



RIGOL

# ГСПФ MDG70000



# Генератор произвольной формы MDG70000

## Основные характеристики

- Четыре канала
- 12 Гвыб./с с интерполяцией
- 16 бит ЦАП
- 10 пс задержка между каналами
- SFDR в полосе 3.5 ГГц до 4 ГГц: -55 дБн
- -100 дБн/Гц на частоте 4 ГГц ,10 кГц отстройка
- 1.5 Гвыборки память на канал
- Опция цифрового преобразования вверх
- Опция формирования последовательности сценариев (SEQ)
- Опция формирования многотонавого сигнала
- 700 мВ на выходе DC HBW, 1000 мВ на выходе DC AMP, 10 дБм на выходе AC



# Два режима: AFG и AWG

## Режим AFG

The screenshot displays the AFG (Arbitrary Function Generator) mode of an oscilloscope. The interface is organized into four channel control panels, each for a different channel (1, 2, 3, and 4). Each panel includes a waveform selector (Sine), a mode selector (Continuous), and a power button (OFF). The parameters for each channel are:

- Channel 1:** Freq: 1.000,000,000 KHz, Ampl: 500.0 mVpp, Offset: 0.0 mV, Phase: 0.000°. The waveform is yellow.
- Channel 2:** Freq: 1.000,000,000 KHz, Ampl: 500.0 mVpp, Offset: 0.0 mV, Phase: 0.000°. The waveform is cyan.
- Channel 3:** Freq: 1.000,000,000 KHz, Ampl: 500.0 mVpp, Offset: 0.0 mV, Phase: 0.000°. The waveform is magenta.
- Channel 4:** Freq: 1.000,000,000 KHz, Ampl: 500.0 mVpp, Offset: 0.0 mV, Phase: 0.000°. The waveform is blue.

Each channel panel also features a small summary box and a waveform preview graph. The summary box for Channel 1 shows: Sine, Freq: 1.00 KHz, Ampl: 500.0 mVpp, Offset: 0.0 mV, Channel, Mode: DC AMP, Invert: Forward. The preview graph shows a sine wave with a peak-to-peak amplitude of 500.0 mV and a period of 1.00 ms.

The top toolbar includes icons for Capture, AWG, and AFG. The bottom status bar shows TX1-TX4 (Sine Continuous, DC AMP), Clock (Internal Reference, 10.00 MHz), Sample (10.00 GSa/s), and the time/date: 13:26:34, 2023/09/14.

# Режим AWG

defaultProj   + New Project   Open Project   Save Project   Save As   Delete Project   Import/Export   Capture   **AWG**   AFG

**Project**

Name	Size	Date	
defaultProj	8.19 KB	2023-09-14	...
test2	8.19 KB	2023-09-04	...

**Channel**

**Waveform**

**Sequence**

**Mod**

### Channel Preview Area

CH1 Real   CH2 Real  
CH3 Real   CH4 Real

Trigger Interval: 10us  
Clock SampleRate: 5.000000000GSa/s

Tap this area to open the project and enter the Channel page

### Waveform Preview Area

Wave	SampleRate	Date
Wave_1	3.07 K	23/08/22 17:31
Wave_2	5.11 K	23/08/23 18:23
Wave_3	24.00 K	23/08/30 18:08
Wave_4_1	12.01 K	23/08/31 18:00

Tap this area to open the project and enter the Waveform page

### Sequence Preview Area

Seq	SampleRate	Date
Seq	0	23/09/12 17:00
Seq_1	0	23/08/31 18:49

Tap this area to open the project and enter the Sequence page

### Mod Preview Area

Mod	SampleRate	Date
Mod_1_1_1	4.00 K	23/08/31 20:50
Mod	40.00 K	23/09/04 19:38
Mod_1_1_1_1_1	7.50 K	23/09/12 17:56
Mod_1_1_1_1_1_1	2.67 K	23/09/12 17:21

Tap this area to open the project and enter the Mod page

Local

All projects   Name

Path Local Disk (C)   Used:688.10 MB   Total:122.00 GB

Local Disk (C)

Name	Size	Date	
UserData		2023-09-12	...

Sync CH1   Sync CH2   Sync CH3   Sync CH4

13:25:19  
2023/09/14

# Меню настройки канала

**Channel Setting**

Couple  CH1  CH2  CH3  CH4

**TX1** TX2 TX3 TX4

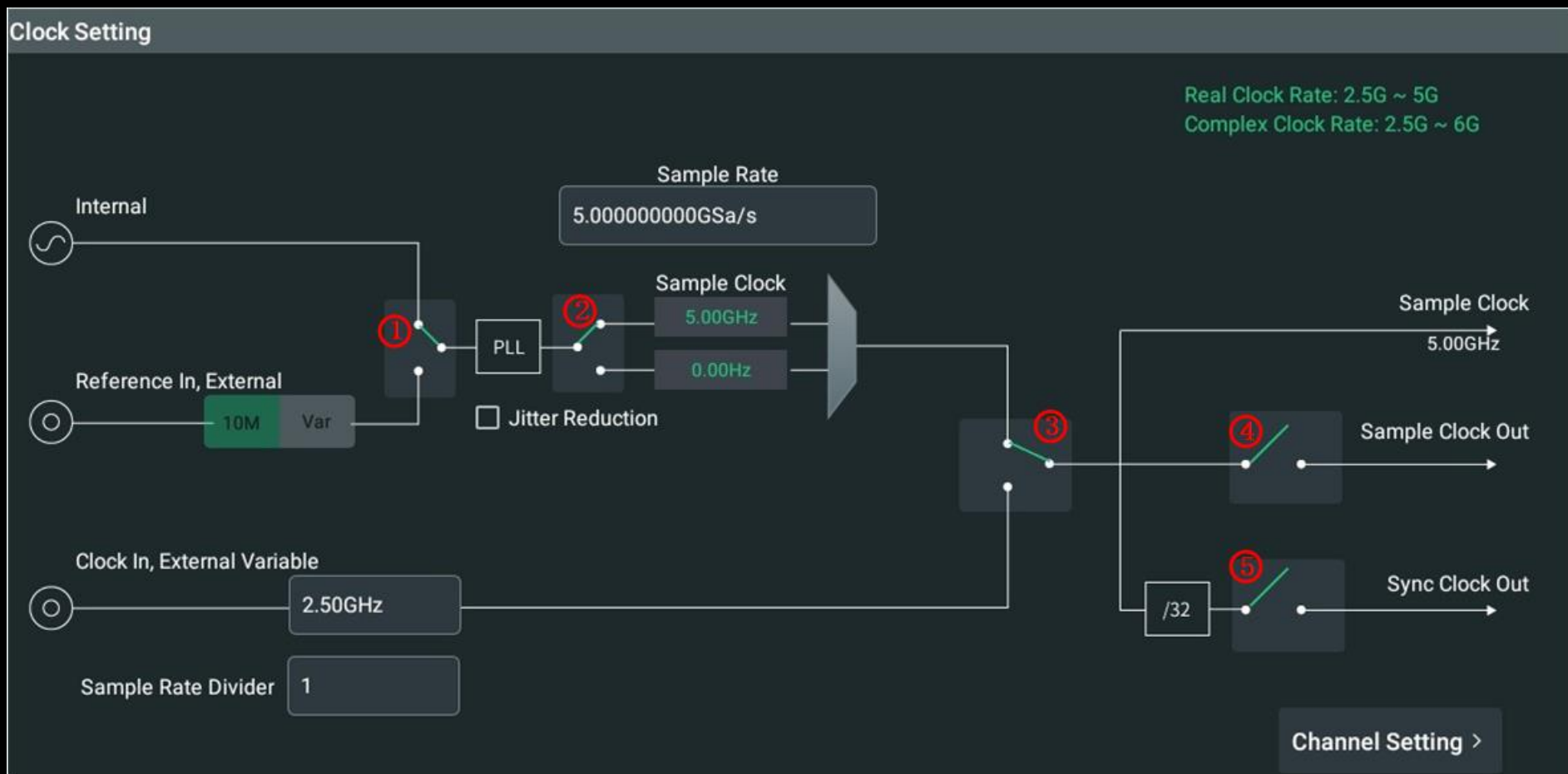
Resolution(bits) 16+0Mkr Output Sample Rate: 5.00GSa/s

The diagram illustrates the channel setting menu with the following components and settings:

- Real Data:** Input signal, marked with a red circle 1.
- SiFi:** Signal processing block, set to Normal.
- Interpolation:** Block set to 1x.
- I Data:** Input signal, processed by Interpolation (2x).
- Center Frequency:** Set to 0.00Hz.
- NCO:** Numerically Controlled Oscillator.
- 90°:** Phase shifter.
- Q Data:** Input signal, processed by Interpolation (2x).
- Interpolation (I/Q):** Blocks set to 2x.
- Summing Junction:** Indicated by a plus sign (+).
- Switch:** Marked with a red circle 2, routing the signal to the DAC.
- Sinc(x)/x:** Filter block.
- DAC Mode:** Set to NRZ.
- 16-bit DAC:** Digital-to-Analog Converter.
- DAC Output Sample Rate:** 5.00GSa/s.
- Mode:** Set to DC HBW, marked with a red circle 4.
- Amplitude:** 350.00mVpp.
- Offset:** 0.00V.

[Clock Setting >](#)

# Меню настройки тактовой частоты



# Временной сдвиг между каналами

Skew Setting

Analog Markers

Adjust the relative timing of the analog outputs

TX1	0ps	TX2	0ps
TX3	0ps	TX4	0ps

The diagram shows four channels (TX1, TX2, TX3, TX4) with a vertical dashed line at 0ns. TX1 is yellow, TX2 is cyan, TX3 is magenta, and TX4 is blue. All channels show a step change at 0ns. The x-axis is labeled with -2ns, 0ns, and 2ns.

Cancel Apply



CH1 Stopped CH2 Stopped CH3 Stopped CH4 Stopped Import/Export Capture AWG AFG

Project Channel

Waveform

H	H	W	Arb	MT	MT	MT	Arb	W	IQ	W		
Wave_1	Wave_2	Wave_3	Wave_4_1	Wave_4	Wave_4_2	Wave	Wave_5	Wave_5_1	Wave_6	Wave_6_1		
3.07 K 23/08/22 17:31	5.11 K 23/08/23 18:23	24.00 K 23/08/30 18:08	12.01 K 23/08/31 18:00	10.00 K 23/08/31 18:08	2.50 K 23/08/31 19:35	20.00 K 23/09/04 20:28	48.00 K 23/09/12 17:05	48.00 K 23/09/12 17:06	48.00 K 23/09/12 17:06	96.00 K 23/09/12 17:19		

Make IQ Import Export Delete Delete All

Basic Wave Table Editor Advanced High Speed Serial

Name Wave Edit Marker Compile  Overwrite existing waveform Edit in table Assign To Channel

Function Sine Length 12.00 K Sample Rate 5.00 GSa/s

Calculate Length Frequency 1.00 GHz Cycles 2.400000 K

Amplitude 500.00 mVpp High 250.00 mV Phase 0.000 °

Offset 0.00 mV Low -250.00 mV

250.00 mV  
-250.00 mV  
0 2.5 5

CH1 350.00mVpp 0.00V DC HBW CH2 350.00mVpp 0.00V DC HBW CH3 350.00mVpp 0.00V DC HBW CH4 350.00mVpp 0.00V DC HBW

Clock Internal Reference Clock 10.00 MHz Sample 5.0000000 GSa/s Trigger 10us

Sync CH1 Sync CH2 Sync CH3 Sync CH4

13:33:27 2023/09/14



# Формирование многоканального сигнала(опция)

CH1 Stopped
CH2 Stopped
CH3 Stopped
CH4 Stopped

Import/Export
 Capture
 AWG
 AFG

Project
Channel
Waveform
Sequence
Mod

Waveform

ALL
Time

Make IQ
 Import
 Export
 Delete
 Delete All

Wave_1	Wave_2	Wave_3	Wave_4_1	Wave_4	Wave_4_2	Wave	Wave_5	Wave_5_1	Wave_6	Wave_6_1		
3.07 K	5.11 K	24.00 K	12.01 K	10.00 K	2.50 K	20.00 K	48.00 K	48.00 K	48.00 K	96.00 K		
23/08/22 17:31	23/08/23 18:23	23/08/30 18:08	23/08/31 18:00	23/08/31 18:08	23/08/31 19:35	23/09/04 20:28	23/09/12 17:05	23/09/12 17:06	23/09/12 17:06	23/09/12 17:19		

Basic Wave
Table Editor
Advanced
High Speed Serial

Name   Edit Marker

Type  Tones

Sample Rate

Start Freq  Spacing

End Freq  Tone Count

Phase  Tones Length

Compile  Overwrite existing waveform

Edit in table Assign To Channel

1.000 K    500.001 M    1.000 G    1.500 G    2.000 G

CH1  
350.00mVpp  
0.00V DC HBW

CH2  
350.00mVpp  
0.00V DC HBW

CH3  
350.00mVpp  
0.00V DC HBW

CH4  
350.00mVpp  
0.00V DC HBW

Clock  
Internal Reference Clock  
10.00 MHz

Sample  
5.0000000 GSa/s

Trigger  
10us

Sync  
CH1

Sync  
CH2

Sync  
CH3

Sync  
CH4

13:28:27  
2023/09/14

# Формирование сигнала ЛЧМ(опция)

CH1 Stopped CH2 Stopped CH3 Stopped CH4 Stopped Import/Export Capture AWG AFG

Project Channel

Waveform

H	H	H	W	W	Arb	MT	W	MT	MT			
Wave_1	Wave_2	Wave_I	SIN500MGHZ	Wave_3	Wave_4_1	Wave_4	Wave_Q	Wave_4_2	Wave			
3.07 K 23/08/22 17:31	5.11 K 23/08/23 18:23	5.11 K 23/08/23 18:28	24.00 K 23/08/23 18:56	24.00 K 23/08/30 18:08	12.01 K 23/08/31 18:00	10.00 K 23/08/31 18:08	12.00 K 23/08/31 18:58	2.50 K 23/08/31 19:35	20.00 K 23/09/04 20:28			

Basic Wave Table Editor Advanced High Speed Serial

Name Wave Edit Marker Compile Overwrite existing waveform Edit in table Assign To Channel

Type Multitone Chirp

Sample Rate User Defined 2.00 GSa/s

Low Freq 1 Hz Sweep Time 10.00 us

High Freq 2.000000000 GHz Sweep Rate 200.00 MHz/us

Freq Sweep Low to High Chirp Length 20.00 K

2.00 GHz  
0.00 GHz  
0 ns 10.00 us

CH1 350.00mVpp 0.00V DC HBW CH2 350.00mVpp 0.00V DC HBW CH3 350.00mVpp 0.00V DC HBW CH4 350.00mVpp 0.00V DC HBW Clock Internal Reference Clock 10.00 MHz Sample 5.0000000 GSa/s Trigger 10us Sync CH1 Sync CH2 Sync CH3 Sync CH4 15:47:43 2023/09/12

# Высокоскоростная последовательность данных

CH1 ▶ Stopped

CH2 ▶ Stopped

CH3 ▶ Stopped

CH4 ▶ Stopped

Import/Export

Capture

AWG

AFG

Project
Channel
Waveform
Sequence
Mod

Waveform

ALL ▾

Time ▾

Make IQ

Wave_1	Wave_2	Wave_3	Wave_4_1	Wave_4	Wave_4_2	Wave	Wave_5	Wave_5_1	Wave_6	Wave_6_1								
3.07 K 23/08/22 17:31	5.11 K 23/08/23 18:23	24.00 K 23/08/30 18:08	12.01 K 23/08/31 18:00	10.00 K 23/08/31 18:08	2.50 K 23/08/31 19:35	20.00 K 23/09/04 20:28	48.00 K 23/09/12 17:05	48.00 K 23/09/12 17:06	48.00 K 23/09/12 17:06	96.00 K 23/09/12 17:19								

Basic Wave

Table Editor

Advanced

High Speed Serial

Name Wave

Edit Marker

Compile

Overwrite existing waveform

Edit in table

Assign To Channel

Pattern

Transmitter

Basic Settings

Step Response

Pattern

Clock ▾

Invert Bits

Bit/Signaling Rate

2.500000 Gbps

Keep SR

Sample Rate 5.000000 GSa/s

Wave Length 2.40 K

Ampl Max 750.00 mV

Ampl Min -750.00 mV

CH1

CH2

CH3

CH4

Clock

Sample

Trigger

Sync CH1

Sync CH2

Sync CH3

Sync CH4

13:43:57  
2023/09/14

# Добавление джиттера и белого шума к сигналу

CH1 Stopped CH2 Stopped CH3 Stopped CH4 Stopped Import/Export Capture AWG AFG

Project Channel

Waveform

Wave\_1 3.07 K 23/08/22 17:31 Wave\_2 5.11 K 23/08/23 18:23 Wave\_3 24.00 K 23/08/30 18:08 Wave\_4\_1 12.01 K 23/08/31 18:00 Wave\_4 10.00 K 23/08/31 18:08 Wave\_4\_2 2.50 K 23/08/31 19:35 Wave 20.00 K 23/09/04 20:28 Wave\_5 48.00 K 23/09/12 17:05 Wave\_5\_1 48.00 K 23/09/12 17:06 Wave\_6 48.00 K 23/09/12 17:06 Wave\_6\_1 96.00 K 23/09/12 17:19

Basic Wave Table Editor Advanced High Speed Serial

Name Wave Edit Marker Compile Overwrite existing waveform Edit in table Assign To Channel

Pattern Transmitter

Random Jitter Noise

Turn On  1 мВ до 500 мВ

Magnitude 0.01 UI

CH1 350.00mVpp 0.00V DC HBW CH2 350.00mVpp 0.00V DC HBW CH3 350.00mVpp 0.00V DC HBW CH4 350.00mVpp 0.00V DC HBW Clock Internal Reference Clock 10.00 MHz Sample 5.0000000 GSa/s Trigger 10us Sync CH1 Sync CH2 Sync CH3 Sync CH4 13:25:47 2023/09/14



# Векторная модуляция

CH1 Stopped CH2 Stopped CH3 Stopped CH4 Stopped Import/Export Capture AWG AFG

Project Mod

Channel Mod\_1\_1\_1 4.00 K 23/08/31 20:50 Mod 40.00 K 23/09/04 19:38

Waveform Name Mod Edit Marker Compile Overwrite existing waveform Assign To Channel

Sequence Mod

Code Type All One

Length 10.00 K

Symbol Rate 100.0000 MSa/s

Mod Type 256QAM

Code OFF

OverSampling 16

Filter Root cosine

Alpha/BT 0.25

Root cosine

Recommended sample rate: 3.20 GSa/s

CH1 350.00mVpp 0.00V DC HBW CH2 350.00mVpp 0.00V DC HBW CH3 350.00mVpp 0.00V DC HBW CH4 350.00mVpp 0.00V DC HBW

Clock Internal Reference Clock 10.00 MHz

Sample 5.0000000 GSa/s

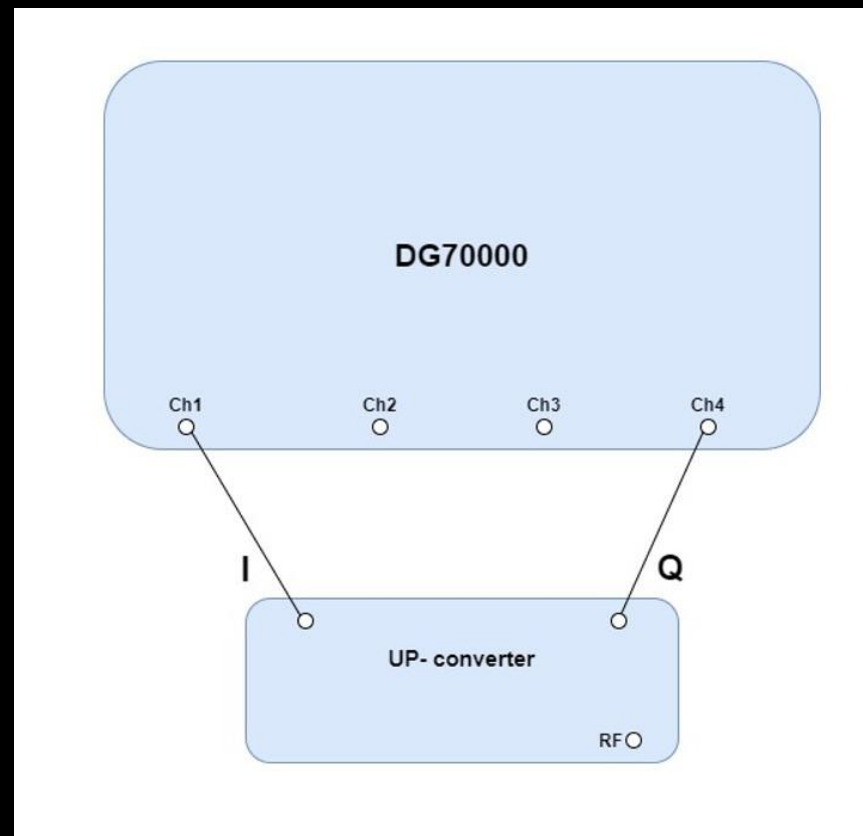
Trigger 10us

Sync CH1 Sync CH2 Sync CH3 Sync CH4

15:46:34 2023/09/12

# Формирование широкополосного сигнала

Полоса модуляции 1.5 ГГц





# Спектр сигнала с векторной модуляцией

Полоса 1.5 ГГц



# Управление через SCPI команды и Web Control

The screenshot shows a web browser window with the address bar displaying "192.168.0.247". The page has a navigation menu on the left with the following items: Welcome, Web Control, Print Screen, Network Status, Network Settings, and SCPI Panel Control. The main content area is titled "Information About This Instrument:" and contains a table with the following data:

Information About This Instrument:	
Instrument Model:	MDG70004
Manufacturer:	Harbin Nosean Test And Control Technology
Serial Number:	MDG7A25300001
Description:	Arbitrary Waveform Generator
LXI Class:	LXI Core 2014
LXI Version:	1.4
Host Name:	MDG7A25300001.local
MAC Address:	50-48-2c-e0-00-00
IP Address:	192.168.1.10
Firmware Revision:	00.01.00.18.19
VISA TCP/IP String:	TCPIP::192.168.1.10::INSTR
Auto-MDIX Capable:	NO
VISA USB Connect String:	USB0::0x1AB1::0x0645::MDG7A25300001::INSTR
SCPI Socket Port	5555

Below the table, there is a button labeled "Web Identification Indicator".

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**Спасибо за  
внимание**