



Chord Professional Systems

SPA RANGE POWER AMPLIFIERS

INTRODUCTION

This product manual is intended to assist trained and qualified technical personnel in verifying the performance of, adjusting and repairing the Chord Electronics range of power amplifiers. The procedures described here are not intended for persons unfamiliar with the appropriate safety and test procedures.

⚠ WARNING ⚠

THERE ARE POTENTIALLY LETHAL VOLTAGES WITHIN THE CHORD PROFESSIONAL RANGE OF AMPLIFIERS, WHICH WILL BE ACCESSIBLE ONCE THE TOP COVER IS REMOVED. **DO NOT ATTEMPT FAMILIARIZATION WITH, INSPECTION OF OR ANY PROCEDURE WHATSOEVER UNLESS YOU HAVE DISCONNECTED THE AMPLIFIER FROM THE WALL AC OUTLET OR OTHER SOURCE OF AC POWER AND THE POWER SUPPLY CAPACITORS ARE COMPLETELY DISCHARGED.** PLEASE TAKE NOTE THAT THE POWER SUPPLY CAPACITORS TAKE AS LONG AS 2 MINUTES TO DISCHARGE. THESE INSTRUCTIONS ARE FOR USE BY COMPETENT TECHNICAL PERSONNEL ONLY. **DO NOT UNDERTAKE ANY SERVICE PROCEDURES IN THE CHORD AMPLIFIER UNLESS YOU ARE TECHNICALLY QUALIFIED TO DO SO.**

Installation

The Chord Professional Systems SPA range are either 2U or 3U high units and may be fitted to a standard bay with four M6 bolts via its front panel. The unit should be positioned to allow free flow of air above and below. Failure to comply with this requirement will cause impaired performance of the unit. The IEC mains lead provided, must be terminated correctly as below:

UK/EUROPE		USA/CANADA
Brown	= Live	= Black
Blue	= Neutral	= White
Yellow/Green	= Earth	= Green

Note: The Amplifier must be earthed at all times via its own mains lead. Failure to do this may be hazardous or may cause a hum or buzz to be heard at the speaker outputs.

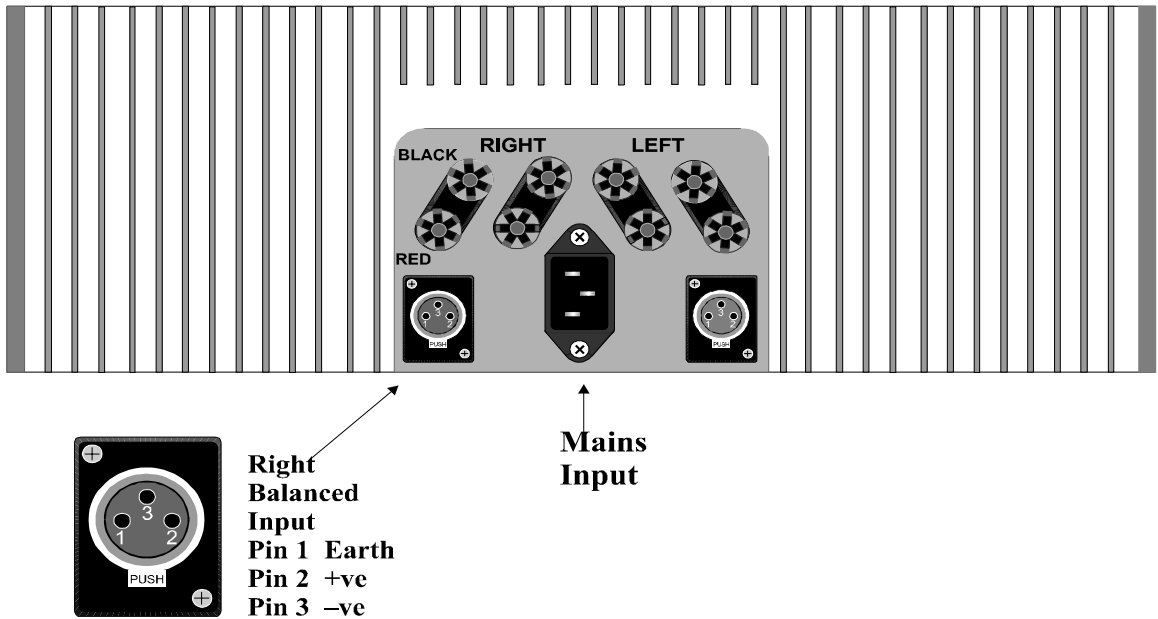
Thermal Management

Two low noise, high reliability PAPST fans have been fitted to all 3U units and are configured to run at approximately 10% of full speed in order to reduce fan noise to the absolute minimum. A thermal sensor has been fitted to each amplifier channel that will increase both fans to full speed if their heatsink temperature exceeds 70°. Full speed will continue until the heatsink temperature has fallen to less than 60°. It is unlikely that 70°C will be exceeded under normal operation.

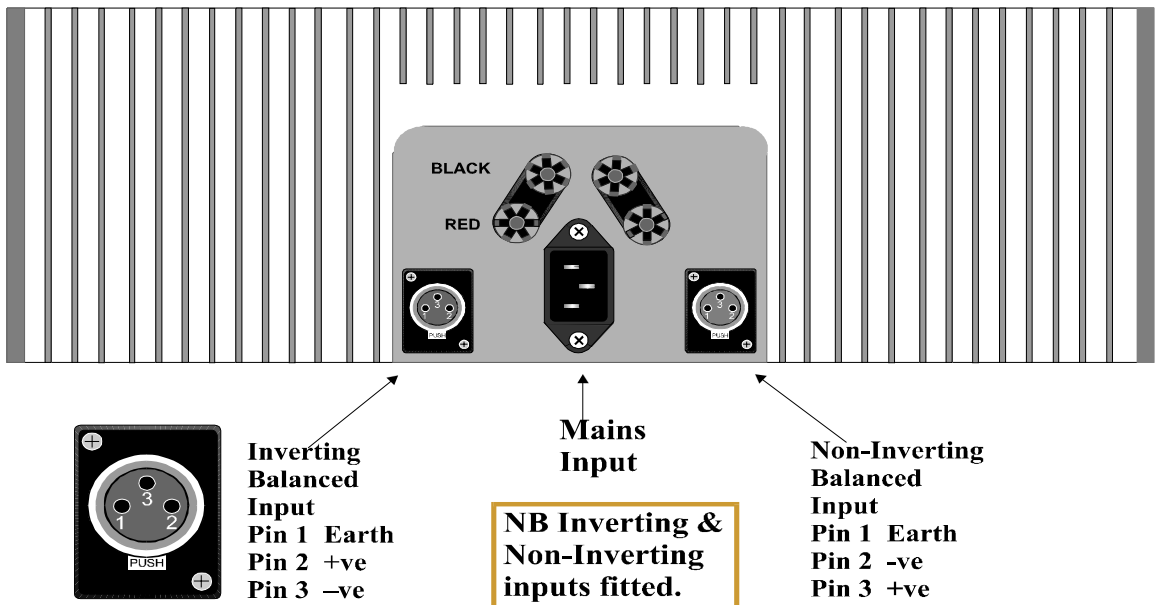
CE This unit complies with EN 50081-1 & IEC 801/2

SPA Range Rear Panels.

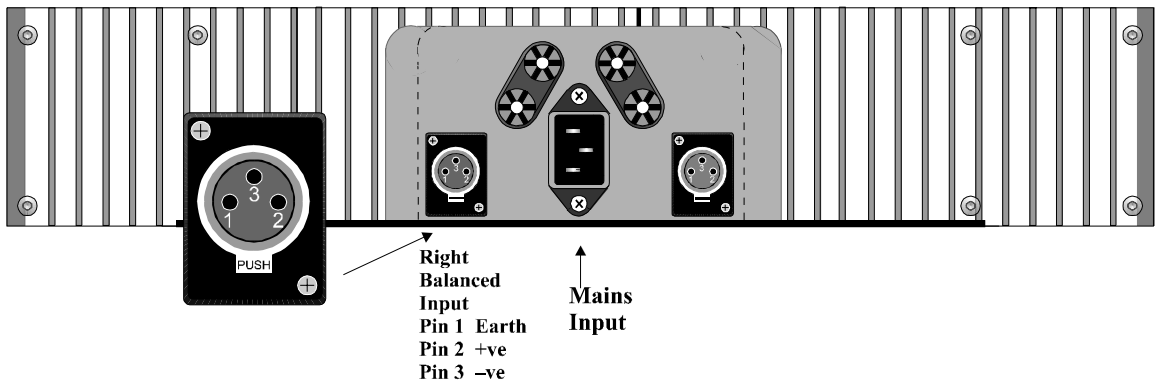
SPA 1032, SPA 1232, SPA 2232 Power Amplifiers;



SPA 1424 Power Amplifier;



SPA 608, SPA 612 Power Amplifiers;



Description and Operation

This amplifier is of advanced design utilising a high frequency power supply. All units are fitted with 300-watt silicon (Mosfet) devices designed exclusively for Chord Electronics Limited.

All amplifier channels have 30 Amp, Gold Plated 4mm output terminals. Each set is connected to the amplifiers via independent relays for redundancy. These will operate approximately 15 seconds after switch on to ensure the amplifier and mixing desks have stabilised. Note: The signal ground is isolated from main chassis ground.

On applying power to the system and depressing the main switch on the front panel, the system fans (If fitted) will run at full speed for a few seconds until the temperature control circuit reduces their speed.

LED Indicators

Power LED Indication

A two-colour LED is fitted to indicate standby and power on status. In standby mode (Power connected and power switch off), the power indicator will display red. In normal operation (Power connected and power switch depressed), the power indicator will display green. If at anytime the unit has been subjected to a severe short at the output terminal, or if the inputs have been subjected to a DC level shift whilst in operation, the unit will go to standby mode and the power indicator will change from green to red. After removing the fault condition, the unit may be reset by switching off for approximately 15 seconds and re-applying power.

Clip LED Indication (SPA 1032, SPA 1232, SPA 2232, SPA 1424 only)

Each amplifier channel is fitted with a 5mm red onset of clip LED. This LED will light when its channel is within 3dB of clipping. A hold circuit will retain the red indication even under narrow spike transient clips.

Signal Detect LED Indication (SPA 1232, SPA 2232)

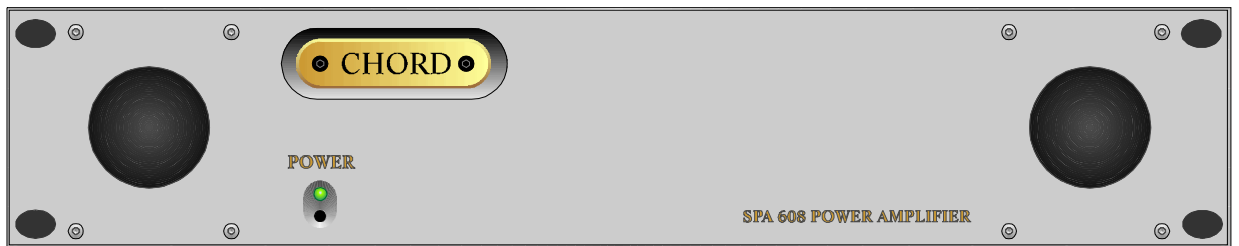
Located just above the two volume potentiometers on the front panel, the SPA 1232, and SPA 2232 has two two-colour LED's for signal detect and onset of clip indication. They will give a green indication if an input signal of greater than 20mV is applied to the input channel. The green illumination will flash to red if the output of its channels amplifier is within 3dB of its clip point. A hold circuit will retain the red indication even under narrow spike transient clips.

Input Sensitivity Adjustment (SPA 1232, SPA 2232 & SPA 1424 only)

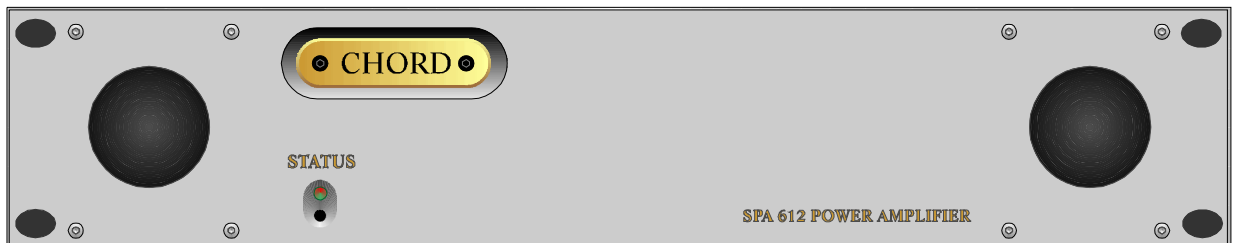
The potentiometers on the front panel (SPA 1232, SPA 2232 & SPA 1424 only) give a gain range of up to 27dB. They may be locked by means of 3mm hex locking screws in the recesses below the potentiometers.

SPA Range Front Panels.

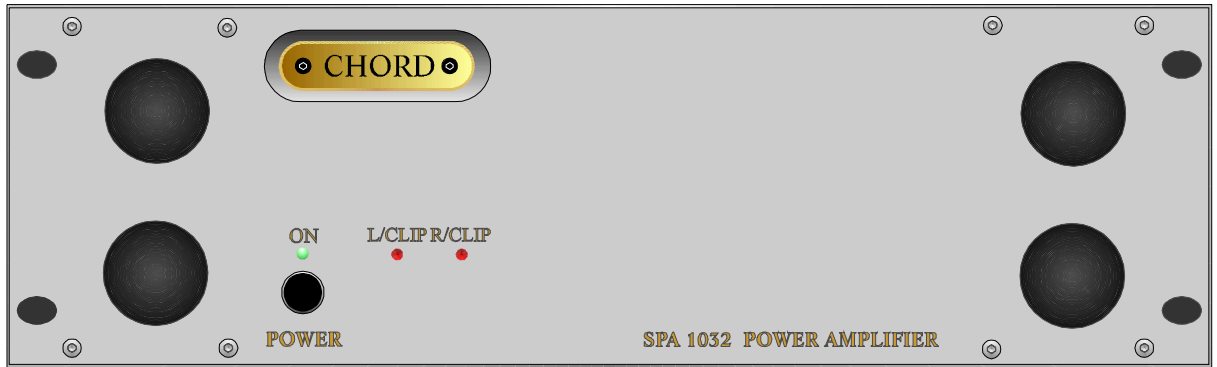
SPA 608 – Low Power Stereo Amplifier.



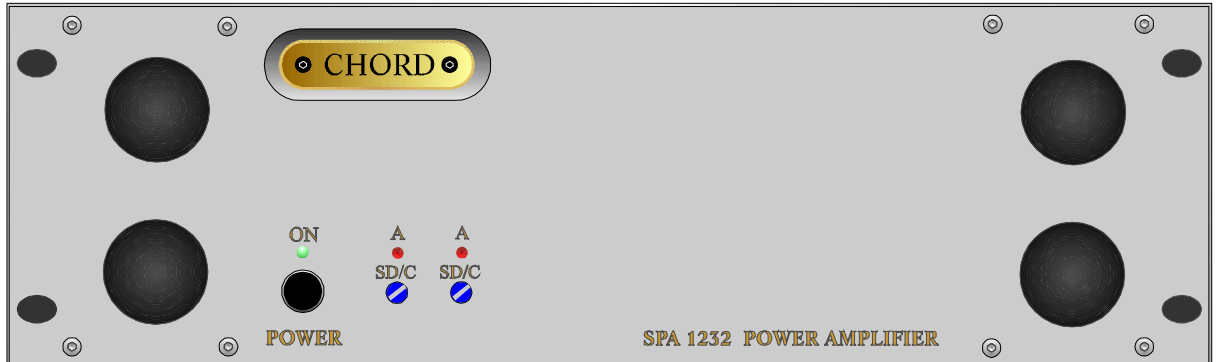
SPA 612 – Medium Power Mono Amplifier.



SPA 1032 – High Power Stereo Amplifier



SPA 1232, SPA 2232 – High Power Stereo Amplifier



SPA 1424 – High Power Mono Amplifier



SIMPLIFIED TEST PROCEDURE FOR THE SPA RANGE OF AMPLIFIERS

INITIAL PREPARATION

Chord Electronics Limited recommends that the power supply be treated as a line replaceable unit because of its specialisation. However, it can be maintained by a competent engineering organisation. The following equipment must be available: -

- i. An isolation transformer (1000VA minimum).
- ii. A voltage regulating AC power supply unit (variable transformer).
- iii. 1 x AC Current Meter (5A or above).
- iv. 1 x M3 Torx anti-tamper screwdriver

1. Remove the bottom cover from the amplifier by removing the eight M3 TORX tamper-proof screws.

2. Ensure that the amplifier POWER ON switch is in the OFF position (Button out).

EARTH BONDING TESTS

1. Check the bonding between the EARTH pin of the mains input socket and each of the amplifier panels (use only the screw heads or the screw holes). Check also to the screw heads of the PSU.

MAINS ISOLATION TEST

1. Check the isolation between the EARTH pin of the mains input socket and the live and neutral pins in turn.

INPUT POWER CONNECTIONS

1. Turn the amplifier over and remove the top cover by removing the six M3 CSK hex screws. This will expose the PSU components.

2. For safety reasons always use the isolation transformer when working with uncovered units. Connect the output of the mains isolation transformer to the input of the variable AC power supply. Set the output to 0V and connect the AC current meter in series with the live input of the amplifier. This will show the current drawn by the amplifier if there is a fault condition and the current will rise quickly. Connect the neutral and earth directly.

3. Observe the AC current meter and slowly increase the AC power supply output. If the AC current meter rises quickly then immediately reduce the output to zero. This will indicate a serious fault in the primary sections of the PSU. (E.g. mains input filter, primary storage capacitors, bridge rectifier) which must be investigated before any further steps can be taken.

4. If no problem is evident, then increase the AC power supply output voltage to approx. 150V. This is sufficient to allow the PSU oscillator to start up and the relays to operate. Check that only the POWER ON LED glows red. Depress the POWER button and check that the current meter does not rise quickly.

5. Check that the POWER LED changes from red to green.

NOTE Take care when using the scope not to connect the earth of the probe to any PSU component.

6. Check the frequency of the PSU oscillator by holding the scope probe close to either of the small transformers T2 or T3. The frequency should be between 75 - 80 KHz.
7. Turn the amplifier over to expose the amplifier PCB.
8. Increase the AC power supply output to the nominal mains voltage of 240V / 110V.
9. Measure the voltage on the power rails of each of the FET blocks. The outer two rails are the +ve and -ve supply and the inner two rails are the gate drivers. The voltage of each supply unloaded shall be 85V ($\pm 5v$). If this voltage is not correct, switch off the amplifier and disconnect the six push-fit connectors between the PSU and the amplifier printed circuit board. Switch on and re-check the supply rails. Any fault can then be isolated to either the PSU or the amplifier board.

NOTE: The system 0V is floating from the chassis ground and is available at pin 1 of the XLR connectors.

OFFSET CHECKS

1. Measure the voltage on each of the 4 speaker channels. This offset voltage should be between 15mV and 50mV.
2. Connect a resistive load of 4 Ohms to one of the speaker channels. Re-check the offset as above. Repeat for the other channel(s).

CHANNEL OUTPUT RELAY AND DETHUMP CIRCUIT TESTS

1. Connect a separate 4-Ohm load to each of the Right channel speaker outputs.
2. Set the Audio sine wave generator output to 250mV at 1KHz and connect to the Right channel input socket. Check that a signal appears only on the relevant output.
3. Remove the sine wave generator from the Right channel, re-connect to the Left channel and repeat the tests detailed in paragraph. 2.
4. Re-connect the sine wave generator to both the Right and Left channels, verify a signal appears on all channels. Release the POWER button and verify that the output signal on all channels disappears immediately and the speaker select LED extinguishes immediately. Wait for five seconds and depress the POWER button to re-apply power. Verify that there is a delay of at least 12 seconds before the channel output relays operate and a signal appears on the output terminals.

FREQUENCY RESPONSE TESTS

LEFT & RIGHT CHANNEL(S)

1. Set the Audio sine wave generator to give an output of 500mV rms, at 20hz. Connect the differential output to the right channel balanced input.
2. Connect a 4 ohm load across the high and low terminals of one of the right channel outputs and measure the voltage. This voltage should be 12.2V +/- 0.25V
3. Repeat for frequencies of 100Hz, 1KHz, 10KHz, 20KHz, and 30KHz.

LOAD TESTS

LEFT & RIGHT CHANNEL(s)

1. Set the output of the Audio sine wave generator to give an output of 750mV at a frequency of 1KHz. Connect the differential output to the input of the right channel. Connect an 8ohm resistive load capable of dissipating 1KW to one of the outputs of the right channel.
2. Using the oscilloscope, monitor the output and slowly increase the amplitude of the input signal. Note the point immediately before clipping occurs and measure the output voltage.
3. Use the table below and verify that the voltage is greater than that shown for this unit.
4. Reduce the input signal to 500mV. Remove the 8-ohm load and replace with one of 4-ohms.
5. Repeat point 2 with this new load connected.
6. Use the table below and verify that the voltage is greater than that shown for this unit.
7. Monitor the output signal and check that no "crossover" distortion exists.
8. Verify that the harmonic distortion of the output signal is no greater than 0.05% at full load.
9. Remove the load and repeat paragraphs 1 to 8 for all other channel output(s).

AUTOMATIC SHUT DOWN TEST

1. Ensure that no input signals are connected to the amplifier.
2. Measure the DC offset of each output channel. Verify the voltage is between 12mV and 50mV. (This is an intentional value designed to provide negative current flow into the power supply if a short circuit occurs, thereby affording protection to the amplifier and load).
2. Connect a pair of 4mm plugs to one speaker output channel and short together. Verify that the amplifier POWER LED changes colour from green through yellow to red
3. Remove the short-circuit, release the power button, wait at least 30 seconds before re-applying power. The unit should power-up as normal.

Chord SPA range output voltage clip level under load conditions.

	SPA608	SPA612	SPA1032	SPA1232	SPA1424
Load Voltage into 8Ω load.	>32v	>44v	>44v	>44v	>60v
Load Voltage into 4Ω load.	>27v	>40v	>40v	>40v	>52v



Chord Professional Systems

TECHNICAL INFORMATION

	SPA608	SPA612	SPA1032	SPA1232	SPA2232	SPA1424
OUTPUT POWER into 8Ω Continuous	120W rms	350W rms	330W rms	330W rms	480W rms	550W rms
OUTPUT POWER into 4Ω Continuous	170W rms	550W rms	350W rms	550W rms	750W rms	950W rms
OUTPUT POWER into 2Ω Continuous	200W rms	680W rms	500W rms	680W rms	850W rms	1400W rms
FREQUENCY RESPONSE	ALL UNITS -1dB, 0.2Hz to 44KHz. -3dB, 0.1Hz to 77KHz.					
SIGNAL TO NOISE RATIO	ALL UNITS BETTER THAN -103dB. 'A' WEIGHTED TWO-THIRDS POWER.					
HARMONIC DISTORTION (THD+N)	ALL UNITS BETTER THAN -75dB					
CHANNEL SEPARATION	-95dB	N/A	-95dB	-95dB	-95dB	N/A
BALANCED XLR INPUTS Inverting	2	1	2	2	2	1
Non-Inverting	0	1	0	0	0	1
INPUT IMPEDANCE KΩ	100	100	100	100	100	100
INPUT CAPACITANCE pF	22	22	22	22	22	22
OUTPUT IMPEDANCE Ω	0.02	0.02	0.02	0.02	0.02	0.02
OUTPUT INDUCTANCE mH	2.6	2.6	2.6	2.6	2.6	2.6
NUMBER OF 4mm BINDING POSTS	8	4	8	8	8	4
OUTPUT SLEW RATE V / μS	70	70	70	70	70	70
VOLTAGE GAIN dB	27	27	27	27	27	27
STABILITY	UC	UC	UC	UC	UC	UC
CLIP INDICATION	X	X	√	√	√	√
SIGNAL DETECT INDICATION	X	X	X	√	√	X
TWIN COOLING FANS FITTED	X	X	√	√	√	√
DIMENSIONS (mm) W x D x H	483 x 354 x 2U		483 x 354 x 3U			
WEIGHT Kg	9	9	13	13	13	13
WARRANTY Years	5	5	5	5	5	5
NUMBER OF 300W OUTPUT DEVICES	8	12	32	32	32	24
AMPLIFIER CLASS	A/B Slide	A/B Slide	A/B Slide	A/B Slide	A/B Slide	A/B Slide
PROTECTION	DC / SC	DC / SC	DC / SC	DC / SC	DC / SC	DC / SC

Key;

UC – Unconditional.

A/B Slide – Class A/B Sliding Bias.

DC/SC – DC level shift protected, Short circuit protected.

If you have any service or technical query, please contact:
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