



2 ELMSWOOD DRIVE  
GODLEY  
CHESHIRE  
SK14 3SE

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Dear Jean

Enclosed is a copy of the software for the Microstim DB. I hope this format is adequate for your requirements.

Kind regards,

Colin Maxwell

```

C OBJECT CODE      LINE SOURCE TEXT
VALUE
00001  ;//=====
00002  ;//
00003  ;// msdb.asm      (PIC 16x84)
00004  ;//
00005  ;//=====
00006
00000000 00007 INDIR   equ    H'00'
00000001 00008 RTCC     equ    H'01'
00000002 00009 PCL      equ    H'02'           ; Program counter low byte
00000003 00010 STATUS  equ    H'03'           ; Status register
00000000 00011 CY       equ    H'0'           ; Carry / borrow bit
00000001 00012 DC       equ    H'1'           ; Digit carry
00000002 00013 Z        equ    H'2'           ; Zero flag
00000003 00014 PD       equ    H'3'           ; Power down
00000004 00015 T0       equ    H'4'           ; Time-out bit
00000005 00016 RP0      equ    H'5'           ; Register page select bits
00000006 00017 RP1      equ    H'6'           ; Not used in 16C84
00000007 00018 RP2      equ    H'7'           ; Not used in 16C84
00000004 00019 FSR      equ    H'4'           ; Indirect pointer
00000001 00020 OPTREG   equ    H'1'           ; OPTION register
00000005 00021 PORTA    equ    H'5'           ; PORT A
00000006 00022 PORTB    equ    H'6'           ; PORT B
00000008 00023 EEDATA   equ    H'8'           ; Eeprom data
00000009 00024 EEADR    equ    H'9'           ; Eeprom address
0000000A 00025 PCLATH   equ    H'A'           ; Program counter high byte
0000000B 00026 INTCON   equ    H'B'           ; Interrupt control
00000085 00027 TRISA    equ    H'85'          ; Data direction port A
00000086 00028 TRISB    equ    H'86'          ; Data direction port B
00000088 00029 EECON1   equ    H'88'          ; Eeprom control
00000000 00030 W         equ    H'0'           ; W reg. as destination
00000001 00031 F         equ    H'1'           ; F file as destination
00000000 00032 ;
00000000 00033 LED      equ    H'0'           ; RA0...led
00000002 00034 SNDR     equ    H'2'           ; RB2...sounder output
00000003 00035 OUTPUT    equ    H'3'           ; RB3...output pin
00000002 00036 FBACK   equ    H'2'           ; RA2...patient feedback
00037
00038
00039
00040
00 00041 org      H'0000'
1283 00042 bcf      3, 5
0186 00043 clrf     PORTB
02 0185 00044 clrf     PORTA
03 1683 00045 bsf      STATUS , 5
04 3004 00046 movlw   4
05 0085 00047 movwf   PORTA
06 30F0 00048 movlw   H'F0'
07 0086 00049 movwf   PORTB
08 1283 00050 bcf      STATUS , 5
09 0806 00051 go     movf   PORTB,0
0A 39F0 00052 andlw  H'F0'           ; isolate switches
0B 009F 00053 movwf   H'1F'
0C 081F 00054 movf   H'1F',0
0D 3C40 00055 sublw  H'40'
0E 1903 00056 btfs   STATUS,2
0F 281D 00057 goto   tof
10 081F 00058 movf   H'1F',0

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M/D

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00123 ;
00124 ;
4A 204B 00125 onehz call _1hz
4A 2849 00126 goto onehz
00127 ;
00128 ;
4B 2069 00129 _1hz call pulse
4C 3005 00130 movlw H'05'
4D 0096 00131 movwf H'16'
4E 0197 00132 do3 clrf H'17'
4F 30FE 00133 do2 movlw H'FE'
50 0098 00134 Movwf H'18'
51 0B98 00135 do1 decfsz H'18',1
52 2851 00136 goto do1
53 0B97 00137 decfsz H'17',1
54 284F 00138 goto do2
55 0B96 00139 decfsz H'16',1
56 284E 00140 goto do3
57 0008 00141 return
00142 ;
00143 ;
58 2069 00144 _2hz call pulse
3005 00145 movlw H'05'
0096 00146 movwf H'16'
5B 0197 00147 dt3 clrf H'17'
5C 307C 00148 dt2 movlw H'7C'
5D 0098 00149 Movwf H'18'
5E 0B98 00150 dt1 decfsz H'18',1
5F 285E 00151 goto dt1
60 0B97 00152 decfsz H'17',1
61 285C 00153 goto dt2
62 0B96 00154 decfsz H'16',1
63 285B 00155 goto dt3
64 3005 00156 movlw H'05'
65 0096 00157 movwf H'16'
66 0008 00158 return
00159 ;
00160 ;
67 2069 00161 _50hz call pulse
68 0008 00162 return
00163 ;
00164 ;
69 1106 00165 pulse bcf PORTB,SNDR
7A 1586 00166 bsf PORTB,OUTPUT
7B 1405 00167 bsf PORTA, LED
6C 3021 00168 movlw H'21'
6D 00A0 00169 movwf H'20'
6E 0BA0 00170 l1 decfsz H'20', 1
6F 286E 00171 goto l1
70 1D05 00172 btfss PORTA,2 ;read patient
71 288D 00173 goto pns
72 3020 00174 pws movlw H'20'
73 00A0 00175 movwf H'20' ;20 for 200 microseconds
74 0BA0 00176 l2 decfsz H'20', 1
75 2874 00177 goto l2
76 1186 00178 bcf PORTB,OUTPUT
77 304D 00179 movlw H'4D' ;number of beeps
78 00A3 00180 movwf H'23'
79 3004 00181 lp1 movlw H'04'
7A 0686 00182 xorwf PORTB, 1
7B 3028 00183 movlw H'28' ;frequency
7C 00A2 00184 movwf H'22'
7D 0BA2 00185 lp2 decfsz H'22',1
7E 287D 00186 goto lp2

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7F 0BA3          00187          decfsz  H'23',1
   2879          00188          goto    lp1
   00189 ;
81 1005          00190          bcf     PORTA,LED          ;led off
   00191 ;
82 302D          00192          movlw   H'2D'              ;number of beeps
83 00A3          00193          movwf  H'23'
84 3004          00194 lp3      movlw   H'04'
rning[202]: Argument out of range. Least significant bits used.
85 0606          00195          xorwf  PORTB, SNDR
86 3048          00196          movlw   H'48'              ;frequency
87 00A2          00197          movwf  H'22'
88 0BA2          00198 lp4      decfsz  H'22',1
89 2888          00199          goto    lp4
8A 0BA3          00200          decfsz  H'23',1
8B 2884          00201          goto    lp3
8C 0008          00202          return
   00203 ;
   00204 ;
8D 3020          00205 pns      movlw   H'20'
8E 00A0          00206          movwf  H'20'              ;20 for 200 microseconds
8F 0BA0          00207 lx2      decfsz  H'20', 1
   288F          00208          goto    lx2
   1186          00209          bcf     PORTB,OUTPUT
92 304D          00210          movlw   H'4D'              ;number of beeps
93 00A3          00211          movwf  H'23'
94 3004          00212 lp1x1    movlw   H'04'
rning[202]: Argument out of range. Least significant bits used.
95 0606          00213          xorwf  PORTB, SNDR;
96 3028          00214          movlw   H'28'              ;frequency
97 00A2          00215          movwf  H'22'
98 0BA2          00216 lp2x2    decfsz  H'22',1
99 2898          00217          goto    lp2x2
9A 0BA3          00218          decfsz  H'23',1
9B 2894          00219          goto    lp1x1
   00220 ;
9C 1005          00221          bcf     PORTA,LED          ;led off
   00222 ;
9D 302D          00223          movlw   H'2D'              ;number of beeps
9E 00A3          00224          movwf  H'23'
9F 3004          00225 lp3x3    movlw   H'04'
A0 1086          00226          bcf     PORTB, 1
A1 3048          00227          movlw   H'48'              ;frequency
   2 00A2          00228          movwf  H'22'
A3 0BA2          00229 lp4x4    decfsz  H'22',1
A4 28A3          00230          goto    lp4x4
A5 0BA3          00231          decfsz  H'23',1
A6 289F          00232          goto    lp3x3;
A7 0008          00233          return
   00234          end

```

MBOL TABLE  
LABEL

VALUE

	00000000
	00000001
ADR	00000009
CON1	00000088
DATA	00000008
	00000001
ACK	00000002
R	00000004

M12

DIR	00000000
T	0000000B
D	00000000
TREG	00000001
TPUT	00000003
L	00000002
LATH	0000000A
	00000003
RTA	00000005
RTB	00000006
0	00000005
1	00000006
2	00000007
CC	00000001
DR	00000002
ATUS	00000003
	00000004
ISA	00000085
ISB	00000086
	00000000
	00000002
hz	0000004B
	00000058
hz	00000067
16C84	00000001
s	00000022
sdone	00000033
s11	0000002B
s12	00000029
s13	00000027
1	00000051
2	0000004F
3	0000004E
1	0000005E
2	0000005C
3	0000005B
	00000009
	0000006E
	00000074
1	00000079
2	0000007D
3	00000084
4	00000088
	00000094
x2	00000098
x3	0000009F
x4	000000A3
2	0000008F
ehz	00000049
s	0000008D
c	00000034
c1	00000036
c2	00000047
c11	00000040
c12	0000003E
c13	0000003C
lse	00000069
s	00000072
f	0000001D
fdone	00000021

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

M13

```
00 : XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX
40 : XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX
   : XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX XXXXXXXX-----
```

1 other memory blocks unused.

ogram Memory Words Used: 168  
ogram Memory Words Free: 856

rors : 0  
arnings : 2 reported, 0 suppressed  
ssages : 0 reported, 0 suppressed