JS-4 Power Supply

User Guide

Introduction and Design

The UpTone Audio JS-4 is a sophisticated regulated linear power supply. It may produce surprisingly audible sonic improvements in fine music systems when used with equipment which is able to operate from an external DC power supply within the JS-4's current capability and output voltage range.

Besides delivering truly state-of-the-art performance, the JS-4 offers a great deal of flexibility in usage so you are likely to find applications for it with various components as your music system evolves.

Our primary goal in designing the JS-4 was to offer a wide range of user-adjustable output voltages without any sacrifice to performance. This has been accomplished via some of the techniques detailed in the *Technical Highlights* section of this *User Guide*.

Digital audio devices draw current in very high frequency bursts. As important as ultra-low output noise is, ultra-low output impedance and the "speed" of regulation response to transient loads can have an even larger impact on sonic performance. Every aspect of the JS-4's topology, circuit design, and parts selection are focused on delivering "fast," highly regulated, ultra-low noise DC to your connected components.

The JS-4's two output channels are 100% isolated from each other, so this supply can be ideal for powering devices on opposite sides of an isolation barrier. UpTone's own award-winning EtherREGEN switch is a prime example: it creates a special active-differential isolation "moat" for Ethernet components. As a result, powering both an upstream and a downstream device requires fully independent power supply rails to avoid defeating the EtherREGEN's isolation feature.

Each of the JS-4's two output rails can deliver 2.1 amps continuous current (with instantaneous peak ability above that) at any of 8 user-adjusted voltages (3.3V, 5V, 6V, 7V, 9V, 12V, 13.5V, and 15V). If 2.1A is not sufficient for a connected component, the JS-4 has a MODE switch to activate custom circuitry which internally joins the two channels—to deliver up to 4 amps continuous current to one output jack (In this mode the other output jack is turned off and the JS-4 operates as a single output supply).

For users who have equipment with even higher current requirements, two separate JS-4 units can be connected together to produce either a single 8A output (both MODE switches set to 4A/Single mode) or one 6A output plus one 2.1A output (one unit set to Single mode, the other to Dual mode). This feature requires a coaxial SMA cable to properly parallel the units along with a custom 'Y' cable—both offered for purchase directly from UpTone Audio.

Since the JS-4's outputs are both fully "floated" from AC mains ground and isolated from each other, it is even possible to fabricate a custom cable such that a single unit's two outputs deliver bi-polar (+/-) supply voltages. Applications for such a bi-polar supply include analog preamp circuits or some rare digital devices that require a plus/minus supply—typically for their analog output stages. Contact UpTone Audio for advice on creating a custom "bi-polar wired" cable for the JS-4 if you have such an application.

During manufacturing, each unit has been carefully tested to assure reliable performance. **Your JS-4 is covered by a 2-year warranty.** Do contact us if you ever have difficulty or need advice or service.

Please read this entire instruction booklet to learn important information about installation and operation of the JS-4.

Technical Highlights

- Two separate channels of highly regulated,100% isolated, ultra-low noise, ultra-low output impedance DC. Each output rail can deliver 2.1 amps continuous current (with instantaneous peak ability above that) at any of 8 user-adjusted voltages (3.3V, 5V, 6V, 7V, 9V, 12V, 13.5V, and 15V).
- Mode switch with custom circuitry to internally parallel the two channels to deliver 4 amps continuous current to the DC-1 output jack (DC-2 jack presents no output in this mode).
- Coaxial SMA jack—combined with an optionally ordered SMA cable and a custom SpeakON 'Y' cable—permits two JS-4 units to be paralleled together to produce either a single 8A output (both MODE switches set to 4A/Single mode) or one 6A output plus one 2.1A output (one unit set to Single mode, the other to Dual mode).
- Custom 75VA dual-primary/dual-secondary R-core transformer with shielding between primaries and secondaries as well as copper outer shield. Objective and subjective performance of this R-core transformer exceeds that of even very expensive toroidal types. Mechanically this R-core transformer operates silently in both 50Hz and 60Hz AC mains frequency countries.
- Special 6th generation Cree silicon-carbide Schottky diodes for AC>DC rectification; 4 for each JS-4 output channel. Objective and subjective performance of these parts is greater than typical Schottky diodes.
- Three distinct stages of high-performance voltage regulation in each output channel, with custom filtration sections between each regulation stage. First stage utilizes a specially controlled, highly efficient (97%) DC-DC regulator operating at 800KHz; Second stage is a high-current, low-noise Micrel linear regulator; Third stage consists of 4 Linear Technology LT3045 ultra-low noise (0.8µV RMS), high PSRR, ultra-low output impedance regulators.
- Unique "hierarchy of charge" design techniques are used to employ filter capacitors—before and after each regulation stage—sized to maximize "speed" and filtration for output, while also reducing AC current-draw peaks by conducting throughout a higher percentage of the AC waveform. This avoids ringing and saturation of the transformer core and thus nearly eliminates any noise going back to the AC mains.
- Seven 1-Farad/2.7V super-capacitors used in series (per channel) to provide 143,000µF of filter capacitance between second regulation stage (Micrel) and final third stage (LT3045s). This large super-capacitor bank handles load fluctuations down to below 1Hz. Fancy, large and expensive "audiophile" electrolytic capacitors are not needed because most all high frequency ripple is already eliminated beforehand—coming off the middle-stage Micrel regulators.
- Carefully chosen arrays of Murata X7R ceramic capacitors are used before and after the final stage of LT3045 regulators, whose job it is to filter any remaining minute amount of high frequencies and to superbly handle high frequency load transients presented by the equipment being powered by the JS-4.
- Logic circuitry associated with output voltage selection adjusts both the input and output voltage of each voltage regulation stage. This allows each regulator to receive an input voltage just 0.7V above the voltage it is set to regulate to. The result is optimum noise performance, low heat dissipation, and the ability to offer a wide final output voltage range without compromise.
- All circuitry is built onto a single large 4-layer PCB with expertly optimized trace widths, thickness, routing, and impedance control. Even the DC output jacks, switches, and AC inlet/fuse/switch module are all right-angle PCB through-hole soldered directly to the circuit board. Elimination of wiring is a performance advantage. [The large R-core transformer is mounted separately to the JS-4 chassis' bottom plate and wired to low-resistance terminals on the PCB board.]
- Ultra-low resistance (≤2mΩ) 4-pole Neutrik SpeakON DC output jacks are used for secure and electrically superior connections.
- Assembled with all stainless-steel hardware in fine-finish aluminum casework sitting on machined aluminum feet with anti-slip rubber rings.

Installation and Use

Placement of JS-4

One benefit of the JS-4's highly efficient, triple-regulated design is that the unit barely gets warm, even when operating with maximum load on both outputs. While you will notice the left and right sides of the casework are finned aluminum heat-sinks, they are not used by the JS-4 as no parts are attached to those heat-sinks internally. The heat-sinks are there simply because the lovely casework we chose for customization is not available in a version without heat-sinks.

The JS-4 case will not get hot, nor does its circuitry or large R-core transformer radiate any electrical or magnetic fields to outside the casework. Therefore you are welcome to locate and position the unit anywhere in your system and can safely stack other devices on top of or underneath the JS-4. Do keep in mind that the fine silver anodized finish of the JS-4 case can be easily scratched if care is not taken.

AC Operating Voltage:

The AC mains operating voltage of your JS-4 has been preset to be appropriate for the country the unit was first shipped to. On the left side of the rear panel you will see a check-mark or 'X' in the box next to either "100~120V" or "200~240." **Connect the JS-4 to AC power only in the voltage range of the checked preset box.**

Powering the JS-4 with the incorrect AC mains voltage—for its present setting—can permanently damage the unit (especially if applying 220~240V to a unit set for 100~120V). Such damage is not covered by UpTone Audio's warranty.

If you move to a country (or sell the unit to an overseas buyer) where the AC mains voltage is in the opposite range than what your JS-4 was preset to, there is an AC voltage selection switch inside the unit—on the circuit board just behind the AC inlet/fuse/switch module.

To access the AC voltage selection switch, first unplug the AC power cord from the unit. Then remove the 6 screws of the top panel using a Torx T10 screwdriver. Move the large red slide switch—using either your thumb fingernail or a flat-blade screwdriver—to the opposite position. Choose either 115V or 230V, depending upon which voltage range you are changing from/to.

Do not touch or move any other elements inside the JS-4's case. After reaffixing the cover panel, please be sure to change the back panel preset indication marking. We use a permanent felt pen marker, but you should be able to erase that mark with some isopropyl ("rubbing") alcohol before remarking the other box to match the internal AC voltage switch setting.

AC Fuse:

The main AC fuse that came installed in your JS-4 is correct for the mains voltage range it was set to when first shipped. **For 100~120V range a 1.0A slow-blow is installed. For 220~240V a 0.5A slow-blow is installed.**

These are always 5mm x 20mm length fuses rated to 250V. If you change your JS-4 to operate from the opposite voltage range, you will need to remove the fuse-holder from the back panel and reinstall with the appropriate amperage rated fuse. The fuse-holder is located in the center of the inlet/fuse/switch module. To remove it, use

your fingernails to simultaneously squeeze together the plastic tabs at top and bottom of the fuse-holder. If you do so correctly, the fuse-holder will slide out easily. Note that only one fuse is used and it is placed into the top position where you see the metal spring clips. **When you reinstall the fuse-holder into the JS-4 the fuse is always on top.** As you slide the fuse-holder back into the unit, make sure the fuse does not fall out. Push the fuse-holder completely back into the inlet/fuse/switch module until it is fully seated and both top and bottom retaining tabs give an audible "click."

AC Cord Connection:

The AC power inlet of the UpTone JS-4 accepts a standard IEC-320 plug. Each unit ships with a thick, 16awg, shielded, 2-meter length Volex-brand cable. The male wall end of the power cord we include has a NEMA 5-15P "American" plug. We do not offer this cable with wall plugs for other country standards such as Schuko or UK Type G. If you reside in a county where the wall mains outlets differ, you can either use any available local mains cord of your choice, or use an adapter plug with the cord we provide. If you have confidence, you could cut off the American plug from the supplied cable and carefully reterminate the cord with a plug matching your local standard.

Powering on the JS-4:

You will notice from the back panel print legend above and below the main power switch that **down is ON and up is OFF.** While this is unusual, the only PCB-mounted inlet/fuse/switch module we could find (a somewhat costly, high-quality part from Schurter of Germany) is manufactured with down as ON and up as OFF.

With an AC power cord connected to both the JS-4 and the wall, flip the power rocker switch down (ON). You will see the amber/orange colored LED—located inside the 'p' of UpTone on the front panel—light up. **Depending upon the position of the output MODE switch, you will also see either one or both green front panel LEDs light up.**

If the amber/orange LED on the front panel does not light, then stop and check power switch position, AC connections and fuse. If all seem correct and the main amber LED still does not light, contact UpTone Audio for advice or service.

Setting the JS-4's MODE switch:

A unique feature of the JS-4 is the ability to switch the unit—without any compromise in performance—between a **dual-output 2.1-amp / 2.1-amp mode and a single-output 4 amp mode.** This is accomplished by setting the position of its MODE toggle switch, located on the back panel in between the DC output jacks DC-1 and DC-2.

As shown on the back panel, the UP position of the MODE switch is the Dual-Output mode. In this position, both the DC-1 and DC-2 jacks will output voltage—and both of the green LEDs on the front panel will be lit. In this Dual-Output mode, the maximum continuous current delivery from each output will be limited to 2.1 amps—regardless of which of the eight DC output voltages are set for that side.

If the MODE switch is set to the DOWN position, the JS-4 will enter Single-Output mode. In this mode, the right side (as viewed from behind) DC-2 jack will not output any voltage, and only one of the two green front panel LEDs will be lit. Only DC-1 (left jack, middle of the back panel) will output any DC voltage, and the maximum continuous current delivery will be 4 amps. **The output voltage for the unit in Single-Output mode will be set only by the DC-1 Voltage Select knob.** [In Single-Output mode the setting of the DC-2 Voltage Select switch is ignored.]

Setting the DC output voltages of the JS-4:

In Dual-Output mode the two outputs of the JS-4 are 100% isolated and independent from each other—all the way back through their triple stages of regulation, through independent sets of high-performance DC rectifying diodes, to the unit's custom, dual-secondary R-core transformer.

Each output of the JS-4 offers you the choice of eight different output voltage settings: 3.3V, 5V, 6V, 7V, 9V, 12V, 13.5V, and 15V. Carefully choose the settings most appropriate for the components you are powering with the JS-4.

The black knobs at the rear of the JS-4 are used to select output voltage. There is a definite detent step for each voltage and you **simply set the white line on each knob to point to the desired output voltage.** [Note: These knobs are on switches which are binary encoders. The JS-4s output voltages do not run through them at all. Each position sets a decimal code which gets used to change voltages in each of the 3 stages of regulation.] You will notice that each output's rotary Voltage Select switch has two positions printed (at about 4 o'clock and 5 o'clock) saying '0' (zero volts). In those settings the corresponding output jack will not output any voltage when any load is connected. These positions need never be used; they exist simply because the special Japanese NKK-brand rotary encoder switch we chose is only available with 10 positions yet we offer 8 output voltage levels.

You should be certain that the equipment you are powering does not draw more continuous current than the JS-4 can deliver (2.1A per output in Dual-Mode, 4A from DC-1 output jack when in Single-Mode). [For reasons of manufacturing economy, the SMPS adapter "wall-warts" or adapter "bricks" than come with many devices are generally specified to be capable of delivering much higher current than what is required. For example: You can safely try powering a device that comes with an AC>DC adapter rated to 3A (3000mA) with a JS-4 in Dual-Mode. Just be sure to select the output voltage setting that matches what your equipment requires. We think you will be surprised at just how many devices will run just great from the 2.1A output of the JS-4.

JS-4 Over-Current Protection and Reset:

If a component does draw more current than a 2.1A output (in Dual-Mode) can provide, you will know that because the JS-4's sophisticated over-current protection circuitry will quickly sense that over-demand, automatically turn off the output voltage of just that channel, and also turn off the corresponding front panel green LED. If that

occurs, it will then be necessary to reset the JS-4 by turn OFF (up) the unit's main power switch, **waiting about 8 seconds,** and then turning it back ON (down). [Keep in mind that any component which was being powered by the other output of the JS-4 will lose power when you switch off the AC power to reset the channel whose over-current protection had tripped. Also, when resetting the JS-4 after an over-current event—by switching off then on—it is not necessary to wait for the front-panel amber LED to go dark. Depending upon load conditions at the time, the amber LED might take a few seconds to go dark, yet the unit will properly reset regardless.]

If you do have a component which definitely draws more than 2.1A continuous current, you should be able to power it by placing the JS-4 in Single-Output 4-amp mode—and using the DC-1 output jack and Voltage Select knob.

The JS-4's over-current protection circuits also work in Single-Output 4-amp mode. In this case it does not trip and turn off output and front LED until the output current demand exceeds 4 amps for more than a certain period of time.

Neutrik SpeakON 4-pole output jacks:

The two DC output jacks of the JS-4 are ultra-low-resistance, high-current, long-contact-line parts manufactured in Europe by Neutrik. We chose their 4-pole SpeakON series models for ease of termination with the heavy-gauge, inductance-lowering "star-quad" wire topology of our SAPPHIRE DC cables.

You most likely purchased with your JS-4 one or two of our SAPPHIRE silver-plated, shielded, Teflon insulated DC cables, and those will have Neutrik SpeakONs at the power supply end and a fine Japanese Oyaide standard 5.5mm outer diameter DC-barrel plug at the device end. The very tip of the Oyaide plugs have a plastic ring which indicates the size of the hole in the plug—to correspond with the diameter of the pin in the DC input jack of the equipment you are connecting to. **A red ring indicates a 2.5mm hole/pin size, while a black ring indicates a 2.1mm hole/pin size.**

If you choose to build your own DC cables or have others custom made, then it is important that you know the pin assignments of the JS-4 SpeakON jacks so that proper voltage polarity can be respected. SpeakON plugs have clear markings inside, next to each wire insertion point. **Only 4-pole SpeakON plugs are compatible with the JS-4**. Do not attempt to use any other type. Examining a 4-pole SpeakON plug you would see the wire contact terminals (either screw/solder type or solder-only type) labeled 1+, 2+, 1-, 2-. When wiring a standard cable for a +DC voltage device, both 1+ and 2+ will provide positive DC voltage while the -Ve/zero-Volt "ground" is to be obtained from SpeakON pins 1- and 2-.

It should be noted that since the JS-4's outputs are both fully "floated" from AC mains ground and isolated from each other, it is possible to fabricate a custom cable (two SpeakONs to some 3-pin connector) such that the unit's two outputs deliver bi-polar (+/-) supply voltages. Applications for a bi-polar supply include analog preamp circuits or some rare digital devices that require a plus/minus supply—typically for their analog output stages. Contact UpTone Audio for advice on creating a custom "bi-polar wired" cable for the JS-4 if you have such an application.

Proper insertion and removal of SpeakON plugs:

The rugged and reliable Neutrik SpeakON plugs require a unique set of movements in order to both make proper contact upon insertion and to avoid damage during removal.

To insert:

1. Hold the DC cable's SpeakON plug with your thumb on top of the spring-loaded retractable button.

2. Line up the 5mm wide key square (seen on the outer diameter of the SpeakON plug's barrel) with the notched opening at the top of the JS-4's SpeakON jack. Your thumb will now be at about the 10 o'clock position.
3. Insert the plug fully into the jack, pushing the collar of the plug housing firmly flush with the jack/back panel of the JS-4.
4. Rotate the entire SpeakON plug clockwise until the thumb-button is at 12 o'clock and the button springs with a loud "click," landing flush against the aluminum back panel.

To remove:

1. Grip the entire SpeakON plug and use your thumb to firmly pull back the top locking button about 4mm.
2. While retracting the locking button, turn the entire plug counter-clockwise.
3. When turned to about 10 o'clock you will be able to easily slide the plug out from the jack.

Notes about adjusting JS-4 Mode and Output Voltage:

The function and procedures for changing the JS-4's operating mode (Dual 2.1/2.1A or Single 4A) and output voltages have been discussed elsewhere in this *User Guide*. Yet you may have questions about when you can safely make those changes.

The JS-4's sophisticated circuits were extensively tested for over a year during product development. We have found the unit to be quite robust and have never caused a failure by changing the MODE or output voltages while the unit is in operation. Still, we advise that you exercise caution when making adjustments to the JS-4. **In general, it is best that you set the desired output voltage(s) prior to powering on the JS-4, primarily to avoid risk of damage to a connected device.**

Likewise, picking the operating mode (Dual 2.1/2/1A or Single 4A) prior to power on is a good idea. The JS-4 will not be damaged from switching MODE while powered on, but output to DC-2 is turned off when switching to Single 4A mode. And switching to Dual 2.1/2.1A mode from Single mode could result in DC-1 seeing an over-current event if its output was connected to a load greater than 2.1A at the moment you switched to Dual mode.

Paralleling two JS-4 units for high current capability:

At the rear of your JS-4, to the right of the DC-1 output jack, you may notice a small gold-plated coaxial/SMA connector labeled "Multi-unit Parallel." This is for optional utilization of the unique capability to pair two JS-4 units together to obtain greater output current capability. If you have such need—and have purchased two JS-4s—here are details about set up and connection of this application.

Two special cables are required to properly parallel two JS-4 units such that they share equally the demands of a high current device you wish to power. One is a parallel 'Y' cable version of our SAPPHIRE DC cable, with two SpeakON plugs to insert in JS-4 and a male SpeakON at the bottom of the 'Y'—into which you will plug one of our standard SAPPHIRE cables. The other required cable—which is included with the purchase of the parallel 'Y'—is a short coaxial/SMA cable. **This coax cable ties together the voltage-set pins of the JS-4's output regulators—to assure that the load is shared evenly between units and without compromise.**

Since a single JS-4 with MODE switch in Single-Mode can already deliver 4 amps (from DC-1), the application for a paralleled JS-4s makes sense only when you have a component requiring more than 4A. Yet here is where it gets interesting as there are two valid configurations:

- If you put the MODE switch of both units in 4A Single-Mode you will obtain 8 amp capability.

- If you put the MODE switch of one unit in 4A Single-Mode and leave the other unit in 2.1A Dual-Mode, you will obtain 6A capability (from 'Y' cable attached to both units' DC-1 output jacks) and a separate 2.1A from the DC-2 output jack of the unit which is set to Dual-Mode.

Some rules about the above:

a) Always plug the Parallel 'Y' cable into the DC-1 jack of both units (DC-2 outputs **can not** be paralleled);
b) Always join both JS-4 units via the coax/SMA cable which comes with the 'Y' cable; (screw the SMA connectors in fully by hand);
c) Always set the output voltage selector knobs of both units' DC-1 channels to the same voltage. (If using the one 6A plus one 2.1A configuration, you can set DC-2 of the unit in Dual-Mode to output any voltage you need; It does not have to match the setting of the paralleled outputs.)

We hope the JS-4 enhances your music system.

Please contact UpTone Audio if you have any questions about application and usage of your JS-4 power supply.

UPTONE AUDIO LLC • MARIPOSA • CALIFORNIA • 95338 • U.S.A.
Phone: 1-209-966-4377 • E-mail: uptoneaudio@gmail.com • www.uptoneaudio.com