COLOUR SIGNAL ANALYSER UN1/541

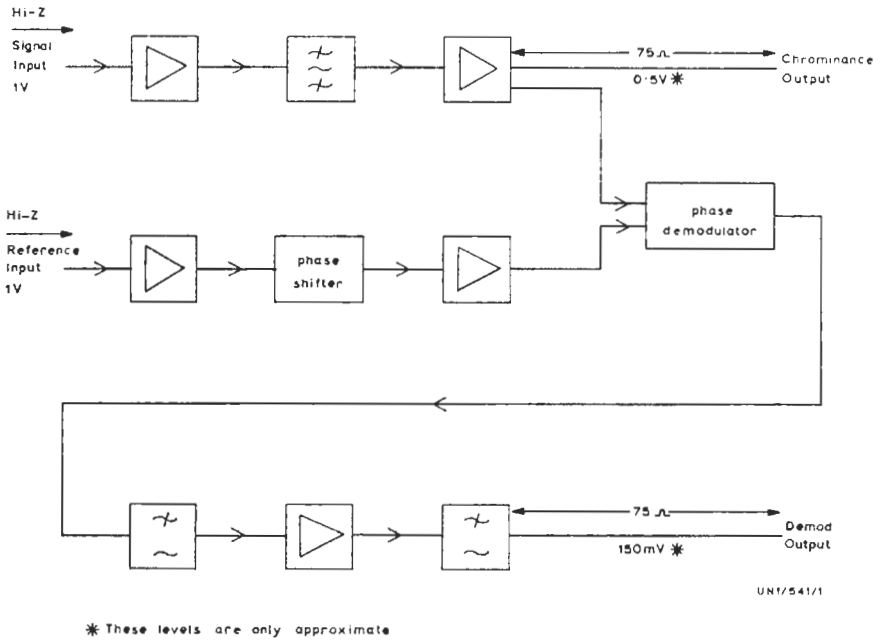


Fig. 1 Simplified Block Diagram of the UN1/541

Introduction

The UN1/541 is used, in conjunction with an oscilloscope, to measure differential gain distortion and differential phase distortion[1].

The inputs to the unit are:

A staircase-plus-subcarrier signal[2,3].

A subcarrier reference signal.

The outputs from the unit are:

A low-frequency signal which is proportional to the phase difference between the input and reference signals.

The sub-carrier (chrominance) component of the input signal.

The unit is constructed on a CH1/12C chassis with index-peg positions 23 and 29. Four calibrated phase-adjustment switches and a demodulator-output *Gain* control are mounted on the front panel of the unit. Mains fuses are mounted on the rear panel. Power supplies at −12 volts are derived from an integral power supplier.

General Specification

Signal Input	5-step non-linearity test signal with 100—300 mV p-p of subcarrier on each level
Reference Input	1 V p-p subcarrier
Outputs	chrominance component of input signal phase-difference signal (labelled *Demod Out*)
Input Impedances	high w.r.t. 75 ohms
Output Impedances	75 ohms
Accuracy of Phase Measurement	±5% per increment

Operating Temperature	0—45 °C
Sensitivity	50—80 mV/degree
Mains Input	200—250 V, 50 Hz
Power Consumption	30 mA at 240 V

Operation

See parent unit[1].

General Description

A simplified block diagram of the unit is given in Fig. 1. The input signal is amplified, filtered to remove the luminance information, amplified again and then fed to the phase demodulator and also to the chrominance output of the unit. The reference subcarrier signal is amplified and passed through a number of variable phase-shifting networks (only one is shown in Fig. 1); it is then amplified and fed to the demodulator. The output from the demodulator is filtered to remove the subcarrier and subcarrier harmonics from the signal; it is then fed via an amplifier stage and a further low-pass filter to the demodulator output of the unit. All the stages following the demodulator are capacitance-coupled.

When the demodulator is correctly set up, it has zero output when it is fed only with reference subcarrier i.e. when there is no input signal or when there is no chrominance information in the input signal. When chrominance information is present in the input signal the amplitude of the demodulator output will depend on the relative phase of the input signal and the reference subcarrier. The calibrated phase shifting networks in the path of the reference subcarrier make it possible for the demodulator output to be adjusted to zero for any given phase difference between the reference and input signals. The amount of phase shift required to bring the highest point of the demodulated output to zero, gives the differential phase distortion of the signal analysed.

Circuit Description

The circuit diagram is given in Fig. 2 on page 3. The input signal is applied via the emitter-follower TR1 to a band-pass filter which removes the luminance information from the signal. The filter has a pass-band centred on 4.433 MHz and a bandwidth of 630 kHz between the 3-dB points. From the filter the signal is fed to a level-raising amplifier comprising transistors TR2, TR3 and TR4. The output from this amplifier forms one of the inputs to the demodulator and is applied also, via emitter-follower TR5, to the chrominance output of the unit.

The reference input is applied via emitter-follower TR8 to the phase-splitting transformer T3. Connected between T3 and emitter-follower TR9 are two variable phase-shifting networks; these networks are controlled by means of switches SA and SB, and provide up to 360 degrees of phase shift in 10-degree steps. A further phase-shifting stage, similar to the first, is connected between transistors TR9 and TR10. Switch SC provides up to 10 degrees of phase shift in 1-degree steps and switch SD provides up to 1 degree of phase shift in 0·1-degree steps. From TR10 the reference signal is fed via a level-raising amplifier comprising transistors TR11 and TR12 to the demodulator[4].

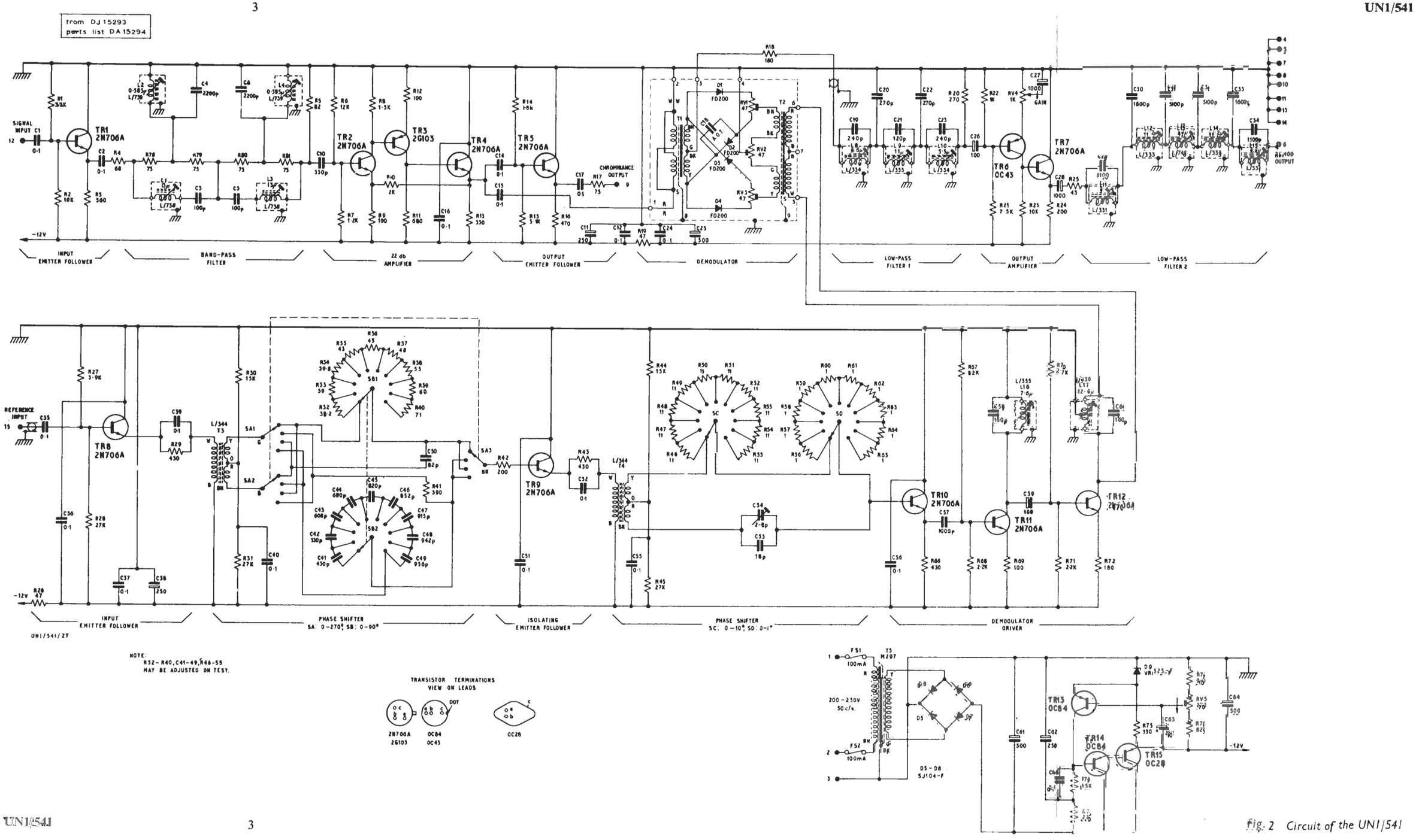
The demodulator output consists of an unwanted high-frequency component (subcarrier and subcarrier harmonics) and a low-frequency component which is proportional in amplitude to the phase difference between the reference subcarrier and the chrominance component of the input signal. The unwanted high-frequency component is removed from the demodulator output by a low-pass filter. The residual signal is then amplified and fed via a further low-pass filter, which improves the resolution of the output waveform when noise is present, to the demodulator output of the unit.

Power supplies at −12 volts are provided by a conventional stabilised power supplier comprising transistors TR13 to TR15.

Maintenance

Routine maintenance is not required; if the calibration of the phase-shifting networks is suspect the unit should be compared with another unit of known reliability. If the calibration proves to be incorrect, or if a component on one of the switches needs replacing and is unidentified, the unit should be returned to Equipment Department for recalibration or repair.

To gain access to the undersides of the printed-wiring boards, the lower board, which carries the mains transformer, must be released from the chassis. When doing this ensure that the mains transformer is not suspended by its screen-connecting wire. If the covers on the phase-changing switches are removed for inspection purposes the switches must be handled with care. Make sure the covers are replaced when the inspection is completed. If one of the phase-changing switches requires replacement, wire in the new switch using the original components. However, should



NOTE:
R52–R40, C41–49, R46–55 MAY BE ADJUSTED ON TEST.

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Fig. 2 Circuit of the UN1/541

one of the resistors (with the exception of the 1-ohm resistors) be damaged, it can be replaced by one of the same nominal value: the 1-ohm resistors are specially manufactured and must be replaced by resistors of the same type.

The demodulator is set up for zero output with a feed of reference subcarrier applied to the unit but without a signal input. The forward resistances D1—D2 and D4—D3 are equalised by RV1 and RV3 respectively. Circuit balance is adjusted by means of RV2 and C18.

References

1. EP1L/508 Remote Signal Analyser.
2. GE4/505A Non-linearity Test Signal Generator.
3. GE4/514 Subcarrier Adder: D. D. Tech. Mem. 9.62.
4. Instruction L1, Section 2.

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