1 Preview recording sessions
- How to read a stage plan and routing table
- Main stereo mic + spot mics + ambience mics
- Review gain staging: How to set preamp gain

2 Student presentation (pa1)
- ■

3 Early feedback

4 Introduction to mixing consoles
4.1 What are mixers for?
- Music is often consumed in stereo on 2 channels (l & r)
  - Public address (pa) systems typically designed in stereo
  - Home stereo systems: nomen est omen
  - Many physical media designed for stereo (e.g., cd)
- But you might want to record many more than just 2 instruments!
- And even a single instrument might require more than 2 mics (drumkit)!
- Problem: How to mix many input signals down to fewer output signals?
- That a mixer’s primary function, but it also serves many others:
  - Central hub for all signals in a recording studio or live pa
  - Built-in mic preamps to amplify signals and provide phantom power
  - On-board eqs and (mostly on digital mixers) other effects
  - Splitting signals to multiple destinations (e.g., record and amplify)
- Mixers can be confusing, but always boils down to 2 simple questions:
  - What goes in where?
  - What comes out where?
4.2 Example models
- All mixers are different. All mixers are the same.
- We’ll look at Mackie CR1604-VLZ in depth (popular small analog mixer)
- But goal is to enable you to find your way around any mixer model
- Principles we learn also apply to your DAW’s built-in software mixer

4.3 Topology
Virtually all mixers feature 3 distinct sections:
- Patchbay (physical inputs; rear or top of console)
- Input channel strips (left side of console)
- Output section (right side of console)

5 Input channel strip
- Mackie CR1604-VLZ: 16 identical mono input channel strips
- Other mixers: (many) mono & (fewer) stereo input channels
- If you understand a single strip, you understand 80% of the mixer ⊗

5.1 Physical inputs
- Mic input (XLR)
- Line input (TRS or TS): keyboards, guitars, CD players, tape returns, etc.¹
- Mackie CR1604-VLZ: Mixes both inputs ⊗, but using same trim ⊗

5.2 Preamps & phantom power
- Phantom power:
  - Mackie CR1604-VLZ: single switch for all 16 channels
  - Larger mixers: per-channel switches
- Trim:
  - Set gain of preamp to amplify mic and/or line input
  - Idea: Set trim once during soundcheck; use faders for actual mix
  - Goal: Set trim such that fader provides ‘meaningful’ signal (as loud as possible without resulting in overload or feedback)
  - Often done by eye (in the first instance), using signal meters
  - Mackie CR1604-VLZ: green -20 LED (signal) & red OL LED (overload)

¹ Note that the line input sockets on the Mackie CR1604-VLZ can very easily be confused with its channel inserts.
5.3 Inserts
• 2 different strategies for applying sound effects
  – Loop-in effects (e.g., compressor, distortion, eq): typically via inserts
  – Mix-in effects (e.g., reverb, chorus): typically via auxiliaries (see below)

• Unusual: An insert combines an output from the mixer (insert send) with an input to the mixer (insert return) in a single socket.

• Inserting a cable into that socket makes the (entire) signal leave the mixer and return through the same cable.

• Typical insert cable: Single TRS plug on mixer end splits into 2 TS plugs on effect end (y cable). Balanced or unbalanced?

5.4 Eq section
Mackie CR1604-VLZ: Typical example of channel strip eq

• Which kind of eq? How many bands?
• Which parameters can be adjusted?

5.5 Mute button
• Takes signal out of the mix

• Mackie CR1604-VLZ:
  – Re-uses red LED that also indicates signal overload (OL)
  – Exercise: Will mute also affect aux sends?

5.6 Fader
• Mackie CR1604-VLZ: 60 mm
• Larger mixers: 100 mm

• Digital mixers might feature motorized faders (parameter automation)

5.7 Direct outputs
• Direct out(put) ≈ ‘insert without return’

• Purpose: Split (single) input signal; send to 2 destinations at once

• Mackie CR1604-VLZ: Direct outs on input channels 1–8 (post-fader)
  – Signal level of direct outs cannot be adjusted (but digital HW & SW mixers often more flexible)
  – Nice hack: Half-plugged inserts can be used as pre-fader direct outs

\[ \text{Figure 2. Loop-in effect (e.g., eq, compressor, distortion), typically implemented as an insert} \]

\[ \text{Figure 3. Mix-in effect (e.g., reverb, chorus, flanger), typically implemented as an auxiliary} \]

\[ ^2 \text{Izhaki} \text{[2011a]} \text{refers to loop-in effects as processors and to mix-in effects as effects.} \]
- Typical application: Multitrack studio recording
  - Send individual input signals 1–8 to DAW via direct outs
  - Feed DAW outputs back into mixer on input channels 9–16
  - Mix inputs 9–16 to main l/r (post-tape monitoring, control room)

5.8 Auxiliaries
- Another way to get signals out of (and back into) the mixer
- Mackie CR1604-VLZ:
  - 6 mono aux sends (4 post-fader; 2 switchable pre/post)
  - 4 stereo aux returns

5.8.1 Pre-fader aux(iliari)es
- Signal leaves mixer before the fader (so fader does not affect it)
- Useful to create additional mix that is independent from main mix
- Typical application: Monitor mix for the musicians (no return required)

5.8.2 Post-fader aux(iliari)es
- Signal leaves mixer after the fader (so fader does affect it)
- Typical application: Mix-in effects (with return)
- Effect output returned via regular input channel(s) or special aux return
- Even if aux send is mono, aux return might be stereo (e.g., reverb)

5.9 Panpot or balance control
- Remember: Panpot for mono inputs, balance control for stereo inputs
- Mackie CR1604-VLZ: Only mono inputs (hence only panpots)
- Panpot law might be switchable on digital (but rarely analog) mixers

5.10 Solo function

<table>
<thead>
<tr>
<th>Mode</th>
<th>Meaning</th>
<th>Output bus used</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFL</td>
<td>Pre-fader listening</td>
<td>Solo (mono)</td>
<td>Live mixing</td>
</tr>
<tr>
<td>AFL</td>
<td>After-fader listening</td>
<td>Solo (mono)</td>
<td>Mixdown</td>
</tr>
<tr>
<td>SIP</td>
<td>Solo-in-place</td>
<td>Main mix (stereo)</td>
<td>Mixdown</td>
</tr>
</tbody>
</table>

- Soloing a channel is not necessarily equivalent to muting all others!
  - Channel strip EQ might or might not affect solo bus

3 Note that this requires an audio interface with more than 2 input channels!
Fader position might or might not affect solo bus

- Different solo modes (cf., table[1])
- Mackie cr1604-vlz:
  - Any solo button activates RUDE SOLO LIGHT in output section
  - Helpful to prevent confusion (what am I listening to?!)
  - Exercise: Is EQ audible in soloed signal?
  - Exercise: Which solo modes are offered?

5.11 Routing inputs to outputs

- Fader position determines level at which input is sent to output bus(es)
- Buttons determine whether input is routed to output(s) at all (on/off)
- Routing buttons on Mackie cr1604-vlz (next to input faders):
  - Main stereo mix (l–r)
  - Sub groups (1–2 & 3–4): additional outputs (panpot applies)

6 Output section

- Less standardized across different models than input channel strips
- Output faders (main stereo mix l–r; sub groups 1–4)
- Aux return controls
- PFL/AFL switch
- Talkback (communication between control room and recording space)

6.1 Signal meters

Mackie cr1604-vlz:

- Single 12-led stereo level meter (not particularly luxurious)
- Serves multiple purposes (e.g., main stereo mix vs. solo bus)

6.2 Main inserts

- Feature on Mackie cr1604-vlz (and many other analog mixers)
- Allows to insert a loop-in effect into main stereo mix
- Typical application: master compressor

6.3 Control-room monitoring

- Control-room and headphone mix controls (assignable source(s))
6.4 Tape return

- Unbalanced RCA connection
  - Send main L/R mix to stereo tape machine (tape send)
  - Feed output of tape machine back into mixer (tape return)
- Tape return for post-tape monitoring

7 Preview ed4 assignment

- Create stems for the individual instruments in a multitrack recording.
- Choose one of three productions you'd like to work with

References & further reading


Thompson, Daniel M. (2005). *Understanding audio. Getting the most out of your project or professional recording studio*. Berklee Press.