cq-tv

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HAPPY NEW YEAR TO YOU ALL.

Editorial:

First of all may I take the opportunity of wishing all our members a Very Happy Christmas and a Prosperous New Year. (And may you all find Staticons in your stockings!).

This is the first occasion on which I have had the privilege of putting something in print since taking over the London Editorial duties of putting the mag "to bed". I have no doubt that I will run into quite a few snags, but I hope that these will be few and far between. If any of you find an outstanding mistake I would be glad to know about it, as I have been set a high standard and it is my intention to keep it up as far as I can. Don't forget that it is YOUR mag, and that it cannot exist without your active support. A special word of thanks is due to Mike Barlow, who by now is safely installed in Montreal, The untiring efforts made by him on behalf of the club have been made doubly apparent to yours truly, and I hope that my efforts will be acceptable to you all. It will not be for want of trying if they are not!

Now to touch a more ticklish problem... that of SUBSCRIPTIONS. These fall due on January 1st.,1958, except in the cases of the few members who have already paid in advance for the coming year. This includes many of the new members who have joined within the last few months. Throughout the year, as usual, the cost of producing the mag. has risen, as have the postal rates, and in an effort to cut down work and postage as much as possible, receipts will be sent out with the magazine each quarter. If you do not get a receipt by return, then this is the most probable reason.

As Mike Barlow mentions in his article, there was some delay in sending over his copy for this issue, and so as to cut the delay in publication to a minimum I have taken the liberty of holding over some of the club reports and items of moreor less that nature, so as to permit the inclusion of the technical articles. These form the backbone of this issue, and I trust that this meets with the general approval of the membership.

Already prepared for the next edition is some interesting information on a wide-band video amplifier for use with a Staticon, with

Already prepared for the next edition is a very interesting wide-band (5Mc/s) video amplifier for use with a Staticon, a Transistor pattern generator, and a small regulated negative EHT supply for use with electrostatic tubes. I hope that this has whetted your appetittes
petites, and hope to hear from many of you before the next issue.

Best Wishes,

Alwyn

BOOK REVIEWS.

Do you approach "Waveforms" with trepidation? If so, then read...

"Elements of Pulse Circuits",
by F.J.M.Farley...Methuen, 8/6.

"An excellent little book, full of "know how" on pulse generators, and their "mode d'emploi". This is book is a must every radio ham wanting a conversion course to ATV, The book is concisely written, and logical in s sequence, and, apart from some of the circuit diagrams, it is a most powerful tool and an effective aid to any TV ham who wants to think for himself. Worth its weight in gold, and just the thing to spend those BOOK TOKENS on in the next few weeks."

G3AST.

Now something a little more practical in content.

"Industrial Television"
by H.A.McGhee.... Newnes, 15/-.

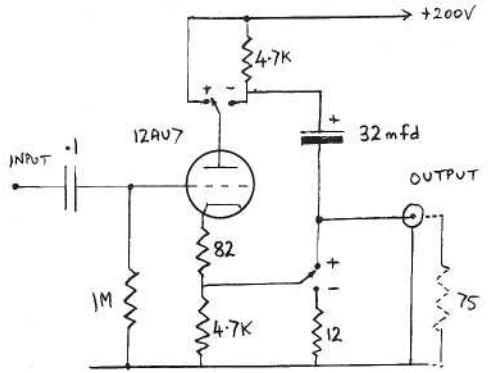
This is a new book by Newnes, covering a wide range of industrial applications of television equipment. It is written around the PYE closed circuit units, and from the ATV point of view there are som very useful sections on Staticon circuitry, with some helpful information on the design of high-peakers. Although the technical information is confined to a relatively small part of the book, it will appeal to many of our members, especially those who are contemplating constructing a camera.

WHY NOT 50:50?

Following standard commercial practice, the BATC standard composite signal is one volt across 75 ohms, syncs negative, whites positive, ratio 70% picture to 30% sync. This was chosen for several good reasons: 75 ohms because this is the standard impedance of small co-axial cables, and it is possible to have long runs of cable that are not frequency conscious when correctly terminated; one volt because this represents a current swing of 13mA in 75 ohms - within the capabilities of standard small receiving type tubes. But the 70:30 ratio was determined primarily by commercial practice, and it might be a good idea to look into this more closely from the amateur point of view.

Consider the units to be found in the average amateur TV station which are fed with composite signals. In general these will only be monitors or transmitter modulators. Now, the monitors will contain sync separ-ator circuits which will be only too happy to have a little more sync pulse. Transmitter modulators for negative modulation will usually contain peak sync clippers to prevent overmodulation; for positive modulation, half of the modulator complexity is in that part whose function is to take the 70:30 input signal and turn it into a 50:50 signal at the output. This is independent of whether the transmitter is for one milliwatt or one kilowatt output.

If we pipe our signals around at a 50:50 ratio, are there any snags? Well, the picture modulation swing has been reduced from 0.7 volt to 0.5 volt, so that the effects of noise and hum will be proportion-ately greater, but this could be overcome by going to a standard level of 1.5 or 2 volts. What do you think? - XG3CVO



Ever got halfway through a unit and discovered the output was going to be upside down? Ever needed a phase reversing stage for effects, etc? Here is a circuit using one or both halves of a 12AU7 to give either positive or negative outputs. With the switch in the positive position, the circuit is a cathode follower with a 75 ohm load; in the negative case, the valve has a 75 ohm anode load and 94 ohms bias. In each case the gain is about 1/5; if a 1 volt linear output is required, i.e 5 volts input, then both halves of the 12AU7 should be paralleled. -XG3CVO

HARLOW.....

Harlow Mobile Rally in September last took place on a deserted airfield - just as windy and as cool as such places can be! A Nissen hut was used to store the exhibition, and the Chelmsford BATC group had a studio in the end of it. The mains was brought in via about 3/4 mile of cable, and Peter Burrage's autotransformer thing came in very handy. G3KOK set up the image orth camera, and soon the pictures were being admired by the mobileers resting from their forest of 160, 80 10 and 2m arrays on a variety of vehicles. Jeremy Royle brought over aerial, converter and TV set, and most excellent results were received from G2WJ/T, the path being about 8 miles with no obstacles. Sound communication was maintained by G2DUS/M on 2m, and all the Chelmsford crew chimed in with assistance - special mention being made of John Tanner who slept out in the Nissen hut as night-watchman. An attempt to work duplex TV had to be cancelled when it transpired that G3CVO/CLOT had brought the wrong power supply for the transmitter!

...AND ENFIELD

Enfield Town Show is rather like a smaller version of the Dagenham Town Show, without the funfair noises. This year, thanks to G3KOK and the Chelmsford crew, amateur TV had a very good showing, sharing a tent with the local RSGB group. Owing to work, Brian, Peter G3KWD and Jack Terry were unable to get down to the show until the Friday night (Sep 20), but with the very willing co-operation of the Enfield boys, a small studio, master control, and monitoring were soon in action. Again John Tanner was one of the night watchmen (he was at Dagenham too).... In the morning G3CVO and Mike Chaney got in free by staggering past the doorman with a "heavy" vision mixer... Martin Lilley arrived from Dagenham by changing buses 7 times. We were all very pleased to meet G3LOS/T G3KFE/T and others of the Enfield BATC group. Enfield RSGB group are very active, especially on VHF, and some of their gear was most interesting from the ATV transmission point of view (they also do a monthly magazine full of technical gen called the "Lea Valley Reflector").

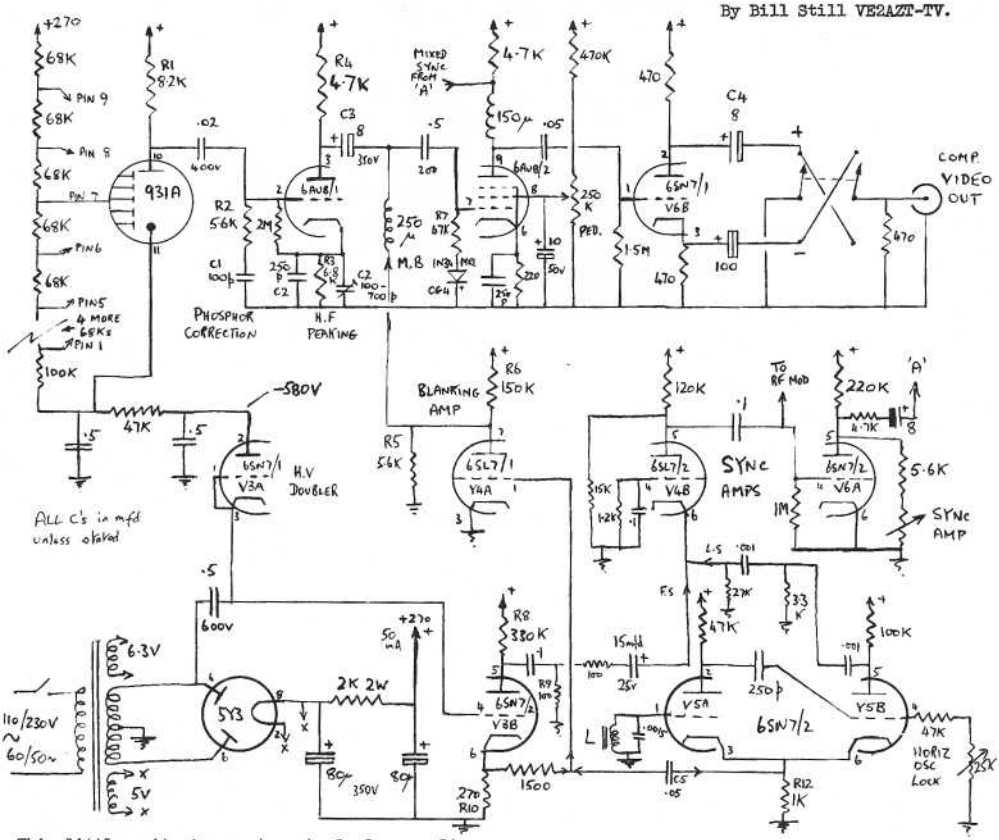
One of the highlights of the ATV demonstrations was a combined effort with the Radio Controlled Models Society; a radio controlled boat armed with a dirty great needle in the bows attacked an unarmed balloon floating on the water, the controller watching by means of G3KOK/Ts camera. The two dimensional picture gave the controller some anxious moments, but at the cost of one or two rammings of the bank, the deed was done most successfully, to the delight of a huge crowd. As far as is known, this is the first time anyone anywhere has controlled a boat by radio and TV..... (BATC Does It Again...).

Another highlight or two were the delightful Irish XYLs who took their interviewing of Danny Blanchflower and others so seriously that they wanted to join the BATC and do it at all our shows (interviewing, that is). Before anyone could get a subscription from them, however, they were away in Jack Terry's machine, and he came home later with a big dent and half a "Keep Left" sign in his rear bumper, so we still don't know....

REMEMBER: YOUR SUBSCRIPTION IS NOW DUE.....

A SIMPLE FLYING SPOT SLIDE SCANNER

By Bill Still VE2AZT-TV.



This little unit gives out a standard one volt composite signal from transparencies, without the need for any form of optical system. The scanning is interlaced, using a simplified form of sync signal, the values shown being for 525 line 60 field operation but no significant changes should be required for 405 625 or 819 line systems, except to the master line frequency control. Two big advantages of this circuit especially for the beginner are that the scanning is done by a completely untouched TV set, and that the power supply is very simple, not even using a choke. With a P4 phosphor (standard TV white), resolution is better than 300 lines, the signal to noise ratio being adequate for amateur use. This is an ideal unit for inserting station "commercials", callsigns, etc, has no tricky adjustments, and can be made by anyone capable of building an audio amplifier. The layout is not critical, but signal leads should of course be kept short.

A 931A photocell runs between HT+ (approx. 270V) and EHT- (approx. 580V) applied through the usual dynode network. The photocell load is 8.2K shunted by the phosphor corrector circuit R2-C1, the values being correct for a P4 phosphor but may be experim--ented with.

The first video amplifier is a triode (½6AU8, but 6U8, ECF82 or similar would probably do) and has a large cathode degeneration resistor R3 shunted by a small capacity C2 to give HF boost. Blanking is added across the common load R4 4.7K in parallel with R5 and R6; the coupling capacitor C3 has to be 8mfd to maintain the field blanking component.

The second video amplifier uses a pentode, and has a form of gamma correction in its grid circuit, and some further HF boost in its cathode. The signal applied to the grid is white-positive; at black, the grid leak resistance is high as the diode MR1 is not conducting. At white, only R7 contributes anything appreciable, so varying the load shunted across R4 and thus dropping the gain of the whites relative to the blacks. With the values shown, the circuit is not noticeably frequency conscious. A very simple

idea, the circuit helps to correct for photocell non-linearity (remember this is a multiplier type) and gives a distinct improvement to the picture.

The negative mixed blanking pulses added previously will cut-off the valve, so giving a clean blanking period. The picture information is now jacked up on the blanking, whose amplitude is varied by the "Pedestal" or sit-up control operating on the screen volts. Mixed syncs are added in the anode circuit, and the resulting composite signal is fed to the output stage. As shown this is switchable to give a positive or negative output, but note that the entire signal syncs and all is inverted, so this switch cannot be used when changing from positive to negative transparencies, but is merely a convenience when feeding into either cathodes or grids of monitors. If the facility is not required, omit the switch and connect the output socket directly to C4. With a P4 phosphor, and the photocell about 12" in front of an 8" x 6" raster, the output should be in excess of 1 volt when terminated in 75 ohms.

The HT+ supply is straightforward. A 5Y3 with resistive smoothing gives about 270 volts at 50mA. One half of V3 (6SN7) is strapped as a diode and used to voltage double negatively, giving an EHT of about -580 volts @ 1mA, which is again resistively smoothed.

The other half of V3 is used to generate the field blanking pulses. The DC connection to the grid keeps the valve cut off except on the positive peaks of the AC from the transformer. The anode resistor R8 330K limits the available current, and the output pulse is developed across the 100 ohm load R9 to earth

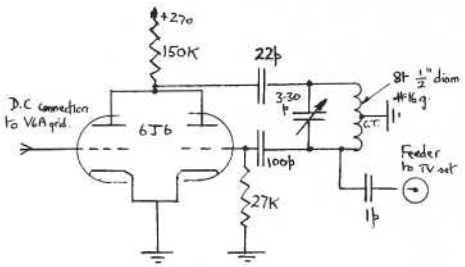
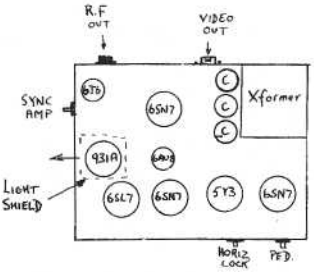


Fig. 2: The modulated Oscillator

The positive pulse developed across R10 in the cathode circuit is fed to the blanking pulse amplifier V4A via a 1500 ohm isolating resistor R11; this is to block line pulses from the line pulse generator from returning to earth via R10. At the same time the field pulse is differentiated by C5 and R12, and the resulting sharp 60 c/s spike locks the oscillator quite rigidly. The tuned circuit in the grid of V5A is tuned to twice line frequency, and V5 is actually a cathode coupled multivibrator dividing by two. As the LC circuit tuning is varied, the interlace will come and go, but there should be no doubt about the correct position as seen on a monitor (check on the flyback lines at full brilliance). The output of V5 contains about 10% of twice-line-frequency pulses, so both line syncs and blanking pulses are amplified and



Typical layout for the unit.

clipped to clean them up. Field and line pulses fed to the sync mixer V4B are lightly differentiated to shorten them somewhat, the blanking pulses remaining at full width. The low anode volts on V4B give a clipping action, although the putput is very low. V6A is a similar clipper with adjustable anode volts, so giving a control of "Sync Amplitude". Both sync and blanking inputs to the video chain are held off by inductances (actually TV linearity coils) so as to maintain the video HF response.

To avoid having to modify the scanning TV set, a most useful addition is shown in Figure 2. This is basically an oscillator on any of the standard TV channels (unused!) which is pulsed by the mixed sync waveform from V4B. The modulated RF output is fed into a piece of feeder which lies near the scanning TV set - an actual connection will not normally be required - and this will lock it very solidly. (The output monitor, possibly another TV set, will of course be fed with the composite TV signal into its video stages, and will extract the necessary sync information from that signal).

The original unit was made on a 6" x 8" x 2" aluminium chassis, including the power supply. The "scanner" was an 8" Canadian Marconi portable TV, and the monitor a modified 10" TV. Results - excellent!

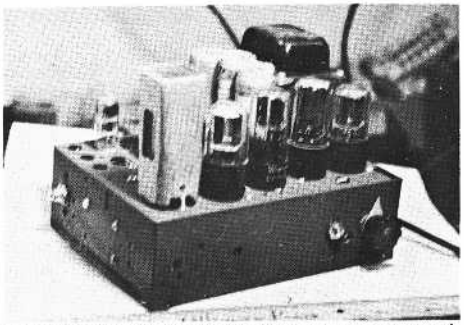


Photo of the completed slide scanner unit. The can (front left) houses the 931a PEC.

Our cover Photo this time provides an interesting view of the the "studio" at R.H.E., with Phil Thorogood drawing attention to a vital notice. Note the lamp reflector used on the mike boom to give some directional response to the mike.

NEGATIVE MODULATION

In view of the fact that over half the members of the B. A. T. C. live in countries where the broadcast standards are for negative modulation, we thought that now would be a good time to introduce some features specifically for such members. Accordingly, this page will appear from time to time as necessary, and will result from contributions, we hope, from members concerned, particularly in Canada, Australia and the U. S. A. We did wonder about printing this page upside-down ....

* * * * * * * * * * * * * * * * * *

Let's consider first of all the essential difference between positive and negative modulation. The first point to notice is that we are dealing with modulation only, that is, something concerned with RF transmission. There is absolutely no difference in the video equipment required, which in either case should still deliver a one volt 70:30 composite signal,white positive, to the input socket of the transmitter modulator. However, in the modulator, the video signal is inverted or not as required by the system of modulation, and two possible final results can be obtained. In the one case, a peak white signal at the input yields maximum RF output from the transmitter. This is termed positive modulation. In the other case, the same white signal will yield minimum RF output, the so-called negative modulation. Exactly the same receiving equipment is used for either system, but the detector diode connections must be reversed suitably to maintain a positive picture on the receiving CRT.

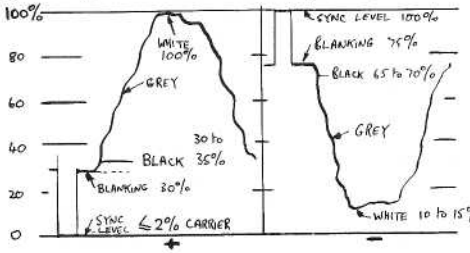


Figure 1: RF envelope levels for Pos. and Neg. Mod.

The actual RF envelope levels corresponding to the input levels vary slightly (see Figure 1). For positive modulation, peak output (100% RF) corresponds to white, 30% to black, and <2% (nominally zero) to the tips of synchronising pulses. For negative modulation, sync tips are 100%, black level 75% and white between 10% and 15% of peak carrier. In the latter case, white could have been zero carrier, but two points arise here. By arranging that at least 10% of vision carrier is always present, this carrier can be used to beat with an FM sound carrier - the vision amplitude variations being clipped off suitably - and so give "intercarrier sound", a scheme which makes for receiver simplification. Secondly, due to the transmitter characteristics being non-linear near cut-off, relatively complicated "white stretch" circuits would be needed to maintain overall linearity if white level was allowed to fall to zero. In the positive modulation case, the carrier is nominally cut-off during syncs, so that if intercarrier sound was used, the sync "buzz" would be permanently superimposed on the sound output. This is one reason why AM sound is usually used with positive mod. transmitters; FM could be used, but not intercarrier-wise, and the FM sound receiver is then more complicated and expensive than the corresponding AM one. To overcome non-linearity, "Sync Stretching" circuits must be used, but as these are only dealing with pulses, they are relatively simple to make.

Intercarrier sound could be used with positive modulation if sync tips were restricted to say 10% carrier. However, the effect of noise on the syncs will obviously be greater than if the syncs corresponded to peak output, as in negative modulation. This could cause poor synchronisation. When the transmitter is cut-off at sync tips, though, as in true positive mod., "negative" noise spikes cannot affect synchronisation, whilst positive spikes can be overcome by suitable circuitry (see figure 2). For negative modulation, either spike may appear at the detector output. This is the reason for not using DC restorers on negative modulation receivers - they would respond to the tips of noise spikes giving streaking effects. The clean positive-mod sync tips can easily be DC restored.

As far as amateur TV stations are concerned, the choice of system is usually already determined by local broadcasting practice. The vision modulator for negative modulation will generally be simpler and will require less output than for positive modulation. One final point - the average carrier transmitted for an average picture is almost the same for either system.

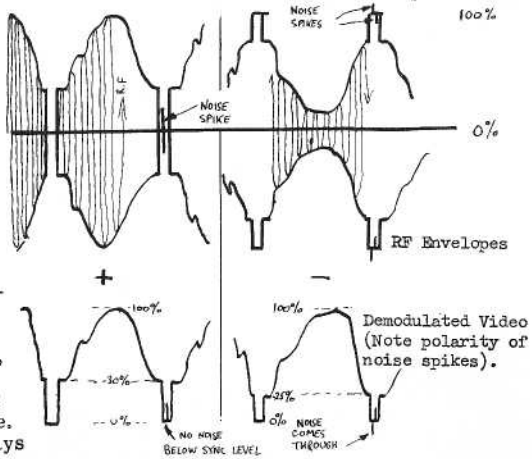


Fig. 2: Effect of Noise on Pos and Neg. Modulation

C.A.T. S PAUSE

Excuse the pun in the heading, but this column will normally be reserved for news of activities in North America. Thought you might be interested in some general background stuff first.

For the Geographically innocent, Montreal is at the right hand side of Canada halfway between the mouth of the St Lawrence and the first big lake down. It is in the same latitude as Paris, is the second largest French town in the world, and has 1300,000 inhabitants or so. The city is built on an island of 200 sq miles of which almost half is built up. Just off-centre is Mount Royal rising to all of 765 ft not counting the TV towers. Apart from this the land is dead flat for miles in any direction, and nearly tree-less - just coarse grass. Land being cheap, the city spreads outwards not up, and tall buildings are rare except in the downtown business and older parts. Electricity is also very cheap, so lights everywhere are the rule, and don't bother to turn them off. Ultra contemporary houses (but very UN furniture), reminds me personally of Stockholm. Building everywhere including roads, few footpaths out of town, shops moving out from the city to the suburbs into shopping centres because of parking difficulties, restaurants open very late, shops and banks to 9pm once or twice a week, sales everywhere all the time, anything delivered, buy your liquor only from the Quebec Liquor Commission.

There are about 600 hams here, and some of them got up at 5.30am to meet us on our arrival. I had my first car (NOT "automobile") ride in the MARC mobile a 1938 Ford with SSB rigs and fluorescent lighting.. Almost made up for Matilda! VE2LS took us house-hunting in his Ford Meteor (about 6dbs up on a Jaguar for size) and after a week in a Motel (3" carpets, 21" TV, very Mr-and-Mrs-Smith-ish) and a week in a hotel (£10 a day without meals, but lush) we have eventually fetched up here at
1740 HARTENSTEIN ST., ST. LAURENT? MONTREAL. We have the lower floor and basement of a double duplex, ie a block contains four apartments, two up, two down plus two basements. Naturally all is maintained at a steady 75°F even if it is +5 or even 30 below outside. Automatic oil furnace, of course. Also immersion heaters, concealed lighting, parquet floors, built-in furniture, HUGE refrigerator, and an immense electric cooker covered in clocks and concealed lamps. The double sink unit has a gadget on the dish brush that squirts detergent into the washing-up bowl..... The two-car garage is heated too, and I am one hour from skiing or swimming in the mountains.... Jealous? Enough of this backchat, and down to CATS business. I have already given a brief and possibly hilarious talk to the MARC on "Ham Operation in G Land" (as if I would know), but have not really got down to finding out all about the local ATV talent. As I write this we have only been in the house for five days...

Nevertheless I have seen Canadian ATV pictures. Charlie Coorsh VE2AFM has his basement done out in Marley tiles, ribbed plywood walls, fitted bar etc. One switch puts on the image orth camera, pointing at the bar, another an iconoscope camera pointing at test cards, etc. A Bill Still type mixer, discharging Cs across suppressor grids, fades from one to the other The vision tx is a standard Still item. Using a

CANADIAN AMATEUR TELEVISION SOCIETY NEWS

Montreal standard TV converter (very noisy to my eye) Bill Stills slide scanner pictures came through well but noisily considering the path of 3 miles.

Bill Still's shack is a corridor into a thick carpet entirely surrounded by Hi Fi speakers (9) a projection TV set, a colour receiver and about 25ft of shelves jammed with LP discs. The "No Brain" slide scanner described in this edition works very well. There is a great deal of other ATV gear there which I have not yet digested. VE2AKT, Bennie, has about 5 studios, two control rooms and two operating theatres in his basement (also a bar, Hi Fi, fish tanks etc) and must be described in another edition.

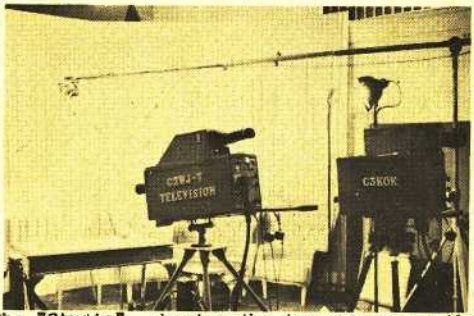
Pierre Labarre VE2LS is in his last year reading Elect. Eng at McGill University, and has done a few vacation stints with CBC. His bedroom shack is on the third floor of a block of apartments on Queen Mary St, roughly halfway up the mountain. He runs an RCA CRV59AAE surplus camera, with an 1846 ike in it that needs 5 to 10 ft candles mosaic illumination. This unit requires only a power supply, some doctoring of the blanking pulses (too wide) and a trim of the sync generator frequency controls, and gives out the CATS standard 1 volt into 75 ohms. Pierre (rudely referred to as "Pie-ear") is going to fit a viewfind-er. The transmitter consists of two p-p 8025s in a parallel line circuit driving two more in the PA running 600V at about 200mA at Black. The modulator is an 807, but on the phone just now (RIverside 4-2593) Pierre couldnt recall just how he'd arranged it. A simple loop sucks the RF up the 300 ohm OPEN WIRE feeder (very common here) into the antenna, which is a folded dipole in a corner reflector. The dipole was made of copper, which, when silver plated and polished, had to be lengthened by 1½ inches to bring it back into resonance. Theres an idea for you, G2WJ!

My own equipment is scarcely unpacked yet, but we have checked that the BATC sync generator still works, and the vidicon camera has excited some interest. The tape recorder does work though, and I should like to resume tape correspondence especially with NZ and Australia, who may have already solved some of the negative mod problems.

Within 24 hours of moving in, Julian Royle of G2WJ/T called in en route to Cornwall, Ont. some 70 miles away; the Basement is now wired to best G2WJ standards. Julian brought with him Nigel Nathan and his wife, BATCs from Worcester, going to Westing-house at Hamilton. Nigel hopes to pep up the CATS in that area when settled. And most Sundays courtesy of Cliff Sunderland VE2CB we have a phone-patch QSO with G2WJ and G2CZS on 10m at 1600 or 1700 GMT, so we are not quite cut-off by the Indians (there are 10 of them the other side of the river). Lapsed member Bill Cheek VE3EAB met Nigel at Hamilton. Incidentally, Nigel met Julian on the last day on board ship, when they both discovered they had a friend in Montreal, one G3CVO....

Excuse the light-heartedness of this contribution. It is either the food (delicious - tried a TOASTED sandwich yet?) the weather (+8°F outside) or the fact that Alwyn has got to make all this into a magazine. Please accept my apologies if this edition is very late, but it is December 8th already and I have only just been able to get down to CQ-TV. CU NXT EDN. MB

RADIO HOBBIES EXHIBITION 1957.



The "Studio", showing the two cameras, mike boom, and the comfortable seating.

For the fifth time this year amateur television was brought before the public's eyes. Dagenham, Enfield, Scout Jamboree, Harlow, and now the Radio Hobbies Exhibition. The stand was organised by the Chelmsford Group and consisted of Jeremy Royle's Photicon and R.F. distribution unit, Brian Partridge's Image Orthicon and A/B vision mixer and Martin Lilley's F.S.S. All this was centred around a small studio arranged for us by Phil Thorogood, the show organiser. Sound equipment was arranged jointly by the Chelmsford and S.W.Essex Groups. Shows were put on regularly from the studio, and these included panel games (with the emphasis on the games!), technical discussions, talks, and general show announcements. In between these there were "commercials" by the other exhibitors at the show. Alot was learnt about studio management and programme presentation, and by the end of the show programme quality was approaching "best commercial standards". In fact, at most times, a crowd could be found round all the TV sets which were used as display units round the hall. The show ran for four days, and in the time only two major faults occurred, a fact which is due in no small measure to the care and attention taken in construction and installation of the equipment on show. A 500pf. capacitor in the F.S.S decided to go short circuit, and caused quite a headache for half-an-hour or so, and in Jeremy's camera, the keystone modulator caused some trouble due to a new cable plug that had just been fitted.

From the point of view of the press, the main attraction was the Televisionfone, a one way television-telephone, and on the firstday John Tanner was interviewed on five occasions by means of it. Publicity was given to the stand in five national newspapers, and all of them concentrated on the TVPhone. Members of the public, however, seemed slightly scared of dialling TEL, and the general opinion was that the idea would not be an advantage in the home. (Bang go all those blind dates!)

The camera in use for this equipment was Ivan Howards Staticon, and the dialling equipment and selector unit were built by Peter Allott.

From the club's point of view, the exhibition was a real success, many new members joined, and much was sold in the way of books and back copies of CQ-TV. Enquiries were generally about local activity and the construction of converters for ATV reception.

9" Monitor, Jeremy and his CCU, monoscope, and RF distribution unit. Rear,FSS & monitor.

As far as we know, the Show will be held next year, so if you have any ideas, suggestion, or gear, please let us know, and the information will be passed on to the organisers.

Our thanks are due to John Tanner for the work that he put in before and during the show and to all those who loaned or operated gear. This is especially so in the case of the kind gentleman with the un-emptiable-coffee-pot!

News in brief.

Grant Dixon is busy with a new colour monitor. This uses three projection tubes, each being fed with the appropriate colour information.

Down in Worthing P.J.Robinson G3KFH/T is in a good VHF site, and is preparing to push out pictures to the north. Power and F.S.S. are at hand, and the Tx is being completed. Also in view are some cross-channel tests.

Chelmsford now has a studio, and somewhere to store the gear. R.F. in the shape of a 4x150 is available, and with 150 watts input some pictures should be available over a large area of S.E.England.