Technical Information Manual

Revision n.3
3 March 2004

MOD. V993
DUAL TIMER
MANUAL REV.3

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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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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. Module description

1.1. Overview

The **Model V993 B** Dual Timer is a 1-unit VME module housing two identical triggered pulse generators.

The module produces NIM, TTL 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 rotary handle or by providing an external voltage (**WSET**).

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).

See § 2.4 for details about signals.

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

The board is equipped with the P1 connector.

Two internal switches allow to select between NIM and TTL output pulses, while input levels are automatically recognised (no selection is required).

2. Technical specifications

2.1. Packaging

The Model V993 B is housed in a 6U-high, 1U-wide VME unit. The board hosts the VME P1 connector.

2.2. Power requirements

The power requirements of the versions available for the V993 B module are as follows:

Table 2.1: Power requirements

+5 V	2.3 A
+12 V	60 mA
-12 V	300 mA

2.3. Front panel
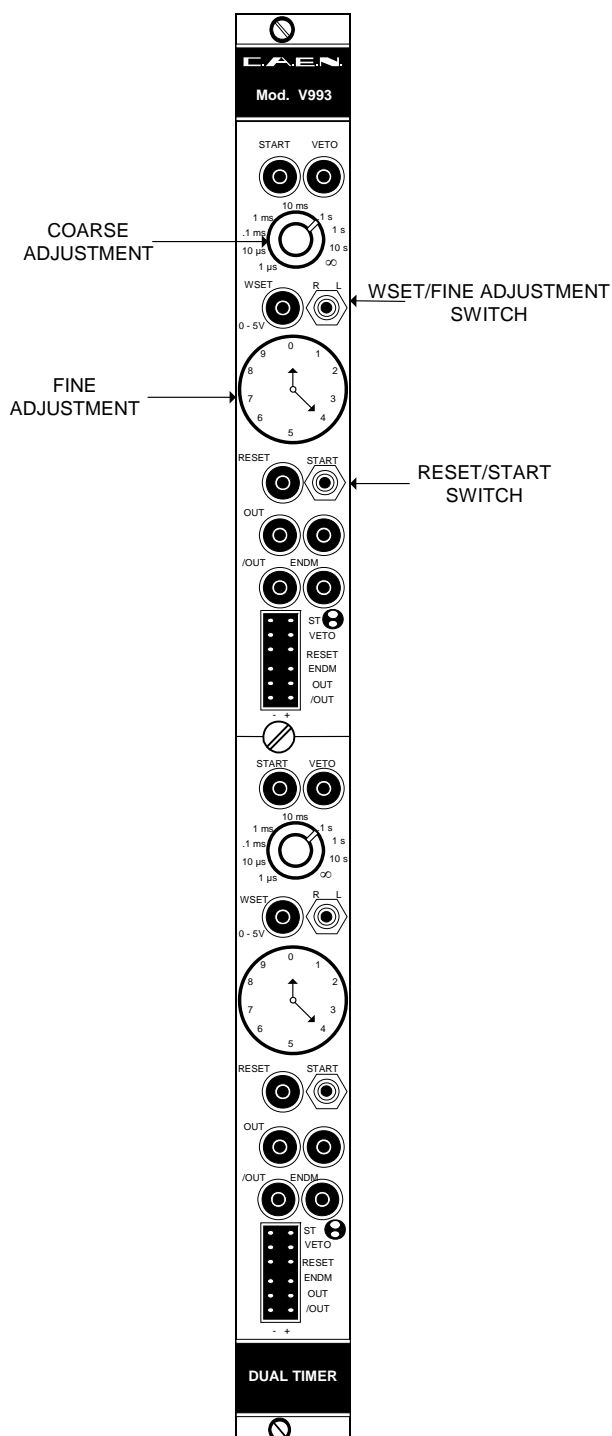
Fig. 2.1: Model V993 B front panel

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2.4. 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:
It 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
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
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

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[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

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

WSET: Signal features:
0 to 5 V DC input on LEMO 00 type connector (1 kΩ 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.: WSET must never exceed the 5 V value in order to avoid damage to the input stage.

2.5. Other components

OPERATION LEDS: 2 green/red LEDs (see § 3.5)

WSET/FINE ADJUSTMENT: Two 2-position switches (see § 3.3)

COARSE ADJUSTMENT: Two 9-position rotary switches (see § 3.3)

FINE ADJUSTMENT: Two rotary handles (see § 3.3)

2.6. Technical specifications table

Table 2.2 Mod. V993 B Technical Features

Packaging	1U-wide VME unit
Output[3] / Section	**OUT**: NIM/TTL signal with a Fan-Out of 2, ECL signal **/OUT**: negated NIM/TTL signal, ECL signal
Output width	50 ns ÷ 10 s (NIM, TTL and ECL levels)
WSET	0 ÷ 5 V
START/OUT delay[6]	<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

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[3] NIM outputs drive a 50 Ω load (termination required), ECL outputs drive a 110 Ω load (termination not required)

[4] Measured with a 1 µs NIM output pulse (1 ms full scale)

3. Operating Modes

3.1. Installation

The V993 B board is provided with the P1 connector only, so it is suitable for both standard VME 6U and VME V430 crates.

⚠️ **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

⚠️ **CAUTION**

ALL CABLES MUST BE REMOVED FROM THE FRONT PANEL BEFORE

EXTRACTING THE BOARD FROM THE CRATE!

3.2. 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 towards right the START/RESET switch (see § 2.4). Note that output pulses are not retriggerable: the START signal/switch is inactive as long as the output status is true.

3.3. Output width adjustment

Each section has a 9-position rotary switch for performing the COARSE ADJUSTMENT (see § 2.5). Actually 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

Actually 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 rotary handle or by supplying the WSET connector with a DC voltage ranging from 0 to 5 Volts: the WSET/FINE ADJUSTMENT SWITCH allows to select between the two ways: Left → WSET, Right → Rotary Handle (see § 2.5).

3.4. Output level selection

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

3.5. 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.