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Category	■FAQ □SOP	**Related OS**	N/A
Abstract	How to set DI filter for solving relay bouncing issue in counter mode		
Keyword	Relay bouncing, Digital filter, counter		
Related Product	ADAM-4150, ADAM-6XXX series		

■ Problem Description:

Users have problem while using DI modules with counter input mode, modules calculate several counts instead of one count during a relay ON-OFF. This document will explain the reason and the way to set DI filter to solve this condition.

■ Answer:

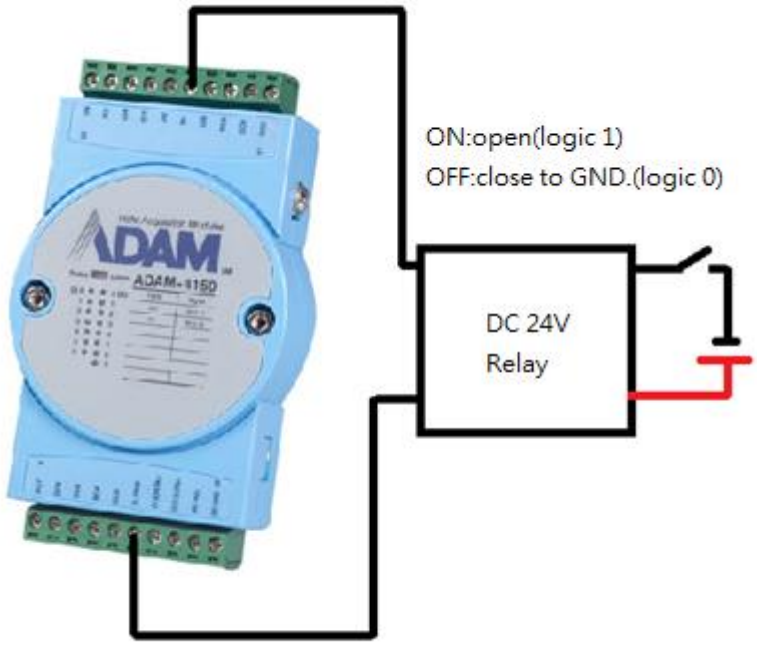

Figure 1. wiring structure

Above is an example for using ADAM-4150 as a DI counter to count the how many time electromagnetic relay switches, the wiring is like *Figure 1.*and Utility setting is like *Figure 2.*When Switching the Relay ON to OFF one time, the counter value increases a lot. (In this case about 8-10 times, *Figure 3.*)

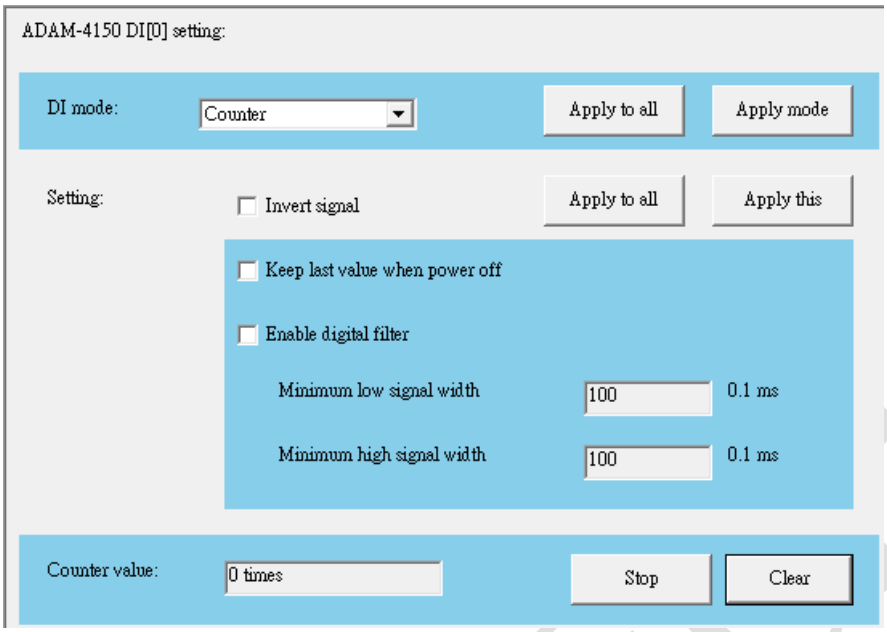

Figure 2. DI0 Utility setting

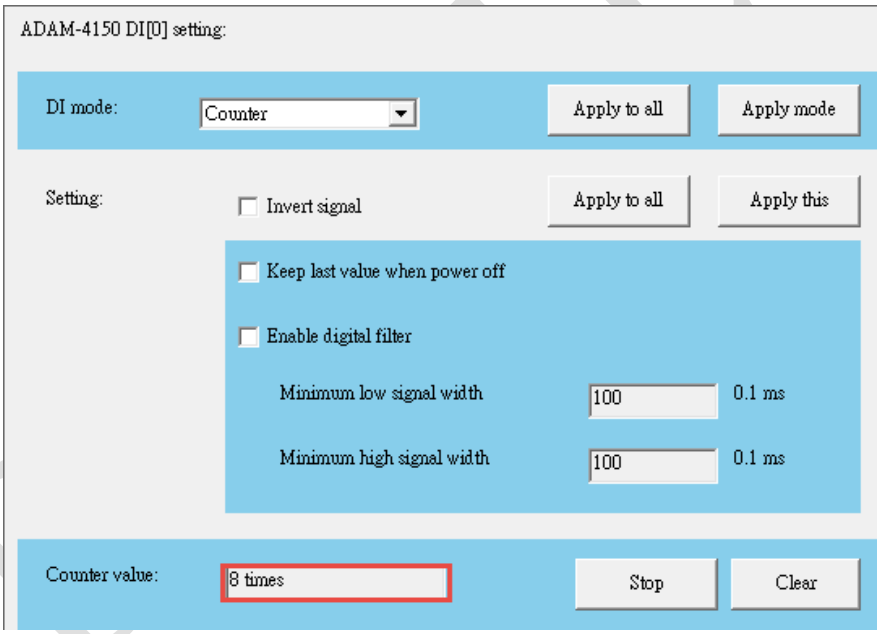

Figure 3. DI counter0 value in Utility(OFF-ON-OFF one time)

The reason for this problem is that the time it takes for contacts to stop bouncing is measured in milliseconds. Digital circuits can respond in microseconds. So the circuit in the module regards the bouncing signal as valid signal. Just like the waveform shown in *Figure 4.* An electromagnetic relay has this behavior (relay bouncing) due to its hardware structure limitation. It is not possible to remove the bounce since it is a mechanical oscillation, given by the spring action and mass of contacts. The red oval shows that during the OFF operation of the relay, it bounces several times. Module will detect High Low signal several times, so the counter value increases more than one time.

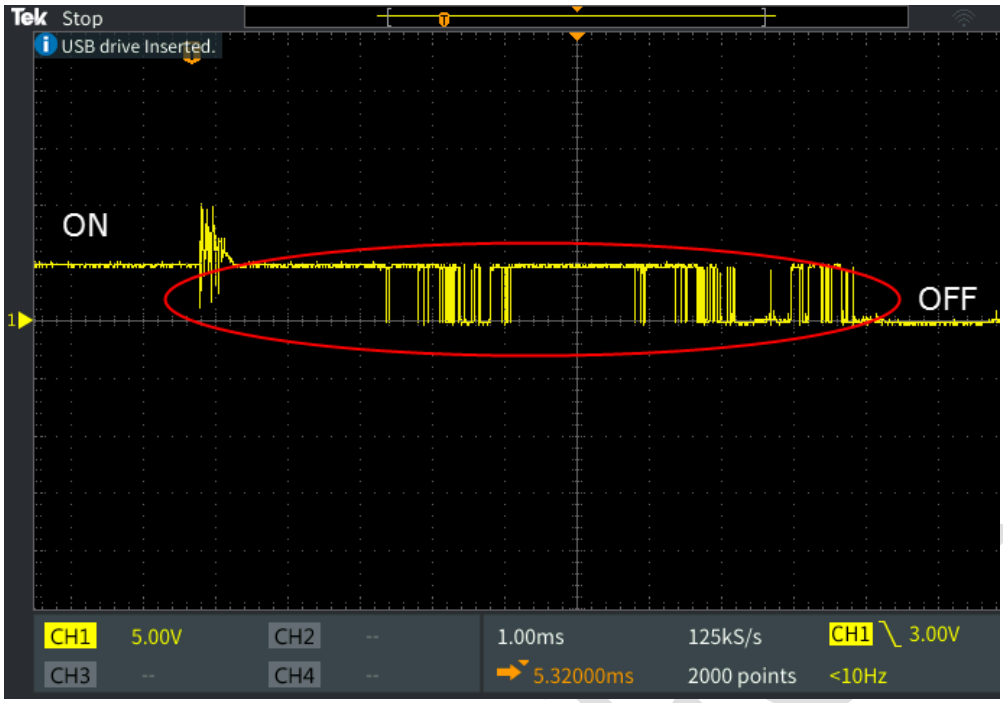

Figure 4. Relay bouncing behavior

Under this application scenario, user can use digital filter to solve this problem. You can define the minimum acceptable signal width by the Minimum low signal width and Minimum high signal width text box. In *Figure 4.* all the low bouncing widths are shorter than 1ms, so in this case digital filter parameters can both be set to 1ms (*Figure 5.*). Module won't see the bouncing signal as valid signal. During the red oval time, DI signal will keep high, so counter value do not change even if bouncing happens.

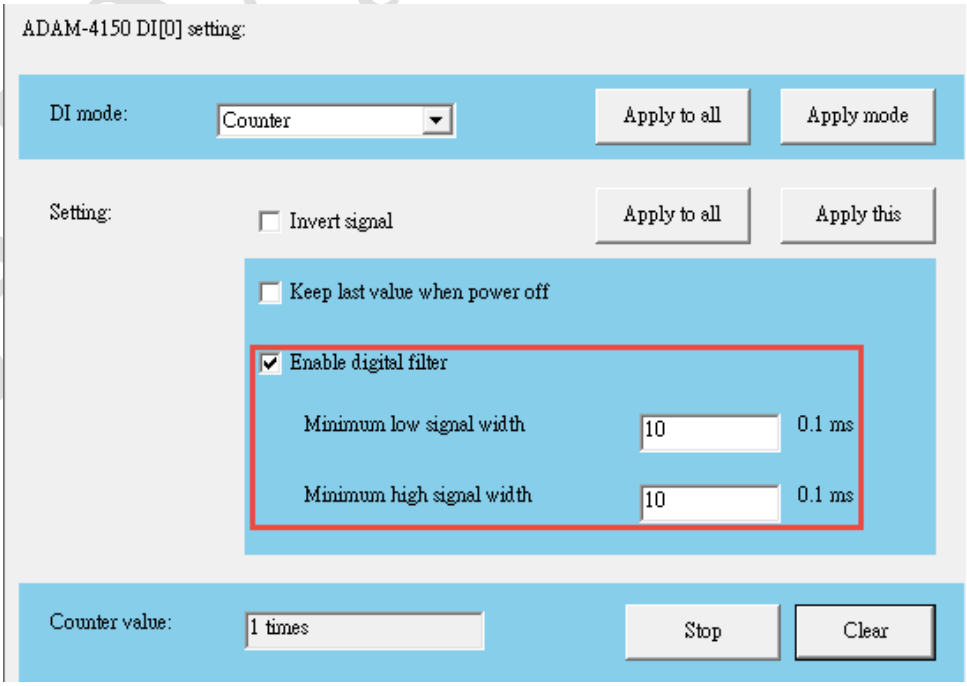

Figure 5. Enabled DI filter

Let's explain one more example about digital filter by *Figure 6.* Under this setting, the high frequency noise will be removed by this filter. As we can see module input result become high when raw data is high for 10ms. And the input result become low until raw data input is low for 15ms.

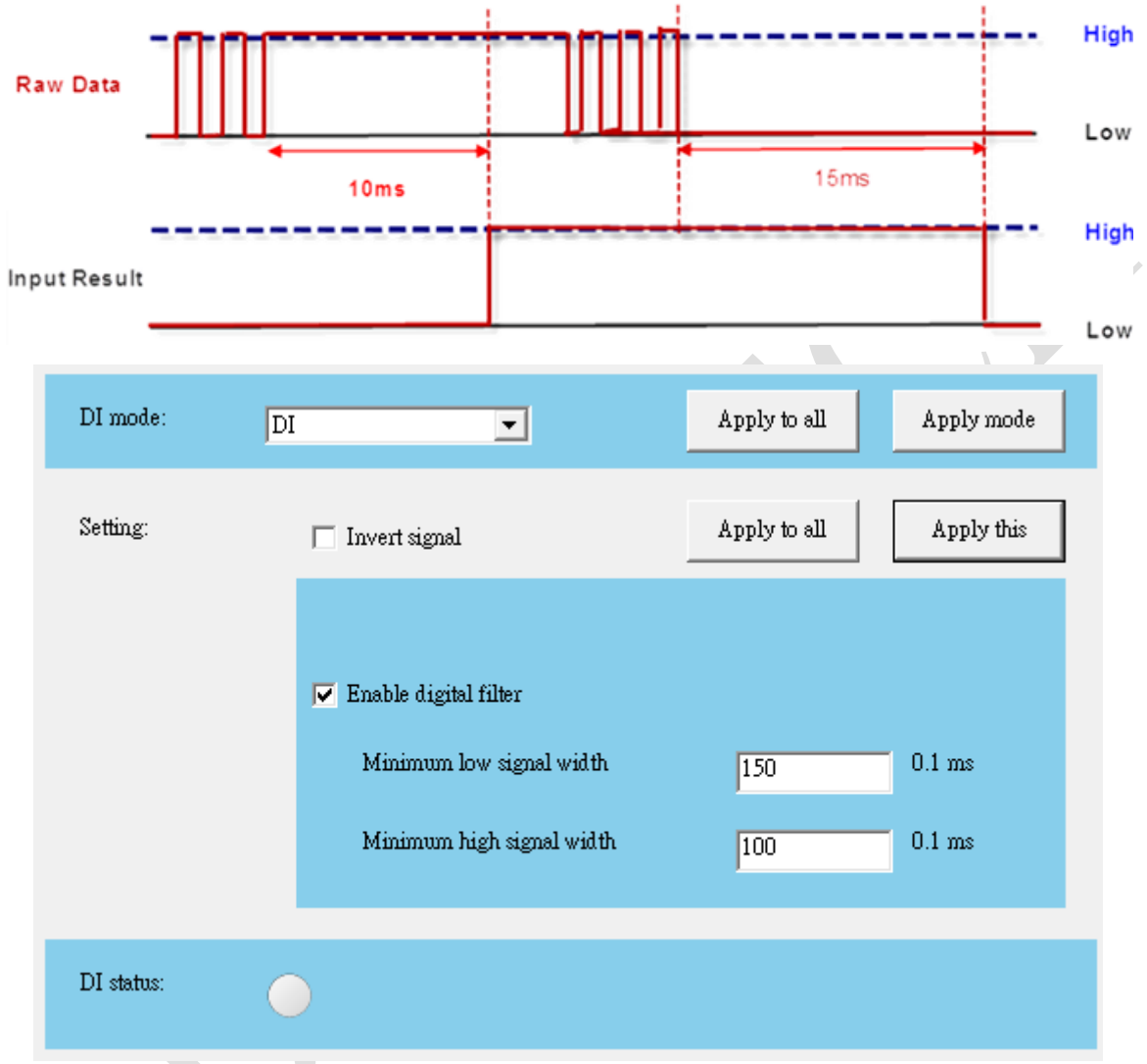

Figure 6. Digital filter function example

For example, the width can be set to 100ms to ensure the counts are right. But under this situation, it cannot detect the input which signal widths are shorter than 100ms. Please note that the low signal width and high signal width are based on users' application, users have to evaluate these value along with the device (bouncing behavior) they use.