SUBNANOSECOND PULSE GENERATOR MODULE

PPG-3/200

USER MANUAL

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SAFETY MANUAL

Electrical safety

- PPG-3/200 pulse generator module is high voltage equipment. Please be careful and operate by qualified personnel only.
- There is a risk of electric shock, strong electromagnetic interference, damage of the generator or other electronic equipment in case of improper use.
- It is strongly prohibited to switch on the generator without output coaxial cable. We recommend using of 50 centimeters length or more coaxial cable between the generator and the load (antenna or first attenuator) to prevent permanent damage of the generator. There is a risk of electrical arcing on the open coaxial connector and destruction of the output circuit of the generator.
- When adding or removing generator to or from the system, ensure that the power supply is unplugged (in OFF state). Please apply power supply voltages only after connecting output and input coaxial cables.
- PPG-3/200 generator is high power equipment. Please allow free air flow around the generator for the cooling. Please do not place the generator in fan down position on the table surface, because it prevents normal air flow.

Operation safety

- Please read this manual before installing and using of the generator.
- Before using the product, make sure that all cables are applicable and not damaged. High voltage connectors should be clean and dry, free from dust, dirt and any obstacles.
- To avoid short circuits keep metal parts like clips, screws and staples away from the generator.
- The generator is designed to work in normal laboratory conditions. Avoid dust, humidity and temperature extremes. Do not place the generator in any place where it may become wet.
- Place the generator on a stable surface.
- If you encounter any technical problem with the generator, please contact with Megaimpulse Ltd. Do not try to repair the generator by yourself.

PACKAGE CONTENT

Please check the package for the following items:

- ✓ PPG-3/200 subnanosecond pulse generator module (hereinafter "generator");
- ✓ Power supply four wires cable;
- ✓ Dual voltage AC/DC switching power supply AC 85V..264V, 47Hz...63Hz / DC +150V, 0.8A; +20V, 1.5A.

Optional items:

- ✓ Semirigid coaxial cable assembly "N connector / SM141 cable / N connector" for the output pulses feeding;
- ✓ Semirigid coaxial cable assembly "N connector / SM141 cable / open" for the output pulses feeding;
- ✓ Flexible coaxial cable assembly "SMA connector / RG316 cable / SMA connector" for the input triggering pulses feeding;
- ✓ Flexible coaxial cable assembly "SMA connector / RG316 cable / BNC connector" for the input triggering pulses feeding.

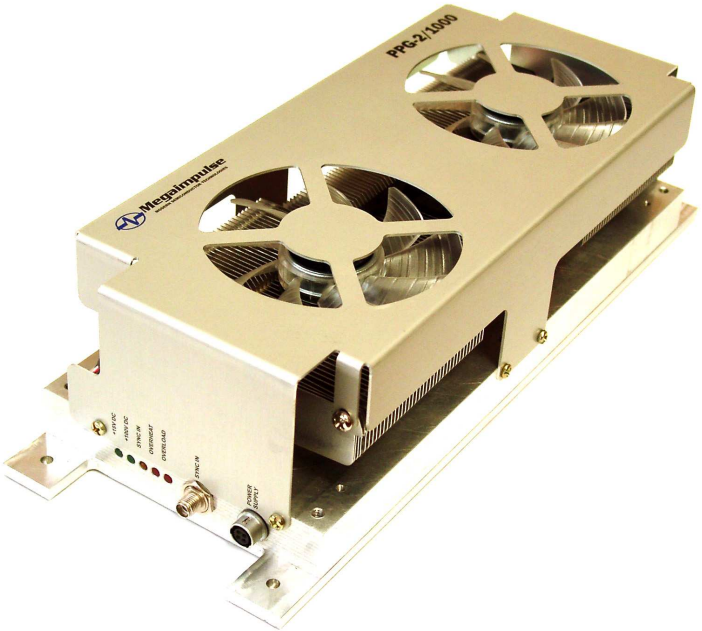


Fig.1. PPG-3/200 subnanosecond pulse generator module. General view from the input connectors and control LED side.

DESCRIPTION OF THE GENERATOR OPERATION

PPG-3/200 generates subnanosecond unipolar bell like 3 kV pulses with up to 200 kHz repetition rate. Output pulse waveform is shown in Fig.2. The generator is designed to operate with 50 Ohm matched load only, i.e. 50 Ohm resistive load or matched impedance antenna connected by 50 Ohm impedance coaxial cable. Operation with unmatched load inevitably results in partial reflection of the energy from the load back to generator and possible overheating. It is strongly prohibited to switch on the generator without the load (with open N type connector). We recommend using of 50 centimeters length or more coaxial cable between the generator and the load (antenna or first attenuator) which prevent damage of the generator in case of the load breakdown or disconnection.

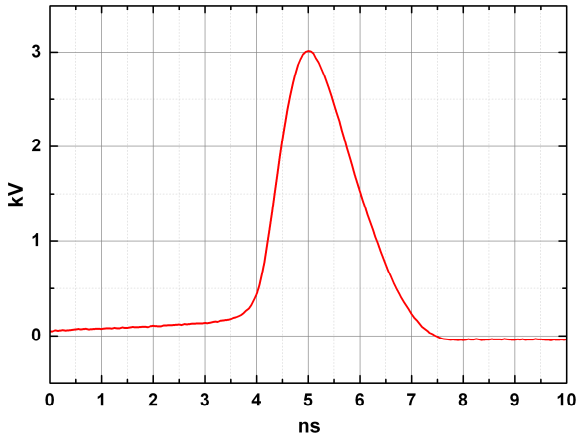


Fig.2. PPG-3/200 output pulse waveform.

PPG-3/200 should be triggered by external triggering pulse. There is no internal triggering mode. Nominal triggering pulse amplitude is +5V at 50 Ohm, pulse duration is 30 ns, rise/fall times is 1 ns. Longer than 3 ns rise time results in increasing of the output pulse jitter.

The generator requires external dual voltage DC power supply, including DC +20V (low voltage) and DC +150V (high voltage). Output pulse amplitude is proportional to the level of high voltage DC supply. It is possible to adjust the output pulse amplitude smoothly by adjusting high voltage DC supply, please see Fig.3. Do not exceed DC +168V level for high voltage supply. There is a risk of damage of the generator.

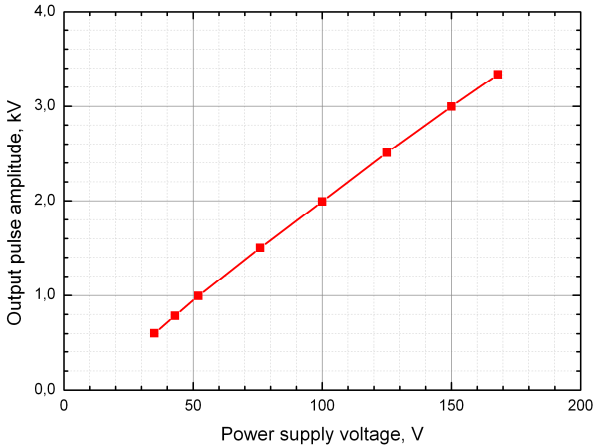


Fig.3. PPG-3/200 output pulse amplitude VS power supply voltage.

The generator comes with four wires DC power supply cable. The ground wires are marked by black color. The low voltage supply wire is marked by “20” label, the high voltage supply wire is marked by “150” label.

The contact pins on the power supply connector are the following:

Pin 1 – DC +150V supply voltage
Pin 2 – ground return (DC +150V)
Pin 3 – DC +20V supply voltage
Pin 4 – ground return (DC +20V)

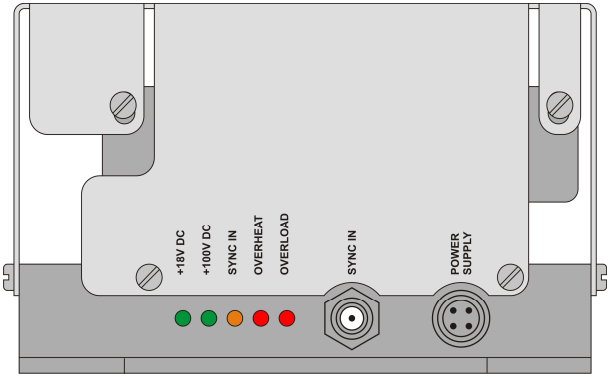
PPG-3/200 is high power unit. The mean output power at 200 kHz repetition rate is about 50 W. The total power consumption is more than 100 W, therefore tens of watts should be dissipated. Two fans and heat sink with thermal tubes are used for this purpose. The rotation speed of the fans is determined by the current dissipated power and the temperature of the generator. When the temperature becomes higher the rotation speed increases. It helps to keep the stable temperature of the generator and reduces temperature drift of the output pulses.

There are internal over temperature and over frequency protections. If the temperature of the generator is too high then the generator stops the operation and red LED “OVERHEAT” lights on. In this case please allow idle operation during few minutes. When the temperature decreases the generator returns to normal operation regime automatically. If the triggering pulses frequency is more than 200 kHz then the generator blocks triggering and red LED “OVERLOAD” lights on. Please reduce the triggering pulses frequency below or equal to 200 kHz.

TECHNICAL SPECIFICATION OF PPG-3/200
SUBNANOSECOND PULSE GENERATOR MODULE

Output pulse amplitude	**3 kV**
Pulse polarity and waveform	**Positive unipolar bell like pulse**
Output cable and load impedance	**50 Ohm**
Pulse rise time (20% - 80% levels)	**600 ps**
Pulse width (FWHM)	**1.7 ns**
Max repetition rate	**200 kHz**
Jitter (RMS)	**40 ps**
Jitter (peak-to-peak)	**200 ps**
Internal delay (from leading edge of triggering pulse to output pulse)	**< 100 ns**
Temperature drift of internal delay	**< 1 ns**
Triggering	**external**
Input triggering pulse connector	**SMA**
Triggering pulse requirements	**+5V amplitude at 50 Ohm, 30 ns width, < 3ns rise time**
Power supply	**Dual DC: +150V, 0.8A; +20V, 1.5A**
Size	**290 x 110 x 72 mm^3 (with mounting flanges)**
Weight	**1.5 kg**

INPUT CONNECTORS AND CONTROL LED SIDE VIEW



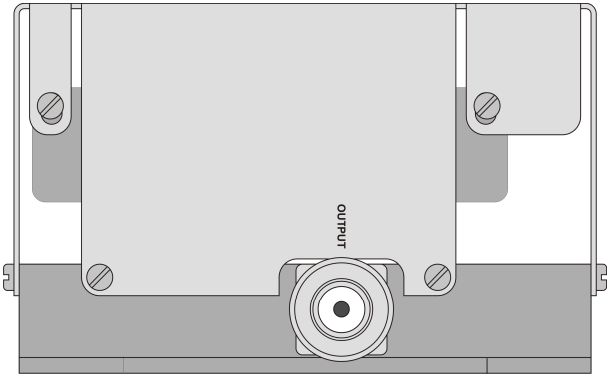
Control LED from left to right:

+18V DC (green) – low voltage power supply “+20V DC is applied”
+100V DC (green) – high voltage power supply “+150V DC is applied”
SYNC IN (orange) – triggering of the generator
OVERHEAT (red) – operation is stopped due to overheating of the generator
OVERLOAD (red) – triggering is blocked because frequency of triggering pulses is above 200 kHz

Connectors:

SYNC IN – SMA type input connector for external triggering signal
POWER SUPLLY – connector for external DC power supplies

OUTPUT CONNECTOR SIDE VIEW



Connectors:

OUTPUT – N type output connector

PUTTING THE GENERATOR INTO OPERATION

➔ Please follow strictly the described steps. It helps to prevent damage of the generator and other equipment.

Step 1.

Unpack the generator and check the presence into the package of the following items:

- PPG-3/200 pulse generator;
- power supply cable and dual voltage AC/DC switching power supply DC +150V , 0.8A; +20V, 1.5A

optional items:

- Semirigid coaxial cable assembly "N connector / SM141 cable / N connector" for the output pulses feeding;
- Semirigid coaxial cable assembly "N connector / SM141 cable / open" for the output pulses feeding;
- Flexible coaxial cable assembly "SMA connector / RG316 cable / SMA connector" for the input triggering pulses feeding;
- Flexible coaxial cable assembly "SMA connector / RG316 cable / BNC connector" for the input triggering pulses feeding.

Step 2.

⇒ If standard AC/DC switching power supply is used:
Plug AC/DC switching power supply into AC outlet. Check the low voltage power supply is DC +20V, high voltage power supply is DC +150V. Adjust the voltage levels by potentiometers if required.

⇒ If another external power supply is used:
Please set external power supplies DC +35V…+168V for high voltage supply and DC +20V for low voltage supply. The power supply should provide up to 0.8A current.

Step 3.

Connect the output coaxial cable and the load to the generator.
Connect triggering pulse generator.

Connect four wire DC power supply cable to the generator. The ground wires are marked by black color. Low voltage supply wire is marked by “20” label, high voltage supply wire is marked by “150” label.

Step 4.

Switch on (plug) AC/DC switching power supply. Both green LED "+18V DC" and "+100V DC" on the generator should light on.
Set external triggering pulses frequency to 1 kHz. Apply triggering pulses, orange LED "SYNC IN" should light on.
3 kV output pulses should be generated. Check them.
Set external triggering pulses frequency to required range below or equal to 200 kHz.

➔ Please pay attention that standard GHz range attenuators are not suitable for direct registration of output pulses because of extremely high pulse peak power. Even 100W and more power attenuators will be broken inevitably. We recommend using of special high voltage pulse attenuators, high voltage directional coupler or GHz range adjusted resistive divider.

The generator is designed for long time operation at max repetition rate 200 kHz. But it can be overheated in case of limited air flow around the generator or high ambient temperature. Red LED "OVERHEAT" lights on in this case and generator stops the operation. Please allow idle operation during several minutes for the cooling. LED "OVERHEAT" lights off and generator returns to normal operation automatically when the temperature decreases.

The maximum repetition rate is 200 kHz. If triggering pulses frequency is above this level then red LED "OVERLOAD" lights on and generator stops the operation. Please reduce the triggering pulses frequency.

TRIGGERING OF THE GENERATOR

The recommended triggering pulse waveform is shown in Fig. 4. Nominal triggering pulse amplitude is +5V at 50 Ohm, pulse duration is 30 ns, rise/fall times are 1 ns. Longer than 3 ns rise time may results in increasing of the output pulse jitter.

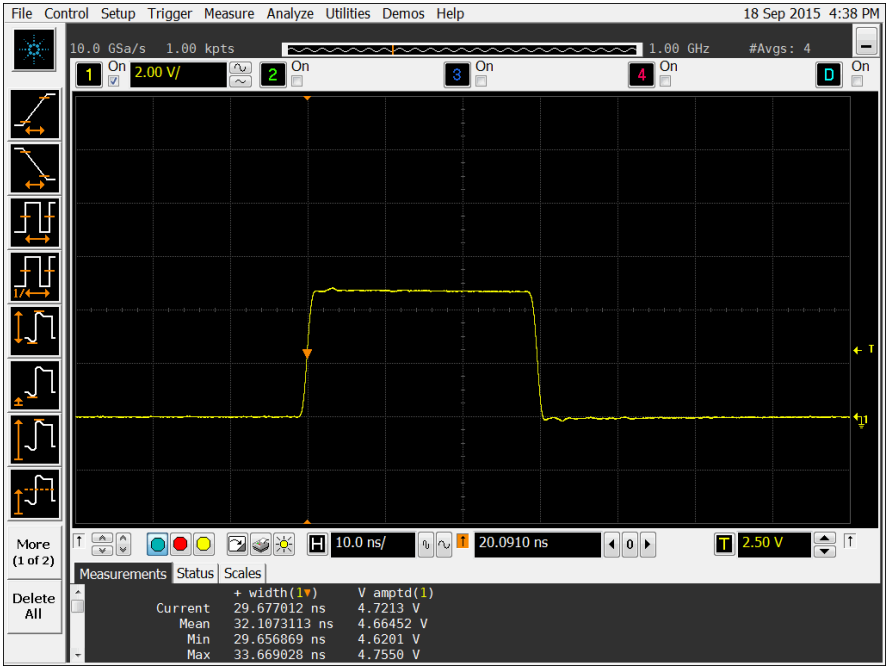


Fig. 4. Recommended triggering pulse waveform.

WARRANTY

Please see your sales agreement to determine the warranty period and warranty condition. The generator has warranty seals.

➔ Removing of the warranty seals terminates the warranty.