
Serial Port Routines Without Using Timer0

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CONCLUSION

Simple transmit and receive routines can be written without using Timer0 to generate the baud rate.

INTRODUCTION

The PIC16C5X has one 8-bit timer (Timer0) which can use an 8-bit prescaler. In some instances, the user would like to use this timer for some other purpose 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.

AN593

Please check the Microchip BBS for the latest version of the source code. Microchip's Worldwide Web Address: www.microchip.com; Bulletin Board Support: MCHIPBBS using CompuServe® (CompuServe membership not required).

APPENDIX A: SER54.ASM

MPASM 01.40 Released

SER54.ASM 1-16-1997 17:32:17

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LOC OBJECT CODE      LINE SOURCE TEXT
VALUE

00001 ;
00002 ;These routines were written to work on the PICDEM1 hardware.
00003 ;The frequency of the clock is 16Mhz and the hardware uses no
00004 ;handshake
00005 ;      TX -> RA3
00006 ;      RX -> RA2
00007 ;
00008 ; Program:          SER54.ASM
00009 ; Revision Date:
00010 ;                12-12-95  Compatibility with MPASMWIN 1.30
00011 ;
00012 ;*****
00013 ;
00014      list      p=16c54
00015 ;
00F42400 00016 clockrate equ  .16000000      ;define clock rate here
00002580 00017 baudrate  equ  .9600              ;define baud rate here
00018 ;
003D0900 00019 fclk      equ  clockrate/4
00020 ;*****
00021 ;The value baudconst must be a 8 bit value only
00000088 00022 baudconst  equ  ((fclk/baudrate)/3 - 2)
00023 ;*****
00000010 00024 count     equ  0x10              ;used to count tx and rx data bits
00000011 00025 txreg     equ  0x11              ;used as temp transmit register
00000011 00026 rcreg     equ  0x11              ;received char is saved here
00000012 00027 delay    equ  0x12              ;used to time the baud rate.
00000013 00028 tempa    equ  0x13
00000010 00029 hi       equ  0x10
00000011 00030 lo       equ  0x11
00000015 00031 gpram    equ  0x15
00032 ;
00033      include "p16c5x.inc"
00001      LIST
00002 ; P16C5X.INC Standard Header File, Version 3.30 Microchip Technology, Inc.
00224      LIST
00034
00035 #define _ral      PORTA,1
00036
00037 ;
00038 #define _tx       PORTA,3
00039 #define _rx       PORTA,2
00040 ;
0000      00041      org      0
0000      00042 start
0000 095A 00043      call    wait
0001 0C0F 00044      movlw  B'00001111'
0002 0025 00045      movwf  PORTA
0003 0C07 00046      movlw  B'00000111'      ;RA3 = output, RA2 = input
0004 0005 00047      tris  PORTA
0005 0066 00048      clrf  PORTB      ;port b all outputs
0006 0040 00049      clrw
0007 0006 00050      tris  PORTB
0008 0CA5 00051      movlw  0xa5      ;test of gpram check if...
```

```

0009 0195    00052      xorwf   gpram,W           ;reset was POR or MCLR low
000A 0643    00053      btfs   STATUS,Z         ;gpram = 0xa5?
000B 0964    00054      call   Mclr             ;yes then do Mclr routine
000C 0CA5    00055      movlw  0xa5            ;else load 0xar in gpram
000D 0035    00056      movwf  gpram
                00057 ;
                00058 ;
000E 0C2F    00059      movlw  0x2f
000F 0033    00060      movwf  tempa
0010 0C38    00061      movlw  B'00111000'
0011 0002    00062      option
0012 0061    00063      clrf   TMR0
0013        00064 Slcheck
0013 0201    00065      movf   TMR0,W
0014 0643    00066      btfs   STATUS,Z         ;if S1 pressed then skip
0015 0A13    00067      goto  Slcheck
                00068 ;
0016        00069 next
0016 02B3    00070      incf   tempa, F
0017 06F3    00071      btfs   tempa,7
0018 0A61    00072      goto  AllDone
0019 0213    00073      movf   tempa,W
001A 0920    00074      call  transmit
001B 0937    00075      call  receive
001C 0093    00076      subwf  tempa,W
001D 0643    00077      btfs   STATUS,Z
001E 0A47    00078      goto  fail
001F 0A16    00079      goto  next
                00080 ;
                00081 ;
0020        00082 transmit
0020 0031    00083      movwf  txreg
0021 0465    00084      bcf    _tx              ;send start bit
0022 0C88    00085      movlw  baudconst
0023 0032    00086      movwf  delay
0024 0C09    00087      movlw  .9
0025 0030    00088      movwf  count
0026        00089 txbaudwait
0026 02F2    00090      decfsz delay, F
0027 0A26    00091      goto  txbaudwait
0028 0C88    00092      movlw  baudconst
0029 0032    00093      movwf  delay
002A 02F0    00094      decfsz count, F
002B 0A30    00095      goto  SendNextBit
002C 0C09    00096      movlw  .9
002D 0030    00097      movwf  count
002E 0565    00098      bsf    _tx              ;send stop bit
002F 0800    00099      return
0030        00100 SendNextBit
0030 0331    00101      rrf    txreg, F
0031 0703    00102      btfs   STATUS,C
0032 0A35    00103      goto  Setlo
0033 0565    00104      bsf    _tx
0034 0A26    00105      goto  txbaudwait
0035        00106 Setlo
0035 0465    00107      bcf    _tx
0036 0A26    00108      goto  txbaudwait
                00109 ;
                00110 ;
0037        00111 receive
0037 0645    00112      btfs   _rx
0038 0A37    00113      goto  receive          ;wait for receive
0039        00114 rxbaudwait
0039 02F2    00115      decfsz delay, F
003A 0A39    00116      goto  rxbaudwait
003B 0C88    00117      movlw  baudconst

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```
003C 0032    00118      movwf  delay
003D 02F0    00119      decfsz count, F
003E 0A42    00120      goto   RecvNextBit
003F 0C09    00121      movlw  .9
0040 0030    00122      movwf  count
0041 0800    00123      return
0042          00124 RecvNextBit
0042 0403    00125      bcf    STATUS,C
0043 0645    00126      btfsc  _rx
0044 0503    00127      bsf    STATUS,C
0045 0331    00128      rrf    rcreg, F
0046 0A39    00129      goto   rxbaudwait
00130 ;
0047          00131 fail
0047 0266    00132      comf  PORTB, F
0048 094A    00133      call  halfsec
0049 0A47    00134      goto  fail
004A          00135 halfsec
004A 0070    00136      clrf  hi
004B 0071    00137      clrf  lo
004C          00138 hsloop
004C 0000    00139      nop
004D 0000    00140      nop
004E 0000    00141      nop
004F 0000    00142      nop
0050 0000    00143      nop
0051 0000    00144      nop
0052 0000    00145      nop
0053 0000    00146      nop
0054 0000    00147      nop
0055 02F1    00148      decfsz lo, F
0056 0A4C    00149      goto  hsloop
0057 02F0    00150      decfsz hi, F
0058 0A4C    00151      goto  hsloop
0059 0800    00152      return
00153 ;
005A          00154 wait
005A 0070    00155      clrf  hi
005B 0071    00156      clrf  lo
005C          00157 dly
005C 02F1    00158      decfsz lo, F
005D 0A5C    00159      goto  dly
005E 02F0    00160      decfsz hi, F
005F 0A5C    00161      goto  dly
0060 0800    00162      return
00163
00164 ;
0061          00165 AllDone
0061 0C55    00166      movlw  0x55
0062 0026    00167      movwf  PORTB
0063 0A63    00168      goto  $
00169 ;
0064          00170 Mclr
0064 0CAA    00171      movlw  0xaa
0065 0026    00172      movwf  PORTB
0066 0075    00173      clrf  gpram
0067 0000    00174      nop
0068          00175 S3check
0068 0625    00176      btfsc  _ral
0069 0A68    00177      goto  S3check
006A 0C55    00178      movlw  0x55
006B 0026    00179      movwf  PORTB
006C 0A6C    00180      goto  $
00181 ;
00182 ;
01FF          00183      org   0x1fff
```

```
01FF 0A00    00184      goto    start
              00185 ;
              00186      end
```

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

```
0000 : XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX
0040 : XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXX-----
01C0 : -----X
```

All other memory blocks unused.

```
Program Memory Words Used:  110
Program Memory Words Free:  402
```

```
Errors   :      0
Warnings :    0 reported,    0 suppressed
Messages :    0 reported,    0 suppressed
```

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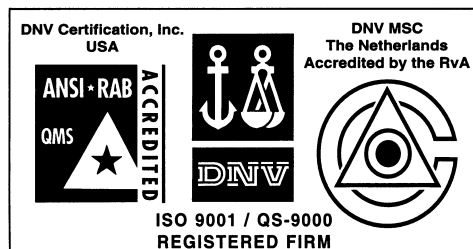
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