SPECTRADYNAMICS, INC.

Delay Line DL-2
Operating Manual

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DL-2 Ver. 1.0 Description

The DL-2 is a delay line unit that may contain up to two line stretchers each providing 250 ps of time delay. The line stretchers have independent inputs and outputs so that they may be used separately or daisy-chained to provide up to 500 ps of delay. Each line stretcher is motorized and can be used for continuous delay adjustment. All delay line unit functions are accessible from the front panel. The unit is also supplied with a RS-232 interface for remote control and automation.

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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 can be setup to operate on 100-120 or 220-240 VAC and a line frequency of 50 to 60 Hz. For conversion to a different line voltage please contact SDI.

Fuse
A 1.0 Ampere 250V slow blow fuse is used in this instrument for 100-120 VAC line voltage. A 0.5 Ampere 250V slow blow fuse is used for 220-240 VAC line voltage. Do not replace with a larger fuse.

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.

Operation
To operate the unit, locate the AC power entry connector on the rear panel and connect the power cable. When power is applied to the unit, a red led located on the front panel, labeled “on”, should light up.

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Se habla español

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The Front Panel

The DL-2 may have two delay lines. Each one provides a continuously adjustable delay from 0 to 250 ps. The practical frequency range for the delay lines IN – OUT is DC to 18 GHz.

ON
The led is on when power is applied to unit and the unit is operating properly. **Note that this is not a button.**

REMOTE
This button is used to enter remote control mode via RS-232. When the instrument is in remote mode the button will be illuminated. To return to front panel control, press this button again.

IN1
SMA input to the first delay line. The led bar graph indicates the approximate value of the time delay. The time delay is varied by pressing the Up button or the Down button.

OUT1
SMA output of the first delay line. The is output may be connected to IN2, the input to the second delay line.

IN2
SMA input to the second delay line. The led bar graph indicates the approximate value of the time delay. The time delay is varied by pressing the Up button or the Down button.

OUT2
SMA output of the continuously adjustable delay line.

Buttons Up and Down
These buttons control the time delay provided by a continuously adjustable line stretcher. The Up button increases the time delay and the Down button decreases the time delay. The relative position of the line stretcher is indicated by the led bar graph located above the control buttons.

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The Back Panel

AC POWER ENTRY MODULE

The DL-2 is configured to operate on 100 – 120 VAC. It uses a 1.0 Amp 250V slow blow fuse. The unit requires a 0.5 Amp, 250 V slow blow fuse for 220 – 240 VAC operation.

RS-232
DB-9 connector for serial communications. This is a dumb terminal RS-232 port. A null modem adapter is not required. Default settings are 9600 baud, 8 bits, no parity, 1 stop bit.

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RS-232 Port

RS-232 Communication Port

The DL-2 functions are accessed through the RS-232 port located on the back panel. A standard serial cable with a DB-9 connector can be used to interface to the DL-2. The user can input commands using a simple dumb terminal program on a remote computer or more sophisticated control can be used with software such as Labview.

Port Settings

On power-up the RS-232 port settings are:

Baud rate 9600 8 Bits 1 Stop Bit No Parity.

Hardware handshaking is not used. The DB-9 connector pinout is described below.

Pin	Function
1	NC
2	Data out
3	Data in
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC

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Specifications

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Operational Bandwidth	IN1 - OUT1	-	DC - 18	-	GHz
	IN2 - OUT2	-	DC - 18	-	GHz
VSWR	IN1 - OUT1	-	<1.5	-	
	IN2 - OUT2	-	<1.5	-	
Insertion Loss	IN1 – OUT1 @ 10 GHz		<1		dB
	IN2 – OUT2 @ 10 GHz		<1		dB
Adjustable Delay Range	IN1 - OUT1		250		ps
	IN2 - OUT2		250		ps

Half Rack Enclosure
Size: 3.5” X 8.5” X 16”
Weight: 20 lbs

AC Power
110–120/ 220–240VAC

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ASCII Command Set

The DL-2 command set is used to control all DL-2 functions via RS-232. The characters sent to the DL-2 must be upper case ASCII characters.

Command Arguments

fval	Fine delay parameter { 0-1023 }

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FDLY1, FDLY1?

FDLY1 sets the time delay inserted in the RF path from IN1 to OUT1.

FDLY1 [fval]<cr>

FDLY1 has 1 parameter and is executed following the carriage return <cr>

fval valid values are 0 – 1023

0 no time delay inserted
512 approximately 125 ps
1023 approximately 500 ps

In remote control mode, a motorized line stretcher sets the time delay and the range of 250 ps is divided into 1024 segments.

Example: FDLY1 512 <cr>

Sets the time delay to approximately 125 ps <cr> is a carriage return.

FLDY1? Queries the time delay setting.

FDLY1?<cr>

FDLY1? is executed following the carriage return <cr>

The results of the query are in the following format.

FDLY1? [fval]<cr>

Example: FDLY1?<cr>

Queries the time delay setting of the RF path from IN1 to OUT1. <cr> is a carriage return.

The function will return:

FDLY? 512<cr>

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FDLY2, FDLY2?

FDLY2 sets the time delay inserted in the RF path from IN2 to OUT2.

FDLY2 [fval]<cr>

FDLY2 has 1 parameter and is executed following the carriage return <cr>

fval valid values are 0 – 1023

0 no time delay inserted
512 approximately 125 ps
1023 approximately 250 ps

In remote control mode, the time delay is set by a motorized line stretcher and the range of 250 ps is divided into 1024 segments.

Example: FDLY2 512 <cr>

Sets the time delay to approximately 125 ps <cr> is a carriage return.

FLDY2? Queries the time delay setting.

FDLY2?<cr>

FDLY2? is executed following the carriage return <cr>

The results of the query are in the following format.

FDLY2? [fval]<cr>

Example: FDLY2?<cr>

Queries the time delay setting of the RF path from IN2 to OUT2. <cr> is a carriage return.

The function will return:

FDLY2? 512<cr>

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HELP

HELP display a listing of available commands.

HELP <cr>

HELP is executed following the carriage return <cr>

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LOCL

LOCL exits remote control mode and the front panel controls are activated.

LOCL <cr>

LOCL is executed following the carriage return <cr>

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*SRE, *CLS

***SRE** queries the instrument for the value of the status register.

***SRE<cr>**

*SRE is executed following a carriage return.

The results of the query are in the following format.

SRE [status]<cr>

status is an 8-bit value that contains the sum of the error conditions. status is 0 when there are no errors.

Invalid command	0x01
invalid parameter	0x02
Delay setting failed	0x04
User interrupted command	0x08

Example: ***SRE<cr>** query status

SRE 2 the return value indicates that an invalid parameter was sent to the synthesizer.

***CLS** clears the status register.

***CLS<cr>**

*CLS is executed following a carriage return.

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WARRANTY

Warranty

The DL-2 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 DL-2 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 judgment 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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