Temecula DSP SG-626

StarGate Digital Reverberator — User Guide

Contents

Introduction

The Temecula DSP SG-626 is a digital recreation of the legendary Ursa Major StarGate digital reverberator, one of the most refined early digital reverbs ever made. Where its predecessor the Space Station was prized for character and warmth, the StarGate was designed for something different: pristine, high-fidelity reverberation with 15kHz bandwidth and up to 20 seconds of decay time.

The SG-626 plugin faithfully emulates the StarGate's PROM-driven architecture, including all 16 reverb programs, the envelope-following modulation system, the analog filter chain, and the hardware gain ceiling limiter. It adds modern conveniences like tempo sync for echo programs and a preset management system.

Features

- 16 reverb programs ranging from tight plates to vast canyons, plus echo modes with delays up to 2 seconds
- Decay times from a fraction of a second to over 20 seconds
- 15kHz bandwidth with 3rd-order elliptic output filtering
- Envelope-following modulation that responds to your playing dynamics
- Independent LF and HF decay controls for tonal shaping
- Three override functions: Input Mute, Dry Only, and Reverb Clear
- Tempo sync for echo programs with note divisions and modifiers
- Preset save/recall system
- Available as VST3, AU, and AAX

System Requirements

- macOS 10.13 or later (AU, VST3, AAX)
- Windows 10 or later (VST3, AAX)
- A DAW that supports one of the above plugin formats

History of the StarGate

Ursa Major and the Digital Reverb Revolution

In 1978, Christopher Moore founded Ursa Major, Inc. in Watertown, Massachusetts with a mission: to produce useful, lasting products of superior value for professional audio users. His first

product, the SST-282 Space Station, introduced a novel approach to digital reverberation using two independent tap systems reading from a shared delay buffer. It became a cult classic.

But Moore wasn't finished. While the Space Station excelled at character and texture, he wanted to push further — toward cleaner, wider-bandwidth reverberation that could convincingly simulate real acoustic spaces, from small plates to massive canyons.

The StarGate 323 (1984)

The StarGate 323, released in March 1984, represented a fundamentally different approach to digital reverb design. Where most reverberators of the era executed DSP algorithms through arithmetic operations, Moore took an unconventional path: he stored the entire reverb algorithm as data in burned EPROM lookup tables, orchestrated by TTL logic running at 8.192 MHz.

The result was a reverberator with 15kHz bandwidth, 15-bit linear PCM conversion for 80dB of dynamic range, and eight room simulations ranging from tight plates to vast canyons. The PROM-driven approach meant that changing the character of the reverb was a matter of changing data, not redesigning circuits.

Moore acknowledged the collaborative effort in the original owner's manual:

> *"Any product such as the 323 StarGate is the work of more than one person. I would like to thank each of the URSA 'MAJORETTES' for their active and supportive involvement in making the 323 a reality. In particular, I would like to thank Mark Bruckner for his contributions to digital design, documentation, and testing; and Charles Anderson for his work on breadboarding, testing, and above all, software optimization (tuning the Rooms)."* — Christopher Moore, StarGate 323 Owner's Manual

The StarGate 626

The StarGate 626 expanded on the 323's design with doubled memory capacity, enabling 16 reverb programs (up from the original eight) and 16 steps each for the decay and pre-delay controls (up from eight). The additional programs include extended rooms with decay times up to 20 seconds and dedicated echo modes with delays reaching 2 seconds. The core PROM-driven architecture remained the same — the 626 simply filled more of the address space with new room simulations and echo algorithms.

The SG-626 Plugin

The Temecula DSP SG-626 recreates the full StarGate 626 in software: all six EPROMs totaling 56 kilobytes of algorithm data, the analog filter chain, the envelope-following modulation system, and the hardware gain ceiling limiter. It adds tempo sync for the echo programs and a preset management system while preserving the character that made the original hardware legendary.

How It Works

The Algorithm as Data

Most digital reverberators execute their algorithms through DSP code — multiply-accumulate units running instructions cycle by cycle. The StarGate takes a radically different approach. Its entire reverb algorithm is stored as data in six EPROMs totaling 56 kilobytes. The circuit itself is generic infrastructure: counters, latches, adders, and comparators. An 8.192 MHz crystal oscillator drives a 256-step master cycle that repeats 32,000 times per second — the 32kHz sample rate. At each step, the circuit reads pre-programmed control bytes from memory. No code, no arithmetic processors, just counting and table lookups.
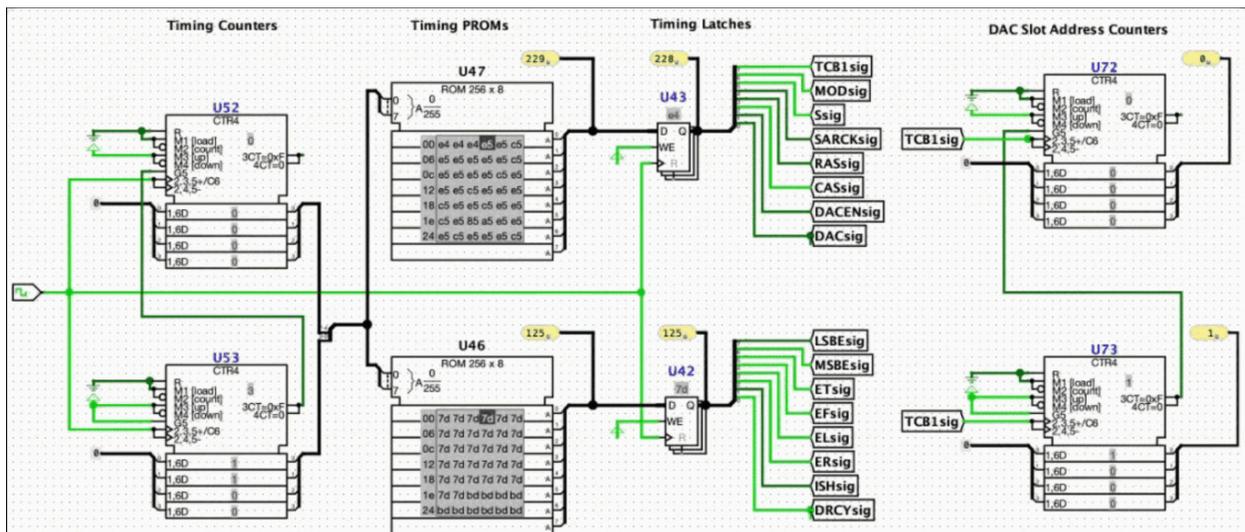
Changing the EPROM contents produces a different reverb character. Each of the 16 programs is a different dataset within the same PROMs, selected by the Room knob. This is why each room sounds so fundamentally different — they aren't parameter variations of a single algorithm, they are entirely different sets of tap positions, decay envelopes, and modulation shapes.

Two Independent Tap Systems

Like its predecessor the Space Station, the StarGate uses two independent groups of taps reading from the same circular delay buffer:

Output taps (8 taps: 4 left, 4 right) create the stereo signal you hear. These taps have fixed delay positions — they never move or modulate. This means the stereo image stays clean and stable, with no pitch artifacts or modulation noise coloring what reaches your speakers.

Feedback taps (15 taps) recirculate audio back into the delay buffer to build up the reverb tail. These taps *are* modulated in both delay position and gain. Because you never hear the feedback taps directly — only their accumulated effect after many recirculations — the modulation artifacts become texture rather than a flaw. They prevent the metallic, ringy character that plagues simpler reverb designs.

Delay Tap Generation

A 16K EPROM stores the tap patterns, indexed by slot number, pre-delay setting, and program selection. Each program contains a completely different set of tap positions.

The tap addresses pass through a bit permutation stage that scatters numerically adjacent taps across non-contiguous memory locations. Without this step, closely-spaced taps would produce a harsh, metallic comb-filtered sound. The permutation decorrelates them, eliminating the regularity that makes cheap delay lines sound artificial.

Envelope-Following Modulation

Rather than modulating at a fixed rate, the StarGate's modulation speed responds to the input signal itself. A bandpass filter (106–370 Hz) tracks the input level with 1ms attack and 100ms release. The resulting envelope is quantized into five discrete rate levels via threshold comparisons, each selecting a different modulation speed from a rate PROM.

This means the reverb breathes with your playing. Loud, active passages drive faster modulation for richer, more diffuse tails. Quiet passages slow the modulation, preserving clarity and detail. The effect is subtle but contributes to the StarGate's organic, natural-sounding decay.

Dual-Domain Gain Modulation

The StarGate modulates tap gains through two cascaded PROM stages:

1. **Gain Ceiling EPROM** — Defines the base decay envelope per tap, indexed by slot, decay setting, and program. This is the "shape" of the reverb: which taps are loud, which are quiet, and how the envelope changes with the Decay knob.

2. **Gain Modulation Waveform EPROM** — Modulates that envelope over time, creating a gain surface that evolves across both tap position and time. Taps "breathe" as the modulation counter advances.

The final gain is the *minimum* of the modulated gain and the ceiling — a hardware limiter built from magnitude comparators that prevents the modulation from producing spikes. This is why the StarGate's reverb tail stays smooth even at long decay times; the gain ceiling catches any momentary peaks before they become audible artifacts.

The Analog Filter Chain

Audio entering the delay buffer passes through several stages of filtering that shape the StarGate's character:

- **LF and HF shelving filters** — Controlled from the front panel, these 6dB/octave filters shape the tonal balance of the reverb
- **15kHz 3rd-order elliptic lowpass** — A steep anti-aliasing filter on both the input path and the stereo output taps
- **219Hz high-pass on the feedback path** — Prevents low-frequency energy from building up in the recirculation loop
- **9kHz notch dip in the feedback path** — A gentle -3dB dip at 9kHz that keeps the high-frequency tail from getting harsh over many recirculations
- **DC blocking and input limiting** — Prevents the delay buffer from saturating

Getting Started

Installation

Run the installer for your platform (macOS or Windows). The plugin will be installed in the standard locations for your system:

- **macOS AU:** `/Library/Audio/Plug-Ins/Components/`
- **macOS VST3:** `/Library/Audio/Plug-Ins/VST3/`
- **macOS AAX:** `/Library/Application Support/Avid/Audio/Plug-Ins/`
- **Windows VST3:** `C:\Program Files\Common Files\VST3\`
- **Windows AAX:** `C:\Program Files\Common Files\Avid\Audio\Plug-Ins\`

After installation, restart your DAW if it was running. The plugin will appear as "Temecula DSP SG-626" in your DAW's effect browser, typically under the Reverb category.

Recommended Setup

The SG-626 works best on an auxiliary send bus. This allows you to blend the reverb with your dry tracks using the send amount on each channel, keeping the original signals intact.
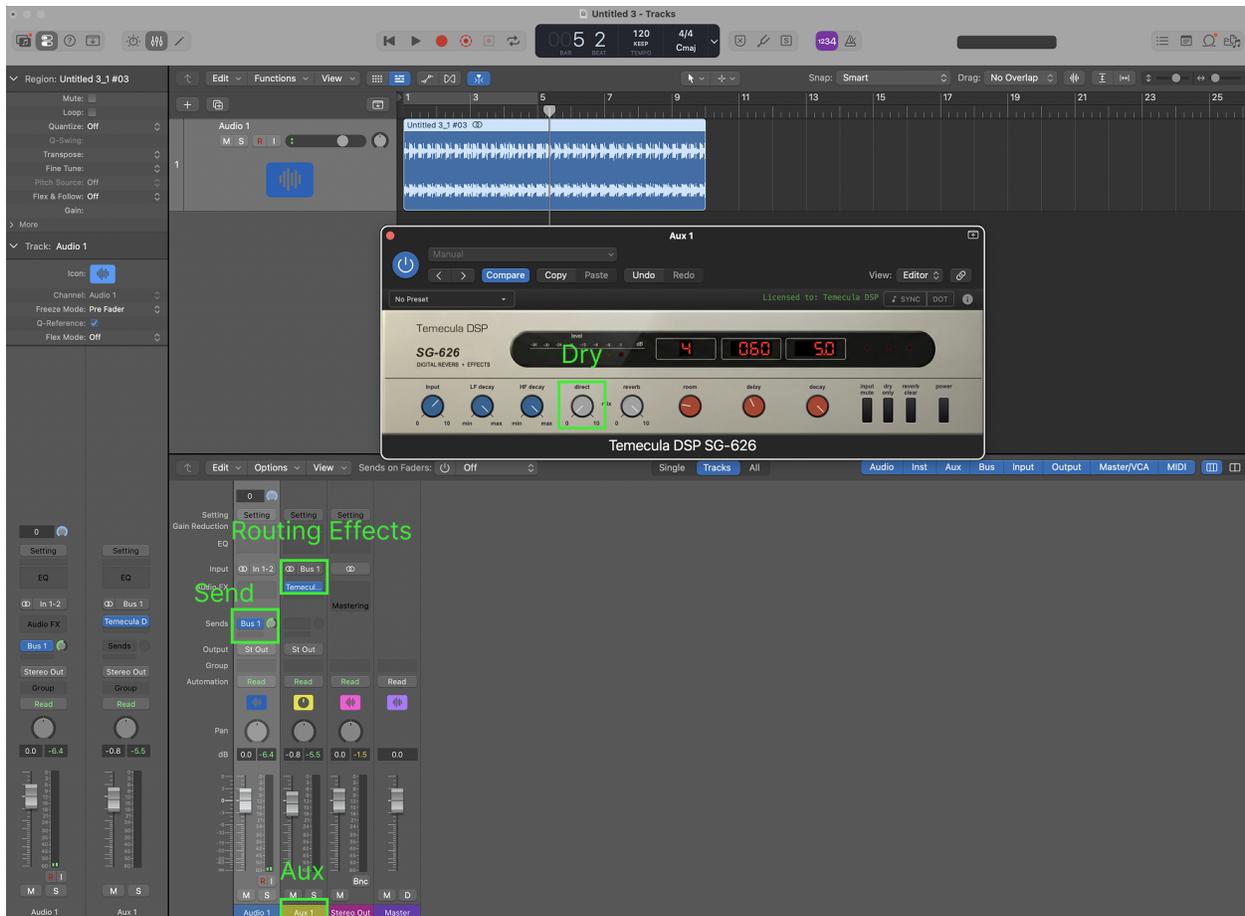
On a send bus:

1. Create an auxiliary bus and insert the SG-626
2. Set Direct Mix to 0 (all wet) and Reverb Mix to 10 (full)
3. Use your DAW's send controls to dial in the reverb amount per track

As a direct insert:

1. Insert the SG-626 directly on a track
2. Use the Direct Mix and Reverb Mix knobs to balance dry and wet signals

Quick Start

For an immediate, natural-sounding reverb:

1. Select **Room 5** (turn the Room knob to display "5") — this is a medium hall, a good all-purpose starting point
2. Set **Pre-Delay** to 2 or 3 (about 30–40ms) — gives the source a moment of clarity before reverb begins
3. Set **Decay** to the middle range (position 7–8, about 3–4 seconds)
4. Set **HF Decay** slightly below center — rolls off high frequencies for a warmer, more natural tail
5. Leave **LF Decay** at center

From here, experiment. Try smaller rooms (1–3) for tighter, more intimate sounds, or larger rooms (7–8) for cavernous spaces. The 16 programs offer a remarkably wide range of characters from a single algorithm.

Uninstalling

macOS

Close any DAWs that have the plugin loaded, then delete the following files:

- **AU:** `/Library/Audio/Plug-Ins/Components/TemeculaDSPSG626.component`
- **VST3:** `/Library/Audio/Plug-Ins/VST3/TemeculaDSPSG626.vst3`
- **AAX:** `/Library/Application Support/Avid/Audio/Plug-Ins/TemeculaDSPSG626.aaxplugin`

You can delete these from the Finder or from the Terminal:

```
sudo rm -rf "/Library/Audio/Plug-Ins/Components/TemeculaDSPSG626.component"
sudo rm -rf "/Library/Audio/Plug-Ins/VST3/TemeculaDSPSG626.vst3"
sudo rm -rf "/Library/Application Support/Avid/Audio/Plug-Ins/TemeculaDSPSG626.aaxplugin"
```

Windows

Open **Settings > Apps > Installed Apps** (or **Control Panel > Programs and Features** on older versions of Windows), find "Temecula DSP SG-626" in the list, and click **Uninstall**. The uninstaller will remove the VST3 plugin and registry entries automatically.

Controls Reference

Left Column — Continuous Knobs

The left column contains five continuously adjustable knobs drawn in blue (input and EQ) or gray (mix).

Input (0–10)

An overall level control for the stereo input. Both channels are scaled equally. In the original hardware, this was a dual potentiometer operating on both inputs simultaneously.

> *"Adjust so yellow -6 LED flashes frequently, yellow -3 LED flashes occasionally, and red 0 LED flashes only rarely."* — Christopher Moore, StarGate 323 Owner's Manual

The peak meter across the top of the display shows instantaneous peak level with a brief hold, helping you set the input for optimal signal-to-noise without clipping.

LF Decay (min–max)

A 6dB/octave low shelving filter in the feedback path that controls the low-frequency decay time relative to the mid-band. The -3dB corner adjusts from 14Hz (at max, boosting lows) to 480Hz (at min, cutting lows).

> *"The LF Decay control will be used less often. If you'd like a harder sound, or to not have bass information muddy up the reverb, you can try reducing LF Decay."* — Christopher Moore, StarGate 323 Owner's Manual

HF Decay (min–max)

A 6dB/octave high shelving filter in the feedback path that controls the high-frequency decay time. The -3dB corner adjusts from 3kHz (at min, cutting highs) to 15kHz (at max, full bandwidth).

> *"The 323 has a bandwidth of 15kHz when the HF Decay control is full clockwise. Generally, in nature anyway, reverberation does not extend to such high frequencies, due to air and wall absorption effects. You will find it preferable to reduce the HF Decay for many kinds of music and reverberant effects. Unless you do so, occasional sibilants, especially in the larger rooms, will hang on for longer than desirable."* — Christopher Moore, StarGate 323 Owner's Manual

Direct Mix (0–10)

Controls the level of the dry (unprocessed) signal in the stereo output.

> *"If the 323 is used with a mixing console in the echo send/receive loop, this control will normally be left at 0, since the Direct signal is mixed at the console."* — Christopher Moore, StarGate 323 Owner's Manual

Reverb Mix (0–10)

Controls the level of the reverb signal in the stereo output.

> *"If the 323 is used in a console echo send/receive loop, this control should normally be left at 10."* — Christopher Moore, StarGate 323 Owner's Manual

Together, Direct Mix and Reverb Mix give you full control over the wet/dry balance. When using the SG-626 as a send effect, set Direct to 0 and Reverb to 10. When using it as an insert, balance both to taste.

Right Column — Stepped Knobs

The right column contains three stepped knobs drawn in red. Each selects from 16 discrete positions (0–15).

Room (0–15, displayed as 1–F, 0)

Selects one of 16 reverb programs. The display shows the selection in hexadecimal: positions 0–14 display as "1" through "F", and position 15 wraps to "0".

> *"Each Room has its own preset early reflection pattern, and set of decay time options. When operated, this switch changes many parameters inside the 323, including delays and gains."* — Christopher Moore, StarGate 323 Owner's Manual

Changing rooms while reverb is in progress may produce an audible glitch. For silent transitions, wait for the reverb tail to die out or engage Reverb Clear momentarily.

See the Programs chapter for detailed characteristics of each room.

Delay / Pre-Delay (0–15)

Adds pre-delay before the onset of reverberation. The range depends on the selected program:

- **Room programs (1–A):** 0–320ms in 16 steps
- **Echo program B:** 20–440ms
- **Echo programs C–E:** 50ms–2.0 seconds
- **Echo program F:** 200ms–2.0 seconds

The display shows the delay value in milliseconds or seconds.

> *"In a modern digital reverberator like the 323, there is already an inherent pre-delay in each room, which scales from short to long as the room size is increased. Although there is, therefore, less need for pre-delay, you may add more pre-delay with this control."* — Christopher Moore, StarGate 323 Owner's Manual

> *"You should note that when the pre-delay is set to 0, and a high proportion of reverb is put in the mix, you may hear some comb filter frequency response effects, due to the interaction of the direct signal and the first few taps. Increasing the pre-delay to 10 or 20ms will eliminate this."* — Christopher Moore, StarGate 323 Owner's Manual

Decay (0–15)

Selects the decay time — how long the reverb tail takes to fade to silence. Each room has its own menu of 16 decay times. The display shows the RT60 value in seconds.

> *"Decay time is one of the most important parameters that determine the sense of ambience of a recording. As a guideline when seeking a natural acoustic environment for a sound, pick shorter decay times for small ensembles, and longer decay times for large orchestras, space music, and pipe organs."* — Christopher Moore, StarGate 323 Owner's Manual

> *"There is also a close relationship between decay time and how rapidly a sound source is changing. Rapid speech or fast musical passages with articulated detail cannot tolerate long decay times or the temporal detail gets lost. On the other hand, slow music can benefit from the extra feeling of space that comes from longer decay times."* — Christopher Moore, StarGate 323 Owner's Manual

With the decay set to 0, no recirculation occurs and you hear only the early reflections from the output taps.

Override Buttons

Three override buttons on the left side of the panel provide real-time performance control. Each has an LED indicator that flashes when the function is active. The buttons are mutually exclusive — engaging one disengages the others.

Input Mute

Mutes the input signal, preventing it from reaching the reverberator. Any reverb already in progress continues to decay naturally.

> *"Input Mute can be used in several ways. With a very long decay time, such as 8 or 10 seconds, you can wait until a note or sound is reverberating and hit Input Mute. Now only the sound that was reverberating will continue as it dies out naturally. Or you can use it to disable the 323 during times in a performance or mixdown when you no longer want reverberation."* — Christopher Moore, StarGate 323 Owner's Manual

Dry Only

Mutes the reverb signal in the output, leaving only the dry path. The reverberator continues processing internally — you just can't hear it.

> *"You can use this feature to eliminate reverb sound from the mix, while still allowing the direct sound through. The reverberator is still reverberating: you just can't hear it. When you next release this button, you will 'rejoin the reverb in progress.'"* — Christopher Moore, StarGate 323 Owner's Manual

Reverb Clear

Forces the decay time to zero regardless of the Decay knob setting, clearing any reverberant energy and stopping all recirculation. Only the early reflections reach the output.

> *"Reverb Clear is useful with long decay times to create moments with no reverberant decay, when only the early reflection sound reaches the output. When you release this button, reverb will immediately begin to build up normally."* — Christopher Moore, StarGate 323 Owner's Manual

Power Button

The power button on the right side toggles the plugin between active and bypass states. When off, the input passes through unprocessed and the displays dim.

Peak Meter

The horizontal meter across the top of the display shows instantaneous peak input level in dB, with brief peak hold. Use this to set the Input knob for optimal gain staging.

Numeric Displays

Three numeric readouts show the current state:

- **Room display** (left) — Current program in hexadecimal (1–F, 0)
- **Delay display** (center) — Pre-delay value in milliseconds or seconds; shows note values when tempo sync is active
- **Decay display** (right) — Decay time in seconds

The 16 Programs

Overview

The StarGate uses one basic algorithm — a set of feedback and output taps reading from a shared delay buffer — but each of the 16 programs loads a completely different dataset from the PROMs. This means each program isn't a parameter tweak; it's a fundamentally different arrangement of tap positions, decay curves, and modulation shapes. The basic difference from room to room is the increasing time delays used.

> *"Once you become accustomed to the controls, it will be easy to appreciate the uses and distinctive qualities of each of the rooms. This is, of course, true to nature, where small spaces have short sound paths and large halls quite long paths. Each of the rooms has a distinctly different character, useful for a variety of program material, instruments, and creative effects."* — Christopher Moore, StarGate 323 Owner's Manual

Room Programs (1–A)

The first ten programs simulate reverberant spaces of increasing size, from tight plates to vast canyons. Programs 1–8 correspond to the original eight rooms of the StarGate 323. Programs 9 and A extend the range with even larger spaces and longer maximum decay times.

Room Characteristics

Display	Program	Acoustic Analog	Inherent Pre-Delay	Max Decay
1	Plate	Fast-diffusing plate reverb	16ms	2.0s
2	Plate	Slightly larger plate	24ms	3.0s
3	Chamber	Studio live chamber	40ms	4.0s
4	Small Hall	Intimate concert space	64ms	5.0s
5	Hall	Medium concert hall	88ms	6.0s
6	Large Hall	Large performance venue	120ms	7.0s
7	Cathedral	Cathedral / large church	160ms	8.0s
8	Canyon	Vast open space	200ms	10.0s
9	Large Space	Extended canyon	—	15.0s

Display	Program	Acoustic Analog	Inherent Pre-Delay	Max Decay
A	Cavern	Maximum space	—	20.0s

The smaller rooms (1–2) have the **fastest diffusion** — they build to peak density quickly, making them ideal for percussion and transient-heavy sources. They also have the **greatest coloration**, which gives them a distinctive character.

The larger rooms (7–8) have the **slowest diffusion** — the reverb builds gradually, leaving the direct sound clearly audible before the tail fills in. They have the **least coloration** and **most spaciousness**, but also the **least intelligibility** for speech and rapid passages.

Qualities by Room Size

Quality	Small Rooms (1–2)	Large Rooms (7–8)
Diffusion speed	Fastest	Slowest
Coloration	Greatest	Least
Percussive sounds	Best	Worst
Spaciousness	Least	Most
Intelligibility	Greatest	Least

Echo Programs (B–F)

Programs B through F are echo-oriented modes with extended pre-delay ranges. Programs C through F support tempo sync when the Sync button is engaged.

Display	Character	Pre-Delay Range	Max Decay
B	Echo	20–440ms	4.0s
C	Long Echo	50ms–2.0s	15.0s
D	Long Echo	50ms–2.0s	15.0s
E	Long Echo	50ms–2.0s	15.0s
F	Very Long Echo	200ms–2.0s	15.0s

In the echo programs, the modulation system is disabled — the taps remain fixed, producing clean, precise echoes rather than diffuse reverberation. This makes them particularly suited to tempo-synced rhythmic delays.

Program 0 (Small Room)

The final position wraps back to a small room with the shortest decay times (up to 1.5 seconds). This provides a tight, compact reverb useful for subtle thickening and ambience.

Suggested Settings

The following table gives a rough starting point for common sources. As Christopher Moore wrote:

> *"There is such a broad range of taste and musical style that a table such as this can only be thought of as a starting point. Please don't read this table as a rigid guide; rather, give free rein to your creativity, and experiment!"* — Christopher Moore, StarGate 323 Owner's Manual

Source	LF Decay	HF Decay	Room	Pre-Delay	Decay Time
Percussion, Snare	moderate	moderate–low	1–3	0–70ms	0–4.0s
Vocals	moderate–high	moderate	2–4	0–100ms	0–4.0s
Piano	moderate–high	moderate–high	3–6	0–120ms	0–4.0s
Chamber Music	high	moderate	3–5	0–60ms	1.5–3.0s
Symphonic Music	moderate–high	high	3–6	0–170ms	2.0–4.0s
Narration	moderate–high	high	1–4	0–30ms	0–2.0s
Synthesizer	moderate–high	moderate–high	3–8	0–240ms	0–6.0s
Space Effects	high	high	6–8	0–320ms	3.5–10.0s

Available Decay Times

Each room has its own set of 16 decay time values (in seconds). The first position is always 0 (early reflections only).

Room	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.0	0.2	0.4	0.6	0.8	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
2	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0
3	0.0	0.4	0.8	1.2	1.6	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0
4	0.0	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.4	3.8	4.2	4.4	4.6	4.8	5.0
5	0.0	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	4.4	4.8	5.2	5.6	6.0
6	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.4	5.8	6.2	6.6	7.0
7	0.0	0.8	1.6	2.4	3.2	4.0	4.4	4.8	5.2	5.6	6.0	6.4	6.8	7.2	7.6	8.0
8	0.0	1.0	2.0	3.0	4.0	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
9	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
A	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	12.0	14.0	16.0	18.0	20.0
B	0.0	0.4	0.8	1.2	1.6	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0
C	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
D	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
E	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
F	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
0	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5

Tempo Sync

Tempo sync is a plugin-only feature not available on the original hardware. When engaged, the echo delay time locks to your DAW's tempo for rhythmically precise delays.

Engaging Tempo Sync

Click the **Sync** button in the toolbar to enable tempo sync. The button illuminates when active. Tempo sync only applies to the echo programs (C, D, E, F) — the button is grayed out on room programs.

Note Divisions

When sync is active, the Delay knob snaps to six note divisions:

Knob Position	Note Value
0–2	1/32 note
3–5	1/16 note
6–8	1/8 note
9–11	1/4 note
12–14	1/2 note
15	1/1 (whole note)

The delay display updates to show the current note value instead of a time in milliseconds.

Note Modifier

The note modifier button (next to the Sync button) cycles through three modes:

- **STR** (Straight) — the base note division
- **DOT** (Dotted) — 1.5x the base note length
- **TRP** (Triplet) — 2/3x the base note length

For example, a 1/8 note at 120 BPM gives 250ms straight, 375ms dotted, or 167ms as a triplet.

Maximum Delay

Tempo-synced delays are clamped to a maximum of 4 seconds (for the delay tap) or 320ms (for the pre-delay component on room programs). At very slow tempos, long note values will be limited to this ceiling.

Usage Guide and Tips

Choosing a Room for Your Source

The most important decision is matching the room size to your source material. The general principle: smaller rooms for intimate sources, larger rooms for grand ones.

> *"As a guideline when seeking a natural acoustic environment for a sound, pick shorter decay times for small ensembles, and longer decay times for large orchestras, space music, and pipe organs. There is also a close relationship between decay time and how rapidly a sound source is changing. Rapid speech or fast musical passages with articulated detail cannot tolerate long decay times or the temporal detail gets lost. On the other hand, slow music can benefit from the extra feeling of space that comes from longer decay times."* — Christopher Moore, StarGate 323 Owner's Manual

Drums and percussion: Start with Rooms 1–3. The fast diffusion of the smaller rooms fuses the reverb with the transient quickly, reinforcing the attack rather than blurring it. Keep decay times short (0–4 seconds).

Vocals: Rooms 2–4 work well. Use moderate pre-delay (30–100ms) to keep the voice clear and intelligible. Roll off HF Decay slightly to prevent sibilants from lingering.

Piano: Rooms 3–6 provide the spaciousness that piano benefits from. The medium rooms let the sustain develop naturally.

Orchestral and symphonic: Rooms 3–6 with longer decay times (2–4 seconds) and moderate pre-delay (up to 170ms). The larger rooms provide the sense of a concert hall.

Synthesizer and ambient: The larger rooms (3–8) give electronic sources room to breathe. Long decay times (up to 6 seconds or more) create evolving washes and textures.

Space effects: Rooms 6–8 with maximum pre-delay and long decay. Programs 9 and A extend the range even further, up to 20 seconds of decay.

Mono to Stereo Conversion

The StarGate's output taps are arranged to produce an uncolored (nearly flat frequency response) stereo signal from a mono input, with the left and right tap groups remaining uncolored even when summed back to mono. This makes the SG-626 ideal for mono-to-stereo synthesis.

> *"The left and right tap groups are arranged to not only be uncolored by themselves, but to remain uncolored when summed to mono. This makes them ideal for mono-to-stereo synthesis. The output will transform a center image mono signal into a pleasingly spacious, natural stereo signal that retains full compatibility in mono."* — Christopher Moore, StarGate 323 Owner's Manual

To use this technique:

1. Set Direct Mix to 0 (no dry signal)
2. Set Reverb Mix to 10 (full)
3. Keep Pre-Delay at 0 to maintain sync with other material in the mix
4. Set Decay to 0 (no recirculation — only the early reflections)
5. Use smaller rooms (1–3) for best results

"Rooms 1 or 2 are nice to use with an announcer's voice in an on-air broadcast appli-cation. The mono, boxy voice is projected into a little space, without the annoying 2 or 3 second decay time of a spring or plate reverb. In addition, the perceived loudness is boosted somewhat — more than the VU meter would tend to make you think. This is because the ear integrates the delayed versions of the direct sound and hears it as louder, even though the peak value may not change so much." — Christopher Moore, StarGate 323 Owner's Manual

Fattening and Doubling

For thickening a source without audible reverberation, use the same mono-to-stereo technique with a small amount of decay:

"In multi-track mixdown, this is a nice technique to use with closely-miked mono pick-ups of drums or any other instruments or voice. It helps save tracks on the multi-track, too, because you know at mixdown that you can derive a stereo signal from a track."
— Christopher Moore, StarGate 323 Owner's Manual

Working with Pre-Delay

Pre-delay separates the dry source from the reverb onset, helping preserve clarity and intelligibility. Each room already has an inherent pre-delay that scales with room size (from 16ms in Room 1 to 200ms in Room 8). The Pre-Delay control adds additional delay on top of this.

"The range of pre-delay (up to 320ms) is so large that a distinct echo can be heard when reverb begins. This can be useful for special effects." — Christopher Moore, StarGate 323 Owner's Manual

A practical tip: with pre-delay set to 0 and a high reverb mix, comb filtering between the direct signal and the earliest taps may be audible. Adding 10–20ms of pre-delay eliminates this.

Using the Override Buttons

The three override buttons — Input Mute, Dry Only, and Reverb Clear — are performance tools designed for real-time use.

Freeze and decay: Set a long decay time (8–10 seconds), let a sound build up in the reverberator, then hit Input Mute. The reverb tail continues to decay naturally with no new input, creating an isolated, fading wash.

Rejoin in progress: Use Dry Only to temporarily hide the reverb while keeping it running internally. When you release, the reverb reappears mid-tail — useful for dramatic reveals.

Clear and rebuild: Reverb Clear instantly silences the tail. Release it during a pause in the music, and reverb builds from scratch on the next sound — useful for transitions between sections with different reverb characters.

Changing Rooms Silently

Switching rooms while reverb is in progress can produce an audible glitch because the internal tap positions change abruptly.

"It is best to wait for a pause in the music if you would like a silent change of Room. In fact, you actually need to wait until any reverberation in process has died out to ensure a silent change." — Christopher Moore, StarGate 323 Owner's Manual

If a silent transition is important, engage Reverb Clear momentarily to flush the tail, switch rooms, then release Reverb Clear.

Taming the High End

The StarGate's full 15kHz bandwidth is wider than many classic reverbs, which can cause sibilants and high-frequency transients to linger in the tail.

"You will find it preferable to reduce the HF Decay for many kinds of music and reverberant effects. Unless you do so, occasional sibilants, especially in the larger rooms, will hang on for longer than desirable." — Christopher Moore, StarGate 323 Owner's Manual

Start with HF Decay at about 60–70% (slightly below max) for a natural sound. Only push it to full for bright, shimmering effects or synthesizer washes where the extended high end is desirable.

Echo Programs

Programs C through F offer long delay times (up to 2 seconds) with optional tempo sync. Unlike the room programs, the echo programs disable the modulation system, producing clean, precise repeats.

Use these for:

- **Rhythmic delays** — Enable Sync and match to your track's tempo
- **Slapback** — Short delay (50–100ms) with moderate decay
- **Ambient echoes** — Long delay with high decay for cascading, overlapping repeats

Specifications

Original StarGate 323 Hardware

Parameter	Value
Bandwidth	15kHz, all rooms, all decay times
Sampling Rate	32kHz

Parameter	Value
Resolution	15-bit linear PCM
Dynamic Range	80dB
Programs	8 room simulations
Pre-Delay	0–320ms, 8 steps
Decay Time	0–10 seconds, 8 steps (room dependent)
HF and LF Decay	Continuously adjustable 6dB/octave shelving filters
Mixing	Stereo Direct and Stereo Reverb Mix controls
Override Functions	Input Mute, Dry Only, Reverb Clear

SG-626 Plugin

Parameter	Value
Bandwidth	15kHz (3rd-order elliptic lowpass on input and output)
Internal Sample Rate	Host sample rate (filter coefficients adapt automatically)
Programs	16 (8 original rooms + extended rooms + echo modes)
Pre-Delay	0–320ms (room programs), up to 2.0s (echo programs), 16 steps
Decay Time	0–20 seconds (room dependent), 16 steps per program
LF Decay	-3dB corner: 14Hz (max) to 482Hz (min)
HF Decay	-3dB corner: 3kHz (min) to 15kHz (max)
Feedback HPF	219Hz (prevents low-frequency buildup)
Feedback Notch	9kHz, -3dB (prevents high-frequency harshness)
Modulation	Envelope-following, 5 discrete rate levels, 8192-step counter
Tempo Sync	Echo programs only; 1/32 to whole note with straight/dotted/triplet
Plugin Formats	VST3, AU, AAX
Platforms	macOS 10.13+, Windows 10+
GUI Size	860 x 209 pixels (scalable: 100%, 150%, 200%)

DSP Architecture

Component	Detail
Delay Buffer	393,216 samples (~12.3 seconds at 32kHz)
Feedback Taps	15 taps, modulated in delay and gain
Output Taps	8 taps (4 left, 4 right), unmodulated

Component	Detail
PROM Data	6 EPROMs, 56KB total algorithm data
Envelope Follower	Bandpass 106–370Hz, 1ms attack, 100ms release
Gain Limiter	Hardware-modeled magnitude comparator ceiling

Credits

Original Hardware

The Ursa Major StarGate 323 was designed and manufactured by Ursa Major, Inc. of Watertown, Massachusetts.

- **Christopher Moore** — Designer, Ursa Major founder
- **Mark Bruckner** — Digital design, documentation, and testing
- **Charles Anderson** — Breadboarding, testing, and software optimization (tuning the Rooms)

The StarGate 323 Owner's Manual was published by Ursa Major, Inc. in March 1984.

Plugin

The Temecula DSP SG-626 plugin was developed by Temecula DSP.

Legal

SST-282, SST-206, and Stargate 626 are model numbers originally used by Ursa Major and Seven Woods Audio. Temecula DSP is not affiliated with the estate of Christopher Moore, Ursa Major, or Seven Woods Audio.

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