SECTION 17

MICROPHONE AMPLIFIER AMC/3

General Description

The AMC/3 is a unit incorporating a microphone amplifier, a peak programme meter and its associated amplifier. It was designed specially for use with the O.B. mobile f.m. transmitter Type 808 and is housed in a container measuring approximately 12½ by 11½ by 7 inches; the amplifier, together with the transmitter and receiver, constitute the three main units of the O.B. equipment. The AMC/3 is supplied with 300 volts h.t. and 12 volts l.t. (both d.c.) from the transmitter power unit and is normally intended for use with a commentator's lip-ribbon microphone.

Electrical Design (Fig.17.2)

A single pentode V1 provides all the gain necessary between microphone output and transmitter input. Normally this valve operates with about 10-dB current negative feedback but the feedback can be removed if maximum gain is required. V1 is followed by a gain control which feeds the output circuit and the P.P.M. amplifier.

The P.P.M. amplifier follows the basic circuit of the PPM/2 and PPM/6, the first valve V2 acting as a voltage amplifier and feeding a double-diode rectifier V3 via a potentiometer acting as *sensitivity* control. The output of V3 is applied to the grid of a variable-mu pentode V4, the anode current of which operates the programme meter. The bias of V4 is adjusted by a variable resistor (*zero* control) and the screen potential by a potentiometer (*law* control).

Mechanical Design

The four valves and most of the components, including the P.P.M. *adjust law* control, are mounted on a horizontal steel plate which is carried on flexible rubber supports attached to a four-sided steel chassis. A recessed vertical panel (Fig. 17.1) at one end of the chassis carries the peak programme meter, the P.P.M. *zero* and *sensitivity* controls (the latter being provided with a locking device), a variable gain-control, gain switch and the input terminals. The electrical connections between the components on the vertical panel and the amplifier are made with flexible wire so that the amplifier may move freely on the rubber supports. The valves are thus fully floating and are reasonably protected against the mechanical shocks which mobile equipment is likely to receive; the rubber mountings also reduce the chances of superimposing ringing noise on the programme if the equipment is subject to knocks or vibration during transmission. The AMC/3 is normally fitted with a cover secured to the chassis and to the vertical panel by screws, which must be removed to change a valve or adjust the law of the programme meter; access to the underside of the amplifier can be obtained by sliding a cover plate from the bottom of the chassis.

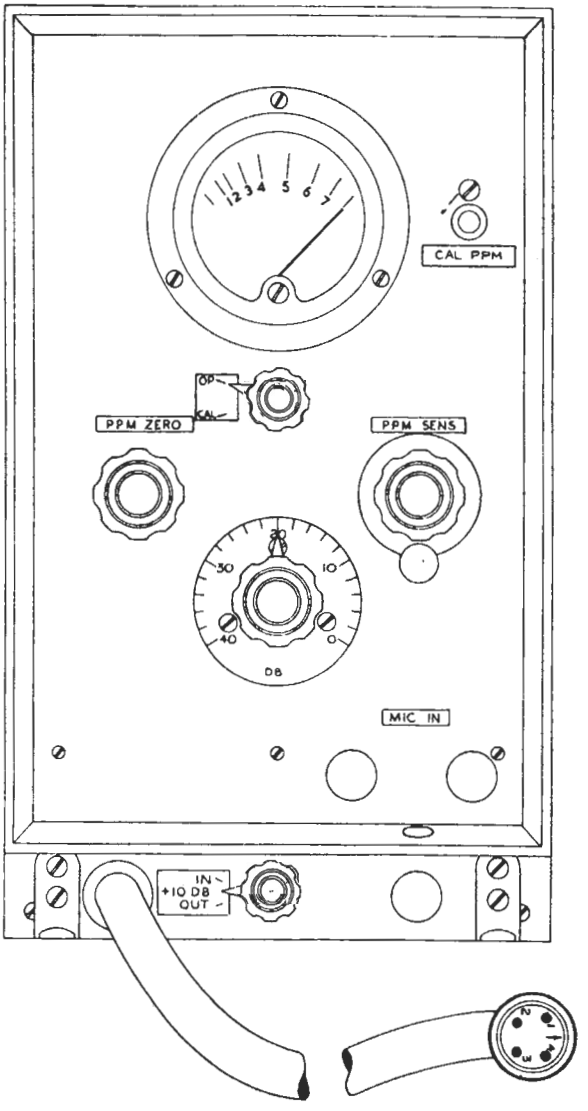

Fig. 17.1 Amplifier AMC/3: Face Panel

The output circuit of the microphone amplifier together with the h.t. and l.t. supplies are carried by a cable which passes through the front panel of the unit and terminates in a 4-pin plug which is inserted in a socket on the transmitter unit.

obtained when required by operating the switch marked +10 *dB* which removes the feedback by connecting a 250-μF capacitor C3 across R3. The h.t. supply for V1 is smoothed and decoupled by the components C5, R6, C4, R4, C1 and the

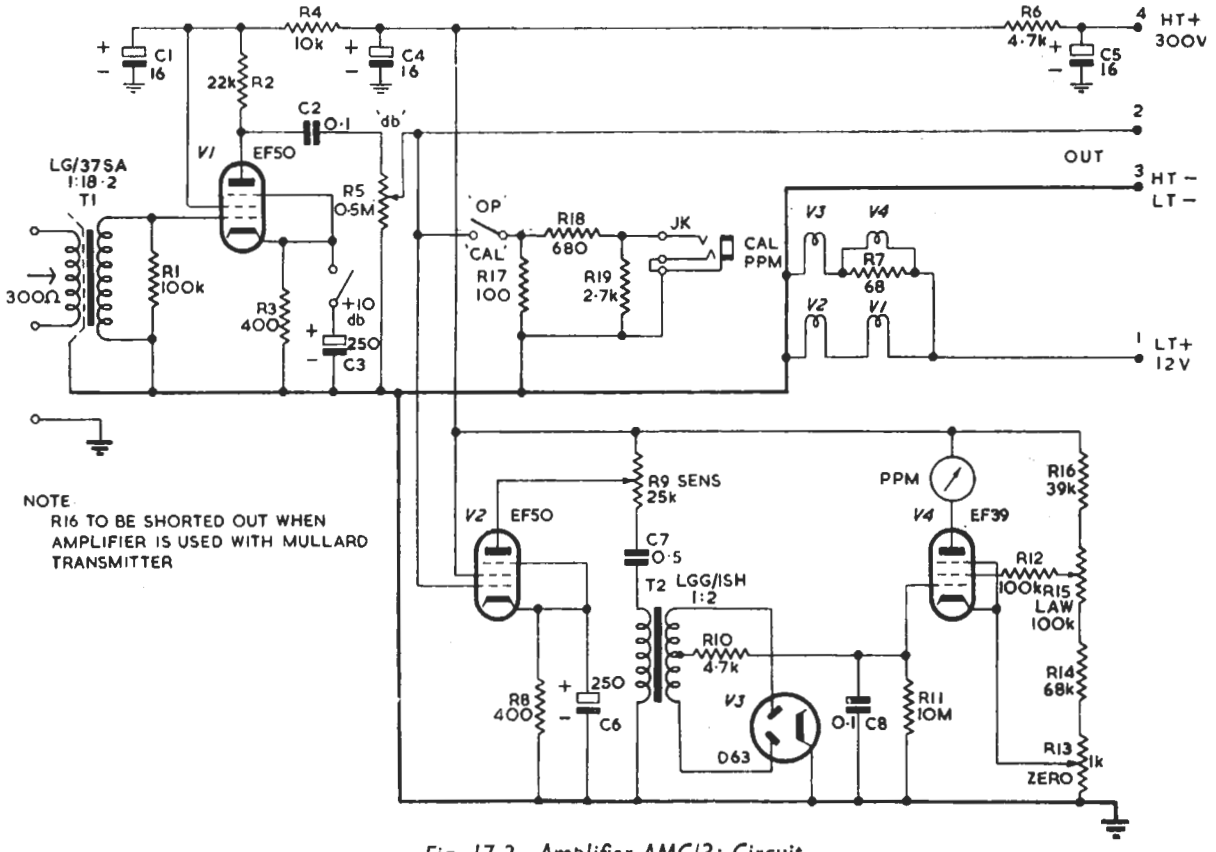

Fig. 17.2 Amplifier AMC/3: Circuit

Circuit Description (Fig.17.2)

The microphone amplifier section consists of a single pentode, type EF50, with a transformer input and an **RC–coupled** output circuit. The turns ratio of the input transformer T1 and its secondary load R1, are chosen to give the unit a 300-ohm balanced input impedance so that the amplifier may be used with any of the standard BBC microphones. The input to the transmitter and the P.P.M. amplifier are both taken from the slider of the stud-type gain-control potentiometer, labelled *dB*; this introduces a loss of 0–38 **dB** as indicated on the engraved scale (Fig.17.1), with infinite attenuation on the bottom stud (marked 40). V1 normally operates with about 10-**dB** current negative feedback provided by the 400-ohm cathode resistor R3 but maximum gain can be

heaters of V1 and V2 are connected in series and fed from a 12-volt d.c. supply in the transmitter.

The first stage of the P.P.M. amplifier is a pentode, type EF50 (V2), which amplifies the signal received from the output circuit of V1. The cathode circuit of V2 includes a bias resistor R8, decoupled by C6, and the screen is fed directly from the h.t. supply. The output of V2 is coupled to the next stage by a parallel-fed transformer T2, the anode circuit of V2 being connected to the slider of the potentiometer R9 which acts as anode resistor. Thus the anode load and the gain of V2 can be controlled by adjustment of R9. The magnitude of the signal fed to the next stage depends on the setting of R9, which is therefore the *sensitivity* control. This circuit enables the gain of V2 to be varied without appreciably

altering the effective source impedance to which the primary winding of T2 is connected.

The second stage is a double-diode rectifier, type D63 (V3), the anodes of which are connected to the secondary winding of T2. When V3 conducts, the centre tap of the secondary winding goes negative and the negative potential is applied to the grid of V4 via the series resistor R10 and the two shunt components C8, R11. The time constant of C8, R11 is one second, a value suitable for operation of the P.P.M. V4 is a variable-mu pentode, type EF39, the anode current of which passes directly through the programme meter. A series bleed circuit composed of R13 to R16 is connected across the h.t. supply and the cathode of V4 is returned to the slider of R13 and the screen to the slider of R15. The setting of R13 controls the grid bias and hence the anode current of V4; the anode current, in turn, affects the reading of the P.P.M. R13 is adjusted with no signal input to give zero reading on the P.P.M. and is therefore labelled *zero*. The setting of R15 controls the screen potential and the g_m of V4. R15 thus decides the change in anode current for a given increment in grid potential and is adjusted so that a 4-dB change in grid potential gives a movement of 1 scale division on the P.P.M. R15 is thus known as the *law* control but it affects the anode current in addition to the g_m and when it is adjusted the *zero* control requires adjustment as well.

The heaters of V3 and V4 are connected in series and fed from the 12-volt d.c. supply in the transmitter. The heater of V3 consumes 0·3 amp and that of V4 consumes 0·2 amp; a 68-ohm resistor R7 is therefore connected across the heater of V4 to bring the current for both valves up to 0·3 amp.

P.P.M. Calibration

(1) Throw the *Op./Cal.* switch to *Cal.*
(2) Set the *dB* control anywhere between 0 and 30 on the scale. (If the setting of the control is not within these limits, the P.P.M. input circuit is shunted by an unsuitably low value of R5.)
(3) Adjust the P.P.M. reading to zero by means of the *zero* control.
(4) Apply 1-kc/s tone at zero level to the *Cal. P.P.M.* jack. (The 600-ohm loss-pad R17–R19 attenuates the tone level at V2 grid and across output terminals 2 and 3 by 18 dB, thus simulating to within 2 dB the normal test output level to the transmitter of −20 dB.)
(5) Adjust the P.P.M. reading to 4 on the scale by means of the *sensitivity* control.
(6) Check that the meter law is correct by applying tone at levels of −8, 0 and +8 dB. The corresponding meter readings should be 2, 4 and 6 on the scale.
(7) If the law is incorrect, proceed as follows:
  (*a*) If the scale is too cramped, i.e., if the meter reads above 2 and below 6:
    (i) Remove the tone-input plug.
    (ii) Rotate the *zero* control until the meter reads between 0 and 1.
    (iii) Bring the pointer back to zero by means of the *law* control.
    (iv) Repeat operation (6) and continue with the adjustments until the law error is reduced to a minimum.
  (*b*) If the scale is too open, i.e., if the meter reads below 2 and above 6, proceed as in (*a*), except that in test (ii) the meter should be set to read **below** zero in the no-signal condition when adjusting the *zero* control.
(8) Return the *Op./Cal.* switch to *Op.*

General Data

Total Feeds
H.T.—15mA at 300 volts
L.T.—0·6A at 12 volts (d.c.)

Impedances
Normal Source—300Ω (balanced)
Input—300Ω (balanced)
Output—250 kΩ approximately (unbalanced) variable depending on gain setting
Output Load—0·5 MΩ (unbalanced)

Test Data

Gain, 61 dB with +10 *dB key* in and 51 dB with +10 *dB key* out

Normal Test Output Level, −20 dB

Total Percentage Harmonic Content
1% at 16 dB above normal test level

Frequency Characteristic
Within ±0·5 dB from 60 to 8,000 c/s.