

Information Unlimited Inc

Marx Generator Series

Impulse Generators

Operational Manual model #IU1045

400 Joules at 400 Kilovolts

These products are fully described on our web site at www.amazing1.com

INTRODUCTION

Information Unlimited is a company dealing with education, research, engineering design, development and manufacturing. The company was established in 1975 and holds many patents. Members of our staff have written books and technical articles appearing in leading technological magazines. Our main laboratory is in southern New Hampshire and was featured on television in September of 2003. Our offices are located in New Hampshire, Florida and Kowloon HK. We also manufacture *spark gaps, rail gaps, pulse and high voltage transformers, triggers* and a host of other HV Components.

SPECIAL NOTE ON RENTED EQUIPMENT

It is very important to save all crates, covers and packing materials as the item must be returned fully operational and undamaged for you to receive back the funds held for the rental period..

WARNING

Please note this system must be operated by only those fully experienced and aware of all high voltage hazards and with full knowledge of high voltage and its safety requirements. This equipment can only be purchased upon receipt of our Hazardous Equipment signed and dated by the user.

WARNING

These devices as sold will require proper housings, safety interlocks, fusing, labeling, qualified training and certain safety compliances dependent on the intended application.

The purchaser will not hold the seller responsible in any way for injuries resulting from proper or improper use of this equipment. ***Please note that this system can store over 10 times the energy to kill a normal human being- obviously extreme caution is required..***

SPECIFICATIONS:

| | |
|------------------------------------|----------------------------|
| RISE TIME | Typically < 10 nano second |
| PULSE WIDTH | Typically 150 nano second |
| ENERGY | 400 Joules |
| PULSE REPETITION RATE | 1 per minute |
| TYPICAL OUTPUT | 350Kv Pulsed |
| MAX. OUTPUT PULSE | 400Kv Pulses |
| GENERATOR IMPEDANCE | < 100 Ohms |
| PEAK CURRENT | 4.5KA Maximum |
| PEAK PULSE POWER | 1.8 Giga Watts. |
| ERECTED CAPACITANCE | 4nf |
| STAGE CAPACITANCE | 40nf |
| NUMBER OF STAGES | 10 |

BASIC DESCRIPTION

All the models of *Impulse Generators* are fully functional with no other equipment needed. They have an input voltage of 115/230volts / 50Hz / 60Hz that can be smoothly varied by a built in *variable voltage transformer (VARIAC*. Output impulse voltage is dependent on the *spark gap* selection & firing system. A manual FIRE button as well as a +5 Volts command Input is also provided to fire the generator. This can also be used to synchronize it with another scientific event which will give a + 5 volts output pulse. The pulse required shall be approximately of the order of 3 to 5 us seconds width and a voltage of 5 to 7 volts Amplitude.

All the Impulse Generators are made on the basic principle of parallel charge and series discharge of *very low inductance capacitors through suitable spark gap system* that can handle these types of peak currents and electrical stresses. *You may find a more detailed description on our web site at www.amazing1.com.*

SYSTEM DESCRIPTION

The basic unit consists of two separate modules designated the CHARGER and STACK.

The CHARGER supplies the charging voltage to the STACK **discharge section**. The STACK section uses a core and coil 10,000 volt transformer connected to an eight stage voltage multiplier of diodes and capacitors producing

over 40 Kv open circuit. The two sections are interconnected by an umbilical cable and a coax cable for the ignition pulse.

The CHARGER is where main system power is controlled by selection of voltage and charge energy along with a meter for indicating the charging voltage. The triggering signal is controlled by a push button switch or remotely via a BNC jack.

SITE ASSEMBLY

Select the area of operation and note proper clearance and proximity to sensitive electronic equipment. Remove the unit from the **packing** crates and check for any physical damage. The crates are marked. Position the individual sections with the charger section located nearest to the wall plug.

CONNECTIONS

The two sections are inter-connected by two cables and heavy grounding leads. All are coded with a letter corresponding to their respective mating points to the individual sections.

1. Connect the heavy green grounding leads to a secure earth ground. This lead should go to a dedicated and verified ground.
2. Connect the IGNITION coaxial cable to its respective coax jacks
3. Connect the heavy multi conductor cable to the DISCHARGE STACK
4. System input line power is 110 volts at 50 to 60 Hz. You may have to select and wire in a plug that mates to your line power receptacle if other than the standard 15 amp USA plug. Line current requirements are less than 3 amps.
5. Connect up the flat copper discharge bars comprising the MAIN DISCHARGE GAP as shown **in the photos**

OPERATION

6. Verify all capacitors in the STACK are fully discharged by shorting each individual one with the safety shorting stick
7. Check if all Spark Gap Assemblies are facing each other and not twisted, If twisted, make it straight facing each other by loosening the hardware.
8. We factory set the lowest gap (trigger gap) to 2-5 mm less than the nine upper gaps. The upper gaps are set at slightly more than 11 mm. This setting allows an automatic self breakdown discharge to occur at 30 to 35 kv without triggering. You can increase by slightly widening the trigger gap. If other gaps prematurely fire they

will require widening also. CAUTION unit should operate at no more than 400 kv as capacitors are rated for 40 kv each. The trick is to get the settings so you can control the firing via the TRIGGER push button or the external trigger function.

It is suggested to wear hearing protection for the remaining test..

Set the MAIN DISCHARGE GAP to approx 250 mm. *You may increase maximum discharge once familiar with operating etc. This is a preliminary setup to verify and familiarize the user with the unit*

Take care that the VOLTAGE CONTROL is at Zero.

Switch on the POWER SWITCH and note the indicator lamp igniting.

Slowly raise the voltage by gradually turning the VC knob clockwise.

Go to 10KvDC and in steps of 5KvDC. Keep raising the voltage and at approximately 30 to 35KvDC an automatic self discharge will eventually occur with a loud shock wave.

Note the operating voltage on the 500 KV METER (This is the self breakdown firing voltage) and will require the setting to be 4 to 5Kv below this voltage level for a controlled discharge where you use the MANUAL FIRE Switch or apply the TRIGGER in synchronization with some other event via a 5 to 9 volt pulse to the BNC connector.

Note pre-firing may occur due to difference in temperature as well as sea level problems. It may take 8 to 10 Shots making adjustments and allowing the spark gap air medium to settle down for consistent firing at a preset required voltage. It is best suited to operate the Marx at **maximum** of 400kv to ensure long life.

All the Spark Gaps are factory set and if adjustment is required for higher voltage, you will have to obtain a proper sized drill bit to reset the gaps. Settings can range from 9 to 13mm Max between the Sphere Electrodes.

See below chart for optional settings of the upper nine gaps:

5mm.....12 kv per stage for 120 kv output between discharge electrodes.

10-11mm.....30 kv per stage for 300 kv output between discharge electrodes.

13-14mm.....40 kv per stage for 400 kv output between discharge electrodes (**absolute maximum!!**).

NOTES:

Always operate the Marx Generator with the bottom *trigger starting gap* of 2 to 5mm less than the other nine spark gaps. Experiment for reliable triggering.

Manually triggering the system using the *manual* or *external* +5 Volts pulse will require the voltage being set to 2-5Kv below *self breakdown voltage*.

Always respect the generator as it can kill you. Always remove all power and individually discharge each capacitor starting from the bottom of the system before handling or making adjustments. Use a suitably insulated probe

Keep a distance of at least 3 meters from the machine when it is operating and wear hearing protection.

Always check the generator voltage as indicated on the panel meter

Always provide a verified ground connection for the Marx Generator as all non circulating and radiating energy must go to ground.

Never operate the system in wet or high moisture conditions.

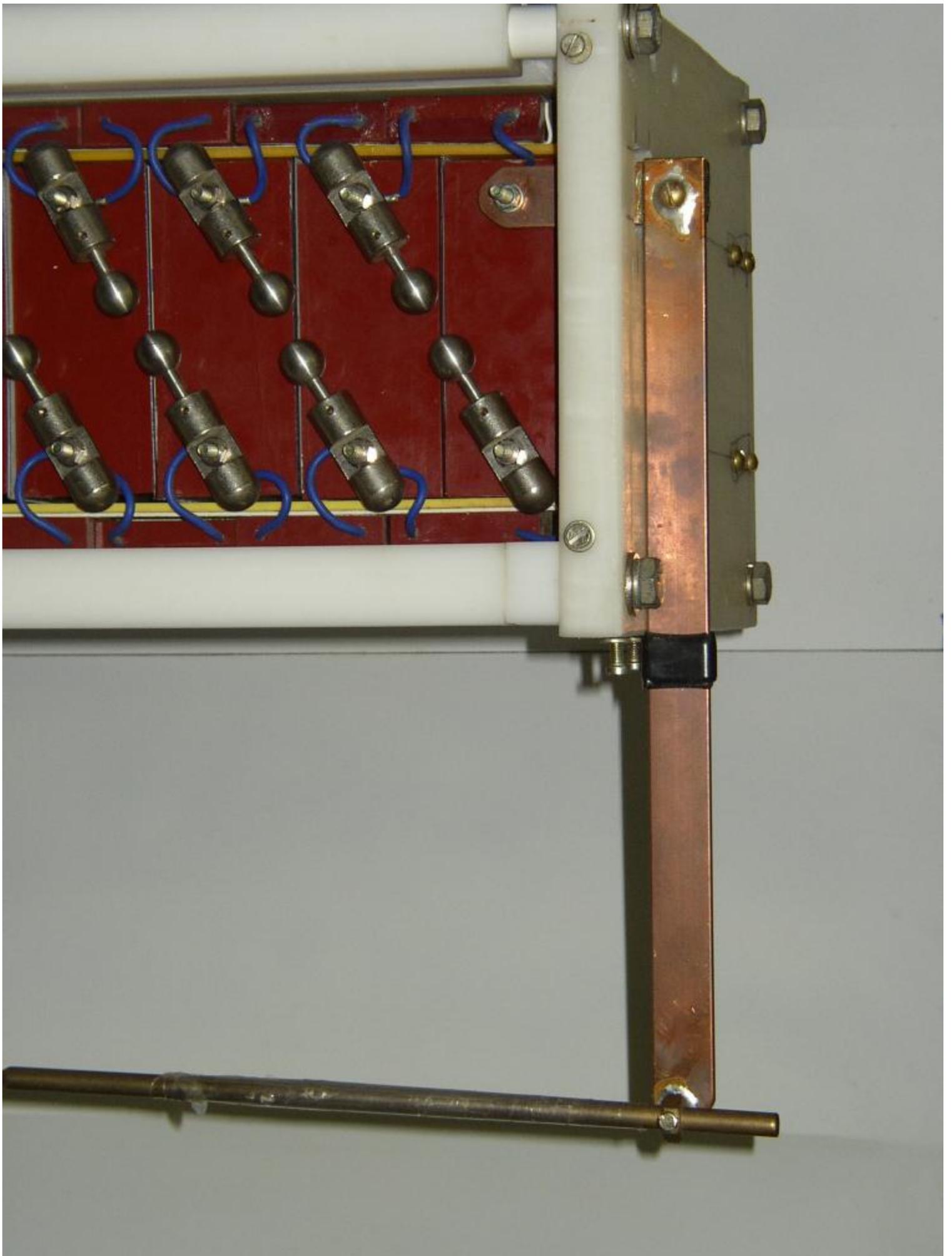
Keep all personal and equipment clear of the discharge area by at least 3 meters.

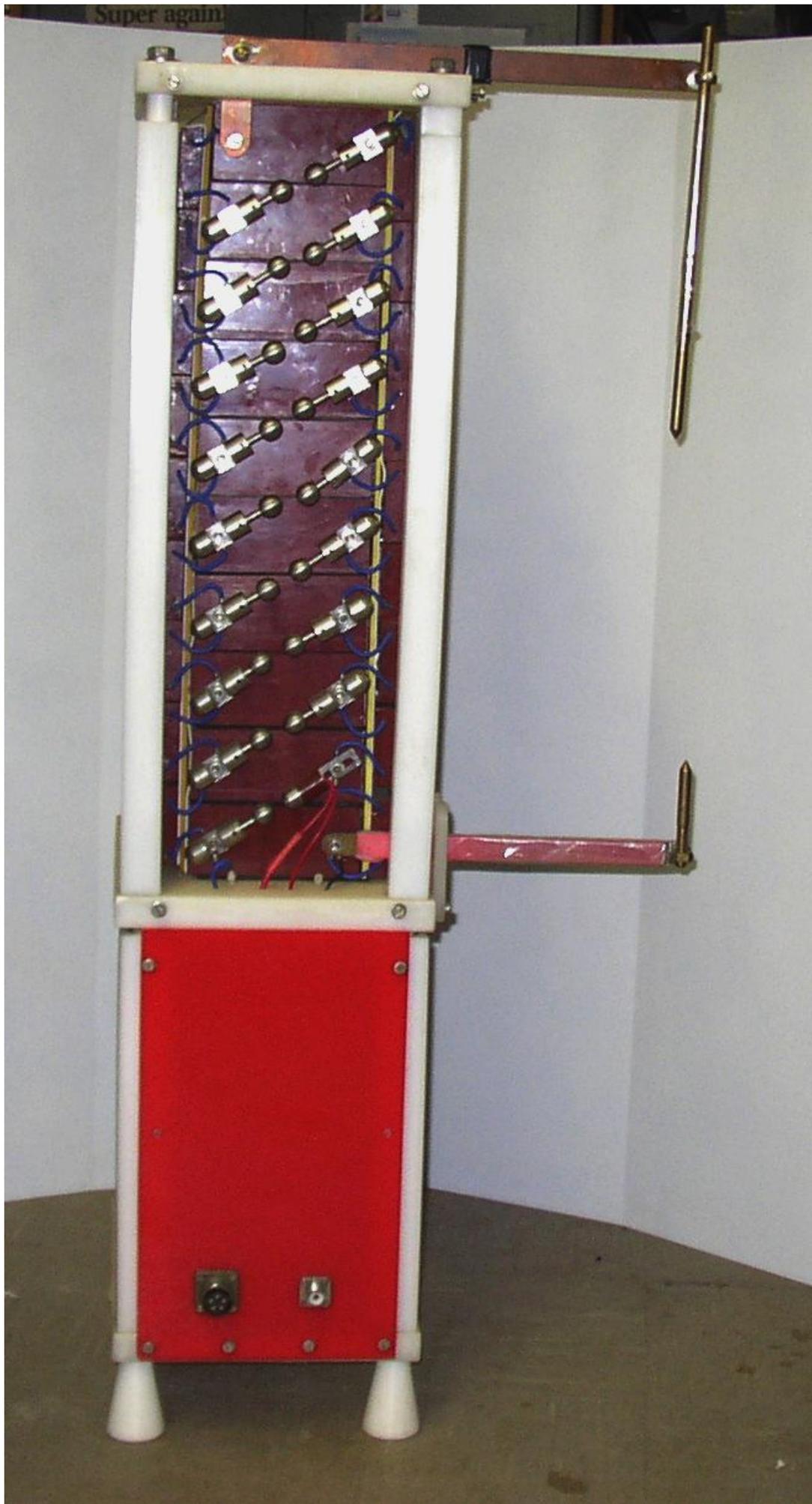
The Marx can radiate damaging amounts of pulse energy. This property requires keeping all other measuring and sensitive equipment away at least by several meters.

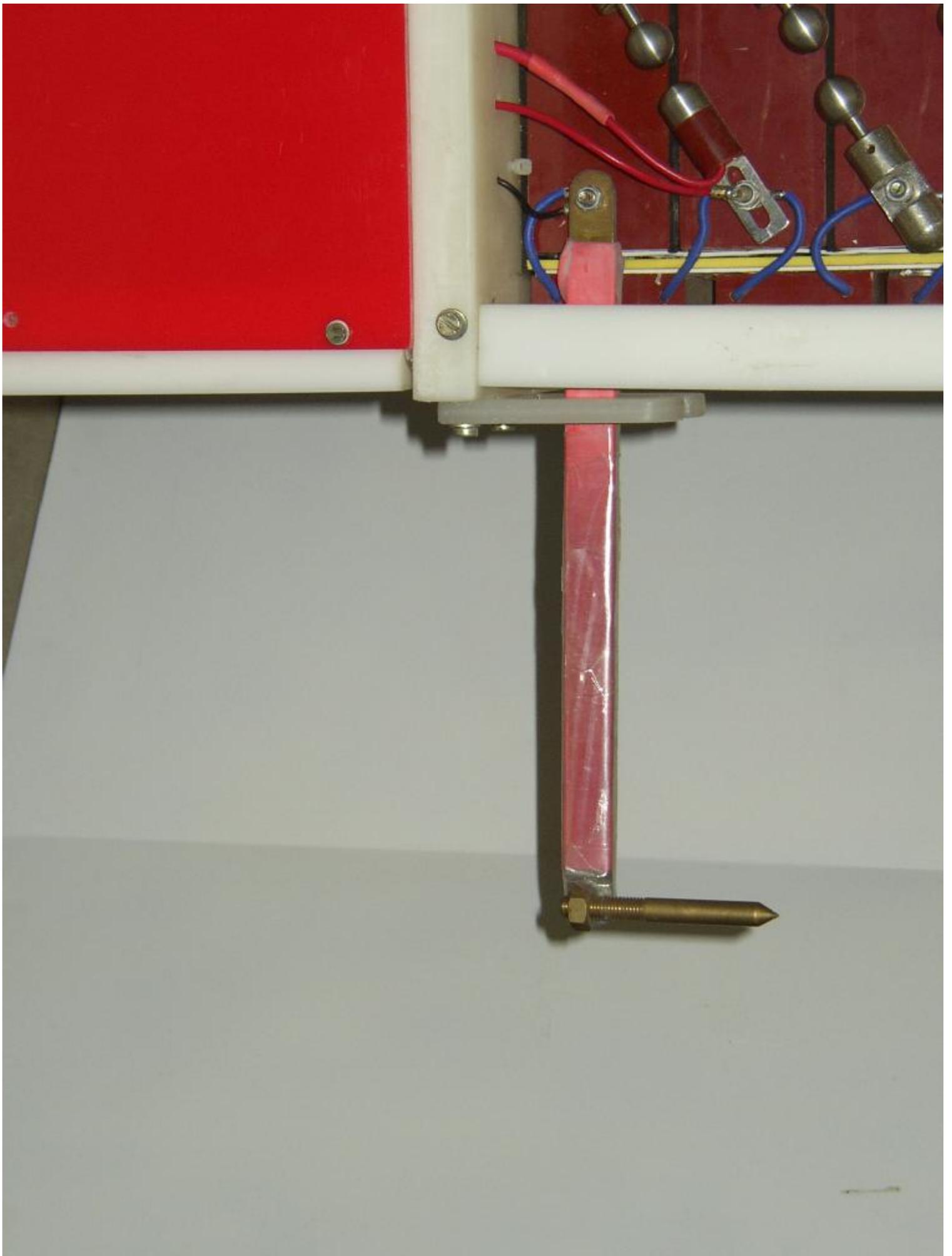
Don't keep explosives, fireworks, dry materials such as hay, sawdust, compressed gas bottles near the generator when it fires.

Items such as dry silk, dry hay, radio isotopes, fireworks, mobile phones or other sensitive communication equipment must be kept at least 10 meters away from the Marx Generator while operating.

Typical discharge wave forms are shown in **photos**.







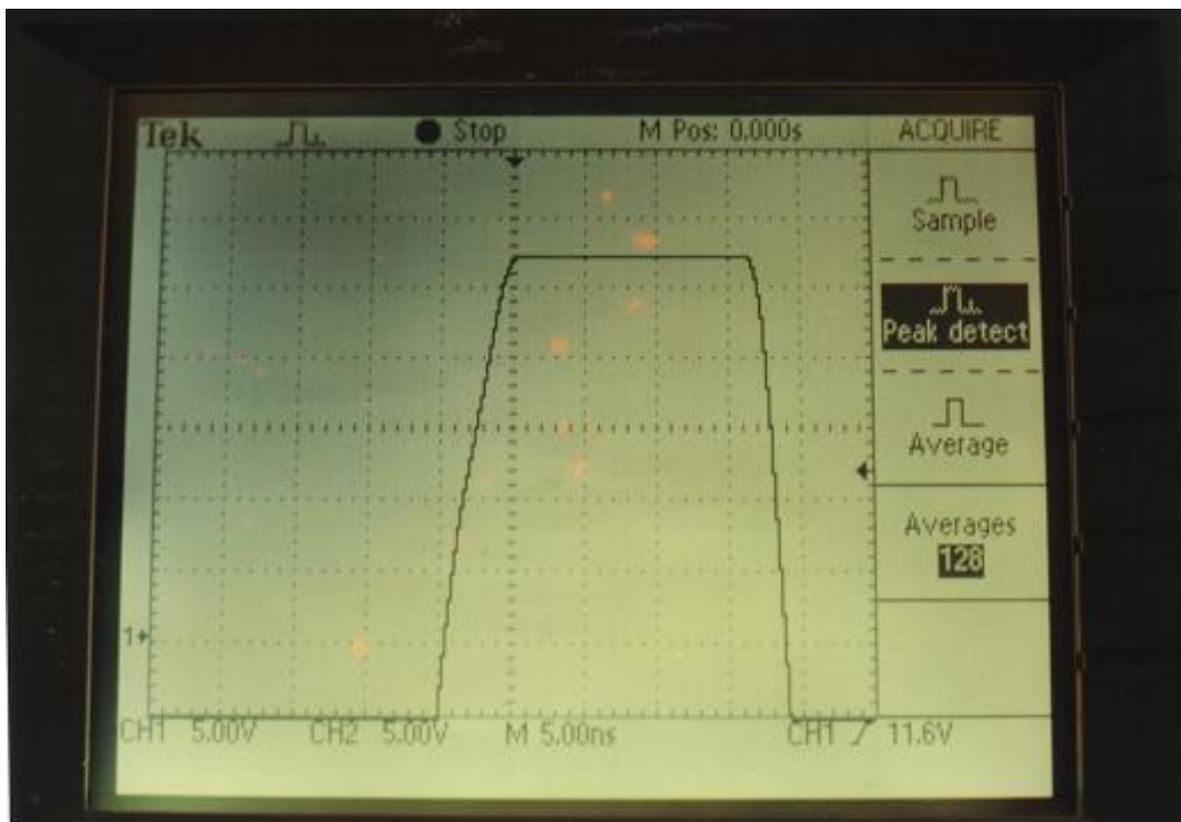


PHOTO10PULSE A typical 5 nanosec rise time and 25 nanosecond pulse width

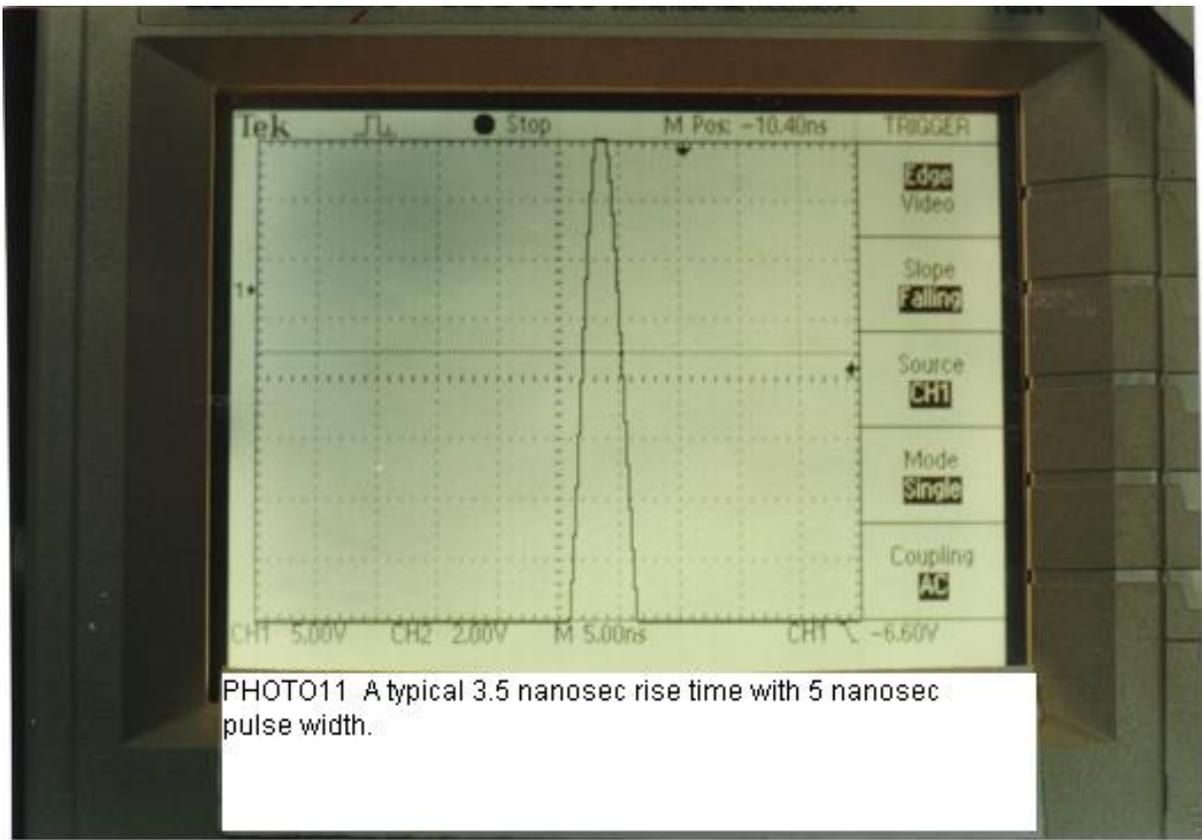


PHOTO11 A typical 3.5 nanosec rise time with 5 nanosec pulse width.