

INSTRUMENTOS PARA TESTES ELÉTRICOS Test Tutorial

Equipment Type: Protection Relay

Brand: ABB

Model: <u>RET670</u>

Functions: <u>27 or PTUV – Undervoltage & 59 or PTOV –</u> <u>Overvoltage</u>

Tool Used: <u>CE-6003, CE-6006, CE-6707, CE-6710, CE-7012 or</u> <u>CE-7024</u>

Objective: <u>Test the pick-up and actuation time of the</u> <u>undervoltage and overvoltage elements using the Quick software</u>

Version Control:

| Version | Descriptions | Date | Author | Reviewer |
|---------|-----------------|------------|--------|----------|
| 1.0 | Initial Version | 30/06/2022 | M.R.C. | G.C.D.P. |



C-----

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Statement of responsibility

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Suggestions for improvement of this material are welcome, just user contacts us via email suporte@conprove.com.br

The tutorial contains knowledge gained from the resources and technical data at the time was writing. Therefore, CONPROVE reserves the right to make changes to this document without prior notice.

This document is intended as a guide only; the manual of the equipment under test should always be consulted.



The equipment generates high current and voltage values during its operation. Improper use of the equipment can result in material and physical damage.

Only suitably qualified people should handle the instrument. It should be noted that the user must have satisfactory training in maintenance procedures a good knowledge of the equipment under test and also be aware of safety standards and regulations.

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INSTRUMENTOS PARA TESTES ELÉTRICOS Sequence for testing the RET670 relay in the Quick software

1. Relay connection to CE-6710

Appendix A shows the relay terminal designations.

1.1 Auxiliary Source

Connect the positive (red terminal) of the Aux Source. Vdc to pin 4 on the relay terminal X11 and the negative (black terminal) of the Aux Source Vdc to pin 5 of the relay terminal X11.



1.2 Voltage Coils

To establish the connection of the voltage coils, connect channels V1, V2 and V3 with pins 19, 21 and 23 of the relay terminal X401 and the common ones to pins 20, 22 and 24. If these last three points are short-circuited, connect all common to that point.



Figure 2



1.3 Binary Inputs

Connect the binary input of the CE-6710 to the binary output of the relay slot X31.

- BI1 to pin 01 and its common to pin 02.
- BI2 to pin 03 and its common to pin 02.
- BI3 to pin 04 and its common to pin 05.
- BI4 to pin 06 and its common to pin 05.





2. Configuration of the RET670 relay

Connect a notebook Ethernet cable to the relay. Then open PCM600 by double clicking on the software icon.



Note: In this tutorial, it is considered that there is no configuration in the relay, so that all parameterization will be inserted in the relay.



2.1 Creating a new file

First, a new project must be added. Click on "File" and then "New Project ... ".

| File | Edit | View | Tools | Window | Help |
|------|-------------------|---------------------------|---------|--------|--------|
| | New Pr | oject | | | Ctrl+N |
| i≊ | Open/N Close P | 1anage F roject | roject | | Ctrl+O |
| | Save | | | | Ctrl+S |
| | Exit | | | | |
| | 1: Loca | l Server∖ | CONPRO | VE | |
| | 2: Loca | Server\ | Rockemb | ach | |

Figure 5

Choose a name for the project, in which case "*PTOV_PTUV*" was used and then click on "*Create*".

| reate New Project | × |
|---|----|
| Server name: | |
| My computer [SUPORTETEC01\PCMSERVER] | |
| Project name: | |
| PTOV_PTUV | |
| Description: | |
| Serão apresentados os detalhes para a parametrização de dois elementos de sobretensão e dois elementos de subtensão. | |
| Create | el |

Figure 6

Right click on the created plant and insert a substation.



| Local Server\PTOV_PT | UV - PCM600 | | |
|---------------------------|------------------|----------------------|---------------------|
| File Edit View Tools | Window Help | | |
| D 🗲 🖬 X 🖻 🛍 | | | |
| Object Types 🛛 🔻 🕂 🗙 | Project Explorer | | → ₽ × |
| General 🗙 | Plant Structure | | |
| Generic IEC61850 IED 🗙 | | | |
| Sub-Transmission IEDs 🛛 🗙 | New 🕨 | General | Substation |
| Transmission IEDs 🗙 | Properties | Create from Template | IED Group |
| | T.' | - | |

Figure 7

Inside the created substation, enter the voltage level according to the following figure:

| 🔤 Local Server\PTOV_P | UV - PCM600 | |
|-------------------------|--|---------------|
| File Edit View Tools | Window Help | |
| Object Types 🛛 🔻 🕂 🗙 | Project Explorer | → ∓ X |
| General 🛠 | Plant Structure | |
| Generic IEC61850 IED | | |
| Sub-Transmission IEDs 🔹 | Substation | |
| Transmission IEDs | IED Compare IEC 61850 Configuration Import Export | |
| | New General | Voltage Level |
| | Cut Create fr Copy Delete Rename Properties | rom Template |
| | Figure 8 | |

Within the voltage level, insert a bay.



| Local ServerVPTOV | _PTU | / - PCM600 | | | | | |
|-----------------------|-------------|--------------------|-----------|----------------------|---|------------|-----|
| File Edit View To | ools | Window Help | | | | | |
| 0 🚅 🔛 🐰 🖻 (| 1 1 1 | | | | | | |
| Object Types 🔷 🔻 👎 | × P | roject Explorer | | | 1 | P X | |
| General : | * | Plant Structure | | | | | |
| Generic IEC61850 IED | * -6 | - PTOV_PTUV | | | | | |
| Sub-Transmission IEDs | * | ि र् र् Substation | age Level | | | | |
| Transmission IEDs : | * | 111 9010 | ago Eoron | | | | |
| | 1 | IED Compare | | | | | |
| | 3 | IEC 61850 Configur | ation | | | | |
| | | New | • | General | • | ₽ | Bay |
| | | K Cut | | Create from Template | | | |
| | 0 | | | | | 1 | |
| | | Delete | | | | | |
| | | Rename | | | | | |
| | | Properties | | | | | |
| | | | Figure 9 | | | | |

The RET670 relay is inserted inside the bay.

| Local Server\PTOV_P | TUV - PCM600 | | |
|---------------------------|---|---|------------------|
| File Edit View Tools | Window Help | | |
| 🗅 🚅 🖬 👗 🖻 🛍 | | | |
| Object Types 🛛 🔻 🕂 🗙 | Project Explorer | | - - - - × |
| General 🛠 | Plant Structure | | |
| Generic IEC61850 IED | | | |
| Sub-Transmission IEDs 🛛 🗙 | चि—्र्युर Substation वि—्ष्युर Voltage Level | | |
| Transmission IEDs 🔦 | 古 Bay | | |
| | IED Compare 동품 IEC 61850 Configuration | | |
| | New > | Generic IEC61850 IED Sub-Transmission IEDs | 1 |
| | В Сору | Transmission IEDs | REB670 |
| | Delete | Create from Template | REC670 REG670 |
| | Properties | | REL670 |

Figure 10



2.2 Configuring Communication

Choose the option "Online Configuration" and click "Next >".

| 🖻 RET670 - Configuration Mode Selection Page 🛛 🛛 🔀 |
|---|
| RET670 Configuration Wizard Configuration Mode Selection Page |
| This wizard helps you to create configuration for your relays. Configuration wizard sets the basic hardware and communication properties. The configuration can be made either offline or online. |
| Online Configuration Offline Configuration |
| Cancel Next > |

Figure 11

Choose the *"Next > "* option again.



Figure 12



On the next screen, the user chooses between two options "LAN1" or "Front Port" and then the IP is configured on the relay itself. To do so, go to the relay's display and search for "Settings > General settings > Communication > Ethernet configuration" and view the desired IP. Adjust this value in the PCM and in this tutorial the "Front Port" option was chosen.

| 🖻 RET670 - IEC61 | 850 communication protoc | col 🛛 |
|-------------------------------------|----------------------------------|---------------|
| RET670 Configur IEC61850 communi | ration Wizard cation protocol | |
| PCM600 communicat | ion | |
| Port: | Front Port | ~ |
| IP address: | 10 . 1 .150 . 3 | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| <u>r</u> | | |
| | Cancel | < Back Next > |
| | | 1 |

Figure 13

Then click "*Next* >" and on the next screen click "*Scan*".

| RET670 - Version Selection Page RET670 Configuration Wizard Version Selection Page | |
|--|---------------|
| Online Mode IED Type Product Version | Scan |
| Cancel | < Back Next > |

Figure 14



If the settings are correct, the software identifies the relay model and its version according to the following screen.

| RET670 - Version Selection Page | |
|---|----------------|
| RET670 Configuration Wizard Version Selection Page | |
| IED Type RET670 Product Version 1.2.3 | Scan |
| Canc | el (Back Next) |

Figure 15

On the next screen, the relay identifies the type of rack and display.

| Dnline Mode | ,87 | 10 |
|----------------|--------------------|----|
| | | |
| Housing Type : | 670 series housing | |
| Display Type : | Large Integrated | |
| | | |



Finally the complete relay information.

| | | 164 |
|--------------------|--|----------------------------|
| Setup is complete. | The configuration that is made for th | ne selected IED is below : |
| IED Type | RET670 | |
| Product Version | 1.2.3 |] |
| IP Address | 10.1.150.3 | |
| Order Option | Online Option Selected | |
| NOTE: Once config | uration wizard is finished it can't be r | reopened. |

Figure 17

2.3 TRM_9I_3U_31

Click on the "+" signs next to "*IED Configuration*" and "*HW Configuration*". Within the last option the relay shows all the slots that are inserted in the relay. Right-click on the " $TRM_9I_3U_3I$ " option and select "*Parameter Setting*".

| Local Server\PTOV_P | TUV - PCM600 | | |
|-------------------------|---------------------------------|--|---|
| File Edit View Tool | is Window Help | | |
| i 🗅 🚅 🖬 🖾 🖻 | | | |
| Object Types 🔷 🕈 🗙 | Project Explorer | ▼ # X | |
| General 🛠 | Plant Structure | | |
| Generic IEC61850 IED | B DTOV_PTUV | | |
| Sub-Transmission IEDs 🕱 | Substation | | |
| Transmission IEDs 🗙 | B Bay | | |
| | B | | |
| | ED Configuration | | |
| | BOM 3 | | |
| | BIM_4 | | |
| | TRM_9[_3U_31] | Fill Parameter Setting | |
| | | Hardware Configuration | |
| | | | |
| | ⊞ — 40 Time | 15C 61850 Configuration | |
| | | Properties | |
| | Analog modules | | |
| | B | | |
| | B - R Application Configuration | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Output | | | → # X |
| Date and Time | Category User Object | Message | ~ |
| 16/7/2013 16:56:17.906 | Message [local]\CONPROVE System | Project opened: SUPORTETEC01\PCMSERVER\PT0V_PTUV | |
| 16/7/2013 17:02:19.234 | Message [local]\CONPROVE RET670 | SCL import successful | |
| Logging Kexceptions | | | <u> </u> |
| | | | terça-feira, 16 de julho de 2013 17:04:33 ABB |
| | | | |

Figure 18



In this window, the current and voltage transformation relationships must be configured. In this case, only channels 10, 11 and 12 will be configured since the protections to be analyzed are undervoltage and overvoltage.

| Local Server\PTOV_P | TUV - PCM600 | | | | | | | | | |
|---------------------------|---|-----------------------|----------------------------|-------------------|---------------------------|------------------------|-----------------------|----------|---------------|--------------|
| Eile Edit View Tools | s <u>I</u> ED <u>W</u> indow <u>H</u> e | alp | | | | | | | | |
| D 🗃 🖬 🎒 🐰 🖻 | n 🛍 🗠 🗽 🖬 🗖 | | 🗄 🗴 🖪 🖻 🚄 🛃 | All parar | neters 💽 🚽 🕀 🛥 🛛 🖽 | 🔟 - 🔼 | | | | |
| Object Types 🛛 🔻 🛱 🗙 | Project Explorer | | | → 中 × | RET670 - Parameter Settin | ng | | | | - 4 Þ X |
| General 🗙 | Plant Structure | | | | Group / Parameter Name | IED Value [SG1/Common] | PC Value [SG1/Common] | Unit | Min | Max 🙆 |
| Generic IEC61850 IED | | / | | | ✓ CTStarPoint9 | | ToObject | | | |
| Sub-Transmission IEDs 🕱 | | tion foltage Level | | | v CTsec9 | | 1 | A | 1 | 10 |
| Transmission IEDs | 8 | Bay | | | v∕ CTprim9 | | 3000 | A | 1 | 99999 |
| | | e RE | T670 | | V NAMECH10 | | TRM#-CH10 | | | 13 charact |
| | | 9 | HW Configuration | | ✓ ChannelType10 | | Off | | | |
| | | | BOM_3 | | ✓ RatedTrans10 | | 1,0 | v | 0,1 | 300,0 |
| | | ✓ VTsec10 | | 115,000 | V | 0,001 | 999,999 | | | |
| | | | LDCMAnalog1_312 | | ✓ VTprim10 | | 400,00 | kV | 0,05 | 2000,00 |
| | | 8 | - % Activate setting group | | V NAMECH11 | | TRM#-CH11 | | | 13 characl |
| | | 6 | | | ✓ ChannelType11 | | Off | | | |
| | | 6 | - Communication | | ✓ RatedTrans11 | | 1,0 | v | 0,1 | 300,0 |
| | | 9 | - R Analog modules | | ✓ VTsec11 | | 115,000 | V | 0,001 | 999,999 |
| | | 6 | | | v VTprim11 | | 400,00 | k₩ | 0,05 | 2000,00 |
| | | | Application Configuration | | V NAMECH12 | | TRM#-CH12 | | | 13 charact |
| | | | | | ✓ ChannelType12 | | Off | | | |
| | | | | | ✓ RatedTrans12 | | 1,0 | v | 0,1 | 300,0 |
| | | | | | ✓ VTsec12 | | 115,000 | V | 0,001 | 999,999 |
| | | | | | ✓ VTprim12 | | 400,00 | kV | 0,05 | 2000,00 |
| | | | | | | | | | | |
| | | | | | < | | | | | |
| | | | | | | | | | | |
| Output | | | | | | | | | | → ₽ > |
| Date and Time | Category | User | Object | Message | | | | | | - |
| 16/7/2013 16:56:17.906 | Message | [local]\CON | IPROVE · System | Project opened: S | UPORTETEC01\PCMSERVER\PT0 | DV_PTUV | | | | |
| 16/7/2013 17:02:19.234 | Message | [local]\COM | IPROVE RET670 | SCL import succes | ssful | | | | | |
| | | | | | | | | | | |
| - cooping UB exceptions | | | | | | | tores feirs 16 | do iulho | de 2012 17:12 | |

Figure 19

In the icon highlighted in green in the previous figure, the changes are sent to the relay. There are three shipping options:

- 1. Send only a specific value.
- 2. Submit all changes made within a settings group.
- 3. Send all parameterized settings within the group.

In this case, only the settings that have been changed are sent.

| 菌 Write parameters to RET670 | |
|--|-------------|
| Parameter range | |
| ⊙ TRM_9I_3U_31 | |
| O Selected group | |
| Selected parameter | |
| Parameter options | |
| Ohanged parameters | 🗹 Read back |
| All parameters | |
| | |
| | OK Cancel |
| | |

Figure 20

NOTE: Whenever the user makes a change in any adjustment group, this procedure must be repeated.



2.4 SETGRPS: 1

Click the "+" sign next to "Activate setting group" and then "SETGRPS: 1" and make sure that group one is active.

| Local Server\PTOV_PTU | V - PCM600 | | | | | |
|--|---|------------------------------------|----------------------------------|--|----------|-----------|
| Ele Edit View Iools | IED Window Help | | | | | |
| 0 🛩 🖬 🍯 🕉 🗞 🕯 | 8 🗠 🔃 🗗 🖬 🗖 🗖 🖉 👘 👘 👘 👘 | 🚙 🛃 🔂 🔂 Al para | meters 🔹 🗣 🛥 🖽 | 1 II 🔼 | | |
| Object Types 🔫 🕂 🗙 📴 | Project Explorer | ~ ₽ X | RET670 - Parameter Setti | ing | | - d Þ - × |
| General 🛠 | Plant Structure | | Group / Parameter Name | IED Value [SG1/Common] PC Value [SG1/Common] | Unit Min | Max |
| Generic IEC61850 IED 🕱 | B - B PTOV_PTUV | | SETGRPS: 1 | | | |
| Sub-Transmission IEDs | E the station | | ActiveSetGrp | SettingGroup1 | | |
| Transmission IEDs | Votage Level Rev | | MAXSETGR | 1 | No 1 | 6 |
| | B RET670 | | | | | |
| | Box 3 the Configuration Contraction Configuration Box 3 the Configuration | 15. 1_12] | | | | |
| 1 | | | < | i.u | | > |
| ; Uutput | | | | | | • # X |
| Date and Time | Category User Object | Message | | | | <u>^</u> |
| 16/7/2013 17:14:33.640 1 16/7/2012 17:14:33.640 | Message [local/LUNPRUVE RET670 Message [local/LONPROVE - RET670 | Heading 3 param Parameters road | eters from IED | | | |
| · IOTT/2010 17.14.34.421 | message [pecapetinent/ver here/u | ji arameters reau : | загорыныў | | | ~ |
| Logging [Exceptions | | | | | | |
| | | | | | | |

2.5 PRIMVAL: 1

Figure 21

Click the "+" sign next to "*Power System*" and select the "*PRIMVAL:1*" option. In this group, the frequency value is adjusted and the standard value in this relay is 50.0Hz. Change the value to 60.0Hz and send the settings to the relay.



Figure 22



2.6 AISVBAS: 1

Click on the "+" signs next to "Analog modules" and select the option "AISVBAS: 1" and set the channel "TRM40-Ch10" as the reference channel, which is equivalent to the voltage phase A. Send these settings to the relay.

| Local Server\PTOV_I | PTUV - PCM600 | | | | | | | | 🛛 |
|------------------------|--------------------|--|--|------------------------------------|------------------------|-----------------------|---------------|---------------|--------------|
| File Edit View Too | ls IED Window Help | 147 | T | | | | | | |
| | | | Al para | ameters 🔹 🖶 🖂 | h • 🔥 | | | | |
| Object Types - 4 × | Project Explorer | | → ♀ × | RET670 - Parameter Setting | a] | | | | - 4 Þ X |
| General 🏠 | Plant Structure | | | Group / Parameter Name | IED Value [SG1/Common] | PC Value [SG1/Common] | Unit | Min | Max |
| Generic IEC61850 IED | B PTOV PTUV | | | AISVBAS: 1 | | | | | |
| Sub-Transmission IEDs | 😑 🦂 Substation | | | ✓ PhaseAngleRef | | TBM40-CM10 | 1 | | |
| Transmission IED : | S Rate | .evel | | | | | | | |
| | | PETS70 ED Configuration ED Configuration ED Configuration ED Configuration ED MV Configuration ED MV Configuration ED MV Configuration ED MV Configuration Configuration | ion 3U_31 aloo[_312 3goup 5:1 4LID-1 :1 3 5:1 3 5:1 3 5:1 3 5:1 5:1 5:1 5:1 5:1 5:1 5:1 5:1 5:1 5:1 | 2 | | | | | |
| | | | | Selected parameter: AISVBAS: 1/Pha | aseAngleRef | | | | |
| Output | | | | | | | | | → # × |
| Date and Time | Category User | Object | Message | | | | | | ^ |
| 16/7/2013 17:14:33.640 | Message [local] | CONPROVE RET670 | Reading 3 param | neters from IED | | | | | |
| 16/7/2013 17:14:34.421 | Message [local] | CONPROVE RET670 | Parameters read | successfully | | | | | |
| 🖺 Logging 🔀 Exceptions | | | | | | | | | |
| | | | | | | terça-feira, 16 d | le julho de i | 2013 17:24:36 | ABB |

Figure 23

2.7 Application Configuration

Select the "Application Configuration" option, right-click and choose "Application Configuration" again. In this field, insert the protection logic blocks.



Figure 24



On the screen that opens right-click and then choose the "Insert FunctionBlock" option.

| Object Types 🔻 🕂 🗙 | Project Explorer T X | RET670 - Parameter Setting RET | 670 - Application Configuration | | - d þ x |
|---|---|--------------------------------|--|--|----------------|
| AI 🖈 | Plant Structure | 1 | 2 | 3 | |
| Basic IED functions 2 Control 2 Control 2 Control 2 Differential protection 2 Internitial protection 2 andware 2 mpedance protection 2 dening 2 dening 2 dulipupor 2 Scheme communication 2 Station communication 2 Valage protection 2 Valage protection 2 Valage protection 2 | PTOV_PTUV PTOV_PTUV | A | Paste Insert Page Insert Variable Insert Variable Insert Variable Insert Hardware Channel Delete page Select All Find Lock | CbHV CbHShift+F CbHShift+F CbHShift+F CbHShift+D CbHShift+D CbHF CbHF CbHF | |
| | | | | | |
| | | 4 | | | > |
| _ | | MainApp | | | - 4 ▷ |
| Application Configuration | | 1 of 1 1 | (M) 254,159 | | |
| Output | | | | | → # : |
| MainApplication Name F | age No Description | | | | |

2.8 SMAI1 (Voltages)

Click on the "+" sign next to "Basic IED functions" and insert the "SMAII" block that will be responsible for the voltage channels. To understand the perfect functioning of the different blocks, consult the "RET 670" manual.



On the next screen set the "Cycle Time" to 8.



| Function Block Inst | ance | |
|--------------------------------------|-----------|----------------|
| Name: | SMAI1 | |
| Cycle Time: | 8 | ~ |
| Execution Order, Instance Number: | 1,13 | ~ |
| | Assign | <u>C</u> ancel |
| | Figure 27 | |

The next step is to route the channel input of the function block with its physical channel. To do this, right-click outside the block and choose the following option.

| MIN AND | | | |
|--------------|-------------------------|--------------|---|
| G | Paste | Ctrl+V | |
| | Insert Page | Ctrl+Shift+P | |
| | Insert Variable | | • |
| | Insert FunctionBlock | Ctrl+Shift+F | |
| | Insert Hardware Channel | Ctrl+Shift+H | |
| | Delete page | Ctrl+Shift+D | |
| | Select All | Ctrl+A | |
| 89 | Find | Ctrl+F | |
| Transfer and | Lock | Ctrl+Shift+L | |
| | | | _ |

Figure 28

Choose the "Analog Input" option and click on "Insert".



Figure 29



| Hardware Channel Al | location | |
|----------------------|----------------|------|
| Hardware Module | TRM_9I_3U_31 | ~ |
| Hardware Channel | CH10 | ~ |
| User Defined Name | CH10 | |
| Create unassigned Ha | rdware Channel | icel |
| I | Figure 30 | |

Repeat the procedure of the 3 previous figures changing the option from *"Hardware Channel"* to *"CH11"* and *"CH12"*. Then make the connections with the block.

| Local Server\PTOV_P | PTUV - PCM600 | | | | d X |
|-------------------------------|--|----------------------------|-----------------------------------|---|--------------|
| File Edit View Tool | ls Format Insert IED Debug Window Help | | | | |
| 0 🛥 🖬 🍊 🖎 🛛 | (🖻 🛍 🔚 🖬 🗐 🕅 🕼 🗠 🗋 🖬 🖉 🖓 👘 | | Fixed | | |
| Object Types 🛛 🔻 🖡 🗙 | Project Explorer 👻 🖣 🗙 | RET670 - Parameter Setting | ET670 - Application Configuration | • | 4 Þ 🗙 |
| All 🗙 | Plant Structure | 1 | 2 | 3 | ~ |
| Basic IED functions | | | | | |
| Control | Substation | | | | |
| Current protection | □ I Bay | | | | |
| Differential protection | BET670 | A | 1 | | |
| Frequency protection | B HW Configuration | 56 | | | 11 |
| Hardware 🎗 | | TRM_91_3U_31.CH10 | SMAI1 | | |
| Impedance protection | BIM_4 | | OFTSPFC AI3P Not used AI1 | | |
| Logic 🏠 | LDCMAnalog1_312 | II • | ORPIL1 A2 Not used A3 | | _ |
| Metering 🗙 | LED | TRM_91_3U_31.CH11 | Not used AIN GRP1L3 | | |
| Monitoring | G SETGRPS: 1 | 1222 | Not used GRP1N | | |
| Multipurpose protection | B — Kg Time | TBM 91 3U 31 CH12 | | | |
| Remote communication | □ □ TERMINALID: 1 | | | | |
| Scheme communication | PRIMVAL: 1 | | | | |
| Station communication | B 1/2 Communication | | | | |
| Supervision 2 | Alang modules AlsvBAS: 1 | | | | |
| Voltage protection | B HM | | | | |
| Hardware I/O | Monitoring Application Configuration | | | | |
| | | | | | |
| | | | | | ~ |
| | | < | | 15 | > |
| | | MainApp | | | • 4 Þ |
| are Application Configuration | | 🛞 🛞 1 of 1 😥 |) 🔘 256,345 | | |
| Output | | | | | ▼ ₽ X |
| MainApplication Name | Page No Description | | | | |
| | | | | | |
| | | | | | |
| a, a, . | | | | | |
| Logging Log Exceptions | Application Configuration | | | | |
| | | | | terça-reira, 16 de juino de 2013 17:43:10 | |

Figure 31

Assign an output to the "AI3P" option. To do so, right-click and choose "Insert Variable > Output".



| 78 | Find | Ctrl+F Ctrl+Sbift+I | |
|----|-------------------------|------------------------|--------|
| | Select All | Ctrl+A | |
| | Delete page | Ctrl+Shift+D | |
| | Insert Hardware Channel | Ctrl+Shift+H | |
| | Insert FunctionBlock | Ctrl+Shift+F | Output |
| | Insert Variable | • | Input |
| | Insert Page | Ctrl+Shift+P | Toput |

Choose a name for this variable, in this case "AI3P_TP_08ms" and connect with the output "AI3P".



Figure 33

By clicking on the icon highlighted in green and on the "*MainApp*" tab, then the name of the tab is changed to "*CANAIS_TENSÃO*", for example.





Figure 34



Close the "Object Properties" window then click on "Insert > MainApplication".

Figure 35



2.9 OV2PTOV (Overvoltage)

Right-click on the new tab, choose the "*Insert Function Block*" option, click on the "+" sign next to "*Voltage protection*" and finally choose the "*OV2PTOV*" block.

| Object Types 🔻 🕈 🛪 | Project Explorer | RET670 - Parameter Setti | ng RETG70 - Application Configuration | .1971 | * 4 Þ x |
|---------------------------|--|--------------------------|--|--|---------|
| Al \$ | Plant Structure | 1 | 2 | 3 | ^ |
| Basic IED functions 2 | E B PTOV_PTUV | | | | |
| Control * | E M Votage Level | | | | |
| Current protection | B- Bay | | Concerning the second data and the second data and the | | |
| Differential protection 2 | III - IIII RE1670 | * | Insert Function Block | | |
| Frequency protection | B W Configuration | | Select a Function Block Type | (4) | |
| Hardware 🎗 | - BOM_3 | | B Metering | 621 | |
| Impedance protection 2 | BIM_4 | | 🕀 🔮 Monitoring | | |
| Logic 🎗 | LDCMAnalog1_312 | | Multipurpose protection Benote communication | | |
| Metering * | LED D | | Scheme communication | 100 | |
| Monitoring 🛠 | Vo Activate setting group D. SETIGRES 1 | | Station communication | | |
| Multipurpose protection 2 | | | Voltage protection | | |
| Remote communication | | | LOVPTUV | _ | |
| Scheme communication | D PRIMVAL 1 | 8 | 0EXPVPH | | |
| Station communication | I Communication | | B0v2PT0v | | |
| Supervision 2 | B (Q) Analog modules () Analog modules () Analog modules | | UV2PTUV | | |
| Voltage protection | ⊕ - ^Q ₀ HMI | | VDCPTOV | * | |
| Hardware I/0 🎗 | ■ R ₀ Monitoring | | Inset | Cancel | |
| | iai — 30 Application Conliguration | | | | |
| | | | | | |
| | | < | 1. | | > |
| | | CANAIS_TENSÃO Ma | inApp2 | | - 4 5 |
| Application Configuration | | (H) (H) 1 of 1 | (m) (m) 259,160 | | |
| Outout | | | | | ~ |
| Maintenfeatine Name | Data Ma | | | | |
| mane-pacaton Name | rayeno petoport | | | | _ |
| | | | | | |
| | | | | | |
| Logging 👸 Exceptions | Application Configuration | | | | |
| | | | ter | ca-feira, 16 de julho de 2013 17:53:48 | ABB |

Figure 36

Click on "Assign" (picture not shown). Insert an input variable using the same name given for the voltage output and connect with the voltage inputs "AI3_TP". Create two output variables and use the following nomenclature.

| Local Server\PTOV_F | РТUУ - РСМ600 | | | | |
|-------------------------------|---|------------------------------|-----------------------------------|--|--|
| File Edit View Too | ols Format Insert IED Debug Window Help | | | | |
| 0 🚔 🖬 🎒 🔃 👌 | x 🖻 💼 🚺 🖬 🔲 🛛 🕅 🖄 🗠 🗋 🖬 🗶 🕬 🗸 | | Fixed | | |
| Object Types 🛛 🔻 🖡 🗙 | Project Explorer + # X | RET670 - Parameter Setting R | ET670 - Application Configuration | | - 4 Þ × |
| Al 🎗 | Plant Structure | 1 | 2 | 3 | ~ |
| Basic IED functions | | | | | |
| Control | Substation | | | | |
| Current protection | B Bay | | | | |
| Differential protection | ■ RET670 | A | | | |
| Frequency protection | EU Configuration | | | | THE OWNER OF THE OWNER OWNER OWNER OF THE OWNER OWNE OWNER OWNE OWNER OWNE |
| Hardware 🛠 | BOM_3 | | | | |
| Impedance protection | BIM_4 | | OV2PTOV 2 | | |
| Logic 🏠 | LDCMAnalog1 312 | ALI3P_TP_06ms 🗩 | USP TRP | to the state of th | |
| Metering 🛠 | LED | | BLOCK TR1 BLKTR1 TR1L1 | | |
| Monitoring | Activate setting group | | BLKTR2 TR1L3 BLKST2 TR2 | | |
| Multipurpose protection | ⊞ — % Time | | TR2L1* TR01.0* | | |
| Remote communication | B Power system | | START* STIT | | |
| Scheme communication | I TERMINALID: 1 | В | STIL1 STIL2 | | |
| Station communication | Gommunication | | ST1L3* ST2* ST2 1* | | |
| Supervision 🕱 | Analog modules | | ST2L2 ST2L3 | | |
| Voltage protection | HMI | | 0.553T 8/1 | | |
| Hardware I/O | B Monitoring | | | | |
| 5 | 🖼 — 💏 Application Configuration | | | | |
| | | | | | (78) |
| | | < | | | > |
| | | CANAIS_TENSÃO MainApp2 | | | - 4 Þ |
| are Application Configuration | | (H) (H) 1 of 1 (H) |) (H) 413,342 | |] |
| Output | | | | | → ‡ X |
| MainApplication Name | Page No Description | | | | |
| | | | | | |
| | | | | | |
| Logging | Application Configuration | | | | |
| | | | | terça-feira, 16 de julho de 2013 17:58:32 | ABB |

Figure 37



Change the name of the tab to "SOBRETENSÃO".

| 🗟 Local Server ΦΤΟΥ_ΡΤΟΥ - PCM600 | | | | | |
|--|---|---|--|--|--|
| Eile Edit View Iools Format Insert IED Debug Window Help | | | | | |
| i D 🖆 🖬 🖨 🔍 X ங 🎕 🗽 🚰 🖬 🗐 🔽 🕼 🗠 🗋 🖬 🖉 X 🗴 | 🕨 🖂 🔐 🗮 🛄 🛄 💽 🖼 Fixed 🔤 📑 🛄 🗐 🗐 🗙 | | | | |
| Object Types 🔻 🕈 X Project Explorer 👻 🕂 X | 70 - Parameter Setting RET670 - Application Configuration 🗧 4 🕨 🗙 | Object Properties 👻 🖣 🗙 | | | |
| All Plant Structure | 1 2 | | | | |
| Basic IED functions | | E Misc | | | |
| Control 🛠 Existation | | Locked False | | | |
| Current protection | | Name SUBRETENSAU Paper Kind A3 | | | |
| Differential protection | A | 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1 | | | |
| Frequency protection | | | | | |
| Hardware 🖈 BOM_3 | | | | | |
| Impedance protection | OV2PTOV A | | | | |
| Logic Logic LDCMAnalog1_312 | AL3P_TP_06ms 20 U3P TR.P | | | | |
| Metering 🖈 | BLOCK TRIT BL/TR1 TR117 | | | | |
| Monitoring | BLKTR2 TR113 BLKST2 TR2 | | | | |
| Multipurpose protection | TR2L1* TR2L2* | | | | |
| Remote communication | STATT STATT | | | | |
| Scheme communication | B STILL* STIL2* | | | | |
| Station communication | STL3 ST2 ST2 1 | | | | |
| Supervision Analog modules | ST2L2* ST2L3* | | | | |
| Voltage protection | 0.583)T.8/(1 | | | | |
| Hardware I/O | | | | | |
| 🗷 —— 📆 Application Configuration | | | | | |
| | | | | | |
| | X | Name Name of work sheet | | | |
| | CANAIS TENSÃO MainApp2 | | | | |
| re Application Configuration | K (1 of 1) N 371,275 | RET670 Application Configuration | | | |
| Output | | <u>≁</u> ± × | | | |
| MainApplication Name Page No Description | | | | | |
| | | | | | |
| | | | | | |
| Logging 🛃 Exceptions Application Configuration | | | | | |
| | | terça-feira, 16 de julho de 2013 18:01:56 🛛 🕂 🥵 | | | |

Figure 38

Close the "Object Properties" window and insert a new tab to create the undervoltage function block.



Figure 39



2.10 UV2PTUV (Undervoltage)

Right-click on the new tab, choose the "*Insert Function Block*" option, click on the "+" sign next to "*Voltage protection*" and finally choose the "*UV2PTUV*" block. On the next screen (not shown) click on "*Assign*".

| All Plan Basic IED functions & E C Control & Current protection & Differential protection & | I Structure PTDV, PTUV रस, Substation = २०२४ Valage Level = २०२४ | 1 | 2 3 | - | | | | |
|---|--|-------------------|---------------------------------|-------|--|--|--|--|
| Basic IED functions Control Control Current protection Differential protection | PTOV_PTUV | | | | | | | |
| Control Current protection Differential protection | | | | | | | | |
| Current protection 2 Differential protection 2 | | | Insert Function Black | | | | | |
| Differential protection | | | Coloris - Constant Direct Trans | | | | | |
| | | A | R Logic | | | | | |
| Frequency protection | B - B HW Configuration | | 🗉 🔮 Metering | | | | | |
| Hardware 🛠 | BOM_3 | | 🖷 🔮 Monitoring | | | | | |
| Impedance protection | TDM OF CH CH | | Remote communication | | | | | |
| Logic 🎗 | BLDCMAnalog1_312 | | Scheme communication | | | | | |
| Metering 2 | LED | | Station communication | | | | | |
| Monitoring 🗶 | Activate setting group Activate setting group SETGRPS 1 | | Voltage protection | | | | | |
| Multipurpose protection | B - & Time | | LOVPTUV | | | | | |
| Remote communication | ⊟ - % Power system | 1.12 | OV2PTOV | | | | | |
| Scheme communication | D PRIMVAL 1 | 8 | ROV2PTOV | | | | | |
| Station communication | S Communication | | | | | | | |
| Supervision 🕿 | B - Analog modules | | | | | | | |
| Voltage protection | ⊞ — % HMI | | Insert Cancel | | | | | |
| Hardware I/O | Wonitoring Section Configuration | | | | | | | |
| | | | | | | | | |
| | | < | | > | | | | |
| re Application Configuration | | CANAIS_TENSAO SOB | (H) (H) 247,139 | • 4 P | | | | |
| Dutput | | | | - 0 x | | | | |
| and the second se | | | | | | | | |

Figure 40

Insert an input variable using the same name given for the output on the "*CANAIS_TENSÃO*" tab and connect it with the voltage input "*AI3_TP*". Create two output variables and use the following nomenclature.

| Local Server\PTOV_P | TUY - PCM600 | | | | |
|------------------------------|-------------------------------------|----------------------------|------------------------------------|---|--------------|
| File Edit View Tools | Format Insert IED Debug Window Help | | | | |
| i 🗅 🚅 🖬 🍓 🖪 🕷 | 🐚 🎕 🛃 🖬 🖬 🐨 🖄 🖄 🖄 🗋 🖬 🗶 🔎 🔛 🕄 |) 🖬 🖬 📇 🗐 💷 🖸 🖬 | Fixed | | |
| Object Types 🔻 🕂 🗙 | Project Explorer + # X | RET670 - Parameter Setting | RET670 - Application Configuration | | - 4 Þ × |
| All 🏠 | Plant Structure | 1 | 2 | 3 | ^ |
| Basic IED functions | | | | | |
| Control | ■ 、秋 Substation | | | | |
| Current protection | ⊟ I Bay | | | | |
| Differential protection | RET670 | A | | | |
| Frequency protection | HW Configuration | | | | |
| Hardware 🗙 | 🗰 BOM_3 | | | | |
| Impedance protection | BIM_4 | | UV2PTUV a | | |
| Logic 🗙 | LDCMAnalog1_312 | AI3P_TP_08ms >> | USP TRIP | TRIP 27-1 | |
| Metering 🗙 | ED Bo Antiona antion | | BLKTR1 TR1L1 BLKST1 TR1L2 | <u> </u> | |
| Monitoring | SETGRPS: 1 | | BLKTR2 TR1L3 BLKST2 TR2 | TRIP_27-2 | |
| Multipurpose protection | B → B Time | | 19213 | | |
| Remote communication | Power system TEBMINALID: 1 | | START | | |
| Scheme communication | O PRIMVAL: 1 | 6 | 571L2* ST1L2* ST1.3* | | |
| Station communication | Communication | | ST2 ST2.1 | | |
| Supervision 🗙 | Analog modules AISVBAS: 1 | | ST2L3 | | |
| Voltage protection | ⊞— ^Q B HMI | | | | |
| Hardware I/D | 😟 🧐 Monitoring | | | | |
| | m OD Abbiedian configuration | | | | |
| | | | | | ~ |
| | | < | | 1 | > |
| | | CANAIS_TENSÃO SOBRETEN | ISÃO MainApp2 | | - 4 ⊅ |
| re Application Configuration | | (H) (H) 1 of 1 (H) |) (H) 438,329 | | |
| Output | | | | | → ‡ X |
| MainApplication Name F | Page No Description | | | | |
| | | | | | |
| | | | | | |
| P Logaina C Eucoptions | Application Configuration | | | | |
| - cogging Log Exceptions | Application Connigeration | | | teres fairs 10 de julke de 2012 10:00:07 | APP |
| | | | | terça-reira, 16 de juiho de 2013 18:08:27 | ADB |

Figure 41



Change the tab name to "SUBTENSÃO".

| Local ServerФTOY_PTUV - РСМ600 | |
|--|---|
| File Edit View Iools Format Insert IED Debug Window Help | |
| i D 🚅 🖬 🖨 🕅 🖄 📾 🗱 🔛 🖬 🖬 🗐 🖬 🕼 🖉 🖬 🖬 🖉 🖬 | 🖳 🕂 🗃 🔽 🛗 🛄 🖸 🔽 Fixed 📑 🔄 🗐 🗐 🗙 |
| Object Types 👻 🕈 🗙 Project Explorer 💌 | # X 70 - Parameter Setting RET670 - Application Configuration ▼ ◀ ▷ X Object Properties |
| Al Plant Structure | 1 2 🛕 📄 👌 🔤 |
| Basic IED functions | E Misc |
| Control 🖈 🖶 국국 Substation | Locked False |
| Current protection | Paper Kind A3 |
| Differential protection | A |
| Frequency protection | |
| Hardware 80M_3 | |
| Impedance protection 🛠 | UV2PTUV |
| Logic LDCMAnalog1_312 | 413P_TP_06ms 20 TRP |
| Metering | BLKTR1 TRL.1 BLKST1 TRL.2 |
| Monitoring Activate setting group | BUCR2 TRIUS BUCR2 TRIUS |
| Multipurpose protection | 184.19 182.19 |
| Remote communication | STATE STITE |
| Scheme communication PRIMVAL: 1 | B STL2 STL2 STL2 |
| Station communication | ST2. ST2.9 |
| Supervision Supervision Supervision Supervision | ST2.2 ST2.3 |
| Voltage protection | |
| Hardware 1/0 | |
| B | |
| | V Name |
| | Name of work sheet. |
| | CANAIS_TENSÃO SOBRETENSÃO MainApp2 |
| re Application Configuration | (H) (e) 1 of 1 (H) (H) 372,325 RET670 Application Configuration |
| Output | • : |
| MainApplication Name Page No Description | |
| | |
| | |
| Logging Acceptions Application Configuration | |
| | terça-feira, 16 de julho de 2013 18:10.16 🛛 🔒 |

Figure 42

2.11 Binary Outputs

The last block to be created is the one for the binary outputs. So create a new tab as shown below.

| 📟 Local ServerV | TOV_P | TUV - PCM | 1600 | | | | | | | |
|----------------------------|-----------|-----------|-------|---|---------------|-------|-----------------------------|-----------------------------------|----------------------------------|-----------------------|
| File Edit View | Tool: | s Format | Inser | rt IED Debug Window Help | 7 | | | | | |
| | Q % | • • · | | MainApplication | 🗩 100% 🝷 🗩 🕎 | • 🖬 🗹 | M 🗄 🗍 🗆 🖸 🛛 | Fixed 🔽 🖬 🖬 🗭 🗡 | | |
| Object Types | • 4 × | Project I | | Page | → ‡ X | RET6 | 10 - Parameter Setting 🖉 RI | ET670 - Application Configuration | | → 4 Þ × |
| Al | * | Plant | • | FunctionBlock | | | 1 | 2 | 3 | ^ |
| Basic IED functions | * | | | Picture | | | | | | |
| Control | \$ | 8 | Tu | Text | | | | | | |
| Current protection | * | | | Variable + | | | | | | |
| Differential protection | * | | | Hardware Channel | | A | | | | |
| Frequency protection | * | | | MainApplication Template Manager | | | | | | |
| Hardware | \$ | | | | | | | | | |
| Impedance protection | * | | | | 21 | | | | | |
| Logic | * | | | LDCMAnalo | _31 g1_312 | | ALISP_TP_08ms SD | USP TRIP | | |
| Metering | * | | | LED | | | | BLOCK TR1 BLXTR1 TR1L1 | | |
| Monitoring | * | | | Getting gr G | oup 1 | | | 6.KTR2 TR1L3 6.KTR2 TR1L3 | TRIP_27-2 | |
| Multipurpose protection | n 🎗 | | | ter serain s. ter − % Time | 5 | | | TR2L1* TR2L2* | | |
| Remote communicati | on 🎗 | | | Re Power system | | | | START START | | |
| Scheme communicat | on 🎗 | | | D PRIMVAL 1 | D: 1 | в | | 571L1* 571L2* | | |
| Station communication | n 🎗 | | | 🛪 🖓 Communication | | | | STL3* ST2* ST2 1* | | |
| Supervision | * | | | Analog modules | | | | ST2L2 ST2L3 | | |
| Voltage protection | * | | | B MAINT AND | | | | 0.57017.8/1 | | |
| Hardware I/O | * | | | H Monitoring | | | | | | |
| | | | | Application Configuration | n | | | | | |
| | | | | | | | | | | 120 |
| | | | | | | | | | | > |
| | | | | | | CANA | IS TENSÃO SOBRETENS | ÃO SUBTENSÃO | | ▼ 4 Þ |
| re Application Config | uration | | | | | E | (d) 1 of 1 (b) | (H) 4,346 | | |
| Output | _ | | | | | | | | | ~ ₽ ¥ |
| MainApplication N | lame 🗍 | Page No | Descr | iption | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| <u>a</u> , | | | | | | | | | | |
| Logging Applica | tion Conh | iguration | | | | | | | | |
| | | | | | | | | | sexta-teira, 19 de julho de 2013 | 08:54:15 |

Figure 43



Right-click inside the new tab and choose "Insert Hardware Channel", then "Binary Output" and "Insert".

| | Insert Page | Ctrl+Shift+P | |
|----|-------------------------|--------------|---|
| | Insert Variable | | • |
| | Insert FunctionBlock | Ctrl+Shift+F | |
| | Insert Hardware Channel | Ctrl+Shift+H | |
| | Delete page | Ctrl+Shift+D | |
| | Select All | Ctrl+A | |
| 89 | Find | Ctrl+F | |
| | Lock | Ctrl+Shift+L | |



| Select a Hardware Channel | |
|---|--|
| Hardware Channels Binary Input Binary Output Analog Input | |
| | |

The next step is to choose the channel module " BOM_3 " and the binary output "BO1".



| 🕾 Local Server\PTOV_PTUV - PCM600 | |
|--|---|
| File Edit View Tools Format Insert IED Debug Window Help | |
| une v 💽 🔍 🖬 🖞 🔊 🖓 📑 🖬 🖓 👘 🐇 🔊 🗳 🐇 🗳 🖞 | |
| Object Types 🔍 🕂 🗙 Project Explorer 🔍 🗣 🕽 | RET670 - Parameter Setting RET670 - Application Configuration + 4 b × |
| All Plant Structure | 1 2 3 |
| Basic IED functions | |
| Control | |
| Current protection | |
| Differential protection | A |
| Frequency protection | |
| Hardware | • <u>•</u> |
| Impedance protection | |
| Logic LDCMAnalog1_312 | |
| Metering 🖈 LED | Hardware Channel Allocation |
| Monitoring | |
| Multipurpose protection 💲 | Hardware Module BOM_3 |
| Remote communication | Hardware Channel B01 |
| Scheme communication | B |
| Station communication 🗙 | User Defined Name BU1 |
| Supervision | Create unassigned Hardware Channel |
| Voltage protection | OK Cancel |
| Hardware I/D | |
| H → 30 Application Loninguration | |
| | |
| | |
| | CANAIS_TENSÃO SOBRETENSÃO SUBTENSÃO MainApp2 - 4 Þ |
| are Application Configuration | (K) (K) 1 of 1 (K) (K) 310,126 |
| Output | → ‡ X |
| MainApplication Name Page No Description | |
| | |
| | |
| Concine Application Configuration | |
| Car cogging Appreasion Confligutation | autoliano 10 de julio de 100 autoliano |
| | sexterierita, 15 de junto de 2013 03:01:13 ADD |

Figure 46

Insert three more outputs keeping the module "BOM_3" and changing the outputs to "BO2", "BO3" and "BO4".

| Local Server\PTOV_ | РТИУ - РСМ600 | | | | 🛛 |
|-------------------------------|---|----------------------------|------------------------------------|---|-----------------------|
| Eile Edit View Io | iols Eormat I <u>n</u> sert <u>I</u> ED <u>D</u> ebug <u>W</u> indow <u>H</u> elp | | | | |
| 0 🛩 🖬 🍊 🔃 | x 🖻 🛍 🔚 🖬 🗐 🐨 🖄 🗠 🗋 🖬 🖉 🗩 🛯 | | Fixed 🔽 🗐 🖪 🗙 | | |
| Object Types 🛛 🔻 🕂 : | × Project Explorer • 7 × | RET670 - Parameter Setting | RET670 - Application Configuration | | * 4 Þ * |
| All S | Plant Structure | 1 | 2 | 3 | ~ |
| Basic IED functions | | | | | |
| Control 2 | ि ररेंद्र Substation | | | | |
| Current protection | B Bay | | | | |
| Differential protection | E RET670 | A | | | |
| Frequency protection | HeD Configuration | | • 5 | | III |
| Hardware \$ | BOM_3 | | BOM_3.801 | | |
| Impedance protection | BIM_4 | | | | |
| Logic 🖇 | LDCMAnalog1_312 | | • 5 | | |
| Metering 2 | ED LED | | BUM_3.BO2 | | _ |
| Monitoring \$ | G Activate setting group | | | | |
| Multipurpose protection | t%b Time | | • } | | |
| Remote communication | Power system TEDMINALID: 1 | 101 | BDM_3, BD3 | | |
| Scheme communication | PRIMVALD. T | В | | | |
| Station communication | E Communication | | BUM_3.804 | | |
| Supervision 2 | G Analog modules G AlsVRAS 1 | | | | |
| Voltage protection | t ⊕ - % HMI | | | | |
| Hardware I/O | t @ Monitoring | | | | |
| | | | | | |
| | | | | | ~ |
| | | < | | | > |
| | | CANAIS_TENSÃO SOBRETENS | 5ÃO SUBTENSÃO MainApp2 | | → 4 Þ |
| are Application Configuration | n | 1 ef 1 |) (H) 29,397 | | |
| Output | | | | | → 4 × |
| MainApplication Name | Page No Description | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Logging Application Co | nfiguration | | | | |
| | | | | sexta-feira, 19 de julho de 2013 09:17: | 17 ABB |

Figure 47



Create four input variables using the same names as the overvoltage and undervoltage block output variables and assign them to each binary output. Change the name of the tab to "SAÍDAS BINÁRIAS".

| Local Server\PTOV_P | ТUV - РСМ600 | | | | |
|------------------------------|--|------------------------|------------------------------|-----------------|---|
| File Edit View Iool | s Eormat Insert IED Debug Window Help | | | | |
| 0 📽 🖬 🗃 🐼 🕷 | - B 🖪 🔣 🖬 📰 🔍 🖾 🕾 🗅 🖬 🖉 🗩 100% - 🗩 🕅 🕻 | | 💷 🖸 🔽 Fixed 📑 | | |
| Object Types 🔻 👎 🗙 | Project Explorer 🗸 🕈 🗙 | 70 - Parameter Setting | RET670 - Application Configu | uration 🔻 4 Þ 🗙 | Object Properties 🔷 🕈 🗙 |
| Al 🎗 | Plant Structure | | | ~ | 20 41 m |
| Basic IED functions | -E - B PTOV_PTUV | | | | E Misc |
| Control | Substation | A | 4 | _ | Locked False |
| Current protection | B Bay | | TRIP_59-1 50 | 5 | Name SÁIDAS_BINÁRIAS |
| Differential protection | E RET670 | | BC | DM_3.801 | r aportana. pra |
| Frequency protection | E UD Configuration | | | _ | |
| Hardware 🎗 | BOM_3 | | TRIP_59+2 2 | 5 | |
| Impedance protection | BIM_4 | | 50 | JM_3.002 | |
| Logic 🎗 | LDCMAnalog1_312 | | | | |
| Metering 🎗 | LED | | TRIP_27-1 20 | M 3.803 | |
| Monitoring | | | | | |
| Multipurpose protection | ⊛— %b Time | 5 | TRIP_27-2 | 5 | |
| Remote communication | - Power system TERMINALID: 1 | | 1 | 5M_3.804 | |
| Scheme communication | D PBIMVAL: 1 | | | | |
| Station communication | ⊛ — ® Communication | | | | |
| Supervision 🎗 | Analog modules | | | | |
| Voltage protection | € HMI | | | | |
| Hardware I/O | B Monitoring | | | | |
| | | | | | |
| | | c | | - | Nama |
| | | < | | > | Name of work sheet. |
| | | CANAIS_TENSÃO S | OBRETENSÃO SUBTENSÃO | 1ainApp2 ₹ 4 Þ | |
| re Application Configuration | | (H) (H) 1 | of 2 😥 💓 394,4: | 93 | RET670 Application Configuration |
| Output | | | | | → 4 × |
| MainApplication Name | Page No Description | | | | |
| | | | | | |
| | | | | | |
| Logging Application Conf | Iguration | | | | |
| | | | | | sexta-feira, 19 de julho de 2013 09:31:06 ABB 🔬 |

Figure 48

Click on the icon highlighted in green to validate the configuration, then on "OK" and save the configuration.

| Object Types V A X Project Explorer V A X RET670 - Parameter Setting RET670 - Application Configuration | • 4 Þ × |
|--|--------------|
| All Plant Structure | ~ |
| Basic IED functions 🗙 🕒 🔁 PT0V_PTUV | |
| Control Substance and A | |
| Current protection | |
| Differential protection 2 BETE 20 BOH _ BOH _ 3.501 | |
| Frequency protection 🗙 | _ |
| Hardware | |
| Impedance protection 2 BIM 4 BIM 4 BIM 4 | |
| Logic | |
| Metering 2 EED TRIP_27-1 20 EW 3 803 | |
| Monitoring | |
| Multipupose protection | |
| Remote communication 2 Power system Mussage 25 Structure System 25 | |
| Scheme communication A PRIMVAL: 1 (j) Configuration validated successfully | |
| Station communication 💲 🐵 Communication | |
| Supervision A Analog modules | |
| Voltage protection | |
| Hardware 1/0 | |
| B→ Trois Application Lontiguration | |
| c | |
| C | > |
| CANAIS_TENSÃO SOBRETENSÃO SUBTENSÃO SÁDAS_BINÁRIAS | - 4 Þ |
| re Application Configuration (8) (9) 1 of 2 (9) (8) 374,106 | |
| Dutput | → ₽ X |
| MainApplication Name Page No Description | |
| | |
| | |
| a) | |
| Loging Application Configuration | |
| sextarfeira, 13 de julho de 2013 09:34:09 | ABB |

Figure 49



INSTRUMENTOS PARA TESTES ELÉTRICOS 3. Parameterization of the ABB RET670 relay

3.1 RET 670 Parameter Setting

Choose the upper tab "*RET 670 Parameter Setting*" and click on the "+" signs next to "*Application Configuration* > *SOBRETENSÃO* > *Voltage protection* > *OverVoltageStep(PTOV,59)*" and finally "*OV2PTOV:1*".

| C. I. P. D. C. S. | Project Explorer 🛛 👻 🕂 🗙 | RET670 - Parameter Setting | RET670 - Application Confid | uration | | | ↓ 4 |
|---|---|------------------------------------|-----------------------------|-----------------------|------|-------|------------|
| 1 🎗 | Plant Structure | Group / Parameter Name | LED Value [SG1/Common] | PC Value [SG1/Common] | Unit | Min | Мах |
| IEC61850 IED 🕱 | | V OV2PTOV: 1 | | | | | |
| mission IEDs 🕱 | च ररेंर Substation ₩ Voltage Level | 🖗 General | | | | | |
| on IEDs 🗙 | 自一 荐 Bay | ⊮ ConnType | | PhN DFT | | | |
| | RET670 IED Configuration | Setting Group1 | | | | | |
| | EI - R Application Configuration | ✓ Operation | | Off | | | |
| | 😟 🖓 CANAIS_TENSÃO | ⊮ UBase | | 400,00 | kV | 0,05 | 2000,00 |
| | 📕 🧧 🌆 Voltage protection | 🖌 Step 1 | | | | | |
| | OverVoltage2Step(PTOV.59) OverVoltage2Step(PTOV.59) | Setting Group1 | | | | | |
| | B SUBTENSÃO | ✓ OperationStep1 | | On | | | |
| | BAIDAS_BINARIAS | ⊮ Characterist1 | | Definite time | | | |
| | | ⊮ OpMode1 | | 1 out of 3 | | | |
| | | ✓ U1> | | 120 | %UB | 1 | 200 |
| | | v t1 | | 5,00 | s | 0,00 | 6000,0 |
| | | ⊮ tReset1 | | 0,025 | s | 0,000 | 60,000 |
| | | ⊮ t1Min | | 5,000 | s | 0,000 | 60,000 |
| | | ✓ ResetTypeCrv1 | | Instantaneous | | | |
| | | ⊮ tlReset1 | | 0,025 | s | 0,000 | 60,000 |
| | | ⊮ k1 | | 0,05 | | 0,05 | 1,10 |
| | | ✓ ACrv1 | | 1,000 | | 0,005 | 200,000 |
| | | < | | | | | |

Figure 50

Activate the function and make the following adjustments, with "Step 1" being responsible for element 59-1. The RET 670 allows adjustments for both line voltage and phase voltage. Another option is regarding the voltage used, if it is only the fundamental, the "DFT" option is used, if the harmonics are considered, the "RMS" option is used, the latter being adopted in this test. The settings use the nominal phase voltage (66.4V) as a base.



| 1 🥦 🔛 📇 📖 | | E E E E E E E E E E E E E | ameters 🔹 🖘 🛥 🕶 🚺 | + •\ | | | | |
|------------------------|------------------|--|---|-----------------------------|-----------------------------|-------|-------|------------|
| ammen Deed/Write | | | | | | | | - 1 |
| | | | | | | | | |
| | | | | | | | | |
| bject Types 💌 4 🗙 | Project Explorer | • 4 × | RET670 - Parameter Setting | RET670 - Application Config | guration | 1.4.4 | 1.646 | |
| eneral 🎗 | Plant Structure | 1.000 | Liroup / Parameter Name | [ED Value [SG1/Common] | PC Value [SG1/Common] | Unit | Min | Max |
| meric IEC61850 IED | Voltage Level | · | v General | | | | | |
| b-Transmission IED s 🕱 | E BET | 670 | ✓ ConnType | | PhN RMS | | | |
| insmission IED s 🛛 🕱 | e 🛍 | IED Configuration | Setting Group1 | | | | | |
| | 8 | BDM 3 | ✓ Operation | | On | | | |
| | | BIM_4 | ⊮ UBase | | 400,00 | kV | 0,05 | 2000,00 |
| | | TRM_9I_3U_31 | V Step 1 | | | | | |
| | | LED | Setting Group1 | | | | | |
| | 9 | Activate setting group | ✓ OperationStep1 | | On | | | |
| | · | Time | ✓ Characterist1 | | Definite time | | | |
| | Ē | Power system | ✓ OpMode1 | | 1 out of 3 | | | |
| | | D PRIMVAL: 1 | ✓ U1> | | 125 | %UB | 1 | 200 |
| | Œ | - Communication | ν t1 | | 2,00 | s | 0,00 | 6000,00 |
| | 9 | AlSVBAS: 1 | ⊮ tReset1 | | 0,025 | s | 0,000 | 60,000 |
| | | - ⁶ G HMI | ⊮ t1Min | | 5,000 | s | 0,000 | 60,000 |
| | 山 日 | Application Configuration | ✓ ResetTypeCrv1 | | Instantaneous | | | |
| | ۲ | CANAIS_TENSÃO | ⊮ tlReset1 | | 0,025 | s | 0,000 | 60,000 |
| | 8- | SUBRETENSAU | v k1 | | 0.05 | | 0.05 | 1.10 |
| | | Working Protocolori Working OverVoltage2Step(PTOV,59) | < | | | | | > |
| | | | | | | | | |
| itput | | | | | | | | ↓ 1 |
| Date and Time | User Message | | | | | | | |
| 19/7/2013 14:50:24 | Parameter | [OV2PTOV: 1/General/Setting Group1/Operation] va | lue modification has effected to parameter [0 | V2PTOV: 1/Step 2/Setting (| Group1/CrvSat2] properties. | _ | | |
| 19/7/2013 14:50:24 | Parameter | IOV2PTOV: 1/General/Setting Group1/Operation1 va | lue modification has effected to parameter [C | V2PTOV: 1/Step 2/Setting 0 | Group1/HystAbs2] properties | | | |

Figure 51

Then "Step 2" is configured, being equivalent to element 59-2.

| Local Server\PTOV_ | РТОУ - РСМ600 | | | | |
|---------------------------|--|--|---|-----------------|---------------------|
| <u>File Edit View I</u> c | ols IED <u>Wi</u> ndow Help | | | | |
| | 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | All parameters 🔹 🔹 🖽 🎽 | L - 🔼 | | |
| Common Read/Write | | | | | → # × |
| | | | | | |
| Object Types 🔻 🕂 | Project Explorer | # × RET670 - Parameter Setting | RET670 - Application Configuration | | - 4 Þ × |
| General | Plant Structure | Group / Parameter Name | IED Value [SG1/Common] PC Value [SG1/Common] | Unit Mir | n Max 🔼 |
| Generic IEC61850 IED | | 🔺 🖌 k1 | 0,05 | 0,0 | 5 1,10 |
| Sub-Transmission IEDs | □ 郡 Bay | ACrv1 | 1,000 | 0,0 | 05 200,000 |
| Transmission IEDs | E BLOO | ✓ BCrv1 | 1,00 | 0,5 | 0 100,00 |
| | 🖃 — 🏙 HW Configuration | CCrv1 | 0.0 | 0,0 | 1,0 |
| | BIM_3 BIM_4 | ✓ DCrv1 | 0,000 | 0,0 | 00 60,000 |
| | TRM_9L_3U_31 | PCrv1 | 1,000 | 0,0 | 00 3,000 |
| | LDCMAnalog1_312 | CrvSat1 | 0 | % 0 | 100 |
| | □ - ^Q B Activate setting group | ✓ HvstAbs1 | 0.5 | %UB 0.0 | 100.0 |
| | B SETGRPS: 1 | Step 2 | | | |
| | B Power system | Setting Group1 | | | |
| | TERMINALID: 1 BIMVAL: 1 | OperationStep2 | Ωn | | |
| | ⊕ R Communication | Characterist2 | Definite time | | |
| | □ - ¹ Analog modules | Britiade? | 1 out of 2 | | |
| | B → B HMI | | 175 | 9/1P 1 | 200 |
| | i → C Monitoring | 02 | 0.500 | ~00 1 | 200 |
| | | V 12 | 0,500 | s 0,0 | JU 60,000 |
| | 😑 — 🔯 SOBRETENSÃO | ✓ tHeset2 | 0,025 | s 0,0 | JU 60,000 |
| | Voltage protection So DiverVoltage2Step(PTDV 59) | Le t2Min | 5,000 | s 0,0 | 30 60,000 🗠 |
| | | × | | | |
| Output | - 83 CUNTENCÃO | | | | * A > |
| Date and Time | lloar Mercane | | | | |
| 19/7/2013 14:50:24 | Parameter (0V2PT0V: 1/General/Setting Group1/Operati | on) value modification has effected to parameter | [OV2PTOV: 1/Step 2/Setting Group1/CrvSat21 properties. | | |
| 19/7/2013 14:50:24 | Parameter [0V2PT0V: 1/General/Setting Group1/Operation | on] value modification has effected to parameter | [OV2PTOV: 1/Step 2/Setting Group1/HystAbs2] properties. | | |
| | | | | | ~ |
| Logging Application Co | figuration EII RET670 - Parameter Setting | | | | |
| | | | sexta-feira, 19 | de julho de 201 | 3 14:54:54 🕂 👫 💦 |

Figure 52





Figure 53

Click on the "+" sign next to "SUBTENSÃO > Voltage Protection > UnderVoltageStep (PTUV,27) " and finally "UV2PTUV:1"

| rila reda unas r | | out. | | | | | | | |
|----------------------|--------------------|---|---|---------------------------------|----------------------|-------------|-------|---------|-----|
| Elle Edit View I | ools [ED Window | | li | | | | | | |
| | | | All parameters 🔹 🤤 👄 | | | | | | |
| bject Types 🔻 👎 | × Project Explore | | T RET670 - Parameter | Setting RET670 - Application (| Configuration | | | • • | 1 Þ |
| eneral | Plant Structu | re 🔁 | up / Parameter Name | IED Value [SG1/Common] | PC Value [SG1/Com | mon] Unit | Min | Max | |
| eneric IEC61850 IED | A → B → B → PTOV_I | PTUV | IV2PTUV: 1 | | | | | | |
| ub-Transmission IEDs | * | W Voltage Level | General | | | | | | |
| ansmission IEDs | * | B Bay | ConnType | | PhN DFT | | | | |
| | | HE16/0 H | Setting Group1 | | | | | | |
| | | Application Configuration | Operation | | Off | | | | |
| | | CANAIS_TENSÃO SOBRETENSÃO | UBase | | 400,00 | kV | 0,05 | 2000,00 | |
| | | Voltage protection | Step 1 | | | | | | |
| | | OverVoltage2Step(PTOV. | 59) Setting Group1 | | | | | | |
| | | SUBTENSÃO | OperationStep1 | | On | | | | |
| | | Voltage protection | Characterist1 | | Definite time | | | | |
| | | UnderVoltage2StepIPTUV | (27) OpMode1 | | 1 out of 3 | | | | |
| | | SÁIDAS_BINARIAS | U1< | | 70 | %UB | 1 | 100 | |
| | | | et | | 5,00 | s | 0,00 | 6000,00 | |
| | | | tReset1 | | 0,025 | s | 0,000 | 60,000 | |
| | | | t1Min | | 5,000 | s | 0,000 | 60,000 | |
| | | | ResetTypeCrv1 | | Instantaneous | | | | |
| | | | t/Reset1 | | 0,025 | s | 0,000 | 60,000 | |
| | | | k1 | | 0,05 | | 0,05 | 1,10 | |
| | | | ACrv1 | | 1,000 | | 0,005 | 200,000 | |
| | | | < | | | | | | > |
| | | | | | | | | | |
| itput | | | | | | | | | • |
| Date and Time | User | Message | | | | | | | |
| 19/7/2013 10:44:59 | | Parameter (0V2PT0V: 1/General/Setting Group1/Oper | ation] value modification has effected to p | arameter [OV2PTOV: 1/Step 2/Set | ting Group1/CrvSat2] | properties. | | | |
| 19/7/2013 10:44:59 | | Parameter (0V2PT0V: 1/General/Setting Group1/Oper | ation] value modification has effected to p | arameter [DV2PTOV: 1/Step 2/Set | ting Group1/HystAbs2 | properties. | | | |
| | | | | | | | | | _ |

Figure 54



Activate the function and make the following adjustments, with "*Step 1*" being responsible for element 27-1. The RET 670 allows adjustments for both line voltage and phase voltage. In this case, the phase voltage value (66.4V) is used.

| Common Read/Write | | | | | | | | - |
|--------------------------|------------------|---|---|-----------------------------|-----------------------------|------|-------|---------|
| 🔲 🔊 🗙 | | | | | | | | |
| bject Types 🛛 🔻 🕂 🤉 | Project Explorer | → ∓ X | RET670 - Parameter Setting | RET670 - Application Confi | guration | | | • 4 |
| ieneral 🖇 | Plant Structure | | Group / Parameter Name | ED Value [SG1/Common] | PC Value [SG1/Common] | Unit | Min | Max |
| eneric IEC61850 IED | | 😑 – 🍓 HW Configuration 🛛 🔼 | ✓ General | 5 | | | | |
| ub-Transmission IEDs 🛛 🕯 | | BIM 4 | ✓ CannType | | PhN RMS | | | |
| ansmission IEDs 💈 | | TRM_91_3U_31 | Setting Group1 | | | 1 | | |
| | | LDCMAnalog1_312 | ✓ Operation | | On | | | |
| | | Activate setting group | ✓ UBase | | 400,00 | κV | 0,05 | 2000,00 |
| | | D SETGRPS: 1 | Step 1 | | | | | |
| | | Power system | Setting Group1 | | | | | |
| | | TERMINALID: 1 | ✓ OperationStep1 | | On | | | |
| | | PRIMVAL: 1 Communication | Characterist1 | | Definite time | | | |
| | | Q Analog modules | V OpMode1 | | 1 out of 3 | | | |
| | | E AISVBAS: 1 | v U1c | | 75 | %UB | 1 | 100 |
| | | · ⊕ · · · · · · · · · · · · · · · · · · | . н | | 2.00 | | 0.00 | 6000.00 |
| | | Reveal Configuration Reveal Configuration | / IBeset1 | | 0.025 | * | 0.000 | 60.000 |
| | | SOBRETENSÃO | t1Min | | 5,000 | | 0.000 | 60,000 |
| | | Voltage protection | ResetTuneCtv1 | | Instantaneous | | 0,000 | |
| | | © OV2PTOV: 1 | IIReset1 | | 0.025 | | 0.000 | 60.000 |
| | | ■ B SUBTENSÃO | | | 0,025 | \$ | 0,000 | 1.10 |
| | | Voltage protection Solution When the second s | V KI | | 0,05 | | 0,05 | 1,10 |
| | | UV2PTUV: 1 | | | | | | |
| lutput | | | | | | | | - |
| Date and Time | User | Message | | | | | | |
| 19/7/2013 14:58:38 | | Parameter [UV2PTUV: 1/General/Setting Group1/Operation] value | e modification has effected to parameter [U | V2PTUV: 1/Step 2/Setting (| aroup1/tBlkUV2] properties. | - | | - |
| 19/7/2013 14:58:38 | | Parameter /I/V/2PTLIV: 1/General/Setting Group1/Operation1 value | e modification has effected to parameter II I | V2PTLIV: 1/Sten 2/Setting (| aroun1/HustAhs21 properties | | | |

Figure 55

| ommon Read/Write | | | | | | | • |
|--------------------------|---|---|-----------------------------|----------------------------|------|-------|--------------|
| | | | | | | | |
| bject Types 🔻 🕂 🤉 | Project Explorer 🗸 🕂 🗙 | RET670 - Parameter Setting | RET670 - Application Config | uration | | | ↓ ₫ ₽ |
| eneral 🖇 | Plant Structure | Group / Parameter Name | IED Value [SG1/Common] | PC Value [SG1/Common] | Unit | Min | Max |
| eneric IEC61850 IED 💈 | | ✓ ACrv1 | | 1,000 | | 0,005 | 200,000 |
| ub-Transmission IEDs 🛛 🕯 | ि - ररेर Substation | ⊮ BCrv1 | | 1,00 | | 0,50 | 100,00 |
| ansmission IED s 🛛 🕏 | ⊟ 琵 Bay | v CCrv1 | | 0,0 | | 0,0 | 1,0 |
| | E RET670 | ✓ DCrv1 | | 0,000 | | 0,000 | 60,000 |
| | Application Configuration | v∕ PCrv1 | | 1,000 | | 0,000 | 3,000 |
| | | ⊮ CrvSat1 | | 0 | % | 0 | 100 |
| | Subhe renside Subhe renside Subhe renside | ⊮ IntBlkSel1 | | Off | | | |
| | OverVoltage2Step(PTOV,59) OverVoltage2Step(PTOV,59) | ✓ IntBlkStVal1 | | 20 | %UB | 1 | 100 |
| | B SUBTENSÃO | v tBlkUV1 | | 0,000 | s | 0,000 | 60,000 |
| | i → Voltage protection | ✓ HystAbs1 | | 0,5 | %UB | 0,0 | 100,0 |
| | D UV2PTUV: 1 | v Step 2 | | | | | |
| | 🔤 SÁIDAS_BINÁRIAS | Setting Group1 | | | | | |
| | | ✓ OperationStep2 | | On | | | |
| | | ✓ Characterist2 | | Definite time | | | |
| | | ✓ OpMode2 | | 1 out of 3 | | | |
| | | ⊮ U2< | | 25 | %UB | 1 | 100 |
| | | v 12 | | 0,500 | s | 0,000 | 60,000 |
| | | < | 100 | | | | > |
| | | | | | | | |
| utput | | | | | | | ~ 1 |
| Date and Time | User Message | | | | | | |
| 19/7/2013 14:58:38 | Parameter [UV2PTUV: 1/General/Setting Group1/Operation] value | e modification has effected to parameter (l | JV2PTUV: 1/Step 2/Setting G | roup1/tBlkUV2] properties. | | | |

Then configure "Step 2" being equivalent to element 27-2.

Figure 56



Click the highlighted icon to save the settings.

| i 📽 🔒 🎒 🕷 🕷 🕷 | d 🛍 🗠 🐹 🗗 🗖 | 🖬 🕅 🧯 💼 🖻 🚄 🗗 🖶 All para | neters 🔄 🔹 🔂 🛥 🗄 🚺 | • 📐 | | | |
|------------------------|------------------|---|---|---|---------|-------|--------------|
| mmon Read/Write | | | | | | | • 4 |
| 🗏 🔊 📉 | | | | | | | |
| ject Types 🛛 🔻 🖡 🗡 | Project Explorer | → ‡ X | RET670 - Parameter Setting | RET670 - Application Configuration | | | → 4 Þ |
| neral 🗙 | Plant Structure | | Group / Parameter Name | IED Value [SG1/Common] PC Value [SG1/Common | i] Unit | Min | Max |
| neric IEC61850 IED 🔹 | | 😑 👘 HW Configuration 🔼 | √ U2< | 25 | %UB | 1 | 100 |
| -Transmission IEDs 🛛 🗙 | | | v 12 | 0,500 | s | 0,000 | 60,000 |
| nsmission IED s 🗙 | | | ✓ tReset2 | 0.025 | \$ | 0,000 | 60,000 |
| | | LDCMAnalog1_312 | ⊬ t2Min | 5,000 | s | 0,000 | 60,000 |
| | | E Activate setting group | ✓ ResetTypeCrv2 | Instantaneous | | | |
| | | SETGRPS: 1 Butime | ⊮ tlReset2 | 0.025 | s | 0,000 | 60,000 |
| | | Power system | v k2 | 0,05 | | 0,05 | 1,10 |
| | | C TERMINALID: 1 | v ACrv2 | 1,000 | | 0,005 | 200,000 |
| | | Communication | ✓ BCrv2 | 1,00 | | 0,50 | 100,00 |
| | | Analog modules | v CCrv2 | 0,0 | | 0,0 | 1,0 |
| | | E | v DCrv2 | 0,000 | | 0,000 | 60,000 |
| | | iQ Monitoring | v PCrv2 | 1,000 | | 0,000 | 3,000 |
| | | GADAIS TENSÃO | ✓ CrvSat2 | 0 | % | 0 | 100 |
| | | 🖮 🔂 SOBRETENSÃO | ✓ IntBlkSel2 | Off | | | |
| | | Woltage protection Woltage/Step(PTOV 59) | v IntBlkStVal2 | 20 | %UB | 1 | 100 |
| | | 0 0V2PTOV: 1 | v tBlkUV2 | 0.000 | s | 0.000 | 60.000 |
| | | SUBTENSÃO Subtensão Subtensão | ✓ Hust∆hs2 | 05 | *UB | 0.0 | 100.0 |
| | | G UnderVoltage2Step(PTUV,27) | < | | | -,- | |
| | | | | | | | |
| tput | | | | | | | 🔺 ģ |
| Date and Time | User | Message | | | | | |
| 19/7/2013 14:58:38 | | Parameter [UV2PTUV: 1/General/Setting Group1/Operation] value | e modification has effected to parameter [I | JV2PTUV: 1/Step 2/Setting Group1/tBlkUV2] propertie | s. | | |
| 19/7/2013 14:58:38 | | Parameter (UV2PTUV: 1/General/Setting Group1/Operation) value | e modification has effected to parameter [l | JV2PTUV: 1/Step 2/Setting Group1/HystAbs2] properti | es. | | |

Figure 57

Right-click on the relay icon and submit the changes. In the following message click on "Yes".

| Local Server\PTOV_P | TUV - PCM600 | | | | | | | |
|----------------------------|--|---------|---------------------------|---|----------------------------|------------------------------|------------------|--------------|
| File Edit View Tool | s IED <u>Wi</u> ndow <u>H</u> elp | | | | | | | |
| | | | 🖹 🖂 🖨 🕞 All paramet | ers 🔹 🗣 🖬 | - 1 | | | |
| Object Types 🔻 🖣 🗙 | Project Explorer | | ▼ ₽ X | RET670 - Parameter Setting | RET670 - Application Confi | nuration | | - 4 Þ × |
| General \$ | Dapt Structure | | | Jun / Parameter Name | IED Value [SG1/Common] | PC Value (SG1/Common) Unit | Min | Max |
| Generic IECE1950 IED | | - | Collapse | 8ET670 | | | | |
| Sub Transmission IEDa | | 1885 | Signal Monitoring | | | | | |
| Tumministic IEDa | - KV Voltage Level | | Disturbance Handling | | | | | |
| | Errer 15 Bau | T | Event Viewer | | | | | |
| | E IED Config | JL EI | Parameter Setting | - | | | | |
| | E So Application | 1 | Application Configuration | | | | | |
| | B SOB | R | Signal Matrix | | | | | |
| | B | 1 | Graphical Display Editor | | | | | |
| | 8 | | Hardware Configuration | | | | | |
| | 🖃 🔛 SUB | T | Migrate Configuration | | | | | |
| | | | IED Licerc | | | | | |
| | | 25 | | - | | | | |
| | SÁID | 14 IL | IED Compare | | | | | |
| | - | - 1 - 1 | IEC 61850 Configuration | | | | | |
| | | 1 | Communication Management | | | | | |
| | | F | License Update Tool | | | | | |
| | | | Create Template | | | | | |
| | | | Import | | | | | |
| | | | Export | | | | | |
| | | | Read from IED | | | | | |
| | | | Write to IED | | | | | 44 C |
| | | | Report Parameters | | | | | > |
| | | | Configuration Language | | | | | |
| Output | | | Communication Port | | | | | → ₽ X |
| Date and Time | User Message | Ж | Cuţ | | | | | ^ |
| 19/7/2013 12:05:27 | Parameter [UV2PTUV: | 1 | ⊆ору | dification has effected to parameter [L | JV2PTUV: 1/Step 2/Setting | Group1/tBlkUV2] properties. | | |
| 19/7/2013 12:05:27 | Parameter [UV2PTUV: | 1 | Delete | dification has effected to parameter [L | JV2PTUV: 1/Step 2/Setting | Group1/HystAbs2] properties. | | - |
| (3) | | | Rename | | | | | ~ |
| Logging Application Conf | iguration Ell RET670 - Parameter Setting | - | Proportion | | | | | |
| | | | riupeides | | | sexta-feira, 19 de julho | de 2013 14:33:06 | ABB |
| | | | Fig | ure 58 | | | | |





4. Quick software adjustments

4.1 Opening the Quick

Click on the "CTC" application manager icon.



Click on the "Quick" software icon.





| Arquivo Home Display Software Options 🔨 🖓 🖓 Software Options |
|--|
| 🕞 🖶 Hrd Set. 🗇 GOOSE Set. 🔗 🔤 🖾 🕼 On Editing 🔹 🔪 🔤 💭 👫 Waveform U., Harmonics 🕼 Set ispo Offset. 🚔 🔯 🗛 🏠 💭 |
| Image: Spine Set. Spine |
| Pre-fault Fault Phases Protection V × |
| Pault General Text: Speak Access of Speak Access of Section Control Co |
| V N001 Descr; Date: rel Data |
| Analog. DC Output |
| Bnary Outputs I ested device: |
| Coose Outputs |
| Time and Advancement Iype: V Manufacturer: V |
| Location: |
| Substation: |
| Bay: |
| Address: V |
| City: State: V |
| Resonable to DC/AC |
| Name |
| a RMS DC Value |
| |
| Tool Test: |
| CE-6710 Series Num: 030101870CM3222211U5HVRGLGLGL220RX0 al RMS DC Value |
| |
| |
| EmorList Protection Status |
| 42 ON Line New Default Preferences OK Cancel |

Figure 62

4.2 Configuring the Settings

When opening the software the "Settings" screen will open automatically (provided that the option "Open Settings when Start" found in the "Software Options" menu is selected). Otherwise click directly on the "Settings" icon.

|) Start | Stop | Image: Settings Image: Set |
|------------|-------|--|
| Gener | ation | Options |
| | | Figure 63 |

Inside the "Settings" screen, fill in the "General Inform." with data from the "Tested device", "Installation location" and the "Responsible". This makes reporting easier, as this tab will be the first to be shown.



| | | _ |
|---------|---|---|
| General | General Inform. System Notes & Obs. Explanatory Figures Check List Others Connections | |
| | Test: | |
| | Descr: Under and Overvoltage Date: | |
| | Tested device: | |
| | Identif: 23031982 V Model RET 670 V | - |
| | Type: Transformer Protection V Manufacturer: ABB V | - |
| | Location: | |
| | Substation: Conprove | 2 |
| | Bay: 1 v | |
| | Address: Visconde de Ouro Preto 75, Custódio Pereira 🗸 🗸 | ~ |
| | City: Uberlândia V State: MG V | - |
| | Responsible: | |
| | Name: Michel Rockembach de Carvalho ~ | - |
| | Sector: Engineering V Registry: 00001 V | - |
| | Tool Test: | |
| | CE-6710 Series Num.: 03010187CCM33222211U5HVRGLGLGL2Z0RXO | |
| | | |
| | | |
| | | _ |

Figure 64

4.3 System

In the following screen, within the "*Nominal*" sub tab, the values of frequency, phase sequence, primary and secondary voltages, primary and secondary currents, transformation ratios of VTs and CTs are configured. There are also two sub tabs "*Impedance*" and "*Source*" whose data is not relevant for this test.

| Settings | | | | | × |
|-----------|--|--|---|---|--|
| General | General Inform. System | Notes & Obs. | Explanatory Figures | Check List Others | Connections |
| | Nominal Impedance Frequency: Phase Seq.: 3φ power: 1φ: Primary Voltage (FF): (FN): Primary Current: Secondary Voltage (FF): (FN): Secondary Current: | Source 60 Hz ABC 47.80 MVA 15.93 MVA 13.80 KV 7.97 KV 2.00 kA 115.0 V 66.40 V 5.00 A | | CForward € | |
| | VTR F: CTR F: | 120.0 | Phase F N | Neutral N Ground | E Displ. D |
| v | VTR D / VTR F: CTR E / CTR F: Invert Polarity: VT's F VT's F | 1,00 1,00 CT's F CT E | Voltage FN 1 Va 2 Vb 3 Vc D 4 VD VD | Events F 5 Ia F 6 Ib 7 Ic E 8 IE EP 9 IEP | k to V0: 1.00 k to V2: 1.00 k to 10: 1.00 k to 12: 1.00 |
| Default 🗸 | | | | Preferences | <u>O</u> K <u>C</u> ancel |

Figure 65



There are other tabs where the user can enter notes and observations, explanatory figures, can create a "*check list*" of the procedures for carrying out the test and even create a schematic with all the schematic of the connections between the test set and the test equipment.

5. Channel Direction and Hardware Configurations

Click on the icon illustrated below.





Then click on the highlighted icon to configure the hardware.

Figure 67



Choose the channel configuration; adjust the auxiliary source and the method of stopping the binary inputs. To finish click on "OK".

| Settings | × |
|--|--|
| Master Slave 1 Slave 2 | Main Sampled Value Others |
| Model CE-6710 Serial Number 03010187CCM33222211U5HVRGLGLGL2ZORXO Analog Outputs: Standard - Voltages: 4 x 300 V: 100 VA 2 x 600 V: 180 VA 2 x 300 V: 150 VA 1 x 600 V: 350 VA 1 x 300 V: 250 VA | Binary Outputs: Initial State Initial State - 250 V B01: NO BO3: NC - B02: NO BO4: NC - B05 and BO6 type: - 60 V - Conventional BO5: NO - 48 V B06: NO - 24 V - O Transistor TTL 110.00 V - |
| Customized Assoc. Standard - Currents: • 6 x 32 A; 210 VA • 3 x 64 A; 400 VA • 2 x 96 A; 550 VA • 2 x 10,00 A; 300 VA • 1 x 192 A; 1100 VA • 1 x 6,00 A; 360 VA Bectromechanical: • 1 x 75 A; 700 VA • 1 x 50 A; 700 VA | Binary / Analog Inputs: BI1: BI - Contact BI2: BI - Contact BI3: BI - Contact BI4: BI - Contact BI5: BI - Contact BI6: BI - Contact BI7: BI - Contact BI8: BI - Contact BI9: BI - Contact BI10: BI - Contact BI10: BI - Contact BI10: BI - Contact BI11: BI - Contact BI1: BI - Contact BI- Contact V BI1: BI - Contact BI1: |
| Customized Assoc. Connect CTs Range 1,25 A | <u>QK</u> |



On the next screen choose "Basic" and on the next window (not shown) choose "YES", finally click on "Confirm".

| Cha | nnels Direct. | | | | | | | × |
|-------|-----------------|------------------|-------------|-------------|-------------------------|--------|---------|---|
| Local | Model | Reset for Hard. | hard | O Basic | | [| Confirm | |
| - 10 | CE-6710 \sim | Connected | Set | Advanced | 6 GOOSE | | Cancel | |
| ote | Serial Number: | | | | so 00002 | | Ganoor | |
| Sem | 03010187CCM3322 | 22211U5HVRGLGLGL | .2Z0RX0 ~ | . 🔽 ON Line | ^s o S. Value | Import | Export | |
| 1 | | | | | | | Dipolt | |
| Rer | 03010187CCM3322 | 22211U5HVRGLGLGL | _2Z0RXO ~ [| . 🕑 ON Line | S. Value | Import | Export | |





6. Test structure for function 27/59

6.1 Voltage x Time > Undervoltage screen

First, click on the tab "*Protection* > *Voltage x time* > *Undervoltage*" so that the data set in the relay are configured in the software. Then, next to the voltage "V", choose a channel as a reference, in this case " AO_V01 ". Only after choosing the node are the fields for setting function 27 active.



Figure 70

6.2 General Settings 27

According to the relay software settings, these values are entered in the "Quick" software. The 27-1 element pick-up is equal to 49.80V (0.75* $V_{nominal}$ /1.73) with actuation time equal to 2.0s and pick-up of element 27-2 equal to 16.60V (0.25 * $V_{nominal}$ /1.73) with actuation time equal to 500.0ms.

There are also fields where the absolute and relative tolerances for both voltage and time must be entered. These values are taken from Appendix A.2. There is also a field where the type of simulation is required, being possible single-phase-ground, two-phase and three-phase.





Figure 71

6.3 Timed Element 27-1 Pick-up Test

For the pick-up test, a ramp is used to decrease the voltage value. To do this, choose the "*Ramp*" option on the "*Fault* > N01" tabs and click on the highlighted icon.

| I | | – o x ^ (2) |
|--|------------------------------------|--|
| Image: Hrd Set. Image: Goose Set Direc Sync. Set. Channels Connection Test Test Delete All | start Stop | Waveform La Harmonics E Set Ispc Offset |
| Hardware Results | Generation | Options Report Units Layout |
| Pre-fault | onitoring + X | Inputs Bin, GUOSE and Analog Y Waveform Y Accumulations Y Phasors Y Harmonics Y Protection |
| Fault | ngle Ref.: Auto | Current x time Voltage x time Differential Ham. Restr. Directional Frequency |
| Channels/ Definition Ramp ∨ N | 1001 | Overvoltage Undervoltage |
| Point Channel Definitions | | An V: AO_V01 V Edit Curve Graph with respect to Pkp Temp. Chart V |
| Va AO_V01 Modules | | |
| Vb AO_V02 tincr 1,00 s | | 2,00 |
| Vc A0_V03 | | |
| 10 AO_102 | | |
| Ic AO_103 | | 1.00 |
| 5 UD01 A0_V04 | ners 🗸 🗸 | |
| 2 UD02 AO_104 Chron | nometer 1: | |
| UD03 A0_05 Stop | Interf. On Wait | v M |
| Disa | able 🗸 0 s | 20,00 30,00 40,00 50,00 |
| Chron | nometer 2: | Canture Time bu: O Chron 01 O Chron 02 Simulation: ABC |
| Stop | Interf. | |
| Disa | able 🗸 | Trad Care |
| | | V % Tol.: 0.50 % |
| ✓ Analog. DC Output | uation Lock Wait betw. Timers: 0 s | Pkp Expected Drp Expected t Expected V Absol. Tol.: 330,00 mV |
| Binary Outputs Fix 1 | Max. Generation Time: | |
| V GOOSE Outputs | mm:ss] (Approximate) | Inst. 1: 49,80 V P a P a 2,00 s t % Tol.: 0,50 % |
| Time and Advancement Man. In | ncrease Ampl. Angle Clean | Inst. 2: 16,60 V P & P & 0,50 s t Absol. Tol.: 35,00 ms |
| | × ¥5,00 | |
| Error List Protection Status | | |
| ★ ON Line New | Aux. Source 250,00 V | V Heating: U% |

Figure 72



For the first channel, set the value of 50.80V, then right-click and choose the following options to configure the voltages as balanced three-phase with positive rotation.

| P | | | | | | | | | | | | | | | <u> </u> |
|---------------------------|-------------|---------|----------|------------|----------|----------|------------|----------|-----------|----------|---------------|---------------|---------------|----------|---|
| катр | | | | | | | | | | | | | | | , |
| Ramp T | ype | | | 🗿 Din | ect | | | | - 1 | 🕗 R | eset Timers t | b Each incre | menting | | Generation Approx. Time of Each Incr.: 1 s |
| Module | s | | , | | sed | | | | - 1 | - K | eep Harmoni | c During Incr | ementing | | |
| | | | | | | | | | | | | | | | |
| Initial Va | lues | | | | | Lin | nits and I | ncreases | | | | | | | Reset |
| Chann | els/ Defini | ition | | | | | | Limit | Inc | ar. | d/dt | N Steps | Time | _ | |
| Point | Channel | Mod. | An | g. Fre | q. | | Va | | | | | | | _ | |
| Va | AO_V01 | 50,80 V | ^ | <u></u> | 0.11- | | Vb | | | - | | | | - | |
| Vb | AO_V02 | 0 V | | Clear All | | | | | | | | | | - 1 | |
| Vc AO_V03 0 V Voltages | | | | | | | + | | Clear M | odules | | | | | |
| la AO_I01 0.A Currents | | | | | | | • | | Clear Ar | gles | | | | | |
| Ib AO_I02 0 A Frequencies | | | | | | | + | | Clear Fre | quencies | | | | | |
| Ic AO_103 0 A | | | | | | | | - | | | | | | | |
| UD01 | AO_V04 | 0 V | Ľ | Delault At | | nat. | | | | ř | Free | 5 11 | | | _ |
| UD02 | AO_V05 | 0 V | | Reduced A | | rmat. | | | | | Ihree-P | n. Eq Non | ninal Rotatio | n | |
| UD03 | AO_V06 | 0 V | | Format. By | y Dec. P | laces IN | lumber | | | _ | Three-P | n. Eq Reve | erse Rotation | | |
| UD04 | AO_104 | 0 A | | Data Asso | ciation | | | | | | Equals | | | | |
| UD05 | AO_105 | 0 A | 0 | 60,0 | 0 Hz | | - | - | _ | ~ | Calculat | e Voltages B | etween Phas | ses | |
| UD06 | AO_106 | 0 A | 0 ° | 60,0 | 0 Hz | | | | | ~ | Calculat | e Displacem | nent | | |
| | | | | | | | | | | _ | - | | | | TT-1 |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Binary O | utputs | | | | | GC | DOSE OL | tputs | | | | | Attent | ion: Th | The Reset Chron settings. Each the Incr., Direct or Pulsed and Incr times, and Reset will be the same for all nodes. |
| Ch | annel | Incr. | | | | | Chan | nel | Incr. | | | | | | |
| BO | 01 | | | | | | | | | | | | | | I T IT |
| BO | 02 | | | | | | | | | | | | | | Incr. 1 |
| BO | BO03 | | | | | | | | | | | | | Limit | |
| BO | 04 | | | | | | | | | | | | Initia | al value | lue |
| BO | 05 | | | | | | | | | | | | | | |
| BO | 06 | | | | | | | | | | | | | | Generation |
| BO | 07 | | | | | | | | | | | | | | Incr. |
| BO | 08 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | OK Cancel |
| | | | | | | | | | | _ | | | | | |

Figure 73

Select the "Va" channel and set the following limit and decrement values. Change generation time for each increment to 3,0s.





Figure 74

NOTE: An important detail is that pre-fault voltage must be entered so that function 27 dropout occurs, because before injecting voltage, the function is already operated. Therefore, use the "*Pre-fault*" tab with rated voltage and time equal to 1.0s.



| ٩ | 🗅 💕 🛃 | , ∣Qui | ick 2.02.19 | 0 (64 Bits) |) - CE-6710 (0 | 301018) | | | | | | | | | | | | | | | | | - 1 |)) | < |
|---------|---|--|---|--|---|------------|--|---|---|----------------|-------------------------|--|-------------------------------------|--------------------------------------|--------------------------|----------------------|-----------------|----------------------------------|--|-------------------|--------------|--|--|-------------------------------------|---|
| An | quivo Hom | ie Di | splay | Software | Options | | | | | | | | | | | | | | | | | | | ^ | ? |
| L Ch | Direc annels | rd Set. nc. Set. onnection Hardware | ବ୍ରେ GOO ⁼୍ SV Se | SE Set | Add Reed Test Test | t Marine D | On Editing elete Test elete All ults | • | itart Stop | 5ettings | ₩ Wav Accu → Phas | eform 🛄 mulation 付 ors Or | Harm Evalu | ionics <u>I</u> iations <u>IV</u> | Set Ispc O Set Vspc C | ffset Offset R | resent eport | > ~ II IES Is rel Units | Recreate Charts | Restore Layout | View | | | | |
| | Pre-fault | ault | | | | - X | Monito | ring | ocheration | - | x | Inputs Bin. | . GOO | SE and Ana | alog V | Waveform | Accur | nulation | ns Phas | ors / Ha | rmonics | Protecti | on | - | × |
| 4 | Pre-fault | | | | 1.00 s | | Angle | Ref.: Auto | | ~ | Гŕ | Current x time | Vo | ltage x tim | e Differe | ential H | larm. Restr. | Dire | ctional | Frequency | | | | | _ |
| | | | | | | | NO01 | 1.010 | | | | Overvoltage | Un | dervoltage | | | | | | | | | | | |
| N001 | Channels/ Point Ch Va AO, Vb AO, Vc AO, Ia AO, Ib AO, Ic AO, UD01 AO, UD02 AO, UD03 AO, | Definition annel _V01 _V02 _V03 _U01 _U02 _U03 _U03 _V04 _U04 _U05 _U05 _U06 | Dir 66,40 V 66,40 V 66,40 V 66,40 V 0 A 0 A 0 A 0 A 0 A 0 A 0 A 0 A 0 A 0 A 0 A 0 A 0 A | Ang. 0° -120,0° 0° | Freq. 60,00 Hz 60,00 Hz | | NO01 Timers Chronome Stop Inte Disable | Ler 1: f. | 0n | v ₩ait s | × | An ~ 2,00 t 1,00 - | V: A | 0_V01 | 0 | Edit Cun | re | | 40 | Braph with | respect to I | ² kp Temp. | Chart | v M | |
| | Analog. DC (Binary Outpu GOOSE Outp Time and Ad Error List ON Line | Output uts puts dvancemen Protectic | nt on Status New | | | | Chronome Stop Inte Disable Actuation Fix Max. [th:mm:s Man. Increa NO01 | ter 2: f. Lock \ Generation Tim s] (Approximat se Ampl. V | Vait betw. Tir e: :: : : : : : : : : : : : : : : : : : | mers: 0 s | 00 V | Dial Tim Timed Curv Time Inst. Inst. | re: re: rd: 1: _4 2: _1 | p Expected 9.80 V 6.60 V | C P d P d P d | apture Time | pected | Chron. 01 | Chro Clea P d t Expect 2.00 s 0.50 s | n. 02 r ed | | Simu V ? V Absol t ? t Absol | ation: AB , Tol.: 0.5 , Tol.: 330 ; Tol.: 0.5 , Tol.: 35 | C ~ 0 % 0 0 % 0 % 00 ms | |
| | | | | | | | | | | 1 | C : | | - | | | | | | | | | | | | |

Figure 75

Choose the stop interface, which in this case is "BI03" and block the first actuation. Start the generation by clicking on the icon below or through the shortcut "Alt + G".

| | | | | | | | | | | | | × | | | | | | |
|-----|--|---|---------------------------------------|----------|------------------------|-------|---|----------------|-----------------|--|---------------------------------|---------------------------------|--|----------------------------------|-----------------------|--------------|-----------|----|
| Ch | Direc | Hrd Set. Sync. Set. Connectior Hardwar | ୍ଟ୍ରେ GOC ବ _ତ SV S 1 | DSE Set | Add Reedi Test Test | , 🔝 🛛 | Dn Editing • elete Test elete All ults | Start Stop | Settings | Waveform L. H Accumulation III En Phasors Optic | armonics 1 Si aluations 1 Si | et Ispc Offsei et Vspc Offse | t et Present Report Beoort Un | Necreate Restor Charts Layout | re View tt T | | | |
| | Pre-fault | Fault | - | | | • × | Monitoring | | • X | Inputs Bin., G | OOSE and Analo | og Wa | /eform Accumu | lations Phasors | Harmonics / Pro | tection | | ₹× |
| É | Pre- | ault | | | 1,00 s | | Angle Ref.: Au | to | ~ | Current x time | Voltage x time | Differential | Harm. Restr. | Directional Freque | ncy | | | |
| | 9 | | D | | | | × N001 | | | Overvoltage | Jndervoltage | | | | | | | |
| | Detiet | Channel | on U | Ann. | Free | | | | | An V | 40 V01 | | dit Curve | Granh v | with respect to Pkp T | emp Chad | | |
| | Va | AO V01 | 66.40 V | Ang. | 60.00 Hz | | | | | | 10_001 | | | | | enge. Griat | | |
| | Vb | AO_V02 | 66,40 V | -120,0 ° | 60,00 Hz | | | | | 2 00 t [s] | | | | | | | | |
| | Vc | AO_V03 | 66,40 V | 120,0 ° | 60,00 Hz | | | | | 2,00 | | | | | | | | |
| | la | AO_I01 | 0 A 0 | 0 * | 60,00 Hz | | | | | | | | | | | | | |
| | lb | AO_102 | 0 A | 0° | 60,00 Hz | | | | | | | | | | | | | |
| | lc | AO_103 | 0 A | 0 * | 60.00 Hz | | | | | 1,00 | | | | | | | | |
| Į Į | UD01 | AO_V04 | 00 | 0. | 60,00 Hz | | Timers | | - × | | | | | | | | | |
| 12 | 0002 | AO_104 | 0.0 | 0* | 60,00 Hz | | Chronometer 1: | | | | | | | | | | | |
| | UD04 | AO 106 | 0A | 0. | 60.00 Hz | | Stop Interf. | On V | Vait | 0 | | | | | | | VI | v] |
| | | | | - | | | B103 | 0s | | | 20,00 | | 30,00 | 40.00 | 50 | .00 | | |
| | | | | | | | Chronometer 2: | | | | | Cantu | re Time by: 🗿 Chu | on 01 () Chron 02 | | Simulation: | ABC V | |
| | | | | | | | Stop Interf. | | | Diel Trees | | Copile | • • • • • • • • • • | | | | | |
| | | | | | | | Disable | × | | Dial Time. | | | | Clear | | | | |
| | | | | | | | | | | Timed Curve: | | | | <i>P</i> | | V % Tol.: | 0,50 % | |
| ~ | Analog. | DC Output | | | | | Actuation Lock | Wait betw. Tim | ers: 0 s | | Pkp Expected | | Drp Expected | t Expected | V | Absol. Tol.: | 330,00 mV | 1 |
| ~ | Binary C | Outputs | | | | | Fix Max. Generation | Time: : | : | limed: | | | | 0 | | | | _ |
| ~ | GOOSE | Outputs | | | | | [hh:mm:ss] (Approx | imate) | | Inst. 1: | 49,80 V | - 4 | | a 2.00 s | | t % Iol.: | 0,50 % | - |
| ~ | Time and Advancement Man. Increase) Angl. Angle Clean Inst. 2: 15.60 V P a P a 0.50 s t Absol. Tol.: 35,00 ms | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| 4 | ON Lir | ie | New | | | | | Aux | . Source 250,00 | V Heating: | 0% | | | | | | | |
| | Figure 76 | | | | | | | | | | | | | | | | | |

To view the values being generated, click on "N01" within the "Monitoring" tab. After the actuation, click on the highlighted icon to capture the tested point.



| ا & | 🗋 💕 🛃 🚽 Quick 2.02.190 (64 Bits) |) - CE-6710 (0301018) | | | | - 0 × |
|----------|---|--|--|--|---|--|
| Arc | uivo Home Display Software | Options | | | | ~ 😮 |
| E Chi | Image: Section of the section of t | Add Reedit Test Test Besults | Start Stop | veform <u>ILL</u> Harmonics <u>I</u> Set Isp cumulation II Evaluations <u>I</u> Set Vs asors Options | pc Offset | View |
| / | Pre-fault Fault | - X Monitoring | • X | / Inputs Bin., GOOSE and Analog | Waveform Accumulations Phasors H | armonics Protection = x |
| Ĺ | Fault | Angle Ref.: Aut | | Current x time Voltage x time Di | fferential Harm. Restr. Directional Frequenc | y |
| ^ | Channels / Definition Bamp | Channels/De | finition | Overvoltage Undervoltage | | |
| 100N | Point Channel Definitions Va AO_V01 Modules Vb AO_V02 tinor 3.00 s Vc AO_V01 Ib Ia AO_0101 Ib Ib AO_0102 Ic Ic AO_0203 ID UD01 AO_0404 ID002 UD02 AO_065 ID | | el Mod. Ang. 1 49,80 ∨ 0 * 2 49,80 ∨ 240,0 * 3 49,80 ∨ 120,0 * 2 3 49,80 ∨ 120,0 * 2 3 3 3 2 3 2 3 <t< td=""><td>An V: A0_V01 V 2.00 tel 1.00 0 20.00</td><td>Edit Curve Graph with</td><td>v M 50.00</td></t<> | An V: A0_V01 V 2.00 tel 1.00 0 20.00 | Edit Curve Graph with | v M 50.00 |
| > > > > | Analog. DC Output Binary Outputs GOOSE Outputs Time and Advancement Error List Protection Status | Cronometer 2: Stop Interf. Deable Actuation Look Fix Max. Generation [bh.mm.st] (Approxi Man. Increase Amp NO01 | Vait betw. Timers: 0 s Time: : : : : : : : : : : : : : : : : : : | Dial Time: Timed Curve: Pkp Expected Timed: Inst. 1: 49,80 V 2 4 Inst. 2: 16,60 V 2 4 | Capture Time by: Coron. 01 Ceer Cer Ce | Simulation: ABC ✓ V % Tol: 0.50 % ✓ V Absol. Tol: 330.00 mV ✓ t % Tol: 0.50 % ✓ t Absol. Tol: 35.00 ms ✓ |
| 47 | ON Line New | | Aux. Source 250,00 V | Heating: 0% | | |
| | | | Fig | ure 77 | | |

Figure 77

In this case, the pickup found was 49.80V, being exactly the value set in the relay.

6.4 Timed Element 27-2 Pick-up Test

Click on the "Fault" tab and the "..." icon and enter an initial value of 17.60V, limit value of 15.60V, with a decrement of -100.0mV and a time of 1.0s.

| namp i | уре | | | Direct | | | | 🔽 Rese | t Timers to E | ach increme | enting | Generation Approx. Time of Each Incr.: 1 s |
|--|---|---------|----------|----------|-------------------------|----------------|-----------------|-----------|---------------|--------------|-----------|--|
| Module | s | | ~ (| Pulsed | | | | 🕗 Кеер | Harmonic D | uring Increm | nenting | |
| nitial Va | lues | | | | Lim | its and li | ncreases | | | | | Reset |
| Chann | els/ Defini | tion | | | | | Limit | Incr. | d/dt | N Steps | Time | |
| Point | Channel | Mod | Ana | Free | V | Va | 15,60 V | -100,0 mV | -100,0 mV/s | 21,00 | 21,00 s | |
| Va | | 17.60 V | Allg. | 60.00 Hz | $\overline{\mathbf{v}}$ | Vb | 15,60 V | -100,0 mV | -100,0 mV/s | 21,00 | 21,00 s | |
| Va | AO_V02 | 17.60 V | -120.0 * | 60.00 Hz | $\overline{\mathbf{v}}$ | Vc | 15,60 V | -100,0 mV | -100,0 mV/s | 21,00 | 21,00 s | |
| Vo | AO_V02 | 17.60 V | 120,0 * | 60.00 Hz | | la | | | | | | |
| - | AO_003 | 0.0 | 0.0 | 60.00 Hz | | lb | | | | | | |
| а Ь | AO_102 | 0.0 | 0.0 | 60.00 H- | | lc | | | | | | |
| - | AO_102 | 0.4 | 0 | 00,00 Hz | | UD01 | | | | | | |
| 0 | AO_103 | 0 M | 0 | 00,00 Hz | | UD02 | | | | | | |
| 1000 | AO_V04 | 0.0 | 0 | 00,00 Hz | | UD03 | | | | | | |
| 1002 | AO_104 | 0 A | 0 | 60,00 Hz | | UD04 | | | | | | |
| 1003 | AU_IUS | UA | 0 | 60,00 Hz | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | . | |
| linary C | utputs | | | | G0 | OSE Ou | tputs | | | | Attention | n: The Reset Chron settings. Each the Incr., Direct or Pulse Incr times. and Reset will be the same for all n |
| inary C Ch | utputs annel | Incr. | | | G0 | OSE Ou Chan | tputs nel Ir | ncr. | | | Attention | n: The Reset Chron settings. Each the Incr., Direct or Pulse Incr times, and Reset will be the same for all no |
| inary C Ch BO | utputs annel D1 | Incr. | | | GO | OSE Ou Chan | tputs nel Ir | ner. | | | Attention | n: The Reset Chron settings. Each the Incr., Direct or Pulsee Incr times. and Reset will be the same for all no |
| Sinary C Ch BO BO | utputs annel D1 D2 | Incr. | | | G0 | OSE Ou Chan | tputs nel Ir | ncr. | | | Attentior | n: The Reset Chron settings. Each the Incr., Direct or Pulsee Incr times, and Reset will be the same for all nc |
| inary C Ch BO BO BO | utputs annel 01 02 03 04 | Incr. | | | GO | OSE Ou Chan | tputs rel Ir | ncr. | | | Attention | n: The Reset Chron settings. Each the Incr., Direct or Pulsee Incr times. and Reset will be the same for all no |
| Iinary C Ch BO BO BO BO | utputs annel 01 02 03 04 05 | Incr. | | | 60 | OSE Ou Chan | tputs rel Ir | ner. | | | Attention | n: The Reset Chron settings. Each the Incr., Direct or Pulsee Incr times. and Reset will be the same for all no |
| Inary C Ch BO BO BO BO BO | utputs annel 01 02 03 04 05 06 | Incr. | | | GC | OSE Ou Chan | tputs rel Ir | ner. | | | Attention | n: The Reset Chron settings. Each the Incr., Direct or Pulsee Incr times, and Reset will be the same for all no unable the same for all no incr. I incr. I inc |
| Binary C Ch BO BO BO BO BO BO | utputs annel D1 D2 D3 D3 D4 D5 D6 D6 D7 | Incr. | | | GC | OSE Ou Chan | tputs rel Ir | ncr. | | | Attention | value Incr. Incr. Incr. Incr. Direct or Pulsee |
| inary C Ch BO BO BO BO BO BO BO | utputs annel D1 D2 D3 D3 D4 D5 D6 D7 D7 R8 | | | | GC | OSE Ou Chan | tputs nel Ir | ıcr. | | | Attention | n: The Reset Chron settings: Each the Incr. Direct or Pulsed Incr times. and Reset will be the same for all no value Incr. Inc |
| Imary C Ch BO BO | utputs annel 01 02 03 04 05 06 06 07 08 | | | | GC | OSE Ou Chan | tputs rel Ir | ner. | | | Attention | n: The Reset Chron settings. Each the Incr., Direct or Pulsed Incr times, and Reset will be the same for all no under the same for all no incr. I for the same |

Rua Visconde de Ouro Preto, 77 - Bairro Custódio Pereira - Uberlândia – MG - CEP 38405-202 Phone (34) 3218-6800 Fax (34) 3218-6810 E-mail: conprove@conprove.com.br Home Page: www.conprove.com -



The next step is to choose the stop interface, which in this case is "BI04" and block the first actuation. Start the generation by clicking on the icon below or through the shortcut "Alt + G".

| | I i i i i i i i i i i i i i i i i i i i | | | | | | | | | | | |
|--|---|---|--|--|--|--|--|--|--|--|--|--|
| Image: Sync. Set. % GOOSE Set. Direct: @ Sync. Set. Channels: % Connection | n Editing tete Test start sta | View | | | | | | | | | | |
| Hardware Resu | ts Generation Options Report Units Layout | | | | | | | | | | | |
| Pre-fault Pault | Monitoring Visit Inputs Bin., GUDSE and Analog Y Waveform Y Accumulations Y Phasors Y H | armonics Protection V X | | | | | | | | | | |
| Fault Channels/ Definition Ramp | Agle Ret: Ado Current xime Unders xime Under xi | y | | | | | | | | | | |
| Point Channel Definitions Va AO_V01 Modules | Print Channel Mod. Ang. Image: Component of the state of | VM 50.00 | | | | | | | | | | |
| Analog. DC Output | Actuation Look Wait betw. Timers: 0 s Pkp Expected Drp Expected t Expected | V Absol. Tol.: 330,00 mV | | | | | | | | | | |
| Binay Outputs GOOSE Outputs Time and Advancement | Pix Max. Generation Time: :::::::::::::::::::::::::::::::::::: | t % Tol.: 0.50 % t Absol. Tol.: 35.00 ms | | | | | | | | | | |
| Error List Protection Status 9 ON Line New Aux. Source 250,00 V Heating: 0% | | | | | | | | | | | | |

Figure 79

The pick-up found for element 27-2 was 16.60V, being exactly the value set in the relay.

| ا 🐣 Arq | □ 😂 🛃 🚽 Quick 2.02.190 (64 Bits) - CE-6710 | 0301018) — | 0 × ^ ? |
|------------|---|--|--|
| D Cha | GODSE Set Sync. Set. \$ SV Set Add Re Test T | Image: Construction in the second | |
| | Pra-fault Fault | Results Generation Generation Puttons Lagout | = × |
| É | Fault | A monitoring A | • ^ |
| ^ | Channels / Definition Bamp | Channele / Definition Converte and Channele / Definition Converte and Channele / Definition | |
| 100N | Definition Point Channel Definition Va AQ_V01 Modules | Image: Channel Definition Pain Channel Definition Va A0_V01 16.60 / 0° Va A0_V02 16.60 / 240.0° Va A0_V03 16.60 / 240.0° Times Va A0_U02 | t ~ |
| | Analog, DC Output Binary Outputs GODSE Outputs Time and Advancement | Cronometer 2: Stop Interf. Stop Interf. Deal Time: Deal Time: Cear Deal Time: Cear Timed Curve: P & M >> Pkp Expected Dp Expected t Expected Timed: P & M >> Phmm:sg)(Approximate) Inst. 1: 49,80 V Not1 V < \$46,00 | ABC ✓ 0.50 % 330,00 mV 0.50 % 35,00 ms |
| E | Protection Status | Aux Source 250 00 V Heating: 0% | |
| | IT IT IT | Figure 80 | |



6.5 Element 27-1 point test

To verify the operating time of element 27-1, remove the "*Ramp*" by choosing the "*Direct*" option and inject voltage values below the pick-up value. Change the stop interface to "*BI03*" and block the first actuation. The figure below shows the value of 48.00V already captured and the value of 18.00V to be captured.



Figure 81

It is verified that the operating times are within the tolerance provided by the manufacturer.

6.6 Element 27-2 point test

To verify the operating time of element 2, choose "BI04" and test points with voltage values below the pick-up. The figure below shows the value of 14.00V already captured and the value of 4.00V not yet captured.

NOTE: Remember to always block the first actuation.





It is verified that the operating times are within the tolerance given by the manufacturer.

6.7 Voltage x Time > Overvoltage screen

Click on the tab "Protection > Voltage x time > Overvoltage" so that the data set in the relay are configured in the software. Next to the voltage "V" chooses a node as a reference, in this case " AO_V01 ". Only after choosing the node are the fields for setting function 59 active.



| ♣ | I 🗅 💕 | 😡 🚽 Qu | iick 2.02.1 | 90 (64 Bits |) - CE-6710 (03 | 01018) | | | | | | | | | | | | | | | | | | - (|) × | |
|---------------------------------|--|------------------|-------------|-------------|-----------------|--------|--------------|--------------|------------|---------------|-------------------------------|-------------------------------------|--|-------------------------------------|------------------------|------------------|-------------------|-----------------------|-------------------|------------|-------------|--------------|------------|-----------|-----|---|
| Are | quivo | Home Di | isplay | Software | Options | | | | | | | | | | | | | | | | | | | | ^ | ? |
| Ch | Image: Bird Set. Image: Open Set | | | | | | | | | | ₩¥ ₩# * + | Vaveform Accumulation Phasors | LL, H | larmonics II Se valuations IV Se | et Ispc C et Vspc (| Offset Offset | Present Report | ▲ ~ ► P31 185 abs rel | Recreat Charts | te Restore | View | | | | | |
| | Pre-fault Fault - X Monitoring - X | | | | | | | | | - v | Innuts B | put | OOSE and Analo | | Wavefor | m Ac | cumulatio | ns Ph | | armonics | Protectio | | - | Y | | |
| f | Foult | | | | | • ^ | Ľ | Angle P | lof: Auto | | | Â | Current x tim | | Voltage x time | Differ | ential | Ham Re | str Dir | ectional | Frequenc | w | / 11000000 | | • | ^ |
| | Fault | | | | | | | Angle R | ei.: Auto | | | | Overvolta | - | Undeprotage | Dire | onda | rianii. No | au. Di | conorrai | riequeri | 4 | | | | |
| 1^ | Chann | els/ Definiti | on D | irect | ~ | | ^ | Chann | els/ Defir | ition | | | Overvoird | | ondervoltage | | | | | _ | | | | | | |
| | Point | Channel | Mod. | Ang. | Freq. | | | Point | Channel | Mod. | Ang. | | An ~ | V: | AO_V01 | ~ | Edit Cu | irve | | C |) Graph wit | h respect to | Pkp Temp. | Chart | ~ | |
| | Va | AO_V01 | 4,00 V | 0° | 60,00 Hz | | | Va | AO_V01 | 4,00 V | 0° | -111 | 1,00 | t | | | | | | | | | | | | |
| | Vc | AO_V02 AO_V03 | 4.00 V | 120.0 ° | 60.00 Hz | | | Vo | AO_V02 | 4.00 V | 1240,0 ° | 11 | 0.800 | | | | | | | | | | | | | |
| | la | AO_101 | 0 A | 0° | 60,00 Hz | | | la | AO_101 | | | | | | | | | | | | | | | | | |
| | lb | AO_102 | 0 A | 0* | 60,00 Hz | | | lb | AO_102 | | | | 0,600 | | | | | | | | | | | | | |
| | lc | AO_103 | 0 A | 0. | 60,00 Hz | | | lc | AO_103 | | | 11 | 0,400 | | | | | | | | | | | | | |
| Į į | UD01 | AO_V04 | 0 V | 0* | 60,00 Hz | | \mathbf{V} | Timers | | | | • × | | | | | | | | | | | | | | |
| 1 | UD02 | AO_104 | 0A | 0° | 60,00 Hz | | C | hronomete | er 1: | | | | 0,200 | | | | | | | | | | | | | |
| | UD04 | AO_106 | 0 A | 0° | 60,00 Hz | | | Stop Interf. | V 0 533 s | | - | 0 | | | | | | | | | | | | V | | |
| | | | | | | | | 0,555 S | | | | 1,00 2,00 | | | | | | | | | | | | | | |
| | | | | | | | C | hronomete | er 2: | | | | Capture Time by: O Chron. 01 O Chron. 02 Simulation: | | | | | | | | \sim | | | | | |
| | | | | | | | S | Stop Interf. | | | | | Dial 1 | ìme: | | | | | | a | ear | | | | | |
| | | | | | | | | Disable | | × | | | Timed Co | irve: | | | | | | P | 10 | | V % | Tol 50 | 0 % | |
| H | Analog | DC Output | | | | -11 | | Actuation L | Lock | Vait betw. Ti | mers: 0 s | _ | | | Pkp Expected | | Dro E | Expected | | t Expe | ected | | V Absol. | Tol.: 0.5 | 0 V | |
| Ě | Pinany. | De Output | | | | -11 | | Du Maria C | | | | _ | Ti | ned: | P | đ | | | Pø | | | | | , | | |
| Ě | Binary Outputs Fix Max. Generation Time: Fix Max. Generation Time: (himm:ss) (Approximate) | | | | | | | _ | In | t. 1: | P | đ | | | Pd | | | | t % | Tol.: 5.0 | 0 % | | | | | |
| Man, Increase Ampl, Angle Clean | | | | | | | | In | t. 2: | P | đ | | | Pø | | | | t Absol. | Tol.: 30. | 00 ms | | | | | | |
| Ľ | INE ON ANYON CHICAN NO01 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Error List | Protectio | on Status | | | | | | | | | | | | | | | | | | | | | | | |
| 41 | ON Lir | ne | New | | | | | | | A | ux. Source 2 | 50,00 | / Heating | | 0% | | | | | | | | | | | |
| | | | | | | | | | | | | | 0 | • | | | | | | | | | | | | |



6.8 General Adjustments 59

According to the relay software settings, these values are entered in the Quick software. The 59-1 element pick-up is equal to 83.00V (1.25* V_{nominal} /1.73) with actuation time equal to 2.0s and pick-up of element 59-2 equal to 116.20V (1.75* V_{nominal} /1.73) with actuation time equal to 500.0ms.

There are also fields where the absolute and relative tolerances for both voltage and time must be entered. These values are taken from Appendix A.2. There is also a field where the type of simulation is required, being possible single-phase-ground, two-phase and three-phase.





Figure 84

6.9 Timed Element 59-1 Pick-up Test

For the pick-up test, a ramp is used to increase the voltage value. To do this, choose the "*Ramp*" option on the "*Fault* > N01" tabs and click on the highlighted icon.

| 8 | I I III IIII = Quick 2.02.190 (64 Bits) - CE-6710 (0301018) Arquivo Home Display Software Options | | - • × ^ @ | | | | | | | | |
|---|---|--|---|--|--|--|--|--|--|--|--|
| (| Channels Connection Hardware Connection Conne | On Editing ▼ elete Test elete All ults Start Stop Start Stop Start Stop | averform LL. Harmonics Image: Set Ispc Offset ccumulation Image: Set Vspc Offset Image: Set Vspc Offset present Report Pilling controls Report Image: Set Vspc Offset | | | | | | | | |
| | Pre-fault Fault - X | Monitoring • X | Inputs Bin., GOOSE and Analog Waveform Accumulations Phasors Harmonics Protection = x | | | | | | | | |
| Í | Fault | Angle Ref.: Auto | Current x time Voltage x time Differential Harm. Restr. Directional Frequency | | | | | | | | |
| | Channels/ Definition Ramp Point Channel Definitions Va AO_V01 Modules Vb AO_V02 timer 1.00 s Ve AO_V03 Is Ia AO_101 Ib AO_0203 UD01 AO_V04 UD02 AO_016 UD04 AO_106 | Channels/ Definition Peint Channel Mod. Ang. Va AQ_VO1 Va AQ_VO2 Va AQ_VO2 Va AQ_UO1 Va AQ_UO2 Va AQ_UO2 Va AQ_UO2 Ia AQ_UO2 Ib AQ_UO2 Times V × Oronometer 1: Stop Intef. BI04 0s Os Os Chronometer 2: Stop Intef. Dasble | Overvoltage Undervoltage An < V: A0_V01 Edt Curve Graph with respect to Pkp Temp. Chart 2.00 [16] | | | | | | | | |
| ŀ | | Actuation lock Wait betw. Timere: 0.0 | V % 101.: [0.30 % | | | | | | | | |
| H | Analog. DC Output | | Timed: | | | | | | | | |
| H | GOOSE Outputs | [hh:mm:ss] (Approximate) | Inst. 1: 83,00 V P & 2,00 s t % Tol.: 0,50 % | | | | | | | | |
| | Time and Advancement Error List Protaction Status | Man. Increase Ampl. Angle Clean N001 V V 45,00 | Inst. 2: 116.20 V P & P & 0.50 s t Absol. Tol.: 35.00 ms | | | | | | | | |
| | ON Line New | Aux. Source 250.00 V | Heating: 0% | | | | | | | | |
| | | | | | | | | | | | |

Figure 85



For the initial value, set 82.00V, for limit value set 84.00V, with an increment of 100mV and a time of 3.0s.

| Ramp | | | | | | | | | | | | × | | | | |
|--------------------|------------|---------|----------|----------|-----|-----------------------------------|---------|----------|-----------------|------------|--------------------------|---|--|--|--|--|
| Ramp T | уре | | | Direct | | | | 🔽 Re | set Timers to E | ach increm | enting | Generation Approx. Time of Each Incr.: 3 s | | | | |
| Modules V O Pulsed | | | | | | Keep Harmonic During Incrementing | | | | | | | | | | |
| Initial Va | luco | | | - | Lim | ite and l | | | | | | Poort | | | | |
| | iues | | | | | | Limit | Incr | d/dt | N Steps | Time | nese | | | | |
| Chann | els/ Defin | tion | 1 | _ | | Va | 84.00 V | 100.0 mV | 33.33 mV/s | 21.00 | 63.00 s | | | | | |
| Point | Channel | Mod. | Ang. | Freq. | | Vb | 84.00 V | 100.0 mV | 33.33 mV/s | 21.00 | 63.00 s | | | | | |
| Va | AO_V01 | 82,00 V | 0° | 60,00 Hz | | Ve | 84 00 V | 100.0 mV | 33.33 mV/s | 21.00 | 63.00 s | | | | | |
| Vb | AO_V02 | 82,00 V | -120,0 ° | 60,00 Hz | | la | | | | | | | | | | |
| Vc | AO_V03 | 82,00 V | 120.0 ° | 60,00 Hz | | lb | | | | | | | | | | |
| la | AO_I01 | 0 A | 0 ° | 60,00 Hz | | lo | | | | | | | | | | |
| lb | AO_102 | 0 A 0 | 0 ° | 60,00 Hz | | LID01 | | | | | | | | | | |
| lc | AO_103 | 0 A 0 | 0° | 60,00 Hz | | UD00 | | | | | | | | | | |
| UD01 | AO_V04 | 0 V | 0° | 60,00 Hz | | UD02 | | | | | | | | | | |
| UD02 | AO_104 | 0 A | 0 * | 60,00 Hz | | UD03 | | | | | | | | | | |
| UD03 | AO_105 | 0 A | 0 * | 60,00 Hz | | UD04 | | | | | | | | | | |
| UD04 | AO_106 | 0 A | 0 ° | 60,00 Hz | | | | | | | | | | | | |
| | | | | | | | | | | | Attention | The Parted Chara cathland. Each the land. Direct or Bullood and | | | | |
| Binary O | utputs | | | | GC | OSE Ou | tputs | | | | Attention: | Incr times, and Reset will be the same for all nodes. | | | | |
| Ch | annel | Incr. | | | | Chan | nel In | ncr. | | | | | | | | |
| BO | 01 | | | | | | | | | | | | | | | |
| BO | 02 | | | | | | | | | | | Incr. I | | | | |
| B003 | | | | | | | | | | | | 1 Limit | | | | |
| ВО | 04 | | | | | | | | | | Initial va | alue | | | | |
| BO | 05 | | | | | | | | | | | * | | | | |
| BO06 | | | | | | | | | | | Generation Time Every | | | | | |
| BO | 07 | | | | | | | | | | | Incr. | | | | |
| BO | 08 | | | | | | | | | | | OK Canad | | | | |
| | | | | | | | | | | | | | | | | |

Figure 86

Change the stop interface, which in this case is "BI01" and start the generation by clicking on the icon below or using the shortcut "Alt + G".

| 8 | ۶ Irqui | Dia angle angle No Home Dis | k 2.02.190 (64 Bit play Softwar | s) - CE-6710 (030 e Options | 1018) | | | _ | | | | | | | | | | | | - | ٥ | × ^ 🕜 |
|------|--------------|---|--|--------------------------------|-------|----------------------------|---|--|---|------------------------|--------------------------|----------------|---|----------------------|--------------------------------|---------------------|---------------------|-------------------------|------------------|--------------------------|----------|---------------------|
| • | Dire | Hrd Set. | 愛 GOOSE Set ミ、SV Set | Add Reedit Test Test | Del | n Edit ete Te ete Al | ing▼ st I | Start Stop | Settings | ₩ War Acci + Pha | veform 🕌 sumulation 🖩 | L Hari Eval | monics <u>Irr</u> i uations <u>Ir⊽</u> | Set Ispc Set Vspc | Offset Offset Pre Rep | sent port abs re | Recreat | te Restore Layout | View | | | |
| | /P | re-fault Fault | | | - X | 1 | Monitoring | Generation | - 1 | × | Innuts Bin | GO | OSE and Ana | log | Waveform | | tions / Ph | asors / H | larmonics V | rotection | | = × |
| ŕ | | Fault | | | | | Angle Ref : Auto | | | | Current x time | V | oltage x time | Diffe | rential Har | m. Restr. E | Directional | Frequenc | v | | | - ~ |
| E | | | Dama | | | • | | | | 1 | Overvoltage | i U | ndervoltage | | | | | | | | | |
| 1001 | | Channel Definit Point Channel Via AO_VI01 Vib AO_V02 Vic AO_V02 Vic AO_U01 Iib AO_I01 Iib AO_I02 Iib AO_I02 UD01 AO_V04 UD02 AO_I04 UD03 AO_I05 UD04 AO_I06 | Definitions Modules threr 3,00 s | | | | Operation Operation <t< th=""><th>inition A Mod. -</th><th>Ang. -</th><th>×</th><th>An ~ 2.00 t 1.00 ~</th><th>V: [5]</th><th>AO_V01</th><th>~</th><th>Edit Curve</th><th>100</th><th>0</th><th>) Graph with</th><th>n respect to Pkp</th><th>Temp. Char</th><th>t,</th><th>V<u>M</u> 140.C</th></t<> | inition A Mod. - | Ang. - | × | An ~ 2.00 t 1.00 ~ | V: [5] | AO_V01 | ~ | Edit Curve | 100 | 0 |) Graph with | n respect to Pkp | Temp. Char | t, | V <u>M</u> 140.C |
| | | | | | | Ch Si | ronometer 2: op Interf. Jisable | v | | | Dial Tin Timed Curv | ne: [/e: _ | | | Capture Time b | by: 🗿 Chron | 01 () 0 0 9 | ron. 02 lear สัยว | | Simulation: V % Tol.: | ABC | ~ |
| Ŀ | - | Analog. DC Output | | | | | Actuation Look | Wait betw. Tir | mers: 0 s | | Time | F at F | kp Expected | 0 1 | Drp Exp | ected | t Exp | ected | | V Absol. Tol.: | 330,00 r | .nV |
| Ľ | ~ | Binary Outputs | | | -11 | | Fix Max. Generation Tr hh:mm:ss] (Approxim | ime: : : : : : : | : | | Inst | 1: [| 83.00 V | Pd | | PA | 2.00 | s | | t % Tol.: | 0.50 % | _ |
| | · · | GOOSE Outputs Time and Advancemen | | | | Man | . Increase Ampl | . 🗌 Angle | Clean | | Inst. | 2: [| 116.20 V | e d | , | Pd | 0.50 | s | | t Absol. Tol.: | 35.00 m | 5 |
| ſ | Erro | or List Protection | Status | | | | | | | | | | | | | | | | | | | |
| C | 6 7 | ON Line | New | | | | | Au | ux. Source 250, | 00 V | Heating: | | 0% | | | | | | | | | |
| | Figure 87 | | | | | | | | | | | | | | | | | | | | | |



To view the values being generated, click on "*N01*" within the "*Monitoring*" tab. After the actuation, click on the highlighted icon to capture the point.

| ی Ar | I □ ☞ □ = Quick 2.02.190 (64 Bits) - CE-6710 (0301018) Arquivo Home Display Software Options | - | 0 × ^ (7 | | | | | | | | |
|---------|--|---|--|--|--|--|--|--|--|--|--|
| Cr | Channels Charles Charles Construction Charles Construction Charles Construction Charles Construction Charles Construction Charles Construction Const | n Editing eta Test start Start Start Stop Generation Generatio Generation Generatio Generation Generation Generation Generation | | | | | | | | | |
| | Pre-fault Fault - X | Monitoring V Inputs Bin., GOOSE and Analog Waveform Accumulations Phasors Harmonics Protection | ▼ × | | | | | | | | |
| | Fault | Angle Ref.: Auto | | | | | | | | | |
| ^ | Channels/ Definition Ramp | Channels/ Definition Undervoltage | | | | | | | | | |
| N001 | Point Channel Definitions Va AO_V01 Modules Vb AO_V02 Iner 3.00 s Ve AO_U03 Is AO_U01 Ib AO_U02 UD01 AO_U20 UD02 AO_U04 UD03 AO_U04 UD04 AO_U06 | Point Channel Mod. Ang. No. Channel Mod. Ang. No. Ang. No. Ang. No. Ang. No. Ang. No. Channel Mod. Ang. No. Ang. No. Ang. No. Channel Mod. Ang. No. No. Channel Mod. Ang. No. No. Channel Mod. Ang. No. No. Ang. No. No. Channel No. Channel No. No. Channel No. | vm .0 140.€ | | | | | | | | |
| | Analog. DC Output Binary Outputs GOOSE Outputs | Chronometer 2: Stop Interf. Capture Time by: Capture Time by: Chron. 01 Chron. 02 Simulation: Dial Time: Capture Time by: Chron. 01 Chron. 02 Simulation: Chronometer 2: Simulation: Chronometer 2: Capture Time by: Chrono. 02 Simulation: Chronometer 2: Capture Time by: Chrono. 02 Simulation: Chronometer 2: Chromometer 2: Chromomete | ABC ✓ 0.50 % 330.00 mV 5.00 % | | | | | | | | |
| ~ | Time and Advancement | Man. Increase _ Ampl Angle _ Gest MS. ∠ 116.20 V / ∠ @ / 20 0.50 s _ t Absol. 1ol.: | 155,00 ms | | | | | | | | |
| | Error List Protection Status | | | | | | | | | | |
| 4 | New | Aux. Source 250,00 V Heating: 0% | | | | | | | | | |
| | Figure 88 | | | | | | | | | | |

In this case, the pickup found was 83.10V, within the range of values provided by the manufacturer.

6.10 Timed Element 59-2 Pick-up Test

Click on the "*Fault*" tab and the "..." icon and enter an initial value of 115.20V, limit value of 117.20V, with an increment of 100.0mV and a time of 1.0s.





Figure 89

The next step is to choose the stop interface, which in this case is "BI02" and start the generation by clicking on the icon below or using the shortcut "Alt + G".





The pick-up value found for element 59-2 was 116.30V, within the range of values provided by the manufacturer.



6.11 Element 59-1 point test

To verify the operating time of element 59-1, remove the "*Ramp*" by choosing the "*Direct*" option and inject voltage values above the pick-up value. Change the stop interface to "*BI01*" and block the first actuation. The following figure shows the value of 85.00V already captured and the value of 115.00V to be captured.





It is verified that the operating times are within the tolerance provided by the manufacturer.

6.12 Element 59-2 point test

To verify the operating time of the 59-2 element, choose "*BI02*" and test points with voltage values above the pick-up. The following figure shows the value of 120.00V already captured and the value of 135.0V not yet captured.



Figure 93

It is verified that the operating times are within the tolerance provided by the relay manufacturer.

7. Report

At the end of the test, you can request an automatic report, just click on the icon illustrated below or use the shortcut "Ctrl + R".







When requesting the report, a screen opens where the user chooses the information that should be shown in the report.

| Presentation Setting | × |
|--|-----------|
| Language Inglês En-US 🗸 🗸 | |
| All General Data of Test General Data of Tested De Local of Installation Reference Values Hardware Settings Values Test Results Notes and Observations Explanatory Figures Check List Connections | vice |
| | OK Cancel |

Figure 95



Figure 96



APPENDIX A

A.1 Terminal Designations



Power supply module (PSM)

Figure 97



Transformer input module (TRM)

Figure 98



| | LOCATION= PN |
|---------------------------------------|---|
| | CONFIGURATION |
| BOX= XA | B0.01 |
| | 7 BO.02 |
| | BO.03 |
| | B0.04 2 |
| | 80.05 |
| | B0.06 |
| <u>+</u> | BO.07 |
| | BQ.08 |
| | BO.09 |
| | 80.10 |
| 4 <u>6</u> | No.11 |
| 16 | 80.11 |
| 18 | BU. 12 |
| | 500 · · · · · · · · · · · · · · · · · · |
| BDX= XB | 80.13 |
| | BO.14 |
| | 80.15 |
| | BO.16 |
| | B0.17 |
| | BO.18 |
| | BO 19 |
| | 80.20 |
| | B0.21 |
| | B0.22 |
| | <u> </u> |
| | 80.23 |
| 18 | 80.24 |
| | 31. 30 |
| · · · · · · · · · · · · · · · · · · · | |
| | |
| | al. |

Binary autout madule (BOM)



A.2 Technical data

OV2PTOV technical data

| Function | Range or value | Accuracy |
|---|--|---|
| Operate voltage, step 1 and 2 | (1-200)% of <i>UBase</i> | \pm 0.5% of U _r at U < U _r \pm 0.5% of U at U > U _r |
| Absolute hysteresis | (0–100)% of <i>UBase</i> | \pm 0.5% of U _r at U < U _r \pm 0.5% of U at U > U _r |
| Inverse time characteristics for steps 1 and 2, see table <u>675</u> | | See table 675 |
| Definite time delay, step 1 | (0.00 - 6000.00) s | ± 0.5% ± 10 ms |
| Definite time delays | (0.000-60.000) s | ± 0.5% ± 10 ms |
| Minimum operate time, Inverse characteristics | (0.000-60.000) s | ± 0.5% ± 10 ms |
| Operate time, start function | 25 ms typically at 0 to 2 x U _{set} | - |
| Reset time, start function | 25 ms typically at 2 to 0 x U _{set} | - |
| Critical impulse time | 10 ms typically at 0 to 2 x U _{set} | ā. |
| Impulse margin time | 15 ms typically | е - |

UV2PTUV technical data

| Function | Range or value | Accuracy | | | |
|---|--|------------------------------|--|--|--|
| Operate voltage, low and high step | (1-100)% of UBase | \pm 0.5% of U _r | | | |
| Absolute hysteresis | (0–100)% of UBase | ± 0.5% of U _r | | | |
| Internal blocking level, step 1 and step 2 | (1–100)% of <i>UBase</i> | ± 0.5% of U _r | | | |
| Inverse time characteristics for step 1 and step 2, see table <u>676</u> | - | See table 676 | | | |
| Definite time delay, step 1 | (0.00 - 6000.00) s | ± 0.5% ± 10 ms | | | |
| Definite time delays | (0.000-60.000) s | ± 0.5% ±10 ms | | | |
| Minimum operate time, inverse characteristics | (0.000–60.000) s | ± 0.5% ± 10 ms | | | |
| Operate time, start function | 25 ms typically at 2 x U_{set} to 0 | 2-1 | | | |
| Reset time, start function | 25 ms typically at 0 to 2 x U_{set} | 387 | | | |
| Critical impulse time | 10 ms typically at 2 x U _{set} to 0 | 200 | | | |
| Impulse margin time | 15 ms typically | - | | | |



APPENDIX B

Equivalence of software parameters and the relay under test.

| Table 1 | | | | | | | | | | | |
|-----------------|------------------|--------|----|--|--|--|--|--|--|--|--|
| Quick Softwa | ABB RET670 Relay | | | | | | | | | | |
| Parameter | Parameter | Figure | | | | | | | | | |
| Overvoltage | | | | | | | | | | | |
| Pkp_Instant.1 | 84 | U1> | 51 | | | | | | | | |
| Tempo_Instant.1 | 84 | t1 | 51 | | | | | | | | |
| Pkp_Instant.2 | 84 | U2> | 52 | | | | | | | | |
| Tempo_Instant.2 | 84 | t2 | 52 | | | | | | | | |
| U | ndervolt | age | | | | | | | | | |
| Pkp_Instant.1 | 71 | U1< | 55 | | | | | | | | |
| Tempo_Instant.1 | 71 | t1 | 55 | | | | | | | | |
| Pkp_Instant.2 | 71 | U2< | 56 | | | | | | | | |
| Tempo_Instant.2 | 71 | t2 | 56 | | | | | | | | |