

Solutions to Lab 2

One possible solution is shown below.

```
/*
  APSC 380 Lab 2 - Sample Solution
  Ed Casas, 1997/8/28
*/

#include "iolib.h"

/* Set alphanumeric LED at position pos
   (counting from the right) to uppercase value
   of (ASCII) character c. */

void settled ( int pos, char c )
{
  spoke ( 0xD0, c | 0x80 ) ;
  spoke ( 0xD1, pos ) ;
  spoke ( 0xD1, pos | 0x08 ) ;
  spoke ( 0xD1, pos ) ;
}

/* Display the characters in array d on the LED
   display in order from left to right. */

display ( char d[] )
{
  int i ;

  for ( i=0 ; i < 8 ; i++ ) {
    settled ( 8 - 1 - i, d[i] ) ;
  }
}

/* Shift the characters in the 8-character
   array d down by 1 position and insert c at
   the end of the array. */

shiftin ( char d[], char c )
{
  int i ;

  for ( i=0 ; i <= 6 ; i++ ) {
    d[i] = d[i+1] ;
  }

  d[7] = c ;
}

/* Turn on (set low) column scan lines given my
   mask m and return the debounced value from
   the keypad input register. */

char pressed ( char m )
{
  char last ;

  spoke ( 0xD0, m ) ;

  return speak ( 0xD0 ) & 0x3f ;
}

/* Wait for all keys to be released then scan
   the columns until a keypress is detected.
   If the input corresponds to a valid
   keypress, return the character corresponding
   to the key pressed. */

char rdkbd ( void )
{
  int m, key=0 ;

  while ( pressed ( 0x0F ) != 0 ) ;

  while ( key == 0 ) {

    m = pressed ( 0x01 ) ;
    if ( m == 0x01 ) key = '0' ;
    if ( m == 0x02 ) key = '4' ;
    if ( m == 0x04 ) key = '8' ;
    if ( m == 0x08 ) key = 'C' ;

    m = pressed ( 0x02 ) ;
    if ( m == 0x01 ) key = '1' ;
    if ( m == 0x02 ) key = '5' ;
    if ( m == 0x04 ) key = '9' ;
    if ( m == 0x08 ) key = 'D' ;

    m = pressed ( 0x04 ) ;
    if ( m == 0x01 ) key = '2' ;
    if ( m == 0x02 ) key = '6' ;
    if ( m == 0x04 ) key = 'A' ;
    if ( m == 0x08 ) key = 'E' ;

    m = pressed ( 0x08 ) ;
    if ( m == 0x01 ) key = '3' ;
    if ( m == 0x02 ) key = '7' ;
    if ( m == 0x04 ) key = 'B' ;
    if ( m == 0x08 ) key = 'F' ;

  }

  return key ;
}

/* Display "APSC 380" and then loop forever
   reading characters from the keyboard and
   shifting them into the display. */

void main ( void )
{
  char c ;
  char disp [8] = { 'A', 'P', 'S', 'C', ' ', '3', '8', '0' } ;

  display ( disp ) ;

  while ( 1 ) {
    c = rdkbd() ;
    shiftin ( disp, c ) ;
    display ( disp ) ;
  }
}
```