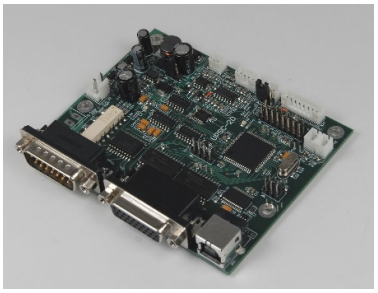
海纳光学
电话：0755-84870203
邮箱：sales@highlightoptics.com

PRECISION LASER SCANNING

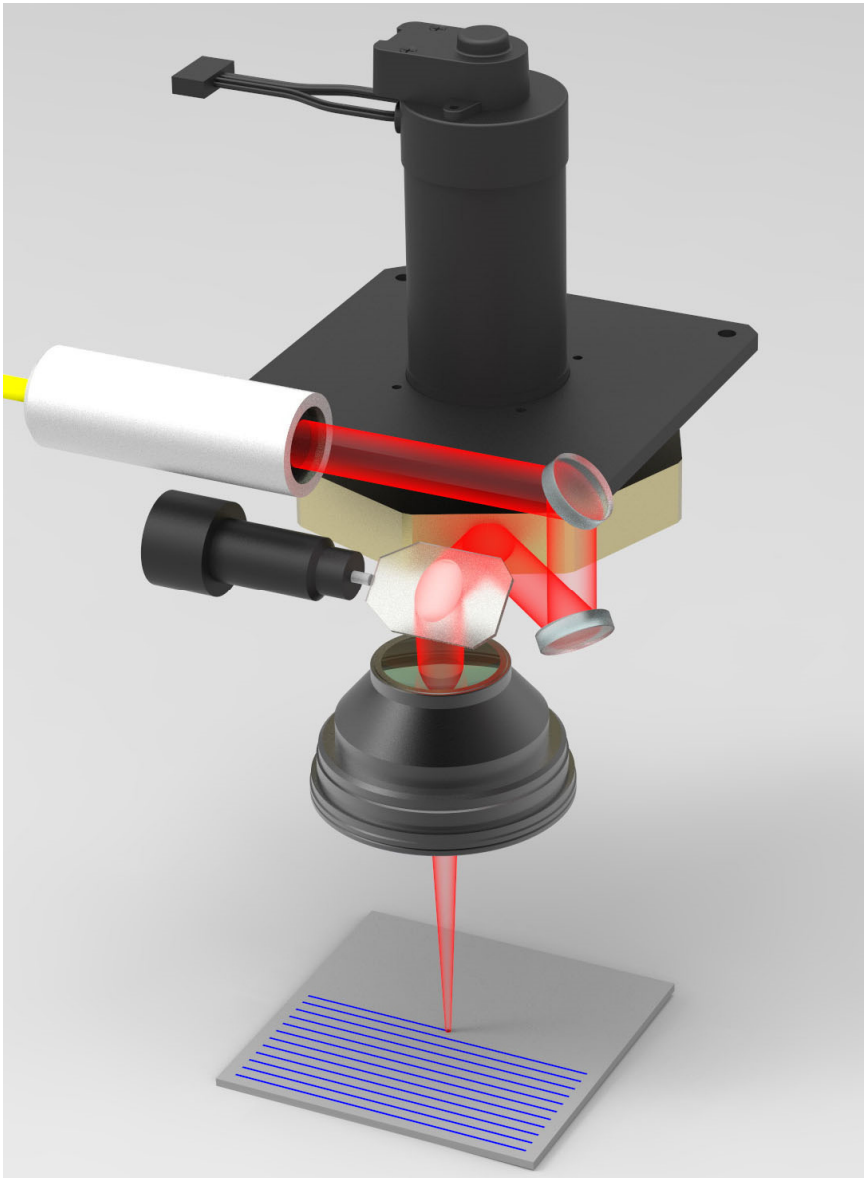
PRECISION RASTER SCAN POLYGON CONTROLLER™

MODEL UPSC-20

Sync a polygon scanner with galvo and laser for Ultrafast cleaning / surface modification



Precision raster scan polygon controller



Application
In some situations, high power and USP / Ultrafast lasers cannot achieve their full speed potential with galvo scanners. When scan speeds of hundreds of meters a second are required, a polygon scanner may be the solution.

The *Precision raster scan polygon controller* can synchronize a polygon scanner with a galvo scanner and a laser to create a raster scan at hundreds of meters per second. The polygon provides a fast X-axis line scan. At the end of each line, the galvo steps one increment to provide the Y-axis. This scanner combination will create a raster scan on a fixed target. Or, the galvo can be used to sync with a moving target. This controller is designed to be used with a Wood Pecker (400-4000 RPM) or Eagle Eye (1000 to 10000 RPM) polygon scanner from Precision Laser Scanning. The controller allows remote control of the polygon speed. A Precision Start Of Scan (SOS) detection kit tells the controller precisely when each scan starts. This allows the controller to turn on the laser at the correct time. The user can adjust the range and overlap of the Y-axis galvo motion. The controller has an analog output to control the movement of the galvo.

The *Precision raster scan polygon controller* is ideal for high speed full field raster scanning as needed for ultrafast cleaning or surface modification. It only does full field scanning. This is not a substitute for a traditional marking system which is used for writing characters or patterns.

Features
- Powerful laser control interface
- SOS pulse input
- Galvo control output
- Scan-on-Demand
- Speed control calibration table
- Safety interlock

The *Precision raster scan polygon controller* has RISC microcontroller with all necessary peripherals. The controller requires a Start-Of-the-Scan (SOS) detection system which consists of tightly focused red laser pointer and shielded detector operated out of plane from the high power working beam. The SOS signal is fed into the processor to give precise timing of the start of the fast X-axis scan which resets the internal 16-bit counter. This counter provides information about the position of the beam throughout the scan. The counter has two hardware compare registers. When the counter reaches a value predefined by some of the compare registers it triggers an event. The event can be used for switching the laser on or off respectively.

The *Precision raster scan polygon controller* has all the necessary signals to control polygon scanner
- polygon motor enable (5V TTL/CMOS)
- control the speed of polygon scanner by means of external TTL reference frequency
- detect @ speed

The controller internally analyzes rotation dynamics of the scanner and sets an internal flag when the mirror reaches stable speed. This flag together with “@Speed” signal is used for safety. In the case instability is detected, the controller immediately switches off

the laser to avoid dangerous situations like back reflection etc. As soon as the speed becomes stable again the laser trigger signal continues operating normally.

Laser control interface

The *Precision raster scan polygon controller* has a powerful laser control interface. It is possible to set laser power and pulse repetition rate as well as other necessary laser parameters by means of output signals:

- laser power:
  - analog voltage: 0...10V
  - digital parallel bus 8 bit
  - PWM
- laser enable
- seed laser enable
- emission enable
- laser frequency
- laser pilot enable
- emergency off
- configurable RS-232 laser control interface

Galvo control

The *Precision raster scan polygon controller* has analog output +/-10 V for controlling any common galvo scanner. The galvo scanner can be used as:

- second (slow) axis, e.g. in laser cleaning application
- compensation of the movement of the conveyer
- compensation of repeatable part (about 90% of the value)

Control interface

The *Precision raster scan polygon controller* has a versatile and simple external interface. It can be used as a part of CNC machine providing all necessary signals as well as simple standalone controller operated by one single button.

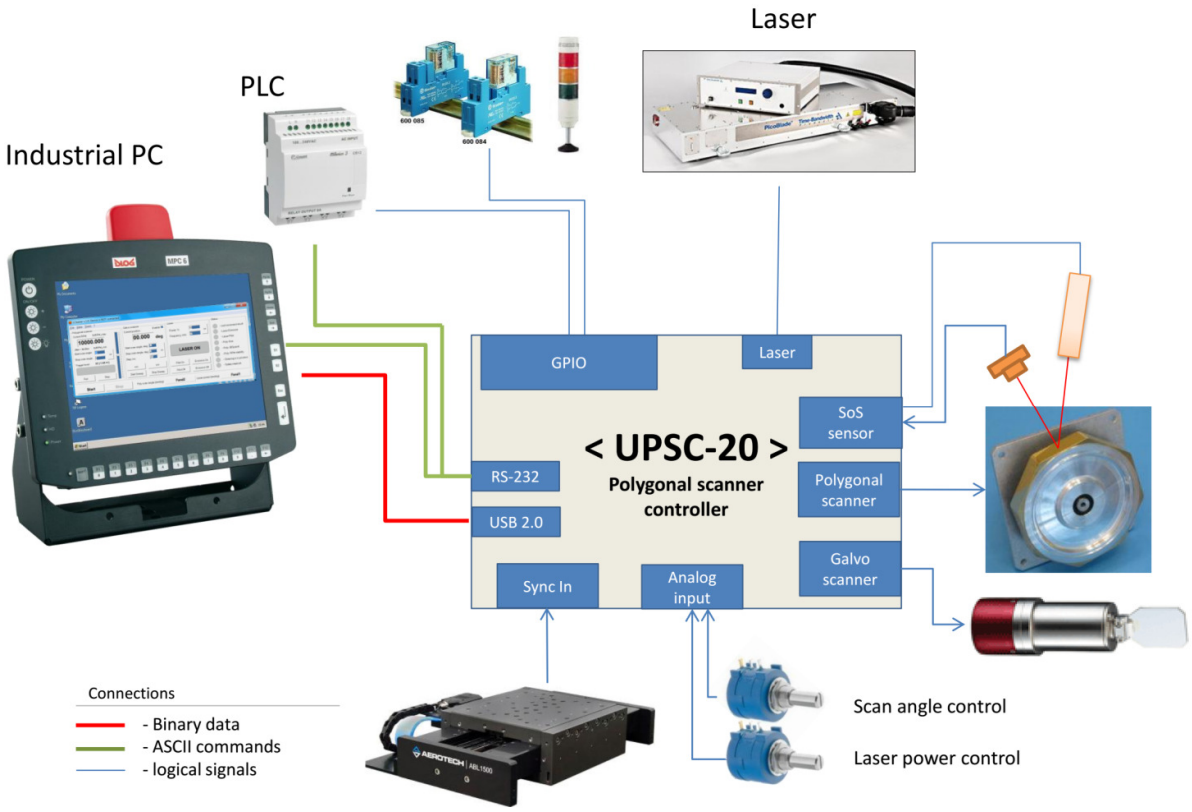
The interface consists of two parts:

- USB connection to a PC - used by controller's software.
- External signals used for connection the controller to external circuits (see pinout table for detailed information)

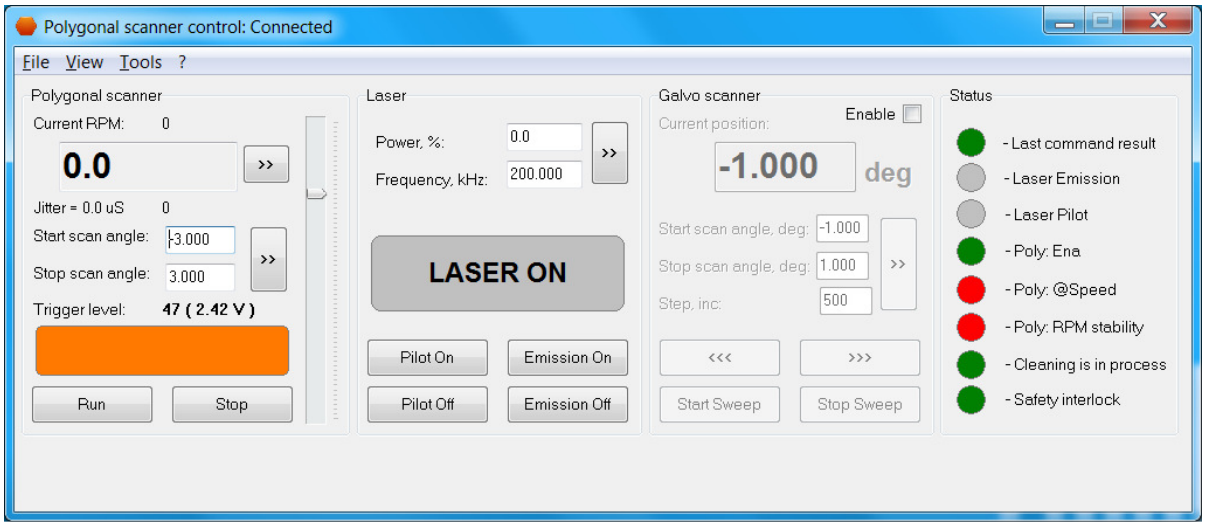
Connecting the controller to a PC via USB makes it possible to control, monitor and configure it from a computer. User can modify parameters such as polygon scanner speed, start and stop scan angles, laser power and frequency and etc. Most of these parameters can be modified when scanner is working. Once the parameters are adjusted the configuration can be saved into EEPROM. After that, the controller can be disconnected from the PC and used as standalone controller. Programmed configuration will be automatically loaded during start-up. Two copies of configuration is saved in the EEPROM. Every copy has its own CRC. During start-up processor check CRC of the first copy. If the CRC check fails, the controller tries the second copy.

External control interface has RS-232 lines, those can be connected to CNC controller, PLC or HMI module. In this case all programmed parameters can be changed by means of simple ASCII commands sent from connected device.

System components overview



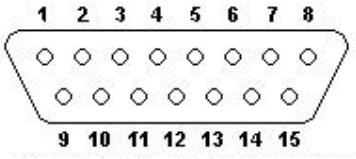
Software



External connectors pinout

Power & Control (X3)

Type: D-Sub, DB-15M, 15 pins, Male, Normal Density



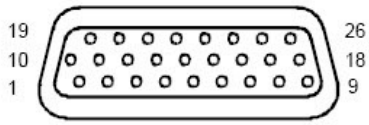
(view from mating (contact) connector side)

Table 1. XP12 connector pinout

Pin#	Dir	Description
1	Input	***Galvo +24V***. Power supply for galvoscanner, +24V, 4A. Do not supply this power if galvoscanner is not used.
2	Input	***Galvo -24V.*** Power supply for galvoscanner, -24V, 4A. Do not supply this power if galvoscanner is not used.
3	Input	***Main Power.*** Device main power supply, +24V, 0.5A. If galvoscanner is used, it's possible to short out this pin to Pin#1 and use positive power +24V of galvoscanner as primary power supply for the device
4	Input	***Run#.*** When the signal is tied to GND the device is working (polygonal mirror rotating, galvo works and etc.) but laser emission IS NOT turnined on. To turn laser emission on, tie EmissionEnable# signal (XP12, Pin#11) to GND.
5	Input	***SafetyInterlock#***. Safety interlock input. Should be tied to GND for normal operation. If SafetyInterlock# is high or not connected output signal SysReady# (XP12, Pin#6) is also high, indicating that whole laser cleaning system IS NOT ready to work.
6	Output	**SysReady#.** Device status. The signal goes low if the device has no errors AND if external SafetyInterlock# signal (XP12, Pin#5) is LOW.
7	Output	***Reserved Output***. Can be programmed for customer's specific purpose.
8	Output	**ReadyToLase#.** Ready for emission signal. After changing Run# signal to LOW polygonal mirror start accelerating. ReadyToLase# signal indicates is the mirror has achieved target speed. After the signal changed to LOW we can apply signal EmissionEnable# (XP12, Pin#11) to switch on laser emission.
9		***Ground***
10	Input	***Sync In.*** Trigger input for Scan-on-Demand function. Scanner makes a scan on rising edge of this signal. Jitter depends on RPM and polygon's facet number.
11	Input	***EmissionEnable#.*** Turn this signal to LOW for turning on laser emission. If polygonal mirror is stopped (signal Run# is not applied) EmissionEnable# signal has no effect. If EmissionEnable# signal is applied BEFORE the polygonal mirror achieved target speed (e.g. signals EmissionEnable# and Run# are applied simultaneously) laser emission is controlled by the controller and will be turned on only when the mirror achieved the speed.
12	Input	***Laser power control***. External laser power control. Connect 10k potentiometer between this pin and GND to control laser power. If connected, position of the potentiometer represents laser power (the laser power value stored in EEPROM is overridden), if not connected – laser power value stored in EEPROM is used.
13	Input	***Scan angle control***. External control of active scan angle for fast (polygonal) axis. Works the same way as Pin#12. Connect 10k potentiometer between this pin and GND to control scan angle. If connected, position of the potentiometer represents scan angle (the angle value stored in EEPROM is overridden), if not connected – scan angle stored in EEPROM is used.
14	Output	***RS-232, TxD***. Communication line between external peripherals (such as PLC, HMI) by means of ASCII commands. Data output.
15	Input	***RS-232, RxD.*** Communication line between external peripherals (such as PLC, HMI) by means of ASCII commands. Data input.

Laser Control (X9)

Type: D-Sub, 26 pins, Female, High Density



(view from mating (contact) connector side)

Table 2. XP13 connector pinout

Pin#	Dir	Description	
1	Output	***Power – D7***	Laser Power - Digital. 8-bit bus, range 0..FF(hex) or 0..255(dec). Least significant bit (lsb) (D0) corresponds to Pin number 8, Most significant bit (msb) (D7) corresponds to pin 1. 00h (0): Minimum output power FFh (255): Maximum output power Level: TTL, 5V
2	Output	***Power – D6***	
3	Output	***Power – D5***	
4	Output	***Power – D4***	
5	Output	***Power – D3***	
6	Output	***Power – D2***	
7	Output	***Power – D1***	
8	Output	***Power – D0***	
9	Output	***Power Latch***. Latches power setting into the laser by the rising edge. Level: TTL, 5V	
10	Output	***Laser power – Analog***. Laser power control. Analog signal. Range: 0…10V, 0V – minimum power, 10V – maximum power	
11	Output	***Laser power – PWM.*** Laser power control by PWM. Level: TTL, 5V	
12	Output	***Laser enable signal***. Level: TTL, 5V	
13	Output	***Emission control signal***. HIGH: Emission Enable LOW: Emission Disable. Level: TTL, 5V	
14	Output	***Pilot enable signal***. Level: TTL, 5V	
15	Output	***Laser frequency***. Level: TTL, 5V	
16	Output	***Emergency laser OFF***. Level: TTL, 5V	
17		***Ground.***	
18		***Ground.***	
19	Output	***EmissionEnable24#***. LOW: Emission Enable HIGH: Emission Disable. Level: OpenDrain, Vmax=50V, Imax = 200mA	
20	Output	***PilotEnable24#*** LOW: Laser pilot (red laser) Enable HIGH: Laser pilot (red laser) Disable. Level: OpenDrain, Vmax=50V, Imax = 200mA	
21		Not connected	
22	Output	***RS-232, TxD***. Laser control via RS-232	
23	Input	***RS-232, RxD***. Laser control via RS-232	
24	Output	***+24VDC***, max current consumption is 200mA	
25	Output	***+5Vout***. +5VDC output, max current consumption is 80mA.	
26		***Ground.***	