

Medical Imaging & Gating

Gating and synchronization of sources, detectors, and acquisition windows in medical imaging research and instrumentation development.



Model 577 Digital Delay/Pulse Generator, front panel.

APPLICATION BRIEF · PULSE & DELAY GENERATORS · dc-62022201

The Mission

Imaging systems built on pulsed sources and gated detectors live or die by timing. In research and instrumentation development for modalities that use timed exposures, gated acquisition, or coincidence windows, the source has to fire, the detector has to open, and the acquisition has to record in a fixed, repeatable relationship. A pulse and delay generator sets and holds that relationship.

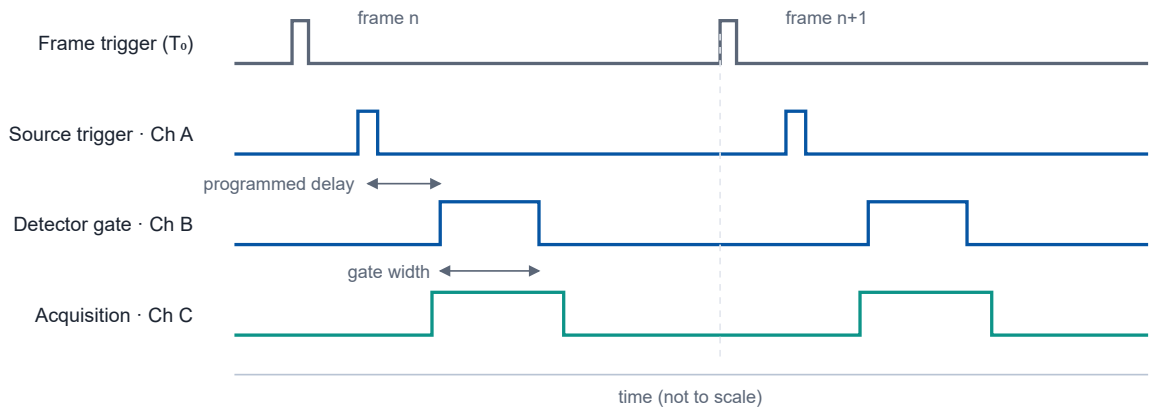
On the test bench, it stands in for the system sequencer, letting engineers gate a detector, delay an acquisition window, and trigger a source while sweeping parameters to characterize a new imaging chain.

The Challenge

Gating precision drives image quality. A detector gate that opens late or jitters from frame to frame blurs the measurement, so delay resolution and low jitter are direct contributors to image fidelity. Multiple channels are usually in play, one to trigger the source, one to gate the detector, one to mark the acquisition, all referenced to a single start so they never drift apart.

A worked case sets the scale. A detector gate 20 ns wide, opened 1 μ s after the frame trigger on a Model 577, is placed with 250 ps setting resolution and moves by less than 50 ps RMS from frame to frame, which is under 0.3 percent of its own width. Its mean position is within $1 \text{ ns} + 0.0001 \times 1 \mu\text{s} = 1.1 \text{ ns}$ of the programmed delay, a fixed offset that a one-time measurement removes. Figure 1 shows the three channels of such a frame.

Bench work also rewards flexibility: adjustable output amplitude to meet a specific trigger threshold, straightforward control for sweeping a delay across a range, and stored setups so a characterization run repeats exactly. Reliability over long acquisitions keeps a study consistent.



■ **SCHEMATIC** **Figure 1.** Gated acquisition: source, detector gate, and acquisition all referenced to one frame trigger, holding the same delay and width frame after frame. Illustrative.

Recommended Berkeley Nucleonics Solutions

The **Model 577** is a strong default: 4 or 8 channels, 250 ps delay and width resolution, channel-to-channel jitter below 50 ps RMS, deep gating and trigger options, and a choice of TTL, adjustable, and optical output modules to meet whatever the source and detector electronics expect. It locks to a 10 to 100 MHz external reference when the imaging chain has its own clock.

For setups that need a wider spread of output modules or 2, 4, or 8 channel flexibility with mixed electrical and optical I/O, the **Model 575** offers the widest I/O choice in the line, including optical inputs and outputs, useful when a detector gate has to cross potentials over fiber. When a compact, lower-cost, or portable timing source fits the bench better, the six-channel USB-powered **Model 525** provides independent gating channels with 4 ns resolution from a laptop or charger.

Why It Works

Referencing source, detector, and acquisition to one start keeps the gating relationship fixed, which is what clean, repeatable images require. The 577 supplies the resolution, jitter, and module flexibility most imaging benches need, the 575 extends the I/O options for tricky grounding or optical isolation, and the 525 covers compact and portable work. Stored setups and stable timebases let a characterization run repeat exactly across a long study.

Getting Started

Berkeley Nucleonics application engineers help match channel count, edge speed, jitter budget, and output module to your timing diagram before you order. Send a block diagram or a short description of the events you need to synchronize, and we will return a configuration recommendation.

Email info@berkeleynucleonics.com or call 800-234-7858. Browse the full Pulse & Delay Generator documentation for datasheets, manuals, and ordering guides.

Berkeley Nucleonics Corp.

Test, Measurement and Nuclear Instrumentation since 1963
For details: info@berkeleynucleonics.com or 800-234-7858

Application Brief

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