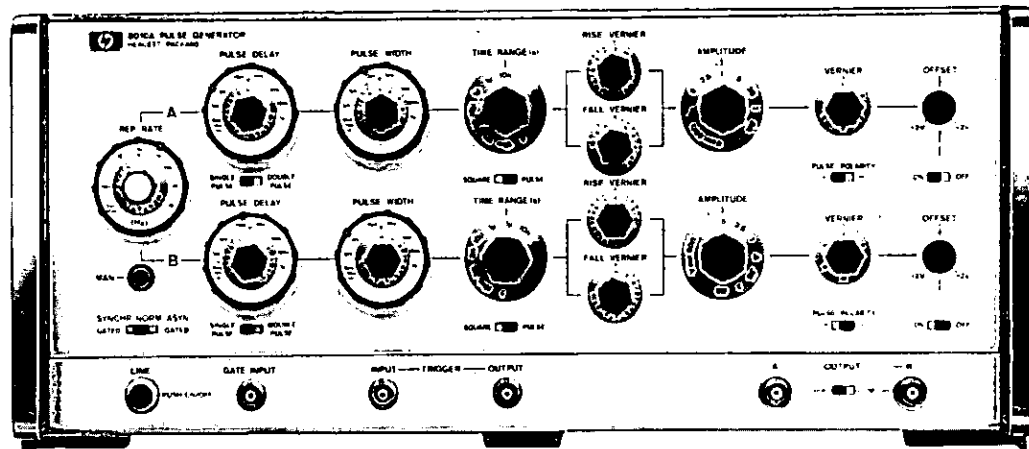




## PULSE GENERATOR

Two Channels for Complex Waveforms  
Model 8010A



8010A

### 8010A Pulse Generator

The Model 8010A Pulse Generator offers all the advantages of the 8005A (page 242) plus many additional features. The 8010A comprises two channels with the repetition rate, from 1 Hz to 10 MHz, common to both. Pulse delay, width, rise and fall times, amplitude, and dc-offset controls are independent for each channel. With the exception of dc-offset all front panel controls are calibrated. Rise and fall times are adjustable from less than 10 ns to 1 s with a ratio of rise to fall or fall to rise of up to 10:1. Amplitude of each pulse is independently adjustable from 5 volts to less than 0.02 volts into 50 ohms. A seven-step attenuator reduces the output in a 5, 2.5, 1 sequence.

In the normal delay mode both pulses are referenced to the trigger output, and so the delay of either pulse can be fixed while that of the other remains variable. Thus Output A can be delayed from 50 ns to 1 s with respect to Output B or vice versa. Additionally, besides the normal delaying modes, a front panel switch makes Output A the reference for Output B. In this mode both waveforms are controlled

by pulse delay A. Hence, the pulse combination of Outputs A and B can be delayed as one complete waveshape with respect to the trigger output. An illustration of the delaying modes is given in Figure 2.

As an extra feature, the Pulse Generator can be operated in a square wave mode. Symmetrical, dc coupled, square waves from 1 Hz to 10 MHz with variable rise and fall times are available at both outputs.

The polarity of either output can be selected individually. Complex waveshapes, of the order shown in Figure 1 are generated by Channels A and B together with the 8010A's combining capabilities. Synchronous gating effectively turns the instrument on and off, permitting the generation of pulse trains of various lengths. On the other hand, in the asynchronous gating mode the repetition rate generator continues to run, so the trigger output is always available. Furthermore, it is possible to gate both channels separately making the 8010A an ideal synchronizing source for the 8006A Word Generator.

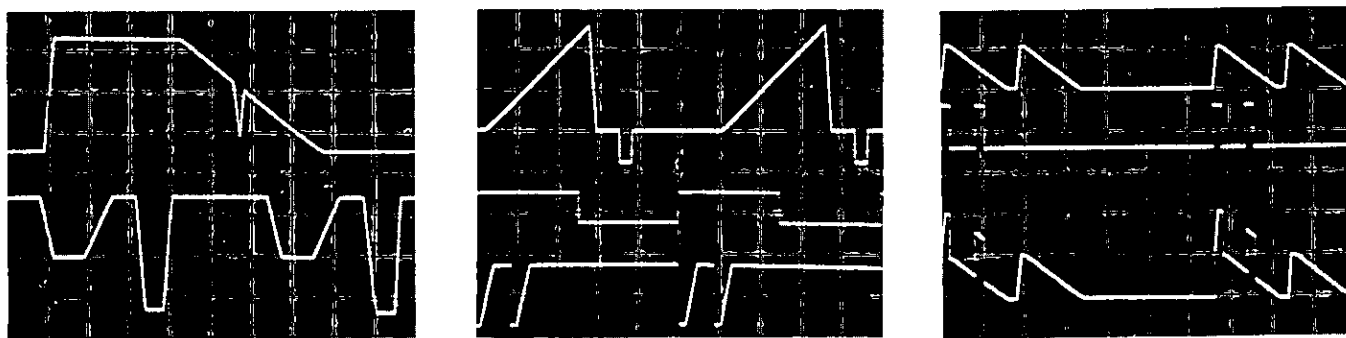


Figure 1. A selection of waveforms showing single and combined outputs.

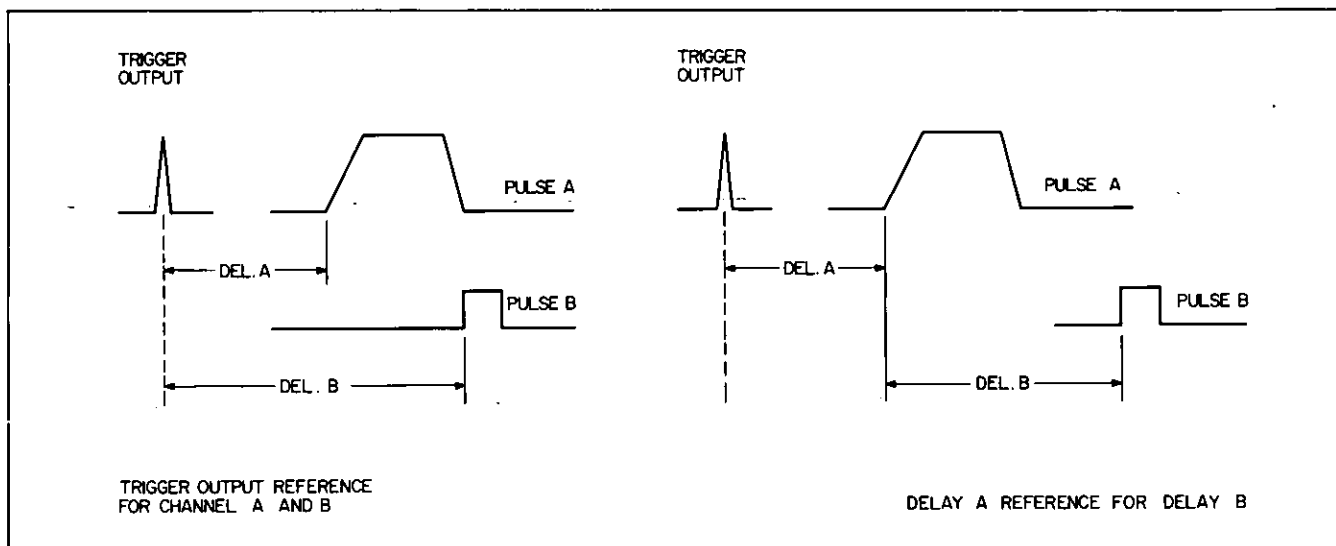


Figure 2.

## Specifications

### Pulse characteristics (with 50 $\Omega$ load impedance)

**Rise and fall times:** sep outputs: <10 ns to 1 s in eight ranges; ranges are common for rise and fall times. Independent verniers provide separate control of rise and fall times within each range up to a max ratio of 1:10.

**Common outputs:** <12 ns to 1 s.

**Accuracy:**  $\pm 15\%$  of setting.

**Linearity:** for transition time >30 ns maximum amplitude deviation from a straight line between the 10% and 90% points is less than 4% of pulse amplitude.

**Overshoot and ringing:** <5% of pulse amplitude.

**Pulse width (A and B):** <20 ns to 1 s in eight ranges. Vernier provides continuous adjustment between ranges.

**Accuracy:**  $\pm 15\%$  of setting.

**Maximum duty cycle:** >90% for repetition rates from 1 Hz to 1 MHz. >50% from 1 to 10 MHz.

**Width jitter:** <0.1% on any width setting.

**Maximum output:** 5 V (10 V across an open circuit) sep or common output.

**Attenuator:** seven-step attenuator reduces output to 0.05 V in 5, 2.5, 1 sequence. Vernier provides continuous adjustment between steps and reduces minimum output to <0.02 V.

**Pulse outputs:** sep outputs: two outputs, each pos or neg selectable. Com outputs: polarity of A and B independently selectable.

**Source impedance:** 50 $\Omega$   $\pm 10\%$  shunted by typically 20 pF.

**DC offset:**  $\pm 2$  V across 50 $\Omega$  load. Independent of attenuator and vernier setting; can be switched off.

**Pulse delay:** (A and B) <50 ns to 1 s delay with respect to trigger output. Eight ranges. Vernier provides continuous adjustment between ranges.

**Accuracy:**  $\pm 15\%$  of setting.

**Delay jitter:** <0.1% on any delay setting.

### Repetition rate and trigger

**Free running:** 1 Hz-10 MHz in seven ranges. Vernier provides continuous adjustment between ranges.

**Accuracy:**  $\pm 15\%$  of setting.

**Period jitter:** <0.1%.

**Square wave:** 1Hz-10MHz output symmetrical to ground.

**Double pulse:** separate for channel A and B. Minimum pulse distance of <50 ns allows maximum rep rate up to 20 MHz.

### External triggering

**Rep rate:** 0 to 10 MHz. Can be triggered with sine waves or pulses of either polarity. (For Square Wave Output frequency divided by a factor of 2).

**Trigger input:** sine waves 1 V p-p. Pulses 0.5 V peak at least 20 ns wide.

**Delay:** approximately 30 ns between trigger input and trigger output.

**Input impedance:** 1.0 k $\Omega$ .

**Manual:** pushbutton for single pulse.

**Sep triggering for both channels:** positive spikes +2 V amplitude <50 ns width. Input impedance 50 $\Omega$  (inputs on rear panel).

### Trigger output

**Amplitude:** >2 V across 50 $\Omega$ .

**Width:** 15 ns  $\pm 10$  ns.

**Polarity:** positive.

**Impedance:** 50 $\Omega$ .

### Gating

**Synchronous gating:** gating signal turns generator "on" pulse rep rate, rise and fall time, amplitude, polarity, delay and width determined by panel control settings. First pulse is coincident with the leading edge of the gate, last pulse is normal width, even if gate ends during the pulse.

**Asynchronous gating:** gating signal turns the output pulse "on" trigger output always available.

**Gate inputs:** at least -2 V enabling.

**Power:** 115 or 230 V +10%, -15%, 50 to 400 Hz.

**Dimensions:** 16 $\frac{3}{4}$ " wide, 7 $\frac{1}{4}$ " high, 18 $\frac{3}{8}$ " deep overall (425 x 184 x 466 mm).

**Price:** \$1700 at factory in West Germany.