CEA-Irfu

Augustin LEMESLE

IRFU/SIS/LDISC

Direction des sciences de la matière
Institut de recherche sur les lois fondamentales de l'Univers

User Manual – PLC Parser Tool

Modification history

Version	Information
10/07/17	Creation
11/07/17	Revision
25/07/17	Correction Paul Lotrus – Modification Augustin Lemesle
12/12/18	Mise à jour – Katy SAINTIN
04/03/20	Mise à jour – Katy SAINTIN

Table of contents

1. Introduction

1.1 Purpose

The purpose of this document is to detail how to use the "PlcParserTool". It will be easier if you have some knowledge in the field of PLC (Programmer Logical Controller) as well as in EPICS as everything related to those topics will not be explained in the present document.

1.2 About the software

PlcParserTool is a standalone tool that is integrated as a CSS plugin software and Phoebus application. This software is available on \\dapnia\data\manip\SISLaboratoire\LAB_DEV_INFORM_INDUSTRIEL\Users\ksaintin\Logiciels

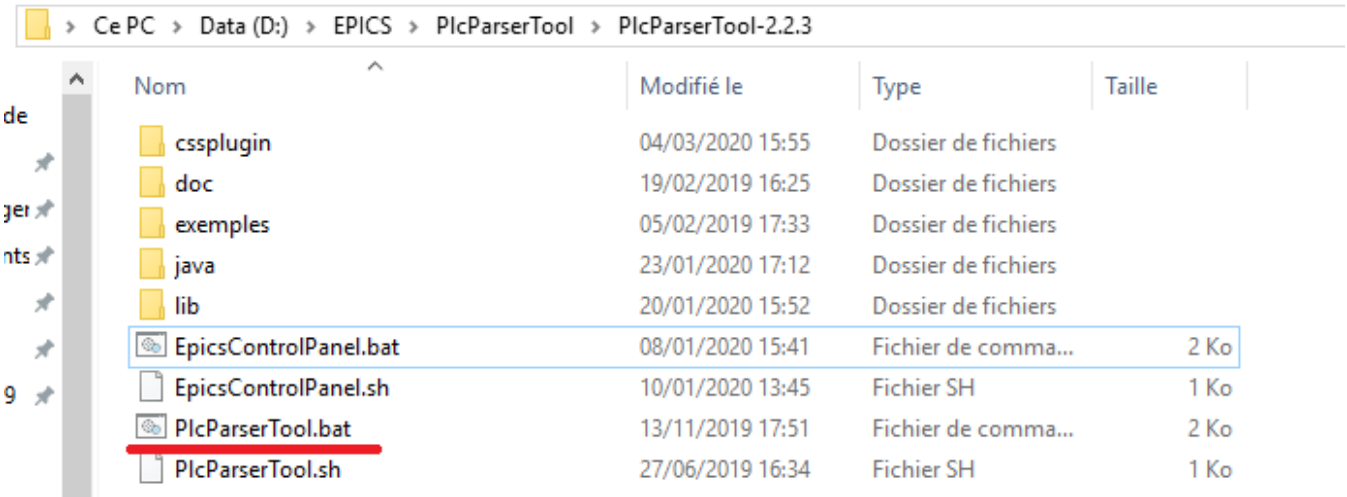
It deliver several service utilities:

- **Generation of EPICS IOC files** from TIA Portal Siemens files (AWL, SDF and XLSX), assuming those following protocol : S7NoDave, S7PLC, Modbus, and Modbus S7PLC mixte protocol. The generated files have to be deployed in EPICS architecture installation. You will need a EPICS expert for this step.

- **Launch a simulated EPICS IOC**: This simulated server publish through Channel Access protocol, all the process variable defined in a PLC. This server allow the user to test a CSS synoptic without the hardware installation.

- **Open a generic client control panel**: to monitor and write on the process variable list. This panel is useful to test a running IOC without a design synoptic.

- **Generate a CSS or Phoebus panel:** starting from a PV list, in order to test an EPICS IOC without a design synoptic.

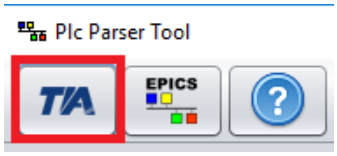


To launch the PLCParserTool in standalone mode, you can execute PLCParserTool.bat on windows OS or PLCParserTool.sh on linux or ubuntu(change the execution permission before command "chmod 755").

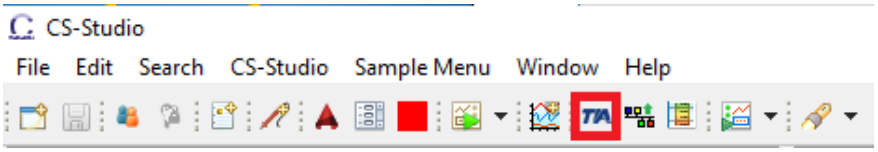
2. How to load your first Siemens database description?

a) Load TIA Portal files

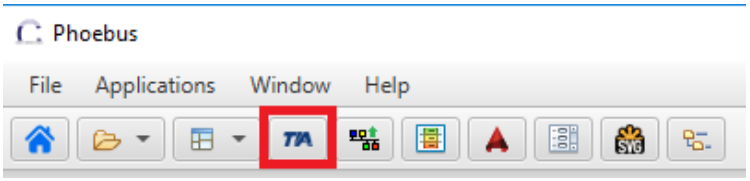
The TIA button will be available :



PLCParserTool menu standalone application



CSS plugin menu application



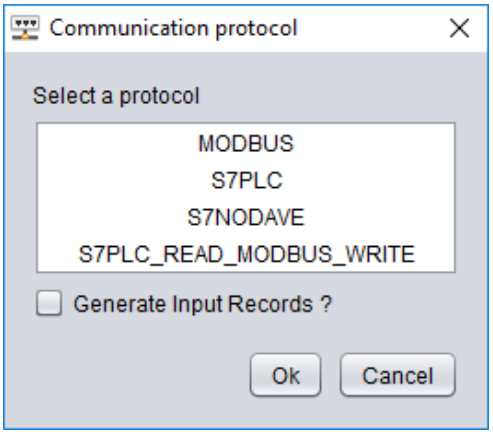
CS Pheobus plugin menu application

By clicking on this button you will load .sdf, .awl and .xlsx files from a directory. A pop-up will be displayed asking you to **choose** the communication **protocol** (between the SCADA and the PLC):

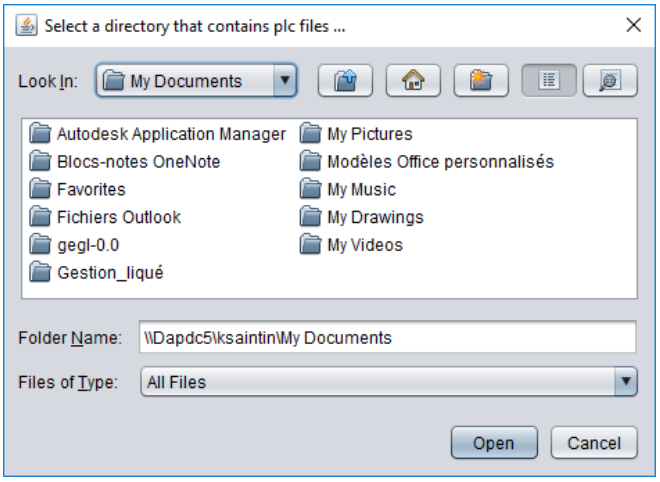
Check "**Generate Input Records"** if you want to generate automatically read only records corresponding to a writable record. By convention, the generated record will be named PVname**R .** No effect on S7PLC Modbus mixt protocol**.**

Select the protocol from the drop down list and then click on "Ok".

Then a file browser is displayed, select a folder **that contains at least one PLC file** .



Protocol choice



From it, you select the **directory** in which your **Siemens files** are stored.
The directory must contain only 1 file in the .sdf or .xlsx format for the same PLC. **Notice that this path is memorised in a preferences file, in order to display directly the good folder next time**.
A warning will occur if the .awl files described in the .sdf or .xlsx do not exist.
You confirm by clicking on the "Ok" button.

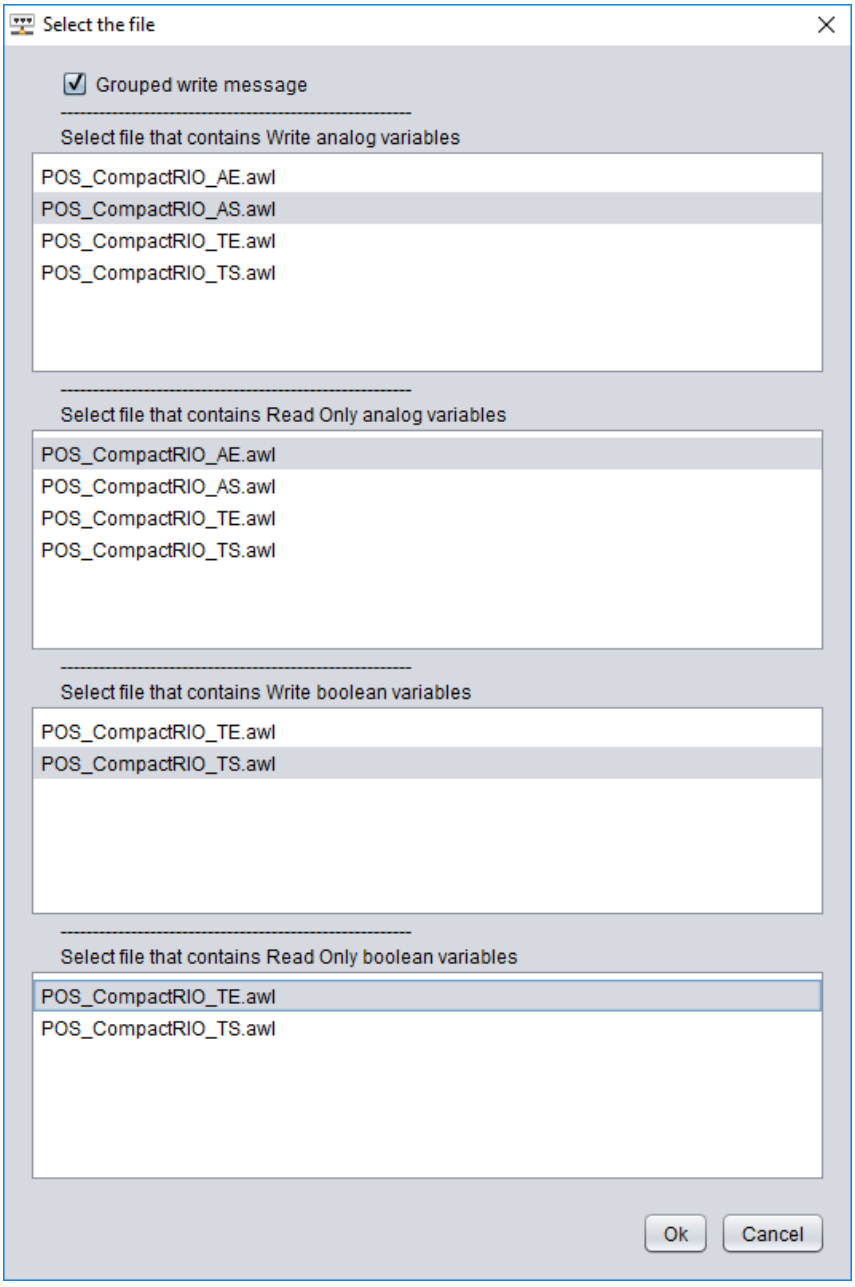
b) Protocol selection

Modbus protocol

The variable have to be defined in 4 separated PLC files :

- Writable analogic variables : **AS** (Analogiques Sorties)
- Read only analogic variables : **AE** (Analogiques Entrées)
- Writable boolean variables : **TS** (TOR (Tout Ou Rien) Sorties)
- Read only boolean variables : **TE** (TOR (Tout Ou Rien) Entrées)

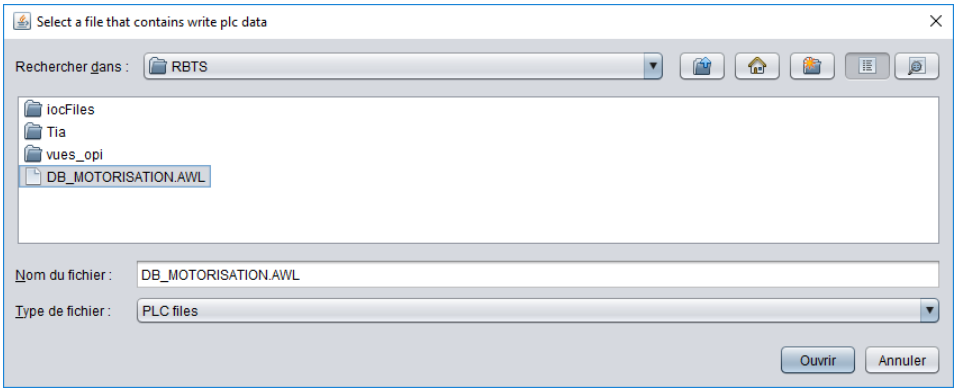
Check « **Grouped write message** » option : if you want to gathered the variable in the same Modbus Message for the write part. In order to reduce the configuration file for the Modbus protocol.



Modbus dialog selection

S7PLC protocol

If "**Generate Input Records" is checked.** A File dialog selection is displayed. Select the PLC file that contains your variables. The tool will generate automatically a record named PV_name**R** for each record found in the PLC files. For example :

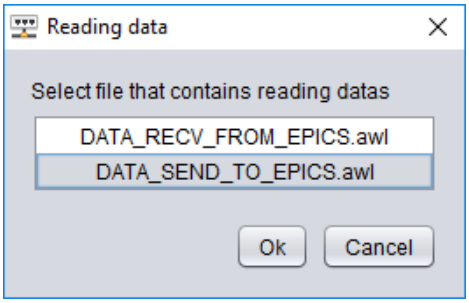


Rbts

Search

Index	Name	Record type	Address	DTYP	DESC
169	Connection_status	bi	@PLC_RBTS	S7plc stat	Connection status with PLC
1	SL-MBT-RBN1-B1-KF3:Reserv2StatR	bi	@PLC_RBTS/2 T=BYTE B=0	S7plc	Reserv
1	SL-MBT-RBN1-B1-KF3:Reserv2Stat	bo	@PLC_RBTS/2 T=BYTE B=0	S7plc	Reserv
2	SL-MBT-RBN1-B1-KF3:CamLim1StatR	bi	@PLC_RBTS/2 T=BYTE B=1	S7plc	Cam limit 1
2	SL-MBT-RBN1-B1-KF3:CamLim1Stat	bo	@PLC_RBTS/2 T=BYTE B=1	S7plc	Cam limit 1
3	SL-MBT-RBN1-B1-KF3:CamLim2StatR	bi	@PLC_RBTS/2 T=BYTE B=2	S7plc	Cam limit 2
3	SL-MBT-RBN1-B1-KF3:CamLim2Stat	bo	@PLC_RBTS/2 T=BYTE B=2	S7plc	Cam limit 2
4	SL-MBT-RBN1-B1-KF3:Reserv3StatR	bi	@PLC_RBTS/2 T=BYTE B=3	S7plc	Reserv
4	SL-MBT-RBN1-B1-KF3:Reserv3Stat	bo	@PLC_RBTS/2 T=BYTE B=3	S7plc	Reserv

If "**Generate Input Records" is not checked.** You have to define a PLC file that contains read only variable and on that contains writable data. You have to select files that contains read only data (from **the IOC side**). All the non-selected files stored in the folder will be considered as writable data. For example:



Rbts Skid

Search

Index	Name	Record type	Address	DTYP	DESC
56	CWM-CWS03:WtrC-LT-070:LLACK	bo	@ESS_SKID/100 T=BYTE B=0	S7plc	Error - LT70 - Level Low - Acknowledge
57	CWM-CWS03:WtrC-LT-070:LVLACK	bo	@ESS_SKID/100 T=BYTE B=1	S7plc	Error - LT70 - Level Very Low - Acknowle
58	CWM-CWS03:WtrC-EC-010:Ack	bo	@ESS_SKID/100 T=BYTE B=2	S7plc	RFQ - Exchanger regulation loop - H10 -
59	CWM-CWS03:WtrC-EC-010:Sel	bo	@ESS_SKID/100 T=BYTE B=3	S7plc	RFQ - Exchanger regulation loop - H10 -
129	CWM-CWS03:WtrC-P-10:StatOn	bi	@ESS_SKID/256 T=BYTE B=0	S7plc	Exchanger regulation loop - Pump PP10 -
130	CWM-CWS03:WtrC-P-10:StatFail	bi	@ESS_SKID/256 T=BYTE B=1	S7plc	Exchanger regulation loop - Pump PP10 -

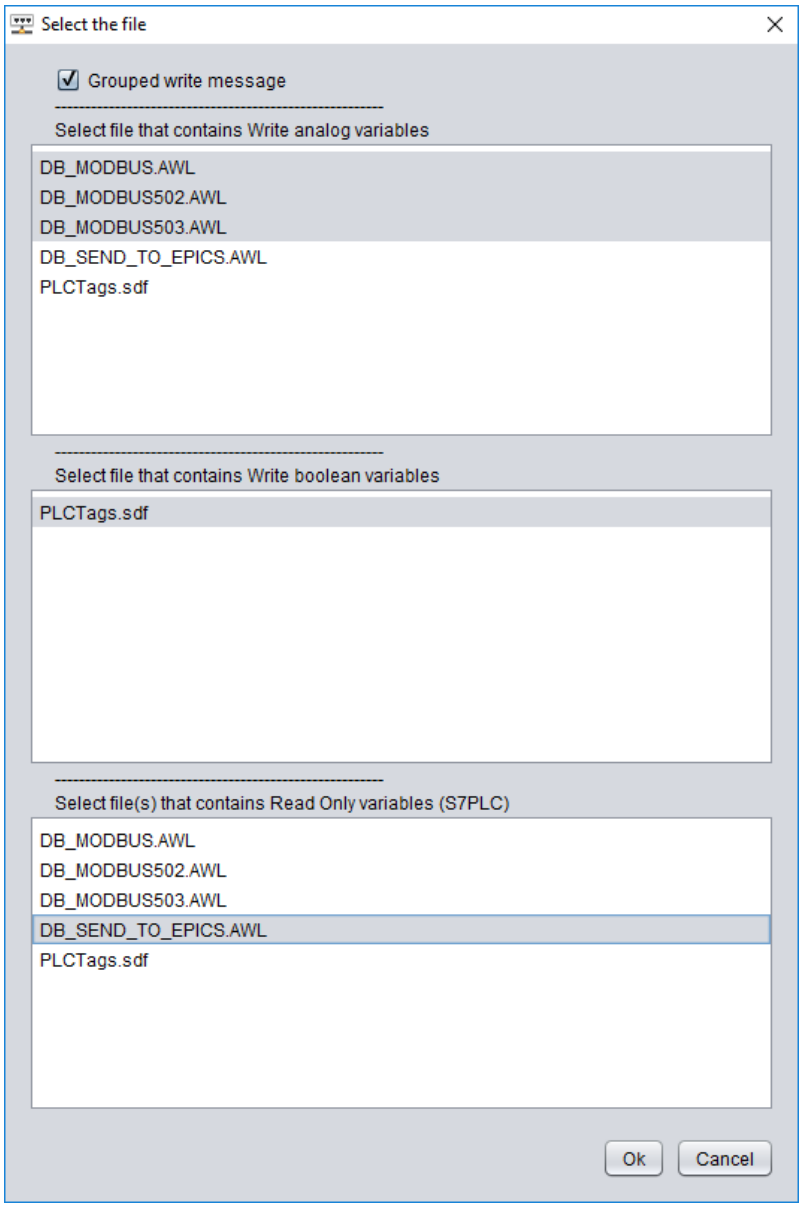
This protocol, use S7PLC protocol for reading information from PLC (in one block), and Modbus for writing values on PLC (on a specific PLC address).

Check « **Grouped write message** » option : if you want to gathered the variable in the same Modbus Message for the write part. In order to reduce the configuration file for the Modbus protocol.

The writable variables have to be defined in 3 separated PLC files :

- Writable analogic variables : **AS** (Analogiques Sorties)
- Writable boolean variables : **TS** (TOR (Tout Ou Rien) Sorties)
- Read only variables

For example:



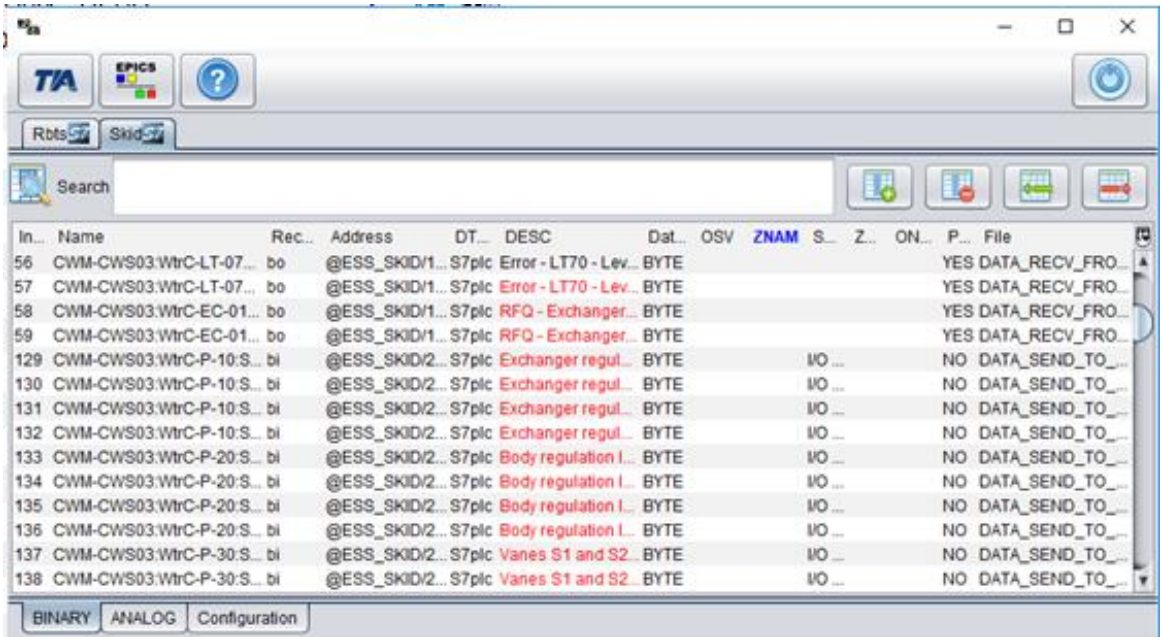
S7PLC Modbus mixt protocol dialog selection

Notice that if the variable follow the naming convention PV_name and PV_nameR, the tool will deduce that PV_name is linked to PV_nameR.

c) Records table

1) The editor

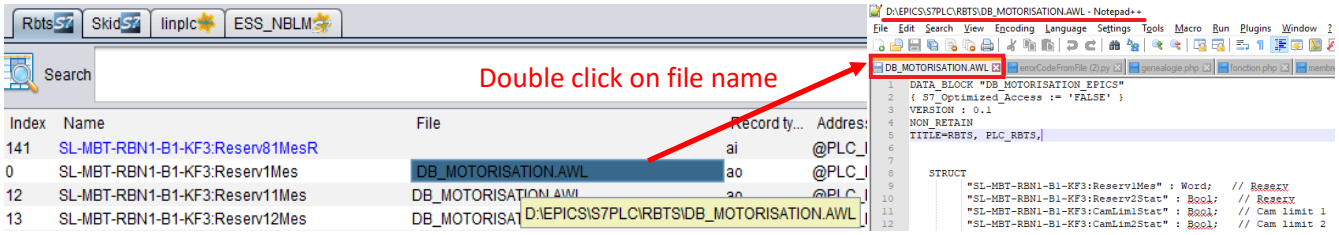
After each PLC files load. An EPICS application view is displayed in a new Tabbed. Here is how an open editor with no records should look like, in this case 2 S7PLC projects are loaded:



Records

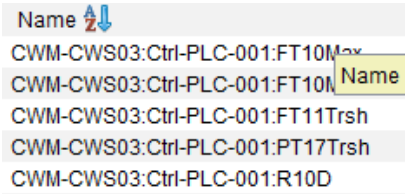
The software will read the data from your Siemens files and display them one by one on a line. The data are splitted in **3 tabbed**, the first page for **binary** records and the second one for **analogic** records, and the last one for the protocol **configuration parameters**. Some columns (EPICS fields) are created automatically.

File column is dedicated to the software. It indicates the PLC file from which the record come from. A tool tip displays the full path of the PLC file on file system. If you double click on the file, it will open the file in a text editor.



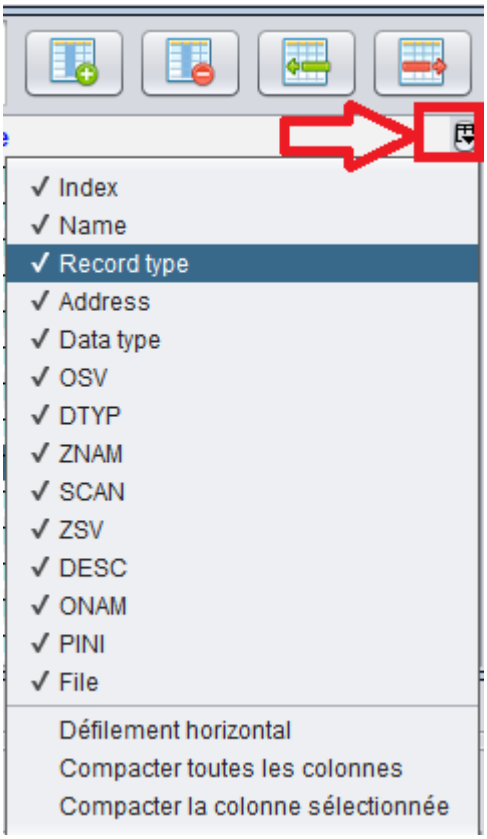
Sorting

By clicking on the header of the column you can sort the table with that column. Clicking a second time will change the order of the sorting.



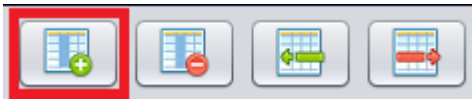
2) The editing menu

By right clicking on the editor, on the top left control of the table you can see a popup menu appear. You can hide/show a column. This parameter is saved in a preference file at the software exit.

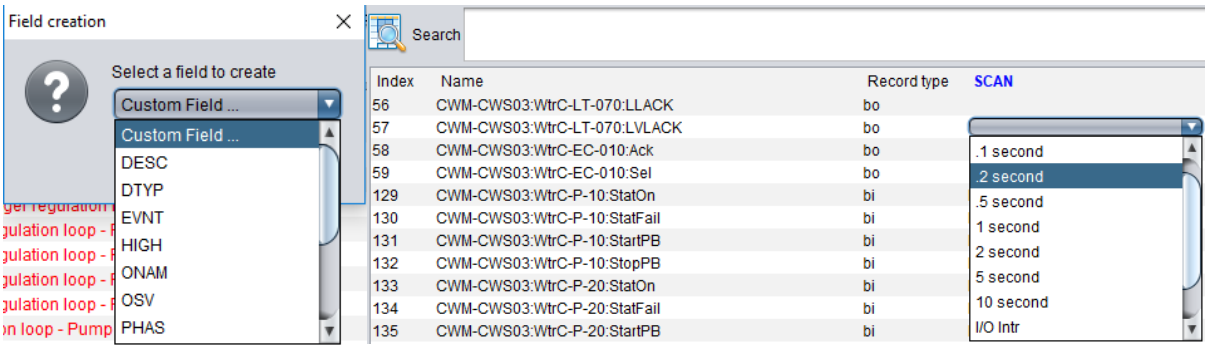


3) Add/Remove an EPICS fields and records

a) **Add an EPICS field**



Select predefined EPICS fields or typed a custom field. (See documentation https://wiki-ext.aps.anl.gov/epics/index.php/RRM_3-14_dbCommon). The field are sorted by alphabetical order.



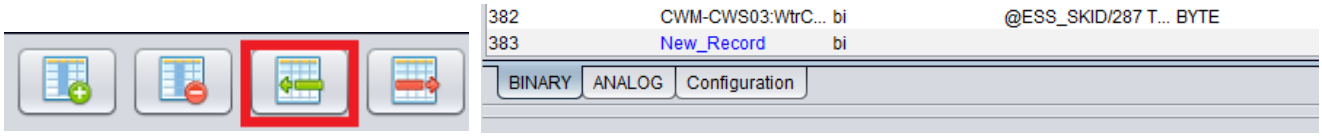
When the select field is known as an enumeration (GBLCHOICE), those choices are displayed in a combo box. **All the new fields and their associated value are kept on reloading a PLC file**. **The DESC, Record Type, Address, DTYP fields will be overwritten**.

b) **Remove an EPICS field**

Select a column to delete in order to enable the Deletion button. Some field are not removable such as Name, Address (INP, OUT), DTYP, DESC … The Button will be disable in this case.

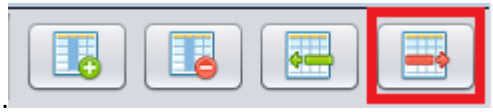
c) "**Add a user Record"**

Click on the following button to insert a new custom record. **This new record will be kept if a PLC file is reloaded**.



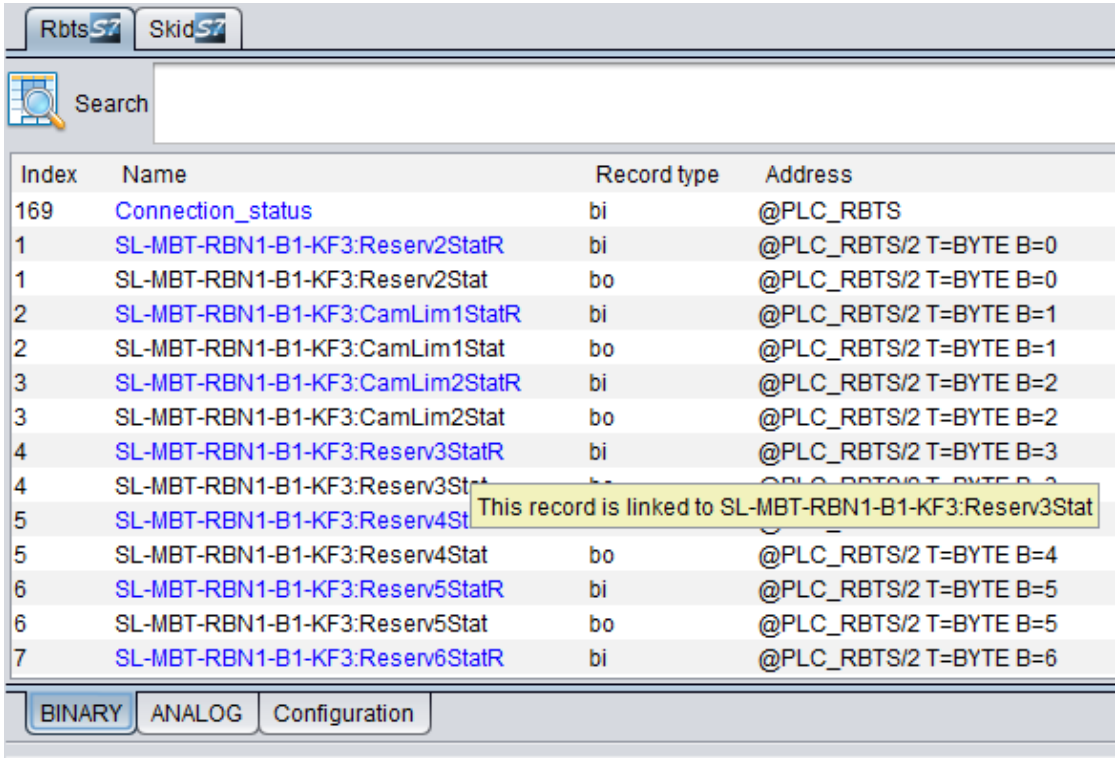
d) "Remove a record"

Select a row to delete in order to enable the Deletion button. Then click on the button.

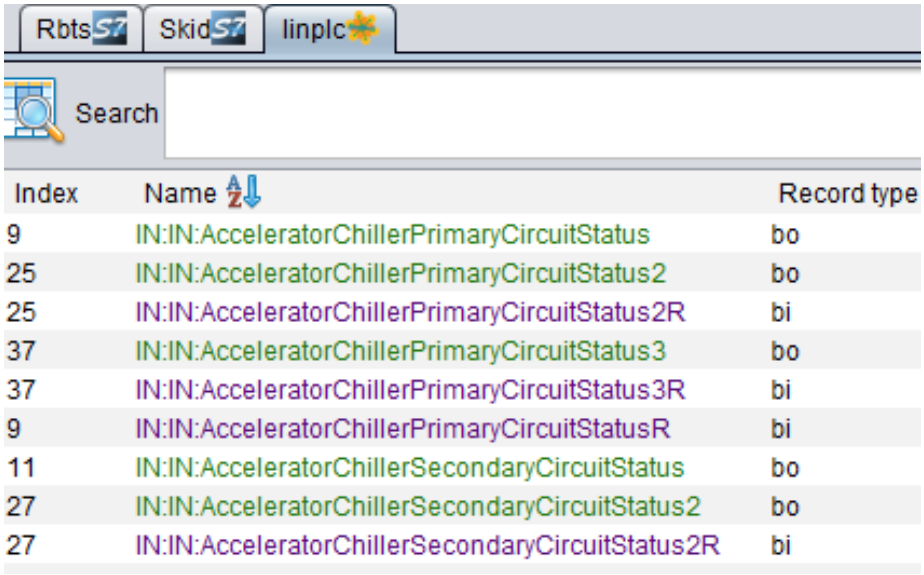


4) Data information and edition

a) **Record information**

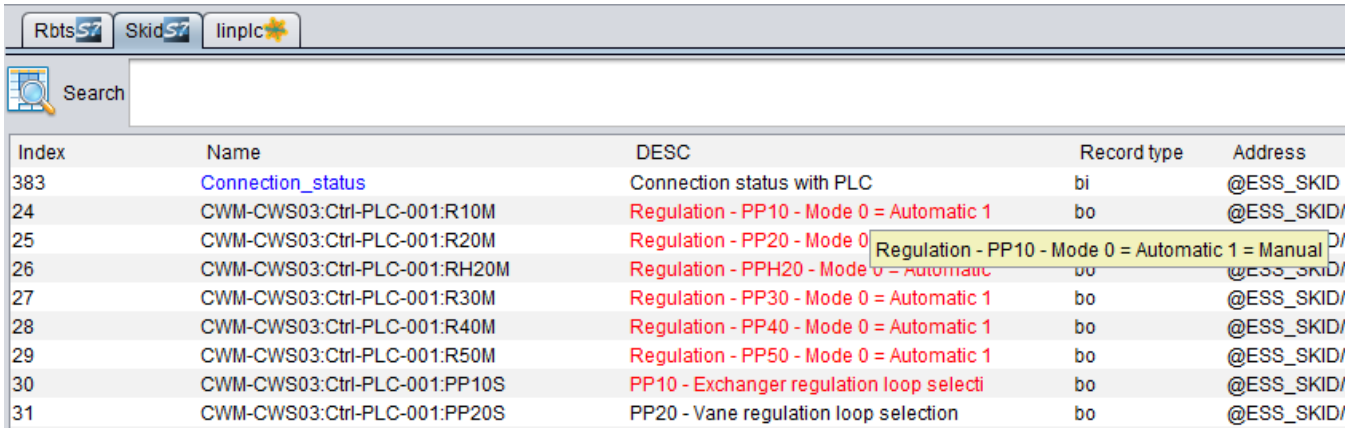


The tool generates all the created records in blue. Those records does not exist in the PLC files, and when they corresponding to a writable record, they name with an R in suffix, for "Read". Right click on the record to display a tooltip informing the linked record name.



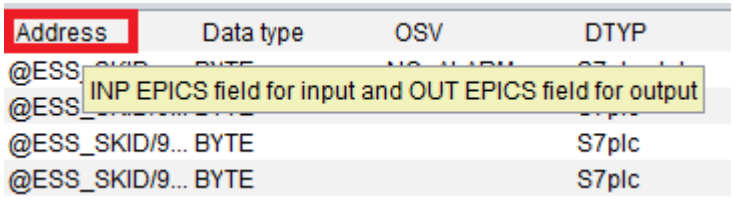
Index	Name	Record type
9	IN:IN:AcceleratorChillerPrimaryCircuitStatus	bo
25	IN:IN:AcceleratorChillerPrimaryCircuitStatus2	bo
25	IN:IN:AcceleratorChillerPrimaryCircuitStatus2R	bi
37	IN:IN:AcceleratorChillerPrimaryCircuitStatus3	bo
37	IN:IN:AcceleratorChillerPrimaryCircuitStatus3R	bi
9	IN:IN:AcceleratorChillerPrimaryCircuitStatusR	bi
11	IN:IN:AcceleratorChillerSecondaryCircuitStatus	bo
27	IN:IN:AcceleratorChillerSecondaryCircuitStatus2	bo
27	IN:IN:AcceleratorChillerSecondaryCircuitStatus2R	bi

When an IOC database file already generated before (db file). All the record found in a db file, and not overwritten by a PLC file, displayed in green. The record generated by the software but comes from the db file are displayed in purple.



Index	Name	DESC	Record type	Address
383	Connection_status	Connection status with PLC	bi	@ESS_SKID
24	CWM-CWS03:Ctrl-PLC-001:R10M	Regulation - PP10 - Mode 0 = Automatic 1	bo	@ESS_SKID/
25	CWM-CWS03:Ctrl-PLC-001:R20M	Regulation - PP20 - Mode 0	bo	@ESS_SKID/
26	CWM-CWS03:Ctrl-PLC-001:RH20M	Regulation - PPH20 - Mode 0 = Automatic	bo	@ESS_SKID/
27	CWM-CWS03:Ctrl-PLC-001:R30M	Regulation - PP30 - Mode 0 = Automatic 1	bo	@ESS_SKID/
28	CWM-CWS03:Ctrl-PLC-001:R40M	Regulation - PP40 - Mode 0 = Automatic 1	bo	@ESS_SKID/
29	CWM-CWS03:Ctrl-PLC-001:R50M	Regulation - PP50 - Mode 0 = Automatic 1	bo	@ESS_SKID/
30	CWM-CWS03:Ctrl-PLC-001:PP10S	PP10 - Exchanger regulation loop selecti	bo	@ESS_SKID/
31	CWM-CWS03:Ctrl-PLC-001:PP20S	PP20 - Vane regulation loop selection	bo	@ESS_SKID/

EPICS DESC (Description) is limited to 40 characters. When a description is truncated, it will be displayed in red. You can see the complete description in the tooltip of the description value.

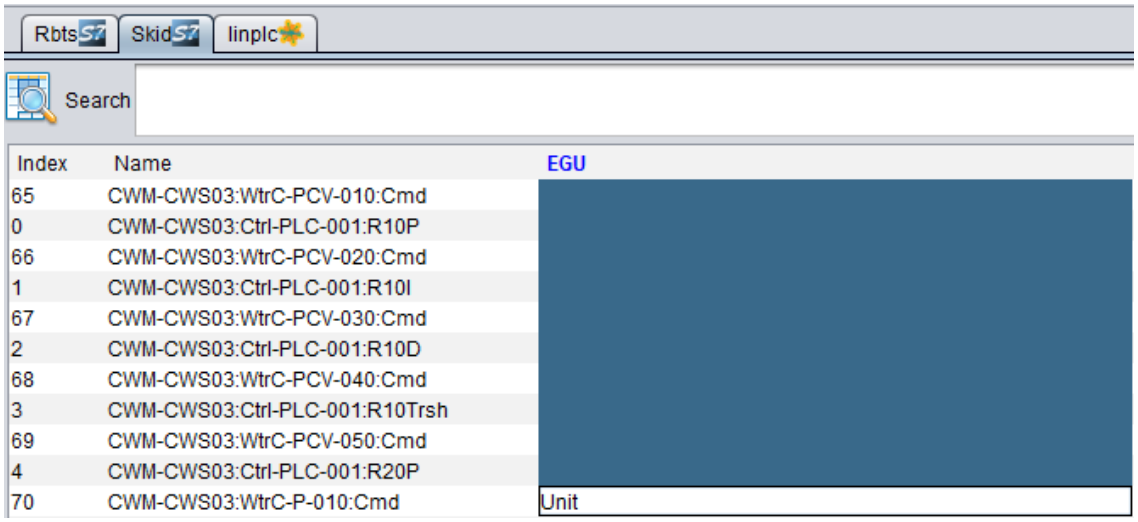


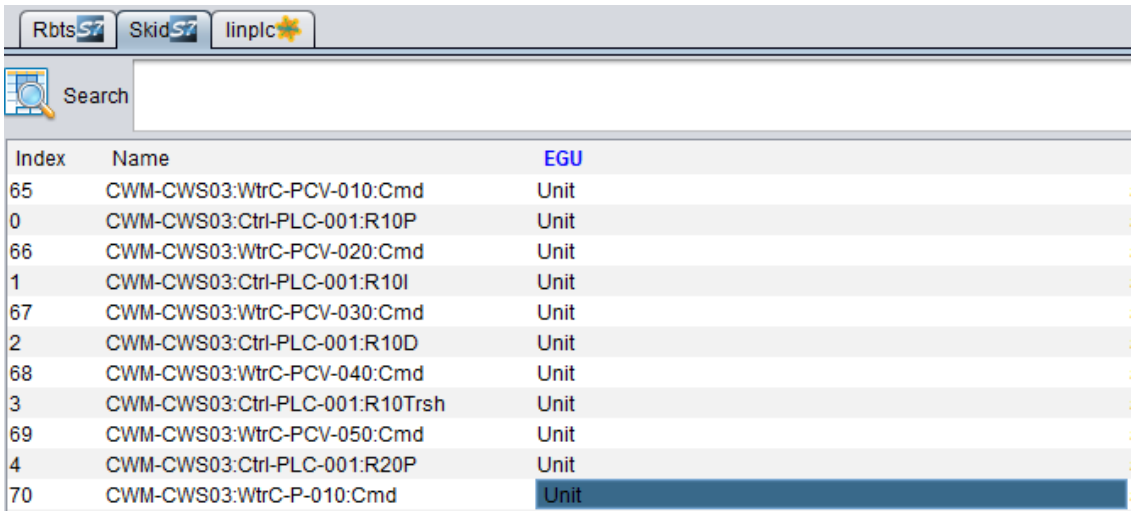
Each column have a tooltip to give a short description of the EPICS field meaning.

b) **Record edition**

To edit data in the table, you need to click on the cell that you want to edit. It will open a text editor or a drop down list if the cell requires multiple choices. You can then type your text or choose from the list.

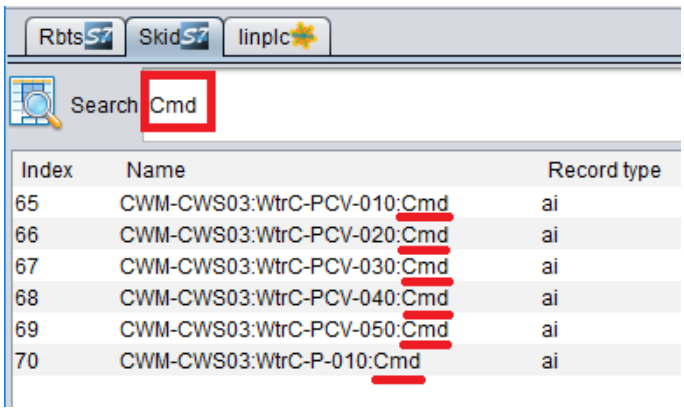
You can apply a value to several records at while in select several row, then changing the value in the last row.





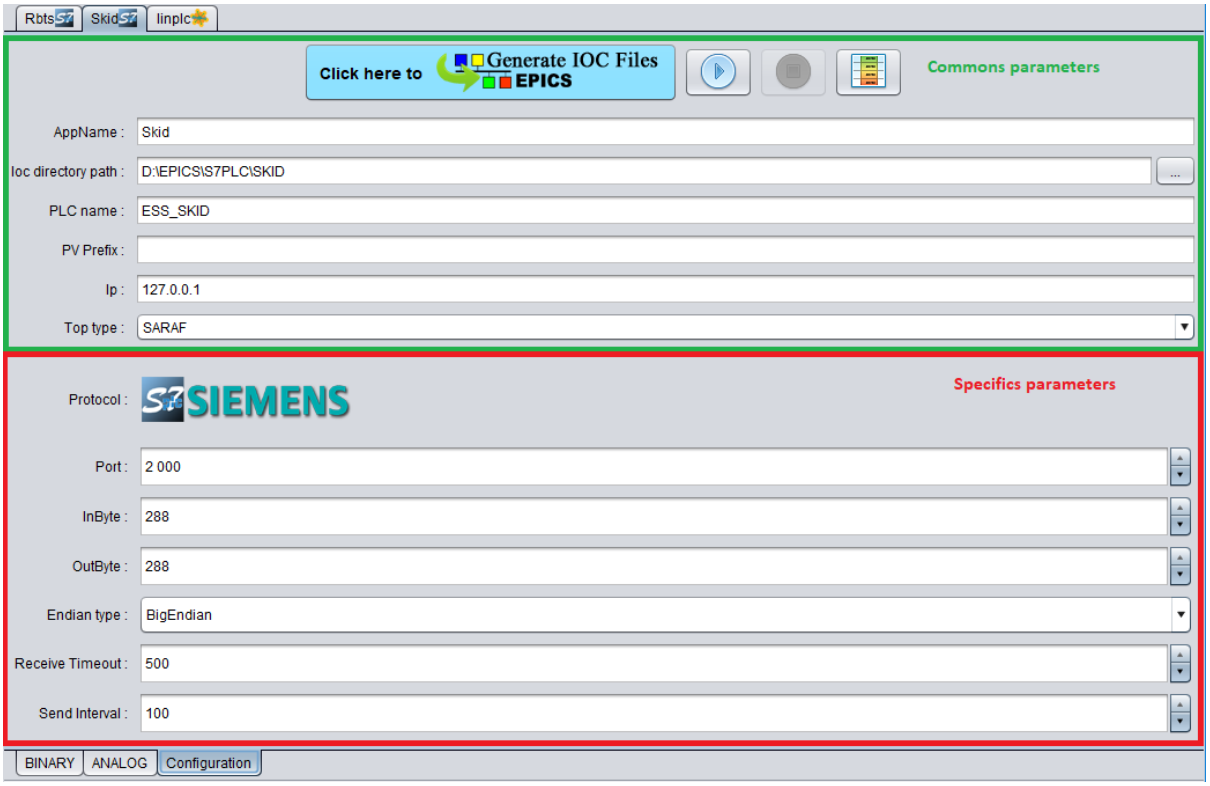
5) Data filtering

You can search a specific record by typing a regular expression in the search bar:

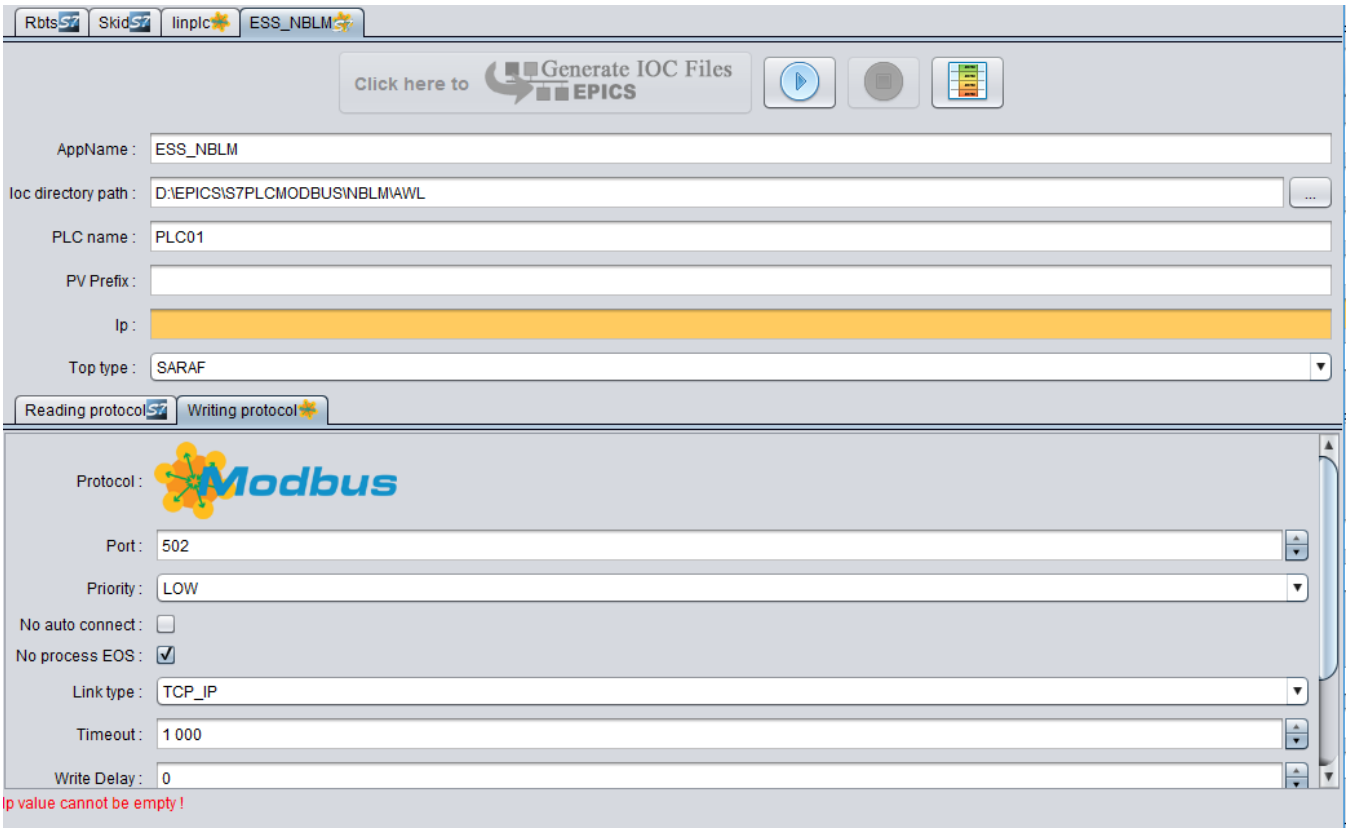


6) Configuration du protocol

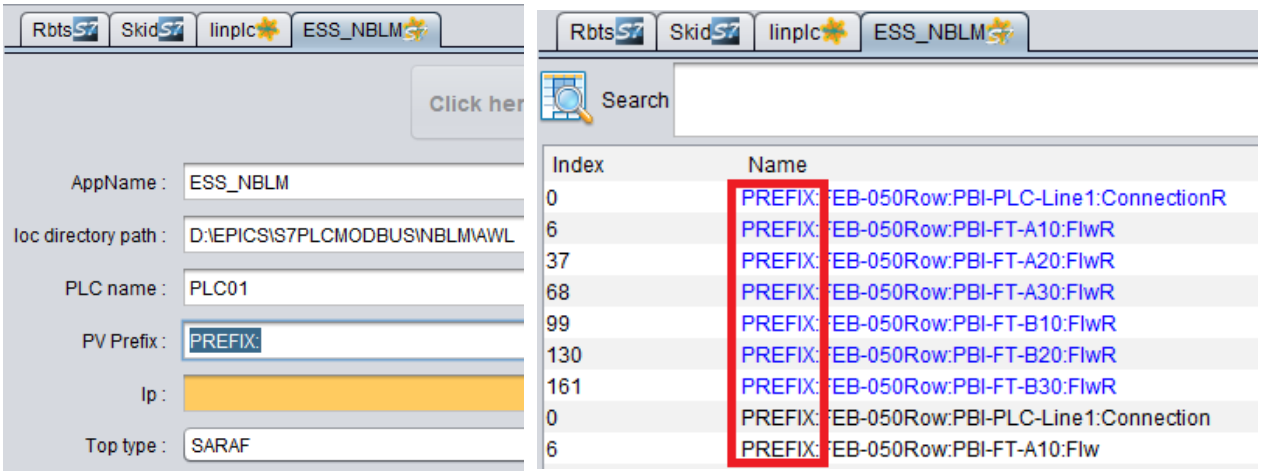
The configuration tabbed pane is splitted in 2 parts. The top frame define the EPICS IOC configuration parameter, and the commons parameters between protocols.



In S7PLC Modbus mixt protocol, there is two tabbed to configure each protocol.

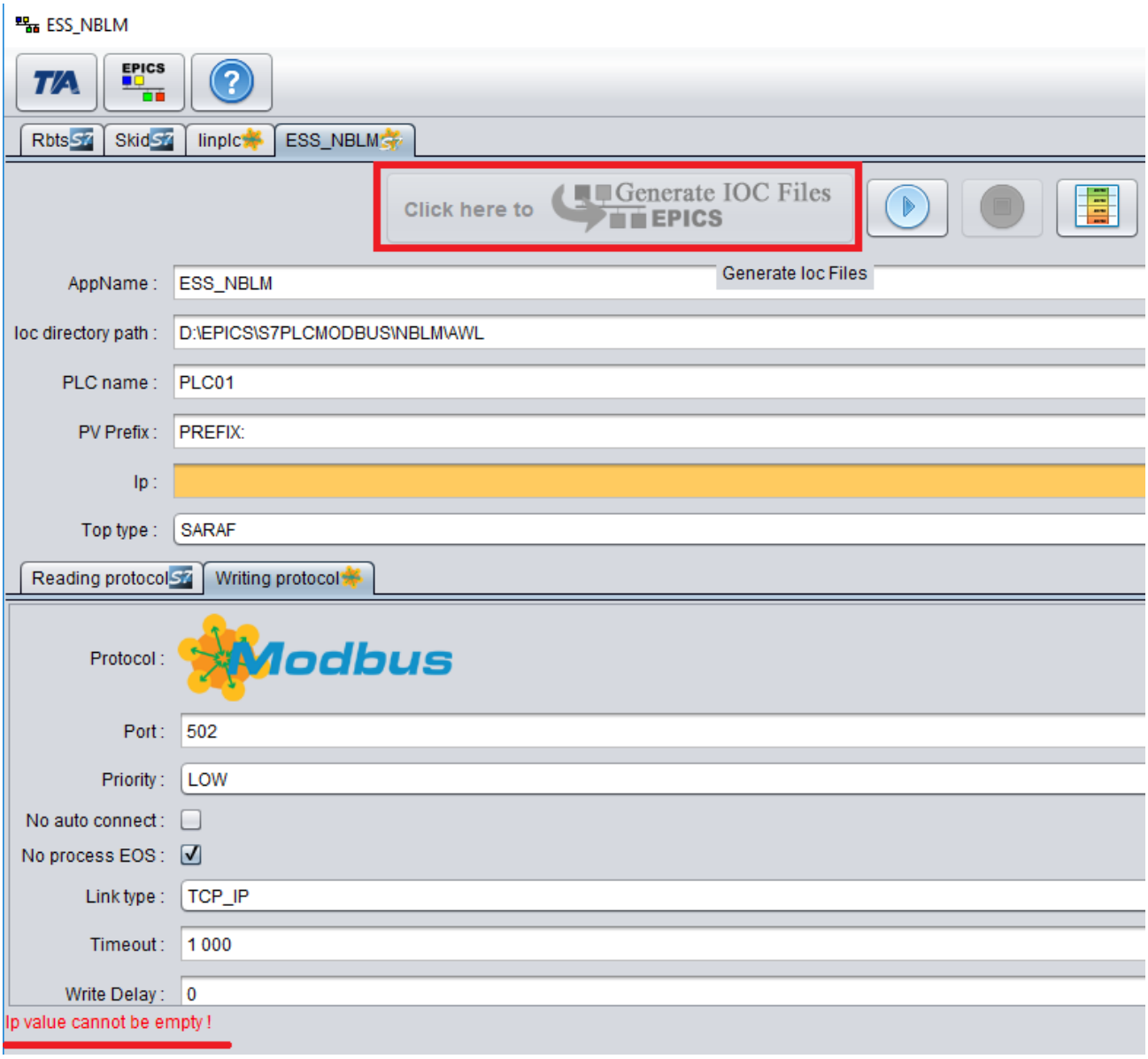


You can set a prefix for your variable name, be careful a variable name cannot exceed 28 characters.



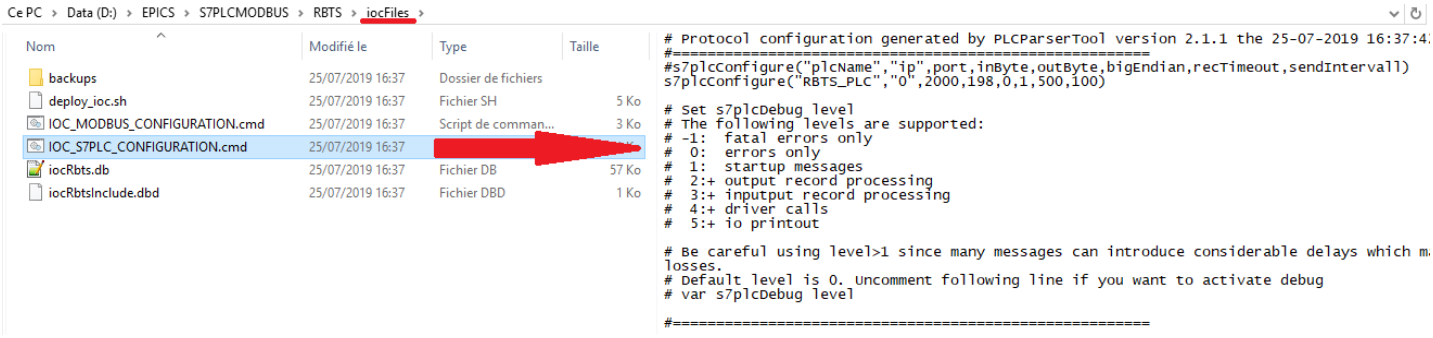
d) Generate EPICS IOC files for the SCADA

In order to enable the "Generate IOC Files" button. You have to enter at least all the parameters identified by **orange background field**. An error appears at the bottom of the panel when there is a missing parameter.



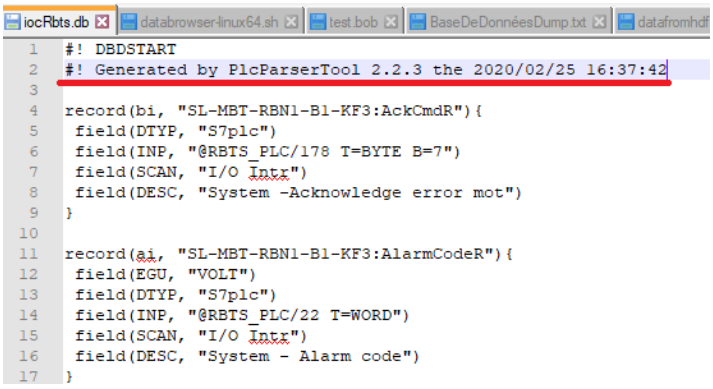
If a generation is done before, the parameters as the IP address is memorised, and it is not necessary to type again. When all is ready, click on this following button.

This will generate several files in iocFiles folder, to copy in a EPICS installation folder:

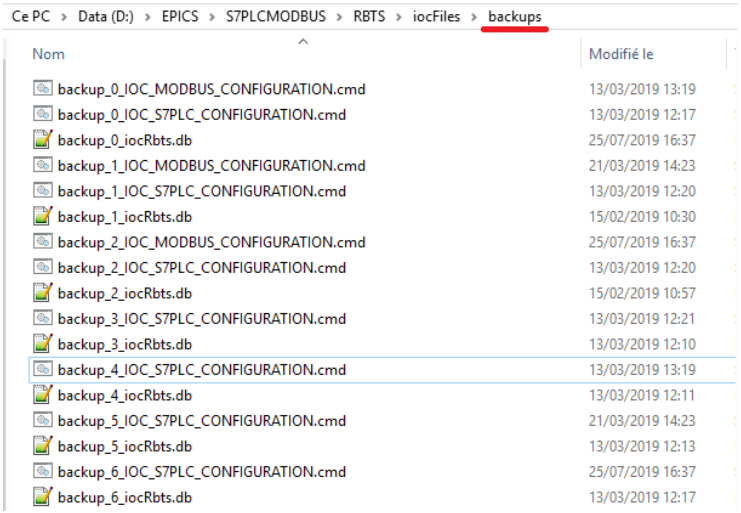


For each protocol, a corresponding cmd file is generated. It contains the EPICS driver configuration parameters as you can see in the previous screenshot for the S7PLC protocol configuration.
This line “s7plcConfigure("RBTS_PLC","0",2000,198,0,1,500,100)” configure :
PLC Name to RBTS_PLC, IPaddress to 0, port 2000 …

A complete db file, that contains the definition of all the EPICS records. In the header there is the date of the generation and the software version of the PLCParserTool.

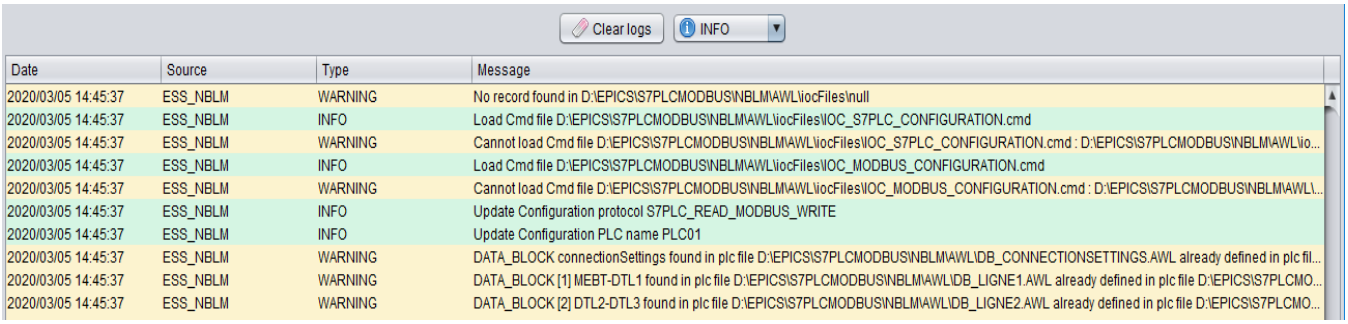


For each generation, in order to keep the old files, a backup file is copy in the backup folder. The software assumes 10 backups.

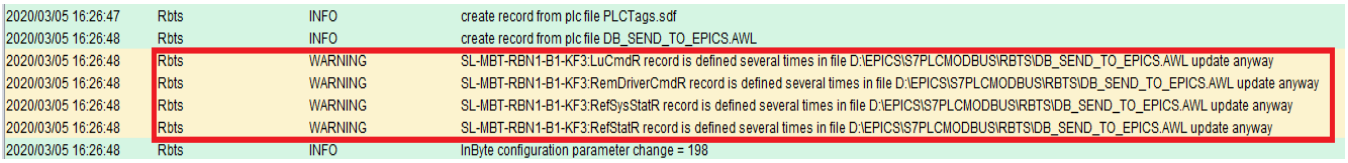


e) Logging view and trouble shot

The software displays all information, warnings and errors in the logging view table. You can filter the log through the Combox box, selecting the logging level you want to display.

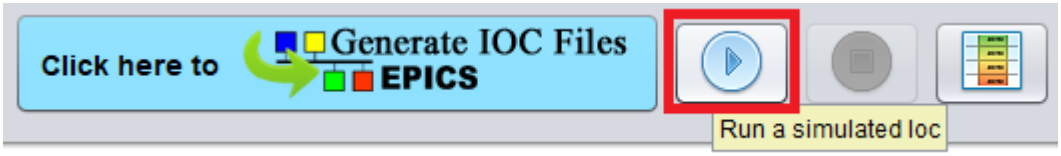


When a variable defined several times, the software take in account the last variable. And a warning is displayed in the logging view.



f) Run a simulated IOC

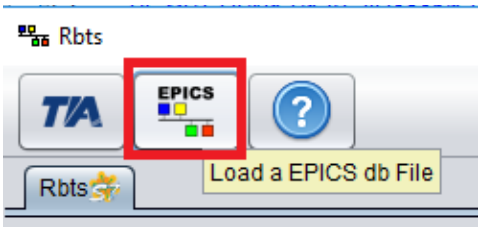
If you want to test an EPICS channel client, as a CSS Synoptic, without the PLC ready behind. It can be useful to test the client view connected to a simulated IOC. In clicking to Play button, the tool will run a IOC with all the process variables available in writable mode. The simulation also create the link between a writable record and a read only record. For exemple writing a value on PV_Name variable, will also copy the value on PV_NameR variable.

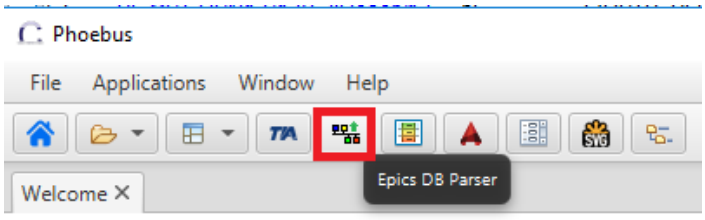


You cannot launch the simulation twice in CSS software. So it is advice to launch the simulation in the Standalone application.

g) Load a EPICS database file

Click EPICS button to load a db file to load. The next steps are the same as previous instructions.

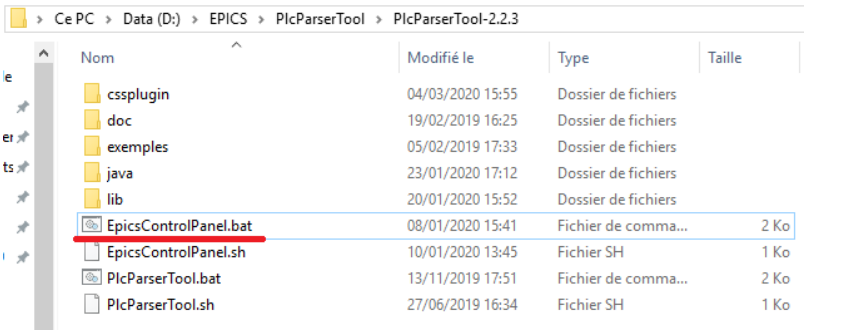


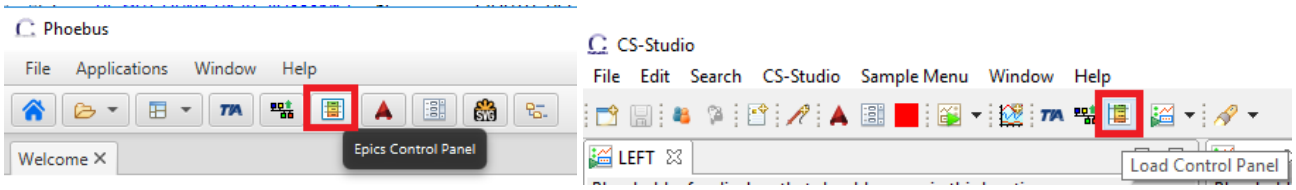


3. Epics Control Panel

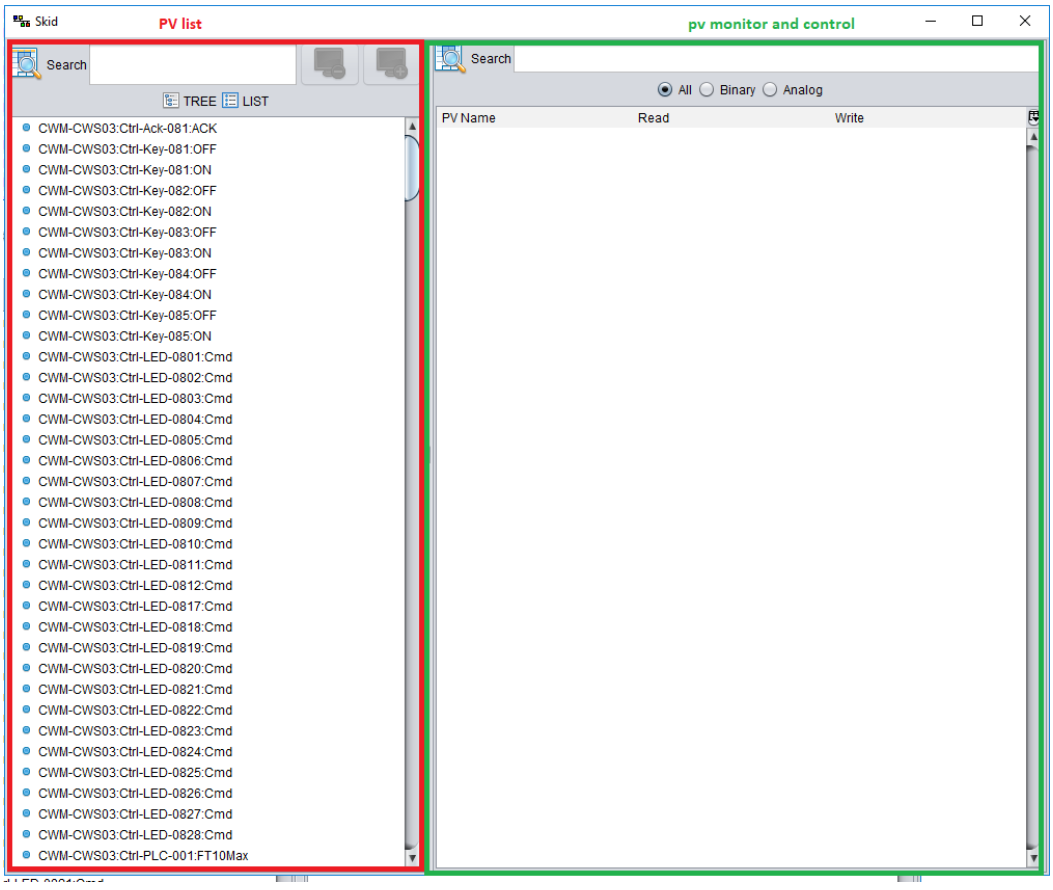
a) Launch the tool

Click on table Button to monitor the process variables. You can run the tool as a standalone tool running EpicsControlPanel.bat on Windows OS and EpicsControlPanel.sh on linux and Ubuntu OS. This button is available in CSS or in Phoebus.



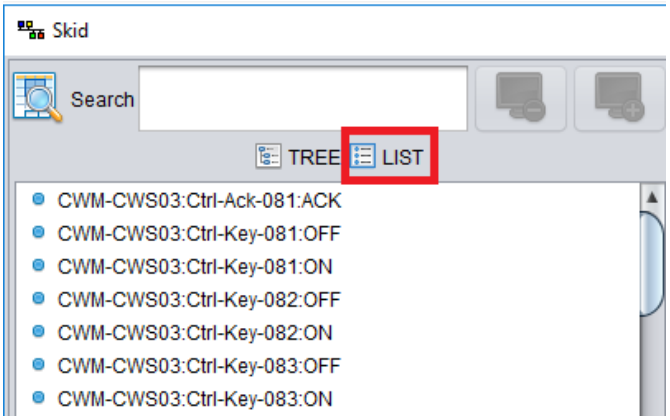


The control panel is composed of 2 frames. The left one displays the PV list and to right one displays a table of the process variable to read and write values.

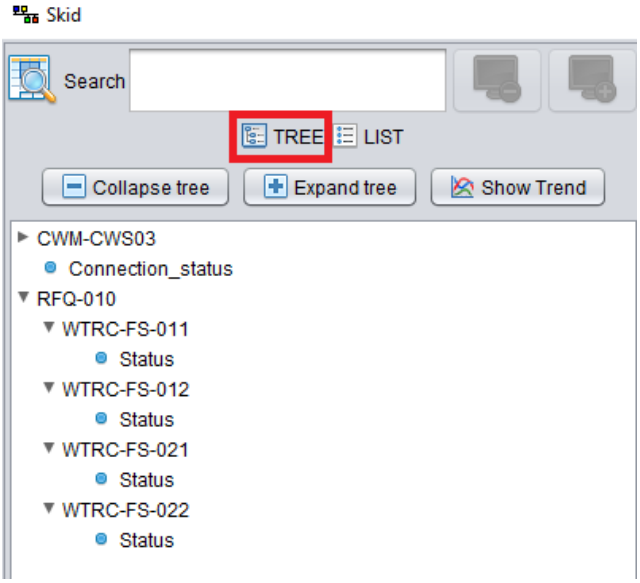


b) PV list display mode

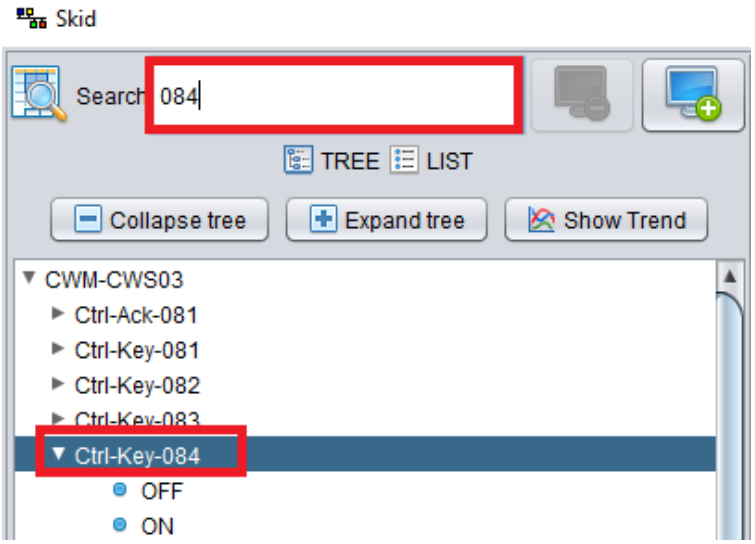
You can display the PV list in flat mode, by clicking LIST icone.



Or in tree mode by clicking on TREE icone. The PV path separator is ":" character. In Tree mode, you can collapse or expand tree on corresponding button.

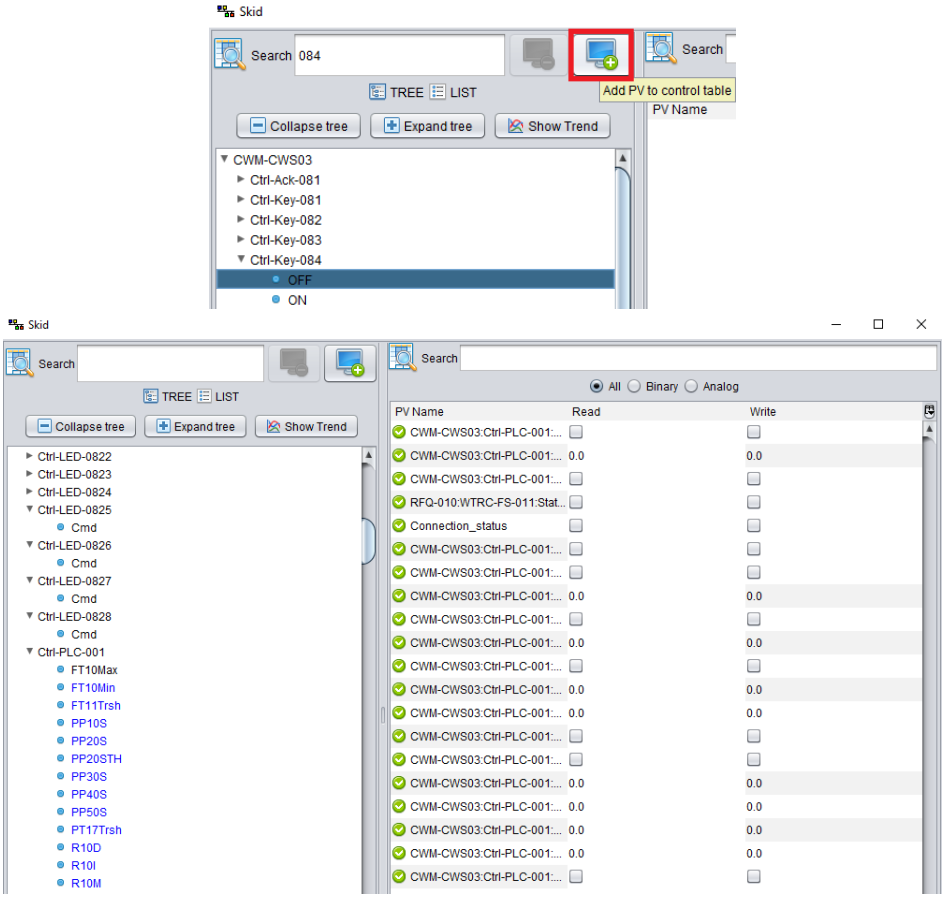


You can filter the PV list typing a regular expression in the Search bar.



c) Add a process variable to monitor panel

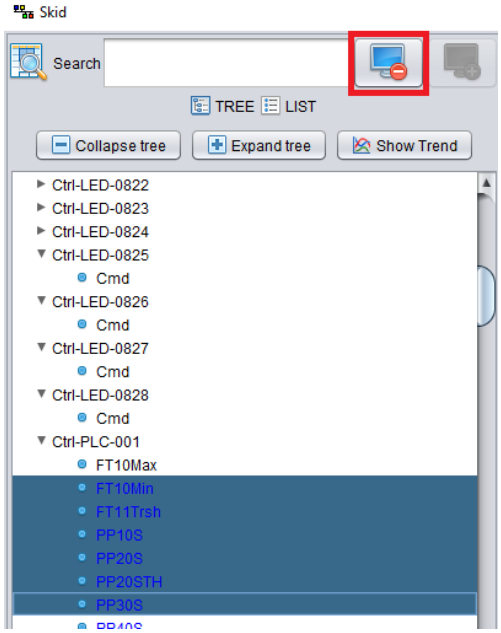
Select a process variable to enable the Add PV button. Notice that if you select a parent folder in TREE mode, it will all the variables contains in this folder.



All the variables displayed in the monitor, are highlight in blue.

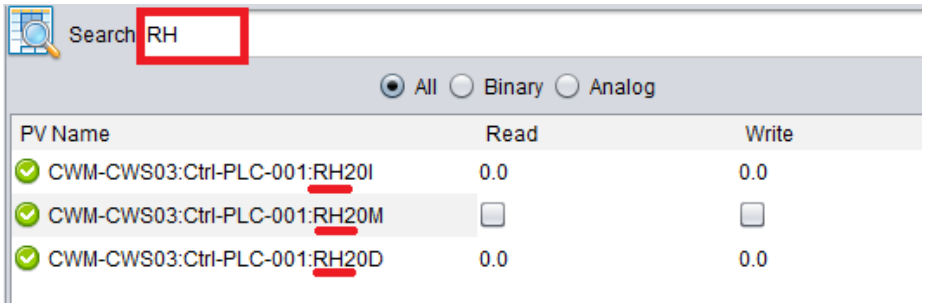
d) Remove a process variable from monitor panel

Select process variables displayed to enable Remove button. Then clicking on it will remove the variable from the monitor panel.

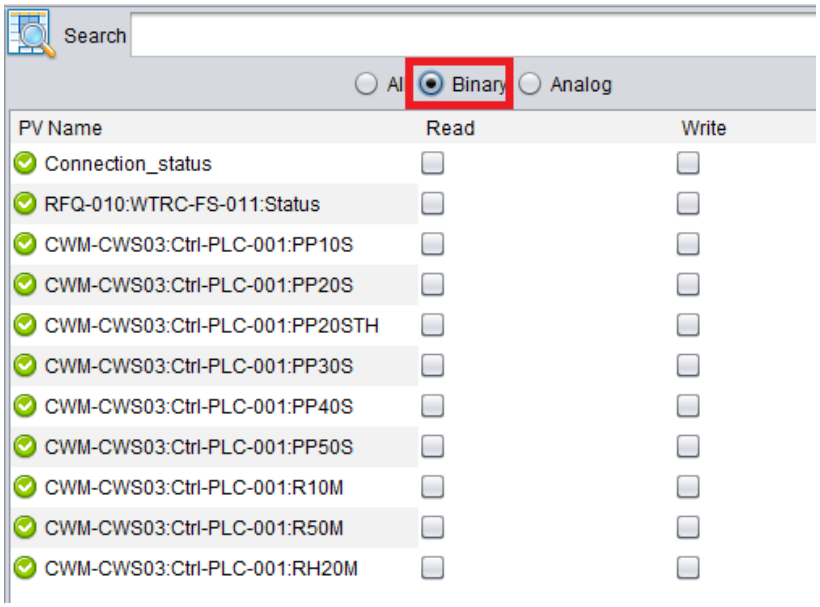


e) Filter variables in the monitor panel

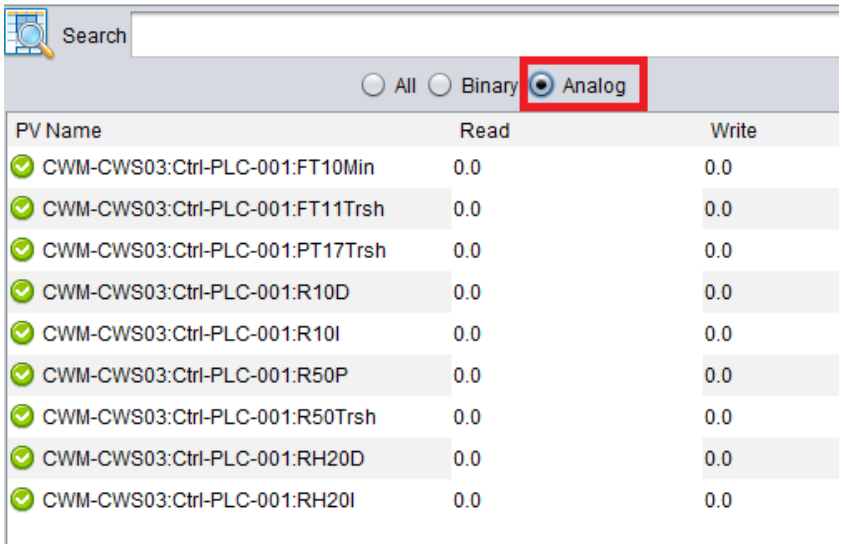
You can filter the variable in typing a regular expression in the search bar.



You can display only binary variable in selecting Binary option.

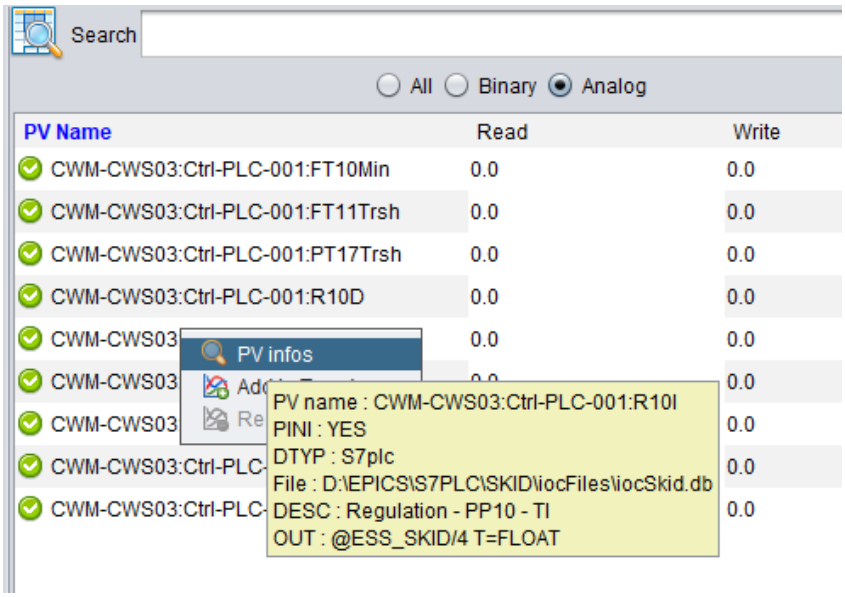


You can display only analogic variable in selecting Analog option.



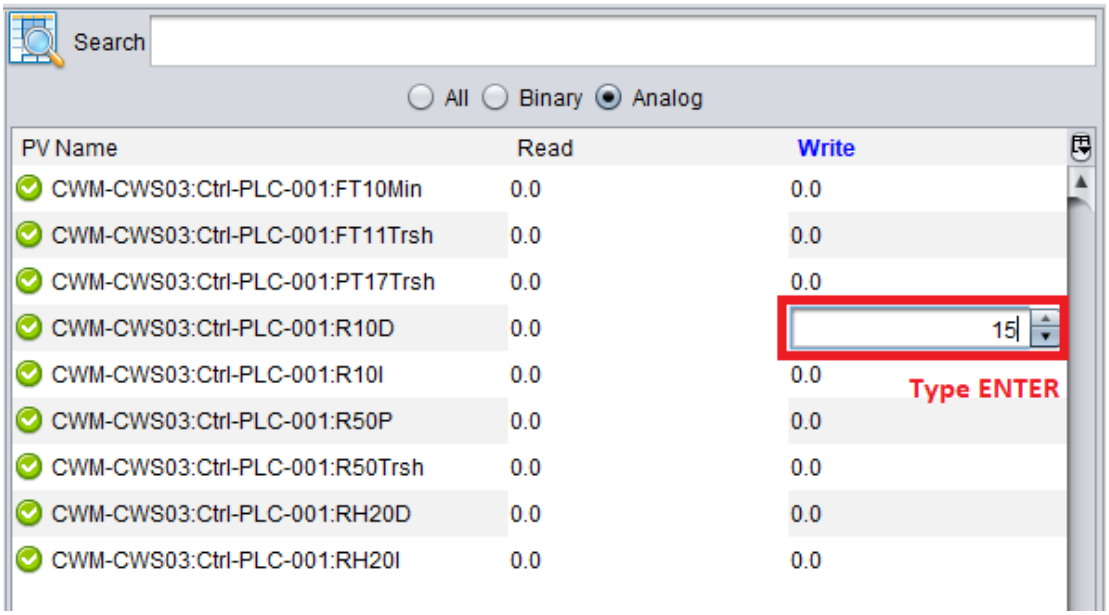
f) Get information on a process variable.

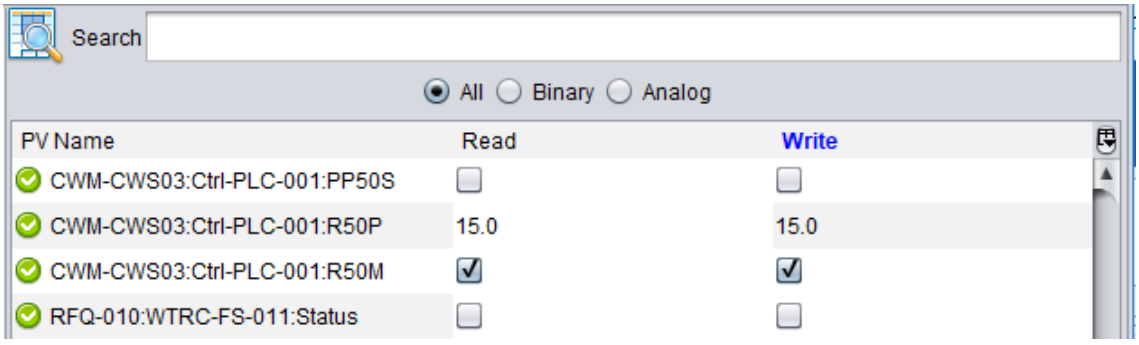
Right click on a process variable to make appear a context menu. “PV infos” menu tooltip will display EPICS information on the variable.



g) Read / Write on a process variable.

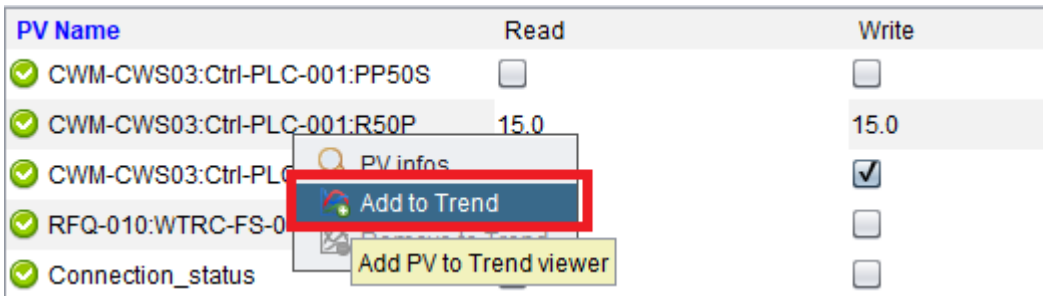
The reading values displayed in the Read column. To write a value you have to enter a value in Write column, or check the box for a binary value. **Then you have to type ENTER to validate the entry**.

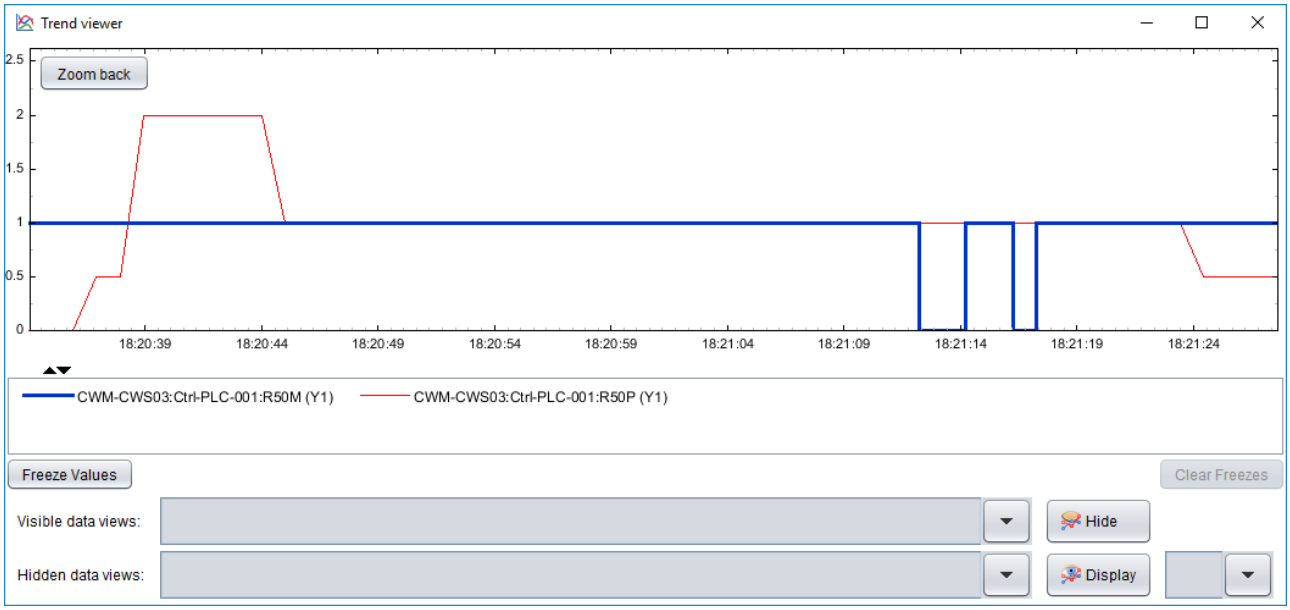




h) Display an historic trend of a PV.

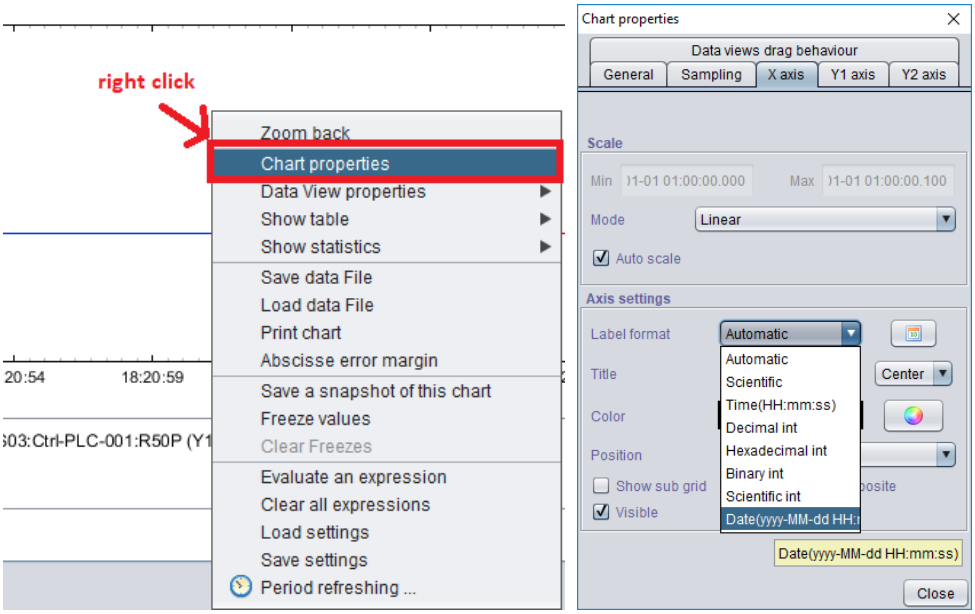
Right click on a variable to display a context menu. Then click on Add to Trend menu to display the variable in a Chart. The variable displayed in the Trend appear in blue.



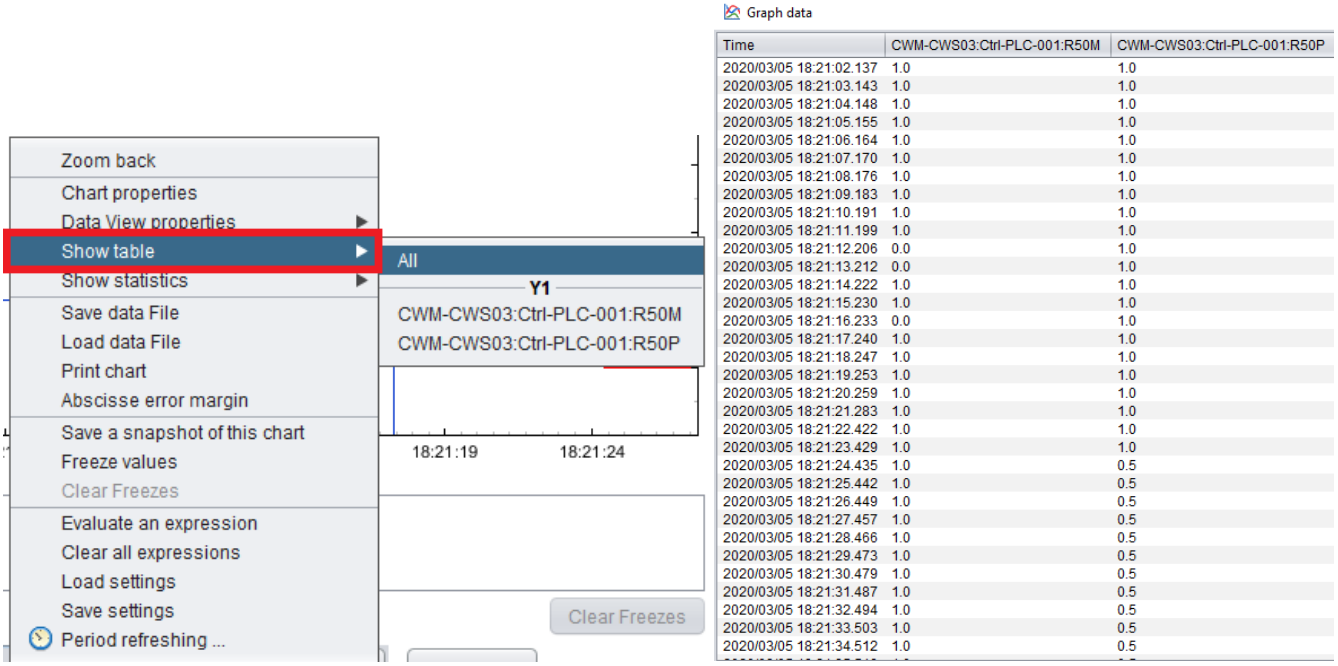


i) Trend functions.

You can change Chart parameters as color background, X axis format, Y1 Y2 axis properties. For that right click on Chart background to make appear a contextual menu.



Show Table menu will display all the data in a table.



Time	CWM-CWS03:Ctrl-PLC-001:R50M	CWM-CWS03:Ctrl-PLC-001:R50P
2020/03/05 18:21:02.137	1.0	1.0
2020/03/05 18:21:03.143	1.0	1.0
2020/03/05 18:21:04.148	1.0	1.0
2020/03/05 18:21:05.155	1.0	1.0
2020/03/05 18:21:06.164	1.0	1.0
2020/03/05 18:21:07.170	1.0	1.0
2020/03/05 18:21:08.176	1.0	1.0
2020/03/05 18:21:09.183	1.0	1.0
2020/03/05 18:21:10.191	1.0	1.0
2020/03/05 18:21:11.199	1.0	1.0
2020/03/05 18:21:12.206	0.0	1.0
2020/03/05 18:21:13.212	0.0	1.0
2020/03/05 18:21:14.222	1.0	1.0
2020/03/05 18:21:15.230	1.0	1.0
2020/03/05 18:21:16.233	0.0	1.0
2020/03/05 18:21:17.240	1.0	1.0
2020/03/05 18:21:18.247	1.0	1.0
2020/03/05 18:21:19.253	1.0	1.0
2020/03/05 18:21:20.259	1.0	1.0
2020/03/05 18:21:21.283	1.0	1.0
2020/03/05 18:21:22.422	1.0	1.0
2020/03/05 18:21:23.429	1.0	1.0
2020/03/05 18:21:24.435	1.0	0.5
2020/03/05 18:21:25.442	1.0	0.5
2020/03/05 18:21:26.449	1.0	0.5
2020/03/05 18:21:27.457	1.0	0.5
2020/03/05 18:21:28.466	1.0	0.5
2020/03/05 18:21:29.473	1.0	0.5
2020/03/05 18:21:30.479	1.0	0.5
2020/03/05 18:21:31.487	1.0	0.5
2020/03/05 18:21:32.494	1.0	0.5
2020/03/05 18:21:33.503	1.0	0.5
2020/03/05 18:21:34.512	1.0	0.5

You can export the data as a csv file in clicking **on Save Data File**. You can reload a CSV file in clicking on **Load Data File**.

You can save a screenshot of this Chart in clicking on **Save a snapshot of this chart** menu.

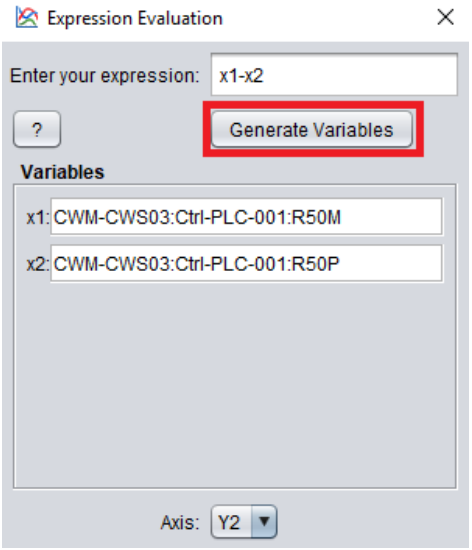
You can configure the period refreshing in clicking on **Period refreshing** menu.

You can generate a new dataview in clicking on **Evaluate an expression** menu. For exemple you can generate a dataview that is the result of dataview 1 – dataview 2. Follow this steps :

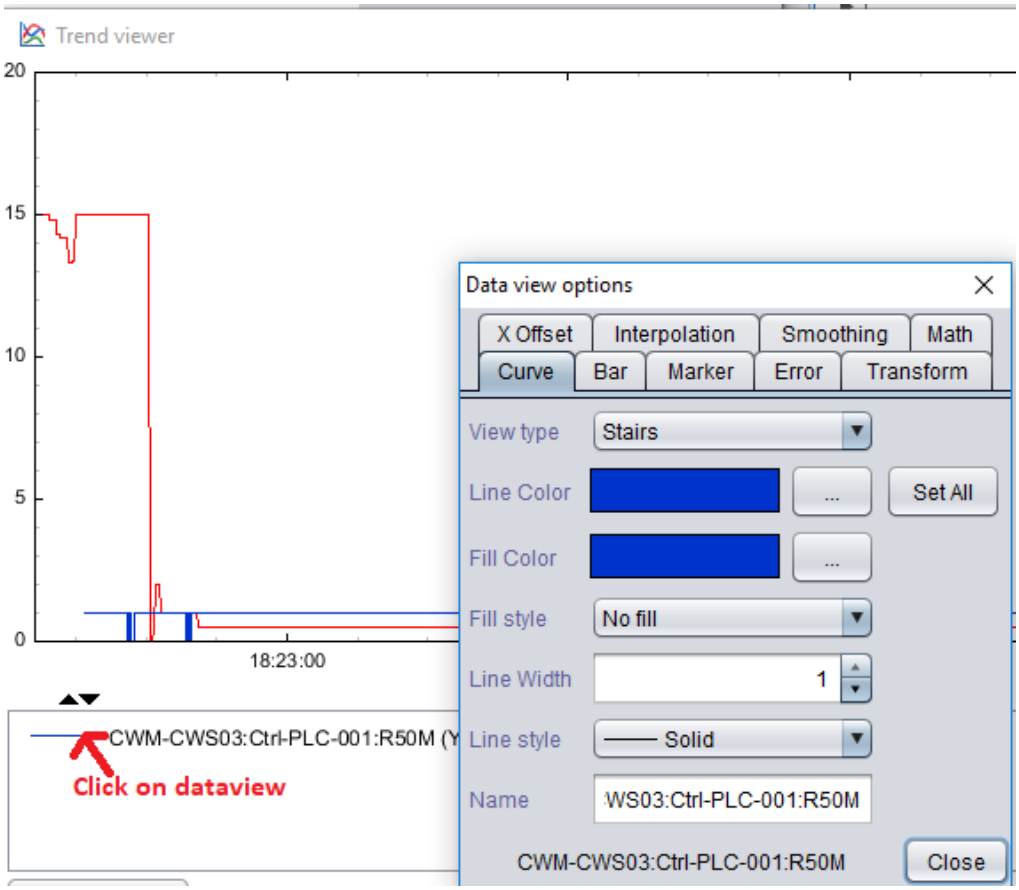
1 – Enter an expression, you can have a Help dialog in clicking on ? button.

2- Click on Generate Variables button. Variables field will appears

3 – Select the dataview



DataView parameters set by right clicking on a dataview in the legend. You can change, the color, the marker … And apply a polynomial transformation or a fitting function.

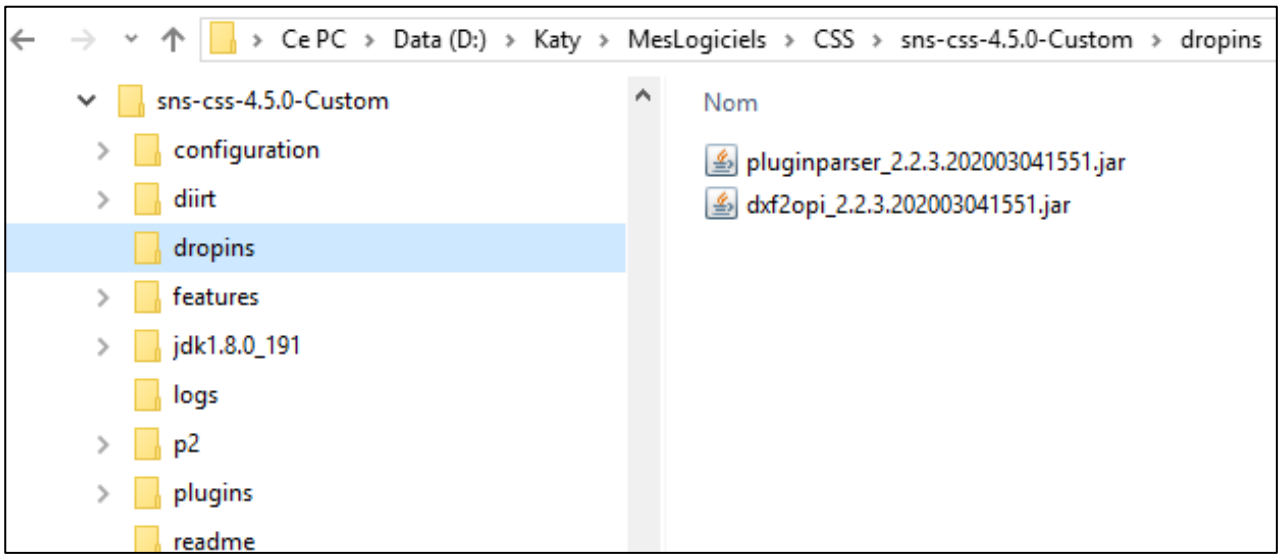


4. OPI CSS and BOB Phoebus plugins

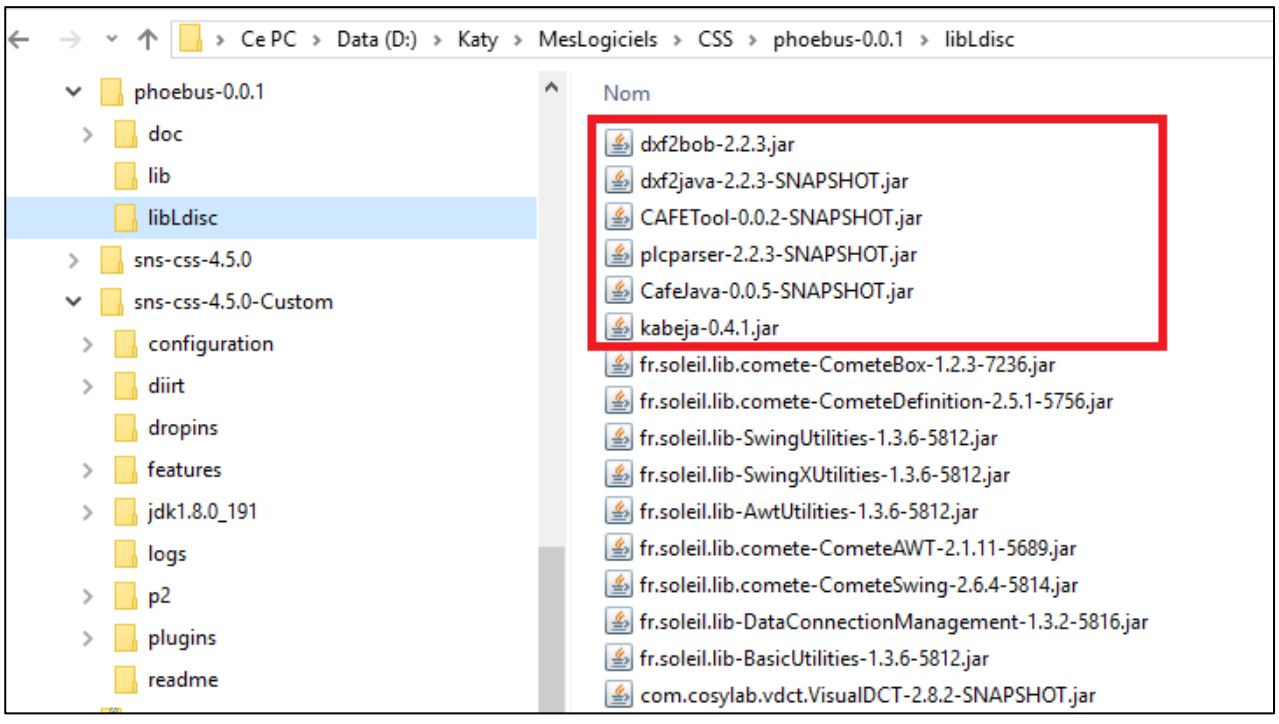
a) Plugin installation.

To launch this plugin, java jar archived files have to be installed in the dropins or plugins CSS installation folder. Or in lib installation Phoebus folder. The files are available on
\\dapnia\data\manip\SISLaboratoire\LAB_DEV_INFORM_INDUSTRIEL\Users\ksaintin\Logiciels\PlcParserTool\cssplugin

\\dapnia\data\manip\SISLaboratoire\LAB_DEV_INFORM_INDUSTRIEL\Users\ksaintin\Logiciels\PlcParserTool\phoebusplugin



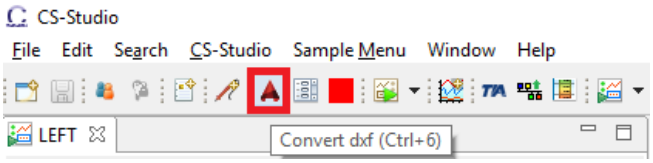
Plugin installation on CSS



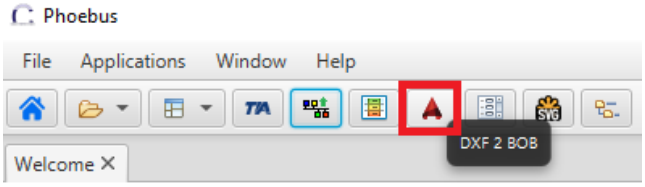
Plugin installation on Phoebus

b) Launch the conversion DXF to OPI or BOB

The button to convert an AutoCAD DXF file to a OPI or a BOB view is :

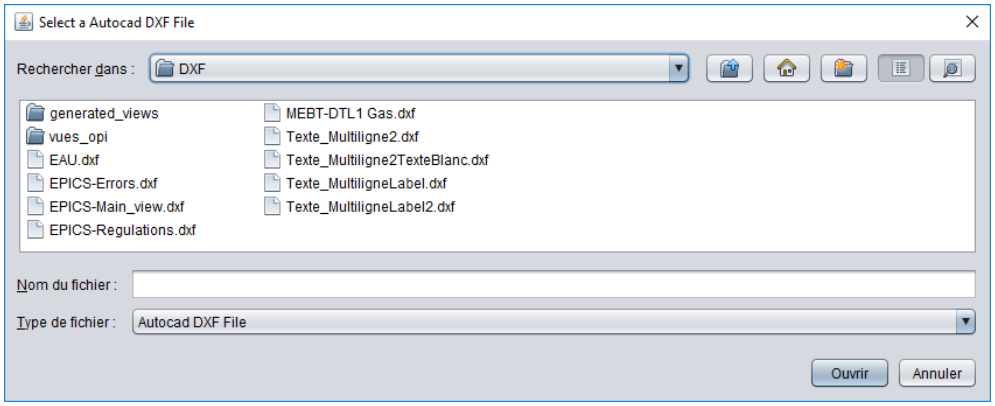


Plugin DXF2OPI in CSS

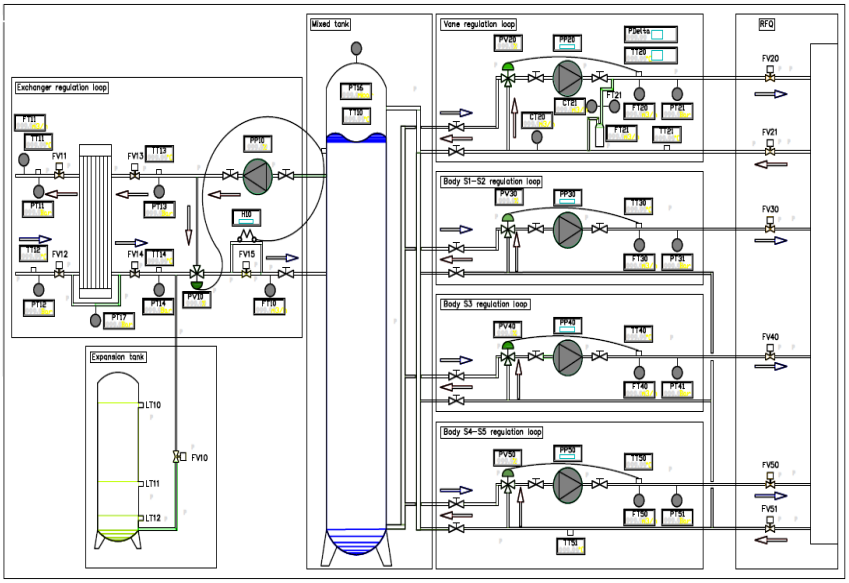


Plugin DXF2BOB in Phoebus

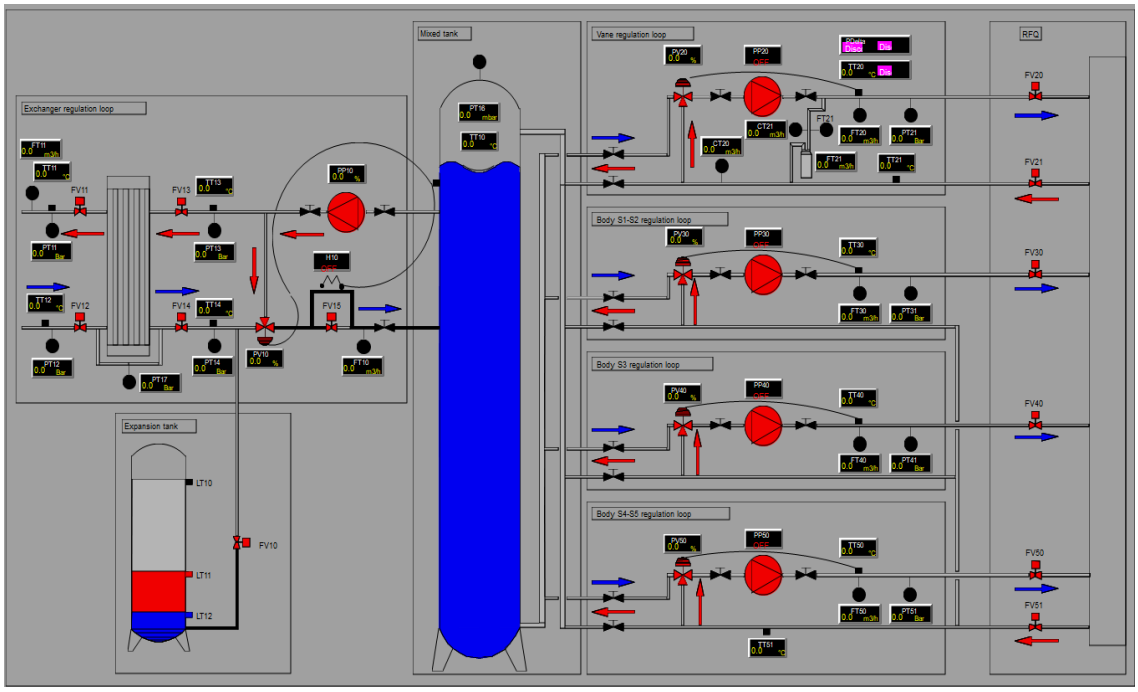
You have to select a dxf file. Notice that the path is saved in a preference file, in order to open the File Chooser dialog directly on the good path the next time.



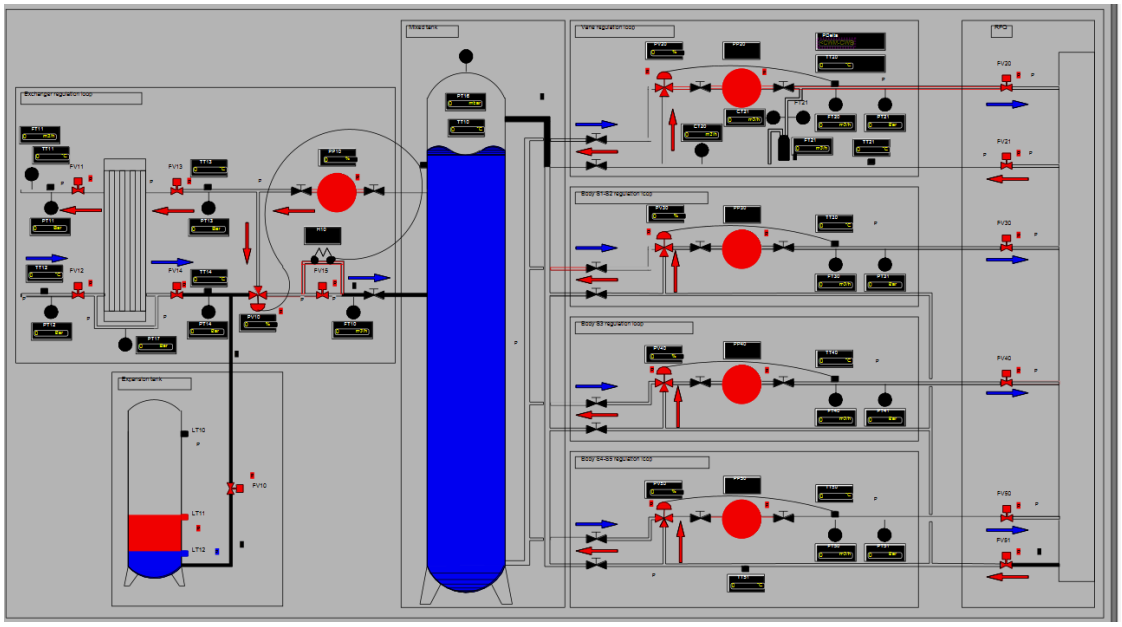
In the following exemple, you can see the conversion result of a Skid DXF files (cooling system of ESS project) to an OPI view and a BOB view.



DXF Skid file (AutoCAD)



CSS Skid conversion result OPI view



Phoebus Skid conversion result BOB view

All the information, warnings and errors appears in a Logging View. The same as the PLCParserTool component.

Logging view : load and generate view file

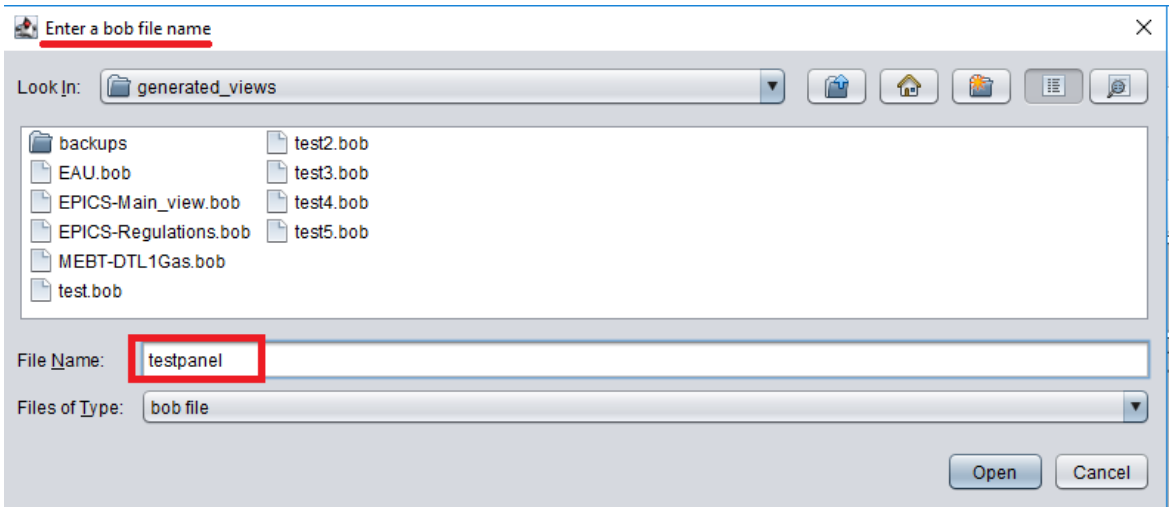
Clear logs | INFO

Date	Source	Type	Message
2020/03/06 10:46:11	DxfDocument	INFO	Load and parse file D:\EPICS\PlcParserTool\PlcParserTool-2.2.3\exemples\DXF\EPICS-Main_view.dxf
2020/03/06 10:46:11	DxfDocument	INFO	Main panel creation...
2020/03/06 10:46:11	TranslatorUtil	INFO	No model found for HATCH
2020/03/06 10:46:11	TranslatorUtil	INFO	Model created heps.dxf.model.Polygon2Model for type SOLID
2020/03/06 10:46:12	TranslatorUtil	INFO	Model created heps.dxf.model.PolyLine2Model for type LWPOLYLINE
2020/03/06 10:46:12	TranslatorUtil	INFO	Model created heps.dxf.model.Ellipse2Model for type CIRCLE
2020/03/06 10:46:12	TranslatorUtil	INFO	Model created heps.dxf.model.Line2Model for type LINE
2020/03/06 10:46:13	TranslatorUtil	INFO	No model found for VIEWPORT
2020/03/06 10:46:13	TranslatorUtil	INFO	Model created heps.dxf.model.Arc2Model for type ARC
2020/03/06 10:46:13	TranslatorUtil	INFO	Model created heps.dxf.model.Text2Model for type TEXT
2020/03/06 10:46:13	TranslatorUtil	INFO	No model found for ATTDEF
2020/03/06 10:46:14	AbstractWidgetContainer	INFO	File creation D:\EPICS\PlcParserTool\PlcParserTool-2.2.3\exemples\DXF\generated_views\EPICS-Main_view.bob
2020/03/06 10:46:14	AbstractWidgetContainer	INFO	Generate file D:\EPICS\PlcParserTool\PlcParserTool-2.2.3\exemples\DXF\generated_views\EPICS-Main_view.bob
2020/03/06 10:46:25	DxfDocument	INFO	New View successfully generated D:\EPICS\PlcParserTool\PlcParserTool-2.2.3\exemples\DXF\generated_views\EPICS-Main_view.bob

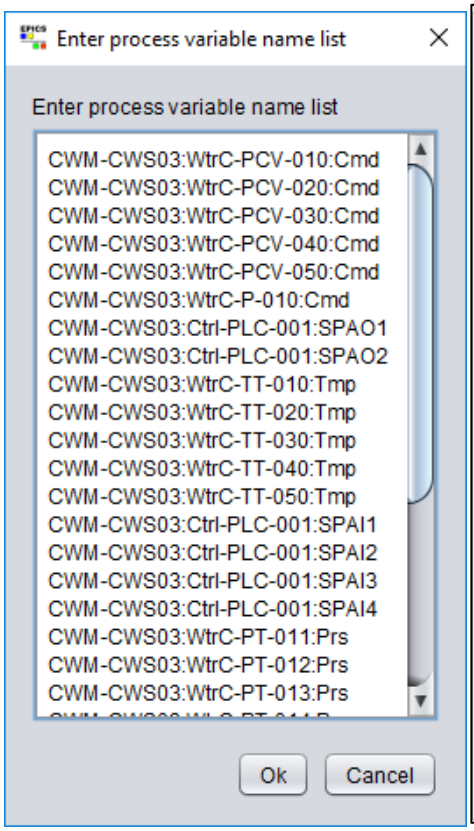
c) Generate a OPI View and a BOB view from a PV List

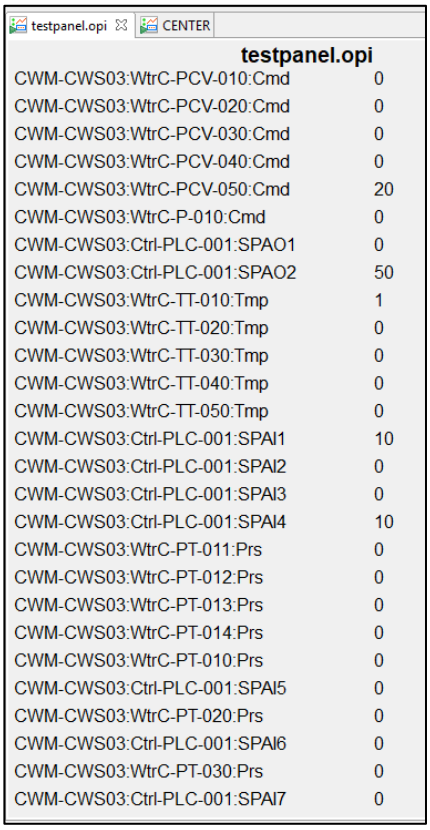
Plugin Generate OPI in CSS Plugin Generate BOB in Phoebus

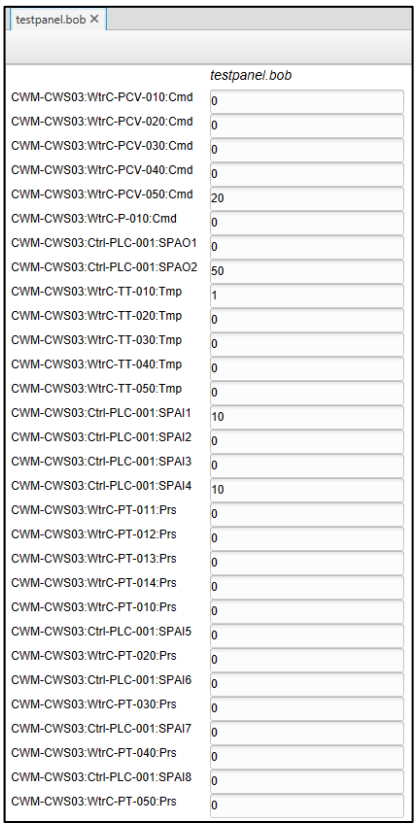
Enter a file name (the software will assume the file extension opi for CSS and bob for Pheobus). Notice that this path is saved in preference file in order to open the File Chooser dialog directly in the good path next time.



Enter a list of variable name. You can copy/paste in this dialog. Then click OK







Generated OPI Panel Generated BOB Panel