SECTION 14

PICTURE PHASE INDICATOR IN1/501

Introduction

The Picture Phase Indicator accepts two signals, which may be either composite video or sync-pulse waveforms, and gives an indication when the signal applied to the *Remote* input is delayed with respect to the *Local* input by any time interval from 0 to 90 μs. (approximate picture synchronism).

The Indicator produces four output signals:

(a) A rectangular-wave signal at picture frequency in which the mark-space ratio is a function of the phase difference between the two input signals. Normally this output is fed to a Picture Phase Meter PA15/501 (Instruction V.13).

(b) A *mixed pulse* output which consists of the voltage sum of two pulse waveforms which are generated at picture frequency. The leading edges of these pulse waveforms are coincident with the leading edges of corresponding line-sync pulses in each of the inputs. The pulses derived from the *Local* input have a duration of 90 μs and those derived from the *Remote* input have a duration of 4 μs.

(c) An *in-phase pulse* output which is a positive-going picture-frequency pulse waveform, during the post-equalisation period of field blanking, if the two input signals are in approximate picture synchronism. This pulse may be added to the video signal which is returned to the source of the *Remote* input signal.

(d) A *gated tone* output of 800 Hz which can be fed to the source of the *Remote* input signal via a control line while picture-phasing is being adjusted manually. The tone is at low level until the two inputs are in approximate picture synchronism when the output takes the form shown in Fig. 14.1.

The IN1/501 is constructed on a CH1/12C chassis with index-peg positions 9 and 12.

Circuit Description

The circuit of the Indicator is given in Fig. 14.2. The two parts incorporating transistors TR1 to TR7 and transistors TR11 to TR17 form two identical picture-frequency pulse generators. The first stage is a simple sync-separator stage with transistor TR1 (TR11) bottomed in the absence of an input signal. An inverted sync-pulse waveform is produced at the collector.

An emitter follower TR2 (TR12) feeds a field-sync separator circuit which has an output waveform as shown in Fig. 14.3(b). The positive-going excursions of this waveform, at the leading edges of the second and subsequent broad pulses, are sufficient to overcome the bias on diode D1 (D6). The first pulse from these edges triggers a monostable multivibrator whose output-pulse duration is set at 544 μs. This value is chosen as being suitable for both the 405-line and 625-line standards without readjustment. The trailing edge of the pulse from the

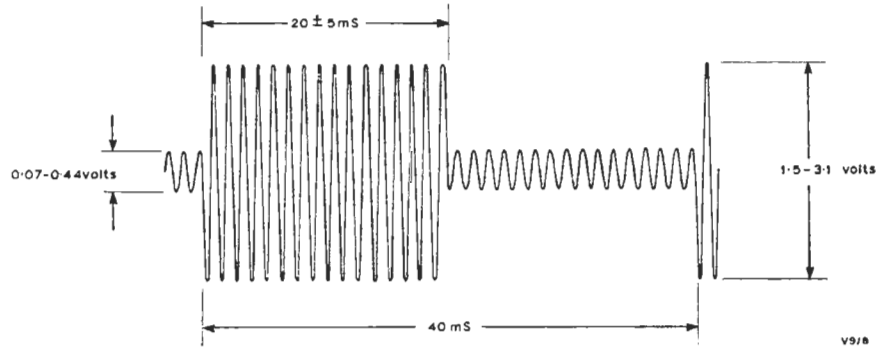


Fig. 14.1 Gated Tone Output Waveform

multivibrator is differentiated to produce a 20-μs pulse at the collector of transistor TR5 (TR15).

The remainder of this part of the circuit forms a pulse coincidence gate whose output is a positive-going picture-frequency pulse at the collector of transistor TR7 (TR17). This pulse is coincident with the line-sync pulse at the start of line 10 on the 625-line standard and at the start of line 7 on the 405-line standard.

These picture-frequency pulses are fed to a Bistable Unit UN9/528 (see Instruction V.14) whose output is a rectangular waveform. This is the output of the Indicator which is fed to a Picture Phase Meter PA15/501. The leading edges of this output are controlled by the remote-input picture-pulses and the trailing edges are controlled by the local-input picture pulses.

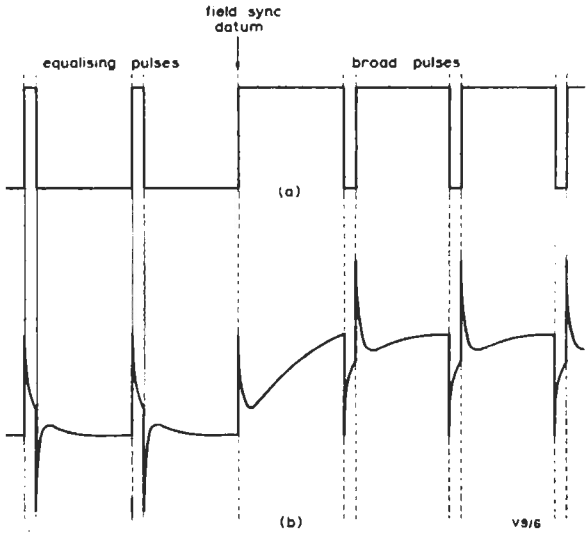


Fig. 14.3 Input and Output Waveforms of the Field-sync Separator Circuit

Each of the picture-pulse generators also feeds a monostable multivibrator. The durations of the output pulses of these multivibrators are 90 μs (local, set by RV2) and about 4 μs (remote). These pulse waveforms are mixed at the outputs of emitter followers TR10 and TR20. The resulting waveform is fed to emitter follower TR26 to give the *mixed pulse* output.

The mixed pulse waveform is also fed to diode D11. When the two inputs to the Indicator are in approximate picture phase, the voltage of this waveform is sufficient to overcome the bias and cause the diode to conduct. A pulse is produced at both the emitter and the collector of transistor TR21. The positive-going pulse at the emitter is attenuated to give the *in phase* output of the Indicator.

The negative-going pulse at the collector of transistor TR21 triggers a monostable multivibrator whose output-pulse duration is approximately 20ms. This pulse is fed to the base of a switching transistor TR24. The emitter of this transistor is fed with a 800-Hz sinewave signal giving a chopped tone waveform at its collector. The resistor chain R109 and RV4 form an attenuator across the transistor giving a continuous low-level background tone. This *gated tone* output is fed through an amplifying stage to a balanced output transformer T2.

The 800-Hz signal is obtained from a Wien bridge oscillator (see Instruction S4). The oscillator includes a constant-current amplifier in which the resistor RV5 controls the gain but also forms part of the frequency determining network.

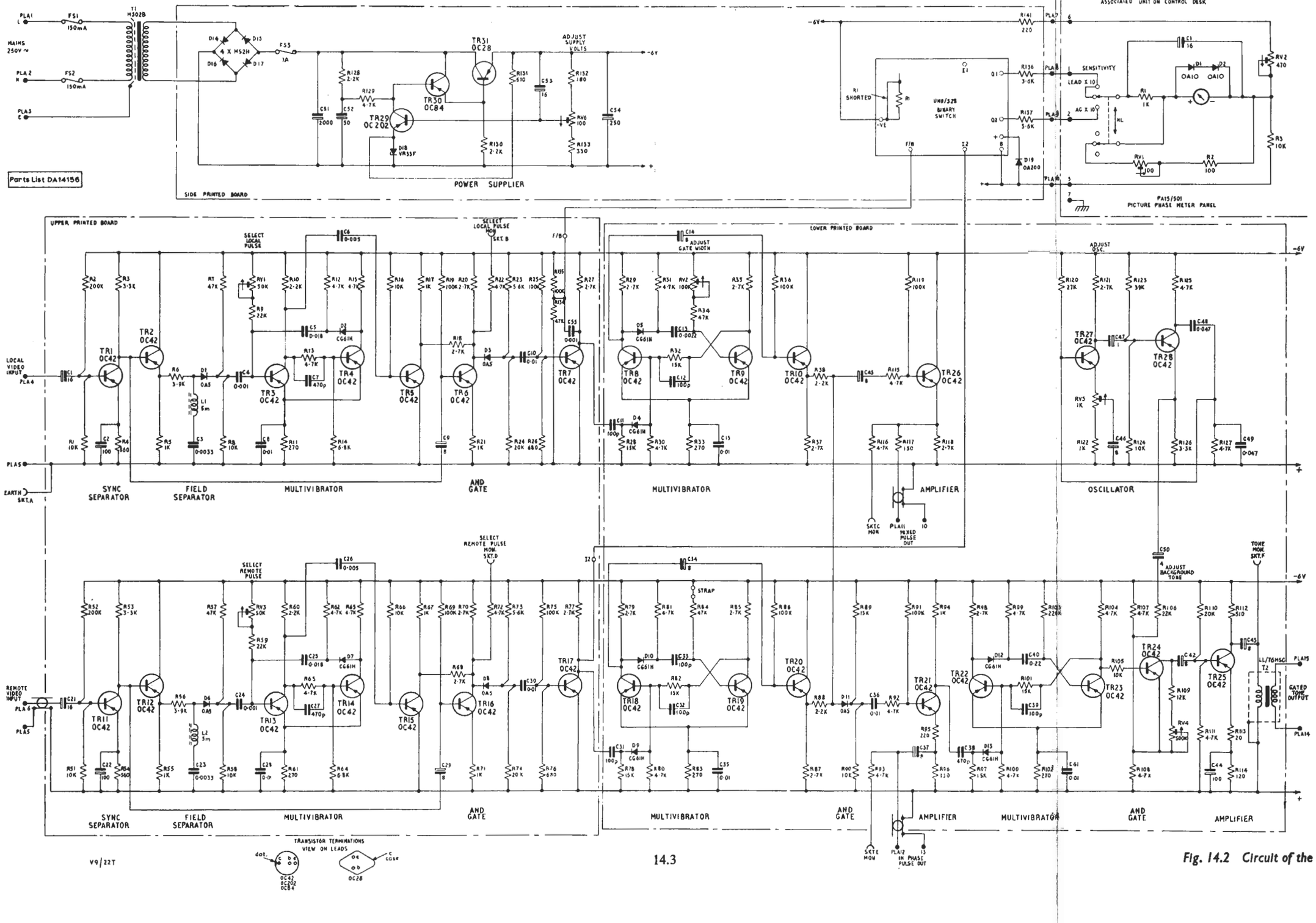
Test Schedule

Apparatus required

Avometer Model 8
Tektronix oscilloscope Type 515A or 540
Line strobing unit (if oscilloscope has no delayed sweep facility)
75-ohm 60-dB variable attenuator
Two sources of 625-line standard video signals derived from separate sync pulse-generators
Source of 405-line standard video signal

Test procedure

1. Check that the ratings of the mains fuses are 150 mA and that the rating of the rectifier output fuse is 1A.
   Switch on the Indicator.
2. Measure the output voltage of the power supplier using the Avometer and set the *Adjust Supply Volts* control RV6 to give 6·0 volts.
3. Switch off the mains supply.
   Remove fuse FS1 and replace it with the Avometer set to read alternating current.
   Switch on and check that the Indicator takes about 20 mA.
   Switch off and restore the fuse.
4. Remove fuse FS3 to measure the current taken by the regulator and the Indicator circuit. It should be about 85 mA.
   Switch off and restore the fuse.
5. Feed a 1-volt p-p 625-line video signal via the attenuator to the terminated *Local* input (pin 4) of the Indicator, and check the level on the oscilloscope.



14.3

Fig. 14.2 Circuit of the IN1/501

6. Observe the waveform at the emitter of transistor TR2. This waveform should consist of sync-pulses with practically no trace of picture information and have an amplitude of about 5 volts. Attenuate the input signal until the amount of picture information starts to increase. The attenuation required should be not less than 6 dB.
   Switch out the attenuation.
7. Trigger the oscilloscope at picture frequency and observe the waveform at the collector of transistor TR3. Check that the negative-going edges of the waveform are coincident with the leading edges of the second broad-pulses of the input waveform.
   Operate the *Select Local Pulse* control RV1 and check that the duration of the pulses can be varied over the range 280 to 585 μs.
   Set the duration of the pulses at approximately 544 μs.
8. Check that the waveform at the collector of transistor TR5 consists of negative-going pulses with a duration of 20 μs, an amplitude of 5 volts p-p and which occur at the trailing edge of the 544-μs pulse.
9. Observe the waveform at the *Select Local Pulse* monitor socket. Adjust the *Select Local Pulse* control, if necessary, so that the field pulses from the collector of transistor TR5 coincide with the sync pulses at the start of line 10.
10. Replace the input signal with the 405-line signal and check that the field pulses coincide with the sync pulses at the start of line 7. If any adjustment of the *Select Local Pulse* control is necessary, repeat steps 9 and 10 until no further adjustment is required.
11. Replace the input signal with the 625-line signal and observe the waveform at the collector of transistor TR7. It should be a train of positive-going picture-frequency pulses of 5 μs duration and almost 6 volts p-p amplitude.
12. Reconnect the input signal to the *Remote* input and repeat stages 5 to 11 for the remote input picture-frequency pulse generator.
13. Observe the waveform at the emitter of transistor TR20. It should be positive-going picture-frequency pulses with a duration in the range 2·5 to 5·5 μs and an amplitude of 5 volts p-p.
14. Connect the second source of 625-line video signal to the terminated *Local* input of the Indicator.
    Observe the waveform at the emitter of transistor TR10. It should be positive-going picture-frequency pulses of 5 volts p-p amplitude. Adjust the *Gate Width* control RV2 and check that the duration can be varied over the range 70 to 200 μs.
    Set the duration of the pulses at 90 μs.
15. Feed the terminated input of the oscilloscope with the *Mixed Pulse* output. The waveform should consist of a mixture of the 90 μs picture-frequency pulses and the corresponding shorter pulses from the *Remote* input chain. Each of the pulses should have an amplitude not less than 0·2 volts p-p.
16. Reconnect the inputs so that both are derived from one source. Reconnect the oscilloscope to the *In Phase* output socket and observe the waveform. It should be identical with the shorter pulse observed from the *Mixed Pulse* output.
17. Remove the termination from the input of the oscilloscope.
    Terminate the *Gated Tone* output with 600 ohms
    Observe the waveform at the emitter of transistor TR28. Adjust the variable resistor RV5 to give an amplitude of 1·5 volts p-p. The frequency should be 800 ± 80 Hz.
    Observe the waveform at the *Gated Tone* output. It should take the form shown in Fig. 14.1. Adjust the *Background Tone* control RV4 to obtain the level shown.

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