SYNC STABILISING AMPLIFIER AM18/521

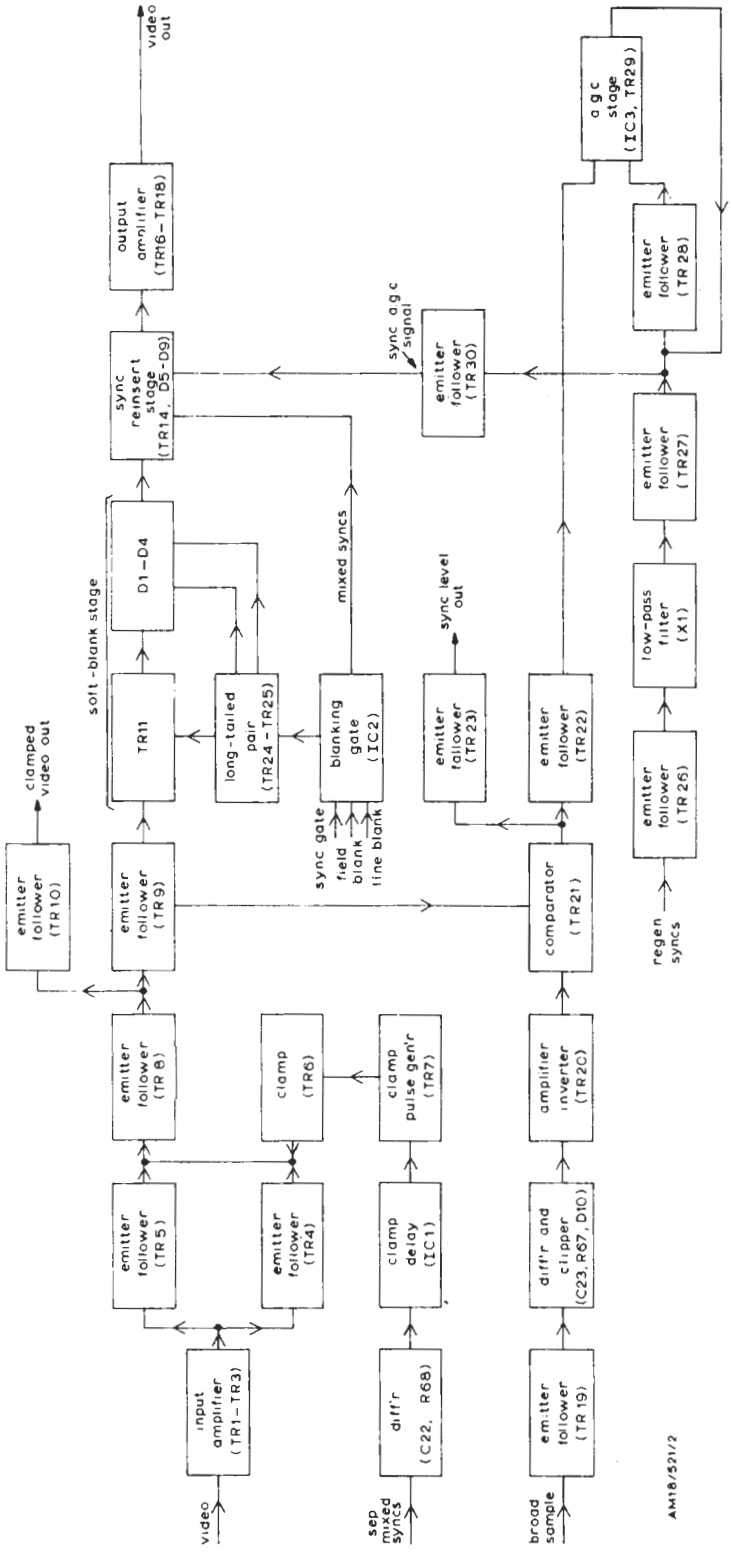


Fig. 1 Block Diagram of the AM18/521

Introduction

The AM18/521 forms part of a sound-in-syncs decoder[1]. The unit accepts a composite video and sound (sound-in-syncs) signal, clamps it at blanking level, removes the existing sync pulses (and the sound-in-syncs information) in a frequency-selective blanking circuit which preserves the subcarrier colour burst, and gates in regenerated sync pulses at an amplitude which is related to the incoming video signal level.

The unit is constructed on a printed-wiring board fitted with a 25-way ISEP connector. Index pin positions are, 3, 13, 15. Power supplies at +12V, −12V and +5V are required.

General Specification

Inputs

Sound-in-syncs Video	1V p-p nominal (normally obtained from UN16/517.
Field Blanking	negative-going, TTL logic levels (normally obtained from UN23/529).
Regenerated Mixed Syncs	negative-going, TTL logic levels (normally obtained from UN23/529).
Broads Sample	positive-going, TTL logic levels (normally obtained from UN23/529).
Line Blanking	negative-going TTL logic levels (normally obtained from UN23/523).
Sync Gate	negative-going, TTL logic levels (normally obtained from UN23/523)
Separated Syncs	positive-going, TTL logic levels (normally obtained from UN16/515).

Outputs

Video	1V p-p nominal, clamped and with re-inserted syncs
Clamped S.I.S. Video Output	2V p-p nominal, for high-impedance monitoring only.
Sync Level	a d.c. signal which is related to input sync amplitude.
Video Output Impedance	75 ohms ±1%.
Input Video Operating Range	+6 dB to −4 dB (Note: below −4 dB the picture/sync ratio is no longer 70/30, sync level becomes high).
Differential Phase Distortion	0·2° p-p
Operating Temperature Range	0°C to 40°C
Power Requirements	120 mA at +12V, 120 mA at −12V, 120 mA at +5V
TTL Logic Levels	logic level 1 about +3·5V (+5V max.) logic level 0 about 0V (+0·4V max.)

Circuit Description

A block diagram of the AM18/521 is given in Fig.1, a circuit diagram is given in Fig.2 and waveforms at various points in the circuit in Fig.3.

Input Amplifier

The video input signal is applied to a feedback amplifier, comprising transistors TR1 to TR3, which increases the signal amplitude to 2 volts p-p. The gain of the stage is determined by the ratio of R13 to the parallel combination of R7 and R10. Capacitor C4 controls the open-loop frequency response and thus maintains the stability of the feedback amplifier; it has negligible effect on the high-frequency (5MHz) performance of the amplifier under normal operating conditions. Capacitor C5 and resistor R11 provide frequency compensation for a delay network contained in a previous unit[2].

Clamp

Transistor TR3 feeds emitter-followers TR4 and TR5 whose outputs are coupled together by R20. The signals applied to either end of R20 have the same a.c. content and any difference in their d.c. level is corrected by charge leakage between C7 and C8, via R20.

The junction of R20 and C8 is a point of low source impedance and high load impedance; the signal is clamped at this point by the action of TR6 which is fed with clamp pulses from TR7. The clamping level is determined by the setting of R25 which is adjusted so that black level is coincident with blanking level.

Soft Blanking Stage

The clamped signal is fed, via compound emitter-follower TR8-TR9, to TR10 (which provides the *Clamped Video Out* signal) and to the blanking stage. During line and field blanking periods the bridge circuit comprising diodes D1 to D4 is forward biased by push-pull blanking pulses developed in the long-tailed pair TR24-TR25, and so presents a low-impedance path to the signal. At all other times the diodes are reverse-biased and the signal is unaffected. The tuned circuit formed by L3, C14 and R39 has a relatively high impedance at 4·43 MHz and so prevents the blanking circuit removing colour-burst information. Field-effect transistor TR11 is switched on during active line periods to damp the tuned circuit and prevent it ringing.

The blanked signal is fed via complementary emitter-follow stage TR12-TR13 to the sync re-insertion stage.

Sync Re-insertion

During active line periods the transistor element (b) of long-tailed pair TR14 is cut off and transistor element (a) conducts. Diodes D5 and D7 are forward biased by the potential drop across R52 and the video signal developed at the emitter of TR13 is passed to the output stage. During sync-pulse periods, however, gating pulses from IC2 drive transistor element (a) into cut off and cause element (b) to conduct. As a result, diodes D5 and D7 are reverse-biased while diodes D8 and D9 become forward-biased, and regenerated sync pulses are inserted into the video signal. Transistor TR15 functions as a constant-current sink for the mean diode current.

Output Amplifier

The output amplifier comprises transistors TR16 to TR18 and consists of a long-tailed pair followed by an emitter-follower output stage. Feedback from the emitter of TR18 to the base of TR17 holds the gain of the output amplifier at 0 dB.

Clamp Delay and Clamp Pulse Generator

The clamp operates on the back porch of the video waveform. The edge of the back-porch period may be disturbed by the sound pulses if the distribution link has low-frequency distortion; therefore, a delay circuit precedes the clamp pulse generator so that clamping takes place between the colour burst and the start of the active line period.

The separated syncs input signal is differentiated and applied to a monostable delay circuit which is formed by the three NAND gates in IC1. The monostable stage generates positive-going pulses which have leading edges coincident with the trailing edge of syncs and these are fed via a further differentiating circuit to clamp pulse generator TR7. The negative-going transitions of the differentiated waveform drive TR7 into cut-off and positive-going clamp pulses with a duration of about 2 micro-seconds are generated at its collector. The clamp pulses are capacitor-coupled to TR6 where they are d.c.-restored by the action of the gate-drain diode. This action ensures that, if clamp pulses are lost, TR6 conducts and holds the clamping point to blanking level.

Regenerated Syncs Filter and Automatic Gain Control

Regenerated sync pulses are fed via emitter-follower TR26 to filter X1 where the pulses are shaped to obtain the correct risetime. From the filter the pulses are fed via emitter-followers TR27 and TR30 to the sync re-insertion stage; preset resistor R97 is set so that the sync pulses are re-inserted into the video signal at the correct d.c. level.

In addition to feeding TR30, the sync pulses present at the emitter of TR27 are fed to an automatic gain control circuit comprising TR28, IC3, and TR29. Transistor TR28 is a peak-negative detector and capacitor C31 is charged to the amplitude of the signal applied to TR28 plus the transistor offset voltage. Integrated circuit IC3 compares this peak-negative signal with a signal derived from the sync amplitude measurement circuit and amplifies any difference between the two signals. Because of the relative operating speeds of IC3 and the measuring circuit, the output of IC3 is a square wave with a variable mark-space ratio. This waveform is smoothed by R96 and C34 and then applied as an amplitude-correction potential to TR29. The drain-to-source resistance of TR29 varies with the correction potential amplitude and so controls the amplitude of the sync pulses present at the base of TR28.

The efficiency of the automatic gain control circuit

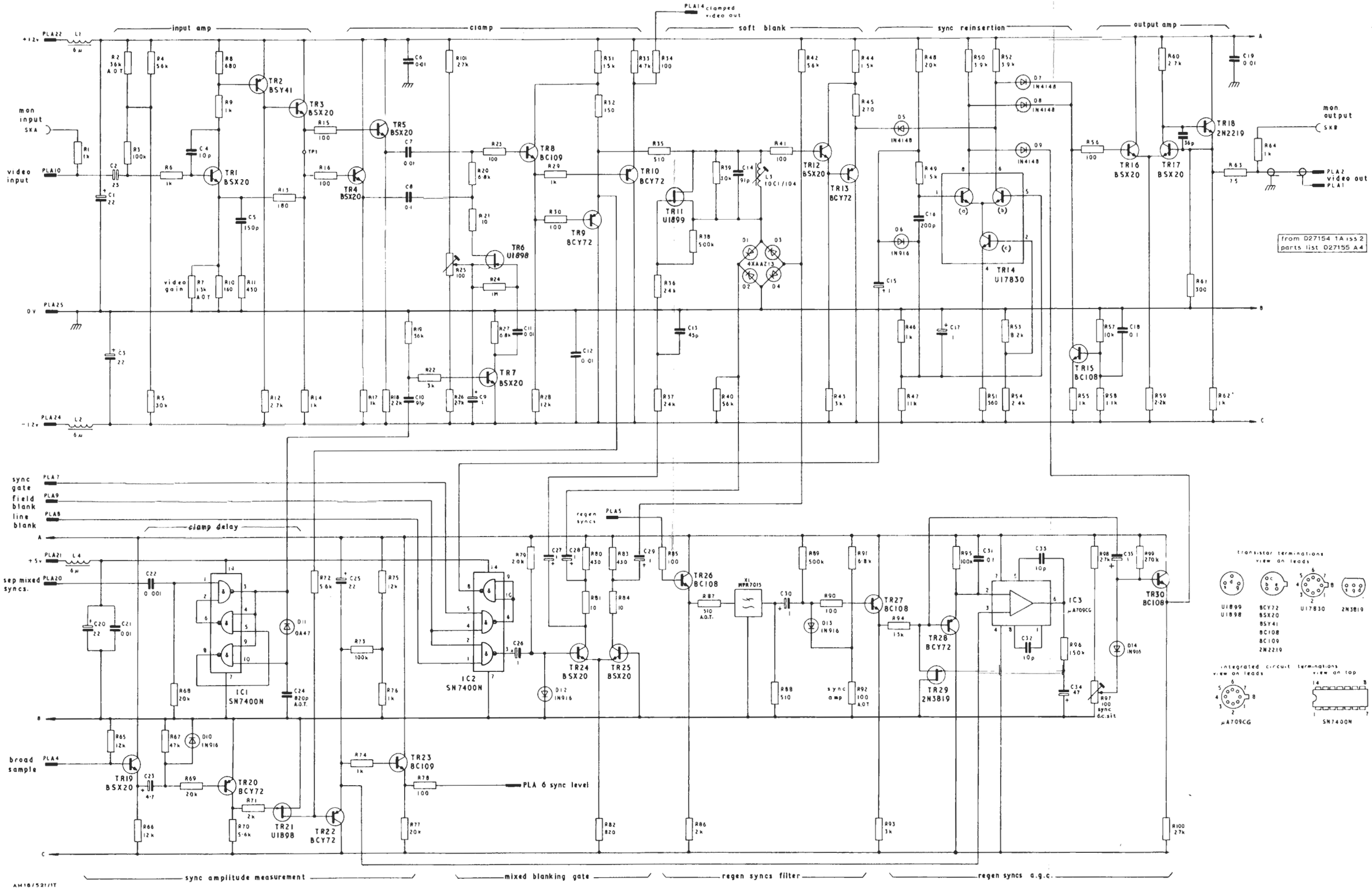


Fig.2 Circuit of the Sync-Stabilising Amplifier AM18/521

is such that the sync amplitude remains correct for a video input range of +6 dB to −4 dB with respect to 1 volt p-p. Below −4 dB the re-inserted syncs are larger in amplitude than the input syncs. The automatic gain control circuit is controlled by the amplitude of the broad pulse component of the input signal and thus is unaffected by any sync amplitude distortion caused by the sound pulses.

Sync Amplitude Measurement

Positive-going broad-sample pulses (separated field syncs) are applied via emitter-follower TR19 and amplifier-inverter TR20 to field-effect transistor TR21 which is fed also with composite video from the emitter of TR9. TR21 is driven into conduction by the broad sample pulses and thus blanks the composite video signal, with the exception of the broad pulses, to blanking level. From TR21 the broad pulses are fed to TR22 which functions as a peak-negative detector and charges C25 to the peak broad-pulse amplitude. The signal thus derived is fed to the automatic gain control circuit and is fed also, via emitter-follower TR23, to the *Sync Level* output.

Alignment

The AM18/521 forms part of a sound-in-syncs decoder and is normally aligned as part of its parent unit. Alignment is required if the AM18/521 is changed (when only preset controls R25 and R97 require adjustment) or if components are changed.

Equipment Required

Sound-in-syncs Decoder CD3M/504
Dual-trace oscilloscope (15 MHz bandwidth, 5mV/cm sensitivity)
Vectorscope
Variable attenuator (minimum range 4 dB).

Alignment Procedure

(a) Preliminary Checks

1. Place the unit on a chassis extender and check that all input feeds and power supplies (listed in the General Specification) are present.
2. Trigger the oscilloscope externally with separated mixed syncs. Use the oscilloscope probe to monitor TP1 and check that the video signal at this point is about 2V p-p.
3. Monitor the video signal at TR9 emitter and check that it is clamped.
4. Monitor the clamp pulses at TR7 collector and check that the pulse duration is 2μs ±0·5 μs.
5. Monitor PLA14 and check that clamped video is present.
6. Monitor TR30 emitter and check that sync pulses are present. Attenuate the video input to the decoder by 3 dB and check that the sync pulse amplitude is reduced.
   Restore the video input to normal level.
7. Check that a signal is present at the video output (sync-pulse and back-porch d.c. sit may be incorrect at this stage of the alignment).

(b) Input Amplifier

1. Switch the oscilloscope to a suitable d.c. range and monitor TP1.
2. Remove the video input signal and check that the steady voltage at TP1 is 0V ±0·4V. If it is not, adjust the value of R2 as required.

(c) Back Porch Blanking Level

1. Apply a composite pulse and bar signal (i.e. one containing field information) to the decoder input. Monitor the video output of the AM18/521 and adjust R25 so that back-porch blanking is at the same level as the black-level component in the active line.

(d) Sync Re-insertion Level and Gain

1. Use the input signal specified in (c) above.
2. Monitor the video output of the AM18/521 and adjust R97 so that sync pulses are inserted at the correct d.c. level.

(e) Video gain

1. Use the input signal specified in (c).
2. Use the oscilloscope to compare the AM18/521 output with the decoder input.
3. If necessary, adjust the value of R7 so that the picture-period gain from the decoder input to AM18/521 output is 0 dB.

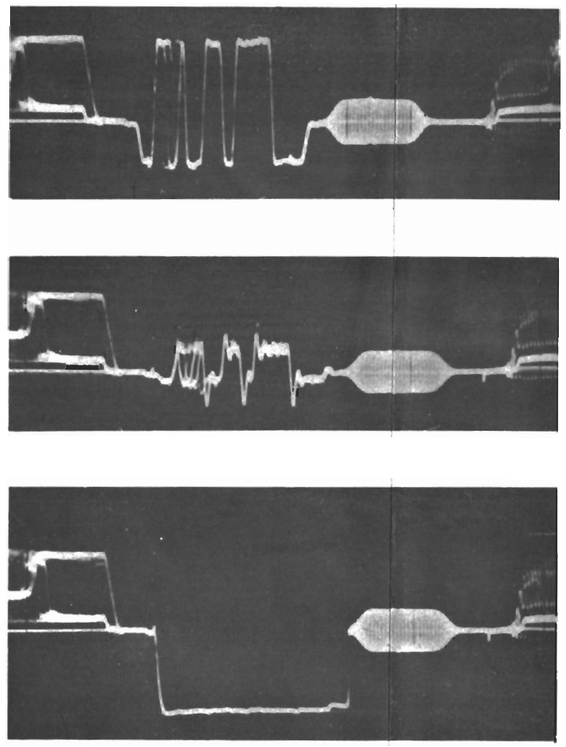
(f) Sync Amplitude

1. Use the input signal specified in (c).
2. Compare the sync component of the AM18/521 output with the broad pulses contained in the decoder input signal. If necessary, adjust the value of R92 to equalise the two amplitudes.
3. Reduce the level of the video input by 4 dB and check that the sync component of the AM18/521 remains within 10% of the amplitude of the broad pulses at the decoder input.

(g) Burst Phase

1. Apply a colour-bar signal to the vectorscope and adjust the controls to give a normal display.
2. Rotate the display anti-clockwise so that the uppermost yellow-bar vector lies on the horizontal axis, and increase the gain so that the display dot lies at the edge of the graticule.
3. Increase the gain still further to bring the burst vectors to the edge of the graticule. Make a note of the angle between the yellow bar and uppermost burst vector.
4. Connect the colour-bar feed to the decoder and connect the vectorscope to the video output of the AM18/521.
5. Repeat the yellow-bar burst measurement described above and adjust L3 to obtain the value previously noted. The setting accuracy should be better than ±0·5°

Continued on page 9



(a) Input video

(b) Blanked video: D5 cathode

(c) D5 anode

(d) Regenerated syncs at D9 cathode

(e) Waveform at D9 anode

(f) Output video

AM18/521/3P

Fig.3 Waveforms in the AM18/521

Maintenance

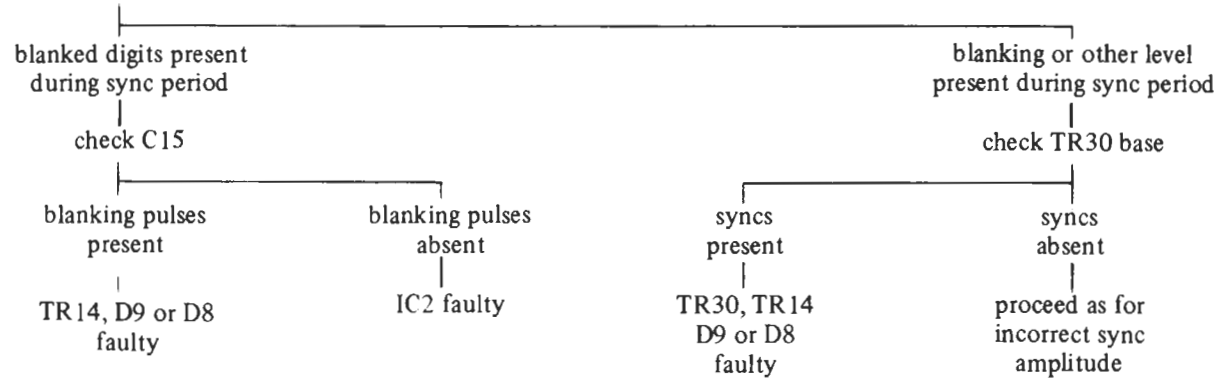
The following flow charts are given to assist in fault location. The charts assume that all input supplies and feeds have been checked and are correct. Where the comment 'TRxx faulty' is made, this implies that the fault lies either with the transistor itself or with an associated component.

References to Typical Associated Equipment

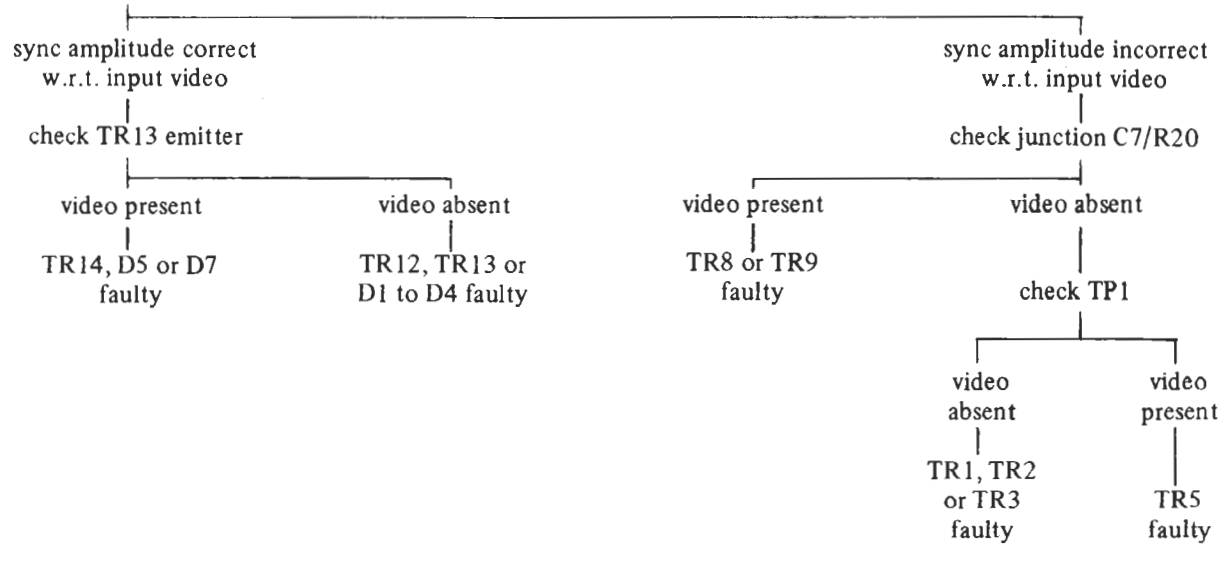
1. Sound-in-syncs Decoder CD3M/504
2. Sound-in-syncs Pulse Separator UN16/517

Output Condition

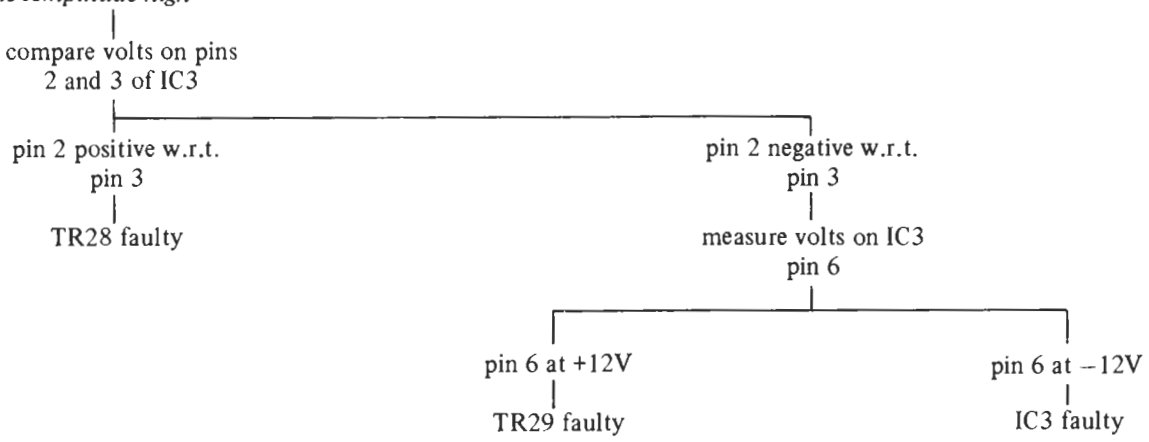
(a) Video but no syncs



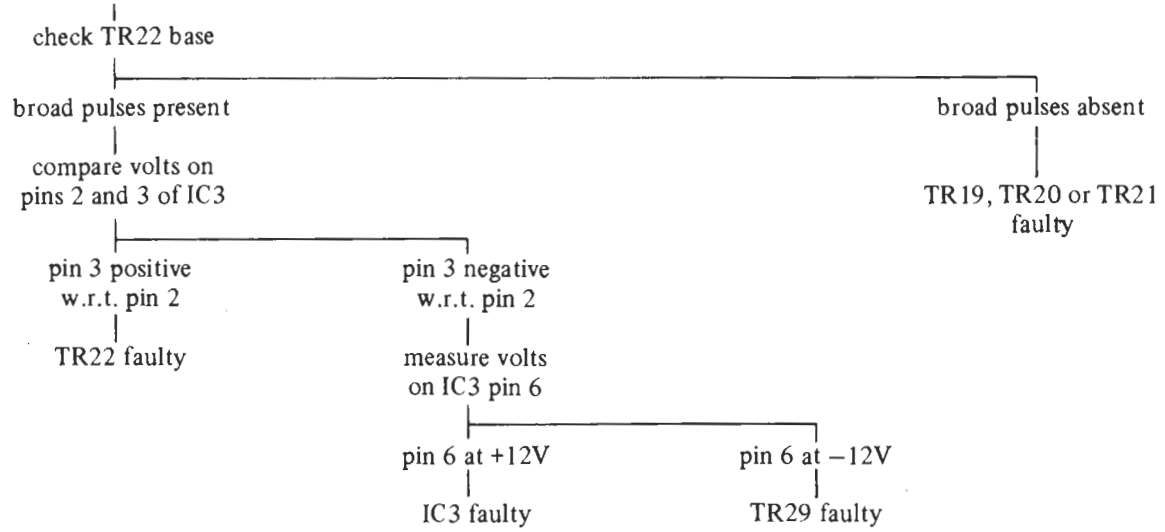
(b) Syncs but no video



(c) Sync Amplitude high



(d) Sync Amplitude low



(e) No Ouptut

TR16, TR17 or TR18 faulty