YOKOGAWA

Continuous Measurement up to 43 MS/s

Time Interval Analyzer

TA520

- Maximum continuous sampling rate 43 Ms/s
- Maximum sampling size 10^9 data samples
- 25 ps measurement resolution
- 100 ps internal jitter
- Built-in printer (standard)
- Inter-symbol interference analysis (option)
- 10.2 GB internal HDD & SCSI (option)
- 6.4" color TFT LCD with wide viewing angle

Internet
Yokogawa Electric WWW server:
http://www.yokogawa.co.jp/Measurement/English/

Bulletin 7043-E

Faster! More memory! Abundant functions!

High speed, high performance and large memory Time Interval Analyzer.

Model TA520 is an ideal jitter analysis instrument for all kinds of optical disks. The maximum sampling rate is up to 43 MS/s at a measurement resolution of 25 ps. It has a greater memory capacity that can store up to 512 k samples of data (during time stamp mode). It also has various useful functions such as a built-in printer, optional internal hard disk & SCSI, and optional inter-symbol interference analysis. The TA520 can be applied to the analysis of a wide range of devices, including optical disks (jitter analysis), laser printers, and communications.

■Characteristics

●43 MS/s maximum continuous sampling rate

The fast sampling rate can be used to analyze various next generation, large capacity optical disks such as DVD-ROM/R/RW/RAM, and high-density MO.

●Maximum memory size of 10^9 data samples

The TA520 has a large memory that can hold 512 k samples of data during the time stamp mode and 10^9 samples of data during the hardware histogram mode. The large memory is very useful for conducting measurements of the inter-symbol interference of a re-writable optical disk and of the rotational fluctuations of a polygon mirror.

●Automatic scaling (auto window function)

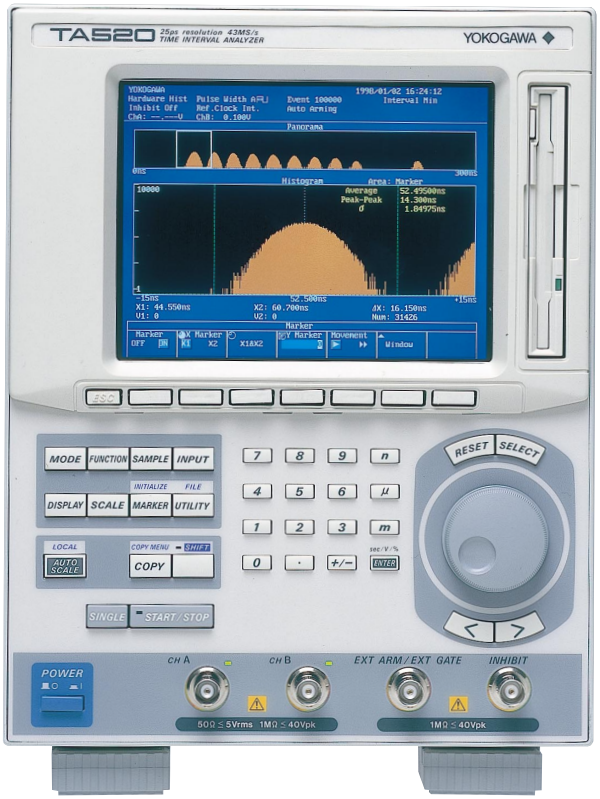
The TA520 is equipped with a function (auto window) that automatically adjusts the scale of the display using the data and clock signals of the optical disk. By using this function, the measurement results can always be displayed at the optimum scale when measuring CAV and ZCLV type optical disks whose clock frequency varies during operation.

●Inter-symbol interference analysis (option)

The Inter-symbol interference analysis function, that analyzes the jitter present in an optical disk's signal, can be installed as an option.

● 10.2 GB internal HDD & SCSI Interface(option)

Large data files, setup information, and screen image data can be stored to the internal 10.2 GB hard disk drive. The files on the internal hard disk can be accessed directly from the PC via SCSI I/F and therefore no programming work is necessary to transfer the data.



Front Panel

6.4" color TFT panel

The TA520 uses a color TFT with a wide viewing angle and high contrast. By assigning different colors to the data, they can be superimposed on top of each other for making comparisons.

Standard internal printer

A hard copy of the screen can be printed on a thermal printer.

3.5" FDD

The floppy disk drive supports MS-DOS format (640K/720K/1.2M/1.44M).

Two input channels, external arming input, inhibit input

Input channels A and B, an external arming input for synchronizing to external devices, and an inhibit input are located on the front panel for easy connection.

Rear Panel

SCSI (option)

ANSI X3.131-1986, 50 pin half pitch

GP-IB interface (standard)

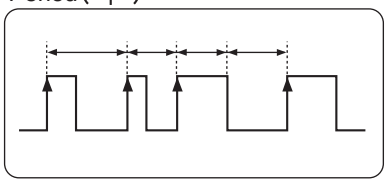
Conforms to IEEE St'd 488-1978

10 MHz reference I/O

Monitor output A and B

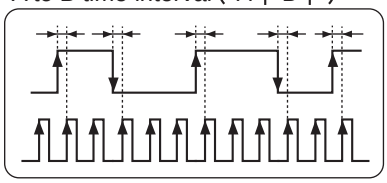
■Examples of measurement function

Period (↑)



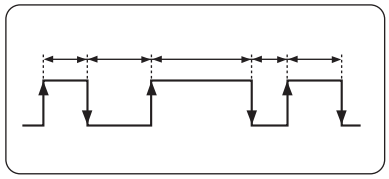
Used to measure the clock period or the fluctuation of the rotation of the motor encoder

A to B time interval (A ↑ B ↑)



Used to measure the data-to-clock jitter on the optical disk

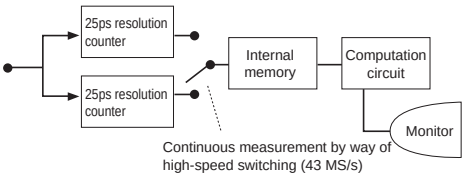
Pulse width (⌐¬)



Used to measure the data-to-data jitter on the optical disk

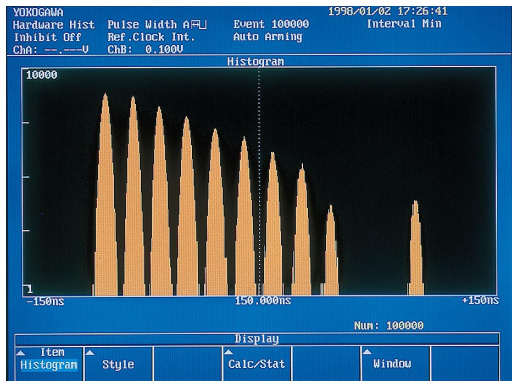
The TA520 contains multiple counter circuits for measuring the period and pulse width. Continuous measurement is achieved by switching between these counters at high speed. As shown in the figure on the right, the TA520 switches between the counters (25 ps resolution) at a maximum rate of 43 M times per second.

The TA520 has two types of measurement modes, the hardware histogram mode (H.H. mode) and the time stamp mode (T.S. mode). Because the histograms are created by hardware in the hardware histogram mode, statistics can be computed quickly for large blocks of data that can contain up to 10^9 data samples. In the time stamp mode, the measured values are stored in the internal memory along with time information indicating the amount of time that has passed since the start of the measurement. The stored data are used to determine the periodic trends, to create histograms, and to calculate statistics.



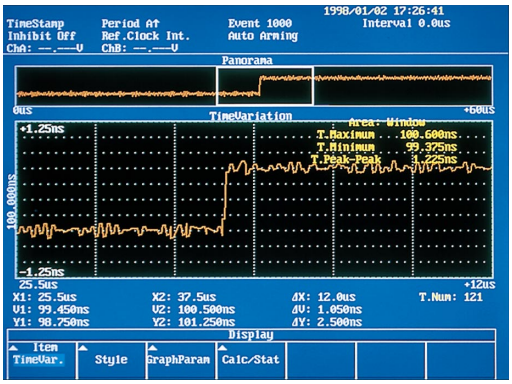
Continuous measurement by way of high-speed switching (43 MS/s)

■Dispray Examples



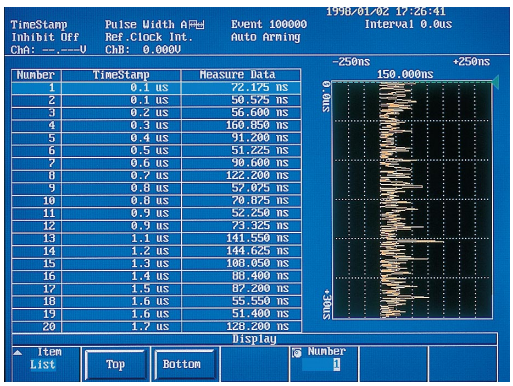
Histogram display

The jitter associated with measurement values can be analyzed using the histogram. This is the most common method used to analyze optical disk jitter. Panoramic display, multi-window function, and other functions are available for the histogram display in the hardware histogram mode.



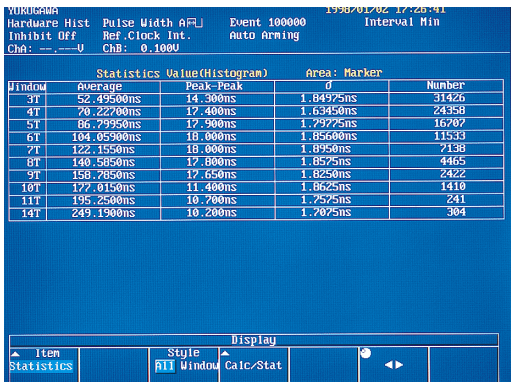
Time variation display (during time stamp mode)

The trends of the measurement values with respect to the elapsed time can be displayed and analyzed. This display is useful for analyzing motor rotation fluctuations and behaviors of the pull-in frequency of PLL circuits.



List display

In the time stamp mode, the various measurement values and the elapsed time since the start of the measurement are listed. The graph is displayed simultaneously which allows one to check the detailed data while looking at the trend. In the hardware histogram mode, the frequencies of the histogram are displayed with numerical values.

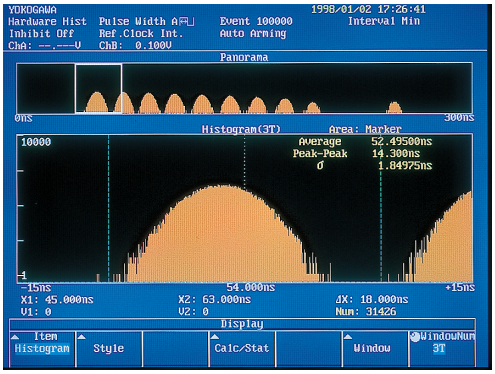


Statistical display

Displays the calculated statistics of the data. When the multi-window function is being used, the statistics of all windows can be listed.

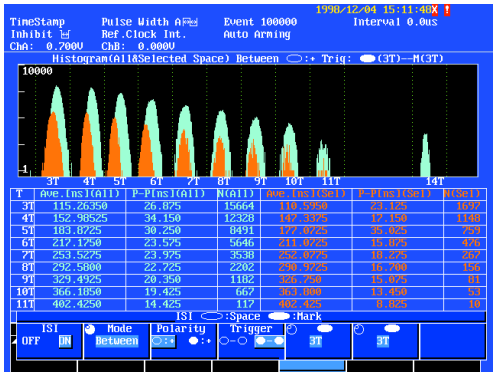
Multi-window function and auto window function

The multi-window function can be used to calculate the histogram and statistics for up to 16 preset windows. In addition, the function can be used to list the statistical analysis values (average value, standard deviation σ, etc.) as well as to analyze trends for each pit length.
The function that automatically adjusts the scale (auto window function) is useful for analyzing CAV or ZCLV type optical disks whose clock frequency varies during operation. There are two methods of auto scaling. One is the “Estimated T” method which estimates the scale by observing just the data signal. The other is the “Measured T” method that adjusts the scale according to the measured clock period.



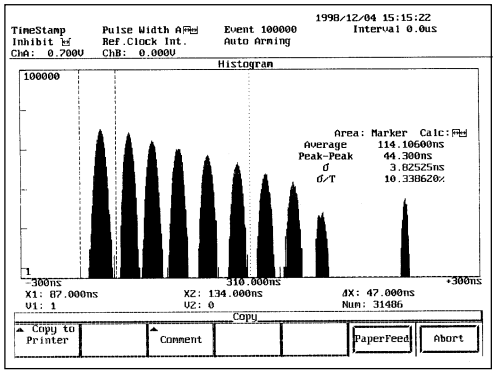
Inter-symbol interference analysis (option)

This optional function detects and analyzes the data that matches the specified data code conditions such as the mark and space in between 3Ts, and the mark and other symbols immediately before and after 14T. The distribution and statistics of the entire data set and of the data extracted according to the specified conditions, can be displayed simultaneously. This function is effective for evaluating the recording characteristics of writable optical disks such as a DVD-R/RAM or a MO.



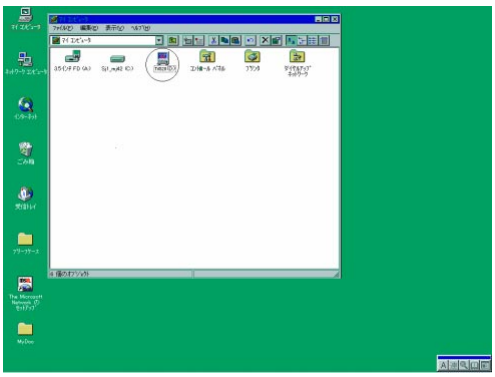
Built-in printer

The TA520 comes standard with a built-in printer. A hard copy of the screen can be printed on the 110-mm thermal printer.In addition, the hard copy image of the screen can be saved to a floppy disk, to the internal hard disk, or to an external medium in BMP, PS, or TIF format. This allows the screen images to be pasted into reports using a word processor. (Black & white or color is selectable)



Internal hard disk & SCSI Interface (option)

The TA520 can also have a 10.2-GB internal hard disk and SCSI I/F installed as options.
Because the TA520 has a large memory that can hold 512 k data samples, the internal hard disk is useful for saving data that cannot fit on a floppy disk. The internal hard disk can be mounted on Windows 95 via SCSI I/F, and therefore, the internal hard disk can be accessed directly from the PC. In addition, the data can be stored on an external recording medium such as a MO or ZIP.
In addition to measurement data, other information such as setup information, screen images, and the results of statistical analysis can be stored on a floppy disk or on the internal hard disk.



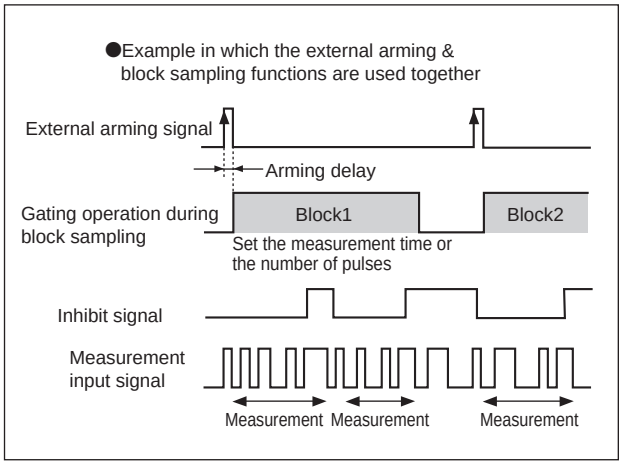
■External synchronization auxiliary inputs

The TA520 is equipped with arming and external gate functions for synchronizing to external devices.

External arming
External gate (shares the same connector with external arming)
Inhibit

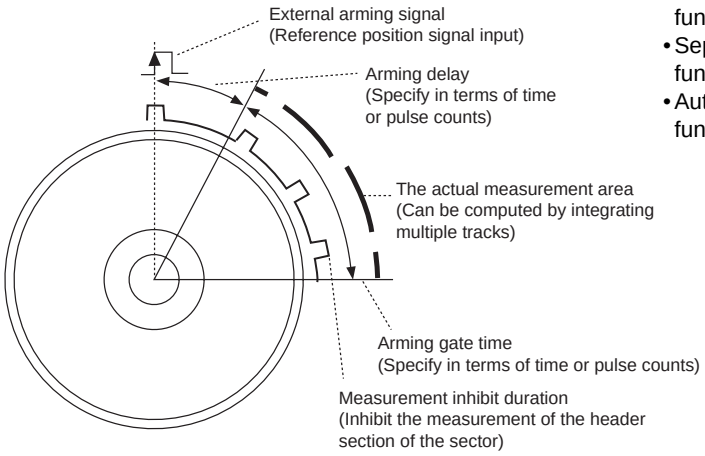
In addition, when the block sampling function is being used, the internal memory can be divided into a maximum of 100 blocks (during the time stamp mode) and statistical analysis can be carried out on each block as well as on the entire set blocks. (During the hardware histogram mode, the memory is divided into a maximum of 1000 blocks and the histogram and the results of the statistical analysis are only displayed for all the blocks.)

For optical disks, using the external arming function in conjunction with the inhibit function allows measurements only on the data or header section of the sectors.



■Application Examples

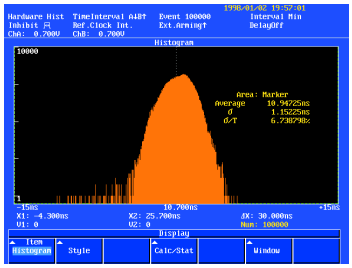
Measurement Example of the DVD-RAM



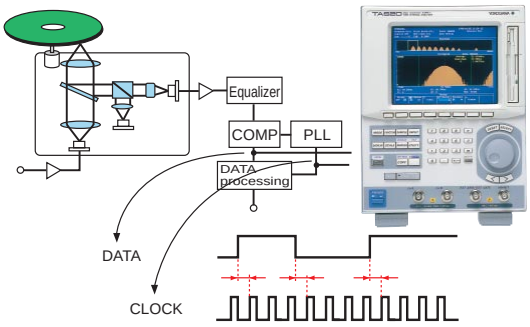
On a DVD-RAM, the jitter analysis must be performed separately for the header and data sections. In addition, since a DVD-RAM is of ZCLV type, automatic scaling is needed in order to handle the clock changes. The TA520 has the following functions to meet these requirements :

- Measurement range spans over multiple tracks (block sampling function).
- Limit the range of the measurement angle (arming gate function).
- Separately measure the header and data sections (inhibit function).
- Automatic scaling for handling clock changes (auto window function).

Example of a DVD-RAM Measurement



Data-to-clock jitter measurements of optical disks



System for evaluating DVD media

DVD Disk inspection device LM330A
Supports DVD-RAM (2.6 G, 4.7 G), RW, R
Courtesy of Shibasoku co., Ldt.

Specifications

Item	Specifications	
Measurement resolution	25 ps	
Internal jitter	100 psrms	
Sampling rate	43 MS/s continuous	
Maximum sampling size	<Time stamp (T.S.) mode> 512000	<Hardware histogram (H.H.) mode> 10^9
Function	Period Pulse width A-B interval	Period Pulse width A-B interval
Measurement range	Period, pulse width: 8 ns to 20 ms A-B interval: 0 ns to 20 ms	Period, pulse width: 8 ns to 3.2 µs A-B interval: 0 ns to 3.2 µs
Gate	Event: 1 to 512000 (step=1) Time: 1 µs to 10 s (step=100 ns) External: 1 µs or greater	Event: 1 to 10^9 (step=1) Time: 1 µs to 10 s (step=100 ns) External: 1 µs or greater
Display	Histogram Time variation List Statistics	Histogram List Statistics
Statistical values	Maximum (MAX), minimum (MIN), average (AVE), standard deviation (σ), P-P, flutter (σ/AVE), jitter (σ/T), offset error, MELE, Median, mode (most frequent value unit:[s] or [%]; possible to measure with the (Ch B) input as clock T	Maximum (MAX), minimum (MIN), average (AVE), standard deviation (σ), P-P, flutter (σ/AVE), jitter (σ/T), RF unit:[s] or [%]; possible to measure with the (Ch B) input as clock T

Item	Specifications	
Block sampling	Count: 2 to 100 times (step=1) except within the maximum sampling size Pause time: 0 s to 1 s (step=1 µs) 1 µs to 1 s (External arming or external gate)	Count: 2 to 1000 times (step=1) except within the maximum sampling size Pause time: 0 s to 1 s (step=1 µs) 1 µs to 1 s (External arming or external gate)
Sampling interval	min or 1 µs to 1 s (step=1 µs) T.S. mode only	
Arming	AUTO/External (either rising or falling edge) Delay (external only) Event: 1 to 10^6 (step=1) Time: 1 µs to 1 s (step=100 ns)	
Maximum measurement time	320 s (when the sampling inteval=0 µs) Maximum:3200s (H.H. mode or sampling interval 0 µs)	
Measurement update rate	400 ms	
Input specifications	Coupling : AC/DC Frequency characteristics(-3 dB) : 200 MHz Impedance : 50Ω/1 MΩ Sensitivity : 100 mVp-p(*) Input range : -5 V to +5 V Trigger level : Manual :-5 V to +5 V (step=1mV, Accuracy=1%+10mV of the setting value) AUTO : 0% to 100% (step=1%, Single Auto/Repetitive Auto) (Trigger hysteresis is fixed)	
Other functions	Inhibit input (Hi/Lo) Zin=1 MΩ, trigger level TTL, TTL/10, 0 V FDD GP-IB Internal HDD (10.2 GB) + SCSI I/F (option)	
General specifications	Rated supply voltage range: 100 to 120 VAC, 200 to 240 VAC Rated supply frequency: 50 Hz to 60 Hz Display: 6.4" color TFT monitor (VGA) Floppy disk drive: 3.5" FDD MS-DOS 640kB/720kB/1.2MB/1.44MB External dimensions: 213 (W) x 264 (H) x 350 (D) mm Wieght: Approx. 9 kg	

The above performance is obtained after warming up the instrument for at least 30 minutes under standard operating conditions.
Standard operating conditions: Ambient temperature 23°C ± 2°C, ambient humidity 50%RH ±10%RH, within ±1% of the rated supply voltage
*MS-DOS is a registered trademark of Microsoft Corporation.

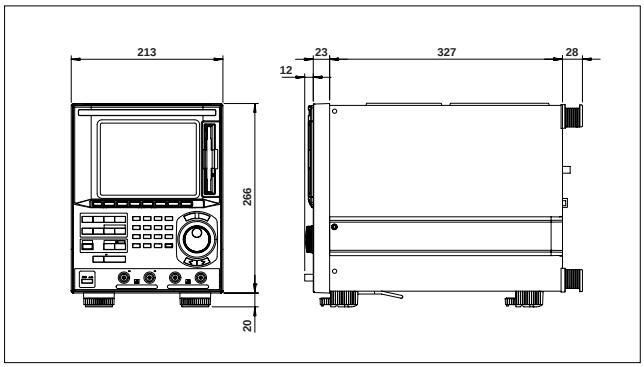
Model and Suffix Codes

Model	Suffix code		Description
704310			TA520 Time Interval Analyzer
Power supply	-1		100 to 120 VAC
	-5		200 to 240 VAC
Power cord	-D		UL, CSA Standard
	-F		VDE Standard
	-R		SAA Standard
	-Q		BS Standard
Options		/C8	Internal HDD+SCSI I/F
		/F1	Inter-symbol interference analysis Function

Optional Accessories (sold separately)

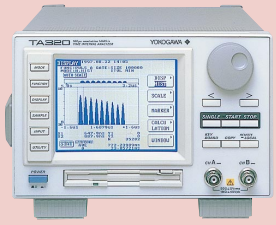
Part name	Model	Suffix code	Specifications	Order qt'y
BNC cable	366924		BNC-BNC(1m)	1
BNC cable	366925		BNC-BNC(2m)	1
Rack mounting kit	751533	-E6	For EIA single unit installation (one TA520 unit)	1
Rack mounting kit	751534	-E6	For EIA multiple unit installation (two TA520 units)	1
Rack mounting kit	751533	-J6	For JIS single unit installation (one TA520 unit)	1
Rack mounting kit	751534	-J6	For JIS multiple unit installation (two TA520 units)	1

External dimensions



Other Models

TA320 Time Interval Analyzer



- Maximum continuous sampling rate 14 MS/s
- Maximum sampling size 10^8
- Measurement resolution 100 ps
- Internal jitter 300 ps rms

Please read the instruction manual thoroughly to ensure correct and safe use of the product.

YOKOGAWA

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