OPERATION MANUAL

Precision DC Source
KDS6-0.2TR

KIKUSUI
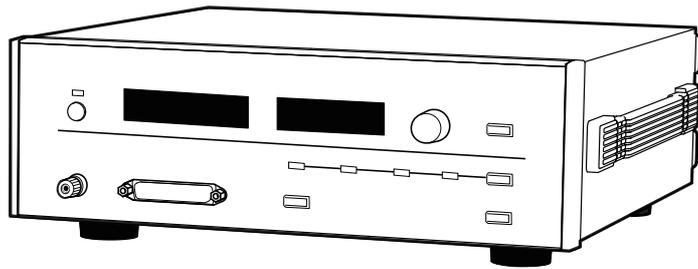
Use of Operation Manual

Please read through and understand this Operation Manual before operating the precision DC source. After reading, always keep the manual nearby so that you may refer to it as needed. When moving the precision DC source to another location, be sure to bring the manual as well.

If you find any incorrectly arranged or missing pages in this manual, they will be replaced. If the manual gets lost or soiled, a new copy can be provided for a fee. In either case, please contact Kikusui distributor/ agent, and provide the "Kikusui Part No." given on the cover.

This manual has been prepared with the utmost care; however, if you have any questions, or note any errors or omissions, please contact Kikusui distributor/agent.

After you have finished reading this manual, store it so that you can use it for reference at any time.

Power Requirements of this Product

Power requirements of this product have been changed and the relevant sections of the Operation Manual should be revised accordingly.
(Revision should be applied to items indicated by a check mark ☑)

☐ Input voltage

The input voltage of this product is＿＿＿＿＿ Vac,

and the voltage range is＿＿＿＿＿ to ＿＿＿＿＿ Vac. Use the product within this range only.

☐ Input fuse

The rating of this product's input fuse is＿＿＿＿＿ A, ＿＿＿＿＿ Vac, and ＿＿＿＿＿ .

⚠ WARNING **Possible electric shock.**
- **Before attempting to check or replace the fuse, be sure to turn the POWER switch off and removing the plug of power cord from an outlet or turn off the circuit breaker of switchboard.**
- **Use a fuse element having a shape, rating, and characteristics suitable for this product.**

☐ Power cord

The product is provided with power cords described below. If the power cord has no plug, attach a plug or crimp-style terminals to the power cord in accordance with the wire colors specified in the drawing.

⚠ WARNING **The attachment of a plug of power cord or crimp-style terminals must be carried out by qualified personnel.**

☐ Without a plug

Blue (NEUTRAL)
Brown (LIVE)
Green/Yellow (GND)

☐ Without a plug
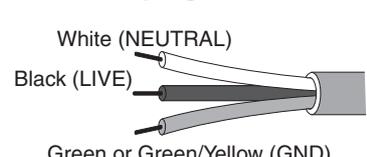
White (NEUTRAL)
Black (LIVE)
Green or Green/Yellow (GND)
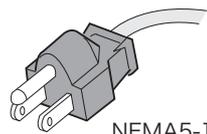
☐ Plug for USA
NEMA5-15
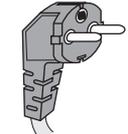
☐ Plug for Europe
CEE7/7
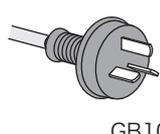
☐ Plug for China
GB1002
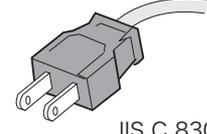
☐ 2P plug
JIS C 8303

☐ Provided by Kikusui distributor/agent
Kikusui agents can provide you with suitable power cord.
For further information, contact Kikusui distributor/agent.

⚠Safety Symbols

For the safe use and safe maintenance of this product, the following symbols are used throughout this manual and on the precision DC source. Understand the meanings of the symbols and observe the instructions they indicate (the choice of symbols used depends on the precision DC source).

⚠ or ⚡	Indicates that a high voltage (over 1000 V) is used here. Touching the part causes a possibly fatal electric shock. If physical contact is required by your work, start work only after you make sure that no voltage is output here.
DANGER	Indicates an imminently hazardous situation which, if ignored, will result in death or serious injury.
⚠ **WARNING**	Indicates a potentially hazardous situation which, if ignored, could result in death or serious injury.
⚠ **CAUTION**	Indicates a potentially hazardous situation which, if ignored, may result in damage to the precision DC source and other property.
🚫	Shows that the act indicated is prohibited.
⚠	Is placed before the sign "DANGER," "WARNING," or "CAUTION" to emphasize these. When this symbol is marked on the precision DC source, see the relevant sections in this manual.
⏚	Protective conductor terminal.
⏛	Chassis (frame) terminal.
|	On (supply)
○	Off (supply)
▢	In position of a bi-stable push control
▢	Out position of a bi-stable push control

⚠Safety Precautions

The following safety precautions must be observed to avoid fire hazard, electrical shock, accidents, and other failures. Keep them in mind and make sure that all of them are observed properly. Using the product in a manner that is not specified in this manual may impair the protection functions provided by the product.

Users

- This product must be used only by qualified personnel who understand the contents of this operation manual.
- If it is handled by disqualified personnel, personal injury may result. Be sure to handle it under supervision of qualified personnel (those who have electrical knowledge.)
- This product is not designed or manufactured for general home or consumer use.

Purposes of use

- Do not use the precision DC source for purposes other than those described in the operation manual.
- This product is not designed or manufactured for general home or consumer use.
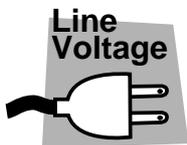
Input power

- Use the precision DC source with the specified input power voltage.
- For applying power, use the power cord provided. Note that the provided power cord is not use with some products that can switch among different input power voltages or use 100 V and 200 V without switching between them. In such a case, use an appropriate power cord.

Fuse

- With products with a fuse holder on the exterior surface, the fuse can be replaced with a new one. When replacing a fuse, use the one which has appropriate shape, ratings, and specifications.

Cover

- There are parts inside the precision DC source which may cause physical hazards. Do not remove the external cover.

Installation

- When installing products be sure to observe 1.2, "Precautions in Setup" described in this manual.
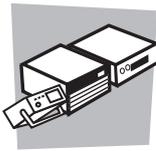- To avoid electrical shock, connect the protective ground terminal to electrical ground (safety ground).
- When connecting the power cord to a switchboard, be sure work is performed by a qualified and licensed electrician or is conducted under the direction of such a person.
- When installing products with casters, be sure to lock the casters.

Relocation

- Turn off the power switch and then disconnect all cables when relocating the precision DC source.
- Use two or more persons when relocating the precision DC source which weights more than 20 kg. The weight of the precision DC sources can be found on the rear panel of the precision DC source and/or in this operation manual.
- Use extra precautions such as using more people when relocating into or out of present locations including inclines or steps. Also handle carefully when relocating tall products as they can fall over easily.
- Be sure the operation manual be included when the precision DC source is relocated.

Operation

- Check that the AC input voltage setting and the fuse rating are satisfied and that there is no abnormality on the surface of the power cord. Be sure to unplug the power cord or stop applying power before checking.
- If any abnormality or failure is detected in the precision DC sources, stop using it immediately. Unplug the power cord or disconnect the power cord from the switchboard. Be careful not to allow the precision DC source to be used before it is completely repaired.
- For output wiring or load cables, use connection cables with larger current capacity.
- Do not disassemble or modify the precision DC source. If it must be modified, contact Kikusui distributor/agent.

Maintenance and checking

- To avoid electrical shock, be absolutely sure to unplug the power cord or stop applying power before performing maintenance or checking.
- Do not remove the cover when performing maintenance or checking.
- To maintain performance and safe operation of the precision DC source, it is recommended that periodic maintenance, checking, cleaning, and calibration be performed.

Service

- Internal service is to be done by Kikusui service engineers. If the precision DC source must be adjusted or repaired, contact Kikusui distributor/agent.

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Chapter 1 Prior to Use

Chapter 2 Names and Functions of Parts

Chapter 3 Basic Operations and Connections

Chapter 4 Remote Control

Chapter 5 Maintenance and Calibration

Chapter 6 Specifications

Introduction

General

The KDS6-0.2TR is a low-noise, high-stability three-channel DC voltage source.

The KDS6-0.2TR is a precision DC source designed for use on the production and inspection lines of electronic devices, including today's popular low-voltage, low-current high-frequency parts, as well as ICs, LSIs, and sensors.

■ Firmware version of the precision DC source to which this manual applies

- KDS6-0.2TR   Ver. 1.0X

The version number appears in the voltage setting display when the power is turned on. The version can also be checked using the *IDN? message via GPIB or RS-232C. For more details on the *IDN? message, refer to Chapter 4, ?Remote Control.?

When inquiring about the KDS6-0.2TR, please provide this version No. and the serial No. affixed to the rear panel.

Sample display:

Model (KDS6-0.2TR)
indicated as 6-0.2t

Firmware version

Features

■ Generation of exact voltages

Generates exact voltages in increments of 100 µV.

■ High-resolution ammeter*

Equipped with a high-resolution ammeter of 1 µA (200-mA range) and 0.1 µA (10-mA range). * In normal mode

■ Remote sensing function

Provided with a remote sensing function allowing for noise reduction and voltage stabilization on the load end.

■ Remote interfacing

Various settings and current readback can be made through GPIB or RS-232C.

Chapter 1   Prior to Use

This chapter provides an explanation of procedures from unpacking to preparations for use.

1.1   Unpacking Check

As soon as you receive delivery of the KDS6-0.2TR, check to make sure that all of the required accessories are included, and that the KDS6-0.2TR and accessories are free from damage. Fig. 1-1 provides a list of accessories.

In the event anything is missing or damaged, contact your Kikusui distributor/agent.

or
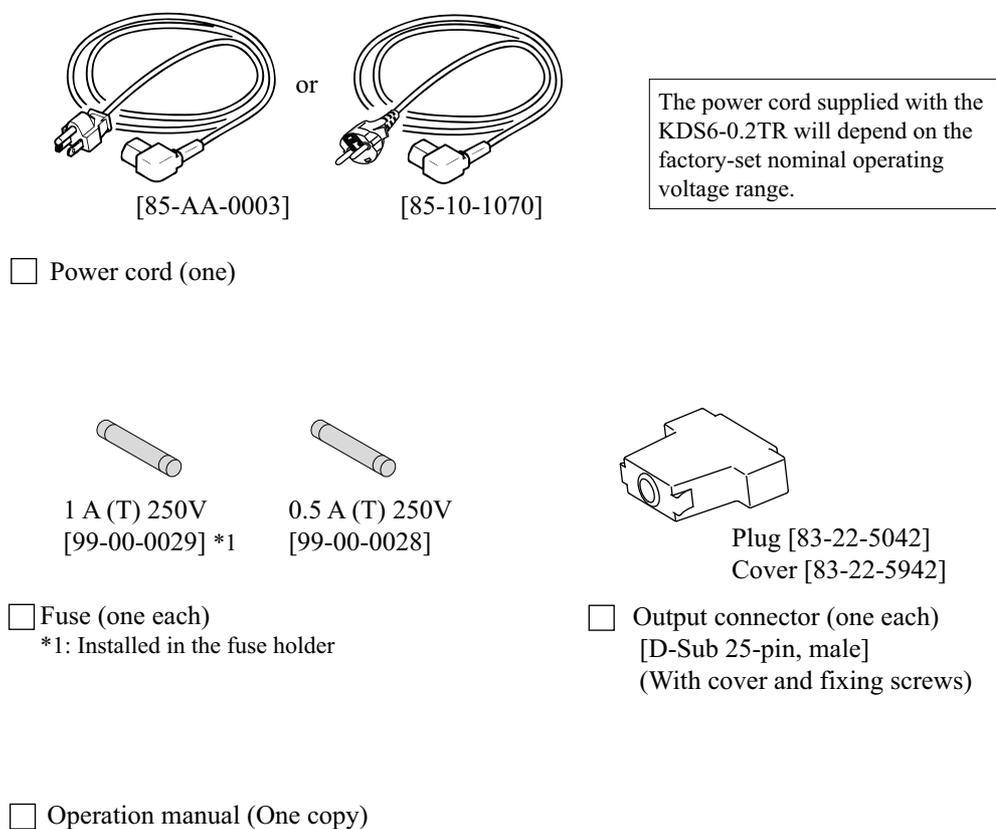
| The power cord supplied with the KDS6-0.2TR will depend on the factory-set nominal operating voltage range. |

[85-AA-0003]   [85-10-1070]

☐ Power cord (one)

1 A (T) 250V
[99-00-0029] *1

0.5 A (T) 250V
[99-00-0028]

Plug [83-22-5042]
Cover [83-22-5942]

☐ Fuse (one each)
    *1: Installed in the fuse holder

☐ Output connector (one each)
    [D-Sub 25-pin, male]
    (With cover and fixing screws)

☐ Operation manual (One copy)

Fig. 1-1   List of accessories

NOTE
• It is recommended that you save the packing materials for use in the event the KDS6-0.2TR must be transported.

1.2   Precautions in Setup

The following precautions deal with establishing a safe environment for the use of the KDS6-0.2TR and must be strictly observed.

■ Do not use in a combustible atmosphere.

Since the KDS6-0.2TR is likely to emit sparks due to internal discharges, do not operate it near alcohol or paint thinner, or in an atmosphere containing these or similar agents.

■ Avoid locations subject to direct sunlight or temperature increases.

Do not operate the KDS6-0.2TR near a heat-generating device or heating appliance, or in locations subject to abrupt increases in temperature.

Temperature range for guaranteed specifications: 23°C ± 5°C

Operating temperature range: 0°C to +40°C

Storage temperature range: -10°C to +60°C

■ Avoid high humidity.

Do not install the KDS6-0.2TR in a highly humid location such as near a water heater, humidifier, water appliance or the like.

Operating humidity range: 20% to 85% RH (without condensation)

Storage humidity range: below 90% RH (without condensation)

Condensation may take place even when the KDS6-0.2TR is operated within the specified operating humidity range. If condensation takes place, do not use it until it is completely dry.

■ Do not expose to corrosive atmosphere.

Do not operate or store the KDS6-0.2TR in a corrosive atmosphere or one with a heavy concentration of airborne sulfuric acid. These and similar environments could corrode conductors or result in poor contact among the connectors within the KDS6-0.2TR, which may result in erroneous operation or malfunction or even lead to fire.

■ Do not install in a location with heavy dust or airborne particles.

Adhesion of dust or particles could lead to electric shock or fire.

■ Do not use in a poorly ventilated location.

The KDS6-0.2TR is naturally air-cooled. Poor ventilation could lead to heat accumulation and may result in fire. Provide ample space on all sides of the KDS6-0.2TR.

■ Do not place any object on top.

Placing a heavy object on the KDS6-0.2TR could lead to malfunction.

■ **Do not place on an inclined surface or in a location subject to vibration.**

The KDS6-0.2TR could fall over, leading to malfunction or personal injury.

■ **Do not operate the KDS6-0.2TR in a location subject to intense magnetic or electric fields.**

An intense magnetic or electric field could cause erroneous operation, resulting in electric shock or fire. Moreover, such placement is likely to impair measurement or lead to similar problems.

■ **Do not operate the KDS6-0.2TR near high-sensitivity measuring instruments or receivers.**

Noise produced by the KDS6-0.2TR may affect other devices.

1.3 Precautions in Transportation

If the KDS6-0.2TR is moved to a new location or otherwise transported, please observe the following:

■ **Turn off the power switch located on the rear panel.**

Moving the KDS6-0.2TR with the power turned on could result in electric shock or malfunction.

■ **Remove all connected wiring.**

Moving the KDS6-0.2TR with connected cables could result in internal wire breakage or cause the device to fall, leading to personal injury.

■ **When transporting the KDS6-0.2TR, always pack it using dedicated packing materials.**

Failure to use the dedicated packing materials may result in malfunction of the KDS6-0.2TR due to vibration or fall during transportation. If you require packing material, please inquire at your Kikusui distributor/agent.

■ **When relocating the KDS6-0.2TR, make sure that it is accompanied by this operation manual.**

1.4 Checking the Input Power and Fuse

The KDS6-0.2TR can be operated within one of the four input voltage ranges indicated in Table 1-1. Check to determine whether the factory-set voltage range corresponds to the voltage you intend to supply to the KDS6-0.2TR. Additionally, the input fuse rating must be compatible with the selected input voltage range.

⚠ WARNING • To avoid electric shock, be sure to unplug the power cord before checking or replacing the fuse.

⚠ CAUTION • Use a fuse featuring shape, rating, and characteristics compatible with the KDS6-0.2TR. Using a fuse with an inappropriate rating or supplying power with a short-circuited fuse holder may damage the KDS6-0.2TR.

To check or change the input supply voltage range and the input fuse, follow the procedure below:

1. Turn the POWER switch off and unplug the power cord.

2. Remove the cover of the fuse holder. Refer to Fig. 1-2.

3. Referring to Table 1-1, check to determine whether the rating and characteristics of the fuse currently installed are suitable for the input voltage. If not, replace the fuse.

Table 1-1 Table of line voltages

▼ MARK	LINE VOLTAGE	FUSE
100	90V–110V	AC250V 1A (T)
120	104V–126V	
220	194V–236V	AC250V 0.5A (T)
240	207V–250V	

4. Insert the cover of the fuse holder by aligning the guide with the input voltage to be used.
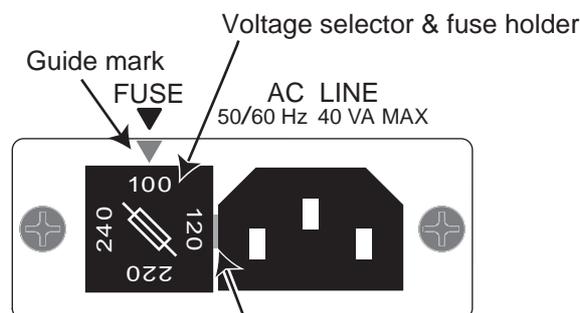
Insert the tip of a flat-head screwdriver here and pull out the cover. Replace the cover after aligning the input voltage to be used with the ▼ mark. (The position illustrated here represents an input voltage of 90 V to 110 V.)

Fig. 1-2 Removing the fuse holder

1.5 Connecting the Power Cord

Connect the power cord to the KDS6-0.2TR.

Insert the 3-pole plug with ground on the cord supplied with the KDS6-0.2TR into an outlet.

The KDS6-0.2TR is designed for connection to a power supply of Overvoltage Category II.

⚠ WARNING
- The power cord for 100 V system shown in Fig. 1-3 has a rated voltage of 125 VAC. If this power cord is used at the line voltage of a 200 V system, replace the power cord with that satisfying that line voltage.

  An appropriate power cord must be selected by qualified personnel. If it is difficult to obtain the power cord, consult Kikusui distributor/agent.

⚠ CAUTION
- Connect the KDS6-0.2TR to an AC power line corresponding to the required input power.

- Do not use the power cord supplied with the KDS6-0.2TR for other apparatuses.
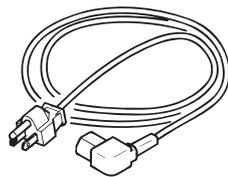
Power cord for 100 V system
[85-AA-0003]
Rated voltage: 125 VAC
Rated current: 10 A
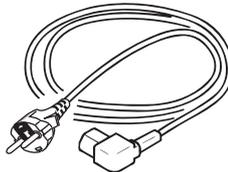
Power cord for 200 V system
[85-10-1070]
Rated voltage: 250 VAC
Rated current: 10 A

Fig. 1-3   Power cord

Connect the power cord as follows:

1. Turn the POWER switch off.

2. Connect the power cord to the AC inlet located on the rear panel.

   Use the power cord designated by Kikusui or one selected by qualified personnel.

3. Insert the plug of the power cord into the outlet.

1.6   Grounding

To reduce noise and ensure safety during measurement, be sure to connect the KDS6-0.2TR to ground.

⚠WARNING • Electric shock may occur, if proper grounding is not furnished.

• Connect the ground terminal to an adequate earth ground.

⚠CAUTION • Failure to connect the KDS6-0.2TR to ground could result in erroneous operation due to external noise, or may increase the noise generated by the KDS6-0.2TR.

For your safety, be sure to earth ground the KDS6-0.2TR.

Connect the power cord to a three-prong power outlet with proper grounding.

Names and Functions of Parts
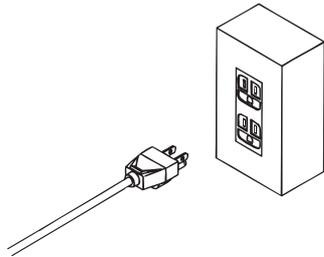
This chapter explains the names and operating methods of the different component parts, as well as the basic functions of the display and other parts.

2.1　Front Panel
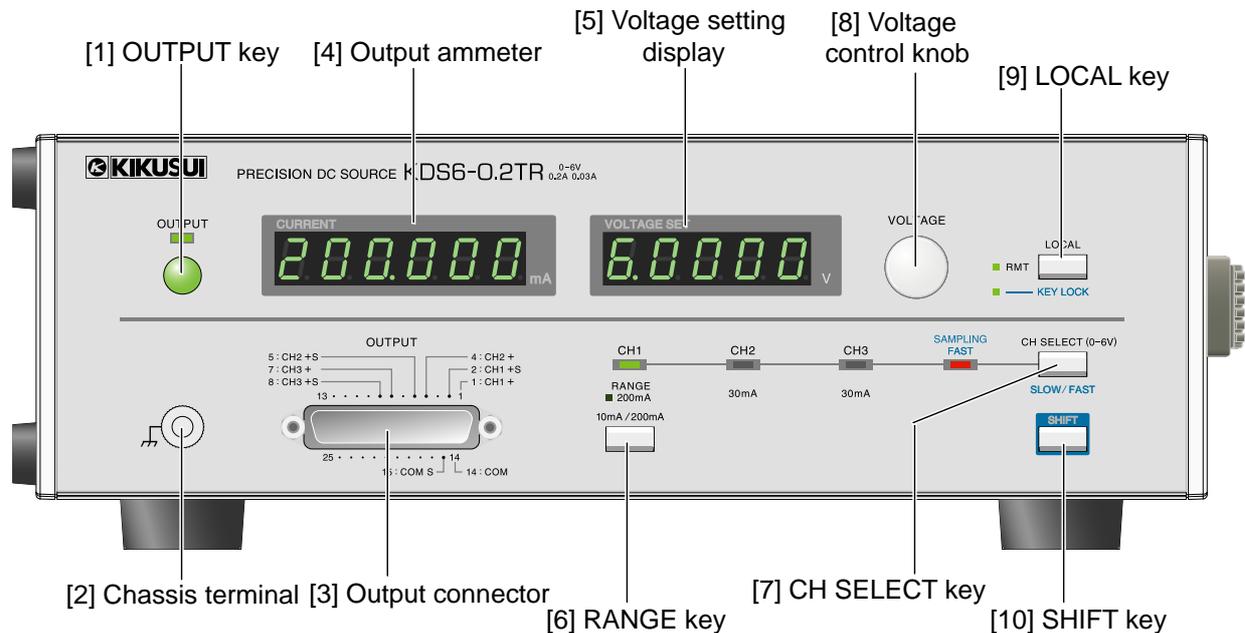
Fig. 2-1

[1]　OUTPUT key

Pressing the key alternately turns the output on and off.

While output is activated, the LED above the key remains lit.

If the LED is flashing, it means that the overcurrent protection function (OCP) has activated to interrupt output.

For more details on the OCP, refer to "OCP function" on page 22.

NOTE　• The OCP function is activated when an over-range state lasts for approximately 1.5 seconds or longer.

[2]　Chassis terminal

This terminal is connected to the chassis (frame) of the KDS6-0.2TR.

[3]　Output connector

This is a voltage output and sensing terminal.

For this connection, use the D-Sub 25-pin male connector supplied.

To minimize the effects of ambient noise, read Chapter 3, "Basic Operations and Connections" before using this connector.

[4]　Output ammeter

Shows the output current of the channel currently selected. The [----] display indicates that the maximum permissible current has been exceeded. If the KDS6-0.2TR is left in this state, the OCP function will activate after approximately 1.5 seconds.

For details, refer to "OCP function" on page 22.

[5]　Voltage setting display

Indicates the voltage setting of the channel currently selected.

[6]　RANGE key

Switches the current range of Channel 1. (Channels 2 and 3 are fixed at the 30-mA range only)

[7]　CH SELECT key

Selects the channel for which voltage is to be set or output current is to be displayed.

[8]　Voltage control knob

Adjusts the voltage of the channel currently selected. The faster the knob is turned, the greater the change in voltage value.

[9]　LOCAL key

Pressing this key when the RMT lamp remains lit (i.e., when the KDS6-0.2TR is controlled through GPIB or RS-232C) enables the user to operate the KDS6-0.2TR from the panel.

[10]　SHIFT key

When the LOCAL key or CH SELECT key is pressed with this key held down, the following key operations are executed:

SHIFT + LOCAL keys

　　Key lock is set or cleared.

SHIFT + CH SELECT keys

　　The sampling rate of the output ammeter is changed.

2.2   Rear Panel
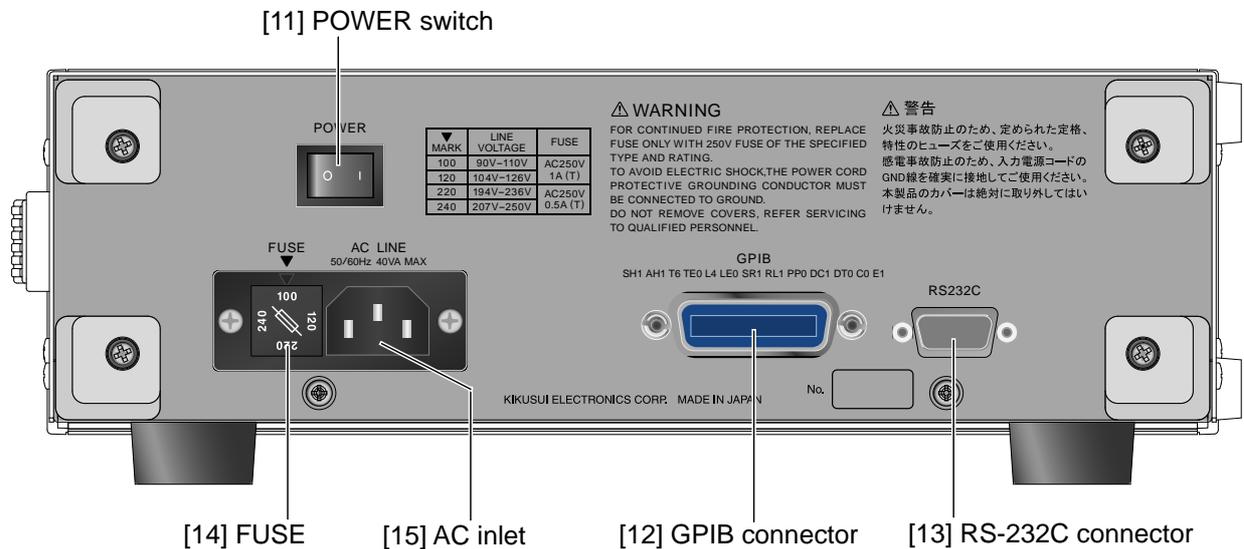
Fig. 2-2

[11] POWER switch

Turns the power on (|) and off (O).

[12] GPIB connector

The connector is used to connect the KDS6-0.2TR to a GPIB controller.

For details on setting the address, refer to 4.1.1, "GPIB Interface."

[13] RS-232C connector

The connector is used to control the KDS6-0.2TR remotely through a computer, sequencer, or the like using an RS-232C interface. The use of cross-cables enables communication at a maximum rate of 38400 bps. For information on settings, connection, and other details, refer to 4.1.2, "RS-232C Interface."

[14]   FUSE

This is a fuse holder for input power that also serves as a voltage selector.

For details, refer to 1.4, "Checking the Input Power and Fuse."

[15] AC inlet

This is the connector for the power cord. When plugging in the cord, push it in as far as it can go.

For details, refer to 1.6, "Grounding."

Chapter 3   Basic Operations and Connections

This chapter explains the basic operations conducted from the panel face.

3.1   Initial Setting Values

When the KDS6-0.2TR is switched on, the setting values specified in Table 3-1 are displayed.

The KDS6-0.2TR is shipped from the factory with the setting values shown in Table 3-1. Setting values marked as "Enabled" under "Backup" in the table are saved in the internal memory (powered by an internal battery). These settings are maintained even if the power has been turned off.

To reset the KDS6-0.2TR settings to the factory values, press and hold the CH SELECT key while turning the power on.

Table 3-1   Table of setting values

Backup	Item	Setting value (factory setting)
Not enabled	RS-232C acknowledge message	Returned (SILEnt off)
	Service request enable register	0
	OUTPUT	Off
	LOCAL/REMOTE	LOCAL
	OCP	Clear
	Switching panel indication with every voltage setting or current read-out	On (ACHSel 1)
Enabled	Voltage setting (all channels)	0.0000 V
	Channel selection	Channel 1
	Channel-1 current range	200 mA
	Output ammeter sampling rate	Normal mode
	KEYLOCK	Clear
	GPIB address	1
	RS-232C bit rate	19 200 bps

3.2   Basic Operations

Channel selection

■ Selecting the channel for which voltage is to be set or output current is to be displayed.

1.   Press the CH SELECT key.

The channel is changed each time the key is pressed, and the LED of the channel currently selected is lit.

CH SELECT key
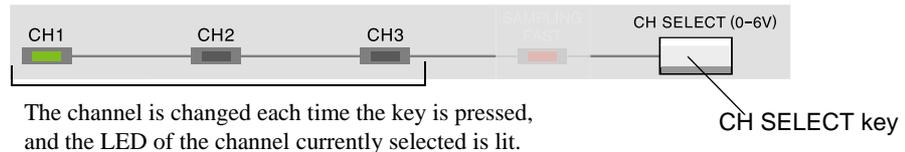
Voltage setting

■ Setting a voltage for the channel currently selected.

1.   Turn the voltage control knob.

Voltage control knob

Turning the knob clockwise increases the setting value, while turning it counter-clockwise reduces the value.
The value changes with the rotation speed of the knob. The faster the knob is turned, the greater the change in voltage value.
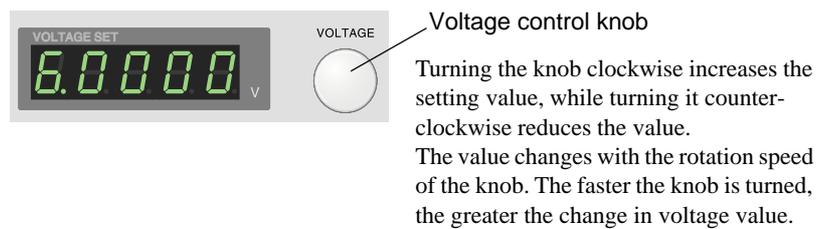
Changing range

■ Changing the current range of Channel 1

1.   Press the RANGE key.

Each time the key is pressed, the LED for RANGE is turned alternately on and off. When the LED is on, the 200-mA range is in effect; when the LED is off, the 10-mA range is enabled.
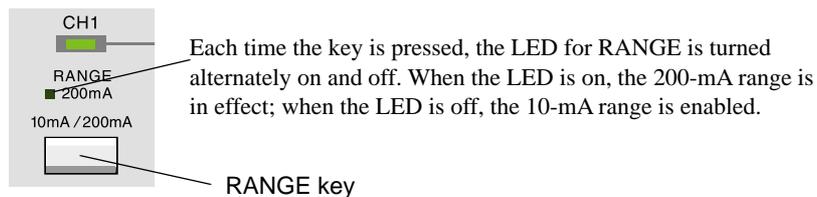
RANGE key

The RANGE key is active only when Channel 1 is selected. Channels 2 and 3 work the 30-mA range only.

Changing sampling rate

■ Changing the sampling rate of the output ammeter

1. Press the CH SELECT key while holding down the SHIFT key.

SHIFT+CH SELECT keys
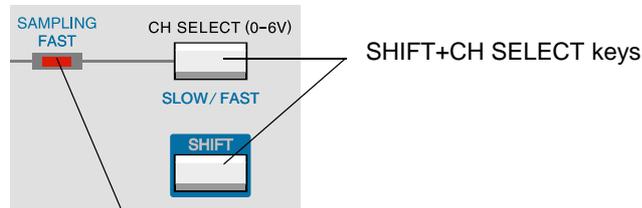
Each time these keys are pressed together, the "SAMPLING FAST" LED is turned alternately on and off. This high-speed mode is in effect when the LED is on, and normal mode is active when the LED is off.
In the high-speed mode, the output ammeter features five-digit resolution.

Key lock

■ Disabling all keys but the OUTPUT key

1. Press the LOCAL key while holding down the SHIFT key.

The keys are locked, causing the "KEY LOCK" LED to light.
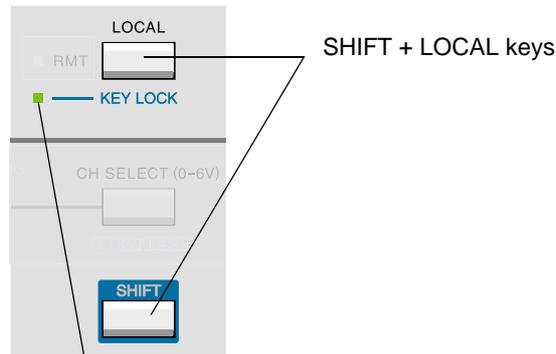
SHIFT + LOCAL keys

In key lock status, the "KEY LOCK" LED remains lit.

■ Clearing the key lock status

1. With the SHIFT key held down, press the LOCAL key continuously for 0.5 seconds or longer.

OCP function

■ [-----] displayed in the output ammeter

If a current exceeding the maximum output flows through any of the channels, [-----] will appear in the output ammeter.

If nothing is done, the OCP (Overcurrent Protection) function will activate, cutting off output after approximately 1.5 seconds. The channel in which the overcurrent occurred is then displayed, and the OUTPUT lamp flashes.

Approx. 1.5 s later
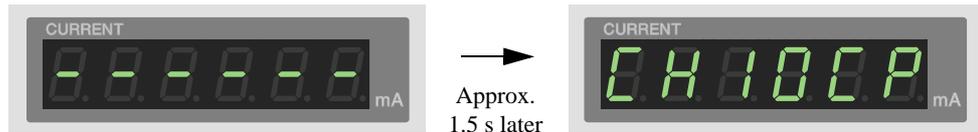
The overcurrent channel is displayed.

[-----] will also appear immediately after power-on, but this merely indicates that initialization of the internal circuit is underway; it does not mean that the OCP function has activated.

■ Clearing OCP

1. Press the OUTPUT key.

   Before pressing the OUTPUT key, make sure to eliminate the cause of OCP activation.

3.3 Connection to the Load

Pin assignment of output connector

The KDS6-0.2TR employs a D-Sub 25-pin female connector for the output connector.

To connect the KDS6-0.2TR to its load, connect to the output with the D-Sub 25-pin male connector supplied, using Table 3-2 as a guide.

Table 3-2 Output connector pin assignment

No.	Name	Remarks	No.	Name	Remarks
1	CH1 +	Channel-1 voltage output terminal	14	COM	Common output terminal
2	CH1 +S	Channel-1 sensing terminal	15	COM S	Common sensing terminal
3	NC	Not in use	16	NC	Not in use
4	CH2 +	Channel-2 voltage output terminal	17	NC	Not in use
5	CH2 +S	Channel-2 sensing terminal	18	NC	Not in use
6	NC	Not in use	19	NC	Not in use
7	CH3 +	Channel-3 voltage output terminal	20	NC	Not in use
8	CH3 +S	Channel-3 sensing terminal	21	NC	Not in use
9	NC	Not in use	22	NC	Not in use
10	NC	Not in use	23	NC	Not in use
11	NC	Not in use	24	NC	Not in use
12	NC	Not in use	25	NC	Not in use
13	NC	Not in use			

As viewed from the front panel of the KDS6-0.2TR
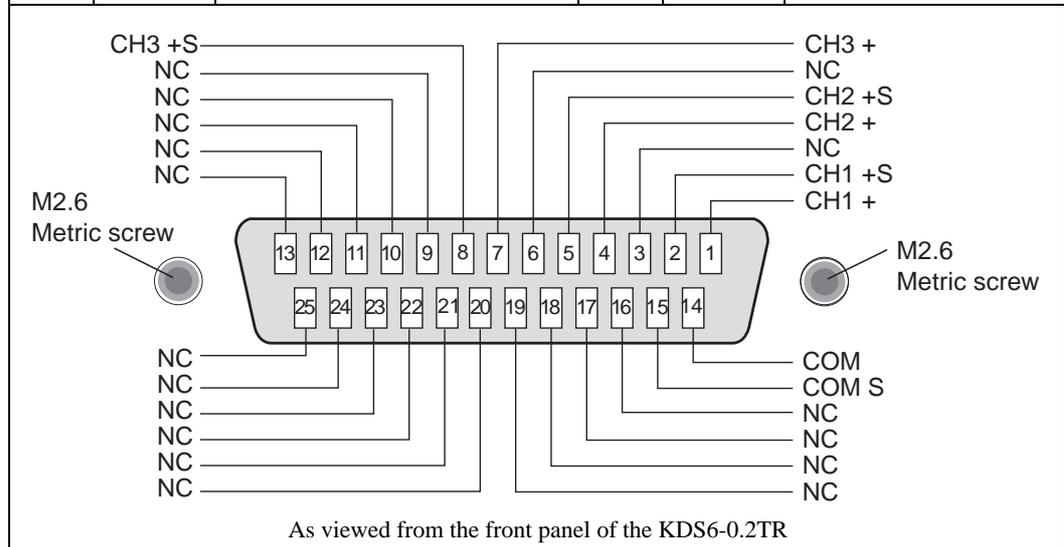
Connector fixing screws

The fixing screws used for the output connector are metric screws (size M2.6).

NOTE
- Operate the KDS6-0.2TR only with the sensing wires connected. Failure to connect the sensing wires will impair the KDS6-0.2TR's ability to deliver precise voltages.

Connection diagram

The sensing point should be located as close to the load end as possible.

If the sensing point is located far from the load end, hum may be picked up, or imprecise voltage may be delivered on the load end, due to the voltage drop caused by the resistance of the load cable.

Moreover, to minimize the effect of external noise, use twisted pair cables for the load cables and sensing wires. It is also recommended that you twist the cabling of each channel further before connecting it to the load.
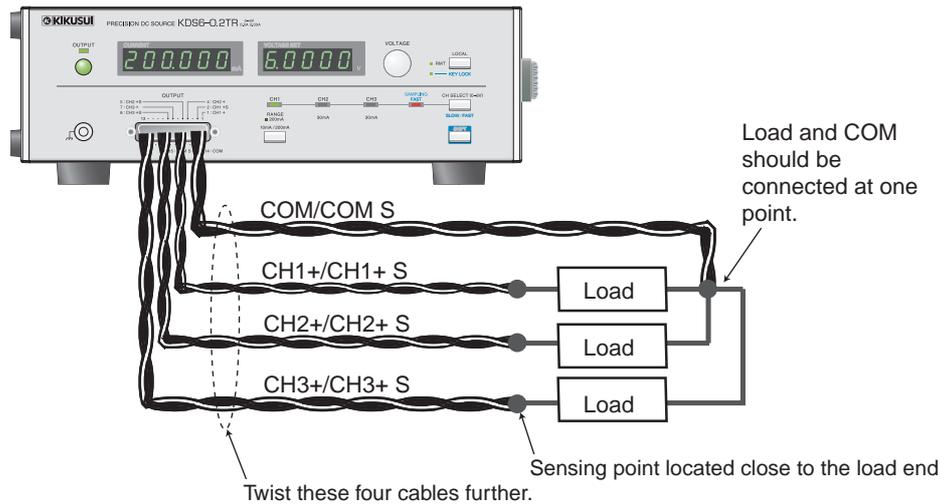
Fig. 3-1   Connection to the load (example of good cabling)
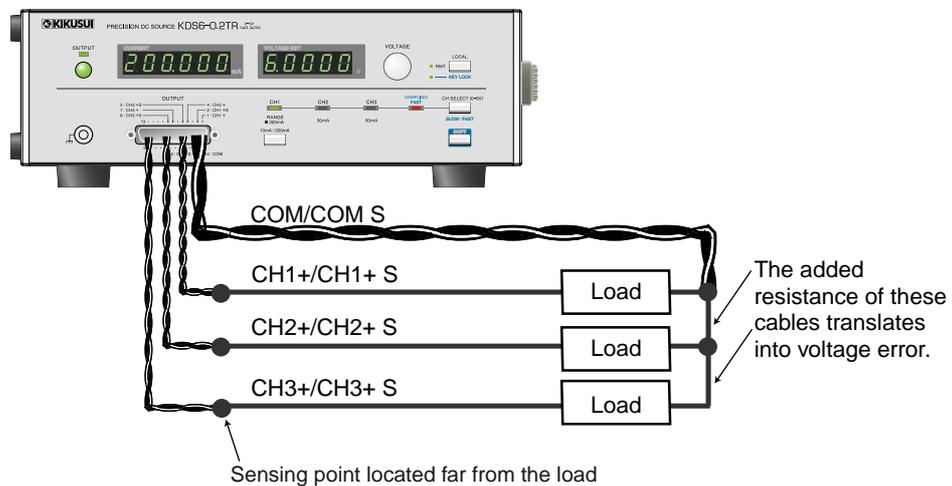
Fig. 3-2   Connection to the load (example of poor cabling)

3.4　About the Load

Unlike other general DC power supplies, the KDS6-0.2TR is optimized as a low-noise voltage source. For this reason, the KDS6-0.2TR is not suitable for use in applications intended to drive loads with abruptly changing current.

If the peak current is lower than the maximum permissible current for each channel, the KDS6-0.2TR may be used without activating the OCP function. However, voltage variation on the order of ±0.1 V to ±0.5 V remains likely for several ms[1] following an abrupt current variation.

When a load subject to abrupt current change is to be connected to the KDS6-0.2TR, it is recommended that you monitor the voltage waveforms on an oscilloscope or the like.

　　[1] Value under a resistance load

■ Sample uses in which abrupt current changes occur

When the KDS6-0.2TR is used to drive a relay coil or resistance, which is switched on/off by an external switch:

If the load is switched on/off by a switch, the current will be subject to significant fluctuations. Use the OUTPUT on/off function with the KDS6-0.2TR to the full extent practicable.

In cases in which an induction load such as a relay is connected, insert a diode in parallel with the coil to prevent problems due to back-electromotive force.

When the KDS6-0.2TR is used as a power source for communication modules or the like that perform TDMA communication:

Some module types give rise to significant current fluctuations when switching between transmission and reception.

This problem can sometimes be resolved by connecting a low-ESR capacitor (100 μF to 1000 μF) to the load. Try this solution first.

Chapter 4

Remote Control

This chapter explains remote control via a GPIB or RS-232C interface.

4.1 Remote Interfaces

The KDS6-0.2TR is equipped with the GPIB and RS-232C remote interfaces.

When either the GPIB or the RS-232C interface is used, the KDS6-0.2TR can be controlled from an external controller in conjunction with programming.

The GPIB and RS-232C interfaces cannot be used simultaneously.

After the power is turned on, the interface used first for communication is selected as the default interface. To select the other interface, turn the power off, then power on and perform communication through the intended interface.

4.1.1 GPIB Interface

To use the GPIB interface, you must establish a GPIB address unique to the device to be connected to the GPIB bus.

The KDS6-0.2TR was factory-shipped with the GPIB address set to 1. To change this setting to another address, follow the procedure described below.

Setting the GPIB address

1. Turn the power switch on while holding down the LOCAL key.

    Do not remove your finger from the LOCAL key too quickly.

    Continue pressing the LOCAL key until "Ib Adr" appears in the output ammeter and a number appears in the voltage setting display.

    The number indicated in the voltage setting display is the present GPIB address.

    Sample display:

    Present address

2. Change the GPIB address by turning the voltage control knob.

    The GPIB address can be specified in a range from 1 to 30.

3. Press the SHIFT key to save the newly established address.

    Pressing the SHIFT key saves the address you have set. If you turn the power off without pressing the SHIFT key, the setting will be lost.

4.1.2　RS-232C Interface

To use the RS-232C interface, the communication protocol of the KDS6-0.2TR must match that of the personal computer (PC) that is to serve as a controller.

For the setting method on the PC side, refer to your computer manual.

■ Communication protocol of the KDS6-0.2TR

Bit rate[*1]	2400, 4800, 9600, 19200, or 38400 bps
Data bit[*2]	8 bits (Fixed)
Parity[*2]	None (Fixed)
Stop bit[*2]	1 bit (Fixed)
Flow control[*3]	XON/XOFF

*1.　The KDS6-0.2TR was factory-shipped with the bit rate set to 19200 bps. To change the bit rate, follow the procedure described below.

*2.　This setting is fixed. Set the PC to be used accordingly.

*3.　If you do not use flow control, perform settings such that "acknowledge messages" will be returned via the "SILent message." Perform settings such that the next message will be sent after the acknowledge messages are confirmed, as one-sided transmission may result in incorrect transmission and/or reception.

Setting the bit rate

To change the bit rate, first activate the GPIB address setting mode, press the LOCAL key again to change the mode, and choose the desired setting.

1. Display the GPIB address as described in "Setting the GPIB address" in 4.1.1, "GPIB Interface."

2. Press the LOCAL key.

Pressing the LOCAL key toggles the device between RS-232C mode and GPIB mode. RS-232C mode is active when 232 is displayed in the output ammeter. The voltage setting display shows the present RS-232C bit rate.

Sample display:

— Present bit rate

3. Change the RS-232C bit rate by turning the voltage control knob.

The bit rate can be set at 2400, 4800, 9600, 19200, or 38400 bps.

When turning the knob counterclockwise, each click selects the next-smaller value; once 2400 is reached, continuing to turn the knob will not change the value.

When the knob is turned clockwise, each click selects the next-higher value; once 38400 is reached, continuing to turn the knob will not change the value.

4. Press the SHIFT key and save the newly established bit rate.

Pressing the SHIFT key saves the bit rate you have set. If you turn the power off without pressing the SHIFT key, the setting will be lost.

RS-232C flow control

Xon/Xoff control is carried out using DC (Device Control) codes.

	Function	ASCII code
DC1	Transmission request	11 h
DC3	Transmission stop request	13 h

Transmission control from the RS-232C terminal to the KDS6-0.2TR

After receiving DC3, the KDS6-0.2TR pauses transmission within 3 characters.
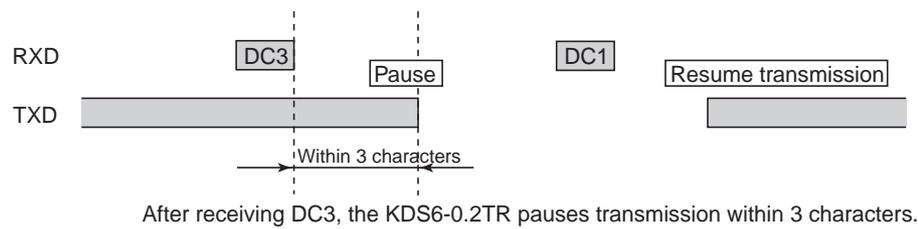
Transmission control from the KDS6-0.2TR to the RS-232C terminal

The RS-232C terminal must pause transmission within 10 characters after receiving DC3.

Fig. 4-1   Transmission control between the RS-232C terminal and KDS6-0.2TR

RS-232C cross cable

Use a D-Sub 9-pin female-female cross cable (using #4-40UNC inch-system screws as fixing screws) to link the computer and the KDS6-0.2TR.

As viewed from the rear panel of the KDS6-0.2TR   Cross cable example
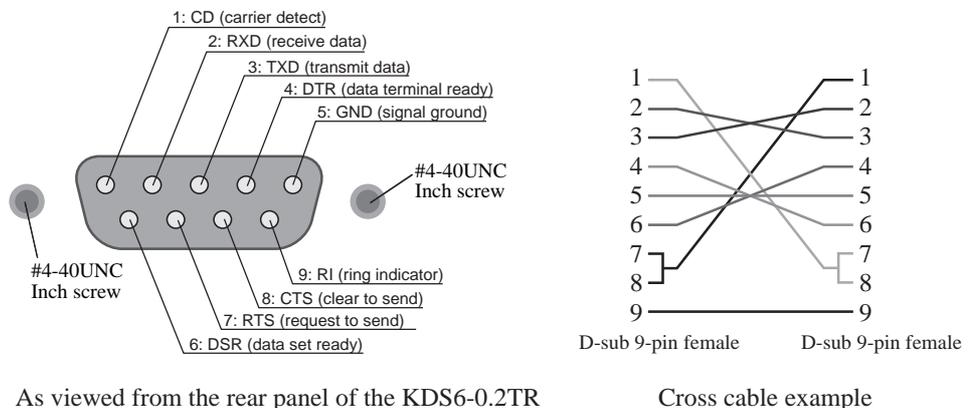
Fig. 4-2   Pin assignment of RS-232C connector

4.2   Messages and Terminators

This section explains the designations used in this manual and the details of communication between the computer (the controller) and the KDS6-0.2TR (the device).

4.2.1   Messages

The orders transmitted from the computer to the KDS6-0.2TR are called "program messages." The responses transmitted from the KDS6-0.2TR to the computer are called "response messages." The program messages include command messages that execute and set specific product functions, and query messages that inquire about the KDS6-0.2TR's settings. Each message is composed of a program header section and a data section.

■ Description method for program messages

A space (ASCII:20h) is required between the program header section and the data section.

```
──→  ┌─────────────────┐   ┌─────────────────────┐   ┌────────┐  ──→
     │  Program header │──→│  Space (ASCII:20h)  │──→│  Data  │
     └─────────────────┘   └─────────────────────┘   └────────┘
```
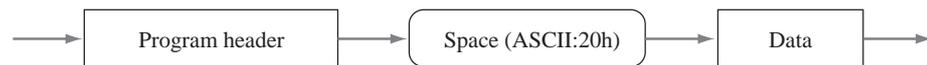
Multiple data items are linked with "," (ASCII:2Ch).

```
                                               ┌─────┐
                                          ┌───→│  ,  │───┐
                                          │    └─────┘   ↓
──→  ┌─────────────────┐   ┌─────────────────────┐   ┌────────┐  ──→
     │  Program header │──→│  Space (ASCII:20h)  │──→│  Data  │
     └─────────────────┘   └─────────────────────┘   └────────┘
```
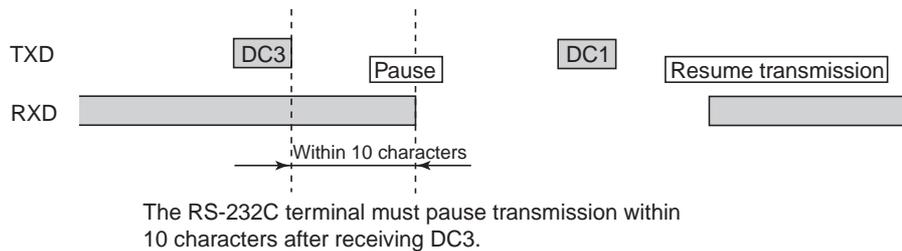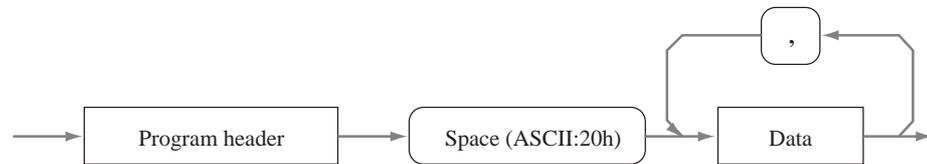
Program message linking is performed with ";" (ASCII:3Bh).

```
        ┌─────┐
   ┌───→│  ;  │←───┐
   │    └─────┘    │
   ↓               │
┌─────────────────────┐
│  Program message    │──→
└─────────────────────┘
```
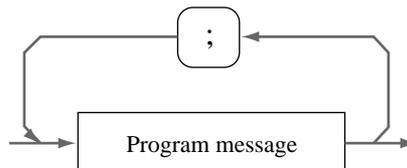
■ Acknowledge messages (RS-232C)

The acknowledge messages are specific to the RS-232C interface and represent information sent from the KDS6-0.2TR to the computer. The messages indicate that the processing of command messages is complete.

```
──→  ┌───────────────────────┐  ──→
     │  Acknowledge message  │
     └───────────────────────┘
```
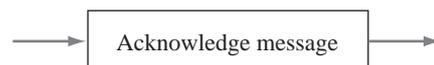
The acknowledge messages consist of ASCII-code character strings; these messages come in two types:

- OK: Normal end
- ERROR: Occurrence of error such as a syntax error

A SILent command message can be used to specify whether or not an acknowledge message should be returned. The KDS6-0.2TR is initially set not to return the acknowledge message.

4.2.2　Terminators

The terminator that indicates the end of a program message is called a "message terminator."

Similarly, the terminator that indicates the end of a response message is called a "response message terminator."

■ Program message terminator

Either one of the following terminators can be used. Advance setting is not required.

Both the RS-232C and the GPIB can be used.	CR (ASCII:0Dh)
	LF (ASCII:0Ah)
	CR+LF (ASCII:0Dh)
Only the GPIB can be used.	CR+EOI
	LF+EOI
	CR+LF+EOI
	EOI only

■ Response message terminator

CR+LF (ASCII:0Dh, 0Ah) is used. In the case of GPIB, EOI is then sent.

4.3　Device Messages

The program messages and response messages supported by the KDS6-0.2TR are collectively referred to as "device messages."

Each of the device messages is explained below.

The program messages are not case-sensitive.

Abbreviations

The program headers are provided in abbreviated form.

The uppercase letters of a device message name are the abbreviation for the device message.

Special symbols and characters

Special symbols and characters used in this manual to describe the program messages and response messages are defined in Table 4-1.

Table 4-1　Definitions of special symbols and characters

Symbol or character	Explanation
< >	These brackets denote program data. Do not include these brackets in the actual program.
{ }	These brackets indicate that one character or number should be selected out of those enclosed in these brackets and placed within '|' marks. Do not include these brackets in the actual program.

SILent (RS-232C only)

This specifies whether an acknowledge message is to be returned to a message accompanied by a response message terminator.

This device message function is effective for the RS-232C only.

Either "OK" or "ERROR" is returned as the acknowledge message.

Program message

- Syntax

   Command message: `SILent <{ON|OFF|1|0}>`

   `SIL <{ON|OFF|1|0}>`

- Program data

Setting acknowledge message	
Data format	Character 1: ON (No message returned) 0: OFF (Message returned)
Initial value	1: ON (No message returned) * The setting is reset to 1 when the power is turned off.

(Example) To set the device to return an acknowledge message

   `SIL 0`

*RST

The following items are initialized by the *RST command message. For setting details, refer to Table 4-2.

Program message

- Syntax

   Command message: `*RST`

Table 4-2   System setting for executing the *RST command

Item	Setting value
Voltage setting (all channels)	0.0000 V
Channel selection	Channel 1
Channel-1 range	200 mA
Output ammeter sampling rate	Normal mode
OUTPUT	Off
KEYLOCK	Clear

GPIB addresses, RS-232C bit rates, and settings performed via SILent and *SRE device messages are not initialized.

*IDN?

Inquires about the model name of the precision DC source and the version of the firmware.

Program message

• Syntax

   Query message: `*IDN?`

Response message

In response to `*IDN?`, the model name, version no., etc., are returned as shown in the example below:

KIKUSUI ELECTRONICS CORP., KDS6-0.2TR,0, 1.00

Company name   Model name   Version No.

Not in use
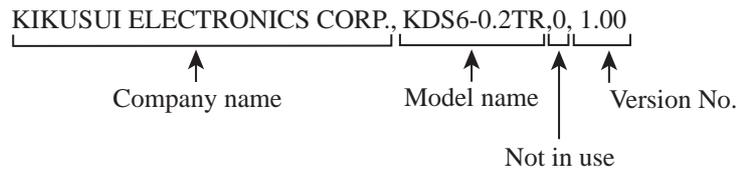
ERR?

Inquires about the contents of an error register.

If an error occurs due to the content of a command message, this is reflected on each bit of the error register. For a grammatical error, "1" is set at bit 0. If the program header is correct, but there is an error in the program data portion, "1" is set at bit 1. These contents are held until they have been read out of the error register. When these contents have been read out, all bits are cleared to "0."

Program message

• Syntax

   Query message: `ERR?`

Response message

In response to `ERR?`, the present error code is returned.

(Example) When there is an error in the program data portion

   1

Contents of error register

Bit	7	6	5	4	3	2	1	0
Error factor	–	–	–	–	–	–	Data Error	Syntax Error
Bit weight	128	64	32	16	8	4	2	1

*STB?

Inquires about the contents of a status byte register.

The value to be returned in a response message varies depending on the setting of the service request enable register. Refer to Fig. 4-3 for bit assignment details.

Program message

• Syntax

   Query message: *STB?

Response message

   In response to *STB?, the present contents of the status byte register are returned.

(Example) If OCP has occurred:

   "1" is returned (against *SRE 0).

   "65" is returned (against *SRE 1 or 9).

*SRE

Sets a service request enable register or inquires about the present setting. For details, refer to Fig. 4-3.

Program message

• Syntax

   Command message: *SRE <Setting value>
   Query message: *SRE?

• Program data

Setting of service request enable register	
Minimum value	0
Maximum value	255
Resolution	1
Data format	Integer
Initial value	0

(Example) To enable all service request factors:

   *SRE 9

Response message

   In response to *SRE?, the present setting is returned as an integer (0 - 255).

	SRQ has occurred

*STB   status byte register

Bit	7	6	5	4	3	2	1	0
Signal name	PON	RQS	ESB	MAV	ERR	–	–	OCP
Bit weight	128	64	32	16	8	4	2	1

*SRE   service request enable register

Bit	7	6	5	4	3	2	1	0
Signal name	–	–	–	–	ERR	–	–	OCP
Bit weight	128	64	32	16	8	4	2	1
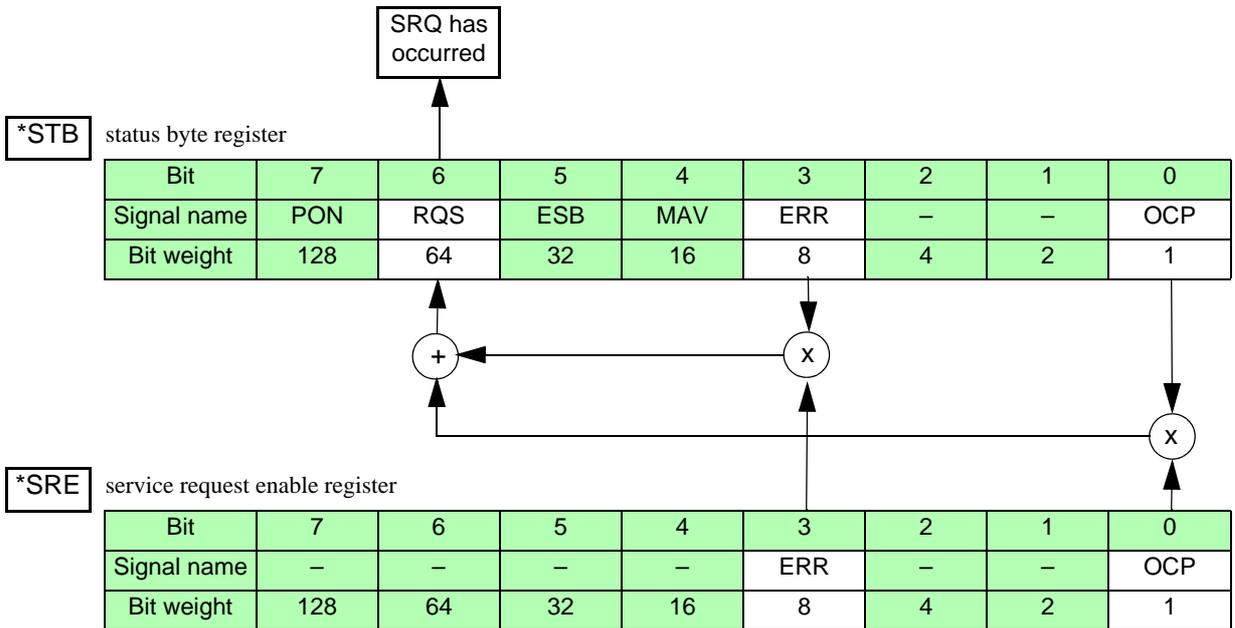
PON: Setting of POWER ON SRQ (not in use)	ERR: ERROR register status summary
RQS: Request service	Not in use
ESB: Event status summary (not in use)	Not in use
MAV: Message ready (not in use)	OCP: OCP status summary

ERR: The bit becomes "1" if a command error or data section error occurs.
OCP: The bit becomes "1" if OCP is activated in any of Channels 1 to 3.
RQS: This bit becomes "1" when the bit registered in the service request enable register becomes "1."
Cleared when serial polling is performed.

Fig. 4-3   Maps of status byte and service request enable registers

*CLS

Clears error registers and status byte registers excluding the RQS bit (bit 6). However, when a factor such as OCP or the like is ongoing, the relevant bit is set immediately after clearing.

The RQS bit (bit 6) of a status byte register is cleared when serial polling is executed or the power is turned off and on again.

Program message
- Syntax
    Command message: `*CLS`

V<n>Set

Sets the voltage value of Channel n, or inquires about the present setting. "n" should be specified in a range from 1 to 3.

Program message

- Syntax

  Command message: V<n>Set <Setting value>

  V<n>S <Setting value>

  Query message: V<n>Set?

  V<n>S?

- Program data

Setting of voltage value for Channel n	
Minimum value	0.0000
Maximum value	6.5000
Resolution	0.0001
Data format	Fixed decimal point
Initial value	0.0000
Unit	V

(Example) To set the voltage value of Channel 1 to 3.1234 V:

V1Set 3.1234

Response message

In response to V1S?, the present setting is returned as fixed decimal point data (0.0000 to 6.5000).

(Example) 3.1234

VSET

Sets the voltage values of Channels 1 to 3 collectively or inquires about the present settings collectively.

Program message

- Syntax

Command message: VSET <CH1 setting value>, <CH2 setting value>, <CH3 setting value>

Setting values are delimited with "," (ASCII:2Ch).

Query message: VSET?

- Program data

Setting of voltage value for Channels 1 to 3	
Minimum value	0.0000
Maximum value	6.5000
Resolution	0.0001
Data format	Fixed decimal point
Initial value	0.0000
Unit	V

(Example) To set Channel 1 to 2.8001 V, Channel 2 to 1 V, and Channel 3 to 0.5 V:

VSET 2.8001,1,0.5

Response message

In response to VSET?, the present settings of the channels are delimited with "," (ASCII:2Ch) and returned as fixed decimal point data (0.0000 to 6.5000).

The data is returned in the order of CH1, CH2, and CH3.

(Example) 2.80001,1.0000,0.5000

I1Out?

Inquires about the output current value of Channel 1.

Program message

- Syntax

    Query message: I1Out?

    I1O?

Response message

- Response data

Output current reading resolutions for Channel 1		
Resolution	Normal mode	0.001 (200-mA range) 0.0001 (10-mA range)
	High-speed mode	0.01 (200-mA range) 0.001 (10-mA range)
Unit	mA	

In response to I1O?, the present output current value is returned as fixed decimal point data.

If OCP has occurred, CH<n>OCP (n = 1 to 3) is returned, "n" indicating the channel in which OCP took place. To clear OCP, the OUTP 0 command is sent.

(Example 1) 200.000

(Example 2) CH1 OCP

I2Out?

Inquires about the output current value of Channel 2.

Program message

- Syntax

    Query message: I2Out?

    I2O?

Response message

- Response data

Output current reading resolutions for Channel 2		
Resolution	Normal mode	0.0001
	High-speed mode	0.001
Unit	mA	

In response to I2O?, the present output current value is returned as fixed decimal point data.

If OCP has occurred, CH<n>OCP (n = 1 to 3) is returned, "n" indicating the channel in which OCP took place. To clear OCP, the OUTP 0 command is sent.

(Example 1) 30.0000

(Example 2) CH2 OCP

I3Out?

Inquires about the output current value of Channel 3.

Program message

- Syntax

  Query message: I3Out?

  I3O?

Response message

- Response data

Output current reading resolutions for Channel 3		
Resolution	Normal mode	0.0001
	High-speed mode	0.001
Unit	mA	

In response to I3O?, the present output current value is returned as fixed decimal point data.

If OCP has occurred, CH<n>OCP (n = 1 to 3) is returned, "n" indicating the channel in which OCP took place. To clear OCP, the OUTP 0 command is sent.

(Example 1) 30.0000

(Example 2) CH3 OCP

IOUT?

Inquires about the output current values of Channels 1 to 3 collectively.

Program message

- Syntax

  Query message: IOUT?

Response message

- Response data

Output current reading resolutions for Channels 1 to 3		
Resolution	Normal mode	0.001 (CH1 200-mA range) 0.0001 (CH1 10-mA range/CH2, 3)
	High-speed mode	0.01 (CH1 200-mA range) 0.001 (CH1 10-mA range/CH2, 3)
Unit	mA	

In response to IOUT?, the present settings of the channels are delimited with "," (ASCII:2Ch) and returned as fixed decimal point data. The data is returned in the order CH1, CH2, CH3.

If OCP has occurred, CH<n>OCP (n = 1 to 3) is returned, "n" indicating the channel in which OCP took place. To clear OCP, the OUTP 0 command is sent.

(Example 1) 200.000,10.3245,-0.0005

(Example 2) CH1 OCP,CH1 OCP,CH1 OCP

OUTPut

Turns output on and off or inquires about the present setting.

Program message

• Syntax

Command message:	`OUTPut <{ON|OFF|1|0}>`
	`OUTP <{ON|OFF|1|0}>`
Query message:	`OUTPut?`
	`OUTP?`

• Program data

Output on/off setting	

Data format	Character
	  1: ON (Output on)
	  0: OFF (Output off)

Initial value	0: OFF (Output off) * The setting is reset to 0 when the power is turned off.

(Example) To set to turn output on:

    OUTP 1

Response message

In response to `OUT?`, the present setting is returned as a character (1 or 0).

(Example) To turn output on: 1
              To turn output off: 0

RANGeset

Switches the current range of Channel 1 or inquires about the present setting.

Program message

- Syntax

  Command message: `RANGeset <{0|1}>`

  `RANG <{0|1}>`

  Query message: `RANGeset?`

  `RANG?`

- Program data

Current range setting for Channel 1	
Data format	Integer: 0: 10 mA 1: 200 mA
Initial value	1: 200 mA

(Example) To set the current range of Channel 1 to 10 mA:

`RANG 0`

Response message

In response to `RANG?`, the present setting is returned as an integer (0 or 1).

(Example) When Channel-1 current range is 10 mA:　　0

When Channel-1 current range is 200 mA:　　1

SAMPlerate

Switches the sampling rate of the output ammeter or inquires about the present setting.

Program message

• Syntax

    Command message: SAMPlerate <{1|0}>
                     SAMP <{1|0}>
    Query message: SAMPlerate?
                     SAMP?

• Program data

Setting of output ammeter sampling rate	

Data format	Integer
	  1: High-speed mode
	  0: Normal mode

Initial value	0: Normal mode

(Example) To set the sampling rate of the output ammeter to HIGH-SPEED:

    SAMP 1

Response message

   In response to SAMP?, the present setting is returned as an integer (1 or 0).

(Example) In high-speed mode: 1
           In normal mode: 0

NOTE: When the sampling rate is set to the high-speed mode, the current measuring resolution will be 5 digits.

KEYLock

Locks all keys except for the LOCAL key or inquires about the present setting.

Program message

- Syntax

  Command message: `KEYLock <{ON|OFF|1|0}>`
  `KEYL <{ON|OFF|1|0}>`

  Query message: `KEYLock?`
  `KEYL?`

- Program data

KEYLOCK on/off setting	
Data format	Character 1: ON (KEYLOCK on) 2: OFF (KEYLOCK off)
Initial value	0: OFF (KEYLOCK off)

(Example) To set to turn the KEYLOCK on:

`KEYL 1`

Response message

In response to `KEYL?`, the present setting is returned as an integer (1 or 0).

(Example) When KEYLOCK is on: 1
When KEYLOCK is off: 0

ACHSel

Each time a voltage setting message or current read-out message is sent, selection is made as to whether or not the panel indication should be switched to the specified channel. This function is useful when you wish to execute the setting or read-out process as rapidly as possible.

Program message

- Syntax

  Command message: `ACHSel <{1|0}>`
  `ACHS <{1|0}>`
  Query message: `ACHSel?`
  `ACHS?`

- Program data

Setting of panel indication switchover	
Data format	Integer 1: (To be switched) 0: (Not to be switched)
Initial value	1 (To be switched) * The setting is reset to 1 when the power is turned off.

(Example) To perform the setting that will not allow switchover:

`ACHSel 0`

Response message

In response to `ACHS?`, the present setting is returned as an integer (1 or 0).

(Example) When panel indication switchover is on: 1
When panel indication switchover is off: 0

4.4 Message Table

A table of the remote interface messages is given below. R/W represents the query message (R) or command message (W).

Table 4-3

	Header	Data					Function and response data
		R/W	Min	Max	Resolution	Unit	
1	SILent	W	OFF(0)	ON(1)	–	–	Acknowledge message (RS-232C)
2	*RST	W	–	–	–	–	Device initialization (resets to factory-settings)
3	*IDN?	R	–	–	–	–	"KIKUSUI ELECTRONICS CORP.,KDS6-0.2TR,0,x.xx" is returned. (x.xx is the version No.)
4	ERR?	R	–	–	–	–	An error register value is returned to clear the error register.
5	*STB?	R	–	–	–	–	A status byte register is read out.
6	*SRE	R/W	0	255	1	–	Setting of service request enable register/read-out of setting value
7	*CLS	W	–	–	–	–	Clearing of status byte register
8	V1Set	R/W	0.0000	6.5000	0.0001	V	Channel-1 voltage setting or read-out of setting value
9	V2Set	R/W	0.0000	6.5000	0.0001	V	Channel-2 voltage setting or read-out of setting value
10	V3Set	R/W	0.0000	6.5000	0.0001	V	Channel-3 voltage setting or read-out of setting value
11	VSET	R/W	0.0000	6.5000	0.0001	V	En-bloc setting or read-out of Channel-1 to Channel-3 output voltages
12	I1Out?	R	–	–	[†]1	mA	Read-out of Channel-1 output current value. If OCP has occurred, "CH<n>OCP" is returned (n = 1 to 3).
13	I2Out?	R	–	–	[†]1	mA	Read-out of Channel-2 output current value. If OCP has occurred, "CH<n>OCP" is returned (n = 1 to 3).
14	I3Out?	R	–	–	[†]1	mA	Read-out of Channel-3 output current value. If OCP has occurred, "CH<n>OCP" is returned (n = 1 to 3).
15	IOUT?	R	–	–	[†]1	mA	En-bloc read-out of Channel-1 to Channel-3 output voltages. If OCP has occurred, "CH<n>OCP" is returned (n = 1 to 3).
16	OUTPut	R/W	OFF(0)	ON(1)	1	–	On/off or status read-out of all-channel outputs. To clear OCP, OUTPut Off or OUTPut 0 is sent.
17	RANGeset	R/W	0	1	1	–	Switching/inquiry of current range of Channel 1. 0:10 mA 1:200 mA
18	SAMPlerate	R/W	0	1	1	–	Switching the sampling rate of the output ammeter. 0: Normal mode. 1: High-speed mode
19	KEYLock	R/W	OFF(0)	ON(1)	1	–	Locks all keys but the LOCAL key.
20	ACHSel	R/W	0	1	1	–	On/off setting of the function to switch panel indication with every voltage setting or current read-out

[†]1: For more information, refer to the detailed description for each message.

— To the present users of the existing KIKUSUI Model SPEC40080 —

The KDS6-0.2TR supports the following device messages used by the existing KIKUSUI Model SPEC40080. Present users of the SPEC40080 can operate The KDS6-0.2TR without modifying the program.

VSET<n> Sets the voltage value of Channel n, or inquires about the present setting. "n" should be specified in the range from 1 to 3.

Program message

- Syntax

    Command message: VSET<n> <Setting value>

    Query message: VSET<n>?

- Program data

Setting of voltage value for Channel n (n = 1 to 3)	
Minimum value	0.0000
Maximum value	6.5000
Resolution	0.0001
Data format	Fixed decimal point
Initial value	0.0000
Unit	V

(Example) To set the voltage value of Channel 1 to 3.1234 V:

    VSET1 3.1234

Response message

In response to VSET<n>? (n = 1 to 3), the present setting is returned as fixed decimal point data (0.0000 to 6.5000).

(Example) 3.1234

IOUT<n>? Inquires about the output current value of Channel n. "n" should be specified in the range from 1 to 3.

Program message

- Syntax

    Query message: IOUT<n>?

Response message

- Response data

Output current reading resolutions for Channel n (n = 1 to 3)		
Resolution	Normal mode	0.001 (CH1 200-mA range) 0.0001 (CH1 10-mA range/CH2, 3)
	High-speed mode	0.01 (CH1 200-mA range) 0.001 (CH1 10-mA range/CH2, 3)
Unit	mA	

In response to IOUT<n>? (n = 1 to 3), the present output current value is returned as a real number. If OCP has occurred, CH<n>OCP (n = 1 to 3) is returned, "n" indicating the channel in which OCP took place. To clear OCP, the OUTP 0 command is sent.

(Example 1) 200.000

(Example 2) CH1 OCP

Chapter 5   Maintenance and Calibration

This chapter explains the maintenance and calibration of the KDS6-0.2TR. To maintain initial performance longer, perform maintenance and calibration on a periodic basis.

5.1   Cleaning

⚠ WARNING   • When cleaning the KDS6-0.2TR, be sure first to turn the POWER switch off and to unplug the power cord.

⚠ CAUTION   • Do not use benzine, paint thinner, or other volatile agent. These chemical agents may cause surface discoloration, damage printed characters, distort or discolor parts, or make the display cloudy. The coating of the panel surface may also peel off if these agents are used.
      • After cleaning the KDS6-0.2TR, allow it to dry thoroughly.

If the panel becomes soiled, clean with a soft cloth impregnated with a neutral detergent diluted with water, then wipe with a dry cloth.

5.2   Checking

Power cord

Check the cord for any cracks in the covering and check the plug for looseness or damage.

⚠ WARNING   • A damaged covering or wire breakage within the power cord poses a risk of electric shock. Stop use immediately.

For purchase of accessories, inquire at your Kikusui distributor/agent.

5.3   Calibration

The KDS6-0.2TR was calibrated prior to shipment from the factory. However, calibration will be required to account for inevitable changes in characteristics through extended use. Periodic calibration (once or twice a year) is recommended.

For details about calibration, inquire at your Kikusui distributor/agent.

Chapter 6 — Specifications

This chapter provides the electrical and mechanical specifications of the KDS6-0.2TR.

Unless otherwise indicated, the specifications are with reference to the following settings and conditions:
- Warm-up time of 30 minutes
- "**% of set" denotes **% of the setting value of output voltage.
- "**% of rdg" denotes **% of the reading value of output current.

6.1   Electrical Specifications

Item			Specifications
Output	Rated output voltage & current range	CH1	0 V to 6 V, 200 mA MAX
		CH2	0 V to 6 V, 30 mA MAX
		CH3	0 V to 6 V, 30 mA MAX
	Output voltages setting range		0.0000 V to 6.5000 V
	Resolution of output voltage setting		100 µV
	Accuracy of output voltage setting		±(0.05 % of set + 2 mV)
	Output ripple noise		100 µVrms or less (10 Hz to 1 MHz)
Current	Resolution of current indication	CH1 10-mA range	In normal mode: 0.1 µA In high-speed mode: 1 µA
		200-mA range	In normal mode: 1 µA In high-speed mode: 10 µA
		CH2	In normal mode: 0.1 µA In high-speed mode: 1 µA
		CH3	In normal mode: 0.1 µA In high-speed mode: 1 µA
	Accuracy of current indication		±(0.2 % of rdg + 20 digits)
Panel indication	Voltage		7-segment LED: 5 digits
	Current		7-segment LED In normal mode: 6 digits In high-speed mode: 5 digits

6.2 General Specifications

Item			Specifications	
Remote interfaces	GPIB		Conforming to IEEE Std.488-1978 SH1, AH1, T6, TE0, L4, SR1, RL1, PP0, DC1, DT0, C0, E1	
	RS-232C	Connector	9-pin D-Sub terminal on rear panel	
		Bit rate	2400, 4800, 9600, 19200, 38400 bps	
		Data bit	8 bits	
		Stop bit	1 bit	
		Parity bit	None	
		Flow control	Provided (XON/XOFF)	
Temperature and humidity range for guaranteed specifications			23ºC ± 5ºC 20% RH to 85% RH (without condensation)	
Operating temperature and humidity range			0ºC to 40ºC 20% RH to 85% RH (without condensation)	
Storage temperature and humidity range			-10ºC to 60ºC 90% RH or less (without condensation)	
Line voltage range (AC 50/60 Hz)	Voltage setting	100 V	90 V to 110 V	
		120 V	104 V to 126 V	
		220 V	194 V to 236 V	
		240 V	207 V to 250 V	
Power consumption			40 VA or less	
External dimensions (largest part)			280W × 88H × 270D mm (305W × 105H × 330D mm)	
Weight			4 kg	
Safety[1]			Compliant with the requirements of the following standard: IEC61010-1:2001 Class I[2] Pollution degree 2[3]	

[1]. Not applicable to custom-made products and modified products.
[2]. This is a Class I equipment. Be sure to ground the KDS6-0.2TR's protective conductor terminal. The safety of this product is only guaranteed when the product is properly grounded.
[3]. Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielectric strength or surface resistivity. Pollution Degree 2 assumes that only non-conductive pollution will occur except for an occasional temporary conductivity caused by condensation.

6.2.1　Accessories

Item	Q'ty	Remarks
Power cord	1	With 3-pole grounding plug
Fuse	One each	250 VAC　1 A(T)　5×20 mm (Built-in; main body) 250 VAC　0.5 A(T)　5×20 mm
Output connector	One each	D-Sub 25-pin, male (with cover and fixing screws)
Operation manual	1	

6.2.2　GPIB Interface

Function	Subset	Description
Source handshake	SH1	All functions available
Acceptor handshake	AH1	All functions available
Talker	T6	All functions available except for talk-only function
Expansion talker	TE0	No function available
Listener	L4	All functions available except for listen-only function
Service request	SR1	All functions available
Remote local	RL1	All functions available
Parallel pole	PP0	No function available
Device clear	DC1	All functions available
Device trigger	DT0	No function available
Controller	C0	No function available
Electrical interface	E1	Open collector

6.3 Outline and Dimensions
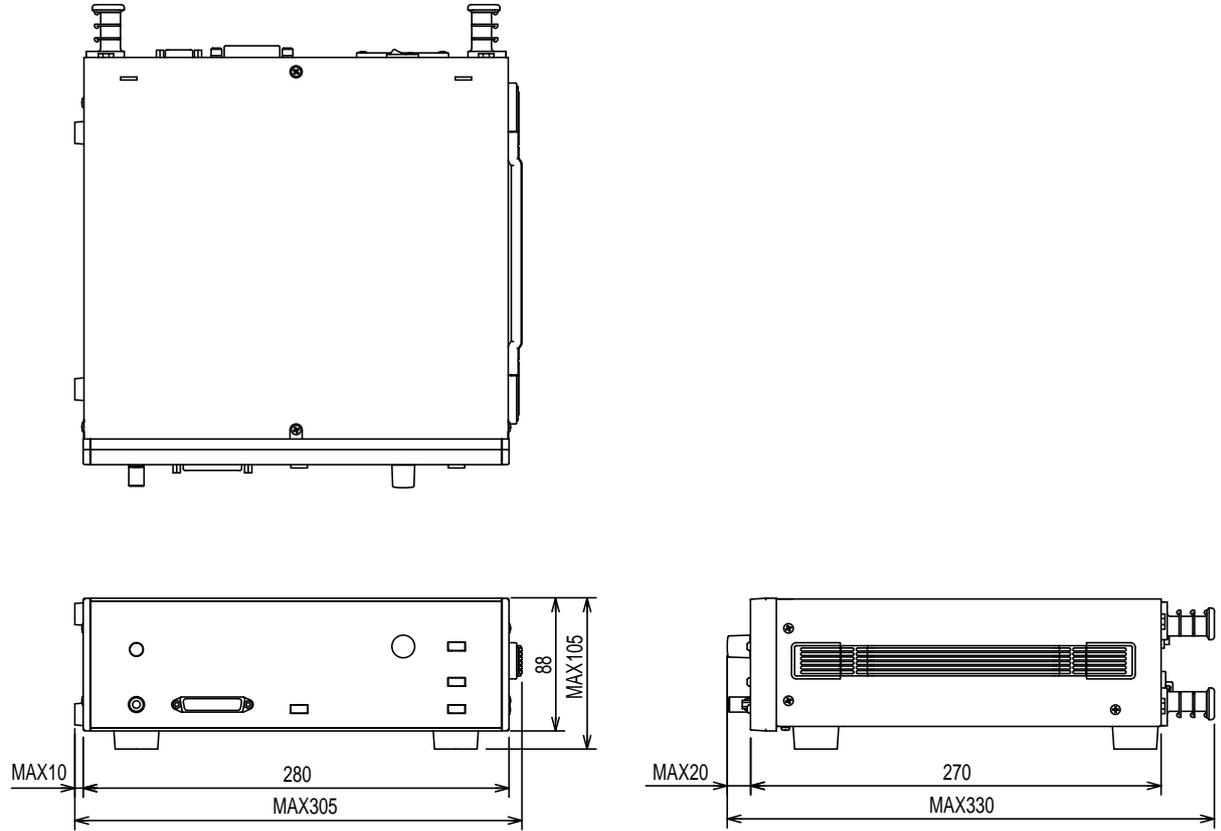
Fig. 6-1   KDS6-0.2TR Outline Diagram

Units: mm

MAX105
88

MAX10   280
MAX305

MAX20   270
MAX330

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