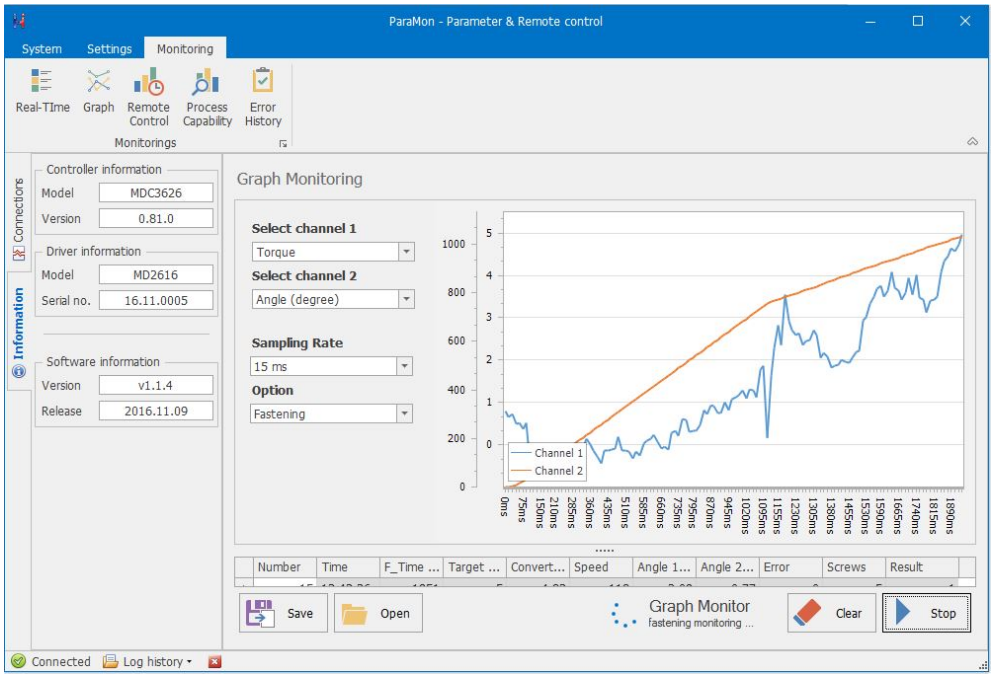
Revision 1

March 21, 2017

mountz®
the torque tool specialists®

ADC Operation Manual



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1. Software installation

1.1 Required PC specification

- OS : Windows 7 or later version

1.2 Software

- Software file : ParaMon v0.00 yyyymmdd.zip
- Install file : setup.exe

The higher version of software will overwrite the lower version of ParaMon software.

2. Operation

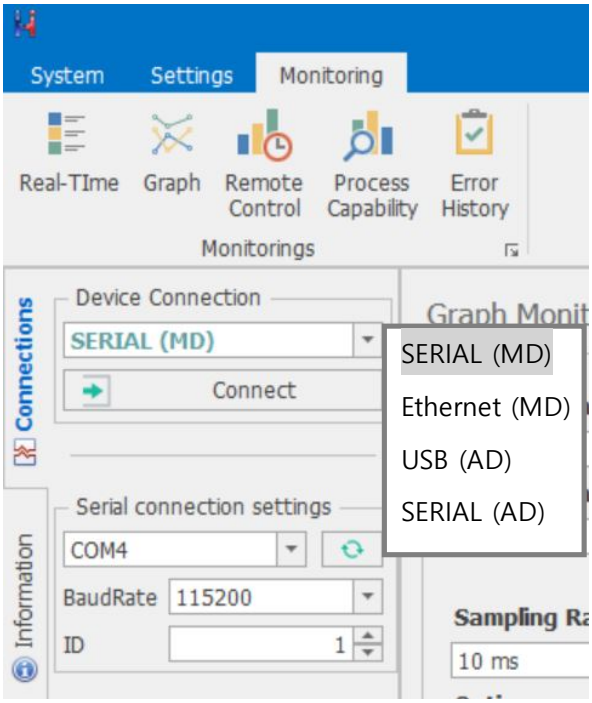
2.1 Connection

ParaMon pc software have 4 selectable connecting options to the MDC or ADC controller.

MDC controller : Serial RS232C or Ethernet

ADC drive : Serial RS422 or USB Serial COM port

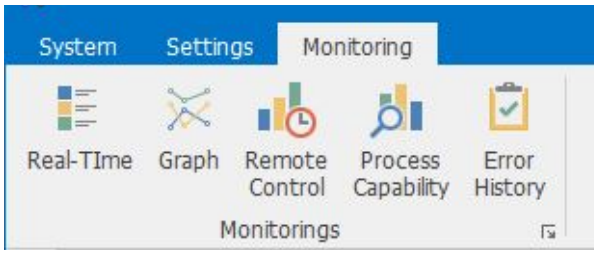
connection requires the information about COM port, Baud rate and the device ID

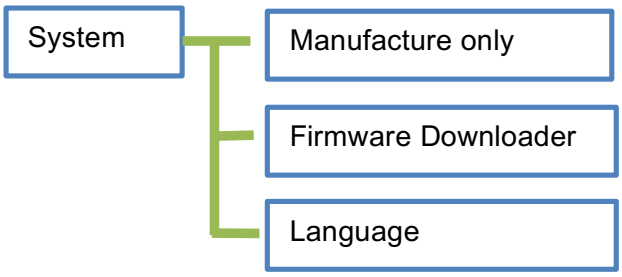


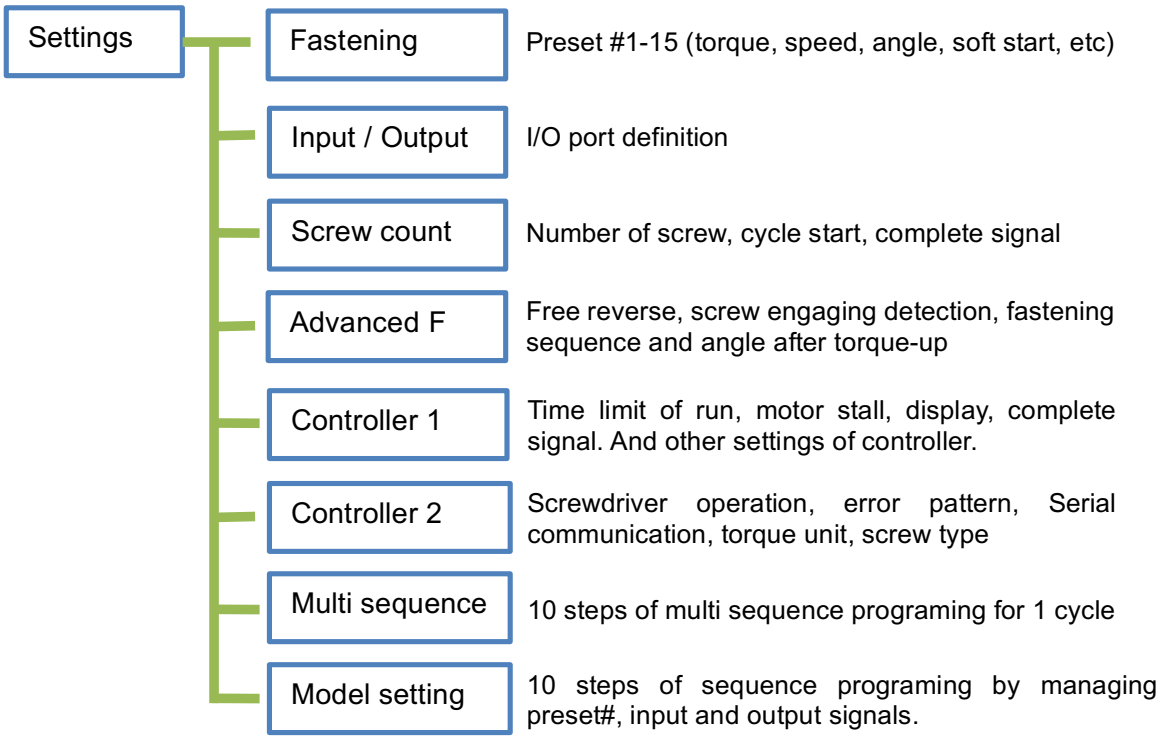
2.2 Menu

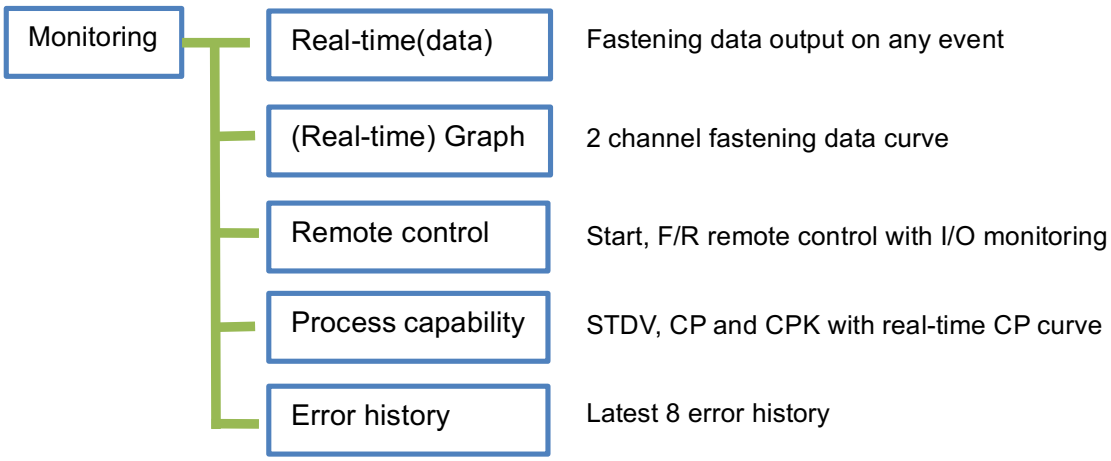
There are 3 main menu.

- System
- Settings
- Monitoring







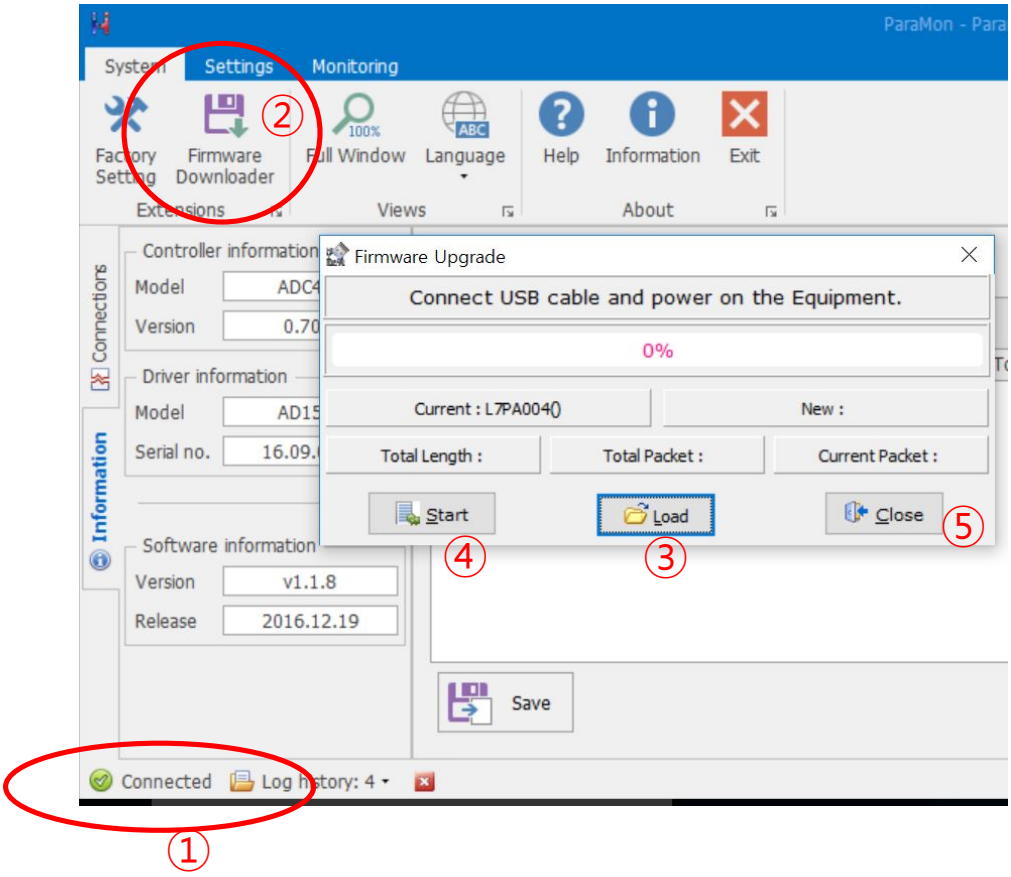


Be sure that the changed parameter on the ParaMon pc software is reflected to the ADC drive immediately.

2.2.1 System

1) Firmware downloader

Drive firmware can be replaced by the below process. Use **USB port only.** **Ethernet is not allowed for firmware download.**



1) Disconnect USB connection of ParaMon from the Drive.

2) Click " Firmware Downloader "

3) Click " Load " on the pop-up window, and select the firmware file on the pc.

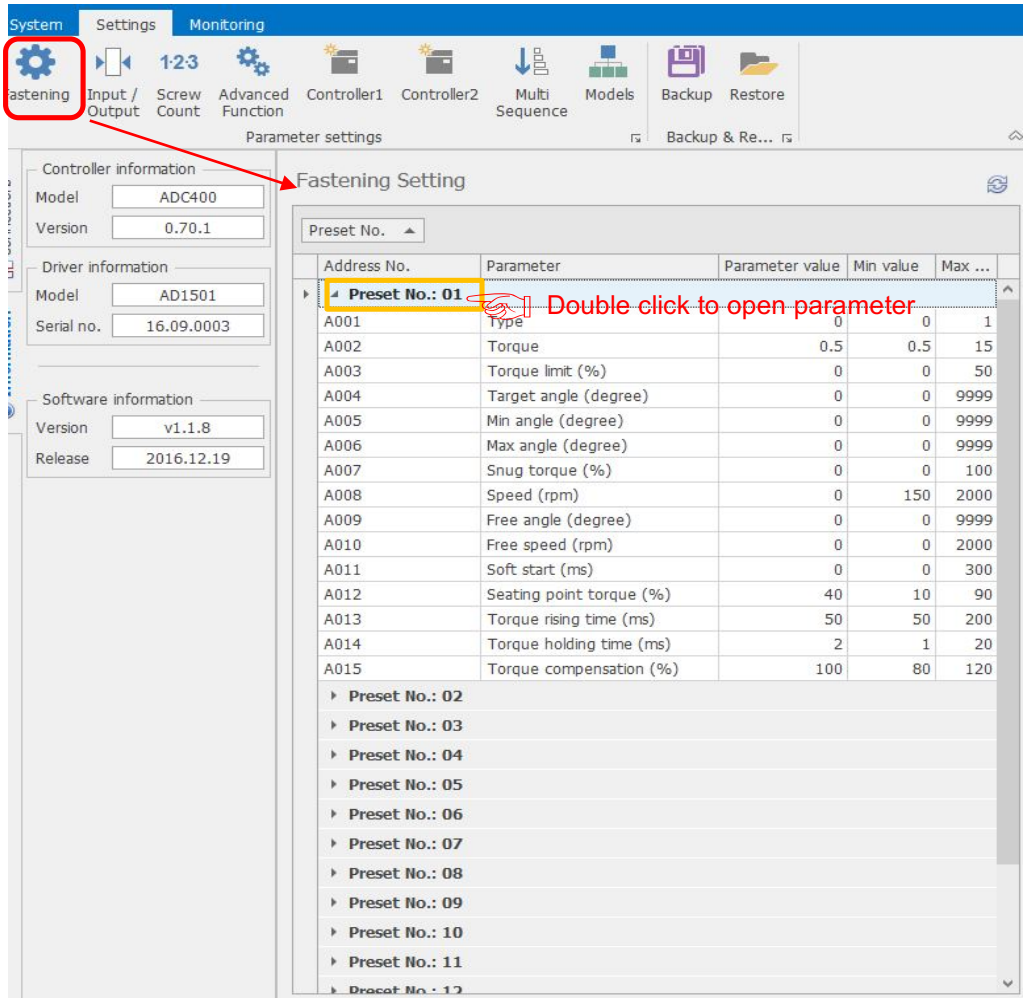
4) Click " Start "

5) See the message " Firmware upload complete " in the message window, and click " Close " to finish the process.

6) Turn the power of the controller OFF, and ON again to initialize the settings

2.2.2 Settings

1) Fastening

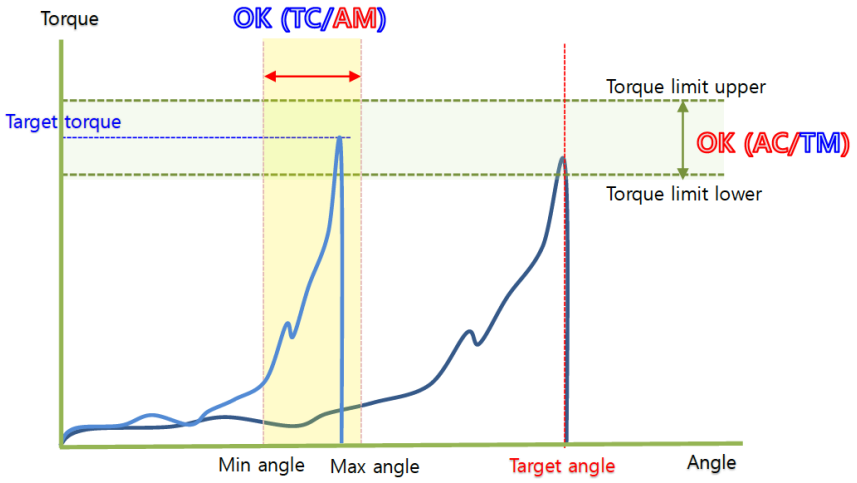


There are 15 preset groups for fastening setting. Each preset # consists of torque, speed, Min & Max angle for fastening OK range, soft start, Free speed before tightening.

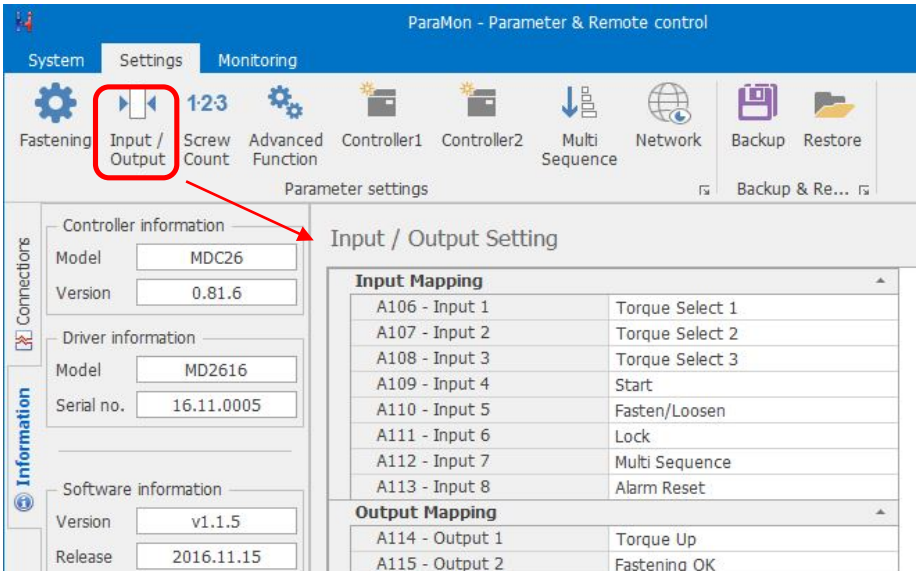
- Control type : TC/AM or AC/TM
  (torque control angle monitoring or angle control torque monitoring)
- Torque : Target torque
- Torque limit (%) : OK torque range in AC/TM mode
- Target angle : Target angle in AC/TM mode
- Min angle (degree) : Minimum angle to be OK in TC/AM mode
- Max angle (degree) : Maximum angle to be OK in TC/AM mode
- Snug torque(%) : Point (% from target torque) to start monitoring angle in TC/AM mode
- Speed : Target speed. Speed is changed by torque setting automatically. To change manually, Auto Speed

must be Disabled in Control 2

- Free speed : Manual setting speed. Shift back to the auto speed after the free angle running
- Free angle : Angle for Free speed.
- Soft start(mS) : Speed reach to the target in the setting time
- Seating point(%) : Auto speed slow down to ramp-up speed for torque control
- Torque rising time(mS) : Time setting from seating point to the target
- Torque holding time(mS) : Target torque holding time
- Torque compensation(%) : Preset # has each torque compensation value.



2) Input / Output management



The digital I/O provide the free assignment feature for Input and Output.

Factory setting of I/O assignments are as following.

To validate changing I/O, turn the power OFF and ON again.

◆ Digital I/O mapping factory setting

Description	Digital Input	Description	Digital Output
Preset select 1	Input 1	Torque up	Output 1
Preset select 2	Input 2	Fastening OK	Output 2
Preset select 3	Input 3	Ready	Output 3
Start	Input 4	Motor Run	Output 4
Fasten / Loosen	Input 5	Alarm	Output 5
Lock	Input 6	Status For/Rev	Output 6
Multi sequence	Input 7	Count Complete	Output 7
Reset	Input 8	Alarm 1	Output 8
Count Start	-	Alarm 2	
Count Reset	-	Alarm 3	
Count Out	-	Sync Out	
Preset select 4	-	Model Complete	
Sync In	-		
Sync resume	-		
CW Lock	-		
CCW Lock	-		
Model Cancel	-		

◆ ADC 50P I/O details

50P I/O pin no.	Description	Factory setting
11, 21	*IN COM*	
12	IN 1	Preset select 1
13	IN 2	Preset select 2
14	IN 3	Preset select 3
15	IN 4	Start
16	IN 5	Forward / Reverse
17	IN 6	Driver Lock
18	IN 7	Multi sequence
19	IN 8	Reset
22	IN 9	-
23	IN 10	-
24	IN 11	-
25	IN 12	-
26	IN 13	-
27	IN 14	-
28	IN 15	-
29	IN 16	-
35	OUT 1 (+)	Torque UP
36	*OUT 1 (-)*	
37	OUT 2 (+)	Fastening OK
38	*OUT 2 (-)*	
39	OUT 3 (+)	Ready
40	*OUT 3 (-)*	
41	OUT 4 (+)	Motor RUN
42	*OUT 4 (-)*	
43	OUT 5 (+)	Alarm
44	*OUT 5 (-)*	
45	OUT 6 (+)	Status F/L
46	*OUT 6 (-)*	
47	OUT 7 (+)	Count complete
48	*OUT 7 (-)*	
49	OUT 8 (+)	
50	*OUT 8 (-)*	

Connector model : 3M MDR10250-52A2PL

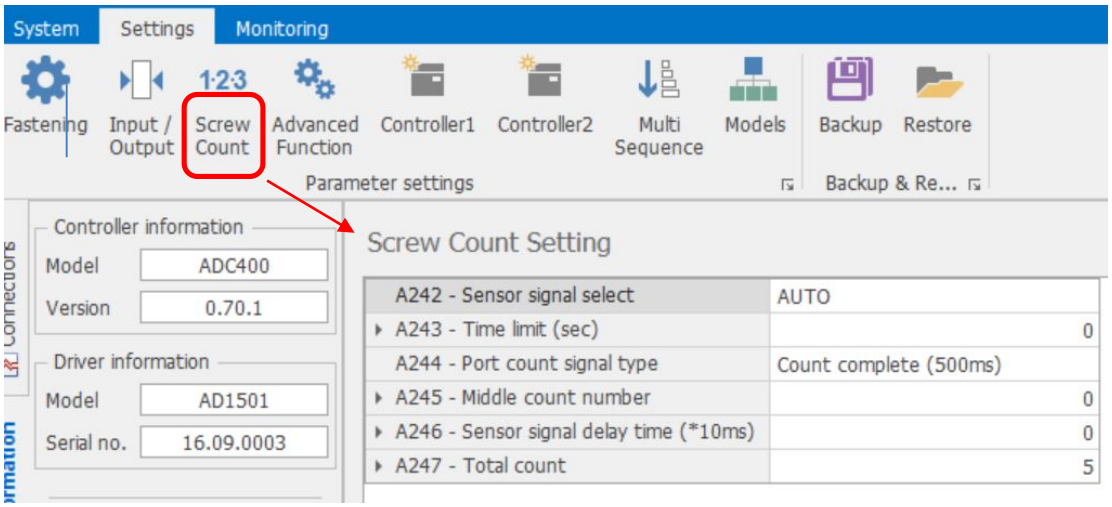
◆ Binary coding with 5 inputs to select preset #

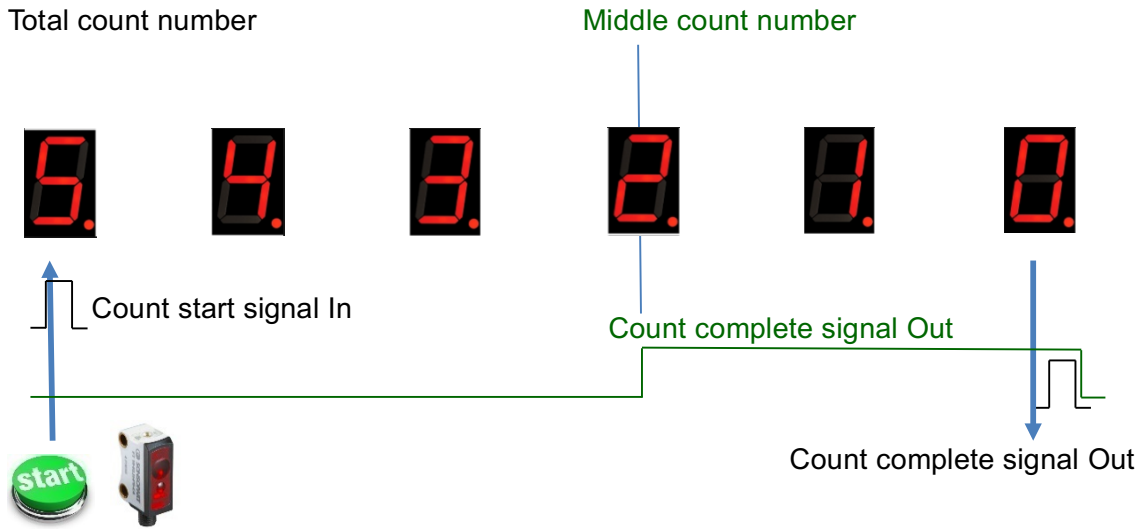
Preset #	Input				
	Preset select 4	Preset select 3	Preset select 2	Preset select 1	Multi sequence
1	0	0	0	1	
2	0	0	1	0	
3	0	0	1	1	
4	0	1	0	0	
5	0	1	0	1	
6	0	1	1	0	
7	0	1	1	1	
8	1	0	0	0	
9	1	0	0	1	
10	1	0	1	0	
11	1	0	1	1	
12	1	1	0	0	
13	1	1	0	1	
14	1	1	1	0	
15	1	1	1	1	
Multi A	0	0	0	1	1
Multi B	0	0	1	0	1

◆ Binary coding with 3 outputs for error codes in 7 groups

Error code	Alarm 3	Alarm 2	Alarm 1
110,113,114,115,116,118,200,201,220	0	0	1
300,301,302,303,304,309	0	1	0
310,311	0	1	1
330,337	1	0	0
332,338	1	0	1
333,334,335,336	1	1	0
AL-xx Alarm (System alarm)	1	1	1

3) Screw count





◆ Count start signal (IN)

1) No signal, auto start (Auto) - auto reset to total number after “0”

2) Sensor or switch with one trigger pulse - Count starts with only trigger pulse. Counting is valid until complete or reset. Reset calls count NG

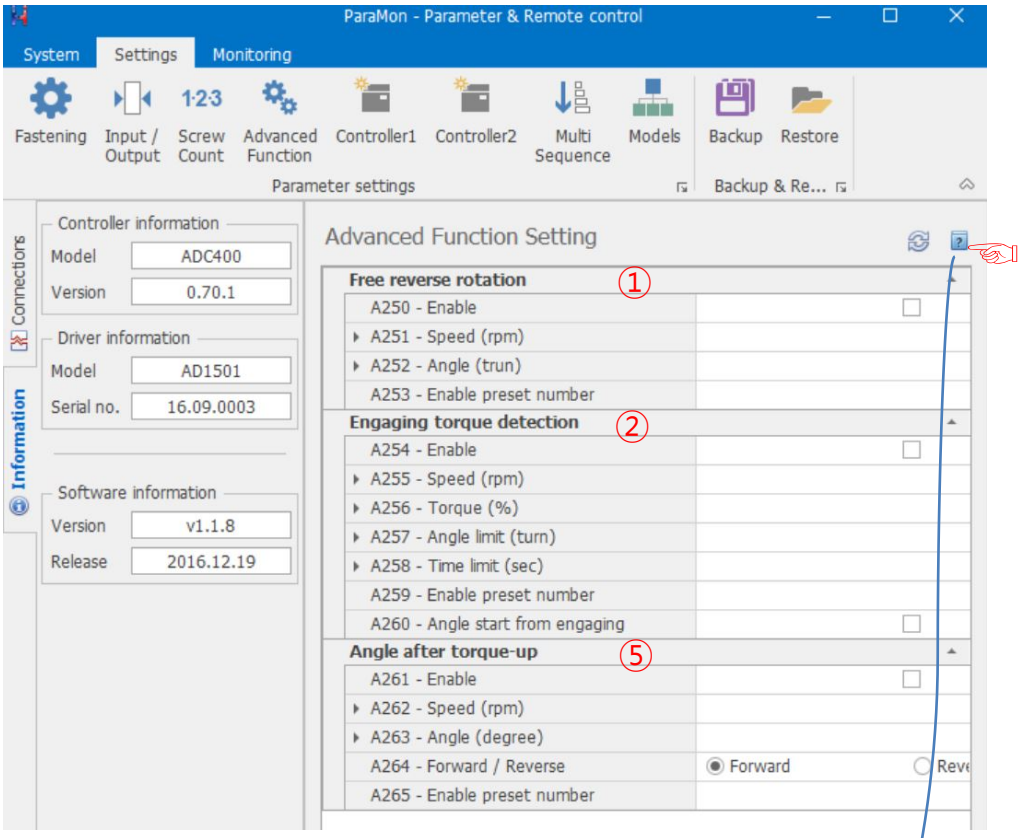
3) One trigger pulse with timer for counting - Counting should be completed within the time of timer from the trigger pulse, otherwise count NG

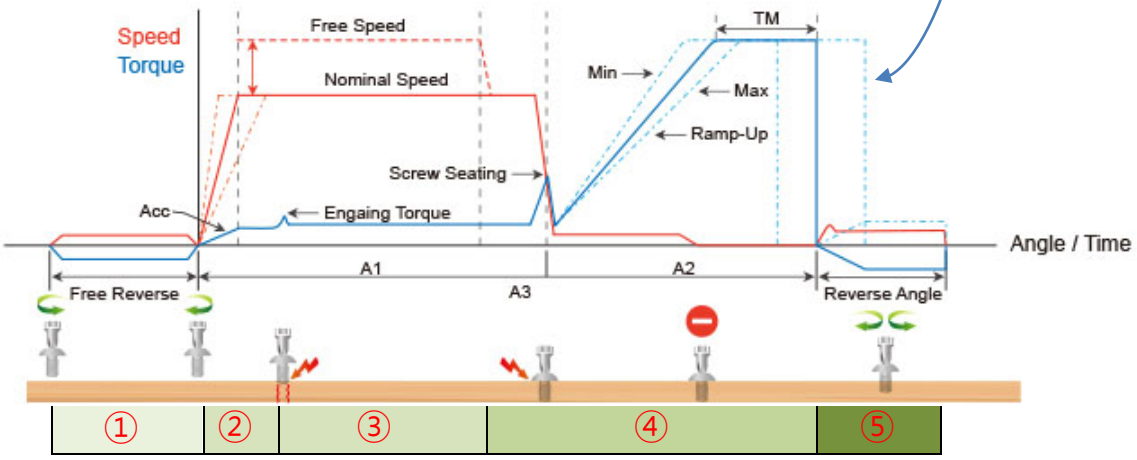
4) One trigger pulse to start counting, another trigger pulse to stop counting and evaluate OK or NG. Any remaining number calls count NG

◆ Count complete signal (OUT)

If mid count number is used, count complete signal out is provided on mid count number and reset on the cycle completed.

4) Advanced functions





There are 4 steps of Advanced Function to customize the screw fastening process.

Step 1 (Option) : Free Reverse rotation to guide the screw into the screw hole smoothly with low speed

Step 2 (Option) : Engaging torque detection – The monitoring angle count is reset and start again from the engaging torque detection point which the screw start joining the thread. It is possible only when the screw engaging provide significantly higher torque than previous free run. Engaging torque setting is by percentage of target torque.

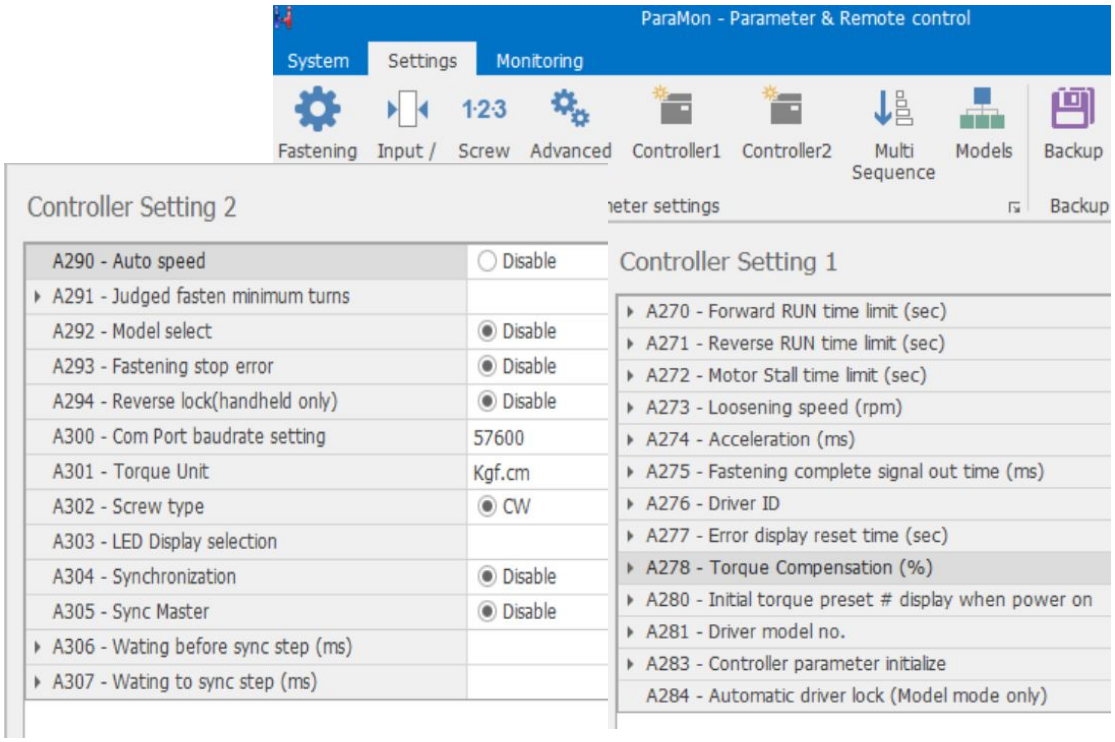
Step 3 (Preset) : Free Speed – The system auto speed by torque setting can be manually replaced to have higher or lower speed than it's original auto speed during the limited angle setting. Be sure that the free speed run should stop before the screw seating point which screw start to tightening joint. To use this option, go the Fastening setting menu.

Step 4 (Preset) : Fastening sequence – have the important parameter factors to the tightening quality.

1) Seating point (%) : It is trash hold point at that the target speed is shifting to torque up process. The factory setting is guided from hard joint. If the it is soft joint, the setting can be higher percentage of the target torque.
2) Torque rising time(mS) : It is the speed and time during ramp-up to the target torque. Quick or slow speed to the target torque according to the condition.
3) Torque holding time(mS) : Tool holds the target torque for the time setting. It stabilizes the tightening condition.

Step 5 (Option) : Angle after torque-up(A261) : It manage extra angle control in both forward or reverse direction after tightening by torque.

5) Controller 1 & 2



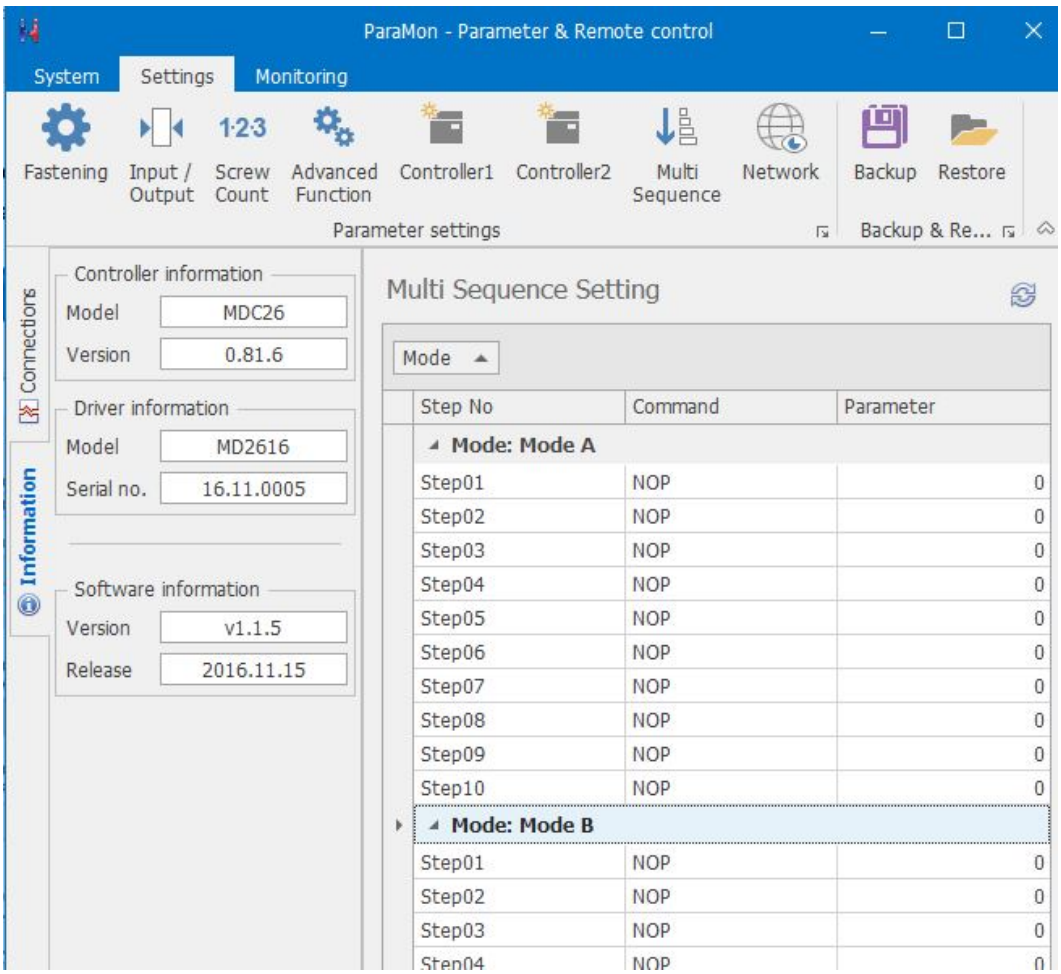
Forward / Reverse motor RUN time, and motor stall time is limited for motor safety. The following parameters is ideally recommended to be kept with factory setting in all application.

- Forward RUN time limit (A270) : Run limit to forward rotation
- Reverse RUN time limit (A271) : Run limit to reverse rotation
- Motor Stall time limit (A272)
- Acceleration (A274) : Slow start of motor to the target speed
- Auto speed (A290) : ENABLE provide the safe speed on the torque setting
- Driver model no.(A281) : not changeable. Auto recognized

Other parameters are selectable and changeable for application requirements.

- Torque unit (A301) : Kgf.cm / Kgf.m / cNm / Nm / ozf.in / lbf.in / lbf.ft Whenever the unit is changed, the controller should be reboot again
- Fastening stop error (A293) : DISABLE does not creat any NG when the tool stop without torque up fully tightening.

6) Multi sequence



◆ Command details

Command	Description
NOP	No operation
Fastening	tool start fastening process in forward rotation
Loosening	tool start loosening process in reverse rotation
Select preset#	Select preset #
Delay	time delay for setting time
Jump	Move to the setting step
Count value = A	Total number “A” to count
Sub if (A)	Subtract 1 from “A” and save the value replacing “A” . If the value “ A” is not “0”, then move to the next lower step. If the value “ A” is “0”, then move to 2nd lower step
End	Finish multi-sequence process

Multi sequence provide a cycle of fastening by a start signal.
Total 10 steps of programing is allowed in MA(Multi A) and MB(Multi B) presets
To program, select the command and required parameter on each step.
To finish the multi sequence programing, last step command should be “END”

[Example of Multi sequence step program]

Setp no	Command	Parameter
Step 1	Count Value = A	10
Step 2	Select Preset#	1
Step 3	Fastening	
Step 4	Loosening	5
Step 5	Select Preset#	3
Step 6	Fastening	
Step 7	Sub if (A)	
Step 8	Jump	2
Step 9	End	

Step 1 : Total counting number is 10
Step 2 : Preset #1 selected and move to the next step
Step 3 : Start fastening and stop by torque or angle setting, and move to the next step
Step 4 : Loosen 5 turns and move to the next step
Step 5 : Preset #3 selected and move to the next step
Step 6 : Start fastening and stop by torque or angle setting, and move to the next step
Step 7 : Subtract 1 from “10” and save “9” by replacing “10”. If the value “ A” is not “0”, then move to the next lower step. If the value “ A” is “0”, then move to 2nd lower step
Step 8 : Jump to step no. 2

Step no.2 to Step no. 6 works for a cycle. Total 10 cycles are operated automatically by a start signal.
Any failure or NG on each step, Multi-sequence process stops and provide the alarm signal.

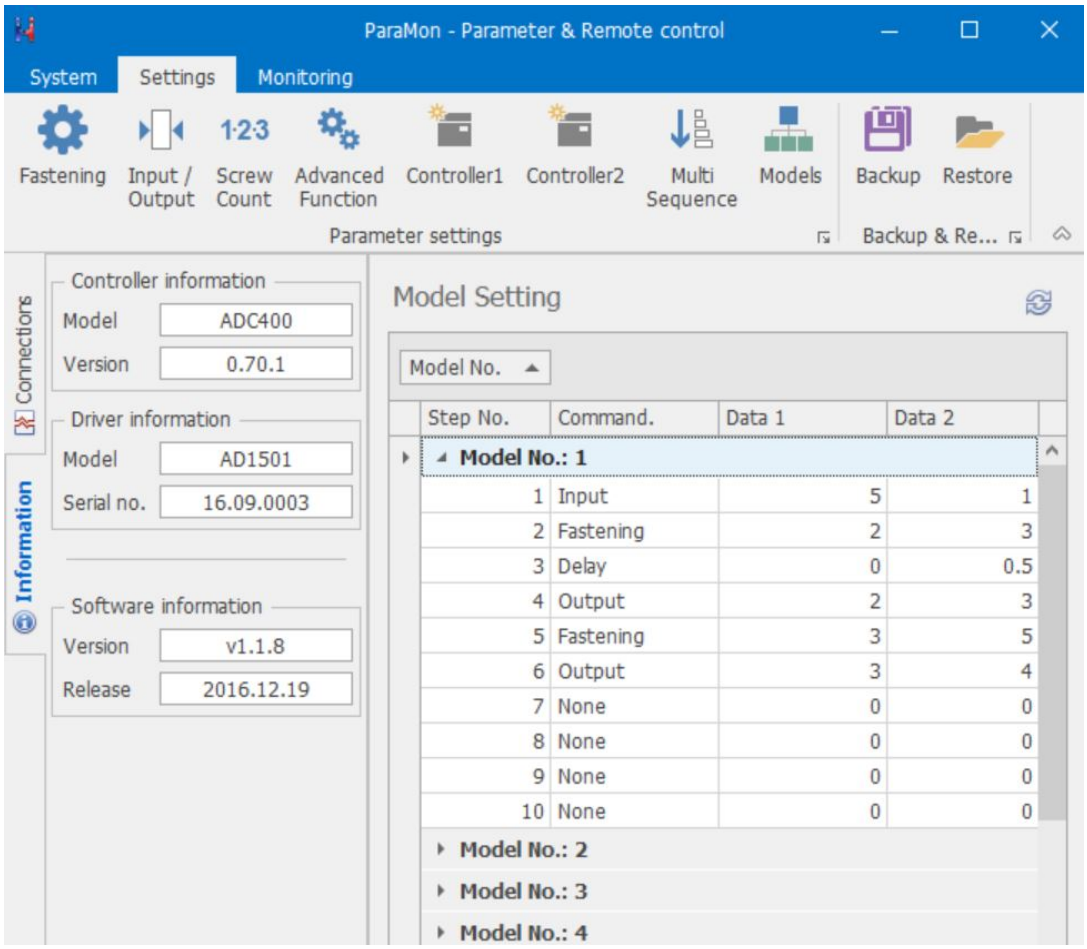
7) Models

It provides sequential screw tightening with screw counting feature together with I/O and time delay managing by programing in 10 steps.
There are 4 different type of command – Input, Output, Fastening and Time delay
Each step can have one of the above four commands with related setting value
The fastening with counting number follows all settings and features in Screw Count menu except the number of screw.
There are total 15 programable Models.
Once Model is selected, the digital inputs for preset # select becomes model # select automatically.

To use Model feature, select Enable on the menu of Controller 2 - Model select (A292).

The spindle can be locked automatically in all steps except Fastening step, by selecting

Enable on the menu of Controller 1 – Automatic driver lock (A284)



◆ Command details

Command	Description	Data 1	Data 2
Input	Mapping digital Input	Input # select from 1 - 16	0 : No output → NG 1 : Active High 2 : Active Low 3 : High status 4 : Low status
Output	Mapping digital Output	Output # select from 1 - 8	0 : No Output → NG 1 : On 2 : Off 3 : On for 0.5s and Off 4 : On for 1.0s and Off
Fastening	Start fastening	Preset # from 1 - 15	Count number from 1 - 250
Delay	Delay time	-	0.1 - 25 sec. (unit: 0.1s)

[Example of Model programing]

Step	Command	Data 1	Data 2	Description
Step 1	Input	5	1	If there is input signal turning on in Input no.5, then move to the next step
Step 2	Fastening	2	3	Fastening total 3 screws with preset# 2. If fastening of all screws are completed, then moves to the next step. If there is the cycle start condition except “Auto” on the menu of Screw Count, counting will start only with the cycle start signal input. And if the workpiece is removed without complete of count number, Model process can be stopped by Model cancel (input). Refer 3) Screw Count on the manual
Step 3	Delay	-	0.5	Delay for 0.5 seconds. Then move to the next step
Step 4	Output	2	3	Provide 0.5s pulse ON signal output in Output # 2. Then move to the next step.
Step 5	Fastening	3	5	Fastening total 5 screws with preset# 3. Then moves to the next step. Screw counting condition is same as Step 2
Step 6	Output	3	4	Provide 1.0s pulse ON signal output in Output # 2. Then move to the next step.

Step 1 : Read the sensor signal when it detect the workpiece loading

- Connect sensor to Digital Input 5 (pin no.16)
- I/O setting → Input 5 : None

Step 2 : Screw tightening with Preset #2

Number of screw = 3

Step 4 : Provide output signal for 0.5 seconds

- Connect buzzer to Digital Output 2 (pin no. 37 & 38)
- I/O setting → Output 2 : None

Step 5 : Screw tightening with Preset #3

Number of screw = 5

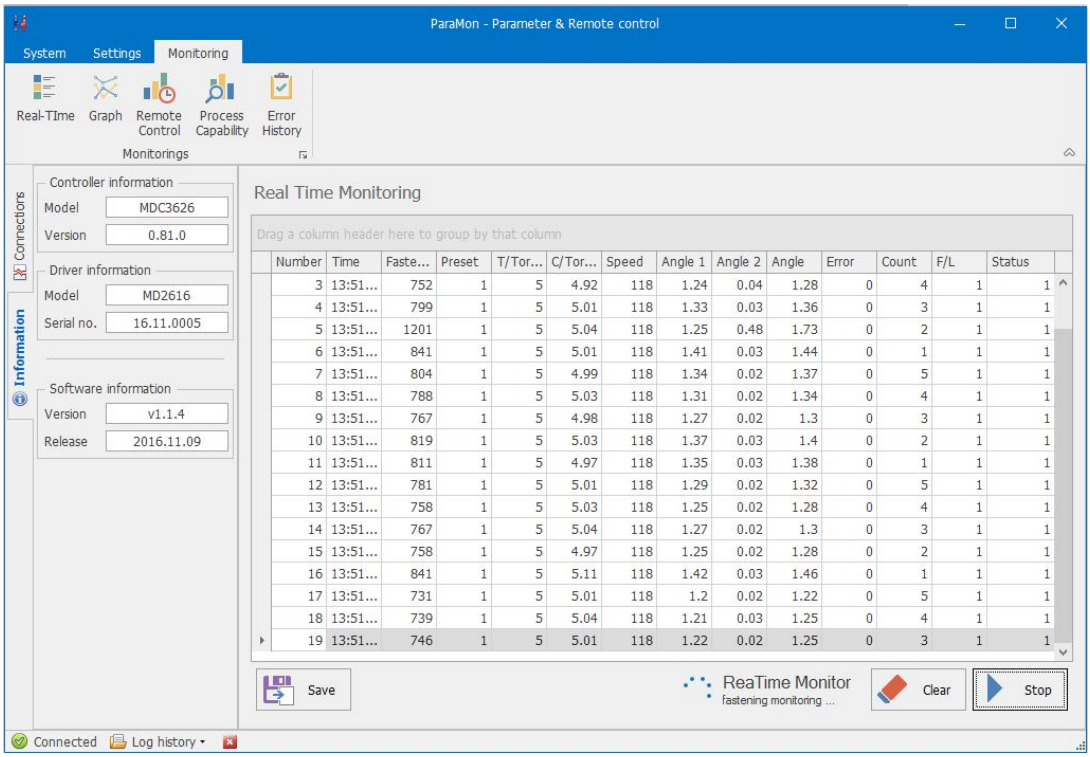
Step 6 : Provide output signal for 0.5 seconds

- Connect buzzer to Digital Output 3 (pin no. 39 & 40)
- I/O setting → Output 3 : None

2.2.3 Monitoring

1) Real-time monitoring

Setting of Auto Data Out (A297) should be " Disable " for Monitoring



The following data are monitored automatically on every event as like motor run, torque up, Forward / Reverse change, preset # change, etc.

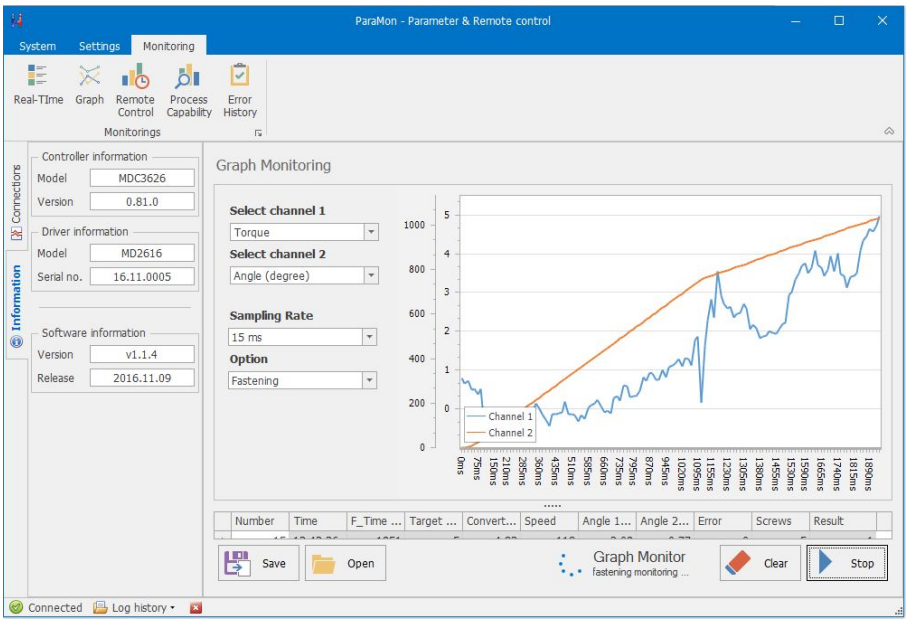
- Date & time
- Fastening time
- Preset #
- Target torque
- Converted torque
- Speed
- Angle 1 (angle from motor start to screw seating point)
- Angle 2 (angle from screw seating point to the end)
- Angle 3 (Angle 1 + Angle 2)
- Snug Angle(degree) : angle from snug torque to the end
- Error code
- Screw count no.
- Forward / Reverse status
- Status (OK, NG)

The monitoring data can be saved in CSV file. And it can open the file.

2) Graph monitoring

Total 200 real-time data are displayed with curve together in two channel.

- Torque, Speed, Angle(degree), Angle(turn) and current
- Data sampling rate : 5ms (1s), 10ms(2s), 15ms(3s)
- Data display option : Fastening, Loosening, All



The monitoring data can be saved in CSV file. And it can open the file.

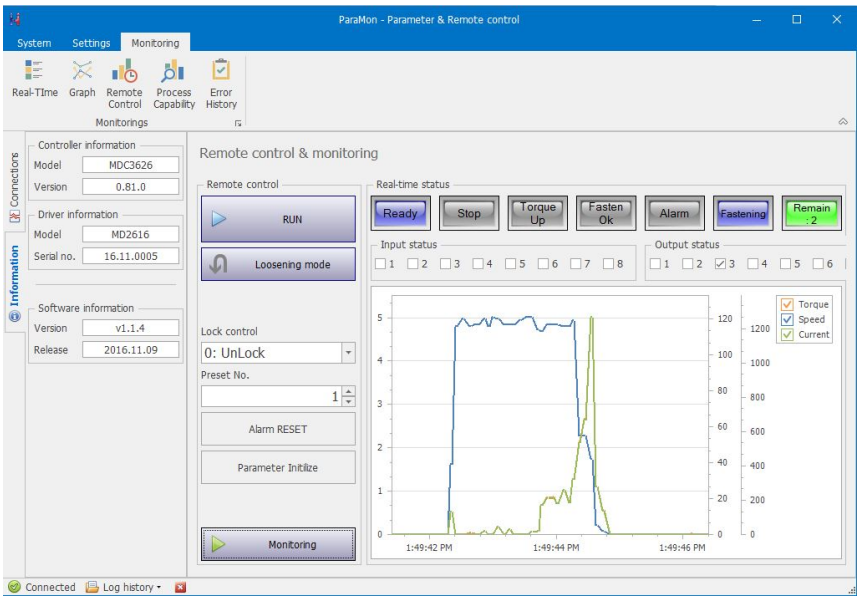
3) Remote control & I/O status monitoring

The tool is operated remotely for the followings.

- Fastening / loosening rotation,
- Tool Start
- Tool lock & unlock

The following main signal status and I/O are monitored and displayed together with torque, speed and current curves.

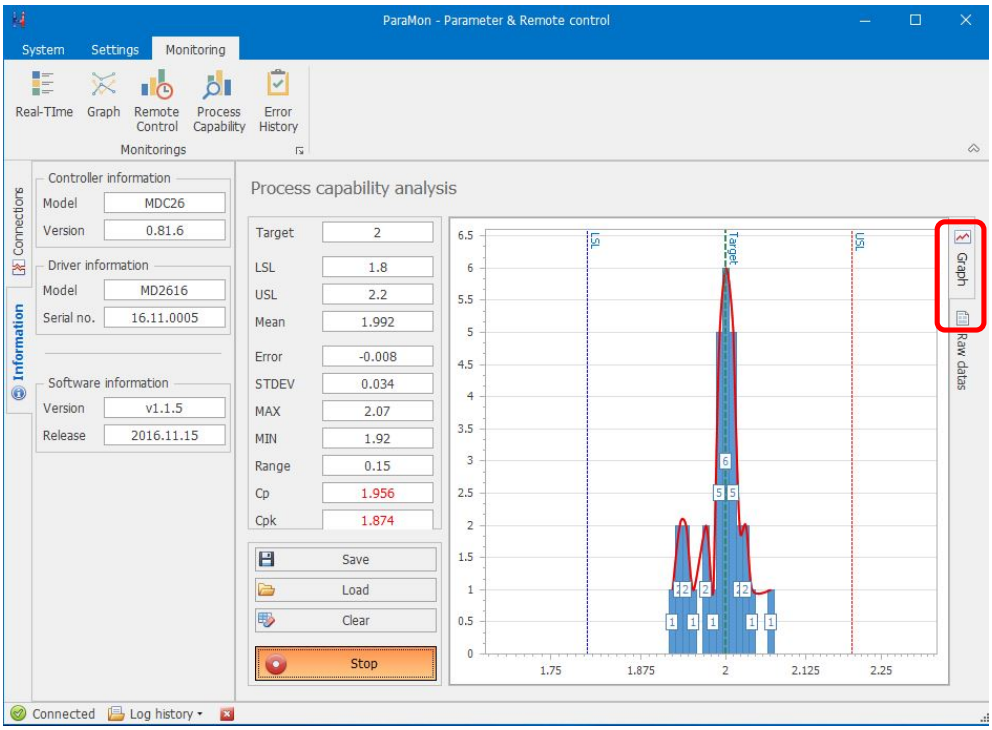
- Ready, Tool start/stop, Torque up, Fastening OK, Alarm, F/R, I/O

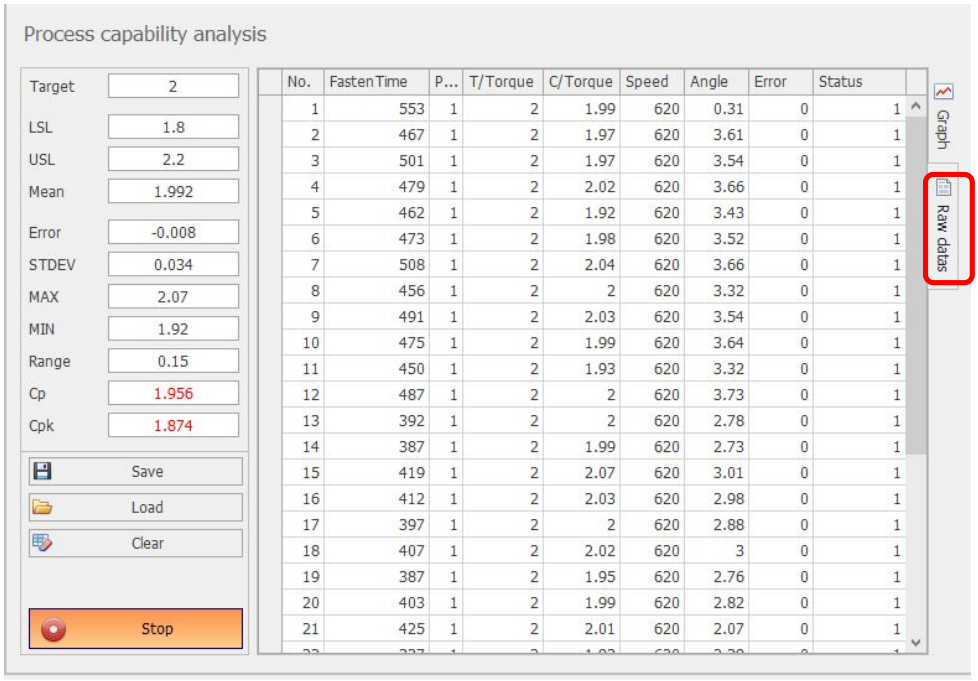


4) Process capability display

From real-time monitoring fastening torque data, the following statistical data are calculated and displayed. The data is updated automatically for every fastening until monitoring cancelled.

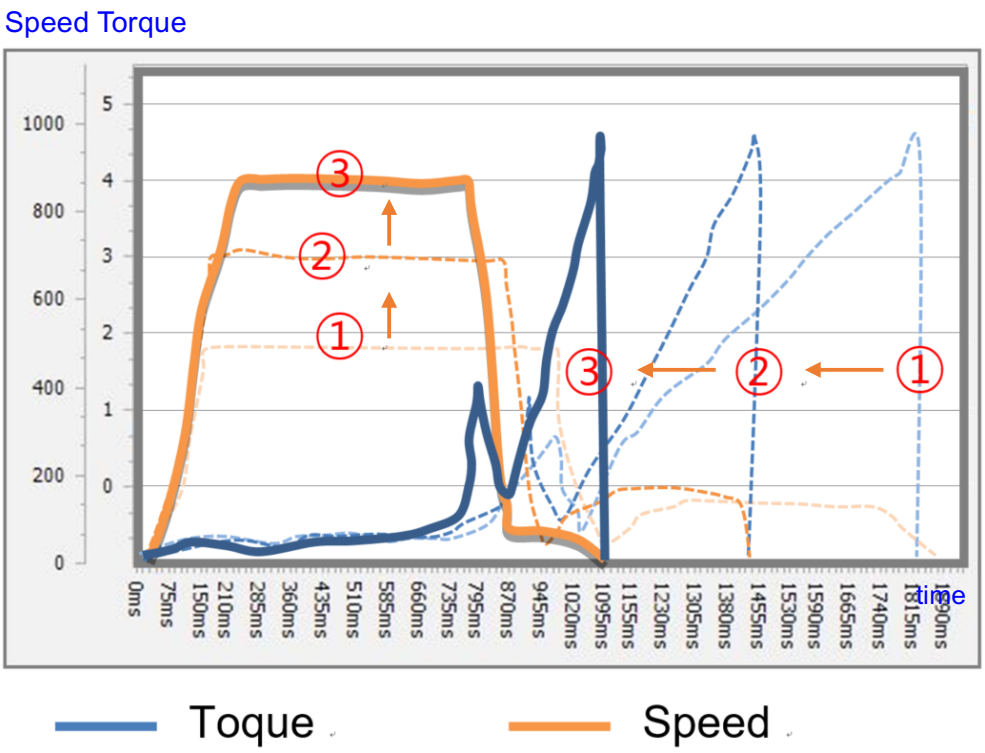
- Average, Standard deviation, CP, CPK



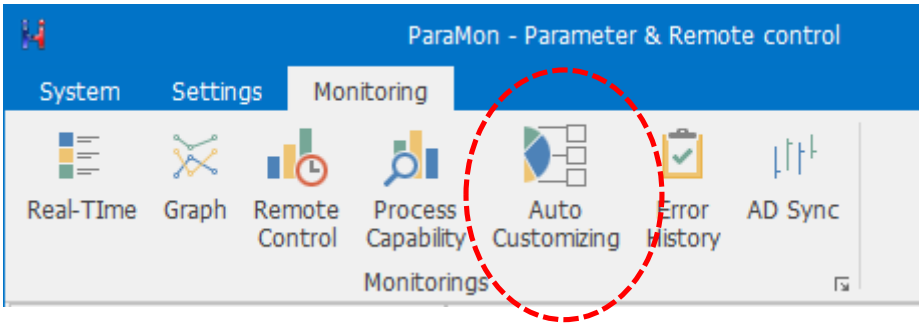


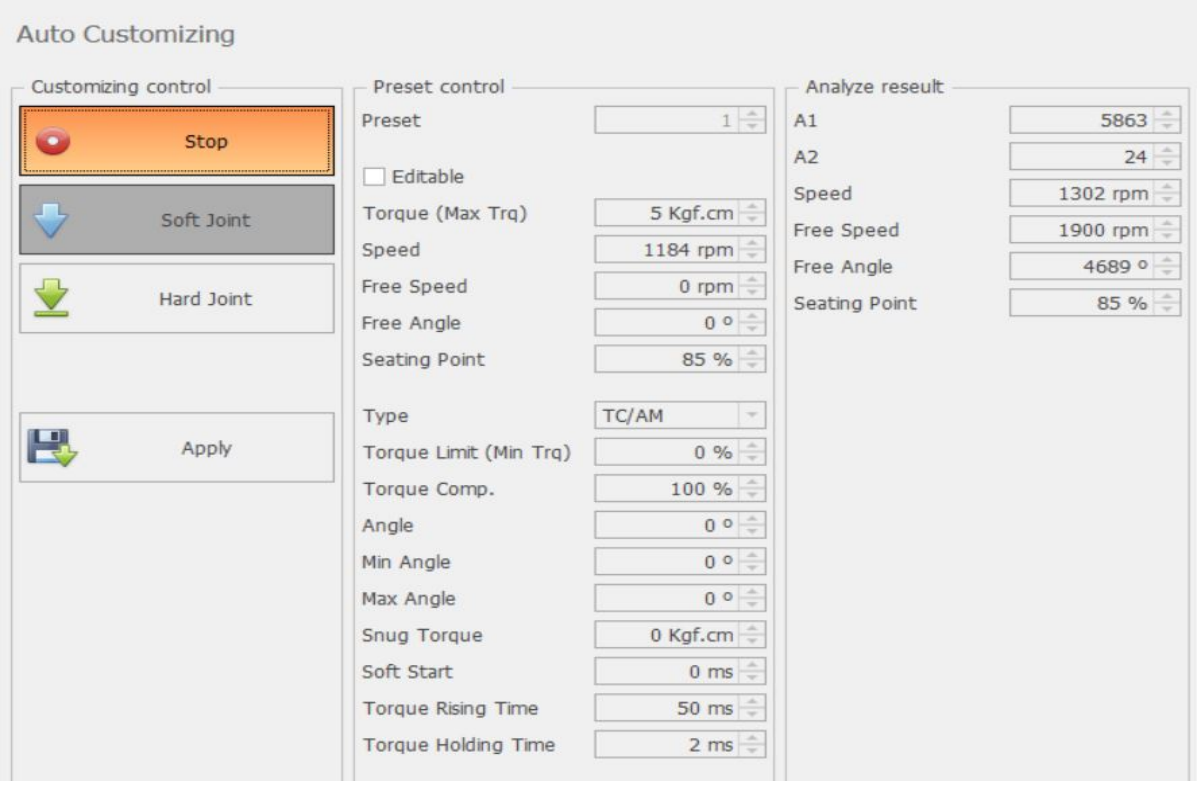
5) Auto customizing

AD tool has the auto speed feature against torque setting not to provide any over torque by speed shock. The auto speed is safe speed on the hard joint condition. On the real application, the settings can be changed manually. Auto customizing feature provides most optimized parameter settings for saving cycle time on the real application.



Click Auto Customizing menu to open the menu.





① Select Preset # to modify parameter settings

② Select one of Soft & Hard joint condition when it is obviously clear or both together when it is not clear to be clarified, then click START

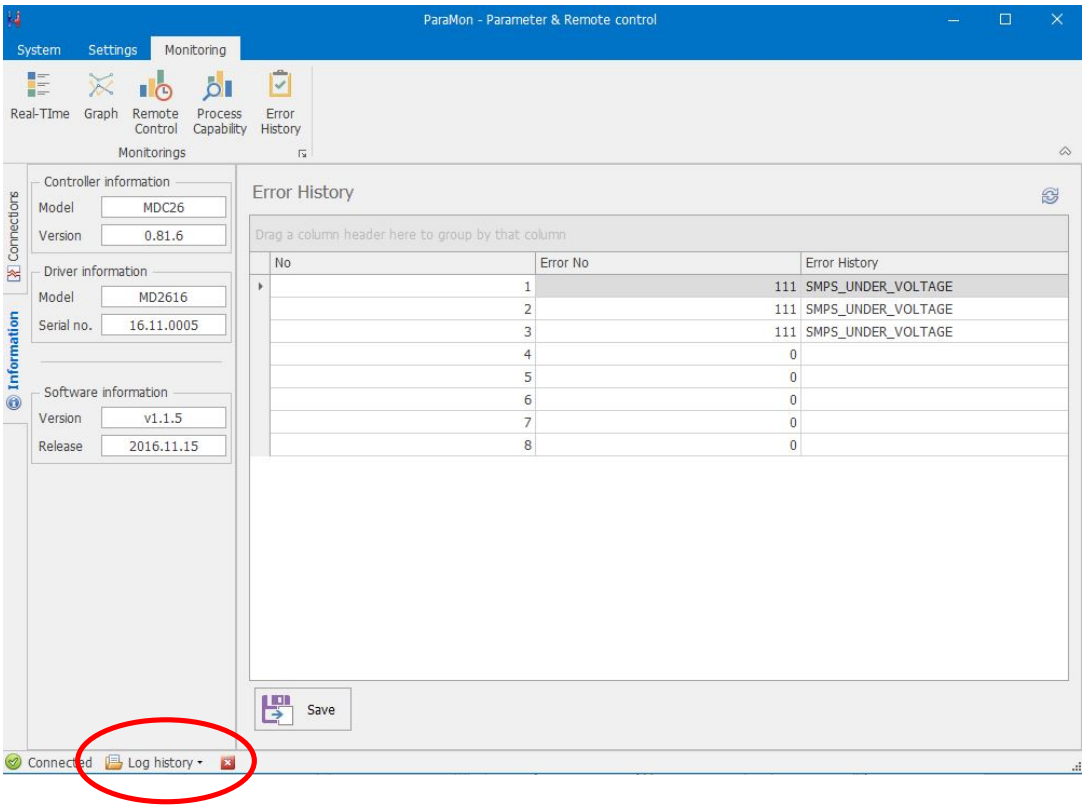
③ Apply screw tightening several times until there is no more parameter changing on the simulation & modification window. Be sure that the fastening condition should be same during the process. The system changes parameter values by the previous fastening data.

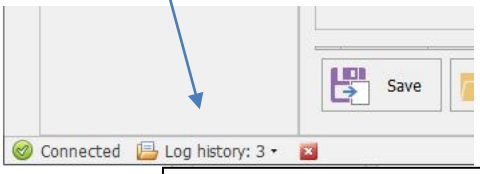
④ Once there is no more changes on the simulation & modification window, click STOP to finish testing.

⑤ Click APPLY to apply the settings on the simulation & modification window. The setting can be modified by manually before applying them.

6) Error history display

The latest 8 tool error (system error only) histories which are saved in the controller





ATTENTION : communication is disconnected

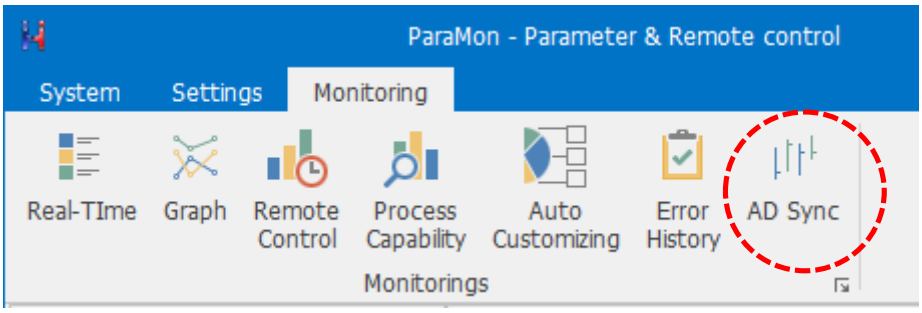
ATTENTION : communication is disconnected

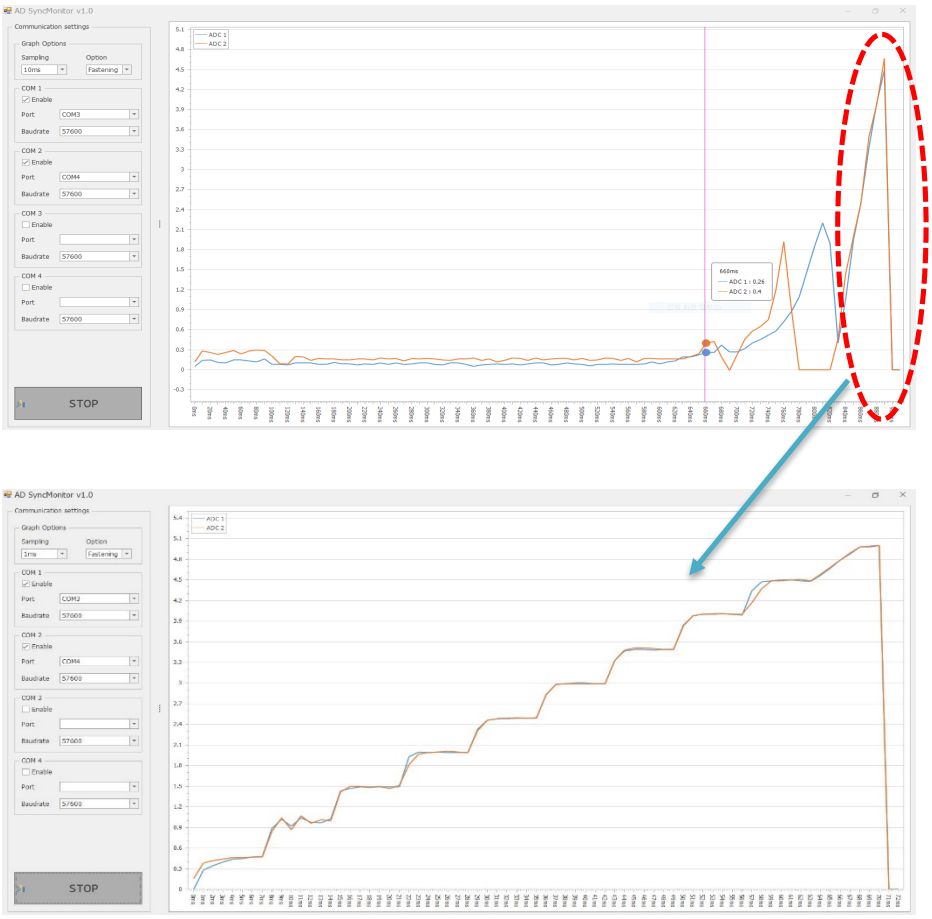
ATTENTION : communication is disconnected

Log history is information about the communication of PC to the tool.

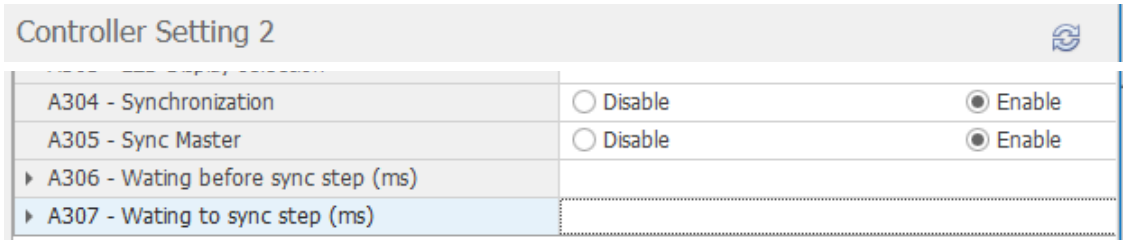
7) AD Synchronizing

Two or more spindles up to maximum 31 spindles can be operated with a torque synchronized condition. The spindle drives should be linked by I/O to be synchronized. One drive should be Master and the others should be slaves. To monitor the torque curve of the multi spindles on the separate software- AD Synch, each drive should be connected to the PC by RS422 communication port. The torque curve of maximum 4 spindles can be monitored on a screen with different colors together. But total 31 spindles can be operated in synchronized condition.





[Setting & Wiring]



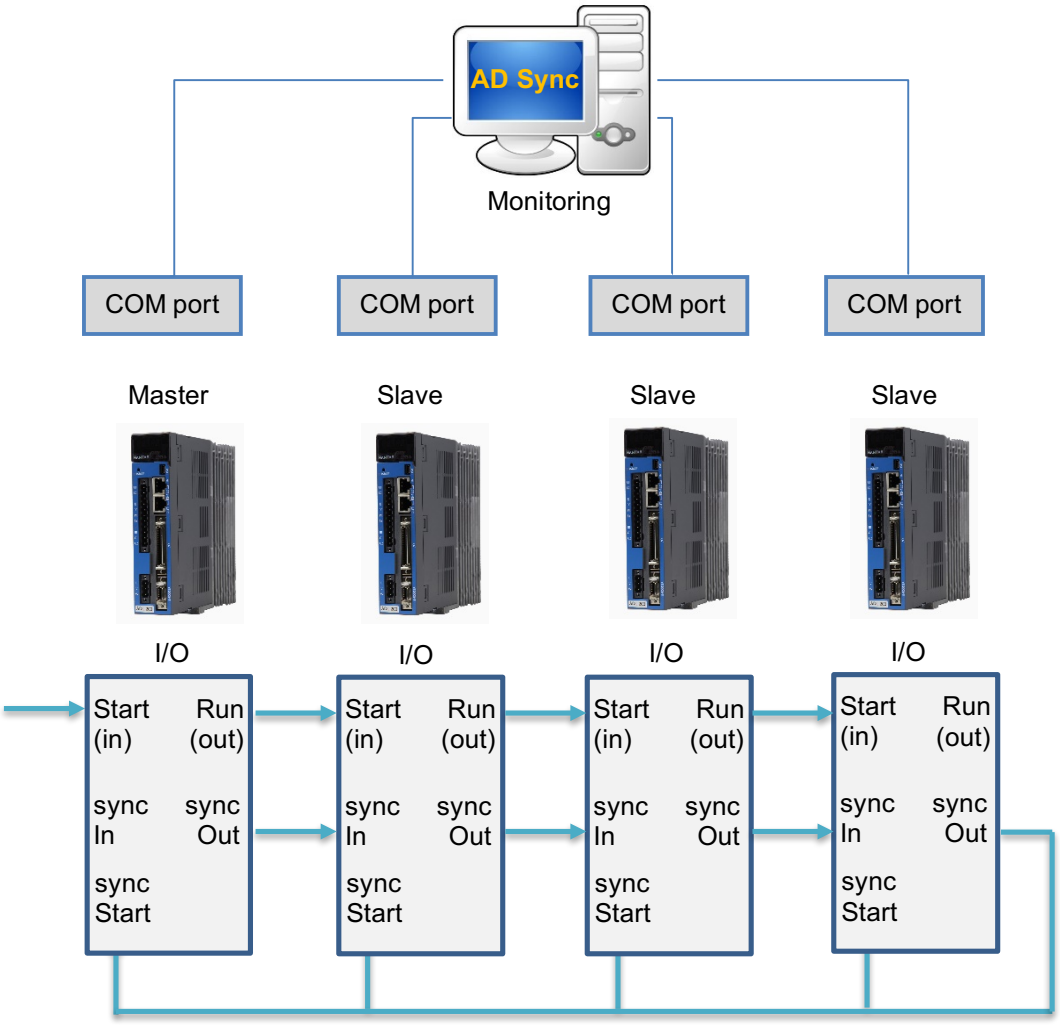
Parameter setting

① A304 Synchronization : Enable

② A305 Synch Master : The only 1st spindle should be Master

③ A306 Waiting before sync step (ms) : Torque synchronization process starts from the torque seating point. The time to reach to the seating point. Once all spindle reach to the seating point, then move to the next step together.

④ A307 Waiting to sync step (ms) : There are 10 sync steps up to the target torque. The waiting time limit between sync steps before moving to next step together.



3. Error & System alarm code

3.1 System error (Er- xxx)

Code Er-	Error	Description	How to reset
110	AD offset error	When the power of controller is ON, the current offset is out of range. Reset and retry booting. If failed, repair is required	RESET button
113	Spindle parameter read error	Reading failure of spindle parameter	Power Off →On
114	Screwdriver recognition error	Controller can not recognize the connected screwdriver	Power Off →On
115	Controller recognition error	Program itself can not recognize the controller information.	Power Off →On
116	Out of torque range	Torque setting is out of the torque capacity	RESET button
118	No motor rotation error	When motor rotation is not monitored	RESET button
200	Parameter reading failure	It failed to read parameter at all. Check the EEP-ROM damage or communication failure	Power Off →On
201	Parameter Checksum error	The read parameter is wrong by the checksum routine	Power Off →On
220	Multi-sequence program error	Multi-sequence program is wrong	RESET button

3.2 Fastening error by the pattern setting (Er- xxx)

Code Er-	Error	Description	How to reset
300	Fastening time limit	Over the fastening time limit on P60	Auto reset after set time
301	Loosening time limit	Over the loosening time limit on P61	Auto reset after set time
302	Model setting error	Failure in Model programing.	
303	Model cancel	The Model process is canceled	
304	Motor stall by loosening failure	Motor stall by loosening failure within time limit on A272	Auto reset after set time
309	Bit socket tray	Bit socket tray application error	
310	Time over in screw counting	Over the time limit of screw counting on A243	Auto reset after set time
311	Screw missing	When the work-piece moves out of the working area without complete number of fastening, it provide alarm for set time(A277) and display the latest number. It can be clear to "0" by pressing RESET button.	Auto reset after set time or RESET button
330	Min Angle error	Target torque reached before the Min angle	Auto reset after set time
331	Target angle setting errir	Target angle setting is out of the range [AC/TM mode]	Auto reset after set time
332	Angle over	Target torque reached over the Max angle	Auto reset after set time
333	No torque complete	Operation stops before complete cycle of torque up by releasing lever trigger	Auto reset after set time

334	Engaging torque detection fail	The engaging torque is not detected in time or angle limit	Auto reset after set time
335	Converted torque error	Converted torque is out of OK range	Auto reset after set time
336	Over torque error	torque reached to the high limit of torque	Auto reset after set time
337	Sync step error1	Synchronizing time limit over before the seating point	Auto reset after set time
338	Sync step error2	Synchronizing time limit over after the seating point	Auto reset after set time

3.3 System alarm (AL- xx)

Code AL-	Alarm	Description	How to fix
10	Over current in Hardware	1) Motor or encoder cable error 2) Motor coil damage 3) Motor stall by mechanic issue 4) Control error by EMC	1) Cable check and repair or replace 2) Resistance test between UVW phase 3) Remove the filaure 4) Check FG connection and improve condition
14	Over current in Software		
16	Current limit over		
11 22 23	Overload by temperature	1) Environment over 50°C 2) Continuous overload 3) Motor cable open	1) Check room temperature 2) Change to higher capacity one 3) Check cable
21	Continuous overload	1) Overload application 2) Motor or encoder cable error	1) Change to higher capacity one 2) Check cable
22 25	Over temperature in drive	1) Environment over 50°C 2) Others	If room temperature is normal, replace drive
24	Motor cable open	Motor cable open or short circuit of motor windings	Replace cable or motor
30	Encoder communication error	1) Encoder cable error 2) Drive error	1) Replace encoder cable 2) Replace drive
31	Encoder cable open		
32 34	Encoder data error		
38	Wrong recognition	1) Spindle and drive can not be matched as a pair 2) Encoder or encoder cable error	1) Check the model of spindle and drive 2) Replace encoder cable
40	Under voltage	1) Input voltage is lower than rated input voltage 2) Voltage drop down during running	1)Main power should be over 190VAC 2) Use 3 phase input power
41	Over voltage	1) Input voltage is over than rated input voltage 2) Acceleration/deceleration error	1)Check power input 2) Have longer acc/dcc time setting
42	Main power fail	Power input voltage out of the range 200 – 230VAC	Check the power voltage input
43	Control power fail		
50	Over speed limit	1) Motor or encoder cable error 2) Encoder failure 3) Drive failure	Repair or replace the failure
60	USB com port		Contact to the manufacturer
63	Parameter checksum		
64	Parameter range		
70	Drive & spindle combination issue		
71	Factory setting required		

Mountz Calibration & Repair Services

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Since 1965, Mountz Inc. has proven in-depth knowledge of torque is reflected in our tool's craftsmanship and our ability to provide solutions to both common and uncommon torque applications. We perform calibrations in accordance with ANSI/NCSL-Z540. Mountz is dedicated solely to the manufacturing, marketing and servicing of high quality torque tools.

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- Torque Wrench Calibration: Click Wrench, Dial Torque Wrench, Beam Wrench, Cam-Over & Break-Over Wrench
- Torque Screwdrivers: Dial, Micrometer, Preset & Adjustable
- Torque Analyzers/Sensors: All brands
- Electric Screwdrivers: All brands
- Air Tools: All brands

Impact Wrenches, Drills, Pulse Tools, Grinders, Percussive Tools, Air Screwdrivers, Nutrunners, DC Controlled Nutrunners

- Torque Multipliers: All brands

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