



## **Time Interval Jitter Meter KJM6775**

DVD/CD compatible, clock frequency range: 4.0MHz - 220MHz

High specs with maximum 74MSPS, minimum resolution of 25ps

Built-in wobble-jitter measurement and Bi-Phase jitter measurement functions

PLL clock regeneration circuits for CD standard speed, 2x, 4x, 8x speed, DVD standard speed and 2x speed

Equipped with a DVD standard-speed equalizer circuit



# Potential capabilities focusing on the next generation media

## TIME INTERVAL JITTER METER

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The KJM 6775 is an instrument to measure jitter on CDs, DVDs and other optical discs. The mainstream measurement method for jitter of RF signals on optical discs is the time-interval method, specified in the DVD Book (DVD Specifications for Read-Only Disc Ver.1.0 Aug 1996). In addition, there are various media appearing in today's optical disc market, accompanied by improvements in the rotation speed of drives.

The KJM6775 is capable of 3 types of jitter measurement: RF to CLOCK jitter, Bi-Phase jitter, and wobble-jitter measurement. It provides a maximum frequency of 220MHz and high-speed processing with a maximum of 74MSPS for RF to CLOCK jitter measurement. This instrument is suitable for jitter measurement of high-speed optical drives and next generation discs. The PLL clock regeneration circuit supports the CD standard speed (as specified in the Compact Disc Reference Measuring Methods Specification Guideline Ver.1.0 May 1999), 2x, 4x,

8x speeds, as well as the DVD-ROM standard speed (as specified in the DVD Specifications for Read-Only Disc Ver.1.0 Aug. 1996), and 2x speed. Since the equalizer is equipped with an equalizer circuit for DVD-ROM standard speed, it is possible to perform measurements conforming to the DVD Book standard on an RF signal input from an optical pickup.

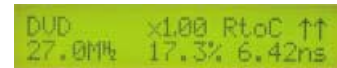
The instrument applies a method for jitter detection where the input data is accumulated as a histogram, then digitally processed all at once, which allows measurements on a single-shot signal or only on part of a disc by combining the three functions of arming, arming delay and inhibit.

The KJM6775 is an improved version of the KJM6765 and the KJM6755A which are widely used in the market. KIKUSUI proudly presents this cutting edge model developed to support the next generation media.

### [Display mode]



▲ The histogram display



▲ The display for Amount of jitter (%)(s), Clock frequency (when measuring RF to clock time interval jitter only)



▲ For Setting the Sample time



▲ Arming and Inhibit

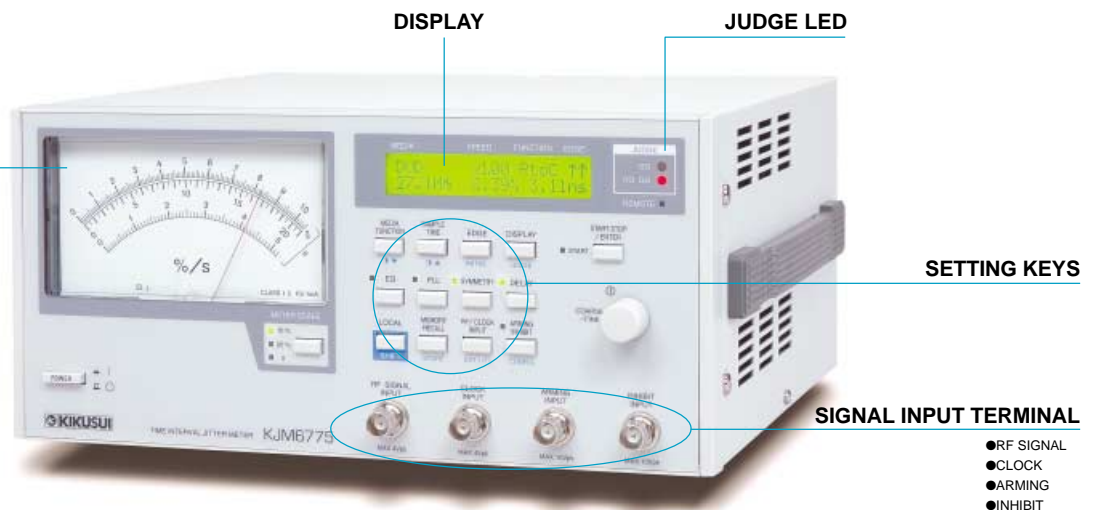


▲ Configuration Menu

## Front Panel

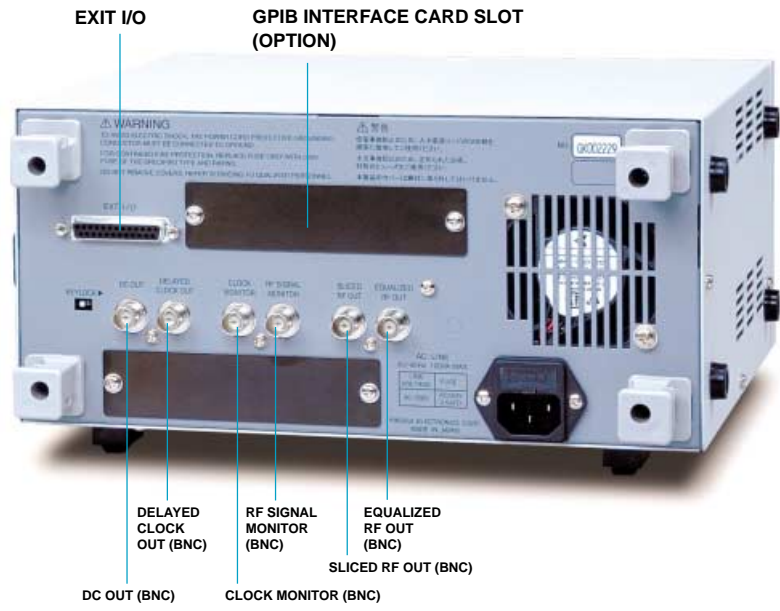
### METER

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.

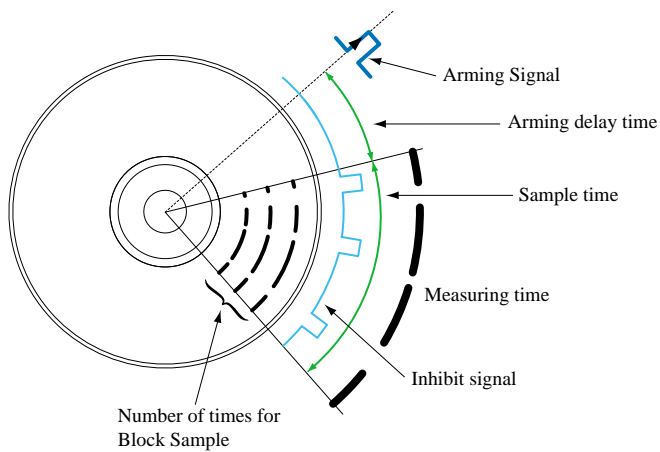


- RF SIGNAL
- CLOCK
- ARMING
- INHIBIT

# Rear Panel



## Arming and Inhibit Functions



## Measurement Principle of Wobble Jitter and Bi-Phase jitter

The Wobble jitter is derived by measuring the Wobble period several times and determining the standard deviation from the collected data; the Bi Phase jitter is derived by measuring the time of 1T in the Bi Phase pulse width several times and determining the standard deviation from the collected data. For Wobble and Bi Phase jitter measurement, the measurement of a single time data point is determined by counting the standard clock signal with a counter and increasing or decreasing the fractional time around the time interval.

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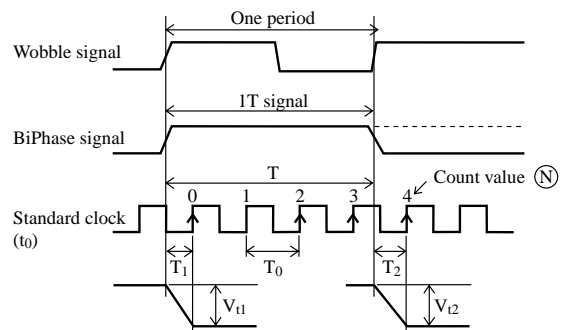
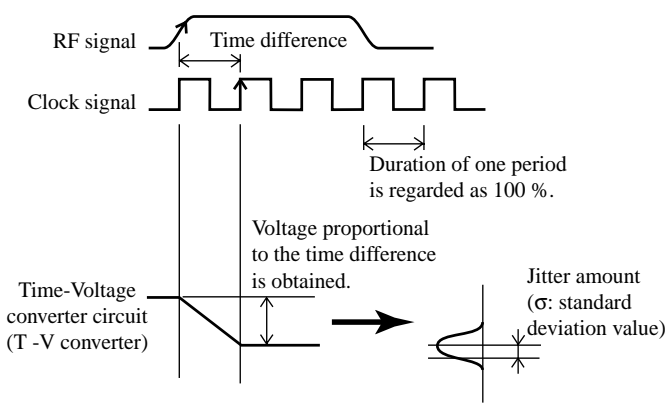
$$T = T_0 \times N + T_1 - T_2$$

T1 and T2 are measured using the time-to-voltage converter as with the time interval jitter measurement.

## Measurement Principle of RF to Clock Time Interval Jitter

The time interval jitter is derived by measuring the time difference from the RF signal edge to the next clock signal edge several times and determining the standard deviation from the collected data. The unit is seconds.

The percentage display value is derived by taking one clock period to be 100 %.



## Expansion features of PLL and EQ for the additional media

| Media    | PLL            | EQ             |
|----------|----------------|----------------|
| CD       | 16 times speed |                |
| DVD-ROM  | quaduple speed | double speed   |
| DVD-RAM1 | standard speed | double speed   |
| DVD-RAM2 | standard speed | standard speed |
| DVD+RW   | standard speed | double speed   |

\* It may be subject to limit in the function by combination of type of media please contact with our sales representative for detail.

# KJM6775 Specifications

## Input

|                        |   |
|------------------------|---|
| RF INPUT Input signal  | EFM signal, 8-16 modulation signals, Wobble signal, Bi-Phase signal |
| Minimum pulse width    | Time interval measurement: 5 ns, Others: 15 ns                      |
| Clock frequency range  | 4.0 MHz to 220 MHz  |
| Duty ratio range       | 45:55 to 50:50  |
| Signal voltage range   | 0.2 Vp-p to 2 Vp-p  |
| Input impedance        | Approx. 1 MΩ (17 pF ± 3 pF), Approx. 50 Ω                           |
| Input coupling         | AC, DC  |
| Maximum input voltage  | ±4 V (DC+AC peak)   |
| Input connector        | BNC   |
| Frequency band (-3 dB) | DC: DC to 250 MHz AC: 35 Hz to 250 MHz                              |

## Measurement • Time interval jitter measurement

|                             |  |
|-----------------------------|--|
| Measuring range             |  |
| Clock frequency range       | 4.0 MHz to 220 MHz   |
| Jitter value range          | 0 % to 20 % of clock period  |
| Calculation range           | 0 T to 1.0 T (T = period of clock signal) *1   |
| Specification-assured range | 4 % to 15 %  |
| Measuring accuracy *2       |  |
| Display indication          | ±(0.4 % + 80 ps of clock period)   |
| Analog meter indication     | ±(0.4 % + 80 ps of clock period + 1 % of FS)   |
| Time resolution             | 25 ps, 50 ps, 100 ps, 200 ps, 400ps *3   |
| Residual jitter             | 2 % or less of clock period *1   |
| Maximum sampling *4 period  | 74 MSPS (Up to 100 consecutive data points) *5<br>52 MSPS (Upper limit to average value) |

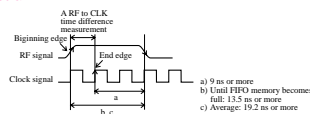
\*1. The clock period is derived from the media speed setting. The clock frequencies of the CD and DVD standard speeds are 4.3218 MHz, and 27.0 MHz, respectively.

\*2. The clock period derived from the media speed setting is applied. If the media speed setting is not correct, the calculation range will not be correct. In this case, the specifications cannot be guaranteed.

\*3. It is subject to change by setting clock frequency of media.

\*4. Continuous measurement requirement

- The time from the end edge to the next RF signal edge is 9 ns or more.
- The time from the beginning edge to the next RF signal edge is 13.5 ns or more.
- The average of the time above b is 19.2 ns or more.



\*5. The KJM6775 has built-in FIFO memory (temporary storage memory) as waiting for calculate processing, data is acquired continuously until the FIFO memory becomes full, even if measurement of sampling period exceeds upper limit to average value: 52 MSPS to 74 MSPS. When the signal is applied at 74 MSPS, the FIFO memory becomes full at 100 data points.

## Wobble jitter measurement

|                             |   |
|-----------------------------|---|
| Measuring range             |   |
| Clock frequency range       | 120 kHz to 1.2 MHz (Average), 80 kHz to 2.4 MHz (Maximum) |
| Jitter value range          | 0 % to 20 %   |
| Calculation range           | 0.5 T to 1.5 T (T = period of wobble signal) *6           |
| Specification-assured range | 4 % to 15 %   |
| Measuring accuracy *7       |   |
| Display indication          | ±0.5 % of wobble period                                   |
| Analog meter indication     | ±(0.5 % of wobble period+1 % of FS)                       |
| Measuring resolution        | 200 ps, 400 ps  |
| Residual jitter             | 2 % or less of wobble period                              |
| Maximum sampling period     | 17 MSPS   |

\*6. The wobble period is derived from the media speed setting. The wobble frequency of the DVD standard speed (27 MHz) is 145.16 kHz, period comes to approx. 6.9 μs.

Moreover, wobble frequency of DVD-RAM1 (29.18 MHz) is 156.88 kHz, period comes to approx. 6.4 μs.

\*7. The wobble period derived from the media speed setting is applied. If the media speed setting is not correct, the calculation range will not be correct. In this case, the specifications cannot be guaranteed.

## Bi-Phase jitter measurement

|                             |   |
|-----------------------------|---|
| Measuring range             |   |
| Clock frequency range       | 3.1 μs to 140 μs (1T average) 1.5 μs to 620 μs (Maximum)  |
| Jitter value range          | 0 % to 20 %   |
| Calculation range           | 0.5 T to 1.5 T (T = 1T pulse width of Bi-Phase signal) *8 |
| Specification-assured range | 4 % to 15 %   |
| Measuring accuracy *9       |   |
| Display indication          | ±0.5 % of 1T Bi-Phase pluse width                         |
| Analog meter indication     | ±(0.5 % of 1T Bi-Phase pluse width+1 % of FS)             |
| Time resolution             | 200 ps, 400 ps, 800 ps, 1.6 ns, 3.2 ns, 6.4 ns, 12.8 ns   |
| Residual jitter             | 2 % or less of 1T Bi-Phase pluse width                    |
| Maximum sampling period     | 17 MSPS   |

\*8. The 1T pulse width is derived from the media speed setting. The 1T average pulse width of the CD standard speed is 158.75 μs.

\*9. The pulse width derived from the media speed setting is applied. If the media speed setting is not correct, the calculation range will not be correct. In this case, the specifications cannot be guaranteed.

## Sample time

|                                |   |
|--------------------------------|---|
| Sample time setting range      | 0.6 μs to 1 s   |
| Sample time setting resolution | 0.2 μs (0.6 μs to 100 μs), 1 μs (100 μs to 1 ms), 10 μs (1 ms to 10 ms) |
| Sample time setting accuracy   | ±(Setting value × 0.01 % + 4 Sample time + 0.15 μs)                     |
| Block sample setting range     | 1 to 100 *10  |

\*10. The maximum number of samples is 2<sup>24</sup>-1. Take into account the period of the input signal and the media type, and set the value so that it does not overflow.  
(Reference) In the case of an EFM signal of 220 MHz clock with 4T average and s equal to approximately 4%, overflow occurs after 3 s.

## Arming • Inhibit

|                                   |   |
|-----------------------------------|---|
| Input level                       |   |
| at x1                             | H level: 2.5 V to 5.0 V, L level: 0 V to 1.0 V                          |
| at x10                            | H level: 0.25 V to 0.5 V, L level: 0 V to 0.1 V                         |
| Input impedance                   | Approx. 1 MΩ  |
| Input coupling                    | DC  |
| Maximum input voltage             | ±10 V (DC+AC peak)  |
| Input connector                   |   |
| Input connector                   | BNC   |
| Arming edge                       | POSITIVE, NEGATIVE  |
| Arming signal minimum pulse width | 100 ns  |
| Arming delay setting range        | OFF and 0.2 μs to 1 s   |
| Arming delay setting resolution   | 0.2 μs (0.2 μs to 100 μs), 1 μs (100 μs to 1 ms), 10 μs (1 ms to 10 ms) |
| Inhibit polarity                  | NORMAL, INVERT  |
| Inhibit valid time                |   |
| In measurement of two signal      | 1 μs to 1 s   |
| In measurement of single signal   | 100 μs to 10 ms (at an inhibit period of 75 % or less)                  |

## Indicating

|                     |  |
|---------------------|--|
| Indicator           | Analog meter, LCD display 2 × 20 letters       |
| Unit                | %, s   |
| Scale               | 10 %, 20 % 1 ns, 2 ns, 5 ns, 10 ns, .....50 μs |
| GO, NO GO judgement | Red(NOGO), Green(GO) 2LED display              |

## Trigger

|  |  |
|--|--|
| Symmetry follow-up   |  |
| AUTO, AUTO+OFFSET, MANUAL  |  |
| CD-ROM   | The response characteristics of AUTO comply with those given in the Compact Disc Reference Measuring Methods Specification Guideline Ver. 1.0 May 1999 |
| CD-R   |  |
| CD-RW  |  |
| DVD-ROM  | The response characteristics of AUTO comply with those given in the DVD Specifications for Read-Only Disc Ver. 1.0 Aug 1996                            |
| DVD-R, ±RW   |  |
| DVD-RAM1   | The response characteristics of AUTO comply with those given in the DVD Specifications for Rewritable Disc Ver. 1.0 July 1997                          |
| DVD-RAM2   | The response characteristics of AUTO comply with those given in the DVD Specifications for Rewritable Disc Ver. 2.0 Sept 1999                          |
| Trigger edge   |  |
| RF   | Rising edge, falling edge and both edges selectable  |
| CLOCK  | Rising edge and falling edge selectable  |
| Manual level setting range   | -1.0 V to +1.0 V   |
| Manual level resolution  | 2 mV   |
| Manual level accuracy  | ±(Setting value×2 % + 20 mV)   |
| Delay circuit (only when making measurements using two time interval jitter signals)             |  |
| Clock signal is delayed to adjust the phase of an RF signal.<br>Phase adjusting range:0° to 360° |  |

## Equalizer circuit

Equalizer circuit in KJM6775 is designed in order to 8-16 modulated signal of reference clock of =27 MHz. Frequency response characteristics based on the DVD book is prescribed in reference clock of 26.16 MHz. Therefore, because reference frequency of 26.16 MHz is converted into 27 MHz, frequency characteristics of the KJM6775 is described 5.0 MHz as 5.16 MHz and 10 MHz as 10.3 MHz.

|  |  |
|--|--|
| DVD book: DVD Specifications for Read-Only Disc Ver. 1.0, Aug. 1996. |  |
| Frequency characteristics  | 5.16 MHz: +3.2 dB ± 0.3 dB (Amplitude ratio as reference is 10 kHz)<br>10.3 MHz: -2.8 dB ± 1.0 dB (Amplitude ratio as reference is 10 kHz) |
| Group delay frequency characteristics                                | Maximum group delay deviation ≤ 6 ns (range: 0.7 MHz ≤ f ≤ 6.7 MHz)  |

# KJM6775 Specifications

## PLL clock-regeneration circuit

Frequency response characteristics based on the DVD book is mentioned by open-loop characteristics. However, frequency response characteristics of the KJM6775 is managed by close-loop characteristics equivalent to open-loop characteristics. Frequency response characteristics can be valid at reference clock of =27 MHz (DVD standard speed mode) or 4.3 MHz (CD standard speed mode).

The frequency response characteristics of each PLL are those obtained by scaling the specifications of the corresponding book or standard.

| CD standard speed mode   |  |
|--|--|
| Synchronizing available signal   | EFM signal that channel clock is equivalent to 4.1 MHz to 4.5 MHz  |
| Frequency response characteristics<br>(Closed loop characteristics, reference is 100 Hz)<br>Comply with the Compact Disc Reference Measuring Methods<br>Specification Guideline Ver.1.0 May 1999 | 1 kHz: 0.19 dB ± 1.7 dB<br>5 kHz: -0.15 dB ± 1.7 dB<br>10 kHz: -1.17 dB ± 1.7 dB<br>20 kHz: -3.82 dB ± 1.7 dB<br>25 kHz: -5.10 dB ± 1.7 dB |

| CD double speed mode   |   |
|--|---|
| Synchronizing available signal   | EFM signal that channel clock is equivalent to 8.2 MHz to 9 MHz   |
| Frequency response characteristics<br>(Closed loop characteristics, reference is 100 Hz) | 2 kHz: 0.19 dB ± 1.7 dB<br>10 kHz: -0.15 dB ± 1.7 dB<br>20 kHz: -1.17 dB ± 1.7 dB<br>40 kHz: -3.82 dB ± 1.7 dB<br>50 kHz: -5.10 dB ± 1.7 dB |

| CD quadruple speed mode  |  |
|--|--|
| Synchronizing available signal   | EFM signal that channel clock is equivalent to 16.4 MHz to 18 MHz  |
| Frequency response characteristics<br>(Closed loop characteristics, reference is 100 Hz) | 4 kHz: 0.19 dB ± 1.7 dB<br>20 kHz: -0.15 dB ± 1.7 dB<br>40 kHz: -1.17 dB ± 1.7 dB<br>80 kHz: -3.82 dB ± 1.7 dB<br>100 kHz: -5.10 dB ± 1.7 dB |

| CD octuple speed mode  |   |
|--|---|
| Synchronizing available signal   | EFM signal that channel clock is equivalent to 32.8 MHz to 36 MHz   |
| Frequency response characteristics<br>(Closed loop characteristics, reference is 100 Hz) | 8 kHz: 0.19 dB ± 1.7 dB<br>40 kHz: -0.15 dB ± 1.7 dB<br>80 kHz: -1.17 dB ± 1.7 dB<br>160 kHz: -3.82 dB ± 1.7 dB<br>200 kHz: -5.10 dB ± 1.7 dB |

| DVD standard speed mode  |  |
|--|--|
| Synchronizing available signal   | 8-16 modulated signal that channel clock is equivalent to 25 MHz to 30 MHz                             |
| Frequency response characteristics<br>(Closed loop characteristics, reference is 100 Hz)<br>Comply with the DVD Specifications for Read-Only Disc Ver.1.0 Aug 1996 | 1 kHz: 0.2 dB ± 1.7 dB<br>3 kHz: 1.3 dB ± 1.7 dB<br>7 kHz: 1.0 dB ± 1.7 dB<br>15 kHz: -4.0 dB ± 1.7 dB |

| DVD double speed mode  |   |
|--|---|
| Synchronizing available signal   | 8-16 modulated signal that channel clock is equivalent to 50 MHz to 60 MHz                              |
| Frequency response characteristics<br>(Closed loop characteristics, reference is 100 Hz) | 2 kHz: 0.2 dB ± 1.7 dB<br>6 kHz: 1.3 dB ± 1.7 dB<br>14 kHz: 1.0 dB ± 1.7 dB<br>30 kHz: -4.0 dB ± 1.7 dB |

| All mode common                      |                   |
|--------------------------------------|-------------------|
| Lock-up time                         | Within 700 ms *11 |
| Synchronizing available jitter range | 0 % to 17 %       |
| Residual jitter                      | 2 % or less       |

\*11. STANDARD is selected at CONFIG menu71: LOCK MODE

## Output(Rear)

| RF MONITOR       |   |
|------------------|---|
| Output amplitude | Approx. 1/4 (terminated with 50 Ω) of input amplitude |
| Output impedance | Approx. 50 Ω  |
| Output connector | BNC   |

| CLOCK MONITOR    |   |
|------------------|---|
| Output amplitude | Approx. 1/4 (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   |

| EQUALIZED RF OUT |   |
|------------------|---|
| Output amplitude | Approx. 0.2 V to 0.3 V (sine wave input with 4 MHz, terminated with 50 Ω) |
| Output impedance | Approx. 50 Ω  |
| Output connector | BNC   |

| DC OUT               |               |
|----------------------|---------------|
| Output amplitude *12 | 0.2 V/%       |
| Output impedance     | Approx. 600 Ω |
| Output connector     | BNC           |

\*12. Under standard setup, the offset and gain of the output amplitude can be modified from the front panel.  
The output amplitude accuracy conforms to the measurement accuracy of each function.

## EXT I/O interface

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

## GPIB interface (optional)

|  |
|--|
| 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 switch, 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<br>Humidity: 90 % or less R.H. (no condensation)  |
| Operating temperature and humidity range                | Temperature: 0 °C to 40 °C<br>Humidity: 20 % to 85 % R.H. (no condensation)  |
| Specification guaranteed temperature and humidity range | Temperature: 15 °C to 35 °C<br>Humidity: 20 % to 85 % R.H. (no condensation)   |
| Supplied voltage range                                  | Rated voltage: 100 V to 240 V AC<br>Allowable voltage: 90 V to 250 V AC  |
| Power frequency range                                   | Rated frequency: 50 Hz/60 Hz<br>Allowable frequency: 45 Hz to 65 Hz  |
| Power consumption                                       | Maximum: 120 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 or less  |
| Dimensions (mm)   | Approx. 280 (W)×132 (H)×270 (D)<br>Maximum: approx. 300 (W)×150 (H)×320 (D)  |
| Weight  | Approx. 5 kg   |
| Battery life  | Approx. three years  |
| Battery backup  | Setup data is backed up.   |
| Accessories   | Power cord for 100 V system [85-AA-0003] 1<br>Power cord for 200 V system [85-AA-0005]<br>Operation manual [Z1-002-722] 1<br>Fuse 2.5 A (T) [99-00-0027] *13 2 |

\*13. The fuse including a spare fuse is contained in the fuse holder.



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