NOISE MEASURING METER ME1/504

Introduction

This instrument measures noise in 75-ohm video circuits in the absence of a signal[1] and expresses the result as the ratio of a standard (0·7 V p-p) video signal to the r.m.s. value of the measured noise. The noise is measured by adjusting a meter to half-scale deflection by means of calibrated attenuators and the attenuator settings give the signal-to-noise ratio directly. The range of the instrument is 20 dB to 85 dB.

If the measurement is taken at a point in the circuit where the normal signal level is not standard then the measurement obtained must be corrected. A feed of the noise being measured is provided (at about 0·7 volts p-p) and this can be fed to an oscilloscope if it is required to examine the noise for patterning or other coherent features.

The calibration of the instrument can be checked by means of an internal calibration oscillator.

The filters and shaping networks contained in the ME1/504 are brought into circuit, in various combinations, by means of three switches located on the front panel of the unit. The facilities provided by these switches are listed below.

Switch SA	*Switch SC*	*Switch SE*
Full Band	5 MHz L.P.	Colour Weighting
10 kHz H.P.	3 MHz L.P.	405-line Weighting
10 kHz L.P.	No Filter	625-line Weighting
Calibrate		No Filter
		Calibrate

The other controls located on the front panel of the instrument are three attenuator controls and a meter *Set Gain* control.

A simplified block diagram of the instrument is given in Fig. 1.

The instrument is constructed on a modified CH1/12C chassis with index peg positions 6 and 38. Power supplies at +12 volts and −12 volts are required[2]. The instrument will operate satisfactorily at temperatures between 5 °C and 45 °C.

Circuit Description

The circuit diagram is given in Fig. 2.

Signal Path

The noise signal from the circuit under test is applied, via a 12-MHz low-pass filter, to switch SA. From SA the signal is routed, either directly or via one of two filter networks, to amplifier no. 1; alternatively SA can be used to select the output of the calibrating oscillator for application to the amplifier. The signal is applied to amplifier no. 1 via the contacts of relay RLA. When these are in the operated condition a 20-dB pad (which forms part of the attenuator described below) is connected in the signal path.

The output of the amplifier is applied to switch SB, which controls the setting of an attenuator giving up to 50 dB of attenuation in 10-dB steps. The gain of the unit is such that this corresponds to signal-to-noise ratios of 20 dB to 70 dB. The attenuation provided consists of a 10-dB pad and two 20-dB pads; one of the 20-dB pads is brought into circuit by the operation of relay RLA and is located at the input to amplifier no. 1. The attenuator output is applied to switch SC and from there it is routed, either directly or through one of two filter networks, to amplifier no. 2.

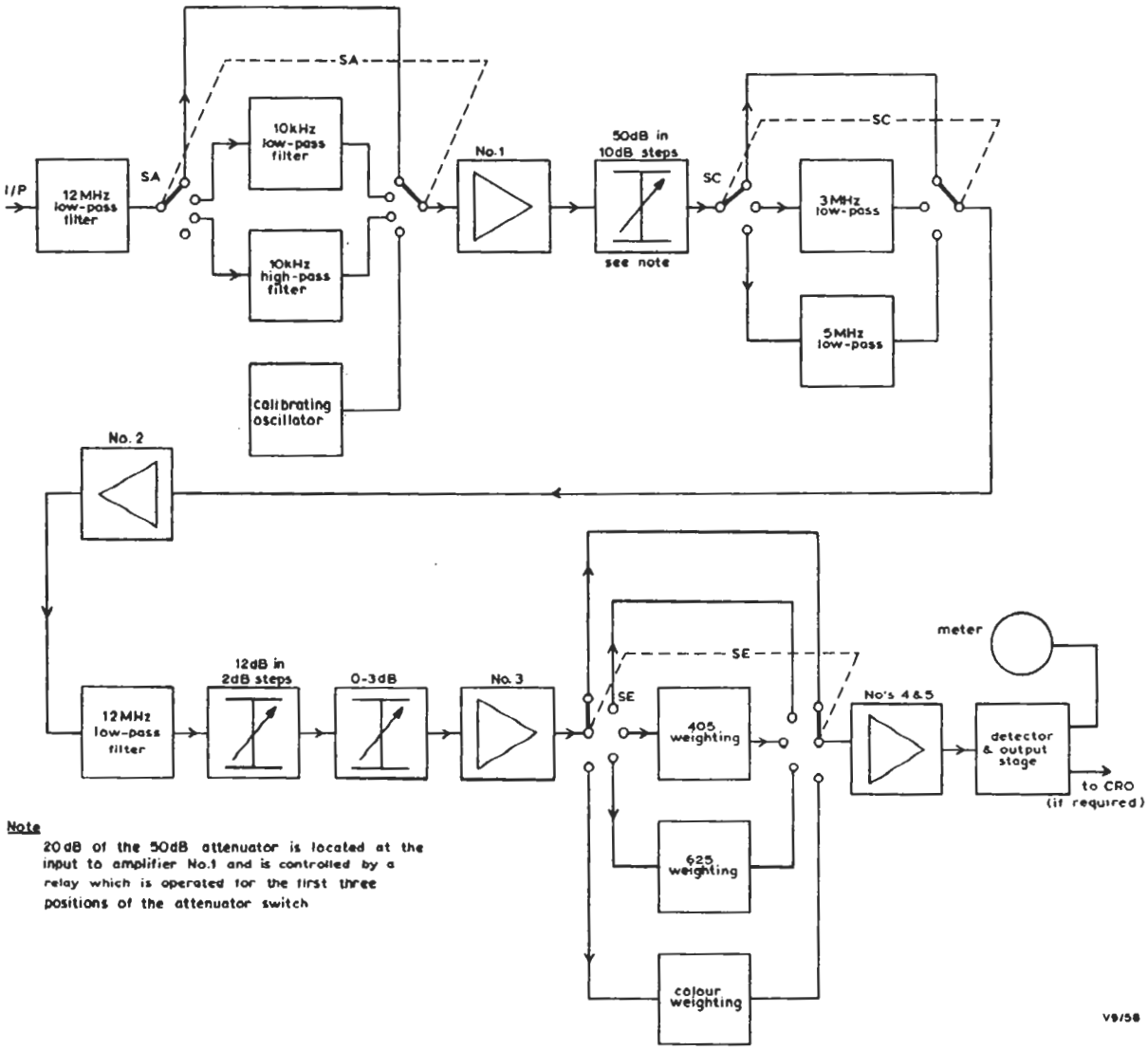
Amplifier no. 2 feeds the signal via a 12-MHz low-pass filter to switch SD; this switch controls the setting of an attenuator which gives up to 12 dB of attenuation in 2-dB steps. The output of this attenuator is applied, via a continuously-variable 0 – 3 dB attenuator, to amplifier no. 3.

From amplifier no. 3 the signal is fed to switch SE and from there it is routed, either directly or through one of three *weighting* networks[3,4], to cascade-connected amplifiers 4 and 5. The output of amplifier no. 5 is fed to the output-and-detector stage.

Amplifiers

Only one amplifier (no. 1) is shown in detail in the circuit diagram. All the amplifiers have the same circuit configuration but amplifiers 2, 3 and 4 have different component values which are shown in the circuit diagram.

The three-stage amplifier consists of an emitter-follower, a common-base amplifier and an emitter-



Note

20dB of the 50dB attenuator is located at the input to amplifier No.1 and is controlled by a relay which is operated for the first three positions of the attenuator switch

Fig. 1 Simplified Block Diagram of the ME1/504

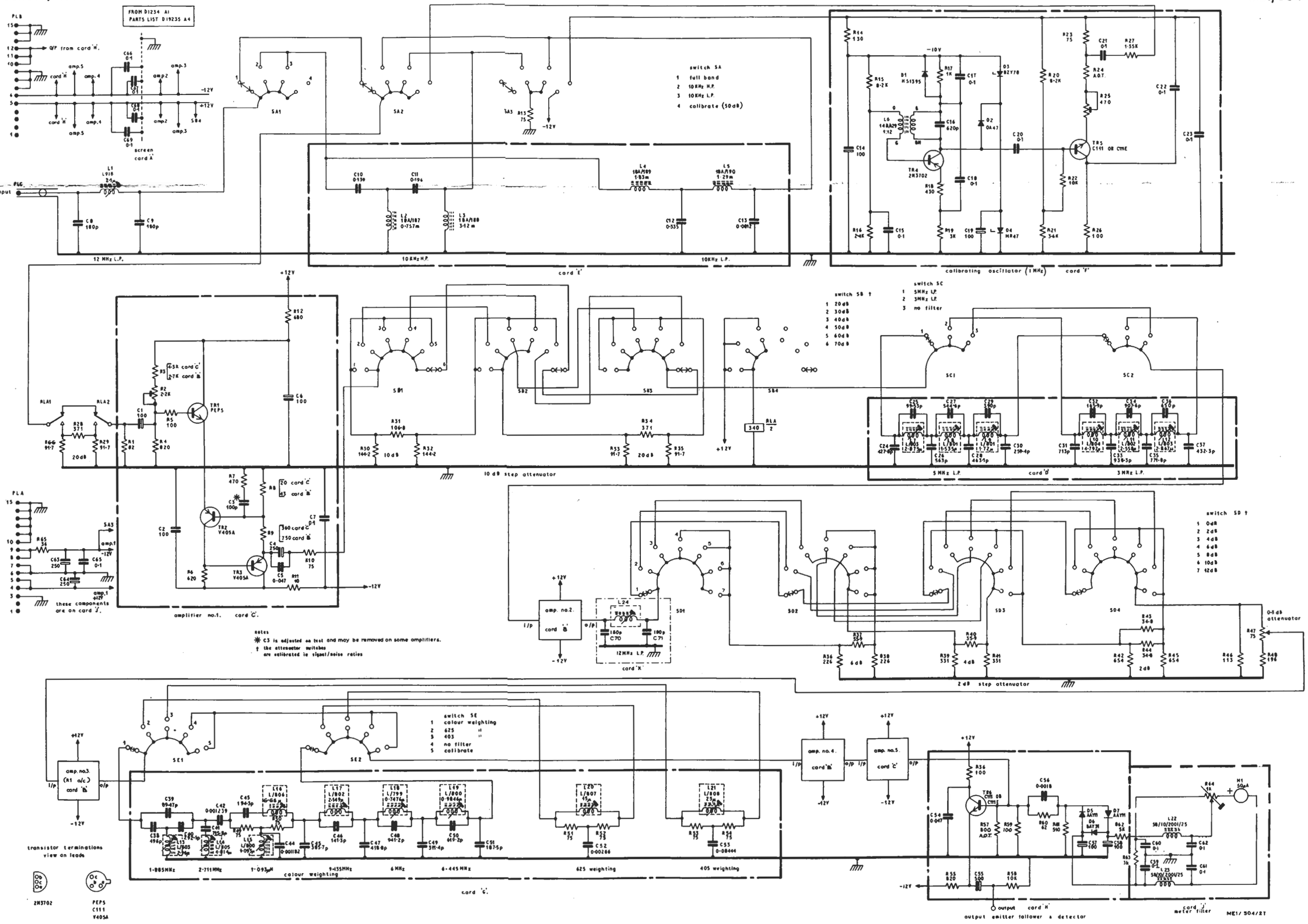


Fig.2. Circuit of the Noise Measuring Meter ME1/504

follower output stage. Negative-feedback is applied over the last two stages. Capacitor C3, which shunts the feedback path, is adjusted on test to compensate for variations in transistor parameters.

Detector and Output Stage

Diodes D5 and D7 rectify the negative-going and positive-going portions, respectively, of the noise signal. The rectified outputs of the diodes are then fed, via identical filter circuits, to the indication meter M1. Diode D6, connected between D5 and D7, is a temperature-compensation device. Resistor R64 is the *Set Gain* control.

An output of the noise being measured is taken from emitter-follower TR6 and fed to the *Noise Output* connector at the rear of the instrument. This output is for use with an oscilloscope, if required.

Calibrating Oscillator

Transistor TR4 functions as an L-C oscillator with an operating frequency of 1 MHz. The collector is coupled, via D2, to the junction of zener diodes D3 and D4 and this point is held at a potential of −4·7 volts. When the collector potential falls below this value diode D2 conducts and limits the amplitude of the positive-going oscillations. Diode D1 and resistor R17, connected between the upper end of the tuned circuit and the −10 volt line, compensate for temperature variations in D2. The action of diodes D2 and D3 stabilises the oscillator output and so the signal applied to TR5 has a constant amplitude. The output of emitter-follower TR5 is fed to the signal path via switch SA2. Control of gain is provided by adjustment of R25.

References

1. Noise Measuring Set, ME1M/503.
2. Stabilised Power Supplier PS2/13F.
3. Colour Noise Weighting Network NE1/503.
4. Designs Department Technical Memorandum 11.35 (67), C.C.I.R. Recommendations 451: Requirements for the Transmission of Television Signals over Long Distances.

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