

Surround speakers

Visaton minis for surround sound

To convert a standard stereo installation into a surround sound setup, at least three additional speakers are needed, of which the centre one must be magnetically shielded. The miniature speakers described in this article have been designed solely for this purpose by the German loudspeaker specialist Visaton.



The surround-sound decoder published last year proved very popular with readers from all over the world. Many of them wrote, however, to ask about suitable loudspeakers.

Since many of these readers expressed a wish to build the boxes themselves, it was a godsend when the German firm of Visaton offered a set of miniature loudspeakers for review. These speakers have been designed especially for surround-sound applications and are available as kits at very reasonable prices.

The centre loudspeaker, which should be placed immediately underneath the television set, uses magnetically shielded drive units. This is a must, otherwise the TV sound and vision will be adversely affected (and how!). Shielded drive units for home construction are still few and far between.

The back speakers have a novel facility. From their own tests, Visaton knew that the directional sensitivity of these speakers had an important effect on the optimum location of the listener. The pair discussed in this article beam upwards, which gives them a more diffuse character, and this in turn enlarges the listening area of op-

timum surround effect. A simple, but effective solution.

CINEMA-LIKE SOUND WITH LIMITED BANDWIDTH

A complete surround-sound installation consists of the power amplifier(s), surround-sound decoder, the standard loudspeakers for the left-hand and right-hand channels, a centre speaker that is placed between these two, and two back speakers that provide the spatial information. The standard

speakers must be of hi-fi quality, since they largely determine the overall sound quality; they are normally driven by the extant a.f. amplifier.

The centre channel is used primarily for speech and its information consists mainly of the sum of the left-hand and right-hand signals from which the low frequencies have been filtered. This is why the frequency range of this speaker need not extend into the very low frequencies. In other words, neither the box nor the drive units need to be large.

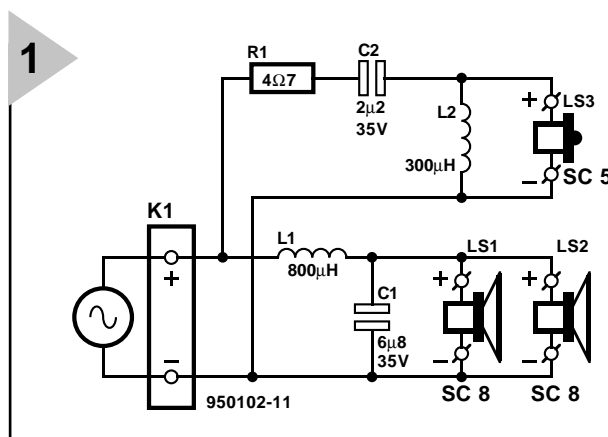


Figure 1. Circuit diagram of the cross-over filter for the Center 80. The filter has a cross-over frequency of about 5 kHz.

The frequency range of the back speakers needs to be only about 100 Hz to 7 kHz, since this is the range of decoder output. Also, the sound level from these speakers is relatively low compared with that from the other three. This means that the drive units for these speakers can be small, good-quality wide-band types.

The power rating of the back speakers need not be high either, primarily because they are not required to reproduce low frequency signals. A rating of 20 W is sufficient in almost all cases.

CENTER 80

The central speaker uses two 80 mm wideband drive units Type SC8 and a 10 mm tweeter Type SC5. These units are, as stated earlier, magnetically shielded. The associated filter, whose circuit diagram is shown in Figure 1, has a cross-over frequency of 5 kHz and roll-offs of 12 dB per octave.

Because of the shielding, the speaker



may be placed in close proximity to a television receiver or computer monitor.

The two 80 mm drive units are located in the bottom half of the enclosure with the tweeter above them. In many other speakers, the tweeter is placed between the two wideband units (the so-called d'Appolito configuration), but this has the drawback that the radiation pattern of frequencies around the cross-over frequency varies appreciably in the vertical direction (assuming that the speaker is upright). Normally, this does not matter much, but since the speaker in surround-sound applications is frequently used lying down, it would mean that sound reproduction varies when the listener moves his/her head slightly to the right or left and this is, of course, not the idea. With the present configuration this effect is virtually non-existent, so that the sound remains homogeneous outside the listening axis. The performance of the Center 80 can be assessed from the frequency characteristic in Figure 2. Note that the

slight hump at 150 Hz ensures that the speaker, in spite of its modest dimensions, produces a voluminous sound.

EFFEKT 80

The effect described in the previous paragraph fortunately does not occur in the back speakers, since these use only a single 80 mm drive unit Type FRS8. In spite of their compactness, the speakers produce an excellent spatial sound effect. As mentioned earlier, they radiate the sound upwards. This produces good scattering of the sound, and obviates the hot spot so often encountered with other surround-sound systems. (A hot spot is a single location in a room where the sound appears concentrated, although it should, of course, be evenly distributed).

The performance of the speakers was measured in a practical setup: the frequency response at a distance of 1 m from each of them, suspended from a wall at ear-height, is shown in Figure 3. The roll-off at higher frequencies is caused by the fact that only reflections are measured there. The 'normal' frequency curve, measured with the speaker lying down and radiating into the direction of the test microphone, is shown in Figure 4.

ENCLOSURES

The enclosures of all three speakers are very easily constructed. Each consists of six rectangular pieces of medium density chipboard, which many DIY retailers will saw to size for you. The boards are glued together with the aid of suitable clamps. The construction diagrams are given in Figure 5. The drive units may be protected by grilles or covers.

Apart from those of the apertures for the drive units, taking into account the grilles or covers, the dimensions of the enclosures are not sacrosanct.

The rear of each enclosure should have holes for the ter-

Figure 4. Frequency characteristic of the Effekt 80 with the drive unit radiating in the direction of the test microphone.

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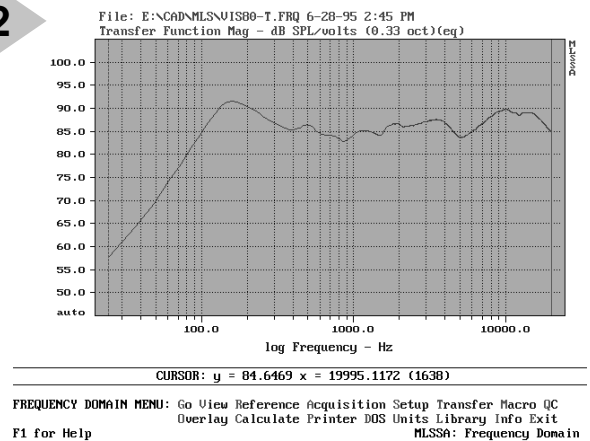


Figure 2. Frequency response of the Center 80. The slight hump at about 150 Hz ensures a voluminous sound reproduction.

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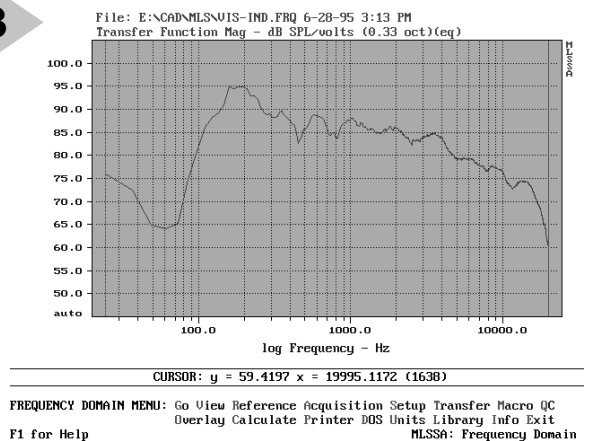


Figure 3. Frequency characteristic of the Effekt 80 when it is hanging from a wall at ear-height with the drive unit pointing upward.

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