Digital Processing Jitter Meter

LE 1871

The LE 1871 Jitter Meter is designed to measure jitter conforming to Blu-ray Disc (Part 1, version 1.0, June 2002) standards. Since the Conventional Equalizer, PLL clock regenerator, and jitter measurement section are provided as standard, the HF signal output from an optical pickup can be directly applied to this instrument for measuring jitter. Combining time interval analyzer TIA in conjunction with digital processing methods allows quick, accurate jitter measurements. A large meter and LED panel make this instrument ideal for production and inspection applications, as well as R&D.
Options include: limit equalizer for Blu-ray Disc (OP70), and jitter measurement units for DVD/CD (OP71), or HFM (OP72) are optionally available. Thus, jitter of DVD/CD, and HF/HFM of Blu-ray Disc can be measured using a single unit. Optional GPIB (OP73) or LAN (OP74) are convenient for implementing an automatic measurement system and ensuring quality control.

Rear Panel

Features

Blu-ray Disc measurement features

- Applicable to three types of disc capacity (x1 speed)
  Jitter of Blu-ray Disc with disc capacity of 23.3 GB, 25.0 GB, and 27.0 GB can be measured.
- Equipped with Equalizer conforming to Blu-ray Disc standards
  The Conventional Equalizer conforming to Blu-ray Disc standards is provided. The boost level of Conventional Equalizer can be varied.
- Digital processing method for quick and accurate measurement
  Root-mean-square value calculation using digital processing method enables quick and accurate measurements.
- Measures the jitter of all-T components conforming to Blu-ray Disc standards
  Measures all components of 2T to 8T and 9T of the HF (DATA) signal with respect to the CLOCK signal, then displays it as jitter in sigma format.
- Displaying jitter as %.
  Jitter component with respect to the clock signal is displayed as a percentage (%).
  No clock period setting is required since the clock is automatically regenerated from the HF (DATA) signal. Measurement will be made correctly even when the HF (DATA) signal deviation is 4%.
- Three polarity modes
  Rising edge, falling edge, and both edges of DATA signal can be selected.
- Applicable dual-layer disc
  The 2T component can be eliminated in DATA to CLOCK measurement mode used when inspecting a dual-layer disc.

Measurement features

- High sensitivity
  The HF (DATA) with a signal level between 0.1 Vp-p and 2.0 Vp-p can be measured.
- Selectable response time
  The jitter indication response time can be set from 0.0 to 5.0 seconds. Response time of the DC output can be set separately.
- Analog and digital displays
  The large analog meter is convenient for adjusting the device under test. Jitter measurement values are also displayed on the large LED panel for parallax-free readings.
- ARMING/INHIBIT functions to specify measurement block on a disc.
  This instrument can correctly measure jitter even when faulty operation (e.g., track jumping) occurs based on the following functions:
  ARMING function can specify the block on a disc to measure jitter.
  INHIBIT function can specify the block on a disc to inhibit measurement.
  The delay time, measurement time, and number of repetition measurements can be set.
  Monitor output connector for an oscilloscope is provided to check measurement block for correct operation.
- Various monitor outputs
  Input signal and and equalized signal can be monitored. A DC voltage in proportion to the full-scale meter indication is output.
- Auto-slicer
  Auto-slicer conforming to Blu-ray Disc standards is provided.

Production Line features

- GO/NO GO judgment mode convenient for production lines
  Jitter measurement results are compared with the preset judgment limits, then displays the results on the LED. The results can also be output. Thus, optimized GO/NO GO targets can be used to continuously push the quality envelope.
- Remote Control Function
  Front panel controls such as jitter measurement range can be remotely controlled.
- RS-232C interface
  This instrument can transfer front panel settings and jitter measurement values to a personal computer via the RS-232C interface. The computer control system can be used to construct an automatic measurement system and ensure quality control.
- Simple operation
  Equalizer boost level, judgment reference, and response time can easily be set with a jog dial.
- Universal voltage
  Since this instrument operates on 90 to 250 V, it can be used throughout the world.

Specifications

Input Section:

HF INPUT:	(1-7 modulation signal input)
Input Coupling:	AC
Measurement Voltage Range:	0.1 to 2.0 V p-p
Input Range:	3 ranges
	0.3 V range: 0.1 to 0.3 V p-p
	0.9 V range: 0.3 to 0.9 V p-p
	2.0 V range: 0.9 to 2.0 V p-p
Input Impedance:	50 Ω
Auto Slicer:	Response time constant: 10 kHz
Maximum Input Voltage:	± 2.5 V
Measurement Control (ARMING IN/INHIBIT IN)	
Input Impedance:	10k Ω
Input Signal Level:	0/+5 V
Maximum Input Voltage:	-0.7 V/+5.7 V

Equalizer Section

Conforms to Blu-ray Disc (Part 1, version 1.0) standards	
Applicable format:	1-7 PP modulation
Channel Bit Rate:	66 MHz
Equalizer Mode:	Conventional Equalizer Mode
Gain Variable Range:	0 to 8 dB (36 steps)
Gain Accuracy:	±0.5 dB
Group Delay Deviation:	≤2.0 nsp-p (5.8 dB: 3 MHz to 16.5 MHz)

Jitter Measurement Section

Applicable Speed:	Clock frequency: 66 MHz ±4 %
Measurement Mode:	DATA to CLOCK
	DATA to CLOCK 2T eliminate mode
Measurement Resolution:	25 ps
Unit Displayed:	% (Sigma value with respect to clock period)
Measurement Accuracy	
Meter Indication:	± 5% of full scale ± residual jitter
Digital Display:	± 5% ± residual jitter
Polarity Section	⌠ ⌡
DATA:	⌡, , BOTH
CLOCK:	(fixed)
Measurement Time Constant:	0.04 s to 5 s

Measurement Control Section (ARMING/INHIBIT function)

Measurement Control Mode:	ARMING mode/INHIBIT mode
Electrical Characteristics	
Input Impedance:	10k Ω
Input Signal Level:	0/+5 V
Maximum Input Voltage:	-0.7 V/+5.7 V
INHIBIT	
ENABLE:	HIGH/LOW
COUNT:	0 to 50, in 1 steps
ARMING	
SLOPE:	RISE/FALL
COUNT:	0 to 50, in 1 steps
START DLY:	0 to 99.99 ms (in 0.01 steps min.)
LENGTH MODE:	SAMPLE/TIME
LENGTH:	0.01 to 99.99 ms (in 0.01 steps min.) (TIME only)

Clock Regenerator (DATA to CLOCK mode only)

Regenerates reference clock signal from DATA signal input.

HF:	66 MHz ± 8%

Clock Frequency Measurement Section (DATA to CLOCK mode only)

Measurement Range:	60.72 MHz to 71.28 MHz
Measurement Accuracy:	± 0.1%

Judgement Section

Outputs GO/NO GO results of jitter and frequency measured with respect to the preset value.

GO/NO GO LED:	Indicates results corresponding to meter indications.
Dedicated Remote Control Connector:	Outputs judgement results for jitter measurement.

Output Section

MONITOR OUT	
To Monitor the HF Signal Input	
Output Impedance:	50 Ω
Output Amplitude:	Up to 2.0 V p-p ± 30% (into 50 Ω, in proportion to input signal)
Output Connector:	BNC
EQUALIZER OUT	
To Monitor the HF signal input.	
Output Impedance:	50 Ω
Output Amplitude:	0.8 V p-p ± 30% (into 50 Ω)
Output Connector:	BNC
DIGITAL OUT (DATA, CLOCK)	
Outputs binary DATA signal and clock signal regenerated by PLL.	
Output Signal:	DATA signal, CLOCK signal
Output Amplitude:	0.15 V p-p (into 50 Ω)
Output Offset Voltage:	0.34 V (into 50 Ω)
Output Connector:	BNC
DC OUT	
Output Voltage:	0.05 V/%
Output Accuracy:	± 2%
GATE MONITOR	
To monitor arming/inhibit control signals.	
Output Amplitude:	TTL Level
Output Impedance:	1k Ω

Remote Control Section

Dedicated Remote Control Connector	
Communicates judgement results and front panel settings.	
Pins for Front Panel Setting	
Input Level:	0/5 V (pulled-up with 47k Ω resistor)
Maximum Input Voltage:	-0.7/+5.7 V
Judgement Results Output Pins	
GO:	5 V (open drain output, pulled-up with 47k Ω resistor)
NO GO:	0 V
Maximum Current Output:	10 mA
RS-232C Interface	
Communication:	Controls function, outputs data.
Baud Rate:	38400 bps max.

General Specifications

Environmental Conditions	
Operating:	Temperature: 0 to 40° C
	Humidity: ≤ 85% RH (without condensation)
Spec-Guaranteed:	Temperature: 10 to 30° C
	Humidity: ≤ 85% RH (without condensation)
Operating Environment:	Indoor Use
Operating Altitude:	Up to 2,000 m
Overvoltage Category:	II
Pollution Degree:	2
Power Requirements:	90 to 250 VAC, 50/60 Hz
	Max. 55 W, 80 VA max
Dimension (WxHxD):	$8^{3}/_{8}$ x $5^{1}/_{4}$ x $11^{13}/_{16}$ in.
	213 x 132 x 300 mm
Weight:	8.8 lbs., 4.0 kg
Accessories:	Power Cord: 1
	Instruction Manual: 1

Specifications Cont'

Option

OP70 Limit Equalizer (For Blu-ray HF)

Conforms to Blu-ray Disc (part 1, version 1.0 standards)

Applicable Format:	1-7 PP modulation
Channel Bit Rate:	66 MHz
Equalizer Mode:	Conventional Equalizer Mode or Limit Equalizer Mode, selectable
Gain Variable Range:	0 to 8 dB (36 steps)
Gain Accuracy:	± 0.5dB
Group Delay Deviation:	≤2.0 nsp-p (5.8 dB: 3 MHz to 16.5 MHz)

OP71 DVD/CD Measurement

Input Section

DATA INPUT (EFM/8-16 modulation signal input)

Input Coupling:	AC (2 Hz/1 kHz, selectable)
Measure Voltage Range:	50 mV to 5 Vp-p
Input Impedance:	1M Ω/50 Ω, selectable
Slice Level:	
VARIABLE:	± 2.5V
AUTO (ASYMMETRY ON):	20 Hz/1 kHz/5 kHz/10 kHz, selectable
Maximum Input Voltage:	± 5V

Jitter Measurement Section

Applicable Speed	
DVD:	Clock Frequency x1 speed: 27 MHz ± 10% x2 speed: 54 MHz ± 10%
CD:	x1, x2, x4, x8, x10, x12 speed
Measurement Mode	
DVD:	PERIOD mode, sum of all -T data in PERIOD mode, PULSE WIDTH mode, sum of all -T data in PULSE WIDTH mode, DATA to CLOCK
CD:	PULSE WIDTH mode, sum of all -T data in PULSE WIDTH mode
Unit Displayed:	ns, %
Measurement Resolution:	50 ps
Display Resolution:	0.01 ns
Measurement Accuracy	
Sigma Value:	±4 % ±0.15 ns
Average Value:	±1 ns
Polarity Section	
DATA:	⎍/∫, ⏊/⎩, BOTH
CLOCK:	⎩ (fixed)
Measurement Item:	σ, σ/T

Clock Frequency Measurement Section (DVD, DATA to CLOCK mode only)

Measurement Range:	24.3 MHz to 59.4 MHz
Measurement Accuracy:	±0.1 %

Clock Regenerator (DVD, DATA to CLOCK mode only)

Regenerates reference clock signal from DATA signal input.

HF:	x1 speed: 27 MHz ±8 %, x2 speed: 54 MHz ±8

OP72 HFM Measurement

Input Section:

Input Coupling:	AC
Measurement Voltage Range:	50 mV to 5 Vp-p
Input Impedance:	1M Ω/50 Ω, selectable
Frequency Range:	x1 speed: 8 MHz, x2 speed: 16 MHz
Slice Level:	±2.5 V (VARIABLE)
Maximum Input Voltage:	±5 V

Jitter Measurement Section:

Measurement Range:	Clock frequency: 3.37 MHz to 3.96 MHz
Measurement Mode:	DATA to CLOCK
Measurement Resolution:	50 ps
Measurement Accuracy:	
Sigma Value:	±5 %
Polarity Section	
DATA:	⎍/∫, ⏊/⎩, BOTH
CLOCK:	⎩ (fixed)
Measurement Item:	σ/T
Unit Displayed:	%

Clock Regenerator

Regenerates reference clock signal from DATA signal input.

HFM:	x1 speed: 3.667 MHz ±8 %

Clock Frequency Measurement Section

Measurement Range:	x1 speed: 3.37364 MHz to 3.96036 MHz
Measurement Accuracy:	±0.1 %

OP73 GPIB (IEEE 488.2)

Function:	Transfers data, controls front panel settings.

OP74 LAN

Function:	Transfers data, controls front panel settings.

OP71 and OP72 cannot be installed together.

OP73 and OP74 cannot be installed together.