```c
/*
 * FileName: main.c
 * Version: 1
 *
 * Created: 8/24/2022 2:09 PM
 * Author: Ethan Zeronik
 *
 * Operations: turn on board LED every half second
 *
 * Hardware:
 *   Atmega2560          micro controller
 *   PORTD.7             LED13 active high
 */

#include <avr/io.h>

#define F_CPU 16000000UL
#include <avr/io.h>
#include <util/delay.h>

/* NOTE: Function prototypes */
// inits IO ports
void IO_init(void);

/* NOTE: Application implementation */
// the main loop of the function, provided to us
int main(void)
{
    IO_init();

    while(1)
    {
        // DEBUG: comment this line out when using simulator
        _delay_ms(500);

        // set it to the inverse of the current value
        PORTB = ~(0x80 & PORTB);
    }
}

/* NOTE: Function implementations */
void IO_init(void)
{
    // set led 13 as output
    DDRB  = 0x80;
    // turn off led on init
    PORTB = 0x80;
}


```

```c
/*
 * FileName: main.c
 * Version: 1
 *
 * Created: 8/31/2022 1:39 PM
 * Author: Ethan Zeronik
 *
 * Operations: sweeps an led bar from right to left
 *
 * Hardware:
 *   Atmega2560          micro controller
 *   PORTA               LED bar (all 8 pins used)
 */

#include <avr/io.h>

#define F_CPU 16000000UL
#include <util/delay.h>

/* NOTE: Function prototypes */
// inits IO ports
void IO_init(void);
// sweeps the given port's bits from 0x00 to 0xff then back to 0x00
void LED_sweep(volatile uint8_t * port);

/* NOTE: Application implementation */
// the main loop of the function, provided to us
int main(void)
{
    IO_init();

    while(1)
    {
        // run the sweep
        LED_sweep(&PORTA);
    }
}

/* NOTE: Function implementations */
void IO_init(void)
{
    // set all 8 leds as outputs
    DDRA  = 0xFF;
    // turn off all leds
    PORTA = 0x00;
}

void LED_sweep(volatile uint8_t * port)
{
    while(!(PORTA & 0x80))
    {
        // DEBUG: comment this line out when using simulator
        _delay_ms(500);

        // move over leds by one
        *port = *port << 1;
        // then add a new bit at LSB
```

```
58          *port = *port | 0x01;
59      }
60
61      // send it back to 0
62      while(!(PORTA == 0x00))
63      {
64          // DEBUG: comment this line out when using simulator
65          _delay_ms(500);
66
67          // move over leds by one
68          *port = *port >> 1;
69      }
70  }
71
```

```c
/*
 * FileName: main.c
 * Version: 1
 *
 * Created: 8/31/2022 2:22:03 PM
 * Author: Ethan Zeronik
 *
 * Operations: sweeps an led bar from right to left
 *
 * Hardware:
 *   Atmega2560          micro controller
 *   PORTB               buttons for the sweep control
 *   PORTA               LED bar (all 8 pins used)
 */

#include <avr/io.h>

#define F_CPU 16000000UL
#include <util/delay.h>

/* NOTE: Custom Macros */
// pin for the start button
#define Start   00
// pin for the pause button
#define Pause   01
// pin for the reset button
#define Reset   02
// macro to get the current pins
#define Buttons (PINB & ((1 << Start) | (1 << Pause) | (1 << Reset)))

/* NOTE: Global Variables */
static int8_t sweepFlag;

/* NOTE: Function prototypes */
// inits IO ports
void IO_init(void);
// sweeps the given port's bits from 0x00 to 0xff then back to 0x00
void LED_sweep(volatile uint8_t * port);

/* NOTE: Application implementation */
// the main loop of the function, provided to us
int main(void)
{
    uint8_t inputSwitches;

    IO_init();

    while(1)
    {
        inputSwitches = Buttons;

        // play button was pressed
        if(!(inputSwitches & (1 << Start)))
        {
            // set the flag so that the sweep function has a direction
            sweepFlag = 1;
        }
```

```
58          // reset button was pressed
59          else if(!(inputSwitches & (1 << Reset)))
60          {
61              // turn off the leds and reset the sweep direction
62              sweepFlag = 0;
63              PORTA     = 0x00;
64          }
65          // if no pause button and the sweep has a direction
66          else if((inputSwitches & (1 << Pause)) && sweepFlag)
67          {
68              // DEBUG: comment this line out when using simulator
69              _delay_ms(100);
70
71              LED_sweep(&PORTA);
72          }
73      }
74  }
75
76  /* NOTE: Function implementations */
77  void IO_init(void)
78  {
79      // set port b as input because it has buttons on it
80      DDRB  = 0x00;
81      // turn on pullup resisitors
82      PORTB = 0xFF;
83
84      // set all 8 leds as outputs
85      DDRA  = 0xFF;
86      // turn off all leds
87      PORTA = 0x00;
88  }
89
90  void LED_sweep(volatile uint8_t * port)
91  {
92      // moving up the line
93      if(sweepFlag == 1)
94      {
95          // if the last led is on
96          if(*port & 0x80)
97          {
98              sweepFlag = -1;
99          }
100
101         // move over leds by one
102         *port = *port << 1;
103         // then add a new led light at LSB
104         *port = *port | 0x01;
105     }
106
107     // moving down the line
108     if(sweepFlag == -1)
109     {
110         // if all the leds are off
111         if(*port == 0x00)
112         {
113             sweepFlag = 1;
114         }
```

```
115
116         // move over leds by one
117         *port = *port >> 1;
118     }
119 }
120
```