CD player - PULSAR CD 1220 R

The **CD 1220 R** employs a fully programmable signal processor (DSP) which can process digital signals in any conceivable way. For this reason it produces better oversampling characteristics than are possible otherwise using ready-made commercially available chips.

Commercial oversampling filters are invariably designed to produce as flat a frequency response as possible, without taking into account time-related characteristics, i.e. those concerning transient response. The inevitable result is long pre- and post-echoes which can seriously distort the listener's perception of the music - especially where peak signals are concerned.

Different types of filter - known as polynomial filters - are now available which exhibit perfect transient signal handling. Unfortunately these filters show a slight drop in treble response at 20 kHz. The **CD 1220 R** makes use of one class of these filters - **BEZIER** polynomial filters - combined with an **IIR** filter in a three-stage oversampling process.

The result is a filter which produces no pre-echoes. The human ear is particularly sensitive to pre-echoes for two reasons: on the one hand they never occur at all under natural conditions, and on the other they are not masked by the main signal - as is the case with post-echoes. This filter also has a flat frequency response, which is a considerable improvement over other polynomial filters (e.g. cubic splines).

Since filters of such refinement cannot be purchased ready-made, the **CD 1220 R** utilises a digital signal processor to fulfil this purpose.

Since the signal processor is completely programmable the **CD 1220 R** is not tied to a particular filter type. As a result we have been able to give the machine a total of five different filter types, each with a different sound character, ranging from the classic **long FIR** filter to the **BEZIER filter**, with **short FIR** filters between the two.

Each of these filters can be activated directly via its own button on the machine's front panel.

Internal view of the **CD 1220 R**

Connection elements

Analog Out The analogue output of the CD player supplies a fixed-level

	output signal. It is designed for connection to a pre-amplifier, integrated amplifier or receiver with its own volume control
Digital Out	Optical digital output for connection to an external digital/analogue converter. Optional co-axial digital output.
RC IN	RC input socket for connection to an "R"-series pre-amplifier, integrated amplifier or receiver.
R-Link	Interface for future system expansions

Standard-filter (long FIR-filter)

The long **FIR**-filter is the standard oversampling filter used in digital technology. Advantages: Extremely linear frequency response in the audible range, very high stop band attenuation, linear phase, constant group delay.

Filter 1 (short FIR-filter)

The short **FIR**-filter has similar characteristics to the long **FIR** filter, but very much lower coefficient (160) and consequently considerably lower pre- and post-echoes. Advantages: Extremely linear frequency response in the audible range, high stop band attenuation, linear phase, constant group delay.

Filter 2 (IIR-filter)

This filter is a classic 8th order **IIR**-filter. It exhibits absolutely no pre-echo effects, albeit a slight tendency to post-echo. This is also a feature of natural instruments, and in any case the post-echo is usually masked by the normal audible signal. Advantages: No pre-echo at all, no treble loss, very high stop band attenuation.

Filter 3 (Bezier- / IIR-filter)

This combination circuit consists of three cascaded filters: a Bezier filter, an IIR filter and a second Bezier filter. It represents a good compromise between transient response and frequency response. Advantages: Virtually no pre-echo, minimal post-echo (in masking range), relatively flat frequency response, no pronounced treble loss.

Filter 4 (Bezier-filter)

The **Bezier**-filter is the ideal filter in terms of transient response, virtually no pre- or post-echo, linear phase, slight treble roll-off at 20 kHz. Advantages: Optimum transient response, linear phase, constant group delay.

2-way converter

Multi-bit and Sigma/Delta (1-bit) converters each have their own advantages in terms of sound quality. Whereas the multi-bit converter provides outstandingly impressive and well-rounded sound characteristics, especially in the bass range, Sigma/Delta converters offer unexcelled clarity, fine detail and resolution in the high-frequency range. For the first time in the world the **CD 1220 R** combines the advantages of both types of converter.

In fact the **CD 1220 R** features no fewer than three converters on each channel: two Sigma/Delta converters in double-differential mode and an additional 20-bit multi-bit co-linear converter. The multibit DAC is responsible for the conversion process in the bass

range, while the primary use of the Sigma/Delta types is in the mid-range / treble area. The net result of these innovations is improved sound plus significant reductions in residual background noise and harmonic distortion compared to products exploiting the previous state of technology.

Specifications

Mechanism	Professional, close-tolerance linear disc mechanism with triple-beam LDGU optics, 780 nm semi-conductor laser, 2 mW power
Wow and flutter	Quartz-controlled, not measurable
Mechanical construction	Rigid all-metal case, multi-shielded sub-assemblies, multi vibration de-coupled
Digital filters	Freely programmable signal processor with four different filter types, 8-times oversampling and 56-bit resolution, FIR short, FIR long, IIR, Bezier, Bezier IIR filters
D/A converter type	Double differential mode. Two 1-bit Sigma-Delta converters with 256-times total oversamling and two multibit DAC 20-bit co-linear converters in 2-way circuit
Noise shaping	4th order (ZSNS)
Analogue filter	Phase-linear Bessel filter, 3rd order with 60 kHz limit frequency
Frequency response	20 Hz - 20 KHz
Distortion / intermodulation	< 0,0015 %
Effective system dynamics	97 dB
Signal: noise ratio (A-weighted)	109 dB
Signal: noise ratio (unweighted)	106 dB
Channel separation 1 kHz / 10 kHz	> 106 / 100 dB
Digital output	Data format SP-DIF 1 x opto = 600 nm/-18 dBm 1 x coax = 0,5 V / 75 Ohms
Analogue output	nominal 2,6 Veff / 22 Ohms
Dimensions	7,5 x 44 x 39 cm
Weight	8 kg
Colours	Black (9005), silver aluminium, chrome (Non-standard version)
Remote control	Via R system or as non-standard version
Special features	Completely separate analogue and digital mains power supplies, own transformers for analogue and digital sections

We reserve the right to alter technical specifications.