Technical Information Manual

MOD. C 671

16 CHANNEL
CONSTANT FRACTION
DISCRIMINATOR

August 1997

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

LIST OF FIGURES

LIST OF TABLES

1. DESCRIPTION

1.1. FUNCTIONAL DESCRIPTION

The CAEN Model C671 is a 16 Channel CONSTANT FRACTION DISCRIMINATOR housed in a 1-unit wide CAMAC module.

The module accepts 16 negative inputs and produces 16 differential ECL outputs that are available both in a prompt output and a delayed output, with delay programmable via CAMAC (a functional block diagram is shown in Fig. 1.1). Each channel can be individually enabled via CAMAC.

The Timing Stage of the discriminator produces an output pulse whose width is adjustable in a range from 24 ns to 400 ns via CAMAC. Moreover it is possible to program via CAMAC a dead time interval during which the discriminator is inhibited from retriggering, in order to protect against multiple pulsing.

The time walk is ±200 ps (100:1 Dynamic range, 20 ns rise time). The fraction can be 20 to 35% (selection upon order, default value 20%). The individual discriminating thresholds are settable in a range from -1 mV to -256 mV (1 mV step), via CAMAC through an 8-bit DAC.

The module's operations are fully controlled via CAMAC. Some operations can be also performed using two external ECL signals:

- VETO: an input signal sent through this connector allows vetoing of all channels simultaneously.
- INHIBIT: an input signal sent through this connector inhibits the delayed outputs.

A front panel "MUX OUT" connector provides four multiplexed monitoring signals, each with a fan-out of two:

- threshold of the selected channel;
- input signal on the selected channel;
- prompt output of the selected channel;
- delayed output of the selected channel.

An "OR" output signal is TRUE on a back panel multipin connector if at least one of the enabled channels is over threshold. The same connector provides an Internal Majority signal and a Current Sum output that provides a current proportional to the input multiplicity, i. e. to the number of input signals over threshold (rate: -1 mA per hit). The Current Sum output can be bussed to several boards in order to obtain an External Majority signal for all modules in a chain with individual programmable Majority level.

(IPN-Orsay Design)

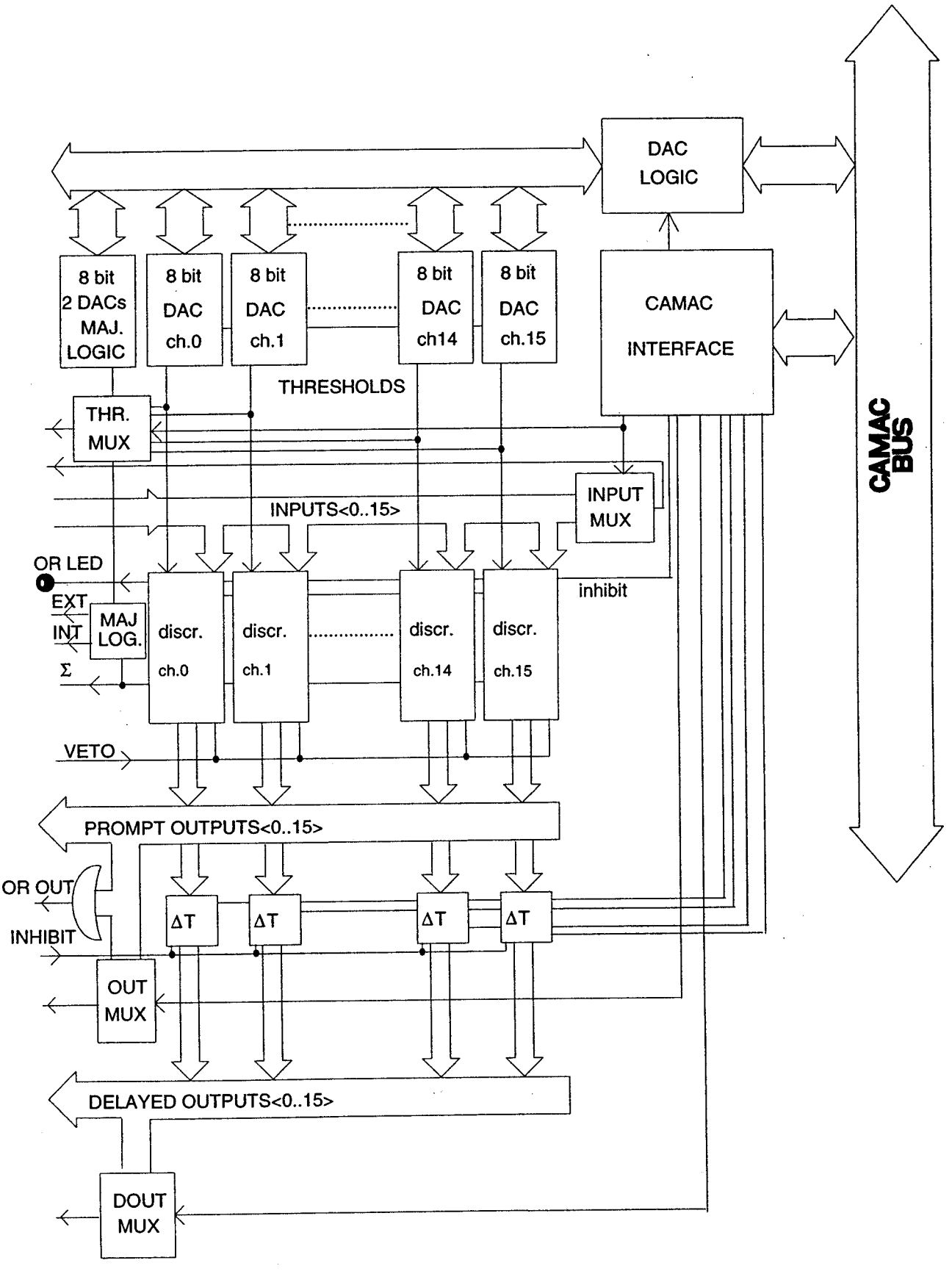

Fig. 1.1: C671 Block Diagram

1.2. PRINCIPLES OF OPERATION

The Constant Fraction Discriminator technique is based on summing the delayed, full height input signal to the inverted and attenuated signal. The resulting signal is fed to a zero-crossing comparator, thus obtaining a precise timing information that eliminates the walk errors induced by constant rise time and varying amplitudes signals.

In order to obtain the timing information from a fraction of the maximum amplitude, the latter must be known. Thus one has the condition that the maximum of the attenuated pulse has to cross the delayed pulse at the selected fraction. This condition leads to the following relation:

$$t_{delay} = t_{rise} (1-F)$$

where:

t_{delay} = selected delay on the Constant Fraction Discriminator;

t_{rise} = rise time of the input signals:

F = Constant Fraction Value.

The Mod. C671 Constant Fraction Discriminator has a factory setting of 20% for the Fraction and 20 ns for the delay. The User may obtain different fractions and delays upon order.

In order to extend the dynamic range in amplitude also to small signals, the C671 operates as a threshold discriminator (NOT Constant Fraction) until the threshold crossing after the zero crossing of the constant fraction shaping.

2. SPECIFICATIONS

2.1. PACKAGING

1-unit wide CAMAC module.

2.2. EXTERNAL COMPONENTS

(Refer To Fig. 2.1)

CONNECTORS:

2, **"IN 0..7, IN 8..15"**, input connectors, 8+8 pins, for 3M connector type SCI-8-MA or equivalent.
1, **"OUT 0..15"**, output connector, double row strip header, 17+17 pins.
1, **"DEL OUT 0..15"**, output connector, double row strip header, 17+17 pins.
1, **"MUX OUT"**, output connector, 8+8 pins, for 3M connector type SCI-8-MA or equivalent.
1, **"VETO, INH, OR, ME, MI, Σ"**, input/output connector, double row strip header, 13+13 pins.

DISPLAYS:

1, **"OR"**, Red LED. It lights up if at least one channel is enabled and over threshold.

2.3. CHARACTERISTICS OF THE SIGNALS

INPUTS

Channels: Negative polarity, 50 Ohm impedance; Maximum ratings: - 5 V.
Input signal rise time Trise must be linked to the module Delay (Tdel) and Fraction (F) by the following: Tdel=Trise*(1-F).

VETO: Std. ECL level, high impedance. Minimum width: 15 ns.

INH: Std. ECL level, high impedance. Minimum width: 15 ns.

OUTPUTS

Prompt Outputs: Differential ECL level on 110 Ohm impedance. Pulse width adjustment: 24 ns to 400 ns approx. Interchannel Width Uniformity: ±5%. Time Walk: ± 200 ps from 1 to 100 times the threshold for 20 ns rise time signals. Jitter: 20 ps @ -5V, 100 ps @ -50 mV.
Delayed Outputs: Differential ECL level on 110 Ohm impedance. Delay adjustment: 36 ns to 535 ns. Pulse width adjustment: 10 ns to 250 ns. Interchannel Uniformity: ±2%.
Jitter: 100 ppm, i.e. 25 ps @ 500 ns delay and -5V, 100 ps @ 500 ns delay and -50 mV.

MUX OUT:
- **Thresholds:** Voltage output corresponding to actual threshold, 10 kOhm impedance. Chainable.
- **Inputs:** Current output, chainable; attenuation: 0.5 on single module (50 Ohm termination), 0.25 on chained modules (50 Ohm termination on both ends of chain).
- **Prompt Outputs:** std. NIM level on 50 Ohm impedance. Chainable.
- **Delayed Outputs:** std. NIM level on 50 Ohm impedance. Chainable.

OR: 2 Differential ECL level (chainable for wired-OR, 100 Ohm termination required at both ends of chain) plus 1 std. NIM level on 50 Ohm.
INTERNAL MAJORITY (MI):1 Differential ECL level on 110 Ohm impedance plus 1 std. NIM level on 50 Ohm.
EXTERNAL MAJORITY (ME):1 Differential ECL level on 110 Ohm impedance plus 1 std. NIM level on 50 Ohm.
Σ: High impedance current source; rate: -1.0 mA per hit.

2.4. GENERAL

Threshold range: -1 mV to -256 mV; -1 mV step.
Fraction: 20% to 30%, to be chosen upon order (20% default value).
Delay: 2.5 to 50 ns, to be chosen upon order (20 ns default value).
Interchannel Insulation: 60 dB for 10 ns rise time signals.
Dead time programmable from 160 ns to 2 μs. Dispersion: ± 10%.
Autowalk: automatic adjustment to input offsets and low frequency input noise of ± 40 mV.

2.5. POWER REQUIREMENTS

+24 V	100 mA
-24 V	150 mA
+ 6 V	1250 mA (NB: requires Y2 rail connected in parallel to +6 V rail on CAMAC Crate)
- 6 V	4500 mA (NB: requires Y1 rail connected in parallel to -6 V rail on CAMAC Crate)

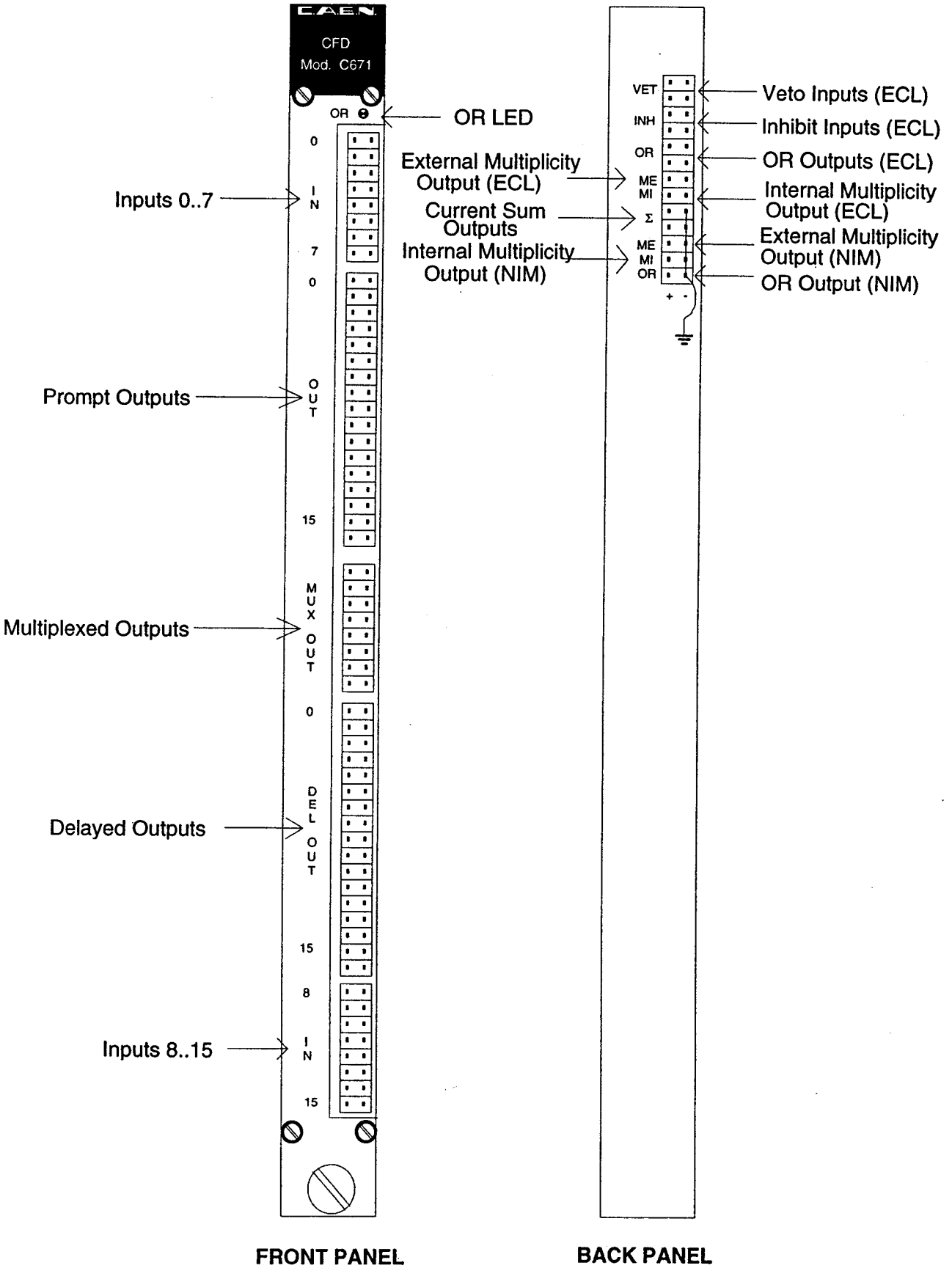

Fig. 2.1: C671 Front and Back Panels

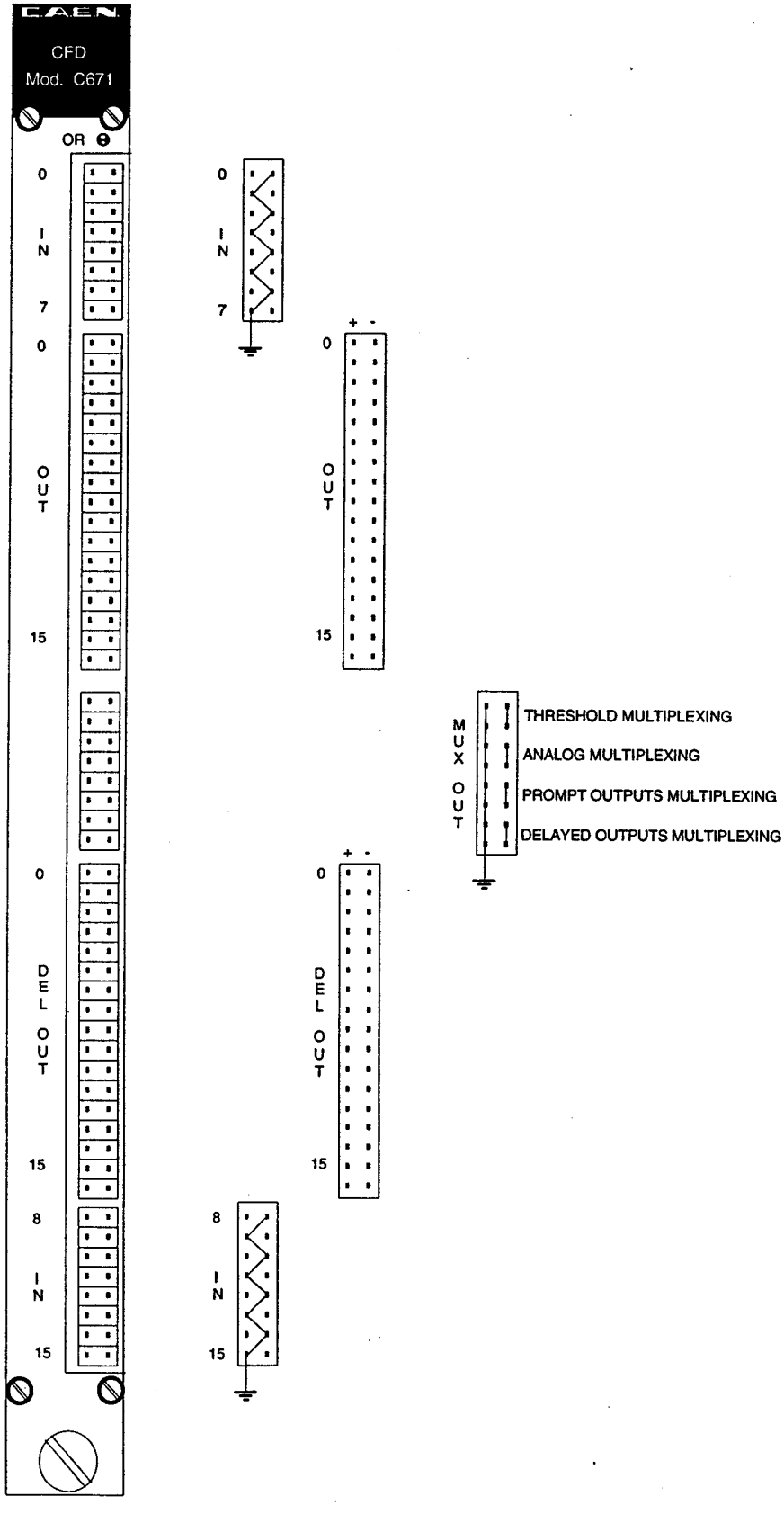

Fig. 2.2: C671 Front Panel Connection Scheme

3. OPERATING MODES

3.1. GENERAL INFORMATION

The CAEN Model C671 is a 16 Channel CONSTANT FRACTION DISCRIMINATOR housed in a 1-unit wide CAMAC module.

The module accepts 16 negative inputs and produces 16 differential ECL outputs that are available both in a prompt output and a delayed output. Each channel can be individually enabled via CAMAC.

The Timing Stage of the discriminator produces an output pulse whose width is adjustable in a range from 24 ns to 400 ns via CAMAC. Moreover it is possible to program via CAMAC a dead time interval during which the discriminator is inhibited from retriggering, in order to protect against multiple pulsing.

The individual discriminating thresholds are settable in a range from -1 mV to -256 mV (1 mV step), via CAMAC through an 8-bit DAC.

The module's operations are fully controlled via CAMAC. Some operations can be also performed using two external ECL signals:

- VETO: an input signal sent through this connector allows vetoing of all channels simultaneously.
- INHIBIT: an input signal sent through this connector inhibits the delayed outputs.

A front panel "MUX OUT" connector provides four multiplexed monitoring signals, each with a fan-out of two:

- threshold of the selected channel;
- input signal on the selected channel;
- prompt output of the selected channel;
- delayed output of the selected channel.

An "OR" output signal is TRUE on a back panel multipin connector if at least one of the enabled channels is over threshold. The same connector provides an Internal Majority signal and a Current Sum output that provides a current proportional to the input multiplicity, i. e. to the number of input signals over threshold (rate: -1 mA per hit). The Current Sum output can be bussed to several boards in order to obtain an External Majority signal for all modules in a chain with individual programmable Majority level.

3.2. MOD. C671 POWER-ON

At Power-On the contents of all the module's Registers are not determined. A setting of the Registers must be performed before any other operation.

It is NOT possible to reset the C671 by performing a C, Z command or an F(9) N CAMAC Function.

3.3. ENABLING/DISABLING THE CHANNELS

The User can enable or disable each of the 16 channels via CAMAC by performing a F(18) N A(0) CAMAC Function (for channels 0 to 7) or an F(18) N A(1) CAMAC Function (for channels 8 to 15) with the Write Lines W1-W8 set to 1 or 0 according to the chosen configuration. A channel is enabled if the corresponding bit is high [e. g., an F(18)NA(0) bin. 11110011, or hex F3, disables channels 2 and 3 of the discriminator].

3.4. FRONT-BACK PANEL SIGNALS

The input channels are accepted on alternate pins to reduce cross talk. The signal and ground pins configuration is shown in Fig. 3.1. The polarity of the ECL prompt and delayed output signals is shown in Fig. 3.2.

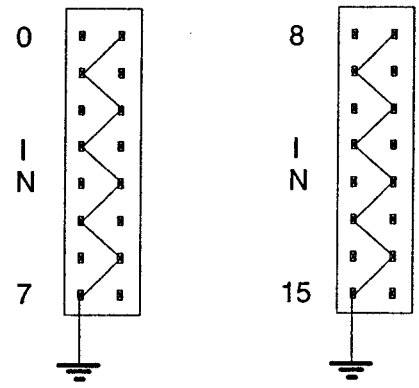

Fig. 3.1: C671 Input Signals Connection Scheme

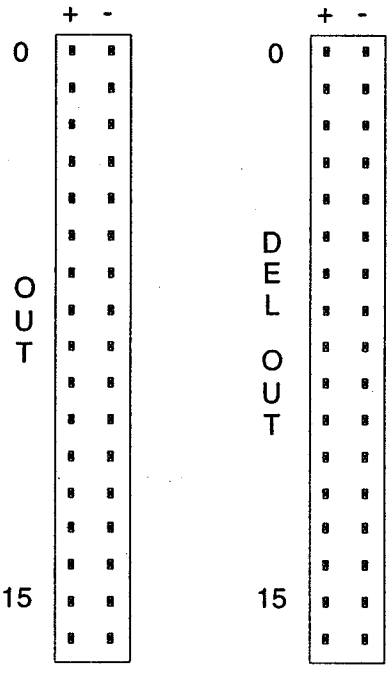

Fig. 3.2: C671 Output Signals Connection Scheme

A front panel "MUX OUT" connector (see Fig. 3.3) provides four multiplexed monitoring signals, each with a fan-out of two:

- threshold of the selected channel;
- input signal on the selected channel;
- prompt output of the selected channel;
- delayed output of the selected channel.

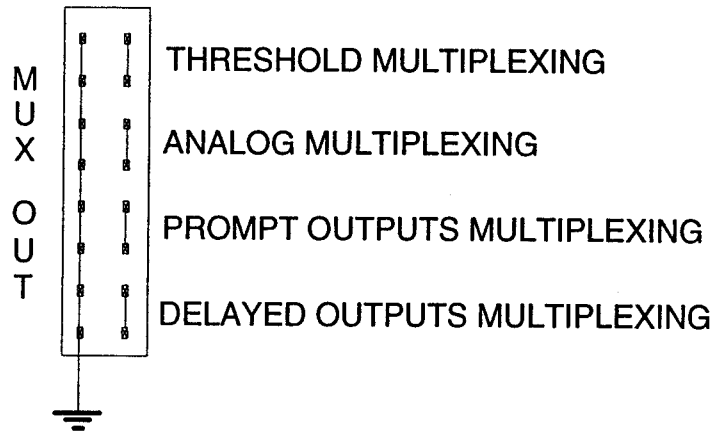

Fig. 3.3: C671 Multiplexed Outputs Connection Scheme

Some control operations can be performed by external ECL signals (indicated on the back panel connector with "VETO", "INH", see Fig. 3.4):

- VETO: an input signal sent through this connector allows vetoing of all Prompt and Delayed Output channels simultaneously. A veto pulse of width T will veto the input during this time T. Its leading edge must precede the input leading edge by at least 10 ns and overlap completely the input signal. This signal can be chained to several modules with the care of terminating with 100 Ohm the 2nd couple of contacts on the last module in a chain.
- INHIBIT: an input signal sent through this connector allows vetoing of all Delayed Output channels simultaneously. A veto pulse of width T will inhibit the Delayed Output during this time T. Its leading edge must precede the Delayed Output leading edge by at least 5 ns and overlap completely the Delayed Output signal. This signal can be chained to several modules with the care of terminating with 100 Ohm the 2nd couple of contacts on the last module in a chain.

On the back panel (see Fig. 3.4) there is also available a couple of Current Sum (Σ) output pins that provide 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 (-25 mV per hit into a 25 Ω load). This current is used for the External/Internal Majority signals generation (MI, ME, see Fig. 3.4 and § 3.10). A couple of OR output pins (see Fig. 3.4) provides also the Logical OR of the Output channels respectively in NIM and ECL standard.

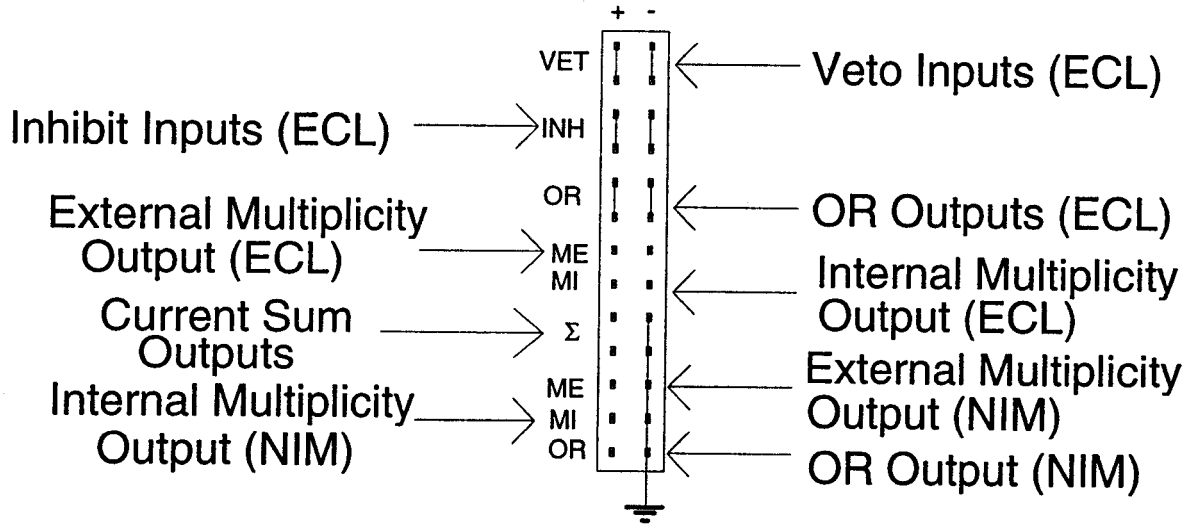

Fig. 3.4: C671 Back Panel Connection Scheme

3.5. SETTING THE THRESHOLDS

For each channel of the C671 there is an 8 bit DAC to allow the Discriminator Threshold setting. The threshold values can be programmed in a range from -1 mV to -256 mV with 1 mV steps (set values: 0 to 255), though a minimum threshold of -5 mV is required. As in all Constant Fraction Discriminators, these thresholds are to be set above the noise level: they do NOT correspond to the actual level that triggers the discriminator outputs, the latter being a "constant fraction" of the input signals.

In order to write the Threshold for each channel, the User must perform an F(16) N A(0-15) CAMAC Function with the desired Threshold value on the W1-W8 Write Lines.

3.6. SETTING THE PROMPT OUTPUT PULSE WIDTH

The output pulse width is adjustable on 8 bit between 24 ns to 400 ns (set values: 0 to 255) and the chosen value is applied to each group of 8 channels. It can be set by an F(20) N A(6) CAMAC Function for channels 0 to 7 and by an F(20) N A(7) CAMAC Function for channels 8 to 15. The set value corresponds to the pulse width as follows: 255 leads to a 400 ns value, 0 leads to a 24 ns value. The setting is not linear.

3.7. SETTING THE DELAYED OUTPUT PULSE WIDTH

The delayed output pulse width is adjustable on 8 bit between 10 ns and 250 ns (set values: 0 to 255) and the chosen value is applied to each group of 8 channels. It can be set by an F(20) N A(0) CAMAC Function for channels 0 to 7 and by an F(20) N A(1) CAMAC Function for channels 8 to 15. The set value corresponds to the delayed output pulse width as follows: 255 leads to a 250 ns value, 0 leads to a 10 ns value.

3.8. SETTING THE DELAY OF THE DELAYED OUTPUTS

It is possible via CAMAC to set the delay of the delayed outputs, with respect to the prompt outputs, individually for each channel. It can be set by an F(17) N A(0 to 15) CAMAC Function (set values: 0 to 255). The set value corresponds to the Delay Time as follows: 255 leads to a 535 ns value, 0 leads to a 35 ns value.

3.9. SETTING THE DEAD TIME

It is possible via CAMAC to set a Dead Time value (range: 160 ns to 2 µs) in common to each of 2 groups of 8 channels. This allows to avoid the triggering of the discriminator for unwanted pulses occurring within the dead time programmed value. It can be set by an F(20) N A(4) CAMAC Function (channels 0 to 7) or an F(20) N A(5) CAMAC Function (channels 8 to 15). The set value corresponds to the Dead Time as follows: 255 leads to a 2 µs value, 0 leads to a 160 ns value. The actual dead time is equal to the greatest among the CAMAC set value and the width of the prompt or delayed outputs.
N.B.: The Dead Time setting must be greater or equal than the prompt or delayed output width value.

3.10. MAJORITY LOGIC

The module houses a Majority Logic that allows to perform both "Internal" and "External" Majority detection (see Fig. 3.1).

The Internal Majority consists in a logic signal, available on the back panel connector in ECL and NIM standard (MI) that is asserted whenever the number of channels over threshold in a single module exceeds a certain Internal Majority Threshold value. It uses the internal current sum of each module. It is possible via CAMAC to set the Internal Majority Threshold (INMAJ) between 1 and 16 performing a F(20) N A(3) CAMAC Function with an appropriate value (MAJTHR) in the WRITE lines W1..W8 (set values: 0 to 90). The relation to use is the following:

MAJTHR = 6*(INMAJ -1),

where INMAJ is the requested Internal Majority (allowed values 1 to 16).

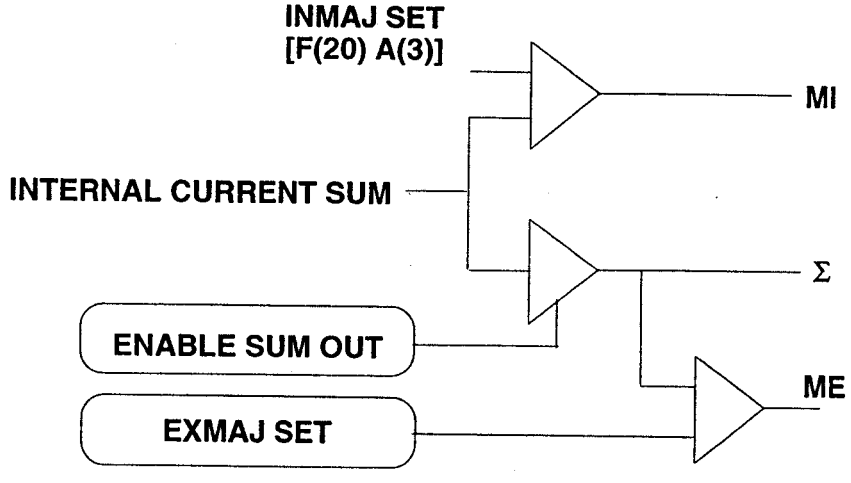

Fig. 3.5: C671 Majority Logic Scheme

The External Majority consists in a logic signal, available on the back panel connector in ECL and NIM standard (ME) that is asserted whenever the number of channels over threshold in a chain of modules exceeds a certain External Majority Threshold value. The User can connect more than one module in chain via the back panel "Σ" outputs: in this case, the Majority logic will act on the sum of the "Σ" outputs of the connected modules (e.g. Majority logic with 32 input channels with 2 C671 Discriminators). The User must take care of terminating on 50 Ω the line linking the "Σ" outputs on both ends of the Modules' chain.

It is possible via CAMAC to set the External Majority Threshold (EXMAJ) between 1 and 43 performing a F(20) N A(2) CAMAC Function with an appropriate value (MAJTHR) in the WRITE lines W1..W8 (set values: 0 to 252). Write line W9 allows to enable (W9=1) or inhibit (W9=0) the Current Sum Output (Σ) of a single module, thus removing its contribution to the total current sum on the chain (if used). The external majority comparator remains anyhow active on the Σ bus. The relation to use for the External Majority Level setting is the following:

MAJTHR = 6*(EXMAJ -1),

where EXMAJ is the requested External Majority (allowed values 1 to 43).

3.11. MULTIPLEXED OUTPUT SIGNALS

A front panel "MUX OUT" connector provides four multiplexed monitoring signals, each with a fan-out of two:

- prompt output of the selected channel;
- delayed output of the selected channel;
- input signal and threshold of the selected channel.

The selection of the channel is independent for each output, i.e. it is possible to monitor the prompt output of one channel and the delayed output of another.

The selection of the channels is performed as follows:

F(19) N A(0 to 15)	Selects Prompt Output Channel to be sent on the Multiplexed Output (W9=1 --> Enabled)
F(21) N A(0 to 15)	Selects Delayed Output Channel to be sent on the Multiplexed Output (W9=1 --> Enabled)
F(22) N A(0 to 15)	Selects Input Channel and Threshold to be sent on the Multiplexed Output (W9=1 --> Enabled)

The enabling/disabling of the channel is obtained performing this function with subaddress 0 to 15 to select the channel (0 to 15) and with the write line W9 set respectively to 1 (= enabled) or to 0 (= disabled).

4. CAMAC FUNCTIONS

The standard CAMAC Functions listed in Table 4.1 allow the User to perform the required control and readout operations on the C671 module.

X response is generated for each valid function.

Q response is generated for each valid function unless otherwise specified.

Table 4.1: Mod. C671 CAMAC Functions

F(16) N A(0 to 15)	Writes Discriminator Threshold (W1 to W8).
F(17) N A(0 to 15)	Writes the Delay value of the Delayed Output (W1 to W8).
F(18) N A(0)	Enables channels 0 to 7 (W1 to W8). (Wn=1 --> Enabled)
F(18) N A(1)	Enables channels 8 to 15 (W1 to W8). (Wn=1 --> Enabled)
F(19) N A(0 to 15)	Selects Output Channel to be sent on the Multiplexed Output (W9=1 --> Enabled)
F(20) N A(0)	Writes the Width of the Delayed Output for channels 0 to 7 (W1 to W8).
F(20) N A(1)	Writes the Width of the Delayed Output for channels 8 to 15 (W1 to W8).
F(20) N A(2)	Writes the External Majority Threshold (W1 to W8) and Enables Current Sum Output (W9=1 --> Enabled)
F(20) N A(3)	Writes the Internal Majority Threshold (W1 to W8).
F(20) N A(4)	Writes the Dead Time for channels 0 to 7 (W1 to W8).
F(20) N A(5)	Writes the Dead Time for channels 8 to 15 (W1 to W8).
F(20) N A(6)	Writes the Width of the Output for channels 0 to 7 (W1 to W8).
F(20) N A(7)	Writes the Width of the Output for channels 8 to 15 (W1 to W8).
F(21) N A(0 to 15)	Selects Delayed Output Channel to be sent on the Multiplexed Output (W9=1 --> Enabled)
F(22) N A(0 to 15)	Selects Input Channel and Threshold to be sent on the Multiplexed Output (W9=1 --> Enabled)

4.1. F(16) N A(0 to 15) FUNCTION (Write Discriminator Threshold)

This CAMAC Function writes on 8 bit (set values: 1 to 255) the Threshold Discriminator values; the Channel thresholds are individually settable (Subaddresses 0 through 15). The value can be selected in steps of 1 mV in a range from -1 to -256 mV (5 mV minimum required).

4.2. F(17) N A(0 to 15) FUNCTION (Write Delay Value of Delayed Output).

This CAMAC function is used to select the Delay value of the Delayed outputs (W1..W8). The Channel delays are individually settable: this command allows to select on 8 bit (set values: 0 to 255) the delay value between 35 ns and 535 ns. The set value corresponds to the Delay Time as follows: 255 leads to a 535 ns value, 0 leads to a 35 ns value.

4.3. F(18) N A(0) FUNCTION (Enable Ch. 0 to 7)

This CAMAC Function allows to enable or disable (bit=1 ⇒ Enabled) the individual Channels from 0 to 7. Channel 0 is associated to W1 and Channel 7 is associated to W8.

4.4. F(18) N A(1) FUNCTION (Enable Ch. 8 to 15)

This CAMAC Function allows to enable or disable (bit=1 ⇒ Enabled) the individual Channels from 8 to 15. Channel 8 is associated to W1 and Channel 15 is associated to W8.

4.5. F(19) N A(0 to 15) FUNCTION (Select Output Channel on MUX OUT)

This CAMAC Function selects the Prompt Output channel to be sent on the Multiplexed Prompt Output pins of the Front Panel MUX OUT connector. The enabling/disabling of the channel is obtained performing this function with subaddress 0 to 15 to select the channel (0 to 15) and with the write line W9 set respectively to 1 (= enabled) or to 0 (= disabled).

4.6. F(20) N A(0) FUNCTION (Write Width of Delayed Output Ch. 0 to 7)

This CAMAC function is used to select the pulse width of the Delayed outputs in common to all Channels from 0 to 7. This command allows to select on 8 bit (set values: 0 to 255) the pulse width value between 10 ns and 250 ns. The set value corresponds to the pulse width as follows: 255 leads to a 250 ns value, 0 leads to a 10 ns value.

4.7. F(20) N A(1) FUNCTION (Write Width of Delayed Output Ch. 8 to 15)

This CAMAC function is used to select the pulse width of the Delayed outputs in common to all Channels from 8 to 15. This command allows to select on 8 bit (set values: 0 to 255) the pulse width value between 10 ns and 250 ns. The set value corresponds to the pulse width as follows: 255 leads to a 250 ns value, 0 leads to a 10 ns value.

4.8. F(20) N A(2) FUNCTION (Write External Majority Threshold & Enable Σ)

This CAMAC Function (see § 3.10) allows to set the External Majority Threshold (EXMAJ) between 1 and 43 performing the Function with an appropriate value (MAJTHR) in the WRITE lines W1..W8 (set values: 0 to 252). Write line W9 allows to enable (W9=1) or inhibit (W9=0) the Current Sum Output (Σ) of a single module, thus removing its contribution to the total current sum on the chain (if used). The relation to use for the External Majority Level setting is the following:

MAJTHR = 6*(EXMAJ -1),

where EXMAJ is the requested External Majority (allowed values 1 to 43).

4.9. F(20) N A(3) FUNCTION (Write Internal Majority Threshold)

This CAMAC Function (see § 3.10) allows to set the Internal Majority Threshold (INMAJ) between 1 and 16 performing the Function with an appropriate value (MAJTHR) in the WRITE lines W1..W8 (set values: 0 to 90). The relation to use is the following:

MAJTHR = 6*(INMAJ -1),

where INMAJ is the requested Internal Majority (allowed values 1 to 16).

4.10. F(20) N A(4) FUNCTION (Write Dead Time Ch. 0 to 7)

This CAMAC function is used to select the Dead Time value in common to all Channels from 0 to 7. This command allows to select on 8 bit (set values: 0 to 255) the Dead Time value between 160 ns and 2 µs. The set value corresponds to the pulse width as follows: 255 leads to a 2 µs value, 0 leads to a 160 ns value.

4.11. F(20) N A(5) FUNCTION (Write Dead Time Ch. 8 to 15)

This CAMAC function is used to select the Dead Time value in common to all Channels from 8 to 15. This command allows to select on 8 bit (set values: 0 to 255) the Dead Time value between 160 ns and 2 µs. The set value corresponds to the pulse width as follows: 255 leads to a 2 µs value, 0 leads to a 160 ns value.

4.12. F(20) N A(6) FUNCTION (Write Width of Prompt Output Ch. 0 to 7)

This CAMAC function is used to select the pulse width of the Prompt Outputs in common to all Channels from 0 to 7. This command allows to select on 8 bit (set values: 0 to 255) the pulse width value between 24 ns to 400 ns. The set value corresponds to the pulse width as follows: 255 leads to a 400 ns value, 0 leads to a 24 ns value, with a non-linear relation.

4.13. F(20) N A(7) FUNCTION (Write Width of Prompt Output Ch. 8 to 15)

This CAMAC function is used to select the pulse width of the Prompt Outputs in common to all Channels from 8 to 15. This command allows to select on 8 bit (set values: 0 to 255) the pulse width value between 24 ns to 400 ns. The set value corresponds to the pulse width as follows: 255 leads to a 400 ns value, 0 leads to a 24 ns value.

4.14. F(21) N A(0 to 15) FUNCTION (Select Del'd Output Ch. on MUX OUT)

This CAMAC Function selects the Delayed Output channel to be sent on the Multiplexed Delayed Output pins of the Front Panel MUX OUT connector. The enabling/disabling of the channel is obtained performing this function with subaddress 0 to 15 to select the channel (0 to 15) and with the write line W9 set respectively to 1 (= enabled) or to 0 (= disabled).

4.15. F(22) N A(0 to 15) FUNCTION (Select Input Ch. & Thr. on MUX OUT)

This CAMAC Function selects the Threshold and Input Channel to be sent espectively on the Multiplexed Threshold and Analog pins of the Front Panel MUX OUT connector. The enabling/disabling of the channel is obtained performing this function with subaddress 0 to 15 to select the channel (0 to 15) and with the write line W9 set respectively to 1 (= enabled) or to 0 (= disabled).