Technical Information Manual

MOD. N 81 A

DOUBLE MANUAL
PROGRAMMABLE
LOGIC UNIT

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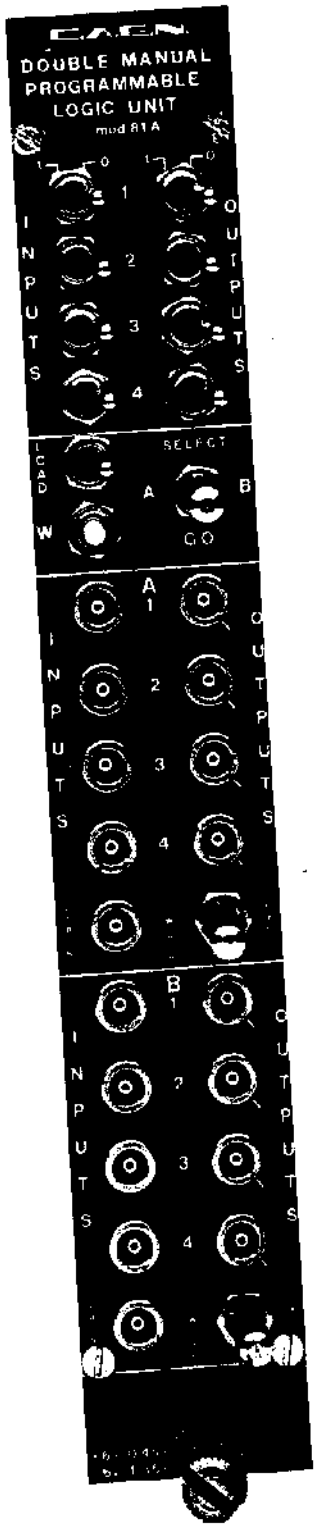
CAEN
DOUBLE MANUAL
PROGRAMMABLE
LOGIC UNIT
mod 81A
INPUTS
OUTPUTS
LOAD
W
SELECT
A
B
GO
A
B

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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.

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DESCRIPTION

Model N 81A is a 1-unit NIM module housing two manually programmable universal logic units, each with 4 inputs and 4 independent outputs.

Model N 81A can conveniently replace all the existing logic modules like coincidence detectors or gates, multiplicity units, fan-outs, and so on.

The required function is easily programmed via the front-panels switches. Each one of the four NIM outputs can be programmed to be any logic function of the four NIM inputs. Even the most complex multiplicity function, which are traditionally carried out by linear circuits, can be digitally realized by the Model N 81A.

A unique feature of this module is its delay time, which is independet of the programmed function. This allows modifications of the logic of a set-up, such as the addition of a further logical variable, to be carried out without changing the interconnections between the modules and without troublesome re-adjustment of the timing of the different variables.

On each section four LEDs perform three tasks, which are:

1) to show the status of the output;

2) to ease programming;

3) to make it possible to read the contents of the function memory.

A back-up, automatically re-charged, battery ensures that the programmed function is not lost when the module remains unpowered for short periods (about 2 hours).

SPECIFICATIONS

(each section)

LOGIC INPUTS.....	4; 50 Ω input impedance, DC coupled, std. NIM logic levels. Min. width : 5 ns
STROBE.....	1 NIM input, DC coupled, 50 Ω input impedance. Min. width : 7 ns.
LOGIC OUTPUTS...	4 independent, separately programmable. Std. NIM logic levels.

MODE SELECTION

A front panel switch selects among 3 modes of operation:

OVERLAP.....	the output width equals the time during which the input satisfy the programmed function.
STROBED...	as above only when STROBE=1.
STROBED+SHAPED	as above, but the output width can be adjusted by the front-panel WIDTH trimmer, between 5 and 60 ns
RISE / FALL TIME :	≤ 2 ns.

GENERAL

MAXIMUM RATE :	100 MHz in "overlap" mode 80 MHz in "strobed" mode 50 MHz in "strobed+ shaped" mode
INPUT-OUTPUT DELAY:	18 ± 0.5 ns
LEDs :	one for each output. In normal running mode, they show the status of the output (a stretcher circuit makes also short pulses visible). Max. operating frequency 30 MHz. In programming mode, each LED is ON when the function, stored with the "Write" command, requires the LED output to be True. In verify mode, each LED is ON only when the set function equals the one stored.

All connectors are **LEMO 00** type.

POWER REQUIREMENTS : +6V 0.45 A
-6V 1.35 A

HOW TO PROGRAM THE N81A

The upper part of the front panel of the module carries two columns of 4 switches each. The left column bears the indication INPUTS. The right column the indication OUTPUTS. This indicates that to each switch of the left column is associated the input connector in the corresponding position either on one section ("4") of the module or on the other ("B") as determined by the SELECT switch. The same correspondence exists between the switches of the right column and the output connectors.

Programming begins by choosing by means of the SELECT switch the section of the module on which the programming has to take place. By means of the OUTPUTS switches one (or more) output(s) can then be selected. The desired function of the 4 inputs may then be entered by activating the corresponding INPUT switches. This function must be entered by means of the W button.

The most efficient way to program the logic unit is often to write a table which assignes to all the possible combinations of the inputs the requested response from the outputs. This is called the "Truth Table" and fully describes the logical behaviour of the unit.

If, for example, we want to program the logic unit to obtain the following functions:

OUT1 = OUT2 = (I1 AND I2) OR (I3 AND I4)

OUT3 = OUT4 = I1 OR I2 OR I3 OR I4

we have the resulting Truth Table:

	I4	I3	I2	I1	O4	O3	O2	O1
0	0	0	0	0	0	0	0	0
1	0	0	0	1	1	1	0	0
2	0	0	1	0	1	1	0	0
3	0	0	1	1	1	1	1	1
4	0	1	0	0	1	1	0	0
5	0	1	0	1	1	1	0	0
6	0	1	1	0	1	1	0	0
7	0	1	1	1	1	1	1	1
8	1	0	0	0	1	1	0	0
9	1	0	0	1	1	1	0	0
10	1	0	1	0	1	1	0	0
11	1	0	1	1	1	1	1	1
12	1	1	0	0	1	1	1	1
13	1	1	0	1	1	1	1	1
14	1	1	1	0	1	1	1	1
15	1	1	1	1	1	1	1	1

If you want to use section ("A") of the unit, place the SELECTswitch on A position.

Put all the INPUT switches on 0 position and all OUTPUT switches on 0 position. Push W button.

This enters the Truth Table first line configuration.

Place the I1 switch on position 1 and put the OUTPUT switches as follows: 01 = 0; 02 = 0; 03 = 1; 04 = 1. Push again W button to enter the second line. Continue as above for every Truth Table line.

At the end, when the SELECT switch is placed on GO position, the logic unit is ready to perform the required functions.

Another way of programming the logic unit, which is more convenient when the desired function is a single one, is by using the LOAD push-button. This one assignes to each OUTPUT the logical value 0 or 1, according to the position of the corresponding OUTPUT switch, for all the 2^4 possible configurations of the INPUTS.

Assume, for example, you want to instruct the unit to perform on OUTPUT 1 the AND of the four INPUTS. You can procede in the following way.

Choose by means of select switch section A or B, as in the previous example, put the OUT1 switch on 0. Press the LOAD button. You have so far programmed the unit to respond 0 on the number 1 OUTPUT for all the INPUTS configurations. Put OUT1 switch on the four INPUT switches on position 1. Press W. If you now place the SELECT switch on GO, the logic unit will perform on OUT1 the logic AND of the four INPUTS.

TEST PROCEDURES

Necessary instruments: 20 MHz pulse generator NIM standard output; Oscilloscope: Tektronix Model 475A or equivalent.

Procedures:

1) Put the SELECT switch on A position.
2) Put all OUTPUT switches on position 1 and push the LOAD button.
3) Put all OUTPUT and INPUT switches on 0 position and push the W button (with this function we have programmed the ("A") section to perform the OR function of all INPUTS).
4) Put the SELECT switch on GO position.
5) Put the ("A") section switch on OVL position.
6) Feed the A1 INPUT a d.c. level 1.
7) Check that at all OUTPUTS there is a d.c. level 1 and that all A leds light on.
8) Feed the A1 INPUT a d.c. level 0.
9) Check that at all OUTPUTS there is a d.c. level 0 and that all A leds are off.
10) Repeat points 6, 7, 8, 9 for the other A INPUTS.

11) Feed A1 INPUT a NIM signal.

12) Check that on all 4 OUTPUTS there is a NIM signal equal in length to the A1 INPUT.

13) Repeat points 11 and 12 for the other A INPUTS.

14) Put the ("A") section switch on STB position.

15) Feed the A1 INPUT a NIM signal and the STNIN INPUT of variable length.

16) Check that on all 4 OUTPUTS there is a NIM signal of equal width to the STBIN signal.

17) Repeat points 15 and 16 for the other A INPUTS.

18) Put the ("A") section switch on STB+SH position.

19) Repeat point 15 and check that the OUTPUTS signal width varies uniformely within 5 nsec to 60 nsec controlled by the WIDTH potentiometer on the front panel.

20) Repeat point 19 for all other A INPUTS.

21) Repeat all the test procedures for the ("B") section.