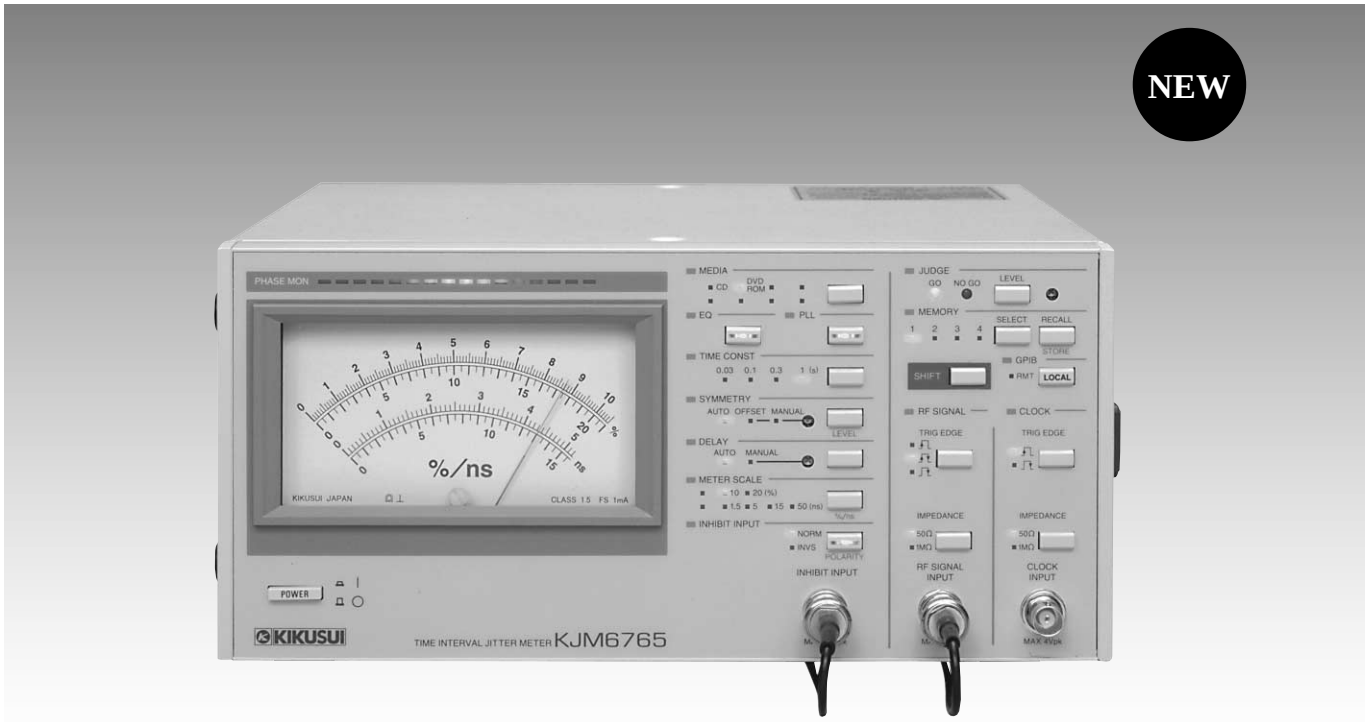
KJM6765

TIME INTERVAL JITTER METER



DVD/CD compatible
Supports a clock frequency of 4.1 MHz to 60 MHz
Comform to the DVD Book

Outlines

Excellent cost-performance
Standard off-the-shelf DVD jitter meter

The DVD Specifications for Read-Only Disks Ver. 1.0, Aug. 1996 (hereafter referred to as the DVD Book) specify the jitter measurement method as follows: "Time differences between all edges of an RF signal and a clock signal generated from the RF signal are measured to obtain their variation (a value) as jitter." The KJM6765 is a DVD jitter meter that employs the time interval method, a measurement method compliant with the DVD Book. Its specialized circuits for jitter measurement enable it to achieve significant cost reduction, as well as jitter measurement by inputting RF signals only in addition to conventional TIA-based two-signal (DATA to CLOCK) tests. Moreover, the PLL clock regeneration circuit, equalizer circuit, and slicer circuit are compliant with the DVD Book. Since its release, the KJM6755A has been acknowledged as the de facto standard for jitter measurement in DVD players thanks to its excellent cost-performance.

Also capable of measuring jitter in CD players, as first introduced in the industry!*
Jitter measurement using the time interval method

The KJM6765 employs the time interval method for measuring jitter in CD players as well as in DVD players, based on principles successfully used in the KJM6755A. The frequency response characteristics of the symmetry follow-up circuit, PLL clock regeneration circuit, and equalizer circuit in the DVD mode comply with the DVD Book, while those of the symmetry follow-up circuit and PLL clock regeneration circuit in the CD mode adhere to the Compact Disk Reference Measuring Methods Specification Guideline Ver. 1.0, May 1999. Moreover, the KJM6765 has an INHIBIT INPUT terminal, enabling it to measure jitter during track jumps or with the index part of the DVD or CD masked.

With the advent of multi-disk players, standardization of the measurement principle for jitter in CD players and DVD players contributes to productivity improvements and reduction in equipment costs. And above all else, it ensures the reliability of measurement results.

* As of Feb. 15, 2000

Features

- Enables time-interval-based measurement of jitter in DVD/CD players
- Supports a clock frequency of 4.1 MHz to 60 MHz
- Equipped with an INHIBIT INPUT terminal as standard
- Incorporates a memory (4 addresses) for presetting the panel settings
- An I/O port has been added for handshaking with an external evaluation unit or jigs
- Equipped with GPIB interface (models with GPIB interface only)

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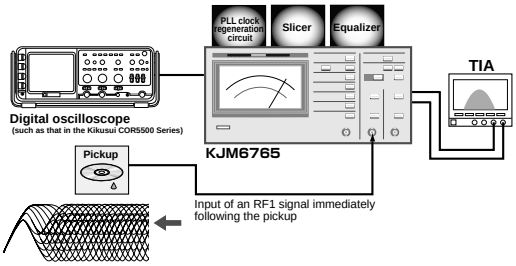
KJM6765 supports the following five measurement methods.

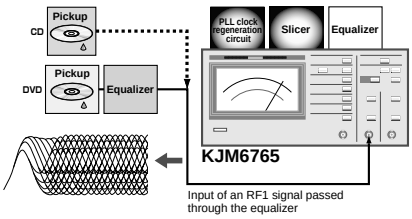
1. Measurement of an RF1 signal from an optical pickup



- The KJM6765 has a terminal on its rear that outputs an RF signal that has passed through the equalizer circuit compliant with the DVD Specifications for read-only disk Ver. 1.0, Aug. 1996 (DVD Book). This allows an equalized RF signal to be monitored using an oscilloscope .
- The KJM6765 has a terminal on its rear that outputs an input RF signal; RF signals sampled immediately following the pickup can be checked.
- From its rear panel, the KJM6765 outputs a binarized signal that has passed through the equalizer, PLL clock frequency, and slicer circuits, and also outputs a clock signal that has passed through the delay circuit to adjust the phase difference to 180° degrees relative to the RF signal. This allows the signals on TIA (Timer Interval Analyzer) to be checked together with the jitter meter. This feature is very useful in checking the correlation between the jitter meter and TIA on production lines and at other locations.

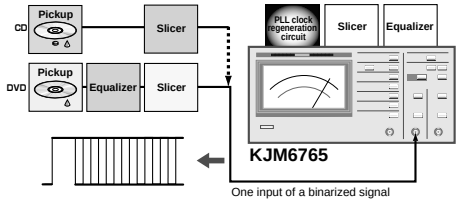
In the past, carrying out measurements using a time interval analyzer (TIA) required a clock signal and binarized RF signal from a DVD player or a jig. Now, however, measurements can be taken simply by connecting TIA to the terminals on the rear of the KJM6765. The KJM6765 is equipped with an equalizer, a PLL clock regeneration circuit, and slicer circuit as standard, and this made KJM6765 compliant with the DVD Specifications for read-only-disk Ver 1.0, Aug. 1996. As a result, it actually has the response characteristics specified in the DVD Book as measurement criteria. KJM6765 is now widely accepted as the de facto standard in the DVD marketplace. Presently, the measurement of jitter in DVD pickups is represented in the specifications, often including the characteristics of both the optical pickups and the equalizer. However, because the KJM6765 equalizer complies with the DVD Book, the characteristics of the optics and the equalizer are evaluated separately. The jitter meter is very useful when, for example, determining the evaluation criteria for each model of DVD pickups or reviewing the pickups of each manufacturer on an OEM basis. Moreover, when it is urgently necessary to evaluate a system, having a KJM6765 on hand allows jitter measurements to be carried out easily using an RF signal. In general, RF signals cannot directly be measured on TIA.
The KJM6765 is equipped with a PLL clock regeneration circuit, and slicer circuit as standard which comply to Compact Disk Reference Measuring Methods Specification Guideline Ver. 1.0 May 1999.

2. Measurement of an RF1 signal from an optical pickup that has passed through an equalizer



In tilt adjustment for DVD pickups or players, an equalizer adjusted to the characteristics of the optics is often used. On production lines, such an equalizer can be installed on the jig side, enabling the sampled signal to be input to the jitter meter. A comparison between the results obtained in (1) and those obtained in (2) reveals the differences between the characteristics of jitter sampled by the DVD-Book-based equalizer and those sampled by the equalizer on the system side.

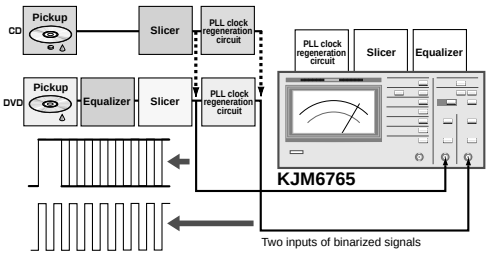
3. Measurement using a binarized signal following use of a slicer



Note:If a binarized signal is to be measured, the SYMMETRY mode of the KJM6765 must be set to MANUAL.

This method uses only the PLL clock regeneration circuit built into the KJM6765. In some semiconductors, a regenerated PLL clock signal is not output externally, but is directly fed back to a servo system. In such cases, the significant power of KJM6765's internal PLL clock regeneration circuit becomes crucial. For example, in the evaluation of disks, the base on the drive side must be maintained in a certain condition. In such a case, the PLL clock regeneration circuit's compliance with the DVD Book provides an advantage.

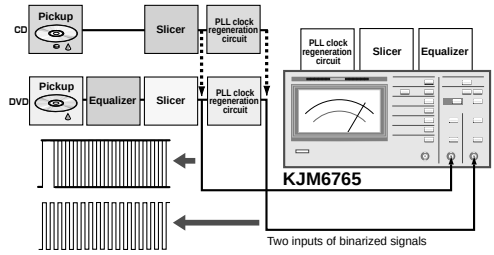
4. Measurement in compliance with the DVD Book



Note:To measure a binarized signal, the SYMMETRY mode of the KJM6765 must be set to MANUAL.

For the DVD Book-specified measurement method,this procedure replaces the time-interval analyzer with a KJM6765.An RF signal after the slicer and a clock signal are input to the KJM6765 for measurement.

5. Supporting a clock signal of 25 MHz to 150 MHz



Note:To measure a binarized signal, the SYMMETRY mode of the KJM6765 must be set to MANUAL.

The KJM6765 can cover the wide range of clock signal (4.1MHz to 60MHz) for future development of 1.5 to 2 times higher speed of Players.

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Specifications

■ Input

Number of input channels	3 (RF, CLOCK, INHIBIT)
RF input	
Input signal	EFM signal, 8-16 modulating signal Minimum pulse width 15ns
CLOCK input	
Input signal	clock frequency CD: 4.1MHz to 25MHz DVD:25MHz to 60MHz Duty ratio within 45:55 to 50:50
Signal voltage range	0.2 to 2Vp-p
Input impedance	1MΩ (18pF ± 3pF), 50Ω
Maximum input voltage	4VpK (DC + AC)
Input connector	BNC
INHIBIT input	
Input level	High level: 4.0 to 5.0V, Low level: 0 to 1.0V
Minimum inhibit period	500ms
Maximum inhibit time	15ms (at an inhibit period of 20 ms or more)
(in measurement of a single signal)	75% of inhibit period (at an inhibit period of 1ms to 20ms) Inhibit period -250ms (at an inhibit period of 500ms to 1ms)
Maximum inhibit time	10ms (at an inhibit period of 13.3ms or more)
(in measurement of two signal)	75% of inhibit period (at an inhibit period of 1ms to 13.3ms) Inhibit period -250ms (at an inhibit period of 500ms to 1ms)
Maximum input voltage	10Vpeak (DC + AC)

■ Measurement

Measurement range	0 to 20%, 0 to 50ns
Specification guaranteed range	
% indication	2% to 15%
ns indication	2% to 15% of clock period
Measurement accuracy	
% indication	±5% of full scale of the meter
ns indication	±2% of clock period + ±2% of meter's maximum value on scale
Residual jitter	
% indication	2% or less
ns indication	±2% of clock period or less
Time constant for conversion into an rms value	30ms, 100ms, 300ms, 1s

■ Indication

Indicator	Analog meter
Unit	%, ns
Scale (FS)	10%, 20%, 1.5ns, 5ns, 15ns, 50ns
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[*1]	AUTO, AUTO+OFFSET, MANUAL
Trigger edge	
RF	Rising edge, falling edge and both edges
CLOCK	Rising edge and falling edge
Delay circuit	Clock signal is delayed to adjust the phase of an input signal. AUTO/MANUAL selection Phase adjusting range in MANUAL mode : 0 to 360°

■ Equalizer circuit[*2]

Frequency characteristics	5.16MHz: +3.2 ±0.3dB
(amplitude ratio as reference is 10kHz)	0.3MHz: -2.8 ±1.0dB
Group delay frequency characteristics	Maximum group delay deviation ≤ 6ns (range: 0.7MHz ≤ f ≤ 6.7MHz)

■ PLL clock regeneration circuit[*3]

CD normal speed mode	
Synchronizing available signal	EFM signal that channel clock is equivalent to 4.1MHz to 4.5MHz
Frequency response characteristics	1kHz: 0.2 ±1.7dB
(amplitude ratio as reference is 100kHz)	5kHz: -0.1 ± 1.7dB 10kHz: -0.9 ± 1.7dB 20kHz: -3.1 ± 1.7dB 25kHz: -4.2 ± 1.7dB
DVD normal speed mode	
Synchronizing available signal	8–16 modulated signal that channel clock is equivalent to 25MHz to 30MHz
Frequency response characteristics	1kHz: 0.2 ±1.7dB
(amplitude ratio as reference is 100kHz)	3kHz: 1.3 ±1.7dB 7kHz: 1.0 ±1.7dB 15kHz: -4.0 ±1.7dB
Lockup time	700ms or less
Synchronizing available jitter range	5 to 17%
Residual jitter	0.7% or less

■ Output (Rear)

RF MONITOR	Output amplitude: Approx. 1/10 (terminated with 50Ω) of input amplitude Output impedance: Approx. 50Ω
CLOCK MONITOR	Output amplitude: Approx. 1/10 (terminated with 50Ω) of input amplitude Output impedance: Approx. 50Ω
SLICED RF OUT	Output amplitude: Approx. 0.2 to 0.3V (terminated with 50Ω) Output impedance: Approx. 50Ω
DELAYED CLOCK OUT	Output amplitude: Approx. 0.2 to 0.3V (terminated with 50Ω) Output impedance: Approx. 50Ω
EQUALIZED RF OUT[*4]	Output amplitude: Approx. 0.2 to 0.3V (sine wave input with 4MHz, terminated with 50Ω) Output impedance: Approx. 50Ω
DC OUT	Output amplitude: 0.2V/%, accuracy of ±0.15V Output impedance: Approx. 600Ω
JITTER OUT	Output amplitude: Approx. 20mV/% Output impedance: Approx. 600Ω
JUDGE OUT	Output logic: Available in EXT I/O Interface
EXT I/O Interface	Four-bit parallel input/output port External recall input of setup memory address Output of setup memory address number Within measuring-range output judge out
GPIB interface[*5]	Complies with IEEE Std. 488-1978. SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0,E1 Operated in address mode. Allows user to set and read each feature on the front panel.

■ Environmental conditions / General Specifications

Warm-up time	Approx. 30 minutes
Storage temperature and humidity ranges	Temperature: -20 to 70°C Humidity: 90% or less R.H. (no condensation)
Operating temperature and humidity ranges	Temperature: 0 to 40°C Humidity: 20% to 85% R.H. (no condensation)
Specification guaranteed temperature and humidity ranges	Temperature: 15 to 35°C Humidity: 20 to 85% R.H. (no condensation)
Allowable range of supplied voltage	90 to 110V / 104 to 126V / 194 to 236V / 207 to 250V AC
Allowable power frequency range	45 to 65Hz
Maximum power consumption	75VA
Insulation resistance	50MΩ or more (500V DC)
Withstand voltage	1500V AC for one minute
Dimensions (mm)	Approx. 280 (W) × 132 (H) × 270 (D) Maximum: Approx. 300 (W) × 150 (H) × 320 (D)
Weight	Approx. 5.5kg
Battery backup	Setup data is backed up.
Accessories	Power cord, 1 pc Three-to-two-conversion adapter: 1 pc Manual: 1 pc Fuses 90 V to 110 V/104 V to 126 V: 1A (T) 1 pc, 0.5 A (T) 2 pcs Fuses 194 V to 236 V/207 V to 250 V: 1 A (T) 2 pcs, 0.5 A (T) 1 pc

*1 Response characteristics in AUTO mode
DVD mode: Complies with DVD specifications for Read-Only Disk Ver. 1.0, Aug. 1996.
CD mode: Complies with Compact Disk Reference Measuring Methods Specification Guideline Ver. 1.0, May. 1999.

*2 This equalizer circuit is designed to handle an 8–16 modulating signal at a reference clock frequency of 27 MHz. Since the frequency response characteristics specified in the DVD Book are for a reference clock frequency of 26.16 MHz, the specifications are determined by converting a frequency of 26.16 MHz to 27 MHz, and by converting 5.0 MHz to 5.16 MHz and 10 MHz to 10.3 MHz. This circuit complies with the DVD Specification for read-only-disk Ver. 1.0, Aug. 1996.

*3 The frequency response characteristics are valid at a reference clock frequency of 27 MHz (DVD normal speed mode) and 4.3MHz (CD normal speed mode) . The frequency response characteristics specified in the DVD Book are represented in the open-loop characteristics, while those of the KJM6765 are controlled by the relevant closed-loop characteristics. The circuit complies with the DVD Specifications for read-only-disk Ver. 1.0, Aug. 1996. Complies with Compact Disk Reference Measuring Methods Specification Guideline Ver. 1.0, May. 1999.

*4 The output amplitude is value at turning on the equalizer.
The KJM6765 incorporates an AGC circuit in the input block to maintain a constant amplitude of the RF signal, passes the signal through the HPF circuit, and processes it in the equalizer and slicer (symmetry correction) circuits, in that order. This is done to maintain constant slicing (symmetry correction) characteristics, regardless of the input amplitude. Thus, the characteristics of the signal output from the EQUALIZED RF OUT terminal contain the characteristics of the AGC and HPF circuits, in addition to those of the equalizer specified in the DVD Book.

*5 Available only for the models with the GPIB feature

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

Panel Description

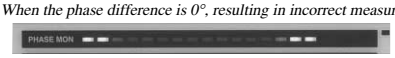
(1)PHASE MONITOR

Displays the phase difference between RF and clock signals, and the distribution of jitter. At the far left of the monitor, 0° phase difference is indicated, and at the far right of the monitor, 360° phase difference is indicated. The frequency distribution of jitter and the average phase difference between RF and clock signals can be seen at a glance; this phase monitor increases the efficiency of operations such as the bottom adjustment of pickups. For example, for pickups that have not yet been adjusted, the frequency distribution of jitter becomes wide, causing the LED indication to be spread out over the entire monitor screen. Pickups that have been adjusted, on the other hand, it has a narrow frequency distribution of jitter, which causes the LED indication to be concentrated in the center of the monitor screen and to appear sharp.

- *Normal jitter measurement status (phase difference is 180°)*

- *When an input signal having distribution peaks at two locations is input*

- *When the phase difference is 0°, resulting in incorrect measurement*



(2)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%.
Deals with clock signals of 4.1 - 60MHz seamlessly. The ns indication shows a jitter value for the absolute value of time.

(3)MEMORY / RECALL key

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

(4)MEDIA key

Selecting the media (CD / DVD-ROM) for measurement.

(5)DELAY key

Selecting the delay mode. In the AUTO mode, the delay time is automatically controlled to maintain the average phase difference between RF and clock signals at 180°. In the MANUAL mode, the delay time must be adjusted using the DELAY-TIME-setting variable register.

(6)PLL and EQ keys

Allows the PLL clock regeneration circuit or equalizer circuit to be turned on/off with a single touch

(7)TRIGGER EDGE key selector key for clock signal

Possible to change the trigger edge of a clock signal. Each time the key is pressed, the trigger edge is switched to the rising or falling edge.

(8)TRIGGER EDGE key selector key for RF signal

The switch to change the trigger edge of an RF signal. Can be selected from among three types: rising edge, both edges, and falling edge.

(9)Input IMPEDANCE key

Allows the input impedance to be changed to 50Ω or 1 MΩ, to suit a jig, FET probe, or other device

(10)METER SCALE key

10%, 20%, 1.5ns, 5ns, 15ns, 50ns

(11)JUDGE key

The GO LED lights up when a measured value is smaller than a judgment-level set value, while the NO GO LED lights up when it is larger than that value. The judgment result is output at the TTL level, or through the GPIB interface.

(12)TIME CONST key

The switch to select a time constant for conversion to an rms value. The time constant can be selected from among 0.03 s, 0.1 s, 0.3 s, and 1 s.

(13)SYMMETRY key

This switch is used to select the operation mode of the symmetry circuit, and the variable resistor for level setting. The operation mode can be selected from among three: AUTO, AUTO+OFFSET, and MANUAL.

[Operations in AUTO]
This jitter meter is equipped with a function that enables the slice level to automatically track the symmetry level of an RF signal, in order to correct asymmetry in the RF signal. This is achieved by performing feedback control of the slice level, so that DC values obtained after the RF signal is sliced become 0.

[Operations in AUTO+OFFSET]
In this mode, an offset function can be added to the slice level.

[Operations in MANUAL]
In this mode, the slice level does not respond to the symmetry level of an RF signal. When an RF signal that has already been binarized using a jig or other means is measured, always set the operation mode to MANUAL. The slice level can be set using the slice-level-setting variable resistor.

(14)INHIBIT key (KJM6765 only)

Used for on/off setting and switch the polarity of the inhibit function.

(15)KEY LOCK switch

When this switch is set in the direction indicated by the arrow, the keys on the front panel will be locked. (KJM6765 provides the dip switch.)

(16)JUDGE OUT terminal

Outputs the judgment results for GO/NO GO at the TTL level. The judgment result is GO when a signal is at a high level, and NO GO when it is at a low level. (KJM6765 has judge output terminal on the EXT I/O connector.)

(17)RF SIGNAL MONITOR terminal

This terminal is used to monitor RF signals, and outputs an amplitude approximately 1/10 of the input amplitude. It is also used in calibration of the probe.

(18)EQUALIZED RF OUT terminal

Outputs an RF signal that has passed through the equalizer when EQ is ON

(19)CLOCK MONITOR terminal

This terminal is used to monitor clock signals, and outputs an amplitude approximately 1/10 of the input amplitude. It is also used in calibration of the probe.

(20)DC OUT terminal

Outputs the voltage proportional to a measured value (0.2 V/%). The output impedance is approximately 600 Ω.

(21)GPIB interface

This is a 24-pin connector in compliance with the IEEE 488-1978 GPIB Standard.
* This is available only for the models with the GPIB feature.

(22)SLICED RF OUT terminal

Outputs an RF signal that has been sliced by the slicer circuit. The output amplitude is 0.2 V to 0.3 V p-p.

(23)DELAYED CLOCK OUT terminal

Outputs a clock signal with a phase difference to an RF signal that has been adjusted by the delay circuit. The output amplitude is 0.2 V to 0.3 V p-p.

(24)JITTER OUT terminal

Outputs the waveform of jitter sampled prior to conversion into a root-mean-square value (rms)

(25)EXT I/O connector

External control connector (D-sub 25 pins)