PEAK PROGRAMME METER ME12/5

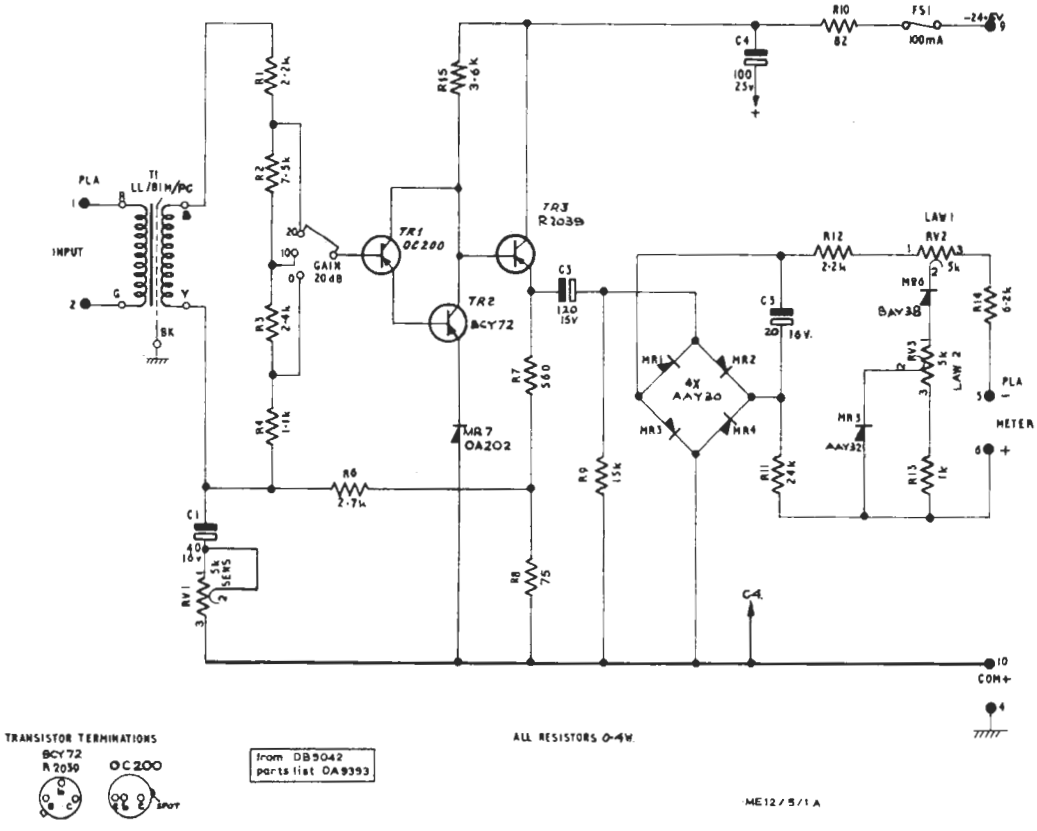

Fig. 1. Circuit of Programme Meter ME12/5

General Description

The ME12/5 is a small and simple peak programme meter amplifier/rectifier employing transistors and has characteristics approximating to those of the standard peak programme meters. It is intended for use, in conjunction with its associated external indicating meter, in applications where the more precise characteristics of the standard instruments are not required.

It has printed wiring and is constructed on a small chassis CH1/19 for plugging into a PN3/25 panel. Its approximate dimensions are 1 in. wide by 3½ in. high by 5¼ in. deep.

Circuit Description (Fig. 1)

Design Basis

The basic principles of operation are similar to those employed in the ME12/4 but the circuit is simplified by using an unbalanced input amplifier instead of a push-pull arrangement, and by omitting the d.c. output amplifier and using a more sensitive indicating meter.

Input Amplifier

Two direct-coupled transistor stages are used to obtain the required amplification. In early models a single transistor was employed for the first stage but this was subsequently changed to a 'super-alpha' pair, as in the ME12/4, to increase the impedance of the first stage and so improve the accuracy of the gain settings.

The first stage is fed from a potential divider across the secondary of the input transformer and the gain can be pre-set to 0, 10 or 20 dB by means of a flying lead. A *Sensitivity* control RV1 in the feedback circuit from TR3 emitter to TR1 base provides fine control of the gain for line-up purposes.

The transistor TR3 is used as an emitter-follower to feed the logarithmic rectifier circuit from a low impedance.

Logarithmic Rectifier

The output signal from the input amplifier is rectified full-wave by the bridge rectifier MR1-MR4 and the resulting unidirectional pulses are applied to a resistance network which includes the rectifiers MR5 and MR6. These two rectifiers behave as non-linear diodes which have a high resistance at low inputs and the voltage developed across each is proportional to the logarithm of the current through it over a wide range.

At an input level to the amplifier of −8 dB, which gives an indication of 2 on the external indicating meter, the resistance of MR5 and MR6 is very high and has almost negligible effect on the current through the meter. At zero level input MR6 passes appreciable current and RV2 is adjusted so that the meter indicates 4. At an input level of +8 dB MR5 also passes appreciable current and RV3 is adjusted to give a meter reading of 6. The meter scale therefore indicates 8 dB between 2 and 4 and a further 8 dB between 4 and 6 giving an approximately logarithmetic scale of 4 dB per division from 2 to 6, the error not exceeding 0·25 dB at 3 and 5 and 0·5 dB at 1.

As severe limiting occurs at a scale reading of about 7, it is difficult to lay down suitable tolerances between 6 and 7, but an increase in input level of 3 dB above that required to indicate 6 should cause the pointer to reach beyond half-way between 6 and 7.

The time constants of the circuit are approximately the same as those of standard peak programme meters, i.e., 2·5 milliseconds for charge and 1 second for discharge, but as the interval between 7 and 1 on the indicating meter is nominally 24 dB and not 26 dB as in earlier peak programme meters employing valves, the pointer fall-back time for a 1-second time constant is 2·77 seconds.

Meter

The associated external indicating meter resembles the normal instrument used with earlier peak programme meters but has a left-hand no-current zero, a full-scale deflection of 100 μA and a resistance of 1,100 ohms. It has a Model-70 case. The scale calibration is given in Table 1.

TABLE 1: METER CALIBRATION*

Position	*Scale Division*	*Current μA*
Left-hand end	Zero Mark	0
	1	9·5
	2	17·5
	3	31·0
	4	47·8
	5	64·0
	6	81·0
	7	96·0
Right-hand end	F.S.D. mark	100·0

Power Supply

The power supply is normally taken from a PS2/9 but any similar source may be used. The total current drawn is 22 mA at 24 volts d.c.

*Note that the meter is intended for mounting on a non-ferrous panel, and its scale calibration may be upset if this is not adhered to.

Test Procedure

The source resistance should be 300 ohms, the gain-adjustment flying lead should be connected to the O-dB tag, and the specified meter should be used.

Adjustment of Sensitivity and Law

Apply 1-kHz tone at a voltage level of —8 dB to the input terminal and adjust the *Sensitivity* control RV1 to give a meter reading of 2.

Increase the input voltage by 8 dB and adjust the *Law 1* control RV2 to give a meter reading of 4.

Increase the input voltage by an additional 8 dB and adjust the *Law 2* control RV3 to give a meter reading of 6.

The controls are to a small degree inter-dependent so the above procedure should be repeated as necessary in order to give meter readings of 2, 4 and 6 at input voltage levels of —8, 0, and +8 dB respectively.

Scale Shape

The remaining meter readings of 1, 3, 5 and 7 should be checked by altering the input level in 4-dB steps. The error should not exceed 0·25 dB at 3 and 5 and 0·5 dB at 1. Severe limiting occurs at about the 7 mark so that an error limit cannot be properly defined but the pointer should read at least half-way between 6 and 7 when the input level is increased 3 dB above that necessary to read 6.

Frequency Response

With zero level input and the frequency varied with constant voltage the meter indication should not change by more than 0·5 dB between 40 Hz and 10 kHz.

Gain Adjustment

With an initial meter reading of 4 with 1-kHz input tone and the gain lead moved successively to 10 dB and to 20 dB a decrease in input level of 10 dB and 20 dB respectively should restore the meter reading to 4 within 0·5 dB.

Time Constants

The time constants should be checked with the standard procedures.

On the rise-time test the meter pointer should flick to not less than 3 dB below the 4 mark.

The meter pointer should fall from 7 to 1 in not less than 2 seconds. Note that the interval between 7 and 1 is 24 dB and the fall-back time for a 1-second time constant is therefore 2·77 seconds.

Input Impedance

The input impedance, checked by a simple substitution method, should be 12 ±1·5 kilohms at 1 kHz.

Obsolescence of Diodes and Transistors

Since this programme meter was first put into service some of the semiconductors originally used in the circuit have become unobtainable or have been changed in type for other reasons. Semiconductors fitted in the past have been:

MR1, MR2, MR3 and MR4 ..	OA10
MR5	OA10
MR6	SX640
TR2	R2039, ACY17, 2G385, GET104
TR3	ACY17, 2G385, GET104

The diodes in this list are not direct equivalents of the now employed types and therefore when it is necessary to replace a faulty diode on one of the early units the entire set of diodes must be replaced by the new types given in Fig. 1. TR2 and TR3 need only be replaced if individually faulty.

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