Extron NetPA Ultra Series Amplifier

SPECIAL PRINT from Professional System, Issue 01/2021
Extron NetPA Ultra Series Amplifier with DSP System and Dante Interface

With the new NetPA-Ultra amplifier models, Extron now also offers a compact 9.5” Ultra Series amplifier with integrated DSP and Dante interface. We tested the four-channel NetPA U 1004 for Low-Z operation with 4x 100 W at 8 Ω or 4 Ω loads.

Text, measurements & pictures: Anselm Goertz

required for optimal speaker output. Another aspect that
is becoming more and more important for users is the
option of networking via Ethernet, so that all devices can
be set and monitored from a central point without direct
access to the hardware. Since the audio source signals are
usually not only local, but include a selection from many
sources, the next step towards audio transmission via the
network is a logical step. The Extron NetPA amplifiers
with DSP and Dante interface offer all of this. The
combination of NetPA technology with the Ultra amplifier
series is new. The new Ultra Series Amplifiers were
presented at the beginning of last year and initially
appeared as XPA Ultra models without DSP and network
interface. With the NetPA Ultra series, Extron now offers
combination of both.

NetPA Ultra series

A comprehensive test report of the Ultra Series Amplifiers
was already published in the Professional System, issue
1/2020. The report ended with the conclusion that a
NetPA version of the Ultra amplifier would be desirable
for many applications. As far as the actual amplifier
technology is concerned, it remains on what is already
known from the Ultra series. All amplifiers in the NetPA
Ultra Series are 9.5” Devices with 1 U height and...
The focus of this article is the new integrated DSP with its extensive functions, as the power amplifiers and their power supplies were already covered in detail in the test report of the XPA Ultra Series (issue 1/2020). The Extron DSP Configurator Software is the user interface for full control and management of the DSP functions. The DSP is accessed via the Ethernet interface, which also provides the interface for the Dante network. The NetPA U 1004 appears in the software with its block diagram (Fig. 01). Here you find four analog and four Dante-based inputs. The analog inputs feature a preamp with a wide gain range from -18 to +60 dB. In each input path a filter bank with three filters, a compressor/limiter and a ducker/adaptive gain function, as well as a digital gain, is available. The output side looks similar with eight Channels. Four are directly connected to the internal power amplifiers. The other four are routed to the analog line level outputs and in parallel to the four Dante-output channels onto the network. The processing on the outputs consists of gain, delay, a compressor/limiter and a filter bank with nine filters. The inputs and outputs linked together via an 8x8 bus matrix mixer. The DSP offers much more than just simple controller functions for the connected loudspeakers. Additional conventional power amplifiers can be controlled via the analog outputs. The inputs can be used for microphone signals routed to the internal amplifier or to the Dante network. Let’s take a simple example with a small conference center with several rooms and a NetPA Ultra amplifier in every room. The Amplifiers can feed the speakers and additional delay lines in each room. The analog inputs take all signals meant for playback. If an additional active subwoofer is used, the signal can be filtered and routed through the analog line level output. At the same time, signals from a central source or the other rooms can be sent over the Dante network. With just a few, easy to configure devices it’s possible to build a complete functional conferencing system.

The Dante interface in the NetPA Ultra amplifier utilizes the UltimoX4 chip from Audinate, with four inputs and outputs to the Dante network. Figure 02 shows a simple example of how the NetPA Ultra amplifier is connected to the APx555 measurement system with the Dante controller software. The measuring system communicates with the PC through USB. The PC is equipped with the Dante Virtual Soundcard (DVS) to access the Dante network.

### ADC, preamp and DAC

The four analog inputs of the NetPA U 1004 are symmetrical and equipped with preamplifiers that also allow the connection of microphones. In the setting with 0 dB gain, the input sensitivity for 0 dBFS full scale on the digital side is +22 dBu at the analog input. The gain can be increased in 1 dB steps up to a maximum of +60 dB, where full scale is already achieved at -38 dBu. This is more than sufficient for most microphones. The gain setting allows even values below 0 dB down to –18 dB, where the sensitivity is then at least mathematically +40 dBu. It should be noted, however, that the –18 dB setting is –118.5 dBu.

<table>
<thead>
<tr>
<th>Gain</th>
<th>0 dBFS</th>
<th>Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>+22 dBu</td>
<td>-104</td>
</tr>
<tr>
<td>20</td>
<td>+2 dBu</td>
<td>-104</td>
</tr>
<tr>
<td>40</td>
<td>-38 dBu</td>
<td>-90.5</td>
</tr>
<tr>
<td>60</td>
<td>-38 dBu</td>
<td>-80.5</td>
</tr>
</tbody>
</table>

**Figure 01** Gain setting for the inputs with values from 18 dB to +60 dB. At 0 dB, 0 dBFS corresponds to a level of +22 dBu on the digital side.
was set for the measurement. The output level is +22 dBu. A digital gain of 3 dB for the DAC with output stage. The maximum level is +22 dBu and is sufficient for all following stages in the NetPA U 1004 and are not available. Four of them feed directly the four output paths (2x analog and 4x via Dante) have passed through the internal distributed noise.

After the maximum of eight input signals (4x analog and 4x via Dante) have passed through the internal processing and the mix matrix, eight output paths are available. Nine freely configurable filters are also more than 100 dB below the fundamental frequencies, approaching half the sampling rate at 24 kHz, leads to a compression of the curve. This effect is created by transforming the filter function from the analog world with a mathematically infinite frequency axis into the digital world, where the frequency axis ends at half the sampling rate. The compression of the filter curve does not mean a deterioration in the audio quality, but only a deviation from the known analog filter function. To avoid that, you would have to use a higher sampling rate such as 96 kHz or curve would be corrected by calculation. With mixing consoles in music production, both methods have a certain relevance. In the case of the NetPA Ultra amplifier it is not important since typically the filter is set once and never touched again.

The range of adjustments for the Bell filter is shown in Figure 11. The Filter Q can be adjusted from 0.70 to 15, which allows all uses, from a wide band adaptation to sharp notches. The upper part in Figure 11 shows a Bell filter with 12 dB gain and a Q factor of 1, for various frequencies varied from 20 Hz to 20 kHz. Up to 10 kHz, the filter curve remains unchanged. At even higher frequencies, approaching half the sampling rate at 24 kHz, leads to a compression of the curve. This effect is created by transforming the filter function from the analog world with a mathematically infinite frequency axis into the digital world, where the frequency axis ends at half the sampling rate. The compression of the filter curve does not mean a deterioration in the audio quality, but only a deviation from the known analog filter function. To avoid that, you would have to use a higher sampling rate such as 96 kHz or curve would be corrected by calculation. With mixing consoles in music production, both methods have a certain relevance. In the case of the NetPA Ultra amplifier it is not important since typically the filter is set once and never touched again.

to distortion, the Signal-to-Noise ratio (S/N) is an important aspect for the microphone input. For the preamp, including the needed ADCs, for the input it is determined by terminating the input with a resistor (here 200 Ω) and then measuring the Noise level at the analog output stage, comparable measurement criteria are available on the Dante network. Both methods have a certain relevance. In the case of the NetPA Ultra amplifier it is not important since typically the filter is set once and never touched again.
The high and low pass filter (Fig. 12) are limited to Butterworth and Linkwitz-Riley functions with 6 to 12 dB/Oct slope. This is sufficient. Only for the separation of subwoofers you might wish for an even steeper filter with 24 dB/Oct. Those who are familiar with filters can build this using two 12 dB/Oct filters. The corner frequencies can be adjusted freely up between 20 kHz and 2.5 kHz.

The shelving filters (Fig. 13) are often used as simple tone controls, which also explains the naming as treble and bass. Typically, such filters would be placed on the user interface, where the user can quickly and easily adjust something if the music is too thin, or the speaker sounds too dull. The type of shelf-filter with 6 or 12 dB/Oct slope and which frequencies are suitable should be tested on site during commissioning. The gain is a maximum of +/- 12 dB. The set frequency is defined at the point where half gain in dB is reached.

Dynamics processors

Dynamic functions in the signal path play a significant role in all systems where signals are played or spoken live, when it is not always possible to predict how loud a signal will be.

The microphone on a lecturer sometimes captures sound with a low level from a distance of half a meter and outside the main axis and sometimes in a loud voice from a short distance. This can result in level differences of 20 dB or more. You do not want to expose the audience to these harsh jumps in signal level. To catch such extremes, a compressor is placed in the input path, which starts to reduce the gain from a certain threshold to a maximum gain of ±12 dB for frequencies from 20 Hz to 20 kHz and a Q from 0.7 to 15. The upper curves show a compression of the audio curve at high frequencies close to the sampling rate.

Function of the limiter

Class-D amplifiers and Everlast power supplies

Details about the power amplifiers and the special Everlast power supplies have already been explained in detail in the test report in the 1/2020 issue of PROFESSIONAL SYSTEM.

What follows is only a brief summary. The output stage channels are based on a special Class D driver module that controls two FETs in the power stage. The driver outputs are completely isolated from the rest of the module and can directly control power levels with a very high supply voltage. The structure is therefore simple and flexible. You need a modulator that generates the PWM signal from the audio signal, the aforementioned driver module and two more power FETs for the output stage. The voltage range you want to cover for the output can then be set via the supply voltage from the switched-mode power supply. To make the output signal of the class D output stage usable, a low-pass filter is required at the output, which acts as a reconstruction filter and filters out the RF components from the signal. The audio signal is then available again after the low-pass filter. The function is comparable to that of a DA converter in this case for high output power. For the low-pass filter, Extron uses its own patented circuit, called CDRS, which suppresses RF components in the signal particularly well and reduces EMC exposed to the environment.

The power supplies for the Ultra models, like most other Extron devices and external power supplies, use an in-house development called Everlast. The name ‘Everlast’ is an allusion to the topic of operational safety. Since the power supply units play a vital role in all electronic devices, a failure is usually not without profound consequences. For tough 24/7 use, Extron did not want to rely on the widespread standard power supplies, so they developed their own Everlast power supplies.

Channel control

Class-D amplifiers and Everlast power supplies

Details about the power amplifiers and the special Everlast power supplies have already been explained in detail in the test report in the 1/2020 issue of PROFESSIONAL SYSTEM.

What follows is only a brief summary. The output stage channels are based on a special Class D driver module that controls two FETs in the power stage. The driver outputs are completely isolated from the rest of the module and can directly control power levels with a very high supply voltage. The structure is therefore simple and flexible. You need a modulator that generates the PWM signal from the audio signal, the aforementioned driver module and two more power FETs for the output stage. The voltage range you want to cover for the output can then be set via the supply voltage from the switched-mode power supply. To make the output signal of the class D output stage usable, a low-pass filter is required at the output, which acts as a reconstruction filter and filters out the RF components from the signal. The audio signal is then available again after the low-pass filter. The function is comparable to that of a DA converter in this case for high output power. For the low-pass filter, Extron uses its own patented circuit, called CDRS, which suppresses RF components in the signal particularly well and reduces EMC exposed to the environment.

The power supplies for the Ultra models, like most other Extron devices and external power supplies, use an in-house development called Everlast. The name ‘Everlast’ is an allusion to the topic of operational safety. Since the power supply units play a vital role in all electronic devices, a failure is usually not without profound consequences. For tough 24/7 use, Extron did not want to rely on the widespread standard power supplies, so they developed their own Everlast power supplies.

Measured values output stages

In the test series a year ago, the eight-channel models of the XPA Ultra series with 8x35 W and the two-channel models with 2x100 W were tested and measured. The version with 4x100 W was not represented in the test field at the time. Therefore, two of the most important measurement results for the power amplifier are presented here, although the focus of this test is on the NetPA DSP module.

Figure 18 shows the distortion values as a function of the output power measured at frequencies of 100 Hz, 1 kHz, and 6.3 kHz for a 4x8 Ω load on the output stage. The clip limit is independent of the frequency exactly at 100 W. In summary, the measurement shows that the distortion increases depending on the frequency, so that values from -80 to -70 dB are achieved at 100 Hz and from -70 dB to ±1 kHz -65 dB. At 6.3 kHz, the THD values are sometimes -50 dB and a little higher. The specification from the data sheet with 0.1% (-60 dB) THD at 1 kHz 3 dB under full modulation (50 W) is exceeded by a few dB. The fluctuating and somewhat higher over the 6.3 kHz measurement is typical of class D amplifiers, likely caused by the PWM modulation.

The power measurement of the NetPA U 1004...
was carried out for a load of 4x 4 Ω and 4x 8 Ω. Since the results of the power values were similar, we only show the once for 4x 8Ω in Figure 19. A 2 Ω operation is not intended.

**Conclusion**

With the NetPA models Extron is expanding its Ultra-amplifier series by a total of eight amplifiers. The two basic models NetPA U 1002 and NetPA U 1004 with 2x 100 W and 4x 100 W output power, are available in a Low-Z version or for 70V or 100V systems. Recently added are the two models NetPA U 2002 SB and NetPA U 8001 SB with 2x 200 W and 1x 800 W for low-Z operation. The difference between the NetPA Ultra Series and the previous XPA Ultra Series is the addition of an integrated DSP and Dante connectivity. The compact devices are much more than just amplifiers. The NetPA Ultra has four analog inputs including microphone preamps and an additional four analog line-level outputs, Dante channels and Power amplifiers connected via a mix matrix and plenty of DSP functions. With this small 9.5 inch device you have all equipment needed for a small Public address system including networking to other Devices, rooms or control centers. With the already known advantages of the Ultra Series models, such as low power consumption, good protection circuits, passive cooling, and a completely closed and compact enclosure, the new NetPA Ultra Ultra Series amplifiers are ideal for all kinds of small and decentralized AV installations.

---

**Distortion values as a function of performance**

Figure 18: Distortion values (THD + N) for channels 1 (bl) and 2 (rt) depending on the power [x-axis] for a load of 4x 8 Ω measured at 100 Hz (dashed), at 1 kHz (solid line) and 6.3 kHz (dotted).

**Power values for different signal types**

Figure 19: Power values of the NetPA U 1004 at 8 Ω per channel with simultaneous loading of all channels. Values for different types of signals.

---

Industry-Leading Amplifiers Now with Dante

With the NetPA® Ultra amplifiers, you get all the advantages of our award winning XPA Ultra amplifiers combined with the power of Dante network audio distribution. Dante connectivity with DDM and AES67 support, makes it easy to distribute audio from a centralized location to decentralized remote amplifiers throughout a facility, building, or campus using standard network hardware. These ENERGY STAR qualified amplifiers also offer integrated DSP, allowing a single device to function as a complete audio system endpoint. NetPA Ultra power amplifiers provide system scalability, easier installation, and simplified wiring, while meeting the stringent quality requirements of professional audio installations.

- Receives audio from the Dante audio network and from analog mic/line level inputs
- Integrated Mix Matrix with DSP
- Analog line outputs provide convenient connection to additional audio equipment
- ENERGY STAR qualified amplifiers with two or four channels
- 100 watts rms output power per channel at 8 ohms, 4 ohms, or 70/100V
- Professional grade signal-to-noise and THD+N performance
- Convection cooled, fanless operation
- Defeatable auto-standby with fast wake up
- Single and dual rack mount hardware included

---

**Extron DSP Configurator Software**

An integrated matrix with essential DSP allows any input to be mixed to any output, with gain adjustments, filters, dynamics, and delay.
The **DMP 128 Plus Series** is the next generation of Digital Matrix Processors featuring Extron ProDSP™ 64-bit floating point technology. The DMP 128 Plus Series are equipped with 12 analog mic/line inputs, eight analog outputs, up to four channels of digital audio input and output via USB, up to eight audio file players, an ACP bus for audio control panels, and new configurable macros. DMP 128 Plus Series processors can be used anywhere from a credenza-based system to a large multi-rack system, and even in a large, complex, decentralized multi-building system.

**Features:**
- All models include a USB Audio interface, providing up to four channels of digital audio sends and returns
- Each of the VoIP lines can support generic Session Initiated Protocol – SIP connectivity, V models only
- Twelve channels of AEC - acoustic echo cancellation, C models only
- Dante audio networking provides a wide range of expansion capabilities, AT Models only
- Eight Aux inputs and outputs can be individually configured as an audio file player, USB Audio, or in V models, VoIP
- Extensive mix matrixing in every DMP 128 Plus allows all inputs to be discretely routed to any or all inputs
- Macros allow the sequencing of commands that can be sent to the local device or external devices via the LAN port

**Audio Control Panels**
The ACP Series of configurable audio control panels interface directly with the DMP 128 Plus audio processors to provide selectable volume and mute for mixing and zone control, plus preset or macro recall for room configuration.