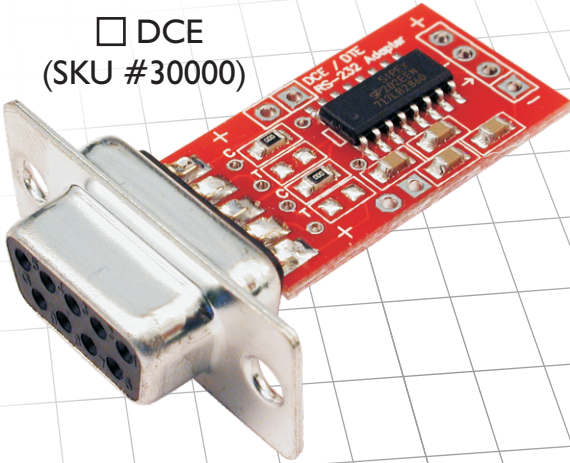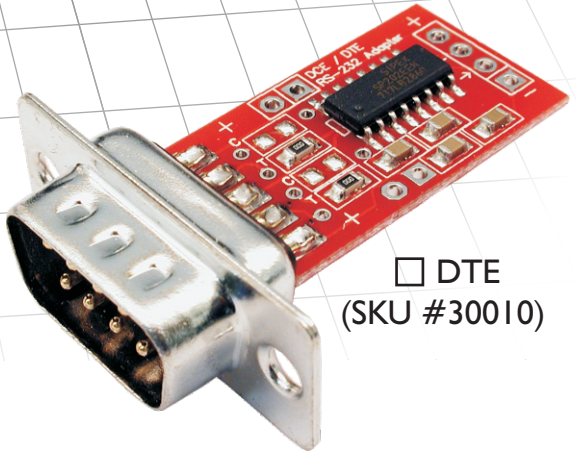# RS-232 Driver Module

Low Cost TTL to RS-232 Adapter

☐ DCE
(SKU #30000)

☐ DTE
(SKU #30010)

- Transmit and receive RS-232 Data
- Can be mounted on any solderless breadboard, or hard-wired
- Reconfigurable for DCE or DTE
- Easy to use
- Ideal for prototyping

SOLARBOTICS® Ltd

www.solarbotics.com
1-866-276-2687

Thank-you for purchasing the RS-232 Driver. You now own a practical solution to connecting any TTL (0-5 Volt) device to a PC or other device that communicates using "true" (±12 Volt) RS-232 signals. The RS-232 Driver is a versatile device; it can be mounted to a solderless breadboard for prototyping or can be hard-wired to (see photos on opposite page).

DCE vs. DTE

The RS-232 standard was developed explicitly for data communications so the names were made to reflect the only two possibilities at the time; that is, modems (DCE), and things that connect to modems (DTE). The standard was designed such that a DTE could be connected to a DCE using a "straight-through" serial cable (i.e.: pin 1 to pin1, pin 2 to pin 2, etc.)

Data Communications Equipment (DCE): Refers to a device that is wired in such a way that it is expecting to talk to a PC. DCE devices transmit on pin 2 and receive on pin 3 of the DB-9 connector. Modems and Serial LCDs/VFDs are examples of DCE devices. DCE devices usually have female connectors.

Date Terminal Equipment (DTE): Refers to a device that is wired in such a way as to connect with a DCE device. DTE devices transmit on pin 3 and receive on pin 2 of the DB-9 connector. PCs, and many PLCs are examples of DTE devices. DTE devices usually have male connectors.

Note that DCE and DTE are only wiring standards. If the RS-232 adapter is configured one way and find that you cannot communicate, try the other option. There is no danger of damaging anything if you choose the wrong configuration.

See "RS-232 Mode Configuration" for more information on setting the configuration.

Options

The RS-232 Driver has been designed to accommodate two different mounting schemes. The user   must decide which will be most convenient for their application. In many cases, soldering four wires to the available solder pads at the far end of the board will be preferred. However the PCB can also mount onto a standard breadboard. In this case three 2-Pin SIP headers (not included) should be soldered to the bottom of the PCB (see Figure 2).
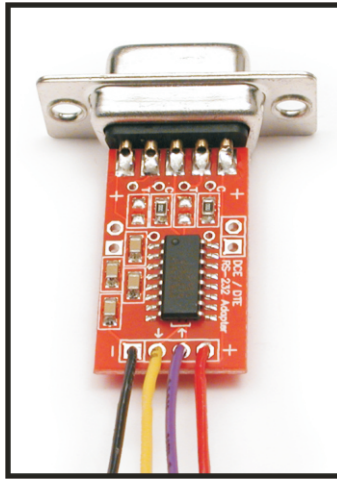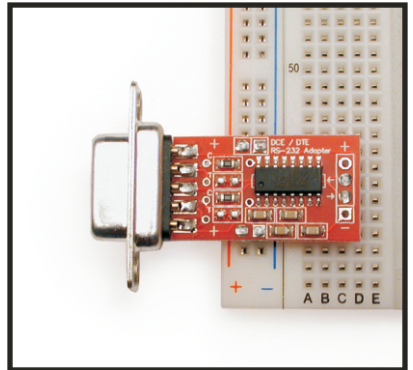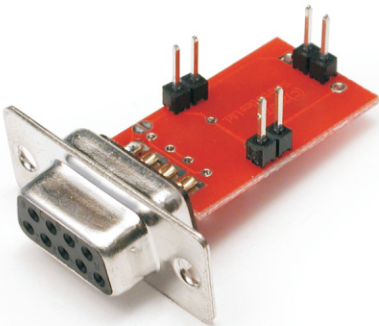
Figure 1: Wired Configuration

Figure 2: Breadboard Mounting

Connections

Power

The RS-232 Driver requires a regulated +5 Volt DC power source. Power can be applied to any of the 3 locations indicated in the Figure 3. The negative terminals are marked by a square pad.

TTL Signals

The TTL-level signals enter and exit via the terminals marked TX and RX in Figure 3. TX stands for "Transmit" and RX is for "Receive".
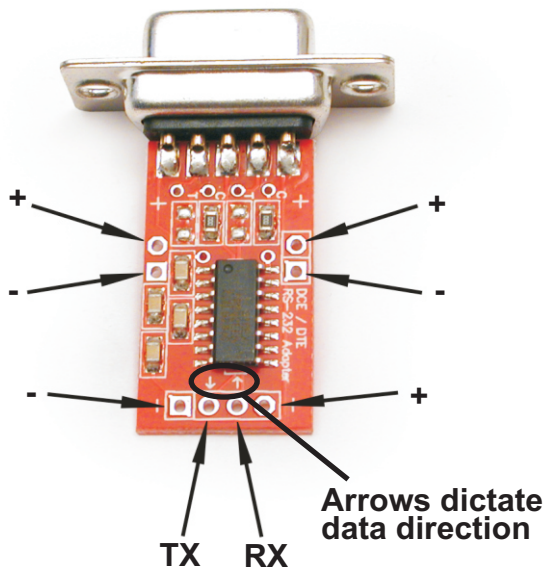

Figure 3: Power & Signal Connections

RS-232 Mode Configuration

Your RS-232 Driver has been pre-configured for DCE or DTE as indicated on the front page of this manual. Should you wish to change the configuration, re-wire the device as per the following section:

DCE Configuration
Sending data from a PC to a TTL device is done by configuring the RS-232 Driver in DCE mode. This is done by soldering zero ohm SMD resistors in the second and fourth locations of the configuration area. See Figure 4(a)

DTE Configuration
To send data from a TTL device to a device expecting signals from a PC then use the DTE configuration. This is done by soldering zero ohm SMD resistors in the first and third locations of the configuration area. See Figure 4(b)

Note: We've pre-configured these units with *zero-ohm* jumper resistors. If need be, you can desolder them and replace them with solder-blobs.
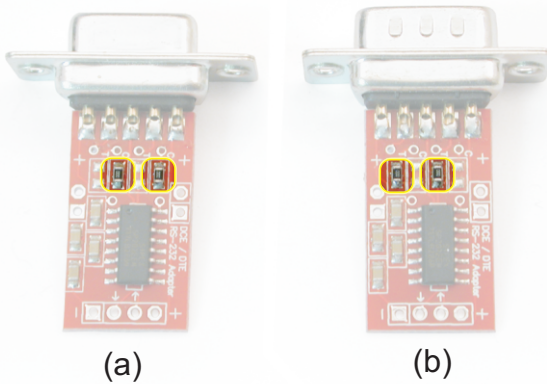

(a)   (b)

Figure 4: Mode Configuration

NOTE: If you purchased the RS-232 Driver in the DCE configuration you will have a FEMALE DB-9 connector. While the gender of the connector will not affect how the device actually operates, it is a widely-accepted convention and if you change the configuration you may find that you need a gender changer to accommodate your cables.

Background Information on RS-232

RS-232 is a point-point communication standard with a maximum specified range of 75 feet. Speeds of over 115 KBaud are possible. High speeds can be problematic at longer distances but low speeds are quite reliable, even at several times the specified maximum range.

Signaling is done using a minimum of 3 Lines (TXD, RXD, GND) and uses ±12VDC to represent the logic levels 0 and 1.

The term TTL stand for Transistor-Transistor Logic and refers to digital logic devices that use 0 and +5 Volts to represent the logic levels 0 and 1 respectively. The RS-232 Driver allows a device designed for TTL signals (such as a microcontroller) to safely communicate with one designed for true RS-232 levels.

Pin Name	Abbr.	Pin #	DCE	DTE
Data Carrier Detect	DCD	1	Output	Input
Receive Data	RXD	2	Output	Input
Transmit Data	TXD	3	Input	Output
Data Ground	GND	5		
Data Set Ready	DSR	6	Output	Input
Request To Send	RTS	7	Input	Output
Clear To Send	CTS	8	Output	Input
Ring Indicator	RI	9	Output	Input

Table 1. RS-232 Wiring (9-Pin)

Cables

The kind of cable used to connect RS-232 devices will have a direct effect on the maximum distance over which reliable communications can be made. The RS-232 specification states a maximum distance of 75 feet or 2500 pF of cable capacitance. This means that if low capacitance cable is used then longer distances can be achieved. For reference, CAT 5 cable has a nominal capacitance of 17 pF/ft which would yield a theoretical maximum cable length of 147 feet at 19.2 Kbaud. Practical experiments have shown that halving the baud rate increases the maximum distance by a factor of 10.

Troubleshooting

Symptom or Error	Probable Cause(s) / Solution(s)
Random or garbled data	Bad ground. Ensure a proper ground connection has been made to the RS-232 Driver
	Incorrect Baud rate. Ensure the baud rate is set to the same speed on both devices
	Incorrect data polarity. Ensure data stream is inverted or non-inverted, as required
No data at all	No Power. Ensure +5 Volts regulated DC (and ground) are applied to each RS-232 Driver
	Transmit and receive signal lines are reversed. Ensure Transmit is connected to "TX", and Receive to "RX"
	No data being sent. Ensure that the device you are expecting data from is actually transmitting

Table 2: Troubleshooting

Technical support is available if you are having problems. If you need help, please provide as much detailed information as possible.
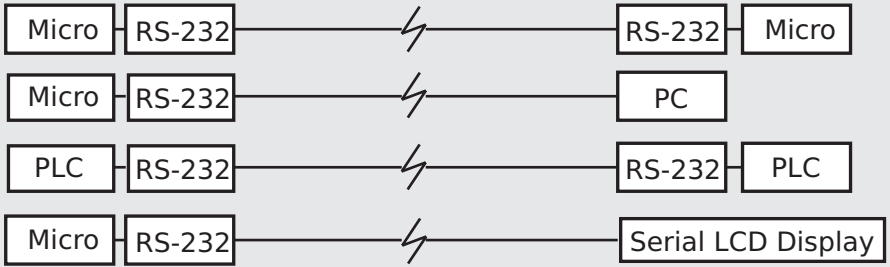
E-mail: support@hvwtech.com
Phone: (403) 730-8603 (Monday - Friday 9am – 5pm Mountain time)

RS-232 Communications Simplified

Connect any TTL Serial Device to any RS-232 Device

Sample Applications

Micro	RS-232	⚡	RS-232	Micro
Micro	RS-232	⚡	PC	
PLC	RS-232	⚡	RS-232	PLC
Micro	RS-232	⚡	Serial LCD Display	

This package contains a fully assembled and tested RS-232 Driver and instructions. The device is pre-configured for DCE or DTE as marked on the front of this package.

Other Neat Solarbotics Products

Serial Communications Adapter (SCA): Convert RS-232 to RS-485. Port powered, and fully transparent - just plug it in and send!

X-Board: A simple serial LCD interface that connects directly to any micro and 2x16/2x20/2x40/4x20 parallel LCD

DIRRS+: A cool IR-ranging distance sensor with serial output (no calculations needed!)

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