2560A
Precision DC Calibrator

USER'S MANUAL

YOKOGAWA ◆
Yokogawa Test & Measurement Corporation

Product Registration

Thank you for purchasing YOKOGAWA products.

YOKOGAWA provides registered users with a variety of information and services. Please allow us to serve you best by completing the product registration form accessible from our website.

http://tmi.yokogawa.com/

Thank you for purchasing the 2560A Precision DC Calibrator. The 2560A is a DC calibrator that sources DC voltage, DC current, and resistance. It also sources thermoelectromotive force and resistance that simulate those of a temperature sensor.

DC voltage	−1224 V to +1224 V
DC current	−12.24 A to +36.72 A
Resistance	1 Ω to 400 Ω
Temperature sensor	Thermocouple:R, S, B, J, T, E, K, N, C, A, user-defined
	RTD: Pt100, user-defined

⚡ ⚠ High voltage

The 2560A sources up to 1224 V of DC voltage.
• To prevent electric shock, be sure to read this manual before use.
• Improper operation may lead to serious, life-threatening accidents. Keep this manual close to the 2560A so that the operator can refer to it anytime.

French

⚡ ⚠ Haute tension

Le 2560A fournit jusqu'à 1224 V de tension c.c.
• Afin d'éviter tout choc électrique, bien lire le présent manuel avant utilisation.
• Une utilisation incorrecte entrainerait des risques d'accidents graves voire mortels. Conservez ce manuel à proximité du 2560A, de sorte que l'opérateur puisse le consulter à tout moment.

This user's manual explains the features, operating procedures, and handling precautions of the 2560A. To ensure correct use, please read this manual thoroughly before beginning operation. Keep this manual in a safe place for quick reference in the event that a question arises.

List of Manuals

The following manuals, including this one, are provided as manuals for the 2560A. Please read all manuals.

Manual Title	Manual No.	Description
2560A Precision DC Calibrator User's Manual	IM 2560A-01EN	This manual. The manual explains the handling precautions, features, specifications, communication interfaces, how to operate the 2560A, and so on.
Model 2560A Precision DC Calibrator User's Manual	IM 2560A-92Z1	Document for China

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

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

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

Notes

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

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Checking the Contents of the Package

Unpack the box and check the contents before operating the instrument. If the wrong items have been delivered, if items are missing, or if there is a problem with the appearance of the items, contact your nearest YOKOGAWA dealer.

2560A

Check that the product that you received is what you ordered by referring to the model name and suffix code given on the name plate on the rear panel.
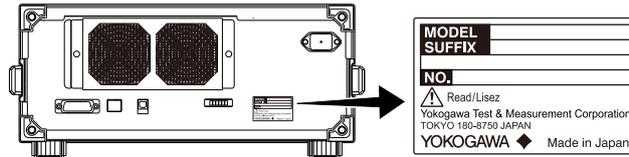
MODEL and SUFFIX Codes

Model	Suffix Code[1]		Specifications
2560A			Precision DC Calibrator
			−1200 VDC to +1200 VDC, −−12 ADC to +36 ADC
Version	-VA		Version A
Temperature unit	-UC		Temperature unit Celsius (°C)
	-UF		Temperature unit Celsius (°C) and Fahrenheit (°F)
Power cord[2]		-D	UL/CSA standard power cord, maximum rated voltage: 125 V
		-F	VDE standard power cord, maximum rated voltage: 250 V
		-R	AS standard power cord, maximum rated voltage: 250 V
		-Q	BS standard power cord, maximum rated voltage: 250 V
		-H	GB standard power cord, maximum rated voltage: 250 V
		-N	NBR standard power cord, maximum rated voltage: 250 V

1   For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

2   Make sure that the attached power cord meets the designated standards of the country and area that you are using it in.

No. (Instrument number)

When contacting the dealer from which you purchased the instrument, please give them the instrument number.

Standard Accessories

The instrument is shipped with the following accessories. Make sure that all accessories are present and undamaged.

Power cord (one cord that matches the suffix code is included)[1]

UL/CSA standard A1006WD	VDE standard A1009WD	AS standard A1024WD	BS standard A1054WD	GB standard A1064WD	NBR standard A1088WD
D	F	R	Q	H	N

Measurement lead B8506ZK	Measurement lead B8506WA	Alligator clip adapter B8506ZL	Fork terminal adapter[2] 758921

Terminal plug A2119JT	Rubber leg cap A9088ZM	Manuals

IM 2560A-01EN
User's Manual (this manual)
IM 2560A-92Z1
Document for China
PIM 113-01Z2
List of worldwide contacts

1 Make sure that the attached power cord meets the designated standards of the country and area that you are using it in.
2 Due to the structure of the product, it is possible to touch the metal parts of the fork terminal adapter 758921. Be careful as this constitutes an electric shock hazard.

Optional Accessories (Sold separately)

The following optional accessories are available for purchase separately.

- Use the accessories specified in this manual. Moreover, use the accessories of this product only with Yokogawa products that specify them as accessories.
- Use the accessories of this product within the rated range of each accessory. When using several accessories together, use them within the specification range of the accessory with the lowest rating.

Item	Model/Part No.	Min. Q'ty	Note
Measurement lead	B8506ZK	1 set	Safety terminal cable. Length: 1 m. Rating: 1500V, 19A
	B8506WA	1 set	Current output cable. Length: 1.5m. Rating: 42V, 80A
	758917	1 set	Safety terminal cable. Length: 0.75 m. Rating: 1000V, 32A
	758933	1 set	Safety terminal cable. Length: 1m. Rating: 1000V, 19A
Alligator clip adapter (large)	B8506ZL	1 set	Safety terminal-to-alligator clip adapter. Red and black, 1 pc each. Rating: 1500V, 32A
	758929	1 set	Safety terminal-to-alligator clip adapter. Red and black, 1 pc each. Rating: 1000V, 32A
Alligator clip adapter (small)	758922	1 set	Safety terminal-to-alligator clip adapter. Red and black, 1 pc each. Rating: 300V/15A
Fork terminal adapter	758921	1 set	Safety terminal-to-fork terminal adapter. Red and black, 1 pc each. Rating: 1000V/20A
RJ Sensor	257875	1	For reference junction compensation. Pt100 sensor.
Rack mount kit	751535-E4	1 set	EIA standard
	751535-J4	1 set	JIS standard

Safety Precautions

This instrument is an IEC safety class I instrument (provided with a terminal for protective earth grounding).
The general safety precautions described herein must be observed during all phases of operation.
If the instrument is used in a manner not specified in this manual, the protection provided by the instrument may be impaired. YOKOGAWA assumes no liability for the customer's failure to comply with these requirements.

The following symbols are used on this instrument.

⚠ Warning: handle with care. Refer to the user's manual or service manual. This symbol appears on dangerous locations on the meter which require special instructions for proper handling or use. The same symbol appears in the corresponding place in the manual to identify those instructions.

⚡ Electric shock, danger

⏚ Ground (earth) or functional ground terminal (do not use this terminal as a protective ground terminal)

∿ Alternating current

| On (power)

○ Off (power)

� Power-on state

⎓ Power-off state

French

⚠ Avertissement : À manipuler délicatement. Toujours se reporter aux manuels d'utilisation et d'entretien. Ce symbole a été apposé aux endroits dangereux de l'instrument pour lesquels des consignes spéciales d'utilisation ou de manipulation ont été émises. Le même symbole apparaît à l'endroit correspondant du manuel pour identifier les consignes qui s'y rapportent.

⚡ Choc électrique, danger

⏚ Borne de terre ou borne de terre fonctionnelle (ne pas utiliser cette borne comme prise de terre)

∿ Courant alternatif

| Marche (alimentation)

○ Arrêt (alimentation)

⎓ Marche

⎓ Arrêt

Failure to comply with the precautions below could lead to injury or death or damage to the instrument.

WARNING

Use the Instrument Only for Its Intended Purpose
The 2560A is a DC calibrator that sources DC voltage, DC current, and resistance. It also sources thermoelectromotive force and resistance that simulate those of a temperature sensor. Use the 2560A only for these purposes.

Check the Physical Appearance
Do not use the instrument if there is a problem with its physical appearance.

Be Careful When Generating High Voltage
- This product generates high voltage. Be careful of electric shock and electric discharge.
- To prevent electric shock, remove rings, watches, and other metallic accessories and jewelry before operation.

Use the Correct Power Supply
Before connecting the power cord, ensure that the source voltage matches the rated supply voltage of the 2560A and that it is within the maximum rated voltage of the provided power cord.

Use the Correct Power Cord and Plug
To prevent the possibility of electric shock or fire, be sure to use the power cord supplied by YOKOGAWA. The main power plug must be plugged into an outlet with a protective earth terminal. Do not invalidate this protection by using an extension cord without protective earth grounding. Additionally, do not use the power cord supplied with this instrument with another instrument.

Connect the Protective Grounding Terminal
Make sure to connect the protective earth to prevent electric shock before turning on the power. The power cord that comes with the instrument is a three-prong type power cord. Connect the power cord to a properly grounded three-prong outlet.

Do Not Impair the Protective Grounding
Never cut off the internal or external protective earth wire or disconnect the wiring of the protective earth terminal. Doing so may result in electric shock or damage to the instrument.

Do Not Use When the Protection Functions Are Defective
Before using this instrument, check that the protection functions, such as the protective grounding and fuse, are working properly. If you suspect a defect, do not use the instrument.

Do Not Operate in an Explosive Atmosphere
Do not operate the instrument in the presence of flammable gases or vapors. Doing so is extremely dangerous.

Do Not Remove the Covers or Disassemble or Alter the Instrument
Only qualified YOKOGAWA personnel may remove the covers and disassemble or alter the instrument. The inside of the instrument is dangerous because parts of it have high voltages.

Ground the Instrument before Making External Connections
Securely connect the protective grounding before connecting to the target device or to an external control unit. Before touching the target device, turn off this instrument and check that there is no voltage or current being output.

Measurement Category
The measurement category of the 2560A terminals is Other (O). Do not use it for main power supply circuits or circuits that fall under Measurement Categories II, III, and IV.

Install or Use the Instrument in Appropriate Locations
* Do not install or use the instrument outdoors or in locations subject to rain or water.
* Install the instrument so that you can immediately remove the power cord if an abnormal or dangerous condition occurs.

Wiring Correctly
This instrument sources large voltage and current. If you do not connect the devices correctly, not only will it damage the instrument or the target device, it may also lead to electric shock or fire. Be careful when you connect the lead wires, and be sure to check the following points.

Before output (before turning on the output), check that:
* Lead wires are connected to the instrument's output terminals correctly.
  Check that output lead wires that should be connected to low voltage-current output terminals (OUTPUT 1) are not connected to the high voltage output terminals or large current output terminals.
* Lead wires are connected to the target device correctly.
  Lead wires are not shorted because of wiring errors, broken insulation of lead wires, unintended contact with conductive parts, and so on.
* The lead wires are fastened firmly to the terminals.
* There no problems with the terminals, such as the presence of foreign substances.

During output (do not touch the terminals or the connected lead wires when this instrument is on), check that:
* There no problems with the terminals, such as the presence of foreign substances.
* The terminals are not abnormally hot.
  The terminal connections may become loose over time. If this happens, heat may be generated due to changes in contact resistance. Periodically check that the lead wires are firmly connected to the terminals. Be sure to turn off both this instrument and the target device before you check the connections.

After output (immediately after the output is turned off)
  After you output a voltage or current, voltage may remain for some time even after you turn the output off. This residual voltage may lead to electric shock. Do not touch the terminals immediately after you turn the output off. The amount of time that voltage remains varies depending on the target device.

CAUTION

Operating Environment Limitations
This product is a Class A (for industrial environment) product. Operation of this product in a residential area may cause radio interference in which case the user will be required to correct the interference.

French

AVERTISSEMENT

Utiliser l'instrument aux seules fins pour lesquelles il est prévu
Le 2560A est un calibreur c.c. qui émet de la tension c.c., du courant c.c. et de la résistance.
Il émet également une force thermo-électromotive et une résistance qui stimulent celles des
capteurs de température. Utiliser le 2560A à ces fins exclusives.

Inspecter l'apparence physique
Ne pas utiliser l'instrument si son intégrité physique semble être compromise.

Manipulez avec précaution lors de la génération de tension élevée
- Le produit génère une tension élevée. Faites attention au choc électrique et à la décharge
  électrique.
- Afin d'éviter tout choc électrique, retirer les bagues, les montres et autres accessoires
  métalliques ainsi que les bijoux avant la mise en service.

Vérifier l'alimentation
Avant de brancher le cordon d'alimentation, vérifier que la tension source correspond à la
tension d'alimentation nominale du 2560A et qu'elle est compatible avec la tension nominale
maximale du cordon d'alimentation.

Utiliser le cordon d'alimentation et la fiche adaptés
Pour éviter tout risque de choc électrique ou d'incendie, toujours utiliser le cordon
d'alimentation fourni par YOKOGAWA. La fiche doit être branchée sur une prise secteur
raccordée à la terre. En cas d'utilisation d'une rallonge, celle-ci doit être impérativement reliée
à la terre. Ne pas utiliser le cordon d'alimentation fourni avec l'instrument pour tout autre
appareil.

Brancher la prise de terre
Avant de mettre l'instrument sous tension, penser à brancher la prise de terre pour éviter tout
choc électrique. Le cordon d'alimentation livré avec l'instrument est doté de trois broches.
Brancher le cordon d'alimentation sur une prise de courant à trois plots et mise à la terre.

Ne pas entraver la mise à la terre de protection
Ne jamais neutraliser le fil de terre interne ou externe, ni débrancher la borne de mise à la
terre. Cela pourrait entraîner un choc électrique ou endommager l'instrument.

Ne pas utiliser lorsque les fonctions de protection sont défectueuses
Avant d'utiliser l'instrument, vérifier que les fonctions de protection, telles que le raccordement
à la terre et le fusible, fonctionnent correctement. En cas de dysfonctionnement possible, ne
pas utiliser l'instrument.

Ne pas utiliser dans un environnement explosif
Ne pas utiliser l'instrument en présence de gaz ou de vapeurs inflammables. Cela pourrait
être extrêmement dangereux.

Ne pas retirer le capot, ni démonter ou modifier l'instrument
Seul le personnel YOKOGAWA qualifié est habilité à retirer le capot et à démonter ou modifier
l'instrument. Certains composants à l'intérieur de l'instrument sont à haute tension et par
conséquent, représentent un danger.

Relier l'instrument à la terre avant de le brancher sur des connexions externes
Connectez le conducteur de terre avant de raccorder le dispositif cible ou une unité de commande externe. Avant de toucher le dispositif cible, mettez l'instrument hors tension, et vérifiez qu'aucune tension ni aucun courant ne sont émis.

Catégorie de mesure
La catégorie de mesure des bornes 2560A est O (Other, Autre). Ne l'utilisez pas pour les circuits d'alimentation principale ou ceux correspondant aux catégories de mesure II, III et IV.

Installer et utiliser l'instrument aux emplacements appropriés
- Ne pas installer, ni utiliser l'instrument à l'extérieur ou dans des lieux exposés à la pluie ou à l'eau.
- Installer l'instrument de manière à pourvoir immédiatement le débrancher du secteur en cas de fonctionnement anormal ou dangereux.

Câblage correct
Cet équipement délivre une tension et une intensité élevées. Si vous ne raccordez pas correctement les appareils, non seulement cela risque d'endommager l'équipement ou l'appareil cible, mais en plus cela risque d'entraîner un choc électrique ou un incendie. Branchez toujours les câbles en plomb correctement et vérifiez les points suivants.

Avant le sortie (avant la mise sous tension), vérifier que :
- Les câbles en plomb sont correctement raccordés aux bornes de sortie de l'équipement. Vérifiez que les câbles en plomb de sortie qui doivent être raccordés aux bornes de sortie de faible tension (SORTIE 1) ne sont pas raccordés aux aux bornes de sortie haute tension ou aux bornes de sortie d'intensité élevée.
- Les câbles en plomb sont correctement raccordés à l'appareil cible. Les câbles en plomb ne sont pas court-circuités en raison d'erreurs de câblage, d'absence d'isolation des câbles en plomb, de contact accidentel avec des pièces conductrices etc.
- Les câbles sont fermement vissés sur les bornes.
- Les bornes ne présentent aucune anomalie, telle la présence de corps étrangers.

Pendant la sortie (ne pas toucher les bornes ni les câbles branchés lorsque l'instrument est sous tension), vérifier que :
- Les bornes ne présentent aucune anomalie, telle la présence de corps étrangers.
- Les bornes ne chauffent pas anormalement. Les raccordements de bornes risquent de se détacher dans le temps. Le cas échéant, une chaleur peut être générée suite aux changements de résistance au contact. Vérifiez régulièrement que les câbles en plomb sont bien raccordés aux bornes. Éteignez bien à la fois cet équipement et l'appareil cible avant de vérifier les raccordements.

Après la sortie (tout de suite après la mise hors tension)
  Une fois une tension ou un courant obtenu(e), la tension peut rester un certain temps, même après la mise hors tension. Cette tension résiduelle peut entraîner un choc électrique. Ne touchez pas immédiatement les bornes après la mise hors tension. La durée pendant laquelle le tension reste varie en fonction de l'appareil cible.

ATTENTION

Limitations relatives à l'environnement opérationnel
Ce produit est un produit de classe A (pour environnements industriels). L'utilisation de ce produit dans un zone résidentielle peut entraîner une interférence radio que l'utilisateur sera tenu de rectifier.

Sales in Each Country or Region

Waste Electrical and Electronic Equipment

Waste Electrical and Electronic Equipment (WEEE), Direcvtive

(This directive is valid only in the EU.)

This product complies with the WEEE directive marking requirement. This marking indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category

With reference to the equipment types in the WEEE directive, this product is classified as a "Monitoring and control instruments" product.

When disposing products in the EU, contact your local Yokogawa Europe B.V. office.
Do not dispose in domestic household waste.

Authorized Representative in the EEA

Yokogawa Europe B. V. is the authorized representative of Yokogawa Test & Measurement Corporation for this product in the EEA. To contact Yokogawa Europe B.V., see the separate list of worldwide contacts, PIM 113-01Z2.

Conventions Used in This Manual

Notes

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

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

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

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

French

AVERTISSEMENT Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures graves (voire mortelles), et sur les précautions de sécurité pouvant prévenir de tels accidents.

ATTENTION Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures légères ou d'endommager l'instrument ou les données de l'utilisateur, et sur les précautions de sécurité susceptibles de prévenir de tels accidents.

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

Characters That Appear on the 7-Segment LED

Because this instrument uses a 7-segment LED display, numbers, letters, and mathematical symbols are displayed using special characters. For details, see section 1.3, "Digital Numbers and Characters."

Symbols and Conventions Used in Procedural Explanations

The contents of the procedural explanations are indicated using the following symbols.

Procedure Carry out the procedure according to the step numbers. All procedures are written under the assumption that you are starting operation at the beginning of the procedure, so you may not need to carry out all the steps in a procedure when you are changing the settings.

Explanation This section describes the setup items and the limitations regarding the procedures. It may not give a detailed explanation of the feature. For a detailed explanation of the feature, see chapter 2.

<<Command Mnemonic>>

Indicates a communication command that corresponds to some of the features described on the procedural explanation page.

Characters and Terminology Used in Procedural Explanations

Dial and Switches

Bold characters used in the procedural explanations indicate dials and switches on the panel.

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1.1   Panels

Front Panel

OUTPUT 1 indicator
Illuminates when the range is set to 100 mV, 1 V, 10 V, 100 µA, 1 mA, 10 mA, 100 mA, 1 A, 400 Ω, or TEMP.
It indicates that voltage or current is output from the low voltage-current output terminals.
→ sec. 2.1, 5.1, 6.1

Main Setting Section
• Used to set and display the output range of voltage, current, resistance, and temperature. → sec. 1.2, 5.2, 5.3, 6.2, 6.3
• Displays the SETUP menu. → ch. 4

DEVIATION/PRESET Section
• Sets the deviation. Displays the lowest digit in high resolution mode. → sec. 1.2, 7.2
• Used to display and set SETUP submenus and options. → ch. 4

RJC indicators
Indicates the current RJC mode. → sec. 6.6

Displays the output value and unit
Displays the output voltage, current, resistance, or temperature and the unit. → sec. 5.4, 6.4

REMOTE indicator
Illuminates when the 2560A is in remote mode (controlled through communications). → sec. 9.1, 10.1, 11.1

OUTPUT 2 indicator
Illuminates when the range is set to 100 V, 1000 V, 10 A, or 30 A. It indicates that voltage is output from the high voltage output terminals or current is output from the large current output terminals. → sec. 2.1, 5.1

HIGH VOLTAGE LED
Illuminates when the range is set to 100 V or 1000 V. → sec. 5.1

High voltage output terminals* ⚠
• Used to connect the included measurement leads → sec. 3.6
• Output terminals for the following ranges: 100 V, 1000 V. → sec. 2.1, 5.1

Bottom legs
→ sec. 3.2

Power switch
Turns the power on and off → sec. 3.4

Low voltage-current output terminals* ⚠
• Used to connect the included measurement leads → sec. 3.6
• Output terminals for the following ranges: 100 mV, 1 V, 10 V, 100 µA, 1 mA, 10 mA, 100 mA, 1 A, 400 Ω, TEMP. → sec. 2.1, 5.1, 6.1

Handle
Available on each side. → sec. 3.1, 3.2

TEMPERATURE dial
Switches the thermocouple or RTD type and the RJC mode. → sec. 6.1, 6.5, 6.6

Large current output terminals* ⚠
• Used to connect the included measurement leads → sec. 3.6
• Output terminals for the following ranges: 10 A, 30 A. → sec. 2.1, 5.1

OUTPUT Section
• Turns the voltage, current, resistance, or temperature output on and off. → sec. 1.2, 5.4, 6.4
• Switches remote mode (controlled through communications) to local mode. → sec. 9.1, 10.1, 11.1

SWEEP Section
Performs up or down sweeps → sec. 1.2, 7.3

SCALE Section
Used to select the main setting (MAX) and main setting (MIN) of the output range. → sec. 1.2, 5.3, 6.3

OUTPUT DIVIDER Section
Divides the output range equally. → sec. 1.2, 7.1

RANGE dial
• Switches the voltage, current, resistance, and temperature ranges. → sec. 5.1, 6.1
• When SETUP is selected, a SETUP menu appears. → ch. 4

Rear Panel

Inlet holes
- Do not block the inlet holes when installing the 2560A.
  → sec. 3.2
- Check the filter periodically to see that it is not clogged.
  → sec. 15.10 ⚠

Functional ground terminal
Shields the measurement lead at ground potential.

Power inlet ⚠
Connect the power cord.
→ sec. 3.3

Nameplate

GP-IB port
Used when controlling the 2560A remotely from a PC through the GP-IB interface
→ ch. 9

External RJ sensor input terminal ⚠
Used to connect an external RJ sensor
→ sec. 3.6, 6.6

USB port (type B)
- Used when writing user-defined files for thermocouple and RTD temperature output from a PC to the 2560A (USB mass storage)
  → sec. 6.5
- Used when controlling the 2560A remotely from a PC through the USB interface (USB-TMC)
  → ch. 11

Ethernet port (100BASE-TX/10BASE-T)
Used when controlling the 2560A remotely from a PC through the Ethernet interface
→ ch. 10

Top and Bottom Panels

Top panel

Bottom panel

Outlet holes
Do not block the outlet holes when installing the 2560A.
→ sec. 3.2

Rear legs
→ sec. 3.2

1.2   Dial and Switches

Main Setting Section

The main setting section is used to set and display the output range of voltage, current, resistance, and temperature. The main setting set using the SCALE switch (explained later) with the MAX indicator turned on is the maximum value (MAX) of the output range and that with the MIN indicator turned on is the minimum value (MIN) of the output range.

Main setting display
Large 5.5-digit 7-segment LEDs are used. The main setting including the polarity is displayed.

Unit display
Two 5×7 dot matrix LEDs are used. Unit is displayed according to the range set with the RANGE dial.

Polarity display

POLARITY switch
Sets the polarity

Main setting dials
Use the main setting dials to specify the main settings. From the left, the dials are the 1st, 2nd, 3rd, 4th, and 5th main setting dials.
Use each main setting dial to set the corresponding digit value, shown by the frames.
Carrying over and borrowing occurs automatically within the selectable range.

For instructions on how to use the SETUP menu, see section 4.2.

SCALE Section

Use the SCALE switch to select the maximum value (MAX) and minimum value (MIN) of the output range. Output divider, deviation, and sweep features operate assuming (MAX – MIN) to be 100%.

MAX indicator

SCALE

MAX

SCALE switch

MIN

Non Zero

Non Zero indicator
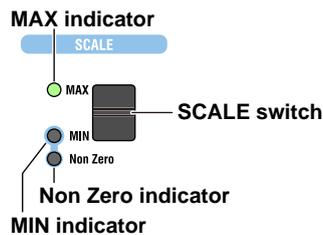
MIN indicator

MAX (Main setting (MAX))

Flipping the SCALE switch up turns the MAX indicator on. Use the POLARITY switch and the main setting dials in this condition to set the maximum value of the output range. When the output is turned on, the specified voltage, current, resistance, or temperature is generated from the output terminals.

MIN (Main setting (MIN))

Flipping the SCALE switch down turns the MIN indicator on. Use the POLARITY switch and the main setting dials in this condition to set the minimum value of the output range. When the output is turned on, the specified voltage, current, resistance, or temperature is generated from the output terminals.
Setting a value other than ±0 (zero) causes the Non Zero indicator to turn on.

OUTPUT Section

Use the OUTPUT section to turn the voltage, current, resistance, or temperature output on and off.

ON indicator

OUTPUT switch

OFF indicator When the 2560A is in remote communication mode and you flip the OUTPUT switch down, the 2560A switches to local mode (except during local lockout (see section 9.4)).
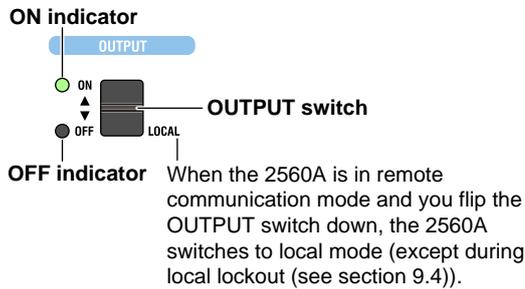
Output display (output display example for +100.000 V)
6-digit 7-segment LEDs are used.

Unit indicators
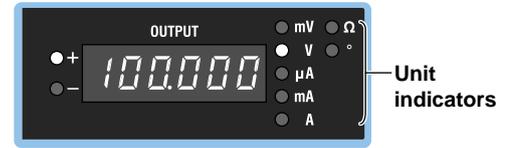
Output ON

Flipping the OUTPUT switch up turns the ON indicator on. The specified voltage, current, resistance, or temperature (the thermoelectromotive force or resistance corresponding to the specified temperature) is generated from the output terminals.
The output value generated from the output terminals is shown on the output display.

Output OFF

Flipping the OUTPUT switch down turns the OFF indicator on. The signal generation from the output terminals is stopped. The output display shows a bar (- - - - - -).

OUTPUT DIVIDER Section

Use the OUTPUT DIVIDER section to divide the output range equally.

n display
Indicates the numerator of the divider value

n dial
Sets the numerator, n, of the divider value. The range is 0 to m.

m dial
Sets the denominator, m, of the divider value. The range is 4 to 15.
Turning the m dial resets numerator n to the denominator m value.
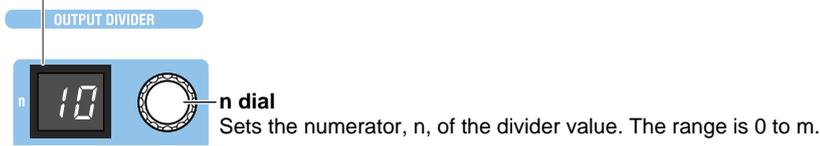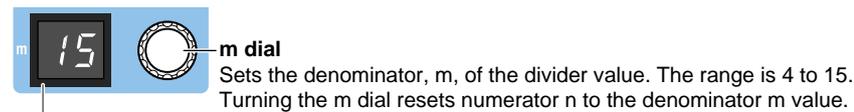
m display
Indicates the denominator of the divider value

When the output is turned on, the voltage, current, resistance, or temperature divided at n/m is generated from the output terminals.

DEVIATION/PRESET Section

Use the DEVIATION/PRESET section to set the deviation as a percentage of the output range.

Deviation display
4-digit 7-segment LEDs are used.

Polarity indicator

PRESET switch
Selects the deviation preset

PRESET indicator
The indicator of the preset selected with the PRESET switch turns on.

Deviation dial 2
Sets the second decimal digit at a resolution of 0.01 You can turn this dial with less force.
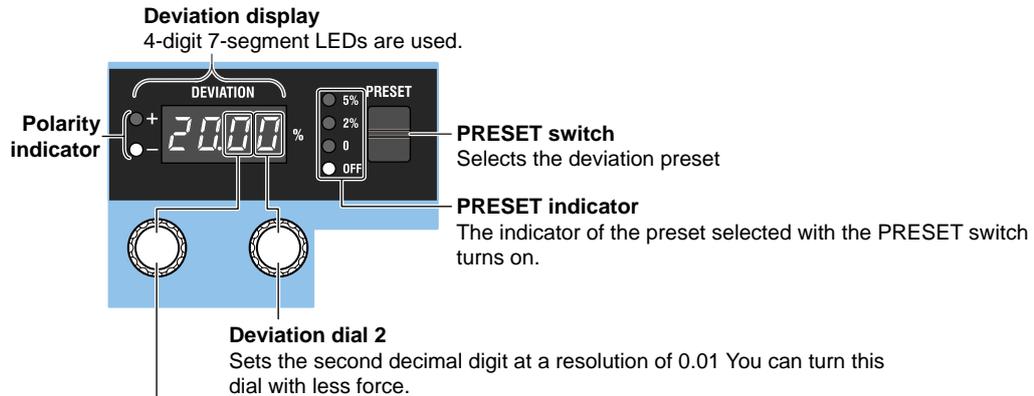
Deviation dial 1
Sets the first decimal digit at a resolution of 0.2

For both dials, carrying over and borrowing occur automatically within the ±20.00% selectable range.

For instructions on how to use the SETUP menu, see section 4.2.

When the output is turned on, the voltage, current, resistance, or temperature with the deviation added or subtracted is generated from the output terminals. In high resolution mode, the most significant digit of the deviation display is used as the least significant digit of the main setting, and deviation dial 1 is used to control the least significant digit.

SWEEP Section

Use the SWEEP section to perform up or down sweeps.
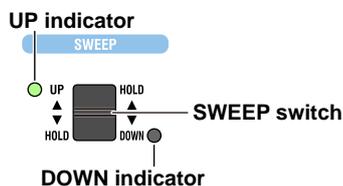
UP indicator

SWEEP switch

DOWN indicator

UP Sweep

Flipping the SWEEP switch up when the output is on turns the UP indicator on. The 2560A starts sweeping toward main setting (MAX). If you flip the SWEEP switch down while sweeping up or if sweeping reaches sweep end value, a beep is sounded, and sweeping stops (HOLD state).

DOWN Sweep

Flipping the SWEEP switch down when the output is on turns the DOWN indicator on. The 2560A starts sweeping toward main setting (MIN). If you flip the SWEEP switch up while sweeping down or if sweeping reaches sweep end value, a beep is sounded, and sweeping stops (HOLD state).
If the set range is 400 Ω (resistance), even if the destination value for down sweeping is less than 1.00 Ω, the output resistance will not decrease beyond 1.00 Ω. The output display will show "1.00" blinking.

1.3 Digital Numbers and Characters

The 7-segment LED on the 2560A shows numbers, letters, and mathematical symbols using special characters in the manner shown below. Some of the characters shown below are not used on the 2560A.

0 → $\mathit{0}$ A → A K → K U → U ^(power) → n

1 → $\mathit{1}$ B → b L → L V → V

2 → $\mathit{2}$ C → C Lowercase c → c M → $\mathit{\bar{n}}$ W → w

3 → $\mathit{3}$ D → d N → n X → II

4 → $\mathit{4}$ E → E O → o Y → y

5 → $\mathit{5}$ F → F P → P Z → $\mathit{\equiv}$

6 → $\mathit{6}$ G → G Q → q + → $\mathit{+}$

7 → $\mathit{7}$ H → H Lowercase h → h R → r − → $\mathit{-}$

8 → $\mathit{8}$ I → i S → $\mathit{5}$ × → $\mathit{''}$

9 → $\mathit{9}$ J → J T → t ÷ → $\mathit{\div}$

2.1   System Configuration

PC

GP-IB
ETHERNET (VXI-11)
USB (USB-TMC)

Communication interface

Command control

External RJ sensor

Low voltage-current output (OUTPUT 1)

HI
LO

High voltage output (OUTPUT 2)

LO   HI

Large current output (OUTPUT 2)

LO   HI

DUT (output target)

DUT (output target)

Range		
100 mV	100 µA	400 Ω TEMP
1 V	1 mA	
10 V	10 mA	
	100 mA	
	1 A	

Range	
100 V	10 A
1000 V	30 A
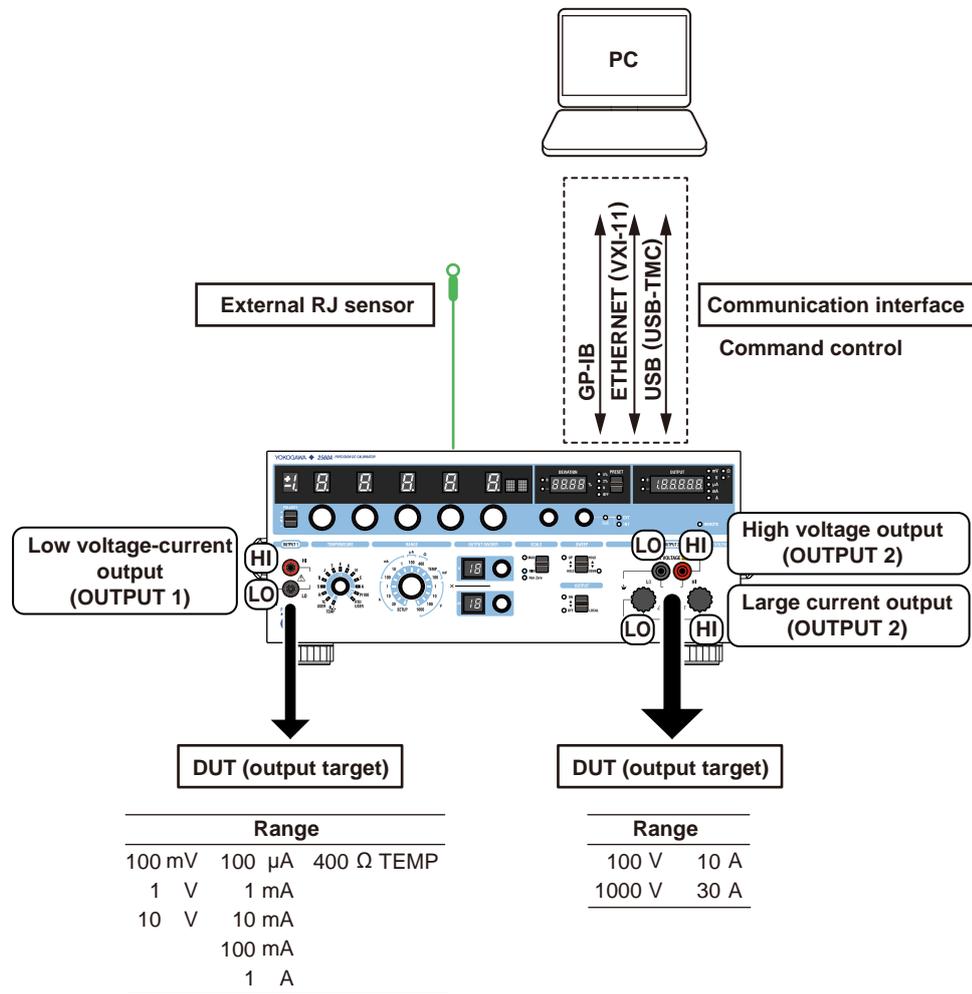
2.2 DC Voltage, DC Current, and Resistance Sourcing

The 2560A is a DC calibrator that sources DC voltage, DC current, and resistance. It also sources thermoelectromotive force and resistance that simulate those of a temperature sensor. This section describes the DC voltage, DC current, and resistance sourcing features. For a description of the thermoelectromotive-force and resistance sourcing features, see section 2.3.

DC Voltage Sourcing

The source range and output current for each voltage range are shown below. The 2560A outputs the specified DC voltage, within the range limited by the maximum output current, to the load circuit connected to the output terminals.

Low voltage-current output terminals (OUTPUT 1)

Range	Source Range[1]	Maximum Output Current[2]
100 mV	±122.400 mV	12 mA or higher[3]
1 V	±1.22400 V	Approx. 120 mA
10 V	±12.2400 V	Approx. 120 mA

High voltage output terminals (OUTPUT 2 plug-in terminals)

Range	Source Range[1]	Maximum Output Current[2]
100 V	±122.400 V	Approx. 30 mA
1000 V	±1224.00 V	Approx. 10 mA

1 If you set the main setting (MAX) to 120% of the range, the main setting (MIN) to 0% of the range, the divider value n/m to 1, and the deviation to –2%, up to 122.4% of the range can be generated.

2 Can be output when the source range is between 1% and 120% of the range.

3 In the 100 mV range, the output voltage may drop significantly when the output current exceeds 12 mA. Connect a load that will not cause the output current to exceed 12 mA.

The 2560A can also perform sink operation (see the next page). But it is not defined as part of the instrument's specifications.

DC Current Sourcing

The source range and output voltage for each current range are shown below. The 2560A outputs the specified DC current, within the range limited by the maximum output voltage, to the load circuit connected to the output terminals.

Low voltage-current output terminals (OUTPUT 1)

Range	Source Range[1]	Maximum Output Voltage[2]
100 µA	±122.400 µA	Approx. 30 V
1 mA	±1.22400 mA	Approx. 30 V
10 mA	±12.2400 mA	Approx. 30 V
100 mA	±122.400 mA	Approx. 30 V
1 A	±1.22400 A	Approx. 10 V

Large current output terminals (large binding posts of OUTPUT 2)

Range	Source Range[1]	Maximum Output Voltage[2]
10 A	±12.2400 A	Approx. 2 V
30 A	0 to +36.720 A	Approx. 1.5 V

1 If you set the main setting (MAX) to 120% of the range, the main setting (MIN) to 0% of the range, the divider value n/m to 1, and the deviation to –2%, up to 122.4% of the range can be generated.

2 Can be output when the source range is between 1% and 120% of the range.

Source and Sink

At the 100 mA range, the 2560A not only outputs current but can also sink current.* Sinking is possible for positive and negative voltage output. Sinking is also possible at other ranges, but it is not defined as part of the instrument's specifications.

* By absorbing the current from a voltage source such as a distributor, the 2560A can simulate a load, like a two-wire transmitter.
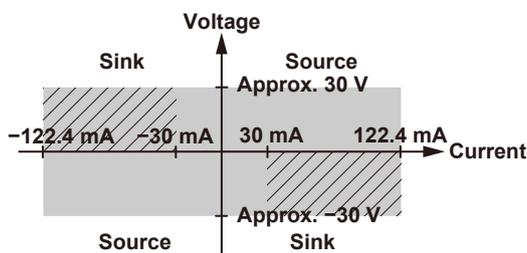
The sink current range is the same as the source range of the 100 mA range.

▨ : Immediately after sinking current in this region, errors exceeding the accuracy specifications may occur due to the increased temperature inside the 2560A.

Resistance Sourcing

The 2560A sources simulation resistance R (= V/I) by outputting voltage V, which is defined as R×I, where R is the specified resistance and I the excitation current for measuring resistance, from its low voltage-current output terminals (OUTPUT 1). The excitation current is supplied to the 2560A low voltage-current output terminals (OUTPUT 1) from the device to be calibrated.* For example, if the excitation current is 1 mA and the specified resistance is 100 Ω, the 2560A outputs 0.1 V.
The source range and excitation current for the resistance are shown below.

* Resistance measuring instrument, RTD thermometer, etc.
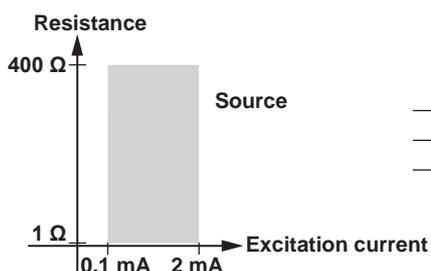
Range	Source Range	Excitation current
400 Ω	1.00 Ω to 400.00 Ω	0.1 mA to 2 mA

Turning the Output On and Off

The specified voltage, current, or resistance output and current sink can be turned on and off.

• ON

The specified voltage, current, or resistance is output from each output terminal. If the main setting display is blinking, the output cannot be turned on.
In current sink mode, sinking is performed.

• OFF

No output is produced. If you change the range or if the overload protection function is activated, the output automatically turns off.

Output Value

The output value of the 2560A is calculated from the scale, output divider, and deviation settings (explained later) within the DC voltage, DC current, or resistance source range explained in this section. The relational expression is shown below.

Output value = MIN + (MAX − MIN)×(n/m) + (MAX − MIN)×(−deviation)

MAX:	Maximum value of the scale (output range) (see section 2.4)
MIN:	Minimum value of the scale (output range) (see section 2.4)
m:	Denominator of the output divider (see section 2.5)
n:	Numerator of the output divider (see section 2.5)
Deviation:	See section 2.6.

2.3 Temperature-Sensor-Simulation Thermoelectromotive-Force and Resistance Sourcing

For the specified temperature, the 2560A sources thermoelectromotive force and resistance that simulate those of a thermocouple and RTD.

Thermocouple

The 2560A outputs from its low voltage-current output terminals (OUTPUT 1) the thermoelectromotive force (voltage) that corresponds to the specified temperature according to the selected thermocouple type. The available thermocouple types are R through A as defined by IEC and JIS standards and are listed in the following table. It is also possible to user-define the relationship between temperature and thermoelectromotive force and output thermoelectromotive force according to the definition.

> * Since a voltage divider is used to set the different thermocouple ranges, the output resistance is approximately 1 Ω. It is not suitable for connecting to a low-impedance load that requires current to flow through. The output voltage will drop if such a load is connected. Connect a high-impedance load, a load that is sufficiently larger than the output resistance. When using thermocouple ranges, do not apply external voltage or current. Doing so may damage the voltage divider.

Type	Source Range
R	–50°C to +1768°C
S	–50°C to +1768°C
B	0°C to +1820°C
J	–210°C to +1200°C
T	–270°C to +400°C
E	–270°C to +1000°C
K	–270°C to +1300°C
N	–270°C to +1300°C
C	0°C to +2315°C
A	0°C to +2500°C
TC USER (user-defined)	–9999.9°C to +9999.9°C But, a range corresponding to the voltage source range (–120.000 mV to +120.000 mV)

RJC Mode

The RJC mode can be set to auto, internal, or manual input. The 2560A corrects the sourced thermoelectromotive force (RJC) according to the selected mode. It is also possible to source thermoelectromotive force without correction.

- Auto
  - When the 2560A detects that an RJ sensor is connected to the external RJ sensor input terminal on the rear panel, the 2560A sources thermoelectromotive force that is corrected using the temperature measured by the external RJ sensor. The 2560A can measure the terminal temperature of the device to be calibrated that is connected to the 2560A using an RJ sensor and source thermoelectromotive force that is corrected using the measured temperature.
  - If an RJ sensor is not connected to the 2560A or is not detected, the 2560A applies its internal RJC.
  - RJ sensors 257875 are sold separately as accessories. An RTD Pt100 can also be used as an RJ sensor.
- Internal

  The 2560A sources thermoelectromotive force that is corrected using the temperature of its low voltage-current output terminals (OUTPUT 1).

- Manual input
  The 2560A sources thermoelectromotive force that is corrected using the manually input temperature.
  If you do not want to apply correction (not use the RJC function), you set the temperature to 0°C.

  * In a thermocouple temperature measurement, the temperature is measured from the thermoelectromotive force that is produced due to the temperature difference between the measurement point and the other contact point. If the other contact point is 0°C, the temperature at the measurement point can be found straight from the thermoelectromotive force. Normally, the other contact point is a terminal on a measuring instrument, so the temperature of that terminal is measured and used for correcting the actual measurement. This is called reference junction compensation.

RTD

The 2560A outputs from its low voltage-current output terminals (OUTPUT 1) the resistance of an RTD Pt100 that corresponds to the specified temperature. The 2560A supports Pt100, which is defined by IEC and JIS standards. It is also possible to user-define the relationship between temperature and resistance and output resistance according to the definition.

Type	Source Range
Pt100	−200.0°C to +850.0°C
RTD USER (user-defined)	−9999.9°C to +9999.9°C But, a temperature range corresponding to the resistance source range (1.00 Ω to 400.00 Ω)

Temperature Unit

If the suffix code is -UC, the temperature unit is Celsius (°C). If the suffix code is -UF, you can select Celsius (°C) or Fahrenheit (°F). You use the SETUP menu to select it.

Turning the Output On and Off

The output of a thermoelectromotive force or resistance that corresponds to the specified temperature can be turned on and off.
- ON
  Thermoelectromotive force or resistance is output from the low voltage-current output terminals (OUTPUT 1). If the main setting display is blinking, the output cannot be turned on.
- OFF
  No output is produced. If you change the thermocouple or RTD type, the output automatically turns off.

Output Value

The output value of the 2560A is calculated from the scale, output divider, and deviation settings (explained later) within the thermoelectromotive force or resistance source range explained in this section. The relational expression is shown below.

Output value = MIN + (MAX − MIN)×(n/m) + (MAX − MIN)×(−deviation)

MAX:	Maximum value of the scale (output range) (see section 2.4)
MIN:	Minimum value of the scale (output range) (see section 2.4)
m:	Denominator of the output divider (see section 2.5)
n:	Numerator of the output divider (see section 2.5)
Deviation:	See section 2.6.

Output Value Unit

You can select the output value unit of the output display from the following. Use the SETUP menu to select it.
• ° for both thermocouple and RTD
• mV for thermocouple and Ω for RTD

User Definition

You can define (user-define) any thermoelectromotive force and resistance that simulate those of thermocouples or RTDs and then source thermoelectromotive force and resistance according to the definitions. User-defined data is created by specifying coefficients of polynomials for each temperature range. The data that you create are written to the 2560A in the following manner.
• Write the user-defined data saved in a file to the 2560A using the USB mass storage feature.
• Transmit the user-defined data for each temperature range using communication commands. The transmitted data is written to the 2560A.

You can assign a type character to distinguish a user definition from other user definitions. The type character is displayed as the second character on the dot matrix LEDs for displaying the unit when a user-defined is selected.

For the user-defined data syntax and setup procedure, see appendix 6.

2.4   Scaling

Scaling is used to set the maximum value (main setting (MAX)) and minimum value (main setting (MIN)) of the output range to your liking within the selectable range of each range. This enables the output divider, deviation, and sweeping features of the 2560A to be used on a wider scale. Scaling cannot be used in high resolution mode.

- Output divider, deviation, and sweep features (explained later) operate assuming (main setting (MAX) – main setting (MIN)) to be 100%.
- To calibrate a 4-20 mA meter at 4 mA, 8 mA, 12 mA, 16 mA, and 20 mA, set the main setting (MAX) to 20 mA and the main setting (MIN) to 4 mA. The output divider and deviation features can be used to calibrate at each of these currents.
- To calibrate a meter that has positive and negative range, a digital meter, or the like, set the main setting (MIN) to a negative value and the main setting (MAX) to a positive value. The output divider, deviation, and sweeping features can be used to calibrate over the span specified by these values.

2.5 Output Divider

Output divider is a feature that divides the voltage, current, resistance, or temperature set with the main setting dials equally by the specified number and outputs the result. The output divider feature cannot be used in high resolution mode.

When calibrating the target meter, the output divider feature divides the voltage, current, resistance, or temperature level into as many points as you need to calibrate. You can set the main setting to the maximum indication on the target meter, and vary the divider value to calibrate the various points on the meter.

Selectable divider value range m (denominator): 4 to 15, n (numerator): 0 to m

Setup example: Main setting (MAX) = 10 A, main setting (MIN) = 0 A, m = 4, n = 0 to 4

Output value = 0 A (10 A×0/4) → 2.5 A (10 A×1/4) → 5 A (10 A×2/4) → 7.5 A (10 A×3/4) → 10 A (10 A×4/4)
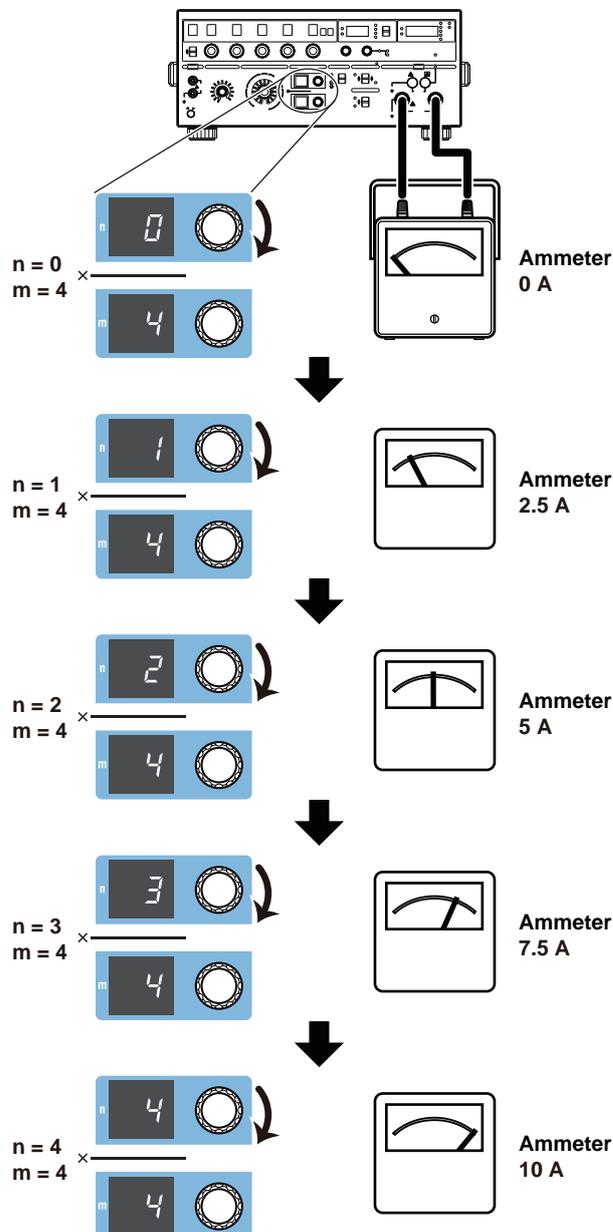
2.6 Deviation and Presets

Deviation output is a feature that adds or subtracts deviation from the voltage, current, resistance, or temperature set with the main setting dials and outputs the result. Deviation cannot be used in high resolution mode.

Deviation

This feature is used to check the relative error (deviation) of the meter scale calibration. If the meter needle is not pointing accurately to the appropriate scale mark, you can turn a deviation dial on the front panel to finely adjust the voltage, current, resistance, or temperature level so that the needle points accurately to the mark. The amount of fine adjustment is displayed as the deviation.

Setup example: Main setting (MAX) = 10 A, main setting (MIN) = 0 A, divider value n/m = 1
Set deviation in the range of –20.00% to +20.00% by assuming (MAX – MIN) to be 100%. However, a deviation that would cause the output value to fall outside the source range of each range is not allowed.
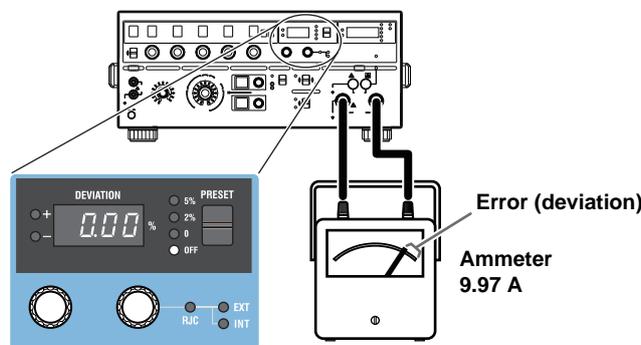
Use the deviation dial to align the meter needle to the accurate scale position.

Error (deviation)

Ammeter 9.97 A

Ammeter 10 A
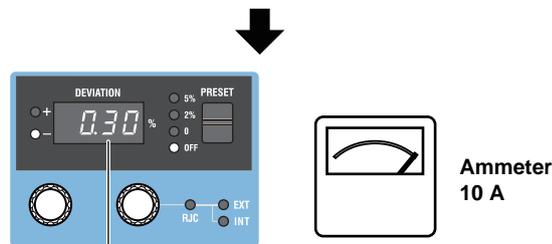
The deviation is –0.30%.

In the example above, before fine adjustment, the meter needle is pointing to 9.97 A, which is 0.30% smaller than the 10 A current output from the 2560A. The deviation polarity (the sign) of the 2560A indicates whether the target device indication is larger or smaller than the accurate position. In this example, because the meter is pointing to a value that is 0.30% smaller than the 2560A output value, the 2560A displays –0.30%.

Deviation at Each Calibration Point

When the deviation feature is used in conjunction with the output divider feature explained in section 2.5, you can check at each calibration point the deviation in reference to the maximum scale value. For example, when the maximum scale value is 10 A, 1% is 0.1 A. If you are using the output divider feature at n = 2 and m = 10, when 2 A is being output, 1% will also be 0.1 A.

Presets

Deviation presets can be used to make the meter indicate values that are short of the accurate scale positions when you change the output divider setting.

You can use this feature to calibrate a meter when using the output divider feature to calibrate the points in increasing or decreasing order.

5%: When calibrating in increasing order, the deviation is set to +5.00%.
When calibrating in decreasing order, the deviation is set to –5.00%.

2%: When calibrating in increasing order, the deviation is set to +2.00%.
When calibrating in decreasing order, the deviation is set to –2.00%.

0%: The deviation is cleared when the divider value is changed.

OFF: The specified deviation is retained even when the divider value is changed.

Example when calibrating in increasing order

Preset (5%)

Indicates a point that is short of the calibration point by the preset amount

Ammeter 4.5 A

$n = 2$
$m = 4$

Use the n dial to move the meter needle up.

$n = 4$
$m = 4$

Indicates a point that is short of the calibration point by the preset amount

Ammeter 9.5 A
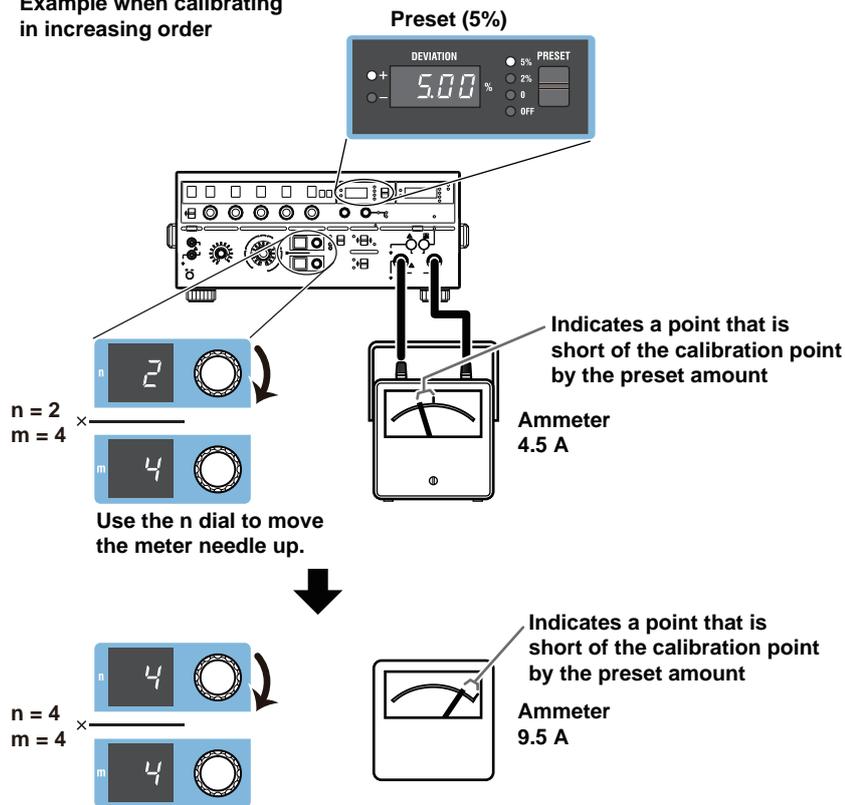
In the above example, the 2560A is generating –5.00% of the output setting. To calibrate the scale, turn a deviation dial to move the meter needle to the correct position. For details on how to read the deviation, see "Deviation" on the previous page.

2.7   Sweeping

Sweeping is a feature used to vary the output value continuously and smoothly toward main setting (MAX) or main setting (MIN) over the specified sweep time. Sweeping cannot be used in high resolution mode.

It is used to move the meter's needle from the minimum scale value to 120% of the maximum scale value at a constant speed and check whether the needle is sticky when it moves. You can select the sweep time according to the meter type. To sweep a wide-angle meter, you can select a long sweep time to move the needle slowly.

Setup example: Main setting (MAX) = 10 A, main setting (MIN) = 0 A
   The sweep time is the time for sweeping between 0% and 100% by assuming (MAX – MIN) to be 100%. Select 8, 16, 32, or 64 approximate seconds.

Sweeps the needle over the specified time.

Ammeter 0 A to 12 A

UP sweep

Ammeter 12 A to 0 A

DOWN sweep
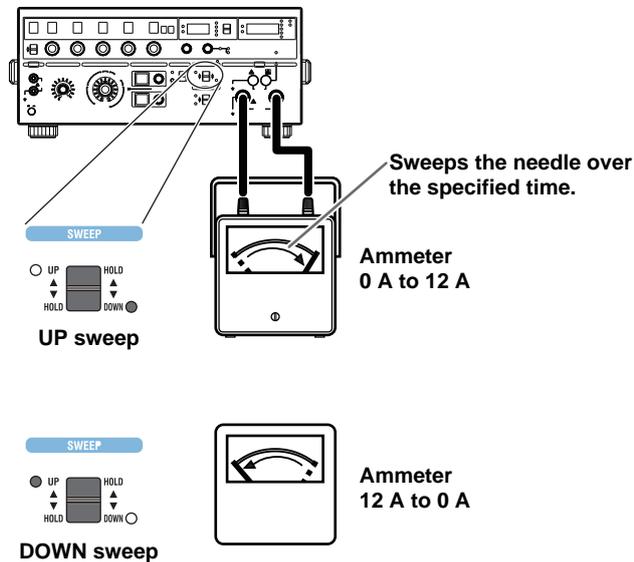
When sweeping up, sweeping is performed up to 120% of the maximum scale value.

2.8   Other Features

High Resolution Mode

Normally, set the main setting of the source voltage or current at 5.5 digit resolution (4.5 digit resolution for 30 A range). In high resolution mode, you can set it at 6.5 digit resolution (5.5 digit resolution for 30 A range).

In normal resolution mode, use the five main setting dials to set 5.5 digits. In high resolution mode, use the five main setting dials and deviation dial 1 to set 6.5 digits.

In high resolution mode, the output divider, deviation output, sweep, and scaling features cannot be used. Further, high resolution mode cannot be used for temperature or resistance ranges.

Turning the Beep Sound On and Off

Beeps are used to indicate the operation status of the device. You can turn it on and off from the SETUP menu.

You can turn the beep sound on or off for the following notifications. You cannot change the volume.
- When a voltage greater than or equal to +150 V or less than or equal to –150 V is to be output, regardless of the output on/off state
- When a sweep operation is held

You cannot turn off the beep sound for the following notifications.
- When the cooling fan stops (error code: E.901, E.907)
- When an abnormal temperature is detected (error code: E.902, E.903)
- When an internal power supply error is detected (error code: E.904, E.905, E.908)
- When an error is detected during a self-test executed at power-on or by some other operation (error codes: E.911 to E950). However, you can turn off the beep sound for these errors by performing the procedure below.
  - Turn the power on
    Control a front-panel dial or switch
  - Execute a self-test using other controls
    Flip the PRESET switch down

Error Log Display

The error log keeps a record of error codes that occur in communication and self-tests while the 2560A is on. You use the SETUP menu to display the error log. The error log is cleared when the power is turned off.

Initialization

This feature initializes the 2560A settings. You use the SETUP menu to do so.
Communication settings and a portion of other settings are not initialized. For details on the items that are initialized, see appendix 7.

Displaying the Product Information

The firmware version, serial number, and the like can be displayed. You use the SETUP menu to display them.
- Firmware version
- Logic program version
- Boot program version
- Serial number (instrument number)

3.1   Handling Precautions

Safety Precautions

If you are using the 2560A for the first time, make sure to read "Safety Precautions," on pages v to vii.

Do Not Remove the Case

Do not remove the case from the instrument. Some parts of the instrument use high voltages and are extremely dangerous. For internal inspection and adjustment, contact your nearest YOKOGAWA dealer.

Unplug If Abnormal Behavior Occurs

If you notice smoke or unusual odors coming from the instrument, immediately turn off the power and unplug the power cord. Also, turn off the power to the target device that are connected to the output terminals. Then, contact your nearest YOKOGAWA dealer.

Do Not Damage the Power Cord

Nothing should be placed on top of the power cord. The power cord should also be kept away from any heat sources. When removing the plug from the power outlet, do not pull on the cord. Pull from the plug. If the power cord is damaged, purchase a replacement with the same part number as the one indicated on page iv.

Correct the Problem If Output Is Automatically Turned Off

If an abnormality is detected in the internal circuit due to a voltage or current overloading, voltage or current output oscillation, and so on, the 2560A will automatically turn off the output and display a warning message (No. 027 to 040) on the output display. For details on the messages, see section 15.3.
In the case of voltage output, remove the cause of the problem, such as the external load, and turn the output on again.
In the case of current output, remove the cause of the problem, such as the external load, short the current terminals, and turn the output on again.
If the output still turns off after you have corrected the problem, the 2560A may be malfunctioning. Contact your nearest YOKOGAWA dealer.

When an Overheating or Internal Circuit Error Is Detected

If the fan stops or an internal overheating or internal circuit error is detected, the 2560A will automatically turn off the output, display an error code (No. 901 to 908), and beep intermittently. If this happens, immediately turn the power switch off. Check that the inlet or vent holes for the cooling fan are not blocked and that there is adequate space around the 2560A. Check for and remove any foreign objects that are caught in the filter on the rear panel. If the same error code appears when you turn the power switch on after waiting at least an hour, the 2560A may be malfunctioning. Contact your nearest YOKOGAWA dealer.

General Handling Precautions

Do Not Place Objects on Top of the Instrument

Never place objects such as other instruments or objects that contain water on top of the instrument. Doing so may damage the instrument. For details on stacking the 2560A, see section 3.2.

Keep Electrically Charged Objects Away from the Instrument

Keep electrically charged objects away from the input and output terminals. They may damage the internal circuitry.

Unplug during Extended Non-Use

Turn off the instrument and remove the power cord from the outlet.

When Carrying the Instrument

First, be sure to turn off the power switch and remove the power cord and other connected lead wires and cables. When carrying the instrument, hold the handles with both hands as shown in the figure below, and move it carefully.
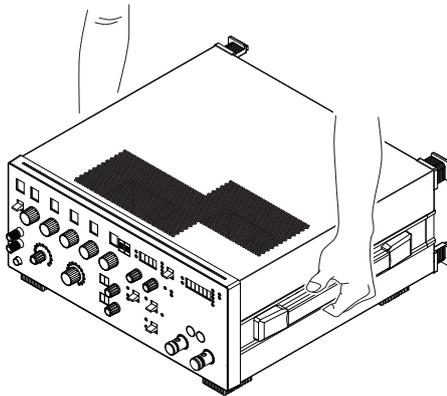
WARNING

- When you hold or put away the handle, be careful not to get your hand caught between the handle and the case.
- When you carry the instrument, be careful not to get your hand caught between the wall, installation surface, or other objects and the instrument.

French

AVERTISSEMENT

- Lorsque vous attrapez ou rabattez la poignée, veillez à ne pas vous coincer la main entre la poignée et l'instrument.
- Lorsque vous déplacez l'instrument, veillez à ne pas vous coincer la main entre l'instrument et le mur, la surface d'installation ou tout autre objet.

When Cleaning the Instrument

When cleaning the case or the operation panel, turn the instrument and remove the instrument's power cord from the outlet. Then, wipe the instrument lightly with a clean dry cloth. Do not use chemicals such as benzene or thinner. Doing so may cause discoloring and deformation.

3.2 Installing the 2560A

WARNING

- Do not install the instrument outdoors or in locations subject to rain or water.
- Install the instrument so that you can immediately remove the power cord if an abnormal or dangerous condition occurs.

CAUTION

If you block the outlet holes on the top or the inlet holes on the rear of the instrument, the instrument will become hot and may break down. In addition, turning the instrument on when there is condensation may damage the instrument.

French

AVERTISSEMENT

- Ne pas installer l'instrument à l'extérieur ou dans des lieux exposés à la pluie ou à l'eau.
- Installer l'instrument de manière à pourvoir immédiatement le débrancher du secteur en cas de fonctionnement anormal ou dangereux.

ATTENTION

Si vous bloquez les orifices de sortie sur le dessus de l'équipement ou les orifices d'entrée à l'arrière de l'équipement, ce dernier s'échauffe et risque de tomber en panne. En outre, mettre l'instrument sous tension lorsqu'il y a condensation peut endommager l'instrument.

Installation Conditions

Install the instrument in a place that meets the following conditions.

Outlet holes are located on the top of the instrument. There are also inlet holes on the rear. To prevent internal overheating, allow for enough space around the instrument (see the figure below), and do not block the inlet and outlet holes.
Do not install the instrument in a location where the air from an air conditioning system blows directly on the output terminals or where the instrument will be affected by heat sources. Such environment can cause errors.

20 cm or more
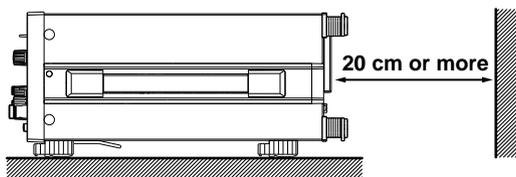
When connecting lead wires or cables, allow for enough space, above and beyond the space shown in the figure above, to carry out the procedure.

Ambient temperature and humidity

Ambient temperature	5°C to 40°C
Ambient humidity	20% RH to 80% RH (no condensation)
	20% RH to 70% RH for ambient temperatures above 30°C

Note

- Condensation may form when the instrument is moved from a low temperature or humidity environment to a high temperature or humidity environment, or when there is a sudden change in temperature. If this happens, allow it to adjust to the surrounding temperature for at least an hour, and use it without condensation. If you transport the instrument in its packing box, to prevent condensation, allow it to adjust to the new ambient temperature for at least an hour before taking it out of the box.
- If the instrument has been stored in a hot-temperature, high-humidity environment, warm up the instrument for at least a day before starting use.

Installation Orientation

Desktop

Install the instrument on a stable surface that is level in all directions and that is not slippery. The supplied rubber stoppers can be attached to bottom legs of the instrument to prevent the instrument from sliding. You can install the instrument in a tilted position using the movable legs. However, if you attach the front rubber leg cap, you will not be able to stack the 2560A.

Movable legs

WARNING

- Do not adjust the movable legs in an unstable condition.
- Do not place the instrument in any position other than those shown in the above figures.
- Do not stack the instruments with the movable legs pulled out.
- Only one instrument can be stacked on top of another. Do not stack multiple instruments on top of one instrument.

French

AVERTISSEMENT

- Ne pas manipuler les pieds escamotables lorsque l'instrument est instable.
- Ne pas placer l'instrument dans des positions autres celles indiquées ci-dessus.
- Ne pas empiler des instruments lorsque les pieds escamotables sont sortis.
- Seul un instrument peut être empilé sur un autre instrument. Ne pas empiler plusieurs instruments les uns sur les autres.

Rubber leg cap A9088ZM

Bottom leg
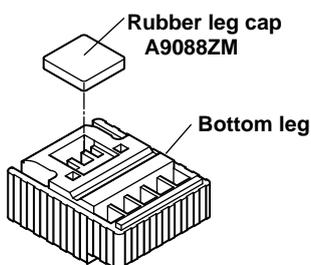
Note

If you attach the front rubber leg cap, you will not be able to stack the 2560A.

Rack Mounting

To mount the instrument on a rack, use a rack mount kit (sold separately).

Item	Model
Model 751533-E4 Rack mount kit (for mounting one 2560A on an EIA standard rack)	751533-E4
Model 751533-J4 Rack mount kit (for mounting one 2560A on a JIS standard rack)	751533-J4

An outline of the mounting procedure is given below. For detailed instructions, see the manual that is included with the rack mount kit.

1. Remove the handles from both sides of the instrument.

2. Remove the four feet from the bottom of the instrument.

3. Remove the four seals covering the rack mount attachment holes. The holes are on the sides of the instrument near the front.

4. Place seals over the feet and handle attachment holes.

5. Attach the rack mount kit to the instrument.

6. Mount the instrument on a rack.

How to remove the handle
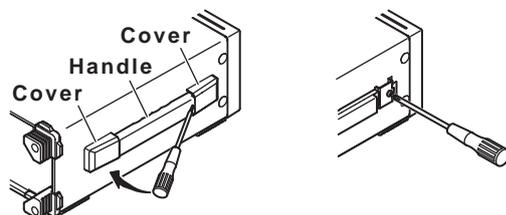
Note

- When rack-mounting the instrument, allow at least 5cm of space around the top panel outlet holes to prevent internal heating. Allow at least 20 cm around the rear panel inlet holes.
- Make sure to provide adequate support from the bottom of the instrument. The support should not block the inlet and outlet holes.
- Store the removed parts in a safe place.
- When rack-mounting the instrument, remove the feet from the rear of the instrument if they are coming into contact with the rack and are thus preventing you from rack-mounting the instrument. After you have rack-mounted the instrument, re-attach the feet to the rear of the instrument.
- Dials and output terminals protrude further out than the front panel position. Make sure you do not hit them against the rack when mounting the instrument.

Do Not Install the Instrument in the Following Kinds of Places

- In direct sunlight or near heat sources
- In an environment with excessive amounts of soot, steam, dust, or corrosive gas
- Near strong magnetic field sources
- Near high-voltage equipment or power lines
- In an environment subject to large levels of mechanical vibration
- On an unstable surface
- Outdoors or in locations subject to rain or water
- Where the air from an air conditioning system blows directly on the instrument or where the instrument will be affected by heat sources

3.3 Connecting to the Power Supply

Before Connecting the Power Supply

Make sure to follow the warnings below when connecting the power supply. Failure to do so may cause electric shock or damage to the instrument.

⚠️

WARNING

- Before connecting the power cord, ensure that the source voltage matches the rated supply voltage of the 2560A and that it is within the maximum rated voltage of the provided power cord.
- Connect the power cord after checking that the power switch of the instrument is turned off.
- To prevent electric shock or fire, be sure to use the power cord for the instrument that is supplied by YOKOGAWA.
- Make sure to connect protective earth grounding to prevent electric shock. Connect the power cord to a three-prong power outlet with a protective earth terminal.
- Do not use an ungrounded extension cord. If you do, the instrument will not be grounded.
- If an AC outlet that conforms to the supplied power cord is unavailable and you cannot ground the instrument, do not use the instrument.

French

⚠️

AVERTISSEMENT

- Avant de brancher le cordon d'alimentation, vérifier que la tension source correspond à la tension d'alimentation nominale du 2560A et qu'elle est compatible avec la tension nominale maximale du cordon d'alimentation.
- Brancher le cordon d'alimentation après avoir vérifié que l'interrupteur d'alimentation de l'instrument est sur OFF.
- Pour éviter tout risque de choc électrique ou d'incendie, utiliser exclusivement le cordon d'alimentation fourni par YOKOGAWA et prévu pour l'instrument.
- Relier l'instrument à la terre pour éviter tout risque de choc électrique. Brancher le cordon d'alimentation sur une prise de courant à trois plots reliée à la terre.
- Toujours utiliser une rallonge avec broche de mise à la terre, à défaut de quoi l'instrument ne serait pas relié à la terre.
- En l'absence de prise secteur conforme au cordon d'alimentation et dans l'impossibilité de mettre l'instrument à la terre, ne pas utiliser l'instrument.

Connecting the Power Cord

1. Check that the power switch (POWER) on the front panel of the instrument is turned off.

2. Connect the power cord plug to the power inlet on the rear panel.

3. Connect the other end of the cord to an outlet that meets the following conditions. Use a grounded three-prong outlet.

Item	Specifications
Rated supply voltage*	100 VAC to 120 VAC, 200 VAC to 240 VAC
Permitted supply voltage range	90 VAC to 132 VAC, 180 VAC to 264 VAC
Rated supply frequency	50Hz/60Hz
Permitted supply frequency range	48 Hz to 63 Hz
Maximum power consumption	Approx. 200 VA

* This instrument can use a 100 V or a 200 V power supply. The maximum rated voltage differs according to the type of power cord. Check that the voltage supplied to the instrument is less than or equal to the maximum rated voltage of the power cord provided with the instrument before using it (see page iii for the maximum rated voltage).

2560A　　　　　　**Three-prong outlet**
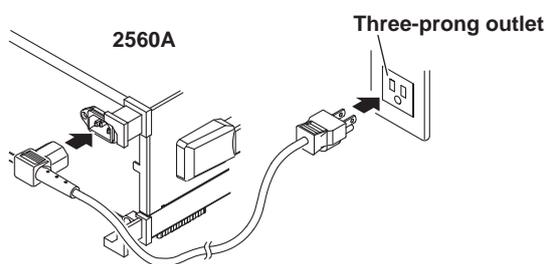
3.4 Turning On and Off the Power Switch

Before Turning On the Power, Check That:
- The instrument is installed properly. → section 3.2, "Installing the 2560A"
- The power cord is connected properly → section 3.3, "Connecting the Power Supply"

Power Switch Location
The power switch is located in the lower left of the front panel.

Turning On and Off the Power Switch
The power switch is a push button. Press the button once to turn the instrument on and press it again to turn the instrument off.
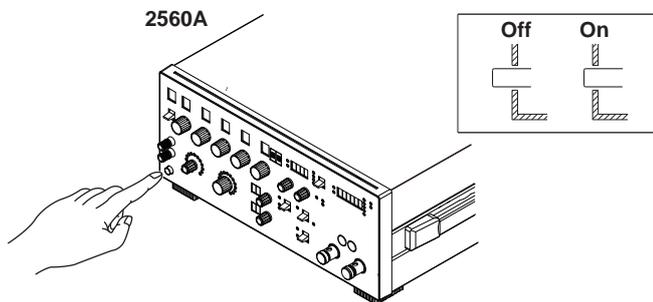
Operations Performed When the Power Is Turned On
When the power switch is turned on, a self-test starts automatically. When the self-test completes successfully, the instrument will be configured with the settings that were in use immediately before the power was turned off. For the settings that are retained even when the power is turned off, see appendix 7.
Check that the instrument has started normally before you use it.

If the 2560A Does Not Start Normally When the Power Is Turned On
Turn off the power switch, and check the following items.
- The power cord is securely connected.
- The correct voltage is coming to the power outlet. → section 3.3, "Connecting to the Power Supply"
- Initialize the 2560A settings → section 15.8, "Initializing the Settings."

If the 2560A still does not work properly after checking these items, contact your nearest YOKOGAWA dealer for repairs. If an error code is displayed, check the information in section 15.3, and take the appropriate actions.

Note
After turning the power switch off, wait at least 10 seconds before you turn it on again.

To Generate Accurate Output
- Allow the instrument to warm up for at least 30 minutes after turning on the power switch. If the instrument has been stored in a hot-temperature, high-humidity environment, warm up the instrument for at least a day before starting use.
  Keep the OUTPUT switch turned off during warm up.
- We recommend that the power be left on at all times.

3

Operations Performed When the Power Is Turned Off

Setup parameters immediately before (approx. 1 s before) the power switch is turned off is stored. The same is true when the power cord is disconnected from the outlet. The next time the power is turned on, the instrument powers up using the stored settings (for the settings that are stored, see appendix 7).

CAUTION

Do not turn off the power when the instrument's output is turned on. Doing so can damage the 2560A. It can also cause damage to the devices connected to the 2560A. Turn the output off first, and the turn off the power.

French

ATTENTION

Ne pas tourner l'appareil hors tension quand la sortie de l'instrument est activée. Cela peut endommager le 2560A. Il peut aussi endommager les appareils connectés à la 2560A. Tourner la sortie première et la coupez l'alimentation.

3.5 Wiring Precautions

WARNING

This product generates high voltage. Be careful of electric shock and electric discharge. To prevent electric shock, remove rings, watches, and other metallic accessories and jewelry before wiring.

Before Wiring
- Ground the instrument before connecting the instrument to the target device. The power cord that comes with the instrument is a three-prong type power cord. Insert the power cord into a grounded three-prong outlet.
- Be sure to turn off the output before connecting or disconnecting the target device.
- To prevent damage that would occur if the OUTPUT switch is flipped inadvertently during wiring, check that the minimum and maximum values on the scale are all set to 0 (zero).
- If a large inductive or capacitive load or oscillating circuit is connected to the output terminals, the output may oscillate and cause high voltage to be applied to the output terminals. If the output oscillates, turn off the OUTPUT switch immediately.

Wiring
- Make sure to fasten the output terminal screws securely so that lead wires do not come loose.
- Only use lead wires whose conductive parts are covered for connecting to the high voltage output terminals (OUTPUT 2 plug-in terminals). Exposed conductive parts can lead to electric shock.
- Do not use lead wires whose conductive parts are exposed due to tears in the insulation or broken cables as they may lead to a short circuit or electric shock.
- For connecting to terminals used for high voltage output, only use lead wires that have safety terminals that cover their conductive parts. Using a terminal with bare conductive parts (such as a banana plug) can be dangerous if the terminal comes loose.
- Do not use the fork terminal adapter 758921 when outputting from the high voltage output terminals (OUTPUT 2 plug-in terminals). Due to the structure of the product, it is possible to touch the metal parts of the fork terminal adapter 758921. Be careful as this constitutes an electric shock hazard.
- Use the accessories of this product within the rated range of each accessory (see page iv). When using several accessories together, use them within the specification range of the accessory with the lowest rating.

Before output (before turning on the output), check that:
- Lead wires are connected to the instrument's output terminals correctly.
  Check that output lead wires that should be connected to low voltage-current output terminals (OUTPUT 1) are not connected to the high voltage output terminals or large current output terminals.
- Lead wires are connected to the target device correctly.
  Lead wires are not shorted because of wiring errors, broken insulation of lead wires, unintended contact with conductive parts, and so on.
- The lead wires are fastened firmly to the terminals.
- There no problems with the terminals, such as the presence of foreign substances.

During output (do not touch the terminals or the connected lead wires when this instrument is on), check that:
- There no problems with the terminals, such as the presence of foreign substances.
- The terminals are not abnormally hot.
  The terminal connections may become loose over time. If this happens, heat may be generated due to changes in contact resistance. Periodically check that the cables are firmly connected to the terminals. Be sure to turn off both this instrument and the target device before you check the connections.
- If the voltage output exceeds 33 Vrms or 46.7 Vpeak, there is a danger of electric shock due to the high voltage. Be extremely careful.

After output (immediately after the output is turned off)
After you output a voltage or current, voltage may remain for some time even after you turn the output off. This residual voltage may lead to electric shock. Do not touch the terminals immediately after you turn the output off. The amount of time that voltage remains varies depending on the target device.

⚠ CAUTION

- Use lead wires that have adequate margins of withstand voltage and current capacity with respect to the voltage or current to be sourced.
  Example:To use a current of 20 A, use copper wires that have a conductive cross-sectional area of 4 mm^2 or greater.
- When outputting current, do not open the current terminals. Doing so will trigger a protection feature, and the output will turn off.
- When outputting voltage, do not short the voltage terminals. Doing so will trigger a protection feature, and the output will turn off.
- Use twisted-pair lead wires to prevent oscillation.
- When using thermocouple ranges, do not apply external voltage or current. Also, do not connect to a charged capacitive load. Doing so may damage the voltage divider inside the 2560A.
- May cause abnormal voltage output when turn off 2560A. 2560A output turned OFF and then turn off 2560A.

French

⚠ AVERTISSEMENT

Ce produit génère une tension élevée. Faites attention au choc électrique et à la décharge électrique. Afin d'éviter tout choc électrique, retirer les bagues, les montres et autres accessoires métalliques ainsi que les bijoux avant le câblage.

Avant le câblage
- Relier l'instrument à la terre avant de le brancher sur l'appareil cible. Le cordon d'alimentation livré avec l'instrument est doté de trois broches. Brancher le cordon d'alimentation sur une prise de courant à trois plots mise à la terre.
- Toujours mettre hors tension avant de brancher ou de débrancher l'appareil cible.
- Afin d'éviter tout endommagement susceptible de se produire si l'interrupteur OUTPUT (Sortie) est actionné accidentellement lors du câblage, vérifiez que les valeurs minimales et maximales sur l'échelle sont toutes définies sur 0 (zéro).
- En cas de branchement d'une importante charge inductive ou capacitive, ou de circuit oscillant sur les bornes de sortie, la sortie peut osciller et entraîner l'alimentation d'une tension élevée sur les bornes de sortie. En cas d'oscillation de la sortie, mettre le commutateur de SORTIE (OUTPUT) immédiatement hors tension.

Câblage
- Serrez bien les vis des bornes de sortie de telle sorte que les câbles en plomb ne se détachent pas.
- Utilisez seulement des câbles en plomb dont les pièces conductrices sont recouvertes pour un raccordement aux bornes de sortie haute tension (bornes enfichables de SORTIE 2). Des pièces conductrices exposées peuvent entraîner une choc électrique.
- N'utilisez pas de câble de plomb dont les pièces conductrices sont exposées, en raison de traces d'usure de l'isolation ou de câbles cassés, car ceci risque d'entraîner un court-circuit ou un choc électrique.
- Pour le raccordement à des bornes utilisées pour une sortie haute tension, utilisez uniquement des câbles en plomb présentant des bornes de sécurité recouvrant leurs pièces conductrices. L'utilisation d'une borne dotée d'éléments conducteurs nus (comme une fiche banane) serait dangereuse si la borne venait à se détacher.
- N'utilisez pas l'adaptateur de borne à fourche 758921 à la sortie des bornes de sortie haute tension (bornes enfichables de SORTIE 2). Compte tenu de la structure du produit, il est possible de toucher les pièces métalliques de l'adaptateur de borne à fourche 758921. Procédez avec soin, car cette opération présente un risque de choc électrique.
- Utilisez les accessoires de ce produit en fonction des valeurs nominales de chacun (reportez-vous à la page iv). Lorsque vous employez plusieurs accessoires en même temps, utilisez les valeurs de l'accessoire ayant les valeurs nominales les plus faibles.

Avant le sortie (avant la mise sous tension), vérifier que :
- Les câbles en plomb sont correctement raccordés aux bornes de sortie de l'équipement. Vérifiez que les câbles en plomb de sortie qui doivent être raccordés aux bornes de sortie de faible tension (SORTIE 1) ne sont pas raccordés aux aux bornes de sortie haute tension ou aux bornes de sortie d'intensité élevée.
- Les câbles en plomb sont correctement raccordés à l'appareil cible.
  Les câbles en plomb ne sont pas court-circuités en raison d'erreurs de câblage, d'absence d'isolation des câbles en plomb, de contact accidentel avec des pièces conductrices etc.
- Les câbles sont fermement vissés sur les bornes.
- Les bornes ne présentent aucune anomalie, telle la présence de corps étrangers.

3

Pendant la sortie (ne pas toucher les bornes ni les câbles branchés lorsque l'instrument est sous tension), vérifier que :
• Les bornes ne présentent aucune anomalie, telle la présence de corps étrangers.
• Les bornes ne chauffent pas anormalement.
  Les raccordements de bornes risquent de se détacher dans le temps. Le cas échéant, une chaleur peut être générée suite aux changements de résistance au contact. Vérifiez régulièrement que les câbles en plomb sont bien raccordés aux bornes. Éteignez bien à la fois cet équipement et l'appareil cible avant de vérifier les raccordements.
• Si la sortie de tension dépasse 33 Vrms ou 46,7 Vpic, il existe un risque de choc électrique dû à la tension élevée. Soyez extrêmement attentif.

Après la sortie (tout de suite après la mise hors tension)
Une fois une tension ou un courant obtenu(e), la tension peut rester un certain temps, même après la mise hors tension. Cette tension résiduelle peut entraîner un choc électrique. Ne touchez pas immédiatement les bornes après la mise hors tension. La durée pendant laquelle le tension reste varie en fonction de l'appareil cible.

⚠ ATTENTION

• Utiliser des câbles qui ont suffisamment de marge de tension de maintien ou de capacité de courant par rapport à la tension ou au courant à émettre.
  Exemple : Pour utiliser un courant de 20 A, utilisez des câbles en cuivre présentant une section de coupe transversale conductrice de 4 mm^2 ou plus.
• Lorsqu'un courant est délivré, n'ouvrez pas les bornes de courant. Ceci risquerait de déclencher une option de protection et de couper la sortie.
• Lorsqu'une tension est délivrée, ne court-circuitez pas les bornes de tension. Ceci risquerait de déclencher une option de protection et de couper la sortie.
• Utiliser une paire torsadée de câbles pour éviter l'oscillation.
• Avec des gammes de thermocouples, ne pas alimenter en tension externe, ni courant. En outre, ne connectez pas à une charge capacitive chargée. Cela pourrait endommager le diviseur de tension à l'intérieur du 2560A.
• Peut cause de tension anormale de sortie quand désactiver 2560A. 2560A sortie éteint et puis désactiver le 2560A.

3.6 Connecting Wires

Wire the lead wires from the target device to the output terminals of the 2560A. Wire them in the following manner.

To prevent electric shock and damage to the instrument, Observe the warnings and precautions provided in section 3.5, "Wiring Precautions."

Wiring High Voltage Output Terminals

The high voltage output terminals (OUTPUT 2) are φ4 mm safety plug-in terminals (banana jacks). Only insert safety terminals whose conductive parts are not exposed into these terminals.

Wiring Example
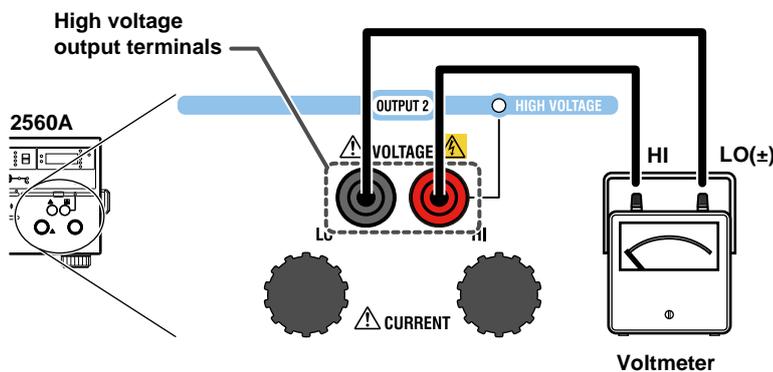
Wiring Large Current Output Terminals

The large current output terminals (OUTPUT 2) are large binding post terminals. The fastening screws are M6. Either wind a wire around a screw or pass a crimped terminal through the screw axis, and then tighten the output terminal knob firmly with your hand. The terminal or knob may break if you apply excessive torque.

Wiring Example
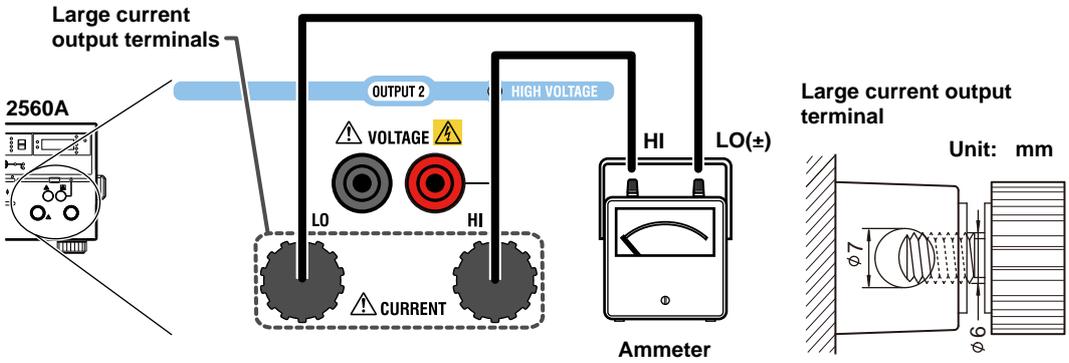
Connecting to a Round Crimped Terminal

To connect leads wire with round crimped terminals to the large current output terminals, follow the procedure below.

1. Turn the large current output terminal knob to remove it.
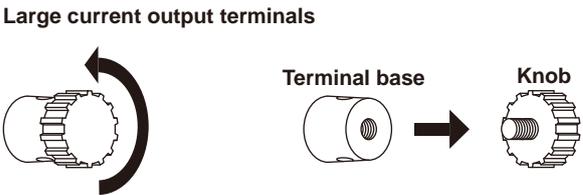
2. Pass the knob screw through the crimped terminal, and then tighten the output terminal knob firmly with your hand. The terminal or knob may break if you apply excessive torque.
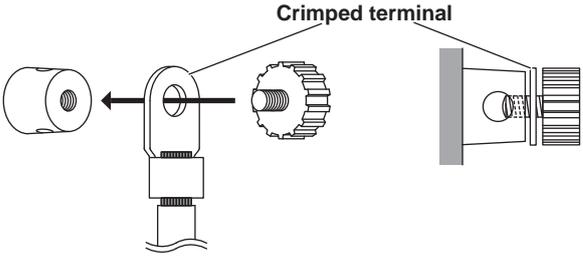
Wiring Low Voltage-Current Output Terminals

Wiring a Voltmeter or Ammeter

The fastening screws of the low voltage-current output terminals (OUTPUT 1) are M6. Either wind the conductive part of the lead wire around the output terminal screw or pinch the screw section with the crimping terminal, and then tighten the terminal knob firmly with your hand. The terminal or knob may break if you apply excessive torque.

Wiring Example

Low voltage-current output terminals

Voltmeter or ammeter
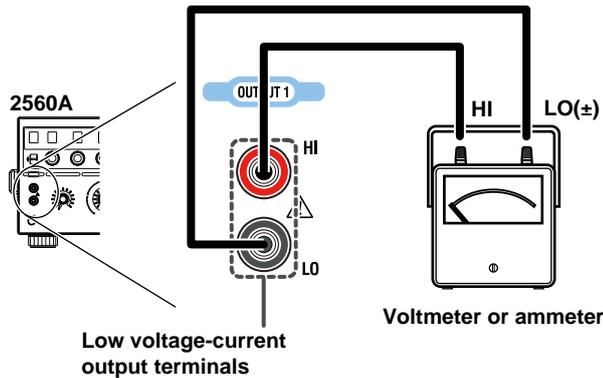
Wiring Resistance Output

The resistance output can be wired into a three-wire system or four-wire system. For wiring examples and precautions, see appendix 4.

Note

- Current sinking (absorption) is possible in any of the voltage or current ranges. For example, by absorbing the current from a voltage source such as a distributor, the 2560A can simulate a load, like a two-wire transmitter. For the maximum sink current, see "DC Voltage Sourcing" or "DC Current Sourcing" in section 2.2. Immediately after sinking current that exceeds 30 mA, errors exceeding the accuracy specifications may occur due to the increased temperature inside the 2560A.

  In the following example, the value is set to 20 mA and the polarity to negative.

Voltage source (e.g., distributor)   4-20 mA
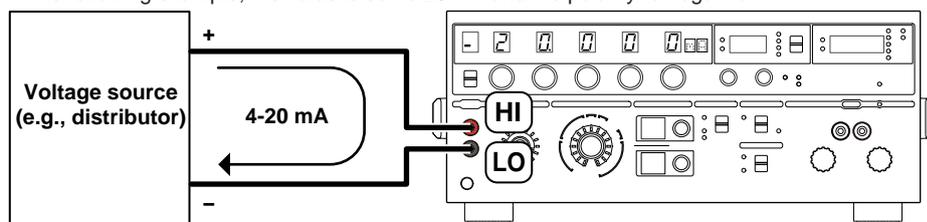
- When using a small output range, such as 100 mV, wind the copper wires directly to the output terminals. If the output terminal temperature changes as a result of making contact with the lead wires, crimping terminals, banana plugs, or other conductors during wiring or due to ambient air movement, errors exceeding the accuracy specifications may occur when a small output range is used. In such situations, wait until the output stabilizes.

Wiring a Thermograph

The fastening screws of the low voltage-current output terminals (OUTPUT 1) are M6. Wind the thermocouple wire or the RTD lead wire around the output terminal screw, and then tighten the terminal knob firmly with your hand. The terminal or knob may break if you apply excessive torque. For wiring examples, see also appendixes 3 and 4.

Wiring Example

2560A

OUTPUT 1

+(A)   −(B)

HI

LO

Thermograph

Low voltage-current output terminals
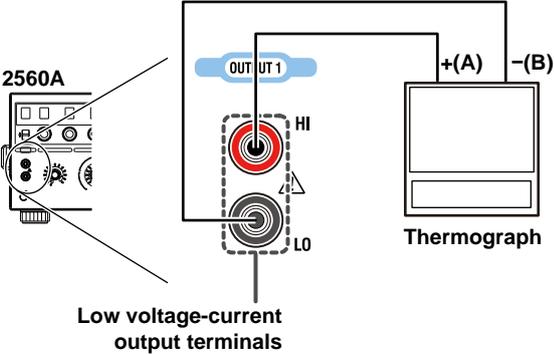
Note

If the output terminal temperature changes as a result of making contact when wiring thermocouples, compensating lead wires, and the like; making contact when connecting external RJ sensors; and due to ambient air movement, errors exceeding the accuracy specifications may occur. In such situations, wait until the output stabilizes.

3

Preparation

Wiring to the External RJ Sensor Input Terminal

To wire an external reference junction (RJ) sensor to the external RJ sensor input terminal on the rear panel of the 2560A, follow the procedure below.

Wiring an RJ Sensor to the Terminal Plug

1. Loosen the screws on the top of the terminal plug (these screws are used to fix lead wires in place), and insert stripped lead wires into the lead wire connection terminals.

   Insert white lead wires into the white positions of the terminal plug and red lead wires into the red positions.

   • Length of stripped wire: 7 mm
   • Conductive cross-sectional area Single wire: 0.14 mm^2 to 1.5 mm^2
                                                     Twisted wire: 0.14 mm^2 to 1.5 mm^2
                                                     AWG: 28 to 16

2. Tighten the screws to fix the lead wires in place.

   Screw tightening torque: 0.22 N•m to 0.25 N•m

Terminal plug

Connect the lead wires to the appropriate terminals according to the three-wire system or four-wire system of the RJ sensor.

Lead wire screw
Terminal plug screw

3-wire
4-wire

Lead wire
Lead wire connection terminal

No connection (NC)
White
White   Red
Red
Ground (GND)

Terminal plug pinout

If this terminal plug is attached to the 2560A's external RJ sensor input terminal, this side will be up.

Attaching the Terminal Plug to the External RJ Sensor Input Terminal

3. Attach the terminal plug with the RJ sensor to the external RJ sensor input terminal of the 2560A.

   The terminal plug cannot be attached upside down. Attach the terminal plug in the proper orientation. Attach it so that the lead wire screw of the terminal plug indicated in step 2 is on the bottom side.

External RJ sensor input terminal

GND RED RED WHITE WHITE NC

⚠ EXT RJ SENSOR Pt100

4-WIRE
3-WIRE
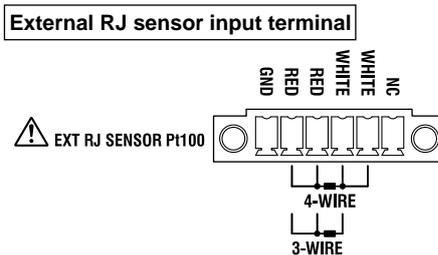
4. Tighten the screws on the left and right of the terminal plug to secure the terminal plug to the 2560A.

   Screw tightening torque: 0.2 N•m to 0.3 N•m

4.1   SETUP Menu Tree Structure

The SETUP menu appears when you turn the RANGE dial and select SETUP. A tree diagram of the SETUP menu is provided below.

An overview of how to use the SETUP menu is provided in section 4.2. For details of how to operate each menu, see the referenced section in the tree diagram.

4

SETUP Menu

RANGE dial

SETUP indicator on

In the tree diagram, the SETUP menu is shown on the left side and the setup parameters on the right.

SWEEP SWEEP
Set the sweep time. → sec. 7.4
Value: 8, 16, 32, 64 **(s)**

RESOL rESoL
Set the resolution mode. → sec. 8.1
Options: NORM norm **5.5 digits**
HIGH HiGH **6.5 (high resolution)**

BEEP bEEP
Set the beep sound. → sec. 8.2
Options: ON   on **Sound**
OFF   oFF **Not sound**

GPIB GPib ——— **NEXT** nExt Set the GP-IB conditions. → sec. 9.3
Moves to/returns from the next menu level

ADRS AdrS
GP-IB address
Value: 0 to 30

TYPE tYPE
Command type
Options: NORM norm **IEEE 488.2**
COMP ComP **2560 compatible**

LAN LAn ——— **NEXT** nExt Configure the network environment. → sec. 10.3
Moves to/returns from the next menu level

DHCP dHCP
DHCP
Options: ON   on **Use**
OFF   oFF **Not use**

IP 1 iP1
IP 2 iP2
IP 3 iP3
IP 4 iP4
IP address
Value: 0.0.0.0 **to** 255.255.255.255
Example: 192 (IP 1).168 (IP 2).0 (IP 3).1 (IP 4)

MASK 1 MASK1
MASK 2 MASK2
MASK 3 MASK3
MASK 4 MASK4
subnet mask
Value: 0.0.0.0 **to** 255.255.255.255
Example: 255 (MASK 1).255 (MASK 2).255 (MASK 3).0 (MASK 4)

To the next page

From the previous page

GATE 1	⌂RŁE1	**Default gateway**
GATE 2	⌂RŁE2	**Value:** 0.0.0.0 **to** 255.255.255.255
GATE 3	⌂RŁE3	**Example:** 0 (GATE 1).0 (GATE 2).0 (GATE 3).0 (GATE 4)
GATE 4	⌂RŁE4	

MAC ⌐RĒ **MAC address display**
Displayed characters: 10 characters, each character ranging from a to f and 0 to 9
Example: 01.23.45.67.89

USB USƄ **Select the USB communication feature.**
Options: TMC Ł⌐Ē **Remote control → sec. 11.3**
STOR SŁor **Mass storage → sec. 6.5**

TEMP ŁE⌐P ——— NEXT ⌐EꞮŁ **Set the temperature display conditions.**
——Moves to/returns from the next menu level——

MONI ⌐oⁿꞮ **Displayed unit for thermoelectromotive force output and resistance output corresponding to the set temperature → sec 6.4**
Options: DEG dE⌂ **° (degrees)**
V.OHM ᵾoHⁿ **V (voltage) or Ω (resistance)**

RJC.R0 ⌐J⌂.⌐0 **Resistance R0 for when the external RJ sensor (Pt100) is at 0°C → sec 6.6**
Value: −1.00 Ω **to** 1.00 Ω
(Set the difference between 100.00 Ω and R0.)

UNIT UⁿꞮŁ **Temperature unit → sec. 6.7**
Options: CEL ⌂EL **Celsius (°C)**
FAR FR⌐ **Fahrenheit (°F)**

ERROR E⌐⌐o⌐ ——— NEXT ⌐EꞮŁ **Displays or clears the error log → sec. 15.5**
——Moves to/returns from the next menu level——

LOG Lo⌂ **Displays the error number and error code**
(Displays log number "0" and error code "NO" if there is no error log.)

CLEAR ⌂LER⌐ **Clearing the Error Log**
EXEC EꞮE⌂ **Executes clearing**

INIT ꞯ⌐ꞮŁ **Initializes the settings → sec. 15.8**
EXEC EꞮE⌂ **Executes initialization**

INFO ꞯ⌐Fo ——— NEXT ⌐EꞮŁ **Displays the product information. → sec. 15.9**
——Moves to/returns from the next menu level——

FIRM	FꞮ⌐ⁿ	**Firmware version**
PCL	P⌂L	**Logic program version (PCL)**
AMP	RⁿP	**Logic program version (AMP)**
BOOT	booŁ	**Boot program version**
SER.NO	SE⌐.⌐o	**Device serial number**

TEST ŁESŁ **Execute a self-test. → sec. 15.7**
EXEC EꞮE⌂ **Executes a self-test**

CAL ⌂RL ——— NEXT ⌐EꞮŁ **Performs simple adjustment**
——Moves to/returns from the next menu level——

PASS PRSS **Enter the password.**
For the password entry and simple adjustment procedure, see the following webpage.
http://tmi.yokogawa.com/products/generators-sources/standard/high-voltage-and-high-current-precision-dc-calibrator-2560a/

4.2   How to Use the SETUP Menu

This section provides an overview of how to use the SETUP menu. For detailed explanations of how to configure individual functions with the SETUP menu, see the relevant sections.

When the SETUP menu is displayed, only the dials and switches for setting and displaying the menu items can be used. (Other dials and switches are disabled.) Also, displays that are not used in the SETUP menu do not turn on.

Setup parameter 1 display
Displays the value or options of a SETUP menu.

Auxiliary information display
Displays the auxiliary information of the SETUP menu. (An auxiliary number is displayed when there are many values to be set, such as in IP address.)

SETUP menu display
Displays the SETUP menu selected by turning the main setting dials.

PRESET indicator
When you change the setting displayed in setup parameter 1, all the PRESET indicators turn on. When you confirm the setting with the PRESET switch, all the PRESET indicators turn off.

Setup parameter 2 display
Displays setup parameters that do not fit in setup parameter 1.
(MAC address, error code during error log display, etc.)

RANGE dial

PRESET switch

Main setting dials
From the left, the dials are the 1st, 2nd, 3rd, 4th, and 5th main setting dials.

Deviation dials
From the left, the dials are the 1st and 2nd deviation dials.

RANGE Dial

First, to enter the SETUP menu, use this dial to select **SETUP**.

Main Setting Dials

You can use any of the main setting dials to select the SETUP menu. However, these dials operate separately in the following situations.
- In a menu for switching the auxiliary information display (menu with auxiliary information), main setting dial 5 (the right-most main setting dial) is used to switch the display.
- In a menu with auxiliary information, operating main setting dials 1 to 4 leaves the auxiliary information as-is and allows the next SETUP menu to be selected. After moving to a menu without auxiliary information and operating main setting dials 1 to 4 to return to a menu with auxiliary information, the menu with the first auxiliary menu is displayed. For example, if you move from GATE 3 of the default gateway to the MAC address menu and operate main setting dials 1 to 4 to return to the GATE menu of default gateway, the GATE1 menu (with the first auxiliary information) is displayed.

Deviation Dials

Turn the deviation dials to select or set the settings (options or values) of each SETUP menu.

*   For options

    You can use either deviation dial 1 or 2 to select the same items.

*   For values

    Turn the deviation dials to set the value. Carrying over and borrowing occurs automatically within the selectable range.

    *   Deviation dial 1

        Enters the second digit from the right when facing the 2560A panel. Turning deviation dial 1 typically changes the value by 2. If changing the value by 2 causes it to exceed the upper limit or go below the lower limit of the selectable range, it is set to the upper or lower limit.

    *   Deviation dial 2

        Enters the first digit from the right when facing the 2560A panel. Turning deviation dial 2 changes the value by 1.

PRESET Switch

Use this switch to confirm the setting that you have changed or cancel the change and return to the previous menu level.

*   Flipping the PRESET switch down confirms the displayed setting.

    *   If "NEXT" is displayed in setup parameter 1, the screen advances to the next level menu.

    *   If you change the current setting with the deviation dials, all PRESET indicators turn on. Flipping the PRESET switch down in this condition turns off the PRESET indicator and confirms the updated setting.

    *   If you flip the PRESET switch down on an execution menu, you cannot return to the previous condition.

*   Flipping the PRESET switch up returns you to the condition before changing the settings.

    *   If there is a previous level menu, "NEXT" is displayed in setup parameter 1, and the screen returns to the previous level menu.

    *   If you change the current setting with the deviation dials and all the PRESET indicators are turned on, flipping the PRESET switch up will not change the display. The settings will not be changed.

Note

If you clear the error log, initialize the settings, and so forth, you cannot undo it. Confirm that it is okay to perform this operation before execution.

5.1   Selecting the Voltage, Current, or Resistance Range

Procedure

Turn the **RANGE** dial to set the voltage, current, or resistance range.

- The indicator for the selected range illuminates.
- The unit corresponding to the selected range appears.

RANGE

Resistance range — Ω

Current ranges — μA, mA, A

Voltage ranges — mV, V

Example: 10 V
The 10 V indicator turns on.

RANGE dial
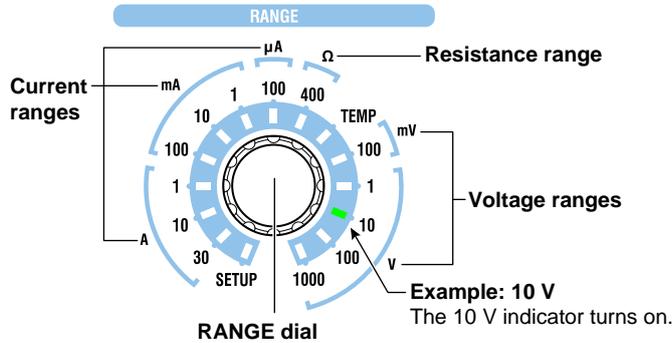
Explanation

Output Terminal Positions

The following figure shows the output terminal positions. The output terminals vary depending on the selected range. For the output terminals corresponding to the selected range, see the range table provided later.

Low voltage-current output terminals (OUTPUT 1)

High voltage output terminals (OUTPUT 2)

Large current output terminals (OUTPUT 2)
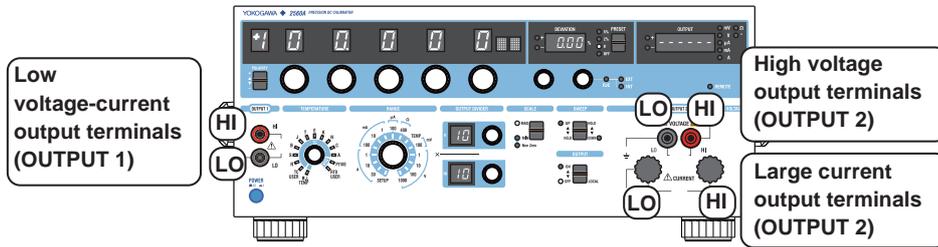
Selecting the Range

Select the range for voltage, current, and resistance.

- When the output is turned on, the signal is output from the appropriate output terminals for the selected range.
- If you change the range when the output is on, the output turns off.

Voltage Range Settings

Select from the following.

100 mV, 1 V, 10 V, 100 V, and 1000 V

Range	Output Terminals
100 mV, 1 V, 10 V	Low voltage-current output terminals (OUTPUT 1) The OUTPUT 1 indicator on the front panel illuminates.

100 V, 1000 V	High voltage output terminals (OUTPUT 2)
	    The OUTPUT 2 indicator on the front panel illuminates.
	    The HIGH VOLTAGE indicator will illuminate even if the output is off.

Current Range Settings

Select from the following.

100 µA, 1 mA, 10 mA, 100 mA, 1 A, 10 A, 30 A

Range	Output Terminals
100 µA, 1 mA, 10 mA, 100 mA, 1 A	Low voltage-current output terminals (OUTPUT 1) The OUTPUT 1 indicator on the front panel illuminates.
10 A, 30 A	Large current output terminals (OUTPUT 2) The OUTPUT 2 indicator on the front panel illuminates.

Resistance Range Settings

400 Ω.

Range	Output Terminals
400 Ω	Low voltage-current output terminals (OUTPUT 1) The OUTPUT 1 indicator on the front panel illuminates.

Note

The 2560A does not have an auto range feature that automatically switches the range according to the main setting.

<<Command Mnemonic>>

```
:SOURce:FUNCtion {VOLTage|CURRent|RESistance}
```
```
:SOURce:RANGe {<Voltage>|<Current>|<Resistance>}
```

5.2 Specifying the Main Setting and Polarity

Specifying the Main Setting

Turn the **main setting** dials to set the source voltage, current, or resistance.

The main setting display shows the specified voltage, current, or resistance.

Setting the Polarity

Flip the **POLARITY** switch up or down to set the polarity.

Example of setting 1.5000 A

Polarity

POLARITY switch

Unit

Use each main setting dial to set the corresponding digit value, shown by the frames.
Carrying over and borrowing occurs automatically within the selectable range.
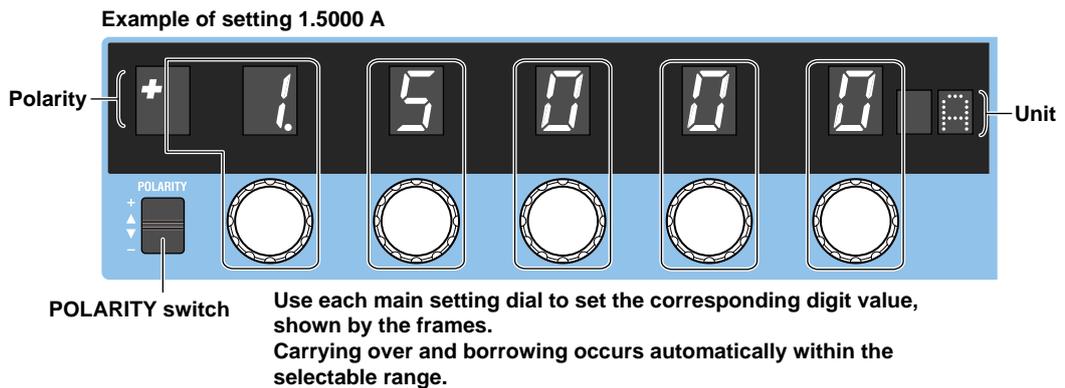
Selectable Range

The selectable range and resolution of each range are as follows. For detailed specifications, see section 16.1.

- If you do not change the range setting, you can change the main setting and polarity even while the output is on.
- You cannot set the polarity to negative in the 30 A range.
- The polarity setting is invalid in the resistance range.

Voltage Ranges

Range	Selectable Range	Resolution
100 mV	± 120.000 mV	1 µV
1 V	± 1.20000 V	10 µV
10 V	± 12.0000 V	100 µV
100 V	± 120.000 V	1 mV
1000 V	± 1200.00 V	10 mV

When a voltage greater than or equal to +150 V or less than or equal to –150 V is to be output, beeps will be generated. For details on how to turn the beep on and off, see section 8.2.

Current Ranges

Range	Selectable Range	Resolution
100 µA	± 120.000 µA	1 nA
1 mA	± 1.20000 mA	10 nA
10 mA	± 12.0000 mA	100 nA
100 mA	± 120.000 mA	1 µA
1 A	± 1.20000 A	10 µA
10 A	± 12.0000 A	100 µA
30 A	0 to +36.000 A	1 mA

Resistance Ranges

Range	Selectable Range	Resolution
400 Ω	1.00 Ω to 400.00 Ω	0.01Ω

*   If you set the output setting to 1.00 Ω or less and turn on the output, 1.00 Ω is generated. For details, see the note in section 5.4.

Main Setting Display

- The main setting appears flush right at the resolution of each range.
- The ratio of the main setting to the range is passed on to the output setting even when you change the range.
  Example: If the main setting is 1.5000 A (15 %) at the 10 A current range and you change the current range to 30 A, the main setting will be 4.500 A.

10 A range
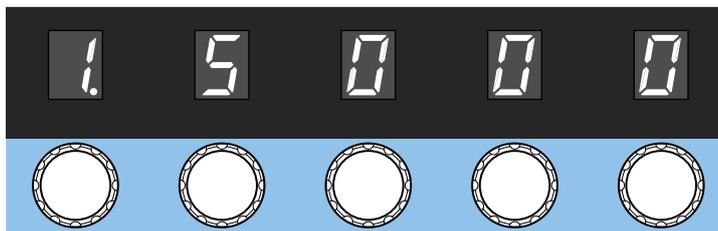
30 A range
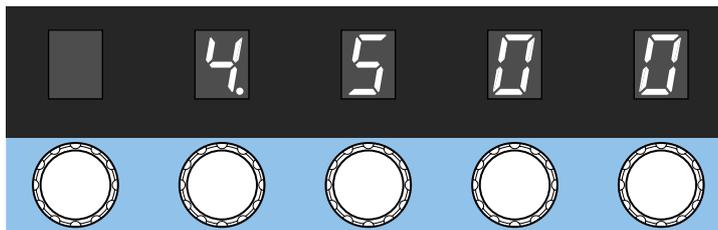
- When you change the range and the specified output value is outside the selectable range of the new range, the main setting and polarity displays blink. If you turn any of the main setting dials in this condition but the main setting still remains outside the selectable range of the new range, the main setting is set to the maximum or minimum setting of the new range, and the blinking will change to solid.

<<Command Mnemonic>>

```
:OUTPut:POLarity[:AUTO] {NORMal|INVerted}
:OUTPut:POLarity:MAXimum {NORMal|INVerted}
:OUTPut:POLarity:MINimum {NORMal|INVerted}
:SOURce:FUNCtion {VOLTage|CURRent|RESistance}
:SOURce:LEVel[:AUTO] {<Voltage>|<Current>|<Resistance>|MINimum|MAXimum}
:SOURce:LEVel:MAXimum {<Voltage>|<Current>|<Resistance>|MINimum|MAXimum}
:SOURce:LEVel:MINimum {<Voltage>|<Current>|<Resistance>|MINimum|MAXimum}
:SOURce:SLEVel[:AUTO] {<Voltage>|<Current>|<Resistance>|MINimum|MAXimum}
:SOURce:SLEVel:MAXimum {<Voltage>|<Current>|<Resistance>|MINimum|MAXimum}
:SOURce:SLEVel:MINimum {<Voltage>|<Current>|<Resistance>|MINimum|MAXimum}
```

5.3   Setting the Output Scaling

Procedure

Specifying the Main Setting (MAX)

1. Flip the **SCALE** switch to the MAX side.

2. Turn the **main setting** dials to specify the main setting (MAX).

Specifying the Main Setting (MIN)

3. Flip the **SCALE** switch to the MIN side.

4. Turn the **main setting** dials to specify the main setting (MIN).
   Setting the minimum value to a value other than ±0 (zero) causes the Non Zero indicator to turn on.

Example of setting +10.0000 V

Main setting dials
2. Set main setting (MAX).
4. Set main setting (MIN).

SCALE

○ MAX
○ MIN
○ Non Zero

SCALE switch
1. Flip to the MAX side.
3. Flip to the MIN side.

Explanation

Scaling is a feature used to set the maximum value (main setting (MAX)) and minimum value (main setting (MIN)) of the output range to your liking within the source range of each range. Output divider, deviation, and sweep features operate within this scale range. Scaling cannot be used in high resolution mode.

Specifying the Main Setting (MAX) and Main Setting (MIN)

You can set these values within the range that meets the following conditions.
- The main setting (MAX) must be greater than or equal to the main setting (MIN).
- If both the main setting (MAX) and main setting (MIN) are negative, the absolute value of the main setting (MAX) must be greater than or equal to that of the main setting (MIN).
- You cannot set the main setting (MAX) to a negative value and the main setting (MIN) to a positive value.
- For details on setting the main setting (MAX) and main setting (MIN) and the resulting conditions, see the following table.

Original Polarities of the Main Setting (MAX) and Main Setting (MIN)	Setup Operation	Resulting Condition
Both positive		
	Set MAX less than or equal to MIN.	MIN = MAX (the specified MAX value)
	Set MIN greater than or equal to MAX	MAX=MIN (the specified MIN value)
	Set MAX to negative with the POLARITY switch	MIN is also set to negative.
	Set MIN to negative with the POLARITY switch	MAX stays positive.*

Original Polarities of the Main Setting (MAX) and Main Setting (MIN)	Setup Operation	Resulting Condition
Both negative		
	Set |MAX| less than or equal to |MIN|.	MIN = MAX (the specified MAX value)
	Set |MIN| greater than or equal to |MAX|	MAX=MIN (the specified MIN value)
	Set MAX to positive with the POLARITY switch	MIN is also set to positive.
	Set MIN to positive with the POLARITY switch	MAX is also set to positive.
MAX is positive; MIN is negative		
|MAX|≥|MIN|	Set MAX to negative with the POLARITY switch	MAX and MIN are set negative.
	Set MIN to positive with the POLARITY switch	MAX and MIN are set positive.
|MAX|<|MIN|	Set MAX to negative with the POLARITY switch	MAX and MIN are negative. The main setting display blinks, and the output turns off.
	Set MIN to positive with the POLARITY switch	MAX and MIN are positive. The main setting display blinks, and the output turns off.

* Some ranges are not applicable. For details, see "Scaling" in section 16.2.

Relation with Other Features

- If you select MAX or MIN with the SCALE switch, the main setting display and the output divider's n display show the following values.

SCALE switch setting	MAX	MIN
Main setting display	Main setting (MAX)	Main setting (MIN) Non Zero indicator turns on for a value other than ±0 (zero).
n display	Same value as the m display	0
Deviation display	0	0

- Changing the range causes the scale settings to change as follows.
    - The polarity of the main setting (MIN) is set to the same polarity as that of main setting (MAX).
    - Main setting (MIN) is set to 0 (zero).
    - The SCALE switch is set to MAX.
- You can change scaling even when the output is on.
- Output divider, deviation, and sweep features operate assuming (main setting (MAX) – main setting (MIN)) to be 100%.

5.4 Turning the Output On and Off

WARNING

- Before turning on the output of the 2560A, make sure that wiring is connected properly.
- Do not touch the terminals or cables when the 2560A output is on. Doing so may cause electric shock.

French

AVERTISSEMENT

- Avant de mettre sous tension la sortie du dispositif 2560A, assurez-vous que le câblage est correctement raccordé.
- Ne touchez jamais les bornes ou les câbles lorsque la sortie du dispositif 2560A est sous tension. Ceci risquerait d'entraîner un choc électrique.

Procedure

Flip the **OUTPUT** switch up.
- The output turns on. The OFF indicator turns off, and the ON indicator turns on.
- Flipping the OUTPUT switch down while the output is on will turn off the output. The ON indicator will turn off, and the OFF indicator will turn on.

Output display (output display example for +100.000 V)
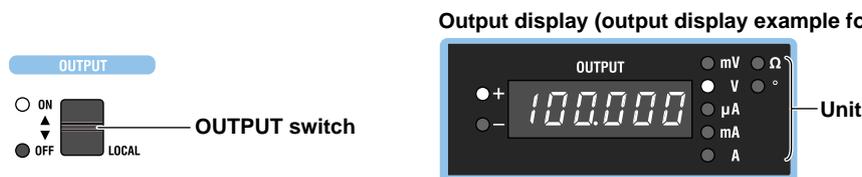
Note
- When outputting current, do not open the output terminals.
  When outputting voltage, do not short the output terminals.
  In either case, the overload protection function will be activated, an error code will be displayed, and the output will be turned off. The time it takes for the error to appear depends on the range and output value.
- If the output terminal temperature changes as a result of making contact with the lead wires, crimping terminals, banana plugs, or other conductors or due to ambient air movement, errors exceeding the accuracy specifications may occur when a small output range is used. In such situations, wait until the output stabilizes. Also while the 2560A is generating output, keep the output terminal temperature from changing due to the effects air conditioning, other heat sources, and the like.

Explanation

When the output is turned on, the 2560A will source the specified voltage, current, or resistance from each output terminal.

• The output terminals vary depending on the selected range. See section 5.1. Before turning on the output, make sure that the lead wires are connected to the proper output terminals.
• If you change the range setting, the output automatically turns off.
• The output display shows the output value, and the unit indicator turns on. However, in high resolution mode (see section 8.1), the output display shows nothing.

Indicator and Output States

Output State	ON Indicator (Green)	OFF Indicator (Red)
ON	Solid	Off
OFF	Off	Solid

Note

If the resistance range is 400 Ω and you set the output value to 1.00 Ω or less, 1.00 Ω is generated, and the output display blinks.

<<Command Mnemonic>>

:OUTPut[:STATe] <Boolean>
:SOURce:READ?

6.1   Selecting Thermocouples and RTDs

⚠️

CAUTION

When using thermocouple ranges, do not apply external voltage or current. Also, do not connect to charged capacitive loads. Doing so may damage the voltage divider inside the 2560A.

French

⚠️

ATTENTION

Avec des gammes de thermocouples, ne pas alimenter en tension externe, ni courant. En outre, ne connectez pas à une charge capacitive chargée. Cela pourrait endommager le diviseur de tension à l'intérieur du 2560A.

Procedure

1. Turn the **RANGE** dial to select TEMP.
   The TEMP indicator illuminates, and the TEMPERATURE dial is enabled.

2. Turn the **TEMPERATURE** dial to select a thermocouple (R, S, B, J, T, E, K, N, C, A, TC USER) or RTC (Pt100, RTD USER) type.
   • The indicator for the selected type turns on.
   • The displayed unit will be °C.

2. Select the thermocouple or RTD type.
The indicator for the selected type turns on.

1. Select TEMP.
The TEMP indicator turns on.

Example: B
The B indicator turns on.

TEMPERATURE dial

RANGE dial
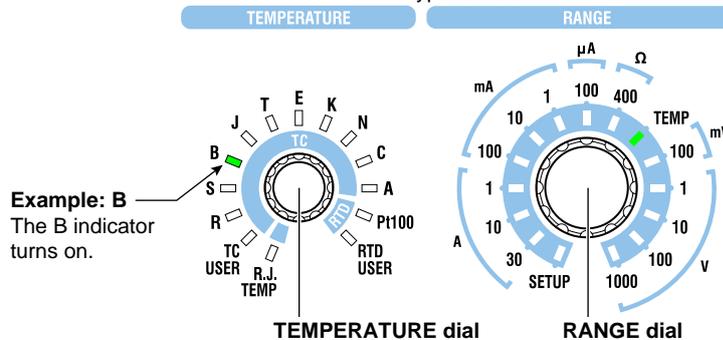
Explanation

Output Terminal Positions

The following figure shows the positions of thermoelectromotive force and resistance output terminals that simulate temperature sensors (thermocouples and RTDs).

Low voltage-current output terminals (OUTPUT 1)
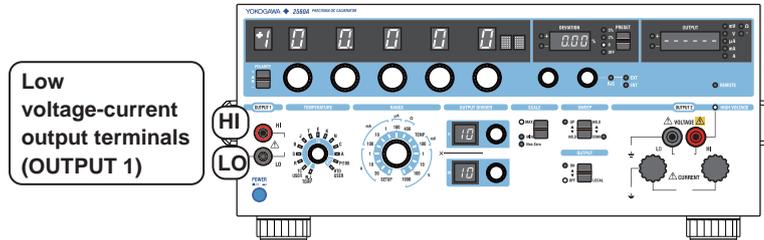
Selecting the Temperature Sensor

Select the thermocouple and RTD types. If you change the type when the output is on, the output turns off.

Thermocouple

Select from the following.

R, S, B, J, T, E, K, N, C, A, TC USER*

* If you select TC USER, the thermoelectromotive force of a user-defined thermocouple can be sourced. For details how to write user-defined data to the 2560A, see section 6.5. For the data definition specifications, see appendix 6.

RTD

Select from the following.

Pt100, RTD USER*

* If you select RTD USER, the resistance of a user-defined RTD can be sourced. For details how to write user-defined data to the 2560A, see section 6.5. For the data definition specifications, see appendix 6.

<<Command Mnemonic>>

```
:SOURce:FUNCtion {TCouple|RTD}
:SOURce:TYPE {R|S|B|J|T|E|K|N|C|A|PT100|USER}
```

6.2 Setting the Temperature

Procedure

Setting the Temperature

Turn the **main setting** dials to set the temperature.

The main setting display shows the specified temperature.

Setting the Polarity

Flip the **POLARITY** switch up or down to set the polarity.

Example of setting +100.0°C

Polarity

Unit

POLARITY switch

Use each main setting dial to set the corresponding digit value, shown by the frames.
Carrying over and borrowing occurs automatically within the selectable range.
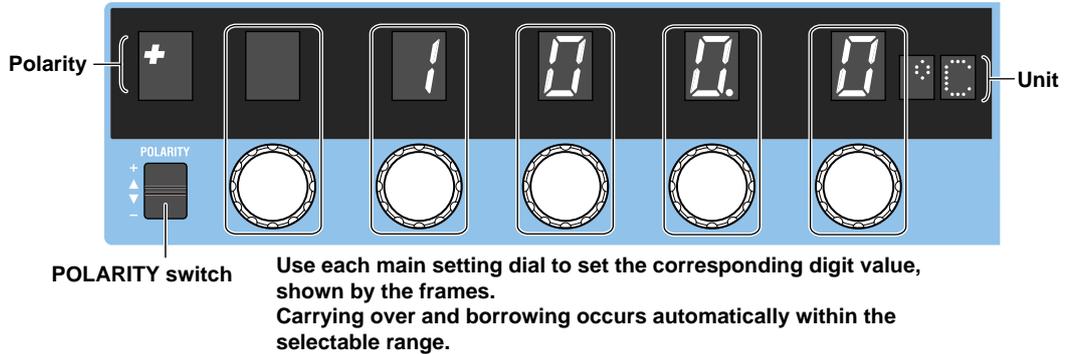
Explanation

Selectable Range

The selectable range and resolution of each thermocouple and RTD type are shown below. For detailed specifications, see section 16.1.

- If you do not change the type, you can change the main setting and polarity even while the output is on.
- If the output setting goes outside the selectable range when you change the polarity, the output turns off, and the main setting and polarity displays blink.

Thermocouple

Type	Selectable Range	Resolution
R	–50°C to +1768°C	0.1°C
S	–50°C to +1768°C	0.1°C
B	0°C to +1820°C	0.1°C
J	–210°C to +1200°C	0.1°C
T	–270°C to +400°C	0.1°C
E	–270°C to +1000°C	0.1°C
K	–270°C to +1300°C	0.1°C
N	–270°C to +1300°C	0.1°C
C	0°C to +2315°C	0.1°C
A	0°C to +2500°C	0.1°C
TC USER	–9999.9°C to +9999.9°C But, a range corresponding to the voltage source range (–120.000 mV to +120.000 mV)	0.1°C

* If you select TC USER, the thermoelectromotive force corresponding to the user-defined temperature can be sourced. For a detailed procedure, see section 6.5. For details on definition expressions, see appendix 6.

RTD

Type	Selectable Range	Resolution
Pt100	–200.0°C to +850.0°C	0.1°C
RTD USER	–9999.9°C to +9999.9°C However, within the temperature range corresponding to resistance source range (1.00 Ω to 400.00 Ω)	0.1°C

*   If you select RTD USER, the resistance corresponding to the user-defined temperature can be sourced. For a detailed procedure, see section 6.5. For details on definition expressions, see appendix 6.

Main Setting Display

- The main setting appears flush right at the resolution of each thermocouple or RTD.
- When you change the type or polarity and the specified main setting is outside the selectable range of the new type, the main setting and polarity displays blink. If you turn any of the main setting dials in this condition but the main setting still remains outside the selectable range of the new type, the main setting is set to the maximum or minimum setting of the new type, and the blinking will change to solid.

<<Command Mnemonic>>

```
:OUTPut:POLarity[:AUTO] {NORMal|INVerted}
:OUTPut:POLarity:MAXimum {NORMal|INVerted}
:OUTPut:POLarity:MINimum {NORMal|INVerted}
:SOURce:FUNCtion {TCouple|RTD}
:SOURce:LEVel[:AUTO] {<Temperature>|MINimum|MAXimum}
:SOURce:LEVel:MAXimum {<Temperature>|MINimum|MAXimum}
:SOURce:LEVel:MINimum {<Temperature>|MINimum|MAXimum}
:SOURce:SLEVel[:AUTO] {<Temperature>|MINimum|MAXimum}
:SOURce:SLEVel:MAXimum {<Temperature>|MINimum|MAXimum}
:SOURce:SLEVel:MINimum {<Temperature>|MINimum|MAXimum}
```

6.3　Setting the Output Scaling

Procedure

Specifying the Main Setting (MAX)

1. Flip the **SCALE** switch to the MAX side.

2. Turn the **main setting** dials to specify the main setting (MAX).

Specifying the Main Setting (MIN)

3. Flip the **SCALE** switch to the MIN side.

4. Turn the **main setting** dials to specify the main setting (MIN).

   Setting the minimum value to a value other than ±0 (zero) causes the Non Zero indicator to turn on.

Example of setting +10.0000 V

Main setting dials
2. Set main setting (MAX).
4. Set main setting (MIN).

SCALE
○ MAX
○ MIN
○ Non Zero

SCALE switch
1. Flip to the MAX side.
3. Flip to the MIN side.

Explanation

Scaling is a feature used to set the maximum value (main setting (MAX)) and minimum value (main setting (MIN)) of the output range to your liking within the source range of each range. Output divider, deviation, and sweep features operate within this scale range. Scaling cannot be used in high resolution mode.

Specifying the Main Setting (MAX) and Main Setting (MIN)

You can set these values within the range that meets the following conditions.

- The main setting (MAX) must be greater than or equal to the main setting (MIN).
- If both the main setting (MAX) and main setting (MIN) are negative, the absolute value of the main setting (MAX) must be greater than or equal to that of the main setting (MIN).
- You cannot set the main setting (MAX) to a negative value and the main setting (MIN) to a positive value.
- For details on setting the main setting (MAX) and main setting (MIN) and the resulting conditions, see the following table.

Original Polarities of the Main Setting (MAX) and Main Setting (MIN)	Setup Operation	Resulting Condition
Both positive		
	Set MAX less than or equal to MIN.	MIN = MAX (the specified MAX value)
	Set MIN greater than or equal to MAX	MAX=MIN (the specified MIN value)
	Set MAX to negative with the POLARITY switch	MIN is also set to negative.
	Set MIN to negative with the POLARITY switch	MAX stays positive.

Original Polarities of the Main Setting (MAX) and Main Setting (MIN)	Setup Operation	Resulting Condition
Both negative		
	Set |MAX| less than or equal to |MIN|.	MIN = MAX (the specified MAX value)
	Set |MIN| greater than or equal to |MAX|	MAX=MIN (the specified MIN value)
	Set MAX to positive with the POLARITY switch	MIN is also set to positive.
	Set MIN to positive with the POLARITY switch	MAX is also set to positive.
MAX is positive; MIN is negative		
|MAX|≥|MIN|	Set MAX to negative with the POLARITY switch	MAX and MIN are set negative.
	Set MIN to positive with the POLARITY switch	MAX and MIN are set positive.
|MAX|<|MIN|	Set MAX to negative with the POLARITY switch	MAX and MIN are negative. The main setting display blinks, and the output turns off.
	Set MIN to positive with the POLARITY switch	MAX and MIN are positive. The main setting display blinks, and the output turns off.

Relation with Other Features

*   If you select MAX or MIN with the SCALE switch, the main setting display and the output divider's n display show the following values.

SCALE switch setting	MAX	MIN
Main setting display	Main setting (MAX)	Main setting (MIN) Non Zero indicator turns on for a value other than ±0 (zero).
n display	Same value as the m display	0
Deviation display	0	0

*   Changing the range causes the scale settings to change as follows.
    *   The polarity of the main setting (MIN) is set to the same polarity as that of main setting (MAX).
    *   Main setting (MIN) is set to 0 (zero).
    *   The SCALE switch is set to MAX.
*   You can change scaling even when the output is on.
*   Output divider, deviation, and sweep features operate assuming (main setting (MAX) – main setting (MIN)) to be 100%.

6.4 Turning the Output On and Off and Setting the Output Value Display Mode

Turning the Output On and Off

Flip the **OUTPUT** switch up.

- The output turns on. The OFF indicator turns off, and the ON indicator turns on.
- Flipping the OUTPUT switch down while the output is on will turn off the output. The ON indicator will turn off, and the OFF indicator will turn on.

Output display example for +100.0°C

OUTPUT switch
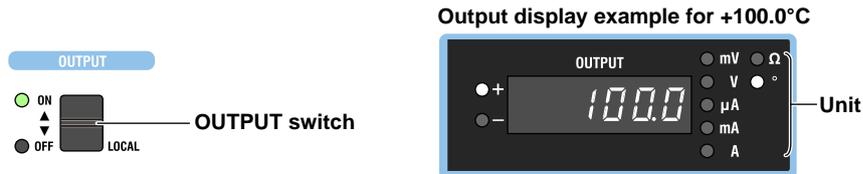
Unit

The following figure shows an example when the output value display mode (explained on the next page) is set to DEG. For the unit, "°" is illuminated. An example when the output value display mode is set to V.OHM is shown below.

Example when the output value display mode is set to V.OHM
(when the temperature is set at +100.0°C)

Display example for thermocouple

Unit
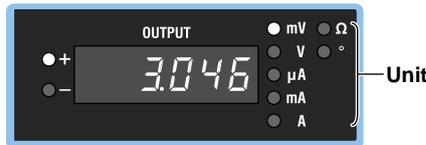
Display example for RTD

Unit
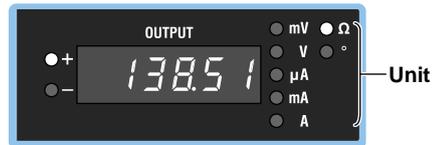
Note

- When outputting temperature, do not short the output terminals.
- If the output terminal temperature changes as a result of making contact when wiring thermocouples, compensating lead wires, and the like; making contact when connecting external RJ sensors; and due to ambient air movement, errors exceeding the accuracy specifications may occur. In such situations, wait until the output stabilizes. Also while the 2560A is generating output, keep the output terminal temperature from changing due to the effects air conditioning, other heat sources, and the like.

The output value display unit of thermoelectromotive force and resistance for the specified temperature on the 2560A is set to "°" by default. By changing the output value display mode settings, you can set the unit to "mV" for thermocouples and "Ω" for RTDs. The procedure is shown on the next page.

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Setting the Output Value Display Mode

1. Turn the **RANGE** dial to select SETUP.

The SETUP menu appears.

1. Select SETUP.
The SETUP indicator turns on.

RANGE dial

2. Turn a **main setting** dial to select TEMP.

"NEXT" appears on the deviation display. All the PRESET indicators turn on.
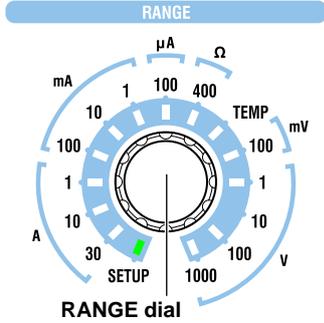
3. Flip the **PRESET** switch down.

The TEMP menu appears. All the PRESET indicators turn off.

Main setting dials (use any)
2. Select TEMP.

PRESET switch
3. Display the TEMP menu.
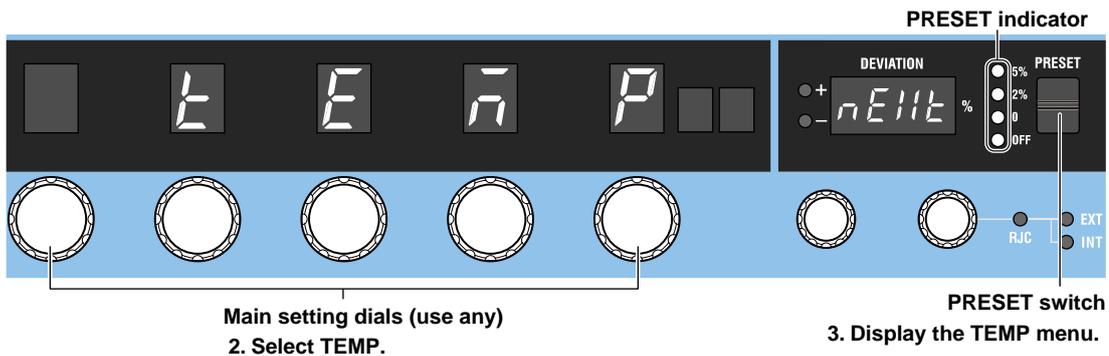
4. Turn a **main setting** dial to select MONI.

The deviation display shows the current output value display mode.

5. Turn a **deviation dial** to select DEG or V.OHM.

• When you change the setting, all PRESET indicators turn on.
• If you decide not to change the setting, step 6 is not necessary.

6. Flip the **PRESET** switch down.

The setting is confirmed. All the PRESET indicators turn off.

Main setting dials (use any)
4. Select MONI.

Deviation dials (either)
5. Select DEG or V.OHM.

PRESET switch
6. Confirm the settings.
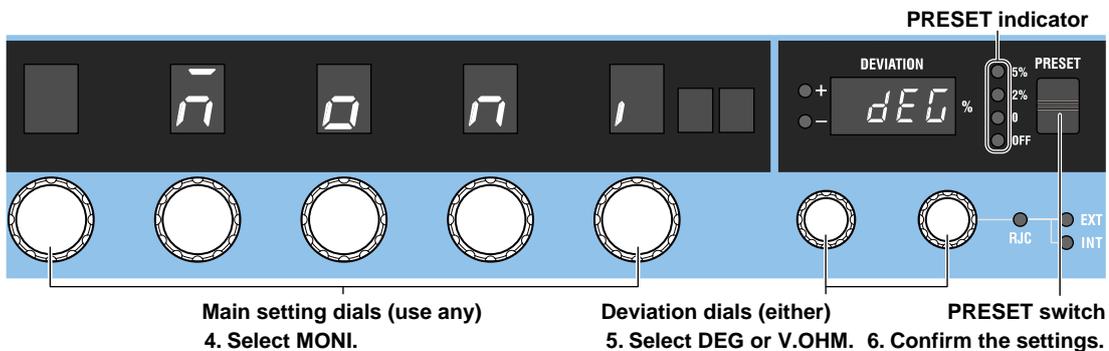
Explanation

Turning the Output On and Off

When the output is turned on, the 2560A will source the thermoelectromotive force or resistance corresponding to the specified temperature from the output terminals.

- If you change the range or the thermoelectromotive force or resistance type, the output automatically turns off.
- If the main setting is outside the selectable range, the output cannot be turned on.

Indicator and Output States

Output State	ON Indicator (Green)	OFF Indicator (Red)
ON	Solid	Off
OFF	Off	Solid

Output Value Display Mode

Select the output value display unit of thermoelectromotive force and resistance for the specified temperature for the following.

- DEG: Unit "°" illuminates regardless of the type.
  Display resolution: 0.1°
- V.OHM: Unit "mV" illuminates when the type is thermocouple and "Ω" when the type is RTD.
  Display resolution: 0.001 mV, 0.01 Ω

Note

If the thermocouple type is B and the output value is less than 43.0°C, the output display blinks when the output value display mode is set to DEG but does not blink when the output value display mode is set to V.OHM.

<<Command Mnemonic>>

```
:OUTPut[:STATe] <Boolean>
:SOURce:READ? [DUAL]
```

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Temperature-Sensor-Simulation Thermoelectromotive-Force and Resistance Sourcing

6.5 Writing User-Defined Data

CAUTION

The USB mass storage feature is used to write user-defined data to the 2560A. To prevent the 2560A from a computer virus infection, before connecting a PC to the 2560A, check that the PC is not infected by a computer virus. Connecting a 2560A that has been infected with a computer virus may infect other devices when they are connected to the 2560A.
If you find out that the PC connected to the 2560A is infected with a computer virus, turn off the 2560A. Computer viruses in the 2560A will be erased.

French

ATTENTION

Le dispositif de mémoire de masse USB permet l'écriture dans 2560A de données définies par l'utilisateur. Pour protéger le 2560A contre les virus informatiques, avant de brancher un PC sur le 2560A, vérifier que le PC est exempt de virus. Le branchement du 2560A infecté par un virus informatique aura pour effet d'infecter les autres appareils branchés sur le 2560A. S'il apparaît que le PC branché sur le 2560A est infecté par un virus informatique, mettre le 2560A hors tension. Les virus informatiques contenus dans le 2560A seront supprimés.

Procedure

Start the 2560A and the PC. Check that they have started normally. For details on how to turn the 2560A power switch on and the operations performed when the power is turned on, see section 3.4.

Setting the 2560A's USB Communication Feature to Mass Storage

1. Turn the **RANGE** dial to select SETUP.
The SETUP menu appears.

1. Select SETUP.
The SETUP indicator turns on.

RANGE

μA   Ω
mA   400
1   100
10   TEMP   mV
100   100
1   1
A   10   10
30   100   V
SETUP   1000

RANGE dial
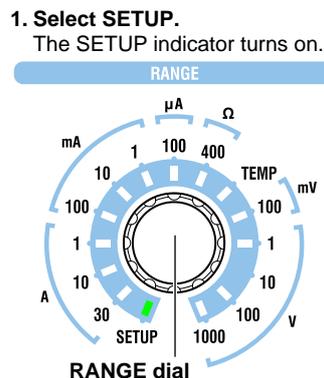
Selecting the Mass Storage Feature

2. Turn a **main setting** dial to select USB.

The deviation display shows the current setting.

3. Turn a **deviation dial** to select STOR.

- When you change the setting, all PRESET indicators turn on.
- If you decide not to change the setting, step 4 is not necessary.

4. Flip the **PRESET** switch down.

The setting is confirmed. All the PRESET indicators turn off.

PRESET indicator

Main setting dials (use any)   Deviation dials (either)   PRESET switch
2. Select USB.   3. Select STOR.   4. Confirm the settings.
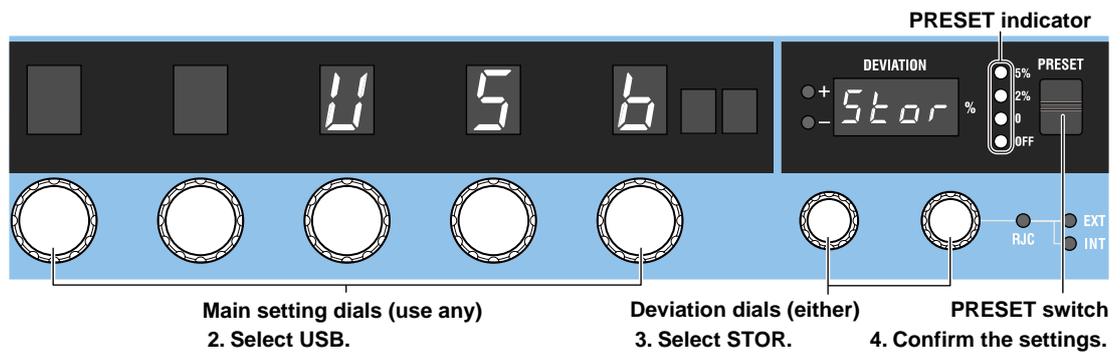
Connecting the 2560A to the PC through USB

5. Using a USB cable, connect the USB port (type B) on the rear panel of the 2560A to the PC.

See the USB interface specifications in section 11.1 and the connection diagram in section 11.2.

Operations on the PC

Opening the Computer Folder

6. Open the **Computer** folder from the Windows **Start** menu.

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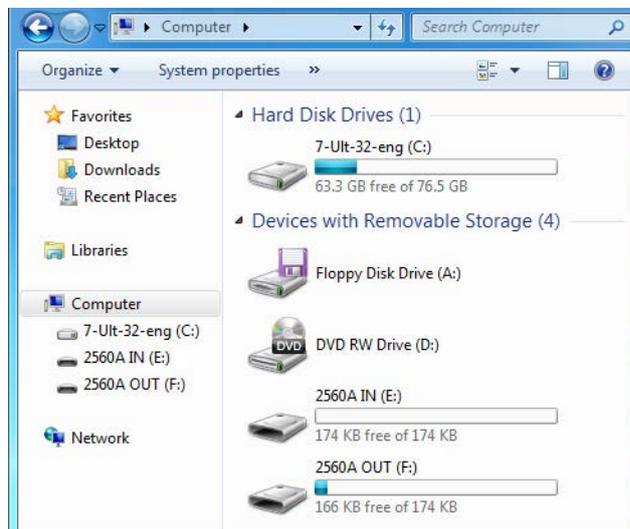
Writing User-Defined Data

7. Double-click the **2560A IN** drive in the computer folder.

The 2560A IN folder opens.

8. Place the user-defined data file (TCUSER.TXT or RTDUSER.TXT) that you created in the 2560A IN folder.

- For the user-defined data definition specifications, see appendix 6.
- The user-defined data file name is fixed. When placing the file in the 2560A IN folder, an error will not occur even if a different file name is used. However, make sure to rename the file to TCUSER.TXT or RTDUSER.TXT before performing step 9 on the next page.

Example in Which a Thermocouple User-Defined Data File (TCUSER) Is Placed in the 2560A IN Folder
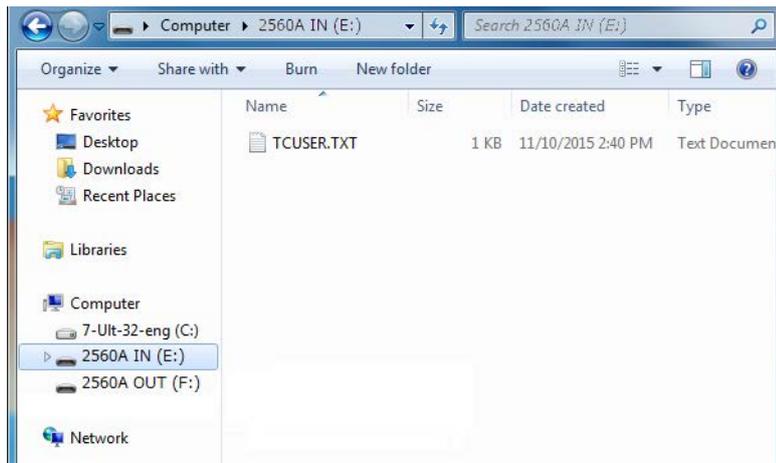
9. Right-click **2560A IN** in the navigation window. On the shortcut menu, click **Eject**.

- The 2560A IN and 2560A OUT drives are ejected from the computer folder. The user-defined data in the file in the 2560A IN folder is written to the 2560A internal memory, and then the 2560A IN and 2560A OUT drives appear again in the computer folder.
- The file in the 2560A IN folder will be deleted.
- The contents written in the 2560A internal memory are saved to TCUSER.TXT or RTDUSER.TXT in the 2560A OUT folder.
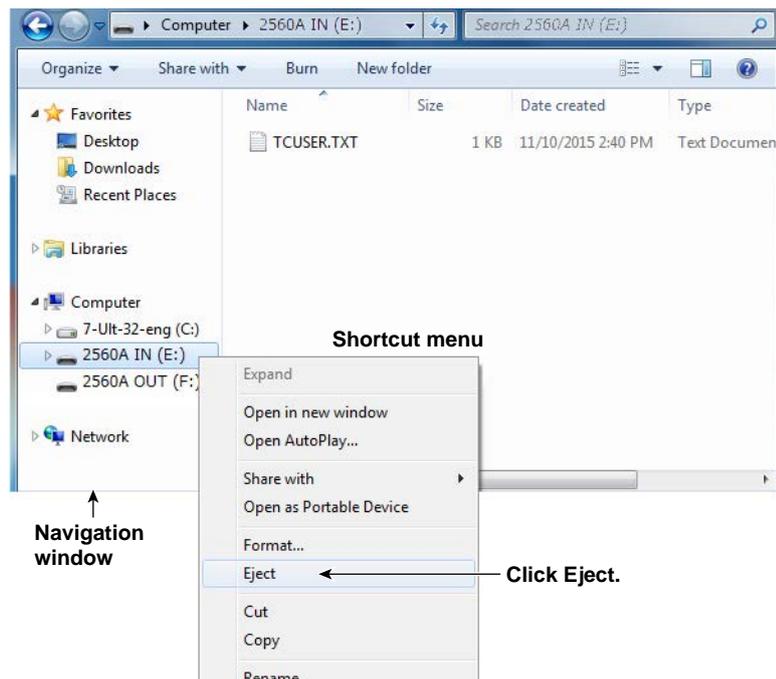
If User-Defined Data Contains Errors

In step 9, the 2560A checks for errors in the data. If an error is found, the output display will show an error code, and the contents in the internal memory of the 2560A will not updated.

Explanation

This section explains how to write user-defined data. After writing user-defined data to the 2560A, you can use the TEMPERATURE dial to set the source type to TC USER or RTD USER and source the user-defined thermocouple thermoelectromotive force or RTD resistance. For the procedure to select the source type, see section 6.1. For the data definition specifications, see appendix 6.

Mass Storage Feature

To exchange user-defined data files between the 2560A and PC, the 2560A's USB communication feature must be set to mass storage.

To remotely control the 2560A with communication commands, the USB communication feature must be set to remote control protocol (TMC). For the procedure, see section 11.3.

Connecting the 2560A to the PC through USB

The USB port on the rear panel of the 2560A is type B. The USB port on the PC is type A. Connect the 2560A to the PC using a USB cable with a type B connector on one end and type A connector on the other.

Note
- You can connect the USB cable before or after the 2560A and PC have started. Do not connect the cable while they are in the middle of the startup procedure.
- Do not connect or remove the USB cable while user-defined data is being written. Doing so may prevent the data from being written correctly. It may also cause the 2560A or PC to run abnormally.

2560A IN and 2560A OUT Folders

If the 2560A and PC are running normally and the 2560A's USB communication feature is set to mass storage, when you connect them with a USB cable, 2560A IN and 2560A OUT drives appear in the computer folder of the PC.
- When the USB cable is connected, the PC's autoplay feature may be activated for the 2560A IN and 2560A OUT drives. If this happens, you can also open the folders by clicking Open folder to view files in the autoplay window.
- The 2560A IN folder is a read/write folder. This is where you place user-defined data files to be written to the 2560A.
- The 2560A OUT folder is a read-only folder. This is where the contents of the user-defined data written in the 2560A's internal memory are saved in a file.

Writing User-Defined Data

The ejection of the 2560A IN drive causes the user-defined data to be written to the 2560A's internal memory. If written data already exists, it will be updated.
- When the data is written, the file in the 2560A IN folder is deleted.
- When the data is written, the data written in the 2560A's internal memory is saved as a file in the 2560A OUT folder. The file data is updated.
- Since the 2560A OUT folder is read-only, you can use a text editor to view the file in the folder, but you cannot save or delete the file.
- You can delete the data written in the 2560A's internal memory by using a communication command. For details on user-definition commands, see "SOURce Group" in chapter 13.

Definition File

The names of the user-defined data files saved in the 2560A IN and 2560A OUT folders are fixed.
The name is not case sensitive.
*   Thermocouple user-defined data file name: TCUSER.TXT
*   RTD user-defined data file name: RTDUSER.TXT

If User-Defined Data Contains Errors

If there is an error in the user-defined data, an error will occur. If an error occurs, the contents in the internal memory of the 2560A will not be updated.

Error File

When an error occurs, the information is saved in a file in the 2560A OUT folder.
*   TC USER error file name: ERRORTCUSER.TXT
*   RTD USER error file name: ERRORRTDUSER.TXT

For details on errors, see "Definition Specifications" or "User-Definition Error Messages" in appendix 6.
If the content in the 2560A's internal memory is updated correctly with user-defined data, the error file is deleted.

When User-Defined Data Is Not Written in Nonvolatile Memory

In the factory default condition or when user-defined data is deleted with a communication command, the 2560A will not have data written in its internal memory. If you select to source a user-defined thermoelectromotive force or resistance, the 2560A will respond in the following manner.

Main setting	Blinking bars (-----) will appear.
Polarity	Will turn off.
RJC indicators	Solid indicators will change to blinking.
Output (OUTPUT)	The output cannot be turned on.
Main setting query using a communication command	9.91E+37 will be returned.

<<Command Mnemonic>>

*   **Thermocouple**

    :SOURce:TCouple:DEFine <String>
    :SOURce:TCouple:DELete
    :SOURce:TCouple:SETTing?
    :SOURce:TCouple:TYPE <String>
    :SOURce:TCouple:WRITe

*   **RTD**

    :SOURce:RTD:DEFine <String>
    :SOURce:RTD:DELete
    :SOURce:RTD:SETTing?
    :SOURce:RTD:TYPE <String>
    :SOURce:RTD:WRITe

6.6 Setting Reference Junction Compensation

Procedure

1. Turn the **RANGE** dial to select TEMP.

   The TEMP indicator illuminates, and the TEMPERATURE dial is enabled.

2. Turn the **TEMPERATURE** dial to select R.J. TEMP.
   - The R.J. TEMP indicator turns on.
   - The displayed unit will be °C.

2. Select R.J. TEMP.
The R.J. TEMP indicator turns on.

1. Select TEMP.
The TEMP indicator turns on.

TEMPERATURE dial

RANGE dial
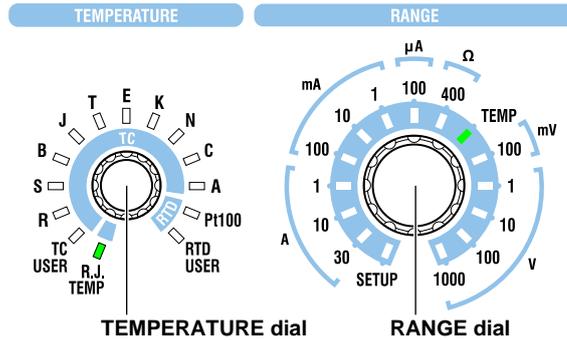
Setting the Reference Junction Compensation Mode

3. Turn the **Deviation dial 1** to set the RJC mode to AUTO, INT, or MAN.

   The main setting display shows the selected reference junction temperature.

Reference junction temperature
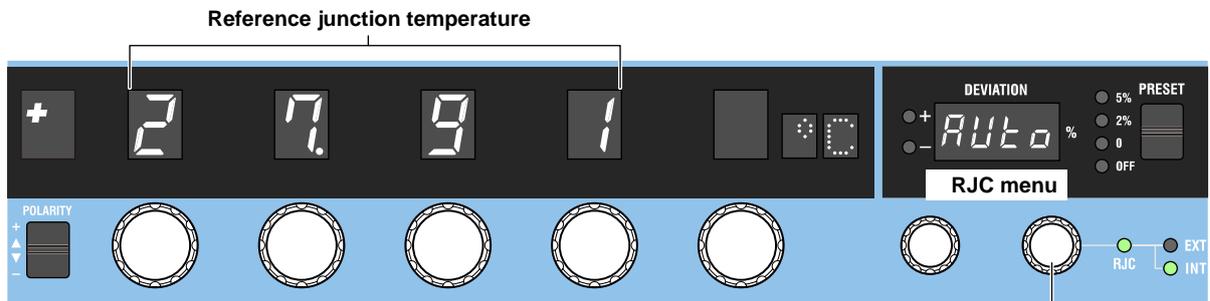
RJC menu

Deviation dial 2
3. Select AUTO, INT, or MAN.

RJC menu

Auto

When an external RJ sensor is connected

When an external RJ sensor is not connected

Internal RJC is applied.
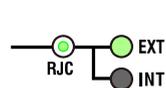
After several seconds
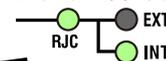
When an external RJ sensor is connected and the 2560A has detected it

Internal

Manual input

When the setting is not 0.00°C

When the setting is 0.00°C

⬤ : On

◉ : Blinking

⬤ : Off

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Setting the Reference Junction Temperature When the RJC Mode Is MAN (Manual input)

4. If you selected MAN (manual input), turn the right-most **main setting** dial to set the reference junction temperature.
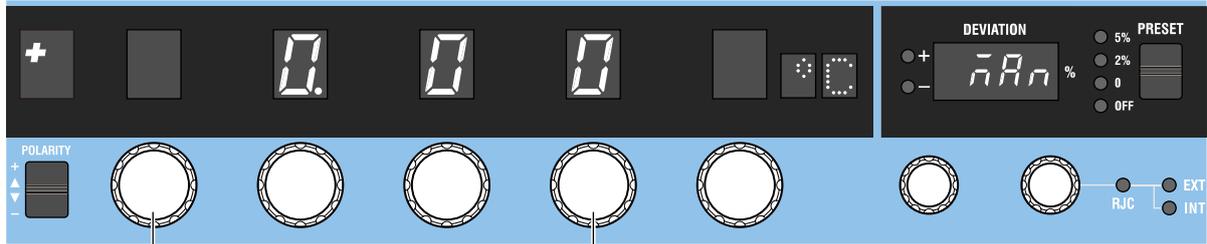
A main setting dial other than the right-most dial
4. Set the reference junction temperature for manual input.

Setting Resistance R0 of an External RJ Sensor

If you want to use the measured temperature of an external RJ sensor for the reference junction temperature, set the resistance for when the RJ sensor is at 0°C.

1. Turn the **RANGE** dial to select SETUP.

The SETUP menu appears.

1. Select SETUP.
The SETUP indicator turns on.

RANGE dial

2. Turn a **main setting** dial to select TEMP.
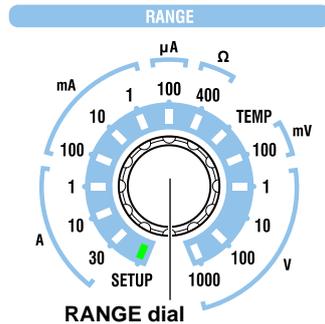
"NEXT" appears on the deviation display. All the PRESET indicators turn on.

3. Flip the **PRESET** switch down.

The TEMP menu appears. All the PRESET indicators turn off.

PRESET indicator
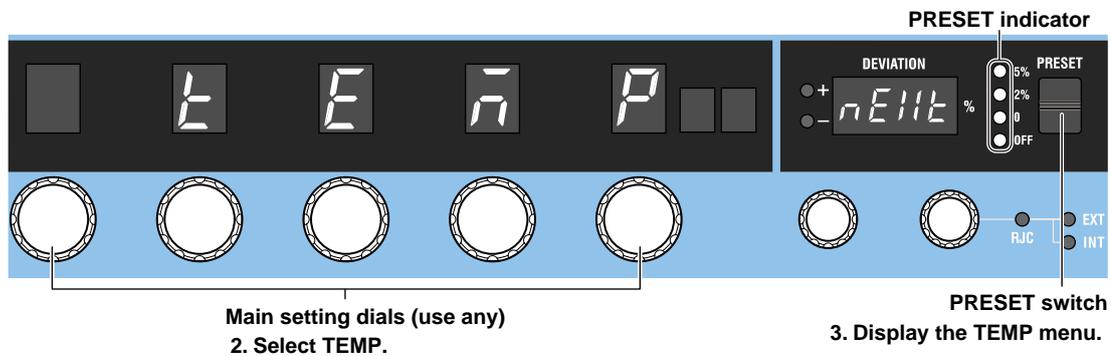
Main setting dials (use any)
2. Select TEMP.

PRESET switch
3. Display the TEMP menu.

4. Turn a **main setting** dial to select RJC.R0.

- The deviation display shows the difference between the currently set 100.00 Ω and R0.
- The output display shows the current R0 resistance.

Difference between 100.00 Ω and R0   **Current R0**
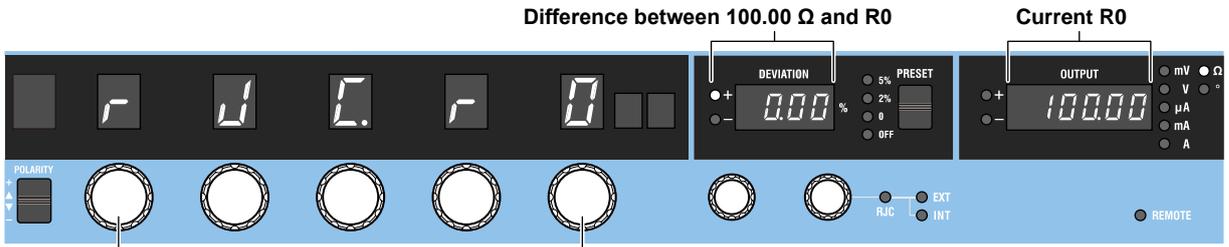
Main setting dials (use any)
4. Select RJC.R0.

5. Turn the **deviation** dials to set the difference between 100.00 Ω and R0.

- When you change the setting, all PRESET indicators turn on.
- If you decide not to change the setting, step 6 is not necessary.

6. Flip the **PRESET** switch down.

The setting is confirmed. All the PRESET indicators turn off.

PRESET indicator

Deviation dials   **PRESET switch**
5. Set the difference between   **6. Confirm the settings.**
100.00 Ω and R0.

6

Temperature-Sensor-Simulation Thermoelectromotive-Force and Resistance Sourcing
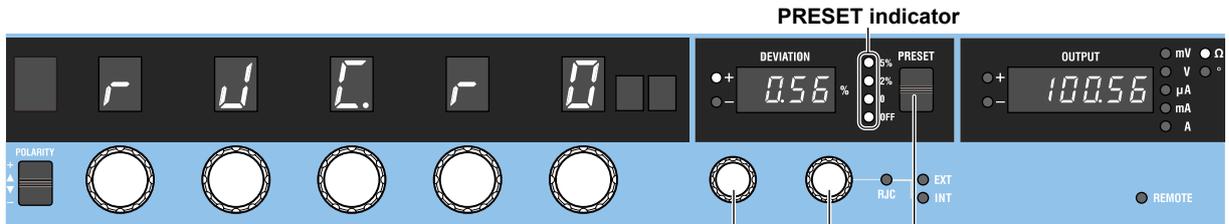
Explanation

The 2560A can source thermoelectromotive force (voltage) that corresponds to specified temperatures after performing reference junction compensation. It is also possible to source thermoelectromotive force without reference junction compensation.

Reference Junction Compensation Mode

Select the reference junction compensation (RJC) mode from the available options below. The 2560A corrects the sourced thermoelectromotive force (RJC) according to the selected mode.

Auto

- **When an External RJ Sensor Is Detected**

  When the 2560A detects that an RJ sensor is connected to the external RJ sensor input terminal on the rear panel, the 2560A sources thermoelectromotive force that is corrected using the temperature measured by the external RJ sensor.

- **When an External RJ Sensor Is Not Detected**

  If an RJ sensor is not connected to the 2560A or is not detected, the 2560A applies its internal RJC.

RJ sensors 257875 are sold separately as accessories. An RTD Pt100 can also be used as an RJ sensor.

Internal

The 2560A sources thermoelectromotive force that is corrected using the temperature of its output terminals.

Manual Input

You can set the reference junction temperature with the main setting dials. The 2560A sources thermoelectromotive force that is corrected using the specified temperature. If you do not want to apply correction (not use the RJC function), set the temperature to 0.00°C.
Selectable range: −20.00°C to ++60.00°C

Reference Junction Temperature Display

The reference junction temperature is displayed with 0.01° resolution.
- If the external or internal reference junction temperature goes below −20°C, which is outside the specification range, −199.99 is displayed. If it goes above +60°C, −199.99 is displayed, In both cases, the RJC indicator will blink.
- If you change the polarity from positive to negative in manual input mode and the setting goes outside the manual-input selectable range, the setting and polarity displays will blink. If you turn any of the main setting dials in this condition but the setting still remains outside the manual-input selectable range, the setting is changed to −20.00°C, and the blinking will change to solid.

Difference in Resistance R0 of the External RJ Sensor

Turn deviation dials 1 and 2 to set the difference between the current R0 resistance and 100.00 Ω. This sets the resistance at 0°C for the RJ sensor that will be used (RTD Pt100).
Selectable range for the difference between the current R0 resistance and 100.00 Ω: −1.00 Ω to +1.00 Ω, default value: 0.00Ω

<<Command Mnemonic>>

```
:SOURce:RJC:MODE {AUTO|INTernal|MANual}
:SOURce:RJC:STATe?
:SOURce:RJC:TEMPerature:AUTO
:SOURce:RJC:TEMPerature:EXTernal?
:SOURce:RJC:TEMPerature:INTernal?
:SOURce:RJC:TEMPerature:MANual
:SOURce:RJC:RESister?
:SYSTem:RJC:RESister <Resistance>
```

6.7 Selecting the Temperature Unit

Procedure

1. Turn the **RANGE** dial to select SETUP.

The SETUP menu appears.

1. Select SETUP.
The SETUP indicator turns on.


RANGE dial

2. Turn a **main setting** dial to select TEMP.

"NEXT" appears on the deviation display. All the PRESET indicators turn on.
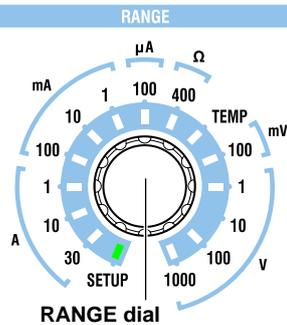
3. Flip the **PRESET** switch down.

The TEMP menu appears. All the PRESET indicators turn off.

PRESET indicator

Main setting dials (use any)
2. Select TEMP.

PRESET switch
3. Display the TEMP menu.
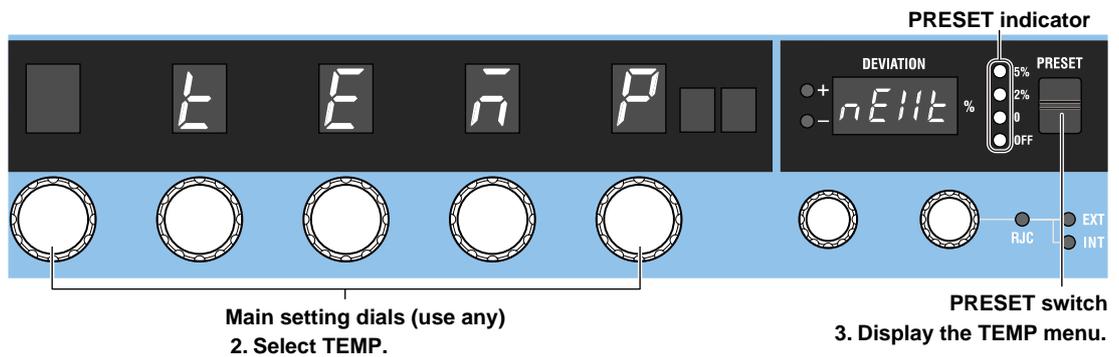
4. Turn a **main setting** dial to select UNIT.

The deviation display shows the current temperature unit.

5. Turn a **deviation dial** to select CEL or FAR.

- When you change the setting, all PRESET indicators turn on.
- If you decide not to change the setting, step 6 is not necessary.

6. Flip the **PRESET** switch down.

The setting is confirmed. All the PRESET indicators turn off.

PRESET indicator

Main setting dials (use any)
4. Select UNIT.

Deviation dials (either)
5. Select CEL or FAR.

PRESET switch
6. Confirm the settings.
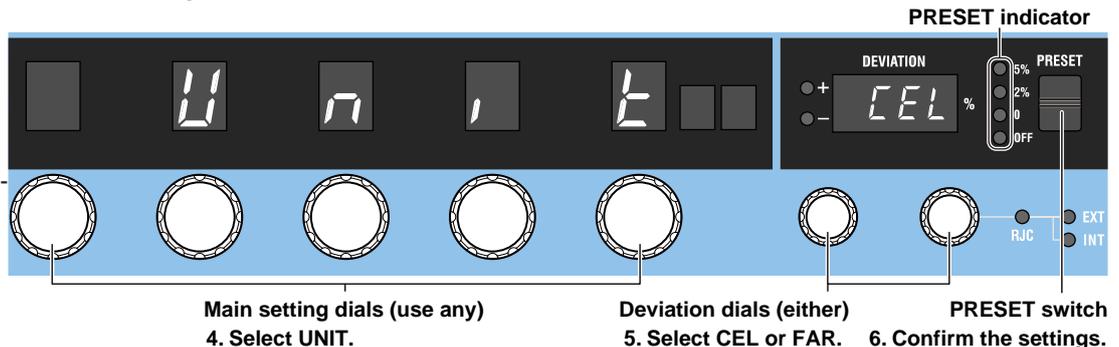
Explanation

On models with the -UF suffix code, you can select the temperature unit.

You can set the temperature using the selected unit.

CEL: °C

FAR: °F

<<Command Mnemonic>>

`:SYSTem:UNIT {C|CEL|F|FAR}`

7.1   Output divider

Procedure

1. Turn the **m** dial to set the denominator (number of divisions) of the divider value.
The m display shows the specified value.

2. Turn the **n** dial to set the numerator of the divider value.
The n display shows the specified value.

OUTPUT DIVIDER

Divider value example: $\times \frac{1}{5}$ $\times$ —————

n dial
2. Set numerator n.

m dial
1. Set denominator m.
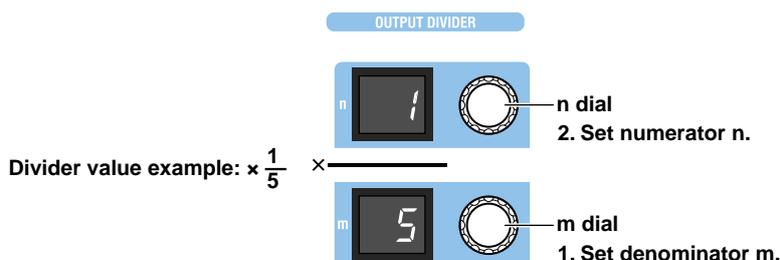
Explanation

Output divider is a feature that divides the voltage, current, resistance, or temperature set with the main setting dials equally by the specified number and outputs the result. The output divider feature cannot be used in high resolution mode.
Selectable range of denominator m: 4 to 15
Selectable range of numerator n: 0 to m

- Turning the m dial resets numerator n to the denominator m value.
- The n value cannot be set larger than the m value.
- Setting a divider value does not affect the value shown on the main setting display.
- When the power is turned on, the value of denominator m that was used previously is restored. In this situation, numerator n will be equal to denominator m.
- The output divider feature cannot be used in high resolution mode.

Output Example

At 100 V range, if main setting (MAX) is set to +100.000 V and main setting (MIN) is set to +0.000 V, the voltage is divided as follows.
- When n/m = 0/5: +0.000 V
- When n/m = 1/5: +20.000 V
- When n/m = 2/5: +40.000 V
- When n/m = 3/5: +60.000 V
- When n/m = 4/5: +80.000 V
- When n/m = 5/5: +100.000 V

When the output is turned on, the output display shows the output value of the voltage, current, resistance, or temperature, and the voltage, current, resistance, or temperature is output from the applicable output terminals. For details on how to turn the output on and off and how to set the range, see chapter 5 or 6.

<<Command Mnemonic>>
```
:DIVider:NUMerator {<NRf>|MINimum|MAXimum}
:DIVider:DENominator {<NRf>|MINimum|MAXimum}
```

7.2 Deviation Output

Setting the Deviation

Turn the **deviation** dials 1 and 2 to set the deviation.

- The deviation display shows the specified deviation.
- The output display shows the output value with the deviation applied.
- Turn deviation dials 1 and 2 to the right to decrease the deviation and increase the output. Turn them to the left to increase the deviation and decrease the output.
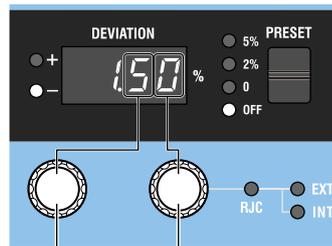
Deviation dial 2

Set the second decimal digit at a resolution of 0.01.

Deviation dial 1

Set the first decimal digit at a resolution of 0.2.

For both dials, carrying over and borrowing occur automatically within the selectable range.

Setting a Preset

Flip the **PRESET** switch up or down to select a preset.

The selected PRESET indicator turns on, and the deviation display shows the preset deviation.
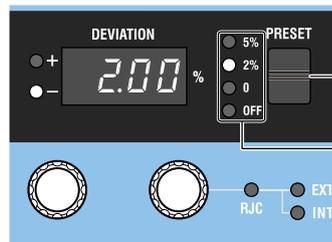
PRESET switch
Select a preset.

Presets

Explanation

Deviation output is a feature that adds or subtracts deviation from the voltage, current, resistance, or temperature set with the main setting dials and outputs the result. Deviation and preset cannot be used while sweeping or in high resolution mode.

Deviation

Set the deviation in the following range.

Selectable range: –20.00% to +20.00%, resolution: 0.01%

However, deviation may not exceed the source range.

- If the output is turned on, the output remains on even if you change the deviation with the deviation dials.
- How the deviation changes when the main setting or the denominator m or numerator n of the output divider is changed depends on the preset setting (explained later). See the description of presets.

- If the output value exceeds the source range as a result of deviation, the deviation display blinks. If you change the deviation in this condition, the deviation is set to the maximum or minimum value that would make the output value fall within the source range, and the deviation display changes from blinking to solid.

Example

Use the deviation dials to read the deviation of the meter to be calibrated (the error between a scale value and needle). Use the main setting and the output divider feature to output the meter scale values (nominal values), and use deviation dials 1 and 2 to align the meter needle to the scale values.

If you turn a dial to the right and set a negative deviation value, the 2560A outputs a value that is larger than the original output value by the main setting value × deviation. A negative deviation means that the meter needle is indicating a value less than the 2560A output.

If the main setting (MAX) is set to +100.000 V, the main setting (MIN) is set to +0.000 V, and the divider value is 5/10, setting deviation to –1% will result in the following.

  Deviation = +100.000×0.01 = +1.000 V

  If the divider value is 5/10, the result will be +50.000 V + deviation (+1.000 V), and +51.000 V will be output.

When the output is turned on, the output display shows the output value of the voltage, current, resistance, or temperature, and the voltage, current, resistance, or temperature is output from the applicable output terminals. For details on how to turn the output on and off and how to set the range, see chapter 5 or 6.

Preset

Select the preset from the following.
- 5%: The deviation is set to +5% when the numerator n of the output divider feature increases and –5% when it decreases.
- 2%: The deviation is set to +2% when the numerator n of the output divider feature increases and –2% when it decreases.
- 0: The deviation is set to 0% when the numerator n of the output divider feature changes.
- OFF: Preset is not set.

When you change the numerator n of the output divider feature, the deviation is set to a value based on the change in n and the preset.
When calibrating a meter, change numerator n of the output divider feature to move the calibration point. A preset is used to take the meter error or overshoot into consideration so that when you move the calibration point, the calibration point is not exceeded.
The sign of the deviation preset is positive when calibrating in increasing order (calibrating from the smallest value) and negative when calibrating in decreasing order (calibrating from the largest value).
- If the preset is set to 0%, 2%, or 5% (a setting other than OFF) and you change the main setting or the denominator m of the output divider, the deviation will be cleared. If you change numerator n of the output divider, the deviation returns to the selected preset.
- If the deviation is set using the deviation dials when preset set to OFF, the deviation will not change even if you change the main setting or the denominator m or numerator n of the output divider.
- Flipping the PRESET switch down from the OFF position sets the deviation to 0%.
- You cannot change the preset while a sweep is in progress.

<<Command Mnemonic>>

```
:DEViation:PRESet {<Percentage>|OFF}
:DEViation:VALue {<Percentage>|MINimum|MAXimum}
```

7

Output Division, Deviation, and Sweeping

7.3　Sweep Output

Setting the Sweep Time

1. Turn the **RANGE** dial to select SETUP.

The SETUP menu appears.

1. Select SETUP.
The SETUP indicator turns on.

RANGE dial
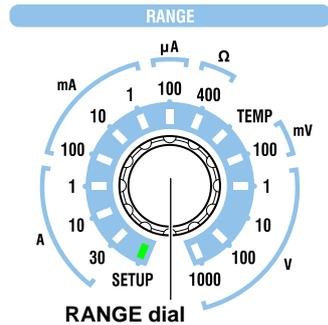
2. Turn a **main setting** dial to select SWEEP.

The deviation display shows the current sweep time.

3. Turn the **deviation dials** to set the sweep time (seconds) to 8, 16, 32, or 64.

• When you change the setting, all PRESET indicators turn on.
• If you decide not to change the setting, step 4 is not necessary.

4. Flip the **PRESET** switch down.

The setting is confirmed. All the PRESET indicators turn off.

PRESET indicator

Main setting dials (use any)   **Deviation dials (either)**   **PRESET switch**
2. Select SWEEP.   **3. Select the sweep time.**   **4. Confirm the settings.**
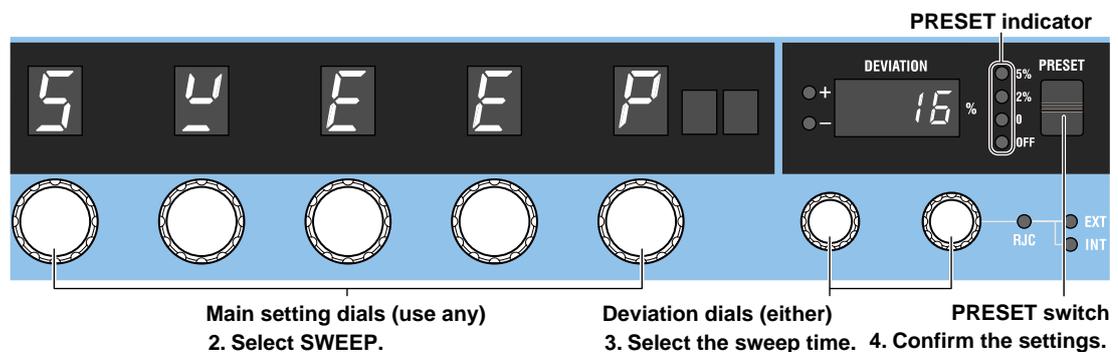
Starting to Sweep

UP Sweep

When the output is turned on, flip the **SWEEP** switch up.

The UP indicator illuminates, and the 2560A starts sweeping toward main setting (MAX). When the sweep end value is reached or if you flip the SWEEP switch down while sweeping is in progress, sweeping will stop (hold state). A beep will sound when the sweep is held.

DOWN Sweep

When the output is turned on, flip the **SWEEP** switch down.

The DOWN indicator illuminates, and the 2560A starts sweeping toward main setting (MIN). When the sweep end value is reached or if you flip the SWEEP switch up while sweeping is in progress, sweeping will stop (hold state). A beep will sound when the sweep is held.

SWEEP

UP   HOLD
HOLD   DOWN

SWEEP switch
UP sweep: Flip up.
DOWN sweep: Flip down.

Explanation

Sweeping is a feature used to vary the output value continuously and smoothly toward main setting (MAX) or main setting (MIN) over the specified sweep time. Sweeping cannot be used in high resolution mode.

Sweep Time

Select the time for the sweep output to move from 0% to 100% from the following.
Approx. 8 s, approx. 16 s, approx. 32 s, approx. 64 s
The default sweep time is approximately 16 s.

Output Example

The following figure shows the sweep operation when the main setting (MAX) is set to +100.000 V and the main setting (MIN) is set to +0.000 V at 100 V range.

UP sweep
120 V
100 V
Output
0   16 s   19.2 s
Sweep time

DOWN sweep
120 V
100 V
Output
0   3.2 s   (16 s)   19.2 s
Sweep time

7

Output Division, Deviation, and Sweeping
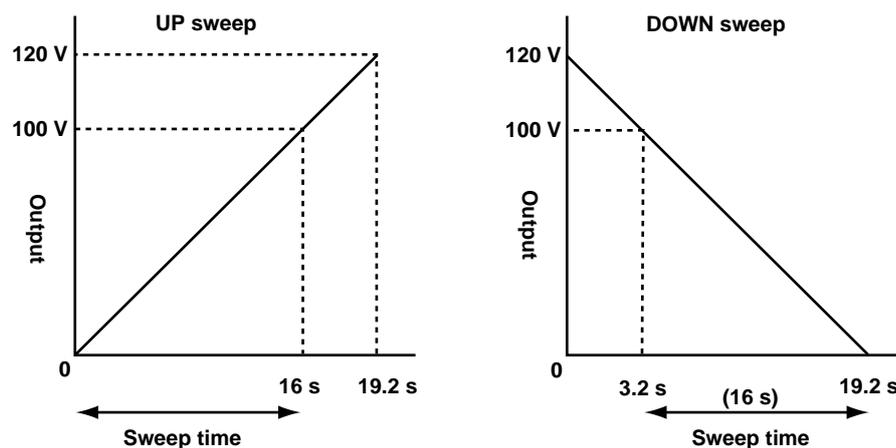
Sweep Direction

Sweeping starts when the output is turned on. When it starts, the output display shows the output value of the voltage, current, resistance, or temperature, and the voltage, current, resistance, or temperature is output from the corresponding output terminals. For details on how to turn the output on and off and how to set the range, see chapter 5 or 6.

UP Sweep

Flipping the SWEEP switch up when the output is on turns the UP indicator on. The 2560A starts sweeping toward main setting (MAX).

DOWN Sweep

Flipping the SWEEP switch down when the output is on turns the DOWN indicator on. The 2560A starts sweeping toward main setting (MIN).

Hold State

If any of the following conditions occurs or if you perform the following operation, beeps will be generated, sweeping will stop, and the output value will be held. (The 2560A returns to normal operation.)

- If the SWEEP switch is flipped down while sweeping up or if sweeping reaches the sweep end value
- If the SWEEP switch is flipped up while sweeping down or if sweeping reaches the sweep end value
- If you control the SCALE switch

Note

- The sweep operation is achieved through the automatic and continuous changing of the output divider value and deviation. Because sweeping begins at the current output divider value and deviation, you can set these in advance to start sweeping from any point within the sweep range.
- To sweep up from 0%, set the output divider value (n) to 0 and the deviation to 0%. For the procedure, see sections 7.1 and 7.2.
- Changing the range or main setting will cause sweeping to stop.
- If you put sweeping in a held state, automatic changing of the output divider value and deviation will be stopped, and the 2560A will return to normal operation. The output divider value and deviation remain at the values when sweeping is held.
- You can hold sweeping when a phenomenon that you want to observe closely occurs during sweeping. You can observe closely by controlling the deviation dials slowly to change the output value.

<<Command Mnemonic>>

```
:SWEep:TIMe <Time>
:SWEep:DIRection {HOLD|UP|DOWN}
```

8.1   Selecting the Resolution Mode

Procedure

1. Turn the **RANGE** dial to select SETUP.

The SETUP menu appears.

1. Select SETUP.
The SETUP indicator turns on.

RANGE dial

2. Turn a **main setting** dial to select RESOL.

The deviation display shows the current resolution mode.

3. Turn a **deviation dial** to select NORM or HIGH.

- When you change the setting, all PRESET indicators turn on.
- If you do not change the setting, the PRESET indicators will not turn on.

4. Flip the **PRESET** switch down.

- The setting is confirmed. All the PRESET indicators turn off.
- The 2560A returns from the SETUP menu to source mode, and the range is set to 1 V.

PRESET indicator

Main setting dials (use any)
2. Select RESOL.

Deviation dials (either)
3. Select NORM or HIGH.

PRESET switch
4. Confirm the settings.

8

Other Features

Explanation

You can select the resolution mode of the source voltage or current.

NORM: 5.5 digit resolution mode. 4.5 digit resolution in 30 A range. The default setting is NORM.

HIGH: 6.5 digit high resolution mode. 5.5 digit resolution in 30 A range. In high resolution mode, temperature and resistance ranges cannot be applied and therefore cannot be selected.

- In high resolution mode, the least significant digit is shown in the most significant digit of the deviation display. In high resolution mode, use the five main setting dials and deviation dial 1 to set the main setting.
- In high resolution mode, the output divider, deviation output, sweep, and scaling features cannot be used. Further, high resolution mode cannot be used for temperature or resistance ranges.
- If you flip the PRESET switch down to confirm the resolution setting, the 2560A returns from the SETUP menu to source mode, and the range is set to 1 V.

Display example
When +10 V is set in the 10 V range and output is set to ON

- **During NORM resolution mode (5.5 digits)**
  The following example is displaying the main setting +10.0000, scale MAX turned on, output divider 10/10, deviation 0.00%, preset 0, and output value +10.0000.
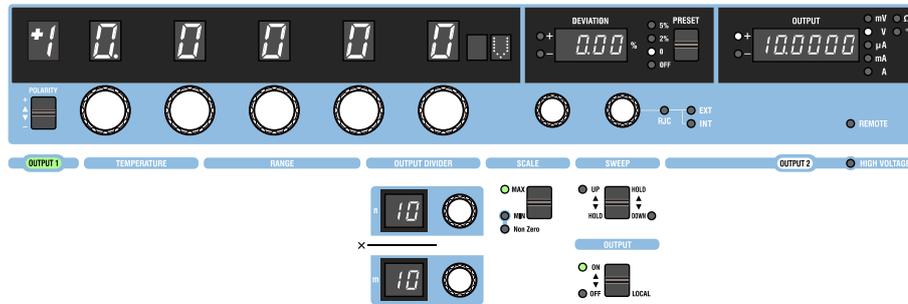
- **During HIGH resolution mode (6.5 digits)**
  The following example is displaying the main setting +10.00000 (the main setting display is showing +10.0000, the deviation display is showing 0 in the most significant digit, and together they are showing +10.00000).
  The output divider, deviation, preset, and output values are not displayed.
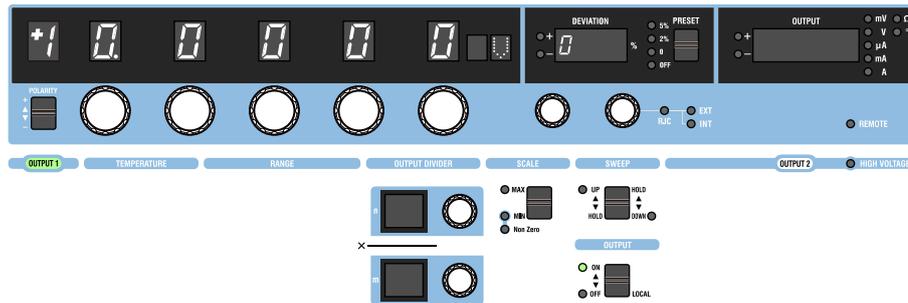
8.2 Turning the Beep Sound On and Off

Procedure

*1.* Turn the **RANGE** dial to select SETUP.

The SETUP menu appears.

1. Select SETUP.
The SETUP indicator turns on.

RANGE dial
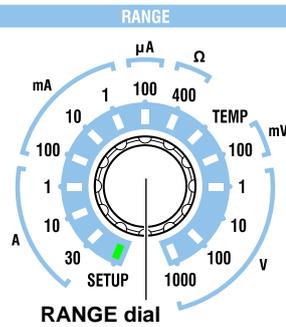
2. Turn a **main setting** dial to select BEEP.

The deviation display shows the current beep sound setting.

3. Turn a **deviation dial** to select ON or OFF.

• When you change the setting, all PRESET indicators turn on.
• If you decide not to change the setting, step 4 is not necessary.

4. Flip the **PRESET** switch down.

The setting is confirmed. All the PRESET indicators turn off.

PRESET indicator

Main setting dials (use any)   Deviation dials (either)   PRESET switch
2. Select BEEP.   3. Select ON or OFF.   4. Confirm the settings.

8

Other Features
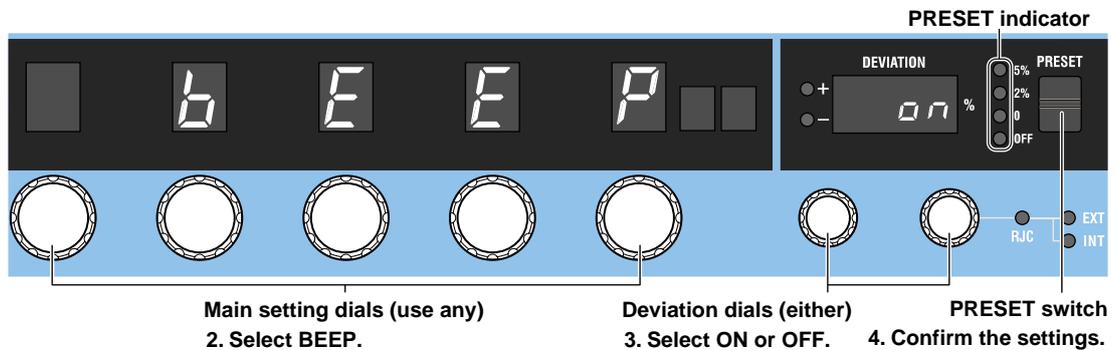
Explanation

You can select whether to sound beeps that indicate the 2560A operating status. You cannot change the volume.

You can turn the beep sound on or off for the following notifications.
- When a voltage greater than or equal to +150 V or less than or equal to –150 V is to be output, regardless of the output on/off state
- When a sweep operation is held

You cannot turn off the beep sound for the following notifications.
- When the cooling fan stops (error code: E.901, E.907)
- When an abnormal temperature is detected (error code: E.902, E.903)
- When an internal power supply error is detected (error code: E.904, E.905, E.908)
- When an error is detected during a self-test executed at power-on or by some other operation (error codes: E.911 to E950) However, you can turn off the beep sound for these errors by performing the procedure below.
  - Turn the power on
    Control a front-panel dial or switch
  - Execute a self-test using other controls
    Flip the PRESET switch down

9.1   GP-IB Interface Features and Specifications

GP-IB Interface Features

Reception Feature
*   With the exception of turning the power switch on and off, you can use the reception feature to specify the same settings that you specify by using the front panel keys.
*   The 2560A can receive panel setup parameters, error codes, and other output requests from a controller.
*   The 2560A can receive status report commands.

Transmission Feature
The 2560A can transmit panel setup parameters, status byte, error codes that occur, and so on.

Note
   Talk-only, listen-only, and controller capabilities are not available.

GP-IB Interface Specifications

Item	Specifications
Supported devices	National Instruments Corporation • PCI-GPIB or PCI-GPIB+ • PCIe-GPIB or PCIe-GPIB+ • PCMCIA-GPIB or PCMCIA-GPIB+ (not supported on Windows Vista or Windows 7.) • GPIB-USB-HS or GPIB-USB-HS+ Driver NI-488.2M Version 2.8.1 and later
Electrical and mechanical	Conforms to IEEE St'd 488-1978
Functional specifications	See the table below.
Protocol	Complies with IEEE St'd 488.2-1992 (when using standard commands)
Code	ISO (ASCII) codes
Mode	Addressable mode
Address	The address can be set in the range of 0 to 30.
Clear remote mode	Clear remote mode by flipping the OUTPUT switch to the LOCAL side. This is not possible when local lockout has been activated by the controller.

Functional Specifications

Function	Subset Name	Description
Source handshaking	SH1	Full source handshaking capability
Acceptor handshaking	AH1	Full acceptor handshaking capability
Talker	T6	Basic talker capability, serial polling, and untalk on MLA (My Listen Address). No talk-only capability.
Listener	L4	Basic listener capability and unlisten on MTA (My Talk Address). No listen-only capability
Service request	SR1	Full service request capability
Remote local	RL1	Full remote/local capability
Parallel polling	PP0	No parallel polling capability
Device clear	DC1	Full device clear capability
Device trigger	DT1	Device trigger capability
Controller	C0	No controller capability
Electric characteristics	E1	Open collector

9

GP-IB Interface

Switching between Remote and Local Modes

When Switching from Local to Remote Mode

The 2560A switches to remote mode when it is in local mode and receives a REN (Remote Enable) message from the PC.

- The REMOTE indicator turns on.
- All dials and switches are disabled except for the flipping of the **OUTPUT** switch to the LOCAL side to change the 2560A to local mode.
- Settings entered in local mode are retained even when the 2560A switches to remote mode.

When Switching from Remote to Local Mode

When the 2560A is in remote mode and you flip the **OUTPUT** switch to the LOCAL side, the 2560A switches to local mode. This is not possible when local lockout (see section 9.4) has been activated by the controller.

- The REMOTE indicator turns off.
- Dials and switches can be used.
- Settings entered in remote mode are retained even when the 2560A switches to local mode.

Note

You cannot use the GP-IB interface simultaneously with other interfaces (USB or Ethernet).

9.2 Connecting through the GP-IB Interface

GP-IB Cable

The 2560A is equipped with an IEEE St'd 488-1978 24-pin GP-IB connector. Use a GP-IB cable that conforms to this standard.

Connection Method

Connect the cable as shown below.

Notes on Connection

- Firmly tighten the screws on the GP-IB cable connector.
- On the PC end, use a GP-IB board (or card) made by National Instruments. For details, see section 9.1.
- The 2560A may not operate properly if the 2560A is connected to the PC through converters (such as a GP-IB to USB converter). For more details, contact your nearest YOKOGAWA dealer.
- Several cables can be used to connect multiple devices. However, no more than 15 devices, including the controller, can be connected on a single bus.
- When connecting multiple devices, you must assign a unique address to each device.
- Use cables that are no longer than 2 m in length to connect devices.
- Make sure the total length of all cables does not exceed 20 m.
- When devices are communicating, have at least two-thirds of the devices on the bus turned on.
- To connect multiple devices, wire them in a daisy-chain or star configuration as shown below. You can also mix these configurations. Loop configuration is not allowed.

9 9

GP-IB Interface

CAUTION

Be sure to turn off the PC and the 2560A before you connect or remove communication cables. Otherwise, erroneous operation may result, or the internal circuitry may break.

French

ATTENTION

Toujours mettre le PC et le 2560A hors tension avant de brancher ou de débrancher des câbles de communication, pour éviter tout dysfonctionnement ou panne du circuit interne.

9.3 Configuring the 2560A GP-IB Settings

1. Turn the **RANGE** dial to select SETUP.

The SETUP menu appears.

1. Select SETUP.
The SETUP indicator turns on.

RANGE

RANGE dial
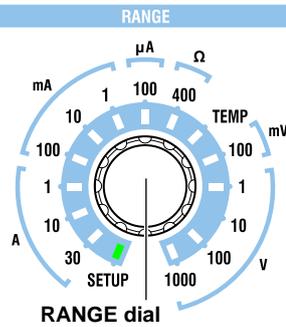
Selecting the GP-IB Interface

2. Turn a **main setting** dial to select GPIB.

"NEXT" appears on the deviation display. All the PRESET indicators turn on.

3. Flip the **PRESET** switch down.

The GP-IB menu appears. All the PRESET indicators turn off.

PRESET indicator

DEVIATION   PRESET
nEIIt

Main setting dials (use any)
2. Select GPIB.

PRESET switch
3. Display the GP-IB menu.

9

GP-IB Interface
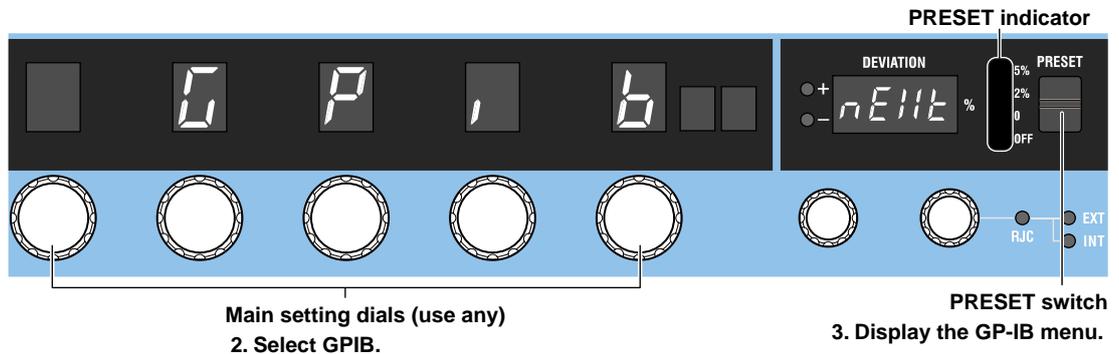
Setting the GP-IB Address

4. Turn a **main setting** dial to select ADRS.

The deviation display shows the current GP-IB address.

5. Turn the **deviation** dials to set the GP-IB address.

- When you change the setting, all PRESET indicators turn on.
- If you decide not to change the setting, step 6 is not necessary.

6. Flip the **PRESET** switch down.

The setting is confirmed. All the PRESET indicators turn off.

Main setting dials (use any)
4. select ADRS.

Deviation dials
5. Set the GP-IB address.

PRESET switch
6. Confirm the settings.
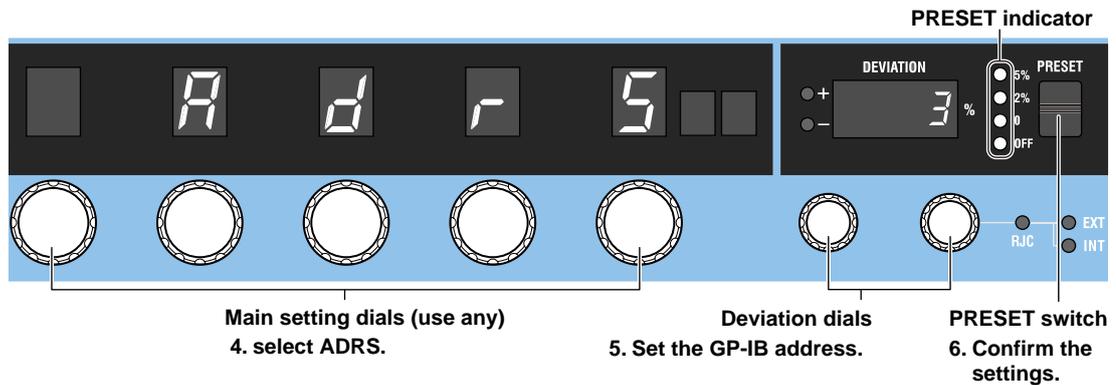
Setting the Command Type

4. Turn a **main setting** dial to select TYPE.

The deviation display shows the current command type.

5. Turn a **deviation dial** to select NORM or COMP.

- When you change the setting, all PRESET indicators turn on.
- If you decide not to change the setting, step 6 is not necessary.

6. Flip the **PRESET** switch down.

The setting is confirmed. All the PRESET indicators turn off.

Main setting dials (use any)
4. Select TYPE.

Deviation dials (either)
5. Select NORM or COMP.

PRESET switch
6. Confirm the settings.
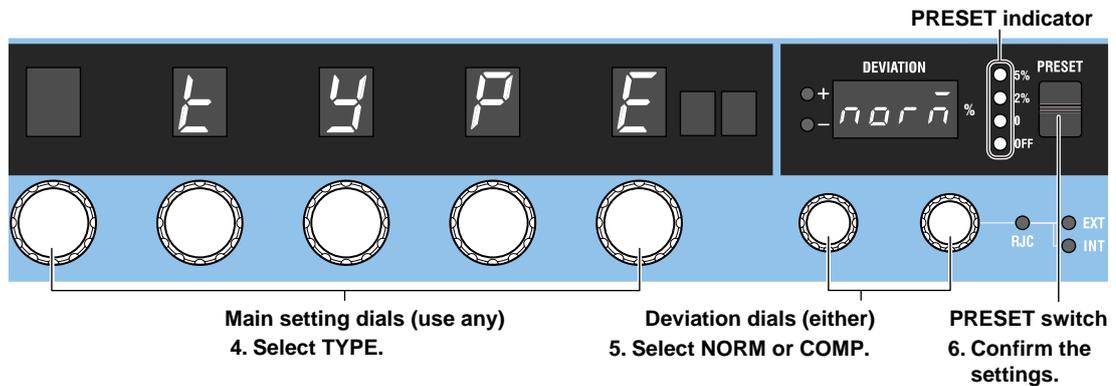
Explanation

To use the GP-IB interface, you must set the GP-IB address and command type.

GP-IB Address

Set the GP-IB address in the following range. Assign a unique address.
0 to 30

Command Type

The 2560A is compatible with the remote control commands of its predecessor model, the 2560. Select the command type depending on your situation.
- NORM: Normal commands. These commands comply with IEEE488.2 (see chapter 11).
- COMP: 2560 compatible commands. These commands cannot be used when the 2560A is set to high resolution mode.

Notes on Using Existing Programs

To use an existing 2560 program on the 2560A, note the following points.
- Insert a wait time of 1 second in operations that change the output. If you do not, the program may not work properly.
- The 2560A stores the polarity and main setting separately for the voltage, current, and temperature. The 2560 stores only a single set of polarity and output setting. As such, to use an existing 2560 program, you need to change the range and then specify the polarity and output setting for the voltage, current, and temperature so that they are congruent with the 2560A settings.

For details on COMP commands, see the 2553 user's manual.

Note

- Only use a single communication interface: USB, GP-IB, or Ethernet. If you send commands simultaneously from more than one communication interface, the 2560A will not execute the commands properly.
- When the controller is communicating with the 2560A or with other devices through GP-IB, do not change the address.
- Each device that is connected in a GP-IB system has its own unique address. This address is used to distinguish between different devices. Therefore, you must assign a unique address to the 2560A when connecting it to a PC or other device.
- The command type setting takes effect when you turn the 2560A off and then back on. If you select COMP, the 2560A will not accept standard commands nor communicate using the USB or LAN interface.

9

GP-IB Interface

9.4 Responses to Interface Messages

Responses to Interface Messages

Responses to Uni-Line Messages

- **IFC (Interface Clear)**

  Clears the talker and listener functions. Stops data transmission if it is in progress.

- **REN (Remote Enable)**

  Switches between the remote and local modes.

  IDY (Identify) is not supported.

Responses to Multi-Line Messages (Address commands)

- **GTL (Go To Local)**

  Switches the instrument to local mode.

- **SDC (Selected Device Clear)**
  - Clears the program message (command) being received and the output queue (see section 14.5).
  - Discards `*OPC` and `*OPC?` commands that are being executed.
  - Immediately aborts `*WAI` and `COMMunicate:WAIT` commands.

  PPC (Parallel Poll Configure) and TCT (Take Control) are not supported.

- **GET (Group Execute Trigger)**

  When the GP-IB command type is set to COMP (compatible commands), this command outputs information about configuration changes and operation status.

Responses to Multi-Line Messages (Universal commands)

- **LLO (Local Lockout)**

  Prohibits switching to local mode through the use of the OUTPUT key on the front panel.

- **DCL (Device Clear)**

  The same operation as the SDC message.

- **SPE (Serial Poll Enable)**

  Sets the talker function on all devices on the bus to serial polling mode. The controller will poll each device one by one.

- **SPD (Serial Poll Disable)**

  Clears the serial polling mode of the talker function on all devices on the bus.

  PPU (Parallel Poll Unconfigure) is not supported.

What Are Interface Messages?

Interface messages are also referred to as interface commands or bus commands. They are commands that are issued by the controller. They are classified as follows:

Uni-line Messages

A single control line is used to transmit uni-line messages. The following three types are available.
- IFC(Interface Clear)
- REN(Remote Enable)
- IDY(Identify)

Multi-line Messages

Eight data lines are used to transmit multi-line messages. The messages are classified as follows:

- **Address Commands**

  Some address commands are valid when a device is designated as a listener, and some are valid when it is designated as a talker. The following five commands are available.

  Commands that are valid on an instrument that is designated as a listener
  - GTL(Go To Local)
  - SDC(Selected Device Clear)
  - PPC(Parallel Poll Configure)
  - GET(Group Execute Trigger)

  A command that is valid on an instrument that is designated as a talker
  - TCT(Take Control)

- **Universal Commands**

  Universal commands are available to all devices regardless of their listener or talker designation. The following five commands are available.
  - LLO(Local Lockout)
  - DCL(Device Clear)
  - PPU(Parallel Poll Unconfigure)
  - SPE(Serial Poll Enable)
  - SPD(Serial Poll Disable)

There are other interface messages: listener-address, talk-address, and secondary commands.

```
────────────────────── Interface messages ──────────────────────
                              ┌─────── Multi-line messages ───────┐
 ┌──── Uni-line ────┐         ┌──── Address ────┐   ┌─── Universal ───┐
 │    messages      │         │    commands     │   │   commands      │
 │    ★IFC          │         │    ★GTL         │   │    ★LLO         │
 │    ★REN          │         │    ★SDC         │   │    ★DCL         │
 │    IDY           │         │    PPC          │   │    PPU          │
 │                  │         │    ★GET         │   │    ★SPE         │
 │                  │         │    TCT          │   │    ★SPD         │
 └──────────────────┘         └─────────────────┘   └─────────────────┘
 ┌──── Listener ────┐   ┌──── Talker ────┐    ┌──── Secondary ────┐
 │    address       │   │    address     │    │    command        │
 └──────────────────┘   └────────────────┘    └───────────────────┘
```
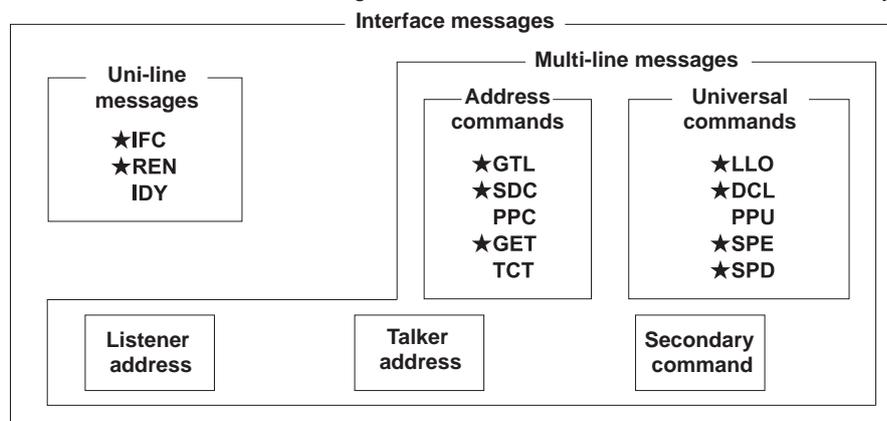
The 2560A supports interface messages marked with a ★.

Note

Difference between SDC and DCL

In multi-line messages, SDC messages are those that require talker or listener designation and DCL messages are those that do not require a designation. Therefore, SDC messages are directed at a particular instrument while DCL messages are directed at all instruments on the bus.

9

GP-IB Interface

10.1   Ethernet Interface Features and Specifications

Ethernet Interface Features

Reception Feature

- With the exception of turning the power switch on and off, you can use the reception feature to specify the same settings that you specify by using the front panel keys.
- The 2560A can receive panel setup parameters, error codes, and other output requests from a controller.
- The 2560A can receive status report commands.

Transmission Feature

The 2560A can transmit panel setup parameters, status byte, error codes that occur, and so on.

Ethernet Interface Specifications

Item	Specifications
Number of ports	1
Connector type	RJ-45 connector
Electrical and mechanical	IEEE802.3 compliant
Simultaneous connections	3
Transmission system	ETHERNET(100BASE-TX/10BASE-T)
Communication protocol	TCP/IP(VXI-11)
Supported services	VXI-11 server, DHCP client

Switching between Remote and Local Modes

When Switching from Local to Remote Mode

The 2560A switches to remote mode when it is in local mode and receives a
:COMMunicate:REMote ON command from the PC.

- The REMOTE indicator turns on.
- All dials and switches are disabled except for the flipping of the **OUTPUT** switch to the LOCAL side to change the 2560A to local mode.
- Settings entered in local mode are retained even when the 2560A switches to remote mode.

When Switching from Remote to Local Mode

When the 2560A is in remote mode and you flip the **OUTPUT** switch to the LOCAL side,
the 2560A switches to local mode. However, this does not work if the 2560A has received a
:COMMunicate:LOCKout ON command from the PC. The 2560A switches to local mode when it
receives a :COMMunicate:REMote OFF command from the PC, regardless of the local lockout
state.

- The REMOTE indicator turns off.
- Dials and switches can be used.
- Settings entered in remote mode are retained even when the 2560A switches to local mode.

Note

You cannot use the Ethernet interface simultaneously with other interfaces (GP-IB or USB).

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Ethernet Interface

10.2 Connecting to the Ethernet Interface

Connection Method

Connect a UTP (Unshielded Twisted-Pair) or STP (Shielded Twisted-Pair) cable that is connected to a hub or other network device to the Ethernet port on the 2560A rear panel.

Hub or router that supports 100BASE-TX/10BASE-T

PC

UTP or STP cable (straight cable)

Network card

2560A

Ethernet port

RJ-45 modular jack
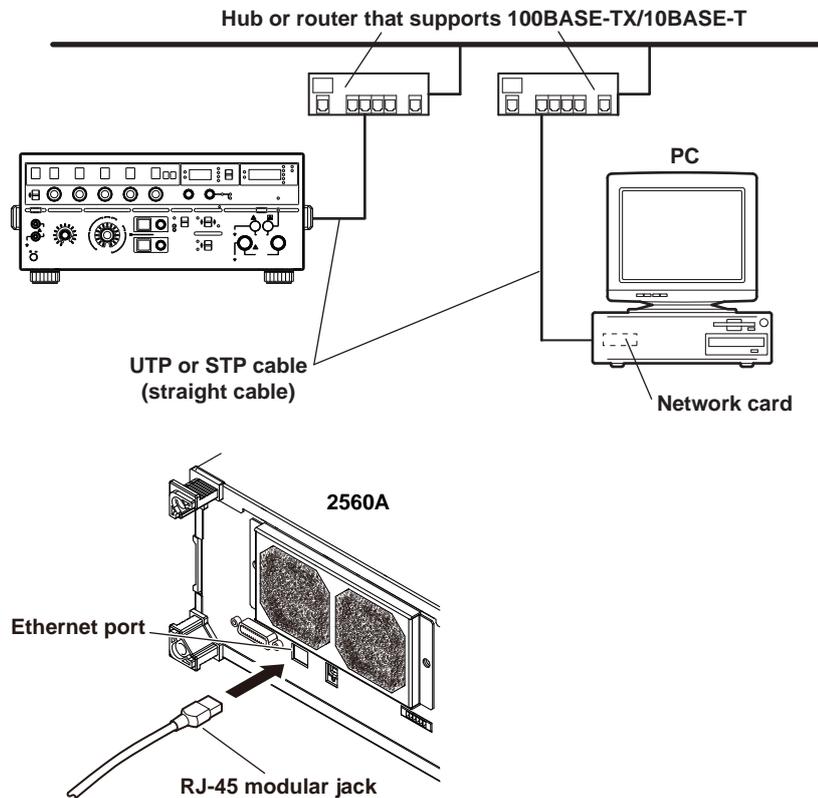
Notes on Connection

- To connect the 2560A to a PC through a hub or router, use straight cables. To directly connect the 2560A to a PC (one-to-one connection), use a crossover cable.
- Use a network cable that supports the data rate of your network.

10.3 Configuring the 2560A Ethernet Settings

1. Turn the **RANGE** dial to select SETUP.

The SETUP menu appears.

1. Select SETUP.
The SETUP indicator turns on.

RANGE dial
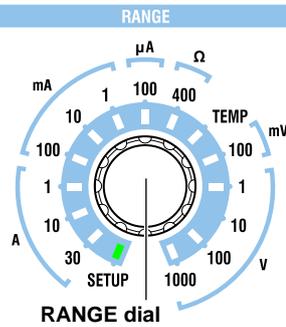
Selecting the Ethernet Interface

2. Turn a **main setting** dial to select LAN.

"NEXT" appears on the deviation display. All the PRESET indicators turn on.

3. Flip the **PRESET** switch down.

The LAN menu appears. All the PRESET indicators turn off.

PRESET indicator

Main setting dials (use any)
2. Select LAN

PRESET switch
3. Display the LAN menu.

10

Ethernet Interface
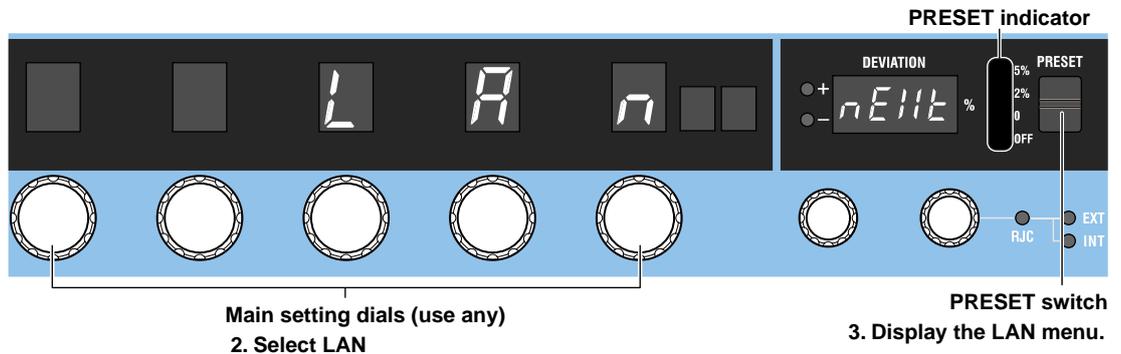
Turning DHCP On and Off

4. Turn a **main setting** dial to select DHCP.

The deviation display shows the current DHCP setting.

5. Turn a **deviation dial** to select ON or OFF.
- When you change the setting, all PRESET indicators turn on.
- If you decide not to change the setting, step 6 is not necessary.

6. Flip the **PRESET** switch down.

The setting is confirmed. All the PRESET indicators turn off.

Main setting dials (use any)
4. Select DHCP.

Deviation dials (either)
5. Select ON or OFF.

PRESET switch
6. Confirm the settings.
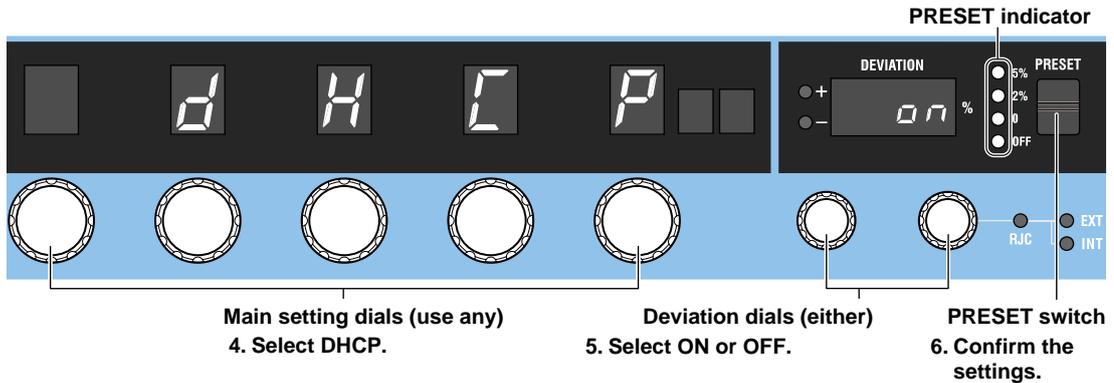
Setting the IP Address, Subnet Mask, and Default Gateway

4. Turn the four left main setting dials to select IP (IP address), MASK (subnet mask), or GATE (default gateway).

5. Turn the right-most **main setting** dial to select the octet number (1 to 4) you want to set.
- The deviation display shows the current octet setting of the IP, MASK, or GATE.
- When octet number 1 is selected, turning the right-most main setting dial to the left shows the previous SETUP menu. When octet number 4 is selected, turning the right-most main setting dial to the right shows the next SETUP menu.

6. Turn the **deviation** dials to set the value of the selected octet.
- When you change the setting, all PRESET indicators turn on.
- If you decide not to change the setting, step 7 is not necessary.

7. Flip the **PRESET** switch down.

The setting is confirmed. All the PRESET indicators turn off.

Displays the octet number

PRESET indicator

Four left main setting dials
4. Select IP, MASK, or GATE.

Right-most main setting dial
5. Select the octet number you want to set.

Deviation dials
6. Set the value of the selected octet.

PRESET switch
7. Confirm the settings.
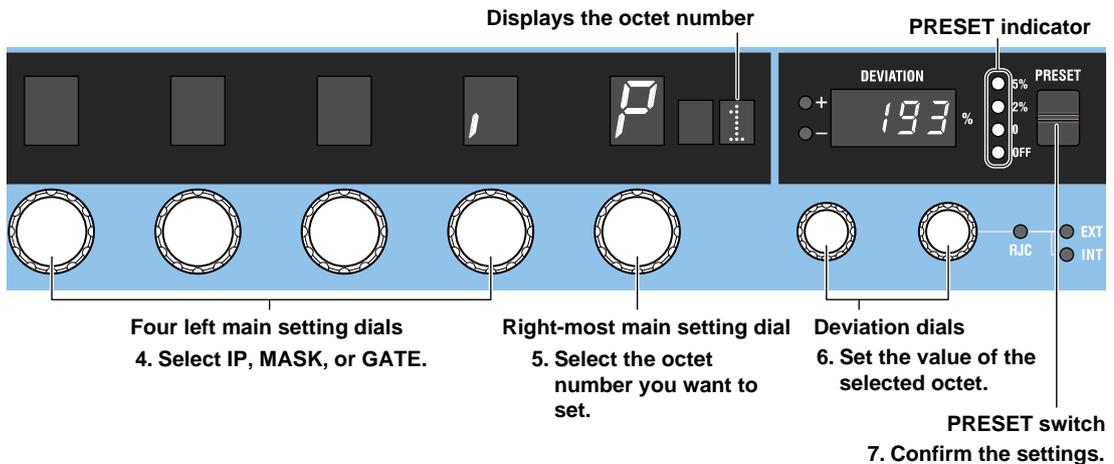
8. Repeat steps 5 through 7 to set the four octets.

9. Repeat steps 4 through 8 to set IP, MASK, or GATE.

Displaying the MAC Address

4. Turn a **main setting** dial to select MAC.

The deviation display and output display show the current DHCP setting.

Displays the second and third octets of the MAC address

Displays the fourth to the sixth octets of the MAC address

Main setting dials (use any)
4. Select MAC.
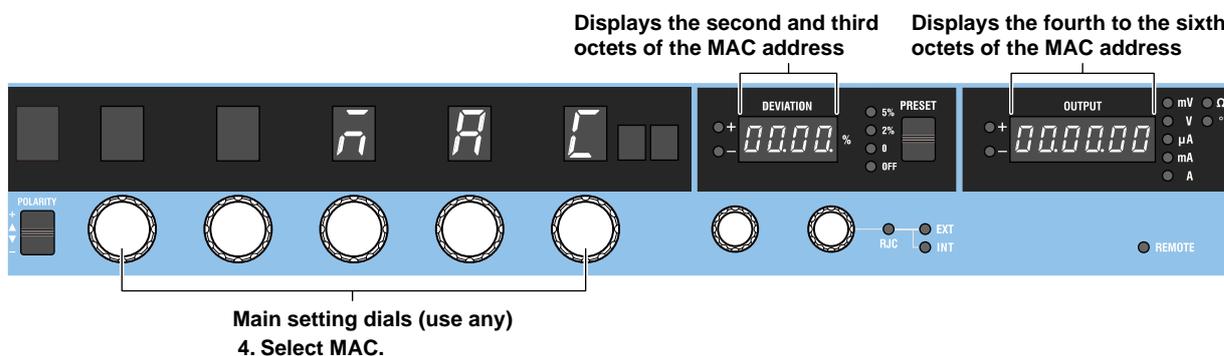
Explanation

To use the Ethernet interface, you must specify TCP/IP settings.

DHCP

DHCP is a protocol that temporarily allocates necessary information to a device so that it can connect to the Internet.

ON

If you are connecting the 2560A to a network with a DHCP server, you can turn on the DHCP setting. If you do, the IP address will be automatically assigned to the 2560A when it is connected to the network, so you do not have to set the address.

OFF

If you set DHCP to OFF, set the appropriate IP address, subnet mask, and default gateway for your network.

IP Address, Subnet Mask, and Default Gateway

The 2560A displays the IP address, subnet mask, and default gateway in the following manner.

IP address display example

Octet number (shown on the unit display)	Each octet value (shown on the deviation display)
1	192.
2	168.
3	0.
4	1

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Ethernet Interface

MAC Address

The MAC address is a unique ID number assigned to an Ethernet card installed in a device. It is 12 characters long, with each character ranging from a to f and 0 to 9. MAC addresses are expressed in octets in hexadecimal notation.

If the MAC address is 00.00.12.34.56.78, the second to the sixth octets are shown as follows: the deviation display shows 00.12, and the output display shows 34.56.78. The first octet is not shown.

Note

Only use a single communication interface: USB, GP-IB, or Ethernet. If you send commands simultaneously from more than one communication interface, the 2560A will not execute the commands properly.

11.1   USB Interface Features and Specifications

USB Interface Features

Reception Feature
- With the exception of turning the power switch on and off, you can use the reception feature to specify the same settings that you specify by using the front panel keys.
- The 2560A can receive panel setup parameters, error codes, and other output requests from a controller.
- The 2560A can receive status report commands.

Transmission Feature
The 2560A can transmit panel setup parameters, status byte, error codes that occur, and so on.

USB Interface Specifications

Item	Specifications
Number of ports	1
Connector type	Type B connector (receptacle)
Electrical and mechanical	Complies with USB Rev. 2.0
Supported transfer modes	HS (High Speed; 480 Mbps) and FS (Full Speed; 12 Mbps)
Supported protocols	USBTMC-USB488(USB Test and Measurement Class Ver.1.0)

Switching between Remote and Local Modes

When Switching from Local to Remote Mode
The 2560A switches to remote mode when it is in local mode and receives a
:COMMunicate:REMote ON command from the PC.
- The REMOTE indicator turns on.
- All dials and switches are disabled except for the flipping of the **OUTPUT** switch to the LOCAL side to change the 2560A to local mode.
- Settings entered in local mode are retained even when the 2560A switches to remote mode.

When Switching from Remote to Local Mode
When the 2560A is in remote mode and you flip the **OUTPUT** switch to the LOCAL side, the 2560A switches to local mode. However, this does not work if the 2560A has received a :COMMunicate:LOCKout ON command from the PC. The 2560A switches to local mode when it receives a :COMMunicate:REMote OFF command from the PC, regardless of the local lockout state.
- The REMOTE indicator turns off.
- Dials and switches can be used.
- Settings entered in remote mode are retained even when the 2560A switches to local mode.

Note
You cannot use the USB interface simultaneously with other interfaces (GP-IB or Ethernet).

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USB Interface

11.2 Connecting through the USB Interface

Connection Method

Connect the cable as shown below.
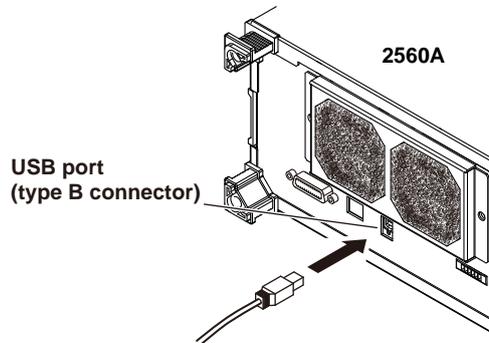
Notes on Connection

*   Be sure to insert the USB cable connector firmly into the USB port.
*   Do not connect or remove the USB cable from the time when the 2560A is turned on until operation becomes available (approximately 20 to 30 seconds). Doing so may damage the 2560A.

11.3 Configuring the 2560A USB Interface

1. Turn the **RANGE** dial to select SETUP.

The SETUP menu appears.

1. Select SETUP.
The SETUP indicator turns on.

RANGE dial

Selecting the Remote Control Feature

2. Turn a **main setting** dial to select USB.

The deviation display shows the current USB feature.

3. Turn a **deviation dial** to select TMC.

- When you change the setting, all PRESET indicators turn on.
- If you decide not to change the setting, step 4 is not necessary.

4. Flip the **PRESET** switch down.

The setting is confirmed. All the PRESET indicators turn off.

PRESET indicator

Main setting dials (use any)
2. Select USB.

Deviation dials (either)
3. Select TMC.

PRESET switch
4. Confirm the settings.

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USB Interface

Explanation

Set the USB communication feature to remote control.
Select the TMC option.

Note

- Only use a single communication interface: USB, GP-IB, or Ethernet. If you send commands simultaneously from more than one communication interface, the 2560A will not execute the commands properly.
- Install the YOKOGAWA USB TMC (Test and Measurement Class) driver on your PC. For information about how to obtain the YOKOGAWA USB TMC driver, contact your nearest YOKOGAWA dealer. You can also access the YOKOGAWA USB driver download web page and download the driver. http://tmi.yokogawa.com/
- Do not use USB TMC drivers (or software) supplied by other companies.

12.1   Messages

Messages

Messages are used to exchange information between the controller and the 2560A. Messages that are sent from the controller to the 2560A are called program messages, and messages that are sent from the 2560A back to the controller are called response messages. If a program message contains a command that requests a response (a query), the 2560A returns a response message upon receiving the program message. The 2560A returns a single response message in response to a single program message.

Program Messages

The program message format is shown below.

<Program Message Unit>
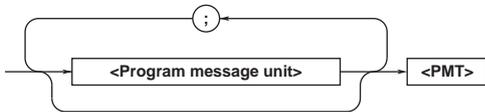
A program message consists of one or more program message units. Each unit corresponds to one command. The 2560A executes the commands in the order that they are received.

Separate each program message unit with a semicolon.

For details on the program message syntax, see the next section.

Example

```
:SOURce:FUNCtion VOLTage; :SOURce:LEVel 1V
         Unit                  Unit
```

<PMT>

This is a program message terminator. The following three types are available.

NL (new line): Same as LF (line feed). ASCII code "0AH."

^END: The END message as defined by IEEE 488.1
               (The data byte that is sent with the END message is the last data byte of the program message.)

NL^END: NL with an END message attached.
               (NL is not included in the program message.)

Program Message Unit Syntax

The program message unit syntax is shown below.

<Program Header>
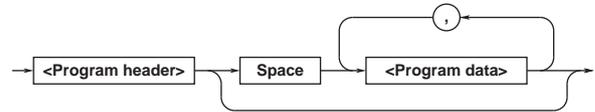
The program header indicates the command type. For details, see section 12.2.

<Program Data>

Attach program data if there are conditions that are required to execute a command. Separate the program data from the header with a space (ASCII code 20H). If there are multiple sets of program data, separate each set with a comma.

For details, see section 12.4.

Example

```
:SOURce:LEVel 1V<PMT>
     Header   Data
```

Response Messages

The response message syntax is as follows:

<Response Message Unit>
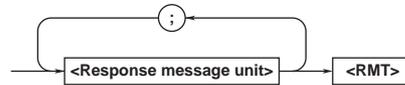
A response message consists of one or more response message units. Each unit corresponds to one response.

Separate each response message unit with a semicolon.

For details on the response message syntax, see the next page.

Example

Unit 1
```
:SOURCE:FUNCTION VOLTAGE;
RANGE 10V
```
Unit 2

<RMT>

RMT is a response message terminator. It is NL^END.

12

Programming Overview

Response Message Unit Syntax

The response message unit syntax is as follows:

<Response Header>
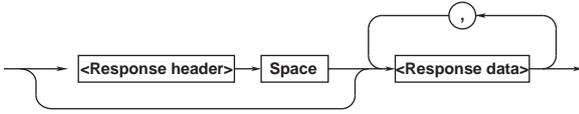
A response header sometimes precedes the response data. Separate the data from the header with a space. For details, see section 12.3.

<Response Data>

Response data contains the content of the response. If there are multiple sets of response data, separate each set with a comma. For details, see section 12.3.

Example

```
100.00E-03<RMT>  :SOURCE:FUNCTION VOLTAGE<RMT>
```

    Data   Header   Data

If there are multiple queries in a program message, responses are returned in the same order that the queries were received in. In most cases, a single query returns a single response message unit, but there are a few queries that return multiple units. The first response message unit always corresponds to the first query, but the nth response unit may not necessarily correspond to the nth query. Therefore, if you want to make sure that every response is retrieved, divide the program messages into individual messages.

Notes on Sending and Receiving Messages

- If the controller sends a program message that does not contain a query, the controller can send the next program message at any time.
- If the controller sends a program message that contains a query, the controller must finish receiving the response message before it can send the next program message. If the controller sends the next program message before receiving the response message in its entirety, an error will occur. A response message that is not received in its entirety will be discarded.
- If the controller tries to receive a response message when there is none, an error will occur. If the controller tries to receive a response message before the transmission of the program message is complete, an error will occur.

- If the controller sends a program message containing multiple message units, but the message contains incomplete units, the 2560A will try to execute the ones that are believed to be complete. However, these attempts may not always be successful. In addition, if such a message contains queries, the 2560A may not necessary return responses.

Deadlock

The 2560A can store at least 1024 bytes of messages in its transmit and receive buffers (the number of available bytes varies depending on the operating conditions). If both the transmit and receive buffers become full at the same time, the 2560A will no longer be able to operate. This condition is called a deadlock. If this happens, you can resume operation by discarding response messages.

Deadlock will not occur if the program message (including the <PMT>) is kept below 1024 bytes. Program messages that do not contain queries never cause deadlocks.

12.2 Commands

Commands

There are three types of commands (program headers) that a controller may send to the 2560A. The commands differ in their program header formats.

Common Command Header

Commands that are defined in IEEE 488.2-1992 are called common commands. The common command header syntax is shown below. Be sure to include an asterisk (*) at the beginning of a common command.
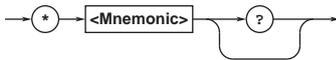
Common command example *CLS

Compound Header

Commands, other than common commands, that are specific to the 2560A are classified and arranged in a hierarchy according to their functions. The compound header syntax is shown below. Be sure to use a colon to specify a lower hierarchical level.
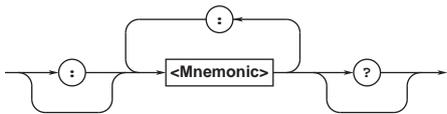
Compound header example :SOURce:FUNCtion

Simple Header

These commands are functionally independent and are not contained within a hierarchy. The format of a simple header is shown below.

Simple header example :OUTPut

> *Note*
> A <mnemonic> is an alphanumeric character string.

When Concatenating Commands

- **Command Groups**
  A command group is a group of commands that have common compound headers arranged in a hierarchy. A command group may contain sub-groups.
  Example Communication interface group
  :SYSTem:COMMunicate:GPIB:ADDRess
  :SYSTem:COMMunicate:ETHernet:DHCP
  :SYSTem:COMMunicate:ETHernet:IP
  :SYSTem:COMMunicate:USB:FUNCtion
  :SYSTem:RJC:RESister

- **When Concatenating Commands of the Same Group**
  The 2560A stores the hierarchical level of the command that is currently being executed and processes the next command on the assumption that it belongs to the same level. Therefore, the common header section can be omitted for commands that belong to the same group.
  Example
  :SYSTem:COMMunicate:ETHernet:DHCP OFF;
  IP "10.0.5.8"<PMT>

- **When Concatenating Commands of Different Groups**
  If the subsequent command does not belong to the same group, place a colon in front of the header (this colon cannot be omitted).
  Example
  :SOURce:FUNCtion VOLTage;
  :SYSTem:COMMunicate:USB:FUNCtion TMC<PMT>

- **When Concatenating Simple Headers**
  If a simple header follows another command, place a colon in front of the simple header (this colon cannot be omitted).
  Example
  :SOURce:LEVel 1V;:OUTPut ON<PMT>

- **When Concatenating Common Commands**
  Common commands that are defined in IEEE 488.2-1992 are independent of hierarchy. A colon is not needed before a common command.
  Example
  :SOURce:RANGe 10V ;*CLS;
  :SOURce:LEVel 1V<PMT>

- **When Separating Commands with <PMT>**
  If you separate two commands with a terminator, two program messages will be sent. Therefore, the common header must be specified for each command even when commands belonging to the same command group are being concatenated.
  Example
  :SOURce:FUNCtion VOLTage<PMT>:
  SOURCE:RANGE 10V<PMT>

Upper-level Query

An upper-level query is a query that is made by appending a question mark to a command higher in the group. The controller can receive all of the settings in a group collectively by executing a highest-level query. Some upper-level queries of a group, which may be comprised of more than three hierarchical levels, can cause the 2560A to transmit all the lower level settings.

The response to an upper-level query can be sent back to the 2560A as a program message. This enables the settings that were present when the upper-level query was made to be reproduced later on. However, some upper-level queries do not return setup parameters that are not currently in use. Exercise caution because not all of a group's information is necessarily returned in a response.

Header Interpretation Rules

The 2560A interprets the header that it receives according to the rules below.

- Mnemonics are not case sensitive.
  Example
    "SOURce" can also be written as "source" or "SOURCE."
- The lower-case characters can be omitted.
  Example
    "SOURce" can also be written as "SOURc" or "SOUR."
- The question mark at the end of a header indicates that it is a query. You cannot omit the question mark.
  Example
    The shortest abbreviation for "SYSTem?" is "SYST?."
- Parts of commands and parameters enclosed in square brackets ([ ]) can be omitted.
  Example
    :OUTPut[:STATe] ON
    can also be written as "OUTP ON."
  However, the last section enclosed in square brackets cannot be omitted in an upper-level query.
  Example
    "SYSTem?" and "SYSTem:COMMunicate?" are different queries.

12.3 Responses

Responses

When the controller sends a query with a question mark, the 2560A returns a response message to the query. The 2560A returns response messages in one of the following two forms.

- **Response Consisting of a Header and Data**
  Responses that can be used as program messages without any changes are returned with command headers attached.
  Example
  ```
  :SOURce:FUNCtion?<PMT>
  ->:SOURCE:FUNCTION VOLTAGE<RMT>
  ```

- **Response Only Consisting of Data**
  Responses that cannot be used as program messages unless changes are made (query-only commands) are returned without headers. However, there are query-only commands whose responses the 2560A will attach headers to.
  Example
  ```
  :SOURce:RTD:SETTing?<PMT> ->
  "    0.0,  850.0, 1.0000000000e+02,
  3.9083000000e-01,-5.7750000000e-05,
  0.0000000000e+00, 0.0000000000e+00,
  0.0000000000e+00, 0.0000000000e+00,
  0.0000000000e+00, 0.0000000000e+00,
  0.0000000000e+00, 0.0000000000e+00,
  0.0000000000e+00, 0.0000000000e+00,
  0.0000000000e+00, 0.0000000000e+00,
  0.0000000000e+00, 0.0000000000e+00,
  0.0000000000e+00, 0.0000000000e+00,
  0.0000000000e+00, 0.0000000000e+00"
  <RMT>
  ```

If You Want the 2560A to Return Responses without Headers

You can configure the 2560A so that even responses that have both headers and data are returned without headers. Use the `COMMunicate:HEADer` command for this purpose.

Abbreviated Form

The 2560A normally returns response headers with the lower-case section removed. You can configure the 2560A so that full headers are returned. Use the `COMMunicate:VERBose` command for this purpose. The sections enclosed in square brackets ([]) are also omitted in the abbreviated form.

12.4 Data

Data

Data contains conditions and values that are written after the header. A space separates the data from the header. Data is classified as follows:

Data	Meaning
<Decimal>	A value expressed in decimal notation
<Voltage><Current> <Resistance> <Temperature> <Time>	A physical value (Example: Voltage range setting ->:SOURce:RANGe 30V
<Register>	A register value expressed as binary, octal, decimal, or hexadecimal (Example: Extended event register value ->:STATUS:EESE #HFE)
<Character Data>	Predefined character string (mnemonic). Select from the available strings in braces { }. (Example: Select the source function ->:SOURce:FUNCtion {VOLTage| CURRent})
<Boolean>	Indicates on and off. Specify ON, OFF, or a value. (Example: Turn the output on. ->:OUTPut:STATe ON)
<String Data>	User-defined string (Example: Ethernet IP address setting ->:SYSTem:COMMunicate:ETHernet: IP "192.168.0.1")
<Block Data>	Data that contains 8-bit values

<Decimal>

<Decimal> indicates a value expressed as a decimal number, as shown in the table below. Decimal values are written in the NR form as specified in ANSI X3.42-1975.

Symbol	Meaning	Example		
<NR1>	Integer	125	-1	+1000
<NR2>	Fixed-point number	125.0	-.90	+001.
<NR3>	Floating-point number	125.0E+0	-9E-1	+.1E4
<NRf>	Any of the forms <NR1> to <NR3>			

- The 2560A can receive decimal values that are sent from the controller in any of the forms <NR1> to <NR3>. This is expressed as <NRf>.
- The 2560A returns a response to the controller in one of the forms from <NR1> to <NR3> depending on the query. The same form is used regardless of the size of the value.
- For the <NR3> form, the plus sign after the "E" can be omitted. You cannot omit the minus sign.
- If a value outside the range is entered, the value is adjusted to the closest value within the range.
- If a value has more significant digits than are available, the value will be rounded.

<Voltage>, <Current>, <Resistance>, <Temperature>, and <Time>

<Voltage>, <Current>, <Resistance>, <Temperature>, and <Time> indicate decimal values that have physical significance. A <Multiplier> or <Unit> can be attached to the form that was described earlier. Use one of the following syntaxes.

Syntax	Example
<NRf><Multiplier><Unit>	5MV
<NRf><Unit>	5E-3V
<NRf><Multiplier>	5M
<NRf>	5E-3

<Multiplier>

Multipliers that you can use are indicated in the following table.

Symbol	Word	Multiplier
EX	Exa	10^{18}
PE	Peta	10^{15}
T	Tera	10^{12}
G	Giga	10^{9}
MA	Mega	10^{6}
K	Kilo	10^{3}
M	Milli	10^{-3}
U	Micro	10^{-6}
N	Nano	10^{-9}
P	Pico	10^{-12}
F	Femto	10^{-15}

<Unit>

Units that you can use are indicated in the following table.

Symbol	Word	Meaning
V	Volt	Voltage
A	Ampere	Current
OHM	Ohm	Resistance
CEL	Celsius	Temperature °C
FAR	Fahrenheit	Temperature °F (only on models with the -UF suffix code)
S	Second	Time

- <Multiplier> and <Unit> are not case sensitive.
- "U" is used to indicate micro (μ).
- "MA" is used for Mega to distinguish it from Milli. However, "MA" is interpreted as milliampere for current.
- If both <Multiplier> and <Unit> are omitted, the basic unit (V, A, or S) is used.

<Register>

<Register> indicates an integer, and can be expressed in hexadecimal, octal, or binary as well as a decimal number. This is used when each bit of the value has a particular meaning. Use one of the following syntaxes.

Syntax	Example
<NRf>	1
#H<Hexadecimal value made up of the digits 0 to 9 and A to F>	#H0F
#Q<Octal value made up of the digits 0 to 7>	#Q777
#B<Binary value made up of the digits 0 and 1>	#B001100

• <Register> is not case sensitive.
• Response messages are always expressed in the <NR1> form.

<Character Data>

<Character Data> is a specified string of character data (a mnemonic). It is mainly used to indicate options and is chosen from the character strings given in { }. The data interpretation rules are the same as those described in "Header Interpretation Rules" in section 12.2.

Syntax	Example
{VOLTage|CURRent}	VOLTage

• As with the header, the COMMunicate:VERBose command can be used to select whether to return the response in the full form or in the abbreviated form.
• The COMMunicate:HEADer setting does not affect <Character data>.

<Boolean>

<Boolean> is data that indicates ON or OFF. Use one of the following syntaxes.

Syntax	Example
{ON|OFF|<NRf>}	ON OFF 1 0

• When <NRf> is expressed in the form, OFF is selected if the rounded integer value is "0" and ON is selected for all other cases.
• A response message is always returned with a "1" if the value is ON and with a "0" if the value is OFF.

<String Data>

<String data> is not a specified character string like <Character data>. It is an arbitrary character string. The character string must be enclosed in single quotation marks (') or double quotation marks (").

Syntax	Example
<String Data>	'ABC' "IEEE488.2-1992"

• If a character string contains a double quotation mark ("), the double quotation mark is expressed as two consecutive quotation marks (""). This rule also applies to single quotation marks.

• A response message is always enclosed in double quotation marks (").
• <String data> is any character string. Therefore, the instrument assumes that the remaining program message units are part of the character string if no closing single (') or double quotation mark (") is encountered. As a result, no error is detected if a quotation mark is omitted.

<Block Data>

<Block data> contains 8-bit values. It is only used in response messages on the 2560A. The syntax is as follows:

Syntax	Example
#N<N-digit decimal number><Data byte sequence>	#800000010ABCDEFGHIJ

• #N
Indicates that the data is <Block data>. N indicates the number of succeeding data bytes (digits) in ASCII code.
• <N-digit decimal number>
Indicates the number of bytes of data (example: 00000010 = 10 bytes).
• <Data byte sequence>
Expresses the actual data (example: ABCDEFGHIJ).
• Data is comprised of 8-bit values (0 to 255). This means that the ASCII code "0AH," which stands for "NL," can also be included in the data. Hence, care must be taken when programming the controller.

12

Programming Overview

12.5 Synchronization with the Controller

Overlap Commands and Sequential Commands

There are two types of commands: overlap and sequential.

With overlap commands, the execution of the next command may start before the execution of the previous command is finished.

With sequential commands, the execution of the next command is held until the execution of the previous command is finished (even if multiple commands are sent consecutively).

All 2560A commands are sequential commands. However, even sequential commands sometimes require synchronization. For example, if the output value is changed and then measured immediately with a measuring instrument, the measured value may have not yet reached the final value. If this happens, you must use the following method to synchronize to the point in time when the new output value is reached.

Achieving Synchronization without Using Overlap Commands

- **Using the `STATus:CONDition?` Query**
  `STATus:CONDition?` is used to query the contents of the condition register (see section 14.4). You can determine whether approximately 500 ms (response time of the 2560A) has elapsed after the output value is changed by reading bit 3 of the condition register. If bit 3 of the condition register is 1, this indicates that approximately 500 ms has not elapsed since the output value was changed or the output was turned on. If the bit is 0, this indicates that approximately 500 ms has elapsed.
  Example
  `:SOURce:LEVel 10V<PMT>`
  `:STATus:CONDition?<PMT>`
  (Read the response. If the bit 3 is "1", return to the previous line.)
  Next command
  The next command is not executed until bit 3 in the condition register becomes "0".

- **Using the Extended Event Register**
  The changes in the condition register can be reflected in the extended event register (see section 14.4).
  Example
  `:STATus:FILTer4 FALL;:STATus:EESE 8;`
  `EESR?;*SRE 8;:SOURce:LEVel 10V<PMT>`
  (Read the response to `:STATus:EESR?`)
  (Wait for a service request)
  Next command
  The `STATus:FILTer4 FALL` command sets the transition filter so that bit 3 in the extended event is set to "1" when bit 3 in the condition register changes from "1" to "0".

  The `:STATus:EESE 4` command is used to only change the status byte based on bit 3 in the extended event register.
  The `:STATus:EESR?` command is used to clear the extended event register.
  The `*SRE 8` command is used to generate service requests based only on the changes in the extended event register bits.
  The next command is not executed until a service request is generated.

- **Using the `COMMunicate:WAIT` Command**
  The `COMMunicate:WAIT` command is used to wait for a specific event to occur.
  Example
  `:STATus:FILTer4 FALL;:STATus:EESR?;:`
  `:SOURce:LEVel 10V<PMT>`
  (Read the response to `:STATus:EESR?`)
  `:COMMunicate:WAIT #H0008<PMT>`
  Next command
  For a description of `:STATus:FILTer4 FALL` and `:STATus: EESR?`, see the previous section about the extended event register.
  The `:COMMunicate:WAIT #H0008` command specifies that the program will wait for bit 3 in the extended event register to be set to "1".
  The next command is not executed until bit 3 in the extended event register becomes "1".

13.1 List of Commands

Command	Function	Page
COMMunicate Group		
:COMMunicate?	Queries all communication settings.	13-4
:COMMunicate:HEADer	Sets or queries whether headers are attached to query responses.	13-4
:COMMunicate:LOCKout	Sets/clears local lockout.	13-4
:COMMunicate:REMote	Sets or queries whether the 2560A is in remote or local mode. On is remote mode.	13-4
:COMMunicate:VERBose	Sets or queries whether the response to a query is returned fully spelled out or in its abbreviated form.	13-4
:COMMunicate:WAIT	Waits for a specified extended event to occur.	13-4
:COMMunicate:WAIT?	Creates the response that is returned when a specified extended event occurs.	13-4
DEViation Group		
:DEViation?	Queries all deviation settings.	13-5
:DEViation:PRESet	Sets or queries the preset value.	13-5
:DEViation:VALue	Sets or queries the deviation.	13-5
DIVider Group		
:DIVider?	Queries all output divider settings.	13-6
:DIVider:DENominator	Sets or queries the denominator m of the output divider.	13-6
:DIVider:NUMerator	Sets or queries the numerator n of the output divider.	13-6
OUTPut Group		
:OUTPut[:STATe]	Sets or queries the output's on/off state.	13-7
:OUTPut:POLarity[:AUTO]	Sets or queries the polarity of the main setting for main setting (MAX) or main setting (MIN), whichever is selected.	13-7
:OUTPut:POLarity:MAXimum	Sets or queries the polarity of main setting (MAX).	13-7
:OUTPut:POLarity:MINimum	Sets or queries the polarity of main setting (MIN).	13-7
SOURce Group		
:SOURce?	Queries all source settings.	13-8
:SOURce:FUNCtion	Sets or queries the source function.	13-8
:SOURce:LEVel[:AUTO]	Sets or queries the main setting for main setting (MAX) or main setting (MIN), whichever is selected.	13-8
:SOURce:LEVel:MAXimum	Sets or queries the main setting (MAX).	13-9
:SOURce:LEVel:MINimum	Sets or queries the main setting (MIN).	13-9
:SOURce:RANGe	Sets or queries the voltage, current, or resistance range.	13-10
:SOURce:READ? [DUAL]	Queries the output value.	13-10
:SOURce:RJC?	Queries all reference junction compensation settings.	13-11
:SOURce:RJC:MODE	Sets or queries the reference junction compensation mode.	13-11
:SOURce:RJC:STATe?	Queries the reference junction compensation operating state.	13-11
:SOURce:RJC:TEMPerature?	Queries the reference junction compensation temperature.	13-12
:SOURce:RJC:TEMPerature:AUTO	Sets or queries the reference junction compensation temperature.	13-12
:SOURce:RJC:TEMPerature:EXTernal?	Queries the external reference junction temperature.	13-12
:SOURce:RJC:TEMPerature:INTernal?	Queries the 2560A's internal reference junction (2560A low voltage-current output terminal) temperature.	13-12
:SOURce:RJC:TEMPerature:MANual	Sets or queries the temperature for when the reference junction compensation mode is set to manual input.	13-12
:SOURce:RJC:RESister?	Queries the resistance of the RJ sensor to be used for the external reference junction for 0°C.	13-12
:SOURce:RTD?	Queries all user-defined RTD settings.	13-12
:SOURce:RTD:DEFine	Sets a user-defined RTD.	13-12
:SOURce:RTD:DELete	Deletes user-defined RTDs.	13-13
:SOURce:RTD:SETTing?	Queries all temperature range settings that are user-defined for the RTD.	13-13

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Commands

13.1 List of Commands

Command	Function	Page
`:SOURce:RTD:TYPE`	Sets or queries the type string for distinguishing user-defined RTDs.	13-13
`:SOURce:RTD:WRITe`	Writes a user-defined RTD.	13-13
`:SOURce:SCALe`	Sets or queries whether main setting (MAX) or main setting (MIN) is to be set.	13-13
`:SOURce:SLEVel[:AUTO]`	Sets or queries the main setting for main setting (MAX) or main setting (MIN), whichever is selected, with polarity information.	13-13
`:SOURce:SLEVel:MAXimum`	Sets or queries the main setting (MAX) with polarity information.	13-14
`:SOURce:SLEVel:MINimum`	Sets or queries the main setting (MIN) with polarity information.	13-14
`:SOURce:TCouple?`	Queries all user-defined thermocouple settings.	13-14
`:SOURce:TCouple:DEFine`	Sets a user-defined thermocouple.	13-14
`:SOURce:TCouple:DELete`	Deletes user-defined thermocouples.	13-14
`:SOURce:TCouple:SETTing?`	Queries all temperature range settings that are user-defined for the thermocouple.	13-14
`:SOURce:TCouple:TYPE`	Sets or queries the type string for distinguishing user-defined thermocouples.	13-15
`:SOURce:TCouple:WRITe`	Writes a user-defined thermocouple.	13-15
`:SOURce:TYPE`	Sets or queries the thermocouple or RTD type.	13-15

STATus Group

Command	Function	Page
`:STATus?`	Queries all the settings of the communication status feature.	13-16
`:STATus:CONDition?`	Queries the contents of the condition register.	13-16
`:STATus:EESE`	Sets or queries the extended event enable register.	13-16
`:STATus:EESR?`	Queries the contents of the extended event register and clears the register.	13-16
`:STATus:ERRor?`	Queries the error code and message of the last error that has occurred (top of the error queue).	13-16
`:STATus:FILTer<x>`	Sets or queries the transition filter.	13-16
`:STATus:QENable`	Sets or queries whether messages other than errors will be stored to the error queue (ON) or not (OFF).	13-16
`:STATus:QMESsage`	Sets or queries whether message information will be attached to the response to the STATus:ERRor? query (ON/OFF).	13-16

SWEep Group

Command	Function	Page
`:SWEep?`	Queries all sweep settings.	13-17
`:SWEep:DIRection`	Sweeps up or down or stops sweeping. Queries the sweep state.	13-17
`:SWEep:TIMe`	Sets or queries the sweep time.	13-17

SYSTem Group

Command	Function	Page
`:SYSTem?`	Queries all the system settings.	13-18
`:SYSTem:BEEP`	Sets or queries the beep sound on/off state.	13-18
`:SYSTem:COMMunicate?`	Queries all the communication settings.	13-18
`:SYSTem:COMMunicate:ETHernet?`	Queries all the Ethernet communication settings.	13-18
`:SYSTem:COMMunicate:ETHernet:DHCP`	Sets or queries the Ethernet DHCP on/off state.	13-18
`:SYSTem:COMMunicate:ETHernet:GATEway`	Sets or queries the Ethernet default gateway.	13-18
`:SYSTem:COMMunicate:ETHernet:IP`	Sets or queries the Ethernet IP address.	13-18
`:SYSTem:COMMunicate:ETHernet:MACaddress`	Sets or queries the Ethernet MAC address.	13-18
`:SYSTem:COMMunicate:ETHernet:MASK`	Sets or queries the Ethernet subnet mask.	13-18
`:SYSTem:COMMunicate:GPIB?`	Queries all the GP-IB communication settings.	13-19
`:SYSTem:COMMunicate:GPIB:ADDRess`	Sets or queries the GP-IB address.	13-19
`:SYSTem:COMMunicate:GPIB:TYPE`	Sets or queries the GP-IB command type.	13-19
`:SYSTem:COMMunicate:USB:FUNCtion`	Sets or queries the USB feature (USB-TMC/storage).	13-19
`:SYSTem:REBoot`	Restarts the 2560A when the specified time elapses.	13-19
`:SYSTem:RESolution`	Sets or queries the resolution mode.	13-19
`:SYSTem:RJC:RESister`	Sets or queries the resistance of the sensor to be used for the external reference junction for 0°C.	13-19
`:SYSTem:TEMPerature:MONitor`	Sets or queries the output value display mode for temperature sourcing.	13-19
`:SYSTem:UNIT`	Sets or queries the temperature unit.	13-19

Command	Function	Page

Common Command Group

Command	Function	Page
*CLS	Clears the standard event register, extended event register, and error queue.	13-20
*ESE	Sets or queries the standard event enable register.	13-20
*ESR?	Queries and clears the standard event register.	13-20
*IDN?	Queries the instrument model.	13-20
*OPC	Sets bit 0 (the OPC bit) of the standard event register to 1 upon the completion of the specified overlap command.	13-20
*OPC?	Returns ASCII code 1 when the specified overlap command is completed.	13-20
*OPT?	Queries the installed options.	13-20
*RST	Initializes settings.	13-20
*SRE	Sets or queries the service request enable register value.	13-21
*STB?	Queries the Status Byte Register value.	13-21
*TST?	Executes a self-test and queries the result.	13-21
*WAI	Holds the execution of the subsequent command until the specified overlap command is completed.	13-21

13

Commands

13.2 COMMunicate Group

The commands in this group deal with communications.

There are no front panel dials and switches that correspond to the commands in this group.

:COMMunicate?

Function	Queries all communication settings.
Syntax	`:COMMunicate?`

:COMMunicate:HEADer

Function	Sets or queries whether headers are attached to query responses.
Syntax	`:COMMunicate:HEADer <Boolean>`
	`:COMMunicate:HEADer?`
	ON|1: Headers are attached.
	OFF|0: Headers are not attached.
Example	`:COMMUNICATE:HEADER ON`
	`:COMMUNICATE:HEADER?`
	`-> :COMMUNICATE:HEADER 1`

:COMMunicate:LOCKout

Function	Sets/clears local lockout.
Syntax	`:COMMunicate:LOCKout <Boolean>`
	`:COMMunicate:LOCKout?`
Example	`:COMMUNICATE:LOCKOUT ON`
	`:COMMUNICATE:LOCKOUT?`
	`-> :COMMUNICATE:LOCKOUT 1`

:COMMunicate:REMote

Function	Sets or queries whether the 2560A is in remote or local mode. On is remote mode.
Syntax	`:COMMunicate:REMote <Boolean>`
	`:COMMunicate:REMote?`
	ON|1: Remote
	OFF|0: Local
Example	`:COMMUNICATE:REMOTE ON`
	`:COMMUNICATE:REMOTE?`
	`-> :COMMUNICATE:REMOTE 1`

:COMMunicate:VERBose

Function	Sets or queries whether the response to a query is returned fully spelled out or in its abbreviated form.
Syntax	`:COMMunicate:VERBose <Boolean>`
	`:COMMunicate:VERBose?`
	ON|1: Returned fully spelled out
	OFF|0: Returned in abbreviated form
Example	`:COMMUNICATE:VERBOSE ON`
	`:COMMUNICATE:VERBOSE?`
	`-> :COMMUNICATE:VERBOSE 1`
Description	• Example of a response fully spelled out
	`:CALIBRATE:RANGE 1.0E+00`
	• Example of a response in abbreviated form
	`:CAL:RANG 1.0E+00`

:COMMunicate:WAIT

Function	Waits for a specified extended event to occur.
Syntax	`:COMMunicate:WAIT <Register>`
	`<Register> = 0 to 65535`
Example	`:COMMUNICATE:WAIT #H0008`
Description	• For details on how to use the :COMMunicate:WAIT command to synchronize the 2560A, see section 12.5.
	• For details on the extended event register, see section 14.4.

:COMMunicate:WAIT?

Function	Creates the response that is returned when a specified extended event occurs.
Syntax	`:COMMunicate:WAIT? <Register>`
	`<Register> = 0 to 65535`
Example	`:COMMUNICATE:WAIT? 65535 -> 1`
Description	For details on the extended event register, see section 14.4.

13.3 DEViation Group

The commands in this group deal with deviation and preset settings. The commands correspond to the front panel deviation dials and PRESET switch.

:DEViation?

Function   Queries all deviation settings.

Syntax   DEViation?

:DEViation:PRESet

Function   Sets or queries the preset value.

Syntax   :DEViation:PRESet {<Percentage>|OFF}

           :DEViation:PRESet?

           <Percentage> = 0PCT|0, 2PCT|2, 5PCT|5

             0PCT|0:0.00%

             2PCT|2:2.00%

             5PCT|5:5.00%

           OFF: Presets are not used.

Example   :DEVIATION:PRESET 0PCT

           :DEVIATION:PRESET? -> 0

:DEViation:VALue

Function   Sets or queries the deviation.

Syntax   :DEViation:VALue {<Percentage>|

           MINimum|MAXimum}

           :DEViation:VALue?

           <Percentage>

           = -20.00PCT|-20.00 to 20.00PCT|20.00

             -20.00PCT|-20.00:-20.00%

             20.00PCT|20.00:20.00%

           MINimum: Minimum value (-20.00%)

           MAXimum: Maximum value (20.00%)

Example   :DEVIATION:VALUE -20.00

           :DEVIATION:VALUE? -> -20.00

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13.4 DIVider Group

The commands in this group deal with the output divider settings. The commands correspond to the front panel m and n dials.

:DIVider?

Function	Queries all output divider settings.
Syntax	`:DIVider?`

:DIVider:DENominator

Function	Sets or queries the denominator m of the output divider.
Syntax	`:DIVider:DENominator {<NRf>|MINimum|MAXimum}`
	`:DIVider:DENominator?`
	`<NRf>` = 4 to 15
	MINimum: 4
	MAXimum: 15
Example	`:DIVIDER:DENOMINATOR 4`
	`:DIVIDER:DENOMINATOR? -> 4`

:DIVider:NUMerator

Function	Sets or queries the numerator n of the output divider.
Syntax	`:DIVider:NUMerator {<NRf>|MINimum|MAXimum}`
	`:DIVider:NUMerator?`
	`<NRf>` = 0 to denominator m
	MINimum: 0
	MAXimum: Denominator m
Example	`:DIVIDER:NUMERATOR 4`
	`:DIVIDER:NUMERATOR? -> 4`

13.5 OUTPut Group

The commands in this group deal with the output on/off setting and polarity setting. The commands correspond to the front panel OUTPUT and POLARITY switches.

:OUTPut[:STATe]

Function   Sets or queries the output's on/off state.

Syntax   :OUTPut[:STATe] <Boolean>
         :OUTPut[:STATe]?
         ON|1: Enabled
         OFF|0: Disabled

Example   :OUTPUT:STATE ON
         :OUTPUT:STATE? -> :OUTPUT 1

Description If the source function is RJTemp and you set the output's on/off state, a "221: Setting conflict" error will occur. Set the source function with the :SOURce:FUNCtion command.

:OUTPut:POLarity[:AUTO]

Function   Sets or queries the polarity of the main setting for main setting (MAX) or main setting (MIN), whichever is selected.

Syntax   :OUTPut:POLarity[:AUTO] {NORMal|
         INVerted}
         :OUTPut:POLarity[:AUTO]?
         NORMal: Positive polarity
         INVerted: Negative polarity

Example   :OUTPUT:POLARITY:AUTO NORMAL
         :OUTPUT:POLARITY:AUTO?
         -> :OUTPUT:POLARITY:AUTO NORMAL

Description • If the source function is RJTemp and you set the polarity, a "221: Setting conflict" error will occur. NORMal is returned as a response to a query. Set the source function with the :SOURce:FUNCtion command.
           • If the output setting goes outside the selectable range of the source function range when you change the polarity, the output will turn off. In this condition, the output cannot be turned on.

:OUTPut:POLarity:MAXimum

Function   Sets or queries the polarity of main setting (MAX).

Syntax   :OUTPut:POLarity:MAXimum {NORMal|
         INVerted}
         NORMal: Positive polarity
         INVerted: Negative polarity

Example   :OUTPUT:POLARITY:MAXimum NORMal
         :OUTPUT:POLARITY:MAXimum?
         -> :OUTPUT:POLARITY:MAXimum NORMAL

Description If the source function is RJTEMP and you set the polarity, a "221: Setting conflict" error will occur. NORMal is returned as a response to a query.

:OUTPut:POLarity:MINimum

Function   Sets or queries the polarity of main setting (MIN).

Syntax   :OUTPut:POLarity:MINimum {NORMal|
         INVerted}
         NORMal: Positive polarity
         INVerted: Negative polarity

Example   :OUTPUT:POLARITY:MINimum NORMal
         :OUTPUT:POLARITY:MINimum?
         -> :OUTPUT:POLARITY:MINimum NORMAL

Description If the source function is RJTEMP and you set the polarity, a "221: Setting conflict" error will occur. NORMal is returned as a response to a query.

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13.6 SOURce Group

The commands in this group deal with setting the source function (voltage, current, thermocouple, RTD, resistance), setting the main setting, setting the reference junction compensation, and creating user-defined thermocouples and RTDs. The commands correspond to the front panel RANGE dial, TEMPERATURE dial, and main setting dials and the SCALE switch.

:SOURce?

Function   Queries all source settings.
Syntax   :SOURce?

:SOURce:FUNCtion

Function   Sets or queries the source function.
Syntax   :SOURce:FUNCtion {VOLTage|CURRent|
            TCouple|RTD|RESistance|RJTemp}
            :SOURce:FUNCtion?
            VOLTage: Voltage
            CURRent: Current
            TCouple: Thermocouple
            RTD: Resistance temperature detector
            RESistance: Resistance
            RJTemp: Reference junction temperature
            (reference junction compensation value)
Example   :SOURCE:FUNCTION VOLTAGE
            :SOURCE:FUNCTION? -> VOLTAGE
Description If the front panel is displaying the SETUP menu,
            "NONE" will be returned in response to a query.

:SOURce:LEVel[:AUTO]

Function   Sets or queries the main setting for main setting
            (MAX) or main setting (MIN), whichever is
            selected.
Syntax   :SOURce:LEVel[:AUTO]
            {<Voltage>|<Current>|
            <Temperature>|<Resistance>|MINimum|MAXim
            um}
            :SOURce:LEVel[:AUTO]?
            <Voltage>: Voltage
            <Current>: Current
            <Temperature>: Temperature
            <Resistance>: Resistance
            MINimum: Minimum value in the selectable
            range*
            MAXimum: Maximum value in the selectable
            range*
            * See "Description."
Example   :SOURCE:LEVEL:AUTO 10V
            :SOURCE:LEVEL:AUTO?
            -> :SOURCE:LEVEL:AUTO 10.0000E+00

Description 1. Even if you include the plus or minus sign in
            the setting with this :SOURce:LEVel[:AUTO]
            command, the polarity will not be set. The
            polarity follows the setting specified by the next
            command. The minimum and maximum values
            are also set to the absolute values of the
            minimum and maximum values for the polarity
            side set by the next command.
            :OUTPut:POLarity[:AUTO]
            :OUTPut:POLarity:MAXimum
            :OUTPut:POLarity:MINimum
         2. To set the value with the sign, use the
            :SOURce:SLEVel[:AUTO] command.
         3. Before setting <Voltage>, use the
            :SOURce:FUNCtion command to set the
            source function to VOLTage.
            Before setting <Current>, use the
            :SOURce:FUNCtion command to set the
            source function to CURRent.
            Before setting <Temperature>, use the
            :SOURce:FUNCtion command to set the
            source function to TCouple or RTD.
            Before setting <Resistance>, use the
            :SOURce:FUNCtion command to set the
            source function to RESistance.
            If you set a main setting of a different source
            function, a "131: Invalid suffix" error will occur.
         4. If the source function is RJTemp and you set
            the main setting, a "221: Setting conflict" error
            will occur. 9.91E+37 is returned as a response
            to a query.
         5. The selectable range changes depending
            on the range setting of the voltage, current,
            or resistance or the type setting of the
            thermocouple or RTD. Set the voltage, current,
            or resistance range with the :SOURce:RANGe
            command. Set the thermocouple or RTD type
            with the :SOURce:TYPE command.
         6. If the resolution mode is set to HIGH, the
            main setting can be set only when the source
            function is set to VOLTage or CURRent.
            Another digit is added to the resolution.

:SOURce:LEVel:MAXimum

Function	Sets or queries the main setting (MAX).

Syntax	`:SOURCe:LEVel:MAXimum {<Voltage>|`
	 `<Current>|<Temperature>|<Resistance>|MINi`
	 `mum|`
	 `MAXimum}`
	 `:SOURCe:LEVel:MAXimum?`
	 <Voltage>: Voltage
	 <Current>: Current
	 <Temperature>: Temperature
	 <Resistance>: Resistance
	 MINimum: Minimum value in the selectable range*
	 MAXimum: Maximum value in the selectable range*
	 * See "Description."

Example	`:SOURCE:LEVEL:MAXimum 10V` `:SOURCE:LEVEL:MAXimum? -> 10.0000E+00`
Description	1. Even if you include the plus or minus sign in the setting with this :SOURCe:LEVel:MAXimum command, the polarity will not be set. The polarity follows the setting specified by the next command. The minimum and maximum values are also set to the absolute values of the minimum and maximum values for the polarity side set by the next command. :OUTPut:POLarity[:AUTO] :OUTPut:POLarity:MAXimum 2. To set the value with the sign, use the :SOURce:SLEVel:MAXimum command. 3. For other notes, see items 3 to 6 in the description of the :SOURce:LEVel[:AUTO] command.

:SOURce:LEVel:MINimum

Function	Sets or queries the main setting (MIN).

Syntax	`:SOURCe:LEVel:MINimum {<Voltage>|`
	 `<Current>|<Temperature>|<Resistance>|MINi`
	 `mum|`
	 `MAXimum}`
	 `:SOURCe:LEVel:MINimum?`
	 <Voltage>: Voltage
	 <Current>: Current
	 <Temperature>: Temperature
	 <Resistance>: Resistance
	 MINimum: Minimum value in the selectable range*
	 MAXimum: Maximum value in the selectable range*
	 * See "Description."

Example	`:SOURCE:LEVEL:MINimum 0V` `:SOURCE:LEVEL:MINimum? -> 0.0E+00`
Description	1. Even if you include the plus or minus sign in the setting with this :SOURCe:LEVel:MINimum command, the polarity will not be set. The polarity follows the setting specified by the next command. The minimum and maximum values are also set to the absolute values of the minimum and maximum values for the polarity side set by the next command. :OUTPut:POLarity[:AUTO] :OUTPut:POLarity:MINimum 2. To set the value with the sign, use the :SOURce:SLEVel:MINimum command. 3. For other notes, see items 3 to 6 in the description of the :SOURce:LEVel[:AUTO] command.

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:SOURce:RANGe

Function	Sets or queries the voltage, current, or resistance range.
Syntax	:SOURce:RANGe {<Voltage>|<Current>|<Resistance>}
	:SOURce:RANGe?
	<Voltage>: 100mV, 1V, 10V, 100V, 1000V
	<Current>: 100uA, 1 mA, 10 mA, 100 mA, 1A, 10A, 30A
	<Resistance>: 400OHM
Example	:SOURCE:RANGE 1V
	:SOURCE:RANGE?
	-> :SOURCE:RANGE 1.0E+00
Description	• Before setting <Voltage>, use the :SOURce:FUNCtion command to set the source function to VOLTage.
	Before setting <Current>, use the :SOURce:FUNCtion command to set the source function to CURRent.
	Before setting <Resistance>, use the :SOURce:FUNCtion command to set the source function to RESistance.
	If you set range of a different source function, a "131: Invalid suffix" error will occur.
	• If the source function is TCouple, RTD, RJTemp and you set the range, a "221: Setting conflict" error will occur. 9.91E+37 is returned as a response to a query.
	• If you change the range, the output turns off.

:SOURce:READ? [DUAL]

Function	Queries the output value.
Syntax	:SOURce:READ?
	-> SOURce:READ <Data>

Data according to the source function is returned.

Source function	Data
VOLTage	Voltage
CURRent	Current
RESistance	Resistance
TCouple or RTD	Temperature

:SOURce:READ? DUAL
-> SOURce:READ <Data1>,<Data2>

Data1 and Data2 according to the source function is returned.

Source function	Data1	Data2
VOLTage	Voltage	Voltage
CURRent	Current	Current
RESistance	Resistance	Resistance
TCouple	Temperature	Thermo-electromotive force
RTD	Temperature	Resistance

Example	When the resolution mode is NORMal

:SOURCE:READ? ->
100 uA range
:SOURCE:READ 100.000E-06
1 mA range
:SOURCE:READ 1.00000-03
10 mA range
:SOURCE:READ 10.0000-03
100 mV or 100 mA range
:SOURCE:READ 100.000-03
1 V or 1 A range
:SOURCE:READ 1.00000+00
10 V or 10 A range
:SOURCE:READ 10.0000E+00
30 A range
:SOURCE:READ 30.0000E+00
100 V range
:SOURCE:READ 100.000E+00
1000 V range
:SOURCE:READ 1.00000E+03
400OHM range
:SOURCE:READ 400.00E+00
TCouple or RTD
:SOURCE:READ 1.0000E+03
When the output is OFF
:SOURCE:READ 9.91E+37

:SOURCE:READ? DUAL ->
100 uA range
:SOURCE:READ
100.000E-06,100.000E-06
1 mA range
:SOURCE:READ
1.00000E-03,1.00000E-03
10 mA range
:SOURCE:READ
10.0000E-03,10.0000E-03
100 mV or 100 mA range
:SOURCE:READ
100.000E-03,100.000E-03
1 V or 1 A range
:SOURCE:READ
1.00000E+00,1.00000E+00
10 V or 10 A range
:SOURCE:READ
10.0000E+00,10.0000E+00
30A range
:SOURCE:READ
30.0000E+00,30.0000E+00
100V range
:SOURCE:READ
100.000E+00,100.000E+00
1000V range
:SOURCE:READ
1.00000E+03,1.00000E+03
400OHM range
:SOURCE:READ 400.00E+00,400.00E+00
TCouple
:SOURCE:READ 1.0000E+03,40.2050E-03
RTD
:SOURCE:READ 100.00E+00,138.51E+00
When the output is OFF
:SOURCE:READ 9.91E+37,9.91E+37

When the resolution mode is HIGH

`:SOURCE:READ? ->`

100 uA range
`:SOURCE:READ 100.0000E-06`

1 mA range
`:SOURCE:READ 1.000000E-03`

10 mA range
`:SOURCE:READ 10.00000E-03`

100 mV or 100 mA range
`:SOURCE:READ 100.0000E-03`

1 V or 1 A range
`:SOURCE:READ 1.000000E+00`

10 V or 10 A range
`:SOURCE:READ 10.00000E+00`

30A range
`:SOURCE:READ 30.0000E+00`

100V range
`:SOURCE:READ 100.0000E+00`

1000V range
`:SOURCE:READ 1.000000E+03`

When the output is OFF
`:SOURCE:READ 9.91E+37`

`:SOURCE:READ? DUAL ->`

100 uA range
`:SOURCE:READ`
`100.0000E-06,100.0000E-06`

1 mA range
`:SOURCE:READ`
`1.000000E-03,1.000000E-03`

10 mA range
`:SOURCE:READ`
`10.00000E-03,10.00000E-03`

100 mV or 100 mA range
`:SOURCE:READ`
`100.0000E-03,100.0000E-03`

1 V or 1 A range
`:SOURCE:READ`
`1.000000E+00,1.000000E+00`

10 V or 10 A range
`:SOURCE:READ`
`10.00000E+00,10.00000E+00`

30A range
`:SOURCE:READ`
`30.0000E+00,30.0000E+00`

100V range
`:SOURCE:READ`
`100.0000E+00,100.0000E+00`

1000V range
`:SOURCE:READ`
`1.000000E+03,1.000000E+03`

When the output is OFF
`:SOURCE:READ 9.91E+37,9.91E+37`

:SOURce:RJC?

Function	Queries all reference junction compensation settings.
Syntax	`:SOURce:RJC?`

:SOURce:RJC:MODE

Function	Sets or queries the reference junction compensation mode.
Syntax	`:SOURce:RJC:MODE {AUTO|INTernal|MANual}`
	AUTO: Auto
	INTernal: Internal
	MANual: Manual input
Example	`:SOURCE:RJC:MODE INTERNAL`
	`:SOURCE:RJC:MODE?`
	`-> :SOURCE:RJC:MODE INTERNAL`
Description	The 2560A corrects the sourced thermoelectromotive force (RJC) according to the set mode.

• AUTO

If an external RJ sensor is detected, a correction is performed using the measured temperature of the external RJ sensor. Otherwise, a correction is performed using the temperature of the 2560A voltage-current output terminals (internal).

• INTernal

A correction is performed using the temperature of the 2560A low voltage-current output terminals (internal).

• MANual

A correction is performed using a manually input temperature. You can set the temperature from the 2560A front panel (see section 6.6 and chapter 4). You can also set it with the :SOURce:RJC:TEMPerature:MANual command. To not apply correction, set the temperature to 0°C.

:SOURce:RJC:STATe?

Function	Queries the reference junction compensation operating state.
Syntax	`:SOURce:RJC:STATe?`
	`-> {EXTernal|INTernal|MANual|OFF}`
	EXTernal: External
	INTernal: Internal
	MANual: Manual input
	OFF: When manual input is selected and the reference junction temperature is set to 0°C.
Example	`:SOURCE:RJC:STATE?`
	`-> :SOURCE:RJC:STATE EXTERNAL`

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Description If the reference junction compensation (RJC) mode is set to AUTO and an external RJ sensor is detected, EXTernal is returned. If an external RJ sensor is not detected, INTernal is returned. If the RJC mode is set to INTernal, INTernal is returned.
If the RJC mode is set to MANual and the manually input reference junction temperature is not 0°C, MANual is returned. If the temperature is set to 0°C, OFF is returned.

:SOURce:RJC:TEMPerature?

Function Queries the reference junction compensation temperature.
Syntax :SOURCE:RJC:TEMPerature?
Example :SOURCE:RJC:TEMPERATURE?
-> :SOURCE:RJC:TEMPERATURE:MANUAL 0.0
Description The manual-input reference junction temperature is returned.

:SOURce:RJC:TEMPerature:AUTO

Function Sets or queries the reference junction compensation temperature.
Syntax :SOURCE:RJC:TEMPerature:AUTO <Temperature>
:SOURCE:RJC:TEMPerature:AUTO?
Example :SOURCE:RJC:TEMPERATURE:AUTO 0.0
:SOURCE:RJC:TEMPERATURE:AUTO?
-> :SOURCE:RJC:TEMPERATURE:AUTO 0.0
Description • If the RJC mode is set to MANual, you can set the reference junction temperature. You can also query the value.
If the RJC mode is set to AUTO or INTernal, you cannot set the reference junction temperature. A "221: Setting conflict" error will occur. You can query the reference junction temperature.
• If the reference junction temperature is outside the measurement range, 9.9E+37 or –9.9E+37 is returned in response to a query.

:SOURce:RJC:TEMPerature:EXTernal?

Function Queries the external reference junction temperature.
Syntax :SOURCE:RJC:TEMPerature:EXTernal?
Example :SOURCE:RJC:TEMPERATURE:EXTernal?
-> :SOURCE:RJC:TEMPERATURE:EXTERNAL 0.0
Description If the reference junction temperature is outside the measurement range, 9.9E+37 or –9.9E+37 is returned.

:SOURce:RJC:TEMPerature:INTernal?

Function Queries the 2560A's internal reference junction (2560A low voltage-current output terminal) temperature.
Syntax :SOURCE:RJC:TEMPerature:INTernal?
Example :SOURCE:RJC:TEMPERATURE:INTernal?
-> :SOURCE:RJC:TEMPERATURE:INTERNAL 0.0
Description If the reference junction temperature is outside the measurement range, 9.9E+37 or –9.9E+37 is returned.

:SOURce:RJC:TEMPerature:MANual

Function Sets or queries the temperature for when the reference junction compensation mode is set to manual input.
Syntax :SOURCE:RJC:TEMPerature:MANual <Temperature>
:SOURCE:RJC:TEMPerature:MANual?
Example :SOURCE:RJC:TEMPERATURE:MANual 0.0
:SOURCE:RJC:TEMPERATURE:MANul?
-> :SOURCE:RJC:TEMPERATURE:MANUAL 0.0

:SOURce:RJC:RESister?

Function Queries the resistance of the RJ sensor to be used for the external reference junction for 0°C.
Syntax :SOURCE:RJC:RESister?
Example :SOURCE:RJC:RESISTER?
-> :SOURCE:RJC:RESISTER 100.00

:SOURce:RTD?

Function Queries all user-defined RTD settings.
Syntax :SOURce:RTD?

:SOURce:RTD:DEFine

Function Sets a user-defined RTD.
Syntax :SOURce:RTD:DEFine <String>
<String>: Definition of the relationship between the temperature range and resistance.
For details on string syntax, see appendix 6.
Example :SOURCE:RTD:DEFINE "-100.0,0.0,100.0,1.0"
Description • You can create a user definition for a single temperature range. To set multiple temperature ranges, repeat this command.
• After creating user definitions for the required temperature ranges, to source the resistance of the user-defined RTD, execute the commands in the following table.

:SOURCE:RTD:WRITE
Writes the user definitions to the 2560A's internal memory. The user definitions take effect.
:SOURCE:FUNCTION RTD
Sets the source function to RTD.
:SOURCE:TYPE USER
Sets the type to USER.
:OUTPUT:STATE ON
Finally, when you turn the output on, the 2560A sources the resistance of the user-defined RTD.

:SOURce:RTD:DELete

Function	Deletes user-defined RTDs.
Syntax	:SOURce:RTD:DELete
Example	:SOURCE:RTD:DELETE
Description	This command deletes all user definitions created with the :SOURce:RTD:DEFine command. To create a new user definition, delete existing user definitions with this command.

:SOURce:RTD:SETTing?

Function	Queries all temperature range settings that are user-defined for the RTD.
Syntax	:SOURce:RTD:SETTing?
Example	:SOURCE:RTD:SETTING? -> "...;100.0,200.0,100.00,-1.0E+3; ..."
Description	All the temperature range settings that have been user-defined are returned in a single character string with each setting delimited by a semicolon. For details on string syntax, see appendix 6.

:SOURce:RTD:TYPE

Function	Sets or queries the type string for distinguishing user-defined RTDs.
Syntax	:SOURce:RTD:TYPE <String> :SOURce:RTD:TYPE? <String>: No character or a single ASCII code character in the range of 20 to 7E (hexadecimal) For the characters that correspond to ASCII codes 20 to 7E, see appendix 9.
Example	:SOURCE:RTD:TYPE "p" :SOURCE:RTD:TYPE? -> :SOURCE:RTD:TYPE "p"
Description	If set to "No character," the two characters "°" and "C" will be displayed in the dot matrix LEDs of the 2560A front panel. If set to a single character, "°C" will be displayed in the first character of the dot matrix LEDs and the specified character in the second.

:SOURce:RTD:WRITe

Function	Writes a user-defined RTD.
Syntax	:SOURce:RTD:WRITe
Example	:SOURCE:RTD:WRITE
Description	The user definition set with the :SOURce:RTD:DEFine command is written to the 2560A's internal memory.

:SOURce:SCALe

Function	Sets or queries whether main setting (MAX) or main setting (MIN) is to be set.
Syntax	:SOURce:SCALe {MAXimum|MINimum} :SOURce:SCALe? MAXimum: Main setting (MAX) MINimum: Main setting (MIN)
Example	:SOURCE:SCALE MAXIMUM :SOURCE:SCALE? -> MAXIMUM

:SOURce:SLEVel[:AUTO]

Function	Sets or queries the main setting for main setting (MAX) or main setting (MIN), whichever is selected, with polarity information.
Syntax	:SOURce:SLEVel[:AUTO] {<Voltage>|<Current>|<Temperature>|<Resistance>|MINimum|MAXimum} :SOURce:SLEVel[:AUTO]? <Voltage>: Voltage <Current>: Current <Temperature>: Temperature <Resistance>: Resistance MINimum: Minimum value in the selectable range MAXimum: Maximum value in the selectable range
Example	:SOURCE:SLEVEL:AUTO -10V :SOURCE:SLEVEL:AUTO -> -10.0000E+00 MINimum: Minimum value in the selectable range MAXimum: Maximum value in the selectable range
Description	1. If you attach a minus sign to the setting, the polarity is set to negative. If you attach a plus sign or do not attach any sign, the polarity is set to positive. 2. To set the value without the sign, use the :SOURce:LEVel[:AUTO] command. 3. For other notes, see items 3 to 6 in the description of the :SOURce:LEVel[:AUTO] command.

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:SOURce:SLEVel:MAXimum

Function   Sets or queries the main setting (MAX) with
            polarity information.

Syntax   :SOURce:SLEVel:MAXimum {<Voltage>|
            <Current>|<Temperature>|<Resistance>|MINi
            mum|
            MAXimum}
            :SOURce:SLEVel:MAXimum?
            <Voltage>: Voltage
            <Current>: Current
            <Temperature>: Temperature
            <Resistance>: Resistance
            MINimum: Minimum value in the selectable range
            MAXimum: Maximum value in the selectable
            range

Example   :SOURCE:SLEVEL:MAXimum –10V
            :SOURCE:SLEVEL:MAXimum?
            -> –10.0000E+00

Description 1. If you attach a minus sign to the setting, the
            polarity is set to negative. If you attach a plus
            sign or do not attach any sign, the polarity is
            set to positive.
            2. To set the value without the sign, use the
            :SOURce:LEVel:MAXimum command.
            3. For other notes, see items 3 to 6 in the
            description of the :SOURce:LEVel[:AUTO]
            command.

:SOURce:SLEVel:MINimum

Function   Sets or queries the main setting (MIN) with
            polarity information.

Syntax   :SOURce:SLEVel:MINimum {<Voltage>|
            <Current>|<Temperature>|<Resistance>|MINi
            mum|
            MAXimum}
            :SOURce:SLEVel:MINimum?
            <Voltage>: Voltage
            <Current>: Current
            <Temperature>: Temperature
            <Resistance>: Resistance
            MINimum: Minimum value in the selectable range
            MAXimum: Maximum value in the selectable
            range

Example   :SOURCE:SLEVEL:MINimum 0V
            :SOURCE:SLEVEL:MINimum? -> 0.0E+00

Description 1. If you attach a minus sign to the setting, the
            polarity is set to negative. If you attach a plus
            sign or do not attach any sign, the polarity is
            set to positive.
            2. To set the value without the sign, use the
            :SOURce:LEVel:MINimum command.
            3. For other notes, see items 3 to 6 in the
            description of the :SOURce:LEVel[:AUTO]
            command.

:SOURce:TCouple?

Function   Queries all user-defined thermocouple settings.

Syntax   :SOURce:TCouple?

:SOURce:TCouple:DEFine

Function   Sets a user-defined thermocouple.

Syntax   :SOURce:TCouple:DEFine <String>
            <String>: Definition of the relationship between
            the temperature range and thermoelectromotive
            force.
            For details on string syntax, see appendix 6.

Example   :SOURCE:TCOUPLE:
            DEFINE "-100.0,0.0,-100.0,1.0"

Description • You can create a user definition for a single
            temperature range. To set multiple temperature
            ranges, repeat this command.
            • After creating user definitions for the
            required temperature ranges, to source the
            thermoelectromotive force of the user-defined
            thermocouple, execute the commands in the
            following table.

            :SOURCE:TCOUPLE:WRITE
              Writes the user definitions to the 2560A's
              internal memory. The user definitions take
              effect.
            :SOURCE:FUNCTION TCOUPLE
              Sets the source function to TCouple.
            :SOURCE:TYPE USER
              Sets the type to USER.
            :OUTPUT:STATE ON
              Finally, when you turn the output on, the
              2560A sources the thermoelectromotive
              force of the user-defined thermocouple.

:SOURce:TCouple:DELete

Function   Deletes user-defined thermocouples.

Syntax   :SOURce:TCouple:DELete

Example   :SOURCE:TCOUPLE:DELETE

Description This command deletes all user definitions created
            with the :SOURce:TCouple:DEFine command. To
            create a new user definition, delete existing user
            definitions with this command.

:SOURce:TCouple:SETTing?

Function   Queries all temperature range settings that are
            user-defined for the thermocouple.

Syntax   :SOURce:TCouple:SETTing?

Example   :SOURCE:TCOUPLE:SETTING?
            -> "...;100.0,200.0,1.0E+5,-1.0E+3;
               ..."

Description All the temperature range settings that have been
            user-defined are returned in a single character
            string with each setting delimited by a semicolon.
            For details on string syntax, see appendix 6.

:SOURce:TCouple:TYPE

Function   Sets or queries the type string for distinguishing
            user-defined thermocouples.
Syntax   :SOURce:TCouple:TYPE <String>
            :SOURce:TCouple:TYPE?
            <String>: No character or a single ASCII code
            character in the range of 20 to 7E (hexadecimal)
            For the characters that correspond to ASCII
            codes 20 to 7E, see appendix 9.
Example   :SOURCE:TCOUPLE:TYPE "k"
            :SOURCE:TCOUPLE:TYPE?
            -> :SOURCE:TCOUPLE:TYPE "k"
Description If set to "No character," the two characters "°" and
            "C" will be displayed in the dot matrix LEDs of the
            2560A front panel.
            If set to a single character, "°C" will be displayed
            in the first character of the dot matrix LEDs and
            the specified character in the second.

:SOURce:TCouple:WRITe

Function   Writes a user-defined thermocouple.
Syntax   :SOURce:TCouple:WRITe
Example   :SOURCE:TCOUPLE:WRITE
Description The user definition set with the
            :SOURce:TCouple:DEFine command is written to
            the 2560A's internal memory.

:SOURce:TYPE

Function   Sets or queries the thermocouple or RTD type.
Syntax   :SOURce:TYPE {R|S|B|J|T|E|K|N|C|A|
            PT100|USER}
Example   :SOURCE:TYPE B
            :SOURCE:TYPE? -> :SOURCE:TYPE B
Description Before setting the type, use the
            :SOURce:FUNCtion command to set the source
            function to TCouple or RTD. If the source function
            is VOLTage, CURRent, RESistance, or RJTemp
            and you set the type, a "221: Setting conflict"
            error will occur. "NONE" is returned as a response
            to a query.

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Commands

13.7 STATus Group

The commands in this group are used to make settings and queries related to the communication status feature.
There are no front panel dials and switches that correspond to the commands in this group.
For information about status reports, see chapter 14.

:STATus?
Function   Queries all the settings of the communication
            status feature.
Syntax   `:STATus?`

:STATus:CONDition?
Function   Queries the contents of the condition register.
Syntax   `:STATus:CONDition?`
Example   `:STATUS:CONDITION?`
            `-> :STATUS:CONDITION 16`
Description For information about the condition register, see
            chapter 14, "Status Reports."

:STATus:EESE
Function   Sets or queries the extended event enable
            register.
Syntax   `:STATus:EESE {<Register>}`
            `:STATus:EESE?`
            `<Register> = 0 to 65535`
Example   `:STATUS:EESE #7659`
            `:STATUS:EESE? -> :STATUS:EESE #7659`
Description For information about the extended event enable
            register, see chapter 14, "Status Reports."

:STATus:EESR?
Function   Queries the contents of the extended event
            register and clears the register.
Syntax   `:STATus:EESR?`
Example   `:STATUS:EESR? -> :STATUS:EESR 1`
Description For information about the extended event register,
            see chapter 14, "Status Reports."

:STATus:ERRor?
Function   Queries the error code and message of the last
            error that has occurred (top of the error queue).
Syntax   `:STATus:ERRor?`
Example   `:STATUS:ERROR?`
            `-> 113,"Undefined header"`

:STATus:FILTer<x>
Function   Sets or queries the transition filter.
Syntax   `:STATus:FILTer<x> {BOTH|FALL|NEVer|`
            `RISE}`
            `:STATus:FILTer<x>?`
            `<x> = 1 to 16`
Example   `:STATUS:FILTER2 RISE`
            `:STATUS:FILTER2?`
            `-> :STATUS:FILTER1 RISE`
Description • Set how each bit in the condition register must
            change to trigger the setting of an event. For
            example, if you specify RISE, a change from 0
            to 1 triggers the setting of an event.
            • For information about the transition filter, see
            chapter 14, "Status Reports."

:STATus:QENable
Function   Sets or queries whether messages other than
            errors will be stored to the error queue (ON) or
            not (OFF).
Syntax   `:STATus:QENable {<Boolean>}`
            `:STATus:QENable?`
Example   `:STATUS:QENABLE ON`
            `:STATUS:QENABLE?`
            `-> :STATUS:QENABLE 1`

:STATus:QMESsage
Function   Sets or queries whether message information
            will be attached to the response to the
            STATus:ERRor? query (ON/OFF).
Syntax   `:STATus:QMESsage {<Boolean>}`
            `:STATus:QMESsage?`
Example   `:STATUS:QMESSAGE OFF`
            `:STATUS:QMESSAGE?`
            `-> :STATUS:QMESSAGE 0`

13.8   SWEep Group

The commands in this group deal with the sweep settings. The command corresponds to the front panel SWEEP switch.

:SWEep?
Function   Queries all sweep settings.
Syntax   :SWEep?

:SWEep:DIRection
Function   Sweeps up or down or stops sweeping. Queries
            the sweep state.
Syntax   :SWEep:DIRection {HOLD|UP|DOWN}
            :SWEep:DIRection?
            HOLD: Sweeping is stopped.
            UP: Up sweeping is executed.
            DOWN: Down sweeping is executed.
Example   :SWEEP:DIRECTION UP
            :SWEEP:DIRECTION? -> UP

:SWEep:TIMe
Function   Sets or queries the sweep time.
Syntax   :SWEep:TIMe <Time>
            :SWEep:TIMe?
            <Time>: 8S, 16S, 32S, 64S
Example   :SWEEP:TIME 16S
            :SWEEP:TIME? -> 16

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Commands

13.9 SYSTem Group

The commands in this group are used to make settings and queries related to the communication interface, such as GP-IB, Ethernet, and USB. These commands correspond to the SETUP menu commands.

:SYSTem?
Function	Queries all the system settings.
Syntax	`:SYSTem?`

:SYSTem:BEEP
Function	Sets or queries the beep sound on/off state.

Syntax	`:SYSTem:BEEP <Boolean>`
	`:SYSTem:BEEP?`
	ON|1: Enabled
	OFF|0: Disabled

Example	`:SYSTEM:BEEP ON` `:SYSTEM:BEEP? -> :SYSTEM:BEEP 1`

:SYSTem:COMMunicate?
Function	Queries all the communication settings.
Syntax	`:SYSTem:COMMunicate?`

:SYSTem:COMMunicate:ETHernet?
Function	Queries all the Ethernet communication settings.
Syntax	`:SYSTem:COMMunicate:ETHernet?`

:SYSTem:COMMunicate:ETHernet:DHCP
Function	Sets or queries the Ethernet DHCP on/off state.

Syntax	`:SYSTem:COMMunicate:ETHernet:`
	`DHCP <Boolean>`
	`:SYSTem:COMMunicate:ETHernet:DHCP?`
	ON|1: DHCP is enabled.
	OFF|0: DHCP is disabled.

Example	`:SYSTEM:COMMUNICATE:ETHERNET:DHCP ON`
	`:SYSTEM:COMMUNICATE:ETHERNET:DHCP?`
	`-> :SYSTEM:COMMUNICATE:ETHERNET:`
	`    DHCP 1`

:SYSTem:COMMunicate:ETHernet:GATEway
Function	Sets or queries the Ethernet default gateway.

Syntax	`:SYSTem:COMMunicate:ETHernet:`
	`GATEway <String>`
	`:SYSTem:COMMunicate:ETHernet:`
	`GATEway?`
	<String> = "x.x.x.x": x = 0 to 255

Example	`:SYSTEM:COMMUNICATE:ETHERNET:`
	`GATEWAY "192.168.0.1"`
	`:SYSTEM:COMMUNICATE:ETHERNET:`
	`GATEWAY?`
	`-> :SYSTEM:COMMUNICATE:ETHERNET:`
	`    GATEWAY "192.168.0.1"`

:SYSTem:COMMunicate:ETHernet:IP
Function	Sets or queries the Ethernet IP address.

Syntax	`:SYSTem:COMMunicate:ETHernet:`
	`IP <String>`
	`:SYSTem:COMMunicate:ETHernet:IP?`
	<String> = "x.x.x.x": x = 0 to 255

Example	`:SYSTEM:COMMUNICATE:ETHERNET:`
	`IP "192.168.0.1"`
	`:SYSTEM:COMMUNICATE:ETHERNET:IP?`
	`-> :SYSTEM:COMMUNICATE:ETHERNET:`
	`    IP "192.168.0.1"`

:SYSTem:COMMunicate:ETHernet:MACaddress
Function	Sets or queries the Ethernet MAC address.

Syntax	`:SYSTem:COMMunicate:ETHernet:`
	`MACaddress?`
	<String> = "xx:xx:xx:xx:xx:xx"
	where xx is a value between 0 and FF

Example	`:SYSTEM:COMMUNICATE:ETHERNET:`
	`MACADDRESS "00:00:64:01:01:01"`
	`:SYSTEM:COMMUNICATE:ETHERNET:`
	`MACADDRESS?`
	`-> :SYSTEM:COMMUNICATE:ETHERNET:`
	`    MACADDRESS "00:00:64:01:01:01"`

:SYSTem:COMMunicate:ETHernet:MASK
Function	Sets or queries the Ethernet subnet mask.

Syntax	`:SYSTem:COMMunicate:ETHernet:`
	`MASK <String>`
	`:SYSTem:COMMunicate:ETHernet:MASK?`
	<String> = "x.x.x.x": x = 0 to 255

Example	`:SYSTEM:COMMUNICATE:ETHERNET:`
	`MASK "255.255.255.0"`
	`:SYSTEM:COMMUNICATE:ETHERNET:MASK?`
	`-> :SYSTEM:COMMUNICATE:ETHERNET:`
	`    MASK "255.255.255.0"`

:SYSTem:COMMunicate:GPIB?

Function   Queries all the GP-IB communication settings.

Syntax   :SYSTem:COMMunicate:GPIB?

:SYSTem:COMMunicate:GPIB:ADDRess

Function   Sets or queries the GP-IB address.

Syntax   :SYSTem:COMMunicate:GPIB:
        ADDRess <NRf>
        :SYSTem:COMMunicate:GPIB:ADDRess?
        <NRf> = 0 to 30

Example   :SYSTEM:COMMUNICATE:GPIB:ADDRESS 1
        :SYSTEM:COMMUNICATE:GPIB:ADDRESS?
        -> :SYSTEM:COMMUNICATE:GPIB:ADDRESS 1

:SYSTem:COMMunicate:GPIB:TYPE

Function   Sets or queries the GP-IB command type.

Syntax   :SYSTem:COMMunicate:GPIB:
        TYPE {NORMal|COMPatible}
        :SYSTem:COMMunicate:GPIB:TYPE?
        NORMal: Normal commands that comply with
        IEEE488.2-1992
        COMPatible: Model2560 compatible commands

Example   :SYSTEM:COMMUNICATE:GPIB:
        TYPE COMPATIBLE
        :SYSTEM:COMMUNICATE:GPIB:TYPE?
        -> :SYSTEM:COMMUNICATE:GPIB:
          TYPE COMPATIBLE

:SYSTem:COMMunicate:USB:FUNCtion

Function   Sets or queries the USB feature (USB-TMC/
        storage).

Syntax   :SYSTem:COMMunicate:USB:
        FUNCtion {TMC|STORage}
        :SYSTem:COMMunicate:USB:FUNCtion?
        TMC: USB-TMC command control feature
        STORage: Storage feature

Example   :SYSTEM:COMMUNICATE:USB:
        FUNCTION STORAGE
        :SYSTEM:COMMUNICATE:USB:FUNCTION?
        -> :SYSTEM:COMMUNICATE:USB:
          FUNCTION STORAGE

:SYSTem:REBoot

Function   Restarts the 2560A when the specified time
        elapses.

Syntax   :SYSTem:REBoot <Time>
        <Time> = 0 (S) to 60 (S)

Example   :SYSTEM:REBOOT 3

:SYSTem:RESolution

Function   Sets or queries the resolution mode.

Syntax   :SYSTem:RESolution {NORMal|HIGH}
        :SYSTem:RESolution?
        NORMal: Normal resolution (5.5 digit) mode
        HIGH: High resolution (6.5 digit) mode

Example   :SYSTEM:RESOLUTION HIGH
        :SYSTEM:RESOLUTION?
        -> :SYSTEM:RESOLUTION HIGH

:SYSTem:RJC:RESister

Function   Sets or queries the resistance of the sensor to be
        used for the external reference junction for 0°C.

Syntax   :SYSTem:RJC:RESister <Resistance>
        :SYSTem:RJC:RESister?

Example   :SYSTEM:RJC:RESISTER 100.00
        :SYSTEM:RJC:RESISTER?
        -> :SYSTEM:RJC:RESISTER 100.00

:SYSTem:TEMPerature:MONitor

Function   Sets or queries the output value display mode for
        temperature sourcing.

Syntax   :SYSTem:TEMPerature:
        MONitor {DEGree|VOHM}
        :SYSTem:TEMPerature:MONitor?
        DEGRee: Temperature display mode
        VOHM: Voltage or resistance display mode

Example   :SYSTEM:TEMPERATURE:MONITOR DEGREE
        :SYSTEM:TEMPERATURE:MONITOR?
        -> :SYSTEM:TEMPERATURE:MONITOR DEGREE

Description If the source function is set to TCouple or RTD
        with the :SOURce:FUNCtion command, setting
        VOHM with this :SYSTem:TEMPerature:MONitor
        command causes the output value display to be
        as follows.
        TCouple: Voltage display (mV)
        RTD: Resistance display (Ω)

:SYSTem:UNIT

Function   Sets or queries the temperature unit.

Syntax   :SYSTem:UNIT {C|CEL|F|FAR}
        C, CEL:°C (Celsius)
        F, FAR: °F (Fahrenheit)

Example   :SYSTEM:UNIT C
        :SYSTEM:UNIT? -> :SYSTEM:UNIT C

Description On models with the -UC suffix code, this
        command is invalid. The unit is fixed at °C
        (Celsius). On models with the -UF suffix code,
        you can set the unit to °C (Celsius) or °F
        (Fahrenheit).

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Commands

13.10 Common Command Group

The commands in this group are defined in IEEE 488.2-1992 and are independent from the instrument's individual functions.

There are no front panel dials and switches that correspond to the commands in this group.

*CLS

Function   Clears the standard event register, extended event register, and error queue.

Syntax   `*CLS`

Example   `*CLS`

Description • If the *CLS command is located immediately after the program message terminator, the output queue is also cleared.
           • For information about each register and queue, see chapter 14, "Status Reports."

*ESE

Function   Sets or queries the standard event enable register.

Syntax   `*ESE {<NRf>}`
            `*ESE?`
            `<NRf> = 0 to 255`

Example   `*ESE 251`
            `*ESE? -> 251`

Description • Specify the value as a sum of the values of each bit in decimal format.
           • For example, specifying *ESE 251 will cause the standard enable register to be set to 11111011.
             In this case, bit 2 of the standard event register is disabled. This means that bit 5 (ESB) of the status byte register is not set to 1, even if a query error occurs.
           • The default value is *ESE 0 (all bits disabled).
           • A query using *ESE? will not clear the contents of the standard event enable register.
           • For information about the standard event enable register, see section 14.1.

*ESR?

Function   Queries and clears the standard event register.

Syntax   `*ESR?`

Example   `*ESR? -> 32`

Description • A sum of the values of each bit is returned in decimal format.
           • When an SRQ is sent, you can check what types of events have occurred.
           • For example, if a value of 32 is returned, this indicates that the standard event register is set to 00100000.
             This means that the SRQ occurred due to a command syntax error.
           • A query using *ESR? will clear the contents of the Standard Event Register.
           • For information about the standard event register, see section 14.3.

*IDN?

Function   Queries the instrument model.

Syntax   `*IDN?`

Example   `*IDN?`
            `-> YOKOGAWA,2560A,123456789,1.01`

Description • The information is returned in this form: <manufacture>, <model>, <serial number>, <firmware version>.
           •
             For details on the model, see "Checking the Package Contents."

*OPC

Function   Sets bit 0 (the OPC bit) of the standard event register to 1 upon the completion of the specified overlap command.

Syntax   `*OPC`

Example   `*OPC`

Description The 2560A does not have overlap commands. The OPC bit is always set to 1.

*OPC?

Function   Returns ASCII code 1 when the specified overlap command is completed.

Syntax   `*OPC?`

Example   `*OPC? -> 1`

Description The 2560A does not have overlap commands. 1 is always returned.

*OPT?

Function   Queries the installed options.

Syntax   `*OPT?`

Example   `*OPT? -> NONE`

Description The command returns the presence or absence of options. Because the 2560A does not have any options, "NONE" is always returned. The *OPT? query must be the last query of a program message. An error occurs if there is a query after this query.

*RST

Function   Initializes settings.

Syntax   `*RST`

Example   `*RST`

Description Communication settings and a portion of other settings are not initialized. For details on the settings that are initialized, see appendix 7.

*SRE

Function	Sets or queries the service request enable register value.
Syntax	`*SRE {<NRf>}`
	`*SRE?`
	<NRf> = 0 to 255
Example	`*SRE 239`
	`*SRE? -> 175` (because the `bit 6, MSS`, setting is ignored)
Description	• Specify the value as a sum of the values of each bit in decimal format.
	• For example, specifying *SRE 239 will cause the standard enable register to be set to 11101111. In this case, bit 4 of the service request enable register is disabled. This means that bit 4 (MAV) of the status byte register is not set to 1, even if the output queue is not empty.
	• Bit 6 (MSS) of the status byte register is the MSS bit itself and is therefore ignored.
	• The default value is *SRE 0 (all bits disabled).
	• A query using *SRE? will not clear the contents of the service request enable register.
	• For information about the service request enable register, see section 14.1.

*STB?

Function	Queries the Status Byte Register value.
Syntax	`*STB?`
Example	`*STB? -> 4`
Description	• A sum of the values of each bit is returned as a decimal value.
	• Because the register is read without executing serial polling, bit 6 is an MSS bit, not an RQS bit.
	• For example, if a value of 4 is returned, this indicates that the status byte register is set to 00000100. This means that the error queue is not empty (in other words, an error occurred).
	• A query using *STB? will not clear the contents of the status byte register.
	• For information about the status byte register, see section 14.2.

*TST?

Function	Executes a self-test and queries the result.
Syntax	`*TST?`
Example	`*TST? -> 0`
Description	• For details on the self-test, see section 15.7.
	• This command returns 0 if the self-test is successful and 1 otherwise.
	• It takes approximately 1 seconds for the test to complete. When receiving a response from the 2560A, set the timeout to a relatively large value.

*WAI

Function	Holds the execution of the subsequent command until the specified overlap command is completed.
Syntax	`*WAI`
Example	`*WAI`
Description	The 2560A does not have overlap commands. This command will be ignored.

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Commands

14.1   About Status Reports

Status Reports

The figure below shows the format of status reports that are read by serial polling. This status report format is an extended version of the status report format defined in IEEE 488.2-1992.

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Status Reports
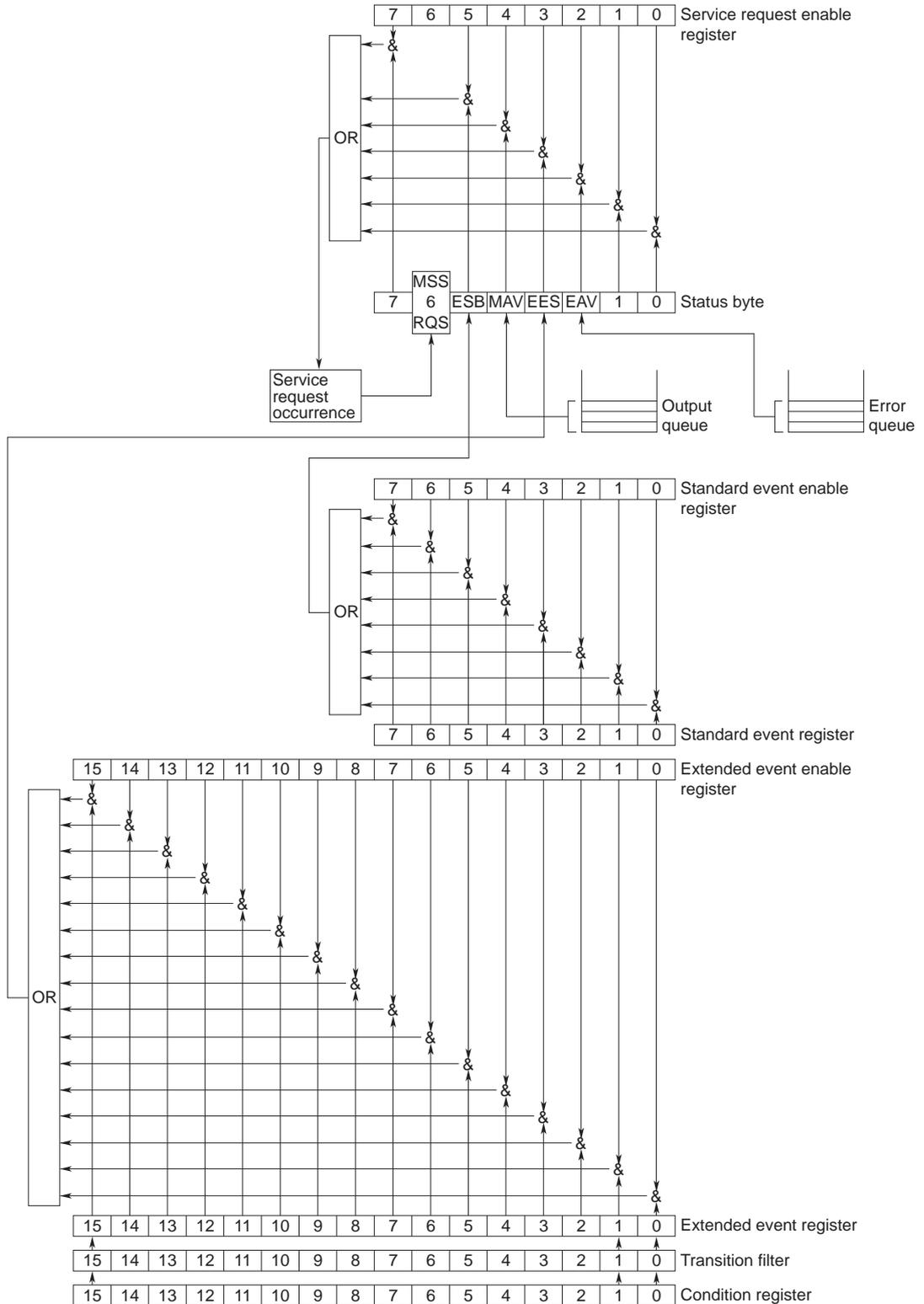
Overview of Registers and Queues

Name	Function	Write	Read
Status byte	—	–	Serial polling (RQS), *STB?(MSS)
Service request enable register	Status byte mask	*SRE	*SRE?
Standard event register	Indicates device status changes	—	*ESR?
Standard event enable register	Standard event register mask	*ESE	*ESE?
Extended event register	Indicates device status changes	—	STATus:EESR?
Extended event enable register	Extended event register mask	STATus:EESE	STATus:EESE?
Condition register	Current device status	—	STATus:CONDition?
Transition filter	Conditions that change the extended event register	STATus:FILTer<x>	STATus:FILTer<x>?
Output queue	Stores response messages for queries	Query commands	
Error queue	Stores error numbers and messages	—	STATus:ERRor?

Registers and Queues That Affect the Status Byte

The following registers affect the status byte bits.

Register	Affected Status Byte Bit
Standard event register	Sets bit 5 (ESB) to 1 or 0
Output queue	Sets bit 4 (MAV) to 1 or 0
Extended event register	Sets bit 3 (EES) to 1 or 0
Error queue	Sets bit 2 (EAV) to 1 or 0

Enable Registers

The following registers are used to mask a bit so that the bit will not affect the status byte even when it is set to 1.

Masked Register	Mask Register
Status byte	Service request enable register
Standard event register	Standard event enable register
Extended event register	Extended event enable register

Reading and Writing to Registers

For example, use the *ESE command to set the standard event enable register bits to 1 and 0. You can use the *ESE? command to query whether the standard event enable register bits are ones or zeros. For details on these commands, see chapter 13.

14.2 Status Byte

Status Byte

	RQS						
7	6	ESB	MAV	EES	EAV	1	0
	MSS						

- **Bits 0, 1, and 7**
  Not used (always 0)
- **Bit 2 EAV (Error Available)**
  This bit is 1 when the error queue is not empty. In other words, this bit is set to 1 when an error occurs. See section 14.5.
- **Bit 3 EES (Extend Event Summary Bit)**
  This bit is set to 1 when the logical AND of the extended event register and the extended event enable register is 1. In other words, this bit is set to 1 when a certain event takes place inside the instrument. See section 14.4.
- **Bit 4 MAV (Message Available)**
  This bit is 1 when the output queue is not empty. In other words, this bit is set to 1 when there is data to be transmitted in response to a query. See section 14.5.
- **Bit 5 ESB (Event Summary Bit)**
  This bit is set to 1 when the logical AND of the standard event register and the standard event enable register is 1. In other words, this bit is set to 1 when a certain event takes place inside the instrument. See section 14.3.
- **Bit 6 RQS (Request Service)/MSS (Master Status Summary)**
  This bit is 1 when the logical AND of the status byte excluding bit 6 and the service request enable register is 1. In other words, this bit is set to 1 when the instrument requests service from the controller. RQS is set to 1 when the MSS bit changes from 0 to 1 and is cleared when serial polling is carried out or when the MSS bit changes to 0.

Bit Masking

To mask a bit in the status byte so that it does not cause an SRQ, set the corresponding bit of the service request enable register to 0.
For example, to mask bit 2 (EAV) so that service is not requested when an error occurs, set bit 2 of the service request enable register to 0. Do this using the *SRE command. To query whether each bit of the service request enable register is 1 or 0, use *SRE?. For details on the *SRE command, see chapter 13.

Status Byte Operation

A service request is issued when bit 6 in the status byte becomes 1. Bit 6 is set to 1 when any other bit becomes 1 (when the corresponding bit of the service request enable register is also set to 1). For example, if an event occurs and the logical OR of a standard event register bit and its corresponding enable register bit is 1, then bit 5 (ESB) is set to 1. At this point, if bit 5 of the service request enable register is 1, bit 6 (MSS) is set to 1, and the 2560A requests service from the controller.
You can check what type of event occurred by reading the contents of the status byte.

Reading the Status Byte

There are two ways to read the contents of the status byte.
- ***STB? Query**
  Bit 6 functions as MSS when a query is made using *STB?. This causes the MSS to be read. This query does not cause any of the status byte bits to be cleared after the status byte is read.
- **Serial Polling**
  Serial polling causes bit 6 to function as an RQS bit. This causes the RQS to be read. After the status byte is read, only the RQS bit is cleared. You cannot read the MSS bit when serial polling is used.

Clearing the Status Byte

There is no way to clear all the bits in the status byte. The bits that are cleared for each operation are shown below.
- ***STB? Query**
  None of the bits are cleared.
- **Serial Polling**
  Only the RQS bit is cleared.
- **When a *CLS Command Is Received**
  When a *CLS command is received, the status byte itself is not cleared, but the contents of the standard event register, which affects the bits in the status byte, are cleared. As a result, the corresponding status byte bits are cleared. Because the output queue is not cleared with a *CLS command, bit 4 (MAV) in the status byte is not affected. However, the output queue will be cleared if the *CLS command is received just after a program message terminator.

14.3 Standard Event Register

Standard Event Register

7	6	5	4	3	2	1	0
PON	URQ	CME	EXE	DDE	QYE	RQC	OPC

- **Bit 7 PON (Power ON)**
  This bit is set to 1 when the instrument is turned on.
- **Bit 6 URQ (User Request)**
  Not used (always 0)
- **Bit 5 CME (Command Error)**
  This bit is set to 1 when there is a command syntax error.
  Example
  Command names are misspelled, or character data that is not one of the available options has been received.
- **Bit 4 EXE (Execution Error)**
  This bit is set to 1 when the command syntax is correct, but the command cannot be executed in the current state.
  Example
  A command whose parameter is outside the allowable range was received.
- **Bit 3 DDE (Device Error)**
  This bit is set to 1 when a command cannot be executed for internal reasons other than a command syntax error or command execution error.
- **Bit 2 QYE (Query Error)**
  This bit is set to 1 when a query command is received, but the output queue is empty or the data is lost.
  Example
  There is no response data, or data is lost due to an overflow in the output queue.
- **Bit 1 RQC (Request Control)**
  Not used (always 0)
- **Bit 0 OPC (Operation Complete)**
  This bit is set to 1 upon the completion of the operation designated by the *OPC command (see chapter 13 for details).

Bit Masking

To mask a certain bit of the standard event register so that it does not cause bit 5 (ESB) in the status byte to change, set the corresponding bit of the standard event enable register to 0.

For example, to mask bit 2 (QYE) so that ESB will not be set to 1 even if a query error occurs, set bit 2 of the standard event enable register to 0. Do this using the *ESE command. To query whether each bit of the standard event enable register is 1 or 0, use *ESE?. For details on the *ESE command, see chapter 13.

Standard Event Register Operation

The standard event register indicates eight types of events that occur inside the instrument. When one of the bits in this register becomes 1 (and the corresponding bit of the standard event enable register is also 1), bit 5 (ESB) in the status byte is set to 1.
Example
1. A query error occurs.
2. Bit 2 (QYE) is set to 1.
3. When bit 2 of the standard event enable register is 1, bit 5 (ESB) in the status byte is set to 1.

You can also check what type of event occurred in the 2560A by reading the contents of the standard event register.

Reading the Standard Event Register

You can use the *ESR? command to read the contents of the standard event register. The register is cleared after it is read.

Clearing the Standard Event Register

The standard event register is cleared in the following three cases.
- When the contents of the standard event register are read using the *ESR command.
- When a *CLS command is received.
- When the 2560A is restarted.

14.4 Extended Event Register

The extended event register receives information about changes in the condition register, which indicates the instrument's internal condition. The information is the result of edge detection performed by the transition filter.

FILTer<x>→

	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Condition register
:STATus:CONDition?

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RJON	CID	0	VLMT	OSC	OUC	0	EMR3	EMR2	0	EMR1	IRJC	SCG	ERJC	OUT	EOS

Transition filter
:STATus:FILTer<x>
{RISE│FALL│BOTH│NEVer}

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Extended event register
:STATus:EESR?

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
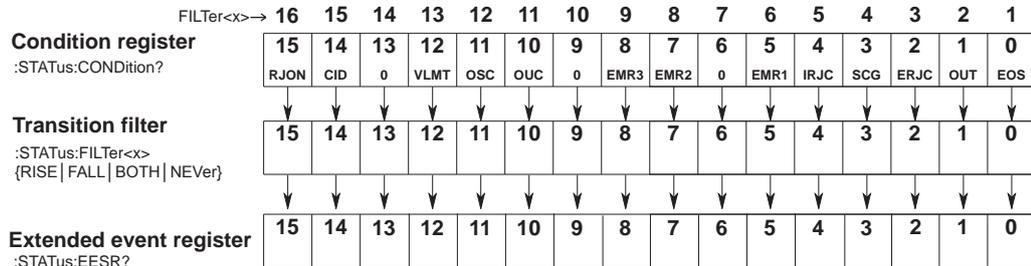
The condition register bits are described below.

Bit 0	EOS (End of Sweep)	This bit is 1 while sweeping and 0 while held.
Bit 1	OUT (Output On)	Set to 1 when output is on.
Bit 2	ERJC (External Rjc Valid)	Set to 1 when the measured value of the external reference junction is within the measurement range.
Bit 3	SCG (Source Change)	Set to 1 when the output is turned on or the output value is changed and changes to 0 after approximately 500 ms.
Bit 4	IRJC (Internal Rjc Valid)	Set to 1 when the measured value of the internal reference junction is within the measurement range.
Bit 5	EMR1 (FAN Stop)	Set to 1 when the fan stops.
Bit 6	–	Always 0
Bit 7	EMR2 (Temprature Error)	Set to 1 when an abnormal internal temperature is detected.
Bit 8	EMR3 (Internal Power Error)	Set to 1 when an internal power supply error is detected.
Bit 9	–	Always 0
Bit 10	OUC (Output Uncontrol Error)	Set to 1 when an output control error is detected.
Bit 11	OSC (Oscillating)	Set to 1 when an amplifier oscillation error is detected.
Bit 12	VLMT (Voltage Limiting)	Set to 1 when an overvoltage load is detected.
Bit 13	–	Always 0
Bit 14	CID (Current Input Detected)	Set to 1 when an excessive current input is detected.
Bit 15	RJON (RJ Connect)	Set to 1 when an external reference junction (RJ) sensor is connected.

The transition filter parameters detect changes in the specified condition register bits (numeric suffixes 1 to 16) and overwrite the extended event register in the following ways.

RISE	The specified extended event register bit is set to 0 when the corresponding condition register bit changes from 0 to 1.
FALL	The specified extended event register bit is set to 1 when the corresponding condition register bit changes from 1 to 0.
BOTH	The specified extended event register bit is set to 1 when the corresponding condition register bit changes from 0 to 1 or from 1 to 0.
NEVer	Always zero.

14

Status Reports

14.5   Output and Error Queues

Output Queue

The output queue stores query response messages. For example, if you send a `:SOURce:LEVel?` command, which requests for the transmission of voltage or current output value, the response message is stored in the output queue until it is read.

As shown below, error messages are stored in order and read from the oldest message first. The output queue is cleared in the following cases.

*   When a new message is received from the controller.
*   When a deadlock occurs (see section 10.1).
*   When a device clear command (DCL or SDC) is received.
*   When the 2560A is restarted.

The `*CLS` command does not clear the output queue. You can determine whether or not the output queue is empty by checking bit 4 (MAV) in the status byte.
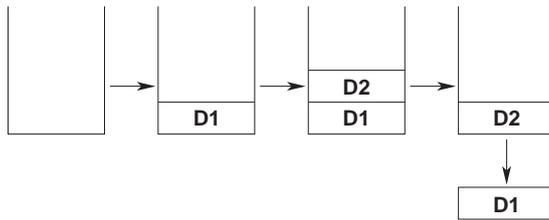
Error Queue

When an error occurs, the error queue stores the error number and message. For example, if the instrument receives an incorrect program message from the controller, the error number (113) and the error message ("Undefined header") are stored in the error queue when the instrument displays the error message.

You can use the `:STATus:ERRor?` query to read the contents of the error queue. Like the output queue, the messages in the error queue are read from the oldest one first.

If the error queue overflows, the last message is replaced with the following message: 350, "Queue overflow"

The error queue is cleared in the following cases.

*   When a `*CLS` command is received.
*   When the 2560A is restarted.

You can determine whether or not the error queue is empty by checking bit 2 (EAV) in the status byte.

15.1   Troubleshooting

Faults and Corrective Actions

- If an error code appears on the output display, see section 15.3.
- If servicing is necessary, or if the instrument does not operate properly even after you have attempted to deal with the problem according to the instructions in this section, contact your nearest YOKOGAWA dealer.

Problems and Solutions	Reference
Nothing appears on the display when the power is turned on.	
Securely connect the power cord to the 2560A and to the power outlet.	3.3
Set the supply voltage and frequency to within the permitted range.	3.3
The output does not turn on.	
Confirm that the load is within the specified range.	2.2
In the case of resistance sourcing, confirm that the excitation current is within the specified range.	2.2
Confirm that the ambient temperature and humidity are within their specified ranges.	3.2
Check the wiring system.	3.6
Set the main setting within the selectable range. If the setting goes outside the source range when the polarity is changed or if the range or type is changed, the output turns off.	5.4, 6.4
Turn the power off and then on again.	3.4
Dials and switches do not work.	
Check the REMOTE indicator. If the REMOTE indicator is on, flip the OUTPUT switch down to turn off the indicator.	1.1
n dial, m dial, deviation dial, PRESET switch, SWEEP switch, and SCALE switch does not operate.	
If set to high resolution mode, set to normal resolution mode.	8.1
The source value is strange (common).	
Use the 2560A in a stable environment within the ambient temperature and humidity ranges indicated in the specifications.	3.2
Use the 2560A in an environment free of noise.	3.2
After turning the power on, warm-up the 2560A for at least 30 minutes.	3.4
Check whether the load is an inductive or capacitive load that is within the allowable range.	16.1
The voltage or current source value is strange.	
Confirm that the load is within the specified range.	2.2
While sourcing, keep the output terminal temperature from changing. Be especially careful when using the 100 μA or 100 mV range.	3.2, 3.5, 3.6
The source value of thermocouple's thermoelectromotive force is strange.	
Confirm that the load is within the specified range.	2.3
While sourcing, keep the output terminal temperature from changing.	3.2, 3.5, 3.6
Confirm that the reference junction compensation mode is set correctly.	2.3, 6.6
If the RJ sensor 257875 is connected directly to the input terminals of the measuring instrument to be calibrated and the temperature of the terminals is different from the ambient temperature, the temperature imbalance will cause the temperature of the terminals to change. This may prevent accurate reference junction compensation. In such a situation, use a relay terminal block that is at the same temperature as the ambient temperature. However, you will need a thermocouple or compensating lead wire.	Appendix 3
The resistance source value or the RTD's resistance source value is strange.	
Confirm that a correct wiring system, three-wire or four-wire, is being used for the measurement instrument to be calibrated.	Appendix 4
Confirm that the excitation current is within the specified range.	2.2
When the output divider and deviation is being set, the output value is strange.	
Check that main setting (MIN) is not set to an inappropriate value.	5.3, 6.3
Unable to write the user definition file.	
Set the USB communication feature to mass storage (STOR).	6.5
Unable to configure or control the instrument through the communication interface.	
Check to make sure that the GP-IB address setting matches the specifications.	9.3
Check to make sure that the TCP/IP settings match the specifications.	10.3
Check that the USB feature is set to remote control.	11.3
Confirm that the interface meets the electrical and mechanical specifications.	9.1, 10.1, 11.1

15.2 Error Indication

Various displays on the 2560A blinks or turns off if a setting is outside the selectable range or if a setting inconsistent with other settings is specified. This section explains the indications, possible causes, and their corrective actions.

Main Setting

1. The polarity, main setting, or unit display on the main setting display blinks. In high resolution mode, the most significant digit of the deviation display also blinks. The output turns off and cannot be turned on.

Cause	The range, temperature type, polarity, or user-defined range change caused the main setting to go outside the selectable range. Examples: • Changing the range to 30 A when negative polarity is set at 10 A range • Changing the temperature type to E when the temperature type is K and the main setting is +1300.0°C • Changing the user definition to "-120, 120, 0" when the user definition is "-9999.9, 9999.9, 0" and the main setting is +9999.9°C
Correction	Operate a main setting dial. The main setting will change to the maximum setting in the appropriate polarity of the range or temperature type or within the selectable range. If changing the polarity would cause the value to be in the selectable range and you change the polarity, blinking changes to solid.

2. The main setting on the main setting display shows "– – – –.–" blinking, and the polarity and unit turn off. The output cannot be turned on.

Cause	The temperature type was set to TC USER or RTD USER when user-defined thermocouple or RTD is not available. Examples: Deleting user definitions with a communication command
Correction	Set the temperature type to a type other than TC USER or RTD USER, or create user definitions.

3. The polarity, main setting, or unit display on the main setting display blinks. The output turns off and cannot be turned on.

Cause	Main setting (MAX) and main setting (MIN) are reversed. Examples: If the range is 10 V, main setting (MAX) is +5.0000V, and main setting (MIN) is –10.0000V, you change main setting (MIN) to a positive value.
Correction	Change the main setting so that the main setting (MAX) and main setting (MIN) are within the selectable range and that they are not reversed.

Output

1. A relevant error code is displayed blinking on the output display. If multiple errors are occurring, error codes are displayed one by one at the blinking interval. The polarity and unit indicators on the output display turn off. The output turns off.

Cause	If a cause of a warning code (see section 15.3) is detected, and the 2560A trips.
Correction	Flip the OUTPUT switch down (OFF) to clear the warning display. After eliminating the cause, flip the OUTPUT switch up (ON) to clear the warning display and turn the output on.

2. The output value and the polarity and unit indicators on the output display blink. The output display shows the lower limit that can be sourced blinking. The output remains on, and the lower limit that can be sourced is output.

Cause	When the output value is less than the lower limit that can be sourced Example: When the range is 400 Ω and the output value determined by the main setting, output divider, and deviation settings is 1 Ω or less.
Correction	Change the main setting, output divider, or deviation so that the output value is 1 Ω or higher.

3. The output value and the polarity and unit indicators on the output display blink. The output display shows 43°C blinking. The output on state is maintained, and the thermoelectromotive force of the temperature determined by the main setting, output divider, and deviation settings is output.

Cause	When the thermocouple type is B and the output value determined by the main setting, output divider, and deviation settings is 43°C or less. (Because the range less than 43°C for thermocouple type B contains two temperature points that correspond to the same thermoelectromotive force.)
Correction	Change the main setting, output divider, or deviation so that the output value is 43°C or higher.

4. The output value and the polarity and unit indicators on the output display blink. The output display shows the lower or upper limit that can be sourced blinking. The output remains on, and a value within the source range is output.

Cause	If the deviation is set to 0 (zero) and the output value determined by the main setting and RJC value (reference junction temperature) is outside the source range Example: If the RJC value changes near the upper or lower limit of the user-defined source range
Correction	Change the main setting or RJC value so that the output value is within the source range.

Deviation

The deviation on the deviation display blinks. The output remains on, and the minimum or maximum value within the source range is output.

Cause	If the output value determined by the main setting, output divider, and deviation is outside the source range Example: • If the output value determined by the user-defined main setting, output divider, and deviation is outside the source range • If the range is 1 V, deviation preset is OFF, deviation is -6.43%, main setting (MIN) is +0 V, and main setting (MAX) is set to +1.15006 V or higher
Correction	Operate a deviation dial. The deviation changes so that the output value is within the source range.

Reference Junction Compensation

1. Of the RJC, EXT, and INT indicators, the one that was on is blinking. If the RJC mode is set to manual input (MAN) and the correction value is 0.00°C, all the RJC, EXT, and INT indicators are turned off and do not blink.

Cause 1-1	If the temperature type is set to TC USER/RTD USER when the user-defined thermocouple/RTD output is not defined Example: If user definitions are deleted with a communication command * In this condition, the output cannot be turned on.
Correction 1-1	Set the temperature type to a type other than TC USER or RTD USER, or create user definitions.
Cause 1-2	If the RJC value (reference junction temperature) is outside the source range of the selected thermocouple type Example: If the thermocouple type is B and the RJC value is –20°C * Even if it goes outside the defined range of the source range of the thermocouple type, the 2560A will expand the definition up to the RJC value and output thermoelectromotive force after applying reference junction compensation.
Correction 1-2	Set the RJC value within the source range of the selected thermocouple type. If the thermocouple type can be changed, changing to a thermocouple type whose source range includes the RJC value will cause the display blinking to change to solid.
Cause 1-3	If the RJC value is outside the source range of the user-defined thermocouple Example: When the source range of the user-defined thermocouple is ±10.0°C and the RJC value is -20°C * Even if it goes outside the source range of the user-defined thermocouple, the 2560A will assume the RJC value to be 0.00°C (no reference junction compensation) and output thermoelectromotive force after applying reference junction compensation.
Correction 1-3	Set the RJC value within the user-defined source range, or change to a user definition that includes the RJC value.

2. The reference junction compensation setting (polarity, main setting, and unit) displays are blinking, and the RJC indicator is also blinking. The output can be turned on. Thermoelectromotive force after applying reference junction compensation at the specified value is output.

Cause	If the RJC mode is set to manual input (MAN) and the specified RJC value (reference junction temperature) is outside the selectable range (-20°C to +60°C) Example: When the RJC value is changed from +60°C to -60°C (polarity change)
Correction	Operate main setting dials 1 to 4. The main setting will change to the maximum setting of the appropriate polarity side or an RJC value within the selectable range. If changing the polarity would cause the value to be in the selectable range and you change the polarity, blinking changes to solid. However, if cause 1-2 or 1-3 persists, blinking of the RJC indicator will continue.

3. The RJC setting is displayed as "–199.99" or "+199.99," and the RJC indicator blinks. The output can be turned on. Thermoelectromotive force after applying reference junction compensation at the specified value is output.

Cause	If the RJC mode is set to auto (AUTO) or internal (INT) and the RJC value (reference junction temperature) is outside the –20°C to +60°C range, the following display is shown.

•   "–199.99" is shown for –20°C or less.

•   "+199.99" is shown for +60°C or higher.

Example:
   If hot air is hitting the reference junction

Correction	Set the RJC value within the –20°C to +60°C range. However, if cause 1-2 or 1-3 persists, blinking of the RJC indicator will continue.

15.3 Error Code Descriptions and Corrective Actions

This section explains error codes that may appear on the front panel.

Error Codes

If any of the following error codes appears, the instrument will beep intermittently. Immediately turn off the power. Servicing is required.

Code	Description
E.901, E.907	A cooling fan error was detected.
E.902, E.903	An internal temperature error was detected.
E.904, E.905, E.908	An internal circuit error was detected.

Error Codes That Appear at Power-on or during the Self-test

If any of the following error codes appears, servicing is required. If the error appears at power-on, the instrument beeps.

Code	Description
E.911 to E.914, E.916	An internal circuit error was detected.
E.915, E.917	A cooling fan error was detected.
E.935, E.936	An internal temperature error was detected.

Warning Codes

Code	Description	Corrective Action	Reference
E.027 to E.030, E.037, E.038	An output control error was detected.	Check the connection conditions or load.	3.5, 3.6
E.032	Excessive input was detected during resistance sourcing.	Check the connection conditions or load.	3.5, 3.6
E.033	An oscillation error was detected in the voltage or current amplifier.	Check the connection conditions or load.	3.5, 3.6
E.034	An overvoltage load was detected.	Check the connection conditions or load.	3.5, 3.6
E.040	An error was detected in the user definition file.	Check the syntax.	Appendix 6

15.4 Communication Error Messages

This section explains communication error messages.

- Error messages that are read from a PC such as through the :STATus:ERRor? command are output in English.
- If servicing is necessary to solve the problem indicated by a message, contact your nearest YOKOGAWA dealer.
- The error messages described here are only those that you can read with the :STATus:ERRor? command from a PC or the like. For other messages, which are displayed on the front panel, see section 15.3.

Communication Syntax Errors (100 to 199)
Error in communication command

Code	Message	Corrective Action	Page
102	Syntax error.	A syntax error not covered by error codes 100 to 199.	Chapter 12, Chapter 13
103	Invalid separator.	Separate data values with a comma.	12-1
104	Data type error.	Use a correct data type.	12-6 and 12-7
108	Parameter not allowed.	Check the number of data values.	12-6 and Chapter 13
109	Missing parameter.	Be sure to include all necessary data values.	12-6 and Chapter 13
111	Header separator error.	Use a comma to separate each header from its data.	12-1
112	Program mnemonic too long.	Check the command length.	Chapter 13
113	Undefined header.	Check the header.	Chapter 13
114	Header suffix out of range.	Check the header.	Chapter 13
120	Numeric data error.	A value must be specified where the syntax contains <NRf>.	12-6
123	Exponent too large.	Where the syntax contains <NR3>, make the exponent that follows E smaller.	12-6 and Chapter 13
124	Too many digits.	Limit numeric values to 255 digits or less.	12-6 and Chapter 13
128	Numeric data not allowed.	Use a data type other than <NRf>.	12-6 and Chapter 13
131	Invalid suffix.	Check the unit of <Voltage>, <Current>, <Resistance>, <Temperature>, or <Time>.	12-6
134	Suffix too long.	Check the unit of <Voltage>, <Current>, <Resistance>, <Temperature>, or <Time>.	12-6
138	Suffix not allowed.	Units other than <Voltage>, <Current>, <Resistance>, <Temperature>, and <Time> cannot be used.	12-6
141	Invalid character data.	Be sure to select one of the listed choices when the syntax contains {...|...|...}.	Chapter 12, Chapter 13
144	Character data too long.	Check the spelling of the strings when the syntax contains {...|...|...}.	Chapter 13
148	Character data not allowed.	Use a data type other than {...|...|...}.	Chapter 13
150	String data error.	Enclose parameters with single or double quotation marks where the syntax contains <String>.	12-7
151	Invalid string data.	The <String> is either too long, or it contains an unusable character.	Chapter 13
158	String data not allowed.	Use a data type other than <String>.	Chapter 13
161	Invalid block data.	<Block data> cannot be used.	12-7 and Chapter 13
168	Block data not allowed.	<Block data> cannot be used.	12-7 and Chapter 13
171	Missing Right	Mathematical operations cannot be used.	—
172	Invalid expression.	Mathematical operations cannot be used.	Chapter 13

Code	Message	Corrective Action	Page
178	Expression data not allowed.	Mathematical operations cannot be used.	Chapter 13
181	Invalid outside macro definition.	The 2560A does not support the IEEE 488.2 macro specifications.	—

Communication Execution Errors (200 to 299)
Error in communication execution

Code	Message	Corrective Action	Page
203	Command protected	See "Adjustment and Calibration" in section 15.12.	15-20
221	Setting conflict.	Check settings that are related to each other.	Chapter 13
222	Data out of range.	Check the ranges of the settings.	Chapter 13
223	Too much data.	Check data byte lengths.	Chapter 13
224	Illegal parameter value.	Check the ranges of the settings.	Chapter 13
225	OverFlow.	Keep program messages to 1024 bytes or less in length, including <PMT>.	12-2
226	Out Of Memory.	Keep program messages to 1024 bytes or less in length, including <PMT>.	12-2
241	Hardware missing.	Check that the specified options are all installed.	—
260	Expression error.	Mathematical operations cannot be used.	—
270	Macro error.	The 2560A does not support the IEEE 488.2 macro specifications.	—
272	Macro execution error.	The 2560A does not support the IEEE 488.2 macro specifications.	—
273	Illegal macro label.	The 2560A does not support the IEEE 488.2 macro specifications.	—
275	Macro definition too long.	The 2560A does not support the IEEE 488.2 macro specifications.	—
276	Macro recursion error.	The 2560A does not support the IEEE 488.2 macro specifications.	—
277	Macro redefinition not allowed.	The 2560A does not support the IEEE 488.2 macro specifications.	—
278	Macro header not found.	The 2560A does not support the IEEE 488.2 macro specifications.	—

Communication Query Errors (400 to 499)
Error in communication Query

Code	Message	Corrective Action	Page
410	Query INTERRUPTED.	Check the transmission and reception order.	12-2
420	Query UNTERMINATED.	Check the transmission and reception order.	12-2
430	Query DEADLOCKED.	Keep program messages to 1024 bytes or less in length, including <PMT>.	12-2
440	Query UNTERMINATED after indefinite response.	Do not write a query after *IDN? or *OPT?.	—

System Communication Errors (300 and 399)
Error in System Operation

Code	Message	Corrective Action	Page
300	Communication device-specific error.	Servicing is required.	—
399	Fatal error in the communication driver.	Servicing is required.	—

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Communication Warning (50)
Warning

Code	Message	Corrective Action	Page
50	*OPC/? exists in message.	Write *OPC or *OPC? at the end of program messages.	—

Other Error (350)

Code	Message	Corrective Action	Page
350	Queue overflow.	Read the error queue.	14-6

> ***Note***
> Code 350 occurs when the error queue overflows.

Information (1 to 99)

Code	Message	Corrective Action	Page
51	Sweeping in progress.	You can only make changes when sweeping is held.	7-6
52	The upper and lower sweep limits are set to the same value.	Check the upper and lower sweeping limits.	7-6
53	The output is off.	Sweeping cannot be executed because the output is turned off. Turn the output on.	5-7, 6-7

Execution Errors (800 to 899)

Code	Message	Corrective Action	Page
802	Invalid command.	CAL on the SETUP menu cannot be executed during adjustment mode.	4-2
804	Invalid command.	Cannot be executed because the communication command type is set to COMP (compatible mode).	9-7
805	Invalid command.	Communication commands cannot be executed because the RANGE dial is set to SETUP.	—

System Errors (900/999)

| Code	Message	Corrective Action	Page
911 to 999	CPU board error.	For details about the message and corrective action, see section 15.3.	15-4

15.5 Displaying the Error Log

Procedure

1. Turn the **RANGE** dial to select SETUP.

The SETUP menu appears.

1. Select SETUP.
The SETUP indicator turns on.

RANGE dial
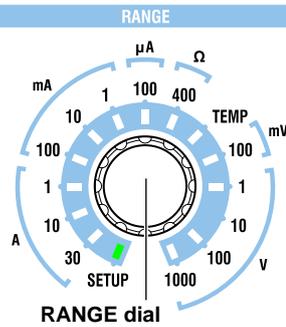
Displaying the Error Log Menu

2. Turn a **main setting** dial to select ERROR.

"NEXT" appears on the deviation display. All the PRESET indicators turn on.

3. Flip the **PRESET** switch down.

The error log menu appears. All the PRESET indicators turn off.

PRESET indicator

Main setting dials (use any)
2. Select ERROR.

PRESET switch
**3. Display the error log menu.**
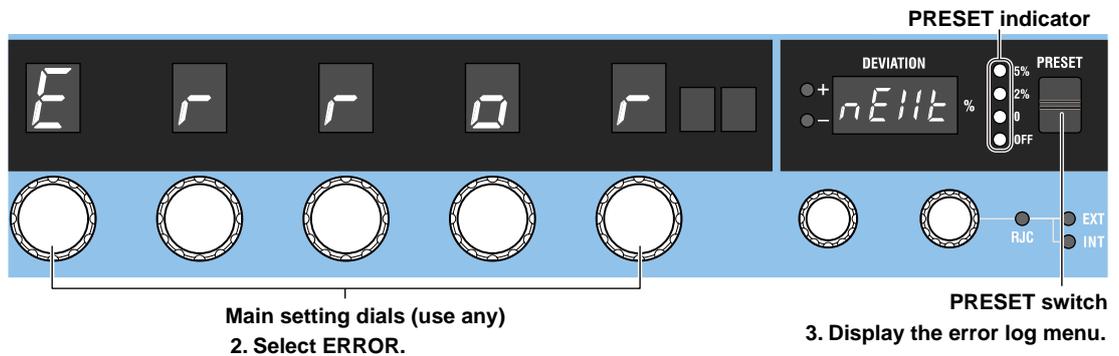
Displaying the Error Log

4. Turn a **main setting** dial to select LOG.
   - If an error log entry is available, the deviation display shows the error log number, and the output display shows the error code.
   - If an error log entry is not available, the deviation display shows "0 (zero)," and the output display "NO." If there is no error log entry, step 5 is not necessary.

5. Turn a deviation dial to select the number of the error log entry to display.
   The error code corresponding to the log number will be displayed.

Displays the log number   **Displays the error code**

Main setting dials (use any)
4. Select LOG.

Deviation dials
5. Select the log number.
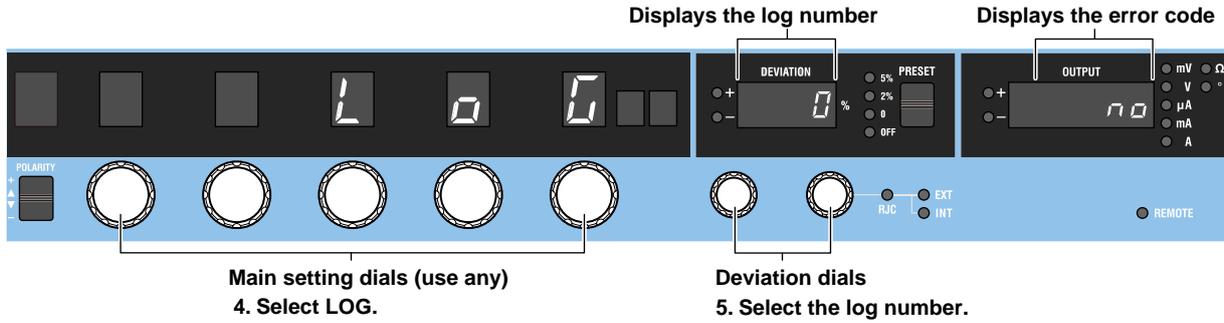
Clearing the Error Log

4. Turn a **main setting** dial to select CLEAR.
   "EXEC" appears on the deviation display. All the PRESET indicators turn on.

5. Flip the **PRESET** switch down.
   The error log will be cleared. All the PRESET indicators turn off.

PRESET indicator

Main setting dials (use any)
4. Select ERROR.

PRESET switch
5. Clear the error log.
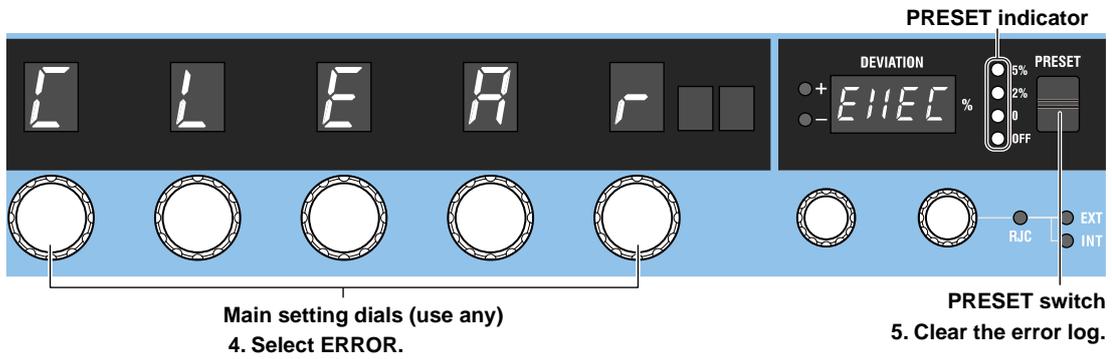
Note

Once you clear the error log, you cannot undo it. Confirm that it is okay to perform this operation before execution.

Explanation

Displaying the Error Log

The error log can be displayed.

- If an error log entry is not available, the deviation display shows "0 (zero)," and the output display "NO."

- If an error log entry is available, the deviation display shows the error log number, and the output display shows the error code. If there are multiple logged errors, you can turn the deviation dial to select a log number. The error code corresponding to the log number will be displayed. Log numbers are assigned in chronological order.

Displays the log number   **Displays the error code**
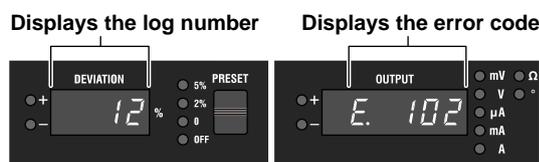
Note

- For details on error codes, see sections 15.3 and 15.4.
- The warning codes in section 15.3 are not logged, so they do not appear in the error log.
- Log numbers range from 1 to 64. Up to 64 errors can be logged. If more than 64 errors occur, communication error code 350 will occur. Check by connecting the 2560A to a PC through a communication interface.

Clearing the Error Log

You can clear the error log. When you clear the error log, every entry is cleared. Once you delete the error log, you cannot recover it.

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15.6　Instrument Error Detection and Clearance

Warning Detection (Trip detection)

If an output control error, excessive input, oscillation error, or overvoltage load is detected, the output automatically turns off (trips). If tripping occurs, the output display shows a warning code. Check the connection conditions or load, and eliminate the cause. For details on warning codes, see section 15.3.

Clearing the Warning

If a warning is detected and the 2560A trips, eliminate the cause, and then clear the warning display.
- Flip the OUTPUT switch down (OFF) to clear the warning display.
- Flip the OUTPUT switch up (ON) to clear the warning display and turn the output on.

High Voltage Notification

If you set the voltage output to +150 V or higher or –150 V or lower, beeps will be generated.
If you set the voltage range to 100 V or higher, the HIGH VOLTAGE indicator will illuminate.
This feature is to warn you of the risk of electric shock due to high voltage.
It is not a malfunction.

Clearing the Warning

Beeping stops when the voltage output falls below ±150 V.
The HIGH VOLTAGE indicator turns off when you set the voltage range below 100 V.

# 15.7 Self-Test

Procedure

1. Turn the **RANGE** dial to select SETUP.

   The SETUP menu appears.

   1. Select SETUP.
   The SETUP indicator turns on.

   RANGE dial
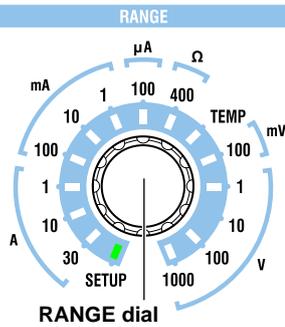
Executing a Self-Test

2. Turn a **main setting** dial to select TEST.

   "EXEC" appears on the deviation display. All the PRESET indicators turn on.

3. Flip the **PRESET** switch down.

   The self-test starts. All the PRESET indicators turn off.
   The deviation display shows WAIT, and the output display shows the self-test item.
   All key operations are invalid during the test.

   Displays the self-test item when executed

   PRESET indicator

   Main setting dials (use any)
   2. Select TEST.

   PRESET switch
   3. Executes a self-test
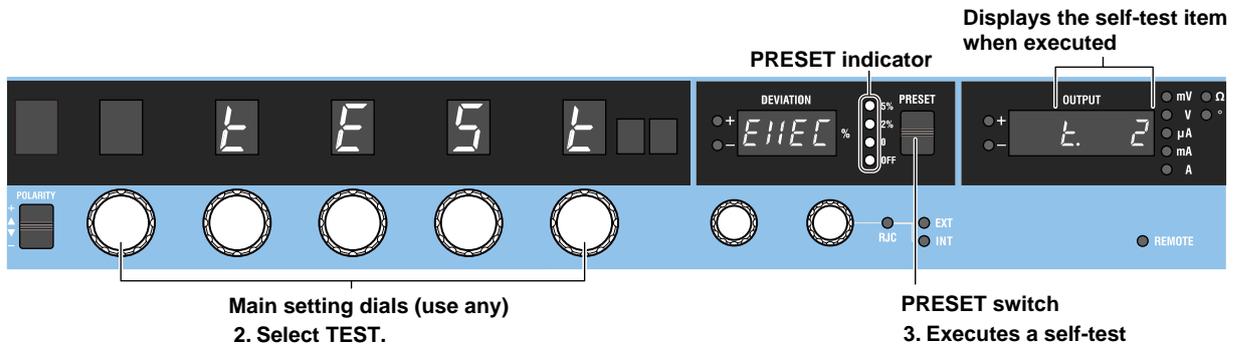
Display after Executing a Self-Test
When a Test Completes Successfully

4. All the PRESET indicators turn on, the deviation display shows "EXIT," and the output display shows "DONE." Flip the **PRESET** switch down.

   The self-test execution menu returns.

   PRESET indicator
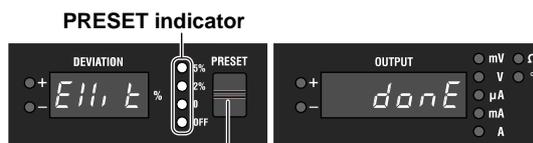
   PRESET switch
   4. Return to the self-test execution menu.

If an Error Is Detected

4. All the PRESET indicators turn on, the deviation display shows "EXIT," and the output display shows the error code. Check the error code, and flip the **PRESET** switch down.

   • The self-test execution menu returns.
   • If multiple errors are detected, the error codes are displayed alternately.

PRESET indicator   **Displays the error code**
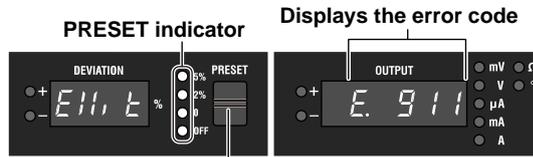
PRESET switch
4. Return to the self-test execution menu.

Explanation

You can execute a self-test. While the self-test is in progress, the output display shows the self-test items.

• If the self-test completes successfully, the deviation display shows "EXIT," and the output display shows "DONE."
• If an error is detected, the error code will be displayed.

Note
   • For details on error codes, see section 15.3.
   • If multiple errors occur, the error codes are displayed alternately.

15.8 Initializing the Settings

Procedure

**1.** Turn the **RANGE** dial to select SETUP.

The SETUP menu appears.

1. Select SETUP.
The SETUP indicator turns on.

RANGE dial
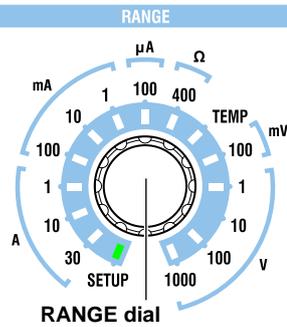
2. Turn a **main setting** dial to select INIT.

"EXEC" appears on the deviation display. All the PRESET indicators turn on.

3. Flip the **PRESET** switch down.

- The 2560A settings are initialized. All the PRESET indicators turn off.
- The 2560A returns from the SETUP menu to source mode, and the range is set to 1 V.

PRESET indicator

Main setting dials (use any)
2. Select INIT.

PRESET switch
3. Executes initialization
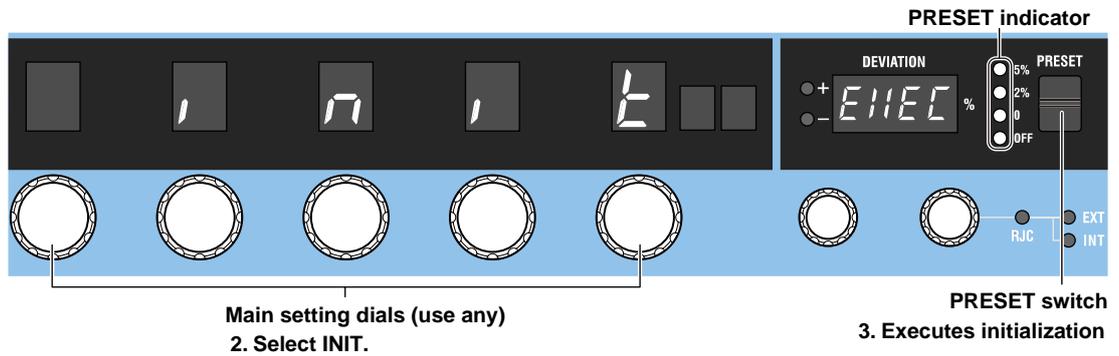
Note

You cannot undo an initialization or the like. Confirm that it is okay to perform this operation before execution.

Explanation

You can initialize settings. Communication settings and a portion of other settings are not initialized.
For details on the items that are initialized, see appendix 7.

Troubleshooting, Maintenance, and Inspection

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15.9 Displaying the Product Information

1. Turn the **RANGE** dial to select SETUP.

The SETUP menu appears.

1. Select SETUP.
The SETUP indicator turns on.

**RANGE dial**
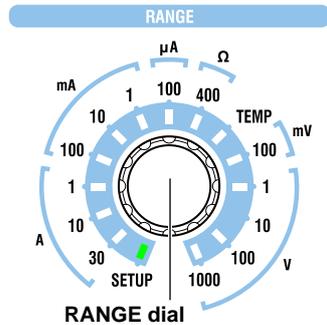
2. Turn a **main setting** dial to select INFO.

"NEXT" appears on the deviation display. All the PRESET indicators turn on.

3. Flip the **PRESET** switch down.

The product information menu appears. All the PRESET indicators turn off.

PRESET indicator

Main setting dials (use any)
2. Select INFO.

PRESET switch
3. Display the product information menu.
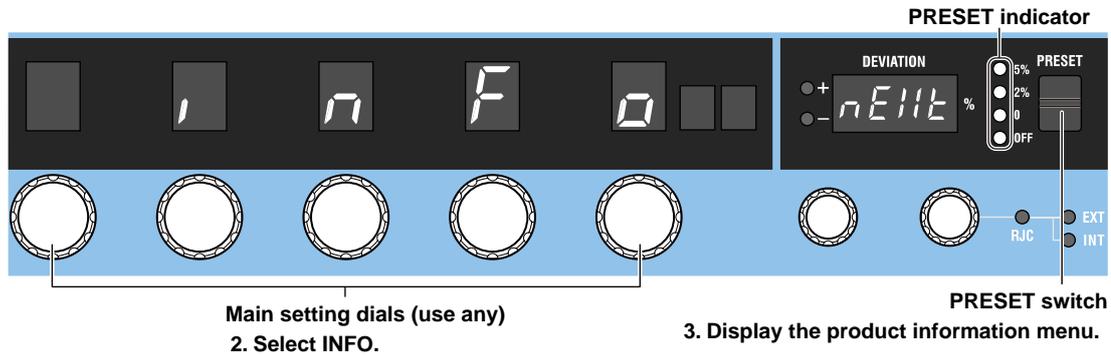
4. Turn a main setting dial to select the product information you want displayed. Select FIRM, PCL, AMP, BOOT, or SER.NO.

The product information is displayed on the deviation display or output display according to the selected item.

Display example of SER.NO

Main setting dials (use any)
4. Select FIRM, PCL, AMP, BOOT, or SER.NO.
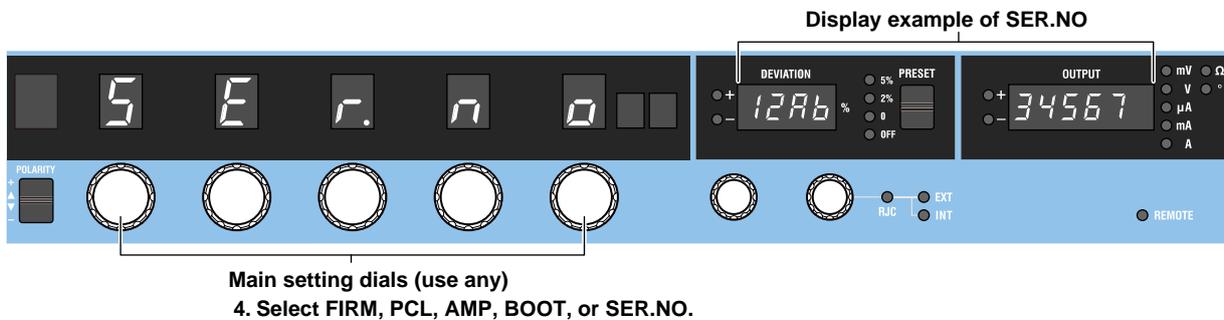
Explanation

You can displays the product information.

Firmware (FIRM), Logic (PCL, AMP) and Boot (BOOT) Information

The version of each program for controlling the 2560A system is displayed. You may need to check these when you update or repair the system.

Serial Number (SER.NO)

You can view the 2560A serial number (instrument number).

The serial number is a combination of alphabet letters and numbers. When communicating with another device through USB, use uppercase letters to specify the serial number.

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15.10 Cleaning the Filter

There is a filter attached to the air inlet on the rear panel of the 2560A.
Check the filter periodically to see that it is not clogged.

Removing the Filter

1. Turn off the 2560A.
2. Pull the lock buttons at the left and right edges of the filter cover toward you.
   Pull them until you hear a click. This will release the lock.
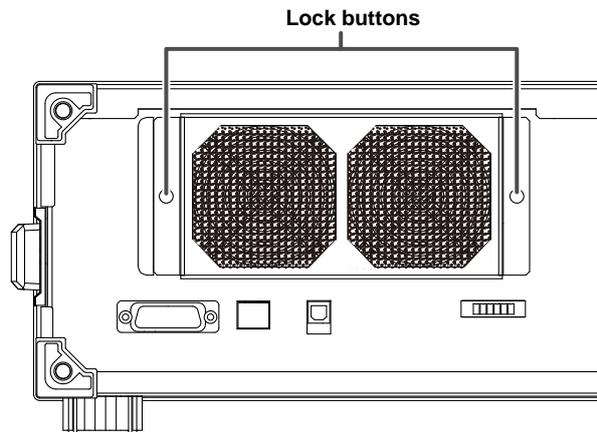
Lock buttons

3. Pull the filter cover toward you.
   The filter cover will come off.
4. Remove the filter from the filter cover.

Filter
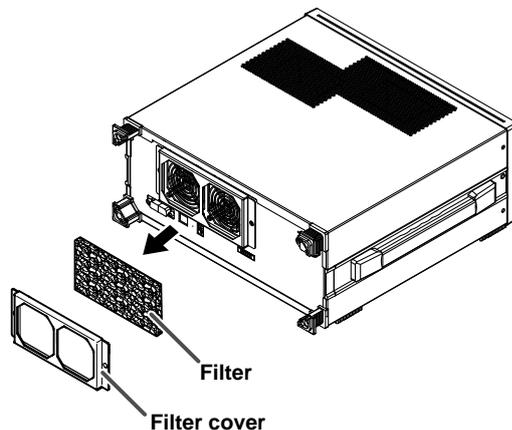
Filter cover

Attaching the Filter

1. Attach the filter to the filter cover.
There is no front or back distinction.

2. Insert the filter cover lock buttons into the filter cover attachment holes on the rear panel.
Make sure that the locks are released.

3. Push the lock buttons.
Push them until you hear a click.

Filter cover attachment holes
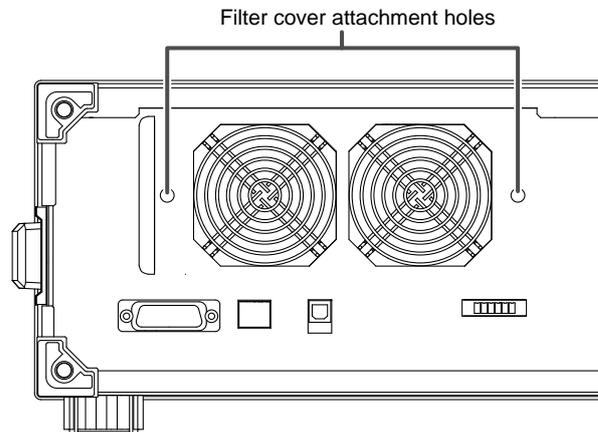
Cleaning the Filter

Clean the filter with neutral agent.

Rinse well with tap water.

After cleaning, swing the filter up and down to drain off excess water (do not wring the filter).

Then, let the filter dry naturally.

Note

If the filter is clogged, the temperature inside the 2560A will increase and will affect the operation and performance. Check the filter once every three months. How fast the filter gets dirty depends on the environment. If the filter is extremely dirty and cannot be cleaned completely, you need to replace the filter. Contact your nearest YOKOGAWA dealer.

Troubleshooting, Maintenance, and Inspection

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15.11 Recommended Part Replacement

YOKOGAWA guarantees the instrument for the period and under the conditions of the product warranty. The warranty does not cover the following expendable items. The replacement period for expendable items varies depending on the conditions of use. Refer to the table below as a general guideline. Contact your nearest YOKOGAWA dealer to have parts replaced.

Part Name	Recommended Replacement Interval
Cooling fan	3 years
Filter	1 year

15.12 Adjustment and Calibration

Calibration

We recommend that you calibrate the 2560A once a year to maintain its accuracy (1 year accuracy). Contact your nearest YOKOGAWA dealer to have your 2560A calibrated.

Adjustment

Contact your nearest YOKOGAWA dealer to have your 2560A adjusted. You can also adjust the 2560A by yourself. Have a qualified engineer adjust the 2560A at a facility with sufficient precision. A manual explaining the simple adjustment procedure of the 2560A is available for downloading from the following webpage. To download the information, you need to register.
http://www.yokogawa.com/jp-ymi/tm/Bu/2560A/

16.1   Source Section

DC Voltage and DC Current Source

DC Voltage Source

Range	Source Range[1]	Setting Resolution[2]	Maximum Output Current[3]	Output Resistance[4]	Maximum Capacitive Load
100 mV	± 122.400 mV	1 µV	12 mA or higher	6 mΩ or lower	10 µF
1 V	± 1.22400 V	10 µV	Approx. 120 mA	6 mΩ or lower	10 µF
10 V	± 12.2400 V	100 µV	Approx. 120 mA	6 mΩ or lower	10 µF
100 V	± 122.400 V	1 mV	Approx. 30 mA	30 mΩ or lower	1 µF
1000 V	± 1224.00 V	10 mV	Approx. 10 mA	1000 mΩ or lower	0.1 µF

Range	Display Resolution	Stability (1h)[5] ±(ppm of setting + V)	Accuracy (±(ppm of setting + V))[6, 7, 8, 9]		Temperature Coefficient ±(ppm of setting + V)/°C
			180 days	1 year	
100 mV	1 µV	20 + 3 µ	40 + 4 µ	60 + 4 µ	5 + 0.3 µ
1 V	10 µV	5 + 5 µ	40 + 10 µ	55 + 15 µ	3 + 1 µ
10 V	100 µV	5 + 50 µ	40 + 100 µ	55 + 150 µ	3 + 10 µ
100 V	1 mV	5 + 500 µ	40 + 1 m	55 + 1.5 m	3 + 100 µ
1000 V	10 mV	5 + 5 m [10]	40 + 10 m [10]	55 + 15 m [10]	3 + 1 m

DC Current Source

Range	Source Range[1]	Setting Resolution[2]	Maximum Output Voltage[3]	Output Resistance[4]	Maximum Inductive Load
100 µA	± 122.400 µA	1 nA	Approx. 30 V	100 MΩ or higher	1 mH
1 mA	± 1.22400 mA	10 nA	Approx. 30 V	100 MΩ or higher	1 mH
10 mA	± 12.2400 mA	100 nA	Approx. 30 V	100 MΩ or higher	1 mH
100 mA	± 122.400 mA	1 µA	Approx. 30 V	10 MΩ or higher	1 mH
1 A	± 1.22400 A	10 µA	Approx. 10 V	1 MΩ or higher	1 mH
10 A	± 12.2400 A	100 µA	Approx. 2 V	10 kΩ or higher	1 mH
30 A	0 to +36.720 A	1 mA	Approx. 1.5 V	5 kΩ or higher	1 mH

Range	Display Resolution	Stability (1h)[5] ±(ppm of setting + A)	Accuracy (±(ppm of setting + V))[7, 8, 9]		Temperature Coefficient ±(ppm of setting + A)/°C
			180 days	1 year	
100 µA	1 nA	50 + 5 n	100 + 12 n	150 + 20 n	10 + 0.5 n
1 mA	10 nA	5 + 15 n	50 + 20 n	70 + 30 n	3 + 1.5 n
10 mA	100 nA	5 + 150 n	50 + 200 n	70 + 300 n	5 + 15 n
100 mA [11]	1 µA	10 + 1.5 µ	70 + 2 µ	90 + 3 µ	10 + 150 n
1 A	10 µA	25 + 25 µ	250 + 50 µ	350 + 70 µ	15 + 6 µ
10 A	100 µA	50 + 500 µ	300 + 1 m	380 + 1.2 m	30 + 60 µ
30 A	100 µA	70 + 1.2 m	450 + 1.5 m	540 + 1.8 m	30 + 300 µ

1 If you set the main setting (MAX) to 120% of the range, the main setting (MIN) to 0% of the range, the divider value n/m to 1, and the deviation to –2%, up to 122.4% of the range can be generated.

2 The resolution in high resolution mode is 1 ppm of range. But, for the 30 A range, it is 100 µA.

3 Can be output when the source range is between 1% and 120% of the range.

4 Using measurement leads B8506ZK, 758917, or 758933, excluding measurement lead aging, and excluding the measurement lead internal resistance.

5 Indicates the 1-hour stability under standard operating conditions with the ambient temperature in the range of 23°C ± 1°C after 1 hour has elapsed with the voltage or current source output turned on.

6 Excludes the voltage drop due to the output resistance.

7 Specifications under standard operating conditions.

8 If the ambient temperature is between 5°C to 20°C or 26°C to 40°C, add the temperature coefficient compensation to the accuracy.

9 For source ranges that exceeds 120% of each range, add 500 ppm of range.

10 For source ranges that exceeds 100 V, add $12\,\text{ppm} \times (\text{source voltage}/1000)^2$ of range.

11 Only for the 100 mA range, the specifications are defined for sinking current up to 30 mA. Immediately after sinking current that exceeds 30 mA, errors exceeding the accuracy specifications may occur due to the increased temperature inside the 2560A.

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Specifications

Resistance Source

Range	Source Range	Setting and Display Resolution	Excitation Current
400 Ω	1.00 Ω to 400.00 Ω	0.01 Ω	0.1 mA to 2 mA

Range	Stability (1h)[1] ±(ppm of setting + Ω)	Accuracy (±(ppm of setting + Ω))[2]		Temperature Coefficient ±Ω/°C
		180 days	1 year	
400Ω	5 + 0.003	55 + 0.005	75 + 0.005	0.002

1   Specifications under standard operating conditions but at an ambient temperature of 23°C±1°C and excitation current of 1 mA.
2   Specifications under standard operating conditions. If the ambient temperature is between 5°C to 20°C or 26°C to 40°C, add the temperature coefficient compensation to the accuracy. When excitation current Is[mA] is between 0.1 mA and 1 mA, add (0.0025/Is) Ω.

Thermocouple Thermoelectromotive Force Source

The 2560A sources thermoelectromotive force that corresponds to the specified temperature.

Type	Source Range	Setting Resolution	Output Resistance
R	–50°C to +1768°C	0.1°C	Approx. 1 Ω
S	–50°C to +1768°C	0.1°C	Approx. 1 Ω
B	0°C to +1820°C	0.1°C	Approx. 1 Ω
J	–210°C to +1200°C	0.1°C	Approx. 1 Ω
T	–270°C to +400°C	0.1°C	Approx. 1 Ω
E	–270°C to +1000°C	0.1°C	Approx. 1 Ω
K	–270°C to +1300°C	0.1°C	Approx. 1 Ω
N	–270°C to +1300°C	0.1°C	Approx. 1 Ω
C	0°C to +2315°C	0.1°C	Approx. 1 Ω
A	0°C to +2500°C	0.1°C	Approx. 1 Ω
TC USER (user-defined)	–9999.9°C to +9999.9°C	0.1°C	Approx. 1 Ω

Compliant thermocouple standards	JIS C1602	R, S, B, J, T, E, K, N, C
	IEC 60584-1	R, S, B, J, T, E, K, N, C, A

Accuracies are shown in the following table.

Type	Set Temperature °C	Stability (1h)[1] ±°C	Accuracy (1 year)[2] ±°C	Temp. Coefficient ±(×10⁻³°C)/°C	RJC Error[3] ±°C
R	–50	0.50	1.10	0.88	0.56
	0	0.30	0.80	0.00	0.41
	100	0.25	0.55	0.88	0.28
	600	0.15	0.40	3.40	0.19
	1600	0.15	0.40	8.52	0.16
	1768	0.20	0.45	8.69	0.18
S	–50	0.40	1.03	0.93	0.52
	0	0.30	0.75	0.00	0.38
	100	0.25	0.56	0.90	0.28
	400	0.20	0.47	3.43	0.22
	1600	0.20	0.44	8.54	0.18
	1768	0.20	0.51	10.46	0.20
B	400	0.40	1.00	0.90	0.04
	600	0.30	0.70	1.75	0.03
	1000	0.20	0.50	3.40	0.02
	1200	0.20	0.44	4.27	0.02
	1820	0.20	0.44	6.91	0.02
J	–210	0.10	0.25	2.83	0.84
	–100	0.05	0.11	0.86	0.40
	0	0.05	0.08	0.00	0.32
	1200	0.10	0.15	6.68	0.29

Type	Set Temperature °C	Stability (1h)[1] ±°C	Accuracy (1 year)[2] ±°C	Temp. Coefficient ±(×10^{-3}°C)/°C	RJC Error[3] ±°C
T	-250	0.30	0.72	5.98	2.13
	-200	0.15	0.29	2.55	0.86
	-100	0.10	0.16	0.86	0.50
	100	0.05	0.10	0.85	0.30
	400	0.05	0.09	1.92	0.22
E	-250	0.20	0.50	5.95	2.07
	-200	0.10	0.20	2.56	0.82
	-100	0.05	0.10	0.85	0.44
	0	0.05	0.07	0.00	0.34
	1000	0.05	0.12	5.53	0.27
K	-250	0.40	0.94	7.71	2.65
	-200	0.15	0.30	2.55	0.84
	-100	0.10	0.15	0.86	0.44
	0	0.05	0.11	0.00	0.35
	800	0.10	0.15	4.26	0.32
	1300	0.10	0.21	7.67	0.38
N	-240	0.40	1.00	5.10	1.99
	-200	0.20	0.44	2.55	0.87
	-100	0.10	0.21	0.86	0.43
	0	0.10	0.16	0.00	0.34
	800	0.10	0.15	3.92	0.22
	1300	0.10	0.20	7.32	0.25
C	0	0.15	0.30	0.00	0.34
	200	0.10	0.26	1.72	0.27
	600	0.10	0.25	3.40	0.24
	1000	0.15	0.30	6.81	0.25
	2000	0.20	0.51	15.30	0.37
	2315	0.25	0.70	20.72	0.51
A	0	0.15	0.34	0.00	0.35
	100	0.10	0.29	0.87	0.29
	600	0.10	0.28	3.42	0.25
	1600	0.15	0.47	11.09	0.35
	2500	0.20	0.79	22.67	0.54

Type	Source Voltage Range	Stability (1h)[4] ±(ppm of setting + V)	Accuracy (1 year)[5] ±(ppm of setting + V)	Temperature Coefficient ±(ppm of setting + V)/°C
TC USER (user-defined)	± 120.000 mV	20 + 3 μ	60 + 4 μ	5 + 0.3μ

1 Specifications without using the reference junction compensation feature (0.00°C in manual input mode), under standard operating conditions, but at an ambient temperature of 23°C±1°C.

2 Specifications without using the reference junction compensation feature (0.00°C in manual input mode), under standard operating conditions. If the ambient temperature is between 5°C to 20°C or 26°C to 40°C, add the temperature coefficient compensation to the accuracy.

3 If the reference junction compensation feature is used, when the input terminal temperature is balanced, add the reference junction compensation error to the accuracy for every ±0.3°C of reference junction temperature measurement error.
   • The 2560A's internal reference junction temperature measurement accuracy is ±0.3°C.
   • The external reference junction temperature measurement accuracy when the RJ sensor 257875 (sold separately) is used with the 2560A is ±0.3°C (typical value).

4 Specifications under standard operating conditions but at an ambient temperature of 23°C±1°C.

5 Specifications under standard operating conditions. If the ambient temperature is between 5°C to 20°C or 26°C to 40°C, add the temperature coefficient compensation to the accuracy.

• Does not include the thermocouple error.

• The stability and accuracy for the temperatures between the set temperatures are those obtained by linear interpolation.

• To add the temperature coefficient compensation or the reference junction compensation error to the accuracy figure for a temperature between the set temperatures, linearly interpolate the accuracies obtained after adding the compensation.

• The thermoelectromotive force for temperatures not listed in the table will be ±(60ppm of V_T + 4 μV) with respect to standard thermoelectromotive force V_T of the interpolating polynomial of IEC 60584-1.

• On models with the -UF suffix code, °F display is possible. Convert the source range, set temperature, stability, accuracy, temperature coefficient, and reference junction compensation error using the following expression. The resolution is 0.1°F.

$$°F = \frac{9}{5} \times (°C) + 32$$

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Specifications

RTD Resistance Source

The 2560A sources resistance that corresponds to the specified temperature.

Type	Source Range	Setting Resolution	Excitation Current
Pt100	–200.0°C to +850.0°C	0.1°C	0.1 mA to 2 mA
RTD USER (user-defined)	–9999.9°C to +9999.9°C However, within the temperature range corresponding to resistance source range (1.00 Ω to 400.00 Ω)	0.1°C	0.1 mA to 2 mA

Compatible RTD standards	JIS C1604	Pt100
	IEC 60751-1	Pt100

Type	Accuracy (±°C)*		Temperature Coefficient
	180 days	**1 year**	**±°C/°C**
Pt100	0.1	0.12	0.006

* Specifications under standard operating conditions. If the ambient temperature is between 5°C to 20°C or 26°C to 40°C, add the temperature coefficient compensation to the accuracy.

Output Noise

Range	DC to 10 Hz	10 Hz to 10 kHz
100 mV	5 µVp-p	10 µVrms
1 V	15 µVp-p	20 µVrms
10 V	50 µVp-p	30 µVrms
100 V	150 µVp-p	400 µVrms
1000 V	1 mVp-p	1 mVrms

Range	DC to 10 Hz	10 Hz to 10 kHz
100 µA	0.1 µAp-p	0.2 µArms
1 mA	0.5 µAp-p	0.5 µArms
10 mA	1 µAp-p	1 µArms
100 mA	5 µAp-p	10 µArms
1 A	0.1 mAp-p	0.1 mArms
10 A	1 mAp-p	4 mArms
30 A	1 mAp-p	4 mArms

Output Terminals

Item	Specifications	
Terminal type	Low voltage-current output terminals:	Binding posts (with a plug-in), equipped with a HI (red) and a LO (black) output terminal
	High voltage output terminals:	Safety plug-in terminal, equipped with a HI (red) and a LO (black) output terminal
	Large current output terminals:	Large binding posts, equipped with a HI (black) and a LO (black) output terminal
Output LO terminal	No ground	
Maximum common-mode voltage	Between the output LO terminal and the case ±15Vpk	

Response Time

Item	Specifications
Voltage or current source	Ranges other than 1000 V: Approx. 0.5 s 1000 V range: Approx. 3 s The time from when the change starts to when the output reaches 0.02 % of the final value at no load condition
Resistance or RTD source	0.1 ms or less (time constant corresponding to the change in excitation current)

Common Mode Rejection Ratio (Voltage or Current Source)

Item	Specifications (for DC or 50/60 Hz signal)	
Voltage output	Ranges other than 1000 V:	120 dB or higher
	1000 V range:	100 dB or higher
Current output	1 A range or less:	100 nA/V or less
	10 A range or higher:	10 µA/V or less

Output Value Equation

The output value of the 2560A is calculated from the scale, output divider, and deviation settings within source range of each range. The relational expression is shown below.

Output value = MIN + (MAX − MIN)×(n/m) + (MAX − MIN)×(−deviation)

MAX:	Maximum value of the scale (output range) (see section 2.4)
MIN:	Minimum value of the scale (output range) (see section 2.4)
m:	Denominator of the output divider (see section 2.5)
n:	Numerator of the output divider (see section 2.5)
Deviation:	See section 2.6.

16

Specifications

16.2 Functions

Item	Specifications		
Range	Numerous ranges for DC voltage, DC current, resistance, temperature (thermocouple and RTD)		
Display			
Main setting display	Main setting:	6-digit LED display	
	Polarity:	+ or –	
	Unit:	mV, V, μA, mA, A, °C, °F (selectable on models with suffix code -UF), Ω	
Deviation display	Deviation:	4-digit LED display	
	Polarity:	+ or –	
	Deviation preset:	5%, 2%, 0, OFF	
Output display	Output value:	6-digit LED display	
	Polarity:	+ or –	
	Unit:	mV, V, μA, mA, A, °, Ω	
n display	Numerator of the output divider:	2-digit LED display	
m display	Denominator of the output divider:	2-digit LED display	
Other indicators	OUTPUT1, OUTPUT2, HIGH VOLTAGE indicator, ON indicator, OFF indicator, MAX indicator, MIN indicator, Non Zero indicator, UP indicator, DOWN indicator, RJC indicator, REMOTE indicator		
Scale	Sets the maximum value (MAX) and minimum value (MIN) for the output divider, deviation, and sweep range. Polarity cannot be set differently in the 1000 V, 10 A, 30 A, and 400 Ω ranges.		
Output divider	Target:	Voltage, current, resistance, temperature	
	Selectable range of denominator m:	4 to 15	
	Selectable range of numerator n:	0 to m	
Deviation	Target:	Voltage, current, resistance, temperature	
	Selectable range:	±20.00%	
	Setting method:	Two dial setting	
		Resolution of deviation dial 1: 0.2% of main setting	
		Resolution of deviation dial 2: 0.01% of main setting	
Presets	5%:	The deviation is set to ±5% when the preset is selected or when the output divider n is changed. Preset to +5 % when increased, 5 % when decreased.	
	2%:	The deviation is set to ±2% when the preset is selected or when the output divider n is changed. Preset to +2 % when increased, 2 % when decreased.	
	0:	The deviation is reset to 0% when the preset is selected or when the output divider n is changed.	
	OFF:	Holds the deviation. It is not preset.	
Sweeping	Target:	Voltage, current, resistance, temperature	
	Speed:	Select the time for changing the setting from 0% to 100% or 100% to 0% from approx. 8 s, approx. 16 s, approx. 32 s, and approx. 64.	
Reference junction compensation (RJC) (Thermocouple thermoelectromotive force source)	The following three modes. The 2560A corrects the sourced thermoelectromotive force (RJC) according to the selected mode.		
	Auto (AUTO)	If an external RJ sensor is detected, a correction is performed using the measured temperature of the external RJ sensor. Otherwise, a correction is performed using the temperature of the 2560A output terminals (internal). For the accuracy specifications when RJ sensor 257875 is used and other specifications of the 257875, see section 16.6.	
	Internal (INT):	A correction is performed using the temperature of the 2560A output terminals (internal). For the specifications of the 2560A's internal reference junction temperature measurement accuracy and reference junction compensation errors, see section 16.1.	
	Manual input (MAN):	A correction is performed using a manually input temperature. Set the temperature from the 2560A front panel (see section 6.6). To not apply correction, set the temperature to 0.00°C. Selectable range: –20.00°C to ++60.00°C	

Item	Specifications	
User definition	Thermocouple	Thermoelectromotive force corresponding to the set temperature can be sourced according to the user-defined polynomial.
	RTD	Resistance corresponding to the set temperature can be sourced according to the user-defined polynomial.
High resolution mode	The main setting of the DC voltage or DC current can be set at 6.5 digit resolution (but 5.5 digits for the 30 A range). It cannot be applied to resistance or temperature. In high resolution mode, the output divider, deviation, preset, sweep, and scaling cannot be used.	
Saving of setup parameters	Saves the setup parameters immediately before (approx. 1 s before) the power switch is turned off. The next time the power is turned on, the 2560A starts with those settings.	
Error log	Logs the error codes of the errors that the 2560A detects. The error log can also be displayed.	
Self-test	Performs a self-test on its condition.	
Initializing the Settings	Resets the 2560A to its default settings.	
Displaying the Product Information	Displays the firmware version, serial number, and the like.	
Communication	Communication commands can be used to remotely control the 2560A. Select the communication interface from GP-IB, Ethernet, and USB.	
Instrument protection	Trip function based on overvoltage, overcurrent, oscillation, and internal heating detection are available.	

16.3 External Input

Item	Specifications
External RJ sensor input terminal	Supports three-wire and four-wire systems
Input connector	Connect the supplied terminal plug A2119JT. The input terminals of the terminal plug A2119JT are screw type. Connect an RJ sensor 257875 or a general RTD Pt100 to the terminal plug A2119JT.
Excitation current	Approx. 1 mA

16

Specifications

16.4 Computer Interface

GP-IB

Item	Specifications
Electrical and mechanical	Complies with IEEE St'd 488-1978
Functional specifications	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, and C0
Protocol	Complies with IEEE St'd 488.2-1992
Address	0 to 30

Ethernet

Item	Specifications
Number of ports	1
Connector type	RJ-45 connector
Electrical and mechanical	Conforms to IEEE 802.3
Transmission system	Ethernet(100BASE-TX/10BASE-T)
Transfer rate	100 Mbps max.
Protocol	TCP/IP
Supported services	VXI-11 server, DHCP client

USB for PC Connection

Item	Specifications
Number of ports	1
Connector type	Type B connector (receptacle)
Electrical and mechanical	Conforms to USB Revision 2.0
Supported transfer modes	HS (High Speed; 480 Mbps) and FS (Full Speed; 12 Mbps)

Supported protocols	USBTMC-USB488 (USB Test and Measurement Class Ver.1.0)
	    GP-IB commands can be used through USB.
	Mass Storage Class Ver. 1.1
	    The 2560A can be accessed from a PC.

16.5 General Specifications

| Item	Specifications
Standard operating conditions	Ambient temperature: 23°C±3°C Ambient humidity: 20%RH to 80% RH (no condensation) After warm-up time has passed
Warm-up time	Approx. 30 minutes (after acclimatizing the 2560A to the operating environment for at least an hour) If the instrument has been stored in a hot-temperature, high-humidity environment, warm up the instrument for at least a day.
Operating environment	Temperature: 5°C to 40°C Humidity: 20%RH to 80% RH (no condensation) 20% RH to 70% RH for ambient temperatures above 30°C
Storage environment	Temperature: −15°C to 60°C Humidity: 20%RH to 80% RH (no condensation)
Operating altitude	2000 m or less
Installation location	Indoors
Installation orientation	Horizontal or tilted using the movable leg
Rated supply voltage	100 VAC to 120 VAC, 200 VAC to 240 VAC (auto switching)
Permitted supply voltage range	90 VAC to 132 VAC, 180 VAC to 264 VAC
Rated supply frequency	50 Hz/60 Hz
Permitted power supply frequency range	48 Hz to 63 Hz
Maximum power consumption	Approx. 200 VA
Withstand voltage	1500 VAC for 1 minute between the power supply and case For the withstand voltage between the measurement section and case for the external RJ sensor 257875 when it is connected, see section 16.6.
External dimensions	Approx. 426 mm (W) × 177 mm (H) × 400 mm (D), excluding protrusions
Weight	Approx. 13 kg

Safety standards	Compliant standards
	  EN61010-1
	    Overvoltage Category II[1]
	    Pollution degree 2[2]
	  EN61010-2-030
	    Measurement category; Other (O)[2]

Emissions	Compliant standards
	  EN61326−1 Class A
	  EN55011 Class A, Group 1
	  EMC standards of Australia and New Zealand EN 55011 Class A, Group 1
	  Korea Electromagnetic Conformity Standard (한국 전자파적합성기준)
	  EN61000−3−2 Class A
	  EN61000−3−3
	  This product is a Class A (for industrial environment) product. Operation of this product in a residential area may cause radio interference in which case the user will be required to correct the interference.
	Cable conditions
	  GP-IB connector (GP-IB)
	    Use a shielded cable that is 3 m in length or less.
	  Ethernet port (ETHERNET)
	    Use a category 5 or better Ethernet cable (STP) that is 30 m in length or less.
	  USB port for PCs (USB)
	    Use a shielded USB cable that is 3 m in length or less.
	  Low voltage-current output terminals (HI, LO)
	    Use the included B8506ZK measurement leads (length: 1 m).
	  High voltage output terminals (HI, LO)
	    Use the included B8506ZK measurement leads (length: 1 m).
	  Large current output terminals (HI, LO)
	    Use the included B8506WA measurement leads (length: 1.5 m).
	  External RJ sensor terminal (EXT RJ SENSOR Pt100)
	    Use the RJ sensor 257875, sold separately.

Item	Specifications
Immunity	Compliant standards EN61326-1 Table 2 (for use in industrial locations)
	Influence in the immunity test environment Within ±15% of the range setting Cable conditions Same as the emission cable conditions.
Environmental standard	Compliant standard EN50581 Monitoring and control instruments

1   The overvoltage category (installation category) is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. The overvoltage category II applies to electrical equipment that is powered through a fixed installation, such as a switchboard.

2   Pollution degree refers to the degree of adhesion of a solid, liquid, or gas which deteriorates withstand voltage or surface resistivity. Pollution degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).

3   The measurement category of the 2560A terminals is Other (O). Do not use it to measure the main power supply or for Measurement Categories II, III, and IV.
   Measurement category O applies to measurement of circuits that are not directly connected to a main power source. This category applies to measurement of secondary electric circuits in equipment across a transformer. The estimated transient overvoltage that may appear at the 2560A signal input terminals is 1500 V.
   Measurement category II applies to measurement of circuits, such as household electric appliances and portable electric tools, that are connected to low-voltage installations.
   Measurement category III applies to measurement of facility circuits, such as distribution boards and circuit breakers.
   Measurement category IV applies to measurement of power source circuits, such as entrance cables to buildings and cable systems, for low-voltage installations.

16.6 RJ Sensor 257875 Specifications

Item	Specifications
Measurement range	–20°C to +60°C
Accuracy	±0.3°C (typical value), in combination with the 2560A
Excitation current	Approx. 1 mA
Withstand voltage	100 VAC for 1 minute between the 257875 measurement section and the 2560A case (Withstand voltage when the sensor is connected to the 2560A's external RJ sensor input terminal)
Cord length	Approx. 1.95 m

• Only connect the RJ sensor 257875 to the 2560A or other designated instruments.
• If the RJ sensor 257875 is connected directly to the input terminals of the measuring instrument to be calibrated and the temperature of the terminals is different from the ambient temperature, the temperature imbalance will cause the temperature of the terminals to change. This may prevent accurate reference junction compensation.

16.7   External Dimensions

Unit: mm

Rear view

177

20

13   **426**   **13**   **(24.5)**   **400**   **32**
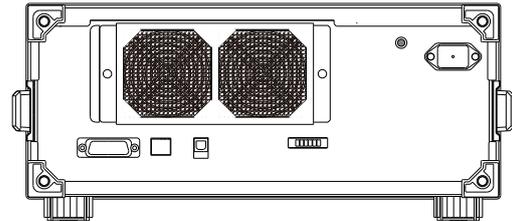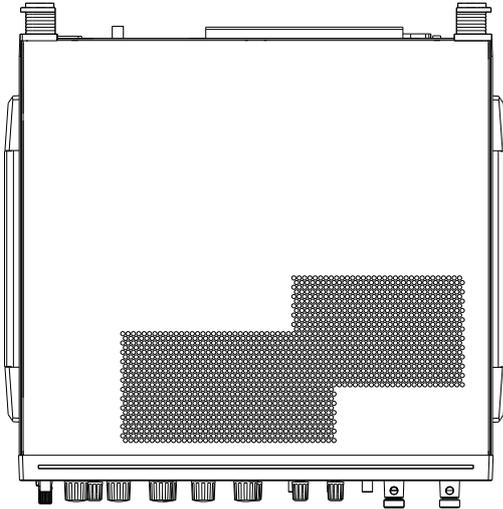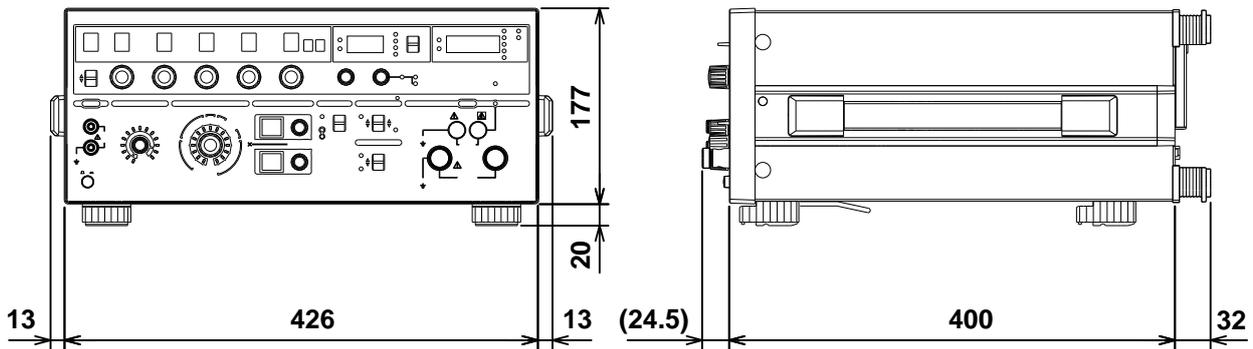
Unless otherwise specified, tolerances are ±3% (however, tolerances are ±0.3 mm when below 10 mm).

Appendix 1 Block Diagram
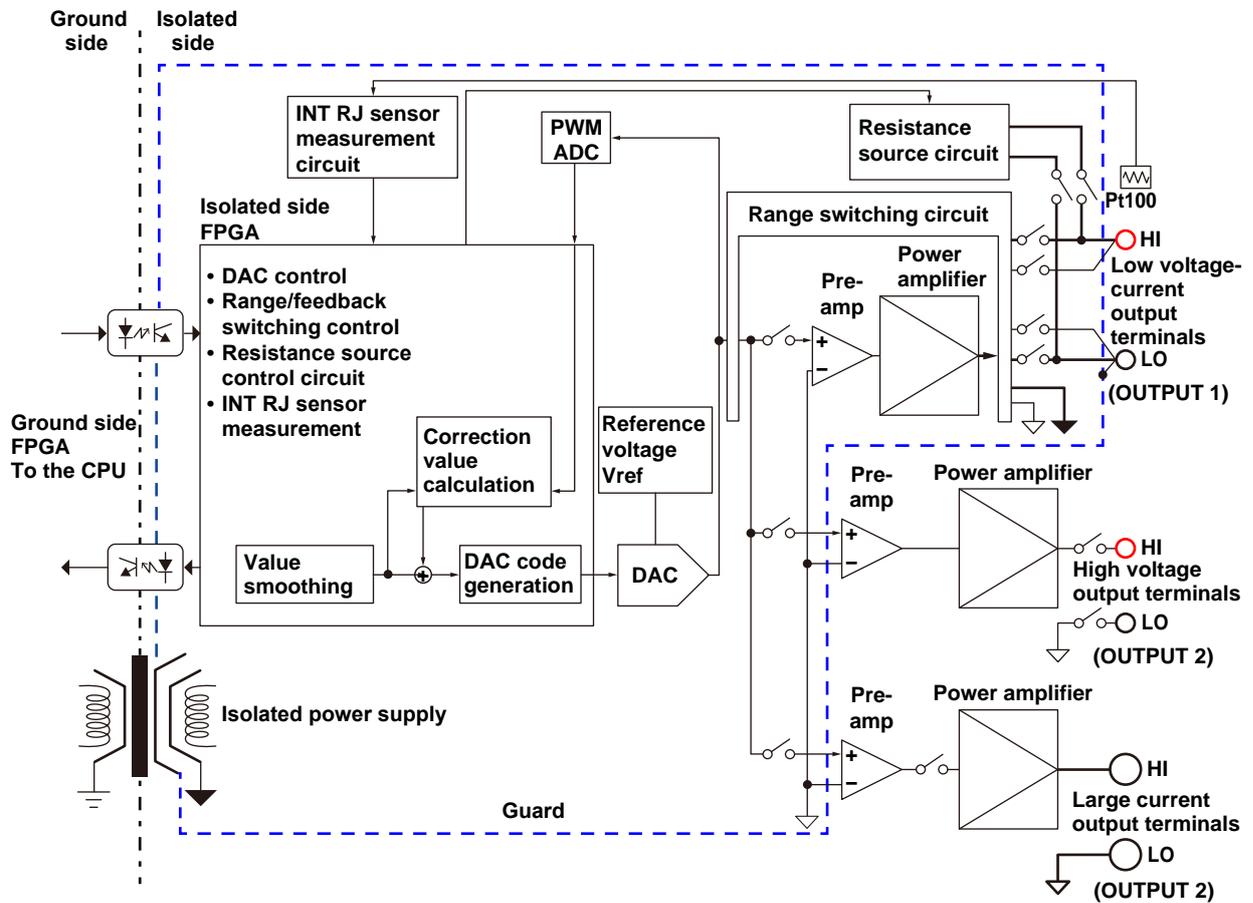
When the output is turned on or when the source value is changed, a source code for setting the DAC is sent from the CPU/FPGA on the ground side to the FPGA on the isolated side. To the source code, the FPGA on the isolated side applies overshoot suppression and rising slope control (smoothing) for reducing inrush current for when a capacitive load is connected. Then, the FPGA sends the source code to the DAC.

On the other hand, the high-speed PWM ADC is sequentially measuring reference voltage Vref and zero level based on a high accuracy reference and the output of its own DAC. The source code is compared and corrected with these values and continuously transferred from the FPGA on the isolated side to the DAC. This method provides long-term stable DAC output.

The pre-amp employs a low-noise, high-precision amplifier that accurately amplifies the DAC output. The power amplifier employs a power-transistor-based push-pull-output amplifier that enables sink operation.

The 2560A does not use relays to invert the polarity for ranges other than 1000 V and 10 A, so glitches due to polarity switching do not occur. The control system on the isolated side is surrounded by a guard potential to suppress the effects of common-mode noise. The low voltage-current output LO terminal is connected to the guard.

Appendix 2 Example of Meter and Transducer Calibration

Output Divider

When an analog meter is calibrated, the 2560A is used to output different voltages or currents so that the meter needle can be adjusted to match the minimum and maximum scale marks and the scale marks in between. The 2560A enables you to set the voltage or current output for the maximum scale mark with the main setting and calibrate the different points of the meter by dividing the output, rather than changing the main setting. For details on 2560A configuration, see chapter 5 or section 7.1.

Main setting (MAX) = 10 A
Main setting (MIN) = 0 A

OUTPUT DIVIDER

n=0
m=4 **Divider value: 0/4**

Ammeter
0 A

OUTPUT DIVIDER

n=2
m=4 **Divider value: 2/4**

Ammeter
5 A
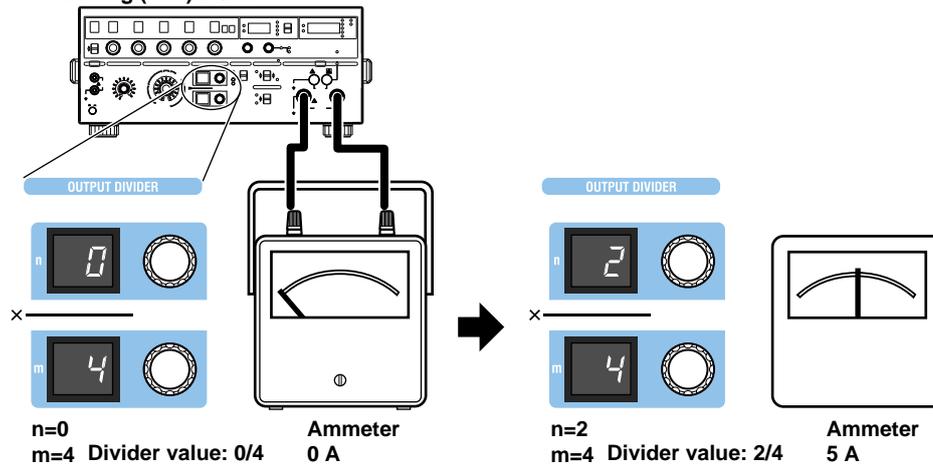
Preset

There are two ways to calibrate an analog meter. One is to calibrate from the minimum value up, and the other is to calibrate from the maximum value down. In either case, it is necessary to keep the needle from exceeding the next calibration position when the meter needle is move to the next calibration point. The 2560A enables you to set a preset to make the meter needle point to a position short of the accurate scale position of the next calibration point when the voltage or current is output. For details on 2560A configuration, see chapter 5 or section 7.2.

DEVIATION 5.00 % PRESET 5% 2% 0 OFF

Main setting (MAX) = 10 A
Main setting (MIN) = 0 A

OUTPUT DIVIDER

Indicates a point that is short of the calibration point by the preset amount

Use the output divider move the meter needle up.

Ammeter
4.5 A
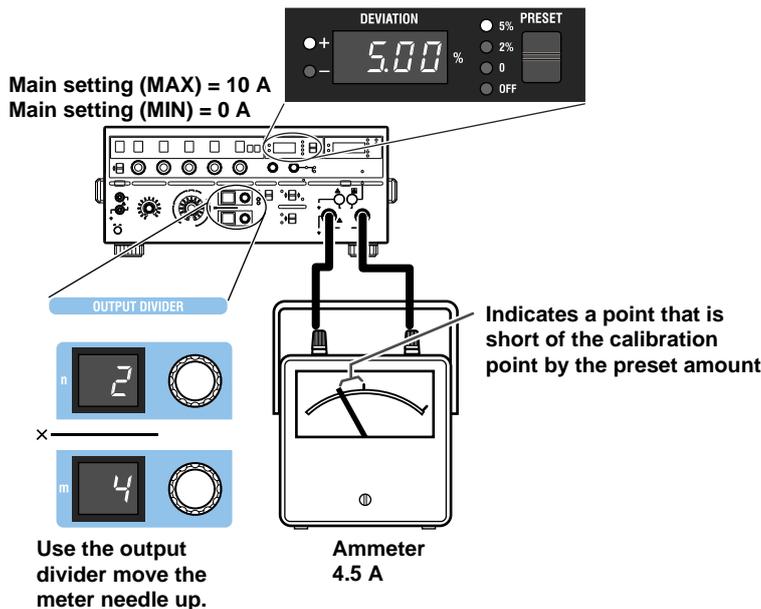
Deviation

The deviation dials are used to move the meter needle that has been forced to point to a position short of the accurate position with the preset feature (see the previous page) to the accurate scale position. The value shown on the deviation display when the needle is pointing to the accurate position is the calibration deviation. For details on 2560A configuration, see chapter 5 or section 7.2.

Main setting (MAX) = 10 A
Main setting (MIN) = 0 A

Use the deviation dial to align the meter needle to the accurate scale position.
Example: 4.5 A → 5 A
　　　The deviation is –0.03%.

Ammeter
4.5 A → 5 A
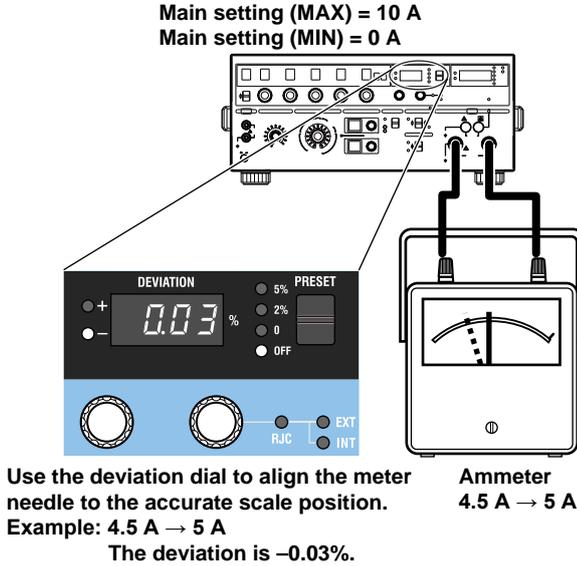
Calibrating a 4-20 mA Meter

To calibrate at 4 mA, 8 mA, 12 mA, 16 mA, and 20 mA, use the SCALE switch and main setting dials to set the scale's main setting (MAX) to 20 mA and main setting (MIN) to 4 mA. Set the output divider's denominator m to 4. Vary the numerator n from 0 to 4, and for each setting turn the deviation dials to align the meter needle. For details on 2560A configuration, see chapter 5 and sections 7.1 and 7.2.

Main setting (MAX) = 20 mA
Main setting (MIN) = 4 mA

Scale setting

Output divider

App

Appendix
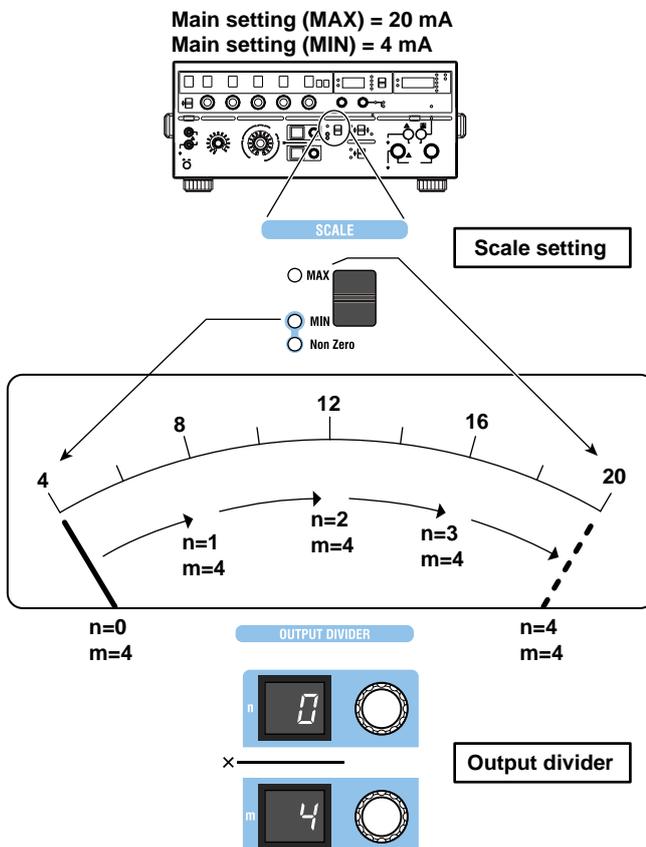
Calibrating a Meter Whose Range Is –10 V to +10 V

Similar to "Calibrating a 4-20 mA Meter" on the previous page, using the SCALE switch and main setting dials, set the scale's main setting (MAX) to +10 V and main setting (MIN) to -10 V. Then, calibrate each point. For details on 2560A configuration, see chapter 5 and sections 7.1 and 7.2.

Calibrating a Transducer

Temperature converters can be calibrated including their linearity.

For a temperature converter whose input is thermocouple type K (–200°C to +800°C) and output is voltage (–10 V to +10 V), set the scale's main setting (MAX) to +800°C and the main setting (MIN) to –200°C. Set the output divider's denominator m to 10. Vary the numerator n from 0 to 10, and check the digital multimeter (DMM) reading connected to the output side of the temperature converter.

For details on 2560A configuration, see sections 6.1 to 6.4 and 7.1.
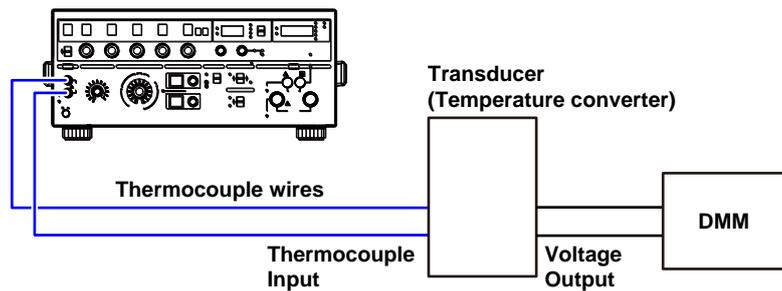
Note

For temperature, the source range of the positive side of the 2560A and that of the negative side are different. When setting main setting (MAX) and main setting (MIN), if the source range is exceeded as a result of changing the polarity, the main setting and polarity blink. If you turn any of the main setting dials in this condition, the main setting is set to the maximum absolute value within that polarity's source range, and blinking changes to solid.

Appendix 3 Thermocouple Calibration Wiring Examples

Thermocouple calibration wiring examples are shown below.

When Using 0°C Reference Junction

Wiring Example

2560A

Copper wires

Thermocouple wires or compensating lead wires

Thermometer, data logger, and the like that support thermocouple input

0°C reference junction
(ice bath, 0°C standard temperature device, etc.)
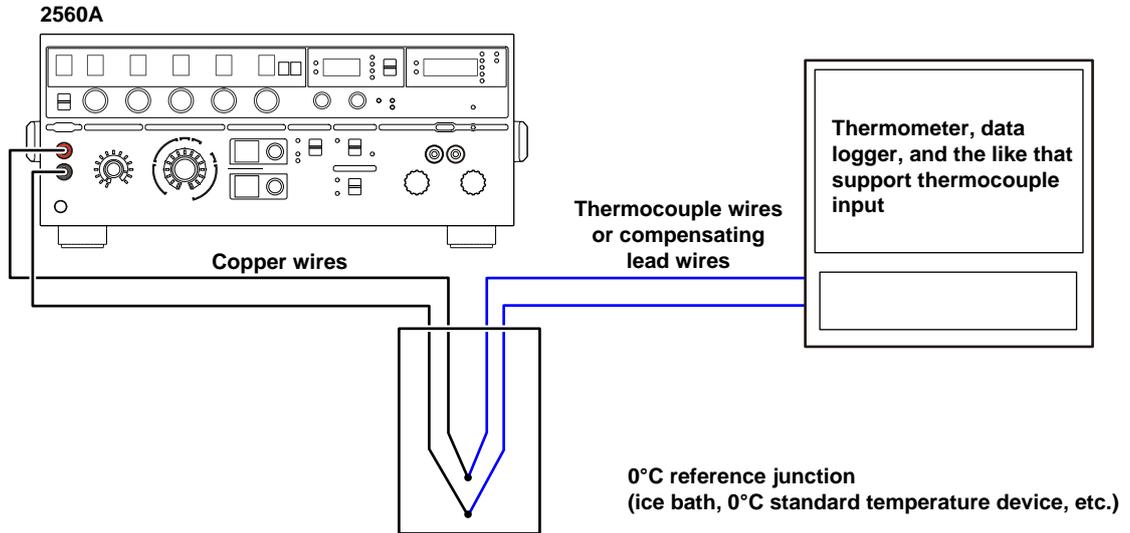
Configuring the 2560A

1. Set the reference junction compensation mode to manual input (MAN) and the reference junction temperature to 0.00°C.

   For details on 2560A configuration, see section 6.6.

2. Set the thermocouple type, temperature, and the like, and calibrate.

   For details on 2560A configuration, see sections 6.1 to 6.4.

When Using the Internal Reference Junction Compensation

Wiring Example

2560A

Thermocouple wires or compensating lead wires

Thermometer, data logger, and the like that support thermocouple input
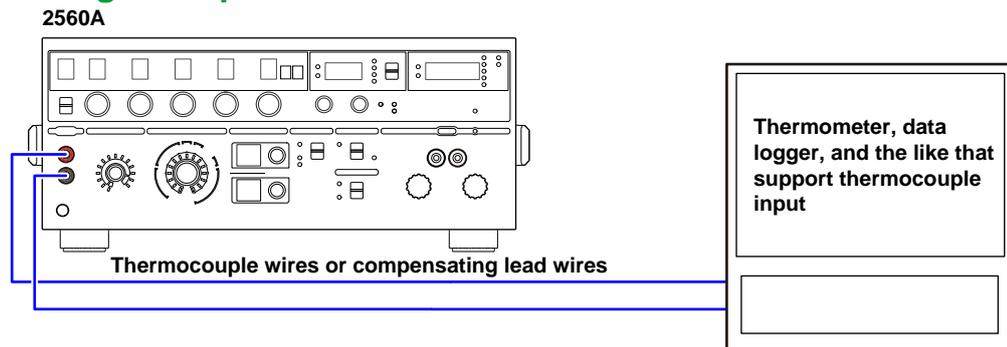
Configuring the 2560A

1. Set the reference junction compensation mode to internal (INT).

   For details on 2560A configuration, see section 6.6.

2. Set the thermocouple type, temperature, and the like, and calibrate.

   • For details on 2560A configuration, see sections 6.1 to 6.4.
   • Reference junction compensation error is added to the thermocouple temperature source accuracy.

When Using an External Reference Junction Compensation

Wiring Example

When Connecting an RJ Sensor Directly to the Device to Be Calibrated

2560A

Connect the measurement section of the RJ sensor to the input terminal of the device to be calibrated.

Thermometer, data logger, and the like that support thermocouple input

Copper wires
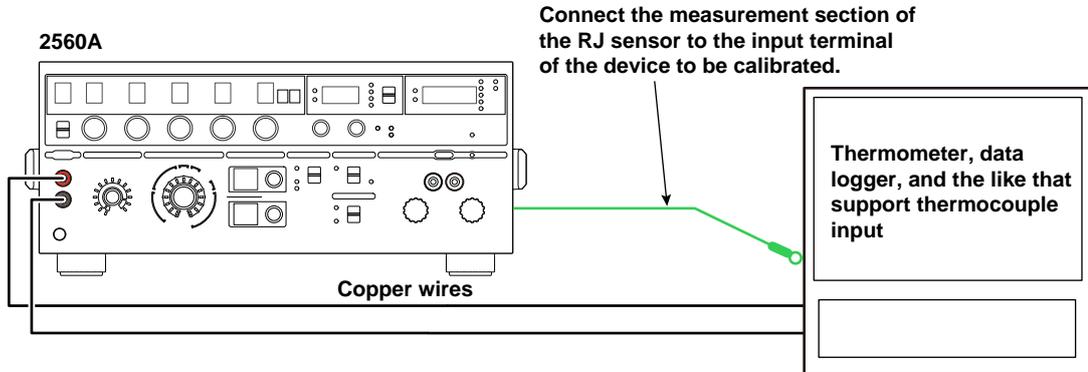
When Connecting an RJ Sensor to a Relay Terminal Block

2560A

Connect the measurement section of the RJ sensor to the relay terminal block.

Thermometer, data logger, and the like that support thermocouple input

Thermocouple wires or compensating lead wires

Copper wire

Off-the-shelf relay terminal block
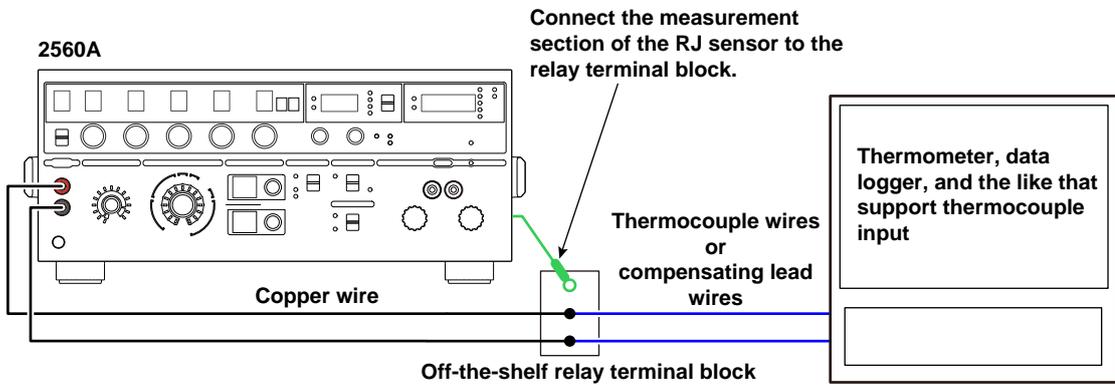
If the measurement section of an RJ sensor is connected to the input terminals of the device to be calibrated and the temperature of the terminals is different from the ambient temperature, the temperature imbalance will cause the temperature of the terminals to change. This may prevent accurate reference junction compensation. In such a situation, use a relay terminal block that is at the same temperature as the ambient temperature. However, you will need a thermocouple or compensating lead wire.

Configuring the 2560A

1. Connect an external reference junction (RJ) sensor to the external RJ sensor input terminal on the rear panel.
   - For the wiring details, see section 3.6.
   - Connect the measurement section of the external RJ sensor to the input terminal or relay terminal block of the device to be calibrated.

2. Set the reference junction compensation mode to AUTO.
   - For details on 2560A configuration, see section 6.6.

3. Set the thermocouple type, temperature, and the like, and calibrate.
   - For details on 2560A configuration, see sections 6.1 to 6.4.
   - Reference junction compensation error is added to the thermocouple temperature source accuracy.

Appendix 4 RTD Calibration Wiring Examples

RTD calibration wiring examples are shown below.

Three-wire System
Wiring Example

2560A

White (A)
Red (b)
Red (B)

Thermometer, data logger, and the like that support RTD Pt100 input
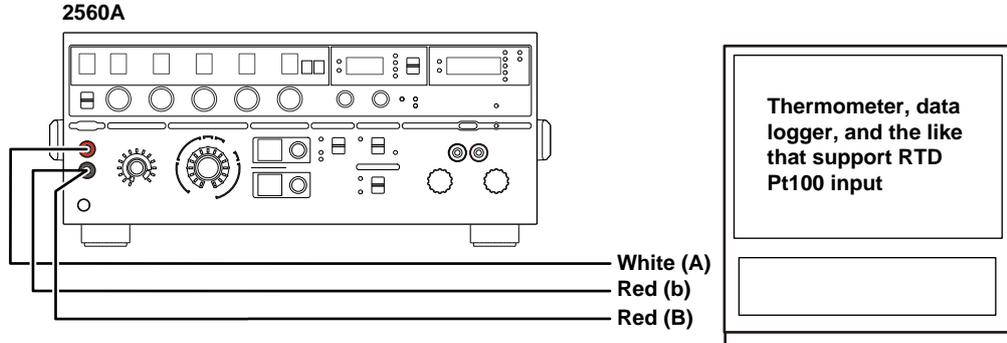
Make the resistances of the three lead wires the same.
Red, white, A, and B are defined in IEC 60751: 2008 and JIS C 1604: 2013.

Configuring the 2560A
Set the RTD, temperature, and the like, and calibrate.

For details on 2560A configuration, see sections 6.1 to 6.4.

Four-wire System
Wiring Example
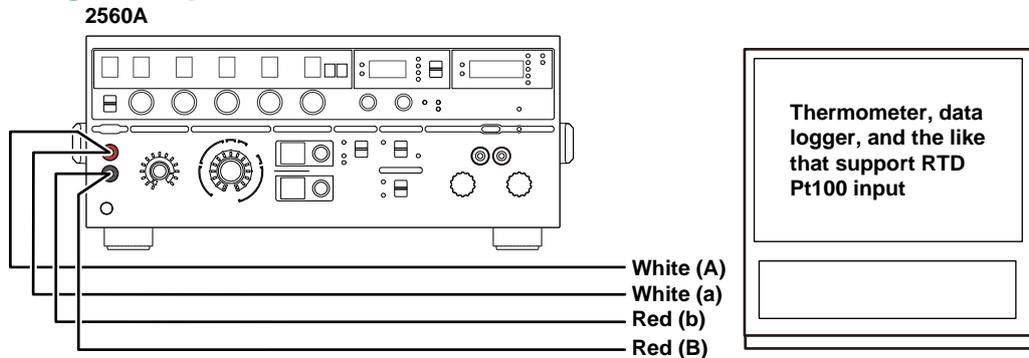
2560A

White (A)
White (a)
Red (b)
Red (B)

Thermometer, data logger, and the like that support RTD Pt100 input

Red, white, A, and B are defined in IEC 60751: 2008 and JIS C 1604: 2013.

Configuring the 2560A
Set the RTD, temperature, and the like, and calibrate.

For details on 2560A configuration, see sections 6.1 to 6.4.

Note
To calibrate more accurately, use the fork terminal adapter set 758921 (included or sold separately) to connect the lead wires (A and B) on the sensing side to the fastening sections of the 2560A output terminals.

2560A   **Four-wire system**   **Three-wire system**
                    White (A)   **White (A)**
Hi   **White (a)**
Lo   **Red (b)**   **Red (b)**
                    Red (B)   **Red (B)**
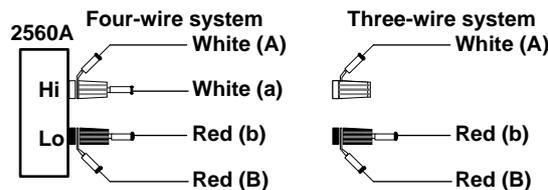
Appendix 5　Two-Unit Parallel Connection

When two units are connected in parallel to the large current terminals of the 2560A, up to 73.44 A of DC current can be output to the two units.

Output target device

HI

LO
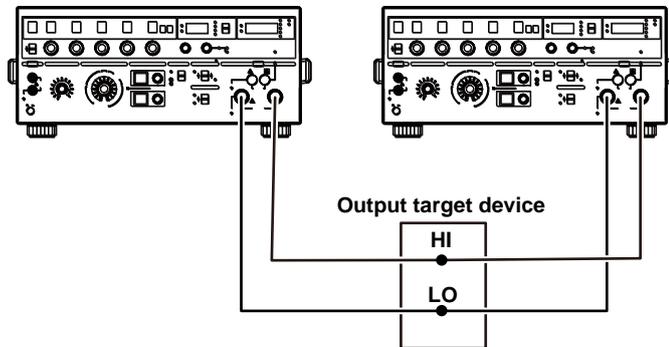
Note

The specifications of accuracy, stability, and temperature coefficient are those obtained by adding the values for two units.

Appendix 6 User Definitions of Thermocouples and RTDs

On the 2560A, you can define (user-define) thermoelectromotive force and resistance that simulate those of thermocouples or RTDs and source thermoelectromotive force and resistance according to the definitions.

Function

Thermoelectromotive Force of a Thermocouple

You can define a thermocouple's thermoelectromotive force source for every temperature range using polynomials. For details on the polynomial syntax, see "Definition Specifications" later in this section.
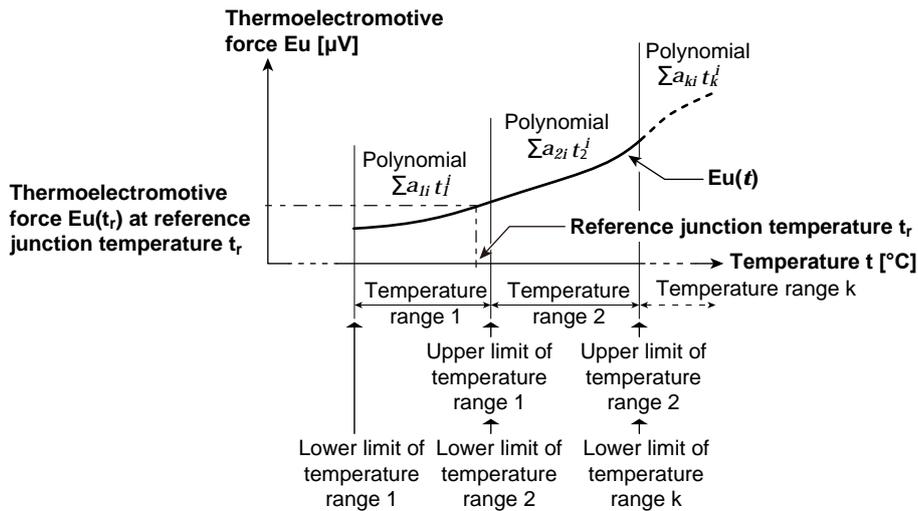
The 2560A calculates thermoelectromotive force Eu_{out} [µV] at temperature t [°C] using the polynomial and the following expression and outputs the resultant value. If the reference junction temperature is not in any of the user-defined temperature ranges, the temperature is assumed to be 0.0°C for the calculation (reference junction compensation).

$$Eu_{out} = Eu(t) - Eu(t_r)$$

Resistance of an RTD

You can define an RTD's resistance source for every temperature range using polynomials. For details on the polynomial syntax, see "Definition Specifications" later in this section.
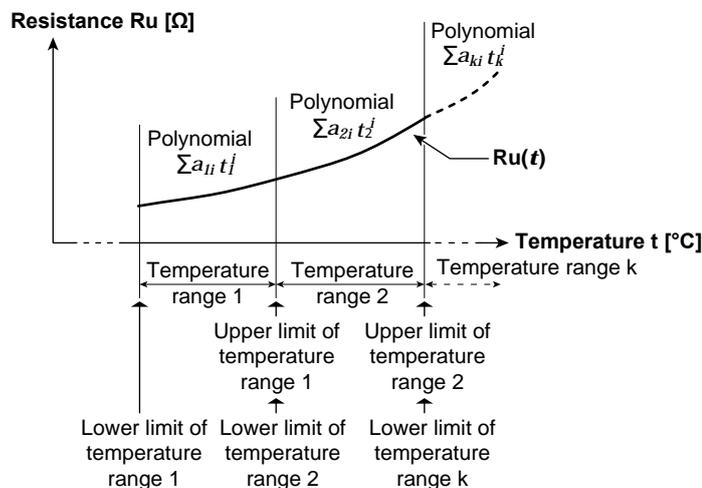
The 2560A calculates resistance Ru [Ω] at temperature t [°C] using the polynomial and outputs the resultant value.

Creating Data

User-defined data is created in text format as shown in the figure below. User-defined data contains characters that indicate the type for distinguishing user definitions (type characters), upper and lower limits of temperature ranges, coefficients of polynomials, and the like. For details on the syntax, see "Definition Specifications" later in this section.

The following webpage provides user-defined data samples.

http://www.yokogawa.com/jp-ymi/tm/Bu/2560A/

Data in text format

Line 1   `TYPE:L`
↑
Type character (1 character)

Upper limit of range
↓
Line 2   `0, 10, 0.00E+00, 1.00E+00, 2.00E+00`
(First   ↑   ↑   ↑   ↑
temperature **Lower limit**   **0th order**   **1st order**   **2nd order**
range)   **of range**   **coefficient**   **coefficient**   **coefficient**

Upper limit of range
↓
Line 3   `10, 20, 0.1E+00, 1.10E+00, 2.10E+00`
(Second   ↑   ↑   ↑   ↑
temperature **Lower limit**   **0th order**   **1st order**   **2nd order**
range)   **of range**   **coefficient**   **coefficient**   **coefficient**

Files That Are Saved

The data that you create is saved as a definition file. The definition file name is fixed. The name is not case sensitive.

- TC USER definition file name: TCUSER.TXT
- RTD USER definition file name: RTDUSER.TXT

Writing to the 2560A

Write the user-defined data from a definition file to the 2560A using the USB mass storage feature. Before the data is written, the 2560A checks for errors in the data. If there are no errors, the data will be written to the 2560A's internal memory. If data is already written, it is updated. If there is an error, the contents in the internal memory will not be updated.

Writing with Communication Commands

You can use communication commands to write user-defined data to the 2560A. A character string is sent for each temperature range using communication commands. A character string must be enclosed in single quotation marks or double quotation marks. To use communication commands to source the thermoelectromotive force or resistance according to the user-defined data, a sequence of commands needs to be executed. For details, see the description of the `:SOURce:RTD:DEFine` or `:SOURce:TCouple:DEFine` command in the SOURce group.

Example: A character string sent using a communication command
```
'0, 10, 0.00E+00, 1.00E+00, 2.00E+00'
"0, 10, 0.00E+00, 1.00E+00, 2.00E+00"
```

Definition Specifications

Item	Specifications
Number of user definitions	Thermocouple user definition (TC USER): 1 set, RTD user definition (RTD USER): 1 set
Temperature range	Lower limit: –9999.9°C, upper limit: +9999.9°C
Number of temperature ranges	Up to 100
Output unit	TC USER: μV, RTD USER: Ω
Output range	TC USER: –120.000 mV to +120.000 mV, RTD USER: 1.00 Ω to 400.00 Ω
Temperature unit displayed on the panel	°C
Polynomial	Create TC USER and RTD USER definition expressions using single-variable high-order polynomials. $$\sum_{i=0}^{n} a_i\, t^i$$ n: Up to 20 a: Coefficient. Can be set using a fixed-point number or floating-point number. If omitted, it is assumed to be zero. t: Temperature Unit: μV for TC USER, Ω for RTD USER: Ω Limitations on creating polynomials • It is assumed that the thermoelectromotive force and resistance polynomials will be written in terms of °C for both TC USER and RTD USER user definitions. • For TC USER, create the polynomial so that 0 V is output at 0°C.
Syntax	Line 1 TYPE:<type><line feed> Line 2 <temperature range 1><line feed> Line 3 <temperature range 2><line feed> Line 4 <temperature range 3><line feed> ⋮ ⋮ Line 101 <temperature range 100><line feed> • Keep the number of characters in line 1 within 512. • The maximum number of temperature ranges is 100. Temperature ranges beyond 100 are ignored.
	<type> No character or a single ASCII code character in the range of 20 to 7E (hexadecimal). For the characters that correspond to ASCII codes 20 to 7E, see appendix 9.
	<temperature range 1 to 100> [Lower limit]，upper limit [，0th order coefficient [，1st order coefficient [，2nd order coefficient . . . [，20th order coefficient] . . .]]] • Use a comma to delimit values. • Parts in square brackets ([ ]) can be omitted.
	Lower limit Set the lower temperature limit of each temperature range. Can be set using a fixed-point number or floating-point number. Selectable range: –9999.9°C to ++9999.9°C If omitted, –9999.9°C is set. If the selectable range overlaps with the next lower temperature range, the lower limit is set to the same value as the upper limit of the next lower temperature range. If the selectable range is higher than the upper limit of the next lower temperature range, the lower limit is also set to the upper limit of the next lower temperature range.
	Upper limit Set the upper temperature limit of each temperature range. Can be set using a fixed-point number or floating-point number. Selectable range: –9999.9°C to ++9999.9°C You cannot omit the upper limit. Make sure that the lower limit is less than or equal to the upper limit.
	nth order coefficients Set the nth order coefficients of the polynomial for each temperature range. Can be set using a fixed-point number or floating-point number. If omitted, 0 is set. Up to 21 coefficients can be set. Use a comma to delimit the coefficients. Set the coefficients so that the thermoelectromotive force or resistance do not exceed the maximum output.

Appendix

App

Item	Specifications
	<line feed> CR, LF, and CR+LF can be used.
	• Even if a temperature range is lower than that of the previous line, the ranges are sorted before they are written in the 2560A.
	• A line whose first character is a sharp (#) is handled as an empty line.
	• Lines that only contain a line feed are ignored.
	• Spaces after a comma or value are ignored.
	• Do not insert a space immediately after a polarity sign (– or +).
	•
Definition file	User-defined data that you create according to the syntax are saved in a text file with the following name. The user-defined data file name is fixed. The name is not case sensitive.
	TC USER definition file name: TCUSER.TXT
	RTD USER definition file name: RTDUSER.TXT
Error file	If there is an error in the user definition, an error will occur. Errors are saved to the following files in the 2560A OUT folder. The file name is fixed.
	TC USER error file name: ERRORTCUSER.TXT
	RTD USER error file name: ERRORRTDUSER.TXT
Error file syntax	LINE x, CHAR y : error message
	• LINE x: Indicates the error line number in the definition text data.
	• CHAR y: Indicates the error character number in the error line.
	• Error message: See "User-Definition Error Messages" below.
Setting user definitions using communication commands	You can use communication commands to set TC USER and RTD USER user definitions. For details on user-definition commands, see "SOURce Group" in chapter 13.
	• TC USER and RTD USER user definitions are set using separate commands.
	• A character string is set for each temperature range. You must send a character string enclosed in single quotation marks (') or double quotation marks (").
	• You can assign a character to identify among different types of user definitions.
	• You can delete the user-defined data written in the 2560A's internal memory.

User-Definition Error Messages

Error Message	Meaning
There is no TYPE description.	There is no TYPE description.
The number of characters for TYPE is not correct.	The number of characters for TYPE is not correct.
The character type used in TYPE is not correct.	The character type used in TYPE is not correct.
The output is outside the possible range.	The output is outside the possible range.
The number of characters in a line exceeds 512.	The number of characters in a line exceeds 512.
The upper limit of the temperature range is omitted.	The upper limit of the temperature range is omitted.
The upper or lower limit of the temperature range is outside the allowed range.	The upper or lower limit of the temperature range is outside the allowed range.
The upper limit of the temperature range is less than the lower limit.	The upper limit of the temperature range is less than the lower limit.
A polynomial coefficient is not specified.	A polynomial coefficient is not specified.
The format of the upper limit, lower limit, or polynomial coefficient is not correct.	The format of the upper limit, lower limit, or polynomial coefficient is not correct.
The number of polynomial coefficients exceeds 21.	The number of polynomial coefficients exceeds 21.

Appendix 7 List of Default Settings and Settings That Are Saved

Setup items		Factory Default Value	Initialized When Settings Are Initialized or with a *RST Command? Yes: Initialized No: Not initialized	Value Saved When Powered Off? Yes: Saved No: Not saved
Output		OFF	Yes	No
Range		1V	Yes	Yes
Temperature type		Thermocouple K	Yes	Yes
Main setting (MAX) Main setting (MIN)	Voltage, current	0.00000	Yes	No The decimal place depends on the range setting.
	Temperature	0.0	Yes	No
	Resistance	0.00	Yes	No
	Voltage, current polarity	+	Yes	No
	Temperature polarity	+	Yes	No
Scale selection		MAX	Yes	No
Output divider	Numerator n	10	Yes	No
	Denominator m	10	Yes	Yes
Deviation		0.00%	Yes	No
Preset		0%	Yes	No
Sweep		HOLD	Yes	No
Sweep time		Approx. 16 s	Yes	No
Resolution mode		NORM (5.5 digits)	Yes	Yes
Reference Junction Compensation (RJC)	Mode	AUTO (auto)	Yes	Yes
	Manual input compensation value	0.00°C	Yes	Yes
	Difference between the resistance for when the external RJ sensor is at 0°C and 100.00 Ω (RJC.R0)	0.00Ω	No	Yes
User definitions	Thermocouple	None	No	Yes
	RTD	None	No	Yes
Temperature output display		°	Yes	Yes
Temperature unit (only on models with the -UF suffix code)		°C	No	Yes
Beep sound		ON	Yes	Yes
GP-IB Interface	addresses	1	No	Yes
	Command type (TYPE)	NORMAL	No	Yes
Ethernet interface (LAN)	DHCP	ON	No	Yes
	IP address	192.168.0.1	No	Yes
	Subnet mask	255.255.255.0	No	Yes
	Default gateway	0.0.0.0	No	Yes
USB interface		TMC	No	Yes

Appendix 8   About the IEEE 488.2-1992 Standard

The 2560A's GP-IB interface conforms to the IEEE 488.2-1992 standard. This standard specifies that the following 23 items be stated in the document. This section describes these items.

(1) Of the IEEE 488.1 interface functions, the subsets that are supported
See section 9.1, "GP-IB Interface Features and Specifications."

(2) The operation of the device when it is assigned an address outside the 0 to 30 range.
The address of this instrument cannot be set to an address outside the 0 to 30 range.

(3) Reaction of the device when the user changes the address
The address change is detected when the user uses the RANGE dial > SETUP > GP-IB menu > ADRS menu and changes the address. The new address is valid until the next time it is changed.

(4) Device settings at power-up. The commands that can be used at power-up.
As a basic rule, the previous settings (the settings that were in use when the 2560A was turned off) are used.
There are no limitations on the commands that can be used at power-up.

(5) Message exchange options
(a)   Input buffer size
1024 bytes.
(b)   Queries that return multiple response messages
See the example of the commands given in chapter 13.
(c)   Queries that create response data when the command syntax is being analyzed
All queries create response data when the command syntax is analyzed.
(d)   Queries that create response data during reception
There are no queries of which the response data are created upon receiving a send request from the controller.
(e)   Commands that have parameters that restrict one another
See the example of the commands given in chapter 13.

(6) Items that are included in the functional or composite header elements constituting a command
See chapters 12 and 13.

(7) Buffer sizes that affect block data transmission
When block data is being transmitted, the output queue is expanded to match the size of the data that is being transmitted.

(8) A list of program data elements that can be used in equations and their nesting limitations
Equations cannot be used.

(9) Syntax of the responses to queries
See the example of the commands given in chapter 13.

(10) Communication between devices that do not follow the response syntax
Not supported.

(11) Size of the response data block
0 bytes

(12) A list of supported common commands
See section 13.7, "Common Command Group."

(13) Device condition after a successful calibration
*CAL is not supported.

(14) The maximum length of block data that can be used for the *DDT trigger macro definition
Not supported.

(15) The maximum length of the macro label for defining macros, the maximum length of block data that can be used for the macro definition, and the process when recursion is used in macro definitions
Macro functions are not supported.

(16) Reply to the *IDN? query
See section 13.7, "Common Command Group."

(17) Size of storage area for protected user data for *PUD and *PUD?
*PUD and *PUD? are not supported.

(18) The length of the *RDT and *RDT? resource names
*RDT and *RDT? are not supported.

(19) The change in the status due to *RST, *LRN?, *RCL, and *SAV!!!BREAK HERE!!!*RST
See section 13.7, "Common Command Group."
*LRN?, *RCL, *SAV
These common commands are not supported.

(20) The extent of the self-test using the *TST? command
See section 13.7, "Common Command Group."

(21) The structure of the extended return status
See chapter 12.

(22) Whether each command is processed in an overlapped manner or sequentially
See section 12.5, "Synchronization with the Controller" and chapter 13.

(23) The description of the execution of each command
See the functions of the commands given in chapter 13.

Appendix 9   ASCII Character Codes

This section provides a table of ASCII character codes.

The table below lists, for each cell: the character, its octal code (top-left), GP-IB code (top-right, where applicable), hexadecimal code (bottom-left), and decimal code (bottom-right).

	0	1	2	3	4	5	6	7
0	NUL (oct 0, hex 0, dec 0)	DEL (oct 20, hex 10, dec 16)	SP (oct 40, hex 20, dec 32; gpib 0)	0 (oct 60, hex 30, dec 48; gpib 16)	@ (oct 100, hex 40, dec 64; gpib 0)	P (oct 120, hex 50, dec 80; gpib 16)	` (oct 140, hex 60, dec 96; gpib 0)	p (oct 160, hex 70, dec 112; gpib 16)
1	SOH (oct 1, hex 1, dec 1; GTL)	DC1 (oct 21, hex 11, dec 17; LLO)	! (oct 41, hex 21, dec 33; gpib 1)	1 (oct 61, hex 31, dec 49; gpib 17)	A (oct 101, hex 41, dec 65; gpib 1)	Q (oct 121, hex 51, dec 81; gpib 17)	a (oct 141, hex 61, dec 97; gpib 1)	q (oct 161, hex 71, dec 113; gpib 17)
2	STX (oct 2, hex 2, dec 2)	DC2 (oct 22, hex 12, dec 18)	" (oct 42, hex 22, dec 34; gpib 2)	2 (oct 62, hex 32, dec 50; gpib 18)	B (oct 102, hex 42, dec 66; gpib 2)	R (oct 122, hex 52, dec 82; gpib 18)	b (oct 142, hex 62, dec 98; gpib 2)	r (oct 162, hex 72, dec 114; gpib 18)
3	ETX (oct 3, hex 3, dec 3)	DC3 (oct 23, hex 13, dec 19)	# (oct 43, hex 23, dec 35; gpib 3)	3 (oct 63, hex 33, dec 51; gpib 19)	C (oct 103, hex 43, dec 67; gpib 3)	S (oct 123, hex 53, dec 83; gpib 19)	c (oct 143, hex 63, dec 99; gpib 3)	s (oct 163, hex 73, dec 115; gpib 19)
4	EOT (oct 4, hex 4, dec 4; SDC)	DC4 (oct 24, hex 14, dec 20; DCL)	$ (oct 44, hex 24, dec 36; gpib 4)	4 (oct 64, hex 34, dec 52; gpib 20)	D (oct 104, hex 44, dec 68; gpib 4)	T (oct 124, hex 54, dec 84; gpib 20)	d (oct 144, hex 64, dec 100; gpib 4)	t (oct 164, hex 74, dec 116; gpib 20)
5	ENQ (oct 5, hex 5, dec 5; PPC)	NAK (oct 25, hex 15, dec 21; PPU)	% (oct 45, hex 25, dec 37; gpib 5)	5 (oct 65, hex 35, dec 53; gpib 21)	E (oct 105, hex 45, dec 69; gpib 5)	U (oct 125, hex 55, dec 85; gpib 21)	e (oct 145, hex 65, dec 101; gpib 5)	u (oct 165, hex 75, dec 117; gpib 21)
6	ACK (oct 6, hex 6, dec 6)	SYN (oct 26, hex 16, dec 22)	& (oct 46, hex 26, dec 38; gpib 6)	6 (oct 66, hex 36, dec 54; gpib 22)	F (oct 106, hex 46, dec 70; gpib 6)	V (oct 126, hex 56, dec 86; gpib 22)	f (oct 146, hex 66, dec 102; gpib 6)	v (oct 166, hex 76, dec 118; gpib 22)
7	BEL (oct 7, hex 7, dec 7)	ETB (oct 27, hex 17, dec 23)	' (oct 47, hex 27, dec 39; gpib 7)	7 (oct 67, hex 37, dec 55; gpib 23)	G (oct 107, hex 47, dec 71; gpib 7)	W (oct 127, hex 57, dec 87; gpib 23)	g (oct 147, hex 67, dec 103; gpib 7)	w (oct 167, hex 77, dec 119; gpib 23)
8	BS (oct 10, hex 8, dec 8; GET)	CAN (oct 30, hex 18, dec 24; SPE)	((oct 50, hex 28, dec 40; gpib 8)	8 (oct 70, hex 38, dec 56; gpib 24)	H (oct 110, hex 48, dec 72; gpib 8)	X (oct 130, hex 58, dec 88; gpib 24)	h (oct 150, hex 68, dec 104; gpib 8)	x (oct 170, hex 78, dec 120; gpib 24)
9	HT (oct 11, hex 9, dec 9; TCT)	EM (oct 31, hex 19, dec 25; SPD)	) (oct 51, hex 29, dec 41; gpib 9)	9 (oct 71, hex 39, dec 57; gpib 25)	I (oct 111, hex 49, dec 73; gpib 9)	Y (oct 131, hex 59, dec 89; gpib 25)	i (oct 151, hex 69, dec 105; gpib 9)	y (oct 171, hex 79, dec 121; gpib 25)
A	LF (oct 12, hex A, dec 10)	SUB (oct 32, hex 1A, dec 26)	* (oct 52, hex 2A, dec 42; gpib 10)	: (oct 72, hex 3A, dec 58; gpib 26)	J (oct 112, hex 4A, dec 74; gpib 10)	Z (oct 132, hex 5A, dec 90; gpib 26)	j (oct 152, hex 6A, dec 106; gpib 10)	z (oct 172, hex 7A, dec 122; gpib 26)
B	VT (oct 13, hex B, dec 11)	ESC (oct 33, hex 1B, dec 27)	+ (oct 53, hex 2B, dec 43; gpib 11)	; (oct 73, hex 3B, dec 59; gpib 27)	K (oct 113, hex 4B, dec 75; gpib 11)	[(oct 133, hex 5B, dec 91; gpib 27)	k (oct 153, hex 6B, dec 107; gpib 11)	{ (oct 173, hex 7B, dec 123; gpib 27)
C	FF (oct 14, hex C, dec 12)	FS (oct 34, hex 1C, dec 28)	, (oct 54, hex 2C, dec 44; gpib 12)	< (oct 74, hex 3C, dec 60; gpib 28)	L (oct 114, hex 4C, dec 76; gpib 12)	\ (oct 134, hex 5C, dec 92; gpib 28)	l (oct 154, hex 6C, dec 108; gpib 12)	| (oct 174, hex 7C, dec 124; gpib 28)
D	CR (oct 15, hex D, dec 13)	GS (oct 35, hex 1D, dec 29)	- (oct 55, hex 2D, dec 45; gpib 13)	= (oct 75, hex 3D, dec 61; gpib 29)	M (oct 115, hex 4D, dec 77; gpib 13)	] (oct 135, hex 5D, dec 93; gpib 29)	m (oct 155, hex 6D, dec 109; gpib 13)	} (oct 175, hex 7D, dec 125; gpib 29)
E	SO (oct 16, hex E, dec 14)	RS (oct 36, hex 1E, dec 30)	. (oct 56, hex 2E, dec 46; gpib 14)	> (oct 76, hex 3E, dec 62; gpib 30)	N (oct 116, hex 4E, dec 78; gpib 14)	^ (oct 136, hex 5E, dec 94; gpib 30)	n (oct 156, hex 6E, dec 110; gpib 14)	~ (oct 176, hex 7E, dec 126; gpib 30)
F	SI (oct 17, hex F, dec 15)	US (oct 37, hex 1F, dec 31)	/ (oct 57, hex 2F, dec 47; gpib 15)	? (oct 77, hex 3F, dec 63; UNL)	O (oct 117, hex 4F, dec 79; gpib 15)	_ (oct 137, hex 5F, dec 95; UNT)	o (oct 157, hex 6F, dec 111; gpib 15)	DEL (RUBOUT) (oct 177, hex 7F, dec 127)

| addresses commands | Universal commands | Listener addresses | | Talker addresses | | Secondary commands | |

Example

Octal → 25, PPU ← GP-IB code
NAK ← ASCII character code
Hexadecimal → 15, 21 ← Decimal

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