

GS200

DC Voltage/Current Source

U S E R ' S M A N U A L

Product Registration

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Thank you for purchasing the GS200 DC voltage/current source.
This user's manual explains the features, operating procedures, and handling precautions of the GS200. 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 a question arises.

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

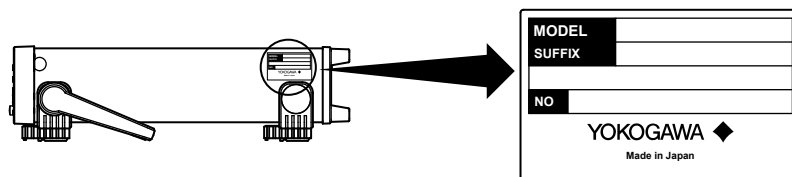
- 1st Edition : December 2009
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Checking the Contents of the Package

After receiving the product and opening the package, check the items described below. 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.

GS200

Check that the model name and suffix code given on the name plate on the side panel are the same as those on your order.



MODEL and SUFFIX Codes

Model	Suffix Code	Description
GS210		DC voltage/current source (front panel output terminals)
GS211		DC voltage/current source (rear panel output terminals)
Supply voltage	-1	100 VAC, 50/60 Hz
	-4	120 VAC, 50/60 Hz
	-7	230 VAC, 50/60 Hz
Power cord ¹	-D	UL/CSA Standard Power Cord (Part No.: A1006WD) [Maximum rated voltage: 125 V; Maximum rated current: 7A]
	-F	VDE Standard Power Cord (Part No.: A1009WD) [Maximum rated voltage: 250 V; Maximum rated current: 10 A]
	-Q	BS Standard Power Cord (Part No.: A1054WD) [Maximum rated voltage: 250 V; Maximum rated current: 10 A]
	-R	AS Standard Power Cord (Part No.: A1024WD) [Maximum rated voltage: 250 V; Maximum rated current: 10 A]
	-H	GB Standard Power Cord (Part No.: A1064WD) [Maximum rated voltage: 250 V; Maximum rated current: 10 A]
Options	/MON	Voltage and current monitoring
	/C10	Ethernet interface

¹ Make sure that the attached power cord meets the designated standards of the country and area that you are using it in.

NO. (Instrument Number)

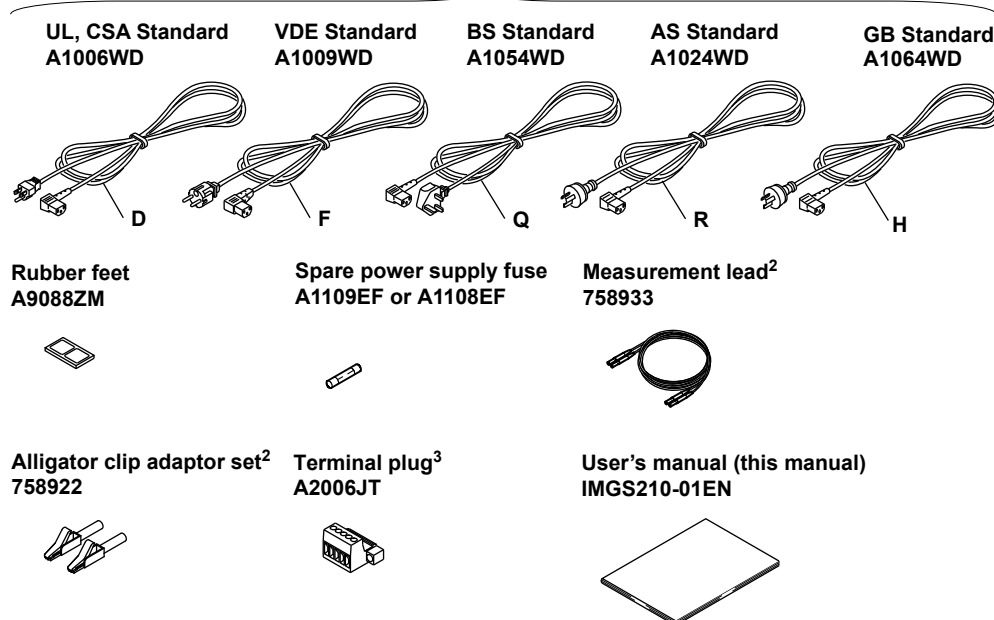
When contacting the dealer from which you purchased the instrument, please tell them the instrument number.

Standard Accessories

The standard accessories below are supplied with the instrument.

Name	Model or Part No.	Quantity	Note
Power cord ¹	See the previous page	1	
Rubber feet	A9088ZM	1	Two rubber feet in one set.
Spare power supply fuse			
Power cord suffix code			
-1 or -4	A1109EF	1	250 V, 1 A, time lag.
-7	A1108EF	1	250 V, 0.5 A, time lag.
Measurement lead	758933	1 set	Safety terminal cable. Red and black, 1 pc each. Only included with the GS210.
Alligator clip adapter	758922	1 set	Safety terminal-to-alligator clip adapter. Red and black, 1 pc each. Only included with the GS210.
Terminal plug	A2006JT	1	Only included with the GS211.
User's manual	IMGS210-01EN	1	This manual.

One of these power cords¹ is supplied according to the suffix code.



- 1 Make sure that the attached power cord meets the designated standards of the country and area that you are using it in.
- 2 Only included with the GS210.
- 3 Only included with the GS211.

Optional Accessories (Sold separately)

The optional accessories below are available for purchase separately.

Name	Model or Part No.	Minimum Q'ty.	Note
Measurement lead	758933	1	Safety terminal cable. Length: 1 m. Red and black, 1 pc. each.
Measurement lead	758917	1	Safety terminal cable. Length: 0.75 m. Red and black, 1 pc. each.
Banana plug set	758919	1 set	φ4 mm plug/φ4 mm socket adapter. Red and black, 1 pc. each.
Small alligator clip adapter	758922	1 set	Safety terminal-to-alligator clip adapter. Red and black, 1 pc each.
Large alligator clip adapter	758929	1 set	Safety terminal-to-alligator clip adapter. Red and black, 1 pc each.
Fork terminal adapter	758921	1 set	Safety terminal-to-fork terminal adapter. Red and black, 1 pc each.
Conversion adapter	758924	1	BNC-to-safety terminal adapter.
Conversion adapter	751512	1	Banana plug-to-binding post adapter.
BNC cable	366924	1	BNC-BNC, length: 1 m.
BNC cable	366925	1	BNC-BNC, length: 2 m.
Safety terminal adapter	758923	1 set	Spring clamp type. Red and black, 1 pc. each.
Safety terminal adapter	758931	1 set	Screw-in type. Red and black, 1 pc. each.
Terminal plug	A2006JT	1	For use with the GS211 rear panel terminals.
Synchronous operation cable	758960	1	RJ-11 cable, 6 pins, length: 1 m.

Safety Precautions

This instrument is an IEC safety class I instrument (provided with a terminal for protective earth grounding).

The general safety precautions described herein must be observed during all phases of operation. If the instrument is used in a manner not specified in this manual, the protection provided by the instrument may be impaired. Yokogawa Electric Corporation 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 instrument which require special instructions for proper handling or use. The same symbol appears in the corresponding place in the manual to identify those instructions.



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



Alternating current



ON (power)



OFF (power)



In-position of a bi-stable push control



Out-position of a bi-stable push control

Be sure to comply with the precautions below. Not complying might result in injury or death.

WARNING

Use the Instrument Only for Its Intended Purpose

The GS200 is a generator that can generate DC voltage and current. Do not use this instrument for anything other than as a DC voltage and current generator.

Check the Physical Appearance

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

Use the Correct Power Supply

Before connecting the power cord, ensure that the source voltage matches the rated supply voltage of the instrument and that it is within the maximum rated voltage of the provided power cord.

Use the Correct Power Cord and Plug

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

Do not use the power cord in a bundled condition. If you use a power plug with foreign substance on it, insulation may be compromised by humidity or other factors and may cause a fire. Clean the power plug regularly.

Connect the Protective Grounding Terminal

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

Do Not Impair the Protective Grounding

Never cut off the internal or external protective earth wire or disconnect the wiring of the protective earth terminal. Doing so poses a potential shock hazard.

Do Not Operate with Defective Protective Grounding or Fuse

Do not operate the instrument if the protective earth or fuse might be defective. Also, make sure to check them before operation.

Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gasses or vapors. Operation in such an environment constitutes a safety hazard.

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 item under measurement or to an external control unit.

If you are going to touch the circuit, make sure to turn OFF the circuit and check that no voltage is present.

Measurement Category

The measurement category of the GS200 signal input terminals is Other (O). Do not use it to measure the main power supply or for Measurement Categories II, III, and IV.

Installation Location

- This instrument is designed to be used indoors. Do not install or use it outdoors.
- Install the instrument so that you can immediately remove the power cord if an abnormal or dangerous condition occurs.

CAUTION

Operating Environment Limitations

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

Waste Electrical and Electronic Equipment



Waste Electrical and Electronic Equipment (WEEE), Directive 2002/96/EC

(This directive is valid only in the EU.)

This product complies with the WEEE Directive (2002/96/EC) 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 Annex 1, this product is classified as a “Monitoring and Control instrumentation” product.

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

New EU Battery Directive



New EU Battery Directive, DIRECTIVE 2006/66/EC

(This directive is valid only in the EU.)

Batteries are included in this product. This marking indicates they shall be sorted out and collected as ordained in ANNEX II in DIRECTIVE 2006/66/EC.

Battery type

Lithium battery

You cannot replace batteries by yourself. When you need to replace batteries, contact your local Yokogawa Europe B.V.office.

Symbols and Notations Used in This Manual

Safety Markings

The following markings are used in this manual.



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

WARNING

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

CAUTION

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

Note

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

Notations Used in the Procedural Explanations

On pages that describe the operating procedures in chapters 3 through 15 and the appendix, the following symbols are used to distinguish the procedures from their explanations.

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.

<<Corresponding Command Mnemonic>>

Indicates a communication command that corresponds to the feature described on the procedural explanation page.

Characters and Terminology Used in Procedural Explanations

Keys

Bold characters used in the procedural explanations indicate characters that are marked on the panel keys.

NUM LOCK + Δ or ∇

This means the following: press the NUM LOCK key to make it illuminate, and then press the Δ or ∇ key. When the instrument is in this state, you can use the Δ and ∇ keys to directly access the items that are marked above and below these keys (numbers 0 to 9, period, and BS).

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1.1 Front Panel

Error indicator

Illuminates when there are errors in the error log → Section 14.2

Remote indicator

Illuminates when the GS200 is in remote mode (controlled through communications) → Section 12.1

Store indicator

Illuminates when store mode is turned on → Section 7.8

Repeat indicator

Illuminates when the program's repeat mode is turned on → Section 6.1

Sampling error indicator

Illuminates when a sampling error occurs in a program or measurement trigger → Sections 6.4 and 7.4

Soft keys, Δ and ∇ keys, and the keypad

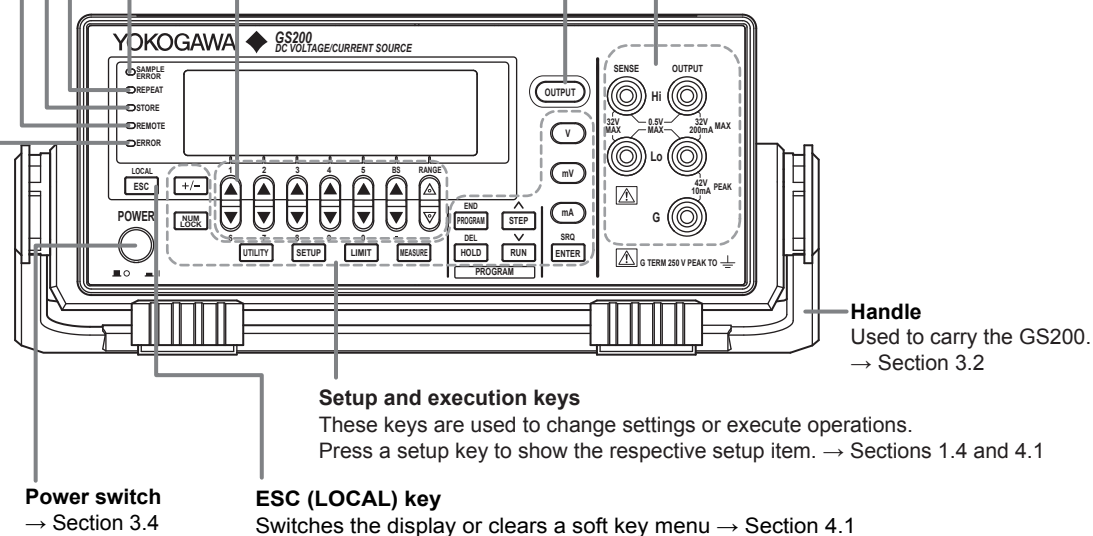
- Use the soft keys to select items on the soft key menus that appear during configuration.
 - Use the Δ and ∇ keys to increase and decrease each digit of the displayed value during numeric input.
 - Use the keypad to specify a value directly during numeric input.
- Section 4.1

Output control key

Press to turn the source on and off. → Section 5.5

Output terminals (only on the GS210)

Used to connect the included measurement leads.
→ Sections 3.5, 4.2, and 4.3



1.2 Rear Panel

I/O terminals for synchronous operation

Used to connect multiple GS200s and perform synchronous operation. → Section 8.2

USB port

Used to connect the GS200 to a PC that has a USB interface and to access the GS200 as USB storage or to control the GS200 through USB-TMC commands.

→ Sections 4.4 and 10.2

Ethernet port*

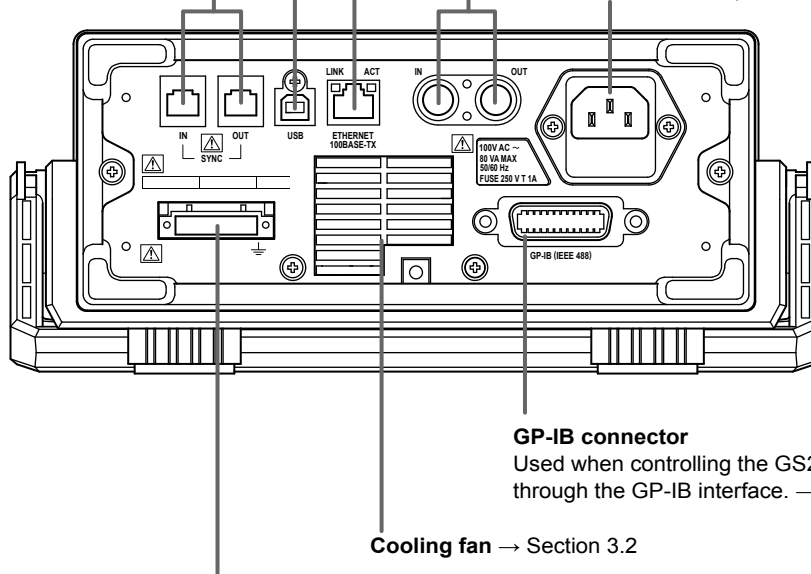
Used to connect the GS200 to a network. → Section 11.2

BNC I/O terminals

Used to receive and transmit trigger, output state, and source change completion signals. → Section 8.1

Power inlet

Connects to a power supply → Section 3.3



GP-IB connector

Used when controlling the GS200 with commands through the GP-IB interface. → Section 12.2

Cooling fan → Section 3.2

Output terminal (only on the GS211)

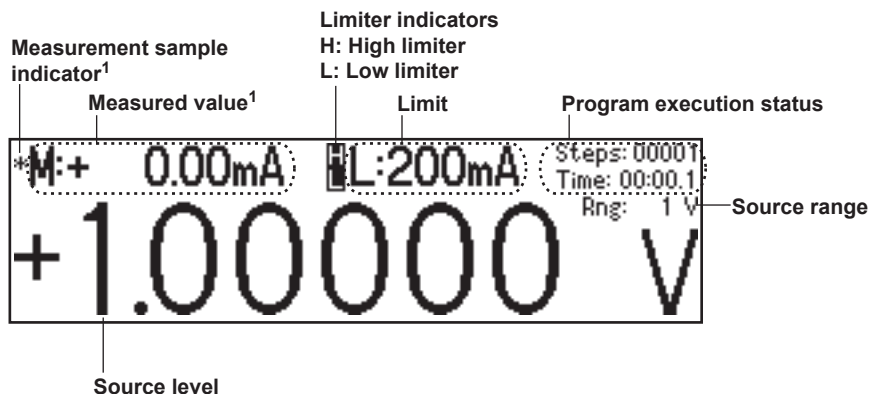
Used to connect the DUT cable. → Sections 3.5, 3.6, 4.2, and 4.3

* Only on models with the Ethernet option (/C10).

1.3 Display Mode and Displayed Contents

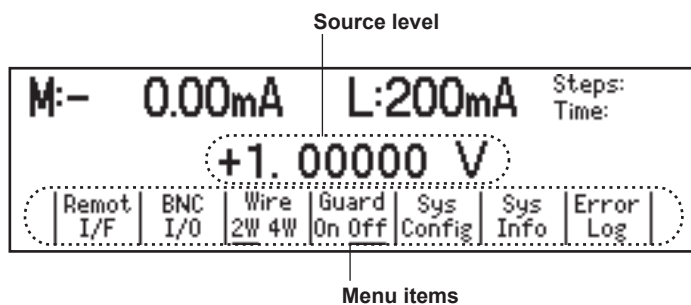
Display Mode

Main Screen



1 This is displayed on models with the monitoring (/MON) option.

Menu Screen



Displayed Contents

Source Level

The source level that is being produced is displayed here.

Measurement Sample Indicator (On models with the /MON option)

During measurement, an asterisk illuminates. When the measurement completes, the asterisk turns off. If you are performing sequential measurements that have a short integration time, the asterisk illuminates and turns off once every 100 ms.

Measured Value (On models with the /MON option)

When the source function is set to voltage, this displays the measured current. When the source function is set to current, this displays the measured voltage. When there is no measured value, "-----" is displayed. When the source range is set to 10 mV or 100 mV, you cannot use the measurement (monitoring) feature. In these situations, the message "Cannot measure in mV source range" is displayed. When the measurement feature is turned off, "Off" is displayed.

On models without the monitoring (/MON) option, nothing is displayed in the measured value area.

1.3 Display Mode and Displayed Contents



Limits

When the source function is set to voltage, this displays the current limit. When the source function is set to current, this displays the voltage limit. When the source range is set to 10 mV or 100 mV, the limit is fixed to 200 mA (you cannot change this value). In these situations, “-----mA” is displayed for the limit.

Note

In voltage source mode's 10 mV and 100 mV ranges, the output resistance is approximately 2 Ω . Therefore, these ranges are not suitable when the GS200 is connected to a load that allows current to flow (a low-impedance load). Connect a load that allows as little current to flow as possible (a high-impedance load).

Limiter Indicators

-  is displayed when the high limiter is activated.
-  is displayed when the low limiter is activated.

Program Execution Status

When a program is running, the following items are displayed.

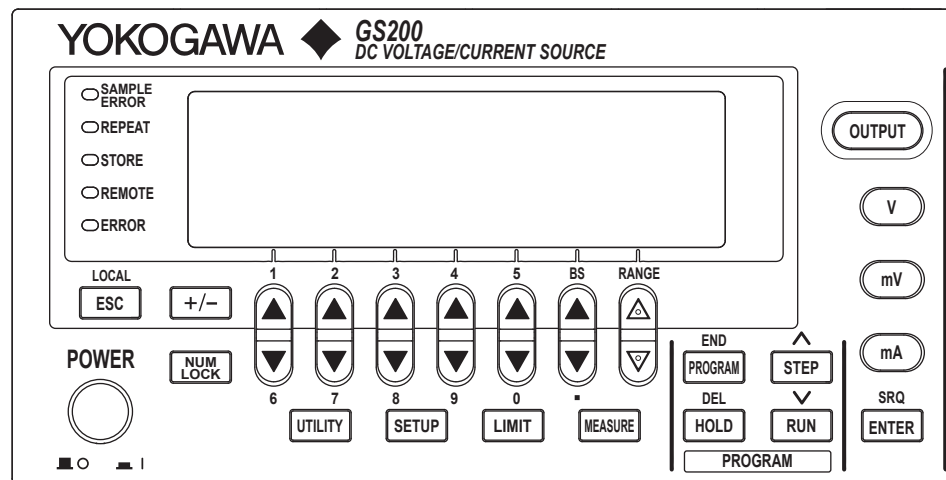
- Steps: The step number that is currently being executed.
- Time: The remaining interval time (minutes:seconds.tenths of seconds).

Source Range

The source range that is currently in use is displayed here.

1.4 Keys

1



General-Purpose Keys

+/- Key (Section 4.1)

This key is used when you enter numeric values or change a value's sign.

NUM LOCK Key (Section 4.1)

When you press the NUM LOCK key, the NUM LOCK key's indicator illuminates, and the GS200 enters keypad mode. In this mode, you can use the Δ and ∇ keys to directly access the items that are marked above and below these keys (numbers 0 to 9, period, and BS).

Δ and ∇ Keys (Section 4.1)

When a soft key menu is displayed, press the Δ keys to make selections and perform actions. Press the Δ and ∇ keys to enter values in up/down key mode and keypad mode.

ENTER Key (Section 4.1)

When the GS200 is in keypad mode, press this key to enter the setting that you have specified.

ESC (LOCAL) Key (Section 4.1)

When a menu is displayed, press this key to display the previous menu (to move up one level in the menu hierarchy). If you press this key when you are entering a value with the GS200 in up/down key mode, the GS200 returns to one screen before the numeric value input screen. When the GS200 is displaying the top menu, you can press this key to switch between the top menu and the main screen. This is also the LOCAL key. When the GS200 is in remote mode, you can press this key to return it to local mode.

Source Keys

V Key (Sections 5.2 and 5.3)

If you press this key when the GS200 is in up/down key mode and is displaying the main screen, the source function is set to voltage, and the source range is set to 1 V. If you press this key when the GS200 is in keypad mode and is displaying the main screen, the voltage source level that you specified is fixed, the source function is set to voltage, and the source range is set to the most appropriate range greater than or equal to the 1 V range.

mV Key (Sections 5.2 and 5.3)

If you press this key when the GS200 is in up/down key mode and is displaying the main screen, the source function is set to voltage, and the source range is set to 10 mV (the circuit that produces the 10 mV range uses the voltage divider). If you press this key when the GS200 is in keypad mode and is displaying the main screen, the voltage source level that you specified is fixed, the source function is set to voltage, and the source range is set to the most appropriate range.

mA Key (Sections 5.2 and 5.3)

If you press this key when the GS200 is in up/down key mode and is displaying the main screen, the source function is set to current and the source range is set to 1 mA. If you press this key when the GS200 is in keypad mode and is displaying the main screen, the current source level that you specified is fixed, the source function is set to current, and the source range is set to the most appropriate range.

RANGE Keys (Section 5.2)

Press these keys to change the source range. Press the Δ key to increase the source range by one. Press the ∇ key to decrease the source range by one. When a menu is displayed, you can use the Δ key as a menu selection soft key. You cannot change the range continuously by holding these keys down.

Depending on the operation menu, these keys may be used to scroll the screen. In these situations, you can scroll the screen by holding these keys down.

LIMIT Key (Section 5.4)

Press this key to display the limit input screen. If you press this key in keypad mode when you are entering a limit, the limit that you specified is discarded, and the GS200 returns to the main screen.

OUTPUT Key (Section 5.5)

Output turns on and off each time that you press the OUTPUT key. When output is turned on, this key illuminates in red. When output is turned off, this key turns off. When you turn output on, the display switches to the main screen.

Program Keys

PROGRAM Key (Chapter 6)

Press this key to display the program menu. If you press this key while you are editing a program, program editing finishes.

RUN Key (Section 6.7)

Press this key to execute the program from its first step.

STEP Key (Section 6.7)

Press this key to execute just one of the program's steps.

HOLD Key (Section 6.7)

Press this key to pause the program that is running. If you press this key while the program execution is paused, the program resumes executing.

If you execute a program by pressing the RUN, STEP, or HOLD key, the display switches to the main screen.

Measurement (Monitoring) Key (Option)

MEASURE Key (Chapter 7)

Press this key to display the measurement setup menu. On models without the monitoring (/MON) option, if you press the MEASURE key, "Not Available" appears.

Setup Information Key

SETUP Key (Sections 9.1, 9.2, and 9.3)

Press this key to list setup files and display the SETUP menu.

Communication, System Setup, and Other Keys

UTILITY Key

Press this key to display the UTILITY menu. Use the UTILITY menu to access the following settings and features:

- Communication settings (section 4.4 and chapters 10, 11, and 12).
- Terminal settings (sections 4.2, 4.3, and 8.1).
- System settings (section 3.7, 4.4, and 15.5 and chapter 9).
- Self-test (section 15.3).
- Product information (section 15.4).
- Error log (section 9.6).

2.1 System Configuration

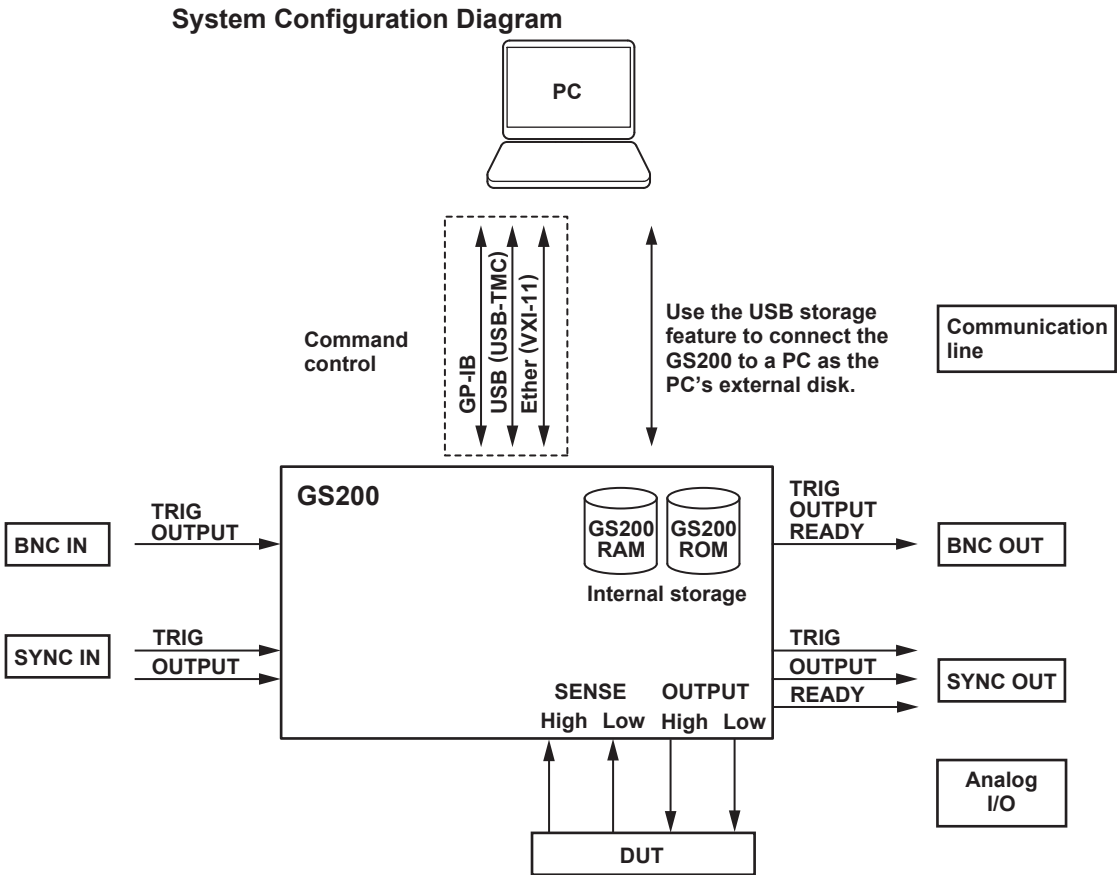
Product Features and System Configuration

GS200 Features

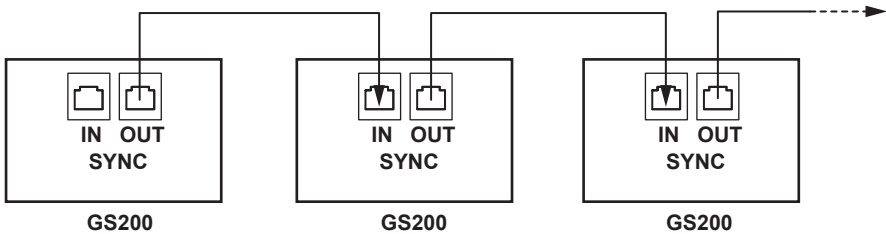
- The GS200 uses dual D/A conversion to produce voltage and current with high accuracy and resolution. It can produce stable current or voltage whether it is used for a short or long period of time and maintains superb linearity over all the ranges. You can also use the GS200 to produce voltage and current that has low noise.
- The GS200 can perform four-quadrant operation by operating as a current source or a current sink in the range of ± 32 V and ± 200 mA.
- The GS200 has an optional voltage and current measurement feature (monitoring feature). The GS200 can measure current in voltage source mode and measure voltage in current source mode. The display resolution is $4\frac{1}{2}$ digits.
- By using the program feature, you can specify up to 10000 steps, each of which controls the generation of voltage or current. You can also generate ramp waveforms by using the slope setting.
- You can use the external I/O BNC connector on the rear panel to control multiple GS200s or other measuring instruments by synchronizing them to actions such as the source action and the output action.
- The I/O terminals for synchronous operation (SYNC IN/OUT) of multiple GS200s can be connected in a daisy chain to allow synchronization of output control and triggers. This increases the number of channels that can be controlled.
- The GS200 has a built-in 4 MB non-volatile storage disk (GS200ROM) for storing various settings and a 16 MB volatile storage disk (GS200RAM) for storing data such as measurement results. If you use USB to connect the GS200 to a PC, you can access these storage disks as the PC's external drives. Because settings and results are saved to general text files or .CSV files, you can use software such as a text editor or a general-purpose spreadsheet application to edit these files or use them to display graphs on your PC.

In addition to the storage feature, the USB interface can be used to perform command control by way of the USB-TMC protocol. Furthermore, command control can be performed by way of other communication interfaces such as GP-IB, and Ethernet (VXI-11 protocol/7655 command socket).

You can also use the Ethernet interface to access the GS200's internal disks through FTP (the FTP server feature) and to display the GS200's information and control it from a Web browser by accessing the GS200 through HTTP (the HTTP server feature).



Synchronous Operation by Connecting the I/O Terminals for Synchronous Operation (SYNC IN/OUT)



2.2 Source Feature and Measurement Feature (Monitoring feature; /MON option)

This section explains the basic features of the GS200: the source feature and the measurement feature (monitoring feature).

Generating Voltage and Current

The GS200 uses dual D/A conversion and a highly accurate power amplifier. This enables you to set the voltage and current at a resolution of $5\frac{1}{2}$ digits.

Voltage Source

The GS200 has 10 mV, 100 mV, 1 V, 10 V, and 30 V ranges. You can specify and generate a positive or negative voltage of up to 32 V.

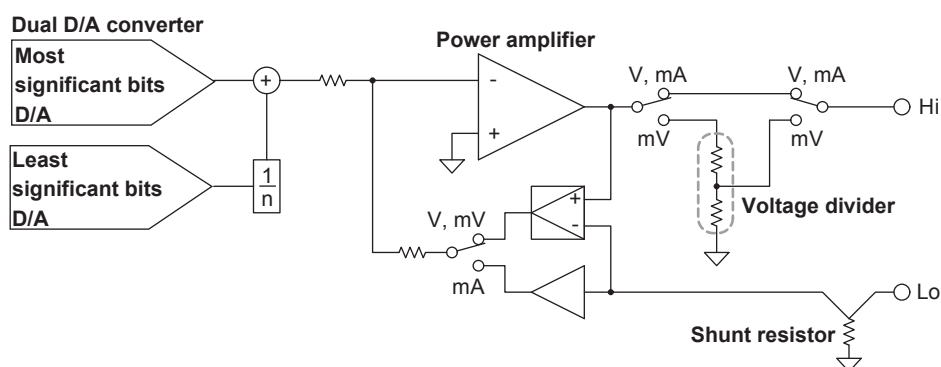
Current Source

The GS200 has 1 mA, 10 mA, 100 mA, and 200 mA ranges. You can specify and generate a positive or negative current of up to 200 mA.

The 1 V, 10 V, and 30 V voltage source ranges enable you to generate a positive or negative output current of up to 200 mA with a low output resistance. These ranges are well-suited to situations such as the evaluation of devices that require current. When you select the 10 mV or 100 mV range, the GS200 uses a voltage divider that consists of a pair of resistors. This enables you to use the GS200 to generate low voltages at resolutions as low as 100 nV or as a $3\text{ }\mu\text{Vp-p}^*$, low-noise voltage signal source. These ranges are well-suited to providing simulated signals to instruments such as sensors.

In current source mode, you can generate a positive or negative output voltage of 30 V on all of the current ranges. Current source mode is well-suited to evaluating the charge/discharge characteristics of rechargeable batteries and other devices.

* 10 mV range, DC to 10 Hz



Source and Sink Operations

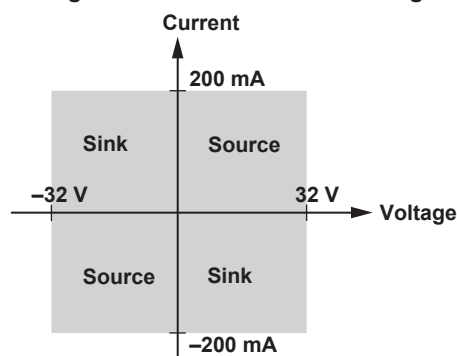
The GS200 can perform four-quadrant operation by operating as a current source or a current sink in the range of ± 32 V and ± 200 mA.

During sink operation, the GS200 operates in the same quadrants as it does during source operation, so you can use it not just as a true constant voltage source but also as a highly accurate electronic load.

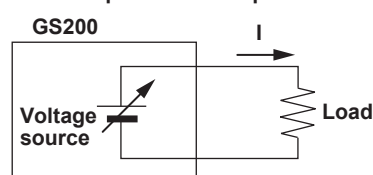
Voltage ranges: 1 V, 10 V, and 30 V
Maximum output current: ± 200 mA (at 1 V, 10 V, and 30 V ranges)

Current ranges: 1 mA, 10 mA, 100 mA, and 200 mA
Maximum output voltage: ± 30 V

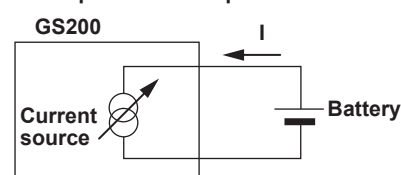
Voltage and Current Generation Region



Source Operation Example



Sink Operation Example

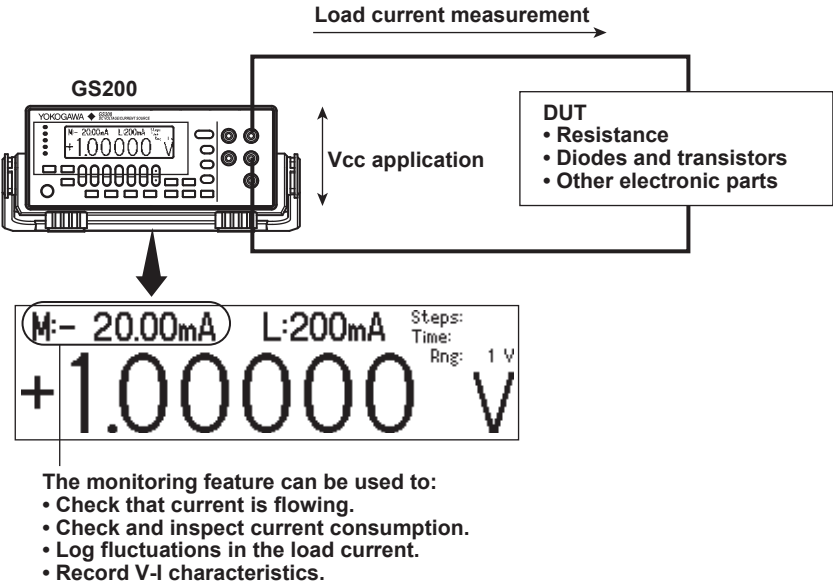


Bipolar Output

Because the GS200 inverts the signal polarity and produces the signal without the use of a mechanical contact, no abnormal voltage (or current) is generated when the polarity is inverted. Therefore, the GS200 can generate continuous, variable output ranging from the maximum negative value to the maximum positive value. This is effective when you want to invert the polarity to generate program output or evaluate zero-crossing comparators. Additionally, when you change settings within the same range, glitches are not generated.

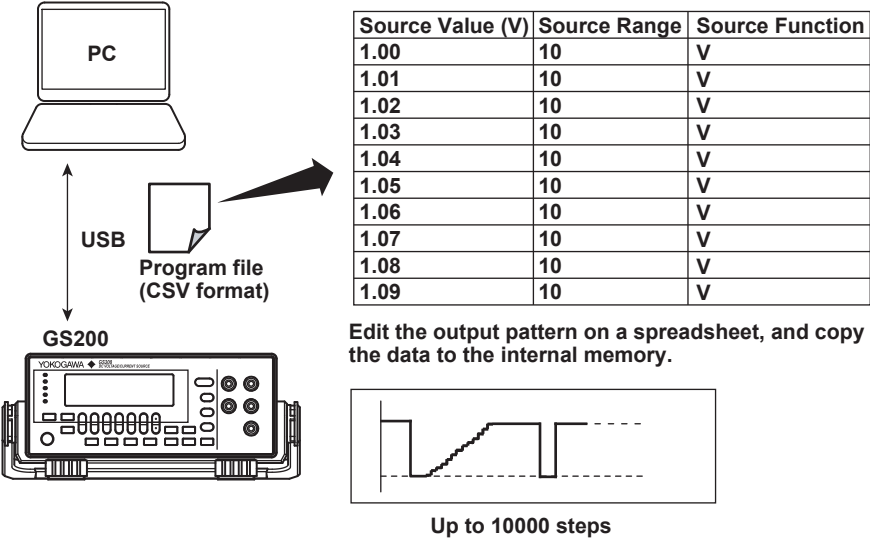
Voltage and Current Measurement Feature (Monitoring feature; /MON option)

The GS200 can measure voltage or current while it generates voltage or current. In voltage source mode, you can measure current with a display resolution of 4½ digits. In current source mode, you can measure voltage with a display resolution of 4½ digits. You can use the store feature to save the measured value together with the source value to the internal RAM disk.



Using up to 10000 Steps to Program the Output

You can use the program feature to specify up to 10000 output steps. You can edit programs from the GS200 or create program files in CSV format on a PC and use the USB storage feature to load the files on the GS200.



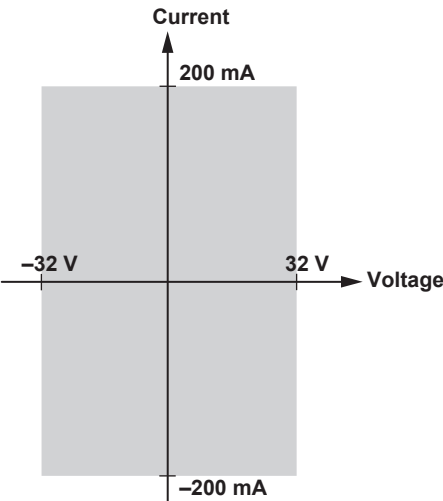
For details on programs, see section 2.4, "Programs."

2.3 Source

Source Range

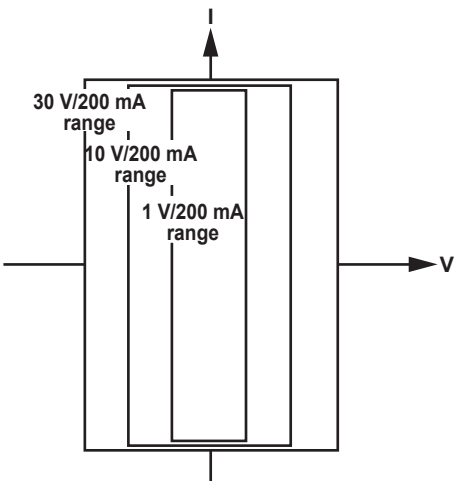
Source Range

The following figure indicates the range that the GS200 can generate.



Voltage Source Range (See section 5.2 for the procedure)

The following voltage source ranges are available.

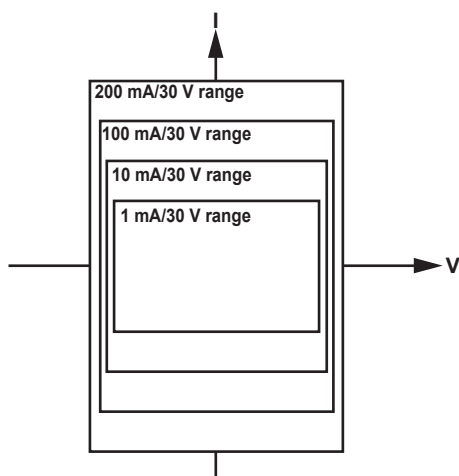


Range	Source Range	Resolution	Max. Load Current
10 mV	±12.0000 mV	100 nV	-----*
100 mV	±120.000 mV	1 µV	-----*
1 V	±1.20000 V	10 µV	±200 mA
10 V	±12.0000 V	100 µV	±200 mA
30 V	±32.000 V	1 mV	±200 mA

* In voltage source mode's 10 mV and 100 mV ranges, because the GS200 uses a voltage divider, the output resistance is approximately 2 Ω. Therefore, these ranges are not suitable when the GS200 is connected to a load that allows current to flow (a low-impedance load). Depending on the load current, the output voltage may decrease. Also, four-terminal connection does not function for these voltage ranges. You must use the two-terminal connection instead. Connect a high-impedance load, a load that is sufficiently larger than the output resistance.

Current Source Range (See section 5.2 for the procedure)

The following current source ranges are available.



Range	Source Range	Resolution	Max. Load Current
1 mA	± 1.20000 mA	10 nA	± 30 V
10 mA	± 12.0000 mA	100 nA	± 30 V
100 mA	± 120.000 mA	1 μ A	± 30 V
200 mA	± 200.000 mA	1 μ A	± 30 V

Source Function (See section 5.1 for the procedure)

The source function can be set to either voltage (V or mV) or current (mA).

Voltage (V): Operates as a constant voltage source. The current limiter is enabled.

Voltage (mV): Operates as a voltage source that uses a voltage divider.

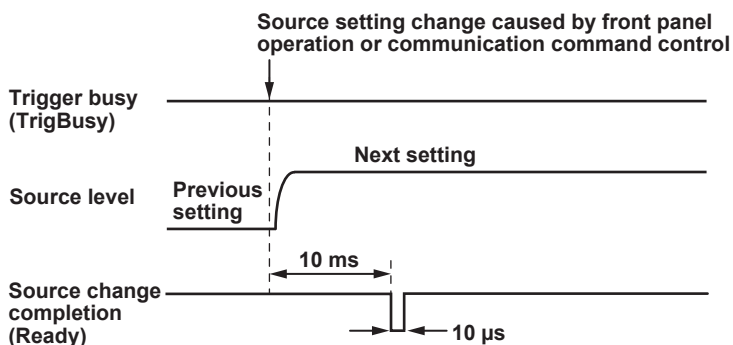
Current (A): Operates as a constant current source. The voltage limiter is enabled.

Source Action

Source action refers to the setting of the source level and the way that the source level changes to the new value. In source actions, various control signals change as shown below.

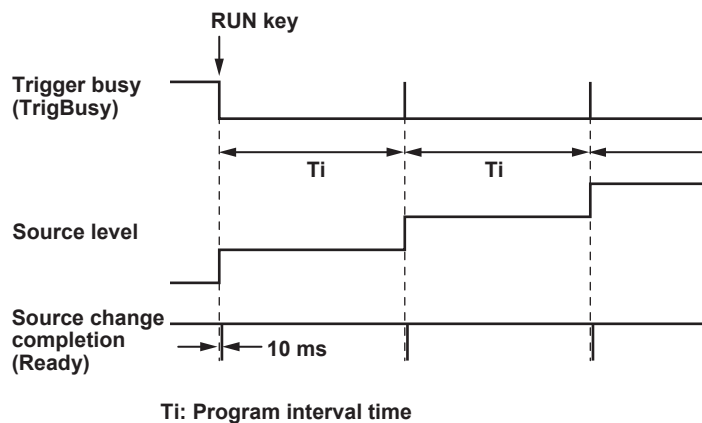
During DC Source Operation (When a program is not running)

The actual source level will change at the time the setting change is instructed from a panel operation or communication command. The source change completion (Ready) signal, which is a low-level pulse signal with a width of 10 μ s, is generated 10 ms after the source level changes. Additionally, the trigger busy (TrigBusy) signal, which indicates the program execution status, remains at high level and does not change.



During Program Execution

When you execute a program, the trigger busy signal is set to low level, and the source level changes. The source change completion (Ready) signal, which is a low-level pulse signal, is generated 10 ms after the source level changes. When each program interval time completes, the trigger busy signal is set to high level. The program proceeds from step to step by repeating this pattern.

**Output ON/OFF (See section 5.5 for the procedure)**

There are two output modes: OFF or ON.

OFF: The output is disconnected, and the specified source level is not generated. In this mode, program and measurement functions are disabled.

ON: The output is connected, and the specified source level is generated. In this mode, program and measurement functions are enabled.

Note

A mechanical relay operates when the GS200 switches between output on and output off. Note the following points when using the GS200.

- It takes approximately 20 ms for the relay to stabilize.
- As the number of on/off operations increases, effects begin to appear such as the relay taking longer to stabilize. Though dependent on the load, the electrical life of the relay is around 100,000 operations.

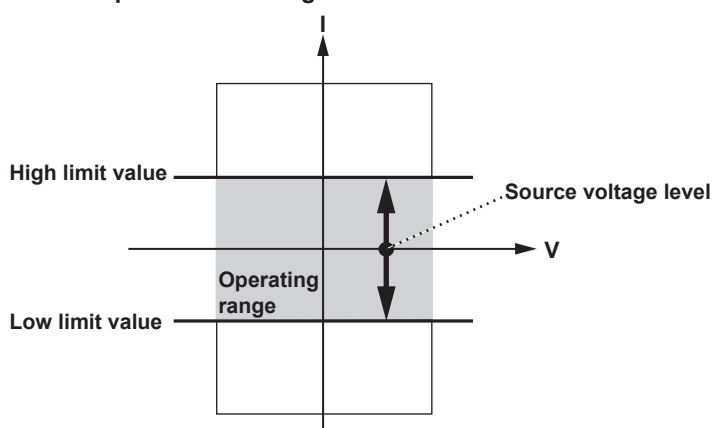
DUT Protection Using Limiters (See section 5.4 for the procedure)**CAUTION**

If a current source that exceeds the current limiter setting is connected in voltage source mode; if a voltage source that exceeds the voltage limiter setting is connected in current source mode; or if a load that exceeds the source range listed above is connected, an abnormal load is detected, and the output is turned off (the output trips). Do not connect these types of loads to the GS200. Doing so may damage the instrument.

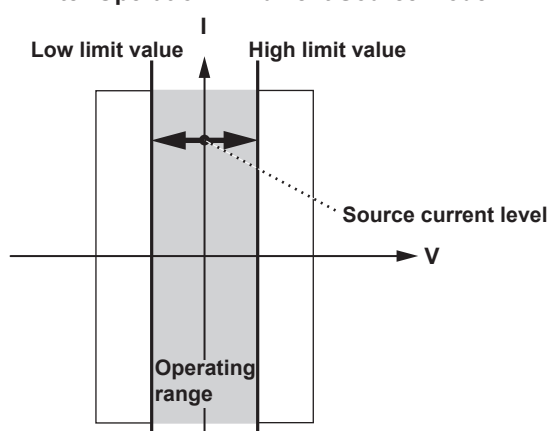
Voltage Limiter and Current Limiter

If a limiter is set, an additional limit can be placed within the source range. This limit can prevent damage to the connected device due to overcurrent or overvoltage. In voltage source mode, the current limiter is enabled. In current source mode, the voltage limiter is enabled.

Limiter Operation in Voltage Source Mode



Limiter Operation in Current Source Mode



A limiter has an operating range which is defined by a positive value and a negative value in relation to 0. The positive value is the high limit. The negative value is the low limit.

If the high limiter is activated, the high limiter indicator (H) is displayed. If the low limiter is activated, the low limiter indicator (L) is displayed.

Tripping the Output

If the GS200's output exceeds the high limiter or falls below the low limiter, the output is automatically turned off. If this occurs, the error indicator illuminates, and the event is written to the error log.

Local Sense and Remote Sense (See section 4.2 for the procedure)

Two wiring systems, 2W (two-terminal connection or local sense) and 4W (four-terminal connection or remote sense) are available. In voltage source mode, when the current flowing through the load becomes large, the voltage drop in the lead wire can no longer be ignored. If this occurs, you can select the four-terminal connection and connect the SENSE terminal near the DUT so that the voltage at the connected location is adjusted to the specified voltage. This alleviates the effects from lead wire resistance, and the desired voltage can be applied to the DUT.

Guard Terminal Feature (See section 4.3 for the procedure)

If the GS200 and the DUT are far apart or if the GS200 shares its power source with electric motors, common mode noise may be superimposed on the power source signal supplied to the DUT. If common mode noise is superimposed on the signal between the GS200's Hi and Lo terminals, the noise current enters the internal source circuit from the output terminals and changes the generated signal. To reduce this effect, a shield for the source circuit is connected to the guard terminal of the GS200. If you connect the noise source to the guard terminal, the noise current passes through the guard and is grounded, bypassing the internal source circuit. This reduces the amount of noise that enters the circuit from the connected power source. Use the guard terminal when a large amount of common mode noise is superimposed on the power source signal.

2.4 Programs

Program Feature (See section 6.1 for the procedure)

The program feature enables you generate the source data pattern that you specified as a program in advance. Each step in the program is executed in order, and each step has a fixed execution time. You can also set the slope time, so you can generate step responses, ramp responses, and various waveforms such as triangular waveforms.

To create and load programs you can:

- Create and edit programs from the GS200 screen.
- Create programs on a PC, save them to the GS200's internal memory (GS200ROM) as program files in CSV format, and load them from the internal disk.

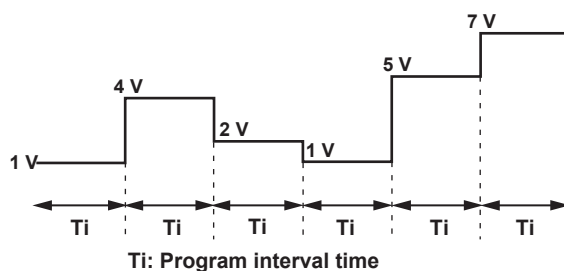
Source data that programs can contain:

- The source level.
- The source range.
- The source function.

Programs can contain up to 10000 steps. If the number of steps exceeds 10000, only the first 10000 steps are loaded.

Program Interval Time (See section 6.2 for the procedure)

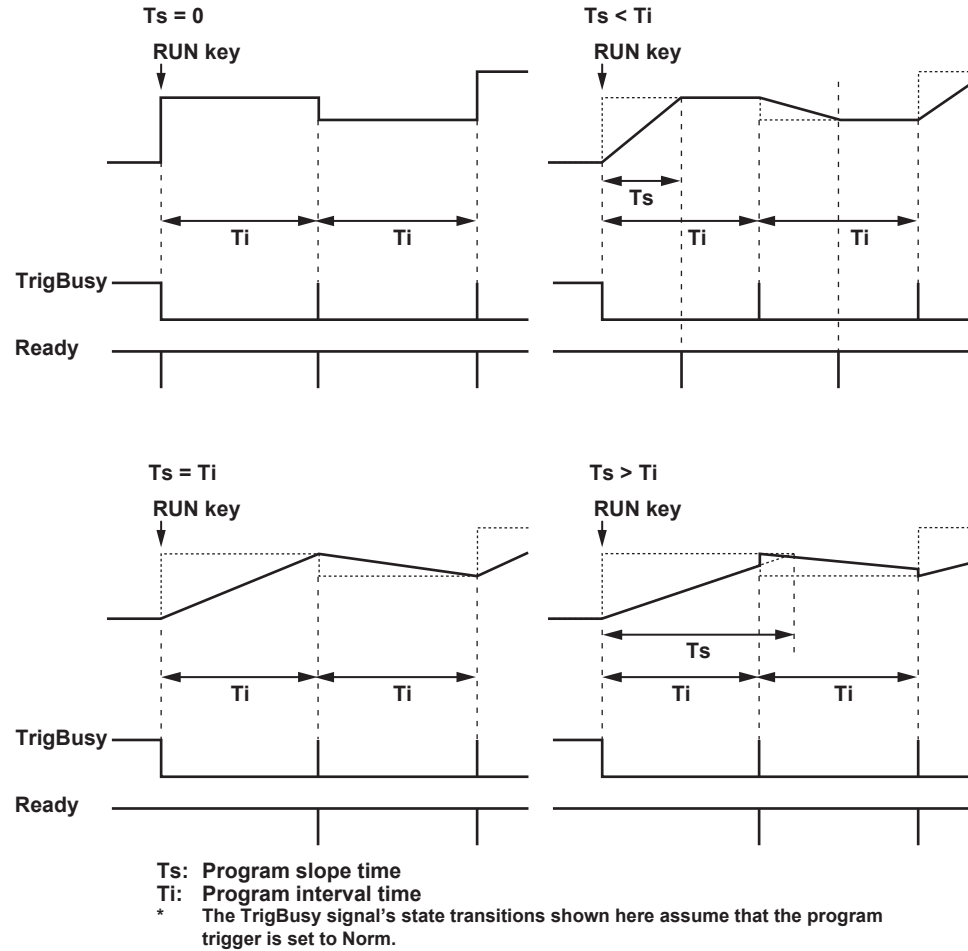
The program interval time specifies the execution interval for each step in the program.



Program Slope Time (See section 6.3 for the procedure)

The program slope time specifies the amount of time that the GS200 takes to linearly change (increase or decrease) the current step's source level to the next step's source level from the beginning of the step. The slope of this linear line is calculated as follows:

$$\frac{\text{Next step's source level} - \text{current step's source level}}{\text{Program slope time}}$$



When Ts is greater than Ti, the situation shown in the bottom right section of the figure above occurs, so be sure to make Ts less than or equal to Ti.

Repeating Programs (See section 6.1 for the procedure)

If you specify to repeat programs, after the last step in a program finishes, the first step in the program begins executing.

Program Triggers (See section 6.4 for the procedure)

Depending on the program trigger setting, there are the following two types of program operation.

When Program Triggers Are Set to Normal (Norm)

You can use the RUN, STEP, and HOLD keys and external triggers to control the program execution.

RUN key: Executes the program from step 1.

STEP key: Executes only one program step.

HOLD key: Pauses the program execution or resumes execution of a paused program.

The program interval time specifies the execution interval for each step in the program.

When Program Triggers Are Set to Measurement End (M.End; only on models with the /MON option)

The program executes the source and measurement operations of each step in the minimum time required. The RUN, STEP, and HOLD keys and external triggers are disabled. Additionally, the program interval setting is ignored.

Program Files

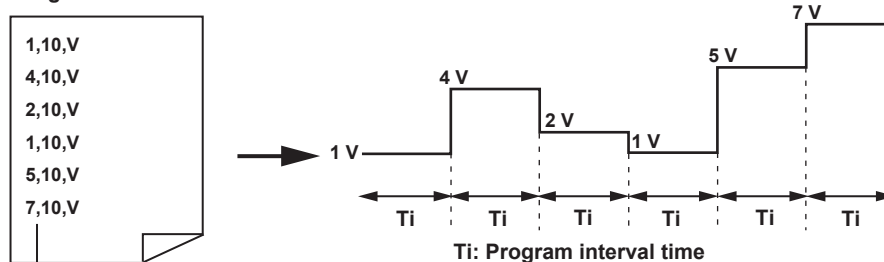
You can use the USB storage feature (see page 2-22) to store programs in the PROGRAM folder in the GS200's non-volatile disk (GS200ROM).

Prgm01.csv and Prgm02.csv that are stored in the PROGRAM folder when the GS200 is sent from the factory or when you format its disk are program file samples. You can check the contents of program files on the display.

Program File Contents (See section 6.5 for the procedure)

Program files are text files that have been created and edited in spreadsheet applications or text editors. Each file contains multiple lines, and each line represents one step in the program.

Program file



Source level, source range, source function

Line

A line is a string of text that is delimited with line-feed codes (LF or CR+LF). Each line defines the following items (from left to right).

- The source level: Defined with an integer or a real number. Examples: 1, 0.485, $-12E-3$
- The source range: Defined with an integer or a real number. Examples: The same as the examples given above.
- The source function: Defined with a character (V or I).

Make the program file a .CSV file by using a separator (choose either a comma or a semicolon) to separate each item. You can also include white space (space or tab characters) before and after each item.

You can omit the source range and source function. If any items are omitted, the same item from the previous step is used. If the source function is not defined in the program's first step, the source function that the GS200 was using when the program file was loaded is used. If the source range is not defined in the program's first step, the source range is set to the most appropriate range for the source level that is defined in the program's first step.

Comments

You can include comments in program files. A comment consists of any text between "//" and a line-feed code or the end of the file. The GS200 ignores comments when it loads program files.

Executing Programs (See section 6.7 for the procedure)

Operations When the Program Trigger Is Set to Norm

You can use the RUN, STEP, and HOLD keys and external triggers to control the program execution. The program interval time specifies the execution interval for each step in the program.

When you press the HOLD or STEP key, the trigger busy (TrigBusy) and source change completion (Ready) signals change as shown in the following example.

Program Setup Example

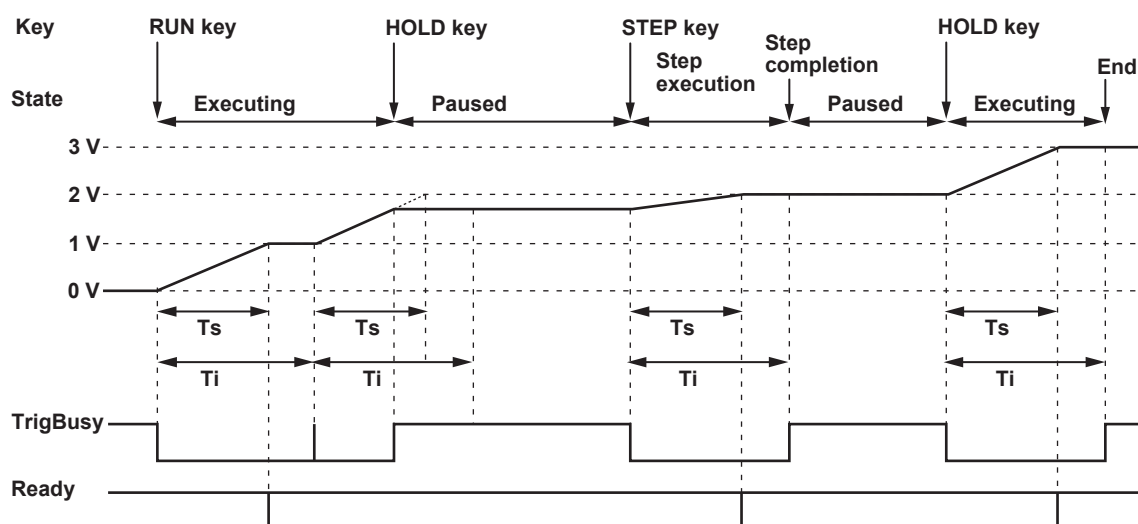
Step 1: 1 V

Step 2: 2 V

Step 3: 3 V

Program Conditions

- Repeat mode is off.
- Program interval time is 5 s.
- Program slope time is 3 s.



Ts: Program slope time
Ti: Program interval time

The low pulse that indicates source change completion (Ready) is generated 10 ms after Ts elapses.

HOLD and STEP

When you press the HOLD key to pause program execution, the paused step is said to be in the “mid-execution” state. If you press the STEP key while the GS200 is in this state, the current step that was in the mid-execution state is re-executed. When this step completes, the GS200 pauses the program again. If, on the other hand, you press the HOLD key while the GS200 is in this state, the GS200 continues program execution from the point that it was paused in the step that was in the mid-execution state.

For example, assume that we have a program that begins at 0 V and ends at 10 V. Each step specifies an increase of 1 V, and a step is executed each second. Now assume that we execute the program and press HOLD when 4 V has been generated for only 0.5 seconds.

• If the STEP Key Is Pressed

The GS200 does not generate 5 V as specified by the next step, but rather generates 4 V for 1 second as specified by the step that was in the mid-execution state, and then pauses execution again. If you press the STEP key once more, 5 V is generated for 1 second, and then the program execution is paused again.

- **If the HOLD Key Is Pressed**

The GS200 generates 4 V for the remaining 0.5 seconds as specified by the step that was in the mid-execution state, generates 5 V for 1 second, and then continues executing the rest of the program.

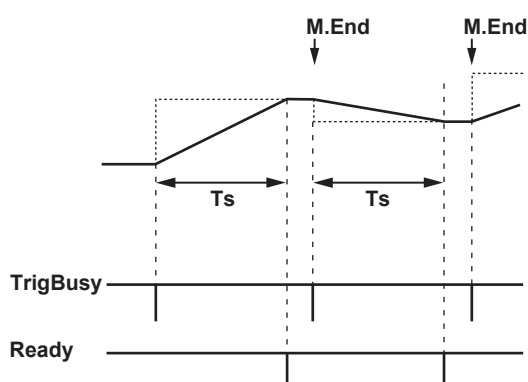
Operations When the Program Trigger Is Set to M.End (/MON option)

When measurement completes, the GS200 proceeds to the next step in the program and changes the source level. If you set the program trigger to measurement end (M.End), and the measurement trigger to source change completion (Ready), the program executes the source and measurement operations of each step in the minimum time required.

The RUN, STEP, and HOLD keys and external triggers are disabled. Additionally, the program interval setting is ignored.

Changes to the Control Signals

The trigger busy (TrigBusy) and source change completion (Ready) signals change as shown in the following example.



T_s : Program slope time

The low pulse that indicates source change completion (Ready) is generated 10 ms after T_s elapses.

2.5 Measurement (Monitoring feature; /MON option)

Measurement Function and Measurement Range

Measurement Function

In voltage source mode, the GS200 measures (monitors) current. In current source mode, the GS200 measures (monitors) voltage.

Measurement Range

When Measuring Voltage

Range	Measurement Range	Resolution
30 V	±31.000 V	1 mV

When Measuring Current

Range	Measurement Range	Resolution
200 mA	±210.00 mA	10 μ A

Measurement ON/OFF (See section 7.1 for the procedure)

Measurement OFF (Off)

Measurement is not performed. Select this mode if you only intend to use the GS200 source features.

Measurement ON (On)

Measurement is performed. The measured value is displayed in the upper-left section of the screen.

Note

When you turn measurements on, noise may be superimposed on the source output depending on the operation of the GS200 internal measurement circuit. To reduce noise in the source output, turn measurements off.

Measurement Operation

Measurement operation refers to a sequence of measurements that is carried out as a result of a measurement trigger. Measurement begins after a measurement trigger is received and the specified measurement delay elapses. For information on triggers, see section 2.6. For information on measurement delay, see the next page.

The overall process of the measurement operation is described in steps 1 to 3 below.

1. Measurement

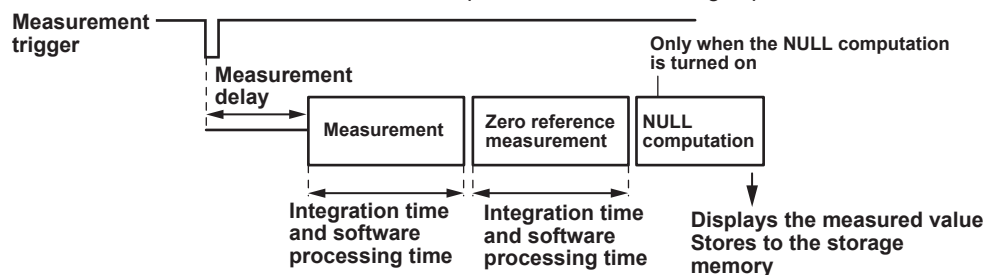
The GS200 performs the target measurement. The time required for measurement is the sum of the integration time and the software processing time.

2. Zero Reference Measurement

The GS200 performs the zero reference measurement. The time required for the zero reference measurement is the sum of the integration time and the software processing time.

3. NULL Computation (See the next page)

The GS200 subtracts the NULL reference value from the measured value and makes the difference the result. If NULL computation is OFF, nothing is performed.



Note

- If you change GS200 settings while measurements are being performed, those measurements are invalid. The measured result display shows “-----,” and you cannot store the results.
- Software processing time is less than 1 ms.

Measurement Delay (See section 7.3 for the procedure)

Measurement delay is the wait time from when a measurement trigger is applied to when the measurement operation is carried out. You can adjust the timing between the measurement trigger and the measurement operation by changing this setting. For example, you can set the time needed for the DUT to stabilize after source change completion to the measurement trigger, so that measurement is performed when the DUT has stabilized.

Highly Accurate Measurement and High-Speed Measurement

Depending on the settings, the following measurement conditions enable you to perform highly accurate measurements or high-speed measurements.

Local Sense and Remote Sense (See section 4.2 for the procedure)

Two wiring systems, 2W (two-terminal connection or local sense) and 4W (four-terminal connection or remote sense) are available (see page 2-9). When the DUT allows a large output current to flow, the voltage drops due to wire resistance. 4W is effective in this kind of situation. In voltage source mode, you can minimize the effect of wire resistance and measure the voltage that is applied to the DUT. In current source mode, you can minimize the effect of wire resistance and measure the voltage that the DUT generates.

Integration Time (See section 7.2 for the procedure)

An integrating A/D converter is used for measurements. If you set a long integration time, the measurement takes longer, but the stability of the measured values increases.

Offset Calibration Feature**Zero Calibration (Manual Zero) Feature (See section 7.7 for the procedure)**

If zero calibration is executed from the GS200's operation menu, output is automatically turned off, the zero reference is measured, and the zero reference is applied to subsequent measured results. The zero point may change due to the passage of time, the GS200 being in an environment where the temperature changes drastically, or due to other factors. By executing zero calibration, the zero point is calibrated, and this enables the GS200 to generate more accurate output.

NULL Computation (See section 7.6 for the procedure)

In NULL computation, the GS200 can display a difference from a given measured value. When you turn NULL computation on, the next measured value is taken to be the NULL value. For subsequent measured values, the measured results are obtained by subtracting this NULL value.

Measured result = measured value – NULL value

Store/Recall (Statistical Computation Value Display)

Storing Measured Results (See section 7.8 for the procedure)

This feature enables you to save the specified number of measured results to storage memory. You can specify a storage count in the range of 1 to 10000. If the storage operation is aborted before the specified storage count is met, the measured results up to that point are stored. If the stored result file generation feature is turned on, the stored results are saved to a result file (Result.csv) in the built-in GS200RAM (see "USB Storage Feature" on page 2-25) when storage completes. If the stored result file generation feature is off, the stored results are not saved to a file. In this case, use the communication feature to read the measured results.

Performing Statistical Computations on Measured Values (Recall; see section 7.9 for the procedure)

The statistical computation results of the most recent measured values in the storage memory can be displayed. The statistical computation parameters are the storage count, maximum value, minimum value, maximum value – minimum value, mean value, and standard deviation.

Total count :	20	Storage count
Maximum :	6.96655E-02	Maximum value
Minimum :	6.79713E-02	Minimum value
Peak-Peak :	1.69429E-03	Maximum – minimum
Mean :	6.85867E-02	Mean value
Standard deviation :	5.97345E-04	Standard deviation

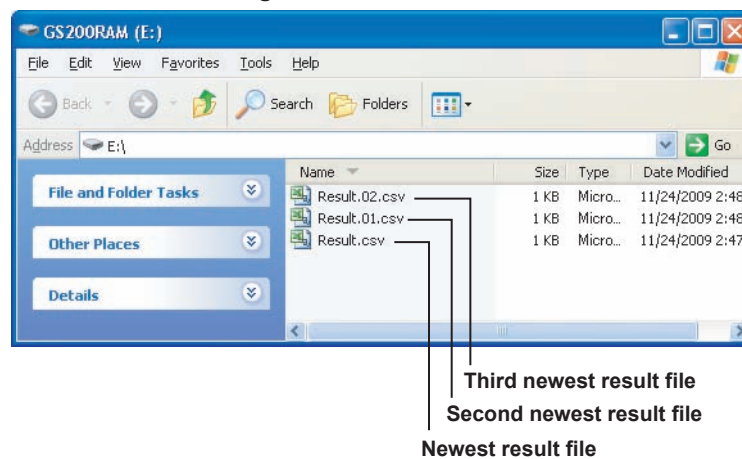
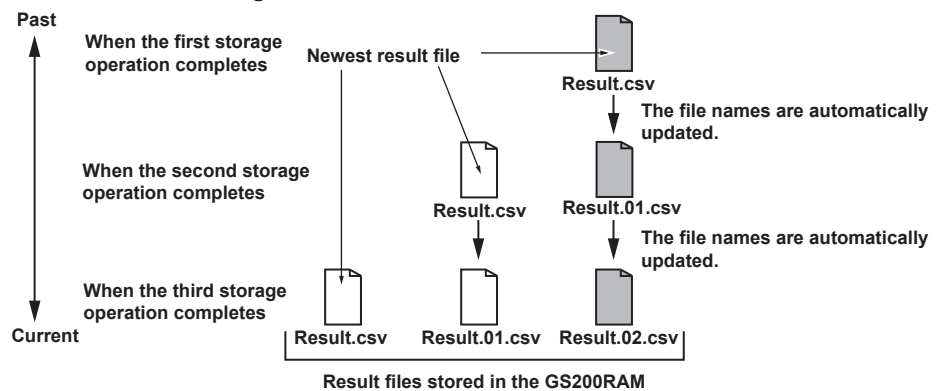
Result File (See section 7.8 for the procedure)

The result file (Result.csv) contains the measured results that have been stored in storage memory. It is generated by the stored result file generation feature and is saved to the internal GS200RAM. Each entry in the result file contains the elapsed time from the start of the first measurement operation (a timestamp), the source function, the measurement function, the source level, and the measured value.

Example of a Result File

	Timestamp	Source function	Measurement function	Source level	Measured value		
	A	B	C	D	E	F	G
1	TM	SF	MF	SL	ML		
2		0 V	I	8.00E-01	0.00E+00		
3		0.1 V	I	8.00E-01	0.00E+00		
4		0.2 V	I	1.00E+00	0.00E+00		
5		0.3 V	I	1.00E-01	0.00E+00		
6		0.4 V	I	2.00E-01	0.00E+00		
7		0.5 V	I	3.00E-01	0.00E+00		
8		0.6 V	I	4.00E-01	0.00E+00		
9		0.7 V	I	5.00E-01	0.00E+00		

The name of the most recent result file is always Result.csv. Up to 33 result files are stored on the GS200RAM. Less files are stored if their size exceeds the memory limit (16 MB). When the storage operation is repeated, the names of existing result files are changed automatically. For example, if two storage operations are completed, the most recent file will be Result.csv, and the previous result file will be changed to Result.01.csv. If the storage operation is repeated further, the name of a result file will be changed as follows: Result.csv, Result.01.csv, Result.02.csv, Result.03.csv, and so on. If the number of result files exceeds 33, the files are deleted in order from the oldest file. However, if deleting the oldest file does not clear sufficient space to make room in the internal GS200RAM for the new result file, multiple result files may be deleted.

GS200RAM Containing Result Files**Result File Numbering****Reading the Storage Result through Communications (See section 7.9 for the procedure)**

You can use the communication feature to read the storage result directly. You can set the format used to read the data to ASCII or binary.

In addition, statistical computation values can also be read using the communication feature.

2.6 Triggering

Overview

The GS200 uses program triggers, which are used to start and pause programs, and measurement triggers, which are used to start measurements.

Program Triggers (See section 6.4 for the procedure)

This trigger is used to drive programs (see section 2.4). On models with the monitoring (/MON) option, you can select the normal (Norm) or measurement end (M.End) trigger source. On models without the monitoring (/MON) option, only the normal (Norm) trigger source is available.

Normal (Norm)

You can use the following four triggers to execute programs.

- **RUN key**
Press this key to begin program execution from step 1. The program proceeds one step each time the program interval time elapses.
- **STEP key**
Press this key to execute only the current step. When the program interval time elapses, program execution stops.
- **HOLD key**
Press this key to pause the program that is running. If you press this key when a program is paused, program execution begins again from the exact point in the step that it was previously paused.
- **External triggers (External)**
The falling edge of a signal applied to TRIG IN of the input terminal for synchronous operation (SYNC IN, see section 8.2) or TRIG IN of the BNC I/O terminal (see section 8.1) on the rear panel is used as a trigger. This trigger performs the same function as the STEP key on the front panel.

Measurement End (M.End; only on models with the /MON option)

When the trigger source is set to measurement end, program execution proceeds from one step to the next as soon as the current step's measurement completes, regardless of the program interval time. You can execute programs at their optimal speed, but program execution always requires the specified integration time (measurement time). However, you have to set the measurement trigger to source change completion (Ready).

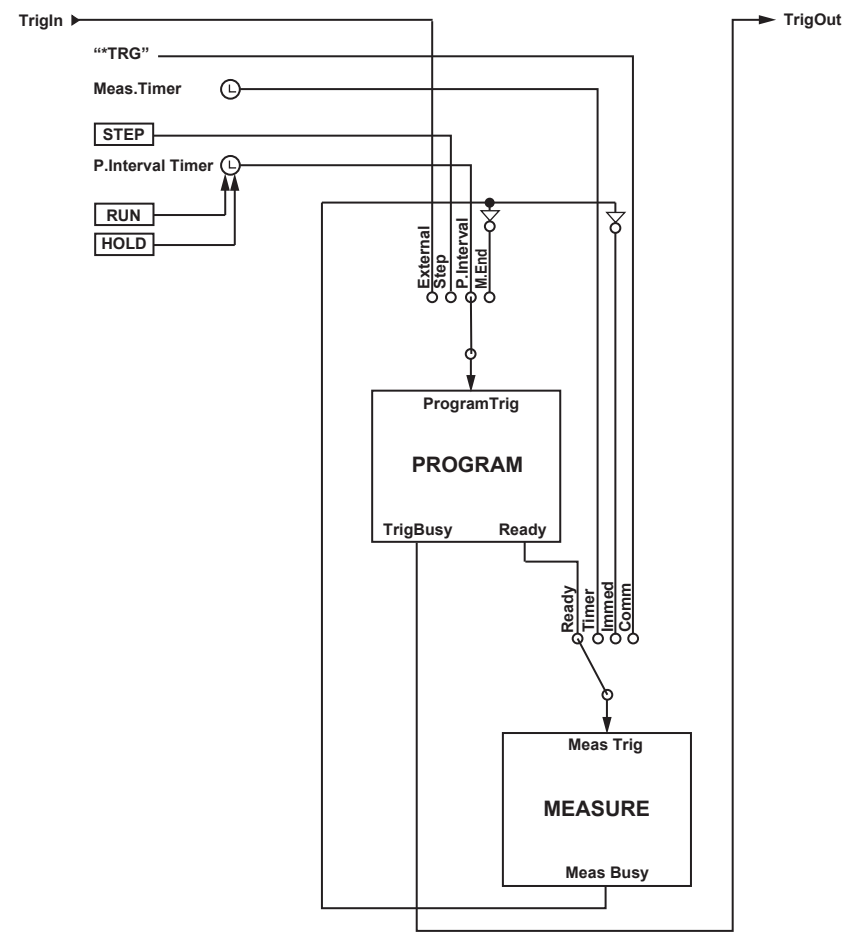
When the program trigger is M.End, the RUN, STEP, and HOLD keys are disabled, and the program interval time is ignored.

Measurement Triggers (/MON option; see section 7.4 for the procedure)

This trigger is used to start a measurement operation (see section 2.5). Select any of the following trigger sources.

- Measurement timer (Timer)
You can set the constant period timer to a period from 0.1 seconds to 3600.0 seconds. The timer is reset when you turn the output on.
- Measurement completion (immediate; Immed)
The end of one measurement triggers the beginning of the next measurement. This is used in situations such as when you need to repeat measurements at high speeds.
- Source change completion (Ready)
This is generated 10 ms after the source level is changed.
- Communication commands (Comm)
You can use the communication command "`*TRG`" to start measurements.

Trigger Block Diagram



Trigger Output (See sections 8.1 and 8.2 for the procedures)

The GS200 can output the program trigger signal from the SYNC OUT terminal (I/O terminals for synchronous operation) or the BNC output terminal to the subsequent GS200s that are connected.

TrigOut

TrigOut transmits the trigger busy signal.

- When program triggers are set to normal (Norm)
When a program trigger is generated, this signal is set to low level. When the program interval time elapses, this signal is set to high level.
- When program triggers are set to measurement end (M.End)
When a program trigger is generated, this signal is set to low level. Regardless of the program interval time, this signal is immediately set back to high level.

Trigger Hold

You can pause program execution by pressing the HOLD key on the front panel or by transmitting the communication command “:PROGrama:HOLD” or “:PROGrama:PAUSE.” To resume program execution, press the HOLD key again, or transmit the communication command “:PROGrama:HOLD” or “:PROGrama:CONTINUE.”

Sampling Error

If one of the following invalid triggers occurs, the sampling error indicator on the front panel illuminates.

- A new measurement trigger occurred while a measurement operation was in progress.
- The RUN or STEP key was pressed or an external trigger signal was received while a program was running.

Note

If sampling errors occur, the trigger generation timing may be too fast. If the sampling error indicator illuminates, check settings such as the selected trigger source and timer period.

2.7 Synchronization

Synchronization

You can connect multiple GS200s and synchronize switching of the output between on and off and their program execution.

External I/O

There are two types of external I/O terminals on the GS200: the I/O terminals for synchronous operation (SYNC In/OUT) and the BNC I/O terminals (IN and OUT).

RJ-11 Connector (I/O terminals for synchronous operation; SYNC IN/OUT; see section 8.2 for the procedure)

By using the I/O terminals for synchronous operation (SYNC IN/OUT) on the rear panel, you can synchronize the operation of multiple connected GS200s. Use synchronous operation cables (758960) that are sold separately to connect the GS200s in a daisy chain. The first unit is connected to the second unit, the second unit is connected to the third unit, and so on. You can synchronize the operation of program triggers and the output state (output on and off).

BNC I/O (IN and OUT; see section 8.1 for the procedure)

You can use the BNC connectors at the top of the rear panel to apply and transmit any of the following signals as external signals. You can use these connectors for synchronous operation and other purposes.

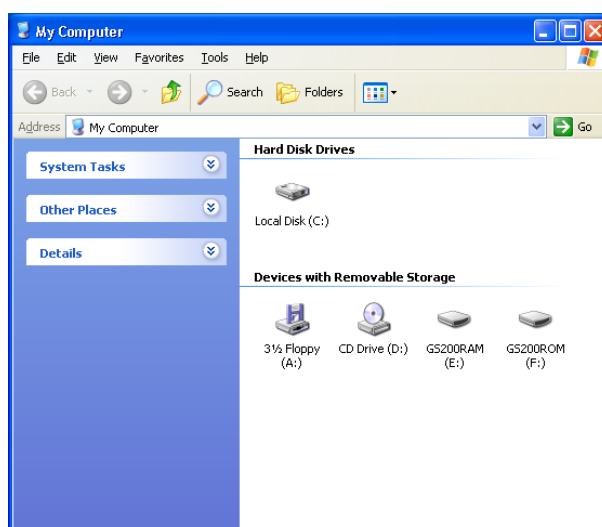
- Output state (output on and off) I/O
- Program trigger I/O
- Source change completion (Ready) output

2.8 Other Features

USB Storage Feature (See section 4.4 for the procedure)

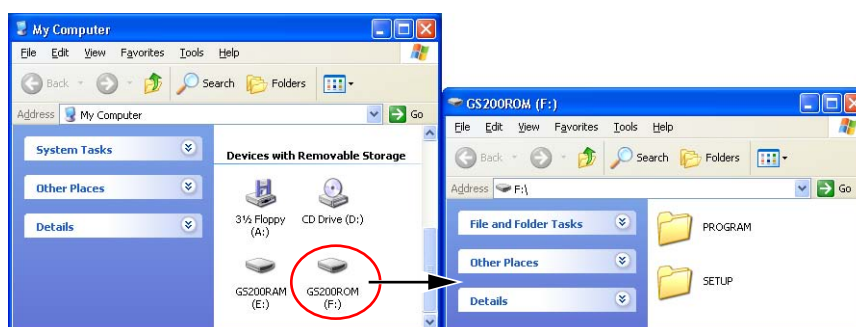
The GS200's internal memory consists of a 4 MB non-volatile disk (GS200ROM) and a 16 MB volatile disk (GS200RAM). If you use a USB cable to connect the GS200 to a PC, you can access these disks from the PC as removable disks. You can store the program files that you have created using a general-purpose spreadsheet application to the GS200ROM non-volatile disk simply by dragging the files from the location they are stored on the PC.

The volatile disk (GS200RAM) stores measured results. If you load the measured result file on your PC, you can use a general-purpose spreadsheet application to edit the data or display the data as graphs. The system file that is used to update the GS200 system is also stored on this disk.



Non-Volatile Disk (GS200ROM)

The GS200ROM is a non-volatile disk. Even if you turn the GS200 off, the contents of this disk are not lost. Two folders are stored on this disk: PROGRAM and SETUP.



PROGRAM

This folder contains all the program output pattern files. All the files in this folder can be used as program files.

When the GS200 is sent from the factory, two sample program files are stored in this folder. These sample program files are also created when you format the disk.

SETUP

This folder contains all the panel setup files. Any of the files in this folder can be selected as a setup file.

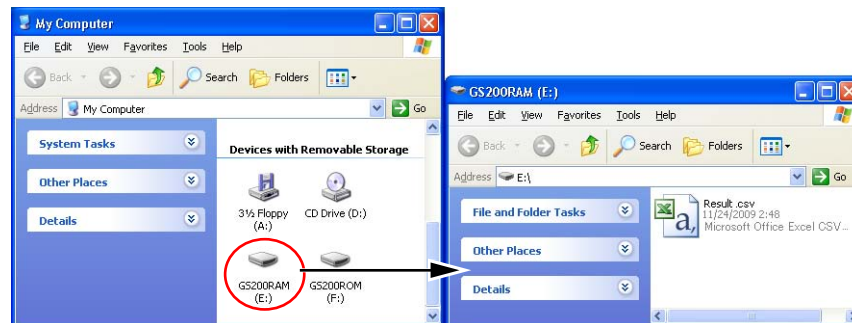
When the GS200 is sent from the factory, a sample setup file is stored in this folder. This sample setup file is also created when you format the disk.

Volatile Disk (GS200RAM)

The GS200RAM is a volatile disk. When you turn the GS200 on, this disk is automatically formatted. During storage, the result file (Result.csv) is created on this disk.

This disk is normally used to transfer files that the GS200 generates to your PC.

However, a system file is transferred from your PC to this disk when you update the system firmware. For details, see section 14.5, “Updating the System Firmware.”



Note

You can create files and folders on the GS200RAM, but be sure that the disk does not become full. The data on this disk is lost when the GS200 is turned off.

Formatting the Disk

You can format the disk if you want to reset the GS200ROM to the factory default conditions, if the non-volatile or volatile disk cannot be detected by your PC, or if you believe the data on the disk is corrupt.

USB Communication (USB-TMC command control; see chapter 10 for the procedures)

The GS200 has a USB2.0 device interface. This interface allows access to the USB storage feature as well as allows command control from a VISA (Virtual Instrument Software Architecture) library using a VISA USB-TMC device driver as defined by the VXI Plug&Play System Alliance.

Ethernet Communications (/C10 option; see chapter 11 for the procedures)

The GS200 has a LAN interface with auto switching between 10 Mbps and 100 Mbps. You can assign a static IP address or obtain an address dynamically from a DHCP server. The following four features are available.

Command Control Using VXI-11

The GS200 has an Ethernet VXI-11 device driver. This allows command control from a VISA library.

Panel Control Using a Browser (see section 11.5 for the procedure)

The GS200 has a Web server feature. This allows you to display the front panel image of the GS200 on a PC's Web browser and remotely control the GS200 from the Web browser.

File Transfer with FTP Clients

Up to five clients can establish FTP connections by way of the anonymous FTP server function. The non-volatile disk (GS200ROM) and volatile disk (GS200RAM) can be handled as a PC file server. Files such as program files can be transferred, and measured result data can be loaded onto a PC through the use of the FTP protocol. For information on the GS200ROM and GS200RAM, see "USB Storage Feature," on page 2-25.

Command Control Using Port 7655

The GS200 has a command mnemonic stream parsing server that can connect up to five clients. The terminator (CR, LF, or CR+LF) can be specified.

Because each server feature is independent, you can for example, control the GS200 using commands while it is transferring files using FTP.

GP-IB Communications (See chapter 12 for the procedures)

The GS200 has an interface that is used to control the GS200 using commands. You can specify the same settings as you would using the front panel keys of the GS200 and output setup data and measured data. Because the command control of the GS200 is mutually independent, other communication features can be used while you are using GP-IB to control the GS200.

Saving, Loading, and Deleting Setup Data (See section 9.2 for the procedure)

The current settings can be saved to a setup file (Setup01.txt to Setup04.txt) on the non-volatile disk (GS200ROM). The saved setup data can be loaded to restore the settings. The setup file is a text file that contains communication commands. This file can be edited later on your PC.

For information on the GS200ROM and GS200RAM, see "USB Storage Feature," on page 2-25.

Selecting the Settings Applied at Power-On (See section 9.3 for the procedure)

The GS200 settings at power-on can be changed from the default settings to the settings selected by the user.

If the selected file is deleted or renamed, the GS200 will start with its default settings.

3.1 Handling Precautions

Read the Safety Precautions

Safety Precautions

If you are using the GS200 for the first time, make sure to read “Safety Precautions,” on pages v and vi.

Do Not Remove the Case

Do not remove the case from the instrument. Some sections inside the instrument have high voltages that 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. If these symptoms occur, contact your nearest YOKOGAWA dealer.

Correct the Problem If Output Is Forcibly Turned Off

If the GS200 detects an internal circuit error due to an excessive external input or electrical oscillation, the output is forcibly turned off, the ERROR indicator illuminates, and the error message “An abnormal load is connected” is displayed. If this happens, remove the cause of the problem, such as the external load, and turn the output on again. If the output still turns off after you have corrected the problem, the GS200 may be malfunctioning. Contact your nearest YOKOGAWA dealer. Note that even if the GS200 is returned to normal, the error display remains until you manually clear it (see section 9.6, “Error Log Display”) or use communication commands to read the error information.

Turn the Power Switch Off If Overheat is Detected

If the GS200 detects an overheat condition such as when the inlet or vent holes for the cooling fan are obstructed or the fan is stopped, the GS200 forcibly turns the output off, displays an “Abnormal Temperature” warning, and produces intermittent beeps. If this happens, immediately turn the power switch off. Check that there is adequate space around the GS200, and check for and remove any foreign objects that are caught in the cooling fan on the rear panel. If the same warning appears when you turn the power switch on after waiting a sufficient amount of time, the GS200 may be malfunctioning. Contact your nearest YOKOGAWA dealer.

Handle the Power Cord with Care

Nothing should be placed on top of the power cord. The power cord should also be kept away from any heat sources. When unplugging the power cord from the outlet, never pull by the cord itself. Be sure to hold and pull by the plug. If the power cord is damaged, purchase a replacement with the same part number as the one indicated on page iii.

General Handling Precautions

Do Not Place Objects on Top of the Instrument

Never place objects such as those that contain water on top of the instrument. Doing so may damage the instrument.

Do Not Apply Shock or Vibration

Do not apply shock or vibration. Doing so may damage the instrument. In addition, applying shock to the input/output terminal or the connected cables can cause electrical noise to enter or be generated from the instrument.

Keep Electrically Charged Objects Away from the Instrument

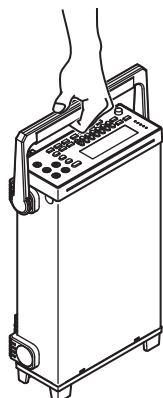
Keep electrically charged objects away from the input and output connectors. They may damage the internal circuitry.

During Extended Periods of Non-Use

Turn off the power switch, and remove the power cord from the outlet.

When Carrying the Instrument

First, remove the power cord and connection cables. The instrument weighs approximately 5 kg. To carry the instrument, use the handle as shown in the figure below, and move the instrument carefully.



When Cleaning the Instrument

When cleaning the case or the operation panel, turn off the power switch, and remove the power cord from the outlet. Then, wipe the instrument lightly with a clean dry cloth. Do not use volatile chemicals such as benzene or thinner for cleaning, as they may lead to discoloration or deformation.

3.2 Installation

Installation Orientation



WARNING

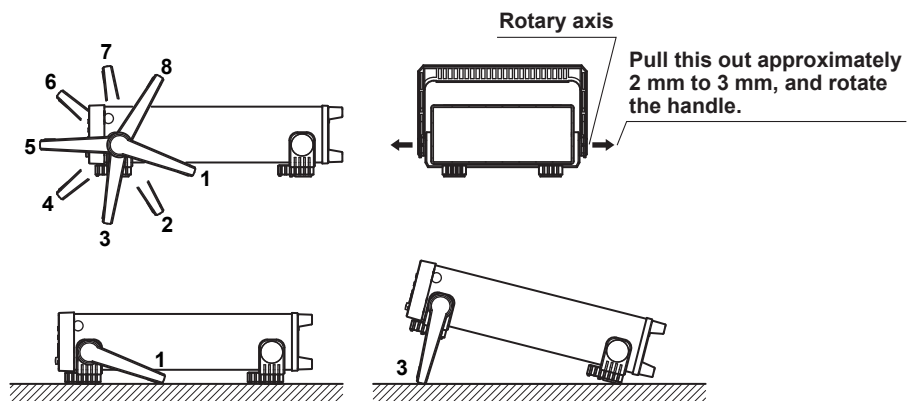
- To prevent fire, never use the instrument with the rear panel facing down. There are vent holes for the cooling fan on the rear panel. Placing the instrument with the rear panel facing down may cause a fire when the instrument malfunctions.
- This instrument is designed to be used indoors. Do not install or use it outdoors.
- Install the instrument so that you can immediately remove the power cord if an abnormal or dangerous condition occurs.

CAUTION

If you block the inlet or outlet holes on the GS200, the GS200 will become hot and may break down.

- Place the instrument in a horizontal position as shown in the left section of the figure below or in an inclined position using the handle as shown in the center section of the figure below.
- To use the handle as a stand to tilt the instrument, first check that the handle is fixed in place, and then position the instrument. To rotate the handle, first pull the handle's rotary axis out approximately 2 mm to 3 mm on both the left and right sides of the instrument, and then rotate it to one of its stop positions.

Handle Stop Positions (We recommend that you use positions 1, 3, 5, and 8. Do not place a heavy load on the GS200 when the handle is in stop position 2 or 4.)



WARNING

- When adjusting the handle, be careful not to injure your hand with the edges of the handle.
- When you put away the handle, be careful not to get your hand caught between the handle or movable legs and the instrument.

3.2 Installation

- Handling the handle without firmly supporting the instrument can be dangerous. Please take the following precautions.
- Only handle the handle when the instrument is on a stable surface.
- Do not handle the handle when the instrument is tilted.
- Do not place the instrument in any position other than those shown in the above figures.

Installation Location

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

Ambient Temperature and Humidity

Use the instrument in the following environment.

- Ambient temperature: 5°C to 40°C
However, when you want to generate output with high accuracy, operate the instrument in the 23 °C ± 5°C temperature range.
- Ambient humidity: 20% RH to 80% RH
No condensation should be present.

Note

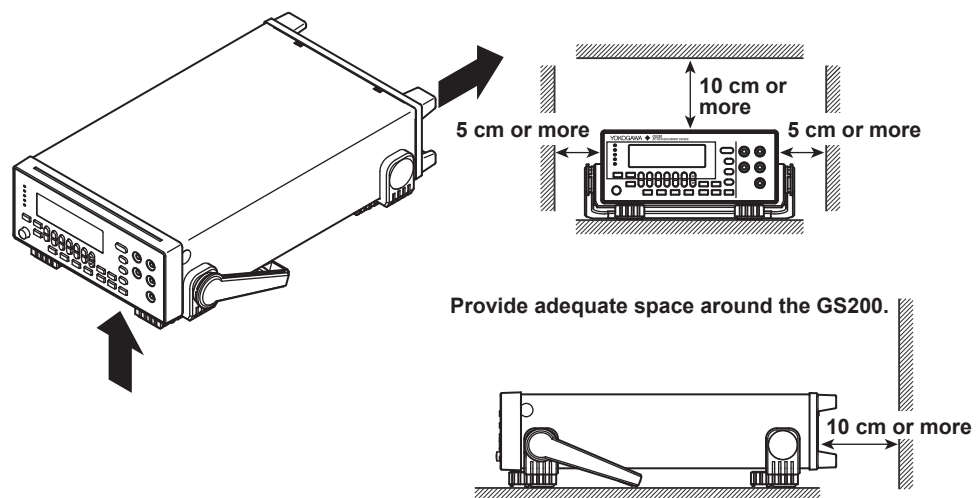
Condensation may form when moving the GS200 from a low temperature or humidity environment to a high temperature or humidity environment, or when there is a sudden change in temperature. In these kinds of circumstances, wait for at least an hour before using the GS200, to acclimate it to the surrounding environment.

Flat and Even Location

Place the instrument on a flat, even surface. Do not place the instrument on an unstable or sloped surface.

Well-Ventilated Location

There are inlet holes on the bottom side of the instrument. In addition, there are vent holes for the cooling fan on the rear panel. To prevent internal overheating, allow for enough space around the instrument (see the figure below), and do not block the inlet and vent holes.



Do Not Install the Instrument in the Following Places

- Outdoors
- In direct sunlight or near sources of heat
- Where the instrument is exposed to water or other liquids
- Where an excessive amount of soot, steam, dust, or corrosive gas is present
- Near sources of strong magnetic fields
- Near high-voltage equipment or power lines
- In an environment that is subject to large levels of mechanical vibration
- On an unstable surface

Storage Location

When storing the instrument, avoid the following places.

- Where the relative humidity is 80% or higher
- In direct sunlight
- Where the temperature is 60°C or higher
- Near a strong source of heat or moisture
- Where the level of mechanical vibration is high
- Where there are corrosive or explosive gasses
- Where an excessive amount of soot, dust, salt, or iron is present
- Where water, oil, or chemicals may splash

We recommend that the instrument be stored in an environment where the temperature is between 5°C and 40°C and the relative humidity is between 20% RH and 80% RH.

Rack Mount

To mount the instrument in a rack, use the separately sold rack mount kit. For the procedure to rack mount the GS200, see the instructions that are included with the rack mount kit.

Name	Model	Note
Rack mount kit	751533-E2	For EIA single mount
Rack mount kit	751534-E2	For EIA dual mount
Rack mount kit	751533-J2	For JIS single mount
Rack mount kit	751534-J2	For JIS dual mount

3.3 Connecting the Power Supply

Before Connecting the Power Supply

To prevent electric shock and damage to the instrument, follow the warnings below.



WARNING

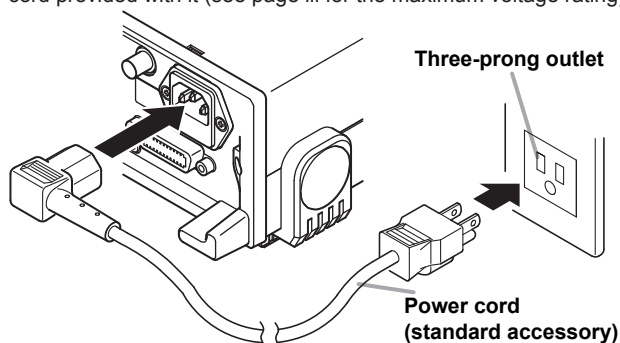
- Before connecting the power cord, ensure that the source voltage matches the rated supply voltage of the instrument and that it is within the maximum rated voltage of the provided power cord.
- Connect the power cord after checking that the power switch of the instrument is turned OFF.
- To prevent electric shock or fire, be sure to use the power cord for the instrument that is supplied by YOKOGAWA.
- Make sure to connect protective earth grounding to prevent electric shock. Connect the power cord to a three-prong power outlet with a protective earth terminal.
- Do not use an extension cord without protective earth ground. The protective features of the instrument will be rendered ineffective.
- Use an AC outlet that complies with the power cord provided and securely connect the protective grounding. If such an AC outlet is unavailable and protective grounding cannot be furnished, do not use the instrument.

Connecting the Power Cord

1. Check that the instrument's power switch is off.
2. Connect the instrument's power cord to the power inlet on the rear panel.
3. Connect the other end of the cord to an outlet that meets the conditions below. The AC outlet must be of a three-prong type with a protective earth ground terminal.

Item	Specifications		
Suffix Code	-1	-4	-7
Rated power supply voltage	100 VAC	120 VAC	230 VAC
Permitted power supply voltage range	90 VAC to 110 VAC	108 VAC to 132 VAC	207 VAC to 253 VAC
Rated power supply frequency	50/60 Hz		
Permitted power supply frequency range	48 Hz to 63 Hz		
Maximum power consumption	Approx. 80 VA		

* The supply voltage that the GS200 can use differs depending on its suffix code. Before you use the instrument, check that the voltage supplied to it is less than or equal to the maximum rated voltage of the power cord provided with it (see page iii for the maximum voltage rating).



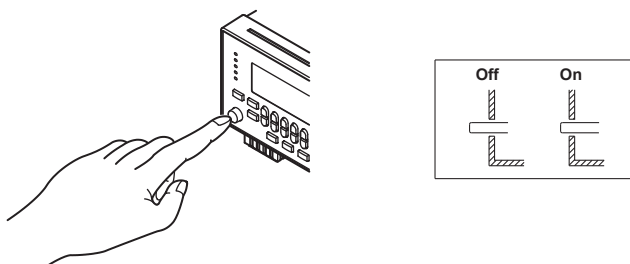
3.4 Turning the Power Switch On and Off

Before Turning On the Power, Check That:

- The instrument is installed properly (see section 3.2, "Installation").
- The power cord is connected properly (see section 3.3, "Connecting the Power Supply").

Location of the Power Switch and On/Off Operation

The power switch is located in the lower left of the front panel. The power switch is a push button. Press the button once to turn the instrument on, and press it again to turn the instrument off.



Operations Performed When the Power Is Turned On

When the power switch is turned on, the GS200 logo appears on the screen, and a self-test starts automatically. If the test completes successfully, the GS200 is configured according to the setup file selected in section 9.3, "Selecting the Settings Applied at Power-On." Check that the GS200 has started normally before you use it.

Note

- Wait at least 5 seconds after you turn the GS200 off before you turn it back on.

When the Power-on Operation Does Not Finish Normally

Turn off the power switch, and check the following items.

- The power cord is securely connected.
- The voltage supplied from the power outlet is correct (see section 3.3).
- You can initialize the settings of the GS210 (see section 9.1).

If, after checking these items, the GS200 still fails to start when you turn the power switch on, it may be malfunctioning. Contact your nearest YOKOGAWA dealer for repairs.

To Generate Accurate Output and Make Accurate Measurements

With the GS200 installed in a location that complies with the guidelines given in section 3.2, allow the instrument to warm up for at least 60 minutes after the power switch is turned on.

Turn the output off during warm-up. After the warm-up time elapses, turn the output on.

Operations Performed When the Power Is Turned Off

The setup data and measured results immediately before the power switch is turned off are not retained. The same is true when the power cord is disconnected from the outlet. We recommend that you save important setup data to the SETUP folder on the non-volatile disk (GS200ROM). See sections 2.8, "USB Storage Feature" and 9.2.

Note

- If you turn the power off while output is on, the GS200 may produce a momentary beeping sound, but this sound does not indicate an error.

3.5 Wiring Precautions



WARNING

- Be sure to turn the GS200 output off before you connect the device that you are generating output for.
- Do not connect a voltage source in voltage source mode or a current source in current source mode. An incorrect connection may damage the GS200.
- Do not connect a load that exceeds ± 32 V or ± 200 mA across the OUTPUT Hi and OUTPUT Lo terminals or across the SENSE Hi and SENSE Lo terminals.
- The maximum allowable voltage between the case and each terminal is ± 250 Vpeak. Applying a voltage that exceeds this value may damage the GS200.
- Keep the voltage that is generated across OUTPUT Hi and SENSE Hi and across OUTPUT Lo and SENSE Lo to less than or equal to ± 0.5 Vpeak.
- When making a four-terminal connection, be careful that the connection to the SENSE terminals does not get cut. If the voltage is not sensed correctly, abnormal voltage may be generated across the OUTPUT Hi and OUTPUT Lo terminals.
- When making a two-terminal connection, use the OUTPUT terminals. If the SENSE terminals are used, the current flows through the SENSE line. This prohibits the GS200 from generating correct output and can damage the GS200.



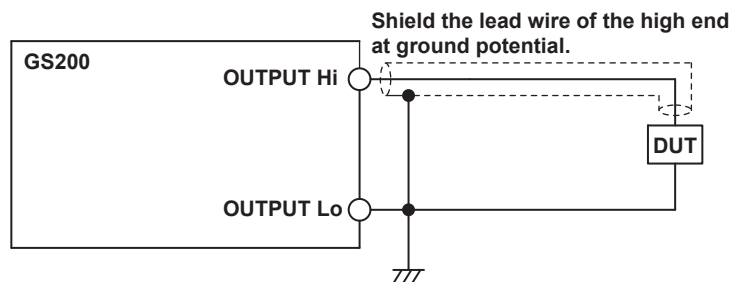
CAUTION

- Use conducting wires that have adequate margins of withstand voltage and current capacity with respect to the voltage or current to be used.
- To prevent oscillations due to stray capacitance and lead inductance, use twisted-pair lead wires to connect to the OUTPUT Hi and OUTPUT Lo terminals. Likewise, use twisted-pair lead wires to connect to the SENSE Hi and SENSE Lo terminals. In particular, wire the lead wires short in the case of a high-capacity load in a four-terminal connection in voltage source mode.

Note

Susceptibility to the effects of noise increases when sourcing or measuring minute currents. Take measures such as using shielded wires. Grounding shielded wires is an effective measure to reduce the effect of noise.

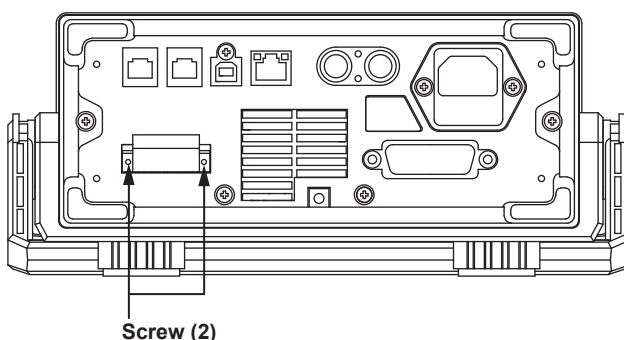
Measure against noise when handling minute currents



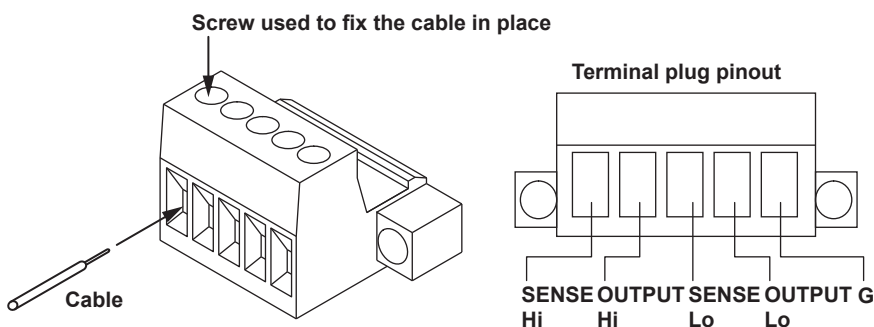
3.6 Wiring the GS211 Rear Panel Terminal Plug

Follow the procedure below to wire the rear panel terminal plug on a GS211, which has rear panel output terminals. To prevent electric shock and damage to the instrument, follow the warnings given in section 3.5, "Wiring Precautions."

1. Unscrew the screws on the left and right of the terminal plug, and remove the terminal plug from the GS211.



2. Loosen the screws on the top of the terminal plug (these screws are used to fix cables in place), and insert stripped cables into the holes.



- Length of stripped cable: 7 mm
- Rated connecting capacity

Single wire:	0.2 mm ² to 2.5 mm ²
Twisted wire:	0.2 mm ² to 2.5 mm ²
AWG:	24 to 12

3. Tighten the screws to fix the cables in place (screw tightening torque: 0.5 N•m to 0.6 N•m).
4. Tighten the screws on the left and right of the terminal plug to attach it to the GS211 (screw tightening torque: 0.2 N•m to 0.3 N•m).

3.7 Setting the Date, Time, and the Time Difference from GMT (Greenwich Mean Time)

Procedure

1. Press **UTILITY** to display the following menu.

Remot	BNC	Wire	Guard	Sys	Sys	Error
I/F	I/O	2W 4W	On Off	Config	Info	Log

2. Press the **Sys Config** soft key to display the following menu.

Display	Beep	Adjust	CSV	Test	Format	Update
4	On Off	Time	Format		Disk	Sys

3. Press the **Adjust Time** soft key.

		Clock	Time			
			Zone			

Setting the Date and Time

4. Press the **Clock** soft key to display the date/time setup screen.

M:-	0.00mA	L:200mA	Steps:
			Time:
2009/10/07 13:50:43			
		Edit	Adjust Zero

5. Press the **Edit** soft key.

M:-	0.00mA	L:200mA	Steps:
			Time:
2009/10/07 13:50:49			
Year	Month	Day	Hour Minute Second Set

6. Press a soft key from **Year** to **Second** that corresponds to the setting that you want to set.
7. In up/down key mode, press the Δ and ∇ keys to set the date and time. In keypad mode, press **NUM LOCK + Δ** or **∇** to set the date and time (see section 4.1).
8. Press the **Set** soft key to set the value.

Synchronizing the Clock

9. Press the **Adjust Zero** soft key to synchronize the clock by resetting the seconds to zero.

If the seconds value is greater than or equal to 30 seconds, the minutes value increases by 1 minute, and the seconds value is set to 0.

		Edit			Adjust Zero
--	--	------	--	--	-------------

3.7 Setting the Date, Time, and the Time Difference from GMT (Greenwich Mean Time)

Setting the Time Difference from GMT (Greenwich Mean Time)

4. Press the **Time Zone** soft key.

M:- 0.00mA L:200mA Steps:
Time:
+09:00
| | | | Edit | | |

5. Press the **Edit** soft key.

M:- 0.00mA L:200mA Steps:
Time:
+09:00
| | | | Hour | Minute | | Set |

6. Press the **Hour** or **Minute** soft key to set the corresponding setting.
7. In up/down key mode, press the Δ and ∇ keys to set the date and time. In keypad mode, press **NUM LOCK** + Δ or ∇ to set the date and time.
8. Press the **Set** soft key to set the value.

Explanation

Setting the Date and Time

- Date (Year/Month/Day)
The year is displayed according to the Gregorian calendar.
- Time (Hour/Minute/Second)
The hour can be set to a value from 0 to 23.

Note

- The date and time settings are backed up with the internal lithium battery when the power is turned off.
- The instrument has leap-year information.

Setting the Time Difference from GMT (Greenwich Mean Time)

Set the time difference in the range of -12 hours 00 minutes to 13 hours 00 minutes. For example, Japan standard time is ahead of GMT by 9 hours. In this case, set Hour to 9 and Minute to 00.

Checking the Standard Time

Using one of the methods below, check the standard time of the region where you are using the GS200.

- Check the date and time setting on your PC.
- Check the website at the following URL: <http://www.worldtimeserver.com/>

Note

The GS200 does not support Daylight Saving Time. To set the time to Daylight Saving Time, reset the time difference from Greenwich Mean Time.

<<Corresponding Command Mnemonic>>

```
:SYSTem:CLOCK:DATE <character string>
:SYSTem:CLOCK:TIME <character string>
:SYSTem:CLOCK:TZONE <character string>
:SYSTem:CLOCK:ADJust
```

4.1 Basic Key Operations and How to Enter Values

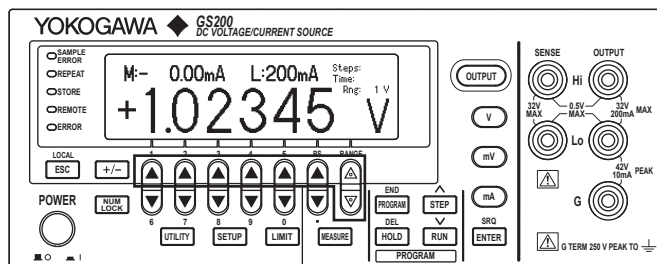
Basic Key Operations

Setting Keys

Press a setting key such as **UTILITY** or **MEASURE** to display a soft key menu at the bottom of the screen.

Soft Keys

Press a soft key to make a choice on the soft key menu or to execute an operation.



Soft keys

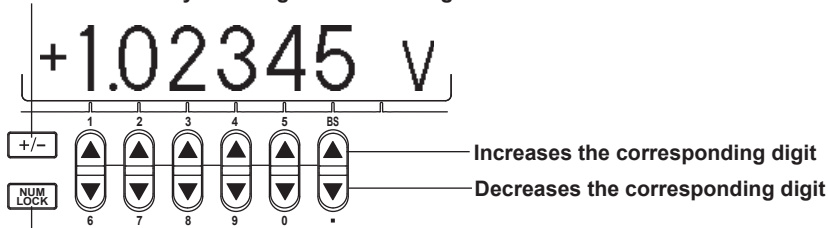
How to Enter Values

There are two modes for entering values: up/down key mode and keypad mode.

Entering Values in Up/Down Key Mode

1. Press the Δ and ∇ keys below each digit that is shown on the display to enter the value.

Press the +/- key to change the value's sign.

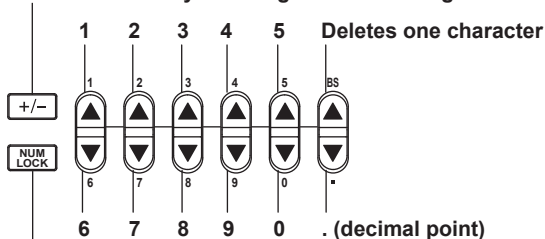


The NUM LOCK key is off in up/down key mode.

Entering Values in Keypad Mode

1. Press **NUM LOCK**. The NUM LOCK key illuminates.
2. Press the Δ and ∇ keys below the display to enter numbers 0 to 9 and the period.

Press the +/- key to change the value's sign.

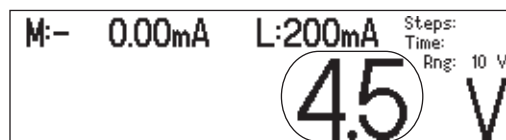


The NUM LOCK key illuminates in keypad mode.

4.1 Basic Key Operations and How to Enter Values

In keypad mode, the value that you are entering blinks.

Example: Entering “4.5”

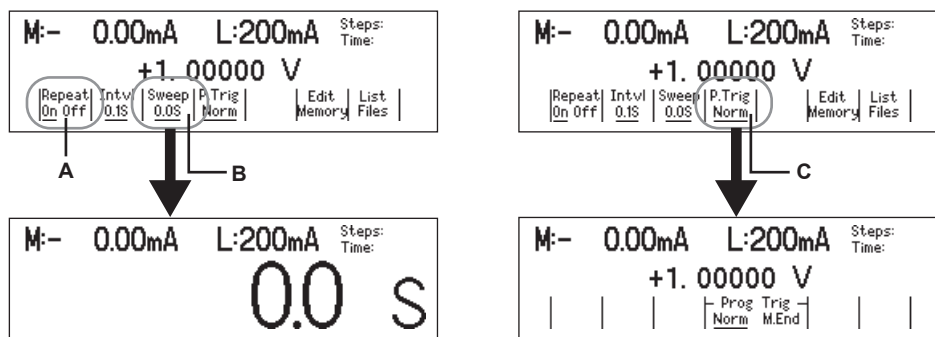


This part of the display blinks.

3. Press **ENTER** to enter the value that you have specified.

How to Operate Setup Menus

1. Press a key to display a corresponding setup menu.
2. Press a soft key corresponding to an item.



- A: The selected setting switches each time you press the soft key. The currently selected setting is underlined.
- B: A numeric setting screen appears when you press the soft key. Enter the value in up/down key mode or keypad mode.
- C: A selection menu appears when you press the soft key. Press the soft key that corresponds to the selection you want to make.

How to Clear Setup Menus

Press **ESC (LOCAL)** to clear the setup menu. If the menu that is shown is under multiple menu levels, press **ESC (LOCAL)** to move up a level in the menu hierarchy.

Note

Procedures in this manual do not include steps for clearing the setup menu.

4.2 Selecting the Wiring System (Remote Sense or Local Sense)

Procedure

1. Press **UTILITY** to display the following menu.

Remot I/F	BNC I/O	Wire 2W 4W	Guard On Off	Sys Config	Sys Info	Error Log
--------------	------------	---------------	-----------------	---------------	-------------	--------------

2. Press the **Wire** soft key to select 4W or 2W.

Explanation

There are two methods for connecting the GS200: 2W and 4W.

2W: Two-terminal connection (local sense)

4W: Four-terminal connection (remote sense)

The connection diagrams are given on the next page.

Note

The four-terminal connection does not function for the 10 mV and 100 mV ranges in voltage source mode. You must use the two-terminal connection instead.



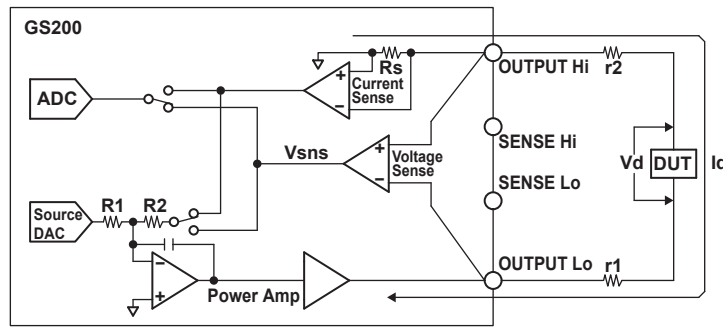
WARNING

- When making a four-terminal connection, be careful that the connection to the SENSE terminals does not get cut. If the voltage is not sensed correctly, abnormal voltage may appear across the OUTPUT Hi and OUTPUT Lo terminals.
- When making a two-terminal connection, use the OUTPUT terminals. If the SENSE terminals are used, the GS200 will be prohibited from generating the correct output, and it may be damaged.

When the GS200 is measuring voltage in current source mode and the current becomes large, the voltage drop in the lead wire can no longer be ignored. In such a case, you can measure the voltage with reduced effects of the lead wire resistance by selecting the four-terminal connection (4W) and connecting the SENSE terminals near the DUT. The effects of the lead wires also appear in voltage source mode. In this case as well, using the four-terminal connection (4W) enables the GS200 to apply the specified voltage to the DUT with reduced effects of the lead wire resistance.

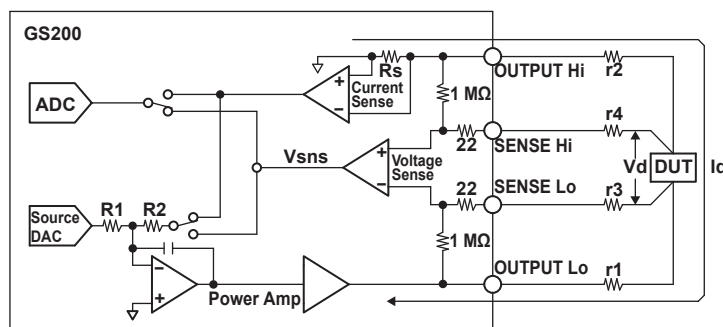
4.2 Selecting the Wiring System (Remote Sense or Local Sense)

Two-terminal connection



A difference of $I_d \times (r_1 + r_2)$ appears across V_d and V_{sns} . This difference cannot be ignored if I_d is large even if r_1 and r_2 are small.

Four-terminal connection



A difference of $I_d \times \left\{ \frac{r_1 \cdot (r_3 + 22 \Omega)}{1 \text{ M}\Omega + r_3 + 22 \Omega + r_1} + \frac{r_2 \cdot (r_4 + 22 \Omega)}{1 \text{ M}\Omega + r_4 + 22 \Omega + r_2} \right\}$ appears across V_d and V_{sns} , but this difference can be ignored if r_1 to r_4 are small.

r1 to r4: Lead wire resistance

Id: Current flowing through the DUT

Vd: Voltage applied to the DUT

Vsns: Voltage sensed by the GS200

(= voltage source level and measured current value)

Note

- If 4W (four-terminal connection) is used, the source voltage across the OUTPUT Hi and OUTPUT Lo terminals will be larger than the voltage generated on the load. If the voltage across the OUTPUT-SENSE terminals exceeds 0.5 V, the GS200 will not be able to generate the voltage correctly, and abnormal load detection may be activated and cause the output to turn off. Be sure that the voltage across the OUTPUT-SENSE terminals does not exceed 0.5 V.
- The four-terminal connection does not function for the 10 mV and 100 mV ranges in voltage source mode. You must use the two-terminal connection instead. Because the output resistance is approximately 2 Ω for these voltage ranges, they are not suitable when the GS200 is connected to a load that allows current to flow (a low-impedance load). Connect a high-impedance load, a load that is sufficiently larger than the output resistance.
- To prevent oscillations due to stray capacitance and lead inductance, use twisted-pair lead wires to connect to the OUTPUT Hi and OUTPUT Lo terminals. Likewise, use twisted-pair lead wires to connect to the SENSE Hi and SENSE Lo terminals. In particular, wire the lead wires short in the case of a high-capacity load in a four-terminal connection in voltage source mode.

<<Corresponding Command Mnemonic>>

:SENSe:REMOte 1|0|ON|OFF

4.3 Setting the Guard Terminal

Procedure

1. Press **UTILITY** to display the following menu.

Remot	BNC	Wire	Guard	Sys	Sys	Error
I/F	I/O	2W 4W	On Off	Config	Info	Log

2. Press the **Guard** soft key to select On or Off.

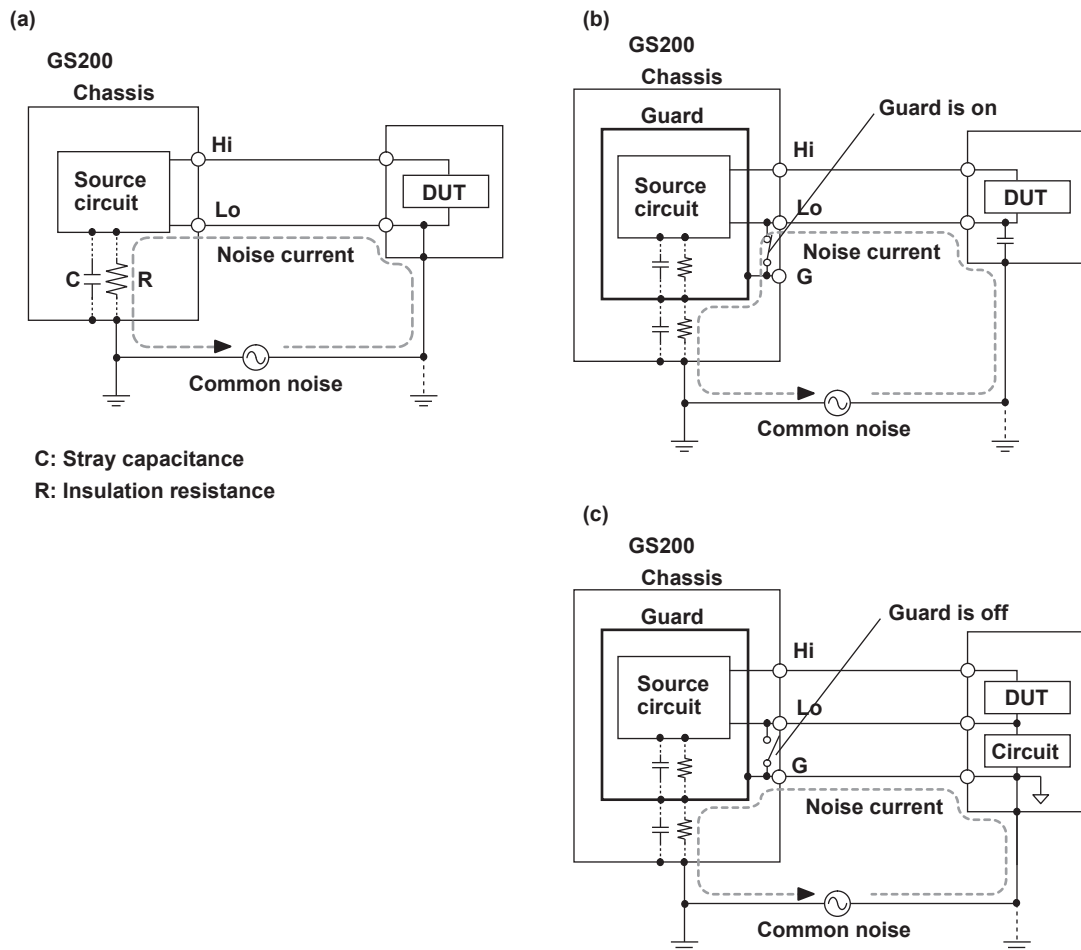
4.3 Setting the Guard Terminal

Explanation

If common mode noise is superimposed on the signal passing through the GS200's output terminals, the noise current enters the internal source circuit from the output terminals and changes the generated signal, as shown in figure (a).

To reduce this effect, a guard is furnished on the GS200's source circuit and is connected to the guard terminal, as shown in figure (b). If you connect the noise source to the guard terminal, the noise current passes through the guard and is grounded, bypassing the internal source circuit. In this way, you can reduce the amount of noise that enters the circuit from the connected power source.

When the GS200 is connected to the DUT (it is directly connected to the noise source), you can reduce the effect of common mode noise by turning the guard feature on. When you do so, the connection becomes like the connection shown in figure (b). When the GS200 is not connected to the DUT, as shown in figure (c), you can reduce the effect of common mode noise by turning the guard feature off and directly connecting the DUT's ground (noise source) to the guard terminal.



<<Corresponding Command Mnemonic>>

:SENSe:GUARd 1|0|ON|OFF

4.4 USB Storage Feature

Procedure

Setting the USB Storage Feature

1. Press **UTILITY** to display the following menu.

Remot I/F	BNC I/O	Wire 2W 4W	Guard On Off	Sys Config	Sys Info	Error Log
--------------	------------	---------------	-----------------	---------------	-------------	--------------

2. Press the **Remot I/F** soft key to display the following menu.

GPIB	USB Storag	LAN			VISA Info
------	---------------	-----	--	--	--------------

3. Press the **USB** soft key to display the following menu.

	USB Mode Storag TMC			
--	------------------------	--	--	--

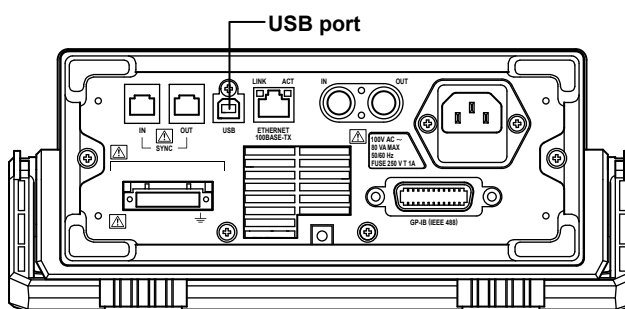
4. Press the **Storag** soft key.

Connection Cable

Use a USB cable that has a type B connector (receptacle).

How to Connect the USB Cable

1. Connect a USB cable to the USB port on the GS200 rear panel.

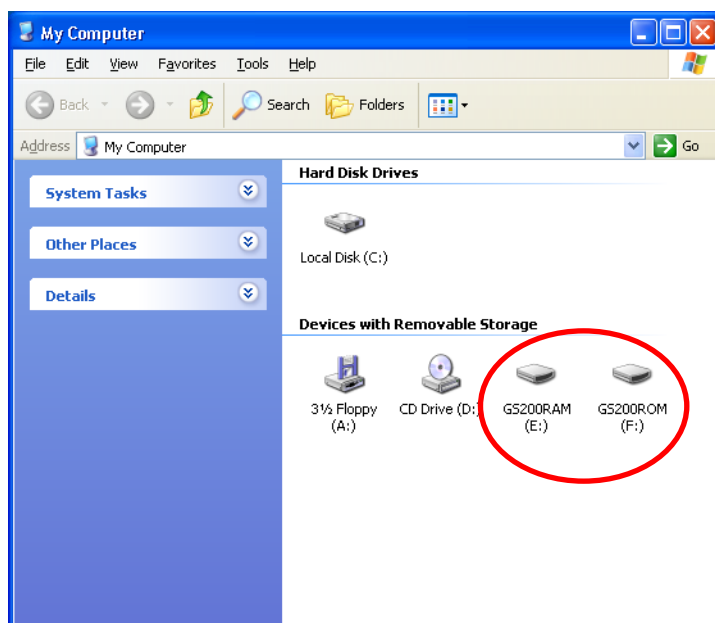


2. Connect the other end of the cable to the USB port on your PC.

Note

- Be sure to insert the USB cable connectors firmly into the USB ports.
- Only insert the USB cable into the USB port. Inserting a USB cable into other I/O terminals may damage the GS200.
- You cannot use the USB storage feature if the USB-TMC command control feature (see section 10.2, "Setting the USB Interface Mode") has been selected.

- After connecting the USB cable correctly, turn the GS200 on. Two removable disks named GS200ROM and GS200RAM appear within My Computer on your PC.



Formatting the Disk

You must format the disk if GS200ROM cannot be detected by your PC, if you want to reset the GS200 to the factory default settings, or if the disk is corrupt.

- Press **UTILITY** to display the following menu.

```

Remot| BNC | Wire | Guard | Sys | Sys | Error |
I/F  | I/O | 2W 4W | On Off | Config | Info | Log |

```

- Press the **Sys Config** soft key to display the following menu.

```

Display| Beep | Adjust | CSV | Test | Format | Update |
4      | On Off | Time  | Formt |      | Disk  | Sys   |

```

- Press the **Formt Disk** soft key to display the following menu.

```

--- Warning ---
Files will be deleted if you format the ROM disk.
Proceed?
| | | | | | | Yes |

```

- Press the **Yes** soft key to format the disk.

Note

- Always format the disk from the GS200 menu. If you format the disk from your PC, folders such as PROGRAM and the sample files are not created.
- You can create files and folders on the disk, but be sure that it does not become full.
- Do not change the existing folder names such as PROGRAM. If you do, you will no longer be able to select files from the GS200.

Explanation**USB Storage Feature**

For details on the USB storage feature, see section 2.8.

GS200ROM

GS200ROM is a 4 MB non-volatile disk with preset folders for different purposes. Files are stored in the appropriate folders.

- **PROGRAM**

The PROGRAM folder stores program files that you can select when you want to execute a program.

When the GS200 is sent from the factory or when the disk is formatted, two sample program files are stored in this folder.

- **SETUP**

The SETUP folder stores the GS200 panel setup data that is selected when settings are loaded.

When the GS200 is sent from the factory or when the disk is formatted, a sample setup file is stored in this folder.

GS200RAM

GS200RAM is a 16 MB RAM disk that is automatically formatted when the power is turned on. It is a volatile disk that is used to exchange files with a PC. The result file (Result.csv) is stored on this disk when the storage operation is carried out. Saved result files can be read from a PC.

When you update the system firmware, system files are written to GS200RAM from your PC. For details, see section 14.5, "Updating the System Firmware."

5.1 Setting the Source Function

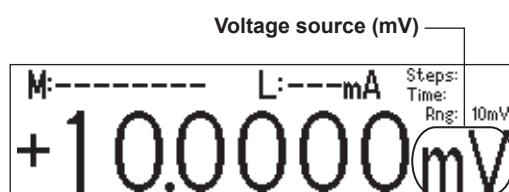
Procedure

Press **V**, **mV**, or **mA**.

Explanation

For details on the source function, see section 2.3.

Display Example of Source Function



The relationship between the keys and the source function is as follows:

- **V** key: Sets the source function to voltage and the source range to 1 V.
- **mV** key: Sets the source function to voltage and the source range to 10 mV (the circuit that produces the 10 mV range uses the voltage divider).
- **mA** key: Sets the source function to current and the source range to 1 mA.

Note

- When you change the source function from voltage (V or mV) to current (mA) or when you change the source function from current (mA) to voltage (V or mV), the source level setting (the value) is retained. When you switch the source function, output is turned off.
- When you switch the voltage source function between mV and V, the source level is retained if it is within the range determined by the new source range. However, the fractional part of the source level that is outside of the range determined by the new source range is discarded. If the output was on before the voltage source function was changed, it remains on. If the source level is outside of the range determined by the new source range, the source level is set to 0.

<<Corresponding Command Mnemonic>>

:SOURce:FUNction VOLTage|CURRent

5.2 Setting the Source Range

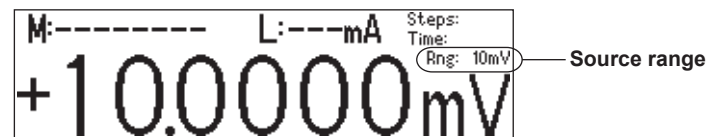
Procedure

Press **RANGE** \triangle or **RANGE** ∇ to set the source range.

Explanation

For details on the source range, see section 2.3.

Display Example of Source Range



Source Range

• Voltage source range

Source Range	Range Generated	Resolution	Max. Load Current
10 mV	± 12.0000 mV	100 nV	-----
100 mV	± 120.000 mV	1 μ V	-----
1 V	± 1.20000 V	10 μ V	± 200 mA
10 V	± 12.0000 V	100 μ V	± 200 mA
30 V	± 32.000 V	1 mV	± 200 mA

• Current source range

Source Range	Range Generated	Resolution	Max. Load Voltage
1 mA	± 1.20000 mA	10 nA	± 30 V
10 mA	± 12.0000 mA	100 nA	± 30 V
100 mA	± 120.000 mA	1 μ A	± 30 V
200 mA	± 200.000 mA	1 μ A	± 30 V

Note

- If you change the range while a capacitive or inductive load such as a capacitor or coil is connected, an abnormal load may be detected due to the energy build-up in the load, and the output may turn off.
- In voltage source mode's 10 mV and 100 mV ranges, because the GS200 uses a voltage divider, the output resistance is approximately 2 Ω . Therefore, these ranges are not suitable when the GS200 is connected to a load that allows current to flow (a low-impedance load). Also, four-terminal connection does not function for these voltage ranges. You must use the two-terminal connection instead. Connect a high-impedance load, a load that is sufficiently larger than the output resistance.
- If the range is changed, a glitch will occur in the output for several μ s to several hundred μ s.
- When the range is changed, the fractional part of the source level that is outside of the range determined by the new source range is discarded. However, if the source level is outside of the range determined by the new source range, the source level is set to 0.
- The source range is fixed. The GS200 does not have an auto range feature.

<<Corresponding Command Mnemonic>>

:SOURCE:RANGe <voltage> | MINimum | MAXimum | UP | DOWN

:SOURCE:RANGe <current> | MINimum | MAXimum | UP | DOWN

5.3 Setting the Source Level

Procedure

7. In up/down key mode, press the Δ and ∇ keys to set the source level. In keypad mode, press **NUM LOCK** + Δ or ∇ to set the source level.

Note

- You can also change the source level when output is on.
- If you enter a source level that exceeds the specified range, a beep sound (see section 9.4, "Turning the Beep Sound On and Off") is generated (only if the beep sound is on).

Explanation

Range of the Source Level

See the Range Generated column in the tables under Source Range in section 5.2, "Setting the Source Range."

When you enter the source level in keypad mode, the appropriate source range is applied for the specified source level, as shown in the table below.

Key	Settings
V	The source function is set to voltage, and the source range is set to the most appropriate range greater than or equal to 1 V.
mV	The source function is set to voltage, and the source range is set to the most appropriate range (the circuit that produces the most appropriate range uses the voltage divider).
mA	The source function is set to current, and the source range is set to the most appropriate range.
ENTER	The source function and source range do not change.

Note

Because an output capacitance of approximately 500 pF exists between the GS200's OUTPUT Hi and OUTPUT Lo terminals:

- If the load changes drastically such as when a short circuit occurs in voltage source mode, a large transient discharge current is generated from the output capacitance.
- If a voltage source (such as a power supply, amplifier, or signal generator) is connected as a load, the load voltage source may be unstable due to the output capacitance.

<<Corresponding Command Mnemonic>>

```
:SOURce:LEVel[:FIX] <voltage>|MINimum|MAXimum
:SOURce:LEVel[:FIX] <current>|MINimum|MAXimum
:SOURce:LEVel:AUTO <voltage>|MINimum|MAXimum
:SOURce:LEVel:AUTO <current>|MINimum|MAXimum
```

5.4 Setting the Limiter

Procedure

1. Press **LIMIT** to display the limiter setup screen.

Example of setting the current limiter in voltage source mode

M:- 0.00mA L:200mA Steps:
Time:
200mA

2. In up/down key mode, press the Δ and ∇ keys to set the limit. In keypad mode, press **NUM LOCK** + Δ or ∇ to set the limit.

Explanation

For details on the limiter, see section 2.3.

Setting Limits

In voltage source mode, the current limiter is enabled. In current source mode, the voltage limiter is enabled.

When you set the limiter, a high limit and a low limit are set. The absolute value of these limits is the same, but their polarities are different.

Example High limit: +200 mA
Low limit: -200 mA

Limiter	Range	Resolution	Enabled When
Current limiter	1 mA to 200 mA	1 mA	Voltage is being generated.
Voltage limiter	1 V to 30 V	1 V	Current is being generated.

When the source range is set to 10 mV or 100 mV, the limit is fixed to 200 mA (you cannot change this value). In this situation, the limit displays “---mA,” as shown in the following figure.


M: Cannot measure in
mV source range. L:---mA Steps:
Time:
Rng: 10mV
+10.0000mV

Display When a Limiter Is Activated

When the high limiter is activated: 

When the low limiter is activated: 

High limiter display example:

*M:+199.97mA  L:200mA Steps:
Time:
Rng: 1 V
+1.00000 V

<<Corresponding Command Mnemonic>>

:SOURce:PROTection:VOLTagE <voltage> | MINimum | MAXimum

:SOURce:PROTection:CURREnt <current> | MINimum | MAXimum

5.5 Turning the Output On and Off

Procedure

Press **OUTPUT**. The OUTPUT key illuminates while the output is on.

If you press **OUTPUT** while the output is on, the output will stop. When the output stops, the OUTPUT key turns off.

Explanation

Turning the Output On and Off

The output relay switches between on and off.

Note

- When the output relay operates, the source level changes as follows.
 - **When Output Is Turned On**
The output relay turns on with the source level set to zero. After the output relay switches, the source level is changed to the specified source level.
 - **When Output is Turned Off**
The source level is set to zero, and then the output relay is turned off.
- When output is off, you cannot execute programs (see chapter 6) or perform measurements (see chapter 7).
- At the 10 V and 30 V ranges, when you turn the output on, an internal process to reduce the zero-point error takes place for 0.4 second. However, the internal process does not take place in the following situations.
 - If the output is turned on within 1 second after it is turned off.
 - If output is turned on within 5 minutes after the power is turned on.

The Relationship between Capacitive and Inductive Loads and Output

- When a capacitive load is connected to the GS200 in voltage source mode, the response time may become longer. Also, if the load has a capacitance of 10 μ F or greater, oscillation may occur.
- If you change the output settings drastically under the usage conditions listed above, the limiter may be activated due to the inrush current.
- When an inductive load is connected to the GS200 in current source mode, the response time may become longer. Also, if the load has an inductance of 1 mH or greater, oscillation may occur.

<<Corresponding Command Mnemonic>>

:OUTPut[:STATe] 1|0|ON|OFF

6.1 Turning Program Repetition Mode On and Off

Procedure

1. Press **PROGRAM** to display the following menu.

Repeat	Intvl	Slope	P.Trig	Edit	List
On Off	0.1S	0.0S	Norm	Memory	Files

2. Press the **Repeat** soft key to select On or Off.
If you select On, the REPEAT indicator illuminates.
If you select Off, the REPEAT indicator turns off.

Explanation

Program Repetition Mode

If you set Repeat to On, when the final step in the program completes, the GS200 will return to the first step in the program and repeat it. You cannot set the number of times that the program is repeated.

<<Corresponding Command Mnemonic>>

```
:PROG:REPEAT[:STATE] 1|0|ON|OFF
```

6.2 Setting the Program Interval Time

Procedure

1. Press **PROGRAM** to display the following menu.

Repeat	Intvl	Slope	P.Trig	Edit	List
On Off	0.1S	0.0S	Norm	Memory	Files

2. Press the **Intvl** soft key to display the program interval time setup screen.

M:- 0.00mA L:200mA Steps:
Time:
0.1 S

3. In up/down key mode, press the Δ and ∇ keys to set the program interval time.
In keypad mode, press **NUM LOCK + Δ or ∇** to set the program interval time.

Explanation

Program Interval Time

The program interval time specifies the execution interval for each step in the program.
For details on the program interval time, see section 2.4.

Range

0.1 s to 3600.0 s

<<Corresponding Command Mnemonic>>

:PROGram:INTerval <time> |MINimum|MAXimum

6.3 Setting the Program Slope Time

Procedure

1. Press **PROGRAM** to display the following menu.

Repeat	Intvl	Slope	P.Trig	Edit	List
On Off	0.1S	0.0S	Norm	Memory	Files

2. Press the **Slope** soft key to display the program slope time setup screen.

M:- 0.00mA L:200mA Steps:
Time:
0.0 S

3. In up/down key mode, press the Δ and ∇ keys to set the program slope time. In keypad mode, press **NUM LOCK + Δ or ∇** to set the program slope time.

Explanation

Program Slope Time

When a program slope time is specified, the source level does not change immediately at the start of the step. The program slope time is the time that the GS200 takes to change the source level gradually (ramp up or down) from the start of a step. For details on the program slope time, see section 2.4.

Range

0.0 s to 3600.0 s

<<Corresponding Command Mnemonic>>

:PROGram:SLOPe <time> | MINimum | MAXimum

6.4 Setting the Program Trigger (/MON option)

Procedure

1. Press **PROGRAM** to display the following menu.

Repeat	Intvl	Slope	P.Trig	Edit	List
On Off	0.1S	0.0S	Norm	Memory	Files

2. Press the **P.Trig** soft key to display the following menu.

			Prgm Trig		
			Norm M.End		

3. Press the **Norm** or **M.End** soft key to set the program trigger.

Explanation

On models with the /MON option, you can select Norm or M.End for the program trigger. On models without the /MON option, the program trigger is fixed to Norm, and this menu is not displayed.

- Norm (Normal)
You can use the RUN, STEP, and HOLD keys and external triggers to control the program execution. The program interval time specifies the execution interval for each step in the program.
- M.End (Measurement end; only on models with the /MON option)
When you turn output on, the program executes automatically. If you set the program trigger to M.End, and the measurement trigger to Ready (source change completion; see section 7.4), the program executes the source and measurement operations of each step in the minimum time required. The RUN, STEP, and HOLD keys and external triggers are disabled. Additionally, the program interval setting is ignored.

<<Corresponding Command Mnemonic>>

:PROGram:TRIGger NORMal|MEND

6.5 Creating and Editing Programs

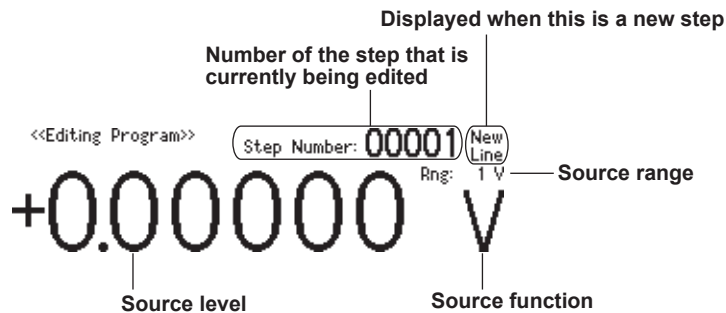
Procedure

Creating and Editing Programs from the GS200

1. Press **PROGRAM** to display the following menu.

Repeat	Intvl	Slope	P.Trig	Edit	List
On Off	0.1S	0.0S	Norm	Memory	Files

2. Press the **Edit Memory** soft key to display the program editing screen.



Setting the Source Function

3. Press **V**, **mV**, or **mA**.

Setting the Source Range

4. Press **RANGE** Δ or **RANGE** ∇ to set the source range.

Setting the Source Level

5. In up/down key mode, press the Δ and ∇ keys to set the source level. In keypad mode, press **NUM LOCK** + Δ or ∇ to set the source level.

Confirming the Settings

6. Press **ENTER** to confirm the settings for that step and increase the number of the step that is being edited by one.

Note

If the number of the step that is currently being edited is 10000, this number is not increased.

7. Repeat steps 3 to 6 to edit all the steps in the program.

Re-Editing Selected Steps in the Program

8. Press **STEP** (\wedge) or **RUN** (\vee) to select the step that you want to edit.
9. Repeat steps 3 to 6 to edit all the steps in the program.

Deleting Multiple Steps

10. Press **STEP** (\wedge) or **RUN** (\vee) to select the first step that you want to delete.
11. Press **HOLD (DEL)** to delete the settings for the current step and all the steps that follow it.

Note

You can delete the settings for all the steps in the program by selecting the first step and then executing the multiple-step-delete operation.

Ending Program Editing

- 12.** Press **PROGRAM (END)** to return to the program menu screen.

Aborting Program Editing

- 12.** During program editing, press **ESC** to display the following screen.

```
<<Editing Program>>      Step Number: 00003 New Line
Press ESC to exit the editing mode.
```

							Not Exit
--	--	--	--	--	--	--	-------------

- 13.** To abort program editing, press **ESC**. The steps that you have edited up to this point are cleared, and the program menu screen is displayed. To continue program editing, press the **Not Exit** soft key to return to the program editing screen.

Note

When the GS200 turns off, the program that you have edited is lost. If you want to keep the program, save it before you turn the GS200 off (see section 6.6).

Creating and Editing Programs from a PC

You can use a spreadsheet application or text editor to create and edit program files from a PC. For information on how to write program files, see section 2.4, “Programs.” For information on how to load program files onto the GS200, see section 6.6.

Explanation

You can create and edit programs from:

- The GS200.
- A PC.

Creating and Editing Programs from the GS200**The Program Editing Screen****New Line**

This is displayed when you are currently editing a new step (the step after the last step).
You can add new steps to the program by editing this step.

Creating a New Program

When you create a new program, the initial source level value is 0 V or 0 mA.

Editing Programs

When you create a program on the GS200, the program is displayed on the screen.
When you load an existing program onto the GS200, the program is displayed on the screen.

Creating and Editing Programs from a PC**Number of Steps**

A program can contain up to 10000 steps. If you use a PC to create a program that contains more than 10000 steps, the GS200 will only load the first 10000 steps.

<<Corresponding Command Mnemonic>>

```
:PROGram:EDIT:START
:PROGram:EDIT:END
:SOURce:FUNctIon VOLTage|CURRent
:SOURce:RANGe <voltage>|MINimum|MAXimum|UP|DOWN
:SOURce:RANGe <current>|MINimum|MAXimum|UP|DOWN
:SOURce:LEVel[:FIX] <voltage>|MINimum|MAXimum
:SOURce:LEVel[:FIX] <current>|MINimum|MAXimum
:SOURce:LEVel:AUTO <voltage>|MINimum|MAXimum
:SOURce:LEVel:AUTO <current>|MINimum|MAXimum
```

6.6 Saving and Loading Programs

Procedure

1. Press **PROGRAM** to display the following menu.

Repeat	Intvl	Slope	P.Trig	Edit	List
On Off	0.1S	0.0S	Norm	Memory	Files

2. Press the **List Files** soft key to display the currently saved files and the following menu.

Prgm01.csv	2009/10/15 09:26
Prgm02.csv	2009/10/15 09:26

Save	Delete		Load	View	↑↓
File	File		File	File	

Saving Programs

3. Press the **Save File** soft key to display the following menu.

Prgm01.csv	2009/10/15 09:26
Prgm02.csv	2009/10/15 09:26

Prgm	Prgm	Prgm	Prgm	Over	
01	02	03	04	Write	↑↓

Using a Soft Key to Directly Specify the Program from Prgm01 to Prgm04

4. Press a soft key from **Prgm01** to **Prgm04** to save the corresponding program. While the program is being saved, the soft key that you pressed is highlighted. When the file save operation completes, an asterisk is displayed to the left of the name of the file that was saved. Return to the menu that was shown in step 2.

*Prgm01.csv	2009/11/09 13:39
Prgm02.csv	2009/10/15 09:26

Save	Delete		Load	View	↑↓
File	File		File	File	

Using the File List to Specify the File to Overwrite

4. Press the **↑↓** soft key to move the cursor (underline) up and down and select the file that you want to overwrite.

5. Press the **Over Write** soft key. When a file is being saved, "Over Write" is highlighted.

When the file save operation completes, an asterisk is displayed to the left of the name of the file that was saved. Return to the menu that was shown in step 2.

*Prgm01.csv	2009/11/09 13:39
Prgm02.csv	2009/10/15 09:26

Save	Delete		Load	View	↑↓
File	File		File	File	

Loading Files That Were Created on a PC onto the GS200

1. Follow the procedures listed in section 4.4, “Setting the USB Storage Feature” and “How to Connect the USB Cable” to connect the GS200 and a PC using a USB cable.
2. Copy the program that you created on the PC to the PROGRAM folder on the GS200's GS200ROM disk.

Loading Programs

1. Press **PROGRAM** to display the following menu.

Repeat	Intvl	Slope	P.Trig	Edit	List
On Off	0.1S	0.0S	Norm	Memory	Files

2. Press the **List Files** soft key to display the currently saved files and the following menu.

Prgm01.csv	2009/10/15 09:26
Prgm02.csv	2009/10/15 09:26

Save	Delete		Load	View	↕
File	File		File	File	

3. Press the **↕** soft key to move the cursor (underline) up and down and select the file that you want to load.

Prgm01.csv	2009/11/09 13:39
Prgm02.csv	2009/10/15 09:26

Save	Delete		Load	View	↕
File	File		File	File	

4. Press the **Load File** soft key.

The program file is loaded. An asterisk is displayed to the left of the file that was loaded.

*Prgm01.csv	2009/11/09 13:39
Prgm02.csv	2009/10/15 09:26

Save	Delete		Load	View	↕
File	File		File	File	

Deleting Programs

3. Press the **↕** soft key to move the cursor (underline) up and down and select the file that you want to delete.

*Prgm01.csv	2009/11/09 13:39
Prgm02.csv	2009/10/15 09:26

Save	Delete		Load	View	↕
File	File		File	File	

4. Press the **Delete File** soft key to display the following menu.

*Prgm01.csv	2009/11/09 13:39
Prgm02.csv	2009/10/15 09:26

	Delete?				
	No	Yes			

6.6 Saving and Loading Programs

- To delete the file, press the **Yes** soft key.
The file is deleted.

Prgm02.csv 2009/10/15 09:26

| Save | Delete | | | Load | View | ↑ |
File File File File

Displaying Program Contents

- Press the ↑ soft key to move the cursor (underline) up and down and select the file that you want to display the contents of.

*Prgm01.csv 2009/11/09 13:39
Prgm02.csv 2009/10/15 09:26

| Save | Delete | | | Load | View | ↑ |
File File File File

- Press the **View File** soft key.
The contents of the program are displayed.

FILE : Prgm01.csv
+0.10000E+00, +1.20000E+00, V
+0.20000E+00, +1.20000E+00, V
+0.30000E+00, +1.20000E+00, V
+0.40000E+00, +1.20000E+00, V
+0.50000E+00, +1.20000E+00, V

↓

- Press **RANGE** △ or **RANGE** ▽ to scroll the display.

Explanation

Program List

The program that was last loaded has an asterisk displayed to the left of its file name.

Saving Programs

Programs are saved as program files (Prgm01.csv to Prgm04.csv) in the GS200ROM's PROGRAM folder. If you save a program number that already exists, the existing program file is overwritten.

Note

- Program files are text files. You can change their contents from a PC.
- You can change the names of the files that are stored in the GS200ROM's PROGRAM folder from a PC.

Loading Files That Were Created on a PC onto the GS200

You can use the USB storage feature to load program files that were created on a PC onto the GS200.

Loading Programs

You can load a saved program file to restore the program.

Note

If the GS200 cannot read program files correctly, its CSV-format settings may not match the program files. Check the CSV-format settings (see section 9.5).

Deleting Programs

You can delete program files that you no longer need.

Displaying Program Contents

You can check the contents of program files.

<<Corresponding Command Mnemonic>>

:PROG_{ram}:SAVE <character string>

:PROG_{ram}:LOAD <character string>

:PROG_{ram}:DELeTe <character string>

:PROG_{ram}:CATalog?

:PROG_{ram}:MEMory <character string> | <block data>

:PROG_{ram}:DEFine <character string>, <character string> | <block data>

6.7 Executing Programs

Procedure

When the Program Trigger Is Norm

1. Press **OUTPUT** or apply an output control signal (output on) to turn output on.

Starting Programs

2. Press **RUN** to start execution from the program's first step.

Pausing Programs

3. Press **HOLD** to pause program execution.

Executing One Program Step

4. Press **STEP** to execute only one program step.

Restarting Programs (From the paused step)

5. Press **HOLD** to restart program execution from the paused step.

Restarting Programs (From the first step)

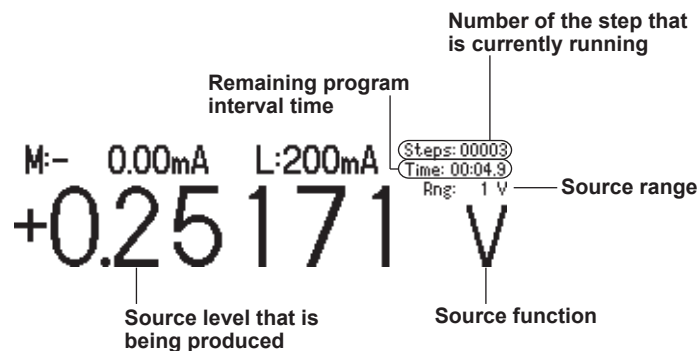
5. Press **RUN** to restart program execution from the program's first step.

When the Program Trigger Is M.End (Option)

Press **OUTPUT** or apply an output control signal (output on) to turn output on. Program execution starts as soon as the measurement operation completes.

Explanation

The GS200's Screen during Program Execution



Changing Settings

While a program is executing, you can:

- Turn output off.
- Turn program repetition on and off.
- Turn measurement on and off.
- Turn NULL on and off.
- Turn storage on and off.
- Turn storage file creation on and off.
- Turn the display on and off.

Executing Programs

For details on executing programs, see section 2.4.

Operations When the Program Trigger Is Set to Norm

You can use the RUN, STEP, and HOLD keys and external triggers to control the program execution. The program interval time specifies the execution interval for each step in the program.

If you press the RUN or STEP key during program execution, a sampling error occurs.

Operations When the Program Trigger Is Set to M.End (Option)

When measurement completes, the GS200 proceeds to the next step in the program and changes the source level. If you set the program trigger to measurement end (M.End), and the measurement trigger to source change completion (Ready), the program executes the source and measurement operations of each step in the minimum time required.

The RUN, STEP, and HOLD keys and external triggers are disabled. Additionally, the program interval setting is ignored.

Note

If you use a PC to copy or delete files on the GS200 during program execution, the timing of the program operations may be affected.

<<Corresponding Command Mnemonic>>

```
:PROGram:RUN
:PROGram:STEP
:PROGram:HOLD
:PROGram:PAUSE
:PROGram:CONTinue
:PROGram:COUNt <integer> | MINimum | MAXimum
```

7.1 Turning Measurement On and Off

Procedure

1. Press **MEASURE** to display the following menu.

Meas	Meas	Store	Store	Null	Zero
On Off	Config	On Off	Config	On Off	Cal

2. Press the **Meas** soft key to select On or Off.

Explanation

On (Measurement on)

When the source function is set to voltage, the GS200 measures current. When the source function is set to current, the GS200 measures voltage. The GS200 performs measurement when output is on. The measured value is displayed in the upper-left section of the screen.

Measured value

M:- 20.00mA L:200mA Steps: Time: Rng: 1 V
+1.00000 V

When the source range is set to 10 mV or 100 mV, you cannot use the measurement feature. The measured value area displays “Cannot measure in mV source range.”

M: Cannot measure in mV source range. L:---mA Steps: Time: Rng: 10mV
+10.00000 mV

If the measured value is greater than the positive limit of the measurement range, the measured value area displays “+OVER.” If the measured value is lower than the negative limit of the measurement range, the measured value area displays “-OVER.”

Off (Measurement off)

Measurement is not performed. The measured value area displays “Off.”

M: Off L:200mA Steps: Time: Rng: 1 V
+1.00000 V

Note

- When you turn measurements on, noise may be superimposed on the source output depending on the operation of the GS200 internal measurement circuit. To reduce noise in the source output, turn measurements off.
- When measurements are being performed, the timing of measurements may be affected if you:
 - Change a setting that is saved when the GS200 turns off (see appendix 1).
 - Copy or delete files from a PC.
- On GS200s without the measurement (monitoring; /MON) option, nothing is displayed in the measured value area.

<<Corresponding Command Mnemonic>>

:SENSe[:STATe] 1|0|ON|OFF

7.2 Setting the Integration Time

Procedure

1. Press **MEASURE** to display the following menu.

Meas	Meas	Store	Store	Null	Zero
On Off	Config	On Off	Config	On Off	Cal

2. Press the **Meas Config** soft key to display the following menu.

Measure Trigger	Integ	Delay	Timer
Timer Immed Ready Comm	1PLC	0mS	0.1S

3. Press the **Integ** soft key to display the integration time setup screen.

M:----- L:200mA Steps:
Time:
1 PLC

4. In up/down key mode, press the Δ and ∇ keys to set the integration time. In keypad mode, press **NUM LOCK + Δ or ∇** to set the integration time.

Explanation

Integration Time

The stability of measured values increases as the integration time is set longer. However, the measurement time will be longer. Set the integration time to an integer multiple of the power line cycle (nPLC). The line frequency is measured automatically inside the GS200. You can use the communication command “:SYSTem:LFRequency?” to check the measured line frequency.

Range

1 PLC to 25 PLC (PLC stands for Power Line Cycles. One PLC is equivalent to one period of the power source signal.)

Note

In one measurement operation, the output value and the zero reference value are both measured. Therefore, the time for one measurement operation is: ((measurement delay + integration time) \times 2) + software processing time (see section 2.5). For example, in an environment where the power supply frequency is 50 Hz (1 PLC = 20 ms), if the measurement delay is set to 0 ms and the integration time is set to 25 PLC (500 ms), the time required for one measurement is the sum of approximately 1 second and the software processing time. Software processing time is less than 1 ms.

<<Corresponding Command Mnemonic>>

:SENSe:NPLC <integer> | MINimum | MAXimum

7.3 Setting the Measurement Delay

Procedure

1. Press **MEASURE** to display the following menu.

Meas	Meas	Store	Store	Null	Zero
On Off	Config	On Off	Config	On Off	Cal

2. Press the **Meas Config** soft key to display the following menu.

Measure Trigger	Integ	Delay	Timer
Timer Immed Ready Comm	IPLC	0mS	0.1S

3. Press the **Delay** soft key to display the measurement delay setup screen.

M:----- L:200mA Steps:
Time:
0mS

4. In up/down key mode, press the Δ and ∇ keys to set the measurement delay. In keypad mode, press **NUM LOCK** + Δ or ∇ to set the measurement delay.

Explanation

Measurement Delay

The measurement delay is the time that the GS200 waits from when the measurement trigger is generated until measurement actually starts. Set this delay if you want to insert a delay after the source level is changed until the measurement is actually started to allow the DUT to stabilize. For details on the measurement delay, see section 2.5.

Range

0 ms to 999999 ms

Note

The time from when the source trigger is applied to when the source level stabilizes varies depending on the load, source range, and limiter level. When you adjust the length of the measurement delay, keep these in mind in addition to the time needed for the DUT to stabilize after the source level is applied.

<<Corresponding Command Mnemonic>>

:SENSe:DElay <time> | MINimum | MAXimum

7.4 Selecting the Measurement Trigger

Procedure

1. Press **MEASURE** to display the following menu.

Meas	Meas	Store	Store	Null	Zero
On Off	Config	On Off	Config	On Off	Cal

2. Press the **Meas Config** soft key to display the following menu.

Measure Trigger	Integ	Delay	Timer
Timer Immed Ready Comm	1PLC	0mS	0.1S

3. Press the soft key that corresponds to the measurement trigger that you want to use.

Explanation

For details on measurement triggers, see section 2.6.

The measurement trigger is a signal source that is used to start measurement. You can set the trigger source to one of the settings below.

Timer (see “Measurement Timer” in section 7.5)

Immed: Measurement completion (immediate)

Ready: Source change completion

Comm: Communication commands

Note

A sampling error occurs if a new measurement trigger is generated while a measurement is in progress.

<<Corresponding Command Mnemonic>>

:SENSe:TRIGger READy|TImeR|COMMunicate|IMMediate

7.5 Setting the Measurement Timer

Procedure

1. Press **MEASURE** to display the following menu.

Meas	Meas	Store	Store	Null	Zero
On Off	Config	On Off	Config	On Off	Cal

2. Press the **Meas Config** soft key to display the following menu.

Measure Trigger	Integ	Delay	Timer
Timer Immed Ready Comm	IPLC	0mS	0.1S

3. Press the **Timer** soft key to display the measurement timer setup screen.

M:----- L:200mA Steps:
Time:
0.1 s

4. In up/down key mode, press the Δ and ∇ keys to set the measurement timer. In keypad mode, press **NUM LOCK + Δ or ∇** to set the measurement timer.

Explanation

Measurement Timer

Set the timer when you want to generate measurement triggers at constant periods. If you set the measurement trigger to Timer (see section 7.4), the measurement timer is enabled.

Range

0.1 s to 3600.0 s

<<Corresponding Command Mnemonic>>

:SENSe:INTerval <time> | MINimum | MAXimum

7.6 Turning the NULL Computation On and Off

Procedure

1. Press **MEASURE** to display the following menu.

Meas	Meas	Store	Store	Null	Zero
On Off	Config	On Off	Config	On Off	Cal

2. Press the **Null** soft key to select On or Off.

Explanation

NULL Computation

When you turn NULL computation on, the NULL value will be set to the next measured value. While NULL computation is on, the measured result is calculated by subtracting the NULL value from the measured value.

<<Corresponding Command Mnemonic>>

:SENSe:NULL[:STATe] 1|0|ON|OFF

7.7 Zero Calibration (Zero reference measurement)

Procedure

1. Press **MEASURE** to display the following menu.

Meas	Meas	Store	Store	Null	Zero
On Off	Config	On Off	Config	On Off	Cal

2. Press the **Zero Cal** soft key to execute the zero reference measurement.
While the zero reference is being measured, the **Zero Cal** soft key is highlighted.

Meas	Meas	Store	Store	Null	Zero
On Off	Config	On Off	Config	On Off	Cal

Explanation

For details on the zero calibration feature, see section 2.5.

Zero Calibration

If zero calibration is executed, output is automatically turned off, the zero reference is measured, and the zero reference is applied to subsequent measured results. The zero point may change due to the passage of time, the GS200 being in an environment where the temperature changes drastically, or due to other factors. By executing zero calibration, the zero point is calibrated, and this enables the GS200 to generate more accurate output measurement.

<<Corresponding Command Mnemonic>>

:SENSe:ZERO:EXECute

7.8 Storing Measured Results

Procedure

1. Press **MEASURE** to display the following menu.

Meas	Meas	Store	Store	Null	Zero
On Off	Config	On Off	Config	On Off	Cal

2. Press the **Store Config** soft key to display the following menu.

		Count	File	Recall
		10000	On Off	

Setting the Storage Count

3. Press the **Count** soft key to display the storage count setup screen.

M:- 0.00mA L:200mA Steps:
Time:
10000

4. In up/down key mode, press the Δ and ∇ keys to set the storage count. In keypad mode, press **NUM LOCK + Δ** or **∇** to set the storage count.

Turning the Result File (Result.csv) Generation Feature On and Off

3. Press the **File** soft key to select On or Off.

Starting the Storage Operation

2. Press the **Store** soft key to start the storage operation. The **STORE** indicator illuminates.

Forcibly Stopping the Storage Operation

3. When the storage operation is in progress, press the **Store** soft key once more to forcibly stop the storage operation. The **STORE** indicator turns off.

Explanation

For details on the storage feature, see section 2.5.

Storage Count

The storage count specifies the number of measured results that are stored.

Range: 1 to 10000

Turning the Result File (Result.csv) Generation Feature On and Off

If you turn the result file generation feature on, when the storage operation finishes, the GS200 stores a result file that contains a list of all the contents of storage memory. The result file (Result.csv) is a text file in CSV format. It is stored on the GS200RAM disk. If the number of measurements that are performed exceeds the storage count, this file only contains results from as many measurements as the storage count specifies.

Note

- GS200RAM is a volatile-memory disk. The files that are stored on it are lost when you turn off the GS200. If there are result files that you want to retain, move them to the connected PC before you turn off the GS200.
- If the measured value is greater than the positive limit of the measurement range, "+INF" is written to the measured value section of the result file. If the measured value is lower than the negative limit of the measurement range, "-INF" is written to the measured value section of the result file.

Stopping the Storage Operation

The storage operation stops automatically when the specified number of results have been stored.

Forcibly Stopping the Storage Operation

When the storage operation is in progress, press the Store soft key to forcibly stop the storage operation. The results that have been stored up to this point are stored on the GS200RAM disk as a result file.

<<Corresponding Command Mnemonic>>

```
:TRACe[:STATe] 1|0|ON|OFF
```

```
:TRACe:FILE:CREate 1|0|ON|OFF
```

```
:TRACe:POINts <integer>|MINimum|MAXimum
```

7.9 Performing Statistical Computations on Measured Values (Recall)

Procedure

1. Press **MEASURE** to display the following menu.

Meas	Meas	Store	Store	Null	Zero
On Off	Config	On Off	Config	On Off	Cal

2. Press the **Store Config** soft key to display the following menu.

		Count	File	Recall
		10000	On Off	

3. Press the **Recall** soft key to display statistical computations of the measured values that were most recently stored.

Explanation

For details on the statistical computation feature, see section 2.5.

Statistical Computations

The following statistical computations are displayed. If no measured results have been stored, each computation displays "-----."

Total count :	20	Storage count
Maximum :	6.96655E-02	Maximum value
Minimum :	6.79713E-02	Minimum value
Peak-Peak :	1.69423E-03	Maximum – minimum
Mean :	6.85867E-02	Mean value
Standard deviation :	5.97345E-04	Standard deviation

<<Corresponding Command Mnemonic>>

:TRACe:DATA:STATistics?

Using Communications to Load Stored Results

You can use the communication feature to read the storage result directly.

<<Corresponding Command Mnemonic>>

:TRACe:ACTual?

:TRACe:DATA:FORMat ASCii|BINary

:TRACe:DATA:ENDian BIG|LITtle

:TRACe:DATA:READ? [TM|SF|SL|MF|ML]

8.1 Synchronous Operation Using the BNC I/O Terminals (IN and OUT)

Procedure

1. Press **UTILITY** to display the following menu.

Remot	BNC	Wire	Guard	Sys	Sys	Error
I/F	I/O	2W 4W	On Off	Config	Info	Log

2. Press the **BNC I/O** soft key to display the following menu.

BNC Out			BNC In		
Trig	Output	Ready	Trig	Output	

3. Set the BNC OUT terminal's signal by selecting Trig, Output, or Ready on the BNC Out menu.
4. Set the BNC IN terminal's signal by selecting Trig or Output on the BNC In menu.

Explanation

For details on the BNC I/O terminals, see section 2.7.

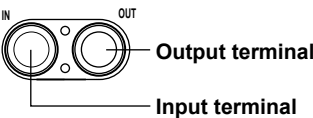
The GS200 can transmit or receive the following signals through the BNC I/O terminals on the rear panel.

- Output terminal (OUT)

Trig:	The TrigBusy signal (see section 2.4)
Output:	An output signal (see section 5.5)
Ready:	The source change completion signal (see section 2.6)
- Input terminal (IN)

Trig:	The STEP trigger for program execution (see section 6.4)
Output:	An output signal

BNC I/O Terminals



8.1 Synchronous Operation Using the BNC I/O Terminals (IN and OUT)

I/O Signals

Output Signals

- Trig
This pin transmits the TrigBusy signal. A low-level signal upon trigger generation and a high-level signal upon source operation completion.
- Output
This pin transmits the output state. A high-level signal if the output is off and a low-level signal if the output is on.
- Ready
This pin transmits the source change completion signal (Ready). This is transmitted 10 ms after the source level changes as a low pulse with a width of 10 μ s.

Input Signal

- Trig
This pin receives the STEP trigger for program execution. When a falling edge is received, the GS200 performs the same operation as if its STEP key had been pressed.
- Output
This pin receives output control signals. When these signals are received, the GS200 performs the same operation as if its OUTPUT key had been pressed. When a falling edge is received, the GS200 turns output on. When a rising edge is received, the GS200 turns output off.

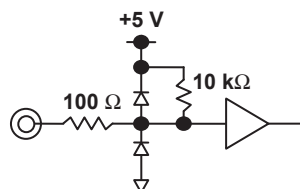
Input Section (IN terminal)

Input level: TTL level

Input logic: Negative logic, falling edge

Minimum pulse width: 10 μ s or greater

• Input Circuit



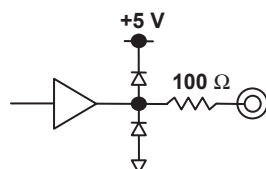
Output Section (OUT terminal)

Output level: TTL level

Output logic: Negative logic, falling edge

Minimum pulse width: Approx. 10 μ s

• Output Circuit



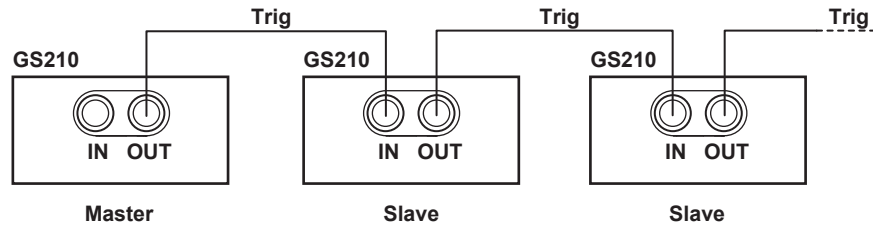
CAUTION

- Only apply a voltage that is within the range of 0 V to 5 V to the input.
- Do not short or apply external voltage to the output.

Using the BNC Terminals to Perform Synchronous Operation with Multiple GS200s

You can synchronize the output (turning on and off) and program execution of multiple GS200s by connecting their OUTPUT OUT and OUTPUT IN or TRIG OUT and TRIG IN signals.

Example of Synchronizing Program Execution



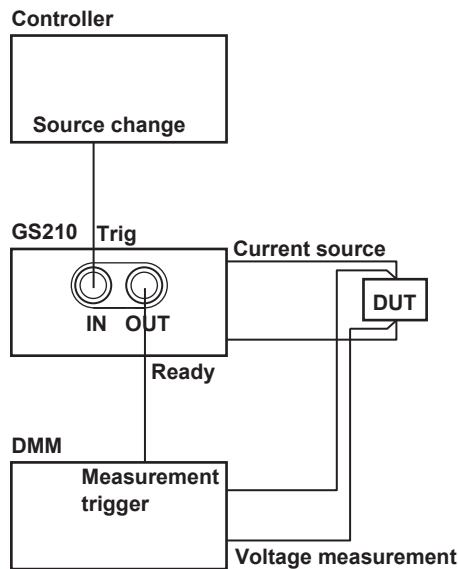
Note

- The maximum delay from TRIG IN to TRIG OUT is less than or equal to 1 μ s.
- The maximum delay from OUTPUT IN to OUTPUT OUT is less than or equal to 20 ms.
- If you are using both the RJ-11 connectors and BNC terminals, do not apply the same signal to them at the same time. Doing so may cause errors.

Using the BNC Terminals to Perform Synchronous Operation with the GS200 and Other Devices

You can control the GS200's output (turning on and off) and program execution by applying OUTPUT IN or TRIG IN signals that are transmitted from a device such as a controller.

Additionally, if you connect the GS200's READY OUT signal to the measurement trigger input of an external DMM, you can start measurements when the output source stabilizes.



<<Corresponding Command Mnemonic>>

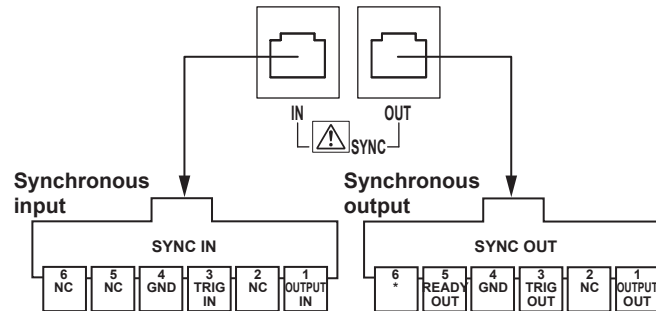
```
:ROUTe:BNCO TRIGger|OUTPut|READY
:ROUTe:BNCI TRIGger|OUTPut
```

8.2 Using the RJ-11 Connectors (SYNC IN and SYNC OUT) to Perform Synchronous Operation

If you connect the I/O terminals for synchronous operation on the rear panel of multiple GS200s, you can operate them in sync.

I/O Terminals for Synchronous Operation

There are two RJ-11 connectors, one for input and another for output.



Pinout

Pin No.	SYNC IN (Synchronous Input)	SYNC OUT (Synchronous Output)
1	OUTPUT IN (output control input)	OUTPUT OUT (output control output)
2	NC	NC
3	TRIG IN (trigger input)	TRIG OUT (trigger output)
4	GND	GND
5	NC	READY OUT (source change completion output)
6	NC	*

* This pin is used for servicing the GS200. Do not use it.

Connecting the GS200s

Use a synchronous operation cable (sold separately; 758960; 6-wire) to connect two GS200s. You can make synchronous operation possible by connecting the synchronous operation output of a higher level GS200 to the synchronous operation input of a lower level GS200.

Note

Do not use other commercially available cables. Only use the synchronous operation cable described above to connect GS200s.

Signals

OUTPUT IN (Output control input)

This pin receives output control signals. When these signals are received, the GS200 performs the same operation as if its OUTPUT key had been pressed. When a falling edge is received, the GS200 turns output on. When a rising edge is received, the GS200 turns output off.

OUTPUT OUT (Output control output)

This pin transmits the output state. A high-level signal if the output is off and a low-level signal if the output is on.

TRIG IN (Trigger input)

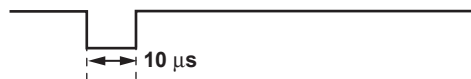
This pin receives the STEP trigger for program execution. When a falling edge is received, the GS200 performs the same operation as if its STEP key had been pressed.

TRIG OUT (Trigger output)

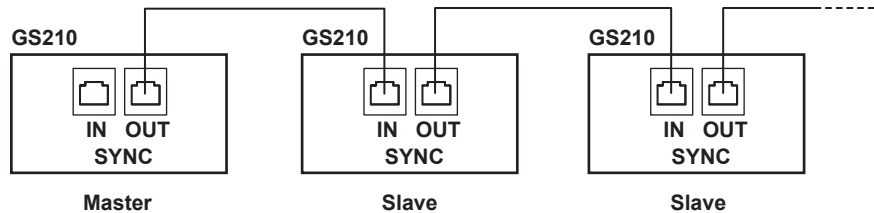
This pin transmits the TrigBusy signal. A low-level signal upon trigger generation and a high-level signal upon source operation completion.

READY OUT (Source change completion output)

This pin transmits the source change completion signal (Ready). This is transmitted 10 ms after the source level changes as a low pulse with a width of 10 μ s.



Note



The maximum delay from TRIG IN to TRIG OUT is less than or equal to 1 μ s.
The maximum delay from OUTPUT IN to OUTPUT OUT is less than or equal to 20 ms.

9.1 Initializing Setup Data

Procedure

1. Press **SETUP** to display the currently saved files and the following menu.

Setup01.txt2009/10/15 09:26

SaveDeleteInitLoadSet to
SetupSetupSetupSetupPwrOn

↕

2. Press the **Init Setup** soft key to initialize the setup data.
While the setup data is being initialized, the **Init Setup** soft key is highlighted.

SaveDeleteInitLoadSet to
SetupSetupSetupSetupPwrOn

↕

Explanation

When you initialize the setup data, the GS200 is returned to its factory default settings. For information on the factory default settings, see appendix 1, “Factory Default Settings.”

<<Corresponding Command Mnemonic>>

*RST

9.2 Saving, Loading, and Deleting Setup Data

Procedure

1. Press **SETUP** to display the currently saved files and the following menu.

Setup01.txt	2009/10/15 09:26
Setup02.txt	2009/11/09 16:29
Setup03.txt	2009/11/02 10:29
Setup04.txt	2009/10/28 14:12
Save Delete	Init Load Set to ↑ ↓
Setup Setup	Setup Setup PwrOn

Saving Setup Data

2. Press the **Save Setup** soft key to display soft keys that represent the files that you can save to (Setup01 to Setup04).

Setup01.txt	2009/10/15 09:26
Setup02.txt	2009/11/09 16:29
Setup03.txt	2009/11/02 10:29
Setup04.txt	2009/10/28 14:12
Setup Setup Setup Setup Over	↑ ↓
01 02 03 04 Write	

Saving the File by Pressing its Corresponding Soft Key

3. Press a soft key from **Setup01** to **Setup04** to save the corresponding file. While the file is being saved, the soft key that you pressed is highlighted.
When the save operation is completed, the display returns to the menu that was shown in step 1.

Setup01.txt	2009/10/15 09:26
Setup02.txt	2009/11/09 16:29
Setup03.txt	2009/11/02 10:29
Setup04.txt	2009/10/28 14:12
Save Delete	Init Load Set to ↑ ↓
Setup Setup	Setup Setup PwrOn

Saving the File by Using the Cursor to Select Its File Name

3. Press the **↑** soft key to move the cursor (underline) up and down and select the setup file that you want to overwrite.
4. Press the **Over Write** soft key. While the file is being saved, the soft key that you pressed is highlighted.
When the save operation is completed, the display returns to the menu that was shown in step 1.

Loading Setup Data

2. Press the **↑** soft key to move the cursor (underline) up and down and select the setup file that you want to load.

Setup01.txt	2009/10/15 09:26
Setup02.txt	2009/11/09 16:29
Setup03.txt	2009/11/02 10:29
Setup04.txt	2009/10/28 14:12
Save Delete	Init Load Set to ↑ ↓
Setup Setup	Setup Setup PwrOn

3. Press the **Load Setup** soft key.
The setup file is loaded. While the file is being loaded, the Load Setup soft key is highlighted.

Deleting Setup Data

2. Press the **↑** soft key to move the cursor (underline) up and down and select the setup file that you want to delete.

Setup01.txt	2009/10/15 09:26
Setup02.txt	2009/11/09 16:29
Setup03.txt	2009/11/02 10:29
Setup04.txt	2009/10/28 14:12
Save Setup	Delete Setup
Init Setup	Load Setup
Set to PwrOn	Set to PwrOn
↑	↓

3. Press the **Delete Setup** soft key to display the following menu.

Setup01.txt	2009/10/15 09:26
Setup02.txt	2009/11/09 16:29
Setup03.txt	2009/11/02 10:29
Setup04.txt	2009/10/28 14:12
Delete?	
No	Yes

4. To delete the setup file, press the **Yes** soft key.
The setup file is deleted.

Setup01.txt	2009/10/15 09:26
Setup02.txt	2009/11/09 16:29
Setup04.txt	2009/10/28 14:12
Save Setup	Delete Setup
Init Setup	Load Setup
Set to PwrOn	Set to PwrOn
↑	↓

Explanation

Saving Setup Data

Setup data is stored in the GS200ROM's SETUP folder as setup files (Setup01.txt to Setup04.txt). If you save a file number that already exists, the existing setup file is overwritten. For information on what settings are saved, see appendix 1, "Factory Default Settings."

Note

- You can change the names of the files that are stored in the GS200ROM's SETUP folder from a PC.
- Saving setup data does not save any programs that you have edited. For information on how to save programs, see "Saving Programs" in section 6.6.

<<Corresponding Command Mnemonic>>

:SYSTem:SETup:SAVE <character string>
*SAV 1|2|3|4

Loading Setup Data

You can load a saved setup file to restore the settings.

<<Corresponding Command Mnemonic>>

:SYSTem:SETup:LOAD <character string>
*RCL 1|2|3|4

Deleting Setup Data

You can delete setup files that you no longer need.

<<Corresponding Command Mnemonic>>

:SYSTem:SETup:DELeTe <character string>

9.3 Selecting the Settings Applied at Power-On

Procedure

Selecting the Settings Applied at Power-On

1. Press **SETUP** to display the following menu.

Setup01.txt	2009/10/15 09:26
Setup02.txt	2009/11/09 16:29
Setup03.txt	2009/11/02 10:29
Setup04.txt	2009/10/28 14:12
Save Delete	Init Load Set to ↑ ↓
Setup Setup	Setup Setup PwrOn

2. Press the **↑** soft key to move the cursor (underline) up and down and select the setup file that you want to load the settings from when the GS200 turns on.

Setup01.txt	2009/10/15 09:26
Setup02.txt	2009/11/09 16:29
Setup03.txt	2009/11/02 10:29
Setup04.txt	2009/10/28 14:12
Save Delete	Init Load Set to ↑ ↓
Setup Setup	Setup Setup PwrOn

3. Press the **Set to PwrOn** soft key.

An asterisk is displayed to the left of the setup file that you selected.

Setup01.txt	2009/10/15 09:26
Setup02.txt	2009/11/09 16:29
* Setup03.txt	2009/11/02 10:29
Setup04.txt	2009/10/28 14:12
Save Delete	Init Load Clear ↑ ↓
Setup Setup	Setup Setup PwrOn

Clearing the Settings Applied at Power-On

2. Press the **↑** soft key to move the cursor (underline) up and down and select the setup file that has an asterisk displayed to the left of its file name.

Setup01.txt	2009/10/15 09:26
Setup02.txt	2009/11/09 16:29
* Setup03.txt	2009/11/02 10:29
Setup04.txt	2009/10/28 14:12
Save Delete	Init Load Clear ↑ ↓
Setup Setup	Setup Setup PwrOn

3. Press the **Clear PwrOn** soft key.

The asterisk disappears.

Setup01.txt	2009/10/15 09:26
Setup02.txt	2009/11/09 16:29
Setup03.txt	2009/11/02 10:29
Setup04.txt	2009/10/28 14:12
Save Delete	Init Load Set to ↑ ↓
Setup Setup	Setup Setup PwrOn

Explanation

If you select the settings applied at power-on, the selected setup file is loaded automatically when the GS200 turns on. If you clear the settings applied at power-on, the factory default settings are loaded each time that the GS200 turns on. For information on the factory default settings, see appendix 1, "Factory Default Settings."

<<Corresponding Command Mnemonic>>

:SYSTem:SETup:PON <character string>

9.4 Selecting the Display Brightness, Turning the Display Off, and Turning the Beep Sound On and Off

Procedure

1. Press **UTILITY** to display the following menu.

Remot	BNC	Wire	Guard	Sys	Sys	Error
I/F	I/O	2W 4W	On Off	Config	Info	Log

2. Press the **Sys Config** soft key to display the following menu.

Display	Beep	Adjust	CSV	Test	Formt	Update
4	On Off	Time	Formt		Disk	Sys

Selecting the Display Brightness

3. Press the **Display** soft key to display the following menu.

Brightness				Turn
1	2	3	4	Off

4. Press a soft key from **1** to **4** to set the display brightness.

Turning the Display Off

4. Press the **Turn Off** soft key to turn the display off. The NUM LOCK key blinks until you turn the display on again. To turn the display on, press any key.

Turning the Beep Sound On and Off

3. Press the **Beep** soft key to select On or Off.

Explanation

Selecting the Display Brightness

You can set the display brightness to a level from 1 to 4. The darkest setting is 1, and the brightest setting is 4.

Turning the Display Off

Turning the display off extends the life of the display and suppresses the noise that the display generates.

Turning the Beep Sound On and Off

If you turn the beep sound on, the GS200 generates beep sounds during operation, such as when an error occurs.

<<Corresponding Command Mnemonic>>

```
:SYSTem:DISPlay:BRIGht <integer> | MINimum | MAXimum | UP | DOWN
:SYSTem:DISPlay[:STATe] 1 | 0 | ON | OFF
:SYSTem:BEEPer 1 | 0 | ON | OFF
```

9.5 Selecting the CSV File Format

Procedure

1. Press **UTILITY** to display the following menu.

Remot	BNC	Wire	Guard	Sys	Sys	Error
I/F	I/O	2W 4W	On Off	Config	Info	Log

2. Press the **Sys Config** soft key to display the following menu.

Display	Beep	Adjust	CSV	Test	Format	Update
4	On Off	Time	Format		Disk	Sys

3. Press the **CSV Format** soft key to display the following menu.

			Point	Sep		
			.	,		

4. Press the **Point** or **Sep** soft key to select the CSV file format.
The two soft keys are linked.

Explanation

The following format combinations are available.

- The decimal point is a period, and the separator is a comma.
- The decimal point is a comma, and the separator is a semicolon.

The default setting is the period and comma combination.

9.6 Error Log Display

Procedure

Error Log Display

1. Press **UTILITY** to display the following menu.

Remot	BNC	Wire	Guard	Sys	Sys	Error
I/F	I/O	2W 4W	On Off	Config	Info	Log

2. Press the **Error Log** soft key to display the error log.

222: Data out of range, LEV						↓	Error description Displayed when the error log contains six lines or more.
					Clear		

3. If the error log contains six lines or more, press the **↕** soft key to scroll the display.

Clearing the Error Log Display

4. Press the **Clear** soft key to clear the error log.

Explanation

The ERROR indicator illuminates if an error such as a runtime error or communication command error is stored in the error memory.

The error log displays errors and messages. An error has an associated error number, and a message does not.

A message is displayed in the error log until the problem indicated by the message is resolved. It is not cleared even if the Clear soft key is pressed.

For the meaning of errors and their corrective actions, see section 14.2, "Error Code Descriptions and Corrective Actions."

Note

- The error memory is also cleared if you use a communication command (":SYSTem:ERRor?") to read errors, or if the GS200 is turned off. You can also clear the error memory by sending the *CLS communication command.
- If the error memory becomes full, "-350: Queue overflow" is entered as the last error indicating that any additional errors will be discarded. When the error memory is cleared, the ERROR indicator turns off.

<<Corresponding Command Mnemonic>>

:SYSTem:ERRor?

:STATus:ERRor?

*CLS

10.1 USB Interface Features and Specifications

USB Interface Features

USB Storage Feature

You can access the two disks, GS200ROM and GS200RAM as external removable disks on your PC (see section 4.4, “USB Storage Feature”).

USB-TMC Command Control Feature

You can control the GS200 by using commands from a VISA (Virtual Instrument Software Architecture) library.

To perform USB-TMC command control, you must first install a VISA library on your PC.

USB Interface Specifications

Electrical and mechanical specifications: Conforms to USB 2.0

Connector: Type B connector (receptacle)

Number of ports: 1

Power supply: Self-powered

Connecting to a Network

Connection Cable

Use a USB cable that has a type B connector (receptacle). For the connection procedure, see section 4.4, “USB Storage Feature.”

10.2 Setting the USB Interface Mode

Procedure

1. Press **UTILITY** to display the following menu.

Remot	BNC	Wire	Guard	Sys	Sys	Error
I/F	I/O	2W 4W	On Off	Config	Info	Log

2. Press the **Remot I/F** soft key to display the following menu.

GPIB	USB	LAN				VISA
	Storage					Info

Setting the USB Interface Mode

3. Press the **USB** soft key to display the following menu.

	USB Mode				
	Storage	TMC			

4. Press the soft key that corresponds to the USB interface mode that you want to use.

Explanation

Setting the USB Interface Mode

Storage (Storage)

Select Storage to use the USB storage feature (see section 4.4, “USB Storage Feature”).

TMC (USB-TMC)

Select TMC to perform command control from a VISA library.

10.3 Viewing the VISA Setup Information

Procedure

1. Press **UTILITY** to display the following menu.

Remot	BNC	Wire	Guard	Sys	Sys	Error
I/F	I/O	2W 4W	On Off	Config	Info	Log

2. Press the **Remot I/F** soft key to display the following menu.

GPIB	USB	LAN			VISA
	Storage				Info

Viewing the VISA Information

3. Press the **VISA Info** soft key to display the network setup information that is necessary for communications using a VISA library.

GPIB : GPIB::1::INSTR
USB : USB::0xB21::0x39::12345678::INSTR
LAN : TCPIP::0.0.0.0::INSTR

Explanation

The VISA information contains a character string that is passed to viOpen() to open a device using a VISA library.

- GPIB: The character string that is passed to viOpen() when using the GP-IB interface.
- USB: The character string that is passed to viOpen() when using the USB-TMC protocol.
- LAN: The character string that is passed to viOpen() when using the Ethernet VXI-11 protocol.

11.1 Ethernet Interface Features and Specifications

Ethernet Interface Features

VXI-11 Server Feature

The VXI-11 server feature is a command mnemonic stream parsing server based on the VXI-11 protocol that allows up to five clients to connect to it on port 111.

Command Control Server Feature

The command control server feature is a command mnemonic stream parsing server that allows up to five clients to connect to it on port 7655.
The terminator (CR, LF, or CR+LF) can be specified.

FTP Server Feature

The FTP server feature is an anonymous FTP server that allows up to five clients to connect to it on port 21.

HTTP Server Feature

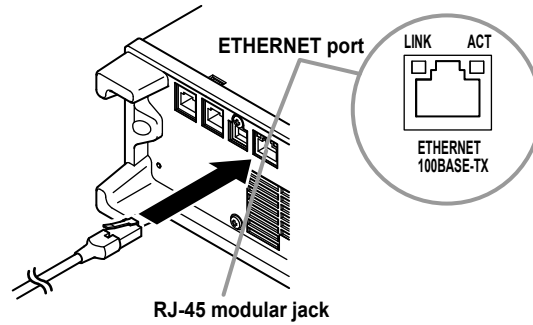
The HTTP server feature (connected to on port 80) enables you to use a Web browser to display various GS200 information and control the GS200 remotely.

Ethernet Interface Specifications

Connector:	RJ-45
Number of ports:	1
Electrical and mechanical specifications:	Conforms to IEEE 802.3
Transmission system:	100BASE-TX/10BASE-T
Maximum data rate:	100 Mbps
Protocol:	TCP/IP

11.2 Connecting to a Network

Connect a UTP (Unshielded Twisted-Pair) cable or an STP (Shielded Twisted-Pair) cable that is connected to a hub or other network device to the 100BASE-TX port on the GS200 rear panel.



ACT indicator

Blinks when packet transmission is in progress

LINK indicator

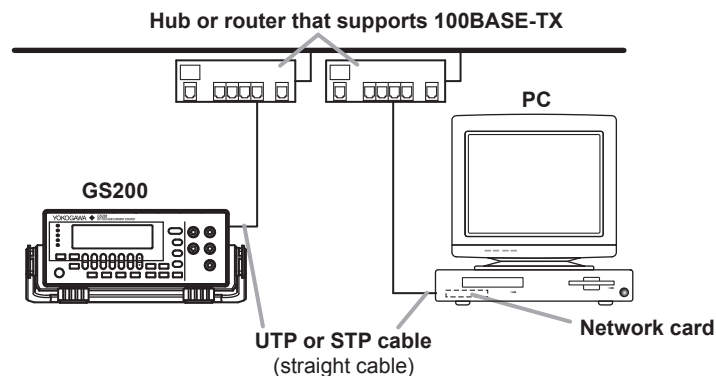
Illuminates when a link is established between the GS200 and another device and the devices are capable of communicating with each other

Connection Cable

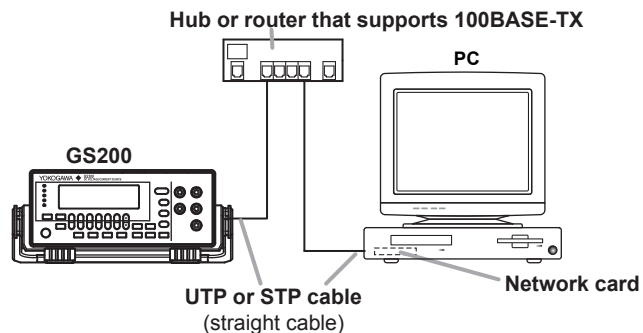
Use one of the following cables to connect the GS200 to a network.

- A UTP (unshielded twisted pair) cable (category 5 or better)
- An STP (shielded twisted pair) cable (category 5 or better)

To Connect to a PC over a Network



To Connect to a PC through a Hub or Router



Note

- Use straight UTP or STP cables that are category 5 or better.
- Do not connect the GS200 to a PC directly. Direct communication without a hub or router is not guaranteed to work.

11.3 Configuring Network Settings (TCP/IP)

Procedure

1. Press **UTILITY** to display the following menu.

Remot I/F	BNC I/O	Wire 2W 4W	Guard On Off	Sys Config	Sys Info	Error Log
--------------	------------	---------------	-----------------	---------------	-------------	--------------

2. Press the **Remot I/F** soft key to display the following menu.

GPIB	USB Storag	LAN			VISA Info
------	---------------	-----	--	--	--------------

3. Press the **LAN** soft key to display the following menu.

DHCP On Off	IP Adrs	Subnet Mask	Default Gateway	Term CR+LF	Over- view
----------------	------------	----------------	--------------------	---------------	---------------

Turning DHCP On and Off

4. Press the **DHCP** soft key to select On or Off.

Setting the IP Address

You can only set the IP address when DHCP is off.

5. Press the **IP Adrs** soft key to display the IP address setup screen.
The NUM LOCK key illuminates, and the GS200 changes to keypad mode.

IP Address	0.	0.	0.	0
---------------	----	----	----	---

6. Press the Δ and ∇ keys that correspond to numbers 0 to 9 and the period to set the IP address.

IP Address	10.	0.	159.	10
---------------	-----	----	------	----

7. Press the **Enter** soft key to confirm the setting.

Setting the Subnet Mask

You can only set the subnet mask when DHCP is off.

5. Press the **Subnet Mask** soft key to display the subnet mask setup screen.
The NUM LOCK key illuminates, and the GS200 changes to keypad mode.

Subnet Mask	0.	0.	0.	0
----------------	----	----	----	---

6. Press the Δ and ∇ keys that correspond to numbers 0 to 9 and the period to set the subnet mask.

Subnet Mask	255.	255.	252.	
----------------	------	------	------	--

11.3 Configuring Network Settings (TCP/IP)

7. Press the **Enter** soft key to confirm the setting.

Setting the Default Gateway

You can only set the default gateway when DHCP is off.

5. Press the **Defalt Gatwy** soft key to display the default gateway setup screen.
The NUM LOCK key illuminates, and the GS200 changes to keypad mode.

Default Gateway	0.	0.	0.	0
-----------------	----	----	----	---

6. Press the Δ and ∇ keys that correspond to numbers 0 to 9 and the period to set the default gateway.

Default Gateway	10.	0.	156.	1
-----------------	-----	----	------	---

7. Press the **Enter** soft key to confirm the setting.

Setting the Transmission Terminator

5. Press the **Term** soft key to display the following menu.

		Terminator:		
		CR	LF	CR+LF

6. Press the soft key that corresponds to the terminator that you want to use.

Restarting the GS200

You must restart the GS200 to apply any new or changed network settings other than the transmission terminator setting.

Explanation

To use the GS200's network features, you must configure the TCP/IP settings.

DHCP (Dynamic Host Configuration Protocol)

DHCP is a protocol that temporarily allocates necessary information to a computer so that it can connect to the Internet. If DHCP is turned on, the following settings will be automatically assigned.

- IP address
- Subnet mask
- Default gateway
- To use DHCP, the network must have a DHCP server. Consult your network administrator to see if DHCP is available.
- Different information may be assigned to the GS200 each time it is turned on. When you are using a PC to access the GS200, you must check the GS200 IP address and other network settings each time you turn the GS200 on.

IP Address (Internet Protocol Address)

- An IP address is a 32-bit value that is expressed using four octets. Each octet is separated by a period and has a value from 0 to 255, as in “192.168.111.24.”
- Obtain an IP address from your network administrator.
- The IP address is automatically assigned in networks that use DHCP.

Subnet Mask

- Consult your network administrator for the subnet mask address. You may not need to set the subnet mask.
- The subnet mask address is automatically assigned in networks that use DHCP.

Default Gateway

The default gateway setting is necessary to communicate between different subnets.

- Consult your network administrator for the default gateway address. You may not need to set the default gateway.
- The default gateway address is automatically assigned in networks that use DHCP.

Transmission Terminator

You can set the terminator that is used to send data from the command control server at port 7655.

- Select CR, LF, or CR+LF.
- The GS200 handles CR, LF, or CR+LF as the terminator when receiving data.

Note

- You must restart the GS200 to apply any changed network settings other than the transmission terminator setting.
- You must also specify network settings, such as the IP address, on your PC. For information on these settings, check your PC's manual (help file) or consult your network administrator.

Viewing the VISA Information

The VISA information contains a character string that is passed to viOpen() to open a device using a VISA library.

For information on how to view the VISA information, see section 10.3.

11.4 Viewing the Network Settings

Procedure

1. Press **UTILITY** to display the following menu.

Remot I/F	BNC I/O	Wire 2W 4W	Guard On Off	Sys Config	Sys Info	Error Log
--------------	------------	---------------	-----------------	---------------	-------------	--------------

2. Press the **Remot I/F** soft key to display the following menu.

GPIB	USB Storage	LAN				VISA Info
------	----------------	-----	--	--	--	--------------

3. Press the **LAN** soft key to display the LAN menu.

DHCP On Off	IP Adrs	Subnet Mask	Default Gatwy	Term CR+LF	Over- view
----------------	------------	----------------	------------------	---------------	---------------

Viewing the Network Settings

4. Press the **Over-view** soft key to display the currently active network settings. Any changes that you have made to these settings are not displayed until you restart the GS200.

```
MAC address : 00:00:64:8B:E0:CE
IP address  : 10. 0.159. 10
Subnet mask : 255.255.252. 0
Default gateway : 10. 0.156. 1
```

Explanation

You can view the following network settings.

- MAC address
The MAC address is a unique 48-bit address assigned to the GS200.
- IP address (see section 11.3)
- Subnet mask (see section 11.3)
- Default gateway (see section 11.3)

Note

If DHCP is enabled, "0.0.0.0" will be displayed for the IP address, subnet mask, and default gateway until an address is assigned to the GS200. If the display does not change even after 30 seconds elapses after the GS200 is turned on, the DHCP address assignment may have failed. If this happens, check that the Ethernet cable is connected correctly and that the LINK indicator of the 100BASE-TX port on the rear panel is illuminated, and then restart the GS200.

11.5 Web Server Feature

The GS200 Web server feature links the Web browser on your PC to the GS200 and enables you to control the GS200 from your Web browser window. The GS200 Web server provides you with the following features.

- **Remote panel feature**

You can use the keys on the remote panel to set or operate the GS200.

- **Command control feature**

You can send communication commands from the command control screen to set or query the GS200.

- **Communication environment display**

You can view the communication settings on the status display.

- **FTP server feature**

You can view the files on the GS200's volatile disk (GS200RAM) and non-volatile disk (GS200ROM) and transmit or copy files to your PC.

Environment on the GS200

Use the Ethernet interface to connect the GS200 to a network. For the connection procedure, see section 11.2. For details on network settings, see section 11.3.

Preparations on Your PC

Logging into the Web Server (GS200)

1. Start Internet Explorer.
2. Type the IP address of the GS200 in the Address box, and press ENTER.
IP address example: `http://10.0.159.30/`
3. If a connection to the GS200 Web server is established, the top page of the GS200 Web Service is displayed.

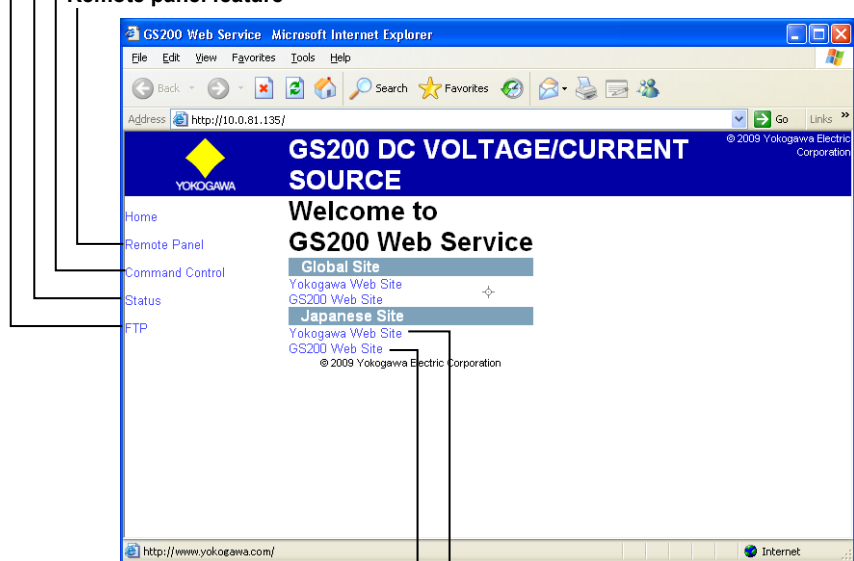
Web Server Window

FTP server feature

Communication environment display

Command control feature

Remote panel feature

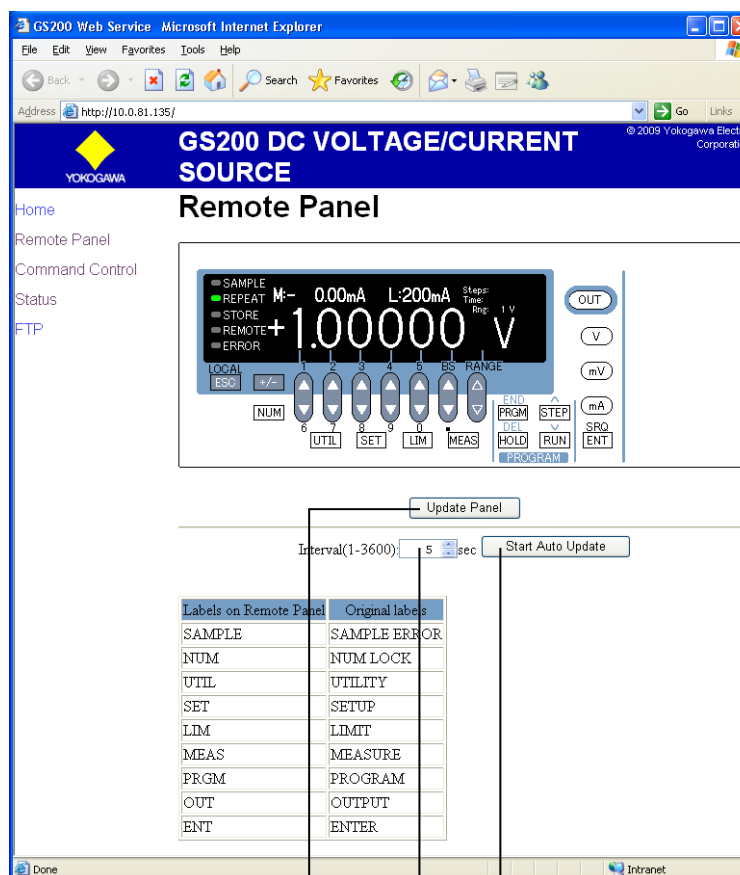


Link to the YOKOGAWA website's top page
Link to the YOKOGAWA website's GS200 page

Using the Web Server Feature

Remote Panel Feature

Click the “Remote Panel” link in the Web server window to display an image of the GS200 front panel.



Click to automatically update the remote panel to reflect the operations carried out on the GS200

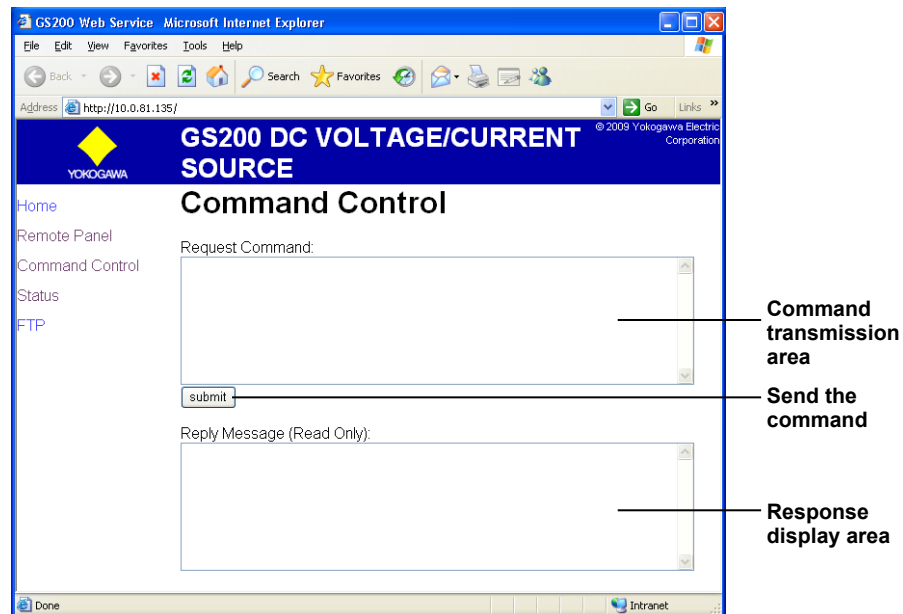
Set the update interval

Click to update the remote panel to reflect the operations carried out on the GS200

You can control the GS200 in the same manner as if you were using the actual keys on the GS200. Use your mouse to click the keys that you want to operate. Operations that you perform on the remote panel are immediately applied to the GS200. To update the remote panel so that it accurately reflects the current operations of the GS200, click Update Panel. Click Start Auto Update to automatically apply the operations on the GS200 to the remote panel at the interval specified in the Interval box.

Command Control Feature

Click the “Command Control” link in the Web server window to display the command control page.



You can send communication commands from the command control page to set or query the GS200. Type the communication command in the command transmission area, and click submit. The response to the transmitted communication command is displayed in the response display area.

Displaying the Communication Environment

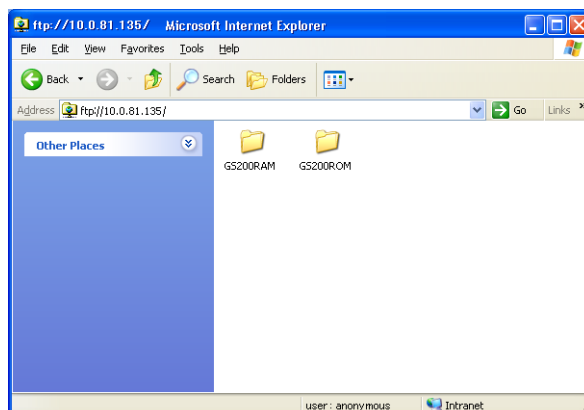
Click the “Status” link in the Web server window to display the communication environment page.



The communication environment of the GS200 is displayed. Click Refresh to update the displayed information.

FTP Server Feature

Click the “FTP” link in the Web server window to display the FTP page.



The GS200 volatile disk (GS200RAM) and non-volatile disk (GS200ROM) are displayed. You can view, duplicate, delete, or transfer these files to your PC from the FTP page. For details on the volatile disk (GS200RAM) and non-volatile disk (GS200ROM), see “USB Storage Feature” on page 2-25.

12.1 GP-IB Interface Features and Specifications

GP-IB Interface Features

Listener Capability

- You can use the GP-IB interface to specify the same settings that you can using the front panel keys. You cannot use it to turn the GS200 on and off or change communication settings.
- The GP-IB interface receives output requests for setup data and measured data from the controller.
- The interface can also receive commands such as status report commands.

Talker Capability

The GP-IB interface transmits setup data, waveform data, and other types of data.

Note

Talk-only, listen-only, and controller capabilities are not available on the GS200.

Switching between Remote and Local Modes

When Switching from Local to Remote Mode

The GS200 switches to remote mode when it is in local mode and it receives a REN (Remote Enable) message from the controller.

- The REMOTE indicator illuminates (see section 1.1).
- All keys other than the LOCAL key are locked.
- Settings entered in local mode are retained even when the GS200 switches to remote mode.

When Switching from Remote to Local Mode

The GS200 switches to local mode when it is in remote mode and you press the LOCAL key.

- The REMOTE indicator turns off.
- Key operations are enabled.
- Settings entered in remote mode are retained even when the GS200 switches to local mode.

GP-IB Interface Specifications

Electrical and mechanical specifications: Conforms to IEEE St'd 488-1987

- Mechanical specifications: See the table below.
- Used codes: ISO (ASCII) codes
- Mode: Addressable mode
- Address selection: On the GP-IB Address menu, set the GP-IB address setting (see section 12.3) to an address from 0 to 30.
- Clearing remote mode: Clear remote mode by pressing LOCAL. However, key operations are invalid when Local Lockout is enabled by the controller.

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

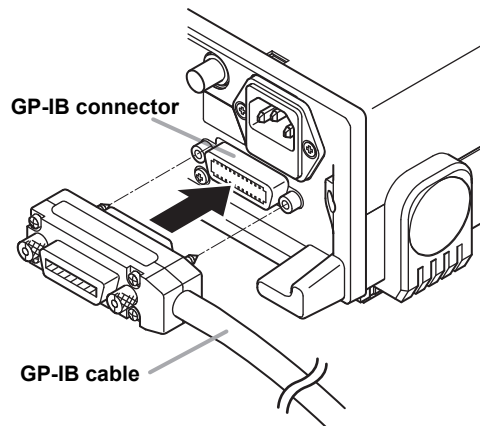
12.2 Connecting the GP-IB Cable

GP-IB Cable

The GS200 is equipped with an IEEE St'd 488-1987 24-pin GP-IB connector. Use a GP-IB cable that conforms to this standard.

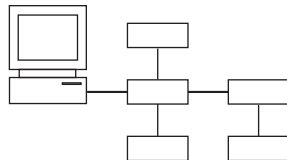
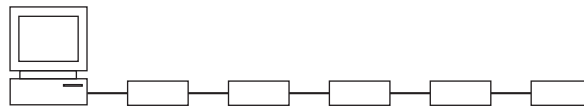
Connection Procedure

Connect the cable as shown below.



Precautions to Be Taken When Connecting the Cable

- Firmly tighten the screws on the GP-IB cable connector.
- Multiple devices can be connected in a single GP-IB system. However, the maximum number of devices that can be connected in any such system (including the controller) is 15.
- When connecting multiple devices, you must assign a unique address to each device.
- Use cables that are 2 m or shorter 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, use a star or daisy-chain configuration as shown below. Loop and parallel configurations are not allowed.



12.3 Setting the GP-IB Address and Command Mode

Procedure

1. Press **UTILITY** to display the following menu.

Remot I/F	BNC I/O	Wire 2W 4W	Guard On Off	Sys Config	Sys Info	Error Log
--------------	------------	---------------	-----------------	---------------	-------------	--------------

2. Press the **Remot I/F** soft key to display the following menu.

GPIB	USB Storag	LAN			VISA Info
------	---------------	-----	--	--	--------------

3. Press the **GPIB** soft key to display the following menu.

Adrs 1	GPIB 7651	Cmd GS200			
-----------	--------------	--------------	--	--	--

Setting the GP-IB Address

4. Press the **Adrs** soft key.

M:- 0.00mA L:200mA Steps:
Time:

1

5. In up/down key mode, press the Δ and ∇ keys to set the GP-IB address. In keypad mode, press **NUM LOCK** + Δ or ∇ to set the GP-IB address.

Setting the GP-IB Command Mode

4. Press the **GS200** or **7651** soft key to set the GP-IB command mode.

Explanation

GP-IB Address

Each device that is connected by GP-IB has its own unique address in the GP-IB system. This address is used to distinguish between different devices. When you connect the GS200 to a controller such as a PC, specify the GS200's GP-IB address on the controller.

Range: 0 to 30

GP-IB Command Mode

GS200 Mode

GS200 mode enables you to use protocol commands that conform to IEEE Std 488.2-1992. For details on commands, see chapter 13.

7651 Mode

7651 mode enables you to use the same commands that are available for the YOKOGAWA 7651 Programmable DC Source. For details on these commands, see section 12.4.

Viewing the VISA Information

The VISA information contains a character string that is passed to `viOpen()` to open a device using a VISA library.

For information on how to view the VISA information, see section 10.3.

12.4 7651-Compatible Mode

You can use the same communication commands with the GS200 that are available for the YOKOGAWA 7651 Programmable DC Source. This is useful when you replace the 7651 with the GS200 or if you want to use both the GS200 and the 7651 in the same system and control them using the same commands.

Note

You can only use the 7651-compatible mode with GP-IB communication. You cannot use it with communication through other communication interfaces.

Setting the GP-IB Command Mode

Follow the procedure in section 12.3 to set the GP-IB command mode to 7651 mode.

Communication Commands That You Can Use in 7651 Mode

See the *7651 User's Manual*, IM7651-01E.

However, there are the following limitations.

- The following commands are not supported.
 - IC memory card initialization (CI)
 - Calibration feature commands (YZPm, YZSm, YZW, YZE, and YZO)
 - RS-232-C-specific commands (<ESC>R, <ESC>L, <ESC>S, and <ESC>C)
- In the return value of the status output command (OC):
 - The CAL switch bit and the normal/calibration mode bit are always 0.
 - The IC memory card bit is always 1.
- If parameters are not included for communication commands that require parameters, a communication error occurs.

The 7651-Mode Status Byte

In 7651 mode, the status byte is also 7651-compatible. For details, see the *7651 User's Manual*, IM7651-01E.

Using Keys to Issue SRQ Interruptions

If you press the ENTER key when the GP-IB command mode is set to 7651, the status byte's SRQ SW bit is set to 1. The GS200 issues an SRQ interruption if it is set to use the SRQ SW bit as an interruption source. For details, see the *7651 User's Manual*, IM7651-01E.

12.5 Responses to Interface Messages

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 of messages are available.

IFC (Interface Clear), REN (Remote Enable), and IDY (Identify)

Multi-line Messages

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

- **Address Commands**

These commands are valid when the instrument is designated as a listener or as a talker. The following five commands are available.

- Commands that are valid on an instrument that is designated as a listener
GTL (Go To Local), SDC (Selected Device Clear), PPC (Parallel Poll Configure), and GET (Group Execute Trigger)
- A command that is valid on an instrument that is designated as a talker
TCT (Take Control)

- **Universal Commands**

These commands are valid on all instruments 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), and SPD (Serial Poll Disable)

Other Interface Messages

Listener address, talker address, and secondary commands are also considered interface messages.

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.

Responses to Interface Messages

Responses to Uni-Line Messages

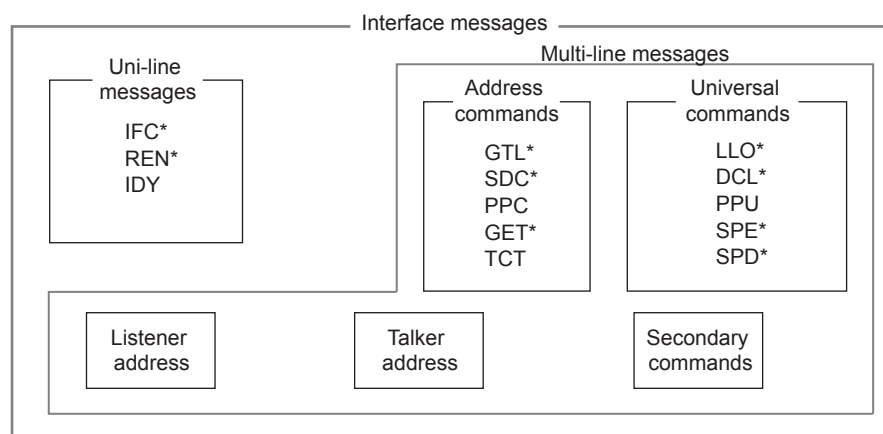
- **IFC**
Clears the talker and listener functions. Stops data transmission if it is in progress.
- **REN**
Switches between the remote and local modes.
- **IDY**
Not supported.

Responses to Multi-Line Messages (Address commands)

- **GTL**
Switches the instrument to local mode.
- **SDC**
 - Clears the program message (command) being received and the output queue (see section 13.3.6).
- **GET**
The same operation as the *TRG command.
- **PPC and TCT**
Not supported.

Responses to Multi-Line Messages (Universal commands)

- **LLO**
Disables the LOCAL key on the front panel to prohibit switching to local mode.
- **DCL**
The same operation as the SDC message.
- **SPE**
Sets the talker function on all devices on the bus to serial polling mode. The controller will poll each device in order.
- **SPD**
Clears the serial polling mode of the talker function on all devices on the bus.
- **PPU**
Not supported.



* Interface message that the GS200 supports

12.6 About the IEEE 488.2-1992 Standard

The GS200'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 "GP-IB Interface Specifications" on page 12-1.
- (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 address is set on the GP-IB Address menu (see section 12.3). 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.
The settings selected in section 9.3, "Selecting the Settings Applied at Power-On."
If you issue the RST common command, the GS200 always returns to the factory default settings.
- (5) Message exchange options
 - (a) Input buffer size
64 KB.
 - (b) Queries that return multiple response messages
See the example of the commands given in section 13.2.
 - (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 section 13.2.
- (6) Items that are included in the functional or composite header elements constituting a command
See sections 13.1 and 13.2.
- (7) Buffer sizes that affect block data transmission
The buffer size of block data is 2 MB.
- (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 section 13.2.
- (10) Communication between devices that do not follow the response syntax
Not supported.

12.6 About the IEEE 488.2-1992 Standard

- (11) Size of the response data block
2 MB maximum.
- (12) A list of supported common commands
See section 13.2.11, "Common Commands."
- (13) Device condition after a successful calibration
The settings return to the conditions that existed before the calibration, measurements are terminated, and previous measured data are invalidated.
- (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 13.2.11, "Common Commands."
- (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
*RST, *RCL, and *SAV
See section 13.2.11, "Common Commands."
*LRN?
This common command is not supported.
- (20) The extent of the self-test using the *TST? command
Performs a test that is equivalent to the self-test that is executed from the front panel. Returns 0 if successful, otherwise returns an error code.
The self-test consists of the RAM test, ROM test, and digital test.
- (21) The structure of the extended return status
See section 13.3.
- (22) Whether each command is processed in an overlapped manner or sequentially
All commands are sequential commands.
- (23) The description of the execution of each command
See the functional and procedural explanations given in chapters 1 to 12 and 14.

13.1 Program Format

13.1.1 Symbols Used in the Syntax

The following table contains the symbols that are used in the syntax discussed mainly in section 13.2. For details on the data, see pages 13-5 and 13-6.

Symbol	Meaning	Example
	Exclusive OR	SOURce:FUNCTION VOLTage CURRent Example SOURce:FUNCTION VOLTage
[]	Can be omitted	OUTPut[:STATe]
...	Can be repeated	

13.1.2 Messages

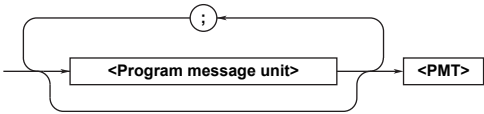
Messages

Messages are used to exchange information between the controller and the GS200. Messages that are sent from the controller to the GS200 are called program messages, and messages that are sent from the GS200 back to the controller are called response messages.

If a program message contains a message unit that requests a response (a query), the GS200 returns a response message upon receiving the program message. The GS200 returns a single response message in response to a single program message.

Program Messages

Data that is sent from the controller to the GS200 is called a program message. 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 GS200 executes the commands in the order that they are received.

Separate each program message unit with a semicolon.

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

Example

:SOURce:FUNCTION VOLTage;RANGe 100E-3<PMT>
Unit Unit

13.1 Program Format

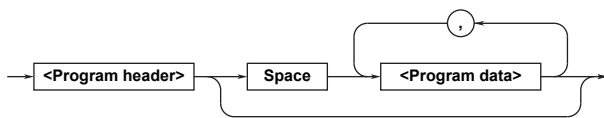
<PMT>

<PMT> is a program message terminator. The following three types of program terminators are available.

- **NL (New line)**
Same as LF (line feed). ASCII code "0AH."
- **^END**
The END message (EOI signal) as defined in IEEE488.1. (The data byte that is sent with the END message is the last data 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 page 13-3.

<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 page 13-5.

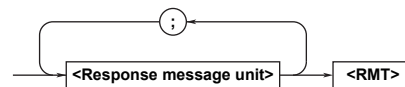
Example

```
:SOURce:FUNCTION VOLTage<PMT>
```

Header Data

Response Messages

Data that is sent from the GS200 to the controller is called a response message. The response message syntax is shown below.



<Response Message Unit>

A response message consists of one or more response message units; each response message unit corresponds to one response.

Separate each response message unit with a semicolon.

For details on the syntax of response message units, see the next section.

Example

```
:SOURce:FUNCTION VOLTage;RANGE 100E-3<RMT>
```

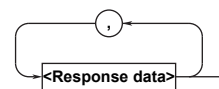
Unit Unit

<RMT>

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

Response Message Unit Syntax

The response message unit syntax is shown below.



<Response Header>

A response header sometimes precedes the response data. Separate the data from the header with a space.

For details, see page 13-5.

<Response Data>

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

Example

50.0E-3<RMT>

1,256<RMT>

VOLT<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 n^{th} response unit may not necessarily correspond to the n^{th} query. Therefore, if you want to make sure that every response is retrieved, divide the program messages into individual messages.

Precautions to Be Taken when Sending and Receiving Messages

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

Deadlock

The GS200 can store at least 64 KB 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 GS200 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 64 KB. Program messages that do not contain queries never cause deadlocks.

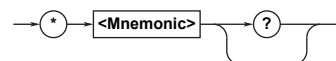
13.1.3 Commands

Commands

There are three types of commands (program headers) that a controller may send to the GS200. The commands differ in their program header formats.

Common Command Header

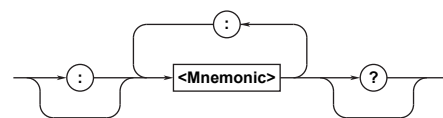
Commands that are defined in IEEE 488.2-1987 are called common commands. The common command header syntax is shown below. Be sure to include an asterisk (*) at the beginning of a common command.



Example *CLS

Compound Header

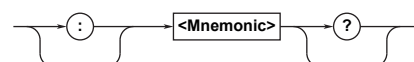
Commands, other than common commands, that are specific to the GS200 are classified and arranged in a hierarchy according to their functions. The compound header syntax is shown below. Be sure to use a colon to specify a lower hierarchical level.



Example :SOURCE:FUNCTION

Simple Header

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



Example :INITiate

Note

A <mnemonic> is an alphanumeric character string.

13.1 Program Format

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 Group of commands related to source

```
:SOURce:FUNctioN
:SOURce:RANGe
:SOURce:LEVel:FIX
:SOURce:LEVel:AUTO
:SOURce:PROTection:VOLTage
:SOURce:PROTection:CURRent
```

When Concatenating Commands of the Same Group

The GS200 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

```
:SOURce:FUNctioN VOLTage;
RANGe 100E-3<PMT>
```

When Concatenating Commands of Different Groups

If the subsequent command does not belong to the same group, place a colon in front of its header.

Example

```
:SOURce:FUNctioN VOLTage;;SENSe:
TRIGger READy<PMT>
```

When Concatenating Simple Headers

If a simple header follows another command, place a colon in front of the simple header.

Example

```
:SOURce:FUNctioN VOLTage;;INITiate<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;*CLS<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:
FUNctioN RANGe 100E-3<PMT>
```

Header Interpretation Rules

The GS200 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 of mnemonics 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
 OUTPut? is OUTP?.
- If the <x> (value) at the end of a mnemonic is omitted, it is interpreted as a 1.
Example If FILT is specified for FILTer<x>, it means FILTer1.
- Parts of commands and parameters enclosed in square brackets ([]) can be omitted.
Example OUTPut[:STATe] 1
 can be written as OUTPut 1.

13.1.4 Responses

When the controller sends a message unit that has a question mark in its program header (a query), the GS200 returns a response message to the query.

13.1.5 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:

Notation	Meaning Example
<Integer>	— 125 -1
<Fixed-point number>	— 125.0 -.90
<Floating-point number>	— 125.0E+0 -9E-1
<Value>	<Integer>, <Fixed-point number>, or <Floating-point number>
<Voltage>	A <Value> to which a voltage unit (V) can be attached. -1.25mV
<Current>	A <Value> to which a current unit (A) can be attached. -75.1E-2A
<Time>	A <Value> to which a time unit (S) can be attached. 360S
<Resistance>	A <Value> to which a resistance unit (ohm) can be attached. 4.7kohm
<Binary/Octal/Hexadecimal>	A binary number following #B, an octal number following #Q, or a hexadecimal number following #H. #B1101 #Q706 #H9F3C
<Character string>	A character string enclosed by double or single quotation marks. "Hello"

* In a <floating-point number>, the + sign after E can be omitted.

<Block Data>

<Block data> is any 8-bit data. It is only used in response messages on the GS200. The syntax is as follows:

Syntax Example

#N<N-digit decimal number><data byte sequence>
#800000010ABCDEFGHJIJ

- #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: ABCDEFGHJIJ).
- 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.

13.1 Program Format

<Multiplier>

The table below lists the <multipliers> that can be added after a <value>.

Symbol	Word	Multiplier
YO	Yotta	10 ²⁴
ZE	Zetta	10 ²¹
EX	Exa	10 ¹⁸
PE	Peta	10 ¹⁵
T	Tera	10 ¹²
G	Giga	10 ⁹
MA	Mega	10 ⁶
K	Kilo	10 ³
M	Milli	10 ⁻³
U	Micro	10 ⁻⁶
N	Nano	10 ⁻⁹
P	Pico	10 ⁻¹²
F	Femto	10 ⁻¹⁵
A	Atto	10 ⁻¹⁸
Z	Zepto	10 ⁻²¹
Y	Yocto	10 ⁻²⁴

13.2 Commands

13.2.1 List of Commands

Command	Function	Page
Output Commands (OUTPut group)		
:OUTPut		
[:STATe]/?	Sets or queries the output state (on/off).	13-10
Source Commands (SOURce group)		
:SOURce		
:FUNCTION/?	Sets or queries the source function (voltage/current).	13-11
:RANGe/?	Sets or queries the source range.	13-11
:LEVel		
[:FIX]/?	Sets or queries the source level in terms of the range that is being used.	13-11
:AUTO/?	Sets or queries the source level in terms of the most appropriate range.	13-12
:PROTection		
:VOLTage/?	Sets or queries the voltage limiter level.	13-12
:CURRent/?	Sets or queries the current limiter level.	13-12
Program Commands (PROGram group)		
:PROGram		
:REPeat		
[:STATe]/?	Sets or queries the program execution repetition mode (on/off).	13-13
:INTerval/?	Sets or queries the program execution timer's period.	13-13
:SLOPe/?	Sets or queries the program slope time.	13-13
:TRIGger/?	Sets or queries the program trigger.	13-13
:EDIT		
:START	Starts program memory editing.	13-13
:END	Ends program memory editing.	13-13
:SAVE	Saves the program memory as a program file.	13-13
:LOAD/?	Loads a program file into program memory.	13-13
:DELeTe	Deletes a program file.	13-14
:DEFine	Creates a program file.	13-14
:MEMory	Writes a program file to program memory.	13-14
:CATalog?	Queries the list of program files.	13-14
:RUN	Executes a program (RUN execution).	13-14
:STEP	Executes a program (STEP execution).	13-14
:HOLD	Pauses and resumes program execution.	13-14
:PAUSE	Pauses program execution.	13-14
:CONTinue	Resumes program execution.	13-14
:COUNT/?	Sets or queries the step that the current program begins execution at.	13-14
Measurement Commands (SENSe group)		
:SENSe		
[:STATe]/?	Sets or queries the measurement feature (on/off).	13-15
:NPLC/?	Sets or queries the measurement integration time in terms of PLC.	13-15
:DELay/?	Sets or queries the measurement delay time.	13-15
:TRIGger/?	Sets or queries the measurement trigger.	13-15
:INTerval/?	Sets or queries the measurement timer's period.	13-15
:NULL		
[:STATe]/?	Sets or queries the NULL computation feature (on/off).	13-15
:ZERO		
:EXECute	Executes measurement zero calibration.	13-16
:REMOte/?	Sets or queries the wiring system (on = 4W/off = 2W).	13-16
:GUARd/?	Sets or queries the guard state (on/off).	13-16

13.2 Commands

Command	Function	Page
Measured Value Read Commands (INITiate, FETCh, READ, and MEASure groups)		
:INITiate	Clears the measured value and prepares the GS200 to perform the next measurement.	13-17
:FETCh?	Queries the measured result.	13-17
:READ?	Clears the measured value, prepares the GS200 to perform the next measurement, and queries the measured result.	13-17
:MEASure?	Clears the measured value, prepares the GS200 to perform the next measurement, generates a measurement trigger, and queries the measured result.	13-17
Store/Recall Commands (TRACe group)		
:TRACe		
[:STATe]/?	Sets or queries the storage state (on/off).	13-18
:FILE		
:CREate/?	Sets or queries the result file generation feature (on/off).	13-18
:POINTs/?	Sets or queries the storage count.	13-18
:ACTual?	Queries the number of stored results.	13-18
:DATA		
:FORMat/?	Sets or queries the load format for stored data.	13-18
:ENDian/?	Sets or queries the byte order for when the load format for stored data is binary.	13-18
:READ? [TM SF SL MF ML]	Loads stored data.	13-19
:STATistics?	Loads statistical values for stored data.	13-19
External I/O Commands (ROUTe group)		
:ROUTe		
:BNCO/?	Sets or queries the output BNC signal.	13-20
:BNCI/?	Sets or queries the input BNC signal.	13-20
System Commands (SYSTem group)		
:SYSTem		
:SETup		
:SAVE	Saves setup data.	13-22
:LOAD	Restores setup data.	13-22
:DELeTe	Deletes a setup file.	13-22
:CATalog?	Queries the list of setup files.	13-22
:PON/?	Sets or queries the setup data at power-on.	13-22
:DISPlay		
[:STATe]/?	Sets or queries the display state (on/off).	13-21
:BRIGHt/?	Sets or queries the display brightness.	13-21
:TEXT/?	Displays or queries the user message.	13-21
:CLEAr	Clears the user message display.	13-21
:NORMal	Displays the main screen.	13-21
:BEEPer/?	Sets or queries the beep sound (on/off).	13-22
:CLOCK		
:TZONe/?	Sets or queries the time zone.	13-21
:DATE/?	Sets or queries the date.	13-21
:TIME/?	Sets or queries the time.	13-21
:ADJust	Corrects the time by ± 30 seconds.	13-22
:ERRor?	Queries and clears the most recent error information.	13-22
:LOCal	Switches the GS200 to local mode.	13-22
:REMote	Switches the GS200 to remote mode.	13-22
:LFRequency?	Queries the line frequency.	13-22

Command	Function	Page
Status Commands (STaTus group)		
:STaTus		
:CONDition?	Queries the condition register.	13-23
:EVENT?	Queries and clears the extended event register.	13-23
:ENABle/?	Sets or queries the extended event enable register.	13-23
:ERRor?	Queries and clears the most recent error information.	13-23
Common Commands		
*CLS	Clears the event register, extended event register, and error queue.	13-24
*IDN?	Queries the device information.	13-24
*OPT?	Queries the option information.	13-24
*RST	Initializes the settings.	13-24
*SAV	Saves setup data.	13-24
*RCL	Restores setup data.	13-24
*TRG	Generates a measurement trigger.	13-24
*TST?	Performs a self-test and queries the result.	13-24
*STB?	Queries the status byte.	13-24
*SRE/?	Sets or queries the service request enable register.	13-24
*ESR?	Queries and clears the standard event register.	13-24
*ESE/?	Sets or queries the standard event enable register.	13-24
*OPC	Generates a standard event OPC when all previous commands complete.	13-25
*OPC?	Returns 1 when all previous commands complete.	13-25

13.2.2 Output Commands (OUTPut group)

	:OUTPut[:STATe]/?	
Function	Sets or queries the output state (on/off).	
Syntax	:OUTPut[:STATe] 1 0 ON OFF	
	1 or ON	Turns the output on.
	0 or OFF	Turns the output off.
	:OUTPut[:STATe]?	
	→ 1	The output is on.
Example	→ 0	The output is off.
	:OUTP ON	
	:OUTP:STAT 0	
	:OUTP?	

13.2.3 Source Commands (SOURce group)

:SOURce:FUNCTION/?

Function	Sets or queries the source function (voltage/current).
Syntax	:SOURce:FUNCTION VOLTage CURRent
VOLTage	Sets the function to voltage.
CURRent	Sets the function to current.
:SOURce:FUNCTION?	
→ VOLT	The function being used is voltage.
→ CURR	The function being used is current.

Example :SOUR:FUNC VOLT
:SOUR:FUNC?

Description During program editing, this command sets or queries the current step's source function.

:SOURce:RANGe/?

Function	Sets or queries the source range.
Syntax	:SOURce:RANGe <voltage> <current> MINimum MAXimum UP DOWN
<voltage>	Specify a voltage range. The smallest range that includes the specified voltage is selected. You have to set the source function to voltage before sending this command.
<current>	Specify a current range. The smallest range that includes the specified current is selected. You have to set the source function to current before sending this command.
MINimum	Sets the range to the minimum range.
MAXimum	Sets the range to the maximum range.
UP	Increases the range by one level.
DOWN	Decreases the range by one level.
:SOURce:RANGe? [MINimum MAXimum]	
MINimum	→ The minimum range.
MAXimum	→ The maximum range.
→ 1E-3	The range that is being used is 1 mA.
→ 10E-3	The range that is being used is 10 mV or 10 mA.
→ 100E-3	The range that is being used is 100 mV or 100 mA.
→ 200E-3	The range that is being used is 200 mA.

→ 1E+0	The range that is being used is 1 V.
→ 10E+0	The range that is being used is 10 V.
→ 30E+0	The range that is being used is 30 V.

Example :SOUR:RANG 100E-3
:SOUR:RANG?

Description During program editing, this command sets or queries the current step's source range.

:SOURce:LEVel[:FIX]/?

Function	Sets or queries the source level in terms of the range that is being used.
Syntax	:SOURce:LEVel[:FIX] <voltage> <current> MINimum MAXimum
<voltage>	Specify a voltage level. You have to set the source function to voltage before sending this command.
<current>	Specify a current level. You have to set the source function to current before sending this command.
MINimum	Sets the level to the minimum value possible with the range that is being used.
MAXimum	Sets the level to the maximum value possible with the range that is being used.
:SOURce:LEVel[:FIX] ? [MINimum MAXimum]	
MINimum→	The minimum level possible with the range that is being used.
MAXimum→	The maximum level possible with the range that is being used.
→ <voltage> <current>	The source level that is being produced.

Example :SOUR:LEV 1.5
:SOUR:LEV?

Description During program editing, this command sets or queries the current step's source level. If you set the current step's source level, program editing will proceed to the next step.

13.2 Commands

:SOURce:LEVel:AUTO/?

Function	Sets or queries the source level in terms of the most appropriate range.	
Syntax	:SOURce:LEVel:AUTO <voltage> <current> MINimum MAXimum	
	<voltage>	Specify a voltage level. The source level is set to the smallest source range that includes the specified voltage. You have to set the source function to voltage before sending this command.
	<current>	Specify a current level. The source level is set to the smallest source range that includes the specified current. You have to set the source function to current before sending this command.
	MINimum	Sets the source range to the maximum range and the source level to the minimum value.
	MAXimum	Sets the source range to the maximum range and the source level to the maximum value.
	:SOURce:LEVel:AUTO? [MINimum MAXimum]	
	MINimum→	The minimum level.
	MAXimum→	The maximum level.
	→<voltage> <current>	The source level that is being produced.
Example	:SOUR:LEV:AUTO 1.5 :SOUR:LEV:AUTO?	
Description	During program editing, this command sets or queries the current step's source level. If you set the current step's source level, program editing will proceed to the next step.	

:SOURce:PROTection:VOLTagE/?

Function	Sets or queries the voltage limiter level.	
Syntax	:SOURce:PROTection:VOLTagE <voltage> MINimum MAXimum	
	<voltage>	Specify a voltage limiter level.
	MINimum	Sets the voltage limiter level to ± 1 V.
	MAXimum	Sets the voltage limiter level to ± 30 V.
	:SOURce:PROTection:VOLTagE? [MINimum MAXimum]	
	MINimum	→ +1E+0
	MAXimum	→ +30E+0
	→<voltage>	The voltage limiter level that is being used.
Example	:SOUR:PROT:VOLT 14 :SOUR:PROT:VOLT?	

:SOURce:PROTection:CURREnt/?

Function	Sets or queries the current limiter level.	
Syntax	:SOURce:PROTection:CURREnt <current> MINimum MAXimum	
	<current>	Specify a current limiter level.
	MINimum	Sets the current limiter level to ± 1 mA.
	MAXimum	Sets the current limiter level to ± 200 mA.
	:SOURce:PROTection:CURREnt? [MINimum MAXimum]	
	MINimum	→ +1E-3
	MAXimum	→ +200E-3
	→<current>	The current limiter level that is being used.
Example	:SOUR:PROT:CURR 13E-3 :SOUR:PROT:CURR?	

13.2.4 Program Commands (PROGram group)

:PROGram:REPeat[:STATe]/?

Function	Sets or queries the program execution repetition mode (on/off).	
Syntax	:PROGram:REPeat[:STATe] 1 0 ON OFF	
	1 or ON	Turns repetition mode on.
	0 or OFF	Turns repetition mode off.
	:PROGram:REPeat[:STATe] ?	
	→ 1	The repetition mode is currently on.
	→ 0	The repetition mode is currently off.
Example	:PROG:REP ON	
	:PROG:REP 0	
	:PROG:REP?	

:PROGram:INTerval/?

Function	Sets or queries the program execution timer's period.	
Syntax	:PROGram:INTerval <time> MINimum MAXimum	
	<time>	Specify a timer period.
	MINimum	Sets the timer period to 0.1 seconds.
	MAXimum	Sets the timer period to 3600.0 seconds.
	:PROGram:INTerval? [MINimum MAXimum]	
	MINimum	→ +0.1E+0
	MAXimum	→ +3600.0E+0
	→ <time>	The timer period that is being used.
Example	:PROG:INT 0.5	
	:PROG:INT?	

:PROGram:SLOPe/?

Function	Sets or queries the program slope time.	
Syntax	:PROGram:SLOPe <time> MINimum MAXimum	
	<time>	Specify a slope time.
	MINimum	Sets the slope time to 0.0 seconds.
	MAXimum	Sets the slope time to 3600.0 seconds.
	:PROGram:SLOPe? [MINimum MAXimum]	
	MINimum	→ +0.0E+0
	MAXimum	→ +3600.0E+0
	→ <time>	The slope time that is being used.
Example	:PROG:SLOP 0.5	
	:PROG:SLOP?	

:PROGram:TRIGger/?

Function	Sets or queries the program trigger.	
Syntax	:PROGram:TRIGger NORMal MEND	
	NORMal	Sets the trigger normal.
	MEND	Sets the trigger to measurement end.
	:PROGram:TRIGger?	
	→ NORM	The normal trigger is being used.
	→ MEND	The measurement end trigger is being used.
Example	:PROG:TRIG MEND	
	:PROG:TRIG?	
Description	This command is only valid on models with the /MON option.	

:PROGram:EDIT:STARt

Function	Starts program memory editing.	
Syntax	:PROGram:EDIT:STARt	
Example	:PROG:EDIT:STAR	
Description	Program memory is cleared the moment that you begin editing.	
	Use the :SOURce:FUNCTION, :SOURce:RANGE, :SOURce:LEVel[:FIX], and :SOURce:LEVel:AUTO commands to configure the program steps.	

:PROGram:EDIT:END

Function	Ends program memory editing.	
Syntax	:PROGram:EDIT:END	
Example	:PROG:EDIT:END	

:PROGram:SAVE

Function	Saves the program memory as a program file.	
Syntax	:PROGram:SAVE <character string>	
	<character string>	The name of the program file that you want to save.
Example	:PROG:SAVE "Test1.csv"	

:PROGram:LOAD/?

Function	Loads a program file into program memory.	
Syntax	:PROGram:LOAD <character string>	
	<character string>	The name of the program file that you want to load.
	:PROGram:LOAD?	
	→ <character string>	The name of the program file that has been loaded.
Example	:PROG:LOAD "Test1.csv"	
	:PROG:LOAD?	

13.2 Commands

: PROGram: DELeTe

Function Deletes a program file.
Syntax : PROGram:DELeTe <character string>
<character string> The name of the program file that you want to delete.
Example : PROG:DEL "Test1.csv"

: PROGram: DEFine

Function Creates a program file.
Syntax : PROGram:DEFine
<character string 1> ,
<character string 2> | <block data>
<character string 1> The name of the program file that you want to create.
<character string 2> The contents of the program file that you want to create.
<block data> The contents of the program file that you want to create.
Example : PROG:DEF "Test1.csv", "1.0,1.0,V"

: PROGram: MEMory

Function Writes a program file to program memory.
Syntax : PROGram:MEMory
<character string> | <block data>
<character string> The contents of the program file that you want to write to program memory.
<block data> The contents of the program file that you want to write to program memory.
Example : PROG:MEM "1.0,1.0,V"

: PROGram: CATalog?

Function Queries the list of program files.
Syntax : PROGram:CATalog?
→ <character string>, ... The list of program file names.
Example : PROG:CAT?

: PROGram: RUN

Function Executes a program (RUN execution).
Syntax : PROGram:RUN
Example : PROG:RUN

: PROGram: STEP

Function Executes a program (STEP execution).
Syntax : PROGram:STEP
Example : PROG:STEP

: PROGram: HOLD

Function Pauses and resumes program execution.
Syntax : PROGram:HOLD
Example : PROG:HOLD
Description If a program is running, this command pauses the program execution. If a program is paused, this command resumes the program execution.

: PROGram: PAUSE

Function Pauses program execution.
Syntax : PROGram:PAUSE
Example : PROG:PAUS
Description If this command is received while a program is paused, an error will occur.

: PROGram: CONTinue

Function Resumes program execution.
Syntax : PROGram:CONTinue
Example : PROG:CONT
Description If this command is received while a program is running, a sampling error will occur.

: PROGram: COUNT/?

Function Sets or queries the step that the current program begins execution at.
Syntax : PROGram:COUNt
<integer> | MINimum | MAXimum
<integer> Specify a step to begin execution at.
MINimum The step to begin execution at is set to step 1.
MAXimum The step to begin execution at is set to step 10000.
: PROGram:COUNt? [MINimum | MAXimum]
MINimum → 1
MAXimum → 10000
→ <integer> The step that is being executed.

Example : PROG:COUN 2
: PROG:COUN?

Description If you specify a step number that is outside of the range designated by 1 and the total number of steps that the specified program contains, an error will occur.

13.2.5 Measurement Commands (SENSe group)

:SENSe[:STATe]/?

Function Sets or queries the measurement feature (on/off).

Syntax :SENSe[:STATe] 1|0|ON|OFF
 1 or ON Turns the measurement feature on.
 0 or OFF Turns the measurement feature off.
 :SENSe[:STATe]?
 → 1 The measurement feature is on.
 → 0 The measurement feature is off.

Example :SENS ON
 :SENS:STAT 0
 :SENS?

Description This command is only valid on models with the /MON option.

:SENSe:NPLC/?

Function Sets or queries the measurement integration time in terms of PLC.

Syntax :SENSe:NPLC
 <integer>|MINimum|MAXimum
 <integer> Specify an integration time in terms of PLC.
 MINimum Sets the integration time to 1 PLC.
 MAXimum Sets the integration time to 25 PLC.
 :SENSe:NPLC? [MINimum|MAXimum]
 MINimum → 1
 MAXimum → 25
 → <integer> The integration time that is being used in terms of PLC.

Example :SENS:NPLC 10
 :SENS:NPLC?

Description This command is only valid on models with the /MON option. For details on PLC, see section 7.2.

:SENSe:DELAy/?

Function Sets or queries the measurement delay time.

Syntax :SENSe:DELAy
 <time>|MINimum|MAXimum
 <time> Specify a measurement delay time.
 MINimum Sets the measurement delay time to 0 ms.
 MAXimum Sets the measurement delay time to 999999 ms.
 :SENSe:DELAy? [MINimum|MAXimum]
 MINimum → +0E-3
 MAXimum → +999999E-3
 → <time> The delay time that is being used.

Example :SENS:DEL 0.5
 :SENS:DEL?

Description This command is only valid on models with the /MON option.

:SENSe:TRIGger/?

Function Sets or queries the measurement trigger.

Syntax :SENSe:TRIGger READy|TIMer|COMMunicate|IMMediate
 READy Sets the measurement trigger to the READY signal.
 TIMer Sets the measurement trigger to the measurement timer.
 COMMunicate Sets the measurement trigger to the *TRG communication command.
 IMMediate Sets the trigger to immediate.
 :SENSe:TRIGger?
 → READ The measurement trigger is the READY signal.
 → TIM The measurement trigger is the measurement timer.
 → COMM The measurement trigger is the *TRG communication command.
 → IMM The measurement trigger is immediate.

Example :SENS:TRIG IMM
 :SENS:TRIG?

Description This command is only valid on models with the /MON option.

:SENSe:INTERval/?

Function Sets or queries the measurement timer's period.

Syntax :SENSe:INTERval <time>|MINimum|MAXimum
 <time> Specify a timer period.
 MINimum Sets the timer period to 0.1 seconds.
 MAXimum Sets the timer period to 3600.0 seconds.
 :SENSe:INTERval? [MINimum|MAXimum]
 MINimum → +0.1E+0
 MAXimum → +3600.0E+0
 → <time> The timer period that is being used.

Example :SENS:INT 0.5
 :SENS:INT?

Description This command is only valid on models with the /MON option.

13.2 Commands

:SENSe:NULL[:STATe]/?

Function Sets or queries the NULL computation feature (on/off).

Syntax :SENSe:NULL[:STATe] 1|0|ON|OFF
1 or ON Turns the NULL computation feature on.
0 or OFF Turns the NULL computation feature off.
:SENSe:NULL[:STATe]?
→ 1 The NULL computation feature is on.
→ 0 The NULL computation feature is off.

Example :SENS:NULL ON
:SENS:NULL:STAT 0
:SENS:NULL?

Description This command is only valid on models with the /MON option.

:SENSe:ZERO:EXECute

Function Executes measurement zero calibration.

Syntax :SENSe:ZERO:EXECute

Example :SENS:ZERO:EXEC

Description This command is only valid on models with the /MON option.

:SENSe:REMOte/?

Function Sets or queries the wiring system (on = 4W/off = 2W).

Syntax :SENSe:REMOte 1|0|ON|OFF
1 or ON Sets the wiring system to remote sense (4W).
0 or OFF Sets the wiring system to local sense (2W).
:SENSe:REMOte?
→ 1 The wiring system being used is remote sense (4W).
→ 0 The wiring system being used is local sense (2W).

Example :SENS:REM ON
:SENS:REM 0
:SENS:REM?

:SENSe:GUARd/?

Function Sets or queries the guard state (on/off).

Syntax :SENSe:GUARd 1|0|ON|OFF
1 or ON Turns the guard state on.
0 or OFF Turns the guard state off.
:SENSe:GUARd?
→ 1 The guard state is on.
→ 0 The guard state is off.

Example :SENS:GUAR ON
:SENS:GUAR 0
:SENS:GUAR?

13.2.6 Measured Value Read Commands (INITiate, FETCh, READ, and MEASure groups)

The commands in this group are only valid on models with the /MON option.

:INITiate

Function Clears the measured value and prepares the GS200 to perform the next measurement.

Syntax :INITiate

Example :INIT

:FETCh?

Function Queries the measured result.

Syntax :FETCh?

→ <real number> The measured result.

Example :FETC?

:READ?

Function Clears the measured value, prepares the GS200 to perform the next measurement, and queries the measured result.

Syntax :READ?

→ <real number> The measured result.

Example :READ?

Description This command is the same as :INIT; :FETC?. If this command is received when the GS200 is not performing measurements, no result is returned.

:MEASure?

Function Clears the measured value, prepares the GS200 to perform the next measurement, generates a measurement trigger, and queries the measured result.

Syntax :MEASure?

→ <real number> The measured result.

Example :MEAS?

Description This command is the same as :INIT; *TRG; :FETC?.

13.2 Commands

13.2.7 Store/Recall Commands (TRACe group)

The commands in this group are only valid on models with the /MON option.

:TRACe[:STATe]/?

Function	Sets or queries the storage state (on/off).	
Syntax	:TRACe[:STATe] 1 0 ON OFF	
	1 or ON	Starts the storage operation.
	0 or OFF	Stops the storage operation.
	:TRACe[:STATe] ?	
	→ 1	The storage operation is in progress.
	→ 0	The storage operation is not in progress.
Example	:TRAC ON :TRAC:STAT 0 :TRAC?	

:TRACe:FILE:CREate/?

Function	Sets or queries the result file generation feature (on/off).	
Syntax	:TRACe:FILE:CREate 1 0 ON OFF	
	1 or ON	Turns the result file generation feature on.
	0 or OFF	Turns the result file generation feature off.
	:TRACe:FILE:CREate?	
	→ 1	The result file generation feature is on.
	→ 0	The result file generation feature is off.
Example	:TRAC:FILE:CRE ON :TRAC:FILE:CRE 0 :TRAC:FILE:CRE?	

:TRACe:POINts/?

Function	Sets or queries the storage count.	
Syntax	:TRACe:POINts <integer> MINimum MAXimum	
	<integer>	Specify a storage count.
	MINimum	Sets the storage count to 1.
	MAXimum	Sets the storage count to 10000.
	:TRACe:POINts? [MINimum MAXimum]	
	MINimum	→ 1
	MAXimum	→ 10000
	→ <integer>	The storage count that is being used.
Example	:TRAC:POIN 2 :TRAC:POIN?	

:TRACe:ACTual?

Function	Queries the number of stored results.	
Syntax	:TRACe:ACTual?	
	→ <integer>	The number of stored results.
Example	:TRAC:ACT?	

:TRACe:DATA:FORMat/?

Function	Sets or queries the load format for stored data.	
Syntax	:TRACe:DATA:FORMat ASCii BINary	
	ASCii	Sets the load format to ASCII.
	BINary	Sets the load format to binary.
	:TRACe:DATA:FORMat?	
	→ ASC	The load format that is being used is ASCII.
	→ BIN	The load format that is being used is binary.
Example	:TRAC:DATA:FORM BIN :TRAC:DATA:FORM?	

:TRACe:DATA:ENDian/?

Function	Sets or queries the byte order for when the load format for stored data is binary.	
Syntax	:TRACe:DATA:ENDian LITtle BIG	
	LITtle	Sets the byte order to little endian.
	BIG	Sets the byte order to big endian.
	:TRACe:DATA:ENDian?	
	→ LITtle	The byte order that is being used is little endian.
	→ BIG	The byte order that is being used is big endian.
Example	:TRAC:DATA:END BIG :TRAC:DATA:END?	

:TRACe:DATA:READ? [TM|SF|SL|MF|ML]

Function	Loads stored data.
Syntax	:TRACe:DATA:READ? [TM SF SL MF ML]
TM	Loads a timestamp.
SF	Loads the source function.
SL	Loads the source level.
MF	Loads the measurement function.
ML	Loads only the measured value.
	→ For each stored result that is contained in the stored data, the time stamp, source function, measurement function, source level, and measured value are returned in that order. Subsequent stored results are separated by the control code <CR><LF>.
Example	:TRAC:DATA:READ?
Description	<p>Stored data is loaded as described below. N represents the number of stored results. n represents an arbitrary stored result. 1 byte equals 1 octet.</p> <ul style="list-style-type: none"> • When the load format is ASCII <ul style="list-style-type: none"> • With no parameters <p>TM,SF,MF,SL,ML<CR><LF><ASCII data set 1>...<ASCII data set N></p> <p><ASCII data set n> consists of <time stamp n>,<source function n>,<measurement function n>,<source level n>,<measured result n>,<source level n>,<measured result n>, and there is a <CR><LF> between <ASCII data set n – 1> and <ASCII data set n>.</p> • With parameters <p>For example, if the parameter TM is specified: <time stamp 1>,...<time stamp N></p> • When the load format is binary <ul style="list-style-type: none"> • With no parameters <p>#8<data size><binary data set 1>...<binary data set N></p> <p><data size> represents the total number of bytes from <binary data set 1> to <binary data set N> in 8 digits. For example, 24 bytes is represented as "00000024."</p> <p><binary data set n> consists of <time stamp n>,<source function n>,<measurement function n>,<source level n>,<measured result n>,<source level n>,<measured result n>, where</p> <p><time stamp n> is an IEEE754 double-precision, 8-byte floating-point number</p> <p><source function n> is one byte of data: 0 for voltage and 1 for current</p> <p><measurement function n> is one byte of data: 0 for voltage and 1 for current</p>

<source level n> is

an IEEE754 double-precision, 8-byte floating-point number

<measured value n> is

an IEEE754 double-precision, 8-byte floating-point number

- With parameters

For example, if the parameter TM is specified:

#8<time size><time stamp 1>...<time stamp n>

<data size> represents the total number of bytes from <time stamp 1> to <time stamp N> in 8 digits. For example, 24 bytes is represented as "00000024."

If this command is received when the storage operation is in process, "NONE" is returned.

:TRACe:DATA:STATistics?

Function	Loads statistical values for stored data.
Syntax	:TRACe:DATA:STATistics?
	→ MIN,MAX,MEAN,STDDEV<CR><LF><real number>,<real number>,<real number>,<real number>
	Returns the statistical values in the following order: minimum value, maximum value, mean, and standard deviation.
	If there is no stored data, "NAN,NAN,NAN,NAN" is returned.
Example	:TRAC:DATA:STAT?

13.2.8 External I/O Commands (ROUTe group)

:ROUTe:BNCO/?

Function	Sets or queries the output BNC signal.	
Syntax	:ROUTe:BNCO TRIGger OUTPut READy	
	TRIGger	Sets the output BNC signal to the program trigger signal.
	OUTPut	Sets the output BNC signal to the output state signal.
	READy	Sets the output BNC signal to the READY signal.
	:ROUTe:BNCO?	
	→ TRIG	The output BNC signal is the program trigger signal.
	→ OUTP	The output BNC signal is the output state signal.
	→ READ	The output BNC signal is the READY signal.
Example	:ROUT:BNCO READ	
	:ROUT:BNCO?	

:ROUTe:BNCI/?

Function	Sets or queries the input BNC signal.	
Syntax	:ROUTe:BNCI TRIGger OUTPut	
	TRIGger	Sets the input BNC signal to the program trigger signal.
	OUTPut	Sets the input BNC signal to the output state signal.
	:ROUTe:BNCI?	
	→ TRIG	The input BNC signal is the program trigger signal.
	→ OUTP	The input BNC signal is the output state signal.
Example	:ROUT:BNCI OUTP	
	:ROUT:BNCI?	

13.2.9 System Commands (SYSTem group)

:SYSTem:SETup:SAVE

Function Saves setup data.
 Syntax :SYSTem:SETup:SAVE <character string>
 <character string> The name of the setup data
 file that you want to save.
 Example :SYST:SET:SAVE "XY_Test.txt"

:SYSTem:SETup:LOAD

Function Restores setup data.
 Syntax :SYSTem:SETup:LOAD <character string>
 <character string> The name of the setup data
 file that you want to restore.
 Example :SYST:SET:LOAD "XY_Test.txt"

:SYSTem:SETup:DELeTe

Function Deletes a setup file.
 Syntax :SYSTem:SETup:DELeTe <character string>
 <character string> The name of the setup file
 that you want to delete.
 Example :SYST:SET:DEL "XY_Test.txt"

:SYSTem:SETup:CATalog?

Function Queries the list of setup files.
 Syntax :SYSTem:SETup:CATalog?
 → <character string>,...The list of setup file
 names.
 Example :SYST:SET:CAT?

:SYSTem:SETup:PON/?

Function Sets or queries the setup data at power-on.
 Syntax :SYSTem:SETup:PON <character string>
 <character string> The name of the setup file
 to load at power-on.
 :SYSTem:SETup:PON?
 → <character string> The name of the setup
 file that is being loaded at
 power-on.
 Example :SYST:SET:PON "XY_Test.txt"
 :SYST:SET:PON?

:SYSTem:DISPlay[:STATe]/?

Function Sets or queries the display state (on/off).
 Syntax :SYSTem:DISPlay[:STATe] 1|0|ON|OFF
 1 or ON Turns the display on.
 0 or OFF Turns the display off.
 :SYSTem:DISPlay[:STATe]?
 → 1 The display is on.
 → 0 The display is off.
 Example :SYST:DISP ON
 :SYST:DISP:STAT 0
 :SYST:DISP?

:SYSTem:DISPlay:BRIGht/?

Function Sets or queries the display brightness.
 Syntax :SYSTem:DISPlay:BRIGht <integer>|MINim
 um|MAXimum|UP|DOWN
 <integer> Specify a brightness level
 from 1 to 4.
 MINimum Sets the brightness level to
 1 (brightest).
 MAXimum Sets the brightness level to
 4 (darkest).
 UP Increases the brightness
 level by 1.
 DOWN Decreases the brightness
 level by 1.
 :SYSTem:DISPlay:BRIGht? [MINimum|
 MAXimum]
 MINimum → 1
 MAXimum → 4
 → <integer> The current display
 brightness.
 Example :SYST:DISP:BRIG 4
 :SYST:DISP:BRIG?

:SYSTem:DISPlay:TEXT/?

Function Displays or queries the user message.
 Syntax :SYSTem:DISPlay:TEXT <character string>
 <character string> Specify the user message.
 :SYSTem:DISPlay:TEXT?
 → <character string> The user message that is
 currently displayed.
 Example :SYST:DISP:TEXT "User Message"
 :SYST:DISP:TEXT?

:SYSTem:DISPlay:TEXT:CLEAr

Function Clears the user message display.
 Syntax :SYSTem:DISPlay:TEXT:CLEAr
 Example :SYST:DISP:TEXT:CLE

:SYSTem:DISPlay:NORMal

Function Displays the main screen.
 Syntax :SYSTem:DISPlay:NORMal
 Example :SYST:DISP:NORM

13.2 Commands

:SYSTem:BEEPer/?

Function Sets or queries the beep sound (on/off).
 Syntax :SYSTem:BEEPer 1|0|ON|OFF
 1 or ON Enables the beep sound.
 0 or OFF Disables the beep sound.
 :SYSTem:BEEPer?
 → 1 The beep sound is enabled.
 → 0 The beep sound is disabled.
 Example :SYST:BEEP ON
 :SYST:BEEP 0
 :SYST:BEEP?

:SYSTem:CLOCK:TZONE/?

Function Sets or queries the time zone.
 Syntax :SYSTem:CLOCK:TZONE <character string>
 <character string> Specify the time difference from GMT as a character string in the format "h:m."
 h = hours (-12 to 13)
 m = minutes (0 to 59)
 :SYSTem:CLOCK:TZONE?
 → <character string> The time difference from GMT that is being used as a character string in the format "h:m."
 Example :SYST:CLOCK:TZONE "9:00"
 :SYST:CLOCK:TZONE?

:SYSTem:CLOCK:DATE/?

Function Sets or queries the date.
 Syntax :SYSTem:CLOCK:DATE <character string>
 <character string> Specify the date as a character string in the format "y/m/d."
 y = year (2001 to 2099)
 m = month (1 to 12)
 d = day (1 to 31)
 :SYSTem:CLOCK:DATE?
 → <character string> The date as a character string in the format "y/m/d."
 Example :SYST:CLOCK:DATE "2009/12/24"
 :SYST:CLOCK:DATE?

:SYSTem:CLOCK:TIME/?

Function Sets or queries the time.
 Syntax :SYSTem:CLOCK:TIME <character string>
 <character string> Specify the time as a character string in the format "h:m:s."
 h = hours (0 to 23)
 m = minutes (0 to 59)
 s = seconds (0 to 59)
 :SYSTem:CLOCK:TIME?
 → <character string> The time as a character string in the format "h:m:s."
 Example :SYST:CLOCK:TIME "12:34:56"
 :SYST:CLOCK:TIME?

:SYSTem:CLOCK:ADJust

Function Corrects the time by ± 30 seconds.
 Syntax :SYSTem:CLOCK:ADJust
 Example :SYST:CLOCK:ADJ

:SYSTem:ERRor?

Function Queries and clears the most recent error information.
 Syntax :SYSTem:ERRor?
 → <integer>,<character string> The error code and error message.
 Example :SYST:ERR?

Description This command is the same as :STATus:ERRor?.

:SYSTem:LOCal

Function Switches the GS200 to local mode.
 Syntax :SYSTem:LOCal?
 Example :SYST:LOC?

:SYSTem:REMote

Function Switches the GS200 to remote mode.
 Syntax :SYSTem:REMote?
 Example :SYST:REM?

:SYSTem:LFRrequency?

Function Queries the line frequency.
 Syntax :SYSTem:LFRrequency?
 → 50 The line frequency is 50 Hz.
 → 60 The line frequency is 60 Hz.
 Example :SYST:LFR?

13.2.10 Status Commands (STATus group)

:STATus:CONDition?		
Function	Queries the condition register.	
Syntax	:STATus:CONDition?	
	→ <integer>	The current value of the condition register.
Example	:STAT:COND?	
 :STATus:EVENT?		
Function	Queries and clears the extended event register.	
Syntax	:STATus:EVENT?	
	→ <integer>	The current value of the extended event register.
Example	:STAT:EVENT?	
 :STATus:ENABle/?		
Function	Sets or queries the extended event enable register.	
Syntax	:STATus:ENABle?<integer>	
	<integer>	Specify an integer from 0 to 65535.
	:STATus:ENABle?	
	→ <integer>	The current value of the extended event enable register.
Example	:STAT:ENAB 7	
	:STAT:ENAB?	
 :STATus:ERRor?		
Function	Queries and clears the most recent error information.	
Syntax	:STATus:ERRor?	
	→ <integer>,<character string>	The error code and error message.
Example	:STAT:ERR?	
Description	This command is the same as :SYSTem:ERRor? .	

13.2.11 Common Commands

***CLS**

Function Clears the event register, extended event register, and error queue.

Syntax *CLS

Example *CLS

***IDN?**

Function Queries the device information.

Syntax *IDN?
→ <character string> Device information in the following format:
"manufacturer,model
name,serial
number,firmware version."

Example *IDN?

***OPT?**

Function Queries the option information.

Syntax *OPT?
→ <character string> The option code.

Example *OPT?

Description If this command is received by models with no options installed, "NONE" is returned.

***RST**

Function Initializes the settings.

Syntax *RST

Example *RST

Description For information on the initial values, see appendix 1, "Factory Default Settings."

***SAV**

Function Saves setup data.

Syntax *SAV 1|2|3|4
1 Saves the setup data to "Setup01.txt."
2 Saves the setup data to "Setup02.txt."
3 Saves the setup data to "Setup03.txt."
4 Saves the setup data to "Setup04.txt."

Example *SAV 2

***RCL**

Function Restores setup data.

Syntax *RCL 1|2|3|4
1 Restores setup data from "Setup01.txt."
2 Restores setup data from "Setup02.txt."
3 Restores setup data from "Setup03.txt."
4 Restores setup data from "Setup04.txt."

Example *RCL 2

***TRG**

Function Generates a measurement trigger.

Syntax *TRG

Example *TRG

Description This command is only valid on models with the /MON option.

***TST?**

Function Performs a self-test and queries the result.

Syntax *TST?
→ 0 Normal completion.
→ 1 RAM test failed.
→ 2 ROM test failed.
→ 3 RAM test and ROM test failed.
→ 4 CPU board test failed.
→ 5 RAM test and CPU board test failed.
→ 6 ROM test and CPU board test failed.
→ 7 RAM test, ROM test, and CPU board test failed.

Example *TST?

***STB?**

Function Queries the status byte.

Syntax *STB?
→ <character string> The current status byte value.

Example *STB?

***SRE/?**

Function Sets or queries the service request enable register.

Syntax *SRE <integer>
<integer> Specify an integer from 0 to 255.
*SRE?
→ <integer> The current value of the service request enable register.

Example *SRE 3

*SRE?

***ESR?**

Function Queries and clears the standard event register.

Syntax *ESR?
→ <integer> The current value of the standard event register.

Example *ESR?

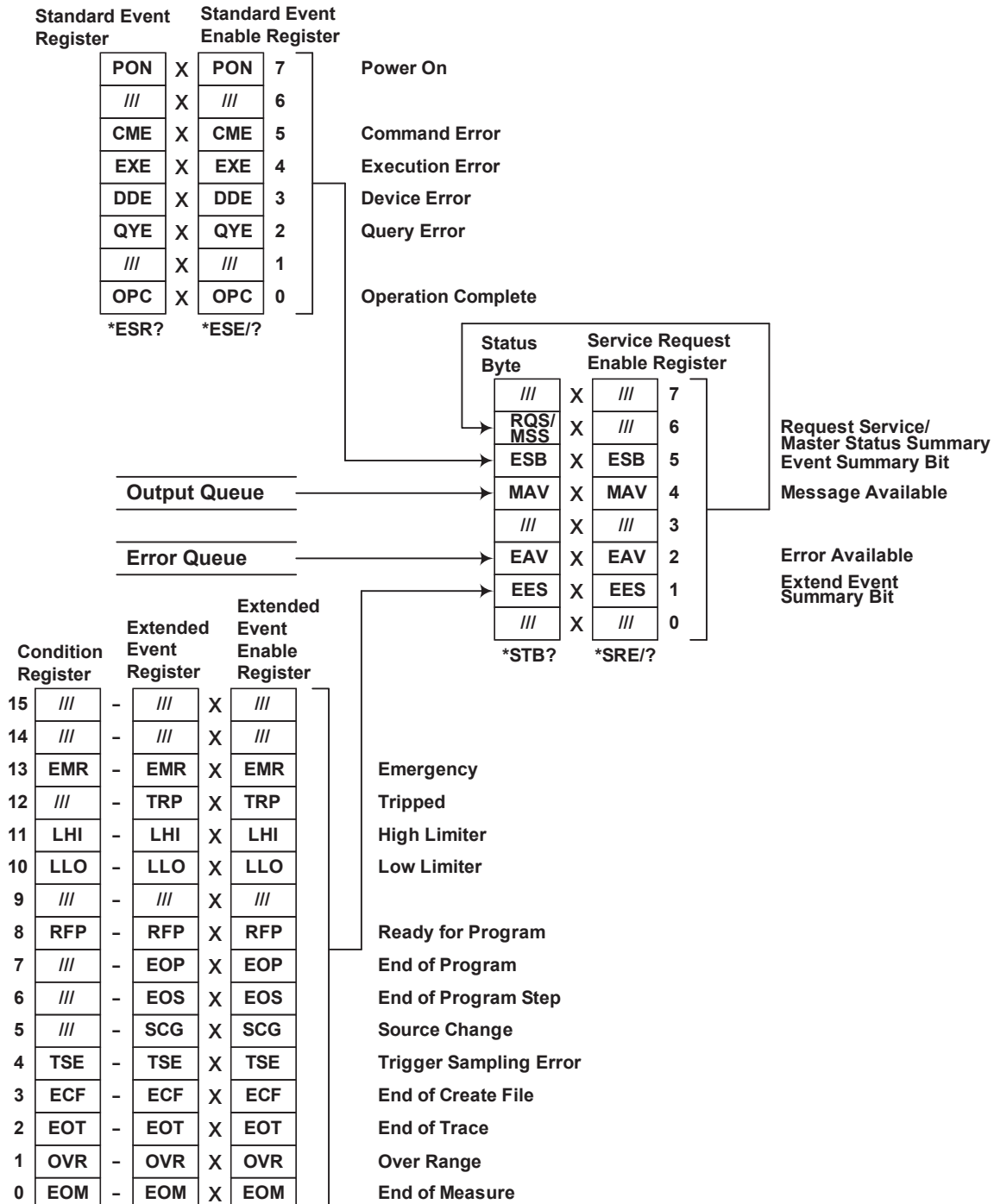
*ESE/?		
Function	Sets or queries the standard event enable register.	
Syntax	*ESE <integer>	Specify an integer from 0 to 255.
	<integer>	
	*ESE?	
	→ <integer>	The current value of the standard event enable register.
Example	*ESE 6	
	*ESE?	
*OPC		
Function	Generates a standard event OPC when all previous commands complete.	
Syntax	*OPC?	
Example	*OPC?	
*OPC?		
Function	Returns 1 when all previous commands complete.	
Syntax	*OPC?	
	→ 1	
Example	*OPC?	

13.3 Status Reports

13.3.1 Status Reports

Status Reports

The figure below shows the format of status reports that are read by serial polling. This status report format is an extended version of the status report format defined in IEEE 488.2-1992.



:STAT:COND? :STAT:EVEN? :STAT:ENAB/?

Overview of Registers and Queues

Name	Function	Write	Read
Status byte		—	Serial polling (RQS), *STB? (MSS)
Service request enable register	Status byte mask	*SRE	*SRE?
Standard event register	Indicates device status changes	—	*ESR?
Standard event enable register	Standard event register mask	*ESE	*ESE?
Extended event register	Indicates device status changes	—	:STATus:EVENT?
Extended event enable register	Extended event register mask	:STATus:ENABle	:STATus:ENABle?
Condition register	Current device status	—	:STATus:CONDition?
Output queue	Stores response messages for queries	Query commands	Same as left
Error queue	Stores error codes and error messages	—	:STATus:ERRor? :SYSTem:ERRor?

Registers and Queues That Affect the Status Byte

The following registers affect the status byte bits.

Register	Affected Status Byte Bit
Standard event register	Bit 5 (ESB)
Output queue	Bit 4 (MAV)
Error queue	Bit 2 (EAV)
Extended event register	Bit 1 (EES)

Enable Registers

The following registers are used to mask a bit so that the bit will not affect the status byte even when it is set to 1.

Masked Register	Mask Register
Status byte	Service request enable register
Standard event register	Standard event enable register
Extended event register	Extended event enable register

Reading and Writing to Registers

For example, use the *ESE command to set the standard event enable register bits to 1 and 0. Use the *ESR? command to query whether the standard event register bits are 1 or 0. For details on these commands, see section 13.2.11.

13.3.2 Status Byte

Status Byte

	RQS						
7	6	5	4	3	2	1	0
	MSS	ESB	MAV		EAV	EES	

Bits 0, 3, and 7

Not used (always 0)

Bit 1 EES (Extended 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. For details, see page 13-30.

Bit 2 EAV (Error Available)

This bit is set to 1 when the error queue is not empty.
For details, see page 13-31.

Bit 4 MAV (Message Available)

This bit is set to 1 when the output queue is not empty.
For details, see page 13-31.

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. For details, see page 13-29.

Bit 6 RQS (Request Service)/MSS (Master Status Summary)

This bit is set to 1 when the logical AND of the status byte excluding bit 6 and the service request enable register is 1. RQS is set to 1 when the MSS bit changes from 0 to 1 and is cleared when serial polling is carried out or when the MSS bit changes to 0.

Bit Masking

To mask a bit in the status byte so that it does not cause an SRQ, set the corresponding bit of the service request enable register to 0.

For example, to mask bit 2 (EAV) so that service is not requested when an error occurs, set bit 2 of the service request enable register to 0. Do this using the `*SRE` command. To query whether each bit of the service request enable register is 1 or 0, use `*SRE?`. For details on the `*SRE` command, see section 13.2.11.

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 GS200 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 also be cleared if the *CLS command is received just after a program message terminator.

13.3.3 Standard Event Register

Standard Event Register

7	6	5	4	3	2	1	0
PON		CME	EXE	DDE	QYE		OPC

Bits 1 and 6

Not used (always 0)

Bit 0 OPC (Operation Complete)

After the GS200 receives the *OPC command (see section 13.2.11), this bit is set to 1 when the operation specified by the *OPC command completes.

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.

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 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.

Bit 5 CME (Command Error)

This bit is set to 1 when there is a command syntax error.

Bit 7 PON (Power On)

This bit is set to 1 when the GS200 turns on.

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 section 13.2.11.

Standard Event Register Operation

The standard event register indicates six types of events that occur inside the GS200. When one of the bits in this register is 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 GS200 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 GS200 is restarted.

13.3.4 Extended Event Register

Extended Event Register

Condition Register
:STATus:CONDition?

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
		EMR		LHI	LLO		RFP				TSE	ECF	EOT	OVR	EOM

Extended Event Register
:STATus:EVENT?

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
		EMR	TRP	LHI	LLO		RFP	EOP	EOS	SCG	TSE	ECF	EOT	OVR	EOM

Each bit in the extended event register that has a corresponding bit in the condition register is set to 1 when the corresponding bit in the condition register changes from 0 to 1.

Bits 9, 14, and 15

Not used (always 0)

Bit 0 EOM (End of measure)

The condition register bit is set to 0 when the GS200 is performing measurement and set to 1 when the GS200 is not performing measurement.

Bit 1 OVR (Over range)

The condition register bit is set to 1 when the measured result is outside of the allowable range and set to 0 when the measured result is within the allowable range.

Bit 2 EOT (End of trace)

The condition register bit is set to 0 when the GS200 is performing storage and set to 1 when the GS200 is not performing storage.

Bit 3 ECF (End of create file)

The condition register bit is set to 0 when GS200 is creating the storage result file and set to 1 when the GS200 is not creating the storage result file.

Bit 4 TSE (Trigger sampling error)

The condition register bit is set to 0 when there is a trigger sampling error and set to 1 when there are no trigger sampling errors.

Bit 5 SCG (Source change)

The extended event register bit is set to 1 when the GS200's source value changes.

Bit 6 EOS (End of program step)

The extended event register bit is set to 1 when a program step completes execution.

Bit 7 EOP (End of program)

The extended event register bit is set to 1 when a program completes execution.

Bit 8 RFP (Ready for program)

The condition register bit is set to 0 when the GS200 is getting ready to execute a program and set to 1 when the GS200 is not getting ready to execute a program.

Bit 10 LLO (Low limiter)

The condition register bit is set to 1 when the GS200's low limiter has activated and is set to 0 when the GS200's low limiter has not activated.

Bit 11 LHI (High limiter)

The condition register bit is set to 1 when the GS200's high limiter has activated and set to 0 when the GS200's high limiter has not activated.

Bit 12 TRP (Tripped)

The extended event register bit is set to 1 when the GS200 output trips.

Bit 13 EMR (Emergency)

The condition register bit is set to 1 when an abnormal temperature has been detected and the GS200 needs to be turned off.

Bit Masking

To mask a certain bit of the extended event register so that it does not cause bit 1 (ESS) in the status byte to change, set the corresponding bit of the extended event enable register to 0. Do this using the :STATus:ENABLE command.

Extended Event Register and Condition Register Operation

The extended event register indicates thirteen types of events that occur inside the GS200. When one of the bits in this register is 1 (and the corresponding bit of the extended event enable register is also 1), bit 1 (EES) in the status byte is set to 1.

Example

1. A program completes execution.
2. Bit 7 (EOP) is set to 1.
3. When bit 7 of the extended event enable register is 1, bit 1 (EES) in the status byte is set to 1.

You can also check what type of event occurred in the GS200 by reading the contents of the extended event register.

The condition register indicates nine types of events that occur inside the GS200. You can check the internal condition of the GS200 by reading the contents of the condition register.

Reading the Extended Event Register and Condition Register

You can use the `:STATus:EVENT?` command to read the contents of the extended event register. The register is cleared after it is read. You can use the `:STATus:CONDition?` command to read the contents of the condition register. The register does not change even if it is read.

Clearing the Extended Event Register

The extended event register is cleared in the following three cases.

- When the contents of the extended event register are read using the `:STATus:EVENT?` command.
- When a `*CLS` command is received
- When the GS200 is restarted.

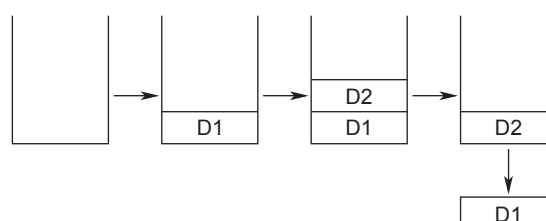
13.3.5 Output Queue and Error Queue

Output Queue

The output queue stores query response messages. As shown below, data is 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 page 13-3).
- When a device clear command (DCL or SDC) is received.
- When the GS200 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 GS200 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 GS200 displays the error message. You can use the `:SYSTem: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 GS200 is restarted.

You can determine whether or not the error queue is empty by checking bit 2 (EAV) in the status byte.

14.1 Troubleshooting

- For the appropriate corrective actions when an error code is shown on the display, see section 14.2.
- If servicing is necessary or the GS200 does not operate properly even after you have performed the corrective actions described below, contact your nearest YOKOGAWA dealer.

Problem	Probable Cause	Corrective Action	Refer to Section
The GS200 does not turn on.	Using a power supply outside the ratings.	Use a correct power supply.	3.3
The GS200 does not start properly	The setup file is corrupt.	If the GS200 does not start properly even after you restart it, hold down the ESC and +/- keys while you turn the power on. The GS200 formats the GS200ROM disk to enable startup. If the GS200 still does not start correctly, servicing is required.	
Nothing is displayed.	The display is turned off.	If the NUM LOCK key is blinking, the display is turned off. Press any key.	9.4
Keys do not work.	The GS200 is in remote mode.	The GS200 is in remote mode when the remote indicator is illuminated. Press the ESC key to switch the GS200 to local mode.	—
	Other causes.	If a certain key does not work, it may be due to a bad connection. Perform the self test's key test. If there are keys that you cannot operate, servicing is required.	14.3
The USB storage feature does not work.	The GS200ROM disk is corrupt.	If only the GS200RAM disk appears on your PC, the GS200ROM disk may be corrupt. Format the disk.	4.4
	The drive has been assigned the same drive letter as another drive on the PC.	Use a management tool on the PC to assign the drive a unique drive letter.	—
	The PC does not support the USB mass storage class.	The USB storage feature is valid on Windows PCs. Check that the GS200 is detected in Device Manager.	—
Files written from a PC cannot be viewed on the GS200.	The file was only written to the PC cache memory.	Carry out the "Safely Remove Hardware" procedure on the PC to make sure that the cache is written to the storage device.	—
The source level or measured value is strange.	Insufficient warm-up.	Warm up the GS200 for 60 minutes after turning on the power.	—
	The ambient temperature is fluctuating.	Use the GS200 in a stable environment that meets the specifications.	—
	The signal contains noise.	Use the GS200 in an environment free of noise. Exercise caution especially when handling minute voltage or current.	3.5
	The GS200 is oscillating.	Check whether the load is within the allowable range. Use twisted-pair wires for wiring.	3.5
	The connection is not correct.	In the case of a four-terminal connection, check that the connection is correct. Note that in the case of a two-terminal connection, the lead wire resistance and contact resistance have an effect on the GS200 when the output current is large.	3.5
The output turns off and the error message "An abnormal load is connected" is displayed.	A load that is outside of the specifications is connected.	Connect a load that is within the specifications.	3.1

14.1 Troubleshooting

Problem	Probable Cause	Corrective Action	Refer to Section
"Abnormal Temperature" is displayed.	The vent or inlet holes are blocked.	Provide adequate space around the GS200.	3.1, 3.2
Unable to save data to the disk.	No free space on the disk.	Delete unneeded files or format the disk.	4.4
Unable to use the communication interface to set the GS200.	Communication settings on the GS200 and PC do not match.	Match the GS200's communication settings with those on the PC.	Chapters 10 to 12

14.2 Error Code Descriptions and Corrective Actions

The following two types of messages can appear in the center of the display or the error log view.

- Error messages (Error)
Error messages are displayed when an inappropriate operation is carried out.
- Confirmation messages
Confirmation messages are not entered in the error queue, but they are displayed in the error log.

Syntax Errors (–100 to –199)

Error No.	Error Message	Corrective Action	Page
–100	Command error	Check whether the command string is incorrect.	—
–101	Invalid_character	Check whether invalid characters such as \$ or & are used in the command header or parameters.	—
–102	Syntax_error	Check that the syntax is correct.	—
–103	Invalid separator	Check the use of the separator (comma).	—
–106	Parameter not allowed	Check the command and the number of parameters.	—
–107	Missing parameter	Check the command and the number of parameters.	—
–113	Undefined header	Check the command mnemonic.	—
–121	Invalid character in number	Check that the notation of the numeric parameter is correct (for example, binary notation should not contain characters other than 0 and 1).	13-5
–123	Exponent too large	Check whether the exponent is within the range of –127 to 127.	—
–128	Numeric data not allowed	Check the parameter format.	—
–131	Invalid suffix	Check the unit that can be used for the parameter.	—
–138	Suffix not allowed	Check the parameter format.	—
–141	Invalid character data	Check the character data that can be used for the parameter.	—
–148	Character data not allowed	Check the command and parameter format.	—
–150	String data error	Check that all strings have closing quotation marks (" or ').	—
–151	Invalid string data	Check that string parameters are in the correct format.	—
–158	String data not allowed	Check the command and parameter format.	—
–160	Block data error	Check that block data is correct.	—
–161	Invalid block data	Check that block data is in the correct format.	—
–168	Block data not allowed	Check the command and parameter format.	—
–170	Expression error	Check the command and parameter format.	—
–178	Expression data not allowed	Check the command and parameter format.	—

14.2 Error Code Descriptions and Corrective Actions

Execution Errors (–200 to –299)

Error No.	Error Message	Corrective Action	Page
–203	Command Protected	Check the command mnemonic.	—
–220	Parameter error	Check the length of each parameter.	—
–222	Data out of range	Check the range of the parameters. If the command can use MINimum or MAXimum for its parameters, the range can also be queried.	—
–224	Illegal parameter	Check the parameter format.	—
–250	Mass storage error	Format the ROM disk. If you cannot format the disk, servicing is necessary.	4-8
–256	Filename not found	Check that the file exists. You can also use the CAtalog? command to query the list of files.	13-14, 13-21
–284	Program currently running	Stop the program that is currently running.	—
–285	Program syntax error	Check that the program file is in the correct format.	2-13
–286	Program runtime error	You cannot stop a program that has already been stopped.	6-12

Device Errors (–300 to –399)

Error No.	Error Message	Corrective Action	Page
–311	Memory error	Restart the GS200. If the error still appears, servicing is necessary.	—
–320	Storage fault	Format the disk. If you cannot format the disk, servicing is necessary.	4-8
–350	Queue overflow	Use :SYSTem:ERRor? to read the error, or use *CLS to clear the error queue.	13-22, 13-24

Query Errors (–400 to –499)

Error No.	Error Message	Corrective Action	Page
–410	Query INTERRUPTED	Check the transmission and reception order.	13-3

Instrument Errors (100 and higher)

Error No.	Error Message	Corrective Action	Page
100	Program is not defined	Select a different program file, or edit the program, and then run it.	6-5
101	Program is not being edited	You can only end program editing when a program is being edited.	6-5
103	Program is being edited	You cannot change GS200 settings or run a program when a program is being edited.	6-5
104	Illegal file	Check that the file is correct.	6-9, 9-2,
105	CSV format may be incorrect	Check the CSV-format setting.	9-6
106	Trigger source is M.End	When the trigger is M.End, you cannot use RUN and STEP to perform program execution.	6-4
107	Stopped because function has changed	Change the source function to match the program, and execute the program again.	6-5
108	Turn OUTPUT on to execute program	Turn output on to execute the program.	6-12
109	Illegal calibration	Servicing is necessary.	—
110	Illegal program function	Make sure that a program only contains the same functions.	—
111	Illegal zero calibration	Servicing is necessary.	—
200	Power-on setup lost	There is no setup file. Specify the setup file correctly.	9-4
201	Failed to read serial number	Restart the GS200. If the error still appears, servicing is necessary.	—
202	Failed to read system parameters	Settings such as the communication settings have been reset to the factory default settings, so set them back to the correct settings. If the same error continues to appear, servicing is required.	—
203	Cannot save file	Check that there is data to save and that the file is not set to read-only.	9-2
204	Cannot load file	Check that there is a file to load and that the contents of the file are correct.	9-2
205	Cannot delete file	Check that there is a file to delete and that the file is not set to read-only.	9-2
300	An abnormal load is connected	Connect a load that is within the specifications.	—
303	Low battery	Request to have the battery replaced, because the timestamp when creating files will not be correct.	—
304	Failed to detect the line frequency	Make sure that the power source is stable, and restart the GS200.	—
500	Storing has not finished yet	Wait for the storage operation to complete (the EOT bit becomes 1) before you start it again.	7-8
600 601 602 603 604	CPU board error	Restart the GS200. If the error still appears, servicing is necessary. When you send the GS200 off for servicing, inform the service technician of the error number.	—

14.3 Self-Test

Procedure

Displaying the Self-Test Menu

1. Press **UTILITY** to display the following menu.

Remot	BNC	Wire	Guard	Sys	Sys	Error
I/F	I/O	2W 4W	On Off	Config	Info	Log

2. Press the **Sys Config** soft key to display the following menu.

Display	Beep	Adjust	CSV	Test	Format	Update
4	On Off	Time	Format		Disk	Sys

3. Press the **Test** soft key.

				Display	Key	Self
				Test	Test	Test

Executing the Display Test

4. Press the **Display Test** soft key. The entire display and the SAMPLE ERROR indicator illuminate.



5. Press **RANGE** ▽ to turn off the entire display. Press **RANGE** △ to illuminate the entire display.
6. When you press one of the ▽ keys that are below the display, the indicators at the top of the front panel illuminate in the following order. The indicators illuminate in the reverse order each time that you press one of the △ keys.
SAMPLE ERROR
REPEAT
STORE
REMOTE
ERROR
The OUTPUT key
The NUM LOCK key
7. Press **ESC** to end the test.

Executing the Key Test

4. Press the **Key Test** soft key.

<<<< Keyboard Test >>>>

To finish the test, press the ESC key twice.

5. Press each key and check that the name of the respective key is displayed.

```
<<<< Keyboard Test >>>>
```

UTILITY(18)

To finish the test, press the ESC key twice.

6. Press **ESC** twice to end the test.

Executing the Self-Test

4. Press the **Self Test** soft key to start the test.

```
<<<< System Test >>>>
      ROM Checking ....
```

5. The results appear after the test finishes.

```
<<<< System Test >>>>
      ROM ... OK
      RAM ... OK
      Digital ... OK
      Test completed.
```

6. Press any key to end the test.

Explanation

Display Test

The display test checks that there are no color dropouts and that the display is functioning normally. If there is a problem with the display, contact your nearest YOKOGAWA dealer.

Key Test

The key test checks whether the front-panel keys are operating properly. If the name of the key that you press is displayed, the key is operating properly. If the name of the key is not displayed, contact your nearest YOKOGAWA dealer.

Self-Test

The self-test checks whether the internal functions of the GS200 are operating correctly. If an error appears, contact your nearest YOKOGAWA dealer.

Note

When any of these tests begins, the output is turned off.

<<Corresponding Command Mnemonic>>

*TST?

14.4 Viewing the Product Information

Procedure

1. Press **UTILITY** to display the following menu.

Remot	BNC	Wire	Guard	Sys	Sys	Error
I/F	I/O	2W 4W	On Off	Config	Info	Log

2. Press the **Sys Info** soft key.

Explanation

The following information is displayed.

Instrument :	DC VOLTAGE/CURRENT SOURCE	Product name
Model :	GS210 /MON /C10	Model
Serial Number :	12345678	Serial number
Firmware Revision :	1.01 2009/09/08 13:50:24	Most recent firmware revision and update date/time
Logic Revision :	5.05.27	Most recent logic revision
Calibration Date :	2009/07/31 11:56:33 All Cal	Calibration date

<<Corresponding Command Mnemonic>>

*IDN?

*OPT?

14.5 Updating the System Firmware

Procedure

Obtaining the Update File

1. Download the most recent system file from the GS200 webpage (<http://tmi.yokogawa.com/products/generators-sources/>) to your PC.
2. Use a USB cable to connect the PC and the GS200.
3. Copy the system file to the volatile disk (GS200RAM).

Updating the System Firmware

1. Press **UTILITY** to display the following menu.

Remot	BNC	Wire	Guard	Sys	Sys	Error
I/F	I/O	2W 4W	On Off	Config	Info	Log

2. Press the **Sys Config** soft key to display the following menu.

Display	Beep	Adjust	CSV	Test	Formt	Update
4	On Off	Time	Formt		Disk	Sys

3. Press the **Update Sys** soft key.
The system file automatically opens, and the update operation is carried out.
An error will occur if the GS200RAM disk does not contain a system file.

4. When the GS200 finishes updating its firmware, it restarts.

Note

- It takes some time to copy the system file to the volatile disk (GS200RAM). Carry out the procedure below to check that the file copy operation is complete before you update the firmware.
Double-click the Safely Remove Hardware icon in the notification area on the Windows desktop.
In the window that opens, click **USB Mass Storage Device**, and then click **Stop**. In the Stop a Hardware device dialog box that opens, confirm the information, and click **OK**. If the copy operation has been completed, the "Safe to Remove Hardware" message will appear.
- After you press the Update Sys soft key, do not turn the GS200 off until the system file has been completely overwritten. Doing so may damage the instrument.
- When you update the system firmware, all the data files stored on the GS200RAM are cleared. Move any data files that you want to keep to a PC before you update the system firmware.

14.5 Updating the System Firmware

Explanation

You must store the most recent system file on the GS200RAM before you update the system firmware.

You can download the system file from the YOKOGAWA website at the following URL:
<http://tmi.yokogawa.com/products/generators-sources/>

The website listed above also contains information about useful applications for use with the GS200.

14.6 Changing the Power Fuse



WARNING

- To prevent fire, only use a fuse that matches the designated rated values (current, voltage, and type).
- Always turn the GS200 off and remove the power cord before you change the fuse.
- Do not short the fuse holder.

Designated Rated Values

The type of fuses that the GS200 uses are described below.

Suffix Code/Rated Supply Voltage: -1 (100 VAC) or -4 (120 VAC)

- Maximum rated voltage: 250 V
- Maximum rated current: 1 A
- Type: Time lag
- Standard: UL/VDE certification
- Part number: A1109EF

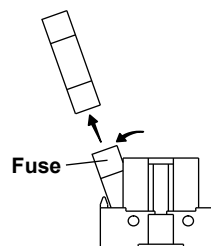
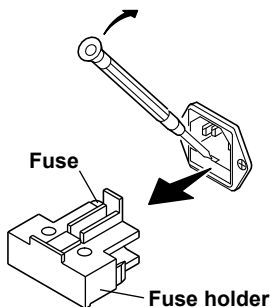
Suffix Code/Rated Supply Voltage: -7 (230 VAC)

- Maximum rated voltage: 250 V
- Maximum rated current: 0.5 A
- Type: Time lag
- Standard: UL/VDE certification
- Part number: A1108EF

How to Change the Fuse

To change the fuse, follow the procedure below.

1. Turn off the power switch.
2. Remove the power cord from the power inlet.
3. Insert a flat-blade screwdriver into the fuse holder groove on the power inlet, press the screwdriver in the direction indicated by the arrow, and remove the fuse holder from the GS200.
4. Remove the blown fuse from the fuse holder.
5. Insert a new fuse into the fuse holder, and re-attach the fuse holder to the GS200.



14.7 Recommended Replacement Parts and Maintenance

Recommended Replacement Parts

The one-year warranty applies only to the main unit of the instrument (starting from the day of delivery) and does not cover any other items nor expendable items (items which wear out). The replacement period for expendable items varies depending on the conditions of use. Refer to the table below as a general guideline. Contact your nearest YOKOGAWA dealer to have parts replaced.

Part Name	Recommended Replacement Period
Cooling fan	3 years
Backup battery (lithium battery)	5 years
VFD	3 years
Source output relay	Electrical life: Approximately 100,000 operations

Calibration

We recommend that you calibrate the GS200 once a year to assure its accuracy. Contact your nearest YOKOGAWA dealer to have your GS200 calibrated.

15.1 Source Section

DC Voltage Source

Range	Range Generated	Resolution	24 h Stability \pm (% of setting + μ V)	90-Day Stability \pm (% of setting + μ V)	90-Day Accuracy \pm (% of setting + μ V)	1-Year Accuracy \pm (% of setting + μ V)	Temperature Coefficient \pm (% of setting + μ V)/ $^{\circ}$ C
10 mV	± 12.0000 mV	100 nV	0.002 + 3	0.014 + 4	0.018 + 4	0.025 + 5	0.0018 + 0.7
100 mV	± 120.000 mV	1 μ V	0.003 + 3	0.014 + 5	0.018 + 10	0.025 + 10	0.0018 + 0.7
1 V	± 1.20000 V	10 μ V	0.001 + 10	0.008 + 50	0.010 + 100	0.016 + 120	0.0009 + 7
10 V	± 12.0000 V	100 μ V	0.001 + 20	0.008 + 100	0.010 + 200	0.016 + 240	0.0008 + 10
30 V	± 32.000 V	1 mV	0.001 + 50	0.008 + 200	0.010 + 500	0.016 + 600	0.0008 + 30

24 h stability is for 23 $^{\circ}$ C $\pm 1^{\circ}$ C and when the voltage variation is within $\pm 5\%$.

90-day stability and 90-day and 1-year accuracy values are for 23 $^{\circ}$ C $\pm 5^{\circ}$ C.

Add the temperature coefficient for 90-day and 1-year accuracy values for 5 $^{\circ}$ C to 18 $^{\circ}$ C and for 28 $^{\circ}$ C to 40 $^{\circ}$ C.

Range	Maximum Output Current	Output Resistance	Output Noise DC to 10 Hz	DC to 10 kHz (Reference)
10 mV	----	Approx. 2 Ω	3 μ Vp-p	30 μ Vp-p
100 mV	----	Approx. 2 Ω	5 μ Vp-p	30 μ Vp-p
1 V	± 200 mA	2 m Ω or less	15 μ Vp-p	60 μ Vp-p
10 V	± 200 mA	2 m Ω or less	50 μ Vp-p	100 μ Vp-p
30 V	± 200 mA	2 m Ω or less	150 μ Vp-p	200 μ Vp-p

Output noise is for when measurements are turned off.

Common mode rejection ratio: 120 dB or higher (DC, 50/60 Hz)

(100 dB or higher for 30 V range)

DC Current Source

Range	Range Generated	Resolution	24 h Stability \pm (% of setting + μ A)	90-Day Stability \pm (% of setting + μ A)	90-Day Accuracy \pm (% of setting + μ A)	1-Year Accuracy \pm (% of setting + μ A)	Temperature Coefficient \pm (% of setting + μ A)/ $^{\circ}$ C
1 mA	± 1.20000 mA	10 nA	0.0015 + 0.03	0.016 + 0.1	0.02 + 0.1	0.03 + 0.1	0.0015 + 0.01
10 mA	± 12.0000 mA	100 nA	0.0015 + 0.3	0.016 + 0.5	0.02 + 0.5	0.03 + 0.5	0.0015 + 0.1
100 mA	± 120.000 mA	1 μ A	0.004 + 3	0.016 + 5	0.02 + 5	0.03 + 5	0.002 + 1
200 mA	± 200.000 mA	1 μ A	0.004 + 20	0.016 + 30	0.02 + 30	0.03 + 30	0.002 + 5

24 h stability is for 23 $^{\circ}$ C $\pm 1^{\circ}$ C and when the voltage variation is within $\pm 5\%$.

90-day stability and 90-day and 1-year accuracy values are for 23 $^{\circ}$ C $\pm 5^{\circ}$ C.

Add the temperature coefficient for 90-day and 1-year accuracy values for 5 $^{\circ}$ C to 18 $^{\circ}$ C and for 28 $^{\circ}$ C to 40 $^{\circ}$ C.

Range	Maximum Output Voltage	Output Resistance	Output Noise DC to 10 Hz	DC to 10 kHz (Reference)
1 mA	± 30 V	100 M Ω or higher	0.02 μ Ap-p	0.1 μ Ap-p
10 mA	± 30 V	100 M Ω or higher	0.2 μ Ap-p	0.3 μ Ap-p
100 mA	± 30 V	10 M Ω or higher	2 μ Ap-p	3 μ Ap-p
200 mA	± 30 V	10 M Ω or higher	10 μ Ap-p	15 μ Ap-p

Output noise is for when measurements are turned off.

Common mode rejection ratio: 100 nA/V or higher (DC, 50/60 Hz)

15.1 Source Section

Item	Specifications									
Limiter	<table><tr><th>Limiter</th><th>Range</th><th>Resolution</th></tr><tr><td>Current limiter (only in voltage source mode)</td><td>1 mA to 200 mA</td><td>1 mA</td></tr><tr><td>Voltage limiter (only in current source mode)</td><td>1 V to 30 V</td><td>1 V</td></tr></table>	Limiter	Range	Resolution	Current limiter (only in voltage source mode)	1 mA to 200 mA	1 mA	Voltage limiter (only in current source mode)	1 V to 30 V	1 V
Limiter	Range	Resolution								
Current limiter (only in voltage source mode)	1 mA to 200 mA	1 mA								
Voltage limiter (only in current source mode)	1 V to 30 V	1 V								
Response time (reference)	10 ms or less for all voltage source and current source ranges. The time for the output to reach within 0.1% of the final value after the output starts changing. Pure resistive load. When the limiter is not enabled.									
LC load	Capacitive load: 10 μF. Inductive Load: 1 mH.									

15.2 Measurement Section (On models with the / MON option)

DC Voltage Measurement

Range	Measurement Range	Resolution	Input Resistance	1-Year Accuracy (1 PLC) $\pm(\% \text{ of reading} + \text{mV})$	Temperature Coefficient $\pm(\% \text{ of reading} + \text{mV})/^{\circ}\text{C}$
30 V	$\pm 31.000 \text{ V}$	1 mV	10 M Ω or higher	0.02 + 2	0.002 + 0.1

DC Current Measurement

Range	Measurement Range	Resolution	Input Resistance	1-Year Accuracy (1 PLC) $\pm(\% \text{ of reading} + \mu\text{A})$	Temperature Coefficient $\pm(\% \text{ of reading} + \mu\text{A})/^{\circ}\text{C}$
200 mA	$\pm 210.00 \text{ mA}$	10 μA	2 m Ω or less	0.03 + 300	0.003 + 30

1 V, 10 V, 30 V source ranges only

15.3 Features

Source

Item	Specifications
Function	Voltage or current

Programming

Item	Specifications
Maximum number of steps	10000
Program trigger	External, internal timer, STEP key, or measurement end (M.End)
Internal timer	0.1 s to 3600.0 s
Slope	0 s to 3600.0 s

Measurement

Item	Specifications
Function	Voltage (current source mode) or current (voltage source mode)
Integration time	1 PLC to 25 PLC
Trigger	Measurement timer (period: 0.1 s to 3600.0 s), measurement end, source change completion (Ready), or communication command
Measurement delay	0 ms to 999999 ms
Storage	Up to 10000 results
Voltage sense	Two-wire system and four-wire system
Auto zero	Measures the internal zero reference and uses it to correct the measured value for each measurement
NULL computation	Displays the result obtained by subtracting the NULL value from the measured value

15.4 External I/O Section (BNC (IN/OUT) and I/O for synchronous operation (SYNC IN/OUT))

BNC I/O

Item	Specifications
Connector	BNC connector
I/O level	TTL
I/O logic	Negative logic, falling edge
Minimum pulse width	10 μ s
IN signal	TRIG IN and OUTPUT IN
OUT signal	TRIG OUT, OUTPUT OUT, and READY OUT

I/O for Synchronous Operation

Item	Specifications
Connector	RJ-11 connector
I/O level	TTL
Minimum pulse width	10 μ s

Pinout

Pin No.	SYNC IN	SYNC OUT
1	OUTPUT IN	OUTPUT OUT
2	NC	NC
3	TRIG IN	TRIG OUT
4	GND	GND
5	NC	READY OUT
6	NC	*

* This pin is used for servicing the GS200. Do not use it.

15.5 Interface

GP-IB Interface

Item	Specifications
Electrical and mechanical specifications	Conforms to IEEE St'd 488-1987
Functional specifications	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, and C0
Protocol	Conforms to IEEE St'd 488.2-1992
Address	0 to 30

USB Interface

Item	Specifications
Number of ports	1
Connector	Type B connector (receptacle)
Electrical and mechanical specifications	Conforms to USB 2.0
Protocol	Mass storage class, USB-TMC

Ethernet Interface

Item	Specifications
Number of ports	1
Connector	RJ-45 connector
Electrical and mechanical specifications	Conforms to IEEE 802.3
Transmission system	100BASE-TX/10BASE-T
Data rate	100 Mbps/10 Mbps
Protocol	VXI-11 server, HTTP server, FTP server, DHCP client, and command socket

15.6 General Specifications

Item	Specifications
Display	256 × 64 dots fluorescent tube (VFD)
Internal memory	GS200ROM: 4 MB (non-volatile; used to save setup files and program files) GS200RAM: 16 MB (volatile, cleared when the power is turned off; used to save the measured results)
Warm-up time	Approx. 60 minutes
Storage conditions	Temperature –15°C to 60°C Humidity 20% RH to 80% RH (no condensation) Elevation 2000 m or less
Operating conditions	Temperature 5°C to 40°C Humidity 20% RH to 80% RH (no condensation) Elevation 2000 m or less
Rated supply voltage	100 VAC, 120 VAC, and 230 VAC
Permitted supply voltage range	Each rated voltage ± 10%
Rated power supply frequency	50/60 Hz
Permitted power supply frequency range	48 Hz to 63 Hz
Maximum allowable input voltage	Across OUTPUT Hi and OUTPUT Lo and across SENSE Hi and SENSE Lo ±32 Vpeak Across OUTPUT Lo and G terminal and across SENSE Lo and G terminal ±42 Vpeak Across each OUTPUT terminal and each SENSE terminal ±0.5 Vpeak Across G terminal and case ±250 Vpeak
Maximum power consumption	Approx. 80 VA
Maximum common-mode voltage	Across each terminal and case ±250 Vpeak
External dimensions	Approx. 213 (W) × 88 (H) × 379 (D) mm (excluding protrusions)
Weight	Approx. 5 kg
Recommended calibration period	1 year

Item	Specifications
Safety standards ¹	Compliant standard EN61010-1, EN61010-2-030 Measurement category Other (O) (250 V _{peak}) ² The overvoltage category (Installation category) CAT II ³ Pollution degree 2 ⁴
Emission ¹	Compliant standards EN61326-1 class A EN55011 class A, group 1 EN61000-3-2 class A EN61000-3-3 EMC Regulatory Arrangement in Australia and New Zealand EN 55011 Class A, Group 1 Korea Electromagnetic Conformity Standard (한국 전자파적합성 기준) This is a Class A product. Operation of this product in a residential area may cause radio interference in which case the user is required to correct the interference. <ul style="list-style-type: none"> Test conditions 1 V range, 1 V source, limit: ± 200 mA, load resistance: 10 Ω, and local sense (2W) All other settings at factory default. Cable conditions <ul style="list-style-type: none"> Output terminals Use the included measurement lead set (758933; red and black, one pc. each; length: 1 m) to connect the OUTPUT terminals. We recommend that you use the same cables when connecting the SENSE terminals for four-terminal connection. (Use cables that are 1 m in length or less.) BNC IN/OUT terminals Use cables that are at least equivalent to 1.5D-QEW cables when connecting the BNC terminals.⁵ ETHERNET port Use shielded (STP) LAN cables that are category 5 or better when connecting the ETHERNET port. (Use cables that are 30 m in length or less.) USB port Use cables that support USB 2.0 (Hi-speed USB) when connecting the USB port⁵ GP-IB connector Use GP-IB cables (IEEE488) when connecting the GP-IB connector. RJ-11 IN/OUT terminals Use shielded cables (758960, length: 1 m) when connecting the RJ-11 terminals.
Immunity ¹	Compliant standard EN61326-1 Table2 ⁶ <ul style="list-style-type: none"> Immunity influence Within the range specified by measured value $\pm 20\%$ of range Test conditions 1 V range, 1 V source, limit: ± 200 mA, load resistance: 10 Ω, and local sense (2W) All other settings at factory default (the cable conditions were tested under the same conditions as the emission test).

1 Applies to products that have a CE mark on their rear panel. For information on other products, contact your nearest YOKOGAWA dealer.

2 The measurement category of the GS200 signal input terminals is Other (O). Do not use it to measure the main power supply or for Measurement Categories II, III, and IV.

Measurement category Other (O) applies to measurement of circuits that are not directly connected to a main power supply. This category applies to measurement of secondary electric circuits in equipment across a transformer. The estimated transient overvoltage that may be applied to the GS200 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.

3 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.

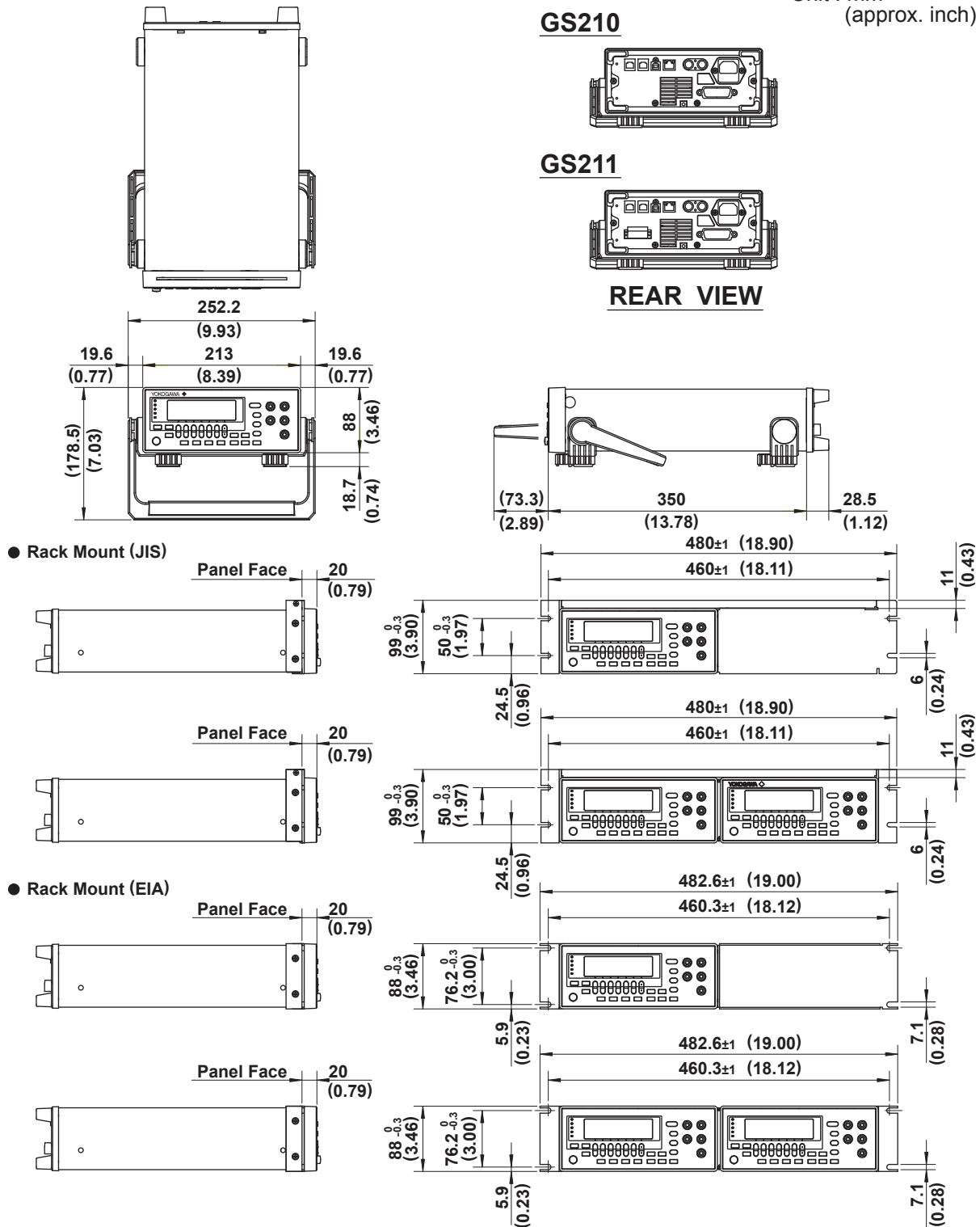
4 Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas which deteriorates withstand voltage or surface resistivity. Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).

5 Use cables of length 3 m or less.

6 Immunity test requirements for equipment intended for use in industrial environments.

15.7 External Dimensions

Unit : mm
(approx. inch)



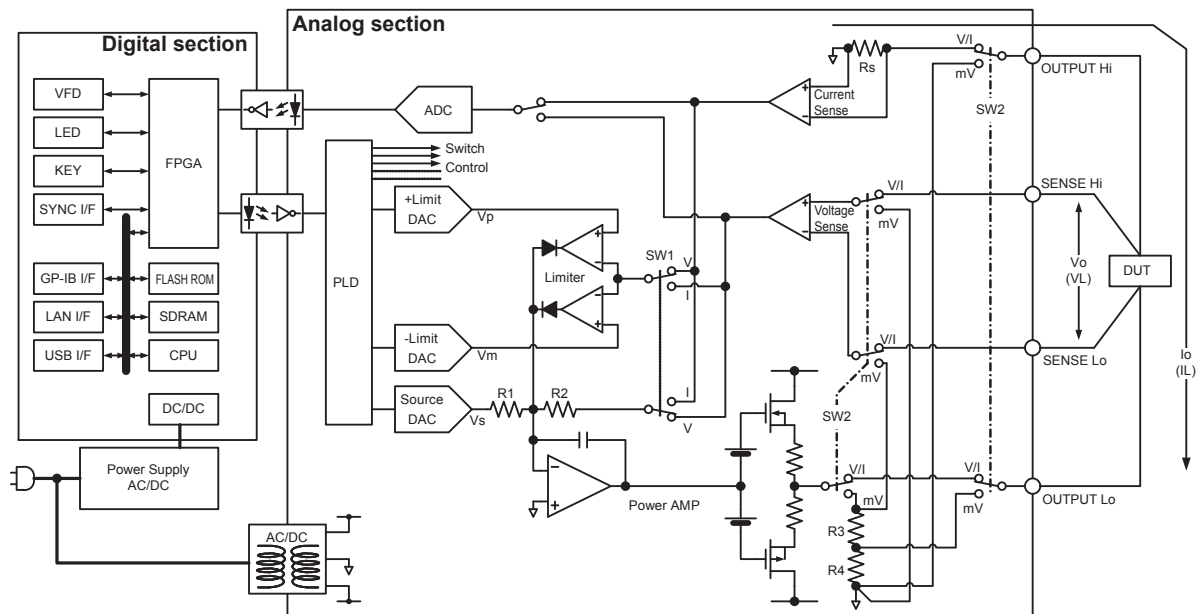
If not specified, the tolerance is $\pm 3\%$. However, in cases of less than 10 mm, the tolerance is ± 0.3 mm.

Appendix 1 Factory Default Settings

Item		Factory Default Setting	Saved When the GS200 Turns Off?	Saved to the Setup Data File?
Source				
	Source function	Voltage	No	Yes
	Source range	1 V	No	Yes
	Source level	0 V	No	Yes
	Voltage limiter	30 V	No	Yes
	Current limiter	200 mA	No	Yes
	Output on/off	Off	No	No
	Program file	Unselected*	No	Yes
	Program repetition mode	On	No	Yes
	Program interval time	0.1 s	No	Yes
	Program slope time	0.0 s	No	Yes
	Program trigger	Norm	No	Yes
Measurement (Option)				
	Measurement on/off	On	No	Yes
	Measurement trigger	Timer	No	Yes
	Measurement timer	0.1 s	No	Yes
	Integration time	1 PLC	No	Yes
	Measurement delay time	0 ms	No	Yes
	NULL computation on/off	Off	No	Yes
	Storage on/off	Off	No	No
	Storage count	10000	No	Yes
	Storage file creation	On	No	Yes
Wiring system		2W	No	Yes
Guard terminal		Off	No	Yes
External I/O	BNC IN terminal	TRIG	No	Yes
	BNC OUT terminal	TRIG	No	Yes
Communication				
	USB feature selection	Storage*	Yes	No
	GP-IB address	1*	Yes	No
	GP-IB command mode	GS200 mode*	Yes	No
	DHCP on/off	On*	Yes	No
	IP address	0.0.0.0*	Yes	No
	Subnet mask address	0.0.0.0*	Yes	No
	Default gateway address	0.0.0.0*	Yes	No
	Transmission terminator	CR+LF*	Yes	No
Other settings				
	File that is loaded when the GS200 turns on	Unspecified*	Yes	No
	Display brightness	4*	Yes	No
	Display on/off	On*	No	No
	Beep sound on/off	On*	Yes	No
	Date and time	Japan Standard Time*	Yes	No
	Time difference from GMT (Greenwich Mean Time)	+9:00*	Yes	No
	CSV file format	Decimal point: .*	Yes	No
		Delimiter: ,*	Yes	No

* This setting is not initialized to its factory default setting when you initialize setup data (see section 9.1) or send the *RST command.

Appendix 2 Block Diagram



The GS200 consists of a digital section that operates at ground potential and an analog section that is isolated from the digital section. The digital section consists of a CPU, FPGA, memory, and various interface circuits. A non-isolated DC-DC converter supplies power to the digital section. The digital section controls the display, keys, communications, and the analog section.

The analog section consists of the voltage source's D/A converters (DACs), an output amplifier, highly stable shunt resistors, and a limiter circuit. An isolated commercial transformer provides power to the analog section.

Data that is sent from the digital section passes through a photocoupler and the PLD and controls each DAC and the various switches that are used for making range settings and other settings.

When the GS200 is operating as a voltage source, SW1 is connected to V, and source voltage V_o is the product of source DAC value V_s and R_2/R_1 . If load current I_L increases positively and $I_L \times R_s$ exceeds positive limiter DAC value V_p , the diode of the limiter circuit will turn on and suppress the load current to V_p/R_s . A similar operation takes place when the load current is negative.

When the GS200 is operating as a current source, SW1 is connected to I, and source current I_o is the product of source DAC value V_s and $(R_2/R_1)/R_s$. If load voltage V_L exceeds positive limiter DAC value V_p , the diode of the limiter circuit will turn on and suppress the load voltage to V_p . A similar operation takes place when the load voltage is negative.

The GS200 is equipped with a measurement circuit that is separate from the source and limiter circuits. In voltage source mode, the measurement circuit uses A/D converters (ADC) to measure the current that is received. In current source mode, the measurement circuit uses A/D converters (ADC) to measure the voltage that is received. Differing from the voltage and current source functions described above, when the mV range is selected in voltage source mode, SW2 is connected to mV. The source voltage V_o is voltage-divided by R_3 and R_4 . In this situation, because the output resistance becomes R_4 ($2\ \Omega$), if the DUT does not have a high impedance, the source voltage is reduced according to the DUT's impedance. Additionally, because selecting mV causes the limiter and current measurement circuits to be disconnected by R_s and SW2 that are used for current sense, these circuits do not operate.

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