



SPECTRADYNAMICS, INC



**CSDA-1
CLOCK SIGNAL DISTRIBUTION AMPLIFIER
OPERATING MANUAL**

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Description

The CSDA-1 is a high performance clock signal distribution and isolation amplifier that provides distribution for 1 PPS signals and RF signals.

The first module receives a 1PPS signal and supplies five buffered outputs designed to drive low impedance loads and long 50 or 75ohm cables. The outputs provide a 2 volt peak-to-peak signal into a 50 ohm load. Propagation delay through the amplifier is typically 10 ns. The channel-to-channel delay differences are less than 1 ns. The distribution module has the small propagation delay and low temperature coefficient of delay that are essential for the distribution of high quality timing signals.

The second module of the instrument receives a 5 MHz +13dBm signal and provides five buffered outputs of 5 MHz and five 10 MHz outputs by multiplying the input frequency X2. The typical cross-channel isolation on the RF distribution module is 126 dB and reverse isolation is typically greater than 135 dB. The phase noise of the modules is exceptionally low, typically -150 dBc/Hz @ Fourier frequency of 1 Hz and -170 dBc/Hz @ Fourier frequencies greater than 10 kHz. Both the input and output are matched to 50 ohms to obtain better than -25 dB return loss. All outputs are AC coupled and the grounds are DC isolated to reduce the effect of ground loops.

The CSDA-1 is designed to be powered by a 100 to 240 VAC mains source or by a +12 to +36 VDC power source. 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 CSDA-1:

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. 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 CSDA-1.

DC Power

The instrument has a DC connector on the back panel with 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 pow-

Instrument Safety and Preparation for Use

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

Second module of the CSDA-1 is designed to distribute 5 MHz RF signals. Third module of the CSDA-1 doubles the 5 MHz input signal and distributes 10 MHz signals. Output levels below +7 dBm will not trigger the signal detection circuit that turns on the signal monitor LED on the front panel. The recommended level for the 5 MHz input signal is +13 dBm +/- 2 dB .

Input signals must be kept below +20 dBm as greater power levels will damage the unit and void all warranties.

The RF outputs of the CSDA-1 are DC isolated from the chassis ground to prevent ground loops. These outputs are rated to a maximum of +50 V.

Absolute Maximum Ratings

Input RF Power	+20dBm Maximum
Reverse RF Power	+20dBm Maximum
Voltage at the RF Input	+50 V Maximum
Voltage at the RF Output	+50 V Maximum
Input Supply Voltage	+ 20VDC
Storage Temperature	-10 to +75 °C
Operation Environment	0 to +50 °C

Front Panel



AC Power

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

DC Power

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

1PPS

The 1PPS LEDs flash on the falling edge of the 1PPS output signal.

5 MHz

The 5 MHz LED will be on if all RF outputs of the third module are greater than +7 dBm.

10 MHz

The 10 MHz LED will be on if all RF outputs of the third module are greater than +7 dBm.

Back Panel



AC POWER

The CSDA-1 is configured to operate on 100 to 240 VAC.

DC POWER

Optional Battery Backup Connector for DC Backup power source.

1PPS INPUT

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.

1PPS OUTPUTS

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

5 MHz INPUT

A 5 MHz, +13 dBm signal should be connected to the SMA jack labeled 5 MHz INPUT.

5 MHz OUTPUTS

Five buffered signals will be provided at the SMA connectors labeled 5 MHz OUTPUTS.

10 MHz OUTPUTS

Five 10 MHz signals will be provided at the SMA connectors labeled 10 MHz OUTPUTS.

Operation

To operate the CSDA-1 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 also apply DC power to the CSDA-1, 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 corresponding monitor LED on the front panel will flash on the falling edge of each output pulse and five buffered outputs will be available at the 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 50 MHz. The propagation delay is typically 10 ns, and the channel-to-channel delay difference is less than 500 ps.

RF Clock Signal Distribution

Attach a 5 MHz +13 dBm signal to the connector labeled 5 MHz INPUT. The 5 MHz and 10 MHz monitor LED's on the front panel will turn on and the 5 MHz and 10MHz outputs will be available on the back panel.

Specifications

PPS Distribution Module

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	-	50	-	Ohms
	output	-	10	-	
Input High Level	Input signal into 50 ohm load	2	-	5	V
Input Low Level	Input signal into 50 ohm load	-0.7	-	0.8	
Output High Level	50 ohm load	2	2.4	-	V
Output Low Level	50 ohm load	-	0.4	0.5	
Temperature-delay	0 - 50 °C	-	3	5	ps/°C
Coefficient	25 - 35 °C	-	3	-	

5 MHZ RF Module

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Max Input Level	1 dB compression	16	17	-	dBm
Bandwidth	+/- 1 dB	-	1-50	-	MHz
Gain	@ 5 MHz	-	0.5	+/- 0.5	dB
Impedance	Input	-	50	-	Ohms
	Output	-	50	-	
Return Loss	Input(S ₂₂) 5MHz	-	-35	-25	dB
	Output(S ₂₂) 5 MHz	-	-25	-25	
Distortion	+13 dBm	-	-45	-42	dBc
Isolation	Output to output	120	130	-	dB
	Output to input	130	140	-	
Phase Noise	1 Hz	-	-150	-147	dBc/Hz
- Referred to the	10 Hz	-	-160	-157	
Input	100 Hz	-	-170	-167	
	>10 kHz	-	-170	-169	
Temperature-delay	0 - 50 °C	-	3	-	ps/°C
Coefficient	25 - 35 °C	-	1.5	-	

All tests done at 5 MHz and +13 dBm input unless otherwise specified



Specifications

10 MHZ RF Module

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Output Level	5 MHz Input +13dBm	-	14	15	dBm
Bandwidth	+/- 1 dB	0.5	0.6	1	MHZ
Gain	@ 10 MHz	-	0.5	2	dB
Impedance	output	-	50	-	Ohms
Return Loss	output(S ₂₂)	-	-25	-20	dB
Distortion	+13 dBm	-	-45	-42	dBc
Isolation	output to output	120	130	-	dB
Phase Noise Referred to the Input	1 Hz	-	-148	-146	dBc/Hz
	10 Hz	-	-158	-156	
	100 Hz	-	-165	-161	
	>10 kHz	-	-170	-166	
Temperature-delay Coefficient	0 - 50 °C	-	10	-	ps/°C
	25 - 35 °C	-	5	-	

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

Warranty and Service

Warranty

The CSDA-1 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 CSDA-1 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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