



How to program an ON-Off (digital) PID control loop with PLC?



Use the "On/Off Time (0.00 – 60.00)" parameter in the PID Special Program.

Pgm000.SRC

Save Monitor Auto-Tune New Dialog Current Lp. 1 Help

Current Value -> Set Value

No. of Loop: Total Loops/Scan Start Data of PID Control: PIDINIT PIDCAL

Index	Device	Set Value	Current Value
Path Calc(0:Forward 1:Reverse)	D00002	Forward	
Sampling Time(0.01 - 60 sec)	D00003	10.00	
Kp(0 - 65535)	D00004	8000	
Ki(0.0 - 3000 sec)	D00005	2000.0	
Kd(0.00 - 300 sec)	D00006	0.00	
Filter(0 - 0.99)	D00007	0.20	
MV Low Limit(0 - 16000)	D00008	0	
MV High Limit(0 - 16000)	D00009	16000	
MV Change Rate Limit(1 - 16000)	D00010	16000	
MV Auto-Apply(0:Disabled 1:Enabled)	D00011	Disable	
SV Ramp(0 - 1000 0:Disabled)	D00012	0	
On/Off Time(0.00 - 60.00)	D00014	0.00	
SV(Set Value : 0 - 16000)	D00100	0	
PV(Process Value : 0 - 16000)	D00101		
MV(Manipulation Value : 0 - 16000)	D00102		
PVnt(After Filter)	D00103		
MV Manual(0 - 16000)	D00104	0	
(0:Auto 1:Manual)	D00105	Auto	
Self Learning Enable(1) / Disable(0)	D00105	Disable	
Kp x 100 (1)	D00105	-	
Auto-Tuning SV Offset(-50 ~ 50)	D00011	0	
PID Error Code	D00015	0	
PID Status Code	D00016		

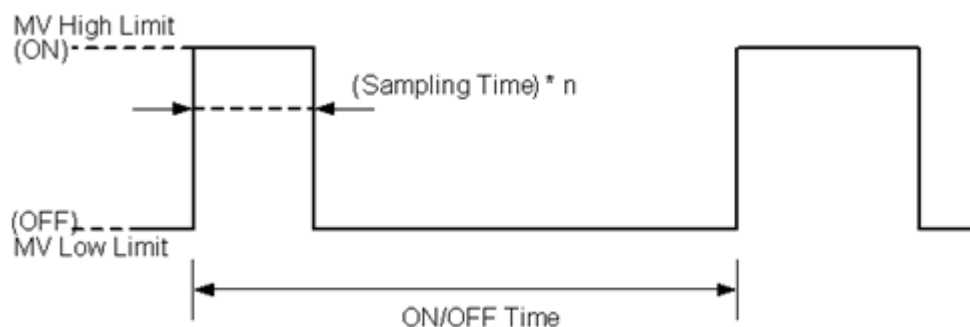
PID Loop Initialized
 Auto-tune Processing
 ON/OFF Ctrl Output
 Self Learn Data Ready
 Stable Status
 PID - 2 Control

1. Configure the "On/Off Time (0.00 – 60.00)" parameter as a non-zero value. (in the unit of second)
2. The value of the "On/Off Time (0.00 – 60.00)" parameter should be configured as 10 times or more of the "Sampling Time" value.
3. Add a sequence program which checks the control output value (MV) as described in the following line: If the MV output was the same value of "MV High Limit," then make the digital output point as ON. Otherwise, put the digital output point as OFF.



This document describes a PID loop which has a digital control output - ON/OFF controlled PID. Although the ON/OFF controlled PID does not have an analog output, the basic concept and parameters are exactly the same as the standard one (PID control by the analog output).

All parameters in the above dialog box have the same meanings. Only one parameter needed to consider for a digital output PID is the "On/Off Time". Normally this parameter is configured as zero in an analog output PID. If this item was configured as any non-zero value, the configured PID loop will perform a digital output control. The "On/Off Time" parameter decides the duty cycle of digital output as shown in the following picture.



During the ON/Off PID control mode, the PLC CPU controls the ON duration within the boundary of defined "On/Off Time". And the output signal state (ON or OFF) is decided at every sampling time period. Because of that, the "On/Off Time" duration is recommended to be configured as at least ten times of the "Sampling Time".

As previously described, the final control output (MV: Management Value, D00102 in the above example PID) will have just two possible output values. One is "MV Low Limit" which imply the OFF output state, and the other is "MV High Limit" which imply the ON output state. However, since the actual control output is a digital output, the programmer has to add a line of sequence program which converts the MV to a digital output signal, as shown in the following picture.



This one sequence program line can be inserted to anywhere of normal scan program type sequence program. In this example, the output actuator assumes to be allocated on the Y0030 point, and there is just one comparison. If the calculated MV has the same value as predefined "MV High Limit", then turn on the control output. Otherwise, it turns off the control output.