

Lab 3: Basic Human Machine Interfaces

Report Due Date: April 2

Background:

Human Machine Interface (HMI) provides the ability to view data and tags from RTAC and execute commands from location remote from the process through a graphical interface. This could be inside a substation or in a control center. Some vendors are moving to web-based interfaces so one does not need special software on your PC or substation. You can view the HMI from anywhere you have a network connection to the RTAC, but adding such abilities also requires good security practices.

In this lab we are using the SEL RTAC to execute the HMI. Measurement data or commands that can be sent through the RTAC can be configured in the HMI. The diagrams are contained in RTAC itself. So, you don't have to move the RTAC diagrams from one PC to another.

HMIs are becoming widely applied in substation control. The purpose of this experiment is to familiarize students with the operating principle of a HMI, including designing their own operating circuit. A HMI will be implemented using a RTAC to monitor data.

Learning Outcomes:

1. Understand the equipment to be used in the experiment.
2. We are going to use a new piece of software in this experiment (diagram builder software).

Equipment needed:

1. Hardware:
 - SEL 849
 - Computer
 - KokoS test set
 - SEL RTAC
 - Wires for connection
2. Software:
 - Diagram builder software
 - SEL AcSELeRator RTAC

Procedure:

1. Connect the circuit and follow the circuit design in experiment 2 (both the communication connections, physical voltage-current connection with KoCoS)
2. Set the voltage and current provided by the power supply at the KoCoS
3. Enter the tags you need to check at RTAC (currents IA, IB and IC, and voltages VAB, VBC and VCA)
4. Design an HMI to display the tags from the SEL 849.

5. Upload the HMI to RTAC
6. Ensure HMI displays correct voltage and current measurements.

Use diagram builder software

- Open the diagram from TA
- Connect the RTAC
- On the left side of the screen you'll see the options in tags
- Drop the required tags into the circuit diagram
- Upload the circuit diagram to RTAC

Detect real-time data with HMI

- Take the SELRTAC online
- Turn on the KoCoS test set
- Open the Web Browser (Google Chrome suggested)
 - Input url: provided by TA (username and password: to be provided by TA)
- Then you click the HMI tab, you will see the diagram you built using the diagram builder software
- We can see the data we want in the interface (additional idea: we may see in the. Lab two. The voltage you measure is equal to the voltage you set times $\sqrt{3}$)

Suggestions

Because this is a more autonomous experiment, students can carry out some of their own ideas when drawing circuit diagrams. We can measure voltage, current and frequency in groups of three.

| Check List for Students | |
|---|--|
| Equipment connection | Put tags into diagram |
| Set alarm value of current and voltage | Upload the diagram to SEL RTAC |
| Open the HMI and measure the data | Go to web interface and check your observations |

Report

1. Provide a screen shot for the web interface of the RTAC HMI
2. Explain the observations made about the alarm conditions when you set the various conditions for the rotating fan (specify your color changes).
3. Comment on what you learned. What would you have liked to try?