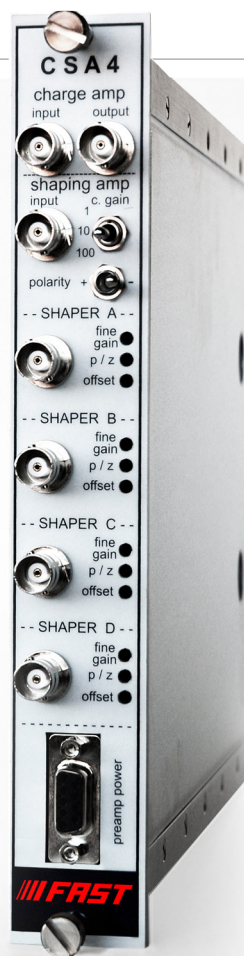


## The new CSA4 The economic amplifier. Now with preamplifier.



### General

Functionally, the Model CSA4 provides in a single width NIM module a preamplifier and a shaping amplifier with four shaping times simultaneously (selectable in the range from 100ns to 8 $\mu$ s: four values out of seven can be ordered : 100ns, 250ns, 500ns, 1 $\mu$ s, 2 $\mu$ s, 4 $\mu$ s, 8 $\mu$ s). A power connector (D-Sub 9 female) is also available at the front panel for the power supply of external preamplifiers.

### Preamplifier Section

The Model CSA4 provides a charge sensitive preamplifier. It is intended to be used in uncritical applications, where the detector / signal source needs no bias voltage supplied from the charge sensitive amplifier (like integration of signals from PMT's).

In applications, where a detector bias is needed or the signal-to-noise ratio is important, an external charge sensitive preamplifier (like our model CSP10...13) close to the detector is recommended.

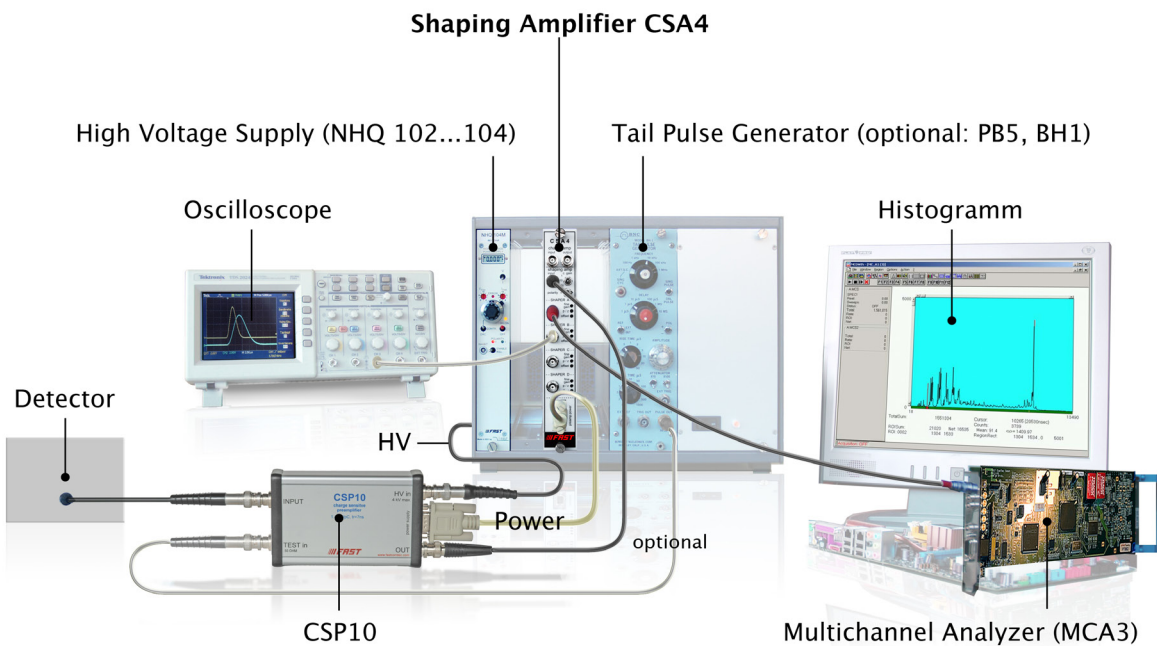
### Typical Setup

The Model CSA4 Shaping Amplifier with its selection of shaping time constants can be used in surface barrier, proportional counter, NaI and Ge(Li) detector applications. The choice of shapings also allows the best possible performance by tailoring the system for the conflicting requirement of optimum signal to noise ratio and high count rate performance. The excellent stability and low noise contribution enhances the use of this amplifier in most applications.

It is intended to be used to read out the signals from a charge sensitive preamplifier (first CSA4 section, CSP1x ... or equivalent).

Gaussian shaping amplifiers (also known as spectroscopy amplifiers, shaping amplifiers, linear amplifiers or pulse amplifiers) accept a step-like input pulse (fast rise time, slow fall time) and produce an output pulse shaped like a gaussian function.

The purpose of this are to filter much of the noise from the signal of interest and provide a quickly restored baseline to allow high count rates.



## Specification

**Inputs:** INPUT - Accepts positive or negative pulses from a associated preamplifier;  $\pm 8$  volts divided by selected gain,  $\pm 10$  volts maximum; rise time, less than SHAPING TIME constant; decay time constant, 40  $\mu$ sec to  $\infty$  for 0.1, 0.25, 0.5, 1, and 2  $\mu$ sec shaping time constants, 100  $\mu$ sec to  $\infty$  for 4, and 8  $\mu$ sec shaping time constant; input impedance, approximately 1k ohms; input BNC connectors located on front panel.

**Outputs:** UNIPOLAR OUTPUTS - Provide positive, linear active filter, near-Gaussian shaped pulses; amplitude linear to +8 volts @  $R_I > 1k\Omega$ , +4 volts @  $R_I = 50\Omega$ , 10 volt max.; output dc level adjustable, front panel output impedance approximately 50 ohms; BNC connectors located on front panels.

**Performance:** GAIN RANGE - Continuously variable x1 to x2500, product of COARSE and FINE GAIN controls.  
 OPERATING TEMPERATURE - 0 to 50° C  
 GAIN DRIFT - Less than or equal to  $\pm 0.0075\%/^{\circ}\text{C}$   
 DC LEVEL DRIFT - Less than or equal to  $\pm 0.1\text{mV}/^{\circ}\text{C}$   
 INTEGRAL NON LINEARITY - Less than or equal to  $\pm 0.05\%$ , over total output range, for 2  $\mu$ sec shaping.  
 OVERLOAD RECOVERY - UNIPOLAR output recovery to within  $\pm 2\%$  ( $\pm 1\%$ ) of full scale output from X1000 overload in 2.5 (2.0) non-overloaded pulse widths, at full gain, any shaping time constant and pole/zero cancellation properly set.  
 NOISE CONTRIBUTION - Less than or equal to 3.4  $\mu\text{V}$  true rms,

referred to input, 3  $\mu$ sec shaping and amplifier gain greater than or equal to 100.

PULSE SHAPING - Near-Gaussian shape; one differentiator, two active filter integrators; time to peak, 2.35 x shaping time; pulse width FWHM: 2.4 x shaping time; time to peak, pulse width measured at 0.1 % of full scale output; 1  $\mu$ sec SHAPING center frequency, 150 kHz; band width, 180 kHz; fc and BW for other shapings are multiples of that given for 1  $\mu$ sec.

**Connector Types:** With the exception of the PREAMP POWER connector, all signal connectors are BNC type.  
 PREAMP POWER – Amphenol type 17-10070

### Power Requirements:

- +12 V dc 200 mA + current drawn from the preamp power connector
- 12 V dc 100 mA + current drawn from the preamp power connector
- +24 V dc 0 mA + current drawn from the preamp power connector
- 24 V dc 0 mA + current drawn from the preamp power connector

**Physical:** Size—Standard single-width NIM module 3.41 x 22.13 cm (1.35 x 6.71 inch)  
 NET WEIGHT—1.0 kg (2.2 lbs)

## Front Panel Controls and Connectors

This section describes the functions of the controls and connectors located on the front panels of the Model CSA4. It is recommended that this section be read before proceeding with the operation of the amplifier.

### Preamplifier Section

Preamplifier input

### Preamplifier Section

Shaping amp input

### Section A

pulse output (sect. A)

### Section B

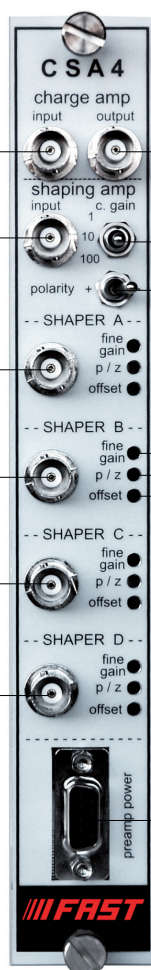
pulse output (sect. B)

### Section C

pulse output (sect. C)

### Section D

pulse output (sect. D)



Preamplifier output

coarse gain toggle switch  
setable to 1, 10 and 100

Polarity Switch

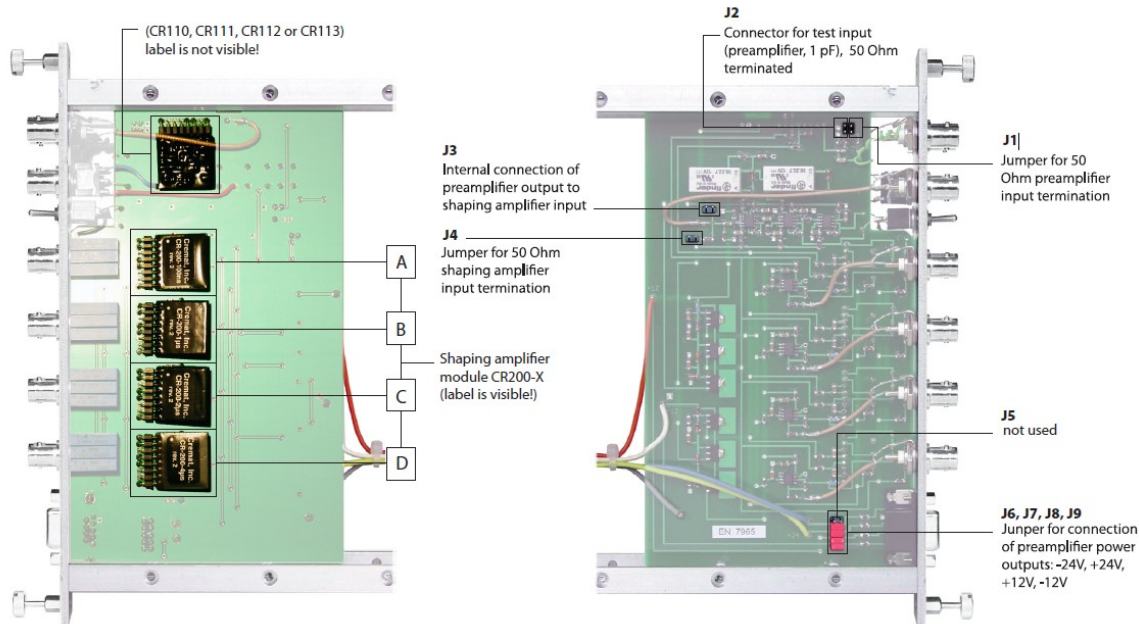
fine gain (sect. B)

pole zero (sect. B)

offset control (sect. B)

D-SUB 9  
female connector  
for power supply  
of preamplifiers  
(CSP10 ...)

## Internal Controls – Module Positions and Jumper



- J1** Selects input impedance of preamplifier input 50  $\Omega$  (installed)
- J2** Test input terminates (signal, ground); terminated with 50  $\Omega$ , 1pF test capacitor
- J3** Connects output of preamp section with the input of the shaping amplifier section
- J4** selects input impedance of shaping amplifier in 50  $\Omega$  (installed) 1k $\Omega$  (open)
- J5** not used
- J6** If installed:- 24 V supply is available on preamp power connection
- J7** If installed: + 24 V supply is available on preamp power connection
- J8** If installed: +12 V supply is available on preamp-power connection
- J9** If installed:- 12 V supply is available on preamp power connection

### Preamplifier Module Specifications

Part #	rise time	decay time constant	Gain	output swing
CR-110	7 ns	140 ns	1.4 V /pC	-6 to +6 Volt
CR-111	3 ns	50 $\mu$ s	150 mV /pC	-3 to +3 Volt
CR-112	6 ns	50 $\mu$ s	15 mV /pC	-3 to +3 Volt
CR-113	20 ns	50 $\mu$ s	1.5 mV /pC	-3 to +3 Volt

### Model specifications

Part #	Shaping time	Output pulse width (FWHM)	$R_{in}$	$C_{in}$
CR-200-25ns	25 ns	59 ns	82 $\Omega$	220 pF
CR-200-50ns	50 ns	120 ns	220 $\Omega$	220 pF
CR-200-100ns	100 ns	240 ns	220 $\Omega$	470 pF
CR-200-250ns	250 ns	590 ns	240 $\Omega$	1000 pF
CR-200-500ns	500 ns	1.2 $\mu$ s	510 $\Omega$	1000 pF
CR-200-1 $\mu$ s	1 $\mu$ s	2.4 $\mu$ s	1.0 k $\Omega$	1000 pF
CR-200-2 $\mu$ s	2 $\mu$ s	4.7 $\mu$ s	2.0 k $\Omega$	1000 pF
CR-200-4 $\mu$ s	4 $\mu$ s	9.4 $\mu$ s	1.2 k $\Omega$	3300 pF
CR-200-8 $\mu$ s	8 $\mu$ s	19 $\mu$ s	2.4 k $\Omega$	3300 pF