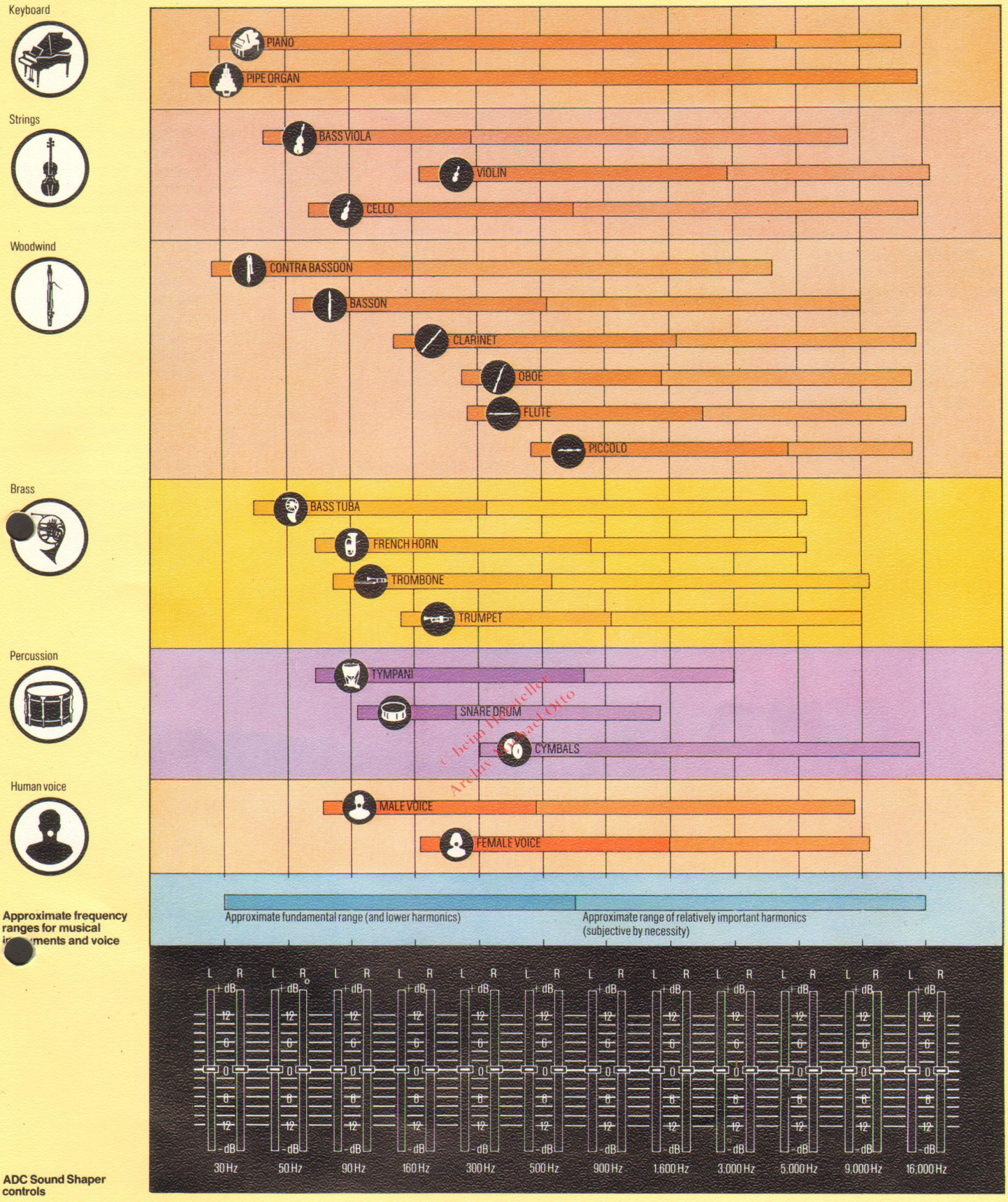
THE ADC SOUND SHAPERS. A LUXURY, OR A NECESSITY?



Approximate frequency ranges for musical instruments and voice

ADC Sound Shaper controls

region will yield a very muddy and 'boomy' quality to the music. A system shy of mid-bass will sound hollow and thin. Controls in this region are important for good overall balance.

The Mid-Range (approx. 400-2600Hz). As the area where the ear is most sensitive to tonal balance, the mid-range is important in adjusting the qualitative sonic characteristics of your system. There is controversy among engineers and audiophiles as to what the proper balance should be in this range. Moreover you will find some settings optimum for certain types of music with other settings just right for different types.

The Upper Mid-Range (approx. 2600-5200Hz). Speaker designers often boost output in this range to effect a quality of 'presence' to the music. Too much energy, on the other hand, sounds overbearingly harsh and strident. A good balance should be achieved between this and a more muffled sound.

The High End (approx. 5200-20,000Hz). The region up to only about 12kHz or so is what is normally perceived as high frequencies. Adjustment in this range affects the brilliance of music, with too much boost in energy yielding an unpleasant and piercing quality.

The last 8,000Hz contains very little musical material. And most adults have hearing which rolls off rapidly above 16 or 17kHz. As a consequence, any control in the 14-20kHz range will have a subtle effect. It can be used to add a little more dimension to the sound or as a very high frequency noise filter.

Once you know what an Equaliser can do, you'll wonder how you ever listened to music without one.

The two new multi-band frequency equalisers from ADC are called Sound Shaper One and Sound Shaper Two.

Before we examine the unique applications of a Sound Shaper let's define exactly what an equaliser is, and then discuss the general reasons for needing one.

An equaliser is a multi-stage, narrow band frequency balance control. Based on the logarithmic or octaval nature of the musical spectrum, one of these devices will segment the audio frequency range and adjust the level of each segment to achieve proper tonal balance, where before the sound may have been totally unacceptable.

So an equaliser is not just a sophisticated tone control.

Tone controls are unable to isolate a particular problem area or act without affecting a very wide frequency range around it.

They always operate on a broad swath of the musical spectrum, unable to affect the mid-bass or upper mid-range without upsetting balance in the low-bass or high end.

They don't attempt to balance the all important mid-range frequencies, the omnipresent area of difficulty.

Now, have you ever listened to an expensive hi-fi system comprised of superb individual components that still failed to sound anything but terrible?

The problem may have been a mismatch of cartridge to speaker, improper speaker placement or a room with severe acoustical imbalances.

The solution to any of these problems is an ADC Sound Shaper.

Nothing less.

Have you ever played a record where the recording engineer has mixed down an otherwise great album in such a way that the vocalist or instruments have been subdued to obscurity or simply drowned each other?

You need an ADC Sound Shaper.

Have you ever regretted buying that high-powered amplifier instead of those enormous speakers with their earth-shattering bass?

You need an ADC Sound Shaper.

Are you exasperated by the obtrusive rumble, hiss and surface noise of your records?

You need an ADC Sound Shaper.

So you begin to see just how useful these machines can be.

Here are nine applications that prove a Sound Shaper is the most important addition to any hi-fi system.

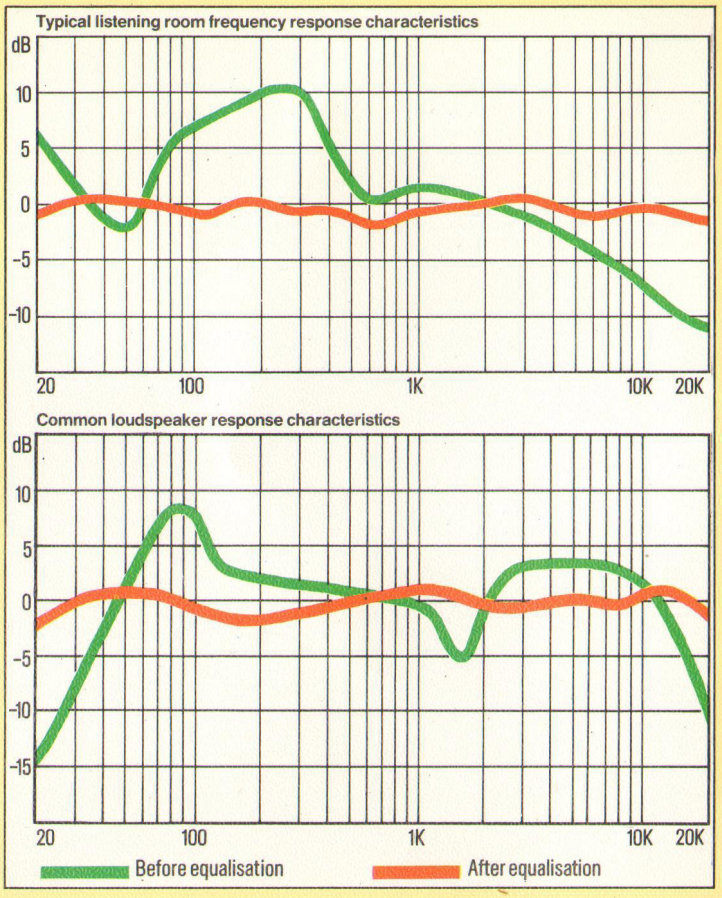
1

Eliminate distortion from your listening room.

The sound reproduction chain starts with the artists and ends at your ears. Between your ears and the music there are a multitude of very important links: the microphone and tape recorder, the record production process, your cartridge and turntable, your receiver and speaker, and so on. Almost all sound system components have been improving year after year to the point that they are now amazingly precise. There is an exception, however; a component that is distorting as much today as it was when Edison invented the phonograph... the listening room.

Your listening room is the final link. Most people don't consider the profoundly important role played by this room in the quality of sound emanating from a hi-fi system. A music system can measure perfectly when considered apart from the room in which it is played and yet sound terrible in the real world of imperfect architectural acoustics.

The problem is that most listening rooms are only listening rooms by accident. They were designed for other things like sitting, or eating, or sleeping, and the conditions that make a room good for something else are likely to make it bad for listening to music. Thick, padded carpeting, overstuffed chairs, heavy curtains and beautiful hanging tapestries make for a very comfortable living room on one hand, but an acoustically dead listening experience on the other. These soft furnishings swallow up your system's sound so effectively as to easily negate the quality of even the most expensive equipment. Another room; one with hard polished floors, lots of bare windows, mirrors and glass covered artwork would present different kinds of problems, becoming a virtual reverberation chamber for high notes and thereby making the overall sound so strident as to be unbearable.



Conventional bass and treble controls have frequency response characteristics that render them almost useless in handling any major room acoustic problems. Typical controls operate over a very wide range, applying significant boost or cut progressively toward the frequency extremes. So it is impossible to affect the mid-bass or upper mid-range without severely altering the low bass or high registers.

In order to accomplish the signal shaping function required for correcting room acoustic aberrations, the flexibility and accuracy of a multi-band graphic equaliser is essential.

The accompanying graph clearly shows the importance of narrow band operation for proper tonal balancing.

2

Make a good speaker a great speaker

The full acoustic potential of any loudspeaker is hardly ever realised in the form that it leaves the factory. In restricting its use to electrically 'flat' incoming signals, a speaker seldom reproduces the lowest or highest notes of which it is capable. Nor does it reproduce all the music in between with optimum balance.

However much speaker manufacturers may make claims to the contrary, there are some very basic laws of physics which determine how low the frequency response of any given (unequalised) speaker will go. The factors involved include the mass of the moving system, the cone area, the magnet and voice coil strength of interaction, and the cabinet volume.

Once a design engineer has committed himself to these design parameters he can't lower true low frequency response. He is absolutely restricted to a very rapid 12dB per octave roll-off starting somewhere just below the in-box resonance point. The only way out is electrical equalisation. By simply sliding a couple of controls you can give that speaker another good solid 20 or 30Hz of bass response.

A device that designers often resort to is allowing a mid-bass hump or peak in output to occur around system resonance. This will give the uninitiated the illusion of plenty of deep bass, where in fact, he is listening to plain old 'boom'! The problem with normal tone controls is that by operating over such a broad band, boosting low bass frequencies can't help but increase the mid-bass also, further contributing to the muddiness around resonance and making the speaker unbearable.

The ADC Sound Shapers

The ADC Sound Shapers are sophisticated two channel graphic controllers which divide the musical spectrum into operative frequency bands, each with an approximate 24dB range of control. The individual controls are designed to interact in order to achieve a beneficial continuity in response. They are line level devices, to be connected between preamp and main amp, or to any tape monitor facility on the back of your receiver. Given only one tape monitor, this function is then passed on to the equaliser. Notwithstanding their sensible pricing, the units have circuitry equal to that found in most professional recording studios.

Sound Shaper One
The SSI operates in five frequency ranges from 60Hz to 10,000Hz. Each range has separate linear (sliding) controls for each channel. The controls will give ± 12dB to either add or subtract from the music giving a total range of 24dB. They're marked in 2dB increments. The power and tape monitor switch are instantly working push-buttons. All audio connections are standard. And installation takes about three minutes. Two minutes later you will know how much more fun your music will be.

Sound Shaper One Technical Specifications

Channels
Two (with separate controls).
Frequency response (flat)
5Hz to 100kHz + 0.5dB-1.0dB.
Control frequencies
60, 240, 1000, 3500, 10,000Hz.
Control range
24dB (± 12dB) nominal.
Harmonic distortion
At 2 volt output (20Hz to 20kHz:) 0.02%.
Intermodulation distortion
At 2 volt output: 0.02%.
Hum & noise (input shorted)
80dB below 1 volt.
Output
Minimum 10 volts RMS into 10K Ohms load.
Gain (frequency controls centered)
Unity ± 1dB.
Recommended output load
10k Ohms or greater.
Output impedance
10K Ohms at 1000Hz.
Input impedance
75K Ohms.
Inputs
2 main, 2 tape monitor.
Outputs
2 main, 2 tape out.
Controls
Power switch, tape monitor, 10 frequency controls (5 each channel). Each slide control has a centre detent for easy location of the flat response position.
Semiconductor complement
8 transistors, 4 diodes fully transistorised with LED power on indicator.
Dimensions (height x width x depth)
$5\frac{5}{16}$" (135mm) x $10\frac{1}{32}$" (256mm) x $6\frac{11}{16}$" (170mm).
Shipping weight
7.44 lbs.
Power consumption
220/240 volts AC, 50/60 Hz 10 watts.

Sound Shaper Two
The SS-2 uses a total of 24 linear potentiometers each with a centre detent for easy location of the flat response position, this model is capable of unusually fine sonic adjustment. Each stereo channel is controlled separately in twelve different frequency ranges. The number of graphic controls and other features put the SS-2 in a class shared only by very much more expensive professional devices.

Unlike other equalisers, internal switching is provided that easily allows equalisation in the record mode. By depressing the *Line-record* and *Monitor* buttons, and without further cable patching, you can record an

equalised signal and monitor the material exactly as it appears on the tape.

Other functions include *Eq-bypass, Meter,* and *Meter adjustment.* As the name implies, *Eq-bypass* allows the equalisation circuitry to be wholly disconnected from the system. It can be used as a convenient comparator between the equalised and unequalised signals. Depressing the *Meter* switch allows the 2-channel meter to indicate output level to within 1dB from 30Hz to 16kHz. *Meter adjustment* is a simple input sensitivity control. The meter, used in conjunction with the ADC SLM-100 Sound Level Meter can measure the response of your entire system or even check stereo balance. The input jack located on the fascia enables the user to place the SLM-100 Sound Level Meter in a desired listening area and with the 20 foot cable supplied with the SLM-100, read the signal strength directly from the meter on the SS-2.

Sound Shaper Two Technical Specifications

Channels
Two (left & right) – with separate controls for each.
Frequency response (flat)
5Hz to 100kHz ± 1dB.
Control frequencies
30, 50, 90, 160, 300, 500, 900, 1600, 3000, 5000, 9000, 16,000Hz.
Control range
24dB (± 12dB) nominal.
Harmonic distortion at 2 volt output
(20Hz to 20kHz)
0.02%
Intermodulation distortion at 2 volt output
0.02%.
Hum and noise (input shorted)
Nominal 85dB below 1 volt.
Output
Nominal 10 volts into 10K Ohms load.
Gain (frequency controls centred)
Unity ± 1dB.
Recommended output load
10K Ohms or greater.
Output impedance
10 Ohms at 1000Hz.
Input impedance
75K Ohms.
Inputs
2 main, 2 tape monitor, sound level meter.
Outputs
2, main, 2 tape out.
Controls
Power switch, meter adjust (left & right), line-record, tape monitor, eq-bypass, meter, 24 frequency controls (12 for each channel).
Semiconductor complement
12 transistors, 22 diodes, 2 integrated circuits.
Accessories included
2 twin shielded 48″ audio cables.
Dimensions (height x width x depth)
160mm x 410mm x 170mm.
Shipping weight
7kgs.
Power consumption
220/240 volts AC 50/60Hz 15 watts.
Accessories available
Sound level meter SLM-100 (includes Test Record R-100, one 20 foot cable.)

Achieve precise room calibration with a Music Sound Level Meter.

SLM-100

It is quite easy to arrive at the proper settings for each of the individual controls on an equaliser simply by using the inexpensive SLM-100 Sound Level Meter and accompanying ADC R-100 Test Record. The record has bands of pink noise that correlate to the controls on the equaliser. After assuming the most common listening position in your room, you use the SLM-100 to measure the signal strength from each band on the R-100 test record. The appropriate slide controls on the equaliser are then raised or lowered to bring all of the measured levels to the same approximate value. That is all that is necessary to come very close to duplicating the acoustics of the sound studio. The SLM-100 Sound Level Meter comes complete with a 20 foot inter-connecting cable for use with the SS-2 Sound Shaper.

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A multi-band frequency equaliser, on the other hand, can bring down the mid-bass hump and at the same time extend true low bass response.

Listening room bass reinforcement effects from walls, floor and ceiling easily cause a 6dB or more variation in low frequency output. This rather dramatic influence often restricts the user to placing his loudspeakers in unmanageable or even impossible locations. Equalisation will correct for any of these bass reinforcement considerations, and allow location of the speakers virtually anywhere.

Design engineers have much more latitude in the higher registers, but this is also the area where the ear is most sensitive to tonal balance. As a result of the psychoacoustic importance of the mid-range and the basically empirical nature of transducer design science, decisions on balance and output in the mid-range and high end are very subjective and open to much disagreement, even among experts.

One well known manufacturer actually publishes frequency response curves showing a rather marked rolloff in the high end of its speaker systems. They claim their speakers display the 'optimum' tonal balance. Many would disagree (especially when listening in an absorbent room). Another manufacturer designs its speakers to have a lot of 'punch' in the upper mid-range, giving the music a 'bigger than life' sound. Many people find this mid-range peak to be very exciting on some types of music but the very same people might complain about the unlistenably bright and strident quality on other musical material.

The debates can and will rage on. There is no panacea at the speaker manufacturing end. The only way to properly shape the signal for your room, and for the kind of music you like, is to use an active equaliser.

3

Make your taste prevail not the recording engineer's

The recording engineer has a tremendous amount of power. It is his subjective decision as to how to mix down and sonically balance the music he records. He usually starts with 16 to 32 tracks of individually recorded music which he has to equalise and somehow mix down to two or four tracks.

The possibilities are endless. Clearly, the man is a professional but, nevertheless, it is his personal interpretation which prevails. If his playback equipment were perfect and identical to yours (it's not!) and if his room were the same as yours (it's not!) and if his hearing were the same as yours (it's not!) and, most important, if his taste always paralleled yours (it can't!) – then maybe you wouldn't want to readjust the tonal balance on many of your records and tapes.

There have got to be times when you want to hear a vocalist who is being drowned out by the instrumentation. Perhaps you like guitar or some other instrument and prefer it a little louder than the engineer did. Whatever it is, whatever you might want to subdue or bring out, all that's needed is an equaliser.

The Musical Spectrum chart will help you understand which controls affect what instruments. Using it as a guide you can successfully begin to tailor the music to your taste. And after you've properly readjusted a recording, you can make the changes permanent simply by making an equalised tape.

4

Eliminate rumble, hiss and surface noise

Any system suffering from rumble or low frequency overload can have the problem remedied by attenuating the lower most control on a multi-band equaliser. With little in the way of fundamentals below about 40Hz, it is unlikely you will miss any of the music.

If you have problems with scratches and other record surface noises, or even tape hiss, you can eliminate much of it without losing a lot of the music simply by bringing down the levels at 9 or 10kHz and above.

If you listen to prerecorded tapes that have been processed with Dolby noise reduction or to Dolby encoded FM broadcasts, but do not have access to a Dolby playback decoder, an equaliser can be used to compensate for the boosted highs without chopping away as much music as would a normal treble control.

5

Improve record, tape and broadcast quality

For some unknown reason, good quality radio broadcasts are a rarity. Individual stations are noted for overmodulating either the highs or the lows. Others are known for prematurely rolling off one or both extremes of the frequency spectrum. In either case, audio equalisation can properly rebalance the signal.

Records and prerecorded tapes are often lacking in tonal balance and range. Also, there are new high performance recording tapes on the market that require special playback equalisation. A multi-band equaliser can make the proper adjustments.

6

Tape in a non-studio environment

Any would-be recording engineer knows how difficult it is to record live performers and make the tape sound smooth and professional. Even in a good studio environment, problems of instrumental balance, microphone placement and input overload are a lot to overcome.

Compound these difficulties with room acoustic inadequacies and you have a real job on your hands. The professional knows that graphic equalisation is a necessity. You too can use a frequency equaliser to make your room into a sound studio.

7

Eliminate feedback and adjust balance in a live performance

A graphic equaliser is a must for good live performing. Significant increases in gain without feedback can be achieved simply by adjusting the proper controls. Also, by boosting the voice frequencies while attenuating those of the back-up band, a vocalist gains better intelligibility and greater 'presence.'

Any musical group trying to gain an identity knows how difficult it is to maintain the same 'sound' travelling from one concert hall to another, each with its own sonic characteristics. A properly used frequency equaliser can help solve the problem by tailoring the group's response to that particular room.

8

Eliminate problems of transducer incompatibility

It's very common where good cartridges and good loudspeaker systems, when played together, result in far less than good sound. Slight resonance peaks or response aberrations which considered separately would be insignificant, can combine to yield dips or peaks that are very displeasing. One well-known 'top-rated' speaker combined with a good 'best-buy' cartridge sounds unbearably harsh and strident, especially in an acoustically hard environment. The answer? Simple! Find the proper slide control on your graphic equaliser and move it down a few dB.

9

Revive your 78's and other old records

It wasn't too long ago that the recording industry settled on the present RIAA standard for phonograph equalisation. When the industry was still fledgling, there were several standards, each quite loosely adhered to and all decidedely inadequate on today's good high fidelity equipment. Even the cutterhead was a limiting factor because it usually had a resonance peak in the midrange, profoundly reducing bandwidth. The resultant complaint is always a lack of true bass or highs, a strident or droning midrange and an unbearable scratchiness up top. An equaliser can correct for these problems, making your old records very listenable. Also, if you want to make the improvement permanent, all you need do is make a recording using the equalised signal.

The musical spectrum

This chart correlates familiar musical instruments with the numerical frequencies that they produce. Given the often talked about musical range of 20Hz to 20kHz, it is surprising to see how low musical fundamentals actually are. (Almost all are under 3500Hz.) It should be understood however that if all instruments were perceived only by their fundamental frequency output (dark bands), they would all sound alike. It is the harmonics or overtones (light bands) that give each individual instrument its character or timbre and set it apart from the rest.

The human ear is more sensitive to certain octaves in the musical spectrum than to others. Whoever designed this engineering marvel deemed it necessary to tune the ear more toward the mid-range frequencies where speech and voice communication occur than to the outer octaves of low-bass and high musical overtones.

As a result, very small energy changes here will cause a more drastic psychoacoustic effect than larger changes would at the frequency extremes.

In order to discuss the qualitative effects of adjustment in tonal balance, it is best to arbitrarily divide the musical spectrum into five ranges:

The Bass (approx. 20-140Hz). There is little musical material with fundamental frequencies below about 60Hz, and what is normally perceived as low bass material is actually in the 60-140Hz range. The very lowest frequency controls can be used to reduce rumble, acoustic feedback and other low frequency aberrations. A control in what is normally labelled the 60-90Hz area will usually cause the greatest perceptible changes in 'bass response.'

The Mid-Bass (approx. 140-400Hz). An over accentuated mid-bass