CS70M New Firmware CC map and other information R. Grieb December 30, 2022
(numbers are decimal, except as noted)

Note: In this document X is equivalent to "I" and Y is "II".
This matches the Yamaha technical documentation.

Function	CC #	Values	
Mod Wheel	01	0-127	same as 32 (LFO mod depth)
VCA Volume	07	0-127	
VCO wave	09	0-127	0-31:Both off, 32-63:Pulse, 64-95:Saw, 96-127Saw + Pulse
Octave X/I	10	0-127	0-20:16',21-42:8',43-64:5.3', 65-86:4',87-108:2.7',109-127:2'
Octave Y/II	11	0-127	0-20:16',21-42:8',43-64:5.3', 65-86:4',87-108:2.7',109-127:2'
VCO PW	12	0-127	
Noise level	13	0-127	
Filter Mode	14	0-127	0-31:LPF, 32-63:BPF, 64-127:HPF
VCF cutoff	15	0-127	
VCF resonance	16	0-127	
VCF env depth	17	0-127	
VCF attack	18	0-127	
VCF decay	19	0-127	
VCF sustain level	20	0-127	
VCF release	21	0-127	
VCF X5	22	0-127	0-63:Off,64-127:On
VCF Env Pol	23	0-127	0-63: Positive envelope 64-127: Negative envelope
VCA sine wave level	24	0-127	
VCA attack	25	0-127	
VCA decay	26	0-127	
VCA sustain level	27	0-127	

VCA release	28	0-127	
VCA X5	29	0-127	0-63:Off,64-127:On
LFO function	31	0-127	global, 0-13: Sine, 14-27:Rmp, 28-41:S/H 42-55: Glide+, 57-80:Glide-, 71-84: RMO 85-127: No LFO
LFO mod depth	32	0-127	global
LFO speed	33	0-127	global
LFO env depth	34	0-127	global
LFO attack	35	0-127	global
LFO decay	36	0-127	global
LFO destination	37	0-127	global 0-7:None 8-15:VCO 16-23:PW 24-31:VCF 32-39:VCA 40-47:VCO+PW 48-55:VCO+VCF 56-63:VCO+VCA 64-71:PW+VCF 72-79:PW+VCA 80-87:VCF+VCA 88-95:VCO+PW+VCF 96-103:VCO+PW+VCA 104-111:VCO+VCF+VCA 112-119:PW+VCF+VCA 120-127:VCO+PW+VCA+VCF
LFO I+II	38	0-127	0-63:Off, 64-127: On
LFO Wheel	39	0-127	0-63:Off, 64-127: On
LFO reset	40	-	Resets non-prog LFO, (value is "don't care") (also resets programmable LFO env gen)
Transpose value (if MIDI bend enabled)	43	0-127	global (64 = no transpose, 127 = +12) (0 = -12 semitones)
Tune Request	44	0-127	0-63 does nothing. 64-127 Requests CS70M to tune oscillators

All Notes Off 123 - (value is "don't care")

Normal mode:
CC's on the base MIDI channel affect all voices
CC's on base+1 affect X sound of all voices
CC's on base+2 affect Y sound of all voices
MIDI notes are accepted on any of these three MIDI channels

Split mode:
CC's on the base channel affect the X sound of the lower voices
CC's on base+1 affect the Y sound of the lower voices
CC's on base+2 affect the X sound of the upper voices
CC's on base+3 affect the Y sound of the upper voices
MIDI notes on base or base+1 are sent to lower voices
MIDI notes on base+2 or base+3 are sent to upper voices

(An exception to the above is the octave CC, which is
separate for X and Y, and always affects the same one)

The following CC's have extra code that allows their
parameters to update as fast as possible:

7 VCA volume
12 VCO pulse width
15 VCF cutoff
19 VCF decay
26 VCA decay
33 Prog LFO speed

Note: Received CC's only change the signals fed to the voice boards.
They do not change patch data. To create or modify a patch, use
the CS70M front panel controls.

Note: Note On/Off MIDI messages are not transmitted, so the CS70M cannot be used
as a MIDI controller. MIDI out is only used for backup sysex transmission.

User settings can be changed as follows:
Press and hold Wheel. This will display the current settings.
The top row of Prog LEDs will indicate the currently selected base MIDI channel.
(The Manual LED indicates channel 16) No OMNI mode setting has been implemented.
Prog 1-8 in the lower row indicate some other User settings.

Prog 9-Man in the lower row indicate the current patch bank selection.
Number switches can now be pressed, one at a time, to change the MIDI channel
or the patch bank, or to toggle individual User settings bits and their LEDs.
Release the Wheel switch when you are finished.

Misc user settings:

1: MIDI CV-only playback mode sequencer clock enable (tempo encoder selects divider)
2: MIDI bend (by semitones) enable
3: Non-Prog LFO free-running mode enable (also disables env trigger for Prog LFO, unfortunately)
4: MIDI CC reception enable
5: MIDI notes in split modes observe split point instead of MIDI channel
6: Wheel plus Store dumps sequencer data instead of all patch banks
7: Change MIDI pitch wheel bend to +/- a fifth instead of an octave (Bend CC not affected)
8: Not assigned

These settings are saved when power is off, along with the MIDI channel and patch bank.

MIDI clocks are assumed to be 24PPQ, but sequencer playback notes can be half notes,
quarter notes, eighth notes, or sixteenth notes. This selection is
made using the Tempo slider when MIDI clocking is enabled:

1) Slower arp clock rate (half notes, 48 pulses per arp step)
2) "Normal" clock rate (quarter notes, 24 pulses per arp step)
3) Faster clock rate (eighth notes, 12 pulses per arp step)
4) Fastest clock rate (sixteenth notes, 6 pulses per arp step)

MIDI clocking is only used in playback mode. Single notes can be recorded in normal
sequencer mode for playback using MIDI clocking. CV-only sequencer data can also be
played back using MIDI clocking. Sequences recorded in normal mode which contain chords
will play back with MIDI clocking, but the results are probably not usable.

MIDI wheel messages (if enabled, and on the base channel) will bend all notes by +/-12 semitones.
Notes are bent in units of semitones, so this is more of a transposition than bending. You can
bend the lowest key down a full octave, but you cannot bend any key higher than the top key,
as this is a limit of the CS70M.

There are now 8 banks of 30 patches each. Only one bank can be accessed at any given time.
The current bank is selected as described above, and is saved when power is off. The bank
selection is only used when a patch is loaded or written. Changing the bank will not affect
the currently loaded patch(es).

To save the current patch bank as MIDI sysex, press the Store switch momentarily.
To save all patch banks as MIDI sysex, press and hold Wheel, then press the Store switch momentarily.
To save sequence data, enable user setting Y6, then press and hold Wheel and tap Store.

To load this data back into the CS70M, turn off memory protect and send the file to MIDI In.
Note: Because the CPU in the CS70M is always busy scanning the keys and controls, and refreshing the control voltages, you may need to slow down the rate at which sysex data is sent to the CS70M for it to be loaded properly. Using MIDI OX, I set the transmit buffer size to 128 bytes and set up a delay between buffers of 200 mSec. This may be more delay than necessary.

Single patch banks occupy 720 bytes. Each byte is sent as two nibbles for MIDI, so there are 1440 data bytes. The header is 7 bytes, plus 1 for the EOX, so the total is 1448 bytes.

All 8 patch banks occupy 5,760 bytes. So the sysex dump contains 11,528 bytes.

Sequence data occupies 10,944 bytes. So the sysex dump contains 21,896 bytes,

You can still Store a patch to a magnetic card. To do this, you would insert the card first, then press Store. Loading a patch from a magnetic card is also still supported.

The Store LED is now also used to indicate MIDI activity. Incoming MIDI data on a channel that is currently enabled will cause the LED to light. This includes Note On, Note Off, and CC messages. The LED will also light when patch dump sysex messages are being received (if RAM is not protected). It will not light when MIDI clocks are received, even if MIDI clocking is enabled.
The Store LED should work normally during magnetic card operations.

Sequencer memory has been increased to approximately three times the original size. Sequencer data is now saved in RAM that is battery-backed up, so it is preserved when power is off.

When the synth is powered on, it checks a small area of battery-backed RAM for a known pattern of data. If it finds this pattern, top row LEDs 1->8 are lit in sequence. This is the normal power-up LED sequence. If the RAM data does not match the pattern, then probably RAM contents (patches and sequence data) have been lost. (or this is the first power up after installation) In this case, the pattern is written to RAM and LEDs 1-8 will flash four times.

The sliders on the CS70M are actually 5-bit encoders. So each one has just 32 settings for the controlled parameter. The patch also saves 5-bit values for the sliders. When you control these parameters using CC's, you have 7-bit resolution instead, so 128 different settings.