CQ-TV

no 66.

The Journal of the British Amateur Television Club

THE BRITISH AMATEUR TELEVISION CLUB

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Cover photo: B.A.T.C. Convention 1966.

CONVENTION 68

The 1968 B.A.T.C . Convention is being held on Saturday 14th September, in the I.T.A. Conference Suite, 70 Brompton Road, London S.W.3, from 10 am to 6 pm.

At 3 pm there will be a General Meeting for members only. Various reports will be given and the business of election of committee members will be carried out. It is expected that the meeting will last about half an hour and that non members will be entertained with a film show.

After the meeting it is hoped there will be some lectures on the subjects of slow scan television, vidicon yokes and video tape recording.

SLOW SCAN

From Cop Macdonald WA2FLT:

Report No. 2966

SLOW-SCAN T.V. RULES ADOPTED FOR AMATEURS ON FREQUENCIES BELOW 420 MC/S

FCC Amateur Radio Service rules (Part 97) have been amended to permit transmission of pictures by narrow band techniques (slow-scan TV) in telephony bands below 420 Mc/s from August 30th, 1968

Amateurs have their choice of amplitude modulation (A5 emission) or frequency modulation (F5 emission).

Slow-scan TV is transmitted by modulating a subcarrier between frequency limits of 1500 cycles per second (black) and 2300 c/s (white). Vertical and horizontal synchronisation is maintained by transmitting short bursts of 1200 c/s tone. Live scenes we transmitted as a series of "stills". A single scene can be scanned in 8 seconds.

The new rules require use of single sideband on bands below 50 Mc/s and allow double sideband above.

Slow-scan TV frequencies below 28 Mc/s are limited to those being reserved for Extra and Advanced Class Amateur licensees. "In addition to providing further incentive to upgrade operator licenses, the limitation should also be some assurance that the operators using slow-scan TV have the requisite technical skill to operate in a manner compatible with existing radiotelephone operation", the Commission said.

POSTBAG

Peter Helm G8AEN is willing to check Xtals within the range 100Hz to 200Mhz for activity and frequency to an accuracy of approximately 3 parts in 10^{10} for amateur use to the nearest Hertz. The only charge is for the return post and packing. Peter's address is: 90 Horne Street, Bury, Lancashire.

T.J. Dennis from Birch near Colchester has been working on a flying spot scanner:- "I have (in my own biased opinion) been able to produce some quite good FSS pictures with MC13-16 scanner and 931 PM, as well as live pictures of objects using Baird's projected raster technique. I have also constructed Mike Cox's SPG using NPN transistors, and a 405kc/s crystal (8/-) with its output divided by eight and five. With transistors at 6d. each, it has been worth it, results being very satisfactory."

B.B.C. ARIEL RADIO GROUP T.V. SECTION

An Amateur T.V Station has been installed in West London at Shepherds Bush. The station includes a transmitter for any standard and a separate room for a studio with one vidicon camera channel.

It is hoped to radiate at least one transmission a week, the output comprising test wavefom, caption, and live studio. In a few months' time a telecine machine should be in operation. The E.R.P. will be about 3 K W, with which we hope to effectively cover the London basin.

Station Call Sign G6ACU/T

Frequencies: Vision 436.0 MHz (when beacon will allow),or 438.75 MHz
Sound 432.29 MHz
Talk Back Station G3NTS on 144.71 MHz or any other band.

For tests etc. contact:-

P. Blakeborough G3PYB, 14A Westow Street, Upper Norwood,
London S.E.19. Tel.01.653.4218

70cm Combining Unit

Ian Waters

Object

To enable two transmitters vision arid source to radiate by one aerial. This requires a low attenuation path from each transmitter to the aerial, and a high attenuation path from transmitter to transmitter.

Construction

The essential part of the combiner consists of a closed ring of co-axial cable, of an impedance equal to the impedance of the main feeders. The ring is made up in multiples of a ¼ wavelength of cable calculated at the mean frequency of the vision and sound channels, taking into consideration the velocity factor of the cable employed. The dimensions of the ring are given in Fig. 1.

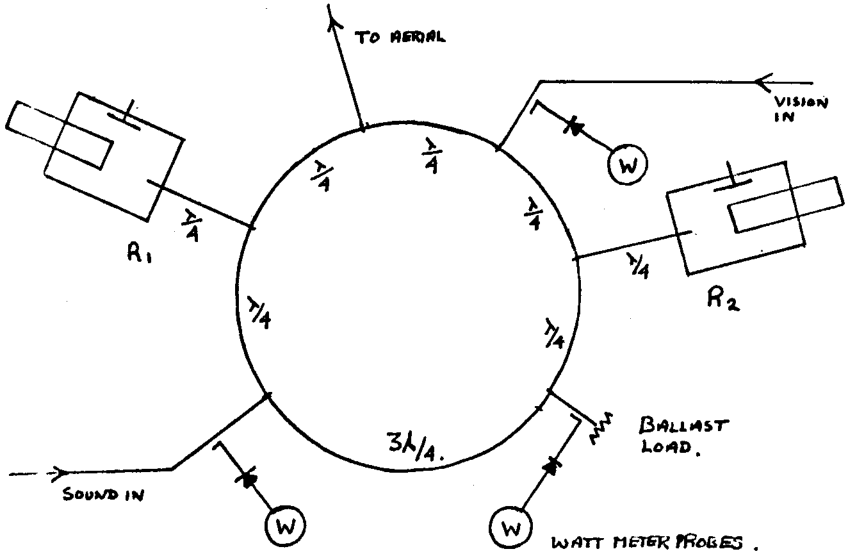


Fig. 1. Dimensions of Ring.

Two high Q quarter wavelength resonator drums are connected to the ring at the points shown by quarter wavelength long stubs of cable. The coupling between the stubs and drums is by means of pins approx. 3/8" long penetrating the drums. Details of the construction of these resonators are given in Fig. 2. All "T" junctions are made by using split clamps formed from this tin plate steel (cocoa tins), by using a simple forming tool in a vice. The details of the "T" joints and tool are given in Figs. 3 & 4.

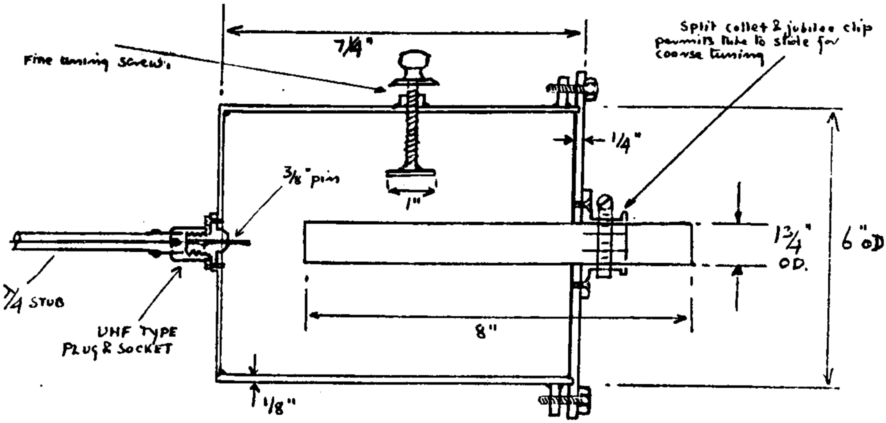
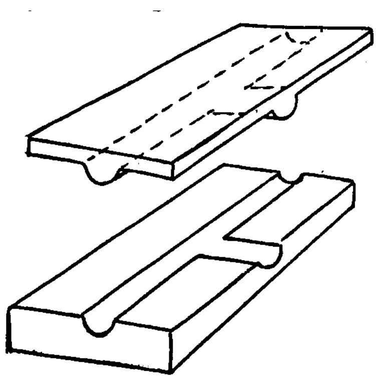


Fig.2. Detail of Resonator Drum.



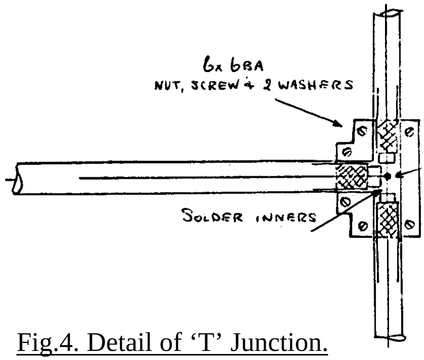


Fig.4. Detail of 'T' Junction.

Fig.3. Detail of Forming Tool for Coaxial 'T' Junctions.

At the point indicated, a Ballast load is connected, this consists of about 100 ft. low quality (high loss) coaxial cable wound on a suitable former. The remote end of this cable is terminated with a resistor, of value equal to the system impedance. A diode and meter is used to indicate the power being dissipated in this load.

Monitoring probes are also inserted in the cables from the two transmitters, these probes are connected to power meters and also via a switch to an amplifier having a high input impedance and a low output impedance so that the modulation may be observed on suitable picture and wave-form monitors. The monitoring circuits are shown in Fig. 5.

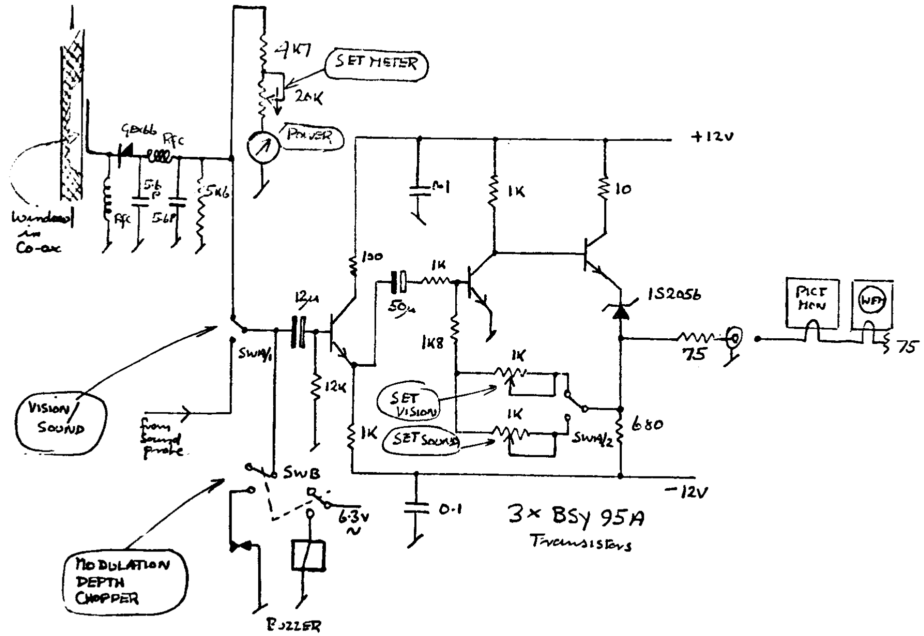


Fig. 5. Monitoring System.

How it Works

(a) Consider the path Sound TX to aerial. The signal splits and travels in both directions, round the ring. Consider the clockwise direction, between the Sound TX junction and the aerial junction - there are 2 x T/4 sections or 180° of phase change. Consider the anti-clockwise direction, here there are 6 x T/4 or 360° + 180° of phase change. Hence both signals add in phase and proceed to the aerial.

(b) Consider Sound to Vision path.
Clockwise: 3 x T/4 = 270°.
Anti-clockwise: 5 x T/4 = 360° + 90°, these are in anti-clockwise phase hence no sound goes back into the vision TX.

(c) Consider Sound to Ballast load.
Clockwise: 5 x T/4 =360° + 90°.
Anti-clockwise: 3 x T/4 = 270°, these are in anti-phase so little sound power is lost in the ballast load.

No mention has yet been made of the function of the resonator drums. These are tuned to resonate at SOUND frequency. They are series resonant and present low impedance at the drum end of the T/4 stub. Due to the stub being a quarter wave long, this gives a high impedance at the "T" junction with the ring. The drums therefore have no effect on the sound path.

(d) Consider the path Vision TX to aerial. This signal can again split and travel two ways. Consider the clockwise direction after travelling a quarter of a wave-length it reaches the resonator junction. Since the drum is of high Q it exhibits an anti-resonance throughout the VISION passband. This high impedance at the drum end is transformed by the quarter wave stub to appear as a low impedance, or near short circuit at the "T" junction. The vision is therefore reflected back in the direction from whence it came suffering a 90° phase change on reflection. It now traverses a further 2 x T/4 before reaching the aerial junction. A total shift of 360° is therefore introduced between the vision TX and aerial.

Consideration of the anti-clockwise direction will show that a similar reflection occurs at the other drum junction and that the total phase change is also 360°. Both signals therefore add and proceed to the aerial with little attenuation.

(e) Consider Vision to sound path.
Clockwise: Any signal not being fully reflected will traverse 5 x T/4 or 360° + 90° .
Anti-clockwise: Any signal not being fully reflected will traverse 3 x T/4 or 270°.
These signals are in anti-phase and will cancel.

(f) Consider Vision to ballast load path.
Clockwise: Any signal not reflected will traverse 2 x T/4 = 180°.
Anti-clockwise: Any signal not reflected will traverse 6 x T/4 = 360° + 180°. These signals are in phase. The ballast load therefore absorbs any vision not reflected.

Tuning Up

Coarse tuning is made by sliding the centre tubes in and out of the resonators. Once the approximate tuning point has been found, these are clamped and fine tuning is performed with the small capacitive disc on a threaded shaft.

Tuning is carried out for minimum sound, power flowing back into the vision TX feed, (as seen on the modulation probe), together with the minimum reading in the ballast power meter. It will be found that tuning is quite critical and that the drums are to some extent temperature conscious and may need slight readjustment as the system warms up.

Performance

The following figures were measured on the prototype.

Insertion Attenuation Vision TX to Aerial approx. 0.75dB.
Insertion Attenuation Sound TX to Aerial approx. 1.0dB.
Cross Attenuation Vision TX to Sound TX approx. 35dB,

Fig. 6 shows the typical insertion loss of the Combiner measured from the vision transmitter to aerial, the variation of response over the vision band is about ± 0.25 dB. Fig. 7 shows the variation of the load impedance seen by the vision transmitter to a similar frequency base.

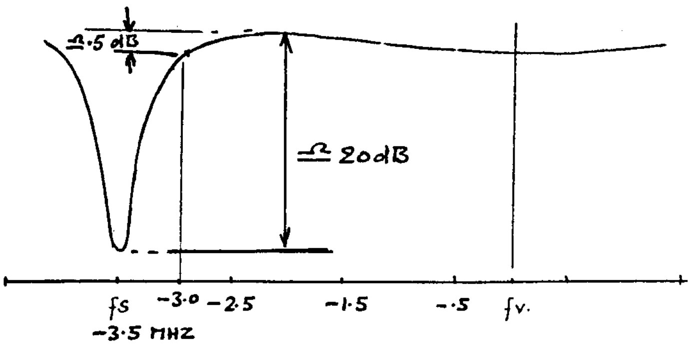


Fig.6. Typical Insertion Loss/Frequency
From Vision TX To Aerial.

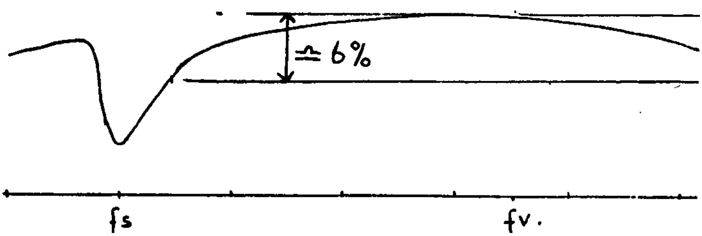


Fig.7. Typical Plot Of Vision Input Impedance/Frequency.

The Use of the Combiner for Duplex Sound Working

Although originally designed to enable simultaneous Vision and Sound to be radiated via one aerial, it has been found that the Combining Unit also enables an important secondary object to be achieved

When the station is operating as a Sound Communications Station only with the Vision TX switched off, the vision connection may be transferred to a receiver, thereby enabling reception of signals more than about 0.75MHz above or below the sound transmitter frequency, while the Sound TX is radiating. Duplex operation on 70 cm transmitting and receiving through the same aerial is therefore possible.

A coaxial relay may be inserted in the Vision connection to transfer the feed to the receiver when duplex is used. For optimum results, the Resonators should be adjusted to give the maximum "S" meter reading on the received signal which will coincide with a minimum tendency to "howl round" if the modulation gain is increased. Spurious crystal current on the receiving converter will clip to zero when the drums are correctly tuned. Since if the drums go out of tune considerable power can be fed into the receiver, it is desirable to use a valve rather than a solid state device in the R.F. stage. The effect of a further High Q rejector tuned to the sound transmitter frequency at the input to the receiver is worth investigating. This can make the adjustment of the main drums less critical and lessen the slight drifting which can occur due to changes in temperature.

This duplex system has worked well on good local signals from stations of up to 30 miles distant but is obviously unsuitable for use with weak DX.

Grille and Step-Wedge Generator

B.W.B. Pethers.

Approx. specification:

Output. 1 volt positive going composite video into 75 ohms.

Standard. Switchable 625/405

Sync waveform. Line front and back porch provided. Simplified field sync pulse group within field blanking with line sync edges maintained throughout. Integral relationship between line and field frequencies.

Grille waveform. Number of horizontal and vertical bars variable between about 5 and 30 (on 625 lines). Horizontal bar duration, 1 line. Vertical bar duration, about 0.3 micro-sec.

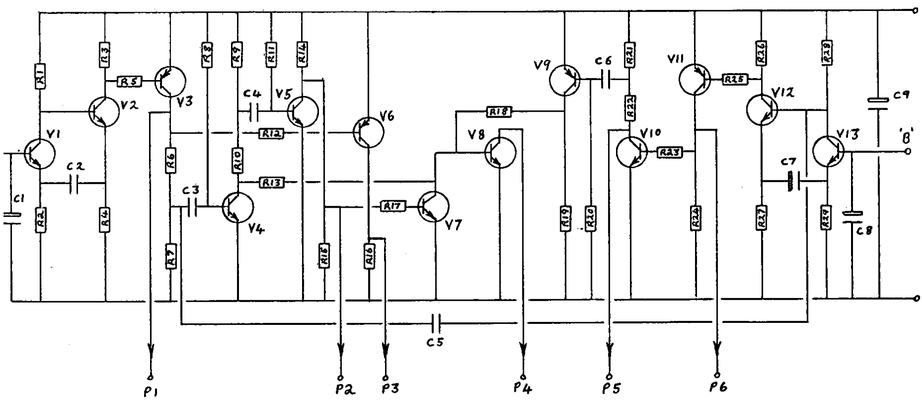
Step waveform. Linear, number of steps equal to number of vertical bars in the grille waveform.

Pulse Generator

VI and V2 form an emitter coupled astable multivibrator whose frequency, determined by the potential on 'A' is arranged to be approximately line frequency with an output pulse width equal to that of line blanking. V3 and V6 provide buffered negative and positive going line blanking pulses respectively. Negative going line blanking from V3 is narrowed by V4 to give at its collector a positive going pulse of front porch width. The trailing edge of this pulse initiates line sync pulse generation in V5 at whose collector a positive going line sync pulse appears.

Similarly V12 and V13 oscillate at approximately field frequency whilst V11 and V10 provide negative and positive going field blanking pulses respectively. The exact frequency is determined by the potential on 'B'. Positive going field blanking from V10 is narrowed by V9 to give at its collector a negative going pulse of width equal to the duration of the field sync pulse group. Field frequency is maintained at a sub harmonic of line frequency via C5.

Between field sync pulse groups V8 is held 'on' except during line sync pulses when its base is shorted to its emitter via V7. During the field sync pulse group V8 is held 'off' except during the front porch pulses which are here used as inter 'broad pulse' pulses thus maintaining a negative going line synchronising edge in the composite sync waveform during the field sync pulse group. Composite syncs appear (inverted) across the collector load of V8 (via P4).



R1	15K	R16	3·3K
R2	6·8K	R17	5·6K
R3	1K	R18	15K
R4	1K	R19	3·3K
R5	15K	R20	27K
R6	2·2K	R21	1K
R7	1K	R22	2·2K
R8	27K	R23	15K
R9	1K	R24	3·3K
R10	2·2K	R25	15K
R11	27K	R26	1K
R12	15K	R27	1K
R13	15K	R28	47K
R14	3·3K	R29	18K
R15	2·2K		

C1	100µF 6v
C2	·015µF
C3	220pF
C4	680pF
C5	22pF
C6	·05µF
C7	4µF 6v
C8	100µF 6v
C9	500µF 25v

PULSE GENERATOR.

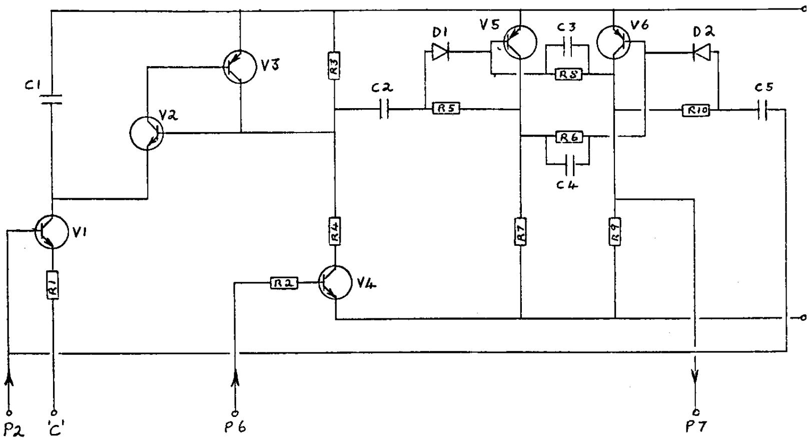
All resistors 0.1 watt rating.

V3, 6, 9, 11 type 2N3702.

Other transistors 2N706.

Horizontal Bar Generator

Positive going line sync pulses applied to the base of V1 result in pulses of collector current whose amplitude is determined by the resistance connected between 'C' and the -12v rail. Cl is charged by these current pulses until the emitter potential of V2 approximately equals that on its base when the positive feedback pair, V2/V3, switch hard on discharging Cl and producing a positive pulse at the junction of R3/R4. Thus V1/V2/V3 form a line counter. V4 inhibits the charging of Cl during field blanking ensuring field locking of the horizontal bars. V5 and V6 form a bistable circuit whose state is reversed by the positive pulse at the junction of R3/R4 and restored by the next line sync trailing edge. The resulting positive going pulse at P7 is nearly one line period long having both edges within line blanking period.



R1	180Ω
R2	15K
R3	1K
R4	1K
R5	33K
R6	33K
R7	3·3K
R8	33K
R9	3·3K
R10	33K

C1	0·1μF
C2	33pF
C3	33pF
C4	33pF
C5	33pF

HORIZONTAL BAR GENERATOR.

All resistors 0.1 watt rating.

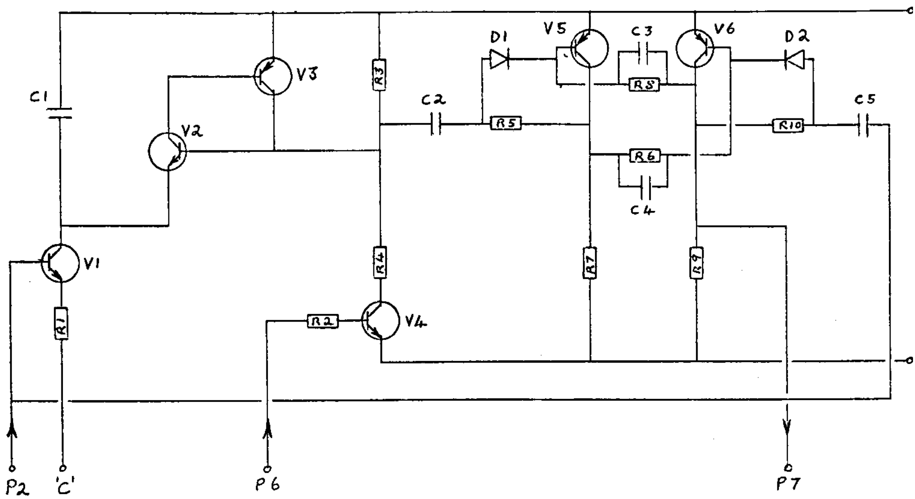
V1, 2, 4 type 2N706, others 2N3702.

D1, 2, type 1N914.

Vertical Bar Generator

V2 and V4 form a collector coupled astable multivibrator whose frequency is determined by the resistance connected between 'D' and the -12v rail. V3 is merely an emitter follower isolating V4 collector from the loading effect of C2. V1 inhibits the multivibrator during line blanking ensuring line locking of the vertical bars.

Positive going horizontal or vertical bars switch V6 on except during line or field blanking when its base is shorted to its emitter via V5. The resistive matrix R13/R14/ R17/R18 together with the sync waveform current fed in via P4 is proportioned to give, at P9, about 2 volts of negative going composite video with the D.C. levels required by the output stages.



C1	·05uF
C2	470pF
C3	33pF
C4	100uF 6v

R1	4.7K	R10	15K
R2	8.2K	R11	15K
R3	680Ω	R12	15K
R4	390Ω	R13	180Ω
R5	15K	R14	560Ω
R6	1K	R15	180Ω
R7	680Ω	R16	1K
R8	390Ω	R17	680Ω
R9	39K	R18	2.2K

VERTICAL BAR GENERATOR.

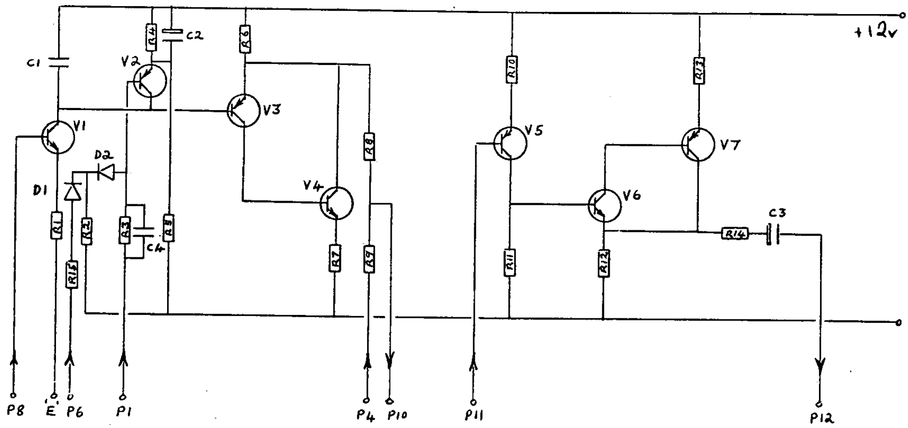
R6,16 0.25 watt, others 0.1 watt
V5,6 type 2N706, others 2N3702
C1 should be connected as close to the 12v supply & V1, 2, 3, 4 as possible.

Blanked Step Generator & Sync Mixer

Positive going vertical bar pulses applied to the base of V1 result in pulses of collector current hose amplitude is determined by the resistance connected between the emitter of V1 and the -12v rail. Cl is charged by these current pulses and discharged by V2 during line and field blanking. Diodes D1 and D2 isolate the pulse generators from excessive loading. The high input impedance presented by the feedback pair V3/V4 prevents excessive sag of the step waveform. Syncs are mixed in via resistive matrix R8/R9

Output Stages

V5 is merely a phase inverter whilst feedback pair V6/V7 together with R14 provide the 75 ohms output impedance.



R1	470Ω	R8	150Ω
R2	15 K	R9	2.2K
R3	15 K	R10	1K
R4	330Ω	R11	1K
R5	1K	R12	100Ω
R6	270Ω	R13	100Ω
R7	100Ω	R14	75Ω
		R15	3·9 K

C1	·01µF
C2	100µF 6v
C3	1000µF 12v
C4	100 pF

BLANKED STEP GENERATOR & SYNC MIXER OUTPUT STAGES.

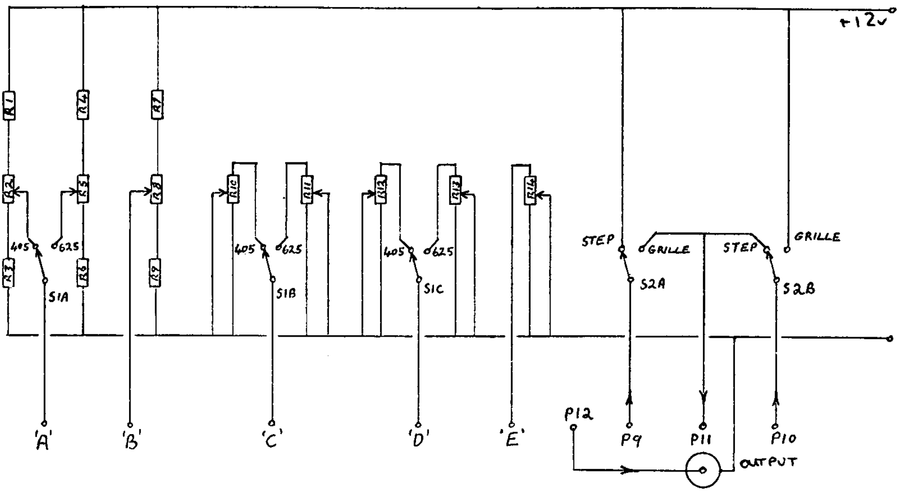
R5 0.25 watt, others 0.1 watt

V1, 4, 6 2N706, others 2N3702

D1, 2 type 1N914

Control Panel

Switches pre-set line frequencies, number of horizontal bars and number of vertical bars via the standards switch. It also switches grille or step waveform to the output stages. To prevent breakthrough the unwanted waveform is shorted to the plus 12v rail.



R1	4·7K	A.O.T	R8	1K	field freq:
R2	1K	405 line freq:	R9	4·7K	
R3	4·7K		R10	1K	405 Number of
R4	4·7K	A.O.T.	R11	1K	625 horizontal lines
R5	1K	625 Line freq:	R12	100K	405 Number of
R6	4·7K		R13	100K	625 vertical lines
R7	4·7K		R14	1K	Step amplitude

CONTROL PANEL

The number of vertical lines (grille)
is also the number of steps unless additional
pre-sets are switched in by S2.
If the number of steps is set to be
different on 405 and 625, "step amp" will
require adjustment when switching standards.
Connections between all parts of the
circuit should be as short as possible.

adverts

Projection E.H.T. Unit
Projection Optics including Scan Coils and two tubes.
"Plumbing" out of ASB8 including valve.
Radar video/sync. generator (regret no circuit).

Any offers for bove to: David Long G6ACH/T 49 Greenways, Delnes Lane, Consett, Co. Durham.

One separate mesh broadcast quality vidicon tube. Price £9.0.0

Dave Bridgen, C/o International Aeradio Ltd., Hayes Road, Southall, Middlesex.

Several RD73 8½" rectangular screen CRTs available removed from monitors used for T.A.C. displays.
Wanted, vidicon camera.

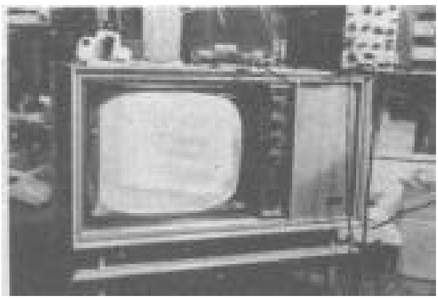
P. Hirst G6ABT/T Frondirion, Penrhyd, Amlwch, AngIesey.

POSTBAG

Norman O'Brien G3LP, G6ADO/T of Cheltenham is building two TX's, one sound and one vision, and will be using, the 405 line system with about 20 watts peak white. Norman is interested in increasing activity in his area.

Roberto Charters D'Azevedo CTINB of Lisbon, Portugal writes to say that TV on 430 to 436.75 MHz is now allowed with a channel bandwidth of 6.75 MHz

Fred Biggs VO1DZ of Gander, Newfoundland has sent us this picture of his "first attempt" at television. This is a closed circuit set up using a vidicon tube which is an ex commercial reject. The caption reads Stand by, Network Trouble VO1DZ/AT/V.



READ

CQ-TV