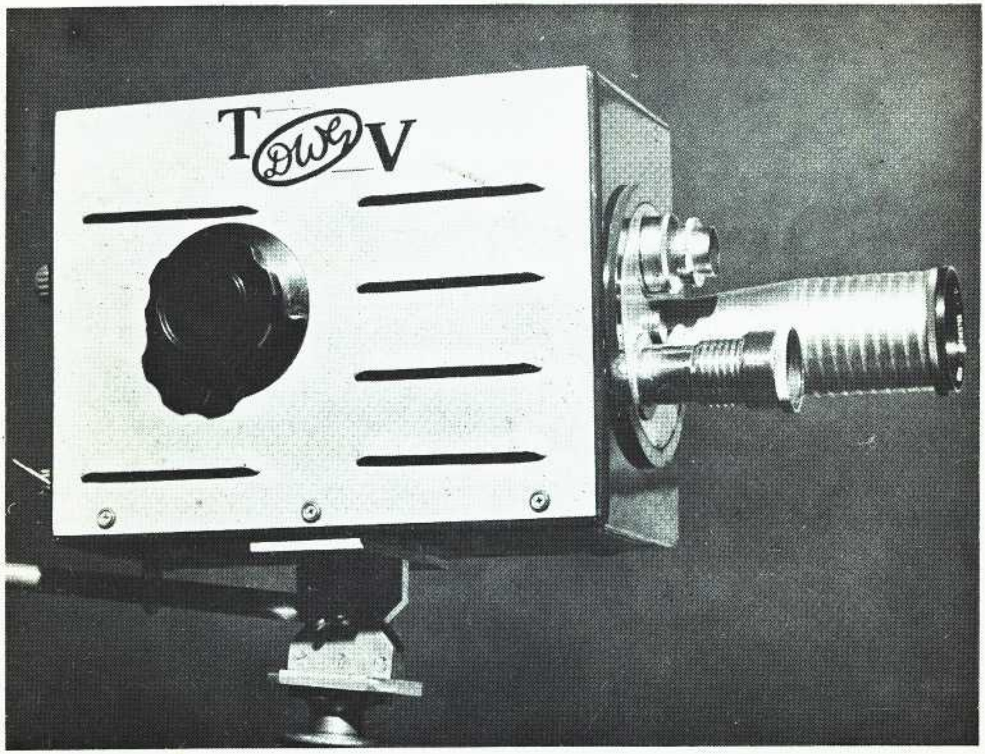


cq-tv

47

CQ-TV - Journal of the British Amateur Television Club.

Published at 20, Hughenden Road, Clifton, Bristol 8.

Editor: J.E.Tanner, G3NDT/T

SIXTH AMATEUR TELEVISION CONVENTION

As already announced, this event will take place on Saturday, 8th September in the Conway Hall, Red Lion Square, Holborn, London,W.C.1, from 10 a.m. to 7 p.m.

It is hoped that a really representative selection of amateur TV gear will be shown in working action ; all members who wish to exhibit are asked to write to the Hon.Sec. as soon as possible, stating what equipment they can bring, the table area (or floor space) and the mains power required. 240 V.A.C. 5 amp sockets will be the standard outlet. If you will need sync pulses, please mention it.

The General Meeting will be held in the Large Hall at 2.30 p.m. One item on the Agenda will be the approval of the provisional Constitution adopted at the previous meeting (copies of which were sent to all members with CQ-TV 46). Would members who wish to bring up any other business for discussion please inform the Hon. Sec. as soon as possible. During the Meeting, non-members will be entertained in the Small Hall. Refreshments will be available during the day.

Admission prices will be the same as in 1960 : members, 3/6d all day, or 2/- after 2 p.m. ; non-members, 5/- all day, or 2/6d after 2 p.m. Tickets are available from the Hon.Sec.

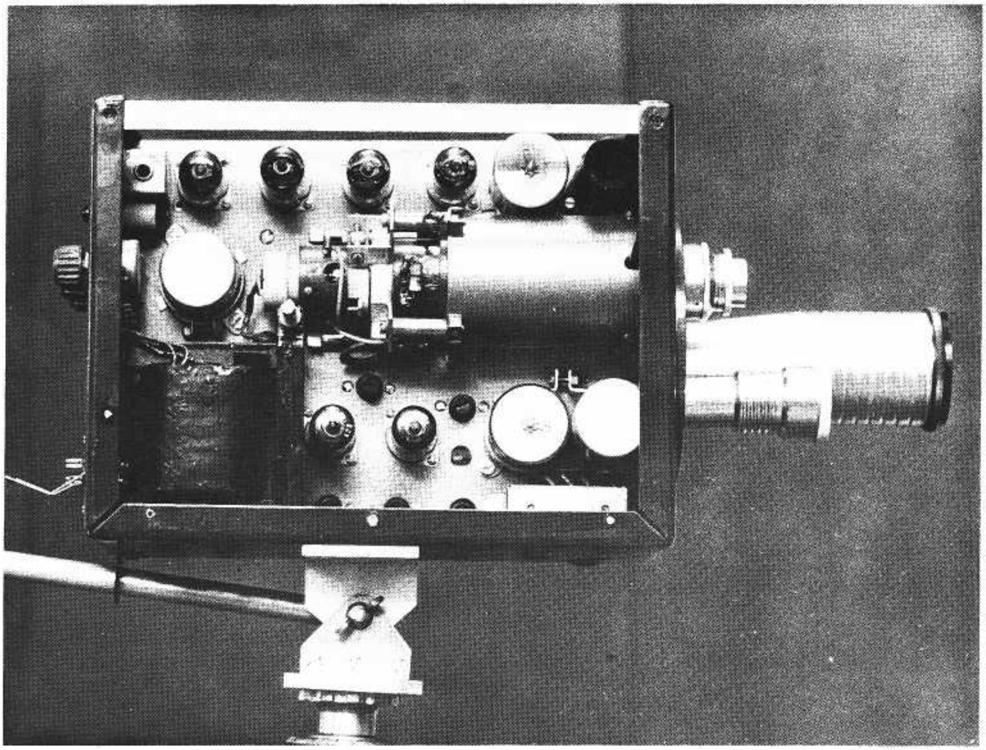
This edition of CQ-TV carries two major articles - one on a complete, self contained Vidicon camera; ideal for the beginner or for the amateur needing a small camera channel without external pulse and control equipment. The other article is about a complete pulse generator - the first time we have been able to describe a complete unit in one edition. Max Brown has developed the circuit, and although he has put a large amount of original thought into the design he asks that the use of circuits from several commercial equipments should be acknowledged.

Because of the space taken up by these two articles this edition's 'What the Other Chap is Doing' feature has been held over to the next edition, as has the new members lists and address changes.

VIDICON NEWS A limited number of Vidicon tubes are occasionally available to members of the Club at £5 each. If you are interested in these tubes please contact John Tanner. The tubes are rejected Staticon/Vidicon tubes with minor blemishes or excessive lag.

SCANNING YOKES Scan & Focus coils are now being made specially for B.A.T.C. Focus coil either for Valve use or Transistor use, as specified at time of ordering. Price (provisional) £5 per set of coils, supplied complete with target screen and connector. Orders to D.S.Reid please. More details available on request.

A SEVEN VALVE CAMERA



This extremely simple camera has been developed by D. Goodyear of St Albans, and is a completely self-contained unit. It is a random interlace unit with self running line oscillator and field driven by the supply mains. No extra pulse equipment is required and the output is positive modulated R.F. in Band 1 ready for display on any domestic television receiver. Although this camera is designed for the 405 line, positive mod system relatively simple modifications will enable the camera to run on 525 or 625 lines, with negative modulated R.F. if required.

Circuit.

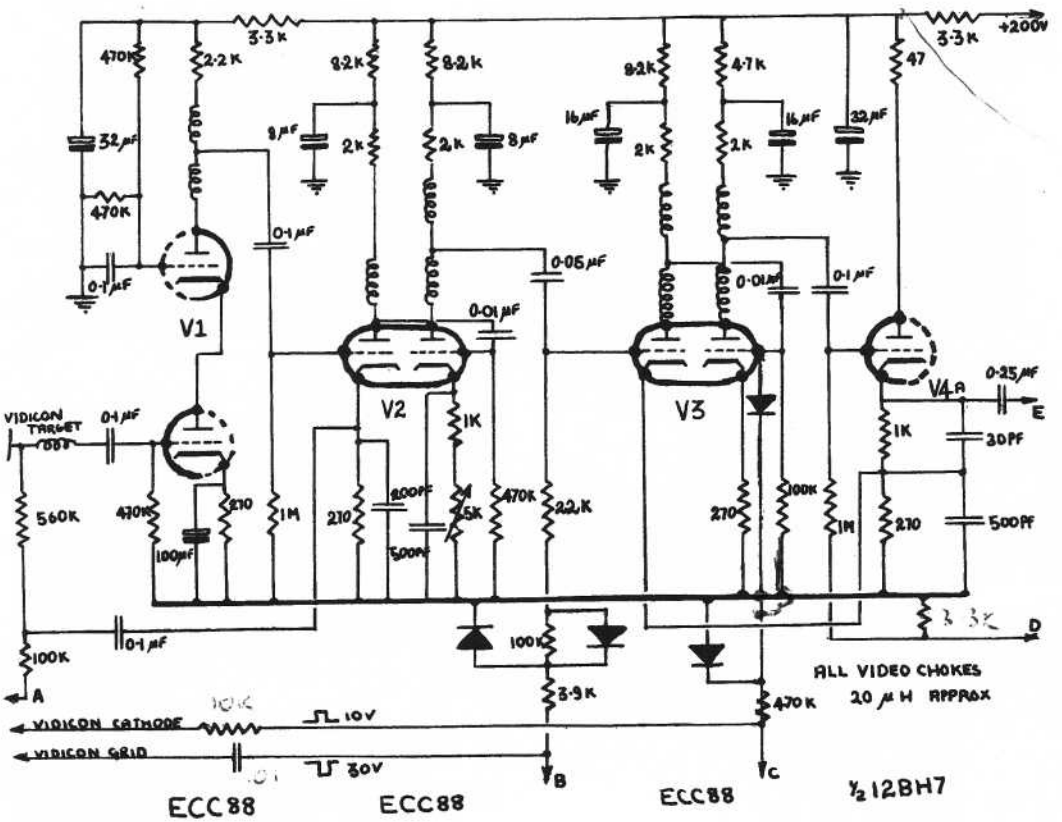
Line Scanning is achieved by a free running multivibrator, precise frequency controlled by the 470K pot in the grid circuit of V6a. The output of the oscillator is coupled to the second half of V7 which is an output tetrode. Line amplitude controlled by a 500 ohm pot in the cathode. Control of line scanning linearity is by a 1K variable in a damping circuit across the scan coils. Camera tube flyback blanking and line sync pulses are taken from the secondary of the line scan transformer.

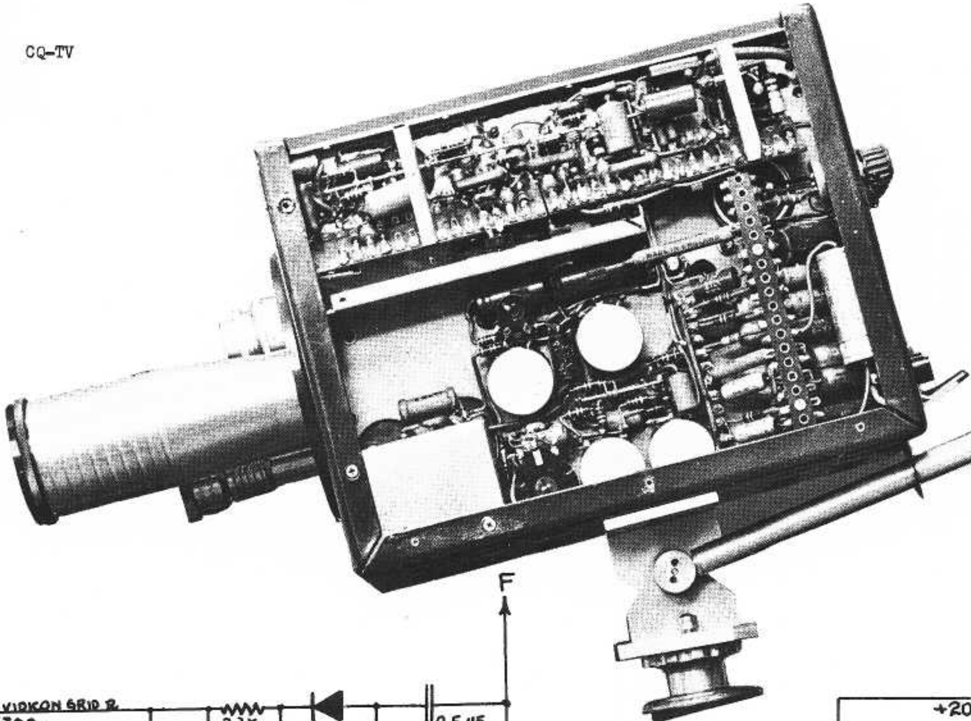
Field scanning is derived from the mains. 50c/s is taken from the mains transformer and after being clipped and shaped is fed to the grid of a triode, V6b used as a discharge switch for the sawtooth generating circuit in its anode circuit. V4b, half a 12BH7, is the field scan output valve used as a cathode follower feeding the scan coils direct. Feedback is taken from the cathode to the sawtooth generator to linearise the scan. Control of scan amplitude and linearity is obtained by the 2 Meg and 2.5K pots associated with the output circuit. To balance the standing potential on the cathode of the cathode follower the scan coils are returned to an adjustable voltage - this acts as a field shift control. Camera tube flyback blanking and field sync pulses are taken from the cathode of the discharge valve.

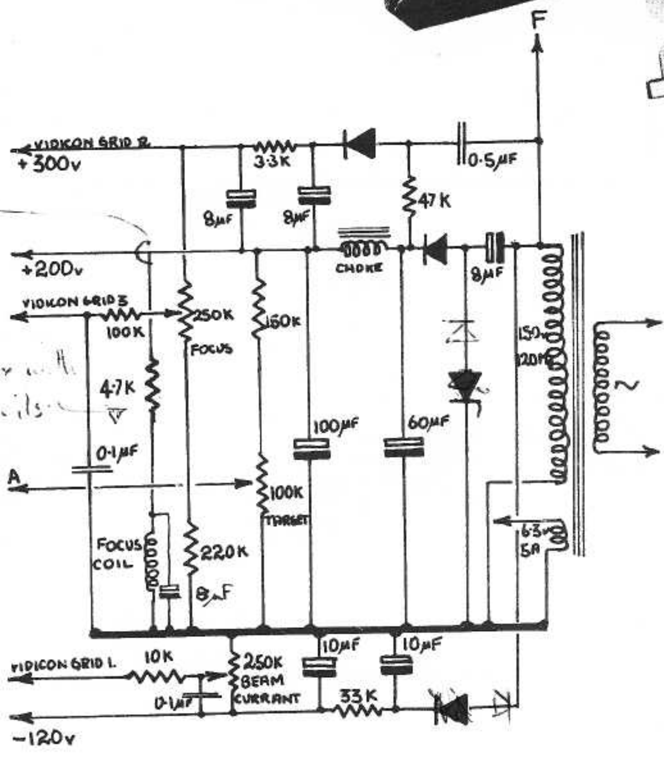
Video amplification starts with an ECC88 cascode amplifier, followed by a second ECC88 - feedback for the first stage is taken from the cathode of the second valve. The following stage has controlled feedback in the cathode for H.F. correction. A third ECC88 follows with line sync pulses mixed in the grid circuit after suitable D.C. Restoration by the diodes. Field syncs are mixed in the following stage in a similar manner. The output now consists of the complete video signal with syncs, and this is fed to the R.F. modulator via V4a, a cathode follower. Feedback is taken from this cathode over the previous two stages, and although syncs are mixed within the feedback loop no troubles have been experienced. V5 is the R.F. oscillator and modulator. Bias on the modulator stage is adjustable to set the R.F. level.

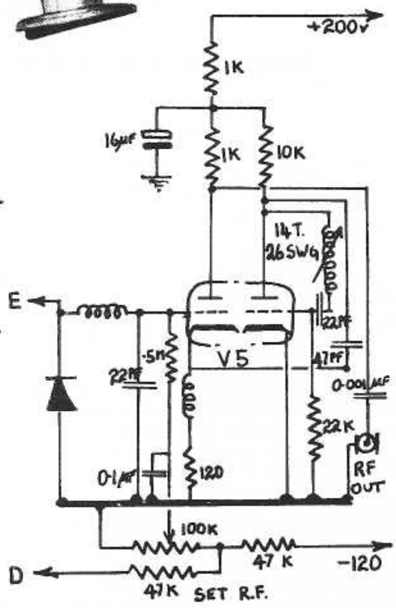
Power for the unit comes from a 150 volt transformer, H.T. for the circuitry coming from a voltage doubler, and 300 volts for the Vidicon G2 from a tripler, with the doubler incorporated. A further circuit provides -120 V for the Vidicon beam control and for the Video amp.

No problems should be experienced setting the camera up once it has been built - check with a pair of headphones that both scans are present (if no 'scope is available) and check that the monitoring receiver locks to the camera, check the voltages on the tube socket, check that R.F. patterning can be seen if a finger is placed near the target connector in the scanning assembly. After these checks plug the tube in, set both scan controls for maximum scan, and then when the target can be seen reduce both scans until the corners of the target cannot be seen. Target volts control will act as a gain control, and a little experimenting with the various controls will soon reveal the best operating conditions. Vidicon tubes are quite robust, but when testing the camera keep the target volts as low as possible, and at all times avoid pointing the camera at intensly hot, bright objects. Also, remember that inverting a camera tube of any type can permanently damage the tube due to small particles falling on the photosensitive layer or blocking the very fine copper meshes used in these tubes.

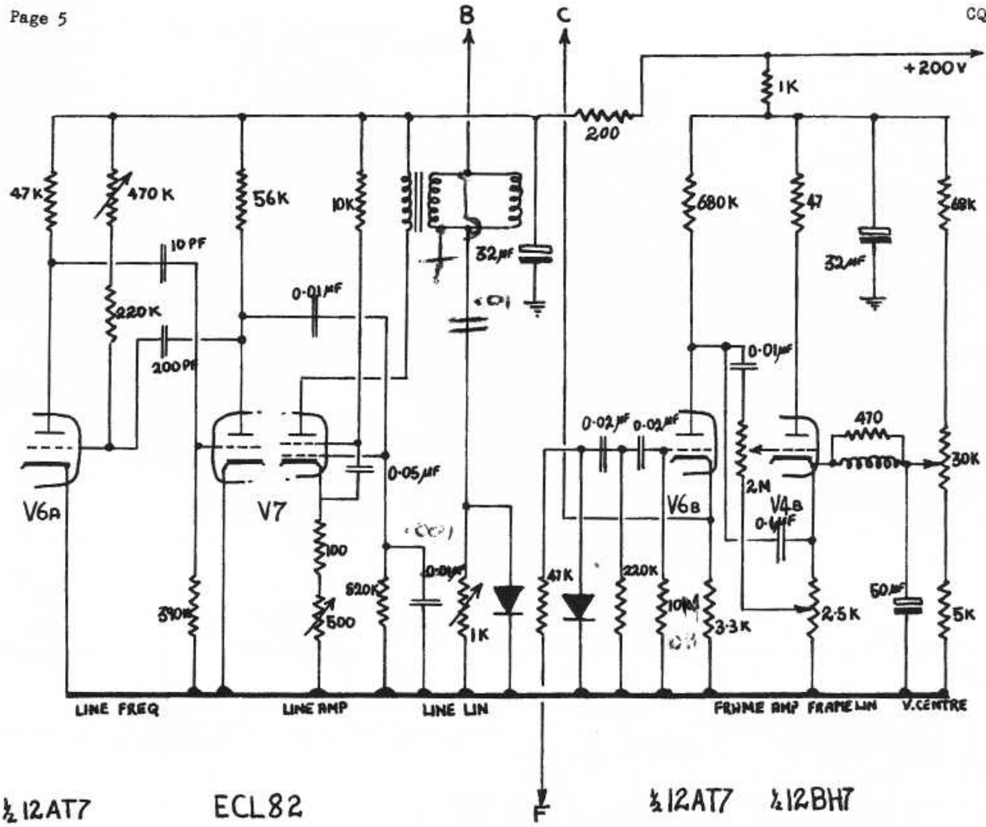





F
VIDKON GRID 2
+300v
3.3K
0.5μF
8μF
8μF
47K
+200v
CHOKE
8μF
VIDKON GRID 3
100K
250K
FOCUS
150K
150v
120MA
4.7K
100μF
60μF
0.1μF
A
100K
TARGET
FOCUS COIL
220K
8μF
6.3v
5A
VIDICON GRID 1.
10K
250K
BEAM
CURRANT
10μF
10μF
0.1μF
33K
-120v


+200v
1K
16μF
1K
10K
14T.
26SWG
E
.5M
22PF
V5
47PF
0.001μF
22K
RF
OUT
0.1μF
120
100K
47 K
-120
D
47K
SET R.F.

12AT7



Photographs of the camera are on the front cover, and with the article. Note the compact layout and generous use of tag strips and boards - video amplifier along the top, power near the back and scans below. If the mains transformer is placed very near to the tube a mumetal shield will be needed. The original camera used E.M.I. scan & focus coils but any of the coils available will suit providing the focus coil is high impedance. Adjust the resistor in series with the focus coil for correct focus with the wall anode volts (electrostatic focus control) set appx mid position.

Performance. The camera should resolve the 3Mc/s on Test Card 'C' with no difficulty at all. 16mm cine lenses are well suited for Vidicon use. A 1 inch lens is a good general purpose focal length, and as wide an **aperture** as possible.
Semiconductor Diodes. Power supply diodes - Silicon diodes with minimum p.i.v. about 600 volts. Diodes used for the video amplifier should be general purpose germanium types. The diode used for the line scan circuit should have a fairly high p.i.v. Note that use of an ECL86, with an additional 820pF across its grid, and screen resistor altered to 1.5K will give improved line scan linearity. Also, for improved picture quality reduce the high peaker capacitor to 270 pF, but this will reduce the overall sensitivity.

Vidicon pin connections:

Pin:	1	2	3	4	5	6	7	8
	Heat.	G1	ic	ic	G2	G3	K	Heat

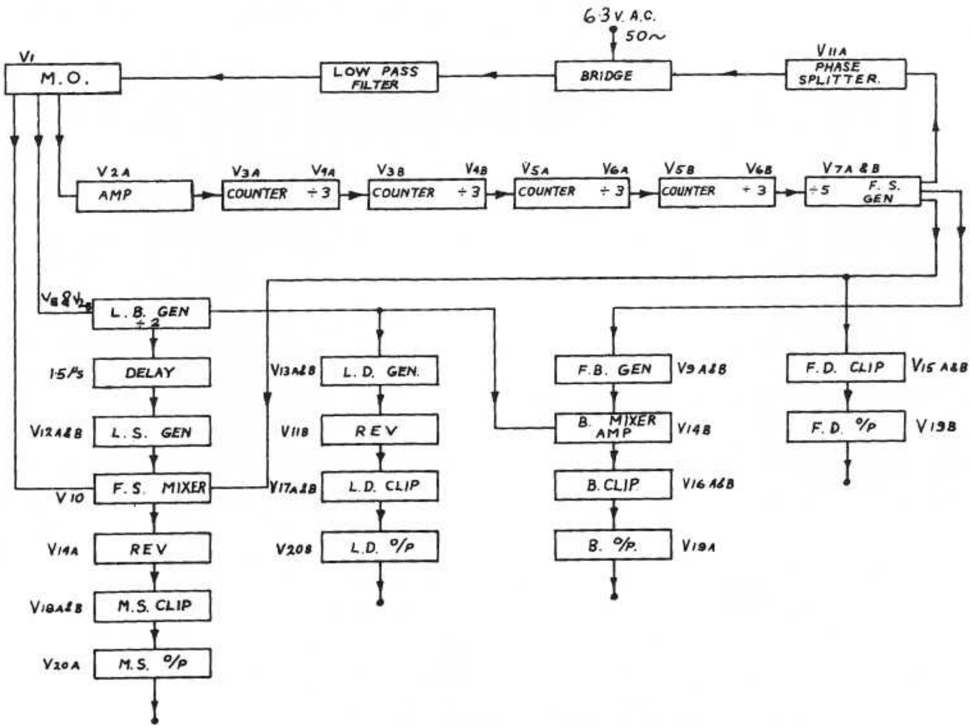
(G3 is Wall Anode - focus volts to this electrode)

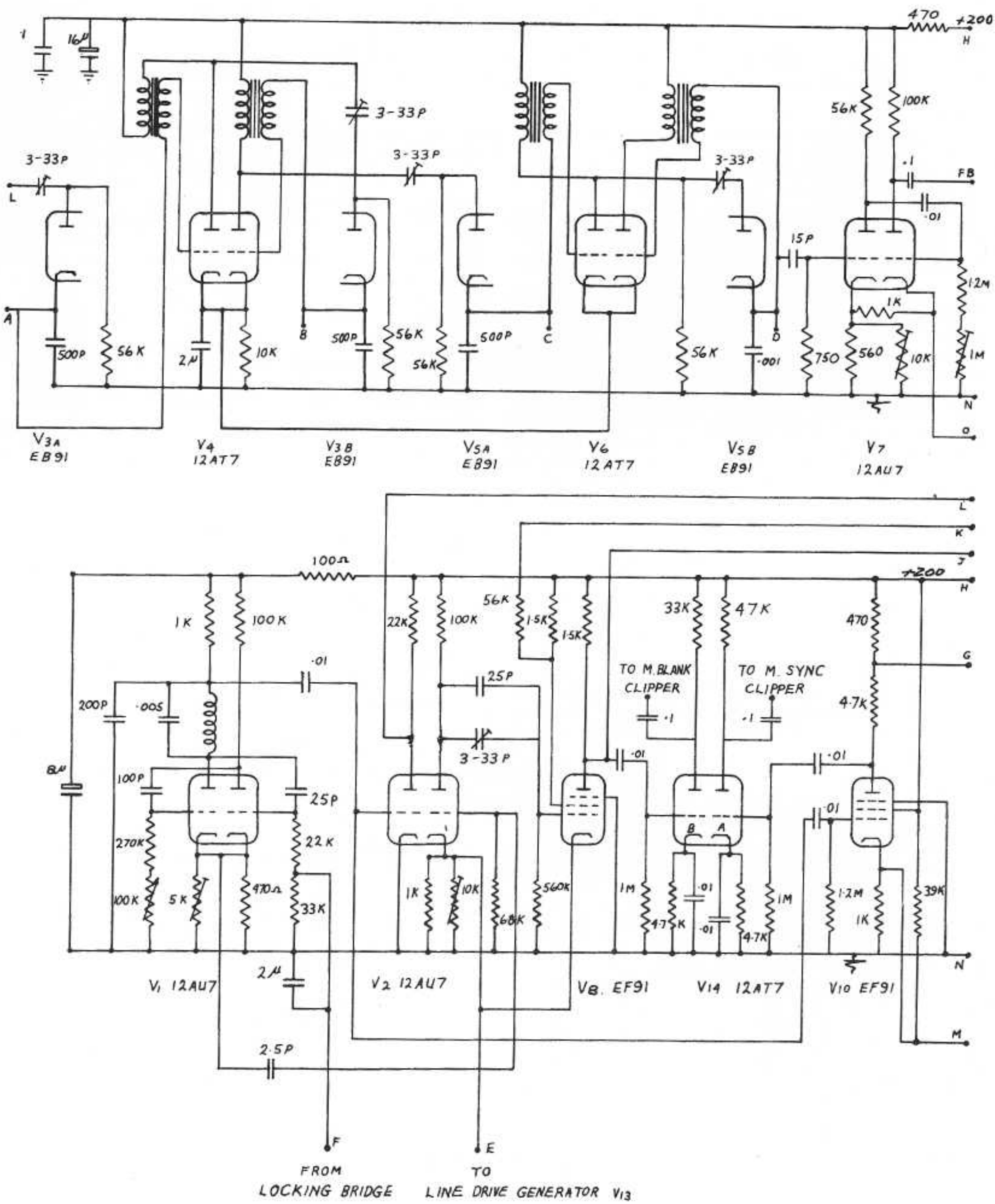
A COMPLETE INTERLACED PULSE GENERATOR

By M.B.Brown. G3KUJ

This sync pulse generator has been designed to produce the standard waveform used by the British 405 line system. The version shown uses a blocking oscillator type counter in the divider chain, but this is not essential, and one version of the unit has given satisfactory service for over a year using the counter chain described by Mike Barlow in CQ-TV number 41, with minor modifications mentioned later.

The whole unit consists of a master oscillator on twice line frequency, the output from this is fed into a divider - a 405 divider shown here although a 525 or 625 divider has been used with good results- the output from the divider compared with a reference, usually the local supply mains, and an A.F.C. loop tied into the M.O. Two other outputs from the M.O. are fed into the pulse forming circuits - one to the field sync mixer, the pulses from the M.O. being the correct polarity and width for use straight into the mixer - the other output to the Line Blanking generator which is set to run at line frequency and acts as the divide by two circuit for the remainder of the line frequency circuits. Line Drives are timed to start coincident with the leading edge of Line Blank. and Line sync starts 1½ uS later, the delay achieved by R.C., the 56K and 200 pF coupling between the L.Blank gen and the L.Sync. gen. This deals with the Line frequency section. Field frequency circuits are driven from the output of the counter chain, and the final divider is arranged to produce a pulse four lines wide for use as a field drive pulse, and to operate the gate for mixing the twice line frequency pulses during the field sync period. All the output waveforms are clipped by multivibrator type clippers, and the four outputs set to 2 volts negative going in 75 ohms by the adjustable resistor in the output valve cathode. Two 12BH7 double triodes cope with all four pulse outputs.

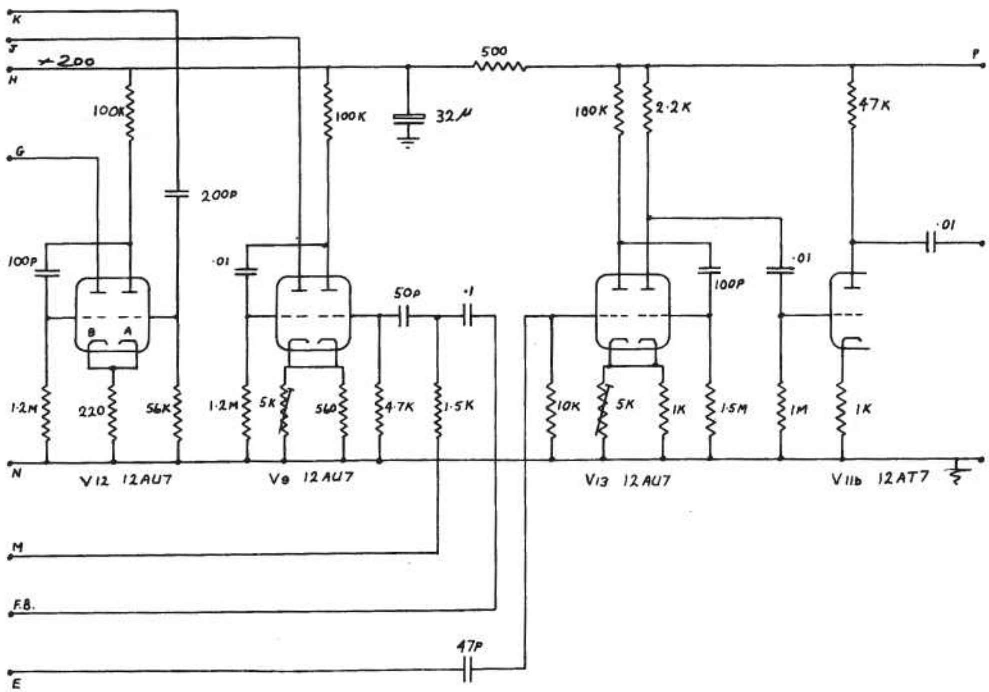


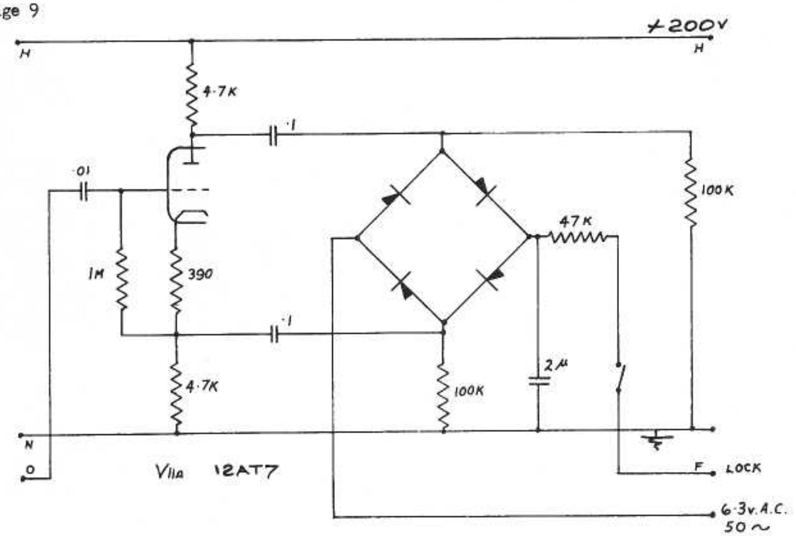

·1
16μ
470
+200
H
3-33P
L
A
500P
56K
2μ
10K
B
500P
56K
56K
500P
C
56K
3-33P
3-33P
3-33P
·001
D
15P
750
560
1K
10K
1M
1·2M
56K
100K
·1
FB
·01
N
O
V3A EB91
V4 12AT7
V3B EB91
V5A EB91
V6 12AT7
V5B EB91
V7 12AU7
L
K
J
+200
H
100Ω
1K
100K
·01
200P
·005
8μ
100P
25P
270K
100K
5K
470Ω
22K
33K
2μ
22K
100K
25P
3-33P
1K
10K
68K
560K
56K
1·5K
1·5K
·01
33K
47K
TO M. BLANK CLIPPER
·1
TO M. SYNC CLIPPER
·1
1M
4·7K
·01
·01
4·7K
1M
B
A
470
G
4·7K
·01
·01
1·2M
1K
39K
N
M
2·5P
V1 12AU7
V2 12AU7
V8 EF91
V14 12AT7
V10 EF91
F
E
FROM LOCKING BRIDGE
TO LINE DRIVE GENERATOR V13

The block diagram shows the functions of each valve. To set the divider chain adjust the master oscillator to appx twice line frequency with the mains lock turned off, then adjust the trimmers in the first four dividers to divide by three. The adjustable resistors in the final counter should now be adjusted to divide by five, with the cathode waveform adjusted to a pulse 400 uS long. The mains lock switch should now be switched on, and a small adjustment to the M.O. frequency will permit the A.F.C. loop to pull in and hold the whole system locked to the mains. While adjusting the M.O. frequency the two variable resistors should be adjusted together to ensure that the output pulses are 8 uS long. The first half of V2 is used as a phase inverter to feed the correct polarity pulses to the counter. With the M.O. correctly set, and locking to the mains, adjust the trimmer and cathode resistor in the M.V. V2b/V8 These should be adjusted to give an 18 uS pulse, at line frequency. No adjustment is provided for line sync width. Line drive width is adjusted by the cathode resistor in V13. V9 cathode resistor is adjusted for a 1.4 mS pulse output. No other adjustments are provided except for the output pulse amplitude controls.

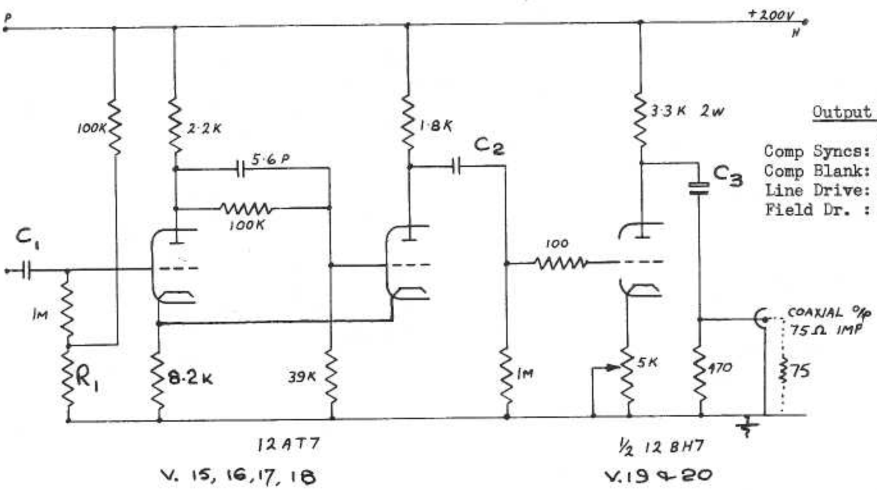
<u>Practical approach to setting up</u>. If an oscilloscope is available with calibrated time scale no problems should arise. Some form of 'scope is essential to set up the counter, but for the pulse widths use a TV receiver modified for video input. Display a B.B.C. or other broadcast picture on the screen. Reduce the width & height. Turn up the brilliance and mark the edges of sync and blanking on the screen. Count the number of shortened flyback lines visible. Now parallel sync and blank outputs from the generator and adjust the various controls to match the pulses from the broadcast station. The number of shortened flyback lines can be set by adjusting the final counter, as this pulse width controls the number of half line frequency, or 'broad' pulses inserted during the field sync period.

The anode load of V1a is shown as an inductor. This can be replaced by a 22K resistor, and some trial and error with other components will bring the M.O. back on frequency, but the mains lock will not hold in for long periods. Winding details of the inductor are not available and here again trial and error will be required.





Power Supply for the generator used on the prototype was 200 volts from a series regulator, but a silicon diode rectifier type sypply should be sufficiently low impedance to operate the generator without any additional regulator. However, some decoupling may be necessary on the H.T. line. Note that the version of this generator built by G3NDT/T uses Mike Barlow's counter chain with the germanium diodes replaced by valve diodes - the final counter followed by a triode phase splitter to feed the locking bridge, and a separate field drive generator instead of the last counter as shown here. Most of the modifications to the Barlow counter are due to Deryck Aldridge. Diodes for the locking bridge - almost any cheap diodes can be used here. Small copper oxide units were used by G3KUJ, G3NDT/T uses valve diodes. The 'Genlock' system used by Mike Barlow is extended in the unit built by G3NDT/T to include facilities for 'Colour Lock' - locking to the output of a divider from the colour subcarrier to line frequency, although this has not been tried yet.



<u>Output Clipper components.</u>

	C1	C2	C3	R1
Comp Syncs:	.25	.25	100uF	68K
Comp Blank:	as for syncs.			
Line Drive:	.01	.01	.25	68K
Field Dr. :	.25	.25	8uF	22K

MEMBERS' ADVERTISEMENTS

Notes on the Construction of the Mike Barlow Pulse Timer Unit.

from Deryck Aldridge.

__Timer Unit.__ If space (and extra heater current) is available use thermionic diodes in place of OA86. EA50 or EB91 give much better step counter waveforms.

For the adjustment of V3 use a 50K variable resistor in series with about 33K as in V4. This gives a much greater range of control and enables the unit to be set to 525 or 625 as well as 405, although the trimmer method is adequate for V2. However, variable R. control for all counters does enable the unit to be set up without going inside!

V5 - the fact that the 6.3 volts supply is connected into the discriminator circuits attached to this valve causes jumping of the step counter waveform when the unit is warming up and hence difficulty in obtaining true lock. This can be avoided by using a buffer stage between the two sections. Half a 12AT7 with anode and cathcde loads of 10K works well.

Difficulty was experienced in obtaining satisfactory operation of the A.F.C. circuit. This was much improved by reducing the 6.3 volts input to about 2 volts using a simple divider. This, incidentally, reduced the amount of smoothing needed to the control amplifier. It was, however still necessary to increase this from .5/330K to .5/3Meg.

For the Beginner:

SOME THOUGHTS ON COUPLING CAPACITORS

Have you ever wondered what value of coupling capacitor you should use, or of what type? Have a look at Figue 1, which shows a typical interstage coupling. If R_a is large compared to R_1 and R_2 then the time cons--tant of the coupling is $= 1/C(R_1+R_2)$. If either R_1 or R_2 is large, then C can be small. Aim at a t.c of at least 0.1mfd and 1M, eg 1mfd and 0.1M, 10mfd and 10K etc.

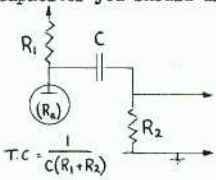


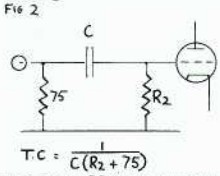
Fig. 1

In the usual case where R_1 is only a few K and R_2 is a grid leak of say 1M, then the resistance of the capacitor must be much greater than 1M or the signal will be potted down by the network of R_c and R_2. So use a good paper capacitor here - but don't mount it so close to the chassis that its bulk introduces appreciable stray capacity to ground.

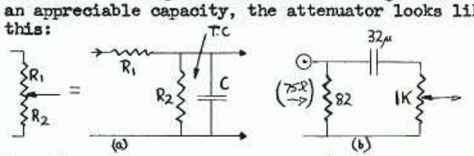
Where both R_1 and R_2 are small, you must use an electrolytic capacitor. If R_2 is say 75 ohms and R_1 a few K, then use at least 32mfd, preferably more. Since R_2 is so low, some leakage won't matter too much, nor will the bulk stray capacity have much effect, so a standard electrolytic is in order here. If the leakage is important, use a low leakage Superlytic type.

Figure 2 shows the usual input circuit to a TV unit. Here if R_2 is small leakage doesnt matter and an electrolytic or low volt paper capacitor can be used. Make sure that the tube does not take grid current though, or R_2 will be shunted by about 1K. If R_2 is larger, we can use a smaller C anyway, and we are back to paper or superlytics. With the input at 75 ohms, stray capacity will have little effect.

Fig 2



One complication arises sometimes when an input attenuator is required. Since the tube grid has an appreciable capacity, the attenuator looks like this:



Thus the response wosens as the pot is turned down. The effect is reduced by keeping $R_1 + R_2$ as small as possible, and then using a large C to maintain the correct time constant, as shown in (b). -M.B