

527nm

L A S E R

model DTL-419QT

INSTRUCTION MANUAL

INFORMATION

The electromagnetic compatibility (2004/108/EC(EMC)) and low voltage Directives (2006/95/EC(Low Voltage))



CE marking

Our products are manufactured in accordance with the requirements of following directives and national regulations based on the directives:

Electromagnetic Compatibility EMC 2004/108/EC
Low Voltage 2006/95/EC(Low Voltage)

Directive 2002/95/EC RoHS



Our products are designed and manufactured in compliance with the restriction of the use of hazardous substances (RoHS) in electrical and electronic equipment Directive.

Our products do not contain hazardous substances in amounts exceeding limits, which could have negative effects on human health or the environment.

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1. PREFACE

This manual describes the installation, operation, service requirements and properties of the model DTL-419QT Diode-Pumped Laser Q-switched with AOM.

APPLICATIONS

Marking
Spectroscopy
Research & Development
Optical Testing

FEATURES

High quality of the laser beam,
Cleanroom-built,
Air cooling, no liquid cooling problems,
Energy and pulse repetition rate control with PC,
External/internal triggering,
All Solid State,
Stability,
The best ratio price/quality,
Simple to use,
Reliability,
Cost effective.

2. WARNINGS AND SAFETY MEASURES

NOTICE:

KNOWLEDGE OF THIS MANUAL IS A PREREQUISITE FOR PROPER WORK WITH THE LASER. BEFORE USING THE LASER, PLEASE CAREFULLY READ THESE INSTRUCTIONS. HEED ALL WARNINGS. PLEASE RETAIN THESE INSTRUCTIONS FOR FUTURE USE.

IMPORTANT SAFEGUARDS AND WARNINGS

1. Follow all safety instructions in this instruction manual. Improper installation and use of laser endanger safety of the operator, and reduce reliability and lifetime of the laser.
2. Installation and control of the laser should be carried out in accordance with this manual.

INFORMATION

Laser-export Co.Ltd reserves the exclusive right to make changes in this manual. The manufacturer reserves the right to change specifications and design of the device without prior notice.

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3. LASER SAFETY

DANGER

Model DTL-419QT corresponds to CLASS IVb (CDRH) High Power laser. The output beam is, by definition, a safety hazard. AVOID DIRECT EXPOSURE TO BEAM. It emits VISIBLE LASER RADIATION of 527 nm wavelength from the aperture in the front of the laser head. INVISIBLE LASER RADIATION of 1053 and 804-810 nm may also be present.

This product complies with 21 CFR 1040.10 and 1040.11 expect for deviations pursuant to Laser Notice №50, dated June 24, 2007.

3.1 Limit access to the laser to qualified users who are familiar with laser safety practices and who are aware of the dangers involved. It is good practice to operate the laser in the room with controlled and restricted access.

3.2 The workplace should be organized in such a way as to not affect the staff of the laser radiation.

3.3 Avoid direct, reflected or scattered exposure to eyes. Never look directly into the laser light source or at reflected laser light from any reflective surface.

3.4 Orange light provided on the top of the laser head indicates a presence of laser radiation emission. Never look into output window of laser head when orange LED lights.

3.5 Maintain experimental setups at low heights to prevent inadvertent beam-eye encounter at eye level.

3.6 Extreme caution should be exercised when using solvents in the area of the laser.

3.7 To prevent accidental contact with eyes, reflected or scattered laser radiation should use protective eyewear for the wavelengths of 527 nm.

3.8 Use the laser in an enclosed room. Laser light will remain collimated over long distances and therefore presents a potential hazard if not confined.

3.9 Place warning signs in the area of the laser beam to alert laser radiation present.

Laser radiation comes from the output window (Fig. 2, position 3) on the front flange of the laser head.

Never look into the output window of laser heat when the laser is connected to a power source.

WARNING! Avoid Eye or Skin exposure to direct radiation. Direct eye contact with the output beam from the laser will cause serious damage and possible blindness. Laser beams can ignite volatile substances such as alcohol, gasoline, ether and other solvents, and can damage light-sensitive elements in video cameras, photomultipliers and photodiodes. Reflected beams may also cause damage. For these reasons, observe all safety precautions in this instruction manual.

Class IV lasers produce dangerous scattered radiation. They can cause a skin damage, and establish an a fire hazard.

Refer to Fig.1, Fig.2 and Fig.3 on following pages for the location and description of safety labels.

For remote locking laser provides contact №№ 3 and 8 control connector plug (Fig. 3 position 1), mounted on the front panel power supply. Description of work control connector is shown in Table 2.

Connecting a cable and power cords so as to protect them from damage when possible jamming various items placed on them or close them.

To protect the equipment during lightning storms or power surges on the network disable laser from the mains supply. This will prevent damage to laser.

Warning! The socket outlet used to connect the AC adapter should have properly grounded. Do not use adapters to connect adapter to an ungrounded network.

4. SPECIFICATIONS

Wavelength	527 nm
Mode of Operation.....	Q-switched with AOM, ext./int. triggering/through RS-232
Max. Value of Average Pulse Energy at 0.01-1 kHz	200 + 15% -10% μ J
Average Pulse Energy at the range, single pulse – 0.01 kHz (unregulated)	200 $\pm$ 25% μ J
Max. Value of Average Output Power (at 5 kHz)	> 500 mW
Range of Pulse Repetition Rate:	
Ext. Triggering ¹	single pulse - 30 kHz
Int. Triggering: through RS-232 ²	0.01 - 30 kHz
without PC ³	1 $\pm$ 0,01 kHz
Pulse Duration (at single pulse - 1 kHz, Average Pulse Energy $\geq$ 160 μ J, FWHM)	7 $\pm$ 3 ns
Beam Diameter (1/e ² , at output aperture)	2.0 $\pm$ 0.6 mm
Pulse-to-Pulse Stability – StdDev/Mean (at 0.01 - 1 kHz, Average Pulse Energy $\geq$ 160 μ J)	< 5%
Beam Profile	TEM ₀₀
Beam Divergence (full angle, 1/e ²)	0.7 $\pm$ 0.4 mrad
Polarization Linearity	> 100:1, horizontal (< 5°)
Beam Height	33.5 $\pm$ 0.5 mm
Laser Emission to Sync Out Pulse ⁴ (at single pulse - 1 kHz, Average Pulse Energy $\geq$ 160 μ J)	
Delay	< 50 ns
Jitter	< 2 ns
Laser Trigger to Sync Out Pulse ⁴ (at single pulse - 1 kHz, Average Pulse Energy $\geq$ 160 μ J)	
Delay	300 $\pm$ 250 ns
Jitter	< 8 ns
Operating Temp/Humidity Range	15 - 35 °C / up to 80% non-condensing
Shipping Temp/Humidity Range(In the manufacturer package)	-40 to +50 °C / up to 80% humidity at 25 °C
Dimensions (without connectors), L x H x W, mm:	
Laser Head	311 x 55 x 90
Laser Head with Heat Sink	311 x 122 x 90
Power Supply ⁵	150 x 43 x 93 (x 115 with key)
Power Supply with Heat Sink	150 x 110 x 93 (x 115 with key)
Weight, kg:	
Laser Head	< 2.5
Power Supply ⁵	< 1.5
Laser Head Heat Sink	< 1.0
Power Supply Heat Sink	< 1.0
Operating Voltage with AC adapter	~90 - 264 V AC
Operating Voltage without AC adapter	12 $\pm$ 10% V DC
Current Consumption	< 6 A
Warm Up Time	< 10 min
Remote Control of Laser Parameters	
(Ext./Int. Triggering, ON/OFF, pulse repetition rate, pulse energy)	via RS-232 interface
Data rate via Interface RS-232	4800 bit/s
Laser Class (CDRH)	IV
Compliance	RoHS CDRH, CE
Operating time between failures	> 5000 hours
Lifetime	> 10000 hours
Max. Value of Average Output Power at 1053 nm	< 50 μ W
Max. Value of Average Output Power at 804-810 nm	< 50 μ W

¹ Triggering with external electric pulse generator; generator is not included in delivery set.

² Generation of periodical laser pulses using PC, step 0.01 kHz. Average energy may be changed by software from 20 μ J up to maximum value (200 + 15% μ J is guaranteed in the range of 0.01-1 kHz, if >1 kHz the max. energy may be less).

³ Generation of periodical laser pulses at 1 kHz rep. rate; external generator and/or PC are not needed.

⁴ Sync Out signal is generated by pulse of laser light.

⁵ Without AC/DC adapter AS-120P-12 (12 VDC).

5. COMPLETENESS

The delivery set consists of:

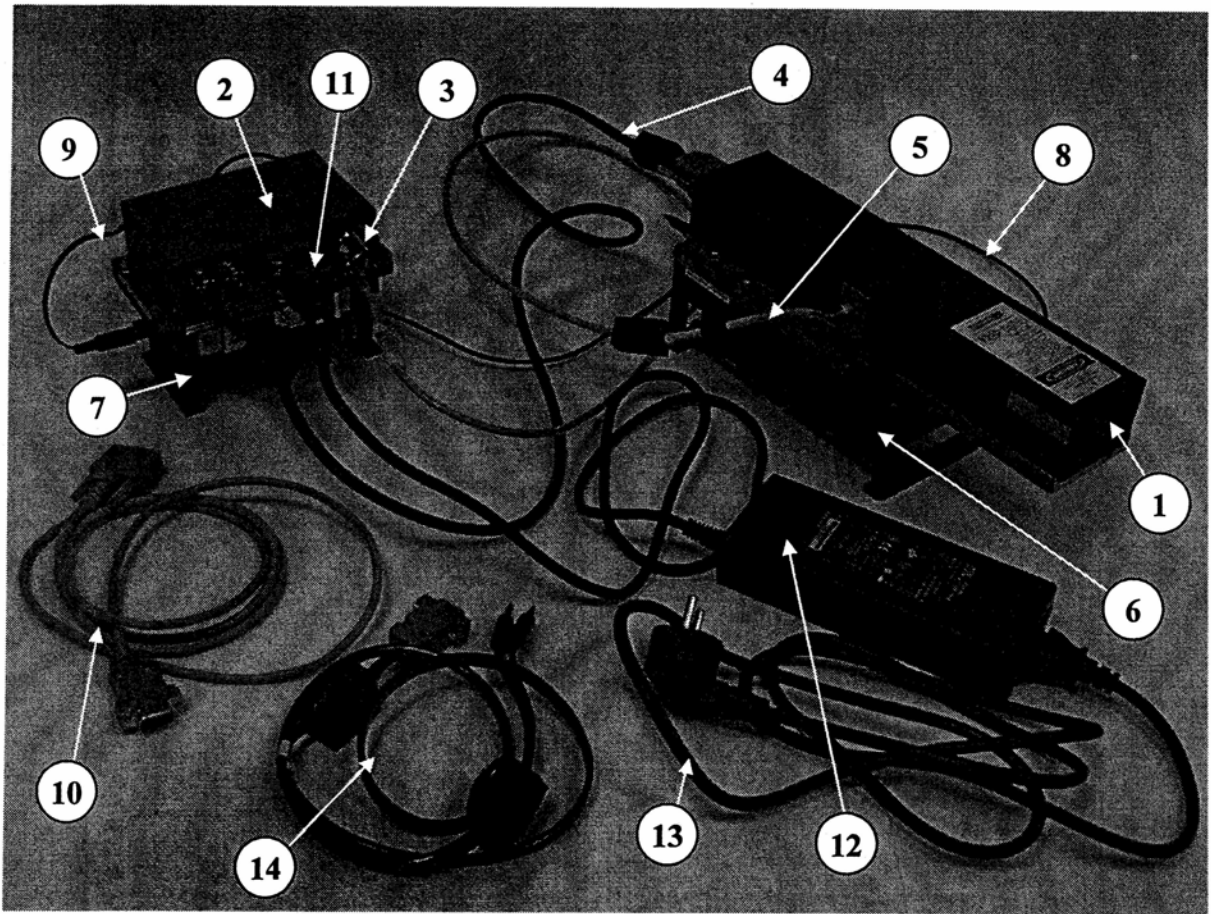


Fig.1. Completeness

- 1 Laser head (further LH)– 1 pc.
- 2 Power supply unit (further PSU)– 1 pc.
- 3 Keys – 2 pcs.
- 4 Signal cable – 1 pc.
- 5 RF cable – 1 pc.
- 6 Fan heat sink for the laser head (further FHS LH) – 1 pc.
- 7 Fan heat sink for the power supply unit (further FHS PSU) – 1 pc.
- 8 Cable for the laser head fan heat sink – 1 pc.
- 9 Cable for the laser power supply unit fan heat sink– 1 pc.
- 10 Cable for connection with PC – 1 pc
- 11 Control connector plug – 1pc.
- 12 AC/DC adapter – 1 pc.
- 13 AC/DC adapter power cable -1 pc.
- 14 Low voltage power cable -1 pc.
- 15 CD with PC Software (not shown). By agreement with the consumer program can be transmitted via email.

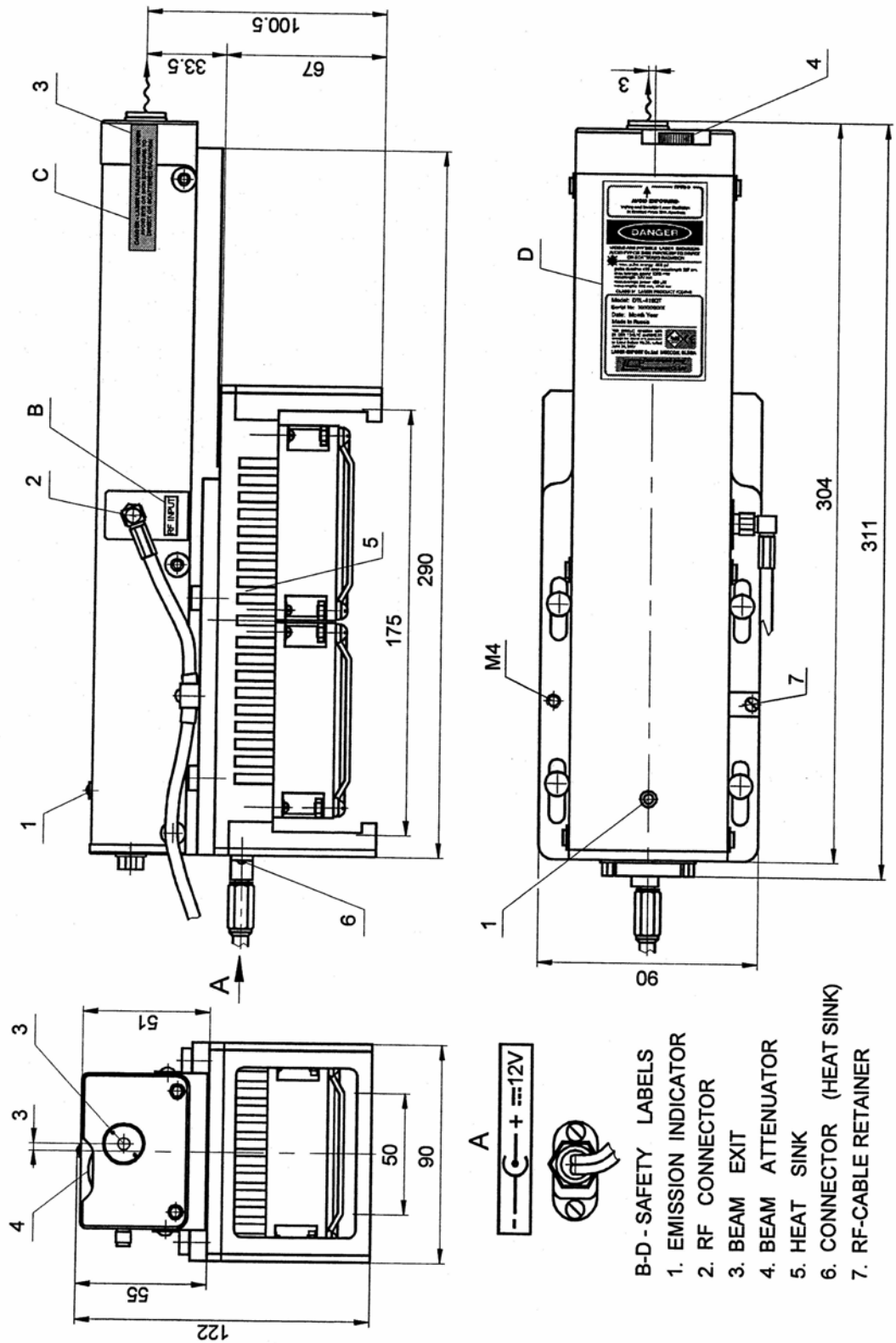


Fig.2 Laser Head

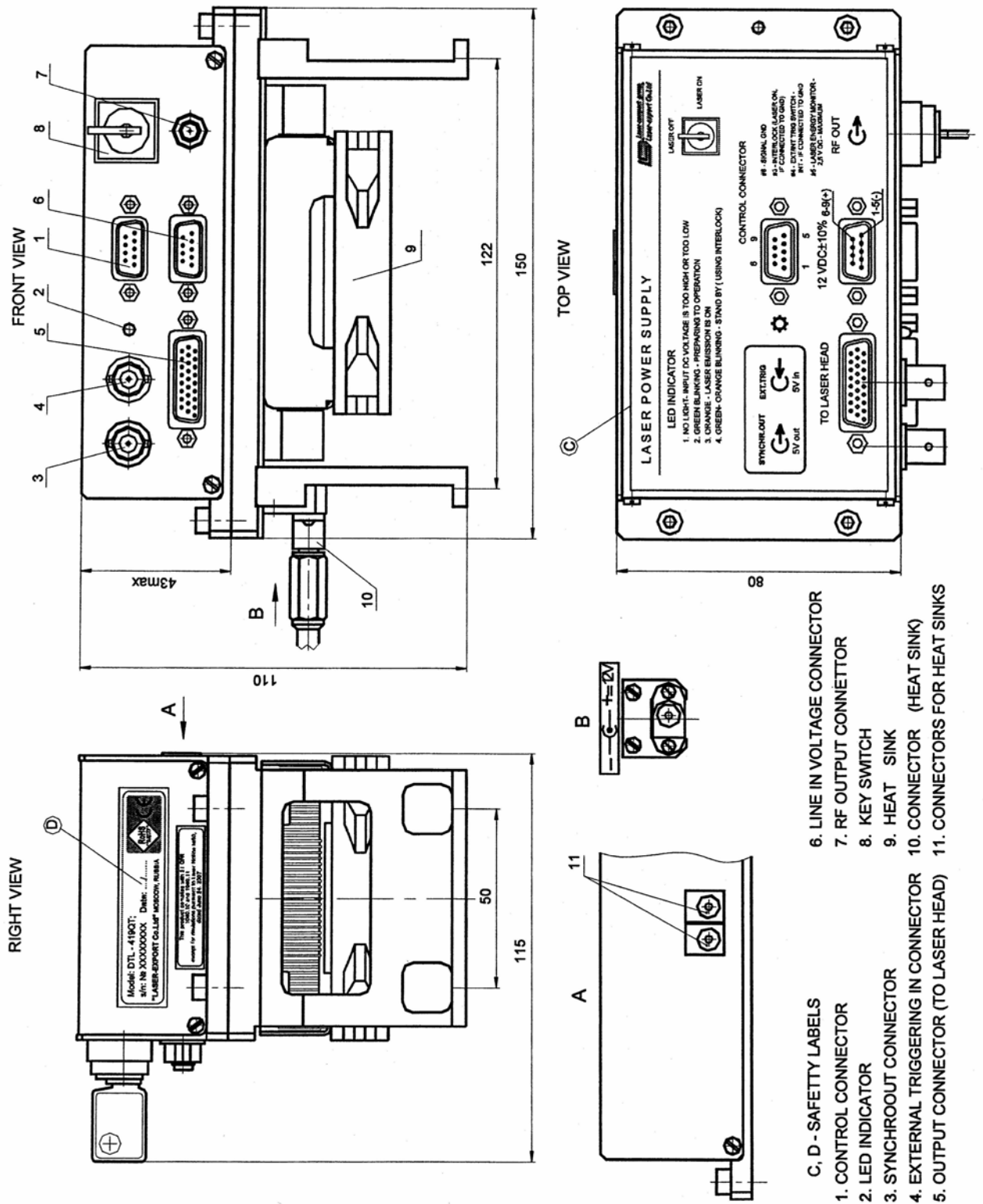
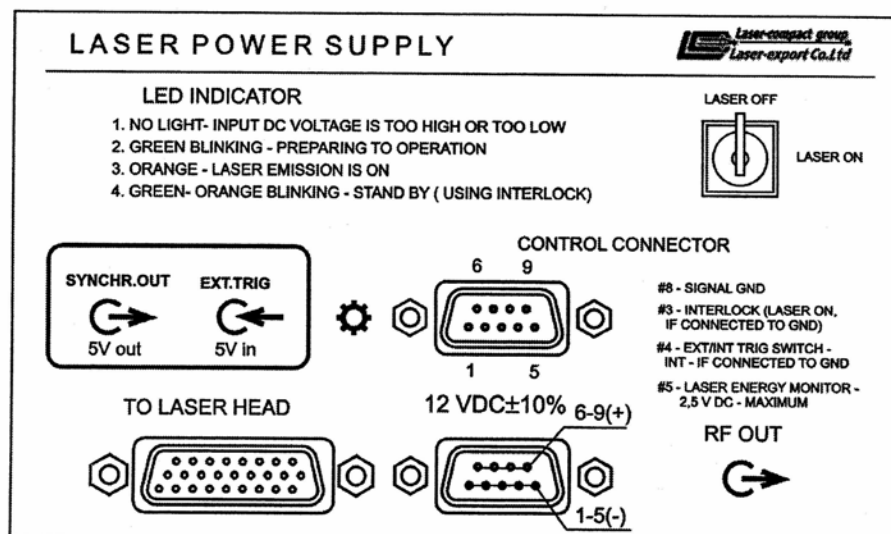


Fig.3 Power supply



DANGER - LASER RADIATION WHEN OPEN
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION



Model: DTL - 419QT;
s/n: № XXXXXXXX Date: .../.../...
"LASER-EXPORT Co.Ltd" MOSCOW, RUSSIA

RoHS **CE**

RF INPUT

This product complies with 21 CFR
1040.10 and 1040.11
except for deviations pursuant to Laser Notice №50,
dated June 24, 2007

S/n XXXXXXXX

Fig.4 Description of warning labels on Fig.2 and Fig.3

6. INSTALLATION & OPERATION

Warning! Study before starting work with the laser safety precautions and safety requirements, described in this manual (see above).

6.1 General comments

To take full advantage of the laser, described its specification, requires a PC with RS-232. At the same time to communicate with the PC you want to use only the cable for connection with PC (Fig.1 position 10), included in delivery set. To work with the laser is not suitable standard cable RS-232. Possible to use USB-COM Adapter connected in series with cable for connection with PC (Fig.1 position 10).

Command communications protocol given on Page 19 of this manual.

The delivery set also includes software highlevel Lc 300 (see Appendix to the Instruction Manual) to work with PCs running it on Windows 2000, Windows XP SP2, Windows Vista or Windows 7.

This laser system can operate without PC and without external pulse generator with 1 kHz pulse repetition rate and constant $200^{+15\%}_{-10\%}$ μJ pulse energy only.

This laser system can operate without PC and with external pulse generator (not supplied). In this case, pulse frequency by an external pulse generator. But in this case pulse energy is constant and equals: $200^{+15\%}_{-10\%}$ μJ in the frequency range of 0,01 to 1 kHz, and $200 \pm 25\%$ μJ at frequencies ranging from single pulse to 10 Hz. Beginning with a certain frequency above 1 kHz (this frequency may vary from the laser to the laser, and decrease with time), the pulse energy decreases.

According to safety standard (CDRH) requirements this laser system classified as a Class IV laser product shall be provided with a manual reset to enable resumption of laser radiation emission after interruption of emission caused by the use of a remote interlock or after an interruption of emission in excess of 5 seconds duration due to the unexpected loss of main electrical power.

6.2 Cooling the laser head and the power supply unit

Necessary condition to meet its laser parameters specifications and warranty conditions is the work of the laser with the appropriate heat sink. The laser is cooled by heat from the metal base laser head and power supply.

The maximum allowable temperature Laser Head is 40°C and Power Supply Unit base plates is 50°C.

There are only two options for the heat sink:

1. Using the attached fan head sinks. Fix the LH and PSU on the corresponding FHS (Fig.1 position.6 and 7) fixing screws. Connect FHS LH and FHS PSU to FHS cables (Fig.1 position. 8 and 9) with the connectors on the rear panel PSU (Fig.3 position.11). It is recommended to use a shorter cable for connecting an FHS with PSU.

2. You can use the laser without FHS providing heat conduction through the LH and PSU bases to customer metal plate. The mounting surface should be flat (within $\pm 0,05$ mm over mounting surface). It is recommended to use a thermal heat compound between the Laser Head (Power Supply Unit) and mounting surfaces to provide good thermal contact.

For mounting to the heat sink on the basis of the LH and PSU provided by 4-hole.

Note: Two holes for the pins underneath it on the basis of the LH, provides for precise positioning of the radiator.

Warning! In case of overheating, protective circuit turns pumping diodes off and they are turned on again automatically after temperature of the base is reduced. Be careful.

6.3 Laser head and power supply connect

Warning: when connecting and disconnecting cables power supply must be disconnected from network power.

Check the serial numbers of the laser head and power supply.

The power supply is factory tuned to optimize the performance of the laser head delivered with the supply. Do not operate a Model DTL-419QT laser head with any power supply but its own. The Model DTL-419QT has features that protect the laser diode pump from destructive current surges. A few precautions will give the additional margin of safety.

If you violate this requirement, the laser can not meet the parameters of its specifications, and warranty on the laser to fail.

Warning! Do not disconnect the laser head and power supply when the laser is turned on. This can lead to a failure of the laser system!

6.4 Preparation of the laser to operate

6.4.1 Provide a cooling the laser head and the power supply unit (p.6.2).

6.4.2 Connect AC/DC adapter power cable (Fig.1 position 13) with AC/DC adapter (Fig.1 position 12).

6.4.3 Connect adapter's low voltage power cable with line in voltage connector PSU 12V (Fig.3 position 6).

Supplied laser also includes low voltage power cable (Fig.1 position 14). It is designed to power the laser from a consumer low-voltage source ($12 \pm 10\%$ V).

Make sure that the output voltage is $12 \pm 10\%$ V when the laser operates on low voltage power supply.

Warning! Connection to the laser a power supply voltage of more than 15 V or voltage peaks over than 15V, may cause damage to the laser.

6.4.4 Connect LH and PSU use signal cable attached (Fig.1 position 4). Push plug of the cord in the proper receptacles of the LH (the connector on the rear flange of the LH) and PSU (Fig. 3 position 5), and screw up the screws on the plug.

6.4.5 Connect the RF cable (Fig. 1 position 5) to the corresponding connector on the front of PSU (Fig. 3 position 7) and LH (Fig. 2 position.2). Attach the RF cable retainer (Fig. 2 position 7).

6.4.6 Insert the control connector plug (Fig. 1 position 11) into the control connector (Fig. 3 position 1) on the front panel power supply and tighten the screws on the connector.

Note: No laser emission if the socket control connector of power supply is not installed plug or cable for connection with PC.

6.4.7 LH and PSU should be grounded! To ground the laser head and power supply unit provides threaded holes M4 on their bases.

6.4.8 Set key switch "ON/OFF" on the front panel of the power supply to "OFF" position (Fig.3 position 8).

6.4.9 Connect power cord to the network power.

6.4.10 Open the beam attenuator on the laser head (Fig. 2 position.4).

6.5 Turning the laser on

6.5.1 General information

There are three main modes of operation with the laser:

- 1) with a PC,
- 2) with an external pulse generator,
- 3) without both of them (see below).

To turn the laser on set the key switch "ON/OFF" on the front panel of the power supply to the "LASER ON" position. The LED indicator on the PSU front panel (Fig.3 position 2) has to blink with green periodically light indicating the process thermal stabilization in the LH. When temperature in LH is stabilized, the LED indicator shall be switched to orange light emission, and a few seconds later the generation of radiation shall be gradually increased.

It takes them approximately 5-6 min between key turning on and reaching target temperatures. (If "Pumping off" is recorded as initial settings the indicator shall light green uninterruptedly, waiting for "turn pump on" command – see Appendix).

6.5.2 Operation without PC and without external generator

Laser can operate without PC and without external generator. To turn the laser on this mode execute p.6.4 and p.6.5.1. Pulse repetition rates of the generation are constant and equal 1 kHz. Pulse energy is in maximum value ($200^{+15\%}_{-10\%}$ μ J) only. To start generation pin #4 of the Interlock socket (Fig. 1 position 11) must be short-circuited to the ground (pin #8) (manufactory preinstalled).

6.5.3 Operation without PC and with external generator

In order to operate in this mode an external generator is needed. Its pulse parameters are shown in the Table 1.

1. To start external generation pin #4 of the Interlock socket must be disconnected with any pins (Fig. 1 position 11). The user has the right to appropriate this description Open / Short # 3 or # 4 to pin # 8 on the control connector plug (see Table 2) (eg, soldering).

2. Execute p.6.4.

3. Set the parameters of the external pulses generator:

- polarity positive;
- amplitude $5 \pm 0,5$ V;
- pulse duration ≥ 1 μ s;
- rise time ≤ 100 ns.

4. Connect external generator with PSU using the BNC socket "External Trigger" (Fig. 3 position 4).

5. Execute p.6.5.1.

Pulse energy is constant and equals $200^{+15\%}_{-10\%}$ μ J.

6.5.4 Operation via RS-232 interface

1. Before working with the laser set on the PC the supplied program Lcc300 (See Appendix to Instruction Manual).

2. Follow the steps to p.6.4 without p.p 6.4.6.

3. Connect the COM port of a PC user with control connector PSU (Fig. 3 position 1) using the supplied cable for connection with PC (Fig. 1 position 10).

More possible to use an adapter USB - COM. To this end, the first use of an adapter, you must install the adapter driver to the computer and set this adapter address of the COM1 or COM2.

Warning! Adapter USB - COM is connected to the power supply only through the cable for connecting with PC.

4. Execute p.6.5.1.

See below Appendix to Instruction Manual.

Attention! Pulse energy at less than 10 Hz pulse repetition rate is constant and can not be regulated ($200 \pm 25\%$ μ J).

7. FRONT PANEL AND REAR PANEL OF POWER SUPPLY

At the front panel of power supply (Fig.3) are:

1) Control connector (position 1).

There is "INTERLOCK, EXT.CONTROL" connector on the front panel of the power supply.

The control connector is used to switch modes from internal or external oscillator at work without a PC. Switching modes is performed by connecting or disconnecting of the contacts of the control connector (see Table 2) or using Lcc300 (see the Annex to the Instruction Manual).

Important! The laser only works when the contacts # 3 and # 8 ("Interlock") of the control connector are connected. If the contacts are disconnected, the laser stops generation.

Also, control connector is for connection and operation of a laser with a PC.

2) LED indicator (position 2).

LED designed for systems status of laser (see Table 3).

3) BNC-connector synchroout (position 3).

Output synchro signal BNC connector provides electric signal, which rise edge is synchronized with optical laser pulse. It may work unstable if output pulse energy is less than approximately 0,3 max value at max. pumping. Sync. out signal is formed by output laser optical pulse.

Parameters of the triggering in and synchronizing out signals are shown in Table 1.

4) External triggering BNC (position 4).

BNC-connector of the triggering pulse is designed to feed pulses from an external generator.

Switching of operation (external or internal triggering mode) is performed by commutating Interlock circuit pins (see Table 2) or using Lcc300 Software (see Appendix to Instruction Manual).

There is *External triggering BNC connector* to use external triggering mode.

5) Output connector (to laser head) (position 5).

6) Line in voltage connector 12V (position 6).

7) RF output connector type of SMA (position 7).

RF output connector delivers RF power to LH AOM by means of RF cable and RF input connector of LH (Fig.1 position 5).

8) Power Switch (position 8).

In the position "OFF" of the key switch "ON/OFF" the power supply is turned off (vertical position).

In the position "ON" of the key switch "ON/OFF" the power supply is on (horizontal position).

There are two connectors 12 VDC on the rear panel to use them as power supply for the two included in shipment heat sinks (for LH and PSU) (Fig.3 position11).

8. TROUBLE SHOOTING GUIDE

Below it can be found a troubleshooting guide that covers several possible problem situations. These problems may be removed by a customer and should not be addressed to Laser-Export Co. Ltd.

Event	Indicators		Possible cause and recommendation
	Status Indicator (PSU)	Status Indicator (LH)	
No laser emission	No light	No light	a) Key switch doesn't turn on. Rec.: turn on the key. b) The power cord is unplugged. Rec.: plug the power cord. c) i) Low input AC voltage - Line voltage is below 90 V, ii) Input DC overvoltage (>14 VDC) or undervoltage (<10 VDC) Rec.: Check voltage.
No laser emission	Red blinking	No light	Laser head is disconnected to power supply, or connection is not proper. Rec.: Check connection
Laser generation stop	Steady red	Light	The laser head is overheated. Rec.: Provide sufficient heat dissipation to laser head.
No laser emission	Orange blinking thrice	Light	RF cable of the Laser head disconnected to power supply, or connection is not proper. Rec.: Check RF connection.
No laser emission	Steady orange	Light	Beam attenuator close. Open beam attenuator.
No laser emission	Steady orange	Light	Start setup 0 μ J (see Communication protocol instructions). Turn on and turn off the laser from a connected PC (see p.p. 6.5.4).

9. OPERATING AND STORAGE

- Do not place laser in dusty or humid places.
- Do not shock or shake laser.
- Keep the laser in terms of the "L" in accordance with GOST 15150: in a heated and ventilated warehouse.

10. WARRANTY

Manufactory warrants that the laser Model DTL-419QT to be free from defects for twelve months from the date of shipment. If it is found defect during the warranty period, the product will either be repaired or replaced. This warranty does not apply to defects resulting from modification or misuse of the laser.

Warning!

Do not disassemble laser head, power supply unit or other parts of the laser. Laser does not have internal components which can be serviced by the user. Only authorized service personnel may open the laser. Servicing should be performed only by qualified service personnel. Warranty does not apply to the laser if the laser or its parts have been subject to disassembly.

To return Model DTL-419QT for repair, Laser Export packing box should be used. Otherwise the laser can have been damaged during shipment.

11. APPENDIX

Table 1. Triggering and synchro signals

EXT.TRIG: (Input signal)	5±0.5 V, positive polarity, input AC impedance 1 KOhms, $\tau_{rise} < 100$ ns
SYNCHR.OUT: (Output signal)	5±0.5 V (50 Ohms load), positive polarity, $\tau_{pulse} = 2.5 \mu s \pm 30\%$, Output impedance - 50 Ohms. $\tau_{rise} \approx 5$ ns.

Sync. Out signal is formed by output laser optical pulse. It may work unstable if output pulse energy is less than approximately 0.3 max value at max. pumping of appropriate frequency.

Table 2. Description of "INTERLOCK, EXT.CONTROL" connector

Pin No	Description	Note
1	TD	RS-232
2	RD	RS-232
3	Interlock	Laser ON – if connected to Signal GND #8 (or <1VDC)
4	Ext./Int. Trig. Switch	Internal – if connected with Signal GND #8
5	Laser energy monitor	2,5VDC - Target energy (maximum energy)
6	SG	RS-232
7	DTR	RS-232
8	Signal GND	

Table 3. System Status Indicators

Pin №	System status	Status Indicator (PSU)	Status Indicator (LH)
1	Preparing to operation	Green blinking	Orange
2	Pumping ON, normal operation	Orange	Orange
3	Input DC overvoltage (>13,5 VDC) or undervoltage (<10,5 VDC)	No light	No light
4	No input voltage, wrong input voltage polarity connection	No light	No light
5	Laser head disconnected or not properly connected to driver.	Red blinking	No light
6	RF cable is disconnected	Orange blinking thrice	Orange
7	Interlock pins are disconnected	Green-orange blinking	No light

Appendix to the Instruction Manual

Lcc 300 Software Instruction.

1 Product Description

This program is intended for control of laser parameters with PC interface RS-232 using OS Windows 2000, Windows XP, Windows 7, Vista. This program may record and read initial settings into EEPROM memory and change both pulse repetition rate (frequency) and laser pulse energy.

2 Lcc300 Installation

Installing of this program is automatically. During the installation the information windows are opened. Customer has opportunity to cancel the installation or change installation folder. In order to install the program run file Lcc300.EXE. Then follow installation information windows which being opened during installation process. If information has to be confirmed press NEXT-NEXT - NEXT – FINISH. On Desktop starting Lcc300 icon appears.

3 Operation with the program

3.1 Start the program

Before the program operation starting all programs and applications used the COM port intended for use with the laser PSU must be closed.

The following window has to appear after the program launching (fig.1)

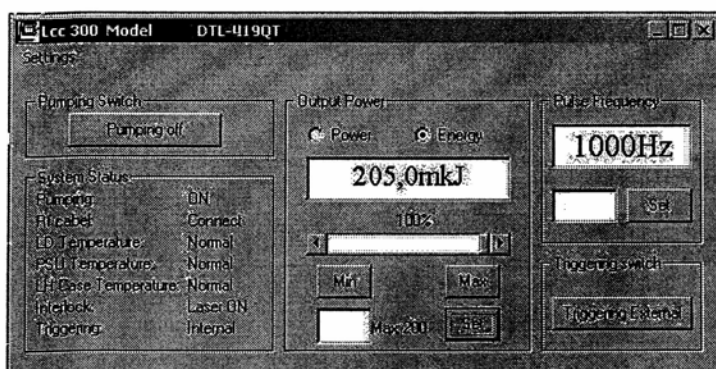


Fig. 1

In case of the program has been launched when the laser is turned off or connected to another COM port except for COM1 it is needed to choose using COM port (usually COM1: or COM2:) from cascading menu <setting> <Port setup> (see fig.2 and 3).

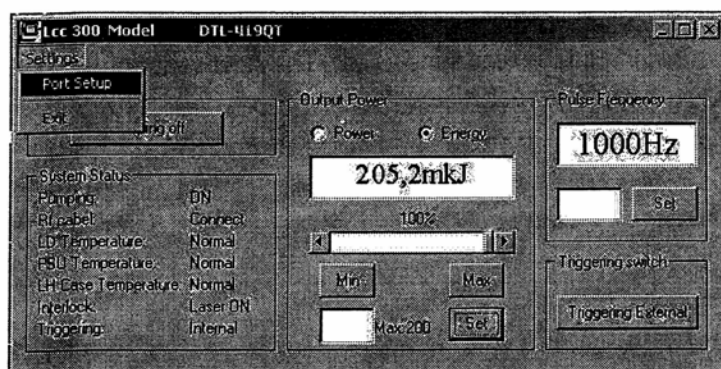


Fig. 2

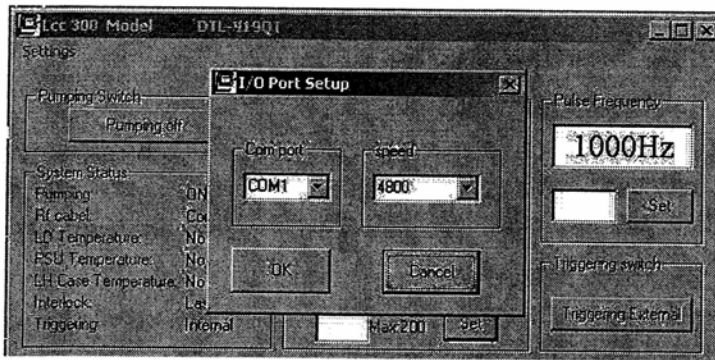


Fig. 3

If the laser is turned on (or connected) with the appropriate COM port the program window becomes active automatically.

If connection between the laser and PC is interrupted by any causes the program window becomes inactive. In this case the procedure of COM port choice has to be repeated.

3.2 Laser parameter's control

General view of the laser control panel is in fig.4.

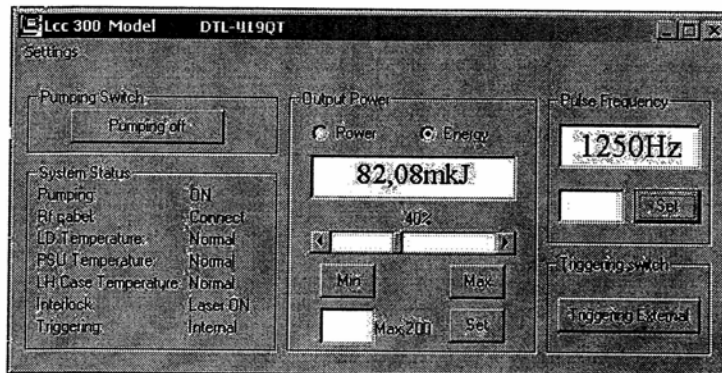


Fig. 4

The frame **< System Status >** consists of status information concerning of Pumping, Rf cable contact, LD Temperature, PSU Temperature, LH Case Temperature, Interlock and Ext./Int. Triggering.

*The frame of frequency (pulse repetition rate) setting and indication **<Pulse Frequency >**.*

In the upper part of the frame it is shown pulse repetition rate of internal triggering. To change pulse repetition rate write new value in the range of 10-30000 Hz in the rectangle on the left side from the **<Set>** button. When **<Set>** button is push new data are written into power supply unit. The new value of the pulse repetition rate read from power supply unit will be indicated in upper rectangle.

*The frame of energy (average power) setting and indication **<Output Power >**.*

In the upper part of the frame it is shown pulse energy measured with internal energy meter (or recalculated power value: energy multiplied by pulse repetition rate indicated in the neighbor frame- see above). There are three ways to change pulse energy:

- With slider in the range of 0-100%,
- write new value in the range of 0-Max.(this value is written near the rectangle) in the rectangle on the left side from the **<Set>** button,
- Push **<Min>** or **<Max>** button.

Attention! Measurements of output average power and energy indicated on PC display using Lcc300 software is not precision. It indicates approximate values only. Use calibrated external power meter for more precision measurements which intended for this purpose.

The frame of triggering switch of mode laser <Triggering switch>.

Here is a button to switch between the Internal <Triggering Internal> and External <Triggering External> runs. To change the frequency range from 0 Hz - 10000 Hz to connect an external electric pulse generator to the BNC - plug the triggering pulse (Fig.3 position 4). Then switch the mode of the laser to the external by clicking <Triggering External>.

Communication protocol instructions

№	First transmitted byte from PC to MK	Second transmitted byte from PC to MK	Second accepted byte from PC to MK	Command description	Note
1	0x80 (10000000 bin)	WWWWWWWW		Set new power value of current switch-on. Not saved in MK EEPROM.	Control of laser energy (0...255)
2	0x83 (1000 0011 bin)	XXXX NNNN		Record variables of laser switch-on modes. Lower bit : Pumping switch-on control. Lower bit: 0-pumping switch-off or 1- pumping switch-on.	2)*
3	0x05 (0000 0101 bin)		XXXX NNNN	Accept laser switch-on mode variables.	
4	0x02 (0000 0010 bin)		0000 00NN	Accept pumping unit temperature status: 1 – normal, 2 and 3 –non normal	
5	0x03 (0000 0011 bin)		0000 00NN	Accept laser head base temperature status: 1 – normal, 2 and 3 –non normal	
6	0x08 (0000 1000 bin)		HHHH HHHH	Accept upper byte of average photocurrent readings.	
7	0x09 (0000 1001 bin)		LLLL LLLL	Accept lower byte of average photocurrent readings.	
8	0x97 (1001 0111 bin)	HHHH HHHH		Set upper byte of frequency divided by 10.	Internal triggering frequency control
9	0x98 (1001 1000 bin)	LLLL LLLL		Set lower byte of frequency divided by 10. Set new frequency value.	Internal triggering frequency control
10	0x9E (1001 1110 bin)	0000 000N		Record triggering mode (INT/EXT) N="0" – INT N="1" – EXT	2)*
11	0x1E (0001 1110 bin)		0000 000N	Accept triggering mode (INT/EXT) N="0" – INT N="1" – EXT	2)*
12	0x 1F (0001 1111 bin)		0000 000N	PSU temperature status (01 – normal, 00 – overheating).	
13	0x 1D (00011101 bin)		0000 000N	It used for RF cable connection checking. 00 – OK, 01 – bad connection.	

Communication rate 4800, 8 bits, no parity bit, single stop-bit.

In order to have a possibility of laser operation without PC the starting settings below are incorporated into the program.

After the turning laser on the starting pumping settings are read from the low-order bit of 00 EEPROM cell ("pumping on" or "pumping off"). The data recording into this cell are performed by the command "0x83 0xXX". So, if, for example, "pumping off" is recorded (programmed) then the laser can not be generated without PC.

The pulse laser energy extreme values (max. or min.) are set according to the 1-st and 2-nd bits.

This value is the default energy value after the laser turning on.

1) Description of the second byte of the command "0x83".

0 bit – (low-order bit) – “1” – pumping on; “0” – pumping off (with PC operation)

1 bit – after turning laser on only: - “1” – pumping on; “0” – pumping off (without PC operation)

Pulse energy value after the laser turning on:

	Min	Max
2 bit –	“0”	“1”
3...7 bits – “0”	- they don't use in the laser.	

2) When Pin 4 and Pin 8 of "INTERLOCK, EXT.CONTROL" connector is closed (preinstalled status of the pins) the microcontroller program can switch the pulse trigger source (INT/EXT). And if these pins are disconnected the program has to operate at external triggering mode only.

Note. Lcc300 program changes settings of 00 EEPROM cell to “0x07” automatically!
This command corresponds “turning laser on and set max. pulse energy value”.

12. TEST REPORT

Laser DTL-419QT

Serial Numbers:

1) Power supply: No 32000424

2) Laser head: No 32000424

Pulse energy, 527 nm at 1 kHz 209 μJ

Line Voltage: ~90-264 (12 $\pm$ 10%) V

Laser proved to be suitable for operation

Date october 2011

Name True

Manufacturer Stamp



Packing list # 2069

1. DTL-419QT

1. Laser head s/n 32000424	1 pc
2. Power supply s/n 32000424	1 pc
3. Keys	2 pcs
4. AC/DC adapter s/n 32000424	1 pc
5. Signal cord s/n 32000424	1 pc
6. RF cord s/n 32000424	1 pc
7. Heat sink with fans for the laser head s/n 32000424	1 pc
8. Heat sink with fans for the power supply s/n 32000424	1 pc
9. Connective cord for the laser head FHS s/n 32000424	1 pc
10. Connective cord for the PSU FHS s/n 32000424	1 pc
11. Cord for connection with PC s/n 32000424	1 pc
12. Control connector plug	1 pc
13. AC/DC adapter power cord 115V s/n 32000424	1 pc
14. Low voltage power cord (red) s/n 32000424	1 pc
15. USB-Serial converter s/n 32000424	1 pc
16. Instruction manual	1 pc

Упаковочная ведомость № 2069

1. DTL-419QT

1. Излучатель с/н 32000424	1 шт.
2. Блок питания с/н 32000424	1 шт.
3. Ключи	2 шт.
4. Сетевой адаптер с/н 32000424	1 шт.
5. Шнур сигнальный с/н 32000424	1 шт.
6. RF шнур с/н 32000424	1 шт.
7. Радиатор с вентиляторами для ИЗ с/н 32000424	1 шт.
8. Радиатор с вентиляторами для БП с/н 32000424	1 шт.
9. Соединительный шнур для радиатора ИЗ с/н 32000424	1 шт.
10. Соединительный шнур для радиатора БП с/н 32000424	1 шт.
11. Шнур для подключения к ПК с/н 32000424	1 шт.
12. Заглушка контрольного разъема	1 шт.
13. Шнур питания для сетевого адаптера с/н 32000424	1 шт.
14. Шнур питания низковольтный с/н 32000424	1 шт.
15. USB-конвертер с/н 32000424	1 шт.
16. Руководство по эксплуатации	1 шт.

Упаковал



Дата 07.10.2011

Проверил

