TSURUGA

MODEL 3586

AC Milliohm Meter

Operation Manual

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I-02660-2

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1．Preface

The model 3586 is a digital milliohm meter with 4-terminal measuring method.
3586 can perform the measurement with high speed samplings 60 times/sec with wide range of measurement from 3 mΩ to 3 kΩ, with high resolution of 0.1 μΩ and with high accuracy. And the DC voltage meter with 2 ranges ,5 and 50 V and ratio display function are also equipped suitable for measuring voltage of battery cell.

We would like to thank you for your purchase of our MODEL 3586. For safety and proper use of this product, please carefully read this operation manual before the use.
This product should be handled by persons having good knowledge in electricity.
The following symbol marks are used in this manual for the safety use of the product.

⚠ Warning This is the warning to avoid danger. Severe injure or fatal accident may occur to the user in case the product is mishandled.

⚠ Caution This is the caution to avoid danger. Minor injury to the user or physical obstacle may occur in case the product is mishandled.

⚠ Warning

- Do not open the case or modify the main body.
- Never touch the terminals when power is ON. There may be risk of electric shock.

⚠ Caution

- The instrument may be damaged if testing method not specified by manufacturer is used. Read the instruction manual carefully and understand the contents before the use.
- The rated data for warm up is specified for more than 30 minutes.
- To avoid break-down, malfunction or deterioration of life time, do not use this product in such places where:
  - ◆Exposed to rain, water drops or direct sunlight.
  - ◆High temperature or humidity, heavy dust or combustible / corrosive gas.
  - ◆Affected by external noise, radio waves or static electricity.
  - ◆Where there is constant vibration or shock.
- Store this product at -20 to 65 ℃.
- Wipe off front panel and housing with dry soft cloth. If necessary, use cloth with small amount of synthetic detergent for cleaning.
  Do not use an organic solvent such as thinner, benzine for front panel or housing cleaning, which might damage shape and color of front panel and housing.

1.1 Preparations prior to use

●Unpacking

When the tester is delivered, please check whether it conforms to the required specifications and has not been damaged in transit. If there is any damage on the tester or it does no work in conformity with the specifications, please inform us of the model and product name.

●Storage

In case of storing the tester for a long time, store it at the place of low humidity and where it is not exposed to the direct sunlight.

1.2 Confirmation prior to use

●Power supply

Use the tester with the power source voltage within 90 to 250 V AC and the frequency 50 / 60 Hz. When connecting the power supply cable, confirm that the power supply switch is turned OFF.

⚠ Warning

- ●Set the instrument where the power switch can be operated easily, and the power cord connector can be easily removed from the AC inlet.
- ●To prevent an electric shock or failure of the unit, connect the power supply cord to a grounded 2 pole outlet.
- ●Don't unplug the power supply cord pulling the cord. Unplugging must be done holding the plug properly.

●Power supply cable

The plug of power supply cable connected to the tester is for 100 V AC use. When the tester is used with 200 V AC, replace the plug with appropriate one for 200 V AC use. Please connect the power supply cable to the power supply connector on the rear panel of the tester. The plug of power supply cable has 3 pins and the round shape pin in the center is for grounding.

●Setting of measuring terminals side use

Make sure to set the measuring terminal side planning to use either from front or rear side to ensure the accurate measurement.

1.3 Warning and caution during measurement

Electrical shock accident or malfunction

⚠ Warning

- In order to prevent defect, the voltage should be less than DC 60 V.
- Connect measuring cable and this instrument first, then measuring cable and the specimen to prevent electric, when DC voltage should be superimposed. And make sure that specimen is power off before connecting measuring cable to avoid accident.
- Short-circuit the probes for several seconds after the measurement and discharge electricity to prevent electrical shock accident when DC voltage is superimposed, since electric charge is accumulated in capacitors of this instrument.
- In order to avoid electric shocks and to ensure the safety of the tester, protective earth connection is necessary. Connect the supplied power cord with ground insulating type bipolar outlet.
- When the tester is used, use the supplied power cord by the manufacturer only. If the power cord not specified by manufacturer is used, it may be the cause of fire.

Connection of the control cable and communication cable

⚠ Caution

- Use the specified cable size to connect the control terminal.
- Make sure that communication cable and control cable are connected surely. If the connection is not undertaken correctly, it may cause of the failure to satisfy specification or malfunction.
- Power supply must be turned off on each device before connection of communication cable and control cable. Failure to turn of the electric power cause the electric shock or malfunction.

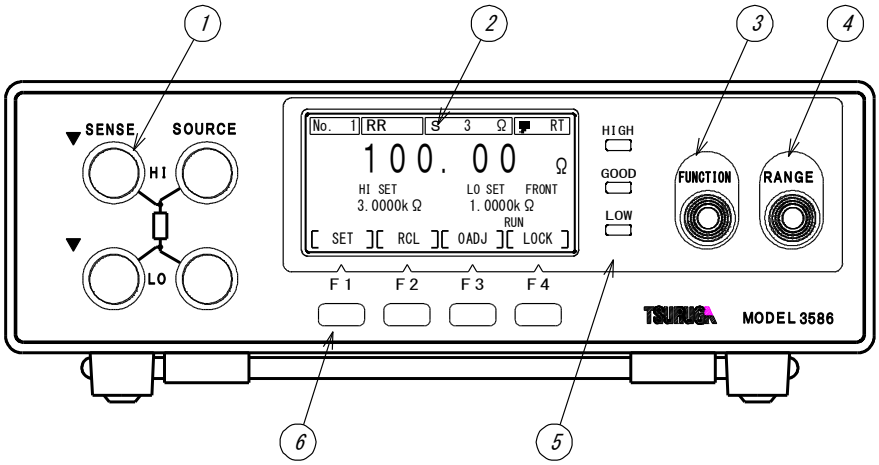
Other caution

⚠ Caution

- Large errors might be occurred by measuring specimen with inductance or capacitance.
- There might be influence on measured values when measuring cable individually penetrates through metal plate or specimen is placed on a metal plate caused by eddy current on metal plate.
- If power supply is done by UPS（Uninterruptible power supply device) or DC-AC inverter, do not use rectangular wave or pseudo rectangular wave output of UPS or DC-AC inverter. If used, this may cause the malfunction of the instrument.
- Do not install this instrument on unstable or vibrating place like trembling rack or inclined place. Drop or tumble may cause accident.

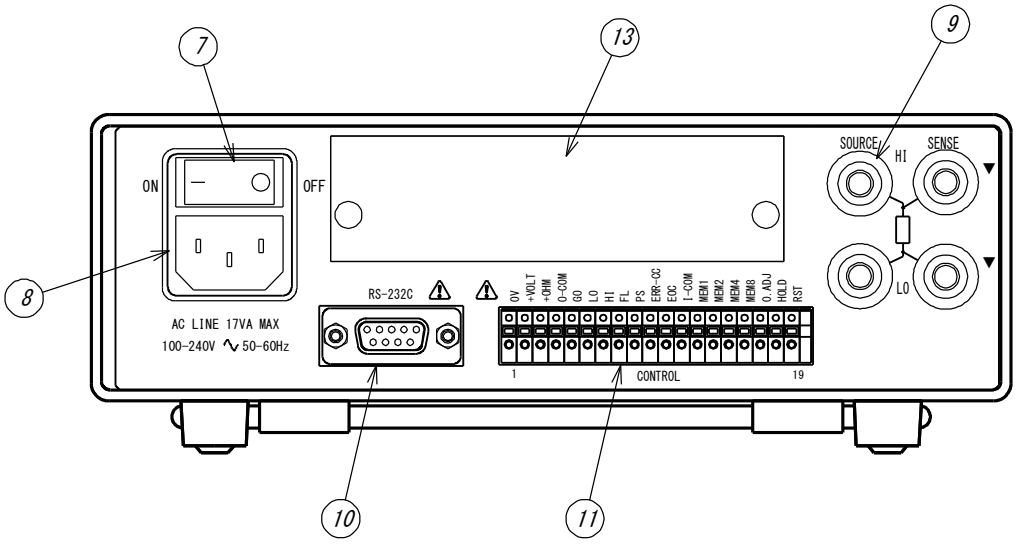
2. Name of parts

2.1 Front panel



① Measuring terminal	SENSE Hi : + terminal of voltage input SENSE Lo : - terminal of voltage input SOURCE Hi : + terminal of current output SOURCE Lo : - terminal of current output →Select 'FRONT' in 4.4.8 measuring terminal selection.
② Display portion	Display setting like Measurement function, Measurement range, Measurement value, Comparator setting, Memory No. can be done.
③ FUNCTION key	It is used for selecting measurement function.
④ RANGE key	Setting range varies depending on measuring functions, For other than VIEW-VV: select from 3 mΩ to 3 kΩ or AUTO range For VIEW-VV function: select 5 V, 50 V or AUTO range
⑤ HIGH GOOD LOW	Red LED is lit up when the measured value exceeds the upper limit value. GOOD: Green lamp is lit up with a good judgment. Red lamp is lit up when the measured value exceeds the lower limit value.
⑥ Setting key	Key F1 to F4 are used for setting the measurement condition, device setting etc.

2.2 Rear panel



⑦ Power supply switch　　Power supply ON / OFF switch

⑧ Power inlet　　Connect the supplied power supply cord. Use the power supply voltage and frequency within the specified range.

⑨ Rear measuring terminal

SENSE Hi : + terminal of voltage input
SENSE Lo : - terminal of voltage input
SOURCE Hi : + terminal of current output
SOURCE Lo : - terminal of current output

→Select 'REAR' in 4.4.8 measuring terminal selection.

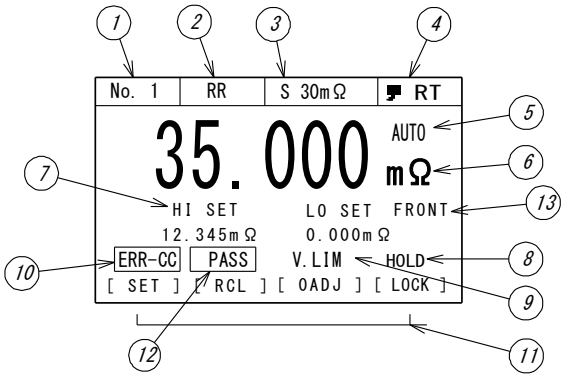
⑩ RS-232C connector　　Connector for RS-232C communication

⑪Input and output terminal　　Terminals for external control

⑬ Interface board mounting part

This is installation area for the BCD interface board.

2.3 Display portion



① Memory No. Displays memory No. (No.1 to No.15)

② Function Displays measurement function
RR : Resistance measurement VV : Voltage measurement
OHM R : Resistance measurement in Ratio RV : Resistance, voltage display

③ Sampling Displays sampling rate
S : Sampling rate 400 ms M : Sampling rate 200 ms
F5 : Sampling rate 20 ms F6 : Sampling rate 16.6 ms

Range Displays the measured range
3 mΩ, 30 mΩ, 300 mΩ, 3 Ω, 30 Ω, 300 Ω, 3 kΩ

④ External control Displays the status of external control
RT : Memory is controlled from the rear panel terminal
RB : Controlled from BCD
: RS-232C communication is ON

⑤ Auto-range Displays the status of auto-range measurement. Individual setting for resistance and voltage measurement is possible.
AUTO : Auto-range ON (none) : Auto-range OFF

⑥ Unit Measurement unit
mΩ : Range of 3 mΩ, 30 mΩ, 300 mΩ
Ω : Range of 3 Ω, 30 Ω, 300 Ω
kΩ : Range of 3 kΩ
V : During voltage measuring % : During ratio display

⑦ Comparator or Voltage meter Displays the setting of comparator (RR,VV)
HI SET : Upper limit of comparator LO SET : Lower limit of comparator
Displays voltage meter (RV)
VOLTAGE shows measured voltage RANGE shows range of voltage meter
Displays ratio setting (OHMR)
STDSET standard resistance is displayed. DEVSET ratio is displayed.

⑧ Hold Displays the condition of sampling
RUN : Sampling is in process, HOLD : Sampling is stopped and HOLD status

⑨ Voltage limitation Open terminal voltage is limited to 20 mV (p-p)
V.LIM : Limitation of open termina voltage is valid
(none) : Limitation of open terminal voltage limitation is not valid

⑩ Source open Displays when the source terminal is open or the value exceeds the measurement range drastically.

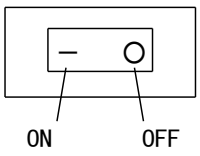
⑪ key guidance Displays the detail of keys F1 to F4

⑫ Voltage comparator PASS Within the set comparator range FAIL Out of set the comparator range

⑬ Selection of measuring terminals Select the measuring terminals, FRONT : front terminals REAR : rear terminals

3. Basic operation method

3.1 Power supply



First confirm the power OFF of the switch located at the rear panel of the instrument and connect cord to the power supply. Then, ON the power supply switch. This instrument becomes in operation condition immediately but it is preferred for preheating for 30 minutes before the use.

As this instrument is equipped with a parameter holding function, following (1) to (3) status can be memorized even though the power supply is turned OFF.

（1）15 sets of memories（Measurement conditions such as measurement function, ranges, comparator settings, zero adjustment settings)

（2）Key lock state

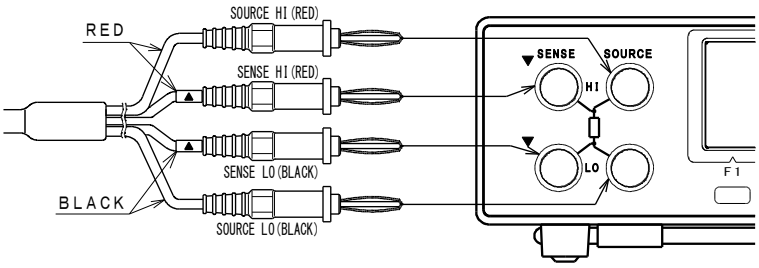
（3）Various types of setting

3.2 Connection of measuring terminals

3.2.1 Connection of measuring terminals (Model 5811-21C : Option)

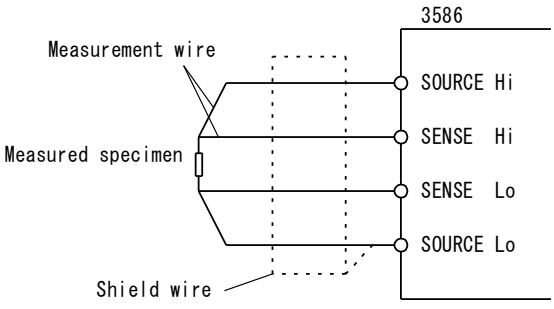
Measuring cables are connected to the measuring terminals on either front panel or rear panel. In order to obtain the accurate measured values, set the position of used terminals ref. 4.4.8. selection of measuring terminals. Terminals on front and rear panel cannot be used simultaneously.

Kelvin clips are to be connected as follows, make sure colors and ▼ signs.



Connection with the device（4-terminals method)

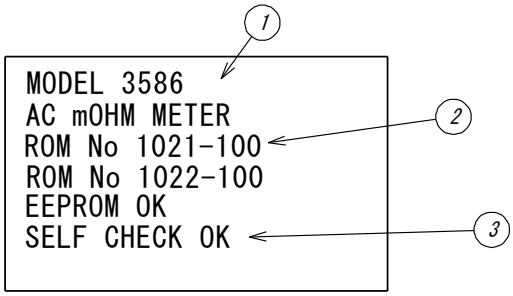
Measurement wires are connected with 4 cables to the measured specimen.



Note: Penetration of disturbing noise to the measuring terminals may cause instability or display or auto range operation. Prevent the noise by connecting with shield wire the shield side to SOURCE Lo. If all 4 wires are not connected properly, the displayed value may be fluctuated.

3.3 Start up display (Self-check)

Self-check screen is displayed for approx. 5 sec. after Power ON., then the display shifts to measurement display.



① Model name　Model name and output option

3586-X　(none)

3586-03　: BCD　TTL output

3586-04N : BCD　OC　NPN output

3586-04P : BCD　OC　PNP output

② ROM No.　The number of the firmware

③ Self-check result　The result of self-check of internal circuit

EEPROM OK　: Memories like setting values are checked.

SELF CHECK OK　: The result of self-check

If the self-test is not good, it shows FAIL.

In case of FAIL, if FUNCTION key is pressed, display can be changed to measurement mode, but the correct measurement cannot be obtained. Contact the nearest distributor or TSURUGA Electric Corporation office.

Refer to “12. Failure symptom”

3.4 Measurement

① When POWER supply is turned ON, self-check is done, the screen shifts measurement display.

② The measurement function is set by pressing 'FUNCTION' key.
To measure resistance, choose 'RR'.

③ Select the measurement range by pressing 'RANGE' key.
If the resistance value is unknown, choose 'AUTO' range.
Pressing 'RANGE' key for more than 1 sec., ON/OFF of 'AUTO' range can be chosen either ON or OFF.
During 'AUTO' range, 'AUTO' is displayed above the unit on the screen.

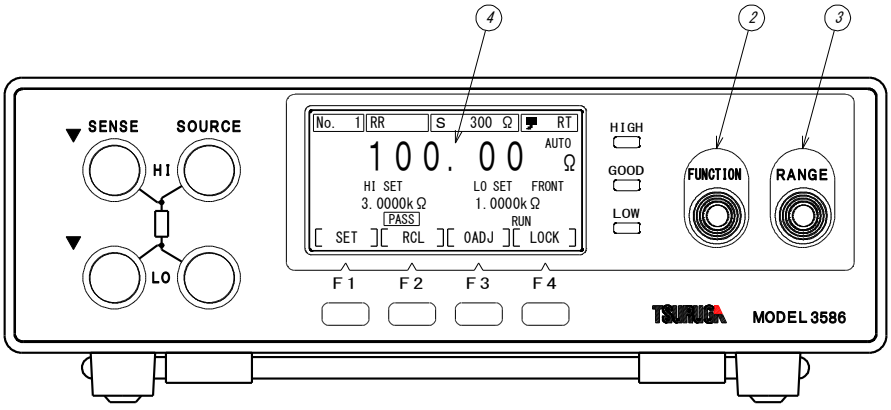
④ The result is displayed, when the measurement cable is connected with the instrument and object to be measured.

④ Refer to "4. Measurement method" for setting of sampling, comparator and etc.

Function : RR Resistance measurement
VV Voltage measurement
RV Resistance and Voltage display
OHMR Resistance ratio display

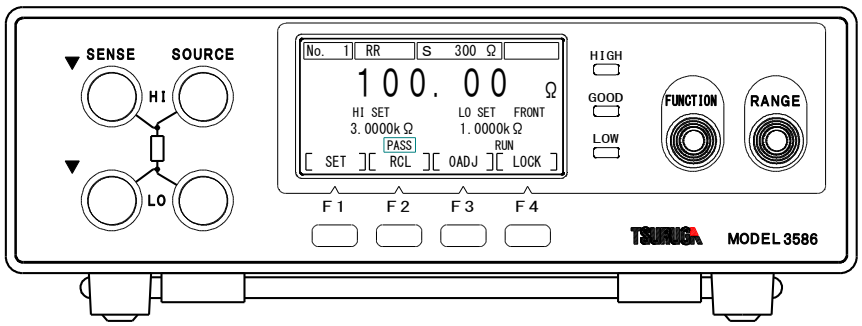
Range : Resistance range is automatically shifted other than VV.
3 mΩ Measuring at 3 mΩ range
30 mΩ Measuring at 30 mΩ range
300 mΩ Measuring at 300 mΩ range
3 Ω Measuring at 3 Ω range
30 Ω Measuring at 30 Ω range
300 Ω Measuring t 300 Ω range
3 kΩ Measuring at 3 kΩ range
AUTO Measuring with automatically switched range between 3 mΩ to 3 kΩ range.

Range : Voltage range is automatically shifted in VV function.
5 V Measuring at 5 V range
50 V Measuring at 50 V range
AUTO Measuring with automatically switched range between 5 V to 50 V range.



3.5 Key lock

It is a switch that prohibits operation of the instrument from the front panel in order to avoid the measurement by unintentional change of setting. Display of the LOCK is converted to reverse color during key lock condition. If other keys are required to use during key lock condition, key lock must be released first to use the other keys.



●Key lock method

Press F4 [LOCK] key for more than 3 sec.

Display of the LOCK is converted to reverse color which shows that instrument is in locked condition.

●Cancellation of key lock

During the key in locked condition, press F4 [LOCK] key for more than 3 s.

Key lock will be released.

3.6 Zero adjustment

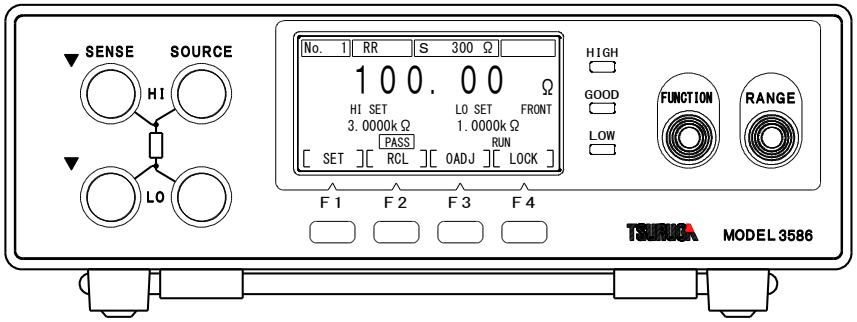
This is the function to eliminate the external cable resistance and connection fixtures during resistance measurement.
Zero adjusted value is subtracted from the measured value and remaining value is displayed.

Display value	=	Measured value	–	Zero adjust value

Note) No Zero adjustment function is done during voltage measurement (VV) .
The Zero adjustment value works in every range.

⚠ Caution

- If [0ADJ] key is pressed at input open condition (∞Ω) , it may cause the malfunction.
- If zero adjust is set at higher range, the measurement over might be caused in lower range.
- If [0ADJ] key is pressed on by mistake, the status can be recovered to normal stage by switching OFF the Zero adjustment function'.
- In case of changing measurement terminals setting, cancel the zero adjustment first and set it again.



● ON/OFF of Zero adjustment function

Pressing 'F 3 '[0ADJ] key to switch ON/OFF of zero adjustment.

[0 ADJ] is converted to reverse display when zero adjustment is ON.

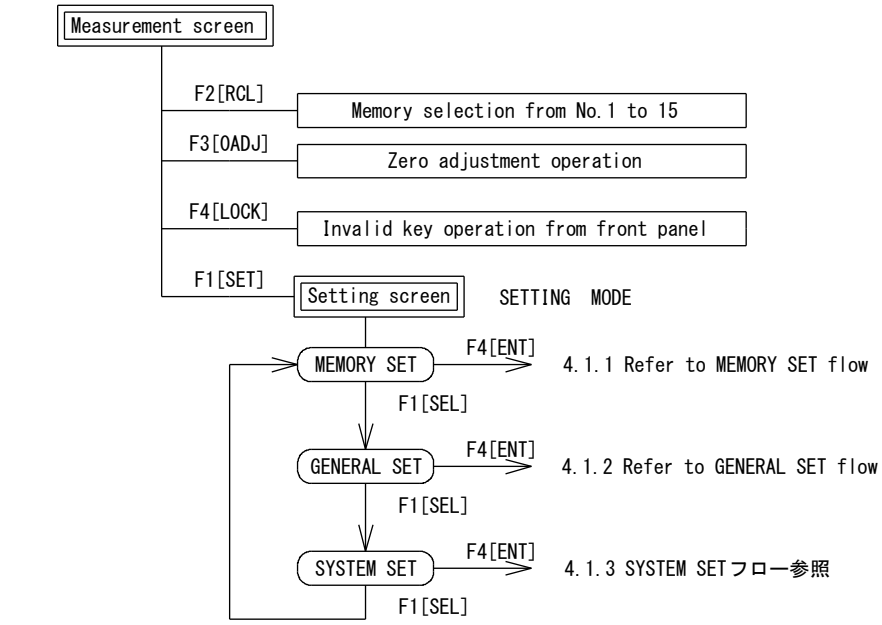
● Memory of Zero adjustment value

The measured value is saved as zero adjustment value when [0ADJ] key is pressed more than 1 sec. during OFF state of zero adjustment.

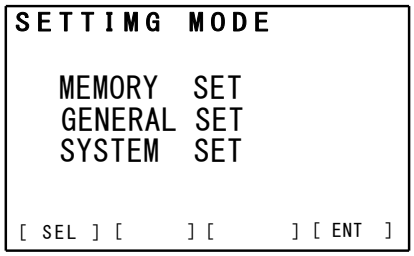
4. Setting operation

4.1 Setting flow

Measurement screen flow

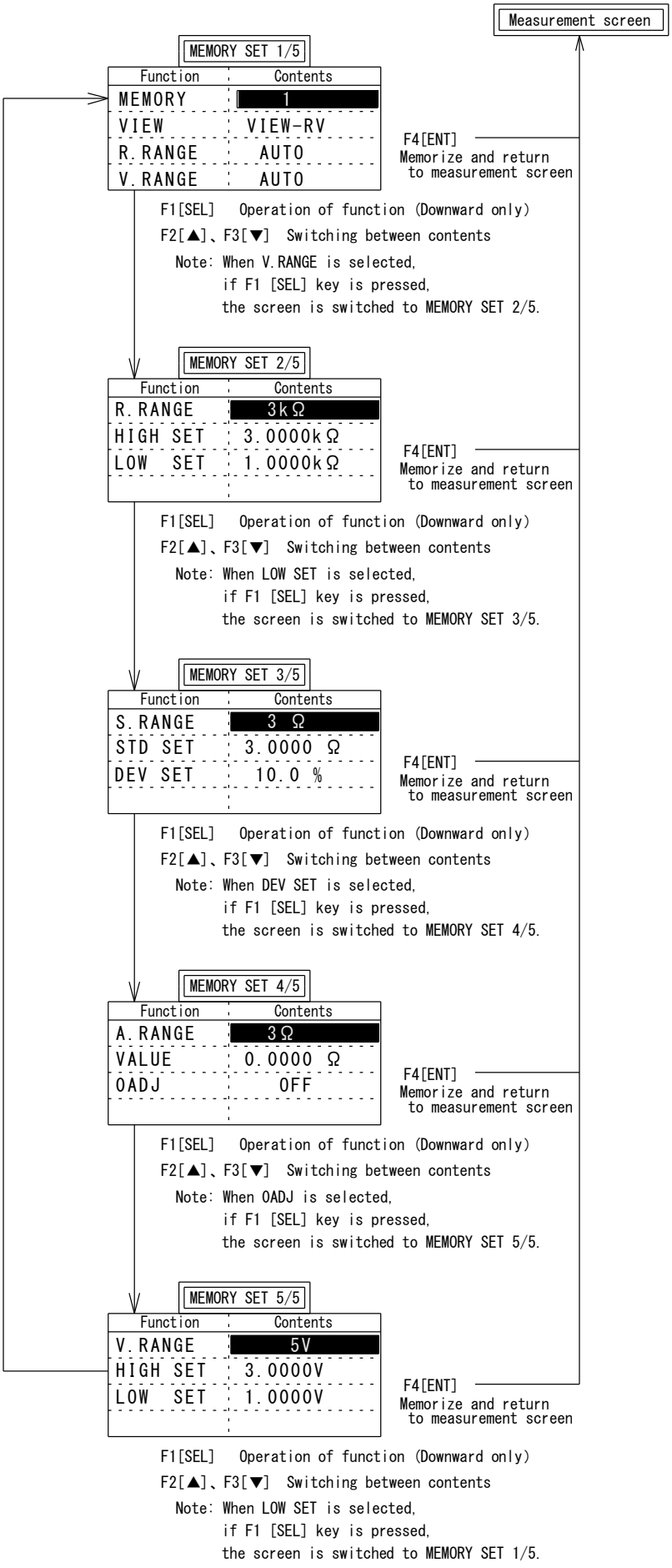


Setting screen

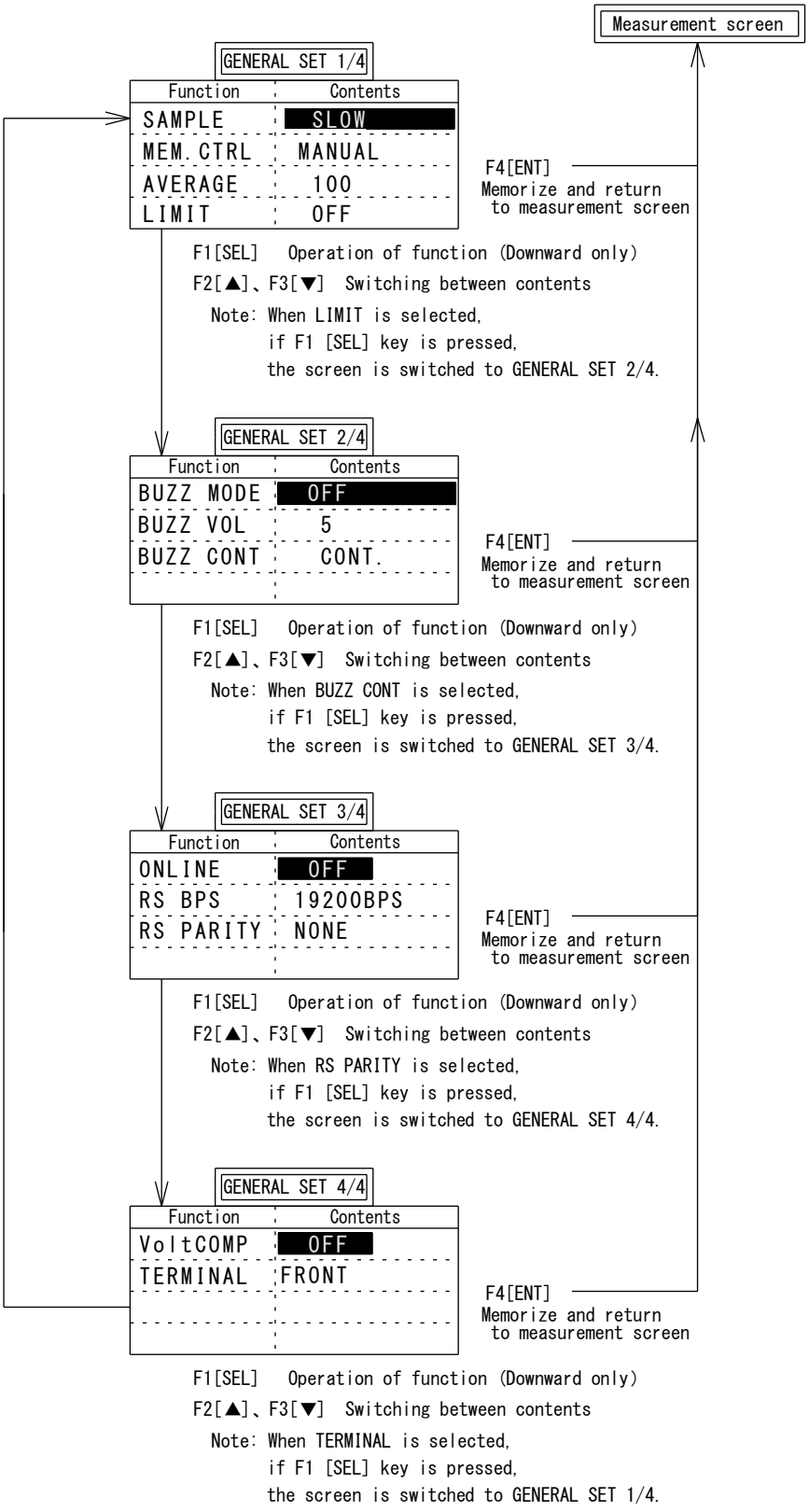


The device becomes HOLD state and judgment output is OFF during setting scree.

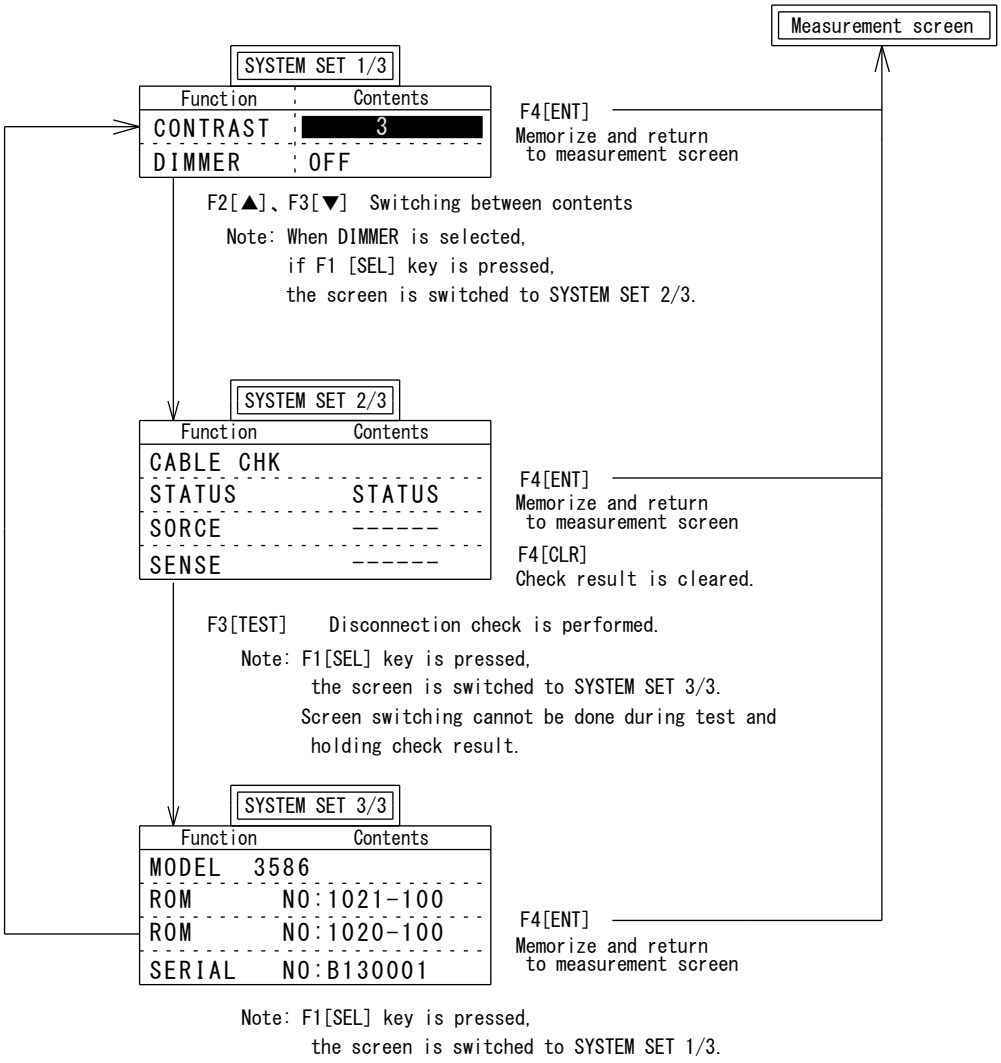
4.1.1 MEMORY SET flow



4.1.2 GENERAL SET flow



4.1.3 SYSTEM SET flow



4.2 Memory

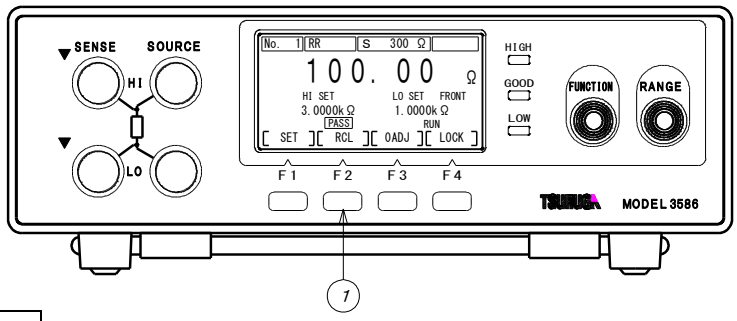
This instrument is equipped with 15 pairs of memories that store comparator and measurement conditions. The following 6 items are available for memory storage.

・Measurement function
・Measurement ranges of resistance and voltage
・Setting of comparator of resistance and voltage（Upper limit value, Lower limit value, Range）
・Standard value of ratio calculation and deviation
・Zero adjust value and operation

Note: Setting cannot be done in ONLINE condition.
Memory cannot be set while memory selection signal is valid.
Memory cannot be selected during HOLD.

[Selection of memory]

●Method from front panel



Call

When F2 [RCL] key (①) is pressed in standby state, memory No. will be increased, set state is called and displayed.

Memory No. from 1 to 15 can be selected.

●Method from external control

Refer to memory operation (5.1.5) for detailed instruction.

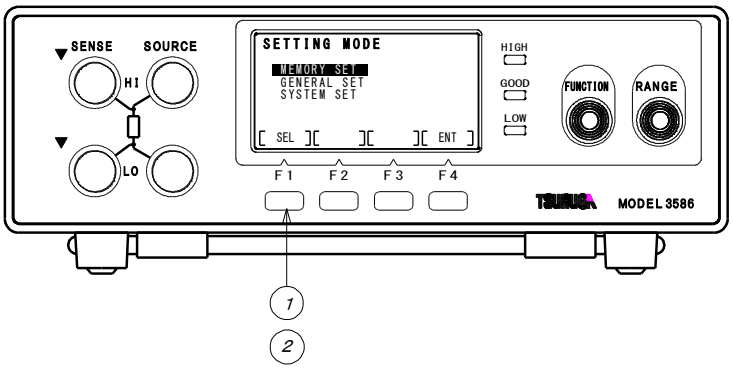
[Memory registration]

After selecting the memory No., set Measurement mode, Measurement range, Comparator and etc. can be set in MEMORY SET.

4.3 MEMORY SET

Memory No., Measurement function, Measurement range, Comparator, Ratio calculation, zero adjustment and Temperature correction can be set at Memory setting.

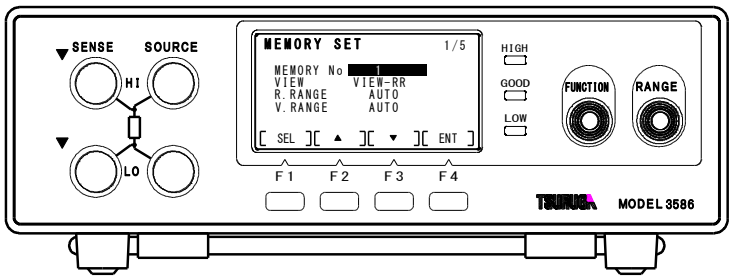
MEMORY SET



① Press F1[SEL] key in standby state.
Display changes to SETTING MODE.

② Press F1 [SEL] key and select MEMORY SET.
Press F4 [ENT] key to change memory setting.

Basic operation

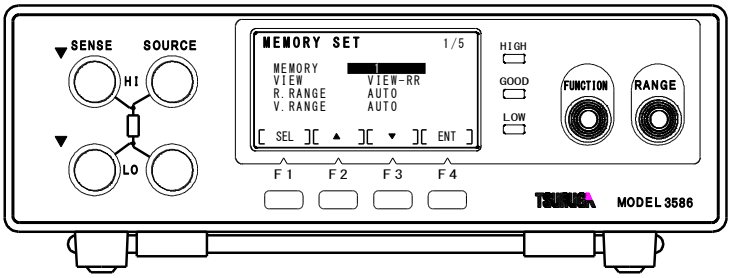


Operation key

F1 [SEL]	: Select setting item (Forward)
FUNCTION	: Select setting item (Reverse)
RANGE	: Select setting item (Forward), Same as F1 [SEL] The selected item is converted to reverse color.
F2 [▲]	: Select setting item or change the setting value.
F3 [▼]	Setting value can be increased [▲] or decreased [▼] by numerical setting.
F4 [ENT]	: Save the setting and the display returns to measurement standby state.

※Setting values can be initialized to factory shipment setting, when F2 [▲] + F3 [▼] keys are pressed simultaneously for more than 5 sec.

4.3.1 Selection of Memory



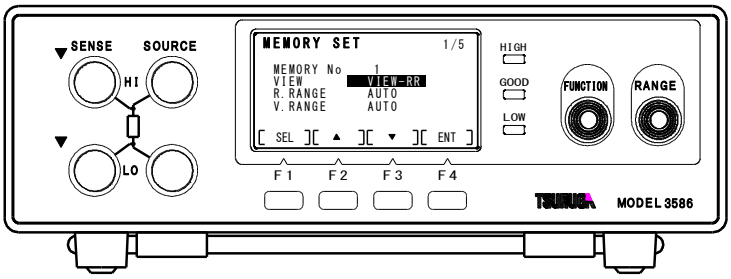
① Press F1[SEL] key to select MEMORY.

② Select the Memory No. by using F2 [▲] and F3 [▼] keys.

③ Press F4 [ENT] to save the setting and the display returns to measurement standby state.
To continue other setting, select the items by pressing F1 [SEL].

MEMEORY : No. 1 to 15 (Memory No.)

4.3.2 Setting of Measurement function



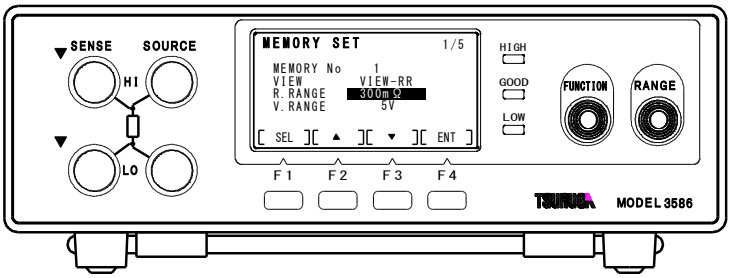
① Press F1 [SEL] to select the MEMEORY SET and press F4 [ENT].
Press F1 [SEL] to select VIEW.

② Select Display mode (Measurement function) by using F2 [▲] and F3 [▼] keys.

③ Press F4 [ENT] to save the setting data and the display returns to measurement standby state.
To continue other setting, select the item by pressing F1 [SEL].

Display mode	VIEW-RR	Resistance meter / Setting of resistance comparator
	VIEW-VV.	Voltage meter / Setting of voltage comparator
	VIEW-RV	Resistance meter / Voltage meter
	OHM-RATIO	Resistance ratio / Setting of ratio comparator

4.3.3 Setting of Measurement range



① Press F1 [SEL] key to select MEMEORY SET and press F4 [ENT] key.
Select R.RANGE by F1 [SEL] key.

② Press F2 [▲], F3 [▼] key to select measurement range.

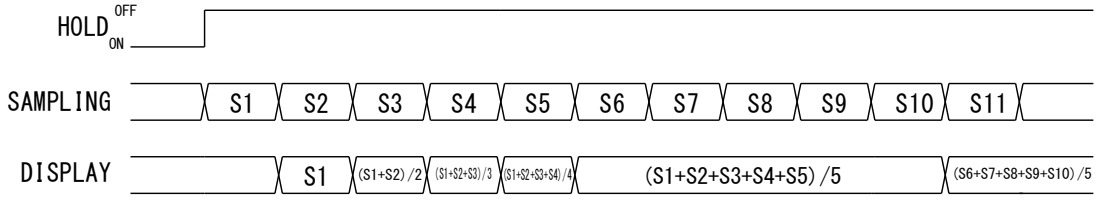
③ Press F4 [ENT] to save the setting and display returns to measurement standby state.
To continue other setting, select the items by pressing F1 [SEL].

RANGE	: 3mΩ	Measuring at 3 mΩ
	30mΩ	Measuring at 30 mΩ
	300mΩ	Measuring at 300 mΩ
	3Ω	Measuring at 3 Ω
	30Ω	Measuring at 30 Ω
	300Ω	Measuring at 300 Ω
	3 kΩ	Measuring at 3 kΩ
	AUTO	Measuring for automatic switching range from 3 mΩ to 3 kΩ.

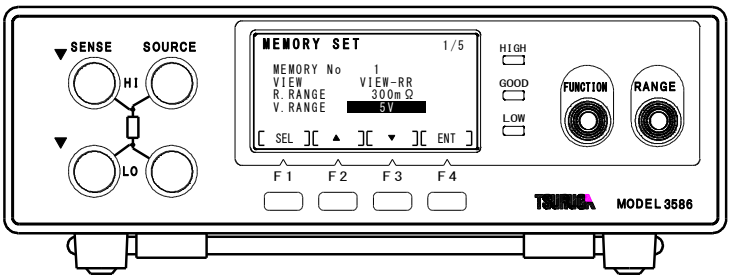
NOTE for 3 mΩ range

Refresh rate of display is different from other ranges in order to reduce influence of noise.

The average function takes priority if it is set.



4.3.4 Setting of voltage measurement range



① Press F1 [SEL] key to select MEMEORY SET and press F4 [ENT] key.
Select V.RANGE by F1 [SEL] key.

② Press F2 [▲], F3 [▼] key to select measurement range.

③ Press F4 [ENT] to save the setting and display returns to measurement standby state.
To continue other setting, select the items by pressing F1 [SEL].

RANGE	: 5V	Measuring at 5 V
	50V	Measuring at 50 V
	AUTO	Measuring for automatic switching range from 5 V to 50 V.

4.3.5 Setting of resistance comparator

Digital comparator can show the comparison result of the displayed value and the upper limit, lower limit value.

Comparison condition

Displayed value ≧ Upper limit set value（HIGH）	HIGH	output
Upper limit set value（HIGH）＞Displayed value ＞Lower limit set value（LOW）	GOOD	output
Displayed value ≦Lower limit set value（LOW）	LOW	output
Over is displayed（OVER）	HIGH	output
Under is displayed（UNDER）	LOW	output

Comparison output

The open collector output can be obtained from the terminal of rear side.

(Refer to section 5.1 External control)

Display HIGH, LOW : Red

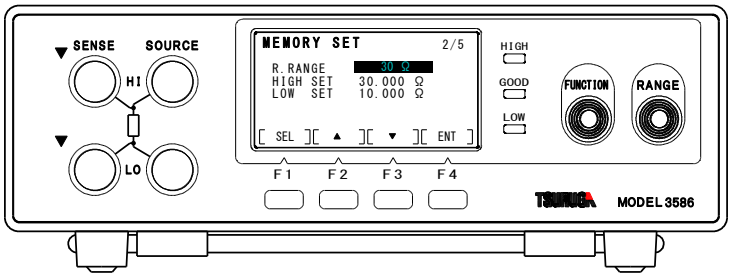
GOOD : Green

Setting range

Comparator can be set from 0 to 35000.

Range can be set at 3 mΩ, 30 mΩ, 300 mΩ, 3 Ω, 30 Ω, 300 Ω and 3kΩ.

Setting method



① F Press F1 [SEL] key to select MEMORY SET and press F4 [ENT] key to fix it

Select HIGH SET or LOW SET or R.RANGE by F1 [SEL] key.

(Selection of setting items can be chosen either forward or reverse way by FUNCTION and RANGE key respectively.)

② Press F2 [▲], F3 [▼] key to change the setting values.

If F2(▲), F3(▼) are pressed continuously, HIGH set and LOW set can be changed in 3 steps.

③ Press F1 [SEL] to select RANGE.

④ Press F2 [▲], F3 [▼] KEY to change the setting

The decimal point and unit of 'HIGH SET', 'LOW SET' are changed accordingly.

⑤ Press F4 [ENT] to save the setting and the display returns to measuring mode.

To continue other setting, select the item by pressing F1 [SEL].

4.3.6 Ratio display

It is a function displayed in percentage with respect to standard resistance value by comparing measured resistance value Rx and standard resistance value Rs.
The comparison judgment (±△%) of deviation can be done.

Equation) $$X = \frac{Rx}{Rs} \times 100\%$$

$$\Delta = \left(\frac{Rx}{Rs} - 1\right) \times 100\%$$

X Ratio (%)
Rs : Standard resistance (Ω) STD SET
Rx : Measured resistance value (Ω) DEV STD
△ : Deviation (%)

Display range -199.9 to 199.9 %
'OVER' or 'UNDER' is displayed, when the value exceeds display range.

Comparison operation

Comparison operation ±△%
Compare values regarding 'DEVSET' as upper and lower deviation.
When comparison range △% is set to 10.0 %, ±10 % of the range corresponding to 100 % is made GO judgment.

LOW judgment : -199.9 to 90.0 %, UNDER
GOOD judgment : 90.1 to 109.9 %
HIGH judgment : 110.0 to 199.9 %, OVER

Comparison output

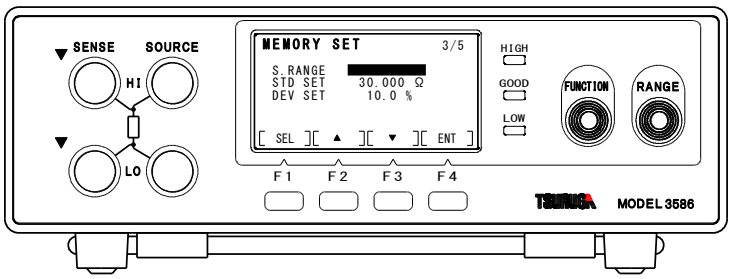
The open collector output can be obtained from the terminal of rear side.
(Refer to section 5.1 Control terminal)

LED display HIGH, LOW : Red
GOOD : Green

Setting range

STD SET can be set from 00000 to 35000.
DEV SET can be set from 0.0 % to 100.0 %.
Range can be set at 3 mΩ, 30 mΩ, 300 mΩ, 3 Ω, 30 Ω, 300 Ω or 3 kΩ.

Setting method



① Press F1 [SEL] key to select MEMORY SET and press F4 [ENT] key.
Select STD SET, DEV SET or S.RANGE by F1 [SEL] key.
(Selection of setting items can be chosen either forward or reverse way by FUNCTION and RANGE key respectively.)

② Press F2 [▲], F3 [▼] key to change the setting values.
If F2(▲) and F3(▼) are pressed continuously, STD set, DEV set can be changed in 3 steps.

③ Press F1 [SEL] to select S.RANGE.

④ Press F2 [▲], F3 [▼] KEY to change the setting
The decimal point and unit of 'STD SET' is changed accordingly.

⑤ Press F4 [ENT] to save the setting and the display returns to measuring mode.
To continue the other setting, select the items by pressing F1 [SEL].

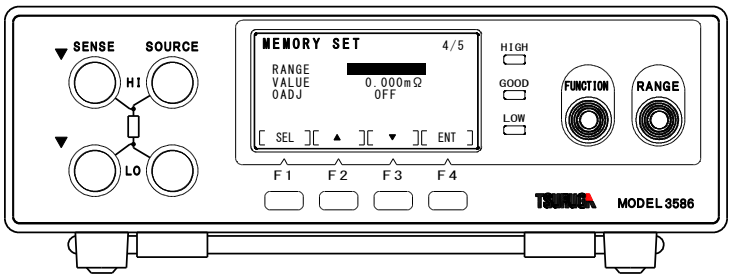
4.3.7 Zero adjustment

This is the function to eliminate the external cable resistance and connection fixtures etc. The value where zero adjust value is subtracted from the measured value is displayed.

Display value	=	Measured value	–	Zero adjust value

※In case of changing measurement terminals setting, cancel the zero adjustment first and set it again.

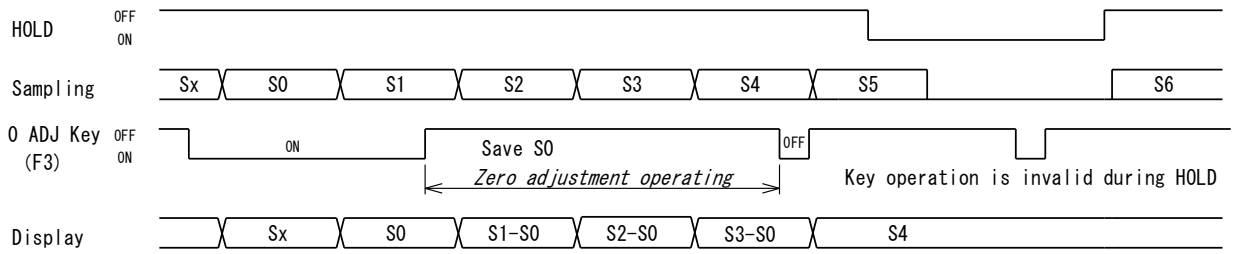
Setting method



① Press F1 [SEL] key to select MEMORY SET and press F4 [ENT] key.
(Selection of setting items can be chosen either forward or reverse way by FUNCTION and RANGE key respectively.)
Select 0ADJ, A.RANGE or VALUE by pressing F1 [SEL] key.
② Press F2 [▲], F3 [▼] key to change the setting values.
③ Select VALUE by pressing F1 [SEL] key.
④ Press F2 [▲], F3 [▼] key to change the setting.
If F2(▲) and F3(▼) are pressed continuously, the speed of VALUE can be changed in 3 steps.
⑤ Press F4 [ENT] to save the setting and the display returns to measurement mode.
If 0ADJ is set ON and the setting operation is ended, zero adjustment operation is activated.
To continue other setting, select the items by pressing F1 [SEL].

Operation of zero adjustment key (F3: 0ADJ)

ON/OFF of zero adjustment function can be set by pressing 0ADJ key (F3) during measurement.
The calculation is done according to the set zero adjustment.
Pressing 0ADJ key (F3) for more than 1 sec., the measured value is saved and the calculation is done.



4.3.8 Setting of voltage comparator

Digital comparator can show the comparison result of the displayed value and the upper limit, lower limit value.

Comparison condition

Displayed value ≧ Upper limit set value（HIGH）	FAIL output
Upper limit set value（HIGH）＞Displayed value ＞Lower limit set value（LOW）	PASS output
Displayed value ≦Lower limit set value（LOW）	FAIL output
Over is displayed（OVER）	FAIL output
Under is displayed（UNDER）	FAIL output

Comparison output

The open collector output can be obtained from the terminal of rear side.

(Refer to section 5.1 External control)

OLED display : PASS or FAIL

LED display : GOOD: Green

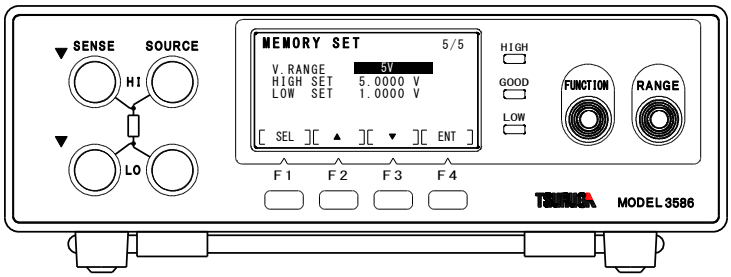
: FAIL: All lamps off

Setting range

Comparator can be set from 0 to ± 50000.

Range can be set at 5 V or 50 V.

Setting method



① Press F1 [SEL] key to select MEMORY SET and press F4 [ENT] key to fix it

Select HIGH SET or LOW SET or V.RANGE by F1 [SEL] key.

(Selection of setting items can be chosen either forward or reverse way by FUNCTION and RANGE key respectively.)

② Press F2 [▲], F3 [▼] key to change the setting values.

If F2(▲), F3(▼) are pressed continuously, HIGH set and LOW set can be changed in 3 steps.

③ Press F1 [SEL] to select RANGE.

④ Press F2 [▲], F3 [▼] KEY to change the setting

The decimal point and unit of 'HIGH SET', 'LOW SET' are changed accordingly.

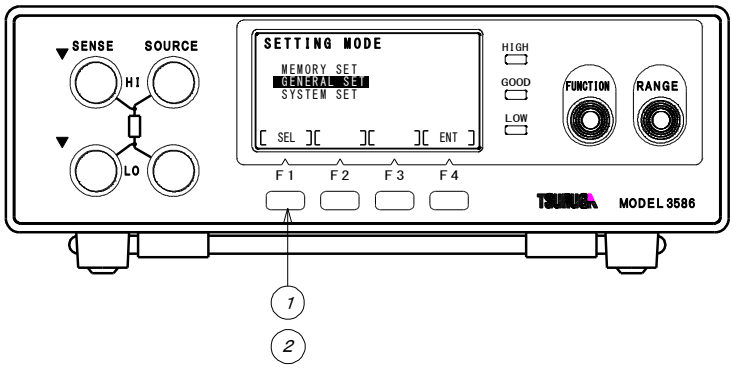
⑤ Press F4 [ENT] to save the setting and the display returns to measuring mode.

To continue other setting, select the item by pressing F1 [SEL].

4.4 GENERAL SET

Sampling cycle, external control, averaging process, limitation of open terminal voltage function, buzzer, communication, voltage comparison function and selection of measuring terminal can be set in GENERAL SET.

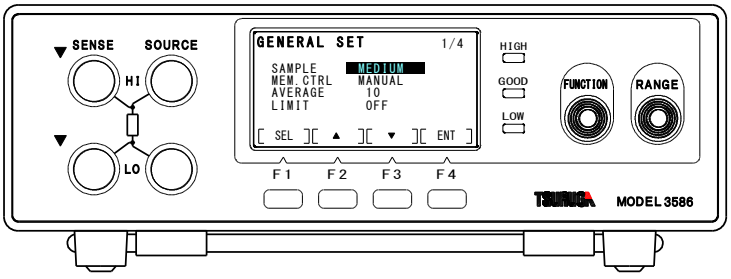
Select GENERAL SET



① Press the F1 [SET] key in the standby state.
Display changes to SETTING MODE.

② Press F1 [SEL] key and select GENERAL SET.
If F4 [ENT] is pressed, display changes to equipment setting.

Basic operation

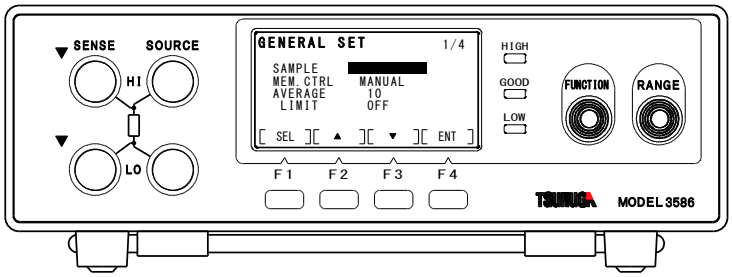


Operation key

F1 [SEL]	: Select setting item (Forward).
FUNCTION	: Select setting item (Reverse).
RANGE	: Select setting item (Forward, same as F1 [SEL]). The color of selected item is converted to reverse color.
F2 [▲]、F3 [▼]	: Setting values can be changed.
F4 [ENT]	: Save the set value and the display returns to the measurement mode.

4.4.1 Setting of Sampling

The sampling speed of measurement can be set.



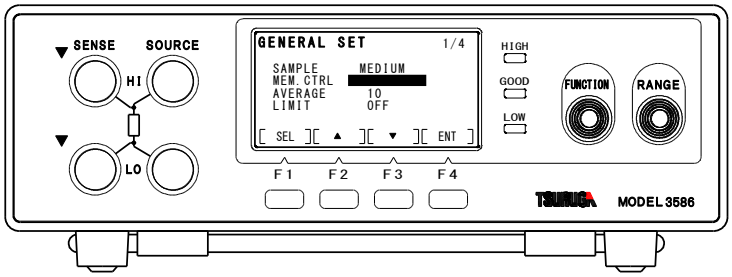
① Press F1 [SEL] key to select GENERAL SET and press F4 [ENT] key.
Select SAMPLE by pressing F1 [SEL] key.
(Selection of setting items can be chosen either forward or reverse way by FUNCTION and RANGE key respectively.)

② Press F2 [▲], F3 [▼] key to select SLOW / MEDIUM / FAST50 / FAST60.

③ Press F4 [ENT] to save the setting and the display returns to the measuring mode.
To continue other setting, select the items by pressing F1 [SEL].

4.4.2 Selection of memory setting by rear panel control

Rear terminals can be used for setting enable / disable of the memory selection.



① Press F1 [SEL] key to select GENERAL SET and press F4 [ENT] key.
Select MEM. CRTL by pressing F1 [SEL] key.
(Selection of setting items can be chosen either forward or reverse way by FUNCTION and RANGE key respectively.)

② Press F2 [▲], F3 [▼] to select MANUAL / REMOTE
MANUAL : Memory is selected by operation of the front panel F2[RCL] key.
REMOTE : Memory is selected by MEM1, MEM2, MEM4, MEM8 of rear control terminals.

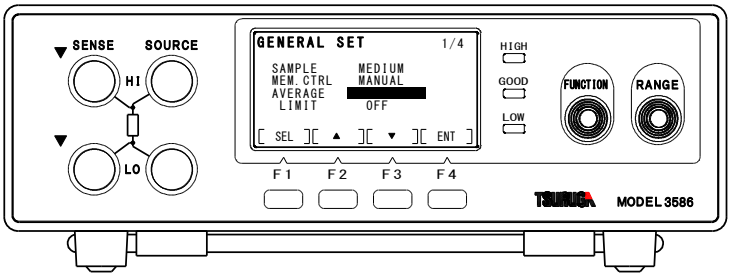
③ Press F4 [ENT] to save the setting and display returns to measurement mode.
To continue other setting, select the items by pressing F1 [SEL].

4.4.3 Setting of average number of sampling times

Setting of average sampling number of resistance measurement can be done. No influence is occurred on voltage measurement.

Measured resistance value is displayed by calculating moving average value.

Noice reduction processing at 3 mΩ range becomes invalid.

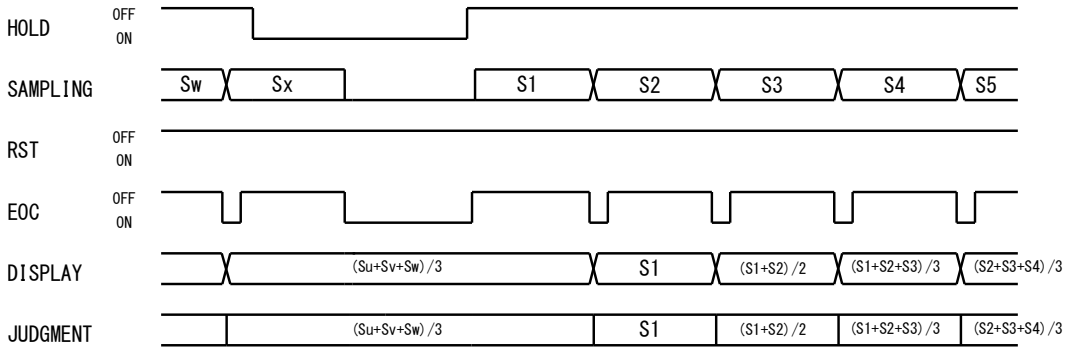


① Press F1 [SEL] key to select GENERAL SET and press F4 [ENT] key.
Select AVERAGE by pressing F1 [SEL] key.
(Selection of setting items can be chosen either forward or reverse way by FUNCTION and RANGE key respectively.)

② Press F2 [▲], F3 [▼] to set average number of sampling times.
Setting range : 1 to 100 times

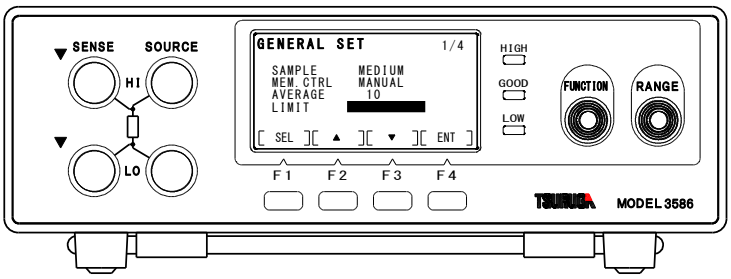
③ Press F4 [ENT] to save the setting and display returns to measurement mode.
To continue the other setting, select the items by pressing F1 [SEL].

When the average sampling number is set 3 times,



4.4.4 Setting of open terminal voltage limitation

Setting of the open terminal voltage limitation can be controlled during resistance measurement. When the setting is ON, applied voltage to the specimen is limited to less than 20 mV peak.



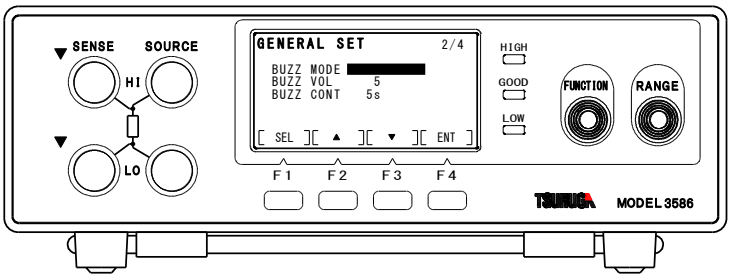
① Press F1 [SEL] key to select GENERAL and press F4 [ENT] key.
Select LIMIT by pressing F1 [SEL] key.
(Selection of setting items can be chosen either forward or reverse way by FUNCTION and RANGE key respectively.)

② Pres F2 [▲], F3 [▼] key to select ON/OFF.
ON : Open terminal voltage limitation is done. V.LMT is displayed.
OFF : No limitation of open terminal voltage is done.

③ Press F4 [ENT] to save the setting and display returns to measurement mode.
To continue the other setting, select the items by pressing F1 [SEL].

4.4.5 Setting of buzzer

Buzzer operation and volume of sound can be set.



① Press F1 [SEL] key to select GENERAL SET and press F4 [ENT] key.
Select BUZZ MODE, BUZZ VOL or BUZZ CONT by pressing F1 [SEL] key.
(Selection of setting items can be chosen either forward or reverse way by FUNCTION and RANGE key respectively.)

② Press F2 [▲], F3 [▼] key to change the setting.

BUZZ MODE

The condition of buzzer ringing is set.

GO : Ring the buzzer during GO judgment of resistance value and calculated value.
HING : Ring the buzzer during HIGH judgment of resistance value and calculated value.
LONG : Ring the buzzer during LOW judgment of resistance value and calculated value.
HILONG : Ring the buzzer during HIGH or LOW judgment of resistance and calculated value.
PASS : Ring the buzzer during PASS judgment of voltage value.
FAIL : Ring the buzzer during FAIL judgment of voltage value.
GOOD : Ring the buzzer during GO both of resistance value and calculated value, and PASS of voltage value.
NG : Ring the buzzer either resistance value and calculated value or voltage value is not GO or PASS.
OFF : No judgment buzzer

BUZZ VOL

Setting range : 1 to 9

BUZZ CONT

The condition of buzzer ringing time is set.

CONT. : Ring buzzer continuously.
1s : Ring buzzer for 1 sec.
5s : Ring buzzer for 5 sec.

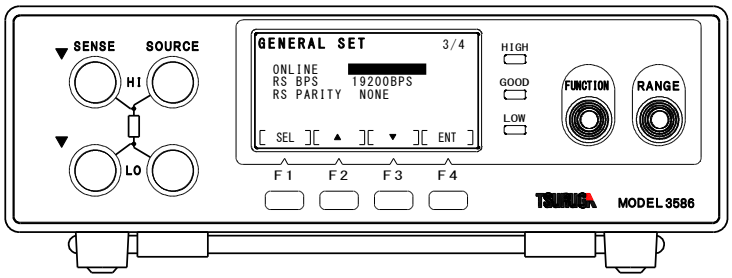
③ Press F4 [ENT] to save the setting and display returns to measurement mode.
To continue other setting, select the items by pressing F1 [SEL].

4.4.6 Setting of communication

RS-232C communication setting is carried out here.

ON/OFF of communication function is carried out by ONLINE setting.

The setting of communication speed by the RS BPS and setting of parity bit by RS PARITY are carried out. The communication speed and parity bit should be set according to the setting of higher level equipment like PC etc.



① Press F1 [SEL] key to select GENERAL SET and press F4 [ENT] key.

Select ONLINE, RS BPS, RS PARITY by pressing F1 [SEL] key.

(Selection of setting items can be chosen either forward or reverse way by FUNCTION and RANGE key respectively.)

② Press F2 [▲], F3 [▼] key to select setting as below.

ONLINE : ON/OFF of the communication function

Control from RS-232C communication can be done with ON.

(ONLINE becomes off, when power is off.)

RS BPS : Set communication speed

9600 bps, 19200 bps, 38400 bps, 57600bps, 115200 bps

RS PARITY : Set parity bit of communication data.

NONE

ODD

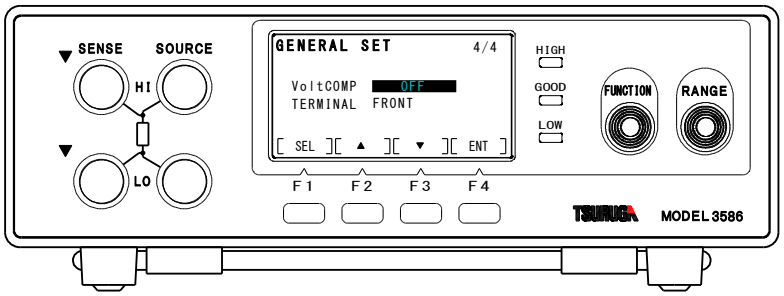
EVEN

③ Press F4 [ENT] to save the setting and the display returns to measurement mode.

To continue the other setting, select the items by pressing F1 [SEL].

4.4.7 Setting of voltage comparator

Voltage comparator can be off, when voltage measuring function is not used.



① Press F1 [SEL] key to select GENERAL SET and press F4 [ENT] key.
Select VoltCOMP by pressing F1 [SEL] key.
(Selection of setting items can be chosen either forward or reverse way by FUNCTION and RANGE key respectively.)

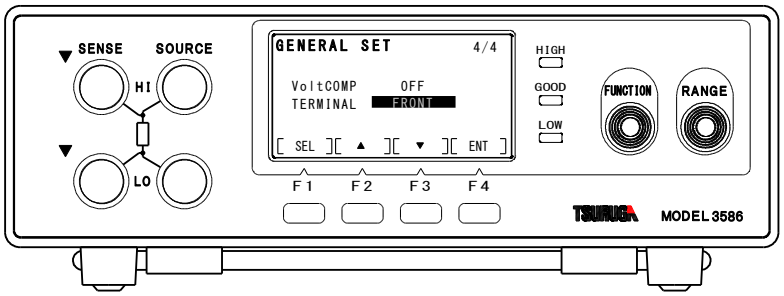
② Press F2 [▲], F3 [▼] key to select setting as below.
VoltCOMP ON : Valid of voltage comparator
VoltCOMP OFF : OFF of voltage comparator

③ Press F4 [ENT] to save the setting and the display returns to measurement mode.
To continue the other setting, select the items by pressing F1 [SEL]

※NOTE
Judgment output is off both for PASS and FAIL during OFF.
OLED and LED lamps are lit off, NONE is output on serial communication,
Buzzer setting on voltage comparator is ignored.

4.4.8 setting of measuring terminal selection

Select the terminal of measuring terminal, front or rear side.



① Press F1 [SEL] key to select GENERAL SET and press F4 [ENT] key.
Select TERMINAL by pressing F1 [SEL] key.
(Selection of setting items can be chosen either forward or reverse way by FUNCTION and RANGE key respectively.)

② Press F2 [▲], F3 [▼] key to select setting as below.

TERMINAL FRONT	Using measuring terminal on front
TERMINAL REAR	Using measuring terminal on rear

③ Press F4 [ENT] to save the setting and the display returns to measurement mode.
To continue the other setting, select the items by pressing F1 [SEL].

※NOTE

Although using different side of measuring terminal from set side enables measurement, measurement error may become larger.

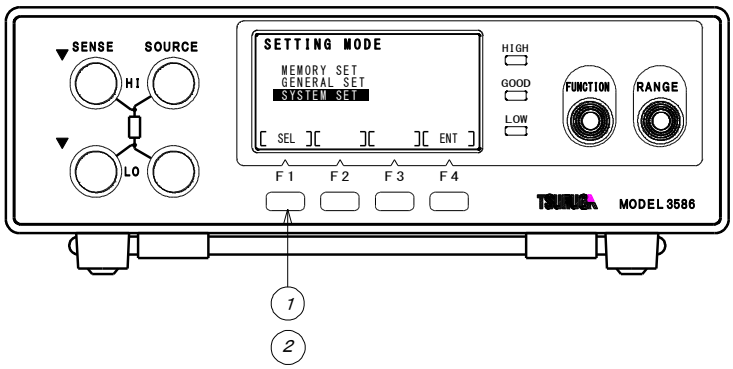
Use the same side of measuring terminal, there are typical error occurs in low resistance range (3 mΩ and 30 mΩ) especially.

4.5 SYSTEM SET

Setting of the contrast of display and display of the instrument can be done.

And disconnection of measuring cable can be performed.

Select SYSTEM SET



① Press F1 [SET] key in the standby state.

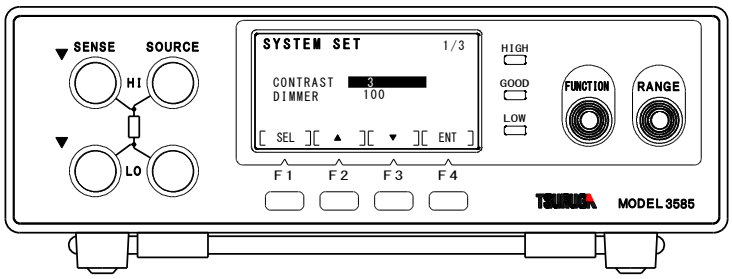
Display changes to SETTING MODE.

② Press F1 [SEL] key to select SYSTEM SET.

If F4 [ENT] key is pressed, the display changes to SYSTEM SET.

4.5.1 Setting of contrast

Adjust the brightness of the display.



① Press F1 [SEL] key to select SYSTEM SET and press F4 [ENT] key to fix it.

Press F1 [SEL] key to select CONTRAST.

② Press F2 [▲], F3 [▼] key for setting.

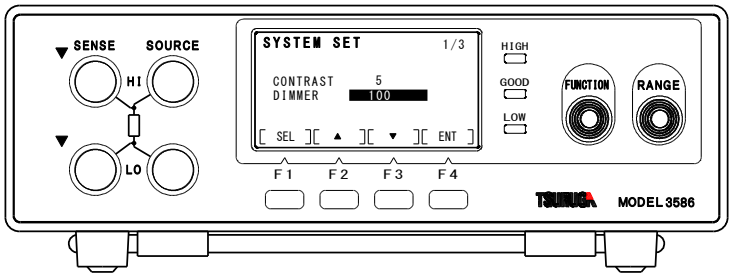
Setting range : 1 to 5

③ Press F4 [ENT] key to save the setting and the display returns to measurement mode.

To continue other setting, select the item by pressing F1 [SEL] key.

4.5.2 Setting of dimmer

Set the automatic adjustment of display brightness.



① Press F1 [SEL] key to select SYSTEM SET and press F4 [ENT] key.
Select DIMMER by pressing F1 [SEL] key.

② Press F2 [▲], F3 [▼] key to set.
Setting range : OFF to 100 (sec.)
OLED display automatically fades dark after the set time of no operation.

③ Press F4 [ENT] key to save the setting and returns to measurement.
To continue other settings, select the item by pressing F1 [SEL] key.

4.5.3 Measuring leads test

Detection of disconnection for SOURCE, SENSE of measuring leads.

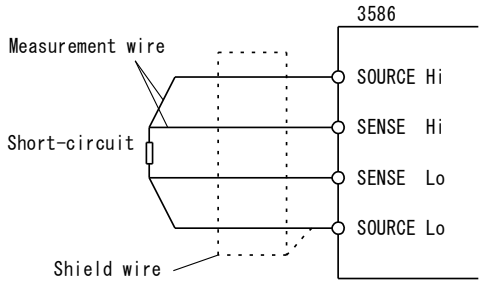
ON of ERR-CC output can be obtained, when disconnection is detected.

And constant ON output is obtained, when no measuring current flows like SOURCE terminal open. Sampling is suspended during disconnection detection.

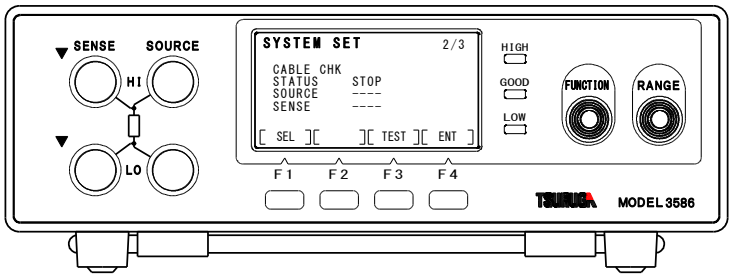
Preparation

Connect measuring leads to the instrument

Short-circuit tips of measuring leads. (Note)



Note) When resistance of specimen is high, proper detection may not be done.



① Press F1 [SEL] key to select SYSTEM SET and press F4 [ENT] key.
Press F1 [SEL] key to select CABLE CHK.

② Press F3 [TEST] key and start the cable check.
STATUS changes to TESTING during checking.
(No key operation is accepted during checking.)
STATUS changes to END after the check.
Checking result is displayed in SOURCE / SENSE.

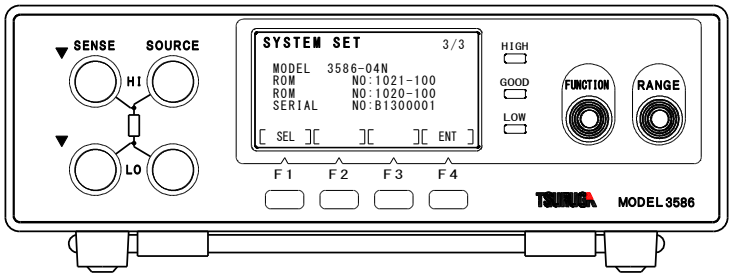
Display of check result

OK	No problem found
NG	Confirm wiring of SOURCE side.
HING	Confirm wiring of SENSE HI side.
LONG	Confirm wiring of SENSE LO side.
HILONG	Confirm all wiring of SENSE side.

③ Press F3 [TEST] key and retry the check.
Press F4 [CLR] key and clear results. Once the result is cleared, returning to measurement by F4 [ENT] key and selecting item by F1[SEL] key are selectable.

4.5.4 Display of the instrument information

Instrument information is shown.



MODEL : Model and option designation

ROM : No. of firmware

SERIAL : Serial No. of the model

① Press F4 [ENT] key to save the setting and return to the measurement.
Press F1 [SEL] key to changes to contrast setting.

5. External control

Selection of memory, control of sampling hold and signals like judgment and etc. can be obtained from the control terminal located at rear panel.

5.1 Control terminal

5.1.1 Terminal arrangement

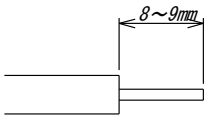
No.	Signal name	Input/ output	Function
1	0V	—	Analog output 0V (Common for 2-3) This terminal is internally connected with No.4, 12. Do not use commonly to avoid measuring errors.
2	+VOLT	Output	Voltage analog output 0-2.5V is output according to voltage measurement (×0.5 times)
3	+OHM	Output	Resistance analog output 0-3.0V is output according to resistance measurement.
4	O-COM	—	Common for output (Common for 5-11) Connected internally with No. 12 I-COM.
5	GO	Output	Comparator GOOD judgment output, ON is output during GOOD judgment.
6	LO	Output	Comparator LOW judgment output, On is output during LOW judgment.
7	HI	Output	Comparator HIGH judgment output, ON is output during HIGH judgment.
8	FL	Output	Comparator FAIL judgment output, ON is output during FAIL judgment.
9	PS	Output	Comparator PASS judgment output, ON is output during PASS judgment.
10	ERR-CC	Output	ON is output, when SOURCE of resistance measurement input is open or larger resistance against the range is connected.
11	EOC	Output	ON is output during sampling stop. Pulse of 6ms width is output during continuous sampling.
12	I-COM	—	Common for input (Common for 13-19) Connected internally with No.4 O-COM.
13 14 15 16	MEM1 MEM2 MEM4 MEM8	Input	Inputting memory No. and recall the memory. Refer to table in Memory operation (5.1.5) .
17	0.ADJ	Input	Input of zero-adjust When this is ON, zero-adjust is done.
18	HOLD	Input	Input of sampling hold When this is ON, measurement is suspended and the result is retained.
19	RST	Input	Judgment reset and input of one-sampling hold. When this is ON, judgment output is OFF. When sampling hold is ON, one shot sampling is done.

5.1.2 Connection

Compatible electrical wire　AWG26 to AWG20

Process the wire shown in figure below and connect it to terminal.

Press the release button down with help of screw driver and insert the wire into it.



Peel length= 8 to 9 mm

5.1.3 Input/output signals

Input signal

Residual voltage of input ON : Less than 1 V（ON, current is less than 30 mA.）

Response time　: 5 ms (MAX.)

Output signal

Signal　: Open collector output（NPN）

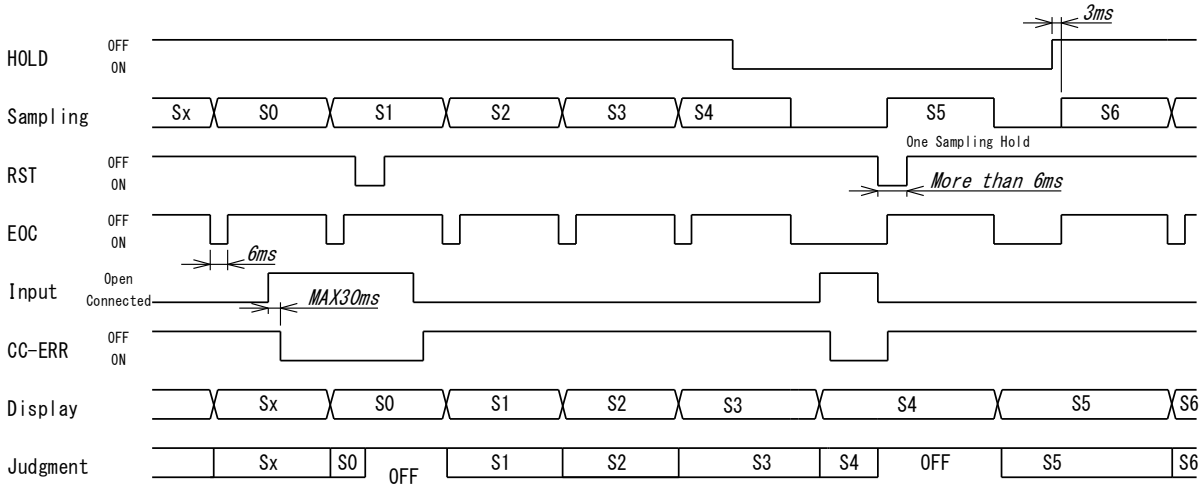
Max. load　: DC 30 V　30 mA

Residual voltage　: Less than　1　V（During load current　30mA）

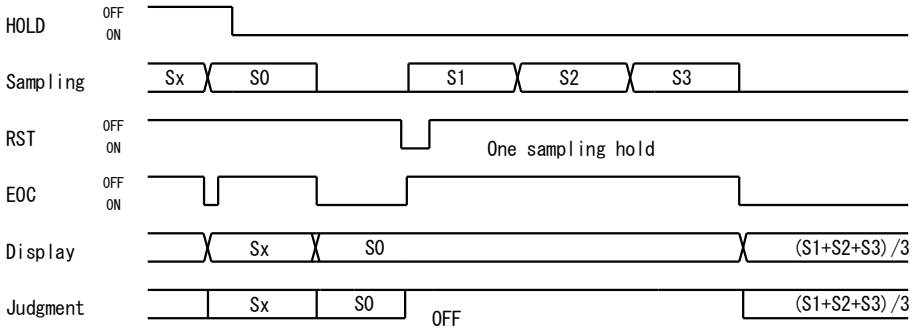
5.1.4 External control timing chart

・Timing of measurement

Average number of times 1 time

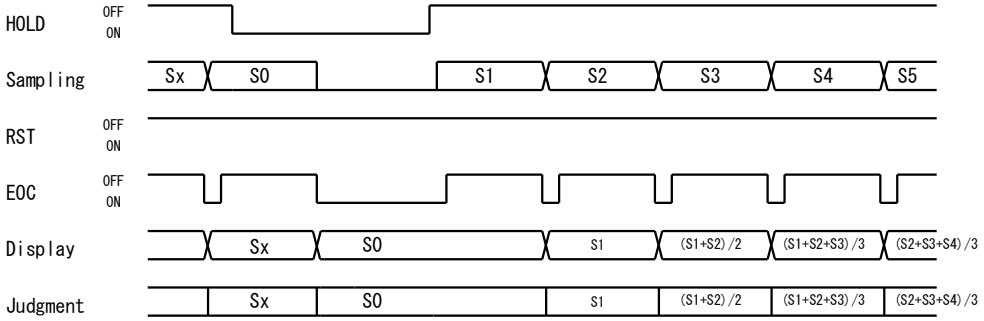


Average number of times 3 times (One sampling hold) ※Note

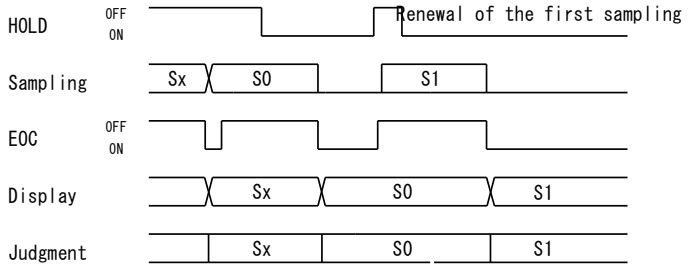


※Note: One sampling hold function cannot ne used in AUTO range, it is used in HOLD range.

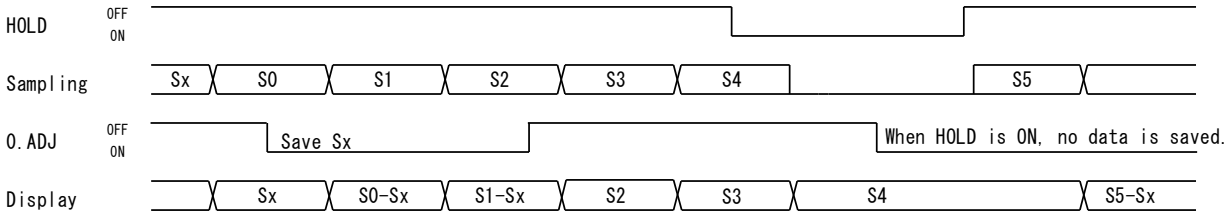
Average number of times 3 times (When HOLD is released.)



Average number of times 3 times (When HOLD is released by pulse.)



・Zero adjustment



5.1.5 Memory operation

① Set the MEM.CTRL to REMOTE at GENERAL SET.

② Input the code of the memory No.

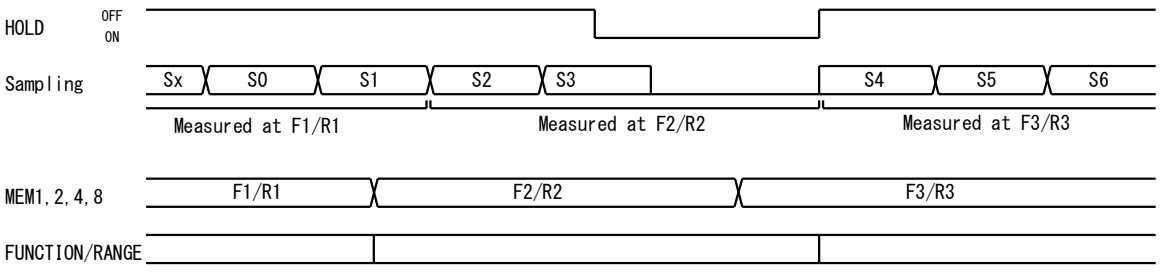
Note: Memory cannot be called except the memory No. code from 1 to 15.

MEM No.	MEM1	MEM2	MEM4	MEM8
1	○	—	—	—
2	—	○	—	—
3	○	○	—	—
4	—	—	○	—
5	○	—	○	—
6	—	○	○	—
7	○	○	○	—
8	—	—	—	○
9	○	—	—	○
10	—	○	—	○
11	○	○	—	○
12	—	—	○	○
13	○	—	○	○
14	—	○	○	○
15	○	○	○	○
	Invalid except above			

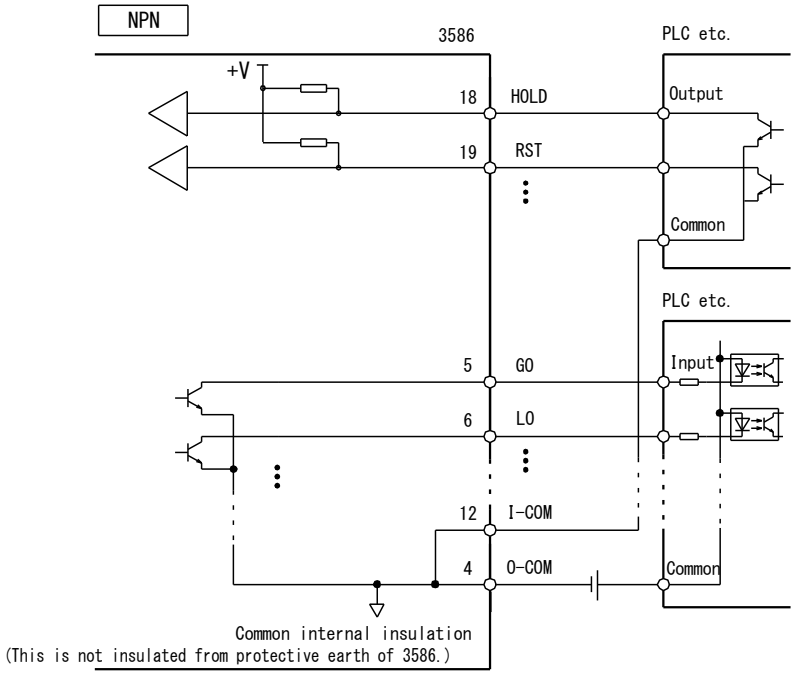
○ : ON（Connection with I-COM）

– : OFF（Open）

・Memory selection



5.1.6 Internal circuit configuration



6. Communication (RS-232C)

The setting of Function, Range, Memory etc., as well as measurement data and judgment result can be obtained by RS-232C communication.

6.1 Specification

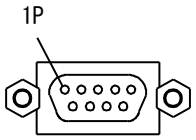
6.1.1 Communication specification

Transmission system	: Start-stop synchronization Full duplex
Transmission rate	: 9600, 19200, 38400,57600,115200bps (Factory setting 9600bps during delivery)
Data bit length	: 8 bit
Stop bit	: 1 bit
Parity bit	: none, even, odd number (Factory setting: none)
Delimiter	: CR+LF (0DH+0AH)
Connector	: D-sub9 pin (male) Inch screw type

6.1.2 Connector pin arrangement

RS-232C connector

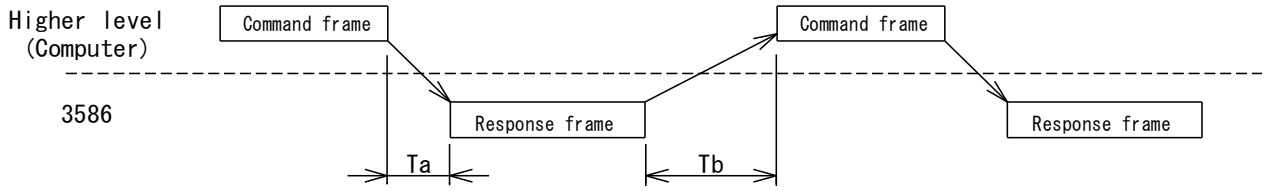
D-sub9 pin connector



RS-232C connector arrangement

Pin No.	3586 signal JIS (RS-232C)	Direction	Function
1			Not used
2	RD (RXD)	Input	Receiving data
3	SD (TXD)	Output	Transmitting data
4			Not used
5	SG (GND)		Ground signal
6			Not used
7			
8			
9			

6.1.3 Operation



Ta Command response time : MAX. approx. 5 ms

Tb After response, command prohibition time : RS-232C MAX. 5 ms

Note: To control the operation by data communication, set ONLINE to ON condition in general SETTING (Refer to 4.4.6). When power is turned to OFF, ONLINE setting is returned to OFF(LOCAL) condition. During every power ON time, ONLINE should be set to REMOTE by outside ONLINE command. If the communication is carried out when ONLINE is OFF(LOCAL) condition, an error response is obtained except read command.

6.2 List of communication command and response

Symbols used in command and response

Symbol	Content	Hexadecimal code
□	Space	20H
[CR]	Carriage Return	0DH
[LF]	Line feed	0AH

Error response

Error response	Content
Command□Err	Command message is not right.
ERR	Not online Set message is not right or set value is out of range.
ERROR	Memory cannot be written down with WRITEMEMORY command.

Caution

The setting contents of communication command cannot be saved, if power is shut down.

If WRITE MEMORY command is used, the setting contents are saved in memory, even though power is shut down during measurement.

Command is case-insensitive.

Command	DATA	
Content	Read out of measured value (Response differs depending on FUNCTION.)	
OHM measurement (RR,VV,RV)	Command	DATA?[CR][LF]　(fixed at 7byte)
	Response	OHM=+30.000mOHM,R-JUDGE=HI□□□,VOLT=+0.1234V,V-JUDGE=FAIL[CR][LF]　(fixed at 58byte)
	Response detail	Resistance measurement=Resistance value・Unit, Resistance judgment=Resistance Judgment result, Voltage measurement=Voltage value・Unit, Voltage judgment=Voltage judgment result[CR][LF]
	Resistance ・Unit Over display	+3.0000mOHM ,+30.000mOHM,+300.00mOHM,+3.0000□OHM,+30.000□OHM,+300.00□OHM,+3.0000kOHM -3.0000mOHM (Negative representation at 0ADJ) +1.2345□OHM,+01.234□OHM,+001.23□OHM (1.2345Ωを 3Ω/30Ω/300Ωレンジで測定した場合) OVER□□□,UNDER□□(Negative representation at 0ADJ)
	Resistance judgment	HI□LO,GO□□□, HI□□□, LO□□□, NULL□, CC□□□
		HI=HI judgment, LO=LO judgment, GO=Possible judgment, NULL=None judgment, CC=Constant current error
	Voltage measurement・Unit Over display	+0.1234V, -0.1234V,+12.345V,-12.345V +1.2345V,+01.234V　(Ex. 1.2345V is measured at 5V/50V range) +OVER□□,-OVER□□
	Voltage judgment	FAIL,PASS,NULL
		FAIL=Judgment impossible, PASS=Judgment possible, NULL=None judgment
Ratio measurement (OHMR)	Response	RATIO=+090.0%,RS=+1.0000□OHM,RX=+00.999□OHM,R-JUDGE=LO□□□,VOLT=+0.0002V,V-JUDGE=FAIL[CR][LF] (86byte 固定)
	Response detail	Ratio measurement=Ratio%, Standard resistance=Standard resistance value・Unit, Measured resistance value=Resistance value・Unit, Ratio judgment=Judgment result, Voltage measurement=Voltage value・Unit, Voltage value judgment=Voltage judgment result[CR][LF]
	Ratio % Over display	+001.0%,+010.0%,+100.0%,-001.0%,+010.0%,-100.0% OVER□□□,UNDER□□
	Standard resistance・Unit	+3.0000mOHM ,+30.000mOHM,+300.00mOHM,+3.0000□OHM,+30.000□OHM,+300.00□OHM,+3.0000kOHM
	Resistance value・Unit	Same format as OHM measurement
	Ratio judgment	Same format as OHM measurement
	Voltage judgment・Unit	Same format as OHM measurement
	Voltage value judgment	Same format as OHM measurement

Command	ONLINE	
Content	Online control	
Read out	Command	ONLINE?[CR][LF]　(fixed at 9byte)
	Response	ONLINE=OFF[CR][LF]　(fixed at 12byte)
	Response detail	Online state＝Online setting[CR][LF]
	Setting of online	ON□,OFF　(fixed at 3byte)
		ON□=Online　Reading out of measured data and setting, setting of values are possible via RS-232C. OFF=Offline　Reading out of setting and measured data are possible via RS-232C.
Setting	Command	ONLINE=ON□[CR][LF]　(fixed at 12byte)
	Command detail	Online state＝Online condition[CR][LF]
	Online setting	Same format as read out
	Response	Same string as Command

Command	IDNT	
Content	Product information (Serial No. is also stated on the sticker of 3586.)	
Read out	Command	IDNT?[CR][LF]　(fixed at 7byte)
	Response	IDNT=TSURUGA,3586-04N,1020-001,1021-002,D7312348[CR][LF]　(fixed at 50byt ※)
	Response detail	Product information＝Manufacturer, Model, ROM version No., ROM1 version No., Srial No.,[CR][LF]
	Manufacturer	TSURUGA　(fixed at 6byte)
	Model	3586-X□□, 3586-03□,3586-04N, 3586-04P　(fixed at 8byte ※)
	ROM No. of measuring part	1020-XXX　(fixed at 8byte)
	ROM No. of display part	1021-XXX　(fixed at 8byte)
	Serial No.	(fixed at 8byte)
	※	The length may be longer in case of special model.

Command	BUZZ	
Content	Buzzer control	
Read out	Command	BUZZ?[CR][LF]　(fixed at 7byte)
	Response	BUZZ=OFF□,01,0[CR][LF]　(fixed at 16byte)
	Response detail	Buzzer control＝Buzzer condition, Volume, Length[CR][LF]
	Buzzer condition	OFF□,GO□□,HI□□,LO□□,HILO,PASS,FAIL,GOOD,NG□□　(fixed at 4byte)
		OFF=no ringing, GO□□=GO judgment, HI□□=HI judgment, LO□□=LO judgment, HILO=HILO judgment, PASS= PASS judgment, FAIL=FAIL judgment, GOOD=All judgments possible, NG□□=Even a judgment impossible
	Volume	01 to 09 (fixed at 2byte)
		Setting of volume
	Length	0 to 2 (fixed at 1byte)
		0=Continuous,1=1 sec.,2=5 sec. ringing
Setting	Command	BUZZ=OFF□,01,0[CR][LF]　(fixed at 16byte)
	Command detail	Buzzer control=Buzzer condition, Volume, Length[CR][LF]
	Buzzer condition	Same format as read out
	Volume	Same format as read out
	Length	Same format as read out
	Response	Same string as command

Command	MEM	
Content	Memory	
Read out	Command	MEMxx? [CR][LF]　(fixed at 8byte)
	Command detail	xx=Memory No. 01 to 15　(fixed at 2byte)
	Response	MEM=01,OHM□□□□□,OHM□□□□□□□,300mOHM,RH3.0000□OHM,RL1.0000□OHM, □5V,VH+3.0000V,VL+1.0000V[CR][LF]　(fixed at 89byte)
	Response detail	Memory＝Memory No., VIEW-MODE,FUCTION, Resistance range, Resistance comparator H・Unit(standard resistance), Resistance comparator L・Unit(Ratio・Unit),Voltage range, Voltage comparator H, Voltage comparator L[CR][LF]
	Memory No.	01 to 15　(fixed at 2byte)
		Specify the memory No.
	VIEW-MODE	OHM□□□□□,VOLT□□□□,OHM-VOLT　(fixed at 8byte)
		This has no effect and only for compatibility with former 3566. Control it in FUNCTION.
	FUNCTION	OHM□□□□□□□, VOLT□□□□□□, OHM-VOLT□□, OHM-RATIO□　(fixed at 10byte)
		OHM□□□□□□□=Resistance meter/ Resistance comparator VOLT□□□□□□=Voltage meter/Voltage comparator OHM-VOLT□□=Resistance meter/Voltage meter OHM-RATIO□=Ratio meter/Ratio setting
	Resistance range	3□□mOHM=3mΩ,30□mOHM=30mΩ,300mOHM=300mΩ,3□□□OHM=3Ω,30□□OHM=30Ω,300□OHM=300Ω 3□□kOHM=3kΩ,AUTO□□□=Auto range　(fixed at 7byte)
	Resistance comparator HIGH・Unit (Standard resistance)	RH3.5000mOHM=3.5000mΩ, RH35.000mOHM=35.000mΩ, RH350.00mOHM=350.00mΩ,RH035.000mOHM= 35.00mΩ RH3.5000□OHM=3.5000Ω, RH35.000□OHM=35.000Ω, RH350.00□OHM=350.00Ω,RH003.50□OHM=3.5Ω RH3.5000kOHM=3.5000KΩ　(fixed at 12byte)
		Setting field of standard resistance appears, when OHM-RATIO is set in FUNCTION. Set the same decimal point both for HIGH setting and LOW setting. Comparator(standard resistance) range is selected depending on position of decima point and unit. Set the comparator as HIGH > LOW.

	Resistance comparator LOW・Unit	RL3.5000kOHM=3.5000kΩ, RL35.000mOHM=35.000mΩ, RL350,00□OHM=350.00Ω　(12byte 固定)
		Same format as resistance comparator HIGH. Setting field of deviation appears, when OHM-RATIO is set in FUNCTION.
	(Deviation)	RL□100.0□%□□=100.0%, RL□010.0□%□□=10.0%, RL□001.0□%□□=1.0%　(fixed at 12byte)
		Specify the deviation at OHM-RATIO in FUNCTION.
	Voltage range	□5V=5V,50V=50V,ATO=Auto range　(fixed at 3byte)
	Voltage comparator HIGH・Unit	VH+5.0000V=+5.0000V,VH+50.000V=+50.000V, VH+05.000V=+5.000V VH-1.0000V=-1.0000V,VH=-10.000V=-10.000V, VH=-01.000V=-1.000V　(fixed at 10byte)
		Set the same decimal point both for HIGH setting and LOW setting. Comparator range is selected depending on decimal position. Set the comparator as HIGH > LOW.
	Voltage comparator LOW・Unit	VL+5.0000V=+5.0000V,VL+50.000V=+50.000V VL-1.0000V=-1.0000V,VL=-10.000V=-10.000V　(fixed at 10byte) Same format as voltage comparator HIGH.
Setting	Command	MEM=01,OHM□□□□□,OHM□□□□□□□,300mOHM,RH3.0000□OHM,RL1.0000□OHM, □5V,VH+3.0000V,VL+1.0000V[CR][LF]　(fixed at 88byte)
	Command detail	Memory＝Memory No., VIEW-MODE, FUCTION, Resistance range, Resistance comparator H・Unit, Resistance comparator L・Unit, Voltage range, Voltage comparator H, Voltage comparator L
	Memory No.	Same format as read out
	VIEW-MODE	Same format as read out
	FUCTION	Same format as read out
	Resistance range	Same format as read out
	Resistance comparator HIGH・Unit	Same format as read out
	Resistance comparator LOW・Unit	Same format as read out
	Voltage range	Same format as read out

	Comparator HIGH・Unit	Same format as read out
	Resistance comparator LOW・Unit	Same format as read out
	Response	Same format as read out
	Response detail	Same format as read out

Command	MEM?	
Content	Read out of memory No.	
Read out	Command	MEM? [CR][LF] (fixed at 6byte)
	Response	MEM=01[CR][LF] (fixed at 8byte)
	Response detail	Memory=Memory No.[CR][LF]
	Memory No.	Specify the memory No. 01 to 15.

Command	MEM CALL	
Content	Switchover of memory No.	
Switchover	Command	MEM=CALL01[CR][LF] (fixed at 12byte)
	Command detail	Memory=CALL memory No.[CR][LF]
	Memory No.	Switchover to specified memory No. 01 to 15.
	Response	Same string as Command

Command	COMPR	
Content	Resistance comparator	
Read out	Command	COMPR? [CR][LF]　(fixed at 8byte)
	Response	COMPR=RH3.0000mOHM,RL1.0000mOHM[CR][LF]　(fixed at 33byte)
	Response detail	Resistance comparator=RH upper limit・Unit, RL lower limit・Unit[CR][LF]
	Resistance comparator HIGH・Unit	RH3.5000mOHM=3.5000mΩ, RH35.000mMOHM=35.000mΩ, RH350.00mOHM=350.00mΩ, RH035.00mOHM=35.00mΩ RH3.5000□OHM=3.5000Ω, RH35.000□OHM=35.000Ω, RH350,00□OHM=350.00Ω,RH003.50□OHM=3.50Ω RH3.5000kOHM=3.5000KΩ
	Resistance comparator HIGH・Unit	Set the same decimal point both for HIGH setting and LOW setting. Comparator range is selected depending on decimal position and unit. Set the comparator as HIGH > LOW.
	Resistance comparator LOW・Unit	RL3.5000kOHM=3.5000kΩ, RL35.000mOHM=35.000mΩ, RL350,00□OHM=350.00Ω Same format as resistance comparator HIGH
Setting	Command	COMPR=RH3.0000mOHM,RL1.0000mOHM[CR][LF]　(fixed at 33byte)
	Command detail	Same format as read out
	Response	Same string as Command

Command	COMPV	
Content	Voltage comparator	
Read out	Command	COMPV? [CR][LF]　(fixed at 8byte)
	Response	COMPV=VH+3.0000V,VL+1.0000V[CR][LF]　(fixed at 29byte)
	Response detail	Voltage comparator=VH upper limit・Unit, VL lower limit・Unit[CR][LF]
	Voltage comparator HIGH・Unit	VH+5.0000V=+5.0000V,VH+50.000V=+50.000V VH-1.0000V=-1.0000V,VH=-10.000V=-10.000V
		Set the same decimal point both for HIGH setting and LOW setting. Comparator range is selected depending on decimal position. Set the comparator as HIGH > LOW.
	Voltage comparator LOW・Unit	VL+5.0000V=+5.0000V,VL+50.000V=+50.000V VL-1.0000V=-1.0000V,VL=-10.000V=-10.000V Same format as voltage comparator HIGH
Setting	Command	COMPV=VH+3.0000V,VL+1.0000V[CR][LF]　(fixed at 29byte)
	Command detail	Same format as read out
	Response	Same string as Command

Command	FUNCTION	
Content	Setting of display function	
Read out	Command	FUNC? [CR][LF]　(fixed at 7byte)
	Response	FUNCTION=OHM-RATIO[CR][LF]　(fixed at 20byte)
	Response detail	Setting of display function=Display function[LF]
	Display function	OHM□□□□□□=Resistance meter/ Resistance comparator VOLT□□□□□=Voltage meter/Voltage comparator OHM-VOLT□=Resistance meter/Voltage meter OHM-RATIO=Ratio meter/Ratio setting　(fixed at 9byte)
Setting	Command	FUNCTION=OHM-RATIO [CR][LF]　(fixed at 20byte)
	Command detail	Same format as read out
	Response	Sam string as Command

Command	RANGE	
Content	Setting range of resistance measurement	
Read out	Command	RANGE? [CR][LF]　(fixed at 8byte)
	Response	RANGE=30□MOHM[CR][LF]　(fixed at 15byte)
	Response detail	Measurement range=Setting range[CR][LF]
	Setting range	3□□mOHM=3mΩ,30□mOHM=30mΩ,300mOHM=300mΩ,3□□□OHM=3Ω,30□□OHM=30Ω,300□OHM=300Ω 3□□kOHM=3kΩ,AUTO□□□=Auto range
Setting	Command	RANGE=30□mOHM[CR][LF]　(fixed at 15byte)
	Command detail	Same format as read out
	Response	Same string as Command

Command	VOLT	
Content	Setting range of voltage measurement	
Read out	Command	VOLT? [CR][LF]　(fixed at 7byte)
	Response	VOLT=□5V[CR][LF]　(fixed at 10byte)
	Response detail	Setting of measurement range=Setting range[CR][LF]
	Setting range	□5V=5V,50V=50V,ATO=Auto range　(fixed at 3byte)
Setting	Command	VOLT=50V [CR][LF]　(fixed at 10byte)
	Command detail	Same format as read out
	Response	Same string as Command

Command	RATIOSTD	
Content	Setting of resistance ratio	
Read out	Command	RATIOSTD? [CR][LF]　(fixed at 11byte)
	Response	RATIOSTD=300.00□OHM,001.1%[CR][LF]　(fixed at 28byte)
	Response detail	Setting resistance ratio=Standard resistance, Deviation[CR][LF]
	Standard resistance	3.0000mOHM=3mΩ,30.000mOHM=30mΩ, 300.00mOHM=300mΩ, 3.0000OHM=3Ω, 30.000□OHM=30Ω,300.00□OHM=300Ω,3.0000kOM=3kΩ　(fixed at 10byte)
	Deviation	100.0%=100.0%, □10.0%=10.0%, □□1.0%=1.0% Setting range: 0.0 to 100.0　(fixed at 6byte)
Setting	Command	RATIOSTD=300.00□OHM,001.1%[CR][LF]　(fixed at 28byte)
	Command detail	Same format as read out
	Response	Same string as Command

Command	AVERAGE	
Content	Setting of average function	
Read out	Command	AVERAGE? [CR][LF]　(fixed at 10byte)
	Response	AVERAGE=□□1 [CR][LF]　(fixed at 13byte)
	Response detail	Setting of average function=Average number of times [CR][LF]
	Average number of times	□□1=1 time(no average),□10=10 times,100=100 times(max. number)
Setting	Command	AVERAGE=□□1 [CR][LF]　(fixed at 13byte)
	Command detail	Same format as read out
	Response	Same string as Command

Command	VIEW	
Content	Setting of display mode (This command is for compatibility with former 3566. FUNCTION is used for 3586.)	
Read out	Command	VIEW? [CR][LF]　(fixed at 7byte)
	Response	VIEW=OHM□□□□□[CR][LF]　(fixed at 15byte)
	Response detail	Setting of display mode=Display mode [CR][LF]
	Display mode	OHM□□□□□=Resistance display mode, VOLT□□□□=Voltage display mode, OHM-VOLT=Resistance voltage display mode
Setting	Command	VIEW=VOLT□□□□[CR][LF]　(fixed at 15byte)
	Command detail	Same format as read out
	Response	Same string as Command

Command	ZEROADJ / ADJUST	
Content	Setting of zero adjustment / Control of zero adjustment	
Read out	Command	ZEROADJ? [CR][LF]　(fixed at 10byte)
	Response	ZEROADJ=0.4614 OHM[CR][LF]　(fixed at 20byte)
	Response detail	Setting of zero adjustment=Resistance value・Unit[CR][LF]
	Resistance value・Unit	3.5000mOHM=3.5000mΩ, 35.000mOHM=35.000mΩ, 350,00mOHM=350.00mΩ 3.5000□OHM=3.5000Ω, 35.000□OHM=35.000Ω, 350,00□OHM=350.00Ω 3.5000kOHM=3.5000KΩ
		Set resistance value is subtracted during ADJUST=ON.
Setting with designated value	Command	ZEROADJ=0.4614 OHM[CR][LF]　(fixed at 20byte)
	Command detail	Same format as read out
	Response	Same string as Command
Renewal with current value	Command	ZEROADJ[CR][LF]　(fixed at 9byte)
	Response	ZEROADJ=0.4614 OHM[CR][LF]　(fixed at 20byte)
	Response detail	Setting of zero adjustment=Resistance value・Unit [CR][LF]
	Resistance value・Unit	Same format as read out The set value is renewed by the resistance value at the time of Command issuance.
Control	Command	ADJUST=ON□[CR][LF]　(fixed at 12byte)
	Command detail	Control of zero adjustment=Vaid・Invalid[CR][LF]
	Valid・Invalid	ON□=Valid, OFF=Invalid　(fixed at 3byte) Control of zero adjustment is possible.

Command	SAMPLING	
Content	Setting of sampling	
Read out	Command	SAMPLING?[CR][LF]　(fixed at 11byte)
	Response	SAMPLING=SLOW□□[CR][LF]　(fixed at 17byte)
	Response detail	Setting of sampling=Sampling [CR][LF]
	Sampling	SLOW□□=SLOW サンプリング, MEDIUM=MEDIUM sampling, FAST50, FAST50 sampling,FAST60,FAST60 sampling (fixed at 6byte)
Setting	Command	SAMPLING=SLOW□□[CR][LF]　(fixed at 17byte)
	Command detail	Same format as read out
	Response	Same string as Command

Command	WRITEMEMORY	
Content	Write down set value int the memory of 3586. Set value is saved in memory by performing this command and the saved value is kept after power off.	
Setting	Command	WRITEMEMORY [CR][LF]　(fixed at 13byte)
	Response	WRITE□SUCCESS [CR][LF]　(fixed at 15byte)
	Response detail	Write into memory□Result[CR][LF]
	Result	SUCCESS =Succes of writing down, ERR□□□□=Not online, ERROR□□=Internal error

Command	READ	
Content	A sampling is done and a measured data is transmitted, when READ is sent while HOLD is ON.	
Setting	Command	READ[CR][LF]　(fixed at 6byte)
	Response	Equivalent to DATA?
	Response detail	(Depends on functions)[CR][LF]
	Result	(Depends on functions)

Command	HOLD	
Content	Sampling hold	
Read out	Command	HOLD? [CR][LF] (fixed at 7byte)
	Response	HOLD=ON□[CR][LF] (fixed at 10byte)
	Response detail	Sampling hold=State [CR][LF]
	State	ON□=Hold ON（sampling suspended）,OFF=Hold OFF(sampling state) (fixed at 3byte)
Setting	Command	HOLD=OFF [CR][LF](10byte 固定)
	Command detail	Same format as read out
	Response	Same string as Command During HOLD=ON

Command	RST	
Content	Reset of judgment	
Read out	Command	RST? [CR][LF] (fixed at 6byte)
	Response	RST=ON□[CR][LF] (fixed a 9byte)
	Response detail	Reset of judgment=state [CR][LF]
	State	ON□=Reset ON (Judgment output and display are OFF）,OFF=Reset OFF (fixed at 3byte)
Setting	Command	RST=OFF [CR][LF] (fixed at 9byte)
	Command detail	Same format as read out
	Response	Same string as Command One sampling hold action is done, when Reset On is transmitted during HOLD ON.

Command	LIMIT	
Content	Limitation of open terminal voltage	
Read out	Command	LIMIT? [CR][LF]　(fixed at 8byte)
	Response	LIMIT=ON□[CR][LF]　(fixe at 11byte)
	Response detail	Limitation of open terminal voltage=State[CR][LF]
	State	ON=Voltage limitation ON　(Open terminal voltage becomes less than 20mVp-p.),OFF=Limitation OFF　(fixe at 3byte)
Setting	Command	LIMIT=ON□[CR][LF]　(fixed at 11byte)
	Command detail	Same format as read out
	Response	Same string as Command

Command	VCOMP	
Content	Control of voltage judgment function	
Read out	Command	VCOMP? [CR][LF]　(fixed at 8byte)
	Response	VCONP=ON□[CR][LF]　(fixed at 11byte)
	Response detail	Control of voltage judgment function=State[CR][LF]
	State	ON=Voltage judgment function ON,OFF=Voltage judgment function OFF　(fixed at 3byte)
Setting	Command	VCOMP=ON□[CR][LF]　(fixed at 11byte)
	Command detail	Same format as read out
	Response	Same string as Command

Command	TEST	
Content	Disconnection・Self-check OLED display shows self-check screen during this command is performed.	
Read out of state	Command	TEST? [CR][LF]　(fixed at 7byte)
	Response	TEST=START□□[CR][LF] TEST=STOP□□□[CR][LF] TEST=TESTING[CR][LF] TEST=END□□□□,SOURCE-OK,SENSE-OK□□□□[CR][LF]
	Response detail	Self-check=State, Result of source side, Result of sense side [CR][LF]
	State	STOP□□□=Seld-check is not performed, START□□=Self-check starts, TESTING=During self-check, END□□□□=Self-check ended ERR=Execution error (During self-check, it cannot start at offline state.)
	Result of source	SOURCE-OK = Source side is normal, SOURCE-NG=Source side is abnormal.
	Result of sense	SENSE-OK□□□□=Sense side is normal. SENSE-HING□□=Sense High side is abnormal. SENSE-LONG□□=Sense Low side is abnormal. SENSE-HILONG=Sense side wires are abnormal.
Check start	Command	TEST=START□□[CR][LF]　(fixed at 14byte)
	Command detail	Self-check starts.
	Response	Same string as Command
Clear the result・ End	Command	TEST=STOP□□□[CR][LF]　(fixed at 14byte)
	Command detail	Check result is cleared and it ends.
	Response	Same string as Command

7. Analog output

The measured data of 3586 can obtained by analog data output.

7.1 Output specification

Output　　Full scale 3V　Output impedance less than 1 kΩ
　　Output is obtained corresponding to resistance display or corrected resistant value.
　　(interlocking with zero adjustment)
Output voltage range　0.0 to - 3.5 V
　　Minus display　: 0.0 V
　　Over display　: 3.5 V
Conversion method　D/A conversion method
Accuracy　　One year accuracy ± 0.2 % F.S. (Defined at the range of 0V to 3V)
Output data　　Measured resistance value
Output 周期　　Renewed with display cycle
Response time　Required time till the output value is within accuracy after display renewal
　　Less than 6 ms
Resolution　　Approx. 3/10000

Range	Display	Analog output	Range	Display	Analog output
30 mΩ 30 Ω 30 kΩ	0.000 mΩ	0.0000 V	300 mΩ 300 Ω	0.00 mΩ	0.0000 V
	10.000 mΩ	1.0000 V		100.00 mΩ	1.0000 V
	24.999 mΩ	2.4999 V		249.99 mΩ	2.4999 V
	30.000 mΩ	3.0000 V		300.00 mΩ	3.0000 V
	35.000 mΩ	3.5000 V		350.00 mΩ	3.5000 V
	OVER	3.5000 V		OVER	3.5000 V
3 mΩ 3 Ω 3 kΩ	0.0000 Ω	0.0000 V			
	1.0000 Ω	1.0000 V			
	2.4999 Ω	2.4999 V			
	3.0000 Ω	3.0000 V			
	3.5000 Ω	3.5000 V			
	OVER	3.5000 V			

When the display is under 0 due to zero adjustment or etc., the output of 0.0000V is obtained.

7.2 Voltage meter output specification

Voltage meter output	Full scale 2.5 V Output impedance less than 1 kΩ Output is obtained corresponding to voltage display.
Output voltage range	0.0 to 2.5 V (absolute value) 1/2 scale Over display : 2.5025 V
Conversion method	D/A conversion method
Accuracy	One year accuracy ± 0.3 % F.S. (Defined during 0 to 2.5 V.)
Output data	Measured voltage data is output
Output cycle	Renewed with display cycle
Response time	Required time till the output value is within accuracy after display renewal Less than 6 ms
Resolution	Approx. 8/10000

Range	Display	Analog output	Range	Display	Analog output
5V	0.0000V	0.0000 V	50V	0.000V	0.0000 V
	1.0000V	0.5000 V		10.000V	0.5000 V
	2.5000V	1.2500 V		25.000V	1.2500 V
	5.0000V	2.5000 V		50.000V	2.5000 V
	-2.5000V	1.2500 V		-25.000V	1.2500 V
	OVER	2.5025 V		OVER	2.5025 V

8. BCD Output (option)

The measured data of 3586 can be obtained by BCD data output.

8.1 Output specification

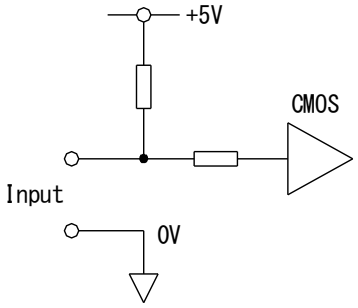
8.1.1 TTL output (-03)

The output of BCD data can be obtained with TTL level.

Output method : BCD parallel code Positive logic

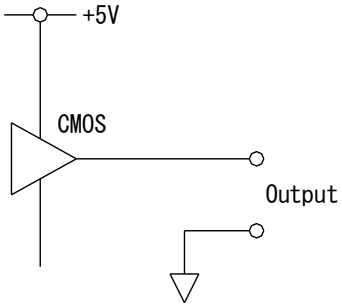
Output "L" level with logic "0", output "H" level with logic "1".

●Input signal



Input level: I_{IL} ≦ -1 mA
"L" = Less than 0.8 V
"H" = 3.5 to 5 V

●Output signal



Output level: TTL level
Ioh = 4 mA
Iol = -4 mA

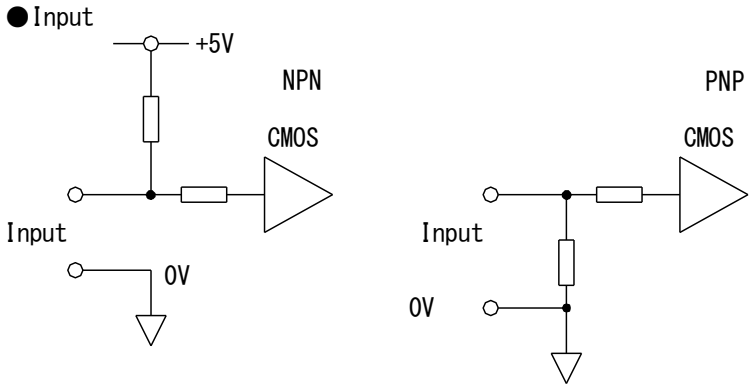
8.1.2 Open collector output (-04)

The output BCD can be obtained with open collector.

Output method : BCD parallel code

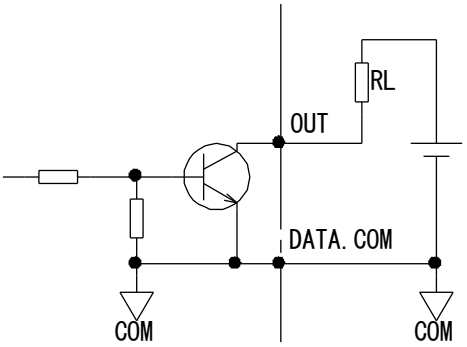
Output "OFF" with logic "0", output "ON" with logic "1".

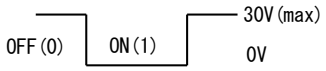
●Input



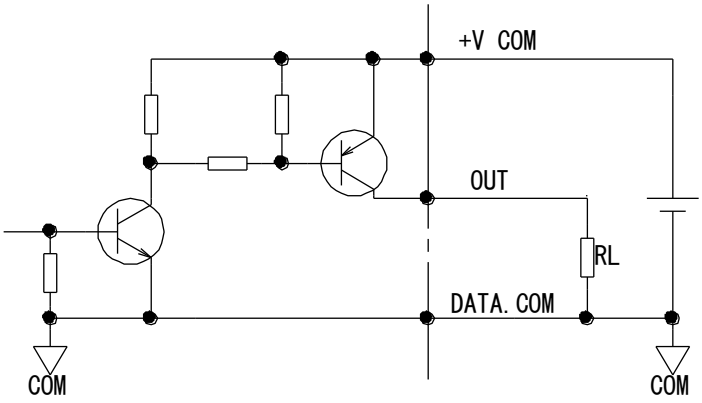
Input level: I_{IL} ≦ -1 mA
"L" = Less than 1.5 V
"H" = 3.5 to 5 V

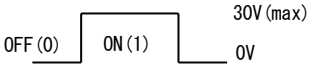
● Output NPN





● Output PNP





Output capacity DC 30 V 30 mA

8.2 Connector pin array

Signal name		No.		Signal name	
UNIT	0	1	26	4	UNIT
	1	2	27	5	
	2	3	28	6	
	3	4	29	7	
$\times 10^0$	1	5	30	1	$\times 10^1$
	2	6	31	2	
	4	7	32	4	
	8	8	33	8	
$\times 10^2$	1	9	34	1	$\times 10^3$
	2	10	35	2	
	4	11	36	4	
	8	12	37	8	
$\times 10^4$	1	13	38	POL	
OUTPUT ENABLE		14	39	OVER	
nHOLD		15	40	nSTROBE	
$\times 10^4$	4	16	41	1	SEL
DP2		17	42	2	
DP3		18	43	4	
DP4		19	44	2	$\times 10^4$
FUNCTION	1	20	45	1	RANGE
	2	21	46	2	
	4	22	47	4	
	8	23	48	N.C.	
INT./nEXT.		24	49	N.C. (+V COM) ※	
DATA COM		25	50	DATA COM	

Connector in use : (Amphenol) 50 pins 57-30500

Note: Do not use N.C pin, which is connected to internal circuit.

※Pin No. 49 is allocated for +V COM in case of BCD option of PNP type (3586-04P).

8.3 Description of input and output signals

8.3.1 Output signal

Measured data output : 1,2,4,8 ($\times 10^0$ - $\times 10^4$)

The output if measured data is obtained with parallel BCD code.
Note: During F50/F60 sampling, 10^0 outputs.

Decimal point output

The output of decimal point is obtained corresponding with the measurement range as code. The 2nd decimal place is fixed as 0 in case of ration display.

Display	DP4	DP3	DP2
3.5000	0	1	1
35.000	1	0	1
350.00	1	1	0
100.00	1	1	0

Unit output

Unit is output as code.

Unit	Code							
	7	6	5	4	3	2	1	0
mΩ	1	0	0	1	1	0	0	0
Ω	1	1	1	1	1	1	1	0
kΩ	0	1	1	0	0	1	0	1
%	1	1	1	0	0	0	0	0
V	1	1	1	1	0	1	1	0

Polarity output

Polarity	POL
Plus (+)	1
minus (−)	0

Over output

Measurement	OVER
OVER	1
Not over	0
Error 1	1

Strobe output (STROBE)

When data is renewed, the logic "1" is output with pulse.

Pulse width During S,M sampling Approx. 10 ms

During F50/F60 sampling Approx. 2 ms

8.3.2 Input signal

※Reverse the logic when PNP type of BCD option (3586-04P) is used.(H level→ L level)

Enable (OUTPUT ENABLE)

In case of L level, all the outputs except STROBE become high impedance.

Selecting output signals (SEL)

The data output on BCD is selected by SEL1, SEL2, SEL4.

During selecting data, make it sure that 3586 is in HOLD state.

SEL code	0	1	2	3	4	5	6	7
RR,RV,VV	VOLT	OHM	OHM	OHM	OHM	OHM	OHM	OHM
OHMR	VOLT	Rs	Rx	Err3	Err3	Err3	Err3	X

Rt : Resistance at certain ambient temperature t : Ambient temperature
RT : Corrected resistance (calculated) Rs : Standard resistance value
Rx : Resistance value X : Ratio

Range input (RANGE)

Before inputting range code, make sure that INT./nEXT Input is at "L" level.

It is applied after the release of HOLD, in case that 3586 is at HOLD state.

Range	Code		
	4	2	1
AUTO	0	0	0
3 mΩ	1	1	1
30 mΩ	0	0	1
300 mΩ	0	1	0
3 Ω	0	1	1
30 Ω	1	0	0
300 Ω	1	0	1
3 kΩ	1	1	0

Function input (FUNC)

Before inputting function code, make sure that INT./nEXT Input is at "L" level.

It is applied after the release of HOLD, in case that 3586 is at HOLD state.

Range	Code			
	8	4	2	1
Resistance measurement	1	0	0	1
Ratio (OHM)	0	1	1	1

HOLD input (nHOLD)

Sampling is performed at “H” level and the output of the measuring data is obtained sequentially.

Sampling is stopped at “L” level and the BCD data, displayed value are retained.

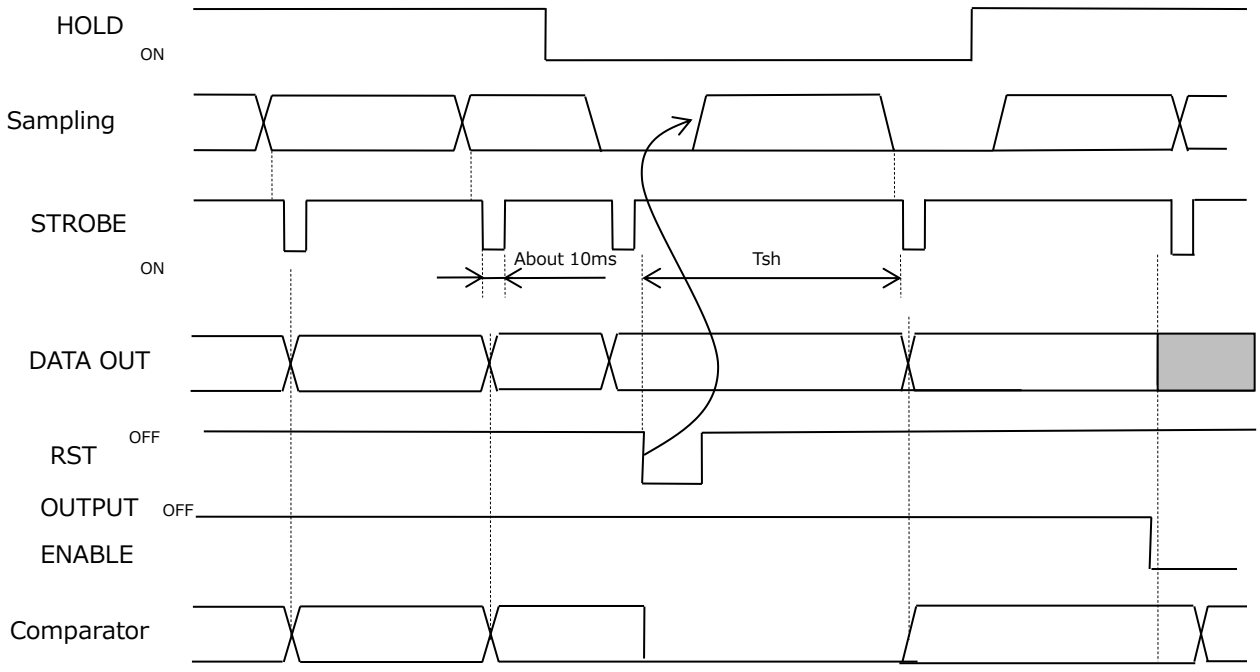
External control input (INT./nEXT.)

The selection of function and range can be done at “L” level. But the control cannot be done during HOLD mode.

If MEM. CTRL is set as REMOTE, priority is given for the REMOTE operation.

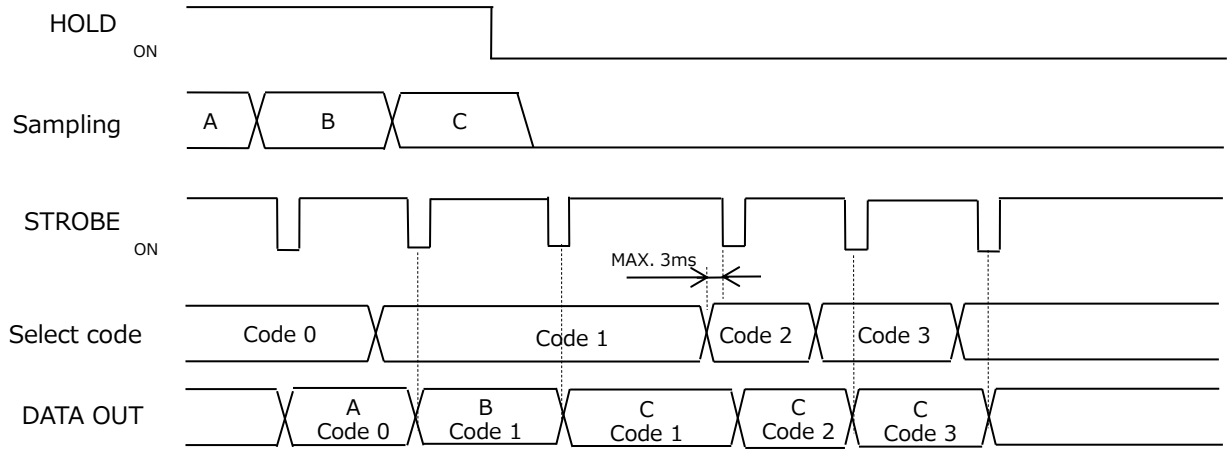
Timing chart

Average number of times = 1 time



Tsh: Sampling cycle + Processing

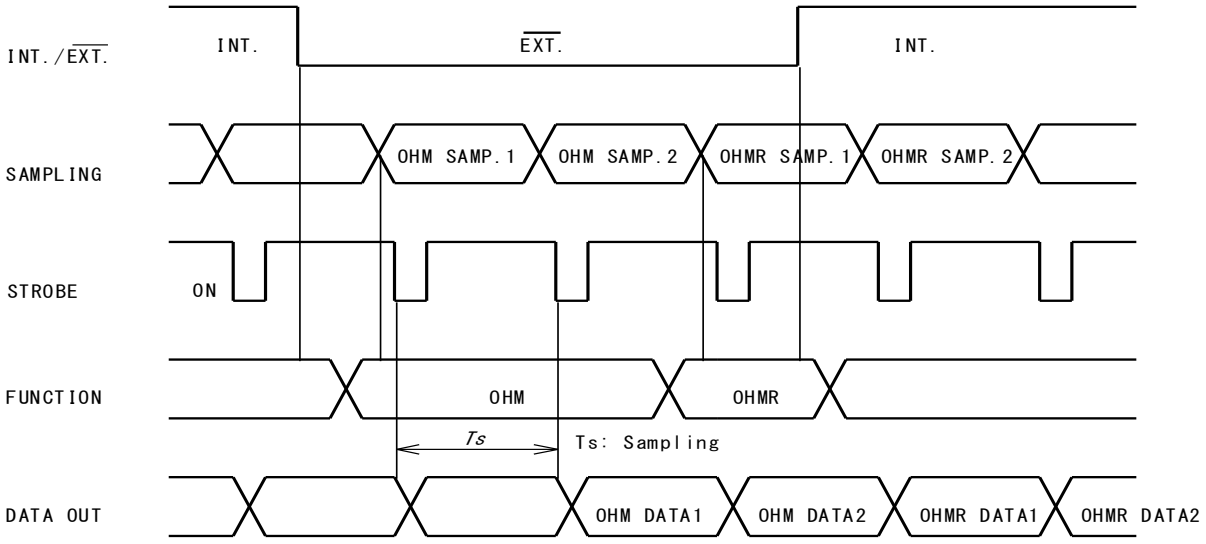
Data select timing chart



If the select code is changed during sampling, the data after the end of the sampling is affected.

If select code is changed during HOLD, output also change corresponding to the change of the code.

Function switching timing chart



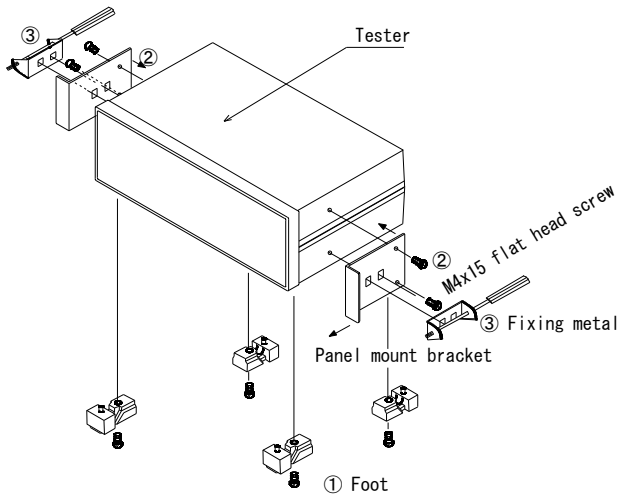
9. Error display

Display	Name	Description
OVER	Over	The measurement is over range.
UNDER	Under	The measurement is under range.
ERR-CC	Source open	When SOURCE of the resistance measurement input is open or the resistance is large with the respect to the measurement value.
ERR-3	Select error	BCD option There is error in display select code.

10. Use in panel-mount

10.1 Assembly drawing

When the tester is used by panel-mounting, use the optional panel-mount bracket.



① Remove the feet (4 parts) at the bottom of the tester.

② Fix the panel-mount bracket to both side of the tester (M4×15flat head screw)

③ Insert the tester from the front of the panel and fix it to the panel with the fixing metal.
Note: In case that the tester is installed to the chassis, utilizing the bottom screw taps of the testers, keep the length of screw at 6mm + thickness of chassis (mm).

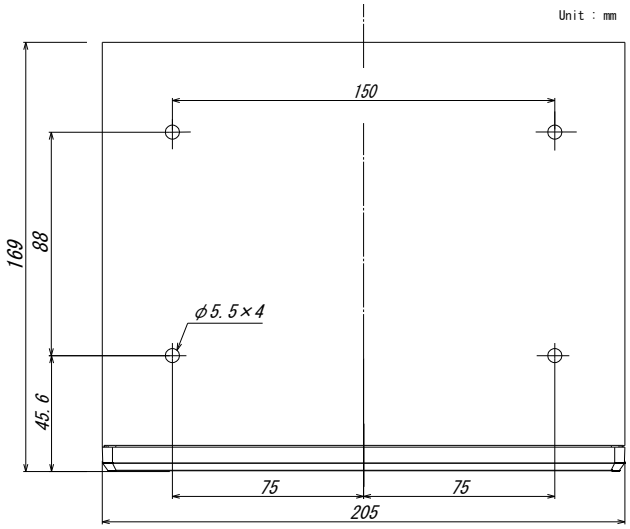
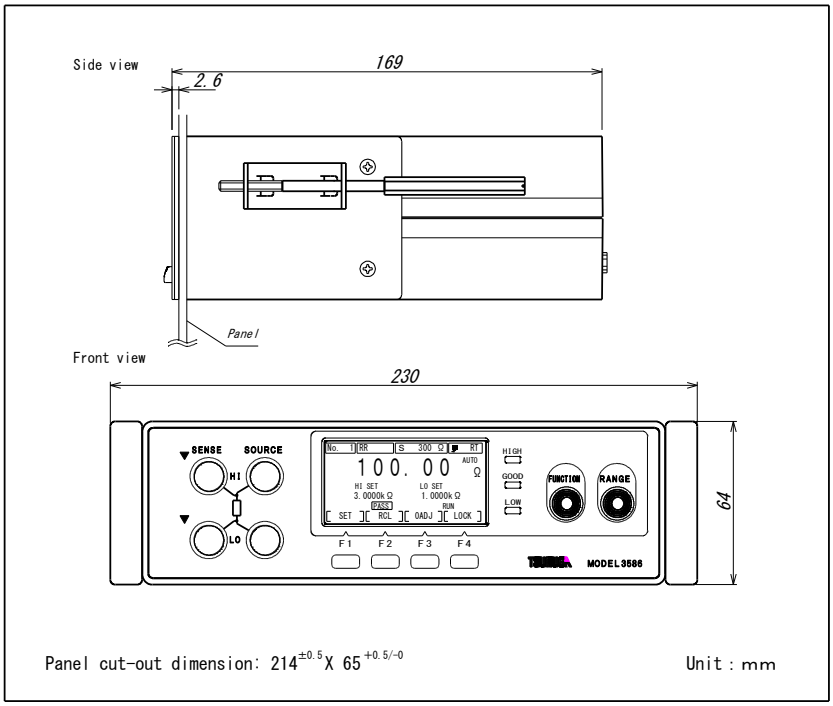


Figure of screw holes and size (top-view)

10.2 External dimensions when fitted with panel-mount bracket



⚠ Warning

- Set the power switch near the instrument when it is used in panel mount.

11. Maintenance

Cleaning

When the front panel or the case becomes dirty, wipe it with soft cloth.
For heavy dirt, wipe it lightly with the soft cloth wetted with the water thinned by neutral cleaner.
Do not use cleaners containing thinner, benzene, alcohol, acetone, ketone, ether or petroleum based detergent as they may deform or discolor the case.

Calibration

The regular calibration is needed to obtain correct measurement result within the range of specified accuracy.
The cycle of calibration depends on actual usage condition and environment of customers. We recommend for regular calibration at TSURUGA ELECTRIC CORPORATION depending on the condition of tester used by customers.

Transportation

During transportation of this tester, be careful of not to damage it by using proper packing box.
The damage on transportation cannot be guaranteed.
During repair request, attach the detail of trouble information.

12. Failure symptom

When the tester is supposed to be faulty, please check the following points before requesting the repair of it.

Symptom	Check points
Although the power is turned ON, display does not light up.	・Is power supply connected to socket properly?
Key is not operable.	・Is the LOCK displayed in reverse color? Cancel the key lock referring to the section 3.5. ・Is the remote control valid? Some key operations are limited. Communication setting External memory selection Priority control from optional BCD signal
Measurement error is large	・Is the right measuring termina selected? Large measurement error occurs in lower ranges (3 to 30 mΩ), unless used measuring termina and set termina differ. Make sure the display on OLED. Refer to 4.4.8 and set it properly. ・Is there any metal plate? Eddie current, specifically influenced on AC ohm tester may cause large error especially in lower ranges by measuring specimen on metal or wiring through metal plate. Keep the distance approx. 30 cm from the metal.
0mΩ is not shown in spite of short-circuit of measuring cable.	・3mΩ range is highly sensitive. Even though measuring cable is short-circuited, it may show several tens of digits due to external noise or inductive noise. This is not a malfunction. Use the instrument at the less noise place.

For repair, contact the nearest office of TSURUGA ELECTRIC CORPORATION.

13. Specification

13.1 Model name

Moel name	Content
3586- X	Without BCD data output, with RS-232C
3586-03	With BCD data output（TTL output）, RS-232C
3586-04P	With BCD data output（open collector PNP）, RS-232C
3586-04N	With BCD data output（open collector NPN）, RS-232C

13.2 Measuring range and accuracy

1. Resistance measurement

During SLOW, MEDIUM sampling

Range	3 mΩ	30 mΩ	300 mΩ	3 Ω	30 Ω	300 Ω	3 kΩ
Resolution	0.1 μΩ	1 μΩ	10 μΩ	100 μΩ	1 mΩ	10 mΩ	100 mΩ
Current	7.4 mA	7.4 mA	1 mA	100 uA	10 uA	5 uA	1.5 uA
Accuracy	Note1	± (0.5 % of rdg. + 8 digit)					
Temperature coefficient	Note2	± (0.05 % of rdg. + 0.8 digit)/℃					
Open terminal voltage	→	Less than 20 mV peak（with ON/OFF function）					

※Accuracy : Defined at 23 ℃ ± 5℃ 45 to 75 %RH
※During MEDIUM, 3 digits are added to the accuracy.
※3mΩ range: Interval average function is available, when moving average is not in use.
Note1 ± (0.5 % of rdg. + 40 digit)
Note2 ± (0.05 % of rdg. + 4 digit)/℃

During FAST50/60

Range	3 mΩ	30 mΩ	300 mΩ	3 Ω	30 Ω	300 Ω	3 kΩ
Resolution	1 μΩ	10 μΩ	100 μΩ	1 mΩ	10 mΩ	100 mΩ	1 Ω
Current	7.4 mA	7.4 mA	1 mA	100 uA	10 uA	5 uA	1.5 uA
Accuracy	Note3	Note5	± (0.5 % of rdg. + 6 digit)				
Temperature coefficient	Note4	Note6	± (0.05 % of rdg. + 0.6 digit)/℃				
Open terminal voltage	→	Less than 20 mV peak（with ON/OFF function）					

※Accuracy : Defined at 23 ℃ ± 5 ℃ 45 to 75 %RH
Note3 ± (0.5 % of rdg. + 20 digit)
Note4 ± (0.05 % of rdg. + 2 digit)/℃
Note5 ± (0.5 % of rdg. + 8 digit)
Note6 ± (0.05 % of rdg. + 0.8 digit)/℃

Accuracy : One-year accuracy Defined at 23 ℃ ± 5℃, 45 to 75 %RH.

2. Voltage measurement

Sampling cycle : SLOW, MEDIUM, FAST50/60

Range	± 5 V	± 50 V
Resolution	100 uV	1 mV
Accuracy	± (0.05 % of rdg. + 5 digit)	
Temperature coefficient	± (0.005 % of rdg. + 0.5 digit)/℃	

※Defined at 23 ℃ ± 5℃ 45 to 75 %RH
※During MEDIUM, 3 digits are added to the accuracy.
※During FAST, 5 digits are added to the accuracy.

13.3 General specifications

Measurement method: 4-terminal method (front/rear)

Maximum allowable applied voltage: Whole range 60V DC

Measurement cable resistance (During limitation of open terminal volatge): SOURCE wires 3, 30 mΩ range Less than 2Ω (less than 500 mΩ)
Others Less than 15 Ω (less than 5 Ω)

Display: OLED display

Display range

Function	Display range
Resistance measurement	-35000 to 35000, OVER, UNDER (During FAST, -3500 to 3500)
RATIO calculation	-199.9 to 199.9, OVER, UNDER
Voltage measurement	-50050 to 50050, OVER, UNDER

Resistance measurement range: 3 mΩ, 30 mΩ, 300 mΩ, 3 Ω, 30 Ω, 300 Ω, 3 kΩ, AUTO

AUTO range Range up More than 35000 (FAST sampling more than3500)
Range down Less than 3000 (FAST sampling less than 300)

Over display: OVER UNDER

ERR-CC display: When SOURCE of resistance measurement input is open, or SOURCE is larger than the measurement range. If FUNCTION is in TEMP mode, this error is not displayed.

Voltage measurement range: 5 V, 50 V, AUTO

AUTO range Range up More than 50000 (FAST sampling more than 5000)
Range down Less than 1000 (FAST sampling less than 100)

Unit display: mΩ, Ω, kΩ, %, V

Sampling cycle:
SLOW 2.5 times/sec. (400 ms)
MEDIUM 5 times/sec. (200 ms)
FAST50 50 times/sec. (20 ms)
FAST60 60 times/sec. (16.6 ms)

Response speed: The required time to measure accurately (fixed range) from the input open to specimen connection.

Resistance measurement
SLOW Approx. 1.2 s
MEDIUM Approx. 600 ms
FAST50/60 Approx. 60/50 ms

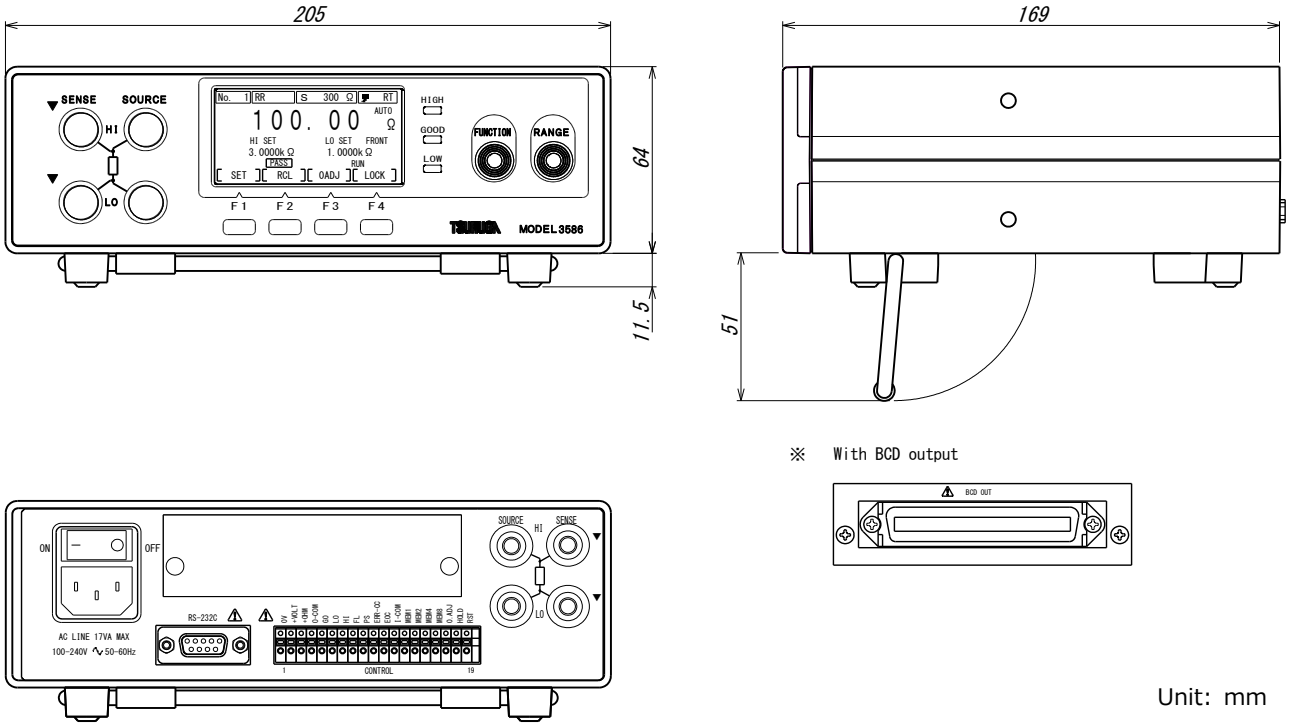
Analog output	Resistance output : 0 to 3 V is output against 0 to 30000 or 3000. Voltage output : 0 to 2.5 V is output against 0 to 50000. (absolute value output without signs) Internal resistance : Less than 1 kΩ Conversion method : D/A converter (14bit) Resolution : 3/10000 (Resistance) 8/10000 (Voltage) Accuracy : ± 0.2 % F.S. (Resistance) ± 0.3 % F.S. (Voltage)
Noise reduction ration	Normal mode More than 60dB (Converted to max. applied voltage) during sampling SLOW Common mode More than 100dB (Converted to max. applied voltage) during sampling SLOW
Parameter retention	Retained in the non-volatile memory Rewritable approx. 100,000 times Retention period approx. 10 years
Insulation resistance	Power supply terminal/Outer case More than DC 500 V 100 MΩ Measuring terminal/Control terminals,RS-232C,Data output/Outer case More than DC 500 V 10 MΩ
Withstand voltage	Measuring terminals, Control terminals, RS-232C, Data output/Outer case AC 500V 1 min. Power supply terminal/Outer case AC1500V 1 min.
Power supply	AC 100 to 240 V 50 to 60Hz
Power supply voltage tolerance range	AC 90 to 250 V
Power consumption	17 VA MAX.
Temperature	0 to 40 ℃
Humidity	Less than 80 %RH (no condensation)
Storage temperature	-20 to 65 ℃, Less than 80 %RH (no condensation)
Use environmental condition	Indoor use Altitude: Less than 2000 m Overvoltage category: OVC Ⅱ Pollution degree: 2 Allowable transient overvoltage of main supply: 1000V (1μs)
Protection grade	IP20 equivalent
Size	205(W) × 64(H) × 169(D) mm
Weight	Approx. 1.3 kg
Accessories	Power supply cord for AC100V·····1 piece Operation manual ·····1 copy Utility software (with RS-232C) ·····CD 1 piece
Options	Kelvin clip (standard type) ····· 5811-21C Clip type lead..... 5811-22 Length 90 cm Pin type lead..... 5811-23A Length 90 cm Voltage pin for replacement (4 pcs) .. 5811-23A-1P Current pin for replacement (4 pcs) .. 5811-23A-1C Foot switch with USB ..... : 5858-04U Panel mount bracket..... : 5811-31 RS-232C USB converter..... : 5858-20 Power cord for AC 200 V..... : 5880-23-030

13.4 Initial setting list

Item		Setting range	Initial setting※ (factory setting)	Memory (1 to 15)
Key lock		ON/OFF	OFF	—
Sampling		SLOW/MEDIUM/FAST50/FAST60	SLOW	—
Zero adjustment		ON/OFF	OFF	○
Zero adjustment value		0 to 35000	0	○
Buzzer setting		OFF/GO/HING/LONG/HILONG/PASS/FAIL/GOOD/NG	OFF	—
Buzzer volume		1 to 9	3	—
Buzzer ringing time		Continuous/1 s/5 s	Continuous	—
RS-232C	Communication speed	9600/19200/38400/56800/115200 (bps)	9600 (bps)	—
	Parity	none/even/odd	none	—
Average function		1 to 100	1	—
Limitation of open terminal voltage function		ON/OFF	ON	—
Memory No.		01 to 15	01	—
Function		VIEW-RR/ VIEW-VV/ VIEW-RV /OHM-RATIO	VIEW-RR	○
Resistance range		3mΩ/30mΩ/300mΩ/3Ω/30Ω/300Ω/3kΩ/AUTO	3Ω	○
Resistance comparator H		0 to 35000	30000	○
Resistance comparator L		0 to 35000	10000	○
Resistance comparator range		3mΩ/30mΩ/300mΩ/3Ω/30Ω/300Ω/3kΩ/AUTO	3Ω	○
Voltage range		5V/50V/AUTO	5V	○
Voltage comparator range H		-50000 to 50000	10000	○
Voltage comparator range L		-50000 to 50000	30000	○
Voltage comparator range		5V/50V	5V	○
RATIO deviation		0.0 to 100.0	10.0	○
RATIO range		3mΩ/30mΩ/300mΩ/3Ω/30Ω/300Ω/3kΩ/AUTO	3Ω	○
RATIO standard resistance		0 to 35000	30000	○
OLED contrst		1 to 5	3	—
Dimmer		OFF 10 to 100(sec.)	100	—
Voltage comparator function		ON/OFF	ON	—

※Note: The setting can be reset to initial value by pressing both [F2] and [F3] simultaneously for more than 5 sec.

13.5 External dimensions



Unit: mm

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