510S Repeater Connection Diagram