NOVATECH INSTRUMENTS, INC.

100MHz DDS Signal Generator

Model 2908A

The Model 2908A is a 100MHz DDS Signal Generator in a table top instrument case. The 2908A generates Cosine, Sine and ACMOS/TTL output signals simultaneously up to 100MHz in 1µHz steps using the 1ppm internal TCXO. The 2908A can also use an external frequency source to provide customer desired frequency range and accuracy. The 48-bit internal resolution allows fractional frequency errors of less than $1x10^{-12}$ when using an external clock input. Phase can be set with 14-bit resolution. Simple RS232 commands allow setting of all parameters, which can be saved in nonvolatile memory. Windows™ software provided.

Specifications:

OUTPUT

TYPES: COS, SINE and ACMOS/TTL simultaneously.
IMPEDANCE: 50Ω
RANGE: 100Hz to 100MHz in 1µHz steps (internal clock); 48-bit resolution.
FLATNESS: +/-3dB from 100Hz to 100MHz referenced to amplitude at 15MHz, +/-1dB from 18-28 ^{o}C.

COSINE/SINE AMPLITUDE

Approx. +13dBm (1.0Vrms) into OC, +7dBm into 50Ω.

ACMOS/TTL AMPLITUDE

V_{OL}<0.5V, V_{OH}>3.0V into a series terminated 30pF load. $T_{r,f}$ <5ns. Duty Factor: 45-55%. 50Ω.

CONTROL

RS232 on rear panel. Rear Panel switch selects clock source. Windows serial control software supplied. Optional rear-panel cable allows control of FSK, BPSK, Chirp and Byte-parallel modes. See overleaf for Modes.

ACCURACY AND STABILITY

On-board TCXO gives <+/-1ppm at 18-28 ^{o}C. Stable to an additional +/-1ppm per year, 18-28 ^{o}C.

EXTERNAL CLOCK INPUT

LEVEL: 0.35-2.5Vrms Sine or Square Wave can be applied to the EXT CLK Input BNC. 50Ω
FREQUENCY: 5MHz to 30MHz with on-board programmable multiplier from 4 to 20 enabled. Multiplier can be bypassed for up to 300MHz direct input.

SPECTRAL PURITY (Typ. 50Ω load)

Phase Noise: <-120dBc, 10kHz offset, 5MHz out.

Spurious:	<-60dBc below 10MHz (typ. 200MHz span)
	<-50dBc below 20MHz
	<-45dBc below 50MHz
	<-40dBc below 100MHz
Harmonic:	<-70dBc below 1MHz
	<-60dBc below 10MHz
	<-50dBc below 20MHz
	<-40dBc below 50MHz
	<-35dBc below 100MHz

POWER REQUIREMENTS

120/240VAC, 15VA Max. 50/60Hz.

ENVIRONMENTAL

Temperature: +5^{o}C to +40^{o}C operating.
Humidity: 80% to 31^{o}C, decreasing linearly to 50% at 40^{o}C.

SIZE

6.4cm H, 18.5cm W, 24.1cm L. 2.5kg.

CONNECTORS

BNCs for COSINE, SINE & ACMOS/TTL OUTs, EXT CLK IN and CLK OUT. 9-pin DE9F for RS232. Optional 24-pin control cable.

ACCESSORIES

Optional USB to RS232 adapter.

30-Jul-2001

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RS232 Serial Commands

RS232 Command	Function
F0 XX.XXXXXXXXXXX	Set Frequency in MHz to nearest 1µHz. Decimal point required.
F1 XX.XXXXXXXXXXX	Start Frequency in MHz to nearest 1µHz. Decimal point required. Same as F0 if Mode 0 is selected.
F2 XX.XXXXXXXXXXX	Stop Frequency in MHz to nearest 1µHz. Decimal point required. Modes 1 and 2.
Fd XX.XXXXXXXXXXX	Delta Frequency in MHz. Software sets to nearest 1µHz. Decimal point required.
E x	x=D for Echo **D**isable, x=E for Echo **E**nable
Q x	x=D for Q-channel **D**isable, x=E for Q-channel **E**nable
R	Reset. This command resets the DDS8m. EEPROM data is preserved and, if valid, is used upon restart. This is the same as cycling power.
CLR	Clear. This command clears the EEPROM valid flag and restores all factory default values.
Px N	Set Phase. N is an integer from 0 to 16383. Phase is set to N*360^o/16384 or N*π/8192 radians. Sets either the phase P1 or P2 depending upon the value of x (1 or 2). The I and Q outputs are always nominally 90^o. In Mode 0, this sets the static phase. In Mode 4, the phase is either P1or P2 depending upon the state of Pin 8 of the parallel connector.
A x	x=E for ACMOS/TTL **E**nable, x=D for ACMOS/TTL **D**isable
S	Saves current state into EEPROM and sets valid flag. State used as default upon next power up or reset. Use the "CLR" command to return to default values.
QUE	Return present frequency, phase and status. Returns an 80-character string of all internal settings: hexadecimal format. See Table 7.
M N	Mode command. N is 0, 1, 2, 3 or 4. 0 is Single Tone, 1 is FSK (pin 8 of parallel port is active), 2 is Triangular Ramped Frequency, 3 is Chirp Frequency and 4 is BPSK (pin 8 is active). Defaults to Mode 0 upon turn-on, unless another mode is saved. See Appendix A.
Td N	Time at each Fd (see Appendix A). N is an integer from 0 to a maximum value of 2^{20}-1 or 1048575. Applies to modes 2 and 3 only. Approximately 3.5ns increments using internal clock. In mode 2, frequency ramps from F1 to F2 and returns to F1 continuously in steps of Fd at time intervals of Td.
Tr N	Repeat time in mode 2 and 3. In mode 3, the frequency will ramp starting at F1 in steps of Fd, at time intervals Td, until Tr times out, repeating continuously from F1. N is an integer between 5 and 2^{32}-1 (4294967295). Approximately 7.0ns increments with the internal clock. A 3.3V CMOS level pulse at the start of each ramp is provided on Pin 10 of the parallel I/O connector. Approximately 40ns (8 system clocks) wide for the internal clock. In Mode 2, Tr sets the timing of an external trigger pulse on Pin 10 of the parallel interface.
Vx N	Set voltage level of output. In default, the amplitude is set to the maximum: approximately +7dBm into 50Ω. N can range from 0 (off) to 4095 (no decimal point allowed). Voltage level is scaled to N/4096. x is I or Q to set the amplitude on the I or Q channel. If N >4095, the scaling is turned off and both outputs are set to maximum. Overrides the "Z" command.
Kp aa	Set PLL reference multiplier constant. Must be one Hex byte as two characters. Legal values are 1 (bypass PLL) and 4 to 20 (01_h, 04_h to 14_h).
Z N	Turns on 30% Amplitude Modulation of Cosine (I) channel output. N is the frequency of modulation in 100Hz steps, 900Hz maximum (9). N = 0 turns off modulation. Use of this command overrides the V command on the I channel. Entering any "M" command turns off modulation.
B aadd	Set a data byte "dd" at address "aa" in Hex. Allows setting of all internal registers. "aa" is in the range of 00_h to 27_h while "dd" is from 00_h to ff_h. No error checking, other then correct format, is performed. It is possible to set the DDS8m into a nonfunctional state requiring a power cycle to recover with this command. Some internal modes may require excessive power and may permanently damage the DDS8m (for debugging).