rev. 02 - 25/10/2004

N455

Quad Coincidence Logic Unit

CAEN
Tools for Discovery

User Manual

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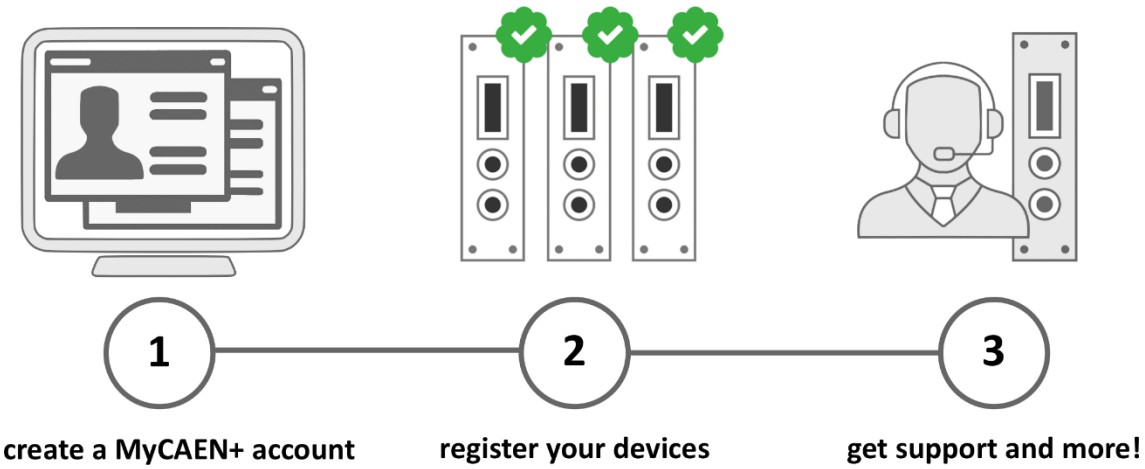

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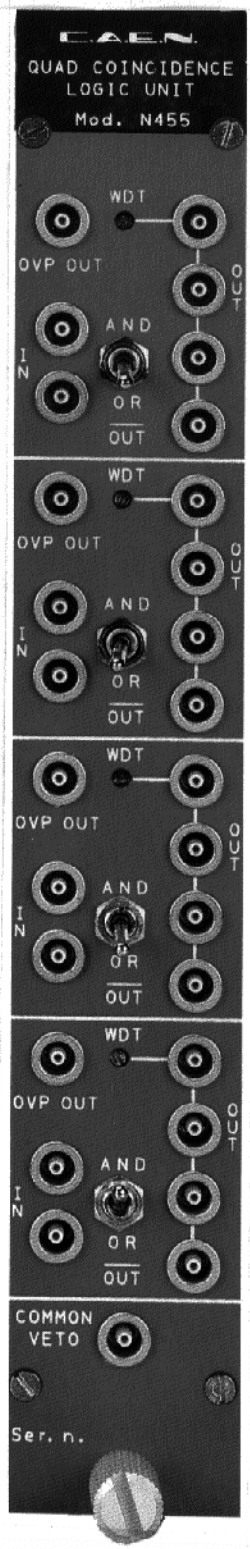
Technical Information Manual

Revision n.2

25 October 2004

MOD. N455

QUAD COINCIDENCE LOGIC UNIT


CAEN
QUAD COINCIDENCE
LOGIC UNIT
Mod. N455
WDT
OVP OUT
OUT
AND
IN
OR
OUT
WDT
OVP OUT
OUT
AND
IN
OR
OUT
WDT
OVP OUT
OUT
AND
IN
OR
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WDT
OVP OUT
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OR
OUT
COMMON
VETO
Ser. n.

CAEN will repair or replace any product within the guarantee period if the Guarantor declares that the product is defective due to workmanship or materials and has not been caused by mishandling, negligence on behalf of the User, accident or any abnormal conditions or operations.

CAEN declines all responsibility for damages or injuries caused by an improper use of the Modules due to negligence on behalf of the User. It is strongly recommended to read thoroughly the CAEN User's Manual before any kind of operation.

CE

CAEN reserves the right to change partially or entirely the contents of this Manual at any time and without giving any notice.

Table of contents

1. DESCRIPTION

1.1 FUNCTIONAL DESCRIPTION

The CAEN Model N 455 QUAD COINCIDENCE LOGIC UNIT is a single width NIM module equipped with four independent sections.

Each section is provided with:

- two input connectors "IN";

- three output connectors "OUT";

- one output connector "$\overline{\text{OUT}}$";

- one output connector "OVP OUT";

- one screwdriver trimmer "WDT";

- one two-position lever switch "AND/OR".

Input and output signals are std. NIM FAST LOGIC level.

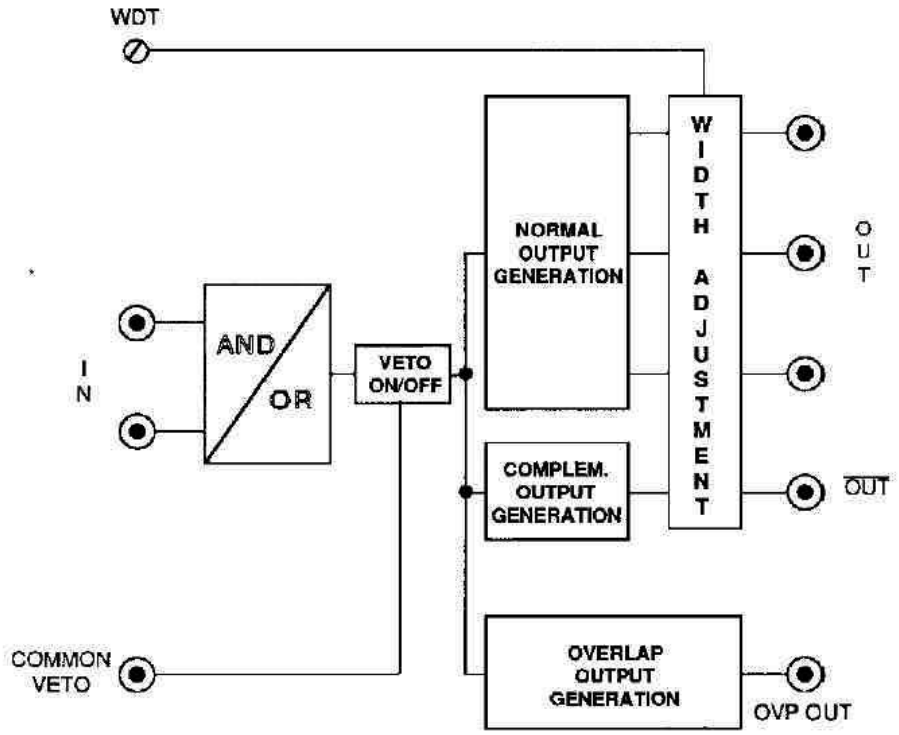
Two input signals per section can be ANDed or ORred by setting the relevant "AND/OR" switches to the appropriate position, and the selected logic function can be verified through the corresponding output signals:

- three shaped normal outputs ("OUT" connectors") and one shaped complementary output ("$\overline{\text{OUT}}$" connector). The width of these signals can be varied by turning the common screw-driver trimmer located on the module's front panel;

- one supplementary output ("OVP OUT" connector) whose width is equal to the time interval in which the selected logic function is true. This output allows the minimum input/output delay to be obtained.

A common VETO input signal can be sent to the homonymous front panel connector in order to disable the input signals of the four module's sections.

The functional block diagram of the N 455 is shown in Figure 1.



IMPORTANT NOTE:
Unused Outputs require a 50 Ω termination

Figure 1 - Functional Block Diagram of the N 455 (One Section).

2. SPECIFICATIONS

2.1 PACKAGING

1-unit wide NIM module.

2.2 EXTERNAL COMPONENTS

CONNECTORS:

- No. 8 LEMO 00 type "IN" (two per section). Input signal connectors.
- No. 12 LEMO 00 type "OUT" (three per section). Normal output signal connectors.
- No. 4 LEMO 00 type "$\overline{\text{OUT}}$" (one per section). Complementary output signal connectors.
- No. 4 LEMO 00 type "OVP OUT" (one per section). Supplementary output signal connectors.
- No. 1 LEMO 00 type "COMMON VETO". VETO input signal connector.

SWITCHES:

- No. 4 two-position lever switches "AND"/"OR" (one per section). Logic function selection.

TRIMMERS:

- No. 4 screwdriver trimmers "WDT" (one per section). Output width adjustment (OUT and $\overline{\text{OUT}}$ signals only).

2.3 CHARACTERISTICS OF THE SIGNALS

INPUT

IN:

- Fast NIM logic level (logical 0 = 0 to -50 mV; logical 1 = -600 mV to -800 mV; 50Ω impedance).
- Minimum width: 3 ns (FWHM).
- Reflections <10%.
- Input protection: +400 mV, -5.6 V.

VETO:

- Fast NIM logic level (logical 0 = 0 to -50 mV; logical 1 = -600 mV to -800 mV; 50Ω impedance). It must precede the leading edge of the coincidence signal by at least 1 ns.
- Minimum width: 3 ns (FWHM).
- Input protection: none.

OUTPUT

Shaped OUT:

- Current source type.
- Fast NIM logic level (logical 0 = +1 mA to -1 mA; logical 1 = -12 mA to -18 mA; 50Ω impedance).
- Width: selectable, via front panel trimmer, in a range from 4 ns to 650 ns.
- Width stability: ±0.2%/°C maximum.
- Rise time: 2.2 ns ±0.1 ns.
- Fall time: 2 ns ±0.1 ns.
- Signal OVERSHOT better than 10%.
- If not all of the output connectors are employed, the others are recommended to be terminated on 50 Ohm .

Shaped OUT:

- Same as above, but with logical 1 = 0 to -1 mA, logical 0 = -12 mA to -18 mA, and rise time = 2.7 ns ±0.1 ns.

OVP OUT:

- Open emitter type.
- Logical 0 ≈ 0; logical 1 ≈ -16 mA; 50Ω impedance.
- The signal width is equal to the time interval in which the selected logic function is true.
- Width stability: ±0.2%/°C maximum.
- Rise time and fall time: 1.5 ns ±0.1 ns.
- Signal OVERSHOT better than 10%.

GENERAL:

- Maximum frequency: 130 MHz (FWHM), with the shaped output width set to 4 ns (minimum value).
- Input -Output delay : ≤16 ns (shaped outputs); ≤10 ns (OVP output).

- Double pulse resolution: min. 6 ns at minimum output width setting.
- Coincidence resolution time: ≥2.5 ns (OVP output); ≥4 ns (shaped outputs, with output width set to 10 ns).

2.4 POWER REQUIREMENTS

+6 V at 200 mA

-6 V at 1.5 A

+12 V at 50 mA

-12 V at 100 mA

3. OPERATING MODE

3.1 GENERAL INFORMATION

The Model N 455 QUAD COINCIDENCE LOGIC UNIT allows the user to perform AND or OR logic functions referred to two input signals per section, for a total of four logic functions simultaneously, and to verify the result of each logic function through the corresponding output signals in two different modes:

- by using the shaped outputs(available at the "OUT" and "$\overline{\text{OUT}}$" connectors), whose width is adjustable in a range from 4 ns to 650 ns;

- by using the OVP output (available at the "OVP OUT" connector) whose width is equal to the time interval in which the selected logic function is true.

It is also possible to disable all the input signals by sending a VETO signal to the "COMMON VETO connector".

3.2 OPERATIONS TO BE PERFORMED

CAUTION: *turn OFF the NIM crate before inserting or removing the module.*

1. Insert the N 455 module into the NIM crate.

2. Connect the signal sources to the "IN" connectors of the selected module's sections (see par. 2.3 for signal characteristics).

3. Connect the module's output connectors to the detection devices to be used.

4. According to the logic function to be performed, set the mudule's front panel switch "AND"/ "OR" to the appropriate position.

5. Turn on all the equipment devices.

4. TEST PROCEDURE

4.1 INTRODUCTION

The operations to be performed to test the N 455 module are listed in the procedure below and have to be carried out according to their numerical sequence. None of the procedural step can be omitted.

Each procedural step contains the operation to be performed and the corresponding effect or the verification to be accomplished.

4.2 NECESSARY INSTRUMENTS

- No. 1 Oscilloscope (150 MHz minimum band width).
- No. 1 Signal Generator capable of producing std. NIM level signals and provided with at least two independent output channels.
- 1 NIM crate.

4.3 PROCEDURE

CAUTION: *Turn OFF the crate before inserting or removing the module.*

1. Insert the module into the crate.
2. Turn ON the crate.
3. For each section of the module perform the following operations:
   (a) Set the "AND"/"OR" switch to "OR" position.
   (b) Via Signal Generator, supply one of the two inputs ("IN" connectors) with a normal fast NIM level signal (3 ns minimum width).
   (c) With the Oscilloscope, verify that:
      (1) a normal fast NIM level signal is present at the "OUT" connectors;
      (2) a complementary fast NIM level signal is present at the "$\overline{\text{OUT}}$" connector;
      (3) a normal fast NIM level signal is present at the "OVP OUT" connector, and that its width is equal to the input signal width;
      (4) no signal is present at the output connectors of the remaining sections;
   (d) With a screwdriver, turn the "WDT" trimmer and verify that the width of all the shaped

outputs ("OUT" and "$\overline{\text{OUT}}$" connectors) can be varied in the range from 4 ns to 650 ns.

(e) Send a VETO signal (fast NIM level) to the "COMMON VETO " connector and verify that no signal is present at the output connectors.

(f) Remove the input signal cable from the selected input connector and connect it to the other one.

(g) Repeat the steps (c) thru (e).

(h) Set the "AND"/"OR" switch to "AND" position.

(i) Via Signal Generator, supply the two inputs ("IN" connectors) with normal fast NIM level signals having different widths.

(j) With the Oscilloscope, verify that:

(1) a normal fast NIM level signal is present at the "OUT" connectors;

(2) a complementary fast NIM level signal is present at the "$\overline{\text{OUT}}$" connector;

(3) a normal fast NIM level signal is present at the "OVP OUT" connector during the time interval in which the set logic function is true;

(4) no signal is present at the output connectors of the remaining sections;

(k) with a screwdriver, turn the "WDT" trimmer and verify that the width of all the shaped outputs ("OUT" and "$\overline{\text{OUT}}$" connectors) can be varied in the range from 4 ns to 650 ns (values between 4 ns and 7 ns cannot be set).

(l) Repeat the step (e).

(m) Remove the VETO signal cable.

(n) Remove one input signal cable and verify that no signal is present at the output connectors.

THE MODULE IS TESTED AND OPERATES CORRECTLY

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