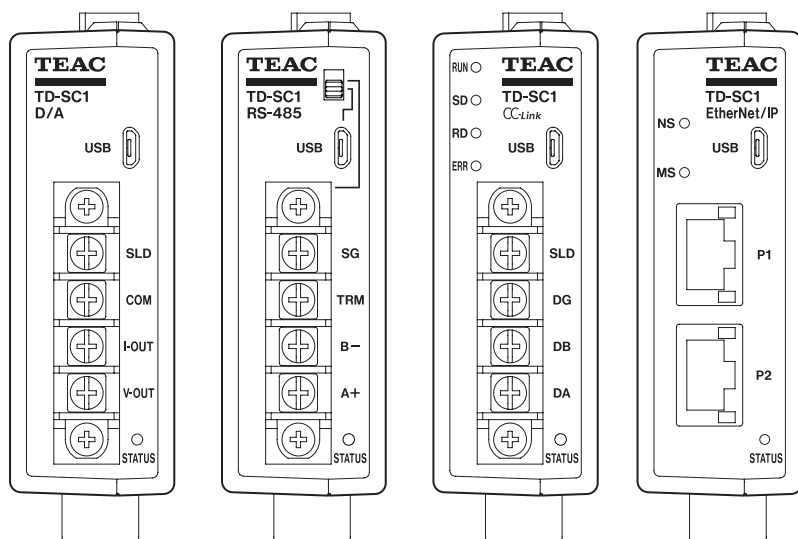


TEAC

Load Cell Signal Conditioner Instructions for Use

TD-SC1



CC-Link EtherNet/IP

Introduction

Thank you for purchasing the TD-SC1 Load Cell Signal Conditioner.

Please read this document in its entirety before using the product to get the best performance and ensure safe and proper operation.

In this manual, "this unit" or "TD-SC1" is used when referring generally to TD-SC1 (D/A), TD-SC1 (485), TD-SC1 (CCL) and TD-SC1 (E/IP) models.

The abbreviation in parentheses shows the type of model. TD-SC1 (D/A) has D/A, TD-SC1 (485) has RS-485, TD-SC1 (CCL) has CC-Link and TD-SC1 (E/IP) has EtherNet/IP™.

Features

- Support for TEDS sensors makes calibration easy. Automatic calibration is also possible when a TEDS sensor is connected.
- An equivalent input function is included, making sensitivity adjustment without actual loads easy.
- Supports remote sense functions. Even using long cables measurement is possible without losing precision.
- Static strain measurement is possible. Identifying load cell defects and other problems through plastic deformity is easy.
- Supports high and low limit comparison functions.
- Supports hold functions, including peak hold, bottom hold and holds with zone designations.
- Attaches to common DIN rails.
- Product complies with RoHS.

EtherNet/IP is a trademark of ODVA, Inc.

Other company names and product names in this document are the trademarks or registered trademarks of their respective owners.

Included accessories

If anything is missing or damaged, contact us. (For contact information, see the last page.)

Input/output connector plug	
B2CF 3.50/18/180LR SN OR BX or equivalent part	1
Micro USB-B cable	1
Power input terminal bank cover (pre-installed on unit)	1

The following additional accessories are included with the TD-SC1 (D/A).

KEC-NS0604-02 D/A terminal bank or equivalent part	1
D/A terminal bank cover	1

The following additional accessories are included with the TD-SC1 (485).

KEC-NS0604-02 RS-485 terminal bank or equivalent part	1
RS-485 terminal bank cover	1

The following additional accessories are included with the TD-SC1 (CCL).

KEC-NS0604-02 CC-Link terminal bank or equivalent part	1
CC-Link terminal bank cover	1

Disclaimers

Information is given about products in this manual only for the purpose of example and does not indicate any guarantees against infringements of third-party intellectual property rights and other rights related to them. TEAC Corporation will bear no responsibility for infringements on third-party intellectual property rights or their occurrence because of the use of these products.

This document describes the safety instructions for the operation of the digital indicator. Before operating the product, read this document carefully to familiarize yourself with the unit.

	WARNING	Follow the instructions below to avoid risk of serious personal injury and death.
Never use beyond the rated specifications as there is the danger of property damage, injury, fire or electrical shock.		
Never use in flammable gaseous environments including the following locations as there is the danger of explosion. • Locations containing corrosive or flammable gases • Locations near water, oil or subject to chemical splash		
If this product malfunctions (smells strange or becomes hot), stop using it immediately and unplug the power cord as there is danger of fire or electrical shock.		
Never attempt to disassemble the product.		
Carefully check connections and wiring before applying power.		
Be sure to ground the product (with ground resistance of 100 Ω or less).		
To allow the operator to immediately shut off the power to the product, install a switch or circuit breaker that complies with both IEC60947-1 and IEC60947-3 requirements near the product. The switch or breaker installed must also indicate that it functions to shut off the power to the unit.		
Do not allow foreign objects such as metal fragments that result from cutting panels, wires or other materials to enter this unit.		
If the unit is dropped or subject to strong impacts, it could break. If this occurs, stop using it and contact the seller from which you purchased it.		
Overvoltage category: I Pollution degree: 2		
If the unit is used in a manner not specified by the manufacturer, the protection provided by the unit may be impaired.		

Safety information



CAUTION

Follow the instructions below to avoid risk of personal injury or property damage.

Disconnect the power cord when performing the following.

- When wiring or connecting cables to the terminal banks for connecting the DC power supply, load cells and external inputs and outputs
- When connecting the ground line

Wait for at least five seconds between turning the unit on and off.

Never touch the connectors while the product is turned on.

When connecting to a power supply, frame ground, signal input/output connector, D/A, RS-485 or CC-Link terminal bank, be sure to wire them correctly after confirming the signal names and pin assignment numbers. Use shielded cables for signal input/output cables (load cell, external input/output).

Before use, fix the cables separately so that they do not hang to prevent the connectors from being pulled out and to protect the connectors from unnecessary pressure.

Conduct wiring in a place so that it will not be together or parallel with electrical wiring.

Avoid use in locations like the following.

- Near a power line
- Where a strong electric or magnetic field is present
- Where static electricity or noise, (for example, from a relay) is generated

Do not install in the following environments.

- Locations subject to temperatures exceeding the specified ranges for temperature and humidity
- Locations subject to radiant heat from heat sources
- Locations with high salt or iron content
- Locations exposed to dirt and dust
- Locations subject to direct vibration or shock
- Locations subject to severe temperature changes
- Outdoor, or locations with an altitude of higher than 2000 m
- Locations where freezing or condensation might occur

Do not operate a damaged unit.

The unit is classified as an open-type (built-in) device and must be installed inside a control panel.

If the top cover or panel faces become dirty, wipe it gently with a soft cloth that has been slightly dampened with a diluted neutral cleaning fluid and wrung out well. DO NOT use a chemically treated dust cloth, paint thinner, or other flammable solvents. Using any of them could damage the coating of the product.

If the product is used in a manner unintended by the manufacturer, the user's safety may be adversely affected.

Always attach the DC power terminal bank cover when an electric current is present.

If subject to electromagnetic waves (from transceivers, mobile phones, amateur wireless transmissions, etc.), use metal pipes for the wiring or make other countermeasures using shielding.

Model for USA

Supplier's Declaration of Conformity

Model number: TD-SC1

Trade name: TEAC

Responsible party: TEAC AMERICA, INC.

Address: 10410 Pioneer Blvd. Unit #3, Santa Fe Springs, CA 90670, U.S.A.

Telephone number: 1-323-726-0303

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



Information

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CAUTION

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Model for Canada

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Model for Europe

DECLARATION OF CONFORMITY

This product complies with the European Directives request, and the other Commission Regulations.



DECLARACIÓN DE CONFORMIDAD

Este producto cumple con las exigencias de las directivas europeas y con los reglamentos de la Comisión Europea.

DÉCLARATION DE CONFORMITÉ

Ce produit est conforme aux directives européennes et aux autres réglementations de la Commission européenne.

KONFORMITÄTSERKLÄRUNG

Dieses Produkt entspricht den Anforderungen europäischer Richtlinien sowie anderen Verordnungen der Kommission.

Model for UK

This product complies with the applicable UK regulations.



WARNING

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

ATENCIÓN

Este es un producto de clase A. En un entorno no profesional, este aparato puede producir interferencias de radio, en cuyo caso el usuario será el responsable de tomar las medidas necesarias para solucionarlo.

AVERTISSEMENT

Il s'agit d'un produit de Classe A. Dans un environnement domestique, cet appareil peut provoquer des interférences radio, dans ce cas l'utilisateur peut être amené à prendre des mesures appropriées.

Warnung

Dies ist eine Einrichtung, welche die Funk-Entstörung nach Klasse A besitzt. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen.

Safety information

DISCLAIMER

TEAC disclaims all warranty, either expressed or implied, with respect to this product and the accompanying written materials. In no event shall TEAC be liable for any damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information or other loss) arising out of the use of or inability to use this product.

Disposing of this product

When disposing of this product, including accessories, consumable parts and related items, follow the regulations of the local, regional and national governments.

For European Customers

Disposal of electrical and electronic equipment and batteries and/or accumulators

- a) All electrical/electronic equipment and waste batteries/accumulators should be disposed of separately from the municipal waste stream via collection facilities designated by the government or local authorities.
- b) By disposing of electrical/electronic equipment and waste batteries/accumulators correctly, you will help save valuable resources and prevent any potential negative effects on human health and the environment.
- c) Improper disposal of waste electrical/electronic equipment and batteries/accumulators can have serious effects on the environment and human health because of the presence of hazardous substances in the equipment.

- d) The Waste Electrical and Electronic Equipment (WEEE) symbols, which show wheeled bins that have been crossed out, indicate that electrical/electronic equipment and batteries/accumulators must be collected and disposed of separately from household waste.



If a battery or accumulator contains more than the specified values of lead (Pb) and/or cadmium (Cd) as defined in the Battery Regulation (EU) 2023/1542, then the chemical symbols for those elements will be indicated beneath the WEEE symbol.



- e) Return and collection systems are available to end users. For more detailed information about the disposal of old electrical/electronic equipment and waste batteries/accumulators, please contact your city office, waste disposal service or the shop where you purchased the equipment.

Introduction.....	2	6-4-2. Communication commands.....	24
Features	2	6-4-2-1. Polling (0001)	24
Included accessories	2	6-4-2-2. Status Polling (0002).....	25
Safety information.....	3	6-4-2-3. Indicator Value Polling (0003).....	26
1. Names and functions of parts.....	10	6-4-2-4. Setting value writing/execution command format	26
1-1. Front.....	10	6-4-2-5. Setting value loading command format	27
1-2. Top	11	6-4-2-6. TEDS command format.....	27
1-3. Bottom	11	6-4-2-7. Maximum Rated Capacity (6002), Maximum Rated Output (6003), Sensor Impedance (6004) and Maximum Excitation Level (6005) data formats	28
2. Installation	12	6-4-2-8. Continuous transmission format.....	28
2-1. Attaching to a DIN rail.....	12	6-4-3. Timing	28
2-2. Removing from a DIN rail.....	12	6-4-4. Commands.....	29
3. Making connections.....	13	6-4-4-1. Execution	29
3-1. Connecting to the input/output connector	13	6-4-4-2. Polling	29
3-1-1. Input/output connector.....	13	6-4-4-3. Calibration	29
3-2. Connecting a strain gauge transducer.....	13	6-4-4-4. Input/output testing	29
3-2-1. About the remote sense function.....	13	6-4-4-5. Condition settings.....	29
3-2-2. Notes about bridge voltage (excitation voltage)	13	6-4-4-6. Comparison settings	29
3-3. Control input and output terminals	15	6-4-4-7. Hold function settings.....	29
3-3-1. Control input terminals.....	15	6-4-4-8. System settings	29
3-3-2. Connecting control input terminals.....	15	6-4-4-9. TEDS	29
3-3-3. Comparison output terminals	16	6-5. Modbus RTU communication mode	30
3-4. Connecting the DC power supply input terminals.....	16	6-5-1. RS-485 communication Modbus RTU settings ..	30
3-5. Input/output testing functions.....	17	6-5-2. Modbus functions.....	30
3-5-1. Input/output testing	17	6-5-2-1. 02 (0x02) Read Input Status.....	30
3-5-1-1. D/A Test Output*.....	17	6-5-2-2. 03 (0x03) Read Holding Register, 06 (0x06) Preset Single Register, 16 (0x10) Force Multiple Registers	32
3-5-1-2. Test Control Input/Output Terminals.....	17	6-5-2-3. 04 (0x04) Read Input Register.....	38
4. Control app	17	6-5-2-4. 05 (0x05) Force Single Coil.....	40
4-1. App availability	17	6-5-2-5. 08 (0x08) Diagnostics.....	40
5. USB	18	6-5-3. Silent Interval (message frame pause time)	40
5-1. Connections	18	7. CC-Link.....	41
5-1-1. USB port	18	7-1. Restrictions	41
5-1-2. When using a TD-SC1 (485).....	18	7-2. CC-Link overview	41
6. RS-485.....	19	Version	41
6-1. RS-485 overview	19	Station type	41
6-2. Connections	19	7-3. Connections	41
6-2-1. RS-485 terminals	19	7-3-1. CC-Link terminals.....	41
6-2-2. Inserting and removing RS-485 terminal bank ..	19	7-3-2. Inserting and removing CC-Link terminal bank ..	41
6-2-3. Connecting the RS-485 terminals	19	7-3-3. Connecting the CC-Link terminals	41
6-2-4. Selecting RS-485 communication.....	19	7-4. CC-Link settings (commands using USB communication).....	42
6-3. RS-485 Communication Settings	20	7-5. CC-Link indicators.....	42
6-4. TD Format / TD Format (BCC) communication modes ..	22		
6-4-1. Communication protocols.....	22		
6-4-1-1. Commands	22		
6-4-1-2. Responses	23		

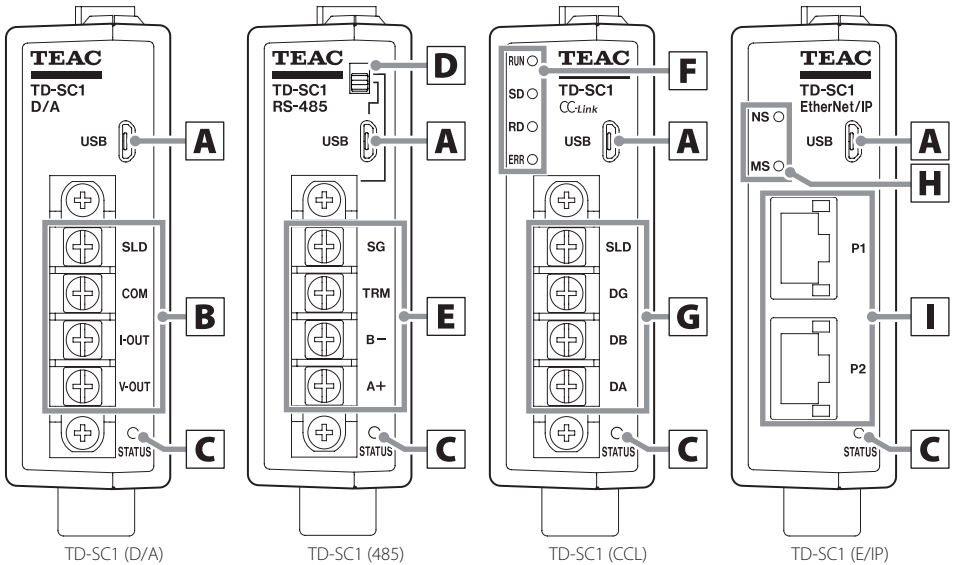
Contents

7-6. Address map	43	10. D/A converter	61
7-6-1. Remote registers with 4 stations occupied	43	10-1. D/A output terminals	61
7-6-2. Remote registers with 2 stations occupied	43	10-1-1. D/A output terminals	61
7-6-3. Remote registers with 1 station occupied	43	10-1-2. Installing and removing D/A output terminal banks	61
7-6-4. Status	44	10-1-3. Connecting D/A output terminals	61
7-6-5. Error codes	44	10-2. D/A Zero	61
7-6-6. Remote I/O with 4 stations occupied	45	10-3. D/A Full Scale	62
7-6-7. Remote I/O with 2 stations occupied	47	10-4. D/A Output Mode	62
7-6-8. Remote I/O with 1 station occupied	48	10-5. D/A Maximum Voltage	62
7-7. Common area commands	49	11. Calibration	63
7-7-1. Calibration	49	11-1. Procedures shared by all calibration methods	64
7-7-2. Input/output testing	49	11-1-1. Locking and unlocking calibration values	64
7-7-3. Condition settings	49	11-1-2. Remote Sense	64
7-7-4. Comparison settings	49	11-2. Equivalent input calibration	65
7-7-5. Hold settings	49	11-2-1. Bridge Voltage	65
7-7-6. System settings	49	11-2-2. Decimal Point Position	65
7-7-7. TEDS	49	11-2-3. Rated Output Value	65
7-8. Setting procedures	50	11-2-4. Rated Capacity Value	65
7-8-1. Writing exclusive area values to the unit	50	11-2-5. Zero Balancing	65
7-8-2. Reading, writing and operations using commands in the common area	50	11-2-6. D/A Output Mode	66
8. EtherNet/IP™	51	11-2-7. D/A Maximum Voltage	66
8-1. Restrictions	51	11-2-8. Calibration Value Lock	66
8-2. EtherNet/IP™ communication specifications	51	11-2-9. Linearization Calibration	66
8-3. Settings	51	11-3. Actual load calibration	67
8-4. Ethernet settings (commands using USB communication)	51	11-3-1. Bridge Voltage	67
8-5. LED	52	11-3-2. Decimal Point Position	67
8-5-1. NS indicator	52	11-3-3. Zero Balancing	67
8-5-2. MS indicator	52	11-3-4. Rated Capacity Value (load calibration)	67
8-6. Cyclic communication (implicit messages)	52	11-3-5. D/A Output Mode	68
Communication from a TD-SC1 to a scanner	52	11-3-6. D/A Maximum Voltage	68
Communication from a scanner to a TD-SC1	53	11-3-7. D/A Full Scale	68
8-7. Message communication (explicit messages)	54	11-3-8. Maximum Display Value	68
8-7-1. Parameters used by all commands	54	11-3-9. Calibration Value Lock	68
8-7-2. Calibration	54	11-3-10. Linearization Calibration	68
8-7-3. Input/output testing	54	11-4. TEDS calibration	69
8-7-4. Condition settings	54	11-4-1. TEDS Calibration	69
8-7-5. Comparison settings	54	11-4-2. Zero Balancing	69
8-7-6. Hold settings	54	11-4-3. Calibration Value Lock	69
8-7-7. System settings	54	11-5. Remote Sense	70
8-7-8. TEDS	54	11-6. Minimum Scale Selection	70
9. Common communication commands	55	11-7. Display Frequency Selection	70
9-1. Calibration	55	11-8. Maximum Display Value	70
9-2. Condition settings	57	11-9. Sensor Input Logic	70
9-3. Comparison settings	58	11-10. Zero Balancing	70
9-4. Hold settings	58	11-11. Zero Point Input Calibration	70
9-5. System settings	59	11-12. Reset zero balancing	70
9-6. TEDS	60	11-13. Digital Zero	70
9-7. Input/output testing	60		

12. Condition settings.....	71	15-5. Device Number.....	82
12-1. Filter.....	71	15-6. Reset.....	82
12-1-1. Low-Pass Filter Selection.....	71	16. TEDS settings.....	83
12-1-2. Moving Average Data Set Size Selection.....	71	16-1. Rewrite TEDS Data.....	83
12-1-3. Automatic Digital Filter.....	71	16-2. Restore TEDS Data.....	83
12-1-4. Moving Average Data Set Size.....	71	16-3. Show TEDS Data.....	83
12-2. Motion Detect.....	72	17. Settings.....	84
12-3. Zero tracking.....	72	17-1. Lock item list.....	84
12-4. Digital offset.....	73	17-1-1. Calibration.....	84
12-5. Digital Zero.....	73	17-1-2. Condition settings.....	84
12-5-1. Enable Digital Zero.....	73	17-1-3. Comparison settings.....	85
12-5-2. Digital Zero Limit Value.....	73	17-1-4. Hold function settings.....	85
12-5-3. Clear Digital Zero.....	73	17-1-5. System settings.....	85
12-6. Switch Static Strain Disp. Mode (static strain display mode).....	73	17-1-6. TEDS settings.....	85
12-7. Select Data Output.....	73	17-1-7. Input/output testing.....	86
13. Comparison settings.....	74	18. Warranty explanation.....	87
13-1. Comparison value settings.....	74	19. Specifications.....	88
13-2. Comparison Pattern Setting.....	74	20. External drawings.....	89
13-3. Comparison Mode Setting.....	75	21. Block diagram.....	90
13-4. Hysteresis.....	76		
13-5. Comparison Output Pattern.....	77		
13-5-1. Standard Output.....	77		
13-5-2. Area Output.....	77		
13-6. Nearly Zero.....	77		
14. Hold function settings.....	78		
14-1. Hold Mode.....	78		
14-1-1. Hold value reading.....	78		
14-1-2. Sample hold.....	78		
14-1-3. Peak hold.....	79		
14-1-3-1. No Zone Definition.....	79		
14-1-3-2. Zone Definition used.....	79		
14-1-4. Bottom hold.....	80		
14-1-4-1. No Zone Definition.....	80		
14-1-4-2. Zone Definition used.....	80		
14-2. External Hold Mode.....	81		
14-3. Clear signal.....	81		
14-4. Zone Definition.....	81		
14-5. Hold Lock.....	81		
14-6. Auto Zero.....	81		
15. System settings.....	82		
15-1. Setting value memory.....	82		
15-2. Save All Setting Values.....	82		
15-3. Device Information.....	82		
15-4. Lock.....	82		
15-4-1. Calibration Value Lock.....	82		
15-4-2. Setting Value Lock.....	82		
15-4-3. Main Unit Operation Lock.....	82		

1. Names and functions of parts

1-1. Front



A USB port

Use this for communication with this unit.

ATTENTION

Do not use a USB hub when connecting the USB port on this unit and a computer. Connect them directly.

B D/A output terminals

C STATUS indicator

Blue	Power on
Magenta	Input level overload, command being executed
Blinking blue/magenta	Starting up (only immediately after the power is turned on)

D USB/RS-485 switch

Use this to select the communication method used with this unit.

E RS-485 terminals

F CC-Link indicators

G CC-Link terminals

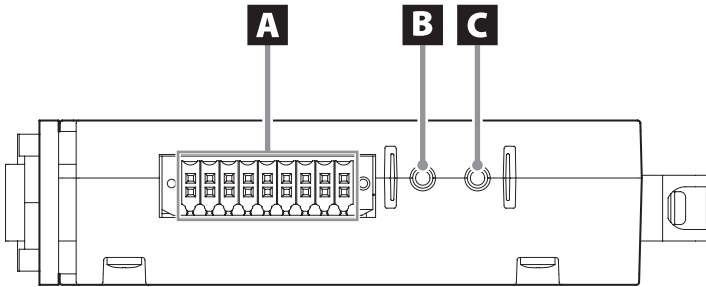
H EtherNet/IP™ indicators

I EtherNet/IP™ connectors

NOTE

Use communications to make settings for this unit. See the chapter on the communication method being used for details.

1-2. Top



A Input/output connector

Insert the included input/output connector plug here. Connect strain gauge transducers, TEDS sensors, control inputs and comparison outputs.

B CAL button

If not TD-SC1 (D/A)

When Calibration Value Lock is OFF, press and hold to conduct actual load calibration.

TD-SC1(D/A) only

D/A test output occurs while pressing this button.

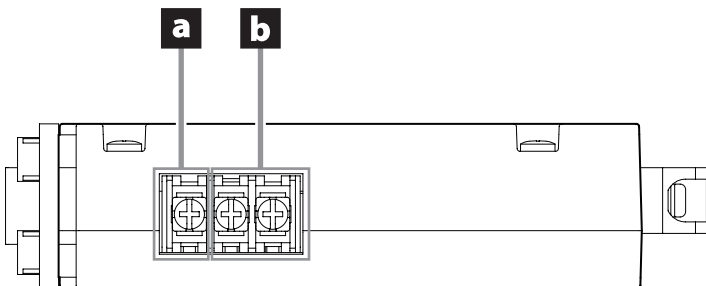
C ZERO button

When Calibration Value Lock is OFF, press and hold to use the zero balancing function.

NOTE

- If Main Unit Operation Lock is ON, the operation buttons (CAL and ZERO) on the unit will be disabled (page 59).
- Pressing and holding the CAL and ZERO buttons at the same time will reset the setting values (page 82).

1-3. Bottom



a FG (frame grounding) terminal

Frame grounding terminal for DC power supply.

⚠ Always be sure to connect the frame grounding terminal.

b DC power supply input terminals

Connect a DC power supply.

The voltage range is DC 24 V $\pm$ 10%.

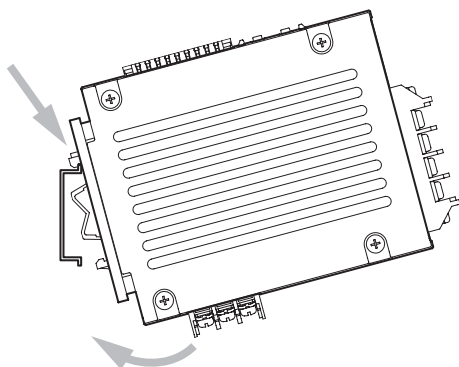
2. Installation

Follow these procedures to install the unit in a control panel.

2-1. Attaching to a DIN rail

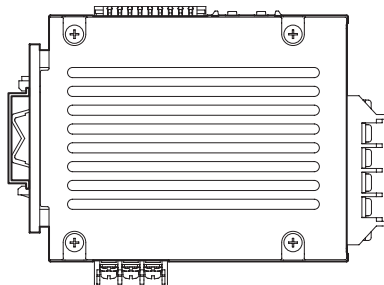
- 1 Insert the adapter into the DIN rail at an angle to attach it.

- The supported DIN rail width is 35 mm.



ATTENTION

After attaching the adapter to the DIN rail, confirm that it is not loose.

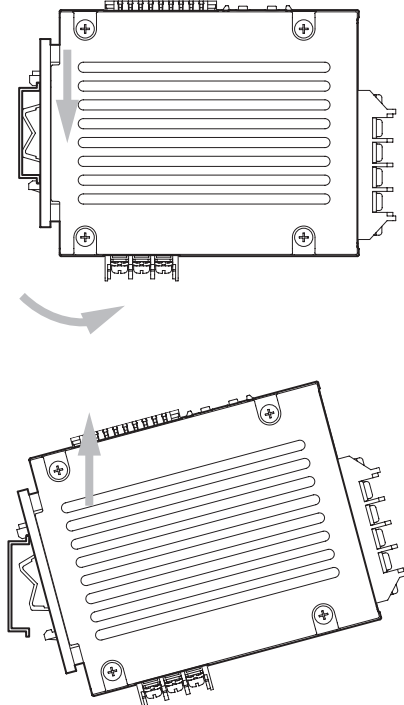


ATTENTION

- When installing multiple TD-SC1 units in parallel, separate them by at least 10 mm (50 mm for TD-SC1 (E/IP) units).
- When installing these units inside other equipment, keep them at least 10 mm from walls.

2-2. Removing from a DIN rail

Press the unit down so that the lower clasp on the adapter disconnects from the DIN rail. Then, pull it forward to remove it.



3. Making connections

3-1. Connecting to the input/output connector

A 2-piece type connector is used.

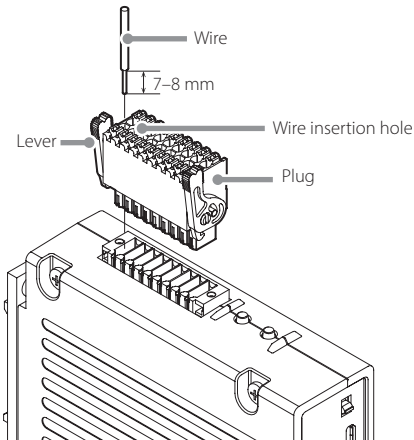
Insert the included input/output connector plug into the input/output connector.

When wiring the input/output connector plug, press the button for each pin while inserting the wire.

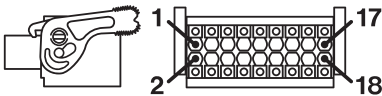
ATTENTION

Do not connect any connector plug other than the one included because doing so could make it unsafe.

3-1-1. Input/output connector



Pin assignments



- 1** Remove 7 to 8 mm of the covering from the wire being connected, and twist it so that the tip does not come apart.

Suitable wiring is 0.14 to 1.5 mm² (26–16 AWG).

- 2** While pressing the buttons attached to each pin, insert the wires into the holes so that the tips do not come apart.

- 3** Pull the wire gently to confirm that it is securely clamped into the hole.

- 4** After the wires have been connected, press the plug into the indicator until the levers on both its sides lock.

3-2. Connecting a strain gauge transducer

3-2-1. About the remote sense function

Set the Remote Sense setting before connecting the sensor (page 55).

By default, this is set to "Unused (4-wire format)".

The 6-wire format (remote sense format) is a superior connection method that compensates for reduced voltages due to cable length and voltage changes due to temperature changes, for example.

In systems installed outdoors and other situations where temperature changes are expected, as well as in cases when general precision is desired, for example, we recommend using the 6-wire format for remote sense.

ATTENTION

- When using the 6-wire format (remote sense format), before connecting a sensor, always set "Remote Sense" to "Used (6-wire format)".
- Use "Unused (4-wire format)" with 4-wire format.
- Incorrect connections or settings could cause damage to sensors.

3-2-2. Notes about bridge voltage (excitation voltage)

As a reference for setting the bridge voltage, consider that the output from the sensor should be increased, and set the maximum voltage in a range that does not exceed the maximum safe excitation voltage on the sensor test report.

A sensor could be damaged if this is set to a value that exceeds its maximum safe excitation voltage.

ATTENTION

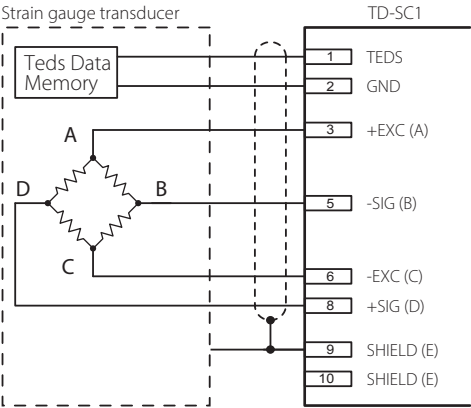
- If the maximum safe excitation voltage is less than 10 V, set the bridge voltage to 5 V before connecting.
- In TEDS calibration, when TEDS data is read, if the bridge voltage setting is greater than the maximum safe excitation voltage recorded in the TEDS memory, the bridge voltage will be changed to a value less than the maximum safe excitation voltage.

NOTE

The default value is 5 V.

3. Making connections

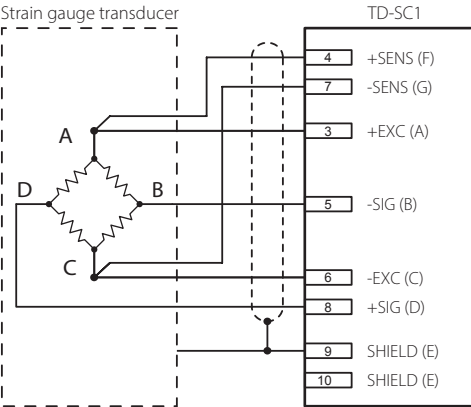
Connecting TEDS sensors and 4-wire sensors



Terminal number	Signal	Wire color
1	TEDS	Orange
2	GND	Green
3	+EXC (A)	Red
4	+SENS (F)	—
5	−SIG (B)	Black
6	−EXC (C)	Blue
7	−SENS(G)	—
8	+SIG (D)	White
9/10	SHIELD (E)	Yellow

- The wire colors are those that we use in the strain gauge transducers that we make.
- TEDS and remote sense (SENS) can be used at the same time.

Connecting using 6-wire format



Usable sensor characteristics

- Output between +SIG and −SIG: ± 5.0 mV/V or less
- Voltage (current) between +EXC and −EXC: 5 or 10 V DC $\pm 10\%$ (30mA maximum current)

ATTENTION

Do not connect sensors that do not meet the rated output (output between +SIG and −SIG) and the maximum safe excitation voltage (voltage between +EXC and −EXC) specifications.

NOTE

If not using the TEDS function, terminals 1 and 2 can be left open.

3-3. Control input and output terminals

3-3-1. Control input terminals

Terminal number	Signal	Explanation
11	D/Z	Sets the indicator value digitally to 0. ● Maintain the ON state for more than 30 ms. This is active when Enable Digital Zero is set to ON.
12	Hold	Holds function using hold start signals when this is ON. This becomes disabled if the Hold Mode is set to "OFF".
13	Clear	This turns on when a hold is cleared in any hold mode except sample hold. Whether Clear signals are enabled or disabled can be set using the Clear signal setting.
17	+(+24 V)	DC24V power supply input terminal
18	-(0V)	This is the 0V terminal for DC24V power supply and the control input signal common terminal.

- When using a control input connector, a separate DC24V power supply is necessary for the control input circuit.
- The control input signal is isolated from the unit's circuits by a photocoupler.

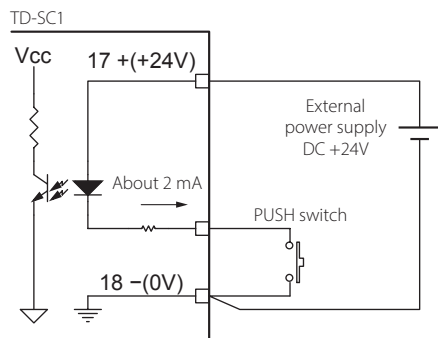
⚠ CAUTION

For terminals 17 and 18, use a power supply that conforms to the limited energy circuit specification in IEC61010-1. Failure to do so could cause fire or other hazards.

3-3-2. Connecting control input terminals

Signals are input with the external input circuit when shorted or opened between any control input terminal and the common terminal.

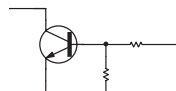
Shorts occur from both contact and non-contact (transistor).



Example when contact signal used



Example when transistor used



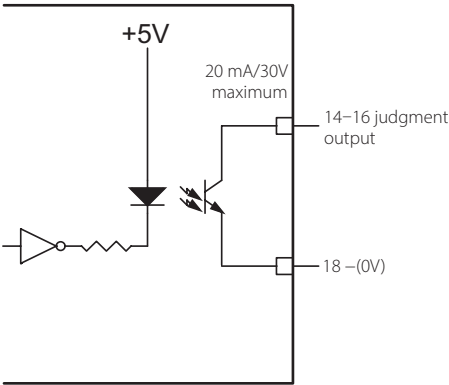
- When external contact is ON, about 2 mA flows. When using a transistor, for example, select one with a resistance of at least 30 Ω and elements that allow a flow of at least 40 mA when on.
- 18 -(0 V) is the common terminal for the 11 IN (D/Z), 12 IN (Hold) and 13 IN (Clear) control input terminals.
- Do not apply voltage from an external source to a control input terminal.

3. Making connections

3-3-3. Comparison output terminals

Terminal number	Signal	Explanation
14	HI	High limit judgment output
15	LO	Low limit judgment output
16	OK	OK judgment output
18	-(0 V)	Comparison output common terminal

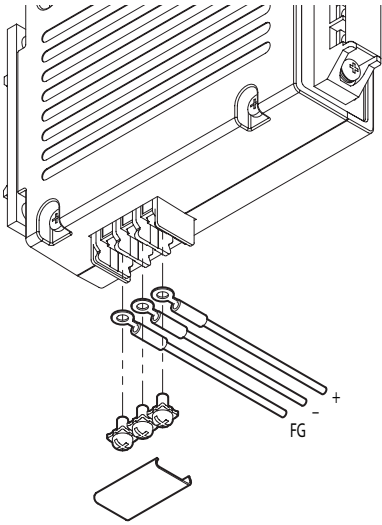
- The comparison output is isolated from the unit's circuits by a photocoupler.
Open collector output (NPN, current sync)
20mA/30V maximum collector current



- For the operation of each signal, see "13. Comparison settings" on page 74.

3-4. Connecting the DC power supply input terminals

The DC power supply input voltage should be $24\text{ V} \pm 10\%$.
Use a power supply cord that is 0.517 to 2.081 mm^2 (20 to 14 AWG).
When connecting to the terminal bank, use a solderless terminal (M3, width of 6 mm or less).



ATTENTION

- If using the unit as a CE compliant product, the power cord must be no more than 3m long.
- Allow the unit to warm up for at least five minutes after supplying power to it.
- The recommended tightening torque for terminals is 0.5 N·m (5.1 kgf·cm).

⚠ Always attach the cover to the power supply input terminal bank. Failure to do so could result in fire, electric shock or malfunction.

⚠ Use a power supply that conforms to a limited energy circuit as specified in IEC61010-1. Failure to do so could cause fire or other hazards.

3. Making connections

3-5. Input/output testing functions

3-5-1. Input/output testing

When input/output testing is on, D/A output and control input/output terminal testing can be conducted.

Input/Output Testing ON/OFF

0: OFF

1: ON

NOTE

When input/output testing is on, only use input/output testing commands. Using other commands could stop input/output testing.

3-5-1-1. D/A Test Output*

While the CAL button is being pressed, a voltage or current is output from a D/A output terminal according to the value set for the Test A/D Input Value.

Select the D/A output using the D/A Output Mode.

Test A/D Input Value

0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0

Unit: mV/V

*TD-SC1 (D/A) only

3-5-1-2. Test Control Input/Output Terminals

Output Terminals

This outputs the status of the set terminal from the output terminals.

Output is assigned to bits.

(output bit 0: OK / 1: LO / 2: HI)

Bit	MSB 2	1	LSB 0
Terminal name	HI	LO	OK

LOW: 1

HIGH: 0

Input Terminals

This returns current input terminal values.

Bit	MSB 2	1	LSB 0
Terminal name	DZ	HOLD	CLEAR

LOW: 1

HIGH: 0

4. Control app

Use communications to make settings for this unit. See the chapter on the communication method being used for details.

A control app that makes the unit's settings easy is available.

Use this control app to make the unit's settings if you are not making your own control app for the unit.

- You can download and use the app for free.

4-1. App availability

Download the control app from the following address.

<https://loadcell.jp/en/>

You can also contact us. (For contact information, see the last page.)

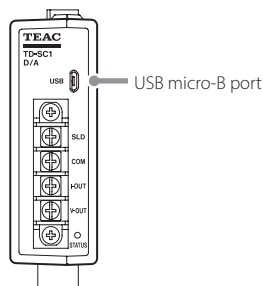
For details about installation and operation procedures, see the attached operation manual.

5. USB

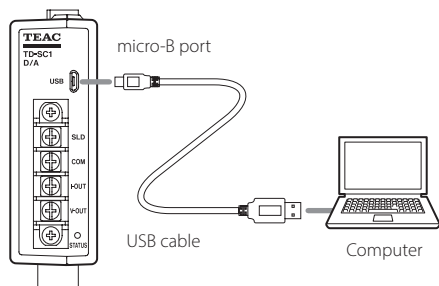
In this chapter we explain the USB functions of the TD-SC1.

5-1. Connections

5-1-1. USB port



Example of connection with a computer



ATTENTION

Do not use a USB hub when connecting the USB port on this unit and a computer. Connect them directly.

5-1-2. When using a TD-SC1 (485)

To use the USB of the TD-SC1 (485) for communication, slide the USB/RS-485 switch down.

- Always disconnect the power before moving the switch.

In this chapter we explain the RS-485 functions of the TD-SC1 (485).

With the TD-SC1 (485), two types of communication protocols can be selected for use.

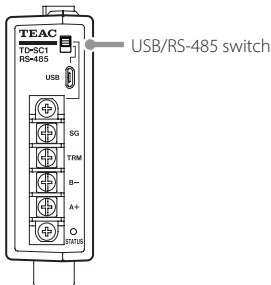
TD Format
Modbus RTU

6-1. RS-485 overview

Format: RS-485 two-wire type
Transmission format: start-stop synchronization, half-duplex transmission

6-2. Connections

6-2-1. RS-485 terminals



RS-485 terminals

Signal name	Explanation
A+	Data (not reversed)
B-	Data (reversed)
TRM	Terminator (by shorting B- and TRM, it can be used as a terminator (110 Ω))
SG	Connection line

6-2-2. Inserting and removing RS-485 terminal bank

- You can remove the terminal bank from the main unit by loosening the two black screws at the ends of the terminal bank and pulling it out.
- Always disconnect the power before removing or installing a terminal bank.

6-2-3. Connecting the RS-485 terminals

- We recommend using twisted-pair cables for connections.
- If these units will be used at both ends, short the B- and TRM terminals. (This will enable termination.)
- Always disconnect the power before working with wiring.
- The recommended torque for the RS-485 terminal screws (M3.5) and attachment screws is 0.69 N·m $\approx$ 7 kgf·cm.
- After wiring, attach the terminal bank cover.

CAUTION

For the RS-485 connector, use the included connector. Do not use any other connector because doing so could make it unsafe.

6-2-4. Selecting RS-485 communication

To use this unit with RS-485 for communication, slide the USB/RS-485 switch up.

- Always disconnect the power before moving the switch.

6-3. RS-485 Communication Settings

RS-485 setting items are added to the TD-SC1 (485).

Setting	Format	Default value	Options
Communication Mode	Selection	TD Format (BCC)	TD Format TD Format (BCC) Continuous Transmission Modbus RTU
TD Format ID Number	Input	1	1 to 31
Baud Rate	Selection	115200	4800 9600 19200 38400 57600 115200
Bit Length	Selection	8-bit	8-bit 7-bit
Parity Bit	Selection	None	None Odd Even
Stop Bit	Selection	1-bit	1-bit 2-bit
Delimiter	Selection	CR + LF	CR + LF CR
Modbus Device Address	Selection	1	1 to 247
Modbus communication inactivity time extension	Selection	0	0 to 30 (ms)

- RS-485 Communication Settings can only be read and written when connected by USB. When connected by RS-485, they can only be read. (RS-485 Communication Settings cannot be changed when connected by RS-485.)
- After changing RS-485 settings, restart the unit.

Communication Mode

Select the RS-485 communication protocol.

- | | |
|-------------------------|--|
| TD Format | This communication protocol is unique to the TD-SC1. |
| TD Format (BCC) | This communication protocol adds checksum (BCC) to the TD format. |
| Continuous Transmission | This continuously transmits TD Format polling command (0001) data. |
| Modbus RTU | Modbus RTU communication protocol |

TD Format ID Number

This can be set between 1 and 31. Set so it does not overlap with the IDs of other stations.

Baud Rate

Set the speed for RS-485 communication.

Bit Length

Set according to the transmission requirements of connected equipment. Set to 8 bit when using Modbus RTU. It will not function if set to 7 bit.

Parity Bit

Set according to the transmission requirements of connected equipment.

Stop Bit

Set according to the transmission requirements of connected equipment.

Delimiter

Set according to the transmission requirements of connected equipment. This is not used with Modbus RTU.

Modbus RTU Device Address

This can be set between 1 and 247. Set this so it does not overlap with the device addresses of other devices.

Modbus communication inactivity time extension

This extends the communication inactivity time set by the system according to the normal communication speed.

Group	Setting name	Command No.	E/IP data length	R/W	Default value	Command data (setting value)	Operation explanation
RS-485 Communication Settings*	Port Selection	5700		R		0: USB 1: RS-485	page 20
	ID Number	5701		R/W	1	1 to 31	
	Communication Mode	5702		R/W	1: TD Format (BCC)	0: TD Format	
						1: TD Format (BCC)	
						2: Continuous Transmission	
	Baud Rate	5703		R/W	5: 115200	3: Modbus RTU	
						0: 4800	
						1: 9600	
						2: 19200	
						3: 38400	
Bit Length**	5704		R/W	0: 8-bit	4: 57600		
					5: 115200		
Parity Bit	5705		R/W	0: None	0: 8-bit		
					1: 7-bit		
					0: None		
Stop Bit	5706		R/W	0: 1-bit	1: Odd		
					2: Even		
Delimiter	5707		R/W	0: CR+LF	0: 1bit		
					1: 2bit		
Modbus	Device Address	5750		R/W	1	0: CR+LF 1: CR	
	Modbus RTU communication inactivity time extension	5751		R/W	0	1 to 247	
							0 to 30: extension time set- ting value (unit: ms)

*When connected by RS-485, RS-485 Communication Settings cannot be changed.

**Set to 8 bit when using Modbus RTU. It will not function if set to 7 bit.

6-4. TD Format / TD Format (BCC) communication modes

6-4-1. Communication protocols

Number of connected units: 32 maximum (including master)
Code: ASCII

TD Format does not use checksums.
TD Format (BCC) adds checksums after data.

6-4-1-1. Commands

TD Format

HEX	0x23	0x30	0x31	0x33	0x30	0x30	0x32	0x2D	0x30	0x31	0x38	0x30	0x30	0x0D
ASCII	#	0	1	3	0	0	2	-	0	1	8	0	0	CR
	ID number			Command No.				Data						

TD Format (BCC)

HEX	0x23	0x30	0x31	0x33	0x30	0x30	0x32	0x2D	0x30	0x31	0x38	0x30	0x30	0x34	0x43	0x0D
ASCII	#	0	1	3	0	0	2	-	0	1	8	0	0	4	C	CR
	ID number			Command No.				Data						Checksum		

The first character in the command must always be "#".
The final characters must be "CR".
The data length will be 0 to 6 characters according to the command.
The checksum (BCC) adds each byte of the ID number, command and data and divides the lower 8 bits into upper and lower parts of 4 bits each and saves them in ASCII as the checksum.
In the example above, the total of the ID number, command and data is as follows.
 $0x30+0x31+0x33+0x30+0x30+0x32+0x2D+0x30+0x31+0x38+0x30+0x30$
 $= 0x24C$
The checksum is the lower 8 bits, which is 0x4C.

6-4-1-2. Responses

The characters at the beginning of the response show the command execution result. The reply is "ACK" if it was completed properly or "NAK" if it ended in an error.

The characters at the end of the response can be set to either "CR" and "LF" or just "CR" (page 20).

Command execution result when completed properly

TD Format

HEX	0x06	0x30	0x31	0x33	0x30	0x30	0x32	0x0D	0x0A
ASCII	ACK	0	1	3	0	0	2	CR	LF

ID number
Command No.

TD Format (BCC)

HEX	0x06	0x30	0x31	0x33	0x30	0x30	0x32	0x32	0x36	0x0D	0x0A
ASCII	ACK	0	1	3	0	0	2	2	6	CR	LF

ID number
Command No.
Checksum

When there is response data, it is sent after the command number.

The data length will be 0 to 9 characters according to the command.

Checksum calculation is the same as in the "Commands" section above.

In the example above, the total of the ID number, command and data is as follows.

$$0x30+0x31+0x33+0x30+0x30+0x32$$

$$= 0x126$$

The checksum is the lower 8 bits, which is 0x26.

Command execution result when ended with error

TD Format

HEX	0x15	0x30	0x31	0x33	0x30	0x30	0x32	0x0D	0x0A
ASCII	NAK	0	1	3	0	0	2	CR	LF

ID number
Command No.

TD Format (BCC)

HEX	0x15	0x30	0x31	0x33	0x30	0x30	0x32	0x32	0x36	0x0D	0x0A
ASCII	NAK	0	1	3	0	0	2	2	6	CR	LF

ID number
Command No.
Checksum

The following are possible causes of errors.

- Improper command number (unsupported command, etc.)
- Overlapping commands issued
- Improper command parameters (setting values)
- Checksum error occurred (when TD Format (BCC) communication mode is selected)

6. RS-485

6-4-2. Communication commands

In this section, examples of transmission using TD Format (BCC) are given.
To transmit using TD Format, remove the checksum from the transmission examples.
These examples are of transmissions with a device with ID number 1.
Example responses are only given for command execution results that have completed properly.
For response data values that are not fixed, numbers are given as “x” and symbols are given as “±”.

- “bit 0” is LSB.

6-4-2-1. Polling (0001)

Command

HEX	0x23	0x30	0x31	0x30	0x30	0x30	0x31	0x32	0x32	0x0D
ASCII	#	0	1	0	0	0	1	2	2	CR
	ID number			Command No.				Checksum		

Response

HEX	0x06	0x30	0x31	0x30	0x30	0x30	0x31							0x2E					0x0D	0x0A
ASCII	ACK	0	1	0	0	0	1	ST1	ST2	±	x	x	x	.	x	x	x	x	CR	LF
	ID number			Command No.				Data								Checksum				

Data

The data is comprised of ST1, ST2 and indicator values.
The code returned for ST1 and ST2 uses ASCII 0x80 and later for bit definition, and the lower 7 bits are assigned to status.
Be aware that the valid statuses for ST1 and ST2 vary as follows depending on the bit length setting,

ST1 (8-bit length)

bit	Name	Status
0	Command Status	0: Standing by 1: Executing
1		2: Error occurred 3: Continuous sending mode
2	Nearly Zero Output	0: OFF 1: ON
3	Hold Output	0: OFF 1: ON
4	Zero Tracking	0: OFF 1: ON
5	Setting Value	0: No.1 1: No.2
6	Memory	2: No.3 3: No.4
7	Fixed Value (1)	

ST2 (8-bit length)

bit	Name	Status
0	Stable Output	0: OFF 1: ON
1	OK Output	0: OFF 1: ON
2	High Limit Judgment Output	0: OFF 1: ON
3	Low Limit Judgment Output	0: OFF 1: ON
4	Indicator Value Exceeded* (±FULL, OVER)	0: OFF 1: ON
5	Fixed Value (0)	
6	Fixed Value (0)	
7	Fixed Value (1)	

*FULL: Maximum display value exceeded,
OVER: AD input overloaded

ST1 (7-bit length)

bit	Name	Status
0	Command Status	0: Standing by 1: Executing
1		2: Error occurred 3: Continuous sending mode
2	Nearly Zero Output	0: OFF 1: ON
3	Hold Output	0: OFF 1: ON
4	Zero Tracking	0: OFF 1: ON
5	Fixed Value (1)	
6	Fixed Value (1)	
7	don't care	

ST2 (7-bit length)

bit	Name	Status
0	Stable Output	0: OFF 1: ON
1	OK Output	0: OFF 1: ON
2	High Limit Judgment Output	0: OFF 1: ON
3	Low Limit Judgment Output	0: OFF 1: ON
4	Indicator Value Exceeded* (±FULL, OVER)	0: OFF 1: ON
5	Fixed Value (1)	
6	Fixed Value (1)	
7	don't care	

*FULL: Maximum display value exceeded,
OVER: AD input overloaded

6-4-2-2. Status Polling (0002)

This only returns poling (0001) status data.

Command

HEX	0x23	0x30	0x31	0x30	0x30	0x30	0x32	0x32	0x33	0x0D
ASCII	#	0	1	0	0	0	2	2	3	CR

ID number

Command No.

Checksum

Response

HEX	0x06	0x30	0x31	0x30	0x30	0x30	0x32					0x0D	0x0A
ASCII	ACK	0	1	0	0	0	2	ST1	ST2	x	x	CR	LF

ID number

Command No.

Data

Checksum

Data

The data is comprised of ST1 and ST2.
The contents of ST1 and ST2 are the same as polling (0001).

6. RS-485

6-4-2-3. Indicator Value Polling (0003)

This only returns polling (0001) indicator values.

Command

HEX	0x23	0x30	0x31	0x30	0x30	0x30	0x32	0x32	0x34	0x0D
ASCII	#	0	1	0	0	0	3	2	4	CR
	ID number			Command No.			Checksum			

Response

HEX	0x06	0x30	0x31	0x30	0x30	0x30	0x32					0x2E					0x0D	0x0A
ASCII	ACK	0	1	0	0	0	3	±	x	x	x	.	x	x	x	x	CR	LF
	ID number			Command No.			Data								Checksum			

6-4-2-4. Setting value writing/execution command format

Command numbers 0000 to 5707 in "6-4-4. Commands" on page 29 are transmitted in this format.

Data is fixed to 6 characters. If the data lacks 6 characters, each opening will be filled with a "0".

- Responses will be returned before execution commands complete operation (Immediate completion).
- Always use a polling command (0001) or polling status (0002) to confirm that the ST1 command status is standby before issuing the next command.
- Parameters set in the command data should be aligned to the right.

Command

Hold Mode Setting (4001) example

HEX	0x23	0x30	0x31	0x34	0x30	0x30	0x31	0x30	0x30	0x30	0x30	0x30				0x0D
ASCII	#	0	1	4	0	0	1	0	0	0	0	0	x	x	x	CR
	ID number			Command No.			6 data characters, aligned to the right						Checksum			

Response

Hold Mode Setting (4001) example

HEX	0x06	0x30	0x31	0x34	0x30	0x30	0x31	0x45	0x30	0x0D	0x0A
ASCII	ACK	0	1	4	0	0	1	E	0	CR	LF
	ID number			Command No.			Checksum				

6-4-2-5. Setting value loading command format

Command numbers 0000 to 5707 in "6-4-4. Commands" on page 29 are transmitted in this format.
Data is fixed to 6 characters. If the data lacks 6 characters, each opening will be filled with a "0".

Command

Hold Mode Setting (4001) example

HEX	0x23	0x30	0x31	0x34	0x30	0x30	0x31	0x45	0x30	0x0D
ASCII	#	0	1	4	0	0	1	E	0	CR

ID number
Command No.
Checksum

Response

Hold Mode Setting (4001) example

HEX	0x06	0x30	0x31	0x34	0x30	0x30	0x31	0x30	0x30	0x30	0x30	0x30				0x0D	0x0A
ASCII	ACK	0	1	4	0	0	1	0	0	0	0	0	x	x	x	CR	LF

ID number

Command No.

6 data characters

Checksum

6-4-2-6. TEDS command format

Command numbers 6001 to 6007 in "6-4-4. Commands" on page 29 are transmitted in this format.
Data is fixed to 8 characters. If the data lacks 8 characters, each opening will be filled with a "0".

Command

Example of TEDS maximum rated capacity (6002)

HEX	0x23	0x30	0x31	0x36	0x30	0x30	0x32	0x32	0x39	0x0D
ASCII	#	0	1	6	0	0	2	2	9	CR

ID number
Command No.
Checksum

Response

Example of TEDS maximum rated capacity (6002)

HEX	0x06	0x30	0x31	0x36	0x30	0x30	0x32	0x32	0x30	0x30	0x32	0x30	0x30	0x30	0x30	0x41	0x44	0x0D	0x0A
ASCII	ACK	0	1	6	0	0	2	2	0	0	2	0	0	0	0	A	D	CR	LF

ID number
Command No.
8 data characters
Checksum

Data

The decimal point position (1st character of data) is 2, so the rated capacity is 200.00.

- See the following page for details about the data format.

6. RS-485

6-4-2-7. Maximum Rated Capacity (6002), Maximum Rated Output (6003), Sensor Impedance (6004) and Maximum Excitation Level (6005) data formats

Byte	+0	+1	+2	+3	+4	+5	+6	+7
HEX								
ASCII	POS	x	x	x	x	x	x	x

Data (no decimal point)

POS(decimal point position)
0: None, 1: 0.0, 2: 0.00, 3: 0.000, 4: 0.0000

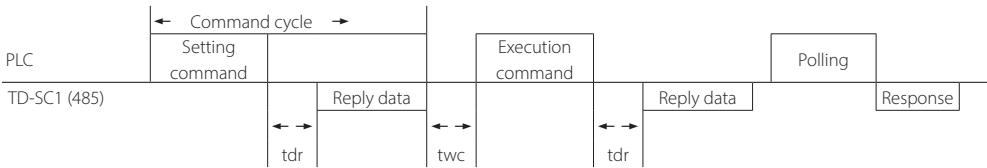
6-4-2-8. Continuous transmission format

In "Communication Mode" on page 20, select "Continuous Transmission" to continuously send polling (0001) response data. No checksum is added during continuous transmission.

HEX	0x06	0x30	0x31	0x30	0x30	0x30	0x31							0x2E			0x0D	0x0A
ASCII	ACK	0	1	0	0	0	1	ST1	ST2	±	x	x	x	.	x	x	CR	LF
	ID number			Command No.				Data										

See "6-4-2-1. Polling (0001)" on page 24 for details about the data format.

6-4-3. Timing



tdr: 5000ms maximum command response
twc: 30ms minimum command interval

ATTENTION

The twc command interval value varies depending on the command type. Leave 30 ms for polling and setting commands. Leave about 100 ms for calibration, setting memory and other commands that include operations.

6-4-4. Commands

6-4-4-1. Execution

Setting name	Command No.	R/W	Default value	Command data (setting value)	Operation explanation
Digital Zero	0000	W		10	page 70
Clear Digital Zero	0000	W		11	page 73
Hold On	0000	W		12	page 15
Hold Off	0000	W		13	
Hold Lock	0000	W		14	page 81
Hold Clear	0000	W		15	page 15
Switch to Home Screen	0000	W		17	page 73
Switch Static Strain Disp. Mode	0000	W		20	page 73

6-4-4-2. Polling

Setting name	Command No.	R/W	Default value	Command data (setting value)	Operation explanation
Polling	0001	R			page 24
Status Polling	0002	R			page 25
Indicator Value Polling	0003	R			page 26

6-4-4-3. Calibration

See "9-1. Calibration" on page 55 for details about the command.

6-4-4-4. Input/output testing

See "9-7. Input/output testing" on page 60 for details about the command.

6-4-4-5. Condition settings

See "9-2. Condition settings" on page 57 for details about the command.

6-4-4-6. Comparison settings

See "9-3. Comparison settings" on page 58 for details about the command.

6-4-4-7. Hold function settings

See "9-4. Hold settings" on page 58 for details about the command.

6-4-4-8. System settings

See "9-5. System settings" on page 59 for details about the command.

6-4-4-9. TEDS

See "9-6. TEDS" on page 60 for details about the command.

6. RS-485

6-5. Modbus RTU communication mode

In this chapter we explain the Modbus RTU communication functions of the TD-SC1 (485).
For information about Modbus RTU communications, refer to dedicated documents about it, for example.

ATTENTION

Modbus RTU is only enabled on devices with firmware version 1.40 or later. The following explanation of Modbus RTU applies to devices that meet this requirement.

Among Modbus communication methods, this unit can use Modbus RTU communication that uses RS-485.
The following Modbus communication functions are supported.

- 02 (0x02) Read Input Status
- 03 (0x03) Read Holding Register
- 04 (0x04) Read Input Register
- 05 (0x05) Force Single Coil
- 06 (0x06) Preset Single Register
- 08 (0x08) Diagnostics
- 16 (0x10) Force Multiple Registers

6-5-1. RS-485 communication Modbus RTU settings

Communication mode: Modbus RTU
Bit Length: 8-bit
Device Address: Set this to a value that does not overlap with other Modbus devices.

Set the communication speed and other items to be compatible with the Modbus network (page 20).

6-5-2. Modbus functions

6-5-2-1. 02 (0x02) Read Input Status

Any number of bits can be read from any address.

Address	Query message setting address	Explanation
1	0	—
2	1	LO
3	2	OK
4	3	HI
5	4	-
6	5	Load decimal point position LSB
7	6	Load decimal point position
8	7	Load decimal point position MSB
9	8	Hold mode LSB
10	9	Hold mode
11	10	Hold mode
12	11	Hold mode MSB
13	12	Setting value memory LSB
14	13	Setting value memory MSB
15	14	FULL ¹
16	15	OVER ²
17	16	-
18	17	—
19	18	-
20	19	-
21	20	-
22	21	-
23	22	-
24	23	-
25	24	-
26	25	-
27	26	Static strain mode
28	27	Stable
29	28	Zero tracking
30	29	Nearly zero
31	30	Zone definition hold active
32	31	HOLD

¹ FULL: Maximum display value exceeded
² OVER: Load cell error The sensor signal is exceeding the regulated value so measurement is not possible.

Load decimal point position

Value	Explanation
0	00000
1	0000.0
2	000.00
3	00.000
4	0.0000

Hold mode

Value	Explanation
0	Constant comparison
1	Sample
2	Peak
3	Bottom

Setting value memory

Value	Explanation
0	Memory 1
1	Memory 2
2	Memory 3
3	Memory 4

6. RS-485

6-5-2-2.03 (0x03) Read Holding Register, 06 (0x06) Preset Single Register, 16 (0x10) Force Multiple Registers

Reading and writing of multiple words for separate setting items using read/continuous write functions is not possible.
A resistor with a number that is higher than the setting value number of bytes cannot be divided and then read or written.

6-5-2-2-1. Calibration

Group	Setting name	Register address	Query message setting address	R/W	Setting value number of bytes	Default value	Setting value
	Bridge Voltage	1002	1001	R/W	2	2	1: 10 V 2: 5 V
	Decimal Point Position	1003	1002	R/W	2	2	0: None 1: 0.0 2: 0.00 3: 0.000 4: 0.0000
	Zero Point Input Calibration	1004	1003	R/W	2		−05000 to +5000 (−5.000 to 5.000 mV/V)
	Zero Balancing	1005	1004	R/W	2	0	When W, command data will be ignored and zero balancing will be conducted. When R, the current setting value will be returned as $\mu\text{V/V}$.
	Remote Sense	1006	1005	R/W	2	0	0: Unused (4-wire format) 1: Used (6-wire format)
	Reset Zero Balancing (Load)	1101	1100	W	2		1: Execute
Equivalent Input Calibration	Rated Output Value	1121	1120	R/W	2	3000	50 to 5000 (0.050 to 5.000 mV/V)
	Rated Capacity Value	1122	1121	R/W	4	10000	1 to 99999
Actual Load Calibration	Rated Capacity Value	1124	1123	R/W	4	10000	1 to 99999
TEDS Calibration	TEDS Calibration	1105	1104	W	2		0

Group	Setting name	Register address	Query message setting address	R/W	Setting value number of bytes	Default value	Setting value
Linearization	Enable/Disable Linearization Calibration	1201	1200	R/W	2	0	0: Disabled 1: Enabled
	Setting Linearization Point	1202	1201	R/W	2	1	1 to 3
	Enable/Disable Selection Point	1203	1202	R/W	2	0	0: Disabled 1: Enabled
	Sensor Output Value for Calibration Point	1204	1203	R/W	2	3000	4-digit sensor output value (no decimal) (0 < setting value < rated output value)
	Output Load Value for Calibration Point (Equivalent Input)	1211	1210	R/W	4	10000	±99999
	Output Load Value for Calibration Point (Actual Load Input)	1213	1212	R/W	4	10000	±99999

6-5-2-2.2. Calibration

Group	Setting name	Register address	Query message setting address	R/W	Setting value number of bytes	Default value	Setting value
Display	Minimum Scale Selection	1403	1402	R/W	2	1	0: 1 1: 2 2: 5 3: 10
	Display Frequency Selection	1404	1403	R/W	2	4	0: 4 times 1: 6 times 2: 10 times 3: 20 times
	Sensor Input Logic	1406	1405	R/W	2	0	0: Standard, 1: Reversed
	Maximum Display Value	1411	1410	R/W	4	11000	00000 to 99999

6-5-2-2.3. Input/output testing

Group	Setting name	Register address	Query message setting address	R/W	Setting value number of bytes	Default value	Setting value
	Input/output testing on/off	1701	1700	R/W	2	0: off	0: off 1: on
External Input and Output Terminals	Output Terminals	1711	1710	W	2		bit 0: OK / 1: LO / 2: HI
	Input Terminals	1712	1711	R	2		bit 0: CLEAR / 1: HOLD / 2: DZ

6. RS-485

6-5-2-2-4. Condition settings

Group	Setting name	Register address	Query message setting address	R/W	Setting value number of bytes	Default value	Setting value
	Low-Pass Filter Selection	2002	2001	R/W	2	4: 100 Hz	0: OFF 1: 3 Hz 2: 10 Hz 3: 30 Hz 4: 100 Hz 5: 300 Hz 6: 1000 Hz
	Moving Average Data Set Size Selection*	2003	2002	R/W	2	0: OFF	0: OFF 1: 16 times 2: 32 times 3: 64 times 4: 128 times 5: 256 times 6: 512 times 7: 1024 times 8: 2048 times
	Automatic Digital Filter	2004	2003	R/W	2	1: ON	0: OFF 1: ON
	Moving Average Data Set Size*	2005	2004	R/W	2	0: OFF	0: OFF 1: Disabled 2 to 2048: Moving average data set size
Motion Detect	Time	2102	2101	R/W	2	1.5	0 to 99 (changed to 0.0 to 9.9 seconds internally)
	Width	2103	2102	R/W	2	000.05	0 to 999
Zero Tracking	Time	2202	2201	R/W	2	0	0 to 99 (changed to 0.0 to 9.9 seconds internally)
	Width	2203	2202	R/W	2	000.00	0 to 999
Digital Zero	Enable Digital Zero	2302	2301	R/W	2	1	0: OFF 1: ON
Digital Offset		2304	2303	R/W	2	0	-19999 to 19999
Digital Zero	Digital Zero Limit Value	2311	2310	R/W	4	99999	0 to 99999

*The last set command for Moving Average Data Set Size Selection or Moving Average Data Set Size is enabled. If only one is set, the other will be set to 0: OFF.

6-5-2-2-5. Condition settings

Group	Setting name	Register address	Query message setting address	R/W	Setting value number of bytes	Default value	Setting value
Select Data Output		2402	2401	R/W	2	0	0: Hold value is output in coordination with display 1: Input is output as is

6-5-2-2-6. Comparison settings

Group	Setting name	Register address	Query message setting address	R/W	Setting value number of bytes	Default value	Setting value
Comparison Pattern Setting		3006	3005	R/W	2	2: LO/OK/HI	0: OK/LO/HI 1: OK/LO/HI 2: LO/OK/HI 3: LO/HI/OK 4: LO/HI/OK
Comparison Mode Setting		3007	3006	R/W	2	0	0: Compare Always 1: Compare During Stable 2: Compare Except Nearly Zero 3: Compare During Stable Except Nearly Zero 4: Compare During Held 5: Disable Comparison
Comparison Value Settings	Reserved	3021	3020		4		
	High Limit Input (HI)	3023	3022	R/W	4	10000 (100.00)	–99999 to 99999
	Low Limit Input (LO)	3025	3024	R/W	4	05000 (050.00)	–99999 to 99999
	Reserved	3027	3026		4		
Comparison Output Pattern		3104	3103	R/W	2	0	0: Standard Output 1: Area Output
Hysteresis		3111	3110	R/W	4	0	0 to 99999
Nearly Zero (range equivalent to zero)		3113	3112	R/W	4	0	0 to 99999

6-5-2-2-7. Hold settings

Group	Setting name	Register address	Query message setting address	R/W	Setting value number of bytes	Default value	Setting value
Hold Mode		4002	4001	R/W	2	1: SAMPLE	0: OFF 1: SAMPLE 2: PEAK 3: BOTTOM
External Hold Mode		4005	4004	R/W	2	0	0: Level 1: Pulse
Clear signal		4006	4005	R/W	2	1	0: Disabled 1: Enabled
Zone Definition		4007	4006	R/W	2	0	0: OFF 1: ON
Auto Zero		4008	4007	R/W	2	0	0: OFF 1: ON

6. RS-485

6-5-2-2-8. System settings

Group	Setting name	Register address	Query message setting address	R/W	Setting value number of bytes	Default value	Setting value
Setting value memory	Manual selection	5003	5002	R/W	2	Memory 1	0: Memory 1 1: Memory 2 2: Memory 3 3: Memory 4
	Save All Setting Values	5004	5003	W	2		90
Device Information	Communication Option	5013	5012	R	2		0: DA 1: EtherNet/IP 2: CC-Link 3: RS-485
	Device Name	5031	5030	R	16		"TD-SC1 " (fixed to 16 total characters, including spaces)
	Version	5039	5038	R	6		"1.00 " (fixed to 6 total characters, including spaces)
Lock	Calibration Value Lock	5202	5201	R/W	2	0	0: OFF 1: ON
	Setting Value Lock	5203	5202	R/W	2	0	0: OFF 1: ON
	Main Unit Operation Lock	5204	5203	R	2	0	0: OFF 1: ON
	Device Number	5501	5500	R/W	2	0	0 to 9999
Communication	Port Selection	5701	5700	R	2		0: USB 1: RS-485

6-5-2-2-9. System settings

Group	Setting name	Register address	Query message setting address	R/W	Setting value number of bytes	Default value	Setting value
USB Communication	Communication Mode	5803	5802	R	2	0	0: TD Format 1: TD Format (BCC)
				W	2		0: TD Format 100: TD Format (BCC)

6-5-2-2-10. TEDS

Group	Setting name	Register address	Query message setting address	R/W	Setting value number of bytes	Default value	Setting value
	Rewrite Data	6011	6010	R/W	2		R: Read TEDS data (without calibration) W: 15, Write TEDS calibration data
	Restore Data	6012	6011	W	2		
	Serial Number	6021	6020	R	8		BCD 0 to 99999999
	Maximum Rated Capacity	6025	6024	R	8		BCD (highest byte is decimal point position)
	Maximum Rated Output	6029	6028	R	8		BCD (highest byte is decimal point position) (mV/V)
	Sensor Impedance	6033	6032	R	8		BCD (highest byte is decimal point position) (Ω)
	Maximum Excitation Level	6037	6036	R	8		BCD (highest byte is decimal point position) (V)
	Calibration Date	6041	6040	R/W	8		R: BCD Year/month/day (yyyymmdd) W: BCD 00yyymmdd
	Model Number	6045	6044	R	8		BCD

6. RS-485

6-5-2-3.04 (0x04) Read Input Register

Reading multiple words is supported.
Specification of words in the middle of each item is not possible.

Address	Query message setting address	Size (byte)	Explanation
1	0	4	Real-time value
3	2	4	Indicator value
5	4	4	Status

Status

Address	Query message setting address	Corresponding bit	Explanation
5	4	0	—
		1	LO
		2	OK
		3	HI
		4	—
		5	Load decimal point position LSB
		6	Load decimal point position
		7	Load decimal point position MSB
		8	Hold mode LSB
		9	Hold mode
		10	Hold mode
		11	Hold mode MSB
		12	Setting value memory LSB
		13	Setting value memory MSB
		14	FULL ¹
		15	OVER ²
		16	—
		17	—
		18	—
		19	—
		20	—
		21	—
		22	—
		23	—
		24	—
		25	—
		26	Static strain mode
		27	Stable
		28	Zero tracking
		29	Nearly zero
		30	Zone definition hold active
		31	HOLD

¹ OVER: Load cell error The sensor signal is exceeding the regulated value so measurement is not possible.

² FULL: Maximum display value exceeded

Load decimal point position

Value	Explanation
0	00000
1	0000.0
2	000.00
3	00.000
4	0.0000

Hold mode

Value	Explanation
0	Constant comparison
1	Sample
2	Peak
3	Bottom

Setting value memory

Value	Explanation
0	Memory 1
1	Memory 2
2	Memory 3
3	Memory 4

6. RS-485

6-5-2-4.05 (0x05) Force Single Coil

Reading/writing multiple bits is not supported.
Operate with 1 bit at a time.

Address	Query message setting address	R/W	Explanation	ON	OFF
1	0	W	Digital Zero	Execute	Unlock
2	1	W	Hold	on	off
3	2	W	Clear Hold	Execute	Execute
4	3	W	Static Strain Mode	Static strain	Indicator value

6-5-2-5.08 (0x08) Diagnostics

The following diagnostic sub codes can be used with this unit.

sub code (Hex)	Sub function name	Query data
00	Return Query Data	Any
01	Restart Communications Option	0x0000
04	Force Listen Only Mode	0x0000
0A	Clear Counters and Diagnostic Register	0x0000
0B	Return Bus Message Count	0x0000
0C	Return Bus Communication Error Count	0x0000
0D	Return Bus Exception Error Count	0x0000
0E	Return Server Message Count	0x0000
0F	Return Server No Response Count	0x0000

6-5-3. Silent Interval (message frame pause time)

The silent interval is required to be at least 3.5 characters by the Modbus RTU specifications.
This unit uses the following values.

Communication Speed	Silent Interval (ms)
4,800	9
9,600	5
19,200	3
38,400	2
57,600	1
115,200	1

In this chapter we explain the CC-Link functions of the TD-SC1 (CCL).

For information about CC-Link communications, refer to dedicated documents about it, for example.

7-1. Restrictions

- Simultaneous use of the TD-SC1 Setup app and CC-Link communication is not guaranteed.
- Ensure that the use conditions will not allow commands to be issued simultaneously when changing settings.

7-2. CC-Link overview

Version

Ver. 1.10

Station type

Remote device station

- Simultaneous use of the TD-SC1 Setup app and CC-Link communication is not guaranteed.
- Ensure that the use conditions will not allow commands to be issued simultaneously when changing settings.

7-3. Connections

7-3-1. CC-Link terminals

Signal name	Explanation	Wire color
DA	DA signal wire	Blue
DB	DB signal wire	White
DG	Digital ground	Yellow
SLD	Connection line (shielded)	

- The wire color is the color of the insulation used by the CC-Link cable.

7-3-2. Inserting and removing CC-Link terminal bank

- You can remove the terminal bank from the main unit by loosening the two black screws at the ends of the terminal bank and pulling it out.
- Always disconnect the power before removing or installing a terminal bank.

7-3-3. Connecting the CC-Link terminals

- Use CC-Link specialty cables to make connections. Connect the shield to the SLD connector.
- If a TD-SC1 (CCL) will be the unit at both ends, connect terminators to both DA and DB.
- Always disconnect the power before working with wiring.
- The recommended torque for the CC-Link terminal screws (M3.5) and attachment screws is 0.69 N·m ≈ 7 kgf·cm.
- After wiring, attach the terminal bank cover.
- Refer to the Install Guide issued by the CC-Link Partner Association.

ATTENTION

- For the CC-Link connector, use the included connector. Do not use any other connector because doing so could make it unsafe.
- Connect the CC-Link terminals of devices that support it to the CC-Link terminal bank.

7. CC-Link

7-4. CC-Link settings (commands using USB communication)

Item	Setting	Command No.	Default value	Setting range/options
Network	Control Signal Input	5710	Control terminal	0: Control terminal, 1: Network
	Memory Control	5711	Manual	0: Manual, 1: Network
CC-Link	Number of Stations Occupied	5101	4 stations occupied	0: 4 stations occupied, 1: 2 stations occupied, 2: 1 station occupied
	Station Number	5102	1	1 to 64
	Communication Speed	5103	10 Mbps	0: 10 Mbps, 1: 5 Mbps, 2: 2.5 Mbps, 3: 625 kbps, 4: 156 kbps

Control Signal Input

The external connector or remote I/O can be selected for external input control (D/Z, HOLD and CLEAR).

Memory Control

Setting value memory selection can be set to manual (command) or remote I/O.

Number of Stations Occupied

Set the number of occupied stations. 1, 2 or 4 stations can be selected.

Station Number

Station number 1 – 64 can be selected. (The high limit changes according to the number of stations occupied.)

Communication Speed

Select the communication speed.

ATTENTION

Restart the power after making CC-Link settings.

7-5. CC-Link indicators

RUN

Unlit: Network not connected or transmission error occurred (invalid carrier, timeout, etc.)

Lit: After network joined, refreshing and polling received normally

Blinking: ---

ERR

Unlit: Normal transmission

Lit: CRC error or device setting error

Blinking: Setting changed while linked

SD

Unlit: No transmission

Lit: Transmitting

Blinking: ---

RD

Unlit: Carrier detection failed

Lit: Carrier detected

Blinking: ---

7-6. Address map

7-6-1. Remote registers with 4 stations occupied

Station	TD-SC1 → Master station			Master station → TD-SC1			
	Remote input	Address	Name	Remote output	Address	Name	Area
1	RWr0000	0x2E0	Indicator value	RWw0000	0x1E0		Exclusive
	RWr0001	0x2E1		RWw0001	0x1E1		
	RWr0002	0x2E2	Real-time input value	RWw0002	0x1E2	High limit (HI)	
	RWr0003	0x2E3		RWw0003	0x1E3		
2	RWr0004	0x2E4	Status	RWw0004	0x1E4	Low limit (LO)	
	RWr0005	0x2E5		RWw0005	0x1E5		
	RWr0006	0x2E6		RWw0006	0x1E6		
	RWr0007	0x2E7		RWw0007	0x1E7		
3	RWr0008	0x2E8		RWw0008	0x1E8	Nearly zero	
	RWr0009	0x2E9		RWw0009	0x1E9		
	RWr000A	0x2EA		RWw000A	0x1EA		
	RWr000B	0x2EB		RWw000B	0x1EB	Hysteresis	
4	RWr000C	0x2EC	Command data	RWw000C	0x1EC		Common
	RWr000D	0x2ED		RWw000D	0x1ED	Command data	
	RWr000E	0x2EE	Command No.	RWw000E	0x1EE		
	RWr000F	0x2EF	Error code	RWw000F	0x1EF	Command No.	

7-6-2. Remote registers with 2 stations occupied

Station	TD-SC1 → Master station			Master station → TD-SC1			
	Remote input	Address	Name	Remote output	Address	Name	Area
1	RWr0000	0x2E0	Indicator value/	RWw0000	0x1E0	High limit (HI)	Exclusive
	RWr0001	0x2E1	Real-time input value	RWw0001	0x1E1		
	RWr0002	0x2E2	Status	RWw0002	0x1E2	Low limit (LO)	
	RWr0003	0x2E3		RWw0003	0x1E3		
2	RWr0004	0x2E4	Command data	RWw0004	0x1E4		Common
	RWr0005	0x2E5		RWw0005	0x1E5	Command data	
	RWr0006	0x2E6	Command No.	RWw0006	0x1E6	Command No.	
	RWr0007	0x2E7	Error code	RWw0007	0x1E7		

7-6-3. Remote registers with 1 station occupied

Station	TD-SC1 → Master station			Master station → TD-SC1			
	Remote input	Address	Name	Remote output	Address	Name	Area
1	RWr0000	0x2E0	Indicator value/	RWw0000	0x1E0		
	RWr0001	0x2E1	Real-time input value	RWw0001	0x1E1		
	RWr0002	0x2E2	Status	RWw0002	0x1E2		
	RWr0003	0x2E3	Error code	RWw0003	0x1E3		

7. CC-Link

7-6-4. Status

This shows the current status of the indicator.

Status	15 (MSB)	14	13	12	11	10	9	8
	OVER ¹	FULL ²	Stable	Static strain value		Decimal point position		
	7	6	5	4	3	2	1	0 (LSB)
	HOLD	Zone definition hold active	Nearly zero		HI	OK	LO	

¹ OVER: Load cell error The sensor signal is exceeding the regulated value so measurement is not possible.

² FULL: Maximum display value exceeded

Decimal point position

Status bit			Decimal point position
10	9	8	
0	0	0	None
0	0	1	0.0
0	1	0	0.00
0	1	1	0.000
1	0	0	0.0000

7-6-5. Error codes

Status	Error code	Explanation
Normal	0	No error
Equipment error	1	A system error has occurred
Calibration error	2	An calibration error has occurred. The calibration value is locked.
Measurement error	3	–FULL (less than the minimum display value) +FULL (greater than maximum display value) –OVER FULL (exceeding maximum negative input) +OVER FULL: (exceeding maximum input) DA output exceeds output range in negative direction. DA output exceeds output range in positive direction.
Command error	4	Command execution error (parameter error) The setting value is locked. Command No. error

7-6-6. Remote I/O with 4 stations occupied

Station	TD-SC1 → Master station			Master station → TD-SC1		
	Remote input	Address	Name	Remote input	Address	Name
1	RX0000	0x0E0	Exclusive area response	RY0000	0x160	Exclusive area request
	RX0001			RY0001		
	RX0002		Common area response	RY0002		Common area request
	RX0003		R/W (response)	RY0003		R/W (request)
	RX0004			RY0004		
	RX0005			RY0005		
	RX0006		CPU operating properly	RY0006		
	RX0007		Decimal point position 1 (load)	RY0007		
	RX0008		Decimal point position 2 (load)	RY0008		
	RX0009		Decimal point position 3 (load)	RY0009		
	RX000A			RY000A		
	RX000B			RY000B		
	RX000C			RY000C		
	RX000D			RY000D		
	RX000E			RY000E		
	RX000F			RY000F		
	RX0010	0x0E1		RY0010	0x161	D/Z
	RX0011		High limit (HI)	RY0011		Clear digital zero
	RX0012		OK (OK)	RY0012		CLEAR
	RX0013		Low limit (LO)	RY0013		
	RX0014			RY0014		HOLD
	RX0015		Nearly zero	RY0015		Indicator value mode
	RX0016		Zero tracking	RY0016		Static strain mode
	RX0017		Stable	RY0017		
	RX0018		Holding	RY0018		Main unit operation lock
	RX0019		Zone definition hold active	RY0019		
	RX001A		Memory selection 1 (response)	RY001A		Memory selections 1
	RX001B		Memory selection 2 (response)	RY001B		Memory selections 2
	RX001C			RY001C		
	RX001D			RY001D		
	RX001E		Maximum display value exceeded	RY001E		
	RX001F		Load cell error	RY001F		
2	RX0020	0x0E2		RY0020	0x162	
	– RX002F			– RY002F		
	RX0030	0x0E3		RY0030	0x163	
3	RX0040	0x0E4		RY0040	0x164	
	– RX004F			– RY004F		
	RX0050	0x0E5		RY0050	0x165	
4	– RX005F			– RY005F		
	RX0060	0x0E6		RY0060	0x166	
	– RX006F			– RY006F		
	RX0070	0x0E7		RY0070	0x167	
	– RX0079			– RY0079		
	RX007A		Error status flag	RY007A		
	RX007B		Remote READY	RY007B		
	RX007C			RY007C		
	– RX007F			– RY007F		

7. CC-Link

RX decimal point position

Decimal point position (load)			Decimal point position
3	2	1	
0	0	0	None
0	0	1	0.0
0	1	0	0.00
0	1	1	0.000
1	0	0	0.0000

7-6-7. Remote I/O with 2 stations occupied

Station	TD-SC1 → Master station			Master station → TD-SC1		
	Remote input	Address	Name	Remote input	Address	Name
1	RX0000	0x0E0	Exclusive area response	RY0000	0x160	Exclusive area request
	RX0001			RY0001		
	RX0002		Common area response	RY0002		Common area request
	RX0003		R/W (response)	RY0003		R/W (request)
	RX0004			RY0004		
	RX0005			RY0005		
	RX0006		CPU operating properly	RY0006		
	RX0007		Decimal point position 1 (load)	RY0007		
	RX0008		Decimal point position 2 (load)	RY0008		
	RX0009		Decimal point position 3 (load)	RY0009		
	RX000A			RY000A		
	RX000B			RY000B		
	RX000C			RY000C		
	RX000D			RY000D		
	RX000E			RY000E		
	RX000F			RY000F		
	RX0010	0x0E1		RY0010	0x161	D/Z
	RX0011		High limit (HI)	RY0011		Clear digital zero
	RX0012		OK (OK)	RY0012		CLEAR
	RX0013		Low limit (LO)	RY0013		
	RX0014			RY0014		HOLD
	RX0015		Nearly zero	RY0015		Indicator value mode
	RX0016		Zero tracking	RY0016		Static strain mode
	RX0017		Stable	RY0017		
	RX0018		Holding	RY0018		Main unit operation lock
	RX0019		Zone definition hold active	RY0019		
	RX001A		Memory selection 1 (response)	RY001A		Memory selections 1
	RX001B		Memory selection 2 (response)	RY001B		Memory selections 2
	RX001C			RY001C		
	RX001D			RY001D		
	RX001E		Maximum display value exceeded	RY001E		
	RX001F		Load cell error	RY001F		Hold/real-time selection
2	RX0020	0x0E2		RY0020	0x162	
	– RX002F			– RY002F		
	RX0030	0x0E3		RY0030	0x163	
	– RX0039			– RY0039		
	RX003A		Error status flag	RY003A		
	RX003B		Remote READY	RY003B		
	RX003C			RY003C		
	– RX003F			– RY003F		

7. CC-Link

7-6-8. Remote I/O with 1 station occupied

Station	TD-SC1 → Master station			Master station → TD-SC1		
	Remote input	Address	Name	Remote input	Address	Name
1	RX0000	0x0E0		RY0000	0x160	D/Z
	RX0001		High limit (HI)	RY0001		Clear digital zero
	RX0002		OK (OK)	RY0002		CLEAR
	RX0003		Low limit (LO)	RY0003		
	RX0004			RY0004		HOLD
	RX0005		Nearly zero	RY0005		Indicator value mode
	RX0006		Zero tracking	RY0006		Static strain value
	RX0007		Stable	RY0007		
	RX0008		Holding	RY0008		Main unit operation lock
	RX0009		Zone definition hold active	RY0009		
	RX000A		Memory selection 1 (response)	RY000A		Memory selections 1
	RX000B		Memory selection 2 (response)	RY000B		Memory selections 2
	RX000C			RY000C		
	RX000D			RY000D		
	RX000E		Maximum display value exceeded	RY000E		
	RX000F		Load cell error	RY000F		Hold/real-time selection
	RX0010 – RX0019	0x0E1		RY0010 – RY0019	0x161	
	RX001A		Error status flag	RY001A		
	RX001B		Remote READY	RY001B		
	RX001C –			RY001C –		

7-7. Common area commands

Setting values (parameters) for commands are made using remote register command data (double word).

See "7-8-2. Reading, writing and operations using commands in the common area" on page 50 for details about reading and writing by command.

7-7-1. Calibration

See "9-1. Calibration" on page 55 for details about the command.

7-7-2. Input/output testing

See "9-7. Input/output testing" on page 60 for details about the command.

7-7-3. Condition settings

See "9-2. Condition settings" on page 57 for details about the command.

7-7-4. Comparison settings

See "9-3. Comparison settings" on page 58 for details about the command.

7-7-5. Hold settings

See "9-4. Hold settings" on page 58 for details about the command.

7-7-6. System settings

See "9-5. System settings" on page 59 for details about the command.

7-7-7. TEDS

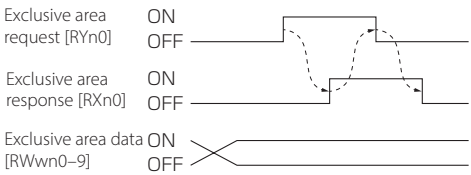
See "9-6. TEDS" on page 60 for details about the command.

7-8. Setting procedures

7-8-1. Writing exclusive area values to the unit

Confirm that all exclusive and common area requests and responses are off before conducting the following.

When the master station "Exclusive area request" (RYn0) is turned on, the exclusive area data will be written to this unit. When this unit completes writing Exclusive area data, "Exclusive area response" (RXn0) will become ON. After confirming that the "Exclusive area response" (RXn0) from this unit is on, turn the "Exclusive area request" (RYn0) off for the master station.



7-8-2. Reading, writing and operations using commands in the common area

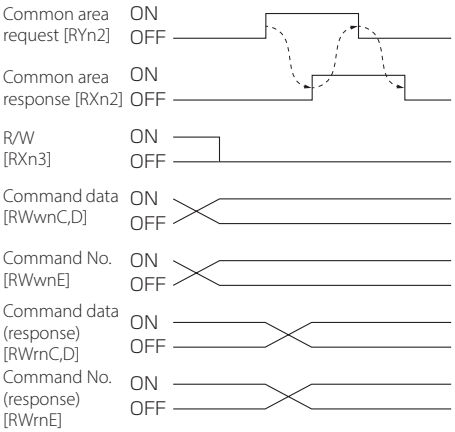
Confirm that all exclusive and common area requests and responses are off before conducting the following.

When the master station "Common area request" (RYn2) is turned on, this unit will execute a command according to the R/W request (RYn3) and Command number (RWwnE). The command will use RWwnC-D command data to read or write the unit's data or execute the specified operation. When this unit completes executing the command, "Common area response" (RXn2) will become ON. After confirming that the "Common area response" (RXn2) from this unit is on, turn the "Common area request" (RYn2) off for the master station.

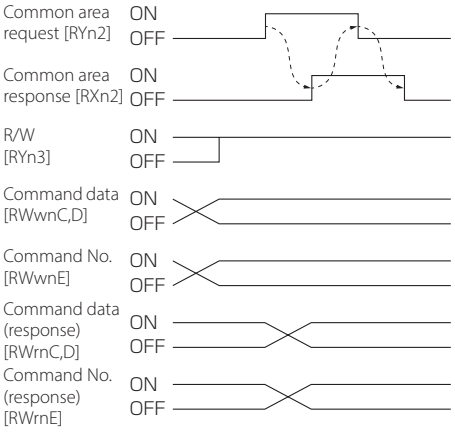
NOTE

If a command ends with an error, the RWrnE Command No. response will be 0xFFFF.

Writing operation R/W = OFF



Reading operation R/W = ON



ATTENTION

- The values that handle command data are all two's complement.
Input values for the valid number of digits, excluding the decimal point.
- After a command is executed, check the command number response or the error code to confirm whether or not the command has been executed properly.

This chapter explains the EtherNet/IP™ functions of the TD-SC1 (E/IP).

For information about EtherNet/IP™ communications, refer to dedicated documents about it, for example.

8-1. Restrictions

- Simultaneous use of the TD-SC1 Setup app and EtherNet/IP™ communication is not guaranteed.
- Ensure that the use conditions will not allow commands to be issued simultaneously when changing settings.

8-2. EtherNet/IP™ communication specifications

Transmission type	10BASE-T/100BASE-TX
Transmission speed	10/100 Mbps
Communication distance	100 m or less between nodes
Transmission cable	Category 5/5e STP cable
Topology	Star, line, tree
Maximum number of connected units	No limit

8-3. Settings

Refer to the following values for connection input/output settings.

- Instance IDs: 100 (input setting), 150 (output setting)
- Data sizes: 16-byte (input setting), 2-byte (output setting)

8-4. Ethernet settings (commands using USB communication)

Item	Setting	Command No.	Format	Default value	Setting range/options
Network	Control Signal Input	5710	Selection	0: Control terminal	0: Control terminal, 1: Network
	Memory Control	5711	Selection	0: Manual	0: Manual, 1: Network
EtherNet/IP	DHCP	5720	Selection	1: Enabled	0: Disabled, 1: Enabled
	IP Address	5721	Input	192.168.0.10	0.0.0.0 to 255.255.255.255
	Subnet Mask	5722	Input	255.255.255.0	0.0.0.0 to 255.255.255.255

- Control signal input: This selects whether device control is conducted by external trigger or implicit message.
- Memory control: This selects whether sensor number and work switching are conducted by implicit message.
(Work switching is only enabled when work switching is set to external input in the work settings.)
- EtherNet/IP: Ethernet settings
- When DHCP is enabled, the IP address and subnet mask fields show the set address items.

ATTENTION

Restart the power after making Ethernet settings.

8-5. LED

8-5-1. NS indicator

Unlit	Either no power supplied or IP address not set
Lit green	Online and connection established
Blinking green	Online but connection not established
Lit red	IP address is duplicated or fatal error
Blinking red	One or more connections have timed out (CIP Class 1 or 3)

8-5-2. MS indicator

Unlit	No power supplied
Lit green	Normal
Blinking green	Scanner is idle
Lit red	Malfunction or network trouble
Blinking red	Parameter error

8-6. Cyclic communication (implicit messages)

- Communication from a TD-SC1 to a scanner will return indicator values and measurement results. Data size is 8 word.
- Communication from a scanner to a TD-SC1 will send control signals to start/stop measurement, for example. Data size is 1 word.

Communication from a TD-SC1 to a scanner

Input data (TD-SC1 to scanner)

Word (16-bit)	Explanation
0	Real-time value
1	
2	Indicator value
3	
4	
5	
6	Status
7	

Status

Bit	31	30	29	28	27	26	25	24
Setting								
Status	HOLD	Zone definition hold active	Nearly zero	Zero tracking	Stable	Static strain value		

Bit	23	22	21	20	19	18	17	16
Setting								
Status								

Bit	15	14	13	12	11	10	9	8
Setting	OVER ¹	FULL ²	Setting value memory		Hold Mode			
Status			bit1	bit0	MSB			LSB

Bit	7	6	5	4	3	2	1	0
Setting	Load decimal point position			Continuous load judgment				
Status	MSB		LSB		HI	OK	LO	

¹ OVER: Load cell error. The sensor signal is exceeding the regulated value so measurement is not possible.

² FULL: Maximum display value exceeded

Hold mode

0	Constant comparison
1	Sample
2	Peak
3	Bottom

Load decimal point position

0	00000
1	0000.0
2	000.00
3	00.000
4	0.0000

Communication from a scanner to a TD-SC1**Output data (scanner to TD-SC1)**

Bit	15	14	13	12	11	10	9	8
Setting	Main unit operation lock						Setting value memory	
Status							MSB	LSB

Bit	7	6	5	4	3	2	1	0
Setting	Static strain mode			HOLD		CLEAR	Clear digital zero	D/Z

8-7. Message communication (explicit messages)

8-7-1. Parameters used by all commands

Read: Get Attribute Single (0x0E)

Write: Set Attribute Single (0x10)

Class (Hex): 0xA2

Attribute: 0x05

By designating each command number in an instance when communicating messages, the desired parameters can be read and written.

NOTE

If values other than parameters are set, they will be ignored.

8-7-2. Calibration

See “9-1. Calibration” on page 55 for details about the command.

8-7-3. Input/output testing

See “9-7. Input/output testing” on page 60 for details about the command.

8-7-4. Condition settings

See “9-2. Condition settings” on page 57 for details about the command.

8-7-5. Comparison settings

See “9-3. Comparison settings” on page 58 for details about the command.

8-7-6. Hold settings

See “9-4. Hold settings” on page 58 for details about the command.

8-7-7. System settings

See “9-5. System settings” on page 59 for details about the command.

8-7-8. TEDS

See “9-6. TEDS” on page 60 for details about the command.

9. Common communication commands

The following commands are the same for RS-485, TD Format / TD Format BCC, CC-Link and EtherNet/IP™.

ATTENTION

- The command system for RS-485 Modbus RTU is different. (See “6-5. Modbus RTU communication mode” on page 30.)
- When commands are used to change settings, they are not written to non-volatile memory, except for some calibration commands. As a result, the original settings will be restored if the power is turned off.
To retain settings even when the power is off, after making some setting changes, use the “Save All Setting Values” command (5003) to save them in the non-volatile memory of the unit.

NOTE

Commands that write data to non-volatile memory when they are executed

1002 Decimal point position
 1003 Zero point input calibration
 1004 Zero balancing
 1100 Reset zero balancing
 1101 Equivalent input calibration rated output value
 1102 Equivalent input calibration rated capacity value
 1103 Actual load calibration rated capacity actual load
 1104 TEDS calibration

USB communication only

5701–5707 Communication settings

9-1. Calibration

Group	Setting name	Command No.	E/IP data length	R/W	Default value (actual unit)	Command data (setting value)	Operation explanation
	Bridge Voltage	1001	1	R/W	2 (5 V)	1: 10 V 2: 5 V	page 65
	Decimal Point Position	1002	1	R/W	2 (0.00)	0: None / 1: 0.0 / 2: 0.00 / 3: 0.000 / 4: 0.0000	page 65
	Zero Point Input Calibration	1003	4	R/W	0 (0 mV/V)	–5000 to 5000 (changed to –5.000 to 5.000 mV/V internally)	page 70
	Zero Balancing	1004	1	R/W	0	When W, command data will be ignored and zero balancing will be conducted. When R, the current set- ting value will be returned as μ V/V.	page 70
	Remote Sense	1005	1	R/W	0	0: Unused (4-wire format) 1: Used (6-wire format)	page 64
	Reset Zero Balancing	1100	1	W		1: Execute	page 70
Equivalent Input Calibration	Rated Output Value	1101	4	R/W	3000 (3.000 mV/V)	50 to 5000 (changed to 0.050 to 5.000 mV/V internally)	page 65
	Rated Capacity Value	1102	4	R/W	10000 (100.00)	00001 to 99999	page 65

9. Common communication commands

Group	Setting name	Command No.	E/IP data length	R/W	Default value (actual unit)	Command data (setting value)	Operation explanation
Actual Load Calibration	Rated Capacity Value	1103	4	R/W	10000 (100.00)	00001 to 99999	page 67
TEDS Calibration	TEDS Calibration	1104	1	W			page 69
Linearization Calibration	Enable/Disable Linearization Calibration	1200	1	R/W	0: Disabled	0: Disabled, 1: Enabled	page 66 page 68
	Select Linearization Point	1201	1	R/W		1 to 3	
	Enable/Disable Selection Point	1202	1	R/W	0: Disabled	0: Disabled, 1: Enabled	
	Sensor Output Value for Calibration Point	1203	4	R/W		4-digit sensor output value (no decimal) (0 < setting value < rated output value)	
	Output Load Value for Calibration Point (Equivalent Input)	1204	4	R/W		±99999	page 66
	Output Load Value for Calibration Point (Actual Load Input)	1205	4	R/W		±99999	page 68
Display	Minimum Scale Selection	1402	1	R/W	0: 1 1: 2 2: 5 3: 10		page 70
	Display Frequency Selection	1403	1	R/W	4 times	0: 4 times 1: 6 times 2: 10 times 3: 20 times	page 70
	Maximum Display Value	1404	4	R/W	11000 (110.00)	00000 to 99999	page 70
	Sensor Input Logic	1405	1	R/W	0: Standard	0: Standard 1: Reversed	page 70

9-2. Condition settings

Group	Setting name	Command No.	E/IP data length	R/W	Default value (actual unit)	Command data (setting value)	Operation explanation
Filter	Low-Pass Filter Selection	2001	1	R/W	4: 100 Hz	0: OFF 1: 3 Hz 2: 10 Hz 3: 30 Hz 4: 100 Hz 5: 300 Hz 6: 1000 Hz	page 71
	Moving Average Data Set Size Selection*	2002	1	R/W	0: OFF	0: OFF 1: 16 times 2: 32 times 3: 64 times 4: 128 times 5: 256 times 6: 512 times 7: 1024 times 8: 2048 times	page 71
	Automatic Digital Filter	2003	1	R/W	1: ON	0: OFF 1: ON	page 71
	Moving Average Data Set Size*	2004	4	R/W	0: OFF	0: OFF 1: Disabled 2–2048: Moving average data set size	page 71
Motion Detect	Time	2101	1	R/W	15 (1.5 second)	0 to 99 (changed to 0.0 to 9.9 seconds internally)	page 72
	Width	2102	4	R/W	00005 (000.05)	00000 to 00999	
Zero Tracking	Time	2201	1	R/W	0 (0.0)	0 to 99 (changed to 0.0 to 9.9 seconds internally)	page 72
	Width	2202	4	R/W	00000 (000.00)	00000 to 00999	
Digital Zero	Enable Digital Zero	2301	1	R/W	1: ON	0: OFF 1: ON	page 73
	Digital Zero Limit Value	2302	4	R/W	99999 (999.99)	00000 to 99999	page 73
Digital Offset		2303	4	R/W	00000 (000.00)	–19999 to 19999	page 73
Select Data Output		2401	1	R/W	0: Display Output	0: Hold value is output in coordination with display 1: Input is output as is	page 73

*The last set command for Moving Average Data Set Size Selection (2002) or Moving Average Data Set Size (2004) is enabled. If only one is set, the other will be set to 0: OFF.

9. Common communication commands

9-3. Comparison settings

Group	Setting name	Command No.	E/IP data length	R/W	Default value (actual unit)	Command data (setting value)	Operation explanation
Comparison Value Settings	High Limit Value (HI)	3002	4	R/W	10000 (100.00)	–99999 to 99999	page 74
	Low Limit Value (LO)	3003	4	R/W	05000 (050.00)	–99999 to 99999	
Comparison Pattern Setting		3005	1	R/W	2: LO/OK/HI	0: OK/LO/HI 1: OK/LO/HI 2: LO/OK/HI 3: LO/HI/OK 4: LO/HI/OK	page 74
Comparison Mode Setting		3006	1	R/W	0: Compare Always	0: Compare Always 1: Compare During Stable 2: Compare Except Nearly Zero 3: Compare During Stable Except Nearly Zero 4: Compare During Held 5: Disable Comparison	page 75
Hysteresis		3101	4	R/W	00000 (000.00)	00000 to 99999	page 76
Comparison Output Pattern		3103	1	R/W	0: Standard Output	0: Standard Output 1: Area Output	page 77
Nearly Zero		3104	4	R/W	00100 (001.00)	00000 to 09999	page 77

9-4. Hold settings

Group	Setting name	Command No.	E/IP data length	R/W	Default value	Command data (setting value)	Operation explanation
Hold Mode		4001	1	R/W	1: SAMPLE	0: OFF 1: SAMPLE 2: PEAK 3: BOTTOM	page 78
External Hold Mode		4004	1	R/W	0: Level	0: Level 1: Pulse	page 81
Clear Signal		4005	1	R/W	1: Enabled	0: Disabled 1: Enabled	page 81
Zone Definition		4006	1	R/W	0: OFF	0: OFF 1: ON	page 81
Auto Zero		4007	1	R/W	0: OFF	0: OFF 1: ON	page 81

9-5. System settings

Group	Setting name	Command No.	E/IP data length	R/W	Default value	Command data (setting value)	Operation explanation
Setting Value Memory		5002	1	R/W	0: Memory 1	0: Memory 1 1: Memory 2 2: Memory 3 3: Memory 4	page 82
Save All Setting Values		5003	1	W		90	page 82
Device Information	Device Name*	5010	8	R		"TD-SC1 " 16-byte (characters first, followed by spaces)	page 82
	Communication Option	5012	1	R		0: DA 1: EtherNet/IP 2: CC-Link 3: RS-485	
	Version*	5020	6	R		"1.00" 6-byte (characters first, followed by spaces)	
Lock	Calibration Value Lock	5201	1	R/W	0: OFF 1: ON	0: OFF 1: ON	page 82
	Setting Value Lock	5202	1	R/W	0: OFF 1: ON	0: OFF 1: ON	
	Main Unit Operation Lock	5203	1	R	0: OFF 1: ON	0: OFF 1: ON	
Device Number		5500	4	R/W	0000	0000 to 9999	page 82

*Not supported with CC-Link

9. Common communication commands

9-6. TEDS

Group	Setting name	Command No.	E/IP data length	R/W	Default value	Command data (setting value)	Operation explanation
Show TEDS Data ¹	Serial Number	6001	4	R		0 to 99999999	page 83
	Maximum Rated Capacity	6002	4	R		BCD (highest byte is decimal point position)	
	Maximum Rated Output	6003	4	R		BCD (highest byte is decimal point position) (mV/V)	
	Sensor Impedance	6004	4	R		BCD (highest byte is decimal point position) (Ω)	
	Maximum Excitation Level	6005	4	R		BCD (highest byte is decimal point position) (V)	
	Calibration Date ²	6006	4	R/W		R (BCD) Year/month/day (yyyy/mm/dd) W (BCD) Year/month/day (yy/mm/dd)	
	Model Number	6007	4	R		BCD	
Rewrite TEDS Data	Rewrite Data	6010	2	R/W		R: Read TEDS data (without calibration) W: 000015, Write TEDS calibration data	page 83
	Restore Data	6011	2	W		W: 000015, Restore TEDS data	page 83

¹ The calibration date is according to BCD, while the others are according to "6-4-2-7. Maximum Rated Capacity (6002), Maximum Rated Output (6003), Sensor Impedance (6004) and Maximum Excitation Level (6005) data formats" on page 28.

² If the date is September 17, 2021, R(BCD) is 20210917 and W(BCD) is 210917.

9-7. Input/output testing

Group	Setting name	Command No.	E/IP data length	R/W	Default value	Command data (setting value)	Operation explanation
	Input/Output Testing ON/OFF	1700	1	R/W	0: OFF	0: OFF 1: ON	page 17
Test Control Input/Output Terminals	Output Terminals	1710	1	W*		bit 0: OK / 1: LO / 2: HI	
	Input Terminals	1711	1	R*		bit 0: CLEAR / 1: HOLD / 2: DZ	

*0 is low and 1 is high for each bit.

ATTENTION

Issuing input/output terminal test commands will forcibly switch the device input/output terminals to test mode. To return to normal mode, use the input/output testing ON/OFF command to turn it off, or turn the power off once and restart the unit.

In this chapter we explain the D/A converter functions of the TD-SC1 (D/A).

The D/A converter settings only affect TD-SC1 (D/A) models. The D/A converter allows for analog output that corresponds to the unit indicator value.

The analog output range is either 0–±10V voltage output or 4–20mA current output. Set the maximum voltage output between ±1 V and ±10 V in 1V steps using the D/A Maximum Voltage setting.

Analog output from zero (0 V, 4 mA) to full scale (±10 V, 20 mA) can be achieved according to the digital values set using D/A Zero and D/A Full Scale settings.

The zero point and full scale cannot be changed separately for current output and voltage output.

10-1. D/A output terminals

10-1-1. D/A output terminals

These can output either voltage or current. They cannot output both at the same time. Use the D/A output mode to set the voltage and current (page 62).

Signal name	Explanation
SLD	GND with external device
V-OUT	D/A voltage output
I-OUT	D/A current output
COM	D/A output common terminal

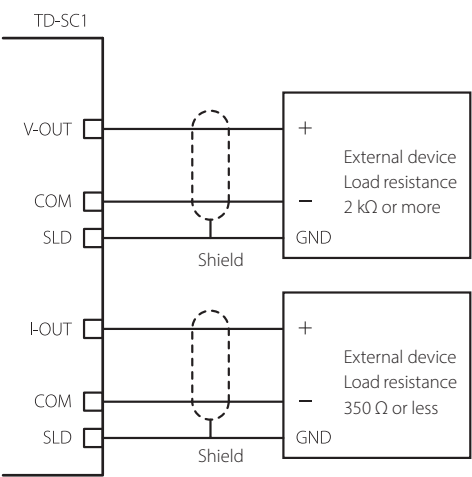
- The D/A output is isolated from this unit's circuits.

For voltage output, connect an external device with a load resistance of 2 kΩ or more to V-OUT and COM.

For current output, connect an external device with a load resistance, including cable wiring resistance, of 350 Ω or less to I-OUT and COM.

NOTE

With static strain display, analog output will be zero.



10-1-2. Installing and removing D/A output terminal banks

- You can remove the terminal bank from the main unit by loosening the two black screws at the ends of the terminal bank and pulling it out.
- Always disconnect the power before removing or installing a terminal bank.

10-1-3. Connecting D/A output terminals

- Always disconnect the power before working with wiring.
- The recommended torque for the D/A output terminal bank screws (M3.5) and attachment screws is 0.69 N·m ≈ 7 kgf·cm.
- After wiring, attach the terminal bank cover.

CAUTION

Use the included connector for D/A output terminal banks. Do not use any other connector because doing so could make it unsafe.

10-2. D/A Zero

Set the indicator value to output for D/A Zero (0V voltage or 4mA current).

10. D/A converter

10-3. D/A Full Scale

With the "10-2. D/A Zero" value as the reference, set the span for the indicator values output to D/A.

When the "10-2. D/A Zero" and "10-3. D/A Full Scale" setting values are added, the "10-5. D/A Maximum Voltage" setting value voltage (20 mA when in electrical current mode) is output.

The following are examples of when "10-5. D/A Maximum Voltage" is set to 10 V.

Setting example 1

D/A Zero	000.00
D/A Full Scale	100.00

Indicator value		D/A output
100.00		10 V (20 mA)
0.00		0 V (4 mA)
-100.00		-10 V(-- mA)

Setting example 2

D/A Zero	020.00
D/A Full Scale	100.00

Indicator value		D/A output
120.00		10 V (20 mA)
20.00		0 V (4 mA)
-80.00		-10 V(-- mA)

Setting example 3

D/A Zero	020.00
D/A Full Scale	-100.00

Indicator value		D/A output
120.00		-10 V(-- mA)
20.00		0 V (4 mA)
-80.00		10 V (20 mA)

Setting example 4

D/A Zero	-010.00
D/A Full Scale	020.00

Indicator value		D/A output
10.00		10 V (20 mA)
-10.00		0 V (4 mA)
-30.00		-10 V(-- mA)

ATTENTION

If calibration is conducted, when the rated capacity is confirmed, it will be set as the D/A full scale value.

10-4. D/A Output Mode

Select voltage or current.

10-5. D/A Maximum Voltage

Voltage setting (limiter)

- The output has an extended range of about 10% more than the set value. The output voltage range is the same in the negative direction. For example, when set to 5 V, the D/A output voltage range will be about -5.5 V to +5.5 V, and +5 V will be output when the "10-2. D/A Zero" and "10-3. D/A Full Scale" setting values are added.

Connecting the unit with a strain gauge transducer and setting how the indicator values will be shown is called "calibration". The following three calibration methods can be used with the unit.

1. Equivalent input calibration

This calibration method does not depend on actual loads. It only requires the input of the strain gauge transducer rated output (mV/V) and the rated capacity (value you want shown). Use this to calibrate easily when an actual load cannot be applied.

Examples:

Load

100kN rated capacity, 2.001mV/V rated output

Pressure

1.00MPa rated capacity, 2.002mV/V rated output

Torque

15.00N·m rated capacity, 2.502mV/V rated output

In this manner, by recording values from test reports, the gain can be determined automatically and shown.

2. Actual load calibration

This calibration method measures the values of actual loads on the strain gauge transducer.

By applying an actual load that is as close as possible to the maximum measured value, calibration with less error is possible.

3. TEDS calibration

This calibration method uses the strain gauge transducer rated output (mV/V) and rated capacity that are recorded in TEDS memory.

Note, however, that equipment with TEDS memory includes both 1kbit and 4kbit devices, but the unit only supports 4kbit.

Sensor check before calibrating

After connecting a sensor and providing power, calibration is not possible if the indicator value is unstable or the status indicator lights magenta. If this occurs, check the indicator value after issuing a Switch Static Strain Disp. Mode execution command, setting it to Static Strain Display Mode. In this mode, the sensor output itself is shown as a strain amount unit (μST), so input between 0 and ±5.0 mV/V will be shown as a value from 0 to ±10000.

Overview of zero balancing and digital zero functions

1. Zero balancing value definition

This is the value for which zero balancing is conducted during the sensor calibration procedures in this chapter.

2. Digital zero (D/Z) value definition

The digital zero (D/Z) function that shows zero separately from the zero balancing value can be used only when Enable Digital Zero is set to ON.

Depending on the setting, the zero value might not be retained when the power is restarted.

Name	When power restarted
Digital zero (D/Z) value	The set zero value is reset, and the zero balancing value is shown.
Zero balancing value	The set zero value is retained.

A strain gauge transducer should have written test results with contents such as the following.	
Rated Capacity	Load, barometric pressure, etc. (with units of kN, Mpa, etc.)
Rated Output	Voltage (unit: mV/V)
Linearity	%R.O.
Hysteresis	%R.O.
Safe excitation voltage (maximum)	V (bridge voltage)
Input Terminal Resistance	Ω
Output Terminal Resistance	Ω
Zero Balance	%R.O.

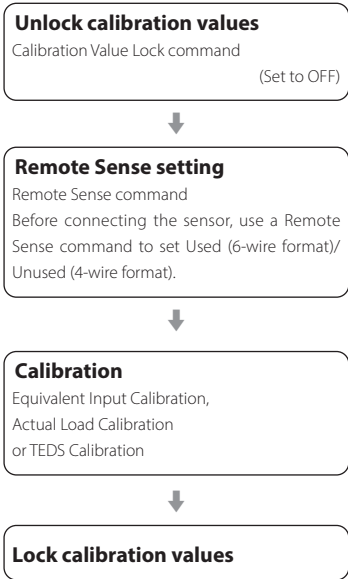
- The data necessary for equivalent input calibration are rated capacity and rated output.
- Some of this data is written to the internal memory of the TEDS sensor.

11. Calibration

11-1. Procedures shared by all calibration methods

The three calibration methods are equivalent input calibration, actual load calibration and TEDS calibration. All the calibration methods have the same procedures before and after calibration.

An overview of the calibration procedures is shown below.



Following an explanation of the procedures to be conducted before and after calibration are explanations of the procedures for equivalent input calibration, actual load calibration and TEDS calibration.

ATTENTION

When calibration is conducted, the D/A Converter setting will be initialized automatically according to the calibration value (TD-SC1 (D/A) only).

11-1-1. Locking and unlocking calibration values

Usually, the unit is used with Calibration Value Lock set to ON. This must be set to OFF before calibration. After calibration, set it to ON again.

ATTENTION

In order to prevent accidental changes to the calibration value, set Calibration Value lock to ON after calibration.

NOTE

See "17-1. Lock item list" on page 84 for information about settings that cannot be changed when Calibration Value Lock is ON.

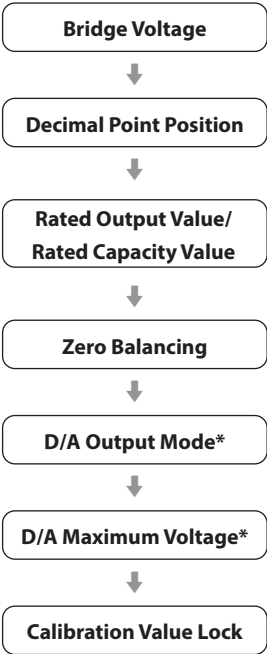
11-1-2. Remote Sense

Before connecting a sensor, confirm the sensor specifications. Furthermore, when using a 6-wire format (remote sense format), use a Remote Sense command to select "Used (6-wire format)". When using a TEDS sensor or a 4-wire format, set it to "Unused (4-wire format)".

11-2. Equivalent input calibration

This method determines the calibration value by recording rated output and rated capacity values from a test report. Use this to calibrate easily when an actual load cannot be applied.

An overview of the equivalent input calibration procedures is shown below.



- See “10. D/A converter” on page 61 for information about D/A settings.

*TD-SC1 (D/A) only

11-2-1. Bridge Voltage

Options: 5 V, 10 V

Set the bridge voltage to supply to the strain gauge transducer.

- As a reference for setting the bridge voltage, consider that the output from the sensor should be increased, and set the maximum voltage in a range that does not exceed the maximum safe excitation voltage on the sensor test report.

ATTENTION

A sensor could be damaged if this is set to a value that exceeds its maximum safe excitation voltage.

NOTE

The default value is 5 V.

11-2-2. Decimal Point Position

Set the decimal point position for the rated capacity value.

11-2-3. Rated Output Value

Input range: 0.050 to 5.000 mV/V

Set the rated output of the strain gauge transducer being used.

11-2-4. Rated Capacity Value

Set the rated capacity of the strain gauge transducer being used.

NOTE

The decimal point position set here will be used as the indicator value decimal point position.

ATTENTION

When using a D/A option, the rated capacity is set as the D/A full scale value.

11-2-5. Zero Balancing

With no load on the sensor, send a Zero Balancing command. During zero balancing, ST1 will be “Executing”.

- If ST1 becomes “Error occurred”, conduct countermeasures and redo calibration.

11. Calibration

11-2-6. D/A Output Mode

Options: voltage, current

11-2-7. D/A Maximum Voltage

Range: ± 1 to ± 10 (1V increments)

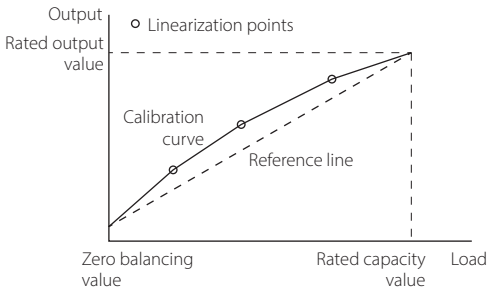
NOTE

For information about D/A settings, see “10. D/A converter” on page 61.

11-2-8. Calibration Value Lock

To prevent unintended changes to the calibration value, Calibration Value Lock should usually be set to ON.

11-2-9. Linearization Calibration



If linearization calibration is not conducted, a line connecting the two points between the zero balancing value and the rated capacity value will be used to calculate load. Conducting linearization calibration improves the linearity of load measurements by increasing the number of calibration points. Set the linearization calibration after equivalent input calibration.

1 Use the Enable/Disable Linearization Calibration command to enable linearization calibration.

2 Use the Select Linearization Point command to set the number of the linearization point (calibration point).

3 Set the calibration values.

Use the Sensor Output Value for Calibration Point and Output Load Value for Calibration Point (equivalent input) commands to set the calibration values.

The calibration point output load value cannot be set to a value that would be 5% or more relative to the straight-line (reference line) that connects the no-load and rated load outputs.

ATTENTION

The following conditions must always be met.

- $0 < \text{output value} < \text{rated output value}$
- Previous output value $<$ current output value

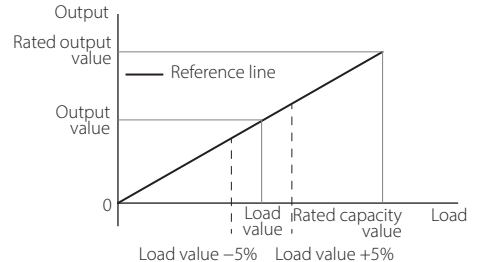
4 Use the Enable/Disable Selection Point command to enable the selection point.

5 Repeat steps 2–3 to set the necessary linearization points.

Linearization points can be set in a maximum of three locations.

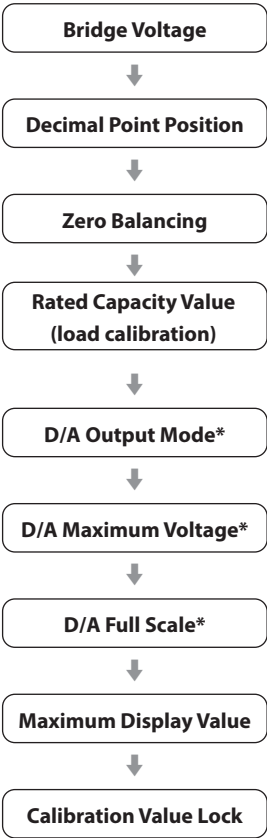
NOTE

- To disable linearization points after setting linearization calibration values, use the Enable/Disable Selection Point command to disable the selected points. Since set calibration values are saved, enabling selected points will enable linearization points without setting values.
- The possible range of linearization is shown by the dashed lines in the illustration below.



11-3. Actual load calibration

Calibrate by applying an actual load to the sensor.



- See “10. D/A converter” on page 61 for information about D/A settings.

*TD-SC1 (D/A) only

11-3-1. Bridge Voltage

Options: 5 V, 10 V
Set the bridge voltage to supply to the strain gauge transducer.

- As a reference for setting the bridge voltage, consider that the output from the sensor should be increased, and set the maximum voltage in a range that does not exceed the maximum safe excitation voltage on the sensor test report.

ATTENTION

A sensor could be damaged if this is set to a value that exceeds its maximum safe excitation voltage.

NOTE

The default value is 5 V.

11-3-2. Decimal Point Position

Set the decimal point position for the rated capacity value.

11-3-3. Zero Balancing

With no load on the sensor, send a Zero Balancing command. During zero balancing, ST1 will be “Executing”.

- If ST1 becomes “Error occurred”, conduct countermeasures and redo calibration.

11-3-4. Rated Capacity Value (load calibration)

1 Apply an actual load to the sensor.

2 Set the rated capacity value.

3 Check ST1.

The process completed properly if it is “Standing by”.

- If it is “Error occurred”, conduct countermeasures and redo calibration.

ATTENTION

For the TD-SC1 (D/A), the rated capacity is set to the D/A full scale value.

NOTE

The decimal point position set here will be used as the indicator value decimal point position.

11. Calibration

11-3-5. D/A Output Mode

Options: voltage, current

11-3-6. D/A Maximum Voltage

Range: ± 1 to ± 10 (1V increments)

11-3-7. D/A Full Scale

With the "10-2. D/A Zero" value as the reference, set the span for the indicator values output to D/A. When the "10-2. D/A Zero" setting value is added, the "10-5. D/A Maximum Voltage" setting value voltage (20 mA when in electrical current mode) is output.

NOTE

For information about D/A settings, see "10. D/A converter" on page 61.

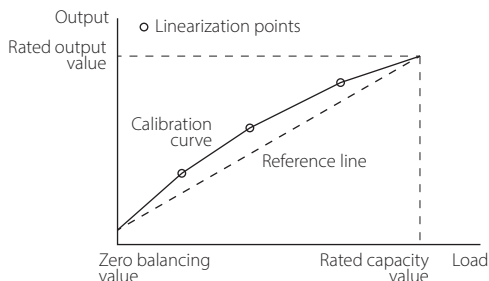
11-3-8. Maximum Display Value

Set the highest displayed value (page 70).

11-3-9. Calibration Value Lock

To prevent unintended changes to the calibration value, Calibration Value Lock should usually be set to ON.

11-3-10. Linearization Calibration



If linearization calibration is not conducted, a line connecting the two points between the zero balancing value and the rated capacity value will be used to calculate load.

Conducting linearization calibration improves the linearity of load measurements by increasing the number of calibration points. Set the linearization calibration after actual load calibration.

1 Use the Enable/Disable Linearization Calibration command to enable linearization calibration.

2 Use the Select Linearization Point command to set the number of the linearization point (calibration point).

3 After applying a load to the sensor, use the Output Load Value for Calibration Point (actual load Input) command to set the load that was applied to the sensor.

After the command is transmitted, the output value will be measured.

The output value cannot be set to a value that would be 5% or more relative to the straight-line (reference line) that connects the no-load and rated load outputs.

ATTENTION

The following conditions must always be met.

- $0 < \text{output value} < \text{rated capacity}$
- Previous output value $<$ current output value

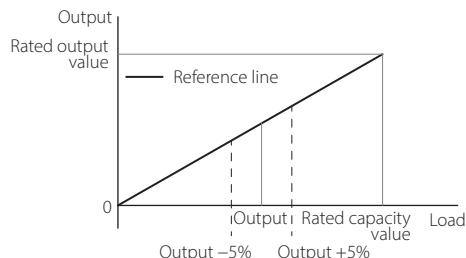
4 Use the Enable/Disable Selection Point command to enable the selection point.

5 Repeat steps 2–4 to set the necessary linearization points.

Linearization points can be set in a maximum of three locations.

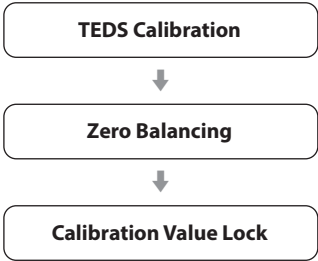
NOTE

- To disable linearization points after setting linearization calibration values, use the Enable/Disable Selection Point command to disable the selected points. Since set calibration values are saved, enabling selected points will enable linearization points without measuring again.
- The possible range of linearization is shown by the dashed lines in the illustration below.



11-4. TEDS calibration

A TEDS sensor has calibration information, including rated output and rated capacity, stored in its memory. TEDS calibration reads this calibration information to automatically record calibration values.



11-4-1. TEDS Calibration

Send a TEDS Calibration command.

Rated capacity digit shown during TEDS calibration

TEDS sensor rated capacity value	Unit shown	Indicator value
1	N, kN	01.000
2	N, kN	02.000
3	N, kN	03.000
4	N, kN	04.000
5	N, kN	05.000
10	N, kN	010.00
20	N, kN	020.00
30	N, kN	030.00
40	N, kN	040.00
50	N, kN	050.00
100	N, kN	0100.0
200	N, kN	0200.0
300	N, kN	0300.0
400	N, kN	0400.0
500	N, kN	0500.0

NOTE

- TEDS data is automatically loaded when the power is turned on.
- The decimal point position for the rated capacity will be used as the decimal point position for the indicator value.
- D/A settings will become as follows*.
D/A Output Mode: Voltage
D/A Maximum Voltage: 10 V
- The Maximum Display Value is set to 110% of the rated capacity.

*TD-SC1 (D/A) only

ATTENTION

The bridge voltage will be set to a value that is less than the maximum safe excitation voltage stored in the TEDS memory.

11-4-2. Zero Balancing

With no load on the sensor, send a Zero Balancing command. During zero balancing, ST1 will be “Executing”.

- If ST1 becomes “Error occurred”, conduct countermeasures and redo calibration.

11-4-3. Calibration Value Lock

To prevent unintended changes to the calibration value, Calibration Value Lock should usually be set to ON.

ATTENTION

If Calibration Value Lock is ON, automatic calibration will not occur when the unit is turned on.

11. Calibration

11-5. Remote Sense

Before connecting the sensor, set which type will be connected in advance.

Options: Used (6-wire format)
Unused (4-wire format)

ATTENTION

Incorrect connections or settings could cause damage to sensors.

11-6. Minimum Scale Selection

Set the minimum digital change of the indicator value.

Options: 1, 2, 5, 10

11-7. Display Frequency Selection

Select the number of times that the indicator value is shown per second.

Options: 4, 6, 10, 20

11-8. Maximum Display Value

Set the highest displayed value.

The default value is set to 110% of the rated capacity.

If this value is exceeded, the STATUS indicator will light magenta.

ATTENTION

The input value will be checked with a value converted to match the input signal.

If the value converted to match the input exceeds 5.0 mmV/V, the setting value will be adjusted to be equivalent to 5.0 mmV/V.

The default value will be checked in the same manner and adjusted if necessary.

11-9. Sensor Input Logic

The sensor input logic can be reversed artificially.

Normally, "Standard" should be used.

NOTE

- "Reversed" does not electrically reverse the input.
- After changing this setting, always redo zero.

11-10. Zero Balancing

You can conduct zero balancing even without resetting the calibration value.

1 Set Calibration Value Lock to OFF.

See "11-1-1. Locking and unlocking calibration values" on page 64.

2 With no load on the sensor, press and hold the ZERO button or send a Zero Balancing command.

During zero balancing, the STATUS indicator will become magenta.

3 Set Calibration Value Lock to ON.

ATTENTION

Zero balancing cannot be conducted during static strain display.

11-11. Zero Point Input Calibration

Set the zero point output value.

- Any desired output value can be set as the zero point.

11-12. Reset zero balancing

This resets the output value for the zero point that has been updated through zero balancing to its default value.

11-13. Digital Zero

The current indicator value becomes zero.

- The digital zero can be adjusted in the range between absolute values of the Digital Zero Limit Value.
- Digital zero is cleared by turning off the power supply or using Clear Digital Zero.

ATTENTION

The digital zero function cannot be executed during static strain display.

12-1. Filter

12-1-1. Low-Pass Filter Selection

Set the low pass filter cutoff frequency (Hz).

Options: 3, 10, 30, 100, 300, 1000, None

NOTE

When set to "None", the AD converter anti-aliasing function is enabled for sampling frequencies to the top of the range.

12-1-2. Moving Average Data Set Size Selection

Set the moving average data set size for the measured data.

Options: OFF, 16, 32, 64, 128, 256, 512, 1024, 2048

NOTE

The last set values for Moving Average Data Set Selection and Moving Average Data Set Size become enabled. If only one is set, the other will be set to 0: OFF.

12-1-3. Automatic Digital Filter

When the input signal is stable, the unit can temporarily set the filter's moving average data set size to 1024, reducing indicator value unsteadiness.

This function is used for the display of indicator values and affects judgments and DA output.

This does not function during hold execution, so it has no effect on measured values.

This function can be disabled by setting it to OFF.

Options: ON, OFF

12-1-4. Moving Average Data Set Size

Set the moving average data set size for the measured data to the desired size.

Range: 0, 2–2048

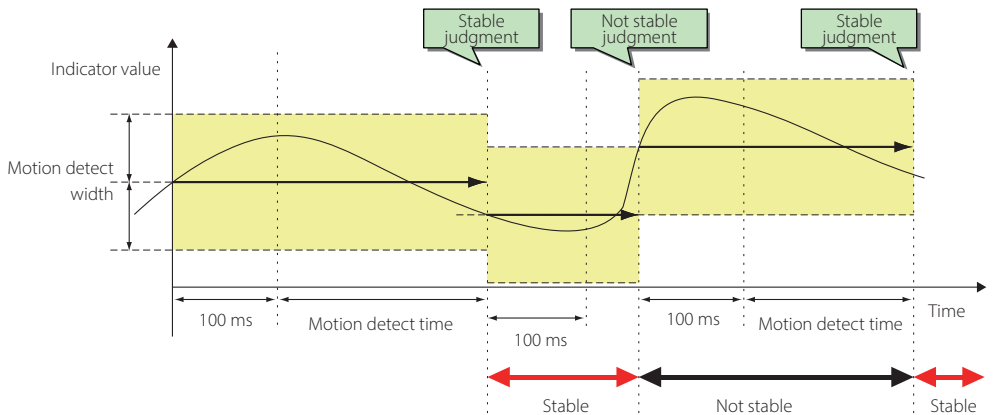
12. Condition settings

12-2. Motion Detect

Set the parameters used to detect stability.

The indicator value is judged to be stable if a difference less than the set width occurs between the current indicator value and the indicator value 100 ms before, and this continues for the set time.

The motion detect function is closely related to the comparison mode. See "13-3. Comparison Mode Setting" for details.



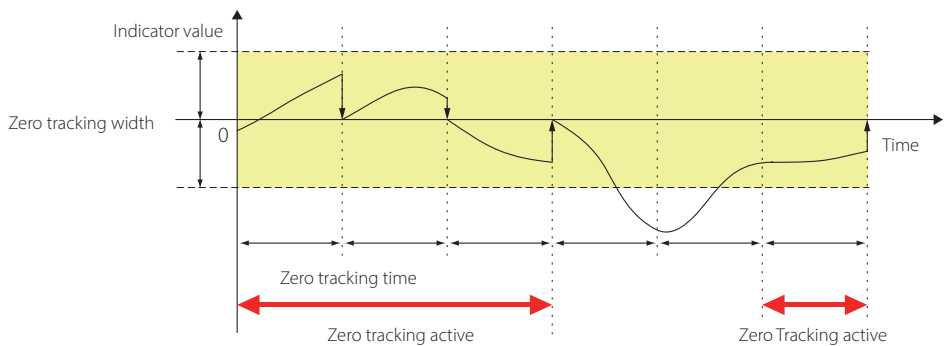
12-3. Zero tracking

This function automatically tracks drift and other gradual changes to the zero point.

With Zero tracking, when the zero point moves no more than the set width, the indicator value is automatically adjusted to zero each set time interval.

This only functions when Calibration Value Lock is ON and Enable Digital Zero is ON.

Zero tracking will not function if its time is set to 0.0 seconds and its width is set to 0.0.



12-4. Digital offset

The set value is subtracted from the measured value (digital zero).

12-5. Digital Zero

12-5-1. Enable Digital Zero

When Enable Digital Zero is set to OFF, the digital zero function will not be executed even if the D/Z signal is ON for the control input terminal.

12-5-2. Digital Zero Limit Value

This sets the digital zero adjustment range. (The setting value unit is the same as for the indicator value.)

ATTENTION

If the current sensor input value exceeds the digital zero limit setting value, the result of Digital Zero Limit Value command execution will end with an error and the indicator value will not become zero.

12-5-3. Clear Digital Zero

The display adjustment that has been made with Digital Zero is reverted so that the unadjusted value is shown again.

When zero balancing has been conducted, the value is shown as zero.

12-6. Switch Static Strain Disp. Mode (static strain display mode)

When a Switch Static Strain Disp. Mode execution command is issued, the input signal is shown using the strain amount unit (μ ST) (page 29).

Use when checking sensor output and when investigating unsteadiness in indicator values, including unsteadiness caused by sensors and cables, as well as for other problems.

NOTE

- To exit static strain display mode, issue a Switch to Home Screen execution command.
- Static strain is shown using 1-gauge method with a gauge factor of 2.0.

12-7. Select Data Output

Select the data output from the D/A converter of the TD-SC1 (D/A).

Select Data Output has the following two options.

The hold value is output in coordination with the display.

The input is output as is.

13. Comparison settings

13-1. Comparison value settings

Use this function to set the high limit and low limit values, compare them with indicator values, and turn judgment output ON for each one.

HI: high limit value

LO: low limit value

ATTENTION

Input values that meet this condition: low limit value < high limit value.

13-2. Comparison Pattern Setting

You can change the judgment output high limit and low limit assignments of HI and LO.

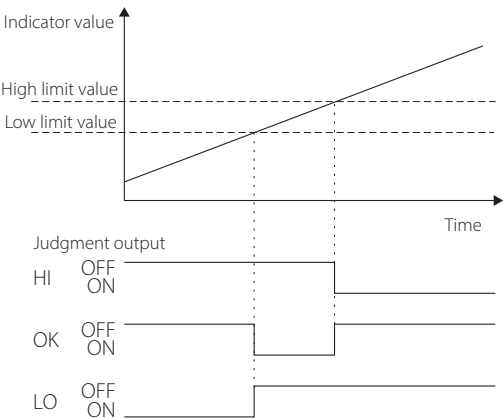
Options:

OK/LO/HI

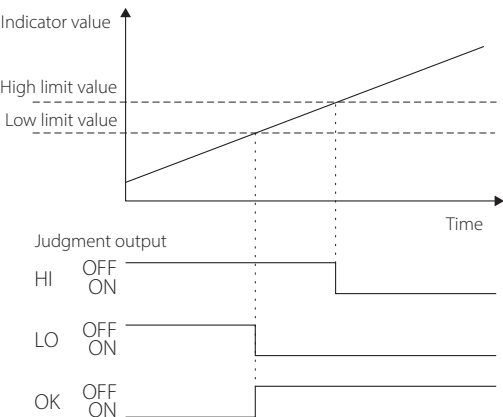
LO/OK/HI

LO/HI/OK

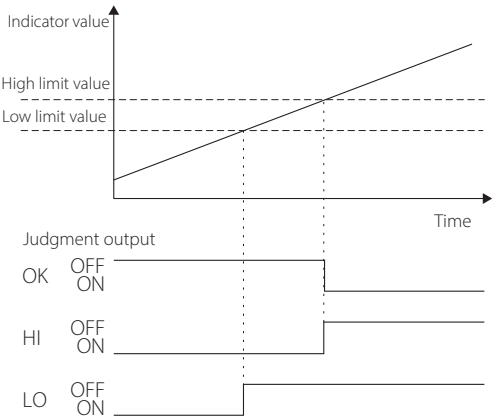
When set to LO/OK/HI, one is assigned to high limit and one is assigned to low limit (when Standard Comparison Output Pattern setting)



When set to OK/LO/HI, all are assigned to high limit (when Standard Comparison Output Pattern setting)



When set to LO/Hi/OK, all are assigned to low limit (when Standard Comparison Output Pattern setting)



13-3. Comparison Mode Setting

Set the conditions for judging high limit and low limit.

NOTE

Compare During Stable, Compare Except Nearly Zero and Compare During Stable Except Nearly Zero comparison modes are closely related to Motion Detect or Nearly Zero functions. See “12-2. Motion Detect” and “13-6. Nearly Zero” for details.

13. Comparison settings

13-4. Hysteresis

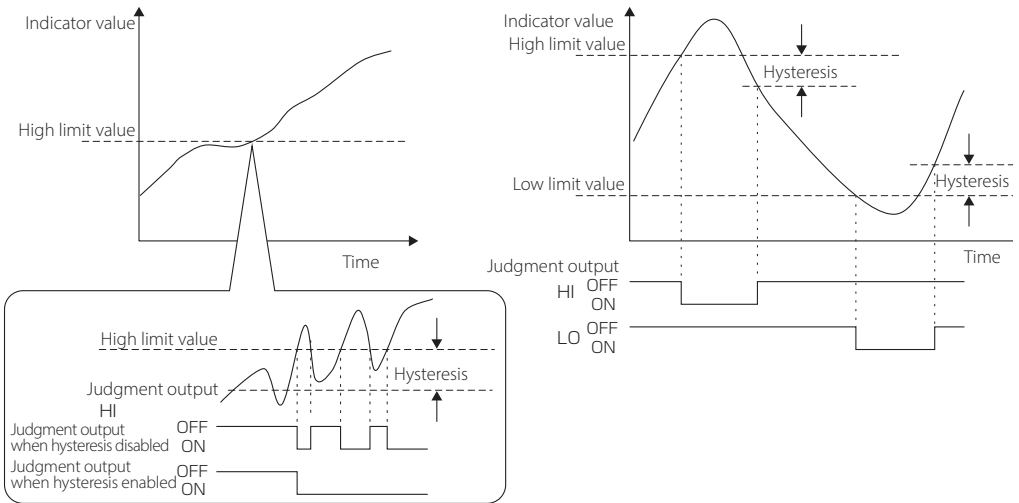
This function applies a width to switching from ON to OFF for high limit and low limit judgment.

If the indicator value fluctuates near a comparison value, causing judgment output to chatter between ON and OFF, adjustment of the hysteresis value can prevent this chattering.

The operation of hysteresis changes as follows according to the Comparison Pattern Setting.

For limit boundary values that are greater than the OK position, it operates in the negative direction. For limit boundary values that are less than the OK position, it operates in the positive direction.

When the Comparison Pattern Setting is LO/OK/HI, hysteresis activates for the high limit value when an indicator value decreases and for the low limit and low limit value when an indicator value increases.



Judgment output conditions (when Comparison Output Pattern is set to Standard Output)

Judgment output	Status	Condition
HI	OFF → ON	High limit value < indicator value
	ON → OFF	Indicator value ≤ (high limit value – hysteresis setting value)
LO	OFF → ON	Indicator value < low limit value
	ON → OFF	(Low limit value + hysteresis setting value) ≤ indicator value

ATTENTION

Set the hysteresis setting value so that it meets the following condition.

Low limit value < (high limit value – hysteresis setting value)

NOTE

- The same hysteresis width setting is used with high limit and low limit values.
- If set to "0", hysteresis will be disabled.

13-5. Comparison Output Pattern

The two types of judgment output operation are Standard Output and Area Output.

In these examples, the judgment output behavior is for when the Comparison Pattern Setting is "1" (OK/LO/HI).

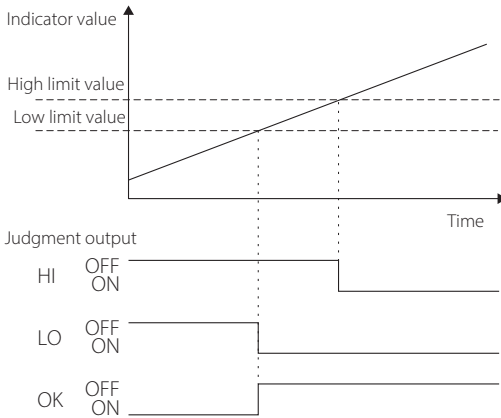
13-5-1. Standard Output

Judgment output operation is as follows.
(when hysteresis is "0")

HI: high limit value < indicator value

LO: low limit value < indicator value

OK: indicator value < low limit value



NOTE

Judgment output operation changes according to the hysteresis setting. See "13-4. Hysteresis" on page 76.

13-5-2. Area Output

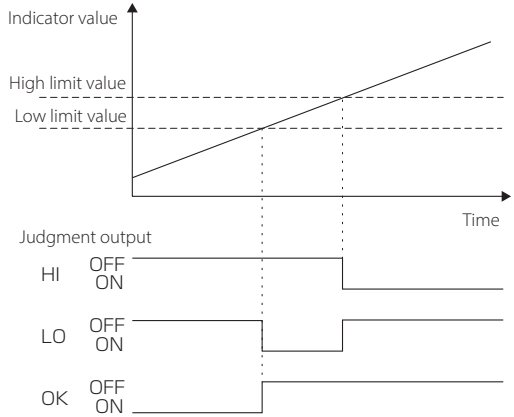
Judgment output operation is as follows.

(when hysteresis is "0")

HI: high limit value < indicator value

LO: Low limit value < indicator value < high limit value

OK: indicator value < low limit value



NOTE

Judgment output operation changes according to the hysteresis setting. See "13-4. Hysteresis" on page 76.

13-6. Nearly Zero

Set the range in which indicator values are evaluated as being nearly zero.

NOTE

Nearly Zero judgment results are closely related to high limit and low limit judgment output.

See "13-3. Comparison Mode Setting" on page 75 for details.

14. Hold function settings

14-1. Hold Mode

The Hold Mode has the following four types.

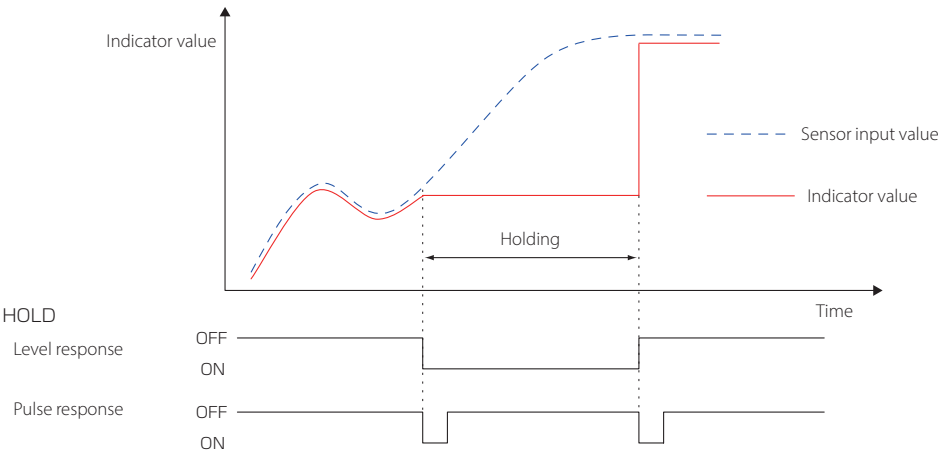
- OFF**
No hold
- Sample**
Sample hold
- Peak**
Peak hold
- Bottom**
Bottom hold

14-1-1. Hold value reading

The data returned by Polling (0001) or Indicator Value Polling (0003) when holding is the hold value.

14-1-2. Sample hold

The Hold On command or a Hold signal from the control input terminal can be used to hold the indicator value. Send a Hold On command to hold an indicator value, and send a Hold Off command to stop holding it.

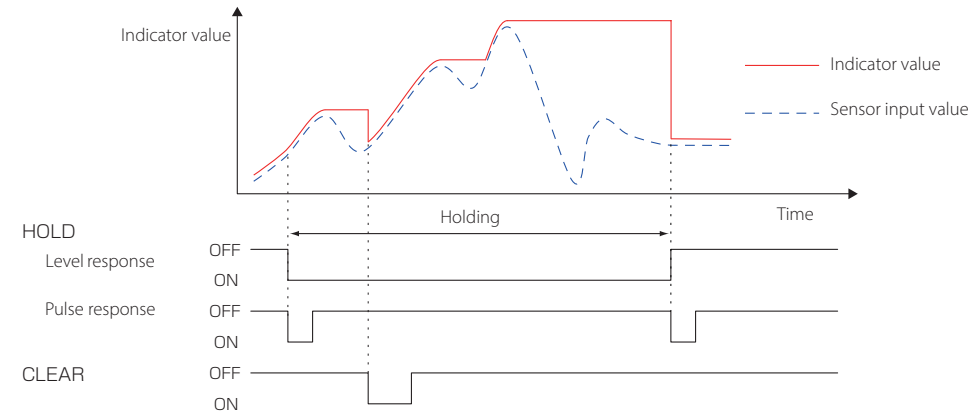


- Level or Pulse can be selected as the control input terminal Hold signal format using the External Hold Mode Setting.
- Zone Definition cannot be used with the sample hold mode.
- When using the sample hold mode, you cannot use a control input terminal Clear signal.

14-1-3. Peak hold

14-1-3-1. No Zone Definition

While a Hold On command is active or while a control input terminal Hold signal is ON, the maximum value (peak value) in the indicator value positive direction is held. Sending a Hold Off command or making the Hold signal OFF will end the peak hold. When holding, sending a Hold Clear command or making the control input terminal Clear signal ON will also reset the peak value.

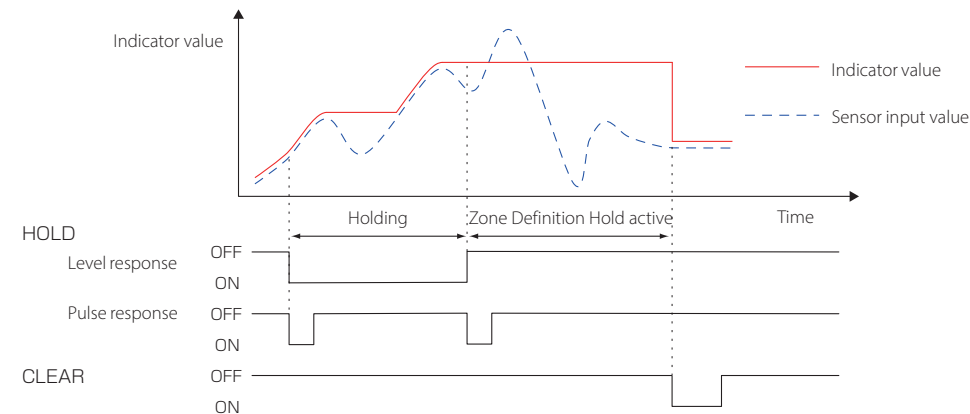


ATTENTION

When using Clear and Hold signals (when level response), maintain the ON state for at least 10 ms.

14-1-3-2. Zone Definition used

The indicator value when the hold operation completes continues to be held. A hold will be reset by sending a Hold Clear command or by the control input terminal Clear signal becoming ON.



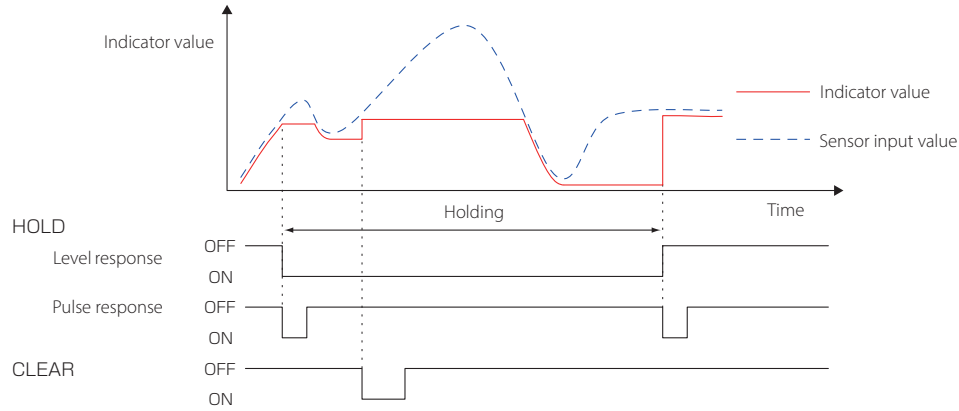
When holding, sending a Hold Clear command or making the control input terminal Clear signal ON will reset the peak value.

14. Hold function settings

14-1-4. Bottom hold

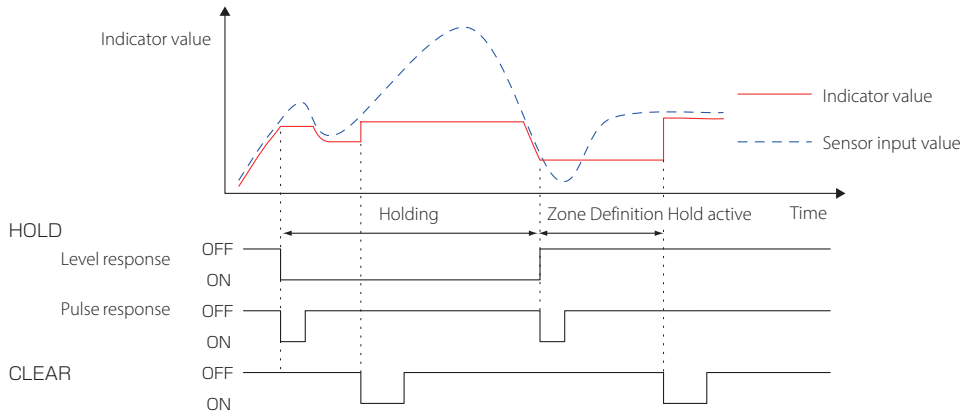
14-1-4-1. No Zone Definition

While a Hold On command has been sent or a control input terminal Hold signal is ON, the lowest indicator value (bottom value) is held. Sending a Hold Off command or making the control input terminal Hold signal OFF will end the bottom hold. When holding, sending a Hold Clear command or making the control input terminal Clear signal ON will also reset the bottom value.



14-1-4-2. Zone Definition used

The indicator value when the hold operation completes continues to be held. A hold will be reset by sending a Hold Clear command or by making the control input terminal Clear signal become ON.



When holding, sending a Hold Clear command or making the control input terminal Clear signal ON will also reset the bottom value.

14-2. External Hold Mode

Select the control input terminal Hold signal format.
The External Hold Mode has the following two types.

Level

Pulse

14-3. Clear signal

The Clear signal command sets whether control input terminal Clear signals are enabled or disabled.

14-4. Zone Definition

When Zone Definition is set to ON, the indicator value when the hold ends will continue to be held.

Send a Hold Clear command or use a Clear signal to stop holding it.

Options: ON, OFF

14-5. Hold Lock

While holding, sending a Hold Lock command will hold the indicator value.

Send a Hold Clear command or use a Clear signal to stop holding it.

14-6. Auto Zero

Set whether or not to automatically execute a Digital Zero when a hold starts (ON/OFF).

ON: automatically execute the digital zero function when a hold starts

OFF: do not automatically execute the digital zero function when a hold starts

15. System settings

15-1. Setting value memory

Select the setting value memory.

You can save up to 4 memories with setting values and switch among them.

- The selected memory setting is changed directly.
- You cannot copy between setting memories.

When shipped from the factory, memories 1 to 4 are set at default values.

See the setting value list for the setting values that can be saved in memories 1 to 4.

NOTE

The calibration value does not change.

ATTENTION

Interrupting the power while writing setting values will not only cause the values to not be recorded, it might also corrupt the memory. Do not interrupt the power supply while executing a Setting Value Memory command.

15-2. Save All Setting Values

The current settings can all be saved together in a setting value memory.

ATTENTION

If the power is interrupted while a setting value is being written, the setting value will be damaged, so the default value will be applied the next time the unit starts up.

15-3. Device Information

The following information can be read from a communicating device.

Device Name
Communication Option
Version*

*Not supported with CC-Link

15-4. Lock

15-4-1. Calibration Value Lock

See "17-1. Lock item list" on page 84 for information about settings that cannot be changed when Calibration Value Lock is ON.

15-4-2. Setting Value Lock

See "17-1. Lock item list" on page 84 for information about settings that cannot be changed when Setting Value Lock is ON.

15-4-3. Main Unit Operation Lock

If Main Unit Operation Lock is ON, the operation buttons (CAL and ZERO) on the unit will be disabled.

15-5. Device Number

You can give this unit a unique number.

15-6. Reset

All settings can be restored to their default values (initialized).

When the power is on, press and hold the ZERO and CAL buttons at the same time to reset the setting values even if Calibration Value Lock and Setting Value Lock are ON.

If Calibration Value Lock and Setting Value Lock are OFF, pressing and holding the ZERO and CAL buttons at the same time will reset the setting values even during startup.

NOTE

Of the setting values that can be saved in Memory 1–4, only the current selected setting value memory is reset.

ATTENTION

Always stop power to the unit once after executing a "Reset".

By connecting a sensor that supports IEEE1451.4 Transducer Electronic Data Sheet (TEDS) to the unit, the rated output stored in the sensor can be loaded and this can be applied to calibration of the indicator with this function.

In addition, the value calibrated by the unit itself can be loaded to the TEDS sensor and its original value can be restored.

These functions are supported by TEDS sensors that comply with the standard shown in the table below.

Note, however that equipment with TEDS memory includes both 1kbit and 4kbit devices, but the unit only supports 4kbit.

TEDS standard			
IEEE 1451.4 (V0.9)	IEEE1451.4 (V1.0)		
	Template ID		
	Bridge Sensors (33)	Strain Gauge (35)	Other
-	✓✓	✓	-

- ✓✓ TEDS calibration, TEDS data writing and TEDS data restoration supported
- ✓ TEDS calibration supported
- Not supported

16-1. Rewrite TEDS Data

The current calibration values (rated output and rated capacity) and calibration date will be written to the TEDS memory.

The indicator unit will not be written.

16-2. Restore TEDS Data

This restores the factory default calibration values of a product using the data from "Rewrite TEDS Data" above.

16-3. Show TEDS Data

The following data can be read by executing commands from the TEDS data display group.

- Serial number
- Maximum rated capacity
- Maximum rated output
- Sensor Impedance
- Maximum excitation level
- Calibration date
- Model number

17. Settings

17-1. Lock item list

17-1-1. Calibration

Group	Setting name	Calibration Value Lock	Setting Value Lock	Setting Value Memory
	Bridge Voltage	✓		
	Decimal Point Position	✓		
	Zero Point Input Calibration	✓		
	Zero Balancing	✓		
	Remote Sense	✓		
Equivalent Input Calibration	Rated Output Value	✓		
	Rated Capacity Value	✓		
Actual Load Calibration	Rated Capacity Value	✓		
TEDS Calibration	TEDS Calibration	✓		
Linearization Calibration	Enable/Disable Linearization Calibration	✓		
	Select Linearization Point	✓		
	Enable/Disable Selection Point	✓		
	Sensor Output Value for Calibration Point	✓		
	Output Load Value for Calibration Point (Equivalent Input)	✓		
	Output Load Value for Calibration Point (Actual Load Input)	✓		
D/A Converter	D/A Output Mode		✓	
	D/A Maximum Voltage		✓	
	D/A Zero		✓	
	D/A Full Scale		✓	
Display	Minimum Scale Selection	✓		
	Display Frequency Selection	✓		
	Maximum Display Value	✓		
	Sensor Input Logic	✓		

17-1-2. Condition settings

Group	Setting name	Calibration Value Lock	Setting Value Lock	Setting Value Memory
Filter	Low-Pass Filter Selection		✓	✓
	Moving Average Data Set Size Selection		✓	✓
	Automatic Digital Filter		✓	✓
	Moving Average Data Set Size		✓	✓
Motion Detect	Time		✓	✓
	Width		✓	✓
Zero Tracking	Time		✓	✓
	Width		✓	✓
Digital Zero	Enable Digital Zero		✓	
	Digital Zero Limit Value		✓	
Digital Offset			✓	
Select Data Output			✓	✓

17-1-3. Comparison settings

Group	Setting name	Calibration Value Lock	Setting Value Lock	Setting Value Memory
Comparison Value Settings	High Limit Value (HI)		✓	✓
	Low Limit Value (LO)		✓	✓
Comparison Pattern Setting			✓	✓
Comparison Mode Setting			✓	✓
Hysteresis			✓	✓
Comparison Output Pattern			✓	✓
Nearly Zero			✓	✓

17-1-4. Hold function settings

Group	Setting name	Calibration Value Lock	Setting Value Lock	Setting Value Memory
Hold Mode			✓	✓
External Hold Mode			✓	✓
Clear signal			✓	✓
Zone Definition			✓	✓
Auto Zero			✓	✓

17-1-5. System settings

Group	Setting name	Calibration Value Lock	Setting Value Lock	Setting Value Memory
Setting Value Memory			✓	
Save All Setting Values			✓	
Device Information	Device Name			
	Communication Option			
	Version			
Lock	Calibration Value Lock			
	Setting Value Lock			
	Main Unit Operation Lock			
Device Number			✓	
RS-485 Communication Settings	Port Selection			
	ID Number		✓	
	Communication Mode		✓	
	Baud Rate		✓	
	Bit Length		✓	
	Parity Bit		✓	
	Stop Bit		✓	
	Delimiter		✓	

17-1-6. TEDS settings

Group	Setting name	Calibration Value Lock	Setting Value Lock	Setting Value Memory
Show TEDS Data	Serial Number			
	Maximum Rated Capacity			
	Maximum Rated Output			
	Sensor Impedance			
	Maximum Excitation Level			
	Calibration Date			
	Model Number			
Rewrite TEDS Data	Rewrite Data			
	Restore Data			

17. Settings

17-1-7. Input/output testing

Group	Setting name	Calibration Value Lock	Setting Value Lock	Setting Value Memory
	Input/Output Testing ON/OFF			
D/A Test Output	Test A/D Input Value		✓	
Test Control Input/Output Terminals	Output Terminals			
	Input Terminals			

18. Warranty explanation

- The warranty period for this device is one year from the date of purchase.
- Be aware that repairs will require payment in the following cases even during the warranty period.
 - (1) Malfunction or damage due to misuse
 - (2) Malfunction or damage caused by modifications or repairs conducted by any party other than our company or a service person designated by our company
 - (3) Malfunction or damage caused by dropping, transportation or similar handling after product delivery
 - (4) Malfunction or damage caused by fire, earthquake, water, lightning or other natural disaster
 - (5) Malfunction or damage caused by external factors, including power supplies and equipment environmental conditions, that deviate from the operation requirements of this product
 - (6) Malfunction or damage if the product was not purchased from our company or an agent designated by our company
- We offer paid service after the conclusion of the warranty period. For details, please contact the retailer where you purchased the unit or a contact on the back cover of this manual.
- Be aware that our company will bear no responsibility for any secondary damages resulting from the operation of this device or related to data.
- Information is given about products in this manual only for the purpose of example and does not indicate any guarantees against infringements of third-party intellectual property rights and other rights related to them. TEAC Corporation will bear no responsibility for infringements on third-party intellectual property rights or their occurrence because of the use of these products.

19. Specifications

Bridge voltage		DC 10 V, 5 V $\pm$ 10% (30mA current maximum, can be used with remote sense)
Signal input range		$\pm$ 5.0 mV/V
Equivalent input/ TEDS	Calibration range	0.05 mV/V – 5.0 mV/V
	Calibration precision	Within 0.1% F.S. (when using 1m standard TEAC Ø8, 6-core shielded cable with 350Ω impedance, 10V BV and 5mV/V setting)
Precision	Linearity	Within 0.01% F.S. +1 digit (when input is 5 mV/V)
	Zero drift	Within 0.5 μ V/°C (input conversion value)
	Gain drift	Within $\pm$ 0.005% F.S./°C
A/D conversion		24-bit, 20000 times/second
Low-pass filter		Select 3, 10, 30, 100, 300, 1000 Hz(–6 dB/oct) or none
D/A output*		4000 times per second, isolated output, $\pm$ 1– $\pm$ 10V maximum voltage (set in 1V steps) and about 1/59000 resolution (when set to $\pm$ 10 V), or 4–20mA output current and about 1/43000 resolution
TEDS function		IEEE1451.4 class 2 mix mode interface
Indicator value	Display range	–99999 to 99999
	Decimal point	Display position selectable
	Times displayed	Select 4, 6, 10 or 20 times/second
Setting items	Calibration settings	Zero Balancing, TEDS Calibration, Actual Load Calibration, Equivalent Input Calibration
	Function settings	High Limit, Low Limit, Comparison Mode, Hysteresis, Nearly Zero, Moving Average, Low Pass Filter, Motion Detect, Zero Tracking, Static Strain, Digital Zero, Digital Offset, Zone Definition, Hold Mode, Lock, Minimum Grid, Display Times, Bridge Voltage, Digital Zero Limit Value, Clear Digital Zero, Comparison Output Pattern, Select Data Output*, D/A Converter*, Remote Sense
Hold functions		Sample hold, peak hold, bottom hold, zone definition hold (peak, bottom)
External input and output signals	Input	Hold, Clear, Digital Zero (isolated from main unit circuits using a photocoupler)
	Output	HI, OK, LO open collector output (isolated from main unit circuits using a photocoupler)
	RS-485**	A+, B– (isolated from main unit circuits using a photocoupler), TRM, SG
	CC-Link***	DA, DB (isolated from main unit circuits using a photocoupler), DG, SLD
	EtherNet/IP****	P1, P2
Power supply		Ratings: 24V DC $\pm$ 10%, 7 W
Operating temperature range		0°C to 40°C
Storage temperature range		–20°C to 60°C
Operating humidity range		85% RH or less (without condensation)
Applicable standards		CE marking, FCC (Class A), UL61010-1, UKCA marking
External dimensions (W × H × D)		Approximately 30 mm × 85 mm × 110 mm (without protrusions)
Weight		About 210 g

*TD-SC1 (D/A) only

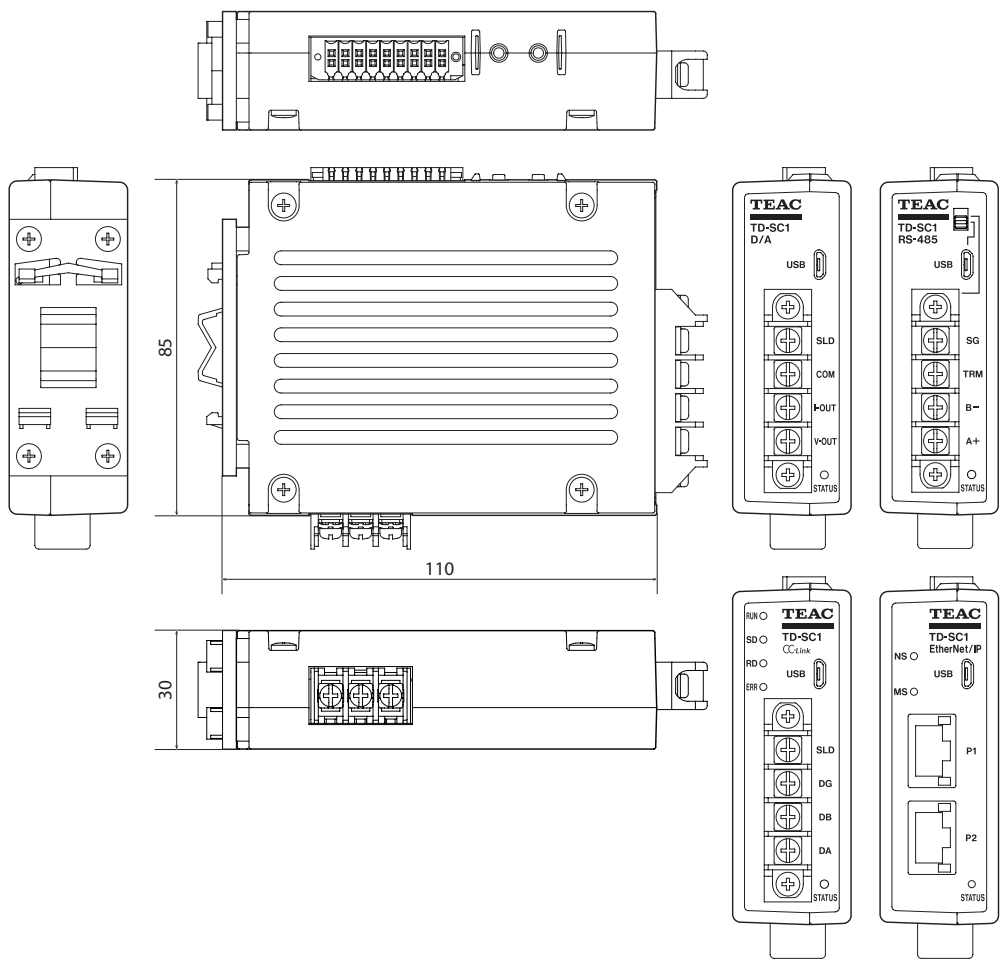
**TD-SC1 (485) only

***TD-SC1 (CCL) only

****TD-SC1 (E/IP) only

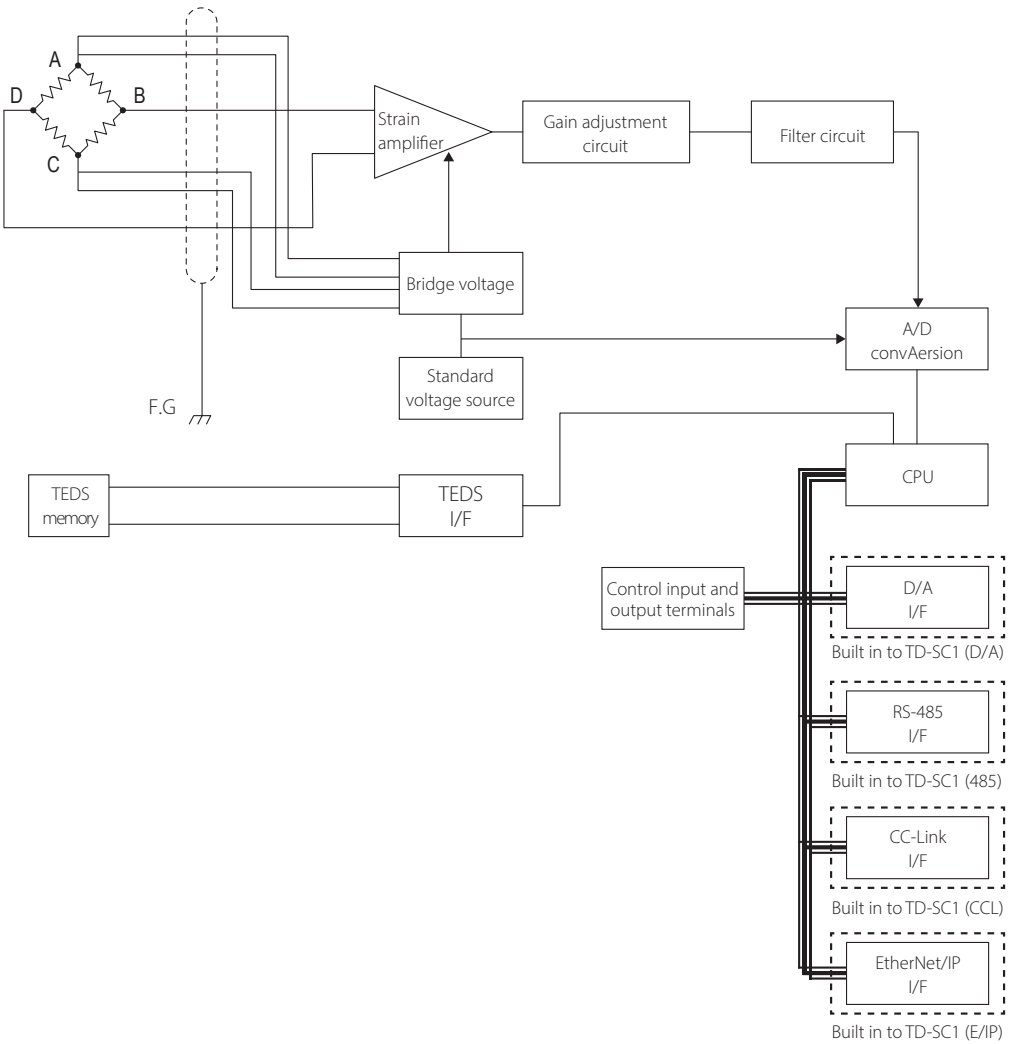
- Specifications and appearance are subject to change without notice.
- Weight and dimensions are approximate.
- Illustrations in this owner's manual might differ slightly from production models.

20. External drawings



Dimensions in millimeters (mm)

21. Block diagram



TEAC

Download the latest version of the IFU from the website link below.
<https://loadcell.jp/en/support/downloads/>



TEAC CORPORATION	1-47 Ochiai, Tama-shi, Tokyo 206-8530, Japan	Phone: +81-42-356-9154
TEAC AMERICA, INC.	10410 Pioneer Blvd. Unit #3, Santa Fe Springs, CA 90670, U.S.A.	Phone: +1-323-726-0303
TEAC EUROPE GmbH. (EU Importer)	Bahnstrasse 12, 65205 Wiesbaden-Erbenheim, Germany	Phone: +49-(0)611-7158-349
TEAC UK Limited (UK Representative)	Luminous House, 300 South Row, Milton Keynes, Buckinghamshire, MK9 2FR, UK	Phone: +44-1923-797205
TEAC SALES & TRADING (ShenZhen) CO., LTD.	Room 817, Xinian Center A, Tairan Nine Road West, Shennan Road, Futian District, Shenzhen, Guangdong Province 518040, China	Phone: +86-755-88311561-2