COMPLEMENTARY PICTURE AMPLIFIER AM5/515

Introduction

The AM5/515 accepts a Pal coded colour video signal and either passes it on unchanged (the positive mode) or inverts the luminance component and phase shifts the chrominance component by 180° (the negative mode). In both modes the gain is unity. A field-phased switch selects the operating mode and permits on-the-air changes.

The unit uses a CH1/12A chassis with index pegs 30 and 43. It includes its own stabilised power supply.

General Specification

Inputs

Video (Pal coded)	1V composite
Mixed Blanking	2V negative going

Outputs

Positive Mode	1V composite (identical to input)
Negative Mode	1V p-p composite signal with 0·7V inverted Luminance and the chrominance phase shifted 180°

Input Impedance

Video	greater than 1 Megohm
Mixed Blanking	greater than 3 Kilohms

Output Impedance 75 ohms

Differential Phase Distortion

Positive Mode	not greater than 0·2°
Negative Mode	not greater than 2°

Operating Temperature

Range	10° to 45°

Power Supply 30 mA at 210V to 260V, 50 Hz

Circuit Description

The circuit diagram is given in Fig. 1 on page 3. TR1 is an emitter follower driving the feedback amplifier TR2/TR3. C2 bootstraps the collector and base of TR1 to give a very high input impedance. The gain of TR2/TR3 is twice that of TR1. TR6 and TR7 clamp the base of TR9 during the back-porch period and under control of pulses from TR20. The main signal path from TR3 is via TR4 to TR9. TR5, fed in parallel with TR4, bootstraps R15 which thus appears to have a very high impedance from the signal path. The clamping potential from R21 and C7 via the emitter follower TR8 is applied through the switching transistors TR6 and TR7 to R15, any transients being by-passed to earth by the low impedance of TR5 emitter circuit.

TR9 and TR10 form a compound emitter follower feeding in parallel the picture inverting transistors TR13 and TR14. At this point the picture signal is positive going.

In the positive mode, TR13 operates as a common base amplifier, its base being held at a steady potential from R20 via the long-tailed pair TR11/TR12. The signal path is through R25/C9, R32 and R31 to the emitter of TR13, giving a positive-going picture signal at the collector which then passes via the feedback pair TR15/TR16 and the delay correcting network L1/C29 to the output terminal. TR12 is conductive because its base is returned to the negative line by TR21. At the same time, mixed blanking from TR18 is short-circuited.

TR21 is conductive during positive-mode working and non-conductive for the negative mode, under control of the bistable multivibrator TR22/TR23.

In the negative mode, TR12 is non-conductive during the picture period but conducts during the blanking period under control of blanking from TR18 (TR21 being non-conductive). The picture signal is applied therefore in parallel to the bases of TR13 and TR14. TR13 thus operates with inputs to both base and emitter and, as the gain through TR13 from base to collector is twice that of the alternative path via TR14, the picture output to TR15 is negative going. The sync signals are not affected as the circuit reverts to positive mode working when TR12 is forced to conduct by each blanking pulse.

During the blanking period, TR12 applies positive-going blanking to the base of TR13. At the same time, negative blanking is applied via TR14 to the emitter of TR13. These two blanking signals add at the collector of TR13 and with proper adjustment of the pedestal control R20, the bottom of the blanking signals coincides with the system black level. The syncs remain negative-going from blanking level in the normal way. Thus, during negative-mode working, TR13 and TR14 are continually switching the signal circuit between the negative and positive modes under control of blanking. This condition persists as long as TR21 remains non-conducting.

TR21 is controlled by the bistable circuit TR22/TR23 which is triggered by TR24. TR24 is conductive only during the field-blanking pulse due to the action of the field phasing switch TR25. TR25 permits on-air positive/negative switching by ensuring that the change-over takes place only during the field-blanking period. A positive-going blanking pulse from TR17 is inverted by TR25 and integrated by C17/R24 to attenuate the line pulses; the resultant negative-going field pulse switches on TR24 during the pulse period. With TR24 conductive, the potential at the junction of R71, R72 and R73 is applied to the base of TR23. This potential is zero for the positive mode and about 6 volts positive for the negative mode, depending on the switch at the vision-mixing position. In the positive mode TR23 is switched hard on, applying a positive bias to TR21 and holding TR22 off. This condition remains, with TR21 conducting, until the remote control switch is opened. The potential at the base of TR23 then rises and TR22 starts to take current, rapidly switching off TR23 and therefore TR21 also. The control switch can be operated at any time but the circuit does not respond until the next field-blanking pulse arrives.

The clamping pulses for TR6 and TR7 are derived from the positive-going blanking pulses at the collector of TR17. The pulses are differentiated by C16 and R54 and the positive-going leading spike cuts off TR19. C15 now charges until the base of TR19 starts to take current again. The trailing positive-going edges of the pulses in the collector circuit are differentiated and cut off TR20, producing negative-going pulses in the collector circuit. (The action of delay pulse generators of this kind is described in *Television Engineering*, Vol. 3, 2nd edition.)

The stabilized power supply follows normal practice. TR29 and TR30 produce a stable zero potential earth point between the +12 volt and −6 volt legs of the supply.

Maintenance

Routine maintenance is not required but the following points can be noted:

1. R80 sets the voltage between the +12V and −6V lines to 18V.
2. The gain-balance control R32 provides adjustment to minimise any luminance level differences between the positive and negative modes.
3. Using the standard change-over method, compare a direct signal with the same signal after passing through the AM5/515. Set R28 to equalise the luminance amplitudes.
4. R20, the pedestal control, provides adjustment when in the negative mode, to ensure that the blanking level is the same as the system black level.
5. The capacitors C3, C9 and C11 set the chrominance amplitude and delay and normally the adjustments should not be disturbed. If any adjustment does become necessary, the procedure given in the Designs Department Specification must be followed.

Reference

1. Designs Department Specification No. 8.378(70).

AIB 8/70

video in

FEEDBACK AMPLIFIER

CLAMP

PICTURE INVERTING AMPLIFIER

video out

M.B. in

CLAMP PULSE GENERATOR

BISTABLE MV

FIELD PHASING SWITCH

from D25653 A1
parts list D25654 A4

transistor terminations
view on leads

DT3200

BC107
BC109
BCY71
BCY72
BFY51
BFY64
V405A

2N918

2N3702
2N3704

AM5/515/1T

Fig 1 Circuit of the Complementary Picture Amplifier AM5/515