

RTAC Steup at the Machine Learning for Power System Lab

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1. Objective

The objective of this system is to learn real time operating system based deterministic and uninterrupted automation for all critical applications.

2. Introduction

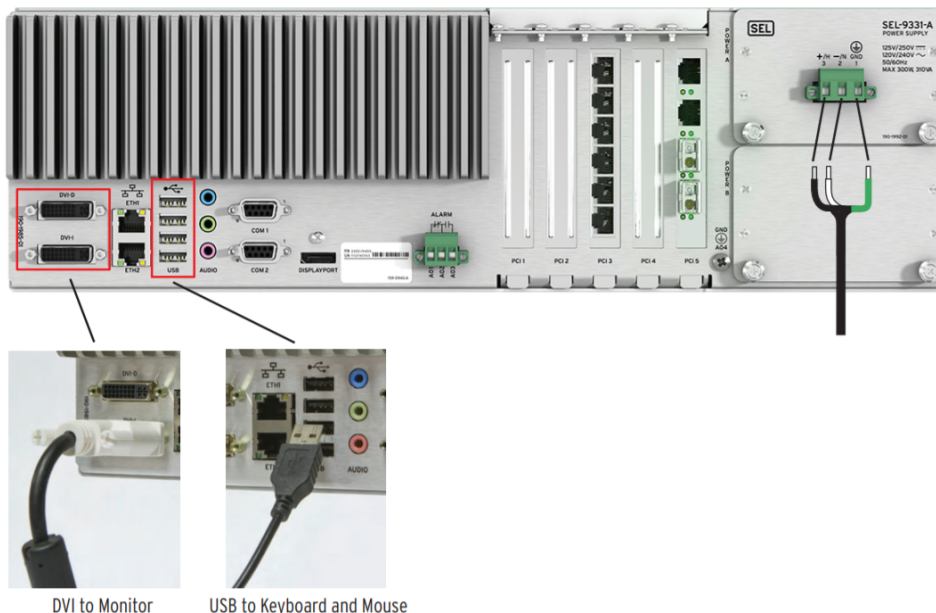
The RTAC features secure communication, advanced data concentration, high-speed logic processing, flexible engineering access, and protocol conversion capabilities between multiple built-in client/server protocols.

3. Software Required

SEL Acseleator Quickset, SEL Acseleator RTAC

4. Installation

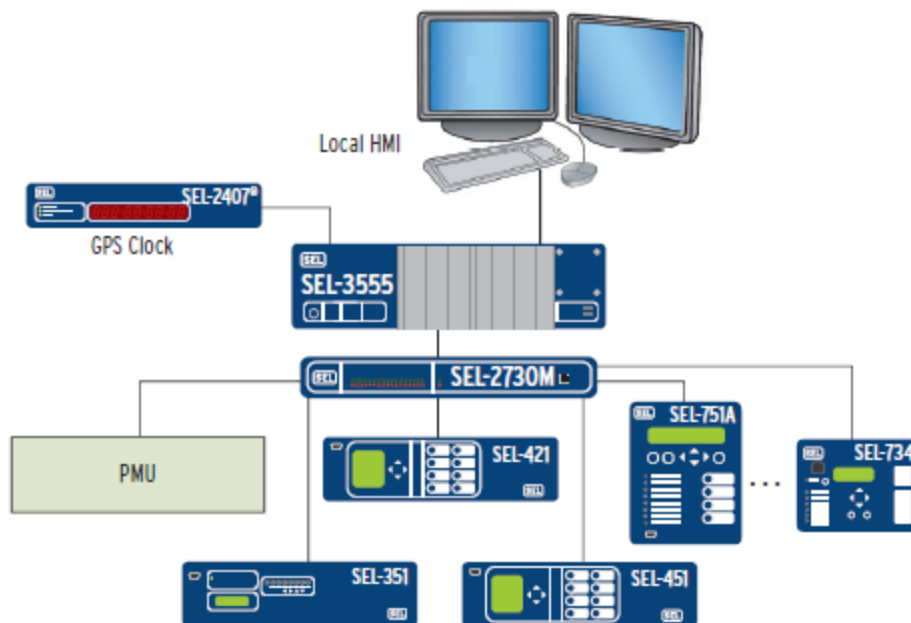
- The first steps in applying the SEL-3555 Real-Time Automation Controller (RTAC) are installing and connecting the device.



- Install the SEL Acselelator RTAC software.



- Establish ethernet connections



5. Ethernet Port Configuration

Use the Ethernet port on the SEL-3555 to connect to the RTAC web interface and to send project configurations to the unit by using ACSELEATOR RTAC software. Web configuration settings are covered in the SEL-5033 ACSELEATOR RTAC Instruction Manual.

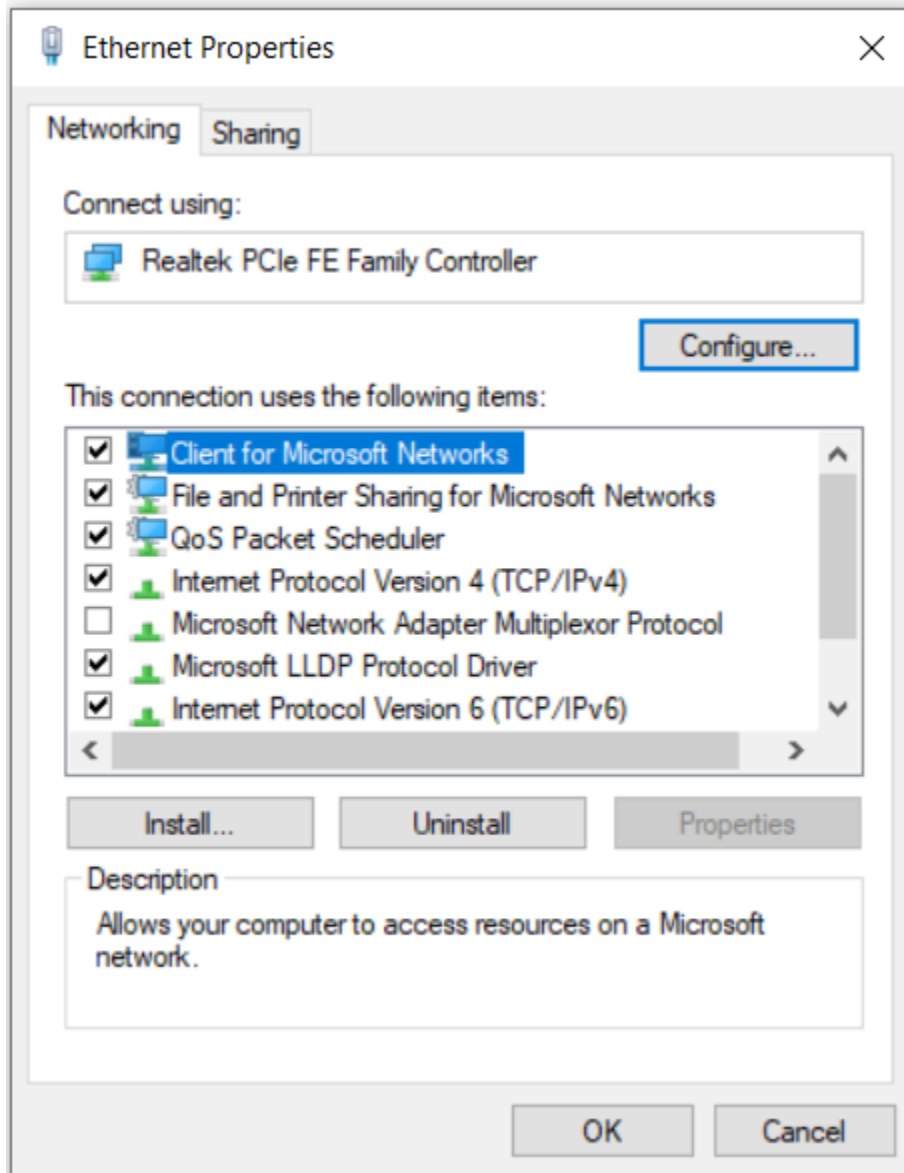
<https://selinc.com/products/3555/>

All Ethernet ports may be used at the same time and have unique SEL-programmed MAC addresses

➤ ETH 1: 192.168.1.2

➤ ETH 2: 192.168.2.2

In order to configure the RTAC's ethernet settings the following changes need to be done to the user's laptop/desktop. Go to Control Panel > Network and Sharing > Change Adapter Settings > Ethernet Properties.



Then double click on Internet Protocol Version 4 (TCP/IPv4)

Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

☐ Obtain an IP address automatically

☒ Use the following IP address:

IP address: 192 . 168 . 1 . 100

Subnet mask: 255 . 255 . 255 . 0

Default gateway: 192 . 168 . 1 . 1

☐ Obtain DNS server address automatically

☒ Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

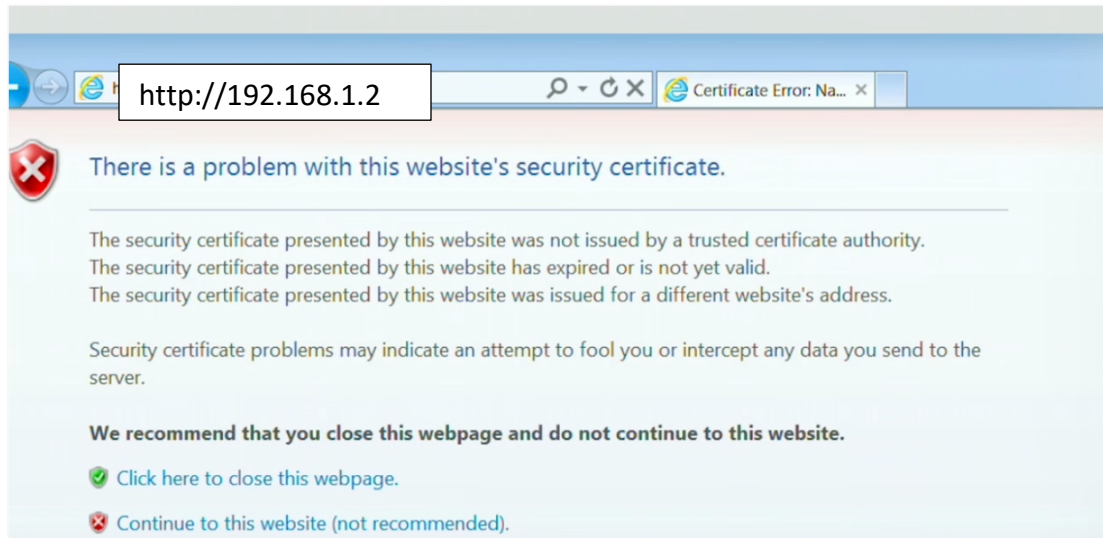
☐ Validate settings upon exit

Advanced...

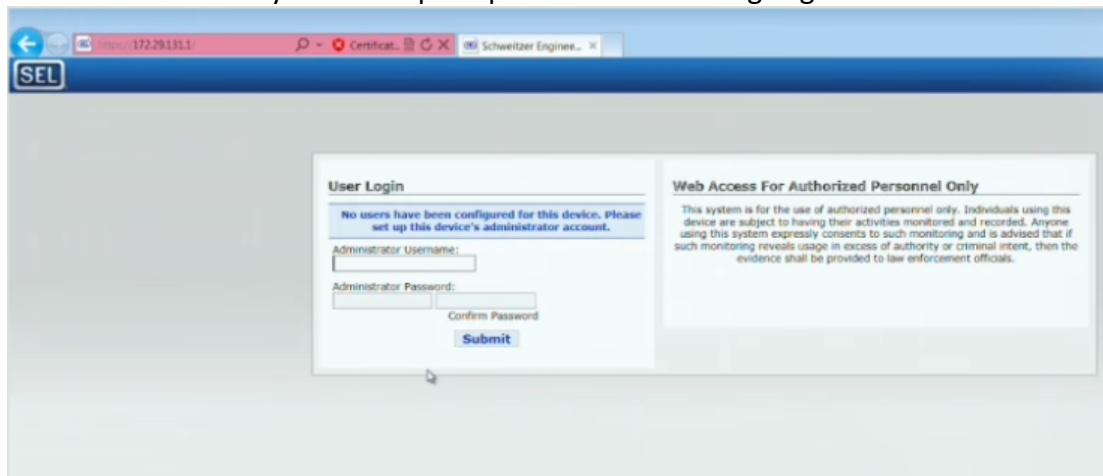
OK Cancel

Make sure that the IP address, Subnet mask and Default gateway are set to the values shown above.

6. Web Interface



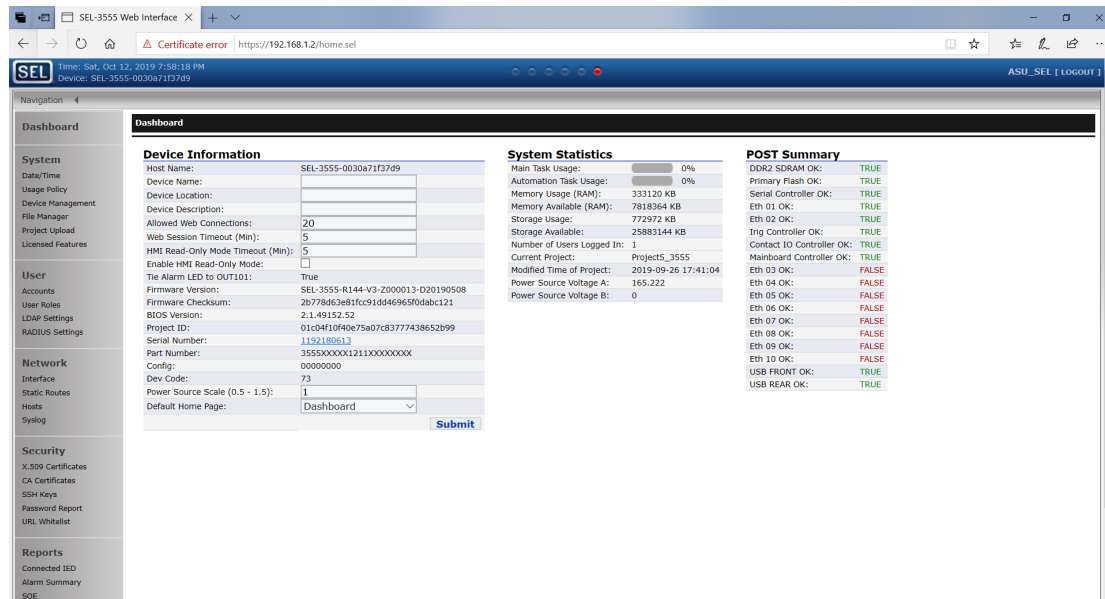
Select continue and you will be prompted to the following Login Screen.



Username: ASU_SEL

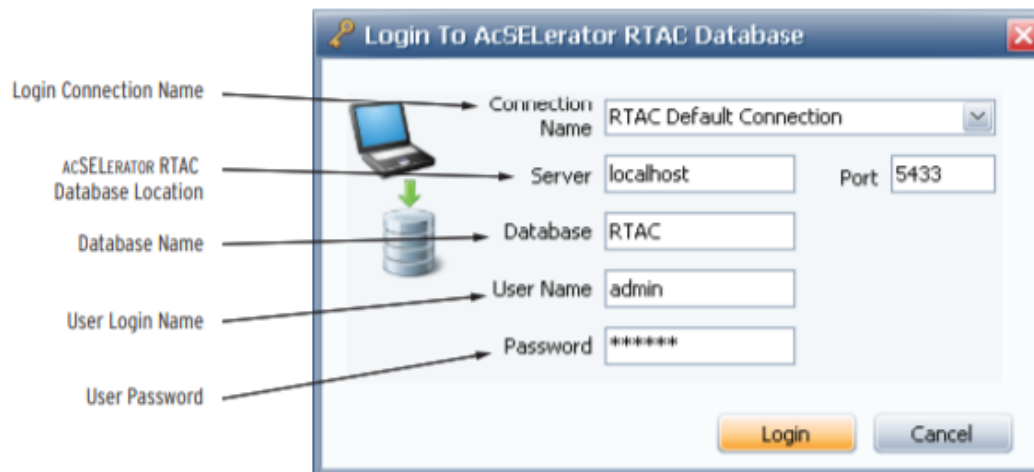
Password: Asu12345@

RTAC's web interface is where you configure usernames and passwords, you can configure the Ethernet addresses and a lot of other information

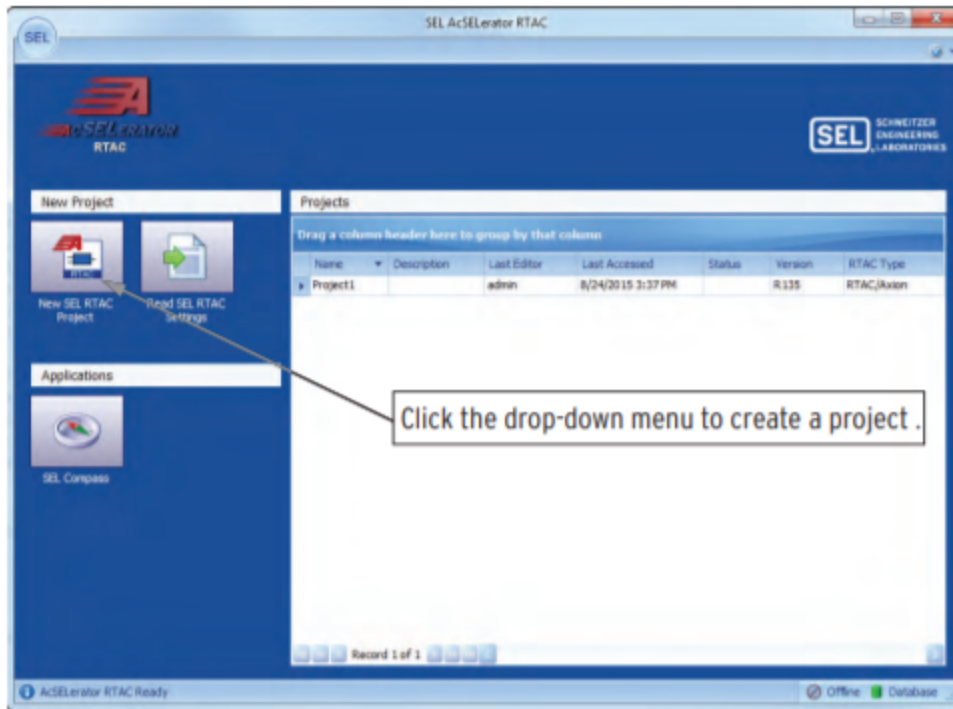


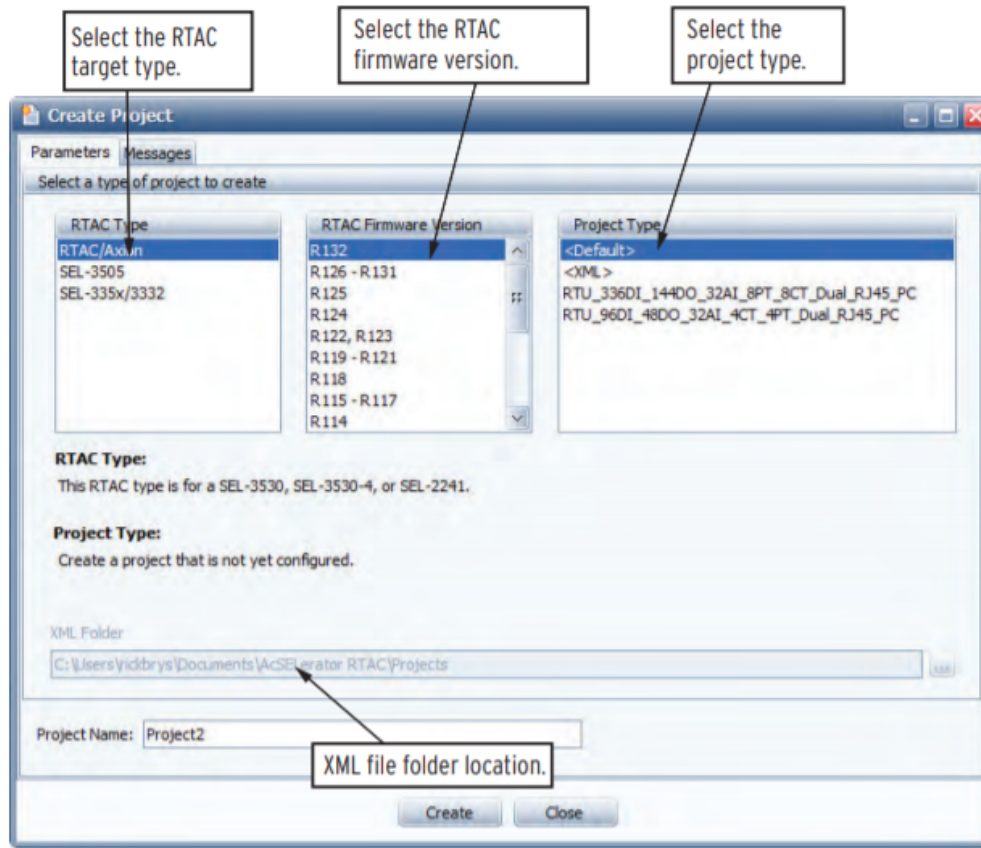
7. SEL Acceleator RTAC

- Open the SEL Acceleator RTAC software. Initially, two user accounts exist for the default database. One user account has a username of admin and a password of TAIL. The second user account has a username of engineer and a password of OTTER.



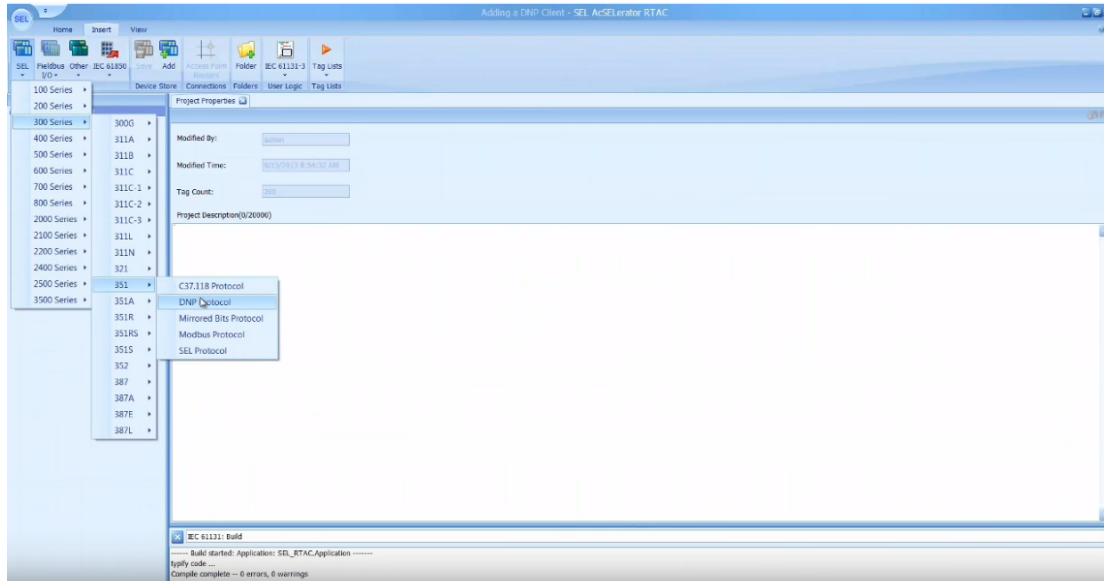
Use the start page that appears after you log in to the Acceleator RTAC database to view existing projects or create new ones.



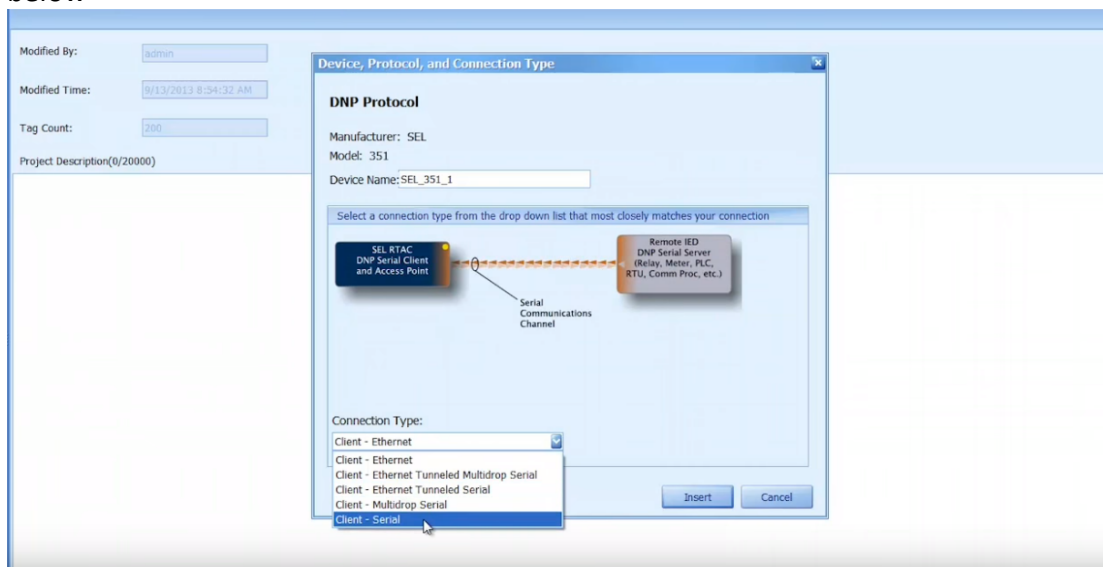


In our experiment the RTAC is SEL 3555. Choose the latest firmware version and let the project type be default.

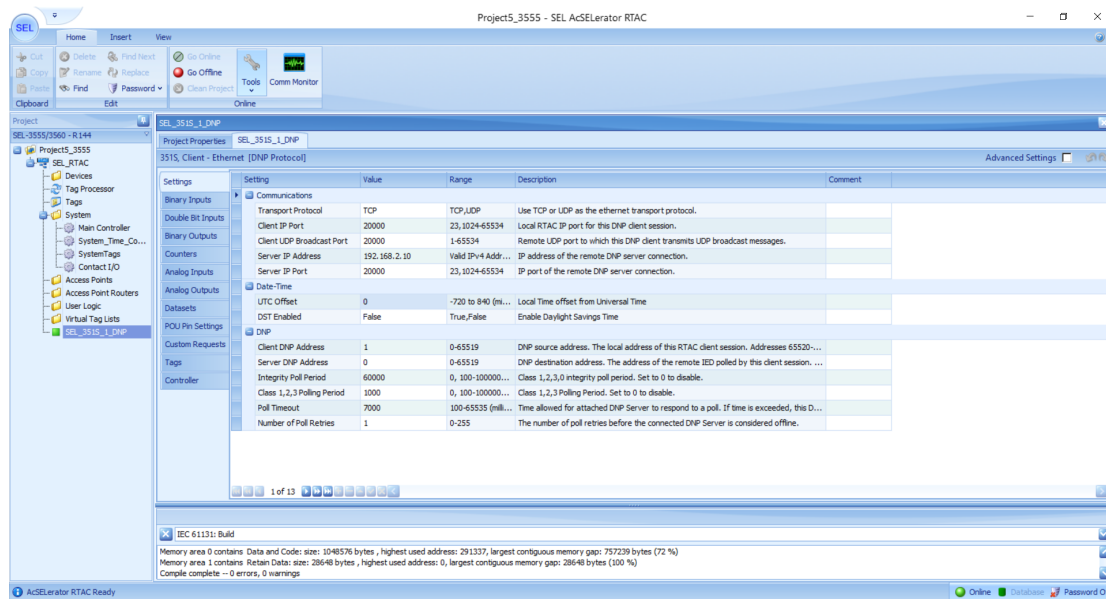
The first thing you do in the project is add SEL 351/ 351S relay under the SEL devices tab as shown below. There are a number of protocols available. We select the DNP protocol.



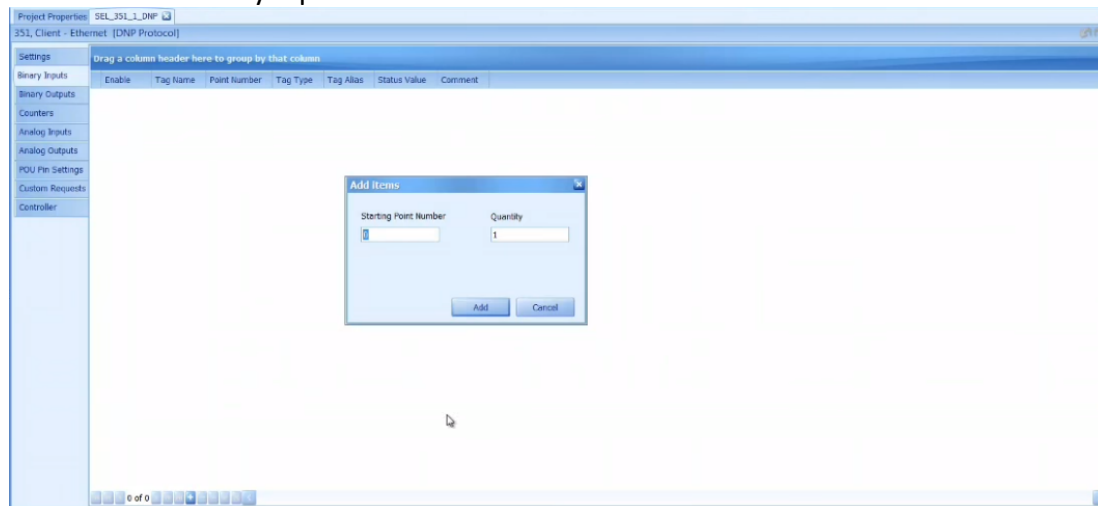
Select the client-server mode of connection as we have a connection via RS232 cable as shown below



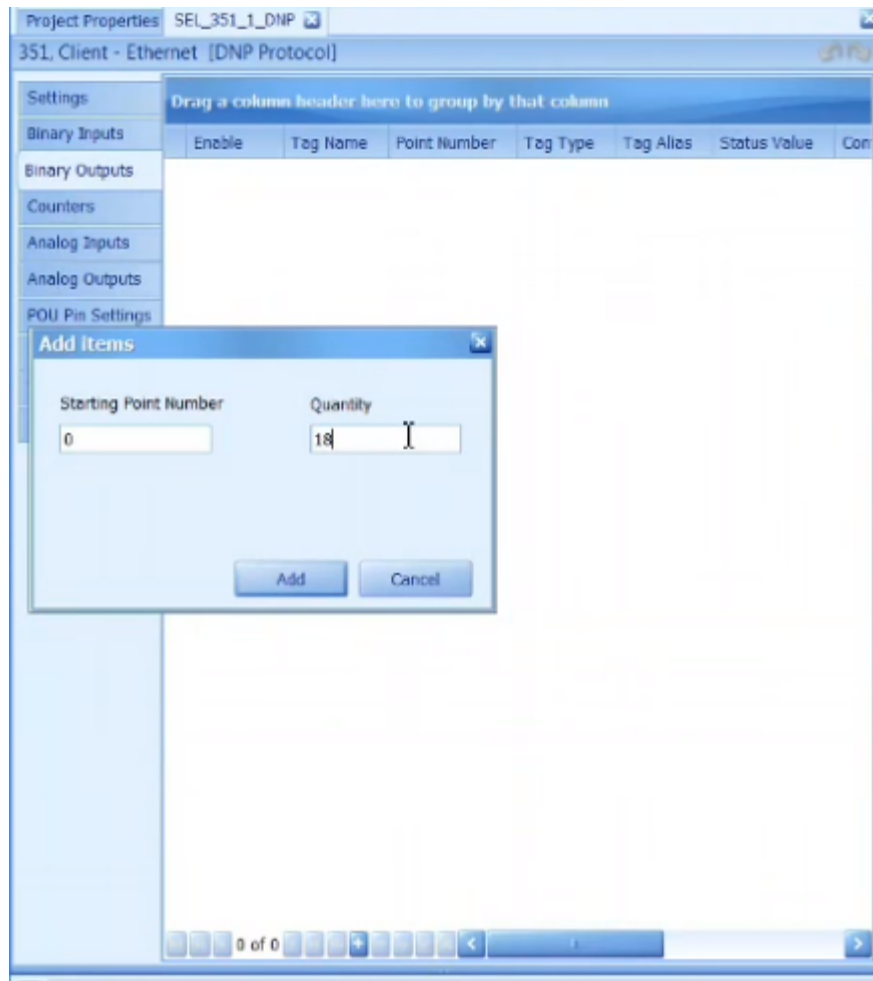
Once the 351S is added double click on the same and configure the IP address, transport method and polling period. Set the parameters to the values shown below.



Then click on binary inputs. We will add 24v of those.

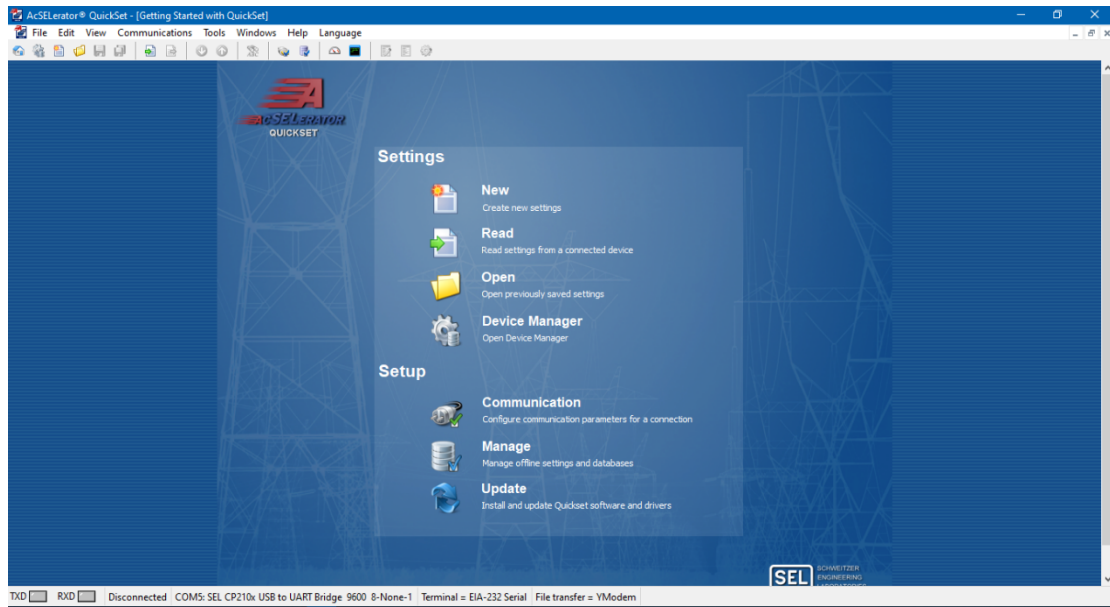


Similarly, we add 18 binary outputs.

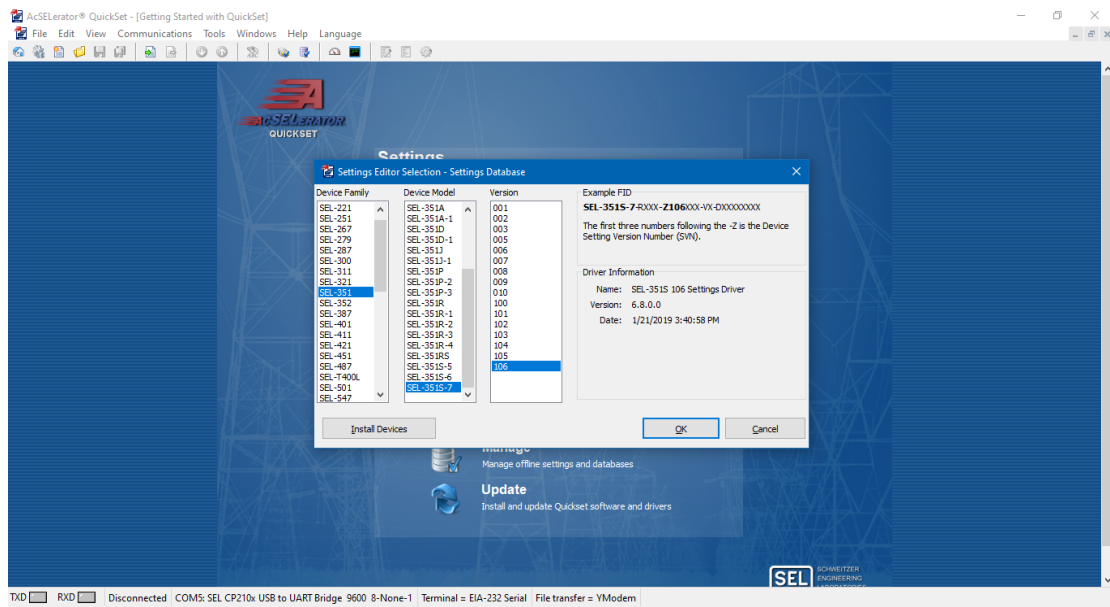


Likewise, add 40 analog inputs. This marks the end of configuration process for RTAC.

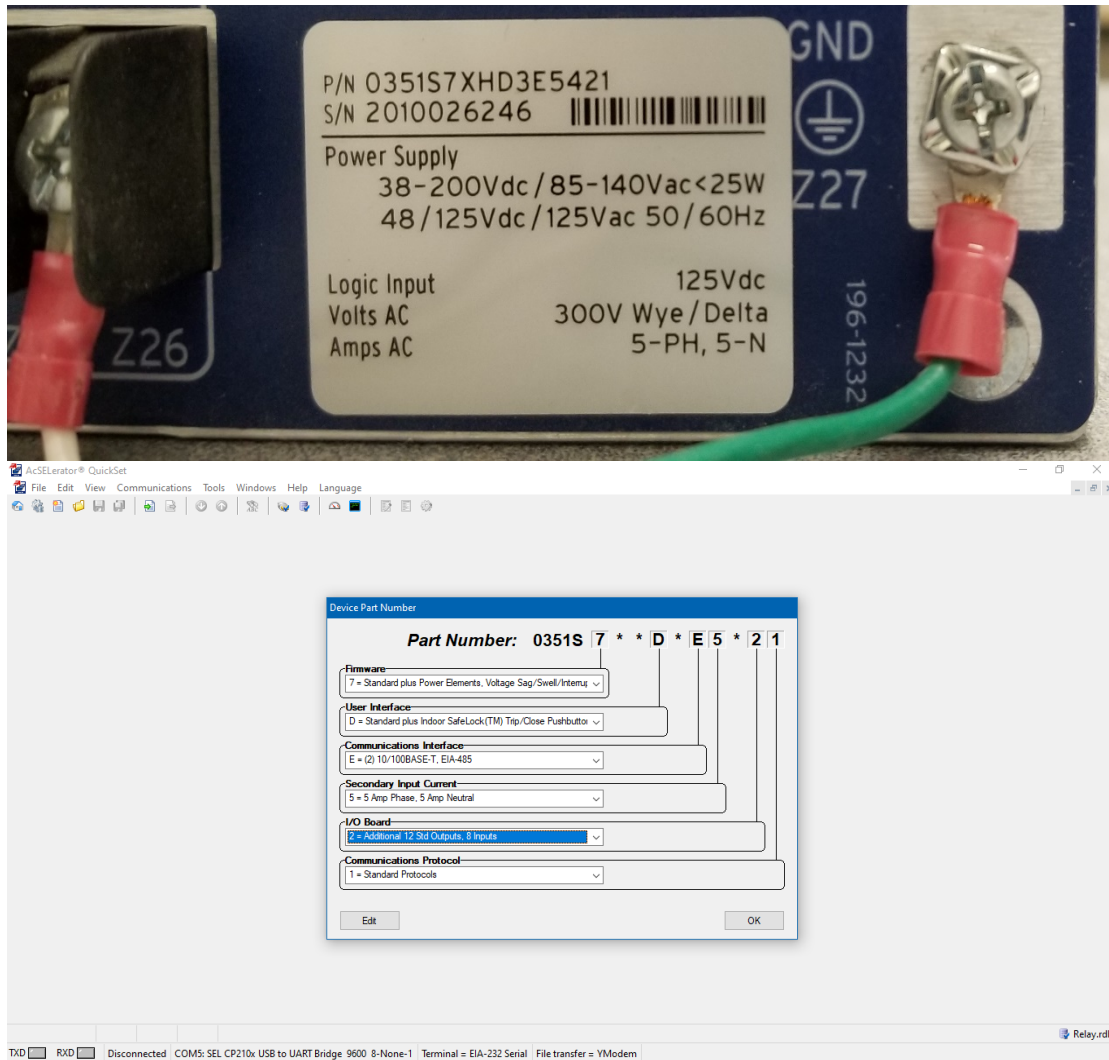
8. Configuration of 351S using Acseleator Quickset
 1. Install and Open SEL AcSElerator QuickSet.



2. Creat new Project and Select Device family, model, and version from devise Part No (P/N).

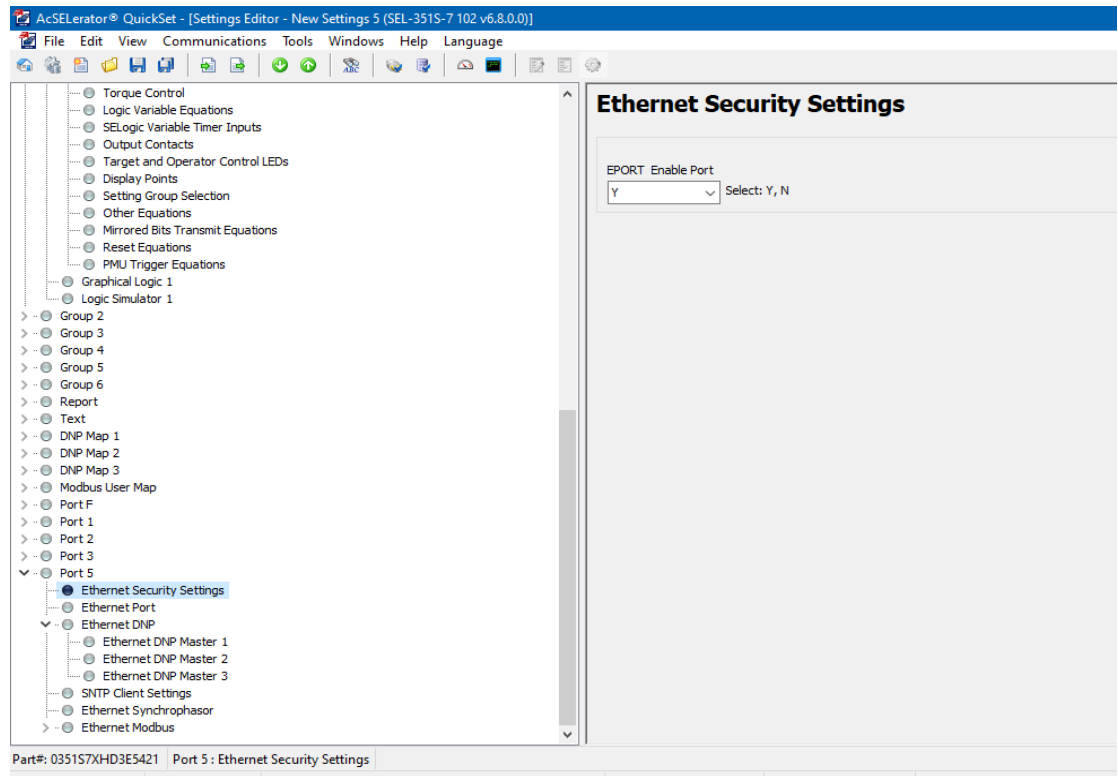


3. Enter Device Part No. as per given Part no. (P/N)

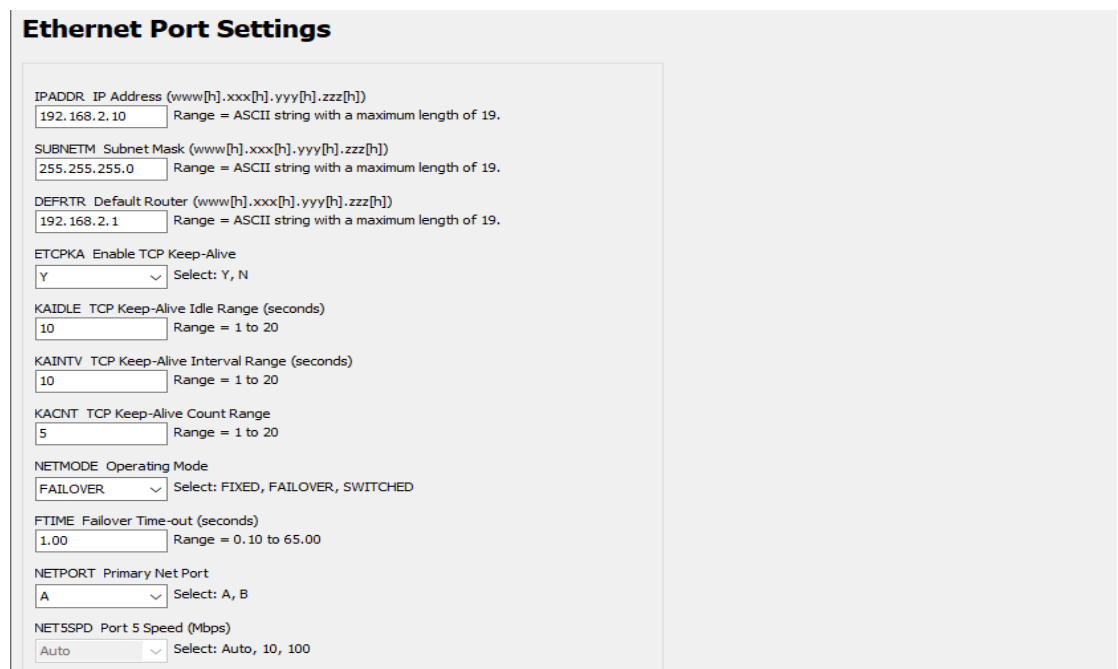


4. Define various settings under Port 5 as per following.

- Ethernet Security Setting



- Ethernet Port Settings



- Ethernet Port Settings

Auto	Select: Auto, 10, 100
NET5ASPD Port 5A Speed (Mbps)	
Auto	Select: Auto, 10, 100
NET5BSPD Port 5B Speed (Mbps)	
Auto	Select: Auto, 10, 100
ETELNET Enable Telnet	
Y	Select: Y, N
MAXACC Maximum Access Level	
2	Select: 1, B, 2
TPORT Telnet Port	
23	Range = 1025 to 65534, 23
TIDLE Telnet Port Time-out (minutes)	
15	Range = 1 to 30
AUTO Send Auto Messages to Port	
N	Select: Y, N
FASTOP Fast Operate Enable	
Y	Select: Y, N
EFTPSERV Enable FTP	
N	Select: Y, N
FTPUSER FTP User Name (20 characters)	
FTPUSER	
FTPCBAN FTP Connect Banner (64 characters)	
FTP SERVER	
FTPIDLE Idle Timeout (minutes)	
5	Range = 5 to 255
EHTTP Enable HTTP Server	
N	Select: Y, N
HTTPPORT TCP/IP Port	
80	Range = 1 to 65535
HTTPIDLE HTTP Web Server Timeout (minutes)	
10	Range = 1 to 30
E61850 Enable IEC 61850 Protocol	
N	Select: Y, N
EGSE Enable IEC 61850 GSE	
N	Select: Y, N

- Ethernet DNP Settings

Ethernet DNP Settings

EDNP Enable DNP Sessions
1 Select: 0-3

DNPNUM DNP TCP and UDP Port
20000 Range = 1 to 65534

DNPADR DNP Address
0 Range = 0 to 65519

- Ethernet DNP Master 1

Ethernet DNP Master 1 Settings

DNPIP1 IP Address (www[h].xxx[h].yyy[h].zzz[h])
192.168.2.2 Range = ASCII string with a maximum length of 19.

DNPTR1 Transport Protocol
TCP Select: UDP, TCP

DNPUDP1 UDP Response Port
20000 Range = 1 to 65534, REQ

REPADR1 DNP Address to Report to
1 Range = 0 to 65519

DNPMAP1 DNP Session Map
1 Select: 1-3

DVARAI1 Analog Input Default Variation
4 Select: 1-6

ECLASSB1 Class for Binary Event Data
1 Select: 0-3

ECLASSC1 Class for Counter Event Data
0 Select: 0-3

ECLASSA1 Class for Analog Event Data
2 Select: 0-3

DECPLA1 Currents Scaling Decimal Places
1 Select: 0-3

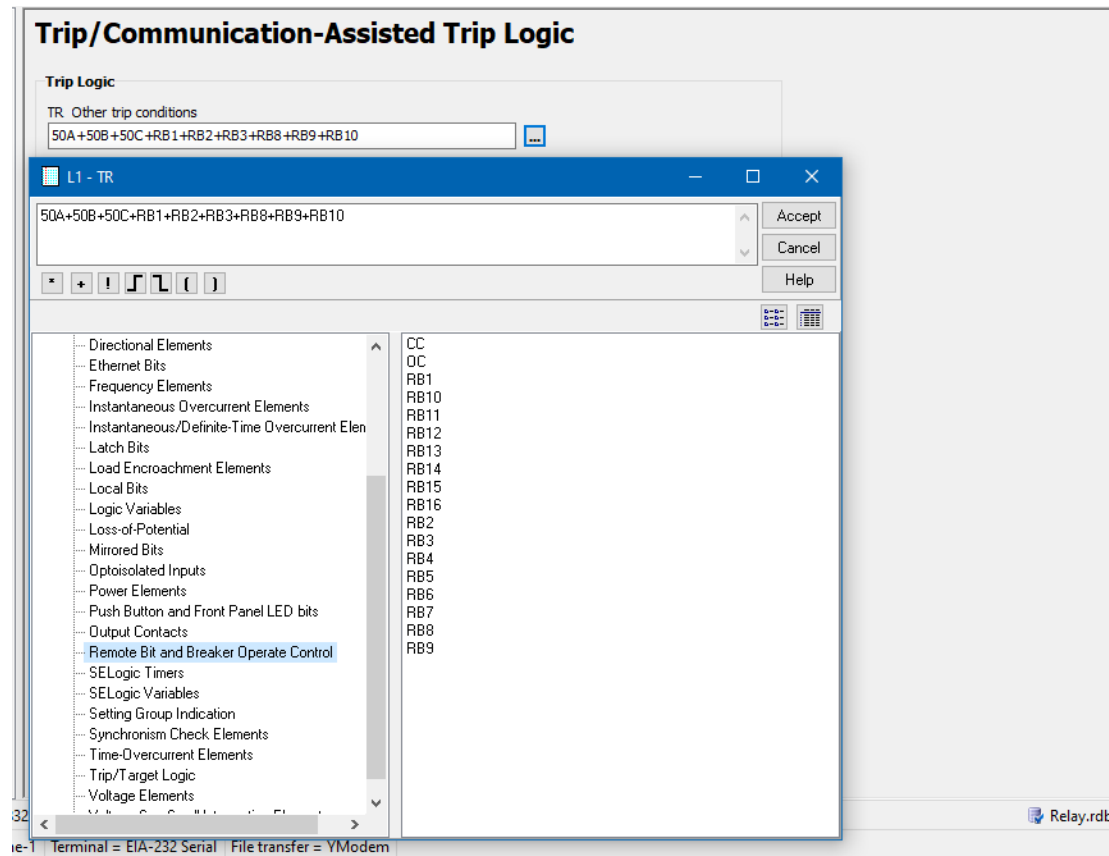
DECPLV1 Voltages Scaling Decimal Places
1 Select: 0-3

DECPM1 Misc Data Scaling Decimal Places	1	Select: 0-3
ANADBA1 Amps Reporting Deadband Counts	100	Range = 0 to 32767
ANADBV1 Volts Reporting Deadband Counts	100	Range = 0 to 32767
ANADBM1 Misc Data Reporting Deadband Counts	100	Range = 0 to 32767
TIMERQ1 Minutes for Request Interval	1	Range = 1 to 32767, I, M
STIMEO1 Seconds to Select/Operate Time-out	5.0	Range = 0.0 to 30.0
DNPINA1 Seconds to Send Data Link Heartbeat	120	Range = 0 to 7200
ETIMEO1 Event Message Confirm Time-out (seconds)	5	Range = 1 to 50
UNSOL1 Enable Unsolicited Reporting	N	Select: Y, N
PUNSOL1 Enable Unsolicited Reporting at Power-Up	N	Select: Y, N
NUM1EVE1 Number of Class 1 Events to Transmit On	10	Range = 1 to 200
AGE1EVE1 Oldest Class 1 Event to Tx On (seconds)	2.0	Range = 0.0 to 99999.0
URETRY1 Unsolicited Message Max Retry Attempts		
URETRY1 Unsolicited Message Max Retry Attempts	3	Range = 2 to 10
UTIMEO1 Unsolicited Message Offline Time-out (seconds)	60	Range = 1 to 5000

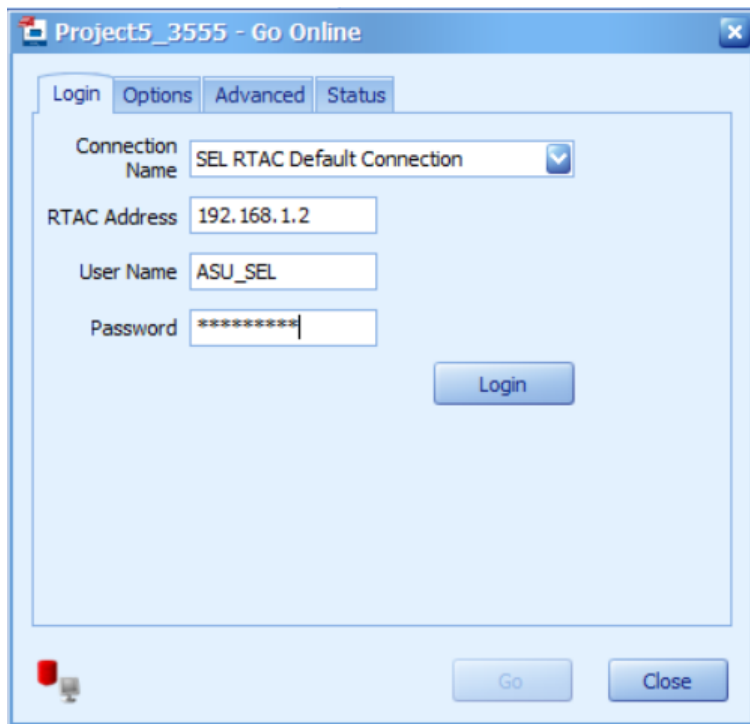
5. Set Trip/Communication-Assisted Trip logic. (Remote Bit from RTAC)

Grup 1 > Logic 1> Trip/Communication-Assisted Trip Logic

Trip/Communication-Assisted Trip Logic	
Trip Logic	
TR Other trip conditions	50A+50B+50C+RB1+RB2+RB3+RB8+RB9+RB10
TRCOMM Communications-assisted trip conditions	RB1+RB2+RB3+RB8+RB9+RB10
TRSOTF Switch-onto-fault trip conditions	0
DTT Direct transfer trip conditions	0
ULTR Unlatch trip conditions	!(51P1+51G1)



9. Open the Accelerator RTAC
 1. Click the Go-online button and enter the ID and password

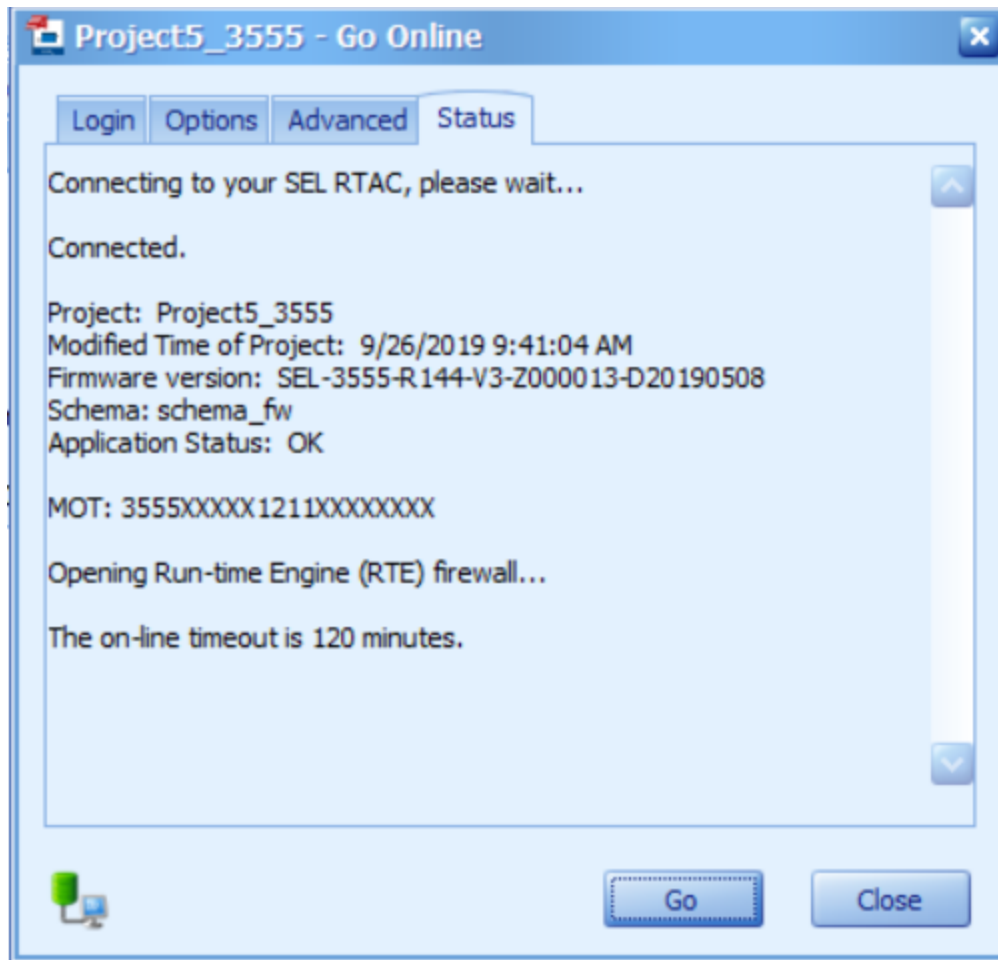


The screenshot shows a web-based login interface titled "Project5_3555 - Go Online". It features four tabs: "Login", "Options", "Advanced", and "Status". The "Login" tab is active, displaying the following fields and controls:

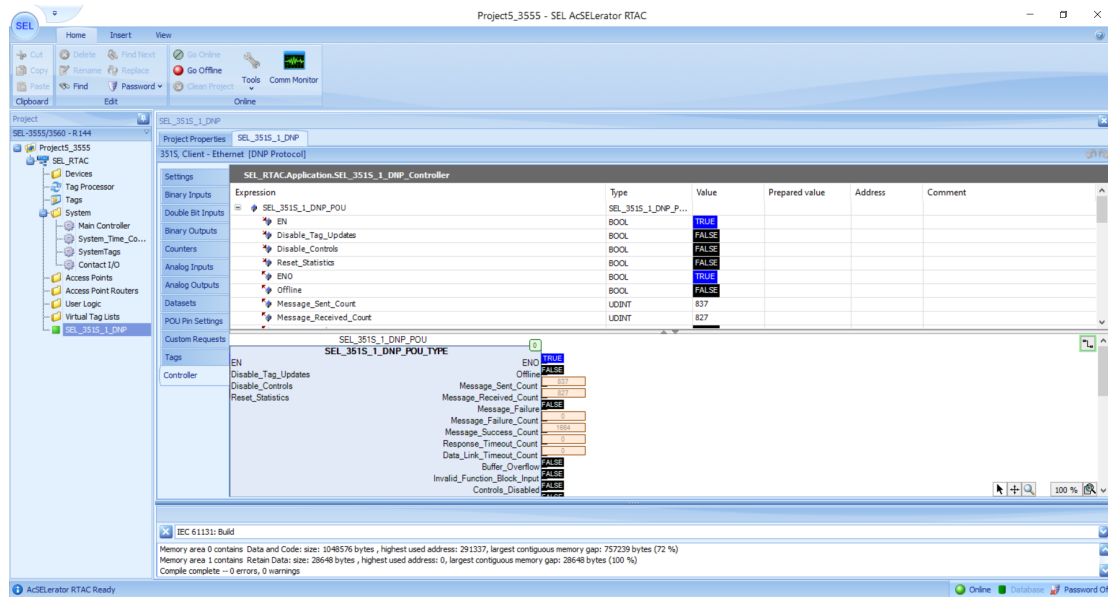
- Connection Name:** A dropdown menu showing "SEL RTAC Default Connection".
- RTAC Address:** A text input field containing "192.168.1.2".
- User Name:** A text input field containing "ASU_SEL".
- Password:** A text input field containing "*****" with a cursor at the end.
- Login Button:** A blue button labeled "Login" positioned below the password field.

At the bottom of the window, there is a red status indicator on the left and two buttons, "Go" and "Close", on the right.

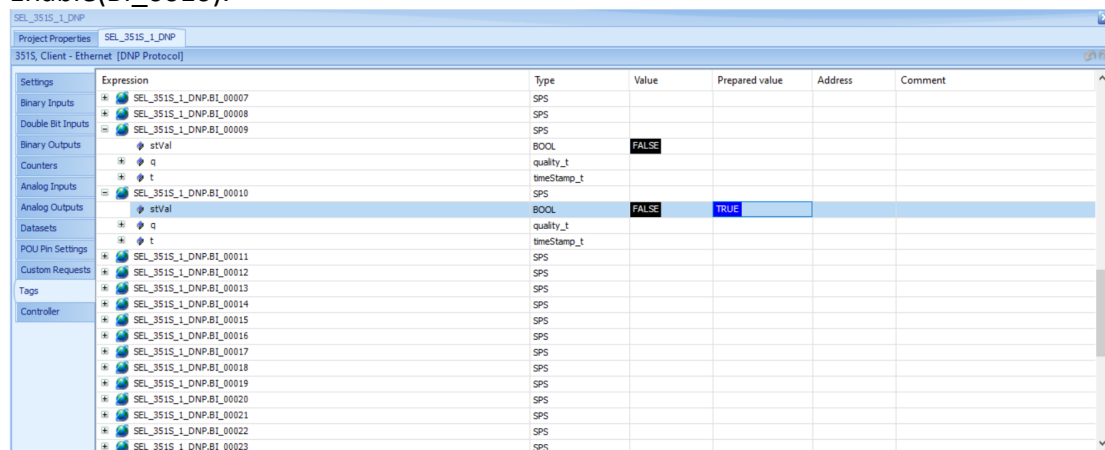
After this hit the Go button.



Click on the controller tab and expand the SEL_351S_1_DNP_POU. Make sure to verify that the offline button is 'FALSE' which implies that the RTAC is successfully communicating with SEL 351S as shown below



In order to issue a trip signal to the relay from the RTAC click on the Tags tab on the left. Ensure that the trip LED (BI_009) is false. The relay must be enabled to perform this action. So put the prepared value 'TRUE' by clicking on the prepared value column and pressing F6 in Enable(BI_0010).



We are going to send a trip signal. So, we need to put the prepared value True on the BO_000_RB1 as shown in the figure below.

SEL_351S_1_DNP						
Project Properties SEL_351S_1_DNP						
351S, Client - Ethernet [DNP Protocol]						
Settings	Expression	Type	Value	Prepared value	Address	Comment
Binary Inputs	* SEL_351S_1_DNP.B1_00021	SPS				
Double Bit Inputs	* SEL_351S_1_DNP.B1_00022	SPS				
Binary Outputs	* SEL_351S_1_DNP.B1_00023	SPS				
Counters	* SEL_351S_1_DNP.BO_00000	DNPC				
	operPulse	operSPC				
Analog Inputs	dtVal	BOOL	FALSE	TRUE		
Analog Outputs	* q	quality_t				
Datasets	* t	timeStamp_t				
POU Pin Settings	* pulseConfig	pulseConfig_t				
Custom Requests	* origin	originator_t				
Tags	* operLatchOn	operSPC				
	* operLatchOff	operSPC				
	* operTrip	operSPC				
	* operClose	operSPC				
Controller	* status	SPS				
	* SEL_351S_1_DNP.BO_00001	DNPC				
	* SEL_351S_1_DNP.BO_00002	DNPC				
	* SEL_351S_1_DNP.BO_00003	DNPC				
	* SEL_351S_1_DNP.BO_00004	DNPC				
	* SEL_351S_1_DNP.BO_00005	DNPC				
	* SEL_351S_1_DNP.BO_00006	DNPC				
	* SEL_351S_1_DNP.BO_00007	DNPC				
	* SEL_351S_1_DNP.BO_00008	DNPC				

After doing this the TRIP LED on the front panel of 351S should light up.