



ES-U-2001-S

USB to Industrial Single RS-422/485

Adapter Installation Guide

Document Reference No.: CP_000074

Version 1.1

Issue Date: 01-04-2022

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1 Introduction

The ES-U-2001-S USB to Industrial Single RS-422/485 Adapter is designed to make serial port expansion quick and simple. Connecting to a USB port on your computer or USB hub, the USB Serial Adapter instantly adds one industrial RS-422/485 interface serial communication port to your system. By taking advantage of the USB bus, the USB Serial Adapter makes it easier than ever to add one RS-422/485 port and serial devices to your system with easy plug and play and hot plug features.

Plugging the ES-U-2001-S into the USB port, the adapter is automatically detected and installed. There are no IRQ & COM port conflicts, since the port doesn't require any additional IRQ, DMA, memory as resources on the system. The RS-422/485 port functions as native Windows COM port, and it is compatible with Windows serial communication applications. The adapter is designed with external switches to set the unit to the RS-422 or RS-485 modes. The upper-case slides open easily for configuration and mode setting.

The USB Serial Adapter provides instant connectivity to RS-422/485 communication devices for factory automation equipment, multi-drop data collection devices, barcode readers, time clocks, scales, data entry terminals, ATMs, and serial communication in harsh environment. The USB to Serial Adapter is suitable for remote access, retail and industrial applications, data collection and other applications requiring high speed RS-422/485 communication ports.

2 Specifications & Features

- FTDI USB-Serial chipset and drivers
- Adds one RS-422 / 485 serial port via USB connection.
- 256 byte receive buffer.
- 128 byte transmit buffer for high-speed data throughput.
- Requires no IRQ, DMA, I/O port.
- Data rates: 300 bps to 921.6K bps.
- Serial Connector: one DB-9 male connector.
- Auto transmit buffer control for 2-wire RS-485 half-duplex operation.
- Termination resistors installed on-board.
- RS-422 data signals: Tx-, Tx+, Rx+, Rx-, GND, RTS-, RTS+, CTS+, and CTS-.
- RS-485 data signals: Tx-, Tx+, Rx+, Rx-(4 wire) and data-, data+ (2 wire).
- Indication LEDs for TxD and RxD port status.
- No external power adapter required
- Easy operation mode configuration and setting
- Virtual COM port drivers for Windows, Linux and macOS

3 Hardware Setup

Before connecting the unit to the RS422/RS485 bus or to the computers USB port, you should set up the hardware switches and jumpers.

3.1 General notes

Serial Bus Configuration

It is important to configure the DIP switches and jumpers to select the correct type of serial bus (RS-422 or RS-485) for your application before connecting the converter to your serial bus. Otherwise, damage can occur to the converter or other equipment on the RS-422/RS-485 bus.

To avoid damage, the serial cables and USB cable should be disconnected from your converter before changing DIP switch settings and before opening the case to change jumper settings.

Termination

For RS-422 or RS-485, it may be necessary to enable termination of the data transmission lines. This depends on the way in which your network is connected and if termination is already provided by other devices on the network. Before applying the termination, check your cable specification for proper impedance matching. The termination option connects a 120 Ohm resistor between the data + and - lines.

Termination is normally used in the node at each end of the bus, but nodes in the middle of the bus should not have termination enabled. Enabling termination resistors on additional nodes which are not at the ends of the bus may cause overloading of the line drivers leading to unreliable operation of the unit and the overall system.

ES-U-2001-S converters have jumpers to allow the internal termination resistors to be enabled if required. This avoids the need to provide an external resistor at the ES-U-2001-S end of the bus.

There are separate jumpers for Tx+/Tx- termination and Rx+/Rx- termination allowing termination to be enabled for either or both if required. When using RS-485 half-duplex, the Tx and Rx pairs are combined into a single bi-directional pair and so only the Tx+/Tx- termination should be enabled. The Rx+/Rx- termination should be disabled.

Biasing

In some cases, the RS-485 lines may float to undefined levels when no transmitter is active, and this can cause additional unexpected characters to appear at the start or end of a message. Biasing resistors are used to set a defined logic level on the serial lines when no node is transmitting. 750 Ohm resistors pull up the Data + line and pull down the Data - line.

ES-U-2001-S converters feature internal biasing resistors with jumpers to enable/disable them.

These should be disabled if another device on your serial bus already provides biasing as biasing of data lines must only occur at a single point in the cabling. Fitting more than one set of bias resistors can cause overloading of the line drivers leading to unreliable operation of the unit and the overall system.

There are four jumpers to select biasing on Tx+, Tx-, Rx+ and Rx-. *When using RS-485 half-duplex, the Tx and Rx pairs are combined into a single bi-directional pair and so only the jumpers for Tx biasing (Pull up of Tx+ and Pull down of Tx-) should be fitted. The Rx biasing should be disabled.*

3.2 RS422/RS485 Mode Switch

Inside the unit, there is a 3-way DIP switch which is set to select the mode of operation. You will need to push down the upper case, and slide it open by following the direction of the red arrow in the illustration below. You can set the switch settings to RS-422 or RS-485 mode as per the requirements of your application. The modes are shown in Table 1 below.



Figure 1 – Push down the upper case and slide it to open

The RS-422 and RS-485 Mode block configuration settings are listed below -

	Operation Mode	S1	S2	S3
RS-422	4 wire with Handshaking	ON	ON	ON
RS-485	Full Duplex (4 wire)	OFF	ON	ON
	Half Duplex (2 wire) - with Echo	OFF	OFF	ON
	Half Duplex (2 wire) - without Echo	OFF	OFF	OFF

Table 1 - RS-422 & RS-485 Mode Block Configuration SW (External DIP Switch) for Mode Setting



Figure 2 - 3-way DIP Switch for Operating Mode Selection

3.3 Termination and Biasing Configuration

Inside the unit, there is a 7 x 3 header block. This allows jumpers to be fitted to enable Tx, Rx and CTS 120 Ohm termination resistors and to enable the Tx and Rx 750 Ohm Biasing resistors.

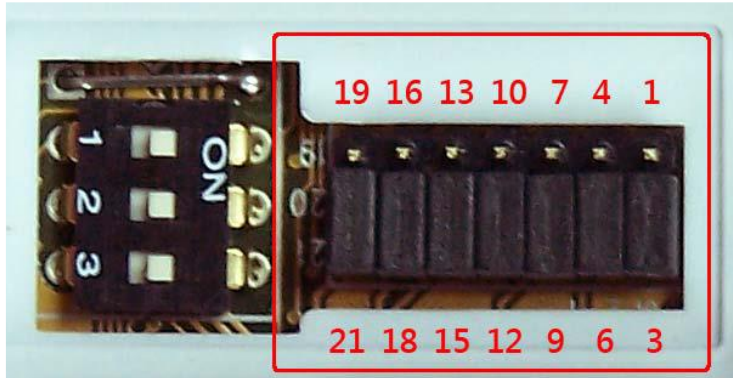


Figure 3 – 7 x 3 Header Block to enable Termination & Biasing Resistors

You will need to open the upper case and set the jumpers as per the requirements of your application. The jumpers control the following settings. Please refer to the notes on the following page before setting the jumpers.

Jumper	Function
1-2 enable 2-3 disable	Tx+/- Termination of 120 Ohm (see notes below table)
4-5 enable 5-6 disable	Pull-up Tx+ to VCC via 750 Ohm Bias resistor (see notes below table)
7-8 enable 8-9 disable	Pull-down Tx- to GND via 750 Ohm Bias resistor (see notes below table)
10-11 enable 11-12 disable	Rx+/- Termination of 120 Ohm (see notes below table)
13-14 enable 14-15 disable	Pull-up Rx+ to VCC via 750 Ohm Bias resistor (see notes below table)
16-17 enable 17-18 disable	Pull-down Rx- to GND via 750 Ohm Bias resistor (see notes below table)
19-20 enable 20-21 disable	CTS Termination of 120 Ohm (for RS422 mode) (see notes below table)

Table 2 – Termination and Biasing Jumpers

Note on Termination:

For RS485 half-duplex, if termination is required, only Tx Termination should be enabled as the Tx and Rx lines are linked. Enable Tx+/- termination (jumper 1-2) and disable Rx+/- termination (jumper 11-12)

For RS485 full-duplex and RS422, termination can be enabled/disabled for Tx+/- and Rx+/- pairs independently using the jumpers as required.

See the notes on Termination in section 3.1 before setting these options

Note on Biasing:

For RS485 half-duplex, if biasing is required, enable Tx+/- biasing only (jumper 4-5 and 7-8) and disable Rx+/- biasing (jumper 14-15 and 17-18)

For RS485 full-duplex and RS422, biasing can be enabled/disabled for Tx+/- and Rx+/- pairs independently as required.

See the notes on Biasing in section 3.1 before setting these options

4 Driver Installation & Verification

Once the jumpers and switches have been configured using the previous sections in this guide, the driver can be installed.

For information on driver installation and connecting the converter to your computer, please refer to the Connective Peripherals USB to Serial Converters Driver Installation Guide (Document CP_000084) which is available from www.connectiveperipherals.com

5 Pin Layouts / Pinout information

5.1 RS-422 Signal Pin-outs of DB-9 Male

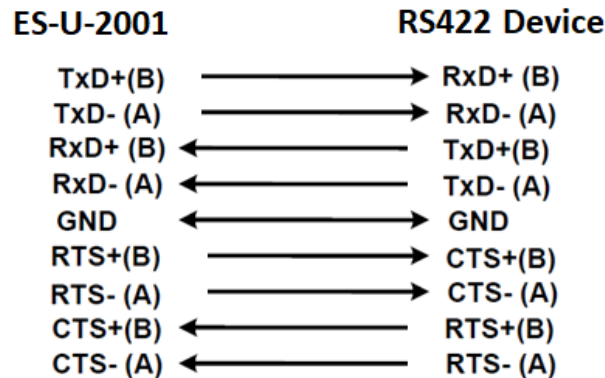
Pin 1	TxD- (A)
Pin 2	TxD+ (B)
Pin 3	RxD+ (B)
Pin 4	RxD- (A)
Pin 5	GND
Pin 6	RTS- (A)
Pin 7	RTS+ (B)
Pin 8	CTS+ (B)
Pin 9	CTS- (A)

5.2 RS-422 Signal Wiring

5.2.1 Point-to-Point 4 Wire Full Duplex



5.2.2 RS-422 with Handshaking



5.3 RS-485 4-Wire (Full duplex) Signal Pin-outs of DB-9 Male

Pin 1	Tx- (A)
Pin 2	Tx+ (B)
Pin 3	Rx+ (B)
Pin 4	Rx- (A)
Pin 5	GND

5.4 RS-485 2-Wire (Half duplex) Signal Pin-outs of DB-9 Male

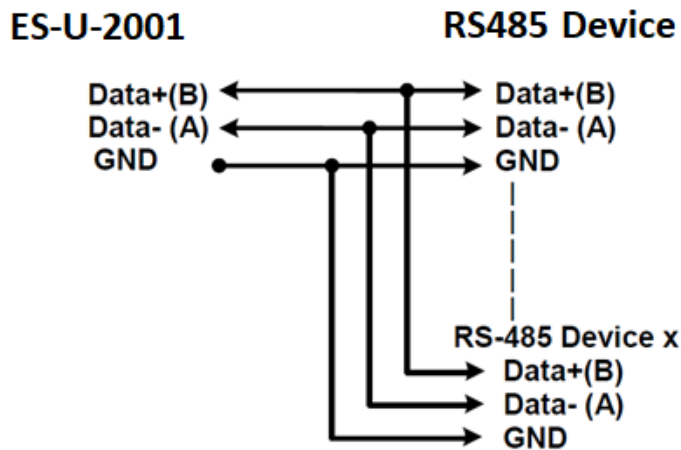
Pin 1	Data- (A)
Pin 2	Data+ (B)
Pin 5	GND

5.5 RS-485 Signal Wiring

5.5.1 Point-to-Point 4-Wire Full Duplex



5.5.2 Multi-drop RS-485 2-Wire Half-duplex



6 Contact Information

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Appendix B - Revision History

Revision	Changes	Date
1.0	Initial release	29-12-2020
1.1	Updated biasing/termination section to provide better description. Moved driver install section to USB to Serial Converters Driver Installation Guide available from www.connectiveperipherals.com	01-04-2022