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Trip Counter with Pulse Metered Value

SIPROTEC 5 Application

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APN-054, Edition 1

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1 Trip counter with Pulse Metered Value

1.1 Introduction

The standard circuit breaker counter indicates all the operations, trip and close, per phase. This counter can be set via the device front. Additional information on circuit breaker can be obtained by implementation of the CB wear monitoring.

If a specific counter that indicates only the trip count of the CB is required this can be implemented with a user defined Pulse Metered Value. This application note will show how this can be done.

1.2 Apply the counters in the Routing Matrix

For a single pole tripping CB a counter per phase is required. For 3-pole tripping applications the description below can be simplified by using only one counter.

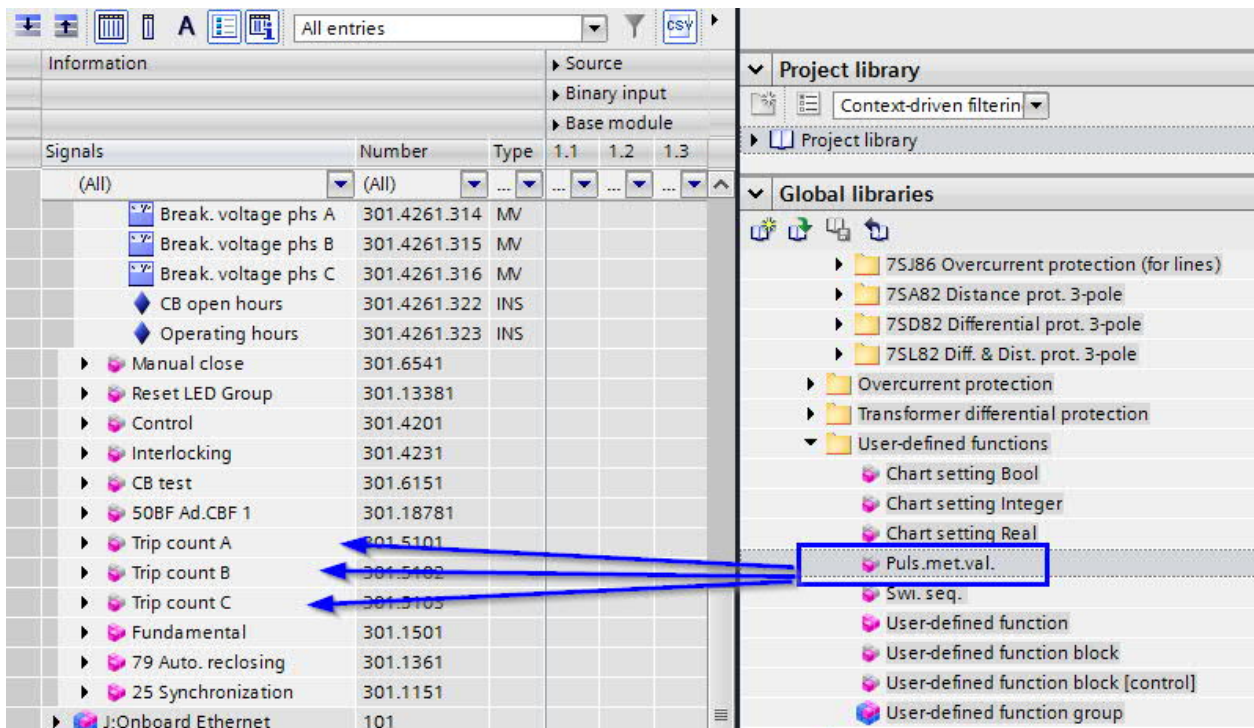


Figure 1: Apply Pulse Metered Value from Library

Drag and drop from the Project Library 3 Pulse Metered Values (1 for 3 pole CB) and rename the counters as shown (or as preferred). The count value will be displayed as metered value; an example display is shown later.

It is recommended to also change the name "Counter" to a more specific designation:

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▼ Trip count A	301.5101			▼ Trip count A	301.5101
▶ >Pulse input	301.5101.500	SPS		▶ >Pulse input	301.5101.50
▶ >External error	301.5101.501	SPS		▶ >External error	301.5101.50
▶ >Restore trigger	301.5101.502	SPS		▶ >Restore trigger	301.5101.50
▶ >Reset				▶ >Reset	301.5101.50
▶ Behavior				▶ Behavior	301.5101.52
▶ Health				▶ Health	301.5101.53
Counter				Trip count A	301.5101.30
Set counter value	301.5101.301	APC		Set counter value	301.5101.30
▼ Trip count B	301.5102				
▶ >Pulse input	301.5102.500	SPS			
▶ >External error	301.5102.501	SPS			



Figure 2: Rename the "Counter" indication

1.3 CFC Logic to increment counter

The diagram below shows the logic applied to increment the counter. The trip per phase is combined with the 3 pole trip via OR-gate; the output is routed to a rising edge detection which increments the counter by means of the ">Pulse input".

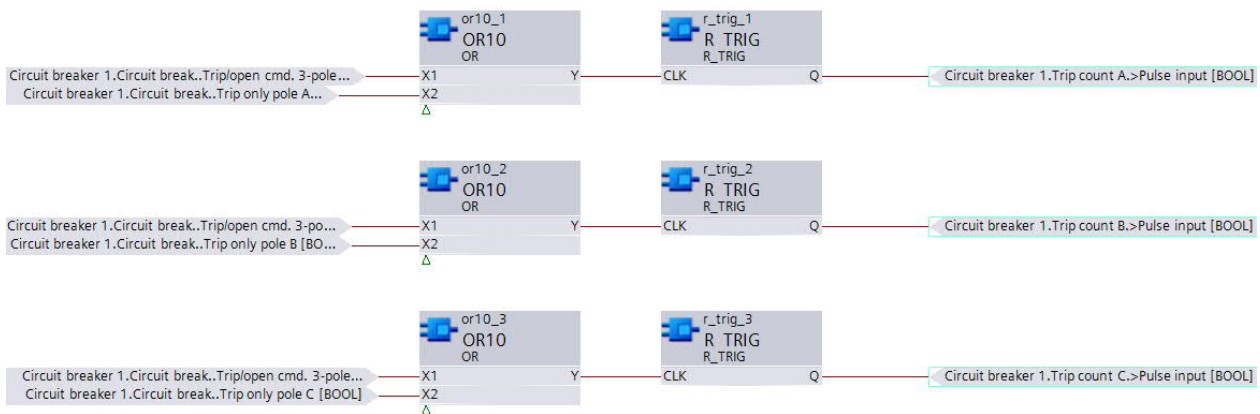


Figure 3: CFC Logic for single pole tripping circuit breaker

1.4 Reading and changing the Trip Counter

The counter values will by default be available as metered values in the circuit breaker:

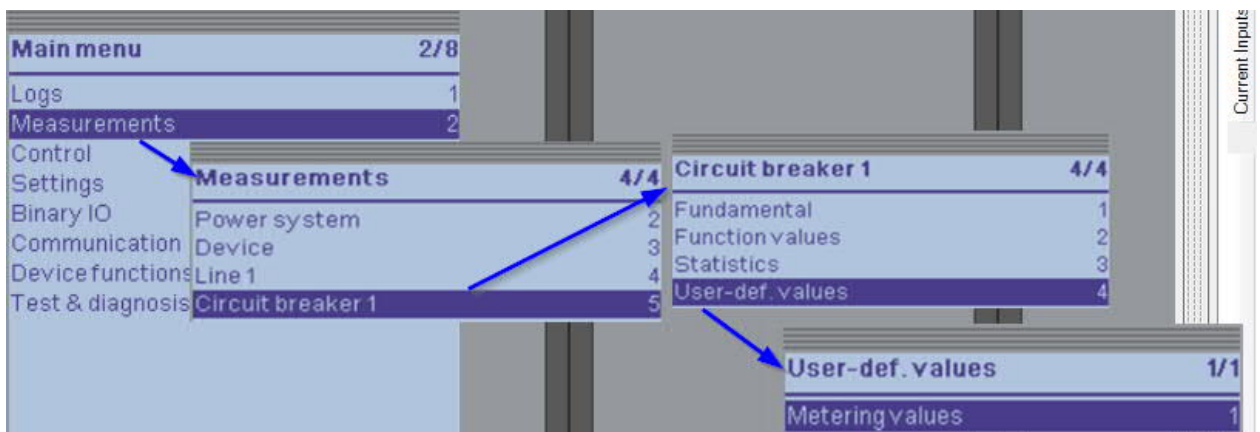
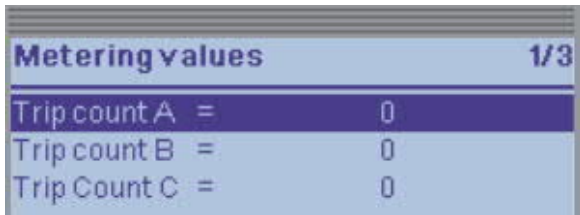


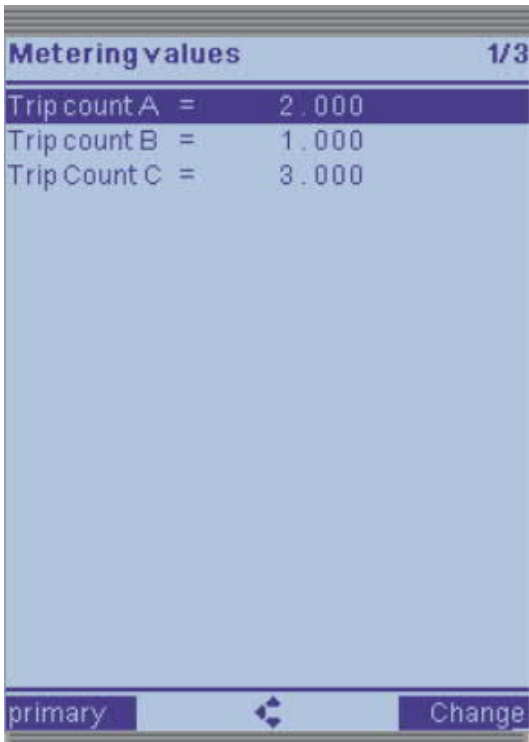
Figure 4: From Main Menu to Circuit Breaker User Defined Metered Values.



Metering values		1/3
Trip count A =	0	
Trip count B =	0	
Trip Count C =	0	

Figure 5: Displayed Trip Count (Counter was renamed: Figure 2)

Once a trip (or more) has been executed the trip counter is updated:



Metering values		1/3
Trip count A =	2.000	
Trip count B =	1.000	
Trip Count C =	3.000	

primary  Change

Figure 6: Counter indication after some operations.

If testing or maintenance will affect the trip count indication, the count values should be noted prior to the testing. When the testing is completed the correct values can be entered for each phase using the "Change" option in Figure 6. Note this is password protected (default Password is 222222).

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Trip counter with Pulse Metered Value

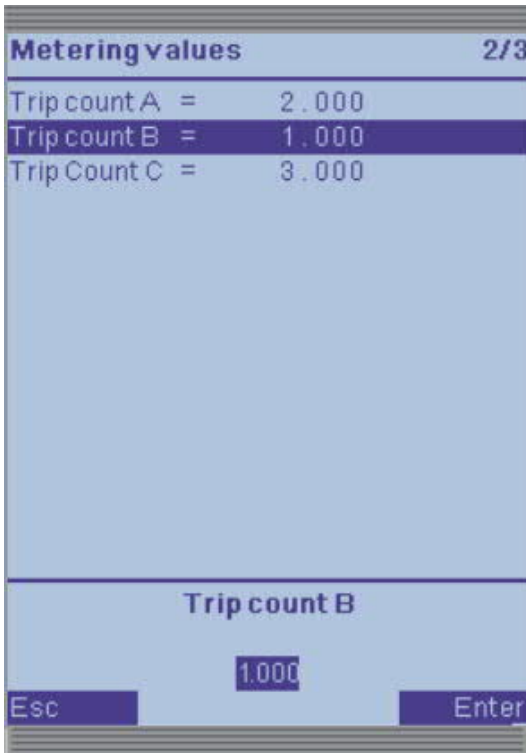


Figure 7: Changing the trip counter values.

1.5 Dedicated display and other options

A dedicated display page can be implemented for the trip counters. In the diagram below the operate counters are also included.

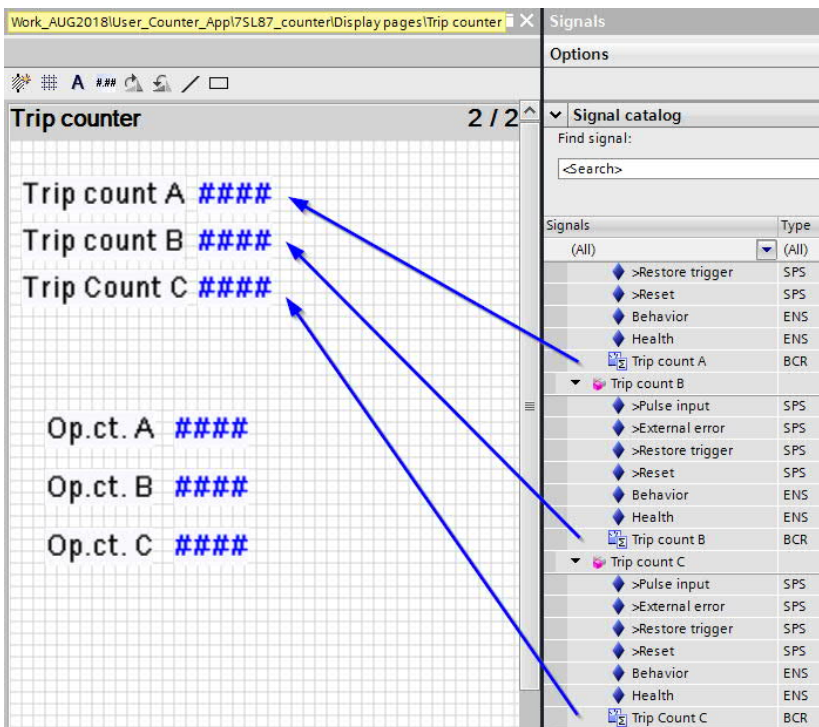
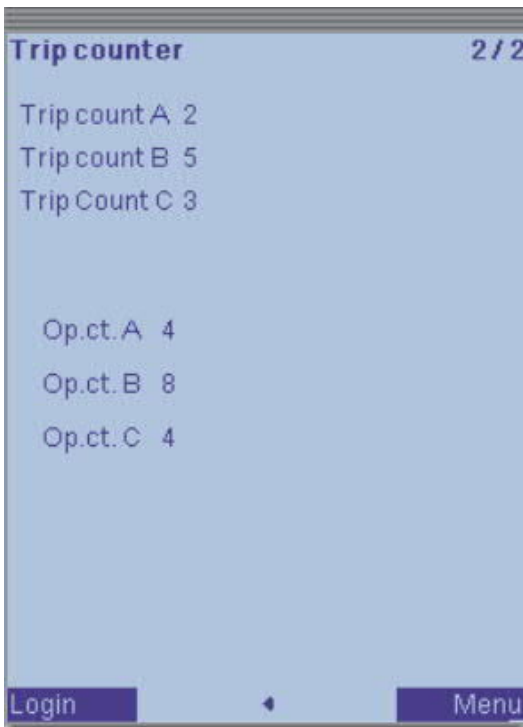


Figure 8: Create Display page with trip counters

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Trip counter with Pulse Metered Value

In the display this appears as follows:



If the trip counter is required in fault logs etc. the count value must be converted:

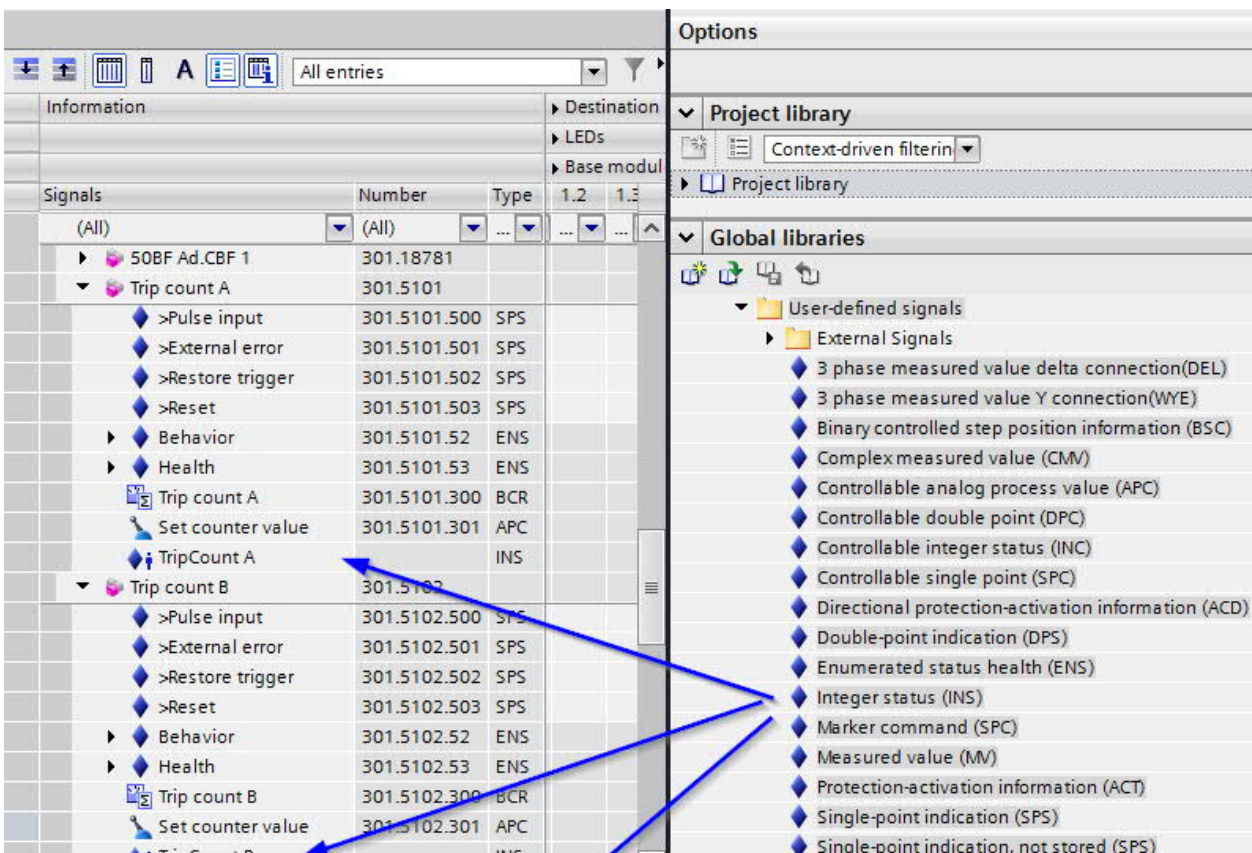


Figure 9: Add an "Integer Status" to each Pulse Counter and rename.

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The integer status is taken from the pulse counter value via the following CFC:

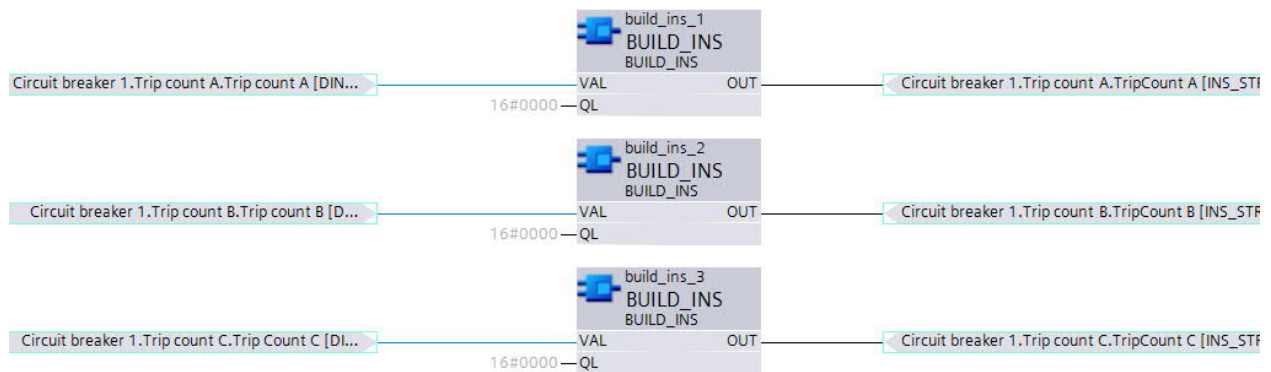


Figure 10: Use "Build_INS" to convert the counter value to a structured integer. This INS can now be included in Fault Log etc.:

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Trip counter with Pulse Metered Value

Information	Number	Type	Signal	O	F	U1	U2	G	M
50BF Ad.CBF 1	301.18781			*	*				
▼ Trip count A	301.5101				*				
▶ >Pulse input	301.5101.500	SPS							
▶ >External error	301.5101.501	SPS							
▶ >Restore trigger	301.5101.502	SPS							
▶ >Reset	301.5101.503	SPS							
▶ Behavior	301.5101.52	ENS							
▶ Health	301.5101.53	ENS							
▶ Trip count A	301.5101.300	BCR							
▶ Set counter value	301.5101.301	APC							
▶ TripCount A		INS			X				
▼ Trip count B	301.5102				*				
▶ >Pulse input	301.5102.500	SPS							
▶ >External error	301.5102.501	SPS							
▶ >Restore trigger	301.5102.502	SPS							
▶ >Reset	301.5102.503	SPS							
▶ Behavior	301.5102.52	ENS							
▶ Health	301.5102.53	ENS							
▶ Trip count B	301.5102.300	BCR							
▶ Set counter value	301.5102.301	APC							
▶ TripCount B		INS			X				
▼ Trip count C	301.5103				*				
▶ >Pulse input	301.5103.500	SPS							
▶ >External error	301.5103.501	SPS							
▶ >Restore trigger	301.5103.502	SPS							
▶ >Reset	301.5103.503	SPS							
▶ Behavior	301.5103.52	ENS							
▶ Health	301.5103.53	ENS							
▶ Trip Count C	301.5103.300	BCR							
▶ Set counter value	301.5103.301	APC							
▶ TripCount C		INS			X				
▶ Fundamental	301.1501								

Figure 11: Routing the counter value to the fault log:

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Time stamp	Relative time	Fault num	Entry num	Functions structure	Name	Value	Quality
15.01.2019 12:01:47.154	00:00:00:00.145	33		Circuit breaker 1:Circuit break.	Break. current 3I0/IN	10000 A	good (process)
15.01.2019 12:01:47.166	00:00:00:00.157	34		Circuit breaker 1:Circuit break.	Definitive trip	on	good (process)
15.01.2019 12:01:47.178	00:00:00:00.169	35		Line 1:67N GFP gnd.sys.1:Definite-T 1	Pickup	phs A gnd forward	good (process)
15.01.2019 12:01:47.186	00:00:00:00.177	36		Circuit breaker 1:79 Auto. reclosing:General	3-pole operate by 79	off	good (process)
15.01.2019 12:01:47.306	00:00:00:00.297	37		Line 1:21 RM Distance 1:Z 1B	Operate	phs A	good (process)
15.01.2019 12:01:47.606	00:00:00:00.597	38		Line 1:21 RM Distance 1:Z 3	Operate	phs A phs B phs C	good (process)
15.01.2019 12:01:47.636	00:00:00:00.627	39		Circuit breaker 1:79 Auto. reclosing:General	Blk.by strtsig.superv.	off	good (process)
15.01.2019 12:01:47.666	00:00:00:00.657	40		Circuit breaker 1:Circuit break.	Definitive trip	off	good (process)
15.01.2019 12:01:47.676	00:00:00:00.667	41		Circuit breaker 1:Trip count A	TripCount A	3	good (process)
15.01.2019 12:01:47.676	00:00:00:00.667	42		Circuit breaker 1:Trip count B	TripCount B	6	good (process)
15.01.2019 12:01:47.676	00:00:00:00.667	43		Circuit breaker 1:Trip count C	TripCount C	4	good (process)
15.01.2019 12:01:47.906	00:00:00:00.897	44		Line 1:21 RM Distance 1:Z 4	Operate	phs A phs B phs C	good (process)
15.01.2019 12:01:53.377	00:00:00:06.368	45		Circuit breaker 1:50BF Ad.CBF 1	Pickup	off	good (process)
15.01.2019 12:01:53.377	00:00:00:06.368	46		Circuit breaker 1:50BF Ad.CBF 1	Trip T2	off	good (process)
15.01.2019 12:01:53.377	00:00:00:06.368	47		Circuit breaker 1:50BF Ad.CBF 1	CB failure pole	off	good (process)

Figure 12: Fault Log with Trip Counter Indication.

1.6 Summary

When user defined operational counters are required with must have similar features as provided by the standard circuit breaker operation counters, the user defined pulse metered values can be applied.

This application note shows all the required steps, by means of a practical example with per phase trip counter, for a circuit breaker with single pole tripping.

A method for including the trip counter in the fault log is also shown.

The process for resetting the trip counter to a specific starting value after testing/maintenance is described.

Published by
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