



PREAMPLIFIERS

**FOR
SEMICONDUCTOR RADIATION DETECTORS**

(Si, Ge, CdTe, CdZnTe, HgI₂)



EURO RAD

EURO RAD offers today the world largest choice of preamplifiers due to 30 years of experience in this area.

These preamplifiers can be purchased either as chips or assembled in various housings with all connectors on.

These preamplifiers are useful for all kinds of semiconductor detectors : Si, Si(Li), GeHP, CdTe, HgI₂, C and scintillation probes using silicon photodiodes.

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In the following pages we are describing the various available preamplifiers with their technical characteristics.

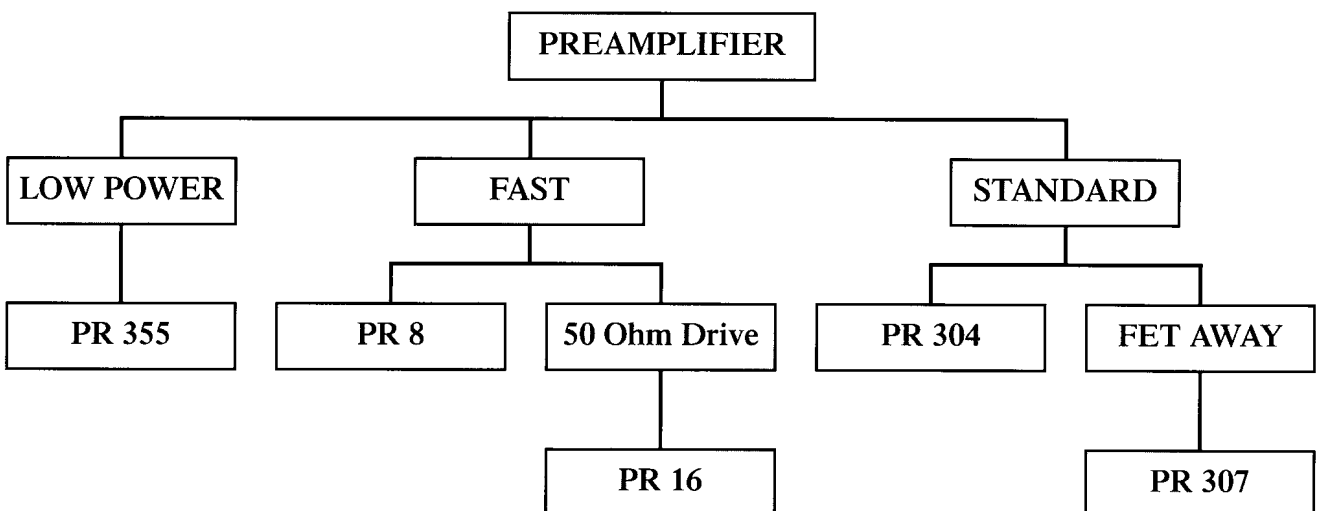
A block diagram of a typical experimental arrangement is also reported.

In addition, advice is given for each preamplifier for the best suited application.

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EURO RAD can also develop customized preamplifiers to fulfil specific needs.

SELECTION TREE :





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CHARGE SENSITIVE PREAMPLIFIERS

SELECTION GUIDE

MODEL REFERENCE	POWER SUPPLY			SENSITIVITY mV/MeV Si	NOISE keV Si		RISE TIME		COMMENTS
	V _{cc} +	V _{cc} -	I _{cc} +		I _{cc} -	(0pf)	(100pf)	0pf	
PR304 ⁽²⁾	12V	- 12V	10mA	9mA	0.85keV	2.9keV	40ns	200ns	Standard product, low noise, low cost
PR355 ⁽²⁾	5V	- 5V	1mA	1mA	1.12keV	8.8keV	100ns	1000ns	Low voltage, low consumption
PR307 ⁽²⁾	12V	- 12V	9mA	5mA	0.85keV	2.9keV	30ns	200ns	Ability to move the FET away (miniature probe)
PR16 ⁽¹⁾	12V	- 12V	16mA	8mA	1.15keV	4.7keV	20ns	75ns	Fast Preamp Bias filtering included, 50 ohm Drive ability
PR16-4	12V	- 12V	16mA	8mA	3.7keV	7.8keV	12ns	25ns	Special preamp with low sensitivity
PR8	12V	- 12V	9mA	4mA	1.15keV	4.7keV	20ns	75ns	Fast Preamp, Bias filtering included

(1) Available in housing : PR16 - H

(2) Available in housing for evaluation : PR XXX - H



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LOW NOISE S.M.D. PREAMPLIFIER MODEL PR 304

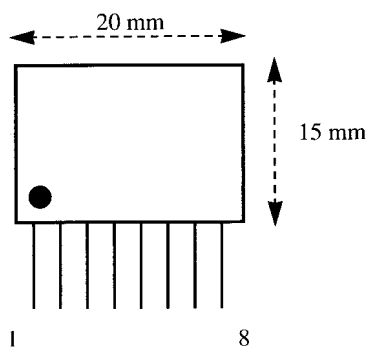
*ADVICE : This standard low noise S.M.D. preamplifier chip is suitable for general spectroscopic applications with all kind of semiconductor detectors.
In addition, the PR304 is of low cost.*

SPECIFICATIONS :

- * Power supply : negative supply $V_{cc-} = -12$ Volts ($I_{cc-} = 4$ mA)
positive supply $V_{cc+} = +12$ Volts ($I_{cc+} = 9$ mA)
- * Output polarity (for a positive charge at the input) : Negative
- * Sensitivity : 2 V/pC
 - for Silicon : 100 mV/MeV
 - for Cadmium Telluride : 70 mV/MeV
- * Fall time : 1 ms
- * Output impedance : 50 Ohm
- * Output coupling : DC
- * Input coupling : AC (DC optional, ordering reference : PR 304 DC)
- * Bias filtering : No
- * Polarization resistor : 100 MOhm (to ground)
- * Support moved away FET : No
- * Integrated shaper : No

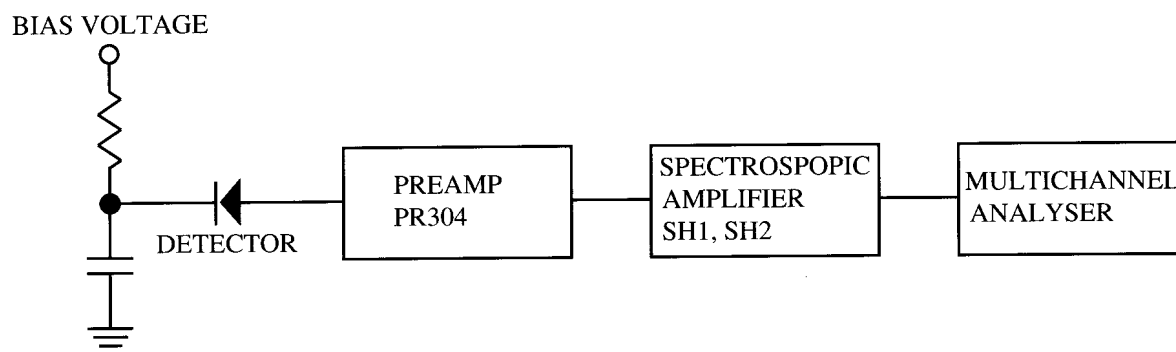
Capacitance (pF)	Rise Time (ns)	Noise (keV)(Si, 1 μ s) (With polarization resistor)	Noise (keV)(Si, 1 μ s) (Without polarization resistor)
0 pF	40 ns	1.5 keV	0.85 keV
56 pF	150 ns	2.7 keV	1.9 keV
100 pF	200 ns	3.8 keV	2.9 keV

SIZE AND PIN ASSIGNMENT :



- 1 : - 12 V
- 2 : + 12 V
- 3 : GND
- 4 : GND
- 5 : OUT
- 6 : GND
- 7 : GND
- 8 : IN

TYPICAL ARRANGEMENT :



LOW POWER CHARGE PREAMPLIFIER MODEL PR 355

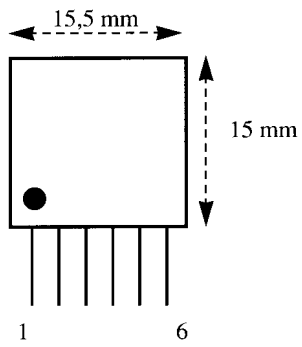
ADVICE : This preamplifier was especially designed for low voltage and low consumption use, where the noise performance needs to be kept intact. It can be used with Si, Ge or CdTe detectors.

SPECIFICATIONS :

- * Power supply : negative supply $V_{cc-} = - 5$ Volts ($I_{cc-} = 1$ mA)
positive supply $V_{cc+} = + 5$ Volts ($I_{cc+} = 1$ mA)
- * Output polarity (for a positive charge at the input) : Negative
- * Sensitivity : 1 V/pC
 - for Silicon : 44 mV/MeV
 - for Cadmium Telluride : 36 mV/MeV
- * Fall time : 2 ms
- * Output impedance : 50 Ohm
- * Output coupling : DC
- * Input coupling : AC (DC optional, ordering reference : PR 355 DC)
- * Bias filtering : No
- * Polarization resistor : 100 MOhm (to ground)
- * Support moved away FET : No
- * Integrated shaper : No

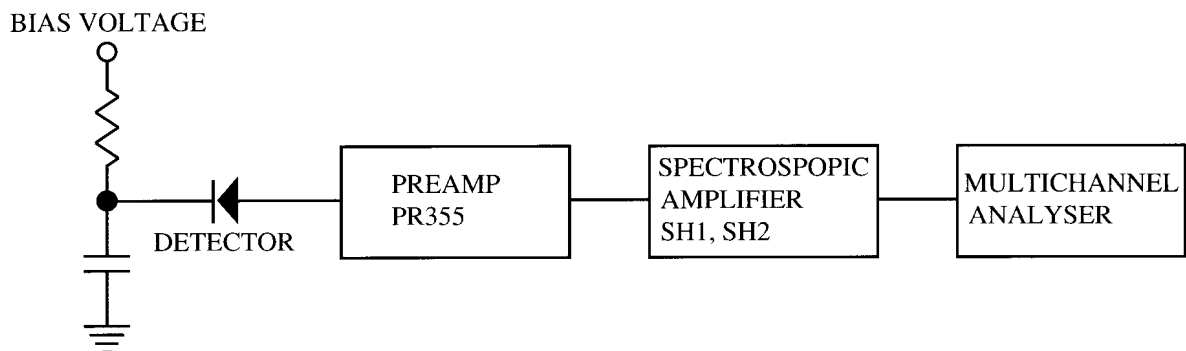
<i>Capacitance (pF)</i>	<i>Rise Time (ns)</i>	<i>Noise (keV)(Si, 1 μs) (With polarization resistor)</i>	<i>Noise (keV)(Si, 1 μs) (Without polarization resistor)</i>
0 pF	100 ns	1.6 keV	1.12 keV
100 pF	1 μ s	9 keV	8.8 keV

SIZE AND PIN ASSIGNMENT :



- 1 : IN
- 2 : GND
- 3 : GND
- 4 : - 5 V
- 5 : + 5 V
- 6 : OUT

TYPICAL ARRANGEMENT :





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**LOW NOISE S.M.D. PREAMPLIFIER
WITH MOVED AWAY FET IN OPTION
MODEL PR 307**

ADVICE : This S.M.D. preamplifier offers the possibility to separate the input FET stage from the rest of the device. This is of special interest when small size devices are needed. This preamplifier is also suitable if the amplification stage needs to be close to the detector (noise reduction).

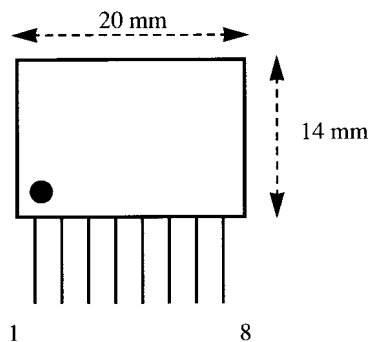
This preamplifier can be adapted to all semiconductor detectors (Si, Ge, CdTe, HgI₂).

SPECIFICATIONS :

- * Power supply : negative supply $V_{cc-} = -12$ Volts ($I_{cc-} = 4.5$ mA)
positive supply $V_{cc+} = +12$ Volts ($I_{cc+} = 8.5$ mA)
- * Output polarity (for a positive charge at the input) : Negative
- * Sensitivity : 1 V (pC)
 - for Silicon : 44 mV/MeV
 - for CdTe : 36 mV/MeV
- * Fall time : 2.2 ms
- * Output impedance : 50 mOhm
- * Output coupling : DC
- * Input coupling : AC (DC optional, ordering reference : PR 307 DC)
- * Bias filtering : No
- * Polarization resistor : 100 M (to ground)
- * Support moved away FET : Yes (PR 307 SF model)
- * Integrated shaper : No

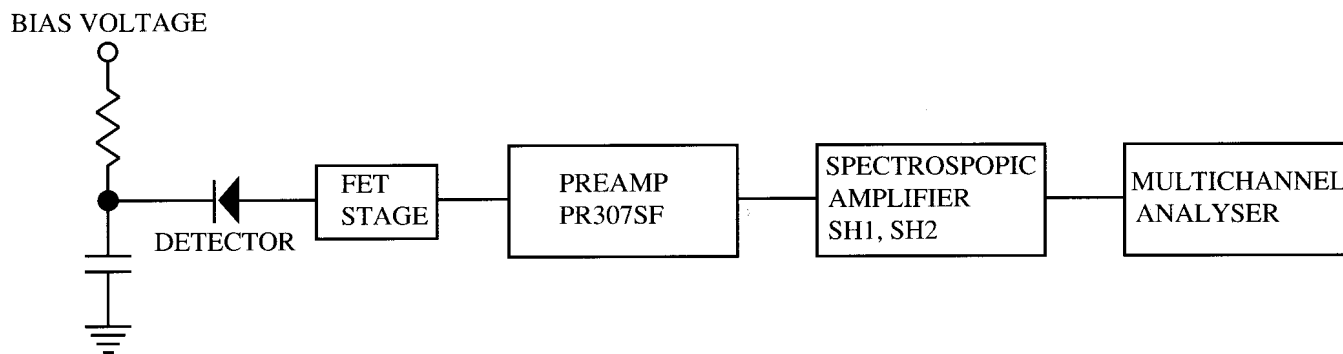
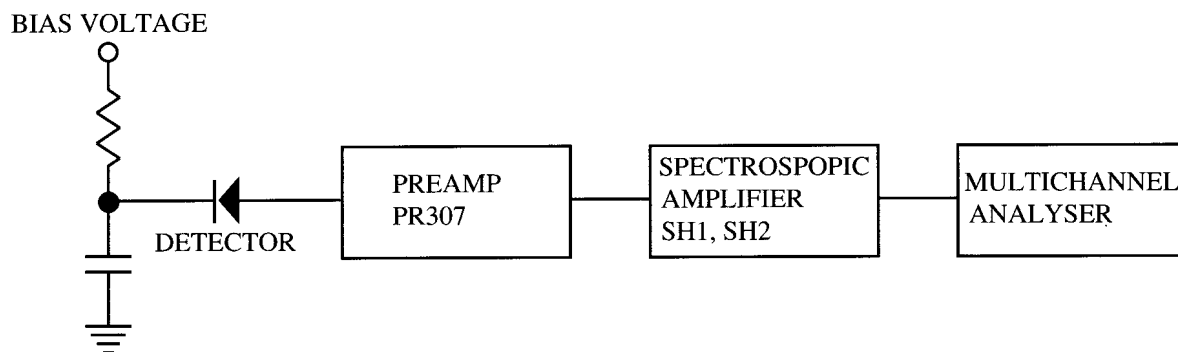
Capacitance (pF)	Rise Time (ns)	Noise (keV)(Si, 1 μ s) (With polarization resistor)	Noise (keV)(Si, 1 μ s) (Without polarization resistor)
0 pF	30 ns	1.5 keV	0.85 keV
50 pF	150 ns	2.7 keV	1.9 keV
100 pF	200 ns	3.8 keV	2.9 keV

SIZE AND PIN ASSIGNMENT :



- 1 : IN (DRAIN)
- 2 : GND
- 3 : FEED BACK
- 4 : GND
- 5 : - 12 V
- 6 : + 12 V
- 7 : GND
- 8 : OUT

TYPICAL ARRANGEMENT :





FAST SPECTROSCOPY CHARGE PREAMPLIFIER

MODEL PR 16

ADVICE : *This is a fast preamplifier offering also good noise performance.
Can be used for all kind of semiconductor detectors.
Available in housing : PR 16 - H*

PARTICULARITIES : *50 Ohm drive ability
50 Ohm/0.5 pF Test Input*

SPECIFICATIONS :

- * Power supply : negative supply $V_{cc-} = - 12$ Volts ($I_{cc-} = 8$ mA)
positive supply $V_{cc+} = + 12$ Volts ($I_{cc+} = 16$ mA)
- * Output polarity (for a positive charge at the input) : Positive
- * Sensitivity : 6.6 V/pC
 - for Silicon : 300 mV/MeV
 - for Cadmium Telluride : 240 mV/MeV
- * Fall time : 50 μ s
- * Output impedance : 50 Ohm
- * Output coupling : DC
- * Input coupling : AC (DC optional, ordering reference : PR 16 DC)
- * Bias filtering : 1 MOhm, MAX \pm 500 V
- * Polarization resistor : 100 MOhm (to bias)
- * Support moved away FET : No

<i>Capacitance (pF)</i>	<i>Rise Time (ns)</i>	<i>Noise (keV)(Si, 1 μs) (With polarization resistor)</i>	<i>Noise (keV)(Si, 1 μs) (Without polarization resistor)</i>
0 pF	20 ns	1.5 keV	1.15 keV
56 pF	30 ns	3.2 keV	3 keV
100 pF	75 ns	5 keV	4.7 keV



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FAST SPECTROSCOPY CHARGE PREAMPLIFIER MODEL PR 16-4

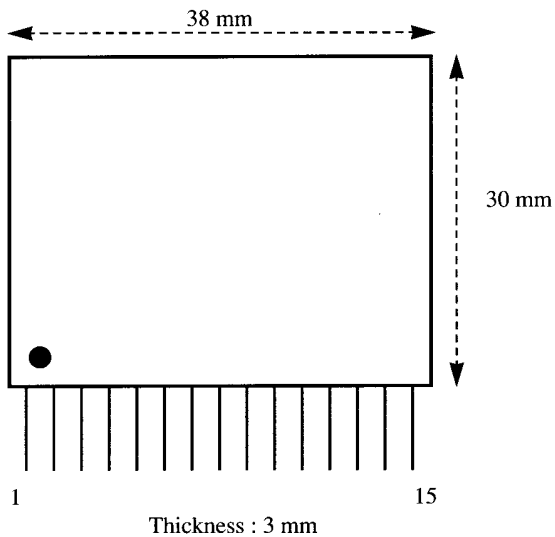
ADVICE : *This fast preamplifier is equivalent to the PR16 model with a lower sensitivity. It can be used with all kind of semiconductor detectors.*

SPECIFICATIONS :

- * Power supply : negative supply $V_{cc-} = -12$ Volts ($I_{cc-} = 8$ mA)
positive supply $V_{cc+} = +12$ Volts ($I_{cc+} = 16$ mA)
- * Output polarity (for a positive charge at the input) : Positive
- * Sensitivity : 0.09 V/pC
 - for Silicium : 4 mV/MeV
 - for Cadmium Telluride : 3.2 mV/MeV
- * Fall time : 50 μ s
- * Output impedance : 50 Ohm
- * Output coupling : DC
- * Input coupling : AC (DC optional ordering reference : PR 16 - 4 DC)
- * Bias filtering : 1 MOhm, MAX \pm 500 V
- * Polarization resistor : 100 MOhm (to bias)
- * Support moved away FET : No

Capacitance (pF)	Rise Time (ns)	Noise (Si, 1 μ s) without polarization resistor
0 pF	12 ns	3.7 keV
100 pF	25 ns	7.8 keV
220 pF	50 ns	13.4 keV
470 pF	80 ns	24.9 keV

SIZE AND PIN ASSIGNMENT :

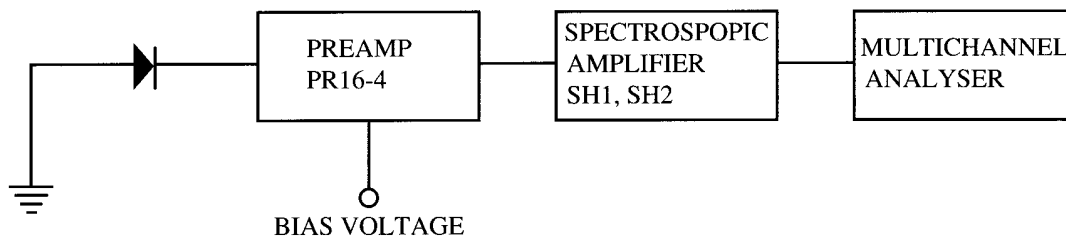


1 : OUT	9 :
2 : GND	10 : H.V.
3 : GND	11 :
4 : - 12 V	12 : GND
5 :	13 : TEST
6 : GND	14 : GND
7 : + 12 V	15 : IN
8 :	

PARTICULARITIES :

50 Ohm drive ability
50 Ohm/0.5 pF Test Input

TYPICAL ARRANGEMENT :





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FAST SPECTROSCOPY CHARGE PREAMPLIFIER MODEL PR 8

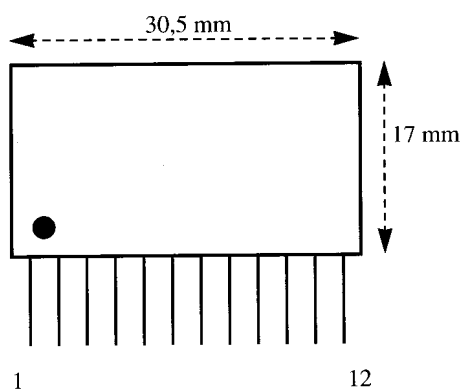
*ADVICE : This fast preamplifier offers good noise performance.
Its sensitivity is lower as compared to the sensitivity of the PR 16 model.
It can be used with all kind of semiconductor detectors.*

SPECIFICATIONS :

- * Power supply : negative supply $V_{cc-} = -12$ Volts ($I_{cc-} = 4$ mA)
positive supply $V_{cc+} = +12$ Volts ($I_{cc+} = 9$ mA)
- * Output polarity (for a positive charge at the input) : Negative
- * Sensitivity : 1 V/pC
 - for Silicon : 44 mV/MeV
 - for Cadmium Telluride : 36 mV/MeV
- * Fall time : 2 ms
- * Output impedance : 50 Ohm
- * Output coupling : DC
- * Input coupling : AC (DC optional, ordering reference : PR 8 DC)
- * Bias filtering : Yes
- * Polarization resistor : 100 MOhm (to bias)
- * Support moved away FET : No
- * Integrated shaper : No

Capacitance (pF)	Rise Time (ns)	Noise (keV)(Si, 1 μ s) (With polarization resistor)	Noise (keV)(Si, 1 μ s) (Without polarization resistor)
0 pF	20 ns	1.65 keV	1.15 keV
50 pF	30 ns	3.35 keV	3 keV
100 pF	75 ns	5 keV	4.7 keV

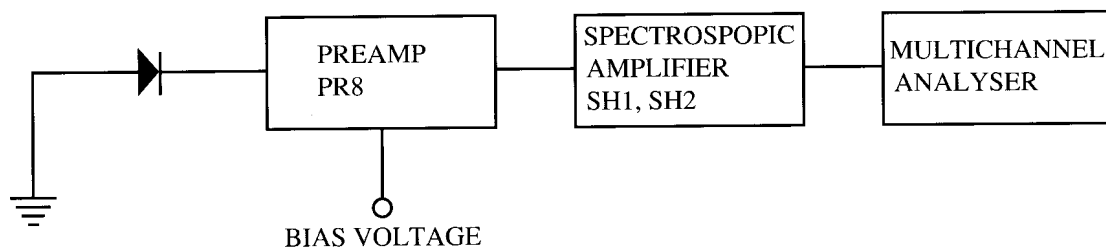
SIZE AND PIN ASSIGNMENT :



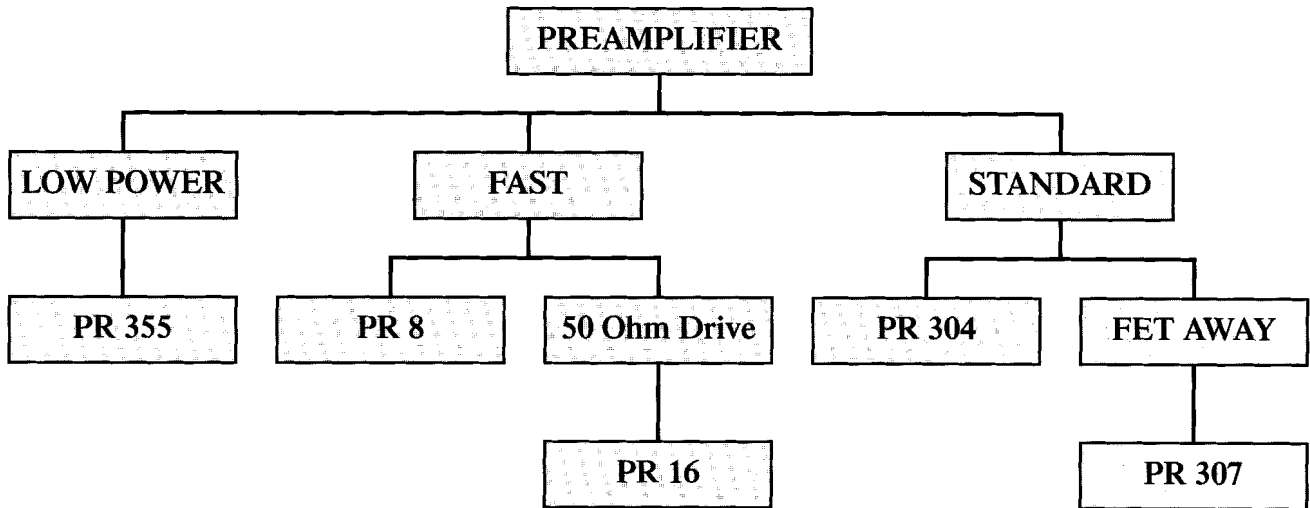
Thickness : 3 mm

1 : OUT	9 : GND
2 : GND	10 : NC
3 : + 12 V	11 : GND
4 : NC	12 : IN
5 : NC	
6 : - 12 V	
7 : GND	
8 : HV	

TYPICAL ARRANGEMENT :

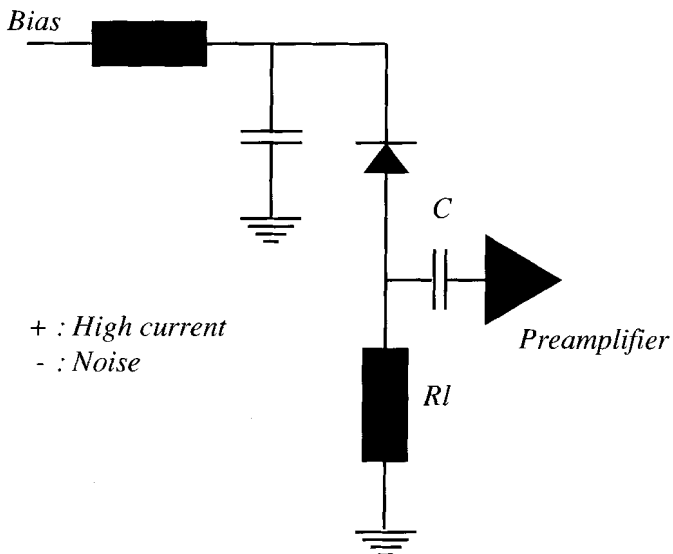


SELECTION TREE :



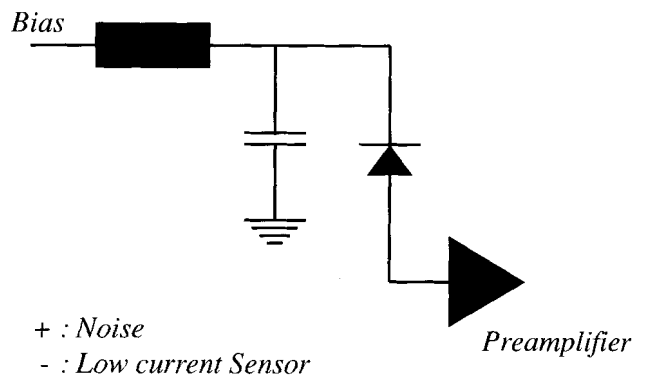
DETECTOR CONNECTION :

AC Coupling



All EURORAD preamplifiers include C and Rl

DC Coupling



All EURORAD preamplifiers can be ordered for DC coupling