SPECTRADYNAMICS, INC.

CLOCK SIGNAL DISTRIBUTION AMPLIFIER
CSDA-1
OPERATING MANUAL

SPECTRADYNAMICS, INC • 1849 Cherry St. Unit 2. • Louisville, CO 80027
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Description

The CSDA-1 is a high performance clock signal distribution and isolation amplifier. The device is used to provide distribution of 1 PPS signals, 5MHz signals and 10 MHz signals. The CSDA-1 contains a pulse distribution module with one input and five buffered outputs that can drive a 50-ohm cable. The second module is a 5MHz distribution amplifier with one input and five outputs. The third module provides five buffered and isolated 10 MHz signals that are derived by doubling the 5 MHz input signal. The channel-to-channel isolation in the RF distribution modules is typically 125 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 –173 dBc/Hz @ Fourier frequency greater than 10 kHz. Both the input and output are matched to 50 ohms to obtain better than 25 dB return loss. All RF outputs are AC coupled and the grounds are DC isolated to reduce the effect of ground loops.

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Safety and Preparation for Use

CAUTION!
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 may be setup to operate on 100-120 or 220-240 VAC and a line frequency of 50 to 60 Hz. **The setup voltage for this CSDA-1 is specified on page 4.**

Fuse
A 0.50 Ampere slow acting fuse is used for 100-120 VAC operation of the PD Module and 1 Ampere slow acting fuse is used for 28 VDC operation.
A 0.25 Ampere slow acting fuse is used for 220 to 240 VAC operation of the PD Module and 1 Ampere slow acting fuse is used for 28 VDC operation.
A 0.50 Ampere slow acting fuse is used for 100-120 VAC operation of the RF Module and 2 Ampere slow acting fuse is used for 28 VDC operation.
A 0.25 Ampere slow acting fuse is used for 220 to 240 VAC operation of the RF Module and 2 Ampere slow acting fuse is used for 28 VDC operation.
All fuses are 250V slow-blow fuse. Only replace fuses with the same type and specifications.

Line Cord
The instrument has a detachable, three wire power cord for connection to a grounded 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.

Service
Do not attempt to service or adjust the instrument unless another person, capable of providing first aid or resuscitation, is present. Contact SDI for any questions or repairs.

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The Front Panel

AC Power LED
The AC POWER LED will turn on when AC power is applied to unit and the unit is operating properly.

DC Power LED
If the CSDA-1 was manufactured with the battery backup option the DC POWER LED should be on when DC power is applied and the unit is operating properly. If the CSDA-1 is not equipped with the battery backup option, the DC POWER LED will not be connected but will still be on the front panel.

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

5 MHz LED
The 5 MHz LED will turn on if the 5 MHz signal is greater than +7 dBm.

10 MHz LED
The 10 MHz LED will turn on if the 10 MHz signal is greater than +7 dBm.

The Back Panel

AC POWER ENTRY MODULE
The CSDA-1 is configured to operate on:

- ❑ 100-120 VAC
- ❑ 220-240 VAC

DC POWER ENTRY MODULE
Optional Battery Backup Connector for +28 VDC Backup power source.

SMA INPUT
The first module in the CSDA-1 is the pulse distribution amplifier that has one input and five outputs. The signal to be distributed should be connected to the SMA jack labeled input. The pulse must conform to TTL levels and must be in the range of 0 V to 5V. **Negative voltages may damage the pulse distribution amplifier.**

The second and third modules in the CSDA-1 are the RF distribution modules. These modules have one input expecting a 5 MHz, +13 dBm signal and have five 5 MHz outputs and ten 10 MHz outputs. The 5 MHz, +13 dBm signal should be connected to the SMA jack labeled 5 MHz input.

SMA OUTPUTS
The pulse distribution module outputs are designed to drive a 50-ohm load. The 5 MHz and 10 MHz outputs are DC isolated from the chassis ground to prevent ground loops. Make sure that the amplifier ground does not float to a potential greater than 50 VDC from the chassis ground. An output ground potential greater than 50 VDC will damage the amplifier and could cause injury or death to personnel.

Battery Backup Module

Description

If you acquired the optional battery backup module for your CSDA-1 you will be able to power your instrument with an external +28 VDC power source. In case of loss of the main AC power this module will automatically power the unit. 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 +28 VDC power source connector is located on the back panel of the instrument. The +28 VDC ground is not connected to the instrument case ground internally, however both ground connections are available at the DC power connector and may be connected together at this point.

DC Voltage

The +28 VDC may be used as backup power to prevent loss of signal during power outages. The DC power supply should be able to provide +28 VDC at 3A. For optimum performance the following specifications should be used for the power supply.

DC Supply	+28 VDC, 3 A
Line regulation	+/- 0.05% for a 10% line change
Load regulation	+/- 0.05% for a 50% load change
Output ripple	< 5mV peak-to-peak

Fuse

Two fuses are used for the +28 VDC operation.
1 Ampere 250V slow-blow fuse is used for the PD module.
2 Ampere 250V slow-blow fuse is used for the RF modules.
Replace fuses with the same type and specifications

Service

Do not attempt to service or adjust the instrument unless another person, capable of providing first aid or resuscitation, is present. Contact SDI for any questions or repairs.

Operation

To operate the unit on DC power, locate the DC power entry connector on the rear panel and connect the power cable. When DC power is applied to the unit, the LED located on the front panel labeled DC POWER should light up. **Connection of the +28 VDC supply is optional**.

DC Connector

WARNING!
DO NOT APPLY AC VOLTAGE TO THIS UNIT THROUGH THE 6 PIN CONNECTOR ON THE REAR OF THE UNIT!
Failure to follow these directions will cause injury or death to personnel, cause irreparable damage to the instrument and void all warranties.

WARNING!
DO NOT REVERSE THE POLARITY OF THE SUPPLY VOLTAGE!
Reversing the polarity of the power supply will cause damage to the unit and void all warranties.

WARNING!
The chassis of the instrument is internally connected to DC ground.

The front +28 VDC connector is wired as follows:
Pin 1 +V (Internal supply voltage for monitoring purpose **DO NOT USE!**)
Pin 2 GND (Internal supply voltage for monitoring purpose **DO NOT USE!)**
Pin 3 -V (Internal supply voltage for monitoring purpose **DO NOT USE!)**
Pin 4 28 VDC GND return
Pin 5 +28 VDC power
Pin 6 Chassis GND /Earth GND

Operation

This unit is designed to operate only with the specified voltage on page 4. For conversion to a different voltage of operation contact SDI.

To operate the unit, locate the power entry module on the rear of the enclosure and connect the power cord. Plug the unit into an appropriate power outlet. A green LED on the front panel labeled “AC POWER” will turn on.

1 PPS Clock Signal Distribution

Attach a cable with the signal to be distributed to the rear panel connector labeled **1 PPS Input**. A green LED on the front panel will flash on the falling edge of each output pulse.

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 under 12 ns, and the channel-to-channel delay difference is less than 1 ns.

5 MHz and 10 MHz Clock Signal Distribution

Attach the signal to be distributed to the 5MHz SMA input connector on the rear panel. The 5 MHz monitor LED will turn on if the signal level is greater than +7 dBm. The 10 MHz monitor LED will turn on when the 5 MHz level is high enough to enable the frequency doubler that generates the 10 MHz signals. The recommended level for the 5 MHz input signal is +13 dBm +/- 2 dB. Five buffered 5 MHz and five buffered 10 MHz signals are available on the rear panel.

1 PPS 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
Temperature-delay Coefficient	0 - 50 ºC 25 - 35 ºC	- -	3 3	5 -	ps/ºC

The rise and fall times were tested with a TTL input signal at 100 kHz.

5 MHz Specifications

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Output Level	5MHz Input +13dBm	12	13	15	dBm
Bandwidth	+/- 1 dB	500kHz	600kHz	1MHz	MHz
Gain	@ 5 MHz	-	0	+/- 0.5	dB
Impedance	output	-	50	-	Ohms
Return Loss	output(S22) 10MHz	-	-25	-20	dB
Distortion*	+13 dBm	-	-48	-45	dBc
Isolation	output to output	120	126	-	dB
Phase Noise	1 Hz 10 Hz 100 Hz >10 kHz	- - - -	-142 -149 -159 -164	-140 -147 -155 -160	dBc/Hz
Temperature-delay Coefficient	0 - 50 ºC 25 - 35 ºC	- -	10 5	- -	ps/ºC

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

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10 MHz Specifications

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Output Level	5MHz Input +13dBm	12	13	15	dBm
Bandwidth	+/- 1 dB	500kHz	600kHz	1MHz	MHz
Gain	@ 5 MHz	-	0	+/- 0.5	dB
Impedance	output	-	50	-	Ohms
Return Loss	output(S22) 10MHz	-	-25	-20	dB
Distortion*	+13 dBm	-	-48	-45	dBc
Isolation	output to output	120	126	-	dB
Phase Noise	1 Hz 10 Hz 100 Hz >10 kHz	- - - -	-142 -149 -159 -164	-140 -147 -155 -160	dBc/Hz
Temperature-delay Coefficient	0 - 50 ºC 25 - 35 ºC	- -	10 5	- -	ps/ºC

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

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Warranty

The CSDA-1 is warranted to be free of defects under normal operating conditions, as specified, for one year from date of original 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.

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