michael cox electronics limited

T E C H N I C A L

I N F O R M A T I O N

RUMBLE METER TYPE 218

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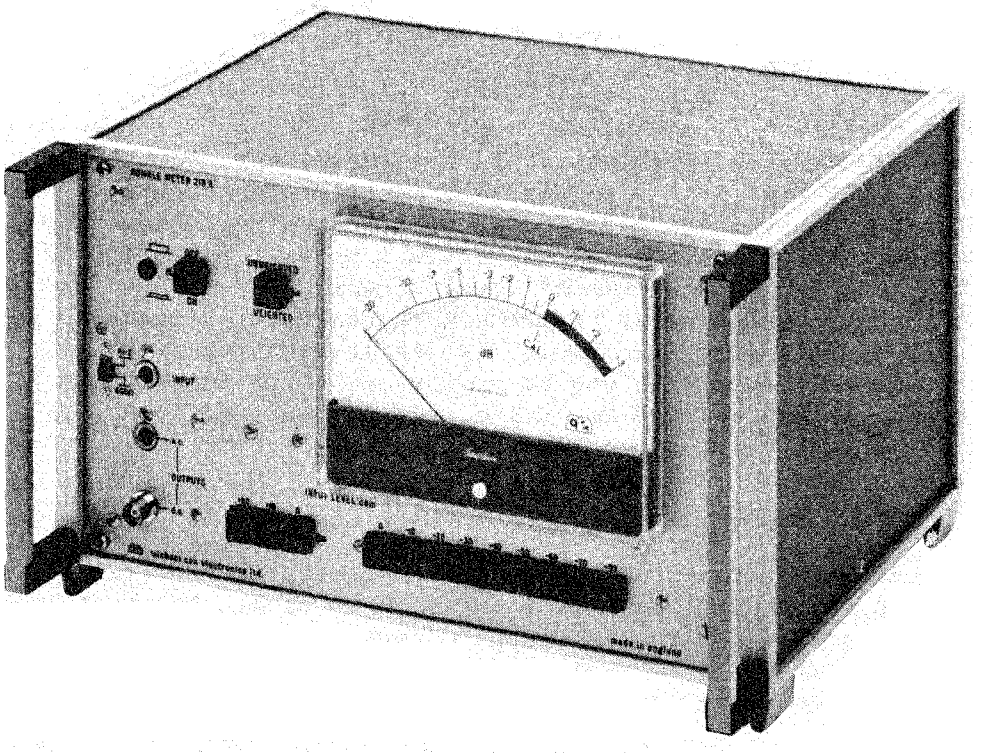


RUMBLE METER TYPE 218B, 218DN

The expression of meaningful disc turntable rumble figures if often made difficult without reference to a known standard method of measurement. The advent of BS4852 in the UK and DIN 45-549 in Germany, have done much to alleviate this difficulty. The DIN standard is substantially in accordance with earlier NAB standard. In order to prevent record hiss and clicks from influencing the results, both standards provide for an upper frequency limit of 315Hz and 12dB/octave (40dB/decade) rolloff above that frequency. The measurement of unweighted rumble is performed with a flat frequency response of 10Hz to 315Hz (graph 1).

In order to assess the subjective annoyance value of the rumble signal, a weighting network designed to approximate the ear's sensitivity to low frequencies is used. This filter has a rolloff at 12dB(octave (40dB/decade) below 315Hz (graph 2). The difference between the BSI and DIN standard is centred on the indicating instrument. The BSI specification calls for a meter with a very long integrating time, whilst the DIN standard employs a V.U.meter to the ASA standard. The Michael Cox Electronics Rumble meter type 218 is available in either BSI and DIN/NAB versions designated 218B and 218DN respectively.

The 218 features a balanced floating input of either bridging or 600Ω impedance, and a blanced floating output for listen purposes. The 218B has an auxiliary dc output of the same time constant as the meter for connecting pen recorders, etc. The corresponding output of the 218DN is parallel to the listen output but unbalanced. The measuring range is from an input of +20dBm to -80dBm and power is from 115-240 mains (50-60Hz). Rechargeable Battery/Mains operation is available as an option.

Connectors are P.O.Jacks for input and listen output, BNC for auxiliary output. Mains connection to BS4491 specification.

The instrument is housed in a free standing case, carrying handles being provided which also serve to protect the controls and meter from accidental collision damage.

The method of operation is as follows:- Place the appropriate test record on the disc reproducer and play the 315Hz reference tone from the test record. Adjust the disc unit's replay gain control such that the rumble meter indicates 0dBm. Select either weighted or unweighted measurement. Allowing the disc reproducer to run on to the unmodulated section of the record, press the input level buttons until a convenient indication ensues on the meter. Reading the meter indication in conjunction with the push buttons results in a figure for rumble. It is suggested that the listen facility is used to ensure that one is really measuring rumble, and not hum or other noises not related to rumble. In the case of 218B, the dc output can be used to drive a pen recorder directly.

Service

To remove the Rumble meter from its' case, remove the four outermost cross-headed screws and slide the whole unit out of the case. The unit can be safely operated in this way as all mains connections are well insulated. Caution should nevertheless be exercised in the event of any mains connections having become exposed due to excessively rough handling.

Input Amplifier and Attenuator (Drwg no.C2184A4)

The input amplifier is a conventional unity gain Class B push-pull amplifier. The only setting up required should any semiconductors be changed is that of setting the quiescent current. A meter capable of measuring 5mA is inserted in place of the shorting link. The skeleton preset R5 is adjusted such that 2.5 $\pm$0.5mA flows through the meter. The meter is removed and the shorting link replaced.

To set up the attenuator, feed a signal of 315Hz at +10dBm into the input. Select +10dBm and adjust the 10dB attenuator multiturn preset R9 such that a level of 0dBm appears at the output pins of the amplifier/attenuator board. Similarly, the 20dBm attenuator preset R10 is adjusted with an input level of +20dBm and the selector at +20, such that again the output of the board is 0dBm.

Filter (Drwg no.C2185A4)

The filter gives the required frequency response for the weighted and unweighted cases. IC1 is used to provide gain such that for the 218B at 315Hz the filter is a unity gain device for both the weighted and unweighted cases, and for 218DN it has 4dB gain for the UW and W cases. No adjustments are required or possible on the filters. The filters are completely separate for the two cases, the requisite switching being performed by the front panel switch.

0-80dB Amplifier (Drwg no.C2186A4)

The amplifier comprises two cascaded stages, each capable of 40dB of gain. Each stage comprises an op.amp.feedback amplifier, the amount of feedback determining the gain. No setting up of the op.amps is required. To adjust the gain settings, proceed as follows:-

Feed in an input signal of frequency 315Hz and level corresponding to that selected on the front panel push buttons. Adjust the relevant multiturn preset such that the output of the amplifier board is 0dBm (or +4dBm for the 218DN). Proceed in this way until all presets are correct. Note that there is no interaction between controls so need arises to repeat any adjustments.

Due to the very high gains available from this circuit, it is essential that power supply decoupling be of a very high order. To this end, the power supply for the op.amps comes through emitter follower regulators S1, S3.

Meter Driver (218B only) (Drwg no.C2187A4)

The ac signal from the 80dB amplifier is rectified by the ac to dc converter, formed by IC1, IC2. The mode of operation of this circuit is as follows: IC1 acts as an active half wave rectifier. The op.amp. serves to linearise the characteristic of the diodes, and the result is to effectively have 'perfect' diodes, but with a reverse in phase and a gain of 2. (Fig.1).

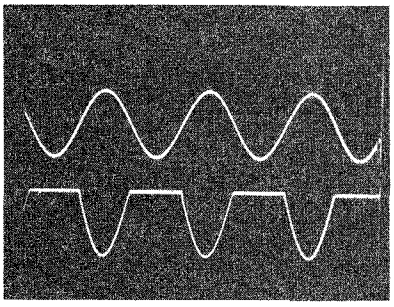


Fig.1

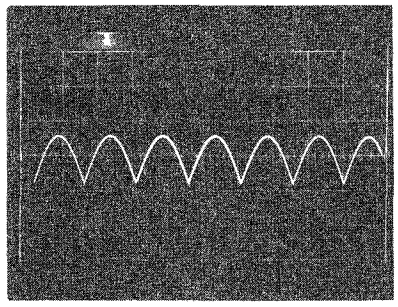


Fig.2.

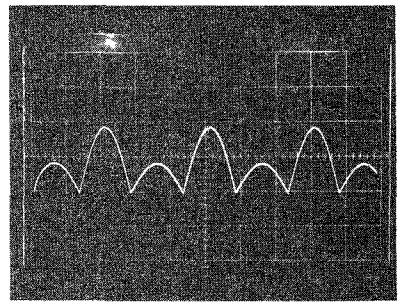


Fig.3

The top and bottom traces of Fig.1 which represent the waveforms present at points A and B respectively are summed by IC2 to give Fig.2. This is easily recognised as a full wave rectified signal and represents the waveform at point C. The symmetry of the wave can be adjusted by means of the ripple preset. This should be adjusted for perfect symmetry between the two half cycles. Fig.3 shows the result of an incorrect setting of this preset.

The raw dc derived from IC1 and IC2 is smoothed by R9 and C1, the time constant of which is that required by British Standards for the Rumble indicating instrument.

The moving coil indicator M1 is driven by the out of balance current of the emitter coupled pair S3, S4. To set up this portion of the circuit proceed as follows:- With no input signal to the unit, adjust the 'zero' preset such that the meter indicates zero deflection. Feed a level of 0dBm at 315Hz into the unit. The input level buttons must be at 0dBm. Adjust the CAL preset such that the meter indicates 0dBm. The dc output buffer used in the 218B is an op.amp. with 100% feedback. No setting up is necessary. Note that the time constant of the dc output is the same as the indicating meter.

VU Meter Adjustment for Type 218DN

With 0dBm at 315Hz input to the Rumble meter, and the selector push buttons at 0dBm, adjust the preset on the rear of the VU meter such that the meter indicates 0VU.

AC Output Driver Card (Drwg no.C2188A4)

The output driver is of identical circuit to the input buffer with the exception that no attenuator is fitted and ac coupling of the input is used. To set up the quiescent current follow the same procedure as for the input buffer. The output impedance at the listen jack is low ($<75\Omega$) and the output is balanced, floating.

5. Power Supply

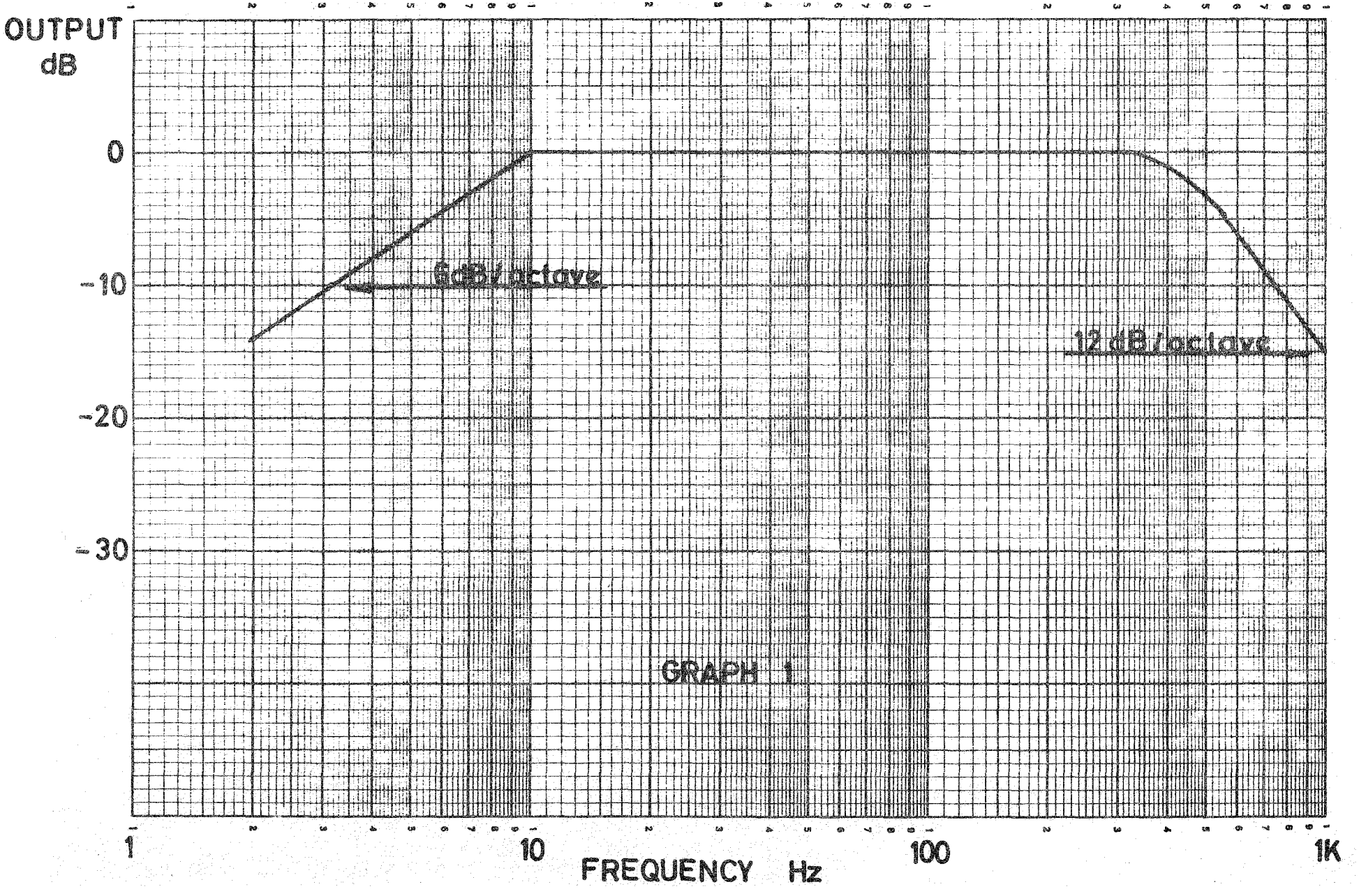
The Power Supply is a modification of our standard 156 supply. The voltage has been raised from ±9V to ±15V. The mains transformer has been removed from the board and placed in the rear of the rack in order that hum be kept to a minimum. Note that this supply and the 156 are not interchangeable although no harm will result if they are incorrectly inserted in a rack since different edge connections are used.

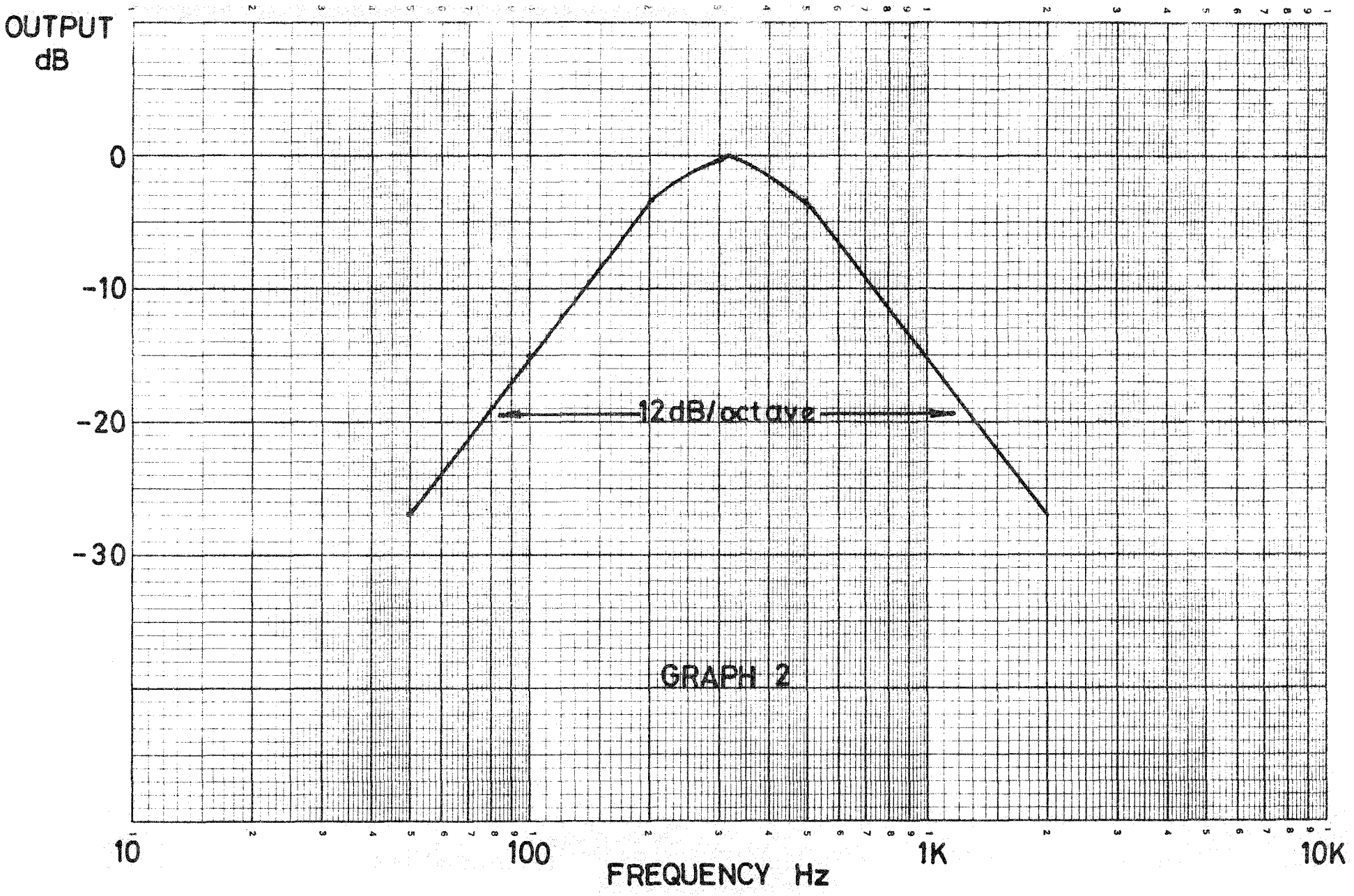
The module uses a conventional bridge rectifier (S1-4) and reservoir capacitor, and this relatively raw dc is fed to the series regulator transistors S8, S9. This raw dc is smoothed by a RC filter and zener diode for the regulator amplifier. The regulator amplifier follows conventional practice, with a differential amplifier (IC1) comparing a fraction of the output with a reference. In this module, the reference voltage is derived from a zener diode (S7) fed a constant current, derived from a field effect transistor with source degeneration. The regulator gives an output of 30 volts. Current limiting is provided by S10. The load current flows through R8 and develops a voltage. As soon as this overcomes the reverse bias on S10 set by the current limit control VR1, the transistor conducts and sinks current from IC1, preventing further increase in output current.

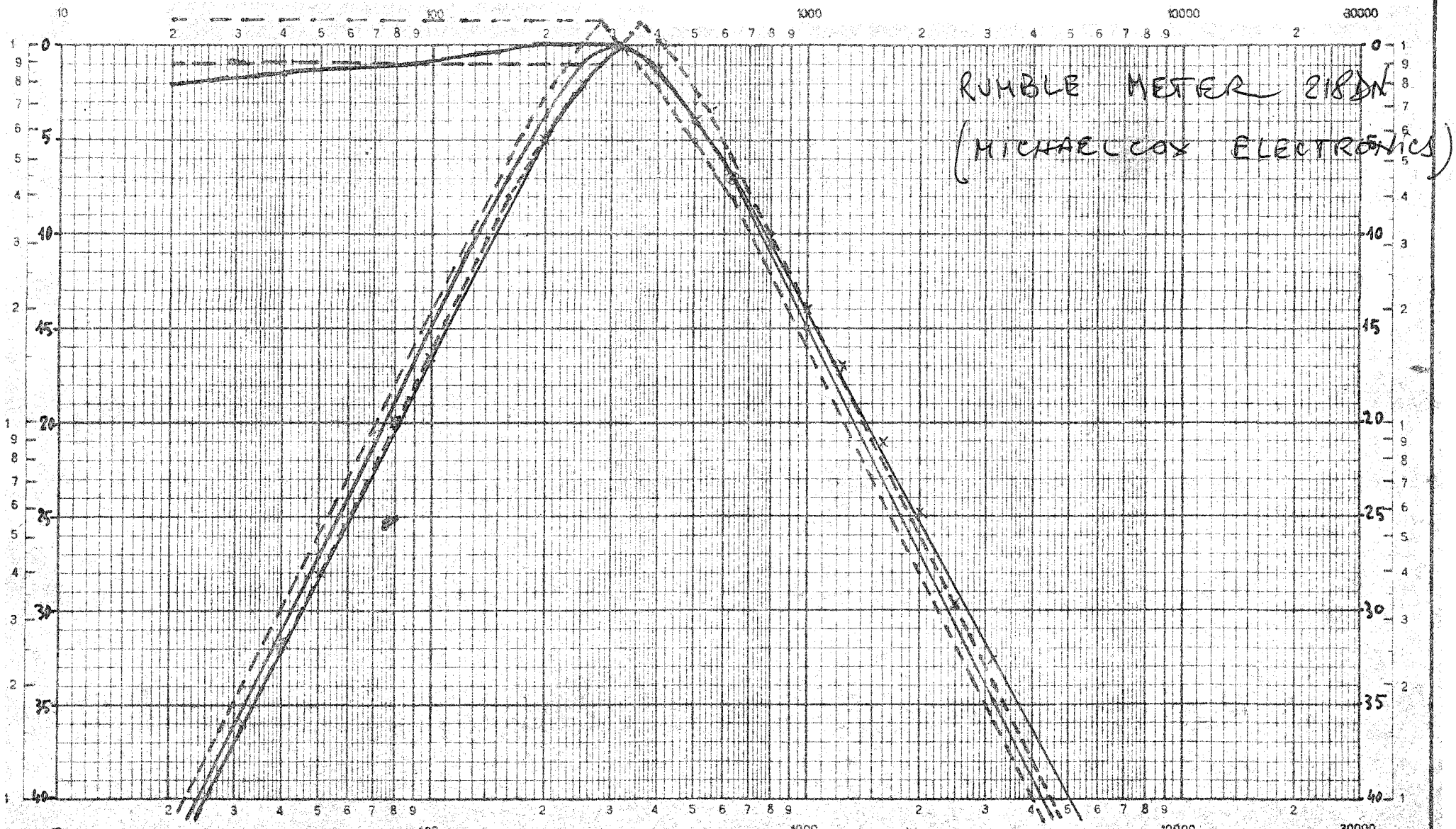
In order to produce + and -15 volts, it is necessary to split the 30 volt supply. This module will be used in the main with equipment in which the load is substantially balanced. Accordingly, the pseudo earth rail is designed to accept out of balance loads to just over 100mA; and uses relatively low power transistors.

The splitter works by comparing the mid point of the overall voltage (30 volts) with the earth rail voltage. The operational amplifier (IC2) amplifies any difference and drives the complementary Class B output stage S14, 15 accordingly. Collector resistors protect the transistors against short circuit of either rail to earth.

The module is factory set to 30 volts. It should not require resetting unless S6 or S7 have been changed. If it should prove necessary to adjust, VR4 should be adjusted to give 30V±0.2V. This in turn should be split within 1% by the output splitter.

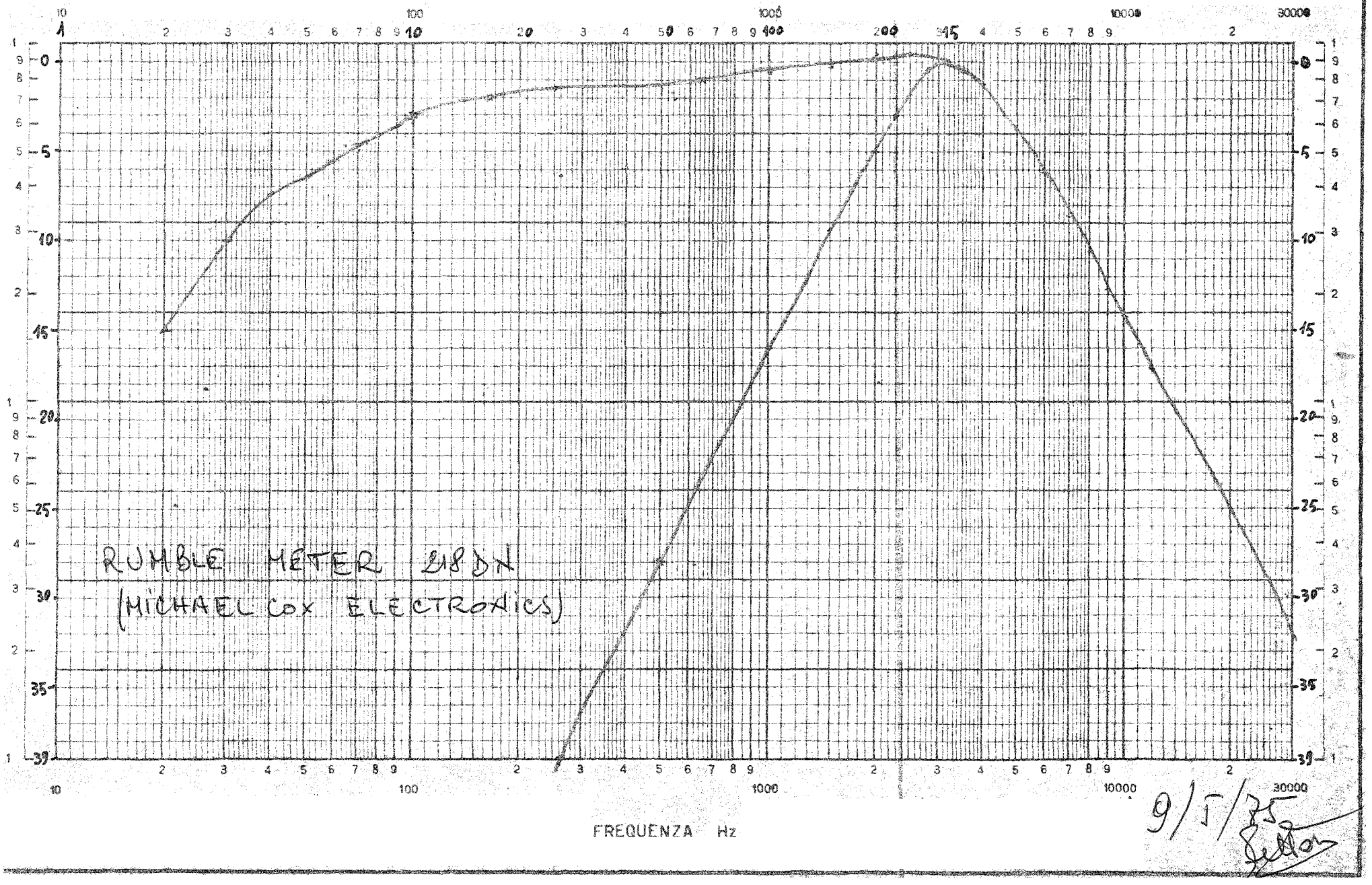

OUTPUT
dB
0
-10
-20
-30
6dB/octave
12 dB/octave
GRAPH 1
1
10
100
1K
FREQUENCY Hz

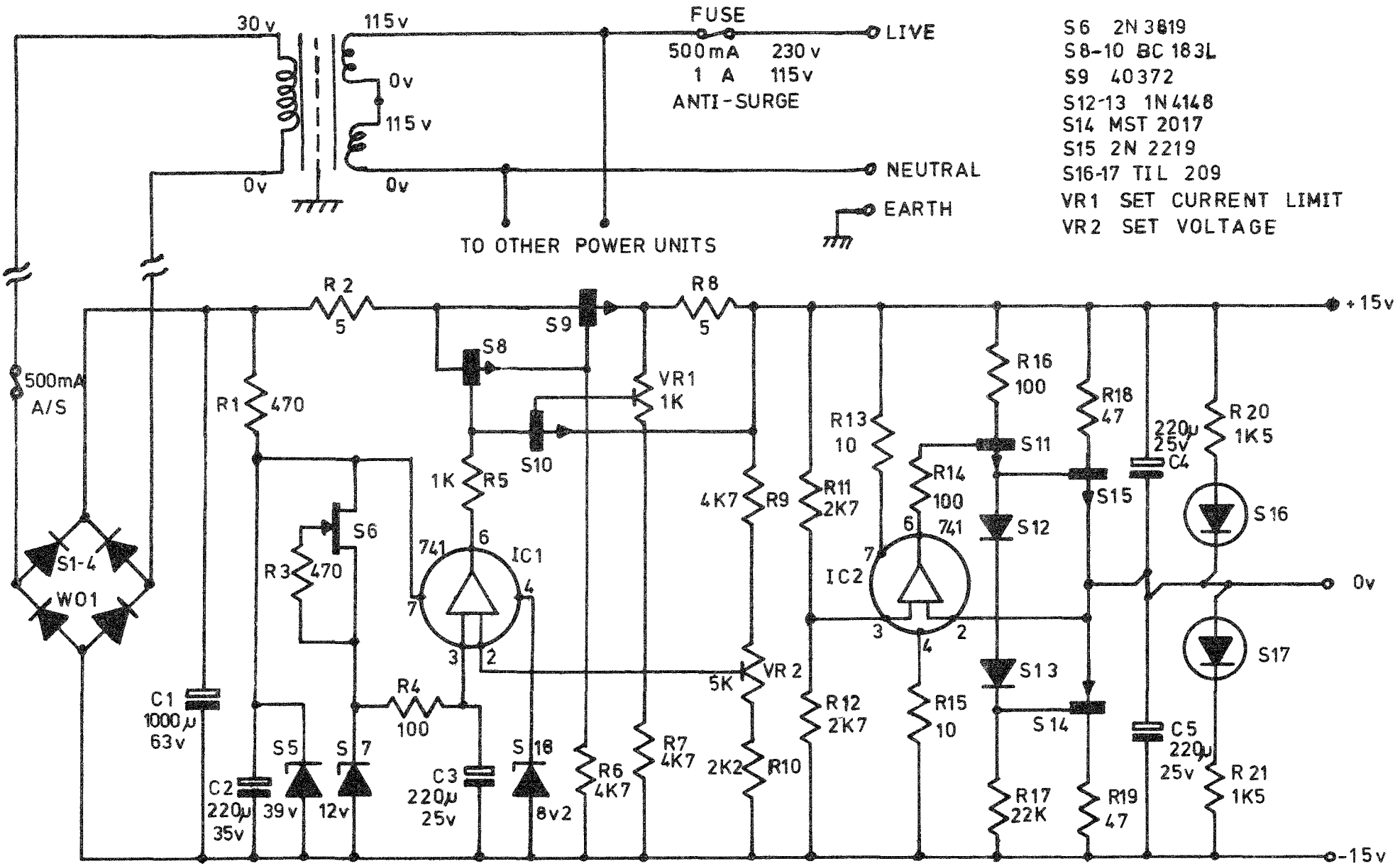

OUTPUT
dB
0
-10
-20
-30
12 dB/octave
GRAPH 2
10
100
1K
10K
FREQUENCY Hz



CURVE DIN 45539 sono le tratteggiate e la continua compresa nel tratteggio

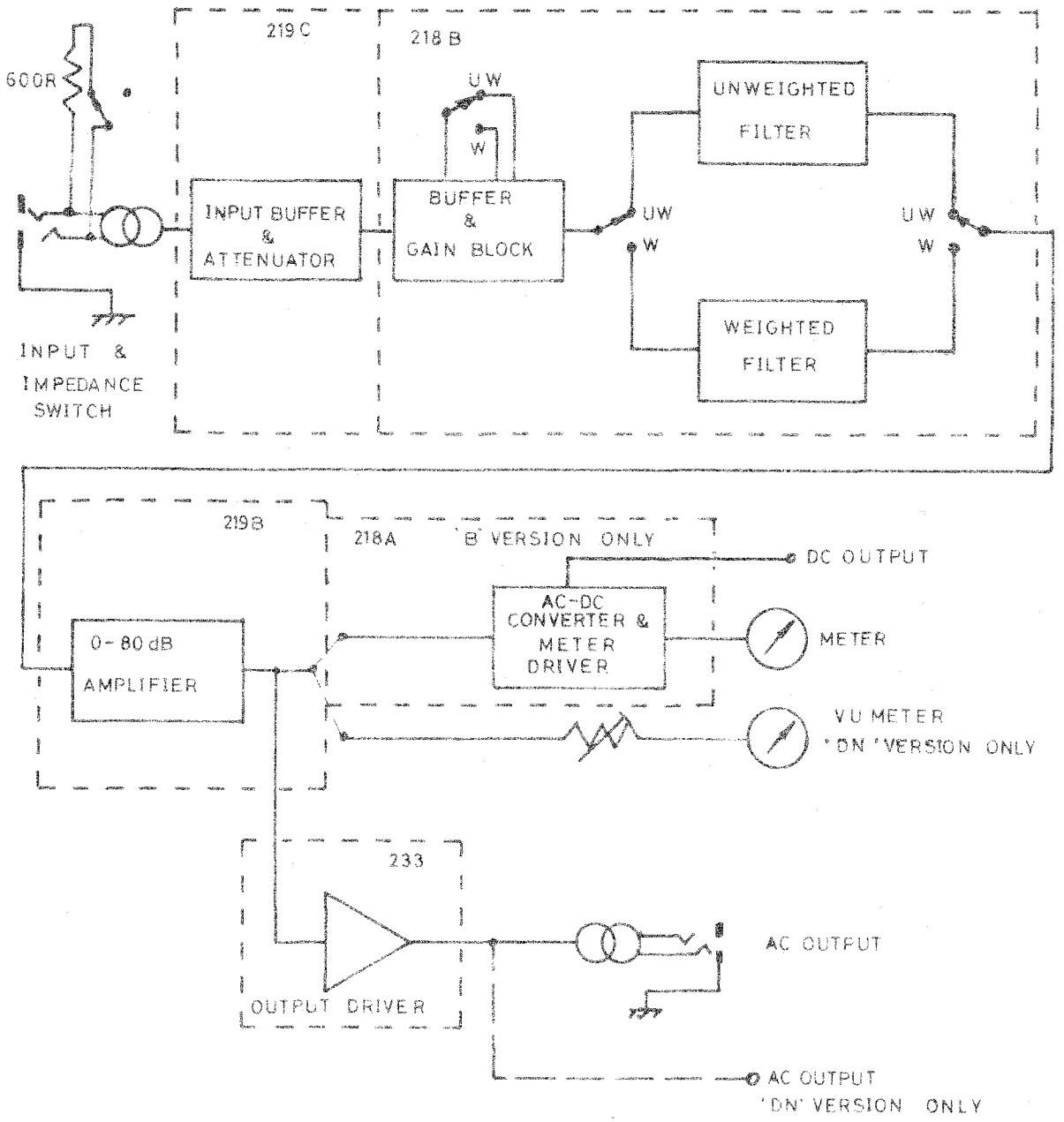
9/5/75


RUMBLE METER 218 DN
(MICHAEL COX ELECTRONICS)
FREQUENZA Hz
9/5/75



216 POWER UNIT

THIRD ANGLE PROJECTION.

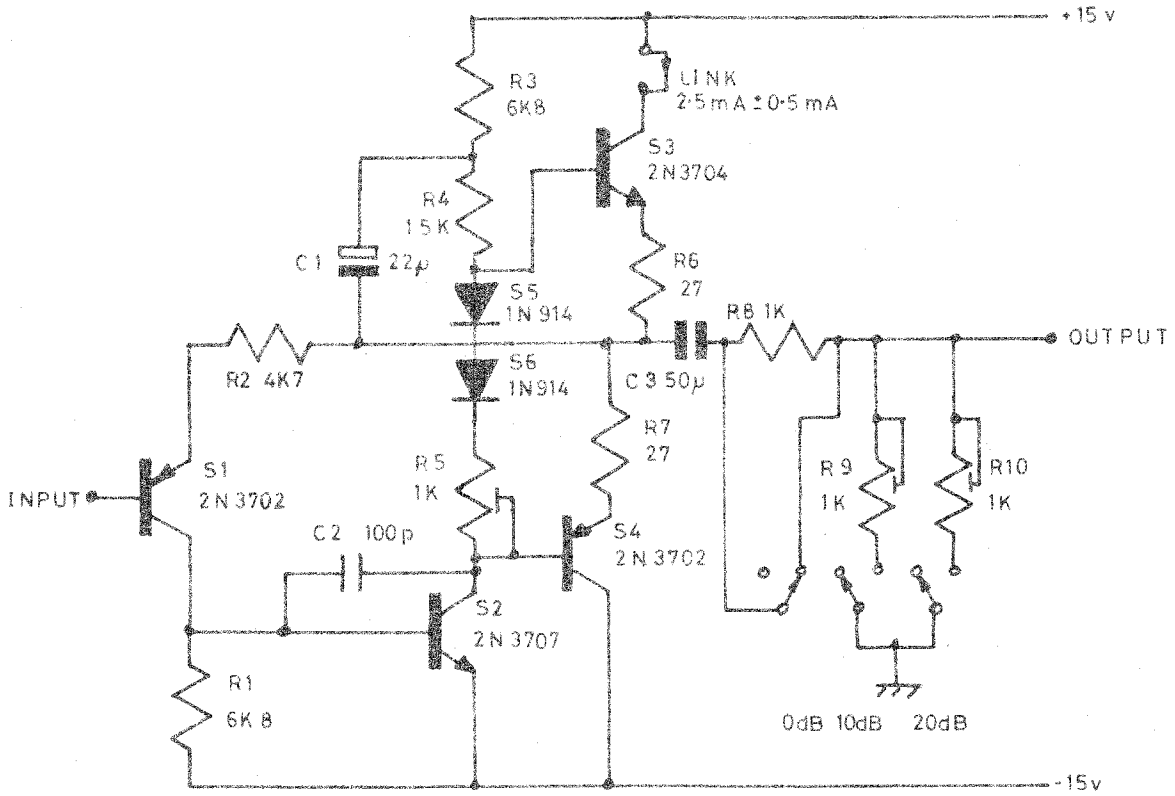


DIMS. IN M/M

MICHAEL COX ELECTRONICS LTD. ENGLAND

MATERIAL	TITLE RUMBLE METER 218 BLOCK SCHEMATIC
FINISH	SCALE — DRN SDA DATE 15-11-74 ISSUE Nº 1 DRG. Nº C 2183 A4

THIRD ANGLE PROJECTION.

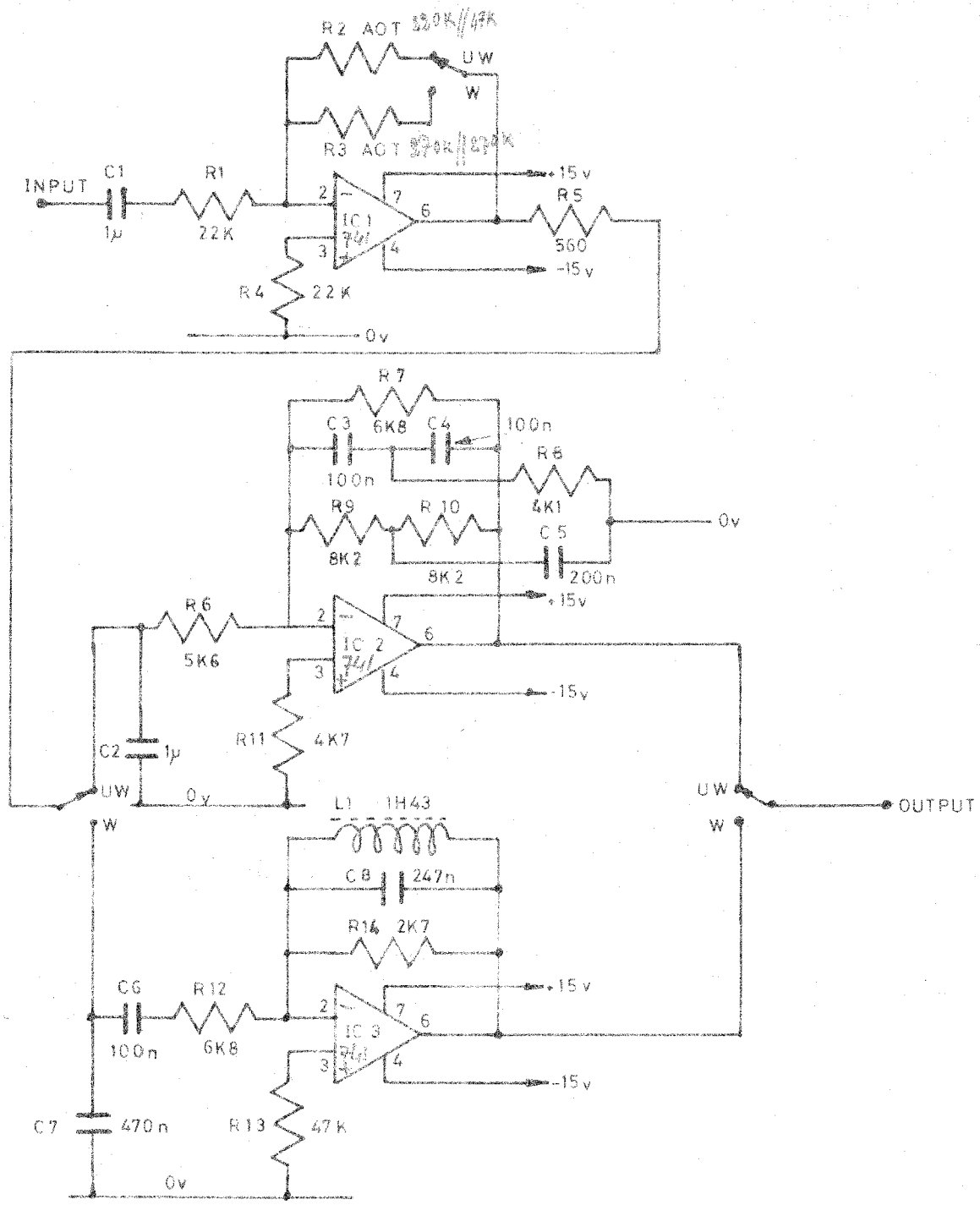


DIMS. IN M/M

MICHAEL COX ELECTRONICS LTD. ENGLAND

MATERIAL	TITLE INPUT BUFFER & ATTENUATOR 219C
FINISH	SCALE | DRN SDA | DATE 15-11-74 ISSUE Nº 1 DRG. Nº C 2184 | A4

THIRD ANGLE PROJECTION.



DIMS. IN M/M

MICHAEL COX ELECTRONICS LTD ENGLAND

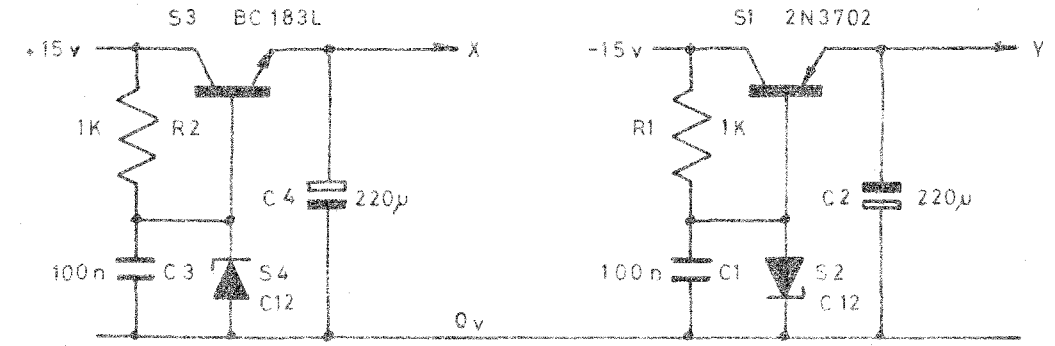
ALL ICS 741

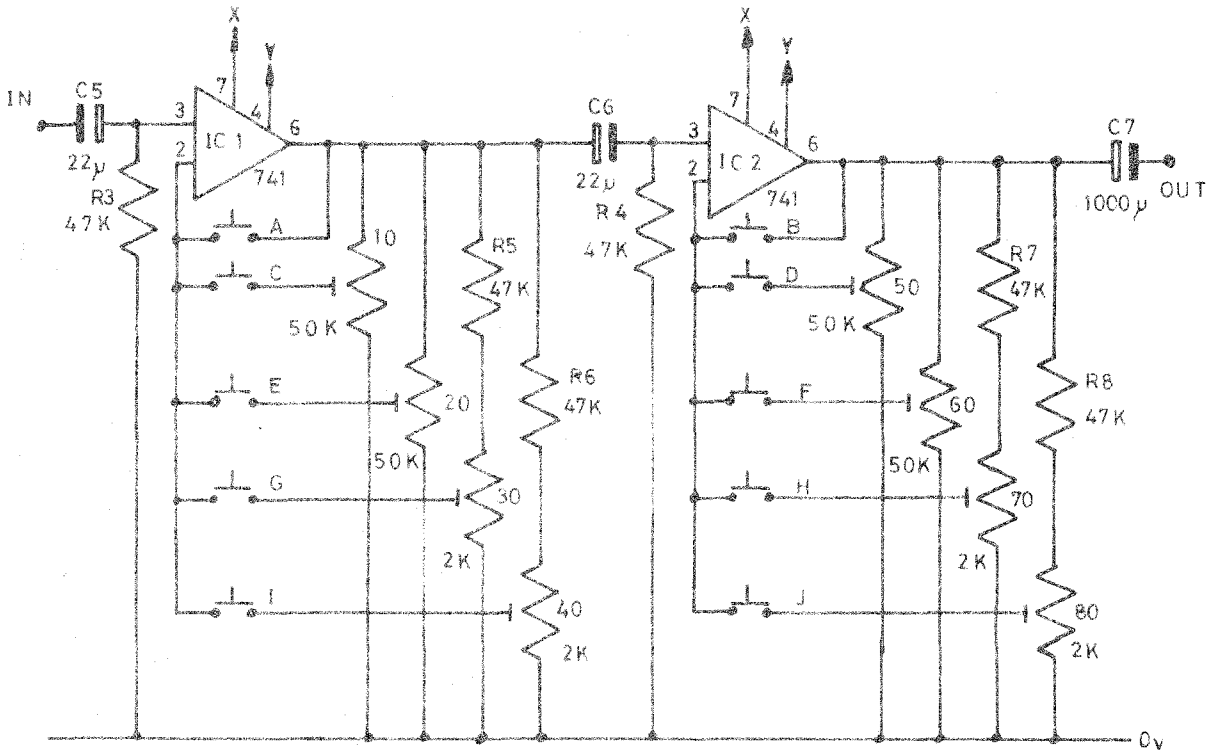
TITLE
RUMBLE FILTERS
218 B

FINISH

SCALE		DRN	SDA	DATE	18-11-74
ISSUE Nº	1				
DRG. Nº		C 2185			A4

THIRD ANGLE PROJECTION.





DIMS. IN M/M

MICHAEL COX ELECTRONICS LTD. ENGLAND

SWITCH SEQUENCE

GAIN dB	SWITCHES CLOSED	
0	A	B
10	C	B
20	E	B
30	G	B
40	I	B
50	I	D
60	I	F
70	I	H
80	I	J

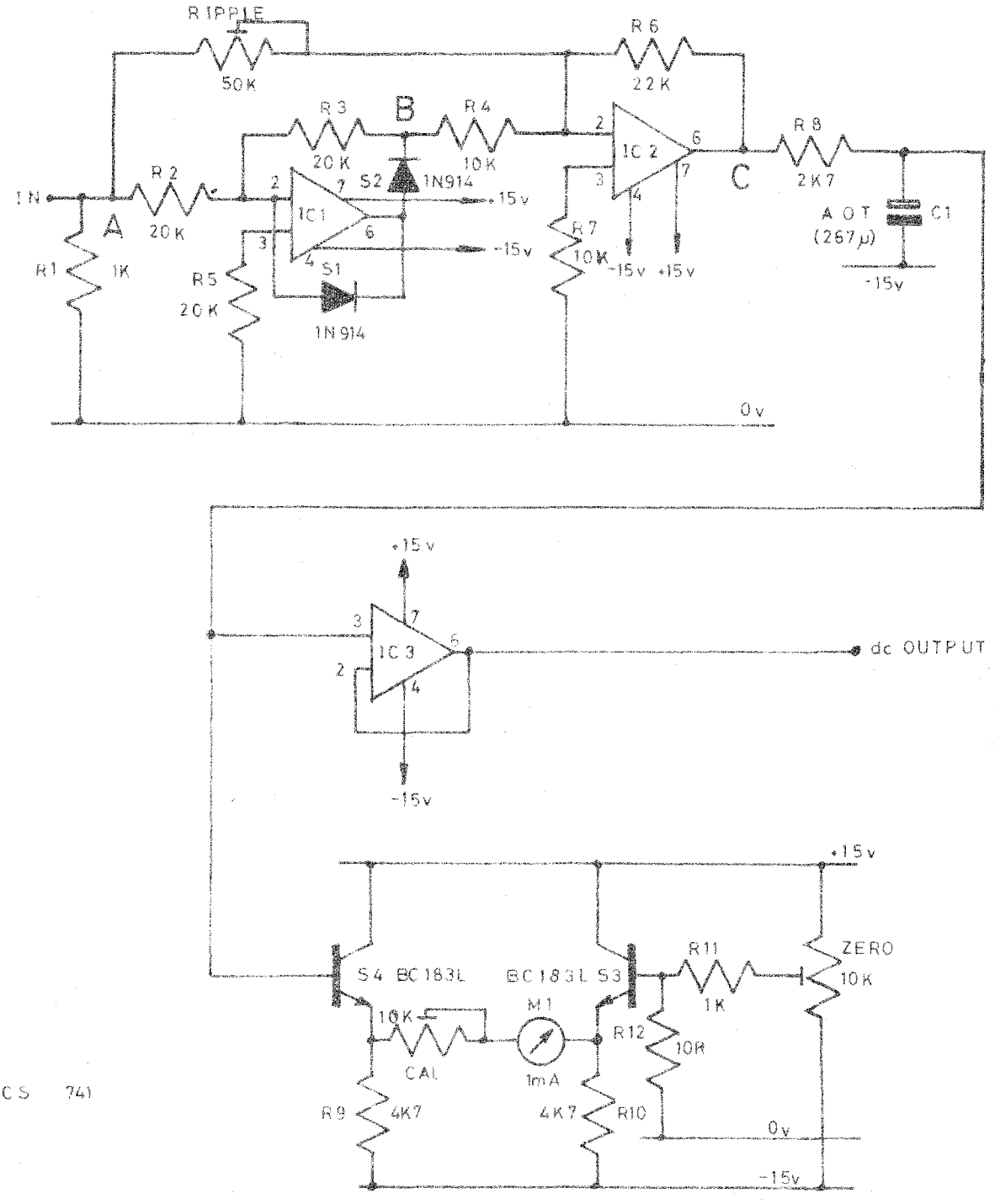
TITLE

0-80dB AMPLIFIER

219 B

SCALE		DRN	SDA	DATE	18-11-74
ISSUE Nº	1				
DRG. Nº	C 2186				A4

THIRD ANGLE PROJECTION.



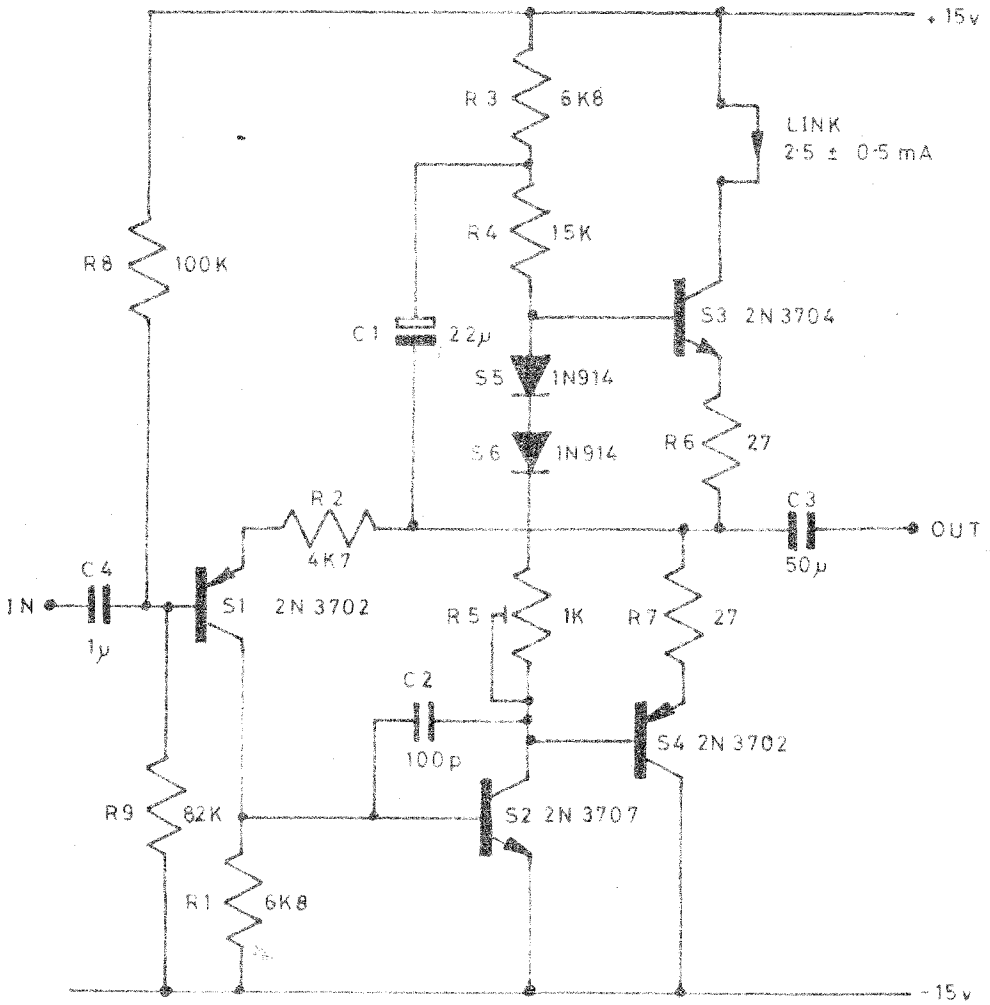
ALL ICS 741

DIMS. IN M/M

MICHAEL COX ELECTRONICS LTD. ENGLAND

MATERIAL	TITLE: AC TO DC CONVERTER & METER DRIVER 218A
FINISH	SCALE: DRN: SDA: DATE: 19-11-74
	ISSUE Nº: 1
	DRG. Nº: C 2187 A4

THIRD ANGLE PROJECTION.



DIMS. IN M/M

MICHAEL COX ELECTRONICS LTD. ENGLAND

MATERIAL	TITLE: OUTPUT DRIVER 233
FINISH	SCALE · DRN · SDA · DATE 19-11-74
	ISSUE Nº 1
	DRG. Nº C 2188 A4