

INSTRUMENTOS PARA TESTES ELÉTRICOS Test Tutorial

Equipment Type: Protection Relay

Brand: SCHNEIDER (AREVA)

Model: <u>P545</u>

Function: 67 or PTOC - Directional Overcurrent

Tool Used: CE-6006; CE-6707; CE-6710; CE-7012 or CE-7024

**Objective:** <u>Perform tests on the directional overcurrent function to</u> prove the operating time and its directionality

Version control:

Version	Descriptions	Date	Author	Reviewer
1.0	Initial release	25/05/2022	M.R.C.	G.C.D.P.



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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 P545 relay in the Overcurrent 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 M2 on the relay terminal and the negative (black terminal) of the Aux Source Vdc to pin M1 of the relay terminal.



## **1.2** Current and Voltage Coils

To establish the connection of voltage coils, connect channels V1, V2 and V3 with pins D19, D20 and D21 of the relay terminal and common to pin D22. To establish the connection of the current coils, connect channels I1, I2 and I3 with pins D1, D4 and D7 of the relay terminal and common to pins D2, D5 and D8. If these last three points are short-circuited, connect all commons to this point.





## **1.3** Binary Inputs

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

• BI1 to pin L1 and its common to pin L2 of the relay.

The figure below shows the details of the connections.



## 2. Communication with the Schneider P545 relay

First, open the *Schneider Electric MICOM S1 Studio* and connect a serial cable from the notebook to the relay. Then double click on the software icon.



Then click on the "Quick Connect" option. The relay software will automatically fetch the settings.





Figure 5

The next step is to create a new project and name it.



#### Figure 6



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0	New System Please enter name, description, path and password for System
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	C:\Documents and Settings\Suporte\Meus documentos\SE S1 Studio\Tutoriai:
	Ok Cancel
1	

Figure 7

In the next window, choose the relay model. If you do not have the model, use the *"Data Model Manager"* software (installed together with MiCOM) to download it.



Figure 8

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Choose the way to communicate whether by serial port (rear or front), by Ethernet or even via modem.



Figure 9

In the next window make sure which serial port (COM) is being used especially if you are using a USB/SERIAL converter and click on *"Finish"*.



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The next screen shows that the connection was made successfully showing the relay type, model and serial number.

Qu	nect iick connect su	ucceeded
eratio	n success. Please	complete configuration
1 yr	be:	P343
Pla	uel: pt reference:	P34331JAOMODOUM Micom
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	ENGLISH	~
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	P545	
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	MICOM	
		Back Finish Car

Figure 11

The next step is to extract all the information set in the relay. Right click on *"Settings"* and left click on *"Extract Settings"*.

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## **INSTRUMENTOS PARA TESTES ELÉTRICOS** Enter the relay password, default value "AAAA".

🏘 Device Password		
Enter Device Pas Please type the passwo	sword rd for device	
Model Plant reference Description Serial Number Software Reference Device Banner	P54531JA6M0D00M MiCOM MiCOM P543/P545 1791992 P5456S_D00_B SENHA PADRAO	
F	°ass <u>w</u> ord : ●●●● Ok	Cancel

Figure 13

The reading of the settings will appear with the name of "000" and can be modified if necessary. In this case the file name was changed to "Direcional de Sobrecorrente".

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Device [P545]	l de Sol rente rente ts	brecorrei	ite			





#### INSTRUMENTOS PARA TESTES ELÉTRICOS 3. Parameterization of the Schneider P545 relay

## 3.1 Frequency

After making a double click on the "Directional de Sobrecorrente" file, enter "SYSTEM DATA", and then "Frequency". Make sure the value set is 60Hz.

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PSL .	Plant, Reference	MICTM	00.05					
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Menu Text	Serial Number		00.08					
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## **3.2** CONFIGURATION

Figure 15

Within the "*CONFIGURATION*" folder, group 1 and the overcurrent function are enabled. NOTE: <u>All other functions must be disabled.</u>

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# 3.3 Setting Values

All parameterization will be done with values referenced to the secondary.

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Figure 17

## 3.4 CT AND VT RATIOS

Adjust the values of primary and secondary voltages and currents and the polarity of the CT.

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## 3.5 Phase Sequence

Click the "+" sign under "GROUP" and "GROUP 1 LINE PARAMETERS". In the "Phase Sequence" option, set the positive sequence (ABC).

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	GROUP I INPUT LABELS				
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## **3.6 GROUP 1 OVERCURRENT**

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	Tal Function	DT	35.02		
	V Isl Directional	Directional Fyd	35.03		
	- V I>1 Current Set	5.000 A	35.04		
	- V I>1 Time Delay	0 s	35.05		
	V I>1 tRESET	0 s	35.09		
	I>2 Status	Disabled	35.0A		
	I>3 Status	Disabled	35.13		
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**Figure 20** The next step is to click on *"Save"* to save the configuration.

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Image: System [Tutorial]         Image: System [Tutorial]         Image: System [Tutorial]         Image: Subscreet state         Image: Subscre	Vew Clarted Vew Clarted CRL I/P LABELS CRL I/P LABELS CRL I/P LABELS CRUp 1 CRUp 1 CRU	Source         Value           Value         Value           Value         Value           VETERS         100.0 km           2.000 Chm         70.00 deg           1.000         0 deg           0.00         0 deg           1.000         0 deg           1.000         0 deg           0.00         0 deg           0.00	Address (C.R)         User not           30. 01.         30. 03.           30. 03.         30. 05.           30. 05.         30. 05.           30. 05.         30. 07.           30. 05.         30. 07.           30. 05.         30. 07.           30. 05.         30. 07.           30. 05.         30. 07.           30. 05.         30. 07.           35. 01.         35. 03.           35. 03.         35. 04.           35. 06.         35. 08.           35. 05.         35. 05.           35. 05.         35. 05.           35. 05.         35. 05.           35. 05.         35. 13.           35. 14.         35. 14.           35. 16.         35. 16.	Search: vts					
	I> Char Angle I> Blocking I GROUP 1 CB FAIL &	30.00 deg 001111 ; P.DEAD	35.1C 35.1D						
	GROUP 1 SUPERVIST     GROUP 1 INPUT LAE     GROUP 1 OUTPUT LA     Group 2     Group 3     Group 4	CON NELS NEEELS							
	<			>					
	F	Figure 21							

3.7 *PSL* 



The configurations of the binary outputs are done through logic blocks being configured in another file. Right click on the "*PSL*" folder and then on "*New File*".

🕸 MiCOM S1 Studio	V4.0.1					
Quick Connect	. File	View	Print	Tools	Options	Help
Studio Explorer						ųΧ
1 🔁 🚖 📖 🚰	-					
Connection	] ons onal de Sot corrente	precorrer	nte	227		
	New File					
🛅 Men 🎦 🛅 MCL 🚖	Add Exis Extract	ting File.	0.			
Ever	Paste					
	Propertie	s				
	F	igure 2	22			

The name of the file name appears as "000", change it to "Direcional de Sobrecorrente".



Double-click on this file to gain access to the logical blocks. Then click on the tool highlighted in red and zoom in on the region highlighted in green.





Figure 24

Note that the first output appears in the figure below (highlighted in red). This output must be associated with a non-directional overcurrent signal.

🔕 Direcional de Sobrecorrente.psl - PSL-Courier	
Eile Edit Yiew Device Tools Help	
12 個 🖷 🖶 🗠 ∽ 🐚 🕷 🕷 🔨 🖬 🖗 🖉 🖉 🖾 🖾 🕼 📑 🕺 🖓 🖓 🖓 🖓 🖓 🖓 🖓 🖓 🖓 🖓 🖓 🖓 🖓	🍇 >> jur 🍫 🛧 🕿 🖶 🖓 😰 🔁 📴
MiCOM P545 Programmable Lo	gic
	Output Contacts
DDB #608	0 Straight Output R1 DDB #000
Signalling Fail DDB #311	0 Straight 0 Uutput R2 DDB #001
Any Trip DDB #522	Dwell Output R3 DDB #002
D M64 Ch1 Input 1 DDB #096	0 Straight 0 0 0
CBfail1 Trip 3ph DDB #834	Dwell Output R6 DDB #005
Ready by by the second se	17/0 054531136M00000M_Group: 1_Timers=15/16: Contacts=1/32: (EDc=10/18_1_coir_54%)
Tione 25	1770 p. 6. 602 54 6. 60 60 1. 100 60 1. 100 60 100 100 100 100 100 100 100 100
Figure 25	

Click on the highlighted arrow and then on the "Zone 1 Trip" block with the right button and then "Delete". To delete this block.





Figure 26

Click on the R1 block and change the "*Mode*" to "*pickup*" and in the "*Pickup Value(ms)*" option, set the value to zero.



Figure 27



The next step is to associate the signal to be monitored with the output block R1. Click the button highlighted in red and choose the following signal.



Figure 28

Now click on the icon highlighted in red and connect the blocks.



Figure 29

Click on the highlighted icon to save the file, then close the logic block editor and return to the *"MiCOM"* software.



ecional de Sobrecorrente.psl - PSL-Courier
it View Device Iools Help
◎ 🕼 🖶 🗠 🗠 🖉 🖓 😻 😻 🖌 🗰 🔖 🖏 🔍 🔍 🕄 🖽 🖑 🚺 🛣 🔿 🗶 🖸 🖉 🗛 🖉 👘 👘 🕹 🖉
Save MiCOM P545 Programmable Logic Output Contacts
Signalling Fail     0     Output R2       DDB #311     0     DDB #001
Any Trip     100       DDB #522     Dwell       0     0
DDB #096         0<
CBfail1 Trip 3ph     0       DDB #334     0
active document 794/1 P545313A6M0D000M Group: 1 Timers=15/16; Contacts=1/32; LEDs=10/18. Logic 54% applies

Figure 30

#### **3.8 Sending Settings to the Relay**

Click the "Device [P545]" icon then the icon highlighted in green.







Send both the function settings and the logic block group 1 of the "Direcional de Sobrecorrente".

Send to 'P545 (MiCOM)'								×	
0 To send a file to the device selec	t the file a	nd then cl	lick the 'Se	nd' buttor	ı				
Select files to send								- 1	
Send File							Туре	^	
Direcional de Sobrecorrente.set Settings Files									
Sobrecorrente.set							Settings File:	5 💌	
Send PSL file	Group 1	Group 2	Group 3	Group 4	CRC Type		Reference ID		
Direcional de Sobrecorrente.psl					Enhanced logic-only	×			
Sobrecorrente.psl					Enhanced logic-only	*			
Uncheck All						[	<u>S</u> end Clos	•	

Figure 32

## 4. Overcurrent software adjustments

## 4.1 Opening the Overcurrent

Click on the "Conprove Test Center" application manager icon.



Click the Overcurrent software icon.



**INSTRUMENTOS PARA TESTES ELÉTRICOS** Conprove Test Center 2.02.171 X Conprove Test Center Version 2.02.171 CONPROVE General Secondary Measurement Secondary Tests Applications for measurement General Tests 👃 Quick Differential A Multimeter Q VCC Aux Power Directional 🐴 Calibration T Distance 🎲 Test Plan 🚵 Master 😬 Meter Remote Generation Setup Power Quality Equipment Set. / Tests FSB OoS 📌 Settings Ramp 👂 Update Firmware Primary Harmonic Restraint 🌚 Software Language Primary Tests Sequencer € ст Y Synchronism ‡ VT Overcurrent Support Transformer Transducer Documentation and assistance Ω Resistance o Transient Playback 0 Tutorials କିଳ୍ଲ PMaster 1/Hz Volts/Hertz Videos 🖾 Contact Other 📆 Forum Additional aplications User Manual 🙀 Transient View Quick Guide Nalidate PDF Reports Self-diagnosis Remote Access Statistical Analysis Copyright Conprove 1984 - 2022 Figure 34



🖉 l 🗅 💕 🛃 = l 9	Overcurrent 2.02.171 (64 Bits)	- CE-6710 (0970322)								- 0 ×
Arquivo Home	Display Software Option	15								~ 🕜
Hrd Set	so SV Set	Settings						×		
Channels Direc 📢 Connecti Hardwa	ion Start are	General	General Inform. Test:	System Notes & Obs.	Explanatory Figures	Check List Others Co	nnections			
Pickup Time Test	t Settings	Overcurrent	Descr:			Date:		_		
Insert/Edit Points			Tested deuteer							-
Edit Point	General Options		Tested device:	Identif:	~	Model		~		Fault A-B-C
New Point	Enable the DropOu			Туре:	~	Manufacturer:		~ _		Angle 0 °
Sequence	Fault Type: A-E		Location:							Test Line
Sequence	Multiple:			Substation:				~ ~		- Pickup Found
Hemove	Fault Angle: 0.0			Bay:	~	]				Dropout Found
Remove All	Tour Mgic. 10,0			Address:			Outro -	<u> </u>		Colors: NT OK Error
Test Points				City:		~	State:			Information:
Points Tested			Responsible:							Current Point:
Nº Fault	Angle Status			Name: Sector:	~	Registry:		~		-m: -t
			Tool Test:							
			CE-6710		Series Num.:	09703227CCM33222211U	5HVRGLGLGL2Z0RXD			
		-								
T	Could & Analy	Default 🗸				Preferences	ок	ancel	Mult P	kp
Inde: Groups	- auit a Angle									
Errors List Prote	ection Status									
🚯 ON Line	New			Aux Sourc	e: 0,00 V Heating:	0%				
				<b>T</b> .•	25					

Figure 35

## 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.



Inside the "Settings" screen, fill in the "General Inform." with details of the tested device, installation location and the person responsible. This makes reporting easier, as this tab will be the first to be shown.



eneral	General Inform.	System N	otes & Obs. Explar	hatory Figures C	heck List Othe	rs Connections		
arou umant	Test:							
	Descr:	Directional Ove	ercurrent		Date:	1		
	Tested device:							
		Identif:	23031982	~	Model	P545		~
		Type:		~	Manufacturer:	Schneider		~
	Location:							
		Substation:	Conprove					~
		Bay:	1	$\sim$				
		Address:	Visconde de Ouro Pr	reto 75, Custódio Per	reira			$\sim$
		City:	Uberlândia		~	9	State: MG	~
	Responsible:							
		Name:	Michel Rockembach	de Carvalho				$\sim$
		Sector:	Engineering	~	Registry:	0001		~
	Tool Test:							
	CE-6710			Series Num.:	03010187CCM332	22211U5HVRGLGL	GL2Z0RXO	

#### Figure 37

#### 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 are not relevant for this test.

ettings		×
General	General Inform. System Notes & Obs. Explanatory Figures Check List Others Connection	ns
Overcurrent	Nominal       Impedance       Source         Frequency:       60 Hz       Phase Seq.:       ABC         3qp power:       14,34 MVA       Ip:       4.76 MVA         1q:       4.76 MVA       Ip:       60 Hz         Primary Voltage (FF):       13.80 KV       Ip:       Impedance         (FN):       7.97 KV       Impedance       Impedance         Primary Voltage (FF):       115.0 V       Impedance       Impedance         (FN):       66.40 V       Impedance       Impedance         Secondary Voltage (FF):       120.0       Impedance       Impedance         VTR F:       120.0       Phase       F       Neutral       N         Ground       E       Phase       F       Neutral       N       E	Displ. D
	VTR D / VTR F:         1.00         Currents           CTR E / CTR F:         1.00         1         Va         5         Ia           Invert Polarity:         2         Vb         5         Ia           VT's F         CT's F         VC         7         Ic           VT D         CT E         D         4         VD         EP         9         IEP	k to V0: 1.00 k to V2: 1.00 k to I0: 3,00 k to I2: 1,00
Default 🗸	Preferences QK	Cancel



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



There are other tabs where the user can insert "*Notes & Obs.*", *Explanatory Figures, and* "*Check List*" of the procedures for carrying out the test and even create a diagram with all the schematic of the connections between the test set and the test equipment.

## 5. Directional Overcurrent Adjustment

## 5.1 Overcurrent Screen > Definitions

In this you must enable the directionality, the curves display mode, the scale used and the time, current and angle tolerances. These tolerances should be taken from the relay manufacturer's manual (Appendix A).

Settings		×
General	Definitions       Overcurrent Elements         General Options       ATTE         Image: Curve Enable Directionality       Pol.:       V-90° (Square          Curves Composition:       Curve with the lower time        You c. Seq., becau polariz         Pickup Mode Settings:       Pickup Definition:       Setting in Amperes        Reference Value for Pickup:         1.00 A       1.00 A       1.00 A	ENTIO an not test individual components (Phase, Residual, , Seq- and Seq0) with different polarizations, use the software only works with one reference zation to generate tensions and evaluate the results.
	Curves Display Mode:       Multiples         I [A] x t -> I in Amperes       Nega         I [m] x t -> I in Multiples       Nega         Multiples Reference:       Lower Pkp         Reference value for Multiple:       1,00 A         Relat       Abso         Initial Scale Factor:       1,00         Final Scale Factor:       20,00         The scale factor defines the multiplier to be applied to the lower Multiple       Abso	pliers for Tests of and Seq0 ative Seq.: 1 Zero Seq.: 3 ent Tolerance tive: 5.00 % plute: 0.10 ln Tolerance tive: 2.00 % plute: 40,00 ms
Default 🗸		Preferences <u>Q</u> K <u>C</u> ancel

Figure 39

#### 5.2 Overcurrent Screen > Overcurrent Elements > Phase

Here the overcurrent element must be configured. To do this, click on "*Phase*" and once on the highlighted icon.





For the element choose the type of curve equal to defined time, pickup value equal to 5.0A, time to 0.0 seconds and dropout factor equal to 0.95.



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Choose the "Individual Directionality" tab and set the "Forward" option, the maximum torque angle (ATM) must be set to  $30^{\circ}$ . Set the angles as  $90^{\circ}$  and  $-90^{\circ}$ .

tings								
General	Definitions Overcurrent Ele	ments						
Overcurrent	Phase Residual Seq +	Seq - Seq 0					+	<b>~</b> - <b>~</b>
	Nº Enab Desc	Cur	ve	Pkp	Pkp [A]	Dial/Time	Drp	Colo
	1 📝 67	Defined Time	-	5,00 A	5,00 A	0 s	0,950	
	Total Characteristic       Sir         Direc:       Forward          Trip:       In the Max          Pol.:       V-90° (Square          W0:       0.00          ATM:       30.00 °          Vmin:       0.00 V          dAng Pos:       90.00 °	Ingle Characteristic		ectionality				
Default V				Prefe	erences	<u>0</u> K		<u>C</u> ancel

Figure 42

## 6. Channel Direction and Hardware Configurations

Click on the icon illustrated below.

🗸   🗋	🖉   🗋 🚔 🚽   Overcurrent 2.02.171 (64 Bits) - CE-6710 (0501119)										
Arquivo	Home	Display	Software	Options	5						
Channels Direc	😭 Hrd Se Ø Sync. S 📢 Conne	et € <mark>S</mark> o GOOS Set ⁵ <sub>U</sub> SV Set ection	5E Set t	Start	Stop	<ul> <li>Next Point</li> <li>Next Line</li> </ul>	॔ Clear test ≝ Clear all				
	dware				Generation						
	Figure 43										



Then click on the highlighted icon to configure the hardware.





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

ster Slave 1 Slave 2	Main Sampled Value Others	
	Binary Outputs:	Auxiliar Source:
Nodel CE-6/10 V Senal Number 0501119/CCM3322221105HVRGLGLGL220RXD V	Initial State Initial State	- 250 V
Inalog Outputs:	BO1: NO V BO3: NO V	- 220 V
Standard - Voltages:	BO2: NO V BO4: NO V	
• 4 x 300 V; 100 VA		- 110 V
○ 2 x 600 V; 180 VA	BO5 and BO6 type:	- 60 V
O 2x 300 V: 150 VA V2 C O −■N2	Conventional BO5: NO ~	- 48 V
1 x 600 V: 350 VA	BO6: NO 🗸	24 V
0 1 x 300 V: 250 VA	IRIG (BO5) /Clock (BO6)	
V4 V4 V4		- Other
		- Off
	Transistor     TTL	110.00 V
		,
Customized Assoc.	Binary / Analog Inputs:	
Standard - Currents:	BI1: BI - Contact	
• 6 x 32 A: 220 VA	BI2: BI - Contact 👻	
0 3x 64 A: 400 VA	BI3: BI - Contact 💌	
	BI4: BI - Contact 🔹	
	BI5: BI - Contact 💌	
	BI6: BI - Contact 💌	
	BI7: BI - Contact 💌	
	BI8: BI - Contact	
15 C - 15	BIJO: BI - Contact	
	BI11: BI - Contact	
	BI12: BI - Contact 🗸	
	Considers absolute values to Voltage-BI	AI 1-6 : 2V; 20V; 600V
U 1x 50 A; /UU VA	Considera absolute Valdes to Voltage-bi	AI 7-12 : 200mV; 2V; 600
Customized Assoc.		OK Carrel

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

Cha	nnels Direct.							$\times$
Local	Model	Reset for Hard.	hard Cat	O Basic		[	Confirm	
v.	CE-6710 ~	Connected	Jei	<ul> <li>Advanced</li> </ul>	GOOSE		Cancel	
ote	Serial Number:				50			
Rem	05011197CCM3322	Import	Export	.;				

Figure 46

## 7. Test structure for function 67

## 7.1 Test Settings

On this tab you must configure the pickup and trip signals with the binary inputs. If necessary, it is possible to enable up to two pre-fault conditions and one post-fault condition. The only test that will be performed is the time test and consequently the directionality test.

Arquivo Home Display Software Options		- ō × ^ 0
Channels     Sync. Set     Sy Sync. Set     Start     Stop     Next Point     Connection       Hardware     Hardware     Generation     Generation	lear test lear all Settings H Phasors Options Report Units Setting A Phasors Present Units Recreate Restore View Layout Layout	
Pickup Time Test Settings		
Direction of the Generation Channels  Channels	Enable Pre-Fault 2     Enable Post-Fault	Voltage Settings
Generation Channel         Mode         Bal. ThreeP. ABC         V           Va         AO_V01 (Hrd. V1)         V1         66.40 V         0 *           Vb         AO_V02 (Hrd. V2)         V         66.40 V         240.0 *           Va         AO_V02 (Hrd. V3)         V         V3         66.40 V         120.0 *           VD         VD         V3         66.40 V         120.0 *         11         0 A         240.0 *           Ib         AO_I01 (Hrd. 11)         V1         12         0 A         240.0 *         12         120.0 *         12         0 A         240.0 *         13         0 A         120.0 *         14         100.0 ms         14         100.0 *         14         100.0 *         14         100.0 ms         14         100.0 ms         15         100.0 ms         16         10         10         10         10         10         10         10         10         10         10         10         10         10         10         10         10         10         10         10		Votage LL         Appli.in faults LL           S7.50 V         Isr.50 V           Votage LN         Appl.in other faults           [33.20 V         Isr.20 V           VTIRNeutral/VTRPhase:         1.00           CTRGround/CTRPhase:         1.00           Inv. Nease VTs         Inv. Neutral VT           Inv. Phase CTs         Inv. Phase CTs
Simulate Error Sampled Value / GO		
Direction of Operating Interfaces	VSen-Min 0.V	Initial step: Absolute Resolution: 100,00 mA
Nº Curve Pickup Interf	ISeq-Min. 0 A	Min. Resolution V Relative Resolution: 0,10 %
1 67 Disab. V BI01 (Hrd: BI1)	3V0 Min. 0 V	Wait Time for each Incrementation: 100,00 ms
Trigger Intef. Software	300 Min.         0 A           VSeq + Min.         0 V           LSeq + Min.         0 A           * Lints are appled to faults that the components are present	Logic of Directional Lock (Appl. in faults LL): Nether Maximum Wating Time of Non-Operation Region: 200 s Waiting Overtime of Timed Curve: 100,00 ms Based Only in Generated Values
Aguardar PPS Trigger Delay 0,00 s	Aux Source: 110.00 V Heating: 0%	Cycle to Cycle Generation 😒
() Ola Fille lacen	To 47	





## 7.2 Time Screen

In this tab, the operating time and directionality are evaluated. For convenience, a sequence of values will be inserted. The value 10.00A was chosen as the initial value, 15.00A as the final value and 5.0A as the increment step and the AE, BE, CE and ABC fault. In the angles choose  $0.0^{\circ}$  as initial value, for the step choose  $35^{\circ}$  and final value choose  $360.0^{\circ}$ . Choose the "Directionality" tab.



Start the generation by clicking on the icon highlighted below or using the command "Alt + G".



## 7.3 Final Result of the Time Test



nnel: irec	Hrd Se Sync. S	t §⊗ GC et ⁵, SV ction	OOSE Set Set	Start Stop	> Next I >> Next I	Point 🧹 Cle Line 🕳 Cle	ear test ear all Set	ings ₩ Wa	sors Prese Repo	Image: Construction     Recreate Restore     View       Image: Construction     Construction     View
	Hard	lware			Generati	on		Options	Repo	Units Layout
Inse sert/E Se Se B Re Test	Time In the second seco	st Settings	)ptions int t Relative to. Fault Type: Multiple I Faul sult Angle:	INom A-B-C = t: 15,00 A 350,0 °	~					Overcurrent Chart Waveform Phases Directionality TOTO
ints T	Fault	Current	Angle	Curve of Reference	Time Nominal	Time Real	Time Error [%]	Time Error Abs	Status	
	A-B-C	10,00 A	315,0 °	67	0 s	26,46 ms		26,46 ms	Passed	
	A-B-C	15,00 A	315,0 *	67	0 s	21,63 ms		21,63 ms	Passed	
	A-B-C	10,00 A	350.0 °	67	0 s	24,20 ms	-	24,20 ms	Passed	
		15 00 A	350,0 °	67	0 s	22,78 ms		22.78 ms	Passed	
	A-B-C									

It is verified that all points in the operating region acted with times within the tolerance given by the relay manufacturer.

#### 8. Report

After finishing the test, click on the "*Present Report*" icon in the previous figure or using the "*Ctrl* +*R*" command to call up the report pre-configuration screen. Choose the desired language as well as the options that should be part of the report.

Presentation Setting	$\times$
Language Inglês En-US	
<ul> <li>All</li> <li>General Data Test</li> <li>General Data of Tested Device</li> <li>Local of Installation</li> <li>Reference Values</li> <li>Hardware Settings</li> <li>Test Settings</li> <li>Overcurrent Settings</li> <li>Selected Simulation Charts</li> <li>Notes and Observations</li> <li>Explanatory Figures</li> <li>Connections</li> </ul>	
OK Cancel	

Figure 51





Figure 52



## APPENDIX A

## **A.1 Terminal Designations**



Figure 53



## A.2 Technical Data

# Three phase overcurrent protection

Accuracy Additional tolerance X/R ratios: ±5% over X/R 1...90 Overshoot: <30 ms

# Inverse time characteristic

# Accuracy

Pick-up: Setting ±5% Drop-off:  $0.95 \text{ x setting } \pm 5\%$ Minimum trip level for IDMT elements: 1.05 x Setting  $\pm$  5% Inverse time stages: ±40 ms or 5%, whichever is greater Definite time stages: ±40 ms or 2%, whichever is greater Repeatability: 5% Directional boundary accuracy: ±2° with hysteresis <3° Additional tolerance due to increasing X/R ratios: +5% over the X/R ratio from 1 to 90. Overshoot of overcurrent elements: <30 ms



## **APPENDIX B**

Equivalence of software parameters and the relay under test.

Table 1								
Overcurrent	Software	Schneider P545 Relay						
Parameter	Figure	Parameter	Figure					
Direc	42	I>1 Directional	20					
Pkp	41	I1> Current Set	20					
Time/dial	41	I1> Time Delay	20					
ATM 42		I > Char Angle	20					