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.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC voltage</td>
<td>-1224 V to +1224 V</td>
</tr>
<tr>
<td>DC current</td>
<td>-12.24 A to +36.72 A</td>
</tr>
<tr>
<td>Resistance</td>
<td>1 Ω to 400 Ω</td>
</tr>
<tr>
<td></td>
<td>RTD: Pt100, user-defined</td>
</tr>
</tbody>
</table>

**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. Consérviez 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.

<table>
<thead>
<tr>
<th>Manual Title</th>
<th>Manual No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2560A Precision DC Calibrator</td>
<td>IM 2560A-01EN</td>
<td>This manual. The manual explains the handling precautions, features, specifications, communication interfaces, how to operate the 2560A, and so on.</td>
</tr>
<tr>
<td>User’s Manual</td>
<td>IM 2560A-92Z1</td>
<td>Document for China</td>
</tr>
<tr>
<td>Model 2560A Precision DC Calibrator</td>
<td>IM 2560A-92Z1</td>
<td></td>
</tr>
<tr>
<td>User’s Manual</td>
<td>IM 2560A-92Z1</td>
<td></td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Document No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIM 113-01Z2</td>
<td>List of worldwide contacts</td>
</tr>
</tbody>
</table>
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.
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Revisions

November 2015 1st Edition
October 2017 2nd Edition
August 2019 3rd Edition
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

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Code1</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>2560A</td>
<td></td>
<td>Precision DC Calibrator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1200 VDC to +1200 VDC, --12 ADC to +36 ADC</td>
</tr>
<tr>
<td>Version</td>
<td>-VA</td>
<td>Version A</td>
</tr>
<tr>
<td>Temperature unit</td>
<td>-UC</td>
<td>Temperature unit Celsius (°C)</td>
</tr>
<tr>
<td></td>
<td>-UF</td>
<td>Temperature unit Celsius (°C) and Fahrenheit (°F)</td>
</tr>
<tr>
<td>Power cord2</td>
<td></td>
<td>UL/CSA standard power cord, maximum rated voltage: 125 V</td>
</tr>
<tr>
<td></td>
<td>-F</td>
<td>VDE standard power cord, maximum rated voltage: 250 V</td>
</tr>
<tr>
<td></td>
<td>-R</td>
<td>AS standard power cord, maximum rated voltage: 250 V</td>
</tr>
<tr>
<td></td>
<td>-Q</td>
<td>BS standard power cord, maximum rated voltage: 250 V</td>
</tr>
<tr>
<td></td>
<td>-H</td>
<td>GB standard power cord, maximum rated voltage: 250 V</td>
</tr>
<tr>
<td></td>
<td>-N</td>
<td>NBR standard power cord, maximum rated voltage: 250 V</td>
</tr>
<tr>
<td></td>
<td>-T</td>
<td>Taiwanese standard power cord, maximum rated voltage: 125 V</td>
</tr>
<tr>
<td></td>
<td>-B</td>
<td>Indian standard power cord, maximum rated voltage: 250 V</td>
</tr>
<tr>
<td></td>
<td>-U</td>
<td>IEC Plug Type B power cord, maximum rated voltage: 250 V</td>
</tr>
<tr>
<td></td>
<td>-Y</td>
<td>No power cord included.3</td>
</tr>
</tbody>
</table>

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.
3 Prepare a power cord that complies with the standard specified by the country or region that the instrument will be used 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
- Taiwanese standard A1100WD
- Indian standard A1101WD
- IEC plug Type B A1102WD

Measurement lead²
- B8506ZK 1 set
- B8506WA 1 set

Alligator clip adapter²
- B8506ZL 1 set
- B8506WA 1 set

Fork terminal adapter³
- 758921 1 set

Terminal plug A2119JT
Rubber leg cap A90882M

Manuals
- IM 2560A-01EN
- User’s Manual (this manual)
- IM 2560A-02Z1
- Document for China
- PIM 113-01Z2
- List of worldwide contacts

Standard accessories are not covered by warranty.

1. Make sure that the attached power cord meets the designated standards of the country and area that you are using it in. If the suffix code is -Y, a power cord is not included.
2. The included measurement leads and alligator clip adapter set are exclusive to this product.
3. 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.

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

Accessories (sold separately) are not covered by warranty.
Safety Precautions

This product is designed to be used by a person with specialized knowledge. 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. This manual is part of the product and contains important information. Store this manual in a safe place close to the instrument so that you can refer to it immediately. Keep this manual until you dispose of the instrument.

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
Make sure that the power supply voltage matches the instrument’s rated supply voltage and that it does not exceed the maximum voltage range of the power cord to use.

Use the Correct Power Cord and Plug
To prevent the possibility of electric shock or fire, be sure to use the power cord for the instrument. 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. Further, do not use this power cord with other instruments.

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 you can use for the instrument is a three-prong 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 classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference.
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-électromotrice 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.

Manipuler 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
Assurez-vous que la tension d'alimentation correspond à la tension d'alimentation nominale de l'appareil et qu'elle ne dépasse pas la plage de tension maximale du cordon d'alimentation à utiliser.

Utiliser le cordon d'alimentation et la fiche adaptés
Pour éviter tout risque de choc électrique, utiliser exclusivement le cordon d'alimentation prévu pour cet instrument. 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. Par ailleurs, ne pas utiliser ce cordon d'alimentation avec d'autres instruments.

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 que vous utiliserez pour l'instrument est un cordon à 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 pouvoir 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 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 classé dans classe A (pour utilisation dans des environnements industriels). L'utilisation de ce produit dans un zone résidentielle peut entraîner une interférence radio que l'utilisateur sera tenu de rectifier.
Waste Electrical and Electronic Equipment

Waste Electrical and Electronic Equipment (WEEE), Directive

(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.

Disposal

When disposing of YOKOGWA products, follow the laws and ordinances of the country or region where the product will be disposed of.

關於在台灣銷售

This section is valid only in Taiwan.
關於在台灣所販賣的符合其相關規定的電源線A1100WD的限用物質含量信息，請至下麵的網址進行查詢
https://tmi.yokogawa.com/support/service-warranty-quality/product-compliance/
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 Attirez 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 Attirez 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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### Chapter 1 Names and Functions of Parts

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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

**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

**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
1.1 Panels

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

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

Bottom panel

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.

**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**
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 indicator**
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.
1.2 Dial and Switches

OUTPUT Section

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

ON indicator

OFF indicator

OUTPUT switch

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 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

m dial

Sets the denominator, m, of the divider value. The range is 4 to 15.

n dial

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

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 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
- DOWN indicator
- SWEEP switch
- 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.

<table>
<thead>
<tr>
<th>0 → 0</th>
<th>A → A</th>
<th>K → K</th>
<th>U → U</th>
<th>^ (power) → ^</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 → 1</td>
<td>B → b</td>
<td>L → L</td>
<td>V → V</td>
<td></td>
</tr>
<tr>
<td>2 → 2</td>
<td>C → c</td>
<td>M → m</td>
<td>W → W</td>
<td></td>
</tr>
<tr>
<td>3 → 3</td>
<td>D → d</td>
<td>N → n</td>
<td>X → x</td>
<td></td>
</tr>
<tr>
<td>4 → 4</td>
<td>E → E</td>
<td>O → o</td>
<td>Y → y</td>
<td></td>
</tr>
<tr>
<td>5 → 5</td>
<td>F → F</td>
<td>P → p</td>
<td>Z → z</td>
<td></td>
</tr>
<tr>
<td>6 → 6</td>
<td>G → G</td>
<td>Q → q</td>
<td>+ → +</td>
<td></td>
</tr>
<tr>
<td>7 → 7</td>
<td>H → H</td>
<td>R → r</td>
<td>– → –</td>
<td></td>
</tr>
<tr>
<td>8 → 8</td>
<td>I → i</td>
<td>S → s</td>
<td>–→ –</td>
<td></td>
</tr>
<tr>
<td>9 → 9</td>
<td>J → j</td>
<td>T → t</td>
<td>+ → +</td>
<td></td>
</tr>
</tbody>
</table>
2.1 System Configuration

- Low voltage-current output (OUTPUT 1)
- High voltage output (OUTPUT 2)
- Large current output (OUTPUT 2)

<table>
<thead>
<tr>
<th>Range</th>
<th></th>
<th>Range</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100 mV</td>
<td>100 V</td>
<td>1000 V</td>
</tr>
<tr>
<td></td>
<td>10 mV</td>
<td>30 A</td>
<td>30 A</td>
</tr>
<tr>
<td></td>
<td>100 µA</td>
<td>10 A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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.

**2.2 DC Voltage, DC Current, and Resistance 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)**

<table>
<thead>
<tr>
<th>Range</th>
<th>Source Range</th>
<th>Maximum Output Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mV</td>
<td>±122.400 mV</td>
<td>12 mA or higher</td>
</tr>
<tr>
<td>1 V</td>
<td>±1.22400 V</td>
<td>Approx. 120 mA</td>
</tr>
<tr>
<td>10 V</td>
<td>±12.2400 V</td>
<td>Approx. 120 mA</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Range</th>
<th>Source Range</th>
<th>Maximum Output Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 V</td>
<td>±122.400 V</td>
<td>Approx. 10 mA</td>
</tr>
<tr>
<td>30 A</td>
<td>±12.2400 A</td>
<td>Approx. 2 V</td>
</tr>
</tbody>
</table>

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.

**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)**

<table>
<thead>
<tr>
<th>Range</th>
<th>Source Range</th>
<th>Maximum Output Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 μA</td>
<td>±122.400 μA</td>
<td>Approx. 30 V</td>
</tr>
<tr>
<td>1 mA</td>
<td>±1.22400 mA</td>
<td>Approx. 30 V</td>
</tr>
<tr>
<td>10 mA</td>
<td>±12.2400 mA</td>
<td>Approx. 30 V</td>
</tr>
<tr>
<td>100 mA</td>
<td>±122.400 mA</td>
<td>Approx. 30 V</td>
</tr>
<tr>
<td>1 A</td>
<td>±1.22400 A</td>
<td>Approx. 10 V</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Range</th>
<th>Source Range</th>
<th>Maximum Output Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 A</td>
<td>±12.2400 A</td>
<td>Approx. 2 V</td>
</tr>
<tr>
<td>30 A</td>
<td>0 to +36.720 A</td>
<td>Approx. 1.5 V</td>
</tr>
</tbody>
</table>

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.
2.2 DC Voltage, DC Current, and Resistance Sourcing

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.

[Diagram]

The sink current range is the same as the source range of the 100 mA range.

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.

[Table]

<table>
<thead>
<tr>
<th>Range</th>
<th>Source Range</th>
<th>Excitation current</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 Ω</td>
<td>1.00 Ω to 400.00 Ω</td>
<td>0.1 mA to 2 mA</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Type</th>
<th>Source Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>-50°C to +1768°C</td>
</tr>
<tr>
<td>S</td>
<td>-50°C to +1768°C</td>
</tr>
<tr>
<td>B</td>
<td>0°C to +1820°C</td>
</tr>
<tr>
<td>J</td>
<td>-210°C to +1200°C</td>
</tr>
<tr>
<td>T</td>
<td>-270°C to +400°C</td>
</tr>
<tr>
<td>E</td>
<td>-270°C to +1000°C</td>
</tr>
<tr>
<td>K</td>
<td>-270°C to +1300°C</td>
</tr>
<tr>
<td>N</td>
<td>-270°C to +1300°C</td>
</tr>
<tr>
<td>C</td>
<td>0°C to +2315°C</td>
</tr>
<tr>
<td>A</td>
<td>0°C to +2500°C</td>
</tr>
<tr>
<td>TC USER (user-defined)</td>
<td>-9999.9°C to +9999.9°C</td>
</tr>
</tbody>
</table>

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.
- **Internal**
  - The 2560A sources thermoelectromotive force that is corrected using the temperature of its low voltage-current output terminals (OUTPUT 1).
2.3 Temperature-Sensor-Simulation Thermoelectromotive-Force and Resistance Sourcing

- 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.

<table>
<thead>
<tr>
<th>Type</th>
<th>Source Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt100</td>
<td>-200.0°C to +850.0°C</td>
</tr>
<tr>
<td>RTD USER (user-defined)</td>
<td>But, a temperature range corresponding to the resistance source range (1.00 Ω to 400.00 Ω)</td>
</tr>
</tbody>
</table>

**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.

\[
\text{Output value} = \text{MIN} + (\text{MAX} - \text{MIN}) \times \left(\frac{n}{m}\right) + (\text{MAX} - \text{MIN}) \times (-\text{deviation})
\]

- **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

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 \((10 \text{ A} \times 0/4)\) → 2.5 A \((10 \text{ A} \times 1/4)\) → 5 A \((10 \text{ A} \times 2/4)\) → 7.5 A \((10 \text{ A} \times 3/4)\) → 10 A \((10 \text{ A} \times 4/4)\)
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.

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

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.

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 or if you are using the instrument in a location where the power supply specifications are different, purchase a power cord that matches the specifications of the region that the instrument will be used in.

**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.

**Operating Environment and Conditions**
This instrument complies with the EMC standard under specific operating environment and operating conditions. If the installation, wiring, and so on are not appropriate, the compliance conditions of the EMC standard may not be met. In such cases, the user will be required to take appropriate measures.
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.

![Handle Image]

**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.

**Ambient temperature and humidity**

<table>
<thead>
<tr>
<th>Description</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>5°C to 40°C</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>20% RH to 80% RH (no condensation)</td>
</tr>
<tr>
<td></td>
<td>20% RH to 70% RH for ambient temperatures above 30°C</td>
</tr>
</tbody>
</table>
### 3.2 Installing the 2560A

**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](image)

**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](image)

**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).

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 751533-E4  Rack mount kit (for mounting one 2560A on an EIA standard rack)</td>
<td>751533-E4</td>
</tr>
<tr>
<td>Model 751533-J4  Rack mount kit (for mounting one 2560A on a JIS standard rack)</td>
<td>751533-J4</td>
</tr>
</tbody>
</table>

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

- 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**

- Make sure that the power supply voltage matches the instrument’s rated supply voltage and that it does not exceed the maximum voltage range of the power cord to use.
- Connect the power cord after checking that the power switch of the instrument is turned off.
- To prevent electric shock or fire, use the power cord for the instrument.
- 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 there is no AC outlet that is compatible with the power cord that you will be using and you cannot ground the instrument, do not use the instrument.

**French**

**AVERTISSEMENT**

- Assurez-vous que la tension d'alimentation correspond à la tension d'alimentation nominale de l’appareil et qu’elle ne dépasse pas la plage de tension maximale du cordon d'alimentation à utiliser.
- 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, utiliser exclusivement le cordon d'alimentation prévu pour cet 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.
- Si une sortie CA conforme au câble d'alimentation fourni n'est pas disponible et que vous ne pouvez pas relier l'instrument à la terre, ne l’utilisez pas.
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.

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

* 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 that you will be using before use.
### 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.

![Power Switch Location Diagram](image)

**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.
3.4 Turning On and Off the Power Switch

**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 then 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 to use 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 are no problems with the terminals, such as the presence of foreign substances.
3.5 Wiring Precautions

During output (do not touch the terminals or the connected lead wires when this instrument is on), check that:

- There are 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 output voltage 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 mm² 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.
3.5 Wiring Precautions

**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 à utiliser est un cordon d’alimentation à 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.
3.5 Wiring Precautions

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 la 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 mm² 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

**CAUTION**

- Confirm that no foreign materials are caught in the contact area between the output terminals and the lead wires.
- Periodically confirm that the output terminals are not loose and that there are no foreign materials caught in the contact area between the current terminals and the lead wires.
- Attaching the terminal plug upside down to the external RJ sensor input terminal of the 2560A may damage the terminal plug or the external RJ sensor input terminal. Check the orientation before attaching the plug.

**French**

**ATTENTION**

- Vérifier l’absence de corps étrangers dans la zone de contact entre les bornes de sortie et les câbles.
- Vérifier régulièrement que les bornes de sortie sont bien serrées et qu’il n’y a aucun corps étrangers dans la zone de contact entre les bornes de courant et les câbles.

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 4 mm safety plug-in terminals (banana jacks). Only insert safety terminals whose conductive parts are not exposed into these terminals.

**Wiring Example**

[Diagram showing 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

![Wiring Example Diagram]

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 Diagram]

- 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

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.
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 mm² to 1.5 mm²
     - Twisted wire: 0.14 mm² to 1.5 mm²
     - 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 diagram]

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

Connecting Wires

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

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.

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
Chapter 4  SETUP Menu

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.

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

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

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

- **BEEP**
  - Set the beep sound. → sec. 8.2
  - Options: ON Sound, OFF Not sound

- **GPIB**
  - Set the GP-IB conditions. → sec. 9.3

  - ADRS
    - GP-IB address
    - Value: 0 to 30

  - TYPE
    - Command type
    - Options: NORM IEEE 488.2, COMP 2560 compatible

- **LAN**
  - Configure the network environment. → sec. 10.3

  - DHCP
    - Options: ON Use, OFF Not use
    - 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)

    - 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)
4.1 SETUP Menu Tree Structure

From the previous page

- **GATE 1**
  - **GATE 2**
  - **GATE 3**
  - **GATE 4**

**MAC**

Default gateway

- Value: 0.0.0.0 to 255.255.255.255
- Example: 0 (GATE 1), 0 (GATE 2), 0 (GATE 3), 0 (GATE 4)

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**

Select the USB communication feature.

- Options: TMC Remote control → sec. 11.3
- STOR Mass storage → sec. 6.5

**TEMP**

Set the temperature display conditions.

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

- **RJC.R0**
  - 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**
  - Temperature unit → sec. 6.7
  - Options: CEL Celsius (°C)
  - FAR Fahrenheit (°F)

**ERROR**

Displays or clears the error log → sec. 15.5

- **LOG**
  - Displays the error number and error code
  - (Displays log number “0” and error code “NO” if there is no error log.)

- **CLEAR**
  - Clearing the Error Log
  - EXEC Executes clearing

- **INIT**
  - Initializes the settings → sec. 15.8
  - EXEC Executes initialization

- **INFO**
  - Displays the product information. → sec. 15.9

- **FIRM**
  - Firmware version

- **PCL**
  - Logic program version (PCL)

- **AMP**
  - Logic program version (AMP)

- **BOOT**
  - Boot program version

- **SER.NO**
  - Device serial number

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

- **CAL**
  - Performs simple adjustment

- **PASS**
  - Enter the password.

For the password entry and simple adjustment procedure, see the following webpage.
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.

**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.

<table>
<thead>
<tr>
<th>Current ranges</th>
<th>Resistance range</th>
</tr>
</thead>
<tbody>
<tr>
<td>mA</td>
<td>100</td>
</tr>
<tr>
<td>µA</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>10</td>
</tr>
</tbody>
</table>

Example: 10 V
The 10 V indicator turns on.

**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.

**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

<table>
<thead>
<tr>
<th>Range</th>
<th>Output Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mV, 1 V, 10 V</td>
<td>Low voltage-current output terminals (OUTPUT 1)</td>
</tr>
<tr>
<td>100 V, 1000 V</td>
<td>High voltage output terminals (OUTPUT 2)</td>
</tr>
</tbody>
</table>

The OUTPUT 1 indicator on the front panel illuminates.

The OUTPUT 2 indicator on the front panel illuminates.

The HIGH VOLTAGE indicator will illuminate even if the output is off.
5.1 Selecting the Voltage, Current, or Resistance Range

**Current Range Settings**
Select from the following.
100 µA, 1 mA, 10 mA, 100 mA, 1 A, 10 A, 30 A

<table>
<thead>
<tr>
<th>Range</th>
<th>Output Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 µA, 1 mA, 10 mA, 100 mA, 1 A</td>
<td>Low voltage-current output terminals (OUTPUT 1)</td>
</tr>
<tr>
<td></td>
<td>The OUTPUT 1 indicator on the front panel illuminates.</td>
</tr>
<tr>
<td>10 A, 30 A</td>
<td>Large current output terminals (OUTPUT 2)</td>
</tr>
<tr>
<td></td>
<td>The OUTPUT 2 indicator on the front panel illuminates.</td>
</tr>
</tbody>
</table>

**Resistance Range Settings**
400 Ω

<table>
<thead>
<tr>
<th>Range</th>
<th>Output Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 Ω</td>
<td>Low voltage-current output terminals (OUTPUT 1)</td>
</tr>
<tr>
<td></td>
<td>The OUTPUT 1 indicator on the front panel illuminates.</td>
</tr>
</tbody>
</table>

**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

**Procedure**

**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**

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 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**

<table>
<thead>
<tr>
<th>Range</th>
<th>Selectable Range</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mV</td>
<td>± 120.000 mV</td>
<td>1 µV</td>
</tr>
<tr>
<td>1 V</td>
<td>± 1.20000 V</td>
<td>10 µV</td>
</tr>
<tr>
<td>10 V</td>
<td>± 12.0000 V</td>
<td>100 µV</td>
</tr>
<tr>
<td>100 V</td>
<td>± 120.000 V</td>
<td>1 mV</td>
</tr>
<tr>
<td>1000 V</td>
<td>± 1200.00 V</td>
<td>10 mV</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Range</th>
<th>Selectable Range</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 µA</td>
<td>± 120.000 µA</td>
<td>1 nA</td>
</tr>
<tr>
<td>1 mA</td>
<td>± 1.20000 mA</td>
<td>10 nA</td>
</tr>
<tr>
<td>10 mA</td>
<td>± 12.0000 mA</td>
<td>100 nA</td>
</tr>
<tr>
<td>100 mA</td>
<td>± 120.000 mA</td>
<td>1 µA</td>
</tr>
<tr>
<td>1 A</td>
<td>± 1.20000 A</td>
<td>10 µA</td>
</tr>
<tr>
<td>10 A</td>
<td>± 12.0000 A</td>
<td>100 µA</td>
</tr>
<tr>
<td>30 A</td>
<td>0 to +36.000 A</td>
<td>1 mA</td>
</tr>
</tbody>
</table>
5.2 Specifying the Main Setting and Polarity

Resistance Ranges

<table>
<thead>
<tr>
<th>Range</th>
<th>Selectable Range</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 Ω</td>
<td>1.00 Ω to 400.00 Ω</td>
<td>0.01 Ω</td>
</tr>
</tbody>
</table>

* 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

![10 A range display]

30 A range

![30 A range display]

- 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

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.

<table>
<thead>
<tr>
<th>Original Polarities of the Main Setting (MAX) and Main Setting (MIN)</th>
<th>Setup Operation</th>
<th>Resulting Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set MAX less than or equal to MIN</td>
<td>MIN = MAX (the specified MAX value)</td>
<td></td>
</tr>
<tr>
<td>Set MIN greater than or equal to MAX</td>
<td>MAX=MIN (the specified MIN value)</td>
<td></td>
</tr>
<tr>
<td>Set MAX to negative with the POLARITY switch</td>
<td>MIN is also set to negative.</td>
<td></td>
</tr>
<tr>
<td>Set MIN to negative with the POLARITY switch</td>
<td>MAX stays positive.*</td>
<td></td>
</tr>
</tbody>
</table>
5.3 Setting the Output Scaling

<table>
<thead>
<tr>
<th>Original Polarities of the Main Setting (MAX) and Main Setting (MIN)</th>
<th>Setup Operation</th>
<th>Resulting Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set</td>
<td>MAX</td>
<td>less than or equal to</td>
</tr>
<tr>
<td>Set</td>
<td>MIN</td>
<td>greater than or equal to</td>
</tr>
<tr>
<td>Set MAX to positive with the POLARITY switch</td>
<td>MIN is also set to positive.</td>
<td></td>
</tr>
<tr>
<td>Set MIN to positive with the POLARITY switch</td>
<td>MAX is also set to positive.</td>
<td></td>
</tr>
<tr>
<td>MAX is positive; MIN is negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MAX</td>
<td>≥</td>
</tr>
<tr>
<td>Set MIN to positive with the POLARITY switch</td>
<td>MAX and MIN are set positive.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MAX</td>
<td>&lt;</td>
</tr>
<tr>
<td>Set MIN to positive with the POLARITY switch</td>
<td>MAX and MIN are positive. The main setting display blinks, and the output turns off.</td>
<td></td>
</tr>
</tbody>
</table>

* 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.

<table>
<thead>
<tr>
<th>SCALE switch setting</th>
<th>MAX</th>
<th>MIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main setting display</td>
<td>Main setting (MAX)</td>
<td>Main setting (MIN)</td>
</tr>
<tr>
<td></td>
<td>Non Zero indicator turns on for a value other than ±0 (zero).</td>
<td></td>
</tr>
<tr>
<td>n display</td>
<td>Same value as the m display</td>
<td>0</td>
</tr>
<tr>
<td>Deviation display</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- 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.

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.

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.
5.4 Turning the Output On and Off

**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**

<table>
<thead>
<tr>
<th>Output State</th>
<th>ON Indicator (Green)</th>
<th>OFF Indicator (Red)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Solid</td>
<td>Off</td>
</tr>
<tr>
<td>OFF</td>
<td>Off</td>
<td>Solid</td>
</tr>
</tbody>
</table>

**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.

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, 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.

Example: B
The B indicator turns on.
6.1 Selecting Thermocouples and RTDs

Explanation

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

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

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Selectable Range</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>-50°C to +1768°C</td>
<td>0.1°C</td>
</tr>
<tr>
<td>S</td>
<td>-50°C to +1768°C</td>
<td>0.1°C</td>
</tr>
<tr>
<td>B</td>
<td>0°C to +1820°C</td>
<td>0.1°C</td>
</tr>
<tr>
<td>J</td>
<td>-210°C to +1200°C</td>
<td>0.1°C</td>
</tr>
<tr>
<td>T</td>
<td>-270°C to +400°C</td>
<td>0.1°C</td>
</tr>
<tr>
<td>E</td>
<td>-270°C to +1000°C</td>
<td>0.1°C</td>
</tr>
<tr>
<td>K</td>
<td>-270°C to +1300°C</td>
<td>0.1°C</td>
</tr>
<tr>
<td>N</td>
<td>-270°C to +1300°C</td>
<td>0.1°C</td>
</tr>
<tr>
<td>C</td>
<td>0°C to +2315°C</td>
<td>0.1°C</td>
</tr>
<tr>
<td>A</td>
<td>0°C to +2500°C</td>
<td>0.1°C</td>
</tr>
<tr>
<td>TC USER</td>
<td>-9999.9°C to +9999.9°C</td>
<td>0.1°C</td>
</tr>
</tbody>
</table>

But, a range corresponding to the voltage source range (-120.000 mV to +120.000 mV)

* If you select TC USER, the thermoemotomotive 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.
6.2 Setting the Temperature

RTD

<table>
<thead>
<tr>
<th>Type</th>
<th>Selectable Range</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt100</td>
<td>-200.0°C to +850.0°C</td>
<td>0.1°C</td>
</tr>
<tr>
<td></td>
<td>-9999.9°C to +9999.9°C</td>
<td>0.1°C</td>
</tr>
<tr>
<td>RTD USER</td>
<td>However, within the temperature range corresponding to resistance source range (1.00 Ω to 400.00 Ω)</td>
<td>0.1°C</td>
</tr>
</tbody>
</table>

* 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**

![Image of a display with settings](image)

**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.

<table>
<thead>
<tr>
<th>Original Polarities of the Main Setting (MAX) and Main Setting (MIN)</th>
<th>Setup Operation</th>
<th>Resulting Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both positive</td>
<td>Set MAX less than or equal to MIN.</td>
<td>MIN = MAX (the specified MAX value)</td>
</tr>
<tr>
<td></td>
<td>Set MIN greater than or equal to MAX</td>
<td>MAX=MIN (the specified MIN value)</td>
</tr>
<tr>
<td></td>
<td>Set MAX to negative with the POLARITY switch</td>
<td>MIN is also set to negative.</td>
</tr>
<tr>
<td></td>
<td>Set MIN to negative with the POLARITY switch</td>
<td>MAX stays positive.</td>
</tr>
</tbody>
</table>
6.3 Setting the Output Scaling

<table>
<thead>
<tr>
<th>Original Polarities of the Main Setting (MAX) and Main Setting (MIN)</th>
<th>Setup Operation</th>
<th>Resulting Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both negative</td>
<td>Set</td>
<td>MAX</td>
</tr>
<tr>
<td></td>
<td>Set</td>
<td>MIN</td>
</tr>
<tr>
<td></td>
<td>Set MAX to positive with the POLARITY switch</td>
<td>MIN is also set to positive.</td>
</tr>
<tr>
<td></td>
<td>Set MIN to positive with the POLARITY switch</td>
<td>MAX is also set to positive.</td>
</tr>
<tr>
<td>MAX is positive; MIN is negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MAX</td>
<td>&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Set MIN to positive with the POLARITY switch</td>
</tr>
<tr>
<td></td>
<td>MAX</td>
<td>&lt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Set MIN to positive with the POLARITY switch</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>SCALE switch setting</th>
<th>MAX</th>
<th>MIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main setting display</td>
<td>Main setting (MAX)</td>
<td>Main setting (MIN)</td>
</tr>
<tr>
<td>n display</td>
<td>Same value as the m display</td>
<td>0</td>
</tr>
<tr>
<td>Deviation display</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- 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

**Procedure**

**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.

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)

**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 of 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.
### Setting the Output Value Display Mode

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

   ![RANGE dial](image)

   1. Select **SETUP**.
   The SETUP indicator turns on.

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 switch](image)

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.
**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

<table>
<thead>
<tr>
<th>Output State</th>
<th>ON Indicator (Green)</th>
<th>OFF Indicator (Red)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Solid</td>
<td>Off</td>
</tr>
<tr>
<td>OFF</td>
<td>Off</td>
<td>Solid</td>
</tr>
</tbody>
</table>

### 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>>**

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

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.
6.5 Writing User-Defined Data

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 thermoelctromotive 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.
6.5 Writing User-Defined Data

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.

<table>
<thead>
<tr>
<th>Main setting</th>
<th>Blinking bars (-----) will appear.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polarity</td>
<td>Will turn off.</td>
</tr>
<tr>
<td>RJC indicators</td>
<td>Solid indicators will change to blinking.</td>
</tr>
<tr>
<td>Output (OUTPUT)</td>
<td>The output cannot be turned on.</td>
</tr>
</tbody>
</table>

<<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.

**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.

   - **Auto**
     - When an external RJ sensor is connected
     - When an external RJ sensor is not connected
     - After several seconds
     - Internal RJC is applied.

   - **Internal**
     - When an external RJ sensor is connected and the 2560A has detected it

   - **Manual input**
     - When the setting is not 0.00°C
     - When the setting is 0.00°C

   - : On
   - : Blinking
   - : Off
### Setting the Reference Junction Temperature When the RJC Mode Is MAN (Manual input)

1. If you selected MAN (manual input), turn the right-most main setting dial to set the reference junction temperature.

### 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.

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.
6.6 Setting Reference Junction Compensation

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.

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.
**Explaination**

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.

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.

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.
6.7 Selecting the Temperature Unit

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.

**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

Procedure

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 1 and 2]

Set the first decimal digit at a resolution of 0.2.
Set the second decimal digit at a resolution of 0.01.

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 and 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.
7.2 Deviation Output

- 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.

\[
\text{Deviation} = 100.000 \times 0.01 = 1.000 \text{ V}
\]

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}
7.3 Sweep Output

Procedure

Setting the Sweep Time

1. Turn the RANGE dial to select SETUP.
   The SETUP menu appears.
   1. Select SETUP.
      The SETUP indicator turns on.

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.
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.

**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.
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](image)

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.
8.1 Selecting the Resolution Mode

**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.

   ![RANGE dial](image)

   **1. Select SETUP.**
   The SETUP indicator turns on.

   ![PRESET indicator](image)

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.

![Main setting dials](image)

![Deviation dials](image)

![PRESET switch](image)
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 E.950) 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

8.2 Turning the Beep Sound On and Off
Chapter 9  GP-IB Interface

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

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

Functional Specifications

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

**Procedure**

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

   **1. Select SETUP.**
   The SETUP indicator turns on.

   ![](image1.png)

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.

   ![](image2.png)

**Selecting the GP-IB Interface**

1. Select SETUP.
   The SETUP indicator turns on.

   **1. Select SETUP.**
   The SETUP indicator turns on.

2. Select GPIB.

   **2. Select GPIB.**
   "NEXT" appears on the deviation display. All the PRESET indicators turn on.

3. Display the GP-IB menu.

   **3. Display the GP-IB menu.**
   The GP-IB menu appears. All the PRESET indicators turn off.
9.3 Configuring the 2560A GP-IB Settings

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.

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.
9.3 Configuring the 2560A GP-IB 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.
9.4 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.

  - 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.

<table>
<thead>
<tr>
<th>Uni-line messages</th>
<th>Multi-line messages</th>
<th>Universal commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>★IFC</td>
<td>★GTL</td>
<td>★LLO</td>
</tr>
<tr>
<td>★REN</td>
<td>★SDC</td>
<td>★DCL</td>
</tr>
<tr>
<td>IDY</td>
<td>PPC</td>
<td>PPU</td>
</tr>
<tr>
<td></td>
<td>★GET</td>
<td>★PPU</td>
</tr>
<tr>
<td></td>
<td>TCT</td>
<td>★SPE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>★SPD</td>
</tr>
</tbody>
</table>

Listener address | Talker address | Secondary 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.
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**

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

**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).
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

UTP or STP cable (straight cable)

Network card

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

Procedure

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

   1. Select SETUP.
      The SETUP indicator turns on.

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.
10.3 Configuring the 2560A Ethernet Settings

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.

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.

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

<table>
<thead>
<tr>
<th>Octet number (shown on the unit display)</th>
<th>Each octet value (shown on the deviation display)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9 2.</td>
</tr>
<tr>
<td>2</td>
<td>6 8.</td>
</tr>
<tr>
<td>3</td>
<td>0.</td>
</tr>
<tr>
<td>4</td>
<td>1.</td>
</tr>
</tbody>
</table>
10.3 Configuring the 2560A Ethernet Settings

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**

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

**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 :COMM:ON:REM: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 :COMM:ON:LOCK:ON command from the PC. The 2560A switches to local mode when it receives a :COMM:ON:REM: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).
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

Procedure

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

   1. Select SETUP. The SETUP indicator turns on.

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.

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.
11.3 Configuring the 2560A 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.
Chapter 12  Programming Overview

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

<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>

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.
12.1 Messages

Response Message Unit Syntax
The response message unit syntax is as follows:

```
<Response header> Space <Response data>
```

**<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>
```

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 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 necessarily 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;*CLS;
:SOURce:LEVel 1V<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:FUNCtion VOLTage;<PMT>
: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,
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:

<table>
<thead>
<tr>
<th>Data</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;Decimal&gt;</td>
<td>A value expressed in decimal notation</td>
</tr>
<tr>
<td>&lt;Voltage&gt;&lt;Current&gt;</td>
<td>A physical value</td>
</tr>
<tr>
<td>&lt;Resistance&gt;</td>
<td>(Example: Voltage range setting: -&gt;:SOURCE:RANGE 30V)</td>
</tr>
<tr>
<td>&lt;Temperature&gt;</td>
<td>-&gt;:STATUS:EESE #HEE)</td>
</tr>
<tr>
<td>&lt;Time&gt;</td>
<td>A register value expressed as binary, octal, decimal, or hexadecimal</td>
</tr>
<tr>
<td></td>
<td>(Example: Extended event register value</td>
</tr>
<tr>
<td></td>
<td>-&gt;:OUPut:STATE ON)</td>
</tr>
<tr>
<td>&lt;Character Data&gt;</td>
<td>Predefined character string (mnemonic). Select from the available strings</td>
</tr>
<tr>
<td></td>
<td>in braces {}</td>
</tr>
<tr>
<td></td>
<td>(Example: Select the source function</td>
</tr>
<tr>
<td></td>
<td>-&gt;:SOURCE:FUNCTION {VOLTage</td>
</tr>
<tr>
<td>&lt;Boolean&gt;</td>
<td>Indicates on and off. Specify ON, OFF, or a value.</td>
</tr>
<tr>
<td></td>
<td>(Example: Turn the output on. -&gt;:OUTPut:STATE ON)</td>
</tr>
<tr>
<td>&lt;String Data&gt;</td>
<td>User-defined string</td>
</tr>
<tr>
<td></td>
<td>(Example: Ethernet IP address setting -&gt;:SYSTem:COMMunicate:ETHernet:IP</td>
</tr>
<tr>
<td></td>
<td>&quot;192.168.0.1&quot;)</td>
</tr>
<tr>
<td>&lt;Block Data&gt;</td>
<td>Data that contains 8-bit values</td>
</tr>
</tbody>
</table>

<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.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;NR1&gt;</td>
<td>Integer</td>
<td>123</td>
</tr>
<tr>
<td>&lt;NR2&gt;</td>
<td>Fixed-point number</td>
<td>125.0</td>
</tr>
<tr>
<td>&lt;NR3&gt;</td>
<td>Floating-point number</td>
<td>125.0E+0 9E1</td>
</tr>
<tr>
<td>&lt;NRf&gt;</td>
<td>Any of the forms &lt;NR1&gt; to &lt;NR3&gt;</td>
<td></td>
</tr>
</tbody>
</table>

- 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.

<Multiplier>
Multipliers that you can use are indicated in the following table.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Word</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX</td>
<td>Exa</td>
<td>10^{18}</td>
</tr>
<tr>
<td>PE</td>
<td>Peta</td>
<td>10^{15}</td>
</tr>
<tr>
<td>T</td>
<td>Tera</td>
<td>10^{12}</td>
</tr>
<tr>
<td>G</td>
<td>Giga</td>
<td>10^{9}</td>
</tr>
<tr>
<td>MA</td>
<td>Mega</td>
<td>10^{6}</td>
</tr>
<tr>
<td>K</td>
<td>Kilo</td>
<td>10^{3}</td>
</tr>
<tr>
<td>U</td>
<td>Micro</td>
<td>10^{-6}</td>
</tr>
<tr>
<td>N</td>
<td>Nano</td>
<td>10^{-9}</td>
</tr>
<tr>
<td>F</td>
<td>Pico</td>
<td>10^{-12}</td>
</tr>
<tr>
<td>F</td>
<td>Femto</td>
<td>10^{-15}</td>
</tr>
</tbody>
</table>

<Unit>
Units that you can use are indicated in the following table.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>Volt</td>
<td>Voltage</td>
</tr>
<tr>
<td>A</td>
<td>Ampere</td>
<td>Current</td>
</tr>
<tr>
<td>OHM</td>
<td>Ohm</td>
<td>Resistance</td>
</tr>
<tr>
<td>CEL</td>
<td>Celsius</td>
<td>Temperature °C</td>
</tr>
<tr>
<td>FAR</td>
<td>Fahrenheit</td>
<td>Temperature °F (only on models with the -UF suffix code)</td>
</tr>
<tr>
<td>S</td>
<td>Second</td>
<td>Time</td>
</tr>
</tbody>
</table>

- <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.
• 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:

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>#N&lt;N-digit decimal number&gt;&lt;Data byte sequence&gt;</td>
<td>#80000010ABCDEFGH1J</td>
</tr>
</tbody>
</table>

• #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: ABCDEFGH1J).
• 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.

<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.

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>#H&lt;Hexadecimal value made up of the digits 0 to 9 and A to F&gt;</td>
<td>#1F</td>
</tr>
<tr>
<td>#O&lt;Octal value made up of the digits 0 to 7&gt;</td>
<td>#777</td>
</tr>
<tr>
<td>#B&lt;Binary value made up of the digits 0 and 1&gt;</td>
<td>#001100</td>
</tr>
</tbody>
</table>

• <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.

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>{ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

• 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.
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
  :STATus:FILTer4 FALL;:STATus:EESE 8; EESR?;:*SRE 8;:SOURce:LEVel 10V
  (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:EESE 8;
  :STATus:CONDition?<PMT>
  :COMMunicate:WAIT #H0008<PMT>
  (Read the response to :STATus:EESR?)
  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".
  Example
  :STATus:FILTer4 FALL;:STATus:EESE 8; EESR?;:*SRE 8;:SOURce:LEVel 10V
  (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 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
  (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.
Chapter 13  Commands

13.1 List of Commands

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<th>Command</th>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
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<td>:COMMunicate?</td>
<td>Queries all communication settings.</td>
<td>13-4</td>
</tr>
<tr>
<td>:COMMunicate:HEADer</td>
<td>Sets or queries whether headers are attached to query responses.</td>
<td>13-4</td>
</tr>
<tr>
<td>:COMMunicate:LOCKout</td>
<td>Sets/clears local lockout.</td>
<td>13-4</td>
</tr>
<tr>
<td>:COMMunicate:REMote</td>
<td>Sets or queries whether the 2560A is in remote or local mode. On is remote mode.</td>
<td>13-4</td>
</tr>
<tr>
<td>:COMMunicate:VERBose</td>
<td>Sets or queries whether the response to a query is returned fully spelled out or in its abbreviated form.</td>
<td>13-4</td>
</tr>
<tr>
<td>:COMMunicate:WAIT</td>
<td>Waits for a specified extended event to occur.</td>
<td>13-4</td>
</tr>
<tr>
<td>:COMMunicate:WAIT?</td>
<td>Creates the response that is returned when a specified extended event occurs.</td>
<td>13-4</td>
</tr>
<tr>
<td>:DEViation?</td>
<td>Queries all deviation settings.</td>
<td>13-5</td>
</tr>
<tr>
<td>:DEViation:FRESet</td>
<td>Sets or queries the preset value.</td>
<td>13-5</td>
</tr>
<tr>
<td>:DEViation:VALUE</td>
<td>Sets or queries the deviation.</td>
<td>13-5</td>
</tr>
<tr>
<td>:DIVider?</td>
<td>Queries all output divider settings.</td>
<td>13-6</td>
</tr>
<tr>
<td>:DIVider:DENominator</td>
<td>Sets or queries the denominator m of the output divider.</td>
<td>13-6</td>
</tr>
<tr>
<td>:DIVider:NUMerator</td>
<td>Sets or queries the numerator n of the output divider.</td>
<td>13-6</td>
</tr>
<tr>
<td>:OUTPut[:STATe]</td>
<td>Sets or queries the output’s on/off state.</td>
<td>13-7</td>
</tr>
<tr>
<td>:OUTPut:POLarity[:AUTO]</td>
<td>Sets or queries the polarity of the main setting for main setting (MAX) or main setting (MIN), whichever is selected.</td>
<td>13-7</td>
</tr>
<tr>
<td>:OUTPut:POLarity:MAXimum</td>
<td>Sets or queries the polarity of main setting (MAX).</td>
<td>13-7</td>
</tr>
<tr>
<td>:OUTPut:POLarity:MINimum</td>
<td>Sets or queries the polarity of main setting (MIN).</td>
<td>13-7</td>
</tr>
<tr>
<td>:SOURce?</td>
<td>Queries all source settings.</td>
<td>13-8</td>
</tr>
<tr>
<td>:SOURce:FUNCTION</td>
<td>Sets or queries the source function.</td>
<td>13-8</td>
</tr>
<tr>
<td>:SOURce:LEVEL[:AUTO]</td>
<td>Sets or queries the main setting for main setting (MAX) or main setting (MIN), whichever is selected.</td>
<td>13-8</td>
</tr>
<tr>
<td>:SOURce:LEVEL:MAXimum</td>
<td>Sets or queries the main setting (MAX).</td>
<td>13-9</td>
</tr>
<tr>
<td>:SOURce:LEVEL:MINimum</td>
<td>Sets or queries the main setting (MIN).</td>
<td>13-9</td>
</tr>
<tr>
<td>:SOURce:RANGE</td>
<td>Sets or queries the voltage, current, or resistance range.</td>
<td>13-10</td>
</tr>
<tr>
<td>:SOURce:READ? [DUAL]</td>
<td>Queries the output value.</td>
<td>13-10</td>
</tr>
<tr>
<td>:SOURce:RJC1</td>
<td>Queries all reference junction compensation settings.</td>
<td>13-11</td>
</tr>
<tr>
<td>:SOURce:RJC:MODE</td>
<td>Sets or queries the reference junction compensation mode.</td>
<td>13-11</td>
</tr>
<tr>
<td>:SOURce:RJC:STATE?</td>
<td>Queries the reference junction compensation operating state.</td>
<td>13-11</td>
</tr>
<tr>
<td>:SOURce:RJC:TEMPerature?</td>
<td>Queries the reference junction compensation temperature.</td>
<td>13-12</td>
</tr>
<tr>
<td>:SOURce:RJC:TEMPerature:AUTO</td>
<td>Sets or queries the reference junction compensation temperature.</td>
<td>13-12</td>
</tr>
<tr>
<td>:SOURce:RJC:TEMPerature:EXTERN al?</td>
<td>Queries the external reference junction temperature.</td>
<td>13-12</td>
</tr>
<tr>
<td>:SOURce:RJC:TEMPerature:INTern al?</td>
<td>Queries the 2560A's internal reference junction (2560A low voltage-current output terminal) temperature.</td>
<td>13-12</td>
</tr>
<tr>
<td>:SOURce:RJC:TEMPerature:MANual</td>
<td>Sets or queries the temperature for when the reference junction compensation mode is set to manual input.</td>
<td>13-12</td>
</tr>
<tr>
<td>:SOURce:RJC:RESister?</td>
<td>Queries the resistance of the RJ sensor to be used for the external reference junction for 0°C.</td>
<td>13-12</td>
</tr>
<tr>
<td>:SOURce:RTD1</td>
<td>Queries all user-defined RTD settings.</td>
<td>13-12</td>
</tr>
<tr>
<td>:SOURce:RTD:DEFINE</td>
<td>Sets a user-defined RTD.</td>
<td>13-12</td>
</tr>
<tr>
<td>:SOURce:RTD:DELETE</td>
<td>Deletes user-defined RTDs.</td>
<td>13-13</td>
</tr>
<tr>
<td>:SOURce:RTD:SETTING?</td>
<td>Queries all temperature range settings that are user-defined for the RTD.</td>
<td>13-13</td>
</tr>
</tbody>
</table>
## 13.1 List of Commands

<table>
<thead>
<tr>
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<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>:SOURce:RTD:TYPE</td>
<td>Sets or queries the type string for distinguishing user-defined RTDs.</td>
<td>13-13</td>
</tr>
<tr>
<td>:SOURce:RTD:WRITE</td>
<td>Writes a user-defined RTD.</td>
<td>13-13</td>
</tr>
<tr>
<td>:SOURce:SCALE</td>
<td>Sets or queries whether main setting (MAX) or main setting (MIN) is to be set.</td>
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</tr>
<tr>
<td>:SOURce:SLEVEL[:AUTO]</td>
<td>Sets or queries the main setting for main setting (MAX) or main setting (MIN), whichever is selected, with polarity information.</td>
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<tr>
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</tr>
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### STATus Group

| :STATus?              | Queries all the settings of the communication status feature.            | 13-16 |
| :STATus:CONDITION?    | Queries the contents of the condition register.                          | 13-16 |
| :STATus:EEESE         | 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 |
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### SWEep Group

| :SWEep?               | Queries all sweep settings.                                              | 13-17 |
| :SWEep:DIRection      | Sweeps up or down or stops sweeping. Queries the sweep state.            | 13-17 |
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### SYSTem Group

| :SYSTem?              | Queries all the system settings.                                         | 13-18 |
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| :SYSTem:COMMunicate?  | Queries all the communication settings.                                  | 13-18 |
| :SYSTem:COMMunicate:ETHernet? | Queries all the Ethernet communication settings.                     | 13-18 |
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| :SYSTem:COMMunicate:ETHernet:GATEeway | 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:MAC address | Sets or queries the Ethernet MAC address.                           | 13-18 |
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| :SYSTem:COMMunicate:GPIB:ADDR ess | 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 |
## Common Command Group

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<th>Function</th>
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</tr>
<tr>
<td>*ESE</td>
<td>Sets or queries the standard event enable register.</td>
<td>13-20</td>
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<tr>
<td>*ESR?</td>
<td>Queries and clears the standard event register.</td>
<td>13-20</td>
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<tr>
<td>*IDN?</td>
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<td>13-20</td>
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<tr>
<td>*OPC</td>
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<td>13-20</td>
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<td>13-20</td>
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<tr>
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<td>13-20</td>
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<td>13-20</td>
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<tr>
<td>*TST?</td>
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<td>13-21</td>
</tr>
<tr>
<td>*WAI</td>
<td>Holds the execution of the subsequent command until the specified overlap command is completed.</td>
<td>13-21</td>
</tr>
</tbody>
</table>
### 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>`  
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.

<table>
<thead>
<tr>
<th>Command</th>
<th>Function</th>
<th>Syntax</th>
</tr>
</thead>
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<tr>
<td>:DEViation?</td>
<td>Queries all deviation settings.</td>
<td>:DEViation?</td>
</tr>
<tr>
<td>:DEViation:PRESet</td>
<td>Sets or queries the preset value.</td>
<td>:DEViation:PRESet {&lt;Percentage&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>:DEViation:PRESet?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;Percentage&gt; = 0PCT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0PCT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF: Presets are not used.</td>
</tr>
<tr>
<td></td>
<td>Example</td>
<td>:DEVIATION:PRESET 0PCT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>:DEVIATION:PRESET? -&gt; 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Command</th>
<th>Function</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>:DEViation:VALue</td>
<td>Sets or queries the deviation.</td>
<td>:DEViation:VALue {&lt;Percentage}</td>
</tr>
<tr>
<td></td>
<td></td>
<td>:DEViation:VALue?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;Percentage&gt; = -20.00PCT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-20.00PCT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20.00PCT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MINimum: Minimum value (-20.00%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MAXimum: Maximum value (20.00%)</td>
</tr>
<tr>
<td></td>
<td>Example</td>
<td>:DEVIATION:VALUE -20.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>:DEVIATION:VALUE? -&gt; -20.00</td>
</tr>
</tbody>
</table>
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.
### 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?

**Example**: :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

**Description**: If the front panel is displaying the SETUP menu, “NONE” will be returned in response to a query.

**Example**: :SOURCE:FUNCTION VOLTAGE

- **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|MAXimum}

  :SOURce:LEVel[:AUTO]?    
  :VOLTage: Voltage
  :CURRent: Current
  :TCouple: Thermocouple
  :RTD: Resistance temperature detector
  :RESistance: Resistance
  :RJTemp: Reference junction temperature

**Description**: If the front panel is displaying the SETUP menu, “NONE” will be returned in response to a query.

- **OUTPut:POLarity[:AUTO]**

  **OUTPut:POLarity:MAXimum**
  **OUTPut:POLarity:MINimum**

**Example**: :OUTPut:POLarity[AUTO]

**Example**: :SOURCE:LEVEL:AUTO 10V

- **Source**: 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 compensation value

**Example**: :SOURCE:FUNCTION VOLTAGE

**Example**: :SOURCE:LEVEL:AUTO?

- **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.

  - **Example**: :OUTPut:POLarity[AUTO]
  - **OUTPut:POLarity:MAXimum**
  - **OUTPut:POLarity:MINimum**

- **Example**: To set the value with the sign, use the :SOURce:LEVEL[:AUTO] command.

- **Example**: Before setting <Voltage>, use the :SOURce:FUNCTION command to set the source function to VOLTage.

- **Example**: Before setting <Current>, use the :SOURce:FUNCTION command to set the source function to CURRent.

- **Example**: Before setting <Temperature>, use the :SOURce:FUNCTION command to set the source function to TCouple or RTD.

- **Example**: Before setting <Resistance>, use the :SOURce:FUNCTION command to set the source function to RESistance.

- **Example**: If you set a main setting of a different source function, a “131: Invalid suffix” error will occur.

- **Example**: If the source function is RJTemp and you set the main setting, a “221: Setting conflict” error will occur.

- **Example**: 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.

- **Example**: Another digit is added to the resolution.
### SOURce Group

#### SOURce:LEVel:MAXimum

**Function**
Sets or queries the main setting (MAX).

**Syntax**
```
:SOURce:LEVel:MAXimum {<Voltage>|<Current>|<Temperature>|<Resistance>|MINimum|MAXimum}
```

**Example**
```
:SOURce:LEVel:MAXimum 10V
```

**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.
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>|MINimum|MAXimum}
```

**Example**
```
:SOURce:LEVel:MINimum 0V
```

**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.
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.
13.6 SOURce Group

: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>

Example: When the resolution mode is NORMAL

:SOURce:READ? ->

100 uA range

:SOURce:READ 100.000E-06

1 mA range

:SOURce:READ 1.00000E-03

10 mA range

:SOURce:READ 10.0000E-03

100 mV or 100 mA range

:SOURce:READ 100.000E-03

1 V or 1 A range

:SOURce:READ 1.00000E+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 1000.000E+00

400OHM range

:SOURce:READ 400.000E+00

TCouple or RTD

:SOURce:READ 1.00000E+03

When the output is OFF

:SOURce:READ 9.91E+37

When the resolution mode is DUAL

: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 1000.000E+00

400OHM range

:SOURce:READ 400.000E+00,400.000E+00

TCouple

:SOURce:READ 1.00000E+03,40.2050E-03

RTD

:SOURce:READ 100.000E+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 30.00000E+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 30.00000E+00,30.00000E+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:TEMPPerature: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
13.6 SOURce Group

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>
Example :SOURCE:RJC:TEMPERATURE:AUTO 0.0
-> :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 0.0
-> :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>
Example :SOURCE:RJC:TEMPERATURE:MANUAL 0.0
-> :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>
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.
Syntax :SOURCE:FUNCTION RTD
Example :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.
13.6 SOURce Group

: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?
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's 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]
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.

13.6 SOURce Group
**13.6 SOURce Group**

`:SOURce:SLEVel:MAXimum`  
**Function**: Sets or queries the main setting (MAX) with polarity information.  
**Syntax**:  
```
:SOURce:SLEVel:MAXimum {<Voltage>|<Current>|<Temperature>|<Resistance>|MINimum|MAXimum}
```

**Example**:  
```
:SOURce:SLEVel:MAXimum -10V
```

**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>|MINimum|MAXimum}
```

**Example**:  
```
:SOURce:SLEVel:MINimum 0V
```

**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?
```

**Example**:  
```
:SOURce:TCouple?
```

**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.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>:SOURCE:TCOUPLE:WRITE</td>
<td>Writes the user definitions to the 2560A's internal memory. The user definitions take effect.</td>
</tr>
<tr>
<td>:SOURCE:FUNCTION TCOUPLE</td>
<td>Sets the source function to TCouple.</td>
</tr>
<tr>
<td>:SOURCE:TYPE USER</td>
<td>Sets the type to USER.</td>
</tr>
<tr>
<td>:OUTPUT:STATE ON</td>
<td>Finally, when you turn the output on, the 2560A sources the thermoelectromotive force of the user-defined thermocouple.</td>
</tr>
</tbody>
</table>

`:SOURce:TCouple:DEFINE`  
**Function**: Sets a user-defined thermocouple.  
**Syntax**:  
```
:SOURce:TCouple:DEFINE <String>
```

**Example**:  
```
:SOURce:TCouple:DEFINE "-100.0,0.0,-100.0,1.0"
```

**Description**  
- Sets the source function to TCouple.  
- Defines the relationship between the temperature range and thermoelectromotive force.  
- For details on string syntax, see appendix 6.

`: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?
```

**Description**  
- Queries all temperature range settings that have been user-defined for the thermocouple.  
- The temperature range settings 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?
```

**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.
### 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.

<table>
<thead>
<tr>
<th>Command</th>
<th>Function</th>
<th>Syntax</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>:STATus?</td>
<td>Queries all the settings of the communication status feature.</td>
<td>:STATus?</td>
<td>:STATus?</td>
<td>For information about status reports, see chapter 14, “Status Reports.”</td>
</tr>
<tr>
<td>:STATus:EESE</td>
<td>Sets or queries the extended event enable register.</td>
<td>:STATus:EESE {&lt;Register&gt;}</td>
<td>:STATus:EESE #7659</td>
<td>For information about the extended event enable register, see chapter 14, “Status Reports.”</td>
</tr>
<tr>
<td>:STATus:ERROR?</td>
<td>Queries the error code and message of the last error that has occurred (top of the error queue).</td>
<td>:STATus:ERROR?</td>
<td>:STATus:ERROR? #113</td>
<td>For information about the transition filter, see chapter 14, “Status Reports.”</td>
</tr>
<tr>
<td>:STATus:FILTER&lt;x&gt;</td>
<td>Sets or queries the transition filter.</td>
<td>:STATus:FILTER&lt;x&gt; {BOTH</td>
<td>FALL</td>
<td>NEVer</td>
</tr>
<tr>
<td>:STATus:QENABLE</td>
<td>Sets or queries whether messages other than errors will be stored to the error queue (ON) or not (OFF).</td>
<td>:STATus:QENABLE {&lt;Boolean&gt;}</td>
<td>:STATus:QENABLE ON</td>
<td>For information about the transition filter, see chapter 14, “Status Reports.”</td>
</tr>
<tr>
<td>:STATus:QMESSAGE</td>
<td>Sets or queries whether message information will be attached to the response to the STATus:ERROR? query (ON/OFF).</td>
<td>:STATus:QMESSAGE {&lt;Boolean&gt;}</td>
<td>:STATus:QMESSAGE OFF</td>
<td>For information about the transition filter, see chapter 14, “Status Reports.”</td>
</tr>
</tbody>
</table>
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}

Example:

:SWEEP:DIRECTION UP
:SWEEP:DIRECTION? -> UP

**:SWEep:TIMe**

Function: Sets or queries the sweep time.

Syntax: :SWEep:TIMe <Time>

Example:

:SWEEP:TIME 16S
:SWEEP:TIME? -> 16
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>
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>
ON|1: DHCP is enabled.
OFF|0: DHCP is disabled.
Example :SYSTem:COMMunicate:ETHernet:DHCP ON

:SYSTem:COMMunicate:ETHernet:GATEway
Function Sets or queries the Ethernet default gateway.
Syntax :SYSTem:COMMunicate:ETHernet:GATEway <String>
Example :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>
Example :SYSTem:COMMunicate:ETHernet:IP "192.168.0.1"

:SYSTem:COMMunicate:ETHernet:MACaddress
Function Sets or queries the Ethernet MAC address.
where xx is a value between 0 and FF
Example :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> = "x.x.x.x" x = 0 to 255
Example :SYSTem:COMMunicate:ETHernet:MASK "255.255.255.0"
13.9 SYSTem Group

**:SYSTem:COMMunicate:GPIB:ADDRess**
Function Sets or queries the GP-IB address.
Syntax :SYSTem:COMMunicate:GPIB:ADDRess <NRf>
Example :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}
Example :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}
Example :SYSTEM:COMMUNICATE:USB:FUNCTION STORAGE

**:SYSTem:REBoot**
Function Restarts the 2560A when the specified time elapses.
Syntax :SYSTem:REBoot <Time>
Example :SYSTEM:REBOOT 3

**:SYSTem:RESolution**
Function Sets or queries the resolution mode.
Syntax :SYSTem:RESolution {NORMal|HIGH}
Example :SYSTEM:REOLUTION 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>
Example :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}
Example :SYSTEM:TEMPERATURE:MONITOR DEGREE

**:SYSTem:UNIT**
Function Sets or queries the temperature unit.
Syntax :SYSTem:UNIT {C|CEL|F|FAR}
Example :SYSTEM:UNIT C
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.

<table>
<thead>
<tr>
<th>Command</th>
<th>Function</th>
<th>Syntax</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>*CLS</td>
<td>Clears the standard event register, extended event register, and error queue.</td>
<td>*CLS</td>
<td>*CLS</td>
<td>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.”</td>
</tr>
<tr>
<td>*ESE</td>
<td>Sets or queries the standard event enable register.</td>
<td>*ESE {&lt;NRf&gt;}</td>
<td>*ESE 251</td>
<td>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.</td>
</tr>
<tr>
<td>*ESR?</td>
<td>Queries and clears the standard event register.</td>
<td>*ESR?</td>
<td>*ESR? -&gt; 32</td>
<td>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.</td>
</tr>
<tr>
<td>*IDN?</td>
<td>Queries the instrument model.</td>
<td>*IDN?</td>
<td>*IDN? -&gt; YOKOGAWA, 2560A, 123456789, 1.01</td>
<td>The information is returned in this form: &lt;manufacture&gt;, &lt;model&gt;, &lt;serial number&gt;, &lt;firmware version&gt;. For details on the model, see &quot;Checking the Package Contents.&quot;</td>
</tr>
<tr>
<td>*OPC</td>
<td>Sets bit 0 (the OPC bit) of the standard event register to 1 upon the completion of the specified overlap command.</td>
<td>*OPC</td>
<td>*OPC</td>
<td>The 2560A does not have overlap commands. The OPC bit is always set to 1.</td>
</tr>
<tr>
<td>*OPC?</td>
<td>Returns ASCII code 1 when the specified overlap command is completed.</td>
<td>*OPC?</td>
<td>*OPC? -&gt; 1</td>
<td>The 2560A does not have overlap commands. 1 is always returned.</td>
</tr>
<tr>
<td>*OPT?</td>
<td>Queries the installed options.</td>
<td>*OPT?</td>
<td>*OPT? -&gt; NONE</td>
<td>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.</td>
</tr>
<tr>
<td>*RST</td>
<td>Initializes settings.</td>
<td>*RST</td>
<td>*RST</td>
<td>Communication settings and a portion of other settings are not initialized. For details on the settings that are initialized, see appendix 7.</td>
</tr>
</tbody>
</table>
### *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.

### *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.

### *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.
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.
14.1 About Status Reports

Overview of Registers and Queues

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
<th>Write</th>
<th>Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status byte</td>
<td>—</td>
<td>—</td>
<td>Serial polling (RQS), *STB?(MSS)</td>
</tr>
<tr>
<td>Service request enable register</td>
<td>Status byte mask</td>
<td>*SRE</td>
<td>*SRE?</td>
</tr>
<tr>
<td>Standard event register</td>
<td>Indicates device status changes</td>
<td>—</td>
<td>*ESR?</td>
</tr>
<tr>
<td>Standard event enable register</td>
<td>Standard event register mask</td>
<td>*ESE</td>
<td>*ESE?</td>
</tr>
<tr>
<td>Extended event register</td>
<td>Indicates device status changes</td>
<td>—</td>
<td>STATUS: EESR?</td>
</tr>
<tr>
<td>Extended event enable register</td>
<td>Extended event register mask</td>
<td>STATUS: EES</td>
<td>STATUS: EES?</td>
</tr>
<tr>
<td>Condition register</td>
<td>Current device status</td>
<td>—</td>
<td>STATUS: CONDITION?</td>
</tr>
<tr>
<td>Transition filter</td>
<td>Conditions that change the extended event register</td>
<td>STATUS: FILTER&lt;x&gt;</td>
<td>STATUS: FILTER&lt;x&gt;?</td>
</tr>
<tr>
<td>Output queue</td>
<td>Stores response messages for queries</td>
<td>Query commands</td>
<td></td>
</tr>
<tr>
<td>Error queue</td>
<td>Stores error numbers and messages</td>
<td>—</td>
<td>STATUS: ERROR?</td>
</tr>
</tbody>
</table>

Registers and Queues That Affect the Status Byte

The following registers affect the status byte bits.

<table>
<thead>
<tr>
<th>Register</th>
<th>Affected Status Byte Bit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard event register</td>
<td>Sets bit 5 (ESB) to 1 or 0</td>
</tr>
<tr>
<td>Output queue</td>
<td>Sets bit 4 (MAV) to 1 or 0</td>
</tr>
<tr>
<td>Extended event register</td>
<td>Sets bit 3 (EES) to 1 or 0</td>
</tr>
<tr>
<td>Error queue</td>
<td>Sets bit 2 (EAV) to 1 or 0</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Masked Register</th>
<th>Mask Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status byte</td>
<td>Service request enable register</td>
</tr>
<tr>
<td>Standard event register</td>
<td>Standard event enable register</td>
</tr>
<tr>
<td>Extended event register</td>
<td>Extended event enable register</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>RQS</th>
<th>7</th>
<th>6</th>
<th>ESB</th>
<th>MAV</th>
<th>EES</th>
<th>EAV</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
</table>

- 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.

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.

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.
14.3 Standard Event Register

Standard Event Register

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>PON (Power ON)</td>
</tr>
<tr>
<td>6</td>
<td>URQ (User Request)</td>
</tr>
<tr>
<td>5</td>
<td>CME (Command Error)</td>
</tr>
<tr>
<td>4</td>
<td>EXE (Execution Error)</td>
</tr>
<tr>
<td>3</td>
<td>DDE (Device Error)</td>
</tr>
<tr>
<td>2</td>
<td>QYE (Query Error)</td>
</tr>
<tr>
<td>1</td>
<td>RQC (Request Control)</td>
</tr>
<tr>
<td>0</td>
<td>OPC (Operation Complete)</td>
</tr>
</tbody>
</table>

- **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.

<table>
<thead>
<tr>
<th>Condition register</th>
<th>:STATus:CONDition?</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>RJON</td>
<td>CID</td>
</tr>
</tbody>
</table>

| 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 |

<table>
<thead>
<tr>
<th>Extended event register</th>
<th>:STATus:EESR?</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>14</td>
</tr>
</tbody>
</table>

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 (Temperature 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.
14.5 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.

<table>
<thead>
<tr>
<th>Problems and Solutions</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing appears on the display when the power is turned on.</td>
<td>Securely connect the power cord to the 2560A and to the power outlet. 3.3</td>
</tr>
<tr>
<td>The output does not turn on.</td>
<td>Set the supply voltage and frequency to within the permitted range. 3.3</td>
</tr>
<tr>
<td>Confirm that the load is within the specified range.</td>
<td>2.2</td>
</tr>
<tr>
<td>In the case of resistance sourcing, confirm that the excitation current is within the specified range.</td>
<td>2.2</td>
</tr>
<tr>
<td>Confirm that the ambient temperature and humidity are within their specified ranges.</td>
<td>3.2</td>
</tr>
<tr>
<td>Check the wiring system.</td>
<td>3.6</td>
</tr>
<tr>
<td>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.</td>
<td>5.4, 6.4</td>
</tr>
<tr>
<td>Turn the power off and then on again.</td>
<td>3.4</td>
</tr>
<tr>
<td>Dials and switches do not work.</td>
<td>Check the REMOTE indicator. If the REMOTE indicator is on, flip the OUTPUT switch down to turn off the indicator. 1.1</td>
</tr>
<tr>
<td>n dial, m dial, deviation dial, PRESET switch, SWEEP switch, and SCALE switch do not operate.</td>
<td>If set to high resolution mode, set to normal resolution mode. 8.1</td>
</tr>
<tr>
<td>The source value is strange (common).</td>
<td>Use the 2560A in a stable environment within the ambient temperature and humidity ranges indicated in the specifications. 3.2</td>
</tr>
<tr>
<td>Use the 2560A in an environment free of noise.</td>
<td>3.2</td>
</tr>
<tr>
<td>After turning the power on, warm-up the 2560A for at least 30 minutes.</td>
<td>3.4</td>
</tr>
<tr>
<td>Check whether the load is an inductive or capacitive load that is within the allowable range.</td>
<td>16.1</td>
</tr>
<tr>
<td>The voltage or current source value is strange.</td>
<td>Confirm that the load is within the specified range. 2.2</td>
</tr>
<tr>
<td>While sourcing, keep the output terminal temperature from changing. Be especially careful when using the 100 μA or 100 mV range.</td>
<td>3.2, 3.5, 3.6</td>
</tr>
<tr>
<td>The source value of thermocouple’s thermoelectromotive force is strange.</td>
<td>Confirm that the load is within the specified range. 2.3</td>
</tr>
<tr>
<td>While sourcing, keep the output terminal temperature from changing.</td>
<td>3.2, 3.5, 3.6</td>
</tr>
<tr>
<td>Confirm that the reference junction compensation mode is set correctly.</td>
<td>2.3, 6.6</td>
</tr>
<tr>
<td>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.</td>
<td>Appendix 3</td>
</tr>
<tr>
<td>The resistance source value or the RTD’s resistance source value is strange.</td>
<td>Confirm that a correct wiring system, three-wire or four-wire, is being used for the measurement instrument to be calibrated. Appendix 4</td>
</tr>
<tr>
<td>Confirm that the excitation current is within the specified range.</td>
<td>2.2</td>
</tr>
<tr>
<td>When the output divider and deviation is being set, the output value is strange.</td>
<td>Check that main setting (MIN) is not set to an inappropriate value. 5.3, 6.3</td>
</tr>
<tr>
<td>Unable to write the user definition file.</td>
<td>Set the USB communication feature to mass storage (STOR). 6.5</td>
</tr>
<tr>
<td>Unable to configure or control the instrument through the communication interface.</td>
<td>Check to make sure that the GP-IB address setting matches the specifications. 9.3</td>
</tr>
<tr>
<td>Check to make sure that the TCP/IP settings match the specifications. 10.3</td>
<td></td>
</tr>
<tr>
<td>Check that the USB feature is set to remote control. 11.3</td>
<td></td>
</tr>
<tr>
<td>Confirm that the interface meets the electrical and mechanical specifications. 9.1, 10.1, 11.1</td>
<td></td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>The range, temperature type, polarity, or user-defined range change</td>
<td>Operate a main setting dial. The main setting will change to the maximum</td>
</tr>
<tr>
<td>caused the main setting to go outside the selectable range.</td>
<td>setting in the appropriate polarity of the range or temperature type or</td>
</tr>
<tr>
<td>Examples:</td>
<td>within the selectable range.</td>
</tr>
<tr>
<td>• Changing the range to 30 A when negative polarity is set at 10 A</td>
<td></td>
</tr>
<tr>
<td>range</td>
<td></td>
</tr>
<tr>
<td>• Changing the temperature type to E when the temperature type is K</td>
<td></td>
</tr>
<tr>
<td>and the main setting is +1300.0°C</td>
<td></td>
</tr>
<tr>
<td>• Changing the user definition to “-120, 120, 0” when the user</td>
<td></td>
</tr>
<tr>
<td>definition is “-9999.9, 9999.9, 0” and the main setting is +9999.9°C</td>
<td></td>
</tr>
</tbody>
</table>

2. The main setting on the main setting display shows “– – – –.–” blinking, and the polarity and unit turn off. The output cannot be turned on.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>The temperature type was set to TC USER or RTD USER when user-defined</td>
<td>Set the temperature type to a type other than TC USER or RTD USER, or</td>
</tr>
<tr>
<td>thermocouple or RTD is not available.</td>
<td>create user definitions.</td>
</tr>
</tbody>
</table>

   Examples:
   - Deleting user definitions with a communication command

3. The polarity, main setting, or unit display on the main setting display blinks. The output turns off and cannot be turned on.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main setting (MAX) and main setting (MIN) are reversed.</td>
<td>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.</td>
</tr>
</tbody>
</table>

   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.

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.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>If a cause of a warning code (see section 15.3) is detected, and the</td>
<td>Flip the OUTPUT switch down (OFF) to clear the warning display and turn the output on.</td>
</tr>
<tr>
<td>2560A trips.</td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>When the output value is less than the lower limit that can be</td>
<td>Change the main setting, output divider, or deviation so that the output</td>
</tr>
<tr>
<td>sourced</td>
<td>value is 1 Ω or higher.</td>
</tr>
</tbody>
</table>

   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.

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.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>When the thermocouple type is B and the output value determined by the</td>
<td>Change the main setting, output divider, or deviation so that the output</td>
</tr>
<tr>
<td>main setting, output divider, and deviation settings is 43°C or less.</td>
<td>value is 43°C or higher.</td>
</tr>
</tbody>
</table>

   (Because the range less than 43°C for thermocouple type B contains two temperature points that correspond to the same thermoelectromotive force.)
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
  - Example: 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.

<table>
<thead>
<tr>
<th>Cause</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>•</td>
<td>“–199.99” is shown for –20°C or less.</td>
</tr>
<tr>
<td>•</td>
<td>“+199.99” is shown for +60°C or higher.</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.901, E.907</td>
<td>A cooling fan error was detected.</td>
</tr>
<tr>
<td>E.902, E.903</td>
<td>An internal temperature error was detected.</td>
</tr>
<tr>
<td>E.904, E.905, E.908</td>
<td>An internal circuit error was detected.</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.911 to E.914, E.916</td>
<td>An internal circuit error was detected.</td>
</tr>
<tr>
<td>E.915, E.917</td>
<td>A cooling fan error was detected.</td>
</tr>
<tr>
<td>E.935, E.936</td>
<td>An internal temperature error was detected.</td>
</tr>
</tbody>
</table>

**Warning Codes**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Corrective Action</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.027 to E.030, E.037, E.038</td>
<td>An output control error was detected.</td>
<td>Check the connection conditions or load.</td>
<td>3.5, 3.6</td>
</tr>
<tr>
<td>E.032</td>
<td>Excessive input was detected during resistance sourcing.</td>
<td>Check the connection conditions or load.</td>
<td>3.5, 3.6</td>
</tr>
<tr>
<td>E.033</td>
<td>An oscillation error was detected in the voltage or current amplifier.</td>
<td>Check the connection conditions or load.</td>
<td>3.5, 3.6</td>
</tr>
<tr>
<td>E.034</td>
<td>An overvoltage load was detected.</td>
<td>Check the connection conditions or load.</td>
<td>3.5, 3.6</td>
</tr>
<tr>
<td>E.040</td>
<td>An error was detected in the user definition file.</td>
<td>Check the syntax.</td>
<td>Appendix 6</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
<th>Corrective Action</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>102</td>
<td>Syntax error.</td>
<td>A syntax error not covered by error codes 100 to 199.</td>
<td>Chapter 12, Chapter 13</td>
</tr>
<tr>
<td>103</td>
<td>Invalid separator.</td>
<td>Separate data values with a comma.</td>
<td>12-1</td>
</tr>
<tr>
<td>104</td>
<td>Data type error.</td>
<td>Use a correct data type.</td>
<td>12-6 and Chapter 13</td>
</tr>
<tr>
<td>108</td>
<td>Parameter not allowed.</td>
<td>Check the number of data values.</td>
<td>12-6 and Chapter 13</td>
</tr>
<tr>
<td>109</td>
<td>Missing parameter.</td>
<td>Be sure to include all necessary data values.</td>
<td>12-6 and Chapter 13</td>
</tr>
<tr>
<td>111</td>
<td>Header separator error.</td>
<td>Use a comma to separate each header from its data.</td>
<td>12-1</td>
</tr>
<tr>
<td>112</td>
<td>Program mnemonic too long.</td>
<td>Check the command length.</td>
<td>Chapter 13</td>
</tr>
<tr>
<td>113</td>
<td>Undefined header.</td>
<td>Check the header.</td>
<td>Chapter 13</td>
</tr>
<tr>
<td>114</td>
<td>Header suffix out of range.</td>
<td>Check the header.</td>
<td>Chapter 13</td>
</tr>
<tr>
<td>120</td>
<td>Numeric data error.</td>
<td>A value must be specified where the syntax contains &lt;NRf&gt;.</td>
<td>12-6</td>
</tr>
<tr>
<td>123</td>
<td>Exponent too large.</td>
<td>Where the syntax contains &lt;NR3&gt;, make the exponent that follows E smaller.</td>
<td>12-6 and Chapter 13</td>
</tr>
<tr>
<td>124</td>
<td>Too many digits.</td>
<td>Limit numeric values to 255 digits or less.</td>
<td>12-6 and Chapter 13</td>
</tr>
<tr>
<td>128</td>
<td>Numeric data not allowed.</td>
<td>Use a data type other than &lt;NRf&gt;.</td>
<td>12-6 and Chapter 13</td>
</tr>
<tr>
<td>131</td>
<td>Invalid suffix.</td>
<td>Check the unit of &lt;Voltage&gt;, &lt;Current&gt;, &lt;Resistance&gt;, &lt;Temperature&gt;, or &lt;Time&gt;.</td>
<td>12-6</td>
</tr>
<tr>
<td>134</td>
<td>Suffix too long.</td>
<td>Check the unit of &lt;Voltage&gt;, &lt;Current&gt;, &lt;Resistance&gt;, &lt;Temperature&gt;, or &lt;Time&gt;.</td>
<td>12-6</td>
</tr>
<tr>
<td>138</td>
<td>Suffix not allowed.</td>
<td>Units other than &lt;Voltage&gt;, &lt;Current&gt;, &lt;Resistance&gt;, &lt;Temperature&gt;, or &lt;Time&gt; cannot be used.</td>
<td>12-6</td>
</tr>
<tr>
<td>141</td>
<td>Invalid character data.</td>
<td>Be sure to select one of the listed choices when the syntax contains {...</td>
<td>...</td>
</tr>
<tr>
<td>144</td>
<td>Character data too long.</td>
<td>Check the spelling of the strings when the syntax contains {...</td>
<td>...</td>
</tr>
<tr>
<td>148</td>
<td>Character data not allowed.</td>
<td>Use a data type other than {...</td>
<td>...</td>
</tr>
<tr>
<td>150</td>
<td>String data error.</td>
<td>Enclose parameters with single or double quotation marks where the syntax contains &lt;String&gt;.</td>
<td>12-7</td>
</tr>
<tr>
<td>151</td>
<td>Invalid string data.</td>
<td>The &lt;String&gt; is either too long, or it contains an unusable character.</td>
<td>Chapter 13</td>
</tr>
<tr>
<td>158</td>
<td>String data not allowed.</td>
<td>Use a data type other than &lt;String&gt;.</td>
<td>Chapter 13</td>
</tr>
<tr>
<td>161</td>
<td>Invalid block data.</td>
<td>&lt;Block data&gt; cannot be used.</td>
<td>12-7 and Chapter 13</td>
</tr>
<tr>
<td>168</td>
<td>Block data not allowed.</td>
<td>&lt;Block data&gt; cannot be used.</td>
<td>12-7 and Chapter 13</td>
</tr>
<tr>
<td>171</td>
<td>Missing Right</td>
<td>Mathematical operations cannot be used.</td>
<td>Chapter 13</td>
</tr>
<tr>
<td>172</td>
<td>Invalid expression.</td>
<td>Mathematical operations cannot be used.</td>
<td>Chapter 13</td>
</tr>
</tbody>
</table>
### Communication Execution Errors (200 to 299)

**Error in communication execution**

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
<th>Corrective Action</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>203</td>
<td>Command protected</td>
<td>See “Adjustment and Calibration” in section 15.12.</td>
<td>15-20</td>
</tr>
<tr>
<td>221</td>
<td>Setting conflict</td>
<td>Check settings that are related to each other.</td>
<td>Chapter 13</td>
</tr>
<tr>
<td>222</td>
<td>Data out of range</td>
<td>Check the ranges of the settings.</td>
<td>Chapter 13</td>
</tr>
<tr>
<td>223</td>
<td>Too much data</td>
<td>Check data byte lengths.</td>
<td>Chapter 13</td>
</tr>
<tr>
<td>224</td>
<td>Illegal parameter value</td>
<td>Check the ranges of the settings.</td>
<td>Chapter 13</td>
</tr>
<tr>
<td>225</td>
<td>Overflow</td>
<td>Keep program messages to 1024 bytes or less in length, including &lt;PMT&gt;.</td>
<td>12-2</td>
</tr>
<tr>
<td>226</td>
<td>Out Of Memory</td>
<td>Keep program messages to 1024 bytes or less in length, including &lt;PMT&gt;.</td>
<td>12-2</td>
</tr>
<tr>
<td>241</td>
<td>Hardware missing</td>
<td>Check that the specified options are all installed.</td>
<td>—</td>
</tr>
<tr>
<td>260</td>
<td>Expression error</td>
<td>Mathematical operations cannot be used.</td>
<td>—</td>
</tr>
<tr>
<td>270</td>
<td>Macro error</td>
<td>The 2560A does not support the IEEE 488.2 macro specifications.</td>
<td>—</td>
</tr>
<tr>
<td>272</td>
<td>Macro execution error</td>
<td>The 2560A does not support the IEEE 488.2 macro specifications.</td>
<td>—</td>
</tr>
<tr>
<td>273</td>
<td>Illegal macro label</td>
<td>The 2560A does not support the IEEE 488.2 macro specifications.</td>
<td>—</td>
</tr>
<tr>
<td>275</td>
<td>Macro definition too long</td>
<td>The 2560A does not support the IEEE 488.2 macro specifications.</td>
<td>—</td>
</tr>
<tr>
<td>276</td>
<td>Macro recursion error</td>
<td>The 2560A does not support the IEEE 488.2 macro specifications.</td>
<td>—</td>
</tr>
<tr>
<td>277</td>
<td>Macro redefinition not allowed</td>
<td>The 2560A does not support the IEEE 488.2 macro specifications.</td>
<td>—</td>
</tr>
<tr>
<td>278</td>
<td>Macro header not found</td>
<td>The 2560A does not support the IEEE 488.2 macro specifications.</td>
<td>—</td>
</tr>
</tbody>
</table>

### Communication Query Errors (400 to 499)

**Error in communication Query**

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
<th>Corrective Action</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>410</td>
<td>Query INTERRUPTED.</td>
<td>Check the transmission and reception order.</td>
<td>12-2</td>
</tr>
<tr>
<td>420</td>
<td>Query UNTERMINATED.</td>
<td>Check the transmission and reception order.</td>
<td>12-2</td>
</tr>
<tr>
<td>430</td>
<td>Query DEADLOCKED.</td>
<td>Keep program messages to 1024 bytes or less in length, including &lt;PMT&gt;.</td>
<td>12-2</td>
</tr>
<tr>
<td>440</td>
<td>Query UNTERMINATED after indefinite response. Do not write a query after *IDN? or *OPT?.</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>

### System Communication Errors (300 and 399)

**Error in System Operation**

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
<th>Corrective Action</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>Communication device-specific error.</td>
<td>Servicing is required.</td>
<td>—</td>
</tr>
<tr>
<td>399</td>
<td>Fatal error in the communication driver.</td>
<td>Servicing is required.</td>
<td>—</td>
</tr>
</tbody>
</table>
## Communication Warning (50)

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
<th>Corrective Action</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>&quot;OPC?&quot; exists in message.</td>
<td>Write &quot;OPC&quot; or &quot;OPC?&quot; at the end of program messages.</td>
<td>—</td>
</tr>
</tbody>
</table>

## Other Error (350)

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
<th>Corrective Action</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>350</td>
<td>Queue overflow.</td>
<td>Read the error queue.</td>
<td>14-6</td>
</tr>
</tbody>
</table>

**Note**

Code 350 occurs when the error queue overflows.

## Information (1 to 99)

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
<th>Corrective Action</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>Sweeping in progress.</td>
<td>You can only make changes when sweeping is held.</td>
<td>7-6</td>
</tr>
<tr>
<td>52</td>
<td>The upper and lower sweep limits are set to the</td>
<td>Check the upper and lower sweeping limits.</td>
<td>7-6</td>
</tr>
<tr>
<td></td>
<td>same value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>The output is off.</td>
<td>Sweeping cannot be executed because the output is</td>
<td>5-7,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>turned off. Turn the output on.</td>
<td>6-7</td>
</tr>
</tbody>
</table>

## Execution Errors (800 to 899)

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
<th>Corrective Action</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>802</td>
<td>Invalid command.</td>
<td>CAL on the SETUP menu cannot be executed during</td>
<td>4-2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>adjustment mode.</td>
<td></td>
</tr>
<tr>
<td>804</td>
<td>Invalid command.</td>
<td>Cannot be executed because the communication command type is set to COMP (compatible mode).</td>
<td>9-7</td>
</tr>
<tr>
<td>805</td>
<td>Invalid command.</td>
<td>Communication commands cannot be executed because —</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>the RANGE dial is set to SETUP.</td>
<td></td>
</tr>
</tbody>
</table>

## System Errors (900/999)

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
<th>Corrective Action</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>911-999</td>
<td>CPU board error.</td>
<td>For details about the message and corrective action, see section 15.3.</td>
<td>15-4</td>
</tr>
</tbody>
</table>
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.

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.

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.”

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.

### 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.

---

**Note**

Once you clear the error log, you cannot undo it. Confirm that it is okay to perform this operation before execution.
15.5 Displaying the Error Log

**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.

![Image showing deviation and output displays](image)

**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.
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 diagram]

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.

![Main setting dials (use any) diagram]

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 diagram]
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.

**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 diagram]

   - Turn the RANGE dial to select SETUP.
   - The SETUP indicator turns on.

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 diagram]

   - Main setting dials (use any)
   - 2. Select INIT.
   - 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.
Displaying the Product Information

Procedure

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

   1. Select SETUP.
      The SETUP indicator turns on.

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.

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.
15.9 Displaying the Product Information

**Explanation**

You can display 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.
15.10 Cleaning the Filter

CAUTION

If the filter attached to the air inlet is dirty, the air intake may be obstructed causing the instrument to heat up and break down.

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.
3. Pull the filter cover toward you. The filter cover will come off.
4. Remove the filter from the 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.

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.
15.11 Recommended Part Replacement

The life and replacement period for expendable items varies depending on the conditions of use. Refer to the table below as a general guideline.

For part replacement and purchase, contact your nearest YOKOGAWA dealer.

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Recommended Replacement Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling fan</td>
<td>3 years</td>
</tr>
<tr>
<td>Filter</td>
<td>1 year</td>
</tr>
</tbody>
</table>

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/
### DC Voltage and DC Current Source

#### DC Voltage Source

<table>
<thead>
<tr>
<th>Range</th>
<th>Source Range</th>
<th>Setting Resolution</th>
<th>Maximum Output Voltage</th>
<th>Output Resistance</th>
<th>Maximum Capacitive Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mV</td>
<td>± 122.400 mV</td>
<td>1 µV</td>
<td>12 mA or higher</td>
<td>6 mΩ or lower</td>
<td>10 µF</td>
</tr>
<tr>
<td>1 V</td>
<td>± 1.22400 V</td>
<td>10 µV</td>
<td>Approx. 120 mA</td>
<td>6 mΩ or lower</td>
<td>10 µF</td>
</tr>
<tr>
<td>10 V</td>
<td>± 12.2400 V</td>
<td>100 µV</td>
<td>Approx. 1200 mA</td>
<td>6 mΩ or lower</td>
<td>10 µF</td>
</tr>
<tr>
<td>100 V</td>
<td>± 122.400 V</td>
<td>1 mV</td>
<td>Approx. 30 mA</td>
<td>30 mΩ or lower</td>
<td>1 µF</td>
</tr>
<tr>
<td>1000 V</td>
<td>± 1224.00 V</td>
<td>10 mV</td>
<td>Approx. 10 mA</td>
<td>1000 mΩ or lower</td>
<td>0.1 µF</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range</th>
<th>Display Resolution</th>
<th>Stability (1h)</th>
<th>Accuracy (±(ppm of setting + V))</th>
<th>Temperature Coefficient (±(ppm of setting + V)/°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mV</td>
<td>1 µV</td>
<td>20 + 3 µ</td>
<td>40 + 4 µ</td>
<td>60 + 4 µ</td>
</tr>
<tr>
<td>1 V</td>
<td>10 µV</td>
<td>5 + 5 µ</td>
<td>40 + 10 µ</td>
<td>55 + 15 µ</td>
</tr>
<tr>
<td>10 V</td>
<td>100 µV</td>
<td>50 + 50 µ</td>
<td>40 + 100 µ</td>
<td>55 + 150 µ</td>
</tr>
<tr>
<td>100 V</td>
<td>1 mV</td>
<td>500 + 500 µ</td>
<td>40 + 1 m</td>
<td>55 + 1.5 m</td>
</tr>
<tr>
<td>1000 V</td>
<td>10 mV</td>
<td>500 + 500 µ</td>
<td>40 + 1.0 m</td>
<td>55 + 1.5 m</td>
</tr>
</tbody>
</table>

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 B85062ZK, 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 12ppm×(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.
### Resistance Source

<table>
<thead>
<tr>
<th>Range</th>
<th>Source Range</th>
<th>Setting and Display Resolution</th>
<th>Excitation Current</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>400 Ω</td>
<td>1.00 Ω to 400.00 Ω</td>
<td>0.01 Ω</td>
<td>0.1 mA to 2 mA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range</th>
<th>Stability (1h)</th>
<th>Accuracy (±(ppm of setting + Ω))</th>
<th>Temperature Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 Ω</td>
<td>±(ppm of setting + Ω)</td>
<td>180 days</td>
<td>1 year</td>
</tr>
<tr>
<td>5 + 0.003</td>
<td>55 + 0.005</td>
<td>75 + 0.005</td>
<td>0.02</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Type</th>
<th>Source Range</th>
<th>Setting Resolution</th>
<th>Output Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>-50°C to +1768°C</td>
<td>0.1°C</td>
<td>Approx. 1 Ω</td>
</tr>
<tr>
<td>S</td>
<td>-50°C to +1768°C</td>
<td>0.1°C</td>
<td>Approx. 1 Ω</td>
</tr>
<tr>
<td>B</td>
<td>0°C to +1820°C</td>
<td>0.1°C</td>
<td>Approx. 1 Ω</td>
</tr>
<tr>
<td>J</td>
<td>-210°C to +1200°C</td>
<td>0.1°C</td>
<td>Approx. 1 Ω</td>
</tr>
<tr>
<td>T</td>
<td>-270°C to +400°C</td>
<td>0.1°C</td>
<td>Approx. 1 Ω</td>
</tr>
<tr>
<td>E</td>
<td>-270°C to +1000°C</td>
<td>0.1°C</td>
<td>Approx. 1 Ω</td>
</tr>
<tr>
<td>K</td>
<td>-270°C to +1300°C</td>
<td>0.1°C</td>
<td>Approx. 1 Ω</td>
</tr>
<tr>
<td>N</td>
<td>-270°C to +1300°C</td>
<td>0.1°C</td>
<td>Approx. 1 Ω</td>
</tr>
<tr>
<td>C</td>
<td>0°C to +2315°C</td>
<td>0.1°C</td>
<td>Approx. 1 Ω</td>
</tr>
<tr>
<td>A</td>
<td>0°C to +2500°C</td>
<td>0.1°C</td>
<td>Approx. 1 Ω</td>
</tr>
<tr>
<td>TC USER</td>
<td>-9999.9°C to +9999.9°C</td>
<td>0.1°C</td>
<td>Approx. 1 Ω</td>
</tr>
</tbody>
</table>

Compliant thermocouple standards

<table>
<thead>
<tr>
<th>Type</th>
<th>Set Temperature °C</th>
<th>Stability (1h)</th>
<th>Accuracy (1 year)</th>
<th>Temp. Coefficient</th>
<th>RJC Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>-50</td>
<td>0.50</td>
<td>1.10</td>
<td>0.88</td>
<td>0.56</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0.30</td>
<td>0.80</td>
<td>0.00</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0.25</td>
<td>0.55</td>
<td>0.88</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>0.15</td>
<td>0.40</td>
<td>3.40</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>1600</td>
<td>0.15</td>
<td>0.40</td>
<td>8.52</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>1768</td>
<td>0.20</td>
<td>0.45</td>
<td>8.69</td>
<td>0.18</td>
</tr>
</tbody>
</table>

| 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      |

Accuracies are shown in the following table.
### 16.1 Source Section

<table>
<thead>
<tr>
<th>Type</th>
<th>Set Temperature °C</th>
<th>Stability (1h) ±°C</th>
<th>Accuracy (1 year) ±°C</th>
<th>Temp. Coefficient ±(×10⁻⁶°C)/°C</th>
<th>RJC Error ±°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>-250</td>
<td>0.30</td>
<td>0.72</td>
<td>5.98</td>
<td>2.13</td>
</tr>
<tr>
<td></td>
<td>-200</td>
<td>0.15</td>
<td>0.29</td>
<td>2.55</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>-100</td>
<td>0.15</td>
<td>0.16</td>
<td>0.86</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0.05</td>
<td>0.10</td>
<td>0.85</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>0.05</td>
<td>0.09</td>
<td>1.92</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>-250</td>
<td>0.20</td>
<td>0.50</td>
<td>5.95</td>
<td>2.07</td>
</tr>
<tr>
<td></td>
<td>-200</td>
<td>0.10</td>
<td>0.20</td>
<td>2.56</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>-100</td>
<td>0.05</td>
<td>0.10</td>
<td>0.85</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0.05</td>
<td>0.07</td>
<td>0.00</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>0.05</td>
<td>0.12</td>
<td>5.53</td>
<td>0.27</td>
</tr>
<tr>
<td>E</td>
<td>-250</td>
<td>0.40</td>
<td>0.94</td>
<td>7.71</td>
<td>2.65</td>
</tr>
<tr>
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<td>0.30</td>
<td>2.55</td>
<td>0.84</td>
</tr>
<tr>
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<td>0.15</td>
<td>0.15</td>
<td>0.86</td>
<td>0.44</td>
</tr>
<tr>
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<td>0.05</td>
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<td>0.00</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
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<td>0.10</td>
<td>0.15</td>
<td>4.26</td>
<td>0.32</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>0.10</td>
<td>0.21</td>
<td>7.67</td>
<td>0.38</td>
</tr>
<tr>
<td></td>
<td>1300</td>
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<td>1.00</td>
<td>5.10</td>
<td>1.99</td>
</tr>
<tr>
<td>K</td>
<td>-250</td>
<td>0.20</td>
<td>0.44</td>
<td>2.55</td>
<td>0.87</td>
</tr>
<tr>
<td></td>
<td>-200</td>
<td>0.10</td>
<td>0.21</td>
<td>0.86</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td>-100</td>
<td>0.10</td>
<td>0.15</td>
<td>0.86</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
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<td>0.11</td>
<td>0.00</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>0.10</td>
<td>0.15</td>
<td>3.92</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>1300</td>
<td>0.10</td>
<td>0.20</td>
<td>7.32</td>
<td>0.25</td>
</tr>
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<td>0.30</td>
<td>0.00</td>
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</tr>
<tr>
<td></td>
<td>200</td>
<td>0.10</td>
<td>0.26</td>
<td>1.72</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>0.10</td>
<td>0.25</td>
<td>3.40</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>0.15</td>
<td>0.30</td>
<td>6.81</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>0.20</td>
<td>0.51</td>
<td>15.30</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td>2315</td>
<td>0.25</td>
<td>0.70</td>
<td>20.72</td>
<td>0.51</td>
</tr>
<tr>
<td>N</td>
<td>-200</td>
<td>0.10</td>
<td>0.34</td>
<td>0.00</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0.10</td>
<td>0.29</td>
<td>0.87</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>0.10</td>
<td>0.28</td>
<td>3.42</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
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<td>0.15</td>
<td>0.47</td>
<td>11.09</td>
<td>0.35</td>
</tr>
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<td>1600</td>
<td>0.10</td>
<td>0.26</td>
<td>11.09</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>2500</td>
<td>0.20</td>
<td>0.79</td>
<td>22.67</td>
<td>0.54</td>
</tr>
<tr>
<td>C</td>
<td>-200</td>
<td>0.10</td>
<td>0.34</td>
<td>0.00</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0.10</td>
<td>0.29</td>
<td>0.87</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>0.10</td>
<td>0.28</td>
<td>3.42</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>1600</td>
<td>0.15</td>
<td>0.47</td>
<td>11.09</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>2500</td>
<td>0.20</td>
<td>0.79</td>
<td>22.67</td>
<td>0.54</td>
</tr>
<tr>
<td>A</td>
<td>0</td>
<td>0.15</td>
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<td>0.00</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0.10</td>
<td>0.29</td>
<td>0.87</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>0.10</td>
<td>0.28</td>
<td>3.42</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>1600</td>
<td>0.15</td>
<td>0.47</td>
<td>11.09</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>2500</td>
<td>0.20</td>
<td>0.79</td>
<td>22.67</td>
<td>0.54</td>
</tr>
</tbody>
</table>

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 VT + 4 µV) with respect to standard thermoelectromotive force VT 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.
   \[
   °F = \frac{9}{5} \times (°C) + 32
   \]
16.1 Source Section

RTD Resistance Source

The 2560A sources resistance that corresponds to the specified temperature.

<table>
<thead>
<tr>
<th>Type</th>
<th>Source Range</th>
<th>Setting Resolution</th>
<th>Excitation Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt100</td>
<td>-200.0°C to +850.0°C</td>
<td>0.1°C</td>
<td>0.1 mA to 2 mA</td>
</tr>
<tr>
<td>RTD USER (user-defined)</td>
<td>-9999.9°C to +9999.9°C</td>
<td>0.1°C</td>
<td>0.1 mA to 2 mA</td>
</tr>
</tbody>
</table>

Compatible RTD standards
- JIS C1604 Pt100
- IEC 60751-1 Pt100

<table>
<thead>
<tr>
<th>Type</th>
<th>Accuracy (±°C)*</th>
<th>Temperature Coefficient ±°C/°C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>180 days</td>
<td>1 year</td>
</tr>
<tr>
<td>Pt100</td>
<td>0.1</td>
<td>0.12</td>
</tr>
</tbody>
</table>

* 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

<table>
<thead>
<tr>
<th>Range</th>
<th>DC to 10 Hz</th>
<th>10 Hz to 10 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mV</td>
<td>5 µVp-p</td>
<td>10 µVrms</td>
</tr>
<tr>
<td>1 V</td>
<td>15 µVp-p</td>
<td>20 µVrms</td>
</tr>
<tr>
<td>10 V</td>
<td>50 µVp-p</td>
<td>30 µVrms</td>
</tr>
<tr>
<td>100 V</td>
<td>150 µVp-p</td>
<td>400 µVrms</td>
</tr>
<tr>
<td>1000 V</td>
<td>1 mVp-p</td>
<td>1 mVrms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range</th>
<th>DC to 10 Hz</th>
<th>10 Hz to 10 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 µA</td>
<td>0.1 µAp-p</td>
<td>0.2 µArms</td>
</tr>
<tr>
<td>1 mA</td>
<td>0.5 µAp-p</td>
<td>0.5 µArms</td>
</tr>
<tr>
<td>10 mA</td>
<td>1 µAp-p</td>
<td>1 µArms</td>
</tr>
<tr>
<td>100 mA</td>
<td>5 µAp-p</td>
<td>10 µArms</td>
</tr>
<tr>
<td>1 A</td>
<td>0.1 µAp-p</td>
<td>0.1 µArms</td>
</tr>
<tr>
<td>10 A</td>
<td>1 µAp-p</td>
<td>4 mArms</td>
</tr>
<tr>
<td>30 A</td>
<td>1 µAp-p</td>
<td>4 mArms</td>
</tr>
</tbody>
</table>

Output Terminals

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal type</td>
<td>Low voltage-current output terminals: Binding posts (with a plug-in), equipped with a HI (red) and a LO (black) output terminal</td>
</tr>
<tr>
<td></td>
<td>High voltage output terminals: Safety plug-in terminal, equipped with a HI (red) and a LO (black) output terminal</td>
</tr>
<tr>
<td></td>
<td>Large current output terminals: Large binding posts, equipped with a HI (black) and a LO (black) output terminal</td>
</tr>
<tr>
<td>Output LO terminal</td>
<td>No ground</td>
</tr>
<tr>
<td>Maximum common-mode voltage</td>
<td>Between the output LO terminal and the case ±15Vpk</td>
</tr>
</tbody>
</table>
16.1 Source Section

Response Time

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage or current source</td>
<td>Ranges other than 1000 V: Approx. 0.5 s</td>
</tr>
<tr>
<td></td>
<td>1000 V range: Approx. 3 s</td>
</tr>
<tr>
<td></td>
<td>The time from when the change starts to when the output reaches 0.02 % of the final value at no load condition</td>
</tr>
<tr>
<td>Resistance or RTD source</td>
<td>0.1 ms or less (time constant corresponding to the change in excitation current)</td>
</tr>
</tbody>
</table>

Common Mode Rejection Ratio (Voltage or Current Source)

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications (for DC or 50/60 Hz signal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage output</td>
<td>Ranges other than 1000 V: 120 dB or higher</td>
</tr>
<tr>
<td></td>
<td>1000 V range: 100 dB or higher</td>
</tr>
<tr>
<td>Current output</td>
<td>1 A range or less: 100 nA/V or less</td>
</tr>
<tr>
<td></td>
<td>10 A range or higher: 10 µA/V or less</td>
</tr>
</tbody>
</table>

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.
# 16.2 Functions

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td>Numerous ranges for DC voltage, DC current, resistance, temperature (thermocouple and RTD)</td>
</tr>
<tr>
<td><strong>Display</strong></td>
<td></td>
</tr>
<tr>
<td>Main setting display</td>
<td>Main setting: 6-digit LED display</td>
</tr>
<tr>
<td>Polarity</td>
<td>+ or –</td>
</tr>
<tr>
<td>Unit</td>
<td>mV, V, µA, mA, A, °C, °F (selectable on models with suffix code -UF), Ω</td>
</tr>
<tr>
<td>Deviation display</td>
<td>Deviation: 4-digit LED display</td>
</tr>
<tr>
<td>Polarity</td>
<td>+ or –</td>
</tr>
<tr>
<td>Deviation preset</td>
<td>5%, 2%, 0, OFF</td>
</tr>
<tr>
<td>Output display</td>
<td>Output value: 6-digit LED display</td>
</tr>
<tr>
<td>Polarity</td>
<td>+ or –</td>
</tr>
<tr>
<td>Unit</td>
<td>mV, V, µA, mA, A, °, Ω</td>
</tr>
<tr>
<td>n display</td>
<td>Numerator of the output divider: 2-digit LED display</td>
</tr>
<tr>
<td>m display</td>
<td>Denominator of the output divider: 2-digit LED display</td>
</tr>
<tr>
<td>Other indicators</td>
<td>OUTPUT1, OUTPUT2, HIGH VOLTAGE indicator, ON indicator, OFF indicator, MAX indicator, MIN indicator, Non Zero indicator, UP indicator, DOWN indicator, RJC indicator, REMOTE indicator</td>
</tr>
<tr>
<td><strong>Scale</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Output divider</strong></td>
<td>Target: Voltage, current, resistance, temperature</td>
</tr>
<tr>
<td>Selectable range of denominator m:</td>
<td>4 to 15</td>
</tr>
<tr>
<td>Selectable range of numerator n:</td>
<td>0 to m</td>
</tr>
<tr>
<td><strong>Deviation</strong></td>
<td>Target: Voltage, current, resistance, temperature</td>
</tr>
<tr>
<td>Selectable range of Deviation preset:</td>
<td>±20.00%</td>
</tr>
<tr>
<td>Setting method:</td>
<td>Two dial setting</td>
</tr>
<tr>
<td>Resolution of deviation dial 1:</td>
<td>0.2% of main setting</td>
</tr>
<tr>
<td>Resolution of deviation dial 2:</td>
<td>0.01% of main setting</td>
</tr>
<tr>
<td>Presets</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>0: The deviation is reset to 0% when the preset is selected or when the output divider n is changed.</td>
</tr>
<tr>
<td></td>
<td>OFF: Holds the deviation. It is not preset.</td>
</tr>
<tr>
<td><strong>Sweeping</strong></td>
<td>Target: Voltage, current, resistance, temperature</td>
</tr>
<tr>
<td>Speed</td>
<td>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.</td>
</tr>
<tr>
<td><strong>Reference junction compensation (RJC)</strong></td>
<td>The following three modes. The 2560A corrects the sourced thermoelectromotive force (RJC) according to the selected mode.</td>
</tr>
<tr>
<td>(Thermocouple thermoelectromotive force source)</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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 +80.00°C</td>
</tr>
</tbody>
</table>
### 16.2 Functions/16.3 External Input

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>User definition</td>
<td>Thermocouple: Thermoelectromotive force corresponding to the set temperature can be sourced according to the user-defined polynomial.</td>
</tr>
<tr>
<td></td>
<td>RTD: Resistance corresponding to the set temperature can be sourced according to the user-defined polynomial.</td>
</tr>
<tr>
<td>High resolution mode</td>
<td>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.</td>
</tr>
<tr>
<td>Saving of setup parameters</td>
<td>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.</td>
</tr>
<tr>
<td>Error log</td>
<td>Logs the error codes of the errors that the 2560A detects. The error log can also be displayed.</td>
</tr>
<tr>
<td>Self-test</td>
<td>Performs a self-test on its condition.</td>
</tr>
<tr>
<td>Initializing the Settings</td>
<td>Resets the 2560A to its default settings.</td>
</tr>
<tr>
<td>Displaying the Product Information</td>
<td>Displays the firmware version, serial number, and the like.</td>
</tr>
<tr>
<td>Communication</td>
<td>Communication commands can be used to remotely control the 2560A. Select the communication interface from GP-IB, Ethernet, and USB.</td>
</tr>
<tr>
<td>Instrument protection</td>
<td>Trip function based on overvoltage, overcurrent, oscillation, and internal heating detection are available.</td>
</tr>
</tbody>
</table>

### 16.3 External Input

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>External RJ sensor input terminal</td>
<td>Supports three-wire and four-wire systems</td>
</tr>
<tr>
<td>Input connector</td>
<td>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.</td>
</tr>
<tr>
<td>Excitation current</td>
<td>Approx. 1 mA</td>
</tr>
</tbody>
</table>
## 16.4 Computer Interface

### GP-IB

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical and mechanical</td>
<td>Complies with IEEE Std’d 488-1978</td>
</tr>
<tr>
<td>Functional specifications</td>
<td>SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, and C0</td>
</tr>
<tr>
<td>Protocol</td>
<td>Complies with IEEE Std’d 488.2-1992</td>
</tr>
<tr>
<td>Address</td>
<td>0 to 30</td>
</tr>
</tbody>
</table>

### Ethernet

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of ports</td>
<td>1</td>
</tr>
<tr>
<td>Connector type</td>
<td>RJ-45 connector</td>
</tr>
<tr>
<td>Electrical and mechanical</td>
<td>Conforms to IEEE 802.3</td>
</tr>
<tr>
<td>Transmission system</td>
<td>Ethernet(100BASE-TX/10BASE-T)</td>
</tr>
<tr>
<td>Transfer rate</td>
<td>100 Mbps max.</td>
</tr>
<tr>
<td>Protocol</td>
<td>TCP/IP</td>
</tr>
<tr>
<td>Supported services</td>
<td>VXI-11 server, DHCP client</td>
</tr>
</tbody>
</table>

### USB for PC Connection

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of ports</td>
<td>1</td>
</tr>
<tr>
<td>Connector type</td>
<td>Type B connector (receptacle)</td>
</tr>
<tr>
<td>Electrical and mechanical</td>
<td>Conforms to USB Revision 2.0</td>
</tr>
<tr>
<td>Supported transfer modes</td>
<td>HS (High Speed: 480 Mbps) and FS (Full Speed: 12 Mbps)</td>
</tr>
<tr>
<td>Supported protocols</td>
<td>USBTMC-USB488 (USB Test and Measurement Class Ver.1.0)</td>
</tr>
<tr>
<td></td>
<td>GP-IB commands can be used through USB.</td>
</tr>
<tr>
<td></td>
<td>Mass Storage Class Ver. 1.1</td>
</tr>
<tr>
<td></td>
<td>The 2560A can be accessed from a PC.</td>
</tr>
</tbody>
</table>
16.5 General Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard operating</td>
<td></td>
</tr>
<tr>
<td>conditions</td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>23°C±3°C</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>20% RH to 80% RH (no condensation)</td>
</tr>
<tr>
<td>After warm-up time has passed</td>
<td></td>
</tr>
<tr>
<td>Warm-up time</td>
<td></td>
</tr>
<tr>
<td>Approx. 30 minutes (after acclimatizing the 2560A to the operating environment for at least an hour)</td>
<td></td>
</tr>
<tr>
<td>If the instrument has been stored in a hot-temperature, high-humidity environment, warm up the instrument for at least a day.</td>
<td></td>
</tr>
<tr>
<td>Operating environment</td>
<td></td>
</tr>
<tr>
<td>Temperature:</td>
<td>5°C to 40°C</td>
</tr>
<tr>
<td>Humidity:</td>
<td>20% RH to 80% RH (no condensation)</td>
</tr>
<tr>
<td>Storage environment</td>
<td></td>
</tr>
<tr>
<td>Temperature:</td>
<td>–15°C to 60°C</td>
</tr>
<tr>
<td>Humidity:</td>
<td>20% RH to 80% RH (no condensation)</td>
</tr>
<tr>
<td>Operating altitude</td>
<td>2000 m or less</td>
</tr>
<tr>
<td>Installation location</td>
<td>Indoors</td>
</tr>
<tr>
<td>Installation orientation</td>
<td>Horizontal or tilted using the movable leg</td>
</tr>
<tr>
<td>Rated supply voltage</td>
<td>100 VAC to 120 VAC, 200 VAC to 240 VAC (auto switching)</td>
</tr>
<tr>
<td>Permitted supply voltage range</td>
<td>90 VAC to 132 VAC, 180 VAC to 264 VAC</td>
</tr>
<tr>
<td>Rated supply frequency</td>
<td>50 Hz/60 Hz</td>
</tr>
<tr>
<td>Permitted power supply frequency range</td>
<td>48 Hz to 63 Hz</td>
</tr>
<tr>
<td>Maximum power consumption</td>
<td>Approx. 200 VA</td>
</tr>
<tr>
<td>Withstand voltage</td>
<td></td>
</tr>
<tr>
<td>1500 VAC for 1 minute between the power supply and case</td>
<td></td>
</tr>
<tr>
<td>For the withstand voltage between the measurement section and case for the external RJ sensor 257875 when it is connected, see section 16.6.</td>
<td></td>
</tr>
<tr>
<td>External dimensions</td>
<td></td>
</tr>
<tr>
<td>Approx. 426 mm (W) × 177 mm (H) × 400 mm (D), excluding protrusions</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 13 kg</td>
</tr>
<tr>
<td>Safety standards</td>
<td></td>
</tr>
<tr>
<td>Compliant standards</td>
<td></td>
</tr>
<tr>
<td>EN 61010-1</td>
<td></td>
</tr>
<tr>
<td>Overvoltage Category II</td>
<td></td>
</tr>
<tr>
<td>Pollution degree</td>
<td>2</td>
</tr>
<tr>
<td>EN 61010-2-030</td>
<td></td>
</tr>
<tr>
<td>Measurement category:</td>
<td>Other (O)</td>
</tr>
<tr>
<td>Emissions</td>
<td></td>
</tr>
<tr>
<td>Compliant standards</td>
<td></td>
</tr>
<tr>
<td>EN 61326–1 Class A</td>
<td></td>
</tr>
<tr>
<td>EN 55011 Class A, Group 1</td>
<td></td>
</tr>
<tr>
<td>EMC standards of Australia and New Zealand EN 55011 Class A, Group 1</td>
<td></td>
</tr>
<tr>
<td>Korea Electromagnetic Conformity Standard (한국 전자파적합성기준)</td>
<td></td>
</tr>
<tr>
<td>EN 61000–3–2 Class A</td>
<td></td>
</tr>
<tr>
<td>EN 61000–3–3</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Cable conditions</td>
<td></td>
</tr>
<tr>
<td>GP-IB connector (GP-IB)</td>
<td>Use a shielded cable that is 3 m in length or less.</td>
</tr>
<tr>
<td>Ethernet port</td>
<td>Use a shielded cable that is 3 m in length or less.</td>
</tr>
<tr>
<td>USB port for PCs (USB)</td>
<td>Use a shielded cable that is 3 m in length or less.</td>
</tr>
<tr>
<td>Low voltage-current output terminals (HI, LO)</td>
<td>Use the included B8506ZK measurement leads (length: 1 m).</td>
</tr>
<tr>
<td>High voltage output terminals (HI, LO)</td>
<td>Use the included B8506ZK measurement leads (length: 1 m).</td>
</tr>
<tr>
<td>Large current output terminals (HI, LO)</td>
<td>Use the included B8506WA measurement leads (length: 1.5 m).</td>
</tr>
<tr>
<td>External RJ sensor terminal (EXT RJ SENSOR Pt100)</td>
<td>Use the RJ sensor 257875, sold separately.</td>
</tr>
</tbody>
</table>
16.5 General Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immunity</td>
<td>Compliant standards&lt;br&gt;EN 61326-1 Table 2 (for use in industrial locations)</td>
</tr>
<tr>
<td>Influence in the immunity test environment</td>
<td>Within ±15% of the range setting&lt;br&gt;Same as the emission cable conditions.</td>
</tr>
<tr>
<td>Environmental standard</td>
<td>Compliant standards&lt;br&gt;EN 50581 Monitoring and control instruments including industrial monitoring and control instruments.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range</td>
<td>−20°C to +60°C</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.3°C (typical value), in combination with the 2560A</td>
</tr>
<tr>
<td>Excitation current</td>
<td>Approx. 1 mA</td>
</tr>
<tr>
<td>Withstand voltage</td>
<td>100 VAC for 1 minute between the 257875 measurement section and the 2560A case</td>
</tr>
<tr>
<td></td>
<td>(Withstand voltage when the sensor is connected to the 2560A's external RJ sensor input terminal)</td>
</tr>
<tr>
<td>Cord length</td>
<td>Approx. 1.95 m</td>
</tr>
</tbody>
</table>

- 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.

![Diagram of RJ Sensor 257875](image-url)
16.7 External Dimensions

Unit: mm

Rear view

Unless otherwise specified, tolerances are ±3% (however, tolerances are ±0.3 mm when below 10 mm).
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.

![Diagram](image)

Main setting (MAX) = 10 A
Main setting (MIN) = 0 A

Ammeter

<table>
<thead>
<tr>
<th>n</th>
<th>m</th>
<th>Divider value</th>
<th>Ammeter</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4</td>
<td>0/4</td>
<td>0 A</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>2/4</td>
<td>5 A</td>
</tr>
</tbody>
</table>

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.

![Diagram](image)

Main setting (MAX) = 10 A
Main setting (MIN) = 0 A

Use the output divider move the meter needle up.

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

\[
\begin{align*}
\text{Main setting (MAX)} &= 10 \text{ A} \\
\text{Main setting (MIN)} &= 0 \text{ A}
\end{align*}
\]

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%.

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.
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 (\(-200^\circ\)C to \(+800^\circ\)C) and output is voltage (\(-10\) V to \(+10\) V), set the scale’s main setting (MAX) to \(+800^\circ\)C and the main setting (MIN) to \(-200^\circ\)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

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

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

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

Connect the measurement section of the RJ sensor to the relay terminal block.

Thermocouple wires or compensating lead wires

Off-the-shelf relay terminal block

Copper wire

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**

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**


**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.
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.

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.

\[
Eu(t) = \sum a_i t^i
\]

The 2560A calculates thermoelectromotive force \( Eu_{out} \) [\( \mu \text{V} \)] at temperature \( t \) [\(^\circ \text{C} \)] 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.

\[
Ru(t) = \sum a_i t^i
\]

The 2560A calculates resistance \( Ru \) [\( \Omega \)] at temperature \( t \) [\(^\circ \text{C} \)] 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

<table>
<thead>
<tr>
<th>Line 1</th>
<th>TYPE:L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upper limit of range</td>
</tr>
<tr>
<td>Line 2</td>
<td>0, 10, 0.00E+00, 1.00E+00, 2.00E+00</td>
</tr>
<tr>
<td>(First temperature range)</td>
<td>Lower limit of range</td>
</tr>
<tr>
<td>Line 3</td>
<td>10, 20, 0.1E+00, 1.10E+00, 2.10E+00</td>
</tr>
<tr>
<td>(Second temperature range)</td>
<td>Lower limit of range</td>
</tr>
</tbody>
</table>

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 thermoelctromotive 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

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of user definitions</td>
<td>Thermocouple user definition (TC USER): 1 set, RTD user definition (RTD USER): 1 set</td>
</tr>
<tr>
<td>Temperature range</td>
<td>Lower limit: –9999.9°C, upper limit: +9999.9°C</td>
</tr>
<tr>
<td>Number of temperature ranges</td>
<td>Up to 100</td>
</tr>
<tr>
<td>Output unit</td>
<td>TC USER: µV, RTD USER: Ω</td>
</tr>
<tr>
<td>Output range</td>
<td>TC USER: –120.000 mV to +120.000 mV, RTD USER: 1.00 Ω to 400.00 Ω</td>
</tr>
<tr>
<td>Temperature unit displayed on the panel</td>
<td>°C</td>
</tr>
</tbody>
</table>

### 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

1. **TYPE**:<type><line feed>
2. `<temperature range 1><line feed>`
3. `<temperature range 2><line feed>`
4. `<temperature range 3><line feed>`
5. `...`
6. `<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 6 User Definitions of Thermocouples and RTDs

**Item Specifications**

- 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

<table>
<thead>
<tr>
<th>Error Message</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is no TYPE description.</td>
<td>There is no TYPE description.</td>
</tr>
<tr>
<td>The number of characters for TYPE is not correct.</td>
<td>The number of characters for TYPE is not correct.</td>
</tr>
<tr>
<td>The character type used in TYPE is not correct.</td>
<td>The character type used in TYPE is not correct.</td>
</tr>
<tr>
<td>The output is outside the possible range.</td>
<td>The output is outside the possible range.</td>
</tr>
<tr>
<td>The number of characters in a line exceeds 512.</td>
<td>The number of characters in a line exceeds 512.</td>
</tr>
<tr>
<td>The upper limit of the temperature range is omitted</td>
<td>The upper limit of the temperature range is omitted</td>
</tr>
<tr>
<td>The upper or lower limit of the temperature range is outside the allowed range.</td>
<td>The upper or lower limit of the temperature range is outside the allowed range.</td>
</tr>
<tr>
<td>The upper limit of the temperature range is less than the lower limit.</td>
<td>The upper limit of the temperature range is less than the lower limit.</td>
</tr>
<tr>
<td>A polynomial coefficient is not specified.</td>
<td>A polynomial coefficient is not specified.</td>
</tr>
<tr>
<td>The format of the upper limit, lower limit, or polynomial coefficient is not correct.</td>
<td>The format of the upper limit, lower limit, or polynomial coefficient is not correct.</td>
</tr>
<tr>
<td>The number of polynomial coefficients exceeds 21.</td>
<td>The number of polynomial coefficients exceeds 21.</td>
</tr>
</tbody>
</table>
### Appendix 7 List of Default Settings and Settings That Are Saved

<table>
<thead>
<tr>
<th>Setup items</th>
<th>Factory Default Value</th>
<th>Value Saved When Powered Off?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes: Saved</td>
</tr>
<tr>
<td>Output</td>
<td>Off</td>
<td>Yes</td>
</tr>
<tr>
<td>Range</td>
<td>1V</td>
<td>Yes</td>
</tr>
<tr>
<td>Temperature type</td>
<td>Thermocouple K</td>
<td>Yes</td>
</tr>
<tr>
<td>Main setting (MAX)</td>
<td>Voltage, current</td>
<td>0.00000</td>
</tr>
<tr>
<td>Main setting (MIN)</td>
<td>Voltage, current</td>
<td>0.00000</td>
</tr>
<tr>
<td>Scale selection</td>
<td>MAX</td>
<td>Yes</td>
</tr>
<tr>
<td>Output divider</td>
<td>Numerator n</td>
<td>10</td>
</tr>
<tr>
<td>Denominator m</td>
<td>10</td>
<td>Yes</td>
</tr>
<tr>
<td>Deviation</td>
<td>0.00%</td>
<td>Yes</td>
</tr>
<tr>
<td>Preset</td>
<td>0%</td>
<td>Yes</td>
</tr>
<tr>
<td>Sweep</td>
<td>HOLD</td>
<td>Yes</td>
</tr>
<tr>
<td>Sweep time</td>
<td>Approx. 16 s</td>
<td>Yes</td>
</tr>
<tr>
<td>Resolution mode</td>
<td>NORM (5.5 digits)</td>
<td>Yes</td>
</tr>
<tr>
<td>Reference Junction Compensation (RJC)</td>
<td>Mode</td>
<td>AUTO (auto)</td>
</tr>
<tr>
<td>Manual input compensation value</td>
<td>0.00°C</td>
<td>Yes</td>
</tr>
<tr>
<td>Difference between the resistance for when the external RJ sensor is at 0°C and 100.00 Ω (RJC.R0)</td>
<td>0.00Ω</td>
<td>No</td>
</tr>
<tr>
<td>User definitions</td>
<td>Thermocouple</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>RTD</td>
<td>None</td>
</tr>
<tr>
<td>Temperature output display</td>
<td>°</td>
<td>Yes</td>
</tr>
<tr>
<td>Temperature unit (only on models with the -UF suffix code)</td>
<td>°C</td>
<td>No</td>
</tr>
<tr>
<td>Beep sound</td>
<td>ON</td>
<td>Yes</td>
</tr>
<tr>
<td>GP-IB Interface</td>
<td>addresses</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Command type (TYPE)</td>
<td>NORMAL</td>
</tr>
<tr>
<td>Ethernet Interface (LAN)</td>
<td>DHCP</td>
<td>ON</td>
</tr>
<tr>
<td></td>
<td>IP address</td>
<td>192.168.0.1</td>
</tr>
<tr>
<td></td>
<td>Subnet mask</td>
<td>255.255.255.0</td>
</tr>
<tr>
<td></td>
<td>Default gateway</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>USB interface</td>
<td>TMC</td>
<td>No</td>
</tr>
</tbody>
</table>
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


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.

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<tr>
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<td>'</td>
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<td>SOH</td>
<td>DC1</td>
<td>!</td>
<td>A</td>
<td>q</td>
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<td></td>
<td></td>
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<tr>
<td>2</td>
<td>STX</td>
<td>DC2</td>
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<td>B</td>
<td>r</td>
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<td></td>
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<td>ETX</td>
<td>DC3</td>
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<td>C</td>
<td>s</td>
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<td>E</td>
<td>u</td>
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<td>SYN</td>
<td>&amp;</td>
<td>F</td>
<td>v</td>
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<td>7</td>
<td>BEL</td>
<td>ETB</td>
<td>'</td>
<td>G</td>
<td>w</td>
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<td>Talker addresses</td>
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Example: Octal 25 = PPE | Hexadecimal 15 = NAK | Decimal 15 = ASCII character code

GP-IB code

DEL (RUBOUT)
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