Laser shutter Manual

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Introduction

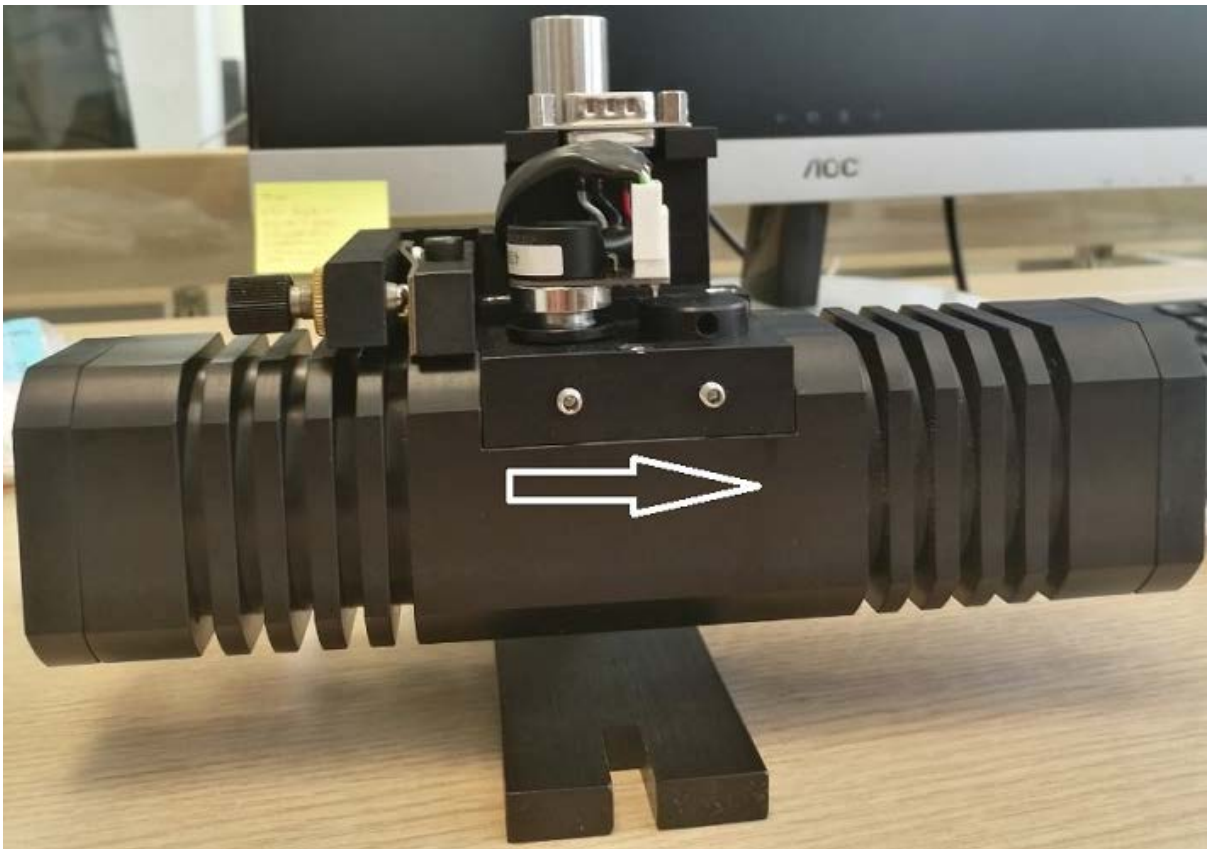


Fig.1 Laser shutter photo.

Possible applications: laser cutting, drilling, engraving, laser surgery systems, research and others.

Laser shutter is designed for fast single interruption or multiple exposure of high power laser beam in spectral region from UV to IR. Operation of Laser Shutter is based on the fast Galvanomagnetic scanner. Scanner is incorporated in nondispersive optical system to achieve speed of blanking better than parts of milliseconds. This new design ensures very high speed and high damage threshold of shutter without using of any dispersive optical elements (lenses, prisms).

Construction. This type of shutter doesn't use focusing lenses. Beam diagram is presented in Fig.2.

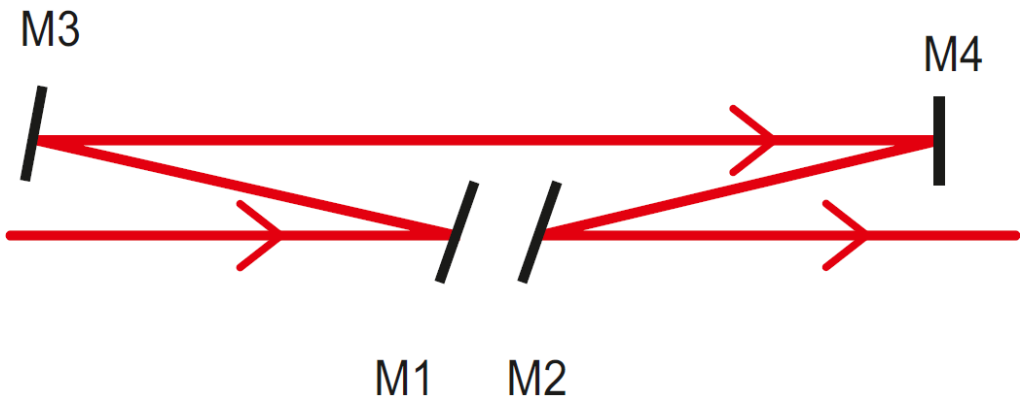


Fig.2. Beam diagram of collinear nondispersive fast laser shutter. M1-rotating galvo mirror, M2-M4-adjustable 100% metal mirror.

System includes: galvo scanner with driver and mount, controller, galvo scanner cable. As an option a green or red diode laser should be applied for system alignment (not included).

Specifications

o Incident beam diameter, not more	10 mm*
o Laser beam polarization	independent
o Laser power, max	200W
o Switching frequency range, max	0-1kHz**
o Switching time (closed-opend), not more	>0.2ms/1ms**
o Typical switching time (opened-opened)	>0.5ms/2ms**
o Control via RS232 port	Yes
oControl via USB port	Yes
o Control from external (0-5V) generator	Yes
o Control from internal (0-5V) generator	Yes
o Manual control	Yes
o Manual switching	Yes
o Shutter position indication	Yes
o Shutter dimensions, max	200*40*60mm
o Electronic box, max	145*215*86mm
o Electrical power consumption, not more	100/220V, 30W

*optionaly up to 30mm
**depends on beam diameter

The results of equipment test are given below. Opening/closing time and residual scattered light are the main parameters of shutter.

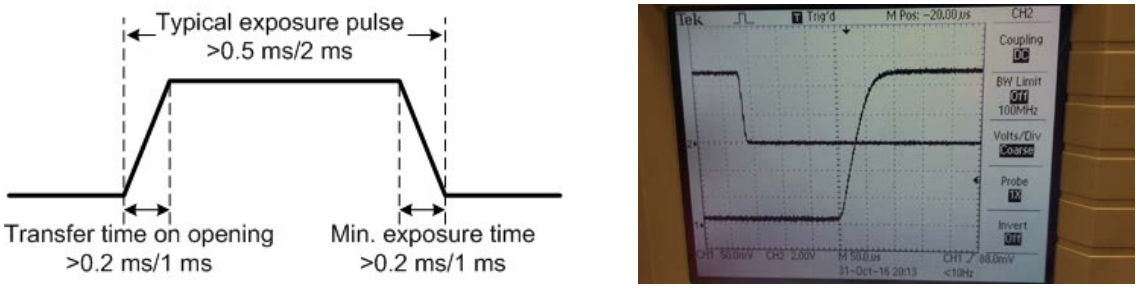


Fig.3. Transient characteristics of FBS.

Operation manual

Shutter as usually is factory aligned and prepared for work.

Alignment of system is very simple and takes only few minutes. For alignment we recommend to use red or green laser. Please keep following order:

1. Align visible laser beam with infrared one.
2. Align beam into the center of shutter's input hole perpendicularly to the front surface of shutter. For that we recommend to press metal mirror to front surface and get a backward reflection.
3. Switchers switch on positions "OPEN", "MAN", "ANALOG". Rotate potentiometer "ANGLE" fully counterclockwise.
4. Switch on power supply of controller. When the power supply is switched-on, the galvo scanner mirror takes position parallel to optical axis (Fig.1). It corresponds to low TTL level and position "beam opened". Under good alignment of system You will see a 100% visible beam throw over the output hole of shutter.

5. Switcher reconnect to position "CLOSE". Under rotation of potentiometer "Angle" clockwise You should get a complete closing of beam. Now shutter is prepared to work.

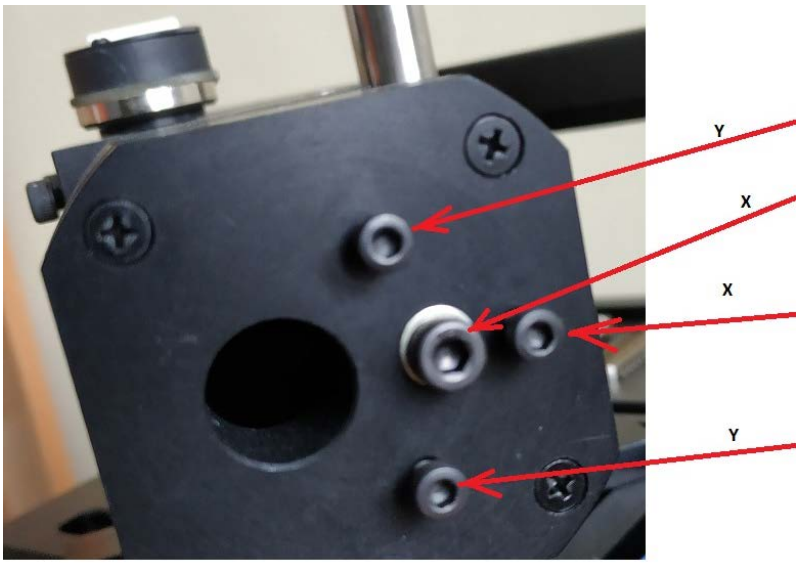


Fig.4 Description of X-Y alignement screws.

Description of switchers

a) b)

Fig.3 Front panel of shutter controllers, a) old version, b)new version with additional option for operation in "Master" mode ("SINC" output) and USB port.

"OPEN/CLOSE"- for regulation of Shuter under first installation in "Manual" regime.

By rotating potentiometer on front panel You can change angle of galvo mirror before reach complete damping of laser beam in "Close" position. This angle remain valid also when You control shutter from external generator!

"MAN/EXT"-for the control Manually by rotating potentiometer on front panel or by using external pulse generator.

"Analog/Computer"- for shutter drive using analog signals or from Computer**.**
In the Position Analog You drive Shuter using *Manually* from internal DC power supply or Externally using pulse generator. TTL Low signal (Ground) correspond "Open" position (100%

transmittion) whereas TTL High (+5V) correspond “Close” position. When You switch in position *Computer* TTL pulses are generated from internal generator. You can change frequency of generation by commands (see below **Control via RS232 port**).

“GEN”-is used for external triggering using positive TTL pulses +(2-5)V. In this case switcher “Manual/External” should be in position “External”, switcher “Analog/Computer” in position “Analog”. Amplitude of shutter angle between Close/Open positions is regulated with potentiometer on front panel. Remember, that shutter due to inertia of mirror have some delay relative to triggering pulse.

“SINC”- output signal for shuter operation in “master” mode (only for new type controller). You can delay laser output relative to shutter up to 300mks.

“Galvo” – Galvanoscanner connection

“RS232” – control via RS232 protocol

“USB” – control via USB2 or USB3 port. In this case RS232 is reconnected automatically.

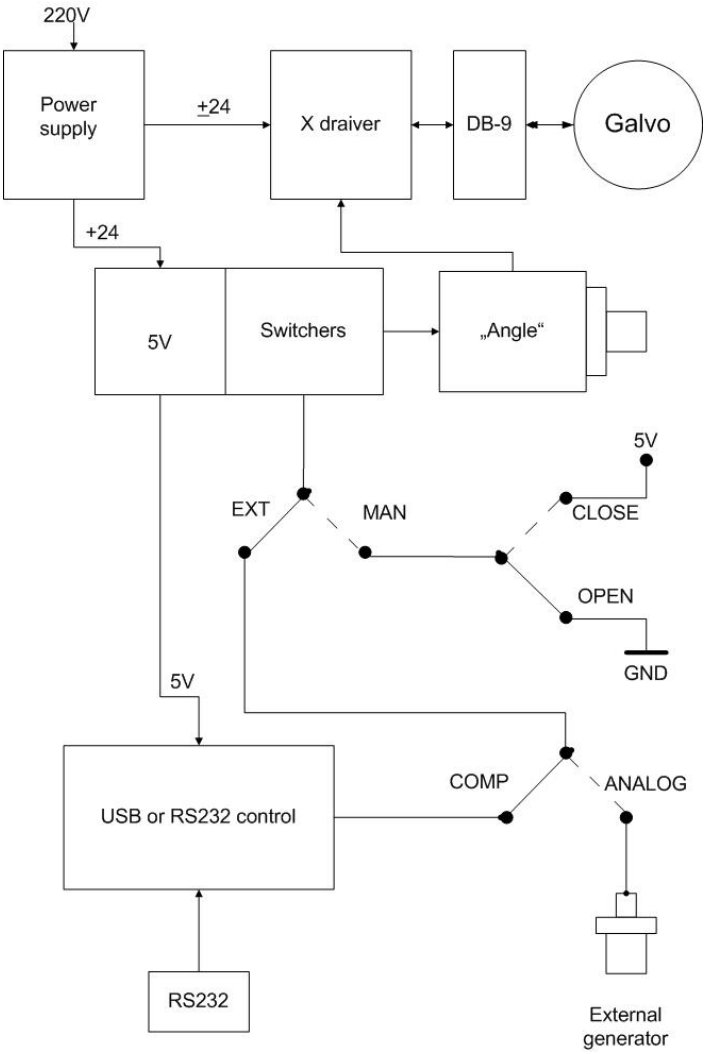
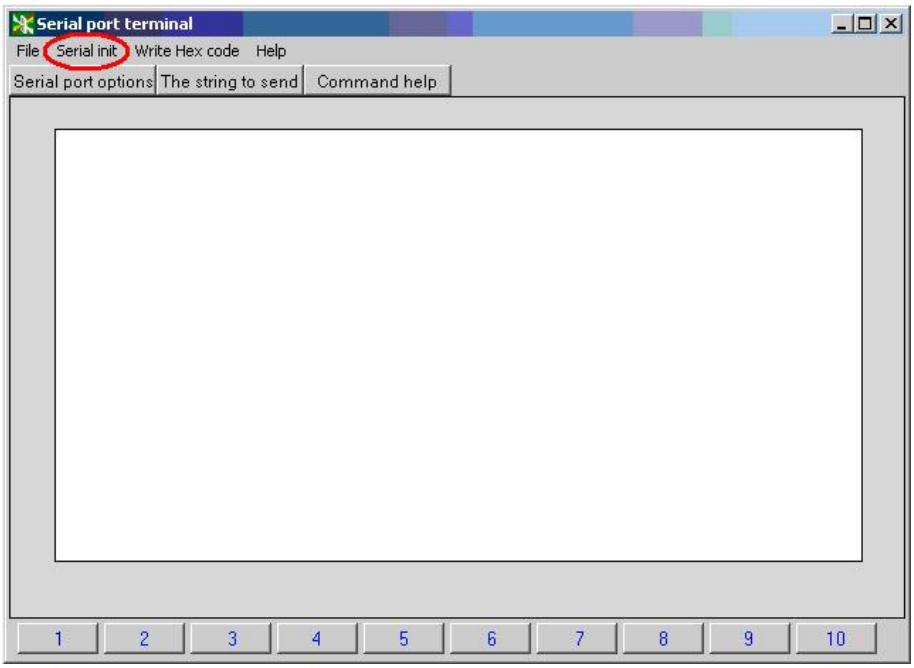


Fig 4. Schematics of switchers

Control via RS232 port

Program runs through “serial port terminal.exe”. Then window opens start COM port activation. This should be done from “serial init”, shown in Fig.5. When opens window asks to enter used COM port. After that you are free to enter commands which are listed below.



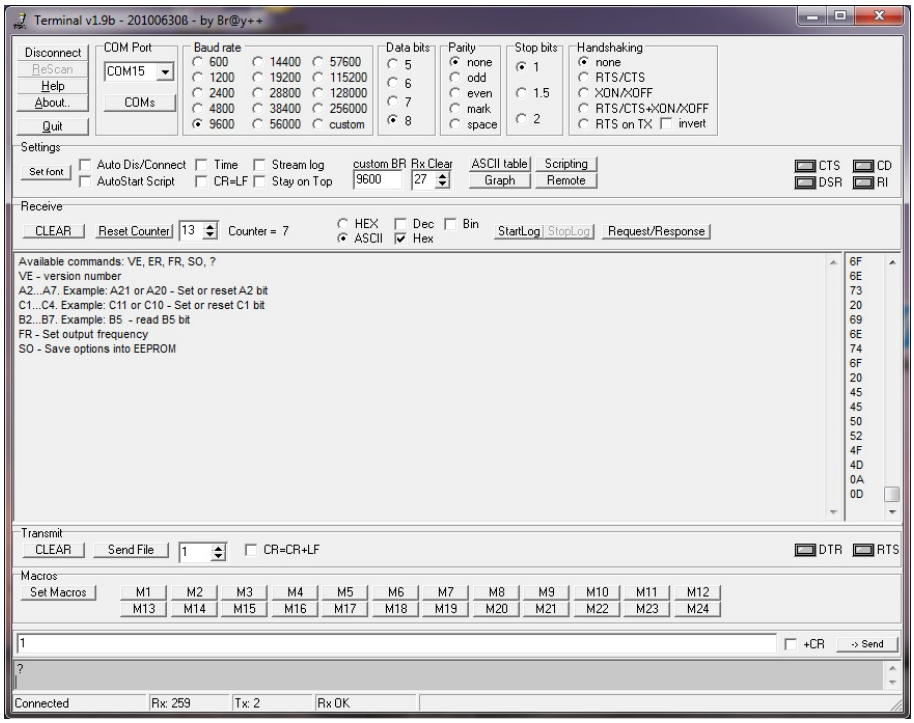


Fig.5. Interface of program

Installation: Put both files "Serial port terminal.exe" and "Bwcc32.dll" into the same directory. Some default commands can be read by "Serial port terminal.exe" from "bydefault.cfg" file. Note: "Bwcc32.dll" is standard Borland C++ 5.02 dynamic library file, found in the C++ 5.02.

UART configuration:
Boud rate:9600
Data bits:8
Paryti:None
Step bits:1
Handshading:none

Commands:

? – help menu
a70 – open shutter
a71 – close shutter
frX – frequency of opening/closing, where X means frequency (min value 0, max 1000)
NOTE: RS-232 has its own standard where digital 1 =+3…9V and 0=-3…-9V. PC and TTL interface have microchips – level converters, which change these analog signals to TTL standard signals. Through RS232 cable commands are sent in ASCII codes.

Control via USB port

In this case RS232 is reconnected automatically.
Driver for USB virtual COM port You can find here:
https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers