



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          clrw
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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```
0096 Setlo
0035 0465      0097      bcf      _tx
0036 0A26      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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