

Ctrlr Panel for Oberheim TEO-5

SysEx Editor / Librarian

Users Guide

Pre-release Version 0.7.1

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Pre-release Version

Note: the TEO5 panel was cloned from the Sequential Take 5 panel, then modified based on the TEO-5 MIDI Implementation manual – the author does not have access to the hardware synth in order to directly test this panel, so some features may need to be corrected.

Overview

The TEO5 panel is used within the Ctrlr application, serving as a program editor and a librarian for the Oberheim TEO-5 synthesizer. This panel uses MIDI System Exclusive (SysEx) messages to send and receive programs (and to save programs to files, and load them from files); and it uses either MIDI NRPN to send and receive individual parameter changes, or MIDI CC (which can control some parameters, but not all).

The panel's features include:

- Send and receive programs via MIDI SysEx between the panel and the synth
- Select destination bank when sending program bank to synth, and when writing bank to file. (Destination bank can be different than the original.)
- Program editor area, which shows as many parameters at once as possible
- Program editor controls send and receive NRPN or CC, so that changes in parameter values made on the panel are immediately sent to the synth's edit buffer, and likewise when parameters are changed on the synth, those new values are received and shown in the program editor
- Panel has four selectable program edit buffers, to facilitate comparing parameters between programs
- Two program bank display windows next to the program editor (always visible, instead of hidden on a separate view)
- Six internal banks of programs in the panel's memory at once, containing a variable number of programs
- Program audition: double-click on a program in a bank window to send it to the synth's edit buffer, and also loads that program into the panel's editor area
- Replace, insert, append, swap, delete of programs in bank / between the two bank windows. (If the same internal bank is displayed in both windows, then this will rearrange within that one bank.)
- Search banks by program name and up to four parameters
- Compare programs within a bank, or between two banks

- Controls to send and receive MIDI program changes and continuous controllers, and an on-screen keyboard to send a MIDI note
- The panel can be used without the synth connected, to view and change program settings, and to manage programs and banks saved in files as SysEx.

The panel's appearance and design is functional, but definitely not fancy, e.g. the controls on the screen use Ctrlr's basic functionality to display buttons and knobs – there are no images of knobs made to appear like those on the actual synth. There's no splashy graphics, no picture background.

This panel was designed using Ctrlr Mac version 5.3.198 (the compiled version available as of early 2024), and is primarily used by its author with the standalone Ctrlr application, and is also used with the Ctrlr-VST plugin within Ableton Live 11. Panels are also tested Ctrlr Windows version 5.3.201.

Configuration for First Use

In the TEO-5 synth's global settings, make note of the MIDI channel selected, and choose these settings:

- MIDI Param Send = NRPN, or CC – match to panel's setting
- MIDI Param Receive = NRPN, or CC – match to panel's setting
- MIDI SysEx = MIDI or USB, based on how the TEO-5 interfaces to your computer

Connect your synth to your computer using a USB cable, or else using a MIDI interface with 5-pin MIDI DIN in and out cables. Note: USB is highly recommended due to the large size of a SysEx program (4693 bytes).

Install the Ctrlr application on your computer (if not already done).

Copy this panel to a folder of your choice.

Open this panel in Ctrlr (File -> Open), then use Ctrlr's MIDI menu to choose the input and output device needed to interface to your synth, and choose the same input and output channel as are selected in the synth's global settings.

Note that if not saved in the panel file, settings changes only affect the current panel use session (which may be desired). To permanently save settings changes in the panel file, click Ctrlr's File menu and choose "Save".

Features of Ctrlr used by this panel

Ctrlr has a standalone version, and also plugin versions Ctrlr-AU and Ctrlr-VST. Many features are the same between these versions; differences for the plugin will be noted.

Ctrlr can have a single panel open, or can have multiple panels open at once (click on each panel's tab to switch between them).

Ctrlr saves its own state information when you quit Ctrlr (and you can also do this with File -> Save CTRLR State) – it saves the panel(s) open, and their selected MIDI devices and channels. Panel(s) open when you quit Ctrlr will be reopened the next time you open Ctrlr, and their MIDI devices will be reconnected on the selected channels. If you do not want any panels opened the next time you open Ctrlr, then you must close all panels before quitting Ctrlr.

Each panel file also includes its own MIDI settings – these are included when you save a panel. This is separate from the Ctrlr application state (it saves one set of info for itself). You would probably save your most-commonly-used MIDI settings in the panel file; if you needed to temporarily use different settings, quitting Ctrlr while the panel remains open would retain those settings in Ctrlr's saved state.

If you close a panel without saving it, any changes made to it (e.g. MIDI settings) do not affect the panel file. This is great for making temporary changes and for experimenting with the panel, but do remember to save the panel if you want the changes to be permanent (or perhaps save the panel with a different name, if desired). Note that the state of panel controls may or may not be retained when saving and later reopening the panel – that depends upon the design of the panel, which may reset some or all controls to default settings each time the panel is opened.

Ctrlr offers a variety of display types and behaviors for panel controls having a range of numeric values – this panel uses the following features:

- Rotary dials and vertical sliders, with their value displayed below. To change its value: left-click the mouse and drag up or down, or left-click once on the numeric value and type in a new value (then press Enter to save, or Escape to cancel).
- Horizontal sliders, with their value displayed in the middle. To change its value: left-click the mouse and drag left or right, or left-click once on the numeric value and type in a new value (then press Enter to save, or Escape to cancel).
- The MIDI Program Change controls show only the numeric value (no dial or slider), along with Plus and Minus buttons above to change the value by one, or left-click once on the numeric value and type in a new value (then press Enter to save, or Escape to cancel).

Ctrlr also offers drop-down combo box controls for parameters having a list of values, on/off buttons, and text fields for program names (left-click to modify the name, then press Enter to save, or Escape to cancel).

Note that Ctrlr's menus are only for performing operations related to Ctrlr's features, for opening and saving panels, etc. Each custom panel in Ctrlr must implement its own method to allow features / operations related to the panel to be selected (e.g. loading or saving a program); this varies from one custom panel to another.

Ctrlr's Tools menu has a MIDI Monitor, which can show MIDI messages being received by and sent from Ctrlr. The Ctrlr/MIDI Monitor window has its own View menu – be sure this has “Monitor input” and “Monitor output” enabled as you prefer; if those options do not have a checkmark next to them in the View menu, they will not be active. The View menu also offers several ways to view MIDI messages – convenient for those who do not just want to look at raw hexadecimal.

Ctrlr's Panel menu contains advanced features to modify the panel, which are not needed for normal panel usage. Panel Mode is used to inspect and to modify controls on the panel layout – be sure that Panel Mode is off when using the panel with the synthesizer, because when Panel Mode is on, it will prevent some controls from sending MIDI messages, for example.

The Ctrlr application manages the controls on the panel (rotary knobs, buttons, tab groups which contain whole sets of other controls, etc.) – displaying them, and changing their values when receiving user input via the computer's mouse and keyboard. For rotary knob controls: click and drag up or down with the mouse to change the value, or else click on the numeric value displayed below the control to enter an exact value. Combo boxes display a popup list of values when clicked.

Controls can have MIDI messages defined such as continuous controllers, and then Ctrlr will automatically generate outgoing MIDI messages whenever the control's value is changed. The Ctrlr application also receives MIDI messages (for the selected device and channel), however each panel must have its own custom Lua functions to handle those MIDI messages – updating a control's value based on an inbound MIDI message requires Lua programming. (The Panel menu contains a Lua Editor.)

The Ctrlr application does not directly provide any synth patch/program librarian features – each panel must implement such features via Lua methods. The Ctrlr application provides use of file load and save dialogs so that the panel can load and save program files, but again this requires custom Lua methods.

Features specific to the Ctrlr plugin

The Ctrlr plugin is opened within a track in the DAW software – it would have one panel open, for that track. When the DAW saves its project, the Ctrlr plugin saves a copy of the panel within that; when the project is reopened, the Ctrlr plugin reopens the panel along with its MIDI settings. Note that the entire panel is saved in the project – it no longer references the original panel file that had been initially opened. You can make changes in this separately-saved panel – changing controls, and even modifying Lua methods. (If you made any changes that you'd want to save permanently, you would need to save them in a separate panel file on the computer with a different name, or else update the original panel file.)

The Ctrlr plugin allows panel controls to be automated within the DAW – with Live 11, this is (up to) 64 controls on the panel having VST Index values 0 – 63, and they are listed in VST Index order. With Ctrlr-VST, the control name is shown (might have to change the value once to make it appear), and range of the panel control (e.g. 0-127) is shown in Live's automation parameter; with Ctrlr-AU, the control name is not shown, and the value is always between zero and one.

Features of the TEO5 Panel

The panel has a message display line at the top, and sections for: MIDI controls, a list of the four program edit buffers, controls to perform tasks related to programs and banks, two bank display windows, and a large section to display / edit a program.

When the panel file is initially opened, the four edit buffers contain programs stored in the panel file. If the banks had been saved to files, the panel will attempt to reload the banks from the same files; otherwise, the banks will be empty.

*Note: If you leave this panel open when quitting Ctrlr, then the next time Ctrlr is opened, the edit buffers will retain their programs, and the banks will be reloaded from files or be empty. If you close this panel without saving the panel (click Ctrlr's File menu and choose "Save"), the panel file is not affected and the next time it is opened it will revert to its saved settings (which may be desired). **If you want to save the changes made to a program bank, be sure to save that bank to a file before closing the panel and/or exiting Ctrlr, and the same is true for changes to a program in the four edit buffers – otherwise, those changes will be lost.***

Edit buffers and program editor

The TEO5 panel has four internal program edit buffers. The active edit buffer is selected by pressing the corresponding green radio button. The program name is displayed next to the radio button. When changing the active edit buffer, the program in that edit buffer will be sent as MIDI SysEx to the synth's edit buffer, unless that edit buffer is muted. (A muted edit buffer allows you to view program parameters without affecting the synth.)

The Program Task group of controls is next to the Active Program Edit Buffer group. It has these buttons:

- 1) LOAD - loads a program from a file into the active edit buffer
- 2) SAVE - save the active edit buffer to a file
- 3) RECV - receive the synth's edit buffer into the Ctrlr panel's active edit buffer
- 4) SEND - send the active edit buffer to the synth's edit buffer
- 5) A combo box plus a "DO IT" button allows additional program tasks:
 - (a) Initialize the panel's active edit buffer
 - (b) Copy between edit buffers – either the entire program plus sequence, or the sequence only
 - (c) Compare two edit buffers

The program editor area has controls for the parameters of the synth – this shows all the settings of a program, and if changed on the panel it will immediately transmit MIDI NRPN to the synth (when

NRPN is chosen in panel settings); and likewise if parameters of the synth are changed (and the synth is set to send NRPN), the panel's controls will receive and display the updated values. If the panel and the synth are set to CC rather than NRPN, then some controls will send and receive changes, while others will not – their values can only be updated by using the Program Send button if the change was made on the panel, or the Recv button if the change was made on the synth.

Note: this panel currently does not display the poly sequence, however it is still part of the program – it is retained within each program when loading, saving, copying, etc.

MIDI Controls

The panel has controls for MIDI Program Change group and program. Like the editor controls, these will send MIDI messages to change the synth's current program, and the panel controls will change to reflect incoming MIDI program changes from the synth. If the checkbox is selected for Request Edit Buffer, the panel will send a MIDI SysEx edit buffer request to the synth after sending a MIDI program change, so that the program editor will reflect the selected program on the synth. *Note: clicking the plus sign when the Program number is 16 will result in switching to program 1 of the next higher bank, and clicking the minus sign when the Program number is 1 will result in switching to program 16 of the next lower bank.*

The panel has a small on-screen MIDI keyboard which can send one note at a time to the synth. The octave displayed can be changed by dragging it right or left (on the Mac, use a two-finger drag); there are also octave up and down buttons above the right end of keyboard. Clicking the mouse near the top of a key sends a lower note velocity value, and near the bottom sends a higher velocity.

After the MIDI keyboard has been clicked with the mouse, it has the “input focus” which means it will also receive certain keys pressed on the computer keyboard and then send corresponding MIDI notes (the velocity value is always 127). This allows chords to be played. As with other similar computer applications, the letter A produces note **C**, the letter W produces note **C#**, the letter S produces note **D**, the letter E produces note **D#**, the letter D produces note **E**, etc. across the two middle rows of the computer keyboard. The octave up and down buttons shift the notes played from the computer keyboard as well. After any other control on the panel is clicked, the MIDI keyboard won't have the input focus anymore, so it won't send MIDI notes from keys pressed.

Next to the keyboard are slider controls which send MIDI Mod Wheel (CC 1), Breath control (CC 2), Foot control (CC 4), Expression (CC 11), and Aftertouch values to the synth, plus a button for the Sustain pedal (CC 64); like other panel controls, these will also display values received via MIDI.

The SEQ PLAY button will start or stop playback of the poly sequence which is part of the current program. *Note: the TEO-5 ends sequence playback when a new program is selected. When selecting a new program using this panel's MIDI Program Change controls, the panel sends playback stop + new bank / program number + playback start to the synth. This is an experimental feature – it does not always work on the synth, so you may need to restart playback manually.*

Program Banks

The panel has six banks, each of which can hold a variable number of program. The panel's two bank windows can each display one of those program banks at a time. If the same program bank is displayed in both bank windows, then bank tasks will affect programs within that one bank. The combo box at the upper right of the bank window selects which of the program banks is shown. Double-clicking on a program in a bank window sends it (via SysEx) to the synth's edit buffer, and also loads that program into the panel's active edit buffer which is displayed in the program editor area. Another way to audition programs: left-click once on a program to select it in the bank window, then press Enter to audition. Use the up and down arrow keys to select a different program.

The Bank Task group of controls is next to the Left Program Bank window. The bank shown in the Left Program Bank will be the target for most tasks; when saving to file or sending as SysEx, it will be the source. For tasks related to one or more programs in a bank, select a single program with a single-click of the left mouse button; select the end of a range of programs (after having already selected the first) by holding the Shift key and then single-click the left mouse button. Programs can be added or removed from the selection by holding the Control key while left-clicking with the Windows version of Ctrl, or holding the Command key while left-clicking on the Mac version. For program-related tasks, if both the left and right bank windows contain the same bank (e.g. both are displaying bank 1), then this will allow programs to be rearranged within that bank.

Bank Task has a combo box which selects these tasks:

- 1) Left bank: Load from file – can load a file with one or multiple programs into the bank displayed in the Left Program Bank window
- 2) Left bank: Save to file as – this uses a combo box to choose whether the bank's contents are saved as one large file containing up to 8 x 16 programs, or a single bank of up to 16 programs, or as a collection of edit buffer dumps (which can't be sent directly to the synth using other generic SysEx applications, however it can contain any number of programs). Programs are numbered sequentially (from one) in the selected bank(s).
- 3) Left bank: Recv SysEx – will receive multiple programs from the synth. The separate combo box chooses "Manual send" to allow you to initiate the transfer from the synth; or choose from the same list as "Save to file" which will cause the panel to send SysEx dump requests for each program in the selected bank / group of banks.
- 4) Left bank: Send as SysEx – this will send all programs in the bank to the synth, to the specified bank(s) selected in the separate combo box. Programs are numbered sequentially (from one) in the selected bank(s).
- 5) Left bank: Names to file – creates a text file listing all programs from the bank
- 6) Left bank: Erase – deletes all programs from the bank (just in the panel's internal memory – does not affect the synth, or any file)

- 7) Edit buffer: replace prog – stores the active program edit buffer into the bank shown in the Left Program Bank window. This overwrites the selected program in the bank. (To use, must select one program first.)
- 8) Edit buffer: append prog – stores the active program edit buffer into the bank shown in the Left Program Bank window by appending it after the selected program in the bank. (To use, must select one program first.)
- 9) Prog: Replace in left bank – this will replace the selected program(s) in the bank shown in the Left Program Bank window with the selected program(s) in the Right Program Bank window.
- 10) Prog: Insert to left bank – this will insert the selected program(s) in the Right Program Bank window before the program selected in the Left Program Bank window.
- 11) Prog: Append to left bank – this will append the selected program(s) in the Right Program Bank window after the program selected in the Left Program Bank window.
- 12) Prog: Swap left-right – this will swap the selected program(s) between the left and right banks
- 13) Prog: Delete from left bank – this will delete the selected program(s) from the bank shown in the Left Program Bank window
- 14) Right bank: Load from file – same file load feature, with the target being the bank shown in the Right Program Bank window
- 15) Right bank: Names to file – creates a text file listing all programs from the bank
- 16) Right bank: Erase – same bank erase feature, with the target being the bank shown in the Right Program Bank window
- 17) Bank / Prog Compare – see section below about this feature

The “Save Bank” button below the Left Program Bank will save that bank using the current filename – this allows a quick save of the bank without having to use the bank task “Left bank: Save to file as” (which always requires the filename to be chosen in the popup dialog box).

Search Banks Window

The “Search” button below the Right Program Bank opens the Search Banks window – this will search through all programs currently loaded in the range of banks specified in the From Bank and Thru Bank fields, and then displays the search results in Right Program Bank window in a separate temporary bank called “Results” (beyond the last internal bank). Search results show the internal bank number and program number followed by the program name. The “Results” bank is read-only, and can only be displayed in the Right Program Bank.

The Program Name search field will perform a partial search – matching any program name which contains the contents of the search field.

Below Program Name, there are four lines which allow searching nearly any program parameter: choose the parameter, specify the comparison type (equals, greater than, less than, not equal), and select the value – depending on the parameter type, the value will be selected either with a rotary dial or a combo box.

If more than one search criteria is entered (either program name or 1-4 parameters), then all criteria must be met.

Press the “Search” button to search using the current criteria. Press the “Done” button to close the search window.

Note that while the search window is open, all other bank and program editor fields remain active – to audition a program in the Results bank, for example.

Bank / Prog Compare Window

This window offers the following features:

- 1) Unique programs from First Bank
- 2) Unique programs from First plus Second Bank
- 3) First Bank programs different from Second Bank

The unique program features compare every parameter within each program – useful to find out if several programs with the same name (e.g. “init program”) are really identical or not. The difference feature could compare a user bank with a factory bank – if the user bank began as a copy of the factory bank but some programs have been changed here and there, this will quickly identify them.

Click the “Compare” button to display the results in the Right Program Bank window in a separate temporary bank called “Results” (beyond the last internal bank). Results show the internal bank number and program number followed by the program name. The “Results” bank is read-only, and can only be displayed in the Right Program Bank.

Results can either show programs in their original order in the source bank(s), or sorted by program name.

The option “Include Unknown Params” will compare the contents of the entire SysEx layout, including any undefined areas between the known synth parameters. Typically this is not needed.

Press the “Close” button to close the window.

Settings Window

Click the Settings button near the top left of the panel to display or hide the Settings window. *Note that if not saved in the panel file, settings changes only affect the current panel use session (which may be desired). To permanently save settings changes in the panel file, click Ctrlr’s File menu and choose “Save”.*

The Debug Level combo box selects the amount of debugging information which is sent to the Lua console (opened using Ctrlr's Panel menu) – for normal panel use, this should be set to Off. *Note that displaying a lot of debugging information on the console can make the panel's controls sluggish, because Ctrlr will spend a lot of time displaying every value in the console in between showing changes to the controls displayed on the panel.*

Ctrlr panels have a VST Index assigned to controls for synth parameters, so that when using Ctrlr-VST those parameters can be automated by the host. Turns out the Ctrlr standalone version also acts as a host, so these index numbers are used in that mode as well. No two controls should have the same VST Index – this also applies when more than one panel is open at once in Ctrlr standalone. However, when a VST host such as Ableton Live has more than one instance of Ctrlr-VST open on separate tracks, the VST Index numbers between tracks do *not* affect each other – in fact, for parameter automation, the VST Index should begin with zero for the panel on each track. (Confusing?) Ctrlr's Modulator List (in the Panel menu) can change VST Index values for controls, but that's done one control at a time. To handle this situation, the panel Settings window contains a VST Index renumber feature: enter a new starting value in the 1st VST Index, and all the numbers for this panel are changed. Also, Ctrlr's Modulator List can be used to change the VST Index for a given control so that the order of parameters in the DAW automation list changes (e.g. give the lowest VST Index number to filter cutoff in order to make that to appear first). After changing number(s) in the Modulator List, change the 1st VST Index so that the panel will renumber all controls, making sure that they begin with the chosen value and also that each control has a unique value. (If two controls had the same number, the one which appears second in the Modulator List will be given the next higher number.)

The MIDI Send Delay control adjusts the delay in milliseconds between SysEx messages when sending a bank of programs to the synth. Due to the large size of the TEO-5's SysEx program, this may need to be increased – especially if used with 5-pin MIDI DIN cables. USB is recommended instead.

Ctrlr allows changing the color of various parts of each control, but only one control at a time, and using 8-character hexadecimal values (user-friendly, huh?) which control transparency + red + green + blue. The Settings window displays those hexadecimal color values for four distinct parts of controls plus the value text color and the background color, and allows those to be changed in one place, affecting all controls (except for controls for panel operation, e.g. Program task buttons). Clicking on a color title (e.g. "Button On") will display that color's red-green-blue values with the three vertical sliders, and the slider values will affect the 8-character hexadecimal value. Changes can be seen instantly, while the Settings window is open. Transparency didn't seem to be particularly useful, so a slider control was not created to affect its value, and it has been set to its maximum (hex FF) for all colors; if you'd like to change this, change the hex value between 00 and FF (the first two characters of the value).

There's a combo box which has a default color scheme plus two user schemes (which can be saved). The colors of the Settings window are not affected by these color schemes, so if current color choices render most of the panel's controls unreadable, the color scheme can still be viewed and changed. Select the default color scheme or user color scheme 1 or 2, then click LOAD to change to that color

scheme. Change the color values as desired. To save the current color choices, select user color scheme 1 or 2, then click SAVE. *Note that this affects the Ctrlr panel while it is open – if you close this panel without the next step, the color scheme change will be lost, reverting to the last-saved values when the panel is reopened. To permanently save the color scheme change in the panel file, click Ctrlr’s File menu and choose “Save”.*

“Allow SysEx send to Factory banks” is off by default. When enabled, the list of banks shown for “Send as SysEx” is expanded to include factory banks. The TEO-5 manual does not mention that factory programs can be replaced, but if the bank number within the SysEx points to factory banks, it does work. **Please use carefully!**

“MIDI param Send/Recv mode” chooses between using MIDI NRPN or CC for sending and receiving parameter changes. NRPN are defined for all program parameters and reflect their entire range and resolution. CC are only defined for a subset of parameters, and if the parameter’s range is greater than 0-127 then it will be scaled to 0-127, e.g. lowpass filter cutoff has a range of 0-164, so using CC reduces the precision.

Revision History

Version	Description
0.7.1	Pre-release version