

20CC

TXX-1 SPECTRON

DUAL TAPE OSCILLATOR | USER MANUAL V1.0

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Introduction

The 20CC TXX-1 Spectron is a Eurorack format dual oscillator inspired by vintage analog multisampling instruments such as the Mellotron and Chamberlin[1]. Spectron uses a unique combination of synthesis and sampling techniques to bring the rich, warbly sounds of these classic instruments into Eurorack for the first time, while also offering new possibilities to manipulate, warp, and mangle them.

Analog multisampled instruments had their heyday in the 1950s through the 1970s. Each key corresponded to a tape recording of a note played on another instrument, often orchestral sounds like strings, woodwinds or choirs, which would play back when the key was pressed. All of Spectron's sounds are based around full, per-key recordings of vintage multisampled instruments.

Rather than simply triggering discrete samples, Spectron organizes many samples to create the illusion of a continuous voltage-controlled oscillator. As pitch changes, playback seamlessly transitions between recordings, preserving the character of each original tape while allowing smooth, continuous frequency control.

There are two timbre-shaping sections not normally found on sample-based instruments: FM and Sync. These are tuned to range from subtle modulations that recontextualize familiar sounds, through radical transformations that are barely recognizable, and all the way to harsh and clangorous, with continuous CV control over all points between.

Spectron also contains an optional built-in envelope, VCA, and LFO, allowing it to function as two complete synth voices.

Lastly, Spectron has a modulation matrix with two dedicated CV inputs and a variety of destinations, allowing for extremely fine-grained control when desired.

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1 20CC is not affiliated with any of the owners of the Mellotron or Chamberlin trademarks - these names are used for illustrative purposes only.

At a Glance

- Two independent, continuously tunable tape-based oscillators
- Per-key multisamples with smooth crossfading between neighboring notes
- Independent 1V/oct, trigger, scan CV, and audio connections for each Deck
- FM and Sync performance buses with CV attenuverters and assignable Deck routing
- Two assignable CV inputs and a flexible modulation matrix
- Built-in ASR envelopes, VCAs, and a morphing global LFO
- Optional four-voice overlap per Deck for pseudo-polyphonic release tails
- Tape streaming and firmware updates via microSD card

Throughout this manual you'll encounter some recurring terms:

- **Deck** — One of Spectron's two independent playback voices, **A** and **B**.
- **Tape** — A set of multisamples of an instrument or instruments, for instance violins or flutes, which together form a single sound.
- **Tape Pool** — A user-defined collection of enabled tapes available to a Deck.

The following chapters introduce the front panel, menu system, and modulation features in the order you're most likely to encounter them while patching.

Front Panel


SPECTRON
DUAL TAPE OSCILLATOR
A MK2FLUTE
B3 VIOLINS
0.00
0.00
TAPE/←
↑SHIFT
1
2
3
4
20CC
ENV
FREQ
LFO
MTRX
FM INDEX
SYNC
5
6
7
8
9
13
VCA
CLEAR
10
14
A B
A B
12
16
ENV/LFO
ENV/LFO
17
18
11
15
23
24
A TRIG B
FM INDEX
SYNC
X MTRX Y
19
20
21
22
25
26
A V/O B
A SCAN B
A OUT B
TXX-1

TAPE/BACK [1]

- Press to enter or exit the **Tape Select Menu**.
- **SHIFT [2] + TAPE/BACK [1]**: Open the **Global Menu**.

SHIFT [2]

Hold to access secondary functions throughout the module.

> See **Appendix A: SHIFT Functions**

ENCODER A [3] / ENCODER B [4]

These adjust different parameters based on the current screen.

Examples include:

- Frequency
- Envelope Attack + Release
- LFO Rate + Shape

ENV [5]

- Press to open the **Envelope Screen**.
- **SHIFT [2] + ENV [5]**: Change the VCA mode. See **Internal VCAs**.

FREQ [6]

Press to open the **Frequency Screen**.

LFO [7]

Press to open the **LFO Screen**.

MTRX [8]

- Press to open the **Modulation Matrix Screen**.
- **SHIFT [2] + MTRX [8]**: Clear all modulation assignments to the Matrix Default Settings.

FM INDEX [9]

Sets the **Frequency Modulation** amount.

FM INDEX ATTENUVERTER [10]

Adjusts the polarity and depth of the signal present at **FM INDEX CV [11]**.

FM INDEX CV [11]

CV input for the FM Bus.

FM ASSIGN [12]

Assigns the FM bus to the decks.

- Press to cycle between:
  - **Deck A**
  - **Deck B**
  - **Deck A** + **Deck B**
  - Off
- **SHIFT [2] + FM ASSIGN [12]**: Select the internal modulation source normalled to **FM INDEX ATTENUVERTER [10]** when no cable is present at **FM INDEX CV [11]**:
  - Envelope
  - LFO

SYNC [13]

Sets the **Sync** ratio.

SYNC ATTENUVERTER [14]

Adjusts the polarity and depth of the signal present at **SYNC CV [15]**.

SYNC CV [15]

CV input for the **Sync** Bus.

SYNC ASSIGN [16]

Assigns the Sync bus to the decks.

- Press to cycle between:
  - **Deck A**
  - **Deck B**
  - **Deck A** + **Deck B**
  - Off
- **SHIFT [2] + SYNC ASSIGN [16]**: Select the internal modulation source normalled to **SYNC ATTENUVERTER [14]** when no cable is present at **SYNC CV [15]**:
  - Envelope
  - LFO

TRIG A [17] / TRIG B [18]

Trigger / Gate input for Deck A and B.

- **TRIG A [17]** and **TRIG B [18]** accept **0-5V** triggers or gates.
- The input of **TRIG B [18]** is normalled to **TRIG A [17]**.
- When a rising edge is detected, the corresponding Deck will restart the currently playing sample. Additionally, the corresponding envelope will begin its attack phase.
- When a falling edge is detected, the corresponding envelope will enter its release phase.

The trigger inputs also interact with **Tape Trigger**.

V/O A [19] / V/O B [20]

1V/octave inputs for **Deck A** and **B**.

The input of **V/O B [20]** is normalled to **V/O A [19]**.

SCAN A [21] / SCAN B [22]

CV input for tape selection.

> See **Scan**

X CV [23] / Y CV [24]

Assignable CV input.

> See **Modulation Matrix Screen**

OUT A [25] / OUT B [26]

Audio output for **Deck A** and **Deck B**.

Tape Select Menu

Press TAPE/BACK [1] to enter the Tape Select Menu.

Each Deck maintains its own independent Tape Pool — a collection of enabled tapes available for playback and scanning.

Selecting Sounds

- **ENCODER A [3]**: Scroll and select tapes for **Deck A**
- **ENCODER B [4]**: Scroll and select tapes for **Deck B**
- Press the corresponding encoder to assign the highlighted tape.

> At the top of each **Tape Pool,** you'll find the **Tape Trigger** setting, and at the bottom, **Reset Tape Pool.** See Tape Trigger and Editing Tape Pools.

Tapes Available in Firmware 1.0

MK2 Flutes	MK2 3 Violins	MK2 Vibes
M400 Bassoon	M400 Cello	M400 Boys Choir
MK400 English Horn	M300A Violin	8 Voice Choir
M4000 Solo Flute	M400 Viola	Combined Choir
MK2 Tenor Sax	M4000 Electric Viola	Drive Guitar
MK2 Trombone	M4000 Cellos	12 String Guitar
MK2 Trumpet	M400 Pipe Organ	MK2 Electric Guitar
MK2 Brass	MK2 Church Organ	

More factory tapes will be made available in future updates. Additionally, an editor application for Mac and Windows, as well as documentation of the .tape file format, is planned to allow users to create their own tape files.

> Tapes are often named after the model for which they were originally recorded. For instance, the famous Flutes tape was made for the Mellotron MK2, used by many 60's psychedelic rock bands.

Editing Tape Pools

Pressing **SHIFT [2]** while in the Tape Menu enables editing the pool. While **SHIFT [2]** is held, you will see the entire collection of available tapes and be able to enable and disable them.

- **SHIFT [2]** + **ENCODER A [3]** or **ENCODER B [4]**
  - **Turn**: Scroll through the list.
  - **Press**: Enable or disable the highlighted tape.

An option at the bottom of the tape pool allows you to reset the pool to the factory default (all tapes enabled).

A future update will allow on-device re-ordering of tapes for each tape pool. For now, it is possible to change the order of tapes by editing the file names of the .tape files on the microSD card (see **Re-ordering Tapes**).

> You may be wondering why you would want to disable tapes from the pool or change their order. As we will see below, it is possible to use triggers and/or CV inputs to select tapes, and you may want your patch to only use a smaller selection of tapes in this case.

Tape Selection Via CV

Tape Trigger

Tape Trigger selects a new tape on every trigger.

Enable **Tape Trigger** independently for Deck A and Deck B at the top of the **Tape Pool** or in the **Global Menu**.

When enabled, an option to change the **Tape Trigger Mode** will appear below.

Mode	Behavior
Cycle	Each trigger advances to the next enabled tape.
Random	Each trigger selects a random enabled tape.
Scan	When Scan is enabled (see below) each trigger will sample the Scan CV and select the corresponding tape. Cycle and Random are not selectable when Scan is active

Scan

Patching a cable into either **SCAN A [21]** or **SCAN B [22]** input will enable **Scan** for the corresponding **Deck**.

This allows you to select tapes within a **Tape Pool** using CV.

- **0V** activates the last selected tape.
- Positive voltages move forward through the Tape Pool.
- Negative voltages move backward.
- The Tape Pool wraps continuously at both ends.
- Selecting a new tape from the **Tape Select Menu** will re-orient the Scan CV around it, placing it at the **0V** position.

The enabled tapes are distributed evenly across the selected **CV Input Scaling** range (±5V or ±10V). See the Global Menu.

Example Tape Pool:

1. **Flute**
2. **Choir**
3. **Drive Guitar ← Selected**
4. **Cello**

- **A 0V CV input at Scan activates Drive Guitar.**
- **Positive voltages move toward Cello, then wrap to Flute and Choir.**
- **Negative voltages move toward Choir, then Flute, before wrapping to Cello.**
- **Sound changes occur immediately at each threshold when Tape Trigger is disabled.**

Tape Trigger + Scan

When a **Scan** input is patched and **Tape Trigger** is active, Spectron samples the voltage present at the Scan input whenever a trigger is received.

The sampled voltage determines which tape is selected.

In this mode, **Cycle** and **Random** are not selectable.

Envelope Screen

Press **ENV [5]** to open the Envelope Screen.

Each Deck can use an Attack-Sustain-Release or ASR envelope to modulate the built-in **VCA**, **FM**, **Sync**, or the **Modulation Matrix**. The envelope screen displays a representation of the shape of the envelope.

By default, both envelopes are linked and share the same Attack and Release settings.

Adjusting Envelopes

- Turn **ENCODER A [3]**: Adjust Attack.
- Turn **ENCODER B [4]**: Adjust Release.
- **SHIFT [2]** + press **ENCODER A [3]**: Link or unlink Envelope B.
  - **Linked**: Both envelopes share the same Attack and Release settings.
  - **Unlinked**: Each envelope can be edited independently. Press **ENV [5]** to switch between Envelopes. The display indicates which Envelope is currently being edited.

When the envelopes are linked, they share sources and destinations in the modulation matrix.

The envelopes will automatically unlink when **TRIG B [18]** is patched.

See also Modulation Matrix

By default, the FM and Sync CV inputs are normalled to the LFO. Pressing **SHIFT [2] + FM ASSIGN [12]** or **SHIFT [2] + SYNC ASSIGN [16]** will toggle between routing the LFO or envelope to the respective CV.

Internal VCAs

Spectron contains an optional internal VCA for each Deck, controlled by the envelope. This allows it to be used as two complete synthesizer voices.

Press **SHIFT [2] + ENV [5]** to change the VCA mode. The VCA LED indicator will change color to indicate which mode is active. This setting is global, affecting **both Decks**.

- Disabled (RED)
  - **Deck A** and **Deck B** sound continuously.
  - Both envelopes remain available as modulation sources.
- Monophonic (GREEN)
  - **Envelope A** controls the amplitude of **Deck A**.
  - **Envelope B** controls the amplitude of **Deck B**.
- Polyphonic (BLUE)
  - This mode is identical to the monophonic VCA mode, except that longer release settings can overlap new notes, enabling a form of pseudo-polyphony. The max number of voices per Deck in this mode is 4.

Frequency Screen

Press **FREQ [6]** to open the Frequency Screen.

Each Deck may be tuned independently.

Adjusting Freq

- Turn **ENCODER A [3]**: Adjust the frequency of **Deck A**.
- Turn **ENCODER B [4]**: Adjust the frequency of **Deck B**.

Tuning Modes

SHIFT [2] + press ENCODER A [3] or ENCODER B [4]: Toggle between **Continuous** and **Stepped** tuning for the corresponding **Tape**.

- Continuous
  - Turn the encoder for fine adjustments.
  - Press and turn for coarse adjustments.
- Stepped
  - Turn the encoder to transpose in semitone increments.
  - Press and turn to transpose by octaves.

Quick Clear

Press **SHIFT [2] + FREQ [6]** to quickly clear the frequency of both decks to 0. This shortcut can be turned off in the **Global Menu**.

LFO Screen

Press **LFO [7]** to open the **LFO Screen**.

Spectron uses a single global LFO shared by **Deck A** and **Deck B**.

Adjusting the LFO

- **ENCODER A [3]**: Adjust **Rate**.
- **ENCODER B [4]**: Adjust **Shape**.

The Shape control continuously morphs between adjacent waveforms. Standard waveforms briefly "snap" into place, making them easy to select while preserving smooth transitions between them.

The available LFO waveforms are:

- **RAMP**
- **TRIANGLE**
- **SAW**
- **SQUARE**
- **SIN**

LFO Settings

- **SHIFT [2] + ENCODER A [3]**: Toggle between **Unipolar** and **Bipolar** operation.
  - **Unipolar**: Outputs positive voltages only.
  - **Bipolar**: Outputs positive and negative voltages.
- **SHIFT [2] + ENCODER B [4]**: Enable or disable **LFO Retrigger**.
  - **Enabled**: The LFO restarts whenever a Trigger is received at either TRIG A [17] or TRIG B [18].
  - **Disabled:** The LFO runs continuously.

Modulation Matrix Screen

Press **MTRX [8]** to open the Modulation Matrix.

The Modulation Matrix allows internal and external modulation sources to be assigned to multiple destinations throughout Spectron.

Selecting Sources

Press **MTRX [8]** to cycle through the available modulation sources.

Each source stores its own independent modulation amounts.

Adjusting Modulation

- **ENCODER A [3]**: Select a destination.
- **ENCODER B [4]**: Adjust the modulation amount.
  - Positive values apply modulation normally.
  - Negative values invert the modulation.
  - A value of **0** removes modulation from the selected destination.
- **SHIFT [2] + ENCODER B [4]**: Reset the selected modulation amount to **0**.
- **SHIFT [2] + MTRX [8]**: Restore the Modulation Matrix to its saved default.

> See Global Menu to learn how to save a default matrix state

Multiple Modulation Sources

A destination may receive modulation from multiple sources simultaneously.

For example:

- Envelope A → Deck A Freq
- Global LFO → Deck A Freq
- X CV → Deck A Freq

The resulting modulation is the sum of all assigned modulation amounts.

> See Appendix B: Modulation Sources and Appendix C: Modulation Destinations for complete lists of modulation sources and destinations.

FM

Spectron offers two-operator (one carrier, one modulator) frequency modulation[2] for each Deck. Essentially, this uses one audio signal (the modulator) to rapidly vary the frequency of another (the carrier), producing timbre changes in the carrier. In Spectron's case, the modulator signal is a sine wave whose frequency is controlled by the frequency of the opposite **Deck** - that is, Deck A's modulator shares the frequency of Deck B, and vice versa. This is *similar* - but not identical - to cross-modulation. Notably, changing the Tape loaded into one Deck will not change the opposite Deck's modulator signal at all, because it is always a sine wave.

- **FM INDEX [9]** controls the amount of modulation from the modulator to the carrier.
- The **FM INDEX ATTENUVERTER [10]** controls the amount of CV at the **FM INDEX CV [11]**, or of the LFO or envelope when no CV is patched.
- **FM ASSIGN [12]** Changes the assignment of the FM bus to each Deck. Press to cycle between A, B, A+B, and Off.
- **SHIFT [2] + FM ASSIGN [12]** Changes the source of FM modulation when nothing is patched, selecting between the envelope and LFO. The ENV and LFO LEDs will flash to show which source is selected. This has no effect when anything is patched to the **FM INDEX CV [11]**.

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2 For technical reasons, Spectron actually uses phase modulation rather than true frequency modulation. In most cases, these are equivalent to one another, so we use the more familiar terminology of FM rather than PM.

Sync

Spectron also implements a novel version of **hard sync**, a classic synthesizer technique, for each Deck. When Sync is enabled on a Deck, Spectron plays back samples at higher speeds, while continuously resetting the playhead on each cycle boundary. The result allows timbre warping similar to pitch shifting or time stretching techniques, while maintaining the original pitch of the sample (including the inherent pitch warble of tape samples!)[3].

- **SYNC [13]** controls the ratio of the playback speed relative to the original sample speed.
- The **SYNC ATTENUVERTER [14]** controls the amount of CV at the **SYNC CV [15]**, or of the LFO or envelope when no CV is patched.
- **SYNC ASSIGN [16]** Changes the assignment of the Sync bus to each Deck. Press to cycle between A, B, A+B, and Off.
- **SHIFT [2] + SYNC ASSIGN [16]** Changes the source of sync modulation when nothing is patched, selecting between the envelope and LFO. The ENV and LFO LEDs will flash to show which source is selected. This has no effect when anything is patched to the **SYNC CV [15]**.

3 Unlink many other dual oscillators, Spectron does not sync Deck A to Deck B or vice versa. Instead, it's better to think of each Deck having its own internal oscillator that it syncs to. This is to allow you to use Sync for timbre control without tying the pitch of Deck A and B together.

Global Menu

Press **SHIFT [2] + TAPE/BACK [1]** to open the Global Menu.

The Global Menu contains settings that persist after power cycling. Many of these options are already available on other screens and are duplicated here for ease of locating.

Device Info

Displays the firmware version, serial number and other information about the unit.

Envelope Link

Selects between **UNLINKED** and **AUTO**, which is linked unless a cable is patched to **TRIG B [18].**

See Envelope Linking

VCA Mode

Selects between **OFF**, **MONO**, and **POLY**

See VCA

FREQ Fine / Stepped

Selects between **FINE** and **STEPPED** frequency adjustment modes for each Deck.

See Frequency Screen

LFO Polarity + LFO Retrigger

See LFO Screen

Normalize Octaves

Enabled by default. When turned on, this maps each tape's range of samples to cover the same range of input CV, approximately 1.5V-4.5V when FREQ is set to O.

Quick Clear FREQ

Enabled by default. When this is turned on, press **SHIFT [2] + FREQ [6]** to quickly clear the frequency parameter of both decks to 0.

Adjust 0V Pitch

By default, Spectron outputs a concert C when the frequency parameter is set to 0 and a 0 Volt CV is received at one of its volt-per-octave inputs. Use this option to adjust the pitch at 0V, for instance to match a sequencer, controller, or MIDI-to-CV device that uses a different zero point.

Modulation Matrix Defaults

Save Default Matrix

Save the current Modulation Matrix as the default.

Selecting **Clear Matrix** (**SHIFT [2] + MTRX [8]**) restores this saved configuration.

Restore Factory Default

Restore the factory Modulation Matrix Default (all assignments set to 0)

CV Input Scaling

Select the operating range for Spectron's CV inputs (FM + Sync, X + Y, and Scan)

- ±5V
- ±10V

Factory Reset

Restore all Global Menu settings, Tape Pool defaults, and Modulation Matrix defaults to their factory configuration.

Updating Firmware

Future firmware updates will be available from
https://www.20cc.cool/spectron

To update, follow the instructions included with the firmware download.

Reordering Tapes

As previously stated, future firmware versions will allow you to re-order tapes within each Tape Pool. This will be most useful when using **Scan** and/or **Tape Trigger**.

For now, it is possible to change the order of tapes by editing the file names of the .tape files on the microSD card where they are stored. Please use the following steps to accomplish this:

1. Turn the power off to the case containing Spectron.
2. Remove the 4 mounting screws and pull Spectron out of the case.
3. Push down on the microSD card, which is inside the silver connector on the top back of the module. Pushing down should cause it to pop out and allow you to remove it.
4. Connect the microSD card to your computer. You will need a microSD to USB adapter. We have had no issue with cheap ones purchased from Amazon and other places. Alternatively, if your PC has a dedicated SD card reader, you can use a microSD to SD card adapter. Mac, Windows, and Linux computers should work in theory.
5. Navigate to the microSD card on your computer. You should see a folder named Tapes. Inside are all the .tape files used by Spectron.
6. These tape files are sorted alphanumerically by filename in the **Tape Select Menu**. Change the number preceding the name to whatever you wish to reorder. The numbers do not need to be consecutive, nor do they need to be unique as long as there are no duplicates of the complete file name.
7. Eject the microSD card from your computer and reinsert it into the module.
8. Reinstall the module by screwing the 4 mounting screws back in.
9. Turn the power to the case back on.

Appendix A: SHIFT Functions

Menu	Control	Function
Global	SHIFT [2] + TAPE/BACK [1]	Open the Global Menu
VCA	SHIFT [2] + ENV [5]	Change the VCA Mode
Tape Select	SHIFT [2]	Show Tape Pool Edit Menu
Tape Select	SHIFT [2] + press ENCODER A [3] or ENCODER B [4]	Enable or disable the highlighted tape
Freq	SHIFT [2] + press ENCODER A [3] or ENCODER B [4]	Toggle between Continuous and Stepped tuning
LFO	SHIFT [2] + press ENCODER A [3]	Toggle Unipolar / Bipolar operation
LFO	SHIFT [2] + press ENCODER B [4]	Toggle LFO Retrigger
Modulation Matrix	SHIFT [2] + press ENCODER B [4]	Reset the selected modulation amount to 0
Global	SHIFT [2] + MTRX [8]	Restore the Modulation Matrix to its saved default
Global	SHIFT [2] + FM ASSIGN [12]	Select the internal modulation source for the FM Bus
Global	SHIFT [2] + SYNC ASSIGN [16]	Select the internal modulation source for the Sync Bus
Global	SHIFT [2] + FREQ [6]	Clear the frequency parameter to 0 for both decks. This shortcut can be disabled in the Global Menu

Appendix B: Modulation Sources

Source	Description
Envelope A	Envelope belonging to Deck A
Envelope B	Envelope belonging to Deck B - not present when envelopes are linked
LFO [7]	LFO Output
Offset	Fixed DC value - this can be useful especially in combination with negative CV signals
X CV [23]	External assignable CV input
Y CV [24]	External assignable CV input

Appendix C: Modulation Destinations

Destination	Description
Deck A Freq	Modulates the frequency of Deck A
Deck B Freq	Modulates the frequency of Deck B
FM A Index	Modulates the FM Index of Deck A
FM B Index	Modulates the FM Index of Deck B
Sync A	Modulates the Sync amount of Deck A
Sync B	Modulates the Sync amount of Deck B
LFO Rate	Modulates the global LFO rate
LFO Shape	Modulates the global LFO shape
Env A Attack	Modulates Envelope A Attack
Env A Release	Modulates Envelope A Release
Env B Attack	Modulates Envelope B Attack - not present when envelopes are linked
Env B Release	Modulates Envelope B Release - not present when envelopes are linked
Deck Swap	Progressively swaps the outputs of Deck A and B. This can be used as a mix control

Additional sources and destinations will be added as firmware development continues.

Specifications

Specification	Value
Width	16 HP
Depth Behind Panel	22mm
Power Draw	~150mA on +12V, much less on -12V
Included hardware	4 × M3 mounting screws

Support

For all support related questions, please contact **support@20cc.cool**

Credits

Spectron's main screen font is based on ZX OCR-B by DamienG
https://damieng.com/typography/zx-origins/zx-ocr-b/

Spectron's hardware design and firmware were created by 20CC without the use of large language models or generative AI tools.