

## Introduction

MBASIC PROGRAM TO READ/WRITE TIME TO THE DALLAS DS1302 RTC CHIP, DISPLAYS TIME IN BCD USING 4 COLUMNS OF LED'S. INTERRUPT ROUTINE MULTIPLEXES THE TIME TO THE DISPLAY USES PORTA BITS 0-2 TO TALK TO THE DS1302. BITS 3-4 FOR SETTING THE TIME USES PORTB BITS 0-3 FOR NUMBER TO OUTPUT, AND BITS 4-7 TO TURN ON TRANSISTORS

```

SECOND    VAR    BYTE
MINUTE    VAR    BYTE
HOUR      VAR    BYTE
DATE      VAR    BYTE
MONTH     VAR    BYTE
DAY       VAR    BYTE
YEAR      VAR    BYTE
TEMP      VAR    BYTE
DIGIT     VAR    BYTE                ;LOOP COUNTER TO SERVICE ONE DIGIT AT A TIME
DIG       VAR    BYTE(4)            ;DIGIT PLACEHOLDERS
TRANS     VAR    BYTE(4)            ;TRANSISTOR MASK FOR DISPLAY, 0 TURNS ON DISPLAY
HRBTN     VAR    BYTE                ;WORKSPACE FOR HOUR BUTTON
MINBTN    VAR    BYTE                ;WORKSPACE FOR MINUTE BUTTON

MINSET    CON    A3
HRSET     CON    A4
CS        CON    A0                ;RST OR CHIP SELECT LINE
SDATA     CON    A1                ;DATA I/O LINE
SCLK      CON    A2                ;CLOCK LINE

TRANS(0)=%11101111                ;MASK FOR 1ST DIGIT
TRANS(1)=%11011111                ;MASK FOR 2ND DIGIT
TRANS(2)=%10111111                ;MASK FOR 3RD DIGIT
TRANS(3)=%01111111                ;MASK FOR 4TH DIGIT

ONINTERRUPT TMR0INT,CLOCK          ;SET UP TIMER 0 INTERRUPT ROUTINE
SETTMR0    TMR0INT32              ;TO MULTIPLEX THE DISPLAYS
ENABLE     TMR0INT                ;REQUIRES LEAST AMOUNT OF WORK TO USE AND IS
                                       ;FAST ENOUGH

;CONFIGURE I/O
TRISA=%11111000                  ;PORTA BITS 0-2 OUTPUT, 3-7 INPUT
PORTA=%00000000                  ;TURN OFF ALL OUTPUTS
TRISB=%00000000                  ;PORT B ALL OUTPUTS
PORTB=%00001111                  ;TURN OFF ALL LEDS
CMCON=%00000111                  ;TURN OFF COMPARATORS

;INITIALIZE SOME VALUES

```



```
MAIN
  GOSUB CLKINIT                ;INITIALIZE CLOCK TO 12:00 AM; 1/1/02; DAY 1; 12
                                ;HR ;ENABLED
                                ;SET TIME VALUES HERE TO WRITE TO CLOCK WITH
                                ;ANYTHING

SECOND = $30                  ;DIFFERENT THAN DEFAULT
MINUTE = $59
HOUR = $12
DATE = $07
MONTH = $03
DAY = $04
YEAR = $02
HOUR = HOUR | $80            ;SET TO 12 HR FORMAT
                                ;SET TIME VALUES HERE TO WRITE TO CLOCK
GOSUB WRITETIME              ;WRITE NEW TIME VALUES TO CLOCKRDLOOP
GOSUB READTIME               ;READ THE TIME IN

BUTTON MINSET,1,3,2,MINBTN,1,SETMIN ;CHECK TO SEE IF MINUTE SET BUTTON IS PRESSED
BUTTON HRSET,1,5,2,HRBTN,1,SETHR   ;CHECK TO SEE IF HOUR SET BUTTON IS PRESSED

FOR TEMP = 1 TO 255          ;JUST A DELAY LOOP
TEMP = TEMP
NEXT
GOTO RDLOOP                  ;LOOP FOREVER

SETMIN
  TEMP = (BCD2BIN MINUTE)     ;CONVERT MINUTE TO BINARY
  TEMP = TEMP + 1             ;ADD 1 TO THE MINUTE
  IF TEMP > 59 THEN           ;CHECK TO SEE IF OVER 59
  TEMP = 0                    ;IF IT IS RESET TO ZERO - HOUR COULD BE ADDED
                                ;HERE

ENDIF

MINUTE = (BIN2BCD TEMP)      ;CONVERT BACK TO BCD
GOSUB WRITETIME              ;GO WRITE NEW TIME
GOTO RDLOOP                  ;RETURN TO MAIN LOOP

SETHR
  HOUR = HOUR & %00011111    ;MASK OFF FORMAT AND AMPM INDICATOR
  TEMP = (BCD2BIN HOUR)      ;CONVERT HOUR TO BINARY
  TEMP = TEMP + 1            ;ADD 1 TO THE HOUR
  IF TEMP > 12 THEN           ;IF HOUR > 12 THEN RESET TO 1
  TEMP = 1                    ;IF 24 HOUR FORMAT IS USED, DO NOT MASK AND
                                ;COMPARE TO 24

  ENDIF
  HOUR = (BIN2BCD TEMP)      ;CONVERT HOUR BACK TO BCD
```



```
GOSUB WRITETIME           ;GO WRITE NEW TIME
GOTO RDLOOP              ;RETURN TO MAIN LOOP
```

```
CLKINIT
  LOW SCLK                ;MAKE SURE CLOCK LINE STARTS LOW
```

IF USING BATTERY BACKUP WITH DS1302, USE THIS ROUTINE INSTEAD OF INITIALIZING THE TIME AND DATE TO A FIXED VALUE - READS CURRENT TIME FROM DS1302 INTO PIC

```
HIGH CS                   ;SELECT DS1302
SHIFTOUT SDATA,SCLK,LSBPRES,[$87\8,$00\8] ;ENABLE WRITE PROTECT
LOW CS                    ;DESELECT DS1302
GOSUB READTIME           ;READ TIME FROM DS1302
RETURN                   ;RETURN TO MAIN LOOP
```

THE FOLLOWING CODE WOULD BE REPLACED IF USING BATTERY TO KEEP TIME IN DS1302

```
HIGH CS                   ;SELECT DS1302
SHIFTOUT SDATA,SCLK,LSBPRES,[$BE\8,$00\8,$00\8] ;BURST WRITE, SECONDS &
SHIFTOUT SDATA,SCLK,LSBPRES,[$92\8]           ;MINUTES TO 0
SHIFTOUT SDATA,SCLK,LSBPRES,[$01\8,$01\8]     ;HOUR TO 12 AM, 12 HOUR
SHIFTOUT SDATA,SCLK,LSBPRES,[$01,$02\8]       ;FORMAT
SHIFTOUT SDATA,SCLK,LSBPRES,[$00\8]           ;DATE TO 1, MONTH TO 1
SHIFTOUT SDATA,SCLK,LSBPRES,[$00\8]           ;DAY TO 1, YEAR TO 02
SHIFTOUT SDATA,SCLK,LSBPRES,[$00\8]           ;CONTROL REGISTER TO 0LOW
;CS
;DESELECT DS1302
RETURN
```

```
WRITETIME
  HOUR = HOUR | $80      ;KEEP IN 12 HR FORMAT
  HIGH CS                ;SELECT DS1302
  SHIFTOUT SDATA,SCLK,LSBPRES,[$BE\8,SECOND\8,MINUTE\8,HOUR\8] ;COMMAND TO
  SHIFTOUT SDATA,SCLK,LSBPRES,[DATE\8,MONTH\8,DAY\8,YEAR\8,$00\8] ;BURST WRITE
  SHIFTOUT SDATA,SCLK,LSBPRES,[DATE\8,MONTH\8,DAY\8,YEAR\8,$00\8] ;MUST WRITE ALL 8
  SHIFTOUT SDATA,SCLK,LSBPRES,[DATE\8,MONTH\8,DAY\8,YEAR\8,$00\8] ;BYTES
  LOW CS
  ;DESELECT CHIP
  RETURN
```

```
READTIME
  HIGH CS                ;SELECT DS1302
  SHIFTOUT SDATA,SCLK,LSBPRES,[$BF\8]         ;COMMAND TO BURST READ
  SHIFTOUT SDATA,SCLK,LSBPOST,[SECOND\8,MINUTE\8,HOUR\8] ;BURST READ
  SHIFTOUT SDATA,SCLK,LSBPOST,[SECOND\8,MINUTE\8,HOUR\8] ;CLOCK
```



```
SHIFTIN SDATA,SCLK,LSBPOST,[DATE\8,MONTH\8,DAY\8,YEAR\8] ;CAN OMIT THIS IF
;NO DATE
;REQUIRED
```

```
LOW CS
;DESELECT CHIP
RETURN
```

```
DISABLE
;INTERRUPT ROUTINE TO DISPLAY TIME IN BCD ON LED'S
```

```
CLOCK
DIG(0) = MINUTE & $0F ;GET MINUTE LOW DIGIT
DIG(1) = MINUTE >> 4 ;GET MINUTE HIGH DIGIT
DIG(2) = HOUR & $0F ;GET HOUR LOW DIGIT
DIG(3) = (HOUR >> 4) & $01 ;GET HOUR HIGH DIGIT AND MASK OFF AM/PM
;FLAG AND INDICATOR
```

TO HAVE NUMERIC DISPLAYS, SEND THE BCD OUTPUT TO A 7447 BCD TO 7 SEGMENT DECODER AND CONNECT 4 DISPLAYS IN PARALLEL

```
DIGIT = (DIGIT + 1) & 3 ;INCREMENT DIGIT TO DISPLAY
;POINTER
PORTB = $F0 ;TURN OFF DISPLAYS
PORTB = (PORTB | DIG(DIGIT)) & TRANS(DIGIT) ;OUTPUT NUMBER, TURN ON
;DISPLAYS

RESUME
```



## About This AppNote

**Author :** Dale Larson

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