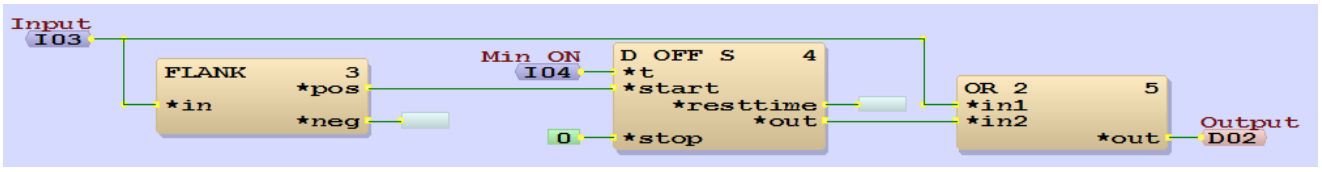
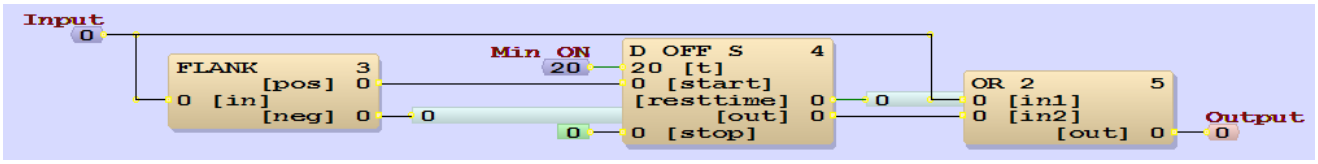
# TT210803 – FUP - Minimum On Off Time

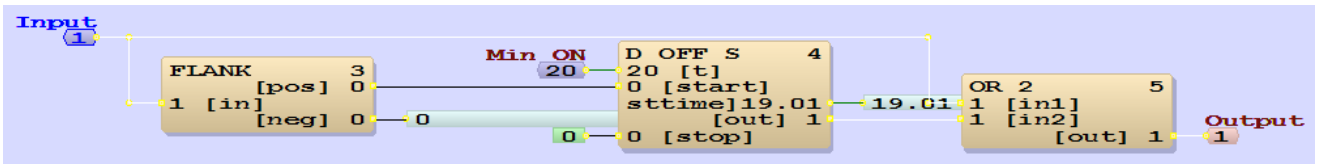
1. In TT190806, we talked about the delay on/off module. Now, we will talk about using the modules to create the minimum on/off time functions. This prevents the equipment to start/stop too frequent by adding the time to wait before it can be start/stop again.
2. First create a FUP page called “minonoff.f” and then add the below logic blocks. This is for the minimum on time function. This make sure once the equipment is started, it will continue to run at least for the “minimum ON time” before it can be stopped.



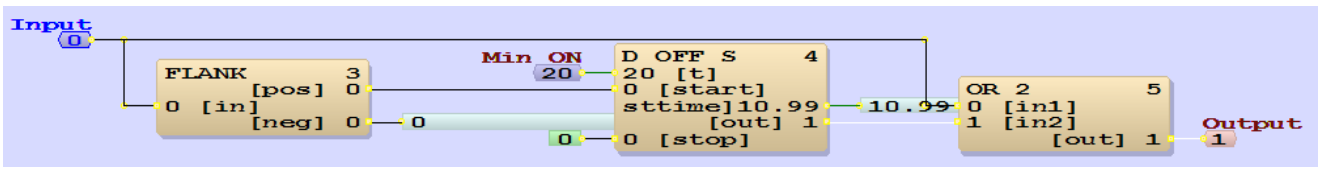

3. The “Flank” module will create a “1” pulse once the “Input” switch from 0 to 1 to the “pos” output. Using the “D_OFF_S” module, the “1” will delay for the “t” time before it drops to 0. Combine both outputs with the “OR_2” module make it. Let’s do a simulation. Output is “0” when input is 0.



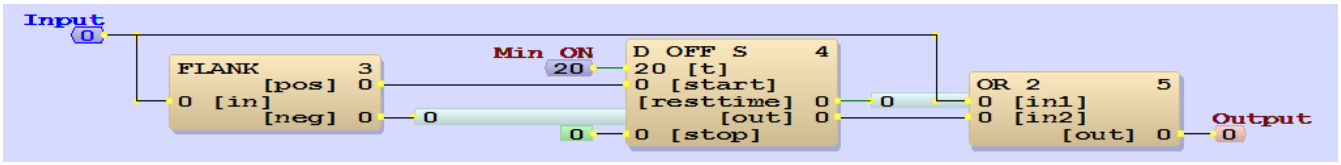

4. Output is “1” when Input change from 0 to 1, and then the “D_OFF_S” module start counting.



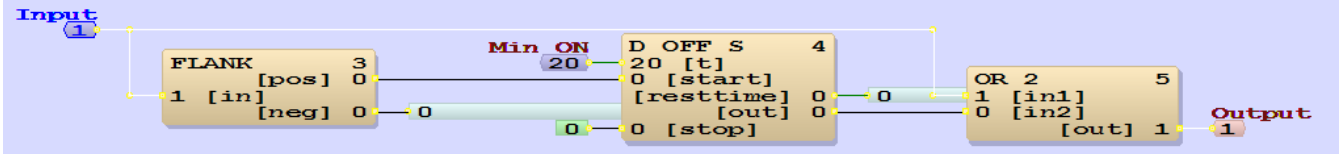

5. Before the counter drop to 0, if input change to “0”, the output will still be kept at “1”.



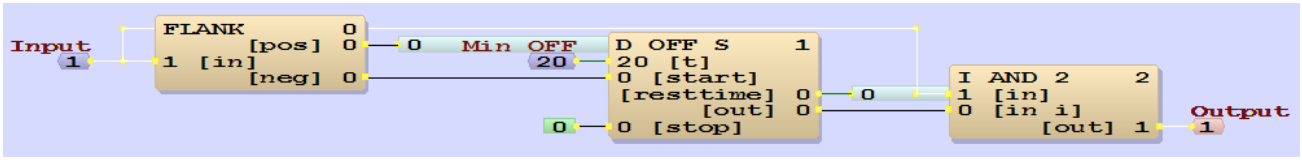

6. Output will change to “0” after the “Minimum ON time”, when Input remains at 0.



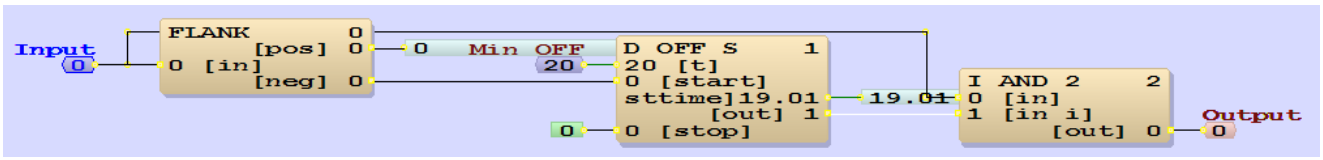

7. After the equipment is running for a long time (i.e. after the minimum ON delay), it can then be stopped without delay anymore. You can see from below that the output of the “D_OFF_S” module is 0, and if Input is now “0”, then the output will go to “0” immediately.



8. This is the logic for the “Minimum OFF time”. This make sure once the equipment is stopped, it cannot be started again until the “minimum OFF time” is over. The principle is basically the same as the “Minimum ON time”.




9. This time the “Flank” module is used to detect the “0” pulse (at the “neg” output), and then start the timer. Using the “I_AND_2” module to combine the 2 outputs.

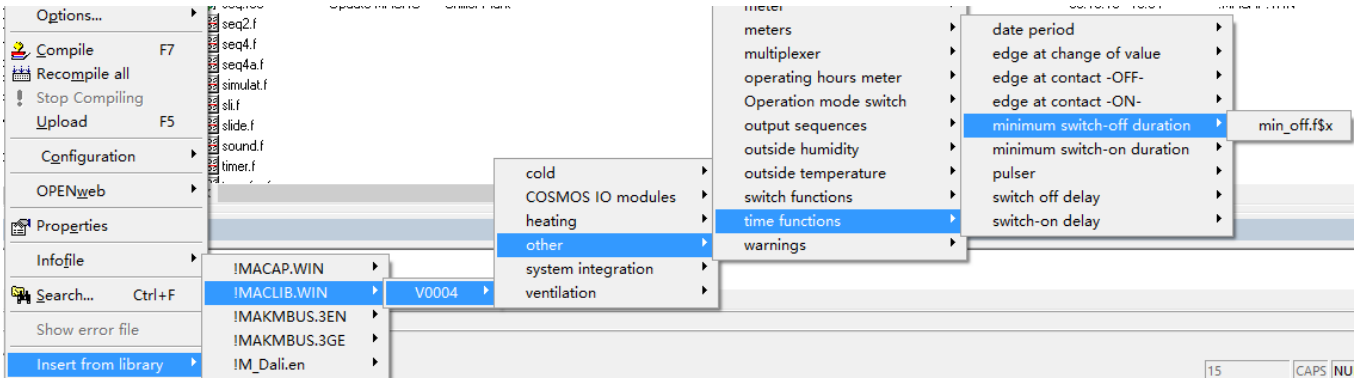



With this module 2 inputs will be connected with an AND-gate which has one inverted input.

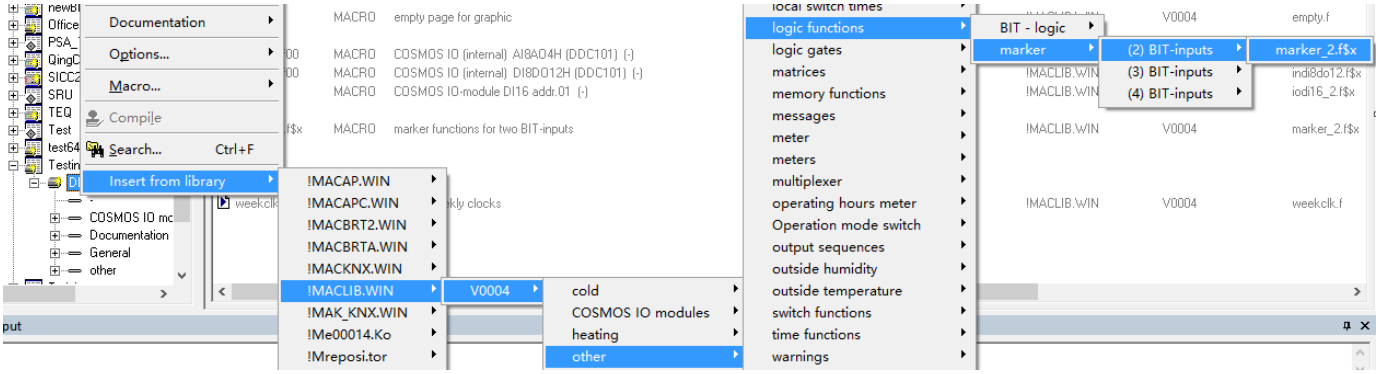
There is following correlation:

| in | in_i | out |
|---|---|---|
| 1 | 1 | 0 |
| 1 | 0 | 1 |
| 0 | 1 | 0 |
| 0 | 0 | 0 |

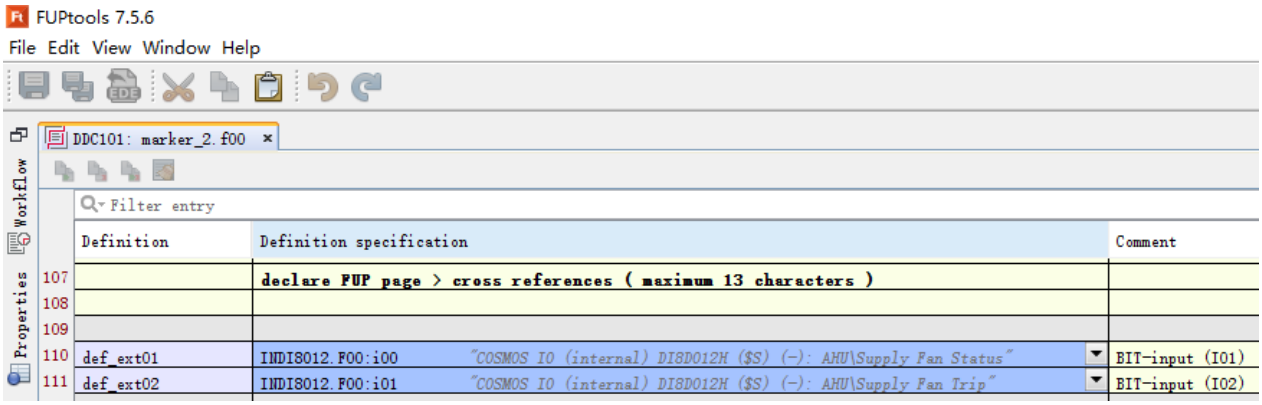
10. We have the macros for both minimum on and off delay functions, so you can use them directly in your controller.



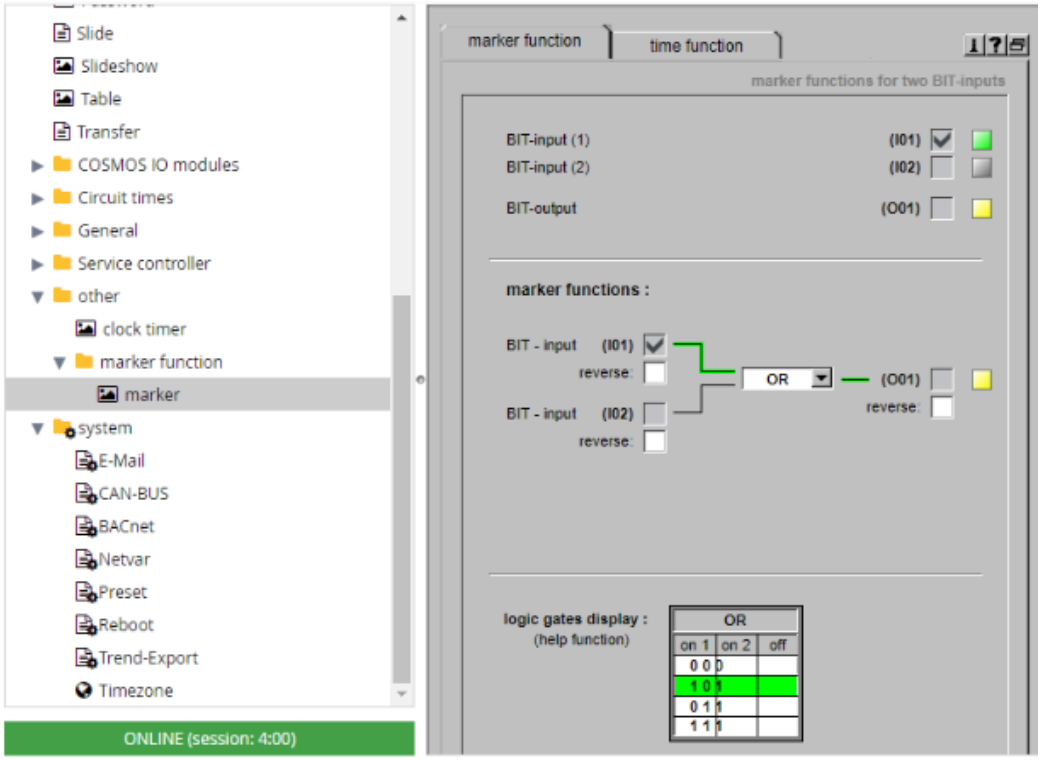

11. You can also use our Macro library for delay on/off with logic, e.g. marker_2. This one has basically all the features you need.



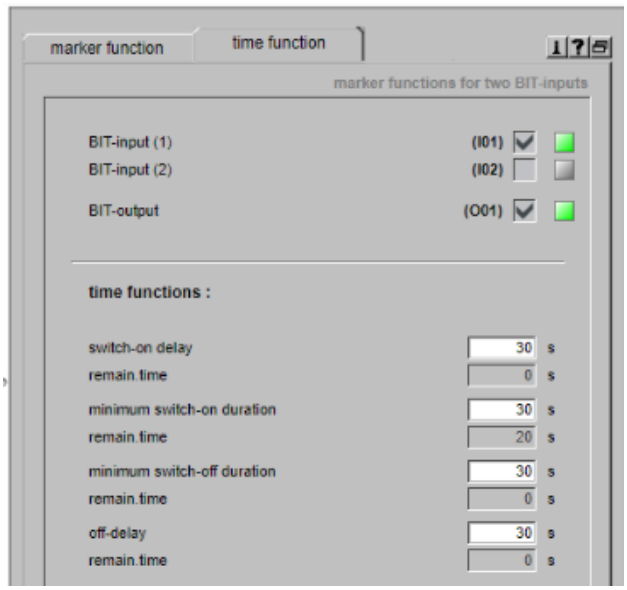
12. Insert the macro to your controller, and configure the inputs

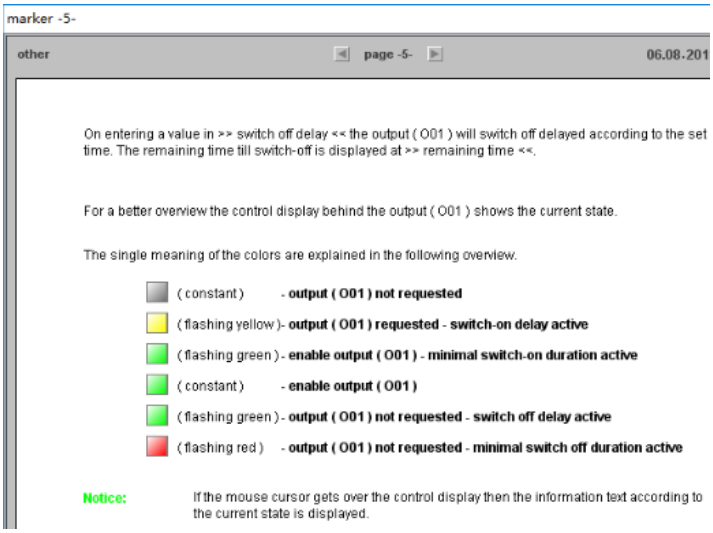



13. This comes with a very nice interface for you to configure the logic and view the result.

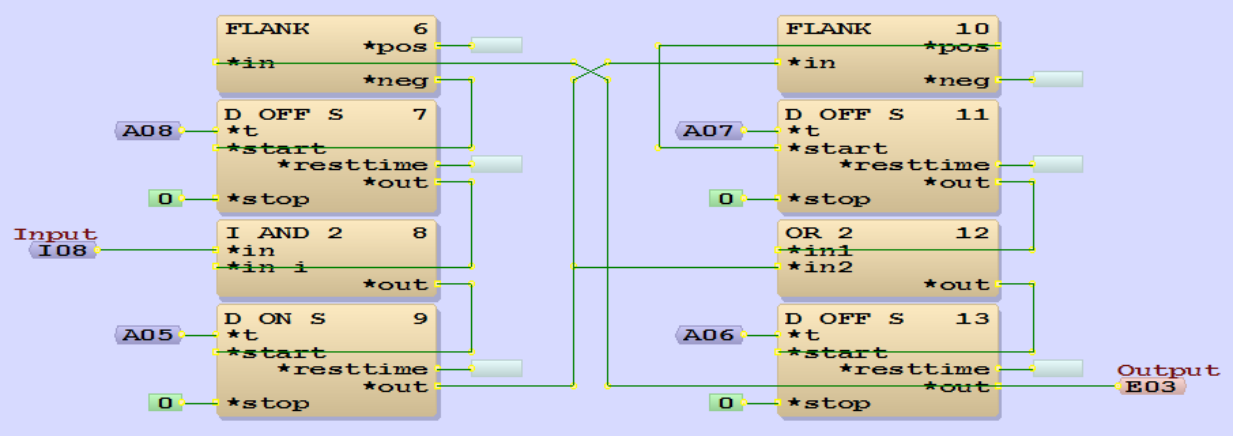



14. Also, you can configure the on/off delay time, and minimum on/off time online. The color indicates the status of the output (click the help button “?” for more information)



15. If you still prefer to create the functions in your own FUP page, below is for your reference.




16. This includes all the 4 delay functions. Please note the order of the function blocks, as it may affect the operation of the modules.