TECH TIP

TIPS FOR USING

PORT POWERED CONVERTERS

Introduction

When using or installing any RS-232 port powered device, it is important to keep a few things in mind. The two main items are the **Power Available** from the RS-232 port and the **Power Dissipated** by the RS-422 or RS-485 system.

POWER DISSIPATION

The power dissipated when using a port powered converter is consumed by:

a) The cable on RS-232 side of converter
b) The termination resistors used on RS-422 or RS-485 transmission line
c) The RS-422 or RS-485 cable
d) The port powered converter

In this discussion, it is assumed that the RS-232 cable is short, 1.8 meters (6 ft), so that the RS-232 cable power is insignificant. The power dissipated by a typical B+B SmartWorx port-powered converter is 50 mW.

Figure 1 shows the power dissipated by 600 meters (2000 ft) and 1200 meters (4000 ft) of transmission line (unterminated). For the data shown in Figure 1, the RS-422 line driver was not power-limited by an RS- 232 port. This table clearly shows that the line power increases as the data rate increases. In this example, the transmission line used is a high quality polyethylene cable recommended for RS-422 and RS-485 applications.

The port-powered converter is operating at the highest power consumption when it is transmitting data to the RS-422 or RS-485 line. All available power, that is not used by the internal converter circuit, is used to drive power to the transmission line.

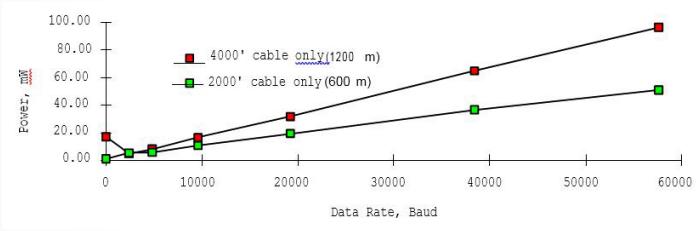

Figure 1. Power vs Baud Rate

The power dissipated by the termination resistors is significant (75 mW for a very short transmission line). Under certain conditions, it is not necessary to terminate the RS-422 or RS-485 transmission line. If the system is operating at low speed or short cable lengths, it does not need to be terminated. Low speed is considered to be signaling rates below 200 kbits/second or when the cable delay (time required for an electrical signal to transverse the cable) is substantially shorter than the bit width or when the signal rise time is more than four times the one-way propagation delay of the cable (i.e. not a transmission line).

As a general rule, if the signal rise time is greater than four times the propagation delay of the cable, the cable is no longer considered a transmission line. For most cables that are 1200 meters (4000 ft) or shorter and baud rates at 19.2k baud or lower, termination is not required.

RS-232 PORT AS A POWER SUPPLY

An RS-232 port can supply only limited power to another device. The number of output lines, the type of interface driver IC, and the state of the output lines are important considerations.

The types of driver ICs used in serial ports can be divided into three general categories:

- Drivers that require plus (+) and minus (-) voltage power supplies such as the 1488 series of interface integrated circuits. (Most desktop and tower PCs use this type of driver.)
- Low power drivers that require one +5 Volt power supply. This type of driver has an internal charge pump for voltage conversion. (Many industrial microprocessor controls use this type of driver.)
- Low voltage (3.3V) and low power drivers that meet the EIA-562 Standard. (Used on notebooks and laptops.)

Table 1 is a comparison of several types of driver ICs. For driver ICs, their ability to deliver power is greater if the output of the driver is in the positive voltage state.

Table 1. Comparison of RS-232 Drivers

Type of RS-232 Driver	State of Line	Voltage @ Current – per driver at max. power	Power Available – from 3 drivers
1488	Positive	+5V @ 6.5 mA	98 mW
1488	Negative	-5V @ 6.5 mA	78 mW*
Charge Pump (MAX232)	Positive	+5V @ 5 mA	75 mW
Charge Pump (MAX232)	Negative	-5V @ 3.5 mA	42 mW*
EIA-562	Positive	+4.5V @ 1.5 mA	none
EIA-562	Negative	-4.5V @ 1.5 mA	none

* The voltage inverter in the port powered converter dissipates power when converting -v.

WHAT TYPE OF DRIVER DO I HAVE ON MY PORT?

To determine the type of driver used on a serial port without looking at the ICs, put a 3K Ohm load on the driver output line to signal ground and measure the voltage. If possible, measure the voltage under both (+) and (-) voltage conditions. These voltage measurements should give values as shown below.

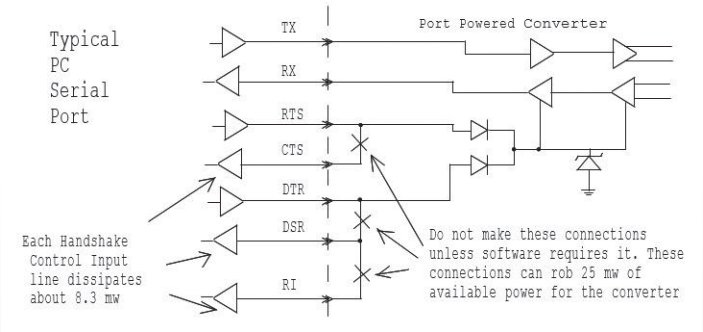

Figure 2. PC Serial Port Used With Port-Powered Converter

LOOP BACK CONNECTIONS

Many port-powered converters have loop back connections, such as RTS connected to CTS. These loop back connections each dissipate about 8.3 mW per input line. The only reason to make these connections is that some software requires these connections. If you have control over the software, change the software so that the loop back conditions are not required. Also, do not complete loop back connections in the cables you are using. See Figure 2.

SUMMARY OF TIPS

- Connect all port driver lines to the converter.
- Keep all unused port driver lines in positive voltage state.
- Determine if the port can drive the converter (what type of driver).
- Don't terminate the transmission line, if not necessary.
- Don't make loop back connections, if not necessary.

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B+B SmartWorx
Powered by ADVANTECH

Enabling An Intelligent Planet

Worldwide Headquarters
Taiwan
ADVANTECH
No. 1, Alley 20, Lane 26, Rueiguang Road,
Neihu District, Taipei 11491, Taiwan, R.O.C.
Toll Free: 0800-777-111
www.advantech.com

US Corporate Headquarters
707 Dayton Road
Ottawa, IL 61350 USA
Phone: 1-815-433-5100
Fax: 1-815-433-5109
orders@advantech-bb.com
www.advantech-bb.com

Cellular Product Group
Sokolská 71, 562 04 Ústí nad Orlicí III.
Czech Republic
Phone: +420 465 521 020
Fax: +420 464 647 299
GSM: +420 603 872 287
cellularsales@advantech-bb.com

OEM & Product Modification
Phone: 815-433-5222
Fax: 815-433-5104
Attn: Custom Dept.
custom@advantech-bb.com
Custom Quote Request Form:
www.advantech-bb.com/custom

European Headquarters
10 Westlink Commercial Park
Oranmore, Co. Galway, Ireland
Phone: +353 91 792444
Fax: +353 91 792445
eSales@advantech-bb.com

Middle East, UAE, Africa
AG Silver Tower, JLT, P.O. Box 48777
Dubai, UAE
Mobile: +971 50 943 65 62
mdeast-afrsales@advantech-bb.com

Latin America, Caribbean
Phone: 1-727-797-0300
Cell: 1-727-480-5920
latamsales@advantech-bb.com

advantech-bb.com