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 8µs: four values out of seven can be ordered: 100ns, 250ns, 500ns, 1µs, 2µs, 4µs, 8µs). A power connector (D-Sub 9 female) is also available at the front panel for the power supply of external preamplifiers.

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.
CSA4 charge amplifier

Inputs: INPUT - Accepts positive or negative pulses from a
associated preamplifier; ± 8 volts divided by selected gain, ±
10 volts maximum; rise time, less than SHAPING TIME constant;
decay time constant, 40 µsec to ∞ for 0.1, 0.25, 0.5, 1, and 2 µsec
shaping time constants, 100 µsec to ∞ for 4, and 8 µsec 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
@ Rl > 1kOhm, +4 volts @ Rl = 50 Ohm , 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 ± 0.0075%/° C
DC LEVEL DRIFT - Less than or equal to ± 0.1 mV/° C
INTEGRAL NON LINEARITY - Less than or equal to ±0.05%, over
total output range, for 2 µsec shaping.
OVERLOAD RECOVERY - UNIPOLAR output recovery to within
±2% (±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 µV true rms,
referred to input, 3 µsec 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: 4, x shaping time; time to peak, pulse width
measured at 0.1 % of full scale output; 1 µsec SHAPING center
frequency, 150 kHz; band width, 180 kHz; fc and BW for other
shapings are multiples of that given for 1 µsec.

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 con-
nector
- 24 V dc 0 mA + current drawn from the preamp power con-
nector

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 output
- Coarse gain toggle switch setable to 1, 10 and 100
- Polarity Switch

Section A
- Pulse output (sect. A)

Section B
- Pulse output (sect. B)
- Fine gain (sect. B)
- Pole zero (sect. B)
- Offset controle (sect. B)

Section C
- Pulse output (sect. C)

Section D
- Pulse output (sect. D)

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

 CSA4 charge amplifier
Internal Controls – Module Positions and Jumper

**Preamplifier Module Specifications**

<table>
<thead>
<tr>
<th>part #</th>
<th>rise time</th>
<th>decay time constant</th>
<th>gain</th>
<th>output swing</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR-110</td>
<td>7 ns</td>
<td>140 ns</td>
<td>1.4 Volts/pC</td>
<td>-6 to +6 volt</td>
</tr>
<tr>
<td>CR-111</td>
<td>20 ns</td>
<td>50 µs</td>
<td>0.15 Volts/pC</td>
<td>-3 to +3 volt</td>
</tr>
<tr>
<td>CR-112</td>
<td>6 ns</td>
<td>50 µs</td>
<td>0.15 Volts/pC</td>
<td>-3 to +3 volt</td>
</tr>
<tr>
<td>CR-113</td>
<td>20 ns</td>
<td>50 µs</td>
<td>1.5 Volts/pC</td>
<td>-3 to +3 volt</td>
</tr>
</tbody>
</table>

**Model Specifications**

<table>
<thead>
<tr>
<th>part #</th>
<th>shaping time</th>
<th>output pulse width (FWHM)</th>
<th>R_s</th>
<th>C_s</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR-200-25ns</td>
<td>25 ns</td>
<td>59 ns</td>
<td>82 Ω</td>
<td>220 pF</td>
</tr>
<tr>
<td>CR-200-50ns</td>
<td>50 ns</td>
<td>120 ns</td>
<td>220 Ω</td>
<td>220 pF</td>
</tr>
<tr>
<td>CR-200-100ns</td>
<td>100 ns</td>
<td>240 ns</td>
<td>220 Ω</td>
<td>470 pF</td>
</tr>
<tr>
<td>CR-200-250ns</td>
<td>250 ns</td>
<td>590 ns</td>
<td>240 Ω</td>
<td>1000 pF</td>
</tr>
<tr>
<td>CR-200-500ns</td>
<td>500 ns</td>
<td>1.2 µs</td>
<td>510 Ω</td>
<td>1000 pF</td>
</tr>
<tr>
<td>CR-200-1µs</td>
<td>1 µs</td>
<td>2.4 µs</td>
<td>1.0 kΩ</td>
<td>1000 pF</td>
</tr>
<tr>
<td>CR-200-2µs</td>
<td>2 µs</td>
<td>4.7 µs</td>
<td>2.0 kΩ</td>
<td>1000 pF</td>
</tr>
<tr>
<td>CR-200-4µs</td>
<td>4 µs</td>
<td>9.4 µs</td>
<td>1.2 kΩ</td>
<td>3300 pF</td>
</tr>
<tr>
<td>CR-200-8µs</td>
<td>8 µs</td>
<td>19 µs</td>
<td>2.4 kΩ</td>
<td>3300 pF</td>
</tr>
</tbody>
</table>

**J1**
Selects input impedance of preamplifier input. 50 Ω (installed)

**J2**
Test input terminates (signal, ground); terminated with 50 Ω, 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 Ω (installed) 1kΩ (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