PicoSource® AS108

8 GHz Agile Synthesizer

Professional and portable performance at low cost

300 kHz to 8 GHz operation
−15 dBm to +15 dBm dynamic range
Fast 55 µs frequency settling time to 10 ppm
Fast amplitude settling: < 25 µs to 1 dB and < 200 µs to 0.1 dB
Sweep, hop and list frequency and level or list phase and level
−100 dBc/Hz phase noise typical at 1 GHz and 10 kHz offset
FM, PM and AM modulation, internal sine or external input
Configurable stand-alone operation mode
External reference clock I/O and trigger I/O
Compact, portable and 12 to 15 V DC powered

Use sweep lists to emulate schemes such as QPSK, QAM, ASK, FSK
Adjustable dwell and trigger sweep or trigger next point modes
Work in and convert units of measure to suit application
Programming examples for LabVIEW, C, C#, Python, MATLAB
Suited to bench, field and system integration applications
USB-controlled from Windows PC and display or tablet
Touch, mouse, keyboard or remote interface software (API included)
Multi-unit operation with synchronized modulation, sweeps, hops and lists

www.picotech.com

Product overview – PicoSource AS108 Agile Synthesizer

The PicoSource™ AS108 Agile Synthesizer generates signals to meet the needs of both benchtop and integrated module applications. Its broad 300 kHz to 8 GHz frequency range, fast settling and programmable phase, frequency and amplitude match it to a wide range of applications, with the added advantages of low cost, small footprint and 12 to 15 V power requirement. The AS108 has professional-grade performance that is effective in both static and parameter-agile applications, making it a bench or field instrument for developers, scientists, educators, students, and service and installation technicians. Its speed, external clock referencing, trigger capabilities and user programmable power-up mode all suit it to system integrations such as automated test, unmanned installations and multi-signal stimulus.

The AS108 is a full-function USB controlled vector (IQ) modulating signal synthesizer. It is supplied with a clean, easy and efficient user interface for controlling its amplitude, frequency and phase agility; including modulations, sweeps, hopping and list modes from Microsoft Windows. Multiple synthesizers can be controlled from multiple instances of the software running on a single controlling PC or device. Remote control is also possible using the API included.

PicoSynth 2 software

The PicoSynth 2 software presents a clean, efficient, touchscreen-compatible user interface for direct and convenient access to synthesis parameters. These can be typed, scrolled or stepped by a configurable increment value, in a selectable unit of measure such as dBm, mW, V RMS, V pk-pk or degrees & radians. Its flexibility matches or exceeds that of the traditional control panel of a benchtop synthesizer.

The controls are presented in three independent parameter tabs, each of which holds separate settings for convenient switching of functionality:

- Carrier wave and basic modulations
- Sweep or hopping of parameters
- Arbitrary list of parameters

Carrier wave and basic modulations

Set carrier wave frequency, level and phase using typed values or scrolled digits, or by stepping by an increment of your choice, and then enable the output.

When required add frequency (FM), phase (ØM or PM) or amplitude (AM) modulation using internal sine modulation synthesis or an external DC-coupled source connected to the front-panel BNC interface. Modulations are derived from digital IQ modulation and the external trigger output (rear-panel BNC) is synchronous with the internal modulation source.

Three independent parameter tabs
Fast and convenient switching between CW, sweep/hop and list modes.

Carrier wave control parameters
Type values, scroll digits or step by selected amount

Modulation controls
Type, source and enable

Internal modulation source parameters
Frequency and depth

Typed entry of parameters
With relevant standard multipliers

Selectable units of measure
Work in or convert to your chosen units of measure

Sweep or hop parameters

Set up sweeps and hops between two parameter values: start of sweep and end of sweep (stop). Either can be the higher value. Set the number of points in a sweep (between 2 and 10,001 points). The dwell time then defines a duration for which each point in the sweep will be output. PicoSynth calculates and displays the duration of the whole sweep and the linear step size between each point. A bidirectional sweep will sweep from the start to stop and back to start in completing a single sweep of the parameter. A hop is a limited case of sweep in which there are only two parameter values that are alternately output.

The AS108 can sweep or hop the frequency, level or phase parameter. It can also sweep or hop two parameters at the same time: frequency and level, or phase and level. This allows, for instance, a simple linear flatness or loss-compensating profile to be applied to a sweep or hop, perhaps increasing output level as frequency increases. The example shown applies a 5 dBm increase in level as the frequency sweeps from 1 GHz to 2 GHz.

Sweeps and hops can be synchronized to external events and instruments using the external trigger input and output (rear panel BNCs) or software trigger. Trigger occurs at, or initiates, a sweep start or next point in sweep. This synchronization flexibility can be of particular value to high-speed system sequencing in, for example, high-speed test.

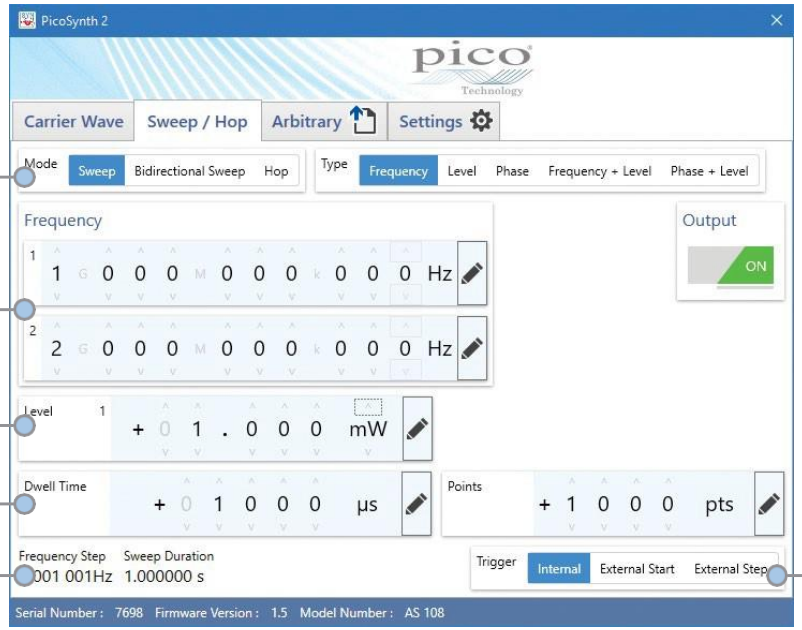
Select sweep or hop mode and type
Single and dual parameter

Frequency start and stop values

Level start and stop values

Set number of sweep points and the dwell period between them

Resulting step sizes and sweep duration

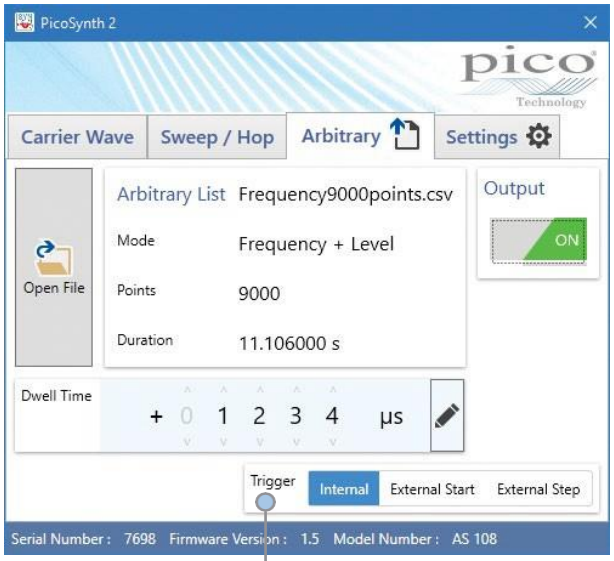


Synchronize the sweep to a trigger
Internal clock, external input or software trigger sources. Trigger a sweep or trigger next point in sweep.

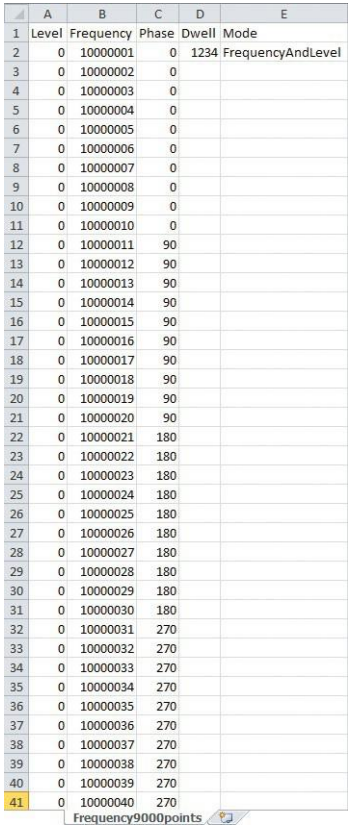
Arbitrary parameter list

Import a parameter list file to generate an arbitrary sequence of frequency/level or phase/level points. The file is in a straightforward comma-separated values (CSV) format that you can create using any text editor or export from a spreadsheet program.

PicoSynth 2 shows a summary of the file contents to help you verify that you have selected the correct file. You can program the dwell time (time between points) and trigger mode.



Trigger mode
Internal: run continuously with the specified dwell time.
External Start: run the whole file, with the specified dwell time, after each trigger event.
External Step: generate one point for each trigger event (ignoring dwell time setting).



	A	B	C	D	E
1	Level	Frequency	Phase	Dwell	Mode
2	0	10000001	0	1234	FrequencyAndLevel
3	0	10000002	0		
4	0	10000003	0		
5	0	10000004	0		
6	0	10000005	0		
7	0	10000006	0		
8	0	10000007	0		
9	0	10000008	0		
10	0	10000009	0		
11	0	10000010	0		
12	0	10000011	90		
13	0	10000012	90		
14	0	10000013	90		
15	0	10000014	90		
16	0	10000015	90		
17	0	10000016	90		
18	0	10000017	90		
19	0	10000018	90		
20	0	10000019	90		
21	0	10000020	90		
22	0	10000021	180		
23	0	10000022	180		
24	0	10000023	180		
25	0	10000024	180		
26	0	10000025	180		
27	0	10000026	180		
28	0	10000027	180		
29	0	10000028	180		
30	0	10000029	180		
31	0	10000030	180		
32	0	10000031	270		
33	0	10000032	270		
34	0	10000033	270		
35	0	10000034	270		
36	0	10000035	270		
37	0	10000036	270		
38	0	10000037	270		
39	0	10000038	270		
40	0	10000039	270		
41	0	10000040	270		

Frequency9000points

Save, recall and other settings

Parameter step increment values and the saving and recall of user settings are addressed under the **Settings** tab.

You can also save to the device a modified or custom power-up setting, allowing the signal source to power up in a known state without further connection or control over USB.

Frequency step size
Used by frequency up/down controls

Level step size
Used by level up/down controls

Phase step size
Used by phase up/down controls

Remote control operation

The PicoSource AS108 is supplied with a DLL that allows you to control the device from C and C-compatible languages and applications such as C++, C#, Python, Keysight VEE, National Instruments LabVIEW and MathWorks MATLAB.

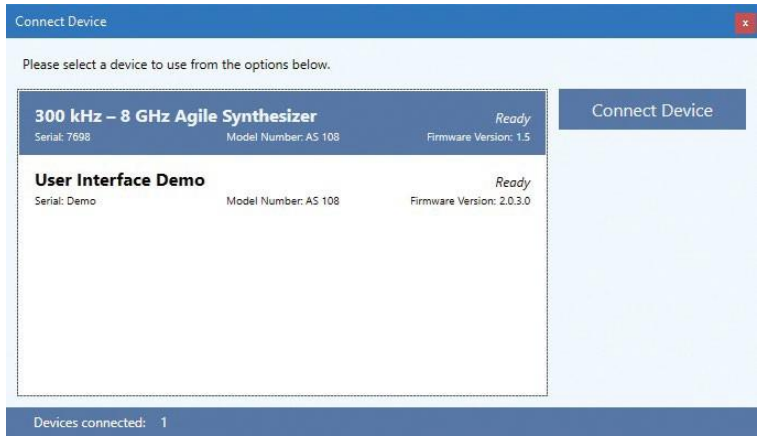
See the *PicoSource AS108 Programmer's Guide* for details.

Multiple device operation

You can control multiple AS108 signal synthesizers from a single PC by running multiple instances of the PicoSynth 2 software. Each time you start a new instance of PicoSynth 2, it will list all compatible connected devices that are not yet being controlled. You can then select any device in the list for connection.

Demonstration mode

The "User Interface Demo" device is always available in this list and allows PicoSynth 2 to run for demonstration purposes without a connected device. You can use this mode to try out the software before buying a device. The software is available for download and trial at www.picotech.com.

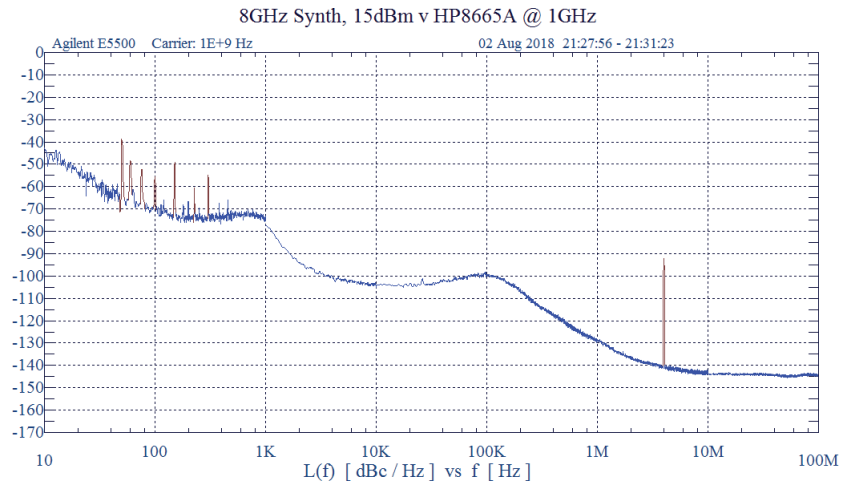


Pack contents

Your PicoSource AS108 8 GHz Agile Synthesizer pack contains the following items:

PicoSource AS108 8 GHz Agile Synthesizer	
Quick start guide	
Inter-series adaptor 18 GHz 50 Ω SMA(f)-N(m)	
PicoWrench RF combination wrench	
12 V power supply, universal input	
USB cable, 1.8 m	
Carry case	

Specifications

General			
Standard conditions are ambient temperature of between 15°C and 30°C, 20 minutes after power-up.			
Carrier wave			
Frequency range	300 kHz to 8.192 GHz		
Frequency resolution	300 kHz to 125 MHz > 125 MHz to 4 GHz > 4 GHz	1 Hz 10 Hz 20 Hz	
Frequency settling time	to ±10 ppm	55 µs maximum	50 µs typical
Frequency accuracy (internal reference)	±5 ppm		
Output power range	−15 dBm to +15 dBm		
Output power resolution	0.1 dBm		
Output power setting accuracy	±1.5 dB		
Output match (VSWR)	1.8:1 maximum	1.4:1 typical	
Output amplitude settling time	to ±1 dB to ±0.1 dB	25 µs maximum 200 µs maximum	
Output protection	25 V DC peak and 20 dBm		
Phase noise at 10 kHz offset	1 GHz 2 GHz 4 GHz 8 GHz	−98 dBc/Hz maximum −94 dBc/Hz maximum −88 dBc/Hz maximum −83 dBc/Hz maximum	−100 dBc/Hz typical −96 dBc/Hz typical −90 dBc/Hz typical −85 dBc/Hz typical
			Measured phase noise at 1 GHz

Harmonics	−20 dBc maximum	−26 dBc typical		Output power set to +10 dBm
Sub-harmonics	−40 dBc maximum	−46 dBc typical		Output power set to +10 dBm
Spurious	−50 dBc maximum	−60 dBc typical		Output power set to +10 dBm
Sweep, hop and list modes				
Sweep, hop or list parameters	Frequency, level, phase, frequency and level, phase and level			
Discrete sweep or list points	2 to 10 001 (or 2 to 1750 points when saving power-up settings to device)			Hop is a special case of sweep with only two points.
Frequency stepping dwell time	27 µs to 65 500 µs (or 27 µs to 1750 µs when saving power-up settings to device)			Excepting any step exceeding ±2.2 GHz to or from the frequency band 7.0 GHz to 8.0 GHz, minimum dwell 100 µs.
Modulation				
Frequency range internal sine source	10 Hz to 5 kHz			
Internal modulation sample rate	37 kS/s			Sampled sideband spurs are generated at 37 kHz offset. At 1 kHz modulation typically < –30 dB relative to sidebands.
Frequency resolution and accuracy	1 Hz resolution ± 0.1% accuracy			
AM depth range	For carrier at 0 dBm 0 dBm to 9 dBm	5% minimum 5% minimum	90% maximum 50% maximum	
FM deviation	2% carrier frequency or 200 kHz maximum			
PM deviation	±180°			
External modulation input bandwidth	DC coupled to 10 kHz			
External modulation input sampling	AM: 125 kS/s. FM / PM: 89 kS/s at 12-bit resolution.			Sampled sideband spurs are generated at 125 / 89 kHz offset. At 1 kHz modulation typically < –50 dB relative to sidebands.
External modulation input sensitivity	BNC(f) 600 Ω ±1 Vpk typical			for selected depth or deviation
External modulation input protection	±5 V DC + AC peak			

Synchronization I/O				
Internal 10 MHz reference output	BNC(f) 50 Ω	−3 dBm minimum	0 dBm typical	Into 50 Ω
External reference input	BNC(f) 50 Ω	−6 dBm sensitivity	6 dBm maximum	
External reference lock range	±5 ppm			
Trigger input threshold voltage	BNC(f) 1 kΩ	0.5 V minimum	2.6 V maximum	
Trigger output logic levels	BNC(f)	Low 0.5 V maximum	High 3.6 V minimum	Into 1 kΩ
		Low 0.2 V maximum	High 1.2 V minimum	Into 50 Ω
Trigger output rise and fall times	40 ns maximum			Into 50 Ω
Trigger in to trigger out delay	0.5 ± 0.1 µs			Gives a lead of 17.5 µs to frequency / phase step, 37.5 µs to a level step.
Trigger out to triggered event delay	17.5 µs typical			Frequency or phase step
	37.5 µs typical			Level step
	Note that dwell period holds off (prevents receipt of) a further trigger			

Miscellaneous and environmental specifications		
Power requirements	+12 V to +15 V DC, 12 W, 2.1 mm jack, centre pin positive	
Control interface	USB 2.0	
Dimensions	W 173 mm x L 232 mm x H 56 mm	Excluding connectors
Weight	1.78 kg	
Operating environment	+5 °C to +40 °C, 80% RH non-condensing, Pollution Degree 2	
Storage environment	−20 °C to +50 °C, 80% RH non-condensing, Pollution Degree 2	
Vibration	0.5 g, 5 Hz to 300 Hz	
Safety	Declared conforming to: EN 61010-1:2010 and EN 61010-2-030:2010 Safety requirements for electrical equipment for measurement, control and laboratory use, general requirements and for testing and measuring circuits.	
EMC	Declared conforming to: EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements. Group 1, Class B. (Emissions) EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements. Basic Environment. (Immunity) EN 61326-2-1:2013 Part 2-1: Test configurations, operational conditions and performance criteria for sensitive test and measurement equipment for unprotected applications. CFR 47 Code of Federal Regulations FCC: part 15 Subpart B – Frequency devices – unintentional radiators. Radiated emissions standard. Class A.	
Warranty	3 years	
ECCN coding	EAR99	

Ordering information

Order code	Description
PQ163	PicoSource AS108 8 GHz Agile Synthesizer
TA314	Inter-series adaptor 50 Ω SMA(f)-N(m)
TA181	Attenuator 3 dB 10 GHz 50 Ω SMA(m-f)
TA261	Attenuator 6 dB 10 GHz 50 Ω SMA(m-f)
TA262	Attenuator 10 dB 10 GHz 50 Ω SMA(m-f)
TA173	Attenuator 20 dB 10 GHz 50 Ω SMA(m-f)
TA265	Precision sleeved coaxial cable 30 cm 1.3 dB at 13 GHz
TA312	Precision sleeved coaxial cable 60 cm 2.2 dB at 13 GHz
TA358	Dual-break torque wrench N-type 1 N·m / 8.85 in·lb
TA356	Dual-break torque wrench SMA / PC3.5 / K-type, 1 N·m / 8.85 in·lb

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PicoSource PG900 Series
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pulse generators

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6 and 8.5 GHz
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