Grimm Audio CC2 Central Clock User Manual

Contents

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Product Information

Product Name	CC2 Clock
Description	A reliable conductor that enhances detail, naturalness, and imaging in digital systems.
Applications	The CC2 can be used in a wide variety of applications such as studio recording, live sound, and home audio environments.
Features	– Provides detailed, natural, and high-quality audio reproduction – Enhances imaging and clarity in digital systems – Affordable and reliable

Introduction

Thank you for selecting the Grimm Audio CC2 Central Clock for your production environment. This product features an ultra low jitter clock oscillator with 2 word clock outputs. It embodies our company philosophy of providing the most transparent signal chain possible, enabling you to achieve the best possible results sonically and artistically. Large parts of the CC2 circuitry, like the oscillator and its power supplies, use a discrete design. Because of this, a CC2 has more than 200 components. After assembly, extensive tests and an individual jitter measurement are carried out.

The CC2 can be used in a wide variety of applications such as:

- House Sync generation in audio studios. Two outputs offer enough flexibility for most modern setups. The extremely low jitter of the CC2 clock outputs maximises the sound recording and playback quality potential of the devices connected.
- Clock stability improvement, and hence improved sound, of digital live audio systems. By slaving your main stage box to a CC2, the system sound quality will likely improve.
- Improvement of your home audio system with word clock equipped devices. This manual describes how to set up the CC2 in your studio, live sound or home environment as well as important tips on how to get the best performance from the CC2. In addition, some background information on the unit’s operation is provided. We hope this investment will bring you many years of creative enjoyment and help you achieve your goals.

Important Safety Instructions

Please follow these precautions when using this product:

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Dangerous voltage is inside this apparatus. The opening is only allowed by qualified service personnel.
6. Verify line voltage before use.
7. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. When the provided plug does not fit into your outlet, consult an electrician for the replacement of the obsolete outlet.

8. Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
9. Unplug this apparatus during lightning storms or when unused for long periods of time.
10. Do not use this apparatus near water.
11. Do not use this apparatus outside.
12. Do not expose the apparatus to dripping or splashing. Do not place objects filled with liquids (flower vases, drink cans, coffee cups, etc) on the apparatus.
13. Clean only with a dry, soft, non-fluffy cloth. Do not spray any liquid cleaner onto the cabinet, as this may lead to dangerous shocks. Do not spray any liquid cleaner onto the faceplate, as this may damage the front panel.
14. Install in accordance with the manufacturer's instructions.
15. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat. Avoid exposure to direct sunlight.
16. Use only attachments or accessories specified by the manufacturer.
17. Use only with a cart, stand, bracket, or table designed for use with professional audio or music equipment. In any installation, make sure that injury or damage will not result from cables pulling on the apparatus and its mounting. If a cart is used, use precaution when moving the cart/apparatus combination to avoid injury from tip-over.
18. This unit runs slightly warm when operated normally. Operate in a normal ventilated area. If this product will be installed in a rack, make certain there is sufficient air movement within the rack.
19. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as when the power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
20. **WARNING**: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.

Product Usage Instructions

1. Read the entire user manual before operating the CC2 Clock.
2. Ensure that you understand the safety instructions mentioned in the manual.
3. Install the CC2 Clock according to the manufacturer's instructions.
4. Make signal connections as per the guidelines provided in the manual.
5. Power on the CC2 Clock and follow the operation instructions for optimal performance.
6. If needed, refer to the section explaining jitter for a better understanding of the unit's operation.
7. For detailed specifications of the CC2 Clock, refer to the specifications section in the manual.
8. Make sure to read and understand the Grimm Audio Limited Warranty information.

Installing

Unpacking and Inspection

Your CC2 was carefully packed at the factory and the packaging it came in was designed to protect it from the trials and tribulations of shipping. Keep the box and all packing materials, so that in the unlikely event that you need to return the CC2 for servicing, you can do so safely.

Mounting the CC2

The CC2 is available in two versions:

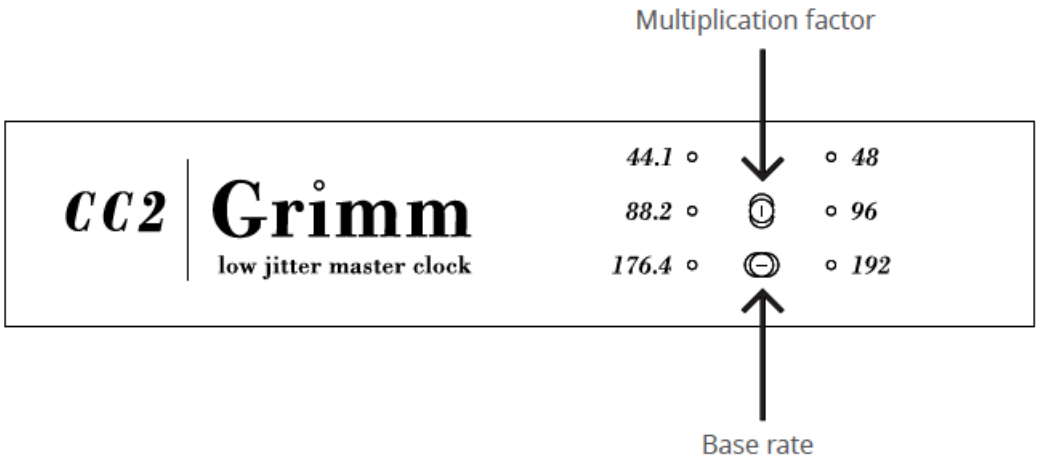
- a small and compact unit for stand alone use.
- a standard rack unit with 19” front.

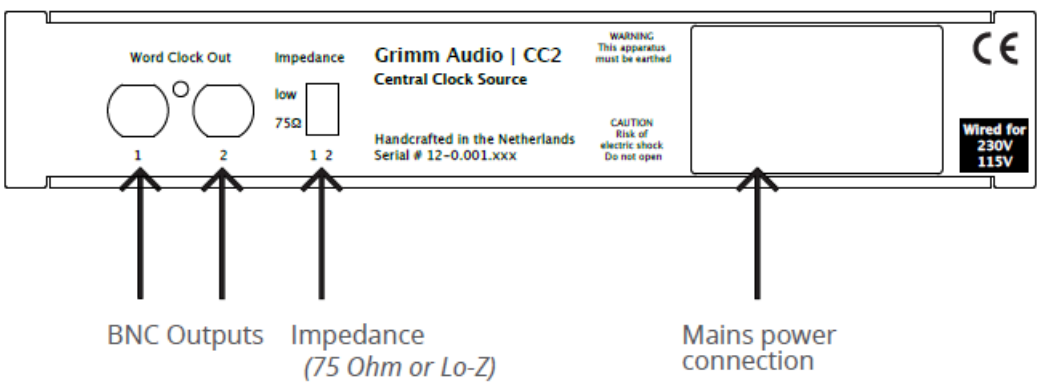
  The CC2 does not produce strong RF fields nor is susceptible to them. You can position it near other digital gear such as computers and disk recorders without worry. In general it is a good idea to keep some distance between monitors (LCD and CRT) and audio cables because of risk of induced low level noise due to stray magnetic fields. Grimm Audio products have a real wooden face plate that provides a beautiful and vivid appearance. The CC2 front panel is made of Padouk. The panel is finished with an environmentally friendly oil. To maintain the outstanding looks, one is advised to take some precautions:
- Do not place the CC2 in very dry environments.
- Do not use chemical or alcohol based cleaner on the wood.
- Avoid exposure to direct sun light, since the padouk wood is susceptible to discolor in UV light.

AC Power Hookup

The CC2 has a linear power supply that needs to be factory set for your local line voltage (115V or 230V +/ -10%). Make sure to check the line voltage at the back near the IEC cable entrance (‘wired for … V’) and verify if this complies with your local mains voltage. The CC2 is shipped with a proper mains cable. Grimm Audio cannot be held responsible for problems caused by using the CC2 with improper AC wiring or voltage. The CC2 does not have a power switch on the front panel; a convenient way to power down the unit is to use a power strip equipped with a switch or eventually power it down with the mains switch at the back.

Signal Connections





Operation

The CC2 is a high performance master clock, it has no slave option. Switches on the front and back offer adjustments to the needs of your system and project.

On the front

- The bottom (horizontal) toggle switch selects a 44.1 or 48 kHz base rate.
- The top (vertical) toggle switch has three positions and sets the multiplication factor of the base rate to 1, 2 or 4.

  These switches control both BNC outputs simultaneously. LEDs on the front indicate the current sample rate setting.

On the back

Two miniature switches select between 75 Ohm or Low output impedance per BNC output.

Output impedance

Word sync connections are usually 5V square waves transmitted using 75 ohm (video) coax cables. Although the word clock frequency itself is relatively low, the transitions are steep. Taken as a whole, word sync is a wideband signal, usually necessitating characteristic termination at least at one end of the cable. Better still is series termination on the transmit end and parallel termination on the receiving end. This minimises reflections even when the cable impedance is not exactly matched. Double termination like this produces a 6dB loss, resulting in an effective 2.7V signal. All Grimm Audio products are designed to work in this manner. Unfortunately there is no standard defined for word sync connections. As a result, implementations vary across various makes. Outputs may be series terminated or low impedance, DC or AC coupled. Inputs may be parallel terminated or high impedance. This yields to 8 permutations, all of them encountered in the field. To make things worse, we have reports from customers that in some cases devices do lock to a word clock signal when terminated, but their sound quality is improved when unterminated. So our advice is to experiment with it yourself on your own device. The output impedance of the CC2's may need to be set "low" in some cases. For instance, a parallel-terminated input expecting a 4V input signal will only work with the CC2's output impedance set low. A fair number of products were found to have parallel terminated input but stop working around 2.5V which is why the CC2 puts out a slightly higher-than-normal voltage in order to allow correct operation in the factory preset mode. Nevertheless, some equipment will only respond correctly when the output impedance switch is set to low.

Connection

The CC2 has two word clock outputs. Each device connected to the CC2 should be set to slave to word clock. The preferred system wiring is 'star distribution' where each output of the CC2 connects to one device. Daisy chain connections using T-junctions should be
avoided where possible. The latter will most likely fail because of the lack of standardisation of termination impedance and signal levels. In case you need more word clock outputs, consider to buy our CC1 clock distributor, which has 16 outputs. Use 75 ohm coaxial cables with a low transfer impedance. Since word clock is an unbalanced connection, noise currents generated by earth loops will flow through the BNC cables and any series impedance in the connection can cause interference. The CC2 has a low-impedance reference plane at the rear, insuring that it will never be affected by circulating currents. By all means, never defeat the safety earth connection of any device that is designed to have an earth connection. Lifting grounds may produce a lethal shock hazard and will likely lead to unwanted high currents through coax shields.

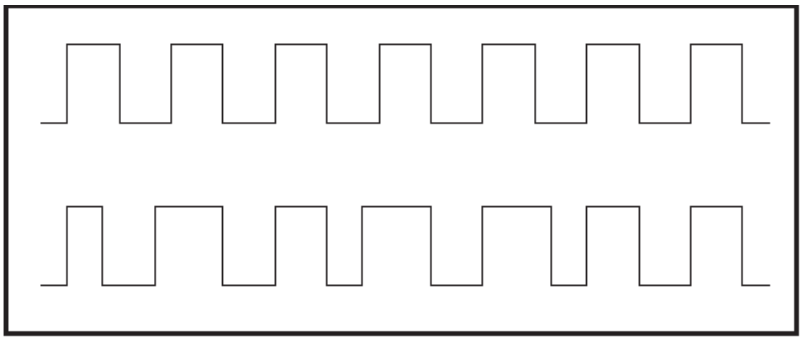
Hints

- Select decent quality 75 Ohm coax cables and certainly do not skimp on the quality of the connectors.

- Make cables no longer than necessary.
- Cables add propagation delay. It is exceedingly rare for differences in clock phase to affect the interoperability of connected audio equipment, but if it happens, using equal length cables throughout helps.
- Disconnect unused cables.

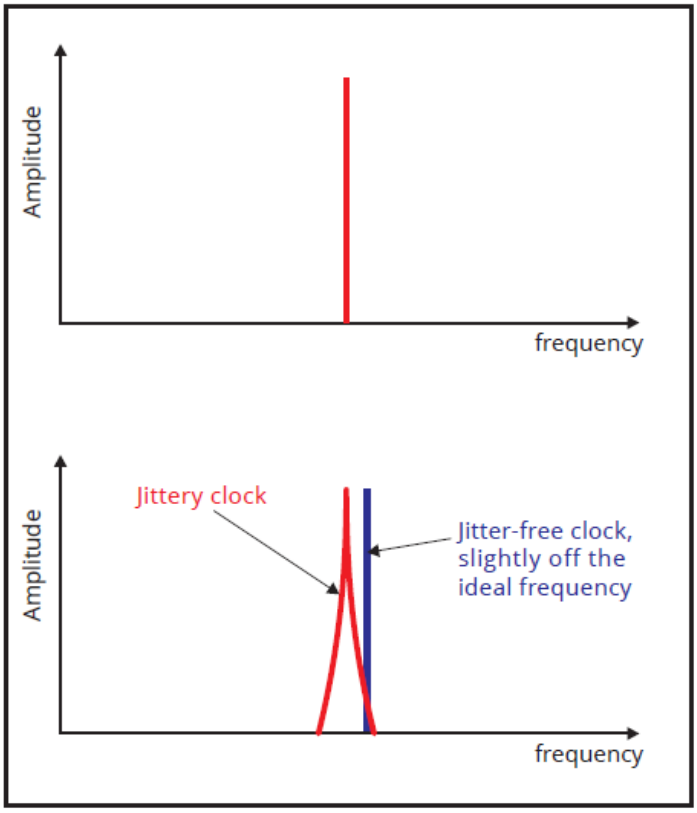
Jitter Explained

Jitter is an instability in the timing of a clock signal. Ideally the rising or falling edges of a clock signal are all separated by exactly the same amount of time. In reality, the timing is more uncertain. The graph below shows the time-domain view of the problem.



A stable and a jittery clock signal

We can also look at the problem spectrally. An ideal clock has only a single frequency components (and harmonics). All energy is concentrated on an infinitely narrow frequency band, see the top picture below. When jitter is present, side bands occur. Some spectral energy is located away from the clock. The faster the timing chatters, the further away from the main frequency you'll find energy.

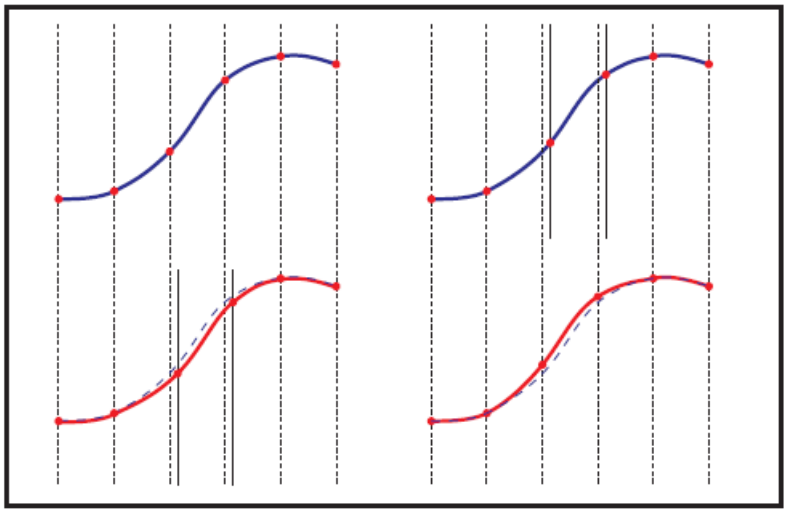


Spectra of clock signals

The red curve in the bottom graph shows only random jitter. Sometimes jitter is periodical and then you wouldn't

see a smooth slope but sharp peaks. An important note is that frequency accuracy has absolutely nothing to do with jitter at all. The red graph shows a jittery clock with an exactly correct frequency, say 44100.0000000Hz, the blue one shows a clock that's somewhat off but otherwise brilliantly stable. A frequency error can be annoying from a practical perspective, but as far as signal quality is concerned you're better off with a stable clock at an inexact frequency.

Jitter is not a problem in fully digital processes. As long as it isn't so large that a processor can't distinguish the previous bit from the next, all-digital processes are completely indifferent about jitter. The problem occurs when you go from the analogue domain into the digital domain or back. Digital audio presumes uniform sampling. That way, given a string of numbers and knowledge of the sampling interval, you can perfectly reconstruct a sampled signal. With jitter that theory falls apart.



Jitter in AD (top) and DA (bottom) converters

Imagine the signal on top. The AD converter samples it at neatly uniform intervals. The DA converter reconstructs the correct values but it gets the timing wrong. The difference between the red and blue curve shows the error. Or take the converse: the DAC is fine but the ADC took samples at the wrong time. The effect is much the same. What's worse in this case is that the numbers we've recorded are now wrong. In the previous case we could select a better DAC, but with a jittery ADC the game is over.

Specifications

- Output impedance 75 Ohm or 25 Ohm ('low'), switchable via micro-switches on the back.
- DC coupled output.
- Output voltage 75 Ohm mode:
- 75 Ohm terminated: 2.7 Vpp
    - unterminated: 5.5 Vpp
    - Output voltage 25 ohm mode:
    - 75 Ohm terminated: 4 Vpp
    - unterminated: 5.5 Vpp
- Internal intrinsic clock jitter <0.6 ps RMS (> 10 Hz).
- Clock frequency master mode: 44.1 or 48 kHz ± 25 PPM, -5 +50 °C.
- Max ambient temperature for operation: 50 °C.
- Life expectancy power supply electrolytics > 45.000hr
- Power supply voltage range +/- 20%
- Fuses:

    - 115 V: fuse 100 mA slow blow
    - 230 V: fuse 50 mA slow blow
- Weight: 1.7 kg
- Dimensions: 400 x 40 x 160 mm.
- Power consumption: 5 W.
- Wood type of front: Padauk.

Grimm Audio Limited Warranty

Grimm Audio BV (“Grimm Audio”) warrants this product to be free of defects in material and workmanship for a period of two (2) years for parts and for a period of two (2) years for labor from the date of original purchase. This warranty is linked to the serial number of the device and can be transferred to second hand owners if they can show their purchase bill. The original owner can extend his limited warranty to a period of five (5) years for labor and parts if he sends the original warranty card that came with the unit to the Grimm Audio factory. The extended warranty is enforcable only by the original retail purchaser and cannot be transferred or assigned.

During the warranty period Grimm Audio shall, at its sole and absolute option, either repair or replace free of charge any product that proves to be defective on inspection by Grimm Audio or its authorized service representative. In all cases disputes concerning this warranty shall be resolved as prescribed by law. To obtain warranty service, the purchaser must first call or write Grimm Audio at the address and telephone number printed below to obtain instructions where to send the unit for service. All enquiries must be accompanied by a description of the problem. All authorized returns must be sent to Grimm Audio or an authorized Grimm Audio repair facility postage prepaid, insured and properly packaged. Proof of purchase must be presented in the form of a bill of sale or some other positive proof that the product is within the warranty period. Grimm Audio reserves the right to update any unit returned for repair. Grimm Audio reserves the right to change or improve design of the product at any time without prior notice.

This warranty does not cover claims for damage due to abuse, neglect, alteration or attempted repair by unauthorized personnel, and is limited to failures arising during normal use that are due to defects in material or workmanship in the product. In no event will Grimm Audio be liable for incidental, consequential, indirect or other damages resulting from the breach of any express or implied warranty, including, among other things, damage to property, damage based on inconvenience or on loss of use of the product, and, to the extent permitted by law, damages for personal injury.

General questions:info@grimmaudio.com
Support: https://www.grimmaudio.com/support-form/
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Documents / Resources

	Grimm Audio CC2 Central Clock [pdf] User Manual CC2 Central Clock, CC2, Central Clock, Clock

References

- Grimm Audio - Driven to Improve

- Contact Support - Grimm Audio