KK SYSTEMS LTD

CE

NEW
AUTO DRIVER ENABLE

K485-ADE – RS232-RS485 Converter with ADE
K422-2 – Enhanced RS232-RS422 Converter

- ✔ Automatic driver enable (ADE) on RS485 eliminates the need for RTS control
- ✔ 9600 baud, 8 bits/word for K485-ADE
- ✔ Suitable for both 2- and 4-wire RS485 RS422 version: K422-2 (0-115kbaud)
- ✔ Controlled slew-rate driver - low EMC
- ✔ No separate power supply required
- ✔ Full RS232 port voltages emitted
- ✔ RS485 port fully varistor-protected for maximum ESD immunity
- ✔ Lowest-ever-priced ADE converter

The K485-ADE™ is an RS232–RS485 interface converter with automatic RS485 driver enable.

It is ideal for use with Windows SCADA applications which cannot provide RTS control.

The K485-ADE turns off its RS485 driver precisely after the last data bit, ensuring proper operation even with the fastest Slave devices. All protocols including MODBUS are supported transparently.

In most applications, the K485-ADE is powered solely from the the RS232 RTS and DTR signals which can be in either HIGH or LOW states.

Overview

This data sheet covers two products based on the same hardware: the **K485-ADE** RS232-RS485 converter, and the **K422-2** RS232-RS422 converter. These are enhanced versions of the well established K485 and K422 converters. All products are protocol independent and are suitable for all protocols in common use including MODBUS.

The K485-ADE is intended for use in 2-wire RS485 systems. It is also suitable for 4-wire RS485 systems where tri-state operation is required. It operates only at 9600 baud with 8 data bits. This covers both 7 bits with parity and 8 bits with no parity. No configuration is required and unusual applications are catered for with special-order versions. A fully configurable universal DIN-rail mounted product, the KD485-ADE, is available for all other applications.

The K422-2 is intended for use in point-to-point RS422 systems, at all baud rates in the range 0–115200 baud. It can also be used as a Master in 4-wire RS485 systems.

RS485/RS422 Basic Principles

RS485 exists in two varieties: **2-wire** and **4-wire**. RS485 systems are always Master/Slave. Each Slave has a unique address and responds only to a correctly addressed message (a "poll") from the Master. A Slave never *initiates* a communication. In a 2-wire system, all devices (including the Master) must have tri-state capability. In a 4-wire system, the Slaves must have tri-state capability but the Master does not really need it (i.e. it can be an "RS422" device) because it drives a bus on which all other devices merely listen; this allows an RS422 device to operate as a Master on a 4-wire RS485 bus.

RS422 is electrically identical to 4-wire RS485 except that the driver is always enabled. It is therefore usable only in point-to-point applications. The K422-2 product version should be used for these applications.

K485-ADE Automatic Driver Enable

In most low-cost RS232-RS485 converters, the RS232 device controls the RS485 driver enable/disable state, by raising the RTS signal when transmitting and dropping it when expecting a response. This "RTS control" results in a lowest-cost product but many RS232 systems do not support it. Also, some operating systems (e.g. Windows) make RTS control difficult to implement.

The K485-ADE controls its RS485 driver automatically by intelligently monitoring the RS232 data. This enables any application written for RS232 (provided of course it correctly handles the required protocols) to operate as an RS485 Master. The K485-ADE enables its RS485 driver immediately on receipt of a start bit, and disables the driver during the second half of the following stop bit. This ensures correct system operation even with Slave devices which respond immediately.

Power Considerations

RS485 theoretically supports up to 32 devices connected to a common bus. With special high input resistance receivers now available this can be increased to 128. These figures are determined solely by the transmitter DC drive capability, and by the receiver input resistance. In practice, several factors can reduce the maximum number of devices:

- **Termination resistors:** It is not generally possible to derive sufficient power from a PC RS232 port to drive a 100Ω terminator with RS422/485 voltage levels. A capacitor, e.g. 1000pF, must be connected in series with any such terminators, to eliminate the DC loading which a resistor alone would produce. The controlled slew rate driver used in this converter makes termination unnecessary for cables shorter than approximately 300m.
- **PC capability:** The converter draws power from the RTS,DTR signals (which can be positive or negative) and from TX (if negative). PC interfaces vary somewhat in their ability to supply power. With the K485-ADE, not more than approximately 10 devices should be connected to the RS485 bus. This assumes the standard RS422/485 receiver input resistance of 12 kΩ.
- **Capacitance:** With very long cables, cable capacitance becomes significant in the power consumption. The following table is a very conservative but useful guide. Note the K485-ADE auto driver enable function works only at 9600 baud.

Baud Rate (baud)	Max total cable capacitance (pF)		Baud Rate (baud)	Max total cable capacitance (pF)
1200	250000		19200	15000
2400	120000		38400	7500
4800	60000		57600	5000
9600	**30000**		115200	2500

- **External supply:** If the power derived from the RTS and DTR signals is insufficient, an external 9V DC power supply can be connected to pin 9 of either connector as shown in the Connections section. The converter then achieves the full RS422/485 specification of 1200m of twisted-pair cable at 9600 baud, and 32 standard-load devices on the RS485 bus.

Connections

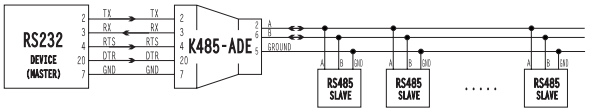


Fig. 1
RS232 to 2-wire RS485

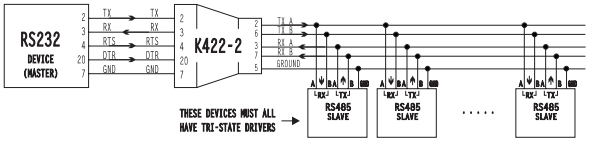


Fig. 2
RS232 to 4-wire RS485

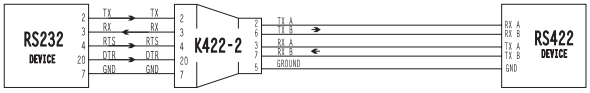
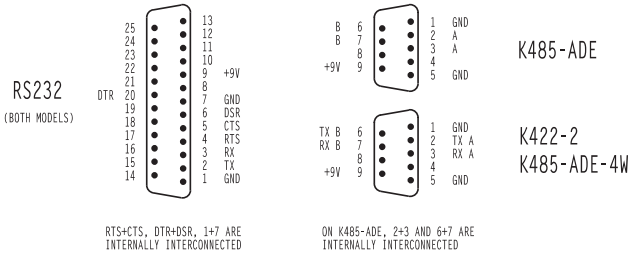


Fig. 3
RS232 to RS422



The K485-ADE is intended to plug directly into a standard 25-way IBM PC RS232 port. If your PC has a 9-way RS232 port, you will need the commonly available 9-25 moulded converter. Alternatively, the K422-99 and K485-99 products (without ADE) are available for 9-way ports.

The K485-ADE is intended for 2-wire operation (fig. 1). For 4-wire systems (fig. 2) where tri-state operation is required for some other reason, e.g. multiple masters, or where the K485-ADE is a Slave device, use the special-order K485-ADE-4W.

A or B: Following RS422/485 standards, the RS4xx connections above are marked **A** and **B**. They are defined as follows: When the RS232 TX input is at the RS232 HIGH level (+12V nominally) the A output is at the RS4xx HIGH level (+5V nominally) and the B output is at the RS4xx LOW level (0V nominally).

When connecting to other RS4xx equipment, you may encounter markings such as HI/LO and +/–. Such non-standard markings are ambiguous and you may need to experiment. Normally, one assumes that the K485's A/B corresponds to the other device's A/B, HI/LO or +/– markings respectively but sometimes this is wrong. One simple way to help establish which is which is to measure the voltages when no communications are taking place: B should be more positive than A.

RS422/485 Grounding: All RS4xx receivers have a finite common mode voltage range, typically +12V to –7V. If you can *guarantee* that the RS4xx interfaces of all the equipment being interconnected will always have their grounds within this range, you can omit the ground connection to the K4xx. In practice this is very difficult to guarantee, so a connection between GND and the other device(s) interface ground is nearly always necessary for reliable operation.

Troubleshooting

If you cannot establish communications, check the following:

- Check that the A/B connections on the converter are connected to the corresponding terminals at the other end. Due to common non-standard markings on some equipment you may need to experiment by swapping the A/B wires. One simple way to help establish which is which is to measure the voltages when no communications are taking place: B should be more positive than A.
- Check that the converter is receiving an adequate supply from the RS232 RTS,DTR signals. This can be checked either by checking the voltage levels on those signals, or by checking the voltage present on pin 9 of either connector. The RTS or DTR voltage must be at least +6V (if positive) or at least –7.5V (if negative); any combination of these is adequate to power the converter. The pin 9 voltage (which is internally generated from RTS,DTR) must be at least +5.5V at all times. The converter

also draws power from any negative level on TX but the effectiveness of this cannot be checked directly. All voltages are measured relative to the GND pins.

- Check that any termination resistors have a series capacitor; see the Power Considerations section.
- Ensure that the grounding instructions are followed; see the Connections section.
- For the K485-ADE, check that your serial parameters are **9600** baud with 8 data bits. The 8 data bits can include a parity bit.

Specification

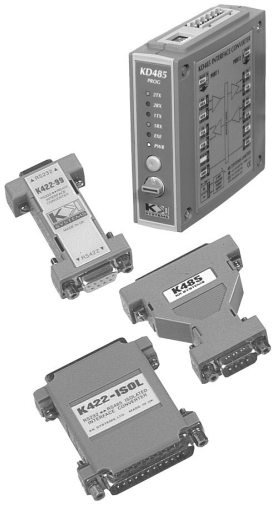
Serial parameters:	K485-ADE: 9600,8,N,1 9600,7,E,1 9600,7,O,1 9600,7,N,2 K422-2: 0-115200 baud, any data format
Power:	RTS,DTR positive: +6V to +15V 4mA typ. at 9600 baud RTS,DTR,TX negative: –7.5V to –13V 6mA typ at 9600 baud External power (pin 9): +5.5V to +14V 4mA typ. at 9600 baud
Environmental:	Operating 0 to +50C; storage –25C to +70C; RH 0 to 90% non-condensing
CE compliance:	Emissions EN50081-2, immunity EN50082-2
Dimensions:	55mm (W) x 17mm (H) x 62mm (L) approx

Ordering Information

Standard products: **K485-ADE**
K422-2

Specials: **K485-ADE-4W** This version does not have the internal TXA-RXA, TXB-RXB interconnections, and is for use on 4-wire RS485 systems where tri-state operation is required.
K485-ADE-4W-FD The K485-ADE disables reception of its own transmitted data. In addition to the 4W option above, this version has a permanently enabled receiver.
K485-ADE-19200 Custom baud rates are available: 2400,4800,19200,38400.

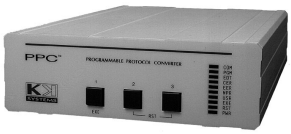
Other Products



A range of high quality very low cost RS232–RS422/485-20mA converters is also available.

Shown on left is the KD485 DIN-rail converter. This robust isolated product is available in 3 versions which cover most industrial conversion applications from simple interface conversion, with a universal model with auto driver enable and addressable adapter modes, to a C–programmable protocol converter with a MODBUS virtual device library for custom protocol conversion requirements.

The "inline" units plug directly into an IBM PC serial port (25-way or 9-way) and are line-powered from the RS232 interface. The range includes isolated models. All units use very low power CMOS technology and low-EMC drivers.



The PPC Programmable Protocol Converter is a unique user-programmable datacomms device which enables a customised protocol converter to be easily produced, using its built-in extended Pascal programming language and four serial RS232/422/485 ports with full modem controls. The PPC can also be programmed in ANSI C.

A single Eurocard 3Ux6HP rack version with four RS232/422/485 ports is also available and there are numerous options. Many PPC-based custom products have been delivered.

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