RMC™ Room Mode Correction
User Guide

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The Room Mode Correction™ System

What Is RMC?

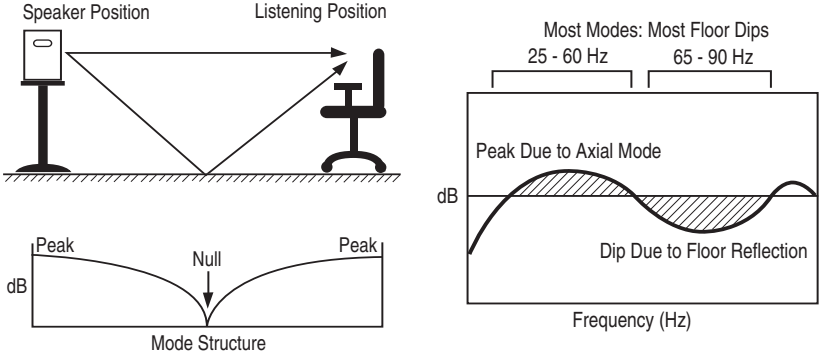
Developed by JBL Professional, RMC™ is a system designed to calibrate and correct low frequency (LF) response in typical listening rooms and production facilities. The LSR6328P full range monitor and LSR6312SP Subwoofer contain a single section parametric equalizer that can be adjusted to compensate for the major low frequency response peak caused by standing waves in a particular listening space. The LSR6332, LSR25P and other systems can experience the benefits of RMC when an LSR6312SP is used in the system.

The RMC process allows you to optimize the low frequency response of your system in your work environment. Using the tools provided in the RMC Kit, simply follow the instructions step-by-step and allow approximately 30 minutes to perform the adjustment process for a stereo system. You will experience a noticeable improvement in the sound quality of your system.

What are Room Modes? Room modes are low frequency resonances caused by standing waves involving the geometry of the room and its boundary surfaces. The most prominent modes are the ones that occur between opposite surfaces. If response peaks due to these modes are not corrected, your mixes may be bass-shy, because you will tend to overcompensate for what may sound like too much bass in the program. Response peaks due to room modes can be accurately removed by introducing a carefully tailored inverse response, which RMC provides. You may also encounter response dips, which are due to local reflections and interferences between the loudspeaker and listening position. The most common reflections are from the floor. You should be aware that no system of equalization can correct for a response dip. Dips can only be compensated for by repositioning loudspeakers and/or listeners in the playback environment. Figure 1 illustrates the typical situation as it exists in most production rooms. The measured response at the listener is shown in the right portion of the figure. In most rooms, the response rise due to the dominant mode will usually be in the range from about 40 Hz to 60 Hz, and the response dips due to floor reflections will be seen in the range from 50 Hz to about 90 Hz.

RMC provides a method for equalizing the peak shown in Figure 1, but the dip, if it is severe, must be corrected through rearrangement of loudspeaker and listening positions. In most cases however, "floor bounces" are not problematic.

Figure 1



What Is Included In The RMC Calibration Kit

- Specialized Sound Level Meter
- Calibration CD
- User Guide
- Measurement Chart Paper (make additional 1-to-1 copies for future use)
- Width Template
- RMC Adjustment Tool
- RMC Remote Bypass Control
- 9 Volt Alkaline Battery

How To Use The RMC Kit

Using the calibration CD, warble tones spaced approximately on one-tenth octave centers are played over the speaker systems, and the room response is measured and plotted point-by-point on chart paper. The center frequency of a response peak is identified, and, using the Width Template, the width of the peak is determined. The height of the peak in dB is also measured. These three values are then entered into the RMC equalizer section located on the rear electronics panel of the LSR6328P or LSR6312SP and, using a look-up table in this manual, an inverse frequency response curve is introduced into the system.

The RMC Meter: Two views of the RMC sound level meter are shown in Figure 2. The meter has a press and hold switch to incease battery longevity. Full-scale on the meter corresponds approximately to a sound pressure level of 86 dB. The meter's scale covers a range of 16 dB, the same as that of the chart paper you will use to record your measurements. Here is a list of meter status indications:

Figure 2

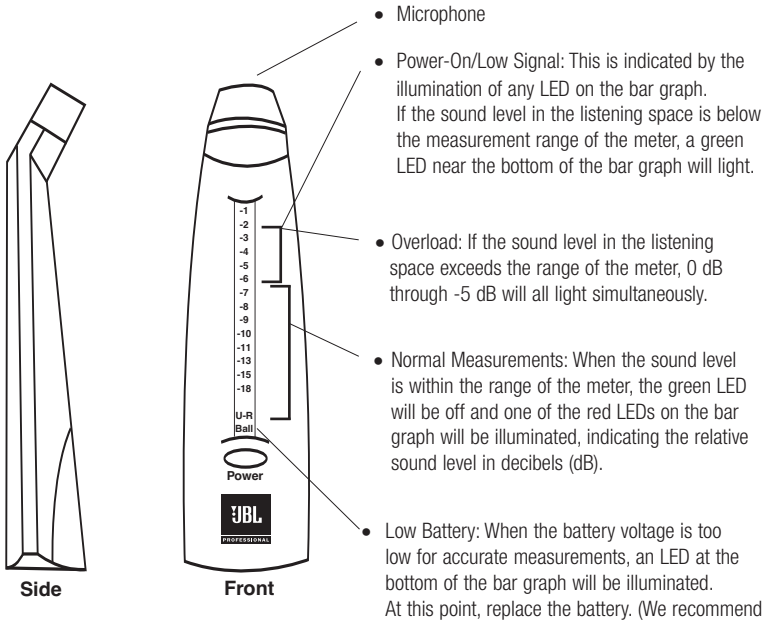
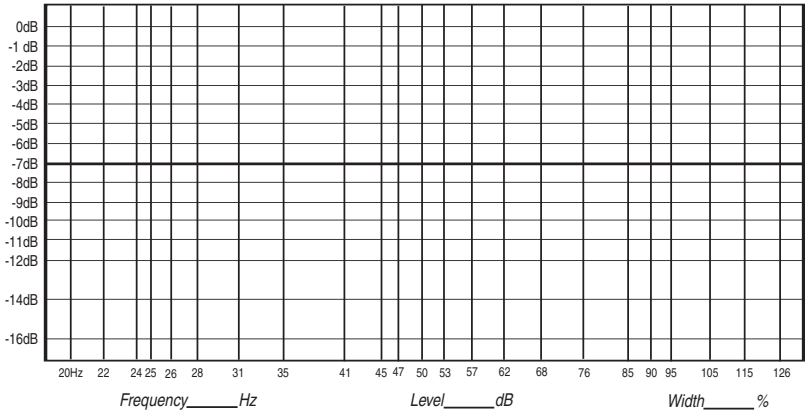


Chart Paper: As you play test tones on the CD through the system, you will plot the readings on the chart paper. A calibration procedure will ensure that the signals you read will fit within the window of the meter. Any signals that appear below -16 dB will simply be entered along the bottom edge of the chart. We recommend you make photo copies of the chart paper for your use, and keep the original master for future duplication. When duplicating, do not enlarge or reduce the size of the chart.

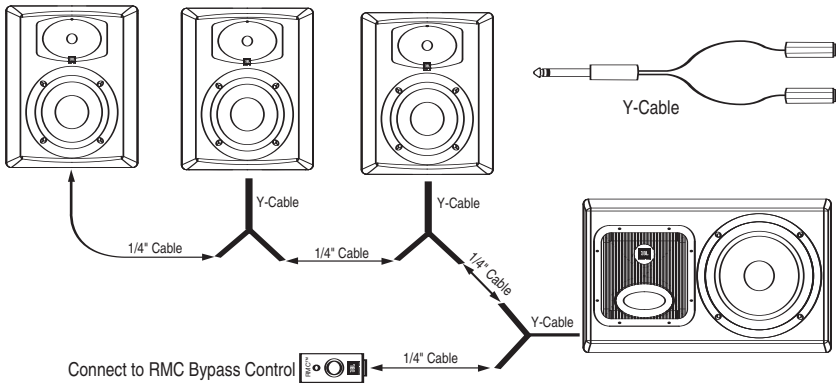
A view of the chart is shown in Figure 3, with the level scale at the left and the frequency scale at the bottom. Below the chart are areas for you to enter your collected data: Frequency (Hz), Level (dB), and Width (%).

Figure 3



The 9-Volt Battery: should be installed in the Sound Level Meter prior to use.

The RMC Remote Bypass Control: when connected to an LSR6328P or LSR6312SP, allows you to bypass the RMC system from the listening position for before-and-after comparisons. You may use mono (tip-sleeve) 1/4" cables such as guitar cables to make the connections as shown below.



Speaker Placement

Where To Place The Loudspeakers

A basic question is “where should I place my loudspeakers in the room?” Here are some pointers for you.

A. Smooth Response: Place the loudspeakers where their frequency response will be the smoothest and most uniform. The best locations are fairly close to a wall (no more than about 10 inches from the wall), or out in the room and positioned on ear-height loudspeaker stands. Figure 4 and Figure 5 show options for both stereo and surround setups.

Figure 4

Near The Wall

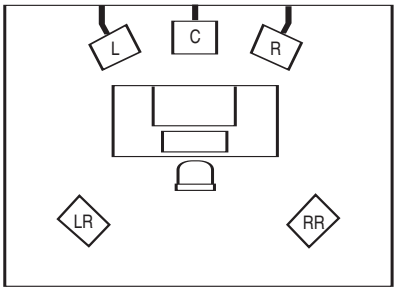
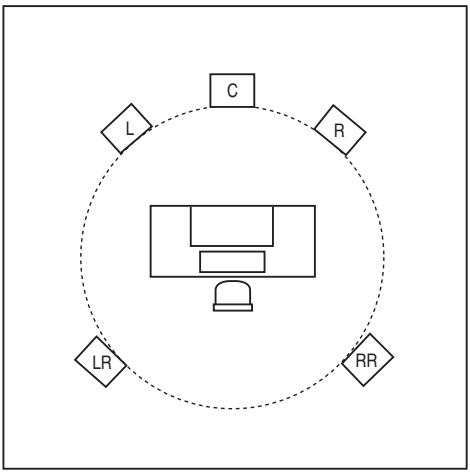


Figure 5



Free-Standing

Boundary surfaces create reflections from the loudspeakers that will, to some extent, interfere with the direct sound from the loudspeaker to the listener, and these will cause peaks and dips in response, primarily in the mid-bass range and lower (roughly 250 Hz and lower).

When the loudspeakers are placed within about 10 inches of the wall, the reflected sound at mid and low frequencies will be largely in phase, or in step, with the direct sound from the loudspeakers, and interferences will be reduced.

Generally, the best place to locate a subwoofer is on the floor against a wall, or within a few inches of the wall. You should avoid the center of the wall, and you should also avoid placing the sub directly in a corner. What you are looking for is response that is generally uniform and free from a severe dip or a pair of peaks, and even slight side-to-side adjustments (6 or 8 inches) can materially affect these. A single peak of course you can adjust through RMC, resulting in the flattest possible LF response.

Alternately, when loudspeakers are placed on stands well out into the room, the path traveled by the reflected signals from the walls will be much longer than the direct path from the loudspeaker to the listener, and the level of the wall reflections will be much lower than direct sound. The result is less interference.

B. Mounting: When positioning loudspeakers on a wall, always follow mounting recommendations provided by the manufacturer of the mounting hardware and aim the principal axes of the loudspeakers at the primary listening position. If your loudspeakers have ports on the back, make sure that there are at least 3 to 4 inches between the port opening and the wall.

Caution: Unsafe mounting or overhead suspension of any heavy load can result in serious injury and equipment damage. Mounting of speakers should be done by qualified persons in accordance with all applicable local safety and construction standards. Be certain to follow the instructions providied by the manufacturer of the mounting bracket, be certain that it is capable of supporting the weight of the speaker to be mounted.

Space your loudspeakers so that the listening angle is symmetrical with the listening position. For stereo, the normal included angle between loudspeakers and listener should be in the range of 35 to 50 degrees. For surround sound applications, follow the recommendations as shown in Figure 5.

C. How Close Should The Loudspeakers Be To The Listener: Ideally, the loudspeakers should be far enough away from the primary listening position so that normal head movements don't interfere with stereo or surround imaging. Also, the loudspeakers should ideally be placed up to 8 feet away from the listening position, which would be ideal. If space is not well damped, you may be required to operate in a "near-field" environment with the loudspeakers no greater than about 4 feet away.

D. What About Setting Up In Very Small Spaces: The first thing you should do in a very small space is ensure that it is as acoustically "dead" as possible. Problems will arise both from boundary reflections as well as from standing waves in the room, and the more heavily damped the room is, the better it will sound. You may also be forced to place your left and right channel loudspeaker virtually at the corners of the space, which compounds response problems. This leads us directly into the next section on boundary compensation.

Boundary Compensation

Your LSR6328P loudspeakers are designed to operate most effectively in relative free space, away from the walls of a room. Internally, they have been equalized to produce the flattest low frequency (LF) response under this free-standing condition. When you move the loudspeaker toward the wall, the LF response below about 150 Hz will rise, reaching a boost of about 3 dB. If you move the loudspeaker toward a corner (the intersection of two walls), the LF response will build up even more. There are two DIP switches on the back panel of the LSR6328P that engage various values of LF attenuation and compensate for these LF build-ups of response, and graphic below shows the settings you should use in order to make these changes. The general rules are as follows:

Free-Standing	0 dB attenuation
Near A Wall	1.5 to 3 dB attenuation
Near A Corner	3 to 4.5 dB attenuation

Use no more attenuation than required to reduce any tendency for the system to sound boomy or bass-heavy. This adjustment should be made before you proceed with the RMC equalization process.

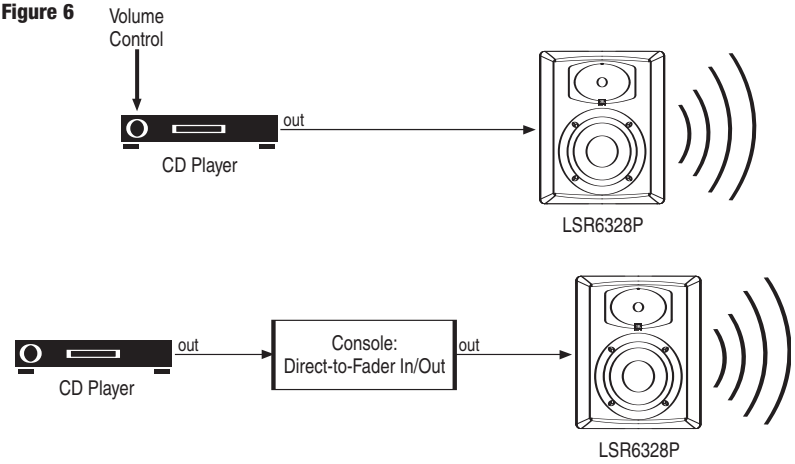
Calibrating Your System

I. LSR6328P System

If your CD player has an output volume control, we strongly recommend that you patch directly from one output of your CD player to the input of the LSR6328P system.

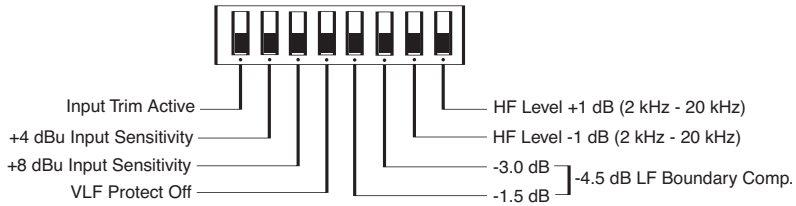
If your CD player does not have an output volume control, patch into a console fader then go directly from the console output to the LSR6328P, bypassing any further controls or functions. These options are shown in Figure 6.

Figure 6



The loudspeakers will be measured one at a time. Set the DIP switches on the back panel of the system to the OFF position. If you are using boundary compensation setting Switches 5 and 6, leave these settings on. Make sure that all controls are set to their counter-clockwise position and that the RMC ENABLE switch is in the OUT position and that the GREEN RMC "Active" LED is OFF.

Figure 7



Taking Measurements

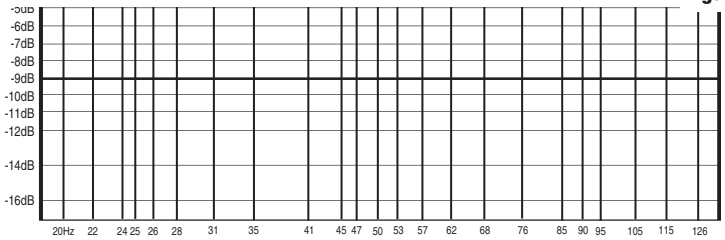
1. Place your speakers in the desired position and wire the system together. For assistance with wiring, see the LSR6300 Series owners manual. Connect the RMC Remote Bypass control to each speaker using "Y" adaptors supplied with each LSR6328P and LSR6312SP. Turn on the speakers.

2. Setting the reference level: Hold the RMC Meter vertically in front of you at ear level with display facing you and microphone facing the speakers. Press and hold the ON button. Play Track 2 on the test CD, adjusting the CD program source level so that the wide-band noise signal will read -7 on the sound level meter. The purpose here is to establish a reference level baseline for your measurements.

3. Now advance to Track 3. This track contains a set of warble tones beginning at 126 Hz, moving downward to the lowest frequencies. As this track is played, keep your eye on the meter. If none of the tones on Track 3 causes an over-reading, draw a horizontal line on the chart paper at a level of -7 dB. (See Figure 3) This will be your baseline reference level.

4. If any of these tones causes an over-load reading on the meter, stop the CD player and adjust the CD source volume downward slightly. Begin the test again, making sure that none of the segments in Track 3 will cause an overload. Once you have set a playback level that causes no overloads, return again to Track 2 and note the new level as observed on the sound level meter; draw a horizontal line on the chart at the indicated level. For example, let's assume that your new level setting from the CD source results in a reading of, say, -9 on the meter; then you would mark the chart paper with a line at -9, which would become your new baseline reference level. (See Figure 8 below)

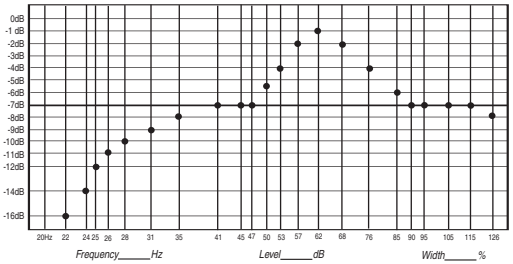
Figure 8



5. For now, let's assume that your initial setting of -7 dB was OK and that there were no overloads when you played Track 3.

6. Beginning with Track 4 and proceeding on to Track 26, make entries on the chart paper for each warble tone. Before each tone plays, an announcer names the frequency of the tone. You will note that the warble tone sequence begins at the highest frequency of 126 Hz, progressing downward to the lowest frequency of 20 Hz. Make your entries by putting a dot on the intersection of the announced frequency and the level as you read it on the sound level meter. This process is shown in Figure 9. Note that the test tracks are about 35 seconds long - probably longer than you will actually need to make an entry. You may speed up the measurement process by pressing the skip button on the CD player once you have made your entry on the chart. During the course of making your entries, you may observe that the meter reading shows a uniform flickering between two adjacent values. If this occurs consistently, it indicates a value halfway between the two LED's, and you may make your entry accordingly at a half-dB step.

Figure 9



7. After you have finished plotting the sequence of readings, simply connect the dots. You are now ready to interpret the plotted data with the help of the following sample plots.

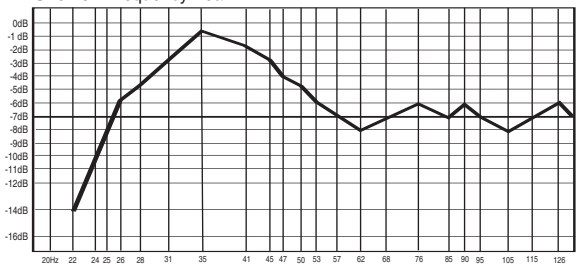
Analyze Your Measurements

Most of your measurements for LSR6328P systems will fall within one of the six examples which follow. Here are detailed descriptions of each example:

Example A:

Absence of a floor interference dip indicates the loudspeaker was probably mounted against a wall in a well-damped room, and not too far away from the monitoring position. You may proceed to equalize the LF room mode for flat response.

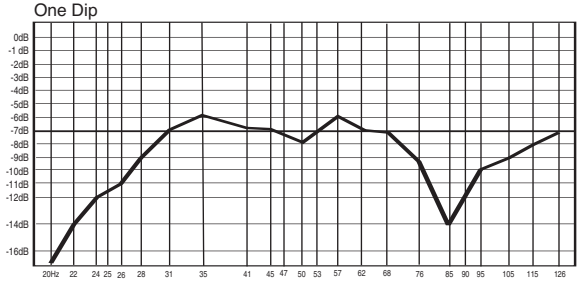
One Low Frequency Peak



Example B:

There are no room mode effects here, but there is a dip due to floor or possibly wall reflections. If the dip is no greater than about 4 or 5 dB, you can ignore it - and let this response remain as is. If the dip is greater than about 6 dB, you might try moving your listening position forward just a bit. This may alleviate the dip somewhat. Otherwise, no equalization is required.

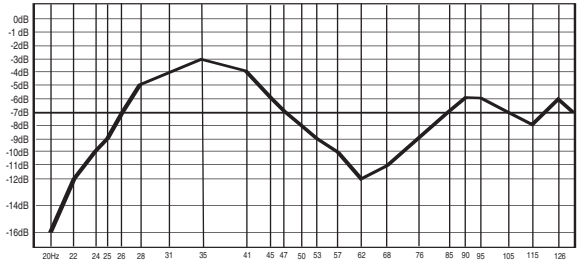
One Dip



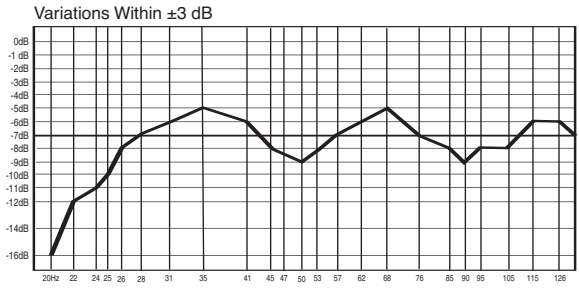
Example C:

This is a very common pattern you will see in fairly live small to moderate size spaces. The dip may result from both floor and wall reflections and as such may be fairly wide. Try moving the monitor and/or your listening position to minimize the dip's width before proceeding. Equalize the peak.

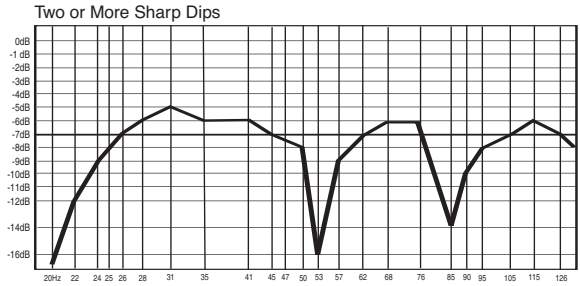
One Peak and Dip Exceeding 6 dB



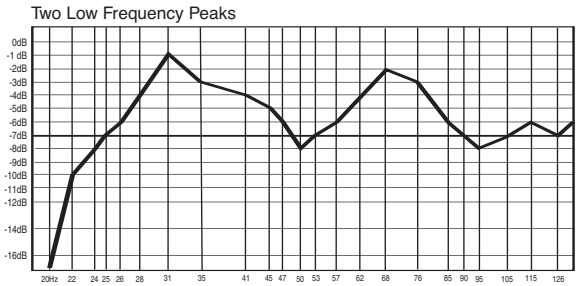
Example D:
This is a near-ideal case, and the recommendation is to do nothing. Your system will be fine as it is.



Example E:
Two interference response dips; no peaks due to room modes. This pattern may be seen in small spaces where two different delay paths are evident, such as from the floor and a wall. The absence of a mode peak indicates that the listener is located toward the center of the room. Slight repositioning of both listener and loudspeaker may change the situation markedly. Otherwise, no equalization is required.



Example F:
Two LF peaks. In general, you should equalize the peak that has the greater area between the curve and baseline. You may wish to engage the boundary compensation to lower the level below 150 Hz, and then repeat the RMC measurement process.



Adjusting The RMC System

When you have identified the peak you wish to equalize, **1.** enter its center frequency in the space provided at the bottom of the chart paper; **2.** in the space provided, enter the level of the peak which is the distance in dB between the peak value and your baseline. Finally, in the space provided, enter the width as determined by the width template.

Figure 10a

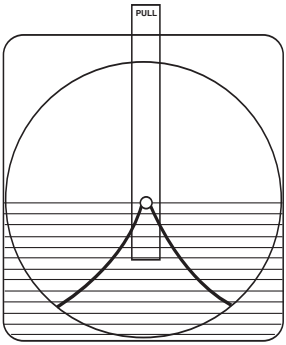
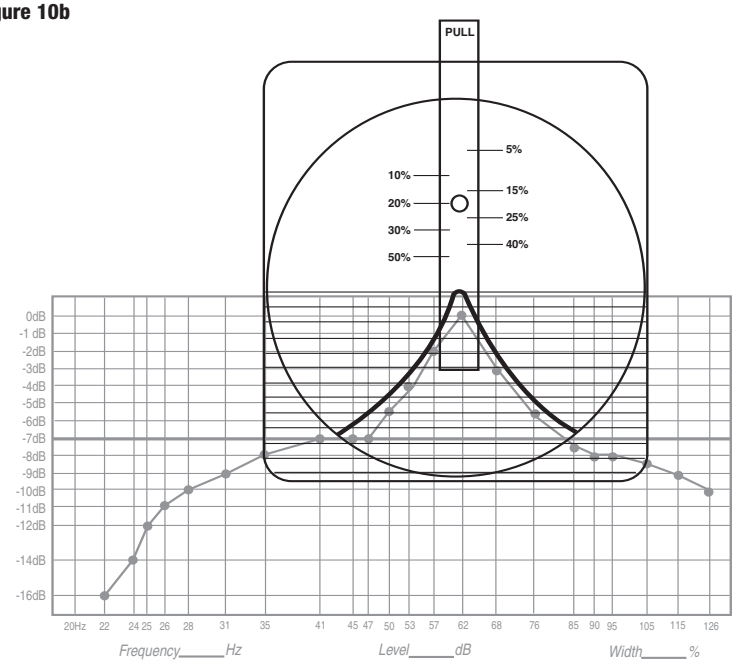


Figure 10a shows the Width Template. To adjust, pull the tab at the top of the width template. As shown in Figure 10b, the template is placed over the peak in a plotted curve and adjusted so that the shape of the template matches that of the plot. The corresponding percentage value of width is then read directly from the vertical index of the template. **3.** Enter the width value in the space provided on the chart paper.

Figure 10b



4.) Enter your tabulated values into the LSR6328P RMC equalizer using the table below:

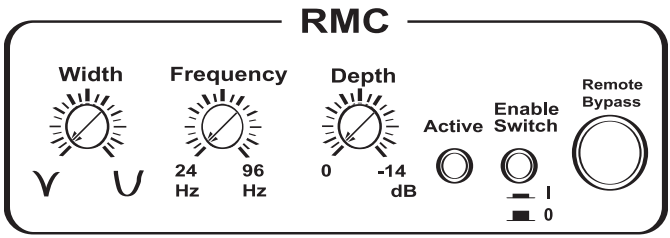
Data Entry in RMC Equalizer Table:

Control Position	Width (%)	Frequency (Hz)	Depth (dB)
0 (CCW)	4.5	24	0.0
1	5.0	25	0.0
2	7.5	26	0.0
3	10.0	28	0.5
4	12.5	31	1.1
5	16.5	35	1.9
6	20.5	41	2.9
7	23.0	45	4.4
8	26.0	47	6.4
9	28.0	50	7.9
10	29.5	53	8.3
11	31.0	57	8.9
12	34.0	62	9.5
13	39.0	68	10.2
14	41.5	76	11.0
15	43.5	85	11.7
16	45.0	90	12.7
17	46.5	90	13.1
18	48.0	95	13.5
19	49.0	95	13.9
20 (CW)	50.0	95	14

(CCW) counter-clockwise
(CW) clockwise

Begin with the three controls in their far left (CCW) counterclockwise position and adjust each one, a click at a time, until you have reached the values entered at the bottom of your measurement chart. (See Figure 11)

Figure 11



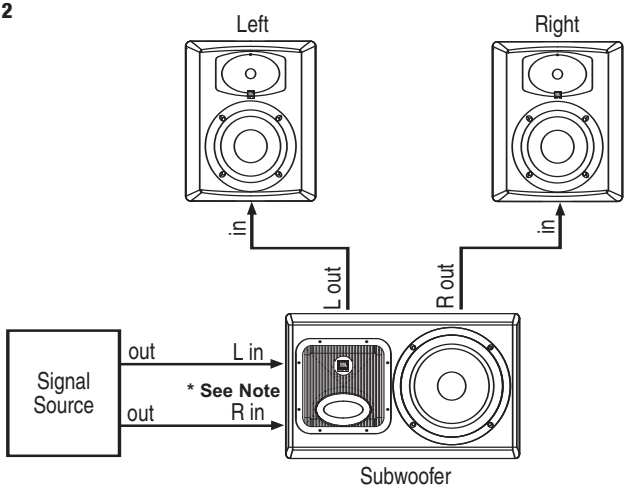
Making these entries requires carefully counting the clicks. If you make a mistake, or have lost count, turn the control to the full counter-clockwise position and start over.

Rechecking the system: After you have made the equalizer entries it is time to re-measure the system, using Tracks 4 through 26 just as you did when making your first sequence of measurements. Turn on the LSR6328P RMC function by engaging the ENABLE switch, the green LED will illuminate. Perform the same calibration procedure for the other speakers in the system. Use the RMC Remote Bypass control to compare before and after settings. At this point you may make any fine adjustments by ear. When you are satisfied with your settings, the RMC Remote Bypass Switch can be disconnected from all loudspeakers.

II. LSR6328P Systems With LSR6312SP Subwoofer

First, make sure that you have completed steps for a stereo LSR6328P system. Signal for the left and right LSR6328P speakers should be fed through the main LSR6312SP unit and the calibration of the left and right LSR6328P units must have been done with the LSR6312SP powered off or in Bypass mode (See LSR6300 owner's manual). Now, to calibrate the RMC system of the LSR6312SP, power up the unit and make sure the Bypass is not active. (See Figure 12) Ensure the RMC system on the LSR6328P units are active.

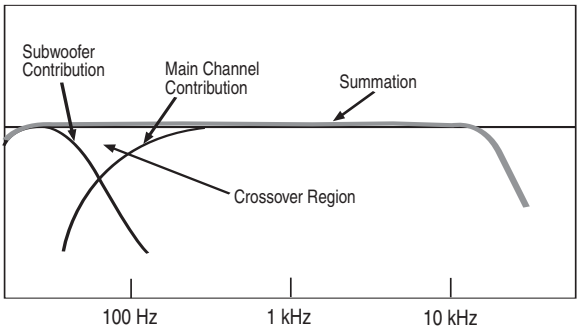
Figure 12



*** Note:** Before calibrating the subwoofer, disconnect the Right Signal Source output from the subwoofer so only the Left Signal Source output is connected to the subwoofer. Following calibration, reconnect the Right Signal Source output to the Subwoofer Right Input.

After the system is connected and levels have been calibrated according to the procedures that follow, the contribution of the subwoofer will match that of the main channel loudspeaker (Figure 13), resulting in smooth response over the crossover region between the two.

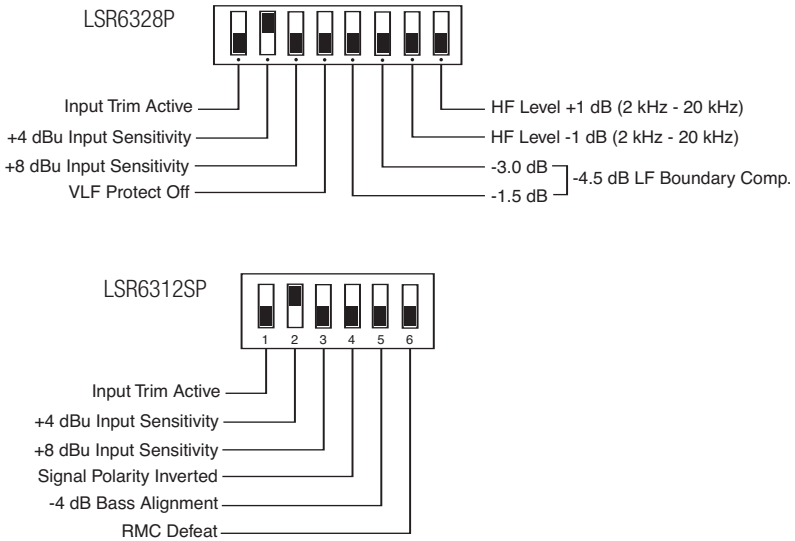
Figure 13



Feed one channel from the CD player into the left or right channel input on the rear of the LSR6312SP and proceed with the following steps:

1. Set both the LSR6328P and LSR6312SP to the same input sensitivity, using the DIP switches on the back panels of each unit, as shown in Figure 14. Make sure that the gain trim pot on the LSR6312SP has been disabled.

Figure 14



2. Make sure the LSR6312SP RMC system is OFF; the defeat is active with dip switch #6 in the UP position.

3. Play Track 27 and adjust the output level of the CD player to get a baseline reading of -7 dB.

Taking Measurements

4. This section has the same measurement procedure as referenced earlier for the LSR6328P on page 8.

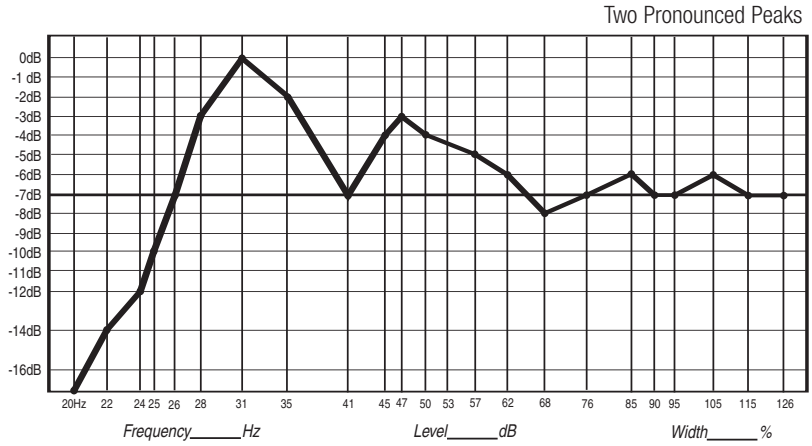
5. Play Track 3 to determine if there are any meter overloads. If there are, reduce the signal level from the CD player to ensure that there will be no overloads. If you do reduce the CD playback level, you will need to adjust your baseline. Play Track 27 again and record the reading as your baseline. Then go to step 6.

6. Using Bands 2 through 26, plot your readings on chart paper and then make these settings on the rear panel of the LSR6312SP. Recheck the system's equalized response by playing Track 3.

Analyze Your Measurements

Because of the extended LF response of the LSR6312SP system and its normal location at the intersection of floor and wall, you may see a variety of response conditions, such as the ones shown in Figures 15 and 16.

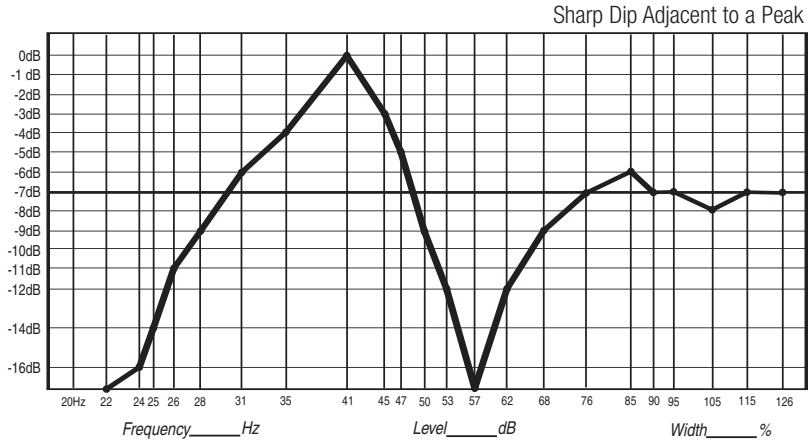
Figure 15



Two pronounced peaks: Figure 15 shows response with a large peak at about 31 Hz and a lesser one at 47 Hz. The first recommendation is that, if the sub is in a corner, move it away from that position along the front wall. The 31 Hz peak will probably diminish significantly as you do this. The 47 Hz peak is then the one you should equalize, since it is clearly in the range where it can affect your judgement of program content and balances.

If the 31 Hz peak does not diminish when you move the sub, you should reduce the overall sub level, bringing the 47 Hz peak down about 5 dB. You can then proceed to equalize the 31 Hz peak with RMC.

Figure 16



A very sharp dip adjacent to a peak: Figure 16 shows a peak at 41 Hz with an adjacent sharp dip at 57 Hz. A deep response dip such as this is caused by destructive interference, and such peaks can occur either above a dominant or strong response peak, as shown here, or below a response peak. Sometimes, moving the test microphone a short distance will virtually eliminate the dip. (Actually, you are not eliminating the dip, but merely moving away from it.) If this appears to be the case, you should make slight rearrangements in the subwoofer location and even move your working space slightly. Remember that you cannot equalize the dip - but you may be able to avoid it altogether by rearranging your workspace.

Another possible alternative here is to engage the polarity switch on the LSR6312SP Subwoofer. Sometimes, this is all that it takes to get rid of - or alleviate - a response dip. Do not worry about which setting of the polarity switch is "correct." Use the setting that results in the most uniform response.

You will soon find out that relatively small changes in the position of a subwoofer along a floor-wall boundary will make significant changes in the measurements you make. Ideally, you would like to make the smallest correction necessary, so do not hesitate to experiment with subwoofer placement. While corner locations are often touted as being the best place to get good bass, that position usually results in fairly wide swings in measured response. This is because of differences in distances and how the room modes are stimulated. The switch setting which produces the most output also assures the phase response is optimal.

Important Note: The crossover frequency between the LSR6312SP and LSR6328P is roughly 80 Hz. If you have carried out equalization at that frequency, or fairly close to it, you may find that the overall response peak that you reduced in the subwoofer's response may still be partially present. The reason is that there are two loudspeakers contributing at that frequency. So do not hesitate to reduce the peak further using the RMC section of the LSR6312SP. This can be done by advancing the RMC Depth Control one click at a time.

Adjustments

If you have more than one LSR6312SP in your system, you must equalize each one separately, in its own position and with the others turned off. In carrying out this procedure, you must feed each LSR6312SP directly with the input measurement signal; however, once the equalization process has been accomplished, you can feed all of the subwoofers in a chain by using the SUMMED OUT of one unit into the input of the next. See Owner's Manual for additional details.

Enter settings into the RMC Equalizer on the electronics panel of the LSR6312SP Subwoofer. Enable the RMC System by setting the RMC Bypass Dip Switch to the OFF or DOWN position. When you have finished equalizing the subwoofer portion of your system, it is time to put the finishing touches on the overall system. You may want to make slight changes in loudspeaker location, as well as adjust the subwoofer level(s) relative to the main channels. Play a variety of music, both stereo and surround sound, before you make any final adjustments. You can adjust the level of each subwoofer using the RMC make up gain on the LSR6312SP electronics panel. You can play Track 27 on the RMC Calibration CD and use the meter to calibrate the subwoofer level. Repeat the procedure for each subwoofer in the system. You can also compare the level of the LSR6328P satellite speakers using Track 2. Normally the subwoofer and satellite levels should be equal, however, you may prefer the balance when the subwoofer output is 1-3 dB greater than the main channel speakers.

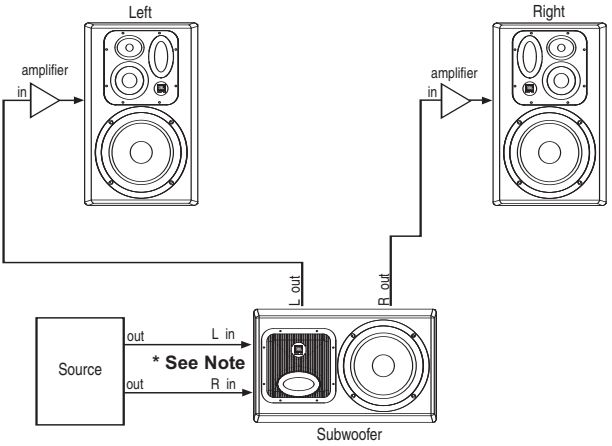
III. LSR6332 Or Other Passive Systems With LSR6312SP Subwoofer

Many engineers will want to use the LSR6312SP subwoofer in stereo or surround activities using passive loudspeaker systems such as the LSR6332. There are two ways you can do this:

Method One

Feed the Left, Center and Right channel power amplifiers through the three sets of signal inputs and outputs on the rear panel of the LSR6312SP, as shown in Figure 17. This will insert 80 Hz high-pass filters ahead of the external power amplifiers driving the Left, Center and Right channels. At the same time, the LF content of each input will be low-passed at 80 Hz, summed, and fed to the integral subwoofer amplifier.

Figure 17



1. Taking Measurements, refer back to LSR6328P Taking Measurements section on page 8.

2. After you have made these connections, play Track 2 over the center loudspeaker and set the volume level to read -7 dB on the sound level meter.

3. Now, play Track 4 and adjust the level at the subwoofer to achieve a reading of -7 dB on the sound level meter. We suggest that you make this adjustment on the rear panel of the LSR6312SP by engaging Switch 1 (S1) and using the makeup gain trim control.

4. You are now ready to play Track 3, to check for any over-readings. Make any level adjustments if necessary by engaging Switch 1 (S1) and using the makeup gain trim control, and then proceed to play Tracks 4 through 26, making your entries on chart paper.

5. Analyzing Your Measurements, refer back to LSR6328P Analyzing Your Measurements section on page 10 and 11.

6. By now, you are familiar with the equalization procedure. Enter the frequency, level and width values at the bottom of the chart and proceed to make the RMC settings on the rear panel of the LSR6312SP.

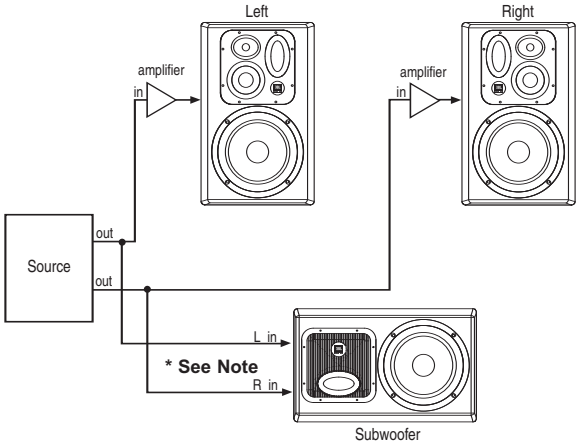
7. Recheck the overall sub and main system balance by playing tracks 2 and 27 as well as a track of music that you know well. Make any small changes in subwoofer balance that seem appropriate.

*** Note:** Before calibrating the subwoofer, disconnect the Right Signal Source output from the subwoofer so only the Left Signal Source output is connected to the subwoofer. Following calibration, reconnect the Right Signal Source output to the Subwoofer Right Input.

Method Two

Many engineers are quite happy with the response of their existing stereo or surround loudspeakers. They may only want to add a subwoofer to their system for more extended bass. In this case, the hookup shown in Figure 18 should be used. You can get a subwoofer feed by sending a parallel or "multed" feed of the LCR front channels - or by using the Direct In to the subwoofer if your signal source has a SUB or 0.1 (point-one) output.

Figure 18



Measurements, Analysis and Adjustments - The next step is to play Tracks 4 through 26 for correcting the major room mode, and then to make final adjustments to your taste.

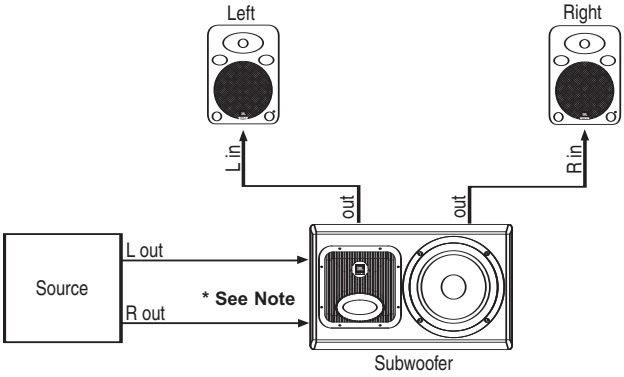
Note: When using full-range satellites not high-passed using the LSR6312SP bass management system, it is recommended a low-pass filter be applied to the feed to the subwoofer so the sub does not produce the same bass frequency as the satellite speakers, which could possibly cause bass cancellation. JBL Professional recommends Method One which will generally produce the best results except in special cases.

*** Note:** Before calibrating the subwoofer, disconnect the Right Signal Source output from the subwoofer so only the Left Signal Source output is connected to the subwoofer. Following calibration, reconnect the Right Signal Source output to the Subwoofer Right Input.

IV. LSR25P or LSR6325P Systems With LSR6312SP Subwoofer

Setup procedures, measurements, analysis and adjustments for LSR25P or LSR6325P systems with a LSR6312SP Subwoofer is the same as the LSR6312SP with LSR6328P system. Refer to this section on page 14. Figure 19 shows a wiring diagram of the LSR25P system.

Figure 19



Note: Do not enable the high pass filter dip switch on the LSR25P system.

Note: When connecting the LSR6312SP Subwoofer to the XLR input of the LSR25P or LSR6325P speaker, set the LSR6312SP Subwoofer DIP Switch to the UP +4dBu sensitivity position. When connecting the LSR6312SP Subwoofer to the LSR25P or LSR6325P RCA input, set the Subwoofer DIP Switches 2 and 3 to the DOWN -10dBV sensitivity position.

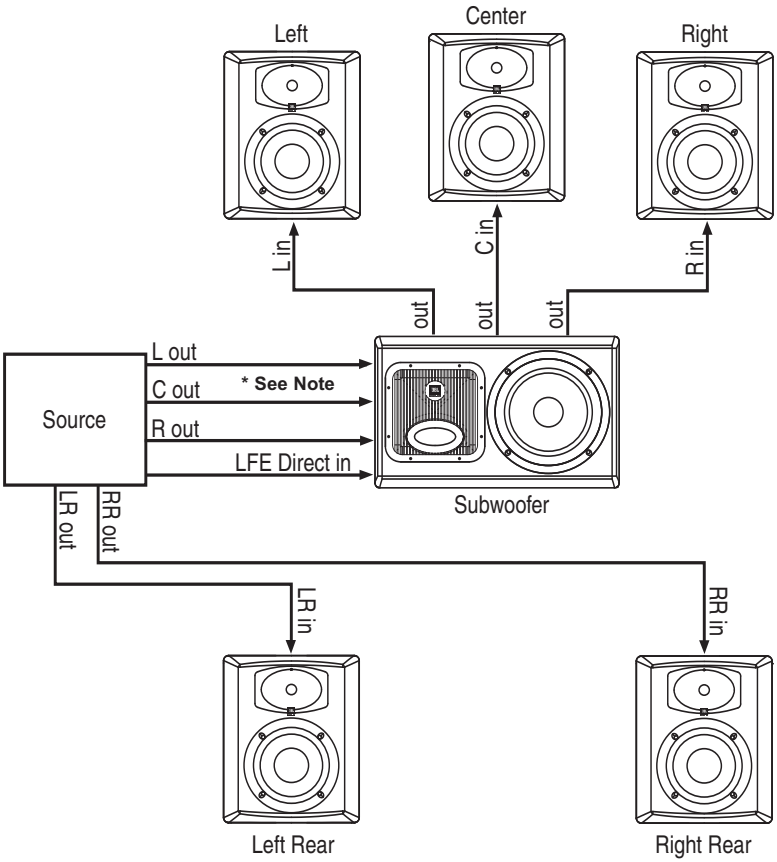
*** Note:** Before calibrating the subwoofer, disconnect the Right Signal Source output from the subwoofer so only the Left Signal Source output is connected to the subwoofer. Following calibration, reconnect the Right Signal Source output to the Subwoofer Right Input.

V. Surround Systems

Figure 20 shows a setup in which 3 LSR6328P units and one LSR6312SP unit comprise the front channels. The rear channels are completely independent of the front set and may even be different loudspeaker models. For example, a pair of LSR25s may be used in the rear.

The front channels and subwoofer have been discussed earlier in this User Guide. If you choose to use a pair of LSR6328Ps for the rear channels, treat them as discussed in Section II on page 14. After connecting the system, refer to pages 8-13 for measurements, analysis and adjustment procedures.

Figure 20

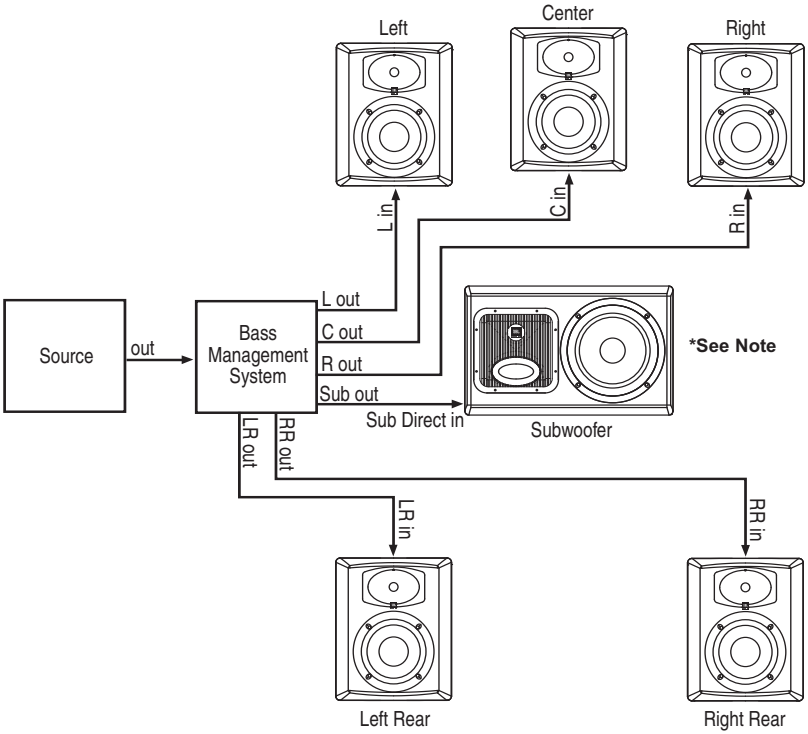


*** Note:** Before calibrating the subwoofer, disconnect the Center and Right Signal Source outputs from the subwoofer so only the Left Signal Source output is connected to the subwoofer. Following calibration, reconnect the Center and Right Signal Source outputs to the Subwoofer Center and Right Inputs.

VI. Multi-Channel Systems With Externally Provided Bass Management

If you are using your LSR6300 system to monitor discrete multi-channel audio, and want to simulate the listening chain of the theater or home theater environment, you may choose to set up your system this way. See Figure 21 below.

Figure 21



1. Perform RMC of each of the satellites. After all satellites are set, turn them off, otherwise the satellites will affect the readings you get when you perform RMC on the subwoofer.

2. Perform RMC on the LSR6312SP subwoofer(s). Since the satellites will be turned off, you will have to monitor the voice on the CD using headphones. Alternately, you can leave one satellite on and attenuate its volume to the point it is barely audible allowing you to hear the voice on the CD.

*** Note:** Before calibrating the subwoofer using the RMC Calibration CD in a system that includes external bass -management, disconnect one output of the CD player so only one channel of the CD player, (Left or Right) is sending signal to the subwoofer. Following calibration, reconnect both channels of the CD player.

3. Turn all speakers on and perform level calibration of all channels.

    - To conform to cinema standard used to playback movies and DVDs, an input signal -20 dBFS (Full Scale) should produce 85 dB SPL from each individual satellite and 95 dB SPL from the subwoofer. A +10 dB gain switch is provided on the LSR6312SP SUB DIRECT IN which can be used to conform to this gain structure.
    - If you are listening to music, you may wish to calibrate the sub without the 10 dB boost to produce the same SPL as each of the satellites.

JBL Professional Contact Information

Mailing Address:

JBL Professional
8500 Balboa Blvd.
Northridge, CA 91329

Shipping Address:

JBL Professional
8500 Balboa Blvd., Dock 15
Northridge, CA 91329

Customer Service:

Monday through Friday
8:00 am - 5:00 pm
Pacific Coast Time in the U.S.A.
(800) 8JBLPRO (800.852.5776)
www.jblpro.com

On the World Wide Web:

www.jblpro.com

Outside the USA:

Contact the JBL Professional Distributor in your area. A complete list of JBL Professional international distributors is provided at our website

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