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16, West Mall,
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BATC

Moving from Chelmsford to Bristol has rather upset the smooth running of CQ-TV, but things are sorting themselves out now. However, the address given at the top of this page should be regarded as temporary until confirmed later. In any case confirmation or otherwise will appear in CQ-TV 40, but in case of a change before and to ease the correspondence it would be appreciated if any queries could be sent to the Hon. Secretary at 149, Ongar Road, Brentwood, Essex.

One of the main items of news mentioned on a separate sheet in CQ-TV 38 was the announcement that Vidicons are now available with scanning coils for £25. Here are some more details. The tubes are all rejects, but are quite satisfactory for amateur purposes. There are usually one or two small spots on the picture. The tubes are supplied complete with scanning coils and socket, and are available to any member anywhere. Orders are being handled by the Hon. Secretary, Don Reid.

At the time of going to press the addresses of the Chairman, Hon. Secretary, Hon. Treasurer and Editor are:

Chairman, C.Grant Dixon M.A., Kyrle's Cross, Peterstow, Ross-on-Wye.
Hon. Secretary, D.S.Reid, M.A., 149, Ongar Road, Brentwood, Essex
Hon. Treasurer, L.A.F.Stockley, F.B.O.A., F.S.M.C., G3EKE, 123 Harbour Rd., Wibsey, Bradford 6, Yorks.
Editor, J.E.Tanner, G3NDT/T, 16 West Mall, Bristol 8.

Standards for slow scan work will be considered in the next edition, any members who have been working in this field are invited to send in any suggestions or comments.

CATHODE RAY TUBES Since the removal of Purchase Tax on replacement C.R.Tubes the following service is available to club members:

New Gun Service Rebuilt tubes supplied ex-stock, fitted with NEW high quality guns of English Make. Fitted with 6.3v /.3 amp heaters. For use as replacement for:
Mullard MW series, All Emitron types, All Cathodeon types, All E.E.V, G.E.C, Cossor and Ferranti types, All Mazda types except CRM 121, 122, 123, 151, 152 and Electrostatic types, All Brimar types except BM and Electro-Static types. These tubes carry a straight guarantee of one year.

Prices	9" & 12"	£4--15--0d
	14" & 15"	£5---0--0d
	16" & 17"	£5--12--6d
	21"	£6--15--0d

Old tube allowance: If a corresponding old tube is handed in, prices are reduced 10/- for sizes up to 15", 12/6 for 16 & 17" and 15/- for 21" tubes.

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Repair Charges:	9" & 12"	£4--5--0d
	14" & 15"	£4-10--0d
	16" & 17"	£5--0--0d
	21"	£6--0--0d

These tubes carry a straight guarantee of nine months.

To order a tube from stock, send details of the type required together with the payment. For tube repairs, write giving make, type and serial number of the tube, do not send the tube until requested. All orders should be sent to John Tanner, and cheques made payable to 'The British Amateur T.V. Club'.

FUNDAMENTALS

AMPLIFIERS Part 1

This series of articles is intended to give some helpful ideas on the design of a video or pulse amplifier of known gain and bandwidth or rise time. In this first article, the relation between rise time and bandwidth will be considered.

Firstly, we must define what is meant by "bandwidth". The bandwidth of a system is the difference between the upper and lower frequencies at which the gain has fallen by 3 dB (i.e. has dropped to 71% approx.) from its value at mid frequencies.

In Fig.1, f1 is the upper frequency and f2 the lower - so B, the bandwidth, is f1-f2. In a typical video amplifier, f1 will be about 3 Mc/s and f2 should only be a few c/s ; so B = f1 almost exactly. The graph shown in Fig.1 is known as the Amplitude Response Curve of the system.

Now the gain drops by 3 dB at the upper frequency f1, when the reactance of the anode to earth capacity, C, is equal to the anode load resistor, R. So $f1 = 1/2\pi RC$; or in units of Mc/s, KΩ and pF : $f1 = 1000/2\pi RC = 160/RC$. So if R= 4·7 KΩ, and C= 20 pF, then B= 1·7 Mc/s.

If a wide bandwidth is required, it is important to keep the anode load small (snag : low gain - so use a valve with a reasonably high g_m), and be careful when wiring to keep the stray capacity as low as possible. This means: keep video leads short, and do not run coupling capacitors close to the chassis. Remember that the "C" represents the output capacity of the valve with which you are concerned, plus the input capacity of the following stage, plus all the wiring and valve base strays. We shall discuss methods of improving bandwidth in a future article.

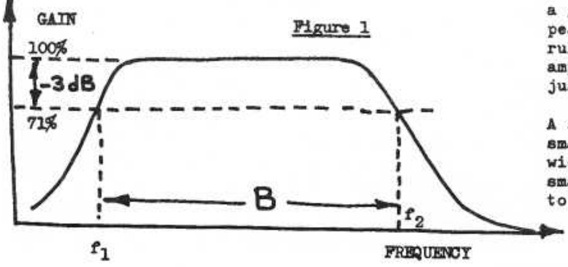

Figure 1

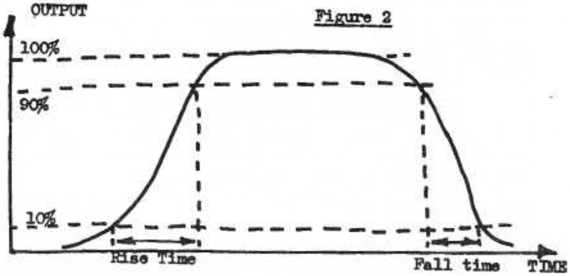

Figure 2

Next, we must define "rise time" ; consider Fig.2. This is a graph of the output of an amplifier against time, and must not be confused with Fig.1. The rise time T is the time taken by the output to rise from 10% to 90% of its final steady value ; and similarly the fall time is the time taken for the pulse amplitude to fall from 90% to 10% of the steady maximum amplitude. In general, rise and fall times are equal, unless a valve is being driven into grid current, or cut-off. For any uncompensated amplifier stage, T is simply related to R and C by the equation T= 2·2CR. The factor 2·2 comes in because the rise and fall are parts of an exponential curve. For a fast rise time, i.e. small T, we can see that R and C must be small - and this is the same condition which we previously found as necessary to give a wide bandwidth.

Finally, we come to the relation between rise time and bandwidth ; since $B= 1/2\pi RC$ and T= 2.2CR, then T= 0·35/B. If B is in Mc/s, then T is in µS ; so a bandwidth of 3·5 Mc/s is equivalent to a rise time of 0·1µS.

It must be emphasized that the equations quoted refer only to a single stage amplifier without any form of peaking or other compensation, such as negative feedback. Fortunately, the relation T= 0·35/B is still a good guide for shunt peaked or cathode peaked stages ; and it also forms a useful rule of thumb when one considers feedback amplifiers, though it has no theoretical justification in this case.

To sum up : Rise Time X Bandwidth = 0·35. A stage with a large bandwidth will have a small rise time, and conversely. To achieve wide bandwidths, i.e. fast rise times, use small anode loads, and keep stray capacity to a minimum by careful layout and wiring.

Don Reid

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MICROWAVE LINKS

by Michael Barlow

We usually think of amateur TV transmitters in terms of 430Mc/s equipment, since this is the lowest assigned frequency band for TV and at this frequency more or less conventional valves and techniques will give useful results. However there are occasions when the construction of 430Mc/s equipment is difficult, due to lack of RF experience on the part of the builder, or the non-availability of suitable valves and components. Alternatively it often happens that in some town there are only two BATC members, and a powerful all-round type of radiation is not required, but merely a point-to-point link. Again the studio site may not be a good VHF site, and a link is required to some co-operative amateur who is in a better situation. There may also be cases where 430Mc/s is already occupied and an additional video or sound link is required; where authority frowns on TV activity the possibilities of microwave operation for undercover activity should not be overlooked! The advantages of a microwave system are that the equipment can be made small, light, inconspicuous and economic, whilst possible dis--advantages are the very narrow beamwidths, calling for accurate aerial alignment and point-to-point working, plus short range - normally optical, but liable to considerable attenuation by trees and houses etc.

The amateur bands available in the UK are the 13, 6 and 3 cm bands roughly (readers should check with their local authorities for precise limits). Microwave components are expensive to buy new, so there is little doubt that Government surplus gear will be used wherever possible. Whilst it is quite possible to use valves such as the CV90, DET22 and DET24 in suitable arrangements, these being disc seal triodes, it will probably be found to be simpler to utilise surplus klystrons such as the CV67 or the 723A/B; the former is a 10cm tube, the latter 3cms. Both are reflex klystrons in which the electron beam is passed through a cavity, reflected back through it again and finally collected by the anode. The power output is only a few milliwatts, but this is adequate for our purposes. Modulation can be applied to the reflector very easily, giving AM or FM or (usually) both; the CV67 also has a control grid that can be used for AM. Cathode or beam voltage modulation is no advantage. The cavity of the 723A/B (2K25 etc) is part of the tube assembly, and is tuned mechanically by a system of screws. The CV67 cavity is external, and any size of cavity can be fitted.

With these points in mind, we will consider the design of a 13cm link using surplus CV67 klystrons. The first point to be decided is whether the link is to be one-way or two-way; since one klystron will be needed at each end in any case (for tx and local oscillator), by offsetting the two carriers by the desired IF frequency, the link can be made two-way very simply. Another vital point is whether AM or FM is to be used. If AM is employed, the domestic TV set can be used as the IF strip if the IF is chosen suitably. If FM is used, slightly more power is obtained from the transmitter, making for a better signal to noise ratio, and for sound use a domestic VHF tuner can be used as the IF. Some of these units have an AFC outlet which could be modified to keep the two klystrons locked together. A very useful buy is the ex-W.D No 10 set IF strip, which is similar to the 45Mc/s Pye strip but has both AM and AFC outputs already fitted. Since a very wideband IF is required for FM, it is suggested that the amateur stick to AM for the time being. Now we can get down to details.

SPECIFICATION OF AN AMATEUR TV LINK

The equipment is to form two terminals of a 13cm two-way link. Using CV67 klystrons and reasonably sized aerials of simple construction a range of 2 miles in the open is required. A video bandwidth of 2.5Mcs would be ample (405 lines); more would be very nice, but even less will still enable a useful picture to be seen. The link will also be valuable as a sound link if a restricted bandwidth must be used. 10% overall linearity as seen on a sawtooth will be acceptable.

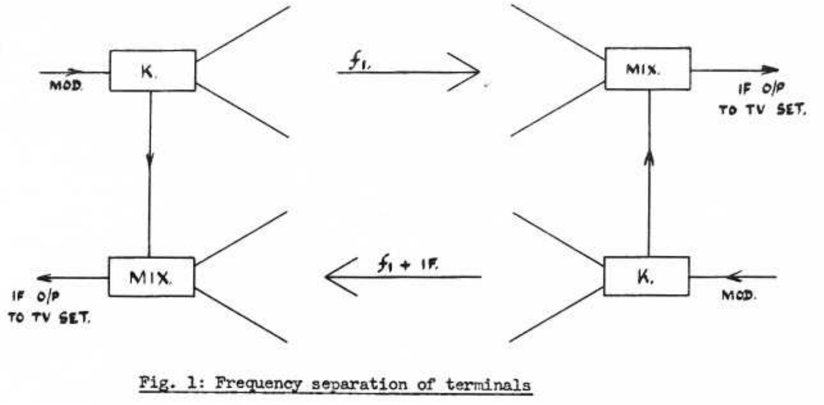


Fig. 1: Frequency separation of terminals

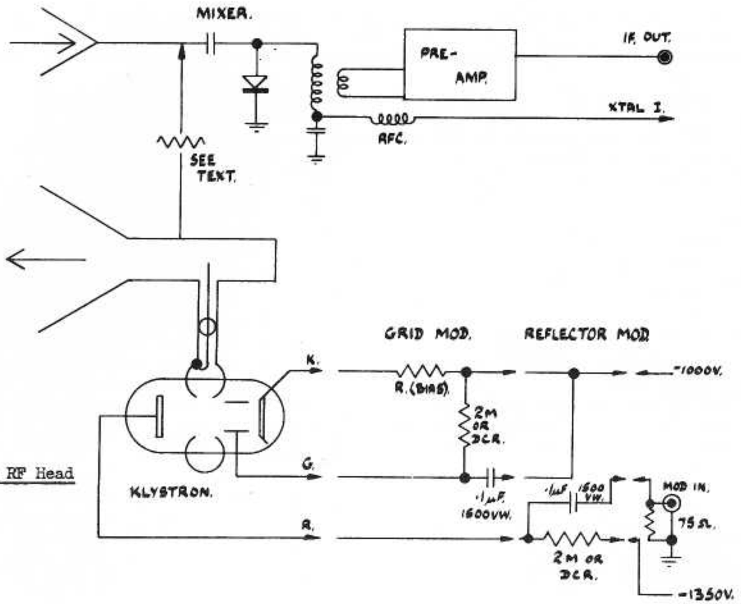


Fig. 2 The RF Head

Construction: the RF head is to be capable of being tied to a mast, hung out of a window or fixed in an attic. A collapsible aerial of size 2ft by 1ft aperture would be ideal, but 3ft by 2ft would be satisfactory. Control unit and power supply can be heavy if separate. Interconnections between the RF head and the control unit should be few and preferably at low voltage. The RF head should be showerproof for use in the open air at exhibitions etc.

Details:

As explained above, the operating frequencies of the klystrons will be separated by the accepted IF frequency so that only the one klystron is needed at each end for a two-way link (Figure 1).

For convenience, a double aerial system will be used. The finite leak of RF from the transmitting aerial to the receiving aerial may be enough to give the correct amount of "local oscillator" injection to the crystal mixer.

A Band 1 IF will be used as this enables a reasonable separation of frequencies to be obtained without an excessive noise level. The standard IF of 35Mcs could equally well be used, bypassing the RF tuner in the TV set. For short links the TV set can be fed directly from the crystal mixer. By switching channels a quick check on "IF" operation is possible.

Automatic frequency control (AFC) should be fitted to at least one end of the link for reliable, unattended operation. A suitable discriminator and DC amplifier can be easily made. Coarse tuning of the klystron will be done at the RF head; fine tuning (variation of reflector volts) can be done by a knob on the power supply, which is more easily accessible.

Automatic Gain control cannot be easily used with AM TV, but existing AGC circuits in the TV sets will still operate of course.

Input and output must be at standard BATC levels: one volt whites positive in 75 Ohms.

The RF head will consist of the two aerials, mixer, oscillator, IF pre-amplifier and possibly the modulator. For weight reasons, the power supply will be kept separate. The transmitter controls, which may all be mounted with the power supply unit, are mod level, sync tip level (DC restorer level) and fine tuning.

Final Design:

Each terminal will be consist of two separate units connected by suitable cables:
a. the RF head and b. the power supply and control unit. A coaxial output to the IF strip will be provided, and this latter may be a domestic TV set, VHF FM receiver or war surplus IF strip as preferred.

The klystrons will be amplitude modulated on the grids or reflectors. Although described as a two-way link, only one way at a time is possible since otherwise the "local oscillator" will be modulated.

The mixer will use a standard crystal diode such as the CS2A designed for microwave mixer service. This will be mounted in a simple cavity, and the IF output will be fed to a cascode pre-amp with a 75 ohm coaxial output. All RF plumbing will be at earth potential to DC.

The cable joining the RF head to PSU must contain:

i. Two 75 ohm co-ax for mod input and IF output.
ii. Earth (may be screens of the co-ax)
iii. Klystron cathode supply (-1000V @ 50mA max)
iv. Klystron reflector supply (-1350V @ 1mA).
v. 230V AC for heater transformer; or 6.3 and 4V.
vi. HT+ for the cascode pre-amp.
vii. Any supplies needed by modulator (if only a few volts swing are required, only a 75ohm resistor is needed for the "modulator").

continued on page 7

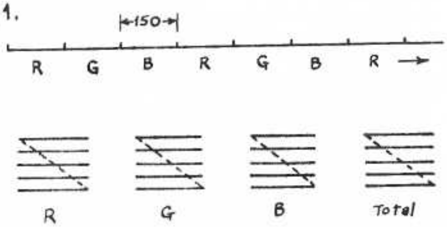
A PROPOSED NEW STANDARD FOR FRAME SEQUENTIAL COLOUR

by Arthur Critchley

After having seen the present system of 150 lines at the 1958 Convention the conclusion was reached that the resulting pictures were too 'liney'. Accordingly an investigation into the possible advantages of interlacing was started.

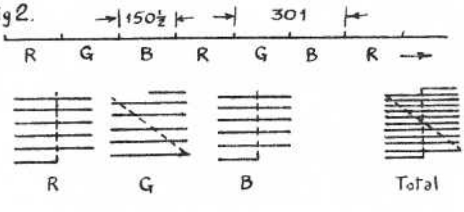
The main advantage, for any television system, is better vertical definition for the same bandwidth. The principle is to have an odd number of lines per picture, i.e. a fractional number per frame. In a sync pulse generator, the interlacing factor is determined by a frequency divider dividing the master oscillator frequency, giving the odd number of lines, by a certain number; its output frequency is then the line frequency.

Fig 1.



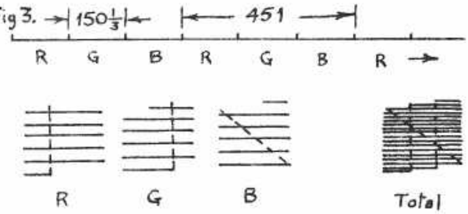
Looking at the present sequential scanning system (Figure 1) there are 150 lines per frame, so the lines for any one frame lie exactly on top of those for the previous frames. The picture then has the same number of lines as one frame.

Fig 2.



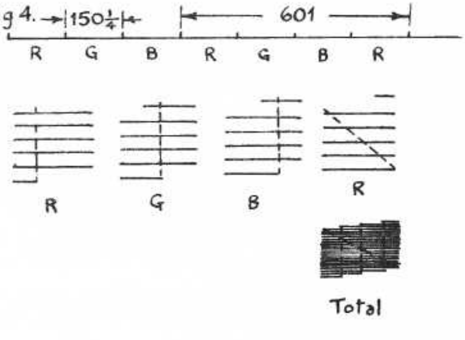
Double Interlacing. Assuming 301 lines per picture there are $150\frac{1}{2}$ lines per field (For double interlacing there are two field scans per picture frame) The picture has 301 lines per frame, so the third field scan starts a new picture, but it is, say, a blue one since for this example the previous two were red and green. This means that the red lines of field 1 and the blue of field 3 occupy the same place on the screen. Similarly the green lines of field 2 occupy the same place as those of field 4. Looking further it will be seen that over 6 field scans, that is 3 frames, the sequence of colour for any one line in the complete picture is Red-Blue-Green, i.e. the line has each colour on it once every six scans, and since there are 301 lines in the picture the effect is that of a 301 line colour picture.

Fig 3.



Triple Interlacing. Assuming 451 lines per picture there are 150 1/3 per field but they do not overlap and are staggered so that each line of the picture is a certain colour all the time. If a primary colour is viewed it will have 150 1/3 line definition whereas a different colour will have displaced colour lines of 300 2/3 or 451 line definition.

Fig 4.



Quadruple Interlacing. Assuming 601 lines per picture or 150¼ per field. It can be seen by studying the diagram (Figure 4) that every line has each colour once in 12 field scans. This produces a 'crawling up' effect of the lines and also a colour flicker of 8 1/3 cycles. Both these effects are part and parcel of each other. On the practical side is the problem of good interlacing which is difficult even on double interlace systems This makes quadruple interlace a non practical system.

It is obviously no good going further so looking once more at these four systems there are only two of any real use; the frame sequential and the double interlace. Since the sequential system is used now and has been rejected for the purpose of this article the double interlaced system is the only one left to be thought about.

The first question that arises is the number of lines to be used; 200? 400? 1000? To decide the final number a few factors must be considered; these are:

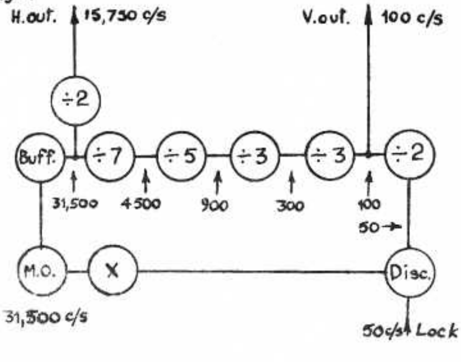
1. Bandwidth
2. Vertical repetition frequency
3. Horizontal " "
4. Availability of components

Considering the last three; the vertical frequency will be kept at 100 cycles. Components are normally made for 405, 525, 625 and 819 lines. This corresponds to frequencies of 10.125, 15.750, 15.625 & 20.475 Kilocycles (double interlaced) The present colour line frequency is 15 Kc/s so line components for 525/625 systems are most suitable. Bearing this in mind a few odd line numbers were worked out using simple odd count ratios. (The numbers must all be odd to give a total odd number) From the list 515 lines seems to be the best since it is exactly the same line frequency as 525 line receivers and is only 5% different from the line frequency used by Grant Dixon.

The proposed standard is, therefore, 515 lines double interlaced, 100 frames.

Now, the sync pulse generator counter. Figure 5 shows a suitable block diagram. This can fairly easily be adapted from an existing 405 line counter if it is of the type with frequency dividers dividing by 5,3,3,3 and 3 The divide by 3 stage is altered to divide by 7, one 3 stage altered to a divide by 5 and one other(the last) to a divide by 2. The vertical drive is taken from in front of the divide by two instead of after it. The master oscillator may need adjusting as the frequency is raised somewhat and a few parts may need altering but apart from this there is very little to do. The existing pulse

Fig 5.



shaper and mixer unit can be used with minor alterations to the various oscillator stages. All these alterations could be arranged on a switch to change systems.

The result of all this is a colour pulse generator at no extra cost!

A.W.C.

Arthur Critchley would be very pleased to have any comments passed on to him. Please send these via the Editor who will forward them.

Counter Ratios	Lines	H. Freq.	Comments
3.3.3.3.3.	243	12,150	Too low
3.3.3.3.3.3.	729	36,450	Too High
3.3.3.3.5.	405	20,250	Too High
3.3.5.5.	225	11,750	Too low
3.5.5.5.	375	18,750	Too high
3.3.5.7.	315	15,750	Good
7.7.7.	343	17,150	fair.

Cover Photograph — This edition shows the Cambridge Group camera being set up by Arthur Critchley (Right), Malcolm Sparrow (rear) and John Tanner (front) during the visit of the Cambridge Gp to Grant Dixon at Easter.

Photo: C.G.D.

The cover picture on the last edition showed Eric Cornelius, VK6EC/T and his Vidicon Camera, together with some of the other necessary gear.

Photo: VK6EC/T

The map showing U.S.A. members is not quite complete yet and is being held over to the next edition.

If high voltage cable is not available use an extra co-ax for the cathode supply, and the reflector supply can be fed through the modulation cable. Figure 2 shows the RF head in outline.

The control section contains the fine tuning (reflector volts) and video input gain controls. A meter is provided to measure crystal mixer current so as to monitor the correct operation of the klystron (Figure 3).

The power supply (Figure 4) is straightforward; the exact requirements will depend on the klystrons being used. Hoever in all cases the reflector volts must be very stable. A point to remember is that most of the electronics in the RF head is highly negative to ground; coupling capacitors should be 1500vw where necessary for safety, and a relaible earth connection must be fitted.

The aerial

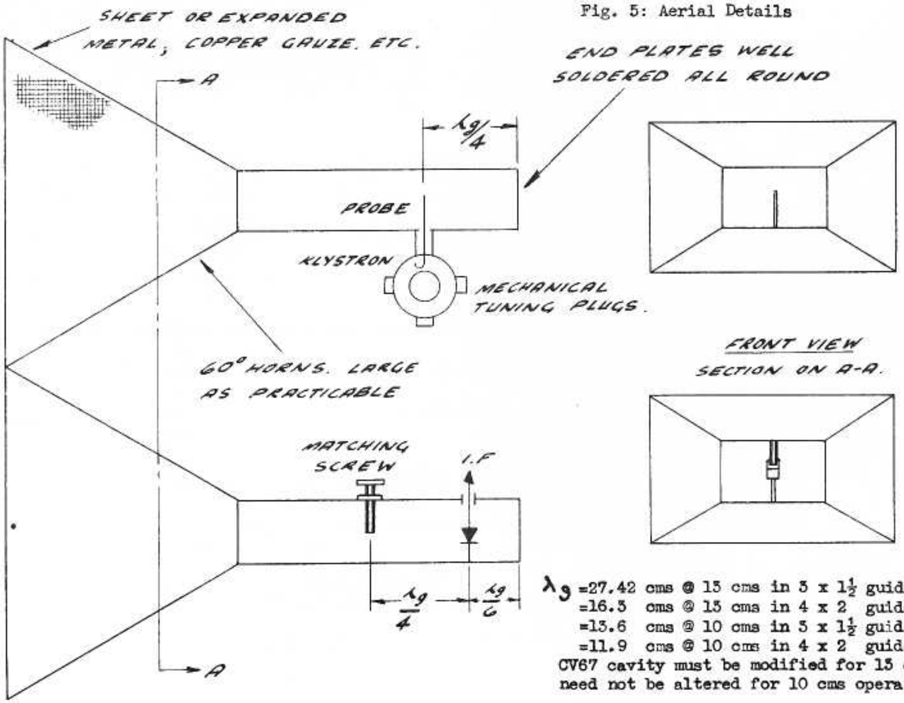
This consists of two horns made of expanded Aluminium fed from a short length of 4" x 2" home-made waveguide, shorted at an odd number of quarter wavelengths from the aerial. The klystron output probe fits through one of the broad sides, whilst in the receiver section the crystal diode is similarly mounted. A quarter wavelength behind or in front of the crystal a matching screw is fitted. If additional oscillator injection is required to obtain the necessary 0.5 to 1mA of mixer crystal current, further probes in both broad sides will be needed (see Figure 5). The estimated gain of the aerial is 17 dbs for an 18" x 9" front aperture. The klystron cavity as fitted will not quite tune down to 13cms, and should be replaced by a home-made cavity of the same thickness but 2 7/8 or 3" diam. The "waveguide" should be smooth and rectangular, but in such short legths exceptional machining accuracy is not needed.

Adjustment

With beam volts applied to the klystron, the reflector volts are steadily increased. If the receiver aerial is close to the transmitter, or a simple crystal probe is made up and placed in the transmitter beam, there will suddenly come a point where RF output is indicated. Depending on the exact klystron and its tuning there may be two or more "modes" as the reflector volts increase, as shown in Figure 6. In general the output power increases with increasing reflector volts, but care must be taken not to exceed the maximum ratings of the tube. In some cases air cooling is necessary.

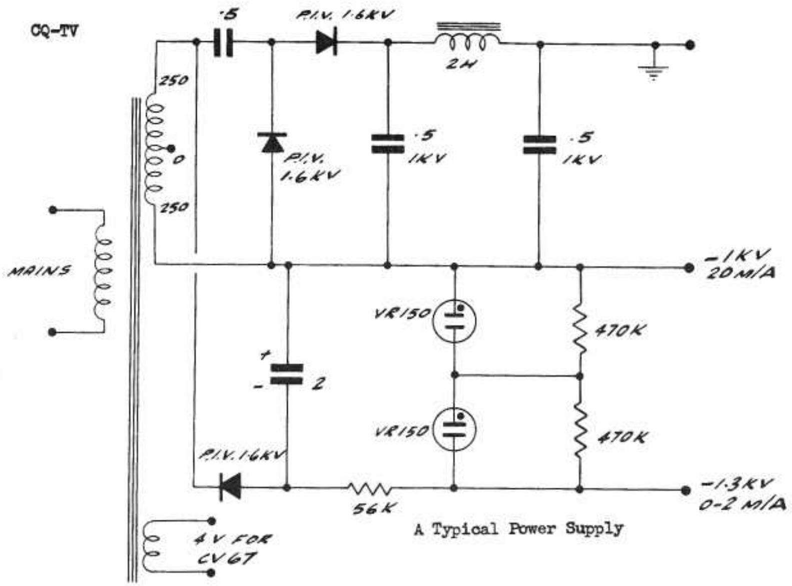
The tops of the modes are fairly flat, and it is to the centre of the flat part that the klystron should be tuned for FM working, but halfway up or down one of the sides of the mode for AM. A sawtooth is the best check on system performance here.

Fig. 5: Aerial Details



λ_g =27.42 cms @ 13 cms in 3 x 1½ guide
=16.3 cms @ 13 cms in 4 x 2 guide
=13.6 cms @ 10 cms in 3 x 1½ guide
=11.9 cms @ 10 cms in 4 x 2 guide

CV67 cavity must be modified for 13 cms, but need not be altered for 10 cms operation.



A Typical Power Supply

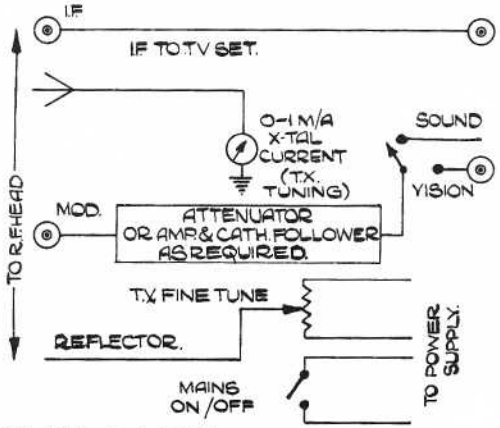


Fig. 3 The Control Unit

Once RF is obtained, adjust the position of the transmitter probe for max forward power; now adjust the crystal mixer position and matching for best IF output having adjusted the injection to give about 0.5 to 1mA of DC in the crystal.

References
RF on the 3, 6 and 13cm Bands. CQ-TV No.7
What - No Watts? CQ-TV No.9
Amateur Microwave Experiments RSGB Bulletin, March, April May 1953, June 1955.
QST Jan 1946.
Electronics April 1955.

Klystron tubes, Harrison, McGraw Hill.

General: MIT series Vols 2, 12, 16.& 7.
Brit. Contrib. to TV (IEE 1951).
Waveguides (Methuen Monograph)
Principles of Radar.

--- There are two more diagrams to complete this article and these will appear in the next edition. This is an unusual type of article for CQ-TV. It is not constructional in the true sense, but is intended to stimulate members to work on this problem. As far as is known, only GI3FWF/T has been on the air with a Klystron so far. News of other members' experiments would be welcomed. -Ed.

WHAT THE OTHER CHAP IS DOING.

Congratulations to Wilson Allen, K9JYO, (Indiana) ; following his amateur work on the design of a camera tube, he has been selected as one of the top 40 science students in the USA - out of 28,000 ! This honour includes a free trip to Washington and vacation work in leading electronics labs in the USA. K9JYO has been very busy completing a camera, using one of his own tubes, for an exhibition on March 1st. Another Indiana member, Wayne Schuler K9IZO has a closed circuit system running, but is unfortunately 100 miles away from K9JYO. Wayne passes on a reference to "Narrow Band Image transmission for 28 Mc/s" by WA2BCW ; the article appeared in QST during summer 1958. This will interest Pluff Plowman G3AST, of Yeovil, who is actively engaged on slow scan facsimile, and intends to transmit on 10 metres when the necessary licence is forthcoming. G3AST is anxious to exchange ideas with others working on slow scan systems, so that Club standards can be set up. He has hopes of a contact with Mike Barlow in Montreal.

John Ambrose (Hemel Hempstead) will soon be making a tour of Australia ; he leaves in May for a 6 month trip, and is looking forward to meeting some Australian members. E.M. Nolan VK9FN/T (Papua) reports good progress with his 625 line vestigial sideband transmitter ; he uses QQE06/40 in the final stage and works on 289-296 Mc/s.

Eric Lincoln (Sunderland) will complete his 5527 camera in the near future, and has plans for a transmitter. J.Bramhill G2BMI of Uxbridge has progressed with his 16/9·5 mm optical telecine unit - we look forward to seeing it at the next Convention. Are any other members actively engaged on telecine work ? Roy Smalley G3LJC/T (Carnforth) has little spare time at present, but after his marriage in April, and subsequent change of address to Poulton-Le-Fylde (Lancs.), he intends to take a more active part in ATV.

Another member who is active once again is Adrian Ball G3MZQ/T (Hutton, Essex). He has just completed his National Service, and is building up a FSS, using a 3FP7 and 931A ; the design is based on that given in Mike Barlow's book "Introduction to ATV". G3MZQ/T intends to build an improved synce puls gen. and acquire a TV set for use as monitor, to replace a 5CP1. An APQ9 unit will form the basis of his transmitter. Alan Sherman (Brentwood) has ideas for adapting a CRT for use as a camera tube ; he has been offered useful facilities at Dagenham Technical College. Michael Wild (Brentwood) is working on a FSS, using a 931A.

John Ware (Chelsea) has built himself a colour TV set using a tri-gun tube, to receive the BBC NTSC signals. He is adding a 70 cm converter to it, and hopes to pick up the colour transmissions from G3ILI/T. Although up at Cambridge, John Deveson (Oxford) found time during his vac to build an oscilloscope and stabilized power supplies - the next item on his list is a sync pulse generator.

Michael Bues has started construction of a FSS - we hope to hear more news of it. Rene Monteil F8UM (France) is basing his FSS on the circuit given by Bill Still in CQ-TV 35. F8UM is, of course, working on the French 819 line standard, so he may experience difficulty in achieving the required bandwidth. P.J.Robinson G3KFH/T (Worthing) transmits on 440·4 Mc/s, and will soon be increasing power to 150 watts. Unfortunately, he lives in a valley, and can only radiate in a north-south direction.

Tom Douglas (Sutton Coldfield) sends news of much activity in the midlands ; there are plans for a number of shows this year. Pictures are regularly transmitted on 70 cm on Sundays - QRM is becoming quite a problem! D. Goodyear of St. Albans has almost completed his staticon chain ; his present snag is how to get rid of 10 volts of line frequency pulses coming out of the camera. One of our father & son teams - S.May and E.F.May of Leicester - has a vidicon and a monoscope in action, and are now thinking about a second vidicon camera. To obtain good results from the monoscope, they found it most important to screen the tube from any stray magnetic fields.

It was good to receive a subscription from our old friend Janko Vasilic (Belgrade), although we have no news of his present activities. Bill Brownbill VK3BU/T has received his vidicon in Geelong, Victoria, and promises more news when it is working. Geelong is 40 miles from Melbourne ; the local radio club has a membership of 50, and meets weekly. Douglas Wiles G3BBY (Grays, Essex) is constructing a monoscope, using the circuits given in CQ-TV 30 by Mike Cox.

We would like to express our thanks to Mullards Limited for the "Mullard Technical Communications", now being received regularly. Any members wishing to refer to these should contact Don Reid.

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