SYNC SEPARATOR UN1/589

Introduction

The UN1/589 accepts a colour video signal at standard level and provides outputs of:

Separated Mixed syncs
Separated colour bursts
Burst-and-syncs

The unit contains a mains-fed stabilised power-supplier and is constructed on two printed-wiring boards accommodated in a CH1/26A plug-in chassis with index-peg positions 18 and 31. The front panel carries a mains neon indicator and monitoring points for *Video Input* and Burst-and-Syncs *(Black-level)* Output. The rear panel carries the mains fuse.

The UN1/589 will operate on 405-line Monochrome, 525-line NTSC and 625-line PAL standards without any switching. With a monochrome input the burst-adding circuitry can be muted to reduce noise and gating transients by the application of an external earth. Unused signal outputs should be terminated.

General Specification

Input Signal Amplitude	standard level colour video signal
Input Impedance	10 kilohm in parallel with 2pF
Output Signals	
Mixed Syncs	2V p-p
Colour Bursts	0·3V p-p
Burst-and-Syncs	0·3V p-p mixed syncs + 0·3V p-p colour bursts (combined amplitude 0·45V p-p)
Output Impedance	75 ohms
Propagation Delay (input to output)	
Mixed Syncs	225 ns ± 25 ns
Colour Bursts	1 cycle ±1° at 4·43MHz (i.e. nominally 225 ns)
Burst-and-syncs	nominally 225 ns
Burst Muting	the burst on the burst - and - syncs output can be removed by the application of an external earth
Allowable Input Distortion (for less than 50-ns jitter on mixed sync output)	Simultaneous disturbance by: a) signal input variation between 0·5V and 2V p-p b) white noise giving a S/N ratio of 30dB c) 0·3V p-p 50 Hz on the input waveform d) l.f. distortion corresponding to a time-constant of 1 ms
Mains Input	230V a.c. ±10%, 30mA
Operating Temperature	10°C to 50°C
Weight	1·1 kg (2½ lb)

Circuit Description

The block diagram of the UN1/589 is given in Fig. 1. The circuit diagram is given in Fig. 2 on page 3.

The colour video signal is fed directly to the input amplifier, TR5–7 and IC1, which offers a high impedance and provides approximately 6-dB gain. The output from the emitter-follower TR7 is split into two routes, one for sync separation the other for burst separation.

Sync Pulse Separation

The video signal taking this path is filtered to improve tolerance in the main sync separator IC2, both to signals with a high noise level and also to signals with subcarrier extending below blanking level. The filter has two stages – a subcarrier trap L1, C8 tuned to 3·6 MHz and a low-pass filter R24, C9. The low-pass filter contributes largely to the 225-ns sync pulse propagation delay through the unit. After filtering, the signal is fed to the emitter-follower TR8. At the emitter of TR8 a side chain is started to generate clamp pulses for use in the clamp preceding the main sync separator. The side chain contains a subsidiary sync-separator stage driving a clamp pulse generator.

R30–31, C2 and used to trigger the clamp pulse generator TR11 from saturation into cut-off. The positive-going pulses, 1·7 $\pm$0·5μs duration, generated at the collector of TR11 drive the clamp TR13–14 directly.

The video feed to the clamp is fed from the emitter of TR8, through the emitter-follower TR12. The clamp circuit must be loaded by a high impedance to minimise the introduction of l.f. tilt on the clamped waveform; emitter-follower TR15 is therefore biased at a low collector current. The emitter of TR15 is connected to one input of the main sync separator, IC2, a long-tail pair slicer circuit. The reference input of the slicer is maintained at the required d.c. level by the emitter-follower TR16.

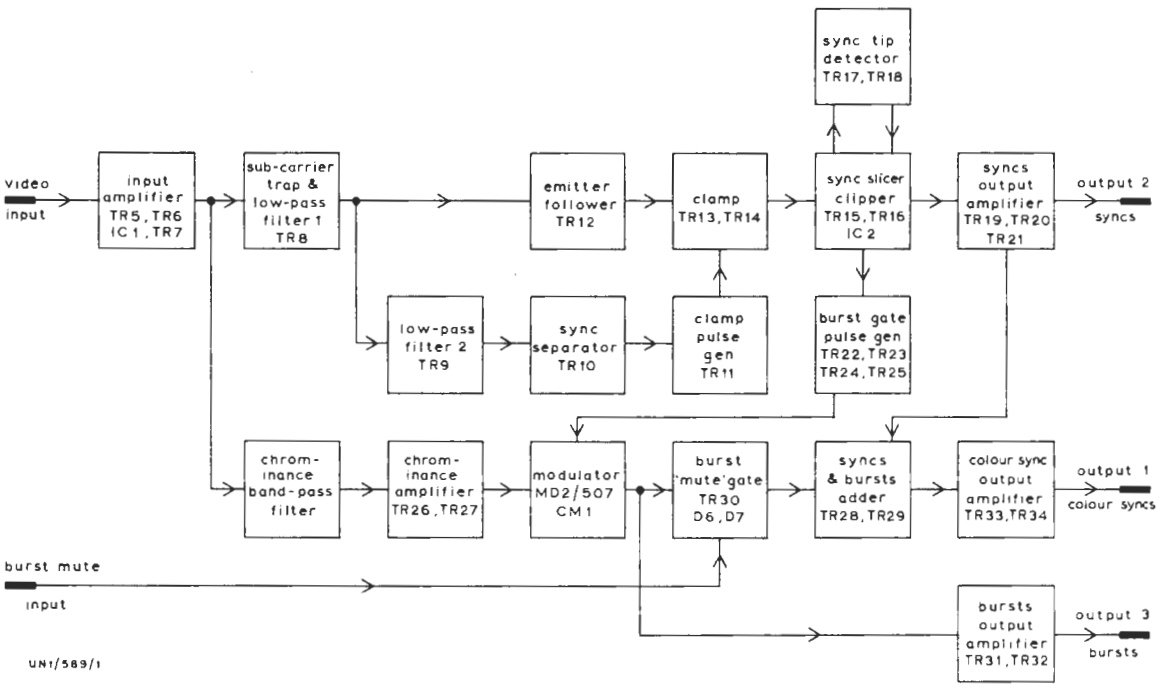
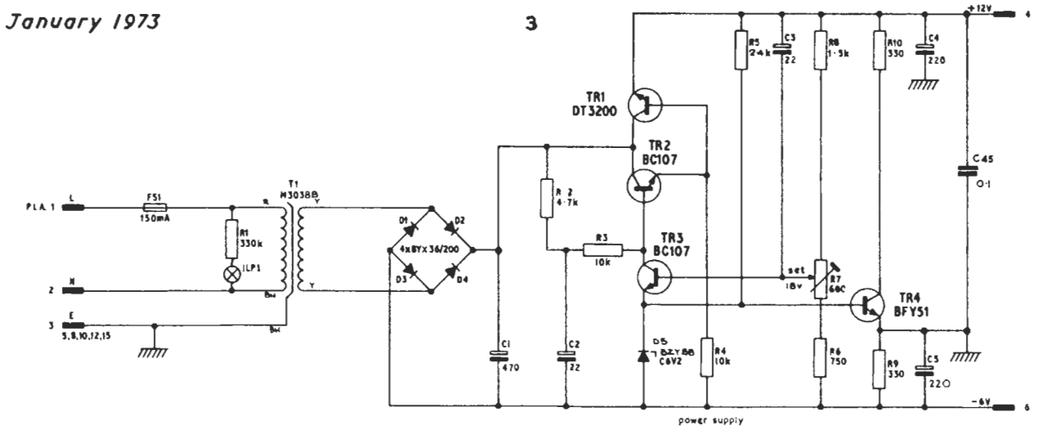


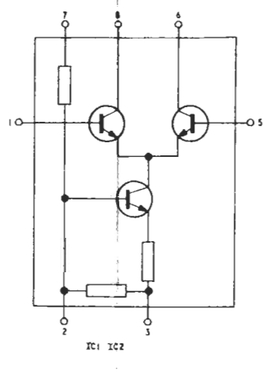
Fig. 1 Block Diagram of the Sync Separator UN1/589

In the side chain, additional filtering to further improve noise immunity, is performed by R27, C10 after which the filtered video signal is passed through the emitter-follower TR9 to the sync-separator stage TR10. The trailing edges of the separated positive-going syncs from TR10 are differentiated by

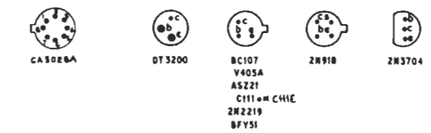
Sync-pulse amplitude at the output of the slicer is controlled by varying the total current through the long-tailed-pair with R43.

The requirement that the sync pulses be sliced at half-amplitude, to preserve the input sync-pulse direction, is met primarily by R40 in the resistor





transistor terminations
view on leads



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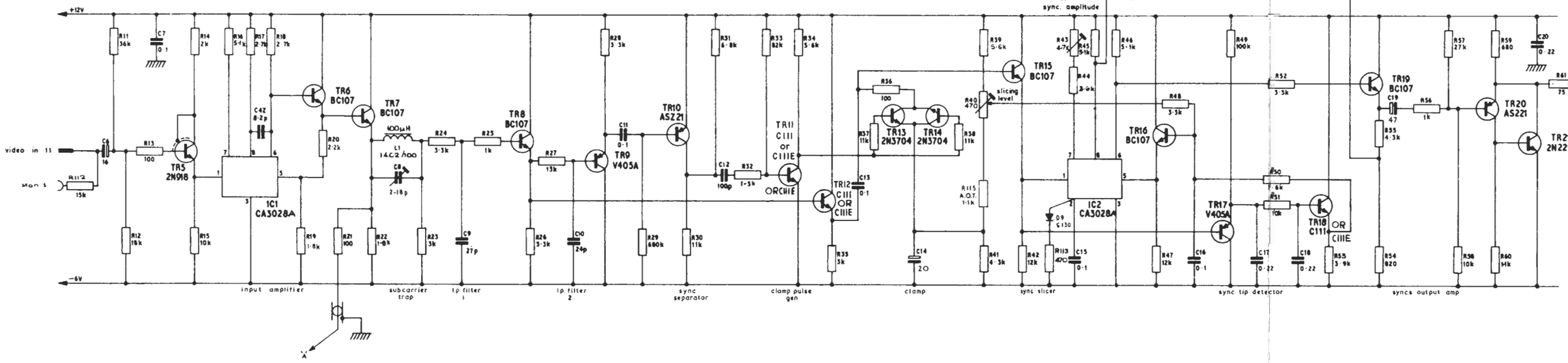

BOARD 1

BOARD 2

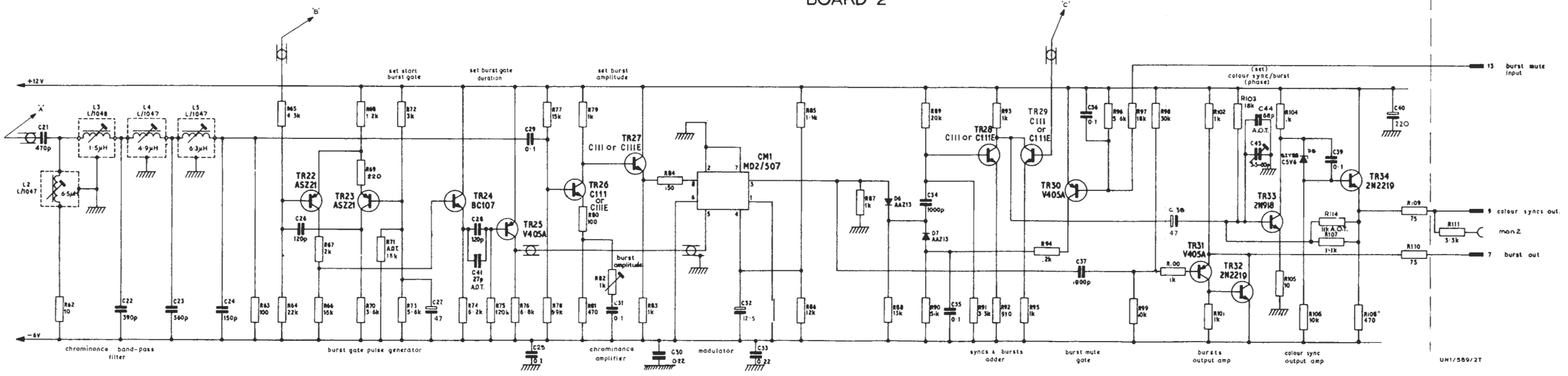

Fig 2 Circuit of Sync Separator UNI/589

chain which biases the slicer. Variation in the setting of R40 changes the d.c. level on pin 5 of IC2 so that the slicer can be set with a standard level input to slice exactly half-way down the sync pulses of the video input. Any variation of the input level is monitored by the sync-tip detector TR17–18 from which a filtered correction voltage, acting in a sense such as to maintain the desired slicing level, is fed to IC2 via R50 and TR16. The value of R50 has been selected to ensure approximately correct slicing over an input variation of ±6dB.

The sync output is taken from pin 6 of IC2 via the emitter-follower TR19 to the output amplifier TR20–21 which provides 2V p-p negative-going mixed syncs across 75 ohm. The complementary sync output from pin 8 of IC2 is used to drive the burst-gate pulse generator.

Colour Burst Separation

The composite input signal is transferred by link 'A' from the emitter of TR7 to the colour burst separator, situated on the hinged printed-circuit board.

Chrominance information is separated from the composite input by the high-pass filter C21, L2 followed by three low-pass sections L3, C22; L4, C23; L5, C24; providing a band-pass characteristic overall. Propagation delay in the filter is adjusted to be exactly one cycle at 4·43 MHz. Chrominance information from the filter is amplified by TR26 and fed by an emitter-follower to the gating modulator[1] input. Burst gating pulses feed the modulation input. Therefore the modulator CM1 acts as a switch, allowing the colour bursts to pass but excluding all remaining chrominance information. The long-tailed-pair slicer IC2 provides the supply of positive-going syncs which are passed through link 'B' to the burst-gating pulse generator TR22–25. These pulses are sharpened in the long-tailed-pair clipper TR22–23 with the aid of feedback through C26. The level at which the clipper operates, governed by the voltage of the base of TR23, determines the timing of the negative-going output pulses. R71 is therefore selected to give the required timing of the start of burst-gating. The clipped pulses are passed by the emitter-follower TR24 to the gate pulse generator TR25. Gate pylse duration is determined by the time-constant C28, C41–R75. Positive-going burst gate pulses are fed directly to the modulator CM1 on pin 5.

The gated colour-burst from the output of CM1 follows two paths. One is to the burst output amplifier TR31–32 which provides an output of 0·3V p-p across 75 ohms. The second path from CM1 is to the syncs and bursts adder TR28–29 operating into a common collector load, R93. The burst-and-syncs signal is passed to the output amplifier TR33–34. Capacitors C43–44 are included to allow the phase of the separated burst output to be set to lead the burst phase of the colour-sync signal by 11° (the increased delay in the colour-sync output is caused by the added complexity of the output amplifier TR33–34).

If the burst is either non-existent at the input or below an acceptable level at the burst output, it can be muted on the burst-and-syncs output by returning PLA13 to earth. This operation bottoms TR30 thereby switching D7 on and reverse biasing D6. In this condition the base of TR28 is isolated ensuring that only separated syncs arrive at the black level output on PLA9.

Power Supply

The power unit is a normal series-stabilised circuit except for the emitter-follower TR4 which splits the voltage supply rails and provides both positive and negative polarities. This simplifies the problem of supplying signal outputs at 0V d.c. offset. The regulated output from the power supply is brought to pins PLA4 and PLA6 to supply an ancillary unit, typically the Sync Monitor MN2/511 installed in a monitoring panel[2]

Alignment Instructions

Apparatus Required

Oscilioscope with 5mV/cm sensitivity
White Noise Generator GE4/501 or equivalent
Colour Calibrator UN2M/505
Video Oscillator 1MHz to 10MHz
Feed of 625-line coded colour bars
Test leads as required in Figs. 3 and 4 (x indicates relative cable lengths)
75-ohm mixing pad
Video distribution amplifier 6dB gain
Video sweep generator (Videoskop or similar)
4·43-MHz Vectorscope with external subcarrier reference

Adjustment of Sync Pulse Separator

1.1 Connect the Video Oscillator, set to 1V p-p at 3·6 MHz, to the input and adjust C8 for minimum sinewave at the emitter of TR8.

1.2 Replace the 3·6-MHz input with 625-line 100% coded colour bars. Examine the terminated mixed syncs output on PLA14 with the oscilloscope.

Attenuate the input by 6dB; adjust R40 to obtain a clean sync output and R43 to give a sync pulse amplitude of 2V p-p across 75 ohm. Remove the attenuator. Check that luminance information on the output is less than 10mV; the presence of excess luminance signal indicates a fault in IC2.

1.3 Add white noise to the colour bar input as in Fig. 3 to give a S/N ratio of 24dB. Examine the output and adjust R40 to give symmetrical noise-spike break-through on sync tips and blanking level. Reduce the signal level by 6dB and re-check symmetry. Adjust R40 for best compromise. Check that sync amplitude is not reduced when the input is attenuated by 6dB.

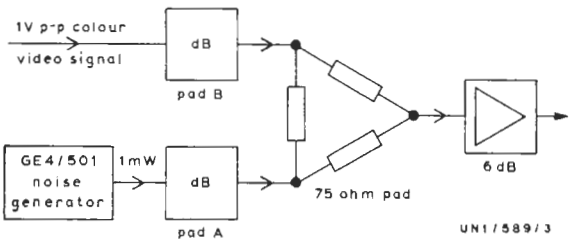

Fig. 3 Test Circuit for UN1/589

1.4 Examine the waveform on the collector of TR25 and compare it with the sync output. Adjust R71 so that the burst-gate pulse starts 250ns ± 50ns after the mid-point of the sync trailing-edge.
Adjust C41 so that the burst gate pulse duration is 3·6 ± 0·1 μs at the tip.

Adjustment of Colour Burst Separator

2.1 Apply a 1V p-p output from the Videoskop, set to sweep from 1MHz to 7MHz, to the UN1/589 input. Connect the sweep-display high-impedance input probe to the emitter of TR27. Initial alignment is simplified by first setting L3 core 1½ turns from the top of its screening can. Adjust L2 for maximum amplitude on the Videoskop display and then turn L2 core anticlockwise to reduce this maximum by ¾dB. Adjust the remaining two low-pass sections, L3 and L4, to give a band-pass characteristic flat within ±0·5dB limits between 3MHz and 5·5MHz and with about 3dB loss at 2·5 MHz and 6·5 MHz.

2.2 With back plate on and the coded colour bar input connected, adjust R82 to give 0·3V p-p colour burst output on PLA7. Adjust the trimming resistors and capacitors in CM1 for optimum rejection of both chrominance information (typically less than 2mV) and gating pulse breakthrough (typically less than 15mV).

2.3 Assemble the equipment as shown in Fig. 4. Test the assembly by substituting a musa coupler for the UN1/589 in the burst-and-syncs path and for the UN1/589 and delay cable in the burst path. Check that the phase of the output signal is constant irrespective of the cable route. Re-connect the cables as in Fig. 4 and ensure that the back plate is fitted.

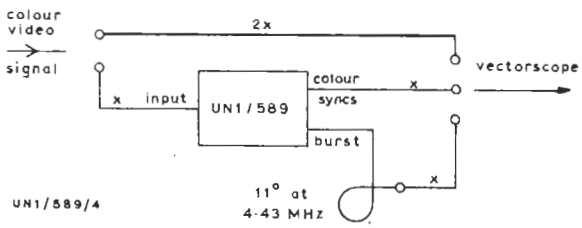

Fig. 4 Test Circuit for UN1/589

Adjust L5 in the filter to obtain a propagation delay of one cycle at 4·43MHz via the burst path and delay cable. Select C44 to achieve the same result from the burst-and-syncs output.

2.4 Reset R82 to obtain 0·3V p-p burst at the burst output. Measure the burst amplitude using a Colour Calibrator UN2M/505.

2.5 Select R114 (in parallel with R107) to give sync pulse amplitude on the burst-and-syncs signal of 300 ± 1·5mV. Reset R82 to give a burst output amplitude of 300mV p-p.

2.6 Examine the shape of the burst output. The top and bottom should be flat within ± 5mV. Any distortion in the shape may be caused by mis-alignment of the chrominance band-pass filter.

Final Checks

3.1 Ensure that the sync pulse component of the burst-and-syncs signal has an amplitude of 300 ± 3mV p-p. If not, adjust R43 to obtain this, then check that the mixed sync output is within ± 10mV of 2V p-p.

3.2 Examine the burst output amplitude on pin 7 and confirm that it is not changed by more than 30mV by the application of an earth to pin 13.

3.3 Remove the input. There should be no spurious outputs and the d.c. offset on all outputs should be less than 0·5V.

Reference to Typical Associated Equipment

1. Carrier Amplitude Modulator MD2/507
2. Sync Separation and Monitoring Panels PA1M/537; PA1M/538; PA1M/544

RDH 7/70