TM301

TORQUE MONITOR

OPERATION MANUAL

01JUL2018REV.3.03

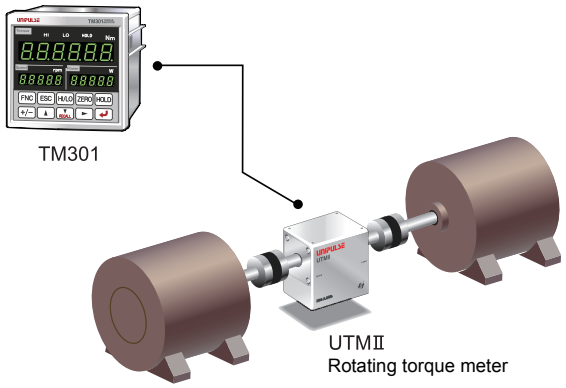
UNIPULSE

Introduction

Thank you very much for purchasing our Torque Monitor TM301.

The TM301 is an indicator only for our company UTMⅡ series. Equipped with peak hold and HI/LO limit comparison functions, the TM301 is used for a testing machine etc.

To take full advantage of high performance of TM301, thoroughly read this operating manual first before use and understand the explanations contained herein for correct operating procedures.Also, carefully store this instruction manual so that it can be referred to at any time.



Safety Precautions

BE SURE TO READ FOR SAFETY

Installation, maintenance and inspection of the TM301 should be performed by personnel having technical knowledge of electricity.

In order to have an TM301 Torque Monitor used safely, notes I would like you to surely follow divide into " ⚠ WARNING " and " ⚠ CAUTION ", and are indicated by the following documents.

Notes indicated here are the serious contents related to safely.

Please use TM301 after understanding the contents well.

⚠ WARNING

This sign forewarns the presence of hazards that could result in serious injury or fatality when incorrectly handled.

⚠ CAUTION

This sign forewarns the presence of hazards that could result in personnel injury or property damage when incorrectly handled.

⚠ WARNING

This sign forewarns the presence of hazards that could result in serious injury or fatality when incorrectly handled.

Warning on design

- For the entire system to function safely when the TM301 becomes faulty or malfunctions, provide a safety circuit outside the TM301.
- Before using the TM301 as described below, make sure to consult with our sales personnel.
  - Use in environments not described in the operation manual.
  - Use greatly impacting human lives and assets, such as medical devices, transport devices entertainment devices, and safety devices.

Warning on installation

- Do not disassemble, repair, or modify the TM301. Doing so may cause a fire or an electric shock.
- Do not install in the following environments.
  - Places containing corrosive gas or flammable gas.
  - Where the product may be splashed with water, oil or chemicals.

Warning on wiring

- Do not connect a commercial power source directly to the signal input/output terminals.
- Be sure to ground the protective ground terminal.
- The attached AC cable is designed for domestic use in Japan, and its rating is 125V AC, 10A. For use at voltages exceeding the rating and for overseas use, have a separate AC cable prepared.
- Before performing the following, make sure that no power is applied.
  - Attachment/detachment of connectors of options, etc.
  - Wiring/connection of cables to the signal input/output terminals.
  - Connection to the ground terminal.
- For connection to the signal input/output terminals, check the signal names and pin assignment numbers, and then carry out wiring properly.
- After wiring, be sure to mount the attached terminal block cover. Otherwise, it may cause an electric shock.
- Do not connect anything to unused terminal(s).
- Before applying power, carefully check the wiring, etc.

Warning during startup and maintenance

- Use a power supply voltage and load within the specified and rated ranges.
- Do not damage the power cord. Doing so may cause fire or electric shocks.
- Do not touch any signal input/output terminal while applying power. Doing so may cause electric shocks or malfunctions.
- If the cover of the main body is opened, it may cause an electric shock internally. Even if the power is off, the internal capacitor is charged. Contact us for internal inspection or repair.
- In the case of smoke, an abnormal smell or strange sound, immediately turn off the power, and disconnect the power cable.

⚠ CAUTION

This sign forewarns the presence of hazards that could result in personnel injury or property damage when incorrectly handled.

Caution on installation

- Use the TM301 as it is incorporated in a control panel, etc.
- Do not install in the following environments.
  - Where the temperature/humidity exceeds the range of the specifications.
  - Where the temperature changes remarkably or there is a danger of freezing or condensing.
  - Outdoors, or where the altitude exceeds 2000m.
  - Places exposed to direct sunlight
  - Dusty places
  - Poor-ventilated places
  - Places containing large quantities of salt or iron powder.
  - Where the main body is directly affected by vibrations or shocks.
- Take adequate shielding measures when using at the following locations.
  - Near a power line.
  - Where a strong electric field or magnetic field is formed.
  - Where static electricity, relay noise or the like is generated.
- Install the TM301 as far away from devices generating high frequency, high voltage, large current, surge, etc., as possible. Also, carry out wiring separately from their power lines. Do not carry out parallel wiring and common wiring.
- Do not use it, broken down.

Caution on wiring

- Tighten the screws for the power input terminal at the specified torque.
  If they are loose, shorts, fire or malfunctions may occur.
  Tightening torque: 0.5N•m
- For external inputs/outputs and options, use shielded cables.
- The temporary overvoltage applied to the power should not exceed 1500V.

Caution during startup and maintenance

- For turning on/off the power, be sure to keep intervals of 5 seconds or more.
- After power-on, make sure to warm up the TM301 for at least 30 minutes or more before use.
- If the TM301 is not used by the specified method, its protective performance may be impaired.
- Maintenance
  - When performing maintenance, disconnect the power.
  - Do not wipe with a wet rag, or with benzine, thinner, alcohol, etc. Doing so may cause discoloration or deformation of the TM301. In the case of heavy contamination, wipe off the contamination with a cloth after dipping it into a diluted neutral detergent and wringing it well, and then wipe with a soft, dry cloth.

Caution during transportation

- When the TM301 is shipped, spacers made of corrugated cardboard are used as cushioning materials.
  Though it is factory-designed so that shocks can sufficiently be absorbed, breakage may result if shocks are applied when the spacers are reused for transportation. If you send the TM301 to us for repair, etc., take adequate measures against shocks by using polyurethane materials, etc., separately.

⚠ CAUTION **This sign forewarns the presence of hazards that could result in personnel injury or property damage when incorrectly handled.**

Caution during disposal

- If you dispose of the product, handle it as industrial waste.
  Also, make sure to remove the built-in lithium battery and collect it separately.

About the Built-in Lithium Battery

⚠ WARNING **This sign forewarns the presence of hazards that could result in serious injury or fatality when incorrectly handled.**

- Never disassemble, deform under pressure or throw the battery into fire.The battery may explode, catch fire or leak.

RoHS-Compliant Product

The parts and attachments (including the instruction manual, packaging box, etc.) used for this unit are compliant with the RoHS Directive restricting the use of hazardous substances with regard to adverse effects on the environment and human body.

What is RoHS?

It is an abbreviation for Restriction on Hazardous Substances, which is implemented by the European Union (EU). The Directive restricts the use of six specific substances in electric and electronic equipment handled within EU borders. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).

Contents

M E M O

Chapter 1

OUTLINE

1 OUTLINE

1-1. Main features of the TM301

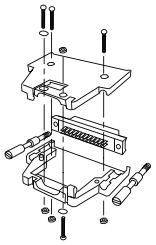
- The TM301 is a simple torque monitor that can easily be connected to our torque meter UTMⅡ series with a dedicated cable.
- In addition to torque, rotation speed and power can also be displayed.
- The TM301 is equipped with hold functions with respect to torque.
  (sample, peak, bottom, P-P, and average holds)
- The TM301 is equipped with the function of recording data according to a print command of the SI/F (up to 30 pieces of the most recent data). Also, data can be checked on the spot by key operation.
- The TM301's compact size of DIN96×96 realizes space-saving.
- By mounting an optional interface according to the purpose, ease of load control can be further improved.

1-2. Contents of the package

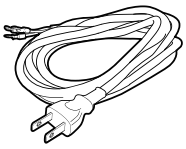
The packaging box contains the following.
Be sure to check them before use.

TM301 body・・・1

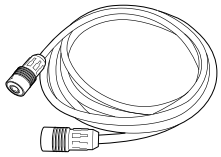
TM301 operation manual・・・1



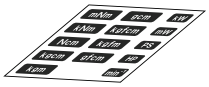
External input/output connector・・・1



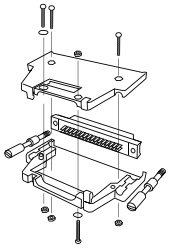
AC input cord (3m)・・・1
(with solderless terminal)



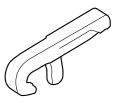
Cable for UTMⅡ connection (2m)・・・1
(with connector)



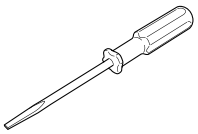
Unit seal・・・1



Connector for
BCD parallel data output・・・1
(with BCD parallel data output option)



Operating tool・・・1
(with D/A converter (3ch) option)

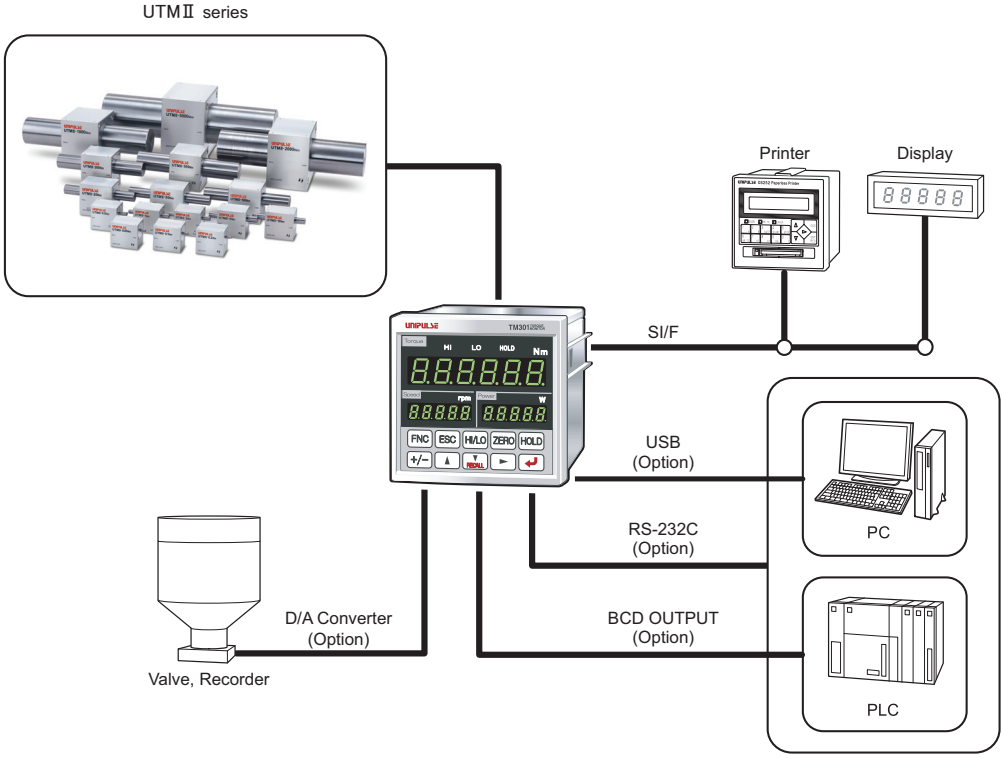


Mini screwdriver for
terminal block connection・・・1
(with D/A converter option)

⚠ CAUTION

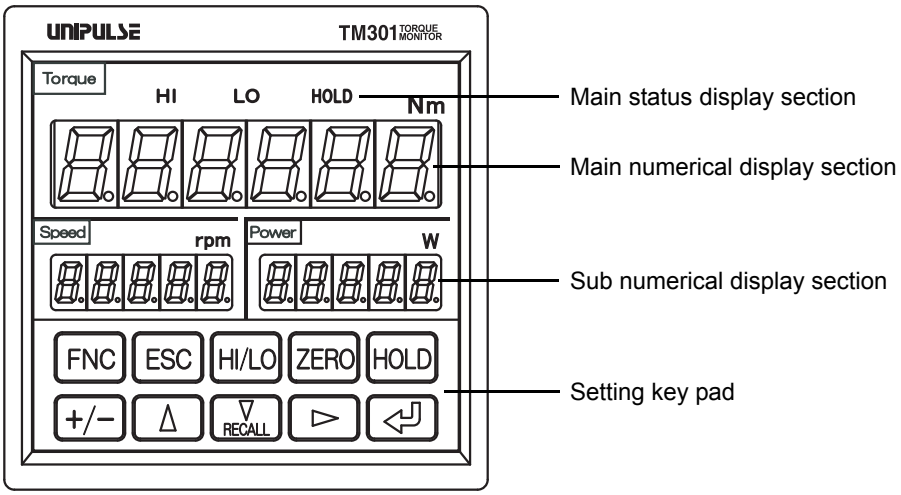
The attached AC cable is intended for domestic use in Japan, and it is rated as 125V AC, 10A. If it is used at voltages exceeding the rating or it is used overseas, have a suitable AC cable ready separately.

1-3. About connectable devices



1-4. Appearance description

■Front panel



Main status display section

The status with respect to torque is indicated.

HI: Lights when the indicated value is larger than the HI limit.
Indicates that the external output "HI" is ON.

LO: Lights when the indicated value is smaller than the LO limit.
Indicates that the external output "LO" is ON.

HOLD: Blinks during hold detection, and lights when a hold is confirmed.
Also, it blinks when hold waiting in all section sample hold.

Main numerical display section

The following display patterns exist.

Indicated value: Displays torque during measurements.

Error display: Displays an error message when an error occurs.

Setting value: Displays setting values in setting mode.

Sub numerical display section

The following display patterns exist.

Indicated value: Displays rotation speed and power during measurements.

Error display: Displays an error message when an error occurs.

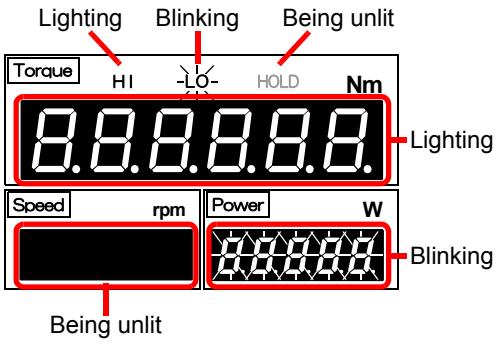
Setting value: Displays the mode number and item number at the rotation speed display section in setting mode; the load value may be displayed at the power display section according to the setting item.

In this operation manual, the display status is expressed as follows:

Lighting: Status display section → Black
Numerical display section → White

Blinking: Lighting state + Lines in a radial pattern

Being unlit: Status display section → Gray
Numerical display section
→ Nothing displayed



Setting key pad

These are keys for commanding settings and operations.

- Use this key to go to a setting mode state.

- Use this key to cancel setting/execution.
- Use this key to go back from a setting mode state to an indication display state.

- Use this key to take a shortcut from an indication value display state to HI/LO limit setting.

- Use this key to go from an indication value display state to torque Digital Zero ready.

- Use this key to execute/release the hold in an indication value display state.

- Use this key to switch the setting in HI/LO limit setting mode.
- Use this key to set whether or not to sign a setting value, when available, in a setting value input state.

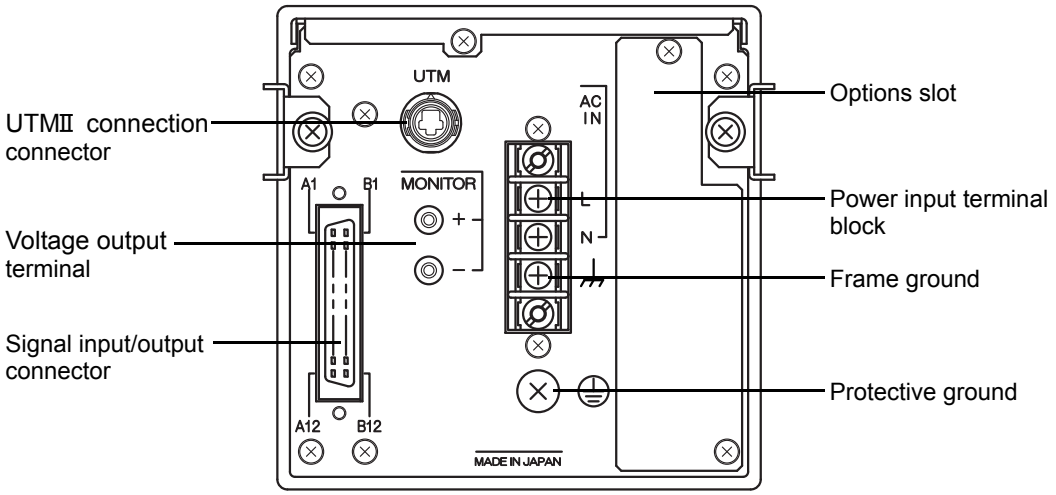
- Use this key to select a trailing setting item number in a setting mode state.
- Use this key to select the previous item number in a setting item select state.
- Use this key to increment the numerical value by one in a setting value input state.

- Use this key to go from an indicated value display state to history mode (record data display).
- Use this key to select a leading setting item number in a setting mode state.
- Use this key to select the next item number in a setting item select state.
- Use this key to decrement the numerical value by one in a setting value input state.

- Use this key to execute Digital Zero reset in a Digital Zero ready state.
- Use this key to increment the leading setting mode number by one in a setting mode state.
- Use this key to move the setting digit by one in the lower direction in a setting value input state.

- Use this key to execute Digital Zero in a Digital Zero ready state.
- Use this key to move to a setting value input state in a setting item select state.
- Use this key to validate the setting value in a setting value input state.

■Rear panel



UTMⅡ connection connector

Connect a UTMⅡ with a dedicated cable.

* For connection, see "■UTMⅡ connection" on page 10.

Voltage output terminal

Input voltage from the UTMⅡ can be checked. (The same as the output voltage of the UTMⅡ.)

* For connection, see "■Voltage output" on page 10.

Signal input/output connector

Connect external input/output signals or SI/F (serial interface).

* For connection, see "■External I/O connection" on page 11.

Power input terminal block

Connect an AC input cord.

The input power source is free in the range of 100 to 240V AC (-15%, +10%). The frequency is 50/60Hz.

* For connection, see "■Power input terminal connection" on page 9.

Frame ground ⏚

Please ground the frame ground terminal to prevent failures due to static electricity.

(The frame and the frame ground terminal are conducted.)

It may be better to remove depending on the environment of the installation location.

Protective ground ⏚

This is a protective ground terminal. Be sure to ground the protective ground terminal to prevent electric shocks.

* For connection, see "■Protective ground connection" on page 9.

Options slot

One option board can in stall in the option slot.

- BCD parallel data output (BCO)
- RS-232C interface (232)
- D/A converter voltage output (3ch) (D3V)
- D/A converter voltage output (DAV)
- D/A converter current output (DAI)
- USB interface (USB)

2 INSTALLATION & CONNECTION

The following are precautions related to connection.
The precautions described here are important for safety.
Make connections after properly understanding the description.

⚠ WARNING

- Do not connect commercial power directly to the signal input/output terminals.
- Make connection to the signal input/output terminals with no power applied because you may receive an electric shock.
- For connections to the signal input/output terminals, carry out wiring properly after confirming the signal names and pin assignment numbers.
- The attached AC cable is intended for domestic use in Japan, and it is rated as 125V AC, 10A. If it is used at voltages exceeding the rating or it is used overseas, have a suitable AC cable ready separately.
- After wiring, make sure to mount the attached terminal block cover. Otherwise, you may receive an electric shock.
- Turn on the power after carefully checking the wiring, etc.
- Do not touch the signal input/output terminals while the power is on. Otherwise, you may receive an electric shock, or a malfunction may occur.

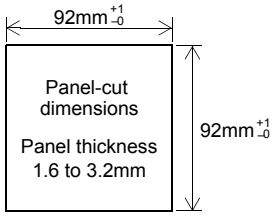
⚠ CAUTION

- Tighten the terminal screws at specified torque. If the terminal screws are loose, short-circuiting, fire, or a malfunction may occur.
- Use shielded cables.

2-1. Installation

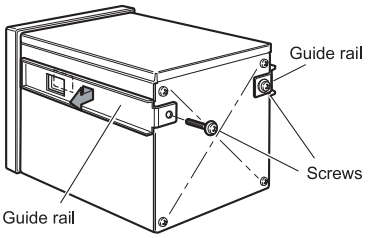
To install the TM301 into a control panel, use the following procedure.

1. Make a hole in the panel according to the panel-cut dimensions.

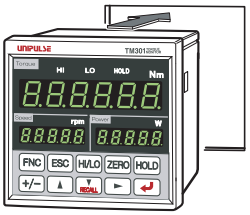


2. Remove the screws (two), and remove the guide rails from both sides.

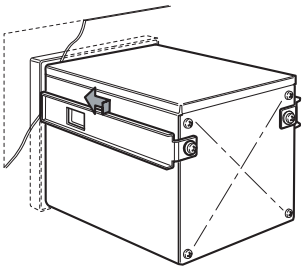
* Do not use other screws than those installed to the TM301 body.



3. Fit in the TM301 from the front of the panel.



4. Install from the rear the guide rails having been removed from both sides in Step 2, and fix them with the screws (two).



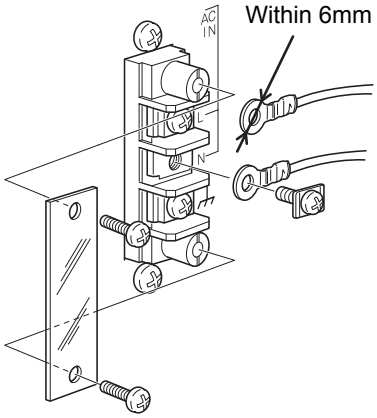
2-2. Connection

■Power input terminal connection

Connect an AC input cord. The input power source is free in the range of 100 to 240V AC (-15%, +10%). The frequency is 50/60Hz.

Make connections to the terminal block with a solderless terminal within 6mm in diameter as shown in the illustration so as not to let the tip of the cable spread out.

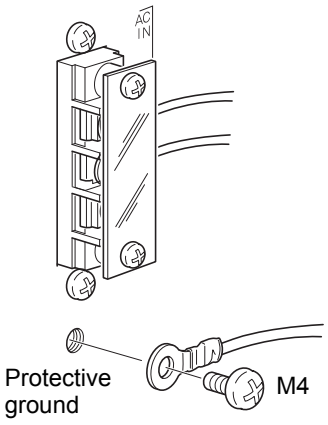
1. Make sure that no power is applied.
2. Remove the terminal block cover.
3. Remove the two screws("L" and "N") at the terminal block.
4. Align the solderless terminals with the screw holes, and then tighten the screws.
5. Mount the terminal block cover.



■Protective ground connection

The grounding terminal is for prevention of electric shocks.
Use an approx. 0.75mm^2 thick wire, and be sure to ground.

1. Make sure that no power is applied.
2. Remove the screws(M4) at the protective ground.
3. Align the solderless terminals(M4) with the screw holes, and then tighten the screws.

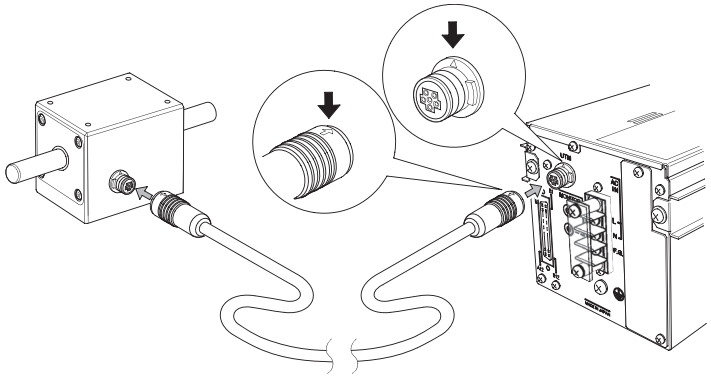


⚠ WARNING

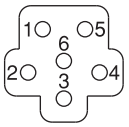
- Connect with no power applied because it may cause an electric shock.
- The attached AC cable is designed for domestic use in Japan, and its rating is 125V AC, 7A. For use at voltages exceeding the rating and for overseas use, have a separate AC cable prepared.
- Since the TM301 has no power switch, install a breaker.
- Be sure to ground the protective ground terminal to prevent electric shocks. Do not use other screws than that attached to the main body.

■UTMⅡ connection

A UTMⅡ can easily be connected with the attached dedicated cable. The cable is nonpolar. Connect paying attention to the orientation of the connector.



●Pin assignments

Pin arrangement	Pin No.	Cable color	Signal name
	1	Red	PWR+ (+24V)
	2	Black	PWR– (0V)
	3	Green	SIG IN (±5V DC)
	4	White	SIG GND
	5	Yellow	PULSE IN+
	6	Brown	PULSE IN–
	Shield	Braided wire	* The shield is not connected to the UTMⅡ housing.

* The wiring colors are those of the cable attached to the UTMⅡ.
* Compatible connector: HR30-6P-6P (HIROSE) (connector optional type: CN90)

■Voltage output

The voltage output terminal outputs the input voltage from the UTMⅡ as it is turned back.
The check of voltage is possible at the probe of a voltmeter, etc.
Since the output voltage is taken out in a step prior to A/D conversion of the sensor input signal, it is not synchronized with indicated values processed digitally, such as Digital Zero and digital filter.
Output in synchronization with indicated values requires an optional D/A converter.
The ±MONITOR terminals are not insulated from the internal circuit.
Use terminal: C-55-111A (manufactured by Miraial or an equivalent) φ2, Depth: 6mm
Compatible terminal: C-55-155B (manufactured by Miraial or an equivalent)

⚠ CAUTIONWARNING

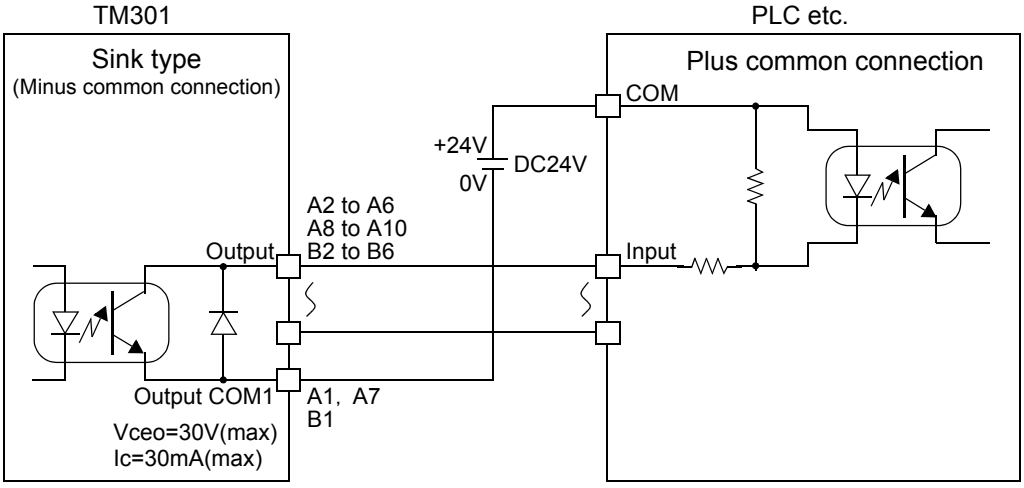
- Do not short-circuit. Doing so will cause a failure.
- Do not apply voltage externally. Doing so will cause breakage.

■External I/O connection

Details of signal, see "8-1.External I/O" on page 55.

- How to connect external output (Sink type)

The external output circuit is operated through an open collector. A1(A7) COM1 is the common terminal. The open collector output capacity is 30mA and the withstand voltage is up to 30V.



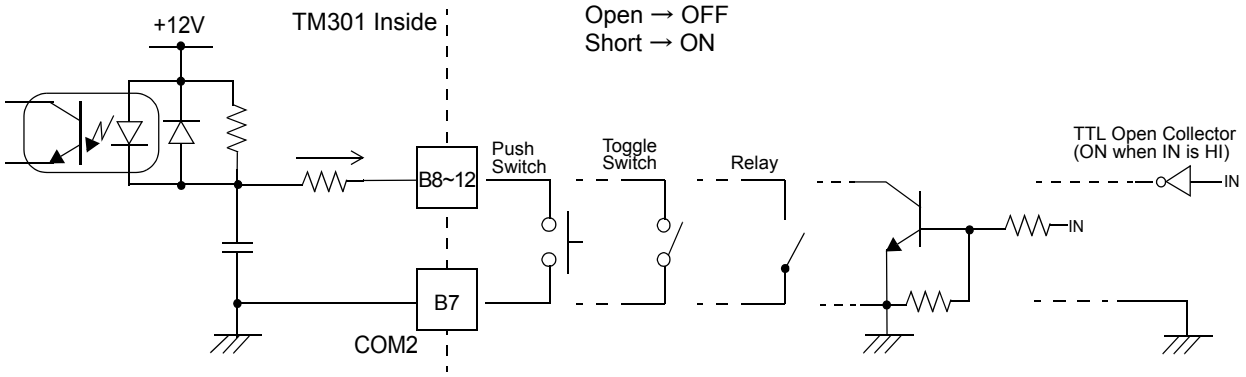
●Output transistor status

Output data	Tr
OFF	OFF
ON	ON

For driving, have an external power source ready.
(24V DC is shown in the illustration.)

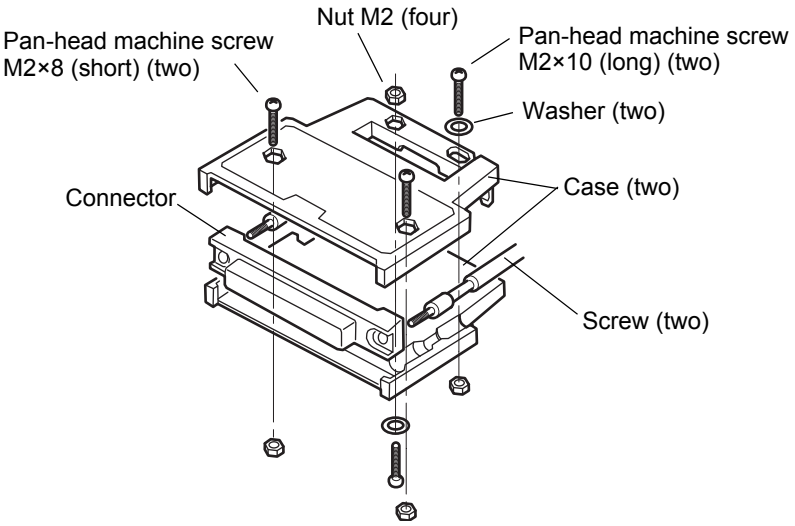
- How to connect external input (minus common connection of no-voltage contact input type)

A signal is inputted to the signal input circuit by short-circuiting or opening the input terminal and the COM2 terminal. Short-circuiting is effected by means of a contact (such as a relay or a switch) or a noncontact (such as a transistor or an open-collector TTL)



- The external element is required to withstand Ic=10mA.
- Leakage from the external element is required to be 100μA or below.

■How to assemble the connector



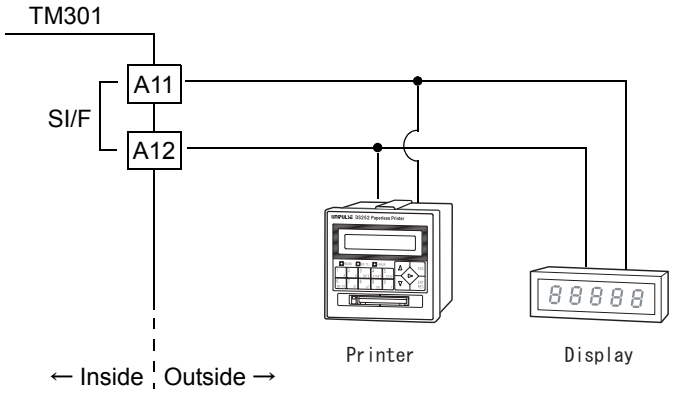
1. Set the connector and screws (two) into the grooves of the case (one side).

2. Cover with the other case, and fit the cases.

3. Tighten the M2×8 pan-head machine screws (two).
Tighten the M2×10 pan-head machine screws (two).
Be aware that washers should be set to the M2×10 pan-head machine screws (two).

■SI/F interface connection

Two-wire serial interface (SI/F) for connecting printers and external display from UNIPULSE.
Connect from A11 and A12 of the external input/output connector.
The interface is nonpolarized and up to three external devices can be connected.
Wiring materials should use a two-core parallel cable, cabtyre cable (electric wire with covering thickened for construction), etc. When a two-core parallel cable or a cabtyre cable is used, the transmission distance is approximately 30m. When a two-core shielded twisted pair wire is used, the transmission distance is approximately 300m.
Do not parallel it with AC lines and high-voltage lines. Doing so will cause malfunction.

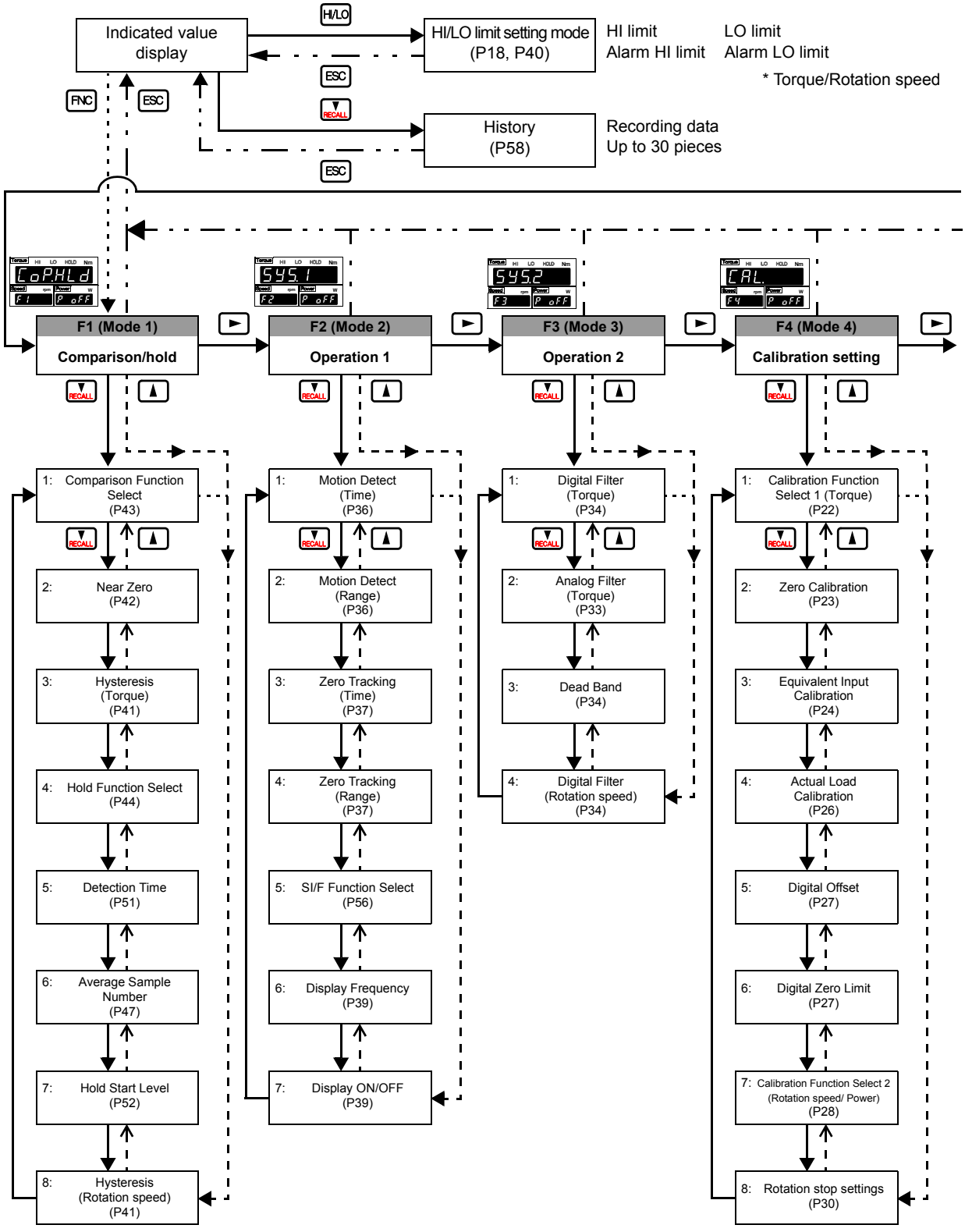


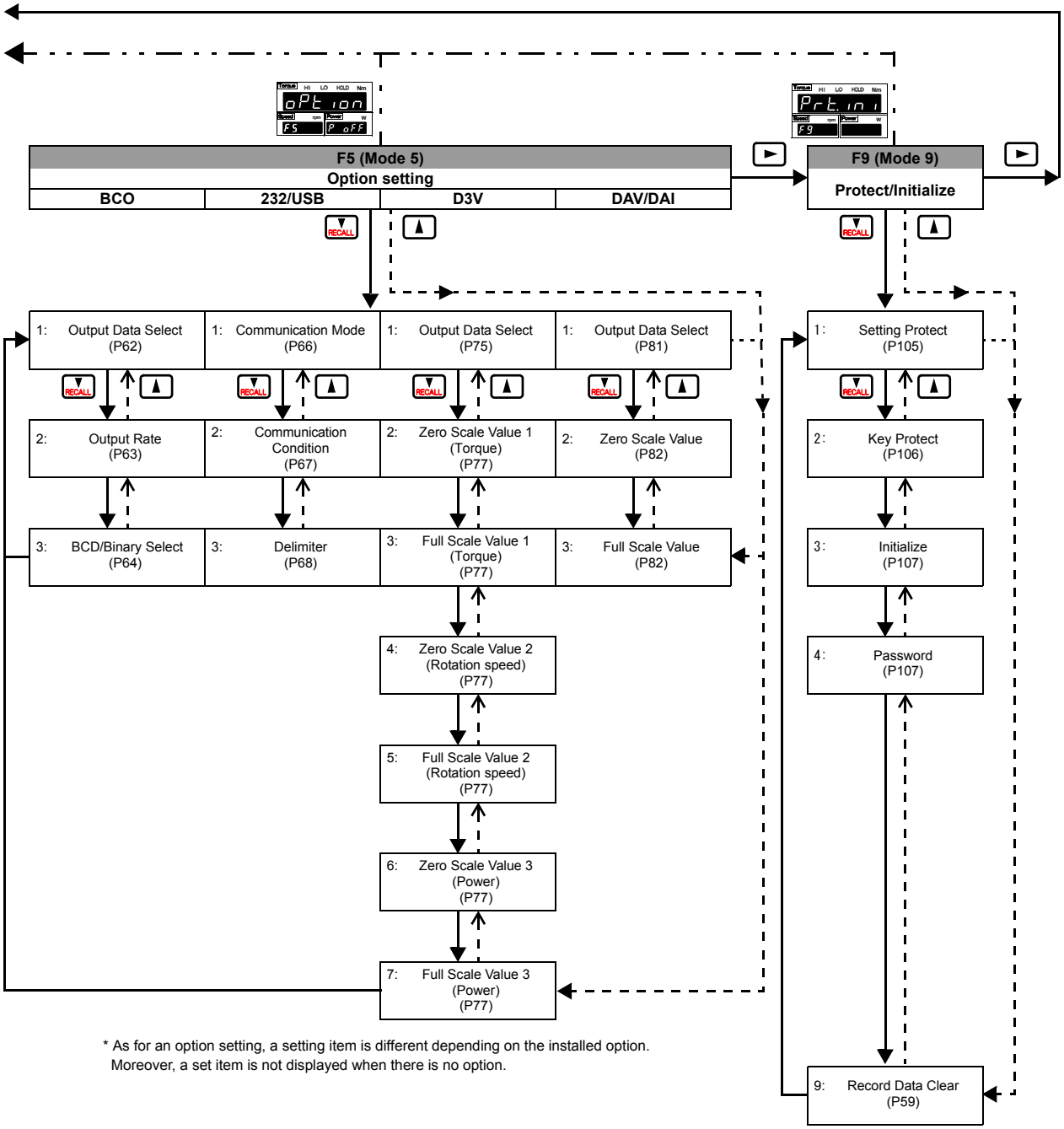
Point

For purchasing peripheral devices, consult our sales department.

3 SETTING MODE CONFIGURATION

3-1. Setting mode composition

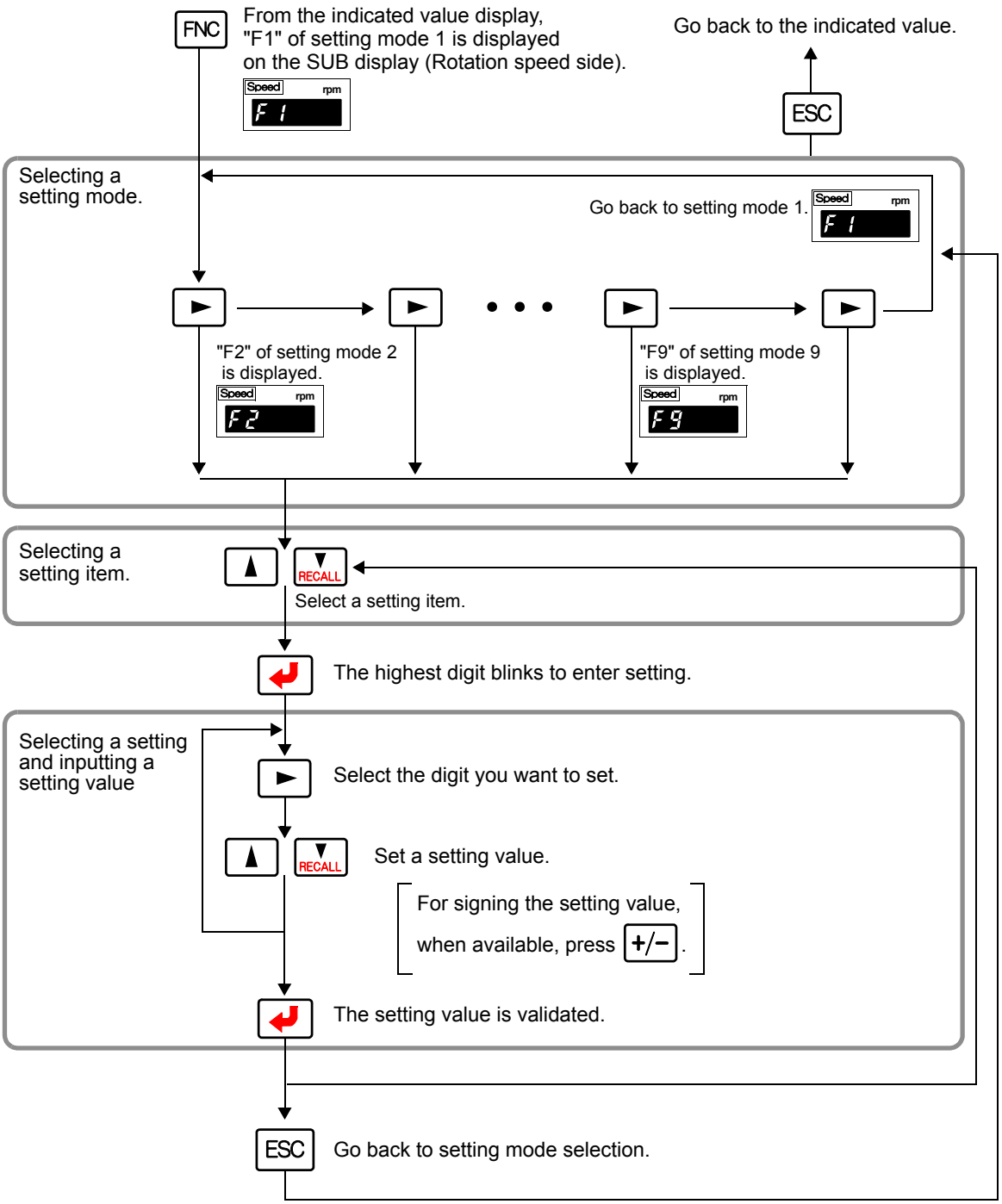




* As for an option setting, a setting item is different depending on the installed option.
Moreover, a set item is not displayed when there is no option.

3-2. Key operation

≪Setting procedure≫

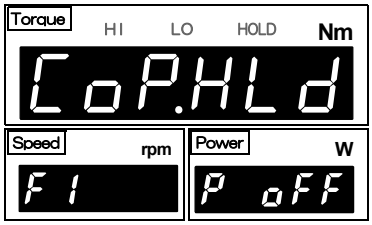


Point

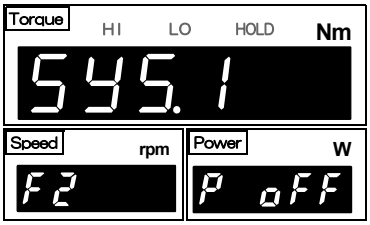
If key operation is not performed for one minute or more between the time of pressing the FNC key and the time of validating with the ↵ key, the setting is stopped to go back to the indicated value display. In that case, the setting value is not saved.

≪Setting mode select state≫

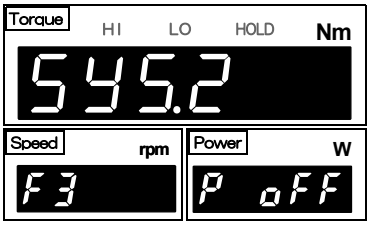
【Setting mode 1 (COP.HLD)】



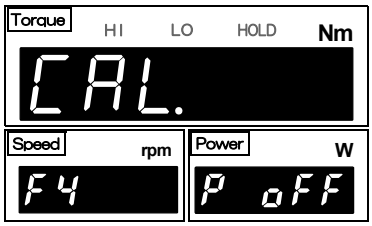
【Setting mode 2 (SYS.1)】



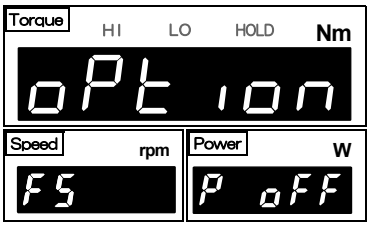
【Setting mode 3 (SYS.2)】



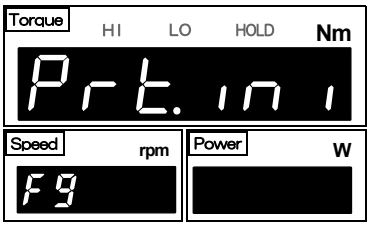
【Setting mode 4 (CAL.)】



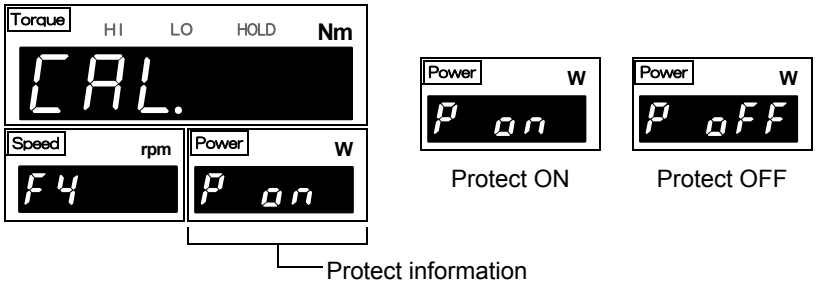
【Setting mode 5 (OPTION)】



【Setting mode 9 (PRT.INI)】



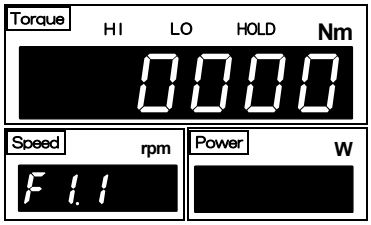
The protect state of each setting mode is visible at a glance.



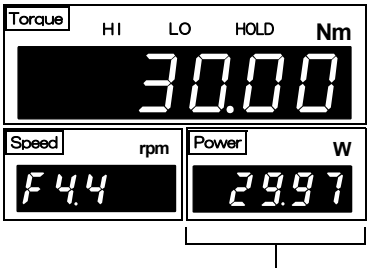
For the protect setting method,
see " ■ Setting protect setting method " on page 105.

≪Setting item select state≫

【Normal setting item】



【Calibration operation item】
(Zero calibration,
equivalent input calibration,
actual load calibration)



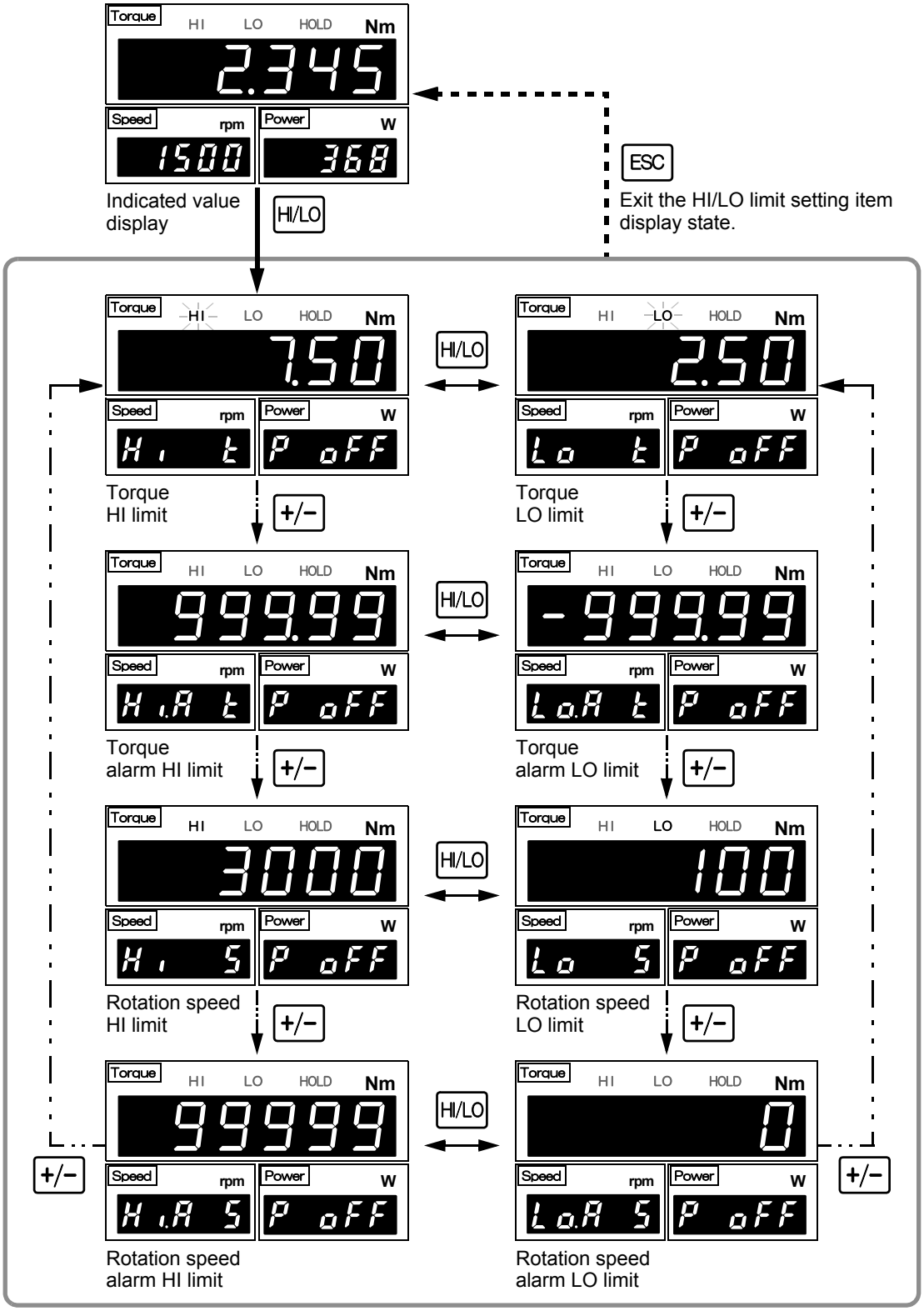
Example) Torque 29.97

≪HI/LO limit setting mode function≫

By pressing [HI/LO] on the indicated value display screen, you can enter a HI/LO limit setting item select state.

Press [↵] at the setting value you want to change, and you will go to a setting value input state.

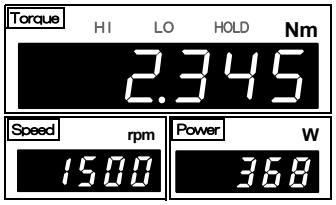
After inputting the setting value, you will go back to the HI/LO limit setting item state.



3-3. Calling a setting mode

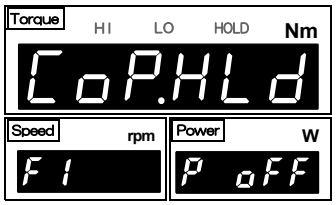
Example) For changing the digital filter (torque) from "000" to "256"

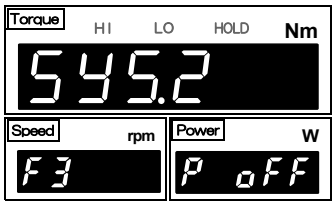
1. Press [FNC] from an indicated value display state.



2. Go to a setting mode select state.

Press [►] twice to make the mode number "3."

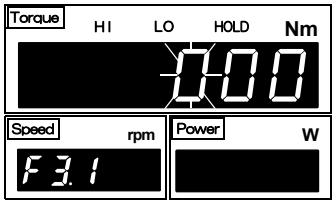




3. Go to a setting item select state.

Press [RECALL] once to select F3-1.

Press [↵].



4. Go to a setting value input state.

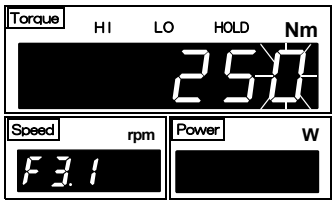
Press [►] to move the setting digit.

Press [▲] [RECALL] to change the numerical value.

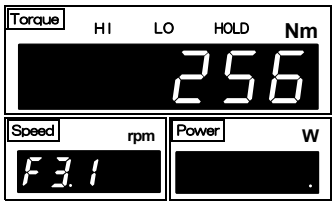
Press [↵] to validate it.

The change can be cancelled by pressing [ESC].

While a signed setting value is being input, press [+/−] to select whether or not to sign it.

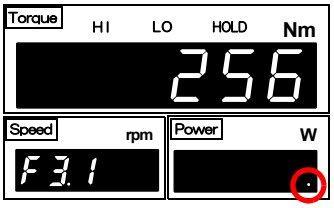


5. Upon validation, you will go back to the setting item select state.



Point

While the lowest decimal place on the sub display (power display side) is lit, writing in NOVRAM is in progress.
If the power is turned off at this time, normal writing cannot be performed.



4 CALIBRATION PROCEDURE

4-1. How to perform calibration

"Calibration" refers to an operation whereby matching between the TM301 and a sensor is obtained. The TM301 uses the two calibration methods as described below.

■Equivalent input calibration

Calibration is performed without an actual load by entering the rated output value (V) and the capacity (to be indicated) of the sensor by the keys. Calibration is easily performed when no actual load is available.

For example, gain will be automatically decided by registering the values as follows.

for UTMⅡ-0.1Nm: 5.000V－0.100Nm
for UTMⅡ-2Nm: 5.000V－2.000Nm
for UTMⅡ-50Nm: 5.000V－50.00Nm
for UTMⅡ-100Nm: 5.000V－100.00Nm

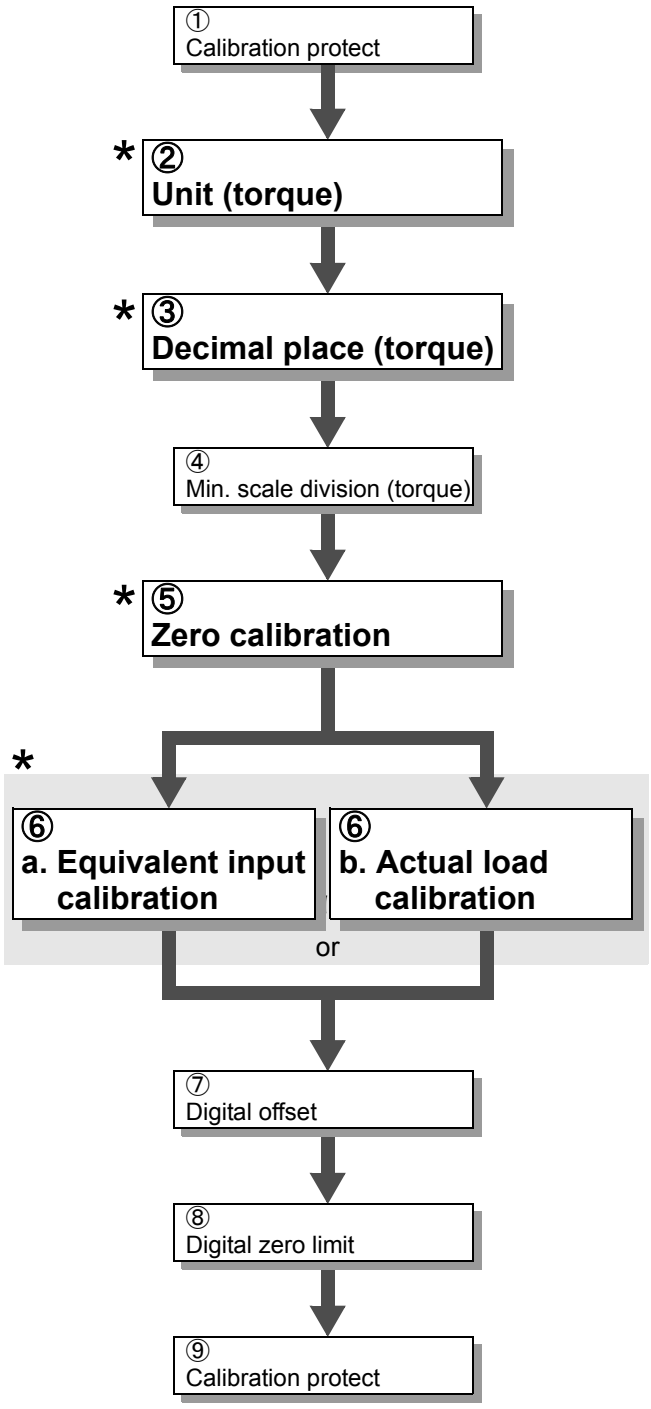
■Actual load calibration

This approach provides calibration by applying an actual load to the sensor and inputting the actual load value. This calibration is without little errors and more correct.

* Perform either actual load calibration or equivalent input calibration. If an actual load cannot be applied, make sure to perform equivalent input calibration alone.

4-2. Procedure of equivalent input calibration and calibration protect (torque)

The equivalent input calibration and the calibration protect uses the following procedure :



Turn off the calibration protect that inhibits calibration.

Set the unit according to the UTMII used.

Set the decimal place.

Set the desired minimum value of digital increments.
(This step may be omitted if there is no change.)

Set the zero point of the sensor in no-load condition (with the sensor unloaded).

Equivalent input calibration
Register the rated output value of the sensor, and the capacity.

Actual load calibration
Set the span (gain) point with a load applied to the sensor.

The calibrated value can be offset in advance.
When not using, set "0."
(This step may be omitted if there is no change.)

Set the load limit that allows digital zero.
(This step may be omitted if there is no change.)

Turn on the calibration protect to prevent misoperation.

* : It is indispensable.

①Releasing the calibration protect

Turn off the calibration protect that inhibits calibration.

≪Setting value≫

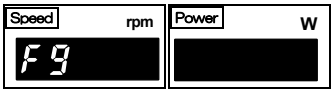
0: OFF Enables rewriting of setting values.

1: ON Disables rewriting of setting values.

◇Calibration protect setting method

1. Select setting mode 9.

Press [FNC] → [►] five times.



2. Set "Calibration protect."

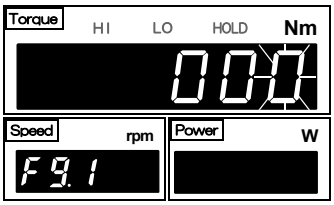
Press [▼ RECALL] once. ⇒ "Setting protect" is displayed.

Press [↵] → [►] twice to make the digit of the calibration protect blink.

Input the setting value with [▲] [▼ RECALL].

(Initial value: 0)

Press [↵] to validate it.



《Setting value》

0 0 0

- Calibration protect: 0: OFF 1: ON
- System protect: 0: OFF 1: ON
- Work protect: 0: OFF 1: ON

3. Press [ESC] twice to go back to the indicated value display.

②Unit (torque) setting

Set the unit for performing calibration.

After this setting, make sure to perform calibration.

≪Setting value≫

0: mNm 1: Ncm 2: Nm 3: kNm 4: kgm 5: kgcm 6: gcm

③Decimal place (torque) setting

Set the decimal place for load-value-related display, setting items, etc.

≪Setting value≫

0: None 1: 0.0 2: 0.00 3: 0.000

Point

Power is calculated by performing internal conversion based on the unit and decimal place settings. Therefore, do not change these settings improperly after calibration. If they are changed, perform calibration again.

For unit conversion, see "4-6.Unit conversion table" on page 32.

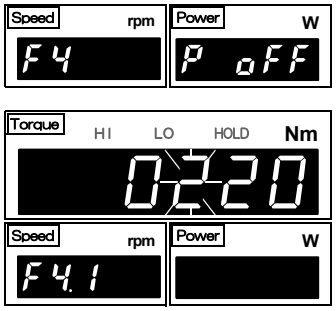
④Min. scale division (torque) setting (This step may be omitted if there is no change.)

Set the minimum unit (scale interval, scale division) of the torque.

≪Setting value≫
0: 1 1: 2 2: 5 3: 10 4: 20 5: 50 6: 100

◇How to set the unit, decimal place, and min. scale division of torque

1. Select setting mode 4.
Press [FNC] → [►] three times.



2. Set "Unit," "Decimal place," and "Min. scale division" of torque.
Press [RECALL] once. ⇒ "Calibration function select 1" is displayed.
Press [↵], and the highest digit blinks.

① Because the highest digit is undefined, move to the lower digit with [►].

② Select unit.
Input the unit with [▲] [RECALL], and move to the lower digit with [►]. (Initial value: 2)

③ Select decimal place.
Input the decimal place with [▲] [RECALL], and move to the lower digit with [►]. (Initial value: 2)

④ Select min. scale division.
Input the min. scale division with [▲] [RECALL], and validate it with [↵]. (Initial value: 0).

《Setting value》
0 2 2 0
- Min. scale division (Torque): 0: 1, 1: 2, 2: 5, 3: 10, 4: 20, 5: 50, 6: 100
- Decimal place (Torque): 0: None, 1: 0.0, 2: 0.00, 3: 0.000
- Unit (Torque): 0: mNm, 1: Ncm, 2: Nm, 3: kNm, 4: kgm (kgfm), 5: kgcm (kgfcm), 6: gcm (gfcm)
- Undefined

3. Press [ESC] twice to go back to the indicted value display.

⑤Zero calibration

Register the zero point with the sensor unloaded. Also, if there is any initial load, such as a jig, for measurements, the zero point can be registered with the initial load applied, but the signal input range needs to be considered as the initial load is subtracted from it.

In addition, there is a way of considering the initial load by using the digital offset. See "⑦Digital offset (This step may be omitted if there is no change.)" on page 27.

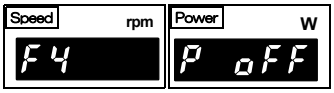
≪Setting value≫
-5.000 to +5.000 [V]

By performing zero calibration, the setting value of zero calibration becomes the sensor output value (V) of the time when it was executed. The load with which zero calibration was performed can be confirmed. However, it stays unchanged when an error occurs.

◇Zero calibration setting method

1. Select setting mode 4.

Press FNC → ► three times.

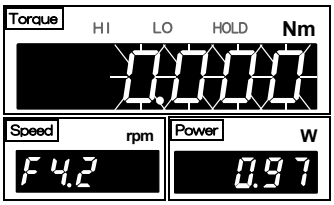


2. Set "Zero calibration."

Press ▼ RECALL twice. ⇒ "Zero calibration" is displayed.

Enter a setting value input state with ↵, and the entire setting value blinks. (Initial value: 0.000)

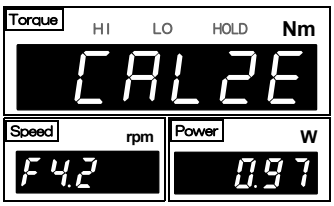
Unload the sensor, check the current load value on the sub display (power display side), and press ↵.



3. Zero calibration is executed.

A message as shown on the right-hand side is displayed.

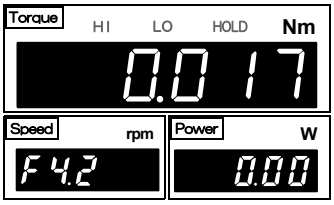
If zero calibration is not executed normally, the alarm sounds and an error is displayed.



4. Go back to the setting item select state.

If zero calibration is executed normally, you will go back to the setting item select state, and the output (V) of the time when it was performed will appear.

The example shows that zero calibration was performed at 0.017V.



5. Press ESC twice to go back to the indicated value display.

⑥a.Equivalent input calibration

Check the specification of the sensor, and register the rated output value and the value you want to display at that time (rated capacity value).

Input the rated output value and display value (rated capacity value) successively.

Equivalent input calibration is not executed by simply inputting the rated output value.

≪Setting value≫

Rated output value [V]:	-5.000 to 5.000 (except 0)
Display value (rated capacity):	-99999 to 99999 (except 0)

By performing equivalent input calibration, the setting value of actual load calibration becomes the input rated capacity value.

However, it stays unchanged when an error occurs.

Point

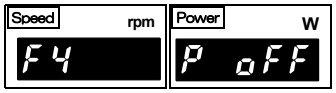
Set a display value (rated capacity value) converted according to the set unit and decimal place of torque.

For unit conversion, see "4-6.Unit conversion table" on page 32.

◇Equivalent input calibration setting method

1. Select setting mode 4.

Press [FNC] → [►] three times.



2. Set "Rated output value" of the sensor.

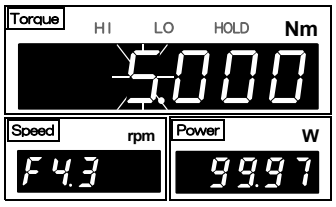
Press [RECALL] three times. ⇒ "Equivalent input calibration" is displayed.

Enter a setting value input state with [↵], and the highest digit blinks.

Check the specification of the sensor in use, and input the rated output value (V) with [▲] [RECALL].

Move to the lower digits with [►]. (Initial value: 5.000)

Press [↵] to validate it.



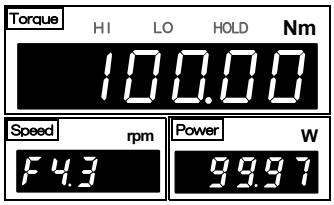
3. Set "Rated capacity value."

Decide the load you want to display at the rated output value, and input it with [▲] [RECALL].

Move to the lower digits with [►].

Press [↵] to validate it.

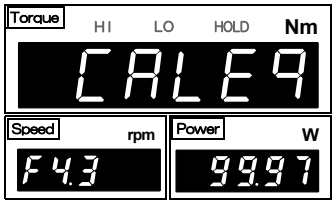
* For inputting a negative sign, press [+/−].



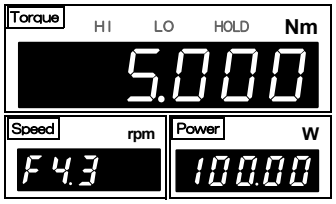
4. Equivalent input calibration is executed.

A message as shown on the right-hand side is displayed.

If equivalent input calibration is not executed normally, the alarm sounds.



5. If equivalent input calibration is executed normally, you will go back to the setting item select state.



Point

If the calibration error (cErr) is displayed, take measures according to each error, and redo calibration. For details, see "12-7.Error/message list" on page 108.

After completion of calibration, make sure to turn on the calibration protect.

⑥b.Actual load calibration

Apply an actual load, and register the value of the actual load (rated capacity value).

≪Setting value≫
-99999 to 99999 (except 0)

By performing actual load calibration, the setting value of equivalent input calibration becomes the sensor output value (V) of the time when it was executed. The load with which actual load calibration was performed can be confirmed. However, it stays unchanged when an error occurs.

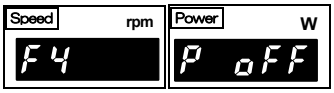
Point

Set a display value (rated capacity value) converted according to the set unit and decimal place of torque.
For unit conversion, see "4-6.Unit conversion table" on page 32.

◇Actual load calibration setting method

1. Select setting mode 4.

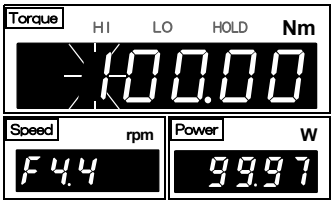
Press [FNC] → [►] three times.



2. Set "Actual load" of the sensor.

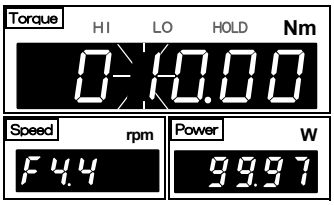
Press [▼ RECALL] four times. ⇒ "Actual load calibration" is displayed.

Enter a setting value input state with [↵], and the highest digit blinks.



Check the capacity of the actually-applied load, and input the value with [▲] [▼ RECALL].

Move to the lower digits with [►]. (Initial value: 10000)

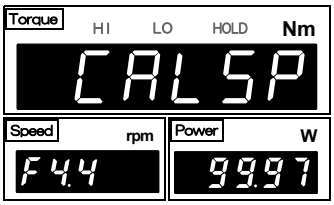


Recheck that the load is properly applied on the sub display (power display side), and press [↵] to validate it.

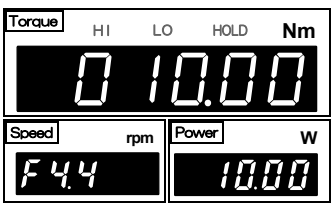
3. Actual load calibration is executed.

If actual load calibration is executed normally, a message as shown on the right-hand side is displayed.

If actual load calibration is not executed normally, the alarm sounds and an error is displayed.



4. If actual load calibration is executed normally, you will go back to the setting item select state.



⑦Digital offset (This step may be omitted if there is no change.)

This function is to subtract a set value from the indicated value. This function is convenient when zero cannot be obtained with no load for some reason or for offsetting. When not using, set "0."

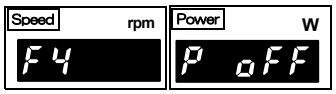
(Displayed value) = (Actual indicated value)−(Setting value of digital offset)

≪Setting value≫
-99999 to 99999

◇Digital offset setting method

1. Select setting mode 4.

Press [FNC] → [►] three times.



2. Set "Digital offset."

Press [▼RECALL] five times. ⇒ "Digital offset" is displayed.

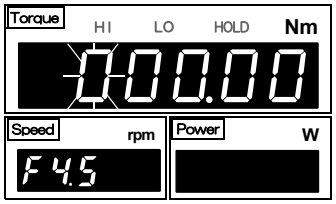
Press [↵], and the highest digit blinks.

Input the setting value with [▲] [▼RECALL].

Move to the lower digits with [►]. (Initial value: 0)

Validate it with [↵].

* For inputting a negative sign, press [+/−].



3. Press [ESC] twice to go back to the indicated value display.

⑧Digital zero limit (This step may be omitted if there is no change.)

Set the load limit that allows digital zero.

If the absolute value of the load at which digital zero is about to be performed is larger than the setting value, an error will result, and the indicated value will not be zeroed.

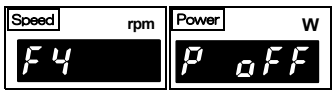
≪Setting value≫
0 to 99999

The amounts of digital zero obtained from the point where zero calibration was performed are monitored.

◇Digital zero limit setting method

1. Select setting mode 4.

Press [FNC] → [►] three times.



2. Set "Digital zero limit."

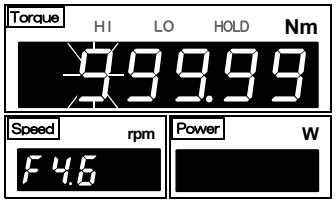
Press [▼RECALL] six times. ⇒ "Digital zero limit" is displayed.

Press [↵], and the highest digit blinks.

Input the setting value with [▲] [▼RECALL].

Move to the lower digits with [►]. (Initial value: 99999)

Validate it with [↵].



3. Press [ESC] twice to go back to the indicated value display.

⑨Locking the calibration protect

Turn on the calibration protect that inhibits calibration.

≪Setting value≫

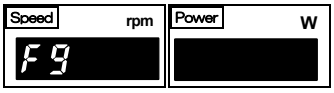
0: OFF Enables rewriting of setting values.

1: ON Disables rewriting of setting values.

◇Calibration protect setting method

1. Select setting mode 9.

Press [FNC] → [►] five times.



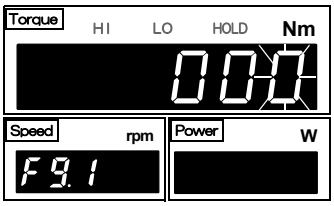
2. Set "Calibration protect."

Press [RECALL] once. ⇒ "Setting protect" is displayed.

Press [↵] → [►] twice to make the digit of the calibration protect blink.

Input the setting value with [▲] [RECALL]. (Initial value: 0)

Press [↵] to validate it.



《Setting value》

0 0 0

Calibration protect
0: OFF 1: ON

System protect
0: OFF 1: ON

Work protect
0: OFF 1: ON

3. Press [ESC] twice to go back to the indicated value display.

4-3. Rotation speed/power display settings

Make settings related to the display of rotation speed and power.

①Pulse rate (rotation speed) setting

Select the rate of a pulse input. Set the number of pulses per rotation.

≪Setting value≫

0: 1 pulse 1: 4 pulses

②Min. scale division (rotation speed) setting

Set the minimum unit (scale interval, scale division) of the rotation speed.

≪Setting value≫

0: 1 1: 2 2: 5 3: 10

③Unit (power) setting

Set the unit of the power. The decimal place is not changed automatically.

≪Setting value≫

0: mW 1: W 2: kW 3: PS 4: HP

④Decimal place (power) setting

Set the decimal place of power. The unit is not changed automatically.

≪Setting value≫

0: None 1: 0.0 2: 0.00 3: 0.000

⑤Min. scale division (power) setting

Set the minimum unit (scale interval, scale division) of the power.

≪Setting value≫
0: 1 1: 2 2: 5 3: 10

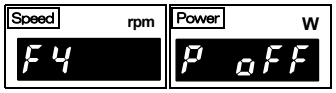
Point

Power is calculated by performing internal conversion based on the unit and decimal place settings. Therefore, do not change these settings improperly after calibration. If they are changed, perform calibration again.
For unit conversion, see "4-6.Unit conversion table" on page 32.

◇How to set the pulse rate and min. scale division of rotation speed, and unit, decimal place, and min. scale division of power

1. Select setting mode 4.

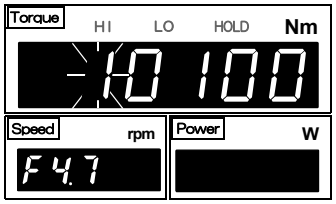
Press [FNC] → [►] three times.



2. Set the "Pulse rate" and "Min. scale division" of rotation speed, and "Unit", "Decimal place", and "Min. scale division" of power.

Press [RECALL] seven times. ⇒ "Calibration function select 2" is displayed.

Press [↵], and the highest digit blinks.



①Select pulse rate (rotation speed).

Input the pulse rate with [▲] [RECALL], and move to the lower digit with [►]. (Initial value: 1)

②Select min. scale division (rotation speed).

Input the min. scale division with [▲] [RECALL], and move to the lower digit with [►].

(Initial value: 0)

③Select unit (power).

Input the unit with [▲] [RECALL], and move to the lower digit with [►]. (Initial value: 1)

④Select decimal place.

Input the decimal place with [▲] [RECALL], and move to the lower digit with [►]. (Initial value: 0)

⑤Select min. scale division (power).

Input the min. scale division with [▲] [RECALL], and validate it with [↵]. (Initial value: 0)

《Setting value》

1 0 1 0 0

- Min. scale division (Power): 0: 1, 1: 2, 2: 5, 3: 10
- Decimal place (Power): 0: None, 1: 0.0, 2: 0.00, 3: 0.000
- Unit (Power): 0: mW, 1: W, 2: kW, 3: PS, 4: HP
- Min. scale division (Rotation speed): 0: 1, 1: 2, 2: 5, 3: 10
- Pulse rate (Rotation speed): 0: 1 pulse, 1: 4 pulses

3. Press [ESC] twice to go back to the indicated value display.

4-4. Rotation stop settings for rotation speed

■Minimum input rotation speed

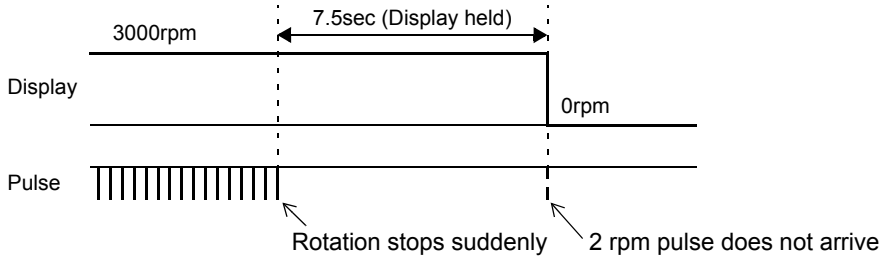
Minimum input rotation speed that can be displayed is selectable.

≪Setting value≫

Pulse rate	Minimum input rotation speed (frequency)				
4 pulses	0: 15 rpm	1: 10 rpm	2: 5 rpm	3: 3 rpm	4: 2 rpm
1 pulse	0: 60 rpm	1: 40 rpm	2: 20 rpm	3: 12 rpm	4: 8 rpm
Max. detection time	1 sec	1.5 sec	3 sec	5 sec	7.5 sec

Example) When set at "2rpm"

Since waiting for pulse detection for the duration of maximum detection time is required when rotation stops suddenly from high speed state, the previous rotation speed is not updated; therefore, the display will become 0 rpm after the display of the rotation speed that was last detected has held for 7.5 seconds.



■Rotation stop mode

Cut-off looks unclear when the rotation stops suddenly due to the constraint of maximum detection time corresponding to the minimum input rotation speed. For this reason, 0 rpm display can be forcibly set with "the cycle of the rotation speed last detected × a certain multiple".

≪Setting value≫

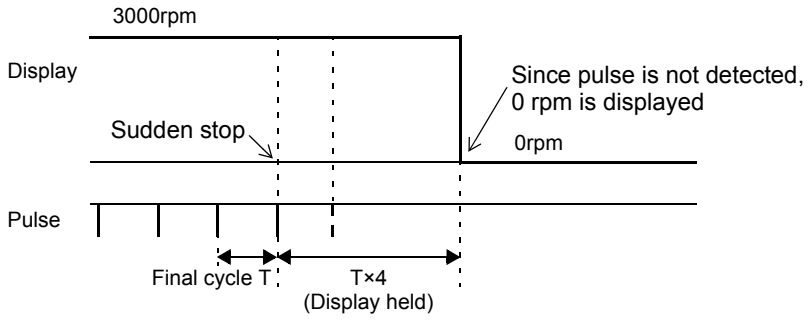
0: OFF (invalid)

After detection is waited for the duration of the maximum detection time corresponding to the minimum input rotation speed, the display becomes 0 rpm.

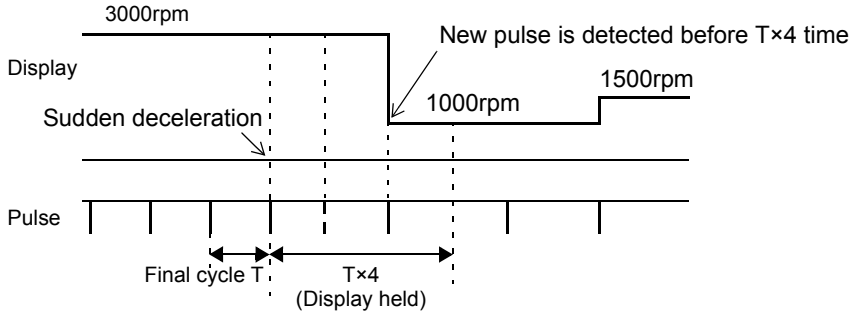
1: 2 times 2: 4 times 3: 8 times (valid)

If pulse is not detected from the cycle of the rotation speed last detected to the cycle of the set multiple, the display becomes 0 rpm forcibly.

Example) When stopped suddenly with the setting of "4 times"



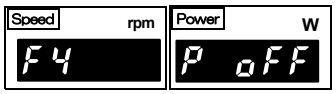
Example) When decelerated suddenly with the setting of "4 times"



◇How to set the rotation stop mode and minimum input rotation speed

1. Select setting mode 4.

Press [FNC] → [►] three times.



2. Set "Rotation stop mode" and "Minimum input rotation speed".

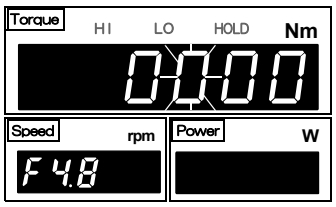
Press [RECALL] eight times. ⇒ "Rotation stop settings" is displayed.

Press [↵], and the highest digit blinks.

① Because the highest digit is undefined, move to the lower digit with [►].

② Select rotation stop mode.
Input the rotation stop mode with [▲] [RECALL], and move to the lower digit with [►].
(Initial value: 0)

③ Select minimum input rotation speed.
Input the minimum input rotation speed with [▲] [RECALL], and validate it with [↵]. (Initial value: 0).



《Setting value》

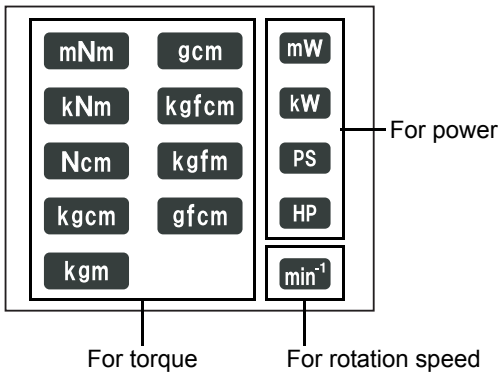
0 0 0 0

- Minimum input rotation speed
  - 0: 15rpm
  - 1: 10rpm
  - 2: 5rpm
  - 3: 3rpm
  - 4: 2rpm
  - * 4 times the above, when the pulse rate is "1 pulse"
- Undefined
- Rotation stop mode
  - 0: OFF
  - 1: 2 times
  - 2: 4 times
  - 3: 8 times
- Undefined

3. Press [ESC] twice to go back to the indicated value display.

4-5. Unit seal

For torque and power, affix a seal according to the unit at which calibration has been performed. Rotation speed does not matter either way.



4-6. Unit conversion table

Refer to the table for calibration of torque and power and unit setting.
After the unit is changed, make sure to affix the attached unit seal.

■Torque unit conversion table

	mNm	Ncm	Nm	kNm	kgm	kgcm	gcm
mNm	1	0.1	10^{-3}	10^{-6}	1.0197×10^{-4}	1.0197×10^{-2}	10.197
Ncm	10	1	10^{-2}	10^{-5}	1.0197×10^{-3}	0.10197	1.0197×10^{2}
Nm	10^{3}	10^{2}	1	10^{-3}	0.10197	10.197	1.0197×10^{4}
kNm	10^{6}	10^{5}	10^{3}	1	1.0197×10^{2}	1.0197×10^{4}	1.0197×10^{7}
kgm	9.8067×10^{3}	9.8067×10^{2}	9.8067	9.8067×10^{-3}	1	10^{2}	10^{5}
kgcm	98.067	9.8067	9.8067×10^{-2}	9.8067×10^{-5}	10^{-2}	1	10^{3}
gcm	9.8067×10^{-2}	9.8067×10^{-3}	9.8067×10^{-5}	9.8067×10^{-8}	10^{-5}	10^{-3}	1

■Power unit conversion table

	mW	W	kW	PS	HP
mW	1	10^{-3}	10^{-6}	1.3596×10^{-6}	1.341×10^{-6}
W	10^{3}	1	10^{-3}	1.3596×10^{-3}	1.341×10^{-3}
kW	10^{6}	10^{3}	1	1.3596	1.341
PS	7.355×10^{5}	7.355×10^{2}	0.7355	1	0.9863
HP	7.457×10^{5}	7.457×10^{2}	0.7457	1.01387	1

5 EXPLANATION OF INDICATED-VALUE-RELATED FUNCTIONS

5-1. About each indicated value

Torque

Analog signal (±5V) from the UTMII is displayed as torque.

Rotation speed

Pulse signal from the UTMII is displayed as rotation speed.

Power

Power calculated from torque and rotation speed is displayed.

Power [W] = Torque [Nm]×Rotation speed×ω (ω: 2π/60 = 0.1047198)

Point

Based on these data, torque/power characteristics with respect to rotation speed can be obtained.

5-2. Analog filter

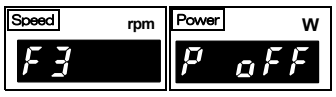
This is a low-pass filter for filtering input signals from the sensor, and canceling unwanted noise components (a filter that passes only the signals with a specific frequency or less, and attenuates signals with higher frequencies). With an increase in the cut-off frequency, the response becomes faster, but noise components may be displayed.

≪Setting value≫
0: 3 1: 30 2: 300 3: 1k [Hz]

■Analog filter setting method

1. Select setting mode 3.

Press [FNC] → [►] twice.



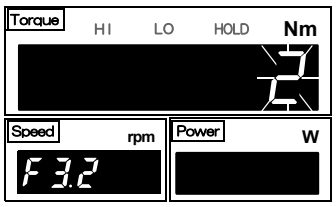
2. Set "Analog filter (torque)."

Press [▼ RECALL] twice. ⇒ " Analog filter (torque) " is displayed.

Press [↵], and present set value blinks.

Input the setting value with [▲] [▼ RECALL].

Press [↵] to validate it. (Initial value: 2)



3. Press [ESC] twice to go back to the indicated value display.

5-3. Digital filter

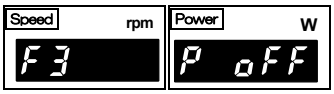
The digital filter is a function for reducing fluctuations of the indicated value by means of a moving average of data converted. With an increase in the number of filterings, the indicated value becomes more stable, but the response to inputs becomes slower. It can be set for each of the torque and the rotation speed.

≪Setting value≫
OFF(0), 2 to 999 [times]
* One time corresponds to one sampling for A/D conversion.

■Digital filter (torque) setting method

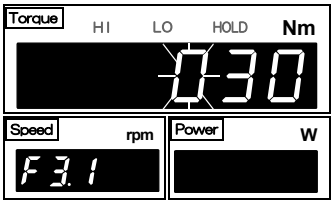
1. Select setting mode 3.

Press [FNC] → [►] twice.



2. Set "Digital filter (torque)."

Press [▼ RECALL] once. ⇒ "Digital filter (torque)" is displayed.
Press [↵], and the highest digit blinks.
Input the setting value with [▲] [▼ RECALL].
(Initial value: 030)
Press [↵] to validate it.



3. Press [ESC] twice to go back to the indicated value display.

* Digital filter for rotation speed is F3-4.

5-4. Dead band

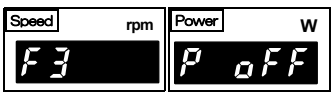
With respect to torque, the display is forcedly zeroed in a certain range by this function. Use this function when you do not want to display minute changes, such as microvibration, near zero.

≪Setting value≫
0 to 9999

■Dead band setting method

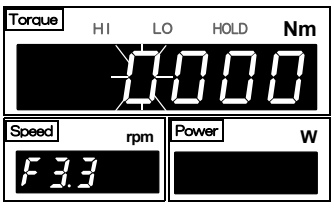
1. Select setting mode 3.

Press [FNC] → [►] twice.



2. Set "Dead band."

Press [▼ RECALL] three times. ⇒ "Dead band" is displayed.
Press [↵], and the highest digit blinks.
Input the setting value with [▲] [▼ RECALL].
Move to the lower digits with [►]. (Initial value: 0000)
Validate it with [↵].



3. Press [ESC] twice to go back to the indicated value display.

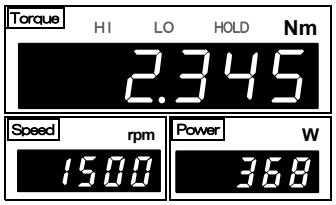
5-5. Digital zero

This function is to zero the indicated value.

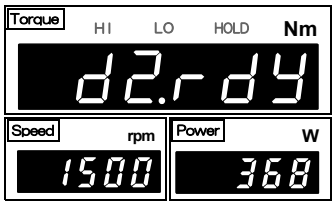
■Digital zero / Digital zero reset by means of keys

With respect to torque, digital zero can be executed.
Digital zero reset can also be executed.

1. Press ZERO on the normal measurement screen.



2. The display becomes as shown on the right-hand side, and execution is waited.



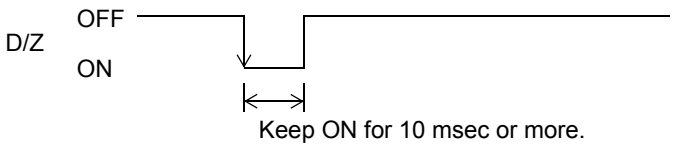
Press ↵ once to zero the indicated value.
Press ► once to perform digital zero reset of the indicated value.
Press ESC once to cancel the state for execute-wait and go back to the indicated value display state.

Point

- When digital zero is performed, if the difference from the zero calibration point exceeds the digital zero limit, the digital zero limit error (d2Err) will result. Also, only the digital zero limit is subtracted.
- If the digital offset is set, even if digital zero is executed, zero will not result. (Indicated value = -Setting value of digital offset)
- When digital zero reset is performed, the condition previous to correction by digital zero is restored.

■Digital zero by means of the external signal "D/Z input"

The instant when D/Z and COM2 of the external input/output connector are short-circuited from an open state (ON edge), digital zero functions to zero torque.



⚠ CAUTION

Digital-zeroed points are saved in SRAM.
When the battery is executed, the digital zero is reset.

5-6. Motion detect

Set the parameters to detect stability of torque.
If the difference between the current indicated value and the 50-msec-previously indicated value becomes less than the set count and that condition continues for more than the set time, the indicated value is regarded as stable.

≪Setting value≫

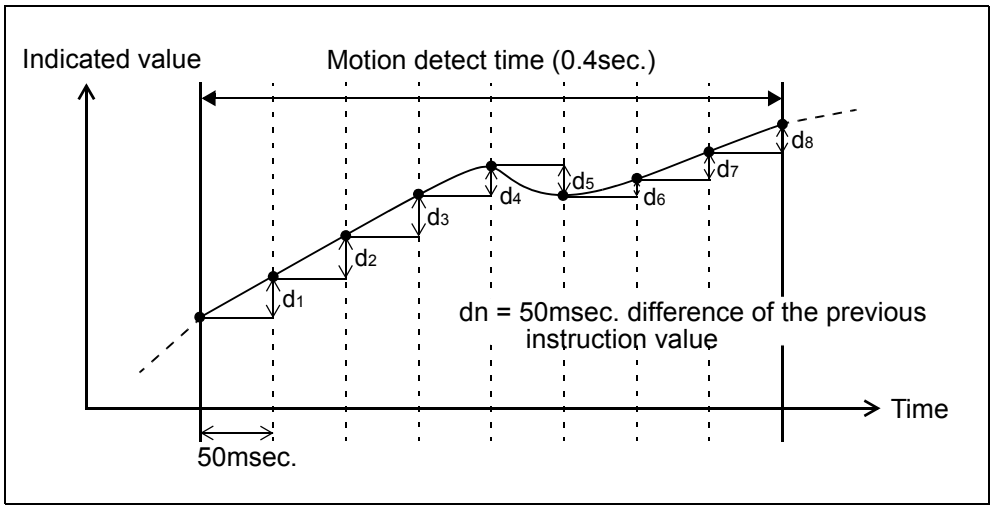
Motion detect (time)	0.0 to 9.9 [second]
Motion detect (range)	000 to 999 [count]

Point

When the time is 0.0 sec. and the width is 000 markings, stable is not detected.
Stability detection by motion detect is closely related to the SI/F print (stable value) function and comparison timing. For details, see "6-4.Comparison timing" on page 43 and "■SI/F print" on page 56.

Setting example

Motion detect (time)	0.4 sec.
Motion detect (range)	010

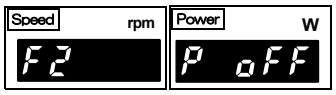


When the condition of dn ≦ set count (010) continues for the set time (0.4 sec.) or more (d1 ≦ 10, and d2 ≦ 10, and ..., and d8 ≦ 10), the indicated value is regarded as stable.

■Motion detect setting method

1. Select setting mode2.

Press [FNC] → [►] once.



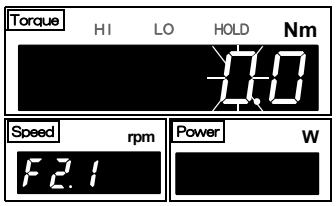
2. Set "Motion detect (time)."

Press [RECALL] once. ⇒ "Motion detect (time)" is displayed.

Press [↵], and the highest digit blinks.

Input the setting value with [▲] [RECALL].

Move to the lower digits with [►]. (Initial value: 0.0)



3. Set "Motion detect (range)."

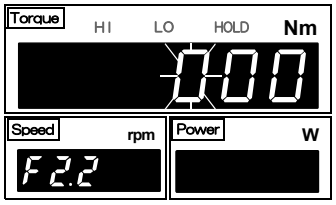
Press [RECALL] once. ⇒ "Motion detect (range)" is displayed.

Press [↵], and the highest digit blinks.

Input the setting value with [▲] [RECALL].

Move to the lower digits with [►]. (Initial value: 000)

Press [↵] to validate it.



4. Press [ESC] twice to go back to the indicated value display.

5-7. Zero tracking

This function is to automatically track and correct gradual changes in the zero point due to drifts (phenomenon in which outputs fluctuate slowly due to temperature change or change with time), etc.

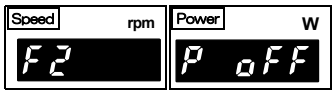
≪Setting value≫

Zero tracking (time)	0.0 to 9.9 [second]
Zero tracking (range)	000 to 999 [count]

■Zero Tracking setting method

1. Select setting mode 2.

Press [FNC] → [►] once.



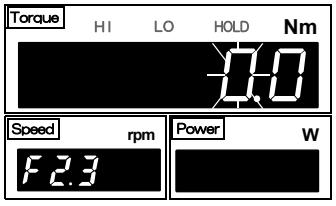
2. Set "Zero tracking (time)."

Press [RECALL] three times. ⇒ " Zero tracking (time) " is displayed.

Press [↵], and the highest digit blinks.

Input the setting value with [▲] [RECALL].

Move to the lower digits with [►]. (Initial value: 0.0)



3. Set "Zero tracking (range)."

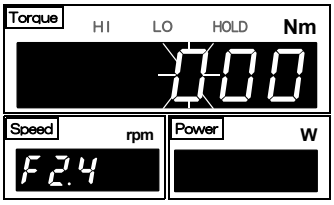
Press [RECALL] once. ⇒ " Zero tracking (range) " is displayed.

Press [↵], and the highest digit blinks.

Input the setting value with [▲] [RECALL].

Move to the lower digits with [►]. (Initial value: 000)

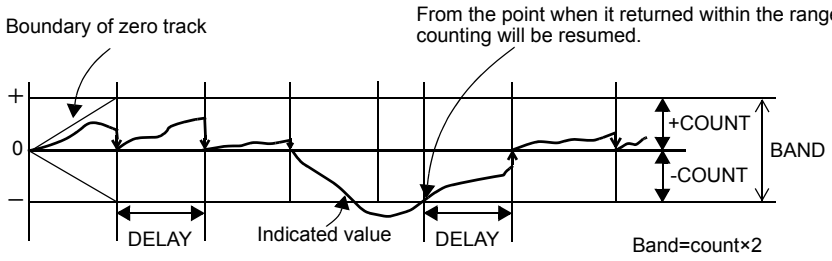
Press [↵] to validate it.



4. Press [ESC] twice to go back to the indicated value display.

Point

- When displacement of the zero point is within the set count of tracking and it continues more than the set time, it is automatically made zero by zero tracking function.
- The time (tracking delay) is set in the range of 0.1 - 9.9 sec., and the band (tracking band) is set in the range of 001 to 999.
  If the time is set at 0.0 sec. and the band at 000, the zero tracking function does not work.



⚠ CAUTION

- Zero tracking is equal to digital zero functioning automatically. Therefore, the digital zero limit is also monitored.
- Zero tracking does not function if the indicated value has already exceeded the tracking band.

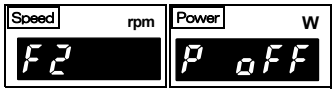
5-8. Display frequency

Set the per-second display update frequency of the indicated value. However, the A/D conversion speed does not change.

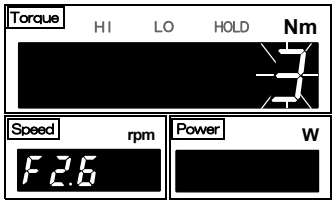
≪Setting value≫
0: 3 1: 6 2: 13 3: 25 [times/sec.]

■Display frequency setting method

1. Select setting mode 2.
Press [FNC] → [►] once.



2. Set "Display frequency."
Press [▼ RECALL] six times ⇒ "Display frequency" is displayed.
Press [↵], and present set value blinks.
Input the setting value with [▲] [▼ RECALL].
Press [↵] to validate it. (Initial value: 3)



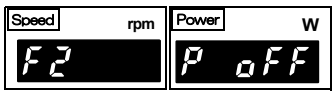
3. Press [ESC] twice to go back to the indicated value display.

5-9. Display ON/OFF

The display of rotation speed and power can be turned ON/OFF by this function.
Torque is always displayed.
Also, internal computation is not stopped.

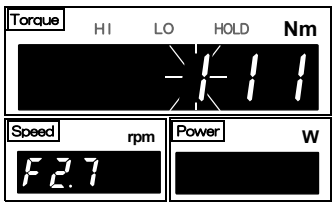
■Display ON/OFF setting method

1. Select setting mode 2.
Press [FNC] → [►] once.



2. Set "Display ON/OFF."

Press [▼ RECALL] seven times ⇒ "Display ON/OFF" is displayed.
Press [↵], and present set value blinks.
Input the setting value with [▲] [▼ RECALL].
Press [↵] to validate it. (Initial value: 111)



《Setting value》
1 1 1
└ Power display
0: OFF 1: ON
└ Rotation speed display
0: OFF 1: ON
└ Torque display
1: ON fixed

3. Press [ESC] twice to go back to the indicated value display.

6 EXPLANATION OF COMPARISON FUNCTIONS

6-1. HI/LO limit comparison

Set the HI/LO limit of torque and rotation speed. (Hold synchronized)

≪Setting value≫
- Torque
  HI limit/LO limit: -99999 to 99999
- Rotation speed
  HI limit/LO limit: 0 to 99999

＜HI/OK/LO output conditions＞
- HI Indicated value ＞ HI limit
- LO Indicated value ＜ LO limit
- OK LO limit ≦ Indicated value ≦ HI limit

Point

With ±LOAD, OFL1, or OFL2 on torque, torque HI, LO is forcedly turned on.
With OFL2 on rotation speed, rotation speed HI, LO is forcedly turned on.

Overload of the torque and rotation speed is monitored. (Hold not synchronized)
When they exceed the alarm HI limit or fall below the alarm LO limit, the external output "ALM" turns ON.

≪Setting value≫
- Torque
  Alarm HI limit: -99999 to 99999 (invalid at 99999 (initial value))
  Alarm LO limit: -99999 to 99999 (invalid at -99999 (initial value))
- Rotation speed
  Alarm HI limit: 0 to 99999 (invalid at 99999 (initial value))
  Alarm LO limit: 0 to 99999 (invalid at 0 (initial value))

- For initial value, since both the alarm HI and LO limits are invalid as default settings, set them again for use.
- Since the alarm HI limit and LO limit are independent, simple use of either one of them is also possible.

■HI/LO limit setting method

See "≪HI/LO limit setting mode function≫" on page 18.

■Alarm HI and LO limits setting method

See "≪HI/LO limit setting mode function≫" on page 18.

6-2. Hysteresis

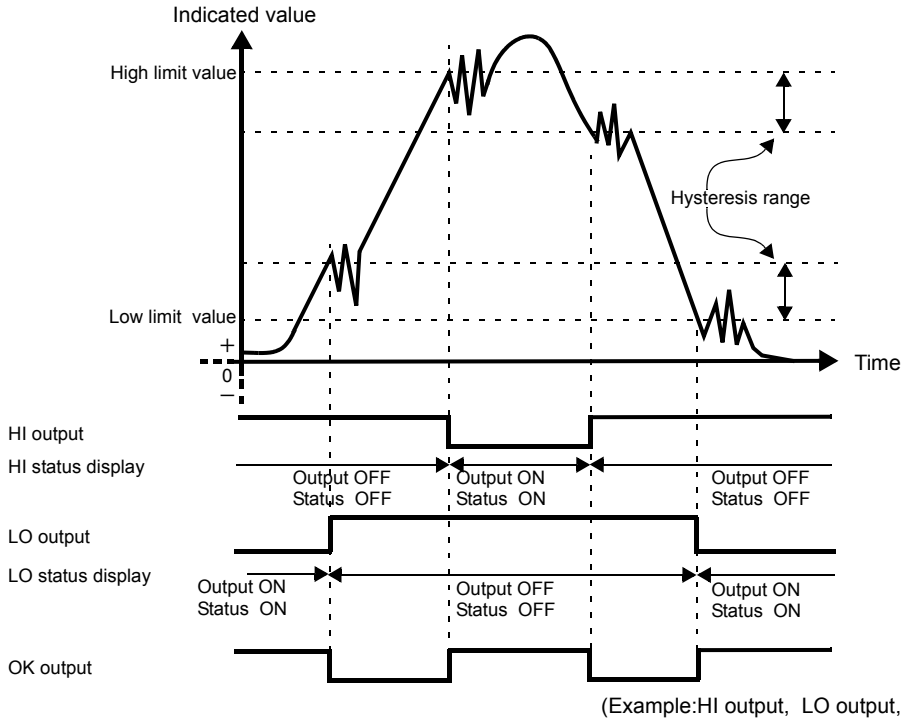
This function is to allow a margin for timing at which HI/LO of the HI/LO limit comparison is turned off. Normally, HI is turned on when the indicated value exceeds the HI limit and is turned off when the indicated value falls below it. However, by setting the hysteresis, HI is turned off when the indicated value falls below the HI limit further lowered by the hysteresis value. This function is effective to prevent chattering (phenomenon in which signals repeat turning on/off immediately after switching of relay contacts and switch contacts) in such a case where signals fluctuate (vibrate) subtly.

≪Setting value≫
Hysteresis range: 0 to 9999

＜HI/LO output conditions＞
- HI
ON conditions　Indicated value ＞ HI limit
OFF conditions　Indicated value ≦ (HI limit setting value－Hysteresis setting value)

- LO
ON conditions　Indicated value ＜ LO limit
OFF conditions　Indicated value ≧ (LO limit setting value－Hysteresis setting value)

- Hysteresis operation

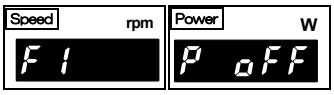


(Example:HI output, LO output, OK output)

Point

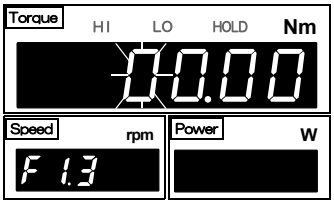
Torque and rotation speed can be set to HI/LO limit comparison, respectively.
However, this does not apply to alarm HI and LO limits.

■Hysteresis setting method



1. Select setting mode1.

Press [FNC] once.



2. Set "Hysteresis."

Press [RECALL] three times ⇒ "Hysteresis (Torque)" is displayed.

Press [RECALL] 8 times for rotation speed ⇒ "Hysteresis (Rotation speed)" is displayed.

Press [↵], and the highest digit blinks.

Input the setting value with [▲] [RECALL].

Move to the lower digits with [►]. (Initial value: 0)

Press [↵] to validate it.

3. Press [ESC] twice to go back to the Indicated value display.

6-3. Near zero

This function is to detect that the torque is near zero.

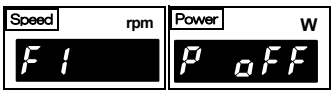
Near zero ON: |Torque| ≦ Setting value of near zero
Near zero OFFF: |Torque| ＞ Setting value of near zero

≪Setting value≫
0 to 99999

Point

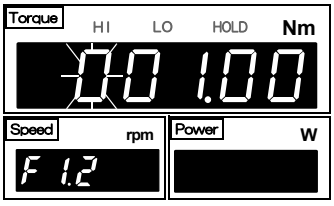
Near zero ON/OFF is closely related to the SI/F print (stable value) function and comparison timing.
For details, see "6-4.Comparison timing" on page 43, and "■SI/F print" on page 56.

■Near zero setting method



1. Select setting mode1.

Press [FNC] once.



2. Set "Near zero."

Press [RECALL] twice ⇒ "Near zero" is displayed.

Press [↵], and the highest digit blinks.

Input the setting value with [▲] [RECALL].

Move to the lower digits with [►]. (Initial value: 100)

Press [↵] to validate it.

3. Press [ESC] twice to go back to the indicated value display.

Point

Near zero operates by absolute value.

6-4. Comparison timing

Set the operating conditions of HI/LO limit comparison (Torque). Select the conditions from the following.

0: All time	HI/LO limit comparison is always performed.
1: Stable	When stable, HI/LO limit comparison is performed.
2: Near zero OFF	HI/LO limit comparison is performed when Near zero is off.
3: Stable and Near zero OFF	When stable and near zero is off, HI/LO limit comparison is performed.
4: Hold	HI/LO limit comparison is performed when a hold is decided.

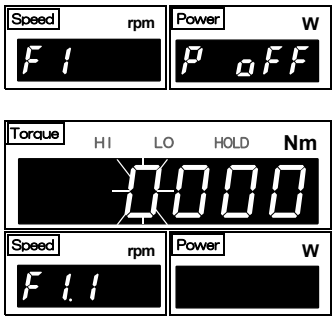
Set the operating conditions of HI/LO limit comparison (Rotation speed). Select the conditions from the following.

0: All time	HI/LO limit comparison is always performed.
1: Torque synchronized	HI/LO limit comparison is performed at the same timing as that of the torque comparison timing.

■Comparison timing (Torque) setting method

1. Select setting mode1.

Press [FNC] once.



2. Set "Comparison timing (Torque)."

Press [RECALL] once. ⇒ "Comparison function select" is displayed.

Press [↵], and the highest digit blinks.

Input the setting value with [▲] [RECALL].

(Initial value: 0)

Press [↵] to validate it.

《Setting value》

0 0 0 0

- Undefined
- Comparison timing (Rotation speed)
  - 0: All time
  - 1: Torque synchronized
- Undefined
- Comparison timing (Torque)
  - 0: All time
  - 1: Stable
  - 2: Near zero OFF
  - 3: Stable and Near zero OFF
  - 4: Hold

3. Press [ESC] twice to go back to the indicated value display.

■Comparison timing (Rotation speed) setting method

1. Select setting mode1.

Press [FNC] once.

2. Set "Comparison timing (Rotation speed)."

Press [RECALL] once. ⇒ "Comparison function select" is displayed.

Press [↵], and the highest digit blinks.

Move to the lower digits with [►].

Input the setting value with [▲] [RECALL]. (Initial value: 1)

Press [↵] to validate it.

3. Press [ESC] twice to go back to the indicated value display.

7 EXPLANATION OF HOLD FUNCTIONS

7-1. Hold functions of torque

The hold functions are to take out a specific point of torque for HI/LO limit comparison. Here, the operation of each hold will be described in detail.

Hold mode	Hold section
0: OFF	None
1: Sample	0: All section 1: External signal
2: Peak	0: All section 1: External signal 2: External signal+Time 3: Level+Time
3: Bottom	
4: P-P	
5: Average	

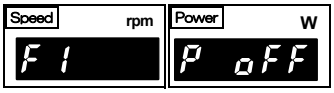
■Flow of hold measurement

1. Select a hold you want to use.
2. If the hold has the setting of section, set a section you want to use.
   For details, see "7-3.Setting of hold section" on page 49.
3. Set the special setting value required for the hold used.
4. After confirmation of wiring, perform hold control by external input etc., and start measurement.

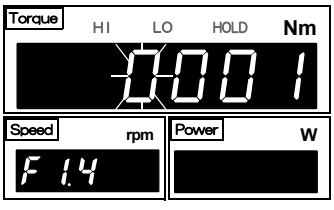
7-2. Setting of hold mode

■Hold mode setting method

1. Select setting mode 1.
   Press [FNC] once.



2. Set "Hold mode."
   Press [RECALL] four times ⇒ "Hold function select " is displayed.
   Press [↵], and the highest digit blinks.
   Move to the lower digits with [►].
   Input the setting value with [▲] [RECALL].
   (Initial value: 0)
   Validate it with [↵].



《Setting value》

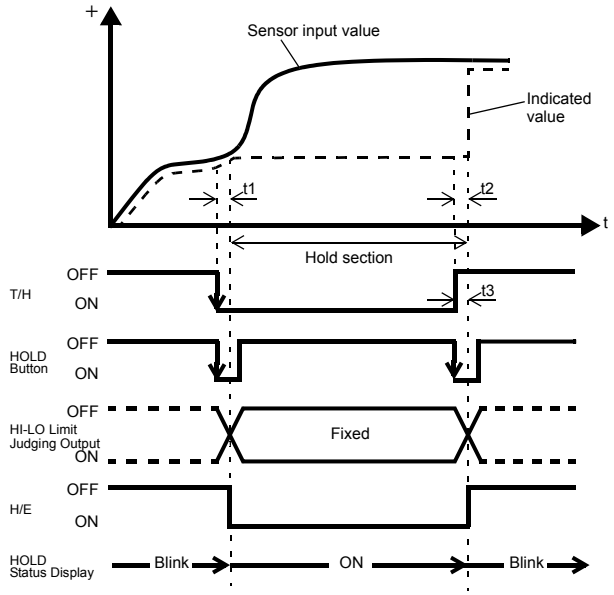
0 0 0 1
- 1: Auto reset
- 0: Hold section
- 0: Hold mode
  - 0: OFF
  - 1: Sample
  - 2: Peak
  - 3: Bottom
  - 4: P-P
  - 5: Average
- 0: Undefined

3. Press [ESC] twice to go back to the indicated value display.

■Sample hold

The start point of the specified section is held.
The section is specified by the setting of "all section" or "external signal."

(Example) All section sample hold



t1: A delay time between the instant when the T/H signal is inputted and the instant when the indicated value is held
Approximately 7ms (MAX.)

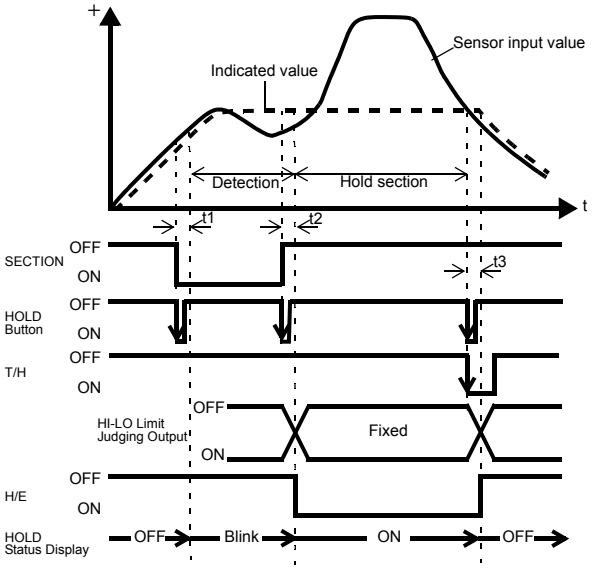
t2: A delay time between the instant when the T/H signal is released and the instant when the indicated value returns to tracking
Approximately 7ms (MAX.)

t3: A minimum reset signal width required for releasing the hold
Approximately 7ms (MIN.)

■Peak hold

The maximum value in the positive direction (peak value) of the specified section is held.
The section is specified by the setting of "all section", "external signal", "external signal+time", or "level+time".

(Example) Externally specified section peak hold



t1: A delay time between the instant when the SECTION signal is inputted and the instant when the value to be held is detected
Approximately 7ms (MAX.)

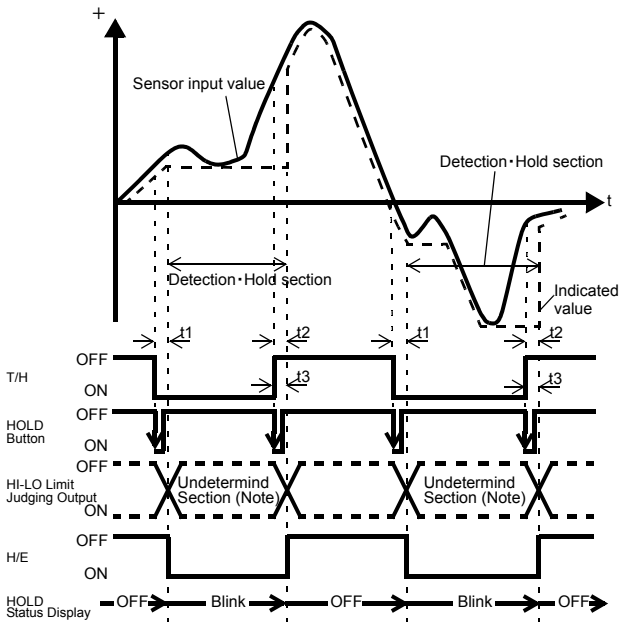
t2: A delay time between the instant when the SECTION signal is released and the instant when the value to be held is determined
Approximately 7ms (MAX.)

t3: A minimum reset signal width required for releasing the hold
Approximately 7ms (MIN.)

■Bottom hold

The maximum value in the negative direction (bottom value) of the specified section is held.
The section is specified by the setting of "all section", "external signal", "external signal+time", or "level+time".

(Example) All section Bottom hold



t1: A delay time between the instant when the T/H signal is inputted and the instant when the indicated value is held
Approximately 7ms (MAX.)

t2: A delay time between the instant when the T/H signal is released and the instant when the indicated value returns to tracking
Approximately 7ms (MAX.)

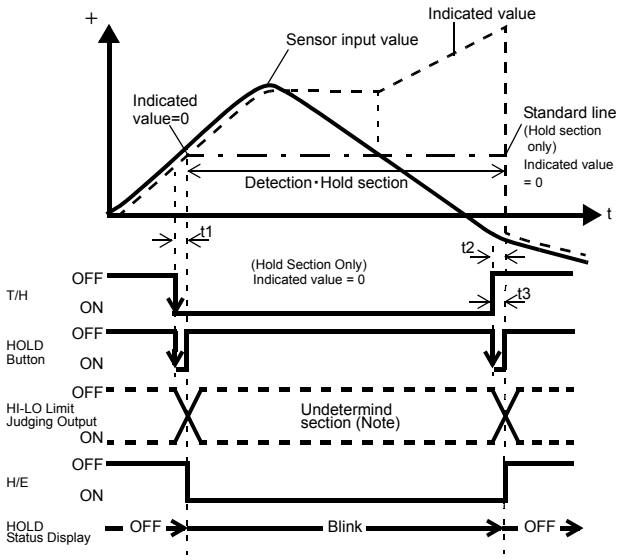
t3: A minimum reset signal width required for releasing the hold
Approximately 7ms (MIN.)

Note: During the undetermined section, the judging output varies with fluctuations in the input waveform. However, the H/E output remains on during the undetermined Section. Read the judging result when the indicated value becomes stable (immediately before the T/H signal rises).

■Peak-to-Peak (P-P) hold

The difference value between the peak and valley over the specified section is held.
The section is specified by the setting of "all section", "external signal", "external signal+time", or "level+time".

(Example) All section Peak-to-Peak (P-P) hold



t1: A delay time between the instant when the T/H signal is inputted and the instant when the indicated value is held
Approximately 7ms (MAX.)

t2: A delay time between the instant when the T/H signal is released and the instant when the indicated value returns to tracking
Approximately 7ms (MAX.)

t3: A minimum reset signal width required for releasing the hold
Approximately 7ms (MIN.)

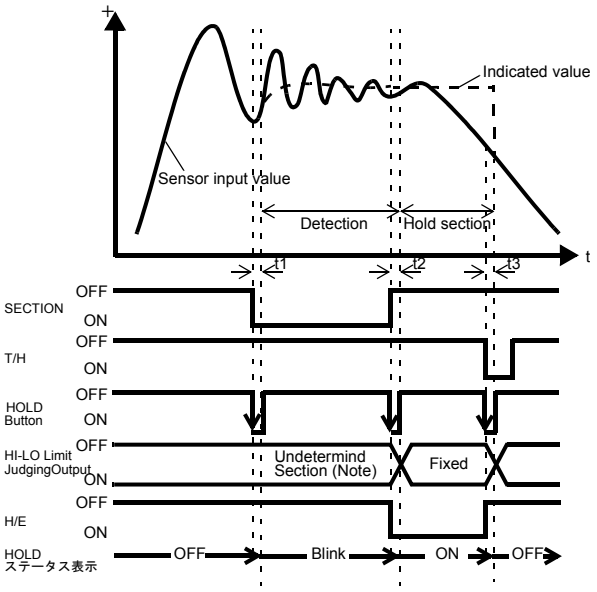
Note: During the undetermined section, the judging output varies with fluctuations in the input waveform. However, the H/E output remains on during the undetermined section. Read the judging result when the indicated value becomes stable (immediately before the T/H signal rises).

■Average hold

The average of the sampling values over the specified section is calculated and updated, and then held.

The section is specified by the setting of "all section", "external signal", "external signal+time", or "level+time".

(Example) Externally specified section average value hold



t1: A delay time between the instant when the SECTION signal is inputted and the instant when the value to be held is detected Approximately 7ms (MAX.)

t2: A delay time between the instant when the SECTION signal is released and the instant when the value to be held is determined Approximately 7ms (MAX.)

t3: A minimum reset signal width required for releasing the hold Approximately 7ms (MIN.)

The detection section is limited by the maximum average value detection time set according to the "average sample number." If the maximum average value detection time is exceeded, detection is automatically terminated, and the average value of that time is held.

■Average sample number

In the average hold, when average processing is performed by each sampling, the maximum average value detection time for average processing is **50 seconds**.

Then, if this average sample number is set at 2 or more, the sampling data used for average calculation becomes the representative value of the sampling values of the set number (average obtained according to the number). By this setting, the average value detection time can be elongated, but error causes by average calculation increase.

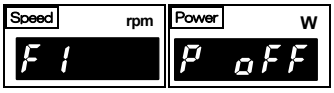
Maximum average value detection time = Average sample number × 50 sec.,
and also the number of average updates will decrease.
Number of average updates = 300 times/sec. ÷ Average sample number

≪Setting value≫
1 to 99 [times]

◇Average sample number setting method

1. Select setting mode 1.

Press [FNC] once.



2. Set "Average sample number."

Press [RECALL] six times ⇒ "Average sample number" is displayed.

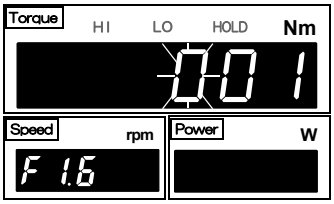
Press [↵], and the highest digit blinks.

Input the setting value with [▲] [RECALL].

(Initial value: 1)

Move to the lower digits with [►].

Press [↵] to validate it.



3. Press [ESC] twice to go back to the indicated value display.

Point

When a hold is used, rotation speed is also held.
The hold value of rotation speed is as follows:

< Sample/ Peak/ Bottom >
Hold at the hold point of torque

< P-P/ Average >
Hold at the end point of section

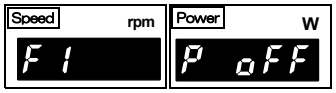
Holding of torque and rotation speed will also result in holding of power.

7-3. Setting of hold section

■Hold section setting method

1. Select setting mode 1.

Press [FNC] once.



2. Set "Hold section."

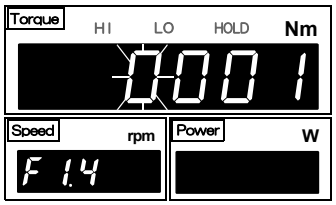
Press [RECALL] four times ⇒ "Hold function select " is displayed.

Press [↵], and the highest digit blinks.

Press [►] twice to make the digit of the Hold section blink. (Initial value: 0)

Input the setting value with [▲] [RECALL].

Press [↵] to validate it.



《Setting value》

0 0 0 1

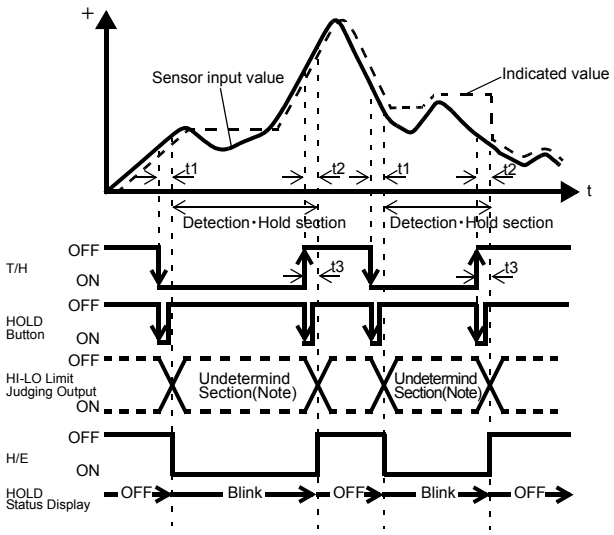
- 1: Auto reset
- 0: Hold section
  - 0: All section
  - 1: External signal
  - 2: External signal + Time
  - 3: Level + Time
  - * This setting is required only when the hold mode is other than "0: OFF."
- 0: Hold mode
- 0: Undefined

3. Press [ESC] twice to go back to the indicated value display.

■All section

By this method, the hold detection section is specified by the T/H signal.
Detection starts with the T/H signal ON to perform each hold operation.
Control is performed simply by the T/H signal without using the SECTION signal.
Therefore, there are tracking sections and detection sections, but there are no hold deciding sections.

(Example) All section peak hold



t1: A delay time between the instant when the T/H signal is inputted and the instant when the indicated value is held
Approximately 7ms (MAX.)

t2: A delay time between the instant when the T/H signal is released and the instant when the indicated value returns to tracking
Approximately 7ms (MAX.)

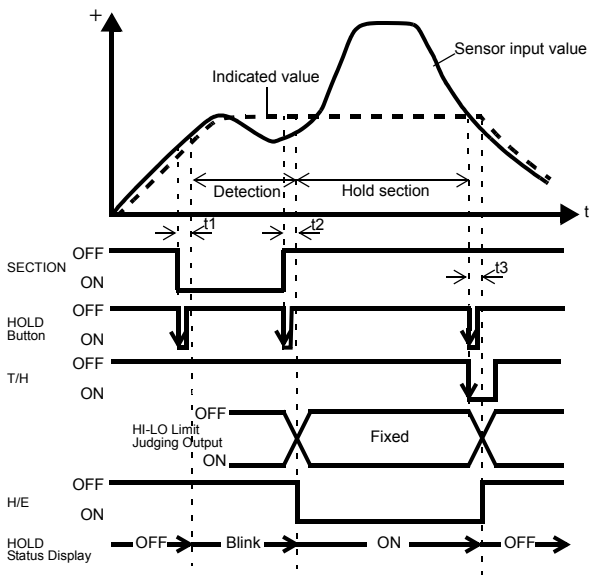
t3: A minimum reset signal width required for releasing the hold
Approximately 7ms (MIN.)

Note: During the undetermined sections, the judging output varies with fluctuations in the input waveform. However, the H/E output remains on during the undetermined ections. Read the judging result when the indicated value becomes stable (immediately before the T/H signal rises).

■External signal

By this method, the hold detection section is specified by the SECTION signal.
Detection starts with the SECTION signal ON, and ends with the SECTION signal OFF to perform each hold operation.
The hold value is maintained until the hold reset signal is turned on.
The hold is released by turning on the T/H signal as a reset signal.
There are tracking sections, detection sections, and hold deciding sections.

(Example) Externally specified section peak hold



t1: A delay time between the instant when the SECTION signal is inputted and the instant when the value to be held is detected
Approximately 7ms (MAX.)

t2: A delay time between the instant when the SECTION signal is released and the instant when the value to be held is determined
Approximately 7ms (MAX.)

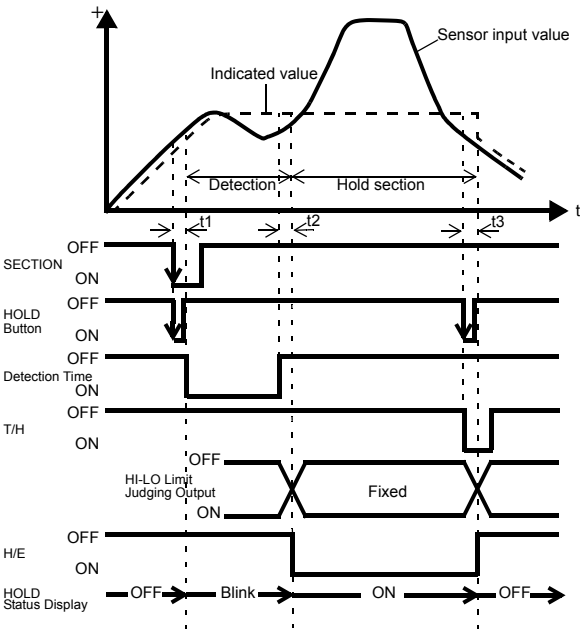
t3: A minimum reset signal width required for releasing the hold
Approximately 7ms (MIN.)

By turning on the SECTION signal again without turning on the T/H signal while the hold is decided, the hold is released and re-detection is started. For details, see "7-4.Auto reset function" on page 53.

■External signal + time

By this method, the hold detection section is specified as a timer. Detection starts with the SECTION signal ON, and ends when the set time (detection time) has elapsed.
The hold value is maintained until the hold reset signal is turned on.
The hold is released by turning on the T/H signal as a reset signal.
There are tracking sections, detection sections, and hold deciding sections.

(Example) External signal + Time specified section peak hold



t1: A minimum SECTION signal width required for beginning detection
Approximately 7ms (MAX.)

t2: A delay time between the instant when the detection time is ended and the instant when the value to be held is determined
Approximately 7ms (MAX.)

t3: A minimum reset signal width required for releasing the hold
Approximately 7ms (MIN.)

By turning on the SECTION signal again without turning on the T/H signal while the hold is decided, the hold is released and re-detection is started.
For details, see "7-4.Auto reset function" on page 53.

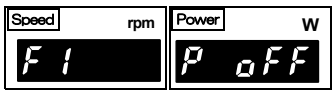
■Detection time

Set the hold detection time.

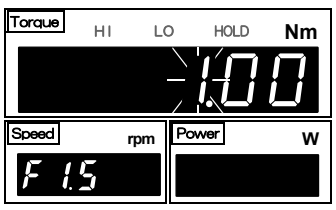
《Setting value》
0.01 to 9.99 [sec.]

◇ Detection time setting method

1. Select setting mode 1.
Press [FNC] once.



2. Set "Detection time."
Press [RECALL] five times ⇒ "Detection time" is displayed.
Press [↵], and the highest digit blinks.
Move to the lower digits with [►]. (Initial value: 1.00)
Input the setting value with [▲] [RECALL].
Press [↵] to validate it.



3. Press [ESC] twice to go back to the indicated value display.

■Level + time

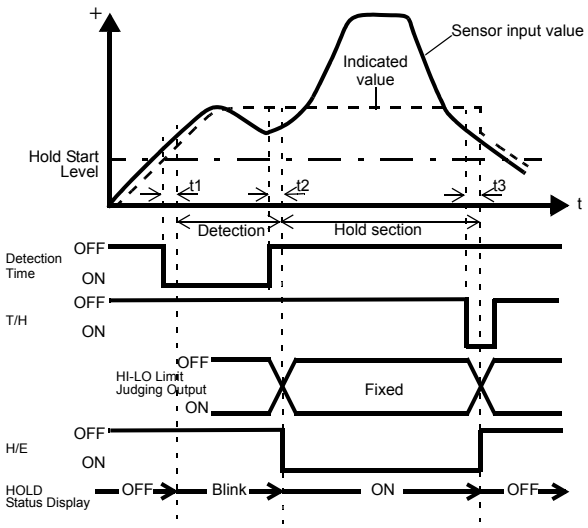
By this method, the hold detection section is specified as a timer. Hold is detected during the predetermined time (hold section time) from the point in time when the torque crosses the hold start level.

The hold value is maintained until the hold reset signal is turned on.

The hold is released by turning on the T/H signal as a reset signal.

There are tracking sections, detection sections, and hold deciding sections.

(Example) Level + Time specified section peak hold



t1: A delay time between the instant when the indicated value exceeds the hold start level and the instant when the value to be held is detected
Approximately 3.5ms (MAX.)

t2: A delay time between the instant when the detection time is ended and the instant when the value to be held is determined
Approximately 7ms (MAX.)

t3: A minimum reset signal width required for releasing the hold
Approximately 7ms (MIN.)

■Hold start level

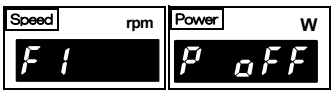
Set the start level in the case where the Section setting is Level + Time for Peak, Valley, PP, or Average hold.

《Setting value》
-99999 to 99999

◇Hold start level setting method

1. Select setting mode 1.

Press [FNC] once.



2. Set "Hold start level."

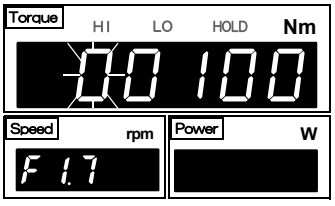
Press [RECALL] seven times ⇒ "Hold start level" is displayed.

Press [↵], and the highest digit blinks.

Move to the lower digits with [►]. (Initial value: 100)

Input the setting value with [▲] [RECALL].

Press [↵] to validate it.

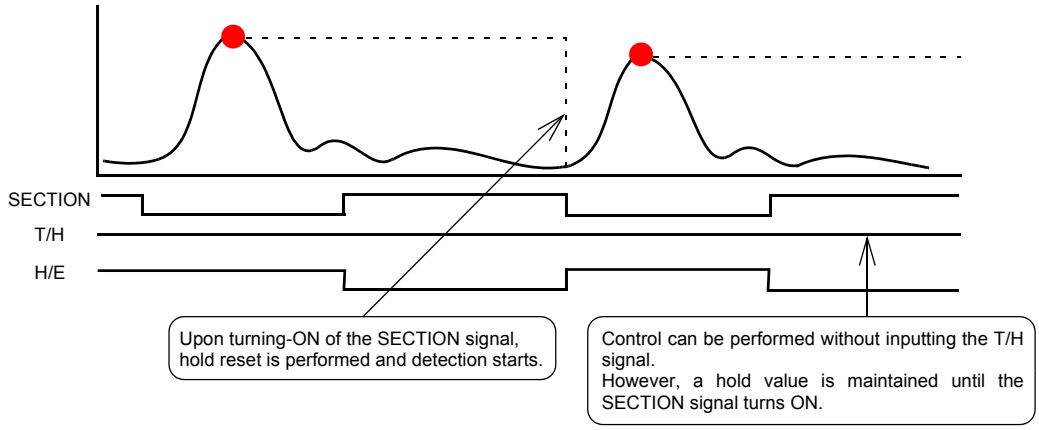


3. Press [ESC] twice to go back to the indicated value display.

7-4. Auto reset function

It is factory-set that each hold is automatically reset at the start of the detection section, and therefore, simple control can be performed by one signal without releasing the hold.

Example) Auto reset in externally specified section peak hold

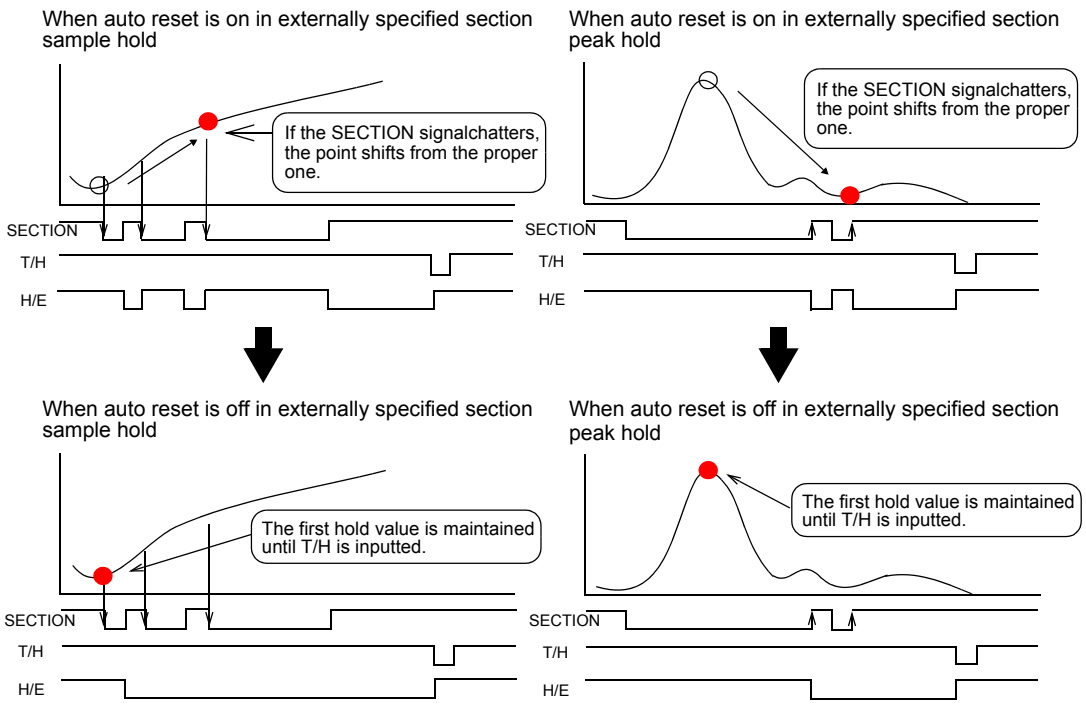


However, when the auto reset functions, if the signal causes chattering, the point that should be taken originally may deviate. Switching is provided so as to prevent the next detection from being performed until the T/H signal is turned on even if the SECTION signal is turned on again.

《Setting value》

0: OFF — After a hold is decided, the next detection is not started until the T/H signal is turned on even if the SECTION signal is turned on.

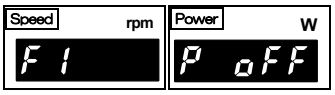
1: ON — After a hold is decided, the next detection is started when the SECTION signal is turned on again even if the T/H signal is not turned on. This is the initial setting (factory default setting).



■Auto reset setting method

1. Select setting mode 1.

Press [FNC] once.



2. Set "Auto reset."

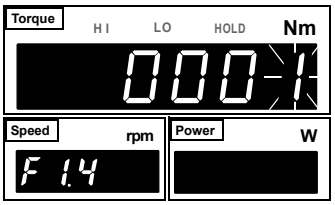
Press [RECALL] four times ⇒ "Hold function select " is displayed.

Press [↵], and the highest digit blinks.

Press [►] three times to make the digit of the auto reset blink. (Initial value: 1)

Input the setting value with [▲] [RECALL].

Press [↵] to validate it.



《Setting value》

0 0 0 1

- 1: Auto reset
  - 0: OFF
  - 1: ON

* This setting is required when the hold section is "external signal", "external signal + time" or "level + time."

- 0: Hold section
- 0: Hold mode
- 0: Undefined

3. Press [ESC] twice to go back to the indicated value display.

8 STANDARD INTERFACE

8-1. External I/O

■Connector pin assignment

A1		COM1	B1		COM1
A2	OUT	ALM HI (Torque)	B2	OUT	
A3	OUT	HI (Torque)	B3	OUT	H/E
A4	OUT	OK (Torque)	B4	OUT	ALM HI (Rotation speed)
A5	OUT	LO (Torque)	B5	OUT	ALM LO (Rotation speed)
A6	OUT	ALM LO (Torque)	B6	OUT	RUN
A7		COM1 (Torque)	B7		COM2
A8	OUT	HI (Rotation speed)	B8	IN	SECTION
A9	OUT	OK (Rotation speed)	B9	IN	T/H
A10	OUT	LO (Rotation speed)	B10	IN	
A11	OUT	SI/F	B11	IN	DZ
A12	OUT	SI/F	B12	IN	CLEAR

Compatible connector: FCN-361J024-AU (manufactured by FUJITSU COMPONENT or equivalent)
Connector cover: FCN-360C024-B (manufactured by FUJITSU COMPONENT or equivalent)
(connector & cover optional type: CN50)

■About outputs

A1, A7, B1	Common for external output signals.	→"■External I/O connection " on page 11
A2	Outputs the alarm HI limit signal of torque.	→"6.EXPLANATION OF COMPARISON FUNCTIONS " on page 40
A3	Outputs the HI limit signal of torque.	
A4	Outputs the OK signal of torque.	
A5	Outputs the LO limit signal of torque.	
A6	Outputs the alarm LO limit signal of torque.	
A8	Outputs the HI limit signal of rotation speed.	
A9	Outputs the OK signal of rotation speed.	
A10	Outputs the LO limit signal of rotation speed.	
B3	Outputs the hold complete signal.	→"7.EXPLANATION OF HOLD FUNCTIONS " on page 44
B4	Outputs the alarm HI limit signal of rotation speed.	→"6.EXPLANATION OF COMPARISON FUNCTIONS " on page 40
B5	Outputs the alarm LO limit signal of rotation speed.	
B6	Outputs the normal run signal.	→"■About the RUN signal " on page 56
A11, A12	2-wire serial interface for connecting a UNIPULSE-manufactured printer, external display, etc.	→"■SI/F interface connection " on page 13 "8-2.SI/F (serial interface) " on page 56

■About inputs

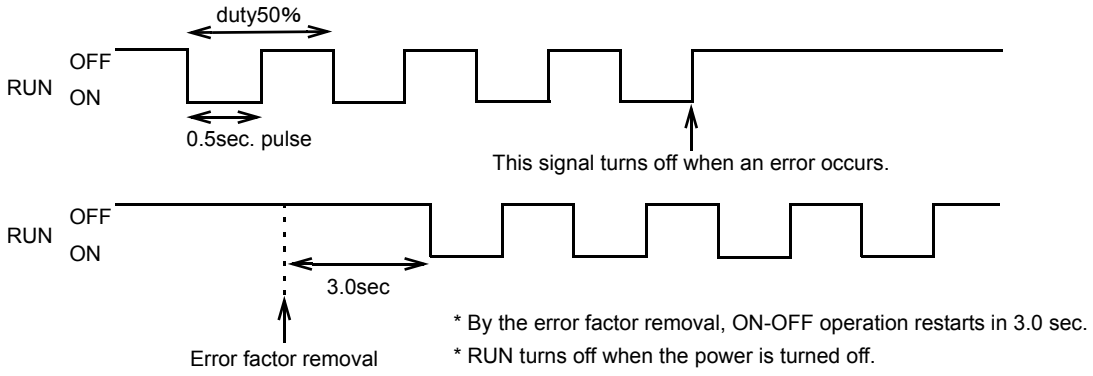
B7	Common for external input signals.	→"■External I/O connection " on page 11
B8, B9	Inputs the hold control signal.	→"7.EXPLANATION OF HOLD FUNCTIONS " on page 44
B11	Inputs the Digital Zero signal.	→"5-5.Digital zero " on page 35
B12	Input for record data clear.	→"9-3.Record data clear " on page 59

■About the RUN signal

The RUN output stops when an abnormal state of the indicated value is detected. The conditions under which the output stops as in an abnormal state are as follows.

- ±LOAD
- OFL1, OFL2
- Calibration error
- Digital zero limit error

* See "12-7.Error/message list " on page 108 about the contents of errors.



8-2. SI/F (serial interface)

■SI/F indicated value format

GROSS area:	Torque
NET area:	Rotation speed
TARE area:	Power

■SI/F print

《Setting value》

0: None	No print command is sent.
1: Stable value	When stabilityis detected, a print command is sent to the SI/F to make the connected printer print automatically. When near zero is OFF, the torque is held until near zero ON after stable ON. Hold is reset in 1.5 sec. after near zero ON.
2: Hold value	When hold is reset, a print command is sent to make the connected printer print the hold value automatically. (When the hold mode is OFF, turn on T/H or press HOLD.)

Point

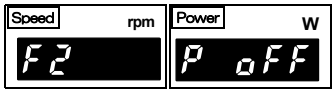
When stable value print is selected, be aware that automatic printing is not performed in the following case.

- When motion detect is set in time: 0.0 sec, count: 000.
  Also, the indicated value is not held in the following case.
- Hold mode: When any item other than none is selected.

◇SI/F print setting method

1. Select setting mode 2.

Press [FNC] → [►] once.



2. Set "SI/F print."

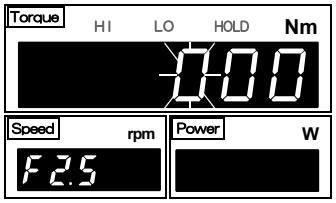
Press [RECALL] five times ⇒ "SI/F function select" is displayed.

Press [↵], and the highest digit blinks. Select the digit of the SI/F print.

Input the setting value with [▲] [RECALL].

(Initial value: 0)

Press [↵] to validate it.

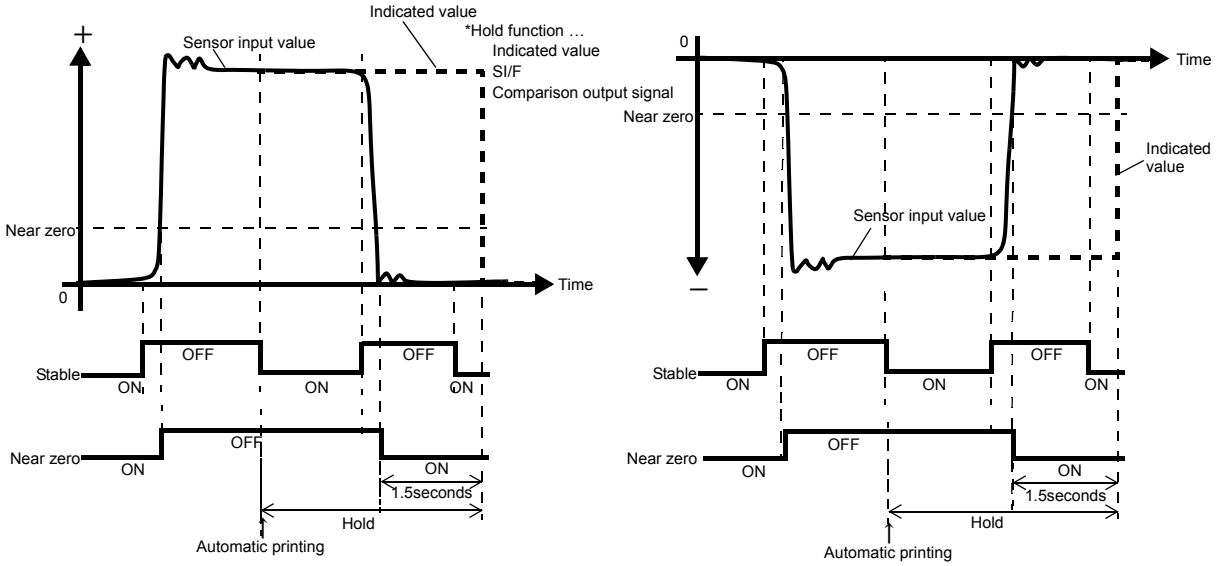


《Setting value》

0 0 0
- Undefined
- Undefined
- SI/F print
  - 0: None
  - 1: Stable value
  - 2: Hold value

3. Press [ESC] twice to go back to the indicated value display.

- Operation of the indicated value hold function



For the "Stable" parameter, see "5-6.Motion detect " on page 36, and for the "Near zero" parameter, see "6-3.Near zero " on page 42.

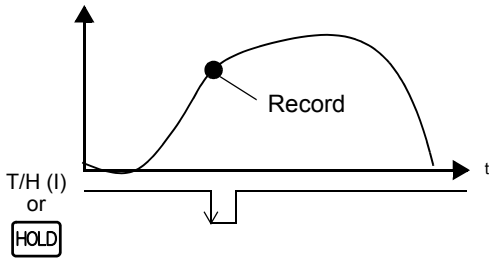
Point

The print command and the record function are closely related. For details, see "9-1.Record timing " on page 58.

9 RECORD FUNCTION

9-1. Record timing

Each value (torque, rotation speed, and power) is recorded according to a print command. Up to 30 pieces of the most recent data can be stored. If 30 pieces are exceeded, the oldest data in chronological order will be overwritten. Select hold value (when hold is reset) or stable value (at stable-time out of near zero) of the SI/F print setting. (For details, see "■SI/F print" on page 56.)
Even without using hold, data can be immediately recorded by setting SI/F print to hold value and by pressing HOLD or turning T/H ON.



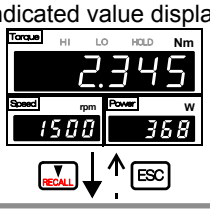
In addition, when using hold with SI/F print at hold value, the value is recorded at the time of release.

9-2. History

Recorded data can be checked on the indicated value display screen in history mode.

1. Enter the history mode with [RECALL] from the indicated value display.

<Indicated value display>



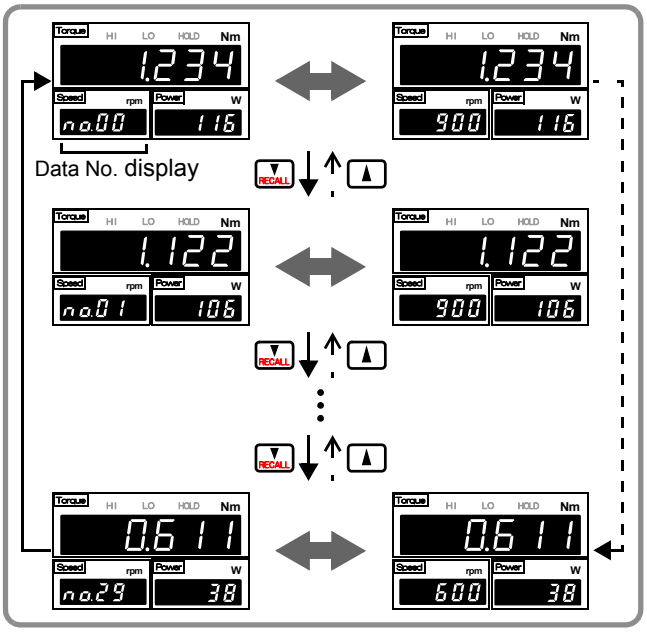
[RECALL] [ESC]

2. The most recent data are displayed.
Rotation speed and data No. are displayed alternately.
No. 00 corresponds to the most recent data.

Data can be checked with [RECALL] and [▲].

No. 29 (30 pieces old) corresponds to the oldest data.

<History>



Point

- Even while the history is displayed, when the record is updated, the record data are updated. In that case, the displayed data No. does not change but the record data alone change.
- The record data are saved in SRAM.
  When the battery runs down, all the record data are cleared to zero.

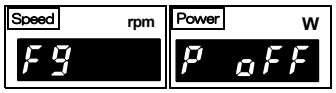
9-3. Record data clear

All 30 pieces of data are cleared to zero.
However, they cannot be cleared if work protect is ON.

■Clear by means of keys

1. Select setting mode 9.

Press [FNC] → [►] five times.



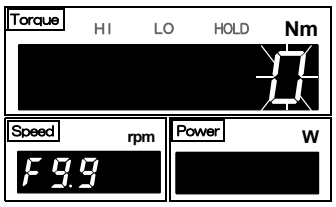
2. Execute "Record data clear."

Press [RECALL] five times ⇒ "Record data clear" is displayed.

Press [↵], and blinks.

Input a value other than zero with [▲] and [RECALL].

Press [↵] to validate it.

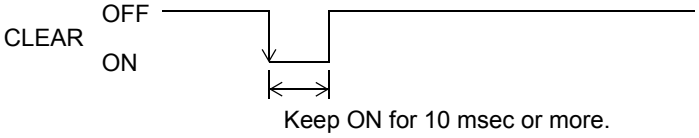


* Upon validation, they are cleared and the set values go back to 0.

3. Press [ESC] twice to go back to the indicated value display.

■Clear by means of the external signal "CLEAR input"

The record data are cleared at the instant when the external input/output connectors CLEAR and COM2 are short-circuited from an open state (at the ON edge).



■Clear by means of communication (232/USB option)

The record data are cleared when a record data clear command is received in communication (232/USB option).

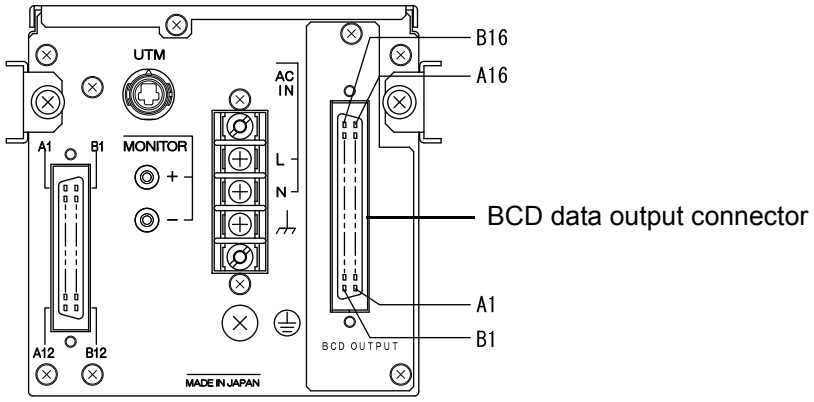
Point

If you enter the history mode after clearing, all data show zero.

10 OPTION INTERFACE

10-1. BCD interface

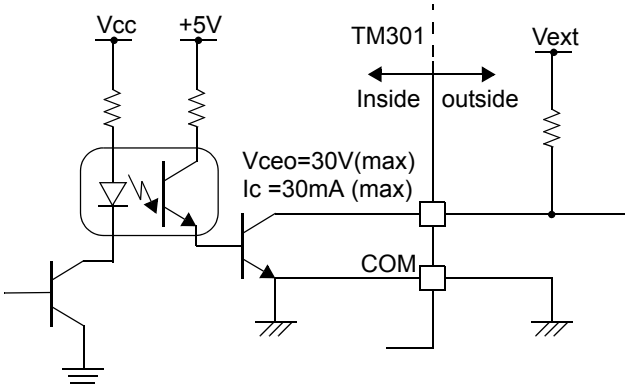
The BCD data output is an interface to extract the indicated value of the TM301 as BCD data. This interface is convenient to process controls, totals, records, etc., by connecting the TM301 to a computer, process controller, sequencer or the like.
The I/O and internal circuits are electrically insulated by photocoupler.



■Connection

●Output

The signal output circuit employs the open collector output.



● Internal transistor status

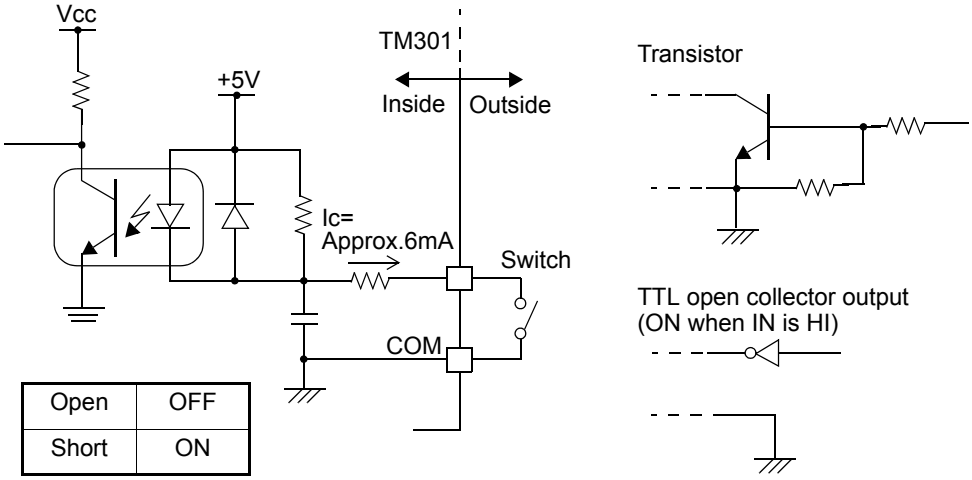
Output data	Negative	Positive
0	OFF	ON
1	ON	OFF

Through logic switching (pin B14)

● Output pin level

Output data	Negative	Positive
0	H	L
1	L	H

●Input



Open	OFF
Short	ON

⚠ CAUTION

- Do not apply external voltage to the signal input circuit.
- The external element is required to withstand Ic=10mA.
- Leakage from the external element is required to be 30μA or below.

■Connector pin assignment

A1	*	COM	B1	*	COM
A2	OUT	1	B2	OUT	1000
A3	OUT	2	B3	OUT	2000
A4	OUT	4	B4	OUT	4000
A5	OUT	8	B5	OUT	8000
A6	OUT	10	B6	OUT	10000
A7	OUT	20	B7	OUT	20000
A8	OUT	40	B8	OUT	40000
A9	OUT	80	B9	OUT	80000
A10	OUT	100	B10	OUT	Minus (polarity)
A11	OUT	200	B11	OUT	OVER
A12	OUT	400	B12	OUT	STAB
A13	OUT	800	B13	OUT	STROBE
A14	IN	Data hold	B14	IN	Logic switching
A15	IN	Data switching 0	B15	IN	Data switching 1
A16	—		B16	—	

Compatible connector: FCN-361J032-AU (manufactured by FUJITSU COMPONENT or equivalent)
Connector cover: FCN-360C032-B (manufactured by FUJITSU COMPONENT or equivalent)
(connector & cover optional type: CN51)

■Output data select

《Setting value》

0: Torque (hold synchronized)
Torque synchronized with a hold is output.

1: Rotation speed — The rotation speed is output.

2: Power — The power is output.

3: Torque (hold not synchronized)
Torque in real time is output.

4: External select — Data selected by the data select input (A15, B15) is output.

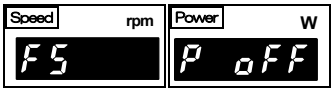
Data select 1	Data select 0	Output data
OFF	OFF	Torque (hold synchronized)
OFF	ON	Rotation speed
ON	OFF	Power
ON	ON	Torque (hold not synchronized)

* In the case of external selection, read after at least 2 cycles.

◇ Output data select setting method

1. Select setting mode 5.

Press [FNC] → [►] four times.



2. Set "Output data select."

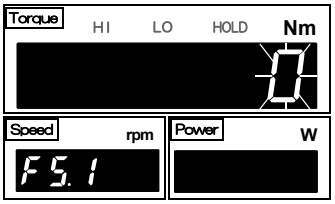
Press [▼ RECALL] once. ⇒ "Output data select" is displayed.

Press [↵] once, and present set value blinks.

Input the setting value with [▲] [▼ RECALL].

(Initial value: 0)

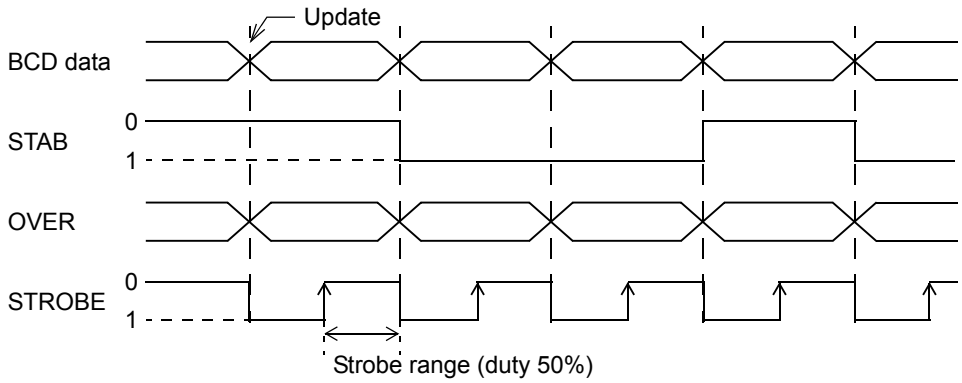
Press [↵] to validate it.



3. Press [ESC] twice to go back to the indicated value display.

■Signal timing

- ● Minus — Turns on when the output indicated value data is negative.
- ● OVER — Turns on at over-scale time.
  -LOAD, +LOAD, OFL1, OFL2
- ● STAB — Turns on at stable-time. See "5-6.Motion detect" on page 36.
- ● STROBE — Strobe pulses are output in synchronization with BCD data.
  For reading the data, use the rising edges of the pulses when the logic is negative, and the falling edges of the pulses when the logic is positive.



■Logic switching

Select the logic of the BCD data output signal. Make selection with B14.

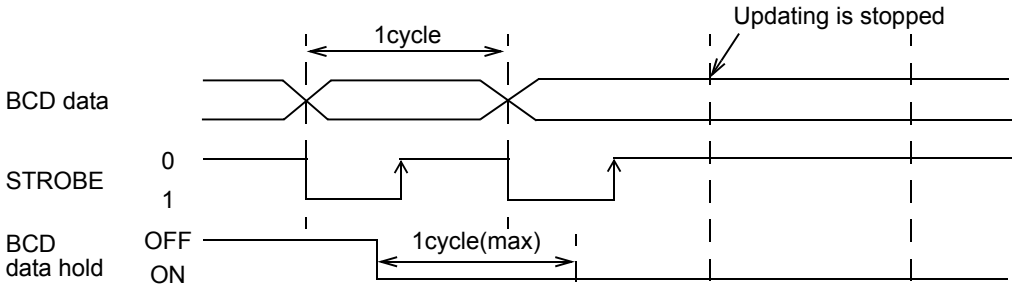
When COM and B14 are open:	Negative logic
When COM and B14 are short-circuited:	Positive logic

Read at least 2 cycles after inputting the logic switching.

■BCD data hold

Updating of the BCD data output signal is stopped. Also, the STROBE output turns OFF.
Make selection with A14.

When COM and A14 are open:	Update stop canceled
When COM and A14 are short-circuited:	Update stopped



Read at least 2 cycles after inputting the BCD data hold.
As long as the BCD data hold is input, data can be read reliably, but because the data is not updated, it may be different from original data.

■Output rate

《Setting value》
0: 10 1: 30 2: 50 3: 100 4: 300 [times/sec.]

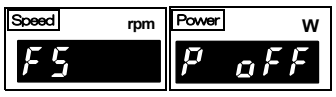
Point

Even if this setting is changed, A/D conversions speed does not change.
Make the output rate slower when reading fails due to a low processing performance of the device that should receive BCD.

◇Output rate setting method

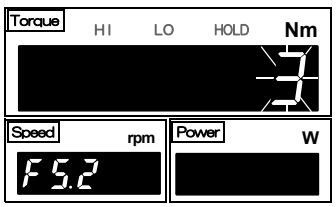
1. Select setting mode 5.

Press [FNC] → [►] four times.



2. Set "Output rate."

Press [RECALL] twice. ⇒ "Output rate" is displayed.
Press [↵], and present set value blinks.
Input the setting value with [▲] [RECALL].
(Initial value: 3)
Press [↵] to validate it.



3. Press [ESC] twice to go back to the indicated value display.

■BCD/binary select

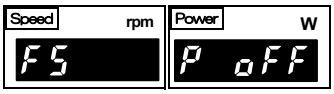
The output data selection can be changed to binary.

《Setting value》
0: BCD 1: Binary

◇BCD/binary setting method

1. Select setting mode 5.

Press [FNC] → [►] four times.



2. Select "BCD/binary select."

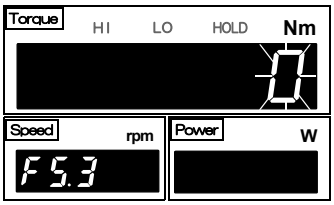
Press [▼ RECALL] three times. ⇒ "BCD/binary select" is displayed.

Press [↵], and present set value blinks.

Input the setting value with [▲] [▼ RECALL].

(Initial value: 0)

Press [↵] to validate it.



3. Press [ESC] twice to go back to the indicated value display.

■Pin assignment at binary

A1	*	COM	B1	*	COM
A2	OUT	2^0	B2	OUT	2^{12}
A3	OUT	2^1	B3	OUT	2^{13}
A4	OUT	2^2	B4	OUT	2^{14}
A5	OUT	2^3	B5	OUT	2^{15}
A6	OUT	2^4	B6	OUT	2^{16}
A7	OUT	2^5	B7	OUT	
A8	OUT	2^6	B8	OUT	Data switching 0 (response)
A9	OUT	2^7	B9	OUT	Data switching 1 (response)
A10	OUT	2^8	B10	OUT	Minus (polarity)
A11	OUT	2^9	B11	OUT	OVER
A12	OUT	2^{10}	B12	OUT	STAB
A13	OUT	2^{11}	B13	OUT	STROBE
A14	IN	Data hold	B14	IN	Logic switching
A15	IN	Data switching 0	B15	IN	Data switching1
A16	—		B16	—	

* With the B8 and B9 outputs, the data specified by the output data selection or by A15 and B15 (data select) can be checked.

10-2. RS-232C interface

The RS-232C is an interface to read the indicated value and status of the TM301 and to write parameters into the TM301.
This interface is convenient to process controls, totals, records, etc., by connecting the TM301 to a computer, process controller, sequencer or the like.

■Communication specifications

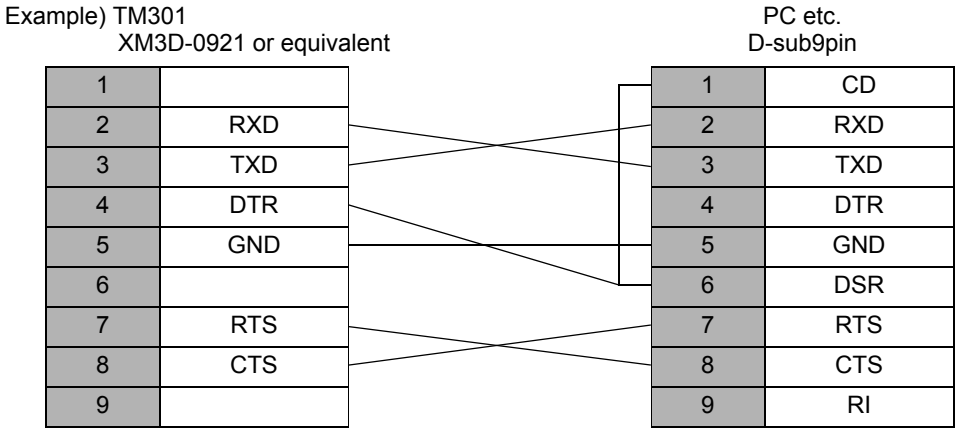
Signal level:	Based on RS-232C	
Transmitting distance:	Approx.15m	
Transmitting method:	Asynchronous, Full duplex	
Baud rate:	9600, 19200, 38400, 57600bps selectable	
Bit configuration:	Start bit:	1bit
	Character length:	7 or 8 bit selectable
	Stop bit:	1 or 2 bit selectable
	Parity:	Parity none, odd or even selectable
	Delimiter:	CR, CR+LFSelectable
Code:	ASCII	

■Connector pin assignment

1	–	
2	IN	RXD
3	OUT	TXD
4	OUT	DTR
5	*	GND
6	–	
7	OUT	RTS
8	IN	CTS
9	–	
Case	*	SHIELD

Adaptable connector 9-pin D-SUB connector
Connector: XM3D-0921 (Omron) or equivalent
Cover: XM2S-0913 (with inch screw thread #4-40)(Omron) or equivalent
(connector & cover optional type: CN34)

■Connection



This connection diagram shows cabling applicable to the case where your PC is DTE (data terminal equipment). For connection with DCE (data circuit-terminating equipment), such as a modem, use straight type cabling.

Prepare cabling after reconfirmation of the connector shape and signal lines (pin assignments) of the equipment you use.

■Communication mode

《Setting value》

0: Send/receive mode

This mode performs communication by a command from the host computer.

In this mode, you can read out the indicated value, status, set values and write in set values.

1: Continuous transmission (hold synchronized) mode

This mode continuously transmits the indicated values and the status.

Indicated value and status are synchronized with hold.

2: Printed transmission mode

When the indicated value is printed (a print command is output to the SI/F), the indicated value and status are sent from the TM301 to host.

3: Continuous transmission (hold not synchronized) mode

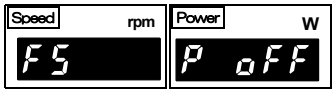
This mode continuously transmits the indicated values and the status.

Only indicated value is not synchronized with hold.

◇Communication mode setting method

1. Select setting mode 5.

Press [FNC] → [►] four times.



2. Set "Communication mode."

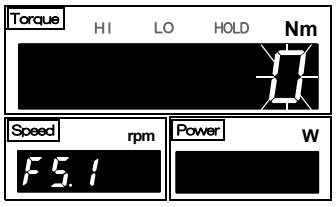
Press [▼ RECALL] once. ⇒ "Communication mode" is displayed.

Press [↵], and present set value blinks.

Input the setting value with [▲] [▼ RECALL].

(Initial value: 0)

Press [↵] to validate it.



3. Press [ESC] twice to go back to the indicated value display.

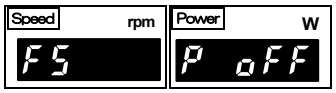
■Communication conditions

Set the communication conditions according to the host.

◇Communication conditions setting method

1. Select setting mode 5.

Press [FNC] → [►] four times.



2. Set "Communication conditions."

Press [▼ RECALL] twice. ⇒ "Communication conditions" is displayed.

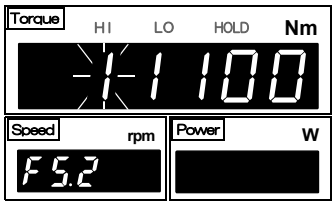
Press [↵], and present set value blinks.

Input the setting value with [▲] [▼ RECALL].

(Initial value: 11100)

Move to the lower digits with [►].

Press [↵] to validate it.



《Setting value》

1 1 1 0 0

- Flow control: 0: None 1: RTS/CTS
- Stop bit: 0: 1bit 1: 2bit
- Parity bit: 0: None 1: Even 2: Odd
- Character length: 0: 7bit 1: 8bit
- Baud rate: 0: 9600 bps 2: 38400 bps 1: 19200 bps 3: 57600 bps

3. Press [ESC] twice to go back to the indicated value display.

■Delimiter

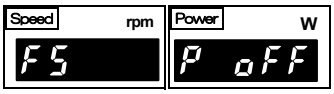
Set the delimiter for sending messages from the TM301.

《Setting value》
0: CR 1: CR+LF

◇Delimiter setting method

1. Select setting mode 5.

Press [FNC] → [►] four times.



2. Set "Delimiter."

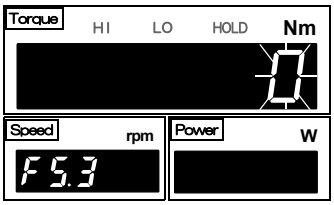
Press [▼ RECALL] three times. ⇒ "Delimiter" is displayed.

Press [↵], and present set value blinks.

Input the setting value with [▲] [▼ RECALL].

(Initial value: 0)

Press [↵] to validate it.

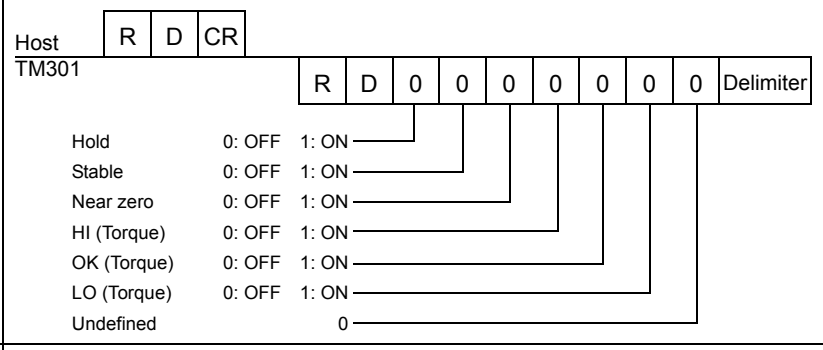
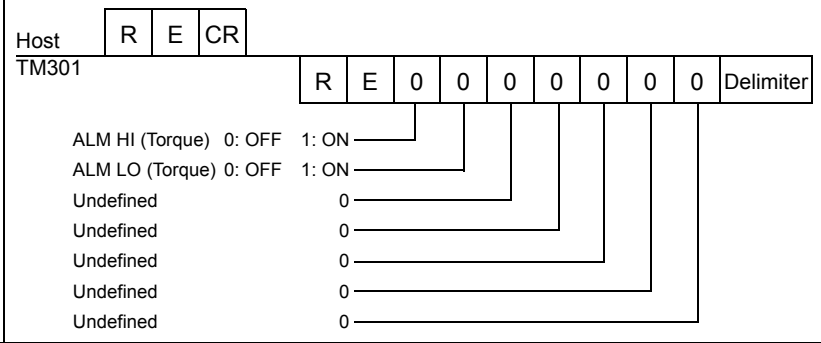
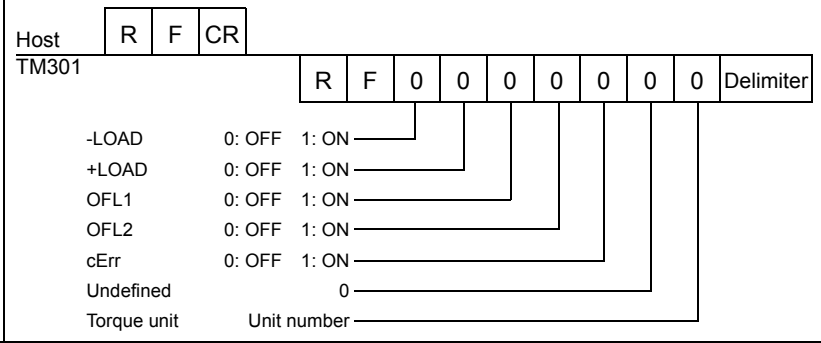
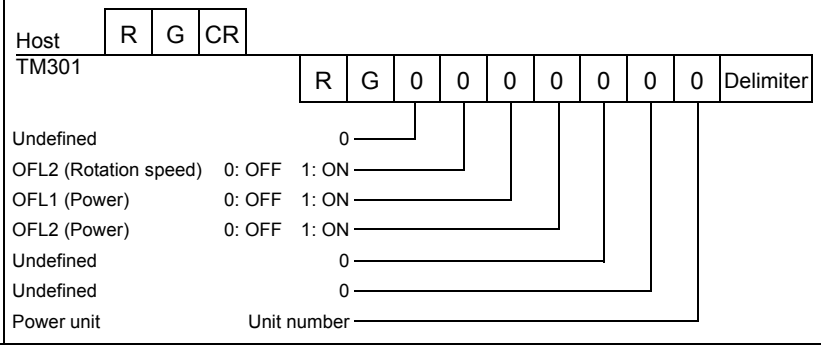
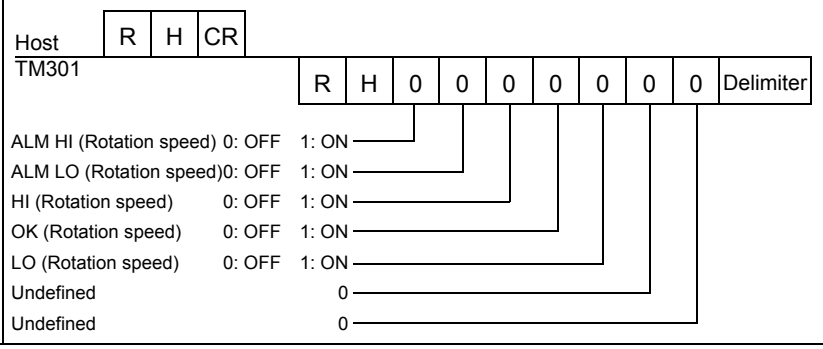


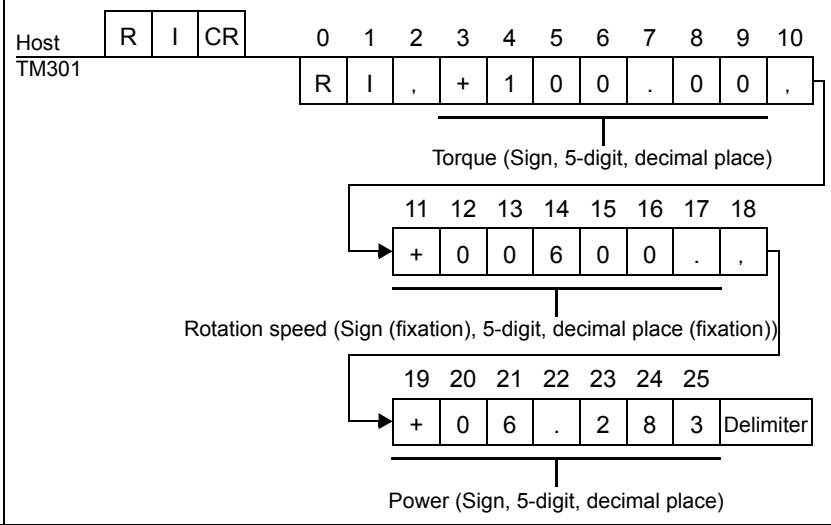
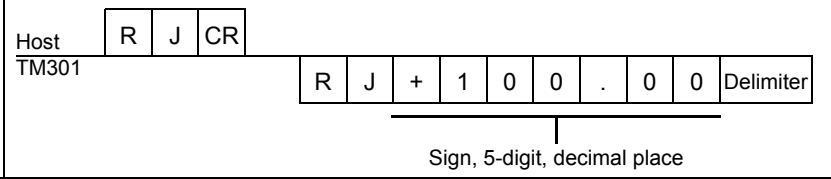
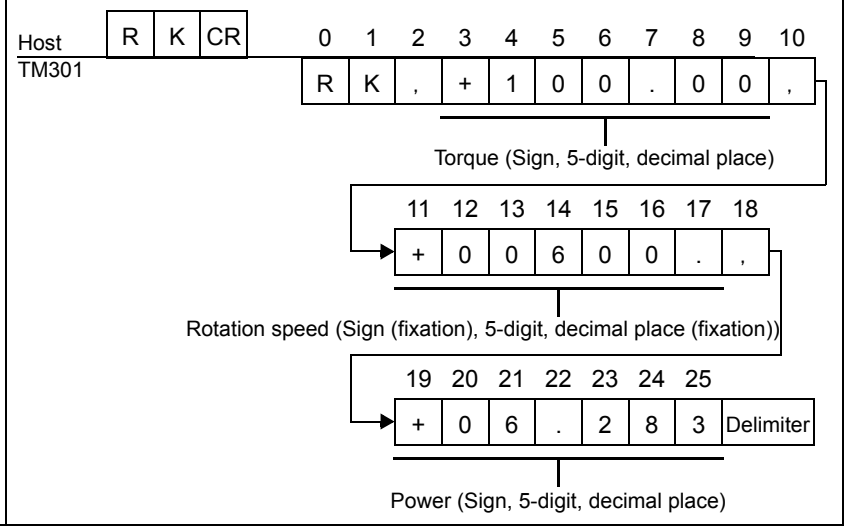
3. Press [ESC] twice to go back to the indicated value display.

■Communication format

1.Send/receive [reading the indicated value/status]

Reading the indicated value/status			
Function	Header		Protocol
	Main	Sub	
Torque (Hold synchronized)	R	A	Host → TM301: R A CR TM301 → Host: R A + 1 0 0 . 0 0 Delimiter Sign, 5-digit, decimal place
Rotation speed	R	B	Host → TM301: R B CR TM301 → Host: R B + 0 0 6 0 0 . Delimiter Sign (fixation), 5-digit, decimal place (fixation)
Power	R	C	Host → TM301: R C CR TM301 → Host: R C + 0 6 . 2 8 3 Delimiter Sign, 5-digit, decimal place

Reading the indicated value/status			
Function	Header		Protocol
	Main	Sub	
Status1 (Torque)	R	D	
Status2 (Torque)	R	E	
Status3 (Torque)	R	F	
Status4 (Rotation speed/ Power)	R	G	
Status5 (Rotation speed)	R	H	

Reading the indicated value/status			
Function	Header		Protocol
	Main	Sub	
Read all (Hold synchronized)	R	I	
Torque (Hold not synchronized)	R	J	
Read all (Hold not synchronized)	R	K	

2. Send/receive [setting value writing/reading]

Setting value writing			
Function	Header		Protocol
	Main	Sub	
Various settings	W	–	Host → TM301: W | | | | | | | | | CR Command (2 digits); Setting value (Sign, 5-digit, no decimal place) (For a setting value with a decimal place, simply write the numerical value excluding the decimal place.) * When the number of digits of the setting value is smaller than five, put a zero in the higher digit(s). Example) 3 digits W | ∗ | ∗ | + | 0 | 0 | 1 | 2 | 3 | CR * When the setting value is unsigned, put a zero in the sign digit. W | ∗ | ∗ | 0 | 0 | 0 | 0 | 0 | 3 | CR
Setting value reading			
Function	Header		Protocol
	Main	Sub	
Various settings	W	–	Host → TM301: W | | | CR (Command) TM301 → Host: W | | | | | | | | | Delimiter Command; Setting value (Sign, 5-digit, no decimal place) (A setting value with a decimal place results in the numerical value excluding the decimal place.)

* Command definition

∗ ∗
- First ∗: Setting mode number (F*)
- Second ∗: Setting value item number

* The mode number of the setting value of HI/LO limit is "0."
* For setting mode numbers and setting item numbers, see "12-1.The list of initial setting value" on page 97.

Point

- "Initialize" and "password" cannot be either read or written.
- When the protect of the setting value you are going to write is ON, it cannot be written. Turn OFF the protect.
- If an output value is written in command 42 (zero calibration), simulated zero calibration is executed with the written value. Also, if an output value is written in command 43 (equivalent input calibration), equivalent input calibration is executed.

3. Send/receive [operation command]

Movement directive			
Function	Header		Protocol
	Main	Sub	
Zero calibration	C	Z	Host → TM301: C Z CR
Equivalent input calibration	C	S	Host → TM301: C S CR * Set the rated capacity value before sending an actual load calibration command.
Digital zero	C	G	Host → TM301: C G CR
Digital zero reset	C	H	Host → TM301: C H CR
Record data clear	C	J	Host → TM301: C J CR
SECTION ON	C	1	Host → TM301: C 1 CR
SECTION OFF	C	2	Host → TM301: C 2 CR
T/H ON	C	3	Host → TM301: C 3 CR
T/H OFF	C	4	Host → TM301: C 4 CR

Point

If the calibration protect is ON, zero calibration and span calibration cannot be performed.

4. Send/receive [returning an error]

Returning an error			
Function	Header		Protocol
	Main	Sub	
Error occurrence (send/receive mode)	E	R	Host → TM301: Command TM301 → Host: E R * Delimiter 1: The command or message length is improper. 2: The protect of the setting value you are going to write is ON, or a calibration command is received while the calibration protect is ON. 3: The format errors of the setting value which tried to write in. 4: Other communication errors (parity error, frame error, etc.)

■Continuousness / printed transmission mode

Continuousness / printed transmission

Function	Header Main	Header Sub	Protocol
Indicated value & Status	G	S	See below

TM301

0	1	2	3	4	5	6	7	8	9	10	11	12
G	S	,	*1	*2	*3	*4	*5	*6	*7	*8	*9	,

13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
±							,	+						.	,

Sign + or −
Torque: 5-digit + decimal place
Sign + (fixation)
Rotation speed: 5-digit + decimal place (fixation)

29	30	31	32	33	34	35	36	37
±							Delimiter	

Sign + or −
Power: 5-digit + decimal place

* When communication mode is "Continuous transmission (hold not synchronized)", only indicated value is not synchronized with hold.

*1
O: Over load (LOAD, OFL)
S: Stable
M: Not stable
H: In holding
Priority: H＞O＞ (S or M)

*2
0: Undefined

*3
Torque unit
Set unit number

*4
Power unit
Set unit number

*5
H: HI limit ON
L: LO limit ON
G: HI limit and LO limit OFF
N: HI limit and LO limit ON
F: Comparison F
Torque
Priority: F＞N＞ (H or L)＞G

*6
H: ALM HI ON
L: ALM LO ON
G: ALM HI and ALM LO OFF
N: ALM HI and ALM LO ON
Torque
Priority: N＞ (H or L)＞G

*7
N: Near zero OFF
Z: Near zero ON

*8
H: HI limit ON
L: LO limit ON
G: HI limit and LO limit OFF
N: HI limit and LO limit ON
F: Comparison F
Rotation speed
Priority: F＞N＞ (H or L)＞G

*9
H: ALM HI ON
L: ALM LO ON
G: ALM HI and ALM LO OFF
N: ALM HI and ALM LO ON
Rotation speed
Priority: N＞ (H or L)＞G

Point

About the timing for continuous transmission

According to the communication baud rate setting, the continuous transmission intervals in the case where the communication modes “Continuous” is selected are as follows:

Communication baud rate	Continuous transmission interval
57600 bps	100 times/sec.
38400 bps	50 times/sec.
19200 bps	25 times/sec.
9600 bps	12 times/sec.

10-3. D/A converter voltage output (3ch)

This converter is used for obtaining analog outputs synchronized with torque, rotation speed and power.

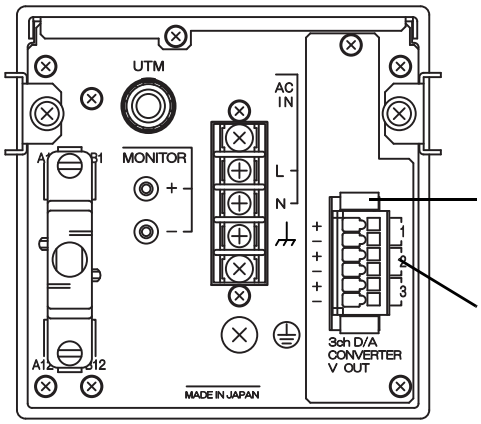
The analog output ranges are -10 to +10V output.

By using the D/A zero setting and D/A full scale setting functions, analog output can be obtained between zero (0V) and full scale (+10V) with respect to the predetermined digital value.

The output circuit and the main unit circuit are isolated.

The resolution is 1/10000 with respect to the ranges of -10 to +10V, and the conversion speed follows the A/D conversion speed.

The maximum voltage output range are about ±11V.



■Connector pin assignment

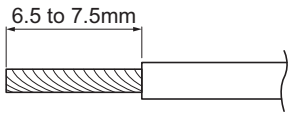
1	Torque	+	VOUT
		−	GND
2	Rotation speed	+	VOUT
		−	GND
3	Power	+	VOUT
		−	GND

Compatible plug 734-106/037-000

Operating tool 734-230

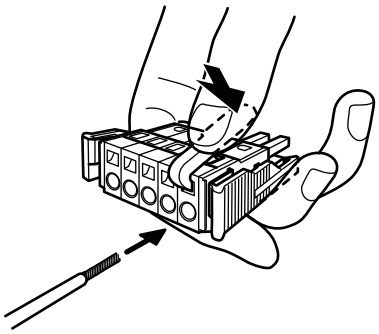
■Connection

A two-piece terminal block is used. Perform wiring with the plug pulled out from the option.
Use of the operating tool included is recommended to facilitate wiring.



1. Strip the casing 6.5 to 7.5mm on the cable to be connected.
Twist the bare wire to fit the terminal hole.

2. Press the operating tool attached to the operation slot at the upper part with a finger and push down the spring.



3. While pressing the operating tool, insert the electric wire into the insertion opening until it hits the wall.

4. The wire will be connected once the operating tool is released. For confirmation, tug the electric wire gently.

The wire can be connected likewise without the operating tool by using a tool such as a flathead screwdriver to press down the spring from the top.

⚠ CAUTION

- Cable can be from 28 to 14AWG (0.08 to 1.5mm^2).
- It is not necessary to solder the cable wires or to fix a solderless terminal.
- If several cables to be inserted to the same hole, twist those cable wires together and insert.
- Connect the cable with the power supply of the main body turned off without fail.
- For the protection from the damage, do not operate the lever without removing the plug.

■Output mode

《Setting value》

0: Data select	The output of each channel corresponds to the data select setting.
1: Zero scale fix	All outputs of the channels are fixed to zero scale output (0V). After confirmation, it will enter the output adjustment mode and zero adjustment for each channel will be enabled.
2: Full scale fix	All outputs of the channels are fixed to full scale output (+10V). After confirmation, it will enter the output adjustment mode and gain adjustment for each channel will be enabled.

■Data select

When the output mode is "0: Data select", the analog output for torque, rotation speed and power will be synchronized with the indicated value.
The output data for each indicated value can be selected.

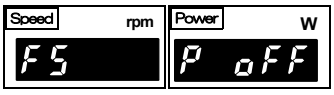
《Setting value》

0: Hold synchronized	Outputs value synchronized with the indicated value.
1: Hold not synchronized	Outputs value without hold even when the indicated value is on hold.

◇ Output mode/ data select setting method

1. Select setting mode 5.

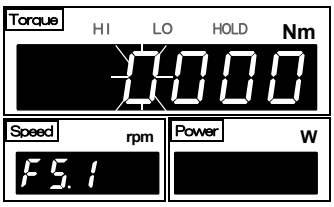
Press [FNC] → [►] four times.



2. Set "Output data select."

Press [▼RECALL] once. ⇒ "Output data select" is displayed.

Press [↵], and the highest digit blinks.



① Set "Output mode."

Input the output mode with [▲] [▼RECALL], and move to the lower digit with [►]. (Initial value: 0)

② Set "Data select 3 (power)."

Input the data select 3 (power) with [▲] [▼RECALL], and move to the lower digit with [►]. (Initial value: 0)

③ Set "Data select 2 (rotation speed)."

Input the data select 2 (rotation speed) with [▲] [▼RECALL], and move to the lower digit with [►]. (Initial value: 0)

④ Set "Data select 1 (torque)."

Input the data select 1 (torque) with [▲] [▼RECALL]. (Initial value: 0)

Press [↵] to validate it.

《Setting value》

0 0 0 0

- Data select 1 (Torque)
  - 0: Hold synchronized
  - 1: Hold not synchronized
- Data select 2 (Rotation speed)
  - 0: Hold synchronized
  - 1: Hold not synchronized
- Data select 3 (Power)
  - 0: Hold synchronized
  - 1: Hold not synchronized
- Output mode
  - 0: Data select
  - 1: Zero scale fix
  - 2: Full scale fix

3. Press [ESC] twice to go back to the indicated value display.

■Zero/Full scale setting

Zero scale 1 to 3 — Set the indicated value to output 0V.

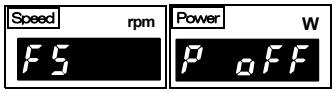
Full scale 1 to 3 — Set the indicated value to output 10V.
The gain will be "full scale - zero scale".
Outputs value within the range of ±gain with the set zero scale at the center.

《Setting value》
Zero/Full scale value -99999 to 99999

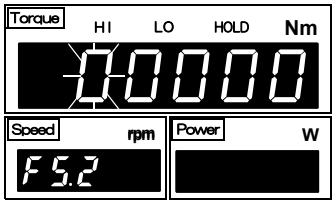
◇ Zero/Full scale setting method

1. Select setting mode 5.

Press [FNC] → [►] four times.



2. Set "Zero scale value 1 (torque)," and "Full scale value 1 (torque)."



① Set "Zero scale value 1 (torque)."

Press [RECALL] twice. ⇒ "Zero scale value 1 (torque)" is displayed.

Press [↵], and the highest digit blinks.

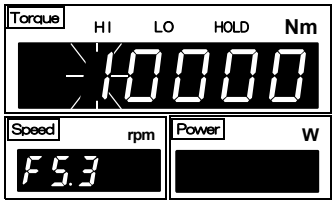
Input the setting value with [▲] [RECALL], and move to the lower digit with [►].

(Initial value: 0)

* For inputting a negative sign, press [+/−].

Press [↵] to validate it.

② Set "Full scale value 1 (torque)."



Press [RECALL] once. ⇒ "Full scale value 1 (torque)" is displayed.

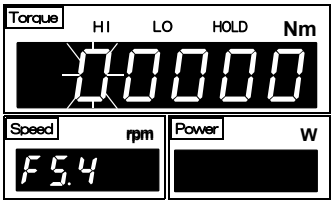
Press [↵], and the highest digit blinks.

Input the setting value with [▲] [RECALL], and move to the lower digit with [►]. (Initial value: 10000)

* For inputting a negative sign, press [+/−].

Press [↵] to validate it.

3. Set "Zero scale value 2 (rotation speed)," and "Full scale value 2 (rotation speed)."



① Set "Zero scale value 2 (rotation speed)."

Press [RECALL] once. ⇒

"Zero scale value 2 (rotation speed)" is displayed.

Press [↵], and the highest digit blinks.

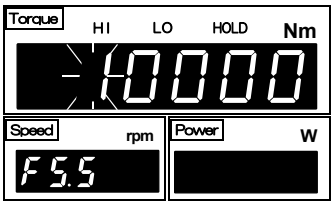
Input the setting value with [▲] [RECALL], and move to the lower digit with [►].

(Initial value: 0)

* For inputting a negative sign, press [+/−].

Press [↵] to validate it.

② Set "Full scale value 2 (rotation speed)."



Press [RECALL] once. ⇒

"Full scale value 2 (rotation speed)" is displayed.

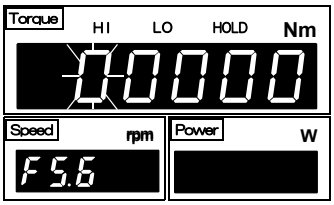
Press [↵], and the highest digit blinks.

Input the setting value with [▲] [RECALL], and move to the lower digit with [►]. (Initial value: 10000)

* For inputting a negative sign, press [+/−].

Press [↵] to validate it.

4. Set "Zero scale value 3 (power)," and "Full scale value 3 (power)."



① Set "Zero scale value 3 (power)."

Press [RECALL] once. ⇒ "Zero scale value 3 (power)" is displayed.

Press [↵], and the highest digit blinks.

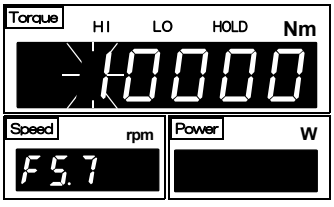
Input the setting value with [▲] [RECALL], and move to the lower digit with [►].

(Initial value: 0)

* For inputting a negative sign, press [+/−].

Press [↵] to validate it.

② Set "Full scale value 3 (power)."



Press [RECALL] once. ⇒ "Full scale value 3 (power)" is displayed.

Press [↵], and the highest digit blinks.

Input the setting value with [▲] [RECALL], and move to the lower digit with [►]. (Initial value: 10000)

* For inputting a negative sign, press [+/−].

Press [↵] to validate it.

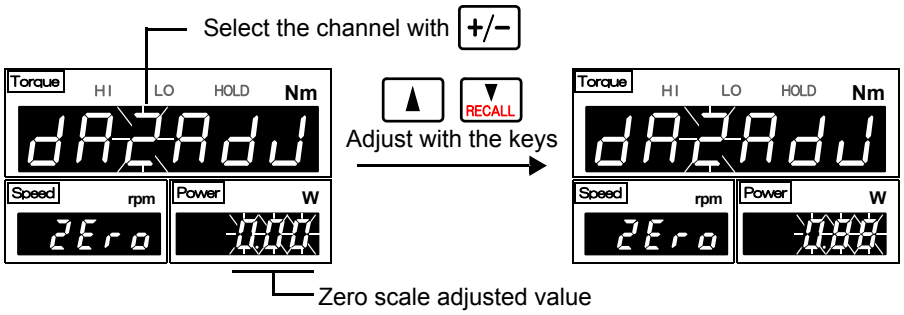
5. Press [ESC] twice to go back to the indicated value display.

■Adjustment by fixed output

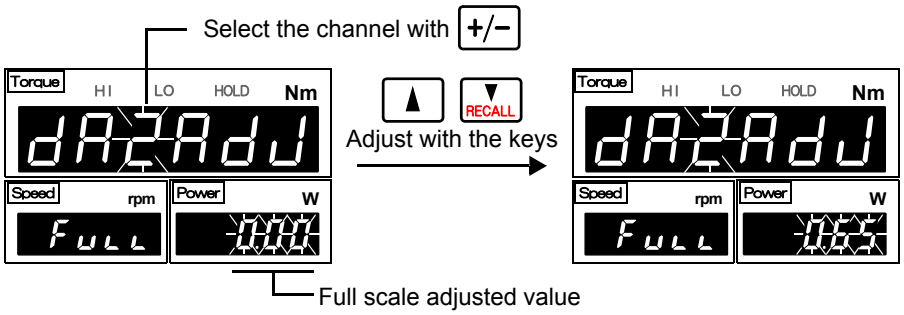
Make output adjustment on the adjustment screen appearing after selecting each fixed output by D/A output data select setting and pressing [↵].

Select the adjusting output channel with [+/−], and make fine adjustment of the output with [▲] [▼ RECALL] while monitoring the output value.
The adjustment values (%) is registered by pressing [↵] and confirming adjustment after completing adjustments for all channels to be adjusted.

◇Zero fixed output



◇Full fixed output



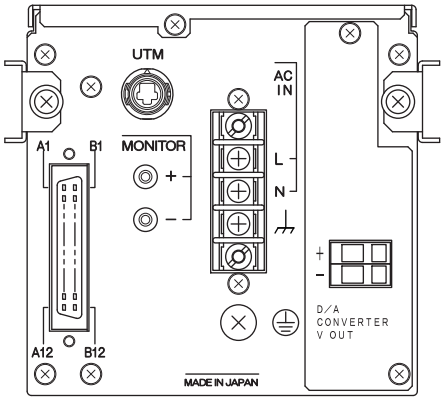
* Keeping on pressing [▲] [▼ RECALL] results in continuous operation.
* The adjustable range is approximately ±2.0V.
* Press [ZERO] to bring the adjusted value back to the central point (0%).
* Press [ESC] to stop adjustment and go back to the indicated value display screen.
* By initializing the system settings, the adjusted value is cleared to go back to 0%.

10-4. D/A converter output

A D/A converter is provided for obtaining analog output synchronized with the indicated value of the TM301. The analog output ranges are -10 to +10V output and 4 to 20mA constant-current output.
By using the D/A zero setting and D/A full scale setting functions, analog output can be obtained between zero (0V, 4mA) and full scale (10V, 20mA) with respect to the predetermined digital value.
The output circuit and the main unit circuit are isolated.
The resolution is 1/10000 with respect to the ranges of -10 to +10V and of 4 to 20mA, and the conversion speed follows the A/D conversion speed.
The maximum voltage output range are about ±11V, the maximum current output range are about 2.4 to 21.6 mA.

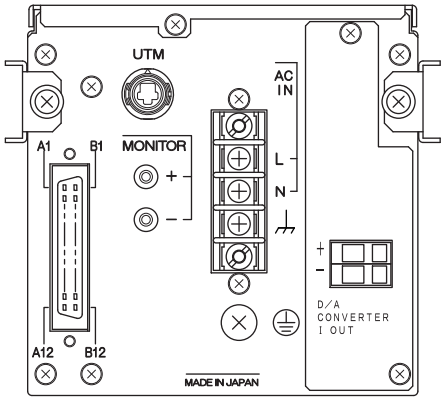
■Connection

DAV (D/A converter voltage output)



+	VOUT
–	GND

DAI (D/A converter current output)

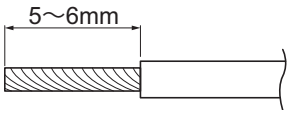


+	IOUT
–	GND

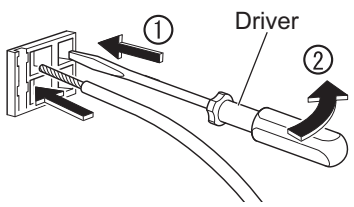
For the output terminals of the D/A converter option, a cage clamp type terminal block is used. Make connections by the following procedure.

Connecting to cage clamp terminal block

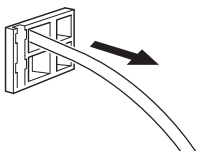
1. Strip the casing 0.2in (6mm) on the cable to be connected.
   Twist the bare wire to fit the terminal hole.



2. Insert the supplied screwdriver into the right hole and lift right.
3. Insert the twisted wires into the left hole.
4. Pull the screwdriver out from the upper hole.



5. Make sure cable is clamped securely and does not come out with a slight tug.



⚠ CAUTION

- Cable can be from 24 to 14AWG (0.2 to 2.5mm^2).
- It is not necessary to solder the cable wires or to fix a solderless terminal.
- If several cables to be inserted to the same hole, twist those cable wires together and insert.
- Connect the cable with the power supply of the main body turned off without fail.

■Output data select

《Setting value》

0: Torque (hold synchronized)
Torque synchronized with a hold is output.

1: Rotation speed — The rotation speed is output.

2: Power — The power is output.

3: Torque (hold not synchronized)
Torque in real time is output.

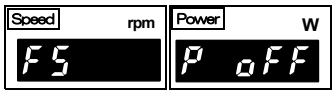
4: Zero fix — Output is fixed at the zero output (0V for voltage output, 4mA for current output). After fixing, you will go to the output adjustment mode, so that zero adjustment can be made.
See "■Adjustment by fixed output" on page 83.

5: Full scale fix — Output is fixed at the full scale (10V for voltage output, 20mA for current output). After fixing, you will go to the output adjustment mode, so that gain adjustment can be made.
See "■Adjustment by fixed output" on page 83.

◇ Output data select setting method

1. Select setting mode 5.

Press [FNC] → [►] four times.



2. Set "Output data select."

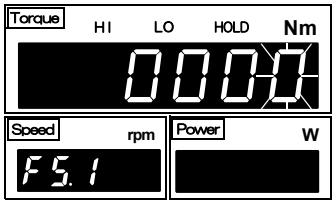
Press [▼ RECALL] once. ⇒ "Output data select" is displayed.

Press [↵], and the highest digit blinks.

Press [►] three times to make the digit of the output data select blink. (Initial value: 0)

Input the setting value with [▲] [▼ RECALL].

Press [↵] to validate it.



《Setting value》

0 0 0 0 — Output data select
- 0: Torque (hold synchronized)
- 1: Rotation speed
- 2: Power
- 3: Torque (hold not synchronized)
- 4: Zero fix
- 5: Full scale fix

0 0 0 — Undefined

0 0 — Undefined

0 — Undefined

3. Press [ESC] twice to go back to the indicated value display.

■Zero/Full scale setting

Zero scale　Set the indicated value to output 0V for voltage output, and 4mA for current output.

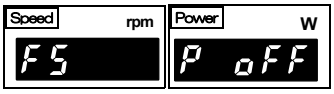
Full scale　Set the indicated value to output 10V for voltage output, and 20mA for current output.

《Setting value》
Zero/Full scale value　-99999 to 99999

◇ Zero/Full scale setting method

1. Select setting mode 5.

Press [FNC] → [►] four times.



2. Set "Zero scale value," and "Full scale value."

① Set "Zero scale value."

Press [RECALL] twice. ⇒ "Zero scale value" is displayed.

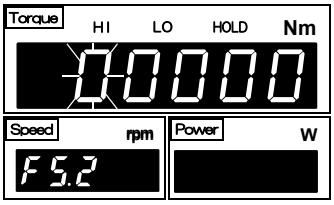
Press [↵], and the highest digit blinks.

Input the setting value with [▲] [RECALL], and move to the lower digit with [►].

(Initial value: 0)

* For inputting a negative sign, press [+/−].

Press [↵] to validate it.



② Set "Full scale value."

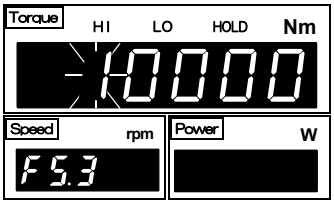
Press [RECALL] once. ⇒ "Full scale value" is displayed.

Press [↵], and the highest digit blinks.

Input the setting value with [▲] [RECALL], and move to the lower digit with [►]. (Initial value: 10000)

* For inputting a negative sign, press [+/−].

Press [↵] to validate it.

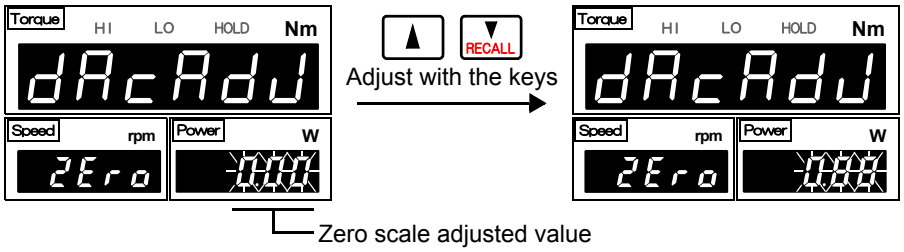


3. Press [ESC] twice to go back to the indicated value display.

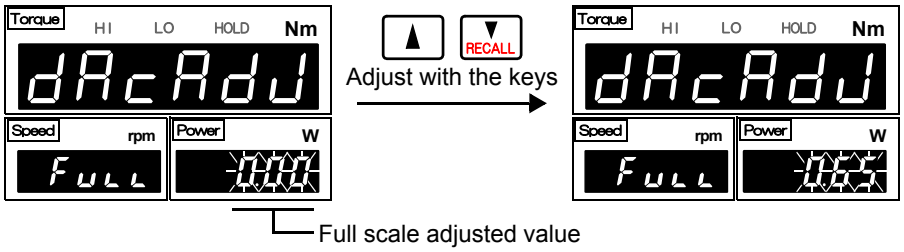
■Adjustment by fixed output

Make output adjustment on the adjustment screen appearing after selecting each fixed output by D/A output data select setting and pressing [↵].
While monitoring the output value, make fine adjustment of the output with [▲] [▼ RECALL], and press [↵] to validate it, so that the adjusted value (%) is registered.

◇Zero fixed output



◇Full fixed output



* Keeping on pressing [▲] [▼ RECALL] results in continuous operation.
* The adjustable range of voltage output is approximately ±2.0V, and that of current output is approximately ±1.6mA.
* Press [ZERO] to bring the adjusted value back to the central point (0%).
* Press [ESC] to stop adjustment and go back to the indicated value display screen.
* By initializing the system settings, the adjusted value is cleared to go back to 0%.

10-5. USB interface

The USB is an interface to read the indicated value of the TM301 and to write parameters into the TM301. This interface is convenient to process controls, totals, records, etc., by connecting the TM301 to PC. Moreover, set values can be read and written by specific PC software, and also input signal can be shown in wave form.

■Communication specifications

Communication standard:	Compliant with USB Ver.2.0, Full speed (12Mbps)	
Class:	Communication device class	
Baud rate:	9600, 19200, 38400, 57600, 115.2k, 230.4k bps selectable	
Bit configuration:	Start bit:	1bit
	Character length:	7 or 8 bit selectable
	Stop bit:	1 or 2 bit selectable
	Parity:	Parity none, odd or even selectable
	Delimiter:	CR, CR+LFSelectable
Code:	ASCII	
Connector:	mini-B TYPE	

■PC hardware requirement

OS:	Windows7 Home Premium/Professional/Ultimate 32/64bit
Display:	800×640 pixels or more
USB port:	One empty port
USB driver:	Virtual COM Port(VCP) Drivers by FTDI Ltd.

■Installation of a USB driver

Please install a USB driver for connecting with USB of the TM301.
Please see the homepage of FTDI for details and perform download and installation of the driver according to a procedure.

* If the PC is already connected to the network, the driver may be automatically installed via the network when the TM301 is connected to the PC.

Guide:	http://www.ftdichip.com/Support/Documents/InstallGuides.htm
Driver:	http://www.ftdichip.com/Drivers/VCP.htm

■Connection of USB

Connects a USB cable.
The USB connector of the TM301 is mini-B TYPE.

■The check of a virtual COM port

Please check the virtual COM port number which the TM301 is connected from the device manager of PC.

■Installation of the TM301 PC application software

When you use the TM301 PC application software, please download and install it from the Unipulse homepage.

* https://www.unipulse.tokyo/en/product/tm301-2/

Download a compressed file from download page to a PC.

▼

Decompress the compressed file by the PC then start installer.

▼

Complete the installation according to the guide.

■The injection of a power supply

On the power supply of TM301.

Please check that a display comes.

■Starting of the TM301 PC application software

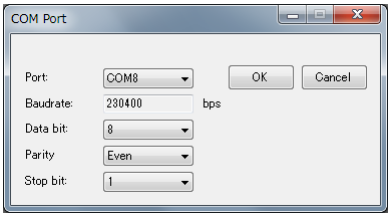
The TM301 PC application software will start by executing an EXE file.

If there is no shortcut on the desktop, please run the EXE file from the destination folder.

EXE file

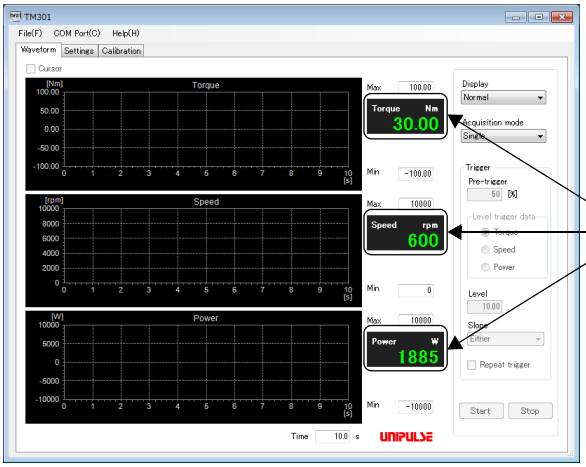
■Specification of a COM port

Please specify virtual COM port that is confirmed on "COM port" in the window menu.



■The check of a indicating value

Check if indicating value on the TM301 is displayed.



■Communication mode

《Setting value》

0: Send/receive

This mode performs communication by a command from the host computer.
In this mode, you can read out the indicated value, status, set values and write in set values.

* Please be sure to use this setting in the case of use of the TM301 PC application software.

1: Continuous transmission (hold synchronized) mode

This mode continuously transmits the indicated values and the status.
Indicated value and status are synchronized with hold.

2: Printed transmission mode

When the indicated value is printed (a print command is output to the SI/F), the indicated value and status are sent from the TM301 to host.

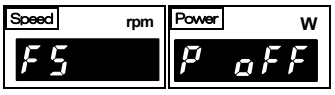
3: Continuous transmission (hold not synchronized) mode

This mode continuously transmits the indicated values and the status.
Only indicated value is not synchronized with hold.

◇Communication mode setting method

1. Select setting mode 5.

Press [FNC] → [►] four times.



2. Set "Communication mode."

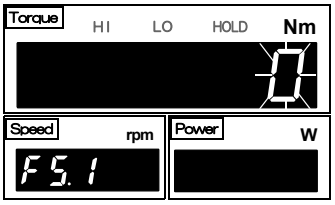
Press [▼ RECALL] once. ⇒ "Communication mode" is displayed.

Press [↵], and present set value blinks.

Input the setting value with [▲] [▼ RECALL].

(Initial value: 0)

Press [↵] to validate it.



3. Press [ESC] twice to go back to the indicated value display.

Point

Please be sure to use the following setting in the case of use of the TM301 PC application software.

Communication mode:	Send/receive
Baud rate:	230.4k bps
Delimiter:	CR

Character length, parity bit, and stop bit do not have specification.
The communication conditions can be united with PC application software.

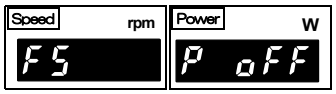
■Communication conditions

Set the communication conditions according to the host.

◇Communication conditions setting method

1. Select setting mode 5.

Press [FNC] → [►] four times.



2. Set "Communication conditions."

Press [▼ RECALL] twice. ⇒ "Communication conditions" is displayed.

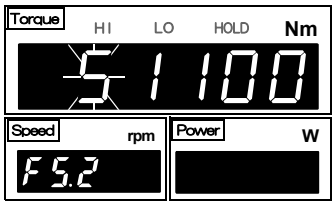
Press [↵], and present set value blinks.

Input the setting value with [▲] [▼ RECALL].

(Initial value: 51100)

Move to the lower digits with [►].

Press [↵] to validate it.



《Setting value》

5 1 1 0 0

- Undefined
- Stop bit
  0: 1bit 1: 2bit
- Parity bit
  0: None 1: Even 2: Odd
- Character length
  0: 7bit 1: 8bit
- Baud rate
  0: 9600 bps 2: 38400 bps
  1: 19200 bps 3: 57600 bps
  4: 115.2k bps 5: 230.4k bps

3. Press [ESC] twice to go back to the indicated value display.

■Delimiter

Set the delimiter for sending messages from the TM301.

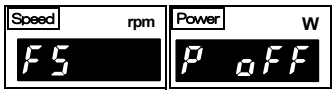
《Setting value》

0: CR 1: CR+LF

◇Delimiter setting method

1. Select setting mode 5.

Press [FNC] → [►] four times.



2. Set "Delimiter."

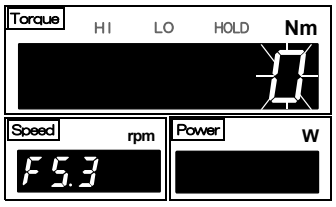
Press [▼ RECALL] three times. ⇒ "Delimiter" is displayed.

Press [↵], and present set value blinks.

Input the setting value with [▲] [▼ RECALL].

(Initial value: 0)

Press [↵] to validate it.



3. Press [ESC] twice to go back to the indicated value display.

■Communication format

The communication format is the same as an RS-232C interface (option).

For details, see "■Communication format" on page 68.

Point

About the timing for continuous transmission

Communication baud rate	Continuous transmission interval
230.4k bps	300 times/sec.
115.2k bps	150 times/sec.
57600 bps	100 times/sec.
38400 bps	50 times/sec.
19200 bps	25 times/sec.
9600 bps	12 times/sec.

11 SPECIFICATIONS

11-1. Specifications

■Analog section

Sensor input for torque (voltage input)

Input resistance	1MΩ
Signal input range	±5V
Non-linearity	0.02%/F.S.±1digit
Zero drift	Within 0.2mV/℃ RTI
Gain drift	Within 0.01%/℃
Analog filter	First-order low-pass filter (-6dB/oct) Selectable from 3, 30, 300, and 1k Hz.
Sampling speed	300 times/sec.
A/D resolution	24bit binary Approx. 1/30000 with respect to 5V
Voltage output	Input voltage cuff (For test point) Use terminal: C-55-111A (manufactured by Miraial or an equivalent) ϕ 2, Depth: 6mm Compatible terminal: C-55-155B (manufactured by Miraial or an equivalent)

Pulse input for rotation speed (open collector input)

Maximum input rotation speed	In accordance with the output frequency of the UTMⅡ series
Minimum input rotation speed	15, 10, 5, 3, 2 rpm selectable * Pulse rate: 4 pulses 60, 40, 20, 12, 8 rpm selectable * Pulse rate: 1 pulse
Minimum detection pulse width	50μs
Circuit configuration	No-voltage contact input (minus common) Open collector connectable (Ic = Approx.10mA)

Drive power supply for UTMⅡ

Power supply voltag	DC24V * One UTMⅡ at the maximum

■Display section

Display	7-segment LED, LED lamps	
	Main display:	Character height 15mm, 6-digit, indicated value: -99999 to 99999
	Sub display:	Character height 8mm, 5-digit, indicated value: -19999 to 99999 (The highest digit of a negative value is -1)

	Status display: HI, LO, HOLD: Red LED Decimal place: 0, 0.0, 0.00, 0.000 (Only a torque and a power. Rotation speed is nothing)
Display item	Display frequency: Selectable from 3, 6, 13, and 25 times/sec.

■Setting section

Setting method	Setting by inputting with membrane keys
Setting value	NOVRAM (non-volatile RAM) or lithium-battery-backed-up C-MOS RAM
Record data	Lithium-battery-backed-up C-MOS RAM

■External input/output section

External input	Dry contact input circuit (minus common type) for hold control, etc. (internal circuit power supply voltage 12V)
External output	Open collector output circuit (sink type) for comparison output, etc. Rated voltage: 30V, driving current: 30mA or less

■Interface

SIF

2-wire serial interface for connecting a UNIPULSE-manufactured printer, external display, etc.

Transmitting method	Asynchronous
Baud rate	600bps
Output data	Torque (GROSS area), Rotation speed (NET area), Power (TARE area)

■Options

BCD parallel data output (BCO)

Open collector output circuit (sink type)

Data format	BCD or binary selectable
Output rate	10, 30, 50, 100, 300 times/sec.
Rated voltage	30V
Driving current	30mA or less
Output data	Selected by the setting of "Torque," "Rotation speed," or "Power," or externally.

RS-232C interface (232)

Transmitting method	Asynchronous
Baud rate	9600bps to 57600bps
Flow control	RTS/CTS controllable

D/A converter voltage output (3ch) (D3V)

Output range	±10V	Common for all channels
Load resistance	2kΩ or more	
D/A conversion speed	Follows the main body A/D conversion speed.	
Resolution	1/10000	
Zero/span adjustment range	±10%F.S.	
Non-linearity	±0.05%F.S.	
Output data	Outputs torque, rotation speed and power at the same time.	

D/A converter voltage output (DAV)

Output range	±10V
Load resistance	2kΩ or more
D/A conversion speed	Follows the main body A/D conversion speed.
Resolution	1/10000
Zero/span adjustment range	±10%F.S.
Non-linearity	±0.05%F.S.
Output data	Selected by the setting of "Torque," "Rotation speed," or "Power."

D/A converter current output (DAI)

Output range	4 to 20mA
Load resistance	350Ω or less
D/A conversion speed	Follows the main body A/D conversion speed.
Resolution	1/10000
Zero/span adjustment range	±10%F.S.
Non-linearity	±0.05%F.S.
Output data	Selected by the setting of "Torque," "Rotation speed," or "Power."

USB interface (USB)

Communication standard	Compliant with USB Ver.2.0, Full speed (12Mbps)
Class	Communication device class
Baud rate	9600, 19200, 38400, 57600, 115.2k, 230.4k bps selectable
Virtual COM port	Set values can be read and written by specific PC software. Input signal can be shown in wave form.
Connector	mini-B TYPE

■General performance

Power supply voltage	AC100 to AC240V (-15%, +10%) [free power source 50/60Hz]		
Power consumption	14W max		
Operating conditions	Temperature:	Operation	-10 to +40℃
		Storage	-40 to +80℃
	Humidity:	85%RH or less (non-condensing)	
Dimension	96 (W)×96 (H)×138 (D)mm (Projections excluded)		
Panel cutout size	92×92 $^{+1}_{-0}$ mm		
Weight	Approximately 1.0 kg		

■Attachment

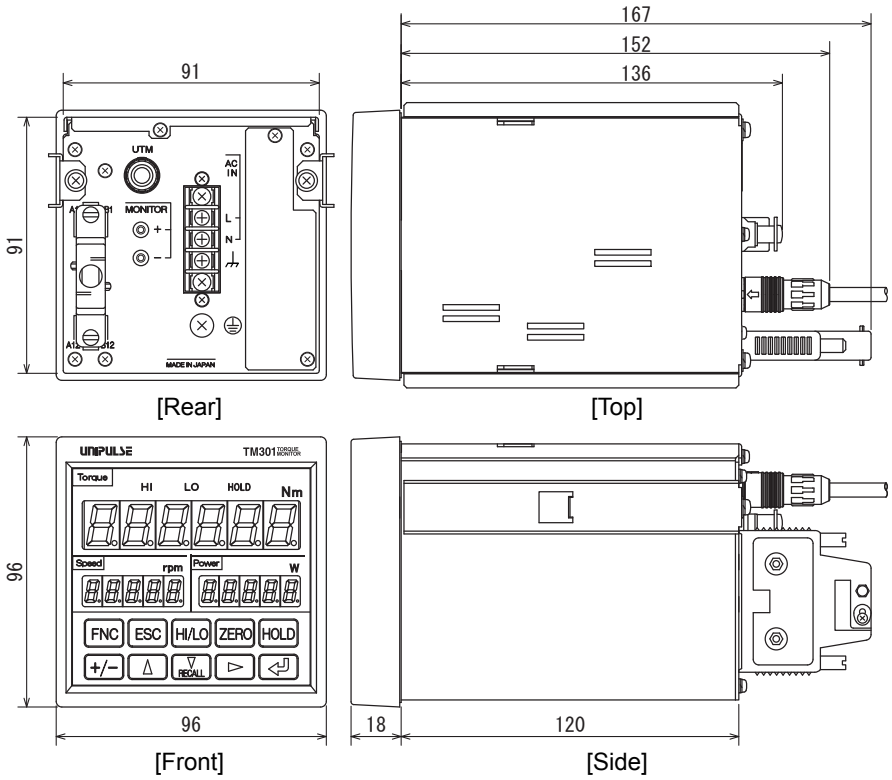
- External input/output connector 1
- AC input cord (3m) (with solderless terminal)* 1
- Cable for UTMII connection (2m) 1
- Unit seal 1
- Connector for BCD output (with BCD output option) 1
- Operating tool (with D/A converter (3ch) option) 1
- Mini screwdriver for terminal block connection (with D/A converter option) 1
- Operation manual 1

* The attached AC input cord is intended for 100V AC power in Japan.

11-2. Dimensions

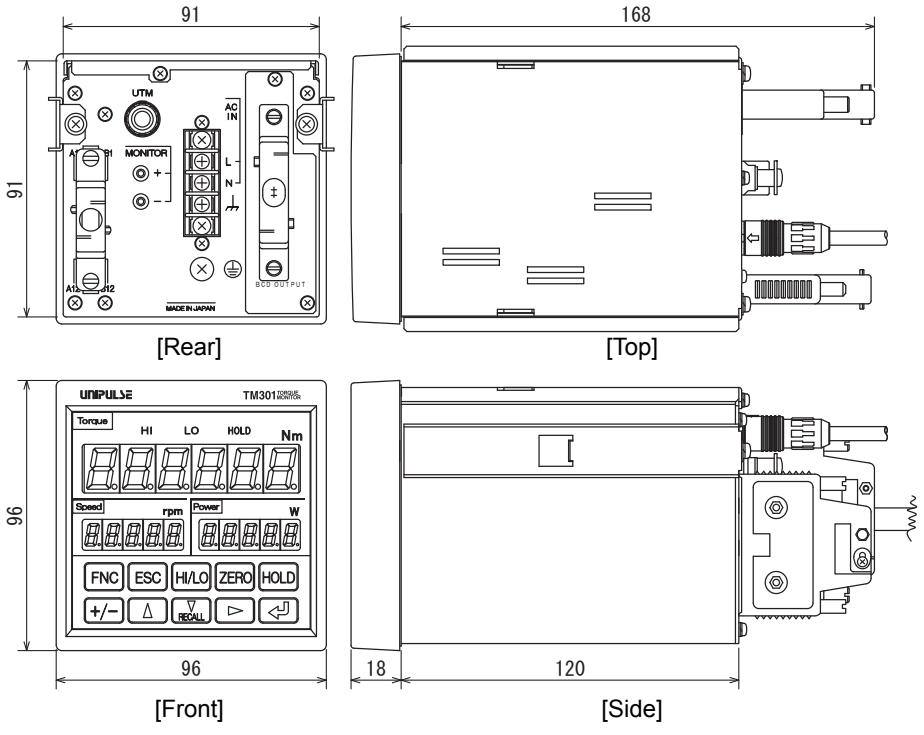
■Standard equipment

[Unit: mm]



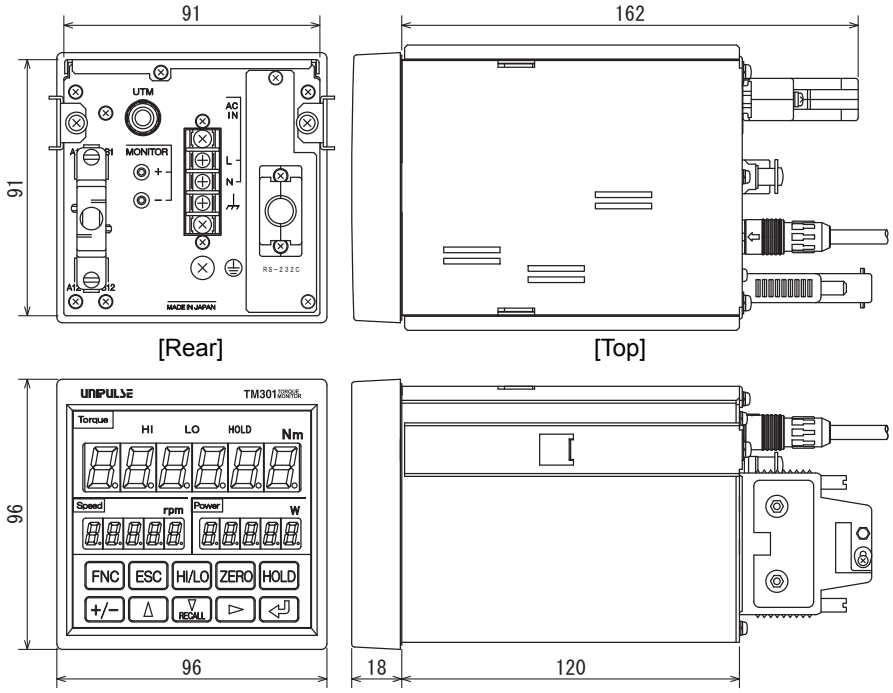
■Equipped with BCD parallel data output interface option

[Unit: mm]



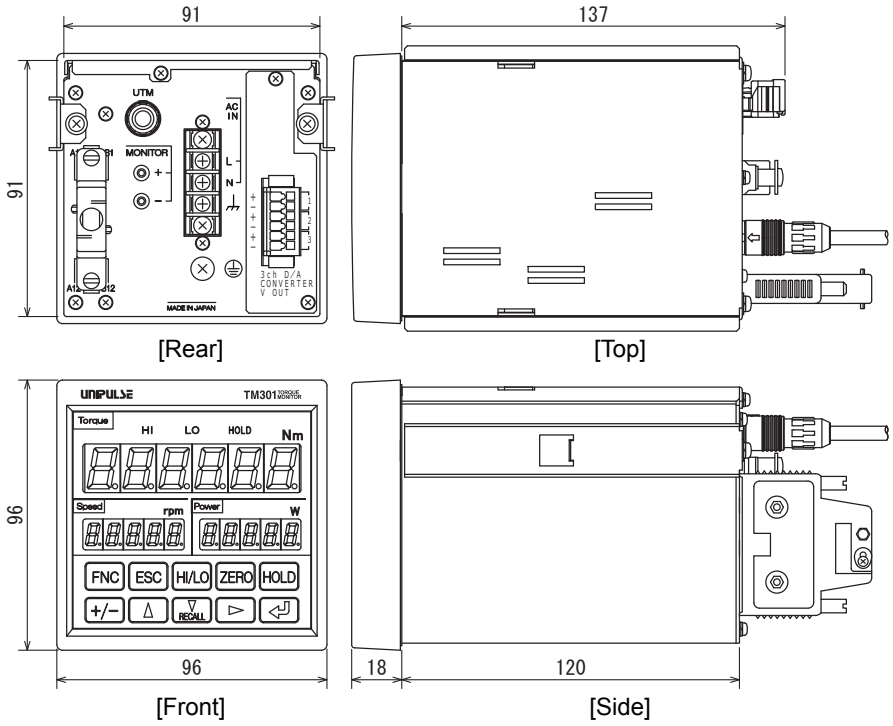
■Equipped with RS-232C interface option

[Unit: mm]



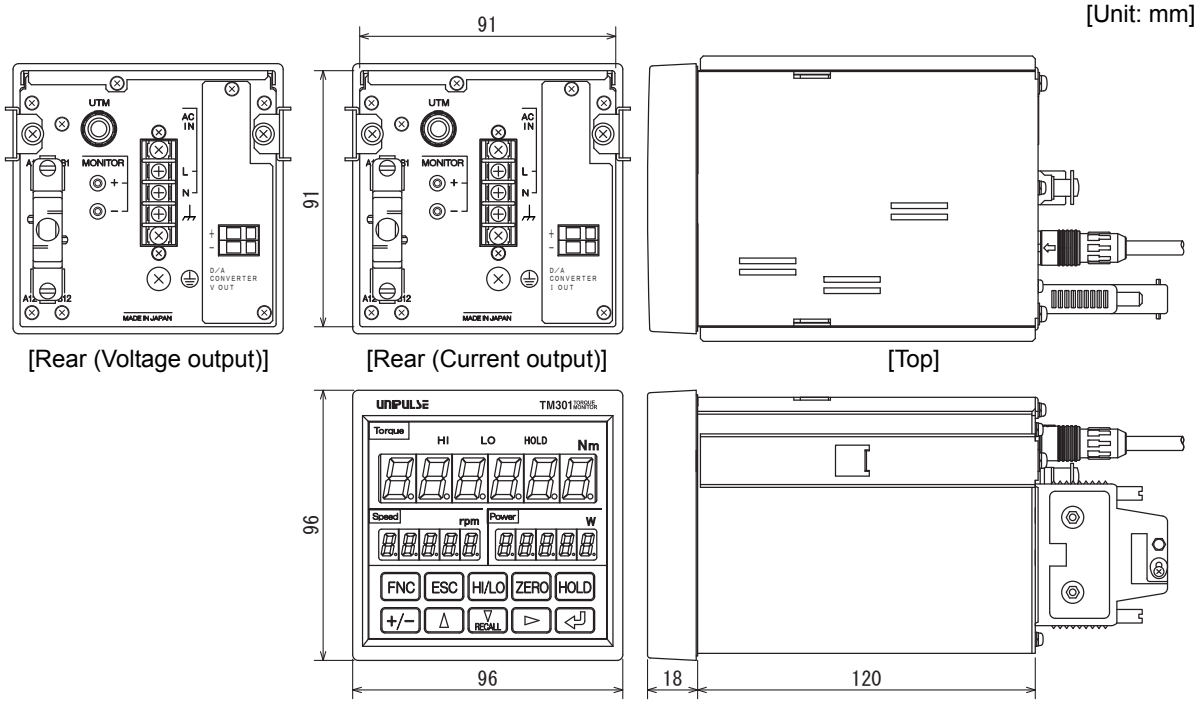
■Equipped with D/A converter (3ch) option

[Unit: mm]



■Equipped with D/A converter option

[Unit: mm]

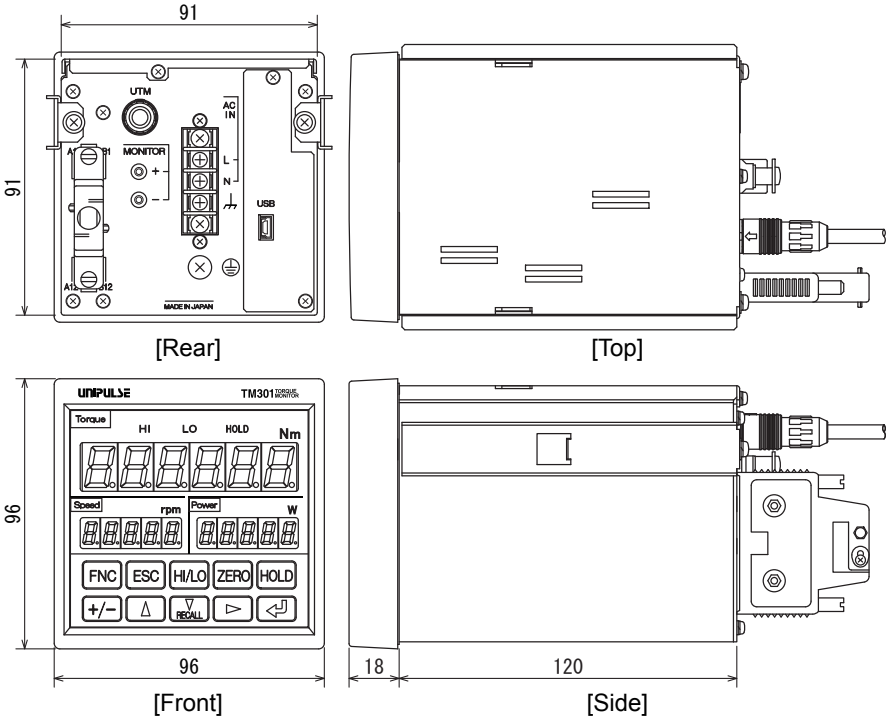


[Rear (Voltage output)] [Rear (Current output)] [Top]

[Front] [Side]

■Equipped with USB interface option

[Unit: mm]



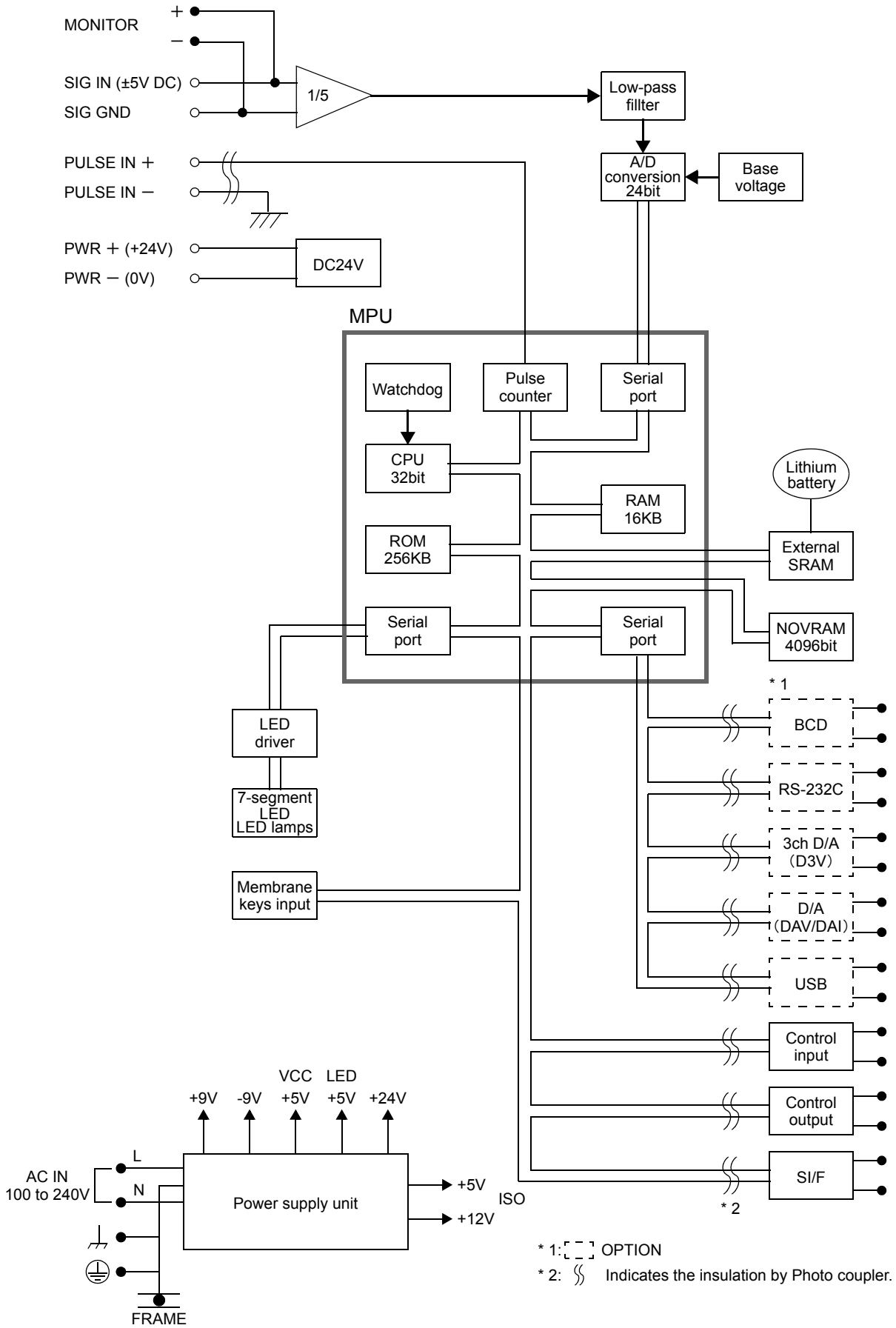
[Rear] [Top]

[Front] [Side]

Chapter 11

SPECIFICATIONS

11-3. TM301 block diagram



12 SUPPLEMENTS

12-1. The list of initial setting value

* Initial value　Factory default value

* Protec
  ○: Work protect
  ◎: System protect
  ●: Calibration protect
  } In accordance with "1. Setting protect" in mode 9.

* NOVRAM
  ◎: Saved in NOVRAM
  No mark: Saved in SRAM (lithium-battery-backed-up)

* Reference　Reference page on which the details of each item are described

■Mode 0: Work setting (HI/LO limit setting mode)

Item No.	Setting value name	Setting value range	Initial value	Protect	NOV RAM	Reference
1	Torque HI limit (HI)	-99999 to 99999	750	○		P18 P40
2	Torque LO limit (LO)	-99999 to 99999	250	○		
3	Torque Alarm HI limit (ALM HI)	-99999 to 99999	99999	○		
4	Torque Alarm LO limit (ALM LO)	-99999 to 99999	-99999	○		
5	Rotation speed HI limit (HI)	0 to 99999	3000	○		
6	Rotation speed LO limit (LO)	0 to 99999	100	○		
7	Rotation speed Alarm HI limit (ALM HI)	0 to 99999	99999	○		
8	Rotation speed Alarm LO limit (ALM LO)	0 to 99999	0	○		
9						

■Mode 1: Work setting (comparison/hold)

Item No.	Setting value name	Setting value range	Initial value	Protect	NOV RAM	Reference
1	Comparison function select	0 0 0 0 └ Undefined └ Comparison timing (Rotation speed) 0: All time 1: Torque synchronized └ Undefined └ Comparison timing (Torque) 0: All time 1: Stable 2: Near Zero OFF 3: Stable and Near Zero OFF 4: Hold	0010	○	◎	P43
2	Near zero	0 to 99999	100	○	◎	P42
3	Hysteresis (Torque)	0 to 9999	0	○	◎	P41
4	Hold function select	0 0 0 1 └ Auto reset 0: OFF 1: ON This setting is required when the hold section is "external signal" or "external signal + time" or "level + time." └ Hold section 0: All section 1: External signal 2: External signal + time 3: Level + time This setting is required only when the hold mode is other than "0: OFF." └ Hold mode 0: OFF 1: Sample 2: Peak 3: Bottom 4: P-P 5: Average └ Undefined	0001	○	◎	P44
5	Detection time*1	0.01 to 9.99 [sec.]	1.00	○	◎	P51
6	Average sample number*2	1 to 99 [times]	1	○	◎	P47
7	Hold start level*3	-99999 to 99999	100	○	◎	P52
8	Hysteresis (Rotation speed)	0 to 9999	0	○	◎	P41
9						

*1: This setting is required only when the hold section is "External signal + Time" and "Level + Time."

*2: This setting is required only when the hold mode is "Average."

*3: This setting is required only when the hold section is "Level + Time."

■Mode 2: System setting (operation 1)

Item No.	Setting value name	Setting value range	Initial value	Protect	NOV RAM	Reference
1	Motion detect (time)	0.0 to 9.9	0.0	◎	◎	P36
2	Motion detect (range)	000 to 999	000	◎	◎	P36
3	Zero tracking (time)	0.0 to 9.9	0.0	◎	◎	P37
4	Zero tracking (range)	000 to 999	000	◎	◎	P37
5	SI/F function select	0 0 0 └ Undefined └ Undefined └ SI/F print 0: None 1: Stable value 2: Hold value	000	◎	◎	P56
6	Display frequency	0: 3 1: 6 2: 13 3: 25 [times/sec.]	3: 25	◎	◎	P39
7	Display ON/OFF	1 1 1 └ Power display 0: OFF 1: ON └ Rotation speed display 0: OFF 1: ON └ Torque display 1: ON fixed	111	◎	◎	P39
8						
9						

■Mode 3: System setting (operation 2)

Item No.	Setting value name	Setting value range	Initial value	Protect	NOV RAM	Reference
1	Digital filter (torque)	0 (OFF), 2 to 999 [times]	30	◎	◎	P34
2	Analog filter (torque)	0: 3 1: 30 2: 300 3: 1k [Hz]	2: 300	◎	◎	P33
3	Dead band	0000 to 9999	0000	◎	◎	P34
4	Digital filter (rotation speed)	0 (OFF), 2 to 999 [times]	30	◎	◎	P34
5						
6						
7						
8						
9						

■Mode 4: Calibration setting

Item No.	Setting value name	Setting value range	Initial value	Protect	NOV RAM	Reference
1	Calibration function select 1 (torque)	0 2 2 0 Min. scale division (Torque) 0: 1 1: 2 2: 5 3: 10 4: 20 5: 50 6: 100 Decimal place (Torque) 0: None 1: 0.0 2: 0.00 3: 0.000 Unit (Torque) 0: mNm 1: Ncm 2: Nm 3: kNm 4: kgm (kgfm) 5: kgcm (kgfcm) 6: gcm (gfcm) Undefined	0220	●	◎	P22
2	Zero calibration	-5.000 to 5.000 [V]	0.000	●	◎	P23
3	Equivalent input calibration	-5.000 to 5.000 [V] (except 0)	5.000	●	◎	P24
4	Actual load calibration	-99999 to 99999 (except 0)	10000	●	◎	P26
5	Digital offset	-99999 to 99999	0	●	◎	P27
6	Digital Zero limit	0 to 99999	99999	●	◎	P27
7	Calibration function select 2 (rotation speed/ power)	1 0 1 0 0 Min. scale division (Power) 0: 1 1: 2 2: 5 3: 10 Decimal place (Power) 0: None 1: 0.0 2: 0.00 3: 0.000 Unit (Power) 0: mW 1: W 2: kW 3: PS 4: HP Min. scale division (Rotation speed) 0: 1 1: 2 2: 5 3: 10 Pulse rate (Rotation speed) 0: 1 pulse 1: 4 pulses	10100	●	◎	P28
8	Rotation stop settings	0 0 0 0 Minimum input rotation speed 0: 15 1: 10 2: 5 3: 3 4: 2 [rpm] * 4 times the above, when the pulse rate is "1 pulse" Undefined Rotation stop mode 0: OFF 1: 2 times 2: 4 times 3: 8 times Undefined	0000	●	◎	P30
9						

■Mode 5: Option setting (BCO option)

Item No.	Setting value name	Setting value range	Initial value	Protect	NOV RAM	Reference
1	Output data select	0: Torque (hold synchronized) 1: Rotation speed 2: Power 3: Torque (hold not synchronized) 4: External selection	0: Torque (hold synchronized)	◎	◎	P62
2	Output rate	0: 10 1: 30 2: 50 3: 100 4: 300 [times/sec.]	3: 100	◎	◎	P63
3	BCD/binary select	0: BCD 1: Binary	0: BCD	◎	◎	P64
4						
5						
6						
7						
8						
9						

■Mode 5: Option setting (232/USB option)

Item No.	Setting value name	Setting value range	Initial value	Protect	NOV RAM	Reference
1	Communication mode	0: Send/receive 1: Continuous transmission (hold synchronized) 2: Printed transmission 3: Continuous transmission (hold not synchronized)	0: Send/receive	◎	◎	P66
2	Communication condition	1 1 1 0 0 (232) 5 1 1 0 0 (USB) Flow control 0: None 1: RTS/CTS * Only 232 option Stop bit 0: 1bit 1: 2bit Parity bit 0: None 1: Even 2: Odd Character length 0: 7bit 1: 8bit Baud rate 0: 9600 1: 19200 2: 38400 3: 57600 4: 115.2k* 5: 230.4k* [bps] * Only USB option	232: 11100 USB: 21100	◎	◎	P67
3	Delimiter	0: CR 1: CR+LF	0: CR	◎	◎	P68
4						
5						
6						
7						
8						
9						

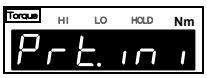
■Mode 5: Option setting (D3V option)

Item No.	Setting value name	Setting value range	Initial value	Protect	NOV RAM	Reference
1	Output data select	0 0 0 0 Data select 1 (Torque) 0: Hold synchronized 1: Hold not synchronized Data select 2 (Rotation speed) 0: Hold synchronized 1: Hold not synchronized Data select 3 (Power) 0: Hold synchronized 1: Hold not synchronized Output mode 0: Output data select 1: Zero scale fix 2: Full scale fix	0000	◎	◎	P75
2	Zero scale value 1 (Torque)	-99999 to 99999	0	◎	◎	P77
3	Full scale value 1 (Torque)	-99999 to 99999	10000	◎	◎	P77
4	Zero scale value 2 (Rotation speed)	-99999 to 99999	0	◎	◎	P77
5	Full scale value 2 (Rotation speed)	-99999 to 99999	10000	◎	◎	P77
6	Zero scale value 3 (Power)	-99999 to 99999	0	◎	◎	P77
7	Full scale value 3 (Power)	-99999 to 99999	10000	◎	◎	P77
8						
9						

■Mode 5: Option setting (DAC (DAV/DAI) option)

Item No.	Setting value name	Setting value range	Initial value	Protect	NOV RAM	Reference
1	Output data select	0 0 0 0 Output data select 0: Torque (hold synchronized) 1: Rotation speed 2: Power 3: Torque (hold not synchronized) 4: Zero fix 5: Full scale fix Undefined Undefined Undefined	0000	◎	◎	P81
2	Zero scale value	-99999 to 99999	0	◎	◎	P82
3	Full scale value	-99999 to 99999	10000	◎	◎	P82
4						
5						
6						
7						
8						
9						

■Mode 9: Protect/Initializ



Item No.	Setting value name	Setting value range	Initial value	Protect	NOV RAM	Reference
1	Setting protect	0 0 0 Calibration protect 0: OFF 1: ON System protect 0: OFF 1: ON Work protect 0: OFF 1: ON	000		◎	P105
2	Key protect	0 0 0 Undefined HOLD key protect 0: OFF 1: ON ZERO key protect 0: OFF 1: ON	000	◎	◎	P106
3	Initialize	1: Work setting 2: System setting 3: Calibration setting	0	○◎●	—	P107
4	Password		0000	—	—	P107
5						
6						
7						
8						
9	Record data clear	0: Cancel 1: Execution	0	○		P59

12-2. Self-check function

The self-check function is to automatically check the memory and detect problems.
This function is to checksum the software, check the NOVRAM operation, check the SRAM operation, and check the lighting of indicators. This function is not to diagnose the analog circuit.

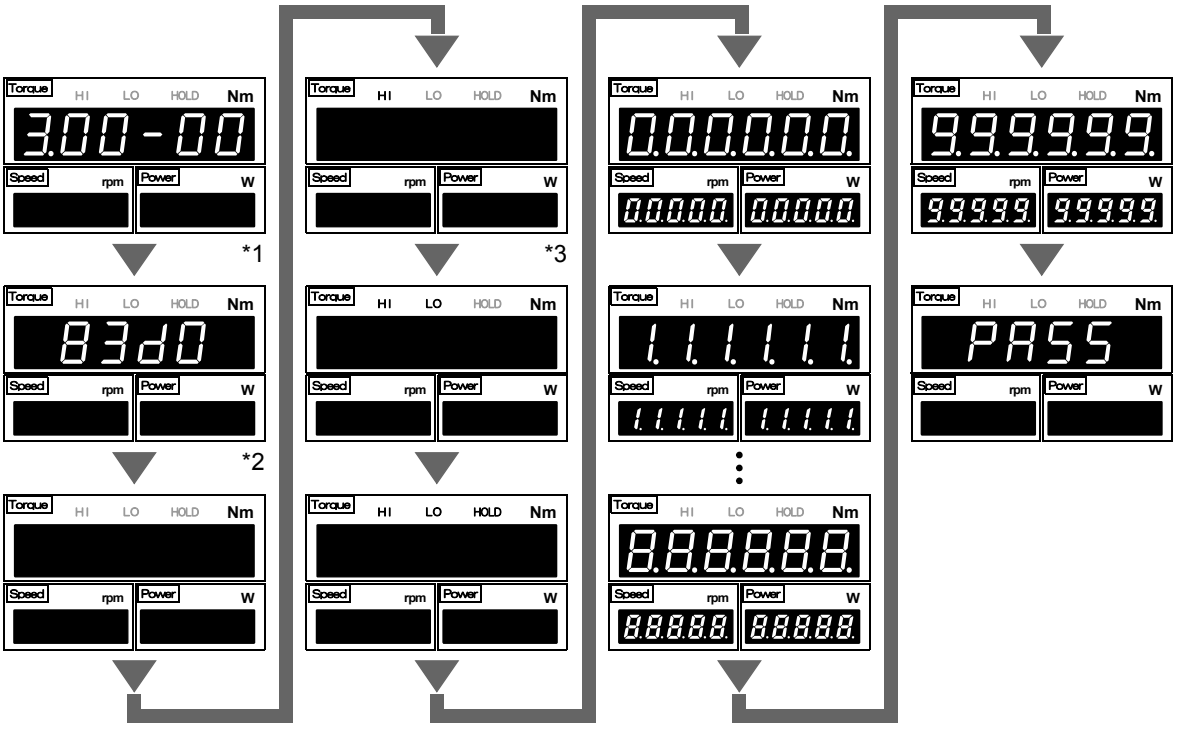
■Self-check method

1. Turn off the power of the TM301.
2. Turn on the power while pressing [ESC].
3. If "PASS" is displayed at the end, it is normal.

⚠ CAUTION

If " PASS " is not displayed at the end, there is a possibility of failure.
(Contact our sales staff.)

Self-check display items



*1: ROM version
*2: Checksum *1 and *2 are subject to change.
*3: Status indications light in sequence.

12-3. Setting protect

Each category of setting values can be locked to prevent rewriting.
For each category, see the setting value list.

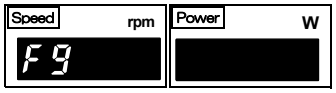
《Setting value》

0: OFF	Enables rewriting of setting values.
1: ON	Disables rewriting of setting values.

■Setting protect setting method

1. Select setting mode 9.

Press [FNC] → [►] five times.



2. Set "setting protect."

Press [RECALL] once. ⇒ "Setting protect" is displayed.

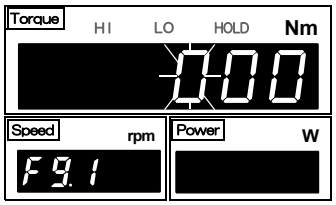
Press [↵], and the highest digit blinks.

Input the setting value of "Work protect" with [▲] [RECALL].

Move to the lower digit with [►]. (Initial value: 0)

Input the setting values of "System protect" and "Calibration protect" in a like manner.

Press [↵] to validate it.



《Setting value》

0 0 0
- Calibration protect
  0: OFF 1: ON
- System protect
  0: OFF 1: ON
- Work protect
  0: OFF 1: ON

3. Press [ESC] twice to go back to the indicated value display.

Point

For the setting items protected by the setting protect, see "12-1.The list of initial setting value" on page 97.

12-4. Key protect

[ZERO] key and [HOLD] key operations are disabled to prevent misoperation.

≪Setting value≫

0: OFF Enables key operations.

1: ON Disables key operations.

■Key protect setting method

1. Select setting mode 9.

Press [FNC] → [►] five times.

2. Set "Key protect."

Press [▼ RECALL] twice. ⇒ "Key protect" is displayed.

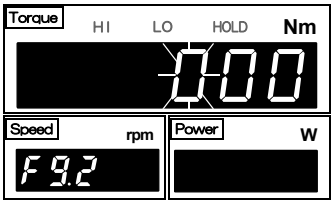
Press [↵], and the highest digit blinks.

Input the setting value of "ZERO key protect" with [▲] [▼ RECALL].

Move to the lower digit with [►]. (Initial value: 0)

Input the setting values of "HOLD key protect" in a like manner.

Press [↵] to validate it.



《Setting value》

0 0 0

Undefined

HOLD Key protect

0: OFF 1: ON

ZERO Key protect

0: OFF 1: ON

3. Press [ESC] twice to go back to the indicated value display.

12-5. Initialize

Each category of setting values can be initialized.
For each category, see the setting value list.

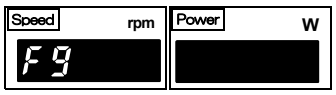
≪Setting value≫
(0: Undefined)
1: Work setting (Including record data)
2: System setting (Including setting protect and key protect)
3: Calibration setting

After inputting the number of the setting value category you want to initialize, press [↵] to validate it, and initialization is executed.
However, if the category is protected, initialization cannot be performed.
Normally, the setting value of "initialize" is "0 (undefined)."

■Initialize setting method

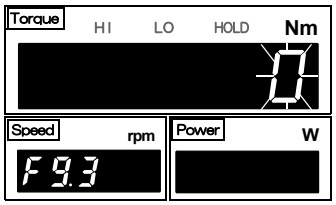
1. Select setting mode 9.

Press [FNC] → [►] five times.



2. Excecute initialization.

Press [▼ RECALL] three times. ⇒ "Initialize" is displayed.
Press [↵], and blinks.
Input the setting value for initialization with [▲] [▼ RECALL].
Press [↵] to validate it.



* Upon validation, initialization is executed and the setting value goes back to "0."

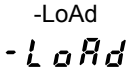
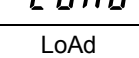
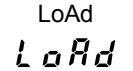
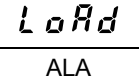
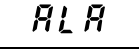
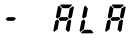
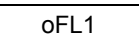
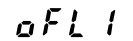
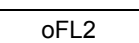
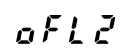
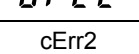
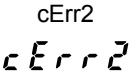
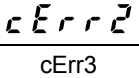
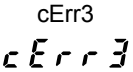
3. Press [ESC] twice to go back to the indicated value display.

12-6. Password

This setting is for maintenance and inspection. Do not operate it.

12-7. Error/message list

■Main numerical display section

-LoAd 	Below the signal input range -5V	The input electric signal greatly exceeds the signal input range. This also occurs when an excessive load is applied to the sensor or the input terminal is opened due to a break in the cabling, etc.
LoAd 	Beyond the signal input range +5V	
ALA 	Beyond the alarm HI limit	This occurs when a larger load than expected is applied to the sensor or calibration is performed below the measurement range. Check the calibration and measuring object.
-ALA 	Below the alarm LO limit	
oFL1 	Below -99999	This occurs when a larger load than expected is applied to the sensor or calibration is performed below the measurement range. Check the calibration and measuring object.
oFL2 	Beyond 99999	
cErr2 	Beyond the zero calibration range in the positive direction	The signal input range is greatly exceeded when zero calibration is performed. Check for an excessive load applied to the sensor and for breaks.
cErr3 	Below the zero calibration range in the negative direction	
cErr4 	Beyond the rated output value in the positive direction/ negative direction. Beyond the rated capacity value.	The signal input range is greatly exceeded when calibration is performed. In the case of equivalent input calibration, check the rated output value, and in the case of actual load calibration, check for an excessive load applied to the sensor and for breaks. Also, Check the setting of rated capacity value (display value) sets it exceeding "±99999".
cErr5 	Rated capacity value = 0	Check the setting of rated capacity value (display value) for being "0" when calibration is performed.
cErr6 	Rated output value 0.000V at the time of equivalent input calibration Rated output value in the range of -0.010 to +0.010V at the time of actual load calibration	Check the rated output value for being 0.000V when equivalent input calibration is performed, and the load for being too light in weight when actual load calibration is performed.
dZ Err 	Digital Zero limit error	When the range of zero point correction (deviation from the zero calibration registered point) by Digital Zero or Zero Tracking exceeds the setting value of Digital Zero limit, Digital Zero limit error occurs. Perform Digital Zero, etc., in a proper range.
CALZE 	Zero calibration in progress	These are not errors. They indicate that each calibration is in execution.
CALSP 	Actual load calibration in progress	
CALEq 	Equivalent input calibration in progress	
Lo bAt 	Lithium battery backup voltage drop	The voltage of the lithium battery for internal memory backup has dropped. The battery needs to be replaced. Ask us for replacement of the battery.

■Sub numerical display section

oFL1 oFL1	Below -19999	The power exceeds the display range. Check the power unit and decimal place settings.
oFL2 oFL2	Beyond +99999	The rotation speed or power exceeds the display range. On the rotation speed side, check the connection with the UTMⅡ, and on the power side, check the power unit and decimal place settings.
ALA ALA	Beyond the alarm HI limit	Rotation speed is at a faster or slower speed than expected. Confirm that rated rotation speed and rotation are not locked and so forth.
-ALA -ALA	Below the alarm LO limit	

12-8. Troubleshooting

Item	Question	Answer/remedy
Sensor	Is a correct indicated value displayed by simply connecting sensor(s)?	Match the sensor output and indicator by equivalent input calibration or actual load calibration. Then, the indicated value is displayed in proportion to the sensor output.
Wiring and connection	The power cannot be turned on.	Check to see if the power cord is properly connected. If not, connect the power cord properly.
		Check to see if the power source is within the specified range. If not, use a power source within the specified range.
	The indicated value is abnormal.	Check to see if the sensor is properly connected. If not, connect the sensor properly.
		Check the sensor for damage. Connect a normal sensor.
		Check the sensor for a mechanical load. Prevent such a load.
		Check the MONITOR terminal to see if the voltage is within ±5V.
Setting and operation	It is desired to decrease the number of digits of the numerical value.	Since there is a need to decrease the number of digits of the value input during equivalent input calibration or actual load calibration, perform calibration again. Also, set the load-related setting values, such as HI and LO limit values, again according to that number of digits.
	How to get hold is unclear.	The control method may differ according to the hold mode used. See "7-1.Hold functions of torque" on page 44.
	Judgment results are not output.	Check to see if the output cable is properly connected. If not, connect the output cable properly.
		In the case of comparison output, the output conditions differ according to the setting of comparison timing. See "6-4.Comparison timing" on page 43.
	Lower digit(s) of the indicated value fluctuates.	Check for calibration exceeding 10000 at approximately 1.7V. Since the resolution is approximately 10000 with respect to approximately 1.7V, calibration exceeding it will cause coarseness, and the indicated value will fluctuate and not become stable. For using as it is, ignore the lower digit(s), or set the min. scale division again.
	Is the voltage output and D/A option different?	The monitor output is made by turning back the sensor input. It is different from the D/A converter that converts from digital to analog through digital processing. Consider that the D/A converter is synchronized with the indicated value.

Item	Question	Answer/remedy
SI/F	The output is abnormal.	Check for parallel wiring with AC lines. Carry out wiring again so as not to become parallel with AC lines.
	The print on the printer is abnormal.	Check to see if the print data setting of the printer side is correct. GROSS area, NET area, and TARE area exist. Check that the areas and setting correspond.
	Automatic printing cannot be performed.	Check to see if the SI/F print setting of the TM301 is correct. Check the setting.
		Check to see if the printer side print setting is automatic printing. Check the setting.
Option	Can two or more options be mounted?	Cannot be mounted. Only one optional function can be mounted.
BCD output option	The output is abnormal.	Check to see if wiring is correct. Check the wiring, and connect the communication cable properly.
		Check to see if the logic is recognized properly. Negative logic/positive logic selection is available.
		Check to see if synchronization is maintained with the strobe signal. Check the setting.
		Check to see if it is in synchronization with the strobe signal. Make the output rate slower or use the BCD data hold if the processing performance of the device that should receive BCD is low.
	Hold values do not result.	The output data differ according to the setting or external selection. Check to see if it is a torque (hold synchronized).
RS-232C option	Communications fail.	Check to see if the communication cable is properly connected. After turning off the power, connect the communication cable properly.
		Check to see if a proper communication cable is used. Check to see if wiring is correct. Check the wiring, and connect the communication cable properly.
		Check to see if the communication conditions of the master and TM301 correspond. Check the communication conditions, and match the settings.
	Reading cannot be performed.	Check to see if the transmission command from the master is correct. Check for any unwanted code included at the head of the transmission command. Check the transmission command.
	Is any program necessary for communicating with PC?	Some program or tool for serial communication is necessary. Create software to exchange commands at required timing.
D3V/DAV/DAI option	The output is abnormal.	Check for greatly exceeding the scale.
		Check for fixed output setting. Set the output setting properly again.

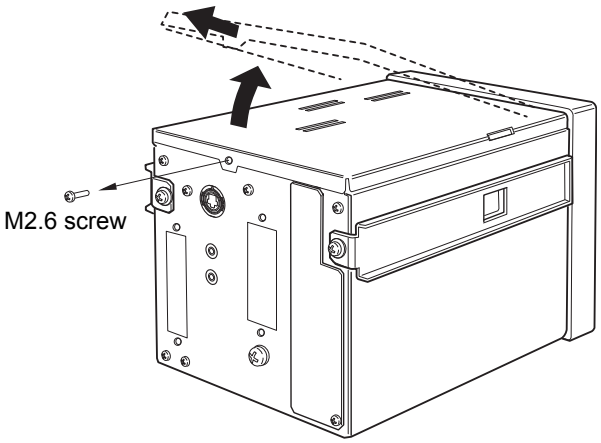
12-9. About disposal of the lithium battery

When disposing of the TM301, make sure to remove the lithium battery and collect it separately. Also, after power-off, take sufficient time to discharge the internal capacitor.

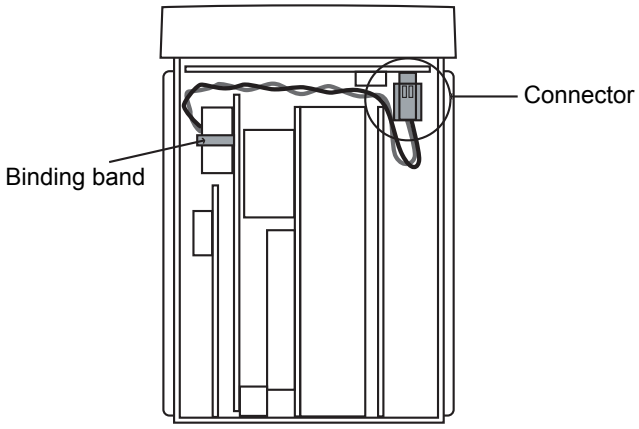
■Removal of the lithium battery

1. Disconnect all cables.

2. Open the top plate.



3. Pull out the connector at the tip of the cable of the lithium battery.
Pinch and pull out the connector while tilting it upward for easy removal.



4. Cut the binding band that fixes the lithium battery with nippers or the like.

5. Cut the red and black cables one by one at the root of the lithium battery with nippers or the like so as not to short-circuit them.

*** Make sure to collect the lithium battery separately.**

Unipulse Corporation

International Sales Department

9-11 Nihonbashi Hisamatsu-cho, Chuo-ku, Tokyo 103-0005
Tel: +81-3-3639-6120 Fax: +81-3-3639-6130

www.unipulse.tokyo/en/

□	Head Office:	9-11 Nihonbashi Hisamatsu-cho, Chuo-ku, Tokyo 103-0005
□	Technical Center:	1-3 Sengendainishi, Koshigaya, Saitama 343-0041
□	Nagoya Sales Office:	TOMITA Bldg. 2-5 Ushijima-cho, Nishi-ku, Nagoya 451-0046
□	Osaka Sales Office:	Sumitomo Seimei Shin Osaka Kita Bldg. 4-1-14 Miyahara, Yodogawa-ku, Osaka 532-0003
□	Hiroshima Sales Office:	Hiroshima Dai-ichi Seimei OS Bldg. 1-2-21 Matoba-cho, Minami-ku, Hiroshima 732-0824