Sound Reinforcement for Jazz and Acoustic Music It's Not Rock and Roll!

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Varieties of Acoustic Jazz

- Big bands (12-18 pieces)
- Small bands (7-10 pieces)
  - Like a small big band
- Small Groups (2-7 pieces)
  - High energy bop and post bop
  - Soloist (including singers) with rhythm section
  - Piano and/or guitar trios
  - Chamber jazz
  - "Free" forms
- Unaccompanied soloists (piano, guitar)

Classical Music

- Symphony orchestras (15-90 pieces)
- Classical chamber groups (3-20 pieces)
- Classical soloists with/without orchestra
- No reinforcement in “good” rooms
  - Large and small halls designed for orchestras
- We must do a full recording-quality mix outdoors and in arenas
- Minimalist miking often the best
- Consider stereo reinforcement

Other Acoustic Music

- Reinforcement needs similar to jazz
  - Classical music
  - Folk music
  - Barbershop quartets
  - Bluegrass
  - Salsa
  - Star with big band, even strings

Performance Venues

- Small rooms (100 – 250 seats)
  - Night clubs, small theaters
  - Reinforce solos and quiet instruments only
  - On-stage leakage may be a problem
- Medium rooms (250 – 750 seats)
  - Larger clubs, most theaters
  - Reinforce solos and quiet instruments only
- Very large rooms and outdoors
  - Reinforce everything

What is Jazz About?

- Rhythm
- Improvisation
  - Mostly soloists, but also accompanists and sections
- Emotional content
- Colors of sound
  - Blend and tonal quality of the instruments
  - Especially in big and small bands
- Interplay between instruments
- Dynamics
- Excitement

A Good Acoustic Mix is Invisible

- We should create the illusion of “a bunch of guys in a room playing”
- The audience should be able to close their eyes and believe there’s no PA!
- Keep every instrument in scale with reality
- Don’t try to make things “larger than life”
  - A piano is a piano, not an orchestra!
  - A solo horn is not louder than the whole band!
- Remember, jazz is about the ensemble, how they blend, and how they interact

Jazz Doesn't Need Much Help!

- In small rooms, the band is almost always loud enough, but quiet instruments and soloists may need some reinforcement for good balance
- In medium-sized rooms, the band is often loud enough, but quiet instruments and soloists need some reinforcement for good balance
- In most large rooms and outdoors, we must do a recording-quality mix of the entire band
- In most rooms, limited stage monitor (foldback) is needed
- **LESS IS MORE!**

200-Seat Theater – No PA at All! (Mics are for recording)

Jazz Doesn't Need Much Help!

- Quiet instruments (almost always)
  - Piano
  - Vibes
  - Flute
- Soloists
  - Horns (often)
  - Singers (almost always)
- Most venues need limited (but good) stage monitors
- LESS IS MORE!

Let's Get Real

- **Do you really believe that this little box can sound as good as a 16-piece big band at 100 dBSPL?**

Let's Get Real

- Do you really believe that this little box can sound as good as a 16-piece big band at 100 dBSPL?
- If you do, I want some of what you're smoking!

Let's Get Real

- But it CAN bring solos and quiet instruments up to balance with the natural level of the band!
- And that's our job!

Big Bands are Naturally Loud

- **But not painful!**

Jazz is not Rock and Roll

Nearly all PA for jazz is

PAINFULLY LOUD!

How did Crazy Loud PA Start?

- Most sound people don't know what jazz actually sounds like
- Many musicians don't understand how sound systems work

And Along Came Maynard

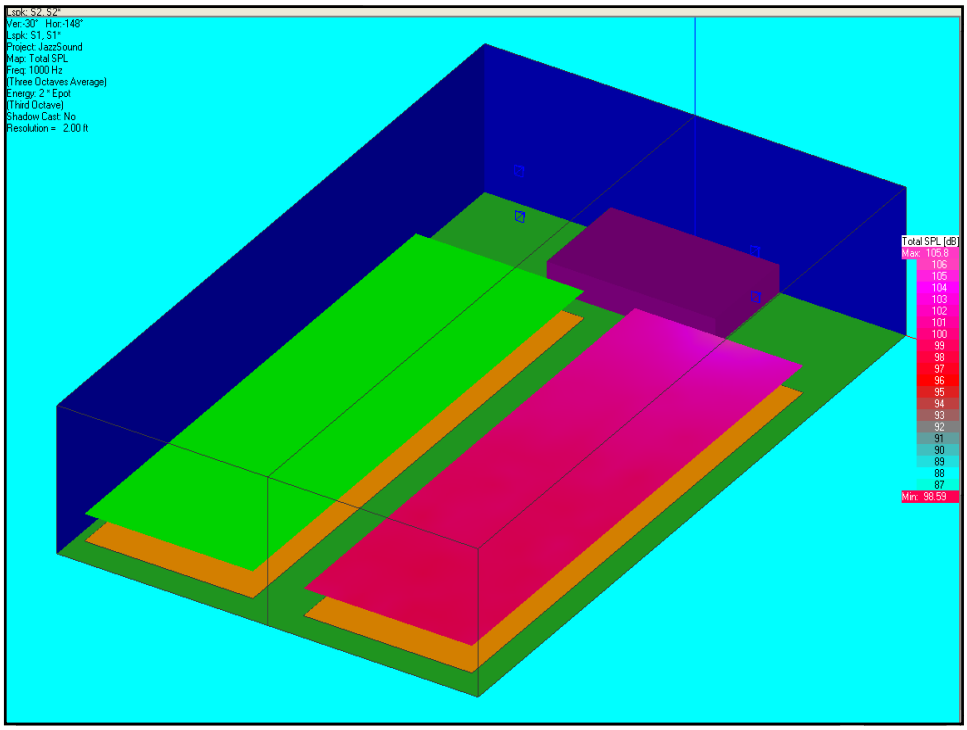
Maynard Before Rock and Roll Sound Reinforcement (Mics are for Recording)

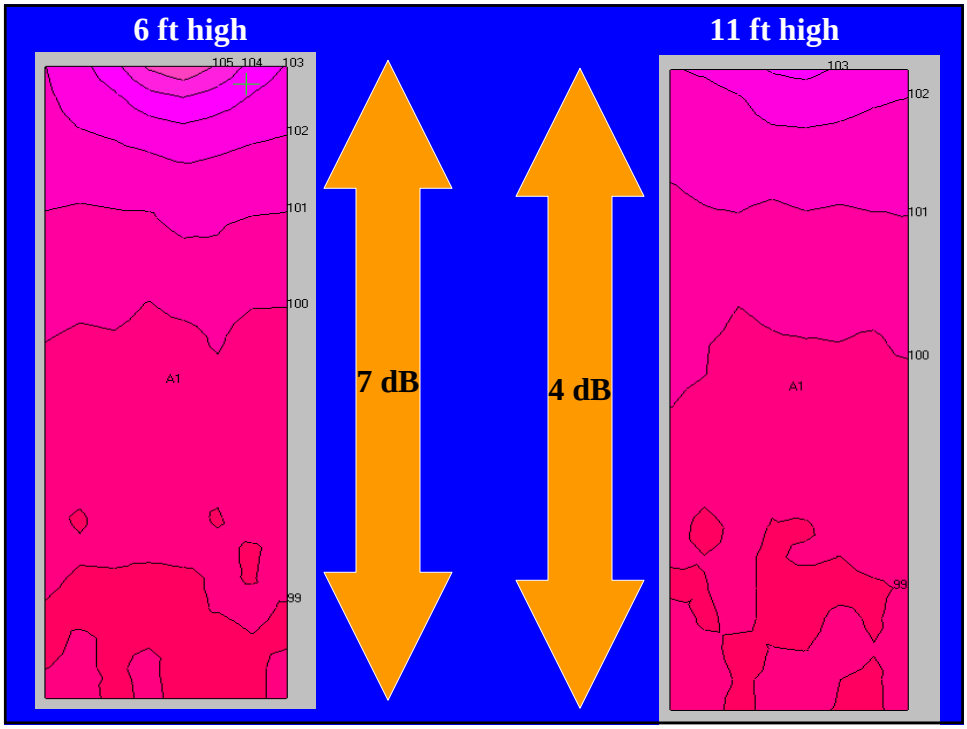
How did Crazy Loud PA Start?

- Maynard Ferguson had some pop hits
  - His record company hired a rock PA crew
  - Shure gave him a zillion 58's
  - It made his band painfully loud
- Miles Davis and Herbie Hancock formed jazz-rock bands
  - Those bands needed loud PA
  - It was "right" for what they were doing then
  - But it is <u>not</u> right for most jazz

How Much PA Do We Need?

- **Enough to get uniform coverage of the audience, ±3dB**
  - **Get the main front loudspeakers up high**
  - **Put them upstage to avoid blasting first rows**
  - **Use delayed loudspeakers in medium and larger rooms**
- **Because bass and drums rarely need much reinforcement in small and medium rooms, natural sound quality and uniform coverage are <u>far</u> more important than loud bass**





Mixing

What Does the Band Sound Like?

- Loudness
- Balance
- Dynamics
- Learn their arrangements
  - So we don't screw them up with our bad mixing

Learn What the Music Sounds Like

- Listen to the band rehearse
- Buy some records and study them
- Understand their musical concepts

Learn How each Instrument Sounds

- Stand in front of it and listen
- Put one ear where you think a mic might work and listen

How Loud Should it Be?

- About as loud as the same band with no PA in a small room (or a good medium-sized room)

Don’t Mix For the Deaf!

Don’t Mix For the Deaf!
(Or deafen your audience)

Zero-Based Mixing

- Small and Medium sized rooms
- Listen to the band with no PA
- Add only what you don't hear enough of
- We usually don't need the band louder, only better balanced

Mixing

- Drummers and bassists are not the star of the band (even when one is the leader)
- Bass and drums are often too loud (or at least loud enough) before you turn the PA on!
- Start with no bass and drums!
- Get the balance of the melody instruments right first
- Get the piano right
- Keep up with soloists
- NOW add bass and drums if you need them!

Mixing Big and Small Bands

- Don’t put a soloist way up on top!
- Jazz is an ensemble art, and a big part of that art is the sound of the sections playing behind the soloist
- A soloist should be just loud enough that he/she is still heard when the band roars around them

Always Think Dynamics

- When music gets quiet (or starts off quiet), let it be soft! The band will almost certainly get loud all by itself.
- When the band roars, let it roar
- Ride levels and EQ only when you’re sure the performer is screwing up his own dynamics or sound with bad mic technique

Zero-Based EQ

- Start with the right mics in the right place and the EQ set flat
- Use low-cut to minimize bass leakage
  - Everything needs some low-cut
    - 40 Hz for bass and kick
    - 75-150 Hz for everything else
- Use *low* EQ to correct for proximity effect
- Use *high* EQ to correct for excessive presence, or to add a little

Bass Leakage and Low-Cut EQ

- Bass leakage is all over most stages, and creates a lot of "mud"
- Use low-cut to minimize bass leakage
  - All mics need some low-cut
    - 40 Hz for bass and kick
    - 75-150 Hz for everything else
- Keeps the mud out of the low end

Mixing Jazz

- Stay with the mix. Jazz is dynamic, things can change a lot from one tune to the next.
- Be prepared for doubles – many musicians play more than one instrument.
- Be prepared for musicians who also sing, especially bassists.
- If in doubt, put up extra mics. You don't have to turn them on if you don't need them, but you can't turn them on if they're not there.

Mixing Small Groups and Trios

- Jazz is an ensemble art, and a big part of that art is the sound of the other horn(s) and the rhythm section behind the soloist
- Don't put a soloist way up on top!
- Bass and drums should not dominate the mix, even when one of them is the leader.

Mixing Tricks

- Pan sections and similar sounding instruments in stereo headphones to help get a mix going fast with a band you don't know
- Once you're close, dump the headphones except for problem solving

Mixing Tricks – the Solo Bus

- It's a great learning tool
- Must be post-fade and post-EQ to be useful
- Once you have the mix locked in, use your solo bus to study leakage
- Use the solo bus to look for problems (rattling mic stand, mic touching a piano string, hum, buzz)

Drums

- The drummer is not the star of the band (even when he's the leader)
- Drums are often too loud before you turn the PA on!
- Jazz drummers drive the band, provide accents, often act as conductors
- Don't reinforce drums in small rooms
- Minimally mic drums in medium-sized rooms
- Minimally mic drums in large rooms
  - Overhead and Kick is usually enough

Bass

- The bass player is not the star of the band (even when he's the leader)
- Bass is often too loud before you turn the PA on!
- Don't reinforce bass in small rooms

Bass

- Every player and instrument are different
- Put multiple mics on bass, use what sounds best in the mix
  - F-hole
  - Above bridge
  - Mic on amp
  - One mic often works better for rhythm, another for solos

Acoustic Rhythm Guitar

- You need a mic on the instrument
- Should not be obvious in the mix
- We should just hear it as brightness around the bass player
- Listen to some Basie records

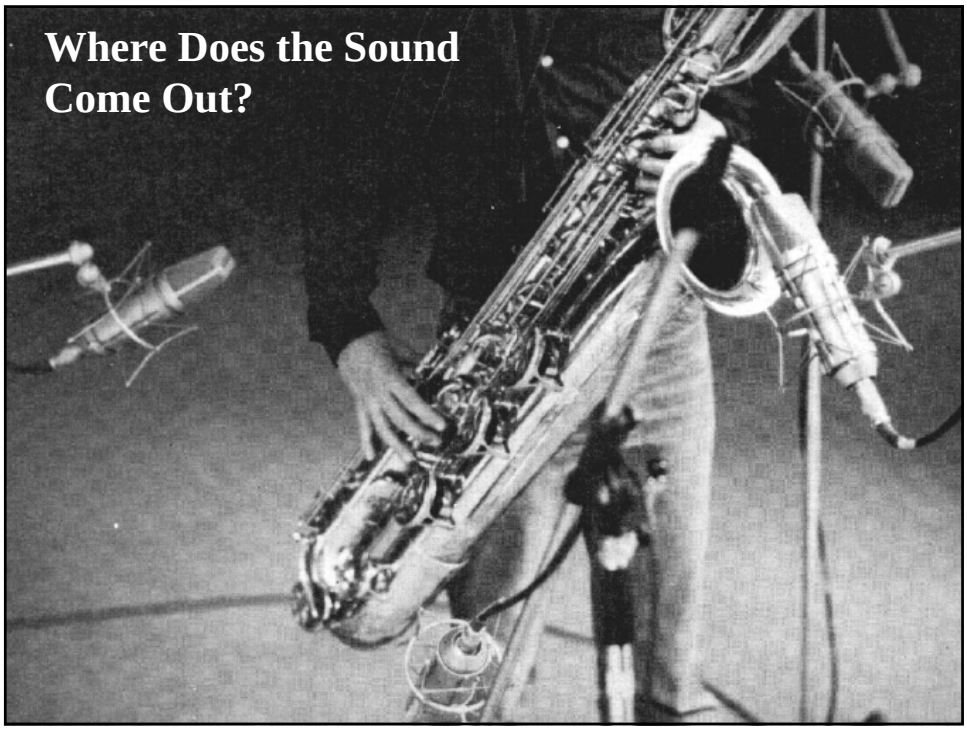
Mic Technique and Placement

- Use your most forgiving mics for down front solo and talk mics
  - You never know when someone is going to work the wrong mic
  - Proximity-corrected mics are a good choice
  - Never use an announce mic if you would be upset if the star sang or played into it
- When doing recording (or broadcast), make sure that all mixers have every mic on stage

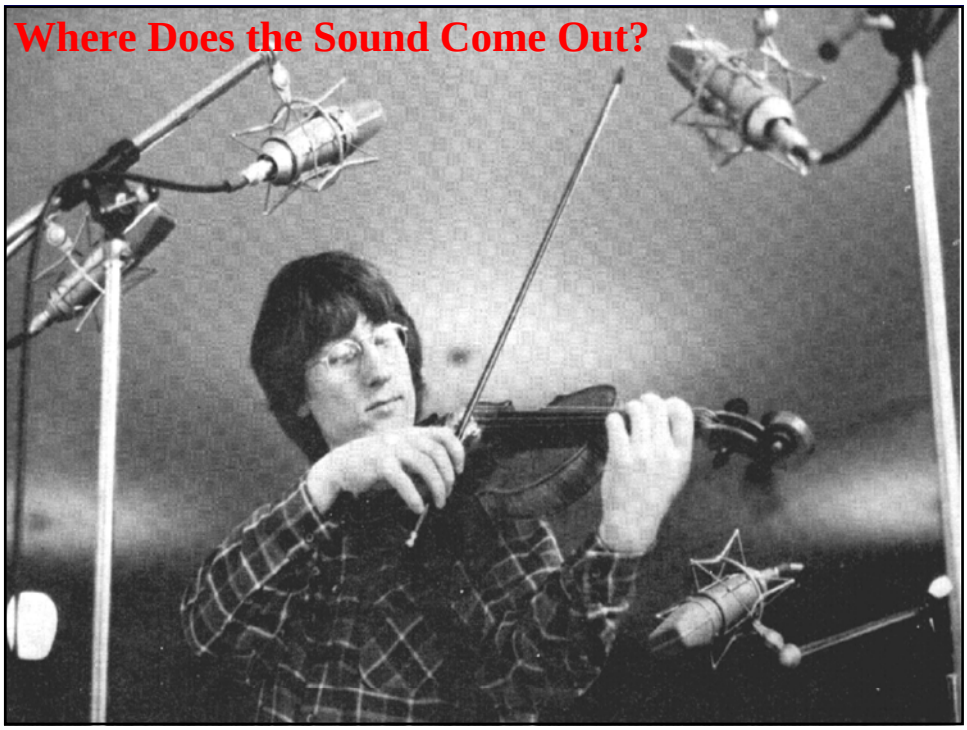
Mic Placement for Horns

Where Does the Sound Come Out?

- "Multi-microphone Pickup of Solitary Acoustical Instruments for Single-Channel Transmission" (1979 AES Paper)



Recommended 2-mic Setup



Where Does the Sound Come Out?

- Saxophone
  - The bell – highs and presence
  - The holes – lows, mids
  - The side of the horn – lows, mids

Where Does the Sound Come Out?

- Micing the bell "totally misses the lower partials which radiate almost exclusively through the open tone holes on the walls of the conical tube. A mic placed at the bell picks up an exaggerated amount of higher frequency components and lacks the fullness of the low frequency energy to balance the spectrum."

Where Does the Sound Come Out?

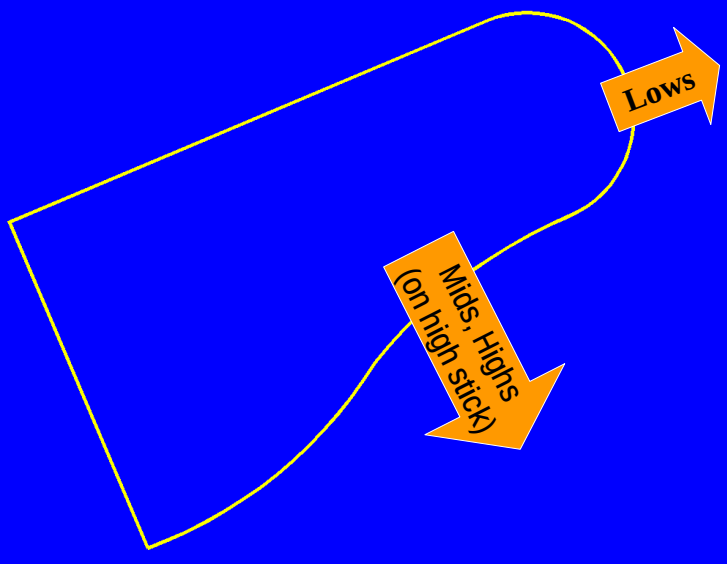
- **"Multi-microphone Pickup of Solitary Acoustical Instruments for Single-Channel Transmission" (1979 AES Paper)**
  - **By Wieslaw Woszczyk (Past President of the AES, and Chair of the AES Technical Council!)**

Stage Setups

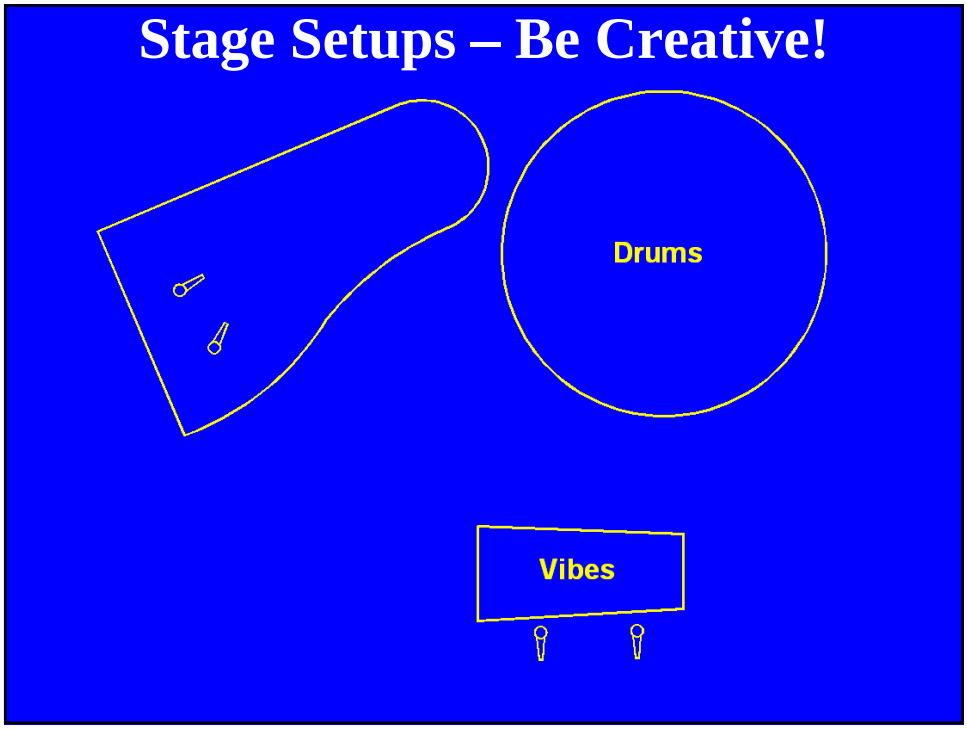
Stage Setups

- Piano mics are often a leakage problem
- Pianos sound better (and carry better) with the lid on a high stick
- Pianos are directional
  - Try to exploit directivity to minimize the need for monitors and reinforcement!
- Position bass amp and drums to minimize leakage into piano mics

Piano Directivity



Stage Setups – Be Creative!



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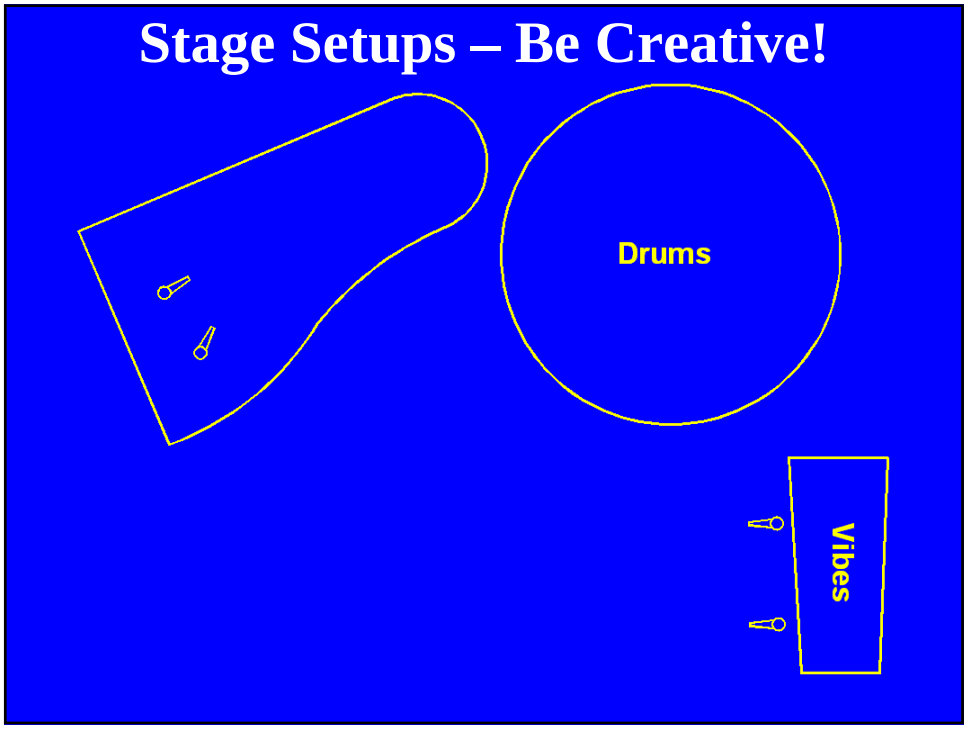



A Standard Big Band Setup
Thad Jones /Mel Lewis Orchestra ca 1970 in large hall. No reinforcement (mics for recording)


Thad/Mel ca 1970 in 700 seat theater
No reinforcement

Kenton on tour with Wally Heider setup ca 1973
Only solos reinforced

Use Conservative Solo Mics

- **Performers often pick up or play into the wrong mic. I like all downstage mics to be as versatile and forgiving as possible.**
- **RE20**
  - **No overload, no proximity effect, it's big so musicians are less likely to crowd it**
- **SM81 with a foam windscreen, -10dB attenuator, and gentle low cut**
  - **I'm not unhappy if a singer picks it up**
  - **Sounds good on most instruments**

Problematic Instruments

- Saxophone
  - Give it some space
  - 1 ft above and in front of bell
- Alto sax
  - Mics with presence peaks give too much bite
- Clarinet, soprano sax
  - Never mic the bell
  - Mic the center of the horn

Problematic Instruments

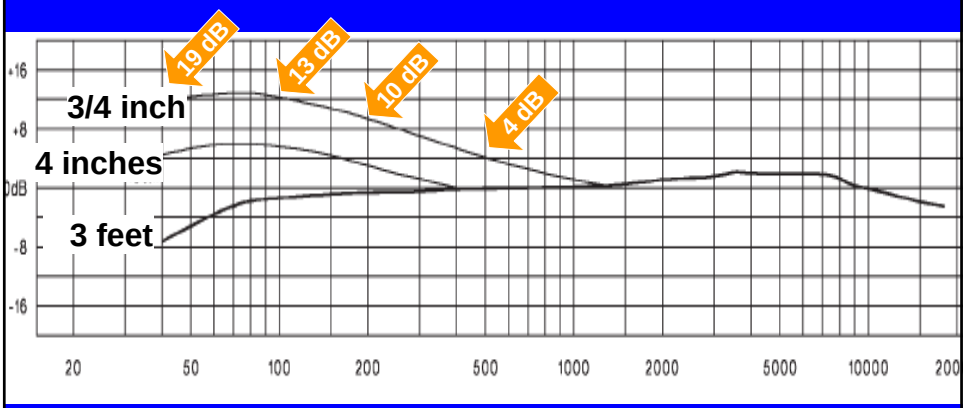
- Trumpet
  - Will overload many condensers
  - Muted trumpets muffled by proximity effect
  - Use a good omni
- Trombone, French Horn, Mellophonium
  - **Destroyed** by proximity effect
  - Use **only** an omni or variable-D cardioid
  - Or give it a lot of space

Problematic Instruments

- Trombone, French Horn, Mellophonium
  - Fundamental 80-500 Hz
  - Harmonics to 8 kHz
- **Destroyed** by proximity effect
  - Boosts fundamentals by 4-18 dB
  - Muddy, muffled sound
  - Overloads mic preamps

Proximity Effect in a Typical Cardioid

(from a Beyer data sheet)



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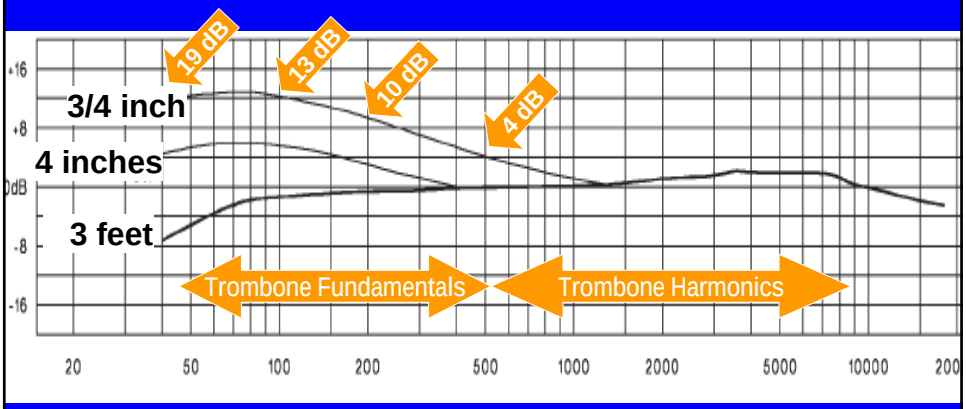
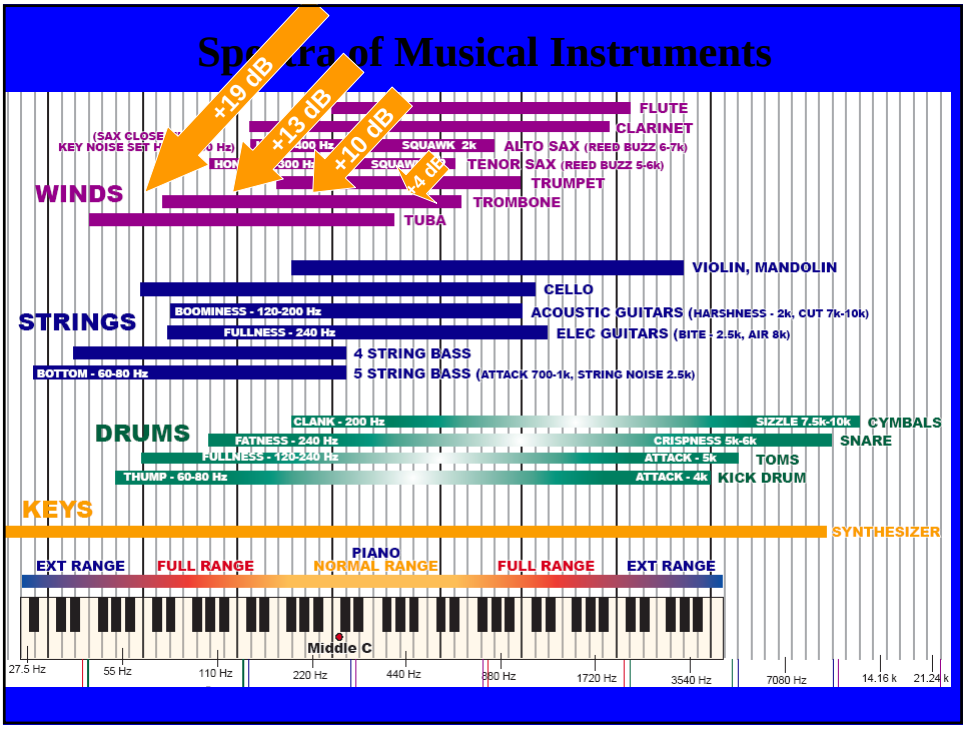


Spectra of Musical Instruments



Don’t be Afraid of Omni Mics

- Good solution for performer who eats mic
- Have no proximity effect
  - Much less popping
  - Much less wind noise
- Sound much more natural off axis
- When miking a loud instrument, inverse square law is usually enough to avoid feedback and leakage
  - Trumpet, trombone

Variable-D Microphones

RE-20

RE-16

D222E

D224E

Most Multi-Pattern Mics have an Omni Setting

C414-Series **TLM 170R** **KSM44**

Omnidirectional Mics Have No Proximity Effect

TC30K

KM 183

4007

A Mellow Ribbon Mic

AKG W23 Windscreen

M160

Some Useful Mics for Jazz

- **Piano**
  - **Large and small cardioid condensers**
  - **SM81, KM184, KSM, C414 (any vintage)**
- **Omni mics (muted trumpet, trombone)**
  - **KM183, 4007, Earthworks**
- **Cardioids with minimal proximity effect**
  - **RE20, RE27, D224E, RE16**
- **Mellow cardioid (vibes, banjo, some singers)**
  - **Beyer M160 (ribbon)**

Some Great References

- *Music, Physics, and Engineering*, Harry Olson, Dover Press, 1967
- *Music, Sound, and Technology*, John Eargle, Van Nostrand Reinhold, 1990
- *Microphones: Design and Application*, Lou Burroughs, Sagamore, 1974
- **And listen to jazz recordings!**
- **http://audiosystemsgroup.com/publish**

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