

By N. McLeod

FUNDAMENTALLY, a mobile discotheque consists of a light show and a sound system. The light show may consist of various medium powered spot-bulbs, controlled sequentially, flashing randomly or made to pulse with the music, and possibly strobe lights or ultra-violet bulbs for extra effect.

The sound system will comprise two turntables with cartridges, some form of mixer, a microphone, a power amplifier or two, and a number (usually two) of loud-speaker cabinets. (The use of two loudspeakers, in addition to spreading the source of sound, is sufficient to convince most of the listeners that the music is stereophonic, whether it actually is or not, and is therefore to be recommended!) Let us examine all these items in turn, starting with the sound system.

TURNABLES

You need two turntables to produce a continuous flow of music. As one record finishes, the next one bursts forth, bang on time, at exactly the right level.

It is essential to be able to control the turntable in order to achieve this; anything else is a secondary consideration. For example, singles are recorded at such high modulation levels as to make most rumble relatively inaudible. Delicate arms, with pretty little weights dangling on nylon cords, are going to be wrecked. Automatic lift-off is tiresome and quite unnecessary, since it takes the deck out of your control while it performs its function. Cueing arms, which lift and lower the pickup onto the record are just a joke, unless you don't mind your records arriving in a rather haphazard manner. Besides, if you have a shaky hand, disco work is not really for you. All you want is a basic turntable that will revolve your records at the desired speed, and that will start and stop quickly without causing the stylus to jump grooves.

MOUNTING

Normally record decks are supplied with springy clips to absorb the vibrations caused by movement near to the player. However, when they are used in a disco console this springy suspension, unless it is very stiff, can be more of a hindrance than a help, as any attempt to touch the deck causes the stylus to bounce merrily over the grooves.

The best idea is to bolt the decks down securely; provided the console rests on a solid table, and the hall in which you are playing doesn't have a bouncy wooden floor, you should have few problems with records jumping unless someone actually collides with you.

CUEING

Before you play a record on your disco you must cue it. To do this you will need a pair of headphones and some means of switching them to the output from either turntable regardless of whether it is turned up on the control panel. Check the speed, start the turntable and place the stylus at the beginning of the record. As soon as you hear the first few notes, stop the turntable and wind back to the beginning, plus a further quarter of a turn to give the turntable time to run up to speed when you start it again.

Should you miss the start by a few grooves, go back and start again. Winding a record backwards under a stylus does neither much good, but as a necessary evil it should be kept to a minimum. Note that when this operation is completed, the whole mechanism should be at rest. It should just wait there until it is needed. Nor should you have to sit there holding anything; your hands should be completely free.

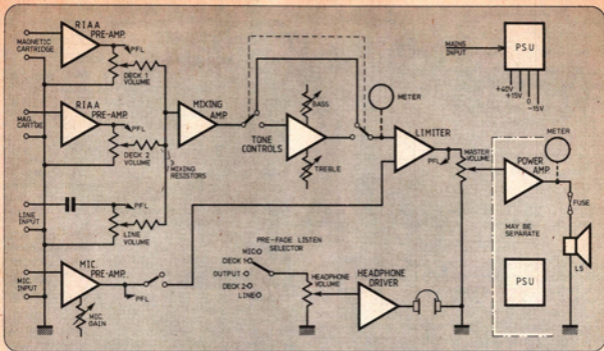


Fig. 1. Representative quality disco console

THE SLIP MAT

Many operators use the slip-mat technique, which is very useful within its limitations. The slip-mat is a piece of felt slightly larger than an LP, with a hole in the middle to fit the centre spindle of the record deck. It is placed (not glued) on the turntable between the platter and the record, allowing the record to be wound back over the felt while the platter is braked. When the record is about to be played, the turntable is started and run up to speed while the operator holds the mat (not the record!). At the appropriate moment he releases the mat and off it goes.

This can be a very effective technique, particularly suited to heavy transcription turntables such as the Garrard 401. It does have the disadvantage, however, that you still have to hold something, namely the mat, until the instant when the record is due to go.

"QUICK-START" MODIFICATIONS

A method which works very well with cheaper idler-driven decks such as the Garrard SP25 is the modification of the mechanism for "quick-start" operation. First the motor switch operated by the on-off lever is shorted out so that the motor is running all the time. Then the notch on the "Off-Man" section of the operating lever should be filed smooth to prevent possible jarring of the turntable as the switch lever is operated.

Finally, any automatic mechanisms should be removed and discarded, as they are of little value in a disco system, leaving a lever which engages and disengages the rubber wheel coupling the motor shaft to the turntable platter, and, of course, the original speed-change arrangements. An idler deck modified in this manner will generally start up to full speed in less than a second, requiring only about a quarter of a

turn of "back-cueing". A switch may be fitted to the front panel to rest the motor when the deck is not in use, if required.

CARTRIDGES

Unfortunately, both for the records and the sound quality, many ready-made units come equipped with ceramic cartridges better suited to highly budget conscious stereo systems than to equipment with any pretensions to quality sound. Ceramic cartridges have the advantage of being cheap to buy, and cheap to keep in styli. They have the advantage, too, of requiring very little circuitry before the pre-fade and mixer circuits, but they require a heavy tracking weight, generally around four to five grams, with consequent record wear.

Magnetic cartridges are only a little more expensive, certainly compared to the cost of a total system. They track at less than half the stylus pressure and with a suitable RIAA preamplifier provide greatly superior sound quality. Something like the Shure M75-B or a Goldring G800 would suit systems using a deck of the calibre of the Garrard SP25, McDonald MP60 or similar.

Choose a cartridge for which you can obtain spare styli easily and cheaply, and always take one with you.

INDIVIDUAL TONE CONTROLS

After the preamplifier you will have a signal which is "flat", that is with all the frequencies of the original recording in their correct proportions. You may, however, wish to equalise it by boosting or attenuating the bass, treble, or a selected part of the frequency

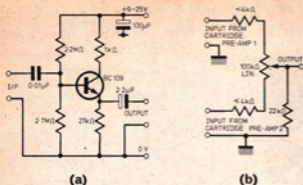


Fig. 2. (a) Impedance converter for ceramic cartridges. (b) "crossfade" control, typical arrangement

range to compensate for deficiencies either in your reproducing equipment or in the record itself. This will require tone controls or filters, of a complexity largely determined by the contents of your wallet.

Generally speaking, though, it should not be necessary to equalise each channel independently. Any records which are of really atrocious quality should not be played, and those with minor shortcomings, together with the limitations of your speakers, can be adequately taken care of by one set of tone controls after the mixing stage.

THE MIXER

The mixer is shown in block form in Fig. 1. There are, of course, many variations, but I have tried to show most of the facilities that can be usefully employed. The RIAA pre-amps are more usually contained within the mixer circuitry itself. A ceramic cartridge requires less of a pre-amp, but an impedance converter (Fig. 2a) is most useful to enable it to be used with the usual values of faders. Note that I have shown each record deck as having its own fader, capable of being independently controlled from maximum gain to zero. I prefer this arrangement to the other, common technique of using a single control with signals fed in at each end, the output being taken from the slider, the so-called "crossfade" control (Fig. 2b).

The trouble with the crossfade arrangement is that you can only do just that; it may not be what you want to do. You cannot compensate for differing modulation levels on your discs with a crossfade control without introducing crosstalk from the other deck. Doing it with the master control is abusing its purpose, as will be explained later, and the only other way is to have a separate "Grams Gain" control, or whatever you decide to call it.

Now if you're going to have two controls for the record decks you may as well have them working like all the other inputs or life is going to get very confusing, and it's bad enough already!

Both record deck faders are taken via mixing resistors to the mixing amplifier. Also feeding the mixing amplifier I have shown a line input, which can be driven by a tape recorder to supply jingles or records you do not personally possess. The use of a tape recorder in this latter manner is even more illegal than using it to tape the records in the first place, and

of course I am not encouraging you to do this. Far better to use it for jingles and announcements to expand the entertainment.

THE MICROPHONE

I have been to a large number of discos where the records are recognisable for their tunes, but the intervening announcements have consisted of a totally unintelligible squawking noise. Do not use a microphone at a disco unless it is clearly audible. With the GPO telephone lines the frequency response is limited to between 300 and 3,000Hz, yet speech is usually quite intelligible even in the presence of interference. These, then, are the frequencies that count. An extension of the bass response gives fullness to the voice, but if overdone makes the sound muddy, and greatly increases the noise produced by handling or touching the microphone.

Extending the treble response makes the voice crisper and sharper unless taken to the extent where it is impossible to increase the gain above a very low level without a squeal of feedback. Generally, with a good microphone, the pre-amp should have a flat response from 300Hz upwards and a steady bass roll-off below that frequency.

It is vital to use the microphone properly. Do not let other people make their own announcements; either they will nearly swallow the microphone while shouting at the top of their voice or they will hold it at waist level and murmur to themselves, both being equally disastrous. If you can obtain a "pop-shield" which fits over the top of the microphone, buy one and use it so that you can speak right up against it without introducing the characteristic "popping" sound. Failing that, speak directly into the mike from about three inches away, clearly and distinctly. You should not have to shout; if you do, you have the wrong microphone.

CHOOSING A MICROPHONE

There is a vast number of obscure oriental microphones around whose quality is not reflected by their appearance or price. If it was, they would be held together with string and exchanged for goldfish and plastic windmills at the fair.

Do not buy a microphone you have never heard of before until you have actually tried it in operation. Failing that, buy from a maker with a proven reputation for good microphones, like Shure or AKG. The AKG D190 is an excellent, though pricey, microphone for disco use with its smooth uncoloured sound and robust construction, while the Sony range of electret microphones produce a clear, crisp sound that is hard to beat at the price.

One warning about electret microphones; do remember to take the battery out when not in use. It doesn't last for ever, and when it leaks it makes a horrible mess. It is advisable to mount your microphone on a flexible "gooseneck" attached to your console so that you can adjust it to a position convenient for use, while leaving your hands free to work the controls.

THE MICROPHONE PREAMPLIFIER

The most important characteristics of a microphone pre-amp are a good overload margin and a reasonable noise level. A versatile design, which uses negative feedback to adjust the gain over a wide range, is shown in Fig. 3. It includes a switch to roll-off the bass

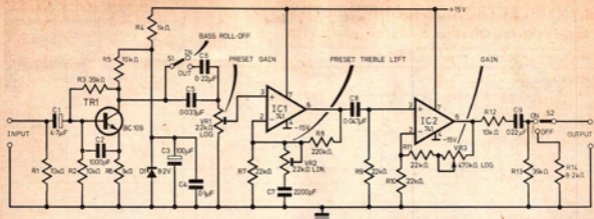


Fig. 3. Circuit of versatile microphone preamplifier for disco use. It requires $\pm 15\text{V}$ at not more than 25mA. The input and output impedances are unaffected by the settings of the controls. VR1 should be set for sufficient output from the circuit with VR3 in mid-position, and VR2 should be adjusted for the best tonal balance at the output of the whole system

response and an adjustment to improve the treble gain. It also includes a preset gain control to match the sensitivity of almost any microphone.

Note that the output is switched on and off, so that the panel gain control can be preset at a level just below that which causes feedback and then forgotten about, with the switch used to turn the microphone on and off when required.

GROUPING AND AUTOMATIC "DUCKING"

All the inputs, from records, microphone or tape recorder are fed into the mixing amplifier. This is just a fairly straightforward amplifier with enough gain to allow for the losses in the fader circuits with a bit to spare, a low input impedance and a low noise level, since any noise it generates will pass into the rest of the system.

If you want to have one of those arrangements where the music "ducks" down automatically whenever you speak, then the music inputs must be grouped together and then the output from the microphone preamp used to control the gain of that group and to feed the output separately. When tone controls are used, it is also a good idea to have the microphone feeding the output separately to avoid it being affected by the settings of the tone controls when they are used to correct deficient recordings (see Fig. 1).

LIMITER

Of all the circuits devised for use with my disco set-up the limiter is far and away the most useful. Its purpose is to control the output in such a way that it will never exceed a certain level, however large the input. Used properly it will eliminate most of the dynamic range of any material played. Why is this a good idea?

In Fig. 4 the vertical axis is scaled in sound level, the further up you go, the louder the environment. The slightly wavy line near the bottom of the graph is intended to show the residual noise produced in the hall by people talking and dancing, together with any

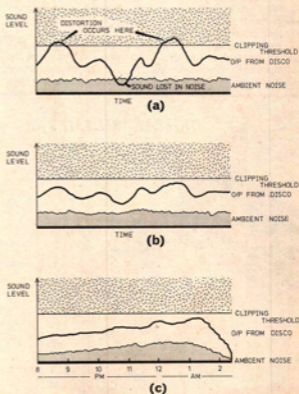


Fig. 4. Running a disco without compression (a) may result in the system running into distortion, or in the output from a very soft part of a recording being lost in noise.

Compressing the dynamic range (b) makes it easier to keep the equipment and the audience happy. A long, but not untypical evening's entertainment is shown in (c). Note that at no time is the disco short of power

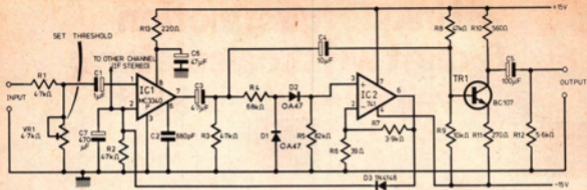


Fig. 5. Limiter circuit to reduce dynamic range. Output around 250mV r.m.s. maximum for inputs above limiting threshold set by VR1. Requires $\pm 15V$ at less than 50mA

other sources of background noise. The straight line above it shows the maximum sound level produced by your equipment when it is working at the maximum volume it can produce without undue distortion.

Between, and in the first instance occasionally crossing the two, is a jagged line indicating the level actually produced by your equipment; in the first diagram without the limiter/compressor, in the second one with it connected in circuit. When the line crosses the top one, your equipment is running into distortion, and if it crosses the bottom one you are no longer properly audible.

Now although modern records contain a good deal of compression already, it is very advantageous to compress them still further for disco work to ensure that your amplifiers and speakers are always working

well within their power limits, and that excessive settings of the input controls do not really matter very much. The less discriminating of disco DJs quite often manage to obtain a limiting effect by driving their power amplifiers into clipping, but because this produces enormous amounts of distortion in addition to threatening the life of the output transistors this method is definitely out for anyone who cares in the least about his sound quality.

The construction of the limiter (Fig. 5) is not critical; 0-1in matrix Veroboard is most suitable. For stereo use, link together the gain control lines (pin 2 of IC1) in the two channels.

Next month: More on choosing and using disco equipment