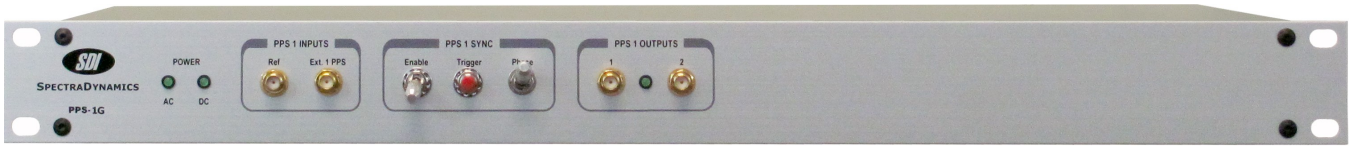
SPECTRADYNAMICS, INC



PPS-1G
1GHz PPS GENERATOR
OPERATING MANUAL

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PPS-1G, 1GHz PPS Generator Operating Manual

PPS-1G:R00-2024

Contents

1.0 Introduction

The PPS-1G is a 1 pulse-per-second (1 PPS) generator. This instrument requires a sine-wave input signal of 1 MHz, 5 MHz, 10 MHz,100 MHz or 1 GHz to generate the 1 PPS.

The PPS-1G generates 1 pulse-per-second outputs with variable pulse width. The input frequency and pulse width may be configured by internal DIP switch settings. The 1 PPS output can be synchronized to an external event. The outputs are designed to drive low impedance loads and long 50 or 75-ohm cables. The channel-to-channel delay differences are less than 1 ns.
Other PPS options:

Product Name	Enclosure	Description
PPS-2	2U Half-rack	One generator, Front panel connectors
PPS-2RM-A*	1U Full-rack	One generator, Rear panel connectors
PPS-2RM-B*	1U Full-rack	Two generators, Rear panel connectors
PPS-2RM-B1*	1U Full-rack	Two generators, Front panel connectors

* 24 VDC option is available for this unit

2.0 Safety and Preparation for Use

The PPS-1G was designed for indoor use only and is not intended for operation outdoors or in a wet environment. The instrument may be mounted in a standard 19-inch instrumentation rack or may be used on a laboratory bench. Inspect the instrument and power cords for damage before first use.

2.1 Electrical safety and preparation for use.

Voltages capable of causing injury or death are present in this instrument. Use extreme caution whenever the instrument cover is removed.

Line Voltage

This instrument is designed to operate with a 100 to 240 VAC, 47 to 63 Hz power source. With the DC24 option installed, this instrument is also capable of operating with a DC power source that can supply +12 to +36 VDC at + 2 Amperes.

Fuse

A 2.0 Ampere 250V 5X10mm slow-blow fuse is used for 100-240 VAC operation.
A 2.0 Ampere 250V 5X10mm slow-blow fuse is used for DC power operation.
Only replace fuses with the same type and specifications.

AC Power

The instrument has a detachable three wire power cord for connection to a grounded AC power source. The enclosure of the unit is directly connected to the outlet ground to protect against electrical shock. Always use an outlet with a protective ground and do not disable this safety mechanism. Detaching the AC power cord is the only option of disconnecting the unit from the AC mains supply. Make sure you have access to the rear panel or provide an external accessible AC disconnect means for your PPS-1G.

DC Power

The PPS-1G may contain a +24 VDC redundant power module to allow the instrument to be powered by a +24 VDC source in case of loss of the main AC power. The switch from AC to DC supply operation is affected by a Schottky diode network and charge storage capacitors to ensure glitch free operation. The +24 VDC may be used as backup power to prevent loss of signal during power outages or as a mains supply source.

If the PPS-1G was acquired with the +24 VDC power option a 6 pin DC connector will be available on the back panel.

2.0 Safety and Preparation for Use

The configuration of the DC connector, if available, is as follows:
Pin 1 NC
Pin 2 NC
Pin 3 NC
Pin 4 +12 to +36 VDC power return
Pin 5 +12 to +36 VDC power
Pin 6 Chassis GND /Earth GND

Verify that the connector of the external DC power supply providing voltage to the unit has the same pin configuration mentioned above. Do not apply AC voltage to the DC power connector. Failure to follow these directions may cause injury or death to personnel, cause irreparable damage to the instrument and voids all warranties.

Please note that the power return (pin 4) is NOT connected to the instrument case ground internally, however both ground connections (pin 4 and pin 6) are available at the DC power connector and may be connected together at this point.

The following specifications should be used to ensure the optimum performance for the PPS-1G:

DC Supply voltage	+12 to +36 VDC, 2 Amps
Line regulation	+/- 0.05% for a 10% line change
Load regulation	+/- 0.05% for a 50% load change
Output ripple	< 5 mV peak-to-peak

Detaching the DC power cord is the only option of disconnecting the unit from the DC mains supply. Make sure you have access to the rear panel or provide an external accessible DC disconnect means for your PPS-1G.

2.2 Instrument safety and preparation for use.

Reference Frequency Settings
The PPS-1G may be configured to operate with a 1 MHz, 5 MHz, 10 MHz , 100 MHz or 1GHz frequency reference. **The default reference frequency setting for the unit is 1 GHz**. To change the input reference frequency, the unit must first be unplugged from the power source(s). Remove the top cover of the instrument. Locate the aluminum bracket with access to the DIP switch. Modify the setting to reflect the selection of your choice following the table on the next page. Replace the top cover of the instrument and connect to the power source. The unit should power up with the new reference frequency setting. Place the Phase switch in the position that minimizes the synchronization error. The synchronization error should always be measured after each synchronization. This error will always be less than 20 ns for either a Phase UP or a Phase DOWN switch position.

2.0 Safety and Preparation for Use

Reference Frequency DIP Switch Configuration

DIP SW 3	DIP SW 7	DIP SW 8	FREQUENCY
OFF	ON	OFF	1 MHz
OFF	OFF	ON	5 MHz
OFF	ON	ON	10 MHz
OFF	OFF	OFF	100 MHz
ON	**OFF**	**OFF**	**1GHz**

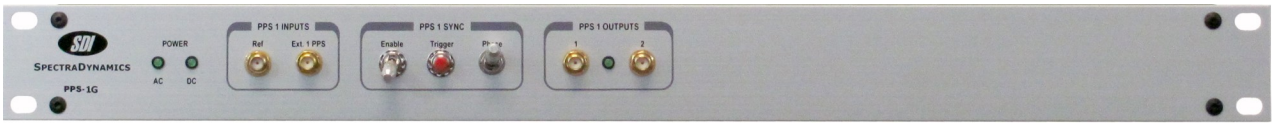
Pulse Width Settings

The PPS-1G pulse generator can be configured for different pulse widths. The default configuration for the unit is a 2.61 us pulse-width when used with a 1 GHz input signal. To change the pulse-width selection, the unit must be unplugged from the power source(s). Remove the top cover of the instrument. Once the cover is removed you will find an aluminum bracket cover in the middle section of the instrument. Locate the DIP switch access port on the aluminum bracket cover. The pulse width of the generator is a multiple of the clock period and can be set according to the table below. Modify the setting and replace the top cover of the instrument. Connect either the AC power or the DC power and the unit will power up with the new pulse width delay settings.

Pulse Delay DIP Switch Configuration

DIP SW 4	DIP SW 5	DIP SW 6	1 MHz pw	5 MHz pw	10 MHz pw	100 MHz and 1 GHz pw
OFF	OFF	OFF	4.096 ms	819.2 us	409.6 us	41 us
ON	OFF	OFF	2.048 ms	409.6 us	204.8 us	20.5 us
OFF	**OFF**	**ON**	**256 ms**	**51.2 us**	**25.6 us**	**2.60 us**
ON	OFF	ON	64 ms	12.8 us	6.4 us	666 ns
OFF	ON	ON	16 ms	3.2 us	1.6 us	185ns
ON	ON	ON	4 ms	0.8 us	0.4 us	64ns

3.0 Front Panel



AC Power
The AC Power LED will turn on when AC power is applied to unit.

DC Power LED - If the instrument was acquired with the DC power option, the DC power LED will light up when DC power is applied to the unit.

PPS 1 INPUTS
Ref - Receives a sine-wave input signal of 1 MHz, 5 MHz, 10MHz, 100 MHz or 1GHz. Power level must be in the range of +5 dBm to + 15 dBm.

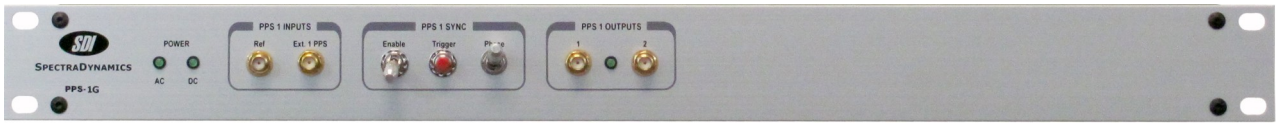
Ext. 1PPS - Receives a 1PPS synchronization input. The 1PPS signal must conform to TTL specifications.

PPS 1 SYNC
Enable - When the switch is positioned to "Enable" selection, the 1PPS output will have the possibility to be synchronized to an external 1 PPS signal. Warning!!! After a synchronization event this switch should be returned to the off or down position to prevent accidental synchronization.

Trigger
When synchronization is enabled and a 1 PPS signal is present on the Ext. 1PPS input the 1PPS synchronization event can be triggered by the push button. Only one synchronization will occur for each trigger.

Phase
Selects the reference clock edge of the synchronization event. The 1PPS will be synchronized to the next reference clock rising edge after the incoming synchronization PPS input when the switch is in the UP position. When the switch is in the DOWN position, the 1 PPS will be synchronized to the reference clock falling edge that occurred before the incoming synchronization PPS input. Warning!!! Toggling the Phase switch will cause loss of synchronization. Select the Phase position that minimizes synchronization errors.

3.0 Front Panel

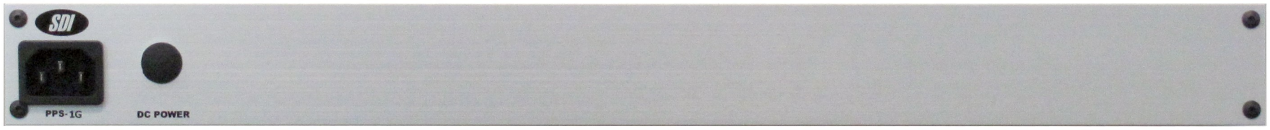


PPS Outputs

1 and 2 - One pulse per second outputs. These outputs provide a 2 volt peak-to- peak signal into a 50 ohm load.

PPS LED - The LED will flash on the rising edge of the 1 PPS output signal from the 1 PPS generator module.

4.0 Back Panel



AC POWER

The PPS-1G is configured to operate on 100 to 240 VAC

DC POWER

If the PPS-1G was acquired with the +24 VDC power option, a DC connector will be available on the back panel, and operation on +12 to +36 VDC will be possible as the main power source or as backup power in case of AC power outages.

5.0 Operation

To operate the PPS-1G, locate the AC power entry module on the rear of the enclosure and/or the DC connector and connect the power cord(s). Plug the unit into appropriate power outlet(s). The LED on the front panel labeled AC will turn on when you apply the AC voltage. If you also apply a DC voltage, the LED labeled DC on the front panel should light up.

Attach an appropriate frequency reference signal to the SMA connector on the front panel labeled Ref. The factory default frequency reference is set to 1 GHz. The unit will generate one pulse per second signals at each of the output ports. An LED on the front panel, in the block labeled PPS OUTPUTS, will flash on the rising edge of each pulse.

To synchronize the output pulses to an external event, connect the external reference pulse signal to the input labeled Ext. 1PPS on the front panel. Enable the synchronization sequence by moving the Enable switch to the Enable position. The Trigger button will arm the synchronization sequence to occur on the next rising edge at the Ext. 1PPS input. Only one synchronization event occurs per push of the Trigger button.

The 1 PPS will be synchronized to the reference clock rising edge after the incoming synchronization PPS input when the switch labeled Phase is in the up position. When the Phase switch is in the down position, the 1 PPS will be synchronized to the reference clock falling edge that occurred before the incoming synchronization PPS input. It is important to turn off the synchronization enable switch by moving it to the down position to disable further inadvertent synchronization events.

6.0 Specifications

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Rise time	10 - 90 %	-	3	4	ns
Fall time	10 - 90 %	-	3	4	ns
Propagation delay	50 ohm load	-	10	12	ns
Differential delay	Channel - Channel	-	200	500	ps
Impedance	input output	- -	50 10	- -	Ohms
Input High Level Input Low Level	Input signal into 50 ohm load Input signal into 50 ohm load	2 -0.7	- -	5 0.8	V
Output High Level Output Low Level	50 ohm load 50 ohm load	2 -	2.4 0.4	- 0.5	V
Input Signal Level	1 MHz, 5 MHz, 10 MHz, 100 MHz and 1 GHz	+5	+7	+15	dBm
External Sync. Error	1 MHz, 5 MHz, 10 MHz 100 MHz and 1 GHz	- -	0.5 +/- 20	- -	Clk period ns
Temperature-delay Coefficient	0 - 50 ºC	-	3	5	ps/ºC

7.0 Warranty and Service

WARRANTY

The PPS-1G is warranted to be free of defects under normal operating conditions, as specified, for one year from date of shipment from SpectraDynamics, Inc (SDI). SDI's obligation and liability under this warranty is expressly limited to repairing or replacing, at SDI's option, any product not meeting the said specifications. This warranty shall be in effect for one (1) year from the date a PPS-1G is sold by SDI. SDI makes no other warranty, express or implied, and makes no warranty of the fitness for any particular purpose. SDI's obligation under this warranty shall not include any transportation charges or costs of installation or any liability for direct, indirect, or consequential damages or delay. Any improper use, operation beyond capacity, substitution of parts not approved by SDI, or any alteration or repair by others in such manner as in SDI's reasonable judgement affects the product materially and adversely shall void this warranty. No employee or representative of SDI is authorized to change this warranty in any way or grant any other warranty.

SERVICE

Do not attempt to service or adjust the instrument unless another person, capable of providing first aid or resuscitation, is present. *Please remember that any alteration or repair may void the warranty.* Contact SDI with any questions or to request an RMA if a repair is needed.

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