The results of the work collaboration during summer practice in JINR 2018

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For the Slow control Warsaw 2018

Fire extinguishing system development for the Slow Control System

Project developer: Dunin Nikita
Supervisor: Krystian Roslon

Structure schematic

"Firesi FRS-RACK (Master)"

RS-485

"Firesi FRS-RACK (Slave)"

Ethernet / RS-232

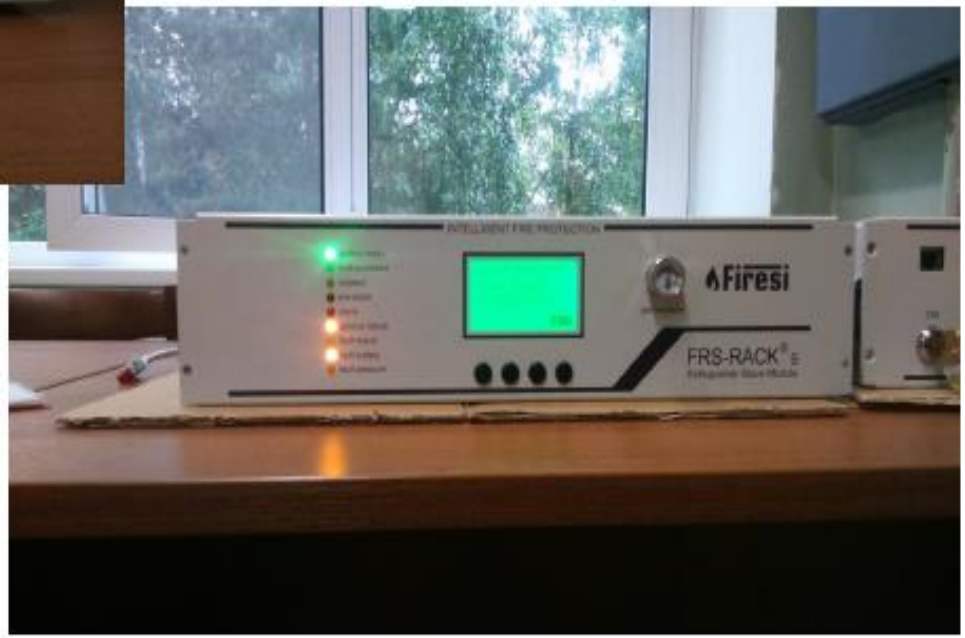
PC

LabVIEW

FRS-RACK

Ведущий модуль
"Master"

Ведомый модуль
"Slave"

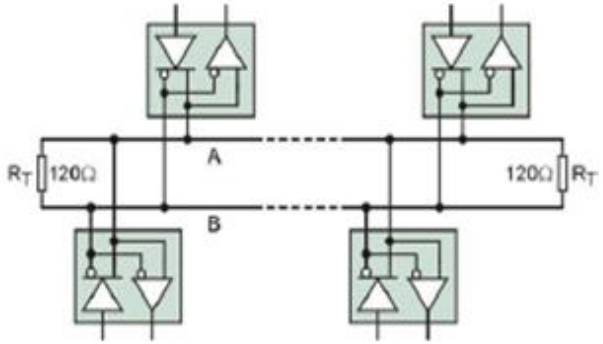


Firesi FRS-RACK™ interfaces

RS232

Ethernet

Master-Slave communication



Interface RS-485

Ведуль модуль - Master

Ведомый модуль - Slave

UDP protocol

```
//Examples UDP ethernet communication
//*************************************************************************************
requset:                                Description UDP ethernet communication from RACK to PC
************************                ************************************************************

01 30 41 71 02

                                        byte 0   : 3  Start packet                                  //1
01 Start                                byte 1   : address always char 0                            //1
30 Adr '0'                              byte 2   : typ A,B,C,D...      A = response for request     //1
41 Command 'A'                          byte 3   : data n*  (TypDat: tGlobStav)                     //n=283
71 30+41=71 Sum                         byte n+4 : Sum (Address+Type+N*data)                        //1
02 End                                  byte n+5 : 2  End packet                                    //1

                                        sum  bytes                                                   288
```

response 288 байт

****

```
03 30 41 53 14 b8 09 00 00 00 00 54 00 e8 03 c4
55 b9 12 8d 55 84 12 cb 55 93 12 b9 5f 69 57 f9
34 44 03 31 29 fd 00 05 01 ee 00 a3 35 00 00 00
01 01 00 00 00 00 00 00 00 10 00 00 00 00 00 00
00 00 b6 d8 a8 08 00 00 42 55 14 13 3e 55 fd 12
bd 18 96 1c f4 61 d3 56 56 35 67 03 76 23 08 01
05 01 ef 00 58 36 00 ee 00 00 00 01 00 00 00 00
00 00 00 10 00 00 00 00 00 af cd 10 0a 00 00 97
54 c0 12 9a 54 7a 12 97 18 17 1c b2 61 5f 56 b5
35 60 03 f1 23 12 01 0f 01 fc 00 1b 3a 00 4d 00
00 00 01 00 00 00 00 00 00 00 10 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 01 10 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
01 10 00 00 00 00 00 00 00 00 00 00 00 00 02 02
```

response 288 байт

****

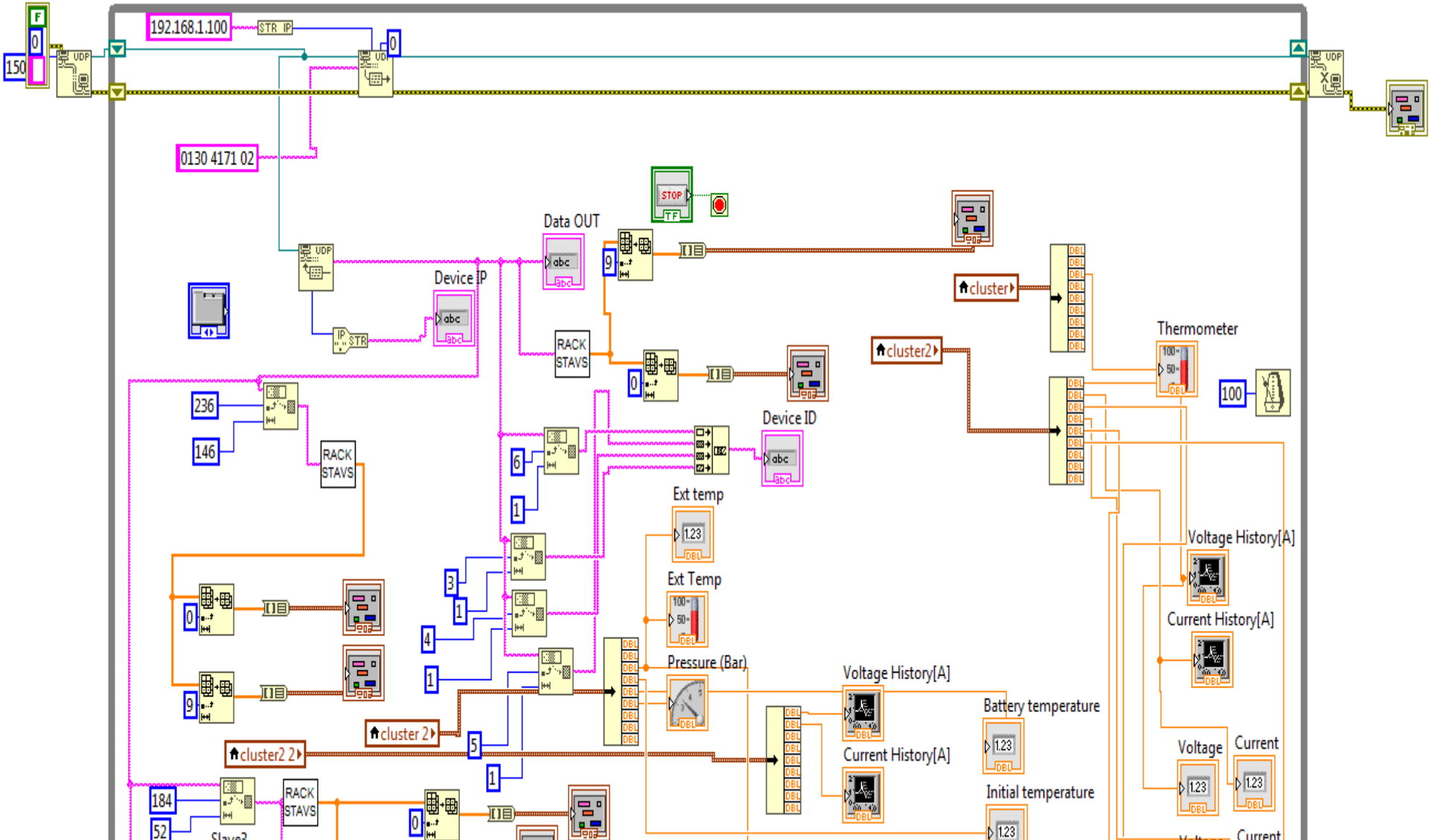
```
03 30 41 53 14 b8 09 00 00 00 00 54 00 e8 03 c4
55 b9 12 8d 55 84 12 cb 55 93 12 b9 5f 69 57 f9
34 44 03 31 29 fd 00 05 01 ee 00 a3 35 00 00 00
01 01 00 00 00 00 00 00 00 10 00 00 00 00 00 00
00 00 b6 d8 a8 08 00 00 42 55 14 13 3e 55 fd 12
bd 18 96 1c f4 61 d3 56 56 35 67 03 76 23 08 01
05 01 ef 00 58 36 00 ee 00 00 00 01 00 00 00 00
00 00 00 10 00 00 00 00 00 af cd 10 0a 00 00 97
54 c0 12 9a 54 7a 12 97 18 17 1c b2 61 5f 56 b5
35 60 03 f1 23 12 01 0f 01 fc 00 1b 3a 00 4d 00
00 00 01 00 00 00 00 00 00 00 10 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 01 10 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
01 10 00 00 00 00 00 00 00 00 00 00 00 02 02
```

```
03  Start
30  adr '0'
41  command 'A'

tGlobStav:
53 14 b8 09 00 00      //id=000009b81453
00 00              //pZac=0       -> (start=0)
54 00              //pKon= 0x0054 -> (end=84)
e8 03              //Max = 0x3e8  ->(Max=1000)
```

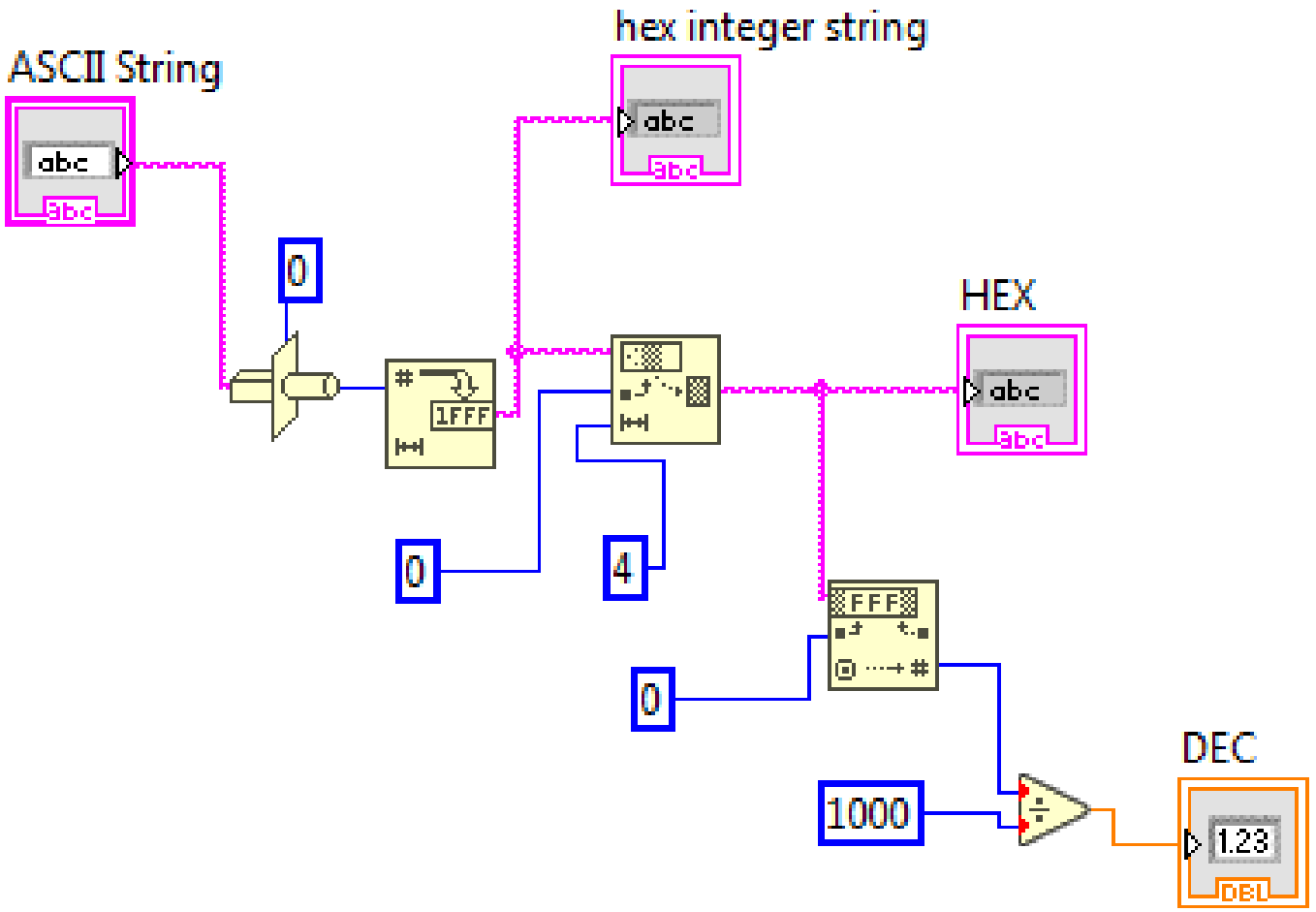
```
c4 55 b9 12 8d 55 84 12 cb 55 93 12 b9 5f 69
57 f9 34 44 03 31 29 fd 00 05 01 ee 00 a3 35
```

```
tGlobStav:
53 14 b8 09 00 00      //id=000009b81453
00 00              //pZac=0       -> (start=0)
54 00              //pKon= 0x0054 -> (end=84)
e8 03              //Max = 0x3e8  ->(Max=1000)

MerA:
c4 55  //VA =0x55c4 -> 21 956 mV
b9 12  //IA =0x12B9 ->  4 793 uA
8d 55  //VB
84 12  //IB
cb 55  //VC
93 12  //IC
b9 5f  //VNET =0x5fb9 -> 24 505mV (mains)
69 57  //VDet
f9 34  //VBat
44 03  //VRelHas
31 29  //VRelSir
fd 00  //ExtTemp =0x00fd = 253  = 25.3 grC
05 01  //TInt   =  0x0105 = 261  = 26.1 grC
ee 00  //TBat
a3 35  //Tlak   =  0x35a3 = 13 731 mBar
```

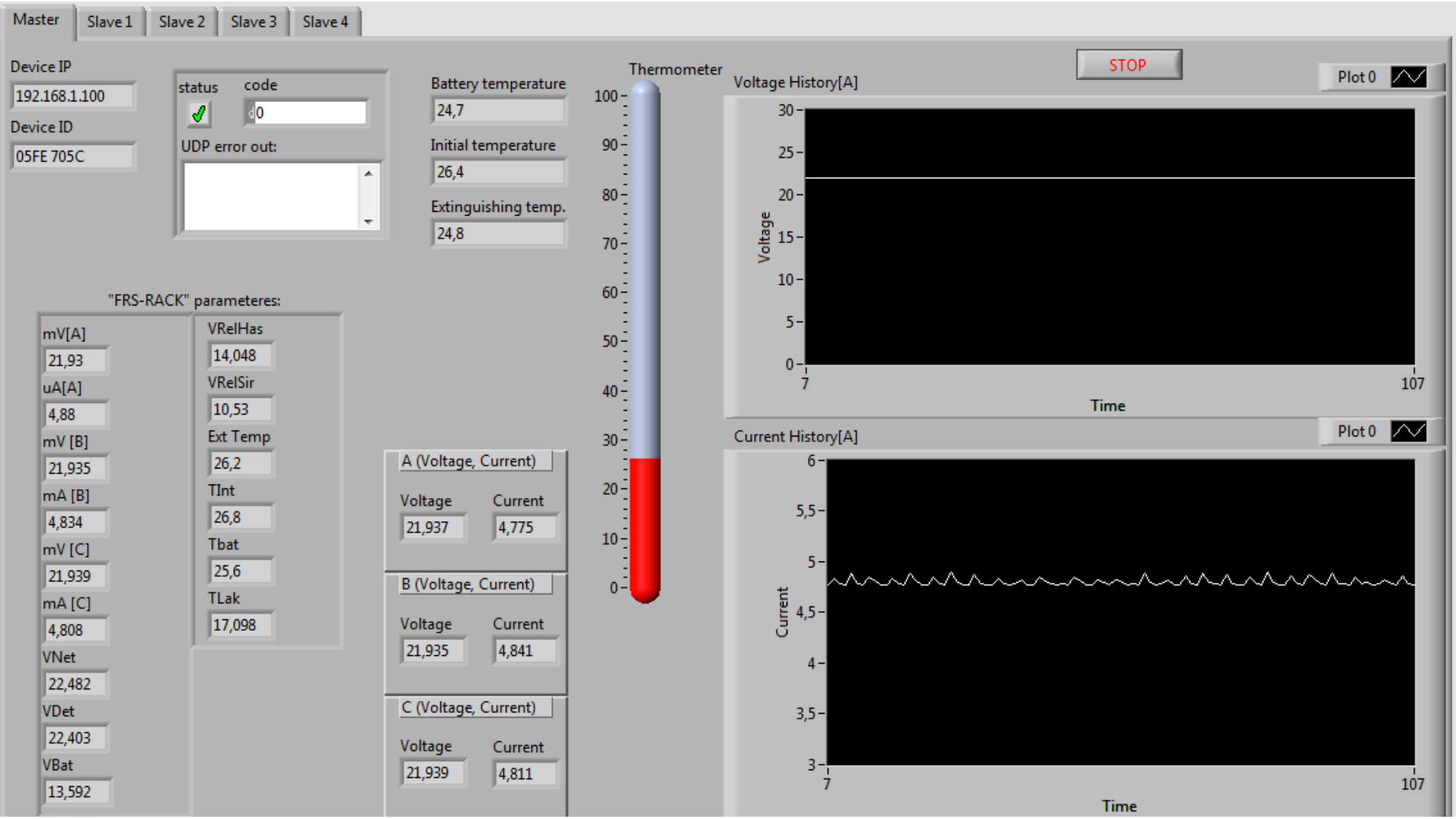
Source code written in “G” (LabVIEW2016)



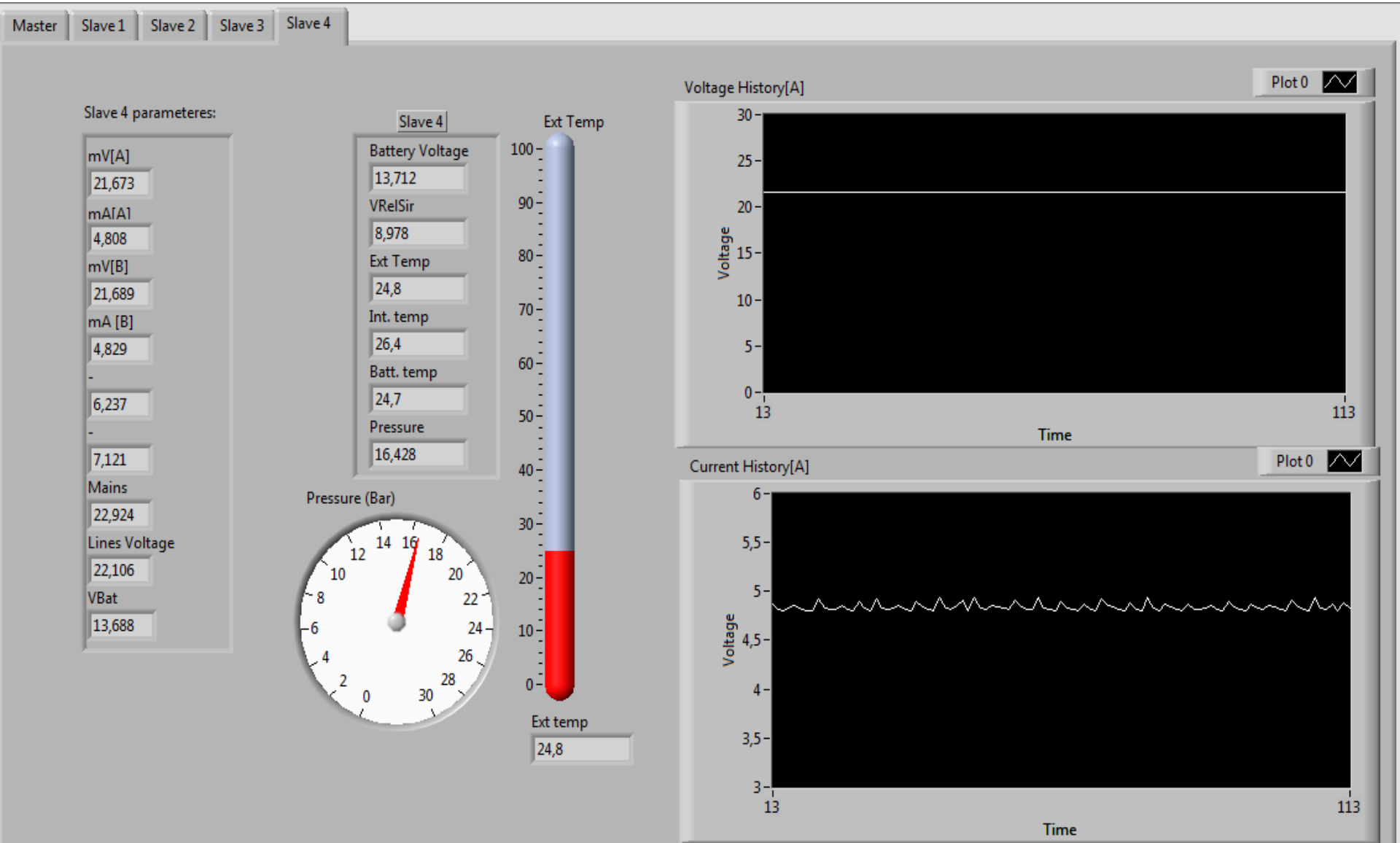
“ASCII to HEX” converting



Software interface for Master module



Software interface for Slave module



Advantages of the system

- The possibility of using cables up to 500 meters.
- Using three temperature sensors (internal, external and measuring t batteries)
- Measuring of pressure gauge.
- Possibility to connect more slave devices (up to 4 PCs.);
- Using of visualization tools in the form of indicators and graphs.

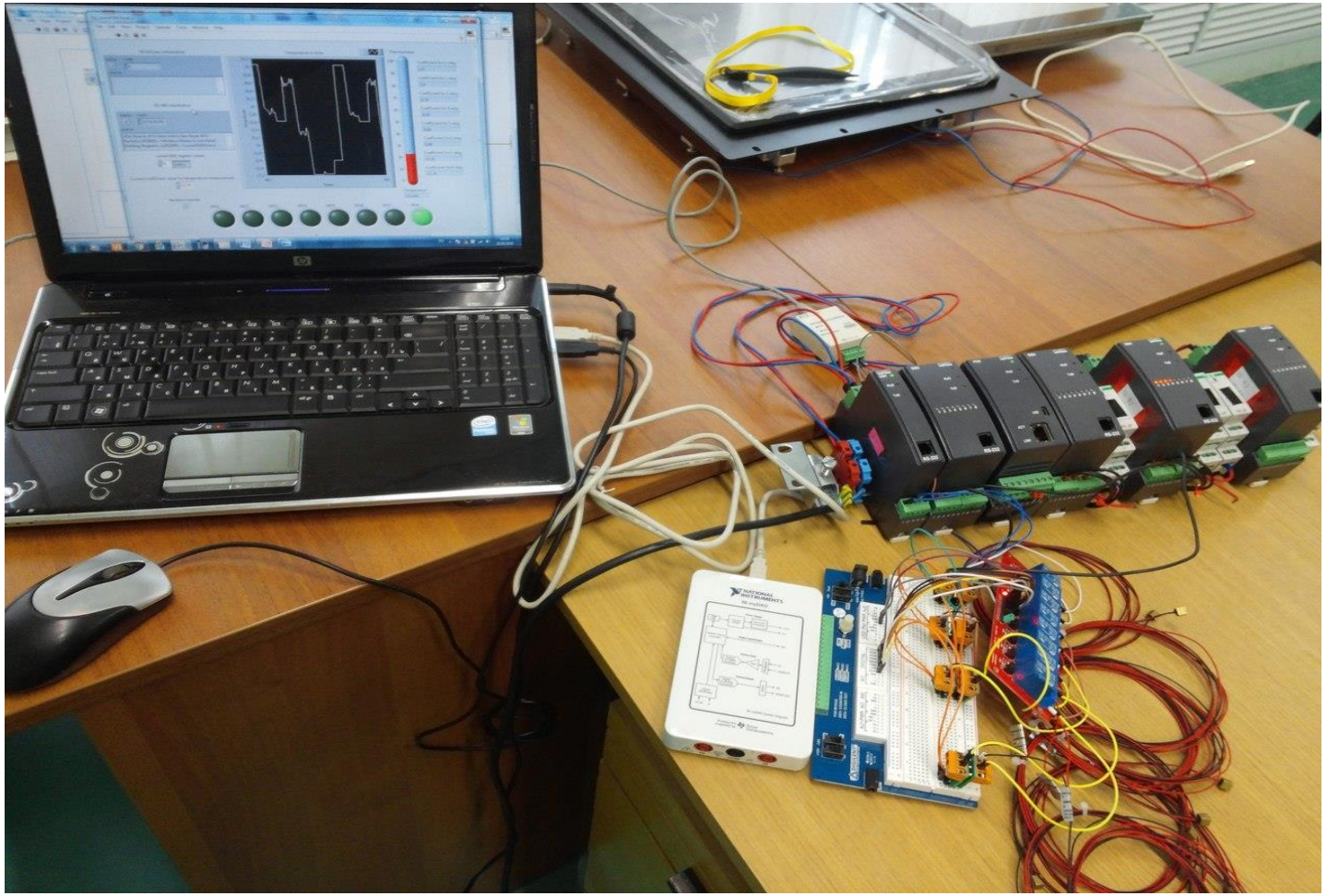
Future improvements

- Data acquisition from new 1u device (TCP/IP)
- SMS-alert for JINR fire department

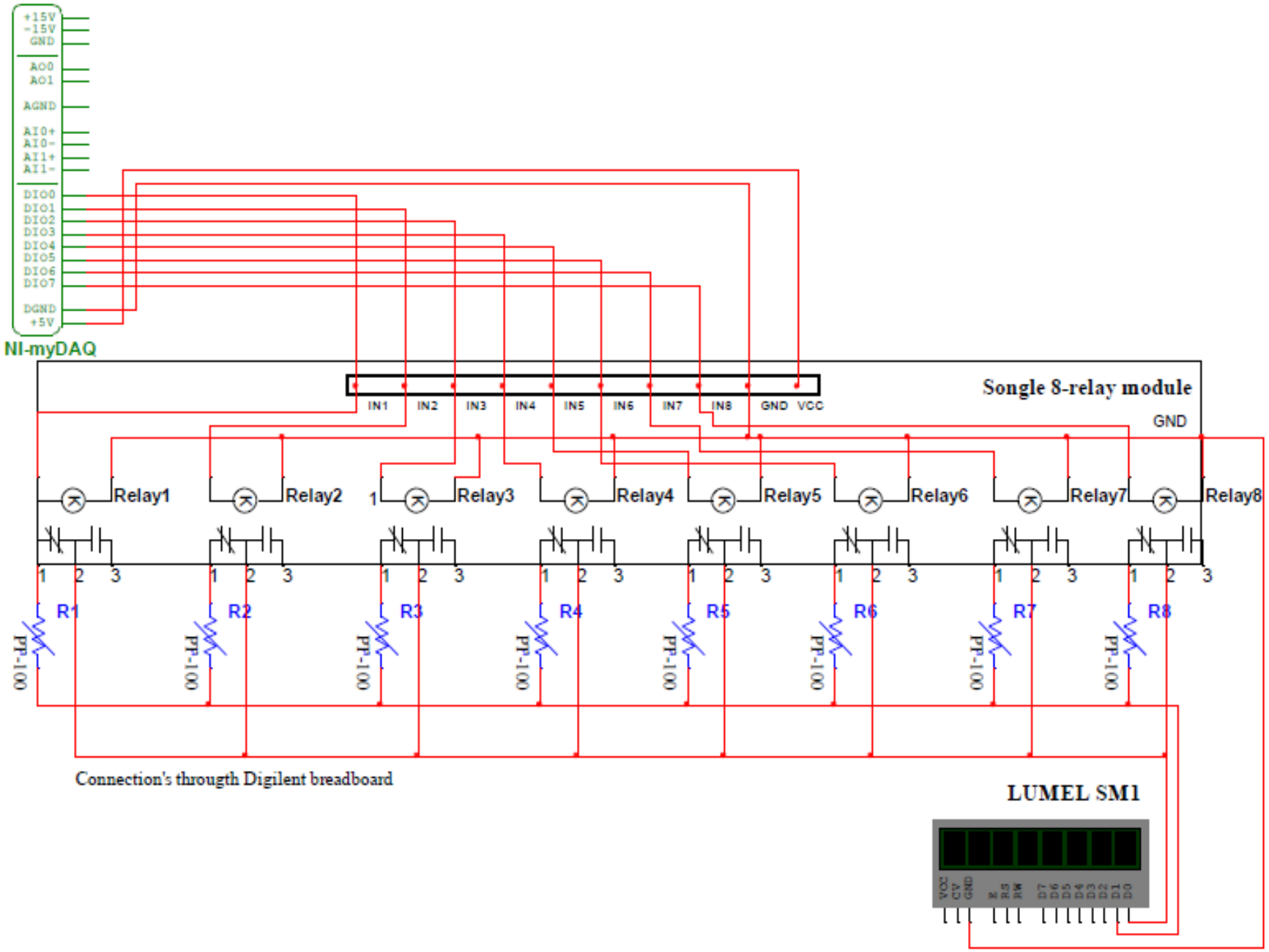
Temperature measurements prototype system for ToF-MPD.

Project developer: Dunin Nikita
Supervisors: Marek Peryt, Krystian Roslon

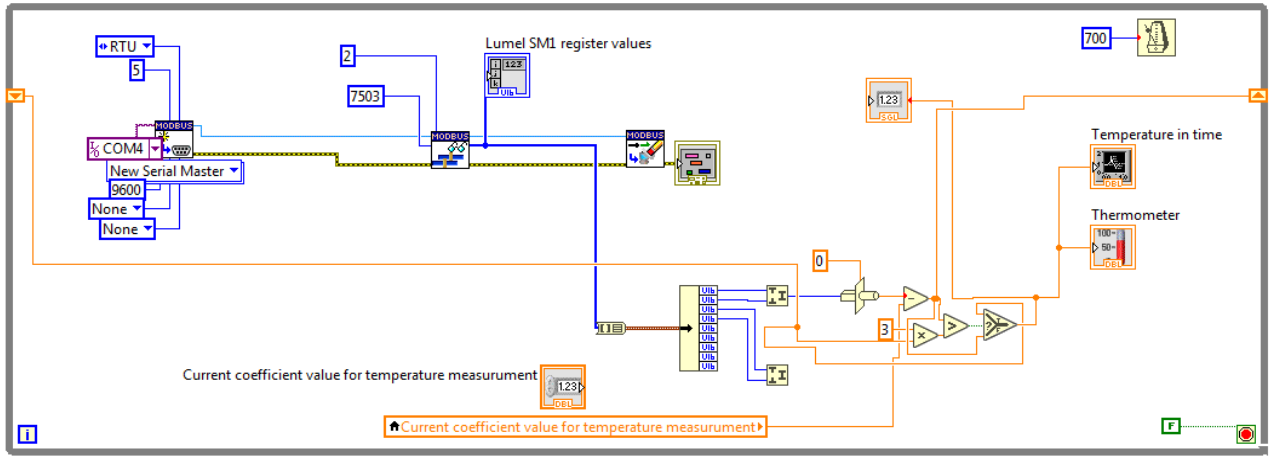
The view of the system

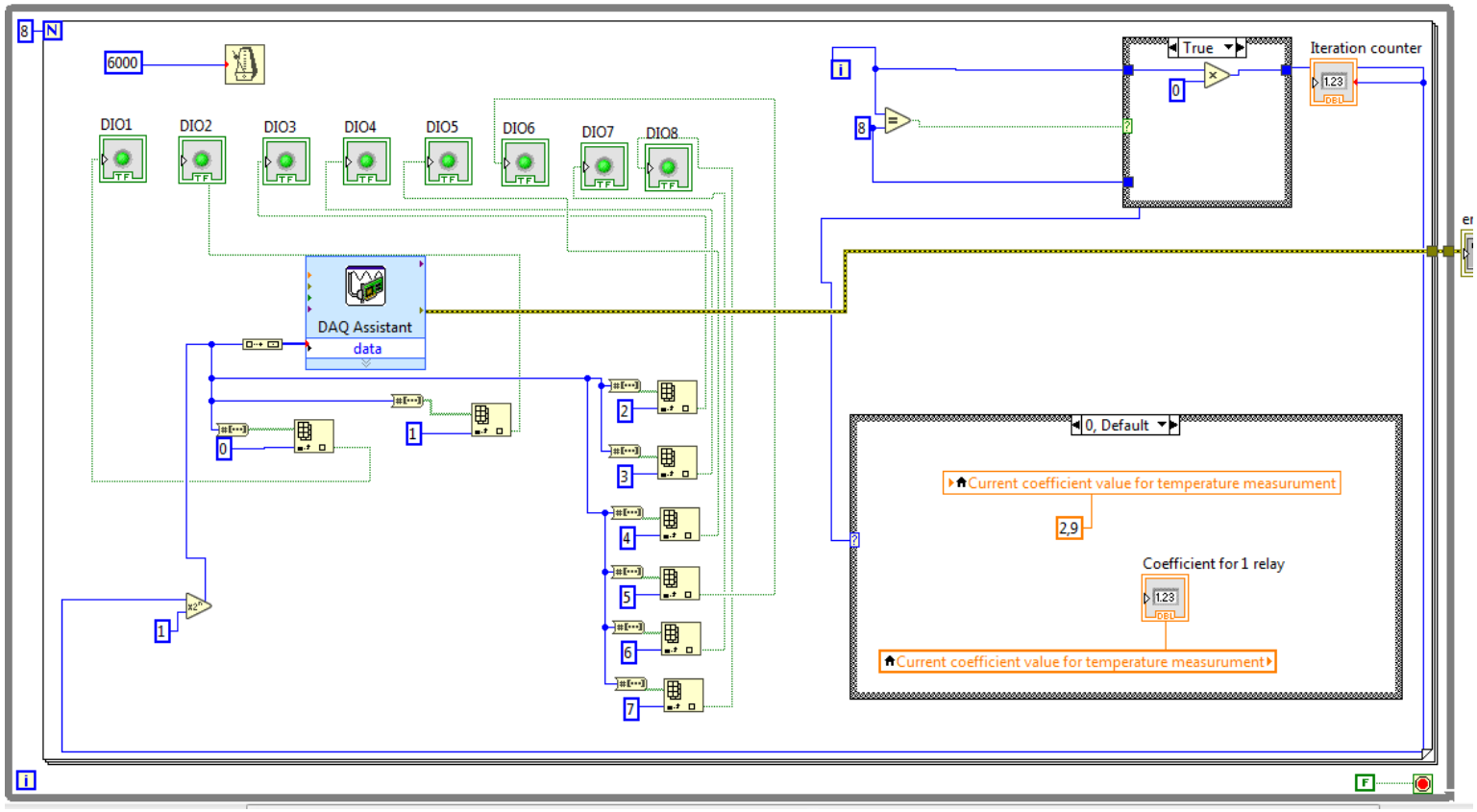


Schematic of the system

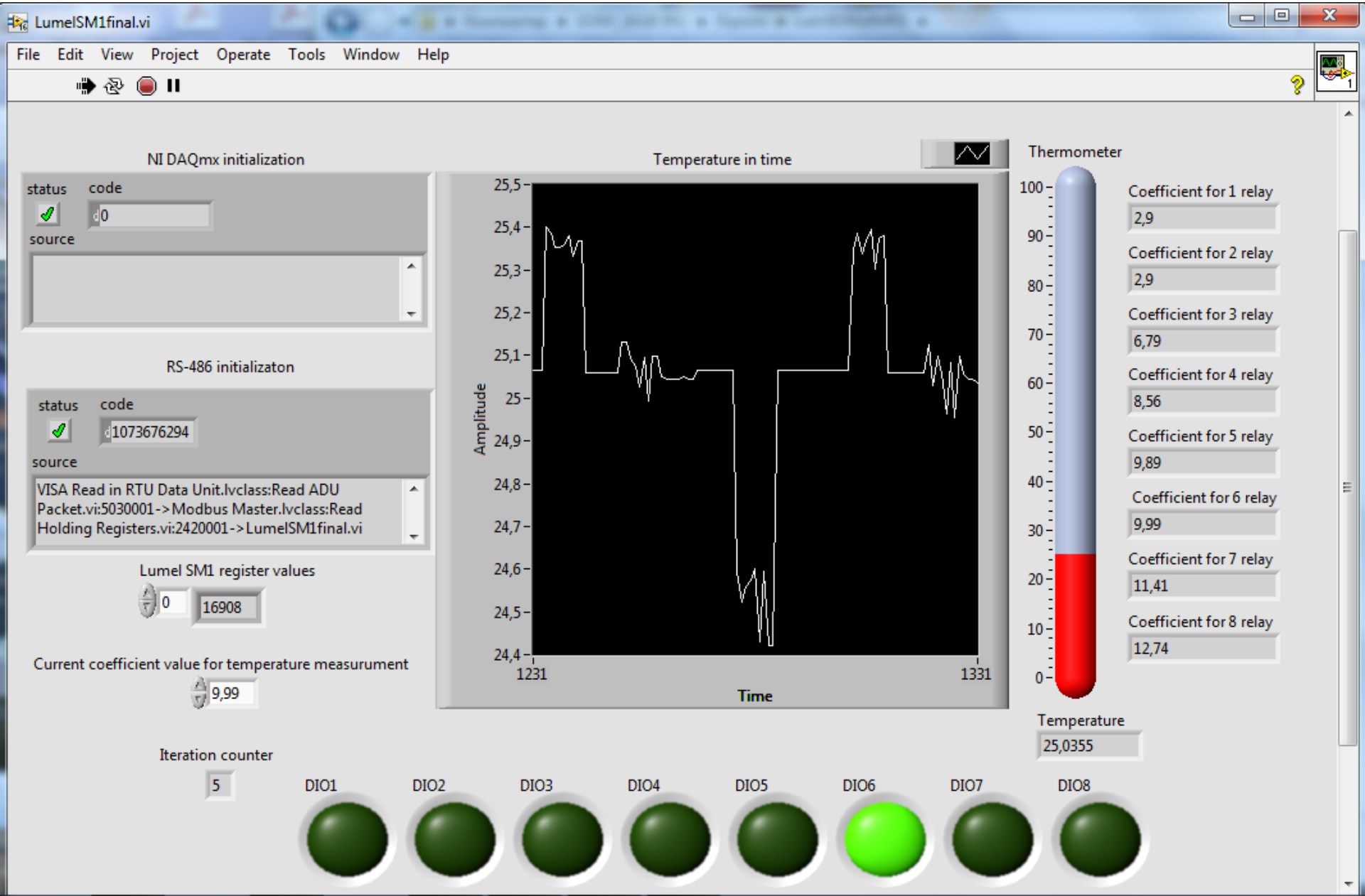


Source code


RTU
5
COM4
New Serial Master
9600
None
None
2
7503
Lumel SM1 register values
700
Temperature in time
Thermometer
0
3
Current coefficient value for temperature measurument
Current coefficient value for temperature measurument


6000
DIO1
DIO2
DIO3
DIO4
DIO5
DIO6
DIO7
DIO8
DAQ Assistant
data
True
Iteration counter
0
8
0, Default
Current coefficient value for temperature measurument
2,9
Coefficient for 1 relay
Current coefficient value for temperature measurument

Interface


LumelSM1final.vi
File Edit View Project Operate Tools Window Help
NI DAQmx initialization
status
code
0
source
RS-486 initializaton
status
code
1073676294
source
VISA Read in RTU Data Unit.lvclass:Read ADU Packet.vi:5030001->Modbus Master.lvclass:Read Holding Registers.vi:2420001->LumelSM1final.vi
Lumel SM1 register values
0
16908
Current coefficient value for temperature measurument
9,99
Iteration counter
5
Temperature in time
25,5
25,4
25,3
25,2
25,1
25
24,9
24,8
24,7
24,6
24,5
24,4
Amplitude
1231
1331
Time
Thermometer
100
90
80
70
60
50
40
30
20
10
0
Coefficient for 1 relay
2,9
Coefficient for 2 relay
2,9
Coefficient for 3 relay
6,79
Coefficient for 4 relay
8,56
Coefficient for 5 relay
9,89
Coefficient for 6 relay
9,99
Coefficient for 7 relay
11,41
Coefficient for 8 relay
12,74
Temperature
25,0355
DIO1
DIO2
DIO3
DIO4
DIO5
DIO6
DIO7
DIO8

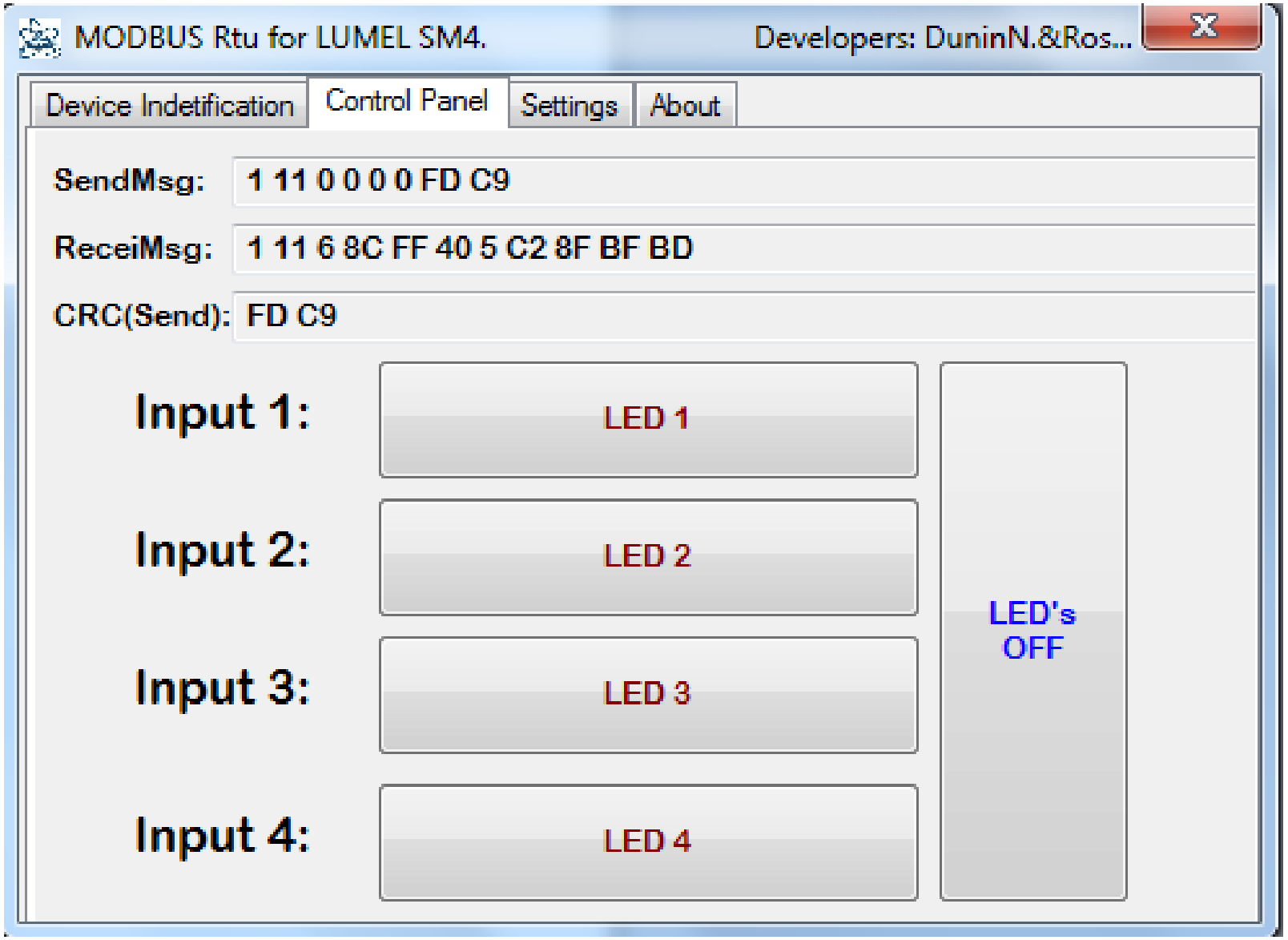
Smart relay control

Project developer: Dunin Nikita
Supervisor: Krystian Roslon

Tools

- Microsoft Visual Studio 2015 (C#) for RS-232
- LabVIEW 2016 (VISA library) for RS-232
- LabVIEW 2016 (Modbus library) for RS-485

C# software with interface



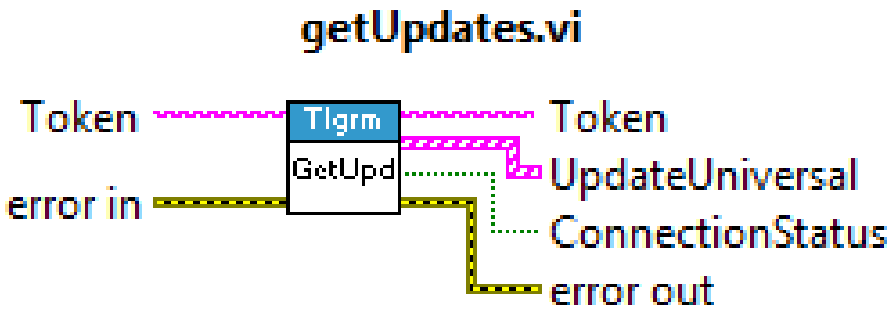

SM4
LUMEL
RxD
TxD
1 2 3 4 5 6 7 8
PK-2P
PK-2P
PK-2P
PK-2P
ID 33

What is the task that unites this projects?

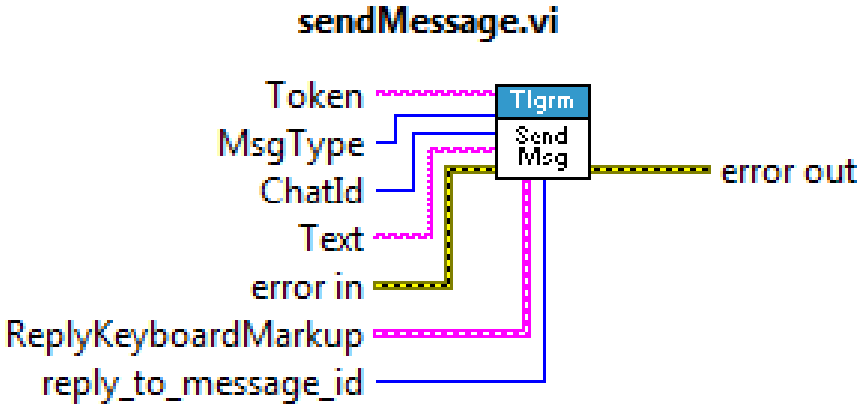
Answer is remote control development

How we can integrate remote control for data acquisition software in LabVIEW?

“get Updates”



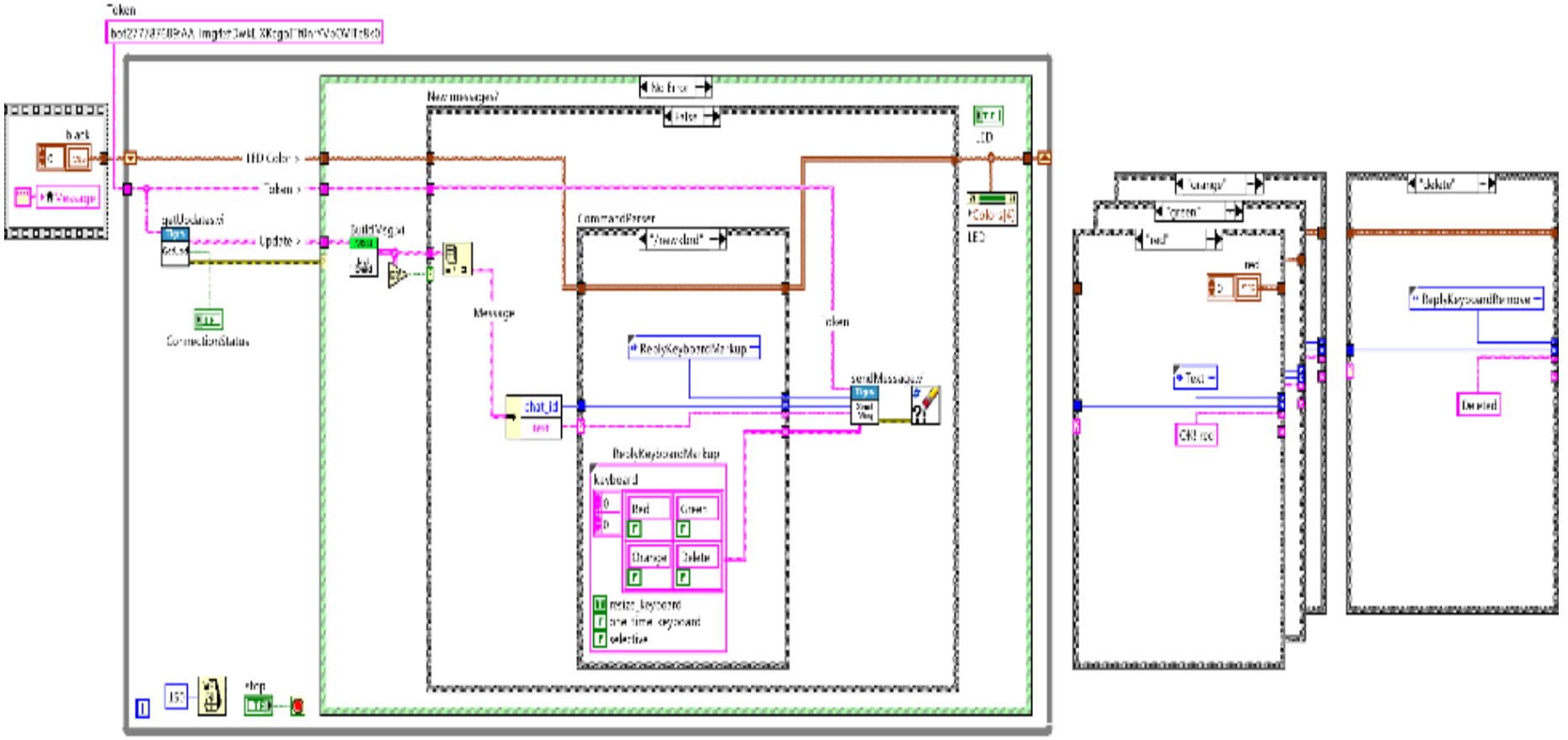
“send Message”



I) An initialization takes place.

II) In an infinite loop with a specified period, occur poll the Telegram servers for new updates. SubVI BuildMsg.vi converts JSON Update objects to messages. If there are new messages, then their text is compared to variants of the Case structure.

III) At the last stage, the reply message is sent to the active chat.



Advantages of messengers using for Labview systems:

1) Software works with any smartphone OS's – Android and iOS;
2) Easy integration with any National Instruments hardware; (MyRIO, cRIO, MyDAQ, etc)
3) Easy integration with other vendors hardware include PLC's, microcontrolles, FPGA's

Video demonstration

Thank you for your attention!