Synthesizers

FS2000 OEM Modular Synthesizer

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The FS-2000 family of OEM Modular frequency synthesizers operates in the frequency of 10 MHz to 18.4 GHz and offer sub-microsecond frequency switching speed, and sub-microsecond level correction, coupled with superb spectral purity. With an installed base of more than a thousand units, supporting hundreds of sub-microsecond switching and high spectral purity applications, the FS-2000 family is a proven performer for a diverse range of stringent applications.

The FS-2000 is based on an iterative, modular direct analog architecture with a central reference generator that synthesizes 50, 100, 150, 200 and 800 MHz signals from a 100 MHz reference derived by multiplying a 5 or 10 MHz reference oscillator appropriately and improving far-out noise by judicious filtering. All frequencies are derived in an iterative frequency generation architecture. Frequencies are generated as a decade of frequency steps over an octave from 500 MHz inputs to the next stage. Final outputs are produced by a scaling module which provides for doubling, dividing, or heterodyning to achieve a range of 10 MHz to 2.3 GHz. Units which have extended frequency ranges use an additional scaling module which doubles to 4.6 GHz, and again to 9.2 and 18.4 GHz. The architecture also provides the additional benefit of simplifying the user interface programming in Binary Coded Decimal (BCD). Naturally, a variety of interfaces are optionally provided, including IEEE-488 and a user-friendly keyboard.

This unique, interactive, modular architecture also allows for easy configurations of OEM or specialized products.

The Best of Both Worlds

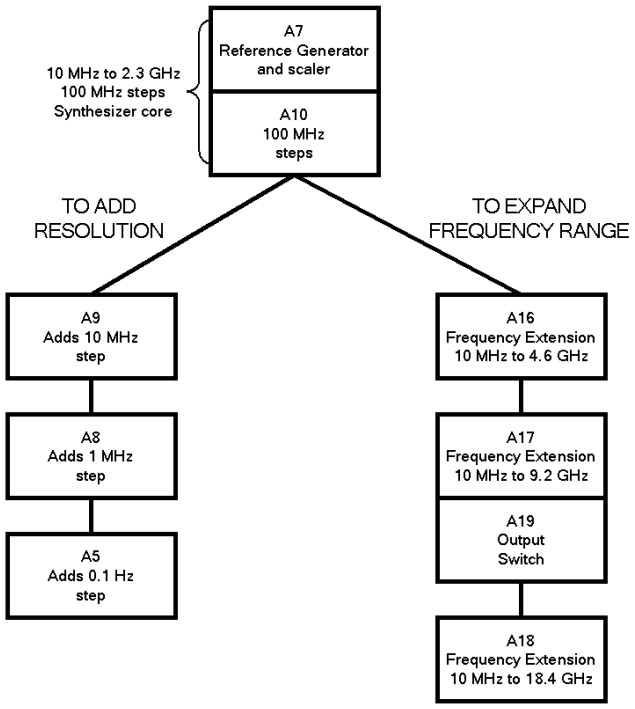
A keyboard-controlled version is available where manual control makes sense. The FS-2000B or FS2000C still provide all the performance of the sub-microsecond System Synthesizer and easy to use, incredibly clean, bench synthesizers. The FS-2000B is like two synthesizers in one; a microsecond switching computer controlled system synthesizer and an IEEE-488 programmable keyboard entry bench synthesizer with extensive sweep and synchronization capability.

You can conveniently use the FS-2000 for system development with the convenience of keyboard entry of frequency increments and sweeps, as well as IEEE-488 programming. With the flip of a switch, the FS-2000B becomes a BCD programmable microsecond frequency switching synthesizer. Even if you do not need fast switching, the FS-2000B-18 is one of the lowest phase noise 18 GHz synthesizers available.

The FS-2000 provides programmable and keyboard controlled modulation of AM and FM and 1 μsec frequency switching up to 4 GHz.

OEM Configuration Guide

Aeroflex's modular architecture and iterative frequency plan makes it ideally suited for custom OEM applications. Just two standard modules make up a 10 MHz - 2.3 GHz, 100 MHz resolution OEM synthesizer with the same specifications as the standard family, needing only DC power and Frequency Reference. To obtain finer resolution and/or wider frequency coverage, just add the appropriate standard modules. Factory assistance is available to help you configure an OEM synthesizer which best meets your electrical or environmental specifications.



SPECIFICATIONS

STANDARD 19 " RACK CHASSIS CONFIGURATIONS

		Available Options					
Frequency Range	FS-2000 Model	AM	FM	Pulse	Attenuation SLOW	Attenuation FAST	Standard Interface
10 MHz to	A-2		O		O		BCD
2.299 999 GHz	B-2						IEEE-488/BCD
10 MHz to	A-4		O		O	O	BCD
3.999 999 GHz *	B-4		O				IEEE-488/BCD
10 MHz to	A-9			O			BCD
9.199 999 GHz	B-9			O			IEEE-488/BCD
10 MHz to	A-18			O			BCD
18.399 999 GHz	B-18			O			IEEE-488/BCD
	MMS-18	O	O		O		MSIB/IEEE-488

O : Optional
* : Option 112 extends the frequency coverage to 4.599 999 GHz

RF OUTPUT

Level

+10 dBm

Leveling

± 2 dB (± 5° C of Calibration Temperature)

Impedance

50 Ohm

Settling time

2 µsec maximum (1 µsec typ); to be within +/-2 dB of final amplitude

FREQUENCY ACCURACY AND STABILITY

Same as Reference Oscillator

REFERENCE OSCILLATOR

Internal

10 MHz Quartz Oscillator Aging rate 5 x 10^{-9}/day after 24 hours (in normal operating environment)

External

Any 5 MHz or 10 MHz Frequency Standard at a level of 0 dBm +/- 2dB

SWITCHING SPEED

The FS-2000 switches between any two frequencies 50 MHz-18 GHz in less than 1 µsec with 1 MHz resolution and 1.2 µsec with 0.1 Hz resolution. the switching time is measured: From the time the FS-2000 receives a strobe command to switch until the phase detector output shows arrival at new frequency. The FS-2000 is unique: the larger the resolution, the faster the switching speed with 1 GHz resolution or more, typically switching in less than 250 nsec.

PHASE NOISE

The FS-2000 provides sub-microsecond switching and superior phase noise performance simultaneously.

Offset from carrier	Carrier Frequency						
	100 MHz	*600 MHz*	*1.2 GHz*	*2.4 GHz*	*4.6 GHz*	*9.2 GHz*	*18.4 GHz*
10 Hz	-100	-85	-79	-73	-67	-61	-55
100 Hz	-113	-98	-92	-86	-80	-74	-68
1 kHz	-128	-113	-107	-101	-95	-89	-83
20 kHz	-145	-138	-132	-126	-120	-114	-108
100 kHz	-147	-140	-134	-128	-122	-116	-110
10 MHz	-147	-140	-134	-128	-122	-116	-110
40 MHz	-147	-140	-134	-128	-122	-116	-110

Includes internal reference phase noise

SPURIOUS SIGNALS

dBc	Frequency Range (GHz)			
	0.05 to 2.3	2.3 to 4.6	4.6 to 9.2	9.2 to 18
Non-Harmonic	-70	-62	-56	-50
Sub-Harmonic **	-40	-40	-30	-30
Harmonic ***	-25 *	-25	-25	-25

* 560 to 800 MHz: -20 dBc ** Option 123: -55 dBc *** FA 4000-1: -50 dBc

FREQUENCY SWEEP MODES

Auto: Sweep repeats automatically

Single: Single sweep activated by front panel keyboard

Sweep Speed: Sweep repeats automatically 1 ms, 10 ms and 100 ms per step external

Synchronized variable to 700 µsec per step

In conjunction with above:

Sweep Up: Frequency sweeps from lower frequency to upper frequency, then return back to lower frequency.

Sweep Down: Frequency sweeps from upper frequency to lower frequency, then returns back to upper frequency.

Sweep Up/Down: Frequency sweeps from lower frequency to upper frequency, then from upper frequency to lower frequency.

Number of Steps: Selectable from 1 to 10,000 steps.

Step Size: Selectable, any size consistent with resolution of unit.

Stop Sweep: Causes internal sweep to halt immediately. Return control to command level.

MODULATION (C CHASSIS ONLY)

FM

Frequency Range GHz	Peak Deviation MHz	3 dB Bandwidth
0.01 - 3.999	0 to 1	10 Hz to 300 kHz
1.15 - 3.999	0 to 10	10 Hz to 300 kHz

AM

Frequency Range MHz	Depth %	3 dB Bandwidth
10 - 180	0 to 90	10 Hz to 50 kHz

REMOTE PROGRAMMING CONTROL INTERFACE

A chassis

44 Bits Parallel BCD TTL Compatible; Positive True with Strobe. Mating Connector: 3M P/n 3564-1000

B and C chassis

In addition to standard Interface IEEE-488-1978, all functions controlled from the front panel, with the exception of the power line switch, are programmable with the same accuracy and resolution as in manual mode.

GENERAL

Operating temperature range

0° to 50°C

Power Requirements

120/250 VAC 48 to 440 Hz, 250 Watts

Weight

FS-2000: 46 lbs. (20.9 kg)

Fs-2000A, FS-2000B or FS-2000C: 50 lbs. (22.7 kg)

Dimensions

FS-2000: 8.37" W x 5.22" H x 25.0" D (21.26 x 13.26 x 63.5 cm)

FS-2000A: 16.75" W x 5.22" H x 23.88" D (42.55 x 13.26 x 60.66 cm)
FS-2000B
FS-2000C

OPTIONS

OPTION 101, ADDED DDS FOR ENHANCED FREQUENCY RESOLUTION, MODULE A5

Frequency Range MHz	Opt 101 Hertz
10 MHz to 2.3 GHz	0.1
2.3 to 4 GHz	0.1
4.6 to 9.2 GHz	0.2
9.2 to 18.4 GHz	0.4

The option 101 limits the switching speed to 1.2 µsec.

OPTION 120, FM MODULATION

Frequency Range MHz	Peak Deviation Wide	+/- MHz Narrow
50-69	1.5	0.15
70-139	0.75	0.075
140-279	1.5	0.15
280-559	3	0.3
560-1149	6	0.6
1150-2299	12	1.2
2300-4599	24	2.4
4600-9199	48	4.8
9200-18399	96	9.6

OPTION 121, PROGRAMMABLE FM, MAINTAINS CONSTANT DEVIATION ACROSS FREQUENCY RANGE

Frequency Range MHz	Peak Deviation MHz
50-1149	0.01, 0.1, 1
1150-18399	0.1, 1, 10

External only FM coupling mode	3 dB Bandwidth
DC	DC to 5 MHz
AC	50 Hz to 5 MHz

OPTION 122, PULSE MODULATION

On / OFF ratio

60 dB

Rise / Fall time

10 nsec

OPTION 125, FAST ATTENUATOR, SOLID STATE

Frequency Range

0.5 to 18 GHz

Attenuation Range

0 to 60 dB

Attenuation Increment

0.25 dB

Switching Time

1 µsec max

OPTION 128, SLOW ATTENUATOR, MECHANICAL

Frequency Range

10 MHz to 18.4 GHz

Attenuation Range

0 to 120 dB

Attenuation Increment

1 dB

Switching Time

20 msec max

Contact the factory for non-standard options such as phase modulation or requirements not satisfied by standard options.

VERSIONS, OPTIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

Ordering

Numbers	Versions
FS-2000A-2	10 MHz to 2.3 GHz (1 MHz Resolution)
FS-2000B-2	10 MHz to 2.3 GHz (1 Hz Resolution) Keyboard Main Frame (includes GPIB)
FS-2000A-4	10 MHz to 4.0 GHz (1 Hz Resolution)
FS-2000B-4	10 MHz to 4.0 GHz (1 Hz Resolution) Keyboard Main Frame (includes GPIB)
FS-2000A-9	10 MHz to 9.2 GHz (2 Hz Resolution)
FS-2000B-9	10 MHz to 9.2 GHz (2 Hz Resolution) Keyboard Main Frame (includes GPIB)
FS-2000A-18	10 MHz to 18.4 GHz (4 Hz Resolution)
FS-2000B-18	10 MHz to 18.4 GHz (4 Hz Resolution) Keyboard Main Frame (includes GPIB)
FS-2000-MMS-18**	10 MHz to 18.4 GHz (0.4 Hz Resolution) includes Frequency Modulation Output Level Control +10 to -110 dBm in 1 dB Steps: Two 4-Slot MMs Modules

** MMS does not include 70001A Main Frame

OPTIONS

101	*(Up to 4 GHz, 0.1 Hz Resolution)* *(4.6 to 9.2 GHz, 0.2 Hz Resolution)* *(9.2 to 18.4 GHz, 0.4 Hz Resolution)*
112	*Extends Upper Frequency of -4 to 4.6 GHz*
116	*100 MHz Reference*
117	*Reversed fan for increased air flow with Filter*
**120*	*Non-programmable Wideband FM*
**122*	*Pulse Modulation 500 MHz to 4, 9, 18 GHz, 60 dB ON/OFF, 40 nsec R/F*
**123*	*Low Subharmonics at -66 dBC*
125	*Fast Attenuator*
126	*High Speed Memory/HP 8510 Interface (separate unit)*
128	*Slow Attenuator*
129	*Differential BCD*
904	*Extra Manual*
905	*Slides for Full Rack*

** These options available in A and B chassis only*

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AEROFLEX
A passion for performance.

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Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.

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