

Function	CC #	Valid Values

LF01 to DCO Freq Amount	01	0-127
LF02 Frequency	14	0-127 LF02 is used for PWM
LF02 Waveform	15	0-127 0-31:Tri,32-63:Rmp Up,64-95:Rmp Dn,96-127:Squ
DCO1 Octave	20	0-127 0-42:16',43-85:8',86-127:4'
DCO1 Waveform	21	0-127 0-31:Off,32-63:Saw,64-95:Pulse,96-127:PWM
DCO1 Pulse/PWM	22	0-127
DCO2 Octave	23	0-127 0-42:16',43-85:8',86-127:4'
DCO2 Waveform	24	0-127 0-15:Off,16-31:Saw,32-47:Square,48-63:New1 64-79:New2,80-95:New3,96-111:New4,112-127:New5
DCO2 Interval	25	0-127
DCO2 Detune	26	0-127
VCF Key Tracking	27	0-127 0-63:Off,64-127:On
VCF Env Amount	28	0-127
Env Decay	29	0-127
Env Sustain	30	0-127
VCA EG Mode	31	0-127 0-63:Gate only,64-127:Env Gen
Sustain pedal	64	0-127 (0-63 off, 64-127 on)
VCF Resonance	71	0-127
Env Release	72	0-127
Env Attack	73	0-127
VCF Cutoff	74	0-127
Key Assign Mode	80	0-127 0-63:Normal rotation,64-127:Reset to Vcel when all keys up
Vibrato LFO selection	81	0-127 0-63:Vibrato uses LF01,64-127:Vibrato uses LF02
LF01 Frequency	85	0-127 LF01 is used for DCO and VCF mod
LF01 Delay	86	0-127
LF01 to VCF Cutoff Amount	89	0-127
LF01 Waveform	90	0-127 0-25:Tri,26-51:Rmp Up,52-76:Rmp Dn,77-102:Squ,103-127: Rand
All MIDI Notes Off	123	0-127 (Value is ignored)

New parameter 65 selects the waveform for LF01. This LFO is used for modulating the DCO frequencies and also the VCF cutoff. This setting is saved in the patch.
Waveform choices are:

- 4 Random
- 3 Square
- 2 Ramp Down
- 1 Ramp Up

0 Triangle

New parameter 66 controls the frequency of LFO2. This LFO is only used for the pulse width modulation. This setting is saved in the patch.

New parameter 67 selects the waveform for LFO2. This setting is saved in the patch. Waveform choices are:

- 3 Square
- 2 Ramp Down
- 1 Ramp Up
- 0 Triangle

New parameter 68 selects LFO2 as the modulation source for the DCO frequency. This setting is saved in the patch. LFO's are used as follows:

Parameter 68 = 1:

- LFO1 mods DCO freq, can be delayed
- LFO1 mods VCF cutoff, can be delayed
- LFO2 mods Pulse width, mod starts immediately

Parameter 68 = 2:

- LFO2 mods DCO freq, can be delayed (with LFO1 delay setting)
- LFO1 mods VCF cutoff, can be delayed
- LFO2 mods Pulse width, mod starts immediately

New parameter 71 enables random arpeggiator mode. In this mode, the arpeggiated notes are played in random order. The up/dn and range select switches also affect note selection. This setting is not saved in the patch, and is set to "off" (0) at power up.

The Poly61 always uses the Up and Down switches to adjust the currently displayed parameter, even if Program is selected. New parameter 72 enables changing this behavior. If parameter 72 has a value of 1, when the Program LED is lit, the up and down switches can be used to step through the patches. This is similar to the pedal input except you can increase or decrease the patch number. If parameter 72 has a value of 0, the up and down switches only affect the displayed parameter, as in the original firmware. The parameter 72 value is saved in EEPROM when power is off.

New parameter 73 selects either normal rotate assignment of keys to voices, or "always start with voice 1" mode. In the new mode, whenever no key is pressed, voice assignment is reset to start with voice 1 on the next key press. This parameter is set to rotate mode (0) at power up.

Parameter 81 is used to set the MIDI channel. It is saved in EEPROM when power is off. MIDI out Note messages are sent on MIDI channel + 1.

New parameter 82 selects the MIDI out mode. It is set to 0 at power up.

- 0: All keys pressed are played, and also send Note On and Note off
- 1: Any keys pressed when all voices are already used will send Note On.
Note Off message is sent for released keys that are not assigned to a voice.
This could be used to chain two Poly61's. The one that is receiving the overflow should be in Mode 0 so that it plays all notes received.
- 2: This mode was inspired by the "alternating rotate" mode of the Oberheim Matrix 1000.
As keys are pressed, they alternate between being assigned to a voice and being sent

out on MIDI. Note Off message is sent for released keys that are not assigned to a voice. This could be used to chain two Poly61's. The one that is receiving the overflow should be in Mode 0 so that it plays all notes received.

New parameter 83 enables (1) or disables (0) sending MIDI program change messages when a new program is selected. This setting is saved in EEPROM when power is off.

New parameter 84 selects the arpeggiator clocking mode as follows:

- 0: Internal clocking mode
- 1: MIDI clocking, 48 clocks/step, no Start/Stop required
- 2: MIDI clocking, 24 clocks/step, no Start/Stop required
- 3: MIDI clocking, 12 clocks/step, no Start/Stop required
- 1: MIDI clocking, 48 clocks/step, Start/Stop required
- 1: MIDI clocking, 24 clocks/step, Start/Stop required
- 1: MIDI clocking, 12 clocks/step, Start/Stop required
- 1: MIDI clocking, 6 clocks/step, Start/Stop required

The "Edit" LED has been re-purposed as a MIDI activity LED. It flashes whenever a MIDI command that we respond to is received on our MIDI channel. It will also flash when a patch sysex packet with the expected header is received.

80 Patches are now supported. To access the extra 16 locations, press and hold the Program switch then press 1 or 2. The display will show 9- or A- as the left digit of the program number. Now press 1-8 to finish selecting the patch. This method can be used to load or to write to the extra 16 patch locations.

Patches are saved in the PIC chip's internal EEPROM, so no battery is needed.

To transmit all EEPROM patches as MIDI sysex, press and hold Program, then press and release Write. You should see SEnd on the display. To load this data back into the Poly61, turn off memory protect and send the file to MIDI In. You should see LOAd on the display. If memory is protected, you will see Prot instead and the EEPROM contents will not be changed.

EEPROM addresses 0-03BFh are saved in the Sysex file. This is 960 bytes. Each byte is sent as two nibbles, so there are 1920 data bytes. The header is 5 bytes, plus 1 for the EOx, so the total size of the packet is 1926 bytes.

Loading saved tape patch files is no longer supported. The patch format has changed to support the increased resolution and new parameters, so the old patches wouldn't be usable anyway. The factory and calibration patches have been converted to the new format and saved as sysex files, which can be loaded with the new firmware.

The Poly61 voice circuitry generates four square waves, octaves apart, for DC02. These are 2', 4', 8', and 16'. The 4', 8' and 16' signals are selected, one at a time, when DC02 is set to square. When DC02 is set to saw, weighted combinations of these square waves are summed to create approximations of a saw waveform:

The 16' saw combines 16', 8', 4', and 2', to generate a stepped approximation to a saw wave with 16 steps.

The 8' saw combines 8', 4', and 2', to generate a stepped approximation to a saw wave with 8 steps.

The 4' saw combines 4', and 2', to generate a stepped approximation to a saw wave with 4 steps.

By combining the four square waves in different combinations, it is possible to create other waveforms for DCO2. The firmware now supports this:

DCO2 wave	New waveform
3	$16' + 4'$
4	$16' + 4' + 2'$
5	$16' + 8' + 2'$
6	$8' + 2'$
7	$8' + 4'$

These waveforms are somewhere in-between pure square waves and sawtooth waves. When they are selected, the DCO2 octave setting has no effect, since they already contain the octave information. Selecting one of these waveforms for DCO2 is saved in the patch.

It is now possible to disable DCO1 by setting the waveform selection to 0. This makes it possible to listen to DCO2 by itself. Disabling DCO1 is saved in the patch.

Notes about some MIDI issues

MIDI data is checked every 5.3 mSec, which is slower than many synths. This is due to a limitation caused by the design of the Poly61 hardware. As a result, MIDI messages that are closer together than this will appear to have arrived at the same time. One result of this is that if the same note is played twice with a very small gap in-between, it will appear to the Poly61 as just one long note. (By very small, I mean something like a few mSec gap, which is easy to obtain using a DAW, but probably not likely if an external controller keybed is being played) This same limitation can affect arpeggiator latch mode, which normally clears all latched keys when it sees an "all keys released" condition. When using a DAW, the time that all of the notes are off can be so short that the Poly61 does not detect this condition, so it incorrectly adds future notes to the latched ones. MIDI clocking of arpeggiated 16th notes also may not behave as expected.