User's Manual

CA500, CA550 Multifunction Process Calibrator

YOKOGAWA
Yokogawa Test & Measurement Corporation

IM CA500-01EN
3rd Edition

Thank you for purchasing the CA500/CA550 Multifunction Process Calibrator. This user's manual explains the features, operating procedures, and handling precautions of the CA500 and CA550. To ensure correct use, please read this manual thoroughly before operation.
After reading this manual, keep it in a safe place. The following manuals, including this one, are provided as manuals for the CA500 and CA550. Please read all manuals.

Manual Title	Manual No.	Description
CA500, CA550 Multifunction Process Calibrator User's Manual	IM CA500-01EN	This document. The manual explains all the instrument features. It is included in the accompanying CD.
CA500, CA550 Multifunction Process Calibrator Getting Started Guide	IM CA500-02EN	Provided as a printed manual. This guide explains the handling precautions, basic operations, and specifications of the instrument.
CA500 Multifunction Process Calibrator User's Manual	IM CA500-92Z1	Document for China.
"전기용품 및 생활용품 안전관리법" 관련일차전지에 대한 대응	PIM 902-01KO	Document for Korea.

The "EN", "Z1", and "KO" in the manual numbers are the language codes.

Contact information of Yokogawa offices worldwide is provided on the following sheet.

Document No.	Description
PIM 113-01Z2	List of worldwide contacts

Notes

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions. The figures given in this manual may differ from those that actually appear on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
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Revisions

- October, 2019 1st Edition
- September, 2020 2nd Edition
- April, 2021 3rd Edition

Conventions Used in This Manual

Prefixes k and K

This manual distinguishes prefixes k and K used before units as follows:

k:	Denotes 1000.	Example: 100 kS/s (sample rate)
K:	Denotes 1024.	Example: 720 KB (file size)

Displayed Characters

Bold characters in procedural explanations are used to indicate panel keys and soft keys that are used in the procedure and menu items that appear on the screen.

Notes and Cautions

The notes and cautions in this manual are categorized using the following symbols.

Improper handling or use can lead to injury to the user or damage to the instrument. This symbol appears on the instrument to indicate that the user must refer to the user's manual for special instructions. The same symbol appears in the corresponding place in the user's manual to identify those instructions. In the manual, the symbol is used in conjunction with the word "WARNING" or "CAUTION."

WARNING Calls attention to actions or conditions that could cause serious or fatal injury to the user, and precautions that can be taken to prevent such occurrences.

CAUTION Calls attention to actions or conditions that could cause light injury to the user or damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

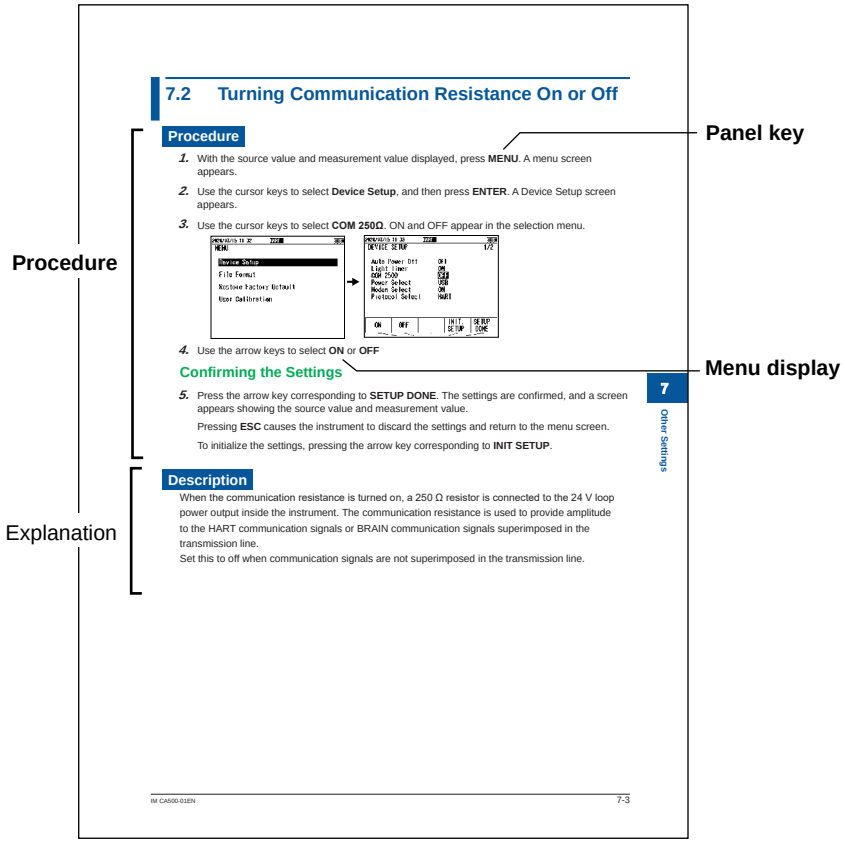
Note Calls attention to information that is important for the proper operation of the instrument.

How to Read This Manual

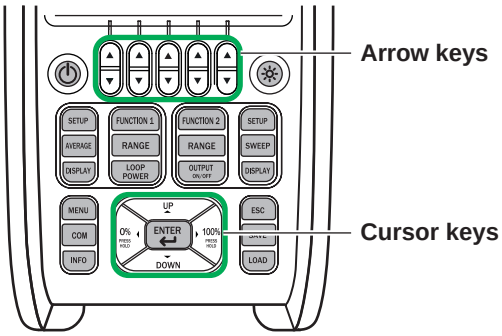
This document provides descriptions with the procedure first followed by the explanation.
In the procedure section, steps for configuring the settings are provided.
In the explanation section, the details of the configure functions are provided.

How the Procedure Is Described

In the procedure section, the panel keys and the names on the menus that are used in the steps are indicated in bold text.



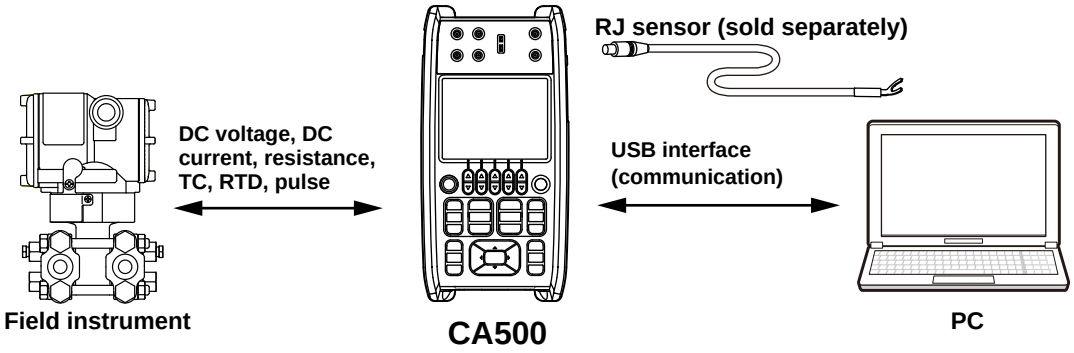
In addition, “arrow keys” and “cursor keys” indicate the following keys.

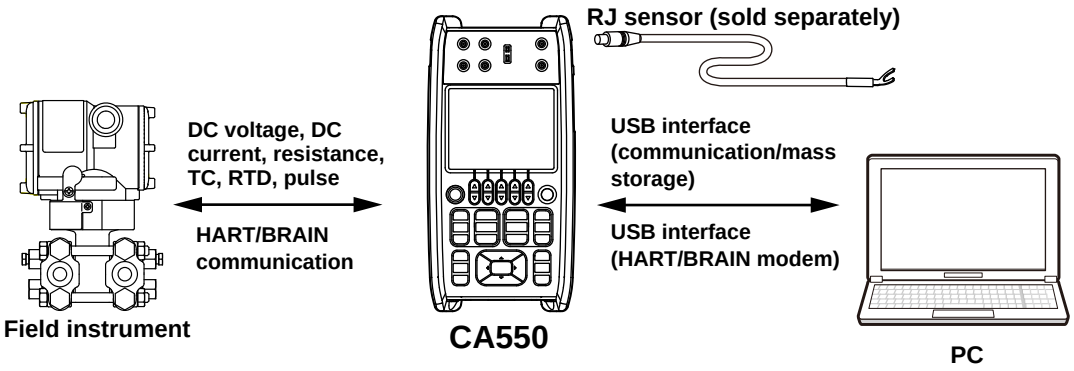


Contents

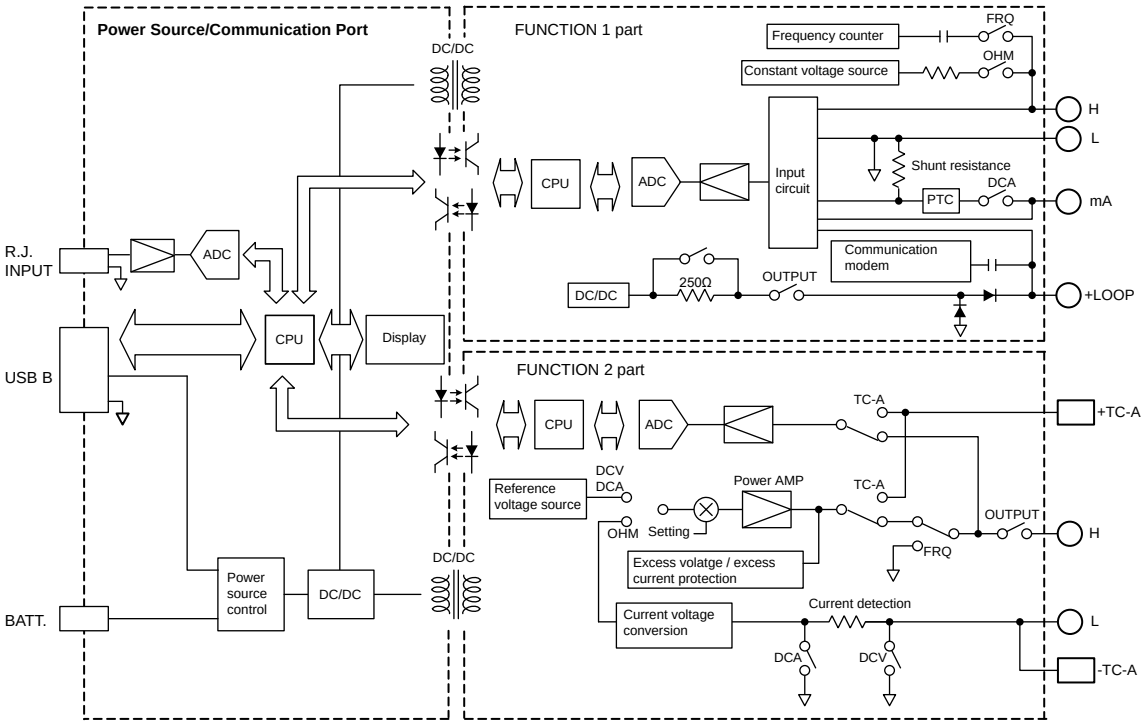
1.1 System Configuration and Block Diagram

System Configuration





Block Diagram



1.2 Source Function

The source function generates DC voltage, DC current, resistance, voltage corresponding to the electromotive force of thermocouples, voltage corresponding to the resistance of RTDs (pseudo-resistance), and pulse signals.
It can be used simultaneously with measurement functions other than temperature measurement using thermocouples.

DC Voltage

This function generates the following DC voltages.

Range	Source Range	Notes
100 mV	±110.000 mV	Maximum output current: 10 mA
1-5 V	0.0000 V to +6.0000 V	Maximum output current: 10 mA Can be used as calibration signals for 1, 2, 3, 4, 5 V.
(1-5 V√)	0.0000 V to +6.0000 V	Maximum output current: 10 mA Values for square root operation
5 V	±6.0000 V	Maximum output current: 10 mA
30 V	±33.000 V	Maximum output current: 1 mA

1-5 V Range

The interval between 0% and 100% is equally divided by four, and the 0%, 25%, 50%, 75%, and 100% values are output.
With the default settings, you can change the output between 1 V, 2 V, 3 V, 4 V, and 5 V in 1 V steps by pressing the UP or DOWN key. This is convenient when calibrating the five points from 1 to 5 V.

Square Root Output Function (1-5 V√)

Values corresponding to the square root of 0%, 25%, 50%, 75% and 100% values are generated. You can change the output using the UP or DOWN key. This can be used as calibration signals for the square root output of differential pressure transmitters.
Percentage and source value

Percentage	1-5 V source value	Square root output (1-5V√)
0%	1.0000 V	1.0000 V
25%	2.0000 V	1.2500 V
50%	3.0000 V	2.0000 V
75%	4.0000 V	3.2500 V
100%	5.0000 V	5.0000 V

DC Current

This function generates the following DC currents.

Range	Source Range	Notes
20 mA	±24.000 mA	Output voltage: 0 to 20 V
4-20 mA	0.000 mA to 24.000 mA	Output voltage: 0 to 20 V Can be used as calibration signals for 4, 8, 12, 16, 20 mA.
(4-20 mA√)	0.000 mA to 24.000 mA	Output voltage: 0 to 20 V Values for square root operation
4-20 mA Simulate	0.000 mA to 24.000 mA	External power supply 5 V to 28 V
(4-20 mA Simulate√)	0.000 mA to 24.000 mA	External power supply 5 V to 28 V Values for square root operation

4-20 mA Range

The interval between 0% and 100% is equally divided by four, and the 0%, 25%, 50%, 75%, and 100% values are output.

With the default settings, you can change the output between 4 mA, 8 mA, 12 mA, 16 mA, and 20 mA in 4 mA steps by pressing the UP or DOWN key. This is convenient when calibrating the five points from 4 to 20 mA.

Square Root Output Function (4-20 mA√, 4-20 mA Simulate√)

Values corresponding to the square root of 0%, 25%, 50%, 75% and 100% values are generated. You can change the output using the UP or DOWN key. This can be used as calibration signals for the square root output of differential pressure transmitters.

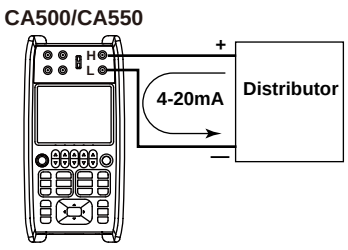
Percentage and source value

Percentage	4-20 mA source value	Square root output (4-20 mA√)
0%	4.000 mA	4.000 mA
25%	8.000 mA	5.000 mA
50%	12.000 mA	8.000 mA
75%	16.000 mA	13.000 mA
100%	20.000 mA	20.000 mA

Simulate (4-20 mA Simulate, 4-20 mA Simulate√) Function

You can connect this instrument to a distributor and simulate a two-wire transmitter. This is valid when the range is set to 4-20 mA Simulate and 4-20 mA Simulate√.

4-20 mA Simulate √ simulates square root output.



Resistance

This function generates the following resistances.

Range	Source Range	Notes
400Ω	0.00 Ω ~ 440.00 Ω	Allowable measurement current: 0.1 mA to 3 mA
4000Ω	0.0 Ω ~ 4400.0 Ω	Allowable measurement current: 0.05 mA to 0.6 mA

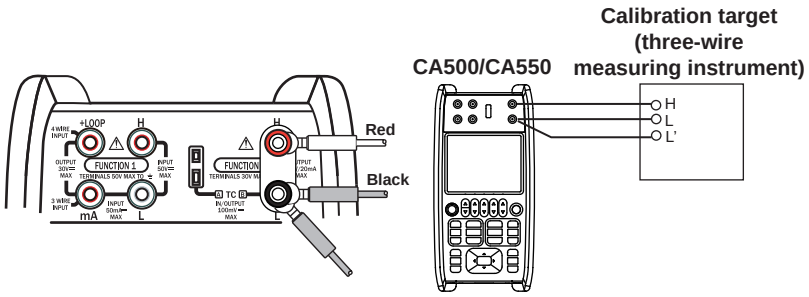
Resistance Source Method

A pseudo-resistance (R=V/I) is sourced by generating a voltage (V=R×I) corresponding to the resistance [R] set on the instrument across the output terminals for the current for measuring resistance [I] supplied to the device to be calibrated such as a resistance measuring instrument and RTD thermometer.

Therefore, this instrument can be used only for instruments that measure pseudo-resistance using a current for measuring resistance.

How to Source Accurately

- When measuring resistance using a two-wire system, use lead cables with low resistance. Because the source resistance is calibrated without including the voltage drop of the leaked cables, the lead cable resistance will result in error.
- To source the resistance accurately, use of the three-wire system or four-wire system.



Thermoelectromotive Force of a Thermocouple

Thermoelectromotive force corresponding to the following temperatures is generated for each thermocouple type.

Thermocouple	Source Range	Notes
K	-200.0°C to +1372.0°C	IEC 60584-1*, **
E	-250.0°C to +1000.0°C	IEC 60584-1*, **
J	-210.0°C to +1200.0°C	IEC 60584-1*, **
T	-250.0°C to +400.0°C	IEC 60584-1*, **
N	-200.0°C to +1300.0°C	IEC 60584-1*
L	-200.0°C to +900.0°C	DIN 43710
U	-200.0°C to +600.0°C	DIN 43710
R	-20.0°C to +1767.0°C	IEC 60584-1*, **
S	-20.0°C to +1768.0°C	IEC 60584-1*, **
B	+600.0°C to +1820.0°C	IEC 60584-1*, **
C	0.0°C to +2315.0°C	IEC 60584-1*
XK	-200.0°C to +800.0°C	GOST R 8.585-2001
A	0.0°C to +2500.0°C	IEC 60584-1
D (W3Re/W25Re)	0.0°C to +2315.0°C	ASTM E1751/E1751M-09e1
G (W/W26Re)	+100.0°C to +2315.0°C	ASTM E1751/E1751M-09e1
PLATINEL II	0.0°C to +1395.0°C	ASTM E1751/E1751M-09e1
PR20-40	0.0°C to +1888.0°C	ASTM E1751/E1751M-09e1

*: Complies also with JIS C 1602

**: The setting can be changed to comply with IPTS-68 (JIS C 1602 1981).

Temperature Scale

This instrument complies with ITS-90 and IPTS-68.

Connection Terminals

This instrument is equipped with the following two types of terminals.

TC-A (TC mini plug)

A thermocouple is connected to the instrument using a thermocouple mini plug set, sold separately. Reference junction compensation using an external RJ sensor (sold separately) is not possible.

TC-B (banana plug)

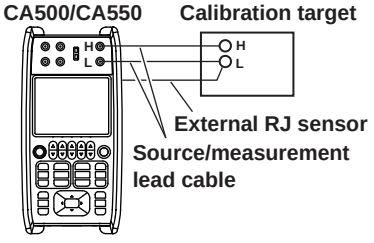
Reference junction compensation using the internal RJ sensor or an external RJ sensor is possible.

Reference Junction Compensation

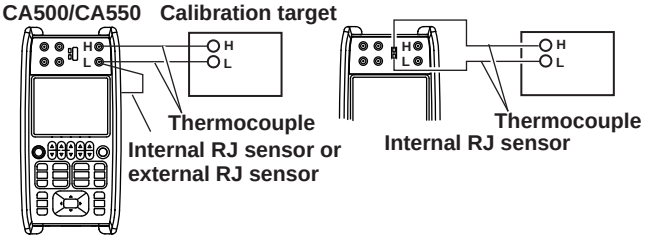
The instrument measures the temperature of the contact using an RJ sensor and generates a voltage based on the temperature component. This instrument can perform reference junction compensation using the internal RJ sensor or an external RJ sensor.

When an instrument with a built-in reference junction temperature compensation is to be calibrated, the reference junction temperature of the device to be calibrated is measured using an external RJ sensor.

Calibrating only the thermometer



Calibrating including the thermocouple



Resistance of an RTD

Resistance corresponding to the following temperatures is generated for each RTD type.

RTD	Source Range	Notes
PT100 (PT100 (3851))	-200.0°C to 800.0°C	IEC 60751*
JPT100 (PT100 (3916))	-200.0°C to 510.0°C	JIS C 1604 1989 (JPt100)
PT100 (3850)	-200.0°C to 630.0°C	JIS C 1604 1989 (Pt100)
PT100 (3926)	-200.0°C to 630.0°C	Minco Application Aid #18
PT200	-200.0°C to 630.0°C	IEC 60751*
PT500	-200.0°C to 630.0°C	IEC 60751*
PT1000	-200.0°C to 630.0°C	IEC 60751*
Cu10	-100.0°C to 260.0°C	Minco Application Aid #18
Ni120	-80.0°C to 260.0°C	Minco Application Aid #18
PT50	-200.0°C to 630.0°C	IEC 60751*
PT50G	-200.0°C to 800.0°C	GOST R 8.625-2006
PT100G	-200.0°C to 630.0°C	GOST R 8.625-2006
Cu50M	-180.0°C to 200.0°C	GOST R 8.625-2006
Cu100M	-180.0°C to 200.0°C	GOST R 8.625-2006

*: Complies also with JIS C 1604

Frequency

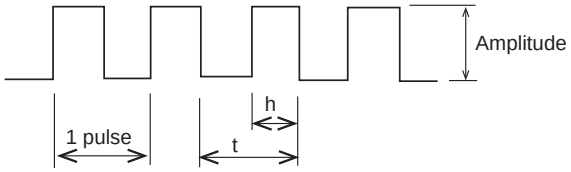
Pulse signals are generated at the following frequencies.

Range	Source Range	Notes
500 Hz	1.00 Hz to 550.00 Hz	
5000 Hz	1.0 Hz to 5500.0 Hz	
50 kHz	0.001 kHz to 50.000 kHz	
CPM	1.0 to 1100.0/min	Generates a signal with a specified number of pulses per minute

The sweep function cannot be used.

For source range CPM, you can set the frequency using the number of pulses to generate per minute.

This instrument outputs waveforms at 50% duty cycle.

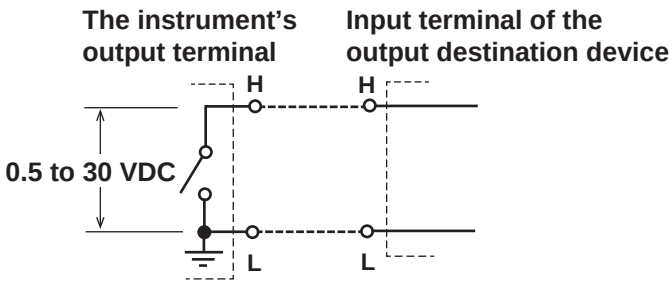


Frequency = pulse count/s, CPM = pulse count/min

Duty: (h/t)×100%

Contact Output

If the contact output is set on during frequency output, a contact signal can be output with the specified frequency or number of pulses.



0% and 100% Values

These values become references for the source values when dividing or sweeping the source values.

When the source is to be generated in divisions, the interval between 0% and 100% is divided equally by a specified number, and the source value is changed stepwise through key operation.

In a linear sweep, the source value is varied linearly from 0% to 100% or from 100% to 0% over a specified time period.

In a step sweep, the interval from 0% to 100% is divided equally by a specified number, and the source value is automatically varied stepwise.

Number of Divisions

The interval between 0% and 100% is divided equally by a specified number, and the source value is changed stepwise by operating the cursor keys (UP and DOWN keys).

For example, if 0% is set to 50 mV, 100% is set to 100 mV, and the number division is set to 4, each time you press UP, the source value changes as follows: 0% (50 mV), 25% (62.5 mV), 50% (75 mV), 75% (87.5 mV), 100% (100 mV).

When the source range is 1-5V, 1-5V√, 4-20mA, 4-20mA√, 4-20 mA Simulate or 4-20mA Simulate√, the number divisions is fixed to 4.

Display Switching

You can select the value to show on the main display of the function 2 display area between a physical value such as a voltage or a percentage.

In the case of a temperature measurement using a thermocouple or RTD, the thermal electromotive force or resistance can be shown in sub display 2. Moreover, in the case of a temperature measurement using a thermocouple, the reference junction temperature can also be shown.

Function	Main display	Sub display 1	Sub display 2	Sub display 3
DC voltage	Source value	Percentage	—	—
	Percentage	Source value	—	—
DC Current	Source value	Percentage	—	—
	Percentage	Source value	—	—
Resistance	Source value	Percentage	—	—
	Percentage	Source value	—	—
Thermocouple	Source value (°C)	Percentage	Source value(voltage)	Temperature monitor (reference junction temperature)
	Percentage	Source value (°C)	Source value(voltage)	Temperature monitor (reference junction temperature)
RTD	Source value (°C)	Percentage	Source value (resistance)	—
	Percentage	Source value (°C)	Source value (resistance)	—
Frequency	Source value	Percentage	—	—
	Percentage	Source value	—	—

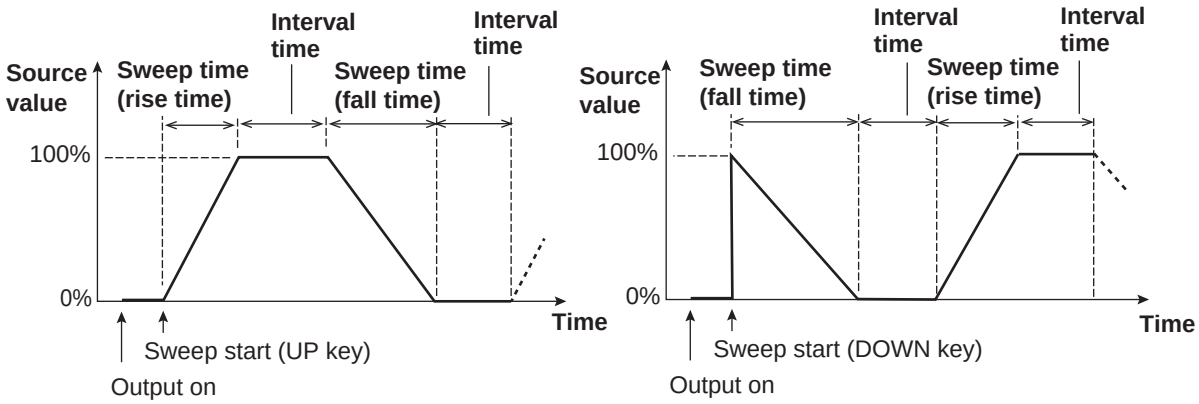
The source value or percentage shown in the main display area can also be changed directly using arrow keys.

1.3 Sweep function

The source value can be varied according to a process set in advance.
There are three types: linear sweep, step sweep, and program sweep.
This cannot be used when the source function is set the frequency.

Linear Sweep

The source value is varied linearly from 0% to 100% (sweep up) or from 100% to 0% (sweep down).



Sweep Time

The time period during which the source value is varied. You can set the rise time and fall time separately.

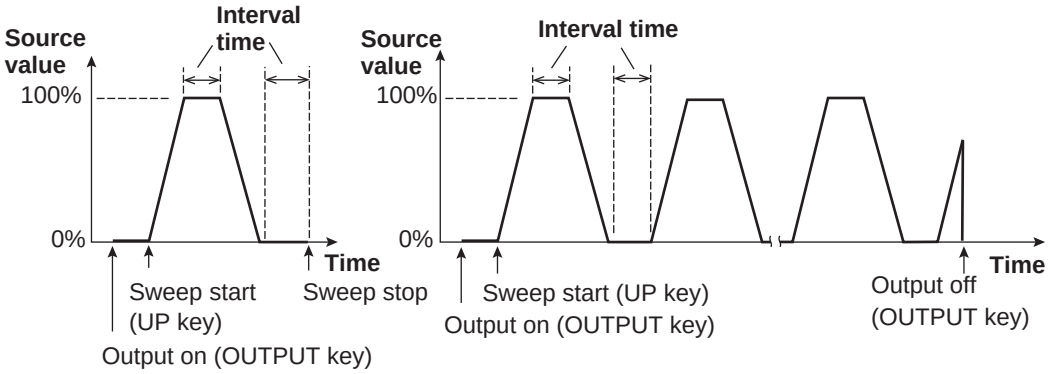
Interval Time

The time period during which the source value is held when the source value reaches 0% or 100% after sweeping.

Repetition

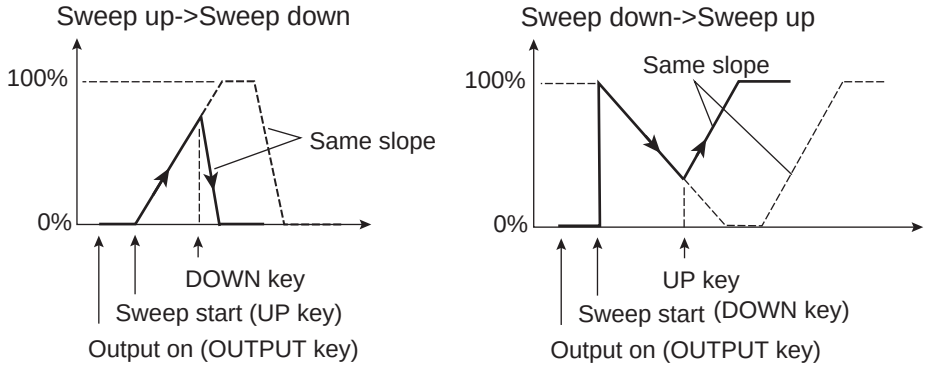
Sweeping is repeated until the source is turned off. If sweeping is performed for one iteration, sweeping stops automatically when the interval time elapses after sweeping.

Repetition: Off **Repetition: On**



Operation While Sweeping Is in Progress

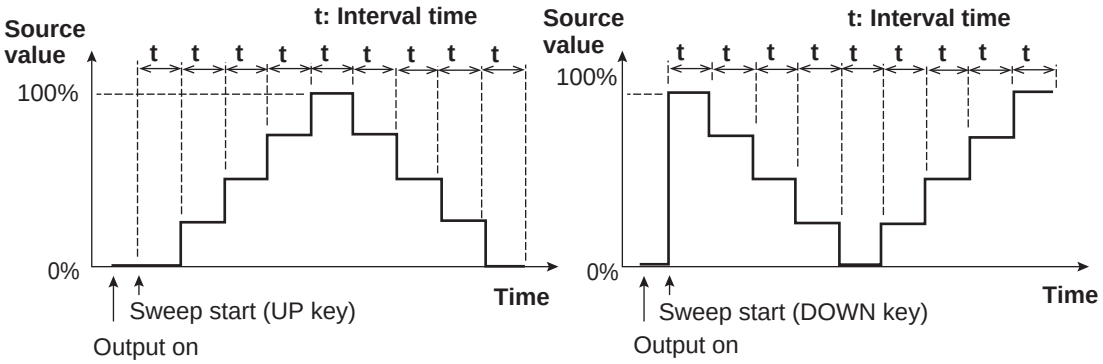
If you press UP or DOWN while sweeping is in progress (including the interval time) the suite direction changes.



If you press OUTPUT while sweeping is in progress, the source turns off.

Step Sweep

The source value interval from 0% to 100% is divided equally by a specified number, and the source value is varied stepwise.
The source time of each step is set with interval time.



Number of Divisions

The source value interval from 0% to 100% is divided by the specified number. The variation of each step is given by
Variation = (100% source value - 0% source value)/number of divisions.

Given 0% source value = 1 V, 100% source value = 5 V, number of divisions = 4,
(5 V-1 V)/4 = 1 V.
The source value is stepped up or down by 1 V.

Interval Time

The time period during which the source value of each step is held.

Repetition

Sweep up->Sweep down or Sweep down->Sweep up can be performed once to complete the sweep, or this cycle can be repeated until the output is turned off.

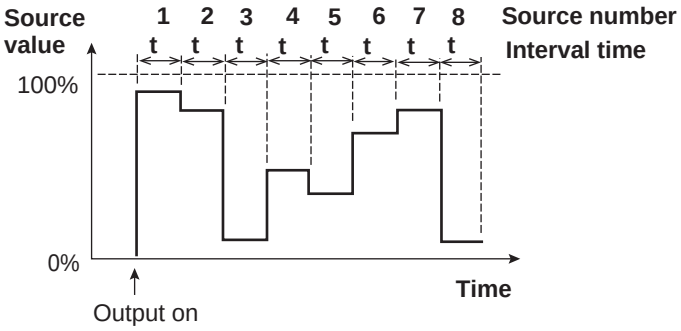
Saving Data

After sweeping, source values, measure values, and other data can be saved to files.
For details, see section 1.6, “Saving and Loading CA500 Data”, or section 1.7, “Saving and Loading CA550 Data”.

Program Sweep

The CA500 and CA550 generate up to 10 and 20 specified values, respectively, in order by switching.

You can set source values to match specific calibration points.



Interval Time

The time period during which each source value is held.

Source Number

You can assign source values to each number from 1 to 10 on the CA500 and 1 to 20 on the CA550.

When the output is turned on, the specified source values are generated in order from source number 1.

The source time of each source number is the interval time.

Saving Data

After sweeping, source values, measure values, and other data can be saved to files.

For details, see section 1.6, “Saving and Loading CA500 Data”, or section 1.7, “Saving and Loading CA550 Data”.

Calibration Target Information (CA550)

On the CA550, you can set the model number, serial number, tag number, and loop name of the device to be calibrated and include them in the saved data.

1.4 Measurement Function

The measurement function measures DC voltage, DC current, resistance, temperature, and pulse signals.
It can be used simultaneously with source functions other than temperature measurement using thermocouples.
Temperature measurement using thermocouples can be performed simultaneously with another measurement.

DC voltage

This function measures the following DC voltages.

Range	Measurement Range	Notes
100 mV	±110.000 mV	Input resistance: 1 GΩ or more
5 V	±6.0000 V	Input resistance: Approx.1 MΩ
50 V	±55.000 V	Input resistance: Approx.1 MΩ

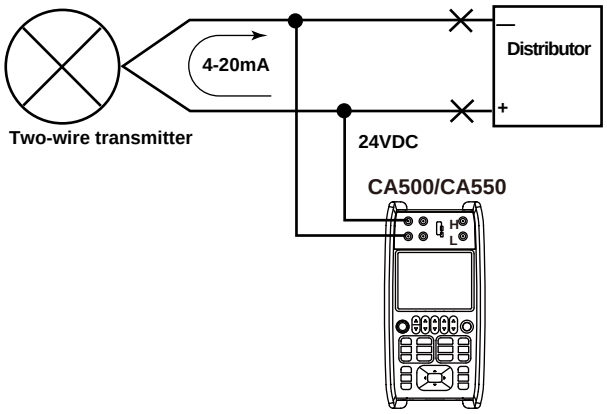
DC Current

This function measures the following DC currents.

Range	Measurement Range	Notes
50 mA	±60.000 mA	Input resistance: 10 Ω or less

Loop Power

A loop test can be performed by applying a constant voltage of 24 VDC to a two-wire transmitter and measuring the transfer signal.



Resistance

This function measures the following resistances.

Range	Measurement Range	Notes
400Ω	0.00 Ω ~ 440.00 Ω	Voltage applied current measurement method Typical values: 1 mA@0 Ω, 781 µA@400 Ω, 240 µA@4 kΩ
4000Ω	0.0 Ω ~ 4400.0 Ω	

Wiring Systems

The following wiring systems are available: two-wire, three-wire, and four-wire.

Two-wire system: Because measurements include the resistance of measurement lead cables and contact resistance, errors become large. Use this when the resistance of the DUT is sufficiently larger then the resistance of the measurement lead cables and contact resistance.

Three-wire system: By making the length of the three measurement lead cables the same, measurements can be made without hardly being affected by the resistance of the lead cables.

Four-wire system: Measurements can be made by eliminating the resistance of measurement lead cables and contact resistance. Use this when you want to make accurate measurements.

Temperature Measurement Using Thermocouples

Temperature is measured using the following thermocouples.

Thermocouple	Measurement Range	Notes
K	-200.0°C to +1372.0°C	IEC 60584-1*, **
E	-250.0°C to +1000.0°C	IEC 60584-1*, **
J	-210.0°C to +1200.0°C	IEC 60584-1*, **
T	-250.0°C to +400.0°C	IEC 60584-1*, **
N	-200.0°C to +1300.0°C	IEC 60584-1*
L	-200.0°C to +900.0°C	DIN 43710
U	-200.0°C to +600.0°C	DIN 43710
R	-20.0°C to +1767.0°C	IEC 60584-1*, **
S	-20.0°C to +1768.0°C	IEC 60584-1*, **
B	+600.0°C to +1820.0°C	IEC 60584-1*, **
C	0.0°C to +2315.0°C	IEC 60584-1*
XK	-200.0°C to +800.0°C	GOST R 8.585-2001
A	0.0°C to +2500.0°C	IEC 60584-1
D (W3Re/W25Re)	0.0°C to +2315.0°C	ASTM E1751/E1751M
G (W/W26Re)	+100.0°C to +2315.0°C	ASTM E1751/E1751M
PLATINEL II	0.0°C to +1395.0°C	ASTM E1751/E1751M
PR20-40	0.0°C to +1888.0°C	ASTM E1751/E1751M

*: Complies also with JIS C 1602

**: The setting can be changed to comply with IPTS-68 (JIS C 1602 1981).

Temperature Scale

This instrument complies with ITS-90 and IPTS-68.

Connection Terminals

This instrument is equipped with the following two types of terminals.

TC-A terminal (TC mini plug)

A thermocouple is connected to the instrument using a thermocouple mini plug set, sold separately. Reference junction compensation using an external RJ sensor (sold separately) is not possible.

TC-B terminal (banana plug)

Reference junction compensation using the internal RJ sensor or an external RJ sensor is possible.

Reference Junction Compensation

The instrument measures the temperature of the reference contact using an RJ sensor and makes measurements based on that temperature.

This instrument can perform reference junction compensation using the internal temperature sensor or an external RJ sensor.

When using the TC-A mini plug terminal, you cannot use an external RJ sensor.

Burnout

Thermocouple burnout is detected. When a burnout is detected, this instrument displays “B OUT” on the screen.

Temperature Measurement Using RTDs

Temperature is measured using the following RTDs.

RTD	Measurement range	Notes
PT100 (PT100 (3851))	-200.0°C to 800.0°C	IEC 60751*
JPT100 (PT100 (3916))	-200.0°C to 510.0°C	JIS C 1604 1989 (JPt100)
PT100 (3850)	-200.0°C to 630.0°C	JIS C 1604 1989 (Pt100)
PT100 (3926)	-200.0°C to 630.0°C	Minco Application Aid #18
PT200	-200.0°C to 630.0°C	IEC 60751*
PT500	-200.0°C to 630.0°C	IEC 60751*
PT1000	-200.0°C to 630.0°C	IEC 60751*
Cu10	-100.0°C to 260.0°C	Minco Application Aid #18
Ni120	-80.0°C to 260.0°C	Minco Application Aid #18
PT50	-200.0°C to 630.0°C	IEC 60751*
PT50G	-200.0°C to 800.0°C	GOST R 8.625-2006
PT100G	-200.0°C to 630.0°C	GOST R 8.625-2006
Cu50M	-180.0°C to 200.0°C	GOST R 8.625-2006
Cu100M	-180.0°C to 200.0°C	GOST R 8.625-2006

*: Complies also with JIS C 1604

Wiring Systems

The following RTD wiring systems are available: two-wire, three-wire, and four-wire.

Two-wire system: Because the resistance in the lead wires connecting the RTD and the instrument is included in the measurement, errors become large. Use this when the RTD and the instrument are close.

Three-wire system: By making the length of the three measurement lead wires connecting the RTD and the instrument the same, measurements can be made without hardly being affected by the resistance of the lead cables.

Four-wire system: Measurements can be made without being affected by the resistance in the lead wires connecting the RTD and the instrument.

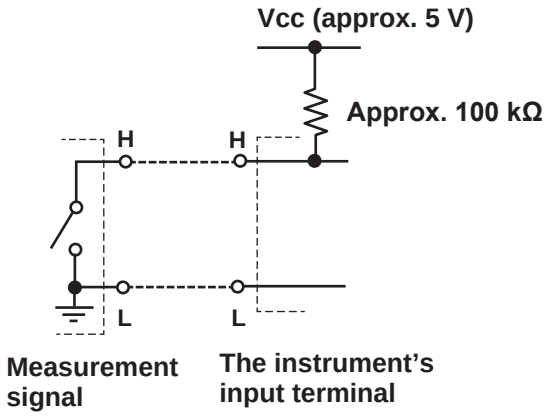
Frequency

This function measures the following frequencies.

Range	Measurement range	Notes
500 Hz	1.00 Hz to 550.00 Hz	
5000 Hz	1.0 Hz to 5500.0 Hz	
50 kHz	0.001 kHz to 50.000 kHz	
Pulse count	0 to 99999	The number of pulses is counted within a unit time period.

Contact Input

The frequency or the number of signals per minute can be measured through a contact input using a non-voltage contact.



Averaging

Moving average values for every five measured values and the maximum value (MAX) and minimum value (MIN) of the moving average values are displayed on the screen.

0% and 100% Values

By mapping the output value (specified according to the specifications of the device to be calibrated) to the 0% or 100% source value of this instrument, you can determine the output value of the device to be calibrated for the source value.

For example, if the source value of 0% is 1 V and that of 100% is 5 V and the output values are 4 mA and 20 mA when 1 V and 5 V are input to the device be calibrated, assign 4 mA to the measured value of 0% and 20 mA to that of 100%.

In this situation, the output value (specified according to the specifications of the device to be calibrated) is 8 mA for a source value of 2 V of this instrument.

4 mA + (20 mA - 4 mA)×(2 V - 1 V)/(5 V - 1 V) = 8 mA

The CA550 calculates the error in the actual output value relative to the output value (specified according to the specifications of the device to be calibrated) that is mapped to the source value. Furthermore, this instrument calculates the measurement value percentages relative to the specified 0% value and 100% value.

Display Switching

You can select the value to show on the main display of the function 1 display area (function 2 display area for temperature measurements using a thermocouple) between a physical value such as a voltage or a percentage.

In the case of a temperature measurement using a thermocouple or RTD, the thermal electromotive force or resistance can be shown in sub display 2. Moreover, in the case of a temperature measurement using a thermocouple, the reference junction temperature can also be shown.

Function	Main display	Sub display 1	Sub display 2	Sub display 3
DC voltage	Measured value	Percentage	—	—
	Percentage	Measured value	—	—
DC Current	Measured value	Percentage	—	—
	Percentage	Measured value	—	—
Resistance	Measured value	Percentage	—	—
	Percentage	Measured value	—	—
Thermocouple	Measured value (°C)	Percentage	Measured value (voltage)	Temperature monitor (reference junction temperature)
	Percentage	Measured value (°C)	Measured value (voltage)	Temperature monitor (reference junction temperature)
RTD	Measured value (°C)	Percentage	Measured value (resistance)	—
	Percentage	Measured value (°C)	Measured value (resistance)	—
Frequency	Measured value	Percentage	—	—
	Percentage	Measured value	—	—

1.5 Calibration Function for Field Instruments

The following functions are available to efficiently calibrate field instruments.

1-5V Range

DC voltages from 1 to 5 V, which are common instrumentation signals, are generated in 1 V steps.
This is useful when calibrating the five input signals: 1 V, 2 V, 3 V, 4 V, and 5 V.

4-20 mA Range

DC currents from 4 to 20 mA, which are common instrumentation signals, are generated in 4 mA steps.
This is useful when calibrating the five input signals: 4 mA, 8 mA, 12 mA, 16 mA, and 20 mA.

Program Sweep (CA550)

By using the CA550 program sweep function, you can assign instrument information such as the calibration target model number, serial number, and tag number. The assigned information can be saved as CSV data along with source values, measured values, and errors.
Because measured values, source values, errors, pass/fail judgment results, and the like can be saved to a file automatically after a program sweep is completed, this is useful for recording data before adjustment or data after adjustment.

Errors and Pass/Fail Judgment (CA550)

The instrument determines the error in the actual output value of the device to be calibrated relative to the output value (specified according to the specifications of the device to be calibrated) that is mapped to the source value.
Moreover, the instrument indicates pass or fail depending on whether the measured value is within the tolerance set in advance.
You can view the errors and pass/fail judgments in the files saved automatically by the program sweep function.

1.6 Saving and Loading CA500 Data

For details on the CA550, see section 1.7.

Saving Data

The following three methods are available to save data.

- Save data by pressing the SAVE key
- Save data automatically after the completion of a step sweep
- Save data automatically after the completion of a program sweep

A total of 100 data entries (memory numbers 1 to 100) can be saved using the above three methods.

Saving Data Using the SAVE Key

The date and time, information such as the specified function and range, and the measured value and source value when the SAVE key is pressed are saved.

Auto Save in Step Sweeps or Program Sweeps

The date and time, information such as the specified function and range, the source value and measured value of each sweep step, and sweep conditions are saved.

Data is saved in a dedicated format of this instrument. Data can be transmitted to a PC using communication commands.

Memory Number

Saved data is automatically assigned a memory number from 01 to 100.
This also applies when data is saved automatically in a step sweep or program sweep. The data of each step is assigned a memory number.

Saved Information

The following information is saved.

Function1 Information

Saved Item	Saved Content
Measured value	
Function	
Range	
0% value	
100% value	
Contact input setting	
Count time	

Function2 Information

Saved Item		Saved Content
Source value		
Function		
Range		
0% value		
100% value		
Sweep setting*	Interval time	
	Repeat	
	Saving Data	ON/OFF
Temperature setting	Thermocouple terminal	TC-A/TC-B
	TC-B RJC setting	ON/OFF
	Burnout setting	ON/OFF
	TC scale standard setting	IPTS-68/ITS-90
	Temperature unit	°C
Frequency setting	Amplitude voltage setting	
	Pulse count setting	
TC measurement settings	0% value	
	100% value	
Contact output setting		ON/OFF

* Not saved when using the SAVE key.

Loading Data

Specify the memory number containing the saved data to load the information. The instrument settings are changed to the loaded settings.

Measured value and source value are shown in the Function1 and Function2 display positions.

1.7 Saving and Loading CA550 Data

For details on the CA500, see section 1.6.

Saving Data

The following three methods are available to save data.

- Save data by pressing the SAVE key
- Save data automatically after the completion of a step sweep
- Save data automatically after the completion of a program sweep

Saving Data Using the SAVE Key

Information such as the specified function and range, and the date and time, measured value, and source value when the SAVE key is pressed are saved. Each time you press SAVE, the measurement data is added to the same file. However, a new file is created in the following cases.

- When a setting is changed on the Device Setup screen
- When the function or range is changed
- When the number of save data points exceeds 2000
- When the power is turned off

Auto Save in Step Sweeps

Information such as the specified function and range, the date and time, source value, and measured value at the completion of each sweep step, and sweep conditions are saved.

Auto Save in Program Sweeps

Calibration target information, information such as the specified function and range, the date and time, source value, and measured value at the completion of each sweep step, and sweep conditions are saved as calibration data of field instruments.

The data format is CSV. You can select a comma, semicolon, or tab for the data separator.
In addition, you can select the measured value to be saved, the decimal symbol of the source value, and the date and time format.

Saved Information

The following information is saved.

Saving Data Using the SAVE Key

Saved Item	Saved Content
MODEL	CA550
FILE TYPE	0: Manually saved data using the SAVE key 1: Automatically saved data by a step sweep 2: Calibration data by a program sweep
FILE VERSION	Version number of the saved file
CSV SEPARATOR	0: Comma, 1: Semicolon, 2: Tab
DECIMAL POINT	0: Period, 1: Comma
DATE FORMAT	0: YYYY/MM/DD 1: DD/MM/YYYY 2: MM/DD/YYYY
FUNCTION1 RANGE	Range DCV: 100 mV, 5 V, 50 V DCmA: 50 mA Ω: 400OHM, 4000OHM RTD: PT100(3850), PT100, JPT100, PT100(3926), PT200, PT500, PT1000, Cu10, Ni120, PT50, PT50G, PT100G, Cu50M, Cu100M Pulse: 500 Hz, 5000 Hz, 50 kHz, PULSE COUNT
FUNCTION1 UNIT	mV, V, mA, ohm, Hz, kHz, degC Blank when the FUNCTION1 function is set to PULSE COUNT or OFF
FUNCTION1 0% VALUE	0% Value, range boundary Blank when the FUNCTION1 function is set to OFF
FUNCTION1 100% VALUE	100% Value, range boundary Blank when the FUNCTION1 function is set to OFF
CONTACT INPUT	Contact input setting. ON/OFF
FUNCTION2 RANGE	Range DCV: 100 mV, 1-5 V, 1-5 V ROOT, 5 V, 30 V DCmA: 20 mA, 4-20 mA, 4-20 mA ROOT, 4-20 mA SIMULATE, 4-20 mA SIM ROOT Ω: 400OHM, 4000OHM TC: K, E, J, T, N, L, U, R, S, B, C, XK, A/, D, G, PLATINEL2, PR20-40 RTD: PT100(3850), PT100, JPT100, PT100(3926), PT200, PT500, PT1000, Cu10, Ni120, PT50, PT50G, PT100G, Cu50M, Cu100M Pulse: 500 Hz, 5000 Hz, 50 kHz, CPM
FUNCTION2 UNIT	mV, V, mA, ohm, Hz, kHz, degC Blank when the FUNCTION2 function is set to CPM or OFF
FUNCTION2 0% VALUE	0% Value, range boundary Blank when the FUNCTION2 function is set to OFF
FUNCTION2 100% VALUE	100% Value, range boundary Blank when the FUNCTION2 function is set to OFF
TC SETTING TERMINAL	Thermocouple terminal setting. TC-A/ TC-B
TC SETTING TC-B RJC	TC-B RJC ON/OFF setting. ON/OFF
TC SETTING BURNOUT	Burnout setting. ON/OFF
TC SETTING SCALE	TC scale standard setting. ITS-90/IPTS-68
FREQUENCY SETTING VOLT	Amplitude voltage setting. 0.1 V to 15.0 V
FREQUENCY SETTING COUNT	Number of output pulse count. 0, 1 to 10000
CONTACT OUTPUT	Contact output setting. ON/OFF

Saving Data Using Step Sweep

Saved Item	Saved Content
MODEL	CA550
FILE VERSION	Version number of the saved file
FILE TYPE	0: Manually saved data using the SAVE key 1: Automatically saved data by a step sweep 2: Calibration data by a program sweep
CSV SEPARATOR	0: Comma, 1: Semicolon, 2: Tab
DECIMAL POINT	0: Period, 1: Comma
DATE FORMAT	0: YYYY/MM/DD 1: DD/MM/YYYY 2: MM/DD/YYYY
FUNCTION1 RANGE	Range DCV: 100 mV, 5 V, 50 V DCmA: 50 mA Ω: 400OHM, 4000OHM RTD: PT100(3850), PT100, JPT100, PT100(3926), PT200, PT500, PT1000, Cu10, Ni120, PT50, PT50G, PT100G, Cu50M, Cu100M Pulse: 500 Hz, 5000 Hz, 50 kHz, PULSE COUNT
FUNCTION1 UNIT	mV, V, mA, ohm, Hz, kHz, degC Blank when the FUNCTION1 function is set to PULSE COUNT or OFF
FUNCTION1 0% VALUE	0% Value, range boundary Blank when the FUNCTION1 function is set to or OFF
FUNCTION1 100% VALUE	100% Value, range boundary Blank when the FUNCTION1 function is set to or OFF
CONTACT INPUT	Contact input setting. ON/OFF
FUNCTION2 RANGE	Range DCV: 100 mV, 1-5 V, 1-5 V ROOT, 5 V, 30 V DCmA: 20 mA, 4-20 mA, 4-20 mA ROOT, 4-20 mA SIMULATE, 4-20 mA SIM ROOT Ω: 400OHM, 4000OHM TC: K, E, J, T, N, L, U, R, S, B, C, XK, A/, D, G, PLATINEL2, PR20-40 RTD: PT100(3850), PT100, JPT100, PT100(3926), PT200, PT500, PT1000, Cu10, Ni120, PT50, PT50G, PT100G, Cu50M, Cu100M Pulse: 500 Hz, 5000 Hz, 50 kHz, CPM
FUNCTION2 UNIT	mV, V, mA, ohm, Hz, kHz, degC
FUNCTION2 0% VALUE	0% Value, range boundary
FUNCTION2 100% VALUE	100% Value, range boundary
TC SETTING TERMINAL	Thermocouple terminal setting. TC-A/ TC-B
TC SETTING TC-B RJC	TC-B RJC ON/OFF setting. ON/OFF
TC SETTING BURNOUT	Burnout setting. ON/OFF
TC SETTING SCALE	TC scale standard setting. ITS-90/IPTS-68
FREQUENCY SETTING VOLT	Amplitude voltage setting. 0.1 V to 15.0 V
FREQUENCY SETTING COUNT	Number of output pulse count. 0, 1 to 10000
CONTACT OUTPUT	Contact output setting. ON/OFF

Saving Data Using Program Sweep

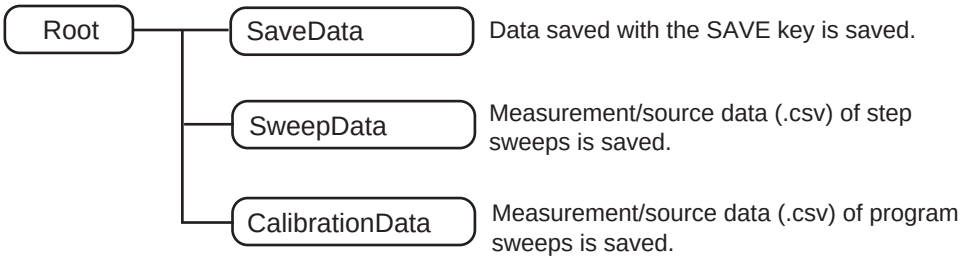
Saved Item	Saved Content
MODEL	CA550
FILE VERSION	Version number of the saved file
FILE TYPE	0: Manually saved data using the SAVE key 1: Automatically saved data by a step sweep 2: Calibration data by a program sweep
CSV SEPARATOR	0: Comma, 1: Semicolon, 2: Tab
DECIMAL POINT	0: Period, 1: Comma
DATE FORMAT	0: YYYY/MM/DD 1: DD/MM/YYYY 2: MM/DD/YYYY
FUNCTION1 RANGE	Range DCV: 100 mV, 5 V, 50 V DCmA: 50 mA Ω: 400OHM, 4000OHM RTD: PT100(3850), PT100, JPT100, PT100(3926), PT200, PT500, PT1000, Cu10, Ni120, PT50, PT50G, PT100G, Cu50M, Cu100M Pulse: 500 Hz, 5000 Hz, 50 kHz, PULSE COUNT
FUNCTION1 UNIT	mV, V, mA, ohm, Hz, kHz, degC Blank when the FUNCTION1 function is set to PULSE COUNT or OFF
FUNCTION1 0% VALUE	0% Value, range boundary Blank when the FUNCTION1 function is set to or OFF
FUNCTION1 100% VALUE	100% Value, range boundary Blank when the FUNCTION1 function is set to or OFF
CONTACT INPUT	Contact input setting. ON/OFF
FUNCTION2 RANGE	Range DCV: 100 mV, 1-5 V, 1-5 V ROOT, 5 V, 30 V DCmA: 20 mA, 4-20 mA, 4-20 mA ROOT, 4-20 mA SIMULATE, 4-20 mA SIM ROOT Ω: 400OHM, 4000OHM TC: K, E, J, T, N, L, U, R, S, B, C, XK, A/, D, G, PLATINEL2, PR20-40 RTD: PT100(3850), PT100, JPT100, PT100(3926), PT200, PT500, PT1000, Cu10, Ni120, PT50, PT50G, PT100G, Cu50M, Cu100M Pulse: 500 Hz, 5000 Hz, 50 kHz, CPM
FUNCTION2 UNIT	mV, V, mA, ohm, Hz, kHz, degC
FUNCTION2 0% VALUE	0% Value, range boundary
FUNCTION2 100% VALUE	100% Value, range boundary
TC SETTING TERMINAL	Thermocouple terminal setting. TC-A/ TC-B
TC SETTING TC-B RJC	TC-B RJC ON/OFF setting. ON/OFF
TC SETTING BURNOUT	Burnout setting. ON/OFF
TC SETTING SCALE	TC scale standard setting. ITS-90/IPTS-68
FREQUENCY SETTING VOLT	Amplitude voltage setting. 0.1 V to 15.0 V
FREQUENCY SETTING COUNT	Number of output pulse count. 0, 1 to 10000
CONTACT OUTPUT	Contact output setting. ON/OFF
TAG NO.	Tag number
MODEL NO.	Model number
SERIAL NO.	Serial number
LOOP NAME.	Loop name
CALIBRATION DATE	Calibration date YYYY/MM/DD
CALIBRATOR S/N	CA550 serial number
No.	Calibration point number
DATE	Calibration date YYYY/MM/DD
TIME	Calibration time of the calibration point hh:mm:ss
MEASURE	Measured value
SOURCE	Source value
ERROR%	Error
PASS/FAIL	Pass/fail

Loading Data

Only the data saved using program sweep can be loaded.

Folder Structure

The following figure shows the CA550 folder structure.



1.8 HART/BRAIN Communication Futures (CA550)

HART Communication

Mutual communication is possible between this instrument and a device supporting HART (Highway Addressable Remote Transducer) communication by superimposing communication signals on 4 to 20 mA DC transmission signals.
The following information can be displayed and configured on the connected device. The obtained information can be used as device information for program sweeping.

- Displaying process variables
- Setting tags, PV units, etc.
- Displaying sensor information
- Displaying and changing device ID information such as software version and tag number
- Setting write-protection on the connected device, displaying alarm information
- Displaying device information such as the manufacturer and model number of the connected device
- Executing loop tests and setting output trimming
- Displaying diagnosis information

BRAIN Communication

Mutual communication is possible between this instrument and a device supporting BRAIN communication by superimposing communication signals on 4 to 20 mA DC transmission signals. The model number, tag number, and self check results of the connected device can be obtained and displayed on this instrument's screen. The obtained information can be used as device information for program sweeping.

* BRAIN is Yokogawa Electric Corporation's original communication protocol.

Modem Function

You can use this instrument as a HART or BRAIN modem for the USB interface.

1.9 Other Features

Communication Function

You can connect the instrument to a PC through the USB port. You can remotely control the instrument from a PC or use the instrument as a USB device on the PC.

Remote Control

You can use dedicated communication commands to remotely control the instrument from a PC. The following operations can be controlled remotely.

- CA500/CA550 configuration (limited features)
- CA500/CA550 configuration retrieval (limited features)
- Measured data retrieval

USB Mass Storage (CA550)

You can use the instrument as a PC's USB mass storage device.
From a PC, you can access the instrument's internal memory and read the data.
Data cannot be written to the instrument's internal memory from a PC.

Auto Power-off

When the auto power-off feature is enabled, the instrument automatically turns off if there is no user interaction for about 30 minutes. Auto power-off is automatically disabled (the icon also disappears) in the following situations.

- Pulse count is in progress.
- The output is on.
- Sweeping is in progress.
- Power is being supplied through USB.

Turning the Screen Light On and Off

To reduce battery consumption, you can turn off the screen light or adjust the brightness between two levels.
Further, the screen light can be turned off automatically when there is no user interaction with the instrument for a given period.

Note

If the screen light is turned on in a dark location, white spots may appear on the screen.
This is due to the material characteristics of the light guide of the screen and has no effect on the performance of the instrument.

Communication Resistance

This instrument has an built-in 250 Ω communication resistor. When communicating with a transmitter, you do not need to prepare a separate external resistor.

Power Supply Priority

When both batteries and USB power supply are available, priority can be given to either source. When the priority power supply cannot be used, a switch is made to the other part supply.

CSV Separator

The CSV separator can be set to a comma, semicolon, or tab.

Decimal Point

The decimal point can be set to a period or comma.

Date Display Format

You can select the date display format from the following:

YYYY/MM/DD
DD/MM/YYYY
MM/DD/YYYY
YYYY: year (Gregorian), MM: month, DD: day

The format is applied to the date and time displayed in the upper left of the screen, the date and time on the LOAD screen, and the date and time saved in CSV files from the CA550.

Language

You can select the language used on the screen from the following:
English, Japanese, Chinese, Korean, Russian

Formatting the Internal Memory

You can format the internal memory.
The format type is quick format (logical format).

Instrument Information

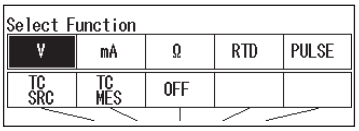
You can view the model (CA500/CA550), serial number, firmware version, and most recent inspection date or calibration date.
A simple wiring diagram is displayed according to the Function 1 and Function 2 settings.

2.1 DC Voltage Source

Procedure

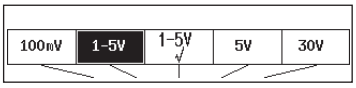
Setting the Function

1. With the source value and measurement value displayed, press **FUNCTION 2**. The function options are displayed.
2. Use the arrow keys to select **V**. The display returns to the source and measurement value display.



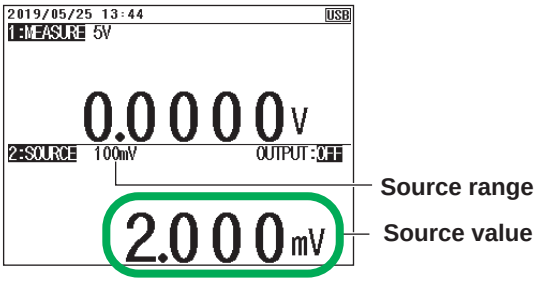
Setting the Source Range

3. Under Function 2, press **RANGE**.
4. Use the arrow keys to set the source range. The display returns to the source and measurement value display.



Setting the Source Value

5. With the source value and measurement value displayed, use the arrow keys to set the source value.



When the source range is 1-5V or 1-5V√, pressing **UP** or **DOWN** changes the source value at a given interval.

Turning the Source On and Off

6. With the source value and measurement value displayed, press **OUTPUT ON/OFF**.

   The displayed voltage is generated. OUTPUT:OFF on the screen changes to OUTPUT:ON.

   To turn off the source, press **OUTPUT ON/OFF** again.
7. When the source range is 1-5V or 1-5V√, press **UP** or **DOWN** to change the source value.

Divided Source

See section 2.8, “Dividing and Generating the Source Values”.

Sourcing with the Sweep Function

See section 2.9, “Sweep Source”.

Description

Source Range

You can select from the following five source ranges.

Range	Source Range
100 mV	±110.000 mV
1-5 V	0.0000 V to +6.0000 V
1-5 V√	0.0000 V to +6.0000 V Values for square root operation
5 V	±6.0000 V
30 V	±33.000 V

1-5V

The interval between 0% and 100% is equally divided by four, and the 0%, 25%, 50%, 75%, and 100% values are output. By default, because the 0% value is assigned to 1.0000 V and the 100% value is assigned to 5.0000 V, this can be used as a calibration signal for instruments that use 1 to 5 V as input signals.

Square Root Commendation Function (1-5V√)

This can be used as a calibration signal for instruments that output the square root of input signals.

Values for square root operation are generated.

Source Value

Voltages within each source range are generated.

In the default setting of the 1-5V range, 1 V to 5 V are divided into four, and 1 V, 2 V, 3 V, 4 V, and 5 V are generated (1 V, 1.25V, 2 V, 3.25 V, 5 V).

In the default setting of the 1-5V√ range, 1 V to 5 V are divided into four, and values corresponding to the square root of 1 V, 2 V, 3 V, 4 V, and 5 V are generated (1 V, 1.25V, 2 V, 3.25 V, 5 V).

Source value = (%/100)×(%/100)×(100% value - 0% value) + 0%

In the default setting of the 1-5V√ range, 0% = 1 V and 100% = 5 V, so for 25% = 2 V,

Source value = (25/100)×(25/100)×(5 V - 1 V) + 1 V = 1.25 V.

Notes about Sourcing

Be careful not to short the output terminals.

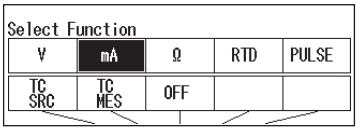
When the output terminals are shorted, the output is automatically turned off by the protection function.

2.2 DC Current Source

Procedure

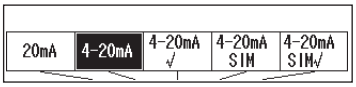
Setting the Function

1. With the source value and measurement value displayed, press **FUNCTION 2**. The function options are displayed.
2. Use the arrow keys to select **mA**. The display returns to the source and measurement value display.



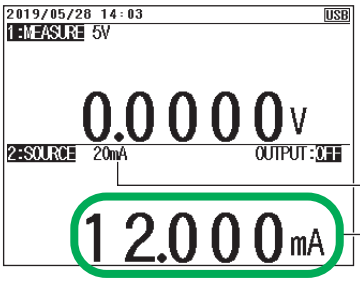
Setting the Source Range

3. Under Function 2, press **RANGE**.
4. Use the arrow keys to set the source range. The display returns to the source and measurement value display.



Setting the Source Value

5. With the source value and measurement value displayed, use the arrow keys to set the source value.



When the source range is 4-20mA, 4-20mA√, 4-20mA Simulate or 4-20mA Simulate√, pressing **UP** or **DOWN** changes the source value at a given interval.

Turning the Source On and Off

6. With the source value and measurement value displayed, press **OUTPUT ON/OFF**.

   The source value set in step five is output, and OUTPUT:OFF on the screen changes to OUTPUT:ON.

   To turn off the source, press **OUTPUT ON/OFF** again.

7. When the source range is 4-20mA, 4-20mA√ , 4-20mA Simulate or 4-20mA Simulate√, press **UP** or **DOWN** to change the source value.

Divided Source

See section 2.8, “Dividing and Generating the Source Values”.

Sourcing with the Sweep Function

See section 2.9, “Sweep Source”.

Description

Source Range

You can select from the following four source ranges.

Range	Source Range
20 mA	±24.000 mA
4-20 mA	0.000 mA to 24.000 mA
4-20 mA√	0.000 mA to 24.000 mA
4-20 mA Sim	0.000 mA to 24.000 mA
4-20 mA Sim√	0.000 mA to 24.000 mA

4-20mA

The interval between 0% and 100% is equally divided by four, and the 0%, 25%, 50%, 75%, and 100% values are output. By default, because the 0% value is assigned to 4.000 mA and the 100% value is assigned to 20.000 mA, this can be used as a calibration signal for instruments that use 4 to 20 mA as input signals.

Square Root Computation Function (4-20 mA√, 4-20 mA Simulate√)

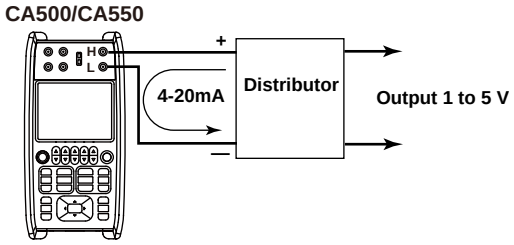
This can be used as a calibration signal for instruments that output the square root of input signals.

DC currents corresponding to the square root of 4 mA, 8 mA, 12 mA, 16 mA, and 20 mA are generated (4 mA, 5 mA, 8 mA, 13 mA, 20 mA).

4-20 mA Simulate/4-20 mA Simulate√

Currents ranging from 4 to 20 mA that simulate transfer signals are generated. This can be used to perform a loop check on the source value by connecting to a distributor or the like.

4-20 mA Simulate √ generates current corresponding to square root computation.



Source Value

Currents within each source range are generated.

In the default setting of the 4-20mA and 4-20mA Simulate ranges, 4 mA to 20 mA are divided into four, and 4 mA, 8 mA, 12 mA, 16 mA, and 20 mA are generated.

In the default setting of the 4-20mA√ and 4-20mA Simulate√ range, 4 mA to 20 mA are divided into four, and values corresponding to the square root of 4 mA, 8 mA, 12 mA, 16 mA, and 20 mA are generated (4 mA, 5 mA, 8 mA, 13 mA, 20 mA).

Source value = (%/100)×(%/100)×(100% value - 0% value) + 0% value

In the 4-20mA√ range, 0% = 4 mA and 100% = 20 mA, so for 25% = 8 mA,

Source value = (25/100)×(25/100)×(20 mA - 4 mA) + 4 mA = 5 mA.

Notes about Sourcing

Be careful not to open the output terminals.

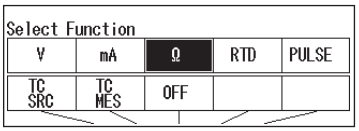
When the output terminals are opened, the output is automatically turned off by the protection function.

2.3 Resistance Source

Procedure

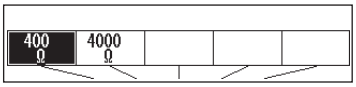
Setting the Function

1. With the source value and measurement value displayed, press **FUNCTION 2**. The function options are displayed.
2. Use the arrow keys to select **Ω**. The display returns to the source and measurement value display.



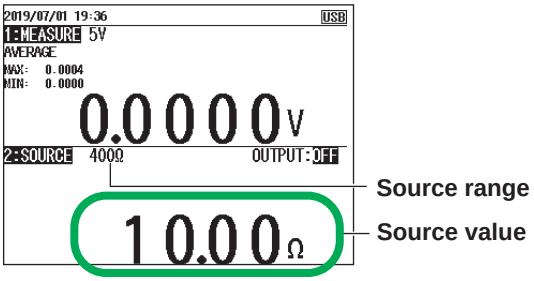
Setting the Source Range

3. Under Function 2, press **RANGE**.
4. Use the arrow keys to set the source range. The display returns to the source and measurement value display.



Setting the Source Value

5. With the source value and measurement value displayed, use the arrow keys to set the source value.



Turning the Source On and Off

6. With the source value and measurement value displayed, press **OUTPUT ON/OFF**.

   The source value set in step five is output, and OUTPUT:OFF on the screen changes to OUTPUT:ON.

   To turn off the source, press **OUTPUT ON/OFF** again.

Divided Source

See section 2.8, “Dividing and Generating the Source Values”.

Sourcing with the Sweep Function

See section 2.9, “Sweep Source”.

Description

Source Range

You can select from the following two source ranges.

Range	Source Range
400 Ω	0.00 Ω ~ 440.00 Ω
4000 Ω	0.0 Ω ~ 4400.0 Ω

Note

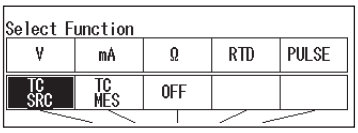
If the allowable measurement current exceeds the upper limit, the source value display blinks.

2.4 Voltage Source Corresponding to TC Thermoelectromotive Force

Procedure

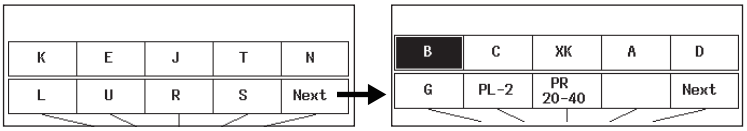
Setting the Function

1. With the source value and measurement value displayed, press **FUNCTION 2**. The function options are displayed.
2. Use the arrow keys to select **TC SRC (source)**. The display returns to the source and measurement value display.



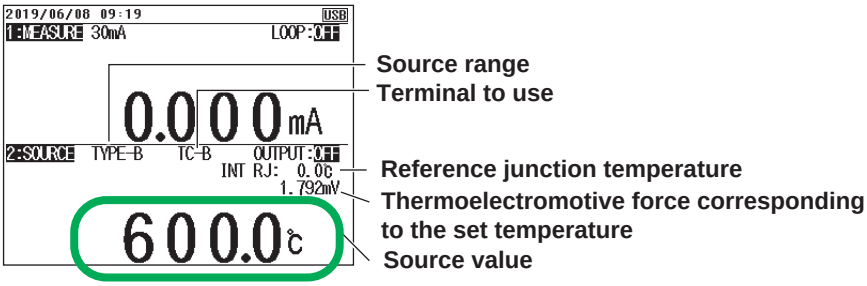
Setting the Source Range (TC Type)

3. Under Function 2, press **RANGE**.
4. Use the arrow keys to set the TC type. The display returns to the source and measurement value display.



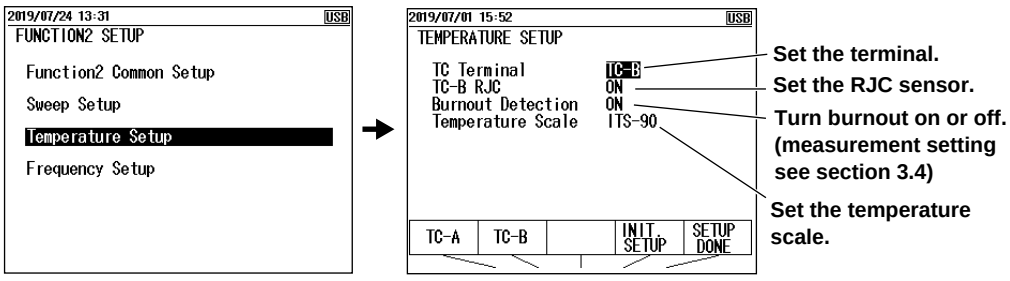
Setting the Source Value

5. With the source value and measurement value displayed, use the arrow keys to set the source value.



Selecting the Terminal

6. With the source value and measurement value displayed, press **SETUP** under Function 2.
7. Select **Temperature Setup**, and press **ENTER**. A Temperature Setup setup screen appears.



8. Select **TC Terminal**. TC-A and TC-B appear in the selection menu.

9. Using the arrow keys, select **TC-A** to use the TC-A terminal (thermocouple mini plug) or **TC-B** to use TC-B.

   To finish entering the settings here, proceed to step 14.

Setting the Reference Junction Compensation (RJC) (when using the TC-B terminal)

10. Select **TC-B RJC**. ON and OFF appear in the selection menu.

11. Use the arrow keys to set RJC to ON or OFF.

    To finish entering the settings here, proceed to step 14.

Setting the Temperature Scale

12. Select **Temperature Scale**. Options appear in the selection menu.

13. Use the arrow keys to set the temperature scale.

Confirming the Settings

14. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and a screen appears showing the source value and measurement value.

    The cancel the settings, press **ESC** to return to the screen in step 6.

    To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Turning the Source On and Off

15. With the source value and measurement value displayed, press **OUTPUT ON/OFF**.

    The source value set in step five is output, and OUTPUT:OFF on the screen changes to OUTPUT:ON.

    To turn off the source, press **OUTPUT ON/OFF** again.

Divided Source

See section 2.8, “Dividing and Generating the Source Values”.

Sourcing with the Sweep Function

See section 2.9, “Sweep Source”.

Description

Source Range (TC Type)

You can select from the following 17 TC types.

TC type (thermocouple)	Source range	TC type (thermocouple)	Source range
K	-200.0°C to +1372.0°C	B	+600.0°C to +1820.0°C
E	-250.0°C to +1000.0°C	C	0.0°C to +2315.0°C
J	-210.0°C to +1200.0°C	XK	-200.0°C to +800.0°C
T	-250.0°C to +400.0°C	A	0.0°C to +2500.0°C
N	-200.0°C to +1300.0°C	D (W3Re/W25Re)	0.0°C to +2315.0°C
L	-200.0°C to +900.0°C	G (W/W26Re)	+100.0°C to +2315.0°C
U	-200.0°C to +600.0°C	PLATINEL II	0.0°C to +1395.0°C
R	-20.0°C to +1767.0°C	PR20-40	0.0°C to +1888.0°C
S	-20.0°C to +1768.0°C	-	-

Match the TC type of this instrument to that of the measuring instrument.

Output Terminal

Set whether to use the TC-A terminal (dedicated thermocouple mini plug) or TC-B terminal (banana terminal).

If you select TC-A terminal, you cannot use an external RJ sensor (sold separately).

When using the TC-B terminal, we recommend that you use the included binding post (99045).

Turning Reference Junction Compensation (RJC) On and Off

When using the TC-B terminal, set whether to perform RJC (ON/OFF).

ON: If an external RJ sensor is connected, the external RJ sensor is used to perform reference junction compensation.
If an external RJ sensor is not connected, the internal RJ sensor is used to perform reference junction compensation.

OFF: Reference junction compensation is not performed.

When the TC-A terminal is used, the internal RJ sensor is always used to perform reference junction compensation.

Note

- The internal RJ sensor measures the temperature of the instrument's terminal.
- When the temperature inside the instrument is high, wait for the temperature to decrease before use.
- For the external RJ sensor, use the 90080 RJ sensor, sold separately.

Temperature Scale

TC types K, E, J, T, R, S, and B can also handle the IPTS-68 temperature scale..

IPTS-68: The international temperature scale standard of 1968

ITS-90: The international temperature scale standard of 1990

Notes about Sourcing

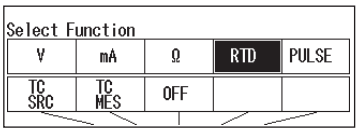
If you perform a temperature measurement or temperature source using an RJC immediately after using loop power or simulating 20 mA, the measured value or source value may be affected by the temperature rise inside the instrument. Wait for the temperature inside instrument to stabilize before using it.

2.5 Resistance Source Corresponding to the RTD Temperature

Procedure

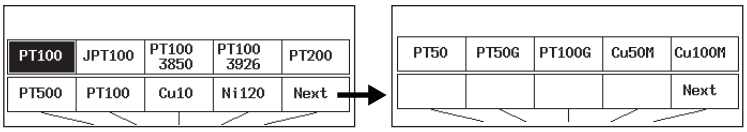
Setting the Function

1. With the source value and measurement value displayed, press **FUNCTION 2**. The function options are displayed.
2. Use the arrow keys to select **RTD**. The display returns to the source and measurement value display.



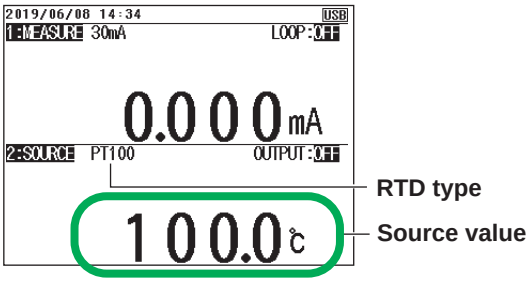
Setting the Source Range (RTD Type)

3. Under Function 2, press **RANGE**.
4. Use the arrow keys to set the RTD type. The display returns to the source and measurement value display.



Setting the Source Value

5. With the source value and measurement value displayed, use the arrow keys to set the source value.



Turning the Source On and Off

6. With the source value and measurement value displayed, press **OUTPUT ON/OFF**.

   The source value set in step five is output, and OUTPUT:OFF on the screen changes to OUTPUT:ON.

   To turn off the source, press **OUTPUT ON/OFF** again.

Divided Source

See section 2.8, “Dividing and Generating the Source Values”.

Sourcing with the Sweep Function

See section 2.9, “Sweep Source”.

Description

Source Range (RTD Type)

You can select from the following 14 RTD types.

RTD	Measurement range
PT100 (PT100 JIS (3851))	-200.0°C to 800.0°C
JPT100 (PT100 former JIS (3916))	-200.0°C to 510.0°C
PT100 (3850)	-200.0°C to 630.0°C
PT100 (3926)	-200.0°C to 630.0°C
PT200	-200.0°C to 630.0°C
PT500	-200.0°C to 630.0°C
PT1000	-200.0°C to 630.0°C
Cu10	-100.0°C to 260.0°C
Ni120	-80.0°C to 260.0°C
PT50	-200.0°C to 630.0°C
PT50G	-200.0°C to 800.0°C
PT100G	-200.0°C to 630.0°C
Cu50M	-180.0°C to 200.0°C
Cu100M	-180.0°C to 200.0°C

Match the RTD type of this instrument to that of the measuring instrument.

Note

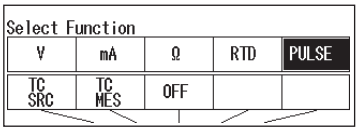
If the excitation current exceeds the upper limit, the source value display blinks.

2.6 Frequency and Pulse Source

Procedure

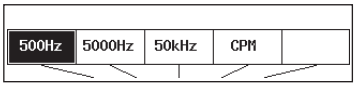
Setting the Function

1. With the source value and measurement value displayed, press **FUNCTION 2**. The function options are displayed.
2. Use the arrow keys to select **PULSE**. The display returns to the source and measurement value display.



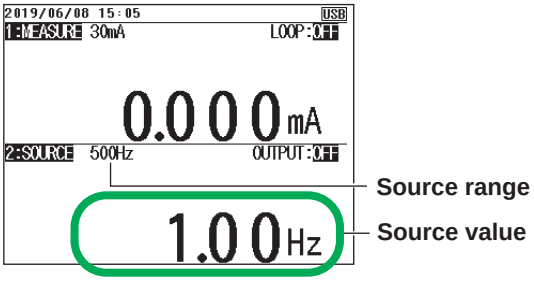
Setting the Source Range

3. Under Function 2, press **RANGE**.
4. Use the arrow keys to set the source range. The display returns to the source and measurement value display.



Setting the Source Value

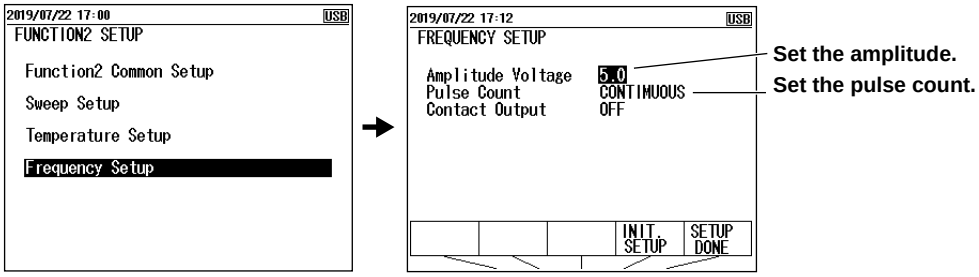
5. With the source value and measurement value displayed, use the arrow keys to set the source value.



Setting the Pulse Signal Amplitude

6. With the source value and measurement value displayed, press **SETUP** under Function 2.

7. Select **Frequency Setup**, and press **ENTER**. A Frequency Setup setup screen appears.



8. Select **Amplitude Voltage**, and press **ENTER**. The settings are displayed at the bottom of the screen.

9. Use the arrow keys to select the amplitude, and then press **ENTER**.

To finish entering the settings here, proceed to step 12.

Setting the Number of Pulses to Source

10. Select **Pulse Count**, and press **ENTER**. The settings are displayed at the bottom of the screen.

11. Use the arrow keys to select the number of pulses to source, and then press **ENTER**.

If you set the number to 0, Continue will be selected.

Setting the Amplitude and the Number of Pulses

12. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and the screen reverts to show the source value and measurement value.

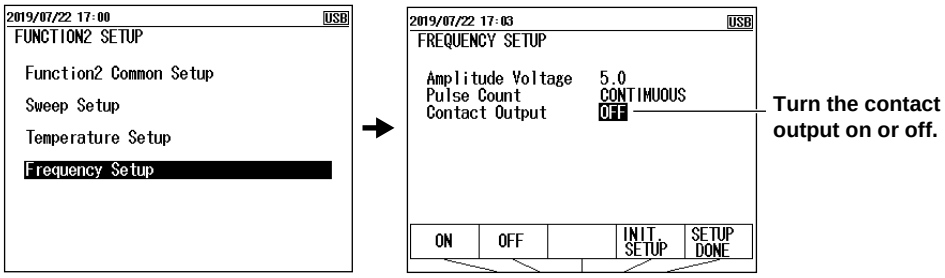
The cancel the settings, press **ESC** to return to the screen and step 6.

To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Turning the Contact Output On and Off

13. With the source value and measurement value displayed, press **SETUP** under Function 2.

14. Select **Frequency Setup**, and press **ENTER**. A Frequency Setup setup screen appears.



15. Select **Contact Output**. ON and OFF appear in the selection menu.

16. Use the arrow keys to set the contact output to ON or OFF. To generate contact signals, select ON.

Confirming the Contact Output

17. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and the screen reverts to show the source value and measurement value.

The cancel the settings, press **ESC** to return to the screen and step 14.

To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Turning the Source On and Off

18. With the source value and measurement value displayed, press **OUTPUT ON/OFF**.

The source value set in step 5 is output. The signal is generated according to the specified pulse count.

To turn off the source, press **OUTPUT ON/OFF** again.

Divided Source

See section 2.8, “Dividing and Generating the Source Values”.

Description

Source Range

You can select from the following four source ranges.

Range	Source Range
500 Hz	1.00 Hz to 550.00 Hz
5000 Hz	1.0 Hz to 5500.0 Hz
50 kHz	0.001 kHz to 50.000 kHz
CPM	1.0 to 1100.0/min

If you select CPM, set the number of pulses to generate per minute.

Bandwidth

Set the voltage of the high side of the pulse signal. The low side is 0 V.

Set the voltage in the range of 0.1 V to 15.0 V.

The default setting is 0.1 V.

Duty Cycle

The duty cycle of the pulse signals that this instrument generates is 50%.

Pulse Count

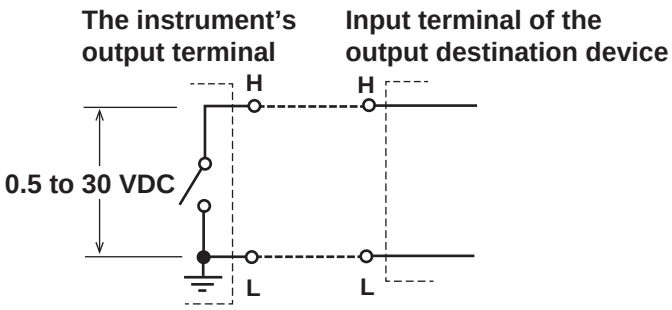
Set the number of pulses to generate.

If you set the number to 0, the instrument continuously generates pulse signals at the specify frequency.

Contact Output

If you turn on the contact output, the non-voltage contact is turned on then off at the specify frequency or the number of pulses/min.

Be careful not to apply a voltage exceeding 30 VDC to the source terminal of this instrument.



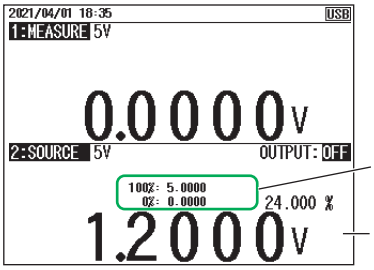
When you turn on the contact output, the amplitude setting is ignored.

2.7 Setting the 0% and 100% Values

Procedure

Setting Values Using the 0% and 100% Keys

1. With the source value and measurement value displayed, use the arrow keys to set the 0% source value.
2. Hold down the **0%** cursor key. The specified source value is assigned to the 0% value.
3. Use the arrow keys to set the 100% source value.
4. Hold down the **100%** cursor key. The specified source value is assigned to the 100% value.



When you display the percentage value, you can check the 0% or 100% values.

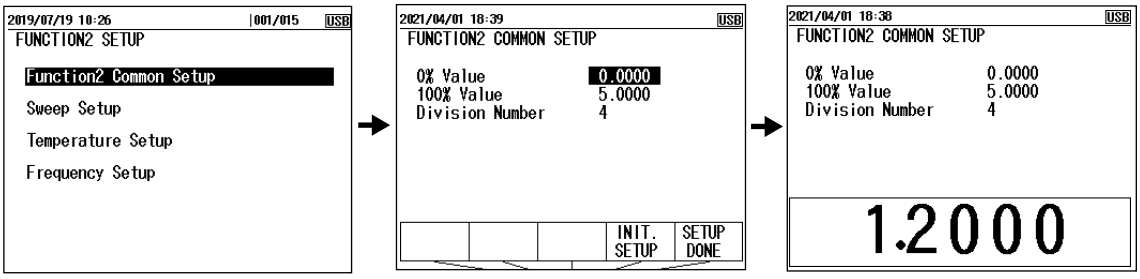
When you hold down the 0% or 100% key, this value is assigned to 0% or 100%.

Note

If you display the percentage on the screen using the DISPLAY key, you can view the assigned 0% and 100% values.

Setting Values Using the Setup Menu

1. With the source value and measurement value displayed, press **SETUP** under Function 2.
2. Use the arrow keys to select **Function2 Common Setup**, and then press **ENTER**.
3. Use the arrow keys to select the **0% Value** value, and then press **ENTER**. The settings are displayed at the bottom of the screen.



4. Use the arrow keys to set the 0% value, and then press **ENTER**.
5. Likewise, set the 100% value.
6. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and a screen appears showing the source value and measurement value.

   The cancel the settings, press **ESC** to return to the screen in step 2.

   To initialize the settings, press the arrow key corresponding to **INIT SETUP**.

Generating the 0% and 100% Values

1. With the source value and measurement value displayed, press **0%** or **100%**.

   The source value is set to the 0% or 100% value.

2. Press **OUTPUT ON/OFF**. OUTPUT:OFF on the screen changes to OUTPUT:ON, and are displayed 0% or 100% value is generated.

   To turn off the source, press **OUTPUT ON/OFF** again.

Description

0% and 100% Values

Set the values within each source range.

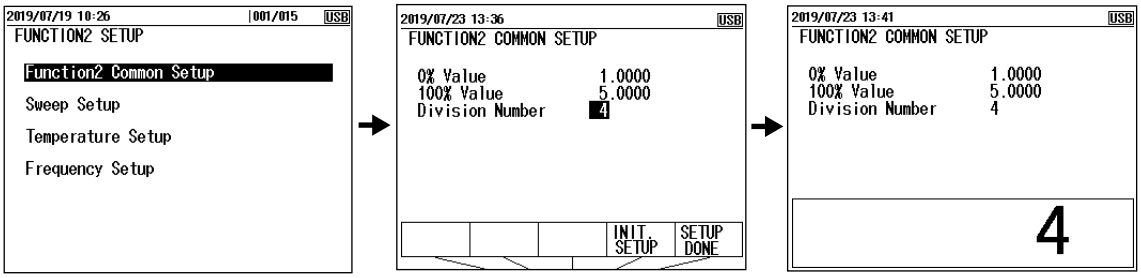
These values become the divided source range or sweep source range.

2.8 Dividing and Generating the Source Values

Procedure

Setting the Number of Divisions

1. With the source value and measurement value displayed, press **SETUP** under Function 2.
2. Use the cursor keys to select **Function2 Common Setup**, and then press **ENTER**.
3. Use the cursor keys to select the **Division Number** value, and then press **ENTER**. The settings are displayed at the bottom of the screen.



4. Use the arrow keys to set the number divisions from the 0% value to the 100% value, and press **ENTER**.

   When the source range is 1-5V, 1-5V√, 4-20mA, 4-20mA√, or 4-20mA Simulate, the number divisions is fixed to 4.

5. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and a screen appears showing the source value and measurement value.

   The cancel the settings, press **ESC** to return to the screen and step 2.

   To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Turning the Source On and Off

6. With the source value and measurement value displayed, press **OUTPUT ON/OFF**.

   The displayed source value is output, and OUTPUT:OFF on the screen changes to OUTPUT:ON.

   To turn off the source, press **OUTPUT ON/OFF** again.

Increasing or Decreasing the Source Value

7. Press **UP** or **DOWN**. The source value increases or decreases by the specified division width.

Note

You can change the source value to the 0% or 100% value by pressing the 0% or 100% key.

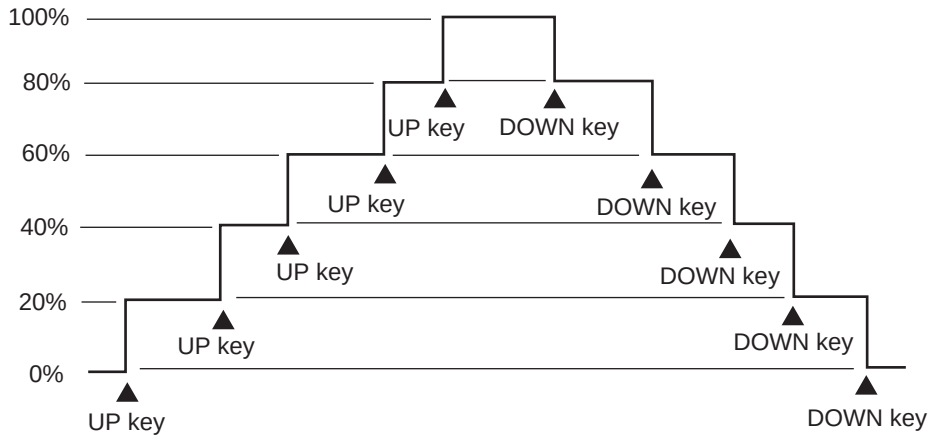
Description

Number of Divisions

The range from the 0% value to the 100% value is divided and output.

For example, if the number of divisions is set to 5, the 0%, 20%, 40%, 60%, 80%, and 100% values are generated.

You can change the source value using the UP and DOWN keys.



The number divisions can be set in the range of 1 to 20.

When the source range is 1-5V, 1-5V√, 4-20mA, 4-20mA√, 4-20mA Simulate, or 4-20mA Simulate√, the number divisions is fixed to 4.

Note

When you use the step sweep function, the source value of each step can be held for the same time period, and the source value can be stepped up or down automatically (see “Step Sweep” in section 2.9, “Sweep Source”).

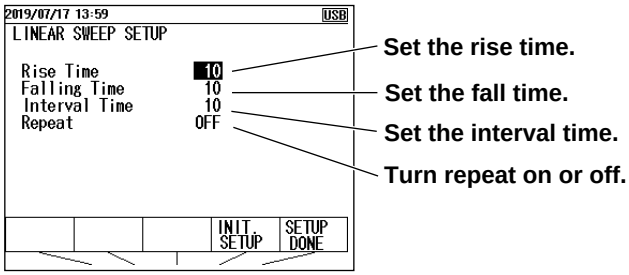
2.9 Sweep Source

Procedure

1. With the source value and measurement value displayed, press **SETUP** under Function 2.
2. Select **Sweep Setup**, and press **ENTER**.

Setting and Executing Linear Sweeps

3. Select **Linear Sweep Setup**, and press **ENTER**.



Setting the Rise and Fall Times

4. Select **Rise Time** or **Falling Time**, press **ENTER**. The settings are displayed at the bottom of the screen.
5. Use the arrow keys to set the rise time or fall time, and press **ENTER**.

Setting the Interval Time

6. Select **Interval Time**, and press **ENTER**. The settings are displayed at the bottom of the screen.
7. Use the arrow keys to set the interval time, and then press **ENTER**.

Turning Repeat On and Off

8. Select **Repeat**. ON and OFF appear in the selection menu.
9. Use the arrow keys to set the sweep repeat to ON or OFF.

Confirming the Settings

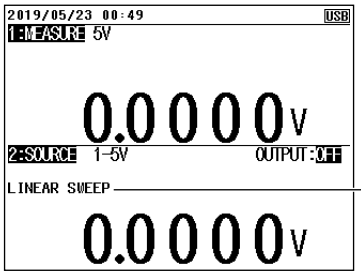
10. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and a screen appears showing the source value and measurement value.

    The cancel the settings, press **ESC** to return to the screen and step 2.

    To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Executing a Linear Sweep

11. With the source value and measurement value displayed, press **SWEEP** under Function 2 several times to display **LINEAR SWEEP** on the screen.



Press SWEEP to display LINEAR SWEEP.

12. Press **OUTPUT ON/OFF** to turn on the source.

13. Press **UP** or **DOWN**. Sweeping starts..

When you press UP, the 0% source values displayed, and sweeping starts from 0% to 100%.

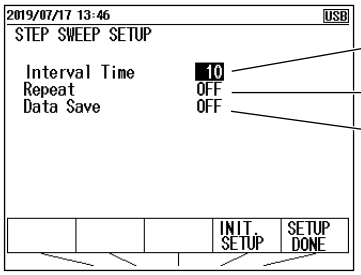
When you press DOWN, the 100% source values displayed, and sweeping starts from 100% to 0%.

If repeat is set to OFF, sweeping stops automatically after one cycle is executed. Press OUTPUT ON/OFF to turn off the source.

If repeat is set to ON, sweeping continues until you turn off the source.

Setting and Executing Step Sweeps

3. Select **Step Sweep Setup**, and press **ENTER**.



Set the interval time.

Turn repetition on or off.

Turn data save on or off.

Setting the Interval Time

4. Select **Interval Time**, and press **ENTER**. A list of options appears.

5. Use the arrow keys to set the interval time, and then press **ENTER**.

The number of steps is determined by the number of divisions of the divided source (see section 2.8, “Dividing and Generating the Source Values”).

Turning Repeat On and Off

6. Select **Repeat**. ON and OFF appear in the selection menu.

7. Use the arrow keys to set the sweep repetition to ON or OFF.

Turning Data Save On and Off

8. Select **Data Save**. ON and OFF appear in the selection menu.

9. Use the arrow keys to set data save to ON or OFF.

When you set this to on, the measurement values and source values are saved automatically when the sweep is completed.

Confirming the Settings

10. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and a screen appears showing the source value and measurement value.

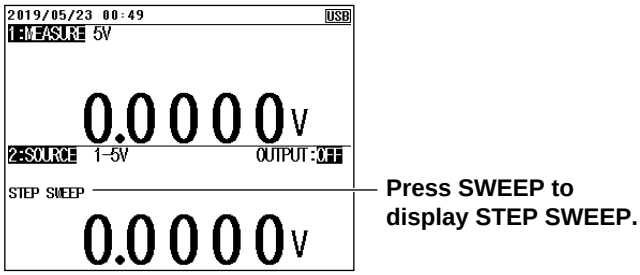
The cancel the settings, press **ESC** to return to the screen and step 2.

To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Executing a Step Sweep

11. With the source value and measurement value displayed, press **SWEEP** under Function 2 several times to display **STEP SWEEP** on the screen.

The source value display is set to the value assigned to 0%.



12. Press **OUTPUT ON/OFF** to turn on the source.

13. Press **UP** or **DOWN**. Sweeping starts.

When you press UP, the 0% source values displayed, and sweeping starts from 0% to 100%.

When you press DOWN, the 100% source values displayed, and sweeping starts from 100% to 0%.

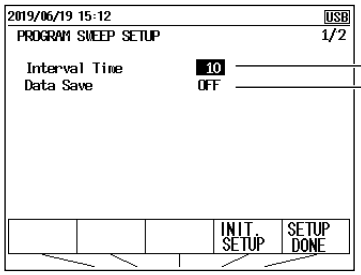
If repeat is set to OFF, sweeping stops automatically after one cycle is executed. Press OUTPUT ON/OFF to turn off the source.

If repeat is set to ON, sweeping continues until you turn off the source.

Setting and Executing Program Sweeps (CA500)

3. Select **Program Sweep Setup**, and press **ENTER**.

CA500



Setting the Interval Time

4. Select **Interval Time**, and press **ENTER**. A list of options appears.
5. Use the arrow keys to set the interval time, and then press **ENTER**.

Turning Data Save On and Off

6. Select **Data Save**. ON and OFF appear in the selection menu.
7. Use the arrow keys to set data save to ON or OFF.

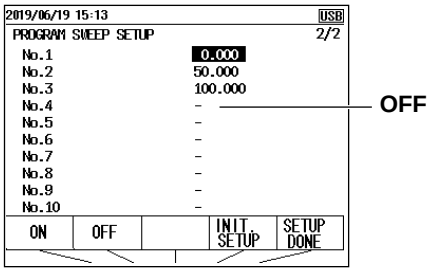
   When you set this to on, the measurement values and source values are saved automatically when the sweep is completed.

Setting the Source Value

8. Use the cursor keys to display page 2/2 of Program Sweep Setup.
9. Select No.1 under Output Data. ON and OFF appear.
10. Use the arrow keys to select ON, and then press **ENTER**. The settings are displayed at the bottom of the screen.
11. Use the arrow keys to select the source value (%), and then press **ENTER**.
12. Likewise, set the source values of Output Data No.2 to No.10.

    For the numbers you will not use, use the arrow keys to select OFF. “-” is displayed for the source value.

    If you set a number to off, the instrument sweeps up to the last number that has a source value assigned. Then, it returns to No.1, and continues the signal generation.



Confirming the Settings

13. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and a screen appears showing the source value and measurement value.

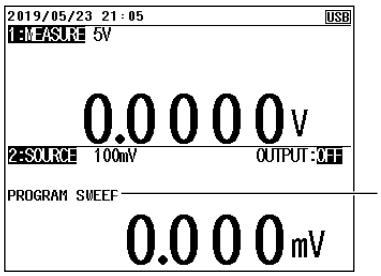
The cancel the settings, press **ESC** to return to the screen and step 2.

To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Executing a Program Sweep

14. With the source value and measurement value displayed, press **SWEEP** under Function 2 several times to display **PROGRAM SWEEP** on the screen.

The source value display is set to the value assigned to source value No. 1.



15. Press **OUTPUT ON/OFF** to turn on the source.

16. Press **UP** or **DOWN**.

The source values are generated in order from No. 1 according to the settings.

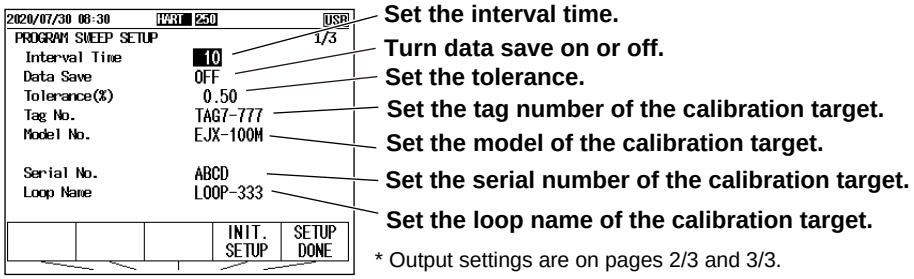
When the last specified number is reached, the instrument returns to No. 1 and continues the signal generation.

To stop a sweep, press **OUTPUT ON/OFF**.

Setting and Executing Program Sweeps (CA550)

3. Select **Program Sweep Setup**, and press **ENTER**.

CA550



* Output settings are on pages 2/3 and 3/3.

Setting the Interval Time

4. Select **Interval Time**, and press **ENTER**. A list of options appears.

5. Use the arrow keys to set the interval time, and then press **ENTER**.

Turning Data Save On and Off

6. Select **Data Save**. ON and OFF appear in the selection menu.

7. Use the arrow keys to set data save to ON or OFF.

When you set this to on, the measurement values and source values are saved automatically when the sweep is completed.

Setting the Tolerance

8. Select **Tolerance**, and press **ENTER**. The settings are displayed at the bottom of the screen.

9. Use the arrow keys to select the tolerance, and then press **ENTER**. The range is 0.00 to 10.00%.

Setting the Calibration Target Information (when necessary)

10. Select **Tag No.**, and press **ENTER**. An alphanumeric character input window appears.

11. Enter the tag number of the instrument to be calibrated.

Use the cursor keys to select characters, and then press ENTER. Press the arrow key corresponding to DONE to confirm the entered character string.

For details on the alphanumeric input window, see chapter 3, “Common Operations,” Getting Started Guide (IM CA500-02EN).

12. Likewise, set information for **Model No.**,**Serial No.**, and **Loop Name**.

Loading Instrument Information

When you select Tag No., LOAD INFO appears in the selection menu. Press the arrow key corresponding to LOAD INFO to assign the latest device information that the instrument loaded to the tag number, model number, and serial number.

Setting the Source Value

13. Use the cursor keys to display page 2/3 of Program Sweep Setup.

14. Select No.1 under Output Data. ON and OFF appear.

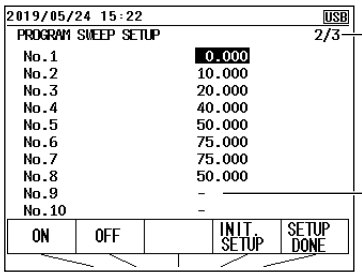
15. Use the arrow keys to select ON, and then press **ENTER**. The settings are displayed at the bottom of the screen.

16. Use the arrow keys to select the source value (%), and then press **ENTER**.

17. Likewise, set the source values of Output Data No.2 to No.20.

For the numbers you will not use, use the arrow keys to select OFF. "-" is displayed for the source value.

If you set a number to off, the instrument sweeps up to the last number that has a source value assigned. Then, sweeping stops.



Confirming the Settings

18. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and a screen appears showing the source value and measurement value.

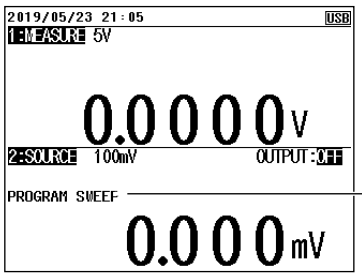
The cancel the settings, press **ESC** to return to the screen and step 2.

To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Executing a Program Sweep

19. With the source value and measurement value displayed, press **SWEEP** under Function 2 several times to display **PROGRAM SWEEP** on the screen.

The source value display is set to the value assigned to source value No. 1.



20. Press **OUTPUT ON/OFF** to turn on the source.

21. Press **UP** or **DOWN**.

The source values are generated in order from No. 1 according to the settings.

When the last specified number is reached, sweeping stops automatically.

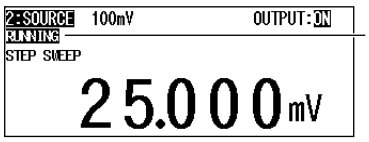
22. Press **OUTPUT ON/OFF** to turn off the source.

Description

Displayed during a Sweep

While a sweep is in progress, RUNNING is displayed on the Function2 screen.

Sweep in progress

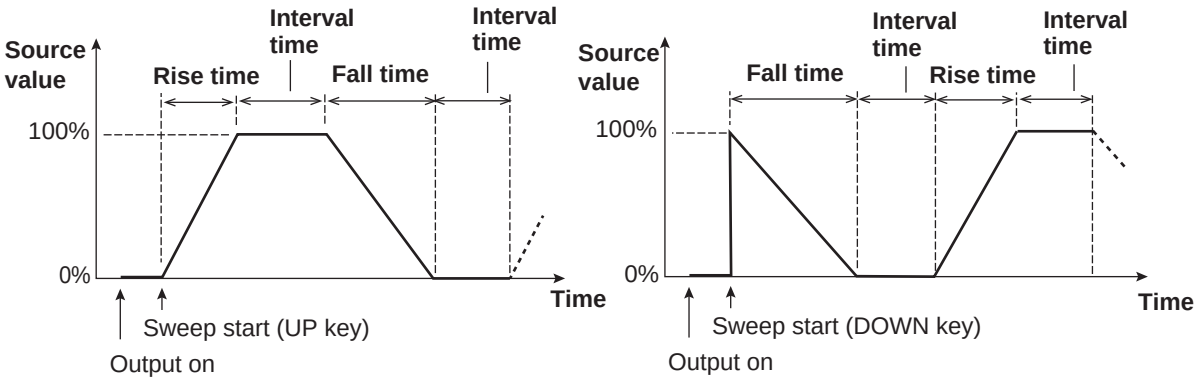


Displays RUNNING

Linear Sweep

The source value changes linearly from the 0% value to the 100% value or from the 100% value to the 0% value.

For instructions on how to set the 0% and 100% values, see section 2.7, “Setting the 0% and 100% Values”.



Note

In a linear sweep, the percent value changes linearly. In the 1-5V√ or 4-20mA√ source range, the source voltage or current is the square root of each percentage.

Rise Time and Fall Time

These are the times during which the source value is varied from 0% to 100% or from 100% to 0%. You can specify 5 to 600 s.

Interval Time

This is the time during which the source value is held at 0% or 100% after the rise or fall time. You can specify 5 to 600 s.

Repeat

The interval for the signal to rise and fall or to fall and rise is considered a cycle. Set whether to stop the sweep after one cycle (OFF) or repeat it (ON).

If you select OFF, sweeping stops after one cycle is completed. If you change the sweep direction while sweeping is in progress, sweeping stops when the interval time elapses after reaching the 0% or 100% value after the change.

If you select ON, sweeping continues until the source is turned off with the OUTPUT ON/OFF key.

Operation While Sweeping Is in Progress

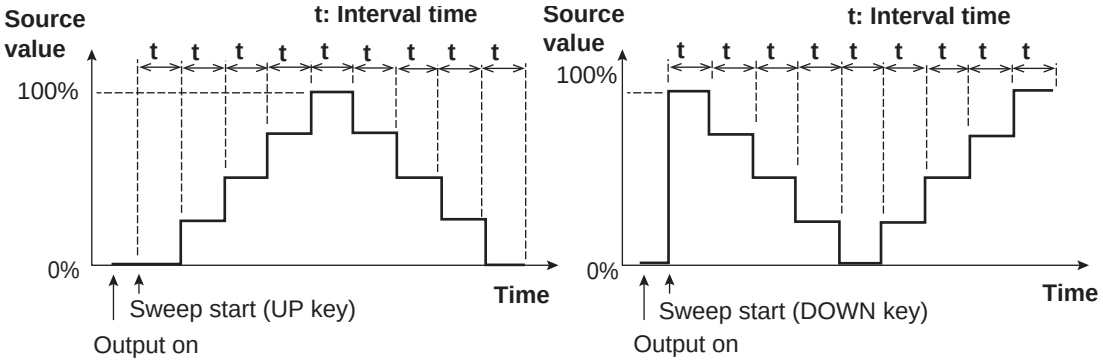
- If you press the UP or DOWN key while sweeping is in progress, you can change the sweep direction.
- Pressing any of the following keys while sweeping stops the sweeping.
  FUNCTION2, RANGE(function2), ESC, OUTPUT, or SWEEP

Pressing any other keys except the power key does not affect the sweeping operation. Some keys are disabled during sweeping.

Step Sweep

The source value interval from 0% to 100% is divided equally by a specified number, and the source value is varied stepwise.

For instructions on how to set the 0% and 100% values, see section 2.7, “Setting the 0% and 100% Values”.



Note

In a step sweep, percentages are equally divided. In the 1-5V√ or 4-20mA√ source range, the source voltage or current is the value for square root operation.

Interval Time

The time period during which the source value of each step is held. You can specify 5 to 600 s.

Repeat

The interval for the signal to rise and fall or to fall and rise is considered a cycle. Set whether to stop the sweep after one cycle (OFF) or repeat it (ON).

If set to OFF, sweeping stops after one cycle is executed, and sweeping stops, and the source value is held.

If you change the sweep direction while sweeping is in progress, the source turns off when the interval time elapses after reaching the 0% or 100% value after the change.

If you select ON, sweeping continues until the source is turned off with the OUTPUT ON/OFF key.

Saving Data

The source value and measurement value of each step are automatically saved. The maximum number of data values that can be saved on the CA500 is 100. The maximum number of data values that can be saved in a single file on the CA550 is 2000, the maximum number of files that can be saved is 250. For details, see section 5.2, “Saving Sweeps”.

Number of Divisions

The number divisions is used for divided output. See section 2.8, “Dividing and Generating the Source Values”.

Operation While Sweeping Is in Progress

Pressing any of the following keys while sweeping stops the sweeping.

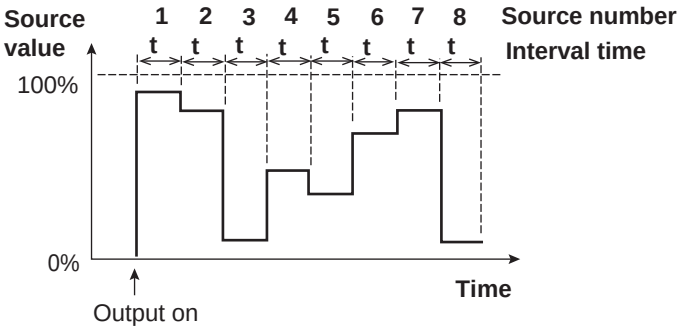
FUNCTION2, RANGE(function2), ESC, OUTPUT, or SWEEP

Pressing any other keys except the power key does not affect the sweeping operation. Some keys are disabled during sweeping.

Program Sweep

Assigned source values in the 0% to 100% range are generated in order by number for a given time period.

You can assign up to 10 source values on the CA500 and 20 source values on the CA550.



Interval Time

The time period during which the source value of each step is held.

You can specify 5 to 600 s.

Source Values (No.1 to No.10 (CA500), No.1 to No.20 (CA550)

Set the source values in percentages.

If not all source values are assigned and there is a source number set off or a unused source number, the instrument sweeps up to the number that a source value is assigned to. Then, on the CA500, the source value returns to No.1 and sweeping continues. On the CA550, sweeping stops.

The source time of each number is the time set with the interval time.

Saving Data (Data Save)

The source value and measurement value of each step are automatically saved. The maximum number of data values that can be saved on the CA500 is 100. The maximum number of data values that can be saved in a single file on the CA550 is 2000, the maximum number of files that can be saved is 250.

Tolerance

Set the tolerance relative to the reference value for making pass/fail judgments on measurement values.

The reference value is an output value (specified according to the specifications of the device to be calibrated) mapped to this instrument's source value (the input value to the device to be calibrated).

The pass/fail judgment result is recorded in the file saved by the CA550 program sweep.

For details on saving program sweeps, see section 5.2, "Saving Sweeps."

Calibration Target Information (Model No., Serial No., Tag No., Loop Name, CA550 only)

Set the calibration target model name, serial number, tag number, and loop name.

The set information is included in the data that is automatically saved during sweeping.

Set the model number and loop name using up to 32 characters, the serial number using up to 16 characters, and tag number using up to 8 characters.

Operation While Sweeping Is in Progress

Pressing any of the following keys while sweeping stops the sweeping.

FUNCTION2, RANGE(function2), ESC, OUTPUT, or SWEEP

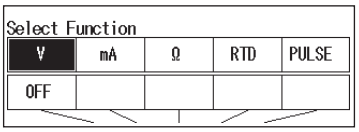
Pressing any other keys except the power key does not affect the sweeping operation. Some keys are disabled during sweeping.

3.1 DC Voltage Measurement

Procedure

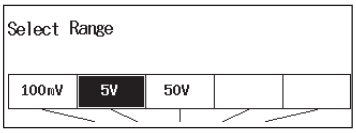
Setting the Function

1. With the source value and measurement value displayed, press **FUNCTION 1**. The function options are displayed.
2. Use the arrow keys to select **V**. The display returns to the source and measurement value display.



Set the measuring range.

3. Under Function 1, press **RANGE**.
4. Use the arrow keys to set the measurement range. The display returns to the source and measurement value display.



Setting the 0% and 100% Values (when necessary)

5. Set the 0% and 100% values according to section 3.7, “Setting the 0% and 100% Values”.

Description

Measurement Range

You can select from the following three measurement ranges.

Range	Measurement Range
100 mV	±110.000 mV
5 V	±6.0000 V
50 V	±55.000 V

0% Value and 100% Value

Assign an output value (specified according to the specifications of the device to be calibrated) to the 0% or 100% measurement value of this instrument, which is mapped to the 0% or 100% source value of this instrument.

The instrument displays errors, pass/fail judgment results (CA550), measurement percentages relative to the assigned value.

3.2 DC Current Measurement

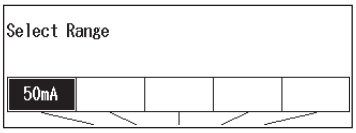
Procedure

Setting the Function

1. With the source value and measurement value displayed, press **FUNCTION 1**. The function options are displayed.
2. Use the arrow keys to select **mA**. The display returns to the source and measurement value display.

Set the measuring range.

3. Under Function 1, press **RANGE**.
4. Use the arrow keys to set the measurement range. The display returns to the source and measurement value display.



Setting the 0% and 100% Values (when necessary)

5. Set the 0% and 100% values according to section 3.7, “Setting the 0% and 100% Values”.

Loop Power Source (when performing loop tests)

6. Press **LOOP POWER**. LOOP on the screen is turned on, and the instrument generates a 24 VDC loop power.

   To stop the source, press **LOOP POWER** again.

Description

Measurement Range

The only available measurement range is 50 mA.

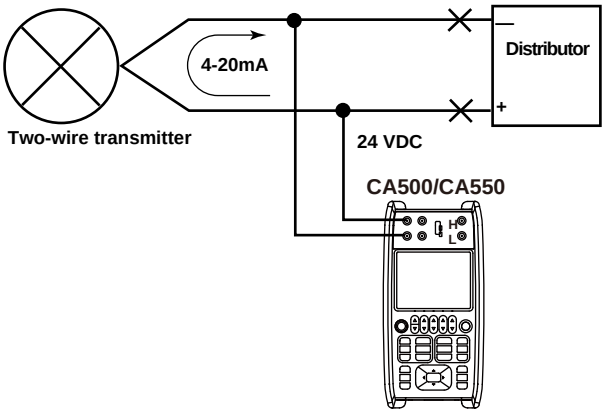
Range	Measurement Range
50 mA	±60.000 mA

Loop Power

Loop power can be generated during DC current measurement.

Transfer signals can be measured while supplying a constant voltage of 24 VDC to the two-wire transmitter.

The two-wire transmitter and distributor are not connected.

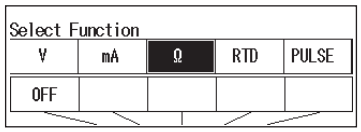


3.3 Resistance Measurement

Procedure

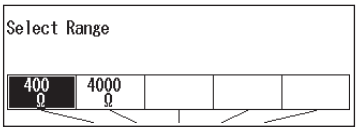
Setting the Function

1. With the source value and measurement value displayed, press **FUNCTION 1**. The function options are displayed.
2. Use the arrow keys to select **Ω**. The display returns to the source and measurement value display.



Set the measuring range.

3. Under Function 1, press **RANGE**.
4. Use the arrow keys to set the measurement range. The display returns to the source and measurement value display.

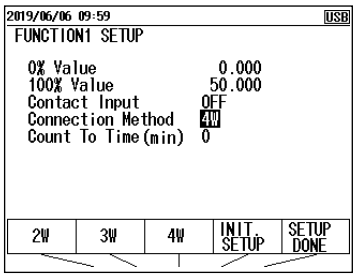


Setting the 0% and 100% Values (when necessary)

5. Set the 0% and 100% values according to section 3.7, “Setting the 0% and 100% Values”.

Setting the Wiring System

6. With the source value and measurement value displayed, press **SETUP** under Function 1.
7. User cursor keys to select **Connection Method**. Wiring systems appear in the selection menu.



8. Use the arrow keys to set the wiring system.
9. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and the screen reverts to show the source value and measurement value.

   The cancel the settings, press **ESC** to return to the screen and step 6.

   To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Description

Measurement Range

You can select from the following two measurement ranges.

Range	Measurement Range
400Ω	0.00 Ω ~ 440.00 Ω
4000Ω	0.0 Ω ~ 4400.0 Ω

Wiring Systems

You can select from 2W (two-wire), 3W (three-wire), and 4W (four-wire).
This setting is shared with the RTD.

3.4 Temperature Measurement Using Thermocouples

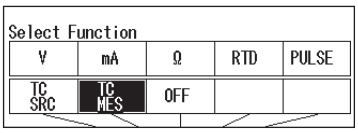
Procedure

Setting the Function

1. With the source value and measurement value displayed, press **FUNCTION 2**. The function options are displayed.

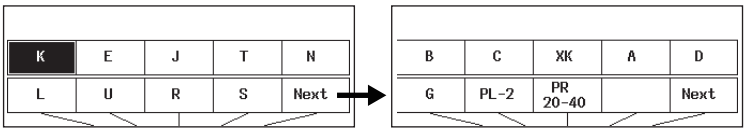
   Temperature measurement using a thermocouple is configured using Function 2.

2. Use the arrow keys to select **TC MES (Measure)**. The display returns to the source and measurement value display.



Setting the Measurement Range (TC Type)

3. Under Function 2, press **RANGE**.
4. Use the arrow keys to set the TC type. The display returns to the source and measurement value display.

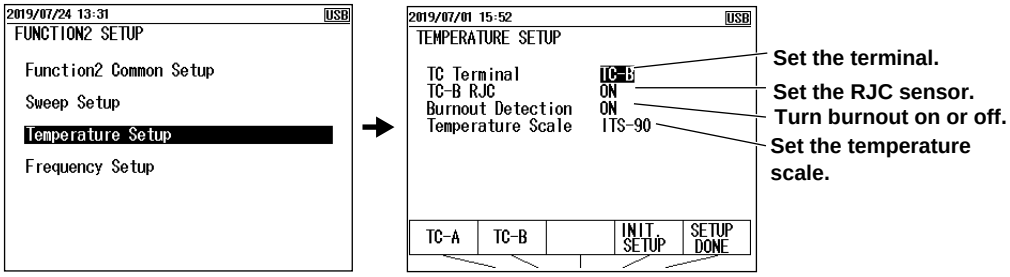


Setting the 0% and 100% Values (when necessary)

5. Set the 0% and 100% values according to section 3.7, “Setting the 0% and 100% Values”.

Selecting the Terminal

6. With the source value and measurement value displayed, press **SETUP** under Function 2.
7. Select **Temperature Setup**, and press **ENTER**. A Temperature Setup setup screen appears.



8. Select **TC Terminal**. TC-A and TC-B appear in the selection menu.
9. Using the arrow keys, select **TC-A** to use the TC-A terminal (thermocouple mini plug) or **TC-B** to use TC-B.

   To finish entering the settings here, proceed to step 16.

Setting the Reference Junction Compensation (RJC) (when using the TC-B terminal)

10. Select **TC-B RJC**. ON and OFF appear in the selection menu.

11. Use the arrow keys to set RJC to ON or OFF.

To finish entering the settings here, proceed to step 16.

Turning Burnout On and Off

12. Select **Burnout Detection**. ON and OFF appear in the selection menu.

13. Using the arrow keys, select ON to use burnout detection or OFF otherwise.

To finish entering the settings here, proceed to step 16.

Setting the Temperature Scale

14. Select **Temperature Scale**. Options appear in the selection menu.

15. Use the arrow keys to set the temperature scale.

Confirming the Settings

16. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and the screen reverts to show the source value and measurement value.

The cancel the settings, press **ESC** to return to the screen and step 6.

To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Description

Measurement Range (TC Type)

Set the TC type to use.

TC type (thermocouple)	Measurement range
K	-200.0°C to +1372.0°C
E	-250.0°C to +1000.0°C
J	-210.0°C to +1200.0°C
T	-250.0°C to +400.0°C
N	-200.0°C to +1300.0°C
L	-200.0°C to +900.0°C
U	-200.0°C to +600.0°C
R	-20.0°C to +1767.0°C
S	-20.0°C to +1768.0°C
B	+600.0°C to +1820.0°C
C	0.0°C to +2315.0°C
XK	-200.0°C to +800.0°C
A	0.0°C to +2500.0°C
D (W3Re/W25Re)	0.0°C to +2315.0°C
G (W/W26Re)	+100.0°C to +2315.0°C
PLATINEL II	00.0°C to +1395.0°C
PR20-40	0.0°C to +1888.0°C

Input Terminal

Set whether to use the TC-A terminal (dedicated thermocouple mini plug) or TC-B terminal.
If you select TC-A, you cannot use an external RJ sensor (sold separately).
When using the TC-B, we recommend that you use the included binding post (99045).

Turning Reference Junction Compensation (RJC) On and Off

When using the TC-B terminal (banana terminal), set whether to perform RJC (ON/OFF).

ON: If an external RJ sensor is connected, the external RJ sensor is used to perform reference junction compensation.
If an external RJ sensor is not connected, the internal RJ sensor is used to perform reference junction compensation.

OFF: Reference junction compensation is not performed.

When the TC-A terminal is used, the internal temperature sensor is always used to perform reference junction compensation.

Note

- The internal RJ sensor measures the temperature of the instrument's terminal.
- When the temperature inside the instrument is high, wait for the temperature to decrease before use.
- For the external RJ sensor, use the 90080 RJ sensor, sold separately.

Burnout

When burnout detection is turned on, the instrument detects burnouts in the thermocouple circuit and displays "B.OUT (Burnout)" on the screen.

Temperature Scale

You can select from the following temperature scales.
IPTS-68: The international temperature scale standard of 1968
ITS-90: The international temperature scale standard of 1990

Notes about Measurement

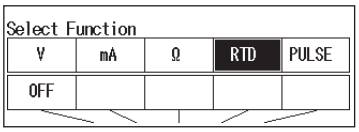
If you perform a temperature measurement or temperature source using an RJC immediately after using loop power or simulating 20 mA, the measured value or source value may be affected by the temperature rise inside the instrument. Wait for the temperature inside instrument to stabilize before using it.

3.5 Temperature Measurement Using RTDs

Procedure

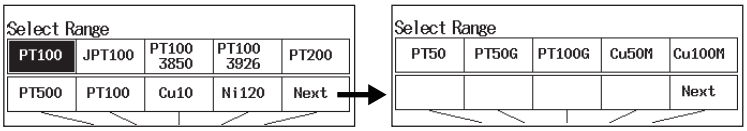
Setting the Function

1. With the source value and measurement value displayed, press **FUNCTION 1**. The function options are displayed.
2. Use the arrow keys to select **RTD**. The display returns to the source and measurement value display.



Setting the Measurement Range (RTD Type)

3. Under Function 1, press **RANGE**.
4. Use the arrow keys to set the RTD type. The display returns to the source and measurement value display.

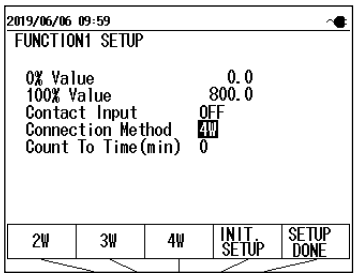


Setting the 0% and 100% Values (when necessary)

5. Set the 0% and 100% values according to section 3.7, “Setting the 0% and 100% Values”.

Setting the Wiring System

6. With the source value and measurement value displayed, press **SETUP** under Function 1.
7. User cursor keys to select **Connection Method**. Wiring systems appear in the selection menu.



8. Use the arrow keys to set the wiring system.
9. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and the screen reverts to show the source value and measurement value.

   The cancel the settings, press **ESC** to return to the screen and step 6.

   To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Description

Measurement Range (RTD Type)

Set the RTD type to use.

RTD	Measurement Range
PT100 (PT100 JIS (3851))	-200.0°C to 800.0°C
JPT100 (PT100 former JIS (3916))	-200.0°C to 510.0°C
PT100 (3850)	-200.0°C to 630.0°C
PT100 (3926)	-200.0°C to 630.0°C
PT200	-200.0°C to 630.0°C
PT500	-200.0°C to 630.0°C
PT1000	-200.0°C to 630.0°C
Cu10	-100.0°C to 260.0°C
Ni120	-80.0°C to 260.0°C
PT50	-200.0°C to 630.0°C
PT50G	-200.0°C to 800.0°C
PT100G	-200.0°C to 630.0°C
Cu50M	-180.0°C to 200.0°C
Cu100M	-180.0°C to 200.0°C

Wiring Systems

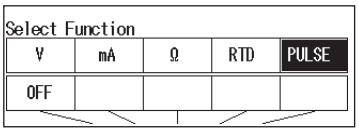
You can select from 2W (two-wire), 3W (three-wire), and 4W (four-wire).
This setting is shared with resistance measurement.

3.6 Frequency and Pulse Measurement

Procedure

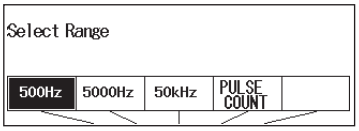
Setting the Function

1. With the source value and measurement value displayed, press **FUNCTION 1**. The function options are displayed.
2. Use the arrow keys to select **PULSE**. The display returns to the source and measurement value display.



Setting the Measurement Range

3. Under Function 1, press **RANGE**.
4. Use the arrow keys to set the measurement range. The display returns to the source and measurement value display.

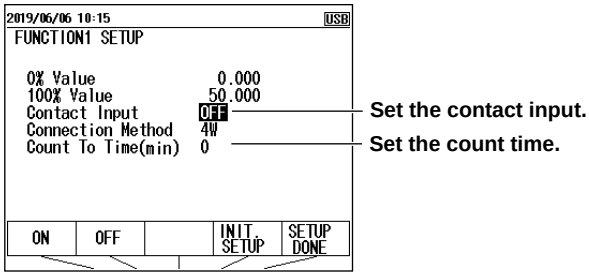


Setting the 0% and 100% Values (when necessary)

5. Set the 0% and 100% values according to section 3.7, “Setting the 0% and 100% Values”.

Setting the Contact Input and Setting the Count Time of the Pulse Count (when the measurement range is set to PULSE COUNT)

6. With the source value and measurement value displayed, press **SETUP** under Function 1.
7. User cursor keys to select **Contact Input**. Options appear in the selection menu.



8. Use the arrow keys to set the contact input.
9. Use the cursor keys to select **Count To Time**, and then press **ENTER**. The settings are displayed at the bottom of the screen.
10. Use the arrow keys to select the measurement time, and then press **ENTER**.

    You can set the measurement range to 1 minute to 60 minutes in steps of number 1 minute.

11. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and the screen reverts to show the source value and measurement value.

The cancel the settings, press **ESC** to return to the screen and step 6.

To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Starting a Pulse Count (When the Measurement Range Is COUNT)

12. With the source value and measurement value displayed, press **ENTER**.

RUNNING and the count time are displayed on the Function1 screen.

When the measurement time elapses, pulse count stops automatically.

To cancel counting while pulse count is in progress, press ENTER again.

Description

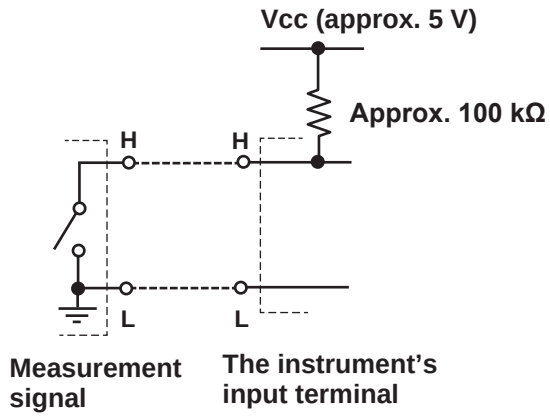
Measurement Range

You can select from the following four measurement ranges.

Range	Measurement Range	Notes
500 Hz	1.00 Hz to 550.00 Hz	frequency, measuring
5000 Hz	1.0 Hz to 5500.0 Hz	frequency, measuring
50 kHz	0.001 kHz to 50.000 kHz	frequency, measuring
PULSE COUNT	0 to 99999	The number of pulses is counted within a unit time period.

Contact Input

The frequency (when the range is set to 500 Hz, 5000 Hz, or 50 kHz) at which the contact turns on or off is measured. Or, the on/off count (when the range is set to PULSE COUNT) is taken.



Count Time of the Pulse Count

Set the time for counting pulses in units of minutes.
When the contact input is on, this is the time over which the number of on/off iterations of the contact is counted.

Displaying the Measured Values

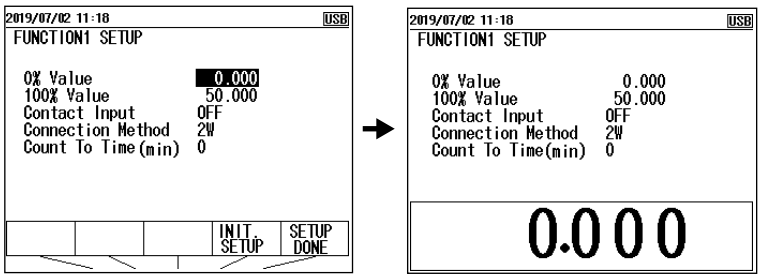
When the measurement signal frequency is low, it may take some time before the measurement result is displayed. During this time, the screen displays "- - - - -."
If the frequency is outside the measurement range, "OL" is displayed.

3.7 Setting the 0% and 100% Values

Procedure

Measurements Other Than Temperature Measurements Using a Thermocouple

1. With the source value and measurement value displayed, press **SETUP** under Function 1.
2. Use the cursor keys to select the **0% Value** value, and then press **ENTER**. The settings are displayed at the bottom of the screen.



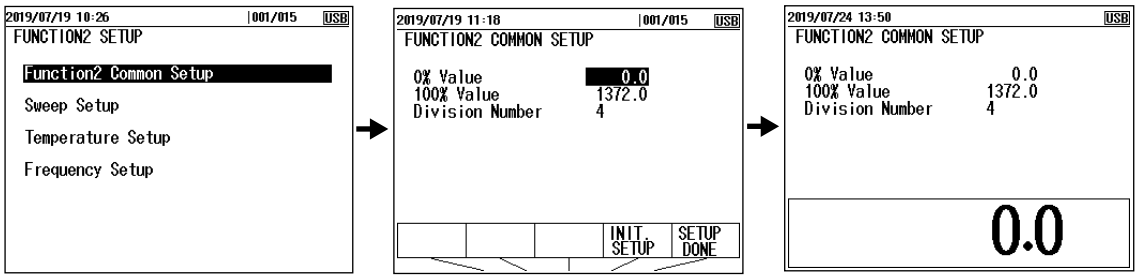
3. Use the arrow keys to select the 0% value, and then press **ENTER**.
4. Likewise, set the 100% value.
5. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and the screen reverts to show the source value and measurement value.

   The cancel the settings, press **ESC** to return to the screen and step 1.

   To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Temperature Measurements Using a Thermocouple

1. With the source value and measurement value displayed, press **SETUP** under Function 2.
2. Use the cursor keys to select **Function2 Common Setup**, and then press **ENTER**. A screen appears for setting the 0% and 100% values.
3. Use the cursor keys to select the **0% Value** value, and then press **ENTER**. The settings are displayed at the bottom of the screen.



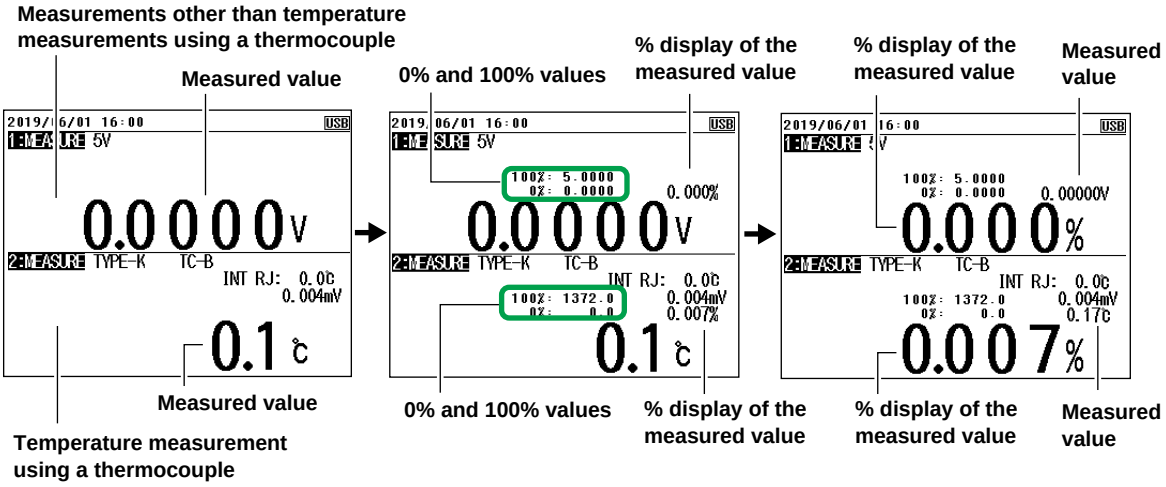
4. Use the arrow keys to select the 0% value, and then press **ENTER**.
5. Likewise, set the 100% value.
6. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and the screen reverts to show the source value and measurement value.

   The cancel the settings, press **ESC** to return to the screen and step 1.

   To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Switching the Display

1. When making measurements other than temperature measurements using a thermocouple, press **DISPLAY** under Function1. When measuring temperature using a thermocouple, press **DISPLAY** under Function2. The measurement value and percentage displays switch.



Description

0% and 100% Values

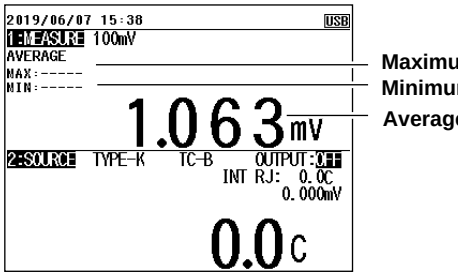
Assign an output value (specified according to the specifications of the device to be calibrated) to the 0% or 100% measurement value of this instrument, which is mapped to the 0% or 100% source value of this instrument.

The instrument displays errors, pass/fail judgment results (CA550), measurement percentages relative to the assigned value.

3.8 Average Value Display

Procedure

1. With the source value and measurement value displayed, press **AVERAGE** under Function 1. The average, maximum, and minimum values are displayed on the FUNCTION 1 screen.



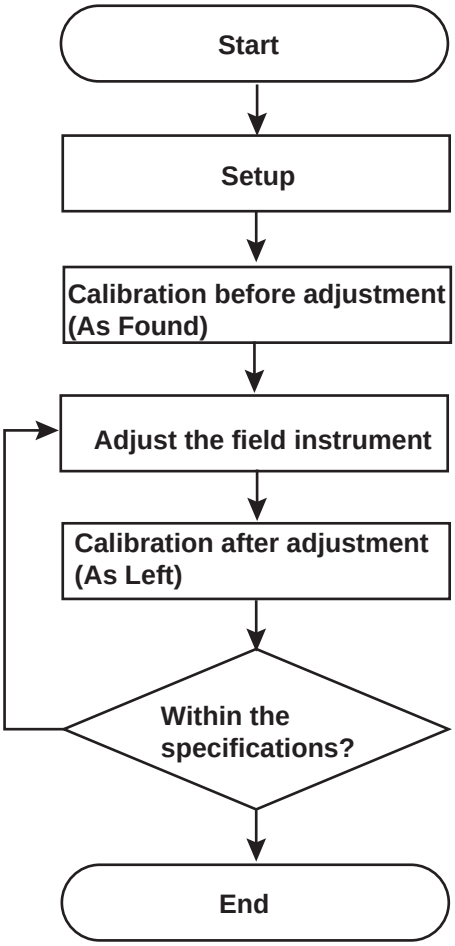
Description

Moving average values for every five measured values and the maximum value (MAX) and minimum value (MIN) of the moving average values are displayed.

4.1 Calibration Procedure

This section explains how to calibrate field instruments using the CA550 program sweep.

Workflow



Set the source, measurement, and program sweep according to the calibration target.

Execute a program sweep
(Save the device information, source value, measurement value, judgment result)

Execute a program sweep
(Save the device information, source value, measurement value, judgment result)

Calibration before Adjustment

Before adjusting a field instrument, check the output value at each calibration point.
Apply a signal to the device to be calibrated using the source function of this instrument and measure the output signal on this instrument.
Compare the value measured on this instrument to the specifications of the device to be calibrated.
The instrument's source values, measurement values, judgment results, and calibration target information are saved in this instrument in CSV format.

Calibration after Adjustment

After adjustment, check whether the output from the device to be calibrated is within the specifications at the same calibration points as those of the calibration before adjustment. If further adjustment is necessary, perform readjustment and calibration again.
By comparing the calibration data before adjustment and calibration data after adjustment, you can maintain the continuity in the measurement values of the field instrument.

4.2 Setting Calibration Conditions

Procedure

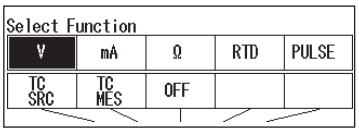
Setting the Source and Measurement

Set the source range and measurement range of this instrument according to the input signal and output signal of the device to be calibrated.

Setting the Source Range (Function 2)

For details on the source range, see chapter 2.

1. With the source value and measurement value displayed, press **FUNCTION 2**. The function options are displayed.
2. Use the arrow keys to set the function of your choice. The display returns to the source and measurement value display.



3. Under Function 2, press **RANGE**.
4. Use the arrow keys to set the source range. The display returns to the source and measurement value display.

Setting the Measurement Range (Function 1)

For details on the measurement range, see chapter 3.

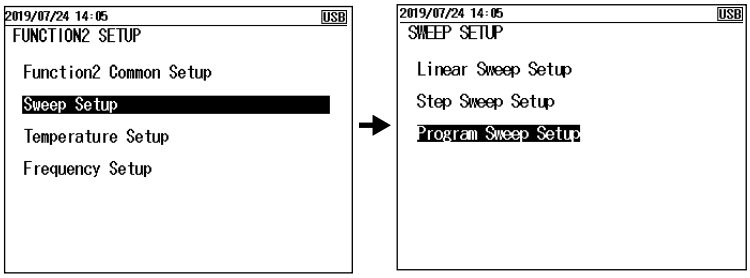
1. With the source value and measurement value displayed, press **FUNCTION 1**. The function options are displayed.
2. Use the arrow keys to set the function of your choice. The display returns to the source and measurement value display.

3. Under Function 1, press **RANGE**.
4. Use the arrow keys to set the measurement range. The display returns to the source and measurement value display.

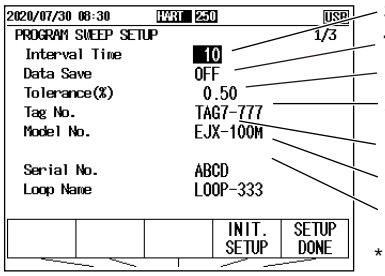
Setting a Program Sweep

Set the program sweep to generate signals at each calibration point.
For details on program sweep, see section 2.9, “Sweep Source”.

1. With the source value and measurement value displayed, press **SETUP** under Function 2.
2. Select **Sweep Setup**, and press **ENTER**.



3. Select **Program Sweep Setup**, and press **ENTER**.



Set the interval time.
Turn data save on or off.
Set the tolerance.
Set the tag number of the calibration target.
Set the model of the calibration target.
Set the serial number of the calibration target.
Set the loop name of the calibration target.

* Output settings are on pages 2/3 and 3/3.

4. Set the interval time, data save, and device information.
   Set data save to on.

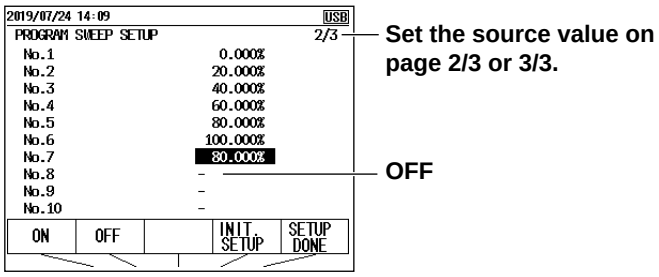
Loading Instrument Information

When you select Tag No., LOAD INFO appears in the selection menu. Press the arrow key corresponding to LOAD INFO to assign the latest device information that the instrument loaded to the tag number, model number, and serial number.

Setting the Source Value

5. Use the cursor keys to display page 2/3 of Program Sweep Setup.
6. Set the source value of each calibration point in order by number from No. 1.

   If a number is set to OFF, the instrument sweeps up to that number and sweeping stops.



Confirming the Settings

7. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and a screen appears showing the source value and measurement value.

   The cancel the settings, press **ESC** to return to the screen and step 2.

   To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Description

A field instrument is calibrated using the source function, measurement function, and program sweep.

Tolerance

Set the tolerance for judging measurement values as a percentage.
Set the tolerance as a percentage of the output value specified according to the specifications of the device to be calibrated.

Judging Measurement Values

Measurement results are judged pass or fail depending on whether the measurement values are within the tolerance.
Judgment results are saved along with the tolerance and the differences between the measurement values and reference values.

Loading Instrument Information

The latest device information loaded into the instrument can be assigned to the tag number, model number, and serial number. If the protocol is set to HART, HART device information is assigned. If the protocol is set to BRAIN, BRAIN device information is assigned. Device HART ID in the HART device information is assigned to the serial number. For BRAIN, the serial number is not assigned.

4.3 Saving Calibration Results

By setting Data Save of the program sweep function to ON, you can save source values, measurement values, judgment results, device information, and so on in CSV format.
The saved data can be displayed on this instrument or saved to a PC.
For details on the data format, see section 5.5, “Saved Data Format (CA550)”.

Note

- On this instrument, you can set the data separator of CSV files to comma, semicolon, or tab. When opening a CSV file in Excel or the like, check the data separator setting that was used when the data was saved.
- You need to install a CDC system definition file for YOKOGAWA products in the PC.
  For details on how to obtain the system definition file, access the following YOKOGAWA’s webpage, and download the file.
  https://tmi.yokogawa.com/library/
  File name: YKCDC USB Driver

Displaying Saved Data

See section 5.3, “Loading and Deleting Saved Data”.

Saving Data to a PC

section 5.4, “Copying Saved Data to a PC (CA550)”See

5.1 Saving Data Manually

Procedure

1. While sourcing or measurement is in progress, press **SAVE**. The source value and measurement value are saved to the internal memory of this instrument when SAVED is pressed.

Description

The method to save data is different between the CA500 and CA550.

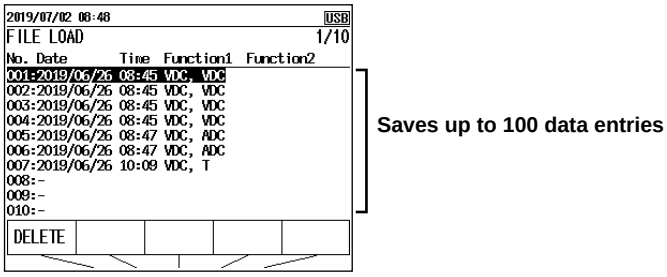
CA500

You can save the date and time, the selected function, range, measurement value, and source value when SAVE is pressed.

Number of Data Values That Can Be Saved

A total of up to 100 data entries can be saved including the saved sweep data.
Memory numbers from 001 to 100 are automatically assigned to the data entries.
Saving is not possible beyond 100 data entries. Delete unneeded data.

List of saved data



Data Format

The format that data is saved in is exclusive to this instrument.
You can load and display the data on this instrument. For instructions on how to load data, see section 5.3, “Loading and Deleting Saved Data”.
Data can also be loaded into a PC using communication commands.

Saved Information

The following information is saved.

Function1 Information

Saved data	Notes
Measured value	
Function	
Range	
0% value	
100% value	
Contact input setting	
Count time	

Function2 Information

Saved data		Notes
Source value		
Function		
Range		
0% value		
100% value		
Temperature setting	Thermocouple terminal setting	TC-A/TC-B
	TC-B RJC setting	ON/OFF
	Burnout setting	ON/OFF
	TC scale standard setting	IPTS-68/ITS-90
	Temperature unit	°C
Frequency setting	Amplitude voltage setting	
	Pulse count setting	
TC measurement settings	0% value	
	100% value	
Contact output setting		ON/OFF

CA550

You can save to a CSV file the date and time, the selected range, measurement value, and source value when SAVE is pressed.

Number of Data Values and Files That Can Be Saved

The maximum number of data entries that can be saved in a single CSV file is 2000.

Data is saved to the same file until any of the following conditions is met.

- When the FUNCTION1 SETUP or FUNCTION2 SETUP is changed
- When the function or range of Function 1 and Function 2 is changed
- When the number of save data points exceeds 2000
- When the power is turned off

Up to 250 CSV files can be saved.

Data Format

The data save format is CSV.

You can save data to a PC through USB and open it using Excel or other PC software applications.

The data separator is the symbol specified in section 7.4, “Setting the Decimal Symbol and CSV Separator”.

File Name

The following file name is automatically assigned.

YYYYMMDDhhmmss_xx.csv

YYYYMMDDhhmmss: year, month, day, hour, minute, and second when the first data entry was saved

YYYY: year, MM: month, DD: day, hh: hour, mm: minute, ss: second

xx: A sequence number starting from 00 that is assigned when the save date and time overlaps

Saved Information

The following information is saved.

Saved Item	Saved Content
MODEL	CA550
FILE VERSION	Version number of the saved file
FILE TYPE	0: Manually saved data using the SAVE key 1: Automatically saved data by a step sweep 2: Calibration data by a program sweep
CSV SEPARATOR	0: Comma, 1: Semicolon, 2: Tab
DECIMAL POINT	0: Period, 1: Comma
DATE FORMAT	0: YYYY/MM/DD 1: DD/MM/YYYY 2: MM/DD/YYYY
FUNCTION1 RANGE	Range DCV: 100 mV, 5 V, 50 V DCmA: 50 mA Ω: 400OHM, 4000OHM RTD: PT100(3850), PT100, JPT100, PT100(3926), PT200, PT500, PT1000, Cu10, Ni120, PT50, PT50G, PT100G, Cu50M, Cu100M Pulse: 500 Hz, 5000 Hz, 50 kHz, PULSE COUNT
FUNCTION1 UNIT	mV, V, mA, ohm, Hz, kHz, degC Blank when the FUNCTION1 function is set to PULSE COUNT or OFF
FUNCTION1 0% VALUE	0% Value, range boundary Blank when the FUNCTION1 function is set to OFF
FUNCTION1 100% VALUE	100% Value, range boundary Blank when the FUNCTION1 function is set to OFF
CONTACT INPUT	Contact input setting. ON/OFF
FUNCTION2 RANGE	Range DCV: 100 mV, 1-5 V, 1-5 V ROOT, 5 V, 30 V DCmA: 20 mA, 4-20 mA, 4-20 mA ROOT, 4-20 mA SIMULATE, 4-20 mA SIM ROOT Ω: 400OHM, 4000OHM TC: K, E, J, T, N, L, U, R, S, B, C, XK, A/, D, G, PLATINEL2, PR20-40 RTD: PT100(3850), PT100, JPT100, PT100(3926), PT200, PT500, PT1000, Cu10, Ni120, PT50, PT50G, PT100G, Cu50M, Cu100M Pulse: 500 Hz, 5000 Hz, 50 kHz, CPM
FUNCTION2 UNIT	mV, V, mA, ohm, Hz, kHz, degC Blank when the FUNCTION2 function is set to CPM or OFF
FUNCTION2 0% VALUE	0% Value, range boundary Blank when the FUNCTION2 function is set to OFF
FUNCTION2 100% VALUE	100% Value, range boundary Blank when the FUNCTION2 function is set to OFF
TC SETTING TERMINAL	Thermocouple terminal setting. TC-A/ TC-B
TC SETTING TC-B RJC	TC-B RJC ON/OFF setting. ON/OFF
TC SETTING BURNOUT	Burnout setting. ON/OFF
TC SETTING SCALE	TC scale standard setting. ITS-90/IPTS-68
FREQUENCY SETTING VOLT	Amplitude voltage setting. 0.1 V to 15.0 V
FREQUENCY SETTING COUNT	Number of output pulse count. 0, 1 to 10000
CONTACT OUTPUT	Contact output setting. ON/OFF

5.2 Saving Sweeps

Procedure

1. Set DATA SAVE to ON in the step sweep or program sweep settings according to section 2.9, “Sweep Source”.
2. Execute a sweep. After the sweep is completed, the source values and measurement values of each step are saved.

Description

When a step sweep or program sweep is completed, the source values and measurement values of each step are saved automatically.

CA500

The saved information is the same as that explained in “Saving Data Manually” and Section 5.1.
A total of up to 100 data entries can be saved including manually save data.
Depending on the number-of-steps setting, 100 data entries may be exceeded when a sweep is saved. In this situation, an error message is displayed when a sweep is started.
Data is saved in a dedicated format of this instrument.
If you abort a sweep, the data up to that point is saved.

CA550

For a step sweep, the same information as that explained in “Saving Data Manually” in Section 5.1 is saved in a single CSV file. If you abort a sweep, the data up to that point is saved.
For a program sweep, the same information as that explained in “Saving Data Manually” in Section 5.1 and the calibration target information are saved in a single CSV file. If you abort a sweep, the data is not saved.
A total of up to 250 step sweep and program sweep files can be saved.

File Name

The following file name is automatically assigned.

Step sweep: YYYYMMDDhhmmss_xx.csv
YYYYMMDDhhmmss: year, month, day, hour, minute, and second when the data entry was saved
YYYY: year, MM: month, DD: day, hh: hour, mm: minute, ss: second
xx: A sequence number starting from 00 that is assigned when the save date and time overlaps

Program sweep: Tag No. + YYYYMMDDhhmm_xx.csv
YYYYMMDDhhmm: year, month, day, hour, and minute when the data entry was saved
xx: A sequence number starting from 00 that is assigned when the save date and time overlaps

Saved Information

The following information is saved.

Saving Data Using Step Sweep

Saved Item	Saved Content
MODEL	CA550
FILE VERSION	Version number of the saved file
FILE TYPE	0: Manually saved data using the SAVE key 1: Automatically saved data by a step sweep 2: Calibration data by a program sweep
CSV SEPARATOR	0: Comma, 1: Semicolon, 2: Tab
DECIMAL POINT	0: Period, 1: Comma
DATE FORMAT	0: YYYY/MM/DD 1: DD/MM/YYYY 2: MM/DD/YYYY
FUNCTION1 RANGE	Range DCV: 100 mV, 5 V, 50 V DCmA: 50 mA Ω: 400OHM, 4000OHM RTD: PT100(3850), PT100, JPT100, PT100(3926), PT200, PT500, PT1000, Cu10, Ni120, PT50, PT50G, PT100G, Cu50M, Cu100M Pulse: 500 Hz, 5000 Hz, 50 kHz, PULSE COUNT
FUNCTION1 UNIT	mV, V, mA, ohm, Hz, kHz, degC Blank when the FUNCTION1 function is set to PULSE COUNT or OFF
FUNCTION1 0% VALUE	0% Value, range boundary Blank when the FUNCTION1 function is set to OFF
FUNCTION1 100% VALUE	100% Value, range boundary Blank when the FUNCTION1 function is set to OFF
CONTACT INPUT	Contact input setting. ON/OFF
FUNCTION2 RANGE	Range DCV: 100 mV, 1-5 V, 1-5 V ROOT, 5 V, 30 V DCmA: 20 mA, 4-20 mA, 4-20 mA ROOT, 4-20 mA SIMULATE, 4-20 mA SIM ROOT Ω: 400OHM, 4000OHM TC: K, E, J, T, N, L, U, R, S, B, C, XK, A/, D, G, PLATINEL2, PR20-40 RTD: PT100(3850), PT100, JPT100, PT100(3926), PT200, PT500, PT1000, Cu10, Ni120, PT50, PT50G, PT100G, Cu50M, Cu100M Pulse: 500 Hz, 5000 Hz, 50 kHz, CPM
FUNCTION2 UNIT	mV, V, mA, ohm, Hz, kHz, degC
FUNCTION2 0% VALUE	0% Value, range boundary
FUNCTION2 100% VALUE	100% Value, range boundary
TC SETTING TERMINAL	Thermocouple terminal setting. TC-A/ TC-B
TC SETTING TC-B RJC	TC-B RJC ON/OFF setting. ON/OFF
TC SETTING BURNOUT	Burnout setting. ON/OFF
TC SETTING SCALE	TC scale standard setting. ITS-90/IPTS-68
FREQUENCY SETTING VOLT	Amplitude voltage setting. 0.1 V to 15.0 V
FREQUENCY SETTING COUNT	Number of output pulse count. 0, 1 to 10000
CONTACT OUTPUT	Contact output setting. ON/OFF

Saving Data Using Program Sweep

Saved Item	Saved Content
MODEL	CA550
FILE VERSION	Version number of the saved file
FILE TYPE	0: Manually saved data using the SAVE key 1: Automatically saved data by a step sweep 2: Calibration data by a program sweep
CSV SEPARATOR	0: Comma, 1: Semicolon, 2: Tab
DECIMAL POINT	0: Period, 1: Comma
DATE FORMAT	0: YYYY/MM/DD 1: DD/MM/YYYY 2: MM/DD/YYYY
FUNCTION1 RANGE	Range DCV: 100 mV, 5 V, 50 V DCmA: 50 mA Ω: 400OHM, 4000OHM RTD: PT100(3850), PT100, JPT100, PT100(3926), PT200, PT500, PT1000, Cu10, Ni120, PT50, PT50G, PT100G, Cu50M, Cu100M Pulse: 500 Hz, 5000 Hz, 50 kHz, PULSE COUNT
FUNCTION1 UNIT	mV, V, mA, ohm, Hz, kHz, degC Blank when the FUNCTION1 function is set to PULSE COUNT or OFF
FUNCTION1 0% VALUE	0% Value, range boundary Blank when the FUNCTION1 function is set to OFF
FUNCTION1 100% VALUE	100% Value, range boundary Blank when the FUNCTION1 function is set to OFF
CONTACT INPUT	Contact input setting. ON/OFF
FUNCTION2 RANGE	Range DCV: 100 mV, 1-5 V, 1-5 V ROOT, 5 V, 30 V DCmA: 20 mA, 4-20 mA, 4-20 mA ROOT, 4-20 mA SIMULATE, 4-20 mA SIM ROOT Ω: 400OHM, 4000OHM TC: K, E, J, T, N, L, U, R, S, B, C, XK, A/, D, G, PLATINEL2, PR20-40 RTD: PT100(3850), PT100, JPT100, PT100(3926), PT200, PT500, PT1000, Cu10, Ni120, PT50, PT50G, PT100G, Cu50M, Cu100M Pulse: 500 Hz, 5000 Hz, 50 kHz, CPM
FUNCTION2 UNIT	mV, V, mA, ohm, Hz, kHz, degC
FUNCTION2 0% VALUE	0% Value, range boundary
FUNCTION2 100% VALUE	100% Value, range boundary
TC SETTING TERMINAL	Thermocouple terminal setting. TC-A/ TC-B
TC SETTING TC-B RJC	TC-B RJC ON/OFF setting. ON/OFF
TC SETTING BURNOUT	Burnout setting. ON/OFF
TC SETTING SCALE	TC scale standard setting. ITS-90/IPTS-68
FREQUENCY SETTING VOLT	Amplitude voltage setting. 0.1 V to 15.0 V
FREQUENCY SETTING COUNT	Number of output pulse count. 0, 1 to 10000
CONTACT OUTPUT	Contact output setting. ON/OFF
TAG NO	Tag number
MODEL NO	Model number
SERIAL NO	Serial number
LOOP NAME	Loop name
CALIBRATION DATE	Calibration date YYYY/MM/DD
CALIBRATOR S/N	CA550 serial number
No.	Calibration point number
DATE	Calibration date YYYY/MM/DD
TIME	Calibration time of the calibration point hh:mm:ss
MEASURE	Measured value
SOURCE	Source value
ERROR%	Error
PASS/FAIL	Pass/fail

Errors and Pass/Fail Judgment

The instrument determines the error in the actual output value of the measured calibration target relative to the output value (specified according to the specifications of the device to be calibrated) that is mapped to the source value and saves it as a percentage.
The instrument judges pass or fail depending on whether the value is within the tolerance specified in the SETUP menu of Function 1.
Proper judgment cannot be made unless the 0% or 100% measurement value of this instrument is assigned to the output value (specified according to the specification of the device to be calibrated) that is mapped to the 0% or 100% source value of this instrument.

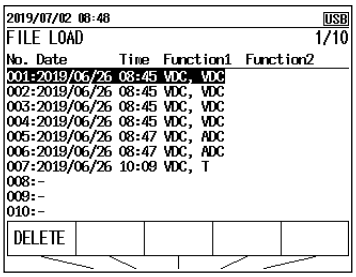
5.3 Loading and Deleting Saved Data

Procedure

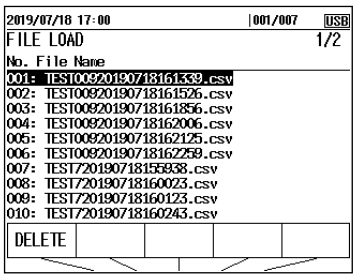
1. With the source value and measurement value displayed, press **LOAD**. A list of saved data is displayed.

   On the CA500, a list of data saved using the SAVE key is displayed. On the CA550, a list of CSV files saved using program sweeps is displayed.

CA500



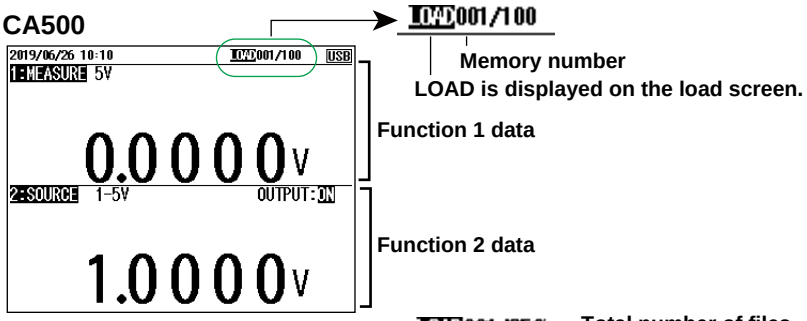
CA550



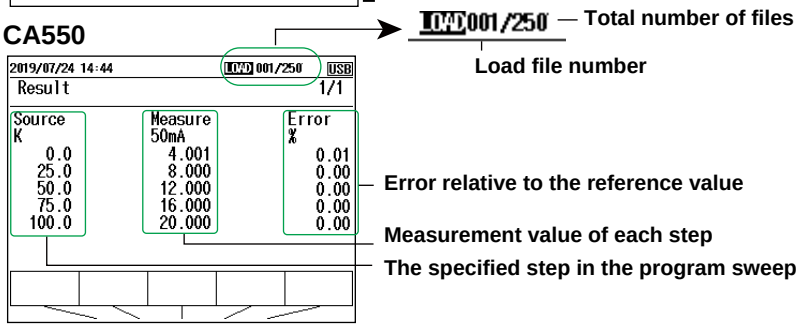
2. Use the cursor keys to select the data you want to load, and then press **ENTER**.

   The screen displays the loaded source value and measurement value (“LOAD” appears at the top of the screen).

CA500



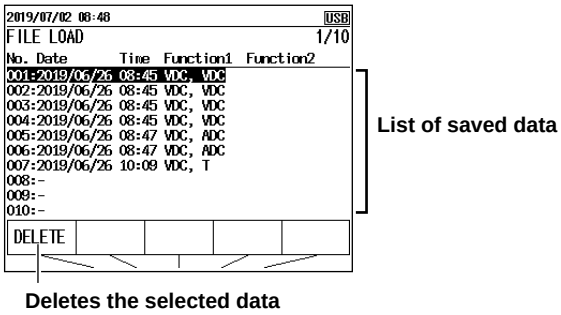
CA550



3. Use the cursor keys to change the displayed data.
4. On the CA500, when you press **ENTER**, the settings in the loaded file are applied to the CA500.
5. When you press **ESC**, the screen returns to the overview screen of step 1.

Delete data.

1. With the source value and measurement value displayed, press **LOAD**. A list of saved data is displayed.



2. Use the cursor keys to select the data you want to delete, and then press **DELETE**. A confirmation message appears.

3. To delete, press **ENTER**. To cancel deleting, press **ESC**.

To delete data that cannot be loaded, format the internal memory (see section 7.7, “Formatting (Initializing) the Internal Memory”).

Description

You can load saved data to view measurement values and source values and change the settings according to the loaded data settings.

Data That Can Be Loaded

The following data can be loaded.

CA500: Data saved manually, data saved using step sweep or program sweep

CA550: File save using program sweep

Deleting Data

When the saved data or the number of files reaches the upper limit, data can no longer be saved. If this occurs, you need to delete data or files.

Data saved on the CA500 or data saved automatically using the CA550 program sweep can be deleted on the ROAD screen. To delete other types of data, format the internal memory.

If you format the internal memory, all the data in the internal memory will be deleted.

5.4 Copying Saved Data to a PC (CA550)

Procedure

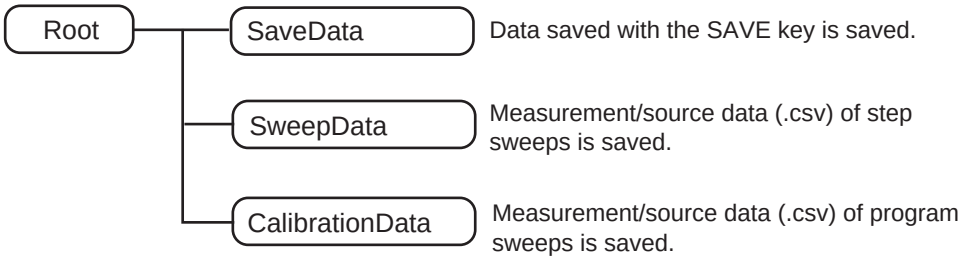
1. Connect this instrument to a PC through USB. This instrument is displayed as a USB storage device on the PC.
2. Copy the necessary data to the PC.

Description

CSV data saved on the CA550 can be copied to a PC.

Folder Structure

The following figure shows the CA550 folder structure.



Note

- Data cannot be written to or deleted from the CA500 internal memory from a PC.
- The CA550 internal memory information displayed on the PC is not updated automatically. To update the information, remove the USB cable, or restart the CA550.

USB Interface Specifications

Electrical and mechanical specifications	Complies with USB Rev.1.1
Connector	Type B connector (receptacle)
Number of ports	1
Power supply	Self powered, bus powered
PC system requirements	A PC running Windows 8.1 or Windows 10 with a standard USB port.

CDC(Communication Device Class)

This instrument uses CDC to communicate with a PC.

You need to install a CDC system definition file for YOKOGAWA products in the PC.

For details on how to obtain the system definition file, access the following YOKOGAWA's webpage, and download the file.

https://tmi.yokogawa.com/library/

File name: YKCDC USB Driver

5.5 Saved Data Format (CA550)

The saved data (CSV) format on the CA550 is as follows:

Data Saved Using the SAVE Key

MODEL	CA550
FILE VERSION	2.01
FILE TYPE	0
CSV SEPARATOR	0
DECIMAL POINT	0
DATE FORMAT	0
FUNCTION1 RANGE	4-20mA
FUNCTION1 UNIT	mA
FUNCTION1 0%VALUE	4.000
FUNCTION1 100%VALUE	20.000
CONTACT INPUT	OFF
FUNCTION2 RANGE	K
FUNCTION2 UNIT	degC
FUNCTION2 0%VALUE	0.0
FUNCTION2 100%VALUE	100.0
TC SETTING TERMINAL	TC-B
TC SETTING TC-B RJC	ON
TC SETTING BURNOUT	ON
TC SETTING SCALE	ITS-90
FREQUENCY SETTING VOLT	3.0
FREQUENCY SETTING COUNT	0
CONTACT OUTPUT	OFF

No.	DATE	TIME	FUNCTION2	FUNCTION1	
1	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx	Measurement/source value
2	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx	
3	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx	
4	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx	

Data Saved Using Step Sweep

MODEL	CA550
FILE VERSION	2.01
FILE TYPE	1
CSV SEPARATOR	0
DECIMAL POINT	0
DATE FORMAT	0
FUNCTION1 RANGE	4-20mA
FUNCTION1 UNIT	mA
FUNCTION1 0%VALUE	4.000
FUNCTION1 100%VALUE	20.000
CONTACT INPUT	OFF
FUNCTION2 RANGE	K
FUNCTION2 UNIT	degC
FUNCTION2 0%VALUE	0.0
FUNCTION2 100%VALUE	100.0
TC SETTING TERMINAL	TC-B
TC SETTING TC-B RJC	ON
TC SETTING BURNOUT	ON
TC SETTING SCALE	ITS-90
FREQUENCY SETTING VOLT	3.0
FREQUENCY SETTING COUNT	0
CONTACT OUTPUT	OFF

No.	DATE	TIME	FUNCTION2	FUNCTION1
1	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx
2	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx
3	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx
4	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx
5	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx
6	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx
7	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx
8	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx
9	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx
10	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx

Data Saved Using Program Sweep

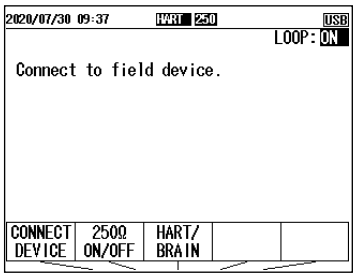
MODEL	CA550
FILE VERSION	2.01
FILE TYPE	2
CSV SEPARATOR	0
DECIMAL POINT	0
DATE FORMAT	0
FUNCTION1 RANGE	4-20mA
FUNCTION1 UNIT	mA
FUNCTION1 0%VALUE	4.000
FUNCTION1 100%VALUE	20.000
CONTACT INPUT	OFF
FUNCTION2 RANGE	K
FUNCTION2 UNIT	degC
FUNCTION2 0%VALUE	0.0
FUNCTION2 100%VALUE	100.0
TC SETTING TERMINAL	TC-B
TC SETTING TC-B RJC	ON
TC SETTING BURNOUT	ON
TC SETTING SCALE	ITS-90
FREQUENCY SETTING VOLT	3.0
FREQUENCY SETTING COUNT	0
CONTACT OUTPUT	OFF
TAG NO	TAG-01
MODEL NO	EJXxx
SERIAL NO	91Mxxyyyy
LOOP NAME	LOOP-01
CALIBRATION DATE	yyyymmdd
CALIBRATOR S/N	91Mxxyyyy

No.	DATE	TIME	FUNCTION2	FUNCTION1	ERROR(%)	PASS/FAIL
1	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx	±xxx.xx	PASS
2	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx	±xxx.xx	PASS
3	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx	±xxx.xx	PASS
4	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx	±xxx.xx	PASS
5	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx	±xxx.xx	FAIL
6	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx	±xxx.xx	PASS
7	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx	±xxx.xx	PASS
8	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx	±xxx.xx	PASS
9	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx	±xxx.xx	PASS
10	xxxx/xx/xx	xx:xx:xx	±xxx.xx	±xx.xxx	±xxx.xx	PASS

6.1 Selecting a Communication Protocol and Establishing a Connection

Procedure

1. With the source value and measurement value displayed, press **COM**. Field communication mode is activated, and the connection standby screen appears.



2. Press the **HART/BRAIN** soft key. The selected protocol is displayed at the top of the screen.

   This setting applies also to the protocol setting of the modem function in section 6.7.

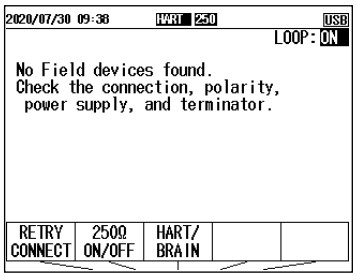
3. If necessary, press the **250Ω ON/OFF** arrow key to turn the communication resistance on or off.

   This setting applies also to the communication resistance setting in section 7.2.

4. Press the **CONNECT DEVICE** arrow key. A connection is made to an instrument with the polling address set to zero.

   When a connection is confirmed, a process display screen appears in the case of HART communication or a menu screen in the case of BRAIN communication.

   If a connection is not confirmed, the connection error screen appears. Check the device settings and connection status, and press the **RETRY CONNECT** arrow key.



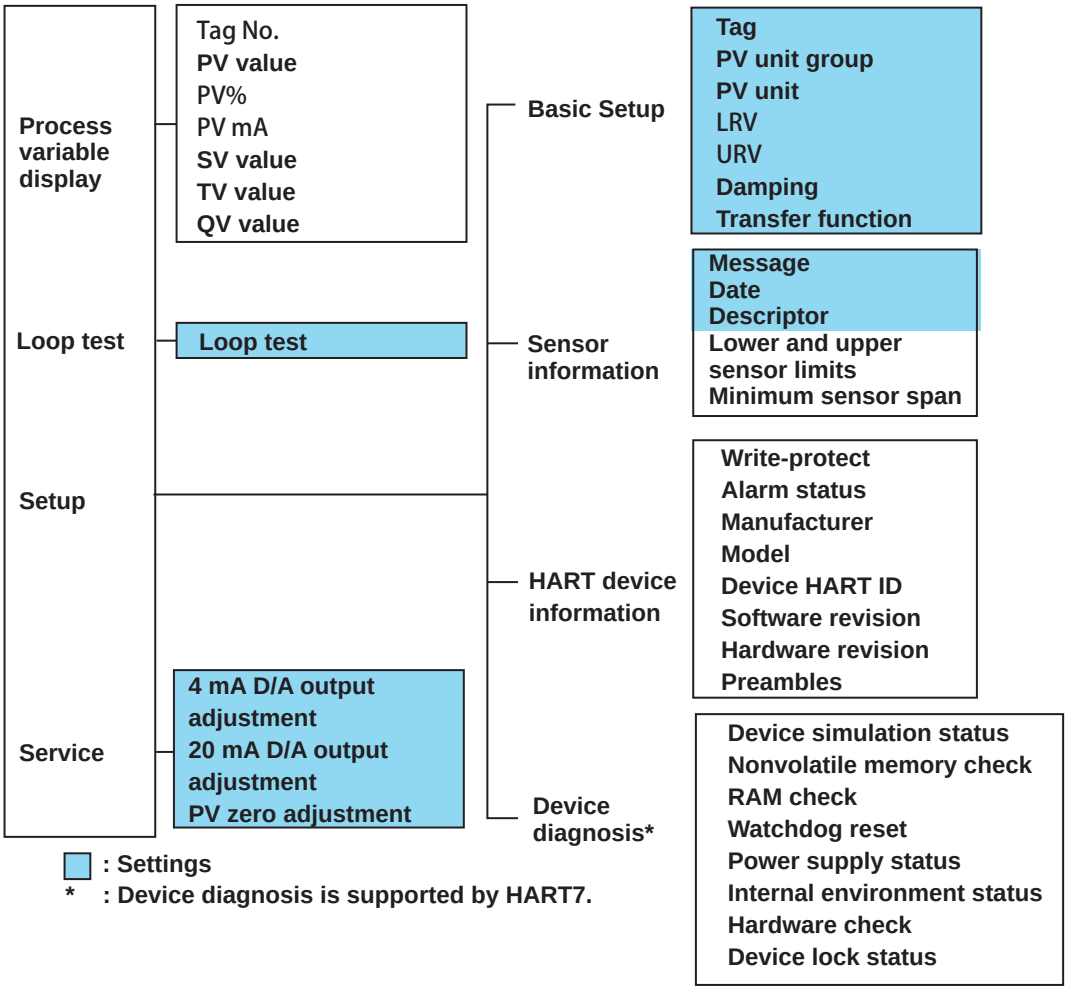
Explanation

Field Communication Mode

Field communication mode is used to communicate with field instruments using HART or BRAIN communication.
Press COM to change the mode to field communication.
In field communication mode, Function1 is fixed to mA and Function2 is disabled.
The field communication protocol is a setting shared with the modem function explained in section 6.7.

HART Communication

The supported protocol revisions are rev. 5, rev. 6, and rev. 7.
A portion of universal and common practice commands are supported.
Multidrop and burst mode are not supported.
By using HART communication, you can connect to a transmitter that supports HART communication, display the device information, and adjust the transmitter.
The following HART communication menu items can be displayed and edited.



Note

Connection is possible with a transmitter in burst mode, but burst data received from the transmitter cannot be displayed.

Process variable display

Process variables that can be obtained using universal commands and common-practice commands can be displayed.

Loop Test

A loop test can be executed.

Settings

You can set and display the following items.

- Basic transmitter setup
- Displaying sensor information
- Displaying HART device information
- Displaying device diagnosis results

Service

The transmitter's 4 mA and 20 mA outputs can be adjusted, and pressure zero adjustment can be performed.

Universal Command and Common Practice Command

- LRV and URV settings only support Common Practice command 35. LRV and URV settings apply to analog output. You cannot set the display range, unit, or other transmitter-specific parameters.
- D/A output adjustment (4 mA) and D/A output adjustment (20 mA) only support Common Practice commands 45 and 46. You cannot set a percentage or other transmitter-specific parameters.
- PV zero adjustment only supports Common Practice command 43. This sets the sensor's zero level, not LRV or URV.
- Universal commands 13 and 18 do not support long tags.
- The following table shows the Universal/Common Practice commands that the CA550 field communication mode supports. The target transmitter needs to support the following commands.

Universal Command

Command	Description		Note
0	Read Unique Identifier	Reads the identifier	Returns the field device ID information
2	Read Loop Current And Percent Of Range	Reads the loop current and percentage	
3	Read Dynamic Variables And Loop Current	Reads dynamic variables and loop current	Reads the PV current, PV value, SV value, TV value, and QV value
12	Read Message	Read a message	
13	Read Tag, Descriptor, Date	Reads a short tag, descriptor, and date	
14	Read Primary Variable Transducer Information	Reads the PV transducer information	Transducer's upper limit, lower limit, and minimum span value
15	Read Device Information	Reads the device information	PV alarm information, PV transfer function, upper PV range limit, lower PV range limit, write protection state
17	Write Message	Writes a message	
18	Write Tag, Descriptor, Date	Writes a short tag, descriptor, and date	

Command	Description		Note
48	Read Additional Device Status	Reads the device status	• The device is in simulation mode. • Non-volatile memory check is disabled or broken. • Battery backed up memory is corrupt. • RAM memory check is disabled or broken. • Watchdog reset was executed. • The power supply or voltage is outside the tolerance range. • Internal or environmental state exceeded the tolerance. • Error detected in hardware not related to the sensor. • The device is write-protected or locked.

Common Practice Command

Command	Description		Note
34	Write Primary Variable Damping Value	Writes a PV damping value	
35	Write Primary Variable Range Value	Writes a PV range value	Upper PV range limit, lower PV range limit
40	Enter/Exit Fixed Current Mode	Starts or exits fixed current mode	
43	Set Primary Variable Zero	PV zero adjustment	
44	Write Primary Variable Units	Writes the PV unit.	
45	Trim Loop Current Zero	Current zero adjustment	
46	Trim Loop Current Gain	Current gain adjustment	
47	Write Primary Variable Transfer Function	Writes a PV transfer function	A transfer function used for the loop current and PV value

BRAIN Communication

Model number, tag number, and self check result information can be obtained from a connected BRAIN device and displayed. In addition, the obtained model number and tag number can be applied to the device information for program sweeping.
The supported protocol revisions are rev.1.00 and rev. 2.00.

Changes to Settings

When the instrument is returned to normal mode from field communication mode, the following settings will be changed. Other settings are returned the values that were in use before switching to field communication mode.

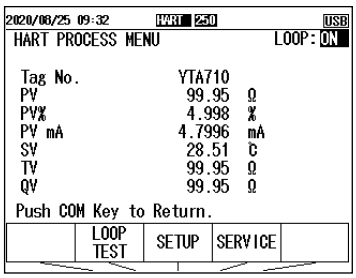
Setting Item	Setting
FUNCTION1 Function	mA
FUNCTION1 Range	50 mA
FUNCTION1 0% value	4.000 mA
FUNCTION1 100% value	20.000 mA
FUNCTION2 Function	mA
FUNCTION2 Range	4-20 mA
FUNCTION2 0% value	4.000 mA
FUNCTION2 100% value	20.000 mA
Modem Select	ON
OUTPUT ON/OFF	OFF
LOOP POWER	Same as in field communication mode

6.2 Displaying Process Variables (HART)

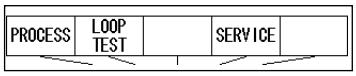
Procedure

1. Set the communication protocol to HART, and press the **CONNECT DEVICE** arrow key according to section 6.1.

   When a connection is confirmed, a process display screen appears.



   If a LOOP TEST, HART SETUP, or HART SERVICE MENU is displayed, press the **PROCESS** arrow key.



2. To return to the screen showing measurement and source values, press **COM**.

Explanation

The transmitter's process variables can be displayed.

Tag No.: The transmitter's tag number (short tag)
PV: Primary Variable
PV%: PV percentage relative to URV-LRV
PV mA: Output value
SV: Secondary Variable
TV: Tertiary Variable
QV: Quaternary Variable

Note

The displayed device variable varies depending on the transmitter.

6.3 Executing a Loop Test

Procedure

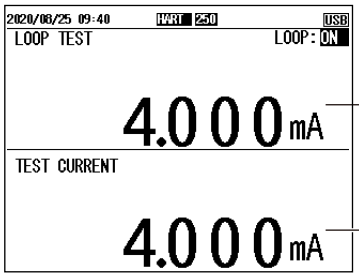
Connect this instrument to the HART device in advance according to section 2.3, “Connecting Cables,” in the separate manual “CA500, CA550 Multifunction Process Calibrator Getting Started Guide”(IM CA500-02EN).

1. Set the communication protocol to HART, and press the **CONNECT DEVICE** arrow key according to section 6.1.

   When a connection is confirmed, a process display screen appears.

2. Press the **LOOP TEST** arrow key. A Loop Test screen appears.

   The HART device’s output value measured by this instrument is displayed in the top half of the screen.



Measured value (output value of the connected device)

Setting

   If the HART device is in fixed current mode, an error message will appear. Because loop tests cannot be performed in fixed current mode, exit from the mode.

3. Using the **UP/DOWN** cursor keys or **0%/100%**, set the output value to assigned to the HART device displayed at the lower half of the screen. The HART device’s output setting is changed.

   The setting can be changed in 4-mA steps. The setting range is 0.001 mA to 24.000 mA.

   You can set any value by using the arrow keys of each digit.

4. Check the difference between the the measured value displayed in the top half of the screen and the setting displayed in the bottom half.

Explanation

You can change a HART device’s output setting from this instrument and compare the actual HART device’s output value to the setting.

In the loop test of the CA550’s field communication mode, you can only perform standalone loop tests, which uses a one-to-one connection between the HART device and this instrument.

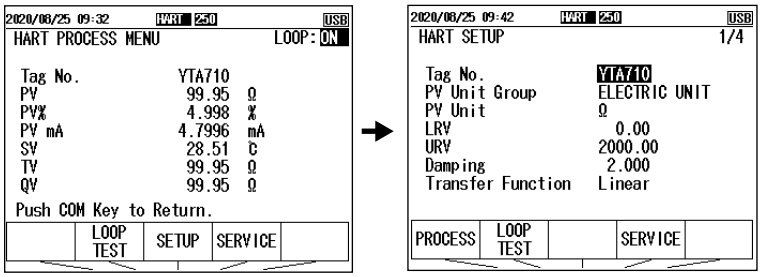
6.4 Configuring a HART Device

Procedure

1. Set the communication protocol to HART, and press the **CONNECT DEVICE** arrow key according to section 6.1.

   When a connection is confirmed, a process display screen appears.

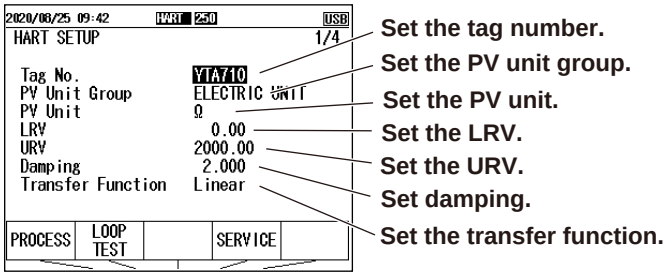
2. Press the **SETUP** arrow key. A HART Setup screen appears.



   You can use the cursor keys to switch between pages in the following order: basic setup, sensor information, HART device information, and device diagnosis results.

   Under HART Setup, you can display and set basic setup, sensor information, HART device information, and devise diagnosis results.

Basic Setup



3. Set **Tag No.**, **PV Unit Group**, **PV Unit**, **LRV**, **URV**, **Damping** (damping time constant), and **Transfer Function**.

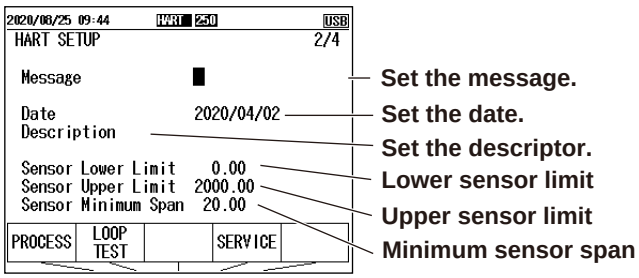
4. Press **ENTER**. The set contents are written to the HART device.

Note

Units not defined by International System of Units (SI units) are displayed in Unit Code. For details on Unit Code, see “HCF_SPEC-183 Common Tables Specification Table 2. Engineering Unit Code.”

Setting and Displaying Sensor Information

3. Use the cursor keys to display page 2/4.



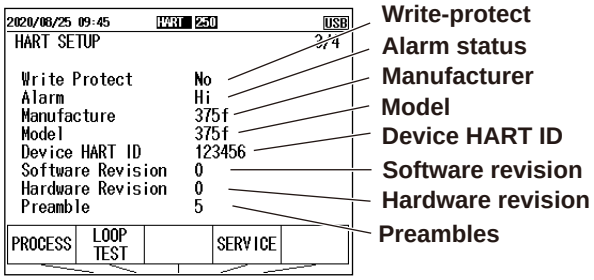
4. Set **Message**, **Date**, and **Description**.

   Sensor Low Limit, Sensor Upper Limit, and Sensor Minimum Span cannot be set.

5. Press **ENTER**. The set contents are written to the HART device.

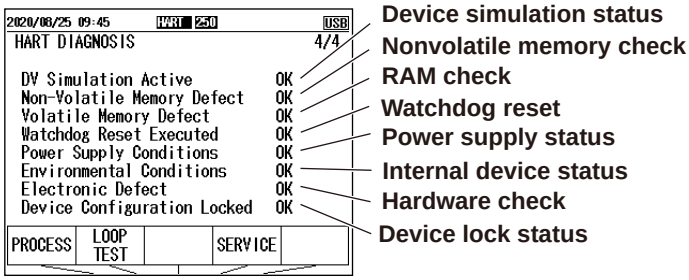
Displaying HART Device Information

3. Use the cursor keys to display page 3/4.



Displaying Device Diagnosis Results

3. Use the cursor keys to display page 4/4.



Explanation

Basic Setup

You can set the following items on the connected HART device.

Tag No.*: Displaying and setting the tag number (short tag)

PV Unit Group: Displaying and setting the unit group of the PV (Primary Variable)

TEMPERATURE	PRESSURE
VOLUMETRIC FLOW	VELOCITY
VOLUME	LENGTH
TIME	MASS
MASS FLOW	MASS PAR VOLUME
VISCOSITY	ELECTRIC UNIT
ENEGY	POWER
RADIAL VELOCITY	MISCELLANEOUS

PV Unit: Displaying and setting the unit of the PV (Primary Variable)
The selectable unit varies depending on the PV Unit Group setting.
Units not defined by International System of Units are displayed in Unit Code.

LRV: Displaying and setting the lower range limit

URV: Displaying and setting the upper range limit

Damping: Displaying and setting the damping time constant

Transfer Function: Displaying and setting the transfer function

*: Applied to Tag No. of the CA550 program sweep (section 2.9)

Sensor Information

You can set and display the sensor information of the connected HART device.

Message: Displaying and setting messages

Date: Displaying and setting the date

Description: Displaying and setting the descriptor

Sensor Lower Limit: Displaying the lower sensor limit

Sensor Upper Limit: Displaying the upper sensor limit

Sensor Minimum Span: Displaying the minimum sensor span

Displaying HART Device Information

The device information of the connected HART device can be displayed.

Write Protect:	Displaying write-protection
Alarm:	Displaying alarm status
Manugfacture:	Displaying the manufacturer (in hexadecimal)
Model*:	Displaying the model (in hexadecimal)
Device HART ID:	Displaying the device's HART ID (in hexadecimal)
Software Revision:	Displaying the software revision
Hardware Revision:	Displaying the hardware revision
Preamble:	Displaying the preamble number

*: Applied to Model No. of the CA550 program sweep (section 2.9)

Note

Device HART ID can be applied to the device information serial number for CA550 program sweeping.

Displaying Device Diagnosis Results

The diagnosis result of the connected HART device can be displayed.

DV Simulation Active:	Displaying the device simulation status
Non-Volatile Memory Defect:	Displaying the non-volatile memory check status
Volatile Memory Defect:	Displaying the RAM check status
Watchdog Reset Executed:	Displaying the watchdog reset confirmation
Power Supply Conditions:	Displaying the power supply status
Enviromental Conditions:	Displaying the internal status
Electronic Defect:	Displaying the status of the hardware excluding the sensor
Device Configration Locked:	Displaying the device lock status

(OK: Normal, NG: Error)

Note

When the protocol revision is rev.5 or rev. 6, a hyphen is displayed for each diagnosis result.

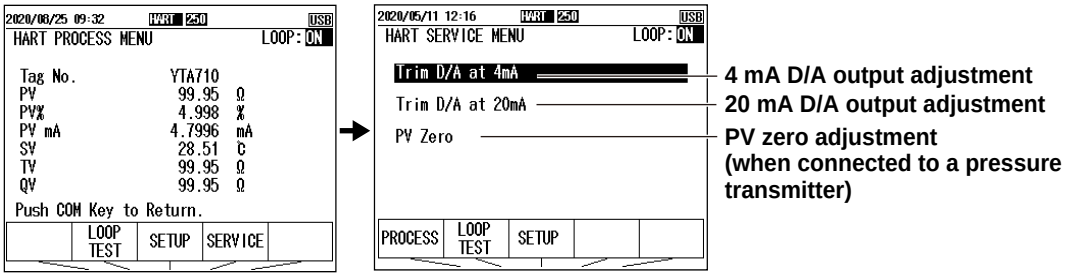
6.5 Calibrating a HART Device

Procedure

1. Set the communication protocol to HART, and press the **CONNECT DEVICE** arrow key according to section 6.1.

   When a connection is confirmed, a process display screen appears.

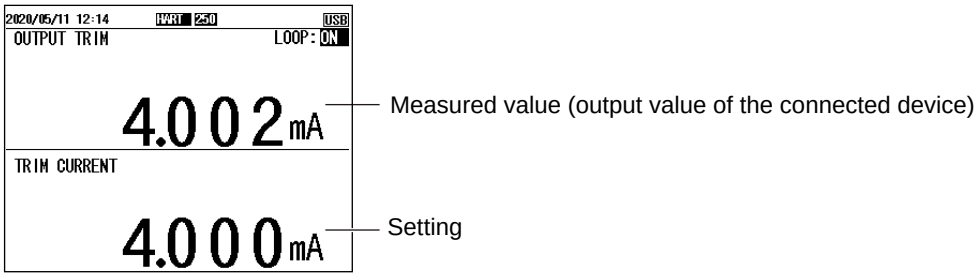
2. Press the **SERVICE** arrow key. A HART SERVICE MENU screen appears.



   Adjust the 4 mA D/A output, 20 mA D/A output, and PV zero.

4 mA D/A Output Adjustment, 20 mA D/A Output Adjustment

3. Use the cursor keys to select **Trim D/A at 4mA**, and then press **ENTER**. A D/A output adjustment screen appears. Send a 4 mA output request from this instrument to the HART device.



   If the HART device is in fixed current mode, an error message will appear. Because D/A output adjustment cannot be performed in fixed current mode, exit from the mode.

4. Check the measured value on this instrument, and use the arrow keys to set the current (the current measured on this instrument) to assign to the HART device.

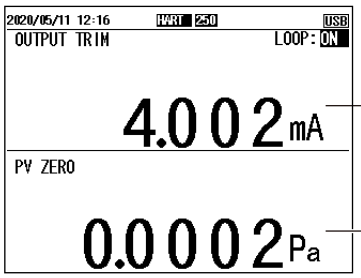
5. Press **ENTER**. The set current is assigned as the output value of the HART device.

6. Likewise, set Trim D/A at 20mA.

PV Zero Adjustment

3. Use the cursor keys to select **PV Zero**, and then press **ENTER**. A PV zero adjustment screen appears.

   The value measured on this instrument is displayed in the top half of the screen and the measured value obtained through HART communication in the bottom half.



Measured value (output current value of the connected device)

Measured value (PV value of the connected device)

4. Press **ENTER**. Zero adjustment is executed on the HART device.

Explanation

4 mA D/A Output Adjustment, 20 mA D/A Output Adjustment

Through HART communication, the HART device's output values are adjusted for the 4 mA or 20 mA output request sent from this instrument to the HART device.
The same value as the measured value (the actual HART device's output value) is sent from this instrument to the HART device, and the HART device's internal output value is adjusted to the actual output value.

PV Zero Adjustment

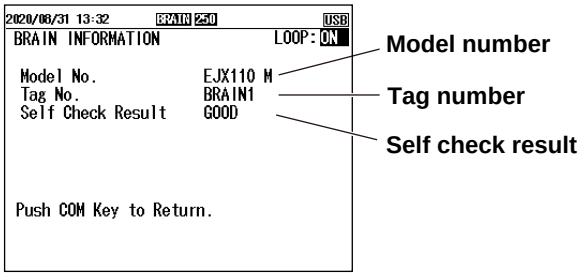
Zero adjustment can be executed on the HART device.
A zero-point output request is sent from this instrument to the HART device through HART communication. The output value (current) at that point is measured, and the measuremnet value is obtained through HART communication at the same time.
Execute zero adjustment if the zero point is not correctly adjusted.

6.6 Connection through BRAIN Communication

Procedure

1. Set the communication protocol to BRAIN, and press the **CONNECT DEVICE** arrow key according to section 6.1.

   When a connection is confirmed, the model, tag number, and self check result of the connected instrument are displayed.



2. To return to the screen showing measurement and source values, press **COM**.

Explanation

The following information is displayed for the connected device.

Model No.

Tag. No

Self Check Result

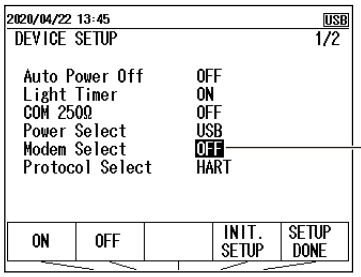
Note

Model No. and Tag No. can be applied to the device information for CA550 program sweeping.

6.7 Turning the Modem Function On and Off and Selecting the Protocol

Procedure

1. With the source value and measurement value displayed, press **MENU**. A menu screen appears.
2. Use the cursor keys to select **Device Setup**, and then press **ENTER**. A Device Setup screen appears.
3. User cursor keys to select **Modem Select**. ON and OFF appear in the selection menu.

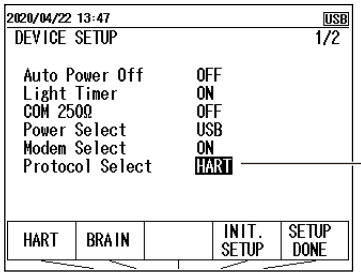


Turn the modem function on or off.

4. Use the arrow keys to select **ON** or **OFF**.

   If you select OFF, you cannot select the protocol with Protocol Select in step 5.

5. User cursor keys to select **Protocol Select**. HART and BRAIN appear in the selection menu.



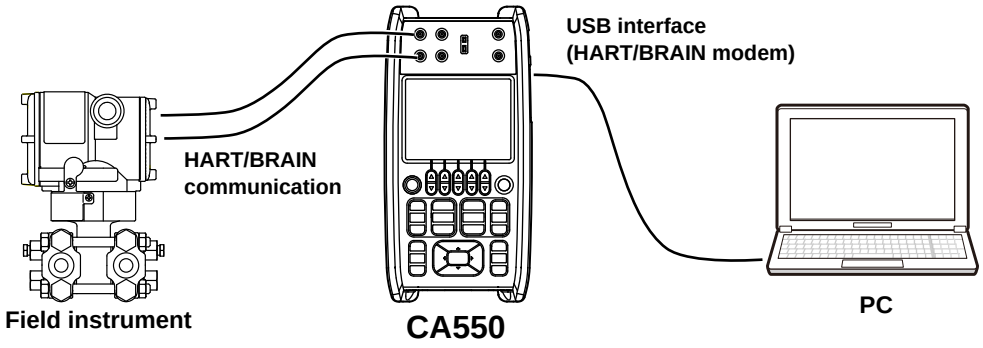
Select the protocol.

4. Use the arrow keys to select **HART** or **BRAIN**.

Explanation

You can use this instrument as a modem for HART or BRAIN communication.
Connect this instrument as a HART/BRAIN modem to a HART/BRAIN device according to section 2.4 in the CA500, CA550 Multifunction Process Calibrator Getting Started Guide (IM CA500-02EN).
By connecting a PC* to this instrument through USB, communication becomes possible between the PC and the HART/BRAIN device.

* A PC in which USB-interface-compatible HART/BRAIN communication application software is installed.



You need to install a CDC system definition file for YOKOGAWA products in the PC connected to this instrument.
To obtain the system definition file, access the following YOKOGAWA's webpage, and download the file.

https://tmi.yokogawa.com/library/
File name: YKCDC USB Driver

Note

When the CA550 is connected to the PC, "CA550 USB UART" and "CA550 USB MODEM" are displayed as COM ports in Device Manager.
CA550 USB UART: COM port for PC communication
CA550 USB MODEM: COM port for HART/BRAIN modem
To use the modem function, use the CA550 USB MODEM port.

6.8 Error Codes

The following two types of error codes are available for HART communication and BRAIN communication.

HART Device Errors

Error No.	Message	Cause, Corrective Action	Loop Device Operation
102	Invalid Selection	The selected item is not allowed on the loop device. Select the appropriate item, and redo the operation.	This command will be discarded, and the settings will not be changed.
103	Passed Parameter Too Large	The specified value is too large. Set the value to a small value, and redo the operation.	This command will be discarded or executed by the connected device.
104	Passed Parameter Too Small	The specified value is too small. Set the value to a large value, and redo the operation.	This command will be discarded or executed by the connected device.
105	Too Few Data Bytes Received	A communication error occurred. Redo the operation.	This command will be discarded, and the settings will not be changed.
106	Device Specific Command Error	A device-specific error was detected. Redo the operation.	This command will be discarded, and the settings will not be changed.
107	In Write Protect Mode	The loop device is write-protected. Release the write protection, and redo the operation.	This command will be discarded, and the settings will not be changed.
108	Update Failure	Updating of the measurement value failed. Redo the operation.	This command will be discarded, and the settings will not be changed.
	Update in Progress	Updating. Wait a moment.	-
	Set to Nearest Value	The value was rounded or truncated. Check the set value.	This command will be executed, and the settings will be changed.
109	Lower Range Value Too High	The LRV value is too large. Change the value, and redo the operation.	This command will be discarded or executed by the connected device.
	Applied Process Too High	The specified value is too large. Change the value, and redo the operation.	This command will be discarded or executed by the connected device.
	Incorrect Mode or Value	The loop device is not in fixed current mode. Redo the operation.	This command will be discarded, and the settings will not be changed.
110	Lower Range Value Too Low	The LRV value is too small. Change the value, and redo the operation.	This command will be discarded or executed by the connected device.
	Applied Process Too Low	The specified value is too small. Change the value, and redo the operation.	This command will be discarded or executed by the connected device.
111	Upper Range Value Too High	The URV value is too large. Change the value, and redo the operation.	This command will be discarded or executed by the connected device.
	Loop Current Not Active	The loop device is set to multidrop mode. Check the device settings, and redo the operation.	This command will be discarded, and the settings will not be changed.
112	Upper Range Value Too Low	The URV value is too small. Change the value, and redo the operation.	This command will be discarded or executed by the connected device.

Error No.	Message	Cause, Corrective Action	Loop Device Operation
114	Span Too Small	The span of the URV and LRV values is smaller than the minimum span. Change the value, and redo the operation.	This command will be discarded or executed by the connected device.
	New Lower Range Value Pushed	The LRV value was updated. Redo the operation.	This command will be executed, and the settings will be changed.
116	Access Restricted	The HART command is not allowed on the loop device. Check the loop device operation mode, and redo the operation.	This command will be discarded, and the settings will not be changed.
129	Invalid Span	The span setting is invalid. Change the URV or LRV value, and redo the operation.	This command will be discarded or executed by the connected device.
130	Buffer Overflow	A communication error (buffer overflow) occurred. Redo the operation.	This command will be discarded, and the settings will not be changed.
132	Busy	The loop device is busy. Wait a while, and redo the operation.	This command will be discarded, and the settings will not be changed.
136	Longitudinal Parity Error	A communication error (longitudinal parity error) occurred. Redo the operation.	This command will be discarded, and the settings will not be changed.
144	Framing Error	A communication error (framing error) occurred. Redo the operation.	This command will be discarded, and the settings will not be changed.
160	Overrun Error	A communication error (overrun error) occurred. Redo the operation.	This command will be discarded, and the settings will not be changed.
164	Command Not Implemented	A function not supported by the loop device was executed. Check the operation.	This command will be discarded, and the settings will not be changed.
192	Vertical Parity Error	A communication error (vertical parity error) occurred. Redo the operation.	This command will be discarded, and the settings will not be changed.
199	Unknown Error	An unknown error occurred. Redo the operation.	This command will be discarded, and the settings will not be changed.

HART Communication Errors

Error No.	Message	Cause, Corrective Action
201	No Response	There is no response from the loop device. Check the power supply and connection to the loop device, and redo the operation.
202	Communication Error	A communication error (parity error) occurred. Redo the operation. If the error persists, check the power supply and connection to the loop device.
203	Communication error	A communication error (framing error) occurred. Redo the operation. If the error persists, check the power supply and connection to the loop device.
204	Communication error	A communication error (overrun error) occurred. Redo the operation. If the error persists, check the power supply and connection to the loop device.
205	Communication error	A communication error (invalid character) occurred. Redo the operation. If the error persists, check the power supply and connection to the loop device.
206	Communication error	A communication error (buffer overrun error) occurred. Redo the operation. If the error persists, check the power supply and connection to the loop device.

Error No.	Message	Cause, Corrective Action
207	Communication error	A communication error (frame error) occurred. Redo the operation. If the error persists, check the power supply and connection to the loop device.
208	Communication error	A communication error (check byte error) occurred. Redo the operation. If the error persists, check the power supply and connection to the loop device.
209	Communication error	A communication error (delimiter error) occurred. Redo the operation. If the error persists, check the power supply and connection to the loop device.
210	Communication error	A communication error (address error) occurred. Redo the operation. If the error persists, check the power supply and connection to the loop device.
211	Communication error	A communication error (command error) occurred. Redo the operation. If the error persists, check the power supply and connection to the loop device.
212	Communication error	A communication error (invalid data) occurred. Redo the operation. If the error persists, check the power supply and connection to the loop device.
299	Unknown Error	A communication error (unknown error) occurred. Redo the operation. If the error persists, check the power supply and connection to the loop device.

BRAIN Communication Errors

Error No.	Error Description	Details
301	No Response	There is no response from the loop device. Check the power supply and connection to the loop device, and redo the operation.

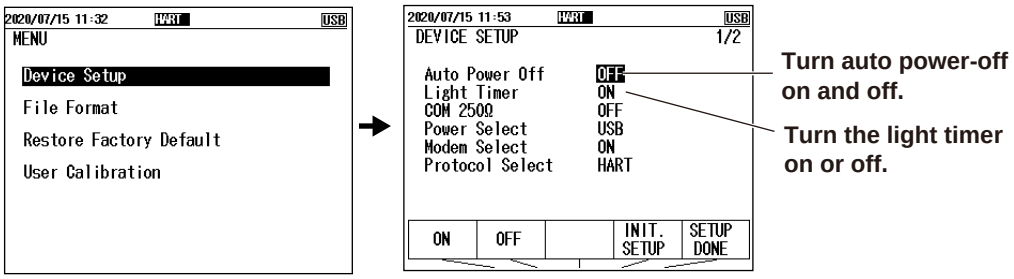
7.1 Auto Power-off, Turning the Light Timer On and Off, and Turning the Light On and Off

Procedure

1. With the source value and measurement value displayed, press **MENU**. A menu screen appears.
2. Use the cursor keys to select **Device Setup**, and then press **ENTER**. A Device Setup screen appears.

Turn auto power-off on and off

3. Use the cursor keys to select **Auto Power Off**. ON and OFF appear in the selection menu.



4. Use the arrow keys to select **ON** or **OFF**.

   To finish entering the settings here, proceed to step 7.

Turning the Light Timer On and Off

5. User cursor keys to select **Light Timer**. ON and OFF appear in the selection menu.
6. Use the arrow keys to select **ON** or **OFF**

Confirming the Settings

7. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and a screen appears showing the source value and measurement value.

   Pressing **ESC** causes the instrument to discard the settings and return to the menu screen.

   To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Turning the Light On and Off and Adjusting the Brightness

1. Press ☼ on the instrument's front panel. Each time you press the soft key, the setting toggles between ON (dark), bright, and OFF.

Description

Auto Power-off

Auto power-off is a function that automatically turns off the power when about 30 minutes elapses after the last user interaction with the instrument.

Auto power-off is automatically disabled (the icon also disappears) in the following situations.

- Pulse count is in progress.
- The output is on.
- Sweeping is in progress.
- Power is being supplied through USB.

Light Timer

Light timer is a function that automatically turns off the screen light when about 10 minutes elapses after the last user interaction with the instrument.

To turn the screen light on again, press the ☼ key.

Turning the Light (screen light) On and Off

Using the ☼ key, you can turn the screen light on and off and change the brightness between two levels.

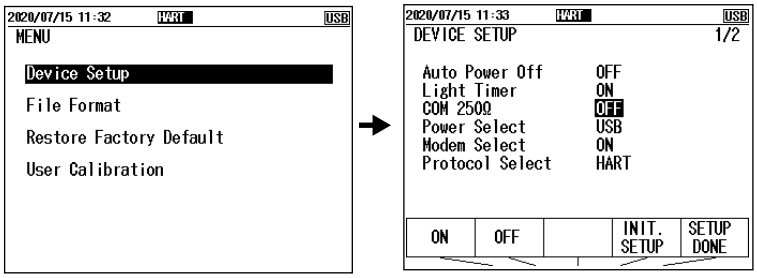
Note

If the screen light is turned on in a dark location, white spots may appear on the screen.
This is due to the material characteristics of the light guide of the screen and has no effect on the performance of the instrument.

7.2 Turning Communication Resistance On or Off

Procedure

1. With the source value and measurement value displayed, press **MENU**. A menu screen appears.
2. Use the cursor keys to select **Device Setup**, and then press **ENTER**. A Device Setup screen appears.
3. Use the cursor keys to select **COM 250Ω**. ON and OFF appear in the selection menu.



4. Use the arrow keys to select **ON** or **OFF**

Confirming the Settings

5. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and a screen appears showing the source value and measurement value.

   Pressing **ESC** causes the instrument to discard the settings and return to the menu screen.

   To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Description

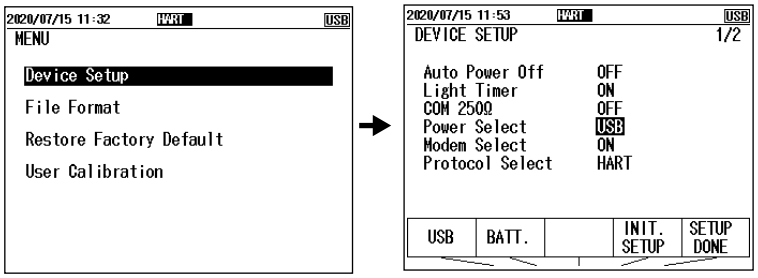
When the communication resistance is turned on, a 250 Ω resistor is connected to the 24 V loop power output inside the instrument. The communication resistance is used to provide amplitude to the HART communication signals or BRAIN communication signals superimposed in the transmission line.

Set this to off when communication signals are not superimposed in the transmission line.

7.3 Setting the Priority Power Supply

Procedure

1. With the source value and measurement value displayed, press **MENU**. A menu screen appears.
2. Use the cursor keys to select **Device Setup**, and then press **ENTER**. A Device Setup screen appears.
3. User cursor keys to select **Power Select**. USB (USB power supply) and BATT. (Batteries) appear on the selection menu.



4. Use the arrow keys to set the priority power supply.

Confirming the Settings

5. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and a screen appears showing the source value and measurement value.

   Pressing **ESC** causes the instrument to discard the settings and return to the menu screen.

   To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Description

When batteries and USB power supply are both available for running the instrument, you can select the power supply to prioritize.

If either the batteries or USB power supply becomes unavailable, a switch is made to the available power supply.

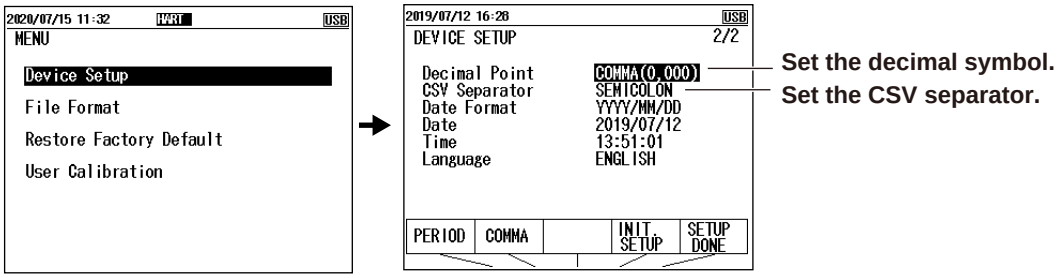
7.4 Setting the Decimal Symbol and CSV Separator

Procedure

1. With the source value and measurement value displayed, press **MENU**. A menu screen appears.
2. Use the cursor keys to select **Device Setup**, and then press **ENTER**. A Device Setup screen appears.
3. Press the cursor keys several times to display Device Setup 2/2.

Decimal Symbol

4. User cursor keys to select **Decimal Point**. PERIOD (.) and COMMA (,) appear on the selection menu.



5. Use the arrow keys to set the symbol to use for the decimal point.

   To finish entering the settings here, proceed to step 8.

CSV Separator

6. Use the cursor keys to select **CSV Separator**. COMMA (,), SEMI COLON (;) and TAB appear on the selection menu.
7. Use the cursor keys to set the symbol to use for the CSV separator.

Confirming the Settings

8. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and a screen appears showing the source value and measurement value.

   Pressing **ESC** causes the instrument to discard the settings and return to the menu screen.

   To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Description

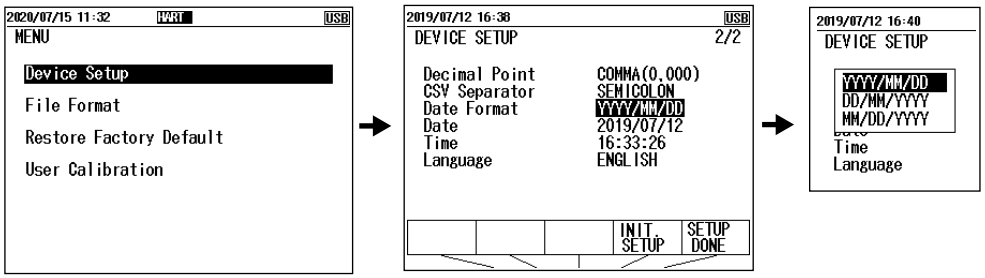
Set the decimal symbol and CSV separator that are used when saving the data sourced and measured by this instrument.

Data can be saved according to the specifications of the software that the data will be used in.

7.5 Setting the Date Display Format

Procedure

1. With the source value and measurement value displayed, press **MENU**. A menu screen appears.
2. Use the cursor keys to select **Device Setup**, and then press **ENTER**. A Device Setup screen appears.
3. Press the cursor keys several times to display Device Setup 2/2.
4. Use the cursor keys to select **Date Format**, and then press **ENTER**. A list of options appears.



5. Use the cursor keys to select the date display format you want to use, and then press **ENTER**.

Confirming the Settings

6. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and a screen appears showing the source value and measurement value.

   Pressing **ESC** causes the instrument to discard the settings and return to the menu screen.

   To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Description

You can select the date display format from the following:

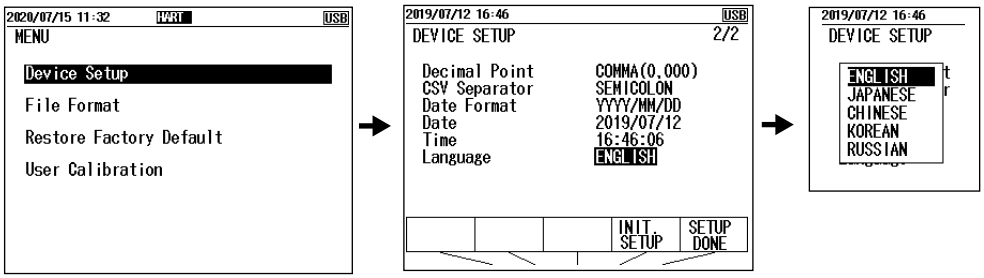
- YYYY/MM/DD: year (Gregorian)/month/day (default setting)
- DD/MM/YYYY: days/month/year (Gregorian)
- MM/DD/YYYY: month/day/year (Gregorian)

The format is applied to the date and time displayed in the upper left of the screen, the date and time on the LOAD screen, and the date and time saved in CSV files from the CA550.

7.6 Setting the Language

Procedure

1. With the source value and measurement value displayed, press **MENU**. A menu screen appears.
2. Use the cursor keys to select **Device Setup**, and then press **ENTER**. A Device Setup screen appears.
3. Press the cursor keys several times to display Device Setup 2/2.
4. Use the cursor keys to select **Language**, and then press **ENTER**. A list of options appears.



5. Use the cursor keys to select the language you want to use, and press **ENTER**.

Confirming the Settings

6. Press the arrow key corresponding to **SETUP DONE**. The settings are confirmed, and a screen appears showing the source value and measurement value.

   Pressing **ESC** causes the instrument to discard the settings and return to the menu screen.

   To initialize the settings, pressing the arrow key corresponding to **INIT SETUP**.

Description

You can select the language used on the screen from the following:

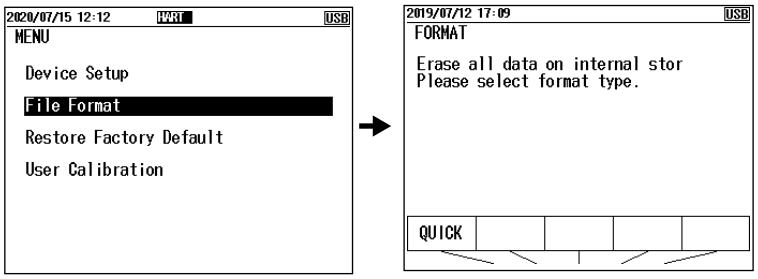
- English (default setting)
- Japanese
- Chinese (simplified)
- Korea
- Russian

7.7 Formatting (Initializing) the Internal Memory

If you format the internal memory, all the data saved in the internal memory will be erased.
Save the necessary data to a PC or the like before formatting the internal memory.
On the CA500, a communication command can be used to load saved data into a PC (see section 8.3, “List of Commands”).
The CA550 can be connected to a PC through USB, and the saved data can be copied to the PC (see section 5.4, “Copying Saved Data to a PC (CA550)”).

Procedure

1. With the source value and measurement value displayed, press **MENU**.
2. Use the cursor keys to select **File Format**, and then press **ENTER**. A File Format screen appears.
3. Press the arrow key corresponding to **QUICK** (quick format).
   A format confirmation message appears.
4. To format, press **ENTER**. To cancel formatting, press **ESC**.
   Pressing **ENTER** executes the format.



Description

The internal memory is formatted with quick format.
Quick: Logical format. Information necessary for the file system is written.
When you execute a format, all the saved data will be erased. On the CA550, after formatting, CalibrationData, SaveData, and SweepData folders are created.

7.8 Resetting the Instrument to Its Factory Default Settings

Procedure

1. With the source value and measurement value displayed, press **MENU**.
2. Use the cursor keys to select **Restore Factory Default**, and then press **ENTER**. A confirmation screen appears.
3. To reset to factory default settings, press **ENTER**. Otherwise, press **ESC**.

Explanation

You can reset the instrument settings, FUNCTION1 and FUNCTION2 settings, and the like to their factory defaults.

The date and time will not be reset.

Factory Default Settings

Device Setup

Setting Item	Default Value
Auto Power OFF	OFF
Light Timer	ON
COM 250Ω	OFF
Power Select	USB
Modem Select	OFF
Protocol Select	HART
Decimal Point	PERIOD(0.000)
CSV Separator	COMMA
Date Format	YYYY/MM/DD
Language	ENGLISH

Function1

Setting Item	Default Value
FUNCTION	V
RANGE	5 V
0% Value	1.0000 V
100% Value	5.0000 V
Contact Input	OFF
Connection Method	2 W
Count to Time	1 min

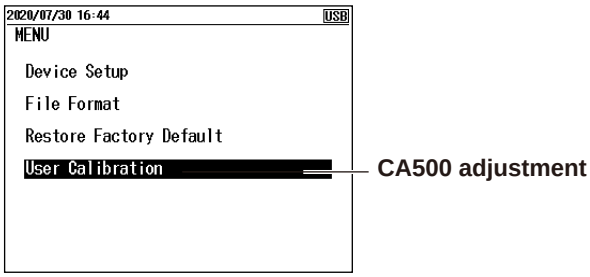
FUNCTION2

Setting Item			**Default Value**
FUNCTION			V
RANGE			1-5 V
Common Setup	0% Value		1.0000
	100% Value		5.0000
	Division Number		4
Sweep Setup	Linear Sweep Setup	Rise Time	10 s
		Falling Time	10 s
		Interval Time	10 s
		Repeat	OFF
	Step Sweep Setup	Interval Time	10 s
		Repeat	OFF
		Data Save	OFF
	Program Sweep Setup	Interval Time	10 s
		Data Save	OFF
		Tolerance	0.50
		Tag No.*1	none
		Model No.*1	none
		Serial No.*1	none
		Loop Name*1	none
Temperature Setup	TC Terminal		TC-A
	TC-B RJC		ON
	Burnout Detection		ON
	Temperature Scale		ITS-90
Frequency Setup	Amplitude Voltage		3.0 V
	Pulse Count		CONTINUOUS
	Contact Output		OFF

7.9 Adjusting the CA500

For the CA500 adjustment procedure, see the manual available at the YOKOGAWA webpage.
A manual explaining the adjustment procedure of the instrument is available for downloading from the following webpage. To download the information, you need to register.

https://tmi.yokogawa.com/library/documents-downloads/instruction-manuals/ca500-ca550-multifunction-process-calibrator-user-adjustment/



8.1 USB Interface Features and Specifications

You can use the USB interface to access the internal memory of this instrument from a PC and remotely control this instrument from a PC.

Remote Control Feature

You can use communication commands to remotely control this instrument from a PC.

USB Storage Device (CA550)

This instrument complies with Mass Storage Class Ver1.x.
The data saved in the internal memory of this device can be loaded into a PC.
It is not possible to delete the data in this instrument or write data to the internal memory of this instrument from a PC.

USB Interface Specifications

Electrical and mechanical specifications Complies with USB Rev.1.1

Connector	Type B connector (receptacle)
Number of ports	1
Power supply	Self powered, bus powered
PC system requirements	A PC running Windows 8.1 or Windows 10 with a standard USB port.

8.2 Connecting through the USB Interface

USB Port

This instrument is equipped with a USB Type B port.

CDC (Communication Device Class)

This instrument uses CDC to communicate with a PC.

You need to install a CDC system definition file for YOKOGAWA products in the PC connected to this instrument.

To obtain the system definition file, access the following YOKOGAWA's webpage, and download the file.For details on how to obtain the system definition file, access the following YOKOGAWA's webpage, and download the file.

https://tmi.yokogawa.com/library/

File name: YKCDC USB Driver

Note

When the CA550 is connected to the PC, "CA550 USB UART" and "CA550 USB MODEM" are displayed as COM ports in Device Manager.

CA550 USB UART: COM port for PC communication

CA550 USB MODEM: COM port for HART/BRAIN modem

To use the modem function, use the CCA550 USB MODEM port.

8.3 List of Commands

Item	Command	Description	Normal	CA150 compatible
Data retrieval	OD	Queries the measurement value	Yes	Yes
	OE	Queries the error information	Yes	Yes
	OM	Queries the memory data	Yes	Yes
	OS	Queries the settings (conditions)	Yes	Yes
Measurement function	MR	Sets or queries the measurement range	Yes	Yes
	VO	Starts, stops or queries the 24 V loop power supply	Yes	Yes
Source function	SD	Sets or queries the source value	Yes	Yes
	SO	Starts or stops or queries the source	Yes	Yes
	SR	Sets or queries the source range	Yes	Yes
Source/ measurement settings	AG	Sets or queries averaging	Yes	No
	BU	Sets or queries the burnout on/off state	Yes	No
	MF	Sets or queries the measurement function	Yes	Yes
	MH	Sets or queries the value corresponding to 100% of FUNCTION1	Yes	No
	ML	Sets or queries the value corresponding to 0% of FUNCTION1	Yes	No
	MSC	Sets or queries the FUNCTION1 display	Yes	No
	PC	Sets or queries the contact I/O	Yes	No
	PU	Sets or queries the PULSE (source) display	Yes	Yes
	SF	Sets or queries the source function	Yes	Yes
	SH	Sets or queries the value corresponding to 100% of FUNCTION2	Yes	No
	SL	Sets or queries the value corresponding to 0% of FUNCTION2	Yes	No
	SP	Sets or queries the pulse count operation state	Yes	No
	SSC	Sets or queries the FUNCTION2 display	Yes	No
	TC	Sets or queries the pulse count time	Yes	Yes
	TE	Sets or queries the TC, RTD (source) display	Yes	Yes
	WC	Sets or queries the wiring system of resistance measurement	Yes	No
Device settings	AP	Sets or queries the auto power-off feature	Yes	No
	DT	Sets or queries the date and time	Yes	Yes
	HB	Sets or queries the field communication protocol		
	IO	Sets or queries the on/off state of the 250 Ω internal resistor	Yes	Yes
	LG	Sets or queries the language	Yes	No
	MM	Sets or queries the modem on/off state	Yes	No
Other	*IDN?	Queries the CA500 or CA550 ID string	Yes	No
	BGD	Queries the calibration date of the CA500 or CA550	Yes	No
	BL	Sets or queries the on/off state of the screen light	Yes	Yes
	BSN	Queries the serial number of the CA500 or CA550	Yes	No
	DW	Decreases the mth digit of the source value by 1.	Yes	Yes
	ESC C/RC	Initializes the settings	Yes	Yes
	ESC S/ST	Outputs the instrument's status byte.	Yes	Yes
	H	Sets or queries the output header of the OD and OM commands	Yes	Yes
	HD	Holds or queries the measurement value display	Yes	Yes
	IM	Sets or queries the status byte detection and mask	Yes	Yes
	OR	Queries the external RJ sensor connection	Yes	Yes
	TS	Executes manual saving	Yes	No
	TT	Sets or queries the international temperature standard	Yes	Yes
	UP	Increases the mth digit of the source value by 1.	Yes	Yes
	YC	Initializes the settings of FUNCTION1 and FUNCTION2	Yes	No

Item	Command	Description	Normal	CA150 compatible
CA150 commands	AS	Sets or queries the current (DCA) source/SIMULATE	Yes	Yes
	MO	Starts or stops or queries the measurement	Yes	Yes
	ND	Sets or queries the n and m values of the n/m divided output	Yes	Yes
	NM	Sets or queries the n/m divided output	Yes	Yes
	OB	Queries the battery charge state	Yes	Yes

8.4 Commands

Command Syntax

The command syntax is explained below.

Setting/Control

Command: Transmission command format

Answer: Response data format of a command (setting/control) without a response
When an error occurs, the same data as the error message ERRm (m = error number) that is displayed on the screen is returned.

Queries

Command: Transmission command format

Return: Response data format of a command with a response (queries)

The delimiter (terminator) is CR+LF.

*IDN?	Queries the CA500 or CA550 ID string
	Command = *IDN?<CRLF> -> Return YOKOGAWA,CA5xx,XXXXXXXXX,a.aa.aaa Parameters Manufacturer: YOKOGAWA Model name: CA500-F1/CA550-F2/CA550-F3 Serial number: 9 digits Version number: a.aa.aaa = Firmware package version

AG	Sets or queries averaging
	Command = AGm<CRLF> -> Answer = AGm<CRLF> Command = AG?<CRLF> -> Return = AGm<CRLF> Parameters m = 0: OFF 1: ON

AP	Sets or queries the auto power-off feature
	Command = APm<CRLF> -> Answer = APm<CRLF> Command = AP?<CRLF> -> Return = APm<CRLF> Parameters m = 0: OFF 1: ON

BGD	Queries the calibration date of the CA500 or CA550
	Command = BGD?<CRLF> -> Return = yyyymmdd<CRLF> Parameters yyyy: Gregorian 4 bytes, mm: month 2 bytes, dd: day 2 bytes

BL	Sets or queries the on/off state of the screen light
	Command = BLm<CRLF> -> Answer = BLm<CRLF> Command = BL?<CRLF> -> Return = BLm<CRLF> Parameters m = 0: Off (default value) 1: On

BSN	Queries the serial number of the CA500 or CA550
	Command = BSN?<CRLF> -> Return = xxxxxxxxx<CRLF> Parameters xxxxxxxxx: Serial number (9 digits)

BU	Sets or queries the burnout on/off state
	Command = BUm<CRLF> -> Answer = BUm<CRLF> Command = BU?<CRLF> -> Return = BUm<CRLF> Parameters m = 0: Burnout disabled 1: Burnout enabled

DT	Sets or queries the date and time
	Command = DTyyyymmddhhmmss<CRLF> → Answer = yyyymmddhhmmss<CRLF> Command = DT?<CRLF> → Return = yyyy/mm/dd,hh:mm:ss<CRLF> Parameters yyyy: Gregorian 4 bytes, mm: month 2 bytes, dd: day 2 bytes hh: hour 2 bytes, mm: minute 2 bytes, ss: second 2 bytes

DW	Decreases the mth digit of the source value by 1.
	Command = DWm<CRLF> -> Answer = DW,OK<CRLF>(normal completion) Parameters m = 1 (least significant digit) to 5 (most significant digit)

ESC C or RC	Initializes the settings ("ESC" = ASCII 0x1B)
	Command = ESC C<CRLF> or Command = RC<CRLF> The following settings (common settings) are not initialized. • Auto power-off setting • International temperature standard selection (ITS-90/IPTS-68) • Date and time settings • Language setting

ESC S or ST	Queries the instrument's status byte ("ESC" = ASCII 0x1B)
	Command = ESC S<CRLF> -> Answer = m<CRLF> or Command = ST<CRLF> -> Answer = m<CRLF> Status byte m is output in decimal notation. See section 8.6, "Status Byte Format."

H	Sets or queries the output data header of the OD and OM commands
	Command = Hm<CRLF> -> Answer = Hm<CRLF> Command = H?<CRLF> -> Return = Hm<CRLF> Parameters m = 0: No headers (default value) 1: With headers

HB	Sets or queries the field communication protocol
	Command = HBm<CRLF> -> Answer = HBm<CRLF> Command = HB?<CRLF> -> Return = HBm<CRLF> Parameters m = 0: HART (default value) 1: BRAIN

HD	Holds or queries the measurement value display
	Command = HDm<CRLF> -> Answer = HDm<CRLF> Command = HD?<CRLF> -> Return = HDm<CRLF> Parameters m = 0: Display updating (default value) 1: Display hold

IM	Sets or queries the status byte detection/mask.
	Command = IMm<CRLF> -> Answer = IMm<CRLF> Command = IM?<CRLF> -> Return = IMm<CRLF> Detects or masks each bit of the status byte. If IM0 is specified, all information bits are masked. If IM63 is specified, the current operating status is applied to all information bits. Parameter m = 0 to 63 1: Detect bit 0 (measurement end) 2: Detect bit 1 (output change end) 4: Detect bit 2 (syntax errors) 8: Detect bit 3 (over-range) 16: Detect bit 4 (24 V loop output error) 32: Detect bit 5 (output errors) (Status byte bits 6 and 7 are fixed.) Default value m = 63 (no masking)

IO	Sets or queries the on/off state of the 250 Ω internal resistor
	Command = IOm<CRLF> -> Answer = IOm<CRLF> Command = IO?<CRLF> -> Return = IOm<CRLF> Parameters m = 0: OFF 1: ON

LG	Sets or queries the language
	Command = LGm<CRLF> → Answer = LGm<CRLF> Command = LG?<CRLF> → Return = LGm<CRLF> Parameters m = 0: English m = 1: Japanese m = 2: Chinese (Simplified) m = 3: Korean m = 4: Russian

MF	Sets or queries the measurement function
	Command = MFn<CRLF> -> Answer = MFn<CRLF> Command = MF?<CRLF> -> Return = MFn<CRLF> Command = MFm,n<CRLF> -> Answer = MFm,n<CRLF> Command = MFm?<CRLF> -> Return = MFm,n<CRLF> Parameters m = 0:FUNCTION1 1: FUNCTION2 (for TC) n = Function 0: DCV 1: DCA 2: Ω 3: TC 4: RTD 5: Freq 7: OFF When the parameter is omitted, m=0 is assumed.

MH	Sets or queries the value corresponding to 100% of FUNCTION1
	Command = MHm<CRLF> -> Answer = MHm<CRLF> Command = MH?<CRLF> -> Return = MHm<CRLF> Parameters m = 100% value The setting range and resolution are the same as the display range of the selected range.

ML	Sets or queries the value corresponding to 0% of FUNCTION1
	Command = MLm<CRLF> -> Answer = MLm<CRLF> Command = ML?<CRLF> -> Return = MLm<CRLF> Parameters m = 0% value The setting range and resolution are the same as the display range of the selected range.

MM	Sets or queries the modem on/off state
	Command = MMm<CRLF> -> Answer = MMm<CRLF> Command = MM?<CRLF> -> Return = MMm<CRLF> Parameters m = 0: OFF 1: ON

MR	Sets or queries the measurement range
	Command = MRn<CRLF> -> Answer = MRn<CRLF> Command = MR?<CRLF> -> Return = MRn<CRLF> Command = MRm,n<CRLF> -> Answer = MRm,n<CRLF> Command = MRm?<CRLF> -> Return = MRm,n<CRLF> Parameters m = 0:FUNCTION1 1: FUNCTION2 (for TC) n= Range [DCV] n = 0: 5 V (500 mV on the CA150) The response to the OD command returns down to one digit lower than the number of significant digits of the 5 V range. 1: 5 V 2: 50 V (35 V on the CA150) 3: 100 mV [DCA] n = 0: 50 mA (20 mA on the CA150) 1: 50 mA (100 mA on the CA150) [Ω] n = 0: 400 Ω (500 Ω on the CA150) 1: 4000 Ω (5 kΩ on the CA150) [TC] n = 0: K 1: E 2: J 3: T 4: R 5: B 6: S 7: N 8: L 9: U 10: C 11: XK 12: A 13: D 14: G 15: Platinel II 16: PR20-40 [RTD] n = 0: PT100 1: JPT100 2: PT100 (3850) 3: PT100 (3926) 4: PT200 5: PT500 6: PT1000 7: Cu10 8: Ni120 9: PT50 10: PT50G 11: PT100G 12: Cu50M 13: Cu100M [PULSE] n = 0: 500 Hz (100 Hz on the CA150) 1: 5000 Hz (1000 Hz on the CA150) 2: 50 kHz (10 kHz on the CA150) 3: COUNT (CPM on the CA150) 4: COUNT (CPH on the CA150) When the parameter is omitted, m=0 is assumed.

MSC	Sets or queries the FUNCTION1 display
	Command = MSCm<CRLF> -> Answer = MSCm<CRLF> Command = MSC?<CRLF> -> Return = MSCm<CRLF> Parameters m = 0: Normal measurement display (no sub display) 1: Measurement display (with sub display) 2: Percentage display (with sub display)

OD	Queries the measurement value
	Command = OD(CrLf) → Return = abcde(CrLf) Command = OD?(CrLf) → Return = abcde(CrLf) Command = ODm(CrLf) → Return = abcde(CrLf) Command = ODm?(CrLf) → Return = abcde(CrLf) Parameters m = 0: FUNCTION1 1: FUNCTION2 <Header section (4 bytes)> a = V: Voltage A: Current O: Resistance T: Temperature F: Frequency b = DC: DC AC: AC R2: Two-wire resistance measurement R3: Three-wire resistance measurement R4: Four-wire resistance measurement c = N: Normal O: Over range E: No data B: Burnout <Data section (11 bytes)> d = measurement value (8 digits) e = E+0, E+3, E-3, E+6 For over range or burnout: de = 99999.E+3 For no data: d = - - -.- - - (the decimal place is according to the set range) e = E+0, E+3, E-3, E+6 If FUNCTION2 is set to TC measurement, the response to OD (CrLf) or OD?(CrLf) is a TC measurement value. To receive the measurement value of Function 1, execute OD0 (CrLf). If m is omitted, the measurement value of FUNCTION1 is output. If FUNCTION2 is set to TC measurement, the response to OD (CrLf) or OD?(CrLf) is a TC measurement value. To receive the measurement value of FUNCTION1, execute OD0 (CrLf).

OE	Queries the error information
	Command = OE<CRLF> -> Return = ERRm<CRLF> Outputs the most recent error. After returning the error, the saved error number is overwritten with “ERR00<CRLF>.” “ERR00<CRLF>” is returned when there is no error. Parameters m = Error code number (See “Error Codes.”)

OM	Queries the memory data (CA500)
	Command = OMm(CRLF) -> Return = n(CRLF) Parameters m = Memory data number (1 to 100) n = Date, time, measurement value, source value(, pulse source amplitude) yyyy/mm/dd,hh:mm:ss,abcde,fghij[,fghij](CRLF) <Date> yyyy/mm/dd = year/month/day hh: mm: ss = hour/minute/second <FUNCTION1 header section> a = V: voltage, A: current, O: resistance, T: temperature, F: frequency b = DC, AC c = N: normal, O: over range, E: no data (Four no data, abc = E) <FUNCTION1 data section> d = Measurement value (8 digits) e = E+0, E+3, E-3, E+6 For over range or burnout: de = 99999.E+3 For no data: d = - - -.- - - (the decimal place is according to the set range) e = E+0, E+3, E-3, E+6 <FUNCTION2 header section> f = V: voltage, A: current, O: resistance, T: temperature, F: frequency g = DC, AC, R2: two-wire resistance measurement, R3: three-wire resistance measurement, R4: four-wire resistance measurement h = N: normal, E: no data (Four no data, fgh = E) <FUNCTION2 data section> i = Source value (7 digits) j = E+0, E+3, E-3, E+6 For over range or burnout: ij = 99999.E+3 For no data: i = - - -.- - - (the decimal place is according to the set range) j = E+0, E+3, E-3, E+6 Supported by the CA500. ERR13 results on the CA550.

OR	Queries the external RJ sensor connection status
	Command = OR<CRLF> -> Return = m<CRLF> Parameters m = 0: Not connected 1: Connected

OS	Queries the settings (conditions)
	Command = OS(CRLF) -> Return = FUNCTION1 a(CRLF) Function b(CRLF) Range c(CRLF) FUNCTION2 d(CRLF) Function e(CRLF) Range f(CRLF) Data g(CRLF) 24V Output h(CRLF) Light i(CRLF) Charge j(CRLF) Parameters a (measurement) = ON/OFF b (measurement function) = DCV, DCA, OHM, TC, RTD, FREQ c (measurement range) = (DCV) 50V, 5V, 100mV (DCA) 50mA (OHM) 4000OHM, 400OHM (TC) K, E, J, T, R, B, S, N, L, U, C, XK, A, D, G, Platinel II, PR20-40 (RTD) PT100, JPT100, PT100 (3850), PT100 (3916), PT200, PT500, PT1000, Cu10, Ni120, PT50, PT50G, PT100G, Cu50M, Cu100M (FREQ) 500Hz, 5000Hz, 50kHz, CPM d (output) = ON, OFF e (source function) = DCV, DCA, OHM, TC, RTD, PULSE f (source range) = (DCV) 100mV, 1-5V, 5V, 30V (DCA) 20mA, 4-20mA, 20mA SIMULATE (OHM) 400OHM, 4000OHM (TC) K, E, J, T, R, B, S, N, L, U, C, XK, A, D, G, Platinel II, PR20-40 (RTD) PT100, JPT100, PT100 (3850), PT100 (3916), PT200, PT500, PT1000, Cu10, Ni120, PT50, PT50G, PT100G, Cu50M, Cu100M (FREQ) 500Hz, 5000Hz, 50kHz, PULSE COUNT g (source value) h (output for 24V LOOP measurement) = ON, OFF i (backlight) = ON, OFF J (charge) = Always OFF

PC	Sets or queries the contact I/O
	Command = PCm,n<CRLF> -> Answer = PCm,n <CRLF> Command = PCm?<CRLF> -> Return = PCm,n <CRLF> Parameters m = 0: FUNCTION1 1: FUNCTION2 n = 0: Contact I/O off 1: Contact I/O on

PU	Sets or queries the PULSE (source) display
	Command = PUm<CRLF> -> Answer = PUm <CRLF> Command = PU?<CRLF> -> Return = PUm <CRLF> Parameters m = 0: Frequency 1: Bandwidth 2: Pulse count This is valid when the source function is set to PULSE. Otherwise, ERR13 results.

SD	Sets or queries the source value

Command = SDm<CRLF> -> Answer = SDm<CRLF>
Command = SD?<CRLF> -> Return = SDm<CRLF>

Parameters

m = Source value

	Source range	m
(DCV)	100 mV:	-110.000 to 110.000
	1-5 V:	0.0000 to 6.0000
	1-5 V√:	0.0000 to 6.0000
	5 V:	-6.0000 to 6.0000
	30 V:	-33.000 to 33.000
(DCA)	20mA:	-24.000 to 24.000
	4-20mA:	0.000 to 24.000
	4-20mA√:	0.000 to 24.000
	20mA Simulate:	0.000 to 24.000
	20mA Simulate√:	0.000 to 24.000
(Ω)	400Ω:	0.00 to 440.00
	4000Ω:	0.0 to 4400.0
(FREQ)	500Hz[1]:	1.00 to 550.00
	5000Hz[1]:	1.0 to 5500.0
	50kHz[1]:	0.001 to 50.000
(PULSE)	CPM:	1.0 to 1100.0
	PULSE DCV[2]:	0 to 15.0000
	PULSE Cycle[3]:	0 (cont), 1 to 99999
(TC)	K:	-200.0 to 1372.0
	E:	-250.0 to 1000.0
	J:	-210.0 to 1200.0
	T:	-250.0 to 400.0
	N:	-200.0 to 1300.0
	L:	-200.0 to 900.0
	U:	-200.0 to 600.0
	R:	-20.0 to 1767.0
	S:	-20.0 to 1768.0
	B:	600.0 to 1820.0
	C:	0.0 to 2315.0
	XK:	-200.0 to 800.0
	A:	0.0 to 2500.0
	D (W3Re/W25Re):	0.0 to 2315.0
	G (W/W26Re):	100.0 to 2315.0
	Platinel II:	0.0 to 1395.0
	PR20-40:	0.0 to 1888.0
(RTD)	PT100 (3850):	-200.0 to 630.0
	PT100 JIS (3851):	-200.0 to 800.0
	PT100 former JIS (3916):	-200.0 to 510.0
	PT100 (3926):	-200.0 to 630.0
	PT200:	-200.0 to 630.0
	PT500:	-200.0 to 630.0
	PT1000:	-200.0 to 630.0
	Cu10:	-100.0 to 260.0
	Ni120:	-80.0 to 260.0
	PT50:	-200.0 to 630.0
	PT50G:	-200.0 to 800.0
	PT100G:	-200.0 to 630.0
	Cu50M:	-180.0 to 200.0
	Cu100M:	-180.0 to 200.0

1 Can be set when the PULSE source display is set to frequency (PU0)
2 Can be set when the PULSE source display is set to amplitude (PU1)
3 Can be set when the PULSE source display is set to pulse count (PU2)

SF	Sets or queries the source function
	Command = SFm<CRLF> -> Return = SFm<CRLF> Command = SF?<CRLF> -> Return = SFm<CRLF> Parameters m = 0: DCV 1: DCA 2: Ω 3: TC 4: RTD 5: Freq 7: OFF Use the PU command to set the amplitude and pulse count of the PULSE source.

SH	Sets or queries the value corresponding to 100% of FUNCTION2
	Command = SHm<CRLF> -> Answer = SHm<CRLF> Command = SH?<CRLF> -> Return = SHm<CRLF> Parameters m = 100% value The setting range and resolution are the same as the display range of the selected source range.

SL	Sets or queries the value corresponding to 0% of FUNCTION2
	Command = SLm<CRLF> -> Answer = SLm<CRLF> Command = SL?<CRLF> -> Return = SLm<CRLF> Parameters m = 0% value The setting range and resolution are the same as the display range of the selected source range.

SO	Starts or stops or queries the source
	Command = SOm<CRLF> -> Answer = SOm<CRLF> Command = SO?<CRLF> -> Return = SOm<CRLF> Parameters m = 0: Source stop 1: Source start

SP	Sets or queries the pulse count operation state
	Command = SPm<CRLF> -> Answer = SPm<CRLF> Command = SP?<CRLF> -> Return = SPm<CRLF> Parameters m = 0: Stop 1: Start

SR	Sets or queries the source range
	Command = SRm<CRLF> -> Answer = SRm<CRLF> Command = SR?<CRLF> -> Return = SRm<CRLF> Parameters [DCV] m = 0: 100 mV 1: 5 V (1 V on the CA150) 2: 30 V (10 V on the CA150) 3: 30 V 4: 1-5 V 5: 5 V 6: 1-5 V √ [DCA] m = 0: 20 mA 1: 4-20 mA 2: 4-20 mA Simulate 3: 4-20 mA √ 4: 4-20 mA Simulate√ [Ω] m = 0: 400 Ω (500 Ω on the CA150) 1: 4000 Ω (5 kΩ on the CA150) [TC] m = 0: K 1: E 2: J 3: T 4: R 5: B 6: S 7: N 8: L 9: U 10: C 11: XK 12: A 13: D 14: G 15: Platinel II 16: PR20-40 [RTD] m = 0: PT100 1: JPT100 2: PT100 (3850) 3: PT100 (3926) 4: R 5: B 6: S 7: N 8: L 9: U 10: C 11: XK 12: A 13: D 14: G [PULSE] m = 0: 500 Hz (100 Hz on the CA150) 1: 5000 Hz (1000 Hz on the CA150) 2: 50 kHz (10 kHz on the CA150) 3: 50 kHz 4: CPM

SSC	Sets or queries the FUNCTION2 display
	Command = SSCm<CRLF> -> Answer = SSCm<CRLF> Command = SSC?<CRLF> -> Return = SSCm<CRLF> Parameters m = 0: Normal management display 1: Percentage display

TC	Sets or queries the pulse count time
	Command = TCm<CRLF> -> Answer = TCm<CRLF> Command = TC?<CRLF> -> Return = TCm<CRLF> Parameters m = 1 to 60

TE	Sets or queries the TC or RTD (source) display
	Command = TEm<CRLF> -> Answer = TEMm<CRLF> Command = TE?<CRLF> -> Return = TEm<CRLF> Parameters m = 0: Temperature value 1: mV value (resistance) 2: Room temperature ERR13 results when the function is not set to TC or RTD.

TS	Executes manual saving
	Command = TS<CRLF> -> Answer = TS,OK<CRLF>

TT	Sets or queries the international temperature standard
	Command = TTm<CRLF> -> Answer = TTm<CRLF> Command = TT?<CRLF> -> Return = TTm<CRLF> Parameters m = 0: IPTS-68 1: ITS-90 (default value)

UP	Increases the mth digit of the source value by 1.
	Command = UPm<CRLF> -> Answer = UP, OK<CRLF> Parameters m = 1 to 5 (1: least significant digit to 5: most significant digit)

VO	Starts, stops or queries the 24 V loop power supply
	Command = VOm<CRLF> -> Return = VOm<CRLF> Command = VO?<CRLF> -> Return = VOm<CRLF> Parameters m = 0: Stop loop power supply (default value) 1: Start loop power supply

WC	Sets or queries the wiring system of resistance measurement
	Command = WCm<CRLF> -> Return = WCm<CRLF> Command = WC?<CRLF> -> Return = WCm<CRLF> Parameters m = 0: Two-wire system 1: Three-wire system 2: Four-wire system

YC	Initializes the settings of FUNCTION1 and FUNCTION2
	Command = YC<CRLF> -> Answer = YC, OK<CRLF>

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AS	Sets or queries the current (DCA) source/SIMULATE
	Command = ASm<CRLF> -> Answer = ASm<CRLF> Command = AS?<CRLF> -> Return = ASm<CRLF> Parameters m = 0: Source 1: SIMULATE(SINK) On the CA500 and CA550, an error is returned when the function of Function 2 is set to mA and the range is not 20 mA. When m = 1, the instrument does not change the source range to 4-20mA Sim but changes the sign of the source value.

MO	Starts or stops or queries the measurement
	Command = MOm<CRLF> -> Answer = MOm<CRLF> Command = MO?<CRLF> -> Return = MOm<CRLF> Parameters m = 0: Sets the function to OFF (stop on the CA150) 1: Sets the function and range to the settings before stopping (start on the CA150) The above action is executed on the CA500 and CA550.

ND	Sets or queries the number divisions and the output step (n/m) of the divided output.
	Command = NDnm<CRLF> -> Answer = NDnm<CRLF> Command = ND?<CRLF> -> Return = NDnm<CRLF> The specified number of divisions is returned in both m and n in response to a query.

NM	Sets or queries the n/m divided output
	Command = NMm<CRLF> -> Answer = NMm<CRLF> Command = NM?<CRLF> -> Return = NMm<CRLF> Parameters m = 1: Sets the source value to the 100% value (OFF on the CA150) 2: Sets the source value to the 100% value (ON on the CA150)

OB	Queries the battery charge state
	Command = OB?<CRLF> -> Return = OBm<CRLF> The CA500 and CA550 always return 0.

8.5 Error Codes

Indication	Description
Err 00	No error (not displayed on the screen)
Err 11	Received an unused command
Err 12	Incorrect command parameter designation
Err 13	Received a command that cannot be executed in the instrument's current condition
Err 16	Detected an error during adjustment
Err 20	24 VLOOP measurement power supply error
Err 23	Detected an overvoltage or overcurrent in the source output
Err 60	Inappropriate setting information saved in EEPROM
Err 61	Inappropriate measurement adjustment information saved in EEPROM
Err 62	Inappropriate source adjustment information saved in EEPROM

8.6 Status Byte Format

Device Status Byte

Status byte format (see the explanation of the <ESC S> command)

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0 (fixed)	1 (fixed)	Output error	24 V power supply error	Over-range	Syntax error	Output change completion	Stop measuring

bit7: Fixed to 0

bit6: Fixed to 1

bit5: Set to 1 when an error occurs during output.
Cleared in the following situations.
- When the status byte is read
- When the function is changed
- When the range is changed

bit4: Set to 1 when an error occurs in the 24 V loop measurement power supply.
Cleared in the following situations.
- When the status byte is read

bit3: Set to 1 when a measurement over-range occurs.
Cleared in the following situations.
- When the status byte is read
- When the function is changed
- When the range is changed

bit2: Set to 1 when a prohibited operation or command is processed, when the command cannot be interpreted, or when a parameter is outside the setting range.
Cleared in the following situations.
- When the status byte is read

bit1: Set to 1 when the output stabilizes after it is changed with the output turned on.
Cleared in the following situations.
- When the status byte is read
- When the function is changed
- When the range is changed
- When a trip occurs

bit0: Set to 1 when measured data is confirmed during measurement.
Cleared in the following situations.
- When the status byte is read
- When the function is changed
- When the range is changed

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