JOINT INSTITUTE FOR NUCLEAR RESEARCH
Veksler and Baldin laboratory of High Energy Physics

FINAL REPORT ON THE SUMMER STUDENT PROGRAM

Software development for operating of DanFysik power supplies that are using for NICA SC-magnets testing

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Contents

Abstract

DanFysik [1] power supplies (PS) are intended for magnetic measurements performing at dipole and quadrupole NICA superconductive magnets [2]. At the moment, the DanFysik System 8500 Magnet Power Supply is manually controlled directly on the equipment. The developed software for remote controlling of DanFysik Power Supply is presented.

Introduction

The System 8500 Precision Magnet Power Supplies (MPS) are DC constant current output power supplies (Fig.1) designed for applications requiring very high stability and low noise combined with reliability and ease of operation.

Fig.1. DanFysik System 8500 Magnet Power Supply.

The System 8500 is available as a range of power, control and interface modules which can be configured to meet specific application requirements with guaranteed performance.

- ULTRASTAB Precision current transducer (DCCT = DC Current Transformer) to achieve new performance levels for stability and linearity over very wide current ranges.
- Optically isolated digital control to eliminate ground loops and conducted noise. The control and interface electronics modules are isolated from the power modules by an electrostatic and thermal shielding wall.
- Very high efficiency - typical 93%.
- Very low noise output.

• Very high immunity against EMI.

• Available for super conducting magnet applications.

It's used for powering magnets for NICA (Nuclotron-based Ion Collider fAcility) and FAIR (Facility for Antiproton and Ion Research) projects.

Main parameters [3] of DanFysik power supplies that are using at JINR, LHEP for testing of SC-magnets are listed at the Table 1. Power supply PS1000 is using for magnetic measurements [4] of superconductive magnets at the injection current. Power supply PS360 is using at DC current for finding a magnetic axis of the superconductive magnets.

	PS360	***PS1000***
Stability class	3 ppm	10 ppm
DC output:	Power range: 36 kW Current range: 360 A Voltage: 100 V Output polarity: Unipolar	Power range: 25 kW Current range: 1000 A Voltage: ±25 V Output polarity: Bipolar

Table 1. Main characteristics of PS.

Software development

There are two ways for controlling Power Supply: local and remote. During the Summer Student Program, I developed a program for managing the DanFysik Power Supplies via RS-232. I used visual programming language G and the graphical programming environment LabVIEW [5].

As a basis I took the component library for LabVIEW Software from the developer [6]. The example of communication with the device was implemented in this library (Fig.2).

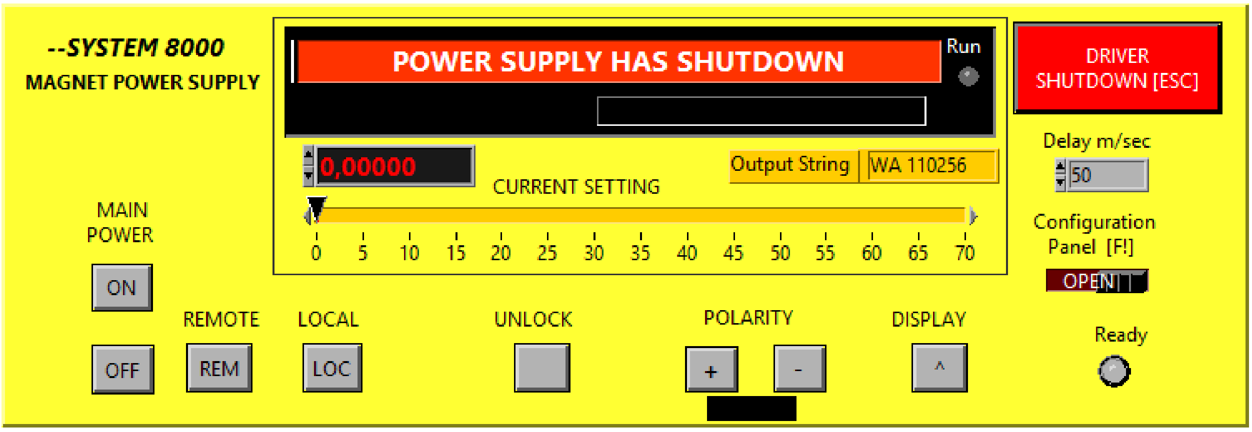

Fig.2. Basic example of the program for DanFysik System 8000. Main panel.

I made an intuitive interface. The development took into account the opinions of employees who will directly use this program. I displayed the state of power supply and main working parameters. The main controlling options were included to the program (Fig. 3).

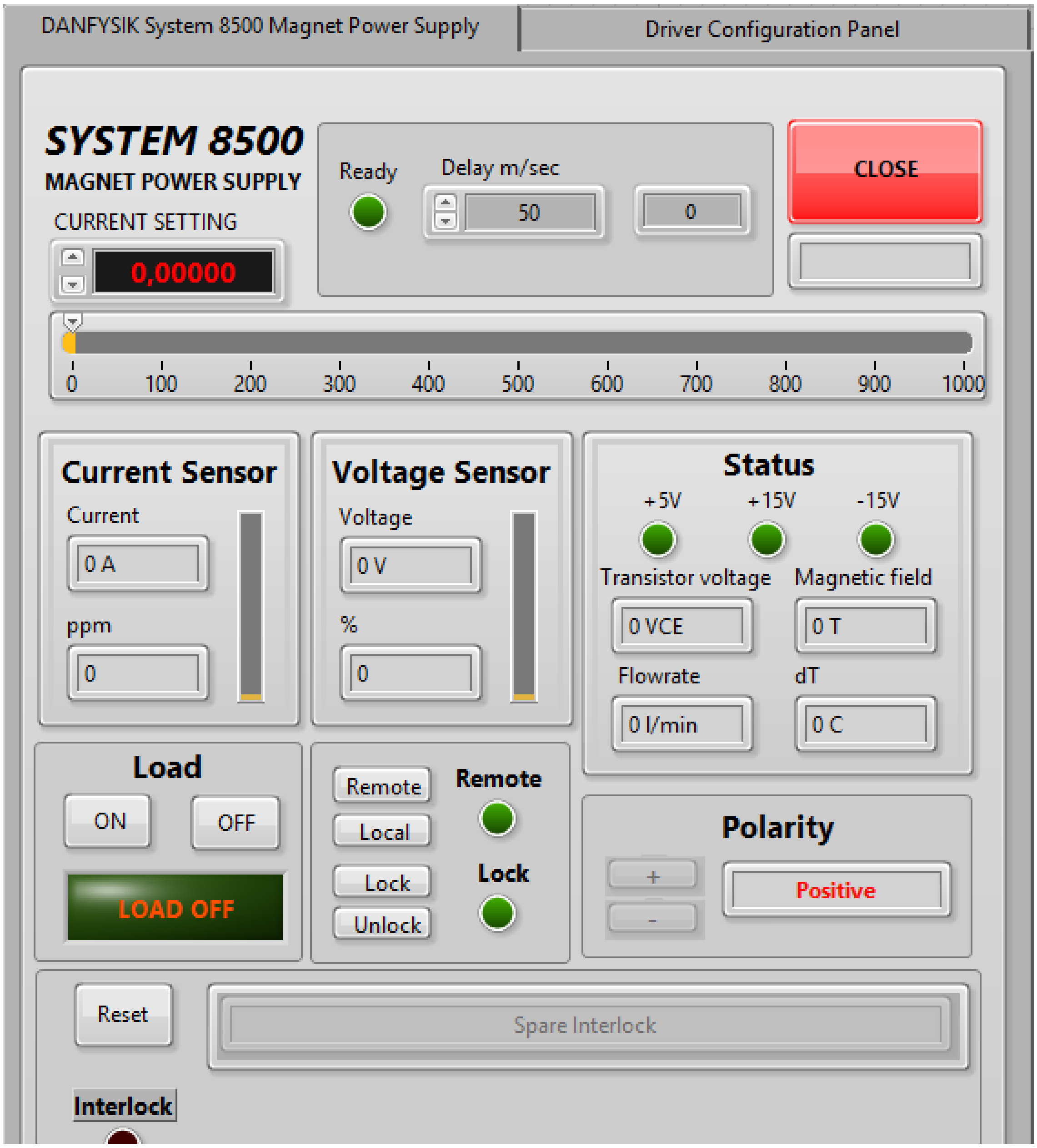

Fig.3. Main panel of the final program.

Configuration Panel is shown at the Figure 4.

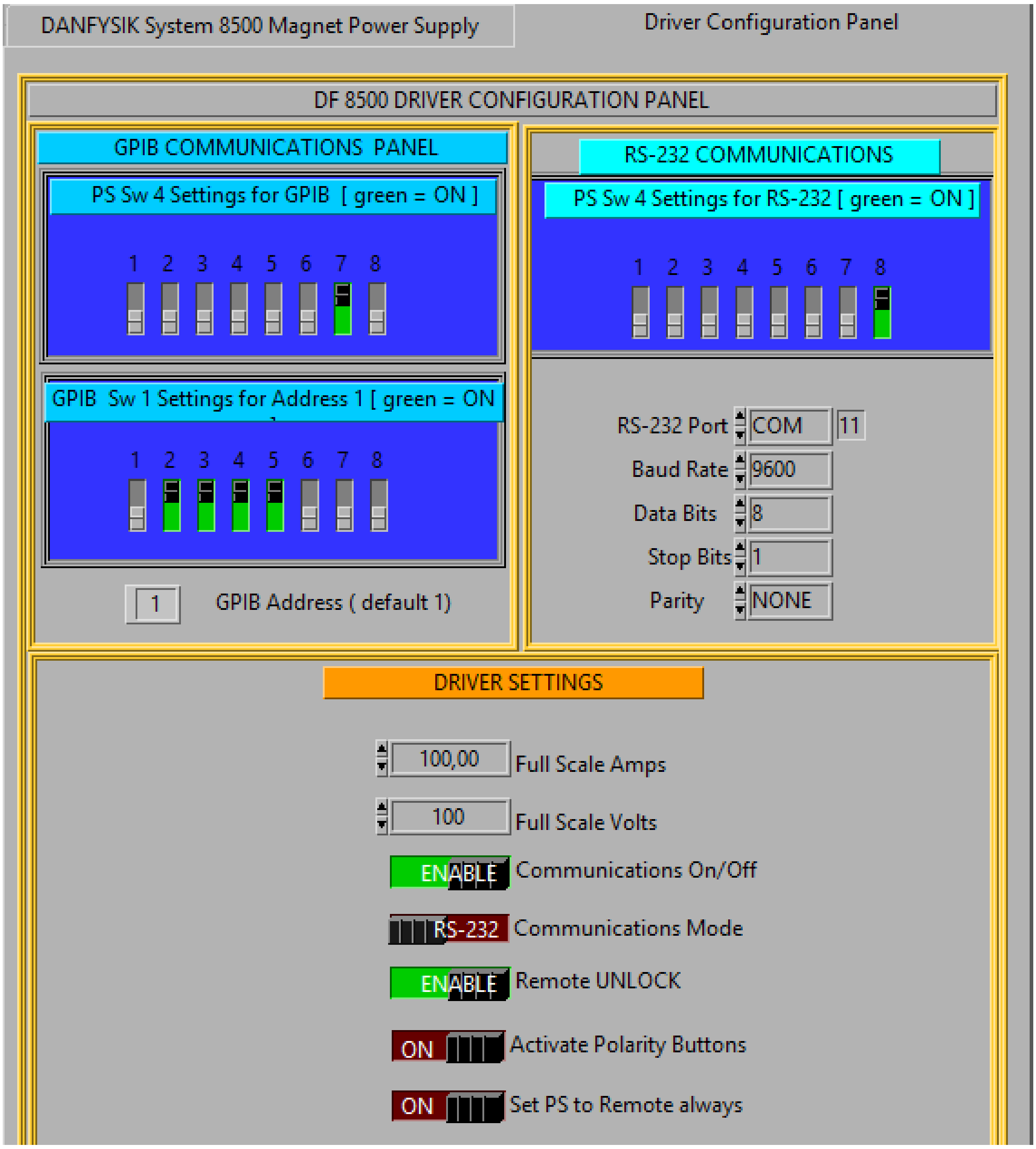

Fig.4. Configuration panel of the final program.

The program saves all working parameters to the configuration file. The LabVIEW code for saving the parameters is shown at Figure 5.

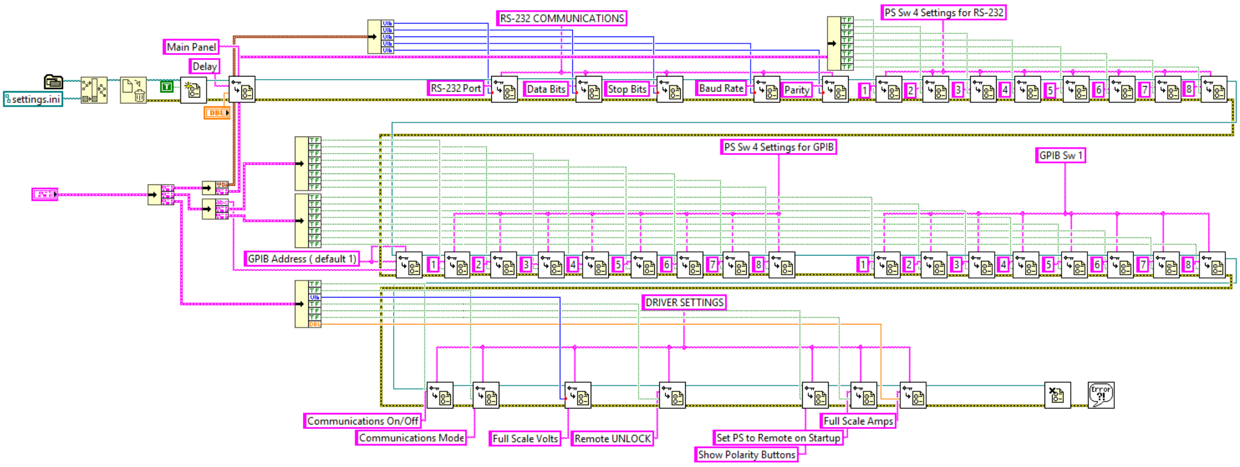

Fig.5. The code of the function for saving the settings.

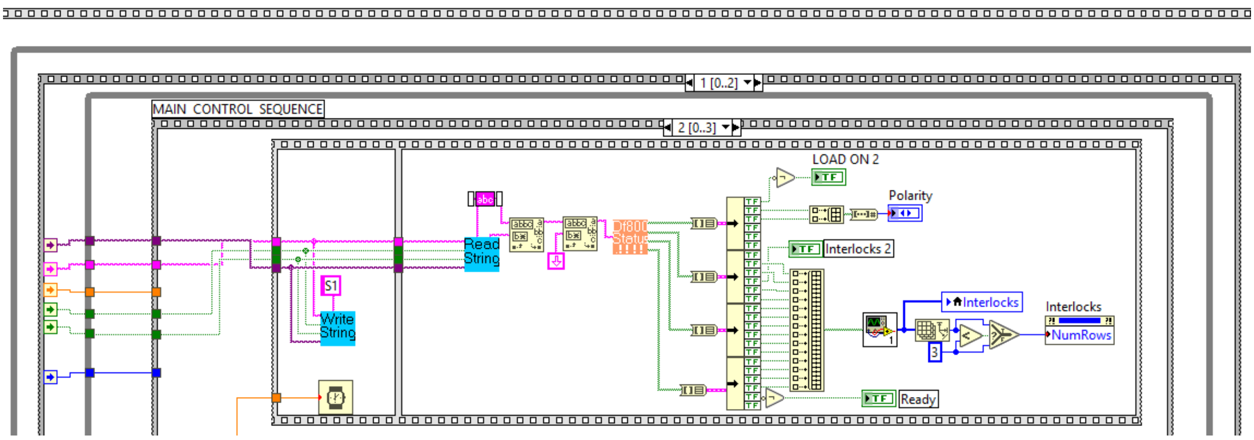

Fig.6. Part of the code for displaying interlocks.

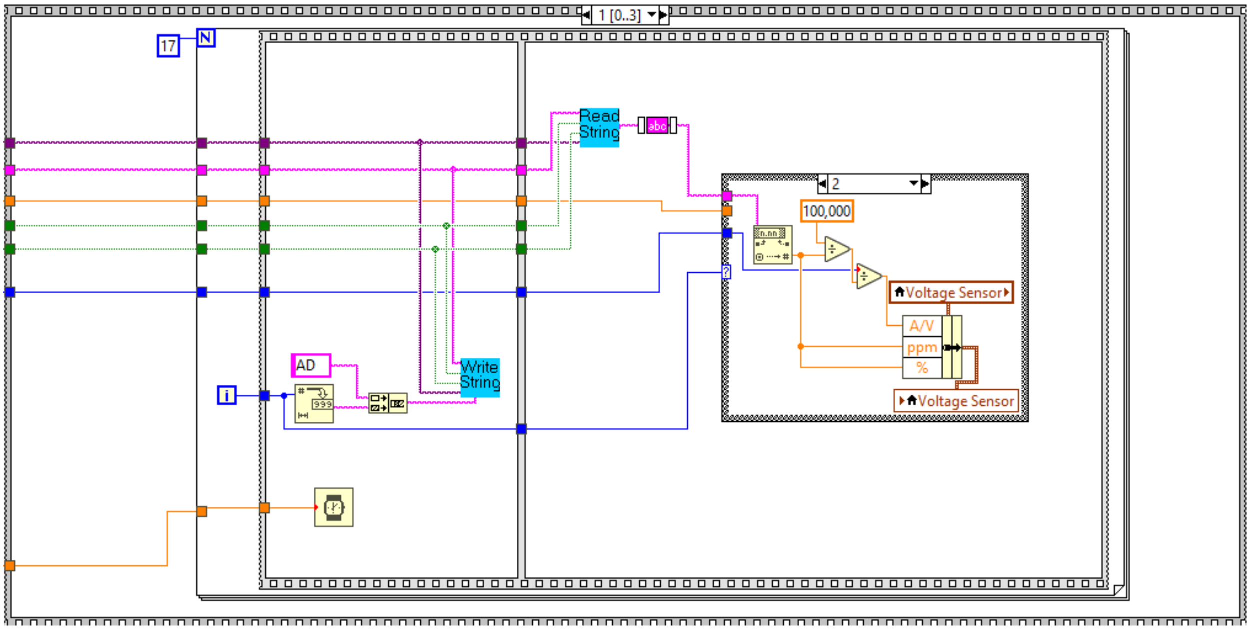

Fig.7. Part of the code for displaying Voltage Sensor.

Conclusion

As a result of the Summer Student Program, I developed a program to control the current source. All the important and necessary indicators are displayed in the program. Now it takes only one click to change the current, turn on / off, change the polarity and other operations. Thus, the program helps to optimize the time spent by the employee on device management.

This solution has already been implemented in the work of the workshop for the assembly of magnets and was positively evaluated by the personnel responsible for managing the power source. This software was successfully used at the cryogenic tests of SC-magnets. The program saves time spent on starting the source, which allows workers to allocate more time directly to the actual testing of the magnets.

Acknowledgements

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References

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