BLANKING AND SYNC MIXER UN1/525

Introduction

The UN1/525 accepts inputs of 0·7-volts p-p non-composite picture signals and 2-volt p-p mixed-sync and mixed-blanking pulses: it produces a 1-volt composite video signal.

The UN1/525 comprises four units, each constructed on a CH1/12A chassis with index peg positions as shown below.

Unit	*Index peg positions*
1	6 and 11
2	6 and 13
3	6 and 15
4 & 4A	6 and 17

Unit 4A can be used as an alternative to unit 4. Units 4 and 4A contain a Power Supplier PS2/22D and unit 4A also contains a High Speed Switch Unit UN9/526.

General Description

A block diagram of the UN1/525 is given in Fig. 1. Unit 1 comprises a 13-dB inverting amplifier. Unit 2 contains two circuits which invert the signal and clip the negative-going excursions of their output signals. The first of these circuits is also used to insert the mixed-blanking waveform. Unit 2 also contains relay circuits which enable the clamping level to be changed from black level to white level. This facility is used to accommodate the change between positive and negative stock in a 16-mm vidicon telecine channel EP6/501.

Unit 3 contains a mixed-blanking clipping-amplifier. This makes the effect of the blanking pulses almost independent of their input level. Unit 3 also contains a sync gate circuit and an inverting output amplifier. Unit 4 contains a mixed sync pulse clipping-amplifier and a clamp. It also contains the power supplier.

Circuit Description

Unit 1

The circuit of Unit 1 is given in Fig. 2. This is a conventional inverting amplifier with a gain of about 13 dB. A complementary emitter-follower output stage provides a very low source impedance to the charging currents which can flow in the clamping capacitor in unit 2.

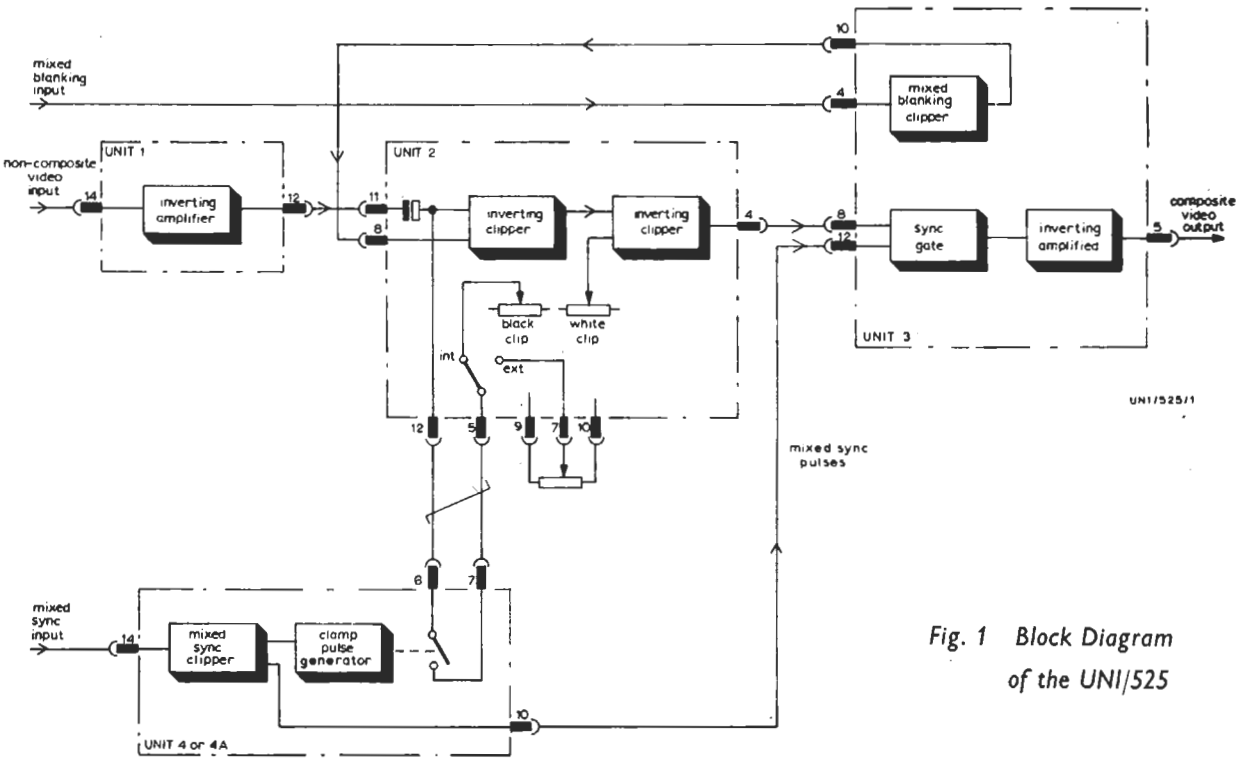

Fig. 1 Block Diagram of the UNI/525

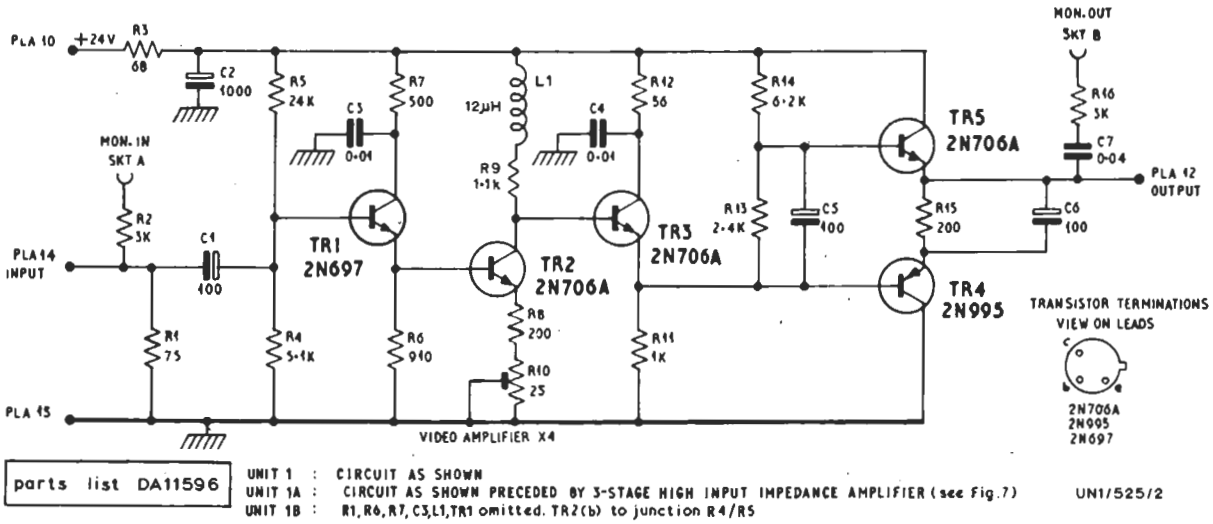

Fig. 2 Circuit of Unit 1, UNI/525

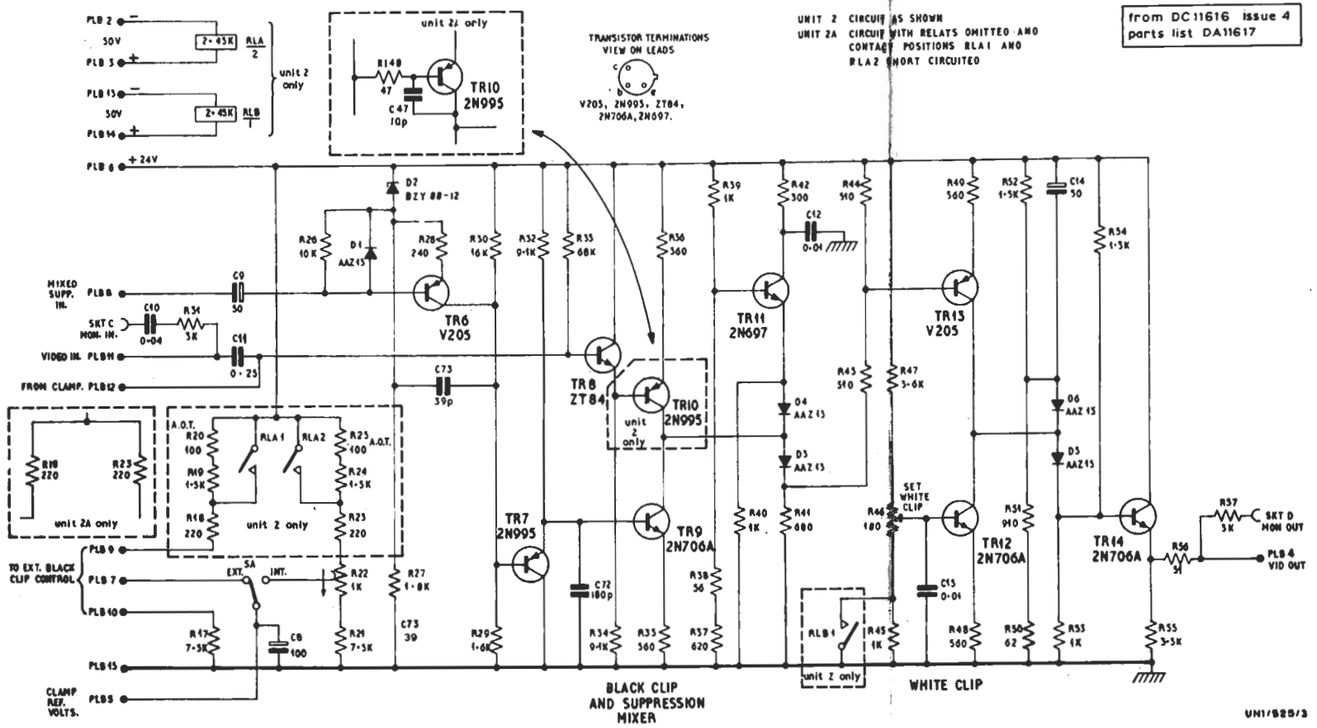

Fig. 3 Circuit of Units 2 and 2A, UNI/525

Unit 2

The circuit of Unit 2 is given in Fig. 3. This unit contains two similar clipping circuits. Each clipping circuit includes an input inverting stage so that the first clipper is a black clipper and the second a white clipper. The principle of these clipping circuits is illustrated in Fig. 4. In the circuit shown in Fig. 4(a) the output voltage V equals the more positive of either the input voltage V_{in} or the reference voltage V_r. This is shown in Fig. 4(b). Such a circuit has the disadvantage of having a high input impedance when the diode is cut off. The circuit of Fig. 4(c) reduces the variation in input impedance. If the second reference voltage V_{r2} is equal to or is just positive with respect to the first reference voltage V_{r1} the clipping characteristic has a gradual transition (dotted line in Fig. 4(b)). If the second reference voltage is just negative with respect to the first the sharp transition in the characteristic is retained. In the circuit shown in Fig. 4(d) the diodes are controlled by the relative magnitude of the currents i_1 and i_2 giving a characteristic as shown in Fig. 4(e).

In unit 2 the white clip circuit reference voltage 1 is set by resistors R53 and R54 and reference voltage 2 is set by resistors R50, R51 and R52. In the black clip circuit reference voltage 1 is set by resistors R41, R43 and R44 and reference voltage 2 is set via emitter follower TR11 by resistors R37, R38 and R39. Transistor TR11 is used to provide a low impedance source for reference voltage 2 in this circuit to accommodate the large changes of current which arise because the black clip current source, transistor TR9, is fed with mixed blanking pulses. The clamping level and hence the black clip level is set by a potential divider R22 or by an external 1-kilohm resistor.

Relay RLA is normally operated for signals which have a value corresponding to black level during the blanking period and released for signals which have a value corresponding to white level during the blanking period. Relay RLB is operated to switch off the white-clipping circuit.

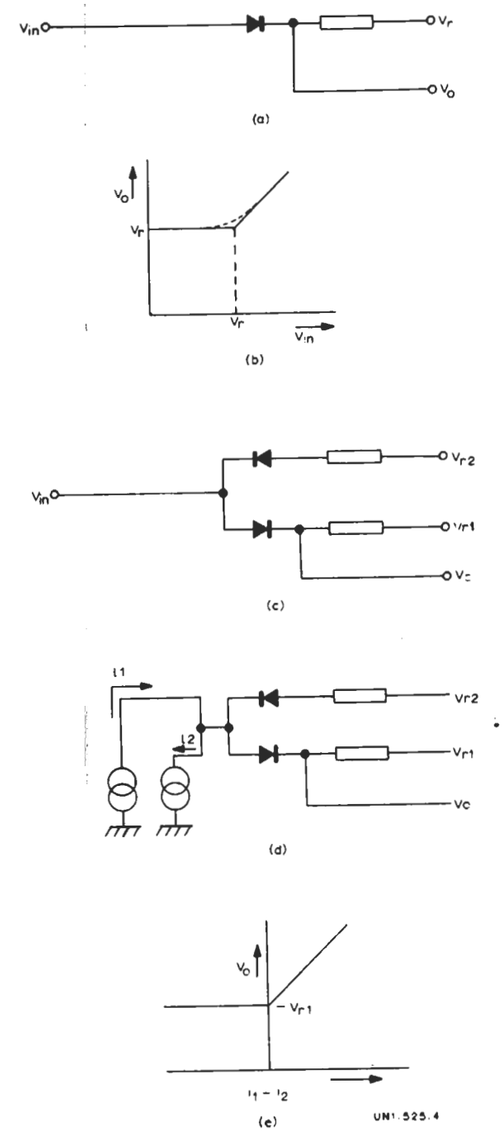

Fig. 4 Illustrating the Operation of the Clipping Circuits (a) simple clipping circuit, (b) input-output characteristic of (a), (c) clipping circuit, (d) current-driven clipping circuit, (e) input-output characteristic of (d)

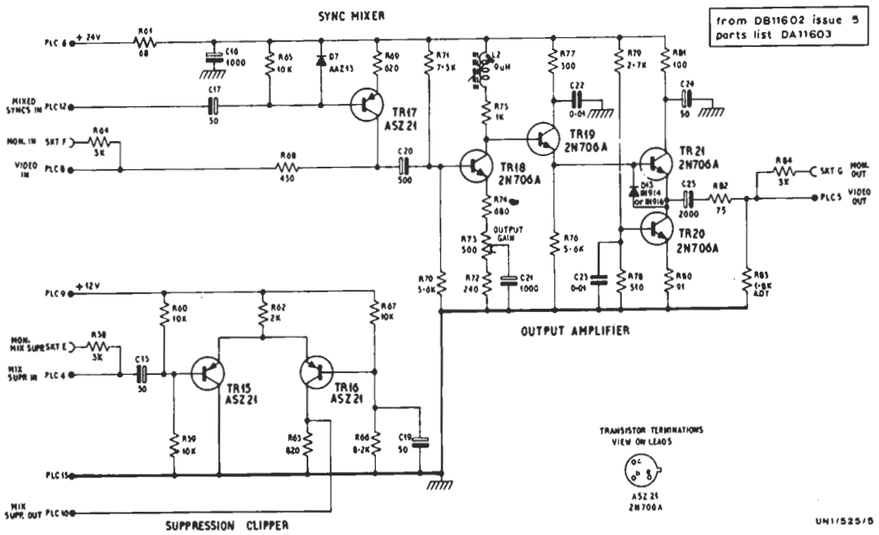

Fig. 5 Circuit of Unit 3, UN1/525

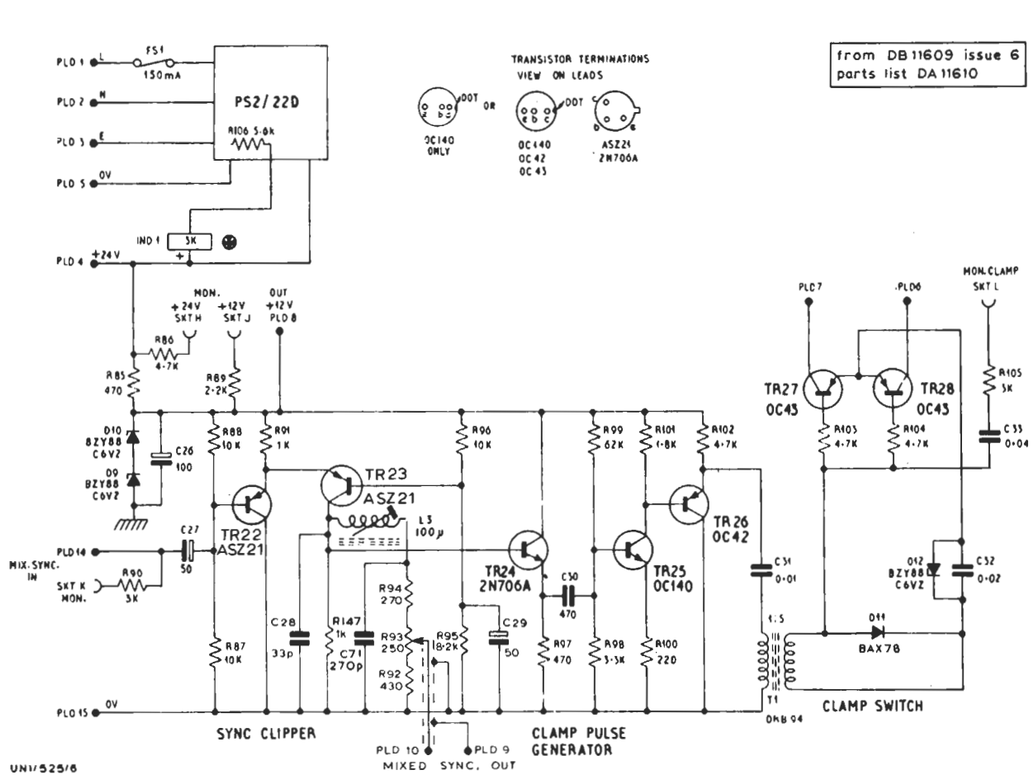

Fig. 6 Circuit of Unit 4, UN1/525

Unit 3

The circuit of this unit is given in Fig. 5. The mixed blanking input waveform is clipped by a long-tailed pair which includes transistors TR15 and TR16. The clipping, which is severe to accommodate large variations in input level, decreases the rise time of the output waveform. Capacitor C18 is included to slow up the output transistions.

The input mixed-sync pulses are d.c. restored at the base of transistor TR17. This transistor conducts during sync pulses producing a positive-going pulse at the base of transistor TR18.

The composite video signal is passed through the output inverting amplifier which includes transistors TR18 to TR21. Diode D13 provides a discharge path for capacitor C25 when the unit is switched off. This is to avoid large reverse emitter-base voltages on transistor TR21.

Unit 4

The circuit of Unit 4 is given in Fig. 6. The input mixed-sync pulse clipping stage is similar to the mixed-blanking clipper in unit 3. The negative-going sync pulses from emitter follower TR24 are differentiated by capacitor C30 and resistors R98 and R99. A negative-going pulse is derived from the trailing edge of mixed sync pulses, amplified and fed to the bases of the clamp transistors TR27 and TR28 causing the impedance between pins 6 and 7 to drop to a very low value for the duration of the clamp pulse.

Unit 4A

The circuit of this unit is given in Fig. 7. Unit 4A has an identical input stage to unit 4, but the remainder of the circuit comprises a High Speed Switch Unit UN9/526.

Test Schedule

Apparatus Required

Oscilloscope.
Test Waveform Generator GE4/506A.
Extender board CH1A/1.

Test Procedure

1. Connect the units as shown in Fig. 1 using the extender board for unit 2.
   Set the *Output Gain* control to its mid position.
   Operate relays RLA and RLB in unit 2.
   Set the switch on unit 2 to *Internal*.
   Connect the input of the oscilloscope terminated in 75 ohms to the composite video output of the UN1/525.
2. Adjust the *Black Clip* control to just eliminate the pedestal.
3. Release relay RLA.
   Adjust the *Output Gain* control to give a white level signal of 0·7 volts (excluding syncs).
   Adjust the *Sync Gain* control to give 0·3 volts p-p of sync pulses.
4. Release relay RLB.
   Adjust resistor R46 in unit 2 so that the circuit is just on the verge of white-level clipping.
5. Operate relay RLA.
   Readjust the *Black Clip* control if necessary.
6. Feed a 0·70-volt p-p non-composite sawtooth waveform to the video input of the UN1/525.
   Replace unit 2 without the extender board.
   Replug unit 1 using the extender board.
   Adjust the gain by means of resistor R10 in unit 1 to give a 0·7-volt p-p picture signal at the output. Check, by temporarily increasing the gain, that symmetrical clipping occurs at greater amplitudes.
7. Set the switch on unit 2 to *External* and check that varying the external black clip 1-kilohm control resistor causes the signal to be either black-clipped or white-clipped except at one position of the control.
8. Release relay RLA.
   The change in clamping level should result in a white-level bar. Increase the white clipping level.
   The lower portion of a sawtooth waveform should appear sitting on 0·7 volts of pedestal. Reset the clipping level.
9. Check that there is no observable distortion to a pulse-and-bar signal.

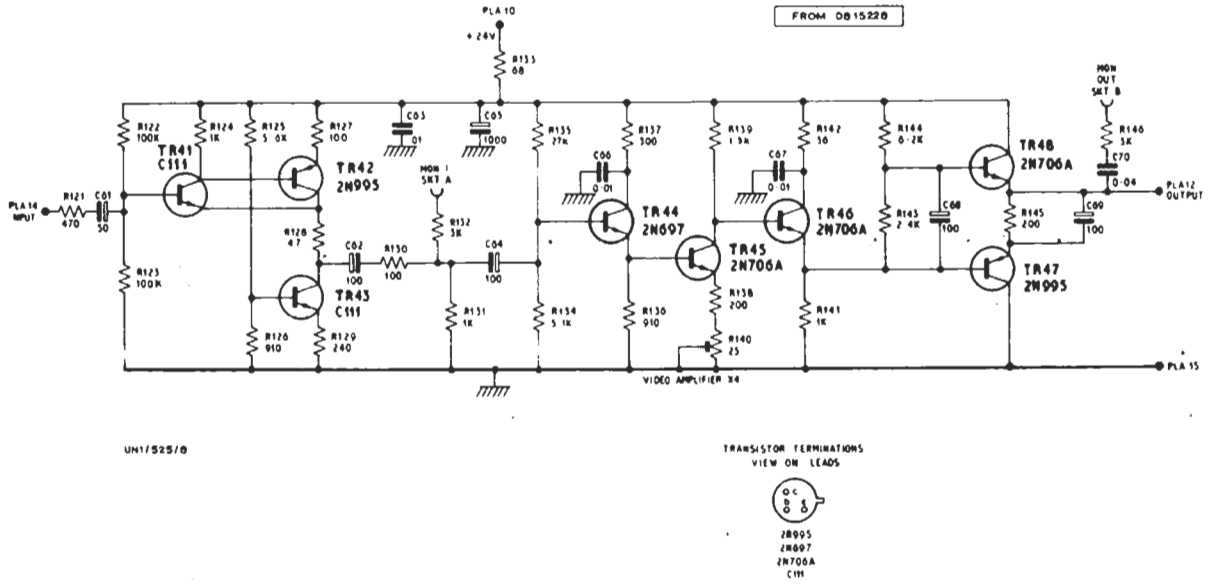

Fig. 7 Circuit of Unit 1A, UNI/525

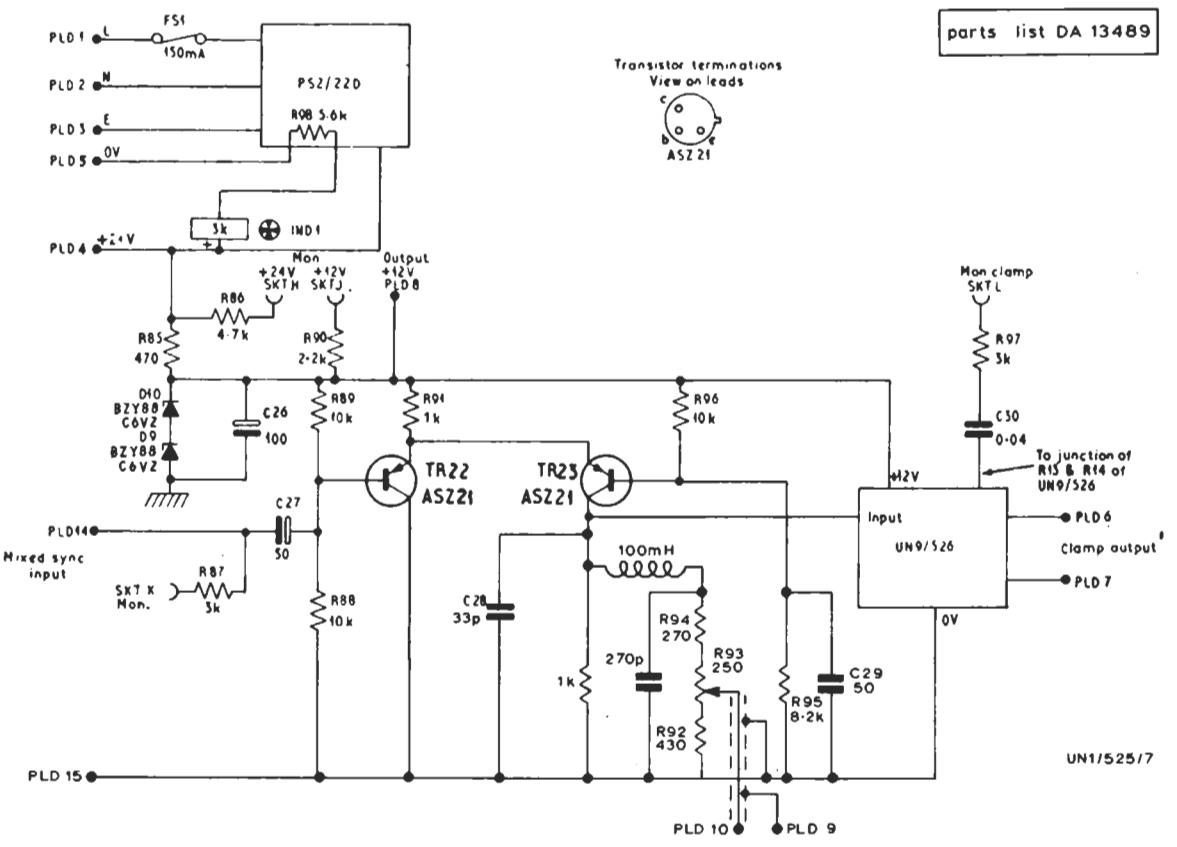

Fig. 8 Circuit of Unit 4A, UNI/525

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