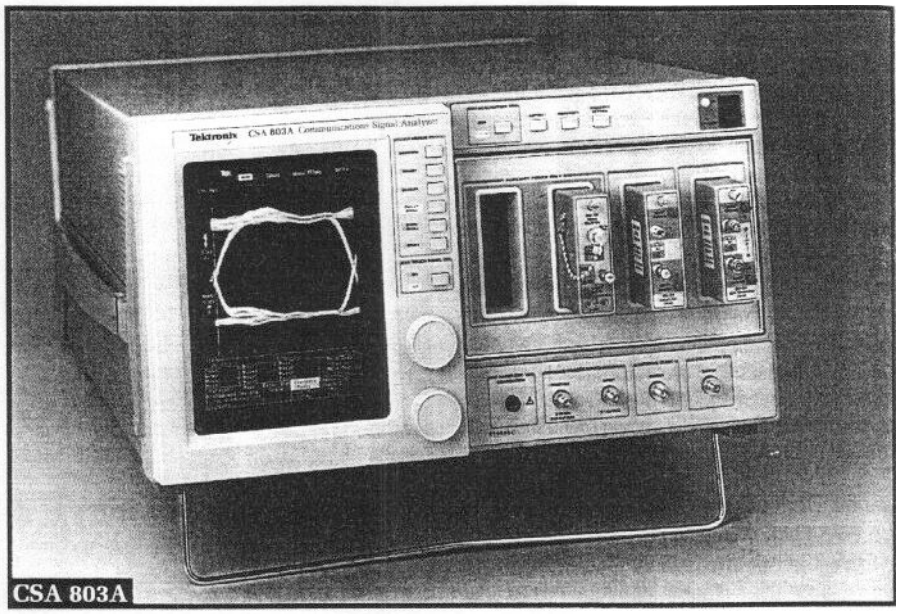
CSA 803A

Communications Signal Analyzer

Specifically designed for communications applications, the CSA 803A Communications Signal Analyzer is the ideal tool for design, development, and production testing of telecommunications and data communications components, terminals, and systems.

CSA 803A

- DC to 50 GHz Bandwidth
- Automatic Statistical Analysis
- 38 Industry Standard Masks (ITU-T & ANSI)
- High Resolution and Repeatability
- 7 ps Rise Time (SD32)
- Modularity Through Sampling Heads
- Triggering to 10 GHz (Prescaler)
- TDR for Precision Impedance Analysis
- FFT for Spectral Analysis
- Extinction Ratio Measured Automatically
- Built-in Automatic Eye Pattern and Pulse Template Testing



CSA 803A

The CSA 803A communications signal analyzer offers the highest bandwidth and time resolution of the 11000 Series. In addition to the easy-to-use, touch-screen user interface and powerful automatic measurement system common to all 11000 Series instruments, the CSA 803A adds single-ended and differential TDR and TDT, timing resolution to 0.01 ps, and up to 50 GHz bandwidth (depending on the sampling head used). This unmatched performance and feature set makes the unit ideal for semiconductor device testing. TDR characterization of circuit boards, IC packages, cables and high-speed digital communication measurements.

The CSA 803A accepts up to two, dual-channel SD Series sampling heads and has built-in trigger capability of up to 10 GHz through the prescaler.

RESOLUTION AND REPEATABILITY

The state-of-the-art digital time base in the CSA 803A provides unmatched timing resolution, with sample intervals to 10 femtoseconds (0.01 ps) and measurement repeatability to1 ps. In addition, the vertical system provides 8 bits of vertical resolution at all deflection factors (80 µV LSB at 2 mV/div). Powerful on-board waveform processing allows expansion with averaging to sensitivities in the 100 µV/div range and beyond.

NON-VOLATILE STORAGE

Waveforms, settings and user defined masks are preserved in battery backed-up memory for added convenience.

FAST FOURIER TRANSFORM (FFT)

FFT allows for analysis of both spectral magnitude and phase of acquired waveforms.

FASTEST ACQUISITION

The CSA 803A, with its multiprocessor-based architecture and high-speed analog, error-sample feedback-loop technology, has the highest sample rate of any sampling oscilloscope. The 200 kHz sampling rate gives the CSA 803A a "real-time" feel for waveform controls and allows high-speed data capture for histograms and automated measurements.

MODULARITY MAKES ROOM FOR GROWTH

In the Tektronix tradition, the CSA 803A can be tailored through modular plug-in sampling heads for a variety of applications. Modularity also offers a path for growth and expansion as new sampling heads become available. For example, for applications requiring superior noise performance, the SD-22 Sampling Head offers two channels of acquisition at 12.5 GHz with 450 µV (typical) of noise. High bandwidth acquisition and TDR are available in the SD-24 sampling head, which offers two channels with 20 GHz bandwidth and two polarity-selectable TDR step generators. The complete SD Series of sampling heads is listed on page 106.

APPLICATIONS

- **Optical Standards Compliance Testing**
- **Electrical Standards Compliance Testing**
- **Timing Analysis**
- **Pass/Fail Mask Measurements for Telecom (SDH/ SONET) and Datacomm (FDDI/ Fiberchannel)**

Product(s) available through your local Tektronix representative (listed in the back of this catalog).

GPIB IEEE-488 The CSA 803A complies with IEEE Standard 488.1-1987, RS-232C and Tektronix Standard Codes and Formats.

ISO 9001

Tektronix Measurement products are manufactured in ISO registered facilities.

Communications Signal Analyzer

STATISTICAL MEASUREMENTS

A built-in statistical database allows the instruments to accumulate three-dimensional waveform data-time, voltage, and sample density. The database is a 512 x 256 x 16-Bit data array which accumulates waveform data by counting the number of times each pixel in the display is activated. This information is then displayed in a color-graded format that gives you an instant qualitative view of the acquired waveform. The power of the statistical database is the measurement capabilities – time and voltage histograms and automatic statistical measurements.

COMMUNICATION APPLICATIONS USING THE STATISTICAL DATABASE

Time and voltage histograms are powerful statistical tools for measuring noise and jitter in communication signals. The histograms include useful information such as mean, RMS deviation, and pk-pk displayed and continuously updated at a user selectable rate. High sample rates make it possible to analyze data concurrent with acquisition rather than in a batch mode later on. The statistical database allows you to change histogram parameters without reacquiring data.

For the first time you can make jitter and noise measurements with one simple selection from an on-screen menu. Controls are provided for adjusting left and right limits, selecting RMS or pk-pk and absolute or relative measurements. For eye diagram measurements you can choose either the eye crossing or the mesial level for jitter measurement location. Either top line or base line can be selected for noise measurements. The CSA does the rest, and displays the jitter and noise measurements in the status menu at the bottom of the screen.

MASK TESTING

For Compliance test to ITU-T and ANSI standards, 38 predefined telecom masks are available by adding Option 1T. The CSA 803A settings are all automatically determined by pressing AUTOSET while the desired mask is displayed. See table for a complete listing of masks.

In addition, you can define and edit up to 10 masks simultaneously. These masks (polygons) may each have up to 50 vertices. The CSA 803A then counts the individual and total samples that fall in each of the defined masks. Once defined the masks can be stored for future use.

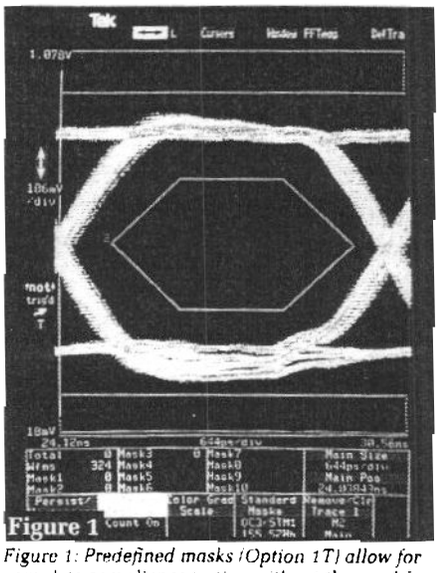


Figure 1

Figure 1: Predefined masks (Option 1T) allow for complete compliance testing without the need for an external computer. See table for a complete mask listing.

Predefined Standard ITU-T and ANSI Eye Pattern and Pulse Masks (Option 1T)

ITU-T SDH and ANSI SONET Optical Standards

OC-1 51.84 Mbits/s	OC-3/STM-1 155.52 Mbits/s	OC-9 466.56 Mbits/s
OC-12/STM-4 622.08 Mbits/s	OC-18 933.12 Mbits/s	OC-24 1.2442 Gbits/s
OC-36 1.8662 Gbits	OC-48/STM-16 2.4883 Gbits/s	

ANSI T1.102 Electrical Standards

DS1 1.544 Mbits/s	DS1 (old) 1.544 Mbits/s	DS1C 3.152 Mbits/s
DS2 6.312 Mbits/s	DS3 44.736 Mbits/s	DS4NA 139.26 Mbits/s
DS4XNA 139.26 Mbits/s	STS1 51.84 Mbits/s	STS3 155.52 Mbits/s
STSX3 155.52 Mbits/s		

ITU-T G.703 Electrical Standards

Single Pulse 64 kbits/s	Double Pulse 64 kbits/s	Data Pulse 64 kbits/s
Timing Pulse 64 kbits/s	Pulse 1.544 Mbits/s	Sym. Pair 2.048 Mbits/s
Coax Pair 2.048 Mbits/s	Sym. Pair 6.312 Mbits/s	Coax Pair 6.312 Mbits/s
Pulse 8.448 Mbits/s	Coax Pair 32.064 Mbits/s	Pulse 34.368 Mbits/s
Coax Pair 44.736 Mbits/s	Pulse 97.728 Mbits/s	Zero Pulse 139.26 Mbits/s
One Pulse 139.26 Mbits/s	STM1 155.52 Mbits/s	CEPT 565 Mbits/s

Other Masks

FDDI 125 Mbits/s	User Programmable (default is OC-192/STM-64)

AUTOMATED MEASUREMENTS MAKE IT EASY

The CSA 803A offers a comprehensive, accurate, and automatic measurement system. Up to six measurements can be displayed on screen at any time, all updated continuously. Any number of measurements may be made over the GPIB or RS-232C interfaces.

For the first time in the industry, you now can make automatic jitter and noise measurements using the statistical measurement mode. Statistical measurements allow automatic pulse parameter measurements on random signals such as eye diagrams and allow you to make stable and accurate measurements even in the presence of jitter and noise.

All measurement parameters are user-controllable and measurement levels may be set in relative (i.e., percentage) or absolute terms. Measurements are also fully annotated so there is no question about which part of the waveform is used for making the measurements.

Measurements include: extinction ratio, amplitude measurements, such as mean, RMS, p-p, and overshoot; timing measurements, such as width, propagation delay, and phase; and energy measurements, that provide direct area or energy results! Measurement statistics are also available to evaluate the stability of any measurement result.

ON-BOARD WAVEFORM PROCESSING

The extensive on-board waveform processing capability of the CSA 803A not only provides smooth "real-time" update rate and control response, it also allows complex waveform calculations to be performed and displayed in the same continuously updated fashion. Calculated waveforms can be as simple as addition of two channels, or more complex, from basic operators (+, −, x, ÷), to specialized math functions such as square root, differentiate, log, envelope, and filter. Calculations can include acquired waveforms, stored waveforms, and constants.

All measurement functions, except hardware measurements, are allowed on calculated traces. In addition, the instrument can be set to stop acquisition after certain conditions, such as when a specified number of averages have been completed.

WINDOWING SHOWS THE DETAILS

The CSA 803A offers another first for sampling oscilloscopes – windows. Similar to the delayed sweep on conventional oscilloscopes, windows allow viewing a long interval on one trace while examining the details of a section of the waveform on a second trace.

Continued on next page.

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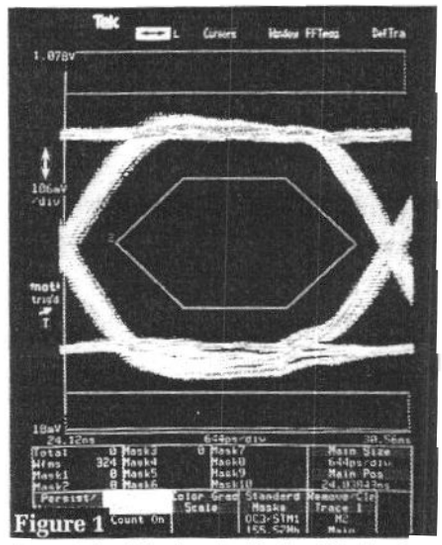

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Continued on next page.

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Up to seven windows can be created on a single main trace, each with independent positions. The instrument can even be programmed to automatically locate a window on a specified transition within the main waveform. Like the other oscilloscopes in the 11000 Series, windows in the CSA 803A are actually re-acquired with a higher resolution than the main waveform – not just digitally expanded from the main trace, as in some lower performance instruments.

Characteristics

VERTICAL SYSTEM

Rise Time/Bandwidth – Determined by the sampling head used.*1

Vertical Resolution – 8-Bits full screen (80 µV LSB at 2 mV/div deflection factor).

Amplifier Gain Accuracy – ±1% of all settings.

Deflection Factors – 2 to 255 mV/div in 1 mV/div increments.

Offset Range – ±2 V.

HORIZONTAL SYSTEM

Main and Window Time Base – 1 ps/div to 5 ms/div, settable in 1-2-5 sequence or in 1 ps increments.

TIME BASE ACCURACY*2

Time interval	Accuracy
≥ 10 ns	0.01% x time interval + 8 ps
1 ns	10 ps
100 ps	5 ps
10 ps	2 ps

Record Length – 512, 1024, 2048, 4096, and 5120 points.

Windows – Any number of window records may be placed on any number of main records, up to a maximum of 8 displayed traces. All window records have the same duration, but may be independently positioned on any main record. The window may be set to automatically track a moving edge on the main record.

Maximum Sample Rate – 200 kHz.

TRIGGER SYSTEM

Trigger Bandwidth – 3.0 GHz (direct), 2 to 10 GHz (Prescaled).

Trigger Holdoff – Adjustable from 5 µs to 2.5 s

Trigger Sensitivity*3 – Direct: DC Coupled, 100 mV p-p, DC –3.0 GHz: Prescaled: AC Coupled, 600 mV p-p, AC Coupled: Attenuates signals below 30 kHz.

Delay Jitter (Ext. Trigger)– 2.0 ps (1.3 ps typical) +5 ppm of selected delay (RMS).

Internal Clock – 100 kHz (drives TDR, Internal Clock Output, and Calibrator).

Trigger Input Range – ±1.5 V (direct), ±2.5 V (Prescaled).

MEASUREMENT SYSTEM

Waveform Processing Functions – Add, subtract, multiply, divide, absolute, average, differentiate, envelope, exponent, integrate, natural log, log, signum, square root, smoothing, and filter.

Measurement Set – Max, min, mid, p-p, mean, RMS, amplitude, extinction ratio, overshoot, undershoot, noise*4, rise, fall, frequency, period, prop delay, cross, width, phase, duty cycle, jitter*4, area +, area –, and energy. Measurements are constantly updated; mean and standard deviation available on all measurements.

Measurement Parameters – Proximal, mesial, distal,and start/stop levels: May be set to relative or absolute values.

Cursors – Paired or split dots, vertical bars, and horizontal bars.

POWER REQUIREMENTS

Line-Voltage Ranges – 90 to 132 V RMS, 180 to 250 V RMS.

Line Frequency – 48 to 440 Hz.

Maximum Power Consumption – 214 W.

ENVIRONMENTAL AND SAFETY

Operating Temperature – 0°C to 50°C.

Nonoperating Temperature – –40°C to +75°C.

Altitude, Vibration, Shock, Bench Handling – Operating and Nonoperating: meets MIL-T-28800C, Type III, Class 5.

Safety – Listed UL 1244, CSA Bulletin 556B.

Electromagnetic Compatibility – Meets the following requirements of MIL-STD-461C: CE-03 Pt 4 Curve 1, CS-01 Pt 7, CS-02 Pt 4, CS-06 Pt 5, RE-02, Pt 7, RS-01 Pt 4, RS-02 Pt 5, RS-03 Pt 7, (limited to 1 GHz). Meets FCC Part 15, subpart J, Class A.

For Germany: Meets VDE 0871/6.78 Class B.

Humidity – To 95% RH at up to 50°C.

PHYSICAL CHARACTERISTICS

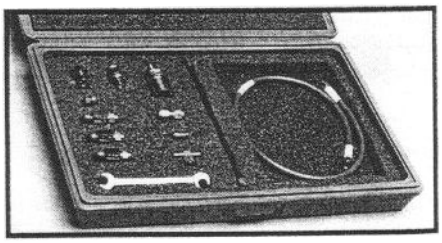
	Benchtop		Rackmount	
Dimensions	**mm**	**in.**	**mm**	**in.**
Width	448	17.6	483	19.0
Height	238	9.4	222	8.8
Depth	599	23.6	550	21.6
Weight ≈	**kg**	**lb.**	**kg**	**lb.**
Net	21.8	48	22.7	50
Shipping	31.3	69	32.3	71

*1 *See Sampling Head Characteristics on page 106. The CSA 803A mainframe has no acquisition bandwidth limits*

*2 *Interpolate linearly between cardinal points.*

*3 *CSA 803A has external trigger only; requires >23 ns pretrigger or use of DL-11 Delay Lines to view trigger point.*

*4 *Available only in statistical measurement mode*



Accessory

AK02

- Provides adaptability to most signal sources for 50 Ω termination
- Includes 50 Ω attenuators, 50 Ω cables, gender adapters

For complete selection information on all Accessory products, see page 338.

Product(s) available through your local Tektronix representative (listed in the back of this catalog).

GPIB IEEE-488 The CSA 803A complies with IEEE Standard 488.1-1987, RS-232C and Tektronix Standard Codes and Formats.

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ORDERING INFORMATION

CSA 803A
Communications Signal Analyzer
Includes: Tutorial Manual (070-7718-00), User Reference (070-7719-00), Command Reference (070-7720-01), Programmer Reference (070-7738-01), Service Reference (070-7721-00), 12-inch SMA-SMA Cable, 2 ea. 8.5 in. SMA-SMA Cable, 1 Wrist Strap, Power Cord, U.S., Power Cord, U.S., 120 V (161-0066-00).

Opt. 1T – Predefined Telecom Masks

Opt. 1R – Rackmount

Opt. 10 – Deletes the 10 GHz prescaler trigger capability. This does not affect the 3.0 GHz trigger.

INTERNATIONAL POWER PLUG OPTIONS

Opt. A1 – Universal Euro 220 V, 50 Hz

Opt. A2 – United Kingdom 240 V, 50 Hz

Opt. A3 – Australian 240 V, 50 Hz

Opt. A4 – North American 240 V, 60 Hz

Opt. A5 – Switzerland 220 V, 50 Hz

See General Customer Information Section for additional description.

Communications Signal Analyzer

ORDERING INFORMATION

SOFTWARE
See Software Section for selection guide and complete description of software available.

SD-14
High Impedance Probe Sampler 3 GHz
Includes: Installation/User Manual (070-8286-00); Service Manual (070-8285-00); 4-post ECB Mount Ground Socket; Edge Tab Ground Socket; 10 ea. Wire-Form Ground, .050 Spacing; 10 ea. Wire-Form Ground, .040 Spacing; Plastic Accessories Case.

SD-20
Loopthrough Sampling Head 20 GHz
Includes: Installation/User Reference (070-7531-00), Service Reference (070-7528-00), Precision 3.5 mm Termination (011-0155-00), 2 SMA Short-circuit Terminations (015-1020-00).

SD-24
Dual TDR/Sampling Head 20 GHz
Includes: Installation/User Reference (070-7052-00), Service Reference (070-7053-00), 2 SMA Short-circuit Terminations (015-1020-00).

SD-26
Dual Sampling Head 20 GHz
Includes: Installation/User Reference (070-7226-01), Service Reference (070-7227-01), 2 SMA Short-circuit Terminations (015-1020-00).

SD-22
Low-Noise Sampling Head 12.5 GHz
Includes: Installation/User Reference (070-7226-01), Service Reference (070-7227-01), 2 SMA Short-circuit Terminations (015-1020-00).

SD-30
Sampling Head 40 GHz
Includes: Installation/User Reference (070-7904-00), Service Reference (070-7905-00), 2 SMA Short-circuit Terminations (015-1020-00).

SD-32
Sampling Head 50 GHz
Includes: Installation/User Reference (070-8268-00), Service Reference (070-8269-00), 1 SMA Short-circuit Termination (015-1020-00).

SD-42
Optical-to-Electrical Converter 6.4 GHz

SD-46
Optical-to-Electrical Converter 20 GHz

RECOMMENDED ACCESSORIES
See page 338 for complete selection information.

PROBES

LOW-Z-PROBES (50 Ω INPUT)
10X, DC – 9.0 GHz. Order P6150

ACTIVE PROBES (Requires 1103 Power Supply) –
10X, DC – 1 GHz, ≥10 MΩ Input Impedance, 1.9 pF. Order P6204
10X, DC – 4 GHz, ≥100 kΩ Input Impedance, 0.4 pF. Order P6217

CART
Order K465

CAMERAS/PLOTTERS
Camera – Order C-9 with Opt. 1A and Opt. 11
Plotter – Order HC 100

CALIBRATION STEP GENERATOR
U.S. – Order 067-1338-00
Universal European – (240 V, 50 Hz). Order 067-1338-01
UK – (240 V, 50 Hz). Order 067-1338-02
Australia – (240 V, 50 Hz). Order 067-1338-03
Switzerland – (240 V, 50 Hz). Order 067-1338-05
Japan – (100 V, 50-60 Hz). Order 067-1338-06

ADDITIONAL ACCESSORIES
Power Strip – Four Outlet, 6 ft., Noise/Surge Suppression*1

SMA Accessory Kit – Order 020-1693-00
Includes: 2 ea. 2X and 5X Attenuators; 2 ea. SMA Terminations, Male Short Circuit, Female Short Circuit, Male 50 Ω, Female 50 Ω, 2 ea. 50 Ω Signal Cables (2 ns), 2 ea. 500 ps Semi-rigid Cable, 2 ea. Male-to-Male adapters, 2 ea. SMA Male-to-BNC Female, 2 ea. Female-to-Female, 1 ea. 50 Ω Power Divider, 1 ea. Combination Wrench (.312, 6 point).

3.5 mm Accessory Kit – Order 020-1692-00
Includes: 1 ea. 50 Ω Reference Air Line, 1 ea. Male-to-Male Adapter, 1 ea. Female-to-Female Adapter, 1 ea 26.5 GHz 50 Ω Terminator (Male), 1 ea. 26.5 GHz 50 Ω Terminator (Female), 1 ea. 26.5 GHz Short Circuit (Male), 1 ea. 26.5 GHz Short Circuit (Female), 2 ea. 50 Ω Terminators (6 dB 26.5 GHz, 2.9 mm), 2 ea. 50 Ω Terminators (20 dB 26.5 GHz, 2.9 mm), 1 ea. Power Divider (26.5 GHz, 2.9 mm), 2 ea. Signal Blews (2 ns, Male-to-Male), 2 ea. Signal Cables (500 ps, Male-to-Male, 2.9 mm Semi-rigid), 1 ea. Torque Wrench, 1 each Combination Wrench (0.312, 6 point), 1 ea. Combination Wrench (0.281, 6 point).

2X Attenuator –
SMA Male-to-Female. Order 015-1001-00

5X Attenuator –
SMA Male-to-Female. Order 015-1002-00

75 Ω to 50 Ω Min. Loss Attenuator –
BNC, AC coupled. Order 011-0112-00

Power Divider – Order 015-1014-00

Blank Sampling Head – Order 200-3395-00

ECL Terminator – Provides the bias and termination for ECL device outputs. At 10 GHz bandwidth and 1% precision attenuation accurate AC and DC measurements are ensured. Attenuation 10X ±1.0% @ DC, 20 dB ±3 dB, DC to 10 GHz. Aberrations: ±3% max with 100 ps rise time. Order 015-0558-00

DC Block (Coupling Capacitor) –
SMA: Order 015-1013-00
BNC: Order 015-0221-00

Slip-On Connector – Order 015-0553-00

Connector Savers – SMA: Order 015-0549-00
APC: Order 015-0552-00

CABLES AND EXTENDERS
Sampling Head Extender Cables
(1 m). Order 012-1220-00
(2 m) Order 012-1221-00

Acquisition Extender – Order 067-1324-00

Card Cage Extender – Order 067-1267-00

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