SECTION SIX: EXTERNAL LASER CONTROL

External Connectors

The information in Table 6-1 describes the utility connector pins. The information in Table 6-2 describes the utility connector trigger input for pin 4. The utility connector is shown in Figure 6-1.

Utility Connector

The utility connector (female 9 pin D-Sub) is located on the rear panel of the controller. See Figure 4-1, Figure 4-3 and Figure 4-4 for the location of the utility connectors on Type A laser head and B1/B2 controllers. The pin description of the utility connector is shown in Table 6-1.

Figure 6-1. Utility Connector (female 9 pin D-Sub)

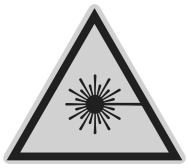
NOTICE
The utility connector is designed only for high-impedance connectivity, e.g., 1 MΩ input impedance or more.

Table 6-1. Utility Connector - Pin Description

PIN	DESCRIPTION	SIGNAL DIRECTION
1	Error monitor, > 4 V at 1 MΩ load, output will indicate an operation error, 10 kΩ impedance	Out
2	Door switch must be permanently closed to GND (pin 9).	-
3	Laser disable (to deactivate short to GND (pin 9))	-
4	Gating and single pulse trigger in, 10 kΩ impedance	In
5	Do not connect!	-
6	Laser diode operation monitor, +3 V to +4 V output (1 MΩ load) when the laser diode is turned on, 10 kΩ impedance (Not redundant, not suitable for signals critical to laser safety).	Out

Table 6-1. Utility Connector - Pin Description (Continued)

PIN	DESCRIPTION	SIGNAL DIRECTION
7	Sync-Out signal (50 kOhm resistor necessary to operate)	Out
8	Remote laser diode enable (optional), +5 V, 10 kΩ impedance	In
9	GND	-



WARNING!
The laser will not turn off completely when the door switch (pin 2) is open. There is some residual emission. To ensure laser safety, do not treat an operating laser with an open door switch as if the laser is turned off.

Trigger Requirements

The trigger input parameters are shown in Table 6-2.

Table 6-2. Trigger Input

TRIGGERING PARAMETERS	
Trigger rise/fall time	< 200 µs
Trigger on time accuracy	< 0.1 µs
Gate low time between two trigger events	> 1 µs
LDG 1 mode trigger duty cycle (Example: For a frequency = 1000 kHz, the trigger high = 900 µs and the trigger off = 100 µs.)	90 % on 10 % off
Trigger input resistance	10 kΩ
Typical TTL high voltage for the trigger input	> 2.4 V Typically 5.0 V
Typical TTL low voltage for the trigger input	Typically < 0.4 V

Utility Cable

The utility cable (PN 1250205) is included in the system.

The utility cable offers easy access by a BNC connector to the gate and single shot trigger (pin 4) of the utility connector (Signal In: cable).

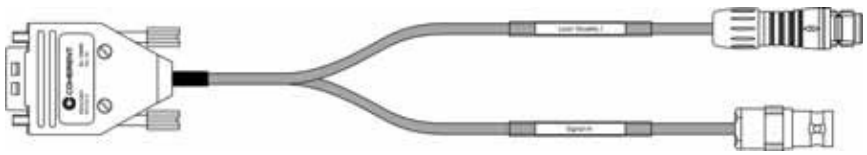


Figure 6-2. Utility Cable

Laser Disable Connector

The laser disable cable provides easy access to the laser disable pin 3. Both pin 2 and 3 must be pulled to the ground on pin 1 to start the laser system.

Pin	Description
1	Signal GND
2	Not used It needs to be connected to signal GND (PIN 1) Pulses can only be generated when (PIN 2) is closed.
3	Laser disable To deactivate shorten with signal GND (PIN 1)

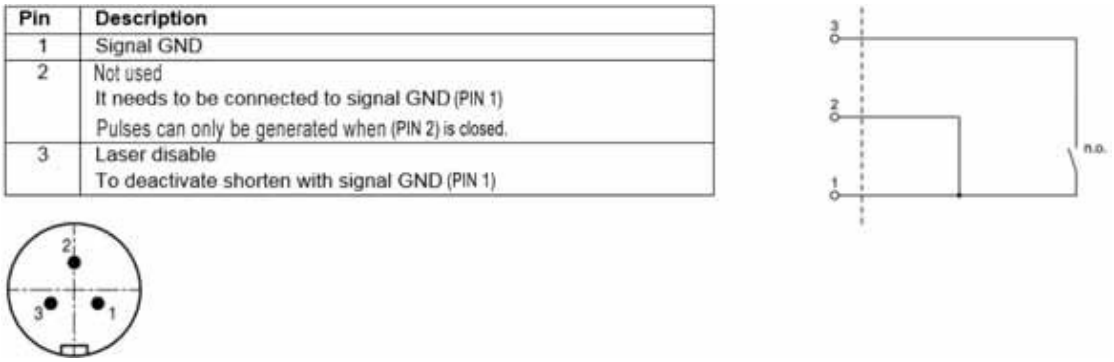


Figure 6-3. Laser Disable and Door Switch Connector Pin Description

Laser Disable Defeat Connector

A laser disable defeat connector (PN 1309044) is included with the laser system. This connector can be used to test the laser without integrating the safety features.

The defeat connector does not fulfill the safety requirements of IEC 60825-1.

Figure 6-4. Disable Defeat Connector

External Computer Control

To operate the Helios laser, a computer must be connected to the system with a RS-232 cable. Commands and queries shown in Table 6-3 are sent to the laser by a terminal program.

Computer Set-up

1. Open a terminal program (example: HyperTerminal).
2. When asked for the connection name, enter one.
3. Select the COM-port to which the controller is connected.
4. Set the RS-232 interface to the parameters shown below:

Baud-rate	9600
Data-bits	8
Parity	none
Stop bits	1
Flux control	none

5. Type random letters into the terminal window to confirm that the "Echo" function is on. If the typed letters do not appear on the screen, turn the local echo on. Go to File>Properties>Settings>ASCIIconfiguration>local echo on.

Syntax

The syntax structure is shown below. Any instruction sent to the laser must have a string of ASCII characters and be terminated by a carriage return <CR>. A space must be present between the command and the numeric value for the command to be valid. Commands are valid if entered in upper or lower case.

Example:

Command

LDO␣1<CR>

Query

LDO␣<CR>

Commands or set values can be discarded by the controller unintentionally. Its is recommended to query the set value after the command is entered to confirm the actual value.

Commands and Queries

To query the settings, type in the command and press ENTER. To enter command values, a space must be placed between the command and the value. See "Syntax" for command structure.

NOTICE
Query the command to confirm it was accepted.

Min. and Max. values give the maximum range allowed by the software. Not every laser utilizes the full range.

Table 6-3. Helios Commands and Queries

COMMAND	FUNCTION	READ/ WRITE	MIN.	MAX.	UNIT	USED ON THE DOUBLE CONTROLLER
LDO	Laser enabled	r/w	0	1		no
LDG	Pulse modes command. The Flare NX supports the pulse modes continuous pulsing (14), gating (4) and single pulse triggering (1). LDF has to be set again after LDG is changed, except for single pulse triggering!	r/w	0	14		no
LDF	LDF is the period between two pulses entered in ns. PRF from 16.7 kHz to 125 kHz can addressed through the controller firmware. Check the laser test sheet which PRF regime applies for your laser model. Example: LDF = 1/PRF; PRF = 50 kHz → LDF = 1/50kHz = 20000ns	r/w	8000	60000	ns	no
LRE	Laser remote enable, activates pin 8 of the utility connector. **ONLY APPLICABLE FOR SINGLE ELECTRONIC SYSTEMS**	r/w	0	1		no

Table 6-3. Helios Commands and Queries (Continued)

COMMAND	FUNCTION	READ/ WRITE	MIN.	MAX.	UNIT	USED ON THE DOUBLE CONTROLLER
LDS	Laser diode pulse current. On top of the laser diode bias current, the controller can add an additional pulse current. This happens when the controller is configured for gating, continuous pulsing or single pulse triggering.		0	7000	mA	yes
LTA	Actual pump diode temperature	r	5000	50000	m°C	yes
LMA	Single electronic: actual resonator and SHG temperature Double electronic: Master - actual resonator temperature Slave - actual SHG temperature	r	0	4000	mA	yes
EOA	Actual q-switch temperature	r	5000	50000	m°C	no
ELT	Pump diode - temperature control deviation. The numeric difference between set point and actual temperature.	r	−32768	32767	m°C	yes
ELM	Single electronic: Resonator and SHG - temperature control deviation. The numeric difference between set point and actual temperature. Double electronic: Master: Resonator TEC - temperature control deviation Slave: SHG - temperature control deviation	r	−32768	32767	m°C	yes
EEO	Single electronic: q-switch - temperature control deviation. The numeric difference between set point and actual temperature. Double electronic: Master: q-switch - temperature control deviation Slave: N/A	r	−32768	32767	m°C	no
LTT	Actual temperature of the controller power stage	r	5000	65535	m°C	yes

Table 6-3. Helios Commands and Queries (Continued)

COMMAND	FUNCTION	READ/ WRITE	MIN.	MAX.	UNIT	USED ON THE DOUBLE CONTROLLER
LER LCE CCE	Status registers of the controller. The numeric output is the sum of multiple bits (flags). For example: $1•2^0+0•2^1+1•2^2 = 5$. The flags reset by the sequence CCE 0, LCE 0, LER 0. For more information on the status registers refer to the “Trouble-shooting” section.	r/w	0	65535		yes
CSR	Controller serial number	r		15	char	yes
HSR	Laser head circuit board serial number	r		15	char	no
HTR	Laser diode operation time	r	0	65535	h	no
HPR	The optimized factory settings for the laser are backed up in an eeprom. After changes have been made to the settings at customer side, the factory settings can be restored by typing HPR. Afterwards, a reboot/power cycle is required. **Slave controller settings are not backed up.**	r				no
	HPR sets the laser parameter back to its original settings. Before this command is sent to the laser, it has to be switched off (LDO 0) After HPR is sent wait at least 2 seconds before a reboot/power cycle of the system.					
HMP	Laser Power Monitor, not available on all models.	r	0	5000	mW	no