

INSTRUMENTOS PARA TESTES ELÉTRICOS Test Tutorial

Equipment Type: Protection Relay

Brand: ABB

Model: <u>RET670</u>

Function: <u>32R or PDOP – Power Directional</u>

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

Objective: Perform tests on the reverse power function to verify its directionality

Version control:

Version	Descriptions	Date	Author	Reviewer
1.0	Initial release	30/05/2022	M.R.C.	G.C.D.P.



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Statement of responsibility

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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 Power Directional 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 Current and 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 those common to pins 20, 22 and 24. If these last three points are short-circuited, connect all common to that point. To establish the connection of the current coils, connect channels I1, I2 and I3 with pins 1, 3 and 5 of the relay terminal X401 and the common ones to pins 2, 4 and 6. If these last three points are short-circuited, connect all common to that point.





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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.



Figure 3

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 Project	Ctrl+N
Å	Open/Manage Project	Ctrl+0
	Close Project	
	Save	Ctrl+S
	Exit	
	1: Local Server\CONPROVE	
	2: Local Server\Rockembach	

Choose a name for the project, in which case "32R" was used and then click on "Create".

Server name: My computer P	
Project name:	
32R	
Description:	
direcional de p	oência reversa

Figure 6

Right click on the created plant and insert a substation.



🔤 Local Server\32R - PC	CM600			
File Edit View Tools	s Window Help			
Object Types 🛛 🔻 🕈 🗙	Project Explorer			→ ₽ ×
General 🔦	Plant Structure			
Generic IEC61850 IED	32R			
Sub-Transmission IEDs 🛛 🗙	New	General	•	्रित Substation
Transmission IEDs 🗙	Properties	Create from Template	(IED Group
	Figu	ıre 7		

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

📟 Local Server\32R - PC	M600		
File Edit View Tools	Window Help		
Object Types 🛛 🔻 🕈 🗙	Project Explorer		• • • ×
General 🛠	Plant Structure		
Generic IEC61850 IED	- 🗐 32R		
Sub-Transmission IEDs 🕈	र्र्र् Substation		
Transmission IEDs 🗙	IED Compare 국급 IEC 61850 Configuration		
	Import Export		
	New	General >	KV. Voltage Level
	X Cut ⊫ Copy	Create from Template	J
	Delete Rename		
	Properties		
	Figure	8	

Within the voltage level, insert a bay.



📟 Local Server\32R -	- PCI	N600			
File Edit View T	Fools	Window Help			
0 🚅 🔛 🐰 🗈	B				
Object Types 🛛 🔻 🖗	×	Project Explorer		▼ ₽ X	
General	*	Plant Structure			
Generic IEC61850 IED	*	· 🖃 – 📋 32R			
Sub-Transmission IEDs	*	Substation			
Transmission IEDs	*	IED Compare 동품 IEC 61850 Configuration			
		New	General	▶ 亞	Bay
		χ Cut I≌ Copy	Create from Template		
		Delete Rename			
		Properties			
		Figure 9			

The RET670 relay is inserted inside the bay.





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, sets the basic hardware and communication properties. The made either offline or online.	Configuration wizard configuration can be
Configuration Mode Online Configuration Offline Configuration	
Can	cel Next >

Figure 11

Choose the *"Next > "* option again.

IEC 61850 PCM600	×
PCM600	
el Kack	Next >
	4 <back< td=""></back<>



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 "*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 protocol	
RET670 Configur IEC61850 communic	ation Wizard ation protocol	
PCM600 communication	on	
Port:	Front Port	~
IP address:	10 . 1 .150 . 3	
	Cancel < B	ack Next >

Figure 13

Em seguida clique em *"Next > "* e na tela próxima tela em *"Scan"*.

RET670 - Version Selection Page RET670 Configuration Wizard Version Selection Page	
Conline 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	
Online Mode IED Type RET670 Product Version 1.2.3	Scan
Cancel	< Back Next >

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

Hous	sing\Display Select	ion Page	1441
Online	Mode		
	Housing Type :	670 series housing	
	Display Type :	Large Integrated	

Figure 16



Finally the complete relay information.

🖻 RET670 - Setup	Complete Page
RET670 Configura Setup Complete Page	ation Wizard
Setup is complete.	The configuration that is made for the 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 reopened.
	Cancel < Back Finish
	Figure 17

2.3 TRM_9I_3U_31

Click on the "+" signs next to "*IED Configuration*" and "*HW Configuration*". Right-click on the "*TRM_9I_3U_31*" option and select "*Parameter Setting*".

📟 Local Server\32R - PC	см600			
File Edit View Tools	s Window Help			
D 📽 🖬 X 🖻 🕰		S		
Object Types 🛛 🔻 🖡 🗙	Project Explorer		▼ Ø	×
General 🛠	Plant Structure			
Generic IEC61850 IED	😑 – 🖯 32R	812		
Sub-Transmission IEDs 🕱		tation Voltage Level		
Transmission IEDs 🗶		- T Bay		
		- RET670		
		😑 📲 IED Config	juration	
		😑 👋 🖶 HW	Configuration	
			BIM 4	
			TRM_9[_3U_31	ietting
			LDUMAnalog1_312	onfiguration
		🗉 🖓 Activ	ate setting group	Configuration
		B ₩ 1 Time	or austom	
		⊞ on Form	munication Properties	
		B — Yo Anal B — Yo Hill B — Yo Hill B — Yo Mon B — Yo Application	ag modules toring i Configuration	
Output				→ ‡ X
Date and Time	Category	User	Object Message	· · · · · · · · · · · · · · · · · · ·
8/8/2013 15:34:54.875	Message	[local]\CONPROVE ·	System Project close	: SUPORTETEC01\PCMSERVER\pol_rev
V 8/8/2013 15:45:01.515	Message	[local]\CONPROVE ·	System Project opene	d: SUPORTETEC01\PCMSERVER\32R
V 8/8/2013 16:02:02.890	Message	liocal/CUNPRUVE ·	HE1670 SUL import su	ccessrui
🖺 Logging				
				quinta-feira, 8 de agosto de 2013 16:02:46 🛛 🔒 🔡

Figure 18



In this window, the current and voltage transformation relationships must be configured. In this case, the first three current channels and the last three voltage channels (not shown) will be configured with a ratio of 3000A to 5A and 400KV to 115V, respectively

🔤 Local Server\32R - PC	M600					
<u>File Edit View Tools</u>	IED Window Help					
		👔 🔂 All parameters 🔹 🞝 🛥 🖼 🚺	- 🔨			
Object Types 🔻 🖛 🗙	Project Explorer	▼ 4 × RET670 - Parameter Setting				- 4 Þ ×
General 🛠	Plant Structure	Group / Parameter Name	ED Value [SG1/Common] PC Value [SG1/Common]	Unit	Min	Max 🔥
Generic IEC61850 IED 🕱		V NAMECH1	TRM#-CH1			13 charact
Sub-Transmission IEDs 🕱	the second	✓ ChannelType1	Off			
Transmission IEDs 🗶	= ┳ Vuldge Level	✓ RatedTrans1	1,0	A	0,1	300,0
	E RET670	✓ CTStarPoint1	ToDbject			
	B HW Configuration	V CTsec1	5	A	1	10
	BOM_3	CTprim1	3000	A	1	99999
	BIM_4 BIM_4	V NAMECH2	TBM#-CH2			13 charact
	LDCMAnalog1_312	✓ ChannelType2	Off			
	B Activate setting group	✓ RatedTrans2	1.0	A	0.1	300.0
	⊕—% Time	CTStarPoint2	ToObject			
	B Communication	CTsec2	5	۵	1	10
	B - Communication	CTorin2	3000	۵.	1	99999
	B B HMI	NAMECH3	TBM#JCH3			13 charact
	B B B Configuration	ChannelTura?	0#			To charge
		P Charlenypes	10		01	200.0
		CTStarBaint2	TaOhinat	<u> </u>	0,1	300,0
		Cristan Units	r obliget		1	10
		✓ LIsec3	5	A	1	10
		✓ U1prim3	3000	A	1	99999
		<				
Output						→ 0 ×
Date and Time	Category User Object	Message				^
4/8/2013 15:34:54.875	Message [local]\CONPROVE System	Project closed: SUPORTETEC01\PCMSERVER\pot_rev				
8/8/2013 15:45:01.515	Message [local]\CONPROVE System	Project opened: SUPORTETEC01\PCMSERVER\32R				
8/8/2013 16:02:02.890	Message [local]\CONPROVE · RET670	SUL import successful				~
Logging Logging						4 P.P.
			quinta-feira, 8 di	e agosto c	le 2013 16:19	.40 ADD

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.

🗴 Write parameters to RET6	570 🛛 🛛
Parameter range	
TRM_9I_3U_31	
 Selected group 	
O Selected parameter	
Parameter options	
Changed parameters	Read back
All parameters	
	OK Canad
Fig	ure 20



<u>NOTE: Whenever the user makes a change in any adjustment group, this</u> 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.



2.5 PRIMVAL: 1

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



Local Server\32R - P	РСМ600									
Eile Edit View Ioc	ols IED <u>W</u> indow	Help	1							
0 🚅 🔒 🎒 🐰 🖻	h 🗈 🗠 🖺 🗗		80 - 3	🗈 🔂 All para	meters 🔹 🗘 🛥 🛛 🕀	i 航 📲 🔼				
Object Types 🛛 🔻 🖡 🗙	Project Explorer			→ ₽ X	RET670 - Parameter Sett	ing				→ 4 ▷ ×
General 🕱	Plant Structure	e			Group / Parameter Name	IED Value [SG1/Common	PC Value [SG1/Common]	Unit	Min	Max
Generic IEC61850 IED 🕱	😑 🖯 32R				PRIMVAL: 1					
Sub-Transmission IEDs 🕱	😑 🥀 Sub	istation			 Frequency 		60,0	Hz	50,0	60,0
Transmission IEDs		Voltage Level					100.00			
		B RET670								
		😑 📲 IED Conf	iguration							
		🖃 🔤 🚻 HW	Configuration							
			BIM_4							
			TRM_9I_3U_31							
			LDCMAnalog1_312							
		e Shad	LED wate setting group							
			SETGRPS: 1							
		🕀 🔂 Tim	e							
		⊟ % Pov	ver system							
			PRIMVAL: 1							
		🕀 😵 Cor	nmunication							
		B Ana	alog modules							
		H Sh Ma	i nitorina							
		E S Applicatio	on Configuration							
							11		_	
					12.			_		
								_		
: Output										▲ û X
Date and Time	Category	User	Object	Message	201000					<u>^</u>
16:22:20.125	Message	[local]\CONPROVE ·	RET670	Parameters writter	n successfully					
¥ 8/8/2013 16:22:27.234	Message	[local]\CONPROVE ·	RET670	Reading 33 parar	neters from IED					
V 8/8/2013 16:22:28.359	Message	[local]\UUNPROVE ·	HE1670	Parameters read :	successfully					~
									1 0010 10 0	

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-Ch1" as the reference channel, which is equivalent to the phase of current A. Then click on the highlighted icon in green to save these settings.



Figure 23



2.7 Application Configuration

Select the "Application Configuration" option, right-click and choose "Application Configuration" again. This tab is used to insert the protection logic blocks.

Local Server\32R - PC	CM600									
Ble Edit View Tools	; IED <u>Wi</u> ndow	Help								
				😑 🗈 🔂 Al para	meters 🔹 🗣 🖼 🔠	· 🔥				
Object Types 🔻 🕸 🗙	Project Explorer			* 0 X	RET670 - Parameter Setting					* 4 Þ *
General 🛠	Plant Structure]			Group / Parameter Name	ED Value [SG1/Common]	PC Value (SG1/Common)	Unit	Min	Мах
Generic IEC61850 IED	🕞 📋 32R	-			Application Configuration					
Sub-Transmission IEDs	E R Subs	tation								
Transmission IEDs	8	Voltage Level								
		B RET670								
		😑 📲 IED Cor	figuration							
		😑 🍓 H	V Configuration							
			BIM_4							
			TRM_9I_3U_3							
			LDCMAnalog1_	312						
		E 90 40	tivate setting group	6						
		I T L	SETGRPS: 1	10.						
		ti - ℃b Ti	ne							
		⊜% Po	wer system							
			PRIMVAL: 1	10.						
		00 - ⁰ 0 Co	mmunication							
		⊟ ^u b Ar	alog modules							
		H Sh H	J AISYBAS: I							
		0 - 0 M	onitoring							
		😟 — 💏 Applicat	ion Configuration	Expand						
				_						
				Parameter Setting	1					
				Application Config	juration		1			>
				표표 IEC 61850 Config	uration					
Output				Properties						→ ₽ X
Date and Time	Category	User	Object	Message						^
\$\overline{1}\$ 8/8/2013 16:22:20.125	Message	[local]\CONPROVE · .	. RET670	Parameters writte	n successfully			_		
3/8/2013 16:22:27.234	Message	[local]\CONPROVE	. RET670	Reading 33 para	meters from IED					
16:22:28:359	Message	[local]\CONPROVE	. RET670	Parameters read	successfully					
(in Logging										
- colling							cuintadaira 8 de	a anosto de	2013 16 26 2	

Figure 24

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

📟 Local Server\32R - P(CM600			
File Edit View Tool:	s Format Insert IED Debug Window Help			
i 🗅 🚅 🖬 🖪 🖪 🕻 🐰	- h 🛍 🗱 🖬 🖬 🗑 🗐 🖄 🗠 🗅 🖬 🗶 🗩 100% 🔹 🗩 🖳 🔅		Fixed 📑 🖬 🖬 🐺 🗙	
Object Types 🛛 🔻 🖡 🗙	Project Explorer 👻 🖣 🗙	RET670 - Parameter Setting	VRET670 - Application Configuration	K ∢ b →
All 🖈	Plant Structure	1	2	3
Basic IED functions	-🗃 - 🖯 32R			
Control	B −			
Current protection	B Bay			
Differential protection	E RETG70	A		
Frequency protection	IED Configuration			
Hardware 🎗	BOM_3		Insert Page	Ctrl+Shift+P
Impedance protection	BIM_4		Insert Variable	
Logic 🎗	LDCMAnalog1_312		Insert FunctionBlock	Ctrl+Shift+F
Metering	LED		Insert Hardware Channel	Ctrl+Shift+H
Monitoring 🛠	Activate setting group SETGBPS: 1		Delete page	Ctrl+Shift+D
Multipurpose protection	time the time		Select All	Ctrl+A
Remote communication	Power system TERMINIE 1		00 Find	Childe
Scheme communication	D PRIMVALD: 1	в	ara rina	Chitshet
Station communication	⊞ % Communication		LOCK	COMPANIE
Supervision 🛠	Analog modules			
Voltage protection	⊕ Shara			
Hardware I/O	Generation Generation			
		<		>
		MainApp		• ₫ ▷
are Application Configuration		1 of 1	(H) 168,121	
Output				🔺 İ :
MainApplication Name	Page No Description			
Cogging Application Conf	iguration			
				quinta-feira, 8 de agosto de 2013 16:35:03 🛛 🕂 🤱 🖁

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2.8 SMAI1 (Currents)

Click on the "+" sign next to "*Basic IED functions*" and insert the "*SMAI1*" block that will be responsible for the current channels of the first winding. To understand the perfect functioning of the various blocks, consult the RET 670 manual.



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

ince	
SMAI1	
8	~
1,13	~
	<u>C</u> ancel
	SMAI1 B 1,13 Assign



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.

6	Paste	Ctrl+V	
	Insert Page	Ctrl+Shift+P	
	Insert Variable		٠
	Insert FunctionBlock	Ctrl+Shift+F	
1	Insert Hardware Channel	Ctrl+Shift+H	- î
	Delete page	Ctrl+Shift+D	
	Select All	Ctrl+A	
89	Find	Ctrl+F	
V.S. ASKED	Lock	Ctrl+Shift+L	



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

Select a Hardware Char	nnel		
Hardware Cha H	innels ut put		
	Ins	ert (Cancel

hannel Allocation

location	<u> </u>
TRM_9I_3U_31	~
CH1	~
CH1	
ardware Channel	
	Cancel
	Idecation TRM_9I_3U_31 CH1 CH1 Idware Channel QK

Figure 30

Repeat the procedure of the 3 previous figures changing the *"Hardware Channel"* option to CH2 and CH3. Then make the connections with the block.

Event Server S2R - PCM600		
File Edit View Tools Format Insert IED Debug Window Help		
- C 🖉 🖬 🖪 🕼 🗴 🐘 🎘 🔚 🔚 🖬 🐨 🐨 🖓 👘 🖬 🖉 🖓 👘	🗸 🔽 🗛 🗄 🔲 🛄 💽 🔽 Fixed 📑 🖬 📰 🗐	X
Object Types 👻 🕈 🗙 Project Explorer 🔍 👻 🖡 🗙	RET670 - Parameter Setting RET670 - Application Configuration	on + 4 b X
All Plant Structure	1 2	3
Basic IED functions 🗙 🕢 🖯 32R		
Control		
Current protection		
Differential protection	A	
Frequency protection	38.000	
Hardware 🖈 BOM_3	TRM_9[_3U_31.CH1 SMAI1	
Impedance protection	DFTSPEC 43P	
Logic Logic LDCMAnalog1_312	GRPLT 42 Notured 43	
Metering 2	TRM_9E_3U_31.CH2 GMPL2 A4 Not used AN	
Monitoring	Not used GRP1N	
Multipurpose protection 🛠 🛞 Time	01/T 8/13	
Remote communication	TRM_9L_3U_31.CH3	
Scheme communication	8	
Station communication		
Supervision Analog modules		
Voltage protection		
Hardware I/O		
B		
		×
		3
	MainApp	▼ 4 P
are Application Configuration	(H) (H) 1011 (H) (H) 169,321	
Output		→ ₫ X
MainApplication Name Page No Description		
Contraction Configuration		
Car couping Application Configuration		avieta faita 9 de acesta de 2012 10.20.00 APP
		quinkanella, 8 de agosto de 2013 16:38:00 ABB

Figure 31

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Assign an output to the "AI3P" option. Right-click and choose "Insert Variable > Output".

		Figure 32	
	Lock	Ctrl+Shift+L	
89	Find	Ctrl+F	
	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	
_			

Choose a name for this variable, in this case "AI3P_TC_08ms" and connect with the output "AI3P".



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





Figure 34

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



Figure 35



2.9 SMAI2 (Voltages)

Repeat the procedure in the previous figures changing the used block to "SMAI2", the channels to CH10, CH11 and CH12 and the output variable to "AI3P_TP_08ms".

Local Server\32R - PC	CM600				
File Edit View Tools	Format Insert IED Debug Window Help				
0 🛩 🖬 🎒 🔃 🐰	🕒 🖻 🗮 🖬 📰 🐨 🖾 🗠 🗋 🖬 📾 📲 📾 👹		Fixed		
Object Types 🛛 🔻 🖡 🗙	Project Explorer 🔹 🕈 🗙	RET670 - Parameter Setting R	RET670 - Application Configuration		→ 4 Þ ×
All 🗙	Plant Structure	1	2	3	<u>^</u>
Basic IED functions	-🖃 - 🟮 32R				
Control	日 - 我 Substation 日 - 地 Voltage Level				
Current protection	😑 📅 Bay				
Differential protection	E RET670	A			
Frequency protection	B M HW Configuration	1367			
Hardware 🎗	BOM_3	TRM_91_3U_31.CH10	SMAI2		
Impedance protection	BIM_4		BLOCK AI3P Not used Al1	AI3P_TP_08ms	
Logic 🎗	LDCMAnalog1_312		GRP2L1 A2 Not used A3		
Metering 🎗	LED	TRM_91_3U_31.CH11	Not used AIN • GRP2L3		
Monitoring	Activate setting group	36	Not used GRP2N		
Multipurpose protection	⊞ - 9a Time	TRM_91_3U_31.CH12	Q:1[T.8](14		
Remote communication	Power system TERMINALID: 1	4			
Scheme communication	BINVAL: 1	8			
Station communication	G Communication				
Supervision 🕱	G Analog modules AISVBAS: 1				
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Figure 36

Click on the icon highlighted in green, click on the "*MainApp2*" tab and change the name of the tab to "*CANAIS_TENSÃO*".



Rua Visconde de Ouro Preto, 77 - Bairro Custódio Pereira - Uberlândia – MG - CEP 38405-202.
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Close the "Object Properties" window and insert a new tab to create the reverse power function block.

Local Server\32R - P	CM600						E 6 🛛
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	he	MainApplication	0 100% • 0 2		Fixed - I D F X		
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Current protection		Yariable •					
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Hardware 🎗	1	BOM_3		TRM. 64, 31, 31, CH10	SMAI2 a		
Impedance protection		BIM_4			BLOCK ASP		
Logic 🎗	1	LDCMAnak	g1_312		06/011 A21		
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						quinta-teira, 3 de agosto de 2013	17:35:38 ABB
				30			

Figure 38

2.10 GOPPDOP (Reverse Power)

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

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Station communication 🕱 🛞 Communication		SDEPSDE		
Supervision 2 In Analog modules		TRPTTR	~	
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e Application Configuration		101 (9 (9 103,120		
Output				+ 0 ×
MainApplication Name Page No Description				
Logging Application Configuration				

Figure 39

Click on "Assign" (picture not shown). Insert two input variables using the same names given for the current and voltage channel outputs and link with the current and voltage inputs respectively. Create an output variable with the following name:





Figure 40





Figure 41



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 Server\32R - PCM600					
Eile Edit View Iools Eormat Insert IED Debug Window Help					
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Basic IED functions 🕿 📋 🕄 Picture					
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				sexta-feira, 9 de agosto de 2013 08:11	:48 ABB

Figure 42

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

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

Figure 43



Insert Hardware Channel	
Select a Hardware Channel	
Hardware Channels Binary Input Binary Output Analog Input	
Insert Cano	el

Figure 44

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

Cocal Server\32R - PCM600	
File Edit View Tools Format Insert IED Debug Window Help	
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Object Types 🗢 🕈 🗙 Project Explorer 🔷 🗣 🕹	RET670 - Parameter Setting RET670 - Application Configuration
All All Plant Structure Basic IED functions Plant Structure Basic IED functions Plant Structure Control All Control Basic IED Configuration Frequency protection All Hardware All Multipurpose protection All Renote communication Scheme communication Scheme communication Supervision Voltage protection All Hardware I/O All Hardware I/O All	A A Hardware Channel Allocation Hardware Channel B0M_3 Hardware Channel B01 Creste unassigned Hardware Channel OK Cancel
Replication Configuration MainApplication Name Page No Description	CANALS_CORRETE CANALS_TENSÃO POTÊNCIA_REVERSA MainApp2
Logging Application Configuration	sexta-feira, 9 de agosto de 2013 08:13:16 🛛 🔒 🔒

Figure 45



Create an input variable using the name of the output variable of the power directional block and associate the binary output. Change the name of the tab to "SAÍDAS BINÁRIAS".

🕾 Local Server\32R - PCM600		
Ele Edit View Iools Format Insert IED Debug Window Help		
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Hardware I/U R Monitoring		
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are Application Configuration	(K) (K) 1 of 1 (H) (H) 393,309	RET670 Application Configuration
Output		▲ ± ×
MainApplication Name Page No Description		
Logging Application Configuration		
	8	exta-feira, 9 de agosto de 2013 08:15:10 🛛 🕂 🥵

Figure 46

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



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Application Configura	tion				1 of 1 🛞 🤇	н) 36,-2		RET670 Applicatio	on Configuration	
Output										₩ ₽ ×
MainApplication Nam	e P	age No Description								

Figure 47

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* > *POTÊNCIA_REVERSA* > *Current protection* > *PhaseOverCurrent4Step(PTOC,51_67)*" and finally "*OC4PTOC:1*".



Activate the function and make the following adjustments:



oject Types 🛛 🔻 🖡	× Project Explorer		▼ ₽ × RET670 - Parameter Setting	RET670 - Application Configu	uration			- 4		
neral	Plant Structure		Group / Parameter Name	ED Value [SG1/Common]	PC Value [SG1/Common]	Unit	Min	Max		
neric IEC61850 IED	☆ 🕞 🖯 🕄 32R		🖉 GOPPDOP: 1							
-Transmission IEDs	Substatic	n haas Laval	🖌 General			1				
nsmission IEDs	* 8 1	3 Bay	✓ IBase		3000	A	1	99999		
	é	RET670	✓ UBase		400,00	kV	0,05	2000,0		
		Application Configuration	⊮ Mode		L1, L2, L3					
		CANAIS_CORRETE	Setting Group1							
		POTÊNCIA_REVERSA	✓ Operation		On					
		Current protection	PD 08 23) 🖌 k		0,000		0,000	0,999		
			✓ IAmpComp5		0,000	%	-10,000	10,000		
		B SAÍDAS_BINÁRIAS	✓ IAmpComp30		0,000	%	-10,000	10,00		
			✓ IAmpComp100		0,000	%	-10,000	10,00		
			✓ UAmpComp5		0,000	%	-10,000	10,00		
			✓ UAmpComp30		0,000	%	-10,000	10,00		
			✓ UAmpComp100		0,000	%	-10,000	10,00		
			✓ IAngComp5		0,000	Deg	-10,000	10,00		
			✓ IAngComp30		0.000	Deg	-10.000	10.00		
			V IAngComp100		0.000	Dea	-10.000	10.00/		
			Step 1							
			0 ° ° 1							
	<u>s</u>									
out	0.2203									
ate and Time	User	Message								
3/2013 08:22:04		Parameter [GUPPDUP: 1/General/Setting Group1/Up	eration] value modification has effected to parameter	(GUPPDUP: 1/Step 2/Setting L	iroup1/1ripDelay2] propertie	25.				
3/8/2013 08:22:04		Parameter [GOPPDOP: 1/General/Setting Group1/Op	eration] value modification has effected to parameter	[GOPPDOP: 1/Step 2/Setting 0	iroup1/DropDelay2] propert	des.				

Figure 49

Local Server\32R - PCM600 Edit View Tools IED Window Help File 🗅 🖆 🛃 🎒 👗 🖻 💼 🕫 📴 🐨 🗄 🗊 😧 🗄 🛄 🔂 🖂 🔁 All parameters • | 💠 🛥 | 🖽 | 🚹 • 🔼 iect Explorer Plant Structure 32R 4%, Voltage Level 5 Bay 6 FETS70 7 FE RET670 - Parameter Setting RET670 - Application Configuration Group / Parameter Name IED Value (SG1/Common) PC Value (SG1/Common) Unit Object Types 🔻 🕈 🗙 Project Explorer - 4 Þ × \$ Min Max General IAngComp30 0,000 Deg -10,000 10,000 Generic IEC61850 IED Sub-Transmission IEDs IAngComp100 0,000 Deg -10,000 10,000 Transmission IEDs \$ Step 1 Setting Group1 OpMode1 OverPowe %SB 0,0 500,0 Power1 10,0 Angle1 180.0 Deg -180.0 180.0 TripDelay1 0,500 0,010 6000,000 s DropDelay1 0,060 0,010 6000,000 Hysteresis1 0.5 0.2 5,0 pu Step 2 Setting Group1 Off OpMode2 120,0 %SB 0,0 500,0 Power Angle2 0.0 Deg -180.0 180.0 TripDelay2 1,000 0.010 6000.000 s DropD elay2 0,060 0,010 6000,000 2 0,5 pu 0,2 5,0 ۶ Output • 4 × Date and Time User Message 1 9/8/2013 08:25:07 Parameter [GOPPDOP: 1/Step 2/Setting Group1/OpMode2] value modification has effected to parameter [GOPPDOP: 1/Step 2/Setting Group1/TripDelay2] properties 9/8/2013 08:25:07 9/8/2013 08:25:07 Parameter (GOPPDDP: 1/Step 2/Setting Group1/0pMode2) value modification has effected to parameter (GOPPDDP: 1/Step 2/Setting Group1/0pMode2) value modification has effected to parameter (GOPPDDP: 1/Step 2/Setting Group1/0pMode2) value modification has effected to parameter (GOPPDDP: 1/Step 2/Setting Group1/0pMode2) value modification has effected to parameter (GOPPDDP: 1/Step 2/Setting Group1/0pMode2) value modification has effected to parameter (GOPPDDP: 1/Step 2/Setting Group1/0pMode2) value modification has effected to parameter (GOPPDDP: 1/Step 2/Setting Group1/0pMode2) value modification has effected to parameter (GOPPDDP: 1/Step 2/Setting Group1/0pMode2) value modification has effected to parameter (GOPPDDP: 1/Step 2/Setting Group1/0pMode2) value modification has effected to parameter (GOPPDDP: 1/Step 2/Setting Group1/0pMode2) value modification has effected to parameter (GOPPDDP: 1/Step 2/Setting Group1/0pMode2) value modification has effected to parameter (GOPPDDP: 1/Step 2/Setting Group1/0pMode2) value modification has effected to parameter (GOPPDDP: 1/Step 2/Setting Group1/Hystersis:2) properties Logging | Application Configuration | EII RET670 - Parameter Setting sexta-feira, 9 de agosto de 2013 08:25:32 🛛 🕂 🥵 🐘

Disable step 2 and click on the icon highlighted in green color to save the changes:

Figure 50

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Right-click on the relay icon and submit the changes. In the following messages click on "Sim".

Local Server\32R - PC	CM 600							
Ele Edit Yiew Iools	: IED <u>W</u> indow <u>H</u> elp							
i D 🧀 🖬 🍯 🗼 🖻		1	🗎 🔁 🖂 🔁 🔂 All para	ameters 💽 🛃 🔁 🔛 🚺	- 🔼			
Object Types 🛛 🔻 🛱 🗙	Project Explorer		→ # ×	RET670 - Parameter Setting	RET670 - Application Confi	guration		- 4 Þ ×
General	Plant Structure		Collapse	Group / Parameter Name	LED Value [SG1/Common]	PC Value [SG1/Common]	Unit Min	Мах
Generic IEC61850 IED	-🖃 - 📵 32R			₽ RET670				
Sub-Transmission IEDs 🕱	Substation	CITER OF	Signal Monitoring					
Transmission IEDs 🗶			Disturbance Handling					
	E RET67		Event Viewer					
			Parameter Setting					
	50 A	a 🎒	Application Configuration					
		3	Signal Matrix					
	e		Graphical Display Editor					
	1		Hardware Configuration					
		G.	Migrate Configuration					
	hourse	9	IED Licerc					
		25						
		1	IED Compare					
		<u> -</u>	IEC 61850 Configuration					
		1	Communication Management					
		E	License Update Tool					
			Create Template					
			Import					
			Export					
			Read from IED					
			Write to IED	and and a second se				10000
			Report Parameters	<				>
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Date and Time	User Message							^
9/8/2013 08:25:07	Parameter (GC	PP &	Cuţ	e modification has effected to parameter [G	OPPDOP: 1/Step 2/Setting	Group1/TripDelay21 properties.		
19/8/2013 08:25:07	Parameter (GC	PP 1	Copy	e modification has effected to parameter [G	OPPDOP: 1/Step 2/Setting	Group1/DropDelay2] properties	1.	
1/2013 08:25:07	Parameter (GC	PP	Delete	e modification has effected to parameter [G	OPPDOP: 1/Step 2/Setting	Group1/Hysteresis2] properties	(-
Logging Application Confi	ouration Fil RET670 - Parameter Setting		Rename					×
		-	Properties			sexta-feira, 9 de a	agosto de 2013 08:33:19	ABB

Figure 51



Figure 52

4. Power Directional software adjustments

4.1 Opening the Power Directional

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



Click on the Power Directional software icon.









Figure 55

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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.



Figure 56

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

General	General Inform, System No	tes & Obs. Explanatory Figures	Check List Othe	rs Connections	
General	Test:	Explanatory righter			
irectional Power	Descr: Reverse Power	Directional	Date:		
	Tested device:				
	Identif:	23031982 ~	Model	RET670	~
	Туре:	Transformer Protection	Manufacturer:	ABB	~
	Location:				
	Substation:	Conprove			~
	Bay:	1	~		
	Address:	Visconde de Ouro Preto 75, Custódio	o Pereira		~
	City:	Uberlândia	~	State:	MG ~
	Responsible:				
	Name:	Michel Rockembach de Carvalho			~
	Sector:	Engineering	Registry:	00001	~
	Tool Test:				
	CE-6710	Series Nun	n.: 03010187CCM332	222211U5HVRGLGLGL22	ZORXO

Figure 57

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



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.



Figure 58

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. Channel Direction and Hardware Configurations

Click on the icon illustrated below.





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".



:ttings	
Master Slave 1 Slave 2	Main Sampled Value Others
Model CE-6710 Serial Number 03010187CCM33222211U5HVRGLGLGL2Z0RX0 V	Binary Outputs: Auxiliar Source: Initial State Initial State B01: NO B02: NO
Standard - Voltages: • 4 x 300 V; 100 VA • 2 x 600 V; 180 VA • 2 x 600 V; 180 VA	BO5 and BO6 type: - 110 V Conventional BO5: NO - 48 V
○ 2x 300 V; 150 VA ○ 1x 600 V; 350 VA ○ 1x 300 V; 250 VA	BO6: NO ✓ 24 V ○ IRIG (BO5) /Clock (BO6) Other Off
Customized Assoc.	Transistor TTL 250,00 V Binary / Analog Inputs:
Standard - Currents: • 6 x 32 A; 220 VA • 3 x 64 A; 400 VA	B11: BI - Contact B12: BI - Contact B13: BI - Contact B14: BI - Contact
2 x 96 A; 550 VA 11 12 2 x 10,00 A; 300 VA 12 12 1 x 192 A; 1100 VA 12 13	BI5: BI - Contact BI6: BI - Contact BI7: BI - Contact BI7: BI - Contact
	BIS: BI - Contact BIS: BI - Contact BIS: BI - Contact BID: BI - Contact
Electromechanical:	BI11: BI - Contact BI12: BI - Contact Considers absolute values to Voltage-BI AI 1-6 : 2V; 20V; 500V
Customized Assoc. Connect CTs Range 1,25 A	AI 7-12 : 200mV; 2V; 500V

Figure 61

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

Cha	nels Direct.		– 🗆 X
Local	Model Reset for Hard.	Basic	Confirm
s.	CE-6/10 V	Advanced	Cancel
jot	Serial Number:		
Ren	09703227CCM33222211U5HVRGLGLGL2Z0RXD <	ON Line ⁵ ₀ S. Value	Import Export

Figure 62

6. Power Directional Adjustment

6.1 Directional Power Screen > Definitions

In this tab you can adjust the pickup definition, power, time and angle tolerances. These tolerances should be consulted in the relay manufacturer's manual (available in Appendix A). There is also the option of limiting a maximum value for both voltage and current.





Figure 63

6.2 Directional Power Screen > Directional Power Elements > Active

Here the reverse power directional element is configured. To do this, click once on the highlighted "+" icon.





Figure 64

For the first element change the name to 32R, choose the directionality as reverse, set the pickup value and the run time. Remembering that the pickup value must be referenced to the secondary according to the following formula:

$$P_{secundary} = \frac{P_{primary}}{VTR * CTR}$$
$$P_{secundary} = \frac{1200M}{\left(\frac{400K}{115}\right) * \left(\frac{3K}{5}\right)}$$
$$P_{secundary} = 995,92W$$

$$P_{secundarv} = 0,1 * 995,92 \approx 99,60W$$

In the "Individual Directionality" tab set the "Reverse" option, the maximum torque angle "ATM" should be set as "Normal" and the positive and negative angular offset as 90° and -90° .





7. Test Structure for function 32

7.1 Test Settings

In this tab, you must configure the trip signal direction with the binary input, in addition to configuring the generation channels. Enter a pre-fault with rated voltage and current with a time of 100ms.



🥵 🗋	📔 🚽 🗧 Power Direction	al 2.0	2.171 (64	4 Bits) - CE-67	710 (0970322)								- 0	\times	
Arquivo	Start Display Sof	twar	Option	s										~ 🕻	Ð
Direc	Config Hrd Stress Config Config Sync ₅, Config Is Connection Hardware	GOO SV	SE St	art Stop	> Next Point >> Next Line	✔ Clear test ∰ Clear all	Settings	Report Unids	Rebuild Restore Graphics Layout	View					
Shootin	o Search Route Test S	ettin	as												
Direc	Generation Channels	1	Enable	e Pre-Simulatio	n 1	Enable i	Pre-Simulation 2	Enable Post-Sin	nulation			Mod	o de Teste		
	Generation Channel		Mode	Trif F	En ABC	-		0				M	de V Cons		
Va	AO V01 (Hrd: V1)	-	V1	66,40 V	0.							V-	N 50.00 \	/	
Vb	AO_V02 (Hrd: V2)	-	V2	66,40 V	240,0 °										
Vc	AO_V03 (Hrd: V3)	-	V3	66,40 V	120,0 °	1						RTPD	esloc / RTF	PPhase:	
VD		-											1,00	_	
la	AO_I01 (Hrd: I1)	•	11	5,00 A	0*							RTC	Terra / RTC	Phase:	
lb	AO_I02 (Hrd: I2)	•	12	5,00 A	240,0 °								1,00	_	
lc	AO_103 (Hrd: 13)	•	13	5,00 A	120,0 °							0	lov TP's P	1360	
IE		-1										ŏ	Inv. TP Shit	ft	
Binany BO GO Direc	& Goose Outputs - Missing	•	Pre Binary & G BO GO Simu	-Simulation Tim ioose Outputs 0; 0; 0; late Error Sam	ne 1: 100,00 ms - Pre-Simulation 1 0; 0; 0 npled Value / GC Initial NA \						Search Test Initial step:	Absolute Resolution:	Inv. TC's Ph Inv. TC Ter 100,00 mA	hase ra	
N	Cupie			Interf Trip		1					Min Resolution $$	Relative Resolution:	0,10 %	-	
No 1 S	Curve 32R art Interf. Software Wat for PPS]	Starting	BI01 (Hrd: E	BI1) V						Max Wait Tin Waiting Ov Mumhar of renatilions in	re Region NO Operation: entime Operation Region: Reset time: case of canaration empr Based Only on General Cycle to Cycle 0	2,00 s 100,00 ms 100,00 ms 2 ed Values ieneration		
(1)	N Line New						Aux font	: 110,00 V He	ating: 0%						

Figure 66

7.2 Shooting Screen

In this tab click on *"Sequence"* and choose the value of the initial and final power and the step. Repeat the process for the angles as shown in the following figure.

🎦 🗋 🚅 🚽 Power Directional 2.02.171 (64 Bits) - CE-6710 (0301018)				×
Arquivo Start Display Software Options				~ ?
Config Hrd & Config GODSE Direc Channels N Connection Hardware Config Struct Channels Config Struct Hardware Config Struct Hardware Config Struct Start Stop Start Stop Channels Config Struct Start Stop Channels Config Struct Start Stop Channels Config Struct Start Stop Channels Config Struct Channels Config Struct Channe	→ Phasors ings ⑤ Trajectory options Report	t Unids	build Restore View raphics Layout - Layout	
Shooting Search Route Test Settings				
Insert / Edit Points		Graphic Wa	Waveform Phasors Trajectories	-
Intent / Edit General Options Edit Point Text Type ABC NEW Point Definitions Text Type: Texts Sequence Ist: 0.00 VA @ 0.00" Text Type: Texts Sequence Benove P. 0.00 VA @ 0.00 VA Statt: StoouVA Benove I: 0.00 A V. StoouVA Statt: StoouVA Remove All System Angle 0.0" Step: 150.00 VA Step: 30.0 Text Points Confirm Cargo Cargo Cargo Cargo	of Points (Ø) 0 ° 0 0 ° cel	391.+994	110.0 ->w,+>ba Type ABC 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00 90.00	s Error .013 ° 54 V Ar
No. S[VA] AngS['] P [W] Q [VAr] Element Reference Region Acted T	Time Time v ominal Real v			
Impo: Points General Info Power FP Ref Bem. Performance Time Error List Protection Status Non Line New	Aux font 250,0	-wVac 00V Heating: ro 67	g 0%	
Tipo: Points O General Info Power FP Ref Bem. Performance Time Error List Protection Status New	Aux font: 250.0	-w;-vAr 20 V Heating: re 67	g 0%	



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



Figure 68

7.3 Final Result of the Shooting Test

In this test, it can be verified that within the operating region the relay operates within the predicted time plus its tolerance. In the case of the non-operation region, the relay does not act, proving the correct functioning of the function.



7.4 Search screen

In this tab, the power value that starts the relay is evaluated. For convenience, a sequence of values will be inserted, set the *"Test Type"* field to *"ABC"*. The field *"Line Definition"* was defined as *"P"*, with an initial value of -50.0W and a final value of -150.0W. In the *"Variable (Q)"* field, the initial value was 200.0Var, the final value was -200.0Var and with a step of -50.0Var.



🍄 🗋 🧀 🔙 🖛 F	Power Directional 2.02.17	71 (64 Bits) - CE-6710 (0301018)			×
Arquivo Start [Display Software Op	rtions			~ (
Direc Channels	Ird 😵 Config GOOSE ync 🍕 Config SV ion	Start Stop > Next Point & Clear test > Next Line & Clear all	Settings	Report Report	Rebuild Restore View Graphics Layout
Hard	Iware	Generation	options	Report Unids	Layout
Snooting Search	Route Test Settings			- Granhic	Wayaform / Dharorr / Trajactorian
_ Insert / Edit	General Options			• Graphic	
Edit Line Edit Line New line Sequence Bernove Remove Al	Test Type ABC Ini Point ISI: ISI: 0.00 VA P: 0.00 W I: [0,00 A End Point ISI: ISI: [0.00 VA P: [0.00 VA P: [0.00 VA ISI: [0.00 VA P: [0.00 VA P: [0.00 VA	© 0.00 * Sequence Q: 0.00 VAr Line definition Vistantian V: 50.00 V Type: P Start: 50.00 W Start: Final: Final: Q: 0.00 V/r Final: Tspo: Start V: 50.00 V/r Confirm Start	No. of Points:) 9 = 200,00 VAr - 200,00 VAr - 50,00 VAr Cagoel	396.+096	1100 →M, →Me Type ABC 5000 Subtle: Subtle: 0000 0000 Ports Found 0000 5000 Ports Found 0000 Ports Found Ports Found
Test Points				•	
Tested Points No. S [VA]	AngS[*] P [W]	Q [VAJ] Element Time Nominal Time Reference Nominal to V&I	Va Vb	-WVA	99196
🚯 ON Line	New		Aux font:	250,00 V Heat	ating: 0%
			E.	immo 70	

Figure 70

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



Figure 71

7.5 Final search test result



Arquivo	Start	Power Dire	ctional 2.02. Software C	171 (64 Bits) Options	- CE-6710 (0	301018)										- 0 × ^ (?
Direc Channel	Config Config Config th Conne Ha	g Hrd ्ि Co g Sync ₅ु Co ection ardware	onfig GOOSE onfig SV	Start	Stop > N Gene	ext Point 🧹 ext Line 🤞 ration	Clear test Clear all	ttings ↔ Waveform ↔ Phasors ↔ Trajectory options	Report Report	P) S abs rel Unids	Rebuild Restore Graphics Layout	View				
Shooting	Search	Route	Test Settings													
Inse	ert / Edit Poi	nts							•	Graphic	Waveform P	hasors Traj	ectories			-
Insert / Test Tested I	Edit Points	General	Options						•	W: +VAr		200	.0		+W; +VAr	Subtite:
No.	Test	S [VA]	AngS [°]	P [W]	Q [VAr]	Element Reference	e Status			4	·			\wedge		Points Found Search Lines
02	ABC	180,1 VA	123,6 °	-99.60 W	150,0 VAr	32R	Approved				\checkmark .	100	1.0	\rightarrow		Colors NT OK Error
03	ABC	140,8 VA	134.8 °	-99,15 W	100,0 VAr	32R	Approved					$ \land $		<u>}</u>	\backslash	S: 337,974 VA ; Ø: -151,645 ° P: -297,425 W ; Q: -160,515 VAr
04	ABC	111,2 VA	153,3 *	-99,30 W	50,00 VAr	32R	Approved									<u>9</u> 4° (4)4
05	ABC	99,60 VA	180,0 °	-99,60 W	0,0289 pVAr	32R	Approved	_				\square	\square			
06	ABC	111,8 VA	-153,4 °	-100,0 W	-50,00 VAr	32R	Approved					\sum			/	
07	ABC	141,3 VA	-134,9 °	-99.80 W	-100,0 VAr	32R	Approved	_			$\prec \cdot$				\leq	
08	ABC	180,0 VA	-123,6 *	-99,50 W	-150,0 VAr	32R	Approved				•				\rightarrow	
09	ABC	223,2 VA	-116,3 °	-99.00 W	-200,0 VAr	32R	Approved					and the second sec				
<u>Tipo:</u>	Points	V 🗹 Ger	ieral Info 🔽	Power 🛃 F	Ref Elem. 🗌	Time 🗌 V	/&			W; -VAr	\times /				+W: -VAr	
Error	List Pro	nection Stat	us						250.00							
<u>(</u> * 0)	v Line	Nev	v					Aux font	• 250,00	Hea	ting: 0%					

Figure 72

It is verified that all active power values are within the tolerance region provided by the 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	×
Language Inglês En-US \sim	
 All General Data Test General Data of Tested Device Local of Installation Reference Values Hardware Settings Test Settings Overcurrent Settings Test Results Selected Simulation Charts Notes and Observations Explanatory Figures Check List Connections 	
ОК	Cancel

Figure 73





Printing Preview... Nº of Pages: 11



APPENDIX A

A.1 Terminal Designations



Power supply module (PSM)

Figure 74



Transformer input module (TRM)







Figure 76

A.2 Technical Data

Function	Range or value	Accuracy		
Power level	(0.0–500.0)% of S _{base}	\pm 1.0% of S _r at S < S _r \pm 1.0% of S at S > S _r		
	At low setting: (0.5-2.0)% of S _{base} (2.0-10)% of S _{base}	< ± 50% of set value < ± 20% of set value		
Characteristic angle	(-180.0–180.0) degrees	2 degrees		
Timers	(0.00-6000.00) s	± 0.5% ± 10 ms		

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 -



APPENDIX B

Equivalence of software parameters and the relay under test.

Table 1			
Power Directional Software		RET 670 Relay	
			-
Parameter	Figure	Parameter	Figure
Ркр 3Ф	65	Power 1	50
Time	65	Angle 1	50