

Dec 08th, 2020

EC- Series DC Torque Control System Operation Manual Using PC Software



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GENERAL SAFETY RULES

WARNING! Read and understand all instructions. Failure to follow all instructions listed below may result in electric shock, fire, and/or serious personal injury.

SAVE THESE INSTRUCTIONS

Work Area

Keep your work area clean and well lit. Cluttered benches and dark areas invite accidents.

Do not operate power tools in explosive atmospheres, such as in the presence of flammable liquids, gases, or dust. Power tools create sparks which may ignite the dust or fumes.

Keep bystanders, children, and visitors away while operating a power tool.

Distractions can cause you to lose control.

Electrical Safety

Grounded tools must be plugged into an outlet properly installed and grounded by all codes and ordinances. Never remove the grounding prong or modify the plug in any way. Do not use ungrounded plugs? . Check with a qualified electrician if you are in doubt as to whether the outlet is properly grounded. If the tools should electrically malfunction or break down, grounding provides a low resistance path to carry electricity away from the user.

Avoid body contact with grounded surface and pipes, radiators, ranges, and refrigerators. There is an increased risk of electric shock if your body is grounded.

Don't expose power tools to rain or wet conditions. Water entering a power tool will increase the risk of electric shock.

Take care when using and handling the power/data cord. Never use the cord to carry the tools or pull the plug from an outlet. Keep the cord away from heat, oil, sharp edges, or moving parts. Replace damaged cords immediately. Damaged cords increase the risk of electric shock.

When operating a power tool outside, use an outdoor extension cord marked W-A or W. These cords are rated for outdoor use and reduce the risk of electric shock.

Personal Safety

Stay alert, watch what you are doing, and use common sense when operating a power tool. Do not use tool while tired or under the influence of drugs, alcohol, or medication. A moment of inattention while operating power tools may result in serious personal injury.

Dress according to local safety guidelines . Do not wear loose clothing or jewelry. Contain long hair. Keep your hair, clothing, and gloves away from moving parts. Loose clothes, jewelry, or long hair can be caught in moving parts.

Avoid accidental starting of tool(s). Be sure the switch is off before plugging in. Carrying tools with your finger on the switch or plugging in tools may result in personal injury.

Remove adjusting keys or switches before turning the tool on. A wrench or a key that is left attached to a rotating part of the tool may result in personal injury.

. Keep proper footing and balance at all times. Proper footing and balance enable better control of the tool in unexpected situations.

Use safety equipment. Always wear eye protection. Dust mask, non-skid safety shoes, hard hat, or hearing protection must be used for appropriate conditions.

Tool use and Care

Use clamps or another practical way to secure and support the workplace to a stable platform. Holding the work by hand or against your body is unstable and may lead to loss of control.

Do not operate a tool beyond its defined limits. Use the correct tool for your application. The correct tool will do the job better and safer at the rate for which it is designed.

Do not use the tool if the switch does not turn it on or off. Any tool that cannot be controlled with the switch is dangerous and must be repaired.

Disconnect the plug from the power source before making any adjustments, changing accessories, or storing the tool. Store idle tools out of reach of children and other untrained persons. Tools are dangerous in the hands of untrained users.

Maintain tools with care. Keep cutting tools sharp and clean. Properly maintained tools, with sharp cutting edges, are less likely to bind and are easier to control.

Check for misalignment or binding of moving parts, breakage of parts, and any other condition that may affect the

operation of the tool. If damaged, have the tool serviced before using it. Many accidents are caused by poorly maintained tools.

Use only accessories that are recommended by the manufacturer for your model.

Accessories that may be suitable for one tool, may become hazardous when used on another tool.

SERVICE

Tool service must be performed only by qualified personnel. Service or maintenance performed by unqualified personnel could result in a risk of injury.

When servicing a tool, use only identical replacement parts. Follow instructions in the Maintenance section of this manual. Use of unauthorized parts or failure to follow maintenance instructions may create a risk of electric shock or injury.

SPECIFIC SAFETY RULES

Hold tool by insulated gripping surfaces when performing an operation where the cutting tool may contact hidden wiring or its cord. Contact with a "live" wire will make exposed metal parts of the tool "live" and shock the operator.

Never lubricate aerosol oil on to the electrical part.

Software Installation

1.1 Required PC specification

- OS : Windows 7 or later Version.
- COM Port : RS-232, Ethernet

1.2 Software

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

If re-install latest version of ParaMon, please delete first, old version of ParaMon

Operation

Connection

ParaMon pc software have 4 selectable connecting options to the ECD-5000U or ADC controller.

ECD-5000U: Serial RS232C or Ethernet

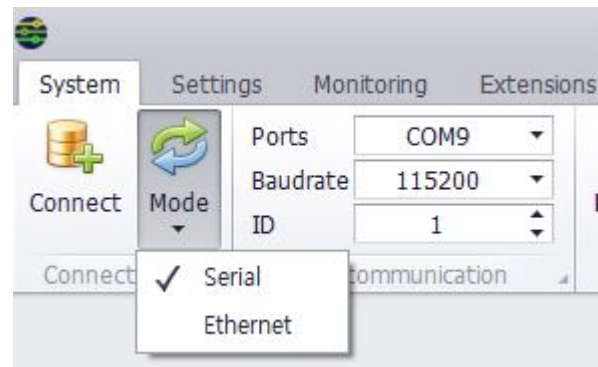
ADC controller : Serial RS422 or USB

COM Port - Each port is has a different COM number, assigned to by the system. The Port you are using may be a number other than "9" as shown in the screenshot.

Baudrate - Typically this has the value: 115200 (as depicted in screenshot)

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

Ethernet connection requires IP address and port no.



The followings are the factory setting address for the Ethernet connection

IP Address : 192.168.1.100

Gateway : 192.168.1.1

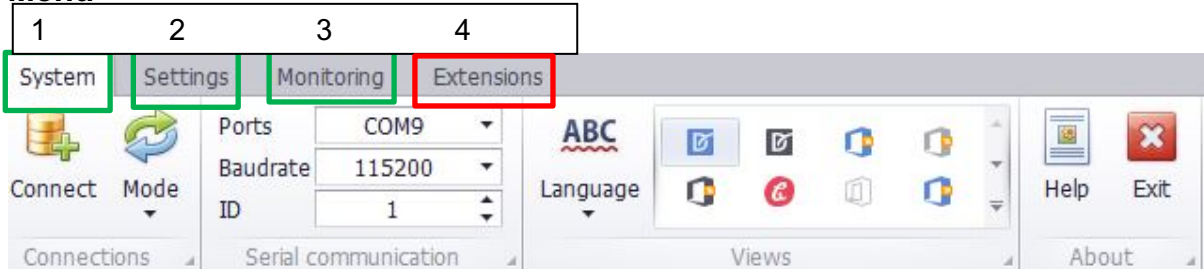
Port : 5000

Subnet mask : 255.255.255.0

Use the IP address 192.168.1.200 or any other nearby address for your PC, avoiding conflict with other devices.

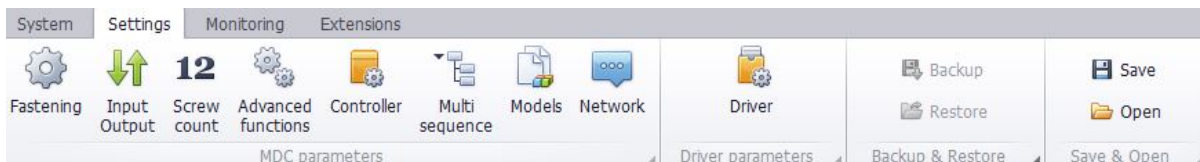


Menu



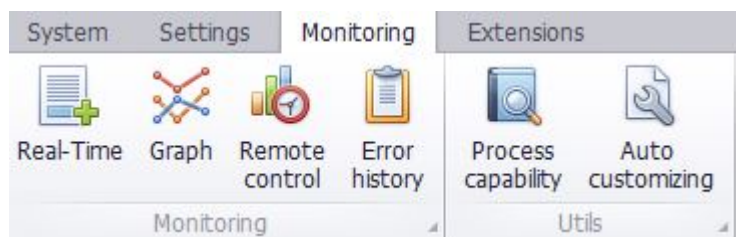
1. System

2. Settings



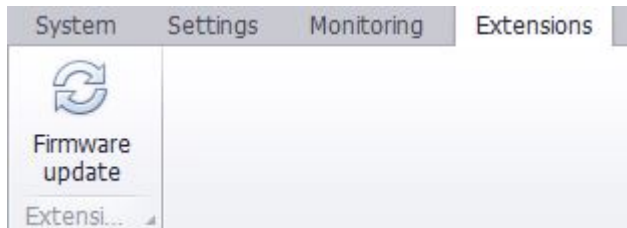
- ◆ Fastening : Preset #1-15 (torque, speed, angle, soft start, etc)
- ◆ Input/output : I/O port definition
- ◆ Screw Count : Number of screw, cycle start, complete signal
- ◆ Advanced Function : Free reverse, screw engaging detection, fastening sequence and angle after torque-up
- ◆ Controller 2 : Time limit of run, motor stall, display, complete signal. And other settings of controller
- ◆ Controller 2 : Screwdriver operation, error pattern, Serial communication, torque unit, screw type
- ◆ Multi Sequence : 10 steps of multi sequence programming for 1 cycle
- ◆ Models : 10 steps of sequence programming by managing preset#, input and output signals
- ◆ Network : Ethernet IP address setting
- ◆ Backup : Save the parameter setting in a file of txt format.
- ◆ Restore : Open the parameter setting file and upload them to the controller.

3. Monitoring



- ◆ Real time : Fastening data output on any event
- ◆ Graph : 2 channel fastening data curve
- ◆ Remote Control : Start, F/R remote control with I/O monitoring
- ◆ Error History : Latest 8 error history
- ◆ Process Capability : STDV, CP and CPK with real-time CP curve
- ◆ Auto Customizing :

4. Extensions



Firmware Update



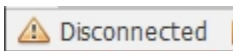
Use SD-Card. Make [update] directory and input Firmware file. Reboot then start update. if update completed then erase file and directory.

Steps for updating the Controller firmware:

Note: **Use RS232C port as Ethernet is not compatible for a firmware upgrade**

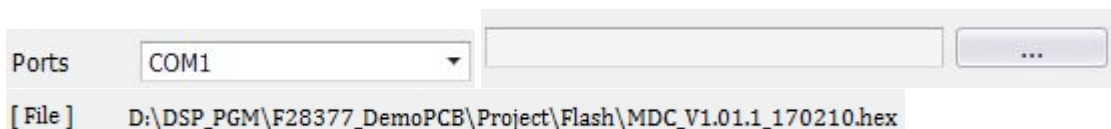
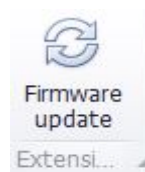
[ParaMon_ ECD-5000U Update Guide]- ECD-5000U, not LCD

Disconnect com port connection of PC

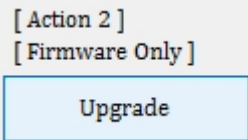


Click "Firmware Update"

Select the same COM port firmware file in the PC



Click " Upgrade " for [Action 2, Firmware only]. If there is no existing firmware in the controller, refer " Firmware upgrade including Kernel data in blow this page



See the message “ Firmware upload complete “ in the message window, and click “ Exit “ to finish the process.

```
firmware page writed: 127 / 135
firmware page writed: 128 / 135
firmware page writed: 129 / 135
firmware page writed: 130 / 135
firmware page writed: 131 / 135
firmware page writed: 132 / 135
firmware page writed: 133 / 135
firmware page writed: 134 / 135
firmware page writed: 135 / 135
Complete firmware update ... 73075 ms
```

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

2) Upgrade Kernel data (Boot Loader)

It is used when there is no existing or erased firmware in the controller. **Use RS232C port . Ethernet is not allowed for firmware download.**

[Before Upgrade]

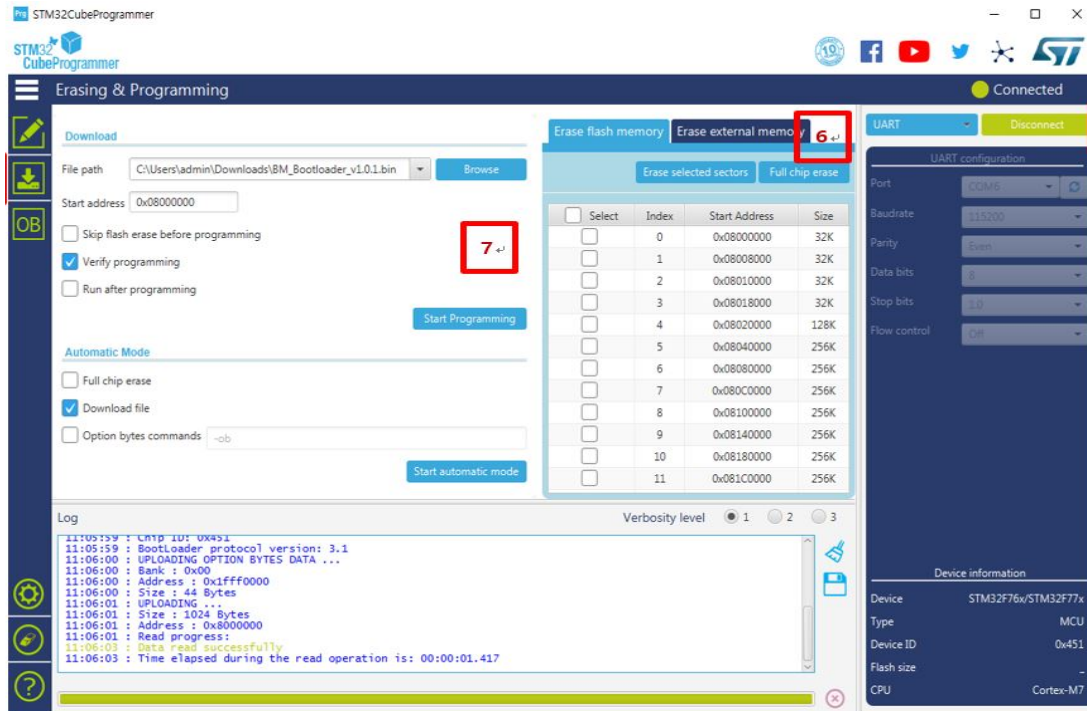
1. Disconnect com port connection of PC and power OFF
2. Select “Upgrade” on the back panel of controller and power ON



[Upgrade Process]

Open the STM32 Cube Programmer program.

(Link: <https://www.st.com/en/development-tools/stm32cubeprog.html#overview>)



Selected COM port and click 'connect' button

Click Left of top button.

Run Full chip erase.

Open the boot load file, click to [Start Programming] button, Run Upgrade, After Upgrade, turn off the power

Settings Programming Fastening

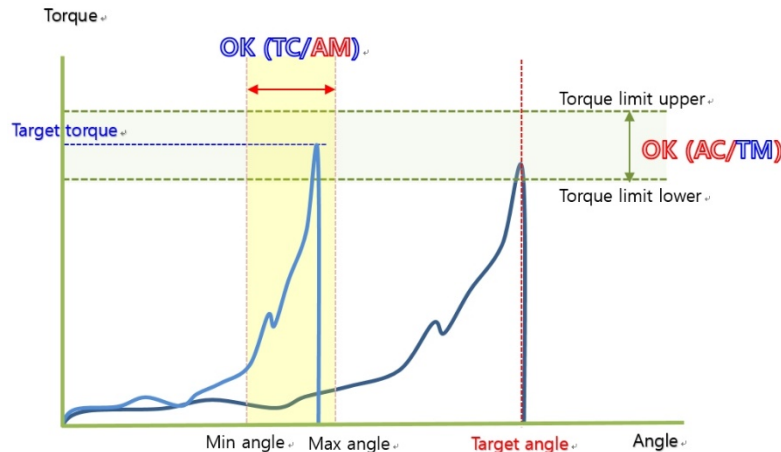
Fastening					
123 Preset					
	Address No.	Parameter	Parameter value	Min value	Max value
Preset: 01					
	A001	Type	TC/AM	0	1
	A002	Target torque	15	8	90
	A003	Torque limit (%)	0	0	100
	A004	Target angle (not use)	0	0	20000
	A005	Min angle (degree)	0	0	20000
	A006	Max angle (degree)	20000	0	20000
	A007	Snug torque	0	0	90
	A008	Speed (rpm)	127	50	690
	A009	Free angle (degree)	0	0	20000
	A010	Free speed (rpm)	0	0	690
	A011	Soft start (ms)	0	0	300
	A012	Seating point from 'Targ...	40	10	95
	A013	Torque rising time (ms)	50	50	200
	A014	Ramp-up speed (rpm)	80	50	552
	A015	Torque compensation (%)	100	80	120
Preset: 02					

Click arrow icon or Double click "Preset No" to open sub parameter group

The parameters in column can be sorted again by clicking column header. Column can be resorted by dragging a column header to the top of table.

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.

Every parameters have the min/max range for available setting.



- Type : TC/AM or AC/TM(torque control angle monitoring or angle control torque monitoring)
- Torque : Target torque for TC/AM or Max torque value for AC/TM
- Torque limit (%) : OK torque range for TC/AM. Out of the limit 🚫 Error 335 or Min torque value for AC/TM
- Target angle : Target angle in AC/TM mode
- Min angle (degree) : Minimum angle to be OK.
- Max angle (degree) : Maximum angle to be OK.
- Snug torque : the point to start monitoring angle when torque value is set.
- 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. It shift back to the auto speed after the free angle setting.
- Free angle : Angle for Free speed.
- Soft start(mS) : Time to reach to the target speed from starting.
- Seating point(%) : Auto target speed slow down at this point to ramp-up for target torque
- Torque rising time(mS) : Ramp-up time from seating point to the target.
- Torque holding time(mS) : Target torque holding time
- Torque compensation(%) : Preset # has each torque compensation value. + or – from 100% to adjust the output torque

I/O Management (Input/Output)

InOut x		
Category		
Address No.	Parameter	Parameter value
Category: Input functions		
A226	Input 1	Preset select 1
A227	Input 2	Preset select 2
A228	Input 3	Preset select 3
A229	Input 4	Start
A230	Input 5	Fasten/Loosen
A231	Input 6	Lock
A232	Input 7	Multi sequence
A233	Input 8	Alarm reset
Category: Output functions		
A234	Output 1	Torque up
A235	Output 2	Fastening OK
A236	Output 3	Ready
A237	Output 4	Run
A238	Output 5	Alarm
A239	Output 6	Status F/L
A240	Output 7	Count complete
A241	Output 8	AL 1

The digital I/O provide the free assignment feature for 8 Inputs and 8 Outputs.
Factory setting of I/O assignments are as following.

If there are same assignments on two or more I/O, the only one assignment on the smallest pin no. is available.
Any others are not validated

[Digital I/O 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	-	Model Complete	
Preset select 4	-	Torque Select 1	
Model Cancel	-	Torque Select 2	

Model select 1	-	Torque Select 3	
Model select 2	-	Torque Select 4	
Model select 3	-	Driver Lock	
Model select 4	-		
F/L Switch Enable			
Set Origin			
Move origin point			

*Set Origin : Record the current location of the driver, this value is save in controller, not preset

[ECD-5000U 25P D-Sub Connector I/O Setting]

Pin No	Description	Factory setting
1	IN 1	Preset select 1
2	IN 2	Preset select 2
3	IN 3	Preset select 3
4	IN 4	Start
5	IN 5	Forward / Reverse
6	IN 6	Driver Lock
7	IN 7	Multi sequence
8	IN 8	Reset
9	X	
10	OUT 1	Torque UP
11	OUT 2	Fastening OK
12	OUT 3	Ready
13	OUT 4	Motor RUN
14	OUT 5	Alarm
15	OUT 6	Status F/L
16	OUT 7	Count complete
17	OUT 8	
18	X	
19	X	
20	X	
21	Out COM	
22	In COM	
23	X	
24	X	
25	X	

[Binary coding with 5 inputs to select Preset # or Model]

Preset or Model	Input				
	Select 4	Select 3	Select 2	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
110,111,112,113,114,115,116,118, 120,121,122 200,201,220	0	0	1
300,301,302,303,304,309	0	1	0
310,311	0	1	1
330,331	1	0	0
332	1	0	1
333,334,335,336	1	1	0
400,401,500	1	1	1

Screw count

ScrewCount ✕					
Drag a column header here to group by that column					
	Address No.	Parameter	Parameter value	Min value	Max value
▶	A242	Sensor signal select	Auto	0	3
	A243	Time limit (sec)	0	0	999.9
	A244	Port count signal type	Count complete (500ms)	0	3
	A245	Middle count number	0	0	99
	A246	Sensor signal delay time (...)	0	0	100
	A247	Total count	1	0	1000

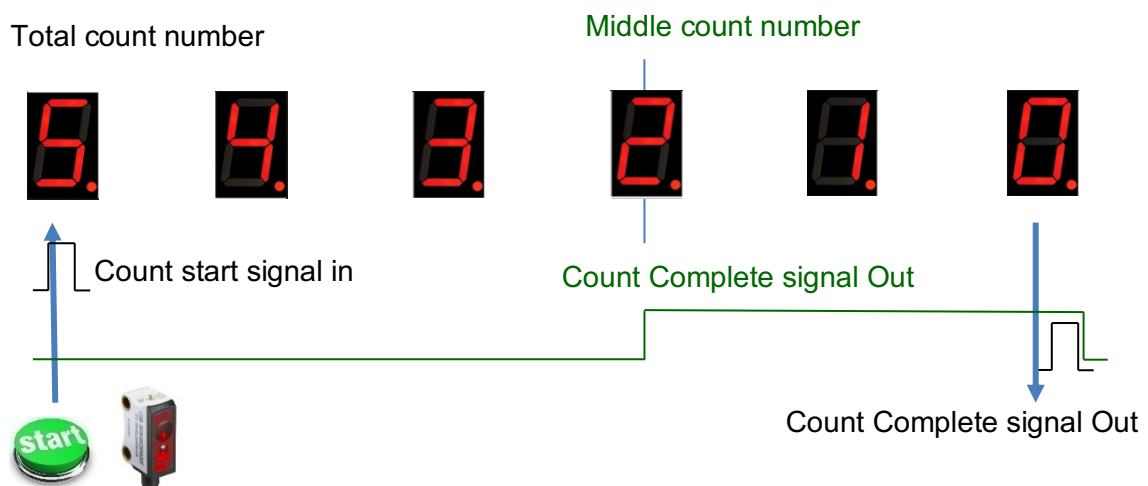
- Count start signal (IN) - Sensor signal select

- ♦ Auto : No signal, auto start (Auto) - auto reset to total number after "0"
- ♦ Continuous ON until completed, otherwise count NG.
- ♦ Sensor or switch with one trigger pulse - Count starts with only trigger pulse. Counting is valid until complete or reset. Reset calls count NG
- ♦ One trigger pulse with timer for counting - Counting should be completed within the time of timer(A243) from the trigger pulse, otherwise count NG
- ♦ One trigger pulse to start counting, another trigger pulse to stop counting and evaluate OK or NG. Any remaining number calls count NG

Address No.	Parameter	Parameter value	
A242	Sensor signal select	Auto	
A243	Time limit (sec)	Value	Desc
A244	Port count signal type	0	Auto
A245	Middle count number	1	Start (Continuous ON)
A246	Sensor signal delay time (...)	2	Start (Pulse) + Time limit (o...
A247	Total count	3	Start (Pulse) + Stop (Pulse)

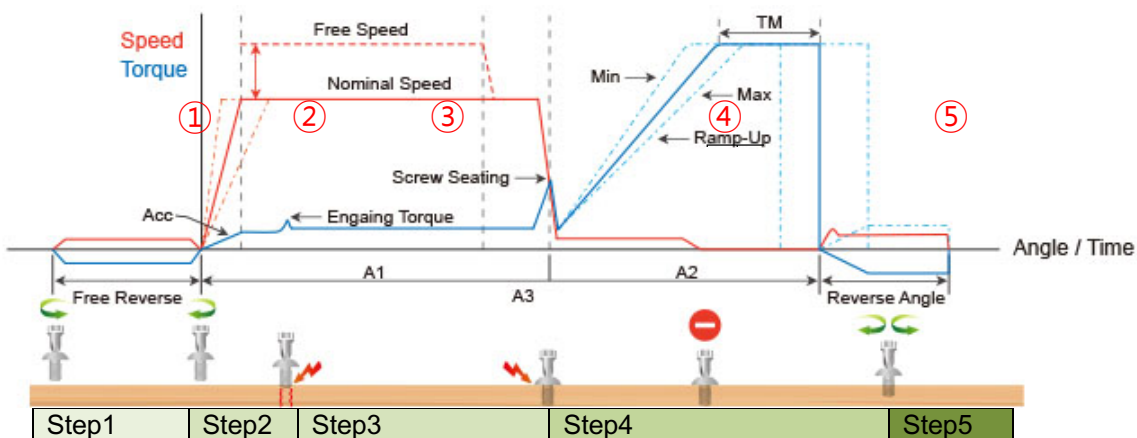
- Count complete signal (OUT)

If mid count number is used, count complete signal out is provided on mid count number and reset on the cycle completed. ▶ A245 - Middle count number



Advanced Function

▼ Advanced: 01				
▼ Category: A. Free reverse rotation				
A650	Speed (rpm)	0	0	0
A651	Angle (turn)	0	0	0
▼ Category: B. Thread tapping				
A652	Min torque (unit)	0	0	0
A653	Max torque (unit)	0	0	0
A654	Speed (rpm)	0	0	0
A655	Finish torque (unit)	0	0	0
A656	Angle start from threa...	<input type="radio"/> NO <input type="radio"/> YES	0	0
▼ Category: C. Engaging torque detection				
A657	Speed (rpm)	0	0	0
A658	Torque (%)	0	0	0
A659	Angle limit (turn)	0	0	0
A660	Time limit (sec)	0	0	0
A661	Angle start from enga...	<input type="radio"/> NO <input type="radio"/> YES	0	0
▼ Category: D. Angle after torque-up				
A662	Speed (rpm)	0	0	0
A663	Angle (degree)	0	0	0
A664	Direction	<input type="radio"/> FOWARD <input type="radio"/> REVERSE	0	0



*Fastening process of the screws is divide into five steps, controls each step with presets and advanced functions.

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.

Thread Tapping - Used if the tightening process uses a torque higher than Target Torque due to no thread (Tap) or no hole on the surface

Step 3 (Preset) : **Free Speed** – The system auto speed by torque setting can be manually replaced to have higher or lower speed than its 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.

This option can be applied to selected preset # at A265 parameter

Controller

Controller				
Drag a column header here to group by that column				
Address No.	Parameter	Parameter value	Min value	Max value
A250	Driver ID	1	1	99
A251	Driver model	MD3211	1	99
A252	Torque unit (※ All parameters are initialize)	Kgf.cm	0	6
A253	Password	0	0	9999
A254	Controller parameter initialize	0	0	9999
A255	Auto speed	<input type="radio"/> NO <input checked="" type="radio"/> YES	0	1
A256	Acceleration (ms)	150	10	1000
A257	Torque holding time (ms)	2	1	20
A258	Use max torque for reverse	<input checked="" type="radio"/> NO <input type="radio"/> YES	0	1
A259	Loosening speed (rpm)	345	50	690
A260	Forward RUN time limit (sec)	10	0	60
A261	Reverse RUN time limit (sec)	10	0	60
A262	Motor stall time limit (sec)	0.2	0.1	0.5
A263	Error display reset time (sec)	2	0	10
A264	Fastening OK signal out time (ms)	0	0	500
A265	Screw type (Checked: CCW / UnChecked: CW)	None	0	32767
A266	Judged fasten minimum turns	0	0	5
A267	Fastening stop error	<input checked="" type="radio"/> NO <input type="radio"/> YES	0	1
A268	Alarm sound control	<input type="radio"/> NO <input checked="" type="radio"/> YES	0	1
A269	Torque calibration (%) (Caution! Select revers)	100	90	110
A270	Selection on panel	<input type="radio"/> NO <input checked="" type="radio"/> YES	0	1
A271	Reverse lock (handheld only)	<input checked="" type="radio"/> NO <input type="radio"/> YES	0	1
A272	Trigger start (handheld only)	<input checked="" type="radio"/> NO <input type="radio"/> YES	0	1
A273	Reverse start (handheld only)	<input checked="" type="radio"/> NO <input type="radio"/> YES	0	1
A274	Preset # display when power on	1	1	17
A275	RS232 select	<input checked="" type="radio"/> MODBUS <input type="radio"/> BARCODE	0	1
A276	Comport baudrate setting	115200	0	5
A277	Auto data output	<input type="radio"/> NO <input checked="" type="radio"/> YES	0	1
A278	Auto data output port	<input checked="" type="radio"/> RS232 <input type="radio"/> ETHERNET	0	1
A279	Protocol	<input checked="" type="radio"/> MODBUS <input type="radio"/> OPEN	0	1
A280	Model selection mode	<input checked="" type="radio"/> NO <input type="radio"/> YES	0	1
A281	Preset/model selection on panel	<input checked="" type="radio"/> PRESET <input type="radio"/> MODEL	0	1
A282	Model start by barcode	<input checked="" type="radio"/> NO <input type="radio"/> YES	0	1
A283	Automatic driver lock (Model mode only)	<input checked="" type="radio"/> NO <input type="radio"/> YES	0	1
A284	Model auto restart	<input type="radio"/> NO <input checked="" type="radio"/> YES	0	1
A285	Crowfoot	<input checked="" type="radio"/> NO <input type="radio"/> YES	0	1
A286	Crowfoot ratio	1	0	10
A287	Crowfoot efficiency (%)	100	0	150
A288	Crowfoot reverse torque	0	0	90
A289	Crowfoot reverse speed (rpm)	100	0	690
A290	LED / Light on time (sec)	0	0	30

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.

- ◆ Driver ID (A250) : Driver ID (A250) : When the ECD-5000U are connected in the network by RS232, the ECD-5000U can be recognized by each ID no. of the ECD-5000U.
- ◆ Driver model (A251) : Driver tool model select.
- ◆ Torque unit (A252) : Kgf.cm / Kgf.m / cNm / Nm / ozf.in / lbf.in / lbf.ft



Caution : Whenever the unit is changed, the controller will be automatically reboot again, and the parameters are initialized to the factory setting

- ◆ Password is available from 0 to 9999. Factory setting is "0"
- ◆ Controller parameter initialize (A254) : Key in " 77 " to flash the parameters back to the factory settings.
- ◆ Auto Speed (A255): Auto speed can be disabled to change speed manually. Be careful of over torque by over speed inertia.
- ◆ Acceleration (A256): Master slow start to the target speed. Each preset # has additional time for slow start.
- ◆ Torque holding time (A257): Torque maintain time.
- ◆ Use max torque for loosen (A258): Use max torque at loosening process.
- ◆ Loosening speed (A259) : Driver loosening speed.
- ◆ Forward RUN time limit (A260) : Run limit to forward rotation
- ◆ Reverse RUN time limit (A261) : Run limit to reverse rotation
- ◆ Motor Stall time limit (A262) : Immediate stop when motor is stalled.
(Ex. If a reverse rotation does not release the screw, causing an overload condition on the motor, stop after that time.)
- ◆ Error display time setting (A263) : The error can be reset automatically by time setting.
- ◆ Fastening OK signal time (A264) : Signal output time setting longer than 200ms which is factory setting. Shorter time than factory setting doesn't work (Min 200ms).
- ◆ Screw type (A265) : Screwdriver start clockwise or counterclockwise in forward rotation. Each preset fastening strategy works in both direction by setting.
- ◆ Judged fasten minimum turns (A266) : No NG judgement in the set turns.
- ◆ Fastening stop error (A267) : Create NG when the tool stops without torque up. If there is Snug torque setting, it create NG of no torque up after Snug torque only.
- ◆ Alarm sound control (A268) : Alarm sound stop control.
- ◆ Torque calibration (A269) : Master torque offset value. Each preset # has additional torque compensation from this offset.
- ◆ Select on panel (A270) : Manual selecting on the panel can be locked
- ◆ Reverse lock (A271) : Reverse rotation can be locked in manual screwdriver.
- ◆ Trigger start (A272) : The pulse start signal by the lever is effective to run the screwdriver until torque up or auto stop by angle in manual screwdriver.
- ◆ Reverse start (A273) : By changing the F/R switch from F to R, the screwdriver starts to run without lever triggering in manual screwdriver.
- ◆ Initial preset # select (A274) : When power on, this preset # is displayed.

- ♦ RS232 select (A275) : Use Modbus protocol or Barcode.
- ♦ Serial COM port baud rate (A276) : The baud rate is available to change from 9,600 to 230,400bps. Depend on the PC specification, it can be changed. Whenever it is changed, the connected PC should be synchronized.

115200	
Value	Description
0	9600
1	19200
2	38400
3	57600
4	115200
5	230400

- ♦ Auto data output (A277) : Fastening data output automatically on every events as like run, For/Rev change, torque up, preset# change, etc
- ♦ Auto data output port (A278) : One of two port should be selected for auto fastening data output, RS232 or Ethernet

Ethernet

☒ Serial

☐ Ethernet
- ♦ Protocol (A279) : Use Modbus protocol or Open protocol.
- ♦ Model select (A280) : To use the multiple sequence of preset # with screw counting feature, Select Model. During Model is used, the preset # by I/O is still available. Preset # selected by I/O is prior to the preset # on the model program
- ♦ Preset/Model selection on the panel (A281) : When Model is enabled on A292, The preset # or model # on the front panel can be loaded
- ♦ Model start by barcode (A282) : Driver lock release by barcode. When model process.
- ♦ Automatic driver lock (A283) : Driver can be locked in out of the process when the Model is used.
- ♦ Model auto restart (A284) : Select Model automatically restart when model complete.
- ♦ LED/ Light on time (A290) : LED lamp off timer from operation stop for sleep.

Multi Sequence

MultiSequence

Multi Sequence

Step No.	Address No.	Command	Parameter value
Multi Sequence: A			
Step 1	A321	Fastening	1
Step 2	A322	Delay (x10 ms)	200
Step 3	A323	Loosening (x0.1 turn)	30
Step 4	A324	Delay (x10 ms)	200
Step 5	A325	Jump	1
Step 6	A326	End	0
Step 7	A327	NOP	0
Step 8	A328	NOP	0
Step 9	A329	NOP	0
Step 10	A330	NOP	0
Multi Sequence: B			
Step 1	A331	NOP	0
Step 2	A332	NOP	0
Step 3	A333	NOP	0
Step 4	A334	NOP	0
Step 5	A335	NOP	0
Step 6	A336	NOP	0
Step 7	A337	NOP	0
Step 8	A338	NOP	0
Step 9	A339	NOP	0
Step 10	A340	NOP	0

[Command Details]

Command	Description
NOP	No operation
Fastening	tool start fastening process in forward rotation
Loosening	tool start loosening process in reverse rotation (0.1)
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 program Setting]

Step 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 : Start fastening preset1 and stop by torque or angle setting, and move to the next step
- Step 3 : Loosen 5 turns and move to the next step
- Step 4 : Start fastening preset3 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.

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 programmable 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 – 8	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 programming]

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.




- Step1 : 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



- Step2 : Screw tightening with Preset #2 Number of screw = 3
- Step3 : Delay process 0.5sec




- Step4 : Provide output signal for 0.5 seconds
- Connect buzzer to Digital Output 2 (pin no. 37 & 38))
 - I/O setting  Output 2 : None



- Step5 : Screw tightening with Preset #3 Number of screw = 5

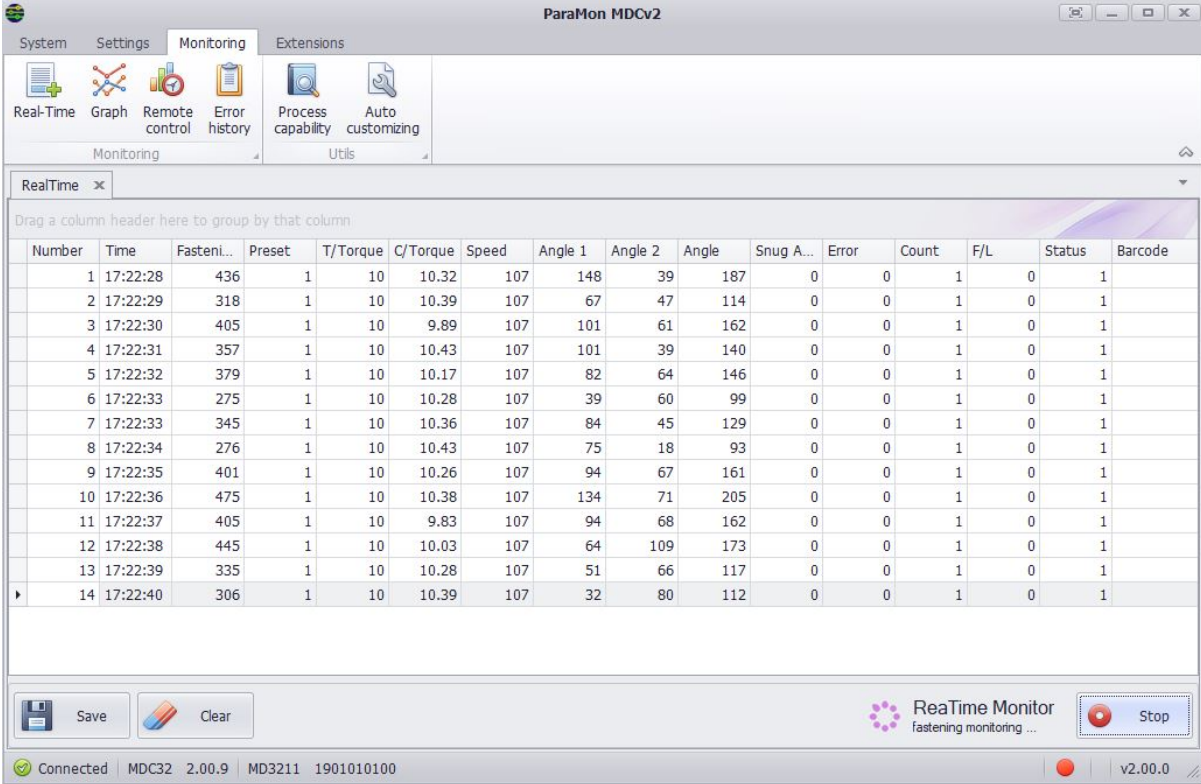


- Step6 : Provide output signal for 1 seconds
- Connect buzzer to Digital Output 3 (pin no. 39 & 40)
 - I/O setting  Output 3 : None
 - End cycle and begin the new cycle....

Monitoring Programming

Real-time Monitoring

For Monitoring Set 'Disable' in parameter 'Auto Data Out (A297)'



ParaMon MDCv2

System Settings **Monitoring** Extensions

Real-Time Graph Remote control Error history Process capability Auto customizing

Monitoring Utils

RealTime x

Drag a column header here to group by that column

Number	Time	Fasteni...	Preset	T/Torque	C/Torque	Speed	Angle 1	Angle 2	Angle	Snug A...	Error	Count	F/L	Status	Barcode
1	17:22:28	436	1	10	10.32	107	148	39	187	0	0	1	0	1	
2	17:22:29	318	1	10	10.39	107	67	47	114	0	0	1	0	1	
3	17:22:30	405	1	10	9.89	107	101	61	162	0	0	1	0	1	
4	17:22:31	357	1	10	10.43	107	101	39	140	0	0	1	0	1	
5	17:22:32	379	1	10	10.17	107	82	64	146	0	0	1	0	1	
6	17:22:33	275	1	10	10.28	107	39	60	99	0	0	1	0	1	
7	17:22:33	345	1	10	10.36	107	84	45	129	0	0	1	0	1	
8	17:22:34	276	1	10	10.43	107	75	18	93	0	0	1	0	1	
9	17:22:35	401	1	10	10.26	107	94	67	161	0	0	1	0	1	
10	17:22:36	475	1	10	10.38	107	134	71	205	0	0	1	0	1	
11	17:22:37	405	1	10	9.83	107	94	68	162	0	0	1	0	1	
12	17:22:38	445	1	10	10.03	107	64	109	173	0	0	1	0	1	
13	17:22:39	335	1	10	10.28	107	51	66	117	0	0	1	0	1	
14	17:22:40	306	1	10	10.39	107	32	80	112	0	0	1	0	1	

Save Clear

ReaTime Monitor
fastening monitoring ...

Stop

Connected MDC32 2.00.9 MD3211 1901010100 v2.00.0

The following data are monitored automatically on every event as like motor run, torque up, Forward / Reverse change, preset # change, etc. (Customizing is not available on the program)

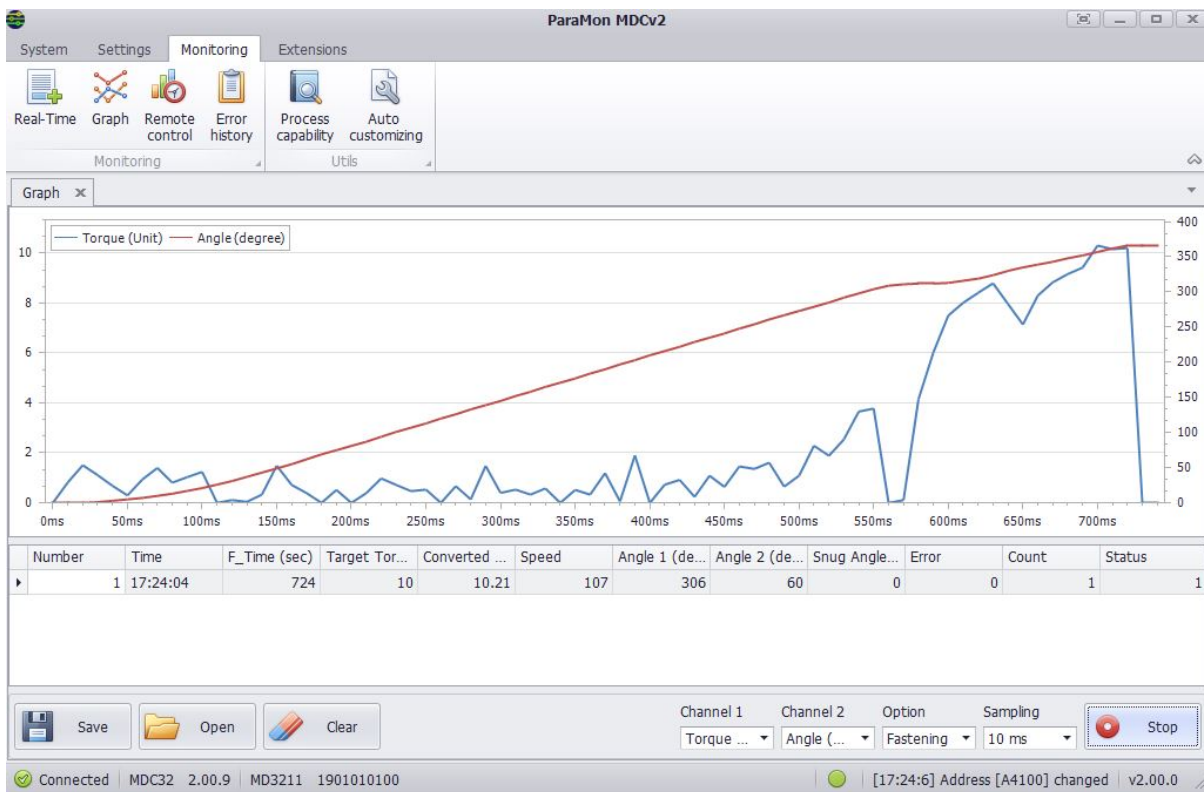
- Date & time
- Fastening time
- Preset #
- Target torque
- Converted torque
- Speed
- Angle 1 (angle from motor start to screw seating point)
- Angle 2 (angle from screw seating point to the end)
- Angle 3 (Angle 1 + Angle 2)
- Snug Angle(degree) : angle from snug torque to the end
- Error code
- Screw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

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

Graph monitoring

200 data for each channel is received and graphically displayed. Up to two channels are available, and the channels that can be set up to the following:

- torque, speed, angle(degree), angle(turn) and current
- data sampling rate : 5ms (1s), 10ms (2s), 15ms (3s)
- data display option : Fasten, Loosen, All



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

Remote control & I/O status monitoring

The tool is operated remotely for the followings.

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



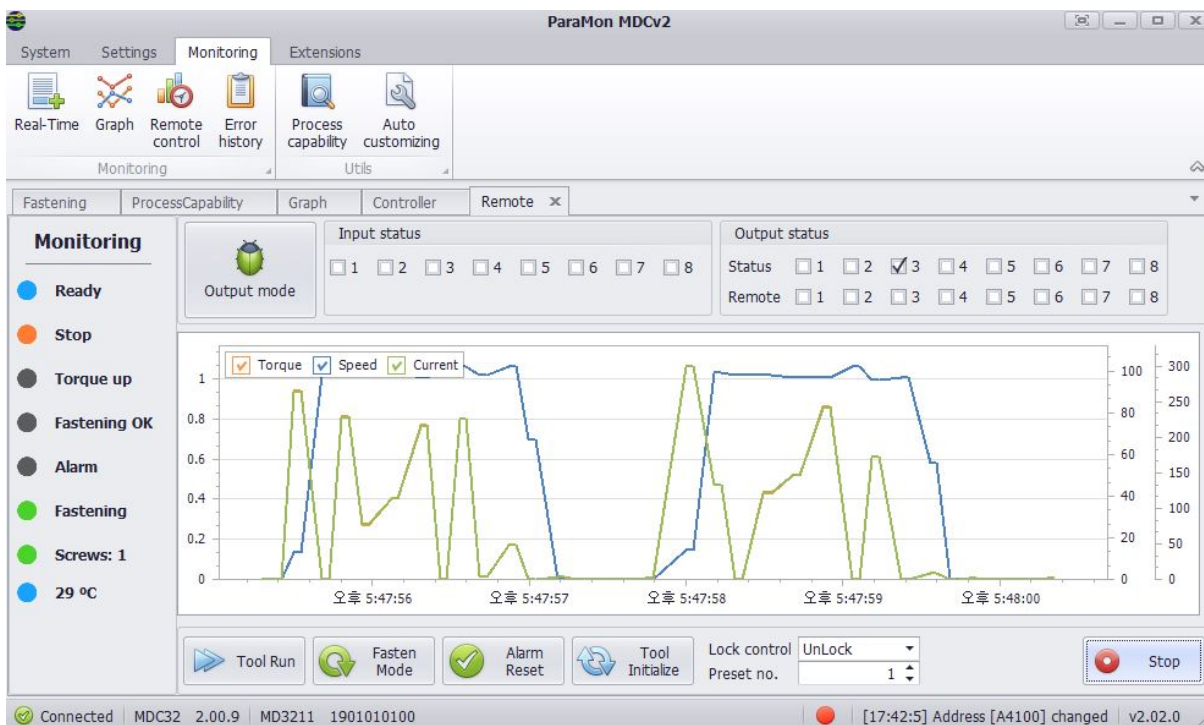
The following main signal status and I/O are monitored and displayed together with torque, speed and current curves.

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

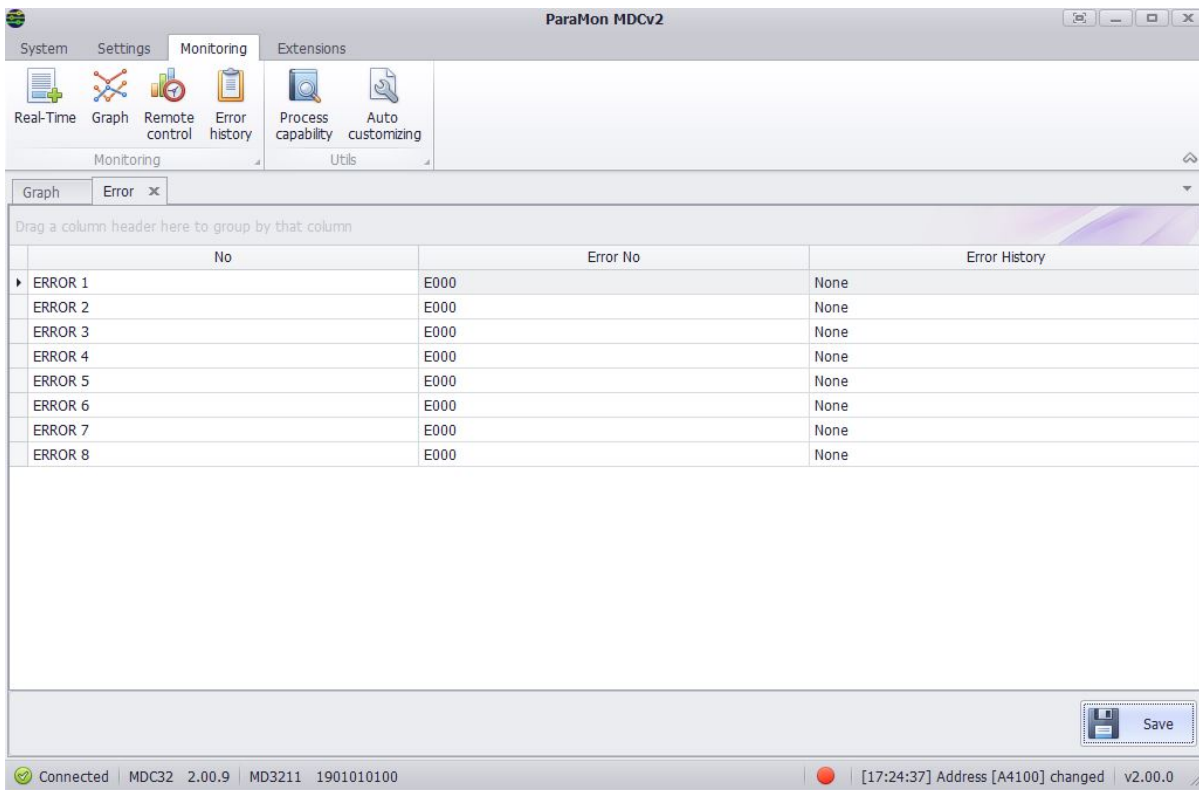
To test Output signal by remote click 'Output mode' and select Remote output no. in 'Output status', Then actual output will activate.

Caution

After output remote test, must Click 'Output mode' one more time and finish Output test mode. Otherwise the output will be occupied by the remote test. Remote test mode can be cancelled by power off of the controller..



Error History display



ParaMon MDCv2

System Settings **Monitoring** Extensions

Real-Time Graph Remote control Error history Process capability Auto customizing

Monitoring Utils

Graph Error **Error**

Drag a column header here to group by that column

No	Error No	Error History
ERROR 1	E000	None
ERROR 2	E000	None
ERROR 3	E000	None
ERROR 4	E000	None
ERROR 5	E000	None
ERROR 6	E000	None
ERROR 7	E000	None
ERROR 8	E000	None

Save

Connected | MDC32 2.00.9 | MD3211 1901010100 | [17:24:37] Address [A4100] changed v2.00.0

The latest 8 tool error histories which are saved in the controller

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.



ProcessCapability x

Target: 6
LSL: 5.4
USL: 6.6
Mean: 5.999
Error: -0.001
STDEV: 0.024
MAX: 6.04
MIN: 5.95
Range: 0.09
Cp: 8.173
Cpk: 8.158

Save Load Clear Start

No.	FastenTime	Pre...	T/Torque	C/Torque	Speed	Angle	Error	Status
1	457	1	6	6.02	963	2041	0	1
2	616	1	6	6	963	2944	0	1
3	704	1	6	6.02	963	3461	0	1
4	627	1	6	6	963	3024	0	1
5	770	1	6	5.98	963	3856	0	1
6	683	1	6	6	963	3350	0	1
7	744	1	6	5.99	963	3697	0	1
8	737	1	6	6.02	963	3648	0	1
9	787	1	6	5.96	963	3924	0	1
10	778	1	6	6	963	3880	0	1
11	659	1	6	5.95	963	3189	0	1
12	729	1	6	6.01	963	3595	0	1
13	735	1	6	6.02	963	3640	0	1
14	710	1	6	6.03	963	3501	0	1
15	825	1	6	5.96	963	4175	0	1
16	793	1	6	6	963	3988	0	1
17	716	1	6	6.04	963	3529	0	1
18	719	1	6	5.98	963	3551	0	1

Graph Raw data

Error and System alarm code

System Error (Er- xxx)

code	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
111	Under voltage	Undervoltage protection on SMPS power supply circuit.	Auto reset
112	Over speed	Over rotation speed than the set value. Check the cable connection.	Auto reset
113	Driver data read	Screwdriver parameter data read error	Power Off →On
114	Screwdriver recognition error	The screwdriver is not compatible with the controller	Power Off →On
115	Controller recognition error	Program itself can not recognize the controller information.	Power Off →On
116	Com error related with I/O data	System failed to read the data from I/O port by communication issue	Power Off →On
118	No motor rotation error	When motor rotation is not monitored	RESET button
120	No SD card board	SD memory card option setting is enabled, but No SD card board detected	
121	SD card writing	Writing on the memory is not available.	
122	SD card failure	SD card board is damaged	
200	Parameter reading failure	It failed to read parameter at all. Check the EEPROM 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	Multi-sequence program is wrong

Fastening Error (Er- xxx)

code	Error	Description	How to reset
300	Run time limit (Forward)	Over time limit on A270	Auto reset after set time or RESET button
301	Run time limit (Reverse)	Over time limit on A271	Auto reset after set time or RESET button
302	Model setting error	Failure in Model programing	Auto reset after set time or RESET button
303	Model cancel	The Model process is canceled	Auto reset after set time or RESET button
304	Motor stall by loosening failure	Motor stall by loosening failure within time limit on A272	Auto reset after set time or RESET button
309	Bit socket tray	Bit socket tray application error	Auto reset after set time or RESET button
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	Auto reset after set time or RESET button
330	Min Angle error	Target torque reached before the Min angle	Auto reset after set time or RESET button
331	Target angle setting error	Target angle setting is out of the range [AC/TM mode]	Auto reset after set time or RESET button
332	Angle over	Target torque reached over the Max angle	Auto reset after set time or RESET button
333	No torque complete	Operation stops before complete cycle of torque up by releasing lever trigger	Auto reset after set time or RESET button
334	Engaging torque detection fail	The engaging torque is not detected in time or angle limit	Auto reset after set time or RESET button
335	Converted torque error	Converted torque is out of torque limit (%)	Auto reset after set time or RESET button
336	Over torque error	Torque reached to the high limit of torque capacity	Auto reset after set time or RESET button
337	Torque up at free speed	Torque up occur at Free speed	

338	Prevailing max torque error	Over max torque at Prevailing	
339	Prevailing min max range error	Prevailing setting min, max torque range invalid	Change Prevailing setting value.
400	Ethernet port fail	Ethernet device IC initializing fail	Power Off →On
401	Ethernet socket error	Ethernet communication error related with socket	Power Off →On
500	Over temperature	Overtemperature over 80°C	Auto reset under 80°C



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