

**365AL DUAL 4-FOLD MAJORITY LOGIC UNIT**  
**465 TRIPLE 4-FOLD LOGIC UNIT (Note - the 465 is no longer available)**  
**622 QUAD 2 INPUT LOGIC UNIT**

(<http://www.lecroy.com/lrs/dsheets/365al.htm>)



- NIM Packaging
- High Speed
- Multiple Input
- Multiple Output
- Selectable Number of Coincident Inputs

**FOR HIGH SPEED LOGIC OPERATIONS**

A logic unit generates a precise standard pulse when the inputs correspond to preset logical conditions. The inputs to the logic modules are standard NIM logic levels typically generated by a discriminator or another logic module. The inputs are restandardized and then compared to the setting of the module.

The logical conditions which can be selected are 4-fold, 3-fold (Model 365AL and Model 465), AND (all units) and an OR (Model 365AL and Model 622). If only one input is selected, then the units will act as a logic fan-out. The output of the logic module has a duration that is either the same period as the coincidence of the inputs (465) or is adjustable via a front-panel potentiometer for maximum flexibility. The output of a logic module is typically part of a trigger system which triggers, gates or disables a data acquisition system.

LeCroy's family of NIM logic modules are flexible and versatile. They offer a number of features and can be easily configured.

**FEATURES**

Multiple Channels - Each module has up to 3 channels and has 2 or 4 inputs per channel. A minimum of 5 outputs are available.

High Speed - All modules have greater than 110 MHz operation. In addition, all channels have adjustable output pulse widths.

Selectable Logic Function - Each unit has a switch selectable logic function from 4-fold coincidence (365AL and 465), to majority logic (365AL) to AND/OR (622).

High Performance - All three modules experience no multiple pulsing, have good output width stability and as low as 5 nsec double pulse resolution.

**FUNCTIONAL DESCRIPTION**

LeCroy's NIM logic units offer flexibility, versatility, high speed and performance packaged in a single width NIM module. All together they provide the functions of majority logic, up to 4-fold coincidence, fan-in and fan-out and AND/OR Logic along with > 110 MHz operation. Each of the channels accept up to 2, Model 622, or 4, Model 365AL and Model 465, standard NIM logic signals.

Both the 365AL and the 465 have inputs which may be individually enabled or disabled without altering cabling or termination by means of front-panel switches. In the 465, with all inputs enabled, four inputs are required. Disabling the logic inputs is equivalent to reducing the number of simultaneous negative

input signals required for an output. Thus, each channel may be programmed for 4-fold, 3-fold or 2-fold logic decisions. With only one input enabled, each channel operates as a logic fan-out.

The 365AL, however, has a selectable number of coincidence values to allow programming of one to four simultaneous input signals required for an output. Thus, it can operate similar to the 465 or can be used for the majority logic as well as a logic fan-in. Alternatively, the 622 features 4 channels with switch selectable AND or an OR output condition of the two inputs.

All three units offer at least 2 sets of bridged outputs and at least one complementary output as well as continuously adjustable output pulse duration. The output pulse width is set via a front-panel screwdriver control pot from 5 nsec to 600 nsec for the 622. The outputs are highly stable and independent of input amplitude, duration and rate. All units are updating and can be retriggered before the end of an output pulse. The 465 also has bridged overlap outputs (-32 mA) whose output pulse width is equal in duration to the coincidence overlap.

Note that each unit can be used in a CAMAC crate with the Model 4501A NIM-to-CAMAC adapter.

## **SPECIFICATIONS**

### *Model 365AL*

#### **INPUT**

Logic Inputs: 4 Lemo -type connectors; 50 ohm impedance; negative NIM level input requirements; each input can be separately enabled or disabled.

Veto Input: Lemo -type connector; 50 ohm impedance; negative NIM level input requirements. Requires 3 nsec minimum width delayed 3 nsec from leading edge of input.

Bin Gate: Via rear connector; clamp to ground from +4 V inhibit; rise times and fall times < 50 nsec.

#### **OUTPUT**

Outputs: 3 pairs; 2 negative (quiescently 0 mA, -32 mA during output), one complementary (quiescently -32 mA, 0 mA during output).

Fan-out: 6-fold, if each output drives two 50 W loads. (Any used output pair should drive 25 ohm for proper amplitude and shape.)

Duration: Continuously adjustable from less than 4 nsec to greater than 50 nsec by means of front-panel screwdriver-adjustable potentiometer. Updating.

Output Rise and Fall Times: 1.2 nsec typical. Fall time is 2.2 nsec maximum at 10 nsec pulse width and longer.

#### **GENERAL**

Functions: AND; OR; Majority Logic; Leading Edge Inhibit; Complement; Pulse standardization without multiple pulsing; coincidence level determined by front-panel selector.

Coincidence Width: 1 nsec and up, determined by input pulse durations.

Rate: 150 MHz minimum.

Input-Output Delay: Approximately 10 nsec.

Double Pulse Resolution: Typical 5 nsec; (6.5 nsec for triple pulses).

Packaging: NIM single-width module; Lemo -type connectors used for all inputs and outputs.

Power Requirements: 55 mA at +12 V (increases to 120 mA if both channels in 4-fold coincidence), 165 mA at -12 V, 22 mA at -24 V.

## Model 465

### INPUT

Logic Inputs: 4; Lemo connectors; 50 ohm impedance; negative NIM-level input requirements; each input can be separately enabled or disabled by front-panel push-buttons.

Veto Input: Standard negative NIM-level signal, 3.5 nsec minimum width. Requires complete overlap of input coincidence for linear outputs and prompt overlap of the leading edge of the input signal that would otherwise create the coincidence condition for the preset outputs. (Veto should precede this leading edge by approximately 5 nsec in this case.)

Bin Gate: Via rear connector; clamp to ground from +4 V inhibits; rise times and fall times < 50 nsec.

### OUTPUT

Preset: 3; one bridged negative (quiescently 0 mA, -32 mA during output) one complementary (quiescently -16 mA, 0 mA during output). Updating.

Overlap: One bridged negative; quiescently 0 V, -32 mA during output; duration equal to coincidence overlap. Non-updating.

Fan-Out: 5 fold, if each output drives a 50 ohm load.

Duration: Continuously adjustable from less than 5 nsec to greater than 500 nsec by means of front-panel screwdriver-adjustable potentiometer. Width stability better than  $\pm 0.2\%/^{\circ}\text{C}$ .

Output Rise Times: OUT: 2.0 nsec typical (maximum 2.5 nsec). OUT\*: 2.2 nsec typical (maximum 2.5 nsec; 3.0 nsec with negative output unterminated).

Output Fall Times: OUT: 2.0 nsec typical (maximum 2.5 nsec). OUT\*: 2.2 nsec typical (maximum 2.5 nsec). Both are slightly longer on wide output durations.

### GENERAL

Functions: 2-fold, 3-fold, or 4-fold coincidences plus fan-out determined by selectively disabling logic input.

Coincidence Width: > 1 nsec, determined by input pulse durations.

Rate: 0 to > 120 MHz.

Input-Output Delay: 13 nsec for preset outputs; 8.5 nsec for overlap output.

Double Pulse Resolution: 8 nsec.

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: Single-width AEC/NIM module; in conformance with AEC standard; Lemo connectors used for all inputs and outputs.

Power Requirements: 65 mA at +12 V, 135 mA at -12 V, 125 mA at +6 V, 640 mA at -6 V, 5 mA at -24 V.

## Model 622

### INPUT

No. of Channels: 4, all identical.

Logic Inputs: 2, 50 ohm direct-coupled; reflections < 7% for standard negative NIM of 2 nsec rise time.

Veto Input: Front-panel connector permits simultaneous inhibiting of all channels; 50 ohm; requires negative NIM-level signal; direct-coupled; must overlap leading edge of input signal that would otherwise cause the coincidence condition; must precede input by approximately 5 nsec.

Bin Gate: Via rear connector, with rear-panel ON/OFF switch; quiescently +4 V, clamping to ground inhibits logic unit; direct-coupled; rise times and fall times approximately 50 nsec.

### OUTPUT

Bridged Negative: 2 pairs; NIM (quiescently 0 mA, -32 mA during output), duration, 5 nsec to 1  $\mu\text{sec}$ , continuously variable up to 600 nsec via front-panel screwdriver control (narrower widths possible at slight expense of amplitude); rise times and fall times (all outputs terminated in 50 ohm) typically 2.0 nsec (maximum 2.5 nsec). Output fall times slightly longer on wide output durations. Width stability better than  $\pm 0.2\%/^{\circ}\text{C}$  maximum. Updating.

Fast Negative Timing: One NIM (quiescently 0 mA, -16 mA during output). Other characteristics same as above, except rise times are typically 1.5 nsec (maximum 2.0 nsec) and minimum width is < 6 nsec.

Complementary: One NIM (quiescently, -16 mA, 0 mA during output). Other characteristics same as for Fast Negative Timing Output.

**GENERAL**

Functions: Fan-in (2-fold); coincidence; inhibit.

Coincidence Width: Determined by input pulse durations; total widths approximately 1.0 nsec and up.

Rate: 110 MHz typical, input and output.

Input-Output Delay: 9.5 nsec typical.

Double Pulse Resolution: < 9 nsec at minimum output width setting.

Multiple Pulsing: None; one and only one output pulse of preset duration is produced for each input pulse, regardless of input pulse amplitude or duration.

Packaging: In RF-shielded, AEC/NIM #1 module (AEC Report #TID-20893); Lemo-type connectors.

Power Requirements: 450 mA at -6 V, 215 mA at +6 V, 165 mA at -12 V, 20 mA at +12 V, 85 mA at -24 V.

**NIM LOGIC UNIT SELECTION CHART**

Model	365AL	465	622
<b>INPUT</b>			
No. of Channels	2	3	4
No. of Inputs	4	4	2
<b>FUNCTION</b>			
Logic	Majority 4-fold selectable coincidence level	Up to 4-fold	AND/OR
<b>GENERAL</b>			
Packaging	Single-width NIM	Single-width NIM	Single-width NIM
Maximum Rate	150 MHz	120 MHz	110 MHz
D.P.R.	5 nsec (6.5 nsec for triple pulses)	8 nsec	< 9 nsec
<b>OUTPUT</b>			
No. of Outputs	4 NIM, 2 NIM*	Preset: 2 NIM, 1 NIM* Overlap: 2 NIM	4 NIM, 1 Fast NIM Timing, 1 NIM*
Width	4 nsec to 50 nsec	5 nsec to 500 nsec (preset only)	5 nsec to 1 µsec
<b>POWER</b>			
-24 V	22 mA	5 mA	85 mA
-12 V	165 mA	135 mA	165 mA
-6 V	600 mA	640 mA	450 mA
+6 V	425 mA	125 mA	215 mA
+12 V	55 mA (120 mA if both in 4 fold coincidence)	65 mA	20 mA