CQ·TV

THE BRITISH AMATEUR TELEVISION CLUB.

80

NOV 1972

THE BRITISH AMATEUR TELEVISION CLUB

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Overseas members may have their copy of C Q - T V sent by air-mail, for a surcharge depending on their country. Details are available from the Treasurer.

Members wishing to have material published in C Q - T V should send the manuscript and drawings to the Editor; articles are invited on all subjects of interest to amateurs and should be of about 1500 words; larger articles should be divided into convenient Parts for publication in consecutive issues of the journal.

COVER PHOTO Colin German GM6ADU/T and his 3 cm equipment.

EDITORIAL

As you will see from the report in this issue, the 1972 B.A.T.C. Convention was a tremendous success and our thanks must go to all who were responsible for organising it, and especially to the I.B.A. for letting us again use their Headquarters. A new committee was elected at the A.G.M. in the afternoon, but as this magazine closed for press before the committee meeting necessary to arrange new officers, the names printed on page 1 are last year's officers. C Q - T V No. 81 will contain a list of new officers for 1973, until then the old ones will continue to do the work.

Gordon Sharpley G6LEE/T who wrote the 'Introduction to Slow Scan' in C Q - T V No. 79 dropped a big clanger (his own words!) when he attributed the first use of FM to WA2BCW. In fact it was John Plowman G3AST who first used this system and won the Courtney Price Trophy for original work in this connection. He later altered his circuits to AM to be compatible with Cop McDonald for his transmissions on Ten Metres, but after the early transatlantic hook-ups, the American Hams started to look seriously at FM, and hence todays standards. Our apologies must go to G3AST for our most serious mistake.

Those of you who use the 70cm band will find the announcement from the M.P.T. printed on page 6 very important. There is still room for a 625 line channel, but please do be careful about sidebands- they musn't be allowed to spill over outside the band. Some work is being done on filters for amateur use, and we hope to publish details soon. One point which should be borne in mind is that 435 - 438MHz are allocated for international satellite use, and even though in U.K. only frequencies around 435 will initially be used, it might be a good idea to note when a satellite is around and not occupy the band for that short time.

If anyone wants a 525 line S.P.G. for $21.75, the Hughes Aircraft Co. I.C. No. HSUB0525 contains all the circuitry necessary except the colour subcarrier generator. The only snag is it is sl small it might get lost!

Our congratulations must go to John Lawrence GW6JGA/T for winning the Practical Wireless Designers' Trophy for 1971. The winning design was John's "Digital Frequency Counter" published by Practical Wireless last year which some of you may have seen. In this magazine John's series "Circuit Notebook" has now been running since November 1969 and would have made it's three years in this issue if John hadn't been too busy preparing an "over the air" lecture from the top of the Great Orme near Llandodno. However, in C Q - T V 81, not only will we print "Circuit Notebook No. 12" but also a report on the portable /T expedition.

Ken Wood, K6118, of 17576 Pinedale Avenue, Fontana, California 92335, U.S.A. has published a "Bibliography of Amateur Television, Slow Scan Television and Facsimile" which he intends to update during December; he would therefore be grateful for any information which may be of use in this work. Amatuer, Club and Private publications would be welcomed, and it is intended to include all available information from all countries so as to provide a ready reference to all Amateurs world wide. Copies of this bibliography are available from Ken at the above address on receipt of sufficient postage. With a weight of 6oz, 76cents or four International reply coupons is sufficient for European subscribers for surface mail.

THE EDITOR

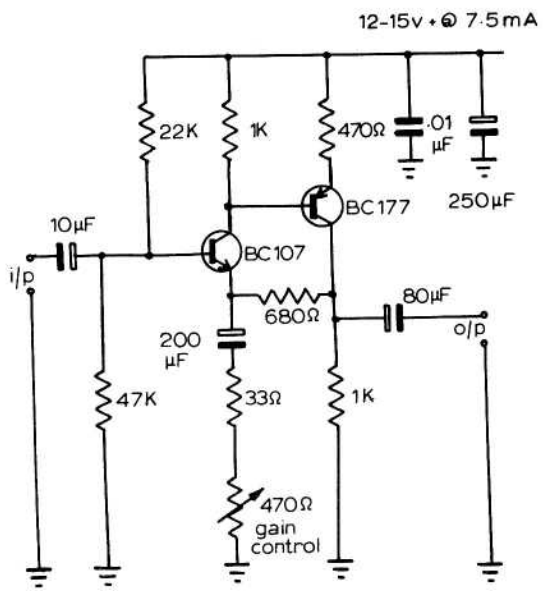
CONTENTS

VIDEO LINE AMPLIFIER

This circuit was sent to C Q - T V by R.A. Rowe, who thought it might be useful to readers. He himself has used it and found it to be very good.

As can be seen from the performance table, the circuit provides a very satisfactory performance for a general purpose amplifier with a useful gain. Should be quite cheap to build too!

Z_{in} = >10K max.0·4v p.p.
Z_{out} = < 250Ω 4v p.p.
Freq. resp. 10Hz - 5MHz ± 1db
Gain control 2x - 10x
Circuit design ZLITAT
Circuit supplied ZLITFX



A SINE WAVE MULTIBURST GENERATOR

by David Wilkinson.

Recent correspondence (C Q - T V 78) has shown the shortcomings of generators using square waves. This generator, which is very simple to make, uses sine wave oscillators.

CIRCUIT DESCRIPTION

This multiburst generator produces a white level burst and sinusoidal burst at 1,2, and 3 MHz, though other or extra frequencies could readily be accomodated. Faichild uL914 I.Cs are used throughout, plus two transistors.

The circuit consists of a chain of monostable multivibrators which produce successive pulses approximately 12 usecs. long. These provide the white-level burst, together with gating pulses for the 3 oscillators.

Each oscillator uses half of a uL914 as a Hartley oscillator followed by the other half as a buffer amplifier. This is gated ON by the B pulses. However, it is desirable that the bursts be coherent from one line to the next; this is achieved by stopping the oscillator, during the blanking period, by means of the positive-going pulses A from Tr1.

The oscillator outputs are combined in a resistive network, together with the white level burst, and amplified by Tr2.

CONSTRUCTIONAL DETAILS

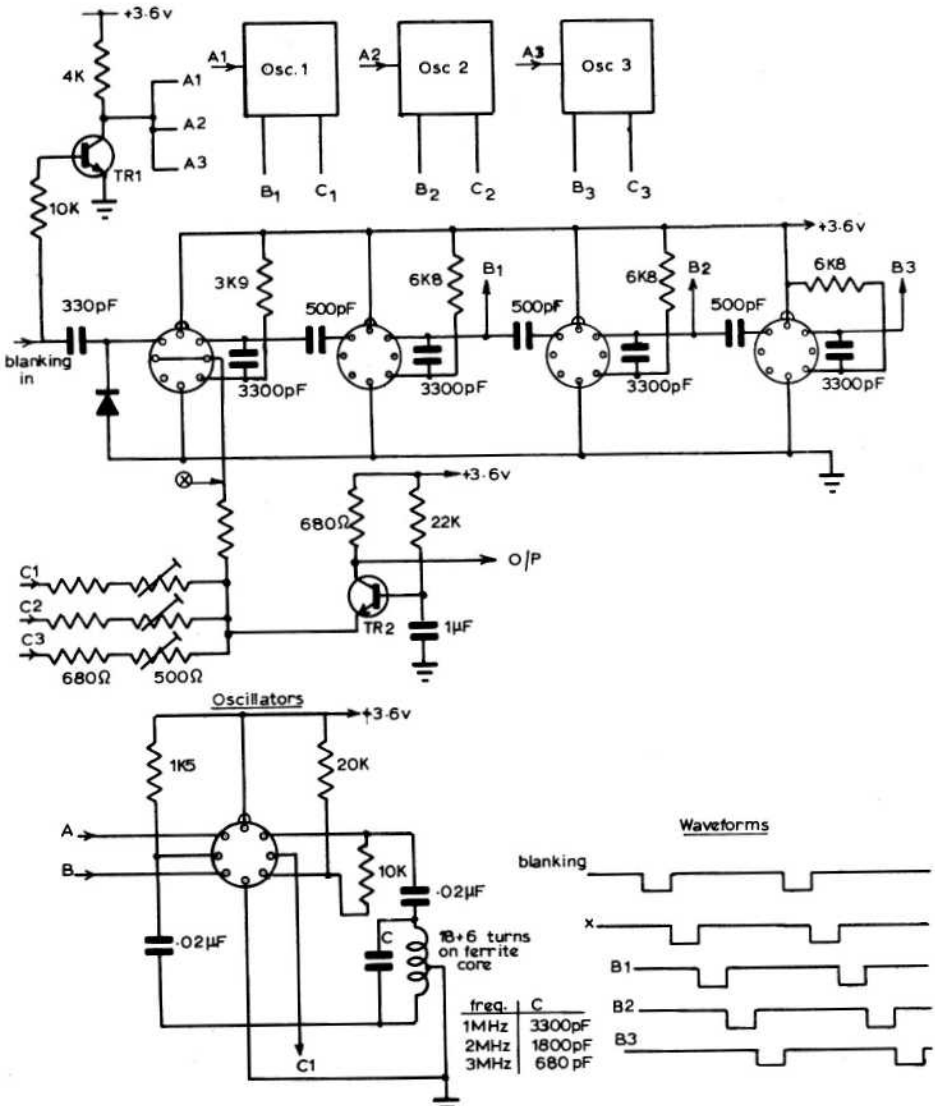
As it was desired to construct the whole unit on a 5" x 3" plug-in Veroboard, it was necessary to select the values of a number of the components, whereas preset pots. would have been more convenient.

The oscillator coils were constructed on wire-ended ferrite cores.

Some adjustment may be needed to achieve linear operation of the buffer half of the I.Cs. It will also be noted that the individual level setting pots. affect the level of both the sinewave component and the d.c. pedestal simultaneously. It might be thought desirable to separate these functions; but, in practice, it is possible to make minor differential adjustments by shunting one of the resistors by a few pf. This again takes up less space!

Whilst the unit makes no pretence of conforming to professional standards, it will be found to be extremely useful for rapid checks of video circuitry.

Further details on multiburst generation will be found on page 13 of C Q - T V No. 77 in the article by D.J. Long G6ACH/T.


+3·6v
4K
A1
A2
A3
TR1
10K
Osc.1
Osc 2
Osc 3
B1
C1
B2
C2
B3
C3
330pF
3K9
500pF
6K8
B1
6K8
B2
6K8
B3
blanking in
3300pF
680Ω
22K
O/P
C1
C2
C3
TR2
1μF
680Ω
500Ω
Oscillators
1K5
20K
A
B
10K
·02μF
·02μF
C
18+6 turns on ferrite core
C1
freq. | C
1MHz | 3300pF
2MHz | 1800pF
3MHz | 680 pF
Waveforms
blanking
x
B1
B2
B3

Letter from America.

by Ron Cohen K3ZKO Philadelphia.

Crystal controlled receivers and transmitters are the popular topic over here at the moment, in fact, it's the greatest boon ever for us, getting more people on the air and increasing activity fantastically; we've never had so much before! And it's all so easy.

Everyone uses the same frequency, crystal controlled in both transmitter and receiver. The advantage of this is that it eliminates one variable, tuning and makes DX contacts up to 100 or even 150 miles quite possible. One only needs to orientate one's narrow beam antennae to select a station and there's no need to tune. Video and audio go on the same frequency thus eliminating one transmitter (or removing the need for a subcarrier) and decreasing bandwidth. This helps us as our 420-450MHz band is very congested with tv, fm, sideband, and CW. Pictures are 3MHz bandwidth, and the transmission system is fully described in the current issue of A5 magazine.

Both signals come from the aerial on the same frequency, but at I.F. the video signal is extracted by feeding into a tv receiver tuned to channel 4. The audio is taken off when the signal is amplified in a normal a.f. stage, via a squelch circuit. Thus one can watch broadcast television, until one hears a voice in the speaker calling C Q; then it is only necessary to switch the receiver to channel 4 to receive the amateur tv pictures. Sensitivity of the receiver is 0.2μv using a low noise transistor pre-amp taken from the ARRL Handbook (with AF239s) which is much better than the 10-12μv performance obtained by a converter.

Even though there is only one frequency, stations are able to have more than one QSO at the same time - even several 2-way QSOs in the same city! By the use of narrow band aerials, amateurs in one part of a city need not interfere with others in other parts of the same city. Most U.S. amateur tv men use J-Slot 8 over 8 or 10 over 10 aerials originally made in Britain but now made by the Antennae Specialist Co. They are most rugged and the best performing antennae we know. One amateur claims a 20dB gain for his new 4 quad Yagi, and he has written a description of this aerial in A5 magazine.

On the subject of 70cm, we in U.S.A. are behind Britain and Europe at the moment - but we are fast catching up! In Britain any amateur with a high QTH near the centre of the country is King! But here in the States we are working on repeaters to get over the long distance problem of a large country - between Philadelphia and New York and Philadelphia and Washington are two that are planned, and one in Chicago is well established and working well. We believe that using the crystal controlled transmitter and receiver concept a repeater system will be easily accomplished.

I am the editor of "A5" Magazine, a journal which at the moment is supplied with articles by enthusiasts from the Philadelphia area. We hope to issue with "A5" soon a directory of amateur tv'ers throughout the USA, possibly even throughout the world. This is difficult - for instance, our only list of B.A.T.C. members is years out of date! Future issues will publish circuits of transmitters and receivers (much needed here, although a transmitter need only cost $30 if bought) and special effects units to enable mixing, wiping, inserts, keying, matting etc. to be carried out.

Work at the moment here is being carried out on our next project, which is duplex working, i.e. simultaneous transmission and reception of pictures.

73s to all in B.A.T.C.
Ron Cohen K3ZKO

PLUMBICON YOKES

A number of plumbicon yokes have found their way into the hands of B.A.T.C. members recently, and G6ADK/T has sent details, printed below for the benefit of those who may need them. The figures refer to the tags on the yokes.

1	-
2	Line coils
3	-
4	Focus coils
5	Alignment 1a
6	Field coils
7	Alignment 2a
8	Screen
9	Line coils
10	-
11	Focus coils
12	Alignment 1b
13	Field coils
14	Alignment 2b

Line coils' resistance is 2.5 ohms
Field coils' resistance is 80 ohms
Focus coils' resistance is 4 Kohms
With 675 volts on the wall anode, the focus current required is 14mA.

THE 70cm BAND.

The Ministry of Posts and Telecommunications have announced that with effect from 1st January 1973 the 70cm Amatuer Frequency Allocation will be ammended and become 430 - 440MHz subject to certain geographical and power limitations.

432 - 440MHz will continue to be available to amateurs on the same licence and conditions as at present whilst as from January 1st 1973 430 - 432MHz will also become available to amateurs except in the area bounded between latitudes 53' and 55' North and longitudes 3' West and 2' East. In practice for UK amatuers this means the area enclosed by a line drawn between Tynemouth in Northumberland to Longtown in Cumberland to a point three miles south of Wrexham in Denbighshire to Boston in Lincolnshire the other boundary being way out in the North Sea.

In addition to the geographical ban 430 - 432MHz may only be used with the A1, A2, A3, F1, F2 and F3 modes of transmission and is subject to a 10 Watt maximum effective radiated power limit.

POSTBAG

D.B. Pitt of 1, Burnwood Drive, Wollaton, Nottingham is interested in reviving the idea of low definition mechanical television, and would like to contact anyone who has similar interests or who is thinking along the same lines.

Ted Groves VK2KK in N.S.W., Australia, writes to tell us that he is active on all bands and is just itching to turn those warbling sounds on 14.230kHz into SSTV pictures. We hope your copy of our new booklet "Slow Scan

Television" will help you to get going on slow scan as soon as possible. Ted sent us this little rhyme - we thought you'd all like to read it:

A wonderful world it t'would be
If we could solve politics, with I.C.s!

Leo Gary W9VRV of Chicago. U.S.A. has recently joined B.A.T. C. and sends these details of his gear. Video comes from a transistorised camera and the transmitter has a 500w video input on 440MHz and 250watts input audio on 444.5MHz. This is fed through a duplexer to an 80 element slot antenna. Welcome to B.A.T.C., Leo!

Colin German GM6ADU/T in Midlothian, Scotland has sent some details of his 3cm rig. One Saturday in September Colin took his portable camera and transmitter a quarter of a mile from his home QTH and transmitted pictures over this path for a period of two hours. Vision frequency was 10,050MHz, F5, deviation +2 MHz, transmitted power 25mw and quality was very good. The site had been specially agreed by the M.P.T. 'ADU/T writes "The cameraman had no monitor but was able to adjust the camera effectively by instructions received over 2metres, in a similar way to the method used on the Appollo missions. My helpers on this test were GM3OWU, GM3ZVB, GM4AOR and GM8BJF; I also had this link working over a path of a few feet at the last Scottish vhf Convention.

"The transmitter, which measures 6" x 5" x 4", uses a KS29A Klystron (similar to the 723A/B). It operates from a 12 volt battery and draws 1.5 amps; a transistor dc convertor supplies the 300v H.T. and the composite video signal from the camera is applied direct to the reflector with no signal processing. The output is fed via a short length of 16 waveguide to a 4" horn antenna. It is much simpler than a 70 cm transmitter.

"The home brew 625 line vidicon camera also runs from a 12 volt battery and draws 0.8 amps. It is crystal controlled by a pulse generator which draws 0.4 amps at 6 volts.

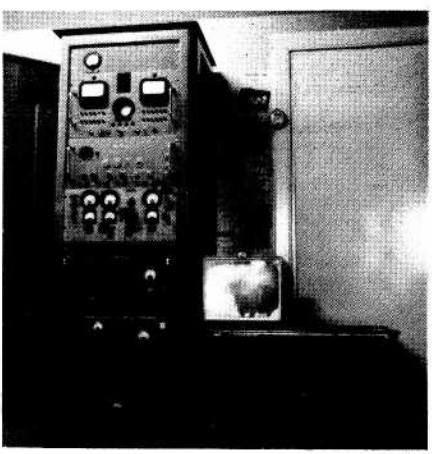
"On the receive side, I have a 2 foot home made adjustable dish on the roof, with a waveguide feed to a radar receiver modified for wideband FM with a 30 MHz IF.

"When the equipment was tested over a six mile path the signal was not sufficient, but there are two ways in which I intend to increase the range. The first is to increase the gain of the receiver; at present this is insufficient to show noise on the monitor so obviously could be improved! Also I intend to make another 2 foot dish for the transmitter, from the same mould as the receiving dish.

"In case anyone is interested, old radar sets including Klystrons, waveguides etc, can sometimes be obtained quite cheaply from ship breaking yards!"

This is probably a UK record for 3 cm transmissions, and our congratulations to GM6ADU/T.

The picture below shows the 19" bay in the shack, with 3 cm, 70 cm, HF and VHF equipment.



INTEGRATED CIRCUITS

PART 10

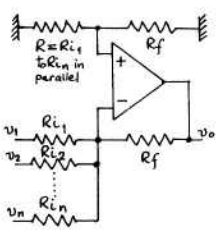
A.CRITCHLEY Dip El; C Eng; MIERE.

OP. AMPS. and BRMs.

This tenth part in the series on ICs continues with Operational Amplifiers and describes the TTL Binary Rate Multiplier 7497 together with an application using both types of IC to generate a digital field scanning waveform for Slow Scan use. A substitute for a retriggerable monostable is also described.

Virtual-earth voltage adder

The virtual-earth adder can be used to add several voltages together with differing gains for each input. Each gain is simply R_f/R_i.



$$v_o = -v_1\frac{R_f}{R_{i_1}} + v_2\frac{R_f}{R_{i_2}} + \ldots + v_n\frac{R_f}{R_{i_n}}$$

or $$v_o = -R_f\left(\frac{v_1}{R_{i_1}} + \frac{v_2}{R_{i_2}} + \ldots + \frac{v_n}{R_{i_n}}\right)$$

The inputs may of course be either positive or negative and this is the basis of a vision or sound mixer.

The **input** voltages can be fed to the non-inverting terminal as well to effect subtraction without the need for an invertor but things begin to get a bit tricky when this sort of thing is done since the gain is now :-

$$G = 1 + \frac{R_f}{R_{i_1} \parallel R_{i_2} \parallel \ldots \parallel R_{i_n}}$$

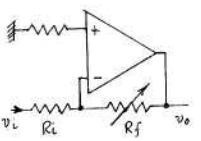
i.e. it increases with every additional input resistance on the inverting input.

Whilst the individual input gains remain constant, the total gain depends on the number of inputs, etc., so for more than a few the calculations become rather lengthy.

Variable gain control

It has already been shown that the gain of an invertor is proportional to Rf/Ri (i.e. the Op Amp has nothing to do with it). By making Rf and Ri a potentiometer the gain can be controlled from unity to A (the open-loop gain).

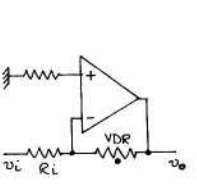
Unfortunately, the change of gain with potentiometer angle is not linear but if Rf (or Ri) is made a linear variable resistance then the change will be linear from **zero** to Rf/Ri. (or Rf/Ri to A).

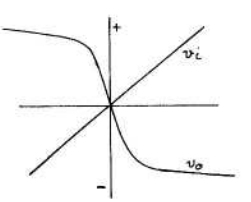


Non-linear Amplification

The basic Op Amp circuit has the two resistors Rf and Ri but there is no reason why either of these should not be replaced by some other device - active or passive.

For instance, if a voltage dependant resistor (VDR) is used to replace Rf the amplifier has a high gain for low-level signals but a low gain for high-level ones. This is because the resistance of the VDR decreases as the voltage across it is increased - to the extent of about the fifth power of the voltage. This arrangement can be effective as a null-detector or a volume compressor.

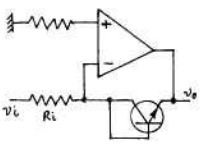


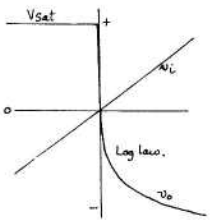


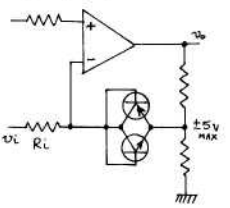
By putting the VDR in place of Ri instead, the opposite effect is obtained; that of a volume expander.

Another non-linear device is a diode. This has a square-law relationship between current and voltage over a small voltage range but is difficult to employ with guaranteed results in a non-linear amplifier.

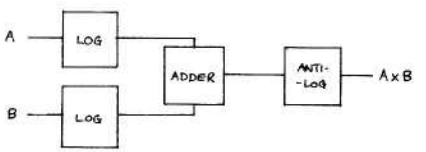
A much better non-linear device is an ordinary transistor connected as a diode. This can maintain its logarithmic characteristic over as much as a nine-decade range of current The effect occurs only for one polarity of voltage as might be expected. When reverse-biassed the resistance is very high and the gain of the Op Amp is also high. To overcome this a second transistor of complementary type can be used in parallel. There still remains a 'dead-spot' of some 0.6 volt per transistor before each transistor turns on. However, this is contained within the feedback loop and the Op Amp effectively reduces it to 0.6/A or a negligible amount. With planar transistors the reverse-bias across them should be limited to some 5 volts. This can be done by attenuating the Op Amp output as shown.



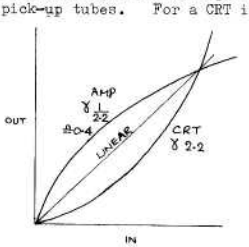




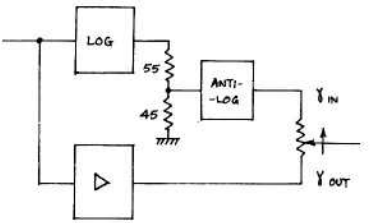
Placing the transistor(s) in place of Ri gives an anti-log characteristic. It is now possible to perform mathematical calculations in analogue form by using these two circuits and a voltage adder



This system can be put to use as a gamma correcting amplifier. Gamma is the term used to denote the law relating light and voltage in cathode-ray tubes and camera pick-up tubes. For a CRT it is of the order of 2.2 and the effect is to crush the whites in the picture. For a vidicon it is about unity and for a photo-cell it is unity (i.e. it is linear). The Image-Orthicon has a variable gamma of about the right amount - 0.5 To give correctly contrasted pictures of unity Gamma the pick-up tube and camera has to have a Gamma of 1/2.2 or about 0.4 - it stretches the blacks.



Gamma can be obtained quite simply with a log/antilog combination by using the mathematical approach :-

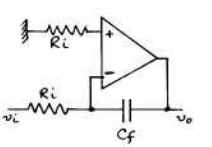


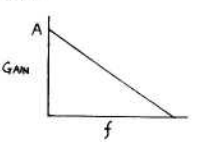
So by taking 40 % of the log output and then taking the antilog the signal is raised to the power 0.4. To use this system with simple control a secondary path is provided for the signal without any non-linear effect such that the peak white-to-black voltage is the same. A mix from one source to the other allows a smooth introduction to the Gamma effect.

This form of Gamma control can also be used with negative film, etc., if the log signal is amplified instead of being attenuated. In both cases good quality Op. Amps are essential. (Note, the amplifiers require only one diode as the correction is unidirectional in a video signal) One problem with Gamma correcting amplifiers is that the gain is theoretically infinite at black level - giving high amounts of noise in the blacks and some form of level system is required to prevent signals below a certain level from being affected at all.

Reactive Feedback

If the feedback resistor, Rf, of the basic Op. Amp is replaced by a capacitor then the amplifier gain depends on the ratio of the capacitive-reactance to Ri. For high frequencies the gain will be low - in fact the gain is inversely-proportional to frequency.





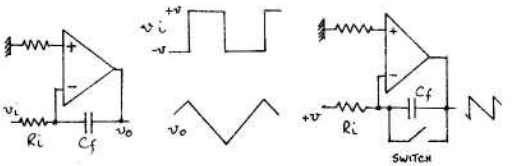
This is therefore an integrator, but it differs from a simple CR network integrator in that there is considerable gain at low frequencies and dc. If a dc voltage is applied to the input it causes a change at the output of the Op Amp which tries to oppose the input because of the negative feedback. At low frequencies, though, the NFB is negligible so the output changes slowly towards A.v_i and soon saturates the Op Amp output. This means that the amplifier saturates for any voltage greater than a very small amount. This steady voltage change is in fact at a linear rate proportional to CR and is known as the characteristic time.

For example, a 1μF and a 1KΩ gives 10^{-3} secs/volt or

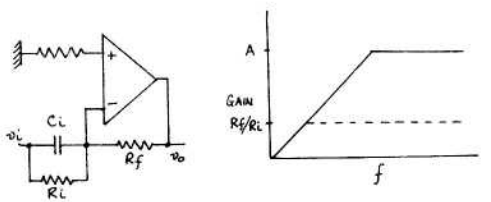
1 volt in 1 ms. A typical Op. Amp would saturate at 10 volts in some 10 ms.

The linear change of voltage with time is very useful if the amplifier is not allowed to saturate by ensuring that the input currents are balanced properly.

If the input to the integrator is made a squarewave voltage then the output voltage will be triangular and of a voltage proportional to the input frequency. A sawtooth can be obtained if the input voltage is made a pulse shape, but the best way to obtain a sawtooth is to discharge the capacitor at regular intervals with some sort of a switch.

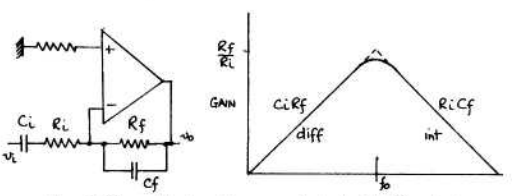


If the capacitor replaces Ri instead of Rf the circuit becomes a differentiator which has a rising frequency response. The problem now is that the gain is a maximum to pulse edges and the amplifier saturates immediately with a slow return to zero voltage. The return is linear but the system tends to be unstable and it is usual to have another resistor across the capacitor to limit the hf gain to Rf/Ri.



Inductors can be used in place of the capacitors but the integrator then becomes a differentiator and vice-versa. Inductances are 'difficult' components anyway and are best avoided in IC circuits.

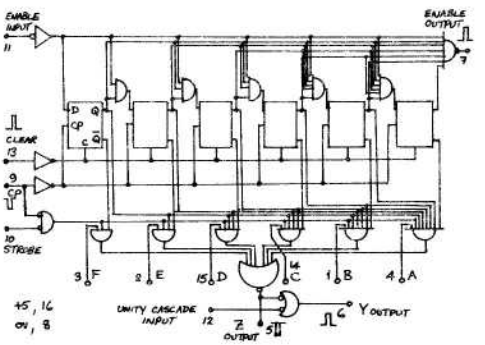
The differentiator and integrator can be combined in a circuit which gives a differentiator with hf roll-off.

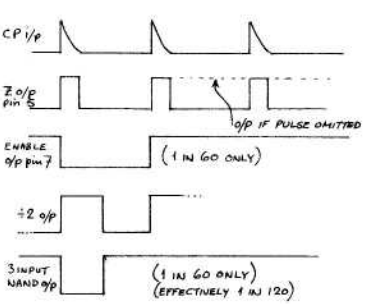


The differentiator time-constant is Ci.Rf and the integrator one is Ri.Cf. If a frequency is chosen such that Ci.Ri = Rf.Cf then at this frequency the gain will be a maximum (of Rf/Ri). This arrangement provides a differentiator with hf loss which attenuates noise. It is a kind of tuned filter. As an integrator the circuit is stable and free from dc drift.

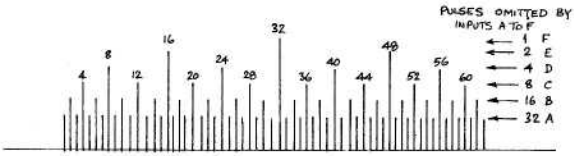
The Binary-Rate-Multiplier 7497

This IC device is basically a six-bit serial binary counter (÷64) with additional circuitry to extract the input clock pulses according to both the state of the count and the states of six inputs. The output of the 7497 can be any number of pulses from 1 to 63 from the input 64. That is, it reduces the pulse rate to some fraction between 1/64 and 63/64.





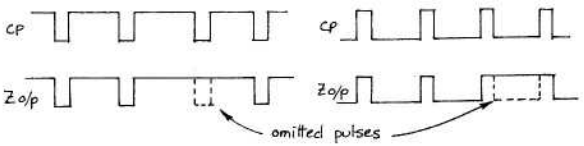
The reduction of pulse rate is achieved by the omission of certain pulses from the sequence. If input F is made low then one pulse is omitted (position 32). Input E causes two pulses to be omitted (positions 16 and 48), etc. as in the diagram. The output sequence is therefore irregular and not suitable for frequency division.



The title of Multiplier is seen to be rather misleading as the device is actually a divider.

For normal use the input-enable and strobe-inputs are made low as is the clear input. The Z-output then consists of negative-going clock pulses with some missing. The Y-output is the inverse of Z (if the unity-cascade input is made low)

If the input clock pulses are positive then the Z-output is still negative.



The devices may be cascaded to cover 12 bits or more by connecting the Enable-output to the Enable and Strobe inputs of the following device. The Z-output is also connected to the Unity-cascade.

An output of 64/64 may be obtained from Y when the BRM is inhibited by the strobe, by connecting the Unity-cascade to the Clock input.

There is a decimal rate multiplier version of the 7497 with the number 74167.

The BRM can be used to make a simple Digital-to-Analogue convertor (D-A). Each output pulse from the BRM is made almost a whole clock-pulse period by making the input clock pulses narrow and positive through a differentiator. The frequency source is of no concern as long as it is of a high frequency

The output pulses are integrated by a simple CR network so that the average dc of the output varies between some 4 volts and 0 volts according to how many pulses are omitted or passed. In practice the voltage does not descend to zero because of the finite width of the input clock pulses.

The D-A directly converts a digital state to an analogue voltage so if a counter is attached to the six inputs the output voltage will be a 64-step staircase if the counter is fed with a steady source of clock pulses.

There are two snags to this very simple system. Firstly, the IC costs some £6 and secondly the maximum rate at which the output can be varied is the oscillator frequency/64. It would be tricky to achieve TV line rates with a satisfactory waveshape.

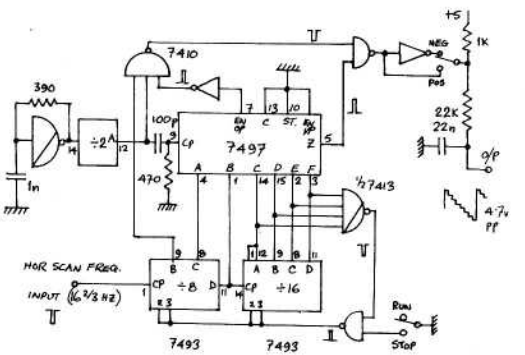
Using a Down-counter gives a reversed staircase but the same result can be more easily obtained by means of an output invertor.

SLOW SCAN - DIGITAL VERTICAL SCAN

This is an extension of the use of a six-bit Binary Rate Multiplier to handle seven bits for 120 levels in a Digital-to- Analogue convertor.

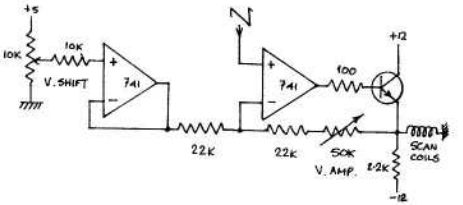
The BRM is fed with high-frequency clock pulses of very short duration via a differentiator so that the output consists of narrow positive pulses at the Z output. These may, or may not, be joined by low voltage levels in the normal manner. The output can be considered as wide negative pulses with narrow gaps and varying numbers of these negative pulses are missing. The average dc of the output depends upon the number actually missing and the clock frequency has no part in the dc voltage. The six gating-inputs are fed with the six Most Significant Bits of the counter so that the output dc voltage would have 64 discrete voltage levels. However, the count is reduced to a total of 120 for Slow Scan use and so the dc voltage has only 60 levels. The output for a continuous count is a rising staircase.

The Least Significant Bit is handled separately as follows. The BRM Enable-output, pin 7, has a negative pulse present which occurs once only for the 60-pulse sequence and this is inverted and gated with the output from the counter LSB and a square-wave from the input to the BRM. The resulting output is a negative pulse once per 60-bit sequence of one half the normal duration - if the LSB is positive. That is, for every other input pulse to the counter the output is a pulse of a 120th of the 60-pulse sequence. This is the equivalent of a step in voltage of one 120th the total output every other pulse and since the 60 levels each take two pulses to change, the result is a 120 level staircase corresponding to 7 bits.



Various refinements are added to enable the scan to be stopped or inverted and a pull-up resistor of 1 KΩ makes the output voltage almost 5 volts peak-to-peak. The pull-up resistor does not have this effect directly on the HRM output pin and this treatment is not recommended except on ordinary gates.

A 741 Op. Amp. is included to convert the 0 to 5-volts staircase to a ±10-volt one with which to drive the scan coils.



There is no reason why this system should not be used for Slow Scan line scan too except perhaps that 120 steps may not be enough in the horizontal direction. The raster would in fact be a dot matrix of 120 x 120 dots rather than 120 lines. The amount of integration shown is not critical except that it should not greatly affect the scan flyback time. To keep this small the clock frequency must be of the order of several MHz and a two-stage integrator may be of use here. In fact, the 741 can have a capacitor put across Rf to do the same job.

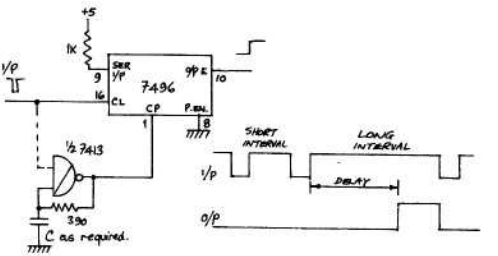
Retriggerable Monostable Substitute

The 74123 retriggerable monostable is a very useful device but unfortunately is rather expensive and difficult to obtain. An effective substitute can be made by using a shift register and oscillator system.

The oscillator is used only as a clocking source for the shift register. The serial input of the shift register is connected to +5 volts via a 1 KΩ resistor to enter a 1 into the first stage. This would normally appear sequentially at all the other outputs; however, the clear input is also used to prevent this happening unless the time between clear pulses is longer than the time taken for the 1 to progress down the register to the output stage.

So if the input clear is fed with closely-spaced pulses the shift register output remains low. If the pulses are widely spaced then after n pulses the output goes high and stays high until the next pulse arrives. This is exactly what a retriggerable monostable does to the input pulses.

The actual period of delay depends on the number of shift stages and the frequency of the oscillator. This is a random frequency but the delay period can be more accurately defined if the oscillator is stopped during the time that the input pulses are low - if the pulses are of a guaranteed width.



FURTHER NOTES ON THE CQ-TV SPG GENLOCK SYSTEM.

The performance of the Genlock system with Helical scan Video-tape recorders is generally satisfactory but when a poor quality machine and tape are used the Genlock is not sufficiently rigid, indeed, it sometimes will not lock at all. The effect shows as ragged lines and the field twitches or may not lock.

The basic causes are tape drop-out and noise spikes. The spikes do not upset the field superlocking but because they occur between line pulses they do upset the genlocking bistable in its generation of squarewaves and this causes the master oscillator to receive sudden error voltages which make it change frequency. Whilst this is usually only enough to cause a line twitch, it may upset the SPG generation of field pulses.

Many VTRs have a head changeover period during the field blanking interval and the resultant noise and spikes get through the genlock system via the equalising pulse detector because this depends for its operation on narrow pulses.

The bistable can also be upset by missing pulses and the nett result is that the odd line or two is missed out of some fields by the SPG counter system. This in turn means that the field pulses, which turn on the superlocking system, arrive rather early. The SPG then is open to being falsely reset by noise - causing a vertical jump of the picture because the SPG makes two fields in rapid succession.

What can be done about it? The speed of response of the correction voltage can be reduced by increasing the 2.2 µF capacitor to some 47 µF, or the 470 Ω resistor in series with the 220 µF capacitor reduced. However, this ruins both the pull-in speed and range and is not very effective anyway.

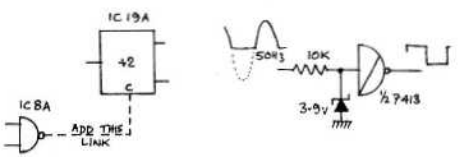
An alternative is to reduce the loop gain of the correction feedback by increasing the 2.2 KΩ output resistor thus giving less effect at the oscillator.

There are two easier and better ways, however. The bistable can be largely prevented from toggling in both directions by feeding the internal reference line syncs to the clear-input instead of to the NAND-gate to mix it with the external pulses. This means that the bistable now acts as an R-S bistable requiring alternate input pulses to give square-waves. Repeated clear pulses will now give no more than a single half-line pulse of error. In the latest version described in CQ-TV 77 this means using the line sync + $\frac{1}{2}$ line after the two-input NAND-gate. This connection may be merely added to the clear-input in fact as it will over-ride itself at the clock-pulse input. It may be necessary to swop over the Q and $\overline{Q}$ outputs of the 7473. There is also the problem that the clear-input must be unused during mains or field-pulse locking. The solution is to add another pole to the control switch. A further slight improvement may be obtained by earthing the K-input to stop the bistable toggling more than once per line.

The second method, which may be done as well as the first, is to remove the output feed from the equalising pulse detector to the superlocking system so that only broad pulses are used. These are wide pulses which are less sensitive to disturbances than the equalising pulses and their detection system ignores both spikes and missing pulses. The snag is that the SPG will lock up $2\frac{1}{2}$ lines late - down the picture. (the lines will still be phased correctly so that the fields are in fact in error). Whether or not this matters greatly is up to the user - at least the fields will be stationary.

These modifications will take care of all but the worst signals from VTRs. Further improvement can be effected by reducing the bandwidth in the sync separator by increasing the 100 pF capacitor.

For those who have yet to try the mains locking system here is a simpler squarer to replace the two transistors. It cannot be put on the Genlock board though.



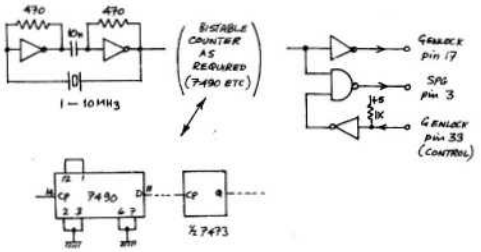
The mainslocking system used in this SPG relies upon the filtering of a 50 Hz square wave for the correction voltage fed to the master oscillator. As a result there is always some portion of this fundamental frequency present in the correction voltage no matter how good the capacitors. This manifests itself as a 50 Hz phase-modulation of the lines resulting in wavy verticals. Unfortunately, there is no simple cure for this other than using picture monitors without flywheel line sync. The normal type of line scan easily follows the phase modulation and the verticals are vertical.

The only way to overcome the problem is to redesign the mainslocking system using a sample-and-hold type of correction voltage generator.

For those amateurs wanting a slow roll-in of the field rather than a superlock it is hoped that a practical circuit may be given in the next issue of CQ-TV.

Crystal Oscillator system for the SPG

Several people have enquired about a suitable crystal oscillator and divider system for the CQ-TV SPG so here is one. The counter shown is a typical one but the actual division ratio depends upon the crystal frequency.



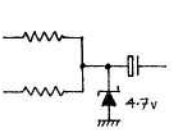
The system of gates at the end of the counter should be retained whatever the counter ratio as a direct feed is required for the Genlock board but a switched feed for the SPG.

The oscillator circuit will work with most crystals of between 1 and 10 MHz but will not work with the glass-enveloped types of twice-line frequency. Do not forget to decouple the 5-volt rail close to the oscillator and counter stages. Two 0.1 µF disc capacitors should be sufficient.

Protection of output stages of SPG

When the SPG is used to drive other equipment there is always the possibility that the coupling capacitors may, at switch-on or switch-off, charge or discharge into the ICs voltages in excess of the IC's ratings with dire consequences.

The problem can be prevented by the use of Zener diodes across the pulse outputs as shown. The Zener diode does not normally conduct as the IC output voltage maximum is less than the Zener voltage but any sudden increase in voltage is limited to this Zener voltage - the diode passing the charging current of the capacitor. If the voltage goes negative then the excursion is limited to -0.6 volt since the diode then acts as a normal silicon diode.



Mains interference

Thermostatically-controlled soldering irons and other mains equipment can cause high-frequency interference spikes on the mains which get through the regulator onto the +5 V rail and upset the SPG counters. One method of reducing the problem is to fit a Zener diode across the 5-volt rail as shown here. This limits the spikes to the Zener voltage in the positive direction. It is important to ensure that the diode passes no current in normal operation by picking its voltage high enough above the rail voltage to allow for component tolerances otherwise the supply will disappear down the zener.

Another interference suppression technique is the use of a small RF choke in the 5-volt rail where it enters the board. The value must be small to avoid resonating the coil with the decoupling capacitors at any frequency within the normal passband of the ICs otherwise the effects will be magnified instead of reduced. This is one reason why IC circuits have only a small value of Lf decoupling capacitor - usually some 10 µF or so. Another reason is to allow the regulator to regulate at a high speed.

Comments on the CQ-TV SPG

The author would be pleased to hear of any comments or criticisms about the SPG and Genlock systems.

Acknowledgement

The author wishes to thank the Directors of EMI Sound and Vision Equipment Division Ltd. for permission to publish these articles.

Next issue

The next issue will contain more about Op. Amps. and how to use them. Some other kinds of Linear Ics will be mentioned also. TTL seven-segment decoders and indicators will be described.

BOOK REVIEW by Arthur W. Critchley.

"Designing with TTL Integrated Circuits"

by the IC Applications Staff of Texas Instruments Inc. Edited by Robert L. Morris and John R. Miller. Published by the McGraw-Hill Book Company in the Texas Electronic Series. Size 10½ x 7⅛ x 1 inches. Price about £8.90

At last - a good book about TTL ICs. It gives just the kind of information that is required and gives it in a very practical manner with plenty of diagrams, circuits and explanations.

The book starts off by introducing digital logic and the binary system and compares RTL, TTL and ECL Integrated Circuits. It then describes the 54/74 series TTL in detail, including Schottky-clamped TTL. A thorough analysis of TTL follows which explains all about current sinking, threshold, types of output stages, loading rules and Schmitt gates. Next is a section on Boolean Algebra and Karnaugh maps and how to combine logic for various functions including code convertors. There is a chapter on bistables (flip-flops as the Americans call them - bistable is much more definitive). Decoders are mentioned as are arithmetic devices and counters of many types and shift registers. The book finishes with a chapter about various applications.

Altogether this is quite the best book I have seen about TTL ICs and I highly recommend it.

Ideas for Amateur Colour Part 4

Nigel Walker
G6ADK'T

For those of you who may be interested in greater detail in the mixer described in the last issue of this magazine, this article concerns itself with the switching logic used by the unit.

Figure 1 shows the master switcher which selects one of the ten channels when the appropriate button is depressed; Figure 2 shows the waveforms that are used to drive the switcher. The timings are quite non-critical, providing they are such that the switching is over before the end of field blanking. There should, of course, be a sufficient number of clock pulses to clock the shift registers to the last output. The switcher relies for its operation on the fact that a button remains depressed for a period of at least 20ms, but in practice it is found that this is easily achieved; in fact, however hard you try to catch it out, it always seems to switch correctly.

The master switcher can be used on its own if it is situated close enough to the cut

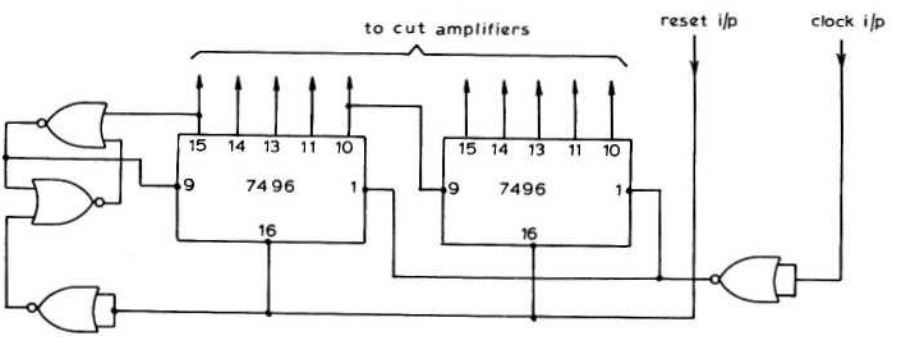


Fig.3. Slave switcher.

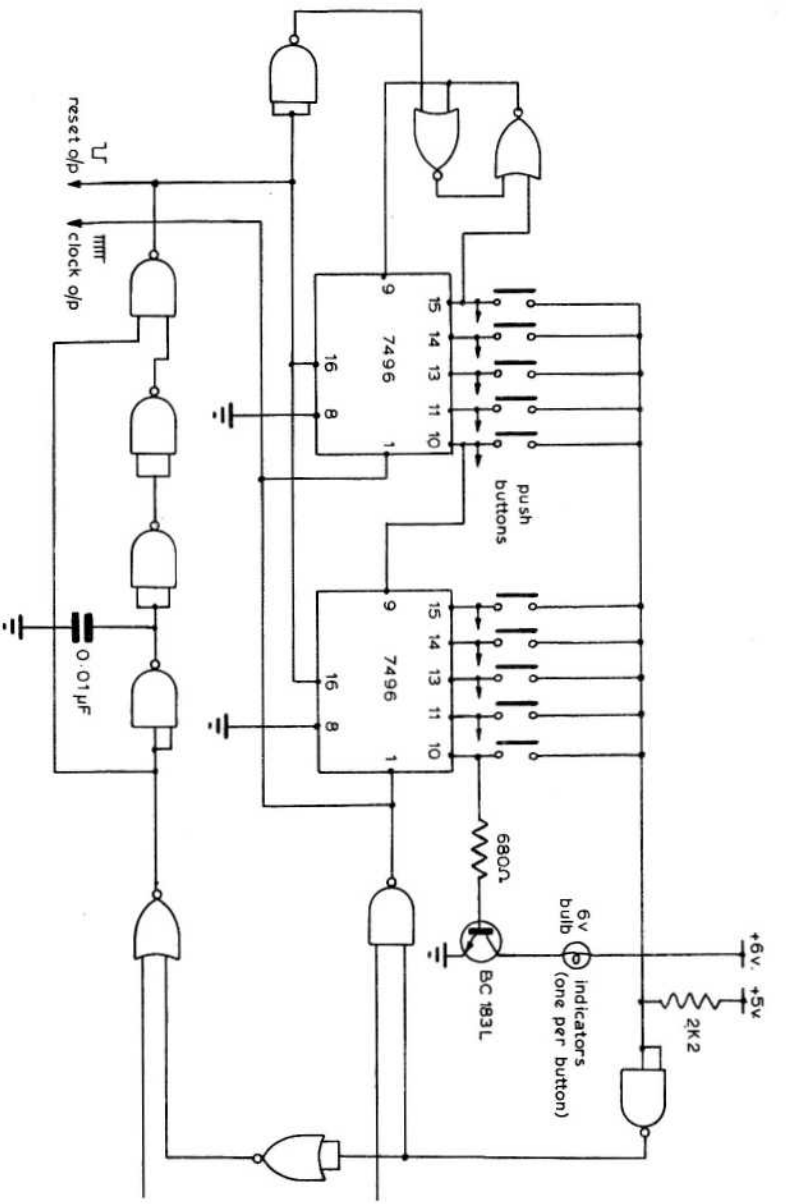


Fig. 1 Master switcher

amplifiers. However, if a remote control panel is required, a slave switcher can be made which switches in step with the master. This is shown in Figure 3.

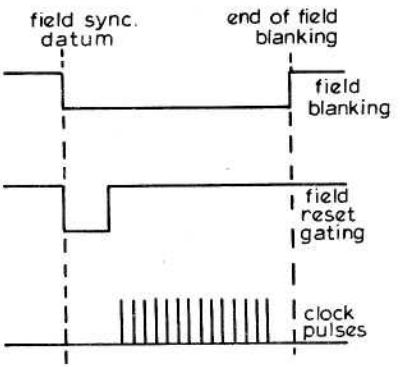
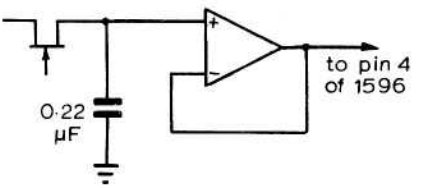


Fig. 2. Pulse timings

Here are some notes on the Video Combining Unit of the mixer, as printed in C Q - T V No. 79. The base of the output emitter follower should connect to the collector of one of the bottom TIS50's; connection to the other collector would result in an inverted output. There should be two 1K resistors connecting pin 6 to the positive supply, and also pin 9 to the positive supply. The rail should be +24v, not 12v. A "741" can be used in place of the LM310 shown in the circuit in C Q - T V 79; the connections are shown below.



HELPFUL HINT

Copper wire can be used as fuse wire if you know the correct size to use. Here are a few useful ones:-

1 amp	47swg	5 amp	38swg
2 amp	43swg	10 amp	33swg
3 amp	41swg	15 amp	30swg
4 amp	39swg	20 amp	20swg

Have you any helpful hints you feel other members would find useful? Send them to the Editor for publication.

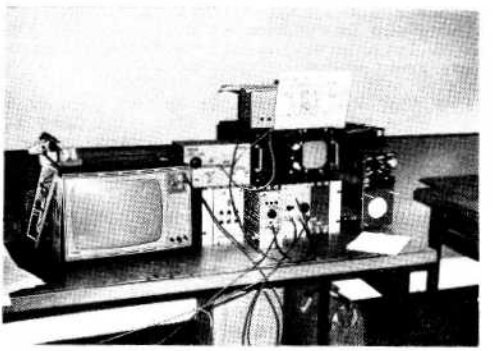
1972 BATC Convention.

The 1972 B.A.T.C. Convention was once again held at the I.B.A. Headquarters in London, after a four year absence, and with about 200 members present proved a tremendous success. A programme organised by our Convention sub-committee of Don Reid and Ian Lever went smoothly (as was to be expected of such a team!) and the Club benefitted from a very friendly meeting.

In the foyer of the Conference Suite stands were run by the R.S.G.B., B.A.T.C. Club Sales and C Q - T V, as well as a Reception Desk and a corner for members' sales and this proved a very busy area all day. All down one side of the main hall, and along one end, a line of tables held individual members displays of equipment and these were so many and so comprehensive that it is impossible to describe them here. Some of the photos show what was there, and a very splendid display it was.

During the afternoon three well known members delivered short lectures on topics of particular interest to amateur tv. Arthur Crichley started the series with a very instructive talk on Integrated Circuits. By now Arthur has become our oracle on I.C.s and on this occasion he proved that he still has more information up his sleeve to give to us. His series of articles in C Q - T V on digital circuits using I.C.s is soon to be published as a booklet now that he has gone on to tell us about linear I.C.s.

Nigel Walker G6ADK/T next gave a lecture on colour television for the amateur, particularly on his own colour equipment which was very impressive. He gave details on circuitry for coders, monitors, mixers, special effects generators and mentioned his use of shift registers for switching logic in vision mixers. He apologised that he hadn't been able to bring his colour camera along, but it wasn't quite finished!



Robert Skegg's 625 - SSTV Convertor

Nigel Walker and his colour display

G3RHI, Mr. B.J. Arnold gave the third lecture, which was all about slow scan television. His booklet on the subject was published on the same day as the Convention, and as can be imagined, it sold like hot cakes! Mr. Arnold's lecture was an informal affair, with his audience clustered around him and his equipment stand. Judging by the size of the crowd, the talk was very popular indeed- your editor just couldn't get near enough to hear!

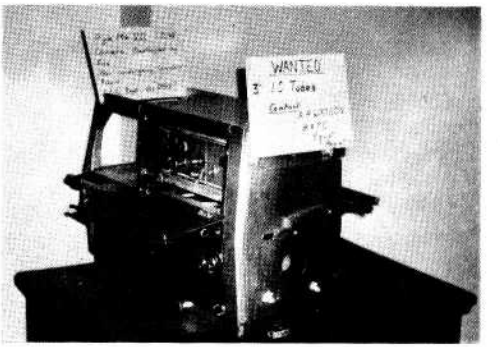
The Annual General Meeting of the Club also took place during the afternoon, the agenda having been published in C Q - T V No. 79. Chairman Malocolm Sparrow G6KQJ/T introduced the meeting, thanking Don Reid for organising the Convention so well, and Bob Roberts G6NR introduced himself to the Meeting, as our new President.

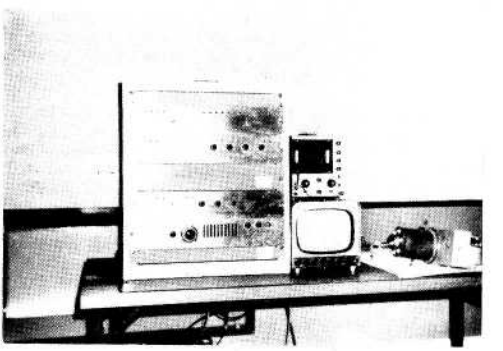
The Chairman in his speech told of what the Club had been doing since the last A.G.M. two years ago. How the subscription had had to be raised to meet inflation, how a membership drive had been conducted to raise new members, how an A.T.V. International Contest had been organised, and how a series of negotiations on licence conditions had been conducted with the Ministry of Posts and Telecommunications by Ian Waters G6KKD/T and Jeremy Royle G6NOX/T. On this last subject, the changes of licence conditions had already been printed in C Q - T V, and the changes of frequency allocation were expected to be announced soon as 432-440MHz with 430-432MHz at reduced power.

The Treasurer gave a resume of the Club's financial situation, pointing out that although we were still solvent, we were operating very near the line and it was going to be touch and go towards the end of the year. The main expenditure was C Q - T V, costing about £600 or more in a year; Club Sales was non-profit making, and thus if the new Value Added Tax raised our costs significantly it might be necessary to raise subscriptions. It was very much hoped that this would not be necessary.

The changes in the Club Constitution published in recent issues of C Q - T V were unanimously agreed by the Meeting, and on the following page you will find in full the current Constitution. This it is hoped now covers all conditions and will suit B.A.T.C. for some time to come.

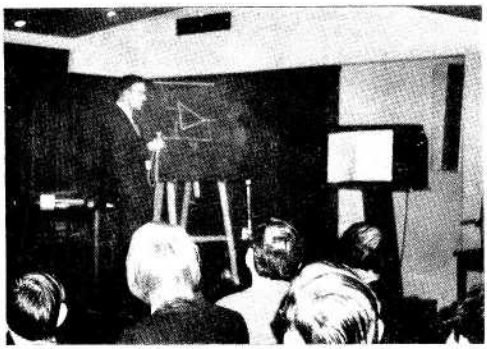
Alan Watson, the committee member responsible for the Equipment Registry reported that the system was working well and was fulfilling a much needed place in the Club's operations. Once more he begged members to enclose a





stamped addressed envelope with their queries, mentioning that several stamps would be useful as often much correspondence was necessary to meet a members demand. Still 90% of forms received have only the "Requirements" section filled in, not for the sale section, and of course this limits the number of demands that can be met. Alan made a special plea for all B.A.T.C. members to look out their surplus gear and send him details of the pieces they don't want. Monitors and Plumbicons are the most wanted items at present.

The entire committee stood down prior to a new election, when Ian Lever, Ian Watson and Cyril Hayward declined invitations to stand for re-election. The rest if the Committee were re-elected, together with James Cunningham, Dave Lawton G6ABE/T and Nigel Walker G6ADK/T. Fuller details of this committee are printed on page 1.



Arthur Critchley talking about I.C.s

3rd World SSTV Contest

Sponsored by cq elettronica Magazine

cq elettronica Magazine proposes the 3rd Worldwide Slow Scan Television Contest.
The purpose of this Contest is to promote increased interest in the SSTV mode of operation as used by Radio Amateurs.

RULES

1) PERIOD OF CONTEST

1st 15.00 - 22.00 GMT February 10th 1973
2nd 07.00 - 14.00 GMT February 18th 1973

2) BANDS

All authorised frequencies on: 3,5 - 7 - 14 - 21 - 28MHz

3) MESSAGES

Exchange of pictures and number of the message

4) EXCHANGE POINTS

a) A two way contact with a station receives one point (total points will be the number of individual stations contacted).

b) No extra points for the same station contacted on different bands.

c) A multiplier of 10 points for each Contintent and of 5 points for each country. The ARRL Countries list will be used except that the W Call areas WØ to W9 and the VE Call areas from VO to VE7 will be considered as separate Countries.

5) SCORING

Total exchange points times the total of the multipliers.

6) PRIZES

1st A free 12 month's subscription to cq elettronica Magazine
2nd A free 6 month's subscription to cq elettronica Magazine
3rd A free 6 month's subscription to cq elettronica Magazine

Special SWL prize

7) SWL
This Contest is also for the SWL's

8) All logs must be received by March 20th 1973
Send them to: Prof. Franco Fanti
via A. Dallolio 19
40139 BOLOGNA Italy.

9) LOGS

Logs to contain: Data, Time(GMT), Frequency, Call sign, Number sent and received, Multipliers Country, Points and Final score.

10) RULES OF BEHAVIOUR AND PENALISATION

The Logs must be compiled in accordance with the Rules listed in (9). The contacts must be made by means of the SSTV mode and it is not permitted to use other modes of transmission either before, during or after the exchange of message by Slow Scan TeleVision. Contacts will only be valid if the contacts are confirmed by the Contest Logs received from entrants with whom contact has been made. During the Contest it is expected that Amateurs will observe the fundamental rules of courtesy and good operation during contacts. Failure to observe any of the above Rules will result in the exclusion of the entry from the final results, and any such Logs received will be considered as check Logs. All Logs received become the property of the Edition CD, and will not be returned. The decision of the organising Committee in any dispute will be final, and any subsequent controversy cannot be referred to the Civil Court.

1972 BATC CONSTITUTION.

INCLUDING CHANGES AGREED AT THE 1972 B.A.T.C. CONVENTION.

1. The Club shall be known as the B.A.T.C.

2. Membership of the Club shall be open to anyone interested in amateur tv in the British Isles or abroad.

3. The Club shall be affiliated to the R.S.G.B.

4. A group may affiliate to the Club by paying a subscription as one member; the affiliated group then shall have one vote and be entitled to all benefits as if it were one member.

5. A membership fee of ten shillings per annum, or other such sum determined by the Committee and approved by a General Meeting of the Club shall be charged, and this shall become due on 1st January each year. If a member does not pay the subscription, then after six months his membership shall cease.

6. The Committee of the Club shall consist of the Officers of the Club, namely the Chairman, the Secretary, the Treasurer, and the Editor of C Q - T V, together with any others the Committee shall deem necessary (all of which are honarary appointments), together with not more than fifteen elected members. All Officers and Committee Members having been in office for two sessions (i.e. approximately four years) must retire, but shall be eligible for re-election. The Committee shall have power to co-opt members of the Club to serve as Officers of the Club or as Committee Members, but all such co-opted members shall be required to retire at the next General Meeting. A minimum of half of the Officers and half of the elected members shall retire at each General Meeting.

7. Committee business may be transacted by post, and the Secretary is empowered to act in any matter which has received the approval of three Officers of the Club, unless an objection is put forward by three or more members of the Committee. The use of the name of the Club shall be solely at the discretion of the Committee.

8. A President shall be appointed by the Committee; such President to hold Office for not more than four years; retiring Presidents are to be listed as past Presidents of the Club.

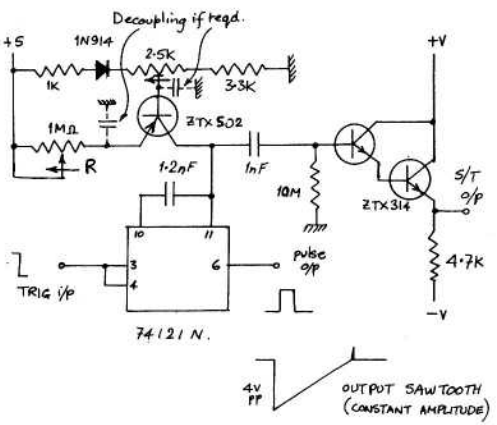
9. General Meetings of the Club shall be held bi-annually at one of the Conventions which shall be organised from time to time by the Committee, at intervals of not more than three years.

10. An extraordinary General Meeting may be called by twelve members provided they give three months notice in writing to the Secretary. Such extraordinary General Meetings shall be held in London and the cost of such a meeting shall be borne by the members demanding it and not by the Committee.

11. All Resolutions at the General Meeting shall be carried by a two-thirds majority of those present. A Quorum shall comprise of thiry ordinary members apart from the Committee. Only members whose subscriptions are paid may vote at a General Meeting.

12. A Resolution for the disolution of the Club shall require a three-quarters majority of those present. Any assets of the Club on disolution shall be distributed among the members who have currently paid their subscription.

USING THE SN7412N AS A LINEAR SAWTOOTH GENERATOR.



The sawtooth voltage present on pin 11 of a SN74121N monostable I.C. can be made extremely linear by making the timing resistor into a constant current source-that is, one where the changing voltage does not change the current. Such a source is to be found in a transistor where the collector current is constant with changing supply voltage if the bias is kept constant (like the pentode valve).

The diagram shows how a transistor can be used for this purpose. A diode is used in parallel with the Vbe drop in order to minimize temperature effects by changing the base voltage to match the emitter voltage drop. It is not essential though.

Both base and emitter can be decoupled and the resistor R situated at a distance. The value of R can be 0 to 1M ohm. With the capacitor value shown and this range of R the monostable delay has a range of 10µS to 10mS continuously variable. The sawtooth on pin 11 has a linearity of less than 0.1%. Voltage and temperature stability are excellent.

A very high input-impedance Darlington Pair is used to extract the sawtooth in order to prevent the loading from worsening the linearity by shunting the constant current source.

MEMBERS ADVERTS

EQUIPMENT REGISTRY
can help out with your problems. If you have surplus gear, or if you want a particular piece of equipment, send details (including a S.A.E.) to Alan Watson whose address is on page 1 of this magazine.

ADVERTISING RATES

Back page £12
Full page £10
Half page £6
Members small ads free; a charge of 10p per line is made to non-members.

FOR SALE

A number of two inch video tape spools, some empty, some containing reject tape. These are free to members able to collect from the address below.

A. M. Hughes
93, Fleetside
West Molesey
Surrey.

FOR SALE

A quantity of TK204 Ikegami cameras with tube less lens, working £16 + postage

A quantity of Pye Lynx cameras with tube less lens, working £25 + postage

2 8½" Beulah monitors, working £10 + postage

1 8½" Beulah monitor less line output transistor £8.50 +postage

3 8½" Beulah monitors less line output transformer and line output transistor £5 + postage

4 9" Ikegami monitors, working £25 + postage

6 16" monitors, working £15.50 + postage

3 19" monitors, working £15 + postage

2 23" monitors, working £13 + postage

2 24" BRC monitors £13.50 + postage

A number of Beulah cameras at prces from £8, all with tube, less lens. This camera makes a very good cheap starting point for amateurs wishing to build their own cameras.

WANTED

Spares for Phillips EL3400A/Peto Scott ET2610 video recorder, including service manual and heads.

Teltronix 'scope, working or not, or Thorn equivalent.

1" video tape (Chromium dioxide preferably)

For the above "For Sale" and "Wanted" adverts phone 01 - 397 - 1230 after 8pm, or reply to:
D. Pattinson
31 Kelvin Grove,
Chessington,
Surrey.

FOR SALE

Hammarlund HQ-170A/vhf amateur band only communications receiver. 160m - 10m with 6m and 2m amateur bands. Recently overhauled. £85. o.n.o.
Marconi Mk. III 4½ inch Image Orthicon camera channel, complete with 3 lenses and handbooks. Offers are invited.
M. J. Sparrow
64, Showell Lane
Penn, Wolverhampton
Staffs.

21 YEARS AGO IN C Q - T V

"Here is a late flash from Doug Wheele. As he was walking down Lisle Street, he saw a familiar tube in the window of a certain shop. Sure enough, 'twas a 5527 Iconoscope. And the price? 35/-! However, Doug felt it was his good day, and offered the bloke thirty bob, and was accepted! He reports that the tube appears to be brand new, works well and that they have NO more.... Happy Christmas Doug!"
(C Q - T V December 1951)
(New readers; there's one in the Science Museum, go and see! ED.)

'slow scan television'

JUST PUBLISHED!

A new 12 page booklet on slow scan television by B.J. Arnold M.A. G3RHI

Chapters on Principles, Background, Monitors, F.S.S. and Cameras.

Circuit diagrams and constructional details.

ONLY 25p (plus 3p postage) from
B.A.T.C. Club Sales.
"Kyrles Cross"
Peterstow
Ross-on-Wye,
Herefordshire.

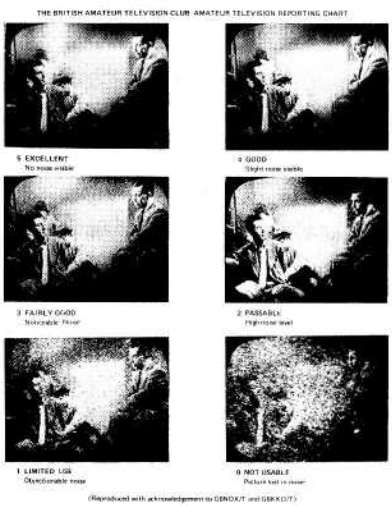
This booklet is the first of a series to be published by C Q - T V further issues will be announced in this journal and will include a reprint of Arthur Critchley's articles on Integrated Circuits.

IN THE NEXT CQ-TV

Circuit Notebook No. 12

More on amateur colour

All the regular articles again.



A Reproduction of the B.A.T.C. Reporting Chart on sale from Club Sales. The full-size Chart measures 8½ins x 10½ins and is printed on white card.

Club Sales Price List

Camera Tubes	English Electric	P849	Amateur grade	£10. 50
	E.M.I.	9677	Amateur grade	£10. 00
		9728	Amateur grade	£10. 00
	(integral mesh)	10667	Amateur grade	£ 8. 00
	4½ inch Image Orthicon 9564 or 9565			
	(older "sticky" type)			£10. 00
	ex-studio vidicons as available			£ 5. 50
Vidicon Deflection and Focus Coil Assembly				£10. 50
Vidicon sockets (paxolin)				. 17p
Vidicon sockets (moulded)				. 25p
"C" Mount in Aluminium for use with cine lenses				. 50p
Lapel badges				. 20p
Lapel badges (with call-sign - to order only)				. 30p
Adhesive emblems (for decorating gear with Club badge)				. 08p
Windscreen stickers				. 06p
B.A.T.C. Reporting Chart (A visual scale of video noise)				. 06p
B.A.T.C. Notepaper and envelopes (100 sheets)				£1. 50
Filmstrips of C Q - T V. 10 copies on each film. (Please state which decade you require i.e. 31-40, 41-50 etc.)				£1. 00

Back Nos. of C Q - T V as available 25p (15p to members of B.A.T.C. for issues up to No. 69, and 20p for issues thereafter)

Please send cash with order to:

B.A.T.C. Club Sales
"Kyrles Cross",
Peterstow,
Ross-on-Wye,
Herefordshire.

Printed Circuit Boards for the C Q - T V SPG

SPG Board	£1. 50
Genlock Board	£1. 50

Please send cash with order to:

A.W. Critchley Esq.,
70, Sussex Road,
Ickenham,
Uxbridge, Middx.

P L E A S E N O T E T H I S L I S T C A N C E L S A L L O T H E R S

J O I N B. A. T. C. A N D R E A D C Q - T V R E G U L A R L Y

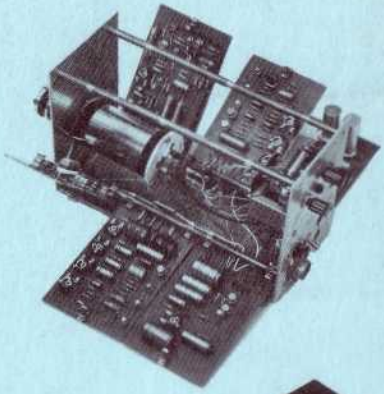
The Membership Secretary will send you an application form on request - ask for some for your friends too.

For an annual subscription of only £1.00 you receive this journal quarterly, can buy cost-price amateur tv gear from Club Sales, and at the same time belong to an internationally known British association dedicated to the cause of amateur tv.

So why not join now?

THE CROFTON CAMERA KIT

Designed by Mullard Educational Service.



Complete kit of parts to construct a good performance low cost Vidicon camera. A comprehensive construction manual is supplied with each kit (available separately at 65p).

Ideal kit for the amateur who wants to incorporate his own design mods. Case has plenty of room to incorporate additional circuitry for a sampling slow scan T.V. camera.

Size: 4½" x 7" x 11". Weight: 6½lb.

Two output sockets (Belling Lee) are provided. Two 4 pole changeover slide switches and a six way F & E chassis mounted plug, which although not used in the basic design, are provided for constructors own use.

Complete kit, less lens and tube, costs £57.00 plus p.p. £1.25.

A UHF modulator kit is also available which has been designed to be housed within the camera, at £6.00 plus p.p. 30p.

Used Vidicon tubes available from £3.50 upwards depending upon quality p.p. 25p.

CROFTON ELECTRONICS

15/17 Cambridge Rd. Kingston-upon-Thames, Surrey KT1 3NG