Minebea

TORQUE TRANSDUCER CALIBRATION SOFTWARE TMHSBD-01

Instruction Manual

EN294-1866

Introduction

Thank you for purchasing our TMHSB Torque Transducer.

This instruction manual describes how to operate the device, as well as noteworthy points. Note that handling or operating the device incorrectly may result in malfunctions. Read this manual thoroughly before use for safety and optimal results.

Keep this instruction manual in a location where it is readily accessible to end users.

Please note that this instruction manual is intended for use by engineers.

Disclaimers

- The details contained in this instruction manual are subject to change without notice due to product improvements.
- While every care has been taken in the preparation of this instruction manual, it may not be possible to correct errors or omissions immediately.
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Scope of Software License

"The software" refers to the TMHSBD-01 software and its accompanying documentation, including the instruction manual.

- A copy may not be retained if all of the rights of the software are transferred. Any transfer of the software (including all component parts, media, and documentation) shall be under the condition of agreement by the recipient to the scope of the license.
- This software may not be rented, leased, copied, modified, amended, reverse-engineered, reverse-compiled, or reverse-assembled in part or in its entirety.
  Likewise, such actions may not be performed by third parties.

Pictograms and Conventions Used in This Manual

This manual uses the following pictograms to indicate actions to avoid at all times, aspects requiring caution, and other noteworthy matters.

Be sure to read the descriptions provided alongside these pictograms.

Warning

This indicates circumstances in which incorrect handling may result in death or serious injury to users.
Avoid the actions described here at all times.

Caution

This indicates circumstances in which incorrect handling may result in injury to users or damage to property.

This indicates operating or procedural precautions or restrictions.
Always read the details included here to avoid malfunctioning.

Safety Precautions

Please be sure to read this manual before attempting to use the equipment.

1. Precautions

Caution

Altering the settings while carrying out measurements using the software may result in incorrect measurements, equipment malfunctions, and damage to peripheral equipment.

Revision History

Date	Manual No.	Revision Reason (Details)
2019/09	DRW. No. EN294-1866	First edition

Contents

1. Overview

The calibration software transfers commands between TMHSB and a computer, allowing users to read TMHSB setting parameter data or write setting parameters as needed.

2. System Operating Requirements

PC	
Operating system	Windows® 7, Windows® 8.0, Windows® 8.1, Windows® 10
CPU	Intel® Pentium® (Dual Core or Single Core) processor Clock speed 2 GHz or higher
Minimum working memory	2 GB or more
Hard disk drive	Free space 1 GB or higher
CD-ROM drive	DVD drive also acceptable (Required for setup.)
Available USB ports	x1 (Required for USB cable communication.)
Minimum resolution	1,280 x 1,024 or higher

3. Usage Precautions

Never turn off the TMHSB power or disconnect the USB cable while reading or writing setting parameters to or from the TMHSB.
If this happens, do not leave the system as is after being shut down in the middle of reading or writing; instead, restore the system to normal operation before resuming reading or writing.

4. Initial Setup

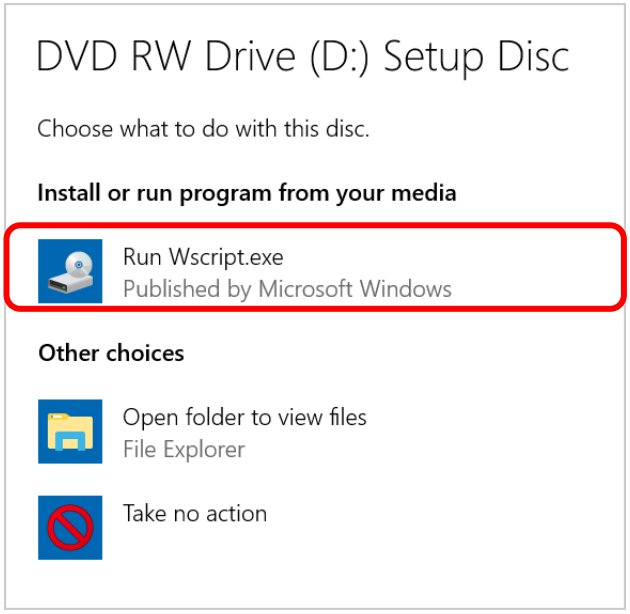
This section describes the installation procedures when using the TMHSBD-01 calibration software for the first time.

4-1. Installation

Install TMHSBD-01 on the PC to be used in accordance with the following procedures.

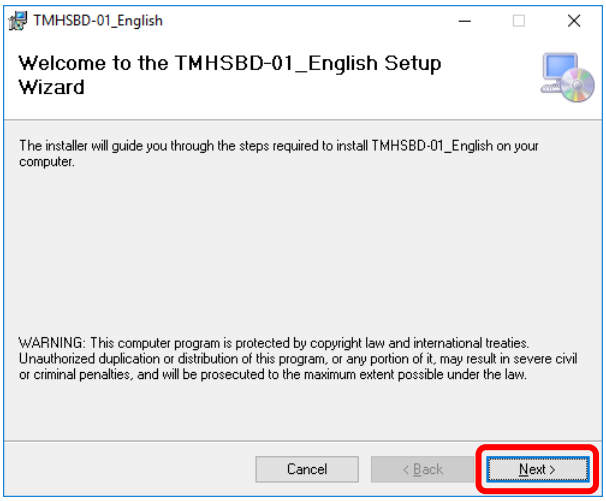
(1) Insert the TMHSBD-01 setup disc (CD-ROM) in the PC.

(2) The [AutoPlay] screen appears.

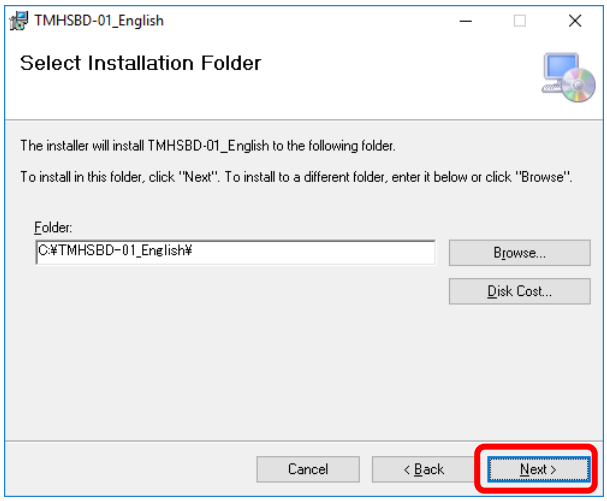


If this does not happen automatically, open the CD-ROM in Windows Explorer or File Explorer, then double-click [TMHSBD-01_English.msi] in the [Setup_English] folder.

(3) The [Setup Wizard] screen appears automatically after the [Windows Installer Dialog] is displayed. Click [Next].



(4) Once the [Select Installation Folder] screen appears, specify the folder in which to install the software, then click [Next].

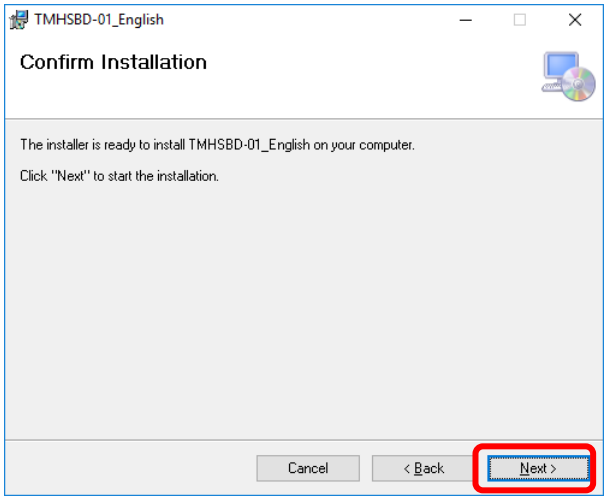


[To change the installation destination folder]

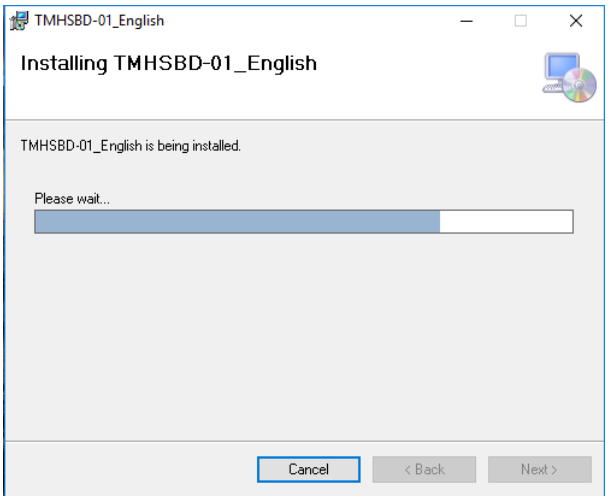
To install to a different location, click [Browse].

Once the [Browse Folder] dialog appears, specify the folder in which to install the software, and then click [OK].

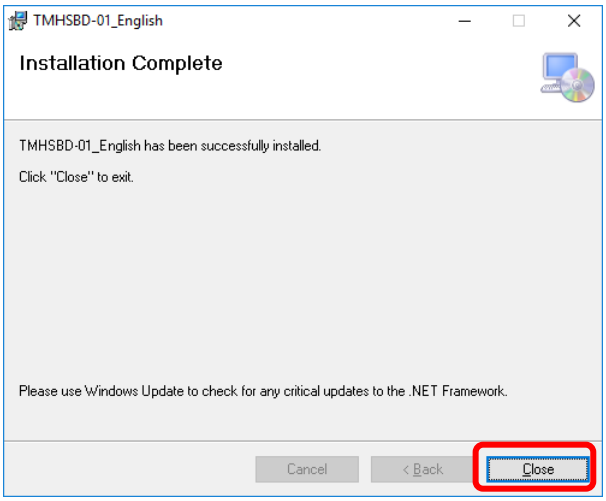
(5) The [Confirm Installation] screen appears.
Click [Next]. Installation starts.



(6) [Installing TMHSBD-01] appears. Wait for installation to be completed.
The screen changes automatically once installation is complete.



(7) [Installation Complete] appears. Click [Close].



4-2. USB Driver Installation

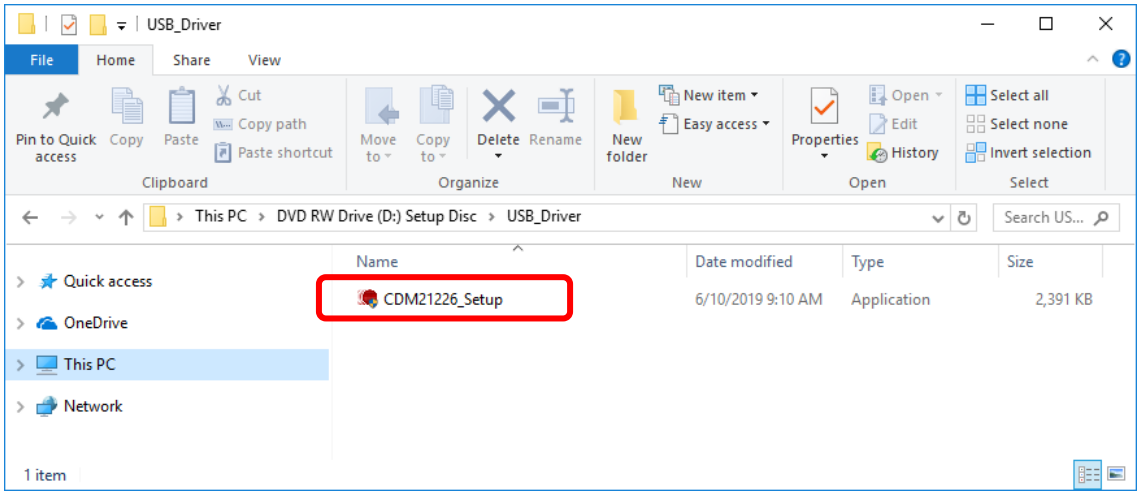
The driver must be installed before the equipment can first be connected to the PC via USB. Install the driver as follows.

The USB drivers are included on the CD-ROM provided.

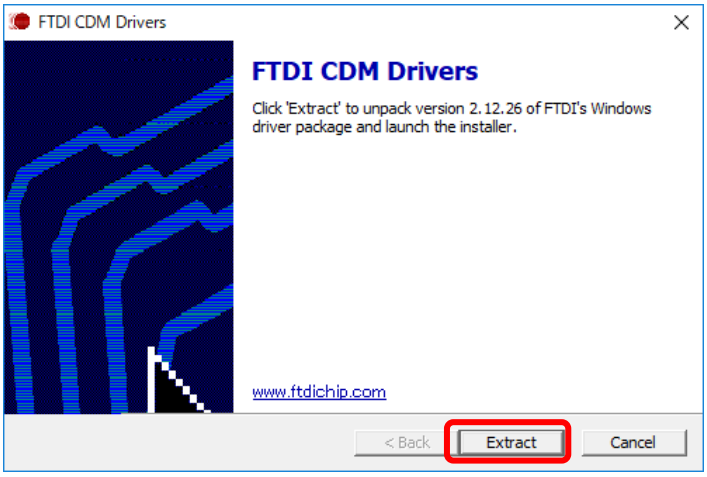
4-2-1. Driver Installation Procedure

(1) Insert the CD-ROM provided in the CD-ROM drive.

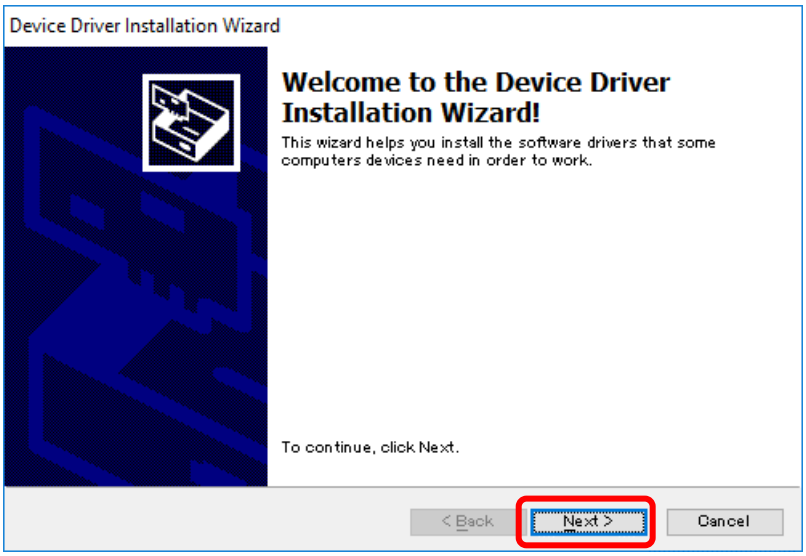
(2) Double-click [¥USB_Driver¥CDM21226_Setup.exe] on the CD-ROM provided to start installation.



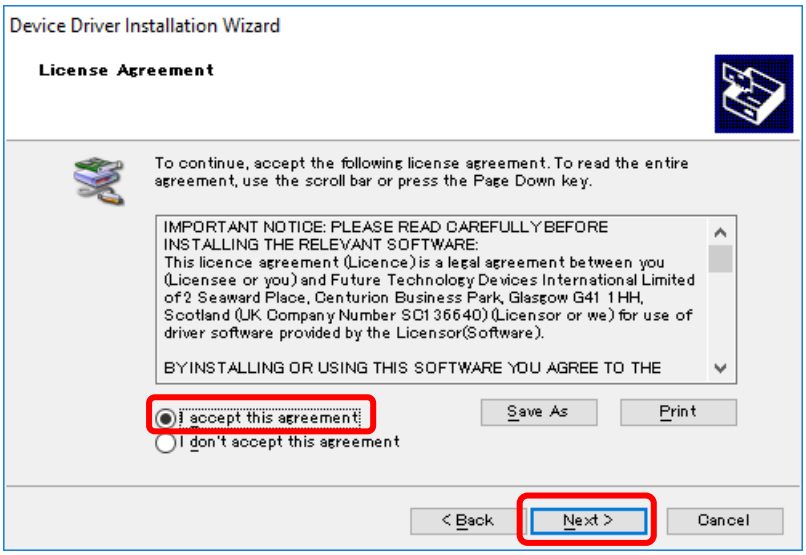
(3) The [FTDI CDM Drivers] screen appears. Click [Extract].



(4) The device driver installation wizard screen appears. Click [Next].

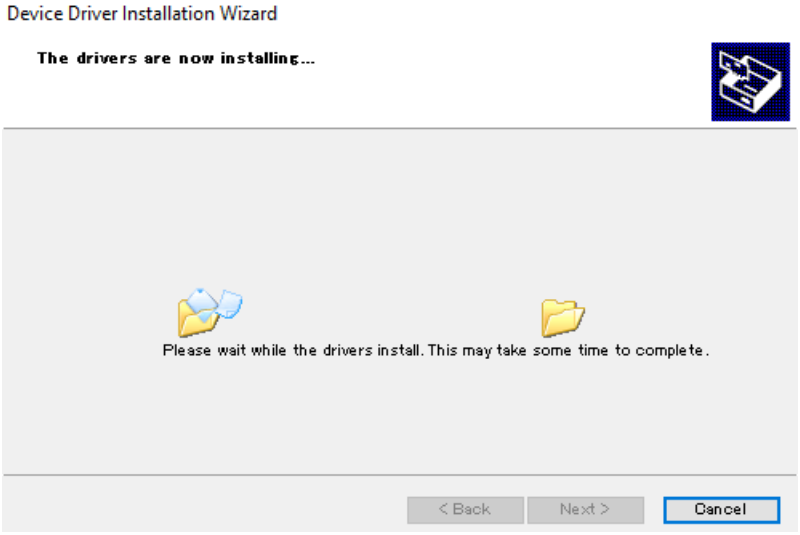


(5) Select to accept the license agreement, then click [Next].

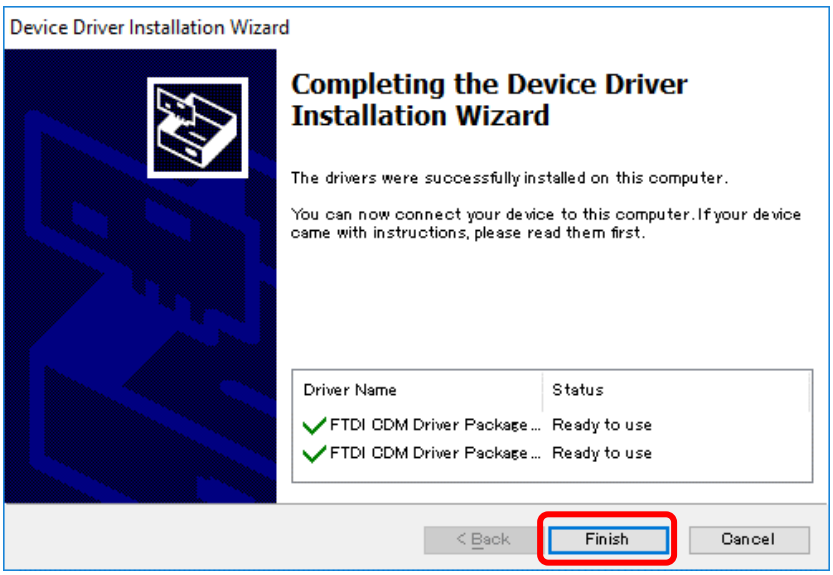


(6) Installation starts. Once installation is complete, the device driver installation wizard complete screen appears. Click [Finish]. Installation ends.

<Screen while installation is in progress>



<Screen when installation ends>



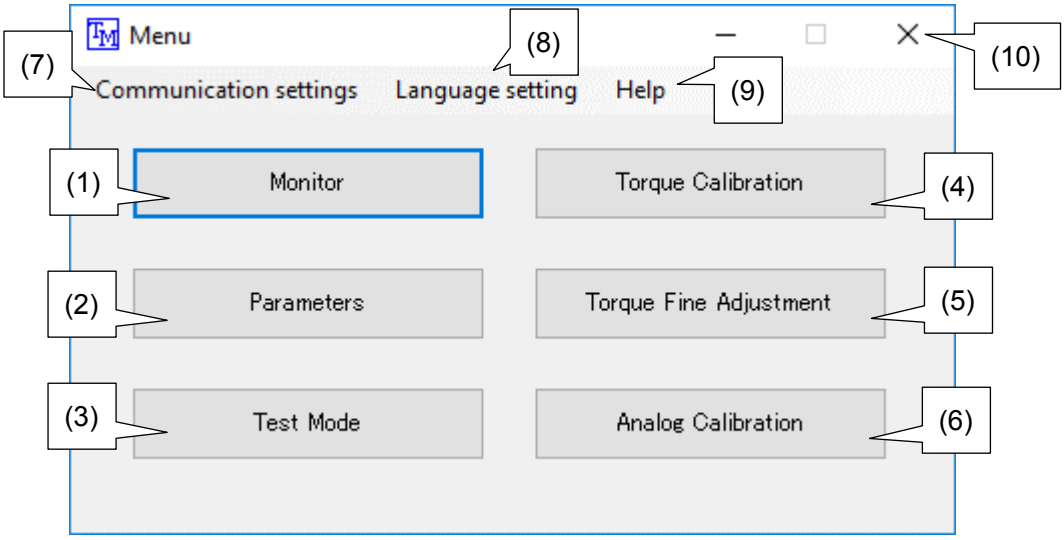
(7) The TMHSB will be recognized automatically when connected to the PC via USB and is ready for use.

5. Launching the Software

The software can be launched using one of the following methods.

- ・Launch by selecting [Start] → [All Programs] → [MinebeaMitsumi] → [TMHSBD-01].
- ・Launch by double-clicking the [TMHSBD-01] shortcut created on the desktop.

After startup, the following screen appears.



[Explanation of functions]

No.	Name	Description
(1)	Monitor	Check the torque value and various status. For details, see "11. Monitor Screen."
(2)	Parameters	Check the version and read or write setting values. For details, see "10. Parameter Settings."
(3)	Test Mode	Check signal input and output. For details, see "13. Test Mode Screen."
(4)	Torque Calibration	Perform torque calibration. For details, see "7. Calibration."
(5)	Torque Fine Adjustment	Perform torque fine adjustment. For details, see "8. Torque Fine Adjustment."
(6)	Analog Calibration	Perform analog calibration. For details, see "9. Analog Output Calibration."
(7)	Communication settings	Set up communication with the TMHSB. For details, see "6. Communication Settings6. Communication Settings."
(8)	Language setting	Switches the display language. After changing the settings, restart the software.
(9)	Help	Displays the calibration software version.
(10)	Quit (×)	Exits the software.

6. Communication Settings

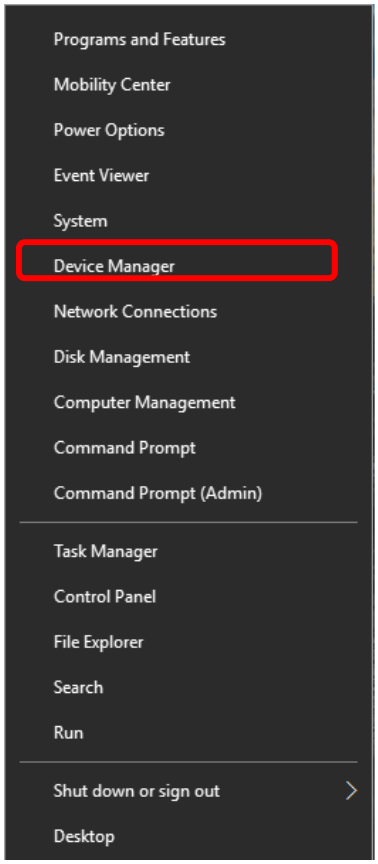
Sets settings used for communication with the TMHSB.

The driver may not be recognized or the COM port number may change if the USB connection location is changed. If a communication error occurs, the COM port number has probably changed. Check the COM port and confirm that it matches the port number in the communication settings.

6-1. Checking the COM Port

Check the COM port for the TMHSB connection.

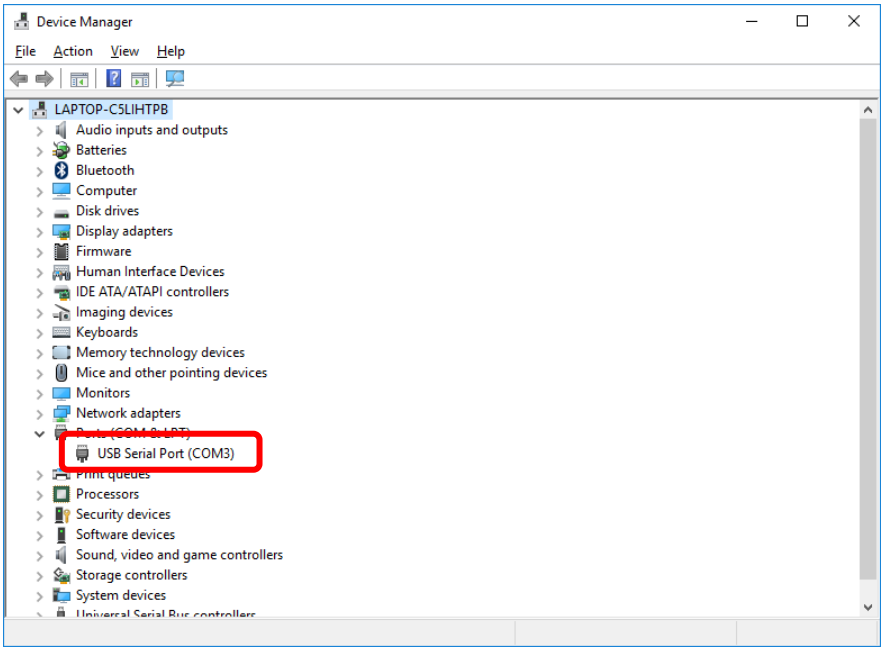
(1) Right-click the desktop Start button, then select [Device Manager] in the menu displayed.



※ In Windows 7, click the desktop Start menu, right-click [Computer] in the menu, then click [Manage] in the menu.
After the [Computer Management] screen is displayed, click [Device Manager].

(2) Open [Ports (COM and LPT)] on the [Device Manager] screen, then check the COM port number.

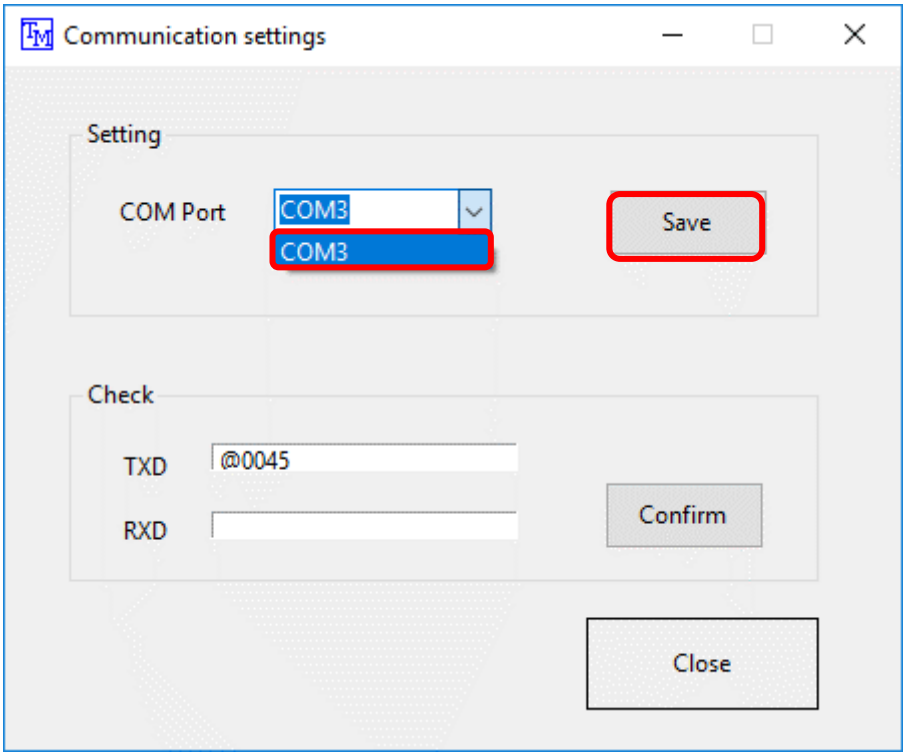
Example: COM3 is used in the following case.



6-2. Setting the COM Port

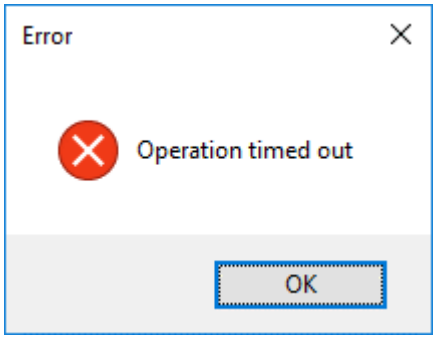
(1) On the menu screen, click [Communication settings].

(2) Select the COM port for the TMHSB connection, then click [Save].



(3) Click [Check] to confirm normal communication.
Communication is normal if [@0045 *****] appears in the RXD box.
* indicates the TMHSB version.

The following message box is displayed if communication was not successful.
See the previous instructions and recheck the communication setting details.
Confirm that the TMHSB is receiving power. Check the cable and connection.
Contact your dealer if this does not resolve the issue.



7. Calibration

Calibration refers to the process of adjusting voltage output to match the torque acting on the torque transducer to ensure that the electrical signal from the torque transducer can be output as an accurate torque value.

For example, this adjustment ensures accurate equipment output of 1000.0 N·m when torque of 1,000 N·m acts on the torque transducer.

7-1. Settings Required for Calibration

(1) Minimum scale division

The minimum measurement interval. The available settings are [1], [2], [5], and [10].

The value set for [Maximum torque value/Minimum scale value] represents the resolution.

For effective use of performance, set in the following range.

Maximum torque value	Minimum scale division
100~10 000	1
200~20 000	2
500~50 000	5
1 000~99 990	10

(2) Maximum torque value

The maximum torque value that can be measured by the torque transducer.

(3) Zero calibration

The setting to be calibrated to ensure that the equipment torque reading is zero when no torque is applied to the torque transducer (initial torque state). This can be calibrated either using the torque value (initial torque state) or by entering the torque transducer output frequency.

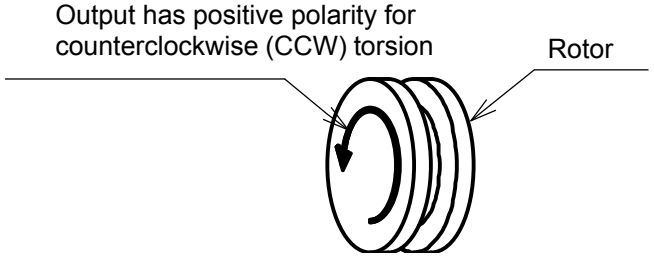
(4) Span calibration in counterclockwise direction (identified as [CCW Span Calibration] on calibration software screen)

The setting to be calibrated to ensure that the variations in the electrical signal from the torque transducer are correct on the equipment as the torque when counterclockwise (CCW) torque is applied to the torque transducer. This can be calibrated either using the torque value (span torque state) or by entering the torque transducer output frequency.

(5) Span calibration in clockwise direction (identified as [CW Span Calibration] on calibration software screen)

The setting to be calibrated to ensure that the variations in the electrical signal from the torque transducer are correct on the equipment as the torque when clockwise (CW) torque is applied to the torque transducer. This can be calibrated either using the torque value (span torque state) or by entering the torque transducer output frequency.

[Torsion direction and output polarity]



- **Recalibrate as necessary if the usage environment changes.**
- **The maximum resolution for valid performance is 10 000.**
- **In clockwise or counterclockwise span calibration, use a value of at least 2/3 of the maximum torque value to minimize calibration errors.**

7-2. Settings to be Altered As Necessary After Calibration

(1) Polarity change

Select the polarity as described in F-19 in "10-4. Setting Parameter List."

Polarity can be selected from [Torque in counterclockwise direction is positive] and [Torque in clockwise direction is positive.].

By default, [Torque in counterclockwise direction is positive] is selected.

(2) Decimal place

Select the decimal place of torque display values on the monitor screen as described in F-01 in "10-4. Setting Parameter List."

By default, [No decimal point] is selected.

(3) Unit

Select the unit of torque display values on the monitor screen as described in F-02 in "10-4. Setting Parameter List." The unit can be selected from [N·m] or [kN·m].

By default, [N·m] is selected.

(4) Torque analog output value

Select the torque value for 10 V output as described in F-21 in "10-4. Setting Parameter List." Any decimals specified are disregarded.

For example, for 10 V output when 1000.0 N·m of torque is applied, specify 10000.

By default, [10000] is selected.

(5) Switch auto zero data save destination

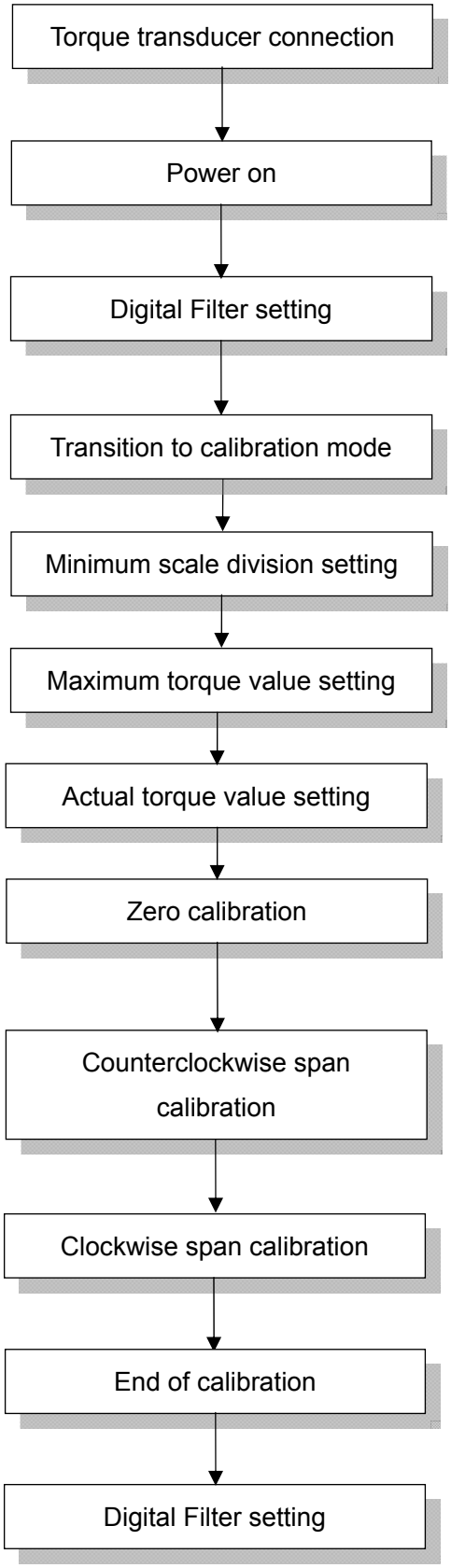
Select whether to save auto zero data to RAM or EEPROM, as described in F-26 in "10-4. Setting Parameter List."

To save auto zero data when the power is turned off, select [1] (EEPROM).

By default, [0] (RAM) is selected.

- **Recalibrate as necessary if the usage environment changes.**
- **The maximum resolution for valid performance is 10 000.**
- **In clockwise or counterclockwise span calibration, use a value of at least 2/3 of the maximum torque value to minimize calibration errors.**

7-3. Sequence of Calibration



Connect the torque transducer to the PC with this software installed.

Turn on and wait about 10 minutes for the torque transducer and PC to stabilize.

Switch F06 Digital Filter to [12] (4096 times).

Switch to calibration mode.

Select the minimum torque scale division.

Set the maximum torque value that can be measured by the torque transducer.

Set the actual torque value to be applied to the torque transducer.

Set the torque transducer to the initial torque state and perform zero calibration.

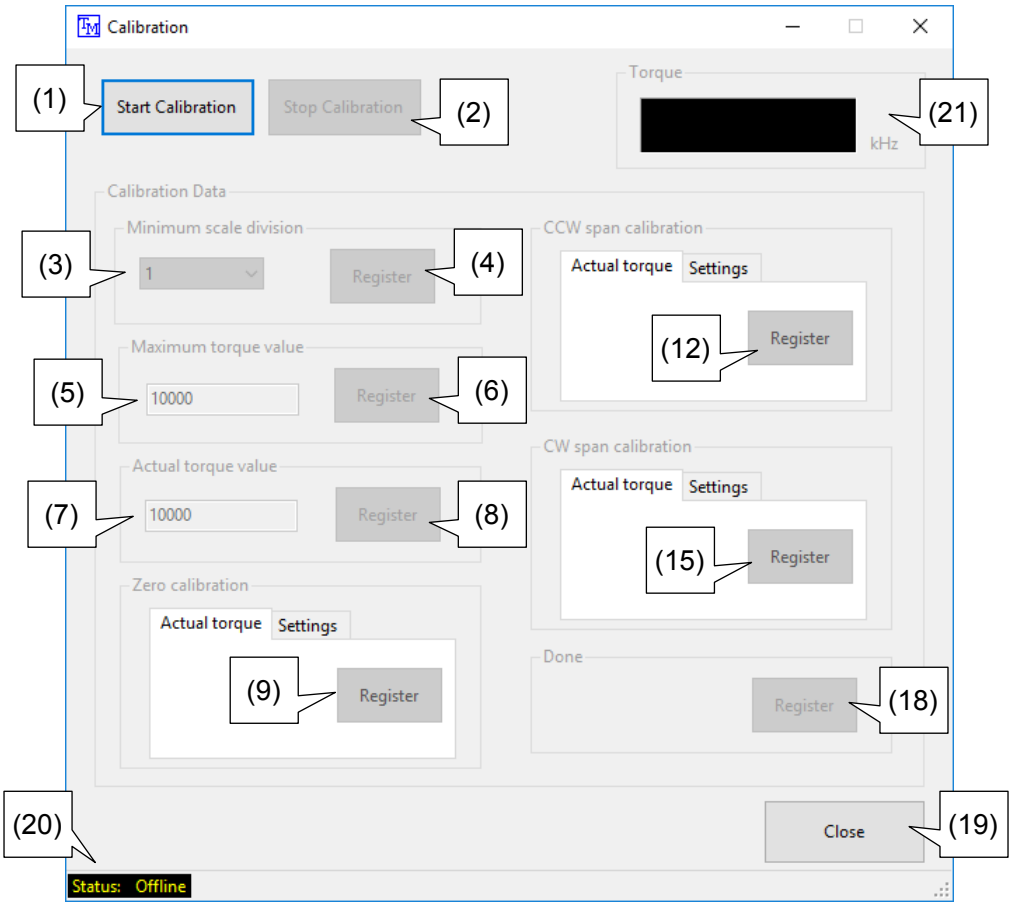
With span torque applied counterclockwise to the torque transducer, register the counterclockwise span point.

With span torque applied clockwise to the torque transducer, register the clockwise span point.

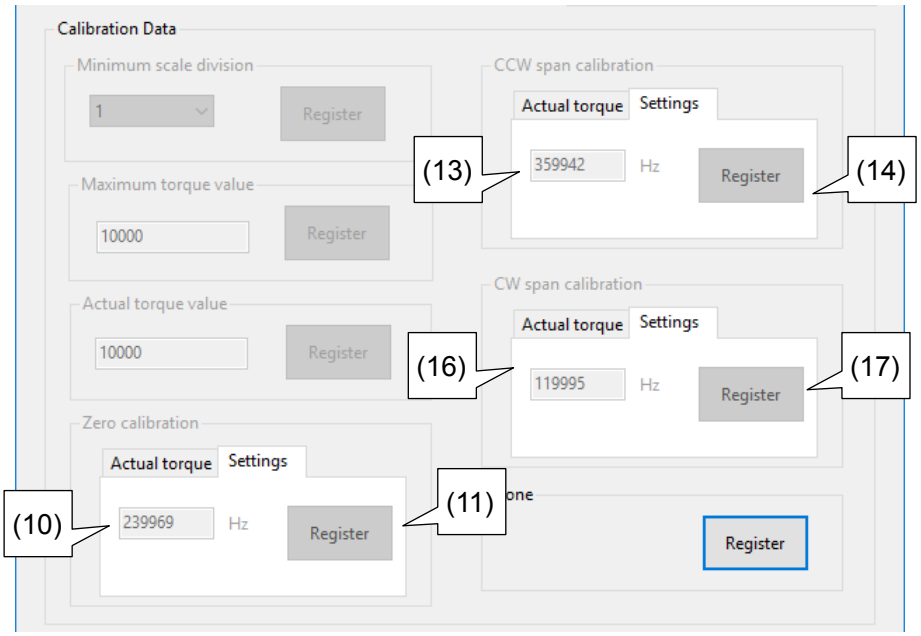
Restore F06 Digital Filter to the original value.

7-4. Screen Description

Actual torque calibration screen



Torque frequency input calibration screen



No.	Name	Description
(1)	[Start Calibration] button	Starts calibration.
(2)	[Stop Calibration] button	Stops calibration.
—	Minimum scale division	
(3)	Minimum scale division selection	Select the minimum measurement value unit from [1], [2], [5], or [10].
(4)	[Register] button	Tentatively registers the minimum scale division.
—	Maximum torque value	
(5)	Maximum torque value setting	Sets the maximum torque value that can be measured by the torque transducer.
(6)	[Register] button	Tentatively registers the maximum torque value.
—	Actual torque value	
(7)	Actual torque value setting	Sets the actual torque value to be applied to the torque transducer.
(8)	[Register] button	Tentatively registers the actual torque value.
	Zero calibration	
(9)	Actual torque - [Register] button	Tentatively registers the torque transducer initial torque state.
(10)	Set - Frequency setting	Sets the frequency value with the torque transducer in the initial torque state.
(11)	Set - [Register] button	Tentatively registers the frequency value with the torque transducer in the initial torque state.
	CCW span calibration	
(12)	Actual torque - [Register] button	Registers the span state with counterclockwise torque applied to the torque transducer.
(13)	Set - Frequency setting	Sets the frequency value of the span state with counterclockwise torque applied to the torque transducer.
(14)	Set - [Register] button	Tentatively registers the frequency value of the span state with counterclockwise torque applied to the torque transducer.
	CW span calibration	
(15)	Actual torque - Register	Registers the span state with clockwise torque applied to the torque transducer.
(16)	Set - Frequency setting	Sets the frequency value of the span state with clockwise torque applied to the torque transducer.
(17)	Set - [Register] button	Tentatively registers the frequency value of the span state with clockwise torque applied to the torque transducer.
(18)	[Register] button	Registers calibration.
(19)	[Close] button	Closes the screen and returns to the menu screen.
(20)	Status:	Shows the status. Offline: Communication stopped Calibration: Communication in progress (calibration in progress)
(21)	Torque, in kHz	Shows the current TMHSB input frequency.

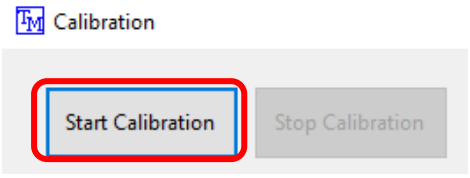
7-5. Calibration

Calibration is performed following the procedure for applying actual torque.

You can also restore the original calibration value as shipped, or restore a calibration state by entering a stored calibration value. In this case, follow the procedure to enter the frequency for torque values without applying torque.

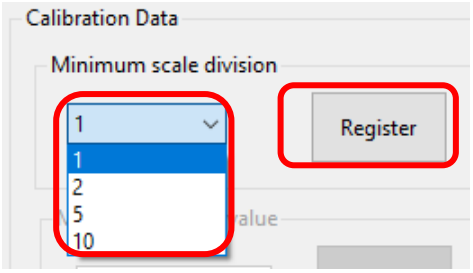
7-5-1. Step 1 Start calibration

Click [Start Calibration]. Calibration begins.



7-5-2. Step 2 Minimum scale division

Set the minimum torque scale division.
Select the minimum scale division from [1], [2], [5], or [10], then click [Register].



7-5-3. Step 3 Maximum torque value setting

Set the maximum torque value.
Specify the maximum torque value, then click [Register].

7-5-4. Step 4 Actual torque value setting

Set actual torque acting on the torque transducer (or torque transducer output).
Specify the actual torque value, then click [Register].

7-5-5. Step 5　Zero calibration

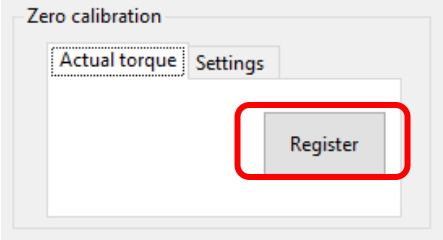
Register the input at the zero point.

Select a calibration method.

(1) Method based on torque value (initial torque state)

Click the [Actual torque] tab.

With the torque transducer in the initial torque state, click [Register].



(2) Method based on torque transducer torque frequency input

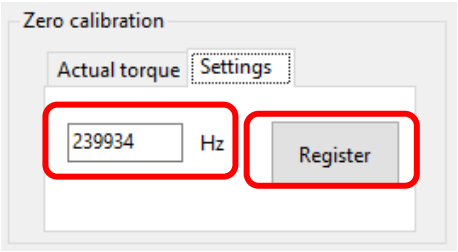
Click the [Set] tab.

The value displayed will be the output frequency for the torque transducer at the initial torque state previously registered.

Set the torque value (frequency) corresponding to the zero point in 1 Hz intervals.

Although the design value is approx. 240000 Hz, individual transducers vary to some extent, and the value may also vary based on installation conditions and temperature.

The value from shipping inspection is noted in the "Zero" column of the calibration value table of the calibration certificate.



To restore the state as shipped, set the zero point frequency as written on the calibration certificate.

7-5-6. Step 6　Counterclockwise span calibration

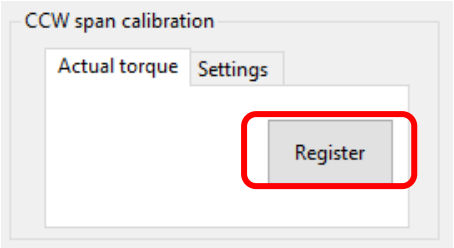
Register the input at the counterclockwise span point.

Select a calibration method.

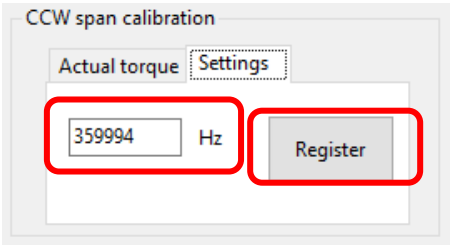
(1) Method based on torque value

Click the [Actual torque] tab.

With the actual counterclockwise torque applied to the torque transducer, click [Register].



(2) Method based on torque transducer torque frequency input
Click the [Set] tab.
The value displayed will be the output frequency for the torque transducer in the previously registered counterclockwise torque state.
Set the torque value (frequency) corresponding to the counterclockwise span point, in 1 Hz increments.
Although the design value is approx. 360000 Hz, individual transducers vary to some extent, and the value may also vary based on temperature.
The value from shipping inspection is noted in the "+Span" column of the calibration value table of the test certificate.

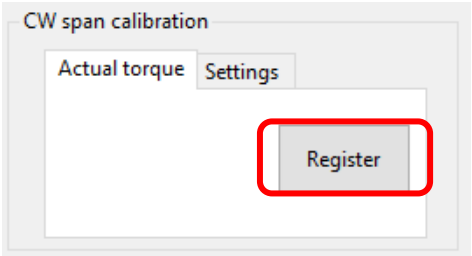


To restore the state as shipped, set the counterclockwise span frequency as written on the test certificate.

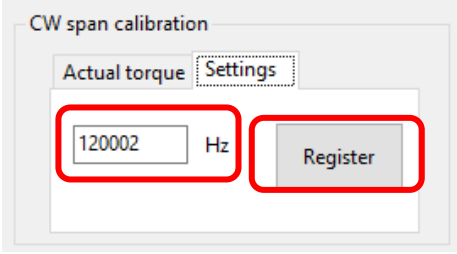
7-5-7. Step 7 Clockwise span calibration

Register the input at the clockwise span point.
Select a calibration method.

(1) Method based on torque value
Click the [Actual torque] tab.
With the actual clockwise torque applied to the torque transducer, click [Register].



(2) Method based on torque transducer torque frequency input
Click the [Set] tab.
The value displayed will be the output frequency for the torque transducer in the previously registered clockwise span state.
Set the torque value (frequency) corresponding to the clockwise span point, in 1 Hz increments.
Although the design value is approx. 120000 Hz, individual transducers vary to some extent, and the value may also vary based on temperature.
The value from shipping inspection is noted in the "-Span" column of the calibration value table of the test certificate.



To restore the state as shipped, set the clockwise span frequency as written on the test certificate.

7-5-8. Step 8 Registration

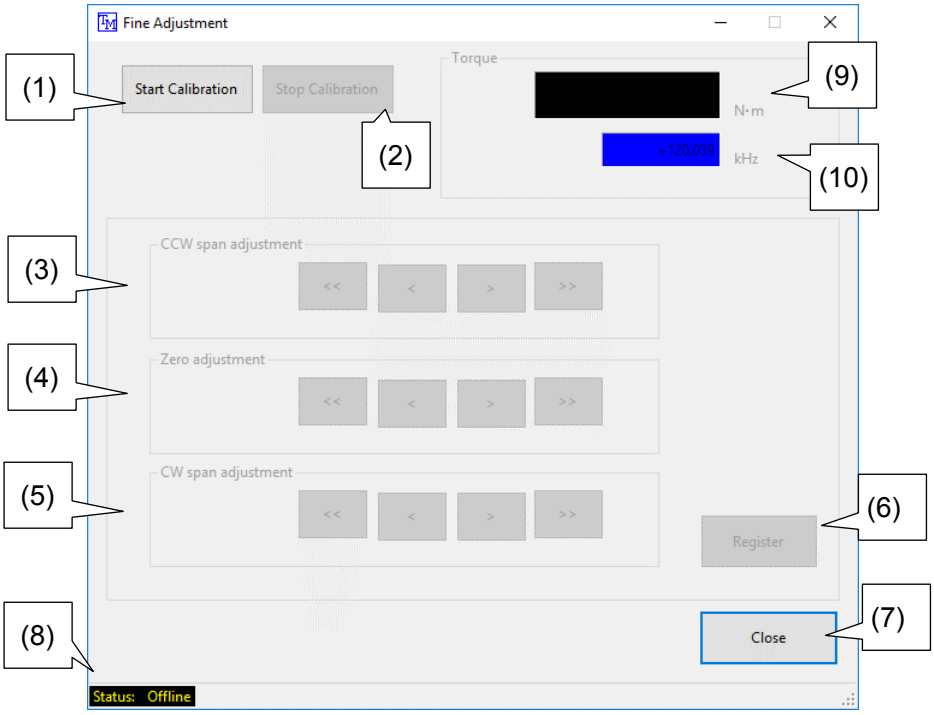
To register calibration, click [Register].
After this, click the [Close] button to return to the menu screen.

Setting values are only tentatively registered until you click [Register]. Setting values are not saved if you click [Stop Calibration] midway.

8. Torque Fine Adjustment

This function fine-tunes the zero point and span point if there are discrepancies between the actual torque and the reading displayed.

8-1. Screen Description

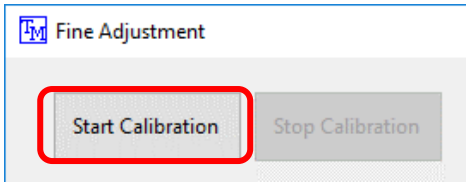


No.	Name	Description
(1)	[Start Calibration] button	Starts torque value adjustment.
(2)	[Stop Calibration] button	Stops torque value adjustment.
(3)	CCW span adjustment	
—	[<<], [<], [>], and [>>] buttons	Increases or decreases the counterclockwise span torque value.
(4)	Zero adjustment	
—	[<<], [<], [>], and [>>] buttons	Increases or decreases the zero torque value.
(5)	CW span adjustment	
—	[<<], [<], [>], and [>>] buttons	Increases or decreases the clockwise span torque value.
(6)	[Register] button	Registers calibration.
(7)	[Close] button	Closes the screen and returns to the menu screen. Enabled only when communication has stopped.
(8)	Status:	Shows the status. Offline: Communication stopped Calibration: Communication in progress (calibration in progress)
(9)	Torque, in N·m	Shows the current TMHSB torque value.
(10)	Torque, in kHz	Shows the current TMHSB input frequency.

8-2. Zero Fine Adjustment

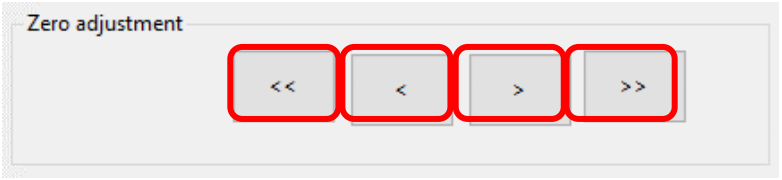
8-2-1. Step 1 Start calibration

Click [Start Calibration]. Calibration begins.



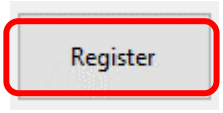
8-2-2. Step 2 Adjustment

Set the torque transducer to the initial torque state, and then adjust the display to "zero" using [<<] (coarse negative adjustment), [<] (fine negative adjustment), [>>] (coarse positive adjustment), and [>] (fine positive adjustment).



8-2-3. Step 3 Registration

To register calibration, click [Register].



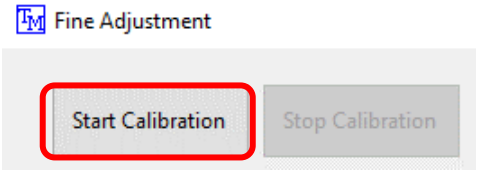
Setting values are only tentatively registered until you click [Register]. Setting values are not saved if you click [Stop Calibration] midway.

The same screen includes [CCW span adjustment], [Zero adjustment], and [CW span adjustment] buttons.
Incorrect adjustment will occur if you click buttons for items other than [Zero adjustment].
If buttons for incorrect items are clicked, always click [Close] to return to the menu without clicking [Register].

8-3. Counterclockwise Span Fine Adjustment

8-3-1. Step 1 Start calibration

Click [Start Calibration]. Calibration begins.

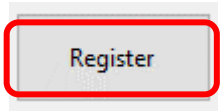


8-3-2. Step 2 Adjustment

Set up a counterclockwise span state on the torque transducer, then adjust the display to "Actual torque value" using [<<] (coarse negative adjustment), [<] (fine negative adjustment), [>>] (coarse positive adjustment), and [>] (fine positive adjustment).

8-3-3. Step 3 Registration

To register calibration, click [Register].



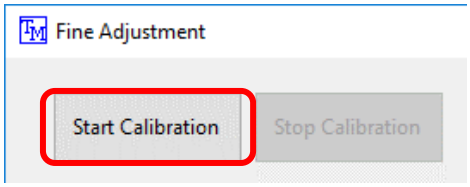
Setting values are only tentatively registered until you click [Register]. Setting values are not saved if you click [Stop Calibration] midway.

The same screen includes [CCW span adjustment], [Zero adjustment], and [CW span adjustment] buttons.
Incorrect adjustment will occur if you click buttons for items other than [CCW span adjustment].
If buttons for incorrect items are clicked, always click [Close] to return to the menu without clicking [Register].

8-4. Clockwise Span Fine Adjustment

8-4-1. Step 1 Start calibration

Click [Start Calibration]. Calibration begins.

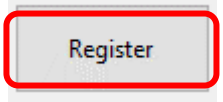


8-4-2. Step 2 Adjustment

Set up a clockwise span state on the torque transducer, then adjust the display to "Actual torque value" using [<<] (coarse negative adjustment), [<] (fine negative adjustment), [>>] (coarse positive adjustment), and [>] (fine positive adjustment).

8-4-3. Step 3 Registration

To register calibration, click [Register].



Setting values are only tentatively registered until you click [Register]. Setting values are not saved if you click [Stop Calibration] midway.

The same screen includes [CCW span adjustment], [Zero adjustment], and [CW span adjustment] buttons.
Incorrect adjustment will occur if you click buttons for items other than [CW span adjustment].
If buttons for incorrect items are clicked, always click [Close] to return to the menu without clicking [Register].

9. Analog Output Calibration

9-1. Analog Output Calibration

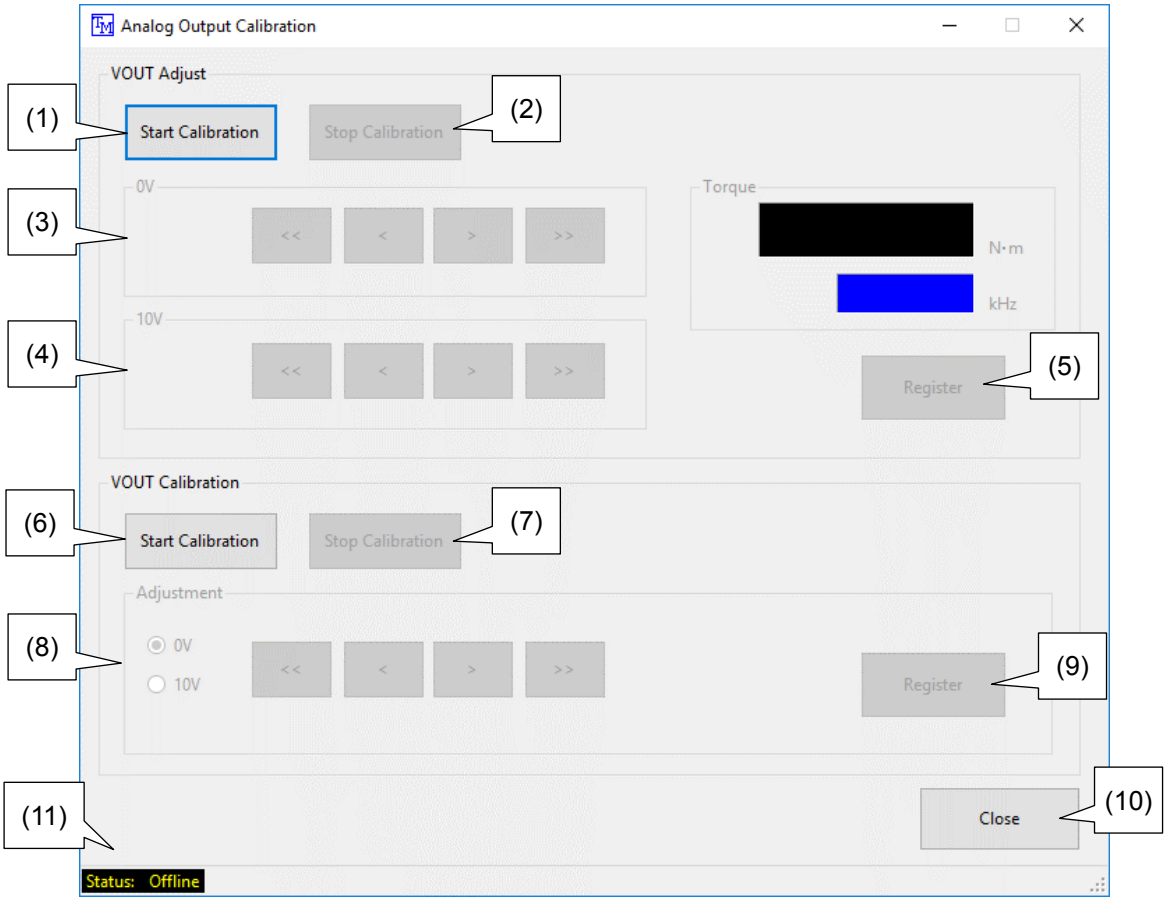
Adjust analog output.

(1) There are two methods of adjustment, as follows.

(2) For details on analog output actual torque fine adjustment, see "9-3. Analog Output Actual Torque Fine Adjustment."

(3) Another function enables adjustment of analog output without applying actual torque. For details, see "9-4. Analog Output Calibration Function."

9-2. Screen Description



<VOUT Adjust: Analog output actual torque fine adjustment>

No.	Name	Description
(1)	[Start Calibration] button	Starts actual torque fine adjustment.
(2)	[Stop Calibration] button	Stops actual torque fine adjustment.
(3)	0V	
—	[<<], [<], [>], and [>>] buttons	Increases or decreases the output voltage in the initial torque state.
(4)	10V	
—	[<<], [<], [>], and [>>] buttons	Increases or decreases the output voltage in the state of analog output maximum torque (F-21).
(5)	[Register]	Registers calibration.

<VOUT Calibration: Analog output calibration>

No.	Name	Description
(6)	[Start Calibration] button	Starts analog output calibration.
(7)	[Stop Calibration] button	Stops analog output calibration.
(8)	Adjustment	
―	[0V], [10V]	Select the analog output for adjustment.
―	[<<], [<], [>], and [>>] buttons	Increases or decreases output of the selected analog output.
(9)	[Register]	Registers calibration.
(10)	[Close] button	Closes the screen and returns to the menu screen.
(11)	Status:	Shows the status. Offline: Communication stopped Calibration: Communication in progress (calibration in progress)

9-3. Analog Output Actual Torque Fine Adjustment

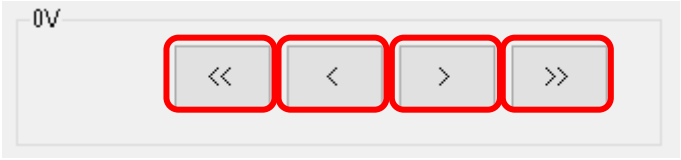
This function enables adjustment of analog output while applying actual torque to the torque transducer.

9-3-1. Step 1 Start calibration

Click [Start Calibration]. Calibration begins.

9-3-2. Step 2 0V calibration

Set the torque transducer to the initial torque state, then adjust the output voltage using [<<] (coarse negative adjustment), [<] (fine negative adjustment), [>>] (coarse positive adjustment), and [>] (fine positive adjustment).

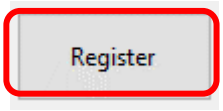


9-3-3. Step 3 10V calibration

Set the torque transducer to the counterclockwise span state, then adjust the output voltage using [<<] (coarse negative adjustment), [<] (fine negative adjustment), [>>] (coarse positive adjustment), and [>] (fine positive adjustment).

9-3-4. Step 4 Registration

To register calibration, click [Register].



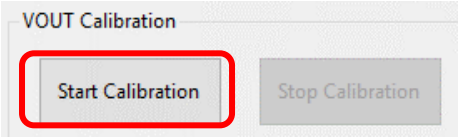
Setting values are only tentatively registered until you click [Register]. Setting values are not saved if you click [Stop Calibration] midway.

9-4. Analog Output Calibration Function

This function enables adjustment of analog output without applying actual torque.

9-4-1. Step 1 Start calibration

Click [Start Calibration]. Calibration begins.

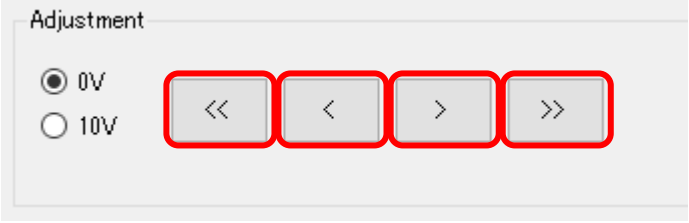


9-4-2. Step 2 0V calibration

Select [0V].

Analog voltage is produced corresponding to the zero point.

Monitor analog output as you adjust the output voltage using [<<] (coarse negative adjustment), [<] (fine negative adjustment), [>>] (coarse positive adjustment), and [>] (fine positive adjustment).

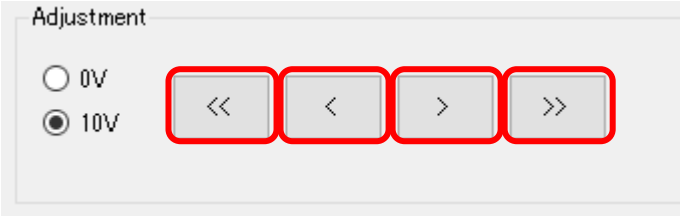


9-4-3. Step 3 10V calibration

Select [10V].

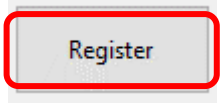
Analog voltage is produced corresponding to the counterclockwise span point.

Monitor analog output as you adjust the output voltage using [<<] (coarse negative adjustment), [<] (fine negative adjustment), [>>] (coarse positive adjustment), and [>] (fine positive adjustment).



9-4-4. Step 4 Registration

To register calibration, click [Register].

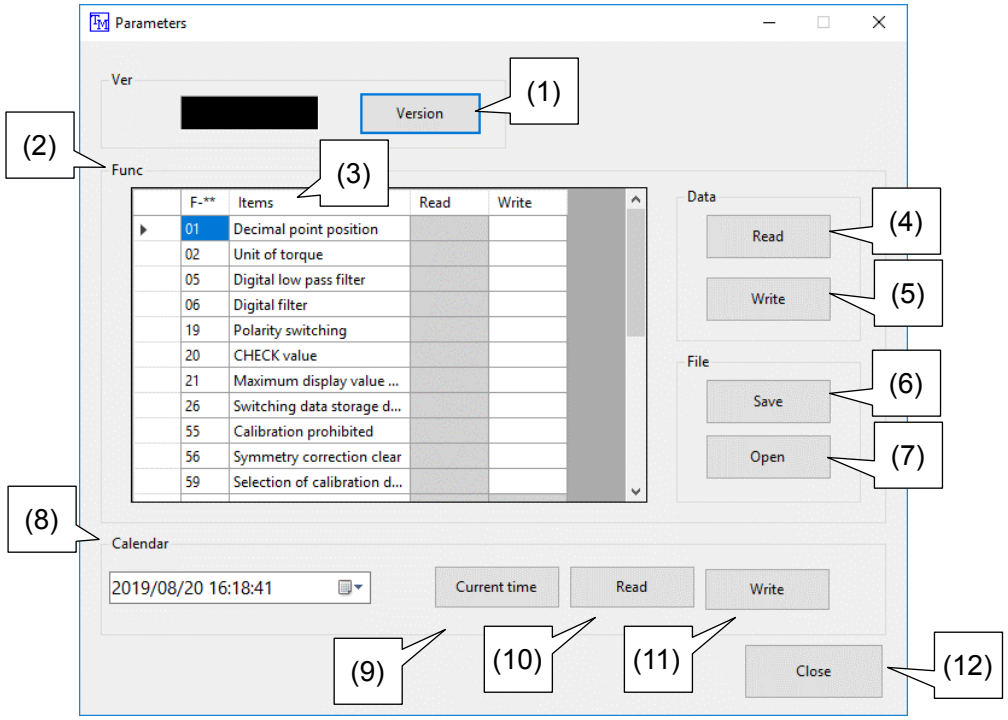


Setting values are only tentatively registered until you click [Register]. Setting values are not saved if you stop midway.

10. Parameter Settings

Check the version and read or write setting values.

10-1. Screen Description



<Information>

No.	Name	Description
(1)	[Version] button	Displays the TMHSB version.

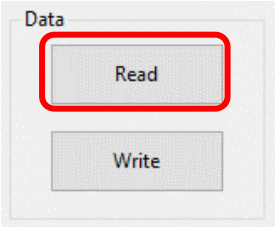
<Setting Values>

No.	Name	Description
(2)	Func	
(3)	Items	Shows relevant setting information.
(4)	[Read] button	Reads information.
(5)	[Write] button	Writes information.
(6)	[Save] button	Saves the information to a CSV file.
(7)	[Open] button	Reads data saved as a CSV file.
(8)	Calendar	
(9)	[Current time] button	Displays the current computer time.
(10)	[Read] button	Reads the TMHSB time.
(11)	[Write] button	Writes time to the TMHSB.
(12)	[Close] button	Closes the screen and returns to the menu screen.

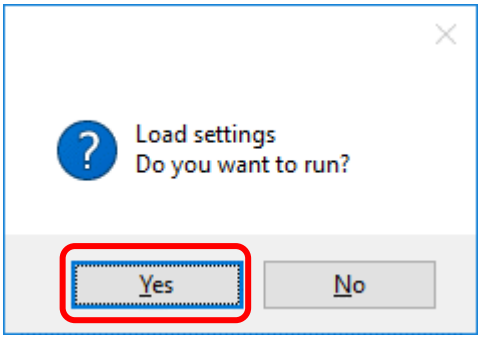
10-2. Reading Setting Parameters

This section describes the procedure for reading TMHSB setting parameters.

(1) Click [Read].



(2) Click [Yes] for the confirmation message.



(3) The TMHSB setting parameters are displayed.

	F-**	Items	Read	Write
▶	01	Decimal point position	0	0
	02	Unit of torque	0	0
	05	Digital low pass filter	8	8
	06	Digital filter	12	12
	19	Polarity switching	0	0
	20	CHECK value	16	16
	21	Maximum display value ...	10000	10000
	26	Switching data storage d...	0	0
	55	Calibration prohibited	0	0

10-3. Writing Setting Parameters

This section describes the procedure for writing TMHSB setting parameters.

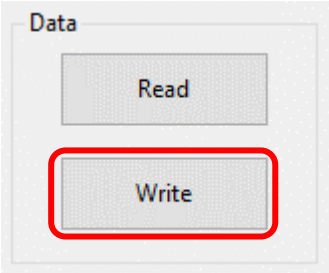
(1) To read setting parameters from the TMHSB, follow the procedure in "10-2. Reading Setting Parameters."

(2) TMHSB setting parameters are displayed in the [Read] and [Write] columns. Enter a [Write] value as desired for the setting parameter to change.

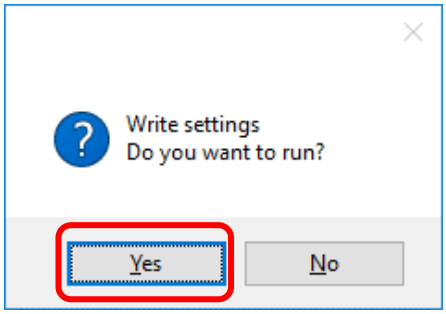
F-**	Items	Read	Write
56	Symmetry correction clear	0	0
59	Selection of calibration d...	1	1
60	Calibration 1 Minimum s...	1	1
61	Calibration 1 Maximum v...	10000	10000
62	Calibration 1 Actual torq...	10000	10000
66	Calibration 1 Zero freque...	239934	239934
67	Calibration 1 CCW span f...	359994	359994
68	Calibration 1 CW span fr...	120002	120002
70	Calibration 2 Minimum s...	1	1
71	Calibration 2 Maximum v...	10000	10000
72	Calibration 2 Actual torq...	10000	10000

The cells for items for which overwriting is prohibited are grayed out (input and selection disabled).

(3) Click [Write] on the screen.



(4) Click [Yes] in the message box.
The information is written.



10-4. Setting Parameter List

Setting parameters are described below.

	Item	Setting Value	Details
F−01	Decimal point display position	●0	No decimal point
		1	1000.0
		2	100.00
		3	10.000
		4	1.0000
F-02	Torque unit	●0	N·m
		1	kN·m
F-05	Digital low-pass filter	0	1 Hz
		1	10 Hz
		2	30 Hz
		3	50 Hz
		4	100 Hz
		5	300 Hz
		6	500 Hz
		7	1 kHz
		●8	6 kHz
F-06	Digital filter	0~12	No. of moving-average samples = 2m m: setting value
		●0	
F-19	Polarity change	●0	Torque in counterclockwise (CCW) direction is positive
		1	Torque in clockwise (CW) direction is positive
F-20	CHECK value	0~20	Fixed output for torque equivalent to 5 % of the maximum display value × the setting.
		●16	
F-21	Analog output maximum torque value	1~ 99 999	The torque value for 10 V output is set here. Unit: count
		●10 000	
F-26	Switch data-saving destination	●0	Save A/Z data to RAM
		1	Save A/Z data to EEPROM
F-55	Calibration prohibition	00	0: Calibration permitted 1: Calibration prohibited 10^0 digit: Calibration data 1 10^1 digit: Calibration data 2
		●00	
F-56	Symmetry correction clear	—	Clear symmetry-corrected data (clockwise) by writing 1234.* 1

●: Initial value

*1: Normal calibration involves calibration with three points, for zero state, counterclockwise span state, and clockwise span state. Counterclockwise and clockwise span are separate, but clearing symmetry correction overwrites the clockwise span to match the counterclockwise span value.

	Item	Setting Value	Details
F-59	Calibration data selection	0	Switch to external signal (SEL. 1)
		●1	Calibration data 1
		2	Calibration data 2
F-60	Calibration 1 minimum scale value	1	Datum value (initial value)
F-61	Calibration 1 maximum torque value	10000	Datum value (initial value)
F-62	Calibration 1 actual torque value	10000	Datum value (initial value)
F-66	Calibration 1 zero frequency value	24000	Datum value (initial value)
F-67	Calibration 1 CCW span frequency value	36000	Counterclockwise span datum value (initial value)
F-68	Calibration 2 CW span frequency value	12000	Clockwise span datum value (initial value)
F-70	Calibration 2 minimum scale value	1	Datum value (initial value)
F-71	Calibration 2 maximum torque value	10000	Datum value (initial value)
F-72	Calibration 2 actual torque value	10000	Datum value (initial value)
F-76	Calibration 2 zero frequency value	24000	Datum value (initial value)
F-77	Calibration 2 CCW span frequency value	36000	Counterclockwise span datum value (initial value)
F-78	Calibration 2 CW span frequency value	12000	Clockwise span datum value (initial value)
F-99	Memory clear	—	Reset function settings to initial values by writing 1234.

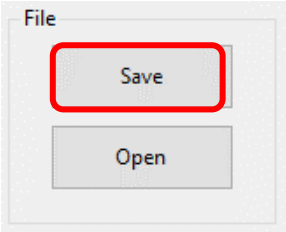
●: Initial value

10-5. Saving Files

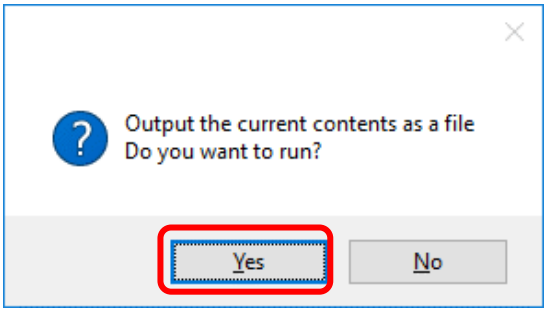
You can save setting items to a file in CSV format.

(1) To read setting parameters from the TMHSB, follow the procedure in "10-2. Reading Setting Parameters."

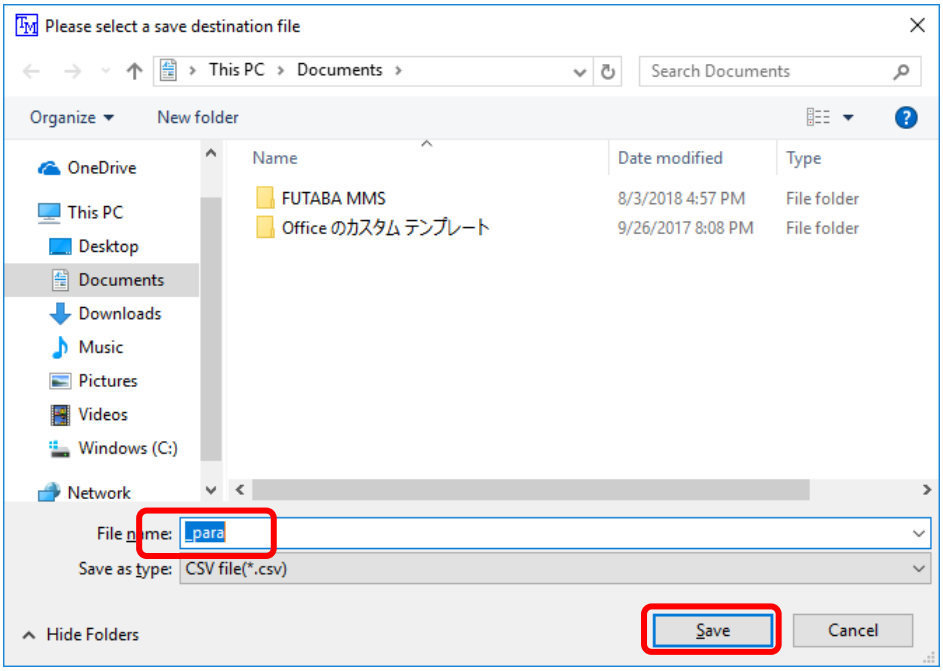
(2) Click [Save].



(3) Click [Yes] for the confirmation message.
Calibration item writing is complete.



(4) A dialog box is displayed to select the destination folder.
Specify the save destination and file name, then click [Save].
To cancel saving, click [Cancel].

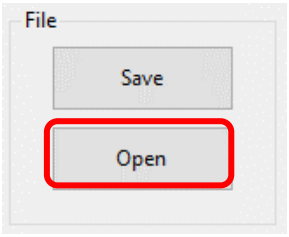


10-6. Reading Files

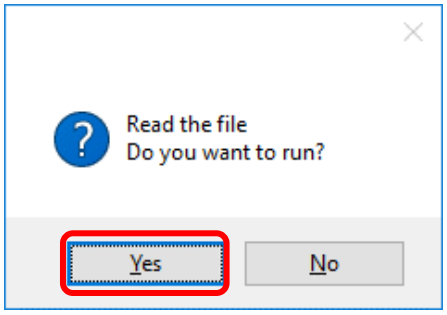
Open a file saved as described in "10-5. Saving Files."

Parameter setting values will be replaced with your previously saved values.

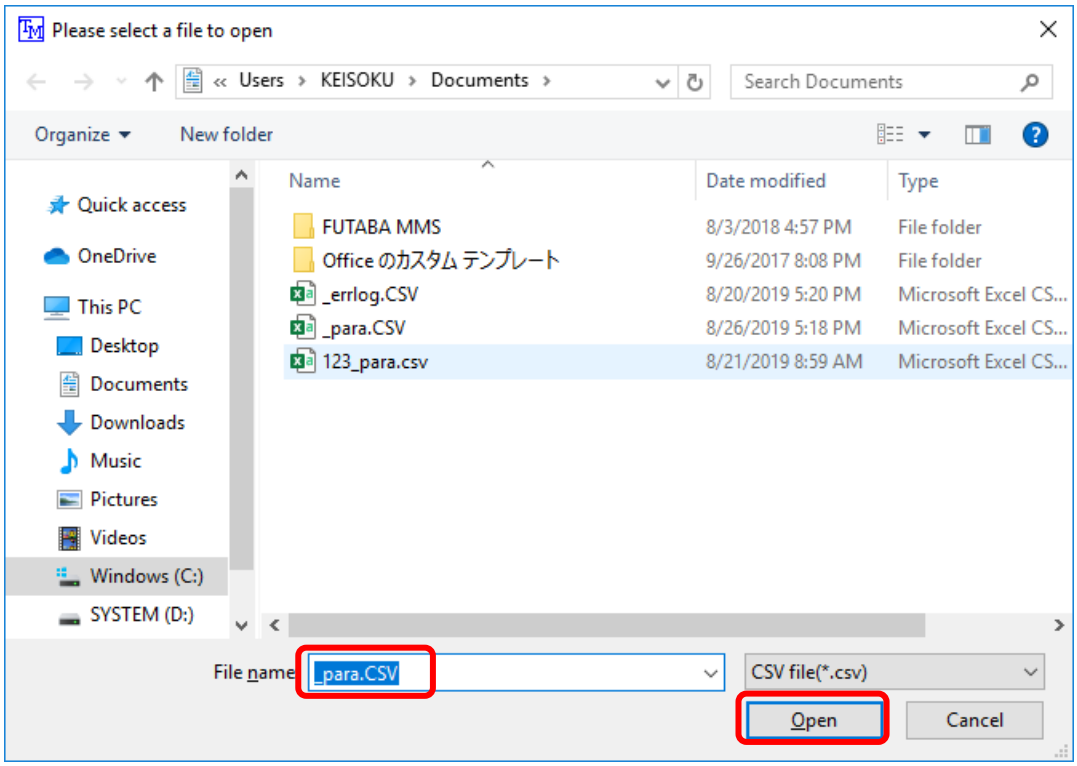
(1) Click [Open].



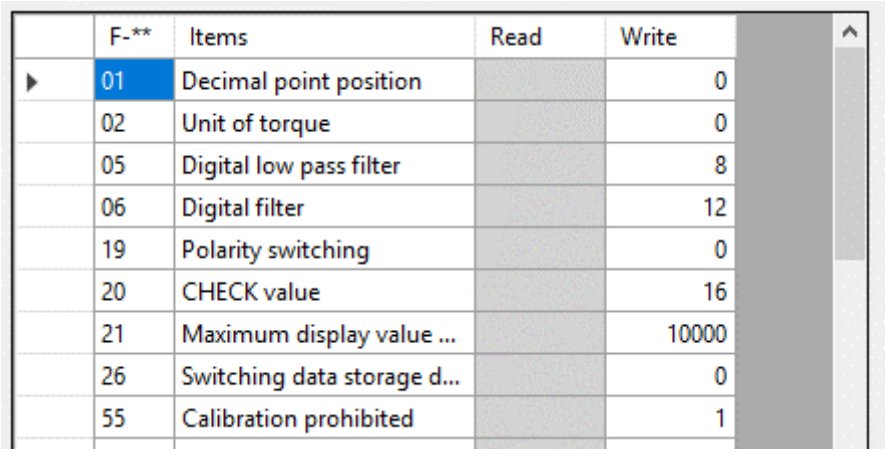
(2) Click [Yes] for the following confirmation message.
File reading is complete.



(3) A dialog box is displayed to select a file to open.
Specify where to read the file from and the file name, then click [Open].



(4) Values read from the file are shown in [Write] items.

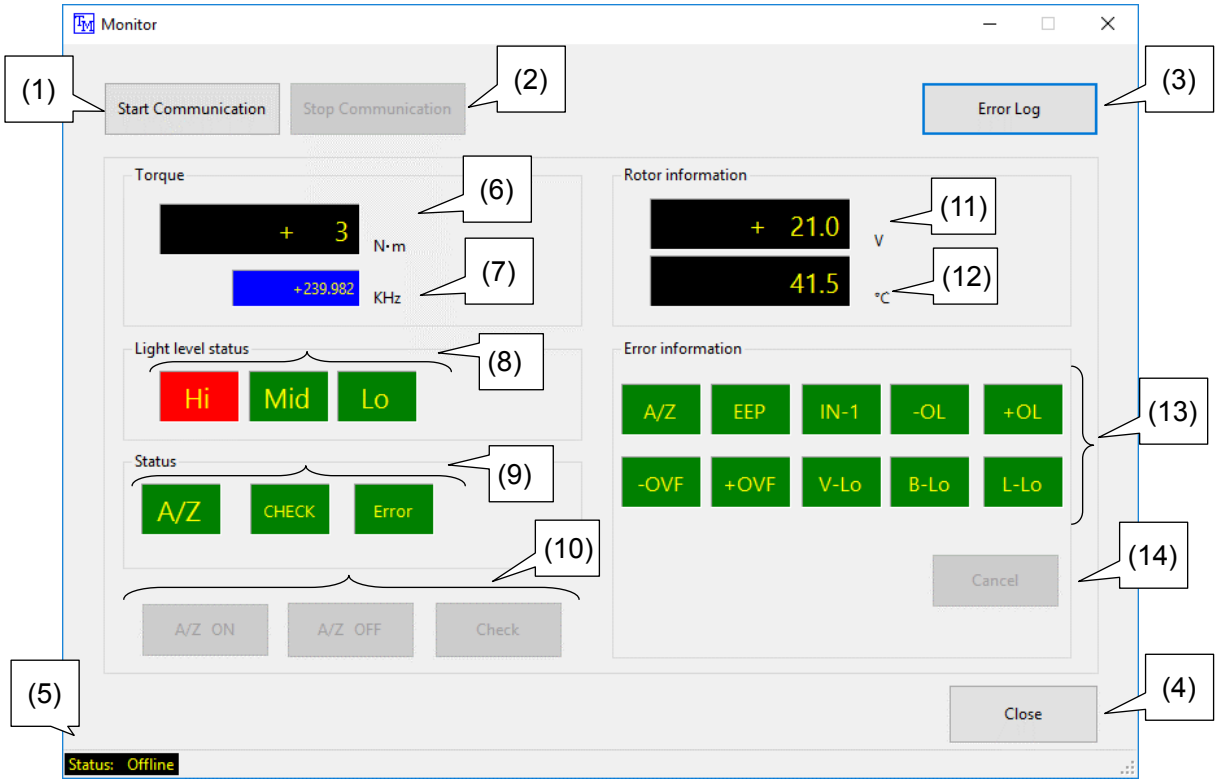


	F-**	Items	Read	Write
▶	01	Decimal point position		0
	02	Unit of torque		0
	05	Digital low pass filter		8
	06	Digital filter		12
	19	Polarity switching		0
	20	CHECK value		16
	21	Maximum display value ...		10000
	26	Switching data storage d...		0
	55	Calibration prohibited		1

11. Monitor Screen

Check the torque value and various status.

11-1. Screen Description



No.	Name	Description
(1)	[Start Communication] button	Starts communication with the TMHSB and shows monitoring of the torque value and various status.
(2)	[Stop Communication] button	Stops communication with the TMHSB.
(3)	[Error Log]	Switches to the error log screen. For details, see "12. Error Log."
(4)	Close	Closes the screen and returns to the menu screen. Enabled only when communication has stopped.
(5)	Status:	Shows the status. Offline: Communication stopped Connection: Communication in progress

<Torque>

No.	Name	Description
(6)	N·m	Shows the torque value.
(7)	kHz	Shows the input frequency.

<Light level status>

No.	Name	Description
(8)	Light level status: Hi	Red when the light level value is Hi.
(8)	Light level status: Mid	Red when the light level value is Mid.
(8)	Light level status: Lo	Red when the light level value is Lo.

<Status>

No.	Name	Description
(9)	A/Z	Red for A/Z status.
(9)	Check	Red for Check status.
(9)	Error	Red for error status.
(10)	[A/Z ON] button	Executes auto zero.
(10)	[A/Z OFF] button	Cancels auto zero.
(10)	[CHECK] button	Switches between checking on/off.

<Rotor voltage>

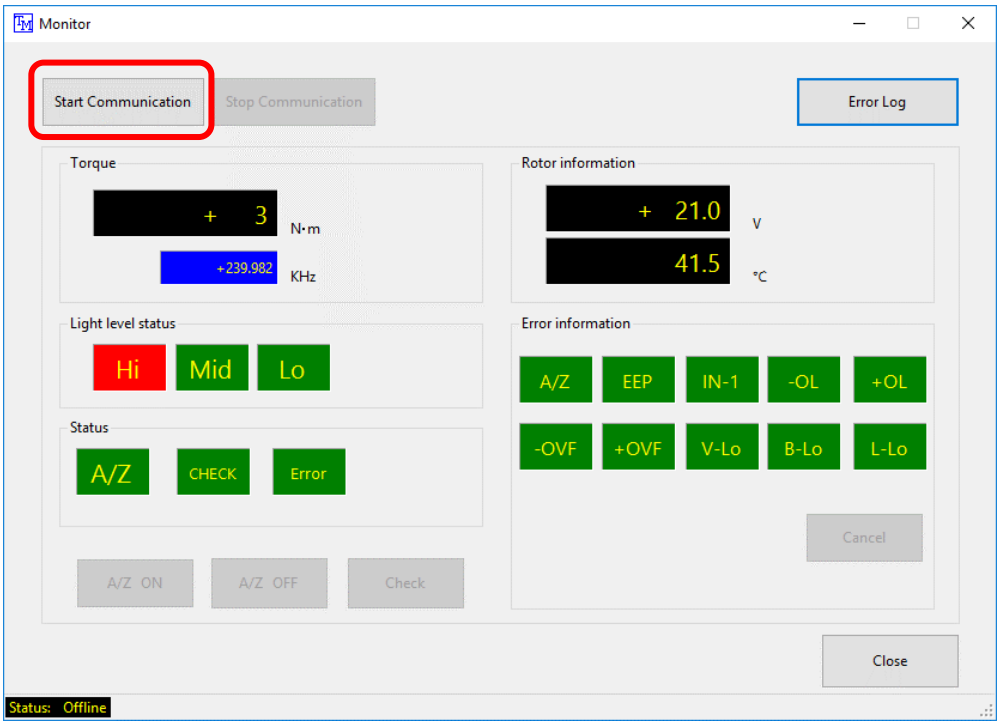
No.	Name	Description
(11)	V	Shows the rotor drive voltage.
(12)	°C	Shows the rotor internal temperature.

<Error information>

No.	Name	Description
(13)	A/Z	Red when auto zero is executed with auto zero out of range (±10 % or more relative to the maximum display value). Confirm that no torque is applied when auto zero is executed.
(13)	EEP	Red when writing to EEPROM failed. Contact your dealer.
(13)	IN-1	Red when no torque signal is supplied. Confirm that the rotor and stator are aligned and that the antenna bolts are not loose.
(13)	+OL	Red when the input torque value exceeds +110 % of the maximum display value. Confirm that the torque applied does not exceed the rated value.
(13)	-OL	Red when the input torque value is less than -110 % of the maximum display value. Confirm that the torque applied does not exceed the rated value.
(13)	+OVF	Red when the input signal exceeds approx. 441.5 kHz. Confirm that the torque applied does not exceed the rated value.
(13)	-OVF	Red when the input signal is less than approx. 38.5 kHz. Confirm that the torque applied does not exceed the rated value.
(13)	V-Lo	Red when the internal rotor voltage is low. Confirm that the rotor and stator are aligned, and that antenna bolts are not loose.
(13)	B-Lo	Red when the voltage of the battery used for calendar functions is low. Contact your dealer.
(13)	L-Lo	Optical transmission is used to send torque values from the rotor to the stator, and this error indicates that the received light level was low. Clean the rotor LED and sensor window. Additionally, confirm that the rotor and stator are aligned.
(14)	[Cancel] button	Clears errors.

11-2. Start Communication

Starts communication with the TMHSB and shows monitoring of the torque value and various status.

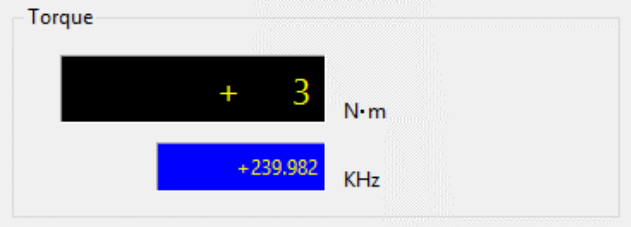


11-3. Stop Communication

Stops communication with the TMHSB.

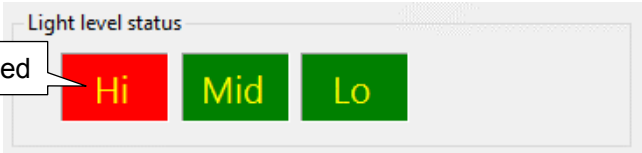
11-4. Torque

Shows the torque value and frequency.



11-5. Light Level Status

Shows the status of the torque meter light level.

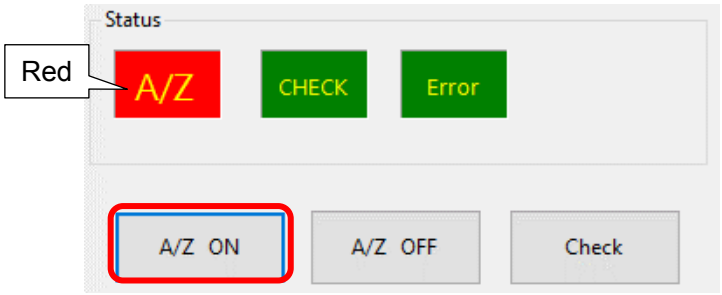


Screen	Details
Red: Hi Mid Lo	Normal torque meter light level.
Red: Hi Red: Mid Lo	Low torque meter light level.
Hi Mid Lo (Red: Hi, Red: Mid, Red: Lo)	The torque meter light level is too low to guarantee torque measurements.

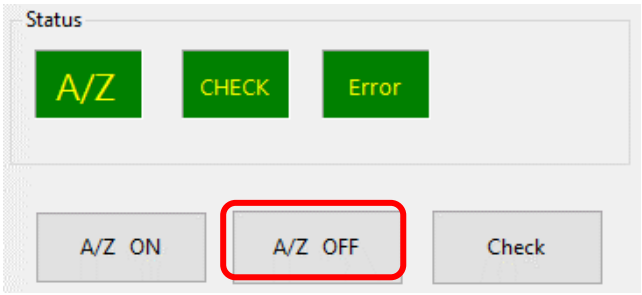
11-6. Auto Zero (A/Z)

Restores the zero point (if disturbed by mounting flange removal or attachment, for example) without affecting the span point.

(1) Click [A/Z ON] to execute A/Z.

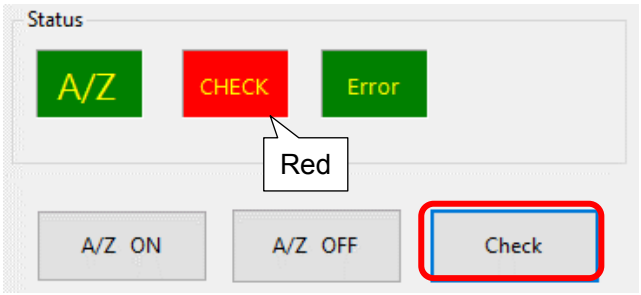


(2) Click [A/Z OFF] to cancel A/Z.



11-7. Check

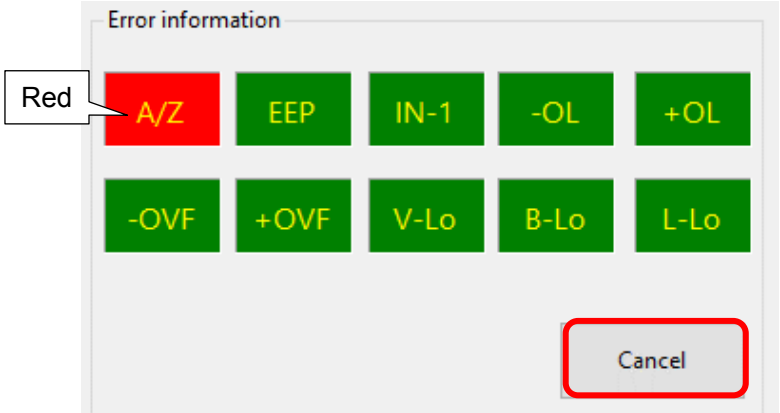
Confirms that the analog output function is working correctly.
Click [CHECK] to switch between checking on/off.
The analog output produced corresponds to the F-20 setting. By default, analog output is approximately 8.0 V.



11-8. Error Information

Shows error information in the case of TMHSB errors.

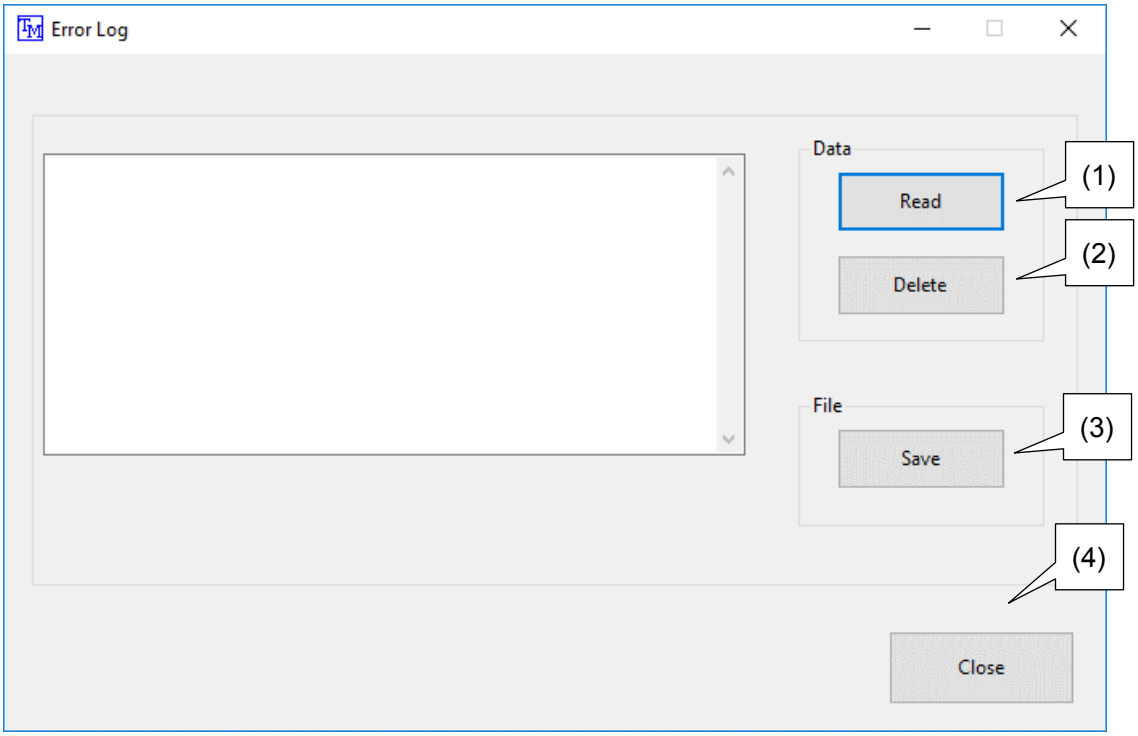
After resolving the error on the TMHSB, click [Cancel] to clear the error information.



12. Error Log

Enables you to check the error log for errors affecting the TMHSB.

12-1. Screen Description

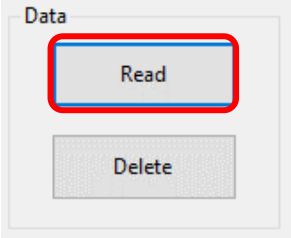


No.	Name	Description
(1)	[Read] button	Reads the error log data saved on the TMHSB.
(2)	[Delete] button	Deletes the error log data saved on the TMHSB.
(3)	[Save] button	Saves the error log as a CSV file.
(4)	[Close] button	Returns to the menu screen.

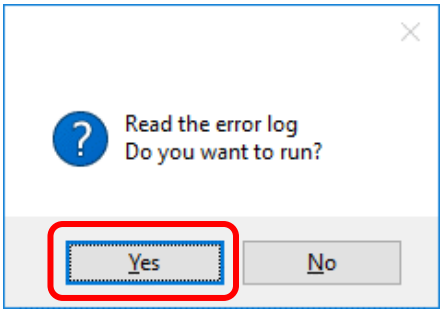
12-2. Reading Error Logs

This section describes the procedure for reading the error log saved on the TMHSB.
Up to 20 of the most recent error log messages can be read.

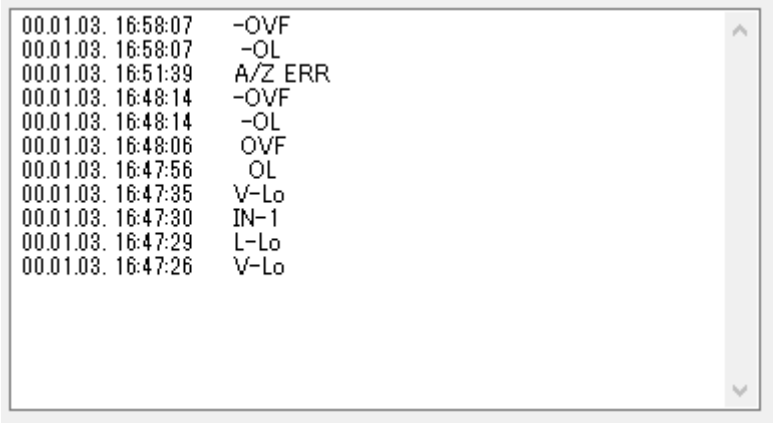
(1) Click [Read].



(2) Click [Yes] for the confirmation message.



(3) The error log is displayed.
The times when errors occurred are displayed with error information.

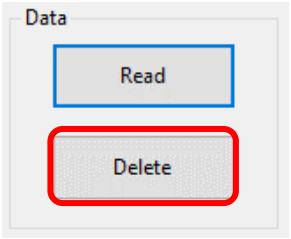


Error	Description
A/Z ERR	When auto zero was executed with auto zero out of range (±10 % or more relative to the maximum torque value)
IN-1	When no torque signal was supplied
OL	If the input torque value exceeds +110 % of the maximum torque value
-OL	If the input torque value is less than -110 % of the maximum torque value
OVF	When the input signal exceeds approx. 441.5 kHz
-OVF	When the input signal is less than approx. 38.5 kHz
V-Lo	When the rotor drive voltage is low and torque measurements cannot be guaranteed
L-Lo	When the torque meter light level was low and torque measurements cannot be guaranteed

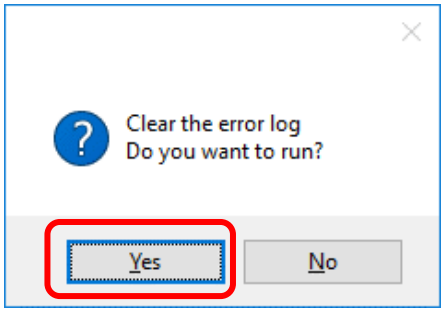
12-3. Deleting Error Logs

This section describes the procedure for deleting the error log saved on the TMHSB.

(1) Click [Delete].

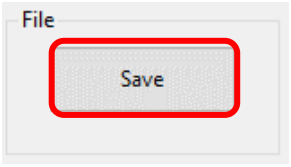


(2) Click [Yes] for the confirmation message.
The error log data saved on the TMHSB is deleted.

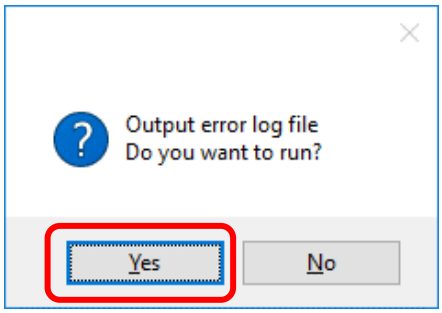


12-4. Saving Error Logs

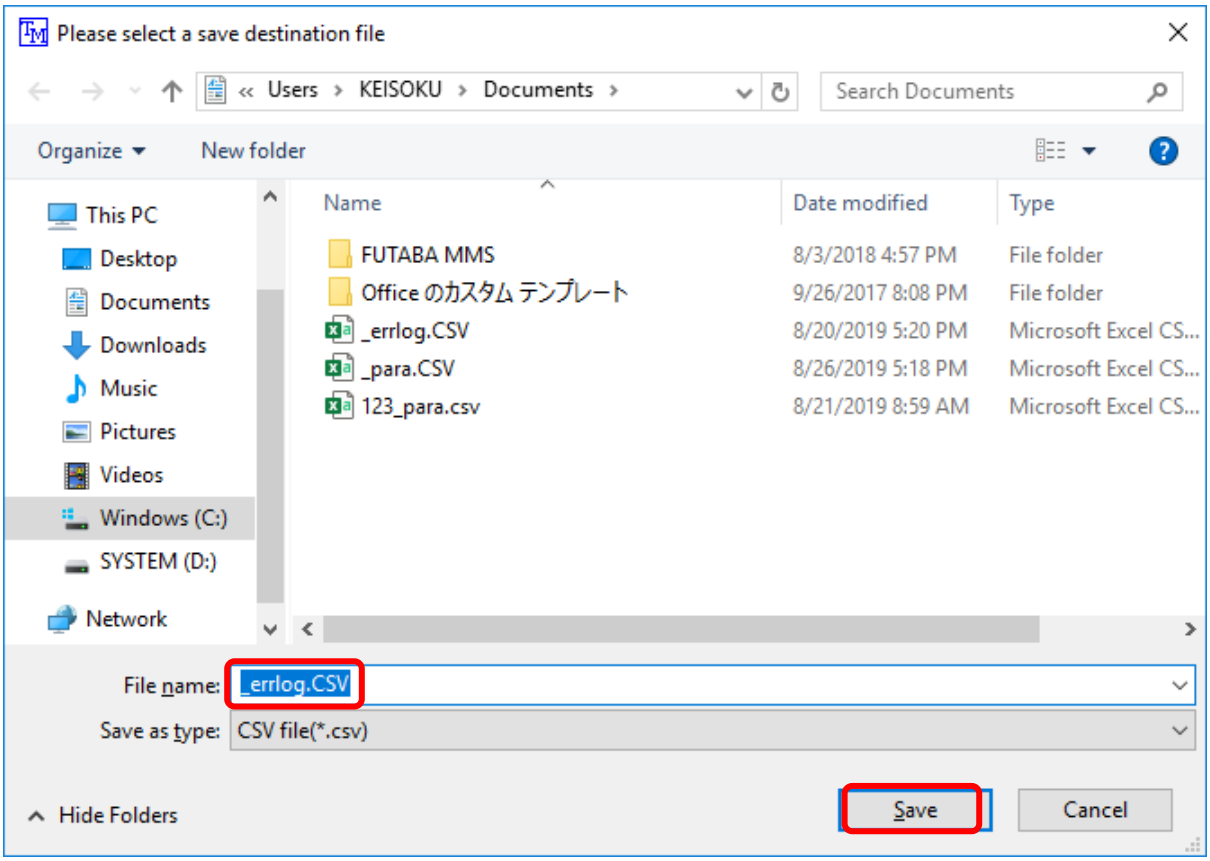
(1) Follow the procedure in "12-2. Reading Error Logs" to read the error log.
(2) Click [Save].



(3) Click [Yes] in the message box.



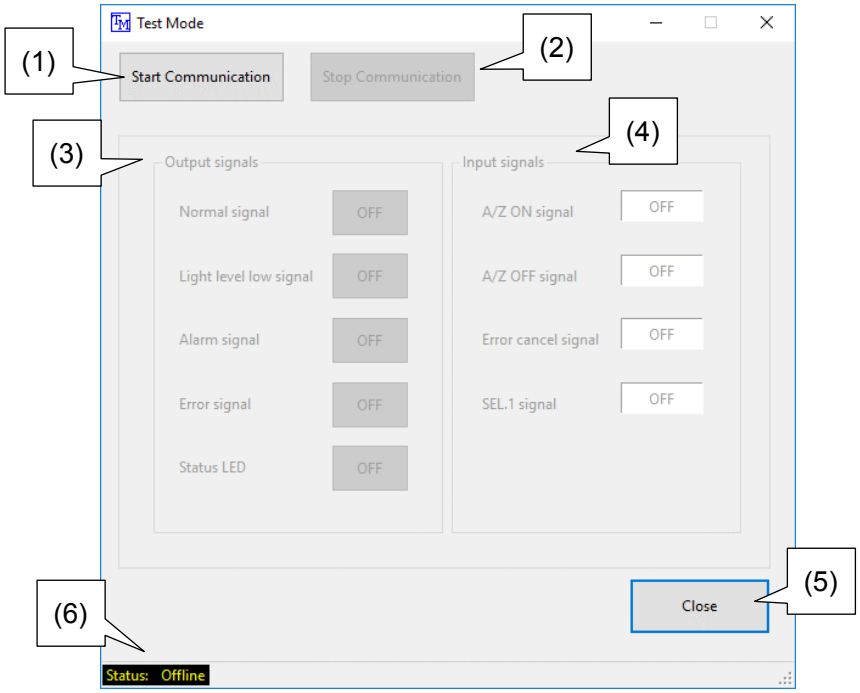
(4) A dialog box is displayed to select the destination folder.
Specify the save destination and file name, then click [Save].
To cancel saving, click [Cancel].



13. Test Mode Screen

This screen is for checking TMHSB input/output and operation of the status LED.

13-1. Screen Description



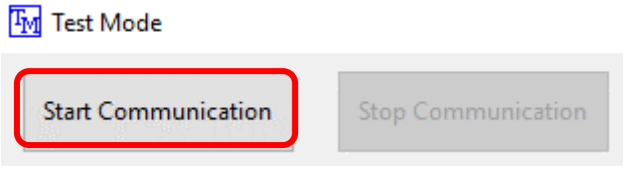
No.	Name	Description
(1)	[Start Communication] button	Initiates communication with the TMHSB and starts checking input/output and operation of the status LED.
(2)	[Stop Communication] button	Stops communication with the TMHSB.
(3)	Output signals	
—	Normal signal	Click [OFF] to switch display to [ON] and activate normal signal output.
—	Light level low signal	Click [OFF] to switch display to [ON] and activate light level low signal output.
—	Alarm signal	Click [OFF] to switch display to [ON] and activate alarm signal output.
—	Error signal	Click [OFF] to switch display to [ON] and activate error signal output.
—	Status LED	Click [OFF] to switch display to [ON] and change the status LED from green to red.
(4)	Input signals	
—	A/Z ON signal	Switching the TMHSB A/Z ON signal to ON displays ON here.
—	A/Z OFF signal	Switching the TMHSB A/Z OFF signal to ON displays ON here.
—	Error cancel signal	Switching the TMHSB error cancel signal to ON displays ON here.
—	SEL. 1 signal	Switching the TMHSB SEL. 1 signal to ON displays ON here.
(5)	Close	Closes the screen and returns to the menu screen. Enabled only when communication has stopped.
(6)	Status:	Shows the status. Offline: Communication stopped Connection: Communication in progress

13-2. Checking Output Signals

This section describes the procedure for checking output signals.

(1) Click [Start Communication].

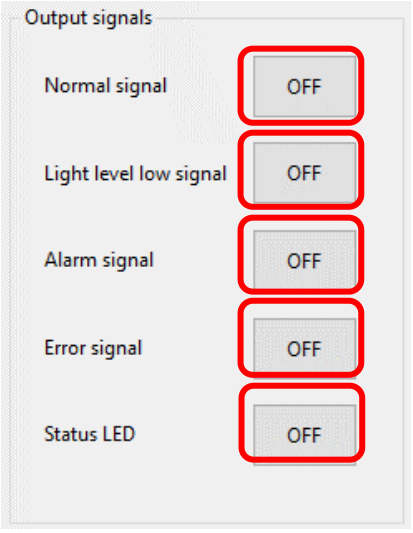
Communication is initiated in test mode.



(2) Click [OFF] next to the item for which to check output signals.

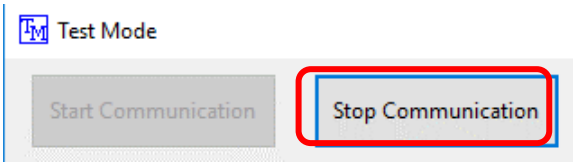
Display switches to [ON], and the corresponding output signal is activated. To deactivate output signals, click [ON].

The status LED is red when the state is on and green when the state is off.



(3) Click [Stop Communication].

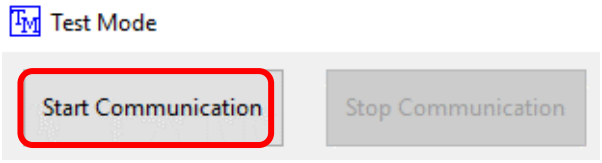
Communication in test mode stops.



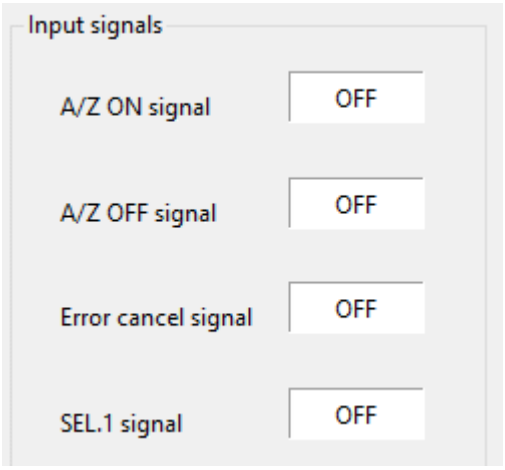
13-3. Checking Input Signals

This section describes the procedure for checking input signals.

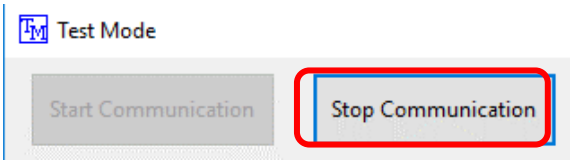
(1) Click [Start Communication].
Communication is initiated in test mode.



(2) Activate TMHSB input signals. Display of corresponding input signals switches to [ON].



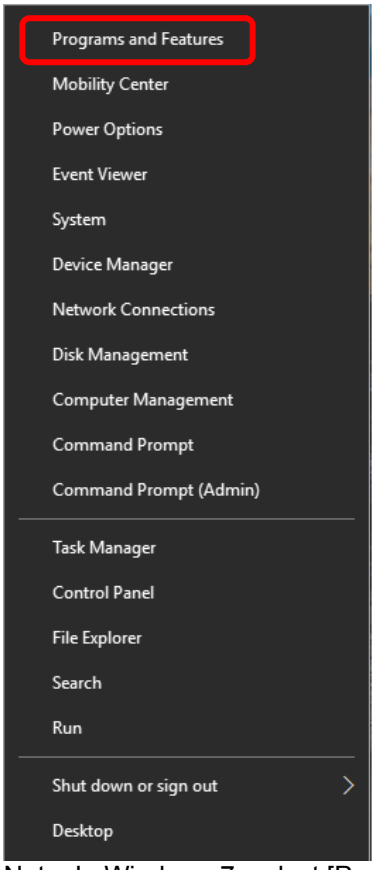
(3) Click [Stop Communication].
Communication in test mode stops.



14. Uninstalling

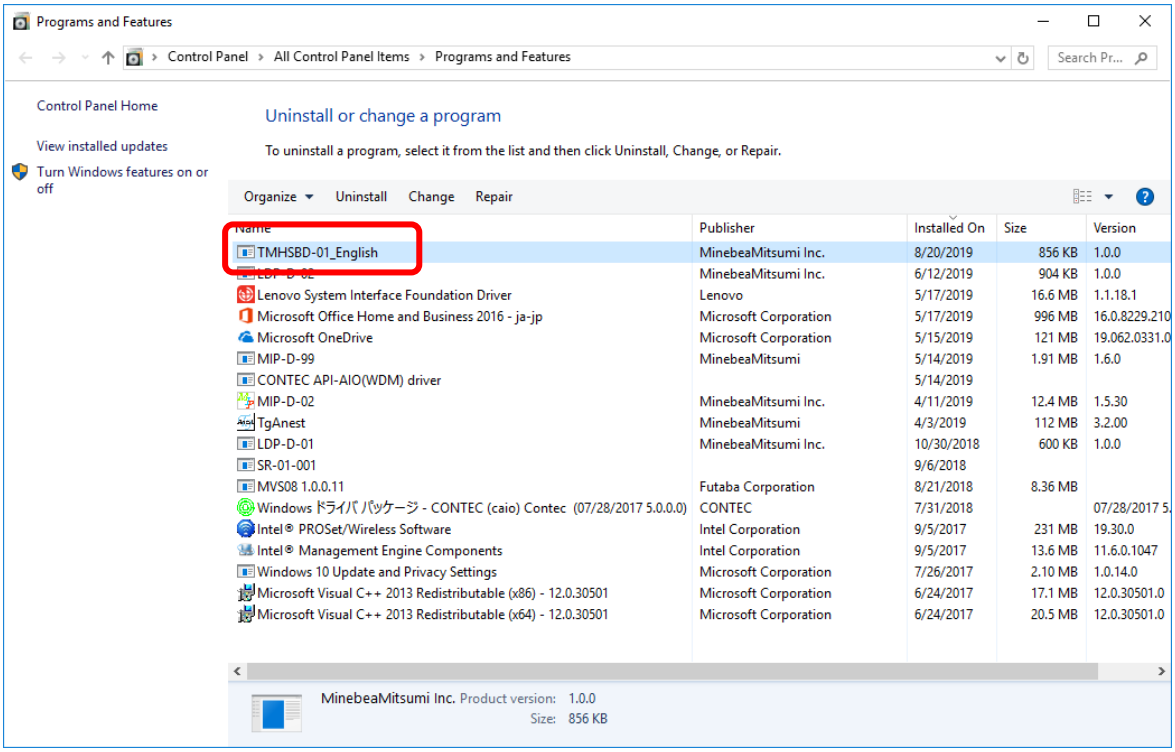
To uninstall (delete) the software, use the following procedure.

(1) Right-click the desktop Start button, then click [Apps and Features] in the menu displayed.

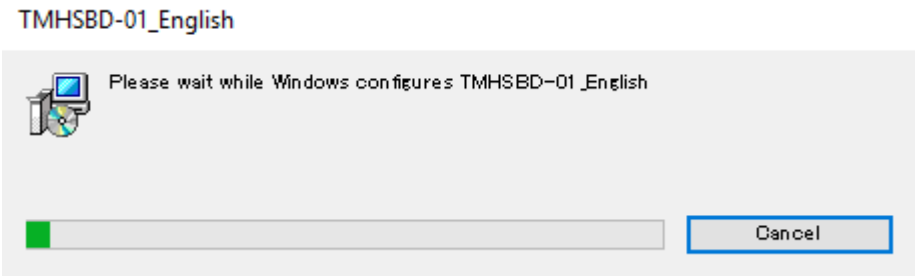


Note: In Windows 7, select [Programs and Features] in Control Panel.

(2) Select [TMHSBD-01], then execute [Uninstall].



(3) Uninstalling is complete once the following window disappears.



●The contents of this manual may subject to change without notice.

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