PULSE-AND-BAR AMPLITUDE DETECTOR UNIT UN20/516

Introduction

The UN20/516 accepts inputs of 2T-pulse, luminance bar and linearity staircase components of an Insertion Test Signal (I.T.S.) waveform. The outputs are four direct voltages corresponding to the 2T-pulse amplitude, the bar amplitude and the maximum and minimum staircase riser amplitudes.

The unit is built on a printed wiring board and mounted on a CH1/43A chassis.

Principle of Operation (Fig. 1)

Fig. 1 shows the basic form of amplitude detector.

A pulse is applied to one input of a differential amplifier and a voltage, fed back from the output of the detector, is applied to the other input. If the input pulse is greater in amplitude than the fed-back signal the differential amplifier produces an output which triggers a monostable multivibrator. An output pulse from the monostable is applied to a diode pump and buffer amplifier. When the amplitude of the fed-back voltage equals the amplitude of the direct input the output from the differential amplifier falls to zero. The output voltage from the detector is then a direct voltage the level of which is proportional to the amplitude of the input pulse.

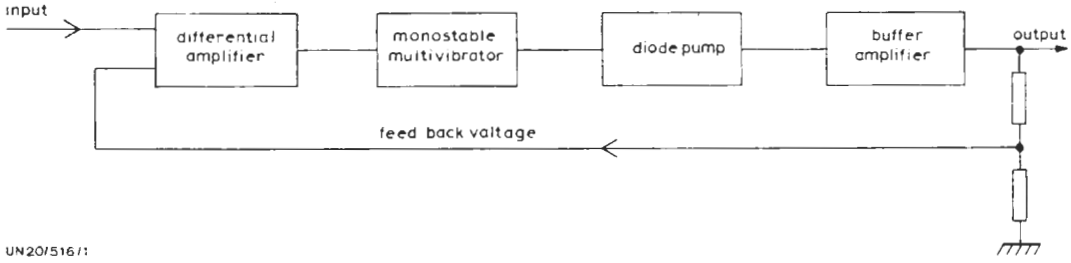

Fig. 1. Basic Circuit of the Amplitude Detector

General Specification

Inputs

I.T.S. 2T-pulse	1·4 volts p-p
I.T.S. luminance bar	1·4 volts p-p
I.T.S. 5-riser staircase	1·4 volts p-p
Input impedance	75 ohms

Output

With input at the specified level	+5 volts d.c.

Logic Levels

Logic 0: input	1·1 volts max.
output	0·4 volt max.
Logic 1: input	1·9 volts min.
output	2·6 volts min.

Power Requirements +6 volts at 50 mA d.c.
+12 volts at 42 mA d.c.
−12 volts at 16 mA d.c.

Continued overleaf

Circuit Description (Fig. 2)

Fig. 2 is a circuit diagram of the UN20/516. The unit comprises three separate sections. The 2T-pulse and the bar measuring circuits are almost identical.

Bar Amplitude Measuring Circuits

These circuits work on the principle previously described.

The bar input is applied via pin PLA6 to a shaping network made up of C21, L1, R21 and R22. The differential amplifier and the monostable functions are performed by integrated circuit 1IC1, and transistor 1TR1 is a common-emitter buffer amplifier. The diode pump comprises capacitors 1C4 and 1C5 and diodes 1D2 and 1D3. Transistors 1TR2 and 1TR3 form a complementary emitter-follower output stage.

The shaped bar input is applied to the non-inverting input of the differential amplifier 1IC1 and a signal is fed back from variable resistor 1R11 to the inverting input. If there is a difference between these two voltages, an output from the amplifier is applied to the base of transistor 1TR1. The signal from the collector of 1TR1 is fed back to the inverting input of the differential amplifier via 1C3 and 1R5. Under these conditions the differential amplifier acts as a monostable circuit and the voltage at the non-inverting input acts as a trigger signal. Thus a difference in the inputs produces a constant-width constant-amplitude output pulse which is applied to the diode pump circuit. A direct voltage builds up across capacitor 1C5 which is applied to the base of transistor 1TR2.

The amplitude of the fed-back voltage is controlled by variable resistor 1R11. A small positive offset voltage is applied to the feedback path via resistor 1R13 to ensure that the monostable action is reliable.

2T-pulse Amplitude Measuring Circuit

This circuit is identical to that previously described except that the initial shaping components are omitted.

Linearity Staircase Amplitude Measuring Circuit

The circuit used to measure the amplitudes of the risers of the staircase waveform is itself in two parts. One part measures the amplitude of the maximum riser and the other measures the amplitude of the minimum riser.

The staircase waveform is applied via pin PLA9 to emitter-follower TR11. The emitter circuit of TR11 includes a subcarrier-frequency rejection filter and a bandpass and differentiation circuit. The output, which is applied to common-emitter amplifiers TR12 and TR13, comprises five pulses each proportional in amplitude to the amplitude of the associated riser of the staircase waveform.

The signal from TR13 is applied to differential amplifier 1C11. This and the following parts of the circuit are almost the same as that described previously for the bar amplitude detector. A conventional monostable circuit is used consisting of two cross-coupled NAND-gates 1IC12a/2 and 1IC12b/2. Another feed of the differentiated waveform is applied to a second differential amplifier IC13 and monostable circuit components 1IC14a/2 and 1IC14b/2. The output of the monostable is applied to the clock pulse input of an asynchronous modulo five up-counter.

An output from each of the bistable units of the counter is applied to a NAND-gate. When the input to this gate is equal to the binary number five, an output pulse is produced which is applied to the diode pump; thus one output pulse is obtained for each five input pulses.

When the fed-back voltage equals the amplitude of the smallest pulse the differential amplifier produces only four risers at its output and the counter does not produce a binary five output. The output from the detector unit as a whole is therefore related to the amplitude of the smallest staircase riser. Once per field a reset signal, corresponding to lines 12 and 325, is applied to a clear terminal on each bistable circuit in the counter to reset all the Q outputs to a logic 0 state.

Setting-up Procedure

The unit is set up as part of its parent equipment.

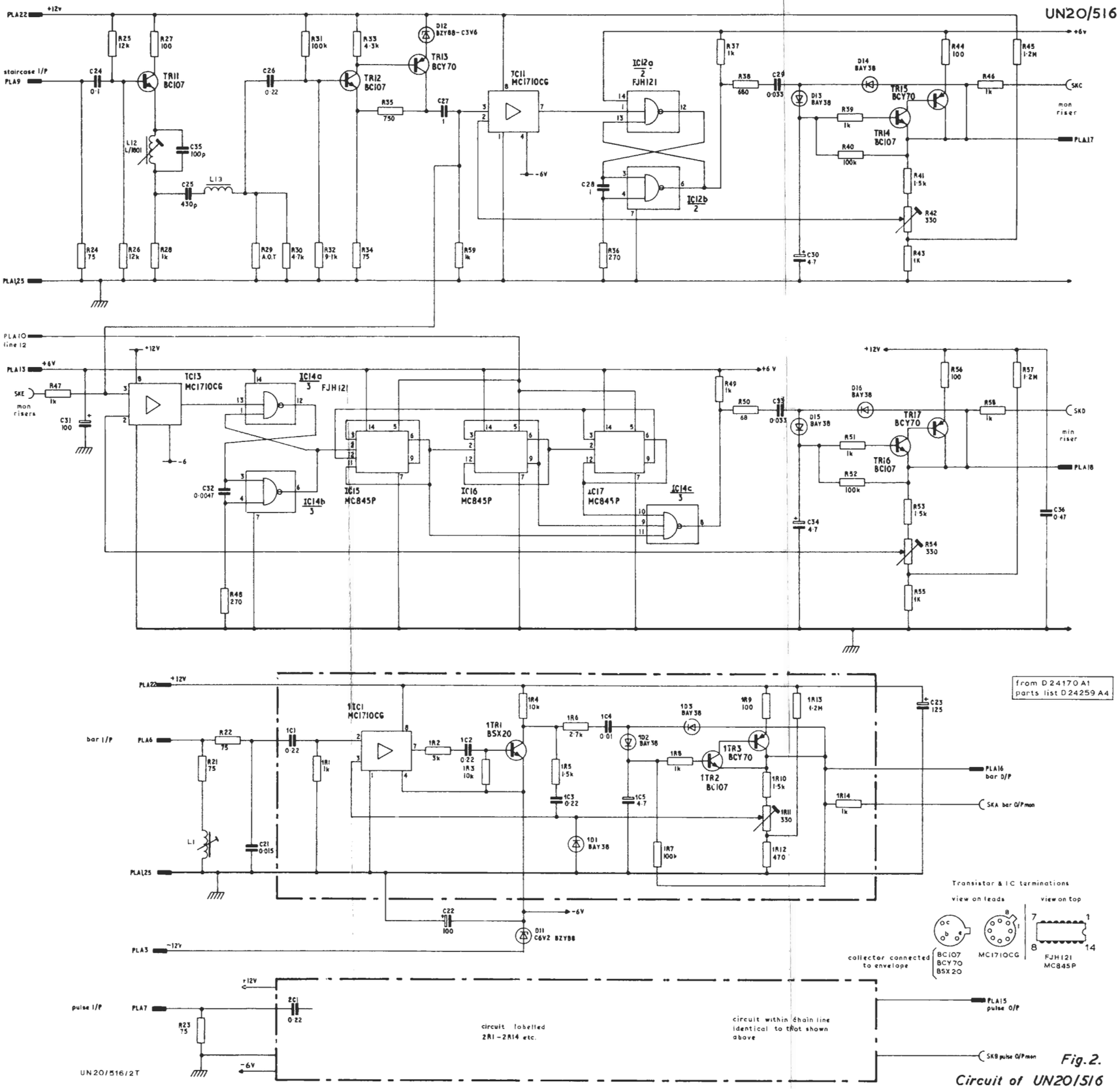

Fig.2. Circuit of UN20/516