XPOW-LD6AX Manual

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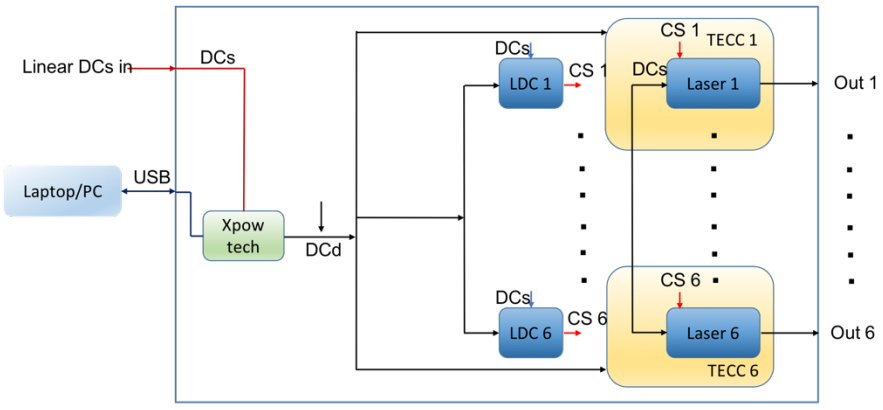
XPOW-LD6AX System Reference Manual

1. Overview

The Xpow-LD6AX system is a integrated, compact, programmable and easy to use device based on low-power microprocessor, suitable for multiple laser control system with butterfly package. This system provides independent 6 channels control, range from 0 - 1500 mA, with independent power supply control.

The Xpow-LD6AX product package includes a USB connector, software controller, current source controller, DC connectors (banana connector) for connection to a linear power supply box and independent power supply box. Please download the latest software and manual at https://www.nicslab.com/. Xpow-LD6AX products span from telecommunication to quantum applications with multi channel laser source controller in laboratory environments.



DCs: direct current static; DCd: direct current dynamic; LDC: laser diode controller;
TECC: Thermo electric cooler controller; CS: current source; PC: personal computer; USB: universal serial bus

Fig. 1. Illustration on how XPOW-LD6AX works

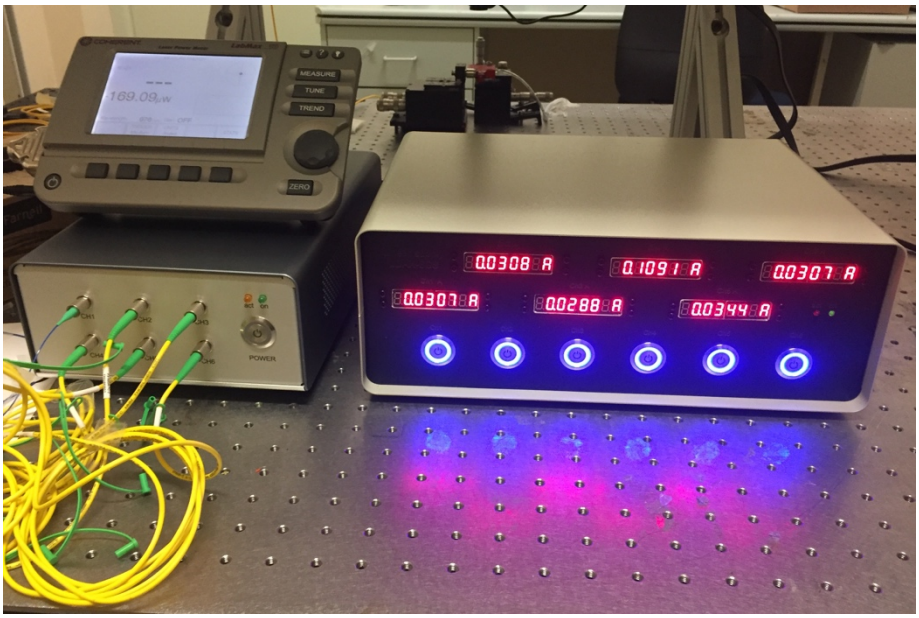


Fig. 2. XPOW-LD6AX setup configuration with independendent linear power supply control.

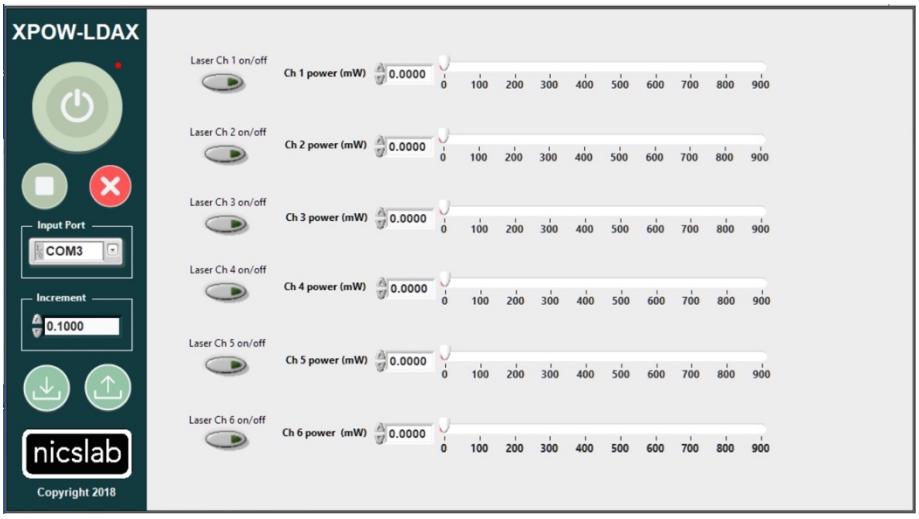


Fig. 3. XPOW-LD6AX Graphical User Interface (GUI).

2. Software and graphical user interface (GUI) features

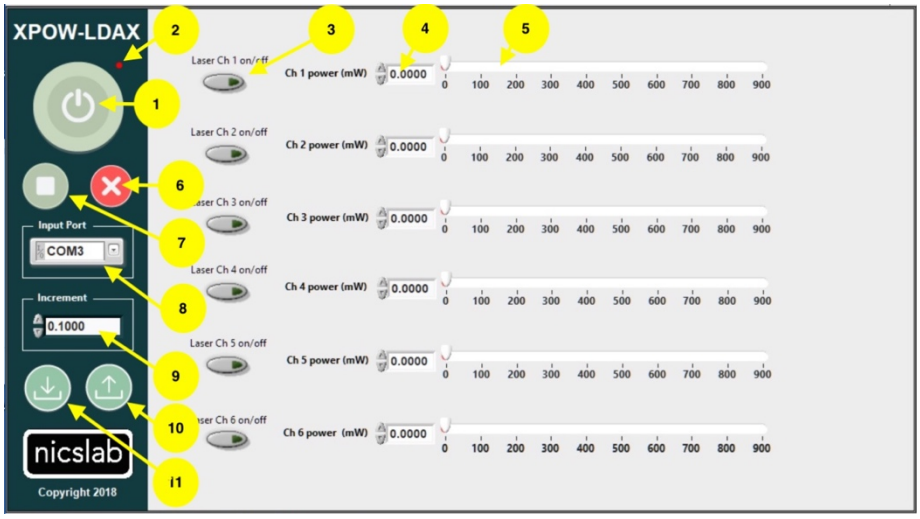


Fig. 4. Xpow-LD6AX graphical user interface features

Table 1: Sofware features

Callout	Component Description
1	On/off switch
2	Indicator (red for standby and green for active)
3	Laser on/off switch
4	Voltage type set entry space
5	Slider
6	Exit/close the software controller
7	Reset all value to zero
8	USB - COM port select
9	Resolution setting
10	Load setting
11	Save setting

3. Hardware and Software Installation

Step-by-step procedure:

1 Connect Xpow-LD6AX to Laptop/PC/workstation via USB. (from back panel in Fig. 5).

Fig. 5. Back panel of LD6AX

2 Connect independent power supply output (Fig. 6) to XPOW-LD6AX back panel and make sure +, - and DC out on the right configuration (Fig. 7)

Fig. 6. Back panel of independent linear power supply

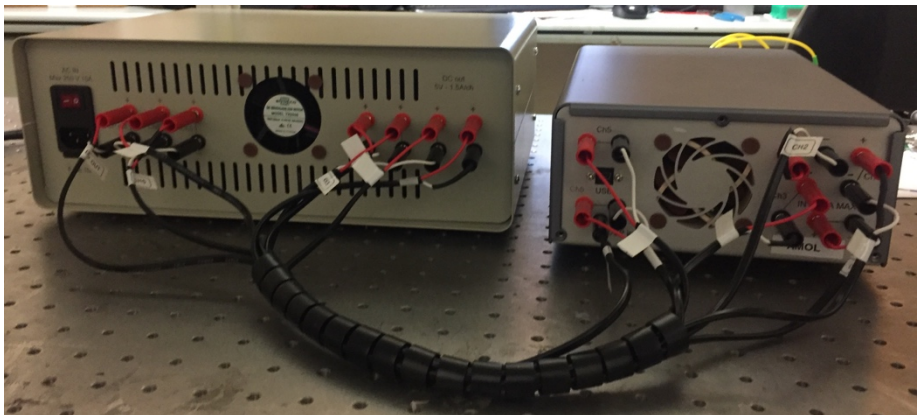


Fig. 7. Connection arrangement from independent power supply to XPOW-LD6AX

3 Connect the power inlet (AC) of independent power supply to AC power source.

4 Arrange the fiber connection according to your needs as shown in Fig. 8 and Fig. 9 (please wear the safety glass when you are ready to turn on and make sure clean the fiber before making any connection).

Fig. 8. Output connection from XPOW-LD6AX through fiber.

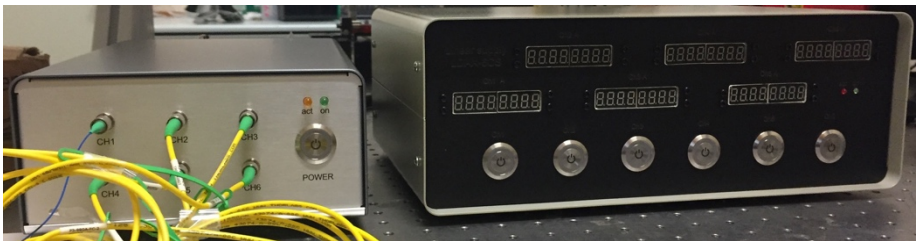


Fig. 9. Setup arrangement for XPOW-LD6AX and Independent power supply.

5 Download the installation file from website download page at www.nicslab.com (you need to sign up to the web) and install XPOW-LD6AX software to your computer/work station.

6 Run XPOW-LD6AX executable file and you will prompt with the software as shown in Fig. 3.

7 Turn on XPOW-LD6AX by push the physical button at the front panel (yellow light on).

8 Check the port connection on Device Manager (there should indicate the port for XPOW-LD6AX Leonardo COM port). (Fig. 10 and Fig. 11)

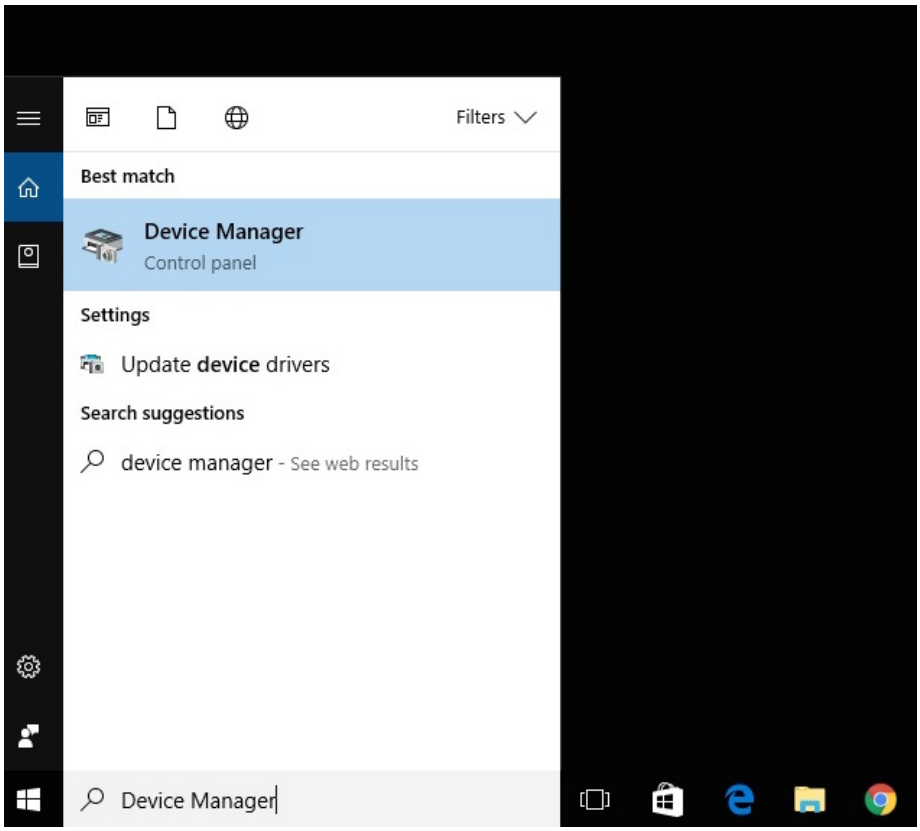


Fig. 10. COM port check on Device Manager (Win 10)

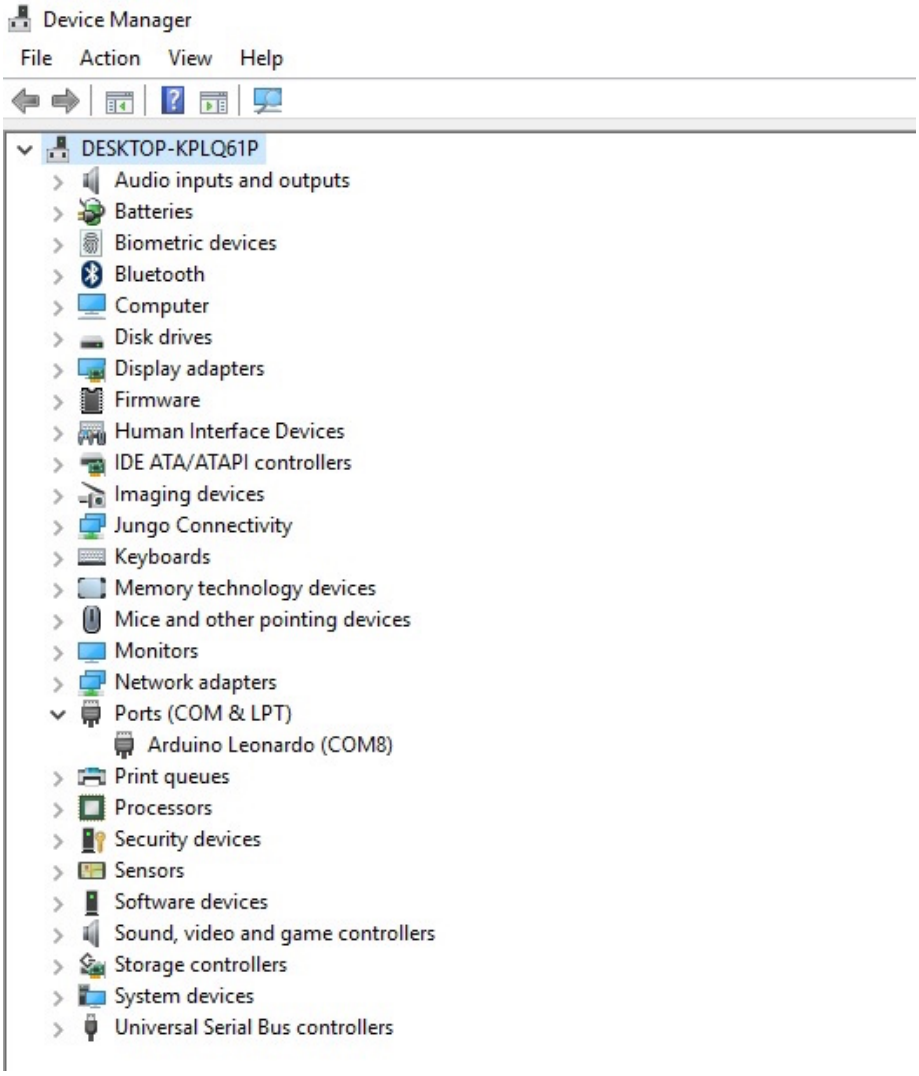


Fig. 11. USB - COM port, select XPOW-LD6AX (Leonardo)

9 Select COM port according to the connection (Fig. 6).

Fig. 12. Front panel of independent linear power supply

Fig. 13. Independent power supply in operation

10 Turn on independent power supply by pushing the main switch button on the back panel (Fig. 6) and on each channel swich (Fig. 12 and Fig. 13).

11 Turn on XPOW-LD6AX by pushing the switch button on the software or GUI as shown in Fig. 4 no.1 (green light will on after few seconds on XPOW-LD6AX box).

12 Select the channel to be activated by clicking the laser enable on channel controller (Fig. 4 no. 3).

13 Adjust the laser power output according to your need with slider or by type it (Fig. 4 no. 4 and 5).

14 To save the voltage setting, click save setting (number 11 on Fig. 4) and type setting file. To avoid error, save to your document folder that does not require admin authorization otherwise run the program by right click the exe file and run as administrator.

15 To load the saved setting, click load setting (number 10 on Fig. 4) and select the saved setting file that you want.

16 For your safety please wear safety equipment during operation such as eye glass protection according to the laser specification.

17 Attention: to turn off the system please first turn off the laser software by push the zeros button or reduce it to 0 output and turn off the laser enable. The next step is turn of the software with x

button (Fig. 4 no. 6). Then you can safely turn off the independent power supply and the last is the XPOW-LD6AX box.

18 Specification for laser driver can be download at brochure link.

19 Please let us know for further information and instruction (email us at support@nicslab.com).

4. Troubleshooting

Problem	Cause	Solution
Front end light off when switch turned on	No USB connection	Check USB connection to Laptop/PC
Green light off when software active	Initialization failed	Restart the software / unplug - plug USB connector
No USB port detected at device manager	No USB connection	Turn on the XPOW-LD6AX box and check USB connection
Saved setting data error	No write access to folder	Run as administrator / save to another folder (unrestricted access)

Please do not hesitate to contact us if there is another issue at support@nicslab.com for technical support.

The architecture of D/A converter consist of a string of DACs followed by an output buffer amplifier as shown in figure above. Each part includes an internal 1.25 V/2.5 V. Because the input coding to the DAC is straight binary, the ideal output voltage using an external reference 5 V (Xpow design currently using 5 V external ref) is given by

Vout = Vref x (D/2^N)
Vout = 5 x (D/2^16);

so for 1 step size:
Vout = 5 x (1/65535);
Vout = 0.076 mV or 0.000076 Volt

Where D = decimal equivalent of the binary code = 0 - 65535 (16 bits),
N = the DAC resolution,
VDD = 5 V,
In Xpow design, Vout is reamplified with 6x gain to achieve 30 V max so 1 step size equivalent to 0.076 mV x 6 = 0.45 mV.

TERMINOLOGY

Relative Accuracy

For the DAC, relative accuracy, or integral nonlinearity (INL), is a measure of the maximum deviation in LSBs (least significant bits) from a straight line passing through the endpoints of the DAC transfer function.

Differential Nonlinearity

Differential nonlinearity (DNL) is the difference between the measured change and the ideal 1 LSB change between any two adjacent codes. A specified differential nonlinearity of ±1 LSB maximum ensures monotonicity. This DAC is guaranteed mono-tonic by design.

Offset Error

Offset error is a measure of the difference between the actual V_{OUT} and the ideal V_{OUT}, expressed in millivolts in the linear region of the transfer function. Offset error is measured with Code 512 loaded into the DAC register. It can be negative or positive and is expressed in millivolts.

Zero-Code Error

Zero-code error is a measure of the output error when zero code (0x0000) is loaded into the DAC register. Ideally, the output should be 0 V. The zero-code error is always positive, because the output of the DAC cannot go below 0 V. It is due to a combination of the offset errors in the DAC and output amplifier. Zero-code error is expressed in millivolts.

Gain Error

Gain error is a measure of the span error of the DAC. It is the deviation in slope of the DAC transfer characteristic from the ideal, expressed as a percentage of the full-scale range.

Zero-Code Error Drift

Zero-code error drift is a measure of the change in zero-code error with a change in temperature. It is expressed in μV/°C.

Gain Error Drift

Gain error drift is a measure of the change in gain error with changes in temperature. It is expressed in (ppm of full-scale range)/°C.

Full-Scale Error

Full-scale error is a measure of the output error when full-scale code (0xFFFF) is loaded into the DAC register. Ideally, the output should be V_{DD} – 1 LSB. Full-scale error is expressed as a percentage of the full-scale range.

Digital-to-Analog Glitch Impulse

Digital-to-analog glitch impulse is the impulse injected into the analog output when the input code in the DAC register changes state. It is normally specified as the area of the glitch in nV-s and is measured when the digital input code is changed by 1 LSB at the major carry transition (0x7FFF to 0x8000).

DC Power Supply Rejection Ratio (PSRR)

PSRR indicates how the output of the DAC is affected by changes in the supply voltage. PSRR is the ratio of the change in V_{OUT} to a change in V_{DD} for full-scale output of the DAC. It is measured in decibels. V_{REF} is held at 2 V, and V_{DD} is varied ±10%.

DC Crosstalk

DC crosstalk is the dc change in the output level of one DAC in response to a change in the output of another DAC. It is measured with a full-scale output change on one DAC (or soft power-down and power-up) while monitoring another DAC kept at midscale. It is expressed in microvolts.

DC crosstalk due to load current change is a measure of the impact that a change in load current on one DAC has to another DAC kept at midscale. It is expressed in microvolts per milliamp.

Reference Feedthrough

Reference feedthrough is the ratio of the amplitude of the signal at the DAC output to the reference input when the DAC output is not being updated. It is expressed in decibels.

Digital Feedthrough

Digital feedthrough is a measure of the impulse injected into the analog output of a DAC from the digital input pins of the device, but is measured when the DAC is not being written to. It is specified in nV-s and measured with a full-scale change on the digital input pins, that is, from all 0s to all 1s or vice versa.

Digital Crosstalk

Digital crosstalk is the glitch impulse transferred to the output of one DAC at midscale in response to a full-scale code change (all 0s to all 1s or vice versa) in the input register of another DAC. It is measured in standalone mode and is expressed in nV-s.

Analog Crosstalk

Analog crosstalk is the glitch impulse transferred to the output of one DAC due to a change in the output of another DAC. The area of the glitch is expressed in nV-s.

DAC-to-DAC Crosstalk

DAC-to-DAC crosstalk is the glitch impulse transferred to the output of one DAC due to a digital code change and subsequent output change of another DAC. This includes both digital and analog crosstalk. The energy of the glitch is expressed in nV-s.

Multiplying Bandwidth

The amplifiers within the DAC have a finite bandwidth. The multiplying bandwidth is a measure of this. A sine wave on the reference (with full-scale code loaded to the DAC) appears on the output. The multiplying bandwidth is the frequency at which the output amplitude falls to 3 dB below the input.

Total Harmonic Distortion (THD)

Total harmonic distortion is the difference between an ideal sine wave and its attenuated version using the DAC. The sine wave is used as the reference for the DAC, and the THD is a measure of the harmonics present on the DAC output. It is measured in decibels.

5. Company Policy

Warranty – We guarantee to provide accurate descriptions and a high quality product. Please do not hesitate to contact us at support@nicslab.com if you would like to have more information. If you have any problems with your order, please notify us within 60 days from the date of shipment of any defects. You agree to pay for the return shipping on exchanges and returns and we will reimburse this cost upon verification of a defect with the product. Moreover, warranty will not apply if the product has been subject to misuse, neglect, accident, modification, or has been soldered or altered in any way.

Return and refund policy – If you are not happy with the product you purchased, for any reason, it is possible to return it for a refund within 5 days of receipt (10 days for an exchange).

Please advise us by email: support@nicslab.com for return authorization.

- Return for refund: within 5 days of receiving your product. (unopened)
- Return for replacement: within 10 days of receiving your product. (damaged or defective)

Please note that no return will be accepted without a return authorization. A return must be in its original and clean condition. Returns in a damaged, scratched or burnt condition will not be accepted. The product must be returned in its original packaging with its receipt and a small note for the reason of the return. This will help us to serve you better and improve our products. Reimbursement only applies upon the confirmation of the above mentioned conditions.

All items will be reimbursed within 3 days of receiving the product (shipping fee excluded). You will need to pay for shipping (if you would like to have a refund instead of a replacement). We will be responsible for refund shipping fees if the return is a result of a shipping error from our side.

For further enquiries please contact:

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