



Application Note

PCD Fault Test Mode Function

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Introduction

This function has been expanded considerably from previous versions. The following features have been added in V2.82:

- Test currents made settable
- Relay time added to fault test display
- Operations records added on start / end of test
- Multiple recloser shots allowed
- Single phase / three phase tests allowed
- Test is aborted if no pick up
- Fault record enabled for all fault tests
- Test currents included in fault record
- KSI sums not updated during fault test
- Counters updated during fault test

Test Setup

- Use a standard PCD with a recloser or simulator connected to the DIO-2 card.
- Start up AFSuite and add the PCD online to the AFSuite database.
- Set the PCD to operate in three or single phase mode with four shots to lockout.
- Set your **Configuration, Primary Protection and Primary Recloser Settings:**

Configuration

Setting	Value
Unit Name	PCD2000
VT Ratio	100 1 - 32000, step:1
VT Connection	120V Wye
Frequency	60 Hz
Recloser Mode	3-Phase Trip
Curve Set	1-Phase Trip 3-Phase Trip
Alternate 1 Setting	Enable
Alternate 2 Setting	Enable
Zone Seq. Coordination	Enable

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Primary Protection

The screenshot shows the 'Primary Protection' configuration window in AFSuite. The window title is 'Unit1 Configuration Unit1 Online'. The main area is titled 'Primary' and contains a table for configuring protection elements. The table has columns for Element, Curve, Pickup, Range, Units, and More. The elements are grouped into Phase Protection and Ground Protection.

Element	Curve	Pickup	Range	Units	More	79-1	79-2	79-3	79-4	79-5
Phase Protection										
51P	Extremely Inverse	500.00	min:100 max:1600 step:10	Amps	+	1PT	1PT	1PT	3PL	3PL
50P-1	Standard	1.2	min:0.5 max:20 step:0.1	Multiplier	+	1PT	1PT	DIS	DIS	3PL
50P-2	Disable	3.0	min:0.5 max:20 step:0.1	Multiplier	+	3PL	3PL	3PL	3PL	3PL
50P-3	Disable	10.0	min:0.5 max:20 step:0.1	Multiplier	+	3PL	3PL	3PL	3PL	3PL
Ground Protection										
51N	Extremely Inverse	50.00	min:10 max:160 step:1	Amps	+	1PT	1PT	1PT	3PL	3PL
50N-1	Standard	1.2	min:0.5 max:20 step:0.1	Multiplier	+	1PT	1PT	DIS	DIS	3PL
50N-2	Disable	3.0	min:0.5 max:20 step:0.1	Mult./Amps	+	1PT	3PL	3PL	3PL	3PL
50N-3	Disable	3.0	min:0.5 max:20 step:0.1	Multiplier	+	3PL	3PL	3PL	3PL	3PL

Primary Recloser

The screenshot shows the 'Primary Recloser' configuration window in AFSuite. The window title is 'Unit1 Configuration Unit1 Online'. The main area is titled 'Recloser' and contains a table for configuring protection elements. The table has columns for Protections, 79-1, 79-2, 79-3, 79-4, and 79-5. The elements are grouped into Single Phase Trip Mode and Mode Select.

Protections	79-1	79-2	79-3	79-4	79-5
51P	Enable 1P	Enable 1P	Enable 1P	Lockout 3P	Lockout 3P
50P-1	Enable 1P	Enable 1P	Disable	Disable	Lockout 3P
50P-2	Lockout 3P	Lockout 3P	Lockout 3P	Lockout 3P	Lockout 3P
50P-3	Lockout 3P	Lockout 3P	Lockout 3P	Lockout 3P	Lockout 3P
51N	Enable 1P	Enable 1P	Enable 1P	Lockout 3P	Lockout 3P
50N-1	Enable 1P	Enable 1P	Disable	Disable	Lockout 3P
50N-2	Enable 1P	Lockout 3P	Lockout 3P	Lockout 3P	Lockout 3P
50N-3	Lockout 3P	Lockout 3P	Lockout 3P	Lockout 3P	Lockout 3P
46	Lockout 3P	Lockout 3P	Lockout 3P	Lockout 3P	Lockout 3P
67P	Lockout 3P	Lockout 3P	Lockout 3P	Lockout 3P	Lockout 3P
67N	Lockout 3P	Lockout 3P	Lockout 3P	Lockout 3P	Lockout 3P
Open Interval Time (s) 0.1 - 200, step: 0.1 0=Lockout	0.2	5.0	10.0	Lockout	Lockout
79 Reset Time (s)	10 3 - 200, step:1				

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Test

Make sure the Breaker is closed.

The general test sequence is settable only from the front panel:

From the Current Metering Mode:

1) Press the ENTER KEY to access the MAIN MENU

2) Scroll down to Test

3) Press ENTER KEY to View TEST MENU

4) From the TEST MENU Scroll down to Fault Test Mode

5) Press ENTER KEY

6) Press ENTER KEY to Enter Password
(Password Default is 4 blanks- PRESS ENTER KEY)

7) Press "C" to continue test

NOTE: The PCD Display will show Psim=02.0 :: Nsim=02.0

This is the Current in Multiple of Pickup setting for Phase and Neutral.

IF the Primary 51P pickup current is set to 600A , then the Psim=2 will simulate 1200A applied. Psim / Nsim can be set from .5 to 10 by using the up and down arrow keys)

8) Press ENTER KEY to start the Fault Test Mode test

The Recloser or Simulator should perform 3 reclose cycles per the example Recloser Settings and then Lockout. The data per Table 1 and Table 2 below can be logged for reference.

9) In AFSuite online, select Records, Operation Summary, Operations Record and Fault Summary as shown below. Record the results in Table 1.

10) Press the Clear key "C" when completed.

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Operations Summary

Unit1 - ONLINE

Unit Meter Records Basic Settings Advanced Settings Communication Utilities

Operations Summary Operations Records Faults Summary

Setting	Value	Setting	Value
Breaker Ops. Counter (3 ph mode)	1	KSI Sum A Counter	0
Reclose Counter 1	15	KSI Sum B Counter	0
Reclose Counter 2	15	KSI Sum C Counter	0
1st Reclose Counter	0	Overcurrent Trip	+
2nd Reclose Counter	0	Phase A Counters (1 ph mode)	+
3rd Reclose Counter	3	Phase B Counters (1 ph mode)	+
4th Reclose Counter	0	Phase C Counters (1 ph mode)	+

Phase A Counters

Setting	Value
Phase A Pole Operation Counter	21
Phase A Recloser Counter 1	15
Phase A Recloser Counter 2	15
Phase A Stage 1 Reclose Counter	0
Phase A Stage 2 Reclose Counter	0
Phase A Stage 3 Reclose Counter	3
Phase A Stage 4 Reclose Counter	0

Close

Overcurrent Trip Counters

Setting	Value
Overcurrent Trip Counter	21
Overcurrent Trip A Counter	21
Overcurrent Trip B Counter	0
Overcurrent Trip C Counter	0
Overcurrent Trip N Counter	21

Close

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Operations Records

Unit1 Configuration Unit1 Online

Unit Meter Records Basic Settings Advanced Settings Communication Utilities

Operations Summary Operations Records Faults Summary

Oper. Num.	Date	Time	Message	Value
384	18 Aug 2004	11:16:46.920	Fault Test End	0
383	18 Aug 2004	11:16:44.850	Recloser Lockout	3
382	18 Aug 2004	11:16:44.850	Recloser Lockout	2
381	18 Aug 2004	11:16:44.850	Recloser Lockout	1
380	18 Aug 2004	11:16:44.850	52b Closed	3
379	18 Aug 2004	11:16:44.850	52b Closed	2
378	18 Aug 2004	11:16:44.850	52b Closed	1
377	18 Aug 2004	11:16:44.850	52a Opened	3
376	18 Aug 2004	11:16:44.850	52a Opened	2
375	18 Aug 2004	11:16:44.850	52a Opened	1
374	18 Aug 2004	11:16:44.850	Breaker Opened	3
373	18 Aug 2004	11:16:44.850	Breaker Opened	2

Fault Summary

Unit1 Configuration Unit1 Online

Unit Meter Records Basic Settings Advanced Settings Communication Utilities

Operations Summary Operations Records Faults Summary

Fault Num.	Recl. Seq.	Elem.	Date	Time	IA(A)	IB(A)	IC(A)	IN(A)	
+	21	Primary-Lockout	51P	18 Aug 2004	11:16:44.850	1200	0	0	120
+	20	Primary-3	51P	18 Aug 2004	11:16:19.180	1200	0	0	120
+	19	Primary-2	50P-1	18 Aug 2004	11:15:58.510	1200	0	0	120
+	18	Primary-1	50P-1	18 Aug 2004	11:15:58.200	1200	0	0	120
+	17	Primary-Lockout	51P	18 Aug 2004	11:05:48.690	1260	0	0	120

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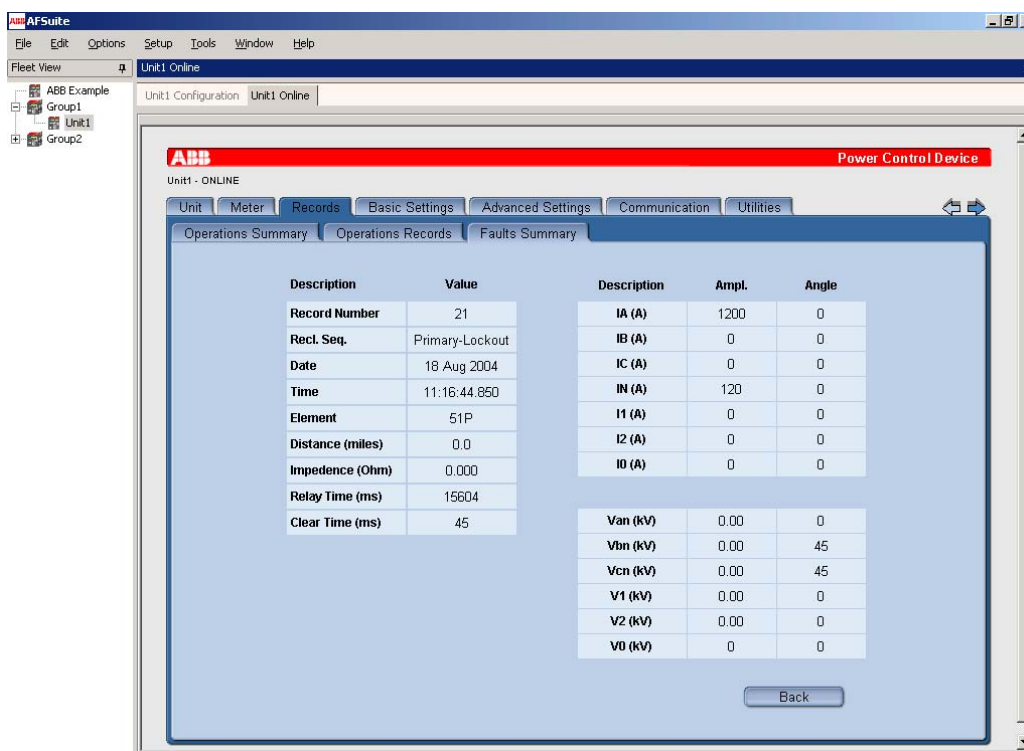


Table 1

Record		3 ϕ 4 shot	1 ϕ 4 shot
Records / Ops. Summary / Breaker Ops			
Records / Ops. Summary / KSI SumA Counter			
Records / Ops. Summary / OC trip Counter			
Records / Ops. Record / Last operation #			
Records / Fault Summary / Last fault record #			
Operation / test		3 ϕ 4 shot	1 ϕ 4shot
1	Let the test run to completion until the unit locks out (3 ϕ or 1 ϕ). The fault display should show the Relay time.		
2	Update the records in AFSuite.		
3	The operations records should show several new operations: Fault test start, breaker trip, breaker contacts, lockout and Fault test end.		
4	The operations summary should show the Breaker Ops Counter and Overcurrent trip counters updated, and the KSI Sum A Counter unchanged		
5	The Faults Summary should show the result of the test. The test current should be logged as the fault current, all the current angles should be zero, and the Relay Time and Clear Time should be logged		

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