

HarmoTools – A tool set for MIDI harmonization in Ableton Live



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How to Install HarmoTools

J74 HarmoTools is *a set of MIDI effects* for Ableton Live. It requires a Max for Live license to run (as in Ableton Live Suite) and it will run properly only in Ableton Live 9 or higher (older versions of Live, such as Live 8, are not supported).

Installation of the tool is extremely easy: unzip the download pack and copy the files to your computer hard drive, any place you like. To start it up, drop the plug-in devices as you need (.amxd) on MIDI (or instrument) tracks in Ableton Live.

J74 HarmoTools overview

J74 HarmoTools provides several tools for real-time filtering in relation to the harmonic content in the Live set. You can have various setup combinations for harmonization based on chords, scales, both and expand the setup for collaboration across multiple computers (all running Ableton Live with HarmoTools).

Combining the HarmoTools devices together you can do the following:

- Real-time harmonization on multiple tracks based on *live chords*
- Real-time harmonization on multiple tracks based on a *given scale*
- Combinations of *live chords and scale* harmonization
- Real time collaboration using the network on multiple systems
- Other applications (such as chord selection, note display, guitar fret visualization)

We will now look at the various devices, providing examples and explanations as we proceed.

Real-Time Harmonization: Working with live Chords

Let's start by explaining how to use the devices which apply harmonization by following chords.

HarmoChord J74.amxd

This is a MIDI device *for chord detection and for signaling chord information to other HarmoTools devices*. The device is able to detect 40+ type of chords, in each of the 12 possible root keys, independently from the chord inversion. You should use this device where chords are generated (by clips or real-time MIDI input). The device must receive MIDI input directly, unfiltered, independently from the fact that an instrument is played or not by the chords (an instrument can be put at the end of the track).

Note: While this device detects chords and spreads this information around in the liveset it does *not* do the harmonization (filtering). To harmonize a track you need to run an instance of the *HarmoChordFilter J74.amxd* device on the target track.

HarmoChordFilter J74.amxd

This is a MIDI device which applies MIDI filtering / harmonization in real time to its MIDI input, based on the chord information detected by the “HarmoChord J74.amxd” device, elsewhere in the liveset.

Two modes of operation are possible for this device, selectable using the rightmost [Mode] button:

- [Mode] = “Adapt”: the device will adapt the incoming phrase using *a phrase transpose approach*, trying to retain the structure of the phrase (that is: all notes will be harmonized the same way). This is useful with basslines or with sequences which need to retain structure. This is also the default mode of operation for the device.
- [Mode] = “Fold”: the device will adapt the phrase using *a note-by-note approach*. This will typically result in changes to the phrase structure, transposing only notes which do not fit within the chord.

Important: it is recommended to send MIDI notes to the HarmoChordFilter from a MIDI clip (or a live MIDI feed) having “C” as root/tonic note. This allows the algorithm to work at best in terms of note role structure in relation to the detected chord.

Tip: Although harmonization is limited to the notes in the chord, the HarmoChordFilter device is flexible in terms of scale changes: you have no scale constraints and you can immediately change key (scale) by just changing chords.

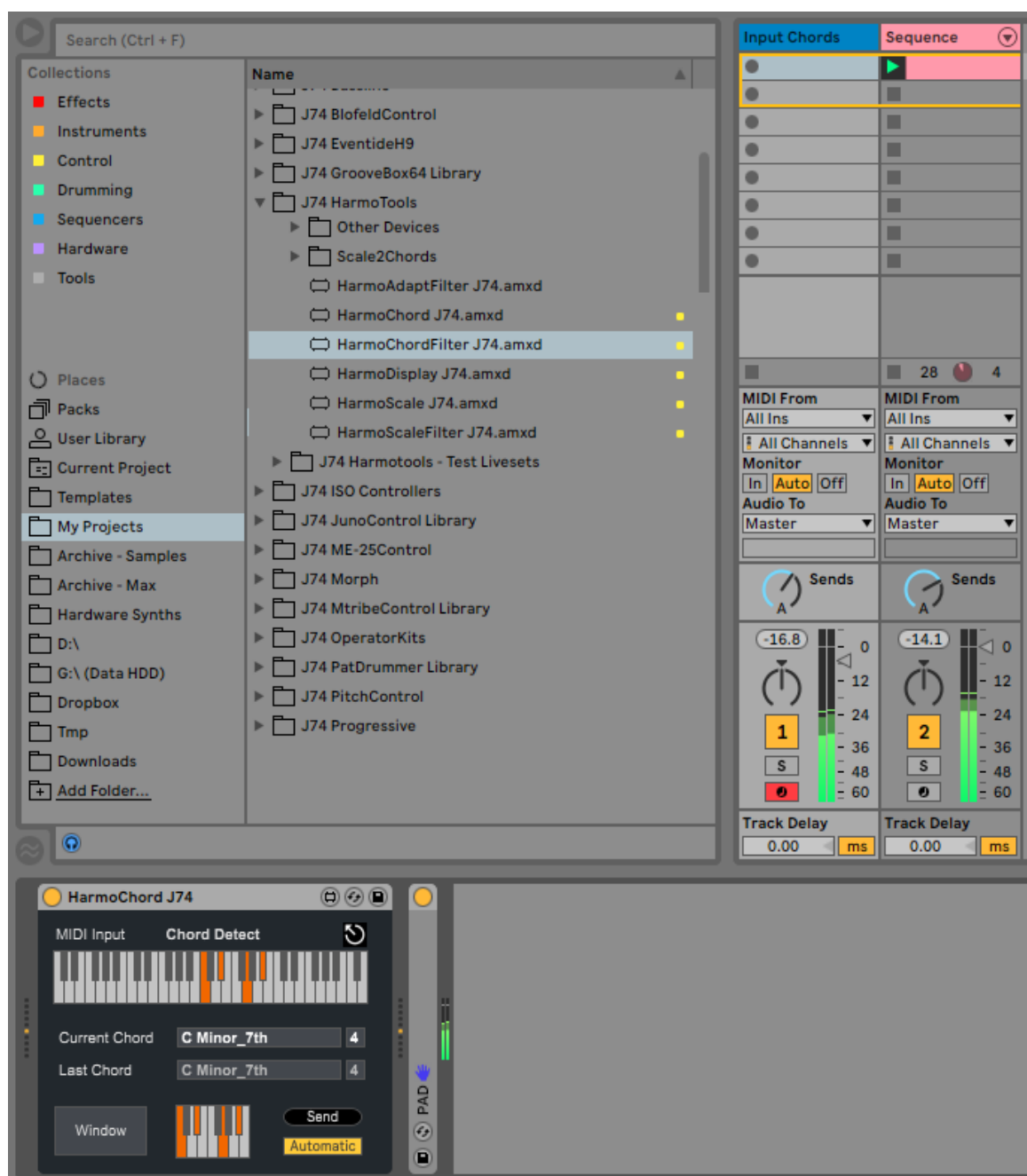
Note: The HarmoChordFilter device harmonizes notes within the chord constraints (only notes part of the chord are used) and has no knowledge of notes which are not in the chord but are still part of the originating scale. To add the ability of do filtering within a scale context, explore the “HarmoAdaptFilter” and the “HarmoScaleFilter” options.

Setup for working with live Chords: using the HarmoChord and HarmoChordFilter devices

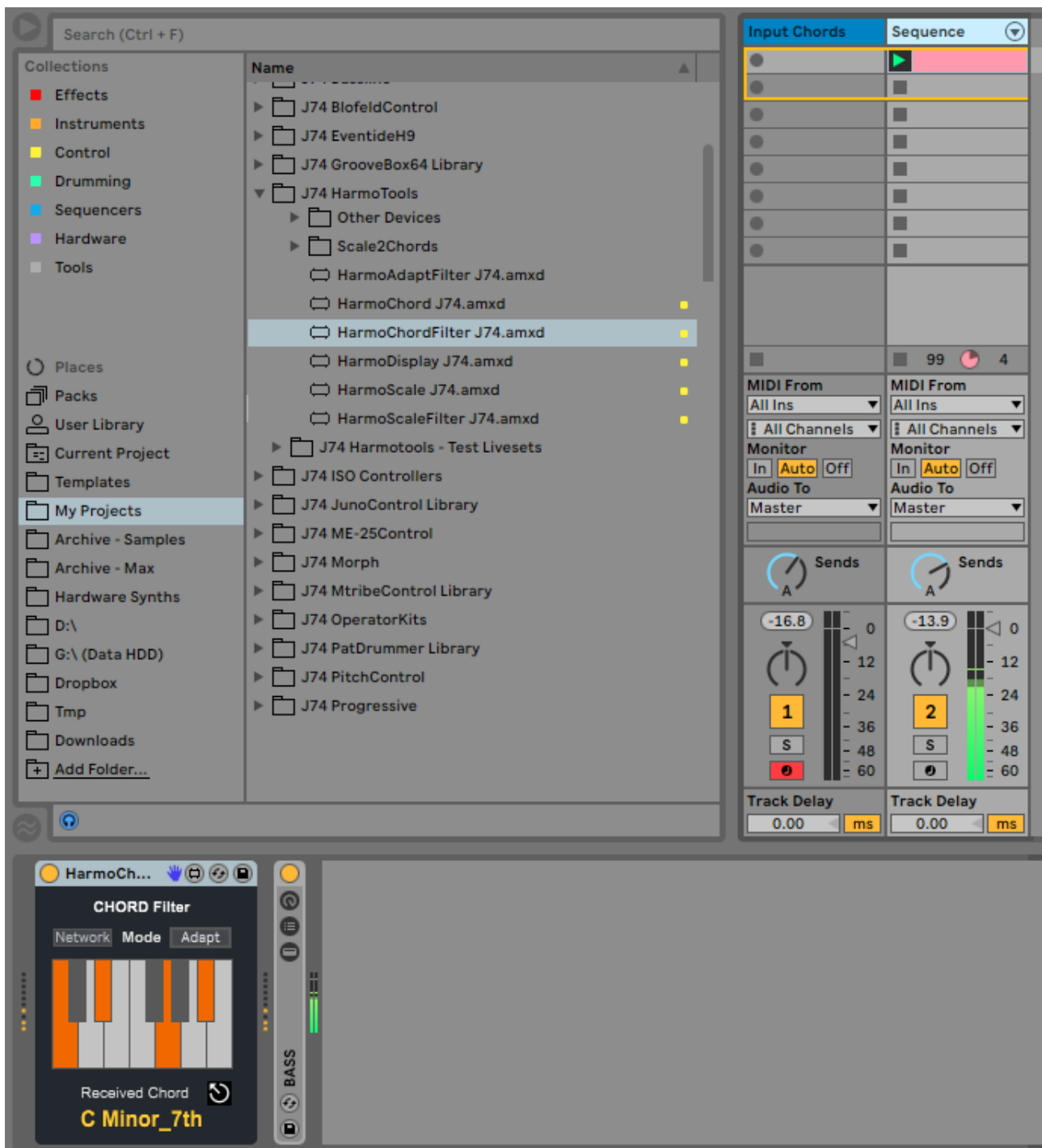
Combining the two devices you can do harmonization within a liveset to follow any chord you play. Suppose you are jamming, have a keyboard for playing chords on track 1 and have prepared a number of MIDI clips (sequences and basslines) on track 2, which you can throw in and out while jamming.

- Set a “HarmoChord J74.amxd” device on the track which gets the chords you are playing (eventually using these chords for playing an instrument at the end of the same track)
- Set a “HarmoChordFilter J74.amxd” device on each track you need to harmonize. These tracks will stay in harmony with the chords, and change harmonically each time a new chord is played.
 - Chose the mode of operation for each HarmoChordFilter device (as either “Adapt” or “Fold”)

Below a picture showing the example doing the chord detection with the HarmoChord device on track 1:



Next a picture showing chord filtering with the HarmoChordFilter device on track 2:



Real-Time Harmonization: Working with a given Scale

Using the chord based filtering / harmonization explained before is fine for sequences and (in most cases) basslines, but may be limiting for solo's. Scale harmonization is a better approach in this case, as it opens up more choices for “less intrusive” note harmonization. The following briefly describes the devices for scale harmonization and their use.

HarmoScale J74.amxd

The HarmoScale device allows you to (pre)define the scale for all other devices to follow (assuming of course you already know the scale to work on). The device defines the scale root and type and spreads this information to all HarmoTools devices in the liveset which react on scales. While this device defines and spreads the scale information, it does not do any actual harmonization (MIDI filtering). To harmonize a track to a scale you need to run an instance of the HarmoScaleFilter device on the target track (as we see next).

HarmoScaleFilter J74.amxd

This MIDI device applies MIDI harmonization in real time to input MIDI, based on the scale information defined by the “HarmoScale J74.amxd” device (or if used by the “HarmoGuessScale J74.amxd” device).

Tip: The setup with these devices is simple. Add a “HarmoScale J74.amxd” anywhere in the set (the device has just a passthrough for input MIDI) and select a scale to work with. Add the “HarmoScaleFilter J74.amxd” on any track you want to have MIDI filtering based on the selected scale.

Note: In alternative to the “HarmoScale J74.amxd” you can use the “HarmoGuessScale J74.amxd” for dynamic guessing of the scale based on MIDI input (scale detection will take some time, though).

HarmoGuessScale J74.amxd

This device analyzes a MIDI feed by collecting notes over time and performs analysis on the collected notes. When a match to a given scale is found (with at least 6 notes to have a match), the device will produce a scale “guess” (root and type). This guess is then spread to all HarmoTools devices in the liveset (like with the HarmoScale device) and the device can react on the guessed scale.

The HarmoGuessScale also offers alternatives to the produced guesses in a menu (some scales produce an equivalent set of notes, but distinguish themselves by the starting note – like for the so called modes, Major, Dorian, Phrygian, Lydian, Mixolydian, Natural Minor and Locrian). While the device detects and spreads this information, it does not do the actual harmonization (MIDI filtering). To harmonize a track to a scale you need to run an instance of the HarmoScaleFilter J74.amxd device on the target track.

Details on using the HarmoGuessScale.amxd device

The user interface (items and parameters) on the HarmoGuessScale device has:

- [Restart_Guess]. This button resets all the data being collected, so you can guess again from scratch.
- MIDI input display, showing the collected notes (since start or since the collection has been cleared due to pressing the [Reset_Guess] button)
- [Last Scale Guess]: the last scale that has being guessed (and spread to all HarmoScaleFilter devices). At least 6 notes need to be collected for a guess to be possible. The little number next to this item shows the number of collected notes.
- [Alternative Guesses]. In harmony several modes can result in the same note set. For instance a C Major scale, a D Dorian or a A Minor scale all produce the same notes. They only diversify in the order, in particular on which is the first note (root) in the scale (in a C major scale the order is CDEFGAB, in a D Dorian DEFGABC, in a A Minor ABCDEFG). This menu collects all the “equivalent” scales (in terms of note set) as alternative guesses. This way your guess can be conceptually more precise, while producing exactly the same results on the filter applied to the Scale device.
- [Active/Inactive]. This toggle activates / deactivates information spreading across the Liveset. If set to “Active” (default) the guess are spread to the HarmoScaleFilter J74.amxd devices. If set to “Inactive” guesses are shown but not spread.

The user interface also allows for additional manipulation once the pop-up window is opened:

- You can modify the Scale using the small keyboard on the display. This is useful if you like to see which changes you can make to get harmonic alternatives.
- You can add (or delete) notes to the recorded input. This is useful if not enough notes have been collected and no guess has yet been made. Adding some extra notes on the small keyboard on the display you can get a guess.
- You can always go back to the recorded input by pressing the [Reset to input notes] button.
- You can use this as a visual display has it can be set floating while you change track or view in Live

Real-Time Harmonization: Adapt to live Chords *within* a given Scale

Another way of doing harmonization, which may be more suitable to certain scenario's, is to do MIDI adaptation using both chord and scale information. This is the purpose of the HarmoAdaptFilter device.

HarmoAdaptFilter J74.amxd

This is a MIDI device which applies MIDI *filtering* in real time to its MIDI input, based on the tonic (root) derived from a detected chord *and* forced within a selected scale. The detection of chords is still done by a “HarmoChord J74.amxd” device (somewhere else in the liveset), as in the other cases; the scale selection is either made locally within the “HarmoAdaptFilter J74.amxd” device (from a menu) or by following a “HarmoScale J74.amxd” (or “HarmoGuessScale J74.amxd”) device, if present elsewhere in the live set.

Note: note filtering as done by the “HarmoAdaptFilter J74.amxd” is somehow alternative to the “HarmoChordFilter J74.amxd” device: while HarmoChordFilter adapts input on a note by note basis and only to the subset of notes in a chord, the HarmoAdaptFilter opens up use of all the notes in a selected scale, while still following the root note of the detected chords. This requires a constraint (the scale you need to pre-select) but offers a wider harmonic spectrum for note choice.

Important: remember to send MIDI input to the HarmoAdaptFilter from a MIDI clip (or live feed) with “C” as the reference root note of the phrase, so that the algorithm works at its best in relation to the chord.

Setup for working with live Chords and a Scale: using the HarmoChord and HarmoAdaptFilter devices

Suppose you are jamming, have a keyboard for playing chords in real-time and that you know the scale you are working on. You have prepared a number of tracks with MIDI clips (sequences and/or basslines), which you can throw in and out while jamming and that these clips have been prepared with “C” as their root.

- Set a “HarmoChord J74.amxd” device on the track which gets the chords you are playing (eventually using these chords also for playing an instrument)
- Set a “HarmoAdaptFilter J74.amxd” device on each track you want to adapt by using the HarmoAdaptFilter device.
 - On these tracks prepare MIDI clips using “C” as the root note for the phrase (independently from the scale you are going to use). This is important in order to have filtering done correctly by the HarmoAdaptFilter device.
 - Finally select the working scale, either manually from the menu of the HarmoAdaptFilter device or from a HarmoScale device elsewhere in the set (the latter is handy if you have multiple devices which need to follow the same scale)

Network Collaboration devices in HarmoTools

Network collaboration in HarmoTools extends the communication of information about chords and scales across an IP network. Once communication of chords and scale detection / selection is up and running, harmonization happens the same way as by working on a local system.

HarmoChordRecv J74.amxd

The HarmoChordRecv J74.amxd device is a tool for chord-based harmonic collaboration, “alternative” to the HarmoChord device. This is used when chord detection has to be done outside the live set and allows chord detection to be *received via the network* (using OSC). Once received this information will be *spread to all other harmonization devices in the liveset* (exactly as done by the HarmoChord device).

Note: In this case the chord detection information will be sent FROM another system in the network. This system is supposed to run the actual chord detection, using the HarmoChord device, in combination with the HarmoChordSend device (which we will see next) for sending information over the network using OSC.

HarmoChordSend J74.amxd

The Max for Live MIDI device used to *send* detected chord information from inside Ableton Live to other systems in the network, using OSC. The actual chord detection still requires the HarmoChord device to analyze the chords. The HarmoChordSend device spreads this information across the network.

HarmoScaleRecv J74.amxd

A Max for Live MIDI device for scale-based harmonic collaboration. This is used when scale definition has to be done outside of Ableton Live and allows *scale definitions* to be *received via the network* (using the OSC protocol). Once received this information will be *spread to all other harmonization devices in the liveset*.

HarmoScaleSend J74.amxd

A Max for Live MIDI device used to *send* scale information from inside Ableton Live to other systems in the network, using OSC. The actual scale definition still requires the HarmoScale device.

How to set up harmonization in network collaboration

Imagine to have two systems in real time collaboration, both using Ableton Live. System 1 could be doing the detection (using the HarmoChord device) and eventually also local harmonization (as explained in the previous examples). System 1 would also have an instance of the HarmoChordSend device in the live set to send the detected chord information to the network, towards another system (System 2).

System 2 would then receive the detected chord information (as detected by System 1) using the HarmoChordRecv device and do the same chord-based harmonization on its local live set. The two systems will harmonize based on the same chords.

In this setup chords are played on Ableton Live [System 1] via MIDI, sent to the HarmChord device on a MIDI track on [System 1]. This computer (System 1) has network connectivity (i.e. through wireless) to another computer (System 2) set to follow these chords for harmonization. On [System 1] a HarmoChordSend device is placed (anywhere in the liveset) for sending the chord information over the network to [System 2] (let's say [System 2] is IP 192.168.1.22, with UDP port set to 4470).

System 1 Parameters (HarmChordSend device)

- [Sending/Bypass] toggle. If active (“Sending”) passes detected chords to OSC output
- [Automatic/Manual] toggle. Automatic passes detected chords immediately. Manual requires you to hit the [Send] button.
- [Target IP] boxes. Four decimal numbers defining the target IP address.
- [UDP port] box. Number as destination UDP port of the communication with the [Target IP].

The target system [System 2] also runs Ableton Live and has a MIDI track dedicated for receiving the network information (via OSC) by using the “HarmoChordRecv J74.amxd” device.

System 2 Parameters (HarmoChordRecv device)

- [Receiving/Bypass] toggle. If active (set to “Receiving”) accepts OSC messages for chord detection
- [UDP port] box. Number for the receiving UDP port of the communication.

As in the previous cases, you will be able to use the other devices for the actual filtering / harmonization driving the various instruments. The MIDI feed to these instruments can be defined (as in the previous examples) by MIDI clips or real-time input.

Other devices in the HarmoTools set

The following devices are utilities targeted to various uses in the context of harmonization.

HarmoDisplay J74.amxd

A very simple utility offering a floating window to display the MIDI activity in the track, including history of all played notes (since last cleared and if history is not disabled). Useful if you want to monitor and study different parallel tracks (using the history option) or to see the effects of harmonization before/after a filter.

The user interface of the “HarmoDisplay J74.amxd” includes:

- [PopUp] and [Float] toggles: open the separate display window and make it floating (always on top)
- The [History] toggle, [Clear] and [Send] buttons: the [History] allows you to collect all notes played. The [Clear] clears the collected buffer, while the [Send] allows you to send the collected buffer to any [HarmoGuessScale J74.amxd] device, even if inserted later. This is useful to visually analyze the content (e.g. study the scale relationships)
- A [Display] button to toggle ON/OFF the device.

HarmoTonicFilter J74.amxd

This little filter device receives chord information as detected by the "HarmoChord J74.amxd" device and filters any incoming MIDI *transposing everything to the chord root note*. If input notes are octaves apart, the output chord roots will be also octave apart (you can also define the octave offset). This is a useful device for simple basslines, as MIDI input (e.g. Clips) is adapted on the fly to match the root of the currently detected chord or for driving a sequencer which supports transposition (like Ableton Live Mono Sequencer of J74 StepSequencer64).

HarmoChordBass J74.amxd

This is a little sequencing device which receives chord information from the "HarmoChord J74.amxd" device and plays a *simple sequence / bass line* based on the detected root. You can define triggers and pitch offsets from the detected root for each step (in sixteens). Note duration or velocity cannot be edited. You can then set a filter device behind this device to stay in harmony.

HarmoDisplayGuitar J74.amxd

A version of the HarmoDisplay device with a *guitar layout*. The device shows in real-time the position of received MIDI notes on the guitar's frets and (when used in combination with the HarmoChord device) can be used as an aid for chord shape finding on a guitar. Besides all possible positions on the frets, the device shows also the most relevant open chords and barre positions (for E and A shapes). It can be useful for learning chord shapes on the guitar or for more advanced players to visualize possible alternatives.

HarmoScale2Chord J74.amxd device

This is a MIDI device which looks like a “rack of chords” (with 9 pads/slots). Each pad/slot hosts and triggers a chord. One simple way of using it is, in fact, as a self-contained “rack of chords” MIDI device: you can program chords manually on each pad individually and use them by triggering the related pad.

Although perfectly possible, this is not the main use of the device. The real target of this tool is in exploring chords within scales using the diatonic harmonization rules. You can do this by using the “HarmoScale2Chord J74.amxd” and “HarmoScale J74.amxd” devices *together* (they must be both somewhere in the same live set, not necessary in the same track); the “HarmoScale J74.amxd” device is used to select a scale. Once a scale has been selected, it causes the “HarmoScale2Chord J74.amxd” device to auto populate its (first seven) pad/slots with chords. Pads can be triggered in input by notes in the C-2 to G#-2 range.

That's all for this user manual. Have fun with these devices!

And by the way, for more software and original stuff check my website:

<http://www.fabriziopoce.com/download.html>