

# Trigger Units

## With High Repetitive Rate Capabilities

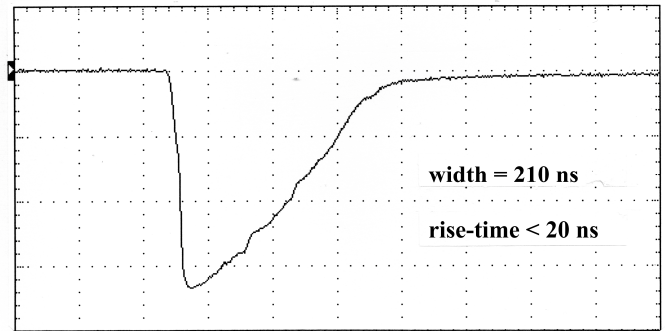
### Specifications of CX trigger unit

- Deuterium-filled thyratron, type: CX 1585, is used. The characteristics of thyratron are: the peak forward anode voltage is up to 35 kV, the peak anode current is 3 kA and the anode heating factor is  $7 \times 10^9 \text{ V} \times \text{A} \times \text{p.p.s.}$  for the pulses with the width of 250 ns. The theoretical repetition rate of the tube is up to 250 pulses per second (p.p.s.).
- The low jitter and the low delay time drift of the thyratron is ensured by the design of highly sophisticated solid state circuits that are mounted on the motherboard. They energize the current and voltage of the cathode heater and of the reservoir heater. See Figure 1.



**Fig. 1.** Photograph of d.c. power heater supply of CX unit

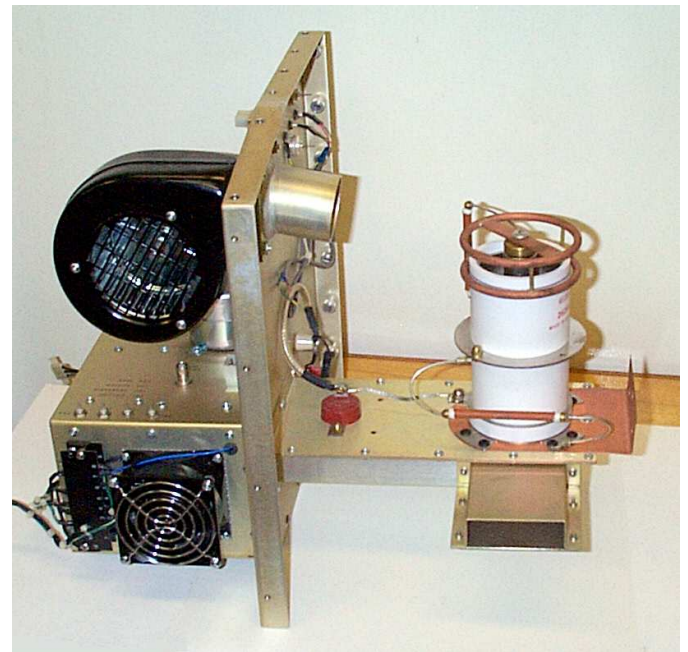
- To have an extended life time, the unit is set to operate at 18 kV with the repetition rate up to 30 pulses per second.
- The unit has the inverse anode voltage protection, built-in d.c. power supply and the time delay circuitry to activate high voltage after the tube heating time of 5 minutes.
- Energy storage consists of  $50 \Omega$  line of  $C=1.7 \text{ nF}$  and the lumped capacitor of  $2.6 \text{ nF}$ .
- Energy stored of  $0.7 \text{ J}$  is sufficient to create a healthy spark breakdown in  $5 \text{ mm}$  gaps, as the energy supplied to the spark channel exceeds  $1 \text{ J/cm}$ . The jitter in the electrical breakdown is  $5$  to  $10 \text{ ns}$ .
- The external  $15 \text{ V}$  trigger pulse is required to activate the unit. Output voltage waveform is given in Figure 2.



**Fig. 2.** Voltage waveform ( $5 \text{ kV/div.}$   $100 \text{ ns/div}$ ) measured with  $50 \Omega$  load for CX unit.

### Further Improvements: FX unit

- Ceramic metal grounded grid thyratrons: HY3204 is employed, because of its faster switching times, higher ( $40 \text{ kV}$ ) peak voltage and higher ( $40 \times 10^9 \text{ V} \times \text{A} \times \text{p.p.s.}$ ) anode heating factor as compared to the positive grid thyratron used in the CX unit.
- Forced air flow is supplied to maintain the ceramic/metal envelope temperature below the maximum rated value. See Figure 3.
- Work is in progress to achieve maximum possible pulse repetition rate with improved rise-time.



**Fig. 3.** Photograph of CX unit

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