

USER MANUAL

RS-232 to RS-485 CONVERTER



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TAS PowerTek Pvt. Ltd
W-61, MIDC Ambad Industrial Area,
Nasik- 422010.
Maharashtra, India.
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Introduction

Thank you for purchasing the RS-232 to RS-485 converter. Although RS-232 ports are found on every computer, because of their slow transmission speed, limited range, and limited networking capabilities, they are not an effective solution for industrial strength long distance communication systems.

Systems based on RS-485 standard, on the other hand, are not subjected to the RS-232 limitations because they utilize differential voltage lines for the data signals. The key features of RS-485 that make it ideal for use in Industrial and Instrumentation Communications applications are –

- Long distance links- up to 1200 meter.
- Bidirectional communications possible over a single pair of twisted cables.
- Differential transmission increases noise immunity and decreases noise emissions.
- Multiple drivers and receivers can be connected on the same bus.
- Wide common-mode range allows for differences in ground potential between the driver and receiver.

RS-232 to RS-485 converter allows RS-232 line signal to bi-directionally convert to and from RS-485 standard. The RS-232 to RS-485 converter allows interfacing any device using an RS-232 serial link to an RS-485 link. The RS-485 link was conceived for long haul data acquisition and control applications.

RS-485 links are much used in industrial process control where reliability is important. Also, the ability to communicate over a long distance at a high speed is important when it comes to industrial plants where the stations might be spread over a large area.

It is very common to have a PC or a PLC in charge of controlling a given process. PC's in general have an RS-232 serial port (COM port) and therefore there are two solutions to link the computer to an RS-485 network: One is to plug an RS-485 interface in a computer slot and the other is to convert the RS-232 level signal coming out the computer serial port into an RS-485 signal. This is what the RS-232 to RS-485 converter does.

Many APFC Controllers of TAS PowerTek provide RS-232 to RS-485 Converter at the back of the controller so that the controller can be connected to a PC or PLC.

Package Content

1. RS-232 to RS-485 converter.
2. DC Power Adapter (7.5 - 9V DC).
3. User Manual.
4. 1.5 meter 9-pin D type female PC cable.
5. Lug set for RS-485.

If any of the items are missing or damaged, contact your distributor or sales representative immediately.

Features

1. Easy installation.
2. Simple to use.
3. Visible Power, Receive, Transmit and RCV DIR LEDs.
4. 3-Pin Connector for RS-485 Interface.
5. Standard 9-pin 'D' female connector for RS-232 Interface.
6. Provision of Selection of one of the three standard baud rates: 4800, 9600, 19200.
7. Wide range power input voltage from DC 7.5V to 9V.
8. Provision of automatic data direction control.
9. Able to support many PC software packages such as Modbus-View, ModScan etc

Specifications

Power input voltage	DC 9V
LED indication	Visible +5V Power, Receive, Transmit and RCV DIR LEDS.
Temperature range	0° to 50° C.
Humidity	10 - 80% (non-conducting)
Dimensions	70mm (L) x 45mm (W) x 18mm (D).
Weight	45 Grams.
Communication Ports	2 Communication Ports. Port 1: RS-232 with TxD, RxD, DTR, RTS & SIG. GND. Port 2: RS-485 with D+, D- & SIG. GND.

Installation



The Converter is housed in a Plastic Cabinet with a 9 Pin D-Type female Connector at one end, 3 pin connector at the other side of the unit. Module has a DC input Power Jack.

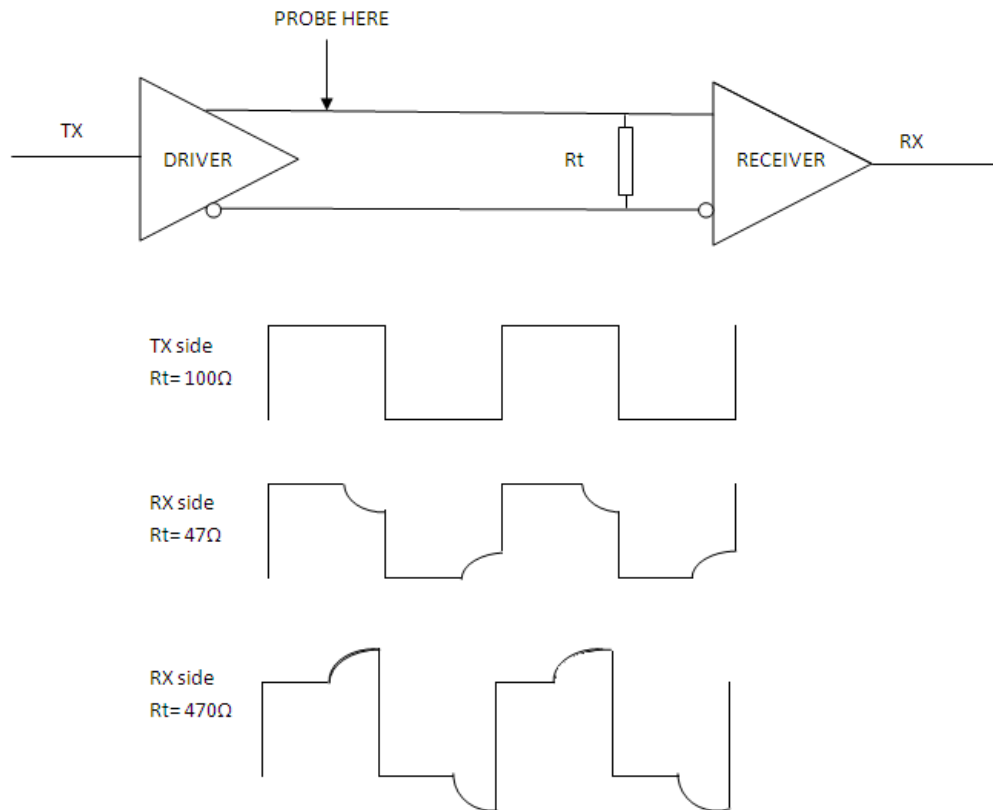
The 9 Pin Serial RS-232 Port can be connected to the Computer or any other Serial Device using appropriate Cable. The 3 pin connector is used for connecting to the RS-485 supported device.

The DC Power Socket can take in DC voltage of +9V at about 100mA from the supplied Power Adaptor.

The RS-232 to RS-485 converter has a 100 Ohms internal terminating resistor at the RS-485 side.

Importance of Terminating Resistor

Each discontinuity in RS-485 transmission line impedance causes signal reflections and distortion. When an impedance discontinuity occurs in the transmission line the immediate effect is signal reflection. This will lead to signal distortion. Especially at line ends, this mismatch causes problems. To eliminate this discontinuity, terminate the line with a resistor of proper value.



SIGNAL DISTORTION

The value of the resistor should be as close as possible to the characteristic impedance of the line. Although receiver devices add some resistance to the whole of the transmission line, normally it is sufficient to the resistor impedance it should be equal to the characteristic impedance of the line.

Example: Each input of the receivers has a nominal input impedance of 18 K Ohms feeding into a diode transistor-resistor biasing network that is equivalent to an 18 K Ohms input resistor tied to a common mode voltage of 2.4 V. It is this configuration which provides the large common mode voltage range of the receiver required for RS-485 systems! (See figure below)

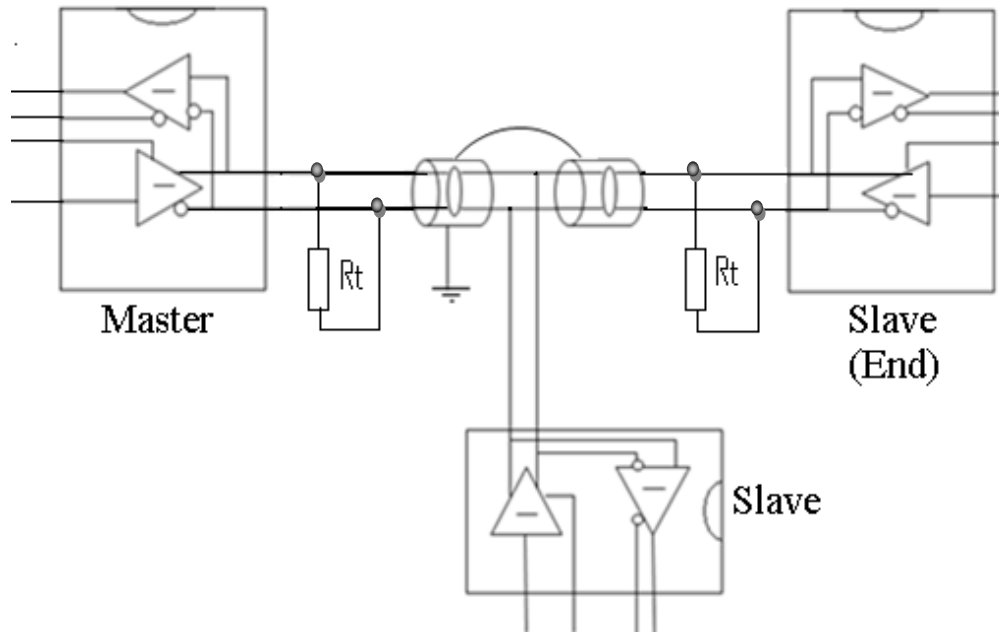


Figure: Termination resistor locations

Because each input is biased to 2.4 V, the nominal common mode voltage of balanced RS-485 systems, the 18K Ω on the input can be taken as being in series across the input of each individual receiver.

If ten of these receivers are put closely together at the end of the transmission line, they will tend to react as ten 36K Ω resistors in parallel with the termination resistor. The overall effective resistance will need to be close to the characteristics of the line.

The effective parallel receiver resistance R_P will therefore be equal to:

$$R_P = 36 \times 10^3 / 10 = 3600\Omega$$

While the termination receptor R_t will equal:

$$R_t = R_o / [1 - R_o/R_P]$$

Thus for a line with a characteristic impedance of 100 Ω resistor, the Termination resistor R_t should be:

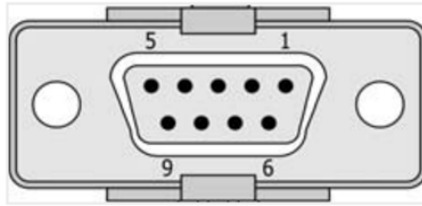
$$R_t = 100 / [1 - 100/3600] = 103\Omega$$

Since this value lies within $\pm 10\%$ of the line characteristic impedance. Thus as already stated above the line termination resistor R_t will normally be equal to the characteristic impedance Z_o .

The star connection causes a multitude of these discontinuities since there are several transmission lines and is therefore not recommended.

Notice: The recommended wiring method that causes a minimum amount of reflection is daisy chaining where all receivers tap from one transmission line and needs to be terminated only twice.

RS-232 9 Pin female connector

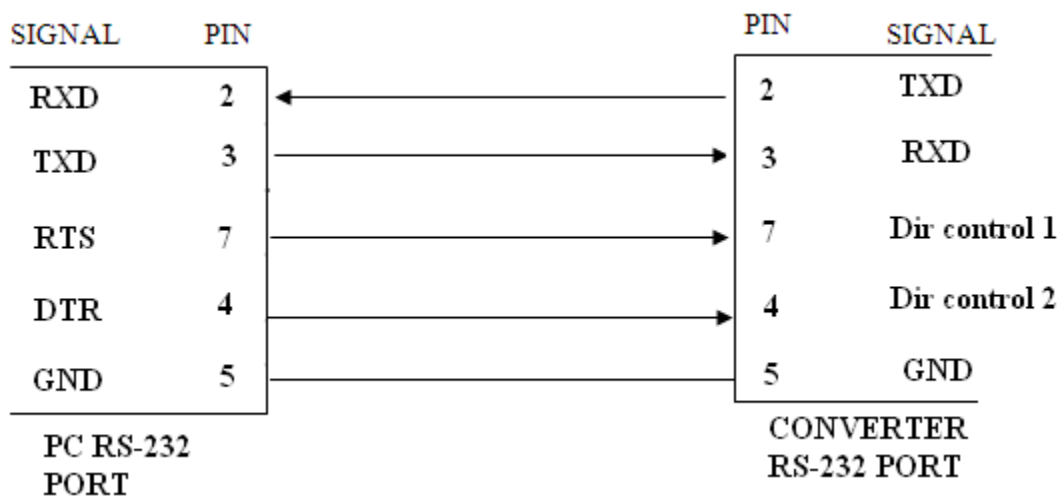


**DB-9 (Female) pin out
Front View**

PIN No.	Description & Direction w.r.t. Converter Module
2- TXD	Transmit data from RS-485 to RS-232
3- RXD	Receive data from RS-232 to RS-485
4- Dir control 2	PC / PLC to Converter for Direction Control, if Jumper Selected.
5-SGND	Signal Ground (Common)
7- Dir control 1	PC / PLC to Converter for Direction Control, if Jumper Selected.

Note: You can use internal jumper to select Automatic Direction Control or Direction Control by PC / PLC Software, using one of the two Output Signals “**Direction control 1**” or “**Direction control 2**” by appropriate internal jumper positions.

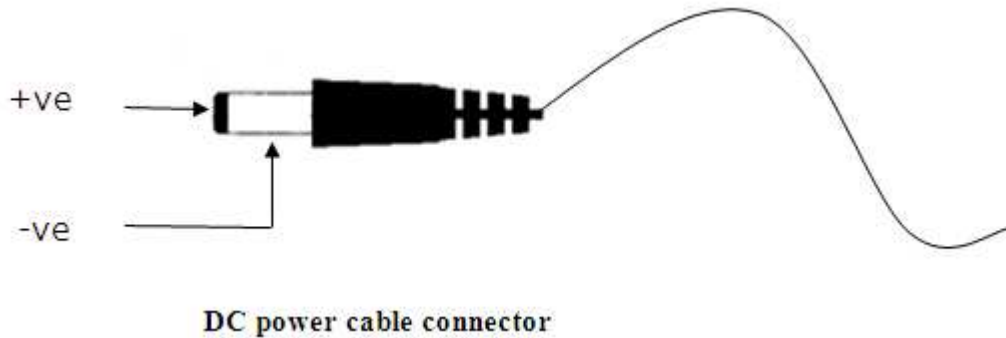
RS-232 PC Communication Port connection



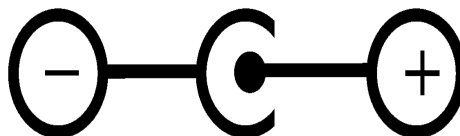
(One meter 9-pin D type female PC cable is provided)

Power Supply

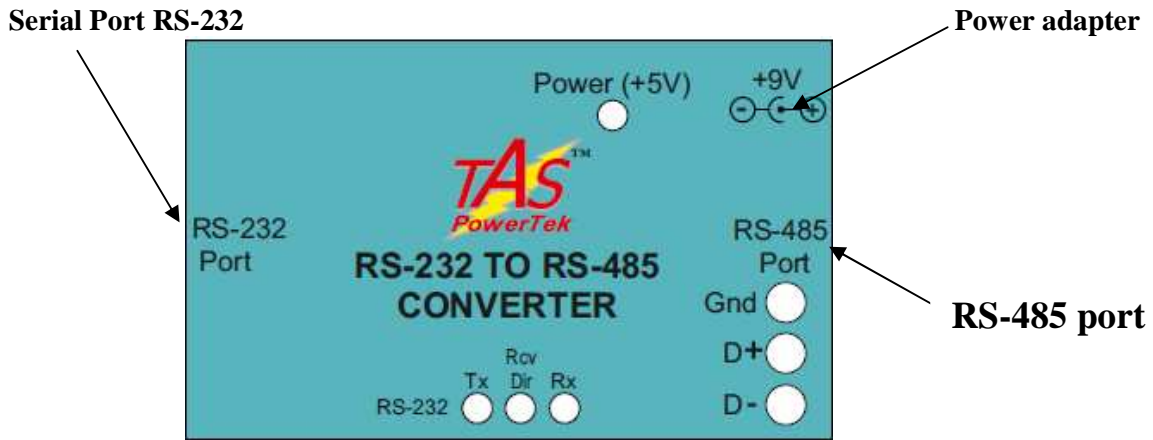
RS-232 to RS-485 converter has a Power Jack adjacent to 3 Pin Connector which can take in +9V DC from the supplied Power Adaptor which has the Positive as shown polarity sequence. The maximum Current required is 100 mA.



Note: Outer Ring is -ve and the Inner Tip is +ve for the DC Supply.
This is also shown on the front sticker on the module, as below.

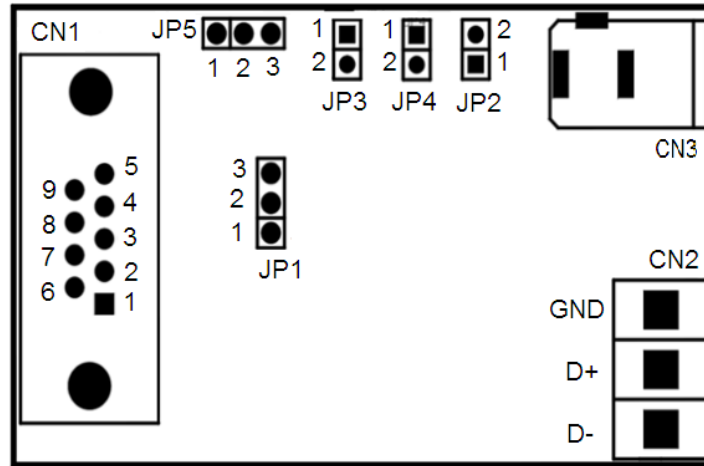


Front Fascia



LED	Function	Description
Tx	Transmit data	This LED lights up whenever there is Data to be Transferred from RS-232 to RS 485 side and remains OFF when there is no data transfer activity.
Rx	Receive data	This LED lights up whenever there is any incoming data from the RS 485 to RS-232 and the same being sent to the PC or Serial Device. Remains OFF when there is no activity.
RCV dir	Receive Direction	This LED lights up whenever there is data transfer from RS-232 (PC / PLC) to RS-485.
Power	Power ON	This LED remains ON when the Unit receives +5 V Power & indicates that the unit is Functional.

Jumper Selection



1. JP1 selection: It is used for selecting direction mode for communication.

Jumper at pin	Operation	Operation
1 & 2	Direction Control by RS-232 Side	Direction of comm. decided by RS 232 Signal DTR or RTS, comes from PC. This option also requires selection of JP5
2 & 3	Auto Direction	Direction of comm. Internally decided by the Converter, based on Data coming from RS-232 Side.

Note: Factory default is Auto Direction mode.

2. Baud Rate for Automatic Data Direction Control, Jumper Selection:

Baud rate Selection	
Baud rate	Select
4800	JP2 In
9600	JP3 In
19200	JP4 In

(Select ONLY one jumper, JP2 or JP3 or JP4, at a time, according to the communication baud rate desired.)

Note: 1) If the Selected Baud Rate does not match with the actual working Baud Rate, then, communication will not be possible.

2) Factory default jumper setting is JP3 in that is 9600 baud rate.

3. JP5 selection: Used to select direction control from PC side (serial cable).

Jumper at pin	Operation	Description
1 & 2 Shorted (In)	Direction control 1	RTS: Request To Send Signal from PC RS-232.
2 & 3 Shorted (In)	Direction control 2	DTR: Data Terminal Ready Signal from PC RS-232.

Configuring the Driver-enable line

When using with software driver-enable control, the routine below sets the state of the driver-enable output. As shown, the routine uses the RtsEnable property to control the RTS. If the driver-enable line is DTR, change the code to use the DtrEnable property instead.

Notes:

- 1] Control Data Direction by PC / PLC (RS-232) Side Software, controlling “Direction Control 1” or “Direction Control 2” Output Lines will provide more reliable Data Communication. The Application Software on the PC / PLC needs to have the toggling facility for “Direction Control 1” or “Direction Control 2”.

```
VB      If driverDisable Then
          mycomPort.SelectedPort.RtsEnable = False
        Else
          mycomPort.SelectedPort.RtsEnable = true
        Else If
```

- 2] Allow sufficient “turn-around” time in your Applications Software, to allow for the change of direction for the RS-485 Buffers, as well as the other end system to decode the message and respond.

- 3] The TAS RS-232 to RS-485 Converter has in-built RS-485 Bus Terminating Resistor of between D+ & D- Terminals, of 100 Ohms. This is a thru'-hole Resistor so that if required, it can be changed to an optimum value, to minimize reflection of signals.

- 4] It is recommended to use twisted & shielded pair of RS-485 Cable for higher immunity to electrical disturbances and also to allow higher communication baud rate. The “Shield” should be terminated to “Signal Gnd.” at only one end of this Data Cable.

- 5] Run the RS-232 as well as RS-485 Cables as far away as possible from high-voltage or high-current or high-power cables. Also keep them away from strong electro-magnetic fields and electrical RF / Noise generating equipments.

- 6] Make sure that the extreme ends of the RS-485 Cable have appropriate RS-485 Bus Terminating Resistors.

- 7] For RS-485 Multi-Drop, Half-Duplex network, the maximum nodes that can be connected is up to 32 Nodes.

- 8] TAS Automatic Power Factor controllers (APFC) some of the units do provide RS-485 Interface. If you want to use this converter with our APFC units, a separate user manual provides the details of Mod-Bus registers & the corresponding values from the APFC units, as well as the data interpretations.

- 9] Contact TAS PowerTek, Nasik, for any other requirements of long-distance Data Communications such as RS-232 to RS-422, RS-422 to RS-232, Differential Line Drivers, Differential Line Receivers etc

Troubleshooting tips:-

Q1. What if LED doesn't glow?

Solution:-

- Check whether the adapter is of proper Voltage & Output Current rating or not. (check whether the adapter is providing sufficient supply or not)
- Check the polarity of DC power jack.

Q2. What step to be taken if Communication failure occurs?

Solution:-

- Check the continuity of RS-232 cable.
- Check the continuity of RS-485 cable.
- Check jumper settings.
 - : JP1- Verify the jumper position for controlling direction bit whether it is from PC side or from internal Automatic data direction control logic.
 - : JP5- If direction control is from PC side then check it is control by RTS or DTR signal.
- If control signals are not received properly, then check the polarity of D+, D- and GND signal for the RS-485 side.

Q3. What to do if garbage information is received?

Solution:-

- See if the Baud rate of converter and PC is matched.
 - : Provision of three baud rates is provided that is 4800, 9600, 19200. So select same Baud Rate on both the ends (Converter and PC).

NOTE: Select only one jumper at a time, for proper baud rate selection.

Warranty and Service

The product supplied with this manual is guaranteed against faulty workmanship for a Period of 12 Months from the date of dispatch.

Our obligation assumed under this guarantee is limited to the replacement of parts which, by our examination, are proved to be defective and have not been misused, carelessly handled, defaced or damaged due to incorrect installation. This guarantee is VOID where the unit has been opened, tampered with or if repairs have been made or attempted by anyone except an authorized representative of the manufacturing company.

When returning the product for service or repair a full description of the fault and the mode of operation used when the product failed must be given.

In any event the manufacturer has no other obligation or liability beyond replacement or repair of this product. The warranty is applicable is for rectification of the defective product/system and would not be applicable for the entire product/system replacement.

Modifications may be made to any existing or future models of the unit, as it may deem necessary without incurring any obligation to incorporate such modifications in Units previously sold or to which this guarantee may relate.

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This product is designed and manufactured in India.

Contact



TAS PowerTek Pvt. Ltd
W-61, MIDC Ambad Industrial Area,
Nasik- 422010.
Maharashtra, India.
Contact No. : +0091-253-6694956

Web: www.taspowertek.com

E-mails:

For Support: design@taspowertek.com

For Sales & Quotations: sales@taspowertek.com