RS-485 Auto-direction on ICOP Boards

2005-05-05

The RS 232 is well-known due to popularity of today's PC's, while the RS422 and RS 485 are less notable. However, these communication hardware are used in industry for control systems and data transfers (small volumes, no hundreds of Mb/s).

Main difference and comparison of RS 422, RS 485, with RS 232

RS-232 – is a point-to-point communication: one port, one device The RS 232 signals are represented by voltage levels with respect to ground. There is a wire for each signal, together with the ground signal (reference for voltage levels). There is a limitation in cable length of about 30 to 60 meters maximum. RS-232 is a point-to-point communication at slow speeds. For example, port COM1 in a PC can be used for a mouse, port COM2 for a modem, etc

RS 422 & 485 uses a different principle: Each signal uses one twisted pair (TP) line - two wires twisted around themselves. We refer this to as “Balanced data transmission”, or “Differential voltage transmission”.

RS-422 – is also intended for point-to-point communications, like RS 232. However, the RS 422 uses two separate TP wires, data can be transferred in both directions simultaneously. RS 422 is often used to extend a RS 232 line, or in industrial environments.

RS 485 – used for multipoint communications: more devices may be connected to a single signal cable - similar to e.g. Ethernet networks, which use coaxial cable. Most RS 485 systems use Master/Slave architecture, where each slave unit has its unique address and responds only to packets addressed to this unit. These packets are generated by Master (e.g. PC), which periodically polls all connected slave units. Both RS 422 & 485 cable can be up to 1,200 meters (4,000 feet) long, and commonly available circuits work at 2.5 MB/s transfer rate. From a network point of view, the RS 485 incorporates a bus topology. Since Slave stations have no means of starting the communication without a risk of collision, they need to be assigned a 'right to transmit' by the Master station. Assignment is done centrally via pooling.

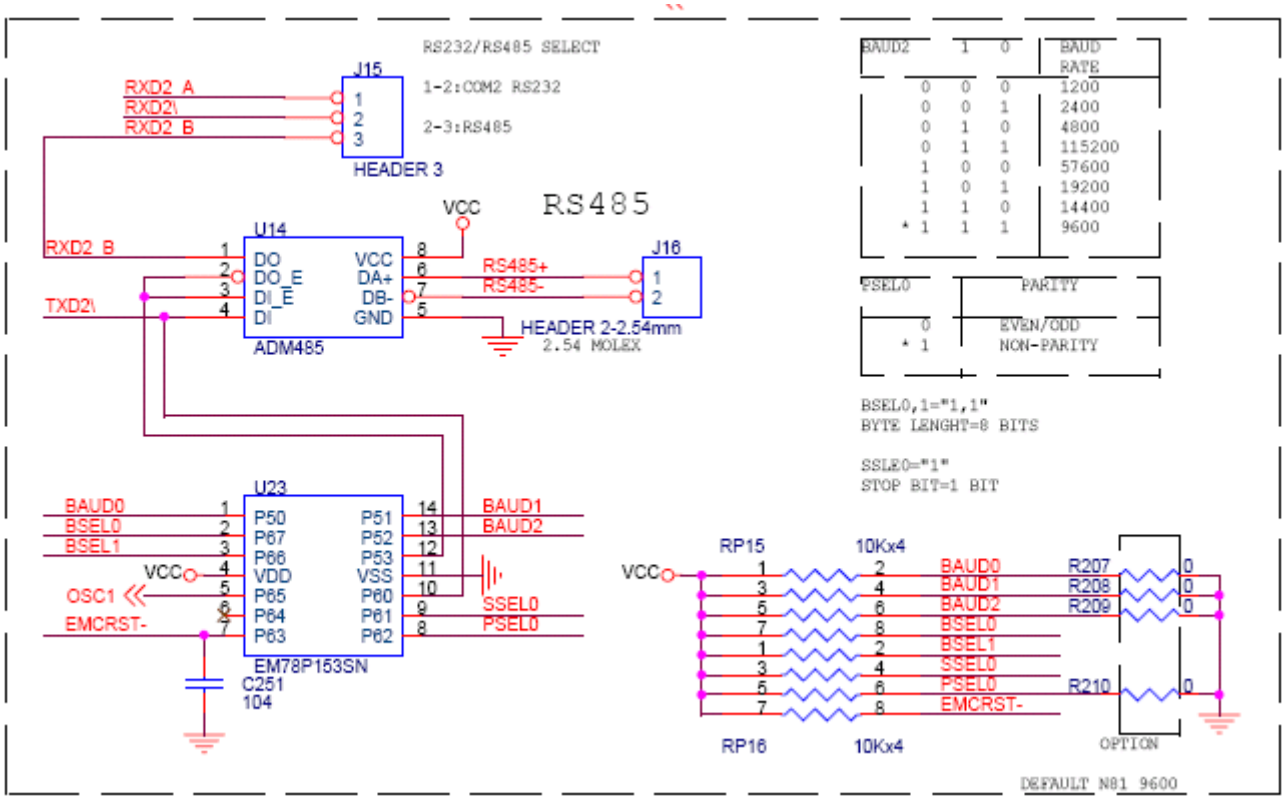
RS-485 driver differs from RS-422, and can be put into a high impedance, tri-state mode, which allows other drivers to transmit over the same pair of wires. There are two methods of tri-stating an RS-485 driver – The first method is to use a control line, often the RTS handshake line, to enable and disable the driver. This requires that the host software raise the RTS line before beginning a transmission to enable the driver, then lower the RTS line after the completion of the transmission.

The second method of RS-485 driver control is referred to as an Automatic Send Data Control. This type of control involves special circuitry that senses when data is being transmitted and automatically enables the driver as well as disabling the driver within one character length of the end of transmission. This is the preferred method of driver control since it reduces software overhead and the number of potential pitfalls for the programmer. This provides

the auto-direction function.

Most of the ICOP boards with RS-485 needs to set RTS pin in order to control data flow direction. The New RS-485 provides automatic direction detection circuit, in which the programmer can use RS-485 function more easily -- by just conducting read/write data via RS-485 port, without needing to set RTS pin.

Herewith is the new circuitry for RS-485 auto-direction:



Because of the additional circuit that needs serial port setting (baud rate, parity, stop bits and data length) to detect data flow. So, the serial port configuration should be coordinated with hardware setting. Default hardware configuration for data detection is: **no parity, data length is 8 bits, one stop bit and baud rate is 9600 bps (N, 8, 1, 9600)**. If serial port setting is different with hardware configuration, some resistors must be altered and changed.

Here are the jumpers setting tables:

Baud Rate	BAUD2	BAUD1	BAUD0
1200	0	0	0
2400	0	0	1
4800	0	1	0
*9600	1	1	1
14400	1	1	0
19200	1	0	1
57600	1	0	0
115200	0	1	1

Parity	PSEL0
EVEN/ODD	0
*NON-PARITY	1

Byte Length	BSEL0	BSEL1
5	0	0
6	0	1
7	1	0
*8	1	1

Stop Bit	SSEL0
1.5	0
*1	1

PS: The data with “*” is default setting.

Refer the above tables to modify the hardware configuration in order to fit your desired software requirement. For example: if baud rate is 19,200 bps, please remove the resistor (R208) on BAUD1 pin. If even or odd parity is required, remove the resistor (R210) connection to PSEL0 pin.

After setting the hardware configuration for RS-485, the programmer can read/write it as RS-232. There is no need to set RTS pins for data direction. The only thing that you need to care about is data collision. Because the RS-485 on ICOP boards is half duplex, so the software programmer needs to handle data collision.

Application

RS-485 Autodirection are best applied in two popular industrial fields: They are the Repeater for UMTS Technology, and Data acquisition for AMR industry The popularity of UMTS Technology is wide spreading rapidly throughout Europe (where it is also called “SPHERAL”, the application is for Video on Mobile phone) ICOP provided a CPU module solution that manages and controls Video signal amplifier for repeater. UTMS stands for "Universal Mobile Telecommunications System” and represents an evolution in terms of services and data speeds from today's "second generation" mobile networks of third generation (3G) mobile technologies identified by the ITU. UMTS represents a customer base of 850 million end users in 195 countries (representing over 70% of today's digital wireless market). UTMS Services is already launched in Austria, Australia, Italy, Japan, Sweden and UK (source: GSM Association). On the other hand, AMR (Automatic Metering Readers) are commonly used in energy sector for offering consumption of water, gas, electricity, industrial chemical fluids, … wherein the amount of energy consumed is measured and recorded as data and transfer to the provider for billing purposes.

Technical Support

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