Personal Stage Monitoring
Selection & Operation

John Born
Shure Inc.
What is a Personal Monitor System?

- Closed Monitor System
  - Does not affect the performance environment
  - Does not depend on the performance environment

- Significant Benefits, including:
  - Sufficient volume
  - No feedback
  - Highly portable
  - Performer controllable

- Wireless or hardwired varieties
Wireless vs. Hardwired

• Hardwired
  – Simple
  – Inexpensive
  – Difficult to share mixes

• Wireless
  – Freedom
  – Easy to share mixes
  – Somewhat more expensive/complex
Components

- **Earphones:**
  - ONE for each performer

- **Receivers (Bodypacks):**
  - ONE for each performer

- **Transmitters**
  - Stereo: ONE for each mix
  - Dual-mono: ONE for every TWO mixes (MixMode™)
  - Mono: ONE for each mix
Configuring a System

• Questions that need answers:
  – 1. How many mixes are required?
    • Communicate with band leader/musicians
    • Will be different for every situation
  – 2. Mono or stereo mixes?
    • Stereo typically only for the “higher end”
    • Mono saves auxiliary sends on smaller mixers
  – 3. How many sends does the mixer have?
    • Only use pre-fader sends for monitor mixes
    • A dedicated monitor board is typically required for more than 4 mixes

There are no “cookie cutter” solutions...
How Many Mixes?

• Number of band members
• Who can share a mix?
• Dual-mono (MixMode™)
• More mixes = more transmitters = “better” system
Stereo vs. Mono

• Stereo
  – More “realistic”
  – Requires twice as many auxiliary sends

• Mono
  – Conserves aux sends and transmitters
  – More cost effective
Stereo mode

- The balance control performs a Stereo left/right function
- Approximately 40dB of stereo separation when centered
Drums Left
Drums Right
Bass
Acoustic Guitar
Electric Guitar
Keys
Lead Vocal

Stereo Mix
Dedicated Monitor Engineer
MixMode™

- Channel 1 & 2 are mono signals sent to both (L/R) earpieces
- The balance control performs a Ch. 1 / 2 relative level function
- Approximately 60dB of separation when panned to one side

Balance Control

Left Ear

Right Ear

Ch. 1

Ch. 2
Monitor Mixers

• Mixer must have enough “sends” to support the number of mixes.
• FOH: How many auxiliary sends?
• Monitor mixers: How many outputs?

Number of sends/outputs must be equal to number of required mixes!
FOH Mix – 2 Aux sends

Components:
- Mixer w/2 pre-fade aux sends
- One stereo transmitter
- Receiver/earphones for each performer

Option 1

<table>
<thead>
<tr>
<th>Aux 1 (Left Input)</th>
<th>Aux 2 (Right Input)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocal Mix</td>
<td>Band mix (Guitars, drums, etc.)</td>
</tr>
</tbody>
</table>

Option 2

<table>
<thead>
<tr>
<th>Aux 1 (Left Input)</th>
<th>Aux 2 (Right Input)</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Front” mix (Vocals, guitars, horns, etc.)</td>
<td>“Backline” mix (Drums, bass)</td>
</tr>
</tbody>
</table>

Option 3

<table>
<thead>
<tr>
<th>Aux 1 (Left Input)</th>
<th>Aux 2 (Right Input)</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Ego” mix (Lead instrument or vocal)</td>
<td>Everything else</td>
</tr>
</tbody>
</table>
FOH Mix – 3 Aux sends

Components
• Mixer w/3 pre-fade aux sends
• One stereo transmitter
• Receiver w/earphones for each performer
• Hardwired system for drummer

Three Monitor Mixes (Dual Mono)

<table>
<thead>
<tr>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aux 1 Cut (System 1 Left)</td>
<td>Aux 2 Cut (System 1 Right)</td>
<td>Aux 1 Cut (System 1 Left)</td>
</tr>
<tr>
<td>Vocal mix</td>
<td>Band mix</td>
<td>&quot;Front&quot; mix</td>
</tr>
<tr>
<td>Aux 2 Cut (System 1 Right)</td>
<td></td>
<td>Aux 2 Cut (System 1 Right)</td>
</tr>
<tr>
<td>Aux 3 Cut (System 2 Left)</td>
<td>Dedicated drum mix</td>
<td>&quot;Backline&quot; mix</td>
</tr>
<tr>
<td>(System 2 Right)</td>
<td>Unused</td>
<td>&quot;Ego&quot; mix</td>
</tr>
<tr>
<td>Vocal mix</td>
<td>Everything else</td>
<td>(System 2 Right)</td>
</tr>
<tr>
<td>Aux 3 Cut (System 2 Left)</td>
<td>Dedicated drum mix</td>
<td>Unused</td>
</tr>
<tr>
<td>Drum mix</td>
<td>Unused</td>
<td>Unused</td>
</tr>
</tbody>
</table>

Figure 6 - Three Mixes using Dual Mono
FOH Mix - 4 Mixes, 3 Aux sends

Four Monitor Mixes (Dual Mono - using only 3 Aux Sends and Monitor Loop Jacks)

Option 1

<table>
<thead>
<tr>
<th>Aux 1 Out (System 1 Left)</th>
<th>Aux 2 Out (System 1 Right)</th>
<th>Aux 3 Out (System 2 Left)</th>
<th>(System 2 Right)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocal mix</td>
<td>Band mix</td>
<td>Horn mix</td>
<td>Band mix (looped from System 1 Right Loop Out Jack)</td>
</tr>
</tbody>
</table>

- Aux 1: Band Mix
- Aux 2: Voice Mix
- Aux 3: Horn Mix

Loop Out
## FOH Mix – 4 Aux sends

### Four Monitor Mixes (Dual Mono)

**Option 1**

<table>
<thead>
<tr>
<th>Aux 1 Out (System 1 Left)</th>
<th>Aux 2 Out (System 1 Right)</th>
<th>Aux 3 Out (System 2 Left)</th>
<th>Aux 4 Out (System 2 Right)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead Vocalist’s mix</td>
<td>Guitarist’s mix</td>
<td>Bassist’s mix</td>
<td>Drummer’s mix</td>
</tr>
</tbody>
</table>

**Option 2**

<table>
<thead>
<tr>
<th>Aux 1 Out (System 1 Left)</th>
<th>Aux 2 Out (System 1 Right)</th>
<th>Aux 3 Out (System 2 Left)</th>
<th>Aux 4 Out (System 2 Right)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocal mix</td>
<td>Band mix</td>
<td>Horn mix</td>
<td>Vocal/Band mix</td>
</tr>
</tbody>
</table>

**Option 3**

<table>
<thead>
<tr>
<th>Aux 1 Out (System 1 Left)</th>
<th>Aux 2 Out (System 1 Right)</th>
<th>Aux 3 Out (System 2 Left)</th>
<th>Aux 4 Out (System 2 Right)</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Ego” mix</td>
<td>“Ego” mix</td>
<td>Band mix</td>
<td>Dedicated Drum mix</td>
</tr>
<tr>
<td>(lead vocal/instrument only)</td>
<td>(everything else)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How Many Components Will I Need?

**Stereo:**
Number of transmitters = number of desired mixes
Number of aux sends = 2 (number of transmitters)
(e.g. 4 mixes requires 4 transmitters and 8 aux sends)

**Dual Mono:**
Number of transmitters = number of desired mixes/2
Number of required aux sends = 2(number of transmitters)
(e.g. 4 mixes requires 2 transmitters and 4 aux sends)

**Mono only:**
Number of transmitters = number of desired mixes
Number of aux sends = number of transmitters
(e.g. 4 mixes requires 4 transmitters and 4 aux sends)

Number of receivers = number of performers
Distributed Mixing

• Accessory for personal monitor system
• Performer controls the mix
• Audio distributed via network cable (Aviom and Hear Back)
• Requires individual transmitter and/or bodypack per performer
Antenna Combining

- Recommended for 3 or more transmitters
- Reduces chances of multipath dropouts
- Advanced combiners reduce IMD products
- Do not combine more than 2 active combiners
- NEVER actively “combine” combiners
Directional Antennas

- Concentrates RF signal in one direction
- Up to 10 dB of additional gain (vs. ¼-wave antenna)
- Reduces multipath dropouts
- Increased range
# Basic Monitor Mixing

1. Put the monitors in your ears, and turn the system on. **DO NOT** put any instruments in your mix yet!

2. Try to play a song. While you are playing, determine what you need to hear more of.

3. Begin bringing instruments into the mix, one at a time. Chances are, you will need vocals first, since those are often the only unamplified "instruments" on stage.

4. Only turn things up as loud as necessary, and resist the temptation to add instruments to the mix that you can hear acoustically.
Basic Monitor Mixing

Amplification vs. Isolation

- **Keyboards**
  - Too Soft: Requires Amplification. **Do Add To Mix.**
- **Samplers**
  - Too Soft: Requires Amplification. **Do Add To Mix.**
- **Turntables**
  - Too Soft: Requires Amplification. **Do Add To Mix.**
- **Vocals**
  - Too Soft: Requires Amplification. **Do Add To Mix.**
- **Acoustic Guitar**
  - Too Soft: Requires Amplification. **Do Add To Mix.**
- **Violin**
  - Too Soft: Requires Amplification. **Do Add To Mix.**
- **Piano**
  - Too Soft: Requires Amplification. **Do Add To Mix.**
- **Electric Guitar Amp**
  - Hard To Hear Without Amplification. **Likely Should Add To Mix.**
- **Horn Section**
  - Can Already Be Heared Acoustically. **Likely Should Not Add To Mix.**
- **Bass Amp**
  - Can Already Be Heared Acoustically. **Likely Should Not Add To Mix.**
- **Drums**
  - Can Already Be Heared Acoustically. **Likely Should Not Add To Mix.**
- **FOH PA**
  - Too Loud: Requires Isolation. **Do Not Add To Mix.**
- **Audience**
  - Too Loud: Requires Isolation. **Do Not Add To Mix.**

**NOTE:** These are guidelines. Personal preference may vary.
Hints and Tips

• Only put sources you can’t hear acoustically into your mix.

• Use ambient microphones and/or drum throne shakers.

• Use effects (reverb), if desired.

• Always use the limiter!
Will personal monitors protect my hearing?

- Using an IEM system does not guarantee hearing protection!
- Some IEM rigs are capable of producing levels in excess of 130 dB SPL.
- Prolonged exposure to these kinds of levels will likely cause hearing loss.
- **It is up to each user to be responsible for protecting his/her hearing.**
Safe Listening with Personal Monitors

DIRECT SOUNDS

- .45 CALIBER PISTOL (25 FT.)
- AIR RAID SIREN (100 FT.)
- PIPE ORGAN (2 FT.)
  (THRESHOLD OF PAIN)
- ROCK MUSIC (10 FT.)
- VOICE SHOUTING (3 FT.)
- HEAVY TRAFFIC (5 FT.)

AVERAGE CONVERSATION (3 FT.)

- AVERAGE SUBURBAN HOME (NIGHT)
- QUIET AUDITORIUM
- EXTREMELY QUIET RECORDING STUDIO

ANECHOIC CHAMBER (THRESHOLD OF HEARING)

PEFORMANCE™
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Safe Listening with Personal Monitors

<table>
<thead>
<tr>
<th>Sound Pressure Level</th>
<th>Exposure time</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 dB SPL</td>
<td>8 hours</td>
</tr>
<tr>
<td>95 dB SPL</td>
<td>4 hours</td>
</tr>
<tr>
<td>100 dB SPL</td>
<td>2 hours</td>
</tr>
<tr>
<td>105 dB SPL</td>
<td>1 hour</td>
</tr>
<tr>
<td>110 dB SPL</td>
<td>30 minutes</td>
</tr>
<tr>
<td>115 dB SPL</td>
<td>15 minutes</td>
</tr>
</tbody>
</table>
Tips for Protecting Your Hearing

• Use isolating earphones
• Use both earphones
• Keep the limiter on
• Pay attention to your ears
• Have your hearing checked regularly
Questions?

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