

SACE PR010/T test unit annex



ABB SACE		SACE PR010/T	RH0029002	L2551	EN
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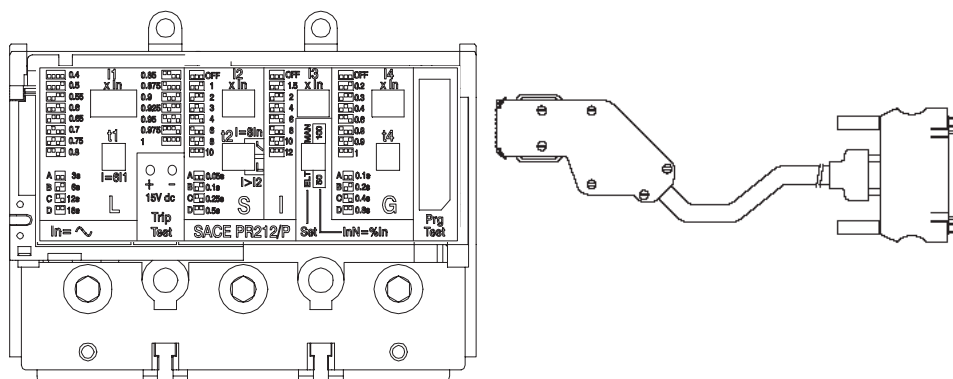
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1. Indications on the functions of the unit SACE PR010/T (version SW 7.0)

Electronic releases foreseen [also known as DUT (Device Under Test)]:

SACE PR111	(in all IEC versions)
SACE PR112	(in all IEC versions)
SACE PR113	(in all IEC versions)
SACE PR111-A	(in all UL versions)
SACE PR112-A	(in all UL versions)
SACE PR113-A	(in all UL versions)
SACE PR121	(in all versions)
SACE PR122	(in all versions)
SACE PR123	(in all versions)
SACE PR212/P	(with test connector on the front)
SACE PR212/MP	(with test connector on the front)
SACE PR222DS	(in all versions)
SACE PR222MP	(in all versions)
SACE PR23EF	(in all versions)

2. SACE PR212/P protection release

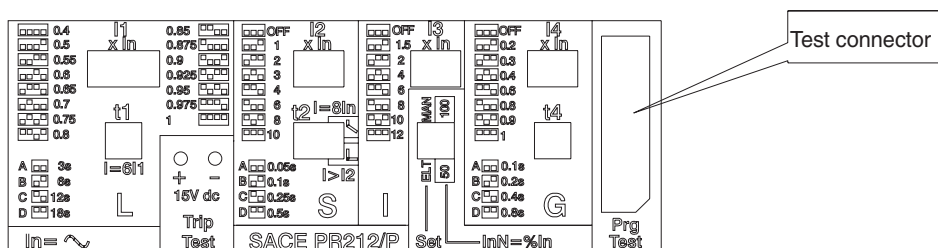


2.1 Operation mode menu tree

1	2	3	4	5	6	7	8	9
Operation mode	7. Select DUT (PR212/P)	1. Test	1. Protections	1. Automatic	Start test (select SET ELT)		Create report	
				2. Manual	1. Default setting	Start test		
					2. User setting	Set parameters		
		2. Reading	1. Ammeter	Read currents				
			2. Config./Param.	1. DUT configuration and param.	1. Manual parameters	Display DUT configuration and parameters		
					2. Electronic parameters	Display DUT configuration and parameters		
				2. Default parameters	1. Only for test	Display default configuration and parameters		
					2. Operative	Display default configuration and parameters		
			3. Information	Read release identification, SW version and Serial Number				
			4. Tripping parameters	Display tripping parameters				
		3. Programming	1. Change DUT parameters	1. DUT config.	Change DUT configuration parameters			
				2. DUT parameters (ELT)	Change DUT protection parameters			
			2. Default parameters	Program DUT with default parameters for normal operation				
			3. Def. default parameters	1. Only for test	Define DUT protection parameters			
				2. Operative	Define DUT protection parameters			

2.2 Indications on operation

- The SACE PR010/T unit can be used only with SACE PR212/P and SACE PR212/P-LSIG protection releases with test connectors on the front.



- The automatic test and the manual test with default parameters may be performed only by turning the protection release to electronic SET with the dip switch provided.
- The manual test may be performed either with electronic SET or with manual SET. In the case of manual test with manual SET, thresholds and curves must be selected with the dip-switches

on the protection; they are automatically updated on the display of the PR010/T unit, where only the test current and the phase on which it is to be applied must be set.

- If during test, reading or programming operations, CB type and CT current rating are not yet defined, the following message will be displayed:

WARNING

Config. not valid

To set the missing data, proceed as follows:

1. Press ENTER
2. Select the type of CB and the current rating of the CT
3. Store the settings by pressing ENTER



WARNING

Connect the test wire provided (between the SACE PR010/T and the SACE PR212/P) the right way round (see drawing in par. 6).

Manual test example for release PR212/P

NOTE: the data indicating the type of CB and protection, the rated current of the CTs and the Neutral setting, are automatically identified by the PR010/T.

In this example, protection function "S" is tested with curve t=k, threshold $I_2=1.00 \cdot I_n$, curve $t_2=0.5s$ supplying a fault current equivalent to 2 times the rated current (I_n).

1. Set the PR212/P in Manual mode with: I1 at 1 In curve D, I2 at 1 In curve D T=K, I3 and I4 in OFF.	
2. From the main menu select 1.	(Operation mode)
3. Select the PR212 unit with x.	(PR212)
4. Select the type of activity with 1.	(Test)
5. Select the type of test with 1.	(Protections)
6. Select the test mode with 2.	(Manual)
7. Select the type of setting used to test the protections with 2.	(User setting)
8. This appears: "Manual test with MAN parameters, press ENTER to proceed".	
9. Select the protection function you want to test with 2.	(S protection test)

10. Using the arrow keys, set I-F=2.00:

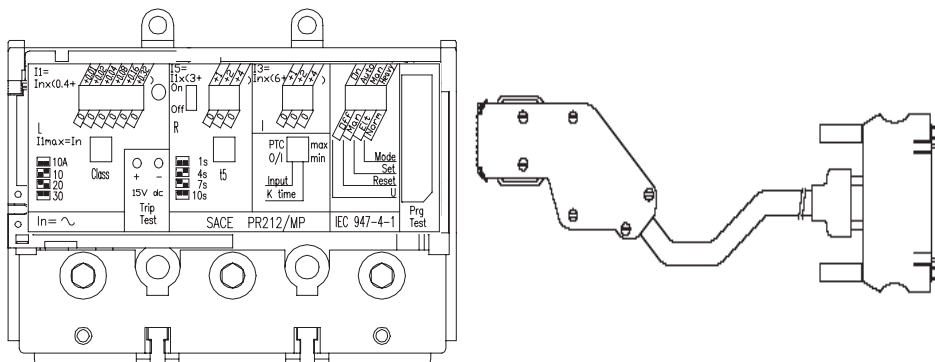
```
S-PROT: t=k,  ON
I2: 1.0  In => 400 A
T2: 0.5 s
I-f: 2.00 => 800 A (*)
```

(*) In this example, the automatically identified rating of the current sensor is 400A.

11. Select the phase (or phases) on which to simulate the fault current. (L1+L2+L3)

12. Press ENTER to activate fault simulation.

3. SACE PR212/MP protection release

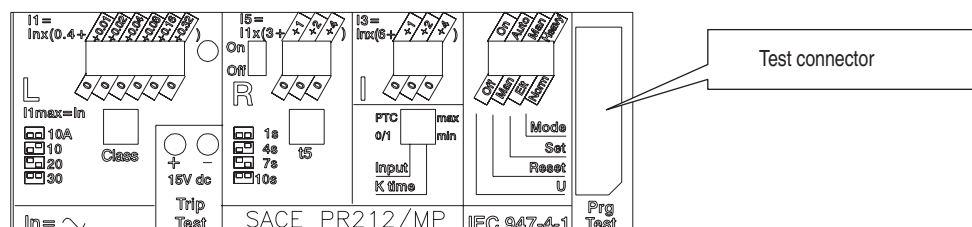


3.1 Operation mode menu tree

1°	2°	3°	4°	5°	6°	7°	8°	9°
1. Operation mode	8. Select DUT (PR212/MIP)	1. Test	1. Protections	1. Automatic	Start test (select SET ELT)		Create report	
				1. Manual	1. Default setting	Start test		
					2. User setting	Set parameters		Start test
			2. Trip test	Start test				
			3. Set coil	Start test				
			4. Reset coil	Start test				
		2. Reading	1. Currents	Read currents				
			2. Config./Param.	1. DUT config./param.	1. Manual parameters	Display DUT configuration and parameters		
					2. Electronic parameters	Display DUT configuration and parameters		
				2. Def. parameters in PR010/T	1. Only for test	Display DUT default configuration and parameters		
					2. Operative	Display DUT default configuration and parameters		
			3. Inputs	Read inputs				
			4. Tripping parameters	Display tripping parameters				
			5. Information	Read release identification, SW version and Serial Number				
		3. Programming	1. Change DUT config./par.	1. DUT configuration	Change DUT configuration parameters			
				2. DUT parameters (ELT)	Change DUT protection parameters			
			2. Download default parameters	Program DUT with default parameters for normal operation				
			3. Def. parameters in PR010/T	1. For test	Define DUT protection parameters			
				2. Operative	Define DUT protection parameters			

3.2 Indications on operation

- The SACE PR010/T unit can be used with all SACE PR212/MP releases with test connectors on the front.



- For the test with SACE PR212/MP protection releases version 1 (with automatic data reading by the PR010/T unit) the maximum test current is $7.3 \cdot I_n$; that is why the automatic test will test the protection functions in accordance with the above.
- The automatic test and the manual test with the default parameter set can only be performed if the protection release is configured in Electronic SET (ELT) mode using the dip switch provided.
- The manual test with the user's parameter set can be run both in electronic SET (ELT) and in manual SET (MAN) mode. In the case of manual test with manual SET, thresholds and curves must be selected with the dip-switches on the protection; they are automatically updated on the display of the PR010/T unit, where only the test current and the phase on which it is to be applied must be set.
- If the PTC for protection against overtemperature is not present, during the tests it is necessary to set the "Input" dip-switch as the generic input (Input = 0/1).
- The "Welded contacts" (WC) input has to be at 0V (no alarm) during the tests.
- At the end of each test, the PR010/T unit waits until the thermal memory has returned to zero before proceeding with any subsequent tests in order to avoid any overlap in operation between the function being tested and the overload function (L).
- For the test on the protection function against locked rotor (R), the PR010/T unit waits for an initial interval, which depends on the class specified for the L protection function (max. duration 24s) before performing the test.
- If during test, reading or programming operations, CB type and CT current rating are not yet defined, the following message will be displayed:

WARNING
Config. not valid

To set the missing data, proceed as follows:

- Press ENTER
- Select the type of CB and the current rating of the CT
- Store the settings by pressing ENTER



WARNING

Connect the test wire provided (between the SACE PR010/T and the SACE PR212/MP) the right way round (see drawing in par. 9).

Example of an automatic test application on the PR212/MP release

NOTE: the data indicating the type of CB and protection and the current rating of the CTs are automatically identified by the PR010/T test unit.

In this example, all the protection functions implemented by the SACE PR212/MP release are tested automatically:

1. Set the PR212/MP in electronic set mode.	(ELT)
2. From the main menu select 1.	(Operation mode)
3. Select the PR212MP unit with x.	(PR212/MP)
4. Select the type of activity with 1	(Test)
5. Select the type of test with 1	(Protections)
6. Select the test mode with 1	(Automatic)
7. Pressing ENTER enables a simulation of the failure for each protection function.	

4. SACE PR222DS protection release

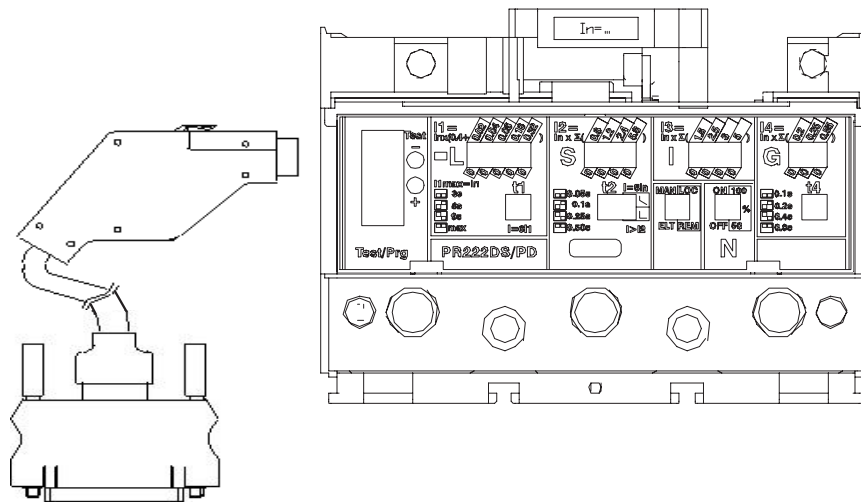


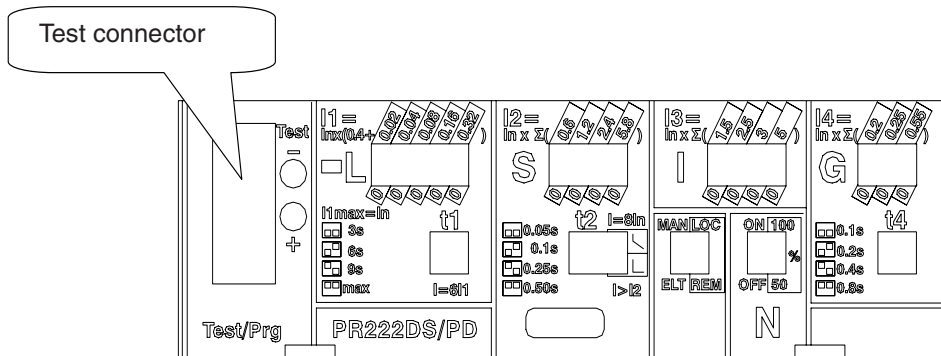
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4.1 Operation mode menu tree

1° 2° 3° 4° 5° 6° 7° 8° 9°									
1. Operation mode	Select DUT (PR222DS)	1. Test	1. Protections	1. Automatic	Start test (select Electronic Set)			Create test report	
			2. Manual	1. Default setting	Start test				
				2. User setting	Set parameters	Start test			
		2. Trip	Start test						
		2. Reading	1. Currents	Read currents					
			2. Last trip.	Display tripping parameters					
			3. Config./param.	1. DUT config.	Display DUT configuration parameters				
				2. DUT parameters	1. Manual parameters	Display manual set parameters			
					2. Electronic parameters	Display electronic set parameters			
				3. Default parameters	1. For test	Display default test parameters			
	2. Operative		Display default operative parameters						
	4. Communication par.	Display communication parameters for system bus							
	5. Information	Read release identification, SW version and Serial Number							
	3. Programming	1.Parameters	Change DUT protection parameters						Store protection unit parameters
		2. Default download	Program DUT with default operative parameters defined in "programming/Define/Manual/Default set"						
		3. Default definition	1. Only for test	Define default par. used for: "Test/Protections/Manual/Default set"				Store parameters in the PR010/T test unit	
			2. Operative	Define default par. for: "Program/Default download"					
		4.Communication par.	Define communication par. for system bus						Store parameters in the PR010/T test unit

4.2 Indications on operation

- The SACE PR010/T unit can be used with all SACE PR222DS/P and SACE PR222DS/PD releases by connecting the test unit to the protection unit with the cable provided, to be inserted in the test connector on the front.



- It is not necessary for the auxiliary supply to be present in order to use the above releases with the PR010/T unit.
- During use of the PR010/T unit, communication between the SACE PR222DS/PD releases and the supervision system connected to them is interrupted.
- Tests must be carried out with the circuit breaker off.
- Automatic testing and manual setting with default parameters must be performed only by configuring the release in Electronic SET (ELT) with the dip switch provided.
- The manual test may be performed either with Electronic SET or with manual SET. In the case of manual test with manual SET, thresholds and curves must be selected with the dip-switches on the protection; they are automatically updated on the display of the PR010/T unit, where only the test current and the phase on which it is to be applied must be set.
- If during test, reading or programming operations, CB type and CT current rating are not yet defined, the following message will be displayed:

WARNING
Config. not valid

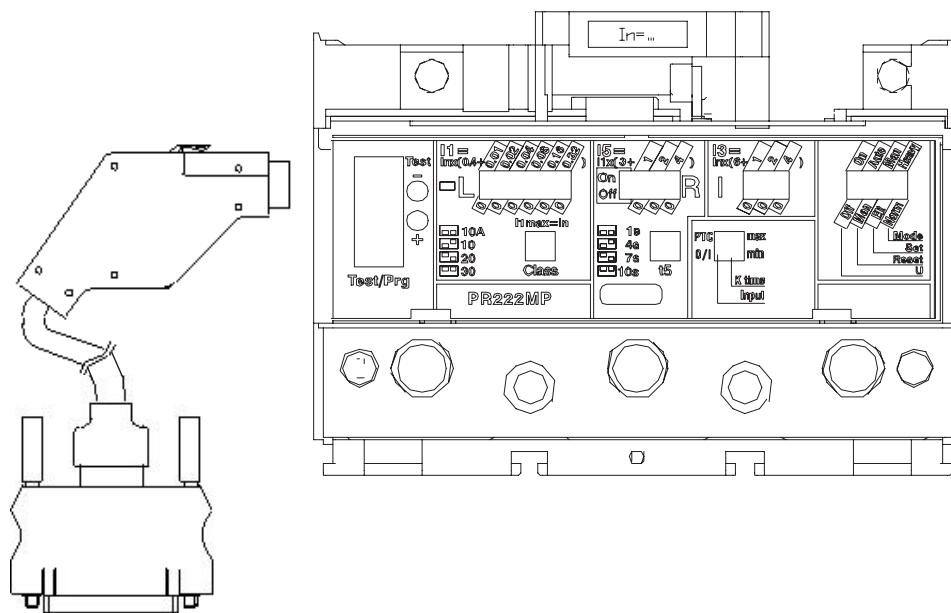
Example of an automatic test application on the PR222DS release

NOTE: the data indicating the type of CB and protection, the rated current of the CTs and the Neutral setting, are automatically identified by the PR010/T.

In this example, all the protection functions implemented by the SACE PR222DS/P and SACE PR222DS/PD release are tested automatically:

1. From the main menu select	1	(Operation mode)
2. Select the PR222DS unit with	x	(PR222DS)
3. Select the type of activity	1	(Test)
4. Select the type of test	1	(Protections)
5. Select the test mode with	1	(Automatic)
6. Pressing ENTER enables a simulation of the failure for each protection function		

5. SACE PR222MP protection release

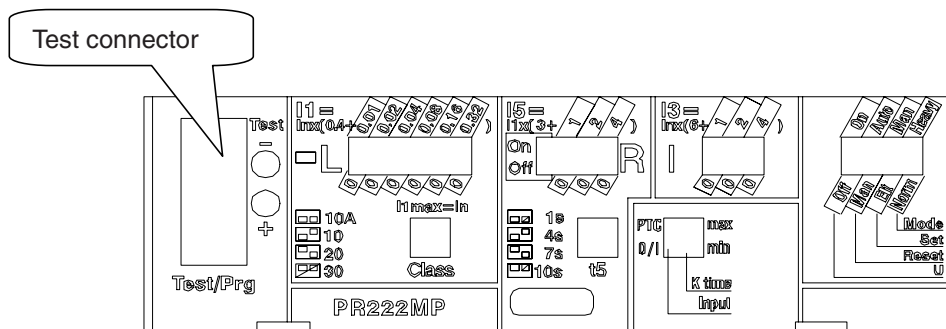


5.1 Operation mode menu tree

1°	2°	3°	4°🔽	5°🔽	6°🔽	7°🔽	8°🔽	9°🔽
1. Operation mode	8. Select DUT (PR222MP)	1. Test	1. Protections	1. Automatic	Start test (select SET ELT)			Create report
				2. Manual	1. Default setting	Start test		
					2. User setting	Set parameters	Start test	
			2. Trip test	Start test				
			3. Set coil	Start test				
		4. Reset coil	Start test					
		2. Reading	1. Currents	Read currents				
			2. Config./Param.	1. DUT config./param.	1.Manual parameters	Display DUT configuration and parameters		
					2. Electronic parameters	Display DUT configuration and parameters		
				2. Def. parameters in PR010/T	1. Only for test	Display DUT default configuration and parameters		
					2. Operative	Display DUT default configuration and parameters		
			3. Inputs	Read inputs				
			4. Tripping parameters	Display tripping parameters				
			5. Information	Read release identification, SW version and Serial Number				
			3. Programming	1. Change DUT config./par.	1. DUT configuration	Change DUT configuration parameters		
					2.DUT parameters (ELT)	Change DUT protection parameters		
		2. Download default parameters		Program DUT with default parameters for normal operation				
		3. Def. parameters in PR010/T		1. For test	Define DUT protection parameters			
				2. Operative	Define DUT protection parameters			

5.2 Indications on operation

- The SACE PR010/T unit can be used only with SACE PR222MP protection releases with test connectors on the front.



- Per For the test with SACE PR222MP protection releases version 1 (with automatic data reading by the PR010/T unit) the maximum test current is $7.3 \cdot I_n$; that is why the automatic test will test the protection functions in accordance with the above.
- The automatic test and the manual test with the default parameter set can only be performed if the protection release is configured in Electronic SET (ELT) mode using the dip switch provided.
- The manual test with the user's parameter set can be run both in electronic SET (ELT) and in manual SET (MAN) mode. In the case of manual test with manual SET, thresholds and curves must be selected with the dip-switches on the protection; they are automatically updated on the display of the PR010/T unit, where only the test current and the phase on which it is to be applied must be set.
- If the PTC for protection against overtemperature is not present, during the tests it is necessary to set the "Input" dip-switch as the generic input (Input = 0/1).
- The "Welded contacts" (WC) input has to be at 0V (no alarm) during the tests.
- At the end of each test, the PR010/T unit waits until the thermal memory has returned to zero before proceeding with any subsequent tests in order to avoid any overlap in operation between the function being tested and the overload function (L).
- For the test on the protection function against locked rotor (R), the PR010/T unit waits for an initial interval, which depends on the class specified for the L protection function (max. duration 24s) before performing the test.
- If during test, reading or programming operations, CB type and CT current rating are not yet defined, the following message will be displayed:

WARNING

Config. not valid

To set the missing data, proceed as follows:

1. Press ENTER
2. Select the type of CB and the current rating of the CT
3. Store the settings by pressing ENTER



WARNING

Connect the test wire provided (between the SACE PR010/T and the SACE PR222MP) the right way round (see drawing in par. 5)

Example of an automatic test application on the PR222MP release

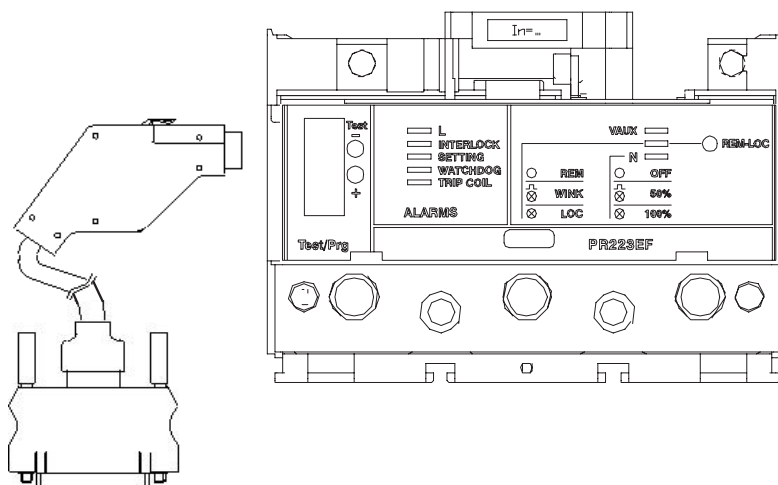
NOTE: the data indicating the type of CB and protection and the current rating of the CTs are automatically identified by the PR010/T test unit.

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In this example, all the protection functions implemented by the SACE PR212/MP release are tested automatically:

1. Set the PR222MP in electronic set mode	(ELT)
2. From the main menu select 1	(Operation mode)
3. Select the PR222MP unit with x	(PR222MP)
4. Select the type of activity with 1	(Test)
5. Select the type of test with 1	(Protections)
6. Select the test mode with 1	(Automatic)
7. Pressing ENTER enables a simulation of the failure for each protection function	

6. SACE PR223EF protection release

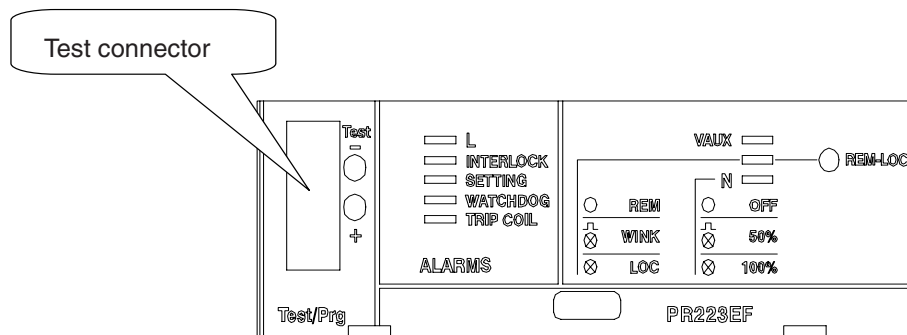


6.1 Operation mode menu tree

1°	2°	3°	4° 	5° 	6° 	7° 	8° 	9° 		
1. Operation mode	8. Select DUT (PR223EF)	1. Test	1. Protections	1. Automatic	Start test (select Electronic Set)			Create test report		
				2. Manual	1. Default setting	Start test				
					2. User setting	Set parameters	Start test			
			2. Trip	Start test						
		2. Reading	1. Measurements	1. Currents	Read measured currents					
				2. Voltages	Read measured line and phase voltages					
				3. Frequency	Read measured frequency					
				4. Peak factor	Read peak factors					
			2. Last trip	Display data of last 20 trips						
			3. Config./param.	1. DUT config.	Display DUT configuration and parameters					
				2. DUT parameters	Display protection parameters					
				3. Default parameters	1. For test	Display default test parameters				
			2. Operative		Display default operative parameters					
			4. Communication par.	Display communication parameters for system bus						
			5. Information	Read release identification, SW version and Serial Number						
		3. Programming	1. Parameters	Change DUT protection parameters						Store protection unit parameters
			2. Default download	Program DUT with default operative parameters defined in "programming/Define Default/Operative"						
			3. Define default	1. Only for test	Define default par. used for: "Test/Protections/Manual/Default set"				Store parameters in the PR010/T test unit	
				2. Operative	Define default par. for: "Program/Default download"					
		4. Communication par.	Define communication par. for system bus						Store protection unit parameters	

6.2 Indications on operation

- The SACE PR010/T unit can be used with all SACE PR223EF releases by connecting the test unit to the protection unit with the cable provided, to be inserted in the test connector on the front.



- It is not necessary for the auxiliary supply to be present in order to use the above releases with the PR010/T unit.
- During use of the PR010/T unit, communication between the SACE PR223EF releases and the supervision system connected to them is interrupted.
- The tests must be carried out with the circuit breaker off.
- If during test, reading or programming operations, CB type and CT current rating are not yet defined, the following message will be displayed:

WARNING
Config. not valid

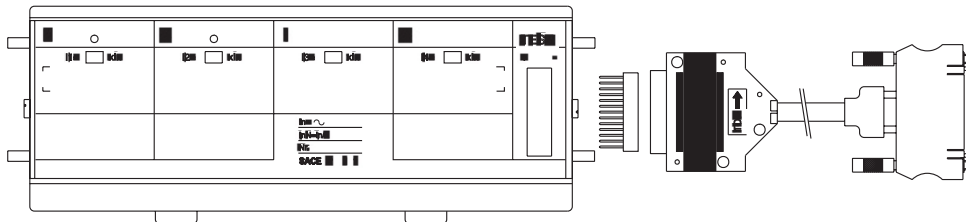
Example of an automatic test application on the PR223EF release

NOTE: the data indicating the type of CB and protection, the current rating of the CTs and the neutral setting are automatically identified by the PR010/T test unit.

In this example, all the protection functions implemented by the SACE PR223EF release are tested automatically:

1. From the main menu select	1	(Operation mode)
2. Select the PR223EF unit with	x	(PR223EF)
3. Select the type of activity	1	(Test)
4. Select the type of test	1	(Protections)
5. Select the test mode	1	(Automatic)
6. Pressing ENTER enables a simulation of the failure for each protection function.		

7. SACE PR111/P protection release



7.1 Default setting for automatic PR111/P testing

To test the protection functions in automatic mode, first set the PR111/P protection unit as follows:

Protection function	Threshold	Curve
L	$0.4 \times I_n$	B
S	$3 \times I_n$	C; $I^2t=k$
I	$8 \times I_n$	-
G	$0.8 \times I_n$	B

7.2 Operation mode menu tree

1°	2°	3°	4°	5°	6°	7°
1. Operation mode	1. Select DUT (PR111)	1. Protections	1. Automatic	Start test		Create report
			2. Manual	Set parameters	Start test	
		2. I inst protection	Start test			

7.3 Indications on operation

In the case of testing with the SACE PR010/T unit for G protection function, the maximum trip time tolerance value is 35%. The minimum threshold is $0.6 \times I_n$ for the manual test.

Example of an automatic test application on the PR111/LSI unit fitted on CB E1B12, with CT = 800 A, Neutral = 50%.

1. From the main menu select 1	(Operation mode)
2. Select the PR111 unit with 1	(PR111)
3. Select the version of the PR111 with 2	(PR111-LSI)
4. Enter 1 to select the Neutral setting	(Neutral = 50%)
5. Enter 2 to select the type of CB	(E1B12)
6. Select the current rating of the CTs fitted with 3	(800 A)
7. Select the type of test with 1	(Protections)
8. Select the test mode with 1	(Automatic)

[Make sure the default setting is programmed for automatic testing as shown under the heading "Default setting for automatic PR111/P testing"].

8. SACE PR111/P-A protection release

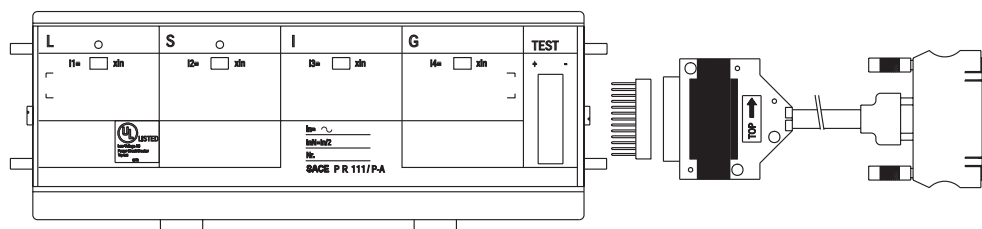


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8.1 Default setting for automatic PR111/P-A testing

To test the protection functions in automatic mode, first set the PR111/P-A protection unit as follows:

Protection function	Threshold	Curve
L	$0.4 \times I_n$	B
S	$3 \times I_n$	C; $I^2t=k$
I	$8 \times I_n$	-
G	$0.4 \times I_n$	B

8.2 Operation mode menu tree

1°	2°	3°	4°	5°	6°	7°
1. Operation mode	4. Select DUT (PR111-A)	1. Protections	1. Automatic	Start test		Create report
			2. Manual	Set parameters	Start test	
		2. I inst protection	Start test			

8.3 Indications on operation

In the case of testing with the SACE PR010/T unit for G protection function, the maximum trip time tolerance value is 35%.

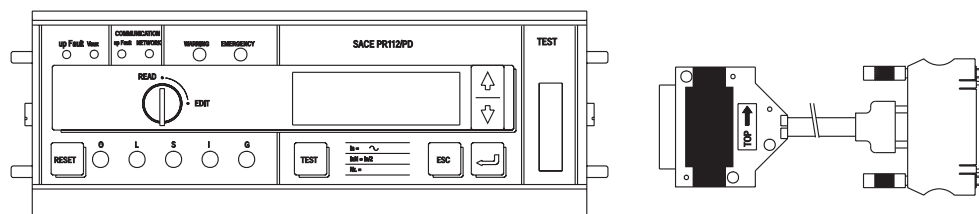
Automatic test example for unit PR111/P-A LSI mounted on CB E1B12, with CT = 800 A, Neutral = 50%.

1. From the main menu select 1	(Operation mode)
2. Select the PR111-A unit with 4	(PR111-A)
3. Select the version of the PR111-A with 2	(PR111-A/LSI)
4. Enter 1 to select the Neutral setting	(Neutral = 50%)
5. Enter 2 to select the type of CB	(E1B12)
6. Select the current rating of the CTs fitted with 3	(800 A)
7. Select the type of test with 1	(Protections)
8. Select the test mode with 1	(Automatic)

[Make sure the default setting is programmed for automatic testing as shown under the heading "Default setting for automatic PR111/P-A testing"].

9. PR112/P and SACE PR112/PD protection release

9.1 Version with key (last letter in serial number A ÷ D)



9.2 Version without key (last letter in serial number M ÷ Z)

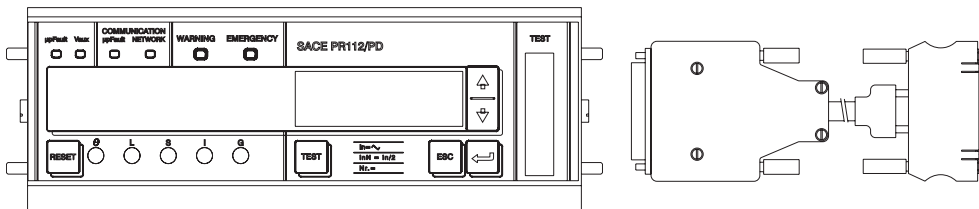


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9.3 Operation mode menu tree

1°	2°	3°	4°	5°	6°	7°	8°	9°	10°
1. Operation mode 2. Select DUT (PR112) 1. Select DUT (PR112A:D) 2. Select DUT (PR112M:Z)			1. Test	1. Protections	1. Automatic	Start test			Create report
					2. Manual	1. Default setting	Start test		
						2. User setting	Set parameters	Start test	
				2. I inst protection	Start test				
				3. Trip	Start test				
			2. Reading	1. Ammeter	Read currents				
				2. Config./Param.	1. DUT config.	Display DUT configuration			
					2. DUT parameters	Display DUT parameters			
					3. Default parameters	1. Only for test	1. DUT config.	Display DUT default config.	
							2. DUT parameters	Display DUT default param.	
					2. Operative	1. DUT config.	Display DUT default config.		
							2. DUT parameters	Display DUT default param.	
				3. Information	Read release identification, SW version and Serial Number				
			3. Programming	1. Change DUT parameters	1. DUT config. Change DUT configuration parameters				
					2. DUT parameters	Change DUT protection parameters			
				2. Default parameters	Program DUT with default parameters for normal operation				
				3. Define default parameters	1. Only for test	1. DUT config.	Def. DUT configuration		
						2. DUT parameters	Def. DUT parameters		
					2. Operative	1. DUT config.	Def. DUT configuration		
						2. DUT parameters	Def. DUT parameters		

9.4 Indications on operation

- The SACE PR010/T test unit can be used:
 - in all SACE PR112/P and SACE PR112/PD protection releases in the version "without key".
 - in all SACE PR112/P and SACE PR112/PD protection releases, in the version "with key", having Sw version 2.20 or later and serial number later than No. xxxxx03x (for PR112/P) or No. xxxxx05x (for PR112/PD).

NOTE: The PR112 software release can be read on the display by choosing in sequence:

- Config/Program.
- Information
- The SACE PR112/PD releases must be connected to the auxiliary power supply for use with the SACE PR010/T unit.

Remarks for PR112 in version "with key"

- G protection function test:
 - If working in automatic mode, the threshold current must be set to a value higher than or equal to $0.4xI_n$ (if it is set at a lower value the PR010/T unit will reset it at $0.4xI_n$ during the test phase). The test current is equal to 2.5 times the threshold current.
 - In the case of manual mode the test current is $1.5xI_n$.
 - It is possible that after a test (with trip) on G protection function other trips of the protection will occur during the next 2s.
- Contact wear for PR112:
 - During testing on the PR112, with timing before trip higher than 10s, there could be an increase in the indications contact wear and number of operations. After some tests wear could reach 100% of the value, resulting in the appearance of the EMERGENCY message. This indication can be reset by the customer by means of the following procedure:
 - Choose in READ mode the page of the contact wear indication
 - Choose EDIT mode by turning the key
 - Hold down the "Up" and "Down" buttons simultaneously for at least 5 seconds.
 - In this way the contact wear and number of operations indications will be reset to zero.



WARNING

Connect the test wire provided (between the SACE PR010/T and the SACE PR112) the right way round (see the adhesive labels on the connectors).

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Manual test example for release PR112/P (vers. "without key").

NOTE: the data indicating the type of CB and protection, the rated current of the CTs and the Neutral setting are automatically identified by the PR010/T test unit.

In this example, protection function "I" is tested with curve $t=k$, threshold $I3=1.5 \cdot I_n$, supplying a fault current equivalent to 2 times the rated current (I_n).

1. From the main menu select	1	(Operation mode)
2. Select the PR112 unit with	x	(PR112)
3. Select the M÷Z version	2	(PR112) (M÷Z)
4. Select the type of activity with	1	(Test)
5. Select the type of test	1	(Protections)
6. Select the test mode	2	(Manual)
7. Select the type of setting used to test the protections	2	(User setting)
8. Select the protection function to be tested	3	(I protection test)
9. Using the arrow keys, fill in the page displayed as follows:		

```

I-PROT: t=k, ON
I3: 1.5In => 3000°
t3: Instantaneous
I-f: 2.00In => 4000 A (*)

```

(*) In this example, the automatically identified rating of the current sensor is 2000 A.

10. Select the phase (or phases) on which to simulate the fault current (L1+L2+L3)
11. Press ENTER to activate fault simulation

10. PR112/P-A and SACE PR112/PD-A protection release

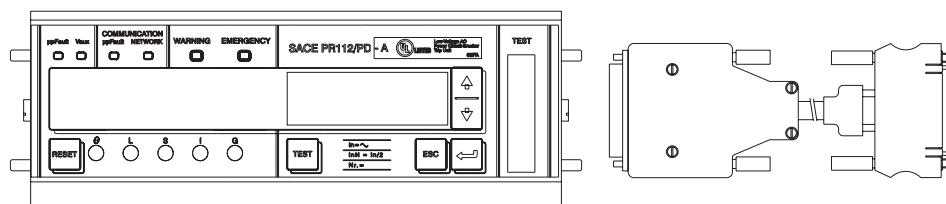


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10.1 Operation mode menu tree

1°	2°	3°	4°	5°	6°	7°	8°	9°		
1. Operation mode 2. Select DUT (PR112-A)	1. Test	1. Protections	1. Automatic	Start test (select SET ELT)				Create report		
			2. Manual	1. Default setting	Start test					
				2. User setting	Set parameters	Start test				
		2. Inst protection	Start test							
		3. Trip	Start test							
		2. Reading	1. Ammeter	Read currents						
			2. Config./Param.	1. DUT configur.	Display DUT configuration					
				2. DUT parameters	Display DUT protection parameters					
			3. Default parameters	1. Only for test	1. DUT configur.	Display DUT default configuration				
					2. DUT protection parameters	Display DUT default parameters				
	2. Operative			1. DUT configur.	Display DUT default configuration					
				2. DUT protection parameters	Display DUT default parameters					
	3. Information		Read release identification, SW version and Serial Number							
	3. Programming	1. Change DUT parameters	1. DUT configur.	Change DUT configuration parameters						
			2. DUT parameters	Change DUT configuration parameters						
		2. Default parameters	Program DUT with default parameters for normal operation							
		3. Define default parameters	1. Only for test	1. DUT configur.	Define DUT configuration parameters					
				2. DUT parameters	Define DUT protection parameters					
			2. Operative	1. DUT configur.	Define DUT configuration parameters					
				2. DUT parameters	Define DUT protection parameters					

10.2 Indications on operation

- The SACE PR010/T unit can be used with all PR112/P-A and PR112/ PD-A protection releases.
- The SACE PR112/PD-A releases must be connected to the auxiliary power supply for use with the SACE PR010/T unit.

NOTE: The PR112/P-A software release can be read on the display by choosing in sequence in READ mode, starting from the main menu:

- Config./Program
- Information



WARNING

Connect the test wire provided (between the SACE PR010/T and the SACE PR112) the right way round (see the adhesive labels on the connectors).

Manual test example for release PR112/P-A.

NOTE: the data indicating the type of CB and protection, the rated current of the CTs and the Neutral setting are automatically identified by the PR010/T test unit.

In this example, protection function "S" is tested with curve t=k, threshold I₂=1.20*I_n, curve t₂=0.4 s supplying a fault current equivalent to 2 times the rated current (I_n).

1. From the main menu select	1	(Operation mode)
2. Select the PR112-A unit with	x	(PR112-A)
3. Select the type of activity with	1	(Test)
4. Select the type of test with	1	(Protections)
5. Select the test mode with	2	(Manual)
6. Select the type of setting used to test the protections with	2	(User setting)
7. Select the protection function you want to test with	2	(S protection test)

8. Using the arrow keys, fill in the page displayed as follows:

```

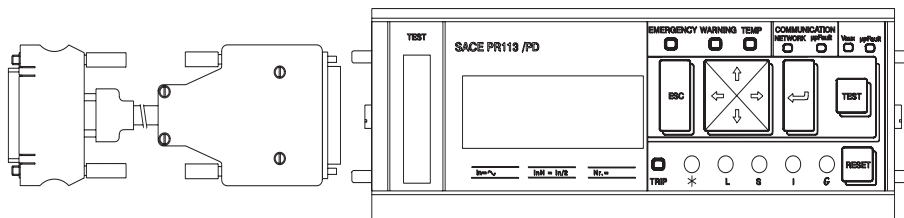
S-PROT: t=k,  ON
S protection test: t=k
I2: 1.2In => 2400 A
T2: 0.4 s
I-f: 2.00 => 4000 A(*)

```

(*) In this example, the automatically identified rating of the current sensor is 2000 A. Check that I-F is lower than I₃.

9. Select the phase (or phases) on which to simulate the fault current (L1+L2+L3)
10. Press ENTER to activate fault simulation.

11. SACE PR113/P and PR113/PD protection release



11.1 Operation mode menu tree

1°	2°	3°	4°	5°	6°	7°	8°	9°		
1. Operation mode 2. Select DUT (PR113)	1. Test	1. Protections	1. Automatic	Start test					Create report	
			2. Manual	1. Default setting	Start test					
				2. User setting	Set parameters	Start test				
			2. Inst protection	Start test						
		3. Trip	Start test							
		2. Reading	1. Currents	Read currents						
			2. Voltages	Read voltages						
			2. Powers	1. Active Power	Read active power					
				2. Reactive power	Read reactive power					
				3. Apparent power	Read apparent power					
	4. Energy counters		Read energy counters							
	5. Power factors		Read power factors							
	6. Freq./peak factor		Read Freq./peak factor							
	7. Last trip		Read last trip							
	8. Config./Param.		1. DUT configur.	Display DUT configuration						
			2. DUT parameters	1. Protection parameters	Read protection parameters					
				2. Other parameters	Read other parameters					
			3. Default parameters	1. For test	1. DUT configur.	Read config.				
					2. DUT parameters	Read param.				
				2 Operative	1. DUT configur.	Read config.				
	2. DUT parameters				Read param.					
	9. Information		Read release identification, SW version and Serial Number							

1°	2°	3°	4°	5°	6°	7°	8°	9°		
1. Operation mode 2. Select DUT (PR113) 3. Programming			1. Change DUT config./ parameters	1. DUT config.	Change DUT configuration parameters					
				2. DUT param.	1. Protection parameters	Change DUT protection parameters				
					2. Other parameters	Change other parameters				
			2. Download def. parameters	Download						
			3. Def. parameters in PR010/T	1. For test	1. DUT config.	Change DUT configuration				
					2. DUT param.	1. Protection parameters	Change protect. par.			
				2. Operative	1. DUT config.	Change DUT configuration				
					2. DUT param.	1. Protection parameters	Change parameters			
						2. Other parameters	Change other parameters			

11.2 Indications on operation

- The SACE PR010/T unit can be used with all SACE PR113/P and SACE PR113/PD protection releases.
- The SACE PR113/PD releases must be connected to the auxiliary power supply for use with the SACE PR010/T unit.
- The tests must be carried out with the circuit breaker off, no voltage to the busbar (V=0) (where the VTs are installed to measure the SACE PR113/P and SACE PR113/PD release voltage) and the auxiliary power supply enabled.



WARNING

Connect the test wire provided (between the SACE PR010/T and the SACE PR113) the right way round (see the adhesive labels on the connectors).

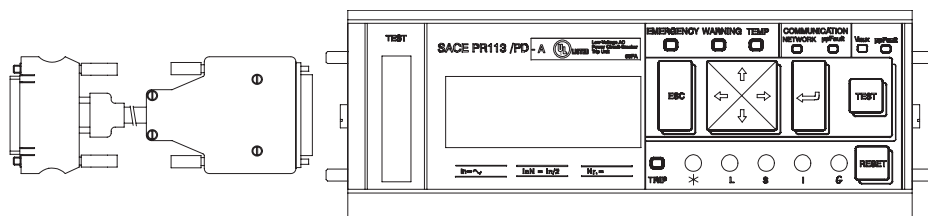
Example of an automatic test application on the PR113 release.

NOTE: the data on the CB and protection, on the current rating of the CTs and on the neutral setting are automatically identified by the PR010/T.

In this example, all the protection functions implemented by the SACE PR113/P and SACE PR113/PD release are tested automatically:

1. From the main menu select	1	(Operation mode)
2. Select the PR113 unit with	x	(PR113)
3. Select the type of activity with	1	(Test)
4. Select the type of test with	1	(Protections)
5. Select the test mode with	1	(Automatic)
6. Pressing ENTER enables a simulation of the failure for each protection function.		

12. SACE PR113/P-A and PR113/PD-A protection release



12.1 Operation mode menu tree

1°	2°	3°	4°	5°	6°	7°	8°	9°			
1. Operation mode 2. Select DUT (PR113-A)	2. Reading	1. Test	1. Protections	1. Automatic	Start test				Create report		
				2. Manual	1. Default setting	Start test					
						2. User setting	Set parameters	Start test			
		2. Inst protection	Start test								
		3. Trip	Start test								
		2. Reading	1. Currents	Read currents							
			2. Voltages	Read voltages							
			3. Powers	1. Active Power	Read active power						
				2. Reactive power	Read reactive power						
				3. Apparent power	Read apparent power						
			4. Energy counters	Read energy counters							
			5. Power factors	Read power factors							
			6. Freq./peak factor	Read Freq./peak factor							
			7. Last trip	Read last trip							
			8. Configuration/ param.	1. DUT configur.	Display DUT configuration						
				2. DUT parameters	1. Protection parameters	Read protection parameters					
					2. Other parameters	Read other parameters					
				3. Default parameters	1. For test	1. DUT config.	Read config.				
						2. DUT param.	Read param.				
					2 Operative	1. DUT config.	Read config.				
					2. DUT param.	Read param.					
			9. Information	Read release identification, SW version and Serial Number							

1°	2°	3°	4°	5°	6°	7°	8°	9°
1. Operation mode	2. Select DUT (PR113-A)	3. Programming	1. Change DUT config./ parameters	1. DUT config.	Change DUT configuration parameters			
				2. DUT param.	1. Protection parameters	Change DUT protection parameters		
					2. Other parameters	Change other parameters		
			2. Download def. parameters	Download				
			3. Def. parameters in PR010/T	1. For test	1. DUT config.	Change DUT configuration		
					2. DUT param.	1. Protection parameters	Change protect. par.	
				2. Operative	1. DUT config.	Change DUT configuration		
					2. DUT param.	1. Protection parameters	Change parameters	
						2. Other parameters	Change other parameters	

12.2 Indications on operation

- The SACE PR010/T unit can be used with all SACE PR113/P-A and SACE PR113/PD-A protection releases.
- The SACE PR113/PD-A releases must be connected to the auxiliary power supply for use with the SACE PR010/T unit.
- The tests must be carried out with the circuit breaker off, no voltage to the busbar (V=0) (where the VTs are installed to measure the SACE PR113/P-A and SACE PR113/PD-A release voltage) and the auxiliary power supply enabled.



WARNING

Connect the test wire provided (between the SACE PR010/T and the SACE PR113) the right way round (see the adhesive labels on the connectors).

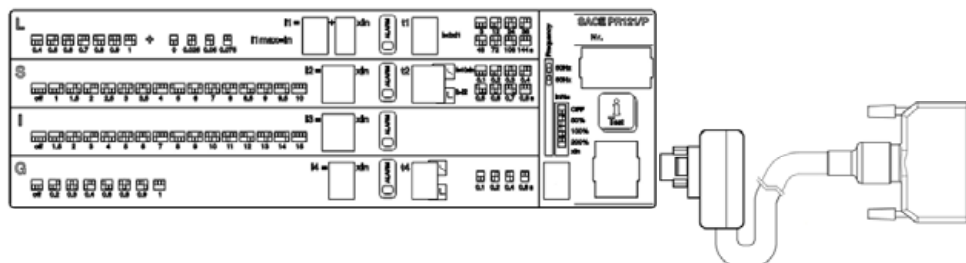
Example of an automatic test application on the PR113 release

NOTE: the data on the CB and protection, on the current rating of the CTs and on the neutral setting are automatically identified by the PR010/T.

In this example, all the protection functions implemented by the SACE SACE PR113/P-A and SACE PR113/PD-A release are tested automatically:

1. From the main menu select	1	(Operation mode)
2. Select the PR113 unit with	x	(PR113 A)
3. Select the type of activity with	1	(Test)
4. Select the type of test with	1	(Protections)
5. Select the test mode with	1	(Automatic)
6. Pressing ENTER enables a simulation of the failure for each protection function		

13. SACE PR121/P protection release



13.1 Operation mode menu tree

PR121 UNIT	
	1. Test
	2. Measurements
	3. History
	4. Config/Param
	5. Information
	6. Status

1. Test	
1. Start automatic test	Test report
2. Start manual test	Test report
3. Start trip test	
2. Measurements	
1. Display currents	
2. Display peak factors	
3. History	
1. Trip History display	
2. Events display	
3. Statistics	
1. Display contact wear	
2. Display total no. prot. trips	
3. Display no. manual oper.	
4. Display no. prot. oper.	
5. Display no. trip failures	
6. Display no. trip tests	

PR121 UNIT	1. Test 2. Measurements 3. History 4. Config/Param 5. Information 6. Status
-------------------	--

4. Config/Param

1. Configurations
 1. Circuit breaker
 1. Display neutral protection
 2. Display plant config.
 3. Display CB TAG Name
 4. Display User Data
 2. Display mains frequency
 3. Local bus unit
 1. Local bus unit presence
 2. Release 1 configuration
 3. Release 2 configuration
 4. Release 3 configuration
 5. Release 4 configuration
 6. Release 6 configuration
 7. Release 7 configuration
 8. Release 8 configuration
 1. Type of signal source Display custom. type
 2. Display source configuration
 3. Release 2 configuration
 4. Release 3 configuration
 5. Release 4 configuration
 6. Release 6 configuration
 7. Release 7 configuration
 8. Release 8 configuration
2. Protection parameters
 1. Protection L parameters
 2. Protection S parameters
 3. Protection I parameters
 4. Protection G parameters

5. Information

1. Protection unit information
2. Circuit breaker information

6. Status

1. Display configuration error

13.2 Indications on operation

- The SACE PR010/T test unit can be used with all SACE PR121/P releases by connecting the test unit to the protection unit with the cable provided, to be inserted in the test connector on the front.
- It is not necessary for the auxiliary supply to be present in order to use the above releases with the PR010/T unit.
- The automatic and manual tests must be performed with the circuit breaker off while the trip test may be performed only with the circuit breaker on; in either case the circulating currents must be null.

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WARNING

For PR121/P releases with a version prior to 1.0, the following limitations must be considered:

1. Startup time protection S:	$0.1 \leq \text{Time} \leq 1.5 \text{ s step } 0.01 \text{ s}$
2. Startup time protection S2:	$0.1 \leq \text{Time} \leq 1.5 \text{ s step } 0.01 \text{ s}$
3. Startup time protection G:	$0.1 \leq \text{Time} \leq 1.5 \text{ s step } 0.01 \text{ s}$
4. Startup time protection Gext:	$0.1 \leq \text{Time} \leq 1.5 \text{ s step } 0.01 \text{ s}$
5. Startup time protection D:	$0.1 \leq \text{Time} \leq 1.5 \text{ s step } 0.01 \text{ s}$
6. Startup current activation threshold not contemplated	
7. Protection U threshold:	$5\% \leq \text{th} \leq 90\% \text{ step } 5\%$
8. Management of unit contacts on local bus not contemplated.	

A description of the various menus is given below.

13.3 Test

By means of the PR010/T unit it is possible to perform some tests on the protection unit, in particular:

1. Automatic test
2. Manual test
3. Trip test

For example, to perform the automatic test it is necessary to follow the procedure described in the following table:

Key to be pressed	Item selected
1	Operation mode
x	PR121/P
1	Test
1	Automatic test
ENTER	

A brief description of the various tests will be given below.

13.3.1 Automatic test of the release PR121/P

With the automatic test, a sequence of 7 different tests will be performed at the currents and phases indicated in the following table.

Test N°	Phase			Value
	L1	L2	L3	
1	■	■	■	0.3 In
2	■	■	■	3.0 In
3	■	■	■	5.0 In
4	■	■	■	10.0 In
5	■	■	■	15.0 In
6	■			0.3 In
7	■			3.0 In

The trip times of the release in the various tests will depend on the settings of the protections; on the display the PR010/T unit will show the trip time and the result of the test (OK;FAILED).

At the end of the test it is asked whether to record a test report which may later be downloaded on a PC.

13.3.2 Manual Test

The manual test allows testing of the release trip time with the desired load condition, in particular it offers the possibility of selecting the current value in a range between 0.00 and 16.00 In and of selecting the phases involved in the test (L1, L2, L3, Ne, Gext).

The release trip time will depend on the settings of the protections; on the display the PR010/T unit will show the trip time and the result of the test (OK, FAILED).

At the end of the test it is asked whether to record a test report which may later be downloaded on a PC.

13.3.3 Trip test

With this test it is possible to send a command to turn off the circuit breaker, thus checking the functionality of the protection opening system.

The trip test command is accepted by the protection unit only if the circuit breaker is on.

13.4 Measurements

It is possible to display the measures of the circulating currents and of the peak factors.

For example to display the current measurements, the following selections must be made:

Key to be pressed	Item selected
1	Operation mode
x	PR121/P
2	Measurements
1	Currents
ENTER	

13.5 History

Under the history menu is the display of the history for the openings of the protection tripped, the events and some statistical information on the openings of the release.

For example to display the history of the openings (trip history), the following selections must be made:

Key to be pressed	Item selected
1	Operation mode
x	PR121/P
3	History
1	Trip history
ENTER	

13.6 Configurations/parameters

It is possible to display and even modify the configurations and parameters of the release.

13.6.1 Configurations

The available configuration parameters are divided into the following sub-sets:

1. Circuit breaker
2. Mains frequency
3. Local bus unit

For example, starting from the main menu, selecting:

Key to be pressed	Item selected
1	Operation mode
x	PR121/P
4	Config./Parameters
1	Configurations
1	Circuit breaker
1	Neutral protection
ENTER	

enters the screen that displays the configuration parameters of the neutral protection and the following screen appears:

```
Neutral protection

Enable: ON[OFF]
Threshold: 50 [...]%
```

Pressing the ENTER key launches editing mode (the cursor starts blinking); the buttons ↑ and ↓ are used to position the cursor on the desired parameter and the buttons ← and → to change the value of the parameters in the allowed range.

13.6.1.1 Local bus unit

From the CONFIGURATIONS menu it is possible to set the parameters for operation of the release unit on the local bus, selecting:

Key to be pressed	Item selected
1	Operation mode
x	PR121/P
4	Config./Parameters
1	Configurations
3	Circuit breaker
...	Local bus unit

At this point it is possible to choose one of the following items:

1. Presence
2. Release 1
3. Release 2
4. Release 3
5. Release 4
6. Release 6
7. Release 7
8. Release 8

Selecting "Presence" sets the presence/absence of a unit on the local bus.

Selecting Release x the configuration parameters of release x on the local bus unit are read/set, for example selecting:

Key to be pressed	Item selected
...	...
4	Release 3
1	Source

The setting of the activation signal of release no. 3 is displayed; pressing the ENTER key launches editing mode (the cursor starts blinking); the setting of the activation signal is changed using the keys ← and →.





If "Custom" is selected, when ENTER is pressed the current setting is displayed, for example:

```

ALARM 1 4...6
→ L Pre-alarm
  L Timing
→ S Timing

```

Where the arrows indicate which elements of the ALARM 1 block are selected.

The buttons  and  are used to display the previous/next screen and the buttons  and  to activate/deactivate the selected element (the arrow next to the element is shown/removed)

There are 18 blocks, each of which is made up of eight elements and is displayed in three consecutive screens; up to 8 elements may be activated for each block.

On the last screen of each block it is possible to define the AND/OR logic applied to the selected elements and the minimum release activation time.

13.6.2 Parameters

The protection parameters are divided into:





1. L protection
2. S protection
3. I protection
4. G protection

For example, selecting:

Key to be pressed	Item selected
1	Operation mode
x	PR121/P
4	Config./Parameters
2	Parameters
1	Protection L
ENTER	

enters the screen that displays the parameters of protection L and the following screen appears:

```
L prot    t=k/i2 [...]
Threshold: x.xx In
Time:     x.xx s
Thermal mem: ON [OFF]
```

Pressing the ENTER key launches editing mode (the cursor starts blinking); the buttons  and  are used to position the cursor on the desired parameter and the buttons  and  to change the value of the parameters in the allowed range.

13.7 Information

On this menu it is possible to view some information on the protection unit and the circuit breaker.

The menu is divided into:

1. Protection unit
2. Circuit breaker

For example, starting from the main menu, selecting:

Key to be pressed	Item selected
1	Operation mode
x	PR121/P
5	Information
2	Circuit breaker
ENTER	

enters the screen that displays information on the circuit breaker:

```
Device: E1B800/4P
Rated Current: xxxxA
```

```
sn: xxxxxxxxxxxxxxxx
```

Pressing the keys **↑** and **↓** passes to the display of the next/previous screen:

```
Install: xx/xx/xxxx
Maint: xx/xx/xxxx
```

13.8 Status

On this menu it is possible to view any signals of an error in configuration/wiring of the protection unit and of the circuit breaker. In particular, one or more of the following messages may be displayed:

1. No alarm
2. L Prealarm
3. T Prealarm
4. L1 Sensor error
5. L2 Sensor error
6. L3 Sensor error
7. Ne Sensor error

8. Gext sensor error
9. TC disconnected
10. Rating Plug error
11. Installation error
12. Device error
13. Invalid Date
14. Configuration error
15. CB status error

Refer to the release user manual for the solution of the errors indicated.

14. SACE PR122/P protection release

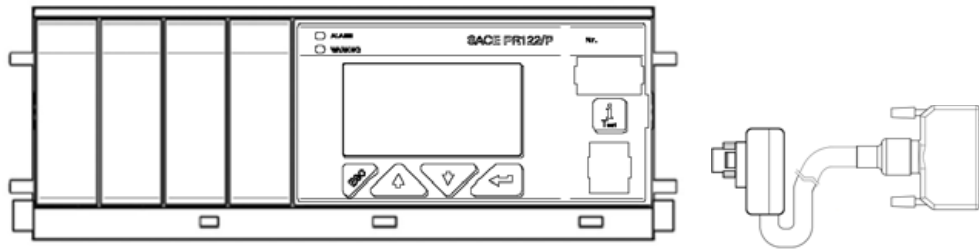


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14.1 Operation mode menu tree

PR122 UNIT	1. Test 2. Measurements 3. History 4. Config/Param 5. Information 6. Status
1. Test	<div> <div>1. Start automatic test</div> <div>Test report</div> </div> <div> <div>2. Start manual test</div> <div>Test report</div> </div> <div>3. Start trip test</div> <div>4. Start signalling module autotest</div> <div>5. Force output S zone sel.</div> <div>6. Force output G zone sel.</div> <div>7. Release output zone sel.</div> <div> <div>8. Start Rc test</div> <div>note 1</div> </div>
2. Measurements	<div> <div>1. Display currents</div> <div>2. Display peak factors</div> <div>3. Display voltages</div> <div> <div>4. POWERS</div> <div> <div>1. Display active power</div> <div>2. Display reactive power</div> <div>3. Display apparent power</div> </div> </div> <div>5. Display energies</div> <div>6. Display power factor</div> <div>7. Display measured frequency</div> <div>8. Reset energies counters</div> <div>9. Reset measurement history</div> </div> <div>note 2</div>
3. History	<div>1. Display trip history</div> <div>2. Display events</div> <div>3. Statistics</div> <div> <div>1. Display contact wear</div> <div>2. Display total no. prot. trips</div> <div>3. Display total no. prot. trips</div> <div>4. Display no. manual operations</div> <div>5. Display no. prot. operations</div> <div>6. Display no. trip failures</div> <div>7. Display no. trip tests</div> </div>
4. Config/Param	<div>1. CONFIGURATIONS >></div> <div>2. PARAMETERS >></div>
5. Information	<div>1. Protection unit information</div> <div>2. Circuit breaker information</div>
6. Status	<div>1. Display configuration error</div>

PR122 UNIT CONFIGURATIONS	1. Circuit breaker 2. Mains freq. 3. Meas. int. 4. Local bus an. Th. 5. Startup curr. Th.	6. Harmonic distortion 7. Modules 8. Local bus unit 9. Data logger 10. System
----------------------------------	--	--

1. Circuit breaker

- | | |
|---|--------|
| 1. Neutral protection parameters | |
| 2. Ground toroide protection parameters | note 1 |
| 3. Plant config. parameters | |
| 4. CB TAG Name | |
| 5. User Data | |

2. Mains frequency

3. Measurement storage period

4. Local Bus analogue threshold

5. Startup current activation threshold

6. Enable/disable harmonic distortion alarm

7. Modules

- | | | |
|-----------------------------------|-----------------------------------|--------|
| 1. Measuring | | |
| 1. Voltage transformer parameters | | |
| 2. Neutral voltage presence | | note 2 |
| 3. Positive power direction | | |
| 2. Communication | | note 3 |
| 1. Operation mode | | |
| 2. Communication parameters | | |
| 3. Signalling module | | |
| 1. Release 1 configuration | | |
| 1. Type of signal source | Display custom. type | |
| 2. Display source configuration | | |
| 2. Release 2 configuration | | |
| 3. Release 3 configuration | | |
| 4. Release 4 configuration | | |
| 5. Input | (signalling module configuration) | note 4 |

8. Local bus unit

- | | |
|---------------------------------|----------------------|
| 1. Local bus unit presence | |
| 2. Release configuration | |
| 1. Type of signal source | Display custom. type |
| 2. Display source configuration | |
| 3. Release 2 configuration | |
| 4. Release 3 configuration | |
| 5. Release 4 configuration | |
| 6. Release 6 configuration | |
| 7. Release 7 configuration | |
| 8. Release 8 configuration | |

9. Data logger

- | | |
|------------------------------|----------------------|
| 1. Data logger configuration | |
| 2. Stop data logger event | Display custom. type |
| 3. Reset data logger | |
| 4. Stop data logger | |

10. System

- | |
|------------------|
| 1. Display clock |
| 2. Set language |

PR122 UNIT	1. L prot.	7. T prot.	13. UV prot.
Protection	2. S prot.	8. LC1 prot.	14. OV prot.
parameters	3. I prot.	9. LC2 prot.	15. RV prot.
	4. G prot.	10. lw prot.	16. RP prot.
	5. Ext G prot.	11. Rc prot.	17. UF prot.
	6. U prot.	12. MCR prot.	18. OF prot.
1. Protection L parameters			
2. Protection S parameters			note 5
3. Protection I parameters			
4. Protection G parameters			note 6
5. Protection Ext G parameters			note 6
6. Protection U parameters			
7. Protection T parameters			
8. Protection LC1 parameters			
9. Protection LC2 parameters			
10. Protection lw parameters			
11. Protection Rc parameters			note 1
12. Protection MCR parameters			
13. Protection UV parameters			note 2
14. Protection OV parameters			note 2
15. Protection RV parameters			note 2
16. Protection RP parameters			note 2
17. Protection UF parameters			note 2
18. Protection OF parameters			note 2

NOTES

- 1 Only for performing LSIG (with measuring module) or LSIRc and presence of residual current in the external toroide.
- 2 Only if measuring module present.
- 3 Only if communication module present.
- 4 Only if signalling module present.
- 5 Only for performing LSI or LSIG or LSIRc.
- 6 Only for performing LSIG.

14.2 Indications on operation

- The SACE PR010/T unit may be used with all SACE PR122/P releases connecting the test unit to the protection unit by means of a special cable to the functional test connector.

- It is not necessary for the auxiliary supply to be present in order to use the above releases with the PR010/T unit.
- The automatic and manual tests must be performed with the circuit breaker off while the trip test may be performed only with the circuit breaker on; in either case the circulating currents must be null.



WARNING

For PR122/P releases with a software version prior to 1.0, the following limitations must be considered:

1. Startup time protection S:	$0.1 \text{ s} \leq \text{Time} \leq 1.5 \text{ s}$ step 0.01 s
2. Startup time protection S2:	$0.1 \text{ s} \leq \text{Time} \leq 1.5 \text{ s}$ step 0.01 s
3. Startup time protection G:	$0.1 \text{ s} \leq \text{Time} \leq 1.5 \text{ s}$ step 0.01 s
4. Startup time protection Gext:	$0.1 \text{ s} \leq \text{Time} \leq 1.5 \text{ s}$ step 0.01 s
5. Startup time protection D:	$0.1 \text{ s} \leq \text{Time} \leq 1.5 \text{ s}$ step 0.01 s
6. Startup current activation threshold not contemplated	
7. Protection U threshold:	$5\% \leq \text{th} \leq 90\%$ step 5%
8. Management of unit contacts on local bus not contemplated.	

A description of the various menus is given below.

14.3 Test

By means of the PR010/T unit it is possible to perform some tests on the protection unit, in particular:

1. Automatic test
2. Manual test
3. Trip test
4. Sign. mod. autotest
5. Force output S ZS
6. Force output G ZS
7. Release output ZS
8. Rc Test

For example, to perform the automatic test it is necessary to follow the procedure described in the following table:

Key to be pressed	Item selected
1	Operation mode
x	PR122/P
1	Test
1	Automatic test
ENTER	

A brief description of the various tests will be given below.

14.3.1 Automatic test of the release PR122/P

- In the absence of the PR120/V measuring module:

with the automatic test, a sequence of 7 different tests will be performed at the currents and phases indicated in the following table:

Test N°	Phase			Value
	L1	L2	L3	
1	■	■	■	0.3 In
2	■	■	■	3.0 In
3	■	■	■	5.0 In
4	■	■	■	10.0 In
5	■	■	■	15.0 In
6	■			0.3 In
7	■			3.0 In

- In the presence of the PR120/V measuring module:

with the automatic test, a sequence of 13 different tests will be performed at the currents, voltages, phase shift and phases indicated in the following table:

Test N°	Phase						Amplitude		Phase shift	
	L1	L2	L3	V12	V23	V31	I [In]	V[Un]	Φ	
1	■	■	■	■	■	■	3.0	1.0	30°	
2	■	■	■	■	■	■	5.0			
3	■	■	■	■	■	■	10			
4	■	■	■	■	■	■	15			
5	■			■	■	■	0.3	1.0	0°	
6	■			■	■	■	3.0			
7	■	■	■	■	■	■	0.3	1.0	210°	
8	■	■	■	■	■	■	3.0			
9	■	■	■	■	■	■	5.0			
10	■	■	■	■	■	■	10			
11	■	■	■	■	■	■	15			
12				■	■	■	0.0	0.4	---	
13				■	■	■		1.3		

For example test n° 5 is performed with:

IL = 0.3 In

$IL2 = IL3 = 0 I_n$

$V12=V23=V31=1 U_n$

Phase shift 0° ($\cos\Phi=1$)

The trip times of the release in the various tests will depend on the settings of the protections; on the display the PR010/T unit will show the trip time and the result of the test (OK/FAILED).

At the end of the test it is asked whether to record a test report which may later be downloaded on a PC.

14.3.2 Manual Test

The manual test allows the release trip time to be tested with the desired load condition, in particular it offers the possibility of selecting the current value in a range between 0.00 and 16.00 I_n , the voltage value in a range between 0.0 and 1.3 U_n , the phase shift between -180° and $+180^\circ$ with step 0.75° , and of selecting the phases involved in the test (L1, L2, L3, Ne, Gext, V1, V2, V3).

The release trip time will depend on the settings of the protections; on the display the PR010/T unit will show the trip time and the result of the test (OK, FAILED).

At the end of the test it is asked whether to record a test report which may later be downloaded on a PC.

14.3.3 Trip test

With this test it is possible to send a command to turn off the circuit breaker, thus checking the functionality of the protection opening system.

The trip test command is accepted by the protection unit only if the circuit breaker is on.

14.3.4 Sign. mod. autotest

When this item is selected, the autotest of the signalling module is launched. Refer to the signalling module manual for further information on this function.

14.3.5 Force output S ZS

Activates the zone selectivity output of the protection S; this command allows checking of the zone selectivity function on the system.

14.3.6 Force output G ZS

Activates the zone selectivity output of the protection G; this command allows checking of the zone selectivity function on the system.

14.3.7 Release output ZS

Deactivates both the zone selectivity outputs of the protections S and G; this command allows checking of the zone selectivity function on the system.

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14.3.8 RC Test

Activates the test of the protection RC. Refer to the protection manual for further information on this function.

14.4 Measurements

It is possible to display the following measurements:

1. Currents
2. Peak factors
3. Voltages
4. Powers
5. Energies
6. Power factor
7. Frequency
8. Reset energies
9. Reset meas. history

For example to display the current measurements, the following selections must be made:

Key to be pressed	Item selected
1	Operation mode
x	PR122/P
2	Measurements
1	Currents
ENTER	

14.5 History

Under the HISTORY menu is the display of the history for the openings of the protection tripped, the events and some statistical information on the openings of the release.

For example to display the history of the openings (trip history), the following selections must be made:

Key to be pressed	Item selected
1	Operation mode
x	PR122/P
3	History
1	Trip history
ENTER	

14.6 Configurations/parameters

It is possible to display and even modify the configurations and parameters of the release.

14.6.1 Configurations

The configuration parameters available are divided into:

1. Circuit breaker
2. Mains frequency
3. Meas. int. (Measurement interval)
4. Local bus an. Th. (Local bus analog threshold)
5. Startup curr. Th. (startup current threshold)
6. Harmonic distortion
7. Modules
8. Local bus unit
9. Data logger
10. System

For example, starting from the main menu, selecting:

Key to be pressed	Item selected
1	Operation mode
x	PR122/P
4	Config./Parameters
1	Configurations
1	Circuit breaker
1	Neutral protection
ENTER	

enters the screen that displays the configuration parameters of the neutral protection and the following screen appears:

Neutral protection

Enable: ON [OFF]
Threshold: 50 [...] %

Pressing the ENTER key launches editing mode (the cursor starts blinking); using the keys ↑ and ↓ the cursor is positioned on the desired parameter and the keys ← and → are used to modify the value of the parameters in the allowed range.

14.6.2 Local bus unit

From the CONFIGURATIONS menu it is possible to set the parameters for operation of the release unit on the local bus, selecting:

Key to be pressed	Item selected
1	Operation mode
x	PR121/P
4	Config./Parameters
1	Configurations
3	Local bus unit
...	...

At this point it is possible to choose one of the following items:

1. Presence
2. Release 1
3. Release 2
4. Release 3
5. Release 4
6. Release 6
7. Release 7
8. Release 8

Selecting "Presence" sets the presence/absence of a unit on the local bus.

Selecting Release x the configuration parameters of release x on the local bus unit are read/set, for example selecting:

Key to be pressed	Item selected
...	...
4	Release 3
1	Source

The setting of the activation signal of release no. 3 is displayed; pressing the ENTER key launches editing mode (the cursor starts blinking); the setting of the activation signal is changed using the keys ← and →.

If "Custom" is selected, when ENTER is pressed the current setting is displayed, for example:

```

ALARM 1 4...6
→ L Pre-alarm
  L Timing
→ S Timing

```

Where the arrows indicate which elements of the ALARM 1 block are selected.

With the keys **↑** and **↓** the previous/next screen is displayed and with the keys **←** and **→** the selected element is activated/deactivated (the arrow next to the element is displayed/removed).

There are 18 blocks, each of which is made up of eight elements and is displayed in three consecutive screens; up to 8 elements may be activated for each block.

On the last screen of each block it is possible to define the AND/OR logic applied to the selected elements and the minimum release activation time.

14.6.3 Parameters

The protection parameters are divided into:

1. L prot.
2. S prot.
3. I prot.
4. G prot.
5. Ext G prot.
6. U prot.
7. T prot.
8. LC1 prot.
9. LC2 prot.
10. Iw prot.
11. RC prot.
12. MCR prot.
13. UV prot.
14. OV prot.
15. RV prot.
16. RP prot.
17. UF prot.
18. OF prot.

For example, selecting:

Key to be pressed	Item selected
1	Operation mode
x	PR122/P
4	Config./Parameters
2	Parameters
1	Protection L
ENTER	

enters the screen that displays the parameters of protection L and the following screen appears:

```
L prot    t=k/i2 [...]
Threshold:  x.xx In
Time:      x.xx s
Thermal mem: ON [OFF]
```

Pressing the ENTER key launches editing mode (the cursor starts blinking); using the keys ↑ and ↓ the cursor is positioned on the desired parameter and the keys ← and → are used to modify the value of the parameters in the allowed range.

14.7 Information

On this menu it is possible to view some information on the protection unit and the circuit breaker.

The menu is divided into:

1. Protection unit
2. Circuit breaker

For example, starting from the main menu, selecting:

Key to be pressed	Item selected
1	Operation mode
x	PR122/P 3
5	Information
2	Circuit breaker
ENTER	

enters the screen that displays information on the circuit breaker:

```
Device: E1B800/4P
Rated Current: xxxxA

sn: xxxxxxxxxxxxxxxxxxxx
```

Pressing the keys ↑ and ↓ passes to the display of the next/previous screen:

```
Install: xx/xx/xxxx
Maint:  xx/xx/xxxx
```

14.8 Status

On this menu it is possible to view any signals of an error in configuration/wiring of the protection unit and of the circuit breaker. In particular, one or more of the following messages may be displayed:

1. No alarm
2. L Prealarm
3. T Prealarm
4. L1 Sensor error
5. L2 Sensor error
6. L3 Sensor error
7. Ne Sensor error
8. Gext sensor error
9. TC disconnected
10. Rating Plug error
11. Installation error
12. Device error
13. Invalid Date
14. Configuration error
15. CB status error

Refer to the release user manual for the solution of the errors indicated.

15. SACE PR123/P protection release

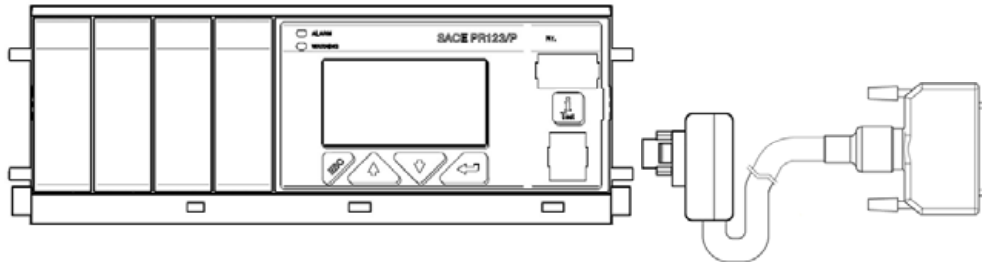


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15.1 Operation mode menu tree

- PR123 UNIT**
1. Test
 2. Measurements
 3. History
 4. Config/Param
 5. Information
 6. Status

1. Test

1. Start automatic test Test report
2. Start manual test Test report
3. Start trip test
4. Start signalling module autotest
5. Force output S zone sel.
6. Force output G zone sel.
7. Release output zone sel.
8. Start Rc test note 1

2. Measurements

1. Display currents
2. Display peak factors
3. Display voltages
4. POWERS
 1. Display active power
 2. Display reactive power
 3. Display apparent power
5. Display energies
6. Display power factor
7. Display measured frequency
8. Reset energies counters
9. Reset measurement history

3. History

1. Display trip history
2. Display events
3. Statistics
 1. Display contact wear
 2. Display total no. prot. trips
 3. Display total no. prot. trips
 4. Display no. manual operations
 5. Display no. prot. operations
 6. Display no. trip failures
 7. Display no. trip tests

4. Config/Param

1. CONFIGURATIONS >>
2. Protection parameters
 1. Set A PARAMETERS >>
 2. Set B PARAMETERS >>

5. Information

1. Protection unit information
2. Circuit breaker information

6. Status

1. Display configuration error

PR123 UNIT

CONFIGURATIONS

- | | |
|----------------------|------------------------|
| 1. Circuit breaker | 7. Harmonic distortion |
| 2. Mains freq. | 8. Modules |
| 3. Meas. int. | 9. Local bus unit |
| 4. Local bus an. Th. | 10. Data logger |
| 5. Startup curr. Th. | 11. System |
| 6. Dual setting | |

1. Circuit breaker

1. Neutral protection parameters
2. Ground toroide protection parameters note 5
3. Plant config. parameters
4. CB TAG Name
5. User Data

2. Mains frequency

3. Measurement storage period

4. Local Bus analogue threshold

5. Startup current activation threshold

6. Dual setting

1. Enable dual setting
2. Default setting
3. Dual setting on CB close
4. Dual setting on Vaux Off
5. Set B on L Bus DI

7. Enable/disable harmonic distortion alarm

8. Modules

1. Measuring
 1. Voltage transformer parameters
 2. Neutral voltage presence
 3. Positive power direction
 4. Warnings
 1. Phase sequence configuration
 2. Power factor configuration
2. Communication note 3
 1. Operation mode
 2. Communication parameters
3. Signalling module note 4
 1. Release 1 configuration
 1. Type of signal source Display custom. type
 2. Display source configuration
 2. Release 2 configuration
 3. Release 3 configuration
 4. Release 4 configuration
 5. Input (signalling module configuration)

9. Local bus unit

1. Local bus unit presence
2. Release 1 configuration
 1. Type of signal source Display custom. type
 2. Display source configuration
3. Release 2 configuration
4. Release 3 configuration
5. Release 4 configuration
6. Release 6 configuration
7. Release 7 configuration

PR123 UNIT CONFIGURATIONS	1. Circuit breaker 2. Mains freq. 3. Meas. int. 4. Local bus an. Th. 5. Startup curr. Th. 6. Dual setting	7. Harmonic distortion 8. Modules 9. Local bus unit 10. Data logger 11. System
	8. Release 8 configuration	
10. Data logger		
	1. Data logger configuration 2. Stop data logger event 3. Reset data logger 4. Stop data logger	Display custom. type
11. System		
	1. Display clock 2. Set language	

PR123 UNIT Protection parameters	1. L prot. 2. S prot. 3. S2 prot. 4. D prot. 5. I prot. 6. G prot. 7. Ext G prot.	8. U prot. 9. T prot. 10. LC1 prot. 11. LC2 prot. 12. lw prot. 13. Rc prot. 14. MCR prot.	15. UV prot. 16. OV prot. 17. RV prot. 18. RP prot. 19. UF prot. 20. OF prot.
1. Protection L parameters			
2. Protection S parameters			
3. Protection S2 parameters			
4. Protection D parameters			
5. Protection I parameters			
6. Protection G parameters	note 5		
7. Protection Ext G parameters	note 5		
8. Protection U parameters			
9. Protection T parameters			
10. Protection LC1 parameters			
11. Protection LC2 parameters			
12. Protection lw parameters			
13. Protection Rc parameters	note 1		
14. Protection MCR parameters			
15. Protection UV parameters			
16. Protection OV parameters			
17. Protection RV parameters			
18. Protection RP parameters			
19. Protection UF parameters			
20. Protection OF parameters			

NOTES

- 1 Only for performing LSIG and presence of residual current in the external toroide.
- 2 Only if measuring module present.
- 3 Only if communication module present.
- 4 Only if signalling module present.
- 5 Only for performing LSIG.

15.2 Indications on operation

- The SACE PR010/T unit can be used with all SACE PR123/P releases by connecting the test unit to the protection unit with the cable provided, to be inserted in the test connector on the front.
- It is not necessary for the auxiliary supply to be present in order to use the above releases with the PR010/T unit.
- The automatic and manual tests must be performed with the circuit breaker off while the trip test may be performed only with the circuit breaker on; in either case the circulating currents must be null.



WARNING

For PR123/P releases with a software version prior to 1.0, the following limitations must be considered:

1. Startup time protection S:	$0.1 \text{ s} \leq \text{Time} \leq 1.5 \text{ s}$ step 0.01 s
2. Startup time protection S2:	$0.1 \text{ s} \leq \text{Time} \leq 1.5 \text{ s}$ step 0.01 s
3. Startup time protection G:	$0.1 \text{ s} \leq \text{Time} \leq 1.5 \text{ s}$ step 0.01 s
4. Startup time protection Gext:	$0.1 \text{ s} \leq \text{Time} \leq 1.5 \text{ s}$ step 0.01 s
5. Startup time protection D:	$0.1 \text{ s} \leq \text{Time} \leq 1.5 \text{ s}$ step 0.01 s
6. Startup current activation threshold not contemplated	
7. Protection U threshold:	$5\% \leq \text{th} \leq 90\%$ step 5%
8. Minimum custom datalogger activation time not contemplated	

A description of the various menus is given below.

15.3 Test

By means of the PR010/T unit it is possible to perform some tests on the protection unit, in particular:

1. Automatic test
2. Manual test
3. Trip test
4. Sign. mod. autotest
5. Force output S ZS
6. Force output G ZS

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7. Release output ZS
8. Rc Test

For example, to perform the automatic test it is necessary to follow the procedure described in the following table:

Key to be pressed	Item selected
1	Operation mode
x	PR123/P
1	Test
1	Automatic test
ENTER	

A brief description of the various tests will be given below.

15.3.1 Automatic test of the release PR123/P

With the automatic test, a sequence of 13 different tests will be performed at the currents, voltages, phase shift and phases indicated in the following table:

Test N°	Phase						Amplitude		Phase shift Φ
	L1	L2	L3	V12	V23	V31	I [In]	V[Un]	
1	■	■	■	■	■	■	3.0	1	30°
2	■	■	■	■	■	■	5.0		
3	■	■	■	■	■	■	10		
4	■	■	■	■	■	■	15		
5	■			■	■	■	0.3	1	0°
6	■			■	■	■	3		
7	■	■	■	■	■	■	0.3	1	210°
8	■	■	■	■	■	■	3		
9	■	■	■	■	■	■	5		
10	■	■	■	■	■	■	10		
11	■	■	■	■	■	■	15		
12				■	■	■	0.0	0.4	
13				■	■	■		1.3	

For example test n° 5 is performed with:

IL1=0,3 In

IL2=IL3= 0 In

V12=V23=V31= 1 Un

Phase shift 0° ($\cos\Phi=1$)

The trip times of the release in the various tests will depend on the settings of the protections; on the display the PR010/T unit will show the trip time and the result of the test (OK/FAILED).

At the end of the test it is asked whether to record a test report which may later be downloaded on a PC.

15.3.2 Manual test

The manual test allows the release trip time to be tested with the desired load condition, in particular it offers the possibility of selecting the current value in a range between 0.00 and 16.00 In, the voltage value in a range between 0.0 and 1.3 Un, the phase shift between -180° and $+180^\circ$ with step 0.75° , and of selecting the phases involved in the test (L1, L2, L3, Ne, Gext, V1, V2, V3).

The release trip time will depend on the settings of the protections; on the display the PR010/T unit will show the trip time and the result of the test (OK, FAILED).

At the end of the test it is asked whether to record a test report which may later be downloaded on a PC.

15.3.3 Trip test

With this test it is possible to send a command to turn off the circuit breaker, thus checking the functionality of the protection opening system.

The trip test command is accepted by the protection unit only if the circuit breaker is on.

15.3.4 Sign. mod. autotest

When this item is selected, the autotest of the signalling module is launched. Refer to the signalling module manual for further information on this function.

15.3.5 Force output S ZS

Activates the zone selectivity output of the protection S; this command allows checking of the zone selectivity function on the system.

15.3.6 Force output G ZS

Activates the zone selectivity output of protection G; this command allows checking of the zone selectivity function on the system.

15.3.7 Release output ZS

Deactivates both the zone selectivity outputs of the protections S and G; this command allows checking of the zone selectivity function on the system.

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15.3.8 RC Test

Activates the test of the protection RC. Refer to the protection manual for further information on this function.

15.4 Measurements

It is possible to display the following measurements:

1. Currents
2. Peak factors
3. Voltages
4. Powers
5. Energies
6. Power factor
7. Frequency
8. Reset energies
9. Reset meas. history

For example to display the current measurements, the following selections must be made:

Key to be pressed	Item selected
1	Operation mode
x	PR123/P
2	Measurements
1	Currents
ENTER	

15.5 History

Under the history menu is the display of the history for the openings of the protection tripped, the events and some statistical information on the openings of the release.

For example to display the history of the openings (trip history), the following selections must be made:

Key to be pressed	Item selected
1	Operation mode
x	PR123/P
3	History
1	Trip history
ENTER	

15.6 Configurations/parameters

It is possible to display and even modify the configurations and parameters of the release.

15.6.1 Configurations

The configuration parameters available are divided into:

1. Circuit breaker
2. Mains freq.
3. Meas. int. (Measurement interval)
4. Local bus an. Th. (Local bus analog threshold)
5. Startup curr. Th. (startup current threshold)
6. Dual setting
7. Harmonic distortion
8. Modules
9. Local bus unit
10. Data logger
11. System

For example, starting from the main menu, selecting:

Key to be pressed	Item selected
1	Operation mode
x	PR123/P
4	Config./Parameters
1	Configurations
1	Circuit breaker
1	Neutral protection
ENTER	

enters the screen that displays the configuration parameters of the neutral protection and the following screen appears:

```
Neutral protection

Enable: ON [OFF]
Threshold: 50[...]%
```

Pressing the ENTER key launches editing mode (the cursor starts blinking); using the keys ↑ and ↓ the cursor is positioned on the desired parameter and the keys ← and → are used to modify the value of the parameters in the allowed range.

15.6.1.1 Local bus unit

From the CONFIGURATIONS menu it is possible to set the parameters for operation of the release unit on the local bus, selecting:

Key to be pressed	Item selected
1	Operation mode
x	PR123/P
4	Config./Parameters
1	Configurations
9	Local bus unit
...	...

At this point it is possible to choose one of the following items:

1. Presence
2. Release 1
3. Release 2
4. Release 3
5. Release 4
6. Release 6
7. Release 7
8. Release 8

Selecting "Presence" sets the presence/absence of a unit on the local bus.

Selecting Release x the configuration parameters of release x on the local bus unit are read/set, for example selecting:

Key to be pressed	Item selected
...	...
4	Release 3
1	Source

The setting of the activation signal of release no. 3 is displayed; pressing the ENTER key launches editing mode (the cursor starts blinking); the setting of the activation signal is changed using the keys ← and →.

If "Custom" is selected, when ENTER is pressed the current setting is displayed, for example:

```

ALARM 1 4...6
→ L Pre-alarm
  L Timing
→ S Timing

```

Where the arrows indicate which elements of the ALARM 1 block are selected.

With the keys **↑** and **↓** the previous/next screen is displayed and with the keys **←** and **→** the selected element is activated/deactivated (the arrow next to the element is displayed/removed).

There are 18 blocks, each of which is made up of eight elements and is displayed in three consecutive screens; up to 8 elements may be activated for each block.

On the last screen of each block it is possible to define the AND/OR logic applied to the selected elements and the minimum release activation time.

15.6.2 Parameters

The PR123/P protection unit has two alternative parameter sets, Set A and Set B; the parameter reading/programming menu contemplates the choice of the set of parameters to be displayed/edited:

1. Set A
2. Set B

After having selected the test on which to operate, the menu for choosing the type of protection is accessed:

1. L prot.
2. S prot.
3. S2 prot.
4. D prot.
5. I prot.
6. G prot.
7. Ext G prot.
8. U prot.
9. T prot.
10. LC1 prot.
11. LC2 prot.
12. Iw prot.
13. Rc prot.
14. MCR prot.
15. UV prot.
16. OV prot.
17. RV prot.
18. RP prot.
19. UF prot.
20. OF prot.

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For example, selecting:

Key to be pressed	Item selected
1	Operation mode
x	PR123/P
4	Config./Parameters
2	Parameters
1	Set A
1	Protection L
ENTER	

enters the screen that displays the parameters of protection L and the following screen appears:

```
L prot t=k/i2[...]
Threshold: x.xx In
Time: x.xx s
Thermal mem: ON[OFF]
```

Pressing the ENTER key launches editing mode (the cursor starts blinking); using the keys ↑ and ↓ the cursor is positioned on the desired parameter and the keys ← and → are used to modify the value of the parameters in the allowed range.

15.7 Information

On this menu it is possible to view some information on the protection unit and the circuit breaker.

The menu is divided into:

1. Protection unit
2. Circuit breaker

For example, starting from the main menu, selecting:

Key to be pressed	Item selected
1	Operation mode
x	PR123/P
5	Information
	Circuit breaker
ENTER	

enters the screen that displays information on the circuit breaker:

```
Device: E1B800/4P
Rated Current: xxxxA
sn: xxxxxxxxxxxx
```

Pressing the keys **↑** and **↓** passes to the display of the next/previous screen:

```
Install: xx/xx/xxxx
Maint: xx/xx/xxxx
```

15.8 Status

On this menu it is possible to view any signals of an error in configuration/wiring of the protection unit and of the circuit breaker. In particular, one or more of the following messages may be displayed:

1. No alarm
2. L Prealarm
3. T Prealarm
4. L1 Sensor error
5. L2 Sensor error
6. L3 Sensor error
7. Ne Sensor error
8. Gext sensor error
9. TC disconnected
10. Rating Plug error
11. Installation error
12. Device error
13. Invalid Date
14. Configuration error
15. CB status error

Refer to the release manual for the solution of the errors signalled.

SACE PR010/T test unit instructions



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1. Safety notes



WARNING

This symbol indicates information about procedures or situations that may cause injury to personnel, damage to the unit or financial loss.



WARNING

Carefully read the entire contents of this handbook. Damage resulting from failure to comply with the instructions effectively invalidates the terms of guarantee. The manufacturer declines all liability for damage to the unit caused by incorrect or improper usage.

ABB SACE also declines all liability for any ensuing damage or injury. Do not use the unit in damp or wet environments.

If in doubt about the safety of the unit, take it out of service to prevent inadvertent usage.

The unit's safety may be impaired if:

1. the unit shows visible signs of damage
2. the unit does not work
3. the unit is stored for a long period or has incurred damage during shipment.

Do not switch on the unit immediately after having transferred it from a hot environment to a cold one. Water condensation could damage or destroy the unit. Wait until the unit adapts to the new ambient temperature before switching it on.

Never leave discharged batteries inside the unit since the battery fluid may leak and damage the unit.

Do not use abrasive detergents, petrol or alcohol etc. to clean the unit, since these products may damage the unit's surface.

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2. Definitions, abbreviations

Abbreviation	Description
CB	Circuit Breaker (for example: ABB SACE Emax and Isomax)
DUT	Device Under Test
HW	Hardware: the physical and electronic components that make up the device.
Password	Secret password which denies unauthorised access to certain SACE PR010/T functions.
PC	Personal Computer
Release	Protection unit otherwise known as a protection release.
SW	Software: the programs used by the microprocessors to execute a set of programmed functions/tasks.
CT	Current transformer
Trip test	Special test designed to trip the CB
TT1	ABB SACE trip test unit for use with some releases.

3. General information

3.1 Introduction

The SACE PR010/T unit is an instrument capable of performing the functions of testing, programming and reading parameters for the protection units equipping ABB SACE low-voltage circuit-breakers. For the specific functions, refer to the respective protection unit. All of the functions mentioned may be carried out "on board" by connecting the SACE PR010/T unit to the front connector on the protection unit. Two different types of test are available: automatic and manual. It is also possible to perform the trip test through the SACE TT1 unit.

By connecting to a PC (using the disc supplied by ABB SACE, or SW downloaded from the ABB Internet site) it is possible to upgrade the software of the SACE PR010/T unit. The unit can also save important test results, which may then be downloaded to a PC following a request for a test report.

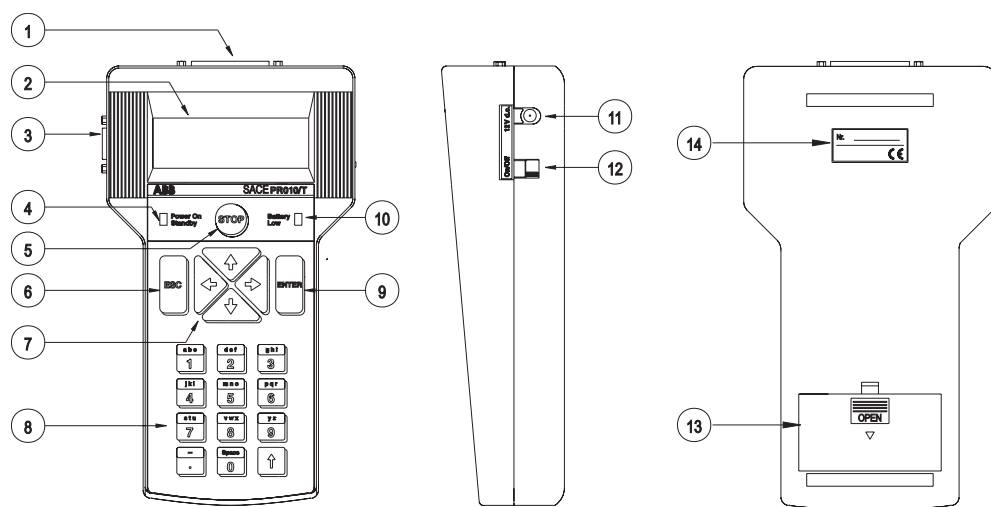
The SACE PR010/T test unit is a portable instrument operated by rechargeable batteries and/or an external power supply.

3.2 Putting into service

To put the SACE PR010/T unit into service, proceed as follows:

- Fit the batteries in the corresponding battery compartment (13), taking care to check the polarity first.
- Connect the external power supply to the 12 Vdc outlet (11).
- Wait for the batteries to charge (when the PR010/T unit is switched off, the battery charge status bar is stationary). Even when the batteries are discharged, the PR010/T unit can still operate if connected to the external power supply.

3.3 General description



1. Cable connector for connection to circuit breaker protection unit
2. Backlit LCD display (4 x 20-character lines) to display messages and test results
3. Cable connector for connection to Personal Computer
4. Green/red unit status indicator led (power on - stand-by)
5. Stop test or special functions key
6. Return/cancel key
7. Arrow selection and setting keys
8. Alphanumeric setting and control keyboard
9. Confirm key
10. Red battery charge status indicator led
11. External power supply socket
12. Sliding unit on/off switch
13. Battery compartment
14. SACE PR010/T unit serial number

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4. Functions

4.1 Test Functions

The SACE PR010/T test unit tests protection units by monitoring both their HW and SW components. In particular, the unit performs the following tests:

- Trip test: by means of SACE TT1 unit
- Protection functions test
- Communication functions test

4.1.1 Trip test

The trip test tests the operation of the microprocessor, release and opening solenoid chain.

The trip test may also be performed with the circuit breaker on.

This test is performed by means of SACE TT1 unit.



WARNING

For safety reasons, the current flow inside the circuit breaker must be zero during testing.

For this reason, the current flow is automatically monitored before testing and registered as zero if the reading detected is below a preset value.

4.1.2 Protection functions test

The device under test is powered up and the fault condition for the protection function to be tested is simulated. In case of units provided with internal bus, the internal status of the protections (alarm and trip messages etc.) may also be monitored.

In case of certain releases, the type of release and circuit breaker and the rated current of the CTs installed are also automatically identified.



WARNING

For safety reasons, protection function tests must only be performed with the circuit breaker off.

These tests may be performed in both automatic and manual mode.

- **Automatic mode:** releases equipped with internal bus (see electrical diagrams in the Technical Catalogue) are automatically tested. The PR010/T unit is in fact capable of self-learning the protection parameter settings and, based on these parameters, of generating a fault signal for each function in order to test the timing. In the event of an anomaly, the type of error detected is indicated by the corresponding message (threshold or timing error). This sequence is automatically repeated on all protection unit functions. Testing may be interrupted at any time using the STOP button, thereby restoring the original conditions/settings of the

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protection unit prior to testing. In the case of releases not equipped with internal bus, the user must preset the protections before testing.

- **Manual mode:** this test may be performed on any type of protection. In this case, the user must set all the protection parameters before testing. During manual testing, the user selects the type of device to be tested from a menu, whereupon device protection functions and thresholds are displayed so that the user can set the required test parameters. If the user selects an intermediate threshold in relation to those actually available, the SACE PR010/T test unit will automatically convert it to the highest one. The fault may be simulated either separately or simultaneously on any combination of phases L1, L2, L3 and NE.

4.1.3 Communication functions test

The SACE PR010/T test unit can also test the serial communication circuits of the protection releases.

4.2 Programming function

Using the SACE PR010/T test unit, the type of releases with internal bus mounted on ABB SACE low voltage circuit breakers can be programmed.

You can also program all the protection function parameters (threshold, curve, interlock parameters etc.). The parameter-programming function does not interrupt the normal operation of the protection unit, although parameters cannot be set if a timing alarm is pending.

The SACE PR010/T test unit will not set parameters outside the permitted range.

A message is displayed at the end of programming to indicate that the parameters have been successfully programmed.

Each operating parameter modified must first be confirmed before it is saved. In the event of a programming error, simply press the ESC key to cancel the last entry/action.

4.3 Parameter reading function

If the SACE PR010/T test unit is connected to releases with internal bus, it is possible to read the main parameters of the protection units.

At the user's express request and, subject to availability, the SACE PR010/T test unit can provide information about the following:

- protection status (thresholds, alarms, trips etc.)
- circuit breaker status (number of operations, contact wear etc.)
- phase, neutral and earth fault current readings
- serial number and SW release (available on the "Information" menu page).

NOTE: The parameter reading function is permanently available, irrespective of the protections and CB status.

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4.4 Protection unit interface

The SACE PR010/T test unit can perform all the operations described above without extracting the protection units from the circuit breakers. The test unit (connector 1) is connected to the releases by a cable fitted with a special connector. The SACE PR010/T test unit is connected to the various types of release using the specific cables for each type of release.

4.5 PC interface

The SACE PR010/T test unit is fitted with a connector (3) for connection to a PC (standard RS232 serial port). This interface is used to update the unit's software and download test reports.

4.6 Test report

The SACE PR010/T test unit can save the main test results in order to compile a test report. The unit can store up to five test reports. After the test reports have been downloaded in the PC it is advisable to delete them from the PR010/T so as to have enough free memory available for new reports. The SACE PR010/T test unit saves data even when disconnected from the power supply. Test results are downloaded to a PC when the user requests a test report. The test report contains the following information, which is automatically supplied by the unit or manually entered by the user:

- unit serial number (Sr. Nr.)	
- date and time of test	Manually entered by user
- operator name	
- type of unit tested	Automatically supplied for releases with internal bus only.

The following information is automatically indicated for each protection function tested:

- type of protection
- threshold selected
- curve selected
- phase tested
- test current
- estimated trip time
- measured trip time
- test results.

Test report example:

```

TEST REPORT WITH SACE PR010/T
SW Version: 3.2

*****
Date:                03/05/00
Hour:                13:55
Operator:            Belometti
Relay S.Nr.:         M0047C03B
Relay type:          PR112
Relay version:       LSIG
CB type:             E1B800
CT rated current:    250 A
Neutral:             50%
*****

Protection:          L
Threshold [In]:      0.400
Curve [s]:           3.00
Curve type:          t=k/i^2
Tested phase(s):     L1
Fault current [In]:  2.40
Expected time [s]:   0.750
Measured time [s]:   0.758
Test result:         OK

Protection:          S
Threshold [In]:      0.800
Curve [s]:           0.35
Curve type:          t=k/i^2
Tested phase(s):     L1
Fault current [In]:  1.60
Expected time [s]:   13.668
Measured time [s]:   11.984
Test result:         OK

Protection:          I
Threshold [In]:      4.000
Curve [s]:           inst
Curve type:          t=k
Tested phase(s):     L1
Fault current [In]:  8.00
Expected time [s]:   0.060
Measured time [s]:   0.016
Test result:         OK

Protection:          G
Threshold [In]:      0.400
Curve [s]:           0.10
Curve type:          t=k/i^2
Tested phase(s):     --
Fault current [In]:  1.00
Expected time [s]:   0.320
Measured time [s]:   0.314
Test result:         OK

```

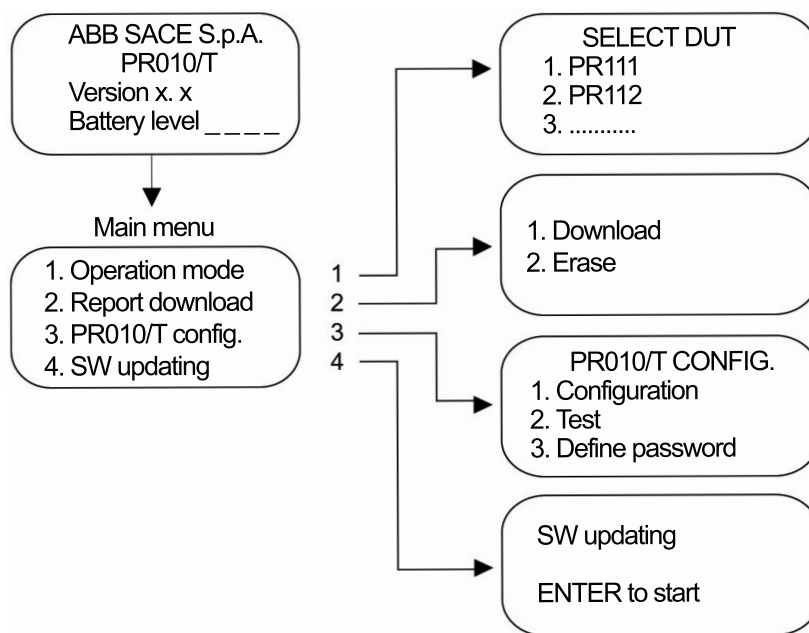
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4.7 Special functions

- With regard to the setting of the protection parameters it is possible to carry out several tests using different thresholds and curves to identify the optimum program for the circuit breaker/ installation.
- The test unit can memorise a special "frequent use" program for each of the protection units that may be electronically programmed (Define default).
- The manual test function also enables a general current to be introduced into the release in order to test the trip time (a particularly useful function for selectivity studies between two or more circuit breakers).

5. Software

5.1 Description



When the SACE PR010/T test unit is first switched on, it runs an initialisation test. If the test result is successful, the software version and battery charge status are displayed on the screen.

To open one of the sub-menus from the main menu, position the cursor using the

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↓ or ↑ keys and press “**Enter**”.

To return to the main menu, press “**ESC**”.

The moving ■ sequence indicates that the test unit is busy, so you must wait until it has finished.

Sub-menu 1. "Operation mode" of the main menu is different for each type of protection unit (see "Operation mode menu tree").

Sub-menus 2. "Report download", 3. "PR010/T Config." and 4. "SW updating" are the same for all the protection units.

5.1.1 Report downloading

The SACE PR010/T test unit can download a test report onto a PC which contains all the information indicated under the heading "Test report".

5.1.2 Test unit configuration

The test unit configuration can be customized.

You can define a password (Define password) to use to access the testing and programming stages, to adjust brightness and contrast, and to select the language of your choice (default password: 00000).

If, after specifying a new password, you want to restore the default setting, you need to zero the password; to do so, select the "Reset password" item and notify ABB SACE of the code displayed (e.g. CODE = 63795).

ABB SACE will provide an unlock code to input on the same page (PLEASE INSERT RESET CODE-----) which enables you to reset the PR010/T with the default password (00000).

N.B. The unlock code can only be used for one password zeroing operation; for any subsequent password zeroing operations, you must go to the "Reset password" page again and notify ABB SACE of the new code it displays (e.g. CODE = 83922) in order to obtain the new unlock code.

You can also perform a test on the unit by selecting the "Test" menu.

The software is self-explanatory; simply follow the instructions that appear on the screen.

5.1.3 Software updating

The software installed on the SACE PR010/T test unit may be upgraded simply by connecting it to a PC and following the procedure described below in the section "Communication with PC".

5.2 Communication with PC

Using the "SD-TU Interface" software provided it is possible to update the SACE PR010/T unit, customizing the list of devices available for the test.

To install the software, just run the application "SD-TU Interface xxx.msi". The steps necessary for updating the test unit software are listed below.

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Further explanations on the use of the "SD-TU Interface" software can be found in the software's own on-line help.

5.2.1 SW updating procedure

1. Switch on the SACE PR010/T test unit.
2. Connect the SACE PR010/T test unit (connector 3) to one of the PC's serial ports (COM1... COM4) using the cable supplied.
3. Run the "SD-TU Interface.exe" program.
4. From the list of devices that appears in the "Device selection" window on the left of the screen, use the mouse (holding down the left key) to select the device you want, dragging it into the "Device" window that appears on the right.
5. Repeat the selection operation indicated in point 4 for all the devices you want to insert (when the memory available is exhausted this is indicated with the message "PR010/T memory completely filled!!").
6. Select Program/From configuration on the PR010/T menu.
7. Now go to the PR010/T unit and select the 4.Update SW menu from the main menu. This message will appear:
 `Update SW`
 `ENTER to confirm`
8. Press ENTER on the SACE PR010/T unit to display the following message:
 `Waiting SW update`
9. Before one minute elapses, press OK in the window displayed on the PC. The SACE PR010/T unit will now display the message:
 `SW Updating in progress`
 accompanied by a progressive status bar indicating the download time remaining. The maximum duration of the procedure may be several minutes, depending on the number of devices selected; the "programming status" bar is displayed on the PC monitor in the "Program PR010/T" window, indicating how the updating is proceeding. If the file is successfully downloaded, the SACE PR010/T unit will display the following message:
 `End SW updating`
 `SW Ver. X.X`
 `Press ESC to restart`
 while the PC will display the message:
 `PR010/T successfully programmed`
 Press ESC on the SACE PR010/T unit to restart the unit with the new software version. Close the PC application.
10. If the file is not successfully downloaded, the SACE PR010/T unit will display the following message:
 `WARNING.SW updating failed`
 `Press ESC to restart`
 and the PC will display the message:
 `Time out error: cannot contact PR010/T`
11. Press ESC on the SACE PR010/T unit to return to the screen:
 `Program failed`
 `ENTER for recovery`
12. Select PROGRAM/from CONFIGURATION in the "PR010/T Program" of the PC.

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13. Proceed as described in point 7 onwards.

5.2.2 Test report downloading procedure

1. Switch on the SACE PR010/T test unit.
2. Using the cable supplied, connect the unit to one of the PC's serial ports
3. Run the "SD-TU Interface" program.
4. On the PR010/T menu select **Get report**
5. On the main menu of the SACE PR010/T unit, select
'2.Report Download',
the following message will be displayed:
'Test report download'
'ENTER to start'
6. Press ENTER on the SACE PR010/T unit to display the following message:
'Waiting for report download'.
Before one minute elapses, press the **Get report** key in the window "get report from PR010/T" displayed on the PC.
7. The SACE PR010/T unit will now display the message:
'Download in progress'
accompanied by a progressive status bar indicating the download time remaining. The maximum transmission duration is about one minute.
8. If the file is not successfully downloaded, the SACE PR010/T unit will display the message:
9. 'END report download'
10. 'Press ESC to restart'
11. while the PC will automatically open the Report window displaying what has been received.
12. Press ESC on the SACE PR010/T unit to return to the main menu.
13. If the file is not successfully downloaded, the SACE PR010/T unit will display the message:
'Download aborted'
'Press ESC to return'
14. The PC will display the message "Timeout error: cannot contact PR010/T"
15. Press ESC and resume as described in point 4 onwards.
16. In the event of problems not described in this section, refer to the "Error messages and troubleshooting table".

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5.2.3 Test report erasing

The following procedure entirely erases the test reports stored in the PR010/T:

1. Switch on the SACE PR010/T test unit.
2. On the main menu of the SACE PR010/T unit, select:

'2.Report Download'

'2.Erase'

The following message will be displayed:

'Report erasing'

'ENTER to proceed'

'ESC to return'

Select ENTER to erase the report.

5.3 Protection unit

See annex RH0029002.

6. Technical specifications

6.1 User interface

The user interface comprises an alphanumeric display, membrane keyboard and indicator led.

Each time a key is pressed, an acoustic signal is emitted. The back-lit LCD display features 4 lines each containing up to 20 characters.

The display's back-lighting automatically switches off when the keyboard is idle, unless connected to the external power supply.

If no key is pressed for at least 5 minutes the display switches off automatically to minimise electrical consumption.

6.2 Power supply

The SACE PR010/T test unit is a portable instrument operated by 6 rechargeable batteries and/or an external power supply.

When installing the rechargeable batteries in the PR010/T unit, pay attention to the polarity indications in the space provided for the batteries.

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The **specifications of the external power supply** supplied are as follows:

Vin	= 100...240 Vac (47...63 Hz)
Vout	= 12 Vdc \pm 5%
Max output current	= 2.7A

The **specifications of the rechargeable batteries** supplied are as follows:

Size	AA
Type	NiMH
Voltage	1.2V
Capacity	1300 mA/h

The operating autonomy of the batteries during testing depends on the type of release tested, the type of tests performed, the different release versions and the operations performed by the user. When testing, for example, a PR112/P unit the batteries operate for about 2 hours under test conditions and 6 hours in stand-by mode.

The battery recharge time is about four hours with unit switched off.

The batteries recharge automatically when the SACE PR010/T test unit is connected to the external power supply.

The rechargeable batteries are supplied discharged. The batteries must therefore be charged before using the PR010/T test unit for the first time.

The test unit may also be connected to the external power supply.

6.3 Inputs/Outputs

The SACE PR010/T test unit uses a set of signals to perform its various testing, programming and reading functions. The main characteristics of these signals are as follows:

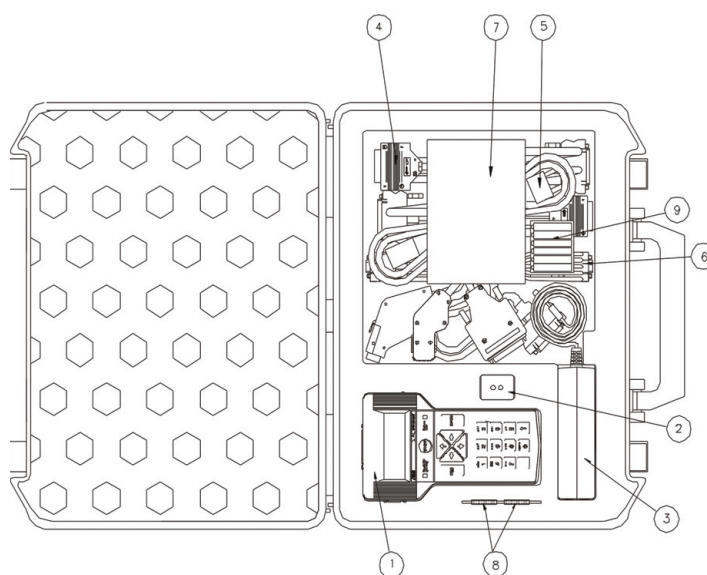
Output voltage range:	- 5 ... +12 Vdc
Maximum output current:	1A constant
Input voltage range:	0 ... +15 Vdc
Minimum input impedance:	1 Mohm

6.4 Mechanical specifications

Plastic enclosure		
Front panel protected against electrostatic discharges		
Dimensions:	Length	= 210 mm
	Max. width	= 120 mm
	Max. depth	= 60 mm
Protection class:	IP30	
Weight (complete with rechargeable batteries):	600 g	
Operating temperature range:	0 °C ... +50 °C	
Storage temperature range:	-20 °C ... +70 °C	
Maximum relative humidity:	90%, (non-condensing)	
MTBF:	15 years @ 30°C	

6.5 Standard equipment

The SACE PR010/T test unit is supplied in a special case, complete with the following accessories:



1. SACE PR010/T test unit complete with rechargeable batteries
2. SACE TT1 TRIP TEST unit
3. External power supply
4. 1m length cables with connectors suited for several types of electronic releases.
5. External power supply connection cable
6. PC connection cable
7. User manual and application software
8. Set of adapters for different types of releases
9. Batteries

6.6 Applicable standards

The SACE PR010/T test unit bears the CE quality mark and fully complies with all major international standards on electromagnetic compatibility (EMC).

Emissions:	IEN55022 class B
Electrostatic discharge:	IEC/EN 61000-4-2
Radiated immunity:	IEC/EN 61000-4-3
Conducted immunity:	IEC/EN 61000-4-6 (1kV)

6.7 Error messages and troubleshooting table

UPDATE ERROR

"SW updating failed" "Press ESC to restart"	This message indicates a software updating error. To rectify, repeat the operation, after first checking the PC-PR010/T connection and the name of the loaded file.
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COMMUNICATION ERROR

"Communication error" "Press ESC to return"	This message indicates that the SACE PR010/T's internal bus is unable to establish a connection with the device under test.
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INVALID DIGITAL VOLTAGE

"DUT internal voltage not valid" "Press ESC to return"	This message indicates an internal DUT voltage reading that is outside the accepted range.
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INVALID PROGRAM

"Program failed" "Press ENTER for recovery"	If this message is displayed when the SACE PR010/T test unit is powered up, it means that the program stored in the SACE PR010/T's memory is incorrect due to the failure of a previous software updating sequence. In this situation, the SACE PR010/T test unit cannot work and must therefore be reloaded with the updated software.
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INVALID WATCH DOG

"Control signal not valid"
"Press ESC to return"

This message indicates that the internal control signal is outside the established range. Check the connection between the SACE PR010/T test unit and device under test.

The following error messages are displayed on the SACE PR010/T unit:

Troubleshooting guide			
No.	Faults	Causes and errors	Checks and remedies
1	The POWER-ON led is not lit	The external power supply is disconnected	Power up the unit with the power supply provided by ABB SACE
		The external power supply is not connected to the mains power supply	Connect the power supply to a 220V power mains
		No batteries fitted	Fit batteries like the ones specified under the heading "Power supply"
		The batteries are flat	Recharge the batteries by connecting the unit to the external power supply
2	The message display is not clear	The contrast and/or brightness setting(s) are incorrectly adjusted	Adjust as described under the heading "Test unit configuration"
3	The display language is incorrect	The language setting is incorrectly programmed	Switch on the unit and 10" later select: 3. ENTER ENTER ENTER Select the correct language with UP and DOWN.

Troubleshooting guide		
4	Problems updating the software installed on the PR010/T unit	Wrong connection cable used to connect the PC to the PR010/T test unit
		Replace with the cable supplied and repeat the operation
		The serial cable is not properly connected
		Make sure the cable connectors are properly inserted
		The PR010/T unit is not ready for Sw updating
		Proceed as described under the heading "Sw updating procedures"
		The PR010/T's time-out elapses before the software starts update
5	Problems downloading the test report to the PC	Make sure the PR010/T unit displays the message "Waiting for file downloading from the PC transfer procedure"
		The update file is not selected
		Select the required software version and repeat the update procedure
6	Problems connecting the cable to the device under test	The wrong type of file is selected
		Select file type PR010t_x.Hex
		The file downloaded is damaged
4	Problems updating the software installed on the PR010/T unit	Use a spare copy or download the updated software version from our Internet site
		Wrong connection cable used to connect the PC to the PR010/T test unit
		Replace with the cable supplied and repeat the operation
		The serial cable is not properly connected
5	Problems downloading the test report to the PC	Make sure the cable connectors are properly inserted
		The PR111-type release is fitted with the wrong adapter
		Fit the correct PR111 adapter
6	Problems connecting the cable to the device under test	The PR111 adapter is damaged
		Replace with the spare one supplied
		A cable for the Isomax Emax circuit breaker, or vice versa
	Problems connecting the cable to the device under test	Use the correct cable for the series is connected to an circuit breaker

6.8 Notes

In view of ongoing revisions to Standards and the latest developments in technology and materials, the characteristics (mechanical, electrical and electronic) and overall dimensions indicated in this handbook are only deemed legally binding subject to confirmation by ABB SACE.

The test unit does not need recalibrating.



WARNING

If necessary, the device may be operated by standard AA-type batteries (non-rechargeable), provided the unit is not simultaneously connected to the external power supply.

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