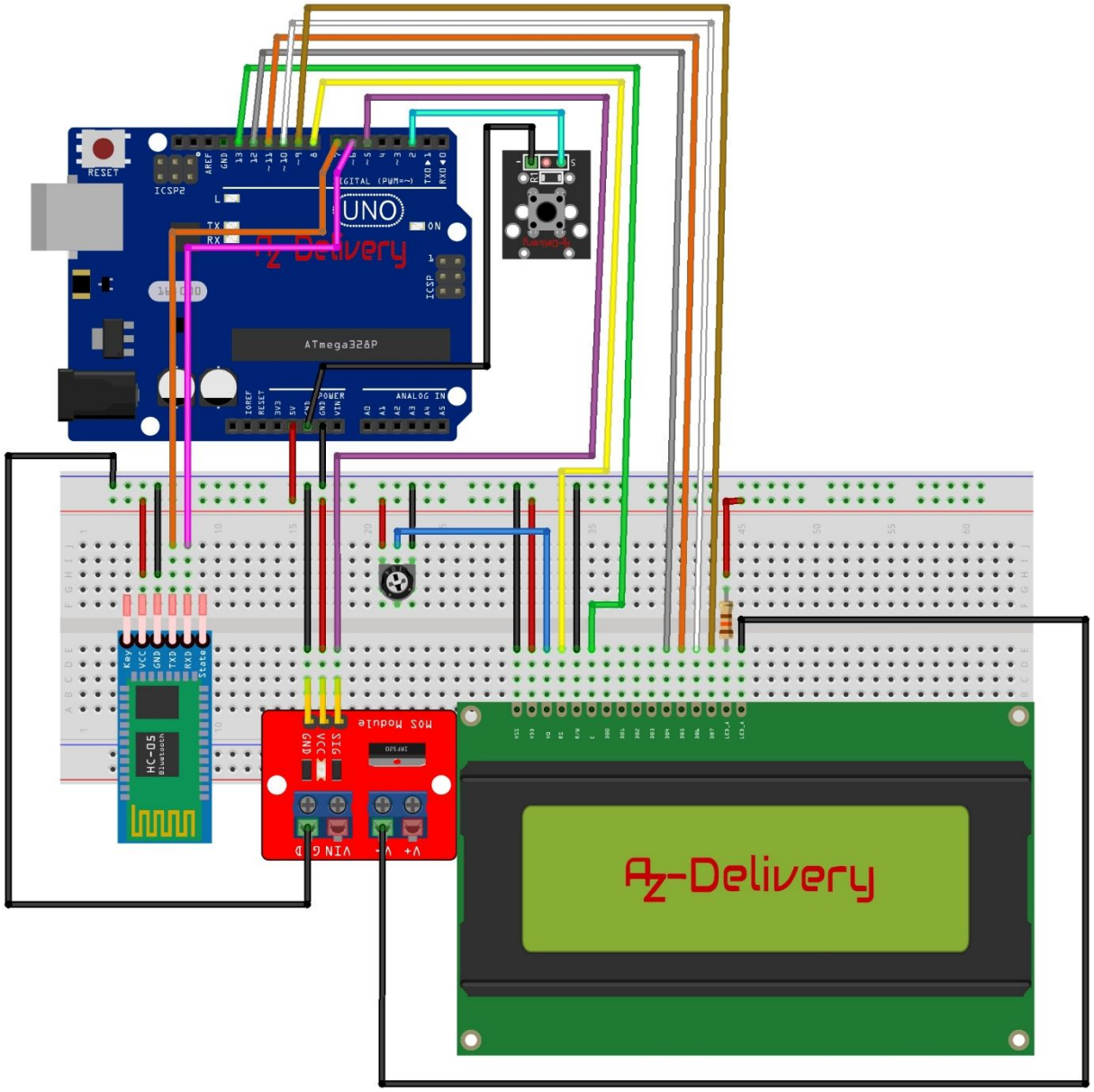
Willkommen zu dem vierten Teil der Bluetooth Display Reihe. In dem heutigen Teil bekommt unser Display neben einem obligatorischen weiteren Bedienermenüpunkt eine weitere kleine Erweiterung der Hardware spendiert. Über diese neue Hardwareerweiterung kann auch ohne das Bedienermenü per Taster die im internen Speicher gespeicherten Nachrichten abgerufen werden!

Dazu verwenden wir einen weiteren freien Port unseres Uno's als Eingang. Genauer: wir verwenden Port 2 als Eingang. An diesem Eingang ist ein Taster an Masse angeschlossen, dessen Tastendruck von unserem Arduino ausgewertet wird.

Doch nun zum eigentlichen Aufbau und zur Implementation der Erweiterung. Im ersten Schritt erweitern wir unsere Hardware wie in folgendem Schaltplan gezeigt, um das KY-004 Button Modul. Insgesamt hat das Bluetooth Display bei Verwendung eines Standard Arduinos 12 Textspeicher mit 4x20 Zeichen. Diese werden aufsteigend von 0 bis 11 beim Drücken des Tasters anzeigt. Wird die Nachricht 11 im Display angezeigt und der Taster gedrückt, springt der Zähler zurück auf die Nachricht0


RESET
ICSP2
UNO
ON
TX
RX
ICSP
ATmega328P
POWER
ANALOG IN
Key
VCC
GND
TXD
RXD
State
HC-05
Bluetooth
MOS Module
SIG
VCC
GND
VIN
GND
V+
V-
AZ-Delivery
fritzing

Als nächstes laden wir für diese Erweiterung auf unseren Arduino UNO folgenden angepassten Code hoch:

```
#include <SPI.h>
#include <Wire.h>
#include <SoftwareSerial.h>
#include <EEPROM.h>
#include <LiquidCrystal.h>
#include <avr/sleep.h>

#define MaxInputBufferSize 20 // maximal 255 Zeichen anpassen an vlcdr
#define EEpromSize 990
#define rLcdChr 20
#define LcdRows 4
#define interval 1000
#define BackgroundLight 5 // Port 5 Hintergrundbeleuchtung LED
#define SwitchPin 2 // Port 12 Taster Nachrichtsauswahl
#define DelayTOPWROFF 500

// EEprom SpeicherzellenAdressen für Konfiguration
#define EEFadeSeconds  993
#define EEPINA 996
#define EEPINC 997
#define EEPINDD 998


SoftwareSerial mySerial(7, 6); // RX, TX
LiquidCrystal lcd(8, 13, 12, 11, 10, 9);

//variables
byte DisplayBankContent = 0;

//Serial Input Handling
char TBuffer;
char Cbuffer[MaxInputBufferSize+1];       //USB Code Input Buffer
String Sbuffer = "";                      //USB String Input Buffer
int value;                                //USB Nummeric Input Buffer
byte Ccount = 0;                          //Number received Chars
byte Inptype = 0;
boolean StrInput = false;
boolean NumberInput = false;
boolean DataInput = false;
boolean EnterInput = false;
byte MenueSelection = 0;

//Druckknopfsteuerung
boolean Switchstate = true;
boolean SwitchstateBuffer = true;
byte SelectedMsg = 0;

//Give Debug Informations over serial Interface
boolean EchoMode = true;

//EEPROM
int eeaddress;                //EEPROM Adress Pointer
byte EEPromBanks = 0;         //Used for Calculating the EEPROM Banks
//SerMnueControl
byte MnuState = 0;            // Maximale Menuetiefe 255 icl Sub
byte Selectedbank =0;

//Real Time Clock
long previousMillis = 0;       // will store last time was measured
long previousMillisB = 0;      // will store last time was measured

//Display Management
boolean DisplayLock = false;
```

```
boolean Directprint = false;
byte DirectprintROW = 0;
byte DirectprintLine = 0;

boolean RefreshDisplay = false;
byte FRMCheck = 0; // Used fpr Writing Operations to eeprom so save Wirte cycles
// BatterieMonitoring
float Voltage;
boolean PowersaveMode = false;

// PWM Lichtsteuerung

byte Currentbrightness = 0;
byte Targetbrightness = 0;
byte FadeSeconds = 0; // Standard = 3


void setup()
{
  EEPromBanks = EEpromSize / ((rLcdChr) * LcdRows);
  lcd.begin(rLcdChr, LcdRows);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("    Bluetooth");
  lcd.setCursor(0, 1);
  lcd.print("     Display");
  mySerial.begin(9600);
  pinMode(SwitchPin,INPUT_PULLUP); // Taster Auswahl Text aus EEprom
  pinMode(BackgroundLight,OUTPUT); // Displaybeleuchtung / Display AN /AUS
  digitalWrite(BackgroundLight,LOW);
  // read Config
  FadeSeconds = EEPROM.read(EEFadeSeconds);
  Currentbrightness = 0;
  Targetbrightness = 0;
  lcd.setCursor(0, 4);
  if (DisplayLock) {  lcd.print("  System gesperrt"); }
  // Further Setup Routines / initalizing
  lcd.setCursor(0, 0);
  Targetbrightness = 255;
  mySerial.flush();
}

//
########################################################################################################
############## //
void loop()
{
SerialcommandProcessor();
runrealTimeClock();
Displayprocessor();
SwitchProcessor();
//End Main loop
}
//
########################################################################################################
############## //

void TextHeader(byte rowm)
{
  mySerial.println("Text for Bank " + String( Selectedbank) + " ROW " + String (rowm) + ":");
}

void SerialcommandProcessor()
{
int a;
Inptype = 0;
Inptype = SerInputHandler();
// 0 keine Rückgabe
```

```
// 1 Nummer
// 2 String
// 3 Data

if ((Inptype > 0) & (!Directprint))
  {
  MenueSelection = 0;
  if ((MnuState < 2) && (Inptype == 2)) {Sbuffer.toUpperCase(); } // For Easy Entering Commands
  if ((Sbuffer == "ECHO")&& (MnuState == 0) && (Inptype == 2))     { MenueSelection = 2;}
  if ((Sbuffer == "S") && (MnuState == 0) && (Inptype == 2))       { MenueSelection = 3;}
  // Erasing ALL EEprom Content
  if ((Sbuffer == "E") && (MnuState == 0) && (Inptype == 2))       { MenueSelection = 4;}
  if ((Sbuffer == "YES") && (MnuState == 1)&& (Inptype == 2))      { MenueSelection = 5;}
  if ((Sbuffer != "YES") && (MnuState == 1) && (Inptype == 2))     { MenueSelection = 6;}
  //Edit  Selected Content
  if ((Sbuffer == "W") && (MnuState == 0) && (Inptype == 2))       { MenueSelection = 7;}
  if ((MnuState == 2) && (value  < EEPromBanks) && (Inptype == 1)) { MenueSelection = 8;}
  if (MnuState == 3)                                               { MenueSelection = 9;}
  if (MnuState == 4)                                               { MenueSelection = 10;}
  //Display  Selected Content
  if ((Sbuffer == "P") && (MnuState == 0) && (Inptype == 2))       { MenueSelection = 11;}
  if ((MnuState == 5) && (Inptype == 1))                           { MenueSelection = 12;}
  if ((Sbuffer == "R") && (MnuState == 0) && (Inptype == 2))       { MenueSelection = 13;}
  if ((MnuState == 6) && (Inptype == 1))                           { MenueSelection = 14;}
  if ((Sbuffer == "D") && (MnuState == 0) && (Inptype == 2))       { MenueSelection = 15;}
  if ((Sbuffer == "Z") && (MnuState == 0) && (Inptype == 2))       { MenueSelection = 16;}
  if ((Sbuffer == "B") && (MnuState == 0) && (Inptype == 2))       { MenueSelection = 17;}
  if ((MnuState == 7) && (Inptype == 1))                           { MenueSelection = 18;}
  if ((Sbuffer == "FADE") && (MnuState == 0) && (Inptype == 2))    { MenueSelection = 19;}
  if (MnuState == 9)                                               { MenueSelection = 20;}
  if (MnuState == 10)                                              { MenueSelection = 21;}
  if (MnuState == 12)                                              { MenueSelection = 25;}
  switch (MenueSelection)
   {
     case 2:
     {
       mySerial.print("Echo ");
       EchoMode = !EchoMode;
       if (EchoMode) {
         mySerial.println(" ON.");

         } else
         {
         mySerial.println(" OFF.");
         }
       mySerial.println("");
       mySerial.flush();
       value = 0;
       MnuState = 0;
       Sbuffer = "";
       break;
     }
     case 3:
     {
      mySerial.println("Read EEEPROM Content:" );
      mySerial.flush();
      for (int a = 0; a < EEPromBanks; a++)
        {
          mySerial.println("EEPROM Memory Bank: " + String(a) );
          mySerial.flush();
          for (int b = 1; b <= LcdRows;b++)
            {
              mySerial.print("Row " + String(b) +": ");
              mySerial.flush();
              for (int c = 0; c <rLcdChr; c++)
                  {
                    eeaddress = 0;
                    eeaddress = (a * (rLcdChr)* LcdRows) + ((rLcdChr) * b) + c;
```

```
                value = EEPROM.read(eeaddress);
                mySerial.print(char(value));
                mySerial.flush();
               }
            mySerial.println(" ");
            mySerial.flush();
           }

     }
   Sbuffer = "";
   mySerial.println("No more EEPROM Banks available.");
   mySerial.flush();
   break;
 }
 case 4:
 {
   value = 0;
   mySerial.print("Erasing EEPROM ");
   mySerial.println("YES/NO:");
   mySerial.flush();
   MnuState = 1;
   Sbuffer = "";
   break;
 }
 case 5:
 {
  value = 0;
  mySerial.print("Erasing EEPROM ");
  mySerial.println("Stand by.");
  mySerial.flush();
  for (int a = 0; a < EEPromBanks; a++)
    {
      //Memory Bank a
      mySerial.println("Clear Bank: " + String(a));
      for (int b = 1; b <= LcdRows;b++)
        {
         for (int c = 0; c <rLcdChr; c++)
           {
             eeaddress = 0;
             eeaddress = (a * (rLcdChr)* LcdRows) + ((rLcdChr ) * b) + c;
             FRMCheck = EEPROM.read(eeaddress);
             if (FRMCheck > 0)
             {
             EEPROM.write(eeaddress,00); // Formatierung
             mySerial.print(".");
             value++;
             delay(30);
             mySerial.flush();
             }
           }
        }
      mySerial.println("");
      mySerial.flush();
    }
  mySerial.println("");
  mySerial.println("Finished. "+ String(value) + " Bytes cleared");
  mySerial.println("");
  mySerial.flush();
  Sbuffer = "";
  MnuState = 0;
  break;
 }
 case 6:
 {
  value = 0;
  Sbuffer = "";
  MnuState = 0;
  mySerial.println("OP abort.");
```

```
 mySerial.flush();
 break;
}
case 7:
{
mySerial.println("EEPPROM Bank Number (0-" + String(EEPromBanks-1) + "):");
mySerial.flush();
MnuState = 2;
value = 0;
Sbuffer = "";
break;
}
case 8:
{
Selectedbank = value;
TextHeader(1);
MnuState = 3;
Sbuffer = "";
value = 0;
break;
}
case 9:
{
WriteEEPROM(Selectedbank,1);
TextHeader(2);
value = 0;
MnuState = 4;
Sbuffer = "";
break;
}
case 10:
{
WriteEEPROM(Selectedbank,2);
value = 0;
MnuState = 0;
Sbuffer = "";
TextHeader(3);
mySerial.flush();
value = 0;
MnuState = 9;
Sbuffer = "";
break;
}
case 11:
{
value = 0;
mySerial.println("EEPPROM Bank Number (0-" + String(EEPromBanks-1) + "):");
MnuState = 5;
Sbuffer = "";
mySerial.flush();
break;
}
case 12:
{
SelectedMsg = value;
DisplayBank(value);
break;
}
case 13:
{
value = 0;
mySerial.println("EEPPROM Bank Number (0-" + String(EEPromBanks-1) + "):");
MnuState = 6;
Sbuffer = "";
mySerial.flush();
break;
}
case 14:
```

```
{
 a = value;
 if ( a < EEPromBanks)
 {
 mySerial.println("Memory Bank: " + String(a) );
 mySerial.flush();
 for (int b = 1; b <= LcdRows;b++)
  {
    mySerial.print("Row " + String(b) +": ");
    mySerial.flush();
    for (int c = 0; c <rLcdChr; c++)
     {
       eeaddress = 0;
       eeaddress = (a * (rLcdChr)* LcdRows) + ((rLcdChr) * b) + c;
       value = EEPROM.read(eeaddress);
       mySerial.print(char(value));
       mySerial.flush();
     }
    mySerial.println(" ");
    mySerial.flush();
  }
 } else
  {
   mySerial.println("Value out of Range.");
   }

 value = 0;
 Sbuffer = "";
 MnuState = 0;
 break;
}
case 15:
{
// Direct pPrint to Display
Directprint = true;
mySerial.println ("Directprint ON.");
if (Directprint)
{
DirectprintROW = 0;
DirectprintLine = 0;
lcd.clear();
lcd.cursor();
lcd.blink();
}
value = 0;
Sbuffer = "";
MnuState = 0;
break;
}
case 16:
{
value = 0;
Sbuffer = "";
MnuState = 0;
break;
}
case 17:
{
mySerial.println("Display Brightness: (max 255)");
MnuState = 7;
value = 0;
Sbuffer = "";
break;
}
case 18:
{
if ((value < 256))
 {
```

```
      Targetbrightness = value;
      mySerial.println("Brightness: " + String (Targetbrightness) + " Set");
     } else
     {
      mySerial.println("Value out of Range.");
       }
  MnuState = 0;
  value = 0;
  Sbuffer = "";
  break;
  }
  case 19:
  {
 mySerial.println("Fade Delay: (max 255 Sec)");
  MnuState = 12;
  value = 0;
  Sbuffer = "";
  break;
  }
  case 20:
  {
  WriteEEPROM(Selectedbank,3);
  value = 0;
  MnuState = 0;
  Sbuffer = "";
  TextHeader(4);
  mySerial.flush();
  value = 0;
  MnuState = 10;
  Sbuffer = "";
  break;
  }
  case 21:
  {
  WriteEEPROM(Selectedbank,4);
  value = 0;
  MnuState = 0;
  Sbuffer = "";
  break;
  }
  case 25:
  {
   if ((value > 0) & (value < 251))
  {
  FadeSeconds = value;
  EEPROM.write(EEFadeSeconds, FadeSeconds);
  mySerial.println("Value " + String (value) + " set.");
  } else
  {
  value = 0;
  Sbuffer = "";
  mySerial.println("Value out of Range.");
  }
  value = 0;
  MnuState = 0;
  Sbuffer = "";
  break;
  }
  default:
  {
    if (DisplayLock)
      {
       lcd.clear();
       DisplayLock = false;
      }
    mySerial.println("-------Smart Bluetooth Display 1.1------");
    mySerial.println("S - Read ALL EEPROM Banks");
    mySerial.println("E - Erase ALL EEPROM Banks");
```

```
        mySerial.println("W - Write sel. EEPROM Bank");
        mySerial.println("R - Read sel. EEPROM Bank");
        mySerial.println("P - Print EEPROM Bank on Display");
        mySerial.println("-----------------------------------------");
        mySerial.println("D - Direct Print");
        mySerial.println("B - Display Brighness Current Value: " + String (Currentbrightness));
        mySerial.println("Other: ECHO");
        mySerial.println("-----------------------------------------");
        mySerial.println("Type Cmd and press Enter");
        mySerial.flush();
        MnuState = 0;
        value = 0;
        Sbuffer = "";
      }
    }
   } // Eingabe erkannt
}

void WriteEEPROM(byte FBank,byte FRow)
{
byte Writecounter;

Writecounter = 0;
 mySerial.print("Saving ");
      for (int c = 0; c <rLcdChr; c++)
        {
         eeaddress = 0;
         eeaddress = (FBank * (rLcdChr)* LcdRows) + ((rLcdChr) * FRow) + c;
         value = EEPROM.read(eeaddress);
         if (Sbuffer[c] != value)
         {
         EEPROM.write(eeaddress,Sbuffer[c]);
         mySerial.print(".");
         Writecounter++;
         }
        }
      mySerial.println(" " + String (Writecounter) + " Bytes written.");
}

void ClearCBuffer ()
 {
 for (byte a= 0; MaxInputBufferSize -1;a++)
  Cbuffer[a] = 0;
 }

byte SerInputHandler()
{
byte result = 0;
int c;
int d;
int a;
int b;
result = 0;
if (CheckforserialEvent())
   {
    if ((NumberInput) and not (DataInput)and not (StrInput))     //Numbers only
      {
      Sbuffer = "";
      value = 0;
      StrInput = false;
      NumberInput = false;
      DataInput = false;
      EnterInput = false;
      a = 0;
      b = 0;
      c = 0;
      d = 0;
      Sbuffer = Cbuffer; // Zahl wird AUCH ! in SBUFFER übernommen, falls benötigt.
```

```
    if (Ccount == 1) { value  = Cbuffer[0]- 48 ; }
    if (Ccount == 2) {
      a = Cbuffer[0] - 48 ;
      a = a * 10;
      b = Cbuffer[1] - 48 ;
      value = a + b;
      }
    if (Ccount == 3) {
      a = Cbuffer[0] - 48 ;
      a = a * 100;
      b = Cbuffer[1] - 48 ;
      b = b * 10;
      c = Cbuffer[2] - 48 ;
      value = a + b + c;
      }
    if (Ccount == 4) {
      a = Cbuffer[0] - 48 ;
      a = a * 1000;
      b = Cbuffer[1] - 48 ;
      b = b * 100;
      c = Cbuffer[2] - 48 ;
      c = c * 10;
      d = Cbuffer[3] - 48 ;
      value = a + b + c + d;
      }
    if (Ccount >= 5)
       {
        Sbuffer = "";
        value = 0;
        Sbuffer = Cbuffer;
        ClearCBuffer;
        result = 2;
       } else
       {
        ClearCBuffer;

        Ccount = 0;
        result = 1;                                  //Number Returncode
        NumberInput = false;
        StrInput = false;
        DataInput = false;
        EnterInput = false;
        Ccount = 0;
        return result;
        }
    }
   if ((StrInput) and not (DataInput))                  //String Input only
     {
     Sbuffer = "";
     Sbuffer = Cbuffer;
     value = 0;
     StrInput = false;
     NumberInput = false;
     DataInput = false;
     EnterInput = false;
     Ccount = 0;
     ClearCBuffer;
     result = 2;                                     //Number Returncode
     }
    if (DataInput) {
     Sbuffer = "";
     Sbuffer = Cbuffer;
     value = 0;
     StrInput = false;
     NumberInput = false;
     DataInput = false;
     EnterInput = false;
```

```
      Ccount = 0;
      ClearCBuffer;
      result = 3;                                   //Number Returncode
      }
      if ((EnterInput) and not (StrInput) and not (NumberInput) and not (DataInput))
      {
      Sbuffer = "";
      value = 0;

      Ccount = 0;
      ClearCBuffer;
      result = 4;                                   //Number Returncode
      }

  NumberInput = false;
  StrInput = false;
  DataInput = false;
  EnterInput = false;
  Ccount = 0;
  return result;

 }
return result;
  //End CheckforSerialEvent
}

// Eingabebuffer

boolean CheckforserialEvent()
{
 while (mySerial.available()) {
    // get the new byte:
    TBuffer = mySerial.read();
    if (TBuffer > 9 && TBuffer < 14)
     {
      Cbuffer[Ccount] = 0;
      TBuffer =0;
      if (EchoMode)
       {
        mySerial.print(char(13));
        mySerial.flush();
       }
       if (Directprint)
        {
        mySerial.println("");
        DirectprintLine = 0;
        DirectprintROW = DirectprintROW + 1;
        if ( DirectprintROW > 3)
        {
               Directprint = false;
               lcd.noCursor();
               lcd.noBlink();
               Sbuffer = "";
               value = 0;
          } else
        {
        lcd.cursor();
        lcd.blink();
        lcd.setCursor(0,DirectprintROW);
        }
        }
       EnterInput = true;
       return true;
    } else if (TBuffer > 47 && TBuffer <58 )
     {
      if ( Ccount < MaxInputBufferSize)
        {
          Cbuffer[Ccount] = TBuffer;
```

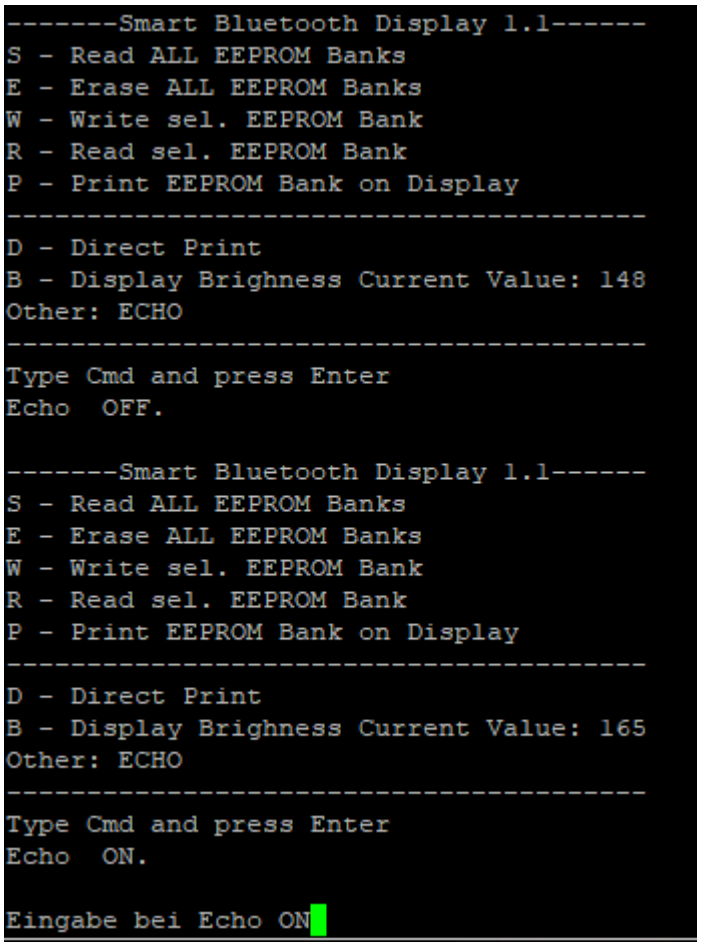
```
          Ccount++;
          if ((Directprint))
            {
              lcd.print(char(TBuffer));
              DirectprintLine = DirectprintLine + 1;
              if ( Ccount > MaxInputBufferSize -1)
              {
                lcd.noCursor();
                lcd.noBlink();
                } else {
                lcd.cursor();
                lcd.blink();
                }
            }
          if (EchoMode) {
          mySerial.print(char(TBuffer));
          mySerial.flush();
          }
        } else {mySerial.print("#"); }
      //Number Input detected
      NumberInput = true;
      }
      else if (TBuffer > 64 && TBuffer < 123 )
      {
       if ( Ccount < MaxInputBufferSize)
          {
          Cbuffer[Ccount] = TBuffer;
          Ccount++;
          if ((Directprint))
            {
              lcd.print(char(TBuffer));
              DirectprintLine = DirectprintLine + 1;
              if ( Ccount > MaxInputBufferSize -1)
              {
                lcd.noCursor();
                lcd.noBlink();
                } else {
                lcd.cursor();
                lcd.blink();
                }
            }
          if (EchoMode) {
          mySerial.print(char(TBuffer));
          mySerial.flush();
          }
         } else {mySerial.print("#"); }

//      if (DebugMode) { mySerial.println("Debug: Char over Serial received ");
//      mySerial.flush(); }
      //Character Char Input detected
      StrInput = true;
     }
    else if ( (TBuffer == 127 ) | (TBuffer == 8 ) )
        {
              if ( DirectprintLine > 0 )
              {
              DirectprintLine = DirectprintLine - 1;
              lcd.setCursor(DirectprintLine, DirectprintROW);
              lcd.print(" ");
              lcd.setCursor(DirectprintLine, DirectprintROW);
              }
              if (( DirectprintLine == 0 ) & ( DirectprintROW > 0 ))
              {
              DirectprintROW = DirectprintROW - 1;
              DirectprintLine = rLcdChr -1;
              lcd.setCursor(DirectprintLine, DirectprintROW);
              }
       if ( Ccount > 0)
```

```
        {
          Ccount--;
          Cbuffer[Ccount] = 0;
          if ((Directprint))
            {
              if ( Ccount > MaxInputBufferSize -1)
              {
                lcd.noCursor();
                lcd.noBlink();
                } else {
                lcd.cursor();
                lcd.blink();
                }
            }
          if (EchoMode) {
          mySerial.print("-");
          mySerial.flush();
          }
        }
     }
    else
      {
       if ( Ccount < MaxInputBufferSize)
        {
          Cbuffer[Ccount] = TBuffer;
          Ccount++;
           if ((Directprint))
            {
              DirectprintLine = DirectprintLine + 1;
              if (TBuffer < 128) {lcd.print(char(TBuffer)); } else  {lcd.print(String(TBuffer)); }
              if ( Ccount > MaxInputBufferSize -1)
              {
                lcd.noCursor();
                lcd.noBlink();
                } else {
                lcd.cursor();
                lcd.blink();
                }
            }
          if (EchoMode) {
          mySerial.print(char(TBuffer));
          mySerial.flush();
          }
        } else {mySerial.print("#"); }
     //Data Input detected
     DataInput = true;
     }
    return false;
    }
  return false;
  }

void Displayprocessor()  // Bei Blauem Display wird auf Scrollfunktion verzichtet, da das nur "schmiert"
{
if (RefreshDisplay)
  {
    lcd.clear();
    RefreshDisplay = false;
       for (int b = 1; b <= LcdRows;b++)
              {
                lcd.setCursor(0, b -1);
                mySerial.print("Row " + String(b) +": ");
                for (int c = 0; c <rLcdChr; c++)
                    {
                      eeaddress = 0;
                      eeaddress = (DisplayBankContent * (rLcdChr)* LcdRows) + ((rLcdChr) * b) + c;
                      value = 0;
                      value = EEPROM.read(eeaddress);
```

```
                    if (value > 31) // Sonderzeichen nicht anzeigen
                    {
                     mySerial.print(char(value));
                     lcd.print(char(value));
                     } else
                    { lcd.print(char(32)); }
                   }
                  mySerial.println();
              }
   }
}

void runrealTimeClock()    //TIMEBASE
{
  // Real Time Clock & Countdown
 // long previousMillis = 0;       // will store last time was measured
 // byte SecDivider = 0;
unsigned long currentMillis = millis();

int StepValue = 0;
// PWM Display Steuerung
 StepValue = 4 * FadeSeconds;
  if(currentMillis - previousMillis > StepValue)
  {
     previousMillis = currentMillis;
  if (Currentbrightness < Targetbrightness
  )
  {
  Currentbrightness = Currentbrightness + 1;
  analogWrite (BackgroundLight,Currentbrightness);
  } else if (Currentbrightness > Targetbrightness)
   {
  Currentbrightness = Currentbrightness - 1;
  analogWrite (BackgroundLight,Currentbrightness);
   }
   }
  if(currentMillis - previousMillisB > 1000)
  {
  // sekundentakt
    previousMillisB = currentMillis;
    }
}

void DisplayBank ( byte cobank)
 {
      if (cobank  < EEPromBanks )
      {
      RefreshDisplay = true;   // Initalize Display Output
      DisplayBankContent = cobank;
      mySerial.println("Bank " + String(cobank) + " is displayed on LCD");
      MnuState = 0;
      Sbuffer = "";
      value =0;
      mySerial.flush();
      } else
            {
              mySerial.println("Bank not available.");
              value = 0;
              MnuState = 0;
              Sbuffer = "";
              mySerial.flush();
            }
 }

void SwitchProcessor()
{
Switchstate = digitalRead(SwitchPin);
if ((!Switchstate) && (SwitchstateBuffer) && (not DisplayLock))// Abfrage Schalter
```

```
  {
   SwitchstateBuffer = false;
   Directprint = false;
   lcd.noCursor();
   lcd.noBlink();
   SelectedMsg = SelectedMsg + 1;
   if (SelectedMsg >  EEPromBanks - 1 )
     {
     SelectedMsg = 0;
     }
    lcd.clear();
    lcd.setCursor(0,0);
    lcd.print("Bank: " + String(SelectedMsg) + " selected");
    lcd.setCursor(0,2);

    delay(10);
    value = DelayTOPWROFF;
    while (digitalRead(SwitchPin) == 0)
    {
     delay(1);
     if (value > 0) {value = value - 1;};
     lcd.setCursor(0,3);
    }
    DisplayBank(SelectedMsg);
  }
if (Switchstate)
    {
     SwitchstateBuffer = true;
   //  delay(10);
    }
}
```

Neben der Hardwareerweiterung haben wir jetzt noch eine kleine Hilfsfunktion im Menü mehr: Der Befehl lautet „echo“. Mit diesem schalten wir die Zeichen Echo Funktion der Seriellen Schnittstelle ein und aus. Um zu verdeutlichen, was das für Auswirkungen hat, wird im folgenden Screenshot zuerst die Echo Funktion mit dem Befehl „Echo“ ausgeschaltet. Dies wird mit „Echo OFF“ quittiert. Mit dem gleichen Befehl wird die Echo Funktion wieder aktiviert. (Toggle Funktion). Dies wird analog hierzu mit „Echo ON“ quittiert. Ab diesem Zeitpunkt wird jedes Eingabezeichen quittiert.



Ich wünsche viel Spaß beim Nachbauen und wie immer bis zum nächsten Mal.