

I N T R O D U C T I O N

The Model 4000 & 4500 Picosecond Step Generators produce extremely fast, high amplitude step function pulses. They are completely solid-state using avalanche transistors and step-recovery diodes. They are available in two options. Option -01 produces a 25V step with a 100ps transition duration time (10%-90% risetime). Option -04 produces a 15V step with a 65ps transition duration time. These generators were originally designed for use in measuring the step response of wide-band networks and instruments such as coaxial cables and traveling wave oscilloscopes. The design goal was to build an extremely stable pulse generator which produced a very clean step function. Option -01 produces a clean step with a near Gaussian like transition and a very flat topline with less than $\pm 2\%$ topline perturbations. Option -04 produces a faster transition duration at the expense of increased baseline and topline perturbations. The duration of the step is 10ns which is usually sufficient for the characterization of very broad-band systems. It is not intended that the step be used for measurement times longer than 10ns. After 10ns, the output pulse has a ragged falling edge waveform with a slow 2nd transition duration of 35ns.

These generators are complete instruments including regulated power supplies, internal rep. rate clock, trigger and step output circuits. They can be operated at repetition rates from single shot up to 100 kHz and also driven by an external TTL sync pulse. A trigger output pulse is provided in addition to the step pulse output. The delay between the trigger and the step output is fixed at 100ns. It features a timing jitter of less than 10ps.

The Models 4000 & 4500 are identical with the exception that the 4500 includes step attenuators. The attenuators provide 0 to 69dB of attenuation in 1dB steps. The attenuators are microwave quality and rated from dc to 18 GHz. The generators are built in a standard 19" wide cabinet. Removeable front panel handles and rack mounting hardware are furnished with them.

NOTE: Model 4000, S/N 1 - 7 & Model 4500, S/N 1 only.

These generators produce a step duration of 20ns. Their final step recovery diode is directly connected to the output connector. As a result they must be terminated in a 50 Ohm, dc, termination to produce the proper step pulse and meet their specifications. In addition no external dc baseline offset is allowed. Generators with later S/Ns include a dc blocking capacitor to isolate the final step recovery diode from external load conditions. Due to the sag introduced by the dc blocking capacitor, the step duration of these generators was reduced to 10ns to meet the step flatness specs.

P I C O S E C O N D P U L S E L A B S , Inc.

MODEL 4000 & 4500, Option -01

P I C O S E C O N D S T E P G E N E R A T O R

SPECIFICATIONS: [1]	Nominal	Limits
AMPLITUDE into 50 OHMS:	27 V	23 V
TRANSITION DURATION: (10%-90% risetime)	100 ps	120 ps
TOPLINE DURATION (98%):	12 ns	> 10 ns > 20 ns [2]
OVERSHOOT:	2%	3%
TOPLINE PERTURBATIONS (<1.5ns):	< +- 2%	+ - 3%
(1.5ns < t < 10ns):	< +- 0.5%	+ - 2%
(1.5ns < t < 20ns):		+ - 2% [2]
BASELINE PRECURSOR:	< 1%	2%
2ed TRANSITION DURATION:	35 ns	
SOURCE IMPEDANCE:	50 Ohms	
BASELINE:	0 V -0.9 V [2]	
EXT. DC OFFSET PERMITTED:	Model 4000 +- 50 V Model 4500 +- 8 V [2] none permitted.	
STEP ATTENUATORS: (Model 4500 only)	0 to 69dB in 1dB steps, 50 OHMs, dc to 18GHz. VSWR < 1.2, dc to 4GHz, < 1.5 to 18GHz. Accuracy: +-0.5dB for 1 to 9dB & 10dB to +-1.5dB at 60dB.	

[1] NOTE: For Model 4000, S/Ns 1 to 7, the output must be terminated in 50 Ohms d.c. for proper operation.

[2] Only for Model 4000-01, S/N 1 - 7.

P I C O S E C O N D P U L S E L A B S , Inc.

MODEL 4000 & 4500, Option -01

P I C O S E C O N D S T E P G E N E R A T O R

SPECIFICATIONS: [1]	Nominal	Limits
AMPLITUDE into 50 OHMS:	27 V	23 V
TRANSITION DURATION: (10%-90% risetime)	100 ps	120 ps
TOPLINE DURATION (98%):	12 ns	> 10 ns > 20 ns [2]
OVERSHOOT:	2%	3%
TOPLINE PERTURBATIONS (<1.5ns):	< +- 2%	+ - 3%
(1.5ns < t < 10ns):	< +- 0.5%	+ - 2%
(1.5ns < t < 20ns):		+ - 2% [2]
BASELINE PRECURSOR:	< 1%	2%
2ed TRANSITION DURATION:	35 ns	
SOURCE IMPEDANCE:	50 Ohms	
BASELINE:	0 V -0.9 V [2]	
EXT. DC OFFSET PERMITTED:	Model 4000 +- 50 V Model 4500 +- 8 V [2] none permitted.	
STEP ATTENUATORS: (Model 4500 only)	0 to 69dB in 1dB steps, 50 OHMs, dc to 18GHz. VSWR < 1.2, dc to 4GHz, < 1.5 to 18GHz. Accuracy: +-0.5dB for 1 to 9dB & 10dB to +-1.5dB at 60dB.	

[1] NOTE: For Model 4000, S/Ns 1 to 7, the output must be terminated in 50 Ohms d.c. for proper operation.

[2] Only for Model 4000-01, S/N 1 - 7.