



Serial Port Routines Without Using the RTCC

INTRODUCTION

The PIC16C5X has one 8-bit timer (RTCC) which can use an 8-bit prescaler. In some instances, the user would like to use this timer for some other purposes and yet be able to do a transmit and receive using the serial port. This application note offers routines to do a simple 8-bit transmit and receive with no handshake, at baud rates from 1200 to 9600. Please note that these routines use a timed loop which is as accurate as the clock which drives the PIC16C5X. The user enters the frequency and baud rate desired. The calculated value "delay" in the serial routine has to be an 8-bit value only. If the value is greater than 8-bits, the frequency and baud rate values have to be changed.

CONCLUSION

Simple transmit and receive routines can be written without using RTCC to generate the baud rate.

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APPENDIX A

MPASM 00.00.66 Beta

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```
LOC OBJECT CODE      LINE SOURCE TEXT
                                0001 ;
                                0002 ;These routines were written to work on the PICDEM1 hardware.
                                0003 ; The frequency of the clock is 16 Mhz and the hardware uses no
                                0004 ;handshake
                                0005 ;      TX -> RA3
                                0006 ;      RX -> RA2
                                0007      list p=16c54,f=inhx8m
                                0008 ;
00F4 2400              0009 clockrate equ .16000000
2580                   0010 baudrate equ  .9600
                                0011 ;
003D 0900              0012 fclk equ    clockrate/4
                                0013 ;*****
                                0014 ;The value baudconst must be a 8 bit value only
0088                   0015 baudconst equ    ((fclk/baudrate)/3 - 2)
                                0016 ;*****
0010                   0017 count  equ    0x10
0011                   0018 txreg  equ    0x11
0011                   0019 rcreg  equ    0x11
0012                   0020 delay  equ    0x12
0013                   0021 tempa  equ    0x13
0010                   0022 hi     equ    0x10
0011                   0023 lo     equ    0x11
0015                   0024 gpram  equ    0x15
                                0025 ;
                                0026      include "pic5x.h"
                                0001 ;This is the common header file for all PIC16C5X parts.
                                0002 ;
                                0003 ;
                                0004      CBLOCK 0x00
0000 0005              0005          _indf, _rtcc, _pcl, _status, _fsr
0005 0002              0006          _porta, _portb
                                0007      ENDC
                                0008 ;
                                0009 ; Porta Bits
0001                   0010 #define    _ra0          _porta,0
0002                   0011 #define    _ra1          _porta,1
0003                   0012 #define    _ra2          _porta,2
0004                   0013 #define    _ra3          _porta,3
                                0014
                                0015
                                0016 ; Portb bits
0005                   0017 #define    _rb0          _portb,0
0006                   0018 #define    _rb1          _portb,1
0007                   0019 #define    _rb2          _portb,2
0008                   0020 #define    _rb3          _portb,3
0009                   0021 #define    _rb4          _portb,4
000A                   0022 #define    _rb5          _portb,5
000B                   0023 #define    _rb6          _portb,6
000C                   0024 #define    _rb7          _portb,7
                                0025 ;
                                0026 ; STATUS Reg Bits
000D                   0027 #define    _carry        _status,0
000E                   0028 #define    _c           _status,0
000F                   0029 #define    _dc          _status,1
0010                   0030 #define    _z           _status,2
0011                   0031 #define    _pd          _status,3
0012                   0032 #define    _to          _status,4
0013                   0033 #define    _pa0         _status,5
0014                   0034 #define    _pa1         _status,6
                                0035 ;
                                0026
```

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```
0015          0027 ;
0016          0028 #define _tx      _porta,3
0016          0029 #define _rx      _porta,2
0016          0030 ;
0016          0031          org      0
0016          0032 start
0000 095A     0033          call    wait
0001 0C0F     0034          movlw  B'00001111'
0002 0025     0035          movwf  _porta
0003 0C07     0036          movlw  B'00000111'
0004 0005     0037          tris   _porta
0005 0066     0038          clrf   _portb
0006 0040     0039          clrsw  _portb
0007 0006     0040          tris   _portb
0008 0CA5     0041          movlw  0xa5
0009 0195     0042          xorwf  gpram,w
000A 0643     0043          btfsc  _z
000B 0964     0044          call   Mclr
000C 0CA5     0045          movlw  0xa5
000D 0035     0046          movwf  gpram
0016          0047 ;
0016          0048 ;
000E 0C2F     0049          movlw  0x2f
000F 0033     0050          movwf  tempa
0010 0C38     0051          movlw  B'00111000'
0011 0002     0052          option
0012 0061     0053          clrf   _rtcc
0016          0054 Slcheck
0013 0201     0055          movf   _rtcc,w
0014 0643     0056          btfsc  _z           ;if S1 pressed then skip
0015 0A13     0057          goto  Slcheck
0016          0058 ;
0016          0059 next
0016 02B3     0060          incf   tempa
0017 06F3     0061          btfsc  tempa,7
0018 0A61     0062          goto  AllDone
0019 0213     0063          movf  tempa,w
001A 0920     0064          call  transmit
001B 0937     0065          call  receive
001C 0093     0066          subwf  tempa,w
001D 0643     0067          btfsc  _z
001E 0A47     0068          goto  fail
001F 0A16     0069          goto  next
0016          0070 ;
0016          0071 ;
0016          0072 transmit
0020 0031     0073          movwf  txreg
0021 0465     0074          bcf   _tx           ;send start bit
0022 0C88     0075          movlw  baudconst
0023 0032     0076          movwf  delay
0024 0C09     0077          movlw  .9
0025 0030     0078          movwf  count
0016          0079 txbaudwait
0026 02F2     0080          decfsz delay
0027 0A26     0081          goto  txbaudwait
0028 0C88     0082          movlw  baudconst
0029 0032     0083          movwf  delay
002A 02F0     0084          decfsz count
002B 0A30     0085          goto  SendNextBit
002C 0C09     0086          movlw  .9
002D 0030     0087          movwf  count
002E 0565     0088          bsf   _tx           ;send stop bit
002F 0800     0089          return
0016          0090 SendNextBit
0030 0331     0091          rrf   txreg
0031 0703     0092          btfss  _c
0032 0A35     0093          goto  Set10
0033 0565     0094          bsf   _tx
0034 0A26     0095          goto  txbaudwait
```

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```
0035 0465      0096 Setlo
0036 0A26      0097          bcf      _tx
                                0098          goto    txbaudwait
                                0099 ;
                                0100 ;
                                0101 receive
0037 0645      0102          btfsc   _rx
0038 0A37      0103          goto    receive      ;wait for receive
                                0104 rxbaudwait
0039 02F2      0105          decfsz  delay
003A 0A39      0106          goto    rxbaudwait
003B 0C88      0107          movlw   baudconst
003C 0032      0108          movwf   delay
003D 02F0      0109          decfsz  count
003E 0A42      0110          goto    RecvNextBit
003F 0C09      0111          movlw   .9
0040 0030      0112          movwf   count
0041 0800      0113          return
                                0114 RecvNextBit
0042 0403      0115          bcf      _c
0043 0645      0116          btfsc   _rx
0044 0503      0117          bsf      _c
0045 0331      0118          rrf      rcreg
0046 0A39      0119          goto    rxbaudwait
                                0120 ;
                                0121 fail
0047 0266      0122          comf    _portb
0048 094A      0123          call   halfsec
0049 0A47      0124          goto    fail
                                0125 halfsec
004A 0070      0126          clrf   hi
004B 0071      0127          clrf   lo
                                0128 hslowp
004C 0000      0129          nop
004D 0000      0130          nop
004E 0000      0131          nop
004F 0000      0132          nop
0050 0000      0133          nop
0051 0000      0134          nop
0052 0000      0135          nop
0053 0000      0136          nop
0054 0000      0137          nop
0055 02F1      0138          decfsz  lo
0056 0A4C      0139          goto    hslowp
0057 02F0      0140          decfsz  hi
0058 0A4C      0141          goto    hslowp
0059 0800      0142          return
                                0143 ;
                                0144 wait
005A 0070      0145          clrf   hi
005B 0071      0146          clrf   lo
                                0147 dly
005C 02F1      0148          decfsz  lo
005D 0A5C      0149          goto    dly
005E 02F0      0150          decfsz  hi
005F 0A5C      0151          goto    dly
0060 0800      0152          return
                                0153
                                0154 ;
                                0155 AllDone
0061 0C55      0156          movlw   0x55
0062 0026      0157          movwf   _portb
0063 0A63      0158          goto    $
                                0159 ;
                                0160 Mclr
0064 0066      0161          clrf   _portb
0065 00E6      0162          decf   _portb
0066 0075      0163          clrf   gpram
                                0164 S3check
```

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```
0067 0625          0165          btfsc  _ral
0068 0A67          0166          goto   S3check
0069 0066          0167          clrf  _portb
006A 0A6A          0168          goto   $
                   0169 ;
                   0170 ;
                   0171          org    0x1fff
01FF 0A00          0172          goto   start
                   0173 ;
                   0174          end
                   0175
                   0176
                   0177
                   0178
                   0179
                   0180
                   0181
```

MEMORY USAGE MAP ('X' = Used, '-' = Unused)

```
0000 : XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX
0040 : XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXX- _____

0180 : _____
01C0 : _____X
```

All other memory blocks unused.

```
Errors   :    0
Warnings :    0
```



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NOTES:

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