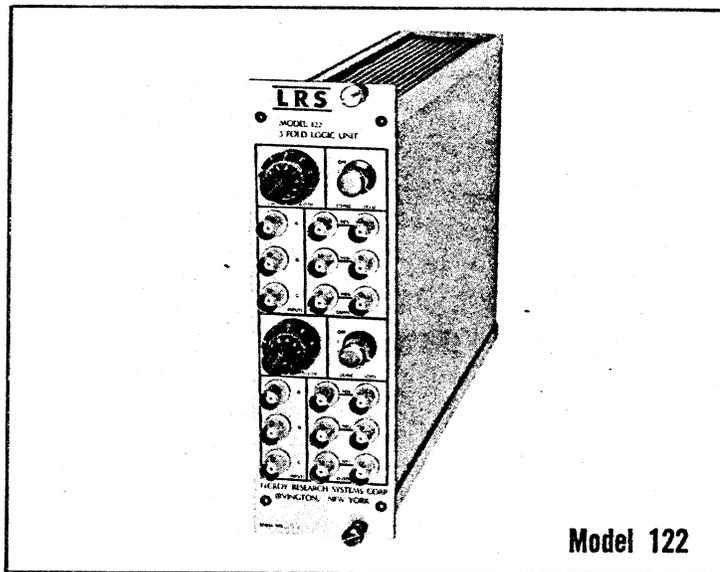


DUAL THREE-FOLD LOGIC UNIT Model 122

- Deadtimeless operation
- Continuously variable output duration
- Direct-coupled design
- No multiple pulsing
- Inputs protected to ± 100 volts
- AEC standard nuclear module packaging
- High built-in fan-out
- Built-in scaler driving
- Double-pulse resolution 8 nSec
- Complementary logic
- Bipolar outputs
- Self-checking



Model 122

LRS Model 122 is a dual, general-purpose three-fold logic unit featuring deadtimeless, non-multiple-pulsing operation and direct-coupled design. It performs the logical functions of fan-in, coincidence, inhibit, and majority logic at rates in excess of 100 MHz, using extremely flexible complementary input logic. Output pulse duration is independent of input overlap time and may be continuously preset from 6 to 150 nSec. The Model 122 sets a new standard for fast logic efficiency and versatility at a very moderate cost.

GENERAL DESCRIPTION (Each channel of two)

The Model 122 accepts logic signals from other Series 100 modules, or photomultiplier pulses directly, at each of its three inputs. A front panel switch selects the number of simultaneous negative signals required for an output, from one to three. Any input serves as an inhibit input when driven with a complementary (positive) logic signal. The duration of the output is set by a ten-turn potentiometer and a three-position range switch. It may be set continuously from 6 to 150 nSec, and is independent of input overlap time, amplitude, and rate. A single output pulse is produced regardless of input duration or amplitude (no multiple-pulsing). One

positive and two negative outputs are delivered simultaneously, each of which may be fanned out to two or more later inputs, or terminated, clipped, or used to drive any scaler requiring six volts or less. At all output widths greater than 8 nSec, there is no deadtime whatever following the output pulse, and the circuit can be retriggered even before the end of an output pulse that is already present. This extremely fast recovery, in a completely direct-coupled circuit, gives a degree of efficiency and rate-independence unmatched by any other available equipment.

The Model 122 is a member of LRS Series 100, an integrated line of high speed logic instrumentation in which modern circuit design, components, and packaging are combined in instruments of unusually broad usefulness to experimental physicists in both high and low energy physics.

SPECIFICATIONS

INPUT CHARACTERISTICS

Logic inputs:

Three; direct-coupled; impedance 50Ω constant to ± 100 volts; 250 mV threshold, nominal; reflections $< 7\%$ for inputs of 2 nSec risetime.

Feedthrough threshold:

Approximately 30 volts with input risetime of 2 nSec; > 100 volts (limit of input protection) for risetimes of 10 nSec or greater.

Slow (bin) gate:

Via rear connector, with rear-panel On-Off switch; rise and fall times approximately 50 nSec; 5 volts at 1 mA inhibits; direct-coupled.

Inhibit:

Any input serves as inhibit when driven with complementary signal.

OUTPUT CHARACTERISTICS

Outputs:

Three; one positive (quiescently-14 mA, 0 mA during output), two negative (0 mA quiescently, -14 mA during output); each with two front panel BNC connectors in parallel for splitting, terminating, or clipping.

Fan-out:

Maximum of 6-fold, if each output drives two terminated 50Ω inputs.

Impedance:

Approximately $10K\Omega$ at amplitudes up to 700 mV; approximately 350Ω above one V; reflections approximately 5% with front panel 50Ω termination.

Amplitude:

Current: 14 mA for loads of 50Ω or less; shunted by 350Ω for larger loads. Voltage: 14R mV for loads of 50Ω or less; approximately 6V for loads of $1K\Omega$ or more.

Duration:

Continuously adjustable 6 to 150 nSec, in three ranges (shorter durations by clipping); internal three position range switch; front panel ten-turn locking potentiometer as vernier. Ranges: 6-15, 12-50, 35-150 nSec; stability approximately $0.3\%/^{\circ}\text{C}$, $0.2\%/^{\circ}\text{C}$, $0.1\%/^{\circ}\text{C}$, respectively; jitter on shortest range less than 20 pSec rms.

Rise and fall time:

Negative outputs: risetime 1.7 nSec, fall 2.5 nSec; positive outputs approximately 2.5 nSec rise and fall.

Scaler driver:

Any output serves as scaler driver, delivering 700 mV into 50Ω inputs of fast scalers, or up to 6V into high impedance inputs of slow scalers.

GENERAL

Functions:

Fan-in (two and three-fold); coincidence (three-fold, two-fold with one inhibit, singles with two inhibits, two-out-of-three majority logic); also self-checking, variable time delay generation, and variable frequency clock pulse generation.

Coincidence width:

Determined by input pulse durations; total widths from approximately 1 nSec up without limit.

Maximum rate:

125 MHz typical, input and output.

Double-pulse resolution:

8 to 40 nSec depending on output pulse duration; given approximately by $T_o/3 + 5.5$ nSec where T_o is output pulse duration.

Time resolution:

Counting rate down by a factor of 100 in 15 pSec at either edge of coincidence curve, when two inputs are driven from two outputs of a Model 121 discriminator; in 60 pSec when driven from separate discriminators triggered by a single Model 1P-1 Instapulser.

Counting efficiency:

Recovery time typically less than output pulse duration; no deadtime following output pulse at output durations greater than approximately 8 nSec.

Input-output delay:

Absolute delay, 12 nSec; jitter < 20 pSec rms.

Multiple-pulsing:

None; one and only one output pulse of preset duration is produced each time the input conditions are satisfied, regardless of the duration of the input pulses or their overlap.

Packaging:

In conformance with AEC standard for nuclear modules (AEC Report TID-20893); RF shielded AEC #2 module, fitting 6/bin; dimensions $2.75 \times 8.75 \times 10$ inches deep. Completely compatible physically and electrically with LRS Power Chassis Model 108P, and with any other AEC power bin of any manufacturer.

Power requirements:

-24 volts at 100 mA, -12 volts at 250 mA, + 12 volts at 200 mA, all $\pm 1\%$. Also available with internal supply voltage regulation, operating from ± 22 to 25 volts; specify Model 111B.