

ADAM-4541 *Fiber Optic to RS-232/422/485 Converter*

ADAM-4542 *Single-mode Fiber Optic to RS-232/422/485 Converter*

Introduction

Fiber optic transmission offers the benefits of wide bandwidth, immunity to EMI/RFI interference, and secure data transmission. The ADAM-4541/ADAM-4542 can be used as an RS-232/422/485 point-to-point or point-to-multipoint connection for transmitting and converting full/half-duplex signals and their equivalents within a fiber optic environment. Fiber optics are the perfect solution for applications where the transmission medium must be protected from electrical exposure, lightning, atmospheric conditions or chemical corrosion.

The ADAM-4541/4542 is specifically designed to link various machinery equipped with RS-232/422/485 communication ports (such as computer systems or manufacturing machines). Using standard ST connectors, the module's fiber optic ports can accommodate a wide range of fiber optic cable sizes, including 62.5/125 (9/125) μm .

Features

- * Compact size economizes space
- * Direct plug-and-play
- * Easily mounted on a DIN-rail, panel or piggyback
- * Transmission speeds of up to 115.2 kbps
- * Optical fibers enable transmission of 2.5 km for ADAM-4541 and 15 km for ADAM-4542.
- * Half/Full-duplex, bidirectional transmission mode
- * Avoids lightning strikes and EMI/RFI interference
- * Prevents damage from electrostatic discharge
- * Stable and error-free data transmission
- * Automatic internal RS-485 bus supervision
- * No external flow control signals required for RS-485
- * Transient suppression and over-current protection on RS-422/485 data lines
- * Reserved space for termination resistors
- * LED for power and data flow indication
- * Power requirement: +10 ~ +30 V_{DC}

Specifications

	ADAM-4541	ADAM-4542
Fiber Optics	multi-mode	single-mode
Wavelength	820 nm	1310 nm
Transmission Distance	2.5 km	15 km
Optical Power Budget (attenuation)	12.5 dB	9 dB
Power Consumption	1 W (typical); 1.5 W (max.)	1.6 W (typical); 2.1W (max.)

- * **Casing:** ABS with captive mounting hardware
- * **Communication mode:** Asynchronous
- * **Connector:** Plug-in screw terminal
- * **Fiber port:** ST
- * **Transmission mode:** Full/Half-duplex, bidirectional
- * **Transmission rate:** Up to 115.2 kbps
- * **Operating temperature:** -10 ~ 70° C (14 ~ 158° F)
- * **Operating humidity:** 5 ~ 95% (non-condensing)
- * **Accessories (included):** Nylon DIN-rail mounting adapter, SECC panel mounting bracket

Note: *Fiber optics are designed for industrial applications. 50/125 μm , 62.5/125 μm , and 100/140 μm are commonly used for multi-mode; 9/125 μm are commonly for single-mode.*

Installation

Unpacking

The ADAM-4541/4542 package includes the following:

- 1 ADAM-4541 or ADAM-4542 module
- 1 mounting bracket
- 1 *User's Manual*
- 1 3P to DB 9 cable (Red:RX, white:TX, Black:GND)

Switch and jumper Settings

Switch Settings

The ADAM-4541/4542 converter has two DIP switches which set the data format (number of bits) and baud rate for the ADAM network. Please remember to configure the I/O 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, one stop bit and no parity bit.

When using the converter in combination with other ADAM modules, do not change the default setting of the converter, since 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 ADAM module's data format, be aware that you will also have to change the data format settings on all the other modules in the network.

SW2

Switch 2 sets the baud rate. The options range from 1200 bps to 115.2 kbps. The factory default is 9600 bps. Be aware that when you change the baud rate, you also have to change the baud rate for all the connected modules accordingly. If the RS-232/422 mode is ON, the baud rate does not need to be set.

Default settings

The ADAM-4541/4542 is not addressable by the host computer. The baud rate and data format are set using SW1 and SW2 in the converter. The default settings are:

Default settings	
Function	Setting
Baud rate	9600 bps
Data format	10 bits

The following tables illustrate the switch settings for the ADAM-4541/4542:

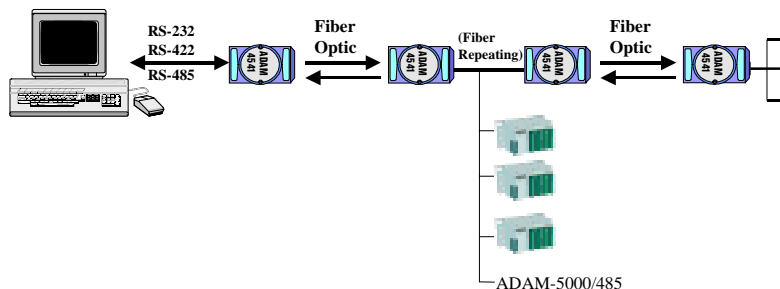
ADAM-4541/4542 data format settings (SW1)		
Data Format	1	2
9 bits	<input type="radio"/>	<input type="radio"/>
*10 bits	<input checked="" type="radio"/>	<input type="radio"/>
11 bits	<input type="radio"/>	<input checked="" type="radio"/>
12 bits	<input checked="" type="radio"/>	<input checked="" type="radio"/>

○ = Off ● = On * = Default

ADAM-4541/4542 baud rate settings (SW2)									
Baud Rate	1	2	3	4	5	6	7	8	9
1200 bps	●	○	○	○	○	○	○	○	○
2400 bps	○	●	○	○	○	○	○	○	○
4800 bps	○	○	●	○	○	○	○	○	○
*9600 bps	○	○	○	●	○	○	○	○	○
19.2 kbps	○	○	○	○	○	●	○	○	○
38.4 kbps	○	○	○	○	○	○	●	○	○
57.6 kbps	○	○	○	○	○	○	○	●	○
115.2 kbps	○	○	○	○	○	○	○	○	●
RS-232/422	○	○	○	○	○	○	○	○	●

○ = Off ● = On * = Default

Block Diagram



Example Program

The following program can be used as a diagnostic test for the ADAM-4541/4542. It will transmit a string to COM1 and also receive a string from COM1 of the computer (a loop-back test).

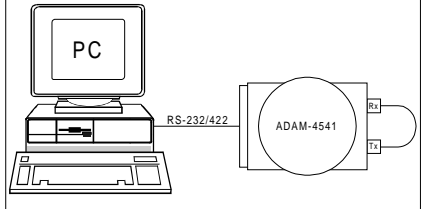
Program: LOOPBACK.C

```
#include <dos.h>
#include <io.h>
#include <stdio.h>
#include <conio.h>
#define TIME_OUT 4000
static int base0=0x3f8;
static int base1=0x2f8;
static char rec[160];
static char cmd[160];
void main ()
{
    int i,timeout;
    char rflag,tflag;
    bioscom(0,0xE3,0); /* Set COM1 as follows: Baud Rate = 9600, Data Bits = 8, */
    printf("\nInput string : "); /* Parity = none, Stop Bits = 1 */
    gets(cmd);
    while (cmd[0] != 'q' && cmd[0] != 'Q')
    {
        cmd[strlen(cmd)] = 0x0d;
        i=0;
        tflag=1;
        while (tflag)
        {
            /* Send data */
            outportb (base0,cmd[i]);
            while ((inportb(base0+5) & 32) !=32);

            rflag=1;
            timeout=TIME_OUT;
            while (rflag)
            {
                /* Check received data */
                if ((inportb(base0+5) & 1) !=0)
                {
                    /*Receive data */
                    rec[i]=inportb(base0);
                    if (rec[i] == 0x0d)
                    {
                        rec[i+1]='\0';
                        printf("\nReceived data : %s\n,rec);
                        tflag=0;
                    }
                    rflag=0;
                }
                else
                {
                    /* Check timeout */
                    timeout--;
                    if (timeout == 0)
                    {
                        printf("Timeout error");
                        rec[i+1]='\0';
                        rflag=0;
                        tflag=0;
                    }
                }
            }
        }
        i++;
    }
    printf("\nInput command : ");
    gets(cmd);
}
```

Signal Wiring

When you run the example program, connect the ADAM-4541/4542 terminals as follows:



Troubleshooting

Possible reasons for malfunction

- The TX and RX connections are reversed.

Solution: Make sure the fiber connection is made so that the TX of one end is connected to the RX of the other.
- Poor connection between the ADAM-4541/4542 and the communication port.

Solution: Make sure the ADAM-4541/4542 is securely plugged into the communication port.
- Attenuation on the fiber causes the signal level to drop below the accepted level.

Solution: Reduce the attenuation by reducing connector loss, transmission distances, etc.
- The connection between the communication ports is neither DTE to DTE nor DCE to DCE connection.

Solution: Add a converter to one of the optical modems, so that the pin assignments from the communication port to the modem are from pin 2 to pin 3 and from pin 3 to pin 2.
- The fiber has been damaged.

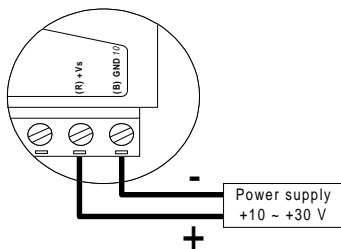
Solution: Repair or replace the fiber.
- The ADAM-4541/4542 has been damaged.

Solution: Use the supplied software to perform a loop-back test of the optical modem. This will detect if the module is damaged.

Power Supply

For the ease of use in industrial environments, the ADAM modules are designed to accept industry standard +24 V_{DC} unregulated power. Operation is guaranteed when using any power supply between +10 and +30 V_{DC}. Power ripples must be limited to 5 V peak to peak, while the voltage in all cases must be maintained between +10 and +30 V_{DC}. All power supply specifications are referenced at the 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 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

Front View

