

SPACEBASS

Quick Start Guide

Overview

The SpaceBass is a Synth with a great tonal range and features dual capacitive touch controllers, 4 synthesis engines, and comprehensive sound shaping capabilities.

Hardware Components

- 20x4 LCD display
- Rotary encoder with push button for menu navigation
- Two MPR121 capacitive touch sensors (0x5D and 0x5A)
- 9V DC power input

Getting Started

Power Up

1. Connect a 9V DC power supply to the power jack, or use a 9V battery
2. The LCD will display the boot screen showing "SPACEBASS"
3. After 2 seconds, Preset 1 will automatically load

Controls Overview

Control	Function
Encoder (turn)	Navigate menu (clockwise = next, counter-clockwise = previous) or adjust value when editing
Button (single tap)	Toggle Edit mode ON/OFF, or Load preset (when on Load Preset menu)
Button (double tap)	Quick save current settings to preset slot (when on Load Preset menu)
Button (long press)	Return to home (Load Preset menu)
Touch Pads A	Main controller - triggers notes based on selected scale and instrument
Touch Pads B	Secondary controller - dedicated PWM synthesizer with independent ADSR

Synthesis Engines

The SpaceBass features 4 synthesis engines accessible through the Instrument LCD menu:

1. Analog

Classic subtractive synthesis with three oscillators (A, B, and Sub). Choose from Saw, Sine, Triangle, or Square waveforms. Independent mix levels for each oscillator provide rich, layered tones.

2. FM Bass

Frequency modulation synthesis with adjustable carrier-to-modulator ratios (0.5x, 1x, 1.5x, 2x, 3x, 4x) and FM Index control for harmonic complexity.

3. PWM (Pulse Width Modulation)

Dual-voice (DUO mode) pulse wave synthesizer with animated pulse width control. Adjustable width, rate, and depth create evolving timbres. Optional sub-oscillator adds depth.

4. Ring Modulation

Metallic, inharmonic tones created by multiplying carrier and modulator waveforms. Adjustable modulator frequency ratio and depth. Independent waveform selection for carrier and modulator. Optional sub-oscillator.

Menu Parameters

Navigate through 38 menu items using the rotary encoder. Press the button to toggle Edit mode and turn the encoder to adjust values.

Preset Management

- Load Preset - Select from 8 preset slots (1-8)
- Save Preset - Store current settings to selected slot

Instrument Parameters

- FM Ratio - Frequency ratio for FM synthesis (0.5x to 4x)
- FM Index - Modulation depth (0.0 to 1.0)
- PWM Width - Pulse width (0.05 to 0.95)
- PWM Rate - Modulation speed (0.1 to 15 Hz)
- PWM Depth - Modulation intensity (0.0 to 1.0)
- PWM Sub - Sub-oscillator on/off
- RM Mod Ratio - Modulator frequency ratio (0.1 to 8.0)
- RM Mod Depth - Modulation amount (0% to 100%)
- RM Car Wave - Carrier waveform (Saw/Sine/Tri/Square)
- RM Mod Wave - Modulator waveform (Saw/Sine/Tri/Square)
- RM Sub - Ring mod sub-oscillator on/off

Musical Parameters

- Key - Root key (C to B with sharps)
- Octave - Octave range (0 to 6)
- Scale - Major, Natural Minor, Dorian, Mixolydian, Lydian, Pentatonic Major, Pentatonic Minor
- Waveform - Oscillator waveform for Analog mode
- Sub Wave - Sub-oscillator waveform
- Sub Level - Sub-oscillator volume (0.0 to 2.0)

Controller A ADSR Envelope

- Attack - Attack time (0 to 2000 ms)
- Decay - Decay time (0 to 4000 ms)
- Sustain - Sustain level (0.0 to 1.0)
- Release - Release time (0 to 4000 ms)

Controller B ADSR Envelope (Independent)

- B Attack - Attack time (0 to 2000 ms)
- B Decay - Decay time (0 to 4000 ms)
- B Sustain - Sustain level (0.0 to 1.0)
- B Release - Release time (0 to 4000 ms)

Filter & Modulation

- Cutoff - Filter cutoff frequency (50 to 12000 Hz)
- Reso - Filter resonance (0.05 to 1.2, max limited to prevent self-oscillation)
- Glide - Portamento time (0 to 400 ms)
- LFO Rate - Modulation speed (0.1 to 20 Hz)
- LFO Depth - Modulation intensity (0% to 100%)

Effects

- Rev Room - Reverb room size (0% to 100%)
- Rev Damp - Reverb damping (0% to 100%)
- Rev Mix - Reverb wet/dry mix (0% to 95%)

Volume Controls

- Vol A - Controller A volume (0.0 to 2.0)
- Vol B - Controller B volume (0.0 to 2.0)

Playing the SpaceBass

Controller A - Main Controller

Touch any of the 12 capacitive pads to trigger notes based on the selected scale, key, and octave. The notes are automatically mapped to the chosen scale, eliminating wrong notes.

- In Analog/FM/Ring Mod modes - monophonic operation with glide
- In PWM mode - dual-voice polyphony (DUO mode) with two simultaneous notes

Controller B - PWM Synthesizer

Controller B operates as an independent PWM synthesizer with its own ADSR envelope, allowing for layered performance. Two-voice polyphony enables chord playing. Volume independently controlled via Vol B parameter.

Quick Tips

- Use Pentatonic Minor scale for easy bass lines without dissonance
- Double-tap the button on Load Preset menu for quick saves during performance
- Long-press the button from any menu to instantly return home
- The LCD shows controller status (A, B, or AB) indicating which touch controllers are active
- PWM instrument operates in DUO mode - touch two pads simultaneously for harmonies
- Adjust LFO Depth to add movement to the filter cutoff frequency
- Glide creates smooth pitch transitions between notes
- Ring Modulation mode is great for aggressive, distorted bass tones

Audio Connections

- Line level output from Audio Board (connect to mixer or amplifier)

Troubleshooting

No Sound

- Check power supply is connected and 9V is present
- Verify audio output connections
- Check Vol A and Vol B parameters are not at 0.0

Touch Pads Not Responding

- Check LCD status display for controller status (should show A, B, or AB)
- If MPR121 error appears, power cycle the unit
- Verify I2C connections between Teensy and MPR121 controllers

Technical Specifications

- Microcontroller: 600 MHz ARM Cortex-M7 processor
- Audio Processing: SGTL5000 codec
- Sample Rate: 44.1 kHz
- Display: 20x4 LCD with I2C interface (0x27)
- Touch Controllers: 2x MPR121 (12 pads each)
- Power Input: 9V DC
- Preset Storage: 8 slots in EEPROM with CRC32 validation