
LAMPIRAN A
PROGRAM CODEVISION AVR

MIKROKONTROLER A

```
#include <mega16.h> // Declare your global variables here

#include <delay.h>

#include <stdio.h> void main(void)

{

// External Interrupt 0 service routine // Declare your local variables here

interrupt [EXT_INT0] void ext_int0_isr(void)

{ // Input/Output Ports initialization

// Place your code here // Port A initialization

delay_us(10); // Func7=In Func6=In Func5=In Func4=In
Func3=In Func2=In Func1=In Func0=In

putchar(0xFF); // State7=T State6=T State5=T State4=T State3=T
State2=T State1=T State0=T

putchar(0xFE); // State7=T State6=T State5=T State4=T State3=T
State2=T State1=T State0=T

putchar(ADCL); PORTA=0x00;

putchar(ADCH); DDRA=0x00;

ADCSRA|=0x40;}

// Port B initialization

#define ADC_VREF_TYPE 0x00 // Func7=In Func6=In Func5=In Func4=In
Func3=In Func2=In Func1=In Func0=In

// Read the AD conversion result // State7=T State6=T State5=T State4=T State3=T
State2=T State1=T State0=T

unsigned int read_adc(unsigned char adc_input)

{ PORTB=0x00;

ADMUX=adc_input | (ADC_VREF_TYPE &
0xff); DDRB=0x00;

// Start the AD conversion // Port C initialization

ADCSRA|=0x40; // Func7=In Func6=In Func5=In Func4=In
Func3=In Func2=In Func1=In Func0=In

// Wait for the AD conversion to complete // State7=T State6=T State5=T State4=T State3=T
State2=T State1=T State0=T

while ((ADCSRA & 0x10)==0);

ADCSRA|=0x10; PORTC=0x00;

return ADCW; DDRC=0x00;

}

// Port D initialization
```

```

// Func7=In Func6=In Func5=In Func4=In          TCNT1L=0x00;
Func3=In Func2=In Func1=In Func0=In          ICR1H=0x00;

// State7=T State6=T State5=T State4=T State3=T  ICR1L=0x00;
State2=T State1=T State0=T

PORTD=0x00;          OCR1AH=0x00;

DDRD=0x00;          OCR1AL=0x00;

// Timer/Counter 0 initialization              OCR1BH=0x00;
// Clock source: System Clock                  OCR1BL=0x00;
// Clock value: Timer 0 Stopped
// Mode: Normal top=FFh
// OC0 output: Disconnected
TCCR0=0x00;
TCNT0=0x00;
OCR0=0x00;

// Timer/Counter 1 initialization
// Clock source: System Clock
// Clock value: Timer 1 Stopped
// Mode: Normal top=FFFFh
// OC1A output: Discon.
// OC1B output: Discon.
// Noise Canceler: Off
// Input Capture on Falling Edge
// Timer 1 Overflow Interrupt: Off
// Input Capture Interrupt: Off
// Compare A Match Interrupt: Off
// Compare B Match Interrupt: Off
TCCR1A=0x00;
TCCR1B=0x00;
TCNT1H=0x00;

// Timer/Counter 2 initialization
// Clock source: System Clock
// Clock value: Timer 2 Stopped
// Mode: Normal top=FFh
// OC2 output: Disconnected
ASSR=0x00;
TCCR2=0x00;
TCNT2=0x00;
OCR2=0x00;

// External Interrupt(s) initialization
// INT0: On
// INT0 Mode: Rising Edge
// INT1: Off
// INT2: Off
GICR|=0x40;
MCUCR=0x03;
MCUCSR=0x00;
GIFR=0x40;

// Timer(s)/Counter(s) Interrupt(s) initialization
TIMSK=0x00;

```

```

// USART initialization                                     // Place your code here

// Communication Parameters: 8 Data, 1 Stop, No
Parity                                                    };
// USART Receiver: Off                                    }
// USART Transmitter: On

// USART Mode: Asynchronous

// USART Baud rate: 115200

UCSRA=0x00;
UCSRB=0x08;
UCSRC=0x86;
UBRRH=0x00;
UBRRL=0x05;

// Analog Comparator initialization

// Analog Comparator: Off

// Analog Comparator Input Capture by
Timer/Counter 1: Off

ACSR=0x80;
SFIOR=0x00;

// ADC initialization

// ADC Voltage Reference: AREF pin

// ADC Auto Trigger Source: None

ADMUX=ADC_VREF_TYPE & 0xff;
ADCSRA=0x84;

// Global enable interrupts

#asm("sei")

while (1)
{

```

MIKROKONTROLER B

```
#include <mega16.h> // Declare your global variables here

#include <delay.h>

#include <stdio.h> void main(void)

// External Interrupt 0 service routine // Declare your local variables here

interrupt [EXT_INT0] void ext_int0_isr(void)

{ // Input/Output Ports initialization

// Place your code here // Port A initialization

delay_us(10); // Func7=In Func6=In Func5=In Func4=In
                Func3=In Func2=In Func1=In Func0=In

putchar(0xFF); // State7=T State6=T State5=T State4=T State3=T
                State2=T State1=T State0=T

putchar(0xFF); // State7=T State6=T State5=T State4=T State3=T
                State2=T State1=T State0=T

putchar(ADCL); PORTA=0x00;

putchar(ADCH); DDRA=0x00;

ADCSRA|=0x40;

} // Port B initialization

// Func7=In Func6=In Func5=In Func4=In
  Func3=In Func2=In Func1=In Func0=In

// State7=T State6=T State5=T State4=T State3=T
  State2=T State1=T State0=T

#define ADC_VREF_TYPE 0x00

// Read the AD conversion result

unsigned int read_adc(unsigned char adc_input)

{

ADMUX=adc_input | (ADC_VREF_TYPE &
0xff); // Port C initialization

// Func7=In Func6=In Func5=In Func4=In
  Func3=In Func2=In Func1=In Func0=In

// Start the AD conversion // State7=T State6=T State5=T State4=T State3=T
  State2=T State1=T State0=T

ADCSRA|=0x40; // State7=T State6=T State5=T State4=T State3=T
  State2=T State1=T State0=T

// Wait for the AD conversion to complete

while ((ADCSRA & 0x10)==0); PORTC=0x00;

ADCSRA|=0x10; DDRC=0x00;

return ADCW;

} // Port D initialization
```

```

// Func7=In Func6=In Func5=In Func4=In
Func3=In Func2=In Func1=In Func0=In
// State7=T State6=T State5=T State4=T State3=T
State2=T State1=T State0=T
PORTD=0x00;
DDRD=0x00;

// Timer/Counter 0 initialization
// Clock source: System Clock
// Clock value: Timer 0 Stopped
// Mode: Normal top=FFh
// OC0 output: Disconnected
TCCR0=0x00;
TCNT0=0x00;
OCR0=0x00;

// Timer/Counter 1 initialization
// Clock source: System Clock
// Clock value: Timer 1 Stopped
// Mode: Normal top=FFFFh
// OC1A output: Discon.
// OC1B output: Discon.
// Noise Canceler: Off
// Input Capture on Falling Edge
// Timer 1 Overflow Interrupt: Off
// Input Capture Interrupt: Off
// Compare A Match Interrupt: Off
// Compare B Match Interrupt: Off
TCCR1A=0x00;
TCCR1B=0x00;
TCNT1H=0x00;

TCNT1L=0x00;
ICR1H=0x00;
ICR1L=0x00;
OCR1AH=0x00;
OCR1AL=0x00;
OCR1BH=0x00;
OCR1BL=0x00;

// Timer/Counter 2 initialization
// Clock source: System Clock
// Clock value: Timer 2 Stopped
// Mode: Normal top=FFh
// OC2 output: Disconnected
ASSR=0x00;
TCCR2=0x00;
TCNT2=0x00;
OCR2=0x00;

// External Interrupt(s) initialization
// INT0: On
// INT0 Mode: Falling Edge
// INT1: Off
// INT2: Off
GICR|=0x40;
MCUCR=0x02;
MCUCSR=0x00;
GIFR=0x40;

// Timer(s)/Counter(s) Interrupt(s) initialization
TIMSK=0x00;

```

```

// USART initialization                                     // Place your code here

// Communication Parameters: 8 Data, 1 Stop, No
Parity                                                    };
// USART Receiver: Off                                    }
// USART Transmitter: On

// USART Mode: Asynchronous

// USART Baud rate: 115200

UCSRA=0x00;
UCSRB=0x08;
UCSRC=0x86;
UBRRH=0x00;
UBRRL=0x05;

// Analog Comparator initialization

// Analog Comparator: Off

// Analog Comparator Input Capture by
Timer/Counter 1: Off

ACSR=0x80;
SFIOR=0x00;

// ADC initialization

// ADC Voltage Reference: AREF pin

// ADC Auto Trigger Source: None

ADMUX=ADC_VREF_TYPE & 0xff;
ADCSRA=0x84;

// Global enable interrupts

#asm("sei")

while (1)
{

```



LAMPIRAN B
PROGRAM GUI MICROSOFT VISUAL C++



```
#pragma once
#include <math.h>
#include <stdio.h>
#include <stdlib.h>
#include <iomanip>
```

```
namespace serial1 {
```

```
    using namespace System;
    using namespace System::ComponentModel;
    using namespace System::Collections;
    using namespace System::Windows::Forms;
    using namespace System::Data;
    using namespace System::Drawing;
    using namespace ZedGraph;
```

```
    /// <summary>
    /// Summary for Form1
    ///
    /// WARNING: If you change the name of this class, you will need to change the
    ///     'Resource File Name' property for the managed resource compiler tool
    ///     associated with all .resx files this class depends on. Otherwise,
    ///     the designers will not be able to interact properly with localized
    ///     resources associated with this form.
    /// </summary>
```

```
    public ref class Form1 : public System::Windows::Forms::Form
```

```
    {
```

```
    public:
```

```
        Form1(void)
        {
            InitializeComponent();
            //
            //TODO: Add the constructor code here
            //
        }
```

```
    protected:
```

```
        /// <summary>
        /// Clean up any resources being used.
        /// </summary>
        ~Form1()
        {
            if (components)
            {
                delete components;
            }
        }
```

```
    private: System::Windows::Forms::Button^ EXIT;
    private: System::IO::Ports::SerialPort^ serialPort1;
    private: System::Windows::Forms::ComboBox^ comboBox1;
    private: System::Windows::Forms::Button^ button1;
    private: System::Windows::Forms::Button^ button2;
    private: System::Windows::Forms::Label^ label1;
    private: System::Windows::Forms::ListBox^ listBox1;
    private: System::Windows::Forms::Timer^ timer1;
```

```
    private: ZedGraph::ZedGraphControl^ zg1;
```

```
private: ZedGraph::ZedGraphControl^ zg2;
private: System::Windows::Forms::Label^ label2;
private: System::Windows::Forms::PictureBox^ pictureBox1;
private: System::Windows::Forms::ListBox^ listBox2;
private: System::Windows::Forms::ListBox^ listBox3;
private: System::Windows::Forms::ListBox^ listBox4;
private: System::Windows::Forms::ListBox^ listBox5;
private: System::Windows::Forms::ListBox^ listBox6;
private: System::Windows::Forms::ListBox^ listBox7;
private: System::Windows::Forms::ListBox^ listBox8;
private: System::Windows::Forms::ListBox^ listBox9;
private: System::Windows::Forms::ListBox^ listBox10;
private: System::Windows::Forms::ListBox^ listBox11;
private: System::Windows::Forms::ListBox^ listBox12;
private: System::Windows::Forms::ListBox^ listBox13;
private: System::Windows::Forms::ListBox^ listBox14;
private: System::Windows::Forms::ListBox^ listBox15;
private: System::Windows::Forms::ListBox^ listBox16;
private: System::Windows::Forms::ListBox^ listBox17;
private: System::Windows::Forms::ListBox^ listBox18;
private: System::Windows::Forms::ListBox^ listBox19;
private: System::Windows::Forms::ListBox^ listBox20;
private: System::Windows::Forms::ListBox^ listBox21;
private: System::Windows::Forms::Label^ label3;
private: System::Windows::Forms::Label^ label4;
private: System::Windows::Forms::Label^ label5;

private: System::Windows::Forms::Label^ label20;

private: System::Windows::Forms::Label^ label6;
private: System::Windows::Forms::Label^ label7;
private: System::Windows::Forms::Label^ label8;
private: System::Windows::Forms::Label^ label9;
private: System::Windows::Forms::Label^ label30;
private: System::Windows::Forms::Label^ label31;
private: System::Windows::Forms::Label^ label32;
private: System::Windows::Forms::Label^ label33;
private: System::Windows::Forms::Label^ label34;
private: System::Windows::Forms::Label^ label35;
private: System::Windows::Forms::Label^ label36;
private: System::Windows::Forms::Label^ label37;
private: System::Windows::Forms::Label^ label38;
private: System::Windows::Forms::Label^ label39;
private: System::Windows::Forms::Label^ label40;
private: System::Windows::Forms::Label^ label41;
private: System::Windows::Forms::Label^ label42;
private: System::Windows::Forms::Label^ label43;
private: System::Windows::Forms::Label^ label44;
private: System::Windows::Forms::Label^ label45;
private: System::Windows::Forms::Label^ label46;
private: System::Windows::Forms::Label^ label47;
private: System::Windows::Forms::Label^ label48;
private: System::Windows::Forms::Label^ label49;
private: System::Windows::Forms::Label^ label50;
private: System::Windows::Forms::Label^ label51;
private: System::Windows::Forms::Label^ label52;
private: System::Windows::Forms::ListBox^ listBoxguna;
private: System::Windows::Forms::Label^ label53;
```

```

private: System::Windows::Forms::ListBox^ listBoxa;
private: System::Windows::Forms::Label^ label54;
private: System::Windows::Forms::Label^ label10;
private: System::Windows::Forms::Label^ label11;
private: System::Windows::Forms::Label^ label12;
private: System::Windows::Forms::Label^ label13;
private: System::Windows::Forms::Label^ label14;
private: System::Windows::Forms::Label^ label15;
private: System::Windows::Forms::Label^ label16;
private: System::Windows::Forms::Label^ label17;
private: System::Windows::Forms::Label^ label18;
private: System::Windows::Forms::Label^ label19;
private: System::Windows::Forms::Label^ label21;
private: System::Windows::Forms::Label^ label22;
private: System::Windows::Forms::Label^ label23;
private: System::Windows::Forms::Label^ label24;
private: System::Windows::Forms::Label^ label25;
private: System::Windows::Forms::Label^ label26;
private: System::Windows::Forms::Label^ label27;
private: System::Windows::Forms::Label^ label28;
private: System::Windows::Forms::Label^ label29;
private: System::Windows::Forms::ListBox^ listBoxb;

```

```

private: System::ComponentModel::IContainer^ components;
protected:

```

```

private:
    /// <summary>
    /// Required designer variable.
    /// </summary>

```

```

#pragma region Windows Form Designer generated code

```

```

    /// <summary>
    /// Required method for Designer support - do not modify
    /// the contents of this method with the code editor.
    /// </summary>
    void InitializeComponent(void)
    {
        this->components = (gcnew System::ComponentModel::Container());
        System::ComponentModel::ComponentResourceManager^ resources = (gcnew
System::ComponentModel::ComponentResourceManager(Form1::typeid));
        this->EXIT = (gcnew System::Windows::Forms::Button());
        this->serialPort1 = (gcnew System::IO::Ports::SerialPort(this->components));
        this->comboBox1 = (gcnew System::Windows::Forms::ComboBox());
        this->button1 = (gcnew System::Windows::Forms::Button());
        this->button2 = (gcnew System::Windows::Forms::Button());
        this->label1 = (gcnew System::Windows::Forms::Label());
        this->listBox1 = (gcnew System::Windows::Forms::ListBox());
        this->timer1 = (gcnew System::Windows::Forms::Timer(this->components));
        this->zg1 = (gcnew ZedGraph::ZedGraphControl());
        this->zg2 = (gcnew ZedGraph::ZedGraphControl());
        this->label2 = (gcnew System::Windows::Forms::Label());
        this->pictureBox1 = (gcnew System::Windows::Forms::PictureBox());
        this->listBox2 = (gcnew System::Windows::Forms::ListBox());
        this->listBox3 = (gcnew System::Windows::Forms::ListBox());
        this->listBox4 = (gcnew System::Windows::Forms::ListBox());
        this->listBox5 = (gcnew System::Windows::Forms::ListBox());
        this->listBox6 = (gcnew System::Windows::Forms::ListBox());
    }

```

```

    this->label21 = (gcnew System::Windows::Forms::Label());
    this->label22 = (gcnew System::Windows::Forms::Label());
    this->label23 = (gcnew System::Windows::Forms::Label());
    this->label24 = (gcnew System::Windows::Forms::Label());
    this->label25 = (gcnew System::Windows::Forms::Label());
    this->label26 = (gcnew System::Windows::Forms::Label());
    this->label27 = (gcnew System::Windows::Forms::Label());
    this->label28 = (gcnew System::Windows::Forms::Label());
    this->label29 = (gcnew System::Windows::Forms::Label());
    this->listBoxb = (gcnew System::Windows::Forms::ListBox());
    (cli::safe_cast<System::ComponentModel::ISupportInitialize^ >(this->pictureBox1))-
>BeginInit();
    this->SuspendLayout();
    //
    // EXIT
    //
    this->EXIT->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 8.25F,
System::Drawing::FontStyle::Bold, System::Drawing::GraphicsUnit::Point,
    static_cast<System::Byte>(0)));
    this->EXIT->Location = System::Drawing::Point(53, 642);
    this->EXIT->Name = L"EXIT";
    this->EXIT->Size = System::Drawing::Size(119, 37);
    this->EXIT->TabIndex = 0;
    this->EXIT->Text = L"EXIT";
    this->EXIT->UseVisualStyleBackColor = true;
    this->EXIT->Click += gcnew System::EventHandler(this, &Form1::EXIT_Click);
    //
    // serialPort1
    //
    this->serialPort1->BaudRate = 115200;
    this->serialPort1->PortName = L"COM5";
    //
    // comboBox1
    //
    this->comboBox1->DropDownStyle =
System::Windows::Forms::ComboBoxStyle::DropDownList;
    this->comboBox1->FormattingEnabled = true;
    this->comboBox1->Items->AddRange(gcnew cli::array< System::Object^ >(8) {L"COM1",
L"COM2", L"COM3", L"COM4", L"COM5", L"COM6",
    L"COM7", L"COM8"});
    this->comboBox1->Location = System::Drawing::Point(72, 580);
    this->comboBox1->Name = L"comboBox1";
    this->comboBox1->Size = System::Drawing::Size(75, 21);
    this->comboBox1->TabIndex = 1;
    this->comboBox1->SelectedIndexChanged += gcnew System::EventHandler(this,
&Form1::comboBox1_SelectedIndexChanged);
    //
    // button1
    //
    this->button1->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 8.25F,
System::Drawing::FontStyle::Bold, System::Drawing::GraphicsUnit::Point,
    static_cast<System::Byte>(0)));
    this->button1->Location = System::Drawing::Point(25, 613);
    this->button1->Name = L"button1";
    this->button1->Size = System::Drawing::Size(75, 23);
    this->button1->TabIndex = 2;
    this->button1->Text = L"Open Port";
    this->button1->UseVisualStyleBackColor = true;
    this->button1->Click += gcnew System::EventHandler(this, &Form1::button1_Click);
    //

```

```

// button2
//
this->button2->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 8.25F,
System::Drawing::FontStyle::Bold, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->button2->Location = System::Drawing::Point(120, 613);
this->button2->Name = L"button2";
this->button2->Size = System::Drawing::Size(75, 23);
this->button2->TabIndex = 3;
this->button2->Text = L"Close Port";
this->button2->UseVisualStyleBackColor = true;
this->button2->Click += gcnew System::EventHandler(this, &Form1::button2_Click);
//
// label1
//
this->label1->AutoSize = true;
this->label1->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 8.25F,
System::Drawing::FontStyle::Bold, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label1->Location = System::Drawing::Point(57, 553);
this->label1->Name = L"label1";
this->label1->Size = System::Drawing::Size(104, 13);
this->label1->TabIndex = 4;
this->label1->Text = L"PORT CONTROL";
//
// listBox1
//
this->listBox1->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox1->FormattingEnabled = true;
this->listBox1->ItemHeight = 25;
this->listBox1->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox1->Location = System::Drawing::Point(940, 72);
this->listBox1->MultiColumn = true;
this->listBox1->Name = L"listBox1";
this->listBox1->Size = System::Drawing::Size(75, 29);
this->listBox1->TabIndex = 5;
//
// timer1
//
this->timer1->Interval = 500;
this->timer1->Tick += gcnew System::EventHandler(this, &Form1::timer1_Tick);
//
// zg1
//
this->zg1->Location = System::Drawing::Point(236, 39);
this->zg1->Name = L"zg1";
this->zg1->ScrollGrace = 0;
this->zg1->ScrollMaxX = 0;
this->zg1->ScrollMaxY = 0;
this->zg1->ScrollMaxY2 = 0;
this->zg1->ScrollMinX = 0;
this->zg1->ScrollMinY = 0;
this->zg1->ScrollMinY2 = 0;
this->zg1->Size = System::Drawing::Size(622, 329);
this->zg1->TabIndex = 8;
//
// zg2
//

```

```

this->zg2->Location = System::Drawing::Point(236, 374);
this->zg2->Name = L"zg2";
this->zg2->ScrollGrace = 0;
this->zg2->ScrollMaxX = 0;
this->zg2->ScrollMaxY = 0;
this->zg2->ScrollMaxY2 = 0;
this->zg2->ScrollMinX = 0;
this->zg2->ScrollMinY = 0;
this->zg2->ScrollMinY2 = 0;
this->zg2->Size = System::Drawing::Size(622, 329);
this->zg2->TabIndex = 10;
//
// label2
//
this->label2->AutoSize = true;
this->label2->Font = (gcnew System::Drawing::Font(L"Haettenschweiler", 23,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label2->ForeColor = System::Drawing::Color::Blue;
this->label2->Location = System::Drawing::Point(959, 28);
this->label2->Name = L"label2";
this->label2->Size = System::Drawing::Size(238, 33);
this->label2->TabIndex = 11;
this->label2->Text = L"Fundamental Frequency";
//
// pictureBox1
//
this->pictureBox1->Image = (cli::safe_cast<System::Drawing::Image^ >(resources-
>GetObject(L"pictureBox1.Image")));
this->pictureBox1->Location = System::Drawing::Point(44, 17);
this->pictureBox1->Name = L"pictureBox1";
this->pictureBox1->Size = System::Drawing::Size(138, 139);
this->pictureBox1->SizeMode =
System::Windows::Forms::PictureBoxSizeMode::StretchImage;
this->pictureBox1->TabIndex = 12;
this->pictureBox1->TabStop = false;
//
// listBox2
//
this->listBox2->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox2->FormattingEnabled = true;
this->listBox2->ItemHeight = 25;
this->listBox2->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox2->Location = System::Drawing::Point(931, 167);
this->listBox2->MultiColumn = true;
this->listBox2->Name = L"listBox2";
this->listBox2->Size = System::Drawing::Size(63, 29);
this->listBox2->TabIndex = 16;
//
// listBox3
//
this->listBox3->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox3->FormattingEnabled = true;
this->listBox3->ItemHeight = 25;
this->listBox3->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox3->Location = System::Drawing::Point(931, 202);

```

```

this->listBox3->MultiColumn = true;
this->listBox3->Name = L"listBox3";
this->listBox3->Size = System::Drawing::Size(63, 29);
this->listBox3->TabIndex = 18;
//
// listBox4
//
this->listBox4->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox4->FormattingEnabled = true;
this->listBox4->ItemHeight = 25;
this->listBox4->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox4->Location = System::Drawing::Point(931, 237);
this->listBox4->MultiColumn = true;
this->listBox4->Name = L"listBox4";
this->listBox4->Size = System::Drawing::Size(63, 29);
this->listBox4->TabIndex = 17;
//
// listBox5
//
this->listBox5->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox5->FormattingEnabled = true;
this->listBox5->ItemHeight = 25;
this->listBox5->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox5->Location = System::Drawing::Point(931, 272);
this->listBox5->MultiColumn = true;
this->listBox5->Name = L"listBox5";
this->listBox5->Size = System::Drawing::Size(63, 29);
this->listBox5->TabIndex = 22;
//
// listBox6
//
this->listBox6->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox6->FormattingEnabled = true;
this->listBox6->ItemHeight = 25;
this->listBox6->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox6->Location = System::Drawing::Point(931, 307);
this->listBox6->MultiColumn = true;
this->listBox6->Name = L"listBox6";
this->listBox6->Size = System::Drawing::Size(63, 29);
this->listBox6->TabIndex = 21;
//
// listBox7
//
this->listBox7->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox7->FormattingEnabled = true;
this->listBox7->ItemHeight = 25;
this->listBox7->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox7->Location = System::Drawing::Point(931, 342);
this->listBox7->MultiColumn = true;
this->listBox7->Name = L"listBox7";
this->listBox7->Size = System::Drawing::Size(63, 29);
this->listBox7->TabIndex = 20;

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//
// listBox8
//
this->listBox8->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox8->FormattingEnabled = true;
this->listBox8->ItemHeight = 25;
this->listBox8->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox8->Location = System::Drawing::Point(931, 377);
this->listBox8->MultiColumn = true;
this->listBox8->Name = L"listBox8";
this->listBox8->Size = System::Drawing::Size(63, 29);
this->listBox8->TabIndex = 19;
//
// listBox9
//
this->listBox9->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox9->FormattingEnabled = true;
this->listBox9->ItemHeight = 25;
this->listBox9->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox9->Location = System::Drawing::Point(931, 410);
this->listBox9->MultiColumn = true;
this->listBox9->Name = L"listBox9";
this->listBox9->Size = System::Drawing::Size(63, 29);
this->listBox9->TabIndex = 23;
//
// listBox10
//
this->listBox10->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox10->FormattingEnabled = true;
this->listBox10->ItemHeight = 25;
this->listBox10->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox10->Location = System::Drawing::Point(931, 447);
this->listBox10->MultiColumn = true;
this->listBox10->Name = L"listBox10";
this->listBox10->Size = System::Drawing::Size(63, 29);
this->listBox10->TabIndex = 24;
//
// listBox11
//
this->listBox11->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox11->FormattingEnabled = true;
this->listBox11->ItemHeight = 25;
this->listBox11->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox11->Location = System::Drawing::Point(1141, 167);
this->listBox11->MultiColumn = true;
this->listBox11->Name = L"listBox11";
this->listBox11->Size = System::Drawing::Size(63, 29);
this->listBox11->TabIndex = 34;
//
// listBox12
//

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    this->listBox12->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
    static_cast<System::Byte>(0)));
    this->listBox12->FormattingEnabled = true;
    this->listBox12->ItemHeight = 25;
    this->listBox12->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
    this->listBox12->Location = System::Drawing::Point(1141, 202);
    this->listBox12->MultiColumn = true;
    this->listBox12->Name = L"listBox12";
    this->listBox12->Size = System::Drawing::Size(63, 29);
    this->listBox12->TabIndex = 33;
    //
    // listBox13
    this->listBox13->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
    static_cast<System::Byte>(0)));
    this->listBox13->FormattingEnabled = true;
    this->listBox13->ItemHeight = 25;
    this->listBox13->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
    this->listBox13->Location = System::Drawing::Point(1141, 235);
    this->listBox13->MultiColumn = true;
    this->listBox13->Name = L"listBox13";
    this->listBox13->Size = System::Drawing::Size(63, 29);
    this->listBox13->TabIndex = 32;
    //
    // listBox14
    this->listBox14->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
    static_cast<System::Byte>(0)));
    this->listBox14->FormattingEnabled = true;
    this->listBox14->ItemHeight = 25;
    this->listBox14->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
    this->listBox14->Location = System::Drawing::Point(1141, 272);
    this->listBox14->MultiColumn = true;
    this->listBox14->Name = L"listBox14";
    this->listBox14->Size = System::Drawing::Size(63, 29);
    this->listBox14->TabIndex = 31;
    //
    // listBox15
    this->listBox15->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
    static_cast<System::Byte>(0)));
    this->listBox15->FormattingEnabled = true;
    this->listBox15->ItemHeight = 25;
    this->listBox15->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
    this->listBox15->Location = System::Drawing::Point(1141, 307);
    this->listBox15->MultiColumn = true;
    this->listBox15->Name = L"listBox15";
    this->listBox15->Size = System::Drawing::Size(63, 29);
    this->listBox15->TabIndex = 30;
    //
    // listBox16
    this->listBox16->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
    static_cast<System::Byte>(0)));
    this->listBox16->FormattingEnabled = true;

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this->listBox16->ItemHeight = 25;
this->listBox16->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox16->Location = System::Drawing::Point(1141, 342);
this->listBox16->MultiColumn = true;
this->listBox16->Name = L"listBox16";
this->listBox16->Size = System::Drawing::Size(63, 29);
this->listBox16->TabIndex = 29;
//
// listBox17
//
this->listBox17->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox17->FormattingEnabled = true;
this->listBox17->ItemHeight = 25;
this->listBox17->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox17->Location = System::Drawing::Point(1141, 377);
this->listBox17->MultiColumn = true;
this->listBox17->Name = L"listBox17";
this->listBox17->Size = System::Drawing::Size(63, 29);
this->listBox17->TabIndex = 28;
//
// listBox18
//
this->listBox18->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox18->FormattingEnabled = true;
this->listBox18->ItemHeight = 25;
this->listBox18->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox18->Location = System::Drawing::Point(1141, 410);
this->listBox18->MultiColumn = true;
this->listBox18->Name = L"listBox18";
this->listBox18->Size = System::Drawing::Size(63, 29);
this->listBox18->TabIndex = 27;
//
// listBox19
//
this->listBox19->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox19->FormattingEnabled = true;
this->listBox19->ItemHeight = 25;
this->listBox19->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox19->Location = System::Drawing::Point(1141, 445);
this->listBox19->MultiColumn = true;
this->listBox19->Name = L"listBox19";
this->listBox19->Size = System::Drawing::Size(63, 29);
this->listBox19->TabIndex = 26;
//
// listBox20
//
this->listBox20->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox20->FormattingEnabled = true;
this->listBox20->ItemHeight = 25;
this->listBox20->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox20->Location = System::Drawing::Point(1141, 482);
this->listBox20->MultiColumn = true;

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this->listBox20->Name = L"listBox20";
this->listBox20->Size = System::Drawing::Size(63, 29);
this->listBox20->TabIndex = 25;
//
// listBox21
//
this->listBox21->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBox21->FormattingEnabled = true;
this->listBox21->ItemHeight = 25;
this->listBox21->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBox21->Location = System::Drawing::Point(1023, 589);
this->listBox21->Name = L"listBox21";
this->listBox21->Size = System::Drawing::Size(66, 29);
this->listBox21->TabIndex = 35;
//
// label3
//
this->label3->AutoSize = true;
this->label3->Font = (gcnew System::Drawing::Font(L"Haettenschweiler", 23,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label3->ForeColor = System::Drawing::Color::Blue;
this->label3->Location = System::Drawing::Point(932, 553);
this->label3->Name = L"label3";
this->label3->Size = System::Drawing::Size(258, 33);
this->label3->TabIndex = 36;
this->label3->Text = L"Total Harmonic Distortion";
//
// label4
//
this->label4->AutoSize = true;
this->label4->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label4->Location = System::Drawing::Point(1095, 592);
this->label4->Name = L"label4";
this->label4->Size = System::Drawing::Size(29, 24);
this->label4->TabIndex = 37;
this->label4->Text = L"%";
//
// label5
//
this->label5->AutoSize = true;
this->label5->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label5->Location = System::Drawing::Point(1021, 77);
this->label5->Name = L"label5";
this->label5->Size = System::Drawing::Size(41, 24);
this->label5->TabIndex = 38;
this->label5->Text = L"Hz";
//
// label20
//
this->label20->AutoSize = true;
this->label20->Font = (gcnew System::Drawing::Font(L"Haettenschweiler", 23,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));

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this->label20->ForeColor = System::Drawing::Color::Blue;
this->label20->Location = System::Drawing::Point(997, 123);
this->label20->Name = L"label20";
this->label20->Size = System::Drawing::Size(115, 33);
this->label20->TabIndex = 53;
this->label20->Text = L"Harmonics";
//
// label6
//
this->label6->AutoSize = true;
this->label6->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label6->Location = System::Drawing::Point(875, 172);
this->label6->Name = L"label6";
this->label6->Size = System::Drawing::Size(56, 24);
this->label6->TabIndex = 71;
this->label6->Text = L"2nd";
//
// label7
//
this->label7->AutoSize = true;
this->label7->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label7->Location = System::Drawing::Point(875, 207);
this->label7->Name = L"label7";
this->label7->Size = System::Drawing::Size(51, 24);
this->label7->TabIndex = 70;
this->label7->Text = L"3rd";
//
// label8
//
this->label8->AutoSize = true;
this->label8->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label8->Location = System::Drawing::Point(875, 242);
this->label8->Name = L"label8";
this->label8->Size = System::Drawing::Size(49, 24);
this->label8->TabIndex = 69;
this->label8->Text = L"4th";
//
// label9
//
this->label9->AutoSize = true;
this->label9->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label9->Location = System::Drawing::Point(875, 277);
this->label9->Name = L"label9";
this->label9->Size = System::Drawing::Size(49, 24);
this->label9->TabIndex = 68;
this->label9->Text = L"5th";
//
// label30
//
this->label30->AutoSize = true;
this->label30->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

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        static_cast<System::Byte>(0));
this->label30->Location = System::Drawing::Point(875, 312);
this->label30->Name = L"label30";
this->label30->Size = System::Drawing::Size(49, 24);
this->label30->TabIndex = 67;
this->label30->Text = L"6th";
//
// label31
//
this->label31->AutoSize = true;
this->label31->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label31->Location = System::Drawing::Point(875, 347);
this->label31->Name = L"label31";
this->label31->Size = System::Drawing::Size(49, 24);
this->label31->TabIndex = 66;
this->label31->Text = L"7th";
//
// label32
//
this->label32->AutoSize = true;
this->label32->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label32->Location = System::Drawing::Point(875, 382);
this->label32->Name = L"label32";
this->label32->Size = System::Drawing::Size(49, 24);
this->label32->TabIndex = 65;
this->label32->Text = L"8th";
//
// label33
//
this->label33->AutoSize = true;
this->label33->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label33->Location = System::Drawing::Point(875, 415);
this->label33->Name = L"label33";
this->label33->Size = System::Drawing::Size(49, 24);
this->label33->TabIndex = 64;
this->label33->Text = L"9th";
//
// label34
//
this->label34->AutoSize = true;
this->label34->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label34->Location = System::Drawing::Point(863, 452);
this->label34->Name = L"label34";
this->label34->Size = System::Drawing::Size(63, 24);
this->label34->TabIndex = 63;
this->label34->Text = L"10th";
//
// label35
//
this->label35->AutoSize = true;
this->label35->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

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        static_cast<System::Byte>(0));
this->label35->Location = System::Drawing::Point(1072, 167);
this->label35->Name = L"label35";
this->label35->Size = System::Drawing::Size(63, 24);
this->label35->TabIndex = 81;
this->label35->Text = L"11th";
//
// label36
//
this->label36->AutoSize = true;
this->label36->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label36->Location = System::Drawing::Point(1072, 202);
this->label36->Name = L"label36";
this->label36->Size = System::Drawing::Size(63, 24);
this->label36->TabIndex = 80;
this->label36->Text = L"12th";
//
// label37
//
this->label37->AutoSize = true;
this->label37->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label37->Location = System::Drawing::Point(1072, 237);
this->label37->Name = L"label37";
this->label37->Size = System::Drawing::Size(63, 24);
this->label37->TabIndex = 79;
this->label37->Text = L"13th";
//
// label38
//
this->label38->AutoSize = true;
this->label38->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label38->Location = System::Drawing::Point(1072, 272);
this->label38->Name = L"label38";
this->label38->Size = System::Drawing::Size(63, 24);
this->label38->TabIndex = 78;
this->label38->Text = L"14th";
//
// label39
//
this->label39->AutoSize = true;
this->label39->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label39->Location = System::Drawing::Point(1072, 307);
this->label39->Name = L"label39";
this->label39->Size = System::Drawing::Size(63, 24);
this->label39->TabIndex = 77;
this->label39->Text = L"15th";
//
// label40
//
this->label40->AutoSize = true;
this->label40->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

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        static_cast<System::Byte>(0));
this->label40->Location = System::Drawing::Point(1072, 342);
this->label40->Name = L"label40";
this->label40->Size = System::Drawing::Size(63, 24);
this->label40->TabIndex = 76;
this->label40->Text = L"16th";
//
// label41
//
this->label41->AutoSize = true;
this->label41->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label41->Location = System::Drawing::Point(1072, 377);
this->label41->Name = L"label41";
this->label41->Size = System::Drawing::Size(63, 24);
this->label41->TabIndex = 75;
this->label41->Text = L"17th";
//
// label42
//
this->label42->AutoSize = true;
this->label42->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label42->Location = System::Drawing::Point(1072, 410);
this->label42->Name = L"label42";
this->label42->Size = System::Drawing::Size(63, 24);
this->label42->TabIndex = 74;
this->label42->Text = L"18th";
//
// label43
//
this->label43->AutoSize = true;
this->label43->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label43->Location = System::Drawing::Point(1072, 447);
this->label43->Name = L"label43";
this->label43->Size = System::Drawing::Size(63, 24);
this->label43->TabIndex = 73;
this->label43->Text = L"19th";
//
// label44
//
this->label44->AutoSize = true;
this->label44->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label44->Location = System::Drawing::Point(1072, 482);
this->label44->Name = L"label44";
this->label44->Size = System::Drawing::Size(63, 24);
this->label44->TabIndex = 72;
this->label44->Text = L"20th";
//
// label45
//
this->label45->AutoSize = true;
this->label45->Font = (gcnew System::Drawing::Font(L"Haettenschweiler", 23,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

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        static_cast<System::Byte>(0));
this->label45->ForeColor = System::Drawing::Color::Blue;
this->label45->Location = System::Drawing::Point(437, 1);
this->label45->Name = L"label45";
this->label45->Size = System::Drawing::Size(200, 33);
this->label45->TabIndex = 82;
this->label45->Text = L"Spectrum Analyzer";
//
// label46
//
this->label46->AutoSize = true;
this->label46->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 10,
System::Drawing::FontStyle::Bold, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label46->Location = System::Drawing::Point(56, 163);
this->label46->Name = L"label46";
this->label46->Size = System::Drawing::Size(117, 17);
this->label46->TabIndex = 83;
this->label46->Text = L"Teknik Elektro ";
//
// label47
//
this->label47->AutoSize = true;
this->label47->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 10,
System::Drawing::FontStyle::Bold, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label47->Location = System::Drawing::Point(39, 180);
this->label47->Name = L"label47";
this->label47->Size = System::Drawing::Size(145, 17);
this->label47->TabIndex = 84;
this->label47->Text = L"Universitas Kristen";
//
// label48
//
this->label48->AutoSize = true;
this->label48->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 10,
System::Drawing::FontStyle::Bold, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label48->Location = System::Drawing::Point(65, 197);
this->label48->Name = L"label48";
this->label48->Size = System::Drawing::Size(85, 17);
this->label48->TabIndex = 85;
this->label48->Text = L"Maranatha";
//
// label49
//
this->label49->AutoSize = true;
this->label49->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 10,
System::Drawing::FontStyle::Bold, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label49->Location = System::Drawing::Point(56, 225);
this->label49->Name = L"label49";
this->label49->Size = System::Drawing::Size(110, 17);
this->label49->TabIndex = 86;
this->label49->Text = L"Lukas Marbun";
//
// label50
//
this->label50->AutoSize = true;

```

```

        this->label50->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 10,
System::Drawing::FontStyle::Bold, System::Drawing::GraphicsUnit::Point,
        static_cast<System::Byte>(0)));
        this->label50->Location = System::Drawing::Point(72, 242);
        this->label50->Name = L"label50";
        this->label50->Size = System::Drawing::Size(71, 17);
        this->label50->TabIndex = 87;
        this->label50->Text = L"0722009";
        //
        // label51
        //
        this->label51->AutoSize = true;
        this->label51->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 10,
System::Drawing::FontStyle::Bold, System::Drawing::GraphicsUnit::Point,
        static_cast<System::Byte>(0)));
        this->label51->Location = System::Drawing::Point(4, 291);
        this->label51->Name = L"label51";
        this->label51->Size = System::Drawing::Size(231, 17);
        this->label51->TabIndex = 88;
        this->label51->Text = L"Ir. Drs. Hanapi Gunawan, M.Sc";
        //
        // label52
        //
        this->label52->AutoSize = true;
        this->label52->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 10,
System::Drawing::FontStyle::Bold, System::Drawing::GraphicsUnit::Point,
        static_cast<System::Byte>(0)));
        this->label52->Location = System::Drawing::Point(59, 274);
        this->label52->Name = L"label52";
        this->label52->Size = System::Drawing::Size(100, 17);
        this->label52->TabIndex = 89;
        this->label52->Text = L"Pembimbing:";
        //
        // listBoxguna
        //
        this->listBoxguna->FormattingEnabled = true;
        this->listBoxguna->Items->AddRange(gcnew cli::array< System::Object^ >(19) {L"1.Klik
ComboBox pada Port", L"  Control dibawah, untuk",
        L"  memilih COM port yang sesuai.", L"", L"2.Klik tombol Open Port, untuk", L"
memulai Spectrum Analyzer.", L"", L"3. Spectrum Analyzer akan mulai ",
        L"  menampilkan grafik sinyal input, ", L"  spektrum frekuensi, frekuensi ", L"
fundamental, harmonisa, dan THD.", L"",
        L"4. Untuk Menghentikan Spectrum ", L"  Analyzer, klik tombol Close Port.", L"",
L"5. Untuk keluar dari aplikasi ini, klik",
        L"  tombol EXIT", L"", L" "});
        this->listBoxguna->Location = System::Drawing::Point(15, 382);
        this->listBoxguna->Name = L"listBoxguna";
        this->listBoxguna->ScrollAlwaysVisible = true;
        this->listBoxguna->Size = System::Drawing::Size(203, 147);
        this->listBoxguna->TabIndex = 90;
        //
        // label53
        //
        this->label53->AutoSize = true;
        this->label53->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 10,
System::Drawing::FontStyle::Bold, System::Drawing::GraphicsUnit::Point,
        static_cast<System::Byte>(0)));
        this->label53->Location = System::Drawing::Point(26, 347);
        this->label53->Name = L"label53";
        this->label53->Size = System::Drawing::Size(170, 17);

```

```

this->label53->TabIndex = 91;
this->label53->Text = L"Instruksi Penggunaan:";
//
// listBoxa
//
this->listBoxa->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->listBoxa->FormattingEnabled = true;
this->listBoxa->ItemHeight = 25;
this->listBoxa->Items->AddRange(gcnew cli::array< System::Object^ >(1) {L"0"});
this->listBoxa->Location = System::Drawing::Point(1083, 73);
this->listBoxa->MultiColumn = true;
this->listBoxa->Name = L"listBoxa";
this->listBoxa->Size = System::Drawing::Size(75, 29);
this->listBoxa->TabIndex = 94;
//
// label54
//
this->label54->AutoSize = true;
this->label54->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label54->Location = System::Drawing::Point(1164, 78);
this->label54->Name = L"label54";
this->label54->Size = System::Drawing::Size(57, 24);
this->label54->TabIndex = 95;
this->label54->Text = L"Volt";
//
// label10
//
this->label10->AutoSize = true;
this->label10->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label10->Location = System::Drawing::Point(998, 173);
this->label10->Name = L"label10";
this->label10->Size = System::Drawing::Size(57, 24);
this->label10->TabIndex = 96;
this->label10->Text = L"Volt";
//
// label11
//
this->label11->AutoSize = true;
this->label11->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label11->Location = System::Drawing::Point(998, 453);
this->label11->Name = L"label11";
this->label11->Size = System::Drawing::Size(57, 24);
this->label11->TabIndex = 97;
this->label11->Text = L"Volt";
//
// label12
//
this->label12->AutoSize = true;
this->label12->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label12->Location = System::Drawing::Point(998, 416);

```

```

this->label12->Name = L"label12";
this->label12->Size = System::Drawing::Size(57, 24);
this->label12->TabIndex = 98;
this->label12->Text = L"Volt";
//
// label13
//
this->label13->AutoSize = true;
this->label13->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label13->Location = System::Drawing::Point(998, 383);
this->label13->Name = L"label13";
this->label13->Size = System::Drawing::Size(57, 24);
this->label13->TabIndex = 99;
this->label13->Text = L"Volt";
//
// label14
//
this->label14->AutoSize = true;
this->label14->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label14->Location = System::Drawing::Point(998, 350);
this->label14->Name = L"label14";
this->label14->Size = System::Drawing::Size(57, 24);
this->label14->TabIndex = 100;
this->label14->Text = L"Volt";
//
// label15
//
this->label15->AutoSize = true;
this->label15->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label15->Location = System::Drawing::Point(998, 313);
this->label15->Name = L"label15";
this->label15->Size = System::Drawing::Size(57, 24);
this->label15->TabIndex = 101;
this->label15->Text = L"Volt";
//
// label16
//
this->label16->AutoSize = true;
this->label16->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label16->Location = System::Drawing::Point(998, 278);
this->label16->Name = L"label16";
this->label16->Size = System::Drawing::Size(57, 24);
this->label16->TabIndex = 102;
this->label16->Text = L"Volt";
//
// label17
//
this->label17->AutoSize = true;
this->label17->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label17->Location = System::Drawing::Point(998, 243);

```

```

this->label17->Name = L"label17";
this->label17->Size = System::Drawing::Size(57, 24);
this->label17->TabIndex = 103;
this->label17->Text = L"Volt";
//
// label18
//
this->label18->AutoSize = true;
this->label18->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label18->Location = System::Drawing::Point(998, 207);
this->label18->Name = L"label18";
this->label18->Size = System::Drawing::Size(57, 24);
this->label18->TabIndex = 104;
this->label18->Text = L"Volt";
//
// label19
//
this->label19->AutoSize = true;
this->label19->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label19->Location = System::Drawing::Point(1207, 486);
this->label19->Name = L"label19";
this->label19->Size = System::Drawing::Size(57, 24);
this->label19->TabIndex = 105;
this->label19->Text = L"Volt";
//
// label21
//
this->label21->AutoSize = true;
this->label21->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label21->Location = System::Drawing::Point(1206, 207);
this->label21->Name = L"label21";
this->label21->Size = System::Drawing::Size(57, 24);
this->label21->TabIndex = 114;
this->label21->Text = L"Volt";
//
// label22
//
this->label22->AutoSize = true;
this->label22->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label22->Location = System::Drawing::Point(1206, 241);
this->label22->Name = L"label22";
this->label22->Size = System::Drawing::Size(57, 24);
this->label22->TabIndex = 113;
this->label22->Text = L"Volt";
//
// label23
//
this->label23->AutoSize = true;
this->label23->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label23->Location = System::Drawing::Point(1206, 276);

```

```

this->label23->Name = L"label23";
this->label23->Size = System::Drawing::Size(57, 24);
this->label23->TabIndex = 112;
this->label23->Text = L"Volt";
//
// label24
//
this->label24->AutoSize = true;
this->label24->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label24->Location = System::Drawing::Point(1206, 311);
this->label24->Name = L"label24";
this->label24->Size = System::Drawing::Size(57, 24);
this->label24->TabIndex = 111;
this->label24->Text = L"Volt";
//
// label25
//
this->label25->AutoSize = true;
this->label25->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label25->Location = System::Drawing::Point(1206, 348);
this->label25->Name = L"label25";
this->label25->Size = System::Drawing::Size(57, 24);
this->label25->TabIndex = 110;
this->label25->Text = L"Volt";
//
// label26
//
this->label26->AutoSize = true;
this->label26->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label26->Location = System::Drawing::Point(1206, 381);
this->label26->Name = L"label26";
this->label26->Size = System::Drawing::Size(57, 24);
this->label26->TabIndex = 109;
this->label26->Text = L"Volt";
//
// label27
//
this->label27->AutoSize = true;
this->label27->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label27->Location = System::Drawing::Point(1206, 414);
this->label27->Name = L"label27";
this->label27->Size = System::Drawing::Size(57, 24);
this->label27->TabIndex = 108;
this->label27->Text = L"Volt";
//
// label28
//
this->label28->AutoSize = true;
this->label28->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));

```

```

this->label28->Location = System::Drawing::Point(1206, 451);
this->label28->Name = L"label28";
this->label28->Size = System::Drawing::Size(57, 24);
this->label28->TabIndex = 107;
this->label28->Text = L"Volt";
//
// label29
//
this->label29->AutoSize = true;
this->label29->Font = (gcnew System::Drawing::Font(L"Rockwell Extra Bold", 15,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
this->label29->Location = System::Drawing::Point(1206, 171);
this->label29->Name = L"label29";
this->label29->Size = System::Drawing::Size(57, 24);
this->label29->TabIndex = 106;
this->label29->Text = L"Volt";
//
// listBox
//
this->listBox->FormattingEnabled = true;
this->listBox->Location = System::Drawing::Point(7, 7);
this->listBox->MultiColumn = true;
this->listBox->Name = L"listBox";
this->listBox->Size = System::Drawing::Size(218, 4);
this->listBox->TabIndex = 115;
//
// Form1
//
this->AutoScaleDimensions = System::Drawing::SizeF(6, 13);
this->AutoScaleMode = System::Windows::Forms::AutoScaleMode::Font;
this->ClientSize = System::Drawing::Size(1281, 709);
this->Controls->Add(this->listBox);
this->Controls->Add(this->label21);
this->Controls->Add(this->label22);
this->Controls->Add(this->label23);
this->Controls->Add(this->label24);
this->Controls->Add(this->label25);
this->Controls->Add(this->label26);
this->Controls->Add(this->label27);
this->Controls->Add(this->label28);
this->Controls->Add(this->label29);
this->Controls->Add(this->label19);
this->Controls->Add(this->label18);
this->Controls->Add(this->label17);
this->Controls->Add(this->label16);
this->Controls->Add(this->label15);
this->Controls->Add(this->label14);
this->Controls->Add(this->label13);
this->Controls->Add(this->label12);
this->Controls->Add(this->label11);
this->Controls->Add(this->label10);
this->Controls->Add(this->label54);
this->Controls->Add(this->listBoxa);
this->Controls->Add(this->label53);
this->Controls->Add(this->listBoxguna);
this->Controls->Add(this->label52);
this->Controls->Add(this->label51);
this->Controls->Add(this->label50);
this->Controls->Add(this->label49);

```

```
this->Controls->Add(this->label48);
this->Controls->Add(this->label47);
this->Controls->Add(this->label46);
this->Controls->Add(this->label45);
this->Controls->Add(this->label35);
this->Controls->Add(this->label36);
this->Controls->Add(this->label37);
this->Controls->Add(this->label38);
this->Controls->Add(this->label39);
this->Controls->Add(this->label40);
this->Controls->Add(this->label41);
this->Controls->Add(this->label42);
this->Controls->Add(this->label43);
this->Controls->Add(this->label44);
this->Controls->Add(this->label6);
this->Controls->Add(this->label7);
this->Controls->Add(this->label8);
this->Controls->Add(this->label9);
this->Controls->Add(this->label30);
this->Controls->Add(this->label31);
this->Controls->Add(this->label32);
this->Controls->Add(this->label33);
this->Controls->Add(this->label34);
this->Controls->Add(this->label20);
this->Controls->Add(this->label5);
this->Controls->Add(this->label4);
this->Controls->Add(this->label3);
this->Controls->Add(this->listBox21);
this->Controls->Add(this->listBox11);
this->Controls->Add(this->listBox12);
this->Controls->Add(this->listBox13);
this->Controls->Add(this->listBox14);
this->Controls->Add(this->listBox15);
this->Controls->Add(this->listBox16);
this->Controls->Add(this->listBox17);
this->Controls->Add(this->listBox18);
this->Controls->Add(this->listBox19);
this->Controls->Add(this->listBox20);
this->Controls->Add(this->listBox10);
this->Controls->Add(this->listBox9);
this->Controls->Add(this->listBox5);
this->Controls->Add(this->listBox6);
this->Controls->Add(this->listBox7);
this->Controls->Add(this->listBox8);
this->Controls->Add(this->listBox3);
this->Controls->Add(this->listBox4);
this->Controls->Add(this->listBox2);
this->Controls->Add(this->pictureBox1);
this->Controls->Add(this->label2);
this->Controls->Add(this->zg2);
this->Controls->Add(this->zg1);
this->Controls->Add(this->listBox1);
this->Controls->Add(this->label1);
this->Controls->Add(this->button2);
this->Controls->Add(this->button1);
this->Controls->Add(this->comboBox1);
this->Controls->Add(this->EXIT);
this->Font = (gnew System::Drawing::Font(L"Microsoft Sans Serif", 8.25F,
System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
static_cast<System::Byte>(0)));
```

```

        this->Name = L"Form1";
        this->StartPosition = System::Windows::Forms::FormStartPosition::CenterScreen;
        this->Text = L"Spectrum Analyzer";
        this->Load += gcnew System::EventHandler(this, &Form1::Form1_Load);
        this->Resize += gcnew System::EventHandler(this, &Form1::Form1_Resize);
        (cli::safe_cast<System::ComponentModel::ISupportInitialize^ >(this->pictureBox1))-
>EndInit();
        this->ResumeLayout(false);
        this->PerformLayout();
    }

#pragma endregion
    private: System::Void EXIT_Click(System::Object^ sender, System::EventArgs^ e) {
        Close();
    }
    private: System::Void comboBox1_SelectedIndexChanged(System::Object^ sender,
System::EventArgs^ e) {
        serialPort1->PortName=(comboBox1->SelectedItem->ToString());
    }
    private: System::Void button1_Click(System::Object^ sender, System::EventArgs^ e) {
        serialPort1->Open();
        button1->Enabled=false;
        timer1->Enabled= true;
        timer1->Interval = 1000;
    }
    private: System::Void button2_Click(System::Object^ sender, System::EventArgs^ e) {
        serialPort1->Close();
        button1->Enabled=true;
        timer1->Enabled= false;
    }

    private: System::Void serialPort1_DataReceived(System::Object^ sender,
System::IO::Ports::SerialDataReceivedEventArgs^ e) {
    }
    private: System::Void timer1_Tick(System::Object^ sender, System::EventArgs^ e) {

        array<unsigned char>^simpan= gcnew array<unsigned char>(30000);
        array<double>^simpan1= gcnew array<double>(2049);

        serialPort1->Read(simpan,0,10000);

        enum BOOLEAN {FALSE , TRUE};
        int u=0;
        int k, i, l;

        while(TRUE)
        {
            if(simpan[u]==255 && simpan[u+1]==255)
                break;
            u++;
        }

        for(i=u+2 , k=u+3 , l=0 ; i<9000, k<9000 , l<1024 ;i+=4 , k+=4 , l++)
        {
            simpan1[l]=((((simpan[i]+(simpan[k]*256))*5.2)/1024))-2.5;
        }
    }

```

```

listBoxb->Items->Clear();
for(k=0;k<1024;k++)
    listBoxb->Items->Add(simpan1[k]);

array<double>^p= gcnew array<double>(3000);
array<double>^x= gcnew array<double>(3000);
for ( int h = 0; h <200; h++ )
    {p[h]=simpan1[h];
    }
for ( int z = 0; z <201; z++ )
    {x[z]=z;
    }

zg1->GraphPane->CurveList->Clear();
zg1->GraphPane->AddCurve("Alpha",x, p,Color::Red,SymbolType::VDash);
zg1->GraphPane->Legend->IsVisible=false;
zg1->AxisChange();
zg1->Invalidate();

int isign=1;
int nn=1024;
int n, mmax, m, j, istep;
double wtemp, wr, wpr, wpi, wi, theta;
double tempr, tempi;

array<double>^data1= gcnew array<double>(9000);
array<float>^data2= gcnew array<float>(6000);
array<float>^data3= gcnew array<float>(20000);
array<float>^amp= gcnew array<float>(1500);
array<double>^x1= gcnew array<double>(3000);
array<double>^y1= gcnew array<double>(3000);

for(i=0; i<1024; i++)
{
    data1[2*i+1] = simpan1[i];
    data1[2*i+2] = 0.0;
}

n = nn << 1;
j = 1;
for (i = 1; i < n; i += 2) {
    if (j > i) {
        tempr = data1[j]; data1[j] = data1[i]; data1[i] = tempr;
        tempr = data1[j+1]; data1[j+1] = data1[i+1]; data1[i+1] = tempr;
    }
    m = n >> 1;
    while (m >= 2 && j > m) {
        j -= m;

```

```

        m >>= 1;
    }
    j += m;
}

    mmax = 2;
while (n > mmax) {
    istep = 2*mmax;
    theta = ((Math::PI)*2)/(isign*mmax);
    wtemp = sin(0.5*theta);
    wpr = -2.0*wtemp*wtemp;
    wpi = sin(theta);
    wr = 1.0;
    wi = 0.0;
    for (m = 1; m < mmax; m += 2) {
        for (i = m; i <= n; i += istep) {
            j = i + mmax;
            tempr = wr*data1[j] - wi*data1[j+1];
            tempi = wr*data1[j+1] + wi*data1[j];
            data1[j] = data1[i] - tempr;
            data1[j+1] = data1[i+1] - tempi;
            data1[i] += tempr;
            data1[i+1] += tempi;
        }
        wr = (wtemp = wr)*wpr - wi*wpi + wr;
        wi = wi*wpr + wtemp*wpi + wi;
    }
    mmax = istep;
}

    int z;
    double y;
    for(i=1,j=0 ; i<2049,j<1024 ; i+=2,j++)
        {data2[j]=((sqrt(pow(data1[i],2)+pow(data1[i+1],2))))*2)/1024;
        data3[j]=((sqrt(pow(data1[i],2)+pow(data1[i+1],2))))*2)/1024;}

    for ( z =0 ; z <513; z++ )
        {x1[z]=z;}

    for(i=0 ; i<512 ;i++)
        {y1[i]=data3[i];}

int flag = 1;
float temp;
int numLength = 1024;
for(i = 1; (i <= numLength) && flag; i++)
{
    flag = 0;
    for (j=0; j < (numLength - 1); j++)
    {
        if (data2[j+1] > data2[j])
        {
            temp = data2[j];
            data2[j] = data2[j+1];
            data2[j+1] = temp;

```

```
        flag = 1;
    }
}
}
```

```
float peak;
int harmonic;
```

```
peak=data2[0];
```

```
int t=1;
for(k=0 ; k<512 ; k++)
    {
        if(peak==data3[k])
            {harmonic=k;
              for(n=2;n<20;n++)
                { amp[t]=data3[k*n];
                  t++;}}}
```

```
listBox1->Items->Clear();
listBox1->Items->Add(harmonic);
listBoxa->Items->Clear();
listBoxa->Items->Add(peak);
```

```
listBox2->Items->Clear();
listBox2->Items->Add(amp[1]);
listBox3->Items->Clear();
listBox3->Items->Add(amp[2]);
listBox4->Items->Clear();
listBox4->Items->Add(amp[3]);
listBox5->Items->Clear();
listBox5->Items->Add(amp[4]);
listBox6->Items->Clear();
listBox6->Items->Add(amp[5]);
listBox7->Items->Clear();
listBox7->Items->Add(amp[6]);
listBox8->Items->Clear();
listBox8->Items->Add(amp[7]);
listBox9->Items->Clear();
listBox9->Items->Add(amp[8]);
listBox10->Items->Clear();
listBox10->Items->Add(amp[9]);
listBox11->Items->Clear();
listBox11->Items->Add(amp[10]);
listBox12->Items->Clear();
listBox12->Items->Add(amp[11]);
listBox13->Items->Clear();
listBox13->Items->Add(amp[12]);
listBox14->Items->Clear();
listBox14->Items->Add(amp[13]);
listBox15->Items->Clear();
listBox15->Items->Add(amp[14]);
listBox16->Items->Clear();
listBox16->Items->Add(amp[15]);
```

```

listBox17->Items->Clear();
listBox17->Items->Add(amp[16]);
listBox18->Items->Clear();
listBox18->Items->Add(amp[17]);
listBox19->Items->Clear();
listBox19->Items->Add(amp[18]);
listBox20->Items->Clear();
listBox20->Items->Add(amp[19]);

float THD;
THD=100*((sqrt(pow(amp[1],2)+pow(amp[2],2)+pow(amp[3],2)+pow(amp[4],2)+pow(amp[5],2)+
pow(amp[6],2)+pow(amp[7],2)+pow(amp[8],2)+pow(amp[9],2)+pow(amp[10],2)+pow(amp[11],2)+
pow(amp[12],2)+pow(amp[13],2)+pow(amp[14],2)+pow(amp[15],2)+pow(amp[16],2)+pow(amp[17],2)+pow(a
mp[18],2)+pow(amp[19],2)))/peak);

listBox21->Items->Clear();
listBox21->Items->Add(THD);

                zg2->GraphPane->CurveList->Clear();
                zg2->GraphPane->AddCurve("Alpha",x1,y1,Color::Purple,SymbolType::None);
                zg2->GraphPane->Legend->IsVisible=false;
                zg2->AxisChange();
                zg2->Invalidate();

};
private: System::Void Form1_Load(System::Object^ sender, System::EventArgs^ e) {
    zg1->GraphPane->Title->Text = "INPUT SIGNAL";
    zg1->GraphPane->XAxis->Title->Text = L"NUMBER OF SAMPLES";
    zg1->GraphPane->YAxis->Title->Text = L"AMPLITUDE (Volt)";

    zg2->GraphPane->Title->Text = "FREQUENCY SPECTRUM";
    zg2->GraphPane->XAxis->Title->Text = L"FREQUENCY (Hz)";
    zg2->GraphPane->YAxis->Title->Text = L"AMPLITUDE (Volt)";
}
private: System::Void Form1_Resize(System::Object^ sender, System::EventArgs^ e) {

}

}

```

LAMPIRAN C
DIAGRAM ALIR
PREDEFINED PROCESS

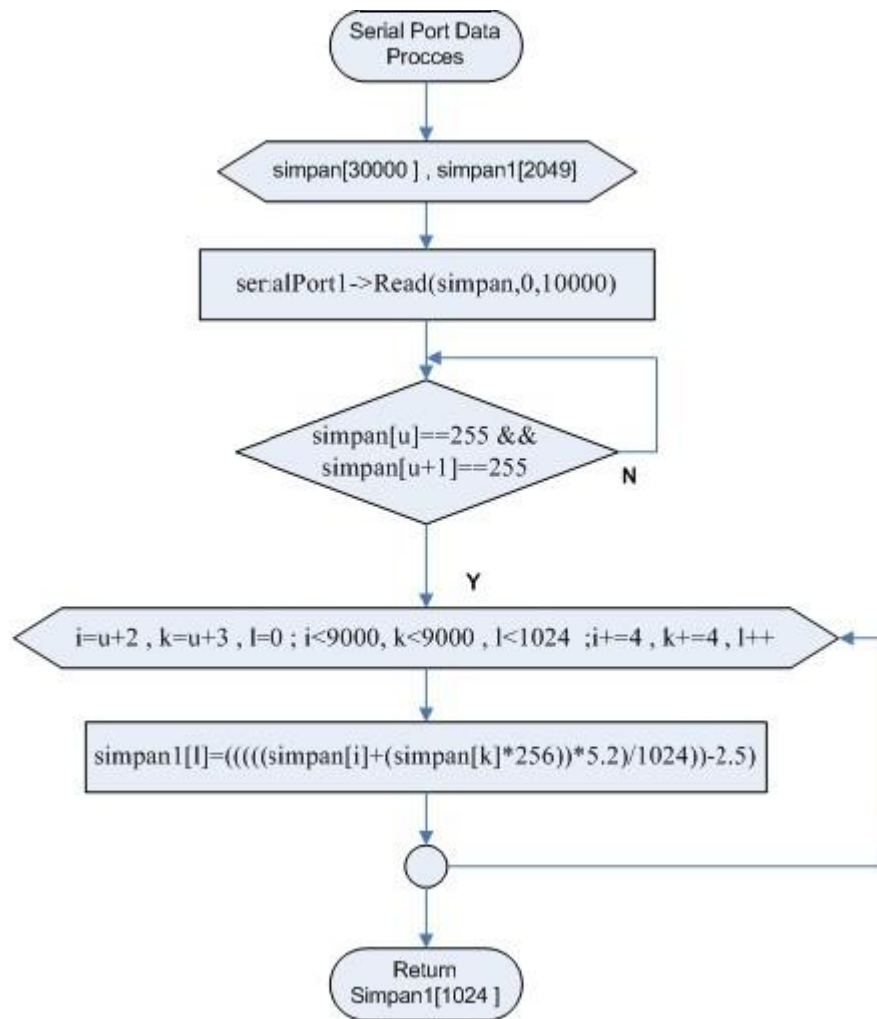
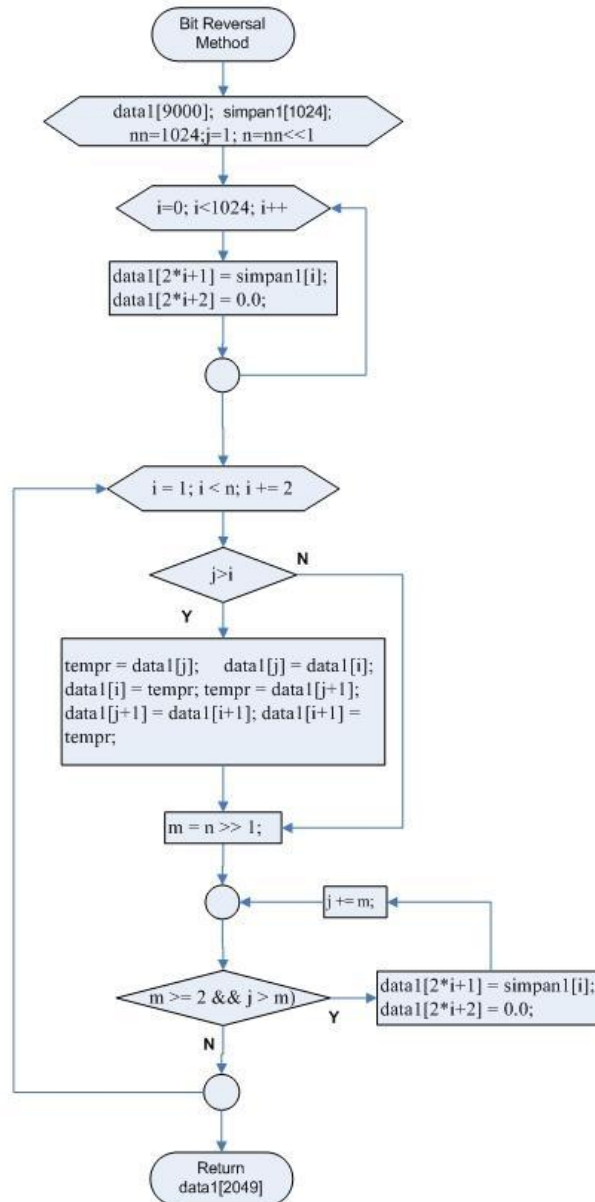


Diagram alir Serial Port Data Process



**Diagram alir FFT bagian 1
(Bit Reversal Method)**

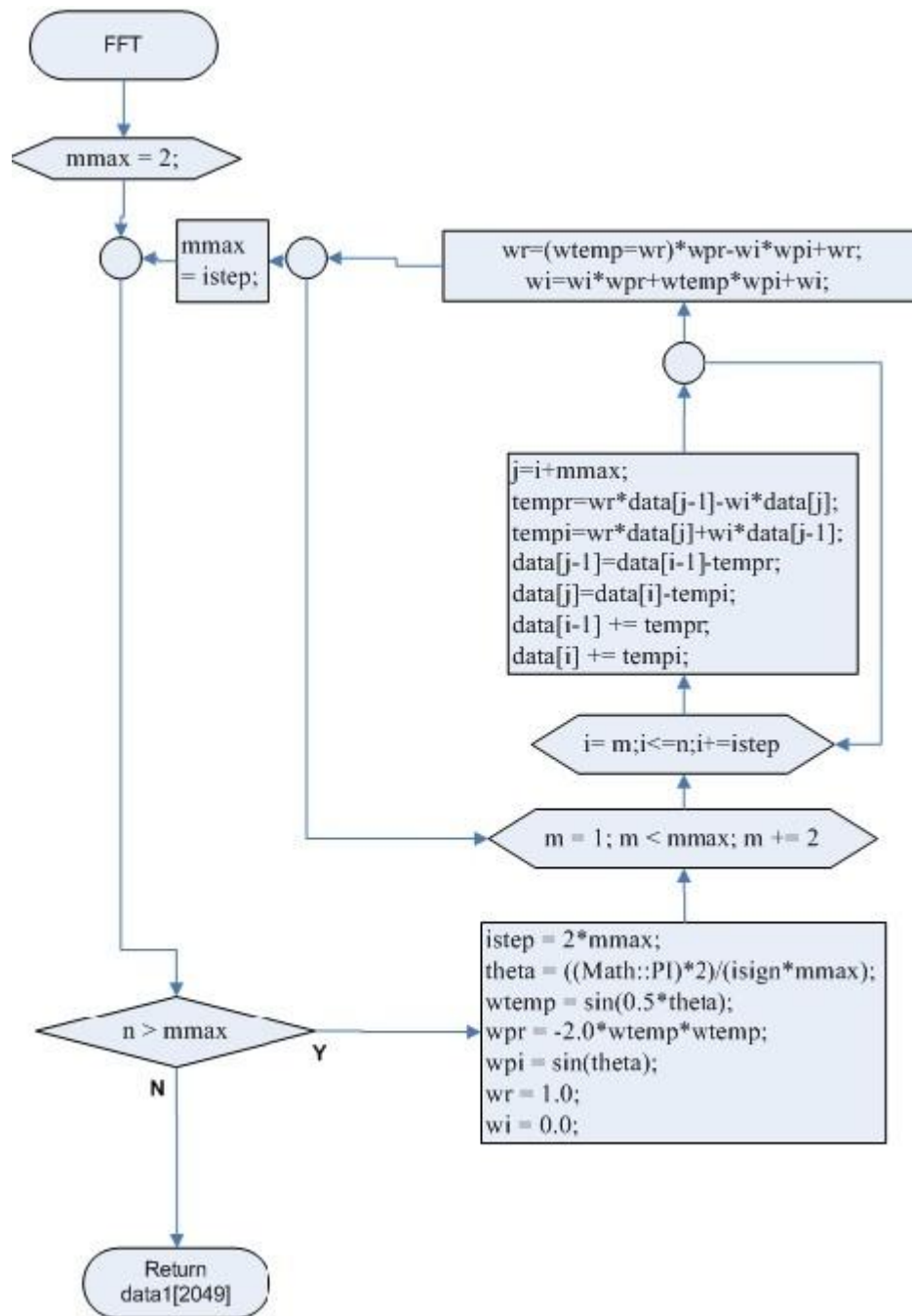


Diagram alir FFT bagian 2

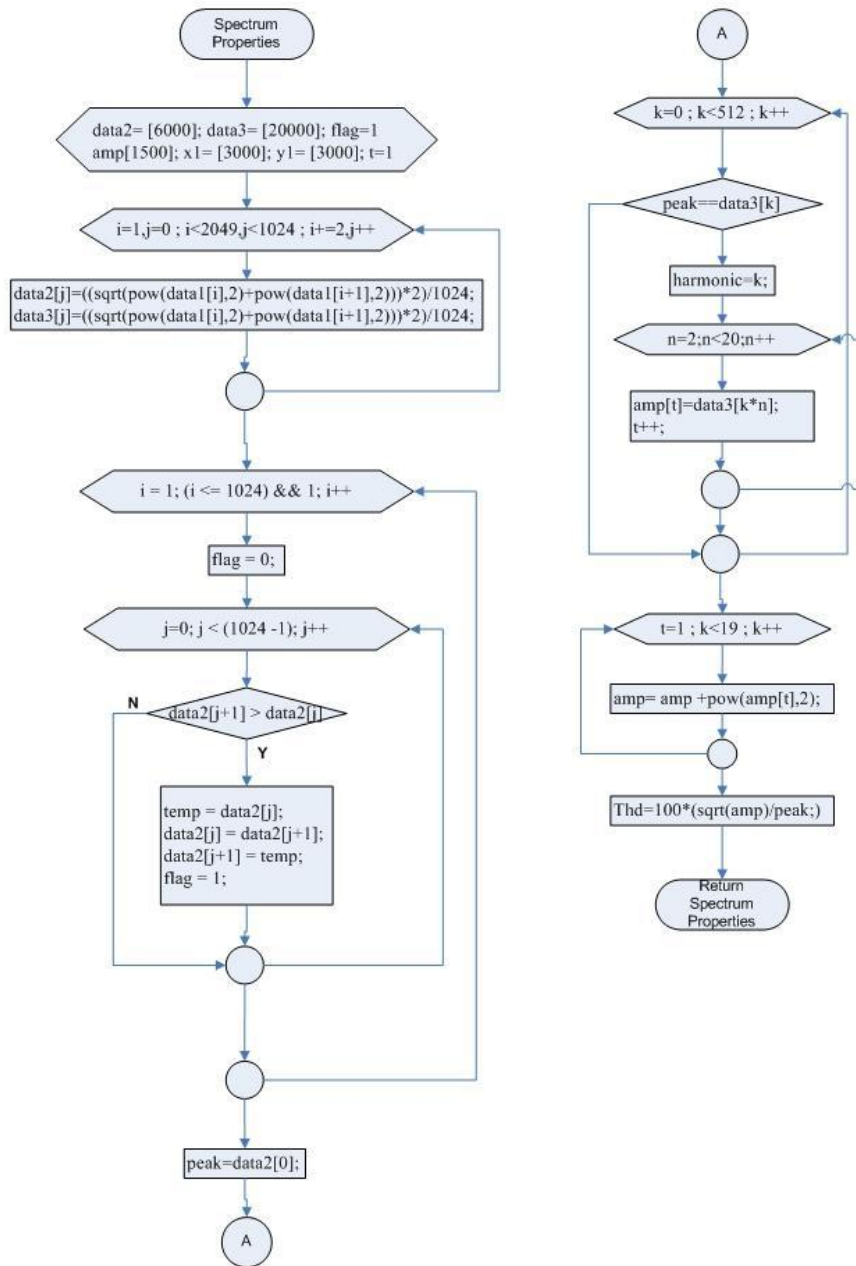


Diagram alir Spectrum Properties

LAMPIRAN D
RANGKAIAN SKEMATIK
AKUISISI DATA

