G7M frequency synthesizers

Features

— Wide frequency range: from 10 kHz[1] to 4/20/40 GHz

— Wide output signal power setting range: from −130/−90/−20 dBm to +15 dBm[2]

— High stability of frequency and output signal power

— Low phase noise −125 dBc/Hz for 10 kHz at offset from 1 GHz carrier

— Pulse modulation. Pulse envelope front/tail less than 10 ns, attenuation during the pause > 70 dB (IMA option)

Description

G7M frequency synthesizers are designed to generate continuous harmonic signals and pulse modulated signals. G7M synthesizers are used for analyzing, tuning, testing and monitoring at manufacturing high-frequency and microwave devices used in radio electronics, communications, radars, measuring equipment. The G7M operating principle is based on combination of direct digital, indirect phase-lock and direct analog frequency synthesis.

G7M series includes three synthesizer types with different operating frequency ranges:

- G7M-04: 10 MHz to 4 GHz;
- G7M-20A: 10 MHz to 20 GHz;
- G7M-40: 10 MHz to 40 GHz.

G7M is computer-controlled with G7M Software installed. Data interchange between G7M and PC is run via Ethernet. G7M program interface is compatible with IVI-COM and SCPI and allows to control G7M using a third-party software. A various of G7M versions are available featured by a certain set of options.

Features and options

Output microwave connector type

The type of the generation unit's output microwave connector is determined by G7M synthesizer options:

- 01R option — type III connector (female);
- 11R option — type N connector (female);
- 03R option — type IX connector, ver. 3 (female);
- 13R option — 3.5 mm connector (female);
- 05R option — 2.4 mm connector (female).

Extended power setting range

(ATA/70 option, ATA/110 option)

ATA/70 is a hardware option that may be provided for all G7M versions. Synthesizer output is provided with built-in 0 ... 70 dB electromechanical step attenuator (with 10 dB step) to extend the lower limit of output power adjustment range to -90 dBm.

ATA/110 is a hardware option that may be provided for G7M-04 and G7M-20A synthesizer versions. Synthesizer output is provided with built-in 0 ... 110 dB electromechanical step attenuator (with 10 dB step) to extend the lower limit of output power adjustment range to -130 dBm.

[1] With NChA option, for G7M-04/20A only.

[2] For ATA70/ATA110 options / without options.

Built-in pulse modulator (IMA option)
IMA is a hardware option provided for all G7M-04 synthesizer versions. This option allows to use built-in pulse modulators operating with internal and external modulation signal sources to modify continuous harmonic signals into pulse modulated signals.

Extended frequency range (NChA option[3])

NChA is a hardware option provided for G7M-04 and G7M-20A synthesizer versions. The option extends operating frequency range by shifting the lower limit up to 10 kHz.

Improved frequency stability (TGA option[4])
TGA is a hardware option that may be provided for all G7M versions. Internal temperature-compensated quartz reference oscillator is replaced with a 10 MHz oven-controlled crystal reference oscillator with higher short-term and long-term frequency stability. Oven-controlled crystal reference oscillator provides relative frequency error within $\pm 1 \times 10^{-7}$, considering calibration accuracy, temperature instability and 1-year long-term instability.

Operation modes

Following G7M operation modes are available:

- fixed frequency and power;
- frequency sweep with uniform or logarithmic step;
- power sweep with uniform step;
- simultaneous frequency and power sweep;
- frequency and power list sweep.

Starting range (list) scanning or tuning to the next range (list) point may be performed continuously (automatic mode), according to external synchronization signal or user's command (manual mode).

Pulse modulation

G7M synthesizer may generate pulse modulated signals with internal or external pulse modulator. Internal pulse modulator based on internal or external modulation signal source is available in G7M-04 version with IMA option only. External pulse modulator may be used for pulse modulation in G7M-20A and G7M-40 versions. External pulse modulator may be controlled by internal or external modulation signal source. Internal clock-pulse oscillator, generating periodic pulse sequence, or internal pulse oscillator (GIP software option), generating periodic pulse sequence from 2 to 255 pulse bursts, may be used as internal modulation signal source. It is recommended to use MI1 pulse modulators as internal pulse modulators operating up to 20 GHz.

Synchronization system

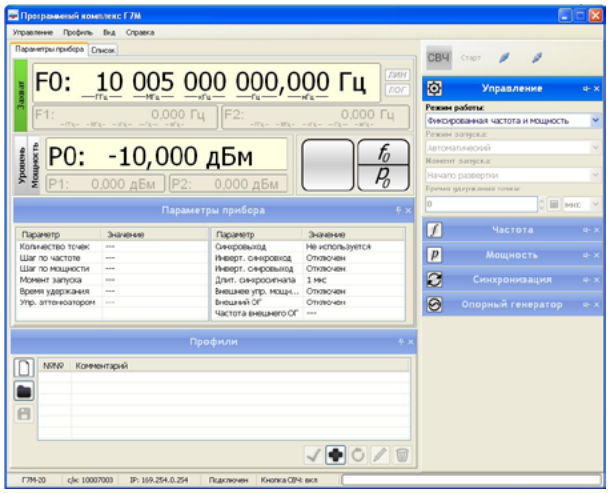
Output signal frequency stabilization of 1, 5 and 10 MHz external reference oscillator, external device frequency stabilization of 10 MHz internal reference oscillator and G7M's flexible digital synchronization system and allows G7M to interact with external devices. This makes it possible to use G7M synthesizer in various measuring circuits without developing additional software, e.g.:

- as a heterodyne signal source for mixer measurement with R4M vector network analyzer or R2M scalar net-

[3] NChA is an additional non-certified option; metrological characteristics of synthesizers provided with this option are not regulated within frequency range below 10 MHz.
[4] TGA is not a certified option. With actual frequency stability improvement, metrological characteristics related to frequency setting error of G7M synthesizers with TGA option will be standardized similarly to G7M without TGA option.

work analyzer;

- as a second signal source for intermodulation distortions measurement using R4M vector network analyzer or SK4M spectrum analyzer.



Software

G7M synthesizers are controlled with G7M Software providing following advantages:

- user-friendly interface;
- saving and loading profiles, frequency/power lists and pulse bursts characteristics;

Specifications

	G7M-04	G7M-20A	G7M-40
Operating frequency range: without options with NChA option	 10 MHz ... 4 GHz 10 kHz ... 4 GHz	 10 MHz ... 20 GHz 10 kHz ... 20 GHz	 10 MHz ... 40 GHz —
Output signal power setting range, dBm: without options with ATA/70 option with ATA/110 option	 −20 ... +15 −90 ... +15 −130 ... +15	 −20 ... +13 −90 ... +10 −130 ... +10	 −20 ... +7 −90 ... +3 —
Output signal power setting error, dB: −20 to +15 (+13) dBm −20 to +7 dBm −90 to −20 dBm	 ± 1 — ± 1.5	 ± 1 — ± 1.5	 — ± 1.5 ± 2.0
Microwave output VSWR	< 2.0	< 1.7	< 2.0
Output frequency step, Hz	1		
Relative frequency setting error for operation with internal reference oscillator for one year: without TGA option with TGA option	 $\pm 1 \times 10^{-6}$ $\pm 1 \times 10^{-7}$		
Time required to set a new frequency, ms	< 1		
Output signal power setting increment, dB	0.1		
Time required to set a new power value, µs	< 200		

Harmonics level, dBc, max.:	
10 kHz to 10 MHz	−30
10 to 125 MHz	−35
0.125 to 4 GHz	−50
4 to 15 GHz	−40
15 to 20 GHz	−50
20 to 40 GHz	−35
Subharmonics level, dBc, max.:	
10 kHz to 2 GHz	—
2 to 15 GHz	−50
15 to 40 GHz	−40
Nonharmonics level, dBc, max.:	
10 kHz to 10 MHz	−60
10 to 125 MHz	−50
125 to 250 MHz	−80
250 to 500 MHz	−75
0.5 to 1 GHz	−70
1 to 2 GHz	−65
2 to 4 GHz	−60
4 to 8 GHz	−55
8 to 16 GHz	−50
16 to 32 GHz	−45
32 to 40 GHz	−40
Built-in pulse modulator (IMA option)	
Pulse envelope front/tail time, ns	< 10
Minimum pulse duration, ns	20
Compression of pulse duration relative to pulse duration of modulation signal, ns	< 6
Power attenuation during the pause, dB	> 70
Internal pulse oscillator (IMA option, GIP option)	
Pulse duration	20 ns ... 3.99999998 sec
Pulse repetition period	40 ns ... 4 sec
Pulse duration and pulse repetition period increment, ns	10

G7M phase noise

Frequency range, GHz	Phase noise level, dBc/Hz, at offset					
	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz
0.01 ... 0.125	−100	−115	−120	−125	−135	−140
0.125 ... 0.25	−95	−125	−130	−135	−135	−140
0.25 ... 0.5	−90	−120	−130	−130	−130	−140
0.5 ... 1	−85	−115	−120	−120	−125	−140
1 ... 2	−80	−110	−115	−115	−120	−140
2 ... 4	−75	−105	−110	−110	−115	−140
4 ... 8	−70	−95	−105	−105	−105	−130
8 ... 16	−65	−95	−100	−100	−100	−125
16 ... 32	−60	−90	−95	−95	−95	−120
32 ... 40	−55	−85	−90	−90	−90	−115

Ordering information

Specify type and version of G7M synthesizer when placing your order. Specify additional options and software options after a hyphen. Order additional accessories (microwave cables, pulse modulators, coaxial adapters) and other devices separately.

Basic supply set	
1) G7M-04/20A/40 frequency synthesizer. 2) Ethernet cable. 3) Power cable. 4) G7M software. 5) Operational documentation. 6) Carrying case. 7) Calibration certificate.	
Versions	
G7M-04/1	Frequency synthesizer, 0.01 ... 4 GHz with 01R option
G7M-04/2	Frequency synthesizer, 0.01 ... 4 GHz with 01R and ATA/70 options
G7M-04/3	Frequency synthesizer, 0.01 ... 4 GHz with 01R and ATA/110 options
G7M-04/4	Frequency synthesizer, 0.01 ... 4 GHz with 11R option
G7M-04/5	Frequency synthesizer, 0.01 ... 4 GHz with 11R and ATA/70 options
G7M-04/6	Frequency synthesizer, 0.01 ... 4 GHz with 11R and ATA/110 options
G7M-04/7	Frequency synthesizer, 0.01 ... 4 GHz with 01R and IMA options
G7M-04/8	Frequency synthesizer, 0.01 ... 4 GHz with 11R and IMA options
G7M-04/9	Frequency synthesizer, 0.01 ... 4 GHz with 01R, ATA/70 and IMA options
G7M-04/10	Frequency synthesizer, 0.01 ... 4 GHz with 11R, ATA/70 and IMA options
G7M-04/11	Frequency synthesizer, 0.01 ... 4 GHz with 01R, ATA/110 and IMA options
G7M-04/12	Frequency synthesizer, 0.01 ... 4 GHz with 11R, ATA/110 and IMA options
G7M-20A/1	Frequency synthesizer, 0.01 ... 20 GHz with 03R option
G7M-20A/2	Frequency synthesizer, 0.01 ... 20 GHz with 03R and ATA/70 options
G7M-20A/3	Frequency synthesizer, 0.01 ... 20 GHz with 03R and ATA/110 options
G7M-20A/4	Frequency synthesizer, 0.01 ... 20 GHz with 13R option
G7M-20A/5	Frequency synthesizer, 0.01 ... 20 GHz with 13R and ATA/70 options
G7M-20A/6	Frequency synthesizer, 0.01 ... 20 GHz with 13R and ATA/110 options
G7M-40/1	Frequency synthesizer, 0.01 ... 40 GHz
G7M-40/2	Frequency synthesizer, 0.01 ... 40 GHz with ATA/70 option
Hardware options	
NChA	Extended operating frequency range, 10 kHz ... 4/20 GHz
TGA	Relative frequency setting error for operation with internal reference oscillator for one year is $\pm 1 \times 10^{-7}$
Software options	
GIP	Built-in pulse oscillator
SRP	Hidden display mode
Pulse modulators	
MI1-18-01-01	Pulse modulator, 0.01 ... 18 GHz, type III (male) – type III (male)
MI1-18-01-01R	Pulse modulator, 0.01 ... 18 GHz, type III (male) – type III (female)
MI1-18-01P-01R	Pulse modulator, 0.01 ... 18 GHz, type III (female) – type III (female)
MI1-18-11-11	Pulse modulator, 0.01 ... 18 GHz, type N (male) – type N (male)
MI1-18-11-11R	Pulse modulator, 0.01 ... 18 GHz, type N (male) – type N (female)
MI1-18-11P-11R	Pulse modulator, 0.01 ... 18 GHz, type N (female) – type N (female)
MI1-20-03-03	Pulse modulator, 0.01 ... 20 GHz, type IX (male) – type IX (male)
MI1-20-03-03R	Pulse modulator, 0.01 ... 20 GHz, type IX (male) – type IX (female)
MI1-20-03P-03R	Pulse modulator, 0.01 ... 20 GHz, type IX (female) – type IX (female)
MI1-20-13-13	Pulse modulator, 0.01 ... 20 GHz, 3.5 mm (male) – 3.5 mm (male)
MI1-20-13-13R	Pulse modulator, 0.01 ... 20 GHz, 3.5 mm (male) – 3.5 mm (female)
MI1-20-13P-13R	Pulse modulator, 0.01 ... 20 GHz, 3.5 mm (female) – 3.5 mm (female)
Additional accessories	
On your request, the device may be supplied with microwave cable assemblies [1], adapter kits, attenuators, control and data display device.	

Ordering example

- Frequency synthesizer G7M-04/3-NChA-TGA — 1 pcs.
- Pulse modulator MI1-18-01-01R — 1 pcs.
- Control and data display device PKU-11 — 1 pcs.

[1] You may select cable length between 200 mm and 15000 mm for your order.