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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

00001     list p=16F877      ; list directive to define
processor
00002     #include <p16F877.inc>    ; processor specific variable
definitions
00001     LIST
00002
00003
=====
00004 ; Build date : Dec 08 2015
00005 ; MPASM PIC16F877 processor include
00006 ;
00007 ; (c) Copyright 1999-2015 Microchip Technology, All rights reserved
00008
=====
00009
00541     LIST
2007 3F72 00003   _CONFIG_C_P_OFF & _WDT_OFF & _BODEN_ON & _PWRTE_ON &
_HS_OSC & _WRT_ENABLE_ON & _CPD_OFF & _LVP
00004
00005     errorlevel -302
00006     errorlevel -306
00007
00008 ; Bank0
00009     cblock 0x20
00010     ; Time stuff
00011     ; for history and elapse
00000020 00012     YearTen
00000021 00013     YearD
00000022 00014     MonT
00000023 00015     MonD
00000024 00016     DayT
00000025 00017     DayD
00000026 00018     HourT
00000027 00019     HourD
00000028 00020     MinT
00000029 00021     MinD ;2b
0000002A 00022     SecT
0000002B 00023     SecD
00024
0000002C 00025     ;in ASCII
0000002D 00026     StartYearT
0000002E 00027     StartYearD
0000002F 00028     StartMonT
00000030 00029     StartMonD
00000031 00030     StartDayT
00000031 00031     StartDayD ;31

```

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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

0000005A 00079     COORD
00080     endc
00081
00082     cblock 0x65
00000065 00083     UCount ;65
00000066 00084     Desired_Gap
00000067 00085     Int_W
00086
00000068 00087     SpotDH ; also in getting address and hist info
00000069 00088     SpotDL ; also store distance multiply
0000006A 00089     SpotB
00080
0000006B 00091     SensorB
00092
0000006C 00093     MUX_Output
0000006D 00094     MUX_Temp
00095

```

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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

00000032 00032     StartHourT
00000033 00033     StartHourD
00000034 00034     StartMinT
00000035 00035     StartMinD
00000036 00036     StartSecT
00000037 00037     StartSecD ;37
00000038 00038     ; Also used in writing distance and angle
FinishHourT
00000039 00040     FinishHourD
0000003A 00041     FinishMinT
0000003B 00042     FinishMinD

```

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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

00000199 00126     ANGLH1
0000019A 00127     ANGLM1
0000019B 00128     ANGLL1
0000019C 00129     DISTH2
0000019D 00130     DISTM2
0000019E 00131     DISTL2
0000019F 00132     ANGLH2
000001A0 00133     ANGLM2
000001A1 00134     ANGLL2
000001A2 00135     DISTH3
000001A3 00136     DISTM3
000001A4 00137     DISTL3
000001A5 00138     ANGLH3
000001A6 00139     ANGLM3
000001A7 00140     ANGLL3
000001A8 00141     DISTH4
000001A9 00142     DISTM4
000001AA 00143     DISTL4
000001AB 00144     ANGLH4
000001AC 00145     ANGLM4
000001AD 00146     ANGLL4
000001AE 00147     DISTH5
000001AF 00148     DISTM5

```

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```

000001C8 00173 DISTL9
000001C9 00174 ANGLM9
000001CA 00175 ANGLM9
000001CB 00176 ANGLL9
000001CC 00177 DISTH10
000001CD 00178 DISTM10
000001CE 00179 DISTL10
000001CF 00180 ANGLH10
000001D0 00181 ANGLM10
000001D1 00182 ANGLL10
000001D2 00183 DISTH11
000001D3 00184 DISTM11
000001D4 00185 DISTL11
000001D5 00186 ANGLH11
000001D6 00187 ANGLM11
000001D7 00188 ANGLL11
000001D8 00189 DISTH12
000001D9 00190 DISTM12
000001DA 00191 DISTL12
000001DB 00192 ANGLH12
000001DC 00193 ANGLM12
000001DD 00194 ANGLL12
000001DE 00195 DISTH13
000001DF 00196 DISTM13
000001E0 00197 DISTL13
000001E1 00198 ANGLH13
000001E2 00199 ANGLM13
000001E3 00200 ANGLL13
000001E4 00201 DISTH14

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```

LOC	OBJECT	CODE	LINE	SOURCE	TEXT
					VALUE
000001E5		00202		DISTM14	
000001E6		00203		DISTL14	
000001E7		00204		ANGLH14	
000001E8		00205		ANGLM14	
000001E9		00206		ANGLL14	
000001EA		00207		DISTH15	
000001EB		00208		DISTM15	
000001EC		00209		DISTL15	
000001ED		00210		ANGLH15	
000001EE		00211		ANGLM15	
000001EF		00212		ANGLL15	
		00213		endc	
		00214			
		00215		;Declare constants for pin assignments	
		00216		#define ULTRAIN2 PORTB,0 ;ok	
		00217		#define MUX1_D PORTB,3 ;wait	
		00218		#define MUX2_D PORTB,2 ;wait	
		00219		#define MUX2_0 PORTC,7 ;ok	

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```

00266
00267 i2c_common_nack macro
00268 banksel SSPCON2
00269 bsf SSPCON2,ACKDT
00270 bsf SSPCON2,ACKEN
00271 btfsc SSPCON2,ACKEN
00272 goto $-1
00273 endm
00274
00275 i2c_common_repeatedstart macro
00276 banksel SSPCON2
00277 bsf SSPCON2,RSEN
00278 btfsc SSPCON2,RSEN
00279 goto $-1
00280 endm
00281
00282 i2c_common_write macro
00283 banksel SSPBUF
00284 movwf SSPBUF
00285 banksel SSPSTAT
00286 btfsc SSPSTAT,R_W ;While
transmit is in progress, wait
00287 goto $-1
00288 banksel SSPCON2
00289 endm
00290
00291 i2c_common_read macro
00292 banksel SSPCON2
00293 bsf SSPCON2,RCEN ;Begin receiving
byte from
00294 btfsc SSPCON2,RCEN
00295 goto $-1
00296 banksel SSPBUF
00297 movf SSPBUF,w
00298 endm
00299 ;RTC Macros;;;;;;;;;;;;;;;;;;;;;;;;;;;
00300
00301 rtc_resetAll macro
00302 banksel RTCDATA
00303 clrf RTCDATA
00304 banksel RTCADD
00305 clrf RTCDATA
00306 call write_rtc ;Write 0 to
Seconds
00307 banksel RTCADD
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```

LOC	OBJECT	CODE	LINE	SOURCE	TEXT
				VALUE	
		00308		incf RTCADD	;Set register address to 1

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```

00220 #define MUX2_1 PORTC,6 ;ok
00221 #define MUX2_2 PORTC,5 ;ok
00222 #define PWM2 PORTC,2 ;ok
00223 #define PWM1 PORTC,1 ;ok
00224 #define MOTOR00 PORTD,0 ;ok
00225 #define MOTOR01 PORTD,1 ;ok
00226 #define RS PORTD,2 ;ok
00227 #define E PORTD,3 ;ok
00228 #define MUX1_0 PORTE,0 ;ok
00229 #define MUX1_1 PORTE,1 ;ok
00230 #define MUX1_2 PORTE,2 ;ok
00231 #define ULTRA_T PORTA,0 ;ok
00232 #define MOTOR10 PORTA,1 ;ok
00233 #define MOTOR11 PORTA,2 ;ok
00234 #define ULTRAIN PORTA,3 ;ok
00235 #define ENCODER PORTA,4 ;ok
00236 #define BUZZER PORTA,5 ;ok
00237
00238
00239 i2c_common_check_ack macro err_address ;If bad ACK
bit received, goto err_address
00240 banksel SSPCON2
00241 btfsc SSPCON2,ACKSTAT
00242 goto err_address
00243 endm
00244
00245 i2c_common_start macro
00246 banksel SSPCON2
00247 bsf SSPCON2,SEN
00248 btfsc SSPCON2,SEN
00249 goto $-1
00250 endm
00251
00252 i2c_common_stop macro
00253 banksel SSPCON2
00254 bsf SSPCON2,PEN
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```

LOC	OBJECT	CODE	LINE	SOURCE	TEXT
				VALUE	
		00255		btfsc SSPCON2,PEN	
		00256		goto \$-1	
		00257		endm	
		00258			
		00259		i2c_common_ack macro	
		00260		banksel SSPCON2	
		00261		bcf SSPCON2,ACKDT	
		00262		bsf SSPCON2,ACKEN	
		00263		btfsc SSPCON2,ACKEN	
		00264		goto \$-1	
		00265		endm	

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```

00309 call write_rtc
00310 banksel RTCADD
00311 incf RTCADD
;Set register address to 2
00312 call write_rtc
00313 banksel RTCADD
00314 incf RTCADD
;Set register address to 3
00315 call write_rtc
00316 banksel RTCADD
00317 incf RTCADD
;Set register address to 4
00318 call write_rtc
00319 banksel RTCADD
00320 incf RTCADD
;Set register address to 5
00321 call write_rtc
00322 banksel RTCADD
00323 incf RTCADD
;Set register address to 6
00324 call write_rtc
00325 endm
00326
00327 rtc_set macro addliteral,dataliteral
00328 banksel RTCADD
00329 movlw addliteral
00330 movwf RTCADD
00331 banksel RTCDATA
00332 movlw datliteral
00333 movef RTCDATA
00334 call write_rtc
00335 endm
00336
00337 rtc_read macro addliteral
00338 movlw addliteral
00339 banksel RTCADD
00340 movwf RTCADD
00341 pagesel read_rtc
00342 call read_rtc
00343 pagesel $
00344 banksel DOUT
00345 movf DOUT ,w
00346 pagesel rtc_convert
00347 call rtc_convert
00348 pagesel $
00349 endm
00350
00351
00352 ;Delay: ~160us
00353 LCD_DELAY macro
00354 movlw 0xFF
00355 movwf lcd_dl
00356 decfsz lcd_dl,f
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```

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```

00357    goto    $-1
00358    endm
00359
00360 ; Display macro
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

00361 Display    macro    Message
00362 local     loop_
00363 local     end_
00364 clrf    Table_Counter
00365 clrw
00366 loop_    movf    Table_Counter,W
00367 call     Message
00368 xorlw   B'00000000' ;check WORK reg to see
if 0 is returned
00369 btfsc   STATUS,Z
00370 goto    end_
00371 call     WR_DATA
00372 incf    Table_Counter,F
00373 goto    loop_
00374 end_
00375 endm
00376
00377 DispTable  macro    Tag
00378 Bank0
00379 movvfw  W_temp
00380 movlw   HIGH Tag
00381 movvfw  PCLATH
00382 movf    W_temp,W
00383 addiw   LOW Tag
00384 btfsc   STATUS,C
00385 incf    PCLATH,f
00386 movvfw  PCL
00387 endm
00388
00389 Bank0  macro
00390 bcf    STATUS,RP1
00391 bcf    STATUS,RP0
00392 endm
00393
00394 Bank1  macro
00395 bcf    STATUS,RP1
00396 bsf    STATUS,RP0
00397 endm
00398
00399 Bank2  macro
00400 bsf    STATUS,RP1
00401 bcf    STATUS,RP0
00402 endm

```

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```

00449 ResetMux1  macro
00450 bcf    MUX1_0
00451 bcf    MUX1_1
00452 bcf    MUX1_2
00453 endm
00454
00455 ResetMux2  macro
00456 bcf    MUX2_0
00457 bcf    MUX2_1
00458 bcf    MUX2_2
00459 endm
00460
00461 WriteMUX2  macro
00462 movf    MUX_Output,W
00463 movwf   PORTE
00464 endm
00465
00466 WriteMUX1  macro
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

00467 movf    MUX_Output,W
00468 movwf   MUX_Temp
00469 rlf    MUX_Temp,F
00470 rlf    MUX_Temp,F
00471 rlf    MUX_Temp,F
00472 rlf    MUX_Temp,F
00473 rlf    MUX_Temp,F
00474 movlw   b'00011111'
00475 andwf  PORTC,F
00476 movf    MUX_Temp,W
00477 iorwf   PORTC,F
00478 endm
00479
00480 GetWritingAddress macro
00481 local   loop_
00482 local   end_
00483 movf    SpotB,W
00484 movwf   SpotDH
00485 bsf    STATUS,IRP
00486 movlw   0x96
00487 movwf   FSR
00488 loop_
00489 movf    SpotDH,W
00490 xorlw  0x0
00491 btfsc   STATUS,Z
00492 goto    end_
00493 movlw   0x06
00494 addwf   FSR,F
00495 decf

```

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```

00403
00404 Bank3  macro
00405 bsf    STATUS,RP1
00406 bsf    STATUS,RP0
00407 endm
00408
00409 DisplayDate  macro
Add9,Add8,Add7,Add6,Add5,Add4,Add3,Add2,Add1,Add0
00410 Bank0
00411 movvfw  W_tempW
00412
00413 movlw   0x32
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

00414 call    WR_DATA
00415 movlw   0x30
00416 call    WR_DATA
00417 movf    Add9,W
00418 call    WR_DATA
00419 movf    Add8,W ;year
00420 call    WR_DATA
00421 movlw   0x2f
00422 call    WR_DATA
00423 movf    Add7,W
00424 call    WR_DATA
00425 movf    Add6,W ;month
00426 call    WR_DATA
00427 movlw   0x2f
00428 call    WR_DATA
00429 movf    Add5,W
00430 call    WR_DATA
00431 movf    Add4,W ;day
00432 call    WR_DATA
00433 movlw   0x20
00434 call    WR_DATA
00435 movf    Add3,W
00436 call    WR_DATA
00437 movf    Add2,W ;hour
00438 call    WR_DATA
00439 movlw   0x3a
00440 call    WR_DATA
00441 movf    Add1,W
00442 call    WR_DATA
00443 movf    Add0,W ;min
00444 call    WR_DATA
00445
00446 movf    W_tempW,W
00447 endm
00448

```

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```

00496 goto    loop_
00497 end_
00498 endm
00499
00500 NEXT_DOT  macro
00501 incf    FSR,F
00502 movf    INDF,W
00503 movwf   LCDDISTH
00504 incf    FSR,F
00505 movf    INDF,W
00506 movwf   LCDDISTM
00507 incf    FSR,F
00508 movf    INDF,W
00509 movwf   LCDDISTL
00510 incf    FSR,F
00511 movf    INDF,W
00512 movwf   LCDANGLH
00513 incf    FSR,F
00514 movf    INDF,W
00515 movwf   LCDANGLM
00516 incf    FSR,F
00517 movf    INDF,W
00518 movwf   LCDANGLL
00519 endm
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

00520
00521 ToBCD   macro    INPUT
00522 movf    INPUT,W
00523 addlw   .256-20 ; C will be set if
number was >= 20
00524 btfsc   STATUS,C
00525 addlw   .6 ; ...adjust
for 20..29
00526 addlw   -(.256-20) ; Back to original
value
00527
00528 addlw   .256-10 ; C will be set if
number was >= 10
00529 btfsc   STATUS,C
00530 addlw   .6 ; ...adjust for
10..29
00531 addlw   -(.256-10) ; Back to original
value
00532 movwf   INPUT
00533 endm
00534
00535 HEXToASCII  macro    INPUT,MSD,LSD
00536 Bank0

```

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```

00537    clrf    MSD    ;Clear output registers
00538    clrf    LSD
00539    swapf   INPUT,W
00540    andlw   0x0f    ;Mask off unwanted
bits
00541    movwf   MSD
00542    movlw   10    ;For BCD lower
nibble only (lower 4 bits)
00543    subwf   MSD,W
00544    movlw   0x30    ;If numerical add
ascii value (-10)
00545    btfsc   STATUS,C
00546    movlw   0x37    ;If alphabetical,
then add a different ascii value (-10)
00547    addwf   MSD,1    ;save in output reg
00548    movf    INPUT,W    ;get lower nibble of input
byte
00549    andlw   0x0f    ;mask off unwanted
data
00550    movwf   LSD
00551    movlw   10
00552    subwf   LSD,W
00553    movlw   0x30
00554    btfsc   STATUS,C
00555    movlw   0x37
00556    addwf   LSD,1    ;and save in output reg
00557    endm
00558
00559 Bin16toBCD MACRO BINL,BINH,BCDL,BCDH,BCDX,TEMP,COUNT
00560    local   Loop_,Next_,Exit_
00561    movlw   0x10    ;16 bits
00562    movwf   COUNT
00563    clrf    BCDX
00564    clrf    BCDH
00565    clrf    BCDL
00566    bcf    STATUS,C
00567 Loop_
00568    rlf    BINL,F
00569    rlf    BINH,F
00570    rlf    BCDL,F
00571    rlf    BCDH,F
00572    rlf    BCDX,F

```

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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

00573    decfsz COUNT,F
00574    goto   Next_
00575    goto   Exit_
00576 Next_
00577    movlw   0x03

```

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```

LOC OBJECT CODE LINE SOURCE TEXT  
VALUE
0007 1303    M
0008 1283    M
0009 00E7    00626    Bank0
000A 0803    00627    bcf    STATUS,RP1
000B 00C8    00628    bcf    STATUS,RP0
000C 0AFO    00629    movwf   Int_W
000D ???     00630    movwf   STATUS,W
Message[305]: Using default destination of 1 (file).
000E 110B    00631    incf   STATUS_temp
000F 1008    00632    bcf    TMROH
0010 1088    00633    goto   INT_Return
0011 1085    00634
0012 1105    00635    ERR
0013 1485    00636    bcf    INTCON,TOIF
0014 ???     00637    bcf    MOTOR00
0015 0848    00638    bcf    MOTOR01
0016 0083    00639    bcf    MOTOR10
0017 0EE7    00640    bcf    MOTOR11
0018 0E67    00641    bsf    PORTA,1
0019 0009    00642    goto   INT_Return
0020 018B    00643    bcf    INTCON
0021 1303    00644    INT_Return
0022 1683    00645    movf   STATUS_temp,W
0023 3018    00646    movwf  STATUS
0024 0085    00647    swapf  Int_W_F
0025 30FF    00648    swapf  Int_W,W
0026 0086    00649    retfie
0027 3019    00650    ****
0028 0087    00651    ****
0029 0188    00652 Mainline
0030 0189    00653    ; Initialize pins
0031 0187    00654    call   Initial
0032 0188    00655    ; Initialize LCD
0033 0189    00656    call   DS
0034 018A    00657    call   InitLCD
0035 018B    00658    call   DS
0036 018C    00659    call   InitLCD
0037 018D    00660    ; Enter Standby Mode
0038 018E    00661    call   Standby
0039 018F    00662    :goto  Operation
0040 018A    00663    00664    ****
0041 018B    00665    00666    00667    Mainline
0042 018C    00667    ; Initialize Pins
0043 018D    00668    Bank1
0044 018E    00669    bcf    STATUS,RP1
0045 018F    00670    bcf    STATUS,RP0
0046 018A    00671    movlw   b'011000'
0047 018B    00672    movwf   TRISA
0048 018C    00673    movlw   b'11111111'
0049 018D    00674    movwf   TRISB
0050 018E    00675    movwf   TRISE
0051 018F    00676    movwf   b'00011001'
0052 018A    00677    movlw   MAIN.ASM 4-7-2016 23:42:36 PAGE 14
0053 018B    00678    movlw   0x06
0054 018C    00679    movwf   MSB in ADRESH
0055 018D    00680    movwf   ADCON1
0056 018E    00681    movwf   Bank0
0057 018F    00682    bcf    STATUS,RP1
0058 018A    00683    bcf    STATUS,RP0
0059 018B    00684    clrf   PORTA
0060 018C    00685    clrf   PORTB
0061 018D    00686    clrf   PORTC
0062 018E    00687    clrf   PORTD
0063 018F    00688    clrf   PORTE
0064 018A    00689    clrf   Last_Reading
0065 018B    00690    clrf   SpotDH
0066 018C    00691    clrf   SpotDL
0067 018D    00692    clrf   SpotB
0068 018E    00693    clrf   GAP
0069 018F    00694    clrf   STATE
0070 018A    00695    clrf   FORWARD
0071 018B    00696    clrf   TMRI_Ultrasonic
0072 018C    00697    movlw   0x10
0073 018D    00698    movwf   TICON
0074 018E    00699    clrf   TMRL
0075 018F    00700    clrf   TMRH
0076 018A    00701    clrf   TMRI
0077 018B    00702    clrf   TMRO
0078 018C    00703    clrf   TMROH
0079 018D    00704    clrf   TMRO
0080 018E    00705    clrf   TMROH
0081 018F    00706    Bank1

```

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```

00578    addwf   BCDL,W
00579    movwf   TEMP
00580    btfsc   TEMP,3
00581    movwf   BCDL
00582    movlw   0x30
00583    addwf   BCDL,W
00584    movwf   TEMP
00585    btfsc   TEMP,7
00586    movwf   BCDL
00587 ;-----
00588    movlw   0x03
00589    addwf   BCDH,W
00590    movwf   TEMP
00591    btfsc   TEMP,3
00592    movwf   BCDH
00593    movlw   0x30
00594    addwf   BCDH,W
00595    movwf   TEMP
00596    btfsc   TEMP,7
00597    movwf   BCDH
00598 ;-----
00599    movlw   0x03
00600    addwf   BCDX,W
00601    movwf   TEMP
00602    btfsc   TEMP,3
00603    movwf   BCDX
00604 ;-----
00605    movlw   0x30
00606    addwf   BCDX,W
00607    movwf   TEMP
00608    btfsc   TEMP,7
00609    movwf   BCDX
00610    goto   Loop_
00611 Exit_
00612    endm
00613
00614
00615
00616
*****  
*****
00617    org    0x0000    ;RESET vector must
always be at 0x00
0000 018A    00618    clrf    PCLATH
0001 2???    00619    goto   Mainline    ;Just jump to the
main code section.
00620
00621    org    0x004
0004 10DB    00622    btfss   INTCON,TOIF
0005 2???    00623    goto   ERR
0006 110B    00624    bcf    INTCON,TOIF
0007 00E5    00625    bcf    INTCON,TOIF

```

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```

LOC OBJECT CODE LINE SOURCE TEXT  
VALUE
0007 1303    M
0008 1283    M
0009 00E7    00667    ; Initialize Pins
000A 0803    00668    Bank1
000B 00C8    00669    bcf    STATUS,RP1
000C 0AFO    00670    bcf    STATUS,RP0
000D 3010    00671    movlw   b'011000'
000E 0090    00672    movwf   TRISA
000F 018E    00673    movwf   TRISB
0010 018F    00674    movwf   TRISE
0011 018A    00675    movwf   b'11111111'
0012 018B    00676    movwf   TRISB
0013 018C    00677    movwf   TRISE
0014 018D    00678    movwf   b'00011001'
0015 018E    00679    movwf   TRISB
0016 018F    00680    movwf   TRISE
0017 018A    00681    movwf   b'11111111'
0018 018B    00682    movwf   TRISB
0019 018C    00683    movwf   TRISE
0020 018D    00684    movwf   b'00011001'
0021 1303    00685    clrf   PORTA
0022 1683    00686    clrf   PORTB
0023 3018    00687    clrf   PORTC
0024 018E    00688    clrf   PORTD
0025 018F    00689    clrf   PORTE
0026 018A    00690    clrf   Last_Reading
0027 018B    00691    clrf   SpotDH
0028 018C    00692    clrf   SpotDL
0029 018D    00693    clrf   SpotB
0030 018E    00694    clrf   GAP
0031 018F    00695    clrf   STATE
0032 018A    00696    clrf   FORWARD
0033 018B    00697    clrf   TMRI_Ultrasonic
0034 018C    00698    movlw   0x10
0035 018D    00699    movwf   TICON
0036 018E    00700    clrf   TMRL
0037 018F    00701    clrf   TMRH
0038 018A    00702    clrf   TMRI
0039 018B    00703    clrf   TMRO
0040 018C    00704    clrf   TMROH
0041 018D    00705    clrf   TMRO
0042 018E    00706    Bank1

```

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```

0040 1303 M bcf STATUS,RP1
0041 1683 M bsf STATUS,RP0
0042 1681 00707 bsf OPTION_REG_TOCS
0043 1201 00708 bcf OPTION_REG_TOSE
0044 2??? 00709
0045 1303 M bcf STATUS,RP1
0046 1283 M bcf STATUS,RP0
0047 3001 00713 movlw 0x01
0048 00F9 00714 movwf PADD
0049 ??? ???? 00715 pagesel ReadEEPROM
004B 2??? 00716 call ReadEEPROM
004C ??? ???? 00717 pagesel $
004E 087A 00718 movf EEVAL,W
004F 3AFF 00719 xorlw 0xFF
0050 1903 00720 btfs STATUS,Z
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

0051 2??? 00721 goto $+2
0052 2??? 00722 goto $+4
0053 ??? ???? 00723 pagesel clearEEPROM
0055 2??? 00724 call clearEEPROM
0056 ??? ???? 00725 pagesel $
0058 0008 00726
0059 00727 return
00728
0059 00729 i2c_common_setup
00730 ;input: none
00731 ;output: none
00732 ;desc: sets up I2C as master device with 100kHz baud rate
0059 1683 1303 00733 banksel SSPSTAT
0058 0194 and clear all flags 00734 clrf SSPSTAT ;I2C line levels,
005C 3018 00735 movlw d'24' ;100kHz baud rate:
10MHz osc / [4*(24+1)]
005D 1683 1303 00736 banksel SSPADD
005F 0093 00737 movwf SSPADD ;RTC only supports
100kHz
0060 3008 00738
0061 1283 1303 00739 movlw b'000001000' ;Config SSP for
Master Mode I2C
0063 0094 00740 banksel SSPCON
0064 1694 00741 movwf SSPCON ;Enable SSP module
00742 i2c_common_stop ;Ensure the bus is
free
0065 1683 1303 M banksel SSPCON2

```

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```

008E 0878 00759 movfw RTC_Sing_DIG
008F ??? 00760 call WR_DATA
0090 302F 00761
0091 ??? 00762 movlw "/"
0092 3005 00763 call WR_DATA
from DS1307---month
0093 1283 1303 M banksel RTCADD
0095 00F3 M movwf RTCADD
0096 ??? ???? M pagesel read_rtc
0098 ??? ???? M call read_rtc
0099 ??? ???? M pagesel $
009B 1283 1303 M banksel DOUT
009D 0875 M movf DOUT ,W
009E ??? ???? M pagesel rtc_convert
00A0 2??? M call rtc_convert
00A1 ??? ???? M pagesel $
00A3 0877 00767 movfw RTC_TENS_DIG
00A4 2??? 00768 call WR_DATA
00A5 0878 00769 movfw RTC_Sing_DIG
00A6 2??? 00770 call WR_DATA
00A7 302F 00771 movlw "/"
00A8 2??? 00772 call WR_DATA
00774
00775 ;Get day
00776 rtc_read 0x04 ;Read Address 0x04
from DS1307---day
00A9 3004 M movlw 0x04
00AA 1283 1303 M banksel RTCADD
00AC 00F3 M movwf RTCADD
00AD ??? ???? M pagesel read_rtc
00AF 2??? M call read_rtc
00B0 2??? ???? M pagesel $
00B2 1283 1303 M banksel DOUT
00B4 0875 M movf DOUT ,W
00B5 ??? ???? M pagesel rtc_convert
00B7 2??? M call rtc_convert
00B8 ??? ???? M pagesel $
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

00BA 0877 00777 movfw RTC_TENS_DIG
00BB 2??? 00778 call WR_DATA
00BC 0878 00779 movfw RTC_Sing_DIG
00BD 2??? 00780 call WR_DATA
00781

```

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```

0067 1511 M bsf SSPCON2,PEN
0068 1911 M btfs SSPCON2,PEN
0069 2??? M goto $-1
006A 0008 00744 return
00745
*****+
006B 00746 Standby
00747 ;goto Operation
006B 2??? 00748 call ClrLCD
00749 Display Welcome_Msg
0000 M local loop_
0000 M local end_
006C 01C1 M clrf Table_Counter
006D 0103 M clrw
006E 0841 M loop_ movf Table_Counter,W
006F 2??? M call Welcome_Msg
0070 3A00 M xorlw B'00000000' ;check WORK reg to see
if 0 is returned
0071 1903 M btfs STATUS,Z
0072 2??? M goto end_
0073 2??? M call WR_DATA
0074 0AC1 M incf Table_Counter,F
0075 2??? M goto loop_
0076 M end_
0076 2??? 00750 call Switch_Lines
00751
0077 3032 00752 movlw "2"
;First line shows 20***+/*
0078 2??? 00753 call WR_DATA
0079 3030 00754 movlw "0"
007A 2??? 00755 call WR_DATA
00756 rtc_read 0x06 ;Read Address 0x06
from DS1307---year
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

007B 3006 M movlw 0x06
007C 1283 1303 M banksel RTCADD
007E 00F3 M movwf RTCADD
007F ??? ???? M pagesel read_rtc
0081 2??? M call read_rtc
0082 ??? ???? M pagesel $
0084 1283 1303 M banksel DOUT
0086 0875 M movf DOUT ,W
0087 ??? ???? M pagesel rtc_convert
0089 2??? M call rtc_convert
008A ??? ???? M pagesel $
008C 0877 00757 movfw RTC_TENS_DIG
008D 2??? 00758 call WR_DATA

```

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```

00BE 3020 00782 movlw "
00BF ??? 00783 call WR_DATA
00784
00785 ;Get hour
00786 rtc_read 0x02 ;Read Address 0x02
from DS1307---hour
00C0 3002 M movlw 0x02
00C1 1283 1303 M banksel RTCADD
00C3 00F3 M movwf RTCADD
00C4 ??? ???? M pagesel read_rtc
00C6 2??? M call read_rtc
00C7 ??? ???? M pagesel $
00C9 1283 1303 M banksel DOUT
00CB 0875 M movf DOUT ,W
00CC ??? ???? M pagesel rtc_convert
00CE 2??? M call rtc_convert
00CF ??? ???? M pagesel $
00D1 0877 00787 movfw RTC_TENS_DIG
00D2 2??? 00788 call WR_DATA
00D3 0878 00789 movfw RTC_Sing_DIG
00D4 2??? 00790 call WR_DATA
00D5 303A 00791 movlw ":" ;
00D6 2??? 00792 call WR_DATA
00793
00794 ;Get minute
00795 rtc_read 0x01 ;Read Address 0x01
from DS1307---min
00D7 3001 M movlw 0x01
00D8 1283 1303 M banksel RTCADD
00DA 00F3 M movwf RTCADD
00DB ??? ???? M pagesel read_rtc
00DD 2??? M call read_rtc
00DE ??? ???? M pagesel $
00E0 1283 1303 M banksel DOUT
00E2 0875 M movf DOUT ,W
00E3 ??? ???? M pagesel rtc_convert
00E5 2??? M call rtc_convert
00E6 ??? ???? M pagesel $
00E8 0877 00796 movfw RTC_TENS_DIG
00E9 2??? 00797 call WR_DATA
00EA 0878 00798 movfw RTC_Sing_DIG
00EB 2??? 00799 call WR_DATA
00EC 303A 00800 movlw ":" ;
00ED 2??? 00801 call WR_DATA
00802
00803 ;Get seconds
00804 rtc_read 0x00 ;Read Address 0x00
from DS1307---seconds
00EE 3000 M movlw 0x00
00EF 1283 1303 M banksel RTCADD
00F1 00F3 M movwf RTCADD
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE


```

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LOC	OBJECT CODE	LINE	SOURCE TEXT	VALUE	
00F2	???? ???? M	pagesel	read_rtc		
00F4	2???	M	call	read_rtc	
00F5	???? ???? M	pagesel	\$		
00F7	1283 1303 M	banksel	DOUT		
00F9	0875 M	movf	DOUT ,W		
00FA	???? ???? M	pagesel	rtc_convert		
00FC	2???	M	call	rtc_convert	
00FD	???? ???? M	pagesel	\$		
00FF	0877 00805	movwf	RTC_TENS_DIG		
0100	2???	00806	call	WR_DATA	
0101	0878 00807	movwf	RTC_Sing_DIG		
0102	2???	00808	call	WR_DATA	
		00809			
0103	3000 00810	movlw	0x0		
0104	00F6 00811	movwf	inmenu		
0105	3071 00813 Delay5s	movlw	0x71		
0106	00BE 00814	movwf	COUNTH		
0107	3040 00815	movlw	0x40		
0108	00BF 00816	movwf	COUNTM		
0109	301C 00817	movlw	0x1C		
010A	00C0 00818	movwf	COUNTL		
010B	00819 Delay5s_0				
010B	1886 00820	btfsc	PORTB,1		
010C	2???	00821	call	TestKey	
010D	00BE 00822	decfsz	COUNTH, F		
010E	2???	00823	goto	\$+2	
010F	00BF 00824	decfsz	COUNTM, F		
0110	2???	00825	goto	\$+2	
0111	0BC0 00826	decfsz	COUNTL, F		
0112	2???	00827	goto	Delay5s_0	
0113	2???	00828	goto	\$+1	
0114	2???	00829	goto	\$+1	
		00830			
0115	00831 SwitchPage				
0115	2???	00832	call	ClrLCD	
		00833	Display	Info_Msg1	
0000	M	local	loop_		
0000	M	local	end_		
0116	01C1	cirf	Table_Counter		
0117	0103	clrw			
0118	0841	M	loop_	movf Table_Counter,W	
0119	2???	M	call	Info_Msg1	
011A	3A00	M	xorlw	B'00000000' ;check WORK reg to see	
if 0 is returned					
011B	1903	M	btfsc	STATUS,Z	
011C	2???	M	goto	end_	
011D	2???	M	call	WR_DATA	
011E	0AC1	M	incf	Table_Counter,F	

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LOC	OBJECT CODE	LINE	SOURCE TEXT	VALUE	
0143	087B	00864	movf	W_temp, W	
0144	3A00	00865	xorlw	0x00	
0145	1903	00866	btfsc	STATUS,Z	
0146	2???	00867	goto	Operation	
		00868			
0147	087B	00869	movf	W_temp, W	
0148	3A03	00870	xorlw	0x03	
0149	1903	00871	btfsc	STATUS,Z	
014A	2???	00872	goto	A_Pressed	
		00873			
014B	087B	00874	movf	W_temp, W	
014C	3A07	00875	xorlw	0x07	
014D	1903	00876	btfsc	STATUS,Z	
		00877			
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C:\Users\Joe\Desktop\AER201\Final\Final.X\build\default\production_ext1472\main.lst					
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LOC	OBJECT CODE	LINE	SOURCE TEXT	VALUE	
011F	2???	M	goto	loop_	
0120	M end_				
0120	2???	00834	call	Switch_Lines	
		00835	Display	Info_Msg2	
0000	M	local	loop_		
		00836	MAIN.ASM	4-7-2016 23:42:36	PAGE 19
LOC	OBJECT CODE	LINE	SOURCE TEXT	VALUE	
0000	M	local	end_		
0121	01C1	M	clrf	Table_Counter	
0122	0103	M	clrw		
0123	0841	M	loop_	movf Table_Counter,W	
0124	2???	M	call	Info_Msg2	
0125	3A00	M	xorlw	B'00000000' ;check WORK reg to see	
if 0 is returned					
0126	1903	M	btfsc	STATUS,Z	
0127	2???	M	goto	end_	
0128	2???	M	call	WR_DATA	
0129	0AC1	M	incf	Table_Counter,F	
012A	2???	M	goto	loop_	
012B	M end_				
012B	3001 00836	movlw	0x1		
012C	00F6 00837	movwf	inmenu		
012D	3071 00838 Delay5s2	movlw	0x71		
012E	00BE 00839	movwf	COUNTH		
012F	3040 00840	movlw	0x40		
0130	00BF 00841	movwf	COUNTM		
0131	301C 00842	movlw	0x1C		
0132	00C0 00843	movwf	COUNTL		
0133	00844 Delay5s2_0				
0133	1886 00845	btfsc	PORTB,1		
0134	2???	00846	call	TestKey	
0135	00BE 00847	decfsz	COUNTH, F		
0136	2???	00848	goto	\$+2	
0137	00BF 00849	decfsz	COUNTM, F		
0138	2???	00850	goto	\$+2	
0139	0BC0 00851	decfsz	COUNTL, F		
013A	2???	00852	goto	Delay5s2_0	
013B	2???	00853	goto	\$+1	
013C	2???	00854	goto	\$+1	
013D	2???	00855	goto	Standby	
		00856			
013E	00857 TestKey				
013E	0EB06 00858	swapf	PORTB,W	;Read PortB<7:4>	
int0	W<3:0>				
013F	1886 00859	btfsc	PORTB,1	;Wait until key is released	
0140	2???	00860	goto	\$-1	
0141	390F 00861	andiw	0x0F		
0142	00FB 00862	movwf	W_temp		
		00863			

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C:\Users\Joe\Desktop\AER201\Final\Final.X\build\default\production_ext1472\main.lst					
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LOC	OBJECT CODE	LINE	SOURCE TEXT	VALUE	
0000	M	local	end_		
0165	01C1	M	clrf	Table_Counter	
0166	0103	M	clrw		
0167	0841	M	loop_	movf Table_Counter,W	
0168	2???	M	call	Past_Info_Date	
0169	3A00	M	xorlw	B'00000000' ;check WORK reg to see	
if 0 is returned					
016A	1903	M	btfsc	STATUS,Z	
016B	2???	M	goto	end_	
016C	2???	M	call	WR_DATA	
016D	0AC1	M	incf	Table_Counter,F	
016E	2???	M	goto	loop_	
016F	3030 00909	DisplayDate	YearTen,MonT,MonD,DayT,DayD,HourT,HourD,MinT,MinD		
		016G	Bank0		
016H	1283	M	bcf	STATUS,RP1	
0170	00C7	M	bcf	STATUS,RP0	
0171	00908	M	movwf	W_tempN	
		0172	3032	M	movlw 0x32
0173	2???	M	call	WR_DATA	
		0174	00909	M	call
		0175	302F	M	movlw 0x2f
		0176	0820	M	movf YearTen,W
		0177	2???	M	call
		0178	0821	M	movf WR_DATE
		0179	2???	M	call
		017A	0822	M	movf Mont,W
		017B	2???	M	call
		017C	0822	M	movf WR_DATE
		017D	2???	M	call
		017E	0823	M	movf MonD,W ;month
		017F	2???	M	call
		0180	302F	M	movf WR_DATE
		0181	2???	M	call
		0182	0824	M	movf DayT,W
		0183	2???	M	call
		0184	0825	M	movf WR_DATE
		0185	2???	M	call
		0186	3020	M	movlw 0x20
		0187	2???	M	call
		0188	0826	M	movf HourT,W
		0189	2???	M	call
		018A	0827	M	movf WR_DATE
		018B	2???	M	call
		018C	303A	M	movlw 0x3a
		018D			

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```

018D 2??? M call WR_DATA
018E 0828 M movf MinT,W
018F 2??? M call WR_DATA
0190 0829 M movf MinD,W ;min
0191 2??? M call WR_DATA
0192 0847 M movf W_tempW,W
0193 2??? 00910 call Switch_Lines
00911 Display Past_Info_Num
0000 M local loop_
0000 M local end_
0194 01C1 M clrf Table_Counter
0195 0103 M clrw
0196 0841 M loop_ movf Table_Counter,W
0197 2??? M call Past_Info_Num
0198 3A00 M xorlw B'00000000' ;check WORK reg to see
if 0 is returned
0199 1903 M btfsc STATUS,Z
019A 2??? M goto end_
019B 2??? M call WR_DATA
019C 0AC1 M incf Table_Counter,F
019D 2??? M goto loop_
019E M end_
019F 0868 00912 movf SpotDH,W
019F 2??? 00913 call WR_DATA
01A0 0869 00914 movf SpotDL,W
01A1 2??? 00915 call WR_DATA
01A2 3002 00916 movlw 0x2
01A3 00F6 00917 movwf inmenu
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```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

01A4 2??? 00918 goto Hold
00919
01A5 00920 A_Pressed
01A5 3010 00921 movlw 0x10
01A6 00AB 00922 movwf SecD
01A7 ??? ???? 00923 pagesel getHistory
01A9 2??? 00924 call getHistory
01AA ??? ???? 00925 pagesel $
01AC 2??? 00926 goto Write
01AD 00927 B_Pressed
01AD 3020 00928 movlw 0x20
01AE 00AB 00929 movwf SecD
01AF ??? ???? 00930 pagesel getHistory
01B1 2??? 00931 call getHistory
01B2 ??? ???? 00932 pagesel $
01B4 2??? 00933 goto Write
01B5 00934 C_Pressed
01B5 3030 00935 movlw 0x30

```

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```

01E8 087B M movf W_temp,W
01E9 3E?? addlw LOW_TableInfo_Msg1
01EA 1803 M btfsC STATUS,C
01EB 0A8A M incf PCLATH,f
01EC 0082 M movwf PCL
01ED 00961 TableInfo_Msg1
01ED 3450 3461 3473 00962 dt "Past OP Log:A-D", 0
3474 3420 344F
3450 3420 344C
346F 3467 343A
3441 342D 3444
3400
00963
01FD 00964 Info_Msg2
00965 DispTable TableInfo_Msg2
01FD 1303 M Bank0
01FE 1283 M bcf STATUS,RP1
01FF 00FB M bcf STATUS,RP0
0200 30?? M movlw W_temp
0201 008A M movwf HIGH_TableInfo_Msg2
0202 087B M PCLATH
0203 3E?? M addlw LOW_TableInfo_Msg2
0204 1803 M btfsc STATUS,C
0205 0A8A M incf PCLATH,f
0206 0082 M movwf PCL
0207 00966 TableInfo_Msg2
0207 3453 3474 3461 00967 dt "Start:l Exit:#", 0
3472 3474 343A
3431 3420 3420
3445 3478 3469
3474 343A 3423
3400
00968
0217 00969 Past_Info_Date
00970 DispTable TablePast_Info_Date
0217 1303 M Bank0
0218 1283 M bcf STATUS,RP1
0219 00FB M bcf STATUS,RP0
021A 30?? M movlw HIGH_TablePast_Info_Date
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```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

021B 008A M movwf PCLATH
021C 087B M movf W_temp,W
021D 3E?? M addlw LOW_TablePast_Info_Date
021E 1803 M btfsc STATUS,C
021F 0A8A M incf PCLATH,f
0220 0082 M movwf PCL

```

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```

01B6 00AB 00936 movwf SecD
01B7 ??? ???? 00937 pagesel getHistory
01B9 2??? 00938 call getHistory
01BA ??? ???? 00939 pagesel $
01BC 2??? 00940 goto Write
01BD 00941 D_Pressed
01BD 3040 00942 movlw 0x40
01BE 00AB 00943 movwf SecD
01BF ??? ???? 00944 pagesel getHistory
01C1 2??? 00945 call getHistory
01C2 ??? ???? 00946 pagesel $
01C4 2??? 00947 goto Write
00948
01C5 00949 Hold
01C5 1886 00950 btfsc PORTB,1
01C6 2??? 00951 goto TestKey
01C7 2??? 00952 goto Hold
00953
01C8 00954 Welcome_Msg
00955 DispTable TableWelcome_Msg
M Bank0
01C8 1303 M bcf STATUS,RP1
01C9 1283 M bcf STATUS,RP0
01CA 00FB M movwf W_temp
01CB 30?? M movlw HIGH_TableWelcome_Msg
01CC 008A M movwf PCLATH
01CD 087B M movf W_temp,W
01CE 3E?? M addlw LOW_TableWelcome_Msg
01CF 1803 M btfsc STATUS,C
01DO 0A8A M incf PCLATH,f
01D1 0082 M movwf PCL
01D2 00956 TableWelcome_Msg
01D2 3457 3465 346C 00957 dt "Welcome Standby", 0
3463 346F 346D
3465 3420 3420
MAIN.ASM 4-7-2016 23:42:36 PAGE 23

```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

3453 3474 3461
346B 3464 3462
3479 3400
00958
01E3 00959 Info_Msg1
00960 DispTable TableInfo_Msg1
M Bank0
01E3 1303 M bcf STATUS,RP1
01E4 1283 M bcf STATUS,RP0
01E5 00FB M movwf W_temp
01E6 30?? M movlw HIGH_TableInfo_Msg1
01E7 008A M movwf PCLATH

```

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```

0221 00971 TablePast_Info_Date
0221 3444 3461 3474 00972 dt "Date: ", 0
3465 343A 3420
3400
00973
0228 00974 Past_Info_Num
00975 DispTable TablePast_Info_Num
0228 1303 M Bank0
0229 1283 M bcf STATUS,RP1
022A 00FB M bcf STATUS,RP0
022B 30?? M movlw W_temp
022C 008A M movwf HIGH_TablePast_Info_Num
022D 087B M PCLATH
022E 3E?? M addlw W_temp,W
022F 1803 M btfsc STATUS,C
0230 0A8A M incf PCLATH,f
0231 0082 M movwf PCL
0232 00976 TablePast_Info_Num
0232 3444 346F 3474 00977 dt "Dots: ", 0
3473 343A 3420
3400
00978
;*****+
****+
00979
00980
;*****+
****+
0239 00981 Operation
0239 2??? 00982 call ClrLCD
00983 Display OP_MSG
0000 M local loop_
0000 M local end_
023A 01C1 M clrf Table_Counter
023B 0103 M clrw
023C 0841 M loop_ movf Table_Counter,W
023D 2??? M call OP_MSG
023E 3A00 M xorlw B'00000000' ;check WORK reg to see
if 0 is returned
023F 1903 M btfsc STATUS,Z
0240 2??? M goto end_
0241 2??? M call WR_DATA
0242 0AC1 M incf Table_Counter,F
0243 2??? M goto loop_
0244 M end_
00984
0244 3E?? 00985 pagesel getStartTime
0246 2??? 00986 call getStartTime
0247 3E?? 00987 pagesel $
0249 3008 00988 movlw 0x8
024A 00E5 00989 movwf UCount
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```

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```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

00990
00991 ; Ready to start
024B 27?? 00992 call HalfS
024C 27?? 00993 call HalfS
00994
00995 ; Start Motors
024D 27?? 00996 call StartMotor
024E 27?? 00997 call Reset_Sensor
024F 27?? 00998 call DS
0250 141F 00999 bsf ADCON0,ADON
0251 168B 01000 bsf INTCON,TOIE
0252 178B 01001 bsf INTCON,GIE
01002
0253 01003 Wait_Interrupt
01004 Bank0
0253 1303 M bcf STATUS,RP1
0254 1283 M bcf STATUS,RP0
0255 27?? 01005 call DS
0256 77?? 01006 pagesel Ultra_Trig
0258 27?? 01007 call Ultra_Trig
0259 77?? 01008 pagesel $ 
025B 084B 01009 movf STATE,W
025C 3A00 01010 xorlw 0x0
025D 1D03 01011 btfss STATUS,Z
025E 27?? 01012 goto Wait_Interrupt2 ; state is 0
025F 27?? 01013 goto Wait_Interrupt ; state is not 0
01014
0260 01015 Wait_Interrupt2
0260 27?? 01016 call DS
0261 77?? 01017 pagesel Ultra_Trig
0263 27?? 01018 call Ultra_Trig
0264 77?? 01019 pagesel $ 
0266 084B 01020 movf STATE,W
0267 3A00 01021 xorlw 0x0
0268 1D03 01022 btfss STATUS,Z
0269 27?? 01023 goto Pipe_Begin ; state is 0
026A 27?? 01024 goto Wait_Interrupt ; state is not 0
01025
026B 01026 StartMotor
01027 ; Load PWM. PWL at 50% and PWM2 at 10%; Prescale 1
026B 130B 01028 bcf INTCON,GIE
026C 130B 01029 bcf INTCON,PEIE
01030 Bank1
026D 1303 M bcf STATUS,RP1
026E 1683 M bcf STATUS,RP0
01031 ; PR2
026F 301F 01032 movlw b'00011111'
0270 0092 01033 movwf PR2
01034 ; CCPXCON and CCPRXL
01035 Bank0
0271 1303 M bcf STATUS,RP1
0272 1283 M bcf STATUS,RP0
0273 300C 01036 movlw b'00001100'
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```

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```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

0296 ??? 01077 goto Sensor_Check
01078
0297 1303 01079 Sensor_Check
01080 Bank0
0297 1303 M bcf STATUS,RP1
0298 1283 M bcf STATUS,RP0
01081 ResetMux1
0299 1009 M bcf MUX1_0
029A 1089 M bcf MUX1_1
029B 1109 M bcf MUX1_2
01082 ResetMux2
029C 1387 M bcf MUX2_0
#MPASM 5.65 MAIN.ASM 4-7-2016 23:42:36 PAGE 27

```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

029D 1307 M bcf MUX2_1
029E 1287 M bcf MUX2_2
029F 27?? 01083 call DS
02A0 27?? 01084 call DS
02A1 01EC 01085 clrf MUX_Output
02A2 01EB 01086 clrf SensorB
02A3 77?? 01087 pagesel Ultra_Trig
02A5 27?? 01088 call Ultra_Trig
02A6 77?? 01089 pagesel $ 
02A8 084E 01090 movf STATE,W
02A9 3A00 01091 xorlw 0x0
02AA 1D03 01092 btfss STATUS,Z
02AB 27?? 01093 goto MUX1_Check
02AC 27?? 01094 goto ReverseDir
01095
02AD 01096 MUX1_Check
01097 WriteMUX1
02AD 086C M movf MUX_Output,W
02AE 00ED M movwf MUX_Temp
02AF 0DED M rlf MUX_Temp,F
02B0 0DED M rlf MUX_Temp,F
02B1 0DED M rlf MUX_Temp,F
02B2 0DED M rlf MUX_Temp,F
02B3 0DED M rlf MUX_Temp,F
02B4 301F M movlw b'00011111'
02B5 0587 M andwf PORTC,F
02B6 086D M movf MUX_Temp,W
02B7 0487 M iorwf PORTC,F
02B8 27?? 01098 call DS
02B9 27?? 01099 call CheckMUX1
02BA 3007 01100 movlw b'111'
02BB 066C 01101 xorwf MUX_Output,W
02BC 1903 01102 btfsc STATUS,Z
02BD 27?? 01103 goto GO_MUX2
Message[305]: Using default destination of 1 (file).

```

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```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

0097 01034 ; CCPXCON and CCPRXL
01035 Bank0
0271 1303 M bcf STATUS,RP1
0272 1283 M bcf STATUS,RP0
0273 300C 01036 movlw b'00001100'
#MPASM 5.65 MAIN.ASM 4-7-2016 23:42:36 PAGE 26

```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

0274 0097 01037 movwf CCPICON
0275 301C 01038 movlw b'00011100'
0276 009D 01039 movwf CCP2CON
0277 3004 01040 movlw b'00000100'
0278 0092 01041 movwf T2CON
0279 3010 01042 movlw b'00010000'
027A 0095 01043 movwf CCPRL
027B 3003 01044 movlw b'00000011'
027C 009B 01045 movwf CCPR2L
01046
027D 1008 01047 ; Start motors
027E 1488 01048 bcf MOTOR00
027F 1085 01049 bcf MOTOR01
0280 1505 01050 bcf MOTOR10
01052
0281 178B 01053 bcf INTCON,GIE
0282 170B 01054 bcf INTCON,PEIE
01055
0283 0008 01056 return
01057
0284 01058 Pipe_Begin
0284 27?? 01059 call DS
0285 77?? 01060 pagesel Ultra_Trig
0287 27?? 01061 call Ultra_Trig
0288 77?? 01062 pagesel $ 
028A 084F 01063 movf UREADING0,W
028B 00E6 01064 movwf Desired_Gap
028C 3B01 01065 addlw 0x01
028D 00D8 01066 movwf UPBOUND
028E 084F 01067 movf UREADING0,W
028F 00D9 01068 movwf LOBOUND
0290 3001 01069 movlw 0x01
0291 02D9 01070 subwf LOBOUND,1
01071
01072
0292 27?? 01073 call HalfS
0293 27?? 01074 call DS
0294 01F0 01075 clrf TMROH
0295 0181 01076 clrf TMRO

```

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```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

02BE 0AEB 01104 incf SensorB
Message[305]: Using default destination of 1 (file).
02BF 0AEC 01105 incf MUX_Output
02C0 27?? 01106 goto MUX1_Check
01107
02C1 01108 GO_MUX2
01109 ResetMux1
02C1 1009 M bcf MUX1_0
02C2 1089 M bcf MUX1_1
02C3 1109 M bcf MUX1_2
Message[305]: Using default destination of 1 (file).
02C4 0AEB 01110 incf SensorB
02C5 01EC 01111 clrf MUX_Output
01112
02C6 01113 MUX2_Check
01114 WriteMUX2
02C6 086C M movf MUX_Output,W
02C7 0089 M movwf PORTE
#MPASM 5.65 MAIN.ASM 4-7-2016 23:42:36 PAGE 28

```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

02C8 27?? 01115 call DS
02C9 27?? 01116 call CheckMUX2
02CA 3007 01117 movlw b'111'
02CB 066C 01118 xorwf MUX_Output,W
02CC 1903 01119 btfsc STATUS,Z
02CD 27?? 01120 goto Sensor_Int
Message[305]: Using default destination of 1 (file).
02CE 0AEB 01121 incf SensorB
Message[305]: Using default destination of 1 (file).
02CF 0AEC 01122 incf MUX_Output
02D0 27?? 01123 goto MUX2_Check
01124
02D1 01125 CheckMUX1
02D1 0806 01126 movf PORTB,W
02D2 00EF 01127 movwf READING
02D3 086C 01128 movf MUX_Output,W
02D4 3C01 01129 sublw 0x01
02D5 1C03 01130 btfss STATUS,C
02D6 27?? 01131 goto MIIF01
02D7 27?? 01132 goto MIIFNOT01
01133
02D8 19EF 01134 MIIF01 btfsc READING,3
02D9 27?? 01135 goto $+3
02DA 0008 01136 return
01137
02DB 1DEF 01138 MIIFNOT01 btfss READING,3
02DC 27?? 01139 goto RECORD
02DD 0008 01140 return
01141

```

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01142				0325	1903	01236	btfsc	STATUS, Z	
01143				0326	???	01237	goto	Sensor13	
02DE 0144 CheckMUX2						01238			
02DE 0806 0145 movf PORTB,W				0327	086B	01239	movf	SensorB, W	
02DF 00EF 0146 movwf READING				0328	3A0E	01240	xorlw	0x0e	
02EO 3006 0147 movlw 0x06				0329	1903	01241	btfsc	STATUS, Z	
02EI 026C 0148 subwf MUX_Output,W				032A	???	01242	goto	Sensor14	
01149						01243			
02E2 1C03 01150 btfss STATUS,C				032B	086B	01244	movf	SensorB, W	
02E3 2??? 01151 goto M2IF67				032C	3A0F	01245	xorlw	0x0f	
02E4 2??? 01152 goto M2IFNOT67				032D	1903	01246	btfsc	STATUS, Z	
01153				032E	???	01247	goto	Sensor15	
02E5 196F 01154 M2IF67 btfsc READING,2						01248			
02E6 2??? 01155 goto \$+3				032F	1903	01249	Sensor0		
02E7 0008 01156 return				032F	3032	01250	movlw	0x32	
01157				0330	00BB	01251	movwf	FinishMind	
02E8 1D6F 01158 M2IFNOT67 btfss READING,2				0331	3037	01252	movlw	0x37	
01159				0332	00BC	01253	movwf	FinishSecT	
02E9 2??? 01160 goto RECORD				0333	3030	01254	movlw	0x30	
02EA 0008 01161 return				0334	00BD	01255	movwf	FinishSecD	
01162				0335	???	01256	goto	Writing	
02EB 01163 RECORD						01257			
02EB 086E 01164 movf GAP,W				0336	1903	01258	Sensor1		
02EC 3A00 01165 xorlw 0x0				0336	3032	01259	movlw	0x32	
FPMPASM 5.65				0337	00BB	01260	movwf	FinishMind	
MAIN.ASM 4-7-2016 23:42:36			PAGE 29	0338	3039	01261	movlw	0x39	
LOC OBJECT CODE	LINE	SOURCE	TEXT	0339	00BC	01262	movwf	FinishSecT	
VALUE				033A	3032	01263	movlw	0x32	
02ED 1D03 01166 btfss STATUS,Z				033B	00BD	01264	movwf	FinishSecD	
02EE 2??? 01167 goto Sensor_Check				033C	???	01265	goto	Writing	
01168						01266			
02EF 086B 01169 movf SensorB, W				033D	3033	01267	Sensor2		
02FO 3A00 01170 xorlw 0x00				033D	3033	01268	movlw	0x33	
02F1 1903 01171 btfsc STATUS, Z				033E	00BB	01269	movwf	FinishMind	
02F2 2??? 01172 goto Sensor0				033F	3031	01270	movlw	0x31	
01173				0340	00BC	01271	movwf	FinishSecT	
02F3 086B 01174 movf SensorB, W				FPMPASM 5.65					
02F4 3A01 01175 xorlw 0x01				MAIN.ASM 4-7-2016 23:42:36					PAGE 31
02F5 1903 01176 btfsc STATUS, Z									
02F6 2??? 01177 goto Sensor1									
01178									
02F7 086B 01179 movf SensorB, W									
02F8 3A02 01180 xorlw 0x02									
02F9 1903 01181 btfsc STATUS, Z									
02FA 2??? 01182 goto Sensor2									
01183									
02FB 086B 01184 movf SensorB, W									
02FC 3A03 01185 xorlw 0x03									
02FD 1903 01186 btfsc STATUS, Z									
02FE 2??? 01187 goto Sensor3									
01188									
LOC OBJECT CODE	LINE	SOURCE	TEXT						
VALUE									
0341 3035 01272 movlw 0x35									
0342 00BD 01273 movwf FinishSecD									
0343 2??? 01274 goto Writing									
01275									
0344 3033 01276 Sensor3									
0344 3033 01277 movlw 0x33									
0345 00BB 01278 movwf FinishMinD									
0346 3033 01279 movlw 0x33									
0347 00BC 01280 movwf FinishSecT									
0348 3038 01281 movlw 0x38									
0349 00BD 01282 movwf FinishSecD									
LOC OBJECT CODE	LINE	SOURCE	TEXT						
VALUE									
0351 2??? 01292 goto Writing									
01293									
0352 3034 01294 Sensor5									
0352 3030 01295 movlw 0x30									
0353 00BB 01296 movwf FinishMind									
0354 3032 01297 movlw 0x32									
0355 00BC 01298 movwf FinishSecT									
0356 3032 01299 movlw 0x32									
0357 00BD 01300 movwf FinishSecD									
0358 2??? 01301 goto Writing									
01302									
0359 3030 01303 Sensor6									
0359 3030 01304 movlw 0x30									
035A 00BB 01305 movwf FinishMind									
035B 3034 01306 movlw 0x34									
035C 00BC 01307 movwf FinishSecT									
035D 3035 01308 movlw 0x35									
035E 00BD 01309 movwf FinishSecD									
035F 2??? 01310 goto Writing									
01311									
0360 3030 01312 Sensor7									
0360 3030 01313 movlw 0x30									
0361 00BB 01314 movwf FinishMind									
0362 3036 01315 movlw 0x36									
0363 00BC 01316 movwf FinishSecT									
0364 3038 01317 movlw 0x38									
0365 00BD 01318 movwf FinishSecD									
0366 2??? 01319 goto Writing									
01320									
0367 3030 01321 Sensor8									
0367 3030 01322 movlw 0x30									
0368 00BB 01323 movwf FinishMind									
0369 3039 01324 movlw 0x39									
FPMPASM 5.65									
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LOC OBJECT CODE	LINE	SOURCE	TEXT						
VALUE									
036A 00BC 01325 movwf FinishSecT									
036B 3030 01326 movlw 0x30									
036C 00BD 01327 movwf FinishSecD									
036D 2??? 01328 goto Writing									
01329									
LOC OBJECT CODE	LINE	SOURCE	TEXT						
VALUE									
0371 086B 01219 movf SensorB, W									
0372 3A0A 01220 xorlw 0xa									
0373 1903 01221 btfsc STATUS, Z									
0374 2??? 01222 goto Sensor10									
01223									
0375 086B 01224 movf SensorB, W									
0376 3A0B 01225 xorlw 0xb									
0377 1903 01226 btfsc STATUS, Z									
0378 2??? 01227 goto Sensor11									
01228									
0379 086B 01229 movf SensorB, W									
0380 3A0C 01230 xorlw 0xc									
0381 1903 01231 btfsc STATUS, Z									
0382 2??? 01232 goto Sensor12									
01233									
0383 086B 01234 movf SensorB, W									
0384 3A0D 01235 xorlw 0xd									
FPMPASM 5.65									
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LOC OBJECT CODE	LINE	SOURCE	TEXT						
VALUE									
0385 2??? 01329 goto Writing									
01330									

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0386 00BC 01330 movwf FinishSecT				
0387 3030 01331 movlw 0x30				
0388 00BD 01332 movwf FinishSecD				
0389 2??? 01333 goto Writing				
01334				

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```

036E 0301    01330 Sensor9
036E 0301    01331    movlw   0x31
036F 00BB    01332    movwf   FinishMinD
0370 3031    01333    movlw   0x31
0371 00BC    01334    movwf   FinishSecT
0372 3032    01335    movlw   0x32
0373 00BD    01336    movwf   FinishSecD
0374 2???    01337    goto   Writing
01338
0375 01339 Sensor10
0375 3031    01340    movlw   0x31
0376 00BB    01341    movwf   FinishMinD
0377 3033    01342    movlw   0x33
0378 00BC    01343    movwf   FinishSecT
0379 3035    01344    movlw   0x35
037A 00BD    01345    movwf   FinishSecD
037B 2???    01346    goto   Writing
01347
037C 01348 Sensor11
037C 3031    01349    movlw   0x31
037D 00BB    01350    movwf   FinishMinD
037E 3035    01351    movlw   0x35
037F 00BC    01352    movwf   FinishSecT
0380 3037    01353    movlw   0x37
0381 00BD    01354    movwf   FinishSecD
0382 2???    01355    goto   Writing
01356
0383 01357 Sensor12
0383 3031    01358    movlw   0x31
0384 00BB    01359    movwf   FinishMinD
0385 3038    01360    movlw   0x38
0386 00BC    01361    movwf   FinishSecT
0387 3030    01362    movlw   0x30
0388 00BD    01363    movwf   FinishSecD
0389 2???    01364    goto   Writing
01365
038A 01366 Sensor13
038A 3032    01367    movlw   0x32
038B 00BB    01368    movwf   FinishMinD
038C 3030    01369    movlw   0x30
038D 00BC    01370    movwf   FinishSecT
038E 3032    01371    movlw   0x32
038F 00BD    01372    movwf   FinishSecD
0390 2???    01373    goto   Writing
01374
0391 01375 Sensor14
0391 3032    01376    movlw   0x32
0392 00BB    01377    movwf   FinishMinD

```

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```

03BC 0A84    01412    incf   FSR,F

```

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LOC	OBJECT CODE	LINE	SOURCE TEXT
	VALUE		
03BD	083D	01413	movf FinishSecD,W
03BE	0080	01414	movwf INDF
03BF	0AE0	01415	incf SpotB,F
03C0	0AEE	01416	incf GAP,F
03C1	2???	01417	goto Sensor_Check
		01418	
03C2		01419 Sensor_Int	
		01420	ResetMux2
03C2	1387	M	bcf MUX2_0
03C3	1307	M	bcf MUX2_1
03C4	1287	M	bcf MUX2_2
03C5	01EE	01421	clrf GAP
03C6	1285	01422	bcf BUZZER
03C7	2???	01424	goto Sensor_Check
		01425	
03C8		01426	
03C8	1285	01428	bcf BUZZER
		01429	; Go beyond the pipe
03C9	2???	01430	call HalfS
03CA	2???	01431	call HalfS
		01432	; Stop both motors
03CB	1088	01433	bcf MOTOR01
03CC	1105	01434	bcf MOTOR11
		01435	; Wait to stop
03CD	2???	01436	call HalfS
03CE	2???	01437	call HalfS
		01438	; Move back
03CF	1408	01439	bsf MOTOR00
03DO	1485	01440	bsf MOTOR10
		01441	Message[305]: Using default destination of 1 (file).
03D1	0AD7	01442	incf FORWARD
		01443	; 4 sec delay
03D2	2???	01444	call HalfS
03D3	2???	01445	call HalfS
03D4	2???	01446	call HalfS
03D5	2???	01447	call HalfS
03D6	2???	01448	call HalfS
03D7	2???	01449	call HalfS
03D8	2???	01450	call HalfS
03D9	2???	01451	call HalfS
03DA	???? ?????	01452	pagesel Ultra_Trig
03DC	2???	01453	call Ultra_Trig
03DD	2???	01454	pagesel \$

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```

0393 3032    01378    movlw   0x32
0394 00BC    01379    movwf   FinishSecT
0395 3035    01380    movlw   0x35
0396 00BD    01381    movwf   FinishSecD
0397 2???    01382    goto   Writing
01383
0398 01384 Sensor15
0398 3032    01385    movlw   0x32
0399 00BB    01386    movwf   FinishMinD
039A 3034    01387    movlw   0x34
039B 00BC    01388    movwf   FinishSecT
039C 3038    01389    movlw   0x38
039D 00BD    01390    movwf   FinishSecD
039E 2???    01391    goto   Writing
01392
039F 01393 Writing
039F 1685    01394    bsf   BUZZER
01395    GetWritingAddress
0000      M      local   loop_
0000      M      local   end_
03A0 086A    M      movf   SpotB,W
03A1 00E8    M      movwf  SpotDH
03A2 1783    M      bsf   STATUS,IRP
03A3 3096    M      movlw  0x96
03A4 0084    M      movwf  FSR
03A5      M      loop_
03A5 0868    M      movf   SpotDH,W
03A6 3A00    M      xorlw  0x0
03A7 1903    M      btfsc  STATUS,Z
03A8 2???    M      goto   end_
03A9 3006    M      movlw  0x06
03AA 0784    M      addwf  FSR,F

```

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Message[305]: Using default destination of 1 (file).

```

03AB 03E8    M      decf   SpotDH
03AC 2???    M      goto   loop_
03AD      M      end_
03AD 2???    01396    call   GetDistance
03AE 0838    01397    movf   FinishHourT,W
03AF 0080    01398    movwf  INDF
03B0 0A84    01399    incf   FSR,F
03B1 0839    01400    movf   FinishHourD,W
03B2 0080    01401    movwf  INDF
03B3 0A84    01402    incf   FSR,F
03B4 083A    01403    movf   FinishMinT,W
03B5 0080    01404    movwf  INDF
03B6 0A84    01405    incf   FSR,F
01406    ; Angle
03B7 083B    01407    movf   FinishMinD,W
03B8 0080    01408    movwf  INDF
03B9 0A84    01409    incf   FSR,F
03BA 083C    01410    movf   FinishSecT,W
03BB 0080    01411    movwf  INDF

```

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```

03DF 3004    01455    movlw   0x04
03E0 00E5    01456    movwf   UCount
03E1 084F    01457    movf   UREADING0,W
03E2 00E6    01458    movwf   Desired_Gap
03E3 3E00    01459    addlw  0x00
03E4 00D8    01460    movwf   UPBOUND
03E5 084F    01461    movf   UREADING0,W

```

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LOC	OBJECT CODE	LINE	SOURCE TEXT
	VALUE		
03E6	00D9	01462	movwf LOBOUND
03E7	3E00	01463	movlw 0x00
03E8	02D9	01464	subwf LOBOUND,1
		01465	
03E9		01466 Straight_Back	
		01467	;call HalfS
03E9	2???	01468	call HalfS
03EA	???? ????	01469	pagesel Ultra_Trig
03EC	2???	01470	call Ultra_Trig
03ED	???? ????	01471	pagesel \$
03EF	084E	01472	movf STATE,W
03FO	3A00	01473	xorlw 0x0
03F1	1D03	01474	btfss STATUS,Z
03F2	2???	01475	goto Straight_Back
03F3	2???	01476	call HalfS
03F4	2???	01477	call HalfS
03F5	2???	01478	call HalfS
03F6	1008	01479	bcf MOTOR00
03F7	10E5	01480	bcf MOTOR10
03F8	2???	01481	goto Termination
		01482	
03F9		01483 OP_MSG	
		01484	DispTable TableOP_MSG
		M	Bank0
03F9	1303	M	bcf STATUS,RP1
03FA	1283	M	bcf STATUS,RP0
03FB	00FB	M	movwf W_temp
03FC	30??	M	movlw HIGH TableOP_MSG
03FD	008A	M	movwf PCLATH
03FE	087B	M	movf W_temp,W
03FF	3E??	M	addlw LOW TableOP_MSG
0400	1803	M	btfsc STATUS,C
0401	0A8A	M	incf PCLATH,f
0402	0082	M	movwf PCL
		0403	01485 TableOP_MSG
0403	344F 3470 3465 01486	dt	"Operating...", 0
		3472 3461 3474	
		3469 346B 3467	
		342E 342E 342E	
		3400	

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```

01487      M      movlw   0x37      ;If alphabetical,
*****  

***  

01488      M      movf    SpotB,W  

01489      M      addwf   SpotDH,1 ;save in output reg
01490 Termination      M      bcf    INTCON,GIE
01491      M      call    ClrLCD
01492      M      movf    Term_Msg
01493 Display      M      local   loop_
0000      M      local   end_
0000      M      local   end_
01494      M      clrf   Table_Counter
01495      M      clrw   Table_Counter
01496      M      movf   Table_Counter,W
01497      M      call    Term_Msg
01498      M      end_
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```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

0416 3A00      M      xorlw  B'00000000' ;check WORK reg to see
if 0 is returned
0417 1903      M      btfsc STATUS,Z
0418 2???      M      goto   end_
0419 2???      M      call    WR_DATA
041A 0AC1      M      incf   Table_Counter,F
041B 2???      M      goto   loop_
041C M end_
041C 2???      01494      call    Switch_Lines
04195      Display      Post_Msg
0000      M      local   loop_
0000      M      local   end_
041D 01C1      M      clrf   Table_Counter
041E 0103      M      clrw   Table_Counter
041F 0841      M      loop_  movf   Table_Counter,W
0420 2???      M      call    Post_Msg
0421 3A00      M      xorlw  B'00000000' ;check WORK reg to see
if 0 is returned
0422 1903      M      btfsc STATUS,Z
0423 2???      M      goto   end_
0424 2???      M      call    WR_DATA
0425 0AC1      M      incf   Table_Counter,F
0426 2???      M      goto   loop_
0427 M end_
0427 2??? 2??? 01496      pagesel getFinishTime
0429 2??? 01497      call    getFinishTime
042A 2??? 2??? 01498      pagesel $
042C 2??? 2??? 01499      pagesel getElapsedTime
042E 2??? 01500      call    getElapsedTime
042F 2??? 2??? 01501      pagesel $

```

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```

044F 3037      M      movlw   0x37
0450 07E9      M      addwf   SpotDL,1 ;and save in output reg
0451      01504      01505 TermMenu
0451 1303      M      bcf    Bank0
0452 1283      M      bcf    STATUS,RPI
0453 01F6      01507      clrfl  inmenu
0454 C86       01508      btfs  PORTB,1
0455 2???      01509      goto   TermMenu
0456      01510      01511 Test_D
0456 0806      01512      swapf  PORTB,W ;Read PortB<7:4>
into W<3:0>
0457 1886      01513      btfsc PORTB,1 ;Wait until key is released
0458 2???      01514      goto   $-1
0459 390F      01515      andlw  0x0F
045A 00FB      01516      movwf  W_temp
045B 087B      01517      movf   W_temp, W ; * pressed, initialize
045C 3A0C      01518      xorlw  0x0c
045D 1903      01519      btfsc STATUS,Z
045E 2???      01520      goto   Mainline
04521      01521
045F 087B      01522      movf   W_temp, W
0460 3A0F      01523      xorlw  0x0f
0461 1903      01524      btfsc STATUS,Z
0462 2???      01525      goto   CheckSub
0463 087B      01526
0464 3A0E      01527      movf   W_temp, W
0465 1903      01528      xorlw  0x0e
0466 2???      01529      btfsc STATUS,Z
0467 087B      01530      goto   Reiterate
0468 3A0D      01531
0469 1903      01532      movf   W_temp, W
046A 2???      01533      xorlw  0x0d
046B 2???      01534      btfsc STATUS,Z
046C 2???      01535      goto   askStore
046D 0876      01536      01537      goto   TermMenu
046E 2???      01538
046C 01539 CheckSub
Message[305]: Using default destination of 1 (file).
046C 0AF6      01540      incf   inmenu
046D 0876      01541      01542      movf   inmenu, W

```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

046E 3A01      01543      xorlw  0x01

```

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```

01502      ToBCD      SpotB      ;convert
number of dots
0431 086A      M      movf    SpotB,W
0432 3BBC      M      addlw   .256-.20 ; C will be set if
number was >= 20
0433 1803      M      btfsc STATUS,C
0434 3BD6      M      addlw   .6      ; ...adjust
for 20..29
0435 3E14      M      addlw   -(256-.20) ; Back to original
value
0436 3EF6      M      addlw   .256-.10 ; C will be set if
number was >= 10
0437 1803      M      btfsc STATUS,C
0438 3ED6      M      addlw   .6      ; ...adjust for
10..29
0439 3E0A      M      addlw   -(256-.10) ; Back to original
value
043A 00EA      M      movwf   SpotB
HEXtoASCII      SpotB,SpotDH,SpotDL
01503      Bank0
043B 1303      M      bcf    STATUS,RPI
043C 1283      M      bcf    STATUS,RPO
043D 01E8      M      clrf   SpotDH ;Clear output registers
043E 01E9      M      clrf   SpotDL
043F 0B6A      M      swapf  SpotB,W
0440 390F      M      andlw  0x0f      ;Mask off unwanted
bits
0441 00E8      M      movwf   SpotDH
0442 3010      M      movlw   10      ;For BCD lower
nibble only (lower 4 bits)
0443 0268      M      subwf   SpotDH,W
0444 3030      M      movlw   0x30      ;If numerical add
ascii value (-10)
0445 1803      M      btfsc STATUS,C

```

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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

0446 3037      M      movlw   0x37      ;If alphabetical,
then add a different ascii value (-10)
0447 07E8      M      addwf   SpotDH,1 ;save in output reg
0448 086A      M      movf    SpotB,W ;get lower nibble of input
byte
0449 390F      M      andlw  0x0f      ;mask off unwanted
data
044A 00E9      M      movwf   SpotDL
044B 3010      M      movlw   10
044C 0269      M      subwf   SpotDL,W
044D 3030      M      movlw   0x30
044E 1803      M      btfsc STATUS,C

```

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```

0488 1903      M      btfsc STATUS,Z
0489 2???      M      goto   end_
048A 2???      M      call    WR_DATA
048B 0AC1      M      incf   Table_Counter,F
048C 2???      M      goto   loop_
M end_
048D 2???      01571      call    Switch_Lines
048E 3030      01572      ;movf  MinT,W
048F 2???      01573      movlw  "0"
0490 0829      01574      call    WR_DATA
0491 2???      01575      movf   MinD,W
0492 3020      01577      movlw  " "
0493 2???      01578      call    WR_DATA
0494 304D      01579      movlw  "M"
0495 2???      01580      call    WR_DATA

```

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LOC	OBJECT CODE	LINE SOURCE TEXT	VALUE
0496	3049	01581 movlw "I"	
0497	27??	01582 call WR_DATA	
0498	304E	01583 movlw "N"	
0499	27??	01584 call WR_DATA	
049A	3020	01585 movlw "	
049B	27??	01586 call WR_DATA	
049C	082A	01587 movf Sect,W	
049D	27??	01588 call WR_DATA	
049E	082B	01589 movf Sect,W	
049F	27??	01590 call WR_DATA	
04A0	3020	01591 movlw "	
04A1	27??	01592 call WR_DATA	
04A2	3053	01593 movlw "S"	
04A3	27??	01594 call WR_DATA	
04A4	3045	01595 movlw "E"	
04A5	27??	01596 call WR_DATA	
04A6	3043	01597 movlw "C"	
04A7	27??	01598 call WR_DATA	
04A8	3020	01599 movlw "	
04A9	27??	01600 call WR_DATA	
04AA	3020	01601 movlw "	
04AB	27??	01602 call WR_DATA	
04AC	3044	01603 movlw "D"	
04AD	27??	01604 call WR_DATA	
04AE	27??	01605 goto WaitMenu	
		01606	
04AF	01607	Menu_Number	
04AF	27???	01608 call ClrLCD	
	01609 Display NumberLabel		
0000	M	local loop_	
0000	M	local end_	
04B0	01C1	M clrf Table_Counter	
04B1	0103	M clrW	
04B2	0841	M loop_ movf Table_Counter,W	
04B3	27??	M call NumberLabel	
04B4	3A00	M xorlw B'00000000' ;check WORK reg to see	
if 0 is returned			
04B5	1903	M btfsc STATUS,Z	
04B6	27??	M goto end_	
04B7	27??	M call WR_DATA	
04B8	0AC1	M incf Table_Counter,F	
04B9	27??	M goto loop_	
04BA	M end_		
04BA	27???	01610 call Switch_Lines	
04BB	0868	01611 movf SpotH,W	
04BC	27???	01612 call WR_DATA	
04BD	0869	01613 movf SpotDL,W	

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LOC	OBJECT CODE	LINE SOURCE TEXT	VALUE
04E3	0A84	M incf FSR,F	
04E4	0800	M movf INDF,W	
04E5	0091	M movwf LCDDISTM	
04E6	0A84	M incf FSR,F	
04E7	0800	M movf INDF,W	
04E8	0092	M movwf LCDDISTL	
04E9	0A84	M incf FSR,F	
04EA	0800	M movf INDF,W	
04EB	0093	M movwf LCDANGLH	
04EC	0A84	M incf FSR,F	
04ED	0800	M movf INDF,W	
04EE	0094	M movwf LCDANGLM	
04EF	0A84	M incf FSR,F	
04F0	0800	M movf INDF,W	
04F1	0095	M movwf LCDANGLL	
04F2	27???	01632 call DisplayDOT	
04F3	27???	01633 goto WaitMenu	
04F4	01634	01635 WaitMenu	
	01636 Bank0		
04F4	1303	M bcf STATUS,RP1	
04F5	1283	M bcf STATUS,RP0	
04F6	27???	01637 call DS	
04F7	1C86	01638 btfss PORTB,1	
04F8	27???	01639 goto WaitMenu	
04F9	27???	01640 goto Test_D	
04FA	01641	01642 askStore	
04FA	27???	01643 call ClrLCD	
	01644 Display Ask_Msg		
0000	M local loop_		
0000	M local end_		
04FB	01C1	M clrf Table_Counter	
04FC	0103	M clrW	
04FD	0841	M loop_ movf Table_Counter,W	
04FE	27???	M call Ask_Msg	
04FF	3A00	M xorlw B'00000000' ;check WORK reg to see	
if 0 is returned			
0500	1903	M btfsc STATUS,Z	
0501	27???	M goto end_	
0502	27???	M call WR_DATA	
0503	0AC1	M incf Table_Counter,F	
0504	27???	M goto loop_	
	M end_		
0505	27???	01645 call Switch_Lines	
0506	01646	WaitAD	
0506	1C86	01647 btfss PORTB,1	

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LOC	OBJECT CODE	LINE SOURCE TEXT	VALUE
04C2	27???	01619 call ClrLCD	
	01620 Bank3		
04C3	1703	M bsf STATUS,RP1	
04C4	1683	M bsf STATUS,RP0	
04C5	3095	01621 movlw 0x95	
04C6	0084	01622 movwf FSR	
	01623 NEXT_DOT		
04C7	0A84	M incf FSR,F	
04C8	0800	M movf INDF,W	
04C9	0090	M movwf LCDDISTH	
04CA	0A84	M incf FSR,F	
04CB	0800	M movf INDF,W	
04CC	0091	M movwf LCDDISTM	
04CD	0A84	M incf FSR,F	
04CE	0800	M movf INDF,W	
04CF	0092	M movwf LCDDISTL	
04D0	0A84	M incf FSR,F	
04D1	0800	M movf INDF,W	
04D2	0093	M movwf LCDANGLH	
04D3	0A84	M incf FSR,F	
04D4	0800	M movf INDF,W	
04D5	0094	M movwf LCDANGLM	
04D6	0A84	M incf FSR,F	
04D7	0800	M movf INDF,W	
04D8	0095	M movwf LCDANGLL	
04D9	27???	01624 call DisplayDOT	
04DA	27???	01625 goto WaitMenu	
	01626		
04DB	01627	DOT	
	01628 Bank0		
04DB	1303	M bcf STATUS,RP1	
04DC	1283	M bcf STATUS,RP0	
04DD	27???	01629 call ClrLCD	
	01630 Bank3		
04DE	1703	M bsf STATUS,RP1	
04DF	1683	M bsf STATUS,RP0	
	01631 NEXT_DOT		
04E0	0A84	M incf FSR,F	
04E1	0800	M movf INDF,W	
04E2	0090	M movwf LCDDISTH	

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LOC	OBJECT CODE	LINE SOURCE TEXT	VALUE
0507	27???	01648 goto WaitAD	
0508	0E06	01649 swapf PORTB,W	
into W<3:0>			;Read PortB<7:4>
0509	1886	01650 btfsc PORTB,1	
released			;Wait until key is
050A	27???	01651 goto \$-1	
050B	390F	01652 andlw 0x0F	
050C	00FB	01653 movwf W_temp	
	01654		
050D	01655	Loop_	
050D	087B	01656 movf W_temp, W	
050E	3A03	01657 xorlw 0x03	
050F	1903	01658 btfsc STATUS,Z	
0510	27???	01659 goto A_	
	01660		
0511	087B	01661 movf W_temp, W	
0512	3A07	01662 xorlw 0x07	
0513	1903	01663 btfsc STATUS,Z	
0514	27???	01664 goto B_	
	01665		
0515	087B	01666 movf W_temp, W	
0516	3A0B	01667 xorlw 0x0b	
0516	01667	btfss PORTB,1	
	MAIN.ASM	4-7-2016 23:42:36	PAGE 42
LOC	OBJECT CODE	LINE SOURCE TEXT	VALUE
0517	1903	01668 btfsc STATUS,Z	
0518	27???	01669 goto C_	
	01670		
0519	087B	01671 movf W_temp, W	
051A	3A0F	01672 xorlw 0x0f	
051B	1903	01673 btfsc STATUS,Z	
051C	27???	01674 goto D_	
051D	27???	01675 goto WaitAD	
	01676		
051E	01677	A_	
051E	3010	01678 movlw 0x10	
051F	27???	01679 goto Store_	
0520	01680	B_	
0520	3020	01681 movlw 0x20	
0521	27???	01682 goto Store_	
0522	01683	C_	
0522	3030	01684 movlw 0x30	
0523	27???	01685 goto Store_	
0524	01686	D_	
0524	3040	01687 movlw 0x40	
0525	27???	01688 goto Store_	
0526	00F9	01689 Store_	
0527	???? ???? ??	01690 movwf PADDR	
0527	???? ???? ??	01691 pagesel storeHist	
0529	27???	01692 call storeHist	

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```

052A ???? ???? 01693 pagesel $  

052A 01694 Display Done_Write  

0000 M local loop_  

0000 M local end_  

052C 01C1 M clrf Table_Counter  

052D 0103 M clrw  

052E 0841 M loop_ movf Table_Counter,W  

052F 27?? M call Done_Write  

0530 3A00 M xorlw 'B'00000000' ;check WORK reg to see  

if 0 is returned  

0531 1903 M btfsc STATUS,Z  

0532 23?? M goto end_  

0533 27?? M call WR_DATA  

0534 0AC1 M incf Table_Counter,F  

0535 27?? M goto loop_  

0536 M end_  

0536 27?? 01695 call HalfS  

0537 27?? 01696 goto Reiterate  

0538 01698 Term_Msg  

0538 01699 DispTable TableTerm  

0538 1303 M Bank0  

0539 1283 M bcf STATUS,RP1  

053A 00FB M movwf W_temp  

053B 30?? M movlw HIGH TableTerm  

053C 008A M movwf PCLATH  

053D 087B M movf W_temp,W  

053E 3B?? M addlw LOW TableTerm  

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```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

053F 1803 M btfsc STATUS,C  

0540 0A8A M incf PCLATH,f  

0541 0082 M movwf PCL  

0542 01700 TableTerm  

0542 344F 3470 3465 01701 dt "Operation", 0  

3472 3461 3474  

3469 346F 346E  

3400  

01702  

01703  

054C 01704 Post_Msg  

054C 01705 DispTable TablePost  

054C 1303 M Bank0  

054D 1283 M bcf STATUS,RP1  

054E 00FB M movwf W_temp  

054F 30?? M movlw HIGH TablePost  

0550 008A M movwf PCLATH

```

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```

050B 01716 TableAsk  

050B 3445 346E 3474 01717 dt "Enter A-D: ", 0  

3465 3472 3420  

3441 342D 3444  

343A 3420 3400  

01718  

05097 01719 Done_Write  

05097 01720 DispTable TableDone  

M Bank0  

05097 1303 M bcf STATUS,RP1  

05098 1283 M bcf STATUS,RP0  

05099 00FB M movwf W_temp  

0509A 30?? M movlw HIGH TableDone  

0509B 008A M movwf PCLATH  

0509C 087B M movf W_temp,W  

0509D 3B?? M addlw LOW TableDone  

0509E 1803 M btfsc STATUS,C  

0509F 0A8A M incf PCLATH,f  

050A0 0082 M movwf PCL  

050A1 01721 TableDone  

050A1 3444 3461 3474 01722 dt "Data Stored", 0  

3461 3420 3453  

3474 346F 3472  

3465 3464 3400  

01723  

050AD 01724 NumberLabel  

050AD 01725 DispTable TableNumberL  

M Bank0  

050AD 1303 M bcf STATUS,RP1  

050AE 1283 M bcf STATUS,RP0  

050AF 00FB M movwf W_temp  

050B0 30?? M movlw HIGH TableNumberL  

050B1 008A M movwf PCLATH  

050B2 087B M movf W_temp,W  

050B3 3B?? M addlw LOW TableNumberL  

050B4 1803 M btfsc STATUS,C  

050B5 0A8A M incf PCLATH,f  

050B6 0082 M movwf PCL  

050B7 01726 TableNumberL  

050B7 3444 346F 3474 01727 dt "Dot Detected:", 0  

3420 3444 3465  

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```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

3474 3465 3463  

3474 3465 3464  

343A 3400  

01728  

050C5 01729 DisplayDOT  

01730 Bank0

```

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```

0551 087B M movf W_temp,W  

0552 3E?? M addlw LOW TablePost  

0553 1803 M btfsc STATUS,C  

0554 0A8A M incf PCLATH,f  

0555 0082 M movwf PCL  

0556 01706 TablePost  

0556 3443 346F 346D 01707 dt "Complete", D", 0  

3470 346C 3465  

3474 3465 3420  

3420 3420 3420  

3420 3420 3420  

3444 3400  

01708  

0567 01709 TimeLabel  

01710 DispTable TableTimeL  

M Bank0  

0567 1303 M bcf STATUS,RP1  

0568 1283 M bcf STATUS,RP0  

0569 00FB M movwf W_temp  

056A 30?? M movlw HIGH TableTimeL  

056B 008A M movwf PCLATH  

056C 087B M movf W_temp,W  

056D 3E?? M addlw LOW TableTimeL  

056E 1803 M btfsc STATUS,C  

056F 0A8A M incf PCLATH,f  

0570 0082 M movwf PCL  

0571 01711 TableTimeL  

0571 344F 3470 3465 01712 dt "Operation Time:", 0  

3472 3461 3474  

3469 346F 346E  

3420 3454 3469  

346D 3465 343A  

3400  

01713  

0581 01714 Ask_Msg  

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```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

01715 DispTable TableAsk  

M Bank0  

0581 1303 M bcf STATUS,RP1  

0582 1283 M bcf STATUS,RP0  

0583 00FB M movwf W_temp  

0584 30?? M movlw HIGH TableAsk  

0585 008A M movwf PCLATH  

0586 087B M movf W_temp,W  

0587 3E?? M addlw LOW TableAsk  

0588 1803 M btfsc STATUS,C  

0589 0A8A M incf PCLATH,f  

058A 0082 M movwf PCL

```

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```

05C5 1303 M bcf STATUS,RP1  

05C6 1283 M bcf STATUS,RP0  

05C7 27?? 01731 call ClrLCD  

05C7 01732 Display DisL  

0000 M local loop_  

0000 M local end_  

05C8 01C1 M clrf Table_Counter  

05C9 0103 M clrw  

05CA 0841 M loop_ movf Table_Counter,W  

05CB 27?? M call DisL  

05CC 3A00 M xorlw 'B'00000000' ;check WORK reg to see  

if 0 is returned  

05CD 1903 M btfsc STATUS,Z  

05CE 23?? M goto end_  

05CF 27?? M call WR_DATA  

05D0 0AC1 M incf Table_Counter,F  

05D1 27?? M goto loop_  

05D2 M end_ 01733 Bank3  

05D2 1703 M bsf STATUS,RP1  

05D3 1683 M bsf STATUS,RP0  

05D4 0810 01734 movf LCDISTH,W  

05D5 1303 M bcf STATUS,RP1  

05D6 1283 M bcf STATUS,RP0  

05D7 27?? 01736 call WR_DATA  

05D7 1703 M bcf STATUS,RP1  

05D8 1703 M bsf STATUS,RP1  

05D9 1683 M bsf STATUS,RP0  

05DA 0811 01738 movf LCDISTM,W  

05DB 1303 M bcf STATUS,RP1  

05DC 1283 M bcf STATUS,RP0  

05DD 27?? 01740 call WR_DATA  

05DE 1703 M bsf STATUS,RP1  

05DF 1683 M bsf STATUS,RP0  

05E0 0812 01742 movf LCDDISTL,W  

05E1 1303 M bcf STATUS,RP1  

05E2 1283 M bcf STATUS,RP0  

05E3 27?? 01744 call WR_DATA  

05E3 1745 ; CM  

05E4 3043 01746 movlw 0x43  

05E5 27?? 01747 call WR_DATA  

05E6 304D 01748 movlw 0x4d  

05E7 27?? 01749 call WR_DATA  

05E8 27?? 01750 call Switch_Lines  

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```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

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```

0000 01C1 M local ANGLEL
0000 M local loop_
05E9 0103 M clrf Table_Counter
05EA 0103 M clrw
05EB 0841 M loop_ movf Table_Counter,W
05EC 27?? M call ANGLEL
05ED 3A00 M xorlw '0'00000000' ;check WORK reg to see
if 0 is returned
05EE 1903 M btfs STATUS,Z
05EF 2???. M goto end_
05F0 2???. M call WR_DATA
05F1 0AC1 M incf Table_Counter,F
05F2 2???. M goto loop_
05F3 M end_
01751 Display ANGLEL
0000 M local loop_
05F4 1683 M clrf Table_Counter
05F5 0813 M incf COUNTH,f
01752 Bank3
05F6 1303 M bcf STATUS,RP1
05F7 1283 M bcf STATUS,RP0
05F8 2???. 01755 call WR_DATA
01756 Bank3
05F9 1703 M bsf STATUS,RP1
05FA 1683 M bsf STATUS,RP0
05FB 0814 01757 movf LCDANGLM,W
01758 Bank0
05FC 1303 M bcf STATUS,RP1
05FD 1283 M bcf STATUS,RP0
05FE 2???. 01759 call WR_DATA
01760 Bank3
05FF 1703 M bsf STATUS,RP1
0600 1683 M bsf STATUS,RP0
0601 0815 01761 movf LCDANGLL,W
01762 Bank0
0602 1303 M bcf STATUS,RP1
0603 1283 M bcf STATUS,RP0
0604 2???. 01763 call WR_DATA
01764 ; DEG
0605 3044 01765 movlw 0x44
0606 2???. 01766 call WR_DATA
0607 3045 01767 movlw 0x45
0608 2???. 01768 call WR_DATA
0609 3047 01769 movlw 0x47
060A 2???. 01770 call WR_DATA
060B 0008 01771 return
01772
060C 01773 DisL
01774 DispTable TableDisL
01775 Bank0
060C 1303 M bcf STATUS,RP1

```

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```

0633 0BBE 01797 decfsz COUNTH, f
0634 2???. 01798 goto $+2
0635 0BBF 01799 decfsz COUNTM, f
0636 2???. 01800 goto $+2
0637 0BC0 01801 decfsz COUNTL, f
0638 2???. 01802 goto HalfS_0
01803
0639 2???. 01804 goto $+1
063A 0000 01805 nop
063B 0000 01806 nop
FPMPASM 5.65 MAIN.ASM 4-7-2016 23:42:36 PAGE 48
LOC OBJECT CODE LINE SOURCE TEXT
VALUE
063C 0008 01807 return
01808
063D 01809 DS ;movlw 0x4e
01810 ;movlw 0x0f
063D 300F 01811 movlw COUNTH
063B 00BE 01812 movwf
063F 3028 01813 movlw 0x28
0640 00BF 01814 movwf COUNTM
0641 01815 DS_0
0641 0BBE 01816 decfsz COUNTH, f
0642 2???. 01817 goto $+2
0643 0BBF 01818 decfsz COUNTM, f
0644 2???. 01819 goto DS_0
01820
0645 2???. 01821 goto $+1
01822
0646 0008 01823 return
01824
0647 01825 GetDistance
01826 Bank0
0647 1303 M bcf STATUS,RP1
0648 1283 M bcf STATUS,RP0
0649 0801 01827 movf TMRO,W
064A 00CD 01828 movwf DistTMRO
064B 0870 01829 movf TMRH,W
064C 00CC 01830 movwf DistTMROH
01831
064D 3003 01832 movlw 0x03
064E 05CC 01833 andwf DistTMROH,F
01834
064F 2???. 01835 pagesel MultiplyDist
0651 2???. 01836 call MultiplyDist
0652 2???. 01837 pagesel $
01838 ;movlw 0x03
01839 ;subwf DistTMRO,f
01840 ;btfs STATUS,C
01841 ;decf DistTMROH,f

```

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```

060D 1283 M bcf STATUS,RP0
060E 00FB M movwf W_temp
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE
060F 30?? M movlw HIGH TableDisL
0610 008A M movwf PCLATH
0611 087B M movf W_temp,W
0612 3E?? M addiw LOW TableDisL
0613 1803 M btfsc STATUS,C
0614 0ABA M incf PCLATH,f
0615 0082 M movwf PCL
0616 01775 TableDisL
0616 3444 3469 3473 01776 dt "Dist. ", 0
3400
01777
061D 01778 ANGLEL
01779 DispTable TableANGLEL
01780 Bank0
061D 1303 M bcf STATUS,RP1
061E 1283 M bcf STATUS,RP0
061F 00FB M movwf W_temp
0620 30?? M movlw HIGH TableANGLEL
0621 008A M movwf PCLATH
0622 087B M movf W_temp,W
0623 3E?? M addiw LOW TableANGLEL
0624 1803 M btfsc STATUS,C
0625 0ABA M incf PCLATH,f
0626 0082 M movwf PCL
0627 01780 TableANGLEL
0627 3441 346E 3467 01781 dt "Ang. ", 0
342E 3420 3400
01782
;*****
***+
01783
01784 ;*****
01785 ; Delay 0.5s
01786 ;*****
062D 01787 HalfS_
0000 01788 local HalfS_0
062D 3088 01789 movlw 0x88
062E 00BE 01790 movwf COUNTH
062F 30BD 01791 movlw 0xBD
0630 00BF 01792 movwf COUNTM
0631 3003 01793 movlw 0x03
0632 00C0 01794 movwf COUNTL
01795
0633 01796 HalfS_0

```

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```

01842 Bin16toBCD
01843 DistTMRO,DistTMROH,DistL,DistH,DistX,W_temp,Table_Counter
0000 M local Loop_,Next_,Exit_
0654 3010 M movlw 0x10 ;16 bits
0655 00C1 M movwf Table_Counter
0656 01C9 M clrf DistX
0657 01CA M clrf DistH
0658 01CB M clrf DistL
0659 1003 M bcf STATUS,C
065A M Loop_
065A 0DCD M rlf DistTMRO,F
065B 0DCC M rlf DistTMROH,F
065C 0DCB M rlf DistL,F
065D 0DCA M rlf DistH,F
065E 0DC9 M rlf DistX,F
065F 0BC1 M decfsz Table_Counter,F
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE
0660 2???. M goto Next_
0661 2???. M goto Exit_
0662 M Next_
0662 3003 M movlw 0x03
0663 074B M addwf DistL,W
0664 00FB M movwf W_temp
0665 19FB M btfsc W_temp,3
0666 00CB M movwf DistL
0667 3030 M movlw 0x30
0668 074B M addwf DistL,W
0669 00FB M movwf W_temp
066A 1BFB M btfsc W_temp,7
066B 00CB M movwf DistL
M ;-----
066C 3003 M movlw 0x03
066D 074A M addwf DistH,W
066E 00FB M movwf W_temp
066F 19FB M btfsc W_temp,3
0670 00CA M movwf DistH
0671 3030 M movlw 0x30
0672 074A M addwf DistH,W
0673 00FB M movwf W_temp
0674 1BFB M btfsc W_temp,7
0675 00CA M movwf DistH
M ;-----
0676 3003 M movlw 0x03
0677 0749 M addwf DistX,W
0678 00FB M movwf W_temp
0679 19FB M btfsc W_temp,3
067A 00C9 M movwf DistX

```

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```

M ; -
067B 3030 M movlw 0x30
067C 0749 M addwf DistX,W
067D 00FB M movwf W_temp
067E 1BFB M btfsc W_temp,7
067F 00C9 M movwf DistX
0680 2??? M goto Loop_
0681 M Exit_
01844 HEXtoASCII DistH,W_temp,FinishHourT
M Bank0
0681 1303 M bcf STATUS,RP1
0682 1283 M bcf STATUS,RP0
0683 01FB M clrf W_temp ;Clear output registers
0684 01B8 M clrf FinishHourT
0685 0E4A M swapf DistH,W
0686 390F M andlw 0x0f ;Mask off unwanted
bits
0687 00FB M movwf W_temp
0688 3010 M movlw 10 ;For BCD lower
nibble only (lower 4 bits)
0689 027B M subwf W_temp,W
068A 3030 M movlw 0x30 ;If numerical add
ascii value (-10)
068B 1803 M btfsc STATUS,C
068C 3037 M movlw 0x37 ;If alphabetical,
then add a different ascii value (-10)
068D 07FB M addwf W_temp,1 ;save in output reg
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```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

068E 084A M movf DistH,W ;get lower nibble of input
byte
068F 390F M andlw 0x0f ;mask off unwanted
data
0690 00B8 M movwf FinishHourT
0691 3010 M movlw 10
0692 0238 M subwf FinishHourT,W
0693 3030 M movlw 0x30
0694 1803 M btfsc STATUS,C
0695 3037 M movlw 0x37
0696 07B8 M addwf FinishHourT,l ;and save in output reg
01845 HEXtoASCII DistL,FinishHourD,FinishMinT
M Bank0
0697 1303 M bcf STATUS,RP1
0698 1283 M bcf STATUS,RP0
0699 01B9 M clrf FinishHourD ;Clear output registers
069A 01BA M clrf FinishMinT
069B 0E4B M swapf DistL,W
069C 390F M andlw 0x0f ;Mask off unwanted
bits

```

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```

01870 ; Entry mode
06BC 3006 01871 movlw b'00000110'
06BD 2??? 01872 call WR_INS
06BE 2??? 01873 call lcdLongDelay
06BF 2??? 01874 call lcdLongDelay
01875
01876 ; Clear ram
06C0 3001 01877 movlw b'00000001'
06C1 2??? 01878 call WR_INS
06C2 2??? 01879 call lcdLongDelay
06C3 2??? 01880 call lcdLongDelay
06C4 0008 01881 return
01882 ;*****
01883
01884 ;ClrLCD: Clear the LCD display
06C5 01885 ClrLCD
06C6 3001 01886 movlw B'00000001'
06C7 0008 01887 call WR_INS
01888 return
01889
01890 ; Four bit write
01891 WR_INS
06C8 1108 01892 bcf RS
06C9 00C5 01893 movwf com
06CA 39F0 01894 andlw 0xF0
06CB 0089 01895 movwf PORTD
06CC 1588 01896 bsf E
06CD 27?? 01897 call lcdLongDelay
06CE 1188 01898 bcf E
06CF 0E45 01899 swapf com,W
06D0 39F0 01900 andlw 0xF0
06D1 0088 01901 movwf PORTD
06D2 1588 01902 bsf E
06D3 27?? 01903 call lcdLongDelay
06D4 1188 01904 bcf E
06D5 27?? 01905 call lcdLongDelay
06D6 0008 01906 return
01907
01908 ; Write data to LCD -
01909 WR_DATA
06D7 1508 01910 bsf RS
06D8 00C6 01911 movwf dat
06D9 0846 01912 movf dat,W
06DA 39F0 01913 andlw 0xF0
06DB 3E04 01914 addlw 4
06DC 0088 01915 movwf PORTD
06DD 1588 01916 bsf E
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```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

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```

069D 00B9 M movwf FinishHourD
069E 3010 M movlw 10 ;For BCD lower
nibble only (lower 4 bits)
069F 0239 M subwf FinishHourD,W
06A0 3030 M movlw 0x30 ;If numerical add
ascii value (-10)
06A1 1803 M btfsc STATUS,C
06A2 3037 M movlw 0x37 ;If alphabetical,
then add a different ascii value (-10)
06A3 07B9 M addwf FinishHourD,l ;save in output reg
06A4 084B M movf DistL,W ;get lower nibble of input
byte
06A5 390F M andlw 0x0f ;mask off unwanted
data
06A6 00BA M movwf FinishMinT
06A7 3010 M movlw 10
06A8 023A M subwf FinishMinT,W
06A9 3030 M movlw 0x30
06AA 1803 M btfsc STATUS,C
06AB 3037 M movlw 0x37
06AC 07B8 M addwf FinishMinT,l ;and save in output reg
01846
01847 return
01848
01849 InitLCD
01850 Bank0
06AE 1303 M bcf STATUS,RP1
06AF 1283 M bcf STATUS,RP0
06B0 1588 M bsf E ;E default high
01852
01853 ;Wait for LCD POR to finish (~15ms)
06B1 2??? M call lcdLongDelay
06B2 2??? M call lcdLongDelay
06B3 2??? M call lcdLongDelay
01855
01856
01857
01858 ; 4 bits, 2 lines, 5x7 dots
06B4 3028 M movlw b'00101000'
06B5 27?? 01860 call WR_INS
06B6 27?? 01861 call lcdLongDelay
06B7 27?? 01862 call lcdLongDelay
01863
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```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

01864 ; display on/off
06B8 300C M movlw b'00000100'
06B9 2??? 01865 call WR_INS
06BA 2??? 01866 call lcdLongDelay
06BB 2??? 01867 call lcdLongDelay
01868 call lcdLongDelay
01869

```

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```

06DE 2??? 01917 call lcdLongDelay
06DF 1188 01918 bcf E
06E0 0846 01919 swapf dat,W
06E1 39F0 01920 andlw 0xF0
06E2 3E04 01921 addlw 4
06E3 0088 01922 movwf PORTD
06E4 1588 01923 bsf E
06E5 27?? 01924 call lcdLongDelay
06E6 1188 01925 bcf E
06E7 0008 01926 return
01927
01928 ; LCD delay
01929 lcdLongDelay
06E8 3014 01930 movlw d'20'
06E9 00C4 01931 movwf lcd_d2
01932
06EA 01933 LLD_LOOP
01934 LCD_DELAY
06EA 30FF M movlw 0xFF
06EB 00C3 M movwf lcd_d1
06EC 0B23 M decfsz lcd_d1,f
06ED 27?? M goto $-1
06EE 0B24 01935 decfsz lcd_d2,f
06EF 27?? 01936 goto LLD_LOOP
06F0 0008 01937 return
01938
06F1 01939 Switch_Lines
06F1 30C0 01940 movlw B'11000000'
06F2 2??? 01941 call WR_INS
06F3 0008 01942 return
01943
06F4 01944 Reset_Sensor
06F4 1783 01945 bsf STATUS,IRP
06F5 3096 01946 movlw 0x96
06F6 0084 01947 movwf FSR
06F7 305A 01948 movlw 0x5A
06F8 00FB 01949 movwf W_temp
06F9 01950 NEXTCLEAR
06F9 087B 01951 movf W_temp,W
06FA 3A00 01952 xorlw 0x0
06FB 1903 01953 btfsc STATUS,Z
06FC 0008 01954 return
06FD 03FB 01955 decf W_temp,F
06FE 302D 01956 movlw 0x2D
06FF 0080 01957 movwf INDF
0700 0844 01958 incf FSR,F
0701 27?? 01959 goto NEXTCLEAR
01960
0702 01961 write_rtc
01962 i2c_common_start
0702 1683 1303 M banksel SSPCON2
0704 1411 M bsf SSPCON2,SEN
0705 1811 M btfsc SSPCON2,SEN

```

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```

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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

0706 2??? M goto $-1
0707 30D0 01963 movlw 0xD0 ;DS1307 address | WRITE
bit
01964 i2c_common_write
0708 1283 1303 M banksel SSPBUF
070A 0093 M movwf SSPBUF
070B 1683 1303 M banksel SSPSTAT
070D 1914 M btfsc SSPSTAT,R_W ;While
transmit is in progress, wait
070E 2??? M goto $-1
070F 1683 1303 M banksel SSPCON2
01965 i2c_common_check_ack WR_ERR
0711 1683 1303 M banksel SSPCON2
0713 1B11 M btfsc SSPCON2,ACKSTAT
0714 2??? M goto WR_ERR
01966
01967 ;Write data to I2C bus (Register Address in RTC)
0715 1283 1303 01968 banksel RTCADD
0717 0873 01969 movf RTCADD,w ;Set register
pointer in RTC
01970 i2c_common_write
0718 1283 1303 M banksel SSPBUF
071A 0093 M movwf SSPBUF
071B 1683 1303 M banksel SSPSTAT
071D 1914 M btfsc SSPSTAT,R_W ;While
transmit is in progress, wait
071E 2??? M goto $-1
071F 1683 1303 M banksel SSPCON2
01971 i2c_common_check_ack WR_ERR
0721 1683 1303 M banksel SSPCON2
0723 1B11 M btfsc SSPCON2,ACKSTAT
0724 2??? M goto WR_ERR
01972
01973 ;Write data to I2C bus (Data to be placed in RTC
register)
0725 1283 1303 01974 banksel RTCDATA
0727 0874 01975 movf RTCDATA,w ;Write data to
register in RTC
01976 i2c_common_write
0728 1283 1303 M banksel SSPBUF
072A 0093 M movwf SSPBUF
072B 1683 1303 M banksel SSPSTAT
072D 1914 M btfsc SSPSTAT,R_W ;While
transmit is in progress, wait
072E 2??? M goto $-1
072F 1683 1303 M banksel SSPCON2
01977 i2c_common_check_ack WR_ERR

```

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```

01995 i2c_common_check_ack RD_ERR
075C 1683 1303 M banksel SSPCON2
075E 1B11 M btfsc SSPCON2,ACKSTAT
075F 2??? M goto RD_ERR
01996
01997 ;Re-Select the DS1307 on the bus, in READ mode
01998 i2c_common_repeatedstart
0760 1683 1303 M banksel SSPCON2
0762 1491 M bsf SSPCON2,RSEN
0763 1891 M btfsc SSPCON2,RSEN
0764 2??? M goto $-1
0765 30D1 01999 movlw 0xD1 ;DS1307 address | READ
bit
02000 i2c_common_write
0766 1283 1303 M banksel SSPBUF
0768 0093 M movwf SSPBUF
0769 1683 1303 M banksel SSPSTAT
076B 1914 M btfsc SSPSTAT,R_W ;While
transmit is in progress, wait
076C 2??? M goto $-1
076D 1683 1303 M banksel SSPCON2
02001 i2c_common_check_ack RD_ERR
076F 1683 1303 M banksel SSPCON2
0771 1B11 M btfsc SSPCON2,ACKSTAT
0772 2??? M goto RD_ERR
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

02002
02003 ;Read data from I2C bus (Contents of Register in RTC)
02004 i2c_common_read
0773 1683 1303 M banksel SSPCON2
0775 1591 M bsf SSPCON2,RCEN ;Begin receiving
byte from
0776 1991 M btfsc SSPCON2,RCEN
0777 2??? M goto $-1
0778 1283 1303 M banksel SSPBUF
077A 0813 M movf SSPBUF,w
077B 1283 1303 02005 banksel DOUT
077D 00F5 02006 movwf DOUT
02007 i2c_common_nack ;Send acknowledgement of data
reception
077E 1683 1303 M banksel SSPCON2
0780 1691 M bsf SSPCON2,ACKDT
0781 1611 M bsf SSPCON2,ACKEN
0782 1A11 M btfsc SSPCON2,ACKEN
0783 2??? M goto $-1
0784 2??? 02008 goto RD_END
0785 0009 02009 RD_ERR
0785 0000 02010 nop

```

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```

0731 1683 1303 M banksel SSPCON2
0733 1B11 M btfsc SSPCON2,ACKSTAT
0734 2??? M goto WR_ERR
0735 2??? 01978 goto WR_END
0736 01979 WR_ERR
0736 0000 01980 nop
0737 01981 WR_END
01982 i2c_common_stop ;Release the I2C bus
0737 1683 1303 M banksel SSPCON2
0739 1511 M bsf SSPCON2,PEN
073A 1911 M btfsc SSPCON2,PEN
073B 2??? M goto $-1
073C 0008 01983 return
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

01984
073D 01985 read_rtc
01986 i2c_common_start
073D 1683 1303 M banksel SSPCON2
073F 1411 M bsf SSPCON2,SEN
0740 1811 M btfsc SSPCON2,SEN
0741 2??? M goto $-1
0742 30D0 01987 movlw 0xD0 ;DS1307 address | WRITE
bit
01988 i2c_common_write
0743 1283 1303 M banksel SSPBUF
0745 0093 M movwf SSPBUF
0746 1683 1303 M banksel SSPSTAT
0748 1914 M btfsc SSPSTAT,R_W ;While
transmit is in progress, wait
0749 2??? M goto $-1
074A 1683 1303 M banksel SSPCON2
01989 i2c_common_check_ack RD_ERR
074C 1683 1303 M banksel SSPCON2
074E 1B11 M btfsc SSPCON2,ACKSTAT
074F 2??? M goto RD_ERR
01990
01991 ;Write data to I2C bus (Register Address in RTC)
0750 1283 1303 01992 banksel RTCADD
0752 0873 01993 movf RTCADD,w ;Set register
pointer in RTC
01994 i2c_common_write
0753 1283 1303 M banksel SSPBUF
0755 0093 M movwf SSPBUF
0756 1683 1303 M banksel SSPSTAT
0758 1914 M btfsc SSPSTAT,R_W ;While
transmit is in progress, wait
0759 2??? M goto $-1
075A 1683 1303 M banksel SSPCON2

```

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```

02011 ;Release the I2C bus
0786 02012 RD_END
02013 i2c_common_stop
0786 1683 1303 M banksel SSPCON2
0788 1511 M bsf SSPCON2,PEN
0789 1911 M btfsc SSPCON2,PEN
078A 2??? M goto $-1
078B 0008 02014 return
02015
02016 org 0x800
02017
0800 02018 getStartTime
02019 rtc_read 0x06 ;year
0800 3006 M movlw 0x06
0801 1283 1303 M banksel RTCADD
0803 00F3 M movwf RTCADD
0804 2??? ????
0806 2??? M pagesel read_rtc
0807 2??? ????
0809 1283 1303 M banksel DOUT
080B 0875 M movf DOUT ,w
080C 2??? ????
080E 2??? M pagesel rtc_convert
080F 2??? ????
02020 Bank0
0811 1303 M bcf STATUS,RP1
0812 1283 M bcf STATUS,RP0
0813 0877 02021 movf RTC_TENS_DIG,W
0814 00AC 02022 movwf StartYearT
0815 0878 02023 movf RTC_Sing_DIG,W
0816 00AD 02024 movwf StartYearD
02025
02026 rtc_read 0x05 ;month
FPMPASM 5.65 MAIN.ASM 4-7-2016 23:42:36 PAGE 56

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

0817 3005 M movlw 0x05
0818 1283 1303 M banksel RTCADD
081A 00F3 M movwf RTCADD
081B 2??? ????
081D 2??? M call read_rtc
081E 2??? ????
0820 1283 1303 M banksel DOUT
0822 0875 M movf DOUT ,w
0823 2??? ????
0825 2??? M pagesel rtc_convert
0826 2??? ????
02027 Bank0
0828 1303 M bcf STATUS,RP1
0829 1283 M bcf STATUS,RP0

```

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```

082A 0877 02028 movf RTC_TENS_DIG,W
082B 00AB 02029 movwf StartMonT
082C 0878 02030 movf RTC_Sing_DIG,W
082D 00AF 02031 movwf StartMonD
082E 3004 02032
082F 1283 1303 02033 rtc_read 0x04 ;day
0831 00F3 M movlw 0x04
0832 ??? ???? M banksel RTCADD
0834 2??? M pagesel read_rtc
0835 2??? ???? M pagesel $
0837 1283 1303 M banksel DOUT
0839 0875 M movf DOUT ,w
083A 2??? ???? M pagesel rtc_convert
083C 2??? M call rtc_convert
083D 2??? ???? M pagesel $
083F 1303 02034 Bank0
0840 1283 M bcf STATUS,RP1
0841 0877 02035 movf RTC_TENS_DIG,W
0842 00B0 02036 movwf StartDayT
0843 0878 02037 movf RTC_Sing_DIG,W
0844 00B1 02038 movwf StartDayD
0845 3002 02039
0846 1283 1303 02040 rtc_read 0x02 ;hour
0848 00F3 M movlw 0x02
0849 ??? ???? M banksel RTCADD
084B 2??? M pagesel read_rtc
084C 2??? ???? M pagesel $
084E 1283 1303 M banksel DOUT
0850 0875 M movf DOUT ,w
0851 ??? ???? M pagesel rtc_convert
0853 2??? M call rtc_convert
0854 2??? ???? M pagesel $
0856 1303 02041 Bank0
0857 1283 M bcf STATUS,RP1
FPPASM 5.65 MAIN.ASM 4-7-2016 23:42:36 PAGE 57

```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

0857 1283 M bcf STATUS,RP0
0858 0877 02042 movf RTC_TENS_DIG,W
0859 00B2 02043 movwf StartHourT
085A 0878 02044 movf RTC_Sing_DIG,W
085B 00B3 02045 movwf StartHourD
02046
02047 rtc_read 0x01 ;min
085C 3001 M movlw 0x01

```

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```

0892 2??? ???? M pagesel $
0894 1283 1303 M banksel DOUT
0896 0875 M movf DOUT ,w
0897 2??? ???? M pagesel rtc_convert
0899 2??? M call rtc_convert
089A 2??? ???? M pagesel $
089B 2??? ???? M pagesel Bank0
089C 1303 M bcf STATUS,RP1
089D 1283 M bcf STATUS,RP0
089E 0877 02066 movf RTC_TENS_DIG,W
089F 00B8 02067 movwf FinishHourT
08A0 0878 02068 movf RTC_Sing_DIG,W
08A1 00B9 02069 movwf FinishHourD
08A2 3001 M movlw 0x01
08A3 1283 1303 M banksel RTCADD
08A5 00F3 M movwf RTCADD
08A6 2??? ???? M pagesel read_rtc
08A8 2??? M call read_rtc
08A9 2??? ???? M pagesel $
08AB 1283 1303 M banksel DOUT
08AD 0875 M movf DOUT ,w
08AE 2??? ???? M pagesel rtc_convert
08B0 2??? M call rtc_convert
08B1 2??? ???? M pagesel $
08B2 2??? ???? M pagesel Bank0
08B3 1303 M bcf STATUS,RP1
08B4 1283 M bcf STATUS,RP0
08B5 0877 02073 movf RTC_TENS_DIG,W
08B6 00BA 02074 movwf FinishMinT
08B7 0878 02075 movf RTC_Sing_DIG,W
08B8 00BB 02076 movwf FinishMinD
08B9 3000 M movlw 0x00
08BA 1283 1303 M banksel RTCADD
08BC 00F3 M movwf RTCADD
08BD 2??? ???? M pagesel read_rtc
08BF 2??? M call read_rtc
08C0 2??? ???? M pagesel $
08C2 1283 1303 M banksel DOUT
08C4 0875 M movf DOUT ,w
08C5 2??? ???? M pagesel rtc_convert
08C7 2??? M call rtc_convert
08C8 2??? ???? M pagesel $
08C9 2??? ???? M pagesel Bank0
08CA 1303 M bcf STATUS,RP1
08CB 1283 M bcf STATUS,RP0
08CC 0877 02080 movf RTC_TENS_DIG,W
08CD 00BC 02081 movwf FinishSecT
FPPASM 5.65 MAIN.ASM 4-7-2016 23:42:36 PAGE 59

```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

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```

085D 1283 1303 M banksel RTCADD
085F 00F3 M movwf RTCADD
0860 2??? ???? M pagesel read_rtc
0862 2??? M call read_rtc
0863 2??? ???? M pagesel $
0865 1283 1303 M banksel DOUT
0867 0875 M movf DOUT ,w
0868 2??? ???? M pagesel rtc_convert
086A 2??? M call rtc_convert
086B 2??? ???? M pagesel $
086C 2??? ???? M pagesel Bank0
086D 1303 M bcf STATUS,RP1
086E 1283 M bcf STATUS,RP0
086F 0877 02049 movf RTC_TENS_DIG,W
0870 00B4 02050 movwf StartMinT
0871 0878 02051 movf RTC_Sing_DIG,W
0872 00B5 02052 movwf StartMinD
02053
02054 rtc_read 0x00 ;seconds
0873 3000 M movlw 0x00
0874 1283 1303 M banksel RTCADD
0876 00F3 M movwf RTCADD
0877 2??? ???? M pagesel read_rtc
0879 2??? M call read_rtc
087A 2??? ???? M pagesel $
087C 1283 1303 M banksel DOUT
087E 0875 M movf DOUT ,w
087F 2??? ???? M pagesel rtc_convert
0881 2??? M call rtc_convert
0882 2??? ???? M pagesel $
0883 2??? ???? M pagesel Bank0
0884 1303 M bcf STATUS,RP1
0885 1283 M bcf STATUS,RP0
0886 0877 02056 movf RTC_TENS_DIG,W
0887 00B6 02057 movwf StartSecT
0888 0878 02058 movf RTC_Sing_DIG,W
0889 00B7 02059 movwf StartSecD
02060
088A 0008 02061 return
02062
088B 02063 getFinishTime
088B 02064 rtc_read 0x02 ;hour
088B 3002 M movlw 0x02
088C 1283 1303 M banksel RTCADD
088E 00F3 M movwf RTCADD
FPPASM 5.65 MAIN.ASM 4-7-2016 23:42:36 PAGE 58

```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

088F 2??? ???? M pagesel read_rtc
0891 2??? M call read_rtc

```

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```

08CE 0878 02082 movf RTC_Sing_DIG,W
08CF 00BD 02083 movwf FinishSecD
08D0 0008 02085 return
02086
08D1 02087 getElapsedTime
02088 Bank0
08D1 1303 M bcf STATUS,RP1
08D2 1283 M bcf STATUS,RP0
0000 02089 local Loop_MinFinish
0000 02090 local addSecTFinish
0000 02091 local addSecDFinish
0000 02092 local Loop_SecFinish
0000 02093 local Loop_MinBegin
0000 02094 local addSecTBegin
0000 02095 local addSecDBegin
0000 02096 local Loop_SecBegin
0000 02097 local getMin
0000 02098 local convert
02099
08D3 01C0 02100 clrf COUNTL ;counter
08D4 01BF 02101 clrf COUNTM ;accumulator,Finish,also sec
08D5 01BE 02102 clrf COUNTH ;accumulator,Begin,also min
02103
08D6 083B 02104 movf FinishMinD,W
08D7 00C0 02105 movwf COUNTL
08D8 3030 02106 movlw 0x30
08D9 02C0 02107 subwf COUNTL,F
08DA 02108 Loop_MinFinish
08D9 0840 02109 movf COUNTL,W
08DB 3A00 02110 xorlw 0x00
08DC 1903 02111 btfsC STATUS,Z
08DD 2??? 02112 goto addSecTFinish
08DE 303C 02113 movlw 0x3c
08DF 07BF 02114 addwf COUNTM,F
Message[305]: Using default destination of l (file).
08E0 03C0 02115 decf COUNTL
08E1 2??? 02116 goto Loop_MinFinish
08E2 2??? 02117 addSecTFinish
08E2 083C 02118 movf FinishSecT,W
08E3 00C0 02119 movwf COUNTL
08E4 3030 02120 movlw 0x30
08E5 02C0 02121 subwf COUNTL,F
08E6 02122 Loop_SecFinish
08E6 0840 02123 movf COUNTL,W
08E7 3A00 02124 xorlw 0x00
08E8 1903 02125 btfsC STATUS,Z
08E9 2??? 02126 goto addSecDFinish
08EA 300A 02127 movlw 0xa

```

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

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```

Message[305]: Using default destination of 1 (file).
08EB 07BF 02128 addwf COUNTM
Message[305]: Using default destination of 1 (file).
08EC 03C0 02129 decf COUNTL
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

08ED 2??? 02130 goto Loop_SecFinish
08EE 083D 02131 addSecDFinish
08EF 00C0 02132 movf FinishSecD,W
08F0 3030 02133 movwf COUNTL
08F1 0240 02134 movlw 0x30
08F2 07BF 02135 subwf COUNTL,W
08F3 0835 02136 addwf COUNTM,F
08F7 02137
08F8 02138 movf StartMind,W
08F9 00C0 02139 movwf COUNTL
08F5 3030 02140 movlw 0x30
08F6 02C0 02141 subwf COUNTL,F
08F7 02142 Loop_MinBegin
08F7 0840 02143 movf COUNTL,W
08F8 3A00 02144 xorlw 0x0
08F9 1903 02145 btfsc STATUS,Z
08FA 2??? 02146 goto addSecTBegin
08FB 303C 02147 movlw 0x3c
08FC 07BE 02148 addwf COUNTH,F
Message[305]: Using default destination of 1 (file).
08FD 03C0 02149 decf COUNTL
08FE 2??? 02150 goto Loop_MinBegin
08FF 0836 02151 addSecTBegin
08F0 02152 movf StartSecT,W
0900 00C0 02153 movwf COUNTL
0901 3030 02154 movlw 0x30
0902 02C0 02155 subwf COUNTL,F
0903 0840 02156 Loop_SecBegin
0904 3A00 02157 movf COUNTL,W
0905 1903 02158 xorlw 0x00
0906 2??? 02159 btfsc STATUS,Z
0907 300A 02160 goto addSecDBegin
0908 07BE 02161 movlw 0xa
0909 03C0 02162 addwf COUNTH,F
Message[305]: Using default destination of 1 (file).
0909 03C0 02163 decf COUNTL
090A 2??? 02164 goto Loop_SecBegin
090B 0837 02165 addSecDBegin
090B 02166 movf StartSecD,W
090C 00C0 02167 movwf COUNTL
090D 3030 02168 movlw 0x30
090E 0240 02169 subwf COUNTL,W
090F 07BE 02170 addwf COUNTH,F

```

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```

0936 3003 M movlw 0x03
0937 074B M addwf DistL,W
0938 00FB M movwf W_temp
0939 19FB M btfsc W_temp,3
093A 00CB M movwf DistL
093B 3030 M movlw 0x30
093C 074B M addwf DistL,W
093D 00FB M movwf W_temp
093E 1BFB M btfsc W_temp,7
093F 00CB M movwf DistL
M ;-----
0940 3003 M movlw 0x03
0941 072A M addwf Sect,W
0942 00FB M movwf W_temp
0943 19FB M btfsc W_temp,3
0944 00AA M movwf Sect
M ;-----
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

0945 3030 M movlw 0x30
0946 072A M addwf Sect,W
0947 00FB M movwf W_temp
0948 1BFB M btfsc W_temp,7
0949 00AA M movwf Sect
094A 2??? M goto Loop_
094B M Exit_
02189 HEXtoASCII MinT,Sect,SecD
M Bank0
094B 1303 M bcf STATUS,RP1
094C 1283 M bcf STATUS,RP0
094D 01AA M clrf Sect ;Clear output registers
094E 01AB M clrf SecD
094F 0E28 M swapf MinT,W
0950 390F M andlw 0x0f ;Mask off unwanted
bits
0951 00AA M movwf SecT
0952 3010 M movlw 10 ;For BCD lower
nibble only (lower 4 bits)
0953 022A M subwf SecT,W
0954 3030 M movlw 0x30 ;If numerical add
ascii value (-10)
0955 1803 M btfsc STATUS,C
0956 3037 M movlw 0x37 ;If alphabetical,
then add a different ascii value (-10)
0957 07AA M addwf SecT,1 ;save in output reg
0958 0828 M movf MinT,W ;get lower nibble of input
byte
0959 390F M andlw 0x0f ;mask off unwanted
data

```

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```

02171
0910 083E 02172 movf COUNTH,W
0911 02BF 02173 subwf COUNTM,F
0912 01BE 02174 clrf COUNTH
0913 02175 getMin
0913 303C 02176 movlw 0x3c
0914 023F 02177 subwf COUNTM,W
0915 1C03 02178 btfss STATUS,C
0916 2??? 02179 goto convert
0917 00FB 02180 movwf COUNTM
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

0918 0ABE 02181 incf COUNTH,F
0919 2??? 02182 goto getMin
091A 3030 02183 convert
091A 02184 movlw 0x30
091B 073E 02185 addwf COUNTH,W
091C 00A9 02186 movwf MinD
091D 01BE 02187 clrf COUNTH
02188 Bin16toBCD
COUNTM,COUNTH,MinT,DistL,Sect,W_temp,Table_Counter
0000 M local Loop_,Next_,Exit_
091E 3010 M movlw 0x10 ;16 bits
091F 00C1 M movwf Table_Counter
0920 01AA M clrf Sect
0921 01CB M clrf DistL
0922 01A8 M clrf MinT
0923 1003 M bcf STATUS,C
0924 M Loop_
0924 0DBF M rlf COUNTM,F
0925 0DBE M rlf COUNTH,F
0926 0DA8 M rlf MinT,F
0927 0DCB M rlf DistL,F
0928 0DAA M rlf Sect,T,F
0929 0BC1 M decfsz Table_Counter,F
092A 2??? M goto Next_
092B 2??? M goto Exit_
092C M Next_
092C 3003 M movlw 0x03
092D 0728 M addwf MinT,W
092E 00FB M movwf W_temp
092F 19FB M btfsc W_temp,3
0930 00A8 M movwf MinT
0931 3030 M movlw 0x30
0932 0728 M addwf MinT,W
0933 00FB M movwf W_temp
0934 1BFB M btfsc W_temp,7
0935 00A8 M movwf MinT
M ;-----

```

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```

095A 00AB M movwf SecD
095B 3010 M movlw 10
095C 022B M subwf SecD,W
095D 3030 M movlw 0x30
095E 1803 M btfsc STATUS,C
095F 3037 M movlw 0x37
0960 07AB M addwf SecD,1 ;and save in output reg
0961 0008 02190 return
02191
0962 02192 rtc_convert
0962 1283 1303 02193 banksel 0x76
0964 00F6 02194 movwf 0x76 ; B1 = HHHH LLLL
0965 0876 02195 swapf 0x76,W ; W = LLLL HHHH
0966 390F 02196 andlw 0x0f ; Mask upper four
bits 0000 HHHH
0967 3E30 02197 addlw 0x30 ; convert to ASCII
0968 00F7 02198 movwf RTC_TENS_DIG ;saves
into 10ths digit
02199
0969 1283 1303 02200 banksel 0x76
096B 0876 02201 movf 0x76,W
096C 390F 02202 andlw 0x0f ; w = 0000 LLLL
096D 3E30 02203 addlw 0x30 ; convert to
ASCII
096E 00F8 02204 movwf RTC_Sing_DIG ; saves into
ls digit
096F 0008 02205 return
02206
0970 02207 clearEEPROM
0970 305F 02208 movlw 0x5f
0971 00BE 02209 movwf COUNTH
0972 302D 02210 movlw 0x2d
0973 00FA 02211 movwf EEPROM
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LOC OBJECT CODE LINE SOURCE TEXT
VALUE

0000 02212 local Loop_
0974 02213 Loop_
02214 Bank0
0974 1303 M bcf STATUS,RP1
0975 1283 M bcf STATUS,RP0
0976 083E 02215 movf COUNTH,W
0977 00F9 02216 movwf PADDR
0978 2??? 02217 call writeEEPROM
Message[305]: Using default destination of 1 (file).
0979 0BBE 02218 decfsz COUNTH
097A 2??? 02219 goto Loop_
097B 0008 02220 return
02221
097C 02222 writeEEPROM

```

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C:\Users\Joe\Desktop\AER201\Final\Final\Xbuild\default\production_ext1472\main.lst					April 7, 2016 23:44
097C 1703	02223	Bank2			
097D 1283	M	bsf	STATUS,RP1		
097E 0879	02224	bcf	STATUS,RP0		
097F 008D	02225	movwf	EEADR		
0980 087A	02226	movf	0xfa, W		
0981 008C	02227	movwf	EEDATA		
0982 138B	02228	bcf	INTCON,GIE		
	02229	Bank3			
0983 1703	M	bsf	STATUS,RP1		
0984 1683	M	bsf	STATUS,RP0		
0985 138C	02230	bcf	EECON1, EEPGD		
0986 150C	02231	bsf	EECON1, WREN		
0987 3055	02232	movlw	0x55		
0988 008D	02233	movwf	EECON2		
0989 30AA	02234	movlw	0xaa		
098A 008D	02235	movwf	EECON2		
098B 148C	02236	bsf	EECON1, WR		
098C 188C	02237	btfsc	EECON1, WR		
098D 2???	02238	goto	\$-1		
098E 110C	02239	bcf	EECON1, WREN		
	02240	Bank0			
098F 1303	M	bcf	STATUS,RP1		
0990 1283	M	bcf	STATUS,RP0		
0991 120D	02241	bcf	FIR2, EEIF		
0992 178B	02242	bcf	INTCON, GIE		
0993 0008	02243	return			
	02244				
0994	02245	ReadEEPROM			
	02246	Bank2			
0994 1703	M	bsf	STATUS,RP1		
0995 1283	M	bcf	STATUS,RP0		
0996 138B	02247	bcf	INTCON, GIE		
0997 0879	02248	movf	PADDR, W		
0998 008D	02249	movwf	EEADR		
	02250	Bank3			
0999 1703	M	bsf	STATUS,RP1		
099A 1683	M	bsf	STATUS,RP0		
099B 138C	02251	bcf	EECON1, EEPGD		
FFFFPASM 5.65	MAIN.ASM	4-7-2016	23:42:36	PAGE 64	
LOC	OBJECT CODE	LINE SOURCE TEXT			
VALUE					
099C 140C	02252	bsf	EECON1, RD		
	02253	Bank2			
099D 1703	M	bsf	STATUS,RP1		
099E 1283	M	bcf	STATUS,RP0		
099F 080C	02254	movf	EEDATA, W		
	02255	Bank0			
09A0 1303	M	bcf	STATUS,RP1		
09A1 1283	M	bcf	STATUS,RP0		

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C:\Users\Joe\Desktop\AER201\Final\Final\Xbuild\default\production_ext1472\main.lst					April 7, 2016 23:44
09C2 00A9	02256	movwf	EEVAL		
09A3 178B	02257	bsf	INTCON, GIE		
09A4 0008	02258	return			
	02259				
09A5	02260	getHistory			
	02261	Bank0			
09A5 1303	M	bcf	STATUS,RP1		
09A6 1283	M	bcf	STATUS,RP0		
09A7 082B	02262	movf	SecD, W		
09A8 00F9	02263	movwf	PADDR		
09A9 2???	02264	call	ReadEEPROM		
09AA 00A0	02265	movwf	YearTen		
Message[305]: Using default destination of 1 (file).					
09AB 0AF9	02266	incf	PADDR		
09AC 2???	02267	call	ReadEEPROM		
09AD 00A1	02268	movwf	YearD		
Message[305]: Using default destination of 1 (file).					
09AE 0AF9	02269	incf	PADDR		
09AF 2???	02270	call	ReadEEPROM		
09B0 00A2	02271	movwf	MonT		
Message[305]: Using default destination of 1 (file).					
09B1 0AF9	02272	incf	PADDR		
09B2 2???	02273	call	ReadEEPROM		
09B3 00A3	02274	movwf	MonD		
Message[305]: Using default destination of 1 (file).					
09B4 0AF9	02275	incf	PADDR		
09B5 2???	02276	call	ReadEEPROM		
09B6 00A4	02277	movwf	DayT		
Message[305]: Using default destination of 1 (file).					
09B7 0AF9	02278	incf	PADDR		
09B8 2???	02279	call	ReadEEPROM		
09B9 00A5	02280	movwf	DayD		
Message[305]: Using default destination of 1 (file).					
09BA 0AF9	02281	incf	PADDR		
09BB 2???	02282	call	ReadEEPROM		
09BC 00A6	02283	movwf	HourT		
Message[305]: Using default destination of 1 (file).					
09BD 0AF9	02284	incf	PADDR		
09BE 2???	02285	call	ReadEEPROM		
09BF 00A7	02286	movwf	HourD		
Message[305]: Using default destination of 1 (file).					
09C0 0AF9	02287	incf	PADDR		
09C1 2???	02288	call	ReadEEPROM		
09C2 00A8	02289	movwf	MinT		
Message[305]: Using default destination of 1 (file).					
FFFFPASM 5.65	MAIN.ASM	4-7-2016	23:42:36	PAGE 65	
LOC	OBJECT CODE	LINE SOURCE TEXT			
VALUE					
09C3 0AF9	02290	incf	PADDR		
09C4 2???	02291	call	ReadEEPROM		

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09A2 00FA	02256	movwf	EEVAL		
09A3 178B	02257	bsf	INTCON, GIE		
09A4 0008	02258	return			
	02259				
09A5	02260	getHistory			
	02261	Bank0			
09A5 1303	M	bcf	STATUS,RP1		
09A6 1283	M	bcf	STATUS,RP0		
09A7 082B	02262	movf	SecD, W		
09A8 00F9	02263	movwf	PADDR		
09A9 2???	02264	call	ReadEEPROM		
09AA 00A0	02265	movwf	YearTen		
Message[305]: Using default destination of 1 (file).					
09AB 0AF9	02266	incf	PADDR		
09AC 2???	02267	call	ReadEEPROM		
09AD 00A1	02268	movwf	YearD		
Message[305]: Using default destination of 1 (file).					
09AE 0AF9	02269	incf	PADDR		
09AF 2???	02270	call	ReadEEPROM		
09B0 00A2	02271	movwf	MonT		
Message[305]: Using default destination of 1 (file).					
09B1 0AF9	02272	incf	PADDR		
09B2 2???	02273	call	ReadEEPROM		
09B3 00A3	02274	movwf	MonD		
Message[305]: Using default destination of 1 (file).					
09B4 0AF9	02275	incf	PADDR		
09B5 2???	02276	call	ReadEEPROM		
09B6 00A4	02277	movwf	DayT		
Message[305]: Using default destination of 1 (file).					
09B7 0AF9	02278	incf	PADDR		
09B8 2???	02279	call	ReadEEPROM		
09B9 00A5	02280	movwf	DayD		
Message[305]: Using default destination of 1 (file).					
09BA 0AF9	02281	incf	PADDR		
09BB 2???	02282	call	ReadEEPROM		
09BC 00A6	02283	movwf	HourT		
Message[305]: Using default destination of 1 (file).					
09BD 0AF9	02284	incf	PADDR		
09BE 2???	02285	call	ReadEEPROM		
09BF 00A7	02286	movwf	HourD		
Message[305]: Using default destination of 1 (file).					
09C0 0AF9	02287	incf	PADDR		
09C1 2???	02288	call	ReadEEPROM		
09C2 00A8	02289	movwf	MinT		
Message[305]: Using default destination of 1 (file).					
FFFFPASM 5.65	MAIN.ASM	4-7-2016	23:42:36	PAGE 65	
LOC	OBJECT CODE	LINE SOURCE TEXT			
VALUE					
09C3 0AF9	02290	incf	PADDR		
09C4 2???	02291	call	ReadEEPROM		

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09C2 00A9	02292	movwf	MinD		
Message[305]: Using default destination of 1 (file).					
09C6 0AF9	02293	incf	PADDR		
09C7 2???	02294	call	ReadEEPROM		
09C8 00B8	02295	movwf	SpotDH		
Message[305]: Using default destination of 1 (file).					
09C9 0AF9	02296	incf	PADDR		
09CA 2???	02297	call	ReadEEPROM		
09CB 00E9	02298	movwf	SpotDL		
09CC 0008	02300	return			
	02301				
09CD 1303	02302	storeHist			
	02303	Bank0			
09CE 1283	M	bcf	STATUS,RP1		
09CF 1303	M	bcf	STATUS,RP0		
	0000	02304	local	first	
	0000	02305	local	second	
	0000	02306	local	third	
	0000	02307	local	forth	
	0000	02308	local	write	
	0000	02309	local	end_	
09CF 0879	02310	movf	PADDR,W		
09D0 3A10	02311	0x10			
09D1 1903	02312	xorlw	0x20		
09D2 2???	02313	btfsr	STATUS,Z		
09D3 0879	02314	goto	first		
09D4 3A20	02315	0x10			
09D5 1903	02316	xorlw	0x30		
09D6 2???	02317	btfsr	STATUS,Z		
09D7 0879	02318	goto	second		
09D8 3A30	02319	0x10			
09D9 1903	02320	xorlw	0x40		
09DA 2???	02321	btfsr	STATUS,Z		
09DB 0879	02322	goto	third		
09DC 3010	02323	0x10			
09DD 00F9	02324	xorwf	PADDR		
09DE 2???	02325	goto	write		
09DF 3020	02326	movlw	0x20		
09E0 00F9	02327	movwf	PADDR		
09E1 2???	02328	goto	write		
09E2 082C	02329	movf	StartYearT,W		
09E3 00FA	02330	movwf	EEVAL		
09E4 2???	02331	call	writeEEPROM		
Message[305]: Using default destination of 1 (file).					
09E5 0AF9	02332	incf	PADDR		
09E6 3040	02333	movlw	0x40		
09E7 00F9	02334	movwf	PADDR		
09E8 2???	02335	call	write		
09E9 082C	02336	incf	PADDR		
09EA 00FA	02337	movf	StartYearD,W		
09EB 00FA	02338	movwf	EEVAL		
09EC 082D	02339	call	writeEEPROM		
09ED 00FA	02340	incf	PADDR		
09EE 00F9	02341	movf			

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0A05	00FA	02381	movwf	EEVAL	
0A06	2???	02382	call	writeEEPROM	
Message[305]: Using default destination of 1 (file).					
0A07	0AF9	02383	incf	PADDR	
FMPASM 5.65					
		MAIN.ASM	4-7-2016	23:42:36	PAGE 67
LOC	OBJECT	CODE	LINE	SOURCE	TEXT
VALUE					
		02384			
0A08	0834	02385	movf	StartMinT,W	
0A09	00FA	02386	movwf	EEVAL	
0A0A	2???	02387	call	writeEEPROM	
Message[305]: Using default destination of 1 (file).					
0A0B	0AF9	02388	incf	PADDR	
		02389			
0A0C	0835	02390	movf	StartMind,W	
0A0D	00FA	02391	movwf	EEVAL	
0A0E	2???	02392	call	writeEEPROM	
Message[305]: Using default destination of 1 (file).					
0A0F	0AF9	02393	incf	PADDR	
		02394			
0A10	0868	02395	movf	SpotDH,W	
0A11	00FA	02396	movwf	EEVAL	
0A12	2???	02397	call	writeEEPROM	
Message[305]: Using default destination of 1 (file).					
0A13	0AF9	02398	incf	PADDR	
		02399			
0A14	0869	02400	movf	SpotDL,W	
0A15	00FA	02401	movwf	EEVAL	
0A16	2???	02402	call	writeEEPROM	
		02403			
0A17	3001	02404	movlw	0x01	
0A18	00FA	02405	movwf	EEVAL	
0A19	00F9	02406	movwf	PADDR	
0A1A	2???	02407	call	writeEEPROM	
		02408			
0A1B	0008	02409	return		
		02410			
	; Active Path Correction				
		02412			
		02413			
0A1C	02414 Ultra_Trig				
0A15	1405	02415	bsf	ULTRA_T	
0A1D	2???	02416	call	Delay_20us	
0A1E	1005	02417	bcf	ULTRA_T	
		02418			
0A1F	02419 Cal_Dist				
0A1F	1D85	02420	btfss	ULTRAIN	
0A20	2???	02421	goto	\$-1	
0A21	1410	02422	bsf	T1CON,TMR1ON	
0A22	02423 Ultra_Hold				
		02424			
		02425			
		02426			
		02427			
		02428			
		02429			
		02430			
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0A49	????	02471	goto		NEAR ; C set, no borrow
		02472			
0A4A		02473	NEAR		
Message[305]: Using default destination of 1 (file).					
0A4A	0ACE	02474	incf	STATE	
0A4B	0865	02475	movf	UCount,W	
0A4C	3A00	02476	xorlw	0x00	
0A4D	1903	02477	btfsc	STATUS,Z	
0A4E	2???	02478	goto	CheckPath	
0A4F	03E5	02479	decf	UCount,F	
0A50	0008	02480	return		
		02481			
0A51		02482	FAR		
0A51	01CE	02483	clrfl	STATE	
0A52	0008	02484	return		
		02485			
FMPASM 5.65					
		MAIN.ASM	4-7-2016	23:42:36	PAGE 69
LOC	OBJECT	CODE	LINE	SOURCE	TEXT
VALUE					
		02486			
0A53		02487	movlw	0x02	
0A54	00E5	02488	movwf	UCount	
0A55	1C57	02489	btfss	FORWARD,0	
0A56	2???	02490	goto	Check_StraightF	
0A57	2???	02491	goto	Check_StraightB	
		02492			
0A58		02493	Check_StraightF		
0A58	084F	02494	movf	UREADING0,W	
0A59	0258	02495	subwf	UPBOUND,0	
0A5A	1C03	02496	btfss	STATUS,C	
0A5B	2???	02497	goto	Turn_LeftF	
0A5C	0859	02498	movf	LOBOUND,W	
0A5D	024F	02499	subwf	UREADING0,0	
0A5E	1C03	02500	btfss	STATUS,C	
0A5F	2???	02501	goto	Turn_RightF	
0A60	0008	02502	return		
		02503			
0A61		02504	Turn_LeftF		
		02505			
		02506			
		02507			
		02508			
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		02512			
		02513			
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		02563			

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0A22	1985	02424	btfsc	ULTRAIN	
0A23	2???	02425	goto	Ultra_Hold	
0A24	1010	02426	bcf	T1CON,TMR1ON	
0A25	080F	02427	movf	TMR1H,W	
0A26	00D0	02428	movwf	UREADING1	
0A27	080E	02429	movf	TMR1L,W	
0A28	00CF	02430	movwf	UREADING0	
0A29	01F8	02431	clrfl	TMRIH	
0A2A	01B8	02432	clrfl	TMRL1	
0A2B	2???	02433	goto	Check_UltraState	
FMPASM 5.65					
		MAIN.ASM	4-7-2016	23:42:36	PAGE 68
LOC	OBJECT	CODE	LINE	SOURCE	TEXT
VALUE					
		02434			
0A2C	02435 Ultra_Trig2				
0A2D	1405	02436	bsf	ULTRA_T	
0A2E	2???	02437	call	Delay_20us	
0A2E	1005	02438	bcf	ULTRA_T	
		02439			
		02440			
		02441			
		02442			
		02443			
		02444			
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		02460			
		02461			
	</td				

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02564
0A8A 02565 Turn_RightB
02566 ; Turn off right motor
0A8A 1085 02567 bcf MOTOR10
02568 ;bsf MOTOR11
02569
0A8B 27?? 02570 call Delay0.2s
0A8C 27?? 02571 call Delay0.2s
0A8D 1485 02572 bcf MOTOR10
02573 ;bcf MOTOR11
02574
0A8E 0008 02575 return
02576
0A8F 02577 Divide_58
02578 ;copy accumulator to temporary
0A8F 0850 02579 movvf UREADING1, w
0A90 00D6 02580 movwf COUNTH1
0A91 084F 02581 movf UREADING0, w
0A92 00D5 02582 movvf COUNTH0
02583
02584
02585 ;shift accumulator right 4 times
0A93 0E4F 02586 swapf UREADING0, w
0A94 390F 02587 andlw 0x0F
0A95 00CF 02588 movwf UREADING0
0A96 0E50 02589 swapf UREADING1, w
0A97 00D0 02590 movwf UREADING1
0A98 39F0 02591 andlw 0xF0
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LOC	OBJECT	CODE	LINE	SOURCE	TEXT
				VALUE	
0A99	06D0	02592	xorwf	UREADING1, f	
0A9A	04CF	02593	iorwf	UREADING0, f	
		02594			
0A9B	09CF	02595	;negate accumulator		
0A9C	09D0	02596	comf	UREADING0, f	
0A9D	0ACF	02597	comf	UREADING1, f	
0A9E	1903	02598	incf	UREADING0, f	
0A9F	0AD0	02599	skpnz		
		02600	incf	UREADING1, f	
		02601			
0AA0	01D1	02602	;subtract temporary from accumulator		
0AA1	1BD3	02603	clrf	UREADING2	
0AA2	09D1	02604	btfsc	UREADING1, 7	
0AA3	0855	02605	comf	UREADING2, f	
0AA4	02CF	02606	movf	COUNTH0, w	
0AA5	0856	02607	subwf	UREADING0, f	
0AA6	1C03	02608	movf	COUNTH1, w	
0AA7	0F56	02609	skpc		
		02610	incfsz	COUNTH1, w	

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02658
02659 ;shift accumulator right 4 times
0ACC 0E52 02660 swapf UREADING20, w
0ACD 390F 02661 andlw 0x0F
0ACE 00D2 02662 movwf UREADING20
0ACE 0853 02663 swapf UREADING21, w
0AD0 00D3 02664 movwf UREADING21
0AD1 39F0 02665 andlw 0xF0
0AD2 06D3 02666 xorwf UREADING21, f
0AD3 04D2 02667 iorwf UREADING20, f
02668
02669 ;negate accumulator
0AD4 09D2 02670 comf UREADING20, f
0AD5 09D3 02671 comf UREADING21, f
0AD6 0AD2 02672 incf UREADING20, f
0AD7 1903 02673 skpnz
0AD8 0AD3 02674 incf UREADING21, f
02675
02676 ;subtract temporary from accumulator
0AD9 01D4 02677 clrf UREADING22
0ADA 1BD3 02678 btfsc UREADING21, 7
0ADB 09D4 02679 comf UREADING22, f
0ADD 02D2 02680 movf COUNTH0, w
0ADE 0856 02682 subwf UREADING20, f
0ADF 1C03 02683 skpc
0AE0 0F56 02684 incfsz COUNTH1, w
0AE1 02D3 02685 subwf UREADING21, f
0AE2 3001 02686 movlw 0x01
0AE3 1C03 02687 skpc
0AE4 02D4 02688 subwf UREADING22, f
02689
02690 ;shift accumulator right 3 times
0AE5 0D54 02691 rlf UREADING22, w
0AE6 0CD4 02692 rrf UREADING22, f
0AE7 0CD3 02693 rrf UREADING21, f
0AE8 0CD2 02694 rrf UREADING20, f
0AE9 0CD4 02695 rrf UREADING22, f
0AEA 0CD3 02696 rrf UREADING21, f
0AEB 0CD2 02697 rrf UREADING20, f
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LOC	OBJECT	CODE	LINE	SOURCE	TEXT
				VALUE	
0AE5	0D54	02691	rlf	UREADING22, w	
0AE6	0CD4	02692	rrf	UREADING22, f	
0AE7	0CD3	02693	rrf	UREADING21, f	
0AE8	0CD2	02694	rrf	UREADING20, f	
0AE9	0CD4	02695	rrf	UREADING22, f	
0AEA	0CD3	02696	rrf	UREADING21, f	
0AEB	0CD2	02697	rrf	UREADING20, f	

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0AAB 02D0 02611 subwf UREADING1, f
0AAB 3001 02612 movlw 0x01
0AAA 1C03 02613 skpc
0AAB 02D1 02614 subwf UREADING2, f
02615
02616 ;shift accumulator right 3 times
0AAC 0D51 02617 rlf UREADING2, w
0AAD 0CD1 02618 rrf UREADING2, f
0AAE 0CD0 02619 rrf UREADING1, f
0AAF 0CCF 02620 rrf UREADING0, f
0AB0 0CD1 02621 rrf UREADING2, f
0AB1 0CD0 02622 rrf UREADING1, f
0AB2 0CCF 02623 rrf UREADING0, f
0AB3 0D50 02624 rlf UREADING1, w
0AB4 0CD0 02625 rrf UREADING1, f
0AB5 0CCF 02626 rrf UREADING0, f
02627
02628 ;add temporary to accumulator
0AB6 0855 02629 movf COUNTH0, w
0AB7 07CF 02630 addwf UREADING0, f
0AB8 0856 02631 movf COUNTH1, w
0AB9 1803 02632 skpnc
0ABA 0F56 02633 incfsz COUNTH1, w
0ABB 07D0 02634 addwf UREADING1, f
02635
02636 ;shift accumulator right 6 times
0ABC 0DCF 02637 rlf UREADING0, f
0ABD 0DD0 02638 rlf UREADING1, f
0ABE 01D1 02639 clrf UREADING2
0ABF 0D01 02640 rlf UREADING2, f
0AC0 0DCF 02641 rlf UREADING0, f
0AC1 0DD0 02642 rlf UREADING1, f
0AC2 0D01 02643 rlf UREADING2, f
0AC3 0850 02644 movf UREADING1, w
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LOC	OBJECT	CODE	LINE	SOURCE	TEXT
				VALUE	
0AC4	00CF	02645	movwf	UREADING0	
0AC5	0851	02646	movf	UREADING2, w	
0AC6	00D0	02647	movwf	UREADING1	
0AC7	0008	02648	return		
		02649			
0AC8	02650	Divide_582			
		02651	;copy accumulator to temporary		
0AC8	0853	02652			
0AC9	00D6	02653	movwf	UREADING21, w	
0ACA	0852	02654	movwf	UREADING20, w	
0ACB	00D5	02655	movwf	COUNTH0	
		02656			
		02657			

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0AF1 0856 02705 movf COUNTH1, w
0AF2 1803 02706 skpnc
0AF3 0F56 02707 incfsz COUNTH1, w
0AF4 07D3 02708 addwf UREADING21, f
02709
02710 ;shift accumulator right 6 times
0AF5 0DD2 02711 rlf UREADING20, f
0AF6 0DD3 02712 rlf UREADING21, f
0AF7 01D4 02713 clrf UREADING22
0AF8 0DD4 02714 rlf UREADING22, f
0AF9 0DD2 02715 rlf UREADING20, f
0AFA 0DD3 02716 rlf UREADING21, f
0AFB 0DD4 02717 rlf UREADING22, f
0AFc 0853 02718 movf UREADING21, w
0AFD 00D2 02719 movwf UREADING20
0AFE 0654 02720 movf UREADING22, w
0AFF 00D3 02721 movwf UREADING21
0B00 0008 02722 return
02723
0B01 300F 02724 Delay_20us ;46 cycles
0B01 300F 02725 movlw 0x0F
0B02 00BE 02726 movwf COUNTH
0B03 0BBE 02727 Delay_20us_0
0B04 27?? 02728 decfsz COUNTH, f
0B04 27?? 02729 goto Delay_20us_
02730
02731 ;4 cycles (including call)
0B05 0008 02732 return
02733
0B06 27?? 02734 Delay0.2s
0B06 27?? 02735 ;499994 cycles
0B06 3088 02736 movlw 0x88
0B07 00BE 02737 movwf COUNTH
0B08 30BD 02738 movlw 0xBD
0B09 00BF 02739 movwf COUNTM
0B0A 3003 02740 movlw 0x03
0B0B 00C0 02741 movwf COUNTL
0B0C 2742 02742 Delay0.2_0
0B0C 0BBE 02743 decfsz COUNTH, f
0B0D 27?? 02744 goto $+2
0B0E 0BBF 02745 decfsz COUNTM, f
0B0F 27?? 02746 goto $+2
0B10 0BC0 02747 decfsz COUNTL, f
0B11 27?? 02748 goto Delay0.2_0
02749
02750 ;2 cycles
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```

LOC	OBJECT	CODE	LINE	SOURCE	TEXT
				VALUE	
0B12	27???	02751	goto	\$+1	

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```

0B13 0000          02752      nop
                  02753
0B14 0008          02754      return
                  02755
0B15          02756  MultiplyDist .l.773
0B15 084C          02757      movf           DistTMROH, w
0B16 00B8          02758      movvwf        FinishHourT
0B17 084D          02759      movf           DistTMRO, w
0B18 00B9          02760      movwwf        FinishHourD
                  02761
                  02762
                  02763      ;shift accumulator right 4 times
0B19 0E4D          02764      swapf         DistTMRO, w
0B1A 390F          02765      andlw         0x0F
0B1B 00CD          02766      movvwf        DistTMRO
0B1C 0E4C          02767      swapf         DistTMROH, w
0B1D 00CC          02768      movvwf        DistTMROH
0B1E 39F0          02769      andlw         0xF0
0B1F 06CC          02770      xorwf         DistTMROH, f
0B20 04CD          02771      iorwf         DistTMRO, f
                  02772
                  02773      ;subtract temporary from accumulator
0B21 0839          02774      movf           FinishHourD, w
0B22 02CD          02775      subwf         DistTMRO, f
0B23 0838          02776      movf           FinishHourT, w
0B24 1C03          02777      skpc
0B25 0F38          02778      incfsz       FinishHourT, w
0B26 02CC          02779      subwf         DistTMROH, f
                  02780
                  02781  ;shift accumulator right 2 times
0B27 0D4C          02782      rlf           DistTMROH, w
0B28 0CCC          02783      rrf           DistTMROH, f
0B29 0CCD          02784      rrf           DistTMRO, f
0B2A 0D4C          02785      rlf           DistTMROH, w
0B2B 0CCC          02786      rrf           DistTMROH, f
0B2C 0CCD          02787      rrf           DistTMRO, f
                  02788
                  02789      ;shift temporary left 1 times
0B2D 1003          02790      clrc
0B2E 0DB9          02791      rlf           FinishHourD, f
0B2F 0DBB          02792      rlf           FinishHourT, f
                  02793
                  02794      ;add temporary to accumulator
0B30 0839          02795      movf           FinishHourD, w
0B31 07CD          02796      addwf         DistTMRO, f
0B32 0938          02797      movf           FinishHourT, w
0B33 1803          02798      skpnc
0B34 0F38          02799      incfsz       FinishHourT, w
0B35 07CC          02800      addwf         DistTMROH, f
                  02801
                  02802
0B36 0008          02803      return

```

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ANGLL5	000001B3
ANGLL6	000001B9
ANGLL7	000001BF
ANGLL8	000001C5
ANGLL9	000001CB
ANGLM1	0000019A
ANGLM10	000001D0
ANGLM11	000001D6
ANGLM12	000001DC
ANGLM13	000001E2
ANGLM14	000001E8
ANGLM15	000001EE
ANGLM2	000001A0

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SYMBOL TABLE

LABEL	VALUE
ANGLM3	000001A6
ANGLM4	000001AC
ANGLM5	000001B2
ANGLM6	000001B8
ANGLM7	000001BE
ANGLM8	000001C4
ANGLM9	000001CA
A_	0000051E
A_Pressed	000001A5
Ask_Msg	00000581
BCLIE	00000003
BCLIF	00000003
BF	00000000
BRGH	00000002
BUZZER	PORTA,5
B_	00000520
B_Pressed	000001AD
Bank0	
Bank1	
Bank2	
Bank3	
Bin16toBCD	
C	00000000
CCPICON	00000017
CCP1IE	00000002
CCP1IF	00000002
CCP1M0	00000000
CCP1M1	00000001
CCP1M2	00000002
CCP1M3	00000003
CCP1X	00000005
CCPIY	00000004
CCP2CON	0000001D
CCP2IE	00000000

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```

LOC OBJECT CODE      LINE SOURCE TEXT
VALUE

          02804
3F72      02805      END
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SYMBOL TABLE
LABEL           VALUE

ACKDT          00000005
ACKEN          00000004
ACKSTAT        00000006
ADCON0         0000001F
ADCON1         0000009F
ADCS0          00000006
ADCS1          00000007
ADDEN          00000003
ADFM           00000007
ADIE           00000006
ADIF           00000006
ADON           00000000
ADRESH         0000001E
ADRESL         0000009E
ANGLEL         0000061D
ANGLH1          00000199
ANGLH10         000001CF
ANGLH11         000001D5
ANGLH12         000001DB
ANGLH13         000001E1
ANGLH14         000001E7
ANGLH15         000001ED
ANGLH2          0000019F
ANGLH3          000001A5
ANGLH4          000001AB
ANGLH5          000001B1
ANGLH6          000001B7
ANGLH7          000001BD
ANGLH8          000001C3
ANGLH9          000001C9
ANGLL1          0000019B
ANGLL10         000001D1
ANGLL11         000001D7
ANGLL12         000001DD
ANGLL13         000001E3
ANGLL14         000001E9
ANGLL15         000001EF
ANGLL2          000001A1
ANGLL3          000001A7
ANGLL4          000001AD

```

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CCP2IF	00000000
CCP2M0	00000000
CCP2M1	00000001
CCP2M2	00000002
CCP2M3	00000003
CCP2X	00000005
CCP2Y	00000004
CCPR1	00000015
CCPR1H	00000016
CCPR1L	00000015
CCPR2	0000001B
CCPR2H	0000001C
CCPR2L	0000001B
CHS0	00000003
CHS1	00000004
CHS2	00000005
CKE	00000006
CKP	00000004
COORD	0000005A
MAIN.PASM 5.65	
	MAIN.ASM 4-7-2016 23:42:36
	PAGE 78
 SYMBOL TABLE	
LABEL	VALUE
COUNTH	0000003E
COUNTH0	00000055
COUNTH1	00000056
COUNTL	00000040
COUNTM	0000003F
CREN	00000004
CSRC	00000007
C_	00000522
C_Pressed	000001B5
Cal_Dist	00000A1F
Cal_Dist2	00000A2F
CheckMUX1	000002D1
CheckMUX2	000002DE
CheckPath	00000A53
CheckSub	0000046C
Check_StraightB	00000A6B
Check_StraightB2	00000A74
Check_StraightF	00000A58
Check_UltraState	00000A3B
ClrLCD	000006C5
D	00000005
DATA_ADDRESS	00000005
DC	00000001
DISTH1	00000196
DISTH10	000001C0
DISTH11	000001D2
DISTH12	000001D8
DISTH13	000001DE

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C:\Users\Joe\Desktop\AER201\Final\Final.X\build\default\production_ext1472\main.lst			April 7, 2016 23:44
DISTH14	000001E4		
DISTH15	000001EA		
DISTH2	0000019C		
DISTH3	000001A2		
DISTH4	000001A8		
DISTH5	000001AE		
DISTH6	000001B4		
DISTH7	000001BA		
DISTH8	000001C0		
DISTH9	000001C6		
DISTL1	00000198		
DISTL10	000001CE		
DISTL11	000001D4		
DISTL12	000001DA		
DISTL13	000001E0		
DISTL14	000001E6		
DISTL15	000001EC		
DISTL2	0000019E		
DISTL3	000001A4		
DISTL4	000001AA		
DISTL5	000001B0		
DISTL6	000001B6		
DISTL7	000001BC		
DISTL8	000001C2		
DISTL9	000001C8		
FMPASM 5.65	MAIN.ASM	4-7-2016 23:42:36	PAGE 79
SYMBOL TABLE			
LABEL	VALUE		
DISTM	000001B5		
DISTM1	00000197		
DISTM10	000001CD		
DISTM11	000001D3		
DISTM12	000001D9		
DISTM13	000001DF		
DISTM14	000001E5		
DISTM15	000001EB		
DISTM2	0000019D		
DISTM3	000001A3		
DISTM4	000001A9		
DISTM5	000001AF		
DISTM7	000001BB		
DISTM8	000001C1		
DISTM9	000001C7		
DOT	000004DB		
DOT1	000004CD		
DOUT	00000075		
DS	0000063D		
DS_0	00000641		
D_A	00000524		
D_A	00000005		

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C:\Users\Joe\Desktop\AER201\Final\Final.X\build\default\production_ext1472\main.lst			April 7, 2016 23:44
FinishMinT	0000003A		
FinishSecD	0000003D		
FinishSect	0000003C		
GAP	0000006E		
GCEN	00000007		
GIE	00000007		
GO	00000002		
GO_DONE	00000002		
GO_MUX2	000002C1		
GO_NOT_DONE	00000002		
GetDistance	00000447		
GetWritingAddress			
HEXtoASCII			
HalfS	0000062D		
Hold	000001C5		
HourD	00000027		
HourT	00000026		
I2C_DATA	00000005		
I2C_READ	00000002		
I2C_START	00000003		
I2C_STOP	00000004		
IBF	00000007		
IBOV	00000005		
INDF	00000000		
INTCON	0000000B		
INTE	00000004		
INTEDG	00000006		
INTF	00000001		
INT_Return	00000015		
IRP	00000007		
Info_Msg1	000001E3		
Info_Msg2	000001FD		
InitLCD	000006AE		
Initial	00000020		
Int_W	00000067		
LCDANGLH	00000193		
LCDANGLL	00000195		
FMPASM 5.65	MAIN.ASM	4-7-2016 23:42:36	PAGE 81
SYMBOL TABLE			
LABEL	VALUE		
LCDANGLM	00000194		
LCDDISTH	00000190		
LCDDISTL	00000192		
LCDDISTM	00000191		
LCD_DELAY			
LLD_LOOP	000006EA		
LOBOUND	00000059		
Loop__	0000050D		
M1IF01	000002D8		
M1IFNOT01	000002DB		

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C:\Users\Joe\Desktop\AER201\Final\Final.X\build\default\production_ext1472\main.lst			April 7, 2016 23:44
D_NOT_A	00000005		
D_Pressed	000001BD		
DayD	00000025		
DayT	00000024		
Delay0.2_0	00000B0C		
Delay0.2s	00000B06		
Delay5s	00000105		
Delay5s2	0000012D		
Delay5s2_0	00000133		
Delay5s_0	0000010B		
Delay_20us	00000B01		
Delay_20us_0	00000B03		
Desired_Gap	00000066		
DisL	0000060C		
DispTable			
Display			
DisplayDOT	000005C5		
DisplayDate			
DistH	0000004A		
DistL	0000004B		
DistTMRO	0000004D		
DistTMROH	0000004C		
DistX	00000049		
Divide_S8	00000A8F		
Divide_S82	00000AC8		
Done_Write	00000597		
E	PORTD, 3		
EEADR	0000010D		
EEADRH	0000010F		
EECON1	0000018C		
EECON2	0000018D		
FMPASM 5.65	MAIN.ASM	4-7-2016 23:42:36	PAGE 80
SYMBOL TABLE			
LABEL	VALUE		
EEDATA	00000010C		
EEDATH	00000010E		
EEIE	00000004		
EIFF	00000004		
EEPQD	00000007		
EEVAL	0000007A		
ENCODER	PORTA, 4		
ERR	0000000E		
F	00000001		
FAR	00000A51		
FFRR	00000002		
FORWARD	00000057		
FSR	00000004		
FinishHourD	00000039		
FinishHourT	00000038		
FinishMinD	0000003B		

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C:\Users\Joe\Desktop\AER201\Final\Final.X\build\default\production_ext1472\main.lst			April 7, 2016 23:44
M2IF67	000002E5		
M2IFNOTE7	000002E8		
MOTOR00	PORTD, 0		
MOTOR01	PORTD, 1		
MOTOR10	PORTA, 1		
MOTOR11	PORTA, 2		
MUX1_0	PORTE, 0		
MUX1_1	PORTE, 1		
MUX1_2	PORTE, 2		
MUX1_Check	000002AD		
MUX1_D	PORTB, 3		
MUX2_0	PORTC, 7		
MUX2_1	PORTC, 6		
MUX2_2	PORTC, 5		
MUX2_Check	000002C6		
MUX2_D	PORTB, 2		
MUX_Output	0000006C		
MUX_Temp	0000006D		
Mainline	0000001A		
Menu_Number	000004AF		
Menu_Time	00000482		
MinD	00000029		
MinT	00000028		
MonD	00000023		
MonT	00000022		
MultiplyDist	00000B15		
NEAR	00000A4K		
NEXTCLEAR	000006F9		
NEXT_DOT			
NOT_A	00000005		
NOT_ADDRESS	00000005		
NOT_BO	00000000		
NOT_BOR	00000000		
NOT_DONE	00000002		
NOT_PD	00000003		
NOT POR	00000001		
NOT_RBU	00000007		
NOT_RC8	00000006		
NOT_TISYNC	00000002		
NOT_TO	00000004		
NOT_TX8	00000006		
NOT_W	00000002		
NOT_WRITE	00000002		
FMPASM 5.65	MAIN.ASM	4-7-2016 23:42:36	PAGE 82
SYMBOL TABLE			
LABEL	VALUE		
NumberLabel	000005AD		
OBF	00000006		
OERR	00000001		
OPTION_REG	00000081		

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C:\Users\Joe\Desktop\AER201\Final\Final.X\build\default\production_ext1472\main.lst		
April 7, 2016 23:44		
OP_MSG	000003F9	
Operation	00000239	
P	00000004	
PADDR	00000079	
PCFG0	00000000	
PCFG1	00000001	
PCFG2	00000002	
PCFG3	00000003	
PCL	00000002	
PCLATH	0000000A	
PCON	0000008E	
PBIE	00000006	
PEN	00000002	
PIE1	0000008C	
PIE2	0000008D	
PIR1	0000000C	
PIR2	0000000D	
PORTA	00000005	
PORTB	00000006	
PORTC	00000007	
PORTD	00000008	
PORTE	00000009	
PR2	00000092	
PS0	00000000	
PS1	00000001	
PS2	00000002	
PSA	00000003	
PSPIE	00000007	
PSPIF	00000007	
PSPMODE	00000004	
PWM1	PORTC,1	
PWM2	PORTC,2	
Past_Info_Date	00000217	
Past_Info_Num	00000228	
Pipe_Begin	00000284	
Post_Msg	0000054C	
R	00000002	
RA0	00000000	
RA1	00000001	
RA2	00000002	
RA3	00000003	
RA4	00000004	
RA5	00000005	
RB0	00000000	
RB1	00000001	
RB2	00000002	
RB3	00000003	
RB4	00000004	
RB5	00000005	
FMPASM 5.65	MAIN.ASM	4-7-2016 23:42:36
		PAGE 83
SYMBOL TABLE		

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C:\Users\Joe\Desktop\AER201\Final\Final.X\build\default\production_ext1472\main.lst		
April 7, 2016 23:44		
Reset_Mux1		
Reset_Mux2		
FMPASM 5.65	MAIN.ASM	4-7-2016 23:42:36
		PAGE 84
SYMBOL TABLE		
LABEL	VALUE	
Reset_Sensor	000006F4	
ReverseDir	000003C8	
S	00000003	
SEN	00000000	
SMP	00000007	
SPBRG	00000099	
SPEN	00000007	
SREN	00000005	
SSPADD	00000093	
SSPBUF	00000013	
SSPCON	00000014	
SSPCON2	00000091	
SSPEN	00000005	
SSPIE	00000003	
SSPIF	00000003	
SSPM0	00000000	
SSPM1	00000001	
SSPM2	00000002	
SSPM3	00000003	
SSPOV	00000006	
SSPSTAT	00000094	
STATE	0000004E	
STATUS	00000003	
STATUS_temp	00000048	
SYNC	00000004	
SecB	0000002B	
Sect	0000002A	
Sensor0	0000032F	
Sensor1	00000336	
Sensor10	00000375	
Sensor11	0000037C	
Sensor12	00000383	
Sensor13	0000038A	
Sensor14	00000391	
Sensor15	00000398	
Sensor2	0000033D	
Sensor3	00000344	
Sensor4	0000034B	
Sensor5	00000352	
Sensor6	00000359	
Sensor7	00000360	
Sensor8	00000367	
Sensor9	0000036E	
SensorB	0000006B	
Sensor_Check	00000297	

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C:\Users\Joe\Desktop\AER201\Final\Final.X\build\default\production_ext1472\main.lst		
April 7, 2016 23:44		
LABEL	VALUE	
RB6	00000006	
RB7	00000007	
RBIE	00000003	
RBIF	00000000	
RC0	00000000	
RC1	00000001	
RC2	00000002	
RC3	00000003	
RC4	00000004	
RC5	00000005	
RC6	00000006	
RC7	00000007	
RC8_9	00000006	
RC9	00000006	
RCD8	00000000	
RCEN	00000003	
RCIE	00000005	
RCIF	00000005	
RCREG	0000001A	
RCSTA	00000018	
RD	00000000	
RD0	00000000	
RD1	00000001	
RD2	00000002	
RD3	00000003	
RD4	00000004	
RD5	00000005	
RD6	00000006	
RD7	00000007	
RD_END	00000786	
RD_ERR	00000785	
RE0	00000000	
RR1	00000001	
RE2	00000002	
READING	0000006F	
READ_WRITE	00000002	
RECORD	000002EB	
RP0	00000005	
RP1	00000006	
RS	PORID,2	
RSEN	00000001	
RTCADD	00000073	
RTCDATA	00000074	
RTC_Sing_DIG	00000078	
RTC_TENS_DIG	00000077	
RX9	00000006	
RX9D	00000000	
R_NOT_W	00000002	
R_W	00000002	
ReadEEPROM	00000994	
Reiterate	0000047D	
FMPASM 5.65	MAIN.ASM	4-7-2016 23:42:36
		PAGE 85
SYMBOL TABLE		
LABEL	VALUE	
StartHourT	00000032	
StartMinT	00000035	
StartMinD	00000034	
StartMonD	0000002F	
StartMonT	0000002B	
StartMotor	0000026B	
StartSecD	00000037	
StartSecT	00000036	
StartYearD	0000002D	
StartYearT	0000002C	
Store_	00000526	
Straight_Back	000003B9	
SwitchPage	00000115	
Switch_Lines	000006F1	
TOCS	00000005	
TOIE	00000005	
TOIF	00000002	
TOSE	00000004	
T1CKPS0	00000004	
T1CKPS1	00000005	
TICON	00000010	
T1LNSYNC	00000002	
T1OSCAN	00000003	
T1SYNC	00000002	
T2CKPS0	00000000	
T2CKPS1	00000001	
T2CON	00000012	
TMR0	00000001	
TMR0H	00000070	
TMR0IE	00000005	
TMR0IF	00000002	
TMR1	0000000B	
TMR1CS	00000001	
TMR1H	0000000F	
TMR1IE	00000000	
TMR1IF	00000000	
TMR1L	0000000E	
TMR1ON	00000000	
TMR2	00000011	

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C:\Users\Joe\Desktop\AER201\Final\Final.X\build\default\production_ext1472\main.lst			April 7, 2016 23:44
TMR2IE	00000001		
TMR2IF	00000001		
TMR2ON	00000002		
TOUTP50	00000003		
TOUTP51	00000004		
TOUTP52	00000005		
TOUTP53	00000006		
TRISA0	00000085		
TRISA0	00000000		
TRISA1	00000001		
TRISA2	00000002		
TRISA3	00000003		
TRISA4	00000004		
TRISA5	00000005		
FPMPASM 5.65		MAIN.ASM 4-7-2016 23:42:36	PAGE 86
SYMBOL TABLE			
LABEL	VALUE		
TRISB	00000086		
TRISB0	00000000		
TRISB1	00000001		
TRISB2	00000002		
TRISB3	00000003		
TRISB4	00000004		
TRISB5	00000005		
TRISB6	00000006		
TRISB7	00000007		
TRISC	00000087		
TRISCO	00000000		
TRISC1	00000001		
TRISC2	00000002		
TRISC3	00000003		
TRISC4	00000004		
TRISC5	00000005		
TRISC6	00000006		
TRISC7	00000007		
TRISD	00000088		
TRISD0	00000000		
TRISD1	00000001		
TRISD2	00000002		
TRISD3	00000003		
TRISD4	00000004		
TRISD5	00000005		
TRISD6	00000006		
TRISD7	00000007		
TRISE	00000089		
TRISE0	00000000		
TRISE1	00000001		
TRISE2	00000002		
TRMT	00000001		
TX8_9	00000006		

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C:\Users\Joe\Desktop\AER201\Final\Final.X\build\default\production_ext1472\main.lst			April 7, 2016 23:44
Ultra_Hold2	00000A32		
Ultra_Trig	00000A1C		
Ultra_Trig2	00000A2C		
W	00000000		
WCOL	00000007		
WREN	00000002		
WRERR	00000003		
WR_DATA	000006D7		
WR_END	00000737		
WR_ERR	00000736		
WR_INS	000006C8		
W_temp	0000007B		
W_tempW	00000047		
WaitAD	00000506		
WaitMenu	000004F4		
Wait_Interrupt	00000253		
Wait_Interrupt2	00000260		
Welcome_Msg	000001C8		
Write	00000164		
WriteMUX1			
WriteMUX2			
Writing	0000039F		
YearD	00000021		
YearTen	00000020		
Z	00000002		
FPMPASM 5.65		MAIN.ASM 4-7-2016 23:42:36	PAGE 88
SYMBOL TABLE			
LABEL	VALUE		
_.org_l_004C	0000004C		
_.org_l_0051	00000051		
_.org_l_0052	00000052		
_.org_l_0056	00000056		
_.org_l_0069	00000069		
_.org_l_0082	00000082		
_.org_l_008A	0000008A		
_.org_l_0099	00000099		
_.org_l_00A1	000000A1		
_.org_l_00B0	000000B0		
_.org_l_00B8	000000B8		
_.org_l_00C7	000000C7		
_.org_l_00CF	000000CF		
_.org_l_00DE	000000DE		
_.org_l_00E6	000000E6		
_.org_l_00F5	000000F5		
_.org_l_00FD	000000FD		
_.org_l_010E	0000010E		
_.org_l_0110	00000110		
_.org_l_0113	00000113		
_.org_l_0114	00000114		

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C:\Users\Joe\Desktop\AER201\Final\Final.X\build\default\production_ext1472\main.lst			April 7, 2016 23:44
TX9	00000006		
TX9D	00000000		
TXD8	00000000		
TXEN	00000005		
TXIE	00000004		
TXIF	00000004		
TXREG	00000019		
TXSTA	00000098		
TableANGLEL	00000627		
TableAsk	0000058B		
TableDisL	00000616		
TableDone	000005A1		
TableInfo_Msg1	000001ED		
TableInfo_Msg2	00000207		
TableNumberL	000005B7		
TableOp_MSG	00000403		
TablePast_Info_Date	00000221		
TablePast_Info_Num	00000232		
TablePost	00000556		
TableTerm	00000542		
FPMPASM 5.65		MAIN.ASM 4-7-2016 23:42:36	PAGE 87
SYMBOL TABLE			
LABEL	VALUE		
TableTimeL	00000571		
TableWelcome_Msg	000001D2		
Table_Counter	00000041		
TermMenu	00000451		
Term_Msg	00000538		
Termination	00000410		
TestKey	0000013E		
Test_D	00000456		
TimeLabel	00000567		
ToBCD			
Turn_LeftB	00000A95		
Turn_LeftF	00000A61		
Turn_RightB	00000A8A		
Turn_RightF	00000A66		
UA	00000001		
UCount	00000065		
ULTRAIN	PORTA,3		
ULTRAIN2	PORTB,0		
ULTRA_T	PORTA,0		
UBOUND	00000058		
UREADING0	0000004F		
UREADING1	00000050		
UREADING2	00000051		
UREADING20	00000052		
UREADING21	00000053		
UREADING22	00000054		
Ultra_Hold	00000A22		

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_.org_l_0136	00000136		
_.org_l_0138	00000138		
_.org_l_013B	0000013B		
_.org_l_013C	0000013C		
_.org_l_0140	00000140		
_.org_l_01AA	000001AA		
_.org_l_01B2	000001B2		
_.org_l_01BA	000001BA		
_.org_l_01C2	000001C2		
_.org_l_0247	00000247		
_.org_l_0259	00000259		
_.org_l_0264	00000264		
_.org_l_0288	00000288		
_.org_l_02A6	000002A6		
_.org_l_02D9	000002D9		
_.org_l_02E6	000002E6		
_.org_l_03DD	000003DD		
_.org_l_03ED	000003ED		
_.org_l_042A	0000042A		
_.org_l_042F	0000042F		
_.org_l_0458	00000458		
_.org_l_050A	0000050A		
_.org_l_052A	0000052A		
_.org_l_0634	00000634		
_.org_l_0636	00000636		
_.org_l_0639	00000639		
_.org_l_0642	00000642		
_.org_l_0645	00000645		
_.org_l_0652	00000652		
_.org_l_068D	0000068D		
_.org_l_0706	00000706		
_.org_l_070E	0000070E		
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SYMBOL TABLE			
LABEL	VALUE		
_.org_l_071B	0000071E		
_.org_l_072B	0000072E		
_.org_l_073B	0000073B		
_.org_l_0741	00000741		
_.org_l_0749	00000749		
_.org_l_0759	00000759		
_.org_l_0764	00000764		
_.org_l_076C	0000076C		
_.org_l_0777	00000777		
_.org_l_0783	00000783		
_.org_l_078A	0000078A		
_.org_2_0807	00000807		
_.org_2_080F	0000080F		
_.org_2_081E	0000081E		
_.org_2_0826	00000826		

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```

._org_2_0835      00000835
._org_2_083D      0000083D
._org_2_084C      0000084C
._org_2_0854      00000854
._org_2_0863      00000863
._org_2_086B      0000086B
._org_2_087A      0000087A
._org_2_0882      00000882
._org_2_0892      00000892
._org_2_089A      0000089A
._org_2_08A9      000008A9
._org_2_08B1      000008B1
._org_2_08C0      000008C0
._org_2_08C8      000008C8
._org_2_098D      0000098D
._org_2_0A20      00000A20
._org_2_0A30      00000A30
._org_2_0B0D      00000B0D
._org_2_0B0F      00000B0F
._org_2_0B12      00000B12
_BODEN_OFF        00003FBF
_BODEN_ON         00003FFF
_BOREN_OFF        00003FBF
_BOREN_ON         00003FFF
_CONFIG          00002007
_CPD_OFF          00003FFF
_CPD_ON           00003BFF
_CP_ALL           00000FCF
_CP_HALF          00001FD
_CP_OFF           00003FFF
_CP_UPPER_256     00002PEF
_DEBUG_OFF         00003FFF
_DEBUG_ON          00002006
_DEV1D            00002006
_FOSC_EXTRC       00003FFF
_FOSC_HS           00003FFE
_FOSC_LP           00003FC
_FOSC_XT           00003FD

```

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SYMBOL TABLE

LABEL	VALUE
_HS_OSC	00003FFE
_IDLOC0	00002000
_IDLOC1	00002001
_IDLOC2	00002002
_IDLOC3	00002003
_LP_OSC	00003F0C
_LVP_OFF	00003F7F
_LVP_ON	00003FFF
_PWRT_E_OFF	00003FFF

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```


```

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```

_FWRT_E_ON        00003FFT
_RC_OSC          00003FFF
_WDTE_OFF        00003FB
_WDTE_ON         00003FFF
_WDT_OFF         00003FB
_WDT_ON          00003FFF
_WRT_ENABLE_OFF  00003DFF
_WRT_ENABLE_ON   00003FFF
_WRT_OFF          00003DFF
_WRT_ON           00003FFF
_XT_OSC          00003FPD
__16F877          00000001
askStore          000004FA
clearEEPROM       00000970
com               00000045
dat               00000046
getElapsedTime    000008D1
getFinishTime     000008B8
getHistory         000009A5
getStartTime       00000800
i2c_common_ack
i2c_common_check_ack
i2c_common_nack
i2c_common_read
i2c_common_repeatedstart
i2c_common_setup    00000059
i2c_common_start
i2c_common_stop
i2c_common_write
inmenu            00000076
lcdLongDelay      000006E8
lcd_d1            00000043
lcd_d2            00000044
lcd_tmp           00000042
read_rtc          0000073D
rtc_convert
rtc_read
rtc_resetAll
rtc_set
storeHist         000009CD
writeEEPROM        0000097C
write_rtc          00000702

```

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Errors : 0
 Warnings : 0 reported, 0 suppressed
 Messages : 38 reported, 73 suppressed

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