CE

RS-232 to RS-485 Optically Isolated Converter,
DB9F to Terminal Block
Product Code IC1655A

This RS-232 to RS-422/485 9-pin converter converts unbalanced, full or half-duplex RS-232 signals to balanced, full or half-duplex RS-422 or RS-485 signals at baud rates up to 115.2 kbps. In addition, the unit optically isolates and surge suppresses the RS-422/485 lines. The driver uses automatic SD (send data) or RTS (handshake) control, or can be configured as always enabled for use in RS-422 systems.

A dipswitch selects communication features. Two LEDs show data traffic in either direction. Only one power supply is necessary, located on the RS-232 side. The isolated power and ground on the RS-422/485 side are generated internally.

Connections are made through a DB9 female connector on the RS-232 side and terminal blocks on the RS-422/485 side. All terminal blocks, dipswitches, and jumpers are located inside the hood and are reachable through the access panel which closes to protect the connections.

The RS-232 port has a DB9 female connector with pins 3 (TD), 2 (RD), and 5 (Signal Ground) supported, pins 7 (RTS) and 8 (CTS) are tied together, and pins 6 (DSR), 1 (CD), and 4 (DTR), are also tied together. There are two LEDs: a Transmit Data LED showing when data goes from the RS-232 side to the RS-485 side, and a Receive Data LED showing data going from the RS-485 side to the RS-232 side. These are very useful for determining if data is getting through the converter.

The RS-485 terminal blocks support Transmit Data (A) and (B), Receive Data (A) and (B), and Signal Ground. A single supply voltage of 10 to 30 VDC on the RS-232 side powers the unit. An 8-position dipswitch allows the selection of baud rate, 2-wire or 4-wire mode, echo on or off, and termination in or out.

RS-422/485 Driver Control

Either RTS Control or Send Data Control may be used to enable the RS-485 driver. This option is user selectable by setting push-on jumpers located next to the terminal blocks. RTS controls the driver using toggling Request to Send (pin 7) of the RS-232 side. Raising RTS enables the driver and lowering RTS disables it. Automatic Send Data Control recognizes the first bit of data from the RS-232 side, enables the transmitter and disables the receiver.

After the last bit of data is sent from the RS-232 side, the unit waits one character length then disables the transmitter and enables the receiver. The timeout can be selected with dipswitches or by changing the value of R21 (see Table 1). The timeout is preset at the factory for 9600 baud. Removing both sets of jumpers completely will constantly enable the RS-485 driver. This makes the unit behave like an RS-422 converter. See Table 2 for standard communications settings.

Termination and Echo Options

Termination resistance can be selected with Switch 8 for high baud rates and long cable distances. The 4-wire/2-wire switches (6 and 7) are turned off for 4-wire mode and on for 2-wire mode. When they are set on, they connect TD(A) to RD(A) and TD(B) to RD(B) internally. Switch 5 controls Echo on and off. When switch 5 is in the off position the receiver is constantly enabled. Placing the switch in the on position allows the driver **or** the receiver to be enabled at any time. In 2-wire mode it is recommended that switch 5 be turned on to prevent data being sent out from "echoing" back through the receiver. Up to 32 receivers can be driven by any one RS-485 driver, allowing you to put together large systems with many drop points. Using an RS-422/485 repeater such as Black Box product code IC1650A can increase the number of receivers.

Table 1. Baud Rate Selection

Baud	Switch 1	Switch 2	Switch 3	Switch 4	R21	Time out (ms)
1200	OFF	OFF	OFF	OFF	820kΩ	9.0
2400	OFF	OFF	OFF	OFF	410kΩ	4.5
4800	ON	OFF	OFF	OFF	Not Used	2.2
9600	OFF	ON	OFF	OFF	Not Used	1.1
19200	OFF	OFF	ON	OFF	Not Used	0.6
38400	OFF	OFF	OFF	ON	Not Used	0.3
57600	OFF	OFF	ON	ON	Not Used	0.2
115200	OFF	OFF	OFF	OFF	8.2kΩ	0.1

Table 2. Standard Communications Settings

Communication Mode	JP1	Switch 5 Echo	Switch 6 4W/2W	Switch 7 4W/2W
RS-422 Mode (full duplex)	Neither	OFF	OFF	OFF
RS-485 4-Wire Mode (full-duplex)	RTS or SD	OFF	OFF	OFF
RS-485 2-Wire Mode (half-duplex)	RTS or SD	ON	ON	ON

Typical RS-422/485 2 Wire Setup
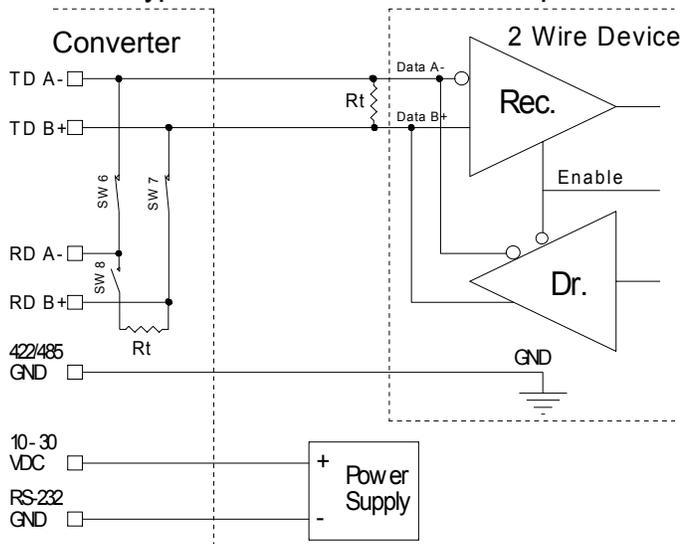
Typical RS-422/485 4 Wire Setup
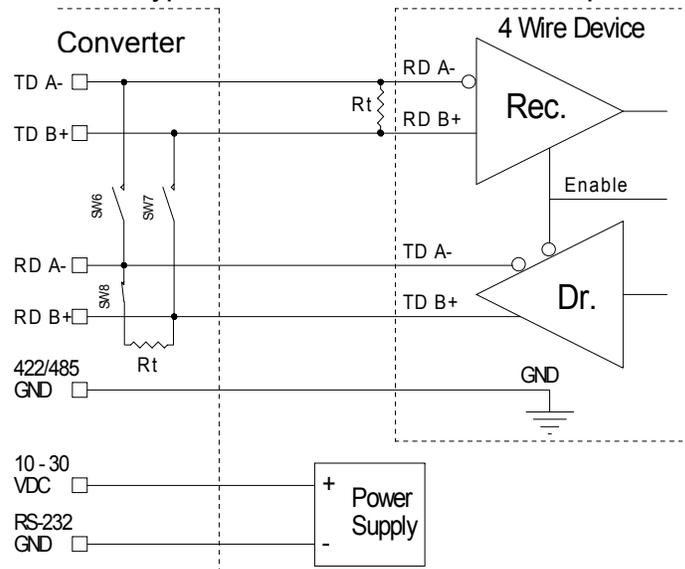
Specifications

Dimensions:	2.7 X 5.1 X 0.9 in (7.0 X 13.0 X 24.0 cm)
Temperature Range:	0°C to 70°C
Supply Voltage:	+10 to 30 VDC @ 95 mA maximum
Data Rates:	up to 115.2 kbps
Connectors:	DB9 female for RS-232
	Terminal blocks for RS-422/485 and power
Isolation:	2000 VAC optical isolation of data signals and ground
Surge Suppression:	7.5V, bi-directional avalanche breakdown device. 500W peak power dissipation Clamping time <1 picosecond (theoretical)

Model Numbers:	IC1655A
Description:	RS-232/485 Optically Isolated Converter
Type:	Light industrial ITE equipment
Standards:	EN 50082-1 (IEC 801-2, IEC 801-3, IEC 801-4) EN 50081-1 (EN 55022, IEC 1000-4-2) EN 61000 (-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11 ENV 50204 EN 55024

CE

RS-422/485
Screw down terminal blocks

TB1:1 TDA(−)
TB1:2 TDB(+)
TB1:3 RDA(−)
TB1:4 RDB(+)
TB1:5 GND

BYPASS
C1
0.01uF
I+5V

Z1
Z2

U3:8 TERMINATION
U3:7
U3:6

R12 4.7K
R14 120

SWITCH 6 & 7
ON = 2 WIRE
OFF = 4 WIRE

I+5V
R7 4.7K

U2
I+5V 13,14
6,7 GND

R15 4.7K
ECHO U3:5

R1 4.7K
I+5V

R20 2.2K
I+5V
D2 1N4148
D3 1N4148
LED2 TRANSMIT DATA

RTS CONTROL JP1:A
SD CONTROL JP1:B

Send Data Control

R2 1K
I+5V

R16 200K U3:1 4800
R17 100K U3:2 9600
R18 56K U3:3 19.2K
R19 27K U3:4 38.4K
I+5V

R21 *

R21 is an optional resistor
to be placed by the user

R5 2.2K
LED1 RECEIVE DATA
I+5V

Isolation

BYPASS
C3 0.01
+5V

RS-232
DB9 female connector

U5
+5V 16
R 8
D 7
R 13
D 14
+5V 12
11
6
−V VOLTAGE INVERTER
+V VOLTAGE DOUBLER
15 GND

C6 1uF
C8 1uF +5V
C5 1uF
C7 1uF

R4 0 ohm
R6 *
R8 *
R10 0 ohm

TD J1:3
RD J1:2
RTS J1:7
CTS J1:8
DSR J1:6
DCD J1:1
DTR J1:4
GND J1:5

Note: Place R6 and R8 for DTE
Place R4 and R10 as 0 ohm for DCE
Shipped as DCE

C16 0.1uF
I+5V

DC to DC
with Isolation

+5V
C14 120uF

Regulator

+10 TO 30 VDC
D4 1N4007
TB1:6
GND TB1:7