APPLICATION NOTE

Programming Serial Ports in RS422/RS485 Mode
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Revision History

03/26/2004  Revision A issued.
           New manual naming method.

06/11/2004  Revision B issued.
           Removed references to ANC115.
           Cleaned up formatting.
           Cleaned up copyright and trademarks.
           Added section for Linux

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Introduction

All cpuModules and utilityModules CM310, CM312, CM313 designed by Real Time Devices have serial ports which support RS232 and RS422/485. RS-232 is a well known interface used to connect a computer to serial mice, modems and other devices. RS422/485 is less popular but it has some advantages such as cable length up to 4000 feet and the option to connect up to 32 computers/devices in a network. Due to the fact that there are no standard RS422/485 devices (like mice or modems) users need to develop their own protocol and software for serial communication with RS422/485. For more details on RS422/485 see a book: Jan Axelson “Serial Port Complete” ISBN 0965081923

Programming

In software, using RS422/485 is very similar to using RS232. One difference is that when using interface RS422/485 several computers can be connected together. When connecting more then 2 nodes some form of arbitration is needed. The user must develop a protocol to make sure that no two devices send data at the same time. Usually, communication is initiated by a specified master computer. The other computer/device transmits data in reply to the master’s request. All other computers/devices would stay in receiving mode with disabled sending (line break). To control sending, the RTS signal is used. On all RTD boards, a low RTS signal enables sending and high RTS disables it. Hardware flow control is not used for RS422/485 communications because RTS is in use.

DOS Example Code

/**************************************************************************
 File Name:    DRVR485.C
 Operating System:   ROM-DOS
 Compiler:    Borland C++ 3.1
 Version:     1.0
**************************************************************************/

//send a string to the other computer
//address - address of the other computer/device
// commandString - pointer to a string to send
// returns TRUE if string sent,
// FASLE if error occur

BOOL sendString(char address, char* commandString) {
    char byteToSend=0;
    //flag that sets when TX buffer is ready to get more bytes
    char checkbuffer = 0x20;
    /* Turn RTS off to enable transmission*/
    outportb(portVar.PORT + 4 , 0x09);
    outportb(portVar.PORT, address);
    while (1) {
        // wait for buffer ready or empty (depending on buffercheck)
        // wait until buffer is ready
        while((inportb(portVar.PORT+5) & checkbuffer) == 0x00);
        if (TERMINATION==byteToSend) break;
    }
}
if (*commandString) {
    byteToSend = *commandString;
    commandString++;
} 
else {
    byteToSend = TERMINATION;
    checkbuffer = 0x40;  //flag that sets when TX buffer is empty
}
outportb(portVar.PORT, byteToSend);
} 
/* Turn RTS on to disable transmission */
outportb(portVar.PORT + 4 , 0x0B);
return TRUE;

**Windows Example Code**

This code is a modified Visual C++ 6.0 example from the Microsoft Development Network (MSDN). The original example program can be downloaded from the following URL:


/ **************************************************************************
File Name : TTY.C
Operating System : Windows 95, 98, ME, NT, 2000, XP
Compiler : Visual C++
Version : 6.0

* This is a part of the Microsoft Source Code Samples.
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**************************************************************************/

To make this program work with interface RS422/485 need to modify the following code of the original program:

1) In function
BOOL NEAR SetupConnection( HWND hWnd )
Replace code:
if (bSet)
   dcb.fDtrControl = DTR_CONTROL_HANDSHAKE ;
else
   dcb.fDtrControl = DTR_CONTROL_ENABLE ;

with the following code:
   dcb.rRtsControl = RTS_CONTROL_DISABLE;  //disable hardware flow control

2) In function
BOOL NEAR WriteCommBlock( HWND hWnd, LPSTR lpByte , DWORD dwBytesToWrite)

After code:
if (NULL == (npTTYInfo = GETNPTTYINFO( hWnd )))
   return ( FALSE ) ;

need to insert the following code:
EscapeCommFunction( COMDEV(npTTYINFO), CLRRTS); // Clear RTS right before
// starting transmitting

3) In function
DWORD FAR PASCAL CommWatchProc( LPSTR lpData )

Need to replace the following code:
if (!SetCommMask( COMDEV( npTTYInfo ), EV_RXCHAR ))
   return ( FALSE ) ;

With the following:
if (!SetCommMask( COMDEV( npTTYInfo ), EV_RXCHAR|EV_TXEMPTY ))
   return ( FALSE ) ; // Add the event to monitor: empty transmitting buffer

After the following code:
WaitCommEvent( COMDEV( npTTYInfo ), &dwEvtMask, NULL );

Need to add the following code:
if ((dwEvtMask & EV_TXEMPTY) == EV_TXEMPTY) {
   EscapeCommFunction( COMDEV( npTTYInfo ), SETRTS ) ; // Set RTS
   // immediately after transmitting is done
}

**Linux Example Code**

For an example of how to use RS422/485 serial port mode under Linux, please see the Software Product SWP-700020032 "RS422/485 Serial Port Mode Example Program for Linux” available from the RTD web site.