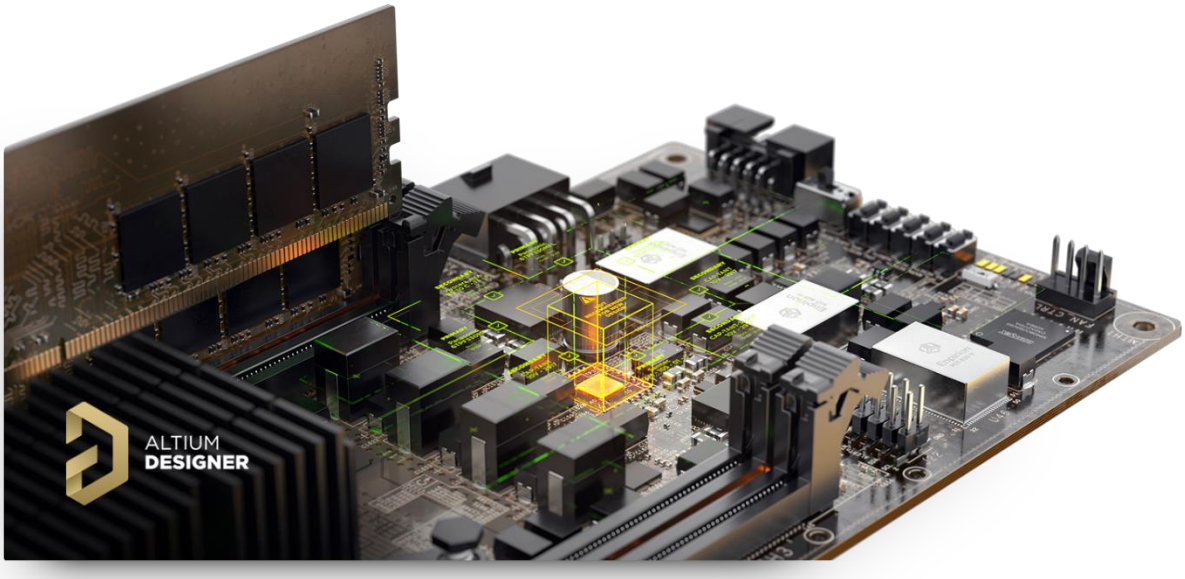

Altium Designer

Advanced Course

Module: Multi-Channel Design

Software, documentation and related materials:

Table of Contents

Multi-Channel Design

1.1 Purpose

This exercise will explore simplifying schematic entry for an audio-mixer design that has repetitive circuits.

1.2 Shortcuts

Shortcuts when working with Multi-Channel Design

F1:	**Help**
C-C:	**Validate Design**
C-O:	**Project Options**
CTRL+S:	**Save Document**

1.3 Preparation

1. **Close all existing projects and documents.**
2. Open the `Mixer.PrjPCB` project found in its respective folder of the Advanced Training.

1.4 Single Channel Design

To set the stage for a multi-channel design, we will begin by reviewing a simple single channel audio filter design.

1.4.1 Examining Design Files

3. In your *Projects* panel, open `Mixer.SchDoc`**.** It should appear as shown in Figure 1. Note the green sheet symbol rectangle in the bottom left corner with a designator of INP. It refers to the schematic `Input channel.SchDoc`**.**

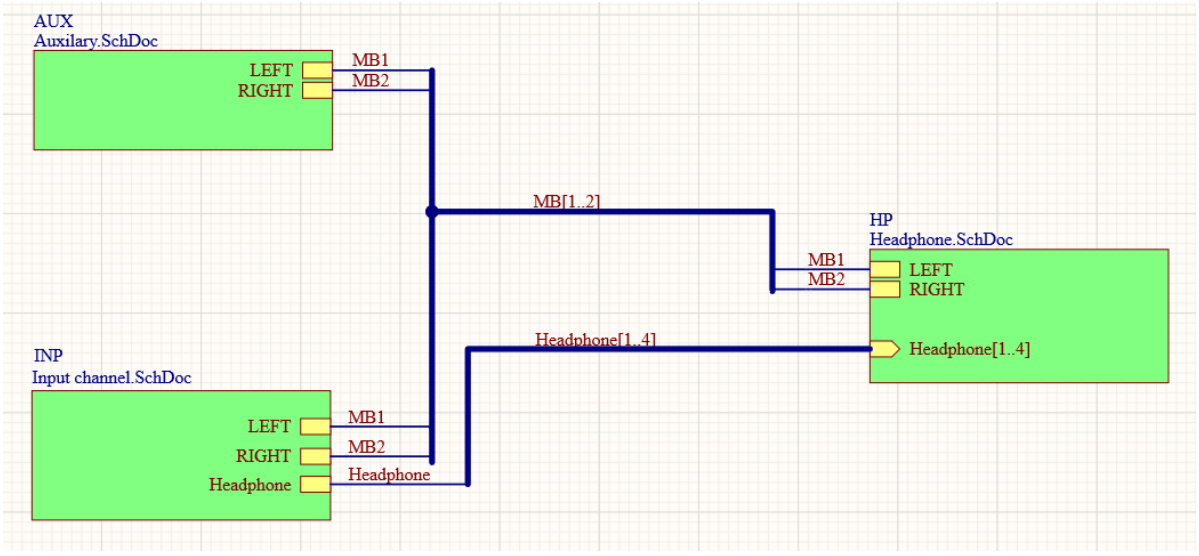

Figure 1. Single Channel design example

4. The lower-level schematic is shown in Figure 2 and contains three ports (Left, Right, and Headphone). These ports have an I/O type of **Unspecified** since these are connected to passive pins.

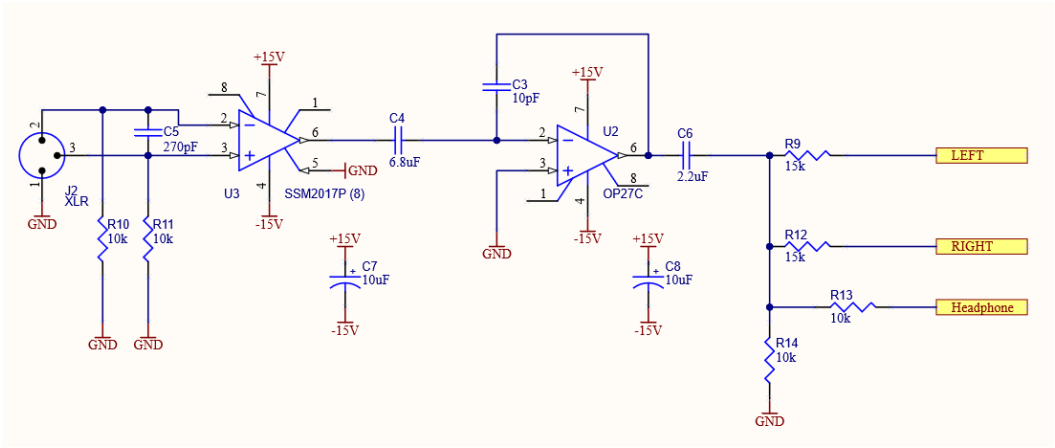

Figure 2. Lower-level schematic Input channel.SchDoc

5. Validate the project using the menus: **Project » Validate PCB Project Mixer.PcbPrj**. Examine the *Messages* panel to verify there are no errors or warnings.

1.4.2 Synchronizing with PCB

6. Open the `Mixer.PcbDoc` file to view the blank PCB document.
7. Synchronize with the schematic using the menus:
   Design » Import Changes from Mixer.PrjPcb.
8. Select the **Execute Changes** button, then close the dialog.
9. Notice the three rows of components appearing to the right of the board as shown in Figure 3. The **INP** block is at the top.
10. Close the PCB **WITHOUT saving** the PCB.

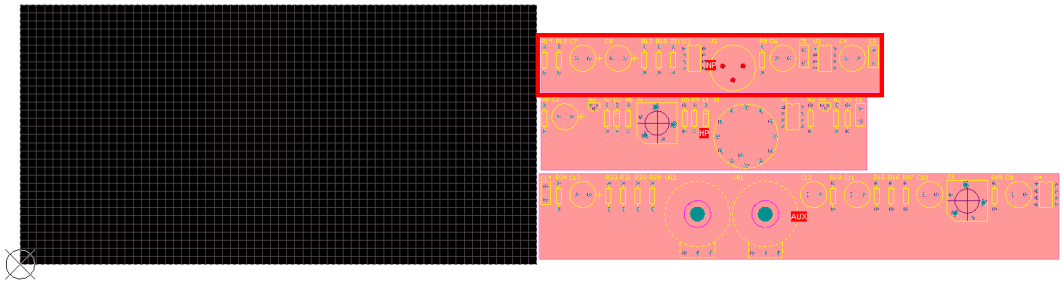

Figure 3. Single Channel design added to PCB document

1.5 Multi-Channel Design

We will now modify this design to a 4-channel mixer by changing the designator on the INP sheet symbol.

Sheet Symbol Indexing Enhancement.
Any digit or number may be used as the first or last index of a repeated Sheet Symbol, including 0. Negative numbers are not allowed. The last index must always be larger than the first index.
In our Example we will start the Indexing with 1.

1.5.1 **Modifying the Schematic**

11. By replacing the `INP` designator of the input channel sheet symbol with `Repeat (INP,1,4)`, the compiler will know to create a total of 4 copies of the input channel schematic and label them INP1, INP2, INP3 and INP4. Make this change to your schematic as shown in Figure 4.
12. By replacing the Sheet-Entry `Headphone` of the input channel sheet symbol to `Repeat (Headphone)`, the compiler will know to create a connection from bus signal Headphone1 to Channel 1, Headphone2 to Channel 2, and so forth, as shown in Figure 4.

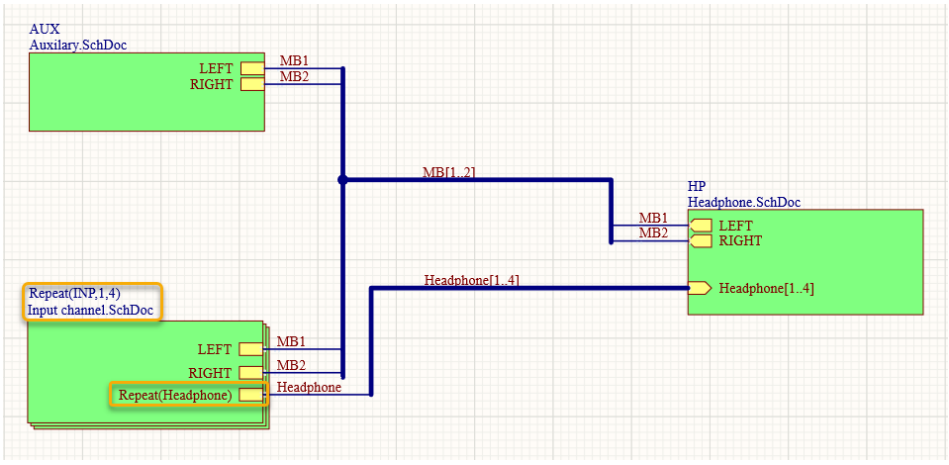

Figure 4. Modifying the input channel block to a 4-channel mixer

Note that `MB1` will connect to all four ports in each instance of the input channel schematic (`INP1, INP2, INP3 and INP4`). However, because of the wire to bus connection for **Headphone**, each of the four lower-level ports of `Input channel` will be individually connected to the bus and then connected individually in `Headphone.SchDoc`.

1.5.2 **Validate the Design**

13. Validate the design and examine the *Messages* panel. You should see no errors or warnings.
14. Open the `Input channel.SchDoc` document and notice the 4 additional tabs that are now visible in the bottom left corner, as shown in Figure 5. The **Editor** tab is unchanged and allows the user to make any desired changes to the schematic.

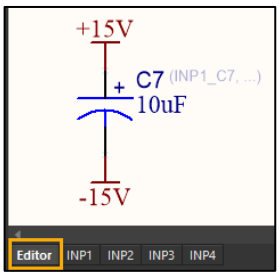

Figure 5. New tabs created in multi-channel schematic page

15. Click on the **INP2** tab and notice that the designator for the bypass capacitor is now `INP2_C7` instead of `C7`, as shown in Figure 6. This is a compiled view showing you the unique designators that will now be assigned to all the components in the multi-channel design.

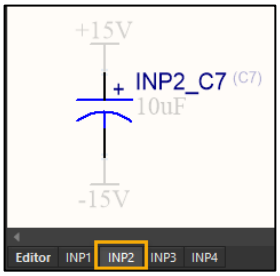

Figure 6. Compile tab for the second channel of the design

1.5.3 **Synchronizing the Design**

16. Open the `Mixer.PcbDoc` file and make it the current view.
17. Synchronize with the schematic using the menus: **Design » Import Changes from Mixer.PrjPcb.** Select the **Execute Changes** button then close the dialog.
18. You should now see 4 INP blocks appearing to the right of the board as shown in Figure 7.

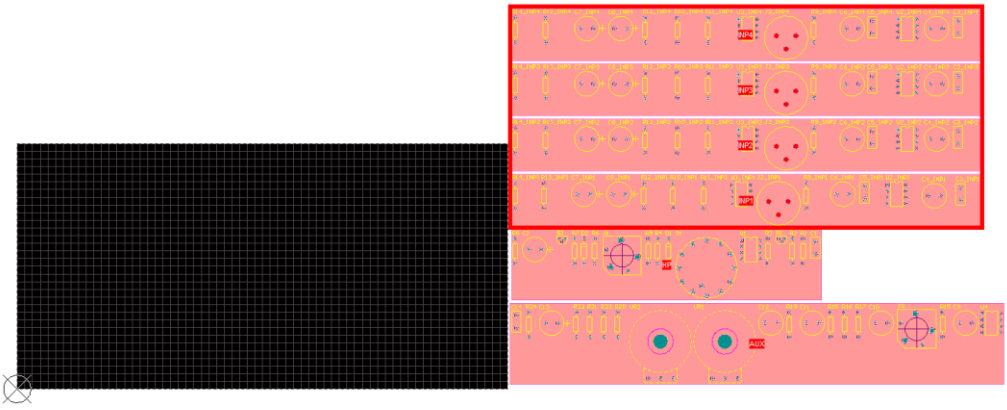

Figure 7. Multi-channel design synchronized with PCB showing 4 input channel blocks

1.5.4 **Changing Designator Format**

19. Change back to `Input channel.SchDoc`, INP2 tab.
20. Select the menus: **Project » Project Options…** to open the project options.
21. Select the tab **Multi-Channel** to change the format of designators as shown in Figure 8.

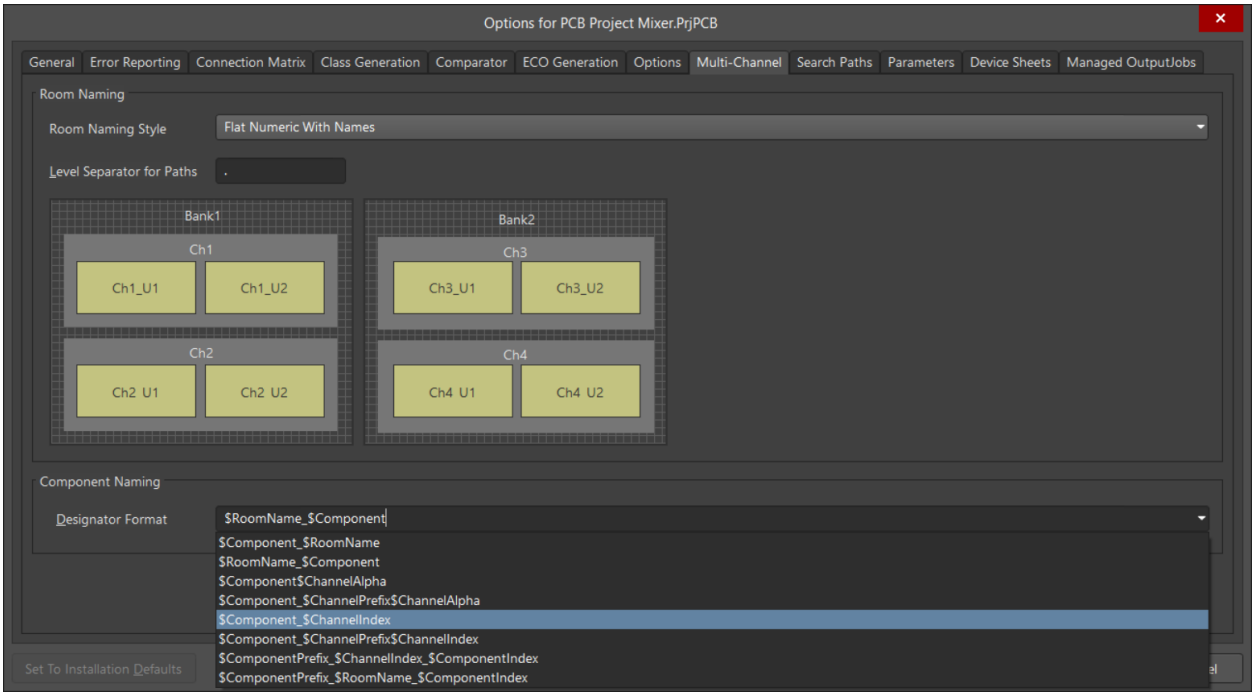

Figure 8. Multi-Channel formatting options

22. Choose $Component_$ChannelIndex from the *Designator Format* drop-down and notice the change in the dialog diagram showing how the new designators will appear. (If needed update the information by changing the tab, IMP2 to, for example, IMP1).
23. Press the **Cancel** button to exit this dialog without saving.
24. Save all your work.
25. **Close the project and any open documents.**

Congratulations on completing module

Multi-Channel Design

from the

Altium Designer Advanced Course

Thank you for choosing Altium Designer