Design Brief

SP33 Pre-Amplifer/Surround Processor

6 pages

Introduction

The SP33 is an audiophile balanced eight channel pre-amplifier/processor featuring full RS-232 control, comprehensive video switching via 1.4 compliant HDMI and powerful custom configuration. It is the natural successor to the successful SP32, which was recognised around the world for its high performance and innovative user interface. As the first of a new generation of Primare home entertainment products however, the SP33 represents a considerable evolutionary advance in terms of design, performance, user flexibility and versatility. It offers a truly modular design platform, which allows for entire audio, video and control sections to be upgraded easily by superior Primare versions of the latest technologies.

Modular Design

The SP33's comprehensively shielded heavy-duty steel chassis houses a newly developed modular design that allows for DSP, video and connections to be upgraded easily with proprietary Primare boards, incorporating thoroughly evaluated and optimised versions of the latest technologies and connectors.

In every instance we have taken special care to keep signal paths short and layouts uncomplicated. Together with high performance FFC-wiring, these techniques give the unit an extremely high performance and the highest possible signal-to-noise ratio. The finest audio grade semiconductors and capacitors have been used whenever possible. All parts that are known to interfere with each other are isolated by shielding, dedicated signal paths and power supplies.

more…

Operational Versatility

Almost every parameter in the configuration of the SP33 can be user defined. Any input can be assigned a name and associated with any audio and video source. Surround format, trigger activation and input sensitivity can be specified for the input. Individual levels, speaker types, crossover frequencies and delay configurations including bass management can be selected for each of the major surround formats. A 250mS global delay system, with dedicated DSP, is incorporated in order to achieve the best possible picture to sound synchronisation. For the highest possible installation flexibility, all the SP33's functions can be controlled in three ways: from the front panel, IR or RS232.

Inputs/Outputs

The SP33 has five HDMI v1.4 inputs and two HDMI v1.4 outputs for audio and video, incorporating a user-selectable audio processing and bypass function (see Technical Information).

HDMI v1.4 capability is significant because it carries uncompressed multi-channel PCM audio from a Blu-ray player to the SP33's DACs and beyond to the amplifiers and loudspeakers. **HDMI 1.4 deployed by the SP33 supports 3D pass-through but not ARC or 4K UHD.**

Eight pairs of unbalanced and two pairs of balanced analogue audio inputs are provided together with seven digital audio inputs (incl. AES/EBU). Via the 'input settings' menu, any audio input can be assigned to any HDMI video input, for simultaneous output to the HDMI video outputs. 7.1 channel analogue audio inputs are also provided for the connection to older DVD-A / SACD players. Both balanced and unbalanced pre-amplified audio outputs (FL, FR, C, SUB, SR, SL, SBL, SBR) are provided for connection to any type of power amplifier. Three 12V high current DC-triggers are provided, as well as IR and RS232 inputs.

HD audio and video upgrade features for SP33

Audio Upgrade (included on all new SP33s)

The audio board uses a Sharc DSP from Analog Devices (ADSP 21367) capable of decoding the HD formats such as DolbyTrue HD and DTS-master HD.

New features with the HD audio board:

Improved and more extended trigger options.
Individual HD format settings including Multi-PCM.
Easy lip-sync access using 'balance´ button.
Upgraded design of the on-screen menu and display of the SPA22 or SP32.

Formats decoded

Dolby Prologic IIx
Dolby DigitalEX, Plus, TrueHD
DTS, DTS-ES, DTS-NEO:6, DTS 96/24, DTS-HD Master Audio, DTS-HD High Resolution Audio, 2ch-PCM, Multi-PCM, LPCM

more...

Dolby TrueHD: lossless encoding of up to 8 channels of audio, built on MLP technology. It offers a maximum bit rate of 18.64Mbps, up to 8 channels of 24bit/96kHz audio and up to six channels of 24bit/192kHz audio. Under the Blu-ray standard, support is optional.

DTS-HD Master Audio: lossless encoding of up to 8 channels of audio. It offers a maximum bit rate of 24.5Mbps, up to 8 channels of 24bit/96kHz audio and two channels of 24bit/192kHz audio. Under the Blu-ray standard, support is optional.

Video Upgrade (included on all new SP33s)

HDMI up-scaling to 1080P, 1080P/24 over 24/50/60Hz, with user selectable bypass for deep colour signals.

Five HDMI inputs, two HDMI outputs (not simultaneous): the user selects which output to use (1 or 2).

HDMI Audio support, user selectable feature to have the audio processed by the SP33 or forwarded to the TV.

Setup menu available on either HDMI output (not at the same time)

Blu-Ray Disc and HD Audio

Blu-ray players can be configured to output uncompressed multi-channel PCM from any Blu-ray Disc. The SP33 will perform accurate D/A conversion on the multi-channel LPCM bit-stream.

Blu-ray Disc is the only source of 5.1 or 7.1 channel HD audio currently available
Most film soundtracks are mastered in 5.1-channel, 24-bit/48kHz PCM
LPCM has the highest bit rate of all three lossless codecs*
Currently 26% of Blu-ray discs carry a native multichannel PCM soundtrack+
Most Blu-ray players can be set to decompress (unpack) Dolby and DTS HD audio formats and output them as uncompressed multichannel PCM audio. Even if the Blu-ray Disc doesn't carry the PCM soundtrack, it's still available from the player.

Blu-ray lossless audio formats*

Three are available currently: multichannel LPCM, Dolby TrueHD and DTS-HD Master Audio.

Multichannel LPCM – Linear Pulse Code Modulation: LPCM (often referred to as PCM) is used for the lossless encoding of audio data in the compact disc Red Book standard; has been defined as a part of the DVD and Blu-ray standards and is used by HDMI. On Blu-ray it offers a maximum bit rate of 27.648Mbps, up to 8 channels of 24bit/96kHz audio and up to six channels of 24bit/192kHz audio. Under the standard, players must have the capability to support LPCM.

Dolby TrueHD: lossless encoding of up to 8 channels of audio, built on MLP technology. It offers a maximum bit rate of 18.64Mbps, up to 8 channels of 24bit/96kHz audio and up to six channels of 24bit/192kHz audio. Under the Blu-ray standard, support is optional.

DTS-HD Master Audio: lossless encoding of up to 8 channels of audio. It offers a maximum bit rate of 24.5Mbps, up to 8 channels of 24bit/96kHz audio and up to six channels of 24bit/192kHz audio. Under the Blu-ray standard, support is optional.
Blu-ray and LPCM+

Currently 87% of all Blu-ray Discs offer lossless multichannel audio, split this way: 8% LPCM, 64% DTS- HD:MA, 15% TrueHD

http://www.blu-raystats.com/Stats/Stats.php

Irrespective of the studios' choice, the only lossless audio format that Blu-ray players must support (because it's mandatory in the standard) is LPCM. Even so most Blu-ray players are able to decode (decompress) DTS-HD:MA and Dolby TrueHD and to output multichannel PCM.

SP33 Technical information

HDMI

The SP33 incorporates a five input HDMI repeater based around the Silicon Image SIL9135, which incorporates digital audio extraction over SPDIF or I2S format. It supports both multi-channel PCM audio from Blu-ray, SACD or DVD-players and the more commonly used Dolby D and DTS formats, which are fed over high quality FFC cable to the DSP processor. A user selectable bypass function for HDMI audio is also available, telling the SP33 either to process or forward HDMI audio to a display device. A user-configured default function addresses any other audio input source, if there is no signal on the defined HDMI input.

DSP

The SP33's DSP is performed by a Freescale DSPC56371 24bit processor, which is able to fast lock and decode all the commonly used multichannel formats (with up to 192kHz sampling frequency). A slave Freescale DSPB56367 24bit processor handles all delay functions, including the global 250mS delay used for perfect synchronising of picture and sound. Analogue signals for Dolby Pro Logic IIX or DTS NEO processing are first converted to digital by a Burr Brown PCM4202, which incorporates an automatic level sensing circuit eliminating the need for manual ADC adjustments.

DACs and analogue circuits

The audio DACs are 24bit, 192kps WM8740s from Wolfson, used in conjunction with Burr Brown OPA2134 and Texas Instruments NE5532 operational amplifiers for the analogue, semi-balanced, DC-servo controlled, buffering and filtration circuits. These feed the purified audio signal into an eight-channel low distortion, half passive volume control CS3318 from Cirrus. For the SP33 we have located all the gain stages and DC-servo circuits before the volume control in order to achieve a much better signal to noise ratio. An eight and two-channel analogue bypass mode bypasses the DSP completely for the analogue fans.

more...

Power Supplies

In order to achieve the best possible signal-to-noise ratio for both audio and video circuits, the power supplies in the SP33 are designed entirely in the linear domain. To save power, the SP33 uses two separate power supply circuits: a small perfectly-tuned supply is used in standby mode to drive the standby functions while in operation we use a large 300VA toroid transformer, which incorporates separate windings for all the different sections of the SP33, such as video, digital and analogue. For the video and digital sections we use dedicated, custom-designed linear regulation technologies. For the delicate analogue section we use rectification and regulation in two steps: voltages are first regulated down to a moderate level and then down to perfection by a fast-acting half discrete circuit. For the low voltage/high current supplies used by the DSP engine, HDMI circuits and other digital parts, we use local regulation techniques in order to achieve fastest possible regulation while keeping disturbance levels at an absolute minimum.

SP33 Features

Modular Architecture.
Fully Balanced Analogue AV Preamplifier & Digital Controller
Dolby® True HD, DTS Master Audio, Dolby® Digital, Prologic IIX, EX 7.1, dts®, dts-ES 6.1, Neo6
1080p HDMI Switching (5in/2out)
DVD-A & SACD 5.1 input,
Multi-Channel PCM Compatible
Fully Configurable & Format independent Bass Management
Two Balanced Source Inputs,
7.1 Balanced Outputs
Discrete IR & Full RS232 Operation,
Programmable Triggers
Upgradeable Architecture.
Available in Black or Titanium
Dimensions W x D x H mm: 430 x 385 x 180
Weight: 12 kg

SP33 Specifications

General		Video	HDMI with HDvideo pass-thru and with 3Dpass and HDMI OSD
Analogue Inputs	2 Balanced, 8 RCA, incl 7.1 inputs	Upscaling	1080p/24
Digital Inputs	1 Balanced, 3 RCA, 3 TOS-Link		
Video Inputs	5 HDMI		
		Other out-/inputs	1 IR Input 3 12v outputs (triggers) 1 RS232
Balanced Analogue	Front (left and right)		
outputs	Center, Sub, Surr (left		
	and right)	Power Consumption	<60W
	Surr back (left and	operate:	
	right)		
RCA Analogue Outputs	Front (left and right) Center, Sub, Surr (left and right) Surr back (left and right)	**Analogue Pre amp data**	
Analogue Record			
Output	1 RCA (left and right)	THD	<0.005%, 20 Hz-20kHz
Zone2	1 RCA (left and right)	Signal-to-Noise	-110 dB
		Frequency Response	10 Hz-100 kHz, 1dB
Digital Output	1 RCA, 1TOS-Link	Input Impedance	47 KΩ, unbalanced
Video Output	2 HDMI – individual settings		
	OSD on both outputs. (not at the same time)	Input Impedance	3 KΩ, balanced
		Output Impedance	47 R unbalanced
Modes	Stereo Bypass Party Dolby Prologic IIx Music Dolby Prologic IIx Movie DTS NEO:6 MUSIC DTS NEO:6 CINEMA	Digital Data	47R Balanced
		Frequency Response	20 Hz-20 kHz± 0.2dB
		THD+Noise	0,005% @1 kHz(AES17 filter)
Decoding Formats	Dolby TrueHD		
	Dolby Digital	Dimensions (WxDxH)	430 x 385 x 180 mm
	Dolby Digital EX		
	Dolby Prologic II	Weight	12 Kg
	Dolby Prologic IIx		
	DTS-HD Master Audio		
	DTS		
	DTS ES		
	DTS Neo:6		
	DTS 96/24		
	MULTI/2 CH PCM/LPCM		
Samping rates	32KHz,44.1KHz,48KHz, 88.2KHz,96KHz,192KHz (AES/EBU)		

Ends June 2014