



User Information

in accordance with art. 13 of the Legislative Decree of 25th July 2005, no. 15 "Implementation of Directives 2002/95/EC, 2002/96/EC and 2003/108/EC, relative to reduction of the use of hazardous substances in electrical and electronic equipment, in addition to waste disposal". The crossed bin symbol shown on the equipment indicates that at the end of its working life the product must be collected separately from other waste. The user must therefore take the above equipment to the appropriate differentiated collection centres for electronic and electro technical waste, or return it to the dealer when purchasing a new appliance of equivalent type, in a ratio of one to one. Appropriate differentiated waste collection for subsequent recycling, treatment and environment-friendly disposal of the discarded equipment helps to prevent possible negative environmental and health effects and encourages recycling of the component materials of the equipment. Illegal disposal of the product by the user will be punished by application of the administrative fines provided for by the legislative decree no. 22/1997 (article 50 and following of the legislative decree no. 22/1997).

DC485USB

USB ← → RS-485 Converter



Instruction Manual

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1.0 General Information.

The **DC485USB Converter** is a USB \longleftrightarrow RS-485 converter that allows the data communication between devices equipped with **USB Serial Port** and devices equipped with **RS – 485 Serial Port** and is **specifically designed** for the use in conjunction with **our radiomodems of the Radiant and DL*** Series**. Characterised by a **maximum data speed** of **115,200 bps** may be used with any devices equipped with a RS – 485 serial port.

The card is equipped with a **type “B” Micro USB female connector**, to connect it to a USB device, such as a personal computer, and a **four poles screw terminal** to connect the RS – 485 device, such as a PLC, a radiomodem and so on. On the RS-485 side are available four signals: the **“A”** and **“B” lines**, the **common Ground (GND)** of the serial port and a **Power (PWR) Line**, an **active High TTL output**, referred to GND, derived from the **DTR signal** of a RS – 232 serial port, that **may be used as a remote ON/OFF switch**. All these lines are **protected against overvoltage** with transient voltage suppressors.

The converter is fed **through the USB line** and its current consumption is less of **100 mA_{dc}**, therefore is **compatible with all types of USB port**. On each side of the screw terminal are present two Led diodes for the signalling of **RxD, green**, and of **TxD, yellow**.

The device is an **open card** protected by an **AISI 304 stainless steel cover** and is equipped with four rubber feet used as anti slide support. This feet may be easily removed and replaced by a chassis mounting system such as hexagonal spacer.

1.1 Technical Characteristics.

The following Table 1 shows the technical characteristics of the **DC485USB Converter**.

Table 1: Technical characteristics of the DC485USB Converter.

Parameter	Value	Notes
Serial Input	USB 2.0 Full Speed	
Serial Output	RS-485 Half Duplex	
Data format	UART	7 or 8 Data bits / Parity / 1 or 2 Stop bit ⁽¹⁾
Data Speed	300 bps \rightarrow 115.200 bps	Selected after the serial port installation.
Requested Drive	VCP, Virtual COM Port	Free downloadable from FTDI website
Operative Systems	Microsoft, Linux, Mac OS-X	Select the VCP driver adequate to own OS
Supply	+ 5 Vdc, USB Powered	Respects the Suspend Mode condition .
Maximum current absorption	< 100 mA_{dc}	Adequate to all USB ports
A and B RS-485: Voltages	0 – 5 Vdc⁽²⁾	No load condition on data line
A and B RS-485: Currents	$\leq \pm 200$ mA	- incoming, + outgoing, internally limited.
A and B RS-485: Impedances	25 Ω	Impedance of the protection circuitry.

PWR line: Operation	Active High	Equals to the DTR criteria of a RS-232 port
PWR line: Voltages	0 – 5 Vdc⁽²⁾	No load condition on PWR line
PWR line: Currents	≤ ± 8 mA	- incoming, +outgoing.
PWR line: Impedances	440 Ω	Impedance of the protection circuitry.
Connecting cable	A type plug – µUSB B type plug	Standard cable, max. length 3 m (3.28 yd).
Temperature operating range	- 20 + 55 °C (-22°F →+158°F)	
Mechanical dimensions	53 x 31 x 21.50 mm 2.086 x 1.22 x 0.846 inches	Overall dimensions with rubber feet.
Weight	18 g 0.635 oz. av.	Max weight with rubber feet.

NOTES:

- (1) After the **Start Bit**. Practically all format with **10** or **11 bits/word** are accepted.
(2) Equals to the supply voltage outgoing from the USB Port. Normally it is **5 Vdc**.

All stated specifications are subjected to change without notice or obligation

1.2 CE Conformity.

The **DC485USB Converter** is **CE compliant** under the following directives and related modifications:

2006/95/CE “**Low Voltage**” Directive

2004/108/CE “**Electromagnetic Compatibility**” Directive

2.0 Circuit description.

The **DC485USB Converter** utilise the **FT232R** integrated circuit produced by FTDI. This integrated circuit allows the implementation of a **VCP (Virtual COM Port)** in a device equipped with only the USB Port, such as a Personal Computer. To install this VCP, the personal computer requires the **installation of a suitable Driver** that may be selected, as function of the installed OS in the PC, into the Drivers Page of the FTDI website www.ftdichip.com

The TTL input/output from the FT232 are connected to the RS-485 Interface chip, characterised by a low power consumption and protected against overvoltages, followed by the overvoltages protection circuitry utilising the **transient voltage suppressors**.

The USB converter furnishes a **DTR criteria** that may be used as **ON/OFF switch** for the external device. As the serial port lines, also this signal is protected against overvoltages.

A **Supply supervisor circuit** controls the **reset line** of the converter chip to avoid any malfunction due to supply problems.

The whole device show a **current consumption lower than 100 mA**, therefore it **can be connected to any type of USB** port, and it is **completely disabled** when the USB port enters in **Suspend Mode**, keeping the **Fail Safe** bias on the RS- 485 lines and **reducing** the current consumption under **500 µA**.

3.0 Selection and Installation of the VCP Driver. Converter parameters.**3.0.1 Selection and Installation of the VCP Driver.**

To operate correctly, the **DC485USB Converter** needs an appropriate driver that must be installed into the Personal Computer. This driver can be downloaded from the FTDI website and installed into own PC. The FTDI allows the selection of the more adequate driver as function of the used Operative System and the computer architecture. In all cases we recommend the installation of the **stable version** of the driver, if a choice between it and a **Beta version** is available, because the second could be **not fully compatible** with the own computer.

From the Home Page of th FTDI website select Drivers and, successively, VCP Drivers to enter in the related page. Into the driver list select the one compatible with own computer and start the download to install it into the pc. Normally the drivers are available in a **zipped file** with **.zip** extension.

For example with a Windows XP operative system the correct procedure is the following:

- Download the selected driver and save it in a directory.
- Unzip this file with an **unzip program**, such as Winzip or Winrar, and extract the files into a suitable directory, such as **C:\FTDI Driver**, so that may be easy to find them when requested.
- Connect the converter to an USB port and, as happens with any new hardware found, a dialogue box will be opened by Windows to complete the installation procedure. The procedure asks the search of the related and, between the

available choice, select the **search into the computer**, specifying the directory in which are stored the requested files, i.e., the C:\FTDI Driver directory.

- At the end of this procedure the new hardware is installed as a **new COM Port** with an automatically assigned **new number**, for example the **COM4**.

To verify the presence of the new COM port, and its **number**, enter in the **Control Panel > System > Hardware > Device Manager > Ports** and verify the presence of the just installed new COM port. To verify the correct driver association, enter in its **Property** and, selecting the **Driver label**, verify the use of the FTDI driver. If this driver is used the DC485USB converter is correctly installed in the computer and may be used. The serial port characteristics may be set in **Property > Port Settings** page. The maximum **verified port speed** is **115.200 bps**.

3.0.2 Converter parameters.

In the final test each converter is loaded with some configuration parameters that identify the device every time it is connected to a PC. All our converters are characterised with a **unique identification code** to avoid the creation of more than one Virtual Com Port, one for each device, if you have more than one converter.

4.0 Signals of the RS – 485 Serial Port.

4.0.1 A and B lines.

The RS – 485 Port connector is characterised by two data lines, **A** and **B**, and the **Common Reference line (GND)** normally connected to the negative pole of the supply and to the earth. If a shielded cable is used, this point may be used also to connect its shield.

The two lines are **balanced** respect to the **common reference line (GND)**, that is, generally, the **negative pole of the supply voltage**. It's recommended to **connect** also the **common reference line**, between the converter and the device, specially if they are quite far and if the cable may be subjected to the influence of a strong magnetic field or a electrostatic discharge. In these cases is recommended **the use of a shielded cable**, with the precaution to connect its **shield only on one side**, to obtain an **equipotential shield**. Both the **A** and **B** lines are **protected against overvoltages** by the use of **transient voltage suppressors**.

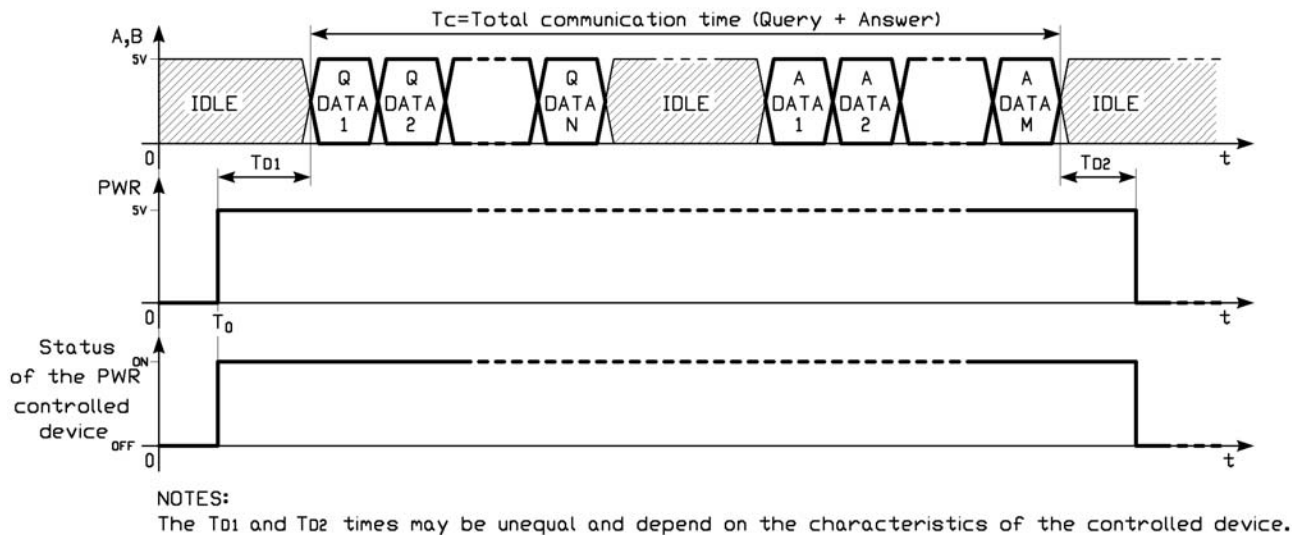
4.0.2 Power (PWR) line.

The DC485USB converter is equipped with an auxiliary **output** signal called **Power (PWR)** that may be used as a **remote switch** of the external device. This is an **active High signal** and it's **referred to Ground (GND)**. The available voltages are **5 Vdc**, when is **High** and **0 Vdc** if it's **Low**. This output is driven by the **DTR criteria** of the Virtual COM Port and, generally, is activated by the application software, that utilises the COM Port. If the application software **does not manage** the DTR of the COM Port, this signal **remains Low** and the external device is **turned OFF**. To use correctly this signal as **remote switching ON/OFF** is necessary to foresee a **delay time** between his activation and the start of data flow, to allow the exhaustion of the **turn ON transient** of the controlled device. At the same manner, at the end of the data flow, a delay time must be inserted between the data end and the turning OFF, to allow the complete data acquisition. These delay times depends on the characteristics of the controlled device and, generally, a delay of **50 or 100 milliseconds** is adequate and may be reduced, but must be experimentally verified.

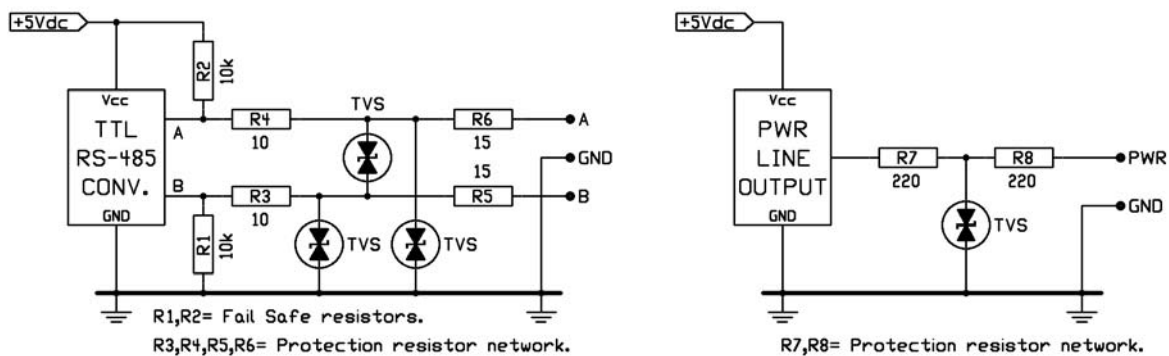
For example, in the devices of the **Radiant series**, this signal is controlled by the **configuration software**, or by some utility software such as the **Radiomodem Test**, in which the required delay times are internally set. This line, as the A and B of the RS-485 serial port, is **protected against overvoltages** and is characterised by an **internal impedance of 450 Ω** therefore it can deliver a current of **2 mA @ 4 Vdc** output, generally adequate to drive a **TTL digital input**. It's possible to connect **directly an optocoupler** between this line and **GND**, without external resistors.

The following Figure 1 shows the correct timing diagram for a correct use of this signal.

Fig. 1: Timing diagram of the PWR line.



As appears clearly the PWR signal must be activated **before** of the communication and must be disabled **after** its end. Of course if the communication foresee a polling cycle of many peripherals it's better to activate the PWR line before the start of the polling cycle and disable it after its end, so that the communication will be not affected by dead times. In the following Figure 2 is present the simplified schematic of the A, B and PWR lines to show the internal impedance. Fig. 2 : Simplified schematics of A, B and PWR line.



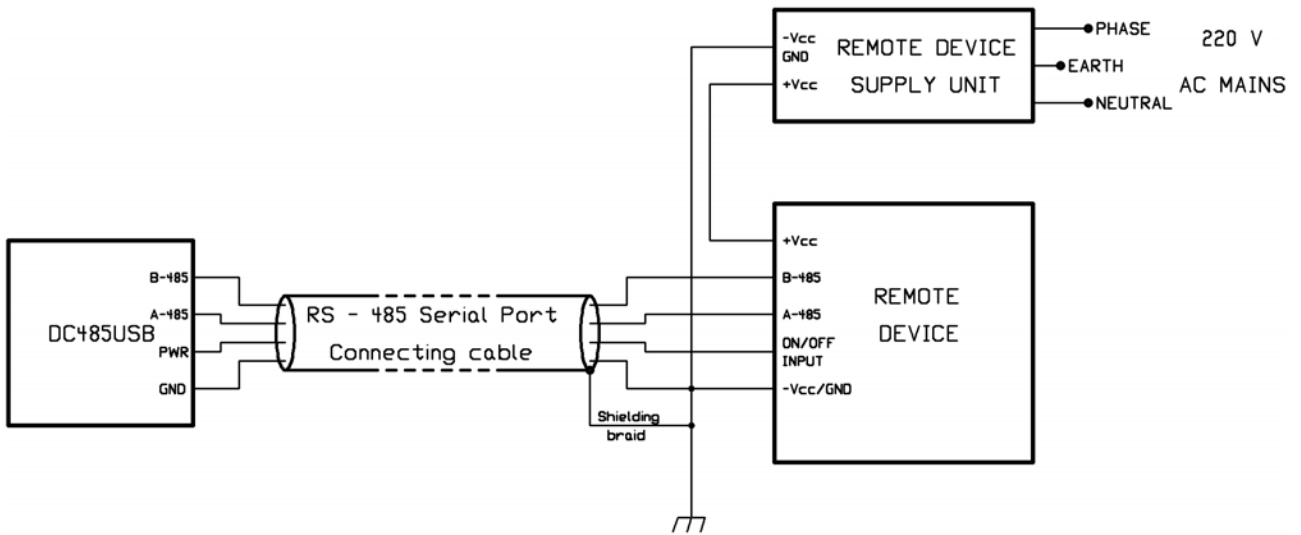
4.0.3 GND line.

The **GND (Ground) line** is the **common reference** for both **A** and **B** lines and for the **PWR line**. It is **electrically connected** to the **GND** of the **USB Port** and **must be connected** to the ground line of the RS – 485 serial port of the external device so that the reference of the two serial port is the same. This is particularly important if the distance between the converter and the device is considerable, and if the negative pole of the remote device feeder is not connected to earth. This line may be used to connect also the shield of the cable connecting it **only on a side**, to obtain the maximum screening efficiency.

4.0.4 Connections to a remote device using the RS – 485 serial port.

The following Figure 3 shows the connection between the DC485USB Converter and a remote device using the RS – 485 serial port and the PWR line as remote switching control. In this case the connecting cable, eventually shielded if the distance are considerably, **must contain 4 wires**: the **A** and **B** lines, the **PWR line** and the **common Ground (GND) line**. The shielding braid of the cable **must be connected only on one side** so that it is **equipotential**. In the figure is clearly shown as the negative pole of the supply of the remote device is connected to the GND line of the converter, to realise a common reference for the data lines. This reference point is normally, for obvious reasons of electrical safety, connected to earth.

Fig. 3: Wiring of the DC485USB Converter and remote device.



If the **PWR signal** is not used, the connecting cable may contains only 3 wires plus the shielding braid.

5.0 Mechanical characteristics.

The following Figure 4 shows the mechanical outline of the DC485USB Converter. All dimensions are in millimeters (inches).

