Rev. 04 - 12/09/2018

N93B / V993C

Dual Timer

CAEN
Tools for Discovery

User Manual

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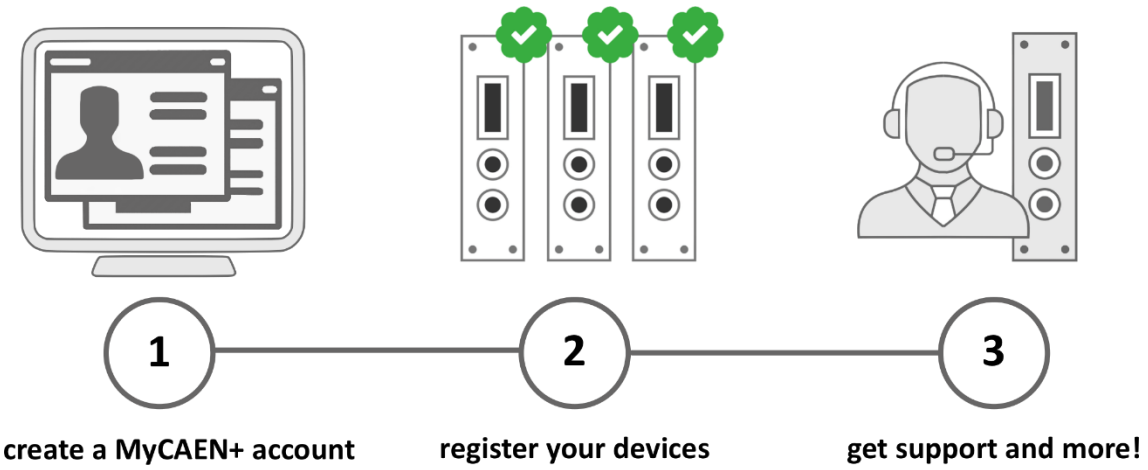

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Purpose of this Manual

This document is the N3B / V993C User's Manual; it contains information about the installation, the configuration and the use of the units.

Change Document Record

Date	Revision	Changes
30 October 2017	2	Updates in § 1, 2, 3
2 May 2018	3	Updates in § 3
12 September 2018	4	Updates in § 2, 3

Disclaimer

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

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1. Module description

Overview

The N93B is a NIM module housing two identical triggered pulse generators.

The V993 C Dual Timer is a 2-unit VME module (6U high) housing two identical triggered pulse generators.

The modules produce NIM, TTL (V993C only) and ECL pulses whose width ranges from 50 ns to 10 s when triggered. Output pulses are provided normal (OUT) and negated (/OUT).

Timers can be re-triggered with the end marker signal.

The coarse adjustment of the output width is provided via a 9-position rotary switch, the fine adjustment can be performed via either a 10 Turn rotary handle with lock or by providing an external voltage (REMOTE).

The trigger START can be provided via either an external signal (NIM, TTL or ECL) or manually via a front panel switch (*START/RESET* switch).

The VETO input (NIM, TTL or ECL TRUE level) allows to disable the START operation.

The ENDM output (NIM, TTL or ECL) is a short pulse produced at the end of any timing cycle.

The RESET input (NIM, TTL or ECL) ends the timing cycle at any time. RESET can also be provided manually via a front panel switch (*START/RESET* switch).

The modules feature LEMO 00 connectors for REMOTE and NIM/TTL signals and male pin couples for ECL signals. Two front panel LEDs display when the module is operating.

On the V993C, two internal switches (one per section) allow to select between NIM and TTL output pulses, while input levels are automatically recognised (no selection is required).

2. Technical specifications

Packaging

The N93B is housed in a NIM mechanics.

The V993C is housed in a 6U-high, 2U-wide VME unit. The board hosts the VME P1 connector.

Power requirements

The power requirements are: N93B 40mA@+24V, 18mA@-24V, 17mA@+12V, 55mA@+6V, 560mA@-6V; V993C 2.3A@+5V, 60mA@+12V, 300mA@-12 V

Front panel

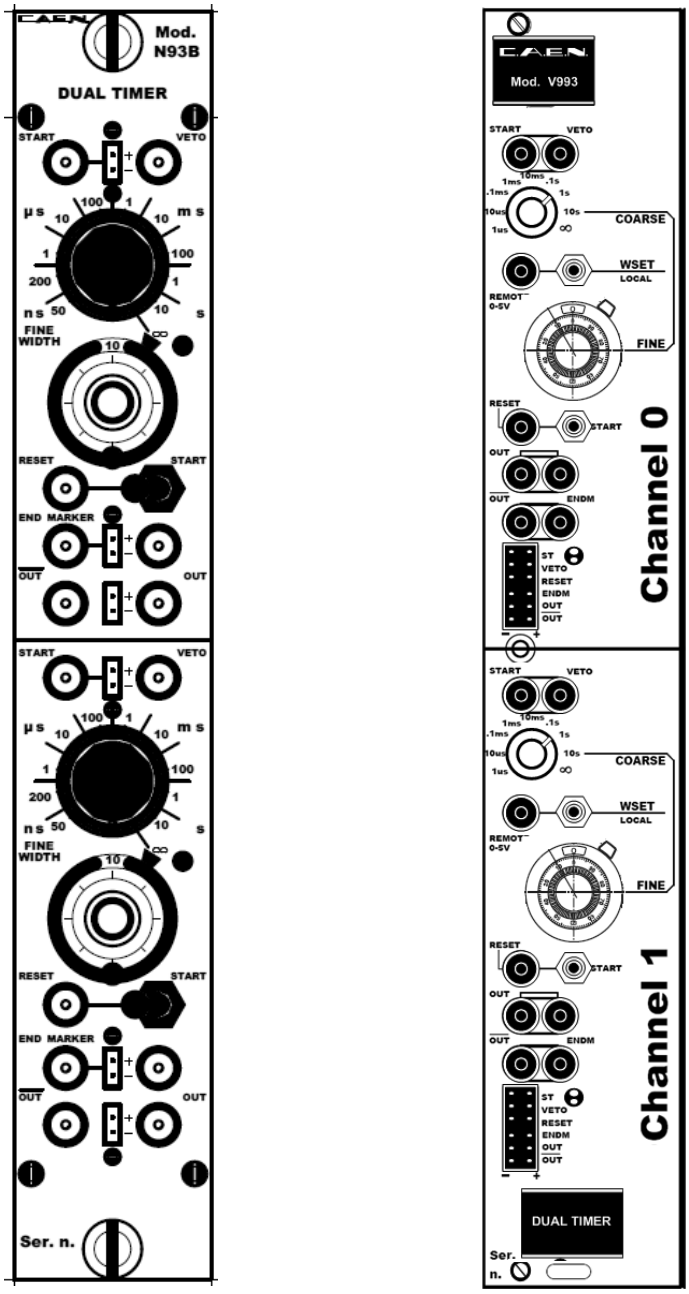

Fig.1: N93B – V993C front panel

Signals features[1]

START INPUT: Signal features:
NIM: Leading edge sensitive, 2.5 ns minimum FWHM on LEMO 00 type connector
TTL: Leading edge sensitive, 1.5 ns minimum FWHM on LEMO 00 type connector
ECL: Leading edge sensitive, 2.5 ns minimum FWHM on a male pin-couple
START/RESET Switch[2]: Momentary switch for single cycle operation
Function: Timer triggering signal

VETO INPUT: Signal features:
NIM/TTL: TRUE level (within ±2 ns of START leading edge) on LEMO 00 type connector
ECL: TRUE level (within ±2 ns of START leading edge) on a male pin-couple
Function: It disables triggering

RESET INPUT: Signal features:
NIM/TTL: Leading edge sensitive, 3 ns minimum FWHM on LEMO 00 type connector
ECL: Leading edge sensitive, 3 ns minimum FWHM on a male pin-couple
START/RESET Switch[2]: Momentary switch
Function: stops the timing cycle at any time. After a RESET, the module is at rest until the next START.

ENDM OUTPUT: Signal features:
NIM: 8 ns wide on LEMO 00 type connector
TTL: 10 ns wide on LEMO 00 type connector (V993C only)
ECL: 8 ns wide on a male pin-couple
Function: It marks the end of the timing cycle

OUT: Signal features:
NIM: 50 ns to 10 s wide, 2 ns rise/fall time, Fan-Out of 2 on LEMO 00 type connectors
TTL: 50 ns to 10 s wide, 4.5 ns rise/fall time, Fan-Out of 2 on LEMO 00 type connectors (V993C only)
ECL: 50 ns to 10 s wide, 2 ns rise/fall time, male pin-couple
Function: Output pulse

/OUT: Signal features:
NIM: 50 ns to 10 s wide, 2 ns rise/fall time, Fan-Out of 2 on LEMO 00 type connectors
TTL: 50 ns to 10 s wide, 4.5 ns rise/fall time, Fan-Out of 2 on LEMO 00 type connectors (V993C only)
ECL: 2 ns to 10 s wide, 2 ns rise/fall time, male pin-couple
Function: Negated output pulse

REMOTE: Signal features:
0 to 5 V DC input on LEMO 00 type connector (1 kOhm input impedance)
Function: It allows to perform the output pulse fine adjustment via an external voltage: 0 V → "short" pulse, 5 V → "long" pulse

N.B.: REMOTE must never exceed the 5 V value to avoid damage to the input stage

Other components

OPERATION LEDS:	green/red LEDs
LOCAL/REMOTE;	2-position switches
START/RESET:	3-position switches
COARSE ADJUSTMENT:	9-position rotary switches
FINE ADJUSTMENT:	Vishay 10 Turns dial with lock
DC Input (rear panel):	+12V DC Input PCB 2.1mm DC Power Jack
	ON/OFF switch A1 switch
	O → power supply OFF.
	I → power supply ON

[1] All ECL inputs are 110 Ω terminated, all NIM/TTL inputs are 50 Ω terminated
[2] START and RESET share the same 3-position switch: LEFT → RESET, Middle → NEUTRAL (stable), RIGHT → START

Fine adjustment dial

Fig.2: Vishay Spectrol Dial

Vishay 11A11B10 Dial, with brake lever (LOCK): Single counter type wheel and a graduated circular dial registering a total count of 11 turns (10 used). Single numeral in window (0 thru 10) indicates completed number of turns of the drive sleeve. Graduated circular dial indicates the percent of the partial turn of the drive sleeve. Transfer point Between 97 and 0. Increasing indication: CW direction; Decreasing indication: CCW direction.

Technical specifications table

Table 1: N93B and V993C Technical Features

Model	N93B	V993C
Packaging	1U NIM mechanics	2U-wide VME unit
Output[3] / Section	**OUT**: NIM signal with a Fan-Out of 2, ECL signal **/OUT**: negated NIM signal, ECL signal	**OUT**: NIM/TTL signal with a Fan-Out of 2, ECL signal **/OUT**: negated NIM/TTL signal, ECL signal
Output width	50 ns ÷ 10	
REMOTE	0 ÷ 5 V	
START/OUT delay	<25 ns	
RESET delay	~30 ns: the timing cycle stops ~30 ns after the RESET pulse is sent	
Rise/Fall Time	< 2 ns	
Thermal stability[4]	-60 ppm/°C	
Humidity range	0 ÷ 80%	
Operating temperature	0 ÷ 45°C	
Storage temperature	-10 ÷ 70°C	

[3] NIM outputs drive a 50 Ohm load (termination required), ECL outputs drive a 110 Ohm load (termination not required)
[4] Measured with a 1 µs NIM output pulse (1 ms full scale)

3. Operating Modes

Installation

Prior to shipment this unit was inspected and found free of mechanical or electrical defects. Upon unpacking of the unit, inspect for any damage, which may have occurred in transport. The inspection should confirm that there is no exterior damage to the unit, such as broken knobs or connectors, and that the panels are not scratched or cracked. Keep all packing material until the inspection has been completed. If damage is detected, file a claim with carrier immediately and notify CAEN. Before installing the unit, make sure you have read thoroughly the safety rules and installation requirements, then place the package content onto your bench and unpack it. To complete the installation:

- Insert the module into a ventilated suitable Crate
- Connect the module section OUTPUT to the device to be triggered
- Power up the Crate

CAUTION

ECL INPUTS ARE SUSCEPTIBLE TO DAMAGE FROM ESD (ELECTROSTATIC DISCHARGE). TO PREVENT THE RISK OF DAMAGING, THE USER SHOULD NEUTRALIZE ANY STATIC ELECTRIC CHARGE BUILT UP ON THE BODY (e.g. TOUCHING AN EARTHED OBJECT) BEFORE HANDLING THE ECL CONNECTORS

Timer triggering

The board has two sections housing one triggered pulse generator each. Each section produces an adjustable width pulse when triggered. The trigger START signal can be sent as external NIM/ECL signal on the relevant START connectors or by pulling right the START/RESET switch. Note that:

- the output pulses are not re-triggerable on the V993C: the START signal/switch is inactive if the output status is true;
- the output pulses are re-triggerable on the N93B: the START signal/switch is active even when the output status is true

Output width adjustment

Each section has a 9-position rotary switch for performing the COARSE ADJUSTMENT. This switch allows to choose between nine width ranges:

50 ns ÷ 1 µs
1 µs ÷ 10 µs
10 µs ÷ 0.1 ms
0.1 ms ÷ 1 ms
1 ms ÷ 10 ms
10 ms ÷ 0.1 s
0.1 s ÷ 1 s
1s ÷ 10 s
∞: Flip-Flop

The 9th position (∞) lets the module work as a Flip-Flop: the output is kept active unless a Reset occurs. Once the COARSE ADJUSTMENT is set, the FINE ADJUSTMENT must be performed either by turning the relevant 10 turns dial handle (Readout shall increase with clockwise and decrease with counter clockwise

Rotation; see p.7) or by supplying the REMOTE connector with a DC voltage ranging from 0 to 5 Volts: the REMOTE/LOCAL SWITCH allows to select between the two ways: LEFT → REMOTE, RIGHT → Rotary Handle.

Output level selection (V993C only)

Two dip switches (one per section, named SW4 and SW8 respectively) allow to produce either NIM or TTL pulses on the LEMO 00 output connectors. The switches' setting is:

Dot NOT visible → NIM
Dot visible → TTL

Such switches are placed on the printed board, close to the front panel. ECL output pulses are produced in any case on the relevant male pins.

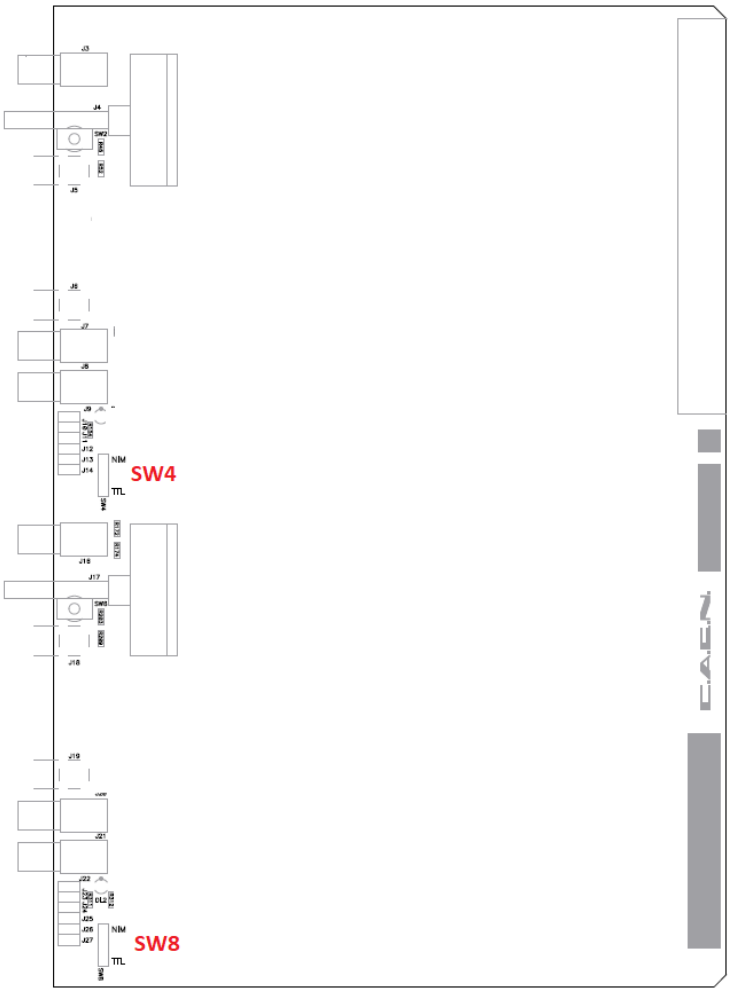

Fig.3: Output Level Switches

LEDs operation

The front panel LEDs are OFF when no output is present; they light up following the output with widths larger than 0.5 s; they light up for a fixed time (≈0.5 s) with output pulses shorter than 0.5 s. They flash at a constant frequency (≈2 Hz) with output frequencies higher than 2 Hz. They light up red for NIM output pulses and green for TTL ones.

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