cq-tv

NUMBER 36

SPRING 1958

Number Thirty-Six. Ninth Year.
Ten Shillings - $ 2.00 per Year.

Published for the British Amateur Television Club at:
16 Norfolk Drive,
Chelmsford, Essex.

Editor: J.E.Tanner,
16 Norfolk Drive,
Chelmsford.

Convention Organiser:
Don Reid,
27 Rose Valley,
Brentwood, Essex.

Editorial

Once again CQ-TV has a new editor, Alwyn Stockley has recently moved to Cleckheaton in Yorkshire to take up a new teaching post. This is rather an upheaval for him, and naturally editing CQ-TV as well as being treasurer is too much. Depending on how this edition turns out and on how Alwyn feels will the future editorship rest. I would like to wish Alwyn and Mrs Stockley all the very best in their new home.

This year will be a very busy one regarding exhibitions, the Chelmsford group have had their first one already. The convention will be in September and the Radio Hobbies Exhibition in the last week of November. If this year is as sucessful as last we will be doing very well.

Regarding the magazine I will repeat what was said in the last edition, That is that the magazine is yours and without support it will cease to exist. It is encouraging to see the increasingly large number of overseas members that are sending in useful articles. This is especially useful as it gives a chance to give those interested in standards other than 405 lines some tried and tested circuits. However to keep a balance between U.K. and overseas systems we must have more articles from users of both otherwise it is necessary to print what ever is available rather than keep a wide coverage of topics taken from a wide range of articles. Apart from technical articles accounts of demonstrations enable all of us to put on better ones ourselves if we can bear in mind the good and bad points brought out by others.

You may notice that there are three different type faces in this edition, this is because some of the material was sent to me ready typed in 4½" columns, and it seemed rather pointless to spend what would have been a long time retyping it all, especially as I am typing for the first time preparing this issue!

September is a long way off but do please make an effort to keep September 6th a clear date. A large amount of work goes into organising a convention, and it can only be sucessful if it is supported. Further details will be given in the next issue, but the date is fixed as Sept. 6th. Do send in any suggestions for the convention that you have.

In this issue we are printing the first large articles on Vidicon/Staticon cameras. With the increasingly large number of cameras of this type that are being constructed it was felt that some basic circuits were required to answer some of the many queries that were being received. As mentioned later in the article, these circuits will give a camera that works although there is room for elaboration and improvements. If you let us know your own ideas, by publishing results in these pages, a really good and comprehensive design can be built up.

If this edition is a little late coming out please remember that taking over the production of a magazine such as this is quite a job, especially as it is a spare time occupation.
I would like to thank all those who have helped me during the last few weeks.

73

John Tanner.

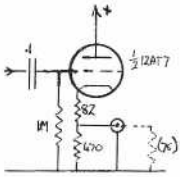
MAKING THE MOST OF YOUR TV SET

By M.Barlow

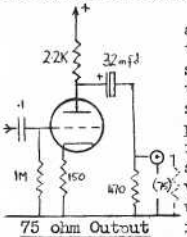
Your domestic television set can be used in a variety of ways in your amateur TV station. If your wife or family absolutely forbid any tinkering with the innards, then Bill Still in CQ-TV 35 showed how to use the TV set for a flying spot scanner. The following notes are for those who can add extra bits without any complaints.

When tuned in to a local TV station, the TV set can be adapted to give out a complete mixed sync waveform, and also a composite vision signal. By adding some switches, the picture tube can be used to display broadcast vision or local, and the timebases can be locked to BC syncs or local - without upsetting the supply of BC video and syncs to your own local gear. Thus on the rear of the set will be co-ax sockets marked BC video (for a test signal source), BC Sync (for genlocking, etc), and inputs for local video and local sync. The inputs may either be terminated in 75 ohms or may be bridging inputs if the signals are to be looped through.

The precise details will vary from TV set to TV set, and must finally be determined by examination of the circuit. Certain broad generalisations can be made. Firstly, for a reasonable TV picture on an average set, there will be about 4 to 5 volts p-p video signal at the output of the detector diode, whether this be a crystal or thermionic type. This is ideal for feeding straight into a simple cathode follower as shown at the right provided the polarity is correct (positive). For a negative signal, use the circuit below, or take the input to the cathode follower from the output of the video amplifier, potted down as required. If no scope is available for checking the signal polarity, work your way back from the picture tube connection, remembering that the video signal will be positive on its grid and negative on its cathode.



Cathode Follower
No polarity change



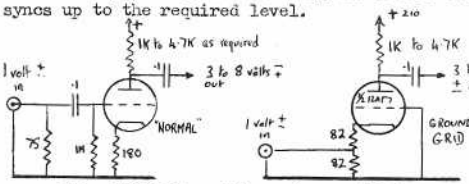
75 ohm Output stage with polarity change

The sync is usually taken off at either the grid or anode of the video stage and fed to the sync separator, which strips off the picture information. The sync separator output is a good place to add another cathode follower; if a pentode sync separator with low anode and screen volts is used, the anode waveform will normally be positive. If it is not, or some other circuit is used, then alternative arrangements will have to be made, such as employing the sync separator circuit described in CQ-TV No 33, and feeding it with positive composite signal from a suitable point.

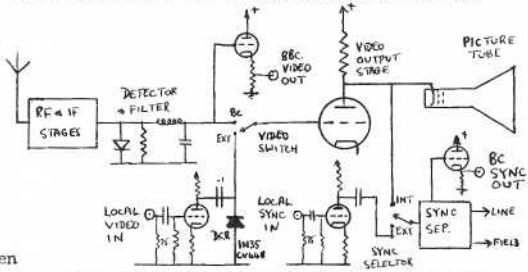
In order to display a local video signal, it must be amplified up to the 4 or 5 volt level and fed into the video amplifier grid. Either a straight amplifier or a grounded grid amplifier is used depending on the polarity required. Since most detectors are DC connected to the video amplifier grid, it is advisable to add a DC restorer in the extra amplifier output to limit the grid swing on the tube; this must also be reversed if the polarity is wrong.

A simple toggle switch can be used in the video grid lead to change from detector ("BC Video") to extra amplifier ("Local Video") but the leads should be kept extremely short and well away from anything else to avoid stray pickup or loss of HF. If the video grid is not already stoppered, put a 100 ohm 1/16 watt resistor right on the grid pin.

The TV set timebases will now take their syncs from whichever input is in use. If the local video input may be non-composite, i.e without syncs, then another switch is required in the lead to the set sync separator to change the syncs from "Internal" to "External". Again a grounded grid or normal amplifier will usually be required to bring the 1 volt external syncs up to the required level.



525 and 625 line TV receivers will have the FM sound takeoff after the video detector, so in some cases the sound subcarrier will appear at the "BC vision" outlet. If this is looped out through the vision mixing equipment and back in via the "Local Video" input, operation of the vision switch from "BC" to "Local" gives a check on picture quality and also response at the subcarrier frequency. If the sound level drops appreciably when the signal goes the long way round, the vision mixer etc is suspect - particularly if the sound section of the TV set includes a limiter!



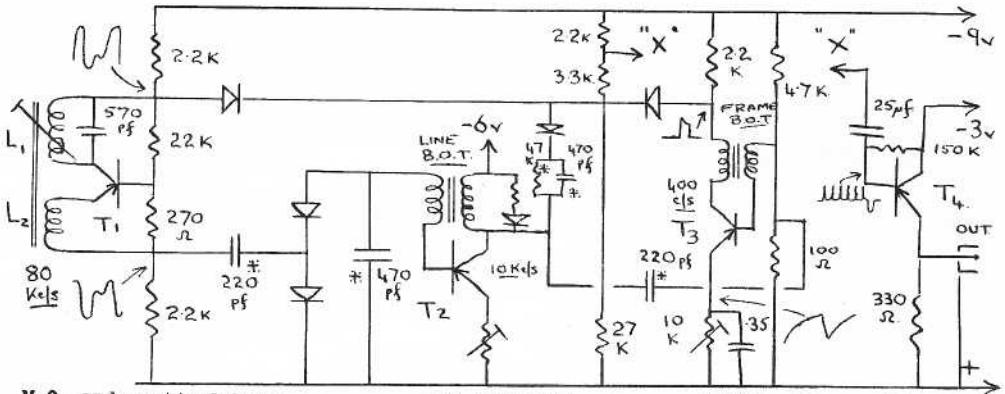
The additional circuits and switches can be mounted on a small chassis that can be removed should the set ever be sold. The extra drain may be 20mA or so of HT, and it may be necessary to include an HT switch if the TV set appears to overheat after long periods.

The loudspeaker can also be switched from "Int" to "Ext" and the "BC Sound" used for test purposes without the use of amplifiers, since all the circuits will be at low impedance and roughly the same levels.

The outline diagram shows how one set - actually a 17" Westinghouse - was connected. Readers are reminded that in some countries it is not permitted to retransmit local broadcast TV programmes, so the BC video outlet should be used with discretion.

A TRANSISTOR PATTERN GENERATOR.

By Mike Cox.



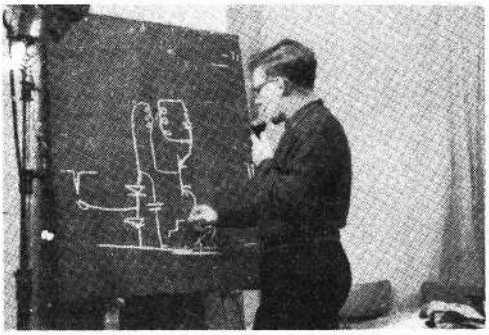
Diodes: CG6E or equiv. T1: R.F. Transistor T2,3,4; Audio type

This compact unit, which aroused so much interest at the Radio Hobbies Exhibition in October, is the first piece of entirely transistor operated equipment to be described in CQ-TV. All the transistors and diodes are available on the surplus market, and the power consumption is only a few milliamps, from a grid bias battery. The pattern generator provides an output of approximately 8 vertical and 8 horizontal bars, together with line sync pulses at about 1v. across 300 ohms.

The master oscillator, T1, is an R.F. type transistor connected to a tuned transformer, and oscillates at about 80Kc/s. Peaky voltage pulses are developed across 2.2k resistors in the positive and negative feeds, the negative pulses driving a step-by-step counter T2, while the positive pulses are clipped to give the vertical bars. T2 runs at line frequency, using a standard blocking oscillator transformer. T3 runs at approximately 400c/s, using a frame transformer. The clipped pulses from the three units are added, and the combined output from "X" is fed to the output stage, T4, connected as an emitter follower. This has a fairly low output impedance, and gives about 1v. across 300 ohms.

Owing to the variations in the individual components, and transistors which may be pressed into use, some alterations may be necessary in places: the most likely are marked * and should be adjusted on test for the most satisfactory results. The master oscillator coil is wound on an adjustable pot core, with a step down from L1 to L2 of 8-1, L1 is about 3.9mH, tuned with 570pf. Some jitter was noticed originally on the horizontal bars but this is considerably reduced by feeding in some differentiated line information via a 220pf.

People who are not used to transistors may be a little surprised at the comparatively low value of resistors and high values of capacitors used, but this is due to the fact that transistors are inherently low impedance devices (that is, the ones WE can afford!) and the circuits vary accordingly.



Mike Cox buisy describing the pattern generator at the Radio Hobbies Exhibition (owing to the rather high noise level he is using a hand microphone rather than the boom) This was one of the many popular studio presentations.

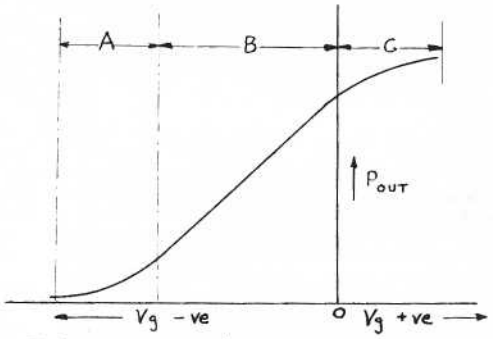
SYNC AND PEAK WHITE STRETCHING

by B.W.Partridge, G3KOK/T

The article described here is equally useful to both the positive and negative modulation systems.

One of the difficulties frequently encountered when grid modulating a transmitter is the crushing of whites and syncs. The explanation for this is easily seen if we look at the curve for Power Out against Grid Volts.

The curve shown is exaggerated to bring out the point. At low power, i.e. grid very negative (A) the increase in grid volts at this point will be much larger for a given power increase than that necessary at point (B). With positive modulation point (A) corresponds to sync portion of characteristic, point (B) to picture portion up to mid whites. In order to maintain the correct relationship between sync and picture therefore the amplitude of the sync pulses will have to be increased in the modulating waveform without increase in picture amplitude. A similar result is obtained when considering point (C) which is the peak white portion.



Typical Grid volts/Power output curve.

The circuit shown in fig. 2 has been developed to perform both operations bearing in mind both simplicity and economy. Briefly the operation is as follows:

The video signal is sync bottom restored to earth. Now if we start at sync bottom level the grid is most positive, i.e. the valve current is maximum. D_2 is open so the effective cathode resistance is 330 ohms in parallel with the forward resistance of the diode, about 250 ohms. This gives the total cathode resistance as about 140 ohms. The effective anode load resistance is 1·5k in parallel with 1·35k, that is about 800 ohms. As the grid goes negative there comes a point when the voltage across the cathode resistor is just less than the bias on D_2, at this point, which is set by the sync stretch control, D_2 shuts off and the effective cathode resistance is 330 ohms. This means that due to cathode feedback the gain drops to 0·6 of its previous value. If thegrid goes still more negative then the current in the valve will drop still further and the voltage across the anode load resistor will drop till D_1 opens. When this happens the effective anode load will be increased from 0·8k to 1·5k, and the gain will increase to 1·9 of its previous value giving peak white stretch.

This circuit can obviously be used for Positive or Negative modulation. If the input polarity is reversed then D_3 must be reversed and the sync stretch and peak white stretch controls will reverse their functions. The gain of the circuit is 1:1 with 2:1 pk. white and sync stretch ratios approximately.

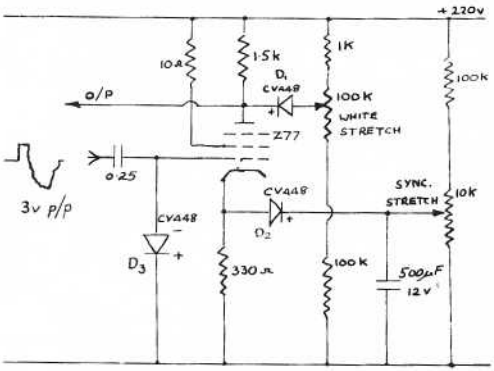


Fig. 2

APPLICATIONS FOR HEADED NOTEPAPER,

Doug Wheele is dealing with this now and enquiries should be sent to him and not to the treasurer as before.

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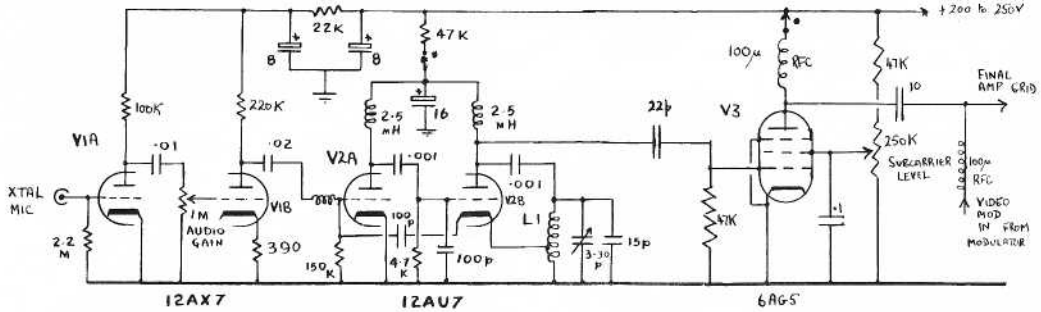
AN FM SOUND SUBCARRIER GENERATOR

By Bill Still



Most negative modulation television systems use FM sound, usually on the "intercarrier" basis. The amplitude of the vision carrier is never allowed to fall below 10 or 15% of maximum at peak white, and the sound is transmitted by a separate FM transmitter. In the receiver the vision carrier is amplified and limited so that the amplitude (vision) modulation is removed, leaving a pure FM sound carrier 4.5 or 5.5 Mc/s away from the vision carrier - which appears as a 4.5 or 5.5Mcs FM subcarrier after the vision detector. The idea is to save receiver components since only one mixer and IF strip is required. A sharply tuned sound trap is required in the video output, and if the FM limiting is not perfect there will be an annoying vision buzz on the sound.

For amateur use the system can be worked in reverse as a means of adding FM sound to an existing AM vision transmitter, and the circuit shown above has been designed by Bill Still VE2AZT to do just this.

V1A and V1B are straightforward AF amplifiers; if other than a crystal mic is used, V1A should have some cathode bias added. An output can be taken from V1B anode to the input of the vision modulator if it is required to transmit sound on the vision channel. V2A is a reactance modulator operating on V2B, the subcarrier oscillator. This runs at 4.5Mcs for 525 and 5.5 for 625 line operation. Any suitable coil will do; for 525 Bill uses 70 turns No 34 AWG on a 1/2" former, tapped 10 turns from ground. Take care that the oscillator is built as stably as possible, using the best VFO construction techniques. If in doubt, listen to the output on a stable communications receiver. V3 is a buffer amplifier to step up the output, which is applied directly to the PA grids together with the vision modulation. It is possible to feed the FM into the input of the modulator at a lower level, but there is danger of cross-modulation occurring (sound on vision and vice versa).

The tube types are not at all critical; Bill used a 6SL7 at V1 and a 6SN7 at V2: V3 could equally well be an EF91, EF50, even a 6J7 etc. The power supply does not necessarily have to be regulated, but it will probably be most convenient to mount this circuit on the modulator chassis and take the power from that. The potentiometer on V3 screen controls the sound carrier level. The HT switch to V2 and V3 enables the subcarrier to be switched out whilst tuning up, etc.

ON THE AIR RESULTS - MONTREAL

Left: A calendar picture of Teresa Brewer televised by Charlie Coorsh VE2AFM-TV of Pratt Ave with his 1849 Iconoscope camera. Received at Bill Still's place on Papineau Ave, about 1½ miles away, on 430Mc/s. 17" TV exposure 1/25 at f8 Super XX film. Photo: Bill Still.

* * * * * * * * * * *

Have you seen this idea of putting test signals in one or two lines of the field blanking period? The picture tube mask prevents them from being visible. The professionals are thinking in terms of a staircase burst of RF, or a sawtooth, or pulse and bar, etc. The idea is to give a continuous check on the overall performance of the TV system, but the presence of a reference white, etc gives an opportunity for simplifying receiver AGC circuits and the like. Lets have your thoughts on which signals would be of most value in amateur work.

$$= \frac{15.5}{1.28} = 10.5 = 20 \text{ db}$$

i.e. 26 db of feedback.

Stage 4 is a feedback pair designed as follows, Tube 3 = 6J6 with E_{ak}=100 volts. Ia=17ma, fixing cathode load as 6600 ohms, and Ek=112 volts, therefore Eg will have to be 110v, from this;

Tube 2 Eb=250v., Ia=10ma, so Ra=14K
Rk=160Ω and bypassed by only 500 pF.
LF gain

$$= \frac{gm.Ra}{1 + gm.Rk} = \frac{9 \times 10^{-3} \times 14 \times 10^{3}}{1 + 9 \times 10^{-3} \times 150} = 52$$

Tube 1 = 6AC7, Ra=1500Ω, Rk=150, gain= 10
Total internal gain = 10x52 = 520
For coupling constants of 0.1 and 1 meg, decoupling is 7500 ohm & 8uF, for zero 50 cycle tilt. Approx. these values are used.

NOTE - Coupling constants between stages differ considerably to ensure stability.

External gain required = 27 db = 22, and set by 660 and 30 ohms in feedback loop.
Therefore feedback, B = 1/22
Feedback factor 1+BA =1 + 520/22 = 24 appx.
Therefore output impedance of 6J6

$$= \frac{1}{gm}\left(\frac{1}{1 + BA}\right) = \frac{90}{24} = 3.7 \text{ ohms.}$$

This is adequately low.

The circuit shown gives all the values as computed and fulfills all the design requirements. It worked first time and is completely stable. Proof of the performance is that the camera will resolve the 5 Mc bars of the RTMA test chart.

* * * * * * * * * *

Can we have some photos please.....

JACK TERRY is one of the few who posseses a car in Chelmsford, here he is with a load of furniture for the new studio. Jack is at the back, John Deveson in the front.

A Vidicon Camera Channel.

by J.E.Tanner.

More and more members of the club are thinking about building a camera. The Vidicon/Staticon type tube is the only one currently available to amateurs. This tube is easy to run with only a very small amount of equipment. The circuits described here have been tried and work reasonably well. However as with any unit as complex as a camera, improvements can always be made. These circuits are intended as a working basis which can be kept as they are or used as a guide for further experiment. The video amp. is the weakest link in the system, it is rather noisy for low light level working but the other article on a video amp. by VK6EC/T should put this right. However the amp. described here is probably easier to start off with as it does not require any peaking coils to be wound. The head amplifier is a feedback circuit, and most of the peaking is obtained by shunting the feedback loop with a .01 mfd capacitor. This actual value will have to be found by experiment as there is a definate optimum value.

The timebase circuits are nothing special, the line is a driven sawtooth generator which feeds into the line output stage. Originally an EL84 was used, but since then a 6CH6 has been used with great sucess. The Vidicon does not need much scanning power and even with the 6CH6 there is as much as three times as much power as is needed, enableing the target to be seen as a ring or disc about 3" dia. in the middle of a 12" monitor. The linearity appears to be very good when looking at a test chart. For the frame an ECL80 is used in a blocking oscillator circuit. Considerable feedback is applied, and once again linearity is good. At the moment blanking for the tube comes from the scan coils for the line and from the anode of the frame output valve for the frame blanking. This system is not very good if long camera cables are used. For the focus coil another 6CH6 could be used, although in the original permanent magnet focussing is used. Fine focus is controlled by adjusting the voltage on the second grid of the tube. Mechanically, the equipment is built in three units; the camera, the power unit, and the camera control unit.

THE CAMERA.

This holds the Vidicon and its scan yoke, the head amplifier, focusing device and a switch to cut the beam in case of emergency.

If the bias supply should fail the beam current would rise to its maximum value, and thus cause damage to the tube. This switch cuts the anode volts of the tube and takes the anode down to chassis. this will cut the beam regardless of the gun potentials. However this switch should not be used as the normal beam switch as the gun can still be over dissipating. This emergency switch is only to protect the photoconductive layer. No scan failure protection has been built in yet although this problem is being thought about. Line scans did fail once and were off for about one minute with the beam up. Any mark that was left dissapeared in a very short time.

(Continued from page 6)

Gas triodes will probably be used because once scans fail the protection circuit will operate and will require resetting before the camera will work again. This is a good feature as it will ensure any temporary failure is noticed, and the camera will not work with any intermittent fault in the scanning circuits. A protection circuit on similar lines could be used on the bias system. The action of protection is to cut the anode volts as with the emergency switch.

THE POWER UNIT.

This is nothing special, being a unit which gives out:

300 volts unreg.
210 volts regulated.
-150 volts stabilised.
6.3 volts a.c.

Any standard power unit will do, the regulation need not be especially good.

THE CAMERA CONTROL UNIT.

This consists of the timebases, line and frame drive amplifiers, the camera tube control circuits and the video amplifier. The unit requires standard 1volt drives and gives out 1 volt - or + non-comp. picture to feed into a vision mixer or vision-blank-sync mixer.

The controls on the unit are:

a) Beam Current
b) Target volts
c) Beam focus
d) Height
e) Width
f) Frame hold
g) Frame linearity
h) Line scan reversal
i) Frame scan reversal
j) Beam on/off switch

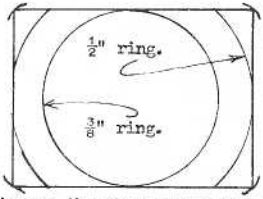
The line linearity is the only control in the camera, apart from the beam switch, and optical focus.

Focussing is best carried out by moving the camera tube and yoke, it is far more difficult to move the lens on the front of the camera.

The circuits shown in this issue are those of the Camera Control Unit and the camera head amplifier. The CCU video amplifier will be held over to the next issue as there are still one or two snags to be ironed out. The camera head amplifier will give a useable signal if the monitor has a good gain. It gives about 0.25 volt. The finished video amplifier will give 1 volt peak to peak into 75 ohms, positive or negative.

One or two hints on the operation of the vidicon tube might prove helpfull. Physically, the vidicon and other similar camera tubes consist of a tube 6 inches long with a special base at the gun end and a metal contact ring at the target end. The signal comes off this ring and the lead from it to the video amplifier should be as short as possible, long leads increase the stray capacities and also cause trouble from RF pick up. This pick up is especially important to keep to a minimum if any transmitters are to be operated near the camera. It has been found almost impossible to operate the camera near amateur Top Band or other LF transmitters.

The characteristic of the photoconductive layer makes the output proportional to the bias volts applied to the target. This is usually run at about + 20 to + 30 volts with respect to the cathode which is at zero potential. Any large increase above these values tends to give a bad flare at the edges of the picture. The beam should be set at a value where it just discharges the peak whites of the picture. The target volts control is in effect a gain control and in practice this is adjusted in conjunction with the video gain control to give the best picture without bad flare or excess noise. The scans are set such that an area $\frac{1}{2}$"x$\frac{3}{8}$" is scanned. To do this a simple method is to scribe two rings on a perspex disc 1" in diameter. This ring is mounted centrally in front of the vidicon and the line scans set to the $\frac{1}{2}$" ring and the frame to the $\frac{3}{8}$ ring. The scans can be centered with these rings by setting them in the centre of the raster with the shift controls. Alignment of the beam is adjusted until the beam focus control causes the picture to rotate about its centre. Alignment is not a necessity, Ivan Howard has a very fine staticon camera and does not have any alignment at all, visitors to the Radio Hobbies Exhibition last year saw this camera on the Televisionfone, and apart from the slight flare due to the lighting being inadequate, the pictures were really good.



Setting up the scans using the ring described here. With the ring in place point the camera at a 60 watt lamp about 2 ft away from the camera

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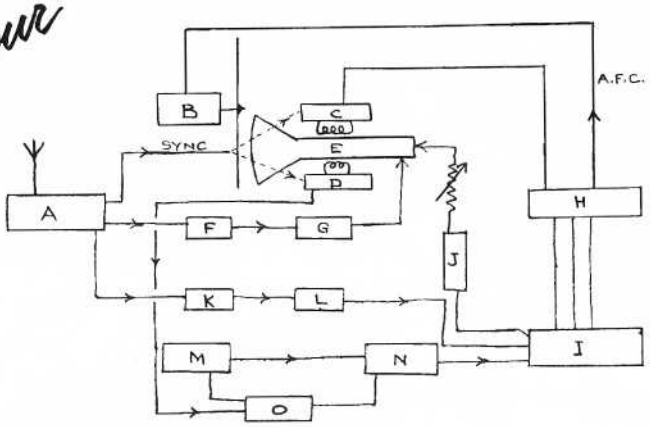
Since writing the section on scan protection Brian Partridge has pointed out that if a gas triode should fail the circuit would not fail safe, and there would be no protection in the event of a scan failure. Hard valves which hold a relay in with scans present will fail safe should a fault occur in the protection circuit. The circuit by George Flanner in CQ-TV number 35 is of the 'fail safe' type and appears to be an excellent one for the job.

continued on back page...

COVER PHOTOGRAPH this time shows the B.A.T.C. studio on show at the Enfield show last year. (see acount in CQ-TV 35) Here Brian Partridge televises John Tanner making an announcement.

Colour



BLOCK DIAGRAM

Of Ivan Howard's colour convertor for receiving the BBC colour transmissions on a Frame Sequential receiver.

KEY

A) RF Channel.
B) Colour wheel motor.
C) Frame timebase.
D) Line timebase.
E) Display tube.
F) Video amplifier. (Z77)
G) 1.5 µSecond delay.
H) Colour switch.
I) Colour demodulator.
J) Crominance amplifier. (6U8)
K) 1st crominance filter. (Z77)
L) 2nd crominance filter. (6U8)
M) Reference Oscillator.
N) Buffer.
O) AFC burst gate.

The circuit diagram and more details will be in CQ-TV as soon as they arrive from Ivan, who is busy sorting out the last few troubles.

In Ross on Wye, Grant Dixon is busy completing the three tube colour monitor. Several problems have cropped up the worst one being lack of scans. To achieve the necessary accurate registration of the three pictures Grant is trying to scan all three tubes with the same timebase.

In Chelmsford, Jack Terry has completed his colour sync generator counter chassis, Jack is experimenting with motor speed control at the moment, and will give the circuits to CQ-TV when they are 100% reliable.

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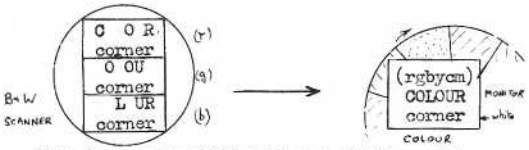
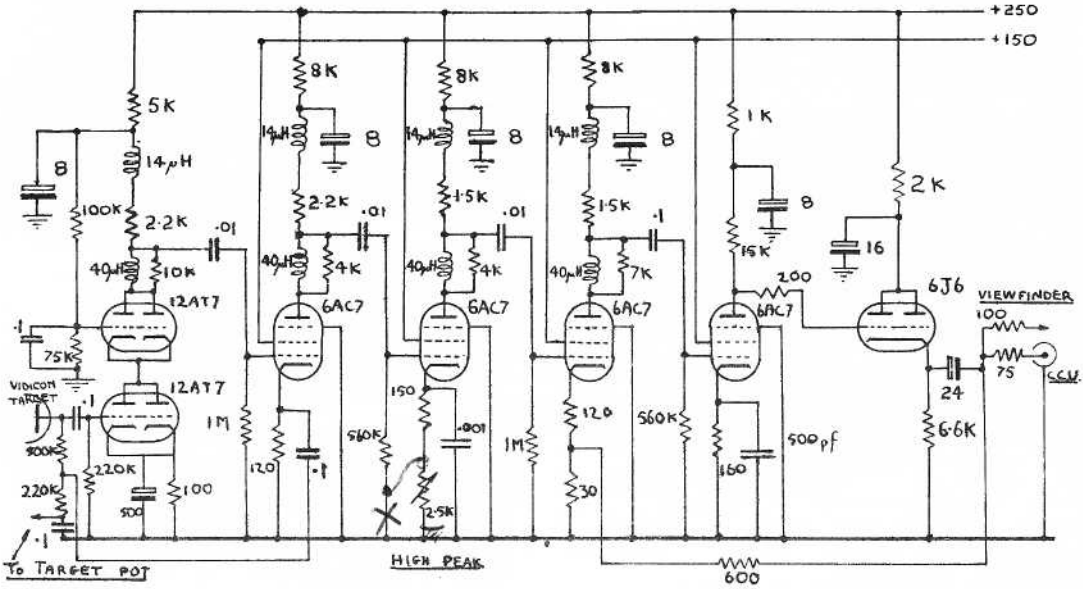


Here is an idea of Jack Terry's which enables owners of flying spot scanners to generate field sequential colour pictures without the need for rotating discs, and in particular without the need for red or green sensitive photocells.

Basically, as indicated in the sketch above, the colour picture is broken down into its three colour components, which are then mounted one above the other in front of the scanner tube. The scanner vertical time base is then run at 1/3 of the field frequency so that three rasters are displayed one above the other on the scanner CRT. One photocell only is used, and this can be matched to the CRT phosphor to give maximum output. The three colour component transparencies are in black and white only, in fact if a detailed picture is required it will be easiest to prepare colour separation negatives (or positives) by taking photographs through R, G and B filters. Details can be found in any photographic textbook. Simpler designs can be cut out of paper by hand, remembering that six colours black and white can be produced from suitable silhouettes. For a simple testcard or geometric pattern, this is a very easy way to get colour.

In theory one could also fix R, G and B strips of colour filters in front of a vidicon, and scan it in the same way to obtain FS colour; as with the above idea, however, the three rasters and subjects must be accurately in registration.

VIDICON CIRCUITS



A VIDEO AMPLIFIER FOR THE VIDICON

by Eric Cornelius.

This article describes the redesign of an orthodox video amplifier into a vastly superior unit without changing valve types. The method of approach would be applicable to almost any suitable valve combination.

The original amplifier was based on ideas from the RCA handbook on the 6198 Vidicon, and on an Image Orthicon head amplifier taken from Chinn. It was designed around tubes on hand and was as follows:

Stage 1 - a pair of 12AT7's in cascode.
Stages 2 & 3 - 6AC7's with cathode hi-peaking
Stages 4 & 5 - 6AC7's as orthodox video amps.
Stage 6 - 6J6 as a cathode follower.

The problem was to redesign the amplifier without change of tubes, but incorporating:-

(a) a high value of target load to minimise noise and microphony.
(b) a feedback input stage.
(c) increased gain and bandwidth.
(d) a feedback output stage for low impedance to match a 70 ohm load, and to overcome a tendency to instability.

The approach was as follows:-

For a target current of 0.2uA (peak white) across 500K., 0.1 volts would be applied to the input stage. An output of 1 volt p/p was required at the output. Minimum LF gain was therefore 20 db. Allowing an extra 20 db for low light level operation, designed external LF gain = 40 db.

For 5Mc bandwidth (625 lines), and 20 pF stray capacity at the target, XC_{stray} is 1600 ohms. As the target load was 500K,

HF loss is 500,000/1,600 = 312 which is 50 db, therefore internal gain must be 40+50 which is 90 db., with 50 db hi-peaking.

This was allocated as follows:-

STAGE	CIRCUIT	gain: HF	LF	Hi-peak	
1	Cascode 12AT7s with 100% feedback.	23	0	23	db
2	6AC7	20	20	-	db
3	6AC7 hi-peaker.	20	-7	27	db
4	6AC7-6AC7-6J6 feedback pair	27	27	-	db
		90	40	50	db

The 12AT7's with 2200 ohm load, and bypassed cathode have a gain of $gm \times Ra = 7 \times 10^{-3} \times 2200$
$= 14 = 23$ db.
Full feedback from the cathode of stage 2 gives an external gain of 1, and 23 db of hi-peak.

Stage 2 (6AC7) is orthodox, but with unbypassed cathode gives:

$$\text{Gain} = \frac{gm.Ra}{1+gm.Rk} = \frac{9 \times 10^{-3} \times 2200}{1 + 9 \times 10^{-3} \times 120} = 9.5 = 10\text{db.}$$

Stage 3 (6AC7 hi-peaker) has an LF gain which is variable, but is set to approx .5 which is -6 db. HF gain is set by Ra= 1500Ω, and, XC_k= 31.8 ohms at 5 Mc.

$$\text{Gain at 5 Mc} = \frac{gm.Ra}{1 + gm.Z_k} = \frac{9 \times 10^{-3} \times 1500}{1 + 9 \times 10^{-3} \times 32}$$

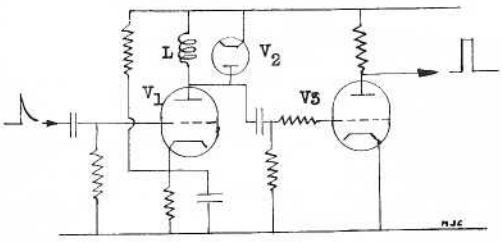
CQ-TV AN INDUCTIVE PULSE GENERATOR

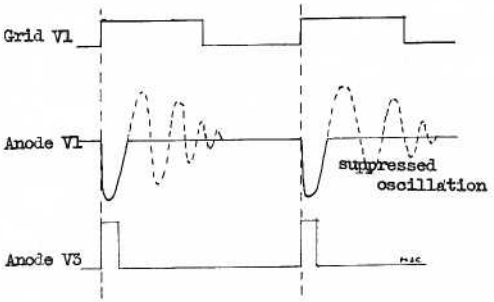
by C.Grant Dixon.

For the production of pulses used in sync or other pulse generators, the multivibrator or flip-flop is the usual choice. The inductive pulse generator is a useful alternative and deserves to be better known. It is a driven device (not self oscillating) and is most suitable for pulses of short length and short mark-space ratio; under these conditions it is better than the multivibrator.

In the diagram V1 has an inductance in its anode circuit and any sudden change in grid voltage will cause 'ringing' oscillations at a frequency determined by L and the total C tuning it. This capacity C_t consists of the anode capacity of V_1, the diode capacity, the input capacity of V_3 and the self capacity of the coil. The presence of the damping diode will of course, prohibit these oscillations whenever the anode of V_1 is positive with respect to the H.T. rail. The action of pulse generation is as follows: V_1 is normally held cut off by the potential divider to the cathode. On receipt of a positive trigger pulse on the grid the anode voltage (initially at H.T. rail) is driven into oscillation of which the first half cycle is negative going and the second positive. The diode suppresses the second half cycle and damps out the rest of the oscillation, thus there is a single negative going pulse of sine wave shape at the anode. the duration of the pulse is $\pi\sqrt{LC_t}$ The purpose of V_3 is to square the pulse and the pulse fed to its grid should be large compared to its grid base, for this reason it is not a good idea to tune L by extra shunt capacity as the output amplitude depends on $\sqrt{\frac{L}{C}}$ and an increase in C would reduce the effectiveness of clipping. The grid stopper in V_3 helps to prevent grid current from flowing; this is to be avoided as it causes overshoot on the trailing edge of the final output pulse.

The whole circuit can be built around a double triode such as a 12AT7 and a crystal diode, and it seems eminently suitable for production of line sync or blanking pulses. It is not too good where very fast rise times are required together with long pulses, but a fast rise time is not always necessary for frame pulses and the circuit may be useful there too.





USEFUL TO REMEMBER THAT:
There is no phase reversal in cathode followers or grounded grid stages.....

* * * * * * * * *

THIS USEFUL TABLE OF CO-AX CHARACTERISTICS WAS SENT IN BY G3GZW and G3LYF/T.

R. F. CABLE CHARACTERISTICS

Uniradio Type	Z_0	Nominal Capacity.	Vel. Ratio.
10	69	23 pF/ft.	.664
17	71	22	.664
31	91	17	.666
33	71	22	.669
39	69	23	.674
41	72	22	.670
42	14	116	.674
43	52	29	.666
45	91	17	.669
54	72	22	.669
55	71	22	.669
56	71	22	.666
57	75	20.6	.666
58	75	20.6	.664
59	75	20.6	.664
60	75	20.6	.664
62	76	20	.664
63	75	14.3	.960
64	125	9.7	.850
65	75	20.6	.664
66	75	20.6	.664
67	52	30	.666
68	98(Duradio)	16	.655
69	52	30	.666
70	72	22	.669
71	75	20.6	.666
72	50	28.5	.720
73	50	29.5	.710
132	42	47	.525
137	42	47	.525
140	66	30	.525
141	66	30	.525
61	76	20	.664

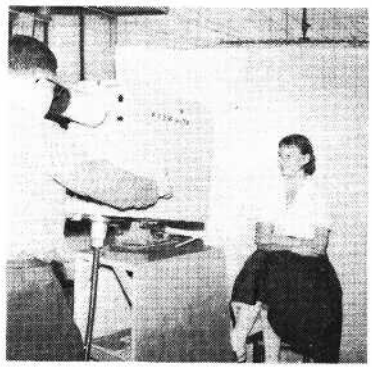
NEW MEMBERS

There was no list in CQ-TV No 35 so this list includes all new members since No. 34.

S.V.Ball, 8 Hilda Rd., Parkstone, Dorset.
Mrs W.Horton, Rt.1, Box 26B, Monticello, N.Y., USA.
T.Vicery, G5VY, 48Willow Rd., Enfield, Middx.
M.Sendecky, 121 Pearson Ave., Toronto 3, Canada.
R.B.Mangold K3BWW, 1518 Collins Rd., Pittsburgh 21, Pa., USA.
W.H.Manners, 20 South Park Drive, Ilford, Essex.
C.G.Holt, 56 Knighton Drive, Leicester.
A.C.Pickstone, 23 Northwood Rd,. Highgate, N6.
R.F.House, 5 Goodwood Parade, Watford.
C.L.Bowes, 94A Westbourne Terrace, London W2.
C.Bogod, 52 Upper Waterloo Rd., Penylan, Cardiff.
D.P.V.Hobley, 21 Hillcroft Ave., Rayners Lane, Pinner, Middx.
M.J.Humphries, G3LRQ, 158 Abbptts Drive, N.Wembly, Middx.
J.Burnside, 18 Wellington Place, Belfast.
C.Harte, G3KLS (c/o Granada TV) 41 Heaton Rd., Withington, Manchester.
R.A.F.Amateur TV Soc. G3MBD/T, 1 Radio School, RAF Locking, Somerset.
G.L.Jackson, G3OZ, 2 Franklyn Drive, Alvaston, Derby
N.P.Sweeney, 43 Wyre Grove, Hayes, Middx.
H.G.Lassman, G3JZX, 268 Amhurst Rd., Stoke Newington, London N16.
R.W.Warren, 6 Seventh Ave., Hayes, Middx.
Jaworski Klemens, Luban Slaski. 111 Wroctawska No 13 Woj, Wroctaw.
K.Briscoe, 311 Eton Rd., Ilford, Essex.
F.Giles ZL2AGI, 11 Kirton St., Masterton, Wairapa, New Zealand.
A.Larsen ZL2ACL, 36 Cole St., Masterton, Wairapa, N.Z.
C.Heath ZL2AME, 25A Fleet St., Masterton, Wairapa, N.Z.
T.B.Richard, 14 Russell Gardens Mews, W.Kensington, London, W14.
A.Wilson, K9JYO, 1220 Elm St., Shelbyville, Indiana, USA.
W.J.Black, 9 Maxim Rd., Crayford,Kent.
B.Clifford, 71 Netley Rd., Ilford, Essex.
G.Oehlenschlager, Sebeka, Minnesota, USA.
P.A.Thorogood, G4KD, 35 Gibbs Green, Edgware, Middx.
H.Carter, 52 Herbert Rd., Hornchurch, Essex.
A.F.Errington, St. Annes, 6 Festing Rd., Southsea, Hants.
P.R.Groves, 47 Belmont Rd., Hemel Hempstead, Herts.
P.W.Lancaster, Brooklands, London Rd., Chelmsford.
W.A.Brownhill, VK3BU/T, 75 Gheringham St., Geelong, Victoria, Australia.
G.D.Judd, G3LUE/T, 317 Baker St., Enfield, Middx.
J.H.Thorpe, Eversley, Alderminster, Nr. Stratford on Avon.
J.J.Atkin, 8 Kingslea, Leatherhead, Surrey.
D.W.Goodyear, 11 Dalton St., St. Albans, Herts.
R.W.Berral, 239 Goldington Rd., Bedford.
V.E.Oliva, G3KPM, 12 Hartam Rd., Holloway, London, N7.
A.B.Catlin, WQAPS, Art's Radio-TV, Stanton, Nebraska, USA.
G.H.Blake, G4AI, La Connings, Germoe, Nr. Penzance, Cornwall.
J.E.Cronk, 93 Thurlow St., Walworth, London, SE17.
J.H.Birkett, BRS 20842, 294 Newark Rd., North Hykeham, Lincoln.
J.Millns, 36 Douglas Crescent, Thornhill, Southampton.
J.V.Newson, G5GY (ex G2GF) 12 Kimberly Rd., North Walsham, Norfolk.
B.W.Palmer, G2BWP, Brydon Lodge, Alexandria Drive Herne Bay, Kent.
M.T.Powell, 3 Picketts Rd., Felixstowe, Suffolk.
E.H.Shrimpton, Oxtall House, Tamworth-in-Arden, Solihull, Warwickshire.
G.R.Nicholls, 40 Vauxhall Drive, Braintree, Essex.
A.Cook, Regent Theatre, Kellerberrin, W. Australia.
M.Meldrum, G3HNH 127 Wardown Crescent, Luton, Beds.
H.A.Cooper, 16 Park Rd., Brentwood, Essex.
M.F.Wild, 186 Warley Hill, Brentwood, Essex.
A.F.Sherman, 34 Mountney Close, Ingatstone, Essex.

CHANGE OF ADDRESS

R.Oakley. now at 244 Little Brays, Harlow, Essex.
R.F.N.Grazebrook Portway House, A.E.R.E. Harwell, Didcot, Berks.
G.S.Chately, G3LOS/T 45 Bullwell Crescent, Cheshunt, Herts.
L.A.Stockley, G3EKE/T (TILL END OF MARCH) 154 Hunsworth Lane, Cleckheaton, Yorks.
M.W.S.Barlow, 1740 Hartenstein St., Montreal, Canada.
J.Brett, 1 Elgin Rd., Seven Kings, Essex.



BOB MANGOLD uses his Image Orthicon in his studio with a very attractive set.....

We must apologise for any outstanding receipts or orders for CQ-TV's etc. that have not been dealt with yet but the treasurer has been very busy moving house in the last few weeks, and club activities have had to take a back seat. However, if you have anything outstanding do let us know and we will try to sort things out.

* * * * * * * * * *

AN R.F. POWER METER

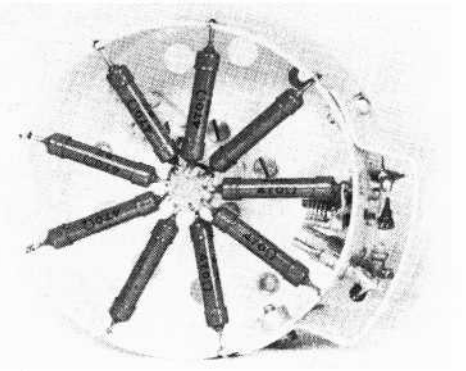
By E.C.Mitchell and D.L. Jones.
G3GZW G3LYF/T

An absorbtion R.F. power meter is always useful when experimenting with 70 cms Tx gear as it forms a good dummy aerial and also enables one to estimate the effiency of the P.A. stage. In the normal run, however, they are much too expensive, and this article describes a cheap and easy to build power meter.

The main part, the load unit, consists of an outer shell $2\frac{5}{8}$ Dia. and $1\frac{1}{4}$ deep (see fig 1) made of brass or copper, and an inner conductor $\frac{3}{8}$ Dia. and $1\frac{1}{8}$ long, with a taper starting $\frac{3}{4}$ from the back and reducing the front end diameter to $\frac{1}{8}$. A hole is drilled back along the axis at this point to enable it to be soldered to the co-ax input connector. the other end of the inner conductor is drilled $\frac{1}{4}$ dia. and $\frac{1}{4}$ deep to receive the ends of resistors R_1 to R_9. Slits should be cut in the outer shell to enable the other ends of R_2 to R_9 to be soldered.

The above dimensions, all in inches, are the only really critical ones, and should be closely followed.

One of the resistors, R_1, is not soldered to the outer shell, instead it passes through a P.T.F.E. or Polythene insulator (a piece from the inner of co-ax will do) set in a hole in the outer shell. The end of R_1 is connected to a rectifier and filter consisting of a GEX66 diode a 22 ohm resistor (erie type 9 or similar) 2 feed through capacitors 1000pf (Erie type 2404 or similar) and a 560 ohm resistor (Erie type 16 or similar). See fig. 2. Most of these components are not critical in position so the holes for the feed throughs can be drilled wherever it is conveniant. The 22 ohm resistor needs to be pressed close to the metal surface otherwise large errors of reading with frequency will result. The co-ax socket in the original load was an American socket type B N C , although there is no reason why the more usual ex Gvmnt. sockets should not be used. The resistors used for R_{1-9} were a special type made by Painton, type 73 NS. These are best for this application since they consist of a ceramic rod sprayed with a metal resistive element. (Skin effect) Erie type 8 can be used but the performance is not so good. The value of the resistors depends on the line impedance from the transmitter, in the original , for 50 ohms, nine 470 ohm resistors were used. There is a slight increase in output with frequency in this device and this may be corrected by shunting the 22 ohm



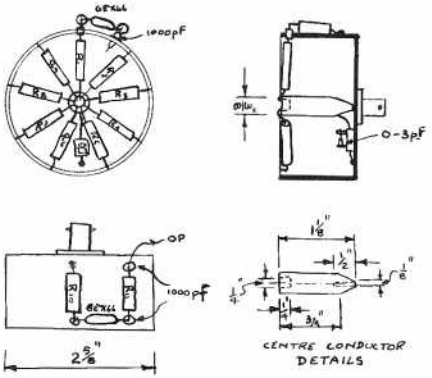


Fig 1

resistor with a 3-10 pF trimmer and adjusting it so that the same indication is given on the meter at max and min frequencies with a constant input power.

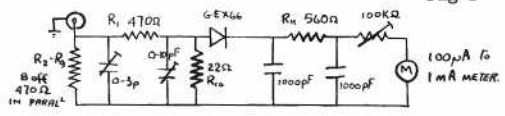
Setting Up

The 0-3 pF trimmer should be adjusted for min standing wave ratio at the input connector. If there is no way of checking the S.W.R. and IF the load dimensions have been adhered to, then screw the trimmer to expose 2/3 of the moving plates. The 100K pot is then adjusted to give full scale deflection with the power at its max required value . This should not exceed 25 watts unless the load is blown when it may be increased to 35 watts.

A standard power meter and transmitter are required to set the calibration but these can be borrowed or in cases of dire need our meter and somebody elses Tx may be pressed into service. (offer open in U.K. only!)

As with most cases of metal work at U.H.F. silver plating helps but is not essential.

Fig 2



WHAT THE OTHER CHAP IS DOING

From the USA, K5BWW, Bob Mangold writes to tell of his station which consists of an Image Orthicon camera, A complete 525 line, 30 frame sync generator and will soon have a TV Tx capable of running the maximum power allowed. The camera has a built in view finder which uses a 5FP4-A tube. The equipment is run by all,300 mA fully regulated power supply unit, and the station looks very smart as can be seen from the picture! Bob lives in Pittsburgh; from many miles away in Brasil, Jose Vincente writes to say that he is interested in making a camera but no tubes are available locally. Several F.S.S. have been constructed by friends of his, using syncs from the local T.V. station. Eric Cornelius in New Zealand has a new tube for his camera to replace the old spotty one, 3 new members have joined from New Zealand so activity is increasing. Eric has sent the video amplifier circuit of his camera, and this, which will resolve 5 mc/s on the 625 line system, appears in the centre pages of this issue. From West Australia, A.Cook tells of his F.S.S. using the 931a photomultiplier. In Bedford, R.W.Berral is building a staticon camera using a 5FP7 in the viewfinder, but his 5FP7 has gone o/c heater and he would like to know of any spares. Congratulations to G.Chatley, G3LOS/T, who has just got married, he says that he will have more room for the gear now. G.Sharpley, G3LEE, of Manchester has just built the G3CVO sync generator and vision-blank-sync mixer. A staticon camera is under consideration to make use of the pulse equipment. Ian Waters, G3KKD/T reports that activity in East Anglia is widespread at the moment; The Matilda Group are active from Cambridge with a low power Tx under the call sign G3MHZ/T, pictures are exchanged with G2DUS and G3KKD regularly each Sunday at 11 am. On 70 cms phone G2WJ can work any of these stations. At G3MHZ there is a staticon camera, almost the same one that gave the excellent pictures at the Dagenham Town Show last year. The pulse equipment and transmitter complete the picture except for the aerial which is a 16 element stack at the top of a 250 ft tower! 300 ft. of 1" diameter feeder runs to the aerial which is rotated by an electric rotating system complete with indicating device. The steel structure of the tower rings whenever the aerial is rotated! At G3KKD the 50 ft. mast is up again after being blown down in last Novembers gales. Time is rather short but progress is being made with a 50 watt transmitter to replace the small 6J6 one in use at the moment. When this is complete work will turn towards a new camera to replace the old Photicon. (this was the second amateur camera to be built in this country, possibly in the world.) G2DUS, Ivan Howard in Stotfold, is busy working on the colour gear. Ivan has completed a convertor to watch the BBC colour test transmissions on his Frame Sequential receiver. The block diagram is shown in this issue, more details at a later date.

Future plans include the transmission of Frame Sequential colour pictures to G3MHZ and the construction of an Image Orthicon colour camera. Mike Cox (N.London) has completed his transistor bar generator and is now busy re-building his pulse equipment. Mike has decided that it is a waste of time to run interlaced considering the extra power and equipment necessary. As soon as this is finished a camera will be built. At G2WJ pressure of work prevents much building work being done although thoughts about a Vidicon camera are a possibility for the future. The old Photicon camera continues to give good pictures, but its size limits the scope for demonstrations. G.A.Couzens writes in from Wirral in Cheshire to ask for any information on the RF Unit type 115 and the Tx type T 3686. Can any one help, the address is: 16 Marine Park, West Kirby, Wirral, Cheshire. Ted Mitchell, G5GZW is starting work on the Vidicon camera as soon as the sync generator is working, some bugs still remain in the mains locking circuit. Ted lives in Basildon, Essex and hopes to put pictures into Chelmsford and Romford before too long. From the midlands, news comes of increased activity as a result of the show put on at the Scout Jamboree. G3KBA/T and G3DFL/T are both radiating vision and several more stations are active on sound only. Skeds on Sunday mornings at 11 am are a regular feature(Why not turn the aerials towards Cambridge one Sunday?) The group now have their camera tube and pictures are expected in the near future. In Chelmsford, Jack Terry is making very good progress with the colour equipment, recently experiments have been towards the problem of controlling the colour wheel speed, and Jack (now G3MFT/T) thinks that he is well on the way to finding a solution to this problem. When everything is working reliably Jack will have the circuits for CQ-TV. Brian Partridge ,G3KOK/T, is working on the new Tx for the studio(see separate article). Peter Allott, G5KWD, is building the sound equipment for the studio. John Deveson and Chris Edgcombe will both be going to Cambridge this year, so they are trying to get some basic units built. John Tanner is improving the Vidicon camera, although a lot of spare time has been taken up with CQ-TV during the last few weeks. John hopes to get Doug Wheele's old 1846 iconoscope going as an interesting experiment. Philip Groves has built the F.S.S. described by C.H.Banthorpe in 'Electronic Novelties for the constructor' and after some minor modifications has produced some good pictures. Philip is thinking about a Vidicon camera now. Bill Hall has been in hospital for the last few weeks and now that he is out and about again we wish him a speedy recovery to the best of health. He says that he 'blew a .1 somewhere!

VIDICON COIL DATA

VIDICON COIL DATA.
An important addition to the details given in CQ-TV No[33] is:

On the outside of the focus coil tightly wrap one or more turns of mu-metal(can be scrounged from old CRT shields). Failure to do this will cause a large spurious signal to be picked up on the target plate connector. This appears to be due to the line scans'ringing' the focus coil. Capacity across the coil does not appear to help much. Any other views on this annoying effect?....

J.E.T.

GROUP NEWS.....

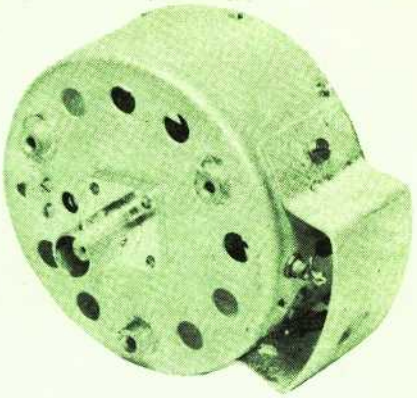
MIDLANDS GROUP. Past meetings have included talks on Multivibrators, Telestill equipment, VHF practice and pulse generators. Grant Dixon paid a surprise visit in February when he showed his three tube colour monitor that is nearing completion. Future meetings include a possible show at the North Midlands Mobile Rally. Meetings are still held at the 'White Swan Hotel' but now on the FIRST Wednesday of each month.

HIGH WYCOMBE. Much work is still going into the camera, and it is hoped to have it going in time to give a demonstration to the High Wycombe Industrial Exhibition in the summer.

SOUTH WEST ESSEX. Recent meetings have included a talk by Don Reid on Miscellaneous Video Circuitry and G3KOK/T on Pulse Generators. Future meetings include a joint meeting with Chelmsford for a film show on March 15. Also G3KOK/T is going to give a further talk on Pulse Generators on April 15.

CHELMSFORD. In February the meeting was held at the new studio for the first time. The group heard a talk on camera tubes given by Mr Turk. The next meeting is the joint one with S.W.Essex to be followed by a demonstration of the NTSC colour convertor built by G2DUS. Club members from High Wycombe, S.W.Essex and Chelmsford recently went to see a production of 'What's my Line' at the BBC Television theatre.

MONTREAL. Monthly meetings continue with the accent on fundamentals. Recent talks have been on "Waveforms" "Pulse Generation" and "Vidicon Cameras". At the latter a working camera was demonstrated, and an assortment of members' vidicons were tested. Write Barlow at 1740 Hartenstein St, St Laurent, Montreal.



ANOTHER VIEW OF THE R.F. POWER METER described on page 12 by G3GZW & G3LYF/T This is the load unit, The actual meter movement is separate.

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BISHOP'S STORTFORD, 1958.

The Chelmsford Group had their first demonstration this year on Februrary 2nd when a 'live show' was given at Bishops Stortford College. G3KOK/T organised things as he used to be at the college. The equipment used was taken over by car and bus, and included Brian Partridge's Image Orthicon, John Tanner's Vidicon, Brian's sync rack and production desk, and Jeremy Royle's R.F. Dis. rack. Three 17" comercial receivers were used as monitors in a hall some 200 yds. away.
The college dramatic society prepared a variety show which was televised and shown to the rest of the college in the other hall. The Gymnasium was used as the studio, with all the Dramatic Societies lighting equipment at our disposal. The show, which was produced by Brian, went off very well after only one very brief rehersal.

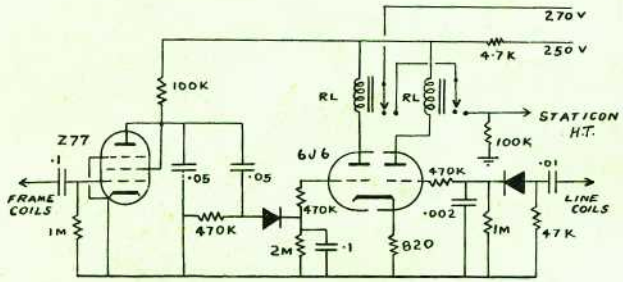
All the equipment behaved very well and a lot was learned by the 8 BATC members and by the audience and actors, about television production. On the way home Jack Terry took two Ekco monitors (each the size of a 12" console T.V.) and three passengers, beside himself, in his car (built to carry four). Besides having to stop to de-cramp the passengers, the party at one stage found themselves driving along Bishop's Stortford railway station platform------ Jack was driving and the passengers thought back to the Enfield Show.(see last issue).....

J.E.T.

IMPORTANT DATES FOR THIS YEAR

Saturday, September 6 th CONVENTION.
Last week in November, Radio Hobbies Exhibition.

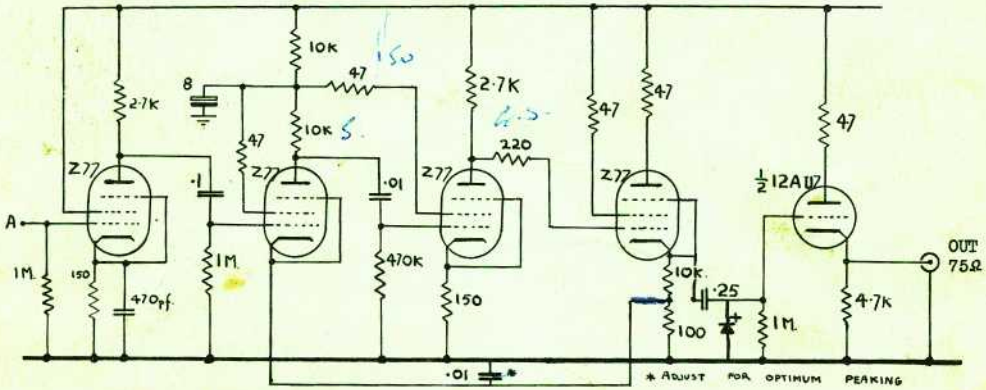
CIRCUITS FOR THE VIDICON OR STATICON



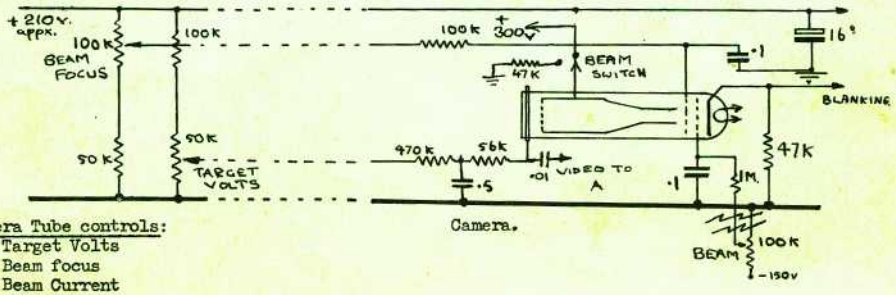
This is George Flanner's scan protection circuit which was shown in in CQ-TV number 33. Failure of either scan takes the tube anode to earth via a 100K. One relay could be used but it is rather tricky to adjust. Note that if if any of the three valves should fail the relay concerned will open, the circuit failing safe.

Camera Tube control circuit. This is built in the C.C.U., but could equally well be put in the camera. With all the controls in the C.C.U. all the cameraman has to think about is the actual picture, but this can prove annoying if the cameraman is the only person who can operate the CCU! It is equally annoying if the cameraman at a show is continually operating the controls on the camera instead of listening to the producer!

Vidicon head amplifier. The capacitor across the feedback line, marked .01, should be adjusted by experiment to give the maximum peaking without introducing distortions in the form of overshoot. Both halves of the 12AU7 cathode follower can be used in parallel, but stoppers are necessary to prevent the valve oscillating.



Vidicon head amplifier. Lead 'A' to be as short as possible.



Camera Tube controls:
Target Volts
Beam focus
Beam Current

Camera.