

```

1  TITLE          DELAYS for IBM PC/XT/AT
2
3      ifdef _WIN32
4          .386p
5          model flat
6      endif
7
8  ;*****
9  ;  REV: V1.0 5/30/1988
10 ;  REV: V1.1 11/20/2000 AZ
11 ;  REV: V1.2 10/06/2003 AZ
12 ;  EXPRO-40 ASSEMBLY SUBROUTINES
13 ;*****
14
15 PUBLIC          _initclk
16
17 PUBLIC          _dly50m, _dly20m, _dly10m
18 PUBLIC          _dly5m, _dly2m, _dly1m
19 PUBLIC          _dly500u, _dly200u, _dly100u
20 PUBLIC          _dly50u, _dly20u, _dly10u
21 PUBLIC          _dly1u
22
23 PUBLIC          _FACT1U
24 PUBLIC          _FACT10U, _FACT20U, _FACT50U
25 PUBLIC          _FACT100U, _FACT200U, _FACT500U
26 PUBLIC          _FACT1M, _FACT2M, _FACT5M
27 PUBLIC          _FACT10M, _FACT20M, _FACT50M
28
29 DGROUP          GROUP    _DATA
30
31      ifdef _WIN32
32 _DATA            SEGMENT DWORD PUBLIC USE32 'DATA'
33      else
34 _DATA            SEGMENT WORD PUBLIC 'DATA'
35      endif
36
37      ASSUME      DS:DGROUP
38
39 _FACT1U          DW      ?
40 _FACT10U         DW      ?
41 _FACT20U         DW      ?
42 _FACT50U         DW      ?
43 _FACT100U        DW      ?
44 _FACT200U        DW      ?
45 _FACT500U        DW      ?
46 _FACT1M          DW      ?
47 _FACT2M          DW      ?
48 _FACT5M          DW      ?
49 _FACT10M         DW      ?
50 _FACT20M         DW      ?
51 _FACT50M         DW      ?
52
53 TMHI             DW      ?
54 TMLO             DW      ?
55
56 _DATA            ENDS
57
58 ;=====
59
60      ifdef _WIN32
61 _TEXT            SEGMENT DWORD PUBLIC USE32 'CODE'
62
63 PUBLIC _inp, _outp
64 ; void outp( unsigned short portaddr, unsigned char value )
65 _outp            PROC     NEAR
66
67                  PUSH     EBP
68                  MOV      EBP,ESP
69
70                  MOV      DX,WORD PTR [EBP+8]
71                  MOV      AL,BYTE PTR [EBP+12]
72                  OUT      DX,AL

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73
74         POP     EBP
75         RET
76
77 _outp     ENDP
78
79 ; unsigned char inp( unsigned short portaddr )
80 _inp      PROC    NEAR
81
82         PUSH    EBP
83         MOV     EBP,ESP
84
85         MOV     DX,WORD PTR [EBP+8]
86         XOR     EAX,EAX
87         IN      AL,DX
88
89         POP     EBP
90         RET
91
92 _inp      ENDP
93
94 _?SCOPE   EQU     NEAR
95
96         else
97
98 _TEXT     SEGMENT BYTE PUBLIC 'CODE'
99         ASSUME  CS:_TEXT
100
101 _?SCOPE   EQU     FAR
102
103         endif
104
105 ; CHECK SYSTEM OSC BY CHECKING LOOP COUNT IN
106 ; BETWEEN TWO TIMER INTERRUPTS (~18.2HZ)
107 ;
108 ; TIMER OSC 14.31818 MHZ/12 = 1.193166 MHZ = 0.838US
109 ; TIMER INT 18.206507 HZ    = 54925.4 US
110 ;
111
112 _initclk  PROC    _?SCOPE
113
114         XOR     AH,AH
115         INT     1AH                ; READ TIMER
116         MOV     DGROUP:TMHI,CX      ; store current value
117         MOV     DGROUP:TMLO,DX
118
119 WAITINT:  XOR     AH,AH
120         INT     1AH                ; READ TIMER
121         CMP     DX,DGROUP:TMLO      ; compare with previous
122         JNZ     CHKCK1
123         CMP     CX,DGROUP:TMHI
124         JZ      WAITINT
125
126         ; TIMER has advanced
127
128 CHKCK1:   MOV     DGROUP:TMHI,CX      ; store current value
129         MOV     DGROUP:TMLO,DX
130         XOR     BX,BX
131
132 CHKCK2:   XOR     AH,AH
133         INT     1AH                ; READ TIMER
134         CMP     DX,DGROUP:TMLO
135         JNZ     CHKCK3
136         CMP     CX,DGROUP:TMHI
137         JNZ     CHKCK3
138         NOP
139         NOP
140         INC     BX
141         JMP     SHORT CHKCK2
142
143 CHKCK3:   MOV     AX,BX
144         PUSH    AX

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145      MOV     DGROUP:_FACT50M,AX      ;50ms
146      XOR     DX,DX
147      MOV     BX,10
148      DIV     BX
149      MOV     DGROUP:_FACT5M,AX       ;5ms
150      XOR     DX,DX
151      MOV     BX,10
152      DIV     BX
153      MOV     DGROUP:_FACT500U,AX     ;500us
154      XOR     DX,DX
155      MOV     BX,10
156      DIV     BX
157      MOV     DGROUP:_FACT50U,AX      ;50us
158
159      POP     AX
160      PUSH    AX
161      XOR     DX,DX
162      MOV     BX,5
163      DIV     BX
164      MOV     DGROUP:_FACT10M,AX      ;10ms
165      XOR     DX,DX
166      MOV     BX,10
167      DIV     BX
168      MOV     DGROUP:_FACT1M,AX       ;1ms
169      XOR     DX,DX
170      MOV     BX,10
171      DIV     BX
172      MOV     DGROUP:_FACT100U,AX     ;100us
173      XOR     DX,DX
174      MOV     BX,10
175      DIV     BX
176      MOV     DGROUP:_FACT10U,AX      ;10us
177      XOR     DX,DX
178      MOV     BX,10
179      DIV     BX
180      MOV     DGROUP:_FACT1U,AX       ;1us
181
182      POP     AX
183      MOV     BX,2
184      MUL     BX
185      MOV     BX,5
186      DIV     BX
187      MOV     DGROUP:_FACT20M,AX      ;20ms
188      XOR     DX,DX
189      MOV     BX,10
190      DIV     BX
191      MOV     DGROUP:_FACT2M,AX       ;2ms
192      XOR     DX,DX
193      MOV     BX,10
194      DIV     BX
195      MOV     DGROUP:_FACT200U,AX     ;200us
196      XOR     DX,DX
197      MOV     BX,10
198      DIV     BX
199      MOV     DGROUP:_FACT20U,AX      ;20us
200
201      RET
202
203 _initclk ENDP
204
205 ;-----
206 ; ALL DELAY LOOP
207 ;
208 _dly50m  PROC    _?SCOPE
209          MOV     BX,DGROUP:_FACT50M
210          JMP     SHORT TMDLY
211 _dly50m  ENDP
212
213 _dly20m  PROC    _?SCOPE
214          MOV     BX,DGROUP:_FACT20M
215          JMP     SHORT TMDLY
216 _dly20m  ENDP

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217
218 _dly10m PROC _?SCOPE
219 MOV BX,DGROUP:_FACT10M
220 JMP SHORT TMDLY
221 _dly10m ENDP
222
223 _dly5m PROC _?SCOPE
224 MOV BX,DGROUP:_FACT5M
225 JMP SHORT TMDLY
226 _dly5m ENDP
227
228 _dly2m PROC _?SCOPE
229 MOV BX,DGROUP:_FACT2M
230 JMP SHORT TMDLY
231 _dly2m ENDP
232
233 _dly1m PROC _?SCOPE
234 MOV BX,DGROUP:_FACT1M
235 JMP SHORT TMDLY
236 _dly1m ENDP
237
238 _dly500u PROC _?SCOPE
239 MOV BX,DGROUP:_FACT500U
240 JMP SHORT TMDLY
241 _dly500u ENDP
242
243 _dly200u PROC _?SCOPE
244 MOV BX,DGROUP:_FACT200U
245 JMP SHORT TMDLY
246 _dly200u ENDP
247
248 _dly100u PROC _?SCOPE
249 MOV BX,DGROUP:_FACT100U
250 JMP SHORT TMDLY
251 _dly100u ENDP
252
253 _dly50u PROC _?SCOPE
254 MOV BX,DGROUP:_FACT50U
255 JMP SHORT TMDLY
256 _dly50u ENDP
257
258 _dly20u PROC _?SCOPE
259 MOV BX,DGROUP:_FACT20U
260 JMP SHORT TMDLY
261 _dly20u ENDP
262
263 _dly10u PROC _?SCOPE
264 MOV BX,DGROUP:_FACT10U
265 JMP SHORT TMDLY
266 _dly10u ENDP
267
268 _dly1u PROC _?SCOPE
269 MOV BX,DGROUP:_FACT1U
270 JMP SHORT TMDLY
271 _dly1u ENDP
272
273 TMDLY PROC _?SCOPE
274 INC BX
275 TMDLY1: NOP
276 NOP
277 DEC BX
278 JZ TMWAITQ
279 XOR AH,AH
280 INT 1AH
281 CMP CX,DGROUP:TMHI
282 NOP
283 CMP DX,DGROUP:TMLO
284 JMP SHORT TMDLY1
285 TMWAITQ: RET
286
287 TMDLY ENDP
288

```

```
289 _TEXT      ENDS
290
291            END
292
```