

MACKIE® *Church Sound* NOTEBOOK™

SPRING
1997

First Issue!



Why a Mackie Church Sound Notebook™?

What, you've never heard of the *Mackie Church Sound Notebook*™? There's a good reason — you're looking at the first issue. And it's the best issue yet!

If you are the operator of a church sound system, the pastor of a congregation, the music minister, or someone who has ever been distracted from your worship by feedback, hum, or other sound problems, you'll soon come to appreciate *MCSN*™. It's an unfortunate fact that the quality of an audio system and the knowledge of its operators doesn't always equal the importance of the program material being presented. We believe that the most important message deserves to be treated as such. And we believe that most church sound technicians agree, evidenced by the ever-present desire they express for quality audio hardware and for the education needed to operate their systems more effectively. The *Mackie Church Sound Notebook* is dedicated to satisfying that desire.

While vital to effective group worship, the "ministry of mixing" is a thankless one, most often performed by unpaid sound crews, longer on desire to serve than on experience or training. If this is the humble ministry to which you have been called, we dedicate the *Mackie Church Sound Notebook* to you.

An ongoing church sound seminar.

It is our goal to use these pages as an ongoing church sound seminar, an opportunity to introduce basic mixing concepts as well as to share more advanced solutions to hookup or operational problems. Where helpful, we'll try to supply the "why" behind the "how." Of course experience is a great teacher, but it can be a faster teacher when you can learn from the experience of others and apply it to your



own. With readers that span the widest range of knowledge and expertise, we will indeed attempt to have a little something for everyone in each issue. We expect you'll want to keep your issues of *MCSN* in some sort of notebook for future reference, so we print it on a nice grade of three-hole paper.

Suitable for framing — or at least putting in a notebook.

Ultimately, we hope to make your work easier, to reduce conflict and stress (at least when it comes to church sound!), to help you produce better tapes and broadcasts, to help you better facilitate the needs of the pastor, the musicians, and of course, the congregation.

So, why have we created the *Mackie Church Sound Notebook*? Because when we're in a church, if we're not operating the system, we don't want to have to think about it.

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Power amp as problem solver? Yep.

MACKIE'S NEW FR SERIES™ M•1400 AMP ALLOWS YOU TO SPEND LESS AND DO MORE

OK ...so the excitement quotient for a power amplifier is somewhere down around that of a 19" equipment rack. After all, how many things does an amplifier do anyway? Usually one. It takes a small audio signal, say a volt or so (go ahead, say "a volt or so" — that's good), and turns it into a big audio signal (approximately a whole bunch of volts). But here's a way you can meet a number of system needs, while practicing good financial stewardship, and it's all done with a power amplifier. Well actually, either of our FR Series™ amplifiers, the M•1200 or M•1400. They're both loaded with problem-solving features that can be expensive add-ons to other amplifiers.

Professional audio engineers long ago discovered that it's easy to have too much of a good thing. One such example is low frequencies. It's hard to beat some good low end in a speaker system for eliciting lots of "oohs" and "ahs" from listeners. Face it, the thrill of the tympani ain't in the midrange. But when the low frequency response of a sound reinforcement system is extended well beyond the lower limits of the instruments it is asked to reproduce, the advantage turns into a disadvantage.

Getting rid of unwanted very low frequencies.

Frequencies, or tones, which are below the lowest frequencies that we hear are referred to as "infrasonic" frequencies. (This should not be, but often is, confused with the term

"subsonic," which refers to speeds which are below the speed of sound and to pressure changes which are lower in *amplitude*, or level, than the threshold of hearing.) Infrasonic sound is stuff that you may feel, but won't hear. It's that energy that lies between about 20Hz (or cycles-per-second) and DC — well below what most sound reinforcement speakers are capable of reproducing. Even those frequencies an octave or so higher, from about 20Hz to 40Hz, are typically below the practical limits of most sound reinforcement loudspeakers. Signals in these regions include some microphone handling noise, wind or breath noise, stage rumble, air conditioner rumble... you get the idea. Undesirable stuff. Allowed to pass freely through your amplifier, into the loudspeakers, such noise uses up valuable amplifier power, causes intermodulation distortion, and may even damage loudspeakers.

Built into each of the FR Series amplifiers is an infrasonic filter which acts as a low frequency stabilizer, blocking ultra-low frequency signals. The result? Your system actually produces a cleaner, tighter low end.

Protect your speakers... and control wayward monitor sound.

When frequencies are reproduced below a speaker's tuned bass cut-off point they can sound awful and may even result in speaker damage. So variable low cut filters are also built into each channel of the M•1200 and M•1400



Take a look at the insides of the M•1400 power amplifier.

amplifiers. Simply dial each low cut filter control to a point just below the speaker cut-off frequency. The control allows you to select a point anywhere up to 170Hz. This is a great way to clean up the sound of a full-range system and can be a real cone saver if you're using small monitors with a fairly high low frequency cut-off.

As you've no doubt noticed, once it is unleashed into an auditorium, low frequency sound is very hard to control. Unlike highs, low frequencies project from the loudspeaker in all directions. As a result, the lows produced by stage monitors become added to the main house sound, causing the system to sound muddy and less intelligible. The M•1200 or M•1400 low-cut filters can help you keep stage monitor low frequencies *under control* — and *on the stage*. Use them to remove as much low end from the stage monitors as you can get away with. Try taking out a little low end at a time. Gradually raise the frequency of the low cut until the praise team begins to

continued on next page

Rear view of the M•1400, showing many of the standard features that you'd have to pay extra for with other amps.



heap upon you everything but praise. Then back off just a metric smidgen until they're happy again.

When you've got to get down... subwoofer addition made easy.

Want *more* bass? Don't tax your poor full-range system, add a subwoofer. You won't want to send your vocal mics through it (in fact, *please* don't), but

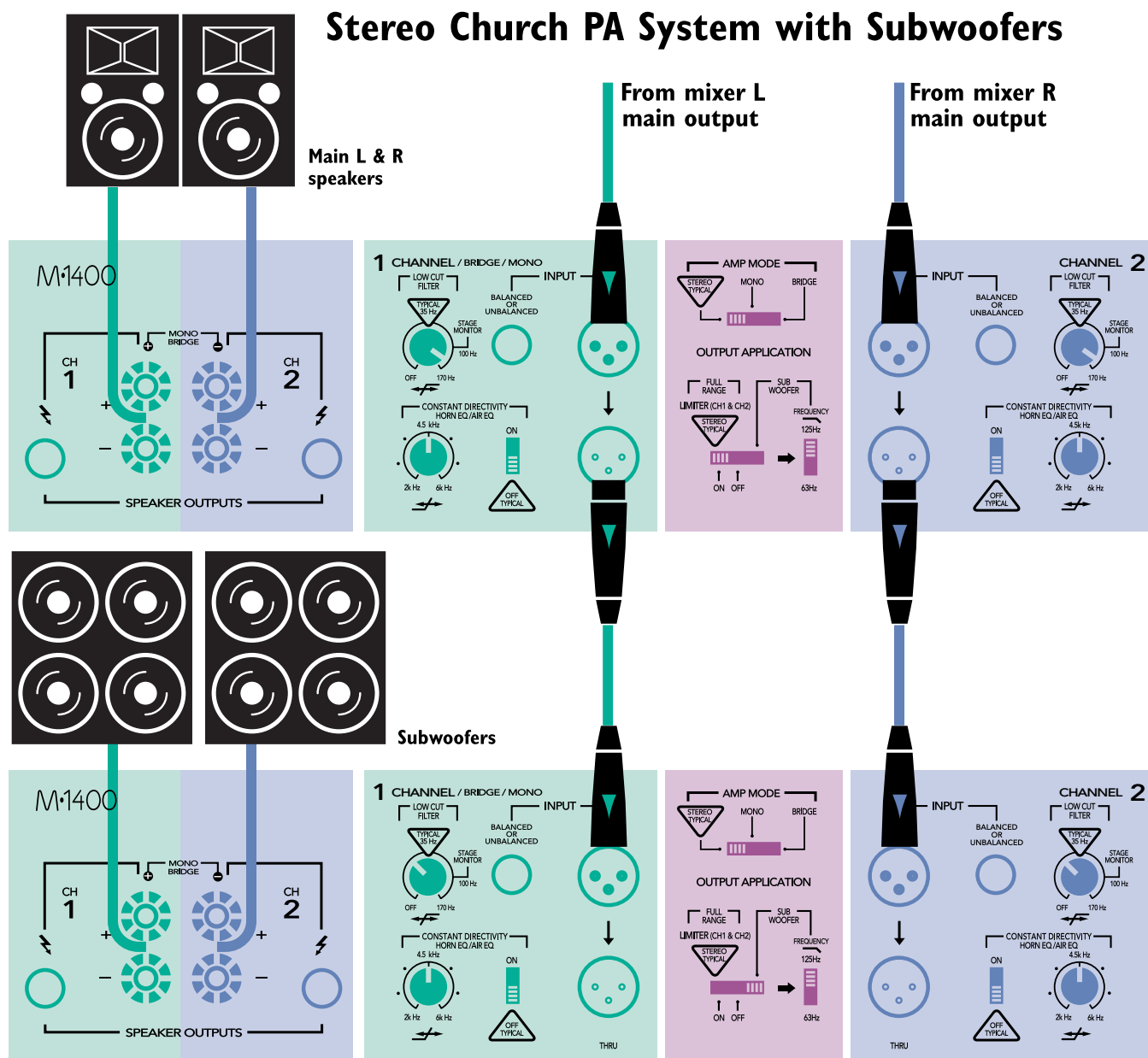
judicious use of a subwoofer may be just what you need to shake things up with a little pipe organ replication, synth, or sound effects.

Subwoofers are designed to handle only a relatively narrow portion of the audio spectrum — the very low end. An electronic, or "active," crossover is used to "part the Watt-ers" (sorry). That is, it

sends the extreme low end to a dedicated (often downright committed) subwoofer amplifier and the rest of the spectrum to the amplifier or amplifiers that drive the other components.

This use of multiple amplifiers, each required to handle only a portion of the

continued on page 6



Above is a sample church hookup using two main mix speaker cabinets and a pair of subwoofers. With Mackie's M1200 and M1400 amps, you can daisy-chain the two amps together so both receive the full program. The first amp is set to send out only the frequencies above 125Hz, which go to the main loudspeakers. The second amp cuts off everything above 125Hz and sends only low frequencies (below 125Hz) to the subwoofers.

How to deal with “split track” accompaniment tapes

Here’s a scenario recently put to our crack tech support team:

“In our church sound system, we have two stereo tape decks, the outputs of which are connected to the stereo inputs on our Mackie mixer. We send our L and R main mixer outputs to a two-channel L/R speaker system. We use a lot of taped tracks to accompany vocals. The use of two tape decks for playback gives us the ability to segue (‘crossfade’) smoothly from one song to another.

“These tapes usually have a ‘demo’ side, which has the accompaniment with a voice or voices added. This is great for learning the song. The other side is the ‘performance’ side which has just the stereo instrumental accompaniment. Others of our taped tracks, however, are referred to as ‘split’ tracks. These have a mono instrumental accompaniment on one track and vocals (for learning purposes) on the other. The split tracks are the ones that cause us problems.

“During a performance, the vocal tracks are not used. We can pan the channel in the direction of the instrumental track and it will come through both L and R channels. So far so good. But this doesn’t allow for any flexibility in assigning this source to any submix bus we may choose. Additional problems lie in providing a monitor mix to the musicians on the platform. The aux channels, used for monitoring, are a sum of the L and R inputs, so if we leave

both tape deck cables attached, we get both channels in the monitors. The pan control is after the aux buses, so it has no effect on them.

“What options do we have that will allow us to handle split taped tracks without losing flexibility?”

MCSN Answers:

This is a fairly common dilemma, and a situation that calls for a little more creative hookup than shown on page 5. First, identify which of the tape deck output cables carries the vocal track of your accompaniment tape. Disconnect that cable from the stereo input channel of your mixer. Finally, make sure that the remaining, connected cable goes to the Left stereo input. The channel will now perform as a normal mono channel.

Here’s another approach...

Connect your tape deck output to two mono input strips. You then have full control over each of the split tracks. If you have a wireless microphone system, there’s a good chance the receiver has a line-level output. You can plug that into the Left input of a stereo input (if your mixer has them) if you need to free up another mono mic channel.

You may also want to create your own split tracks: Record your choir or

children’s chorus on one track of a tape, alongside your accompaniment on the other. Or use multitrack tape or disk to allow for stereo accompaniment plus voices — even separate tracks for different choral sections. By playing this recording back through separate mono input channels of your Mackie mixer, you can fold some vocals back to the singers to help them with pitch, timing, or overall confidence. You can also use these vocal tracks to subtly add additional voices to the singers during the performance. This can be a lifesaver when



some of your vocalists don’t show up, they don’t sing out in performance like they did in rehearsal (especially great for bashful children), or when optimal miking of the vocalists for sound reinforcement is not possible during the performance.

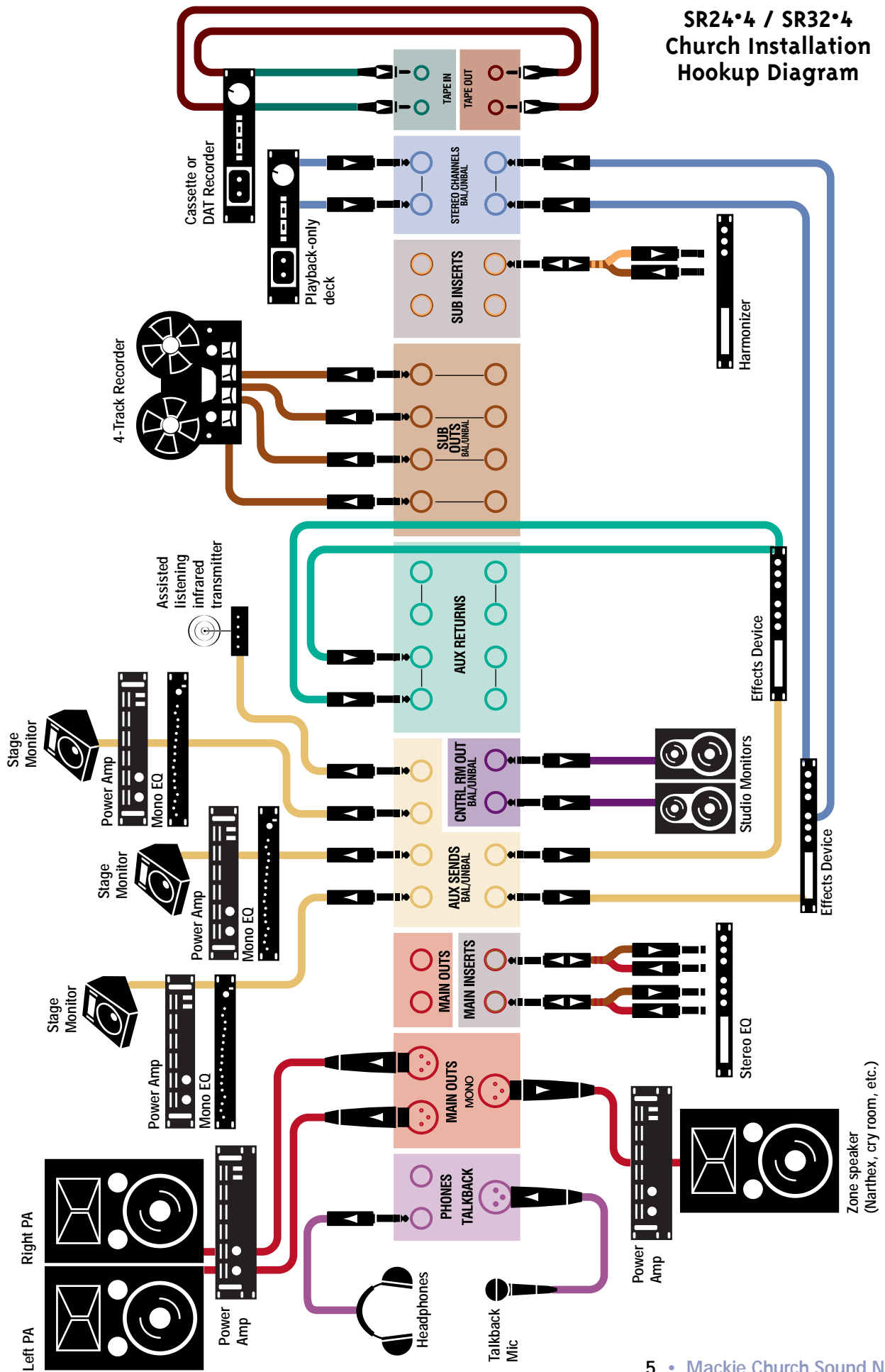
NOTE: If you are using prerecorded instrumental accompaniment, you will need to dub it to this new tape alongside the vocals. Check with the music publisher or CCLI for legal permission.

SR24•4 / SR32•4 Church Installation Hookup Diagram

The hookup diagram on the following page shows a typical church installation. See the article above for some additional ideas that make using split tracks easy. Both of these SR Series mixers have two stereo channel strips (chs. 21-22 and 23-24 on the SR24•4; chs. 29-30 and 31-32 on the SR32•4) to aid you in split track use. Each model also has a separate mono main output, so you can feed the mono program to a cry room, lobby speaker, or even to a recording tape deck or broadcast feed for a mono version of a service.



SR24•4 / SR32•4 Church Installation Hookup Diagram



AMPS

continued from page 3

whole audio spectrum, is a great way to maximize amplifier efficiency, allocate power effectively, and reduce distortion. But an external electronic crossover gobbles up valuable rack space, and both it and the plug-in crossover modules which are add-ons to some amplifier models can be quite costly.

No need to buy expensive add-ons.

There is, however, a way to add the benefits of a subwoofer without the additional cost of an active crossover. An "Output Application" switch on the FR Series amps allows you to select one of three output modes: 1) full range stereo output, 2) full range stereo with a limiter, or 3) subwoofer output. In the subwoofer position, an on-board 18dB per octave subwoofer filter offers selectable 63Hz and 125Hz roll-off frequencies. This means the amplifier can be set to deliver to the subwoofer only those frequencies below 63 or 125Hz. Such a filter is referred to as a low pass (or high cut) filter because, well, it allows only the lows to pass.

Because such low frequency energy is normally monaural (the same in both amplifier channels), this subwoofer circuit combines, or "sums," the signals from both channels 1 and 2 and delivers the same signal to both amplifier output stages. You may connect one or more subwoofers to each channel, or switch

the "Amp Mode" selector on the rear panel to "bridge" mode and the FR Series amplifier is turned into an extra-beefy monaural powerhouse.

With a subwoofer and an M*1200 or M*1400, you're prepared to do some serious woofing.

Send those high frequencies on thru.

But so far, we've only isolated the low frequencies and sent them to the subwoofer. Handling the rest of the speakers is just as simple. Use the same fully-adjustable, low cut (also known as a "high pass") filter that we discussed earlier to roll-off the low frequency output of an M*1200 or M*1400 at the subwoofer's high-end cut-off frequency, 63Hz or 125Hz. This amplifier is now ready to power the rest of the system as shown in the illustration on page 3. The position of the Amp Mode switch on this amplifier determines whether the output will be stereo, two-channel mono, or one bridged very high power mono output.

Delivering the audio signal from your mixer to both amplifiers is also a breeze. The FR Series amplifiers have both female XLR and 1/4" input jacks, which are connected in parallel. You can plug your mixer output into either. Each channel also features a male XLR "thru" connector, which is also in parallel with the input. Run a cable from each "thru" connector on one amp to the corresponding XLR input connector on the second amp and you're set. It's that simple. (Again, see page 3 for a detailed diagram.)

Better dispersion of high frequency info.

Another frequency-shaping task is required in systems that include constant-directivity (CD) horns on compression drivers. CD horns are designed to eliminate the "beamy" high frequency that characterizes conventional horn styles. Because they spread the high frequency energy over a wider coverage angle, CD horns require a specially shaped high frequency boost to deliver a flat frequency response. This cannot be accomplished with a graphic equalizer, so is normally handled with a special circuit in some ancillary (that's not an architectural term; it translates more like "expensive") rackmount gear.

By now you've probably guessed where we're headed. Both the M*1200 and M*1400 FR Series amplifiers incorporate a sweepable high frequency boost control on each channel, designed to provide just the response tailoring required. If you do not require CD horn equalization, the same control can be used to provide what Mackoids call "Factory Air." That's the breathy, airy sound that's tough to achieve with garden variety equalizers — just the thing for breathing a little life into otherwise dull speakers or into an exceptionally dead acoustical environment.

There's a lot to tell about the FR Series amplifiers, and we'd love to share it all with you. In brief, it's the heartwarming story of a young amp from Woodinville that successfully combines performance, reliability and value... call or write and we'll send you the novel.

A close-up of the rear of an M-1400 and the money-saving features you'd have to pay extra for on other amps.



Truth – and Mackie – in Nicaragua

While the popular contemporary Christian music group **Truth** swept through the Pacific Northwest on tour, we at Mackie were visited by the group's FOH mixer Todd Herrbach and monitor mixer, Justin Zebell.

"I have known Mackie for a while," Todd says, "I've used 1604s, 1202s and 244s. We're very excited about the new 4048."

In their 25 years of touring, Truth has held 8,000 concerts and traveled over two million miles.

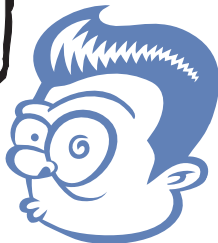
That's Todd in the picture at right, mixing on a Mackie CR1604-VLZ which they recently put to the challenge in Nicaragua. Truth ministers through approximately 300 concerts per year.



Truth soundman Todd Herrbach happy to be spreading the word in Nicaragua. Though the setup for this particular event is spare, the CR1604-VLZ® is suitable for much more intricate audio programs. Wait till they get their SR40-8!

TRANSIENT RESPONSE *

"Do you know what all those knobs are for?"



"What happens when I push this?"

* The unsolicited comments of congregation members as they pass by the mixer.

MACKIE CHURCH SOUND NOTEBOOK

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www.mackie.com



- The "ins" and "outs" of inserts
- How to cure yourself of knob-phobia
- RFI: What it is and what to do about it
- Physics: Simple, phun, usephul phacts

Setting channel levels *first* for optimally dynamic sound

Before you begin playing with any of those other enticing mixer controls, you need to first adjust input trim levels. This gives you a relative balance of the various mic and instrument levels as a starting point for building your mix. From there you can make further adjustments or "tweaks" to arrive at a good overall mix. On Mackie compact mixers, though, proper level setting also lets you make maximum use of our UnityPlus gain structure for maximum headroom.

Because this procedure is so important, we made it very easy.

Here's how you set Unity Gain on a channel. First, turn the input trim control of the desired channel all the way down. Next, connect the mic or line input to that

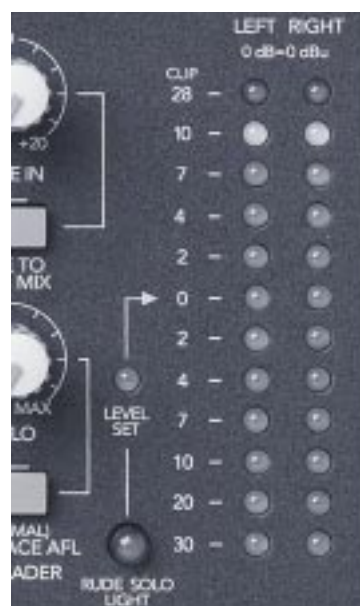


Adjust the channel trim (at the top of the channel strip)...

channel. (Turn down or mute all other channels.) Press the channel's solo button — make sure it's set to PFL mode if you have a PFL/AFL option. Have the vocalist sing (or the guitarist play), turn up the channel's input trim, and you should see the input level on the mixer's meters. Adjust the input trim until the meter level is around zero dB. (On our MS1202-VLZ, MS1402-VLZ, and CR1604-VLZ we made it even easier by silk-screening a "level set" marker next to the zero dB LED.) Now you can adjust the channel's volume — with either fader or gain control — to suit your needs. Don't forget to turn up the master volume or you may not be able to hear the sermon!

That's all there is to it. In about ten seconds per channel, you've optimized the mixer for maximum headroom, minimum noise — and loads of extra gain above Unity. This will allow you to produce a dynamic presentation and get the most out of your mixer.

If you aren't currently using a Mackie mixer, that's okay. You are forgiven. But the level setting procedure above is still



... until the signal averages 0dB on the meters (marked "Level Set").

important, and it works with most any mixer. In a future issue of *MCSN* we'll delve further into some of the concepts mentioned above, such as headroom and noise.

Want to see our products in color? Want to see more hookups? Why not call 1-800-898-3211 and ask for a copy of **IN YOUR FACE?** Tell 'em CHURCH SOUND NOTEBOOK sent you.

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