SPECTRADYNAMICS, INC

PD-100i
PULSE DISTRIBUTION AMPLIFIER
OPERATING MANUAL

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PD-100i Pulse Distribution Amplifier Operating Manual

PD-100i:R02-2018/LA

Contents

Description

The PD-100i is a high speed pulse signal distribution amplifier that provides distribution for 1 PPS signals and RF signals with a frequency range of 1 to 100 MHz.

The first module receives a 1PPS signal and supplies six buffered outputs designed to drive low impedance loads and long 50 or 75 ohm cables. The outputs provide a 3.7 volt peak-to-peak signal into a 50 ohm load. The channel-to-channel delay differences are less than 200ps. The distribution module has the low temperature coefficient of propagation delay that is essential for the distribution of high quality timing signals.

The second module of the instrument receives a 1-100 MHz signal and provides six buffered square wave outputs. The input to this module does not have to be TTL level logic, the input may be a sinewave or any other signal that needs to be converted to a square wave. The typical cross-channel isolation on the RF distribution modules is 100 dB and reverse isolation is typically greater than 110 dB. The phase noise of the modules is exceptionally low, typically –148 dBc/Hz @ Fourier frequency of 1 Hz and –170 dBc/Hz @ Fourier frequencies greater than 10 kHz. All outputs are DC coupled and conform to TTL specifications.

The PD-100i is designed to be powered by a 100 to 240 VAC mains source or by a +12 to +36 VDC power source if the instrument was acquired with the DC power option. The DC power module may be used as a main power source for the instrument or in conjunction with the AC power module as a backup power supply in case of loss of the main AC power. The instrument is designed to automatically switch from AC to DC supply operation using a Schottky diode network and charge storage capacitors to avoid any glitches and ensure uninterrupted continuous operation.

The requirements for the external DC power supply are +12 to +36 VDC at 2 Amperes. The following specifications should be used to ensure the optimum performance for your PD-100i:

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	< 5mV peak-to-peak

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. This instrument was designed for indoor use only.

Line Voltage
This instrument is designed to operate with a 100 to 240 VAC, 47 to 63 Hz power source. Optional DC operation with +12 to +36 VDC, + 2 Amperes is also possible.

Fuse
A 1.0 Ampere 250V slow-blow fuse is used for 100-240 VAC operation.
A 2.0 Ampere 250V slow-blow fuse is used for +12 to +36 VDC 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 PD-100i.

DC Power
If the instrument was acquired with the DC power module, the DC connector on the back panel has the following configuration:
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 from your DC power supply has the 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

1 PPS Signals

The 1 PPS signal to be distributed should conform to TTL specifications. Make sure you Only apply TTL level (0-5V) signals to the 1PPS INPUT Connector.
Do not apply negative voltages as they will damage the pulse distribution amplifier.

RF Signals

The second module of the PD-100i is designed to distribute RF signals. The recommended input levels are +7 to +20 dBm. Greater power levels will damage the unit and void all warranties. The RF outputs of the PD-100i are DC coupled.

Absolute Maximum Ratings

Input RF Power	+20dBm Maximum
Reverse RF Power	+20dBm Maximum
Voltage at the RF Input	+5 V Maximum
Voltage at the RF Output	+5 V Maximum
Voltage at 1 PPS input	-0.7 VDC to +5.5 VDC
Reverse Voltage at 1 PPS output	-0.7 VDC to +5.5 VDC
DC Supply Voltage	+ 40VDC
Storage Temperature	-10 to +75 ºC
Operation Environment	0 to +50 ºC

Front Panel

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

DC
The DC Power LED is on when DC power is applied to unit.

1PPS
The 1PPS LED flashes on the falling edge of the 1PPS output signal.

CLOCK
The CLOCK LED will be on if an RF signal is present at the CLOCK input.

1PPS OUTPUTS
The pulse distribution module outputs are designed to drive a 50-ohm load.

CLOCK OUTPUTS
Six buffered square wave signals will be provided at the SMA connectors labeled CLOCK OUTPUTS.

Back Panel

AC POWER

The PD-100i is configured to operate on 100 to 240 VAC.

DC POWER

Optional Battery Backup Connector for DC Backup power source.

1PPS IN

The 1 PPS signal to be distributed should be connected to the SMA jack labeled 1 PPS INPUT. The pulse must conform to TTL levels.

CLOCK IN

A 1-100 MHz, +13 dBm signal should be connected to the SMA jack labeled INPUT.

Operation

To operate the PD-100i locate the AC POWER entry module on the rear of the enclosure and/or the DC POWER connector and connect the desired power cord(s). Plug the unit into an appropriate power outlet. If you supply AC power to the unit, the LED on the front panel labeled AC Power will turn on. If you apply DC power to the PD-100i the DC power LED located on the front panel should light up.

1 PPS Clock Signal Distribution

Attach a cable with the signal to be distributed to the SMA connector on the rear panel labeled 1PPS INPUT. The 1PPS LED on the front panel will flash on the falling edge of each output pulse and six buffered outputs will be available at the front panel SMA connectors labeled 1PPS OUTPUTS.

Although the device was designed to distribute precision one pulse per second signals, it may be used to distribute pulses up to a frequency of 100 MHz. The propagation delay is typically 7 ns, and the channel-to-channel delay difference is less than 200 ps.

RF Clock Signal Distribution

Attach a 1-100 MHz +13 dBm signal to the back panel connector labeled INPUT. The CLOCK LED on the front panel will turn on and the buffered square wave outputs will be available on the front panel.

PPS Distribution Module

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Rise time	10 - 90 %	-	0.9	1	ns
Fall time	10 - 90 %	-	0.9	1	ns
Propagation delay	50 ohm load	-	7	8	ns
Differential delay	Channel - Channel	-	100	200	ps
Impedance	input output	- -	50 9	- -	Ohms
Input High Level Input Low Level	Input signal into 50 ohm load Input signal into 50 ohm load	3.7 0	3.8 -	5 0.8	V
Output High Level Output Low Level	50 ohm load 50 ohm load	3.7 -	3.8 0.4	5 0.5	V
Temperature-delay Coefficient	0 - 50 ºC	-	3	5	ps/ºC

CLOCK DISTRIBUTION Module

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Level		7	13	20	dBm
Bandwidth		-	1-100	-	MHz
Impedance	output	-	9	-	Ohms
Rise Time	+13 dBm	-	0.9	1	ns
Fall Time	+13 dBm	-	0.9	1	ns
Isolation	output to output	115	120	-	dB
Phase Noise (Referred to the Input)	1 Hz 10 Hz 100 Hz >10 kHz	- - - -	-148 -163 -168 -170	-145 -160 -165 -167	dBc/Hz
Temperature-delay Coefficient	0 - 50 ºC	-	3	-	ps/ºC

All tests done at 10 MHz and +13 dBm input unless otherwise specified.

Warranty and Service

Warranty

The PD-100i 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 PD-100i 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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