

DS-3020

Spectrum Series™ Synthesizers
Ultra-Low Phase Noise, 0.1 - 20 GHz

Ultra-low phase noise synthesizer

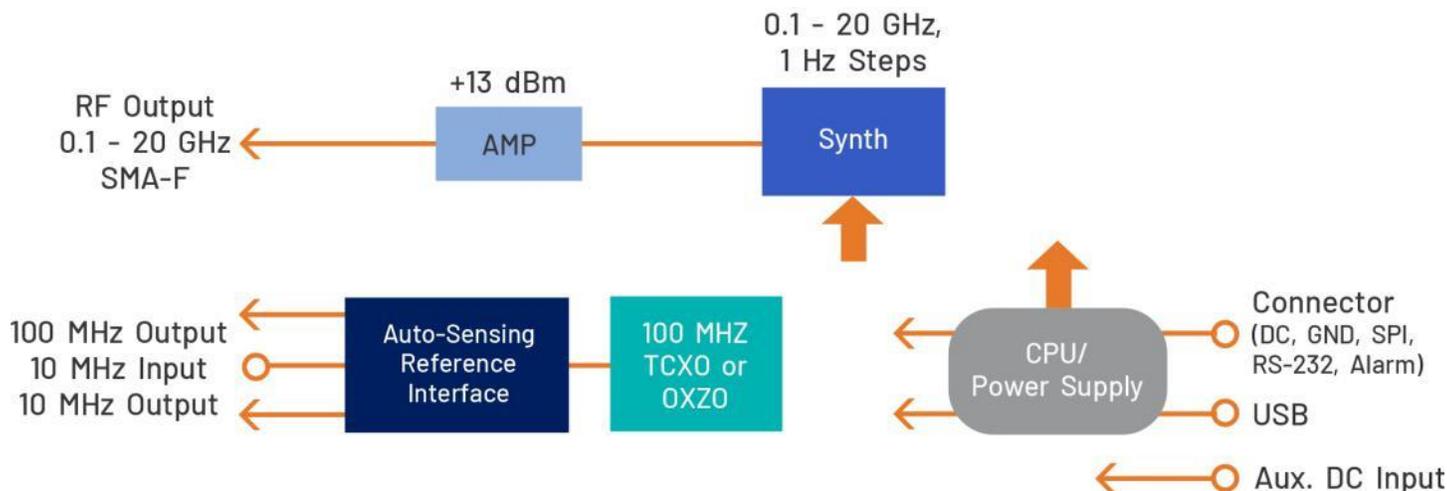
- 100 MHz to 20 GHz in 1 Hz steps
- State-of-the-art phase noise
- 10W power consumption
- Auto-sensing reference clock
- -30° to +70° C temperature range
- SPI, SCPI, and USB control – command-set and GUI control



Mercury's DS-3020 series is a state-of-the-art, DDS-based synthesizer family tuning continuously from 100 MHz to 20 GHz, in 1 Hz steps. Industry leading low phase noise and spurious performance meet and exceed requirements of the most demanding test equipment, receivers, and carrier transmitters.

Tuning is accomplished via 4-wire SPI, RS-232 SCPI commands or USB tuning. The synthesizer includes an internal reference which will auto-lock to an external 10 MHz reference when present.

DS-3020 BLOCK DIAGRAM



SPECIFICATIONS

RF Output

Parameter	Value
Frequency Tuning Range	100 MHz to 20 GHz
Frequency Tuning Resolution	1 Hz
Switching Speed	50 microsec, max, list mode; 200 microsec nominal mode
RF Power Output	+13 dBm typ
RF Power Flatness, over freq range	+/- 2 dB max
Harmonics	-12 dBc max
Non-Harmonic spurious	-60 dBc max
VSWR (in band)	2.5:1 max (50 ohm)
Connector	SMA-female

General

Parameter	Value
DC Power	+9 to +15 VDC
Power Consumption	12W typ after warm-up
Stand-By Power & Wake-Up	<2 Watt in stand-by (std reference). Wake-up time approx. 100 mS
DC Power & Control Connector	14 Pin Male. Harwin M80-5401442. Datamate High Reliability series. Mates with M80-4611442 (female).
Aux DC Power	2.00 mm center pin. CUI MODEL: PJ-063AH. Mates with Jack insertion Diameter/Depth: 5.5.
USB Connection	Mini-USB
Operating Temperature	-30° to +70° C baseplate
Warm Up Time	2 minutes, max
Humidity	95% non-condensing
Alarm Type	TTL, Hi = OK
Size, Inches	6.5 x 4 x 0.7
Weight	14.5 oz.

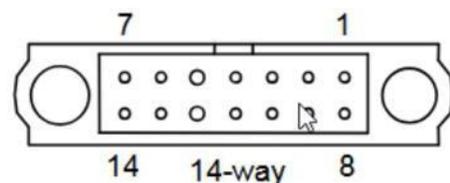
Reference

Parameter	Value
Internal Oscillator Type	OCXO
Internal Reference Frequency	100 MHz
Internal Reference, Aging, per year	<1 ppm
Internal Reference Stability over temp*	+/- .01 ppm
*Stability Temperature Range	-20° to +70° C
Reference Output, 10 MHz	10 MHz @ 6 dBm, +/- 2 dB, locked to the reference in use
Reference Output, 100 MHz	100 MHz @ 6 dBm, +/- 2 dB, locked to the reference in use
External Reference Input (customer supplied)	10 MHz @ 0 dBm, +/- 6 dBm
External Reference Input Max (no damage)	+17 dBm
Locking Range of External Reference	+/- 0.5 ppm
Reference Select	Auto-Sense; locked to external if present, otherwise internal
Input/Output Connectors	SMA-female

The DS-3020 has an internal 100 MHz reference. Two versions are available with differing stabilities and phase noise. A sample of the 100 MHz is provided. An external 10 MHz can be used to phase lock the internal 100 MHz and a sample of the external 10 MHz reference is provided for daisy-chaining purposes.

MONITOR AND CONTROL

Monitor and Control of the DS-3020 is accomplished by a single connector which provides DC, Ground, 4-Wire SPI, RS-232 (for SCPI commands), Alarms, and Muting. The interface connector locks to the female mating connector, providing a rugged and stable coupling for lab or field use. A secondary connection port is provided utilizing mini-USB. A user GUI is provided via the USB and packet level control is accomplished via SPI.



PROGRAMMING

Part	Description
DC Power & Control Connector	Multi-pin interface, male (all connections on one connector)
Programming Interfaces	RS-232 for SCPI commands, and 4 -Wire SPI (Clock/MOSI/MISO/SS)
Alternate Programming Port	USB, mini-USB form factor with GUI on Windows

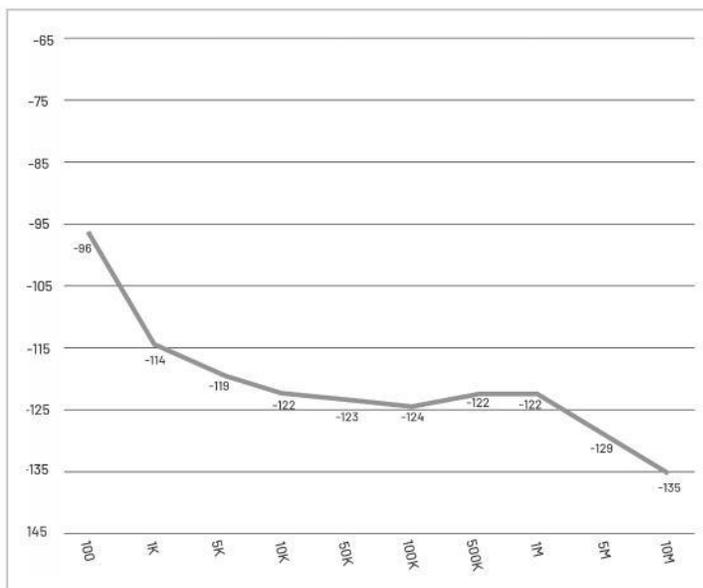
14-Pin Connector	Designation
Pin 1	RS-232 TX
Pin 2	ARM_NRST
Pin 3	LD OUT (5V)
Pin 4	SWDIO
Pin 5	SPI: MOSI
Pin 6	SPI: SS
Pin 7	+VIN
Pin 8	RS-232 RX
Pin 9	SW_CLK
Pin 10	TRIGGER
Pin 11	SPI: MISO
Pin 12	SPI: SCLK
Pin 13	GND
Pin 14	+VIN

PHASE NOISE

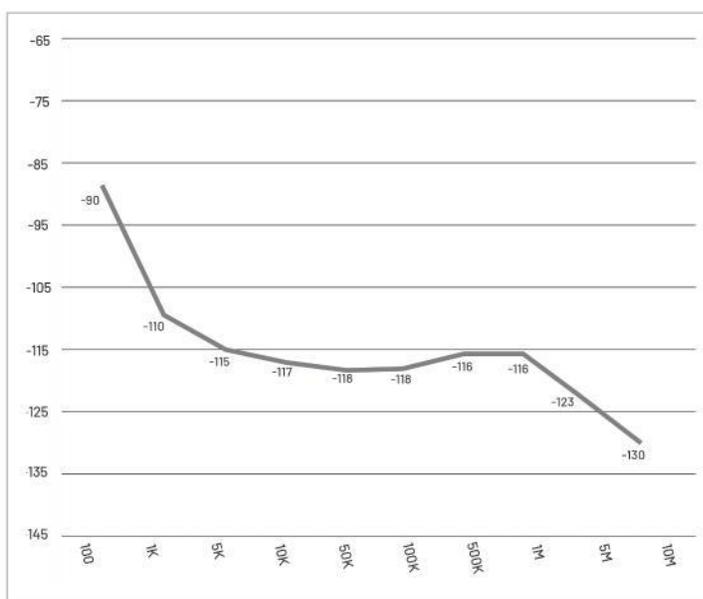
Model DS-3020 was created to give state-of-the-art noise performance. It is OCXO-based.

Phase Noise: typ, in dBc/Hz	2.5 GHz	5 GHz	10 GHz	20 GHz
100 Hz	-108	-102	-96	-90
1 kHz	-126	-120	-114	-110
10 kHz	-134	-128	-122	-117
100 kHz	-138	-132	-124	-118
1 MHz	-134	-128	-122	-116

Phase Noise: typ, in dBc/Hz	2.5 GHz	5 GHz	10 GHz	20 GHz
10 MHz	-147	-141	-135	-130
Deg RMS	0.02	0.05	0.10	0.20



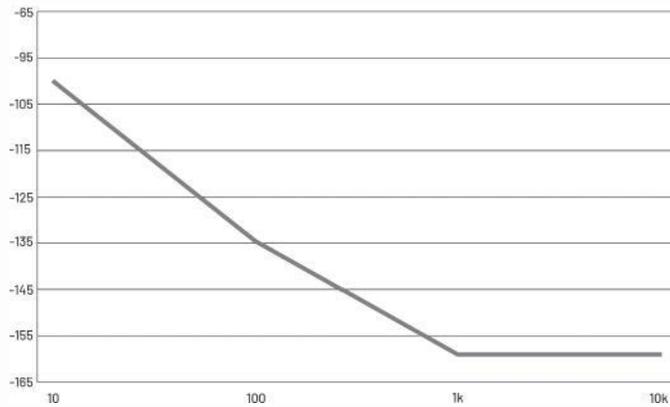
Phase Noise of DS-3020 at 10 GHz Output



Phase Noise of DS-3020 at 20 GHz

100 MHz Reference Oscillator Output Phase Noise

Phase Noise: typ, in dBc/Hz	DS-3020 (OCXO)
10 Hz	-100
100 Hz	-135
1 kHz	-160
10 kHz	-160



Phase Noise 100 MHz Reference Output

GUI-DRIVEN INTERFACE AND CONTROL

Examples of the GUI are shown below. Complete control is also available using SPI.

List and Sweep Modes are available.

Home List Mode List Management Sweep Mode Setup/Status

Synthesizer List Mode Setup

List #	RF On	Frequency in MHz	Dwell in milli-Sec
1	<input checked="" type="checkbox"/>	16,400.00	0.0
2	<input checked="" type="checkbox"/>	16,200.00	0.0
3	<input checked="" type="checkbox"/>	16,000.00	0.0
4	<input checked="" type="checkbox"/>	15,800.00	0.0
5	<input checked="" type="checkbox"/>	15,600.00	0.0
6	<input checked="" type="checkbox"/>	15,400.00	0.0
7	<input checked="" type="checkbox"/>	15,200.00	0.0
8	<input checked="" type="checkbox"/>	15,000.00	0.0
9	<input checked="" type="checkbox"/>	14,800.00	0.0
10	<input checked="" type="checkbox"/>	14,600.00	0.0
11	<input checked="" type="checkbox"/>	14,400.00	0.0
12	<input checked="" type="checkbox"/>	14,200.00	0.0
	<input type="checkbox"/>		

Synthesizer List

DL All Upload All

DL Range Start End Erase All

DL Changed Upload Rng

Computer

Save To Disk

Clear Grid

Load From Disk

Home List Mode List Management Sweep Mode Setup/Status

Synthesizer Sweep Mode Control

Start Frequency MHz

Stop Frequency MHz

Increment Frequency MHz

Dwell Time mS

Run Count

Sweep Direction

Sweep Up

Sweep Down

Sweep Up/Down

Increment Control

Hardware Trig

Software Delay

Run Continuous

Home List Mode List Management Sweep Mode Setup/Status

Synthesizer List Mode Control

Frequency MHz

Dwell Time mS

Global Current Entry

List#

Run Count

Run Continuous

RF Output On Off

Step Control

SW Delay

HW Trigger

Step Direction

Step Up

Step Down

Step Up/Down

SW Delay Source

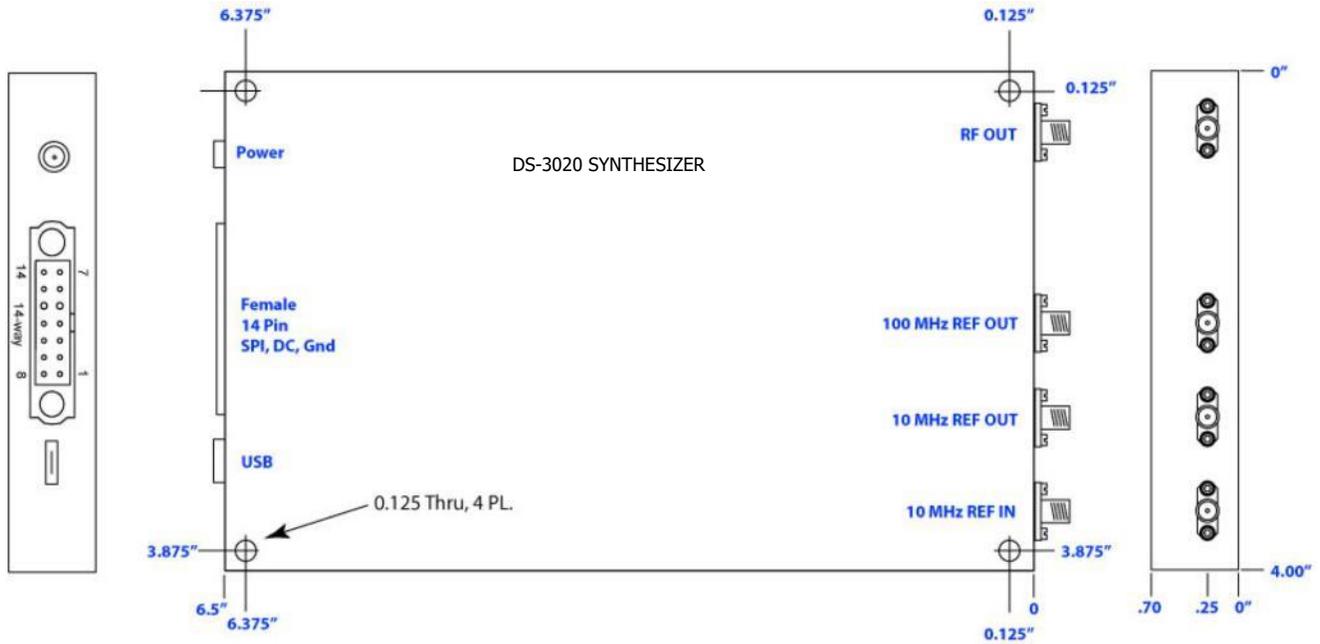
Global Delay

Indv. Delay

ORDERING INFORMATION

Model	Description
DS-3020	DS-3020 with "Ultimate" Phase Noise profile and stability
Option - SK	Optional Shock Mount Kit
Option - HS	Heatsink and Mount Kit
Option - CAB	Custom Cable Kit

DS-3020 OUTLINE DRAWING



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