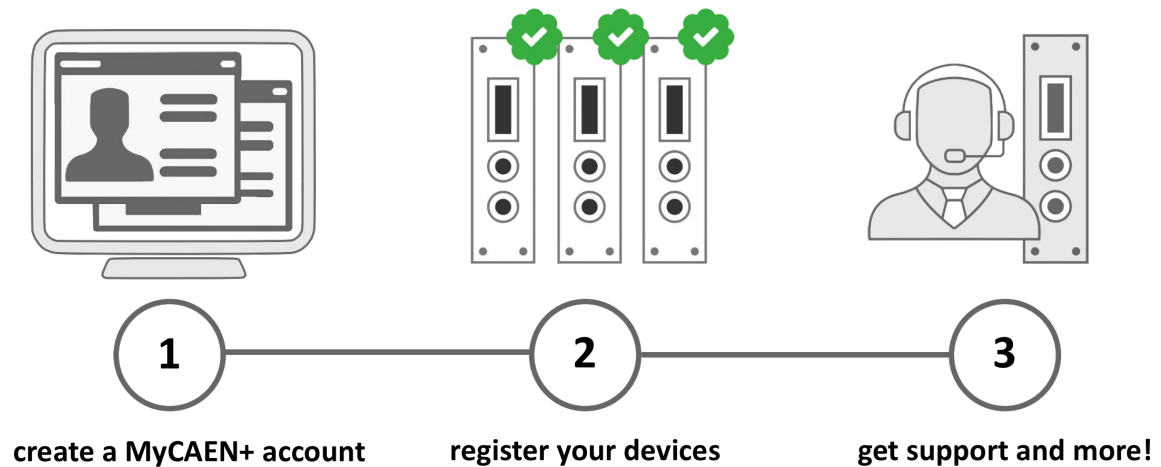




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# Technical Information Manual

Revision n. 7  
5 July 2011

**MOD. N844/N844P/N845**  
*8-16 CHANNEL*  
*LOW THRESHOLD*  
*DISCRIMINATOR*

**NPO:**  
**00103/00:844-5.MUTx/07**

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# 1. General description

## 1.1. Functional description

The CAEN Model N845 is a 16 CHANNEL LOW THRESHOLD DISCRIMINATOR housed in a single width NIM module.

The module accepts 16 negative inputs and produces 16 NIM outputs + 16 /NIM outputs (complementary) on 48 front panel LEMO 00 connectors (NIM outputs are provided with a Fan-Out of two); a functional block diagram is shown in Fig. 1.1.

A 8 Channel version, the CAEN Model N844, sharing the same functional features with the 16 Channel Model N845, is also available.

The timing stage of the discriminator produces an output pulse whose width is adjustable in a range from 6 to 106 ns.

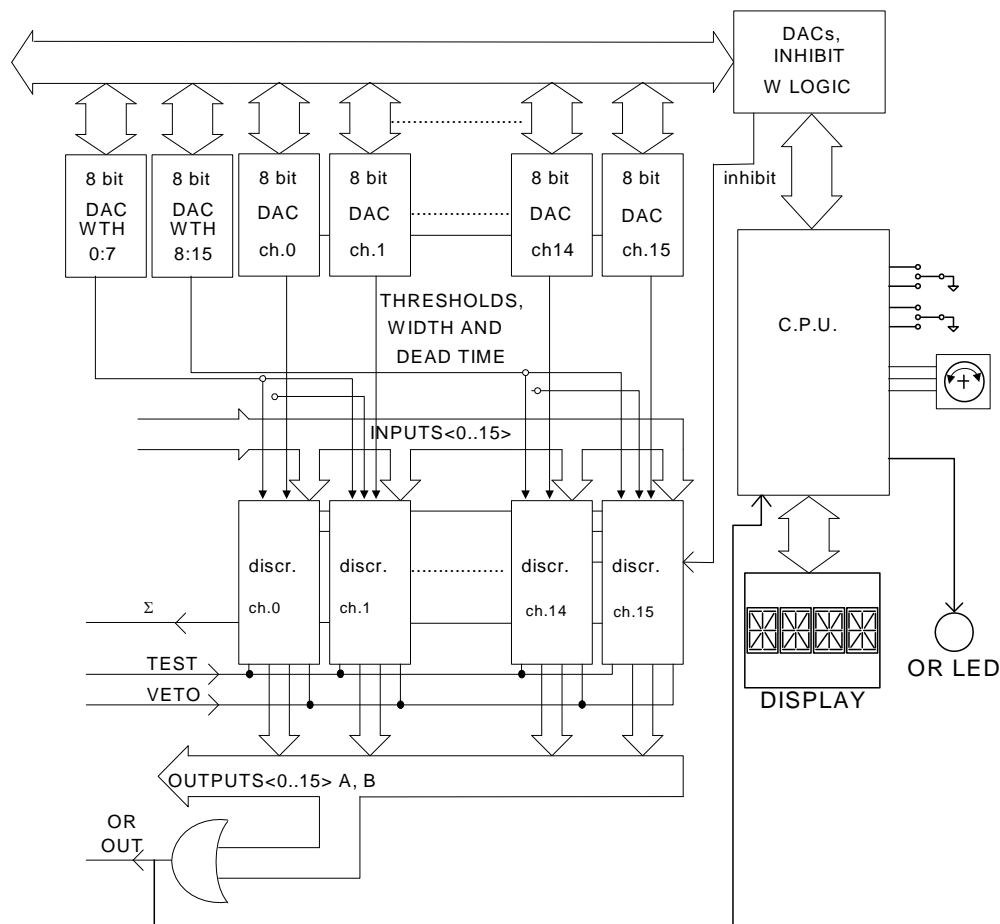
The discriminator thresholds are individually settable in a range from -1 mV to -255 mV (1 mV step), via an 8-bit DAC. A 8 Channel positive input version (Model N844 P), with the thresholds settable in the 1 mV to 255 mV range, is also available. N844 boards can be converted into N844P (and N844P into N844 as well) by CAEN Personnel (module must be returned to CAEN); the Ordering Code of the customization is WN844POLEXCH.

The back panel houses VETO and TEST inputs, the logical OR output (the relevant "OR" LED lights up if at least one channel is over threshold) and the Current Sum ( $\Sigma$ ) output, which generates a current proportional to the input multiplicity, i.e. to the number of channels over threshold, at a rate of -1.0 mA per hit (-50 mV per hit into a 50 Ohm load)  $\pm$  20%.

**Table 1.1: Available items**

Code	Item	Description
WN844POLEXCH	N844 Polarity Exchange	Polarity Exchange
WN844PXAAAAA	N844P	8 Ch Low Threshold Discriminator 50Ohm Positive Inputs
WN844XAAAAAA	N844	8 Ch Low Threshold Discriminator 50 Ohm Negative Inputs
WN845XAAAAAA	N845	16 Ch Low Threshold Discriminator 50 Ohm Negative Inputs

## 1.2. Block diagram



**Fig. 1.1: Mod. N845 Block Diagram (16 Channel)**

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## 2. Technical Specifications

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### 2.1. Packaging

The Model N844-N845 is housed in a 1U-wide NIM unit.

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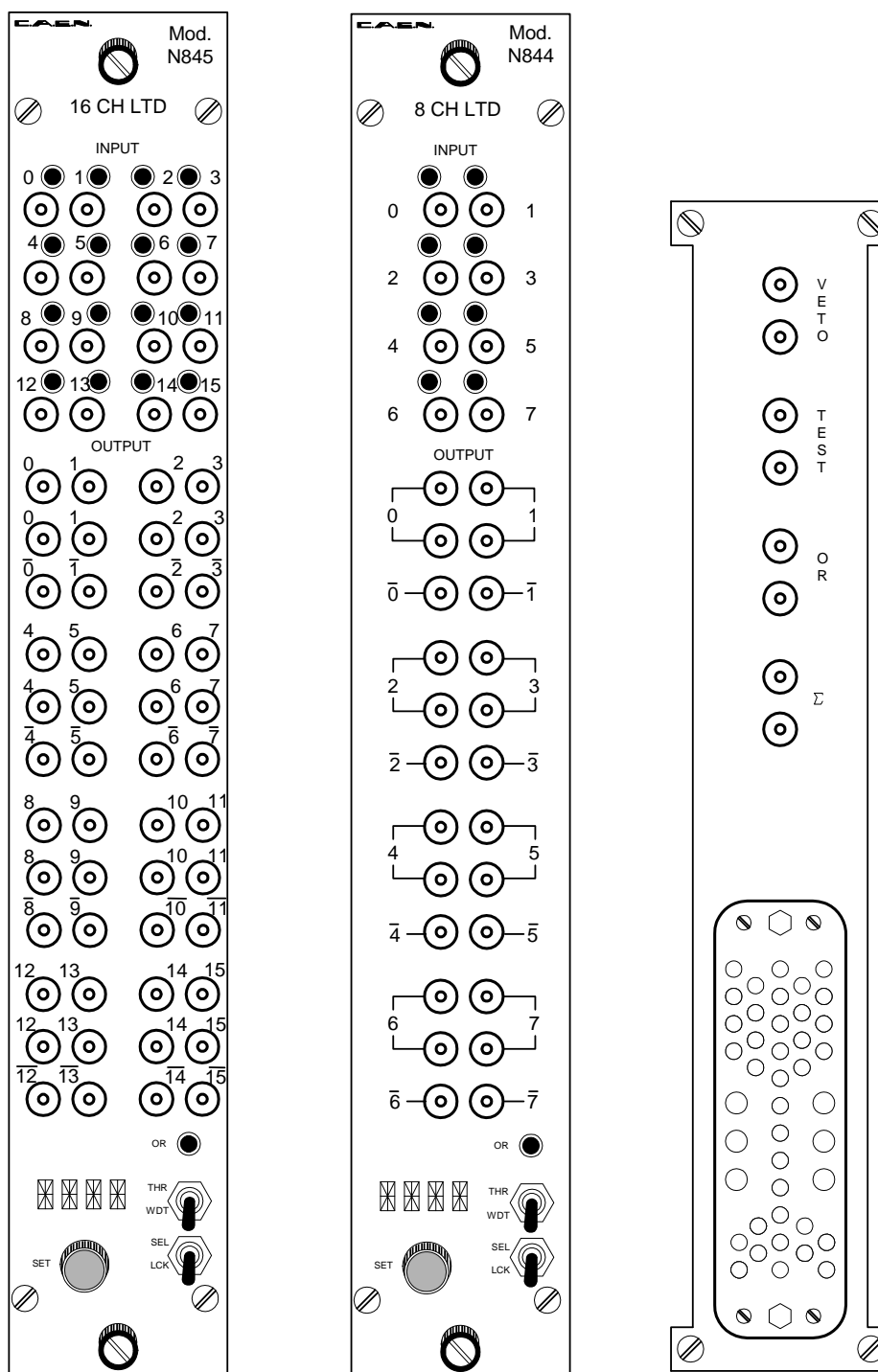
### 2.2. Power requirements

The power requirements of the Mod. N844-N845 are as follows:

**Table 2.1: Power requirements**

Power Supply	N844/N844P	N845
+ 12 V	40 mA	60 mA
- 12 V	30 mA	30 mA
+ 6 V	400 mA	800 mA
- 6 V	1.85 A	3.4 A

## 2.3. Front and back panel



**Fig. 2.1: Mod. N845-N844 front panel and back panel**

## 2.4. Input/Output connections

The location of the Mod. N844-N845 connectors is shown in Fig. 2.1. Their function and electromechanical specifications are listed in the following subsections and refer to the Mod. N845 (the Mod. N844 features specified between [ ]).

### 2.4.1. INPUT features

#### INPUT CHANNELS:

##### Mechanical specifications:

16 [8] LEMO 00 type connectors.

##### Electrical specifications:

Neg. polarity (pos. on N844 P), 50 Ohm impedance; DC coupling; maximum ratings: N844/N845: -0.4 V; (N844 P: 0.4 V); max. input frequency 60 MHz. Min. input: -3 mV (N844 and N845), +3 mV (N844 P).

#### VETO INPUT:

##### Mechanical specifications:

2 bridged LEMO 00 type connectors.

##### Electrical specifications:

standard NIM signal, high impedance, 15 ns minimum FWHM; leading edge of the VETO must precede of at least 12 ns the leading edge of the input and overlap completely the input signal; acts on all signals.

#### TEST INPUT:

##### Mechanical specifications:

2 bridged LEMO 00 type connectors.

##### Electrical specifications:

standard NIM signal, high impedance, 5 ns minimum FWHM, 70 MHz maximum input frequency. Test/Output delay: 10 ns.

### 2.4.2. OUTPUT features

#### OUTPUT CHANNELS:

##### Mechanical specifications:

48 [24] (32 [16] Fan-Out of two for OUT and 16 [8] single for /OUT) LEMO 00 connectors.

##### Electrical specifications:

NIM level on 50 Ohm impedance; pulse width adjustment from 6 ns to 106 ns; I/O delay: 9.5 ns.

#### OR OUTPUT:

##### Mechanical specifications:

2 LEMO 00 type connectors, Fan-Out of two.

##### Electrical specifications:

standard NIM signal, 50  $\Omega$  impedance, 10 ns minimum FWHM, 50 MHz maximum frequency.

#### $\Sigma$ OUTPUT:

##### Mechanical specifications:

2 bridged LEMO 00 type connectors.

##### Electrical specifications:

current output ( $-1 \text{ mA} \pm 20\%$  per hit), high impedance.  
15 ns minimum FWHM, 30 MHz maximum frequency.

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## 2.5. Other components

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### 2.5.1. Displays

The front panel hosts the following LEDs:

#### **INPUT**

Type: 16 [8] red LEDs

Function: channel selected; they light up either when the channels are being programmed or when they are inhibited.

#### **OR**

Type: 1 green LED

Function: it lights up if at least one output signal is present.

#### **4 DIGIT DISPLAY**

Type: 4 digit red LED display

Function: it indicates the channels' status and programmed parameters' values.

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### 2.5.2. Front panel switches

#### **UPPER SWITCH**

Function: it allows to select the parameter which must be programmed.

#### **LOWER SWITCH**

Function: it allows to select the channel/block which must be programmed (SEL mode), and to "freeze" the programmed values (LCK mode).

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### 2.5.3. Rotary handle

Function: it allows to set the value of the parameter which is being programmed.

## 2.6. Technical specification table

**Table 2.2: Technical specification table**

Features referred to Mod. N845 (Mod. N844/N844 P features specified between [ ] )

<b>Packaging</b>	1U-wide NIM unit
<b>Input channels</b>	16 [8] inputs (negative [N844:negative, N844 P:positive] polarity, 50 $\Omega$ impedance, DC coupling)
<b>Max. input voltage</b>	N844/N845 : -400 mV ; N844 P: +400 mV
<b>Min. detectable signal</b>	N844/N845 : -3 mV ; N844 P : +3 mV
<b>Max. input frequency</b>	60 MHz
<b>Double pulse resolution</b>	16 ns (8 ns output pulse width)
<b>Threshold range</b>	N844/N845: -1 mV to -255 mV (-1 mV step) N844 P: 1 mV to 255 mV (1 mV step)
<b>Output channels</b>	32 [16] NIM (bridged) + 16 [8] /NIM (single) (50 $\Omega$ )
<b>Input/output delay</b>	10.5 $\pm$ 1.5 ns
<b>Output width</b>	Programmable from 6 ns to 106 ns
<b>Output rise/fall time</b>	OUT: 1.2 ns; /OUT: 2.5 ns
<b>Interchannel insulation</b>	45 dB for 2.5 ns rise time input signals
<b>Control inputs</b>	NIM signals, high impedance: <b>VETO:</b> allows vetoing of all channels simultaneously <b>TEST:</b> triggers all the enabled channels at once
<b>Control outputs</b>	<b>OR:</b> standard NIM signal, 50 $\Omega$ impedance; logic OR of outputs <b><math>\Sigma</math>:</b> current proportional to input multiplicity (-1 mA $\pm$ 20% per hit), high impedance
<b>Displays</b>	<b>INPUTS:</b> 16 [8] red LEDs; they light up when the channel is being programmed or when it is inhibited <b>4-DIGIT DISPLAY:</b> it indicates the channels' status and programmed parameters' values <b>OR:</b> green LED; it lights up if at least one output signal is present

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## 3. Operating Modes

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### 3.1. Power ON Status

At Power ON the values of all the module's parameters are those programmed before the last turning off. If one parameter's value is meaningless, the unit sets it at half of its range.

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### 3.2. Back panel signals

Some operations can be performed via two external NIM signals:

- **TEST:** an input signal sent through this connector triggers all the enabled channels at once. This feature allows a complete test of the module without removing any input cable as well as it allows generation of a pattern of pulses suitable to test any following electronics.
- **VETO:** an input signal sent through this connector allows vetoing of all channels simultaneously. A veto pulse of width T will veto the input during this time T. Its leading edge must precede the output leading edge by at least 12 ns and overlap completely the input signal. VETO does not affect the TEST signal.

Each one of these high impedance inputs is provided via two bridged connectors (placed on the board's back panel) for daisy chaining.

Note that since these are high impedance inputs, the chain has thus to be terminated on 50  $\Omega$  on the last module; the same is needed whenever one module only is used, whose inputs have thus to be properly matched

Moreover the back panel houses a Current Sum ( $\Sigma$ ) output (on two bridged connectors) which generates a current proportional to the input signal multiplicity, i.e. to the number of channels over threshold, at a rate of -1.0 mA per hit (-50 mV per hit into a 50  $\Omega$  load)  $\pm 20\%$ . An OR output (with a Fan-Out of two) provides the logical OR of the output channels.

---

### 3.3. Setting the threshold and disabling the channels

For each channel of the N844-N845 the discriminator threshold is set up via an 8 bit DAC. The threshold values can be programmed in a range from -1 mV to -255 mV with -1 mV steps (N844P: 1 mV to 255 mV with 1 mV steps). In order to set the threshold the Upper Switch (see § 2.5.2) must be placed on the THR position and the Lower Switch removed from the LCK position, then the channel that must be programmed is selected pulling up repeatedly the Lower Switch (the selected channel's Led lights up). Note that after the last channel, by pulling up the lower switch, the Leds light up all together and, at this point, the threshold setting is performed over all the channels (this value must be confirmed by placing the Lower Switch on the LCK position, otherwise it is ignored). The

threshold value is set via the front panel Rotary handle (see § 2.5.3) and shown on the 4-Digit Display: 1 leads to a  $-1\text{mV}$  and 255 to a  $-255\text{ mV}$  threshold value (reversed values for the N844 P); the step which follows 255 is four "\*" appearing on the display (the relevant channel is inhibited), then again 0, 1, 2 etc; inhibited channels' Leds are always lit when the lower switch is in lock (LCK) position. Once all the channels' thresholds have been set to the desired value the Lower Switch must be placed on the LCK (lower) position and the word *LOCK* appears on the display.

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### 3.4. Setting the output pulse width

The output pulse width is adjustable on 8 bit from 6 to 106 ns and the chosen value is applied to a group of 8 channels each. The Mod. N845 has two groups (Ch. 0, 1, 4, 5, 8, 9, 12, 13 and Ch. 2, 3, 6, 7, 10, 11, 14, 15, respectively), the Mod. N844 has only one group. The Upper Switch must be placed on the WDT position and the Lower Switch removed from the LCK position, then the group is selected pulling up repeatedly the Lower Switch (the selected group's Leds light up all together). The width's value is set via the Rotary Handle and shown on the display (0 leads to a 6 ns and 255 to a 106 ns width with a non-linear relation for intermediate values); the step which follows 255 is again 0, then 1, 2 etc. Once the Pulse Widths have been programmed the Lower Switch must be placed on the LCK position and the word *LOCK* appears on the display.

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