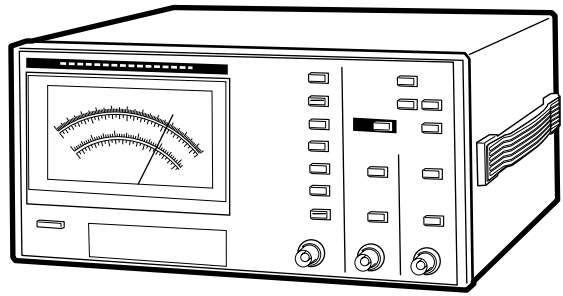
Part No. Z1-002-622, IA002855
Jul. 2006

OPERATION MANUAL

CD TIME INTERVAL JITTER METER

KJM6335



KIKUSUI

Use of Operation Manual

Please read through and understand this Operation Manual before operating the product. After reading, always keep the manual nearby so that you may refer to it as needed. When moving the product 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 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.

Disposing of used Kikusui products in the EU

Under a law adopted by member nations of the European Union (EU), used electric and electronic products carrying the symbol below must be disposed of separately from general household waste.
This includes the power cords and other accessories bundled with the products. When disposing of a product subject to these regulations, please follow the guidance of your local authority, or inquire with your Kikusui distributor/agent where you purchased the product.
The symbol applies only to EU member nations.

Disposal outside the EU

When disposing of an electric or electronic product in a country that is not an EU member, please contact your local authority and ask for the correct method of disposal.

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

- To avoid electrical shock, always disconnect the AC power cord or turn off the switch on the switchboard before attempting to check or replace the fuse.
- Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that short circuits the fuse holder may result in fire, electric shock, or irreparable damage.

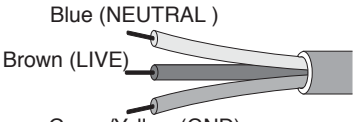
Power Requirements of this Product (cont'd)

☐ AC power cord

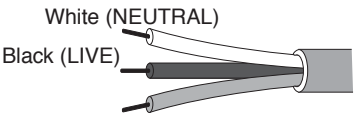
The product is provided with AC power cords described below. If the code has no power plug, attach a power plug or crimp terminals to the code in accordance with the wire colors specified in the drawing.

⚠WARNING • The attachment of a power plug or crimp terminals must be carried out by qualified personnel.

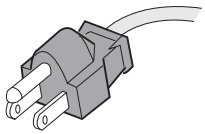
☐ Without a power plug



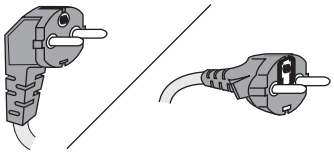
☐ Without a power plug



☐ Plugs for USA



☐ Plugs for Europe



☐ Provided by Kikusui distributor/agent

Kikusui agents can provide you with suitable AC 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 product. Understand the meanings of the symbols and observe the instructions they indicate (the choice of symbols used depends on the products).

	Indicates that a high voltage (over 1 000 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 product 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 product, see the relevant sections in this manual.
	Indicates a protective conductor terminal.
	Indicates a chassis(frame) terminal.

⚠Safety Precautions

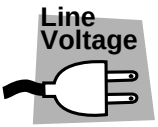
The following safety precautions must be observed to avoid fire hazard, electrical shock, accidents, and other failures. Keep them in mind and make sure that all of them are observed properly.

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 product for purposes other than those described in the operation manual.

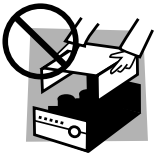


Input power

- Use the product with the specified input power voltage.
- For applying power, use the AC 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.

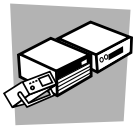
Fuse

- 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 product which may cause physical hazards. Do not remove the external cover.



Installation

- When installing products be sure to observe "Precautions for Installation" described in this manual.
- To avoid electrical shock, connect the protective ground terminal to electrical ground (safety ground).
- 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 product.
- Use two or more persons when relocating the product which weights more than 20 kg. The weight of the products can be found on the rear panel of the product 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 product is relocated.

Operations

- Check that the AC input voltage setting and the fuse rating are satisfied and that there is no abnormality on the surface of the AC power cord. Be sure to unplug the AC power cord or stop applying power before checking.
- If any abnormality or failure is detected in the products, stop using it immediately. Unplug the AC power cord or disconnect the AC power cord from the switchboard. Be careful not to allow the product 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 product. If it must be modified, contact Kikusui distributor/agent.

Maintenance and checking

- To avoid electrical shock, be absolutely sure to unplug the AC 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 product, 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 product must be adjusted or repaired, contact Kikusui distributor/agent.

Overvoltage category

To standardize insulation requirements with respect to the level of transient overvoltage, IEC60664 (Insulation coordination for equipment within low-voltage systems) classifies circuits into four categories according to the frequency of occurrence of voltage transients. For details, see the IEC Standards.

Overvoltage category I

Equipment of overvoltage category I is equipment for connection to circuits in which measures are taken to limit transient overvoltages to an appropriately low level.

Examples are protected electronic circuits.

Overvoltage category II

Equipment of overvoltage category II is energy-consuming equipment to be supplied from the fixed installation.

Examples of such equipment are appliances, portable tools and other household and similar loads.

If such equipment is subjected to special requirements with regard to reliability and availability, overvoltage category III applies.

Overvoltage category III

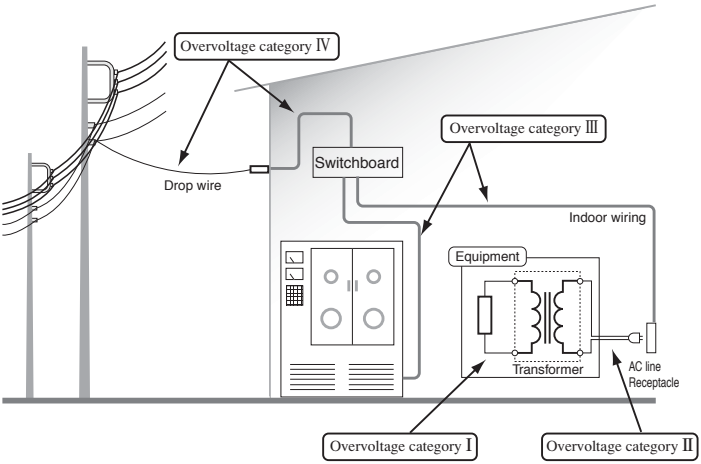
Equipment of overvoltage category III is equipment in fixed installations and for cases where the reliability and the availability of the equipment is subject to special requirements.

Examples of such equipment are switches in the fixed installation and equipment for industrial use with permanent connection to the fixed installation.

Overvoltage category IV

Equipment of overvoltage IV is for use at the origin of the installation.

Example of such equipment are electricity meters and primary overcurrent protection equipment.


Overvoltage category Ⅳ
Drop wire
Switchboard
Overvoltage category Ⅲ
Indoor wiring
Equipment
Transformer
AC line
Receptacle
Overvoltage category Ⅰ
Overvoltage category Ⅱ

Contents

Preface

Description

The KJM6335 is capable of measuring the amount of jitter in CD players by the time interval method. Measurements of jitter in CD players and other equipment can be achieved using this instrument alone.

Because the KJM6335 incorporates a the symmetry follow-up circuit, PLL clock-regeneration circuit, and phase-difference correction circuit, it eliminates the need for externally provided circuits.

The response characteristics of symmetry follow-up or PLL clock regeneration in the CD standard speed adhere to the Compact Disc Reference Measuring Methods Specification Guideline Ver. 1.0 - May 1999.

The instrument has an inhibit input feature that allows jitter measurement with the undesired signal part masked.

GPIB interface is available as an option.

This Operation Manual applies to products running

ROM version 1.0x.

For reference to any product, please contact Kikusui distributor/ agent, and provide your instrument ROM version and serial number given on the rear panel.

For checking the ROM version, see 3.3, "Checking the ROM Version".

Chapter 1 Setup

1.1 Unpacking and Packing

■ Unpacking

When the meter is delivered to your site, first check it for damage during transit or to see if it is complete all the accessories required. If any damage or deficiency is found, please contact Kikusui distributor/agent.

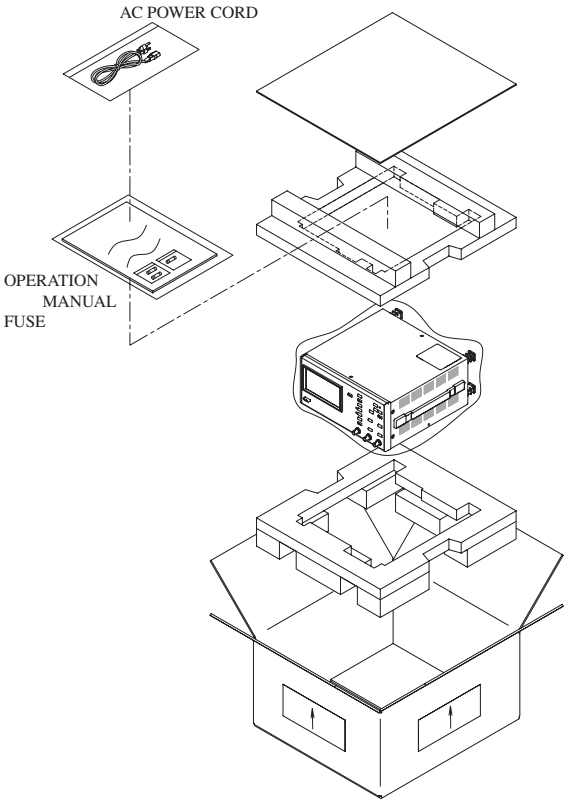
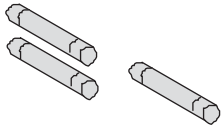


Fig. 1-1 Unpacking/packing

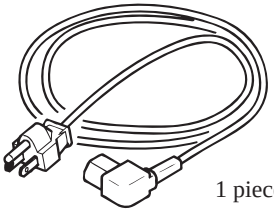
Three fuses are included with the product. At the time of delivery, different types of fuses are provided in accordance with the settings of the line voltage range, as follows:



3 pieces

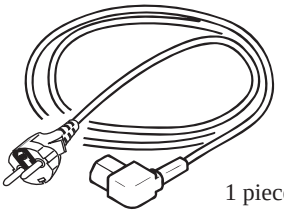
Line voltage range	Inside the fuse holder	Provided separately
90V-110V	1A(T) 1 piece	0.5A(T) 2 pieces
104V-126V	1A(T) 1 piece	0.5A(T) 2 pieces
194V-236V	0.5A(T) 1 piece	1A(T) 2 pieces
207V-250V	0.5A(T) 1 piece	1A(T) 2 pieces

☐ Fuse 0.5A(T):[99-00-0028], 1A(T):[99-00-0029]



1 piece
[85-AA-0003]

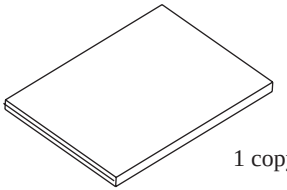
or



1 piece
[85-AA-0005]

The power cord that is provided varies depending on the destination for the product at the factory-shipment.

☐ AC power cord



1 copy

☐ Operation Manual [Z1-002-622]

Fig. 1-2 Accessories

■ Packing

⚠CAUTION
- Use proprietary packing when transporting meter.
- If package is needed, please contact Kikusui distributor/agent.
- Disconnect AC power code, connection cables, etc. from body when packing.

Packing should Refer to Fig.1-1 "Unpacking/packing" to avoid placing cushioning material in the wrong direction.

1.2 Precautions for Installation

Be sure to observe the following precautions when installing the meter.

■ Do not use the meter in a flammable atmosphere.

To prevent explosion or fire, do not use the meter near alcohol, thinner, or other combustible materials, or in an atmosphere containing such vapors.

■ Avoid locations where the meter is exposed to high temperatures or direct sunlight.

Do not locate the meter near a heater or in areas subject to drastic temperature changes.

Operating temperature range :0 ℃ to 40 ℃

Optimum (specification guaranteed)
temperature range : 15 °C to 35 °C

Storage temperature range :-20 ℃ to 60 ℃

■ Avoid humid environments.

Do not locate the meter in a high-humidity environment—near a boiler, humidifier, or water supply.

Operating humidity range: 20 % to 85 % R.H
(no dew condensation is allowed)

Storage humidity range: 90 % R.H or less
(no dew condensation is allowed)

Condensation may occur even within the operating humidity range. In that case, do not start using the meter until the location is completely dry.

■ Do not place the meter in a corrosive atmosphere.

Do not install the meter in a corrosive atmosphere or one containing sulfuric acid mist or the like. This may cause corrosion of various conductors and imperfect contact with connectors, leading to malfunction and failure, or in the worst case, a fire.

■ Do not locate the meter in a dusty environment.

Dirt and dust in the meter may cause electrical shock or fire.

■ **Do not use the meter where ventilation is poor.**

Provide sufficient space around the meter. Otherwise, heat may accumulate in the meter, resulting in fire.

■ **Do not place any object on the meter.**

Particularly a heavy one, as doing so could result in a malfunction.

■ **Do not place the meter on a tilted surface or in a location subject to vibrations.**

If placed on a non-level surface or in a location subject to vibration, the meter may fall, resulting in damage and injury.

■ **Do not use the meter in locations affected by strong magnetic or electric fields.**

Operation in a location subject to magnetic or electric fields may cause the meter to malfunction, resulting in electrical shock or fire.

■ **Secure adequate space around the power plug.**

Do not insert the power plug to an outlet where accessibility to the plug is poor. And, do not place objects near the outlet that would result in poor accessibility to the plug.

1.3 Precautions on Moving

When moving or transporting the meter to an installation site, observe the following precautions.

■ **Turn the POWER switch off.**

Moving the meter with the power on may result in electrical shock or damage.

■ **Remove all wirings connected.**

Moving the meter with cables connected may break the cables or cause the meter to fall, resulting in injury.

■ **For transportation, use the special packing material for the meter.**

Transport the meter in its original package to prevent vibration and falls, which may damage the meter. If you require packing material, contact Kikusui distributor/agent.

1.4 Checking the Line Voltage and Fuse

This meter is used by selecting one of the four line voltage ranges specified in Table1-1. Check the default settings to determine whether the voltage is suitable for your meter. Use a input power fuse appropriate for your line voltage range.

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

⚠CAUTION • Make sure that the fuse used conforms to the meter specifications, including shape, rating, and characteristics. Using a fuse with different rating or short-circuiting, the fuse holder will damage the meter.

When checking or changing the line voltage range, or when checking or replacing the power fuse, observe the following instructions:

1. Turn off the POWER switch and disconnect the power cord.
2. Remove fuse holder as shown in Fig. 1-3 "Removing Fuse Holder".
3. Referring to the LINE VOLTAGE table on the rear panel, check the rating and blowing characteristic of the fuse mounted. If a wrong fuse is used, replace it.

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

Table 1-1 LINE VOLTAGE

4. Check the line voltage to use from the LINE VOLTAGE table, adjust the voltage selector to the ▼ mark and push in the cover.

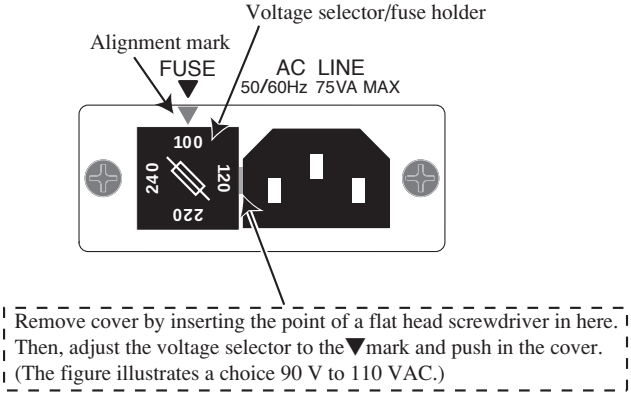


Fig. 1-3 Removing Fuse Holder

1.5 AC Power Cord Connection

The power cord that is provided varies depending on the destination for the product at the factory-shipment.

⚠WARNING

- This product is designed to be connected to a power supply classified as Overvoltage Category II. Do not connect to a power supply classified as Overvoltage Category III or IV. For a description of the Overvoltage Category, see "Overvoltage Category" on page VII.
- The power cord for 100-V system shown in Fig. 1-4 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.

  Have a qualified engineer select the appropriate power cord. If obtaining the right power cord is difficult, contact Kikusui distributor/agent.

- **Do not use the power cord that comes with the product as a power cord for other equipment.**

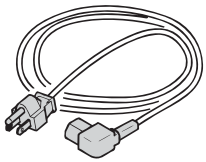
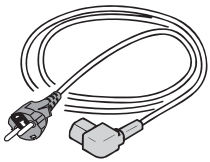
	Power cord for 100-V system [85-AA-0003] Rated voltage: 125 VAC Rated current: 10 A
	Power cord for 200-V system [85-AA-0005] Rated voltage: 250 VAC Rated current: 10 A

Fig. 1-4 AC power cord

1. Check that the AC power supply is within the input power supply range of the product.
2. Check that the POWER switch is turned off.
3. Connect the AC power cord to the AC LINE connector on the rear panel.

   Use a AC power cord specified by Kikusui or one that has been selected by a qualified engineer.
4. Insert the power plug to the outlet.

1.6 Grounding

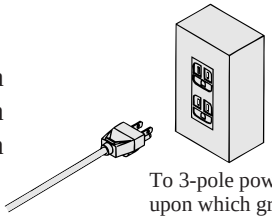
⚠WARNING
- Not grounding the meter creates danger of electric shock.
- Connect the ground terminal to an electrical ground (safety ground).

⚠CAUTION
- Not performing adequate grounding work on the meter results in malfunction or the production of large noises from the meter.

To ensure safety, provide secure grounding.

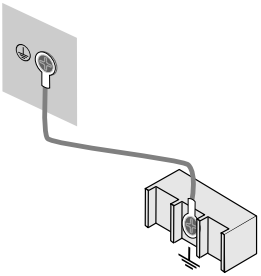
The meter can be grounded by one of the two methods specified below. Select one, and ground the meter securely.

a. Plug the AC power cord into a 3-pole power outlet upon which grounding construction has been performed.



To 3-pole power outlet upon which grounding construction has been performed

b. Connect terminal ⏚ on the meter rear panel to the ground terminal (GND).

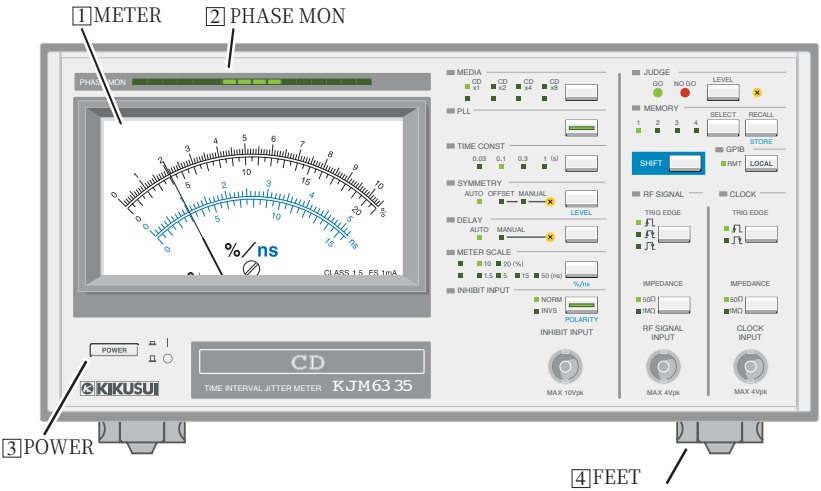


To the ground terminal (GND)

Fig. 1-5

Chapter 2 Names and Functions of Controls

2.1 Front Panel



1 METER

This meter indicates a jitter value (standard deviation value).

The % indication shows a jitter value in percentage to one clock cycle when one clock cycle is regarded as 100 %.

The ns indication shows a jitter value in the absolute value of time.

2 PHASE MONITOR

Displays the phase difference between RF and clock signals and the distribution of jitter. The leftmost part of the monitor indicates a phase difference of 0°, while the rightmost part shows a phase difference of 360°. The frequency jitter distribution is indicated as luminance.

3 POWER switch

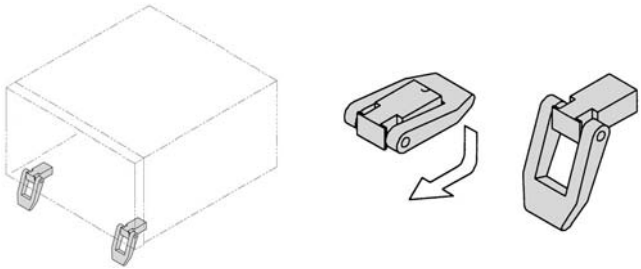
Turns instrument power ON or OFF.

Press the switch switches between turn ON ⏏ (|) and OFF ⏏(○).

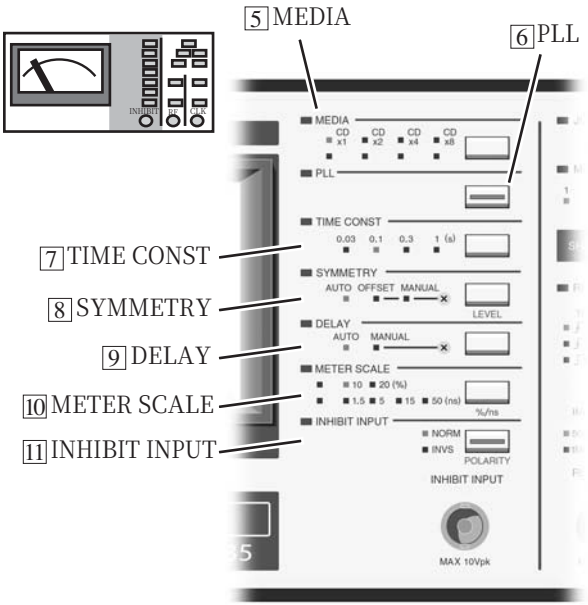
4 FEET

Used to raise the front panel to get a better view of the meter or improve the operability of the keys.

Pull the feet forward until you hear them click.



⚠CAUTION • When you use the meter with the feet pulled forward, do not place any article on it nor exert forces on it.



5 MEDIA

- **MEDIA key**

  Used to select the media to be measured.

  Each time this key is pressed, the media type is switched between CD×1, CD×2, CD×4 and CD×8 in turn. If another media type is added at the customer's request, use this key to select it.

  Pressing this key with the 15 SHIFT key held down causes the instrument to be initialized.

  See 3.2, "Initialization".

- **MEDIA LED**

  The selected media type is indicated by an LED at the left of the MEDIA key.

6 PLL

- **PLL key**

  Used for on/off setting of the PLL clock-reproducing circuit corresponding to the media selected with the 5 MEDIA key.

  When the PLL key is ON, a clock is reproduced from an RF signal. It is ON while the LED on the key is lit, and OFF while the key is not lit.

7 TIME CONST

- **TIME CONST key**

  Used to select time constant for conversion into rms values when the amount of jitter is converted into a rms value.

  Pressing the key switches the time constant in order 0.03 s, 0.1 s, 0.3 s and 1s.

  Pressing this key with the 15 SHIFT key held down allows you to check the ROM version.

  See 3.3,"Checking the ROM Version",

- **TIME CONST LEDs**

  The selected time constant is indicated by an LED to the left of the TIME CONST key.

8 SYMMETRY

- **SYMMETRY/LEVEL key**

  Used to select the symmetry-level follow-up circuit operation mode.

  Pressing the key switches operation mode in order AUTO, OFFSET, and MANUAL settings.

  Pressing this key with the 15 SHIFT key held down causes the meter to indicate a slice level for as long as the key is pressed. The 0 % indication of the meter shows about 0 % level with respect to the full amplitude of an input signal, while the 10 % (20 %) indication of the meter shows 100 % level. Since the internal circuit is AC coupling, the actual slice level changes with the duty ratio of an RF signal.

- **SYMMETRY LEDs**

  The selected operation mode is indicated by an LED to the left of the SYMMETRY/LEVEL key.

  AUTO

  In this mode, the slice level will automatically follow up the symmetry level of an RF signal.
  The frequency response characteristics comply with the CD Reference Measuring Methods when MEDIA is CD×1. That is, the response characteristic corresponding to the media selected using the [5] MEDIA key is automatically selected.

  OFFSET

  In this mode, the slice level will automatically follow up the symmetry level of an RF signal. However, the use of the SYMMETRY LEVEL variable resistor allows you to set an offset from the automatic follow-up level.

  MANUAL

  In this mode, the slice level does not follow up the symmetry level of an RF signal. Use the SYMMETRY LEVEL variable resistor to set the slice level manually. When inputting a signal whose waveform is shaped using any other slicer, always have the symmetry-circuit operation mode set to MANUAL. Using the instrument with the symmetry circuit set to any mode other than MANUAL prevents accurate measurement or completely disables measurement.

- **SYMMETRY LEVEL variable resistor**

  Used to set an offset from the automatic follow-up symmetry level when the symmetry-circuit operation mode is set to OFFSET, or to set the slice level when the operation mode is set to MANUAL.

  When the symmetry-circuit operation mode is set to OFFSET, an offset can be set to the slice level set in AUTO within ±10 % range, where the peak-to-peak amplitude of an RF signal is 100 %.

  When the SYMMETRY mode is set to MANUAL, the range in which the slice level can be varied is approximately 10 % to 90 %,

where the peak-to-peak amplitude of an RF signal is 100 %. Since the internal circuit is AC coupling, the actual slice level changes with the duty ratio of an RF signal. Set an optimum slice level according to the duty ratio of the input signal.

For details, see 3.7 "Symmetry and Slice Level".

9 DELAY

- **DELAY key**

  Used to switch the DELAY mode.

  Pressing the key switches DELAY mode between AUTO and MANUAL.

- **DELAY LEDs**

  The selected delay is indicated by an LED to the left of the key.

  AUTO

  Controls delay time automatically so that the average phase difference between RF and clock signals is 180˚.

  MANUAL

  Lets you adjust delay time using the DELAY TIME variable resistor.

- **DELAY TIME variable resistor**

  Used to set delay time when DELAY mode is set to MANUAL.

  Minimum delay time applies when this variable resistor is turned fully counterclockwise, while the maximum delay time applies when it is turned fully clockwise. Adjust the variable resistor so that the jitter distribution is centered within the 2 PHASE MONITOR.

10 METER SCALE

- **METER SCALE / %/ns key**

  Used to switch to full scale of the meter.

  When the unit is %, the maximum value on the scale changes between 10 % and 20 % each time this key is pressed. When the unit is ns, the maximum value on the scale changes to 1.5 ns, 5 ns, 15 ns, and 50 ns in sequence each time the key is pressed.

  Pressing this key with the 15 SHIFT key held down causes the unit to be switched between % and ns.

- **METER SCALE LEDs**

  The selected scale status is indicated by an LED to the left of the METER SCALE / %/ns key.

11 INHIBIT INPUT

- **INHIBIT INPUT / POLARITY key**

  Used for on/off setting of the inhibit function.

  It is ON while the LED on the key is lit, and OFF while the key is not lit.

  Pressing this key with the 15 SHIFT key held down causes polarity of the inhibit function to be switched.

- **INHIBIT INPUT LEDs**

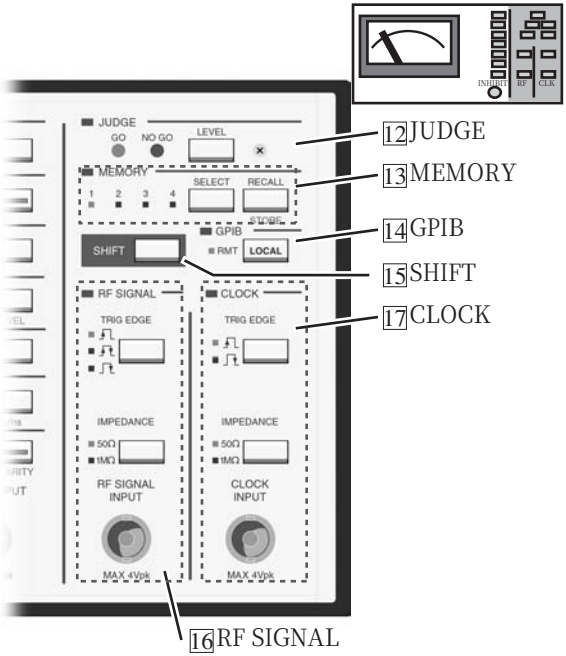
  The selected polarity is indicated by an LED to the left of the key.

- **INHIBIT INPUT terminal**

  This BNC terminal is used to input an RF signal.

  The maximum input voltage is 10 Vpeak (DC + AC).

  For details, see 3.5 "Inhibit Function".



12 JUDGE

- **JUDGE LEVEL key**

  The judgement level is indicated on the meter while this key is pressed. The meter's scale is set with the 10 METER SCALE key.

- **JUDGE LEDs**

  GO LED lights up when a measured value is lower than a set value of judge level; NO GO LED(red) lights up when the measured value is larger than the set value.

  If no signal is input or the clock frequency is outside the specified range, the NO GO LED blinks.

- **JUDGE LEVEL variable resistor**

  This variable resistor is used to set a judgement level.

  The judgement level can be individually set in the unit (% or ns) which is set with the 10 METER SCALE key.

  Even when you change the unit, the set value of each judgement level is retained.

13 MEMORY

Allows you to store in memory up to four types of instrument panel settings.

- **MEMORY SELECT key**

  Selects a setup memory address. When this key is pressed, the setup memory address changes to 1, 2, 3, and 4 in sequence.

- **MEMORY LEDs**

  A selected address is indicated by the relevant LED at the left of MEMORY SELECT key. The LED blinks for three seconds after selection of the address and will change from blinking to continuously lit if you recall or store the panel settings during this period.

  If recall or store is not performed within three seconds after the selection, the LED returns to the state it was in before the MEMORY SELECT key was pressed.

  Further, if any operation other than recall or store is carried out while the LED is blinking, the LED goes off.

- **MEMORY RECALL / STORE key**

  Used to recall the memory contents.

  Pressing this key with the 15 SHIFT key held down causes the panel settings to be stored at a selected setup memory address.

14 GPIB

- **GPIB LOCAL key**

  Pressing this key while the instrument is in the remote state controlled by GPIB (the RMT LED at the left of the key is lit) causes the instrument to return to control from the front panel (local status).

- **RMT LED**

  Lights up when the instrument is in the remote state controlled using the GPIB interface.

  If an invalid operation is performed (such as operating the panel in the key lock state), this LED blinks regardless of the GPIB condition.

15 SHIFT

- **SHIFT key**

  Pressing a other key with the SHIFT key held down performs as follows.

	Operating functions
SHIFT key + 5 MEDIA key	Intialization
SHIFT key + 7 TIME CONST key	Checking the ROM Version
SHIFT key + 8 SYMMETRY key	Indicated a slice level
SHIFT key + 10 METER SCALE key	Switching a meter unit
SHIFT key + 11 INHIBIT INPUT key	Switching a polarity of inhibit input
SHIFT key + 13 MEMORY RECALL key	Stored in memory adress

16 RF SIGNAL

- **RF SIGNAL TRIG EDGE key**

  Used to switch the trigger edge of a RF signal.

  Pressing the key switches the trigger edge in order rising edge ( ), both edges ( ), and falling edge ( ) setting.

- **RF SIGNAL TRIG EDGE LEDs**

  The set trigger-edge status is indicated by the LED to the left of the RF SIGNAL TRIG EDGE key.

- **RF SIGNAL IMPEDANCE key**

  Used to switch the input impedance of a RF signal.

  Pressing the key switches the input impedance between 50 Ω and 1 MΩ.

- **RF SIGNAL IMPEDANCE LEDs**

  The set input impedance is indicated by the LED to the left of the RF SIGNAL IMPEDANCE key.

- **RF SIGNAL INPUT terminal**

  This BNC terminal is used to input an RF signal.

  The maximum input voltage is 4 Vpeak (DC + AC).

17 CLOCK

- **CLOCK TRIG EDGE key**

  Used to switch the trigger edge of a clock signal.

  Pressing the key switches the trigger edge between rising edge (⎍) and falling (⎍) setting.

- **CLOCK TRIG EDGE LEDs**

  The set trigger edge status is indicated by the LED to the left of the CLOCK TRIG EDGE key.

- **CLOCK IMPEDANCE key**

  Used to switch the input impedance of a clock signal.

  Pressing the key switches the input impedance between 50 Ω and 1 MΩ.

- **CLOCK IMPEDANCE LEDs**

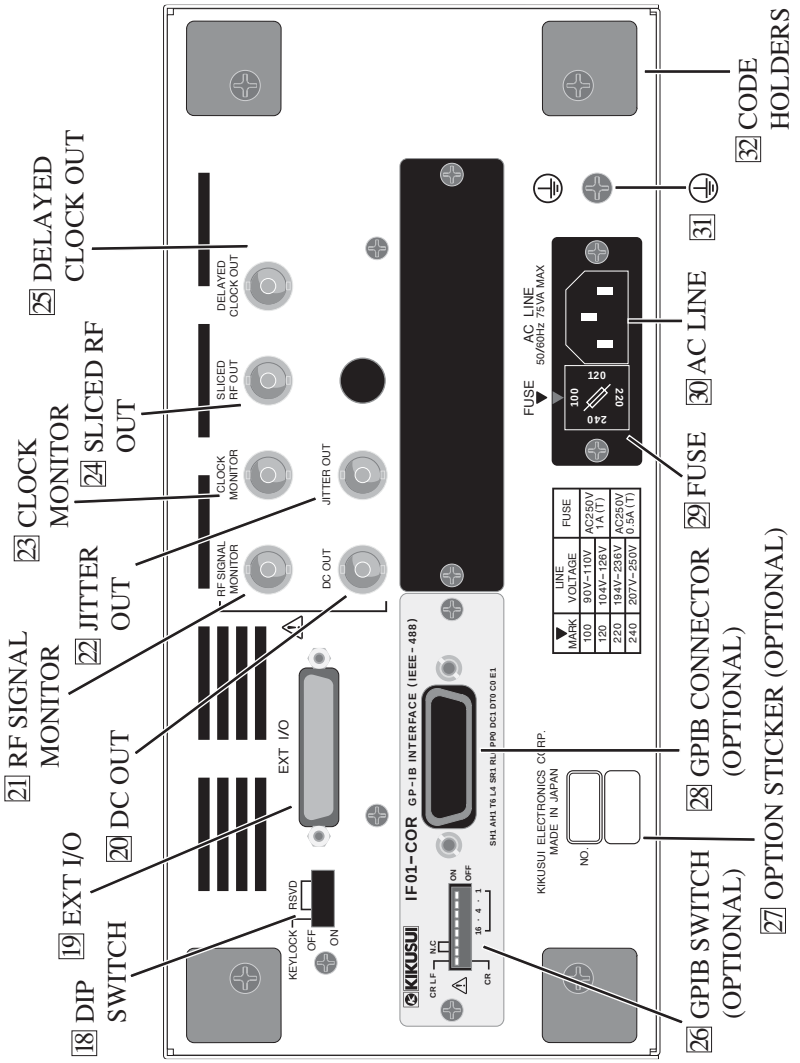
  The set input impedance is indicated by the LED to the left of the CLOCK IMPEDANCE key.

- **CLOCK INPUT terminal**

  This BNC terminal is used to input a clock signal.

  The maximum input voltage is 4 Vpeak (DC + AC).

2.2 Rear Panel



18 DIP switch

- **KEY LOCK**

  Move this switch in the direction of the down(ON) to lock the keys on the front panel.

- **RSVD**

  Not used

19 EXIT I/O

External control connector (D-sub 25 pins)

20 DC OUT (BNC)

Outputs a voltage proportional to a measured value (0.2 V/%). Output impedance is approx. 600 Ω.

The output is "0 V" when no signal is input.

21 RF SIGNAL MONITOR (BNC)

Used to monitor an RF signal, this terminal outputs an amplitude approximately 1/10 (terminated with 50 Ω) of input amplitude. It's also used to calibrate the probe. Output impedance is approx. 50 Ω.

22 JITTER OUT (BNC)

Outputs the waveform of jitter sampled before conversion into a root-mean-square value. Output impedance is approx. 600 Ω.

23 CLOCK MONITOR (BNC)

Used to monitor a clock signal, this terminal outputs an amplitude approximately 1/10 (terminated with 50 Ω) of input amplitude. It's also used to calibrate the probe. Output impedance is approx. 50 Ω.

24 SLICED RF OUT (BNC)

Outputs an RF signal sliced by the slice circuit. The output amplitude is 0.2 V to 0.3 Vp-p (terminated with 50 Ω). The output impedance is approx. 50 Ω.

25 DELAYED CLOCK OUT (BNC)

Outputs a clock signal that has undergone a phase adjustment with respect to an RF signal in the delay circuit. The output amplitude is 0.2 V to 0.3 Vp-p (terminated with 50 Ω). The output impedance is approx. 50 Ω.

26 GPIB switches (optional)

Used to set the GPIB address of the meter.

27 Option sticker (optional)

Indicates that optional are installed in this meter.

28 GPIB connector (optional)

A 24-pin connector complying with the IEEE-488-1978 GPIB Standard, which connects instrument to computer.

29 FUSE

Fuse holder and voltage selector for input power

Place a fuse matching the line voltage in the fuse holder and insert with the line voltage indication positioned at the ▼ mark. The relationship between line voltage and correct fuses is given in the LINE VOLTAGE table on the rear panel.

30 AC LINE

Power cord connector for supplying line voltage.

⚠WARNING • Improper handling of the AC power cord may cause of electric shock. Always follow the procedure, See 1.5, "AC Power Cord Connection".

---

31 ⏚

Connects this terminal to electrical ground.

⚠WARNING •Always carry out grounding. For more information, see 1.6, Grounding.

---

32 Cord holders

Wind the AC power cord around these holders when storing the KJM6335.

Chapter 3 Operation

3.1 Power on

1. Check the POWER switch is set to OFF.
2. Referring to the LINE VOLTAGE table on the rear panel, check the line voltage available to the jitter meter and the voltage selector setting match.
3. Connect accessory power cord to AC LINE on the rear-panel.
4. Connect the plug to prescribed power line.

⚠CAUTION • Damage to the fuse could result if the line voltage available to the jitter meter and the voltage selector setting do not match.

---

5. Using the adjusting screw at the center of the meter, adjust mechanically pointer of the meter to indicate "0".
6. Turn on the POWER switch.

   Front panel displays the status of the jitter meter in which it had been before it was last turned off.

3.2 Initialization

Pressing the MEDIA key with the SHIFT key held down, initializes the instrument, restoring all settings on the instrument front panel to factory-shipped setting.

Note that the contents of the setup memory remain the same setting.

The default setting after initialization (factory-shipped setting) and the contents of the setup memory upon shipment from the factory are as follows:

MEDIA	:CD×1
PLL	:OFF
TIME CONST	:0.03 s
SYMMETRY	:AUTO
DELAY	:AUTO
METER SCALE	:10 %
INHIBIT INPUT	:OFF
INHIBIT POLARITY	:NORM
JUDGE LEVEL	:8 %
MEMORY	:OFF (unlit)
TRIG EDGE (RF)	:  (rising)
TRIG EDGE (CLK)	:  (rising)
IMPEDANCE (RF)	:1 MΩ
IMPEDANCE (CLK)	:1 MΩ

3.3 Checking the ROM Version

The ROM version is indicated by the meter, using its 0 % -10 % scale divisions. Pressing the TIME CONST key with the SHIFT key held down. This causes the pointer of the meter to indicate 10 % at first, then move three times, stopping for approximately 2 seconds in each instance, and finally returning to a measured value.

The three values indicated by the pointer show ver. x.xx.

e.g.: if the meter pointer moves to 10, 1, 2, 3, and then to the measured value, the ROM version is ver. 1.23.

3.4 Operation

3.4.1 Measuring to Use RF Signal after Slicing and Regenerated Clock Signal

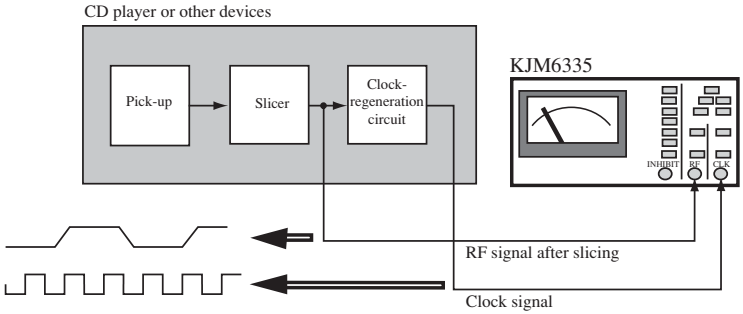


Fig. 3-1

Connection

Connect an RF signal after slicing and clock signal to the instrument from the CD player or other device, as shown in Fig. 3-1. When carrying out measurement, note the signal output impedance of the device under test. For example, if the signal output impedance of the DUT is 50 Ω, the input impedance of the instrument should be set to 50 Ω and it is recommended that a 50 Ω coaxial cable (such as 3D-2V) be used. If you use a 10:1 oscilloscope probe, set the input impedance of the instrument to 1 MΩ.

NOTE • When using the 10:1 probe, calibrate the probe to see 3.10, "Calibrating the Probe".

Instrument Settings

MEDIA	:CD×1 (Clock signal frequency: 4.1 MHz to 25 MHz) CD×8 (Clock signal frequency: 25 MHz to 36 MHz)
PLL	:OFF
TIME CONST	:any value (Select any range suitable for easy measurement.)
SYMMETRY	:MANUAL
DELAY	:AUTO or MANUAL
METER SCALE	:Select any scale according to measured value.
INHIBIT INPUT	:OFF
INHIBIT POLARITY	:NORM
TRIG EDGE(RF)	:both edges (⨍)
TRIG EDGE(CLOCK)	:any edge

NOTE

- When measuring a signal, which has been converted both edges or a single edge using a special equipment, always set TRIG EDGE (RF) to a single edge (rising edge or falling edge). If the both-edge setting is selected, measurement will be disabled.
- When inputting an RF signal after slicing, always use the instrument with the SYMMETRY mode set to MANUAL. If SYMMETRY is set to any mode other than MANUAL, accurate measurement is not possible, or measurement may be disabled. For detail, see 3.7,"Symmetry and Slice Level" and 2.1,"Front Panel".

When SYMMETRY mode is set to MANUAL, the slice level needs to be set manually. Follow the procedures given below.

1. Pressing the SYMMETRY key with the SHIFT key held down. The meter will indicate a slice level until the keys are released.
2. Turn the SYMMETRY LEVEL variable resistor to set the slice level required. The meter's 0 % indication shows about 0 % slice level with respect to the full amplitude of an input signal, while 10 % (20 %) indication shows 100 % slice level. Since the internal circuit is AC coupling, the actual slice level changes with the duty ratio of an RF input signal. Set the optimal slice level according to the duty ratio of the input signal. For detail, see 3.7 "Symmetry and Slice Level".
3. The meter indicates the measured value when you release your hand from the SHIFT key and the SYMMETRY key.

When DELAY mode is set to AUTO, delay time is automatically adjusted so that the average phase difference between the RF and clock signals becomes 180˚. Use the instrument with DELAY set to MANUAL, if AUTO mode is not suitable, as with cases in which the jitter distribution has two frequency peaks.

When DELAY mode is set to MANUAL, turn the DELAY TIME variable resistor for optimum phase difference by observing the PHASE MONITOR. For detail, see 3.8 "Adjusting Delay".

3.4.2 Measuring to Use RF Signal after Optical Pick-up and Regenerated Clock Signal

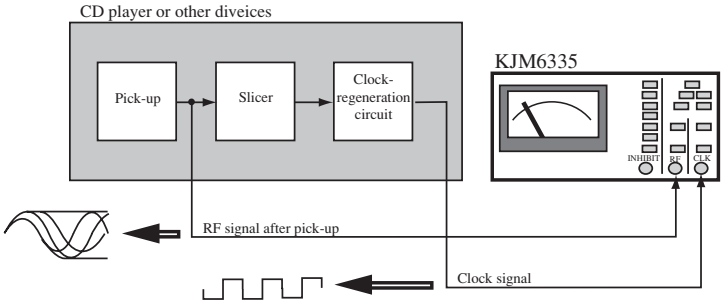


Fig. 3-2

Connection

Connect a RF signal after pick-up and regenerated clock signal to the instrument from the CD player or other device, as shown in Fig. 3-2.

Instrument Settings

MEDIA	:CD×1 (Clock signal frequency: 4.1 MHz to 25 MHz) CD×8 (Clock signal frequency: 25 MHz to 36 MHz)
PLL	:OFF
TIME CONST	:any value (Select any range suitable for easy measurement.)
SYMMETRY	:AUTO or OFFSET
DELAY	:AUTO or MANUAL
METER SCALE	:Select any scale according to the measured value.
INHIBIT INPUT	:OFF
INHIBIT POLARITY	:NORM
TRIG EDGE(RF)	:both edges( )
TRIG EDGE(CLOCK)	:any edge

When inputting RF output after the pick-up, always use the instrument with SYMMETRY mode set to AUTO or OFFSET.

When SYMMETRY mode is set to AUTO, the slice level of the instrument will automatically follow up the symmetry level of the RF signal.

When SYMMETRY is set to OFFSET, the slice level will automatically follow up the symmetry level of the RF signal, but you may offset the automatic follow-up level by using the SYMMETRY LEVEL variable resistor.

For detail, see 3.7 "Symmetry and Slice Level" and 2.1 " Front Panel".

For setting the delay when DELAY mode is set to MANUAL, see 3.8 "Adjusting Delay".

NOTE

- The characteristics of the meter comply with Compact Disc Reference Measuring Methods Specification Guideline Ver.1.0 May 1999. A difference between the characteristics of the symmetry follow-up circuit (slicer circuit) in the CD player and those of the instrument will result in a difference in measured values with respect to 3.4.1 "Measuring to Use RF Signal after Slicing and Regenerated Clock Signal".

3.4.3 Measuring to Use RF Signal Only

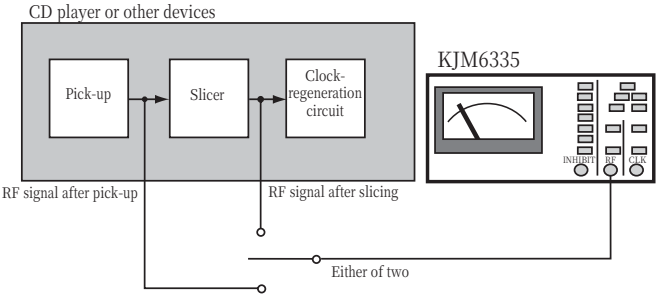


Fig. 3-3

Connection

Connect a RF signal after pick-up or slicing to the instrument from the CD player or other device, as shown in Fig. 3-3.

Instrument Settings

MEDIA	:CD×1 ,CD×2 ,CD×4 ,CD×8
PLL	:ON
TIME CONST	:any value
	(Select any range suitable for easy measurement.)
SYMMETRY:	:AUTO or OFFSET (for RF signal after pick-up)
	:MANUAL (for RF signal after slicing)
DELAY	:AUTO or MANUAL
METER SCALE	:Select any scale according to measured value.
INHIBIT INPUT	:OFF
INHIBIT POLARITY	:NORM
TRIG EDGE(RF)	:both edges( )
TRIG EDGE(CLOCK)	:any edge

NOTE

- When measuring a signal, which has been converted both edges or a single edge using a special equipment, always set TRIG EDGE (RF) to a single edge (rising edge or falling edge). If the both-edge setting is selected, measurement will be disabled.

For detail, see 3.7 "Symmetry and Slice Level" and 2.1 "Front Panel". For setting the slice level when SYMMETRY is set to MANUAL, see 3.4.1 "Measuring to Use RF Signal after Slicing and Regenerated Clock Signal".

For setting the delay when DELAY is set to MANUAL, see 3.8 "Adjusting Delay".

NOTE

- The characteristics of the meter comply with Compact Disc Reference Measuring Methods Specification Guideline Ver.1.0 May 1999. A difference between the characteristics of the symmetry follow-up circuit (slicer circuit) in the CD player and those of the instrument will result in a difference in measured values with respect to 3.4.1 "Measuring to Use RF Signal after Slicing and Regenerated Clock Signal".
- Set the MEDIA to the speed of the CD player measured.

3.5 Inhibit Function

Use of the inhibit function allows you to measure jitter with the undesired signal or another part masked.

Inputting a pulse synchronized with data you wish to mask to the INHIBIT INPUT terminal causes the instrument to stop jitter measurement during the time corresponding to the pulse width.

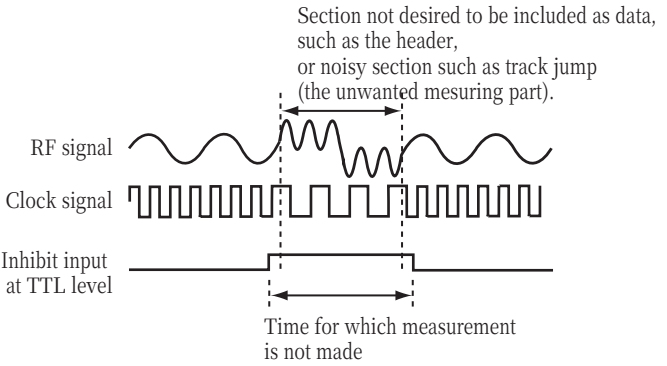


Fig. 3-4

Input a pulse synchronized with data you wish to mask to the INHIBIT INPUT terminal. The input level is TTL level.

Press the INHIBIT INPUT/POLARITY key. When the LED on the key top is lit, the inhibit function is on.

Pressing the INHIBIT INPUT/POLARITY key with the SHIFT key held down, allows you to switch the polarity. The polarity state is indicated by an LED at the left side. When NORM is lit, inhibition is performed at the High level of an input signal, and when INVS is lit, it is performed at the Low level of the signal.

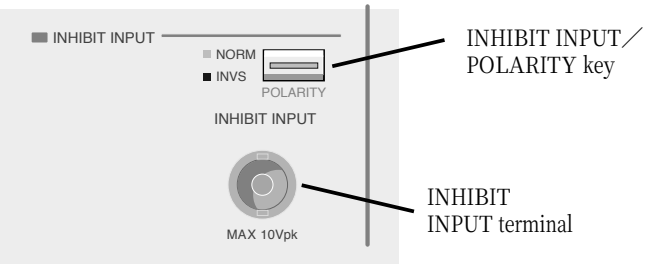


Fig. 3-5

3.6 Setting the Contents of the Setup Memory

A maximum of four types of instrument panel settings can be stored in the setup memory for later recall.

Store method:

When you press the MEMORY SELECT key, one of LEDs "1" to "4", indicating the setup memory address at the left of the key, blinks.

Each time you press the key, the setup memory address switches to 1, 2, 3, and 4 in sequence; select the setup memory address where you wish to store the panel settings. Pressing the MEMORY RECALL/STORE key with the SHIFT key held down, stores the panel settings at the selected setup memory address.

The selection state (condition in which the LED is blinking) will be automatically cancelled unless you accept a store action within 3 seconds, and will return to the status that existed before the MEMORY SELECT key was pressed. Moreover, if you change the panel settings in the selection state, the LED goes off.

Recall method:

There are two methods of recalling the contents of the setup memory. One is a direct recall in which the contents of the setup memory are recalled as soon as the MEMORY RECALL/STORE key is pressed. The other is a select & recall in which you select the setup memory address to be recalled using the MEMORY SELECT key and then perform the recall.

- **Direct recall**

In this method, the contents of the setup memory will be recalled as soon as you press the MEMORY RECALL/STORE key. Each time you press the MEMORY RECALL/STORE key, the setup memory address switches to 1, 2, 3, and 4 in sequence and the contents of the setup memory are recalled.

If the condition immediately before pressing the MEMORY RECALL/STORE key is a recall status of the setup memory (the LED at the left of the key is lit), pressing the MEMORY RECALL/STORE key causes the contents of the next setup memory address to be recalled.

If the condition immediately before pressing the MEMORY RECALL/STORE key is a state where the panel settings have been changed (the LED at the left of the key is unlit), pressing the MEMORY RECALL/STORE key causes the contents of the setup memory address recalled before the panel settings were changed to be recalled again.

Changing the panel settings after recalling the setup memory contents causes the LED at the left of the key to go off.

- **Select & recall**

  In this method, select the setup memory address you wish to recall using the MEMORY SELECT key and then press the MEMORY RECALL/STORE key to recall the contents of that setup memory address.

  When you press the MEMORY SELECT key, one of LEDs "1" to "4", indicating the setup memory address on the left of the key, blinks. Each time you press the key, the setup memory address changes to 1, 2, 3, and 4 in sequence; select the setup memory address you wish to recall.

  Press the MEMORY RECALL/STORE key to recall the contents of the selected setup memory address.

  The selection state (condition in which the LED is blinking) will be automatically cancelled unless you accept a recall action within 3 seconds, and will return to the status that existed before the MEMORY SELECT key was pressed. Moreover, if you change the panel settings in the selection state, the LED goes off.

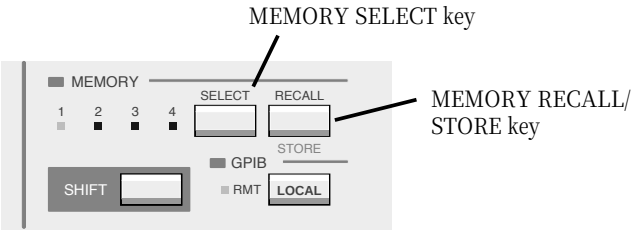


Fig. 3-6

3.7 Symmetry and Slice Level

The CD (EFM) modulation systems provide a time ratio of 50:50 between "1" and "0" when bit strings are averaged. In other words, DSV (Digital Sum Value) is "0," indicating that the signal does not contain a DC value. However, when signals are recorded to disc, the pit length on the disc changes, due to various conditions such as optical power at mastering, the developing time of the original disc, and other factors. When a pickup reads the disc, the RF signal will have a DC value. This phenomenon is called "asymmetry." Slicing the RF signal at the center of the full amplitude of the RF signal when binary-coding the signal gives a DC value to the signal obtained after slicing. In slicing the RF signal, a certain slice level will prevent the signal from taking a DC value after slicing. This level is known as the symmetry level of the RF signal.

Operations When SYMMETRY mode is set to AUTO (AUTO: lit)

The KJM6765 has a feature that allows the slice level to follow up the symmetry level of an RF signal automatically to correct the asymmetry of the RF signal. This is done by feeding back the slice level so that the DC value of a signal obtained after slicing the RF signal becomes 0.

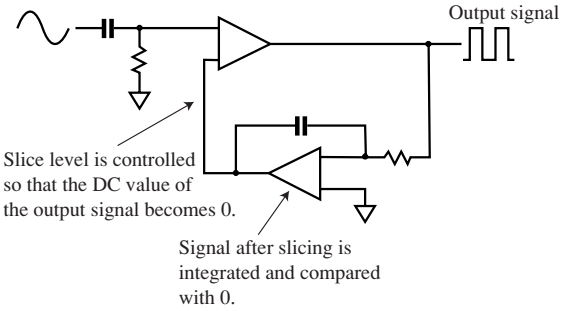


Fig. 3-7

Fig. 3-7 shows a typical automatic symmetry level follow-up circuit. Changing the slice level of an input signal in this way varies the DC value of the signal obtained after the slicer. This allows for feedback control.

Operation When SYMMETRY mode is set to OFFSET (OFFSET: lit)

The OFFSET mode lets you offset the slice level that automatically follows up the symmetry level in AUTO action. An offset should be adjusted by turning the variable resistor next to SYMMETRY mode key, using an adjusting screwdriver.

Operation When SYMMETRY mode is set to MANUAL (MANUAL: lit)

The automatic symmetry-level follow-up circuit is intended for an RF signal before slicing. Input of a signal with brief rise and fall times, such as square waves, limits the control range. For signals whose duty ratio is not 50 %, control is entirely disabled. Thus, when a sliced signal is input, the automatic symmetry level follow-up circuit must be disabled.

To disable automatic symmetry level follow-up, set SYMMETRY to MANUAL.

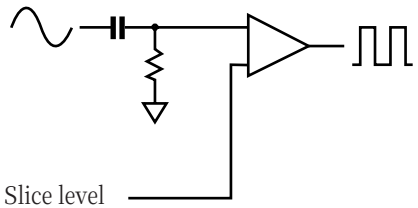


Fig. 3-8

Fig. 3-8 shows the circuit with SYMMETRY mode set to MANUAL. When the symmetry mode is set to MANUAL, feedback control is disconnected and the slice level is given directly from DAC. The range in which the slice level can be varied is approximately 10 % to 90 %, where the peak-to-peak amplitude of an RF signal is 100 %. However, as shown in the figure above, because the input of the slicer is AC coupled, there is a difference between the set slice level and the actual slicing level arising from the duty ratio of the input signal.

e.g.: When the duty ratio of an input signal is 50 %

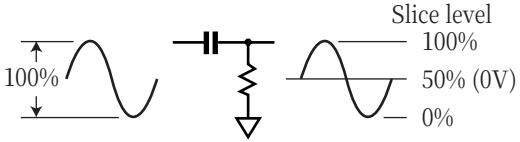


Fig. 3-9

As shown in Fig. 3-9, because a signal whose duty ratio is 50 % (such as a sine wave) does not have a DC value, the set slice level agrees with the actual level where the signal is sliced. To slice when the signal is at a point midway between its peaks, set the slice level to 50 %.

e.g.: When the duty ratio of an input signal is not 50 %

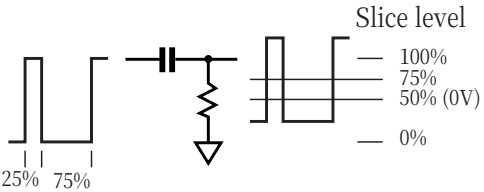


Fig. 3-10

As shown in Fig. 3-10, if a signal whose duty ratio is not 50 % is input, coupling it to AC causes a DC offset. In the example above, because the duty ratio of the input signal is 25:75, the signal obtained after coupling to AC will be offset up by 25 %. Thus, to slice when the signal is at a point midway between its peaks, set the slice level to 75 %.

If the duty ratio is not 50 %, check the signal using an oscilloscope or the like and set an optimum slice level by referring to the above example.

Since the frequency bandwidth of the RF input is about 38 MHz, for thin pulses with pulse width below 15 ns, the amplitude may decrease, KJM6335 cannot measure jitter.

Checking and Setting Slice Level

The slice level can be adjusted using the SYMMETRY LEVEL variable resistor when OFFSET or MANUAL mode is set in the SYMMETRY mode.

1. Pressing the SYMMETRY/LEVEL key with the SHIFT key held down, While the keys are held down, the meter indicates a slice level. The slice level is indicated relative to a meter value as shown below.

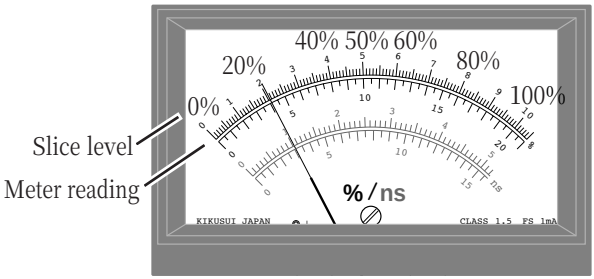


Fig. 3-11

2. To alter the slice level, make the appropriate settings on the SYMMETRY LEVEL variable resistor.

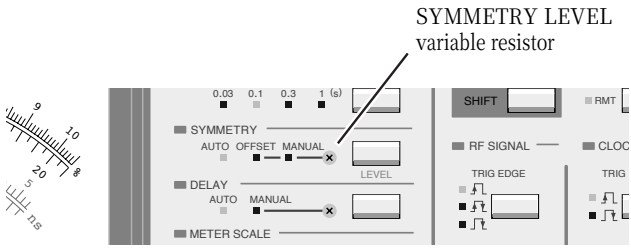


Fig. 3-12

3.8 Adjusting Delay

To measure the amount of jitter of an RF signal relative to a clock signal, the ideal average phase difference between the edge of the clock signal and that of the RF signal is 180˚.

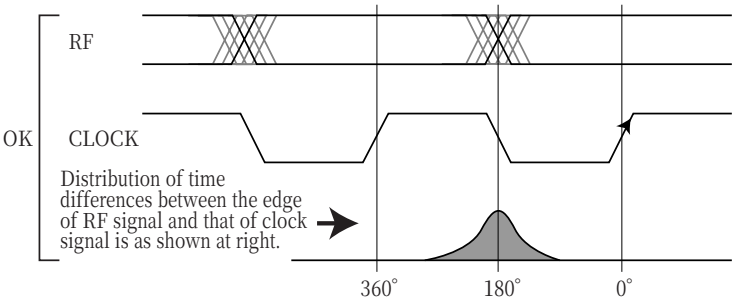


Fig. 3-13

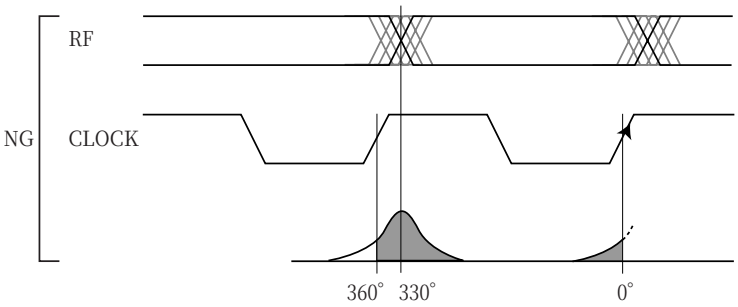


Fig. 3-14

Two timings in Figs. 3-13 and 3-14 compare the phase difference between the RF and clock signals at 180˚ and the phase difference between them at 330˚. Essentially, jitter should be distributed in the range 0 to 360˚, as shown in Fig. 3-13, but is distributed at 0˚ and 330˚ in Fig. 3-14. This results in a higher a standard deviation value, and jitter cannot be measured accurately. The phase difference must be adjusted so that the average phase difference between the two signals is located at 180˚.

This adjustment can be handled by the delay circuit. When DELAY mode is set to AUTO, the instrument automatically adjusts the average phase difference to 180°. When DELAY is set to MANUAL, use the variable resistor next to the DELAY key to adjust the phase difference so that the peak (brightest part) of the PHASE MONITOR above the meter is approximately centered.

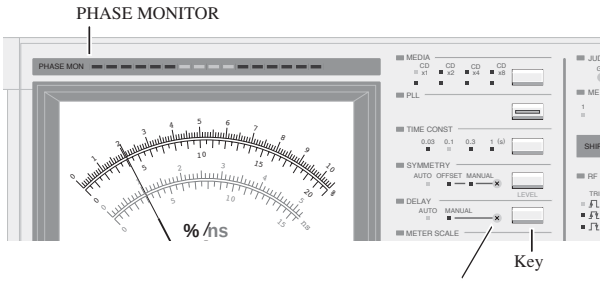


Fig. 3-15

NOTE

- When DELAY is set to AUTO, it takes some time for the reading to stabilize after the coupling of the signal to the delay circuit from MANUAL mode. Moreover, a jitter of 15 % or more or jitter distribution in two or more peaks may disable the correct action.

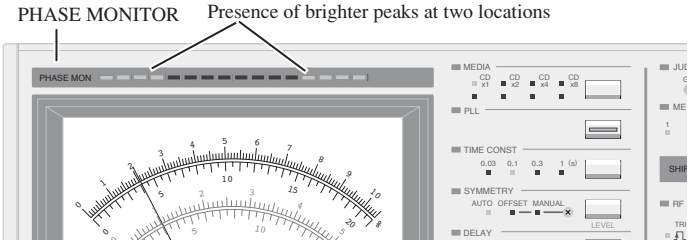
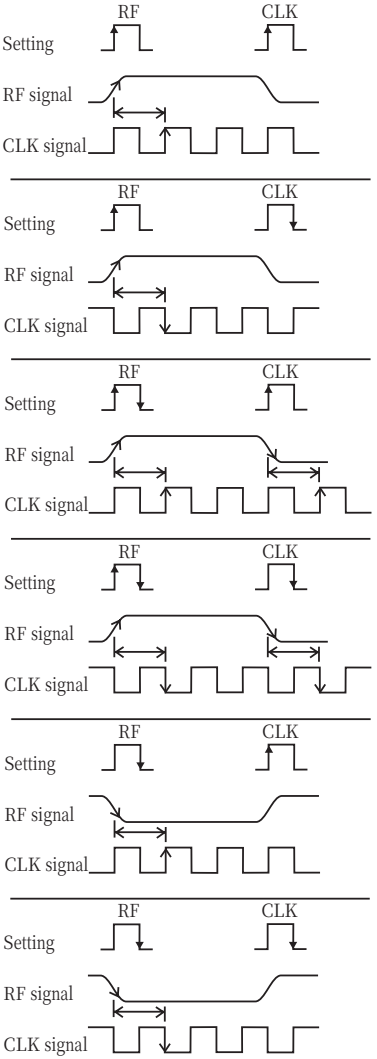


Fig. 3-16

3.9 Selection of Trigger Edge

This meter measures the time difference between the RF signal and the clock signal and indicates its dispersion as a standard deviation value. To measure the time difference, specify the two edges of each signal to be measured, using the RF SIGNAL TRIG EDGE key and CLOCK TRG EDGE key.



Measure the time difference between the rise of the RF signal and the rise of the clock signal. Then, determine the amount of jitter.

Measure the time difference between the rise of the RF signal and the fall of the clock signal. Then, determine the amount of jitter.

Measure the time difference between the rise of the RF signal and the rise of the clock signal and that between the fall of the RF signal and the rise of the clock signal. Then, determine the amount of jitter.

Measure the time difference between the rise of the RF signal and the fall of the clock signal and that between the fall of the RF signal and the fall of the clock signal. Then, determine the amount of jitter.

Measure the time difference between the fall of the RF signal and the rise of the clock signal. Then, determine the amount of jitter.

Measure the time difference between the fall of the RF signal and the fall of the clock signal. Then, determine the amount of jitter.

Fig.3-17

NOTE

- When measuring an RF signal that has had single edge converted by edge detection, set the trigger edge of the RF signal in the meter to either the rising edge or the falling edge, thus bringing the trigger edge into line with the RF signal to be measured. Note that measurement fails if both edges are selected at the same time.

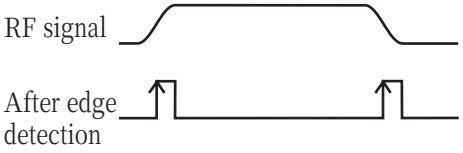


Fig. 3-18

In this case, be sure to select the rising edge as the trigger edge of the RF signal of the meter.

3.10 Calibrating the Probe

In addition to a 50 Ω coaxial cable, you may also use a 10:1 probe with a 100 MHz bandwidth.

If you use the probe, calibrate the probe (phase correction) as follows first:

Measuring Instrument and Other Items Required for Calibration

100 MHz bandwidth oscilloscope	1	Kikusui COR5500 or equivalent
50 Ω BNC-BNC cable	1	Kikusui SA550 or equivalent
50 Ω terminator	1	
Adjusting screwdriver	1	

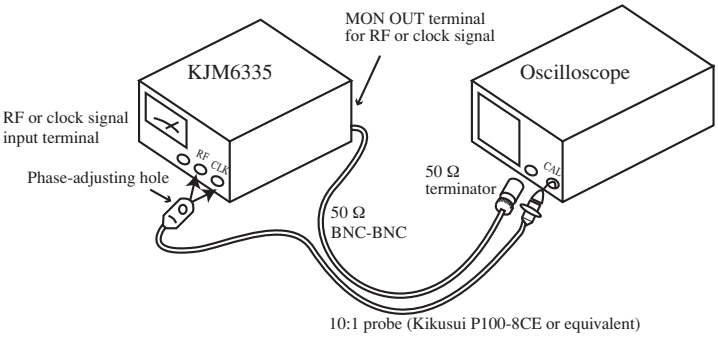


Fig. 3-19

As shown in Fig. 3-19, connect the BNC-BNC cable and probe so that they run parallel, without forming large loops (which are vulnerable to external noise). Insert the adjusting screwdriver through the phase adjusting hole and correct the phase while monitoring square waves on the oscilloscope. For adjusting waveforms, see the description of the oscilloscope probe calibration method.

NOTE • If the probe has not been calibrated (phase not corrected), the instrument will not indicate a correct value.

Chapter 4 GPIB Operation

The GPIB interface is factory option.

4.1 Summary

The GPIB interface supported by the KJM6335 is controlled by IEEE 488 standard interface.

It's electrical and mechanical specifications conform to IEEE std488.1-1987.

Use of the GPIB interface allows you to set the function of each panel other than the POWER and KEYLOCK switches, read the setting condition of a function, or read out the set values.

4.2 Setting a GPIB Address

Be sure to set address before connecting the external computer. The address is set in the five DIP switches (ADRS) of the GPIB switch. Indication of 16 • 4 • 1 stands for 16 8 4 2 1. The address is specified by the sum of values indicated for the DIP switches set to ON (upperside). When all five DIP switches are set to OFF, the address value is 0. For example, to set the address to 6, set the DIP switch indicated as 4 and the DIP switch indicated as • (=2) between 4 and 1 to ON to set 6=4+2.

Turn the meter power on again. The address set becomes valid after power on.

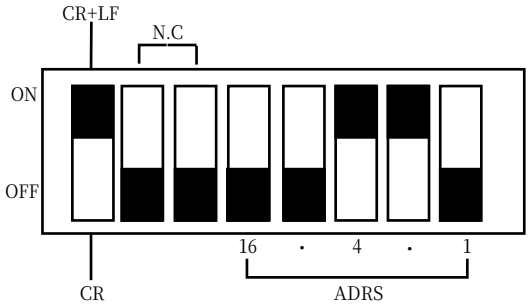


Fig. 4-1 Example Address Setting

NOTE • The address is set to "2" before delivery.

4.3 GPIB Basic Operation

Messages and terminators

■ Program message

The text of data that is transmitted from the controller(computor or other controllers) to a device(KJM6335 or other devices) is called a program message. Program messages are grouped into two types: command messages, which carry device data, and query messages, which request response messages.

Abbreviations are provided for program messages and some character program data. (Abbreviations omit lower-case characters from program message headings.)

■ Response message

The text of data that is transmitted from a device to the controller is called a response message.

All response messages are returned in abbreviations.

■ Message structure

Each message is composed of a program header and data.

■ Terminator

- **Program message terminator**

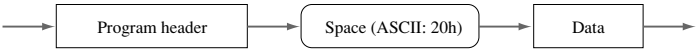
  The terminator used to mark the end of a program message is called a program message terminator.

- **Response message terminator**

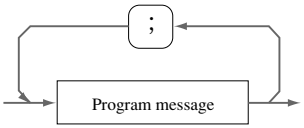
  The terminator used to mark the end of a response message is called a response message terminator.

Message

- An intervening space (ASCII: 20h) is required between the program header and data.



- Program messages are separated from one another by a colon (;) (ASCII: 3Bh).



- The kinds of program message terminators listed can be used without presetting. (A CR alone, without an EOI, cannot be used.)

  LF

  LF+EOI

  EOI

  CR+EOI

- Only LF + EOI can be used as a response message terminator.

NOTE

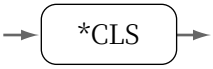
- Always set the CR+LF/CR selector switch of the GPIB switches to CR+LF. Note that the message terminators always use LF+EOI, regardless of this setting. They do not switch to CR+LF.
- When linking program messages for send, the number of characters to be sent at any one time should be 250 characters or less, including message terminators ";", and " " (space).
- When sending program messages in abbreviations, use abbreviations only. A mixture of abbreviations and standard program messages will produce errors.
- A response message will be returned in abbreviated form.

4.4 Device Message

*CLS

Resets the status byte register and the event status register.

■ Program message

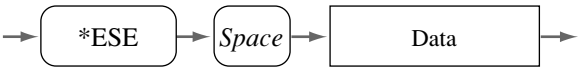


*ESE

Sets or resets the individual bits of the event status enable register. The default is 0h.

Running *RST resets the bits to their initial value.

■ Program message



■ Program data

Event status enable register set/reset	
Minimum	0h
Maximum	FFh
Resolution	1h
Data type	Hex

Table 4-1

e.g.: To set the CME (Command Error) bit of the event status enable register.

*ESE #H20

■ Response message

*ESE? ... Returns the contents of the event status enable register.

The contents of the register will not be cleared if they are read out. They will not be cleared even it they are read with the *RST or *CLS message.

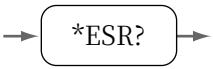
e.g.: When the data is 30h.

A value of #H30 is returned.

*ESR?

Returns the contents of the event status register. The individual bits are reset when read.

■ Program message



■ Response message

*ESR? ... Returns the contents of the event status register.

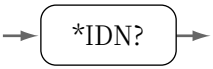
e.g.: When the data is A0h.

A value of #HA0 is returned.

*IDN?

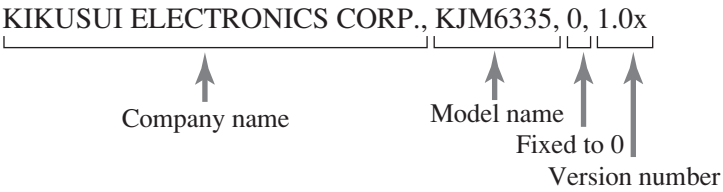
Returns instrument model information.

■ **Program message**



■ **Response message**

The instrument returns model information in the following format:



*RST

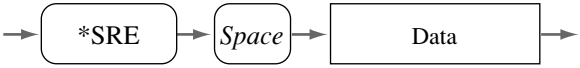
Brings settings to the same condition as the initial mode set. The status and error registers will not be cleared.

■ **Program message**

*SRE

Sets or resets the individual bits of the service request enable register. Bit 6, however, cannot be set.

■ Program message



■ Program data

Service request enable register set/reset	
Minimum	0h
Maximum	FFh
Resolution	1h
Data type	Hex

Table 4-2

e.g.: To set ESB bit of the service request enable register.

*SRE #H20

■ Response message

*SRE? ... Returns the contents of the service request enable register. The contents of the register will not be cleared if they are read out. They will not be cleared even it they are read with the *RST or *CLS message.

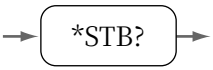
e.g.: When the data is 20h.

A value of #H20 is returned.

*STB?

Returns the contents of the status byte register. The contents of the status byte register will be cleared by the *CLS message.

■ **Program message**



■ **Response message**

e.g.: When the data is 60h.
A value of #H60 is returned.

CLOCk:IMPedance

Sets the input impedance of CLOCK INPUT.

■ Program message

■ Program data

Setting value for the input inpedance of CLOCK INPUT	
Data type	Character
Character program data	50, 1M

Table 4-3

e.g.: To set the input impedance of CLOCK INPUT to 50 Ω.

CLOC:IMP 50

■ Response message

CLOC:IMP?... Returns the current input impedance of CLOCK INPUT.

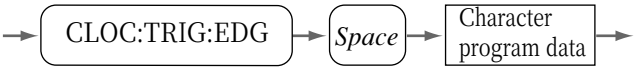
e.g.: When the current input impedance of CLOCK INPUT is 1 MΩ.

A value of 1M is returned.

CLOCk:TRIGger:EDGe

Sets the polarity of the input trigger edge of CLOCK INPUT.

■ Program message



■ Program data

Setting the TRIG EDGE of CLOCK INPUT	
Data type	Character
Character program data	POSitive, NEGative

Table 4-4

e.g.: To set the polarity of the input trigger edge of CLOCK INPUT to rising edge( ).

CLOC:TRIG:EDG POS

■ Response message

CLOC:TRIG:EDG?... Returns the current TRIG EDGE status of CLOCK INPUT.

e.g.: If the polarity of the input trigger edge of the current CLOCK INPUT is set to falling edge( ).

A value of NEG is returned.

DELay:CONtrol

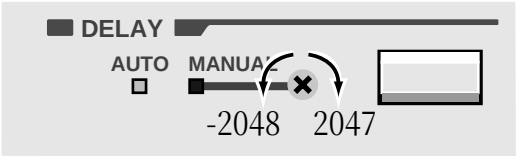
Sets the level when DELAY mode is set to MANUAL. Even when the instrument reverts from the remote status achieved using GPIB to control from the front panel (local status), this level set-value will be retained until the DELAY TIME variable resistor is operated.

■ Program message

■ Program data

Setting the delay control level	
Data type	Integer
Minimum	-2048
Maximum	2047
Resolution	1

Table 4-5



In panel operations, turning the DELAY TIME variable resistor clockwise means setting the delay in the direction of 2047, while turning it counterclockwise means setting it in the direction of -2048.

e.g.: To set the delay control level to center.

DEL:CON 0

■ Response message

DEL:CON?… Returns the set value of the level applied when the DELAY mode is set to MANUAL.

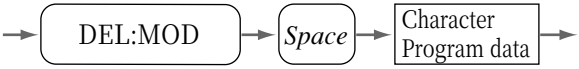
e.g.: When the set value of the level is +100

A value of 100 is returned.

DELay:MODe

Specifies DELAY mode.

■ Program message



■ Program data

Setting the DELAY mode	
Data type	Character
Character program data	AUTo, MANual

Table 4-6

e.g.: To set DELAY mode to AUTO.
DEL:MOD AUT

■ Response message

DEL:MOD? … Returns the current DELAY mode status.

e.g.: When the current DELAY mode is MANUAL.
A value of MAN is returned.

ERRor?

Reads an error code from the error queue.

■ Program message

■ Response message

Message code	Explanation
0	No error
-11	Syntax error
-12	Out of range error
-13	Illegal keyword
-15	Illegal instruction
-18	Error buffer full
-19	None of the above

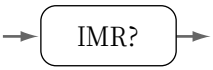
Table 4-7 Error Messages

e.g.: If an out of range error occurs.
A value of -12 is returned.

IMR?

Returns an indication of whether the measured value is 20 % or less.

■ Program message



■ Response message

IMR?… Returns an indication of whether the measured value is 20 % or less.

e.g.1: When the measured value is 20 % or less.

A value of 1 is returned.

e.g.2: When the measured value is over 20 %.

A value of 0 is returned.

INHibit

Sets ON or OFF for the inhibit circuit.

■ Program message

■ Program data

Setting the INHIBIT	
Data type	Character
Character program data	ON, OFF

Table 4-8

e.g.: To turn on the inhibit circuit.
INH ON

■ Response message

INH?… Returns the current status of the inhibit circuit.

e.g.: When the inhibit circuit is currently on.
A value of ON is returned.

INHibit:POLarity

Sets the polarity for the inhibit circuit.

■ Program message

■ Program data

Setting the INHIBIT POLARITY	
Data type	Character
Character program data	NORMal, INVerse

Table 4-9

e.g.: To set the polarity of inhibit circuit to INVERSE
INH:POL INV

■ Response message

INH:POL?… Returns the current polarity of the inhibit circuit.

e.g.: When polarity of the inhibit circuit is currently NORMAL.
A value of NORM is returned.

JITter?

Returns the measured jitter value in units corresponding to the meter scale currently set. The range of measured values is 0.00 % to 20.00 % on the % scale or 0.0 ns to 50.0 ns in the ns scale.

■ Program message

■ Response message

JIT?… Returns the current JITTER value.

e.g.1: When the current JITTER value is 12.34 %.

A value of 12.34 is returned.

e.g.2: When the current JITTER value is 23.4 ns.

A value of 23.4 is returned.

e.g.3: When no signal is input:

When measurement is disabled, such as when the clock frequency is outside the specified range:

A value of 100.00 or 100.0 is returned.

JITter:VALue?

Returns the measured jitter value in units corresponding to the meter scale currently set. The range of measured values is 0.00 % to 20.00 % on the % scale or 0.0 ns to 50.0 ns in the ns scale.

■ Program message

■ Response message

JIT:VAL?… Returns the current JITTER value.

e.g.1: When the current JITTER value is 12.3 %.

A value of 12.30PCT is returned.

e.g.2: When no signal is input:

When measurement is disabled, such as when the clock frequency is outside the specified range:

A value of 100.00PCT or 100.0NS is returned.

JUDge?

Returns the judgement result of JUDGE.

■ Program message

■ Response message

JUD?…Returns the JUDGE result.

e.g.1: When the result is GO.
A value of 1 is returned.

e.g.: When the result is NOGO.
A value of 0 is returned.

JUDge:LEVel

Specifies a JUDGE level value. The judgement value is stored in both % and ns units.

■ Program message

■ Program data

Setting the JUDGE level	
Data type	Real
Minimum	0.00/0.00PCT, 0.0NS
Maximum	20.00/20.00PCT, 50.0NS
Resolution	0.01/0.01PCT, 0.1NS

Table 4-10

e.g.: To set JUDGE level to 6.55 %.

JUD:LEV 6.55PCT

■ Response message

JUD:LEV?… Returns the JUDGE level in units corresponding to the currently set meter scale.

e.g.1: When the JUDGE level is 8.5 % on the % scale.

A value of 8.50PCT is returned.

e.g.2: When the JUDGE level is 15.5 ns on the ns scale.

A value of 15.5NS is returned.

JUDge:RESult?

Returns the judgement result of JUDGE.

■ Program message

■ Response message

JUD:RES?…Returns the JUDGE result.

e.g.1: When the result is GO.
A value of GO is returned.

e.g. 2: When the result is NO GO.
A value of NOGO is returned.

MEDia:TYPe

Sets the type of media to be measured.

■ Program message

■ Program data

Setting the MEDIA type	
Data type	Character
Character program data	CDx1, CDx2, CDx4, CDx8

Table 4-11

e.g.: To set media type to CD×1.
MED:TYP CDX1

■ Response message

MED:TYP?… Returns the media type of the current object to be measured.

e.g.: When the media type is set to CD×1.
A value of CDX1 is returned.

MEMory:RECall

Recalls the panel settings from the setup memory.

■ Program message

■ Program data

Recalling the PANEL setting	
Data type	Character
Character program data	1, 2, 3, 4

Table 4-12

e.g.: When the contents of setup memory 3 are recalled.

MEM:REC 3

■ Response message

MEM:REC?… Returns the contents of the currently valid setup memory address. If any operation is carried out after a recall, "0" is returned as an invalid address.

e.g.: When the address 4 is recalled.

A value of 4 is returned.

MEMory:STOre

Stores the panel settings from the setup memory.

■ Program message

■ Program data

Storaging the PANEL setting	
Data type	Character
Character program data	1, 2, 3, 4

Table 4-13

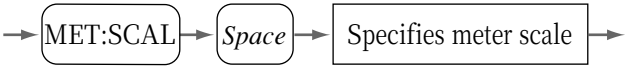
e.g.: When the contents are stored to setup memory 1.

MEM:STO 1

METer:SCALe

Sets maximum value of meter scale.

■ Program message



■ Program data

Specifing meter scale		
Data type		Character
Character program data	% scale	10/10PCT, 20/20PCT
	ns scale	1.5NS, 5NS, 15NS, 50NS

Table 4-14

e.g.1: To specify meter scale to 20 %.
MET:SCAL 20

e.g.2: To specify meter scale to 15 ns.
MET:SCAL 15NS

■ Response message

MET:SCAL?…Returns the current maximum value of meter scale.

e.g.1: When the current maximum value of meter scale is 10 %.
A value of 10PCT is returned.

e.g.2: When the current maximum value of \meter scale is 5 ns.
A value of 5NS is returned.

PLL

Sets ON or OFF for PLL clock-regeneration circuit. The PLL clock-regeneration circuit may not be activated, depending on the type of media selected.

Moreover, switching to the other type of media with the equalizer circuit activated may cause the equalizer to be off by compulsion.

■ Program message

■ Program data

Setting the PLL	
Data type	Character
Character program data	ON, OFF

Table 4-15

e.g.: To turn ON the PLL clock-regeneration circuit.

PLL ON

■ Response message

PLL? … Returns the current status of the PLL clock-regeneration circuit.

e.g.: When the PLL clock-regeneration circuit is currently ON.

A value of ON is returned.

PLL:STATus?

Returns the status of the PLL clock-regeneration circuit.

■ Program message

■ Response message

PLL:STAT? … Returns the current status of the PLL clock-regeneration circuit.

e.g.1: When the PLL clock-regeneration circuit has locked on to an input signal.

A value of LOCK is returned.

e.g.2: If the PLL clock-regeneration circuit has not yet locked on to an input signal.

A value of UNLOCK is returned.

PORT1?

Reads out data from a 4-bit input port of EXT I/O and returns the value read. The upper four bits are always treated as "0."

■ **Program message**

■ **Response message**

PORT1? … Reads out data from a 4-bit input port of EXT I/O and returns the value read.

e.g.: When all 4-bit input ports are held at "H"

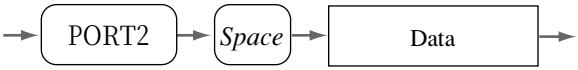
A value of #H0F is returned.

PORT2

Outputs data to a 4-bit output port of EXT I/O. The upper four bits are always treated as "0."

A set value can be stored in the setup memory in the same way as the panel settings.

■ Program message



■ Program data

Outputs data to a output port	
Data type	Hex
Minimum	0h
Maximum	Fh
Resolution	1h

Table 4-16

e.g.: When all 4-bit output ports are held to "H"

PORT2 #H0F

■ Response message

PORT2? …Returns data output to a 4-bit output port of EXT I/O.

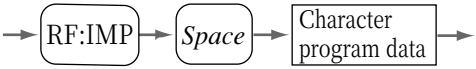
e.g.: When all 4-bit output ports are held at "L"

A value of #H00 is returned.

RF:IMPedance

Sets the input impedance of RF SIGNAL INPUT.

■ Program message



■ Program data

Setting value for the input inpedance of RF SIGNAL INPUT	
Data type	Character
Character program data	50, 1M

Table 4-17

e.g.: To set the input impedance of RF SIGNAL INPUT at 50 Ω.
RF:IMP 50

■ Response message

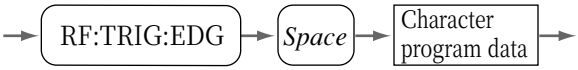
RF:IMP?…Returns the current RF SIGNAL INPUT impedance.

e.g.: When the input impedance of RF SIGNAL INPUT is currently 1 MΩ.
A value of 1M is returned.

RF:TRIGger:EDGe

Sets the polarity of input trigger edge of RF SIGNAL INPUT.

■ Program message



■ Program data

Setting the TRIG EDGE of RF SIGNAL INPUT	
Data type	Character
Character program data	POSitive, NEGative, EITher

Table 4-18

e.g.: To set the polarity of input trigger edge of RF SIGNAL INPUT to both edge(⨍).

RF:TRIG:EDG EIT

■ Response message

RF:TRIG:EDG?… Returns the current the polarity of input trigger edge status of RF SIGNAL INPUT.

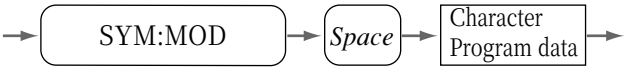
e.g.: When the trigger edge of RF SIGNAL INPUT is currently rising edge(⨍).

A value of POS is returned.

SYMmetry:MODe

Sets the SYMMETRY mode.

■ **Program message**



■ **Program data**

Setting the SYMMETRY mode	
Data type	Character
Character program data	AUTo, autoOFFSet, MANual

Table 4-19

e.g.: To set SYMMETRY mode to AUTO.
SYM:MOD AUT

■ **Response message**

SYM:MOD? …Returns the current SYMMETRY mode status.

e.g.: When the SYMMETRY mode is currently in MANUAL.
A value of MAN is returned.

SYMmetry:OFFSet:LEVel

Sets the symmetry offset/slice level.

This message is valid only when SYMMETRY mode is set to OFFSET or MANUAL. Whether a set value is reflected in symmetry offset level or slice level depends on the SYMMETRY mode.

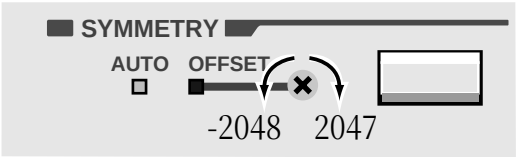
Even when the instrument reverts from the remote status achieved using GPIB to control from the front panel (local status), this level set-value will be retained until the SYMMETRY LEVEL variable resistor is operated.

■ Program message

■ Program data

Setting the symmetry offset/slice level	
Data type	Integer
Minimum	-2048
Maximum	2047
Resolution	1

Table 4-20



In panel operations, turning the SYMMETRY LEVEL variable resistor clockwise means setting an offset level in the direction of 2047. Turning it counterclockwise means setting it in the direction of -2048.

e.g.: To set the SYMMETRY offset level to "0".

SYM:OFFS:LEV 0

■ Response message

SYM:OFFS:LEV?… Returns the current symmetry offset/slice level.

Returns an offset level when the SYMMETRY mode is OFFSET or a slice level when it is MANUAL.

e.g.: When the symmetry offset/slice level is currently 2047.

A value of 2047 is returned.

SYMmetry:SLICe:LEVel?

Returns the slice level. The response message returns the reference level of the slicer regardless of the SYMMETRY mode.

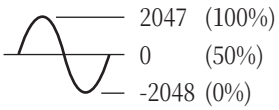
■ Program message

■ Response message

SYM:SLIC:LEV?… Returns slice level.

The slice level is returned in the range of -2048 to 2047 with respect to an input signal.

Note that since the internal circuit is coupled to AC, the actual slice level changes with the duty ratio of an RF signal. For detail, see 2.5 "Symmetry and Slice Level".



e.g.: When the slice level is currently 2047(100 %).
A value of 2047 is returned.

TIMe:CONst

Set the time constant for conversion into rms values.

■ Program message

■ Program data

Setting the time constant for conversion into rms values	
Data type	Character
Character program data	0.03, 0.1, 0.3, 1

Table 4-21

e.g.: To set the time constant for conversion into rms values to 1s.

TIM:CON 1

■ Response message

TIM:CON? …Returns the current time constant for conversion into rms values.

e.g.: When the time constant for conversion into rms values is currently 0.3 s.

A value of 0.3 is returned.

UIS?

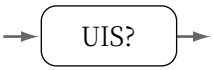
Returns an indication of whether measurement is impossible.

When no signal is input.

When measurement is disabled, such as when the clock frequency is outside the specified range.

Under any of the above conditions, measurement is determined to be impossible.

■ Program message



■ Response message

UIS? … Returns an indication of whether measurement is impossible.

e.g.: When measurement is disabled.

A value of 1 is returned.

Details of Event Status Register and Event Status Enable Register

Bit	Register name	Explanation
7		Not used with the KJM6335.
6		Not used with the KJM6335.
5	CME (Command Error)	Any one of the following events has been encountered while decoding a message: • Syntax error in the message received • Illegal character data received • Illegal suffix unit received • Illegal data type received
4	EXE (Execution Error)	Any one of the following events has been encountered while running a message: • Received data out of bounds • Received message not supported
3		Not used with the KJM6335.
2		Not used with the KJM6335.
1	UIS (Undesirable Input Signal)	This register is set in case of any one of the following events. • No signal is input • The clock frequency is outside the specified range
0	IMR (In Meas Range)	This register is set when the measured value decreases to 20 % or less.

Table 4-22 Event Status Register and Event Status Enable Register

NOTE

- The individual bits of the event status register and the event status enable register are set when they are 1 and are reset when they are 0.
- Run *ESR? to read the event status register and *CLS to reset it.

Details of Status Byte Register and Service Request Enable Register

Bit	Register name	Explanation
7		Not used with the KJM6335.
6	RQS (Request)	Signifies the generation of a service request. This bit is reset when read by serial polling.
	MSS (Master Summary Status)	ORed result of the status byte register and service request enable register, which is read by running *STB.
5	ESB (Standard Event Status Bit)	ORed result of the event status register and event status enable register, which is read by serial polling or running *STB?.
4		Not used with the KJM6335.
3		Not used with the KJM6335.
2		Not used with the KJM6335.
1		Not used with the KJM6335.
0		Not used with the KJM6335.

Table 4-23 Status Byte Register and Service Request Enable Register

About Status Register

The format of status data is shown below.

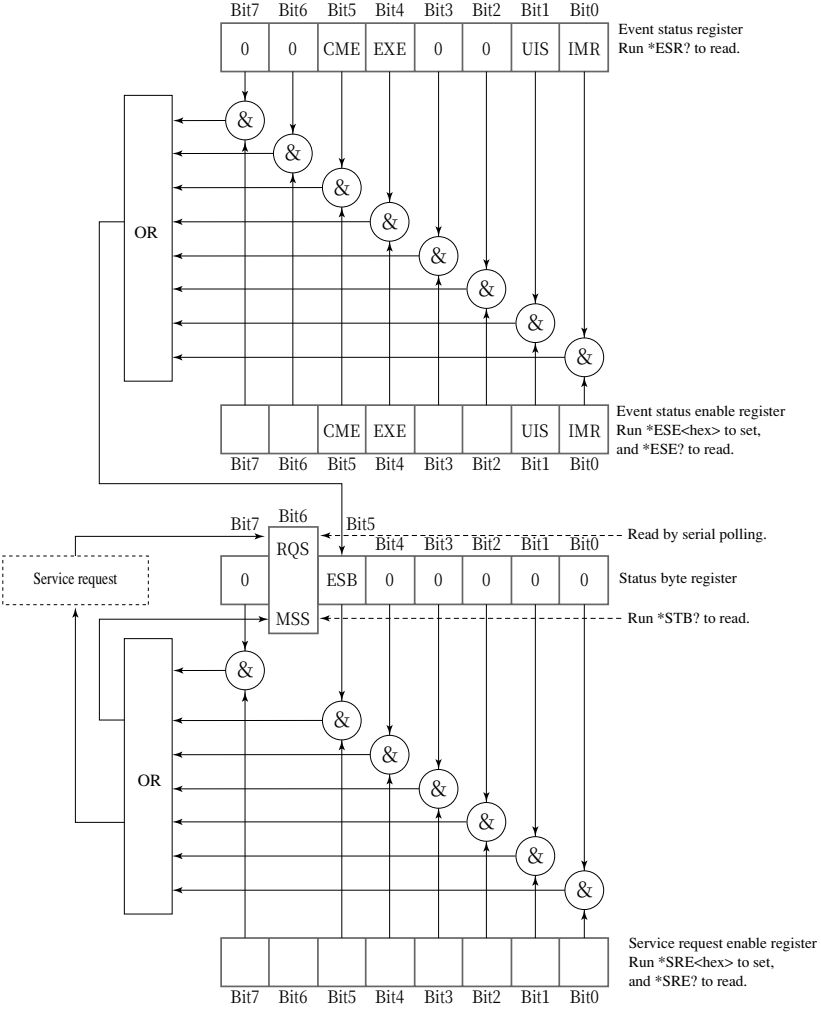


Fig. 4-2 Status Data Format

NOTE

- The individual bits of the status byte register and the service request enable register are set when they are 1 and are reset when they are 0.
- *CLS resets the status byte register.

4.5 GPIB specifications

GPIB Interface Functions

Function	Subset	Description
Source handshake	SH1	All functions operable
Acceptor handshake	AH1	All functions operable
Talker	T6	All functions operable, except for the talk-only function
Listener	L4	All functions operable, except for the listen-only function
Service request	SR1	All functions operable
Remote local	RL1	All functions operable
Parallel poll	PP0	No functions operable
Device clear	DC1	All functions operable
Device trigger	DT0	No functions operable
Controller	C0	No functions operable
Device driver	E1	Open collector driver

Table 4-24 GPIB Interface Functions

GPIB Connector

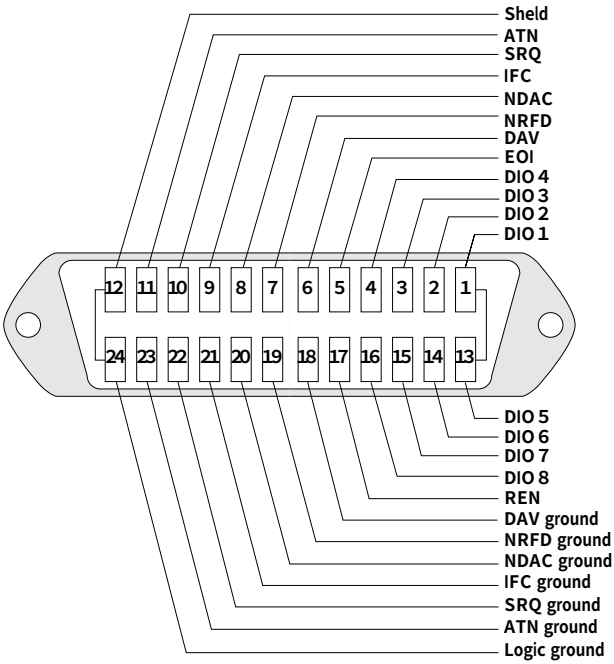


Fig. 4-3 GPIB Connector

4.6 Sample Program

The following demonstrates a sample program in which the KJM6335 is GPIB-controlled, using Microsoft Visual Basic via a National Instruments GPIB board meeting NI-488.2 specifications.

The program sets up each item, then displays a jitter value and judgment result once.

```
'-------------------------------------------------------
Dim rd As Integer
Call ibfind("DEV2", rd)       'Opens GPIB device.
Call ibconfig(rd, 6, 1)       'Sets device configuration (enable
                              'repetition of addressing).
'Model information acquisition [company name, model, and version number]
'-------------------------------------------------------
Call ibwrt(rd, "*IDN?")       'Sends model information acquisition
                              'message.
Dim strModelInfo As String
strModelInfo = Space(128)
Call ibrd(rd, strModelInfo) 'Reads out model information and stores it
                              'to a variable.
MsgBox Left(strModelInfo, ibcntl)
'Front panel setup
'-------------------------------------------------------
Call ibwrt(rd, "TIM:CON 0.3")   'Sets TIME CONST to 0.3s
Call ibwrt(rd, "SYM:MOD AUT")   'Sets SYMMETRY mode to AUTO
Call ibwrt(rd, "DEL:MOD AUT")   'Sets DELAY mode to AUTO
Call ibwrt(rd, "RF:TRIG:EDG POS") 'Sets trigger edge to POSITIVE
                              '( ⎍ ) (RF SIGNAL INPUT)
Call ibwrt(rd, "RF:IMP 50") 'Sets impedance to 50Ω
                              '(RF SIGNAL INPUT)
Call ibwrt(rd, "CLOC:TRIG:EDG POS")
                              'Sets trigger edge to POSITIVE
                              '( ⎍ )(CLOCK INPUT)
Call ibwrt(rd, "CLOC:IMP 50")   'Sets impedance to 50Ω(CLOCK
                                'INPUT)
Call ibwrt(rd, "MET:SCAL 20")   'Sets meter scale to 20%
Call ibwrt(rd, "JUD:LEV 7.77") 'Sets judgment level to 7.77%
Call ibwrt(rd, "PLL ON")      'PLL clock regeneration circuit to ON
Call ibwrt(rd, "EQ ON")       'Equalizer circuit to ON
' Jitter value acquisition
'-------------------------------------------------------
Dim strImrStat As String
strImrStat = Space(16)
Do
    Call ibwrt(rd, "IMR?")    'Sends a measurement status acquisition
                              'message.
    Call ibrd(rd, strImrStat)
Loop Until Left(strImrStat, 1) = "1"
                              'Waits for the measured value to reach
                              '20% or less.
```

```
'-----------------------------------------------------
Call ibwrt(rd, "JIT:VAL?")  'Sends jitter value acquisition message.
Dim strJitterValue As String
strJitterValue = Space(128)
Call ibrd(rd, strJitterValue)  'Reads out jitter value and stores it to
                               'a variable.
strJitterValue = Left(strJitterValue, ibcntl)
Dim dJitterValue As Double
dJitterValue = Val(strJitterValue)
MsgBox "Jitter Value = " + Str(dJitterValue)
' Judgement information acquisition
'-----------------------------------------------------
Call ibwrt(rd, "JUD:RES?")  'Sends judgment information acquisition
                            'message.
Dim strJudgment As String
strJudgment = Space(128)
Call ibrd(rd, strJudgment)  'Reads out judgment result and stores it to
                            'a variable.
strJudgment = Left(strJudgment, ibcntl)
MsgBox "Judgement  = " + strJudgment
```

Chapter 5 Control Using EXIT I/O

5.1 Outline

The KJM6335 allows you to control the following six functions using the EXT I/O connector on its rear.

Recalling the contents of the setup memory

The panel settings stored in the setup memory can be recalled by external control.

The contents of the setup memory can be recalled using the INC, DEC, or RTN terminals of the EXT I/O connector.

Four-bit input ports

Four-bit data input to PI0 to PI3 of the EXT I/O connector can be read via GPIB. This allows you to check the condition of a jig and other devices.

Four-bit output ports

Four-bit data can be output to PO0 to PO3 of the EXT I/O connector via GPIB. This allows you to control a jig and other devices.

Judgement output

Outputs an indication of whether the measured value is larger or smaller than the JUDGE level set on the front panel to GO OUT or NOGO OUT of the EXT I/O connector.

Memory address output

Outputs the address of the recalled setup memory contents to MEM1 to MEM4 of the EXT I/O connector.

Within-measuring-range output

Outputs an indication of whether the measured value is within the measuring range of the instrument to IN MEAS RANGE of the EXT I/O connector.

5.2 Description of the EXT I/O Connector Terminal

The EXT I/O connector is a 25-pin D-sub connector (female). The signal level is TTL level.

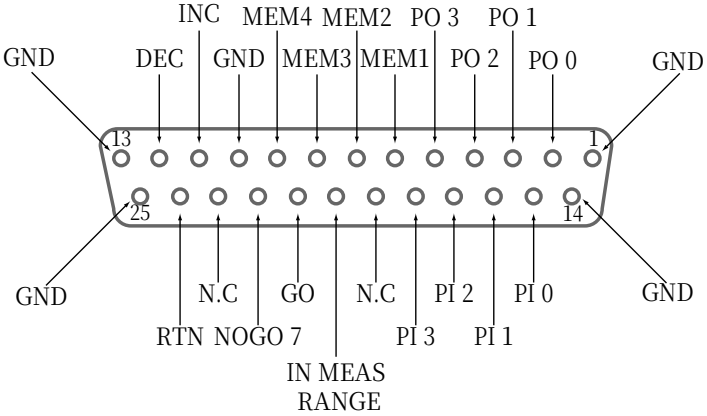


Fig. 5-1 Connections of EXT I/O Connector Pins

Pin number	Name	In/out	Function
1	GND	-	Ground
2 to 5	PO0 to PO3	OUT	Four-bit output ports
6 to 9	MEM1 to MEM4	OUT	Output of setup memory address
10	GND	-	Ground
11	INC	IN	Increment of setup memory address
12	DEC	IN	Decrement of setup memory address
13	GND	-	Ground
14	GND	-	Ground
15 to 18	PI0 to PI3	IN	Four-bit input ports
19	N.C	-	Spare terminal (Leave this pin unconnected.)
20	IN MEAS RANGE	OUT	Output indicating whether jitter is within the measuring range
21	NOGO	OUT	Judgement output
22	GO	OUT	Judgement output
23	N.C	-	Spare terminal (Leave this pin unconnected.)
24	RTN	IN	Return of setup memory address
25	GND	-	Ground

Table 5-1 Pin Configuration of the EXT I/O Connector

NOTE

- Use the shielded type of 25-pin D-sub connector and cable to avoid malfunction caused by noise and other problems. The shields should be connected to any of the GND terminals of the EXT I/O connector.
- The input ports are pulled up at 10 kΩ.
- The output impedance of the output ports is 240 Ω to 290 Ω.
- The response time of within-measuring-range output (IN MEAS RANGE) is the time obtained by adding approximately 0 ms to 50 ms to the set value of TIME CONST.

  However, if any of the variable resistors on the panel is operated, and during control by GPIB, it is the time obtained by adding approximately 0 ms to 200 ms to the set time of TIME CONST.

  For details on how to set TIME CONST, refer to [7] TIME CONST in chapter 2, Names and Functions of Controls.

5.3 Recalling the Contents of the Setup Memory

Connecting the INC, DEC, or RTN terminal of the EXT I/O connector to the GND terminal allows you to increment the address of the setup memory to recall the contents of that memory address.

NOTE

- Do not connect the INC, DEC, and RTN terminals to GND terminals together.
- Provide an interval of 100 ms or more between a recall action and the next action (H-level period).
- When each terminal is an L level, the instrument may not work normally by operation from the front panel.

Incrementing the setup memory address

Connecting the INC terminal (no. 11) to the GND terminal (pin no. 1, 10, 13, 14, or 25) causes the INC terminal to become "Low". Holding the INC terminal "Low" for 100 ms or more causes the setup memory address to be incremented by 1 and the contents of the resulting setup memory address to be recalled.

Decrementing the setup memory address

Connecting the DEC terminal (no. 12) to the GND terminal (pin no. 1, 10, 13, 14, or 25) causes the DEC terminal to become "Low". Holding the DEC terminal "Low" for 100 ms or more causes the setup memory address to be decremented by 1 and the contents of the resulting setup memory address to be recalled.

Returning the setup memory address

Connecting the RTN terminal (no. 24) to the GND terminal (pin no. 1, 10, 13, 14, or 25) causes the RTN terminal to become "Low". Holding the RTN terminal "Low" for 100 ms or more causes the setup memory address to return to "1" and the contents of the resulting memory 1 to be recalled.

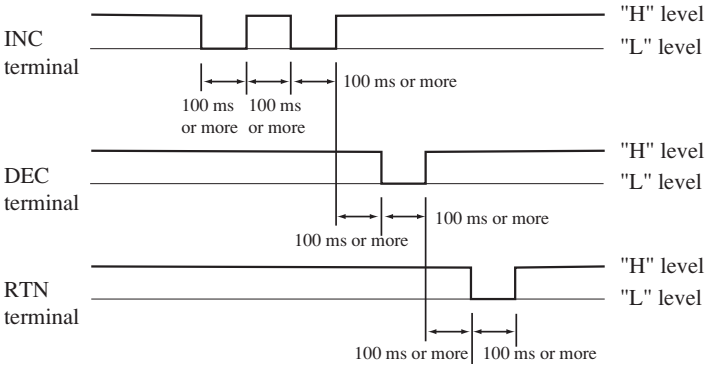


Fig. 5-2 Timing Chart

5.4 Data Input/Output

This allows you to read out data input to the PI0 to PI3 terminals of the EXT I/O connector via GPIB. It also allows you to output data to the PO0 to PO3 terminals.

The use of this 4-bit signal allows you to control a special equipment for KJM6335 or check its status.

For details, see the PORT1 and PORT2 commands in chapter 3, "Operation".

5.5 Output of Setup Memory Address

Outputs setup memory address that is recalled to the MEM1 to MEM4 terminals of the EXT I/O connector.

The relationship between a recalled setup memory address and output to the MEM1 to MEM4 terminals is as shown below:

If a panel setting is changed after the contents of the setup memory address are recalled, invalid status results.

Address	MEM1	MEM2	MEM3	MEM4
1	H	L	L	L
2	L	H	L	L
3	L	L	H	L
4	L	L	L	H
Invalid	L	L	L	L

Table 5-2

5.6 Judgement Output

The judgement of whether the measured value is larger or smaller than the JUDGE level set on the panel will be output to the GO or NOGO terminal of the EXT I/O connector.

Condition	GO	NOGO
Set value < measured value	L	H
Measured value > set value	H	L

Table 5-3

5.7 Within-Measuring-Range Output

An indication of whether the measured value is within the measuring range of the instrument is output to the IN MEAS RANGE terminal of the EXT I/O connector. The measuring range of the instrument is within 20 %. If the measured value exceeds 20 %, a "Low" signal is output. If it is 20 % or less, a "High" signal is output.

Chapter 6 Maintenance

Periodic maintenance, inspection, and calibration are recommended to keep the product long-lived with unfailing initial performance.

6.1 Cleaning

If the panel or any other exterior surface of the product is smeared, clean the surface by wiping lightly with a soft cloth moistened with a neutral detergent solution.

⚠WARNING • Turn OFF the POWER switch before cleaning.

⚠CAUTION • Never use organic solvents, such as thinner and benzine, for cleaning. Use of organic solvents could result in surface discoloration, marking erasure, clouded display and so on.

6.2 Inspection

Check the power cord for ruptures in the covering, play or cracks in the plug and so on.

⚠WARNING • Ruptures in the covering or any other defect in the power cord could cause electrical shock hazards. Discontinue using the power cable immediately.

For purchasing accessories, please contact Kikusui distributor/agent.

6.3 Calibration

This product was calibrated at shipment. However, recalibration is required after long-term usage.

For calibration, please contact Kikusui distributor/agent.

6.4 Replacing the Backup Battery

An internal battery backs up the contents of the panel memory even if the instrument is turned off. If the panel settings in effect before the instrument was turned off and those after it is turned on differ, the battery should be replaced.

Battery life varies, depending on usage; generally it should be replaced after three years from shipment.

For replacement, please contact Kikusui distributor/agent.

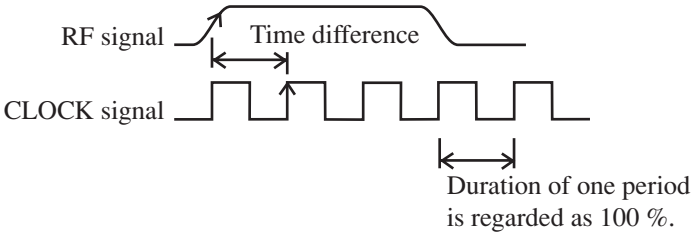
Chapter 7 Specifications

Measurement Principle

Time difference in a clock signal is measured several times based on an RF signal, and variations in the time difference are obtained as percentages relative to a single clock period, assuming that a single clock period is 100 %.

In the actual method of obtaining a standard deviation value, a time difference is converted into a voltage and this voltage is converted into the jitter value by the rms conversion circuit.

The unit of jitter value is % or ns.



Input

Number of input channels		3(RF, CLOCK, INHIBIT)
RF INPUT	Input signal	EFM Minimum pulse width:15 ns
	Signal voltage range	0.2 V to 2 Vp-p
	Input impedance	1 MΩ(18 pF±3 pF), 50 Ω selectable
	Maximum input voltage	4 Vpeak(DC+AC)
	Input connector	BNC
CLOCK INPUT	Input signal	Clock frequency CDx1 :4.1 MHz to 25 MHz CDx8: 25 MHz to 36 MHz Duty ratio 45:55 to 50:50
	Signal voltage range	0.2 V to 2 Vp-p
	Input impedance	1 MΩ, 18 pF±3 pF, 50 Ω selectable
	Maximum input voltage	4 Vpeak(DC+AC)
	Input connector	BNC
INHIBIT INPUT	Input level	H level 4.0 V to 5.0 V L level 0 V to 1.0 V
	Minimum inhibit period	500 µs
	Maximum inhibit time (in measurement of a single signal)	15 ms(at an inhibit period of 20 ms or more)
		75 % of inhibit period (at an inhibit period of 1 ms to 20 ms)
		Inhibit period - 250 µs (at an inhibit period of 500 µs to 1 ms)
	Maximum inhibit time (in measurement of two signals)	10 ms(at an inhibit period of 13.3 ms or more)
		75 % of inhibit period (at an inhibit period of 1 ms to 13.3 ms)
		Inhibit period - 250 µs (at an inhibit period of 500 µs to 1 ms)
	Maximum input voltage	10 Vpeak(DC+AC)
	Input connector	BNC

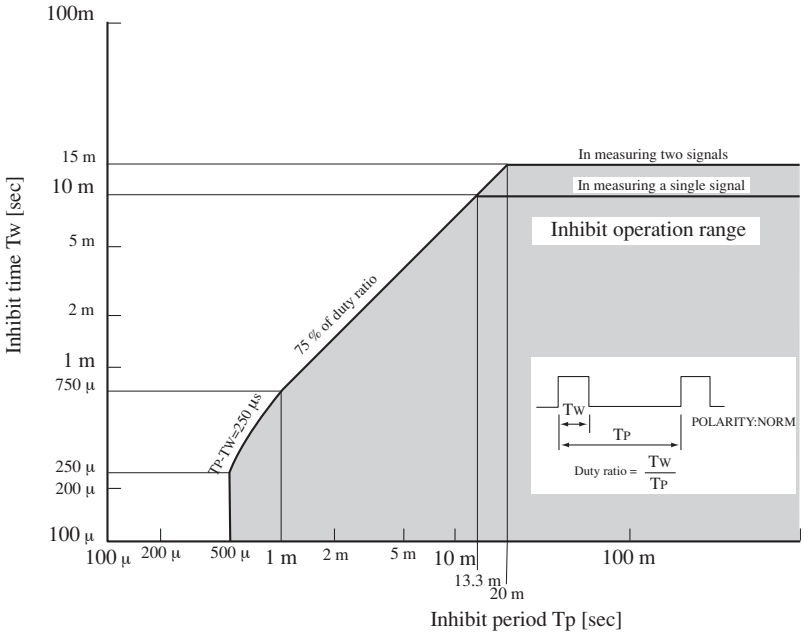


Fig.7-1 Relationship Between the Inhibit Period and Inhibit Time

Measurement

Measuring range		0 % to 20 %, 0 ns to 50 ns
Specification-assured range	% indication	2 % to 15 %
	ns indication	2 % to 15 % of clock period
Measuring accuracy	% indication	±5 % of FS
	ns indication	±2 % of clock period＋ ±2 % of FS
Residual jitter	% indication	2 % or less
	ns indication	2 % of clock period or less
Time constant for conversion into rms value		30 ms, 100 ms, 300 ms, 1 s

Indicating

Indicator	Analog meter
Unit	%, ns
Scale (FS)	10 %, 20 % 1.5 ns, 5 ns, 15 ns, 50 ns
GO or NO GO judgment	Two LEDs, red(NO GO) and green(GO), indication
PHASE MONITOR	Indicates the phase difference between the RF signal and clock signals and the distribution of jitter. The distribution of jitter frequency is indicated by the brightness on the meter.

Trigger

Symmetry follow-up		AUTO, OFFSET, MANUAL CD: The response characteristics of AUTO comply with those given in the Compact Disc Reference Measuring Methods Specification Guideline Ver.1.0, May 1999.
Trigger edge	RF	Rising edge, falling edge and both edges selectable
	CLOCK	Rising edge and falling edge selectable
Delay circuit		Clock signal is delayed to adjust the phase of an RF signal. AUTO/MANUAL selectable Phase adjusting range in MANUAL mode: 0˚ to 360˚

PLL clock-regeneration circuit

Frequency response characteristics is mentioned by open-loop characteristics. However, frequency response characteristics of the KJM6335 is managed by close-loop characteristics equivalent to open-loop characteristics. Frequency response characteristics can be valid at reference clock of 4.3 MHz (CD standard speed mode).

Synchronizing available signal	CD standard speed mode	EFM signal that channel clock is equivalent to 4.1 MHz to 4.5 MHz
	CD double-speed mode	EFM signal that channel clock is equivalent to 8.2 MHz to 9.0 MHz
	CD quadruple-speed mode	EFM signal that channel clock is equivalent to 16.4 MHz to 18.0 MHz
	CD octuple-speed mode	EFM signal that channel clock is equivalent to 32.8 MHz to 36.0 MHz
Frequency response characteristics (Closed loop characteristics, reference is 100 Hz) Complied with the Compact Disc Reference Measuring Methods Specification Guidline Ver.1.0 May 1999. It is the frequency response characteristics of each speed that was scaled the characteristics of the standard speed mode up by each magnification.	CD standard speed mode	5 kHz : -0.2 dB ±1.7 dB 10 kHz : -1.2 dB ±1.7 dB 15 kHz : -2. 5 dB ±1.7 dB 20 kHz : -3.8 dB ±1.7 dB 25 kHz : -5.1 dB ±1.7 dB
	CD double-speed mode	10 kHz : -0.2 dB ±1.7 dB 20 kHz : -1.2 dB ±1.7 dB 30 kHz : -2.5 dB ±1.7 dB 40 kHz : -3.8 dB ±1.7 dB 50 kHz : -5.1 dB ±1.7 dB
	CD quadruple-speed mode	20 kHz : -0.2 dB ±1.7 dB 40 kHz : -1.2 dB ±1.7 dB 60 kHz : -2.5 dB ±1.7 dB 80 kHz : -3.8 dB ±1.7 dB 100 kHz : -5.1 dB ±1.7 dB
	CD octuple-speed mode	40 kHz : -0.2 dB ±1.7 dB 80 kHz : -1.2 dB ±1.7 dB 120 kHz : -2.5 dB ±1.7 dB 160 kHz : -3.8 dB ±1.7 dB 200 kHz : -5.1 dB ±1.7 dB
Lock-up time	All mode common	Within 700 ms
Synchronizing available jitter range		5 % to 17 %
Residual jitter		0.7% or less

Output(Rear)

RF MONITOR	Output amplitude	Approx. 1/10(terminated with 50 Ω) of input amplitude
	Output impedance	Approx. 50 Ω
	Output connector	BNC
CLOCK MONITOR	Output amplitude	Approx. 1/10(terminated with 50 Ω) of input amplitude
	Output impedance	Approx. 50 Ω
	Output connector	BNC
SLICED RF OUT	Output amplitude	Approx. 0.2 V to 0.3 V(terminated with 50 Ω)
	Output impedance	Approx. 50 Ω
	Output connector	BNC
DELAYED CLOCK OUT	Output amplitude	Approx. 0.2 V to 0.3 V(terminated with 50 Ω)
	Output impedance	Approx. 50 Ω
	Output connector	BNC
DC OUT	Output amplitude	0.2 V/%、accuracy of ±0.15 V
	Output impedance	Approx. 600 Ω
	Output connector	BNC
JITTER OUT	Output amplitude	Approx. 20 mV/%
	Output impedance	Approx. 600 Ω
	Output connector	BNC

EXT I/O interface

Pin number	Name	In/out	Specifications
1	GND	—	Ground
2 to 5	PO0 to PO3	OUT	Four-bit parallel output ports. Settable via GPIB
6 to 9	MEM1 to MEM4	OUT	The bit representing of a selected setup memory address number is output in "H".
10	GND	—	Ground
11	INC	IN	External recall input Setup memory address is incremented by 1 at "L" input.
12	DEC	IN	External recall input Setup memory address is decremented by 1 at "L" input.
13	GND	—	Ground
14	GND	—	Ground
15 to 18	PI0 to PI3	IN	Four-bit parallel input ports. They can be read out via GPIB.
19	N.C	—	Spare terminal (Leave this pin unconnected.)
20	IN MEAS RANGE	OUT	"H" output when the measured value is within 20 %
21	NOGO	OUT	"H" output when the JUDGE level is NO GO
22	GO	OUT	"H" output when the JUDGE level is GO
23	N.C	—	Spare terminal (Leave this pin unconnected.)
24	RTN	IN	External recall input Setup memory address returns to "1" at "L" input.
25	GND	—	Ground

EXT I/O Common Specifications

Input voltage range	H:4.0 V to 5.0 V, L:0 to 1.0 V
Maximum input voltage	-0.5 V to 5.5 V
Output voltage range	H:3.9 V to 5.0 V, L:0 to 0.4 V
Output impedance	240 Ω to 290 Ω
Maximum output current	10 mA
Input/output connector	25-pin D-sub connector (female)
Signal level	TTL

GPIB interface (optional)

Complies with IEEE Std. 488-1978. SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, E1
Operated in address mode. Allows you to set the function of each panel other than the POWER and KEYLOCK switches, read the setting condition of a function, and read out a measured value.

General specifications

Warm-up time	30 minutes or more
Storage temperature and humidity range	Temperature: -20 ˚C to 60 ˚C Humidity: 90 % or less R.H. (no condensation)
Operating temperature and humidity ranges	Temperature:0 ˚C to 40 ˚C Humidity: 20 % to 85 % R.H. (no condensation)
Specification guaranteed temperature and humidity ranges	Temperature:15 ˚C to 35 ˚C Humidity: 20 % to 85 % R.H. (no condensation)
Allowable range of supplied voltage	90 V to 110 V, 104 V to 126 V 194 V to 236 V, 207 V to 250 V AC
Allowable power frequency range	45 Hz to 65 Hz
Maximum power consumption	Maximum: 75 VA
Insulation resistance	50 MΩ or more (500 V DC)
Withstand voltage	1500 V AC for one minute
Earth continuity	25 A AC/0.1 Ω max.
Safety*1, *2	Conforms to the requirements of the following directive and standard. Low Voltage Directive 73/23/EEC EN61010-1 Class I Pollution degree 2
Electromagnetic compatibility (EMC)*1	Conforms to the requirements of the following directive and standard. EMC Directive 89/336/EEC EN61326 EN61000-3-2 EN61000-3-3 Under following conditions ·Used the shielded cable which length is less than three meters when any signal cables are connected.

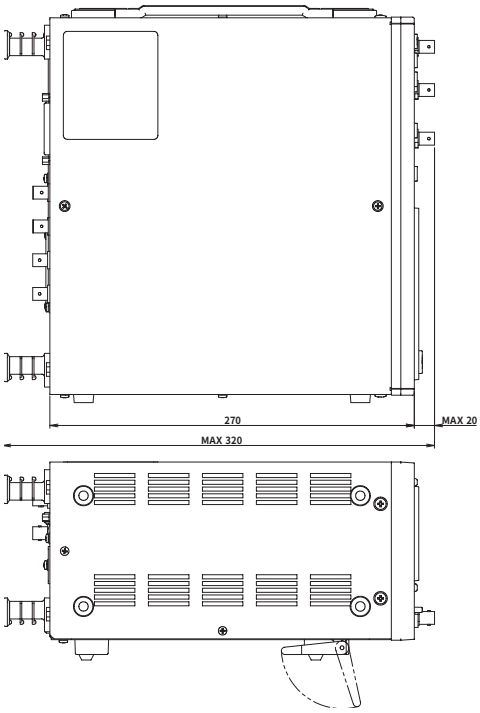
Dimensions (mm)			Approx. 280(W) x 132(H) x 270(D) Maximum: approx. 300(W) x 150(H) x 320(D)				
Weight			Approx. 5.5 kg				
Battery life			Approx. three years				
Battery backup			Setup data is backed up.				
Accessories			Code	Quantity			
				▼ Mark	Line Voltage	▼ Mark	Line Voltage
				100	90 V to 110 V	220	194 V to 236 V
				120	104 V to 126 V	240	207 V to 250 V
	Power cord		85-AA-0003	1			
			85-AA-0005			1	
	Fuse	T 1.0 A, 250 V	99-00-0029	1		2	
	*3	T 0.5 A, 250 V	99-00-0028	2		1	
	Operation Manual		Z1-002-622	1		1	

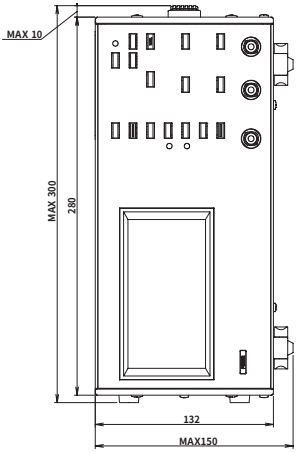
*1 Only on models that have CE marking on the panel. Not applicable to custom order models.

*2 This instrument is a Class I equipment. Be sure to ground the protective conductor terminal of the instrument. The safety of the instrument is not guaranteed unless the instrument is grounded properly.

*3 A total of three fuses are provided with the instrument. The breakdown voltage of the fuses depends on the setting of the line voltage range upon shipment from the at factory.
The fuse holder is equipped with
1 A fuses for 90 V to 110 V / 110 V to 126 V or
0.5 A fuses for 194 V to 236 V / 207 V to 250 V
for shipment.

External dimensions

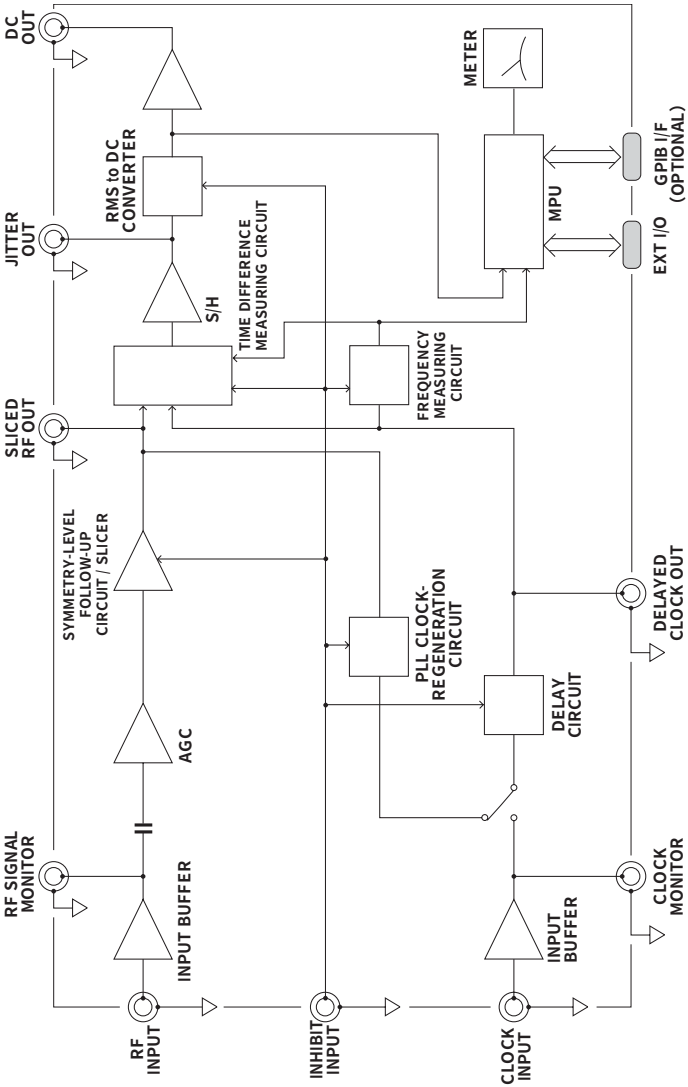




[Unit: mm]

Appendix

KJM6335 Block Diagram



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