

# **SYNTHESIZER 1002**

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USER MANUAL



The PPG Synthesizer 1002 is part of the early history of synthesizer development in Germany and reflects Wolfgang Palm's technical expertise and spirit of experimentation. It laid the foundation for later innovations in the field of hybrid and digital synthesizers.

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# Important Safety Instructions

**IMPORTANT: ALWAYS FOLLOW BASIC SAFETY MEASURES WHEN OPERATING ELECTRICAL DEVICES.**

## **GENERAL USE AND CARE**

READ ALL INSTRUCTIONS BEFORE USING THE PRODUCT AND KEEP THEM FOR FUTURE REFERENCE.

### **Keep the product dry.**

Do not use it near water, such as a bathtub, sink, or swimming pool, or in a wet basement. Do not expose the product to rain or moisture.

### **Clean the product with a dry cloth only.**

Do not use liquids or cleaning agents.

### **Protect the power cord.**

Make sure it isn't walked on or pinched, especially at the plug and where it connects to the device.

### **Use only the manufacturer's accessories**

and the provided AC adapter. Ensure any external equipment is installed according to its own safety instructions.

### **Unplug the device**

during lightning storms or when it will be unused for a long time.

### **Prevent spills and objects from falling into the enclosure**

through any openings.

## **Installation and Environment**

### **Do not block ventilation openings.**

Install the product according to the manufacturer's instructions to ensure proper airflow.

### **Avoid heat sources.**

Do not install or operate the product near radiators, stoves, or other heat-producing devices. Avoid direct sunlight.

### **Store and operate the product within the specified temperature ranges.**

Use the PPG 1002 between 50°F and 95°F (10°C and 35°C). Store it between 32°F and 135°F (0°C and 57°C). Never leave the device in a closed vehicle on a hot day, as temperatures can exceed the safe limits.

## **Hearing Safety**

This product, when used with an amplifier and headphones or speakers, can produce high sound levels.

To prevent permanent hearing loss, do not operate the device at a high or uncomfortable volume for extended periods.

## **Service and Repairs**

Refer all servicing to qualified personnel.

Service is required if the device is damaged in any way, such as a damaged cord or plug, liquid or objects have fallen inside, or if the device has been dropped or exposed to rain/moisture.

## **Compliance and Interference**

This equipment has been tested and found to comply with the applicable limits for a Class B device. It is designed to provide reasonable protection against harmful interference in a residential installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for assistance.

**CAUTION:** Any changes or modifications to this product not expressly approved by the manufacturer could void your authority to operate the equipment.

# SYNTHESIZER

## 1002

In 1975, Wolfgang Palm made synthesizer history with the PPG 1002. Built in Germany at a time when innovation, craftsmanship, and bold ideas defined electronic music, the 1002 stood out as a unique alternative to international icons like the ARP Odyssey or the Minimoog – offering musicians in the German-speaking world a more accessible, yet truly distinctive instrument.

The early pre-production models already carried an air of mystery and exclusivity: rounded chassis, illuminated front panels, and integrated “Spring-Cords” for direct patching – features that set them apart and hinted at Palm’s visionary approach. In the later production versions, these details gave way to practical multi-switches, but the essence remained untouched: uncompromisingly analog, unmistakably individual, and full of character.

One of the most influential bands of the era, **Tangerine Dream**, embraced the PPG 1002 wholeheartedly. Their mastermind **Edgar Froese** used it extensively, both in the studio and on stage, shaping countless soundscapes that continue to inspire generations of electronic musicians.

The PPG 1002 was more than just a synthesizer. It was a promise – of a sound that still resonates today.

# NEW FEATURES

True to its roots, the original sound engine remains unchanged. But with thoughtful modifications, the PPG 1002 now offers even greater sonic depth and enhanced performance possibilities.

## **From Keyboard to Desktop – the new PPG 1002**

Originally conceived as a monophonic keyboard synthesizer, the PPG 1002 now takes on a new form: a compact desktop console unit.

This redesign brings several advantages:

**Space-saving & flexible** – The desktop format integrates seamlessly into modern studio setups without taking up the footprint of a full keyboard.

**Optimal ergonomics** – All knobs and switches are clearly laid out on the angled front panel, always within easy reach.

**Free to combine** – Instead of a fixed keyboard, the 1002 connects effortlessly to any preferred MIDI or CV/Gate controller, sequencer, or modular system.

**Focus on sound** – Your attention stays fully on the unique analog engine, without distraction from an attached keyboard.

The result: the unmistakable character of the original PPG, reborn in a more versatile and contemporary form.

## **Second analog oscillator extensions**

In the 1975 version, the second analog oscillator was very basic and offered only a sawtooth waveform.

In today's reissue, we have significantly expanded its capabilities: it now features switchable waveforms between sawtooth and square, as well as a sub-oscillator. The sub-oscillator can be smoothly blended with the main waveforms, creating a far broader and more powerful sonic palette.

On the PPG 1002, VCO2 can be synchronized to VCO1. Technically, this means:

- VCO2 "listens" to the reset signal from VCO1.
- Whenever VCO1 completes a cycle (i.e., its waveform returns to zero), VCO2 is also reset to zero.
- This happens regardless of VCO2's own frequency – VCO2 is forced to align its cycle with VCO1.

To allow modulation of the second VCO, pitch modulation via the filter envelope was added. In sync mode, this shifts the frequency spectrum, enabling very metallic sounds.

Rich overtones:

When VCO2 runs faster or slower than VCO1, complex, sharp waveforms are produced. This happens because VCO2 is abruptly "forced" to reset its natural waveform.

Modulatable timbre:

Changing VCO2's frequency produces aggressive, metallic, or hissing sounds.

Modulating the sync frequency (e.g., with Modulation Oscillators) can create lively, rhythmic textures that are otherwise hard to achieve.

Typical applications:

- Leads with bite or aggressive presence
- Effect-like pads or "resonance-like" sounds
- Experimental sequences and textures

### **AUDIO MIXER extensions**

The audio mixer now includes a ring modulator, which ring-modulates the signal from VCO1 and VCO2. A toggle switch allows you to select whether noise or ring modulation is heard as the sound source.

### **FILTER extensions**

The PPG 24 dB low-pass filter now opens up new expressive possibilities, allowing modulation through key velocity or an externally applied control voltage (CV). This lets the filter respond dynamically, giving your sounds more life, movement, and emotional depth.

### **External modulation options**

If you want to control the 1002 via CV, there are now expanded modulation possibilities. We've added an additional CV bus that acts directly on the filter cutoff, enabling, for example, modulation via velocity or other external sources.

### **MIDI**

We've added a straightforward yet powerful way to control the 1002 via MIDI. By integrating a MIDI-to-CV interface, you can trigger notes and simple modulations directly from your MIDI setup. While the MIDI functionality remains intentionally simple, the entire analog signal path is fully preserved, ensuring that all the warmth, character, and responsiveness of the original 1002 remain intact.

### **External Power Supply**

The PPG 1002 now comes with a universal external power supply (100–240 VAC, 50/60 Hz), which reduces weight and heat, while also enhancing the instrument's stability.

# GETTING STARTED

First, carefully remove your new PPG 1002 from its packaging. We recommend keeping the original packaging in case you ever need to transport or ship the instrument safely. Along with the synthesizer, the package includes this user manual, a power adapter, and the connection cable.

## SETUP & CONNECTIONS

Place the PPG 1002 on a stable surface, such as a table or keyboard stand, ensuring it is at a comfortable playing height. To get started, connect the PPG 1002 to a power source and an audio monitoring system, or listen through headphones.

### Power Supply

The PPG 1002 uses a universal power supply that supports AC sources from 100 to 240 volts at 50 or 60 Hz. The included power supply comes with a detachable IEC power cord.

- Connect the IEC power cord to the PPG 1002 power supply.
- Plug the power supply into the DIN socket on the **rear** of the PPG 1002.
- Connect the other end of the power cord to a suitable electrical outlet.
- Turn on the PPG 1002 using the POWER switch.



# CREATING SOUND

In analog synthesizers, each circuit has a specific function; each oscillator, filter, and envelope generator is a separate module. In the PPG 1002, these modules are connected internally via audio and control signals.

Audio signals are the sounds generated by the instrument's tone circuits.

Control signals change the behavior of these circuits by providing a continuously variable voltage, forming the basis of a voltage-controlled synthesizer.

Another type of control signal is the gate or trigger, which simply initiates an event. For example, pressing a key sends a control voltage to the oscillators to set the pitch, while simultaneously sending a gate signal to trigger the volume and filter envelopes.

Additional modulation connectors on the right side of the panel expand the PPG 1002's capabilities and allow it to interface with other voltage-controlled devices.

## **Audio Monitoring**

Connect the PPG 1002 to an instrument amplifier, powered speaker, or other monitoring system. Two 1/4" jack outputs are located on the right side of the panel:

**Output 1** is a line-level output suitable for connection to a mixer, recording system, or other audio equipment.

**Output 2** is also a line-level output and includes a headphone output, which can be adjusted using the Output 2 volume control.

- Turn off the monitoring system and set the PPG 1002's volume control fully counterclockwise.

- Connect the PPG 1002 to your audio monitoring system using the appropriate output.
- Turn on the PPG 1002.
- Set the volume control to approximately halfway.
- Turn on the monitoring system and adjust the levels to your desired listening volume.

**Note:** As the PPG 1002 is an analog instrument, allow it to **warm up for 5–10 minutes** before use to ensure optimal performance.

### **HEADPHONE MONITORING**

The PPG 1002 has a headphone output. Connect your headphones to the headphone jack and adjust the volume using the audio output 2 volume control.

# EXPLORING SOUNDS

If you're new to analog subtractive synthesis or the PPG 1002, here's a simple experiment to familiarize yourself with the key components of the sound generator and their functions. First, set up the front panel controls of the PPG 1002 as described:

## **1. Oscillator Controller:**

Tune to center, Glide to zero, Modulation to zero, Attenuator to zero.

## **2. Audio-Oscillator:**

Octave Range to +1, Waveform Mix to Sawtooth, Attenuator to zero

## **3. Audio/Subaudio-Oscillator:**

Octave Range to +2, Pict to zero, Waveform Mix to center, Sync Switch to off, Wave Switch to Sawtooth, Envelope Switch to off, Key CV Switch to on

## **4. Audio Mixer:**

Audio Oscillator to position 8, Audio/Sub. Oscil. to position 8, Noise to zero

## **5. Voltage Controlled Filter:**

Cutoff Frequency to position 4, Filter Charact. (Resonance) to position 6

## **6. Filter Controller:**

Amount Of Envelope to position 5, Modulation to zero, V/OCT-CV Switch to off, Velo-CV Switch to off, Attenuator to zero

## **7. Envelope Generator:**

Attacktime to zero, Kind Of Envelope to position right, Decaytime to position 6, Trigger Input Switch to position Gate

## **8. Voltage Controlled Amplifier:**

Decaytime to position 5, Velocity AMT to zero, Output Level 1 to position 5, Control Input Switch to position Envelope, Control Source Switch to position Filter

### **9. Input/Autput Connections:**

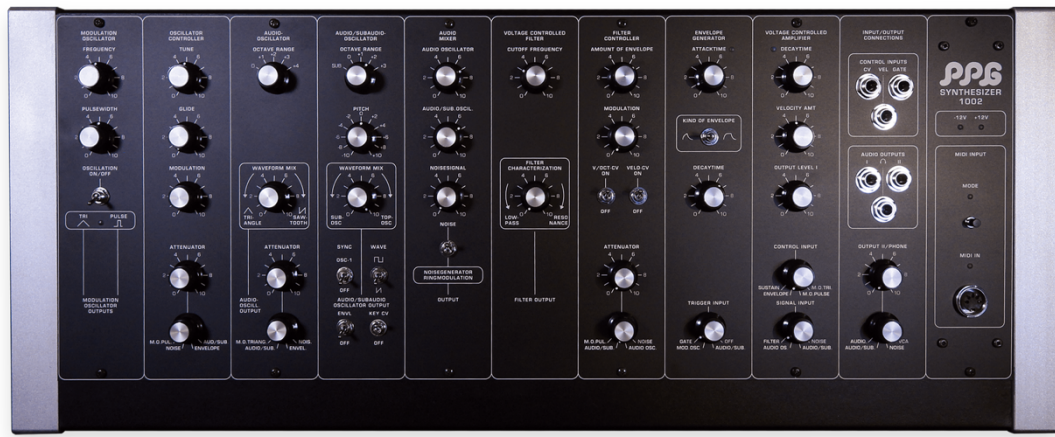
Use Audio Outputs 1/2 or Headphone, Adjust the headphone volume with the Output-2/Phone control, Source Switch to position VCA.

### **10. MIDI:**

If you want to use MIDI and the PPG 1002 is not responding on the correct MIDI channel, press the MIDI Learn button above the MIDI input jack while sending notes to the PPG 1002.

# FEATURES

The PPG 1002 is a standalone monophonic analog synthesizer and a direct ancestor of the PPG modular synthesizers.



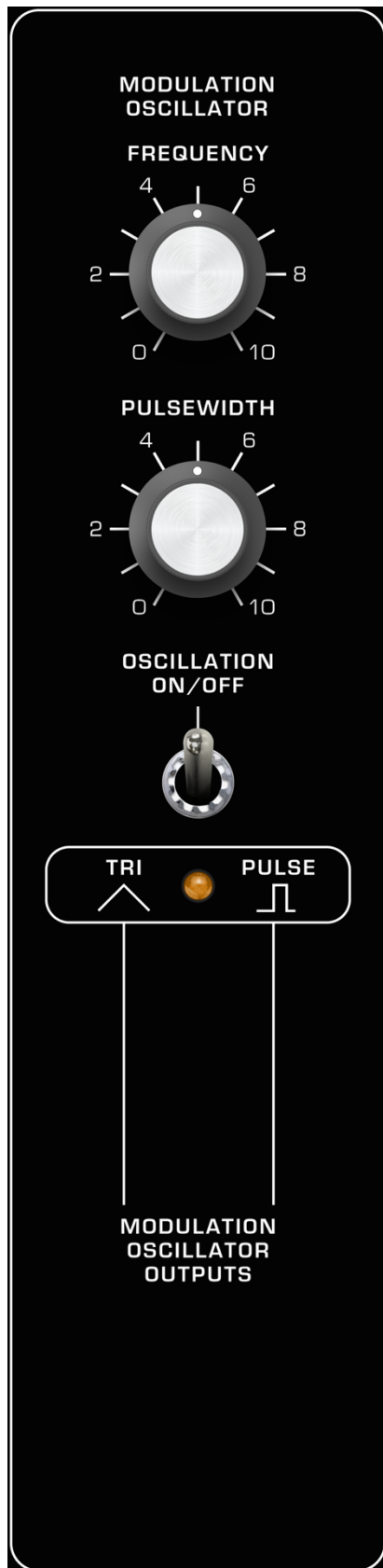
The main components of the synthesizer include:

- Modulation Oscillator (Low-Frequency Oscillator)
- Oscillator Controller
- Audio Oscillator (Oscillator 1)
- Audio/Subaudio Oscillator (Oscillator 2)
- Suboscillator
- Noise Generator
- Ringmodulator
- Audio Mixer
- Voltage Controlled Filter (24dB Lowpass)
- Filter Controller with Filter Envelope Generator
- Voltage Controlled Amplifier (VCA) with Amp Envelope Generator
- Two independent audio outputs
- MIDI and CV/Gate control

The front panel organizes these elements and controls by type CONTROLLER, OSCILLATORS, MIXER, FILTER, OUTPUT, etc—in an intuitive and efficient layout.

Each function is operated using dedicated knobs and switches. Like its modular successors, the PPG 1002 is made up of independent synthesizer circuits connected through audio paths and control lines.

Instead of patch cables, rotary switches are used to establish connections between these modules.



# MODULATION OSCILLATOR

The PPG 1002 is equipped with a dedicated Modulation Oscillator (LFO), designed to add movement, depth, and expression to your sound design.

It offers two classic modulation waveforms:

1. **Triangle** – bipolar, ideal for smooth, flowing modulations such as vibrato, filter sweeps, or gradual pitch variations.
2. **Pulse** – unipolar, perfect for sharper, rhythmic effects and stepped modulation patterns that bring energy and pulse into your sound.

The Modulation Oscillator includes a Frequency control to adjust the modulation rate, ranging from slow, evolving cycles to fast, tremolo-like motion.

A Pulse Width control shapes the square wave, allowing for subtle rhythmic nuances or more pronounced modulation effects.

For hands-on performance, a dedicated On/Off toggle switch gives you instant control over the modulation source.

By combining its two waveforms and shaping options, the Modulation Oscillator transforms static tones into evolving soundscapes – from gentle vibrato to bold, rhythmic pulses.



# OSCILLATOR CONTROLLER

The Oscillator Controller of the PPG 1002 is the central interface for shaping and modulating the two VCOs, balancing tuning precision with expressive modulation options.

- **Tune** (Tuning Control): Fine-tunes the oscillator pitch, ensuring perfect accuracy or deliberate detuning for creating warm, animated textures.
- **Glide** (Glissando Control): Enables smooth pitch transitions between notes, delivering the classic portamento effect for fluid, expressive lines.
- **Modulation** (Modulation Oscillator Depth Control): Sets the modulation depth of the Modulation Oscillators triangle waveform applied to the oscillators.
- **Attenuator**: Allows precise adjustment of modulation depth from an additional source, providing nuanced control for complex patches.
- **4-Position Selector Switch**: Expands the sonic palette by offering four distinct modulation sources:

- Modulation Oscillator Pulse for rhythmically precise, pulse-driven modulation,
- Noise for raw, unpredictable variations,
- Envelope for dynamic, time-based shaping,
- VCO 2 for oscillator cross-modulation and richer harmonic interactions.

# OSCILLATORS

At the core of every great analog synthesizer lie its oscillators – the true heartbeat of sound creation. The PPG 1002 is equipped with two authentically designed analog VCOs, delivering the raw power and warmth that define vintage synthesis. Each note controls both VCOs (Voltage-Controlled Oscillators) simultaneously. The waveform, octave, and pitch of each VCO can be set independently. This makes it possible to create multi-layered and harmonically complex sounds.



# AUDIO OSCILLATOR

The first voltage-controlled oscillator serves as the primary sound source of the instrument. It includes the following controls:

- **Octave Range Selector:** A 5-position rotary switch selects the oscillator's pitch range (0, +1, +2, +3, +4).
- **Waveform Mix Control:** Continuously blends between a triangle waveform and a sawtooth waveform.
- **Attenuator:** Adjusts the modulation depth applied from the selected modulation source.
- **4-Position Modulation Source Selector:** Determines the active modulation input for VCO 1. The available sources are:
  - **Modulation Oscillator Triangle**
  - **Audio/Sub-Oscillator (VCO 2)**
  - **Envelope Generator**
  - **Noise**

This configuration allows for both classic oscillator shaping and flexible modulation

routing.



# AUDIO/ SUBAUDIO OSCILLATOR

The second oscillator functions as both an audio oscillator and a subaudio modulation source. It combines the roles of a tone oscillator and a modulation oscillator, offering wide flexibility.

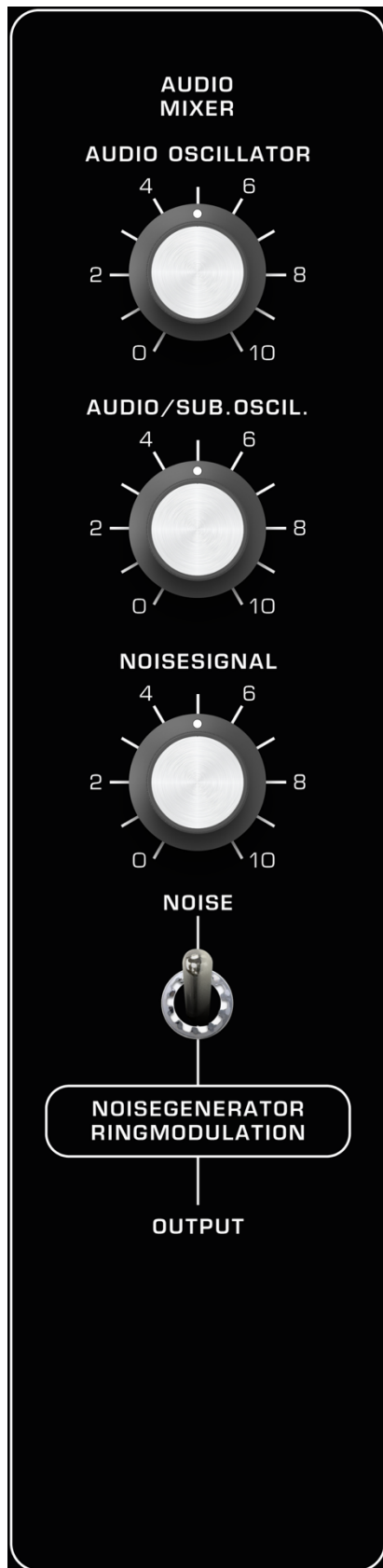
- **Octave Range Selector:** A 5-position rotary switch selects the operating range: Sub (very slow frequencies for Modulation Oscillator-style modulation), 0, +1, +2, and +3.
- **Pitch Control:** Provides independent tuning of VCO 2 relative to VCO 1, allowing for subtle detuning or more pronounced intervals.
- **Waveform Mix Control:** Continuously blends between the main waveform and a suboscillator, which operates one octave below the selected waveform.
- **Waveform Selector (Toggle):** Switches the main oscillator waveform between sawtooth and square.

- **Sync Switch:** Forces VCO 2 to synchronize with VCO 1. In sync mode, VCO 2's waveform is reset to the beginning of its cycle every time VCO 1 completes a cycle. This creates complex, harmonically rich tones and distinctive metallic timbres, especially when VCO 2 is tuned above VCO 1 or modulated dynamically.
- **Envelope-to-Pitch Switch:** Routes the envelope generator to modulate VCO 2's pitch. In sync mode, this produces dramatic, sweeping sync effects with a powerful, cutting character.
- **Keyboard Control Switch:** Disconnects VCO 2 from keyboard tracking. When disabled, VCO 2 no longer follows the played notes, useful for subaudio operation (e.g., in *Sub* mode when functioning as an additional Modulation Oscillator).

Thanks to its dual-purpose design, VCO 2 serves both as a versatile companion oscillator and as a modulation source. The sync function is particularly notable, as it allows the creation of sounds that cannot be achieved with single oscillators—ranging from sharp sync leads to evolving, harmonically complex textures.

## Notice

The VCO-2 features a powerful sub-oscillator function, which is controlled by the Waveform Mix knob. Imagine the sub-oscillator as an extra, deep foundation wave that strengthens the main signal by one octave down. This is particularly useful for giving rich, massive bass sounds more weight and fullness. Because this additional signal is created with analog frequency division, it's possible to hear minimal inaccuracies in the sub-signal's sound on extremely high notes. However, this effect is unnoticeable for most applications in the bass and mid-range.



# AUDIO MIXER

The Audio Mixer is the central control point for blending and combining the fundamental sound sources of your synthesizer. It allows you to create a balanced ratio between the individual signals, laying the groundwork for complex sound textures.

## Available Sound Sources:

- **Audio Oscillator (OSC-1):** The audio signal from the first voltage-controlled oscillator (VCO-1).
- **Audio/Subaudio Oscillator (OSC-2):** The signal from the second oscillator (VCO-2), which can operate in both the audio and subaudio ranges.
- **Noise Signal:** The noise signal, which is used for percussive sounds, effects, or as a basis for unharmonic textures.

## Special Functions:

**Selector Switch (White Noise / Ring Modulation):** This switch provides you with a crucial creative choice. In the standard position, White Noise is routed to the mixer. This is ideal for adding percussive or atmospheric elements to your sound.

**Ring Modulation (Ring Mod):** When you set the selector switch to Ring Mod, a ring-modulated audio signal is sent to the mixer instead of the noise. The ring modulator is a multiplier that generates a completely new, complex sound signal from the signals of the Audio Oscillator (OSC-1) and the Audio/Subaudio Oscillator (OSC-2).

### **How the Ring Modulator Works**

Unlike the simple addition or subtraction of waveforms found in frequency modulation (FM) or subtractive synthesis, ring modulation multiplies the two input signals ( $V_{out} = V_{in1} \times V_{in2}$ ).

The resulting output signal does not contain the original frequencies of the two oscillators but only the sum and difference frequencies of their harmonics.

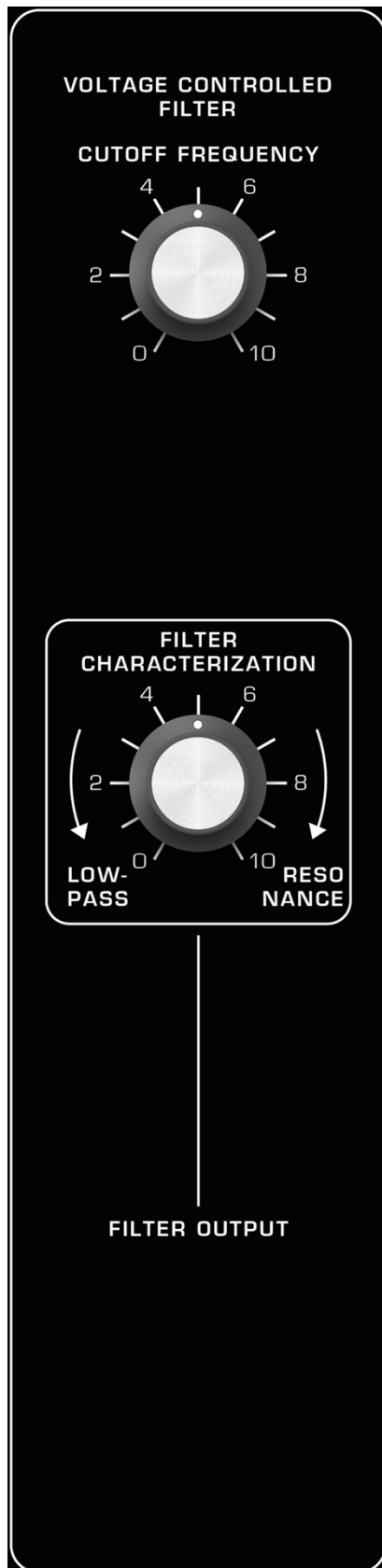
$$f_{out} = f_1 \pm f_2$$

$f_1$  = Frequency of OSC-1

$f_2$  = Frequency of OSC-2

This leads to a bell-like, metallic, and often unharmonic sound spectrum that is excellent for effects, sharp, percussive tones, or experimental sound design applications. By changing the frequencies of OSC-1 and OSC-2, you can achieve dramatic spectral shifts and create unexpected harmonic (or disharmonic) relationships.

Using the individual level controls on the Audio Mixer, you can then fine-tune the ratio between the oscillator signals and the ring modulation signal to produce a wide range of sounds, from subtle overtones to extreme, piercing effects.



# VOLTAGE CONTROLLED FILTER

The Voltage Controlled Filter (VCF) is a crucial module for shaping the timbre of your sound. Its primary function is to remove or emphasize certain frequencies, dramatically altering the character of the audio signal.

## 24dB Low-Pass Filter

The VCF in this module is a **24dB Low-Pass Filter**. This means it allows all frequencies **below** the cutoff frequency to pass through, while progressively attenuating (reducing the volume of) all frequencies **above** it. The "24dB" refers to the filter's steepness or slope. A 24dB/octave slope means that for every octave above the cutoff frequency, the volume of the signal is reduced by 24 decibels. This creates a very sharp and noticeable cutoff, making it highly effective for sculpting sounds from bright and buzzing to soft and muted.

## Controls:

- **Cutoff Frequency:** This knob controls the main frequency point at which the filter begins to attenuate the signal. Turning the knob clockwise opens the filter, allowing more high frequencies (harmonics and overtones) to pass through, resulting in a brighter sound. Turning it counter-clockwise closes the filter, removing high frequencies and making the sound darker and softer.
- **Filter Characterization (Resonance):** The Filter Characterization control adds resonance to the filter's cutoff frequency. Resonance is a feedback loop within the filter that boosts the frequencies right at the cutoff point. As you increase the resonance, you'll hear a sharper, more focused peak at the cutoff frequency. This can create everything from subtle emphasis to a sharp, whistling sound.

## Self-Oscillation:

When you turn the Resonance knob to its maximum setting, the filter will begin to self-oscillate. At this point, the feedback loop is so strong that the filter generates its own continuous sine wave at the cutoff frequency, even without an audio input signal. This effectively turns the filter into a simple sine-wave oscillator. While it's a great feature for creating pure tones or as a unique sound source, it's important to note that it's not as precise in tuning as a dedicated voltage-controlled oscillator (VCO).



# FILTER CONTROLLER

The Filter Controller is the central hub for modulating and animating the Voltage Controlled Filter (VCF). It provides a variety of sources to control the **cutoff frequency**, allowing you to create dynamic and evolving timbres.

## Control Options:

- **Amount of Envelope:** This knob determines how much the **envelope generator** affects the filter's cutoff frequency. By adjusting this, you can create classic sounds where the filter opens and closes with each note, from sharp percussive attacks to slow, sweeping fades.
- **Modulation:** This control dictates the amount of modulation from the Modulation Oscillator triangle wave. It's perfect for adding a consistent, rhythmic movement to the filter, which can be used to create pulsing or wobbling effects.

- **Keyboard Voltage (Key CV) Switch (On/Off):** When this switch is set to "On," the filter's cutoff frequency is directly influenced by the notes you play on the keyboard. Higher-pitched notes will open the filter more, making them brighter, while lower-pitched notes will keep it more closed, resulting in a darker sound. This is a crucial feature for creating more expressive and realistic instrumental sounds.
- **Velocity CV Switch:** This switch allows you to use the Velocity CV (Control Voltage) as a modulation source. This CV is typically generated by a MIDI-to-CV interface or can be patched in from an external source. With this activated, the force with which you press a key can directly influence the filter's cutoff, allowing for highly expressive playing.
- **Attenuator & Modulation Source Selector:** This section provides a dedicated attenuator knob and a selector switch to choose a modulation source for even more intricate filter movements. The available sources are:
  - **Modulation Oscillator Pulse Wave:** Provides a stepped, rhythmic modulation for a more jarring effect compared to the smooth triangle wave.
  - **Audio/Subaudio Oscillator (VCO-2):** Using VCO-2 as a modulation source allows for **audio-rate modulation**, also known as **Filter FM**. When the VCO is in the audio range, this can create complex, metallic, and often noisy timbres.
  - **Audio Oscillator (VCO-1):** Similar to VCO-2, this also provides audio-rate modulation for the filter's cutoff. This is another powerful tool for extreme sound design.
  - **Noise:** Using the noise signal as a modulation source results in a chaotic, random, and often sizzling or crackling effect on the filter's cutoff.



# ENVELOPE GENERATOR

The Envelope Generator is a critical module for shaping the dynamic evolution of a sound over time. It controls how a sound's amplitude (volume) or other parameters (like filter cutoff) change from the moment a note is played until it ends. This module focuses on the **attack** and **decay** phases of the sound.

## Controls:

- **Attacktime:** This knob sets the attack time of the envelope. It determines how long it takes for the sound to reach its maximum volume after a trigger signal is received.

**Fast Attack:** A short attack time creates a sharp, immediate sound, ideal for percussive sounds like drums or plucked instruments.

**Slow Attack:** A long attack time results in a gradual fade-in, perfect for pads, strings, and ambient textures.

- **Decaytime:** This knob controls the decay time. It sets how long it takes for the sound to fade from its peak amplitude down to the sustain level (if one is used) or to silence.

**Kind of Envelope Switch:** This switch allows you to select between two types of envelopes:

- **Envelope with Sustain:** In this mode, the envelope has a sustain phase. After the initial attack and decay, the sound will hold at a constant volume for as long as you hold the key. When you release the key, the sound will begin to decay.
- **Envelope without Sustain:** In this mode, the envelope is a simple **attack-decay** shape. The sound will reach its peak and then immediately begin to decay back to silence, regardless of how long the key is held. This is commonly used for percussive sounds.
- **Trigger Source Switch:** Envelope Trigger Sources  
This multi-control switch determines the signal that will **trigger** the envelope, starting its attack-and-decay cycle. A trigger is essentially a command that tells the envelope generator to begin.

**Available Trigger Sources:**

- **Gate:** This is the most common trigger source. A gate signal is typically generated by a MIDI-to-CV interface whenever you press a key on your keyboard or is supplied from an external source. As long as the key is held, the gate is high, which can be used to sustain the sound (if the envelope is set to have a sustain phase).
- **Modulation Oscillator (LFO):** When this option is selected, the Modulation Oscillator pulse wave acts as the trigger. This allows the envelope to be re-triggered automatically at a constant tempo determined by the Modulation Oscillator frequency. This is a powerful tool for creating rhythmic patterns, stuttering effects, or repeating percussive sounds.
- **Audio/Subaudio Oscillator (VCO-2):** This enables the envelope to be triggered by the signal of the second oscillator. When the oscillator is in the audio range, this results in an extremely fast, high-frequency re-triggering, which can be used to create complex, distorted, or metallic textures.
- **Off:** In this position, the envelope is disabled and will not be triggered. This is useful if you want to bypass the envelope gene



# VOLTAGE CONTROLLED AMPLIFIER (VCA)

The Voltage Controlled Amplifier (VCA) is the final stage in your signal chain, used to control the overall volume or gain of the audio signal. While the Envelope Generator determines the *shape* of the sound's volume over time, the VCA acts as the actual "volume knob" that is controlled by that envelope and other modulation sources.

## Controls:

### Decay Time (Second Envelope

**Generator):** This control sets the decay time for a second, dedicated envelope generator. This second envelope is specifically hard-wired to modulate the VCA's gain, providing another layer of dynamic control over the sound's volume.

**Velocity Modulation:** The Velocity AMT (Amount) knob on the VCA features a unique design choice that's important to understand

for proper use.

For true velocity control, a standard approach would be to route the envelope generator's control voltage through a dedicated VCA. While

effective, this method would alter the envelope's intended shape and could lead to unwanted changes in the sound's character.

To avoid this, this module's design takes a different approach: the Velocity CV (Control Voltage), whether generated automatically by MIDI or patched in externally, is used to apply a gain offset to the VCA.

What This Means for You:

This gain offset directly adds to the VCA's overall gain. Essentially, it acts like a separate, subtle volume boost that responds to how hard you press a key.

Benefit: This method does not interfere with the original signal path or the carefully shaped envelope. Your envelope's decay curve will remain perfectly intact, preserving the integrity of your sound design.

Important Consideration: Because the velocity adds a gain offset, it can prevent the VCA from fully closing, especially with high velocity values. If you have the VCA set to a low gain or if your envelope has a short decay, you might notice that the sound continues to ring out softly even after the envelope should have closed.

This is not a defect but a deliberate design choice that prioritizes the purity of the envelope's shape. To avoid unwanted ringing, simply adjust the Velocity AMT knob or use a lower velocity setting when playing.

**Volume Control for Output 1:** This is the master volume knob for the main audio output of the VCA, allowing you to set the final loudness level of your synthesized sound.

### VCA Control Switch

This switch determines the source of the control voltage that drives the VCA's gain.

**Sustain:** In this position, the VCA remains open, as if you were holding a key down indefinitely. It is controlled by a fixed internal voltage, allowing for continuous, drone-like sounds.

**Envelope:** This is the most common setting. The second envelope generator is used to control the VCA's volume, allowing you to shape the attack and decay of your sound.

**M.O. Pulse:** Here, the Modulation Oscillator's (LFO) pulse wave controls the VCA. This creates a rhythmic, on-off gating effect, similar to a tremolo but with a hard, square-wave-like character.

**M.O. Tri:** In this setting, the VCA's gain is modulated by the Modulation Oscillator's triangle wave. This provides a smooth, continuous tremolo effect, perfect for creating pulsating or wobbling sounds. Triangle has a lower modulation amount than Pulse.

### **Audio Source Selector**

This second switch determines which audio signal is routed to the VCA for final processing.

**Filter:** This is the standard setting, routing the signal from the filter's output to the VCA. This means the sound has been processed by the filter, and its timbre is now ready to be shaped in volume by the VCA.

**Audio OS:** This option bypasses the filter and sends the pure, raw signal directly from the Audio Oscillator (VCO-1) to the VCA. This is useful for creating unfiltered sounds or for using the VCA as a simple volume control for the oscillator.

**Audio/Sub:** Similar to the previous setting, this bypasses the filter and sends the pure signal from the Audio/Subaudio Oscillator (VCO-2) directly to the VCA.

**Noise:** This selects the raw white noise signal and routes it directly to the VCA, completely bypassing the oscillators and filter. This is ideal for generating percussive or wind-like sounds.



# INPUT/ OUTPUT CON.

The Input and Output Connector module is the final interface between your synthesizer and the external world. It provides all the necessary connections for controlling the instrument and routing its audio signals to other equipment.

## Inputs:

**CV (Control Voltage):** This input receives a control voltage signal, typically used to control the pitch of the oscillators. A standard 1-volt-per-octave (1V/Oct) signal is used, allowing you to play the synthesizer chromatically using an external keyboard or sequencer.

**Velocity:** This input receives a control voltage signal that represents the velocity (or force) with which a key is pressed. This CV is routed to the VCA, allowing you to add expressive dynamics to your playing, where harder hits result in louder sounds. This control voltage can also be routed to the filter cutoff.

**Gate:** This input receives a gate signal (voltage trigger), a simple on/off voltage

that tells the synthesizer when a key is pressed or released. This signal is used to trigger the envelopes and sustain notes, giving each sound a clear beginning and end.

## **Outputs:**

**Audio Output 1:** This is the main audio output of the synthesizer, typically carrying the final, processed signal from the VCA. It is the primary way to connect the synthesizer to a mixer, audio interface, or amplifier.

**Audio Output 2:** This is a second, independent audio output that can be used for various purposes, such as sending a different signal to a separate effects processor or creating a stereo setup.

**Headphone Output:** This dedicated output allows for private monitoring of your sound without affecting the main audio outputs.

## **Controls:**

**Volume Control for Output 2 and Headphones:** This knob adjusts the volume level for both the second audio output and the dedicated headphone output. This allows you to monitor your sound privately without affecting the main audio output.

**Audio Signal Selector for Output 2:** This multi-control switch determines which audio signal is sent to the second audio output. This gives you flexible routing options for external effects processing or creating complex signal chains.

The available sources are:

**Audio OSC:** Routes the pure, unfiltered audio signal directly from the Audio Oscillator (VCO-1). This bypasses the VCF and VCA.

**Audio/Sub:** Sends the pure, unfiltered audio signal directly from the Audio/Subaudio Oscillator (VCO-2), also bypassing the VCF and VCA.

**Noise:** Routes the raw noise signal from the noise generator.

**VCA:** Sends the audio signal from the end of the entire signal chain, which includes the effects of the filter and VCA. This is the most common setting for a processed output.

### **Tip: Precisely Tune Your Oscillators**

Since the Audio Signal Selector for Output 2 allows you to output the raw audio signals of the oscillators separately from the main signal chain, you can use this function specifically to precisely tune your VCOs.

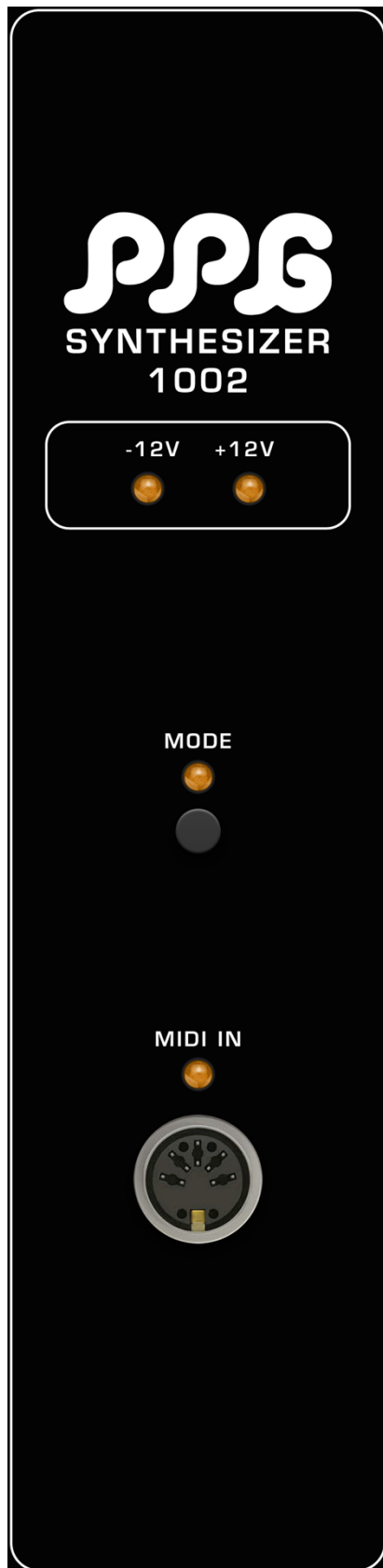
Connect an external tuner to Audio Output 2.

Use the Audio Signal Selector to choose the signal from Audio OSC (VCO-1).

Use the tuning knob on VCO-1 to set it to your desired frequency.

Switch the selector to Audio/Sub (VCO-2) to tune this oscillator separately.

This way, you can monitor and precisely set the pitch of both oscillators individually and independently. This is especially useful before creating complex sounds with the ring modulator or filter FM, as a clean starting point ensures the best results.



# MIDI CONNECTOR AND POWER CONTROL

The Power and MIDI Interface module serves two critical functions: providing the necessary power to all synthesizer modules and acting as the main bridge for communication with external MIDI devices.

**Power Supply Section:** Control LEDs: These LEDs provide visual feedback on the status of the two main operating voltages. They confirm that the module is receiving power and that the internal power rails are functioning correctly, which is essential for stable and reliable synthesizer operation.

**MIDI Interface Section:** MIDI Mode LED: This LED indicates the current MIDI operating mode of the synthesizer, showing whether it is set to receive MIDI data from an external device.

**MIDI Mode Switch:** This switch allows you to select between different MIDI modes, such as different MIDI channel

**MIDI IN Status LED:** This LED flashes whenever the module receives incoming MIDI data (e.g., note-on, note-off). It's a useful diagnostic tool to confirm that your MIDI connection is active.

**MIDI IN DIN Socket:** This is the standard 5-pin DIN connector for receiving MIDI data from external devices like a MIDI keyboard, a computer via a MIDI interface, or a sequencer. This connection is what allows you to control the synthesizer's pitch, velocity, gate, and other parameters from an external source.

# MIDI

The PPG 1002 synthesizer features an internal MIDI-to-CV converter, which translates incoming MIDI messages into the control voltages (CV) and gate signals that the analog modules understand. This interface allows you to control the synthesizer using any standard MIDI controller.

For easy functional checks, the interface has two dedicated LEDs:

**MIDI Mode LED:** This LED indicates the current MIDI operating mode. It will light up when the synthesizer is ready to receive MIDI data from an external device. This LED also confirms that a gate signal is being generated, which is crucial for triggering the envelopes and sustaining notes.

**MIDI IN Status LED:** This LED is a useful diagnostic tool. It flashes whenever the module receives any incoming MIDI data, such as note-on, note-off, or control change messages. If your MIDI connection is active and data is being sent, this LED will visually confirm it.

The **Mode Switch** on the MIDI Interface is a multi-function button used to program and configure the behavior of the internal MIDI-to-CV converter. It provides an intuitive way to assign MIDI channels, control parameters, and manage firmware settings without complex menus or software.

The interface operates exclusively in classic monophonic mode with last note priority. This means it can only play one note at a time. If you play multiple notes simultaneously, the synthesizer will sound only the last note you pressed. This is a common and intentional design choice for classic monophonic synthesizers.

## Programming Functions:

**Learn MIDI Channel:** Hold down the switch while playing a note on your MIDI controller. The interface will then learn and lock onto that specific MIDI channel, ensuring it only responds to messages on that channel.

**Note Tuning Mode:** Hold down the switch while moving the pitch wheel up and down. This action toggles the internal note tuning mode on or off.

**Factory Reset:** Hold down the switch for 10 seconds while the device is idle to reset all parameters to their default factory settings.

**Reboot:** Hold down the switch for less than 5 seconds and then release to reboot the device.

## Note CV & Micro-Tuning

The synthesizer's Note CV input works on a 1-volt-per-octave (1V/Oct) standard, a crucial feature for controlling pitch in the analog world. This means that for every 1-volt increase in the control voltage, the pitch of the oscillators will go up by exactly one octave.

However, a key feature of this interface is its optional micro-tuning capability. This goes beyond the standard 1V/Oct system and provides a powerful tool for advanced users.

How it Works:

In a special operation mode (accessed via the Learn Switch), you can program the interface so that every single MIDI note can be set to output its own unique CV level within a selected output range.

Benefits:

**Alternate Tuning Schemes:** You can break free from the traditional 12-tone equal temperament scale and program your own custom tunings, such as just intonation or historical scales.

**Correcting VCO Tracking Imperfections:** No two analog oscillators are perfectly identical, and their pitch may drift slightly across octaves (a phenomenon known as "tracking error"). With this micro-tuning feature, you can compensate for these imperfections by precisely adjusting the CV output for each note, ensuring that your oscillators stay perfectly in tune across their entire range.

## Tuning Mode and the Role of the Pitch Wheel

To manually adjust the pitch of each individual note, you use a special function of the Tuning Mode in conjunction with your MIDI controller's pitch wheel.

**How to Activate the Mode:** To enable note CV tuning mode, hold down LEARN switch and move Pitchbend wheel up, then release LEARN switch and return Pitchbend wheel to neutral.

### How to Adjust the Pitch of a Note:

**Play a Note:** Press a single key on your MIDI keyboard. The synthesizer is now ready to edit the tuning of that specific note.

**Use the Pitch Wheel:** While holding the key, you can move the pitch wheel of your MIDI controller up or down. Each movement of the wheel changes the tuning curve for that single note, adjusting its pitch accordingly.

**Save Your Changes:** After you've set the desired tuning for the note, release the key. The new tuning setting for this note is automatically saved in the interface's internal memory.

**Repeat the Process:** To adjust other notes, simply play the next note and repeat the process with the pitch wheel.

**How to Exit the Mode:** To disable note CV tuning mode, hold down LEARN switch and move the Pitchbend wheel down, then release LEARN switch and return Pitchbend wheel to neutral.

**Control messages:** While in note tuning mode Midi2CV Mk2 recognizes the following control messages:

| MIDI CC | Value | ACTION                       |
|---------|-------|------------------------------|
| 115     | > 0   | Reset all notes tuning       |
| 116     | > 0   | Reset last note tuning       |
| 117     | > 0   | Increment last note tuning   |
| 118     | > 0   | Decrement last note tuning   |
| 119     | > 0   | Interpolate last note tuning |

You can also use pitch wheel to quickly get note tuning into required range.

# MIDI SYSEX DATA FORMAT

Sysex message format:

```
0xf0, // Sysex
0x29, // manufacturer ID
'2','C','V',0x00, // Product ID
// * Command byte (SysexCmd)
// * Modifier byte (SysexMod)
// * Payload bytes (nibbelized)
0xf7 // Sysex end
```

MIDI Sysex commands:

```
0x05, // set velocity curve, 0-8: linear, soft1/2/3, hard1/2/3,
wide1/2

0x0B, // set pitch bend range: 0 - disable, 1-12 semitones

0x7F, // set all device settings at once
```

# FIRMWARE UPDATE

MIDI interface firmware update steps:

Connect your MIDI interface output to MIDI IN

Power on the PPG 1002 while holding down the LEARN switch. LEDs will blink shortly then MIDI IN LED will stay steadily lit. Alternatively, you can request firmware update by sending 'request\_firmware\_update.syx' file to MIDI IN.

Send firmware update sysex file (\*.syx) to your MIDI interface port with 250ms delay between sysex buffers. MIDI LED will be blinking while firmware sysex is being received. On successful update, LEDs will blink 3 times one after another. On error, both LEDs will blink together 5 times.

You can request firmware update without using LEARN switch by sending REQUEST ACTION sysex 0x00 with modifier byte set to 0x01. This facilitates firmware updates for applications where LEARN switch is not present or is difficult to access.

# SPECIFICATIONS

## **DIMENSIONS**

Width: 25.79" / 655 mm

Depth: 10.24" / 260 mm

Height: 3.94" / 100 mm

Net Weight: 22 lbs. / 10 kg.

## **TEMPERATURE**

Storage Temperature: 5F to 140F (2C to 60C)

Nominal Operating Temperature: 50F to 95F (10C to 35C)

## **SOUND SOURCES**

Oscillators x 2

Noise Generator

## **OSCILLATORS**

Frequency Range: 0.1 to 20kHz

Oscillator Stability (short term) > 0.25 %

Waveforms:

Triangle

Sawtooth

Rectangle

Sub

## **NOISE GENERATOR**

White Noise

## **MODULATION OSCILLATOR**

Rate: 0.05Hz to 30Hz

Waveform: Triangle, Rectangular

## **FILTER**

Filter-Type: Voltage-Controlled Low Pass Filter

Cutoff Frequency Range: 10Hz - 20kHz

Filter Slope: 24dB per Octave

**ENVELOPE GENERATOR I**

Attack Time: 1 millisecond to 8 second

Decay Time: 4 millisecond to 15 second

**ENVELOPE GENERATOR II**

Attack Time: 1 millisecond to 8 second

**VOLTAGE CONTROLLED AMPLIFIER (VCA)**

Loudness Contour Dynamic Range: 75dB

**AUDIO OUTPUT LEVELS**

High Level Output Typical Voltage: 0.5 volts

Maximum Voltage: 4.2 volts (peak-to-peak)

Nominal Output Impedance: 100Ohms

Headphone Output (mono)

Maximum Voltage: 0.8 volts

Output Impedance: 100Ohms

**CONTROL VOLTAGE INPUTS**

Velocity CV: 1/4" TRS 0 to +5 volts;

Oscillators (Pitch): 1/4" TRS 1 volt per octave

Gate Trigger: +5 volt V-Trigger

**MIDI JACKS (5-PIN DIN STYLE)**

MIDI In: Note On (Trigger), Note #, Velocity, Pitch Bend, and Mod Wheel

**POWER SUPPLY**

Self-switching external supply from XP

100–240 volts

50/60Hz

1.3Ampere

5-Pin DIN connector

# PPG STATUTORY WARRANTY PERIOD

PPG guarantees that its products are free from material and workmanship defects and conform to the specifications at the time of delivery. The statutory warranty rights are governed by the applicable provisions of the German Civil Code (BGB), which include, in particular, a statutory warranty period of two years.

## **Returning Your Product**

Before returning a product, you must request an RMA (Return Material Authorization) number from PPG. Please contact PPG Support at [support@ppgsynthesizers.com](mailto:support@ppgsynthesizers.com)

All products must be carefully packed and shipped with the included power supply. We recommend securing the instrument with thick bubble wrap or packing paper. Please do not use packing peanuts, towels, bedding, or clothing as packaging materials, as these do not provide adequate protection. Improper packaging may result in the warranty not being honored.

Once you have received the RMA number and your product is properly packed, please send it **insured and prepaid** to PPG Synthesizers in Germany, and be sure to include your return shipping address.

## **Return Address:**

PPG Synthesizers  
Seilerstrasse 41 - 43  
22763 Hamburg  
Germany

## **What We Will Do**

Upon receipt, the product will be inspected for obvious signs of misuse or damage caused during transport. If the product is damaged or does not

meet the statutory warranty requirements, PPG will provide you with a repair cost estimate. After the repair has been completed, the product will be returned to the address you provided.

### **CARING FOR YOUR PPG SYNTHESIZER**

Clean your PPG Synthesizer with a soft, dry cloth only – do not use solvents or abrasive cleaners. Please observe the safety instructions at the beginning of this manual.

### **IMPORTANT SAFETY NOTE:**

There are no user-serviceable parts inside the PPG Synthesizer. All servicing should be carried out by qualified personnel only.

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PPG 1002 Synthesizer User's Manual Version 1

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