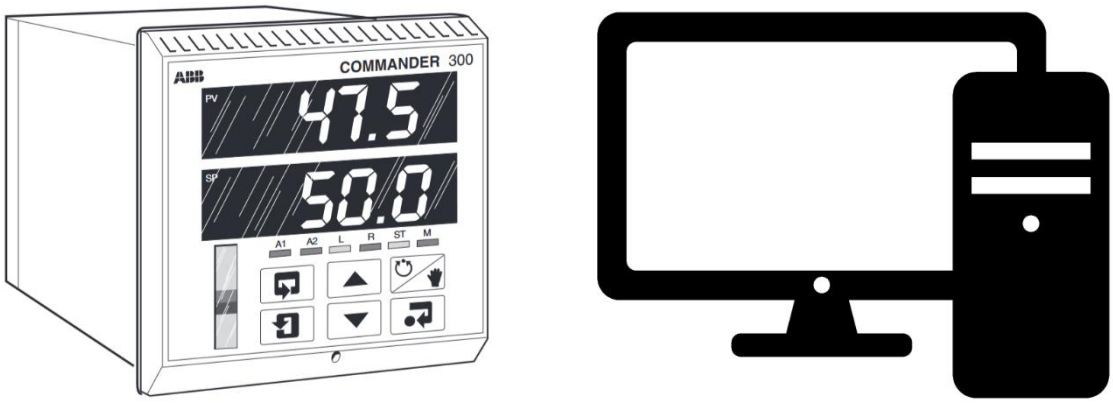
UCO – SERIAL COMMANDER 300

Documentation



An open-source Graphical User Interface for monitoring ABB's Commander 300 Universal Process Controller

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1. Introduction

UCO - Serial Commander 300 (UCO-SC300) is an open-source Graphical User Interface (GUI) developed to monitor ABB's Commander 300 universal process controller. Communication is established through the RS422/485 standard via the serial communication expansion module for the Commander 300. This application provides the user with the appropriate tools to view and save process variables and controller parameters, change the operation mode (manual/automatic) or set the desired value of the control signal in manual mode or the setpoint value in automatic mode. The application is simple as its main function is monitoring and data logging, leaving all the configuration of the C300 controller to be done from its button panel. Only the functionality to modify the control signal or the reference has been added to the application so that experiments can be done where a pure step jump is applied to these signals, which would be very difficult with the up/down arrow buttons of the Commander 300. It is available at https://github.com/AntonioRuizR/UCO-SC300.

2. Serial configuration

The Commander 300 controller communicates with the computer running the interface via the RS422/485 standard. For this purpose, a correct communication with the PC must be configured. The procedure for configuring the serial interface of the Commander 300 can be found in detail in the relevant documentation. The characteristics of the serial communication are as follows:

- Baud rate: **9600**.
- Data Bits: **8**.
- Parity: **No Parity**.
- Stop bits: **1**.
- Flow control: **No flow control**.

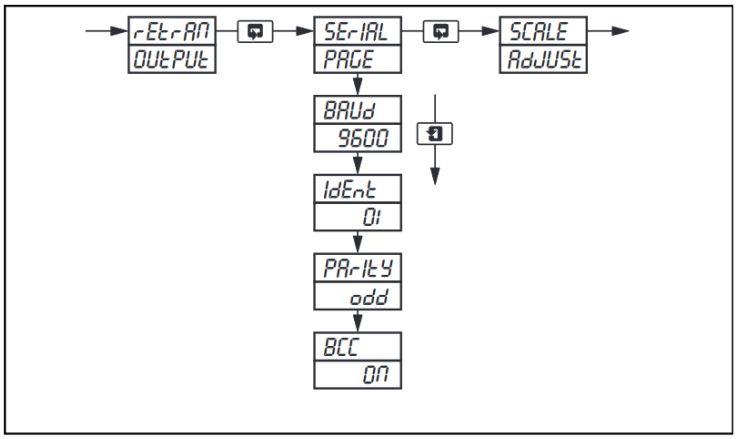

Figure 1: Commander 300 Serial Configuration Example (ABB Documentation)

3. Software structure

UCO - Serial Commander 300 has been designed to make working with the ABB Commander 300 controller simple and fast. All available tools are contained in a single window shown in Figure 2. Each section of the application is discussed below.

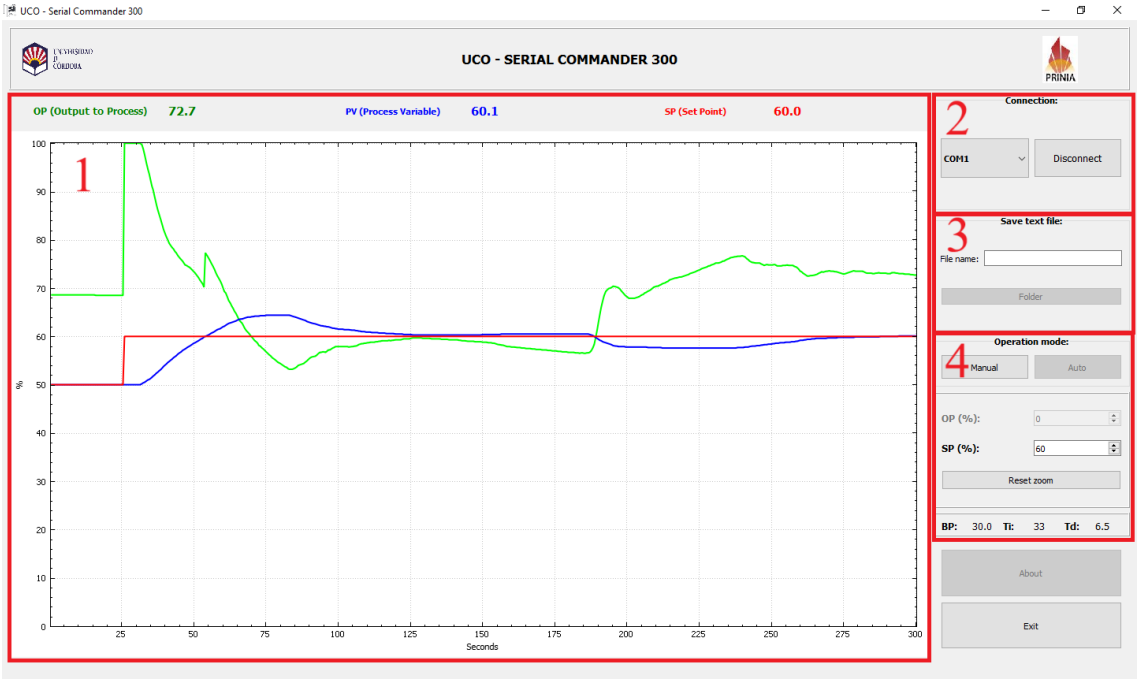

Figure 2: UCO-Serial Commander 300

a) Data display panel

Section 1 shown in Figure 2 consists of a graphic panel in which the evolution in seconds of the process variables is represented in percentage, with a sampling time of 500 ms. Depending on the operating mode chosen (manual/auto), the signals represented will vary. Although by default, the graph shows a time window of 300 seconds, it is possible at any time to zoom with the mouse wheel and to move the graph with the mouse on the horizontal axis.

- **Manual mode**: Control signal or OP (*Output to Process*) and PV (*Process Value*) are represented. SP (*Set Point*) representation is disabled and hidden.
- **Auto mode**: The three fundamental variables of the control loop are depicted, Output to Process (OP), Process Value (PV) and Set Point (SP).

On top of the graph, all these variables are represented numerically.

b) Connection panel

The connection panel shown in section 2 of Figure 2 allows users to establish a connection to the desired serial port linked to the Commander 300. Once the connection is successfully established, data is received and displayed graphically and numerically. In addition, this GUI automatically detects the mode of operation (Manual or Auto). To stop obtaining data, the button to disconnect the communication from the serial port must be pressed, keeping all the data previously obtained for review. The data obtained and its graphical representation are deleted and reset when a new connection is established.

c) Data saving tool

UCO - Serial Commander 300 incorporates a function to save the received data in a comma separated values (csv) file. At a sampling rate of 500 ms, a text line with the following elements is saved in this file:

$$OP\ ,\ PV\ ,\ SP\ ,\ BP\ ,\ T_I\ ,\ T_D$$

The last three data are the parameters of the PID controller: BP is the proportional band, TI is the integral time constant, and TD is the derivative time constant. BP is related to the proportional gain KP according to the expression BP=100/KP. In case the Commander 300 is configured in manual mode, the value of SP is registered as '0.0'.

By default, the application saves the data on the Desktop of the computer. If user wishes to specify another directory or a USB drive, it must be specified in panel 3 of Figure 2 and do so before establishing the serial connection with the Commander 300, as afterwards the Folder button is disabled. Once the application is running and the connection has been established through the communication panel, to start the generation of the 'csv' file, user must indicate the desired name and press the 'Enter' key (Figure 3).

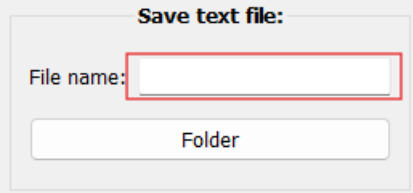

Figure 3: Data saving panel

d) Operation mode panel

In this application panel (section 4 in Figure 2), the tools necessary to send certain commands to the Commander 300 are provided. Two buttons are available at the top of the panel to change the operating mode: *Manual* or *Auto*. In manual mode, the Output to Process value can be edited. Similarly, by selecting Auto mode, the Set Point value can be modified while the Output to Process value is blocked from editing..

A button has also been provided to reset the default view of the graph (Figure 4). Finally, at the bottom of the panel, the parameter values of the configured PID control are shown: BP, TI and TD. Only the values are shown, which are not editable. The modification of these parameters must be done from the button panel of the Commander 300 itself.

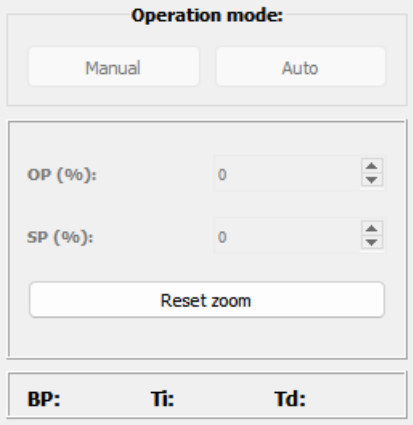

Figure 4: Operation mode panel

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