Laser Controller LP Linear Rev. 1.1

Preliminary Manual

Setting up the System

IMPORTANT: Never make or break any connections between the laser head and the laser controller when the laser controller is switched on (no hot-plugging).

1. Ground yourself when making connections to the laser head or the controller
2. Make sure the mains power switch on the back panel is OFF
3. Make sure the key switch on the front panel is OFF
4. Connect the power cord to the mains input on the back panel
5. Connect the DSUB-25 cable from the laser controller to the laser head
6. Connect the S-VIDEO cable from the laser controller to the laser head

Powering up and Operating the System

1. Turn on the mains power switch on the back panel. The green LEDs of the power supplies should light up.
2. Power up the controller by turning the key swith on the front panel. The "Status" LED on the Front Panel will blink green slowly for about 5 to 10 minutes as the laser system stabilizes to its thermal steady-state condition.
3. When the "Status" LED is lit up green continuously, the laser is ready for operation. Push the red "Emission" Button to turn on the laser emission.
4. When shutting down the system, always turn off laser emission first, then power down the system by turning the key switch, and then turn off the mains switch on the back panel.

Remote Control (via Digital I/O on front panel)

The 15-pin DSUB connector on the front panel allows full remote control of the laser controller via TTL signals. The complete functionality of the front panel user controls and indicators (switches and LEDs) is available through the digital I/O interface. The Digital I/O connector also has two signals which are routed straight-through to the PLL Interface Connector on the back panel (PLL_LOCKED and PLL_EN), thereby allowing remote control of the PLL and the laser controller through the same interface.

Interfacing with the PLL

The 15-pin DSUB connector on the back panel is intended for interface with a Onefive SYNC unit or a user-specific PLL unit.

Tuning the Repetition Rate via the PLL Interface

The laser contains a slow repetition rate tuning mechanism which allows to keep the repetition rate within the locking range of the PLL. When applying a logic high signal to the pins PLL_UP or PLL_DN, the laser repetition rate is tuned up or down by a small step (typically a few tens of Hz, depending on the specific laser model). The slow tuning mechanism requires several minutes to settle to its new steady-state value. The inputs PLL_UP and PLL_DN are disabled for about 5 seconds after commanding a frequency step before they are ready to accept new input. It is

advisable to apply only a short 5V pulse (max. 1s) to these inputs and then wait for at least 3 minutes before commanding another frequency step.

IMPORTANT: The slow repetition rate tuning mechanism is only enabled when the laser emission is on. For this reason, the PLL Interface has a digital output "LASER_EM_EN" which is high when the laser emission is enabled (this must be polled by any software which automates the repetition rate tuning via the PLL_UP and PLL_DN signals).

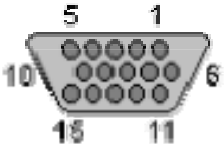
Resetting the Repetition Rate

To reset the repetition rate to the factory preset value, proceed as follows:

1. Turn the laser controller off.
2. Press and hold the "Amp Stab" Button on the front panel as you power up the laser controller by turning the key switch on the front panel
3. Keep holding the "Amp Stab" button for about 4 seconds until the yellow LED in the button lights up. Then you can let go of the button. The "Status" LED on the front panel will light up red for several seconds as the controller resets the frequency tuning mechanism.
   After this, the laser controller goes back into normal operation.

NOTE: Do not switch off the controller during this reset process (it takes several seconds) as this could cause corruption of the controller memory.

Digital I/O (Remote Control) pinout



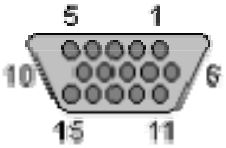
15-pin high-density DSUB connector on front panel of laser controller

The digital I/O connector allows full remote control and monitoring of the laser system using TTL signal levels (HI=5V, LO=0V). The connector is a standard 15-pin female high-density DSUB socket. A standard computer VGA monitor cable can therefore be used. Make sure that all front-panel switches are in the OFF position during remote control of the system.

pin	**name**	**type**	**remarks**
1	TEMP_GOOD	output (active-HI)	laser head temperature stabilized
2	ERROR	output (active- HI)	system error (e.g. defective temp. sensor)
3	EXT_MOD_ENABLED[1]	output (active- HI)	external modulation enabled
4	AMP_STB _ENABLED[2]	output (active- HI)	amplitude stabilization enabled
5	LASER_EM_ENABLED	output (active- HI)	laser emission is enabled
6	LASER_EM	input (active- HI)	turn on laser emission
7	PLL_LOCKED	output (active- HI)	PLL locked
8		reserved	for factory use only. DO NOT CONNECT
9		reserved	for factory use only. DO NOT CONNECT
10	GND	supply	power ground
11	EXT_MOD[1]	input (active- HI)	enable external modulation input
12	AMP_STB[2]	input (active- HI)	enable amplitude stabilization
13	PLL_EN	input (active- HI)	enable PLL Unit
14	+5V	supply	logic supply voltage (max. 100 mA)
15	POWER	input (active- HI)	apply +5V to power up the laser controller

(1) only for systems with "External Modulation" Option
(2) only for systems with "Amplitude Stabilization" Option

Sync (PLL) Interface pinout



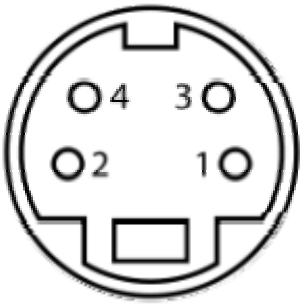
15-pin high-density DSUB connector on back panel of laser controller

pin	name	type	remarks
1	+5V	logic supply	1mA max. (e.g. for wiring to switches)
2			DO NOT CONNECT
3			DO NOT CONNECT
4			DO NOT CONNECT
5			DO NOT CONNECT
6	PLL_LOCKED[1]	input (active- HI)	From LOCK-DETECT signal of PLL
7	GND	supply	power ground
8	GND	supply	power ground
9	GND	supply	power ground
10	GND	supply	power ground
11	PLL_EN[1]	output (active- HI)	enable PLL Unit
12	PLL_UP[2]	input (active- HI)	for slow frequency tuning (f+)
13	PLL_DN[2]	input (active- HI)	for slow frequency tuning (f-)
14	LASER_EM_EN	output (active- HI)	laser emission enabled
15	AUX_PWR_EN	output (active- HI)	DO NOT CONNECT

(1) The signals PLL_LOCKED (Pin 6) and PLL_EN (Pin 11) are wired straight through to the corresponding signals in the Digital I/O connector on the front panel.

(2) These inputs should only be pulsed to logic high for a short time (max. 1s) to command a frequency tuning step. After commanding a frequency tuning step, these inputs are disabled for a period of about 5 seconds before they will accept further step commands. Holding these inputs at logic high continuously will cause repeated stepping of the laser frequency every 5 seconds and can tune the laser far away from its usual operating point. See remarks about resetting the frequency tuning to the factory preset in the manual.

S-Video Connector (Photodetector Supply) Pinout



4-pin S-Video
female connector
(same at laser head and
backplane of laser driver)

1	GND
2	GND
3	+5V
4	Slow Photodiode Signal Out

The laser head contains fast and slow photodiode detectors. Both circuits are supplied with 5V from the laser controller via a shielded S-Video cable. The slow photodiode detector output signal is also routed in the S-Video cable. It is proportional to the average output power of the laser and is used for the optional amplitude stabilization. The fast photodiode detector output signal (trigger) is routed separately via a 50-Ohm coaxial cable and is accessible at the SMA connector at the laser head.