

## O.B. LOUDSPEAKERS: LS3/1 SERIES

See also AM8/1, AM8/4, FL6/1, FL6/10

### General Description

Loudspeaker LS3/1 has been designed for use at O.B. points where a monitoring loudspeaker is required which has a greater output and better quality than are provided by loudspeakers such as the General Purpose Loudspeaker LS1/1, but which is more easily transported than the high-quality loudspeakers used in studio listening rooms, e.g., the LSU/10.

It consists of two separate units as follows:

- (a) Cabinet CT4/1, approximately 2 ft. 6 in. high by 18 in. wide by 12 in. deep, in which is mounted a Plessey L.F. Loudspeaker Type CP73025/12/5, two G.E.C. H.F. Loudspeakers (G.E.C. Pressure Unit Type BCS 1852/T247) and a cross-over Filter FL6/1. The total weight is 47 lb.
- (b) Mains-operated 15-watt Loudspeaker Amplifier AM8/1.

The response at the low-frequency end of the range is about half an octave less than that of the LSU/10 and the acoustic power output is also less.

The considerations leading to the design of this and other high-quality monitoring loudspeakers are described in a Paper by D. E. L. Shorter published in *Proc. I.E.E.* Vol. 105, Part B, No. 24, November 1958.

### Loudspeaker Cabinet CT4/1

Cabinet CT4/1 is constructed of  $\frac{3}{8}$ -in. thick plywood with a layer of  $\frac{3}{8}$ -in. soft building board firmly glued to the internal surfaces. This construction reduces sound transmission through the walls to a sufficiently low level while keeping the weight to a minimum. The top, sides and back are lined with sound-absorbing material consisting of glass-fibre blankets 2 in. thick, and the bottom of the cabinet is filled with similar material in a cotton bag to a depth of approximately 5 in.

For ease of transport and because space at O.B. points is often limited the size has been restricted to the dimensions mentioned and a carrying handle is fitted to each side. As the internal volume of the enclosure is only  $2\frac{3}{4}$  cubic feet no vent is provided since the performance of the loudspeaker at low frequencies is better without one.

Also because of the limited space at O.B. points the listener may be very close to the loudspeaker;

it is therefore essential that the low-frequency and high-frequency units should be as nearly coaxial as possible. The two h.f. units are therefore mounted within the cone of the l.f. unit behind a rectangular opening 10. in high by  $7\frac{1}{2}$  in. wide in the front of the cabinet.

A partially perforated aluminium plate is fitted in the opening, an area of  $7\frac{3}{4}$  in. by  $5\frac{1}{2}$  in. in the middle being left unperforated to form a baffle and support for the two h.f. units which are mounted on it behind two holes  $2\frac{3}{8}$  inches in diameter. The plate offers little obstruction to sound from the l.f. unit.

The front of the opening in the cabinet is covered with woven material, and a metal cover plate is provided which can be clipped into position for protection when the loudspeaker is not in use. A parking position for this cover plate is provided on the back of the cabinet.

Care has been taken in the design of the cabinet and in the mounting of equipment in it to prevent the occurrence of unwanted vibrations and rattles as far as possible, but it is essential that all fixing screws and similar items should be kept quite tight if this object is to be achieved.

### L.F. and H.F. Loudspeaker Units

The low-frequency moving coil unit has a 15-inch cone and without the crossover network has an axial frequency range extending to about 4 kHz. When used with a full-sized circular opening in the front of the cabinet the response is appreciably directional above 500 Hz but by making the opening rectangular in shape and restricting it to  $7\frac{1}{2}$  inches in width and 10 inches in height the axial response at the upper end of the range is slightly lowered and the response at oblique angles in the horizontal plane is raised, thus making the system less directional in the horizontal plane.

The two high-frequency units are of the moving-coil type commonly used in conjunction with horns but are designed for use as direct radiators without horns. The diaphragm is of plastic-impregnated fabric and moves as a whole up to at least 10 kHz. A thin metal plate is fitted in front of the diaphragm, and the centre portions of both are slightly conical in shape. Slots are cut in the front plate at a tangent to the cone-shaped centre

portion to provide an outlet for the sound. The overall diameter is only  $2\frac{1}{8}$  in. and the unit is therefore less directional at high frequencies than a conventional cone or single horn radiator.

Two h.f. units are used to increase the power-handling capacity of the system and they are mounted one above the other on a small baffle to improve the response at the lower end of their frequency range. As used in the LS3/1 the axial frequency range extends from about 1.5 kHz to 12 kHz.

#### *L.F. Unit*

Flux density: 12,000 gauss

D.C. resistance: 11-13.4 ohms

Fundamental resonance of unit unmounted:  
25  $\pm$  5 Hz.

#### *H.F. Units*

D.C. resistance: 11-12.5 ohms each

Fundamental resonance: 1.6 kHz

Impedance at resonance: 45 ohms each  
approx.

#### **Cross-over Filter**

The cross-over Filter FL6/1 is mounted inside the loudspeaker cabinet below the loudspeaker units and is wired to them; it therefore forms a permanent part of the loudspeaker system. Its input is wired to a plug near the bottom of the removable back of the cabinet, sufficient length of wire being left to allow the back to be removed and placed against the side of the cabinet when access is required to the filter or loudspeaker units. A connector lead is provided for connecting the output of the loudspeaker amplifier AM8/1 to the input of the filter.

It is important that the loudspeaker units are

correctly phased by connecting the leads between them and the filter to the appropriate terminals, red wires being connected to positive terminals and black wires to negative terminals. The polarity markings on the l.f. and h.f. units follow opposite conventions but this disparity is taken into account in the crossover network.

#### **Amplifier**

Although an AM8/1 nominally forms part of the LS3/1, an AM8/4 with its internal equaliser out of circuit may be used instead.

#### **Loudspeaker LS3/1A**

This is the same as the LS3/1 except that the l.f. speaker unit is a Goodmans Industries Type C129B/15PR/15 ohm, and the amplifier is an AM8/4.

The Goodmans l.f. unit has the following characteristics:

Flux density: 8,500 gauss

D.C. resistance: 11 ohms

Fundamental resonance

(unmounted): 30 Hz

The AM8/4 is used with its optional internal equalization out of circuit.

The h.f. speaker units are substantially the same as those in the LS3/1 but have a modified maker's type number, BCS1852/T534, corresponding to a different colour finish. The manufacturer of these h.f. units is Rola Celestion (whereas for the LS3/1 they were nominally made by G.E.C.).

#### **Loudspeaker LS3/1B**

This is the same as the LS3/1A except that the cross-over filter is an FL6/10.

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