



# Altium Designer

Advanced Training with Altium 365

Multi-Channel Design 1 - Schematic Entry

**Altium**  
TRAINING





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# Multi-Channel Design 1 - Schematic Entry

## 1 Purpose

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This module explores simplifying schematic entry for an audio-mixer design that has repetitive circuits.

## 2 Shortcuts

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Shortcuts used when working with Multi-Channel Design 1 - Schematic Entry


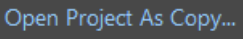

F1	Help
C » C	Validate Design
C » O	Project Options
CTRL+S	Save Document





## 3 Preparation

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1. Close all existing projects and documents.
2. Next, create a copy of the Training Project: Multi-Channel Design 1 - Schematic Entry.
3. Select **File » Open Project...** to open the *Open Project* dialog.
4. Enable the folder view button .
5. Navigate to the predefined Training Project Multi-Channel Design 1 - Schematic Entry (Top\Projects\Altium Designer Advanced Training Course\...).
6. Select **Open Project as Copy...** .
7. In the new dialog *Create Project Copy*:
  - a) Add your name to the project name: Multi-Channel Design 1 - Schematic Entry - [Your Name].
  - b) Add a description: Altium Advanced Training - [Your name].
  - c) Open the *Advanced* section.
  - d) Select the **Ellipsis Button**  from the *Folder* configuration to open the *Choose Folder* dialog.
    - i) Select the folder with your name: Project\For Attendees\[Your name].
    - ii) Select **OK**.
  - e) Change the **Local Storage** path if needed.
  - f) Select **OK** to create the copy.
8. Wait until Altium Designer creates the copy of the project and opened the Project for you in the *Projects* panel, this may take up to 1 minute.

Hint: For details how to copy the predefined training project, see module *03 Getting started - Opening a Project*.





## 4 Single Channel Design

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

### 4.1 Examining Design Files

- 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*.

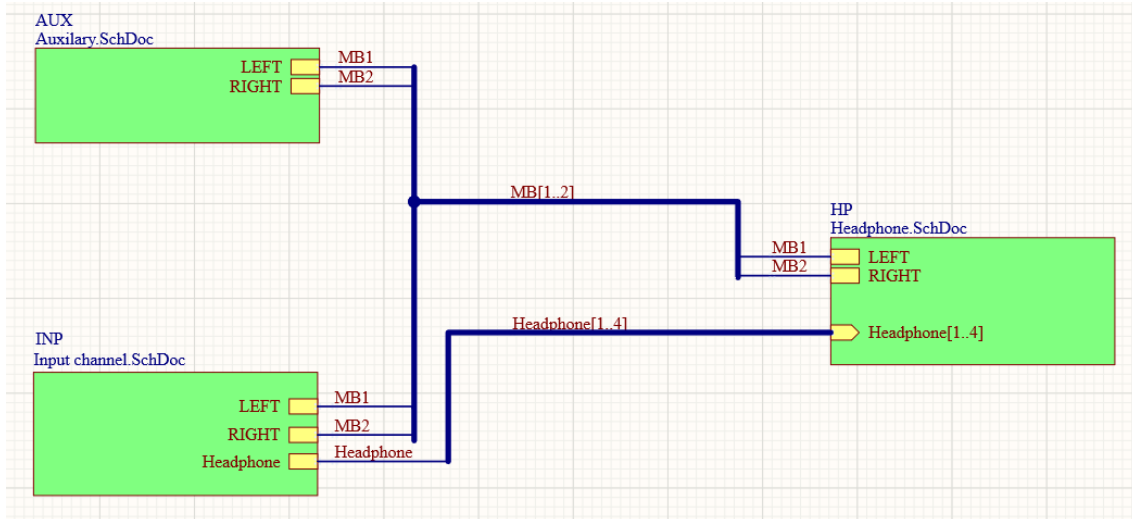


Figure 1. Single Channel design example

- 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.

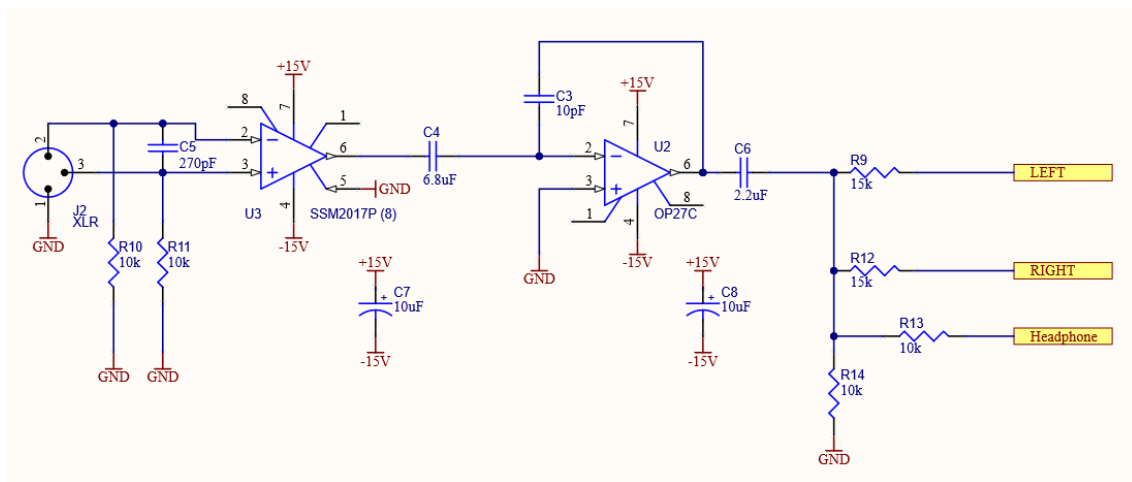


Figure 2. Lower-level schematic *Input channel.SchDoc*

- Validate the project using the **Project » Validate PCB Project Multi-Channel Design.PcbPrj** menu. Examine the *Messages* panel to verify there are no errors or warnings.





## 4.2 Synchronizing with PCB

12. Open the `Mixer.PcbDoc` file to view the blank PCB document.
13. Synchronize with the schematic using the **Design » Import Changes from Multi-Channel Design.PrjPcb** menu.
14. Select the **Execute Changes** button, then close the dialog.
15. 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.

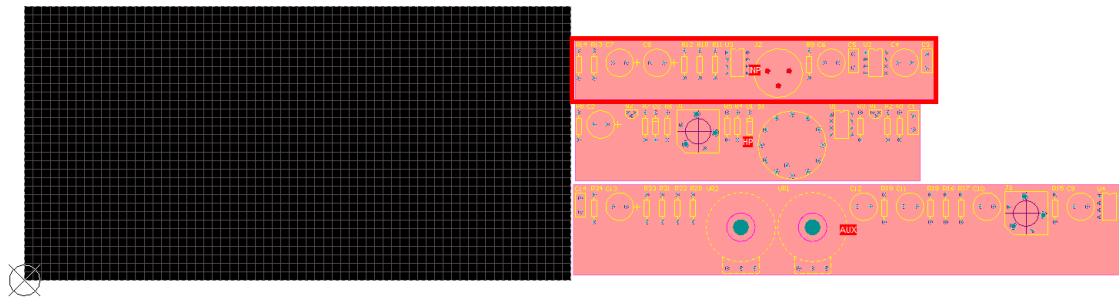


Figure 3. Single Channel design added to PCB document

16. Close the PCB **without saving** it.





## 5 Multi-Channel Design

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

Hint: 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 aren't allowed. The last index must always be larger than the first index. In this example, you will start the Indexing with 1.

### 5.1 Modifying the Schematic

17. By replacing the `INP` designator of the input channel sheet symbol with `Repeat (INP, 1, 4)`, the compiler will 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.
18. By replacing the Sheet-Entry `Headphone` of the input channel sheet symbol to `Repeat (Headphone)`, the compiler will create a connection from bus signal `Headphone1` to Channel 1, `Headphone2` to Channel 2, and so forth, as shown in Figure 4.

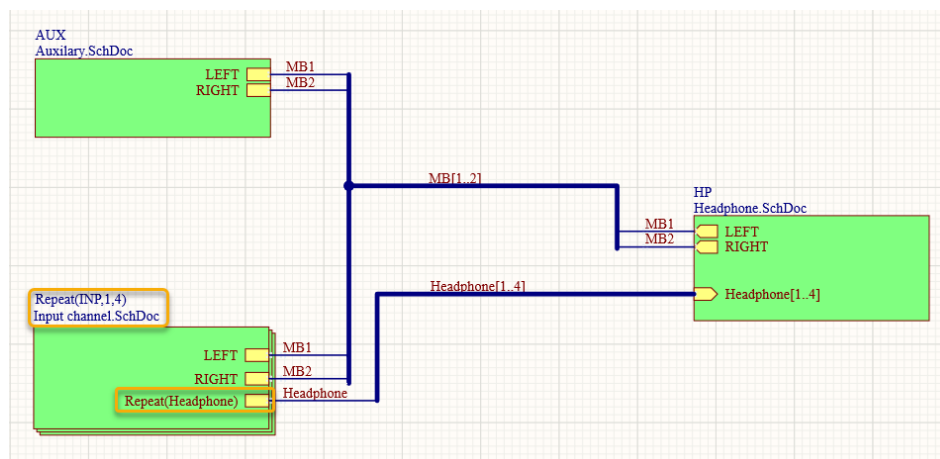


Figure 4. Modifying the input channel block to a 4-channel mixer

Note: `MB1` will connect to all four ports in each instance of the input channel schematic (`INP1`, `INP2`, `INP3` and `INP4`). However, due to 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`.







## 5.2 Validating the Design

19. Validate the design and examine the *Messages* panel. There should be no errors or warnings.
20. Open the `Input_channel.SchDoc` document and notice the four additional tabs that are now visible in the bottom left corner, as shown in Figure 5. The **Editor** tab is unchanged and allows you to make any changes to the schematic.

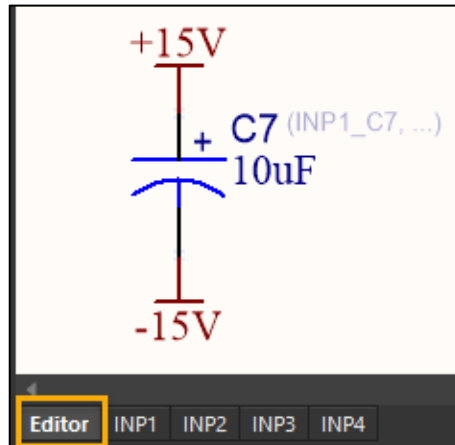


Figure 5. New tabs created in multi-channel schematic page

21. Select 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 be assigned to all the components in the multi-channel design.

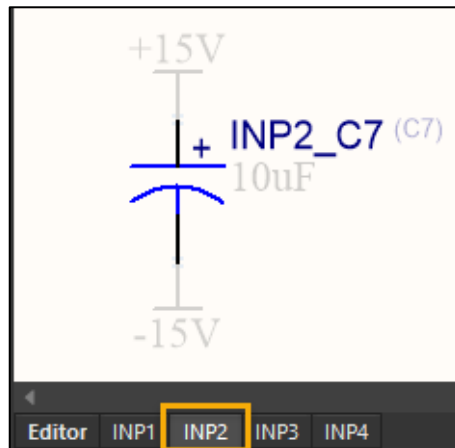


Figure 6. Compile tab for the second channel of the design





## 5.3 Synchronizing the Design

22. Open the `Mixer.PcbDoc` file and make it the current view.
23. Synchronize with the schematic from **Design » Import Changes from Multi-Channel Design.PrjPcb** menu. Select the **Execute Changes** button and close the dialog.
24. You can see four INP blocks appearing to the right of the board, as shown in Figure 7.

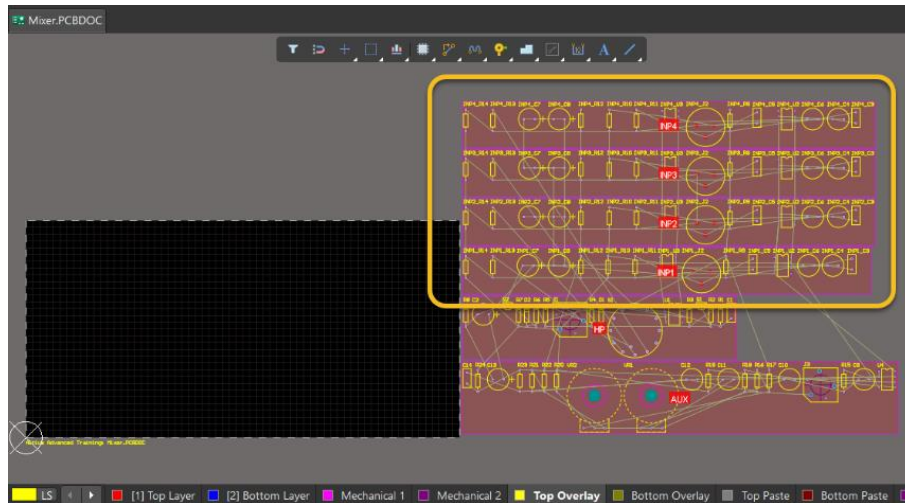


Figure 7. Multi-channel design synchronized with PCB showing four input channel blocks

## 5.4 Changing Designator Format

25. Change back to `Input channel.SchDoc`, INP2 tab.
26. From **Project » Project Options...** menu, open the project options.
27. Select the **Multi-Channel** tab to change the format of designators, as shown in Figure 8.

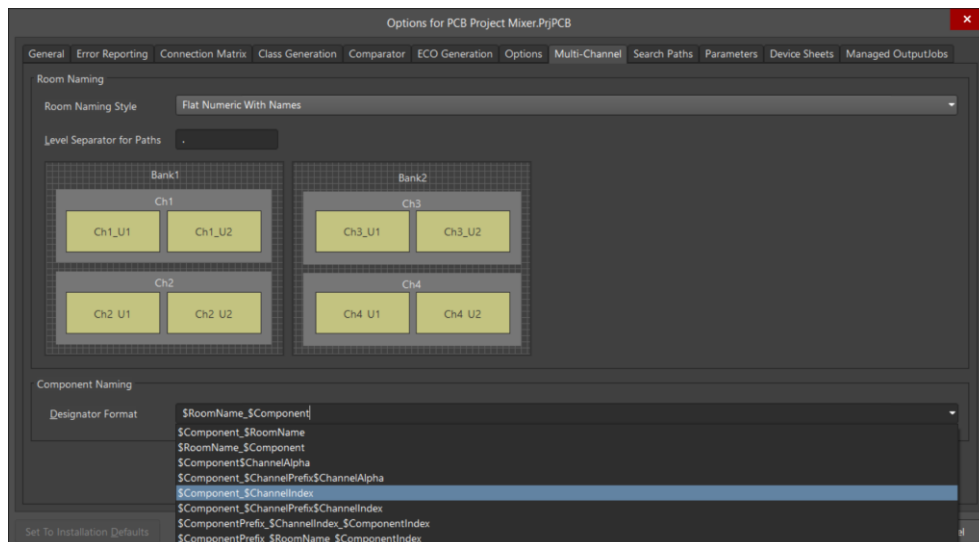


Figure 8. Multi-Channel formatting options


28. Choose **\$Component\_\$ChannelIndex** from the *Designator Format* drop-down and notice the change in the dialog diagram showing how the new designators will appear.
29. Press the **Cancel** button to exit this dialog without saving.
30. Save all documents using **File » Save All**.





31. Save the modifications to the server:

- a) In the *Projects* panel, next to the Project name you find the command **Save to Server**

**Save to Server** 

- b) Select **Save to Server**.

- c) In the dialog *Save [Project Name]*:

- i) Add the comment `Multi-Channel Design 1 - Schematic Entry - [Add Your Name] - Finished.`
- ii) Select **OK**.

32. When ready, close the project and any open documents, **Window » Close All**.





**Congratulations on completing the Module!**

Multi-Channel Design 1 - Schematic Entry

from

**Altium Designer Advanced Training  
with Altium 365**

Thank you for choosing **Altium Designer**

