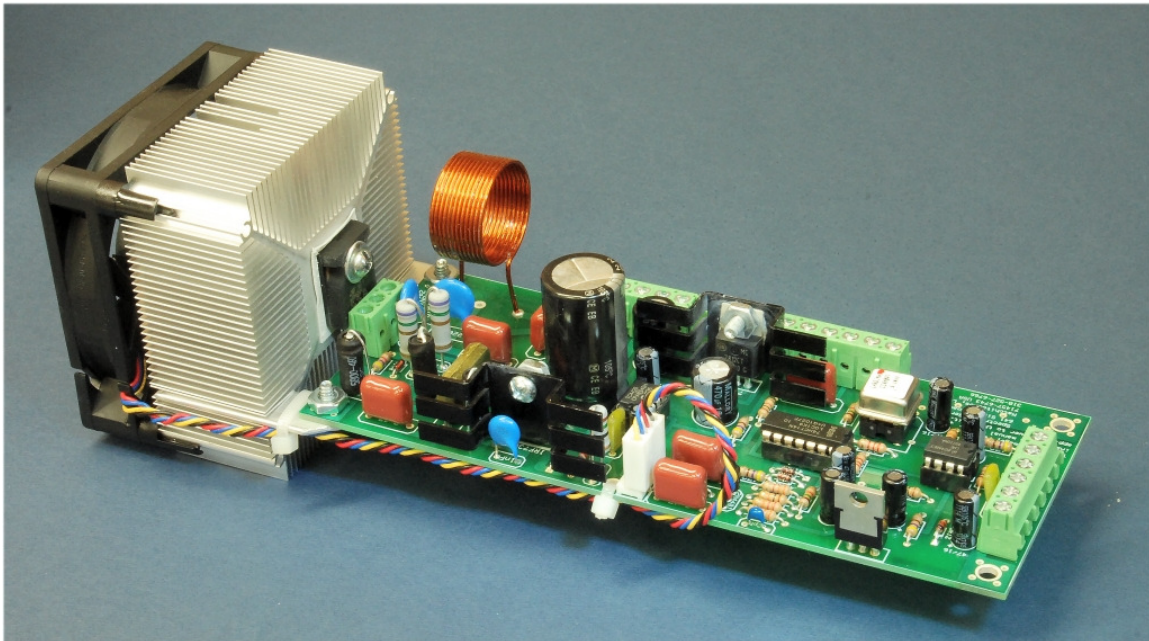


The Spectrotek SPA4 Processor-Amplifier

Technical Specifications as of 27 May 2014

The SPA4 amplifier has been designed to provide researchers with an integrated audio signal processor and high power amplifier system capable of accepting an input signal from multiple frequency sources while providing enough output power to operate large plasma tubes.

The SPA4 accepts inputs from a wide range of signal sources, including laptop and desktop computers having a line level output or headphone jack, CD players, DVD players, MP3 players, Most cell phones, the UDB1108S, the Spooky2, the GB-4000, the F-165, F-175 and other F-series units, the PROGEN II 4050, or any other frequency generator that is capable of producing a square, sine or triangle wave output or a 5 volt modulated 3.1 MHz signal. Acceptable input signal levels for the SPA4 are between 0.25 and 10 volts peak-to-peak, depending on the mode of operation selected. Modulation frequencies between 1 Hz and 400,000 Hz may be used with the SPA4.



The Spectrotek model SPA4.

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SPA4 Technical Specifications:

DC Power Supply Input:

- SPA4 Logic circuits +19 to +22 volts DC filtered and regulated, at 0.75 Ampere.
- SPA4 RF output amplifier +12 to +190 volts DC maximum, filtered and regulated at 2.5 amperes maximum, the actual current required varies with power output and modulation duty cycle.

Carrier Frequency:

- 3.1 (standard) or 3.3 MHz. Frequency to be specified at time of order. The carrier frequency may be changed by the user by replacing the plug-in oscillator module with a module of a different frequency.
- Customer requested frequencies in the range of 2.6 MHz to 3.7 MHz are available on special order.

RF Power Output:

- The SPA4 will produce up to 500 watts peak power, or 250 watts average power as measured across a 50-ohm load when the carrier is modulated by a 50% duty cycle square wave.

Input Audio Signal Waveform and Frequency Range:

- Sine, triangle, or square wave from a computer or various signal and frequency generators.
- Frequency range when using INPUT A, X2 mode: 10 to 30,000 Hz (30 KHz.)
- Frequency range when using INPUT A, X1 mode: 6 to 200,000 Hz (200 KHz.)
- Frequency range when using INPUT B: 1 to 400,000 Hz (400 KHz.)
- Direct input modulated 3.1 MHz carrier using INPUT B.

Modulation Modes - INPUT A:

- X1 Mode - The modulation frequency equals the input audio frequency using sine, triangle, or square waves.
- X2 Mode - The modulation frequency equals TWICE the input audio frequency using sine or triangle waves only.

Modulation Frequency Ranges – Input A, X1 Mode:

Input Audio Frequency Range in X1 Mode, @ 50 - 7200 mV p/p Input Level with a Sine or Triangle Wave Input Signal:

- Low - 6 Hz.
- High - 200,000.
- This will square wave modulate the carrier over the range of 4 to 200,000 Hz.
- Usable frequency range from 4 to 400,000 Hz with increased audio input level.
- This will square wave modulate the carrier over the range of 4 to 400,000 Hz.

Modulation Frequency with a Square Wave input signal of 50 - 7200 mV p/p:

Note: Square wave audio is usable in X1 Mode only, and the duty cycle follows the duty cycle of the input signal to the SPA4.

- Low - 75 Hz.
- High - 200,000 Hz.
- This will square wave modulate the carrier over the range of 75 to 200,000 Hz.

Modulation Frequency Ranges – Input A, X2 Mode:

Input Audio Frequency Range in X2 Mode @ 40 - 7200 mV p/p input level with a Sine or Triangle Wave Input Signal:

- Low - 40 Hz.
- High - 30,000 Hz at maximum audio gain, or 60,000 Hz at minimum audio gain.
- This will square wave modulate the carrier over the range of 80 to 60,000 Hz or 80 to 120,000 Hz.
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NOTE: In the X2 Mode, when using a sine or triangle wave audio input, the output of the Controller Board will maintain a 50% duty cycle ratio to within 10% or less across the input frequency range of 40 to 30,000 Hz at maximum audio gain, or 40 to 60,000 Hz at minimum audio gain. This allows unattended operation of the equipment without the need for constant audio gain adjustments when using an audio sweep signal generated by a computer sound card. It is necessary to maintain low source impedance and a constant voltage as the audio frequency changes during the sweep.

Modulation Modes - INPUT B:

- Square wave modulation of the internally generated 3.1 MHz carrier by a square, sine or triangle wave, TTL level input signal or,
- Amplification of an externally modulated, 3.1 MHz TTL level input signal.

Operation of the SPA4 Input B with a square wave modulation signal:

A minimum of 2.25 volts-peak-to-peak is required to trigger the SPA4. Ideally, the drive signal should be a square wave TTL signal, which has a voltage swing of 0 to +5 Volts.

Input B Modulation Duty Cycle vs. Frequency with a square wave modulation signal:

For a duty cycle of 1% to 50%: 1 Hz to 400 KHz
For a duty cycle of 1% to 89%: 2 Hz to 400 KHz
For a duty cycle of 1% to 98%: 3 Hz to 400 KHz
For a duty cycle of 1% to 99%: 4 Hz to 400 KHz

Operation of the SPA4 Input B with a sine wave modulation signal:

A minimum of 2.5 volts-peak-to-peak is required to trigger the SPA4 when using sine waves. The maximum allowable sine wave voltage input should be limited to no more than 7.0 volts-peak-to-peak to prevent possible damage to the input circuit of the SPA4. When using sine waves, the duty cycle of the modulated output of the SPA4 will be limited to the range of 20% to 58%.

Input B Modulation Duty Cycle percent vs. voltage with a sine wave modulation signal:

2.5 VPP for 20% duty cycle (Minimum duty cycle % possible with sine waves).
3.12 VPP for 37% duty cycle (for Maximum Sidebands).
5.0 VPP for 50% duty cycle (for Normal Operation).
5.58 VPP for 58% duty cycle (Clipping of input signal occurs above this level).

The maximum recommended modulation frequency when using the SPA4 is 400 KHz.

CAUTION: When the modulation frequency begins to exceed about 400 KHz, excessive RF voltages will be developed in the SPA4's tank circuit and the LC31 coupler. These voltages may cause the STW20NK50Z MOSFET in the SPA4 to fail.

Specifications subject to change.

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