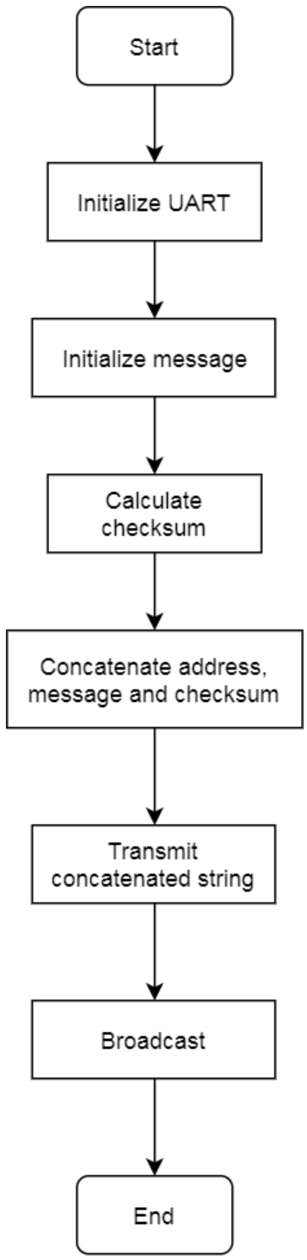
Task 1

```
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
; 1DT301, Computer Technology I
; Date: 2017-10-17
; Author:
; Student name 1: Ruth Dirnfeld
; Student name 2: Alexandra Bjäremo
;
; Lab number: 6
; Title: CyberTech Wall Display
;
; Hardware: STK600, CPU ATmega2560
;
; Function: Displaying a character on the CyberTech Wall Display
;
; Input ports: TX, RX on PIND2, respective PIND3.
;
; Output ports: CyberTech Wall Display connected to serial port RS232
;
; Subroutines: Initialization and transmission routines for the display
; Included files: m2560def.inc
;
; Other information: Clock set at 1,83MHz
;
; Changes in program: None.
;<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
#include<avr/io.h>
#include<stdio.h>
#include <stdlib.h>
//#define BAUD 2400
//#define UBRR_VAL 47

void uart_int(void);
void uart_trans(unsigned char data);

int main(void){
		uart_int();
		char towrite[50];
		char* temp ="\rAO0001R";
		int i;
		int checksum=0;
		for (i=0;i<8;i++){
				checksum+=temp[i];
}
```

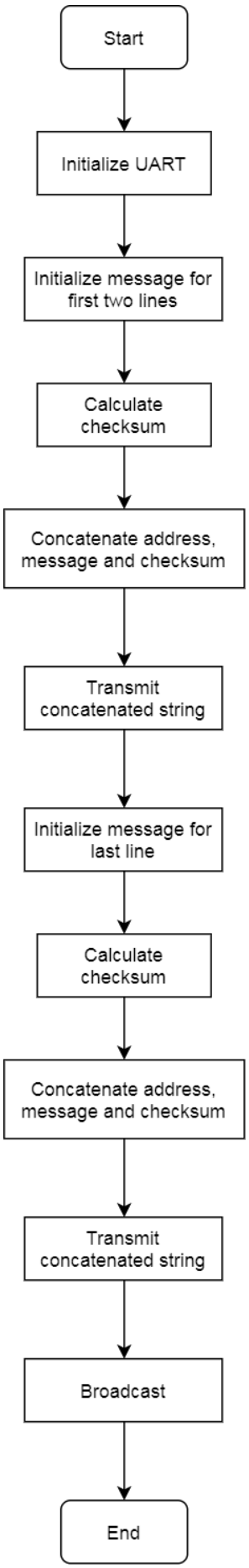


```
		checksum=checksum%256;
		sprintf(towrite,"%s%02X\n", temp, checksum);
		for(i=0;i<11;i++){
			uart_trans(towrite[i]);
		}
		temp ="\rZD0013C\n";
		for(i=0;i<9;i++){
			uart_trans(temp[i]);
		}
		return 0;
}

void uart_int(void){
		UBRR1L=25;
		UCSR1B =(1<<TXEN1) | (1<<RXEN1);
}
void uart_trans(unsigned char data){
		while(!(UCSR1A & (1<<UDRE1)));
		UDR1 = data;
}

/*Description
*A program that broadcasts a character to the CyberTech Wall Display.
*/
```

Task 2

```
/*;>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
; 1DT301, Computer Technology I
; Date: 2017-10-17
; Author:
; Student name 1: Ruth Dirnfeld
; Student name 2: Alexandra Bjäremo
;
; Lab number: 6
; Title: CyberTech Wall Display
;
; Hardware: STK600, CPU ATmega2560
;
; Function: Displaying characters on all the CyberTech Wall Display lines.
;
; Input ports: TX, RX on PIND2, respective PIND3.
;
; Output ports: CyberTech Wall Display connected to serial port RS232
```

```
; Subroutines: Initialization and transmission routines for the display
; Included files: m2560def.inc
;
; Other information: Clock set at 1,83MHz
;
; Changes in program: None.
;<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< */
#include<avr/io.h>
#include<stdio.h>
#include <stdlib.h>
//#define BAUD 2400
//#define UBRR_VAL 47

void uart_int(void);
void uart_trans(unsigned char data);

int main(void){
                uart_int();
                char towrite[100];
                char* temp ="\rAO0001Pizza123456789012345678 9is";
                int i;

                //first two lines
                int checksum=0;
                for (i=0;i<34;i++){
                                checksum+=temp[i];
                                }
                checksum=checksum%256;
                sprintf(towrite,"%s%02X\n", temp, checksum);
                for(i=0;i<37;i++){
                                uart_trans(towrite[i]);
                                }

                //last line
                checksum=0;
                temp="\rBO0001life";
                for (i=0;i<12;i++){
                                checksum+=temp[i];
                                }
                checksum=checksum%256;
                sprintf(towrite,"%s%02X\n", temp, checksum);
                for(i=0;i<15;i++){
                                uart_trans(towrite[i]);
                                }
```



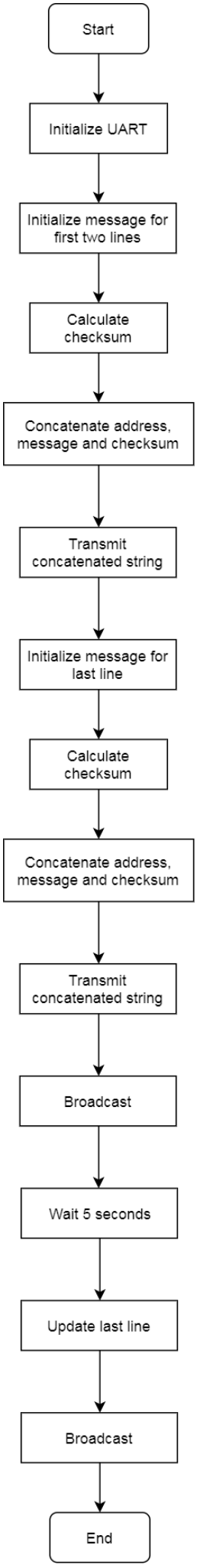
```
		//*********
		temp ="\rZD0013C\n";
		for(i=0;i<9;i++){
				uart_trans(temp[i]);
				}
		return 0;
}

void uart_int(void){
		UBRR1L=25;
		UCSR1B =(1<<TXEN1) | (1<<RXEN1);

}
void uart_trans(unsigned char data){
		while(!(UCSR1A & (1<<UDRE1)));
		UDR1 = data;
}


/*Description
*A program that broadcasts characters on all the lines of the
*CyberTech Wall Display.
*/
```

Task 3

```
/*;>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
; 1DT301, Computer Technology I
; Date: 2017-10-17
; Author:
; Student name 1: Ruth Dirnfeld
; Student name 2: Alexandra Bjäremo
;
; Lab number: 6
; Title: CyberTech Wall Display
;
; Hardware: STK600, CPU ATmega2560
;
; Function: Displaying characters on all the CyberTech Wall Display lines
; and changing the last line after 5 seconds.
;
; Input ports: TX, RX on PIND2, respective PIND3.
;
; Output ports: CyberTech Wall Display connected to serial port RS232
;
; Subroutines: Initialization and transmission routines for the display
```

```
; Included files: m2560def.inc
;
; Other information: Clock set at 1,83MHz
;
; Changes in program: None.
;<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< */
#include<avr/io.h>
#include<stdio.h>
#include <stdlib.h>
#define F_CPU 1830000UL
#include <util/delay.h>

//#define BAUD 2400
//#define UBRR_VAL 47

void uart_int(void);
void uart_trans(unsigned char data);

int main(void){
		uart_int();
		char towrite[200];
		char* temp ="\rAO0001Computer Science,201712345678Computer Technology";
		int i;

		int checksum=0;
		for (i=0;i<55;i++){
				checksum+=temp[i];
				}
		checksum=checksum%256;
		sprintf(towrite,"%s%02X\n", temp, checksum);
		for(i=0;i<58;i++){
				uart_trans(towrite[i]);
				}

		checksum=0;
		temp="\rBO0001Assignment#6";
		for (i=0;i<20;i++){
				checksum+=temp[i];
		}
		checksum=checksum%256;
		sprintf(towrite,"%s%02X\n", temp, checksum);
		for(i=0;i<23;i++){
				uart_trans(towrite[i]);
		}
```

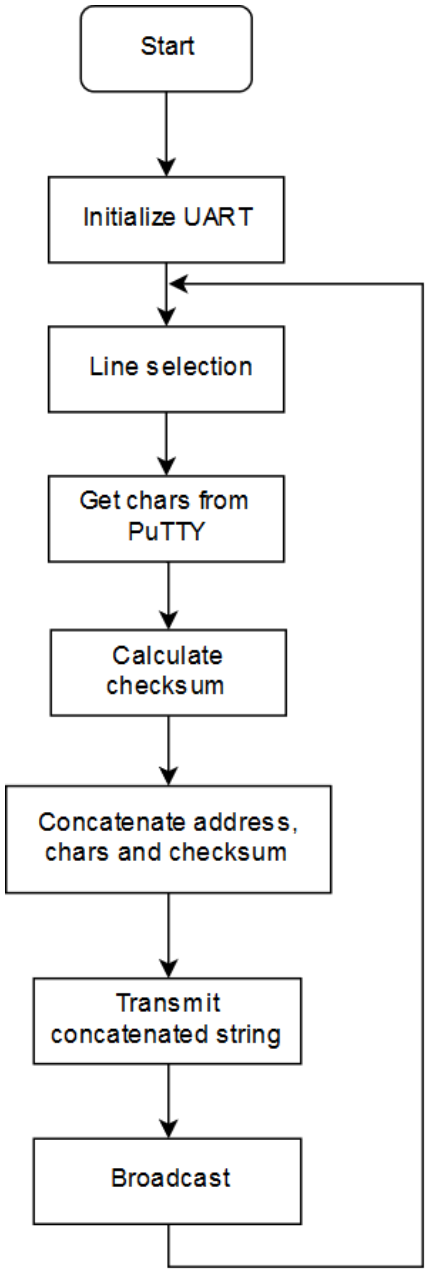
```
		temp ="\rZD0013C\n";
		for(i=0;i<9;i++){
			uart_trans(temp[i]);
		}

		_delay_ms(5000);

		checksum=0;
		temp="\rBO0001Ruth and Alex";
		for (i=0;i<21;i++){
			checksum+=temp[i];
			}
		checksum=checksum%256;
		sprintf(towrite,"%s%02X\n", temp, checksum);
		for(i=0;i<24;i++){
			uart_trans(towrite[i]);
			}

		//*********
		temp ="\rZD0013C\n";
		for(i=0;i<9;i++){
			uart_trans(temp[i]);
			}
		return 0;
}

void uart_int(void){
		UBRR1L=25;
		UCSR1B =(1<<TXEN1) | (1<<RXEN1);

}
void uart_trans(unsigned char data){
		while(!(UCSR1A & (1<<UDRE1)));
		UDR1 = data;
}



/*Description:
*A program that broadcasts characters on all the lines of the CyberTech Wall Display
*and changing the last line after 5 seconds.
*/
```



Task 4-5

```
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
; 1DT301, Computer Technology I
; Date: 2017-10-17
; Author:
; Student name 1: Ruth Dirnfeld
; Student name 2: Alexandra Bjäremo
;
; Lab number: 6
; Title: CyberTech Wall Display
;
; Hardware: STK600, CPU ATmega2560
;
; Function: Displaying characters on the CyberTech Wall Display that
; have been transmitted through PuTTY.
;
; Input ports: TX, RX on PIND2, respective PIND3.
;
; Output ports: CyberTech Wall Display connected to serial port RS232
;
; Subroutines: Initialization and transmission routines for the display
; Included files: m2560def.inc
;
; Other information: Clock set at 1,83MHz
;
; Changes in program: 2017-10-25, 2017-10-28, 2017-10-31, 2017-11-03,
; 2017-11-10, 2017-11-15.
;<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
#include <avr/io.h>
#include <stdio.h>
#include <util/delay.h>
#define F_CPU 1843200UL
#define FOSC 1843200 // Clock Speed
#define SPEED_BAUD 2400
#define UBRR_value 47
#define START 0x0D
#define END 0x0A
#define MessageLen(x)  (sizeof(x) / sizeof((x)[0]))
void uart_init (void) {
			UBRR1L=UBRR_value;
			UCSR1B=(1<<TXEN1) | (1<<RXEN1);
}
void uart_trans(unsigned char data) {
			while (!(UCSR1A & (1<<UDRE1)));
```

```
                UDR1 = data;                    }
unsigned char uart_read(void) {
                while (!(UCSR1A & (1<<RXC1))) ;
                return UDR1;
}

int calculate_chksum(char define[], int define_size, char *message) {
                int sum = 0;
                for(int i = 0; i < define_size; i++){
                                sum += (int)define[i];          }
                for(int i = 0; i < strlen(message); i++){
                                sum += (int)message[i];         }
                return (sum+13)%256;       // '/r =13'
}

void display(char memory, char *message) {
        char towrite[] = {'A','O','0','0','0','1'};
        towrite[0] = memory;
        char checksum[2];
        int sum = calculate_chksum(towrite, MessageLen(towrite), message);
        sprintf(checksum,"%02X",sum);
        display_this(towrite, MessageLen(towrite), message, checksum);
}

void stahp(){
                char exec[7] = {'Z','D','0','0','1','3','C'};
                uart_trans(START);
                for(int i = 0; i < MessageLen(exec); i++) {
                                uart_trans(exec[i]);            }
                uart_trans(END);
}

void display_this(char towrite[], int command_size, char *message, char checksum[]){
                uart_trans(START);
                for(int i = 0; i < command_size; i++){
                                uart_trans(towrite[i]);         }
                for (int i = 0; i < strlen(message); i++ ){
                                uart_trans(message[i]);         }
                uart_trans(checksum[0]);
                uart_trans(checksum[1]);
                uart_trans(END );
}

void get_chars(char line, char *message, int index) {
                char input = uart_read();
```



```
		if (input == '>'){
				display(line, message);
				stahp();
				return;		}
		else{
				message[index] = input;
				index++;
				get_chars(line, message, index);		}
}

unsigned char get_address() {
		char input = uart_read();	}

int main(void){
		uart_init();
		char *message;
		message = malloc(48 * sizeof(int));
		int index = 0;
		char line;
		while (1) {
				line = get_address();
				get_chars(line ,message, index);		}
}


/*Description
*A program that receives character input from the PuTTY terminal and then displays them on the
*CyberTech Wall Display. The program allows the user to switch between the lines used for
*outputting.
*/
```