

CeeS User manual

an upgrade for Yamaha CS10, CS15 and CS30

Introduction

CeeS is an upgrade for Yamaha CS10, CS15 and CS30 synthesizers. It adds MIDI input and output as well as additional filter modulation sources.

Features

- MIDI input and output
- MIDI CC control of cutoff and resonance. For CS15 and CS30: independent control of both filters
- Additional LFO for each filter with multiple waveforms and optional MIDI clock sync
- Velocity and aftertouch can be linked to cutoff, LFO amount or LFO frequency
- CS30: Sequencer can be clocked via MIDI clock or a MIDI note. Adjustable MIDI clock divider with many options
- CS30: Extended note range for MIDI input
- MIDI CC control of all additional parameters
- Built-in configuration menu to quickly set many additional parameters
- Fully additive: does not change the behaviour or sound of the synthesizer unless desired.
- Low latency: ~1ms

Table of Contents

Introduction.....	1
Features.....	1
MIDI note input.....	3
Filter control.....	3
Additional LFOs.....	3
Velocity and Aftertouch.....	4
Sequencer control (CS30).....	4
MIDI output.....	5
Peculiarities of MIDI out.....	5
Configuration Menu.....	6
Entering the Configuration Menu.....	6
Save and exit the configuration menu.....	6
Using the Configuration Menu.....	6
Set the MIDI input channel.....	6
Set the MIDI output channel.....	6
Set the filter velocity link.....	6
Set the filter velocity link depth.....	6
Set the filter aftertouch link.....	7
Set the filter aftertouch link depth.....	7
CS30: Set the sequencer clock source.....	7
CS30: Set the sequencer clock divider.....	7
Factory reset.....	7
Appendix.....	9
MIDI controller chart.....	9
Latencies.....	10

MIDI note input

CeeS accepts MIDI notes in the following ranges.

CS10	24 – 60 (C2 - C5)
CS15	24 – 60 (C2 - C5)
CS30	24 – 72 (C2 – C7) which adds 5 notes to the keyboard's range

The MIDI channel is 1 by default, but can be changed in the Configuration Menu.

MIDI velocity and aftertouch can be linked to various parameters, such as filter cutoff. See chapter Velocity and Aftertouch.

Filter control

CeeS provides MIDI CC control of filter cutoff and resonance for the filter (CS10) or both filters (CS15, CS30).

The MIDI cutoff control is additive to the existing cutoff setting. At a CC value of 0, the cutoff is unaltered. Increasing the CC value will increase the filter cutoff.

The MIDI resonance control is *subtractive* to the existing resonance setting. This means at a CC value of 0 the resonance is unaltered. Increasing the CC value will decrease the resonance.

MIDI controller numbers can be found in the Appendix.

Additional LFOs

Two additional LFOs are implemented, one for each filter. The LFOs feature:

- MIDI control of all parameters
- Multiple Waveforms: Triangle, Rising sawtooth, falling sawtooth, square and S/H
- Free running mode, frequency adjustable between 0.13Hz (8s period) and 750Hz on a logarithmic scale
- Can run synced to MIDI clock with 18 different dividers
- Adjustable LFO-Delay and optional phase reset
- Velocity and aftertouch can be linked to LFO depth and speed. See Velocity and Aftertouch

The LFOs can only be controlled via MIDI CC. MIDI controller numbers can be found in the Appendix.

Velocity and Aftertouch

MIDI velocity and aftertouch can each be linked to one of the following parameters:

- Filter cutoff (filters 1 or 2)
- Depth of the additional filter LFO (1 or 2)
- Speed / or clock divider of the additional filter LFO (1 or 2)

These controls are additive to the existing filter cutoff or LFO parameters.

There is also an additional depth control for both the velocity and the aftertouch link.

By default velocity and aftertouch links are turned off. The links can be activated in the Configuration Menu. Here, the link depth can be adjusted as well.

The links and depth can also be controlled via MIDI CC, see Appendix.

Sequencer control (CS30)

CeeS allows the CS30 sequencer to be synced to MIDI in two possible ways:

- Synced to MIDI clock with adjustable clock divider
- Triggered by MIDI note 0. Each time the note is played, the sequencer advances one step. The sequencer gate follows the MIDI note's gate.

It is possible to set the sequencer clock source via MIDI CC, or in the Configuration MenuConfiguration Menu.

By default, the clock source is set to the internal clock of the CS and the sequencer can be used normally with the START/STOP button and CLOCK SPEED knob.

Independently from the selected clock source, the MANUAL sequencer mode continues to function normally.

MIDI output

CeeS also supports MIDI output. The output channel is 1 by default, but can be changed in the Configuration Menu.

The note range is the same as the synth's keyboard:

Notes 24 – 60 (C2 – C5) for CS10, CS15

Notes 29 – 72 (F2 – C6) for CS30

Peculiarities of MIDI out

CeeS is piggybacking on the original YM24800 key assigner. It reads its keyboard signals and injects its own to simulate key presses.

This approach means that we do not alter the existing connection between the keyboard and the CV generation. This has the advantage that we do not add any delay or latency – playing on the keyboard is exactly as before.

It also means that for MIDI out, we can only read a keyboard key when the YM24800 IC reads it. If it does not, we can not read it either.

As it happens, in certain circumstances, the YM24800 does not read all keys. Specifically, this happens when you start playing a high note and add multiple lower notes afterwards. After playing between 3 and 6 notes (this varies), the key assigner stops reading notes below the ones currently pressed. Higher notes can always be added.

Interestingly, this does not happen when you start a chord by playing a low note first and then add higher notes on top. Here, we could easily send out chords with 10 notes (I don't have more fingers, but more might be possible).

Conclusion: CeeS will not turn your CS synth into a master keyboard. But MIDI out is certainly sufficient for some situations.

Configuration Menu

CeeS features a built in configuration menu to set various parameters.

The configuration menu can be accessed by pressing a special combination of keys.

Entering the Configuration Menu

Press and hold down the 8 keys from F to C of the lowest octave.

Hold down F, then F#, G, .. and finally C.

As a confirmation, you will hear a high C note play 3 times.

Note that even in the config menu, the synthesizer will continue to play normally.

Save and exit the configuration menu

Press the C key labeled SAVE & EXIT to save the configuration and exit the config menu.

Using the Configuration Menu

Once you have entered the configuration menu, you can use the keyboard keys to set various parameters.

While in the configuration menu, each key press results in a high C note being played. This is to indicate that you are in the config menu.

The lowest 17 keys in the menu labeled OFF, 1, 2, ... 17 are used to set various values. We are calling them the 'value-keys' from now on.

The other keys are used to select the parameter to adjust, or change a setting directly.

Set the MIDI input channel

Press the C labeled MIDI IN, then press a value-key to set the MIDI input channel between 1-16, or press OFF to set the MIDI input channel to OMNI (react to all channels)

Set the MIDI output channel

Press the D labeled MIDI OUT, then press a value-key to set the MIDI output channel between 1-16, or press OFF to turn MIDI output off.

Set the filter velocity link

Press the E key labeled 'velocity link'. Then use the lowest 7 value-keys to set the velocity link as desired.

Set the filter velocity link depth

Press the F key labeled 'velocity depth'. Then use the value-keys to set the velocity depth from 0 (OFF) to 16 (full)

Set the filter aftertouch link

Press the G key labeled 'aftertouch link'. Then use the lowest 7 value-keys to set the velocity link as desired.

Set the filter aftertouch link depth

Press the A key labeled ' aftertouch depth'. Then use the value-keys to set the aftertouch depth from 0 (OFF) to 16 (full)

CS30: Set the sequencer clock source

Press the keys labeled Sequencer Clock source to set the clock source to internal, MIDI Clock or MIDI note.

CS30: Set the sequencer clock divider

Press the key labeled Sequencer Clock Divider. Then, use the value-keys to set the clock divider between 4/1 and 1/32th.

Factory reset

Press the key A# key labeled 'factory reset' set reset the configuration to default.

Appendix

MIDI controller chart

Parameter	MIDI CC	Range	Parameter	MIDI CC	Range
Filter 1 cutoff	16	0 – 127	Filter 2 cutoff	17	0 – 127
Filter 1 resonance	18	0 – 127	Filter 2 resonance	19	0 – 127
LFO 1 depth	20	0 – 127	LFO 2 depth	27	0 – 127
LFO 1 shape	21	0 – 127	LFO 2 shape	28	0 – 127
LFO 1 frequency	22	0 – 127	LFO 2 frequency	29	0 – 127
LFO 1 divider	23	see table	LFO 2 divider	30	see table
LFO 1 delay	24	0 – 127	LFO 2 delay	31	0 – 127
LFO 1 retrigger	25	≥ 64 → ON	LFO 2 retrigger	32	≥ 64 → ON
LFO 1 sync	26	≥ 64 → ON	LFO 2 sync	33	≥ 64 → ON
Seq clock source	34	See table	Seq clock divider	35	See table
Velocity link	36	See table	Aftertouch link	37	See table
Velocity depth	38	0 – 127	Aftertouch depth	39	0 – 127

Additional “easter egg” envelopes

Filter 1 ADSR	MIDI CC	Range	Filter 2 ADSR	MIDI CC	Range
Amount	40	0 – 127	Amount	48	0 – 127
Delay	41	0 – 127	Delay	49	0 – 127
Attack	42	0 – 127	Attack	50	0 – 127
Decay	43	0 – 127	Decay	51	0 – 127
Sustain	44	0 – 127	Sustain	52	0 – 127
Release	45	0 – 127	Release	53	0 – 127
Loop	46	≥ 64 → ON	Loop	54	≥ 64 → ON
Invert	47	≥ 64 → ON	Invert	55	≥ 64 → ON

Sequencer clock source CC values

0 – 42	43-85	86-127
Internal	MIDI clock	MIDI note

Sequencer clock divider CC values

0 – 6	7 – 13	14 – 20	21 – 27	28 – 34	35 - 41	42 - 48	49 - 55	56 - 62
4 Bars	3 Bars	2.5 Bars	2 Bars	1.5 Bars	1 Bar	3 / 4	1 T	1 / 2
63 – 69	70 – 76	77 – 83	84 – 90	91 – 97	98 – 104	105 – 111	112 – 118	119 - 125
3 / 8	1 / 2 T	1 / 4	3 / 16	1 / 4 T	1 / 8	3 / 32	1 / 8 T	1 / 16
126-127								
1/32								

Velocity and aftertouch link CC values

0 – 18	19-37	38-56	57-75	76-94	95-113	114-127
None	Cutoff 1	LFO 1 depth	LFO 1 Speed	Cutoff 2	LFO 2 depth	LFO 2 speed

LFO midi mapping

Midi CC values for the various LFO shapes

0 - 25	26 - 51	52 - 77	78 - 103	104 - 127
Triangle	Saw	Inverted Saw	Square	Random

Midi CC values for the LFO clock divider in synced mode

0 - 6	7 - 13	14 - 20	21 - 27	28 - 34	35 - 41	42 - 48	49 - 55	56 - 62
4 Bars	3 Bars	2.5 Bars	2 Bars	1.5 Bars	1 Bar	3 / 4	1 T	1 / 2
63 - 69	70 - 76	77 - 83	84 - 90	91 - 97	98 - 104	105 - 111	112 - 118	119 - 125
3 / 8	1 / 2 T	1 / 4	3 / 16	1 / 4 T	1 / 8	3 / 32	1 / 8 T	1 / 16
126-127								
1/32								

LFO midi value vs Period / frequency in free running mode

VAL	Period	VAL	f[Hz]	VAL	f[Hz]	VAL	f[Hz]	VAL	f[Hz]	VAL	f[Hz]	VAL	f[Hz]
0	8 s	16	2.13	32	4.13	48	6.13	64	24.38	80	54.4	96	168.8
1	4 s	17	2.25	33	4.25	49	6.25	65	26.25	81	56.3	97	187.5
2	2.67 s	18	2.38	34	4.38	50	6.38	66	28.13	82	58.1	98	206.3
3	2 s	19	2.5	35	4.5	51	6.5	67	30	83	60	99	225
4	1.6 s	20	2.63	36	4.63	52	6.63	68	31.88	84	61.9	100	243.8
5	1.33 s	21	2.75	37	4.75	53	6.75	69	33.76	85	63.8	101	262.7
6	1.14 s	22	2.88	38	4.88	54	6.88	70	35.63	86	65.6	102	281.4
7	1 s	23	3	39	5	55	7.5	71	37.51	87	67.5	103	300.2
8	0.89 s	24	3.13	40	5.13	56	9.38	72	39.38	88	69.4	104	318.9
9	0.8 s	25	3.25	41	5.25	57	11.25	73	41.26	89	71.3	105	337.7
10	0.73 s	26	3.38	42	5.38	58	13.13	74	43.13	90	73.1	106	356.4
11	0.67 s	27	3.5	43	5.5	59	15	75	45.01	91	75	107	375.2
12	0.62 s	28	3.63	44	5.63	60	16.88	76	46.88	92	93.8	108	393.9
13	0.57 s	29	3.75	45	5.75	61	18.75	77	48.76	93	112.5	109	412.7
14	0.53 s	30	3.88	46	5.88	62	20.63	78	50.63	94	131.3	110	431.4
15	0.50 s	31	4	47	6	63	22.5	79	52.51	95	150	111	450.2
												112	469
												113	487.7
												114	506.5
												115	525.2
												116	544
												117	562.7
												118	581.5
												119	600.2
												120	619
												121	637.7
												122	656.5
												123	675.2
												124	694
												125	712.7
												126	731.5
												127	750.2

Latencies

The measured latency between the end of a MIDI NOTE ON message and the rising edge of the gate is between 1-1.8ms.

This time includes the latency of the synthesizer, not just the CeeS kit:

The YM24800 IC scans the keyboard every 0.8ms which results in the above jitter of 0.8ms. This is the latency / jitter a human player would experience when playing on the keyboard.

Output latency between a keyboard press and MIDI output has been measured to be 2-3ms.