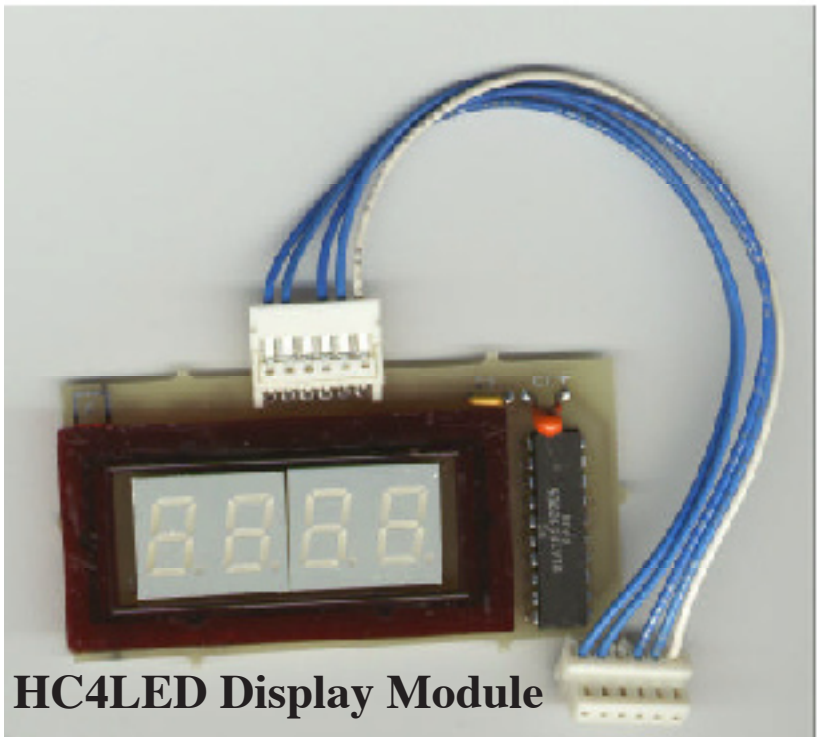


HC4LED Display Module

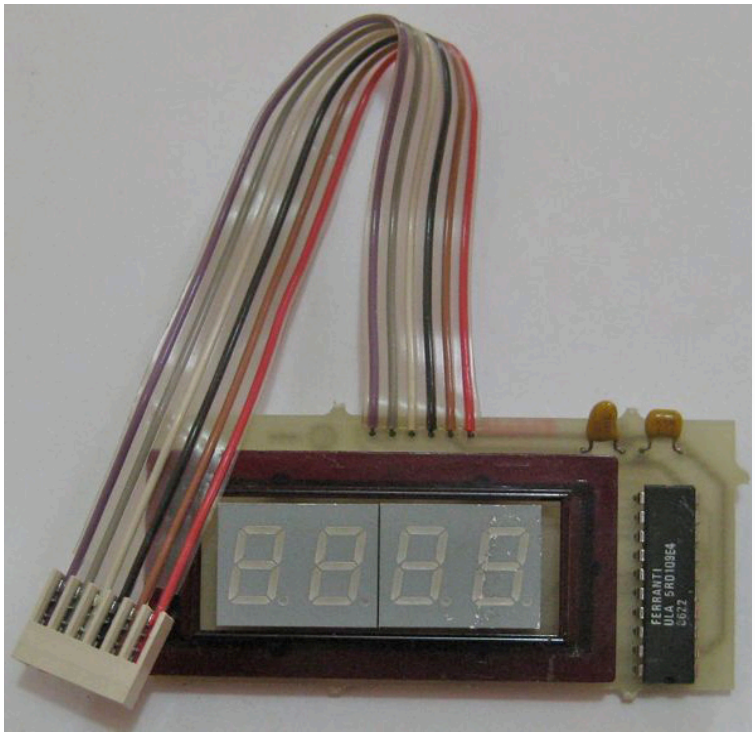
HC4LED

Hitt Consulting
105 S. Locust Street
Shiremanstown, PA 17011
info@hittconsulting.com
<www.hittconsulting.com>

17 March 2010

* unit is 3.0” by 1.4”, displays are 0.39” high
* 4-Digit, 7-Segment LED Display with **no decimal points**
* segment addressable, can create characters/symbols
* SPI Driver IC, uses SHIFTIN command
* requires +5vdc, uses 60 ma with all segments lit
* 6 pin 0.100” spaced femal connnector

* used/pulled from working equipment, may have minor cosmetic scratches
* two cable formats, remaining available units have single ended cable soldered to board



Wulfden at Hawk’s Mountain

The Shoppe at Wulfden

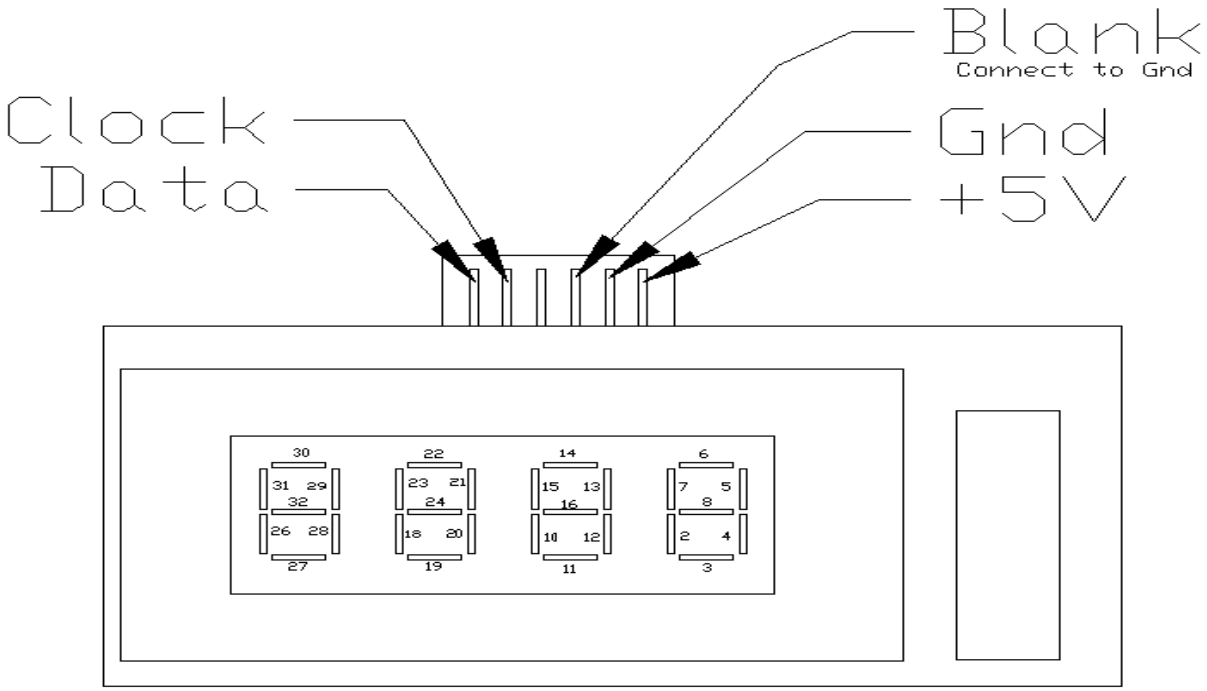
PO Box 188

Underhill Center, VT 05490

now available from

<http:/www.wulfden.org/TheShoppe/HC4LED/>

HC4LED: 4-Digit 7-Segment Display



(see next page for chart comparing the two different cable assembly configurations)

OVERVIEW

The HC4LED Display Module contains 4 digits of 7-segment displays. Each digit is segment addressable. In other words any segments can be turned on or off. This allows great flexibility to create some letters and symbols, as well as moving segment displays.

The module contains a display driver that controls each segment so the microcontroller does not have to continually refresh the display. The interface is simple SPI serial (2-wire), consisting of a clock and data line. There is also a "Blank" signal input that MUST be connect to ground for the display to show any segments. The display can be blanked by connecting this line to +5 or allowing it to "float".

The module requires about 60mA when all segments are on.

SPI SERIAL INTERFACE

The module uses a simple SPI interface with clock and data lines. The data state is shifted in when the clock signal goes from low to high (rising edge). Segment values (0 or 1) are shifted in starting on the left most digit and travel through each segment until they reaches the rightmost digit. Therefore when sending new segment values for the whole display they should be sent starting with the rightmost digit. Note that 8 bits are required even though there are only 7 segments (the first bit is ignored). The decimal points are NOT connected and cannot be made to function.

IMPORTANT: The display will not be updated with the new segment states until the clock line is held high for at least 1millisecond.

	Wire Colors*		
Pin	**2 plugs**	**single plug**	**Function**
1	blue	brown	Data
2	blue	lt.green	Clock
3	no wire	white	n.c.
4	blue	black	Enable/Blank**
5	blue	tan	Gnd
6	white	red	+5vdc

* - the singled ended plug/cable with the multi-colored wire may have varying wire color configurations. The colors shown refer to the unit picture on the first page of this document. It is the position of the wires where soldered to the board that is paramount. Pin 1 is to the left when looking at the front of the board.

** - Pin 4 is an Enable line. Some websites/project descriptions referred to this line as the blanking line. If pin 4 is connected to GND, the display is Enabled. If Pin 4 is left to float or is pulled up to +5 the display will remain blank. Its safest to consider this an Enable line and that it must be grounded for the display to function.

On subsequent pages in this sheet you will find sample source code listings for Parallax Basic Stamp 1, 2, and SXB, and also for PIC Basic. At the Wulfden website you will find sample soruce code files for these as well as for Picaxe, Arduino, and Parallax Propeller.

<http://www.wulfden.org/downloads/code/>

Example Programs

Parallax(R) Basic Stamp 2

```
' HC4LED.BS2
' This program demonstrates the use of the HC4LED display module
' HC4LED Pinout:
'   Pin1 = +5VDC (White wire)
'   Pin2 = Gnd
'   Pin3 = Blank (Must connect to Gnd to enable display)
'   Pin4 = No Connection
'   Pin5 = Clock (Connect to pin 1 for this demo program)
'   Pin6 = Data (Connect to pin 0 for this demo program)
'
'
' To display values:
'   Set the "zeros" variable to 0=No leading zeros; or 1=Show leading zeros
'   Set the variable "value" to 0 to 9999
'   Then use "GOSUB DisplayValue" to show the value on the display
'
' Each segment of the display is addressable, so you can create letters
'  and symbols.
' To display custom symbols:
'  Set the variables "segments(0)" thru "segments(3)" (segments(0) is on the left)
'   simply add the segment values that you want on
'  Then use "GOSUB DisplaySegments" to show the segments on the display
'
'   ---4---
'  |       |
'  2       8
'  |       |
'  |---1---|
'  |       |
' 64       16
'  |       |
'   --32---
'
' For example "F" would be 4+2+1+64 = 71
'

' {$STAMP BS2}
' {$PBASIC 2.5}

Clock PIN 1                ' HC4LED module's Clock pin
Dat   PIN 0                ' HC4LED modules's Data pin

value    VAR Word           ' Required; Holds value to display
zeros    VAR Bit            ' Required; Determines if leading zeros are displayed
cnt      VAR Byte           ' Required; Used by display routines
segments VAR Byte (4)       ' Required; Used by display routines & customer chars

'
DO                          ' Repeat forever
  FOR value = 0 TO 1000     ' Count from 0 to 1000
    GOSUB DisplayValue      ' Display count on HC4LED module
    PAUSE 100               ' Wait 0.1 seconds
  NEXT                      ' Next count
  PAUSE 1000                ' Wait 1 second
  segments(0) = 28 ' 7      ' Setup to display "72°F"
  segments(1) = 109' 2
  segments(2) = 15 ' °
  segments(3) = 71 ' F
  GOSUB DisplaySegments     ' Display custom characters
  PAUSE 2000                ' Wait 2 seconds
LOOP                        ' Repeat forever
STOP


DisplayValue:
' Call with:
'  value = (value to display)
'  zeros = (0=No leading zeros; 1=Show leading zeros)
  FOR cnt = 0 TO 4
    LOOKUP value DIG cnt, [126,24,109,61,27,55,115,28,127,31],segments(3-cnt)
  NEXT
```

```
  IF zeros = 0 THEN
    IF segments(0) = 126 THEN
      segments(0) = 0
      IF segments(1) = 126 THEN
        segments(1) = 0
        IF segments(2) = 126 THEN
          segments(2) = 0
        ENDIF
      ENDIF
    ENDIF
  ENDIF


DisplaySegments:
' Call with:
'  segments(0) thru segments(3) set to custom character values
'  segments(0) is on the left; segments(3) is on the right
  SHIFTOUT Dat, Clock, MSBFIRST,[segments(3), segments(2), segments(1), (segments(0) >> 1)\7]
  Dat = segments(0) & 1
  HIGH Clock
' Clock MUST remain high for at LEAST 1 millisecond for the
'  new data to be latched onto the display.
  PAUSE 1
  RETURN
```

End of program listing

Parallax(R) Basic Stamp 1 / Prop 1

```
' HC4LED.BS1
' This program demonstrates the use of the HC4LED display module
' HC4LED Pinout:
'   Pin1 = +5VDC (White wire)
'   Pin2 = Gnd
'   Pin3 = Blank (Must connect to Gnd to enable display)
'   Pin4 = No Connection
'   Pin5 = Clock
'   Pin6 = Data
'
'
' To display values:
'   Set the "zeros" variable to 0=No leading zeros; or 1=Show leading zeros
'   Set the variable "value" to 0 to 9999
'   Then use "GOSUB DisplayValue" to show the value on the display
'
' Each segment of the display is addressable, so you can create letters
'  and symbols.
' To display custom symbols:
'  Set the variables "segments(0)" thru "segments(3)" (segments(0) is on the right)
'   simply add the segment values that you want on
'  Then use "GOSUB DisplaySegments" to show the segments on the display
'
'   ---4---
'  |       |
'  2       8
'  |       |
'  |---1---|
'  |       |
' 64       16
'  |       |
'   --32---
'
' For example "F" would be 4+2+1+64 = 71
'


' {$STAMP BS1}
' {$PBASIC 1.0}

SYMBOL Clk     = 0      'Display Clock is pin 0
SYMBOL Dat     = PIN1   'Display Data is pin 1
SYMBOL Cnt     = B2     'Counter variable for DisplayDigit subroutine
SYMBOL digit   = B3     'Current value digit
SYMBOL value   = W2     'Value to be displayed
```

```
' Next available variables are: BIT8,B6,W3

Start:
  DIRS  = %00000011     'Set Clock and Data pins as outputs rest as inputs
  HIGH Clk

Main:
  ' Display HELP
  LOW Clk
  B0 = 79
  GOSUB DisplaySegments
  PULSOUT Clk,1         ' Pulsout last bit except for last digit
  B0 = 98
  GOSUB DisplaySegments
  PULSOUT Clk,1
  B0 = 103
  GOSUB DisplaySegments
  PULSOUT Clk,1
  B0 = 91
  GOSUB DisplaySegments
  HIGH Clk              ' Keep Clk high to latch in new display data
  ' Show HELP for 5 seconds
  PAUSE 5000

  ' Display values from 1000 to 0
  FOR value = 1000 TO 0 STEP -1
    GOSUB DisplayValue
  NEXT
  GOTO Main


DisplayValue:
' Call with "value" set to the value to be displayed
  LOW Clk
  digit = value // 10
  GOSUB DisplayDigit
  PULSOUT Clk,1
  digit= value / 10 // 10
  GOSUB DisplayDigit
  PULSOUT Clk,1
  digit= value / 100 // 10
  GOSUB DisplayDigit
  PULSOUT Clk,1
  digit= value / 1000 // 10
  GOSUB DisplayDigit
  HIGH Clk
  RETURN


DisplayDigit:
' Called by DisplayValue subroutine
  LOOKUP digit,(126,24,109,61,27,55,115,28,127,31),B0

DisplaySegments:
' Call with B0 containing the segments for the next digit
  FOR cnt = 1 TO 7
    Dat = BIT7
    PULSOUT Clk,1
    B0 = B0 * 2
  NEXT
  Dat = BIT7
  RETURN
```

END OF LISTING

```
'=========================================
'
'   File..... HC4LED.SXB
'   Compiler.. SXB Version 1.42.01
'   Purpose... Demonostrate use of HC4LED display module
'   Author.... Terry Hitt
'   E-mail.... terry@hittconsulting.com
'   Started...
'   Updated...
'
'=========================================

' ----------------------------------------
' Program Description
' ----------------------------------------

' HC4LED Pinout:
'   Pin1 = +5VDC (White wire)
'   Pin2 = Gnd
'   Pin3 = Blank (Must connect to Gnd to enable display)
'   Pin4 = No Connection
'   Pin5 = Clock (Connect to RA.0 for this demo program)
'   Pin6 = Data (Connect to RA.1 for this demo program)
'
'
' Each segment of the display is addressable, so you can create letters
'  and symbols.
' To display custom symbols:
'  Set the variables "segments(0)" thru "segments(3)" (segments(0) is on the left)
'   simply add the segment values that you want on
'  Then use "DisplaySegments" to show the segments on the display
'
'    ---4---
'   |       |
'   2       8
'   |       |
'   |---1---|
'   |       |
'  64       16
'   |       |
'    --32---
'
' For example "F" would be 4+2+1+64 = 71
'

' ----------------------------------------
' Device Settings
' ----------------------------------------

DEVICE SX28,OSC4MHZ,TURBO,STACKX,OPTIONX
FREQ 4_000_000

' ----------------------------------------
' IO Pins
' ----------------------------------------

Clk       VAR RA.0
Dat       VAR RA.1

' ----------------------------------------
' Variables
' ----------------------------------------

value     VAR Byte (4)
segments  VAR Byte (4)
cnt       VAR Byte
temp1     VAR Byte

' ========================================
  PROGRAM Start
' ========================================

' ----------------------------------------
' Subroutine Declarations
' ----------------------------------------

DisplayValue    SUB 4
UpdateValue     SUB
DisplaySegments SUB 4
LEDOut          SUB 1
```

```
' ----------------------------------------
' Program Code
' ----------------------------------------

Start:
  HIGH Clk

Main:
  DisplayValue 1,2,3,4
  PAUSE 1000
  DisplaySegments 91,103,98,79 ' HELP
  PAUSE 1000
  DisplayValue 0,0,0,0
  DO
    INC value(3)
    IF value(3) > 9 THEN
      value(3) = 0
      INC value(2)
    ENDIF
    IF value(2) > 9 THEN
      value(2) = 0
      INC value(1)
    ENDIF
    IF value(1) > 9 THEN
      value(1) = 0
      INC value(0)
    ENDIF
    IF value(0) > 9 THEN
      value(0) = 0
    ENDIF
    UpdateValue
    PAUSE 1
  LOOP

  GOTO Main

' ----------------------------------------
' Subroutine Code
' ----------------------------------------

DisplayValue:
  PUT value,__PARAM1,__PARAM2,__PARAM3,__PARAM4

UpdateValue:
  FOR cnt = 0 to 3
    READ DigitSegs+value(cnt),segments(cnt)
  NEXT
  GOTO DisplayArray

DisplaySegments:
  PUT segments,__PARAM1,__PARAM2,__PARAM3,__PARAM4

DisplayArray:
  HIGH Clk
  LEDOut segments(3)
  LEDOut segments(2)
  LEDOut segments(1)
  LEDOut segments(0)
  RETURN


LEDOut:
  temp1 = __PARAM1
  SHIFTOUT Dat, Clk, MSBFIRST, temp1
  RETURN

' ----------------------------------------
' Data
' ----------------------------------------

DigitSegs:
  DATA 126,24,109,61,27,55,115,28,127,31
```

END OF LISTING

```
  ;  *** COMPILED WITH BAS2PIC VERSION 0.30 ***
  ; ' Test Program for BAS2PIC compiler 0.30
  ; ' Use with Microchip PICkit1 and a PIC12f675
  ; ' Shows how to control the HC4LED display module

  list p=12f675                 ;DEVICE 12f675
  #include <p12f675.inc>
  errorlevel -302               ;Ignore BANK warnings
__INTW EQU 0x20
__INTSTATUS EQU 0x21
__TEMP EQU 0x22

  ; ' FOLLOWING LINE IS FOR DEVICE CONFIGURATION SEE DEVICE DOCUMENATION
  __CONFIG  _CP_OFF & _WDT_OFF & _BODEN_ON & _PWRTE_ON & _INTRC_OSC_NOCLKOUT & _MCLRE_OFF &
_CPD_OFF

  ORG 0x00                      ;PROGRAM START
  NOP                           ;REQUIRED FOR DEBUGGER
  GOTO START

  ORG 0x04                      ;INTERRUPT VECTOR
  GOTO __INTERRUPT


  ; ' Define Pins
#DEFINE Clk GPIO,5              ;DIM Clk AT GPIO.5
#DEFINE Dat GPIO,4              ;DIM Dat AT GPIO.4

  ; ' Define Variables
cnt EQU D'35'                   ;DIM cnt AS BYTE
segments EQU D'36'              ;DIM segments AS BYTE
#DEFINE segmentsMSB segments,7  ;DIM segmentsMSB AT segments.7


START:

  BCF STATUS,RP0                ;  BANK 0
  CLRF GPIO                     ;  GPIO=%00000000 'All output off
  MOVLW B'00000111'             ;  CMCON=%00000111 'No comparitors
  MOVWF CMCON
  BSF STATUS,RP0                ;  BANK 1 ' SET REGS IN BANK 1
  MOVLW B'11111111'             ;   TRISIO=%11111111 'All pins inputs
  MOVWF TRISIO
  CLRF VRCON                    ;   VRCON=0 ' VRef Off
  MOVLW B'00010001'             ;   ANSEL=%00010001 ' Analog Select
  MOVWF ANSEL
  BCF STATUS,RP0                ;  BANK 0
  MOVLW B'00000001'             ;  ADCON0=%00000001 ' Analog Configure
  MOVWF ADCON0

  MOVLW B'11001111'             ;  TRISIO = %11001111 ' Make Clk & Dat outputs
  BSF STATUS,RP0
  MOVWF TRISIO
  BCF STATUS,RP0
  BSF Clk                       ;  HIGH Clk

AGAIN:
  MOVLW D'71'                   ;  segments = 71
  MOVWF segments
  CALL SendSegments             ;  GOSUB SendSegments
  MOVLW D'15'                   ;  segments = 15
  MOVWF segments
  CALL SendSegments             ;  GOSUB SendSegments
  MOVLW D'109'                  ;  segments = 109
  MOVWF segments
  CALL SendSegments             ;  GOSUB SendSegments
  MOVLW D'28'                   ;  segments = 28
  MOVWF segments
  CALL SendSegments             ;  GOSUB SendSegments
  CLRF __TEMP ; 255+1=0         ;  DELAY 255,255
  MOVLW D'0' ; 255+1=0
  ADDLW 0xFF
  BTFSS STATUS,Z
  GOTO $-2
  DECFSZ __TEMP,F
  GOTO $-4
```

```
  ; ' Clear display
  CALL SendSegments             ;  GOSUB SendSegments
  CALL SendSegments             ;  GOSUB SendSegments
  CALL SendSegments             ;  GOSUB SendSegments
  CALL SendSegments             ;  GOSUB SendSegments
  CLRF __TEMP ; 255+1=0         ;  DELAY 255,255
  MOVLW D'0' ; 255+1=0
  ADDLW 0xFF
  BTFSS STATUS,Z
  GOTO $-2
  DECFSZ __TEMP,F
  GOTO $-4

  GOTO AGAIN                    ;  GOTO AGAIN


SendSegments:
  MOVLW D'1'                    ;  FOR cnt=1 TO 8
  MOVWF cnt
__FOR_cnt_1:
  BCF Dat                       ;    LOW Dat
  BTFSS segmentsMSB             ;    IF segmentsMSB = 0 THEN DatSet
  GOTO DatSet
  BSF Dat                       ;    HIGH Dat
DatSet:
  BCF Clk                       ;    LOW Clk
  MOVLW D'10'+D'1'              ;    DELAY 10
  ADDLW 0xFF
  BTFSS STATUS,Z
  GOTO $-2
  BSF Clk                       ;    HIGH Clk
  MOVLW D'10'+D'1'              ;    DELAY 10
  ADDLW 0xFF
  BTFSS STATUS,Z
  GOTO $-2
  BCF STATUS,C                  ;    segments = segments << 1
  RLF segments,F
  MOVLW D'8'                    ;  NEXT cnt
  SUBWF cnt,W
  BTFSC STATUS,Z
  GOTO $+3
  INCF cnt,F
  GOTO __FOR_cnt_1
  RETURN                        ;  RETURN

  SLEEP                         ;END
  GOTO $

__INTERRUPT:                    ;DEFAULT INTERRUPT CODE
  RETURN                        ;RETURN WITHOUT ENABLING FURTHER INTERRUPTS
  END
```

END OF LISTING