YOKOGAWA

TA220

Blu-ray Disc Jitter Meter

Digital Jitter Meter

- Blu-ray Disc equalizer and PLL
- Limit equalizer (optional)
- Capable of measuring data-to-clock jitter and pulse width jitter
- Standard-equipped with function for analyzing data-to-clock jitter excluding 2T
- Inhibit function and block sampling function
- Standard-equipped with Ethernet and GP-IB interfaces
- A variety of display capabilities, with analog meter and two LED indicators

Bulletin 7046-00E

A Blu-ray Disc jitter meter made by Yokogawa

Sophisticated measurement functions

● Blu-ray Disc equalizer and PLL

With a Blu-ray Disc equalizer, auto-slicer, and PLL clock regeneration circuit (66 MHz), the TA220 can measure data-to-clock jitter directly from RF signal inputs. In addition to the conventional equalizer which is provided as a standard feature, an optional limit equalizer is also available.

● Data-to-clock jitter and pulse width jitter measurement capability

The TA220 can measure Blu-ray Disc data-to-clock jitter and pulse width jitter (data-to-data jitter). During pulse width measurements, any window width can be set, so it is also possible to measure mean values and the jitter for pulse widths other than 2T (e.g., 3T and 8T).

Compatibility with testing systems

● Standard-equipped with Ethernet and GP-IB interfaces

The Ethernet or GP-IB interface can be used to download TA220 measurement results to a PC, or to control measurement condition settings or start/stop measurement.

● Measurements synchronized with an external device (inhibit function, arming function, block sampling function)

The inhibit function allows you to measure just a specified range using an external gate signal. The block sampling function stores data obtained from repeated measurements. If you are taking repeated measurements of a small recording area, you can use the arming function to specify the measurement start point based on an external trigger signal, and use the inhibit function to limit the measurement area. These functions can be combined with the block sampling function to perform repeated measurements and store measurement data, so that you have enough samples to perform an analysis.

● Advanced I/O capabilities

The jitter ratio is converted to a 0.2 V/% (initial value) analog voltage value and output through the JITTER DC OUT port on the rear panel, so measurement results can be output through the A/D converter board on the tester without using a communication interface.

Improved production efficiency

● Store/Recall function

As many as seven panel settings can be stored in and recalled from the internal memory. You can significantly reduce the time required to set up the jitter meter by storing settings for each evaluation parameter in the internal memory.

● DtoC high-speed calculation function DC OUT

During data-to-clock jitter measurement, the output from JITTER DC OUT can be updated as quickly as every two milliseconds. This capability makes it possible to check relative jitter fluctuations over a disc rotation using an oscilloscope or other instrument.

■ Front panel

Rotary knob: You can check the jitter value while turning this knob to change the equalizer boost setting or arming delay setting.

Data-to-clock jitter measurement excluding 2T: Select from the following measurement functions: data-to-clock jitter measurement, pulse width jitter measurement, data-to-clock jitter measurement excluding 2T marks and spaces.

Pulse width measurement: Set any window size to measure data-to-data jitter or pulse width average values.

Store/Recall function: As many as seven panel settings can be stored in and recalled from internal memory.

Conventional equalizer/limit equalizer selection: Selects either the conventional equalizer (standard) or limit equalizer (optional).

Ethernet (standard):
100BASE-TX/10BASE-T

GP-IB interface (standard)

Key lock switch

Power supply:
100 to 120 V AC,
200 to 240 V AC,
50/60 Hz

■ Rear panel I/O connectors (from upper left)

EXT ARM IN:	External arming input
INHIBIT IN:	Gate signal input for measurement inhibit period and PLL hold period (for conventional equalizer only)
SLICED RF OUT:	Sliced signal output
CLOCK OUT:	Regenerated PLL clock output
MONITOR OUT:	For RF signal monitor and probe adjustments
EQUALIZED OUT:	For RF signal monitor after passing through equalizer circuit
JITTER DC OUT:	Jitter D-A analog output/judgment output
LEVEL DC OUT:	Level D-A analog output/judgment output

Advanced measurement functions for everything from adjustments to testing

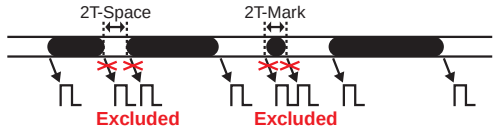
The TA220 has the functions you need for production line adjustments and testing, including data-to-clock jitter measurement, data-to-clock jitter measurement excluding 2T marks and spaces, clock period measurement, pulse width measurement, and input signal amplitude measurement.

◆ Data-to-clock jitter measurement

The TA220 can internally generate a synchronous clock from an RF signal for data-to-clock jitter measurement. The polarity of data edge can be selected from "↑", "↓", and "↑&↓".

● Data-to-clock jitter measurement excluding 2T

If you select the [E2T] measurement function, you can measure data-to-clock jitter excluding the edges adjacent to 2T marks and spaces. This function is useful for testing dual-layer discs.

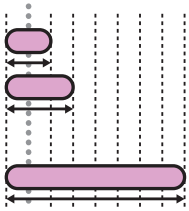


◆ Clock period measurement

This function measures the period of the internally generated PLL clock. This function is useful for checking whether the disc rotation speed is stable.

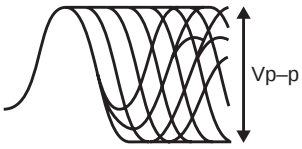
◆ Pulse width (data-to-data) jitter measurement

This function can be used to measure pulse width (data-to-data) jitter and average values. The window can be set to any value (0.00 to 999.99 nanoseconds), so you can even measure jitter and pulse width average values for recording lengths other than 2T, such as 3T and 8T.
The store/recall function makes it easy to recall separate settings for each recording length.



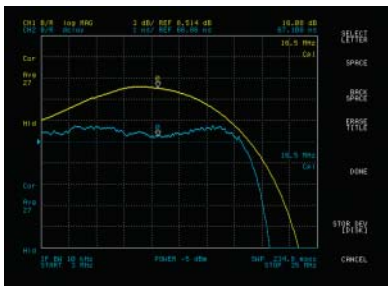
◆ Level measurement

With this function, the amplitude (Vp-p) of the input RF signal can be measured simultaneously with the jitter measurement. This can be used when the D-to-C high-speed calculation function is off. Measurement results are displayed numerically on the front panel LED, and also output as analog voltage (initial value: 1 V/1 Vp-p) through an output connector on the rear panel.

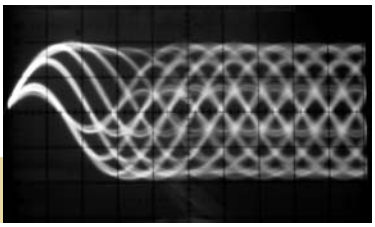


■ Blu-ray Disc equalizer and PLL circuit

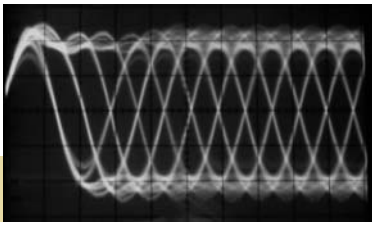
The TA220 has a conventional equalizer conforming to Blu-ray Disc RE standard version 1.0, as well as an auto-slicer and PLL clock regeneration circuit. These features can be used to measure jitter directly from an RF signal. The equalizer boost can be varied in 0.1 dB steps in the range of +3.0 dB to +9.0 dB. Maximum group delay deviation is very flat, at 1 nsp-p
(3.0 MHz ≤ f ≤ 22 MHz).
In addition, an optional limit equalizer can also be installed together with the conventional equalizer. Boost can be varied in the range of +3.0 dB to +9.0 dB. In addition, this equalizer has a preset menu of boost values for 23 GB, 25 GB, and 27 GB.



Measured waveform with conventional equalizer

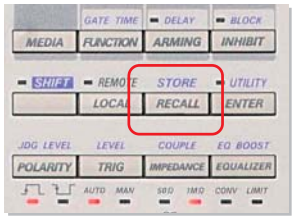


Measured waveform with limit equalizer

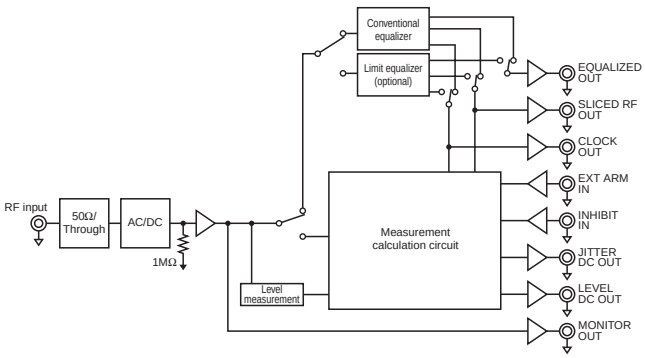


■ Store/Recall function

As many as seven TA220 settings can be stored in and recalled from the internal memory. The stored information includes all settings other than the GP-IB address. You can recall preset settings such as measurement function changes, boost settings, and window changes for pulse width jitter measurement. Even during automatic measurement, settings can be changed in a single step using the Store/Recall function, without sending multiple commands.



■ TA220 function block diagram



Specifications

Item	Specifications	
Input unit	RF input	
	Minimum pulse width:	10 ns
	Input voltage range:	0.1 Vp-p to 5 Vp-p (with conventional equalizer and AGC off) 0.1 Vp-p to 0.7 Vp-p (with conventional equalizer or AGC on) 0.1 Vp-p to 2.0 Vp-p (with limit equalizer on)
	Input coupling:	AC, DC
	Trigger	
	AUTO:	Auto-slicer (10 kHz)
	AUTO + MANUAL:	Trigger setting range: AUTO + setpoint (CODE setting -1000: approximately -2.2 V to +1000: approximately +2.2 V)
	MANUAL:	Trigger setting range: CODE setting (-1000: approximately -2.2 V to +1000: approximately +2.2 V) When MANUAL is selected with pulse width measurement, equalizer, and AGC off Trigger setting range: ±2 V (1 mV steps) Trigger setting accuracy: ±(10 mV + 4% of setting)
	(When limit equalizer is used, "AUTO + MANUAL" and "MANUAL" cannot be used.)	
	Arming input	
	Setting:	Select from the following: Internal, External ↑, External ↓
	Input:	Zin = 10 kΩ, TTL level
	Arming delay:	0.0 to 100.0 ms (0.1 ms steps)
	Inhibit input	
	Setting:	Select from the following: OFF, POS, NEG
	Input:	Zin = 10 kΩ, TTL level
	Inhibit effective time:	0.1 ms to 100 ms
Measurement items	Data-to-clock phase difference jitter and average values	
	Measurement range:	0 to 20%, 0 to T ns (T: clock period)
	Trigger settings:	↑, ↓, ↑ & ↓
	2T exclusion function:	Function for data-to-clock jitter measurement excluding edges before and after 2T data
	Pulse width jitter and average values (window range LEFT and RIGHT may be set as desired)	
	Window setting range:	0.00 to 999.99 ns (0.01 ns steps)
	Level measurement	
	Measurement function:	ON/OFF setting
	Measurement range:	100 mVp-p to 2 Vp-p (3 mVp-p resolution)
	Measurement accuracy:	±(5% + 10 mV) (amplitude 1 Vp-p, 100 kHz sinewave measurement)
Display	Analog meter	
	Display:	Jitter σ (s), jitter ratio σ/T (%)
	Jitter ratio scale:	Switch between 10% and 20% scale
	Jitter scale:	Select from the following: 0.5 ns, 1.0 ns, 5.0 ns, 10 ns, 50ns, 0.1 µs, 0.5 µs, 1.0 µs, 5.0 µs
	7-segment LED display	
	Display:	Measurement values (jitter σ, jitter ratio σ/T, average value AVE, clock period T, number of samples Snum, level measurement Level) and settings
	Display ranges:	Jitter ratio 0% to 25%, jitter 0 to 99.999 ns
	Dot matrix display:	Set parameters, scale range
	GO/NO-GO LED display:	Green (GO), Red (NO-GO) Judgment parameter is jitter σ or jitter ratio σ/T.
Measurement update rate	With DtoC high-speed calculation function off: 50 ms (Gate: 30 milliseconds, during data-to-clock jitter measurement: Both data edges) With DtoC high-speed calculation function on: 2 ms	
Gate time	Setting range:	With DtoC high-speed calculation function off: 1 ms to 1000 ms (1 ms steps) With DtoC high-speed calculation function on: 2 ms to 1000 ms (2 ms steps)
Block sampling	Set number of blocks: 1 to 99 (steps of 1) The maximum numbers of blocks that can be set are as follows: With DtoC high-speed calculation function off: (5 seconds / gate time) or 99, whichever is less With DtoC high-speed calculation function on: (1 second / gate time) or 99, whichever is less	

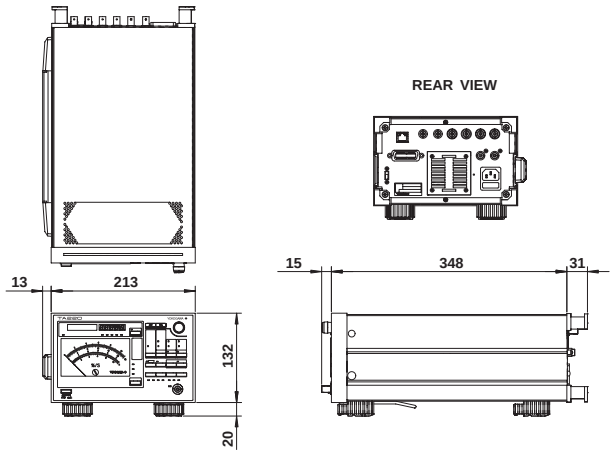
Item	Specifications	
Equalizer	Conventional equalizer circuit (conforms to Blu-ray Disc RE standard version 1.0)	
	Frequency characteristic:	16.5 MHz: +5.8 dB ± 0.3 dB (amplitude ratio using 100 kHz as reference)
	Maximum group delay deviation:	1 nsp-p (typical; 3.0 MHz ≤ f ≤ 22 MHz)
	Boost variable range:	+3.0 dB to +9.0 dB (0.1 dB steps)
	Limit equalizer circuit (option /LEQ) (conforms to Blu-ray disc RE standard version 1.0)	
	Frequency characteristic:	16.5 MHz: +5.8 dB ± 0.3 dB (amplitude ratio using 100 kHz as reference)
	Maximum group delay deviation:	2 nsp-p (typical; 3.0 MHz ≤ f ≤ 22 MHz)
	Boost variable range:	+3.0 dB to +9.0 dB (0.2 dB steps)
PLL clock regeneration	Type of signal which can be synchronized:	1-7 modulation signal equivalent to basic clock in range of 64 MHz to 68 MHz
	PLL characteristic:	fn = 8 kHz, ζ = 2.0
	PLL hold:	When set to ON, holds the oscillating frequency for the duration of the INHIBIT input time plus 220 µs (typical). (Cannot be used with the limit equalizer.)
DC clamp function	When the DC clamp function is set to ON, the auto-slicer DC cutoff is set to 3 MHz for the INHIBIT input period. (Cannot be used with the limit equalizer.)	
Rear panel I/O	Output connectors	
	LEVEL DC OUT	
	Output level:	0 V to +5 V DC (initial setting: 1 V/Vp-p), 600 Ω output
	Output accuracy:	±10 mV (disabled when DtoC high-speed calculation function is on)
	JITTER DC OUT	
	Output level:	0 V to +5 V DC (initial setting: 0.2 V/%), 600 Ω output
	Output accuracy:	±10 mV
	EQUALIZED OUT:	50 Ω output
	MONITOR OUT:	50 Ω output
	CLOCK OUT:	50 Ω ±0.4 V
	SLICED RF OUT:	50 Ω ±0.4 V
	Input connectors	
	EXT ARM IN:	DC 10 kΩ TTL
	INHIBIT IN:	DC 10 kΩ TTL
Store/Recall function	Stores and recalls up to seven settings.	
Communication	GP-IB:	IEEE Std. 488.2-1992
	Ethernet:	100BASE-TX, 10BASE-T
General specifications	Rated supply voltage:	100 to 120 V AC, 200 to 240 V AC
	Rated supply frequency:	50/60 Hz
	Maximum consumed power:	150 VA
	External dimensions:	Approximately 213 (W)×132 (H)×350 (D) mm (not including protruding parts)
	Weight:	Approximately 5 kg

The performance values presented above are obtained after allowing the equipment to warm up under the reference operating conditions.

Reference operating conditions: Ambient temperature of 23°C ±5°C, ambient humidity of 50% ±10% RH, supply voltage within 1% of rating

External dimensions

(unit: mm)



Model and suffix codes

Model	Suffix code	Description
704610	-BD1	BD conventional equalizer, D-to-C high-speed calculation
Power cord specifications	-D	UL/CSA standard
	-F	VDE standard
	-Q	BS standard
	-R	AS standard
	-H	GB standard
Optional specifications	/LEQ	Limit equalizer option

NOTICE

- Before operating the product, read the instruction manual thoroughly for proper and safe operation.
- If this product is for use with a system requiring safeguards that directly involve personnel safety, please contact the Yokogawa sales offices.

YOKOGAWA

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