CQ-TV MAGAZINE No. 138

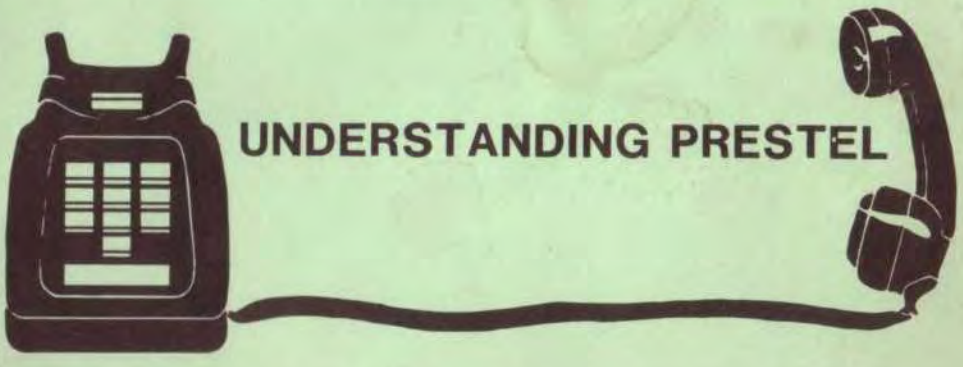
BRITISH AMATEUR TELEVISION CLUB

MAY. 1987

Introducing

BROADBAND

P.A. MODULES FOR 1.3GHz



UNDERSTANDING PRESTEL

1987 BATC SHOW - 3RD MAY

FULL DETAILS INSIDE

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MEMBERSHIP

FULL YEAR: £6 or £1.50 for each remaining quarter of the year. All subscriptions fall due on the first of January. Membership application forms are available by sending a stamped addressed envelope to Dave Lawton, whose address may be found on page-2 of this magazine.

OVERSEAS MEMBERS are asked to send cheques bearing the name of the bankers London agent. Postage stamps are not acceptable as payment. Overseas airmail is extra - please enquire from Dave Lawton or see the rates list printed in the most recent 'November' issue of CQ-TV.

The British Amateur Television Club is affiliated to the Radio Society of Great Britain and has representatives on the committee of the European Amateur Television Working Group.

The BATC is registered under the DATA PROTECTION ACT, all queries to Dave Lawton.

CQ-TV is produced by the British Amateur Television Club as its official journal and is sent free to all members. It is not for general sale.

Articles contained in CQ-TV magazine may be quoted by non profit-making organisations without prior permission of the Editors, provided both the source and author are credited. Other organisations may obtain permission in writing from the Editor

The BATC maintains many pages of news and information associated with amateur television on the Prestel Information Service. Club pages may be found within the ClubSpot section and full details were last published in CQ-TV 134. Copies of the article (two pages) may be obtained from the Publications department.

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CLOSE FOR PRESS DATE for the next issue.....20th June

NEED ANY HELP?

Members of the BATC committee are available to help and advise club members on any ATV related subject. Remember that all such work is done in their spare time so please try to keep such queries to a minimum.

GENERAL CORRESPONDENCE - Club affairs; video tape library; technical queries, especially related to handbook projects: TREVOR BROWN G8CJS, 14 Stairfoot Close, Adel, Leeds 16. Tel: (0532) 670115

MEMBERS SERVICES - PCB's; components; camera tubes; accessories etc. (other than publications); queries related to such supplies: PETER DELANEY G8KZG, 6 East View Close, Wargrave, Berkshire RG10 8BJ. Tel: (07352) 23121

MEMBERSHIP - Anything to do with membership including new applications; queries and information about new and existing membership; change of address; non-receipt of CQ-TV; subscriptions; membership records; data protection; Prestel: DAVE LAWTON GOANO, 'Grenehurst', Pinewood Road, High Wycombe, Bucks HP12 4DD: Tel: (0494) 28899

LIBRARY - Any queries relating to the borrowing or donation of written material to the BATC central library. PAUL MARSHALL G8MJW, Fern House, Church Road, Harby, Nottinghamshire NG23 7ED: Tel: (0522) 703348

PUBLICATIONS - Anything related to the supply of BATC publications. CQ-TV back issues and other publications are normally only available if listed on the Publications order form at the centre of this issue: IAN PAWSON G8IQU, 14 Lilac Avenue, Leicester LE5 1FN. Tel: (0533) 769425

EXHIBITIONS AND RALLIES - also arrangements and information about lectures and talks to clubs; demonstrations etc: SITUATIONS VACANT - any volunteers are asked to contact Trevor Brown.

CLUB LIAISON - and anything of a 'political' nature; co-ordination of ATV repeater licences: GRAHAM SHIRVILLE G3VZV, The Hill Farm, Potsgrove, Milton Keynes, Bucks MK17 9HF. Tel: (0525) 25343

TVI & RADIO INTERFERENCE - any problems of this nature please to: Les Robotham G8KLH, 38 Ennerdale Avenue, Stanmore, Middx. HA7 2LD (not committee).

CQ-TV MAGAZINE - Anything destined for publication in CQ-TV magazine (except regular columns) or forthcoming BATC publications. Articles; review items; advertisements; other material; queries on the content of past issues.
EDITOR: JOHN WOOD G3YQC, 47 Crick Road, Hillmorton, Rugby CV21 4DU. Tel: (0788) 69447 -
ASSISTANT EDITOR: MIKE WOODING (see next item).

CONTESTS & AWARDS, CQ-TV ASSISTANT EDITOR - Mike Wooding G6IQM, 5 Ware Orchard, Barby, Nr. Rugby CV23 8UF Tel: (0788) 890365.

Where possible it is better to telephone your query rather than write. Please do not call at unsocial hours. As a guide, try to call between 6.30 and 9.30pm evenings and not before 11am at weekends.

EDITORS POSTBAG

Dear Ed,

In CQ-TV131 (1985) I put a wanted ad in 'Market Place' asking for video heads for an old Sony 2000 VTR. I had a great number of replies offering complete machines etc, but one in particular first phoned, then contacted me via GB3KN repeater, and sent a pair of heads for the machine.

Unfortunately, since I was moving house at the time from my address in Dartford, the accompanying letter was mislaid, so I don't know the person's name and address.

Would you please print this letter in CQ-TV so that I may say "thank you" to the person concerned and apologise for not replying to his letter.

It is good to know that there are some very nice people in the BATC. Super mag., keep up the good work.

P Martin GOGIR (ex-G60PP)

Dear Ed,

With reference to Mr.Dixon's (G3PFR) letter in CQ-TV 137 entitled "Where on 10GHz?" (p.47), I would like to say that I have been a member of the Microwave Society for some time now, and THEY advocate the use of 10.4GHz for WBFM. Before I wrote the article on 10GHz TV I endeavoured to find a bandplan. After searching through back issues of Radio Communication to 1980 (especially in G3PFR's column!), and in the VHF/UHF Handbook, I could find no mention of the bandplan shown in his letter. Still, thanks to the RSGB Microwave Committee and Mr.Dixon for at least publishing a plan.

The method of frequency measurement was also referred to and was said to be 'highly inaccurate'. I would just mention that the particular method described in my article is in fact suggested by the Microwave Society itself, as a means of determining frequency for those lacking more accurate test equipment. I compared this method with my own, using a Hewlett Packard X532B frequency meter, and found that the frequencies never varied by more than about 10MHz from that required. This represents only a 2% error.

Several times the possibility of interference to other band users was mentioned. Whilst we must all be very careful to minimise interference, whatever band we use, the possibility of it occuring on 10GHz is, in my opinion extremely remote.

I hope that this letter dispells any doubts in the minds of potential users of the 10GHz allocation, and hope that they will be encouraged to have a go on this interesting band.

Roy Humphreys G4WTV

NEWS ROUNDUP

BATC AT THE NEC

We are sorry not to have been at the RSGB amateur radio exhibition at the Birmingham NEC this year. Since we were unable to agree terms with the RSGB we felt that, owing to the exobitantly high charges being asked, we couldn't justify the expenditure this year. Despite the fact that the RSGB were told that we wouldn't be there they nevertheless still included us on their floor plan! Our apologies - on behalf of the RSGB - to those who sought but could NOT find.

GRAND BRING-AND-BUY SALE AT CRICK

Due to the success of Andy Emmerson's impromptu bring-and-buy sale at the last show, the committee decided that there is a need for an 'official' sale. Accordingly they have arranged with the Rugby ATV repeater group (GB3RT) to provide such a facility at this years show. A small percentage of the sale price will be charged for the service and all proceeds will go towards the repeater fund.

MEMBERS SERVICES

BATC Members Services does not hold stocks of BATC publications, and vice versa. Please sent your order to the appropriate address, as otherwise extra delay and expense is caused in fulfilling the order. Several members have been making payment by open postal order - please, for your own security, send a crossed postal order or cheque payable to 'BATC'.

Batches of callsign badges are sent to the engravers once per magazine cycle. Please ensure that your order reaches BATC Member's Services by the CQ-TV close for press date, given in each issue. Badges are distributed to members as soon as they have been engraved.

If you require a special 'C' mount, such as for a lens turret, please write to Members Services with a drawing of your requirements.

Some new boards are in preparation, and will be announced on the BATC Prestel pages, if you cannot wait for the next CQ-TV.

Oh yes. Several of you wondered if there is a significance in the title pictures (train and flag). There's a purpose in EVERYTHING in CQ-TV, they mean 'British made' and 'Express service', (well.....!)

FREE GEAR!

A quantity of used equipment has been made available to the BATC through the kindness of W.Vinten Ltd. Included are C mount zoom lenses with servo drives, small camera viewfinders, microphones, Ni-cad 12 volt batteries and matching chargers, leads, mounts and earpieces. The viewfinders require only 12V dc and standard video to produce a display on the 1" tube. Information on the circuitry will be available. The lenses are 6:1, f1.4 and are designed to suit the 2/3" format.

The charge for each item will reflect the cost of distribution and photocopying only and the equipment will be available on the BATC stand at the Crick Show in May - first come, first served.

REPEATER NEWS

An application has been made to provide an ATV repeater on Barby Hill, near Rugby. The callsign GB3RT (Rugby Television) has been applied for and the repeater will operate in FM only on RMT-2. Contacts here are myself (John, G3YQC) and CQ-TV assistant Editor Mike, G6IQM. Anyone who would like to assist or just support this venture is invited to contact either of us.

We always say the best way to understand what we are editing and writing about is to do it, well now perhaps we can write about repeaters with more authority (?)

An application has also been made for a repeater up the Emley Moor TV mast (GB3ET). David long, G3PTU or Trevor Brown, G8CJS (BATC Secretary) are the contacts here.

An application has been made for an ATV repeater, GB3NV, in the Nottingham area. Richard Smith, G8BWC can be contacted for further information.

The Bristol Group's GB3ZZ continues apace. Much of the hardware is about ready by now, the aerials are already up and manned trials will take place soon. The licence application went to the DTI in December 1986 and it looks as though its seal of approval could be coming very soon.

Any more? Nope, that's it for this time, hope they all get off the ground OK. Let's hope for some more in time to come, they all help to keep sticky fingers off our bands.

VHF COMMUNICATIONS MAGAZINE

Since I put in the piece about an article in VHF Communications magazine (CQ-TV137 p70) I have received several enquiries as to where one might take out a subscription. I don't know. I have asked round everyone I can think of, including the RSGB but have drawn a blank. Can anyone help? If so please phone me (ed) on (0788) 69447. Anyone requiring this information might like to phone me when I hope to have the gen by then.

CQ-TV BREAKS MACHINERY

CQ-TV137 was so thick that it upset the binding machines which put it together!

Unfortunately, after about 800 magazines had already been packed, Daisy (XYL of committee member G4EUF) who packs all the inland magazines ready for mailing, found that many were damaged on page 69. Upon further examination she found that around half the magazines were damaged and could not be issued.

A few frantic phone calls later and the emergency team went into action. Daisy filtered out all the bad ones and sent the rest off as usual. Our printers worked during the night to produce over a thousand replacement copies, the next night the binders did likewise and, within three days the new mag's were delivered ready for packing.

Unfortunately the 400 or so overseas ones had already departed so, as a precaution, they were all sent out again, so everyone should now have a good copy of issue 137.

What a panic, and we must thank Daisy for the superb way in which she handled the crisis, and for packing the whole lot again so quickly. Let's not forget the printers and the binders for nipping in smartly to fill the breach.

It seems that to prevent it happening again I should slim the magazine down. Now, I ask you, how can I possibly do that? We'd better just keep our fingers crossed that's all!

CQ-TV COPY - AGAIN!

Copy getting a little thin again chaps. Could do with some more please if the magazine page count is to remain at its present level. Don't forget that I am always open to suggestions for articles which you would like to see in the mag, I may be able to get them written specially.

Sorry there isn't a satellite TV column this time. No copy had been received by the closing date.

G5KS - 35 NOT OUT!

G5KS, well known TVer in the Birmingham area, celebrates his 35th year as a member of the BATC this year. Arthur joined in 1952 when the club was in its infancy and its members were counted in tens rather than thousands as we now do.

Arthur in fact started TV experimenting before the war and built his own TV receiver around that time. He has been very active on the bands since he got his licence back after the hostilities, and is at present putting the finishing touches to his 24cm FM-TV station. Many present amateurs owe their continuing interest to Arthur who is always ready to help and advise others. Congratulations Arthur.

CQ-TV INDEX

You should all have received a free gift with this issue - a complete index of CQ-TV and handbooks for the last several years. A bit of an experiment this one; it has been produced on a sophisticated word processing system and the original manuscript printed using a laser writer. We in the BATC office have our eyes on such a system for the not too distant future, it will certainly enable us to smarten up the magazine layout and would enable (if necessary) an increase to the more conventional A4 format. What do you all think about good ol' CQ-TV going large format?

4 x COLOUR SUBCARRIER CRYSTALS

Need a four-times colour subcarrier frequency (17.73447MHz) crystal? G4UKW advises that Verospeed of Stansted Road, Boyatt Wood, Eastleigh, Hants SO5 4ZY, Tel: (0703) 644555 stocks them under stock number 90-367919 at £1.99 each. Apparently their service is very good and they take 'plastic' money as well.

I.A. RECORDINGS

It's amazing how you run across members isn't it? I received a handout advertising some videos on industrial history and, being quite interested in same I found out more. It seems that the organisation is masterminded by BATC member Peter Egglestone.

I.A.Recordings is a voluntary organisation whose aim is to record past and present British industrial activity by using modern techniques, especially video. Productions available so far deal with hand rolling of steel, hand made bricks, Telford's last canal, Birmingham canal navigations, the new Dudley tunnel, handmade barrels and the Manchester ship canal. All are available for sale in Beta, VHS and U-matic formats from P.O.Box 476, Telford, Shropshire TF8 7RH.

FLICKER FREE TV's

Several magazines have carried these details recently, still, no reason why CQ-TV can't get in on the act is there? ITT have brought out a new IC; the RGB2923 double-scan processor. This chip actually doubles the normal horizontal frequency rate and thus displays each line, twice, at double the usual speed thus eliminating flicker.

The chip uses a special A/D converter that has a low brightness resolution, but a high time resolution of 1/8 of the clock interval. A switched D/A converter translates the input signals to analogue output signals with doubled frequency.

What with flicker free pictures, digital on-screen manipulation of TV channels, MAC processing etc., where will it all end I wonder?!

APOLOGY FROM THE PRINTERS

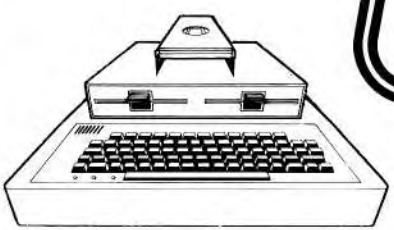
May we take this opportunity to apologise for any inconvenience caused from the previously printed book.

We will endeavour to make every effort to ensure that our highest standards are reached in future.

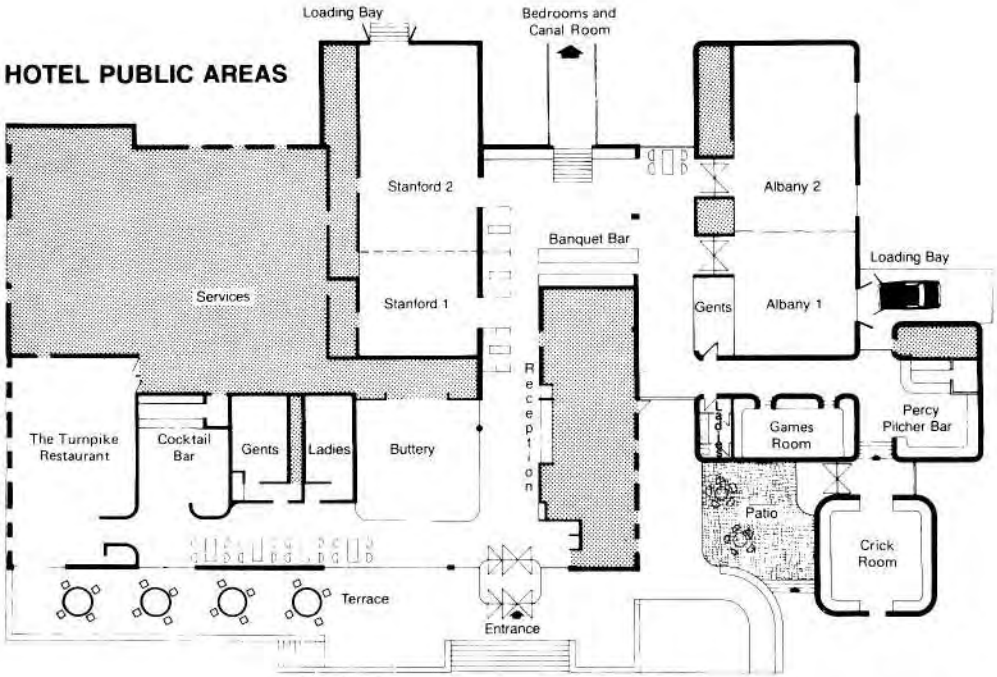
ON LOCATION

ANNUAL BATC SHOW

POST HOUSE HOTEL CRICK



SUNDAY 3RD MAY



SATURDAY 2nd MAY

AFTERNOON

A meeting of the European Amateur Television Working Group will take place during the afternoon. Representatives from several member countries will be there and BATC members will be welcome. Further details from Andy Emmerson, G8PTH on Northampton 844130.

EVENING

The usual social get-together will take place in the Percy Pilcher bar throughout saturday evening. members are welcome to come along. please wear your callsign badge so that we know who you are.

SUNDAY 3rd MAY

This years show will be as large as ever and will include lots of new trade stands. A marque will be erected again and we hope to have some space available for member's use (not guaranteed). Anyone wishing to reserve space, either inside the building or in the marque is asked to contact Trevor Brown G8CJS on Leeds (0533) 670115 as soon as possible. We do ask that members bring along their own projects or equipment for demonstration or display. Space will be provided free of charge for this purpose and it gives us all a chance to exchange ideas on things television. Please advise Trevor beforehand. A grass area outside will be available for members to display and sell their wares.

GIANT BRING-AND-BUY

For the first time an organised bring-and-buy stand will be available for members who wish to display and sell items of equipment, but who do not wish to miss the show by conducting business themselves. The sale is to be organised by the Rugby ATV Repeater Group and will be open to all. There will be no registration fee but a minimum charge of 50p for a single item or 5% of the total amount realised (whichever is the greater) will be made. All proceeds go towards Rugby's proposed ATV repeater GB3RT. NOTE: Although every effort regarding security will be made, neither the BATC nor the Rugby ATV Repeater Group can accept responsibility for the safety of goods. Items are left at the owner's own risk.

DEMONSTRATIONS

There will be demonstrations of: fast-scan ATV equipment, slow-scan TV equipment, broadcast satellite TV, narrow-band TV, repeater groups, aeronautical ATV from a model helicopter equipped with a camera and 24cm transmitter, mini-mobile ATV from a remote controlled buggy also equipped with a camera and transmitter. There will of course be other exhibits including those by members.

LECTURES

The following events will take place in the Stanford suite:

11am A seminar and discussion on ATV repeaters will be conducted by Graham Shirville G3VZV and Paul Elliott G4MQS. Both are members of the RSGB Repeater Management Committee and the BATC Committee. Anyone interested in amateur TV repeaters is invited to attend.

2pm A lecture on broadcast satellite TVRO techniques and equipment will be given by North East Satellite Systems.

3pm A lecture entitled "Digital Effects in Television" will be given by Trevor Brown G8CJS. (This item is subject to any last minute changes. Details will be posted outside the lecture room on the day).

4pm A talk on lighting techniques for the amateur and small studio will be given by Peter Delaney G8KZG and Bob Robson GW8AGI.

LUNCHEON

The Turnpike restaurant is licenced and has an adjoining cocktail bar. Members are advised to book luncheon in advance, special children's meals are available.

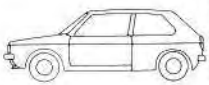
SNACKS AND DRINKS

There is an excellent coffee shop and buttery bar as well as the Percy Pilcher pub, all of which sell food.

Car parking facilities are provided around the hotel, although, at peak times cars may need to be parked in the driveway or on the grass verge at the roadside. Large grounds and gardens surround the hotel and we hope to again have a fun castle for the children. The grass may be used for picnicking.

Members staying overnight should be sure and book in advance. The BATC has arranged for half-price overnight accommodation to be available to members, please mention the BATC show when booking. Hotel reservations may be made by telephoning Rugby (0788) 822101.

How to get there

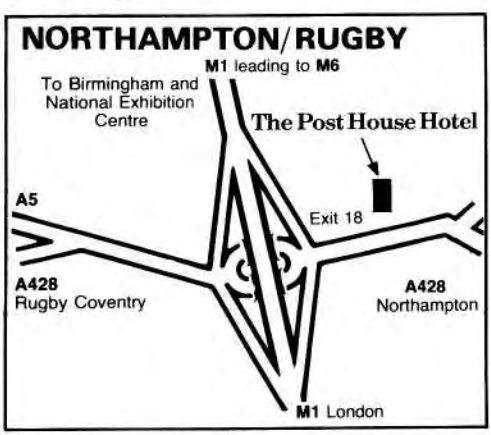


Located in the centre of the Country, the POST HOUSE HOTEL is about 300 yards East of exit 18 of the M1 motorway.
Motorists should leave the motorway at J18 and take the A428 signposted to Crick and Northampton.
Those travelling on the A5 Watling Street will find that it passes very close to the motorway roundabout. If in doubt, follow the M1 motorway signs to the roundabout and then take the second exit, signed A428.

The nearest mainline and Inter-City railway station is 'Rugby Midland' situated in the town itself.
Busses to Crick are infrequent but there is a taxi rank outside the main entrance.

Both the Oxford and Grand Union canals pass close to Rugby and Crick where there are numerous marinas, wharfs and moorings at which to stop. Members using this mode of transport should consult their Waterways guide publications for the necessary information.

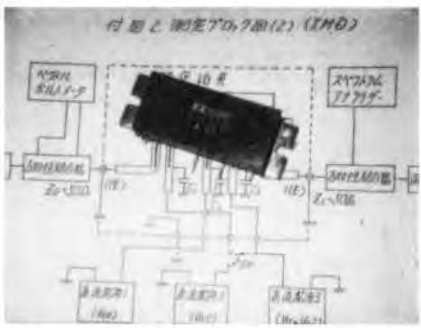
The nearest major terminal is Birmingham International Airport. This is situated between Birmingham and Coventry and is around 30-miles from the Convention venue.
The POST HOUSE HOTEL has its own Heliport for those arriving by helicopter. Members wishing to use this facility should contact the Hotel in advance to make their arrangements.
Tel: 0788 822101



A 15W SOLID-STATE POWER AMPLIFIER FOR 24

By John Wood G3YQC

At last, after years of waiting and knowing all along they were being made - RF power modules for the 1.3GHz band have reached our shores.



Having been a keen devotee of 24cm ATV for many years, I have been anxiously awaiting the arrival of a decent power module, capable of delivering a reasonable power level yet at an affordable price. For ages I have struggled on with a 2C39 PA with all its inherent power supplies, blowers and tuning drift. I have kept an eye on the one or two designs for discrete transistor PA's, but apart from being a bit difficult to make and align (too easy to blow up a £25 transistor), and needing reasonable test equipment to set them up, they somehow never quite produced the power which one hoped for. Now all that has changed and with the module described here, you can realise up to 15 Watts of RF output for around 1 Watt in, and without any alignment whatsoever!

The module is in fact used in the ICOM IC1271 23cm transceiver and is specified as a 10W device. I contacted Thanet Electronics explaining what I was about, they were most helpful and supplied circuit details of the transceiver so that I could work out how to use the module. In fact they very kindly telexed Japan for the device data sheet as well which, despite being mostly in Japanese, proved very useful indeed. Please don't deluge Thanet with similar requests though, the information given here is about as much as you could glean from the sheets anyway. I should like to thank Thanet Electronics, and especially Chris in the Service Department for his valuable assistance with this project. The price of the module (January '87) is £61.21 plus VAT and postage, but a quick call to Thanet will give you any updating on that. It will also tell you whether they are in stock.

DESCRIPTION

The module itself is designated SC-1040 and has the ICOM name and logo printed on it. Anyone who has seen the 70cm Motorola MHW-710 'blue brick' will know what it looks like - except that this one is black! The circuitry is encapsulated and mounted onto a slab of metal. This serves not only to dissipate heat but also provides a means of bolting it on to an additional heat sink. Fig.3 illustrates the general apearance from the top.

SPECIFICATION

	typ	Max
Power output (Vcc=12.5v, Vbb=9v, f=1.24-1.3GHz)	18W	20W
Power input	1W	2W
Gain (typical)	13dB	15dB
Vcc	12.5v	17V
Vbb	+9v	+10v
Total power consumption (at 15W output)	4.3A	
Operating frequency	1.24 - 1.3GHz	
Operating temperature	-30 - +110%C	
Input/output impedances	50-ohms	

CIRCUIT CONSIDERATIONS

Fig.1 shows the complete circuit diagram of the power amplifier. RF input is via a 50-ohm stripline (3mm wide on 1.5mm double-sided PC board) to which pin-1 is soldered. Pins 2 and 4 carry the 13v supply to the collectors of the three amplifying stages and heavy decoupling is used to ensure a 'clean' supply. Power is directly applied to pin 4 and also to pin 2 via an RF choke. Pin 3 is the base bias supply (Vbb) for all stages and requires +9v. This voltage can easily be derived from the main supply by using a 1A +9v three terminal regulator. Pin 5 conveys the RF out, again via a stripline.

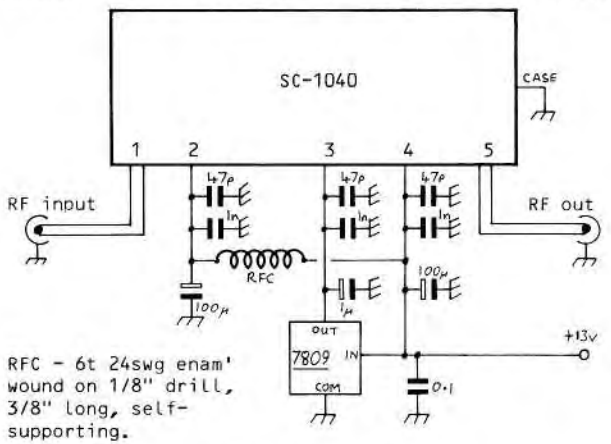


Fig.1 POWER AMPLIFIER CIRCUIT

COMPONENT CONSIDERATIONS

Although the amplifier uses only a few external components it is worth considering them in more detail: The 47pF and 1n decoupling capacitors should be miniature ceramic types of at least 35v working. The 100uF electrolytics are radial (upright mounting) types at 25v working, whilst the 1uF need only be 16v. The 0.1 may be any small type (preferably ceramic).

The 7809 regulator is a bit of a rare beast. I use a 7808 and wire a series silicon diode (1N4001 etc) in series with its common leg (see Fig.2).

Don't forget to insulate the body from ground! If you can't get an 8v device either then use a 7805. In this case you will need a 3.9V zener (BZY88C3V9) in the common leg. The voltage on pin 3 doesn't seem to be very critical, in fact I observed little change in output when it was reduced to 8v. Nevertheless I recommend that you get as near to the specified 9v as you can.

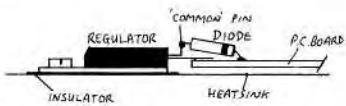


Fig.2 Regulator diode

The module gets rather hot, therefore you will need a good heat sink, especially with us TV'ers driving the poor thing at 100% duty cycle for hour-long transmissions. My prototype uses one of those finned heatsinks which is flat on one side (150 x 95mm), however this gets a bit too warm for my liking after a few minutes of full power operation. What I do is use a small equipment fan to blow some air onto the heatsink fins, this keeps it nice and cool. However many of you will not wish to go to this trouble so be prepared to shell out on a good sized heatsink for safety.

CONSTRUCTION

Fig.4 illustrates the full-size PC board pattern which I have devised. Although I used a piece of 1.6mm Teflon board, I see no reason why good quality double-sided fibreglass board should not be just as effective. The shaded area is the copper land and you can see that the pattern is all made with straight lines. This means that instead of having to etch a board, you can cut away the unwanted copper using a sharp craft knife. The dots indicate where stakethrough wires should be fitted to bond together the upper and lower ground planes, and five crosses indicate 6BA mounting holes.

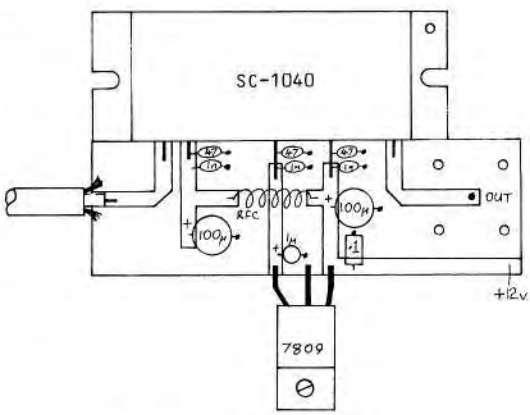


Fig.3 COMPONENT LAYOUT

For the type of heatsink I used I thought the best way of connecting the output would be to mount a BNC socket onto the heatsink (see fig.5) and let the centre pin protrude up through. The pin passes through the PC board itself and is soldered into the end of the output stripline. Because the top and bottom ground planes have been bonded together with wires, the board itself cannot lay flat against the heatsink. I spaced the board away using five 6BA brass washers (four on the BNC socket flange and one at the other end). This meant that the board could be firmly fixed and made a good ground connection.

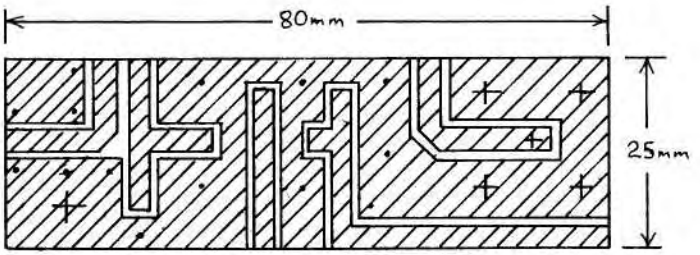


Fig.4 PRINTED CIRCUIT PATTERN

A recommended sequence of assembly is as follows:-

1. Having produced a PC board, drill small holes for the stakethroughs. Now drill holes for the 4-hole fixing BNC socket pin and its four mounting screws, then another 6BA clearance hole as indicated by a cross at the other end of the board.

2. Lay the board in a suitable position on the heatsink (bear in mind such things as leaving enough room to fit the aerial plug and where the module fixing screws will protrude through the heatsink). Then mark and drill the heatsink to accept the BNC socket and the end mounting screw. The centre hole for the socket will need enlarging to accept the protruding boss under the socket's flange.

3. Solder the stakethroughs in (use resistor wire offcuts or a piece of tinned copper wire) ensuring that the underneath solder joints are as low-profiled as possible. These may be filed flatter if they stand too proud for the washers. Now fit the PC board to the heatsink using the five washers (see fig.5) and finally solder the coax socket centre pin to the output line.

4. Now position the regulator (fig.3) and fit it to the heatsink using a 4BA screw and nut. Note that if you are using a lower voltage device and wiring a diode in the common lead, the regulator must be insulated from the heatsink by a mica washer. A 6BA screw will then be required together with suitable insulating bushes. Alternatively a 4BA nylon screw and nut can be used.

The regulator legs are carefully bent out and positioned so that they lie against the board in their correct places, then they can be soldered in. If a series diode is to be used the common (centre) pin should not be soldered to the board but should instead be bent upwards at right angles. The lead is clipped off short and the diode soldered from it to ground (see fig.2). Now install the 1uF and 0.1 capacitors, they are to decouple the regulator and should be fitted as close to the leads as possible. The regulator voltage should be tested now before the module is fitted. Connect +12v (or so) to the board and check that +9v (or a bit less perhaps) is available at the regulator's output.

5. Position the power module against the edge of the board in a position where its pins line up with the PC tracks. Now mark the positions for two fixing holes and drill and tap them 4BA in the heatsink.

6. By offering up the module you will see that the pins (wires) protrude from it slightly higher that the PC board. These wires must be bent down and then out so that they lay flat on the board. DO NOT bend the wires directly from

the module body, doing this more than a couple of times will surely break off the leads and render the module useless. (Well you never know if it will need to be removed at a later date, perhaps for re-fitting somewhere else). Grasp the lead against the module using a pair of long-nosed pliers, then bend it downwards. Now, using the pliers, bend the leads out again so that they lay flat on the board - trim off any excess (see fig.5).

7. Solder the leads to the PC board and then fit the small decoupling capacitors (don't fit them too far away from the module body) in the positions shown. Fit the choke, ensuring that it does not short to ground and finally install the two 100uF electrolytic capacitors.

8. A coaxial cable for the drive should be soldered to the input, splitting the braid in two and soldering to either side of the input line (see fig.3). Now check over your work and make sure the supplies are connected correctly.

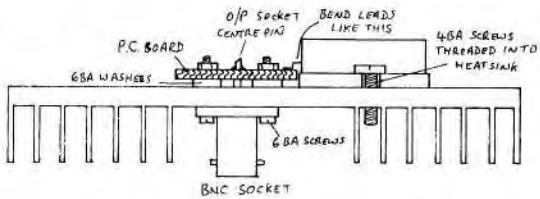


Fig.5 **MECHANICAL ARRANGEMENT**

TESTING

Not much to do here. The bias supply (Vbb) should have already been tested, so connect the output to a terminated power meter, dummy load or aerial. Apply around 1W of drive to the input and you should see a healthy reading. Do remember that to get a correct measure of output on a non-terminated (thru) type of meter, the output termination should be a good quality 50-ohm RESISTIVE load, an aerial is only resistive at the frequencies where it is correctly matched, therefore using one as a load may well alter the power meter reading to some extent. If you have no power meter then you can get an indication of whether it is working by (a) measuring the total current drawn, (b) feeling the heatsink get warm and (c) getting someone to look at an off-air picture.

No problems have been experienced with my prototype unit, and provided it has been assembled as described, it should work first time. I havn't yet run the amplifier into an open circuit (and I hope I never will!), so I can't comment on its ruggedness in that respect. My advice is DON'T!

FINAL NOTES

I was hoping to plot a graph of power output versus power input over the frequency range. However, the appropriate test equipment was not available to me at the time, so I have had to refer only to the maximum power output condition. I have every reason to suppose though that the power gain will remain substantially constant over a fairly wide range of input levels. If this is so it should be possible to calculate the approximate power output to expect from lower drive levels.

Although the specification quotes a 1W drive level for full output, I had to drive it with just over 1.2W to gain the maximum 15W from my unit. I must point out though that I am using it at 1249MHz which is fairly close to its specification limit, and it is perhaps reasonable to suppose that a slight degradation in performance is being experienced because of that.

I am using a (slightly) throttled back Fortop TVT1300 as a drive source, but I would think that the Solent 1W 24cm ATV transmitter would be almost ideal.

FUTURE PLANS

This article represents the first part of my attempt to produce designs for a high power, decent quality 24cm ATV transmitter that can be built and reliably set up by anyone with basic amateur construction skills and facilities. It is my intention to do away with much of the complicated circuitry normally associated with 24cm TV transmitters, by providing a basic design which can be embellished as the individual desires. I have identified the worst problem area as that of creating RF power at 1.3GHz, therefore I intend to use power modules such as this to do all the hard work.

There is a 1-Watt 'driver' module to suit the SC-1040 but this was not available at the time of writing (January). However Thanet have ordered some from Japan, and as soon as they arrive, I shall set about the next part of the project. The 1W module (according to the data sheet) needs just 16mW to drive it, therefore I hope to produce a simple 24cm signal frequency oscillator/buffer and FM-TV modulator to act as a prime mover. My intention is to use external pre-emphasis and sound subcarrier modules, especially since they are available commercially (Wood & Douglas and the Worthing Group (pre-emphasis only)) or can easily be built oneself.

That's the idea anyway. We have the first part so let's hope the next goes together without too much difficulty.
See you on 24!

Several weeks later.....

Since the previous piece was written, several stations in my area have scrounged the information and produced amplifiers from the design. I am happy to say that all worked first time and have given no cause for complaint.

I have tested my own unit on the air quite extensively to make sure that it is reliable. Continuous transmissions at full power for one to two hours being typical. I too have noticed no problems at all and certainly no falloff in performance. Encouraged and inspired by the project I decided at last to embark on a completely new 24cm ATV transmitter for my own shack. Since its completion I have been urged by people on the air to publish the details, so that others may be made aware of an alternative approach to the problems of good quality FM-TV transmissions on 24cm.

THE CONCEPT

Having learnt from much previous experience, it is my opinion that many of the problems (poor colour, difficult sound, low resolution etc) are largely attributable to a restricted transmission bandwidth. Let's consider a typical transmission:

A vision deviation of 4MHz may be considered as typical. A 6MHz sound subcarrier is present which represents close to the highest modulating frequency. Determining the overall channel bandwidth, using 'rule of thumb' techniques, twice the deviation plus the highest modulating frequency roughly approximates the channel bandwidth, which in this case is 14MHz. In actual practice it is likely to be a bit more than that but it will do as a guide.

Now look at the RF amplifiers commonly used in our popular transmitters (often cribbed from 23cm narrow-band designs), and consider the number of tuned circuits in an amplifier string and the Q of the lines. What you find is that all those high-Q circuits act as very efficient filters, cutting off quite sharply either side of the wanted frequency. In my experience it is rare that such circuits are able to pass a 14MHz wide signal without a considerable falloff as the modulation extends the carrier towards its high frequency limits. It stands to reason that if the high frequency component is not being radiated at the same level as the low, it will not be available at the demodulator, and therefore the high frequency parts of a TV signal will be impaired. Not only that but you will also severely limit the effectiveness of any vision de/pre emphasis networks.

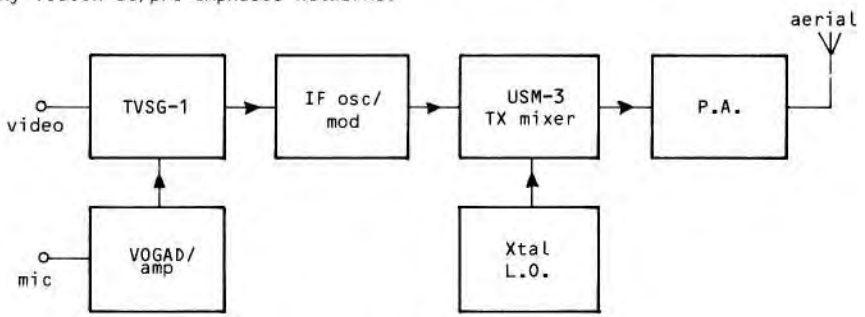


Fig.6 TRANSMITTER BLOCK DIAGRAM

My basic requirements for a transmitter were simple. I wanted two frequencies; 1249MHz for repeater input and 1255MHz for International simplex, and these had to be STABLE. I needed two power levels; low for local contacts and higher for DX working, plus the usual video invert (in case of Frenchmen!), variable deviation, i/c sound and optional pre-emphasis. Of course the main consideration was one of quality and an ability to pass both colour and sound subcarriers without attenuation.

Because of stability I ruled out a signal frequency oscillator, and for reasons of quality and bandwidth I ruled out frequency multiplication of the modulated signal. The most elegant way of producing power at 24cm is to mix two oscillators together in a 'conventional' high-level mixer. This is when I thought of my old friend Piper Communications who import those excellent VHF, UHF and microwave kits from West Germany.

I already had a suitable crystal controlled local oscillator, and a suitable design for a modulated IF oscillator. I already had an excellent wideband PA so all I needed was a decent mixer and driver amplifiers. I knew Piper did a universal 23cm transmit mixer (USM-2) which had a tuned IF input circuit, although it was specified as being suitable for television operation, so I phoned them about it. I was told that the original USM-2 had been superceded

by the USM-3, and that this not only delivered at least one watt out but also had a wideband IF input circuit, making it particularly suitable for my application. The price at £73.71 semed at first quite enough, then I remembered the quality and performance of previous modules from the same source. Coupled with that was the fact that it was complete with case and BNC sockets, so I put in my order.

Fig.6 shows the block diagram of the resultant transmitter.

LOCAL OCILLATOR

The local oscillator I use is part of a complete 23cm converter - the UEK-3 from Piper Communications. This works very well but, if one requires just a local oscillator, then the UEK-3 works out somewhat expensive.

I have just spotted that the RSGB are doing a new oscillator module. The first part of the article is in February 1987 Rad' Com' (page 128). The unit looks ideal and there may even be a PC board available in due course. The circuitry is quite straightforward and the power output (+10dBm) is just right for this application. I use the 'standard' frequency of 1,152MHz.

IF OSCILLATOR

This is the 70MHz module described in CQ-TV 132, except that I have modified it for a higher frequency. The frequency required may be easily calculated, eg: wanted frequency = 1249MHz, L.O. frequency = 1,152MHz therefore the IF frequency should be 97MHz. In fact I have added a transistor to switch in added 'C' to the oscillator in order to provide two transmit frequencies. The modified circuit is shown in Fig.7 and includes all the circuitry between the collector of Tr2 and the oscillator TR3. You will see that the 1k resistor from Tr2 has been changed to a 1uH inductor. This is to further reduce the risk of RF getting back into the modulator. If you don't want the two-frequency system then just modify the capacitor values in the oscillator to those shown here.

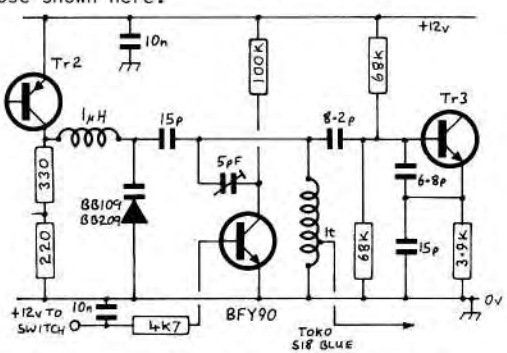


Fig.7 MODIFIED IF OSCILLATOR CIRCUIT FROM CQ-TV 132 (p. 11)

To align, set to the highest frequency first (no volts on the switch line) and adjust L2's core for the frequency required, then apply +12v to the switching line and adjust the trimmer to the required frequency. Switch back and forth between the two several times, adjusting each time, until the two frequencies are correct.

L2 should be changed to a Toko S18 blue coil with a ferrite core, although in some layouts you may in fact need an aluminium core to reduce the inductance. Best to equip with one of each. You will probably find that the resistor R3 will not be needed.

USM-3 TRANSMIT MIXER

I put this unit together from the kit, connected up the two oscillators, switched on and quickly tuned up as directed to find that I had just over TWO Watts output. The unit adjusted very nicely and no trace of instability could be found. Now I had so much power in hand I enjoyed the luxury of optimising for minimum unwanted products at the output. I achieved better than 50dB down for the local oscillator and better than 65dB down for everything else. I checked the harmonics up to 24GHz and could find nothing on the spectrum analyser above the third.

The mixer has a built-in attenuator for the IF input signal. Since I am only using 10mW or so of IF drive I omitted the fixed resistors and just left in the 100R preset potentiometer (drive adjust) and wired a 100R fixed resistor across it, (this to more nearly preserve the 50-Ohm input impedance). The pot' may then be used to set whatever output power you require.

Because I am using the previously described 'black brick' amplifier, I didn't want to radiate 15W or so all the time as the poor old chaps down the road have to keep replacing their front-end transistors! So I removed the 100R fixed resistor from across the variable and installed a second preset. I fitted a miniature changeover relay as well and arranged to relay switch the two presets to the mixer input. Now that I had two controls I could set one for high power and the second for low, at the flick of a front panel switch.

SUBCARRIER GENERATOR

No point in re-inventing the wheel so I used a Wood & Douglas TVSG-1. Unfortunately this needs around one volt of audio input so I developed the VOGAD circuit and associated output amplifier described elsewhere in this issue. If you do use this circuit remove the 680R input terminating resistor from the TVSG-1 and control the deviation from the amplifier output control.

That's the transmitter I use now. The first two stations worked both (independently) stated that they had never seen amateur TV pictures of such high quality, nor had they heard such superb intercarrier audio. I put this firmly down to the wideband circuitry of the IF generator/modulator, the transmit mixer and especially the power amplifier. By the way, I have been able to saturate the power amplifier module now and achieved 18.5W output (into a resistive load) using 13.5v.

Catalogues of Piper Communications products are available at 40p each. For anyone interested in VHF, UHF and microwaves this makes fascinating reading on its own. There are some real gems there for TV'ers I can promise you.

Piper Communication, 4 Severn Road, Chilton, Didcot, OXON OX11 OPW. Tel: (0235) 834328 (evenings - before 9pm).

Most other components, including the BFY90, BB209, 1uH fixed inductor, Toko coil and trimmer are available from Bonex Ltd (see ad's in CQ-TV).

THE 'OTHER' HALF ....

As you probably know many BATC members work in the broadcast television industry, indeed several members of our committee make their living in this way.

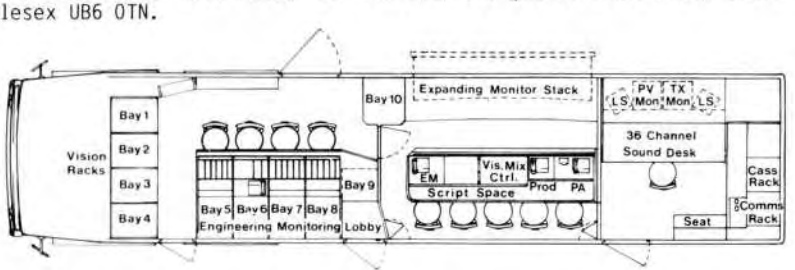
One such member is our treasurer Brian Summers, G8GQS, who works for in BBC outside broadcasting. Many of you will have seen round Brian's own outside broadcast vehicle which has been on show at most BATC functions in recent years. However I thought you might like to see what he is currently working with.

BBC TYPE 6 COLOUR MOBILE CONTROL ROOM

This mobile control room is a complete outside broadcast facility which was first brought into service for the last royal wedding. It is of conventional, three-area layout comprising the engineering area at the front, the production area central and the sound area at the rear. All three control desks are aligned along the length of the vehicle, the general layout of which may be seen from the diagram below.

The unit is designed for six-camera operation using Link 130 or Link/NEC 100 cameras, however a combination of main and lightweight cameras is chosen to meet the needs of the individual programme. The vehicle is fitted with a Grass Valley 1600 vision mixer which has sixteen sources available on each of four control banks. The sound mixer is a 36-channel Calrec with 8 stereo groups.

The above information is taken from a BBC outside broadcast leaflet from the engineering publicity department. Copies are available from Brian by sending an SAE to:- Mr. B.Summers, 29 Perivale Grange, Perivale Lane, Greenford, Middlesex UB6 0TN.



SPECMANSHIP

PART-1 - The decibel

By Mike Wooding G6IQM

Whilst reading through equipment specifications, looking at circuit designs or just listening on-air, we come across all sorts of jargon. Some of this terminology may have very little significance to you as to their meaning and use. Therefore, I decided to try and explain some of the more common and important ones that we come across in amateur television. There I came upon my first stumbling block, where to start? Being in radio and electronics as a career I am supposed to know what these terms mean and how to apply them, my problem was "how much do I assume need not be said"?

In this, the first part of a series, I intend to try to explain the meaning behind, and the use of, various terms with reference to some of the theory. Unfortunately, theory generally involves some maths, which I will try to avoid as much as possible, if not for your sake then for mine! (it's been a long time since I was at college!).

THE DECIBEL

Ever since the Department of Trade and Industry decided to specify the output power from our transmitters in dBW, there have appeared several learned articles seeking to explain the term. If however, you spent your school maths lessons chatting to people of the opposite sex rather than contemplating the significance of the logarithmic ratio when applied to gain and loss figures in telecommunications apparatus, then such articles will probably have not meant very much to you. With a little guidance, a bit of finger counting and some blind faith, anyone can learn to handle the dreaded decibel well enough for the practical purposes of most amateurs.

If you build a linear amplifier which produces 100 Watts output with only 1 Watt input, the gain of the amplifier can be expressed as the output-to-input ratio, ie. 100/1 = 100. The amplifier is said to have a 'power gain' of 100.

If you now build a series of pre-amplifiers and connect the lot together in such a way, that to get your 100W output you only need 1 microwatt (1uW) of input, the power gain has become 100/0.000001 which of course is 100,000,000!

All those zeros are a bit mind boggling, did you manage to divide 100 by 0.000001 and get it right? I know you've all got pocket calculators but even that can't work it out correctly if your index digit stabs at the zero key once too often.

Fortunately, some clever-dick a few hundred years ago invented a mathematical tool which enabled us lesser beings to handle incredibly large or small numbers without tripping over our own zeros! He called this tool Logarithms. A later whizz-kid decided that logarithms were just the thing for expressing all sorts of ratios and showed that they could describe ratios of powers, voltages, currents, gearboxes, sound units and so on. This guy's name was Bel and we can all lay the blame for our confusion well and truly at his feet.

Now for the blind faith: A power gain of ten just happens to be 10dB - remember that. Our first amplifier had a gain of 100, so what's that in decibels? Start with the input which was 1W and, as we've just said, ten

times that equals 10dB which I hope you can see is 10 Watts. Now starting from this point, ten times 10 Watts gives our 100W and is a further 10dB. Add this to the first 10dB and you get 20dB total. So without any knowledge of logarithms we've worked out that a 100W amplifier driven by 1W has a power gain of 20dB. Easy isn't it? - now try this:-

If you double your power it is said to increase by 3dB - remember this too (it's the last one - honest!). So if you start off (say) with 1uW and increase it by 3dB, you get 2uW. Increase this by another 3dB (making a total of 6dB) and you get 4uW. Double again to 9dB to get 8uW. Can you see that the dB figure only increases by three each time whilst the actual power figure grows at an alarming rate by doubling itself every time. You won't have to do that many times before your power reaches monumental proportions, but the dB figure representing that power is still quite small. Let's have an example:-

Starting with our 1uW and doubling it over and over again until we get 1KW (1000 Watts or 1,000,000,000uW) our dB figure - adding 3 each time we doubled the power - has only reached 90dB, a bit easier to say (and write) than "one thousand million"! Also dB's were only added whereas powers were multiplied, it's easier to add than multiply. Of course it works the other way too with losses instead of gains. Every time you lose half your power it goes down by 3dB (written as -3dB), and if your power drops to one tenth then it has dropped by -10dB. So if you have a complete circuit where some parts give gain whilst others give losses then the total gain (or loss) is arrived at by simply adding and subtracting the individual dB figures.

Fig.1 shows the business end of a television transmitting station. The PA delivers 10W. The aerial changeover relay loses a bit (-1dB), the coax cable run to the aerial loses some more (-4dB), all the coax plugs and sockets together lose another -1dB between them and the aerial has a gain of +16dB. All the losses added together make -6dB. But the aerial gain makes this up plus a further 10dB, so that the actual power radiated by the aerial is 10dB greater than the power delivered by the PA. The PA gave 10W so the aerial radiates 100W. And all without a logarithm in sight!

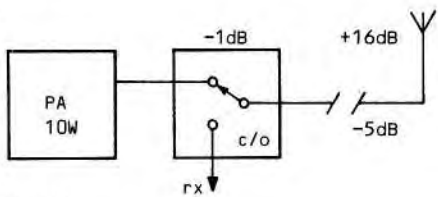


Fig.1

Having come this far let's finish with a bit more blind faith. Remember our original amplifier which delivered 100W (20dB) from a 1W input? If a manufacturer said his amplifier had a gain of 20dB, how much power would it deliver? We don't know because he hasn't stated his reference input level. If however, he said his amplifier delivered 20dBW, then we know that its output is 100W because the 'W' stuck on the end means "referenced to one Watt". Similarly if an amplifier is said to have an output of 10dBm, its output power is 10mW because the 'm' tacked on the end means "referenced to one milliwatt". So from now on don't let anyone tell you that his rig has an output of so many dB because it is meaningless. It might have a GAIN of so many dB but until he says what his reference level is (usually 1W or 1mW) you have no way of calculating the output power.

Table-1 gives some gains and losses of power ratios to enable you to change your Watts to dBW or dBm and vice-versa.

Finally, (and just to confuse), if we start talking about voltage ratios instead of power ratios the dB figures double. So if a given voltage doubles it is said to increase by 6dB (instead of 3dB for power), and if the voltage increases by ten times it is said to increase by 20dB (instead of 10dB for power). You don't need to understand why, just be on your guard against "spec-manship" where a manufacturer might choose to express his new amplifier's voltage gain rather than its power gain because the dB figure is twice as big, he's not telling a lie but he might hope that the bigger number will impress you enough to buy it.

DECIBELS dBW	DECIBELS dBm	WATTS W	DECIBELS dBW	DECIBELS dBm	WATTS mW
+29	+59	800	-1	+29	800
+28	+58	640	-2	+28	640
+27	+57	500	-3	+27	500
+26	+56	400	-4	+26	400
+25	+55	320	-5	+25	320
+24	+54	250	-6	+24	250
+23	+53	200	-7	+23	200
+22	+52	160	-8	+22	160
+21	+51	125	-9	+21	125
+20	+50	100	-10	+20	100
+19	+49	80	-11	+19	80
+18	+48	64	-12	+18	64
+17	+47	50	-13	+17	50
+16	+46	40	-14	+16	40
+15	+45	32	-15	+15	32
+14	+44	25	-16	+14	25
+13	+43	20	-17	+13	20
+12	+42	16	-18	+12	16
+11	+41	12.50	-19	+11	12.50
+10	+40	10.00	-20	+10	10.00
+9	+39	8.00	-21	+9	8.00
+8	+38	6.40	-22	+8	6.40
+7	+37	5.00	-23	+7	5.00
+6	+36	4.00	-24	+6	4.00
+5	+35	3.20	-25	+5	3.20
+4	+34	2.50	-26	+4	2.50
+3	+33	2.00	-27	+3	2.00
+2	+32	1.60	-28	+2	1.60
+1	+31	1.25	-29	+1	1.25
0	+30	1.00	-30	0	1.00

Table-1

INTERNATIONAL ATV CALLING 144.750 MHZ

A 50HZ STANDARD

By Jeff Underwood, G6BNE

How many times has there been a requirement for an accurate 50Hz signal source? For instance: when converting a 'mains only' TV camera for battery use. Also, some cameras have 50Hz oscillators which are locked to the mains frequency, but when used on battery the oscillators free-run, often producing mediocre accuracy. I had a similar ploblem; a mains only camera, which relied on AC for its 50Hz timebase, there being no oscillator at all.

With an eye for new applications for existing integrated circuits, I came across the M706BI 50Hz timebase C-MOS chip. This employs a 3.2769MHz clock and has an internal divider chain to produce 50Hz with phase complimentary outputs. The circuit is shown in Fig.1

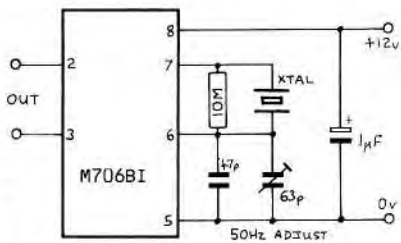


Fig.1 CIRCUIT DIAGRAM

The unit can be assembled on a small piece of stripboard and will fit into the most compact cameras. Since most cameras run off 12v this supply is adequate, however, being C-MOS, it will quite happily run from lower voltages.

The output of the circuit is simply connected to the original AC input point to the timebase, either output may be used. All components are available from Electromail (RS Components).

Results on my camera are excellent and I observe no interference to the field sync. I see no reason why this circuit couldn't form the basis for a voltage invertor, by using both outputs. Or perhaps even a battery clock.

Narrow Bandwidth TeleVision Association

The NBTVA, founded in 1975, specialises in the mechanical and low definition aspects of ATV and offers genuine (moving) TV within a basic bandwidth of 6 - 7KHz.

The techniques, basically an updated form of the Baird system, are a unique mixture of mechanics, electronics and optics.

Membership is open world-wide on the basis of a modest yearly subscription (reduced for BATC members) which provides an annual exhibition and quarterly 12-page newsletters, together with other services.

For further details write to: Doug Pitt, 1 Burnwood Drive, Wollaton, Nottingham, NG8 2DJ or telephone Nottingham (0602) 282896.

UNDERSTANDING PRESTEL

By Mike Wooding G6IQM

In response to several enquiries we have received concerning Prestel, and since the club is now operating a lot of frames on the system, I have decided to write this article as an introduction to Prestel for those to whom it is a mystery.

Prestel is a large data-base, accessible, with the appropiate equipment, over the ordinary telephone network by simply dialling a number. This telephone number, and there are several throughout the country, gives direct access to the main-frame computers driving the system, and hence to over 300,000 pages of information. The service is operated by British Telecom who provide and maintain the computers and peripherals, and of course the telephone network. The information in the frames is provided in the main by companies and organisations, giving details of goods or services that they provide. The information available varies from details of the Aberdeen Harbour Board to zoos and safari parks. You can enquire the price of theatre tickets and also book your seats. You can check the availabilty and price of aircraft tickets and make reservations. You can even conduct mail order shopping with various large companies. You can see then that one can access information concerning just about anything you care to mention. Furthermore, the system is expanding daily with new companies coming 'on line' offering an even greater diversity of information.

EQUIPMENT

To enable you to access the Prestel network there are several things you will need:

1) A customer identity number and a personal password.
2) A terminal unit to send and receive data to and from the main-frame computers.
3) A telephone line.
4) A modem (modulator/de-modulator) unit.

Your customer identity number and personal password are obtained from Prestel upon receipt of your initial subscription, which at present is £6.50 per quarter. Prestel enquiries are answered by phoning 01-822-1122.

The terminal may be a dedicated Prestel unit comprising a keyboard, monitor, dialler and communications interface (ie: modem). Alternatively, a home computer with suitable software may be used and programs are available for most of the popular makes of computer. These are priced from around £30 upwards.

The telephone line is, of course, provided by British telecom, but it must be an exclusive exchange line and not a party line. The connection can

be your existing telephone line with the instrument still connected for normal use, when the Prestel system is not being accessed.

The modem is the piece of equipment that is connected between your terminal equipment and the telephone line. The unit is the communication interface and the word 'modem' is actually a mnemonic for modulator and demodulator. As the name implies, the modem modulates the output data from the terminal unit into a format suitable for transmission over the telephone network, and subsequent reading by the main-frame computers. Also, the modem demodulates the incoming data into the correct format for reading by the terminal unit.

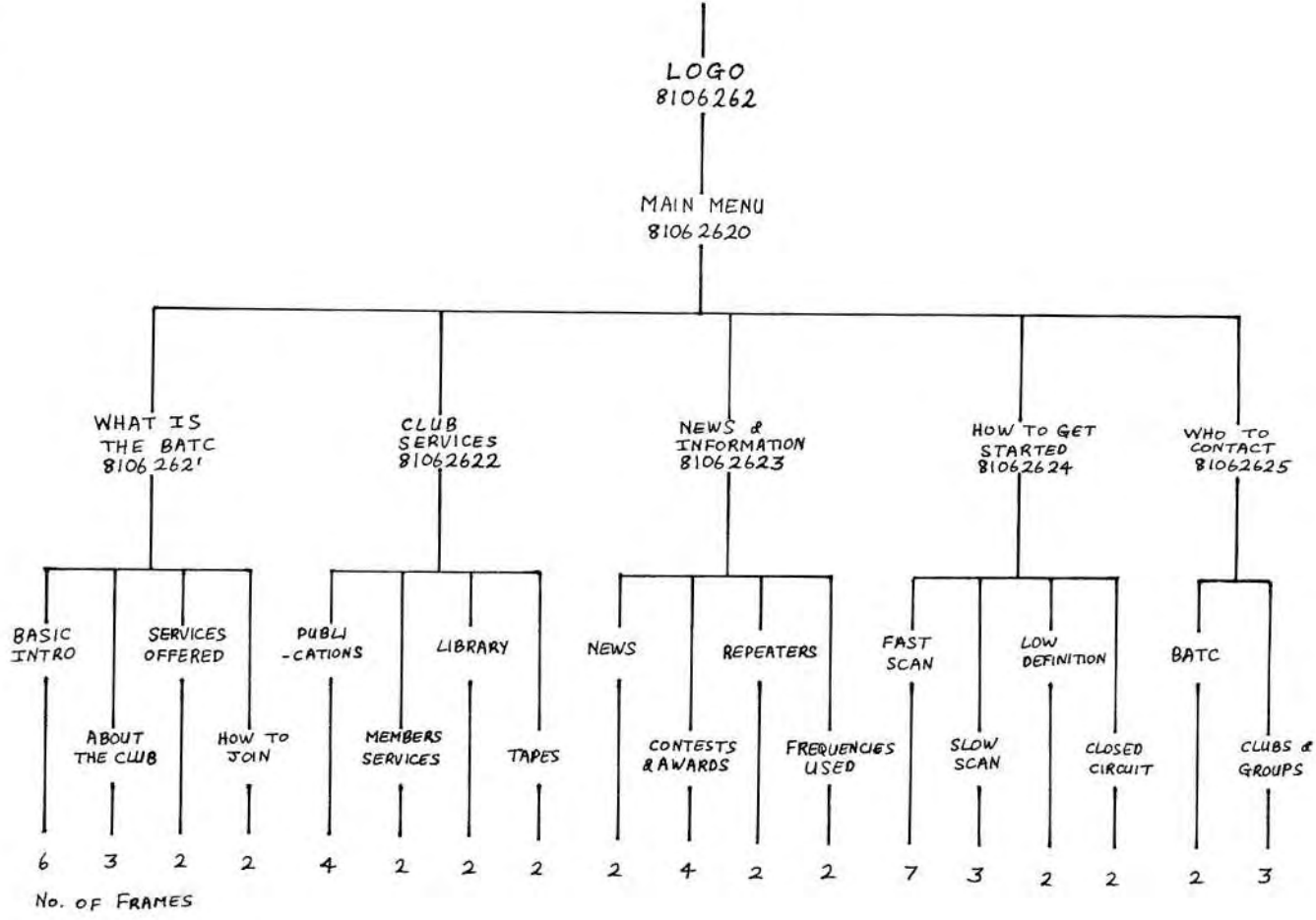
Modems come in a variety of types with differing facilities. They may be acoustic types, where the telephone handset sits in a cradle and the signals transferred by acoustic couplers. The main disadvantage with this type of modem is that any loud extraneous noises in the vicinity of the handset may cause the system to drop out or malfunction. The main advantage is their price, starting from approximately £25. An alternative is the direct coupled variety where, as the name suggests, the unit is hard wired to the telephone line. This type of modem has the immediate advantage of being completely immune to interference from external noises. Unfortunately, as with most things, this advantage is reflected in the cost of such devices, ranging as they do from about £60 upwards. It is possible by checking with suppliers to get special offers on modems, often with the computer software included in the price.

A problem with direct coupled modems is that they have to be connected to your telephone line. However, since December 1986, due to what our leaders call liberalisation, you may now connect extensions etc to your telephone system yourself, as long as the connection is not made to the Network Termination Block. That is to say that you are not allowed to hard wire anything into the block where the incoming line is terminated. You MUST get BT to fit the first extension socket or block, then you can fit any approved equipment yourself if you wish.

The modem and terminal unit, or computer with appropiate software, can be purchased from most computer retailers. As previously mentioned a home computer can be used as long as a suitable program is available for it. There is no special requirement for a large memory, any standard machine will suffice. When using the system only the frame selected is held in your computer's memory, the rest of the work is being done by the Prestel computers.

CHARGES

The information system itself is divided into menu pages and information pages. The menu pages and most information pages are accessible free of charge. However, certain information pages carry an extra charge which is payable to the Information Provider. When chargeable pages appear on a menu a warning is shown alongside the page number indicating the amount payable


LOGO
8106262
MAIN MENU
81062620
WHAT IS THE BATC
81062621
CLUB SERVICES
81062622
NEWS & INFORMATION
81062623
HOW TO GET STARTED
81062624
WHO TO CONTACT
81062625
BASIC INTRO
ABOUT THE CLUB
SERVICES OFFERED
HOW TO JOIN
PUBLI-CATIONS
MEMBERS SERVICES
LIBRARY
TAPES
NEWS
CONTESTS & AWARDS
REPEATERS
FREQUENCIES USED
FAST SCAN
SLOW SCAN
LOW DEFINITION
CLOSED CIRCUIT
BATC
CLUBS & GROUPS
6 3 2 2 4 2 2 2 2 4 2 2 7 3 2 2 2 3
No. OF FRAMES

(usually a few pence) upon selecting that page. Any charges for using such pages are due quarterly and are shown on the Prestel subscription invoice. These charges apply whenever such pages are accessed.

Apart from the quarterly subscription and page charges there are other costs to be born when using the system. The cost of the telephone call and the charge for time spent connected to the system. The telephone call in nearly all cases is charged at local rates, the only exclusions being people who live in very remote places. Details of these charges are available from your dialling code book or telephone directory. The charge for time spent on the system is 6p per minute Monday to Friday 8am to 6pm and Saturday 8am to 1pm. At all other times and on Bank Holidays there is no charge.

MAILBOXES and CUGS

Apart from the availabilty of accessing this large store of information, another useful facility offerred is the Mailbox. This enables any user to leave messages for other users, Information Providers or Prestel itself. These messages are then picked up when the recipient next logs into the system and, if necessary, a reply lodged in the originators mailbox. Whenever a user logs in if any messages await attention in the users mailbox a prompt message appears on the screen.

Within the system there are Closed User Groups (CUGS) which, in many cases, are groups of businesses with similar trading interests such as insurance etc. These CUGS use the system as a data base linking them together for the transfer of private information. Any frames allocated to them are not accessible to a user unless, as a member of the group, the appropiate access code is known.

There is a CUG which is available to any user upon payment of a further subscription to Prestel. This is Micronet 800 and is operated as a joint company by Prestel with Telemag Ltd. The subscription is a further £10 per quarter, bringing the combined amount to £16.50. Further details are available by phoning Micronet on 01-278-3143. Micronet offers, among other things, computer programs and games that you can down load into your computer and store on disc or tape for later use. You can also hold real time 'conversations' with other members over the system, and also access Prestel's Viewfax, School link and ClubSpot.

The ClubSpot service is of interest to BATC members since it is in this area that we find the BATC, RSGB, Amsat UK and Bartag frames. Direct access is by selecting the page numbers shown below, thus avoiding a search for the correct menu page.

BATC	8106262
RSGB	8107
AMSAT UK	8106263
BARTG	8106261

In order to help you find your way around the BATC pages, the following 'tree' shows the layout and initial content of the pages and frames. A 'page' represents a main subject, whilst a 'frame' represents a screen of information residing within a page. A page may comprise one or more frames and each has its own number. For example: the 'LOGO' page (number 810626a) is a page by itself whereas 'Club Info' (page number 81062621) comprises four frames; each having the same page number but identified by a suffix letter appended to the end. Although at the present time it is not necessary to subscribe to Micronet to be able to access the club's pages, this may not always be the case.

I hope that this article has helped to clear away some of the mysteries of Prestel and the facilities available through the system. The telephone numbers for Prestel and Micronet 800 enquiries again are:

Prestel 01-822-1122
Micronet 800 01-278-3143

TV DISTRIBUTION AMPLIFIER

John Wood, G3YQC

Not so much amateur as general TV this one. How many of you run more than one TV set in the house from a single aerial? It's OK if you live close to a TV transmitter but many of us live in fringe areas. After splitting the available signal, usually passively, into two or more, there is often not enough signal left to drive the sets properly.

What is required of course is an aerial amplifier with multiple outputs, so that a decent signal can be fed to each set. I came across this problem when I wanted to watch the test matches on three TV's (strategically placed around the house), so I put together the little amplifier shown in Fig.1.

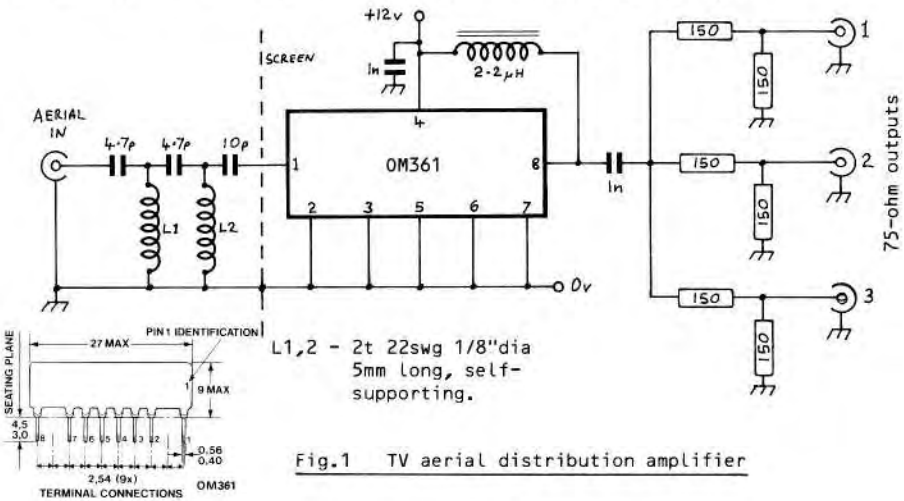


Fig.1 TV aerial distribution amplifier

CIRCUIT DESCRIPTION

This amplifier is based around a OM361 hybrid RF module (Electromail 302-485) which, by itself, exhibits around 28dB gain flat across the UHF TV spectrum. In fact the module amplifies at full spec. right down to about 40MHz, so they are pretty useful devices to have around.

I live close to Rugby Radio station and BBC Daventry and I therefore need to keep an eye on the bandwidth of amplifiers, otherwise their already strong signals will just blast in along with everything else. Therefore I have included a simple high-pass filter at the input which effectively attenuates signals below the bottom of the UHF band. This can be seen from the plot in fig.2. The HF rolloff is due to the amplifier's natural bandwidth characteristics.

I suppose it would have been nice to divide the output signal using toroidal transmission line transformers. However, always one to find the easy way out, as well as making the design repeatable for others, I opted for a simple

resistive divider circuit. Each output is largely independent of the others and will match into 75-ohm coaxial cables. The total gain for each leg of this design is around 10dB. The quoted noise figure for the OM361 is only around around 6dB, not good for communications but reasonable for domestic TV.

CONSTRUCTION

Be a little careful about the construction of this unit. Make sure you keep input and output components well separated and preferably screened from each other, otherwise the amplifier may tend to self-oscillate.

Probably the best way of building is to make a little printed circuit board, double sided, with the top as just an earth plane. Solder the ground legs of the amplifier to both top and underside and provide several similar stakethroughs around the rest of the board. Keep all tracks as short as possible and make sure the decoupling capacitor at pin-4 is mounted close to the pin. The choke is an ordinary axial type available from Bonex Ltd. Capacitors should be miniature ceramics and resistors 1/4W carbon. L1 and L2 are made from enamelled or bare copper wire

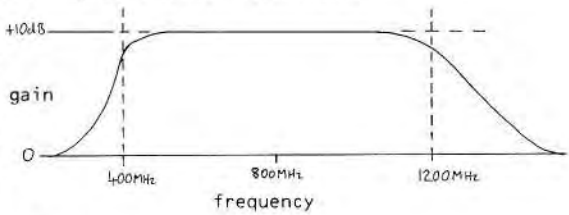


Fig.2

For those not able to make a PC board it is possible to lie the amplifier flat onto a piece of plain copper laminate and hand-wire the components to the legs. The ground connections should be carefully bent down and then out ('L' shaped) so that the amplifier lies against the board and the leads just touch the surface. Solder these five leads to the board which will firmly secure the amplifier. For the other component connections (other than those to ground) small pieces (around 3/16" square) of PCB material may be cut from an off cut and glued to the main board, these will act as junction pads to which the other components can be soldered.

It is still possible to put a screen in the position shown, although the lead of the 10pF capacitor will have to be brought through a hole, and insulated, either by using a feedthrough insulator or by sliding a short piece of plastic sleeving over the lead. Keep the lead length to a minimum. Alternatively the screen can bridge across the module itself, towards the input end. Although a suitable shape will have to be cut out of the screen first.

TESTING AND OPERATION

The amplifier should be tested to see that it performs satisfactorily and does not self-oscillate, then it can be mounted into a small metal box. Power should be fed into the box via a 1n feedthrough capacitor.

The unit will draw around 50mA and will run quite warm. If it is provided with a suitable power supply, and adequately protected and made safe, it can be left on permanently in the loft. Mine has been running up there for four months now and seems perfectly happy.

TV ON THE AIR

By Andy Emmerson G8PTH

SLOW-SCAN NEWS

No reports this time but don't forget the new BATC book 'The Slow-Scan Companion'. It's selling very well indeed and is being acclaimed by everyone. Can you afford to be without one?

MICROWAVE MATTERS

G3YQC reports superb results with his new ATV transmitter for 24cm. Details may be found elsewhere in this issue.

Dave, G1GPE (Leamington Spa) is happy to announce that he is fully operational on 24cm. Running both Wood & Douglas and Solent receivers Dave has already made many contacts around the midlands. On transmit is a Solent 1W transmitter into a 24cm Power module to the design elsewhere in this issue. Output is 15W.

SEVENTY CM.

No activity during the last three months reported!.

Well, that's it - you must have all taken up weather satellites or given up ATV. Luckily we had two letters from abroad this time, so here goes.

Starting off with D. Dobricic YU1AW from the Jugoslavian amateur radio club, we learn that ATV is very much the flavour of the month there. "Suddenly, we got very interesting and exciting opportunity for our future ATV activity. Every few weeks we are getting permission to broadcast program devoted to amateur radio and other technically inclined program, on one of the commercial channels (usually UHF 43)."

He goes on to say they use non-professional tape formats - in other words VHS and Beta - and really could do with a time base corrector. It all sounds great fun.

From even further away, in Warsaw, Stanislav Pazur brings us up to date on ATV activities in Poland. There are just two magazines for hams, "Radioelektronik" which everyone can buy, and "PZK Bulletin" which is for members only of PRV, the national radio club. Neither magazine publishes much on ATV (to date there have been just three articles, all on SSTV). At the end of 1985 the Polish Radioamateurs Union, PZK, recorded 6462 licensed amateurs, 1817 SWLs and 560 club stations (80 being RTTY stations). An ATV club was founded in May 1985: it is called Polski Zwigzek Radiowideografii - the Polish Radiovideographers Union. Founding members were SP2JPG, SP3CMX and SPLRS, with Wojciech Cwojdzinski SP2JPG as president.

First ever station authorised for SSTV was SP3ZHC from Zielona Gora, and using the special event callsign SPOPIR she hooked up with OZ3WP on March 3rd, 1980. Since then SSTV operation has expanded, and between 15 and 20 stations are now active (one is a club station). There are no fast-scan stations and the

shortage of RF power output valves and semiconductors is the reason for this.

The second meeting of the Radiovideograph club was held in Leszno on May 10/11th last year; around 100 amateurs attended. Jurgen Y23NE was also present as a guest from Germany. A special event station SPORVG operated during the meeting. On Polish TV's second channel network there is now a monthly programme for radio enthusiasts. Its main goal is to popularise HF and VHF activity and has the special station SP6TVP which operates during the programme. SP6ARR, who works for TV Poland, is the presenter. What a shame we have now regular program for hams on British TV.

Let's have a bit more news for the next "On the Air"! Please let me have your news and photos - send them to me at 71 Falcutt Way, Northampton, NN2 8PH - and have fun.

THE SIMPLEST PATTERN GENERATOR

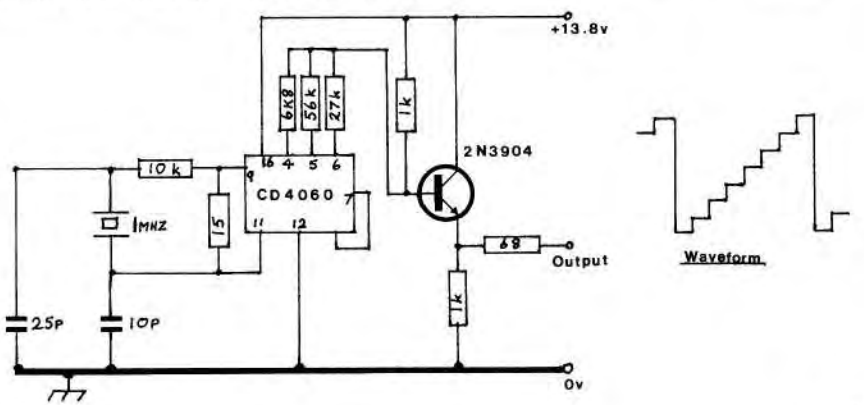
By Terry Bond

This circuit was originally put together to provide a simple video source for testing a portable microwave link in the field, but could also prove useful in the shack for setting up video equipment.

The circuit is based on a 14-bit decade counter; the CD4060B, and is very simple in design and construction. The 1MHz crystal provides a clock for the counter and the 2N3904 transistor (any low noise small signal NPN type may be used e.g. BC109) provides an emitter follower buffer stage for the output.

The output waveform is a simple rising staircase which will give a Grey Scale bar pattern on the screen. Although there is no Field synchronisation pulse on the waveform this should not cause any problems as most receivers will lock field to blanking. Indeed the internal test signals on most VCR's carry no field pulses yet adequate locking is obtained with most receivers.

The unit can be constructed on Vero board, the layout not being critical to the operation, but it is suggested that it is housed in a metal box in order that stray RF does not affect the clock.



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NARROWBAND
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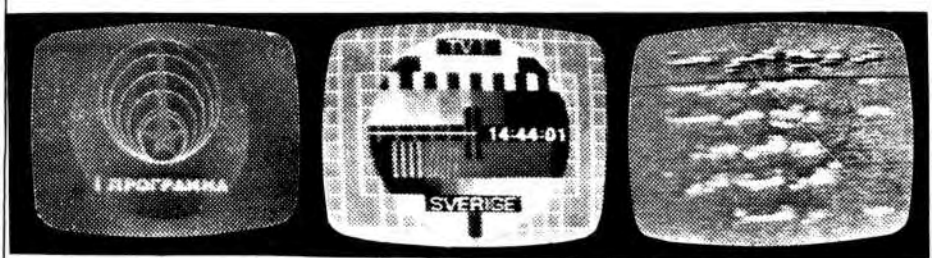

From May until September, Sporadic-E ionisation affects Band I frequencies between 40 and 70 MHz. Watch its fascinating effects by viewing TV pictures from Europe and even further afield. Countries logged last year included Russia, Poland, Czechoslovakia, Hungary, Yugoslavia, Rumania, Iceland, Norway, Finland, Spain, Italy, Portugal, Switzerland, Austria, Denmark, Sweden, Morocco, Tunisia, Jordan, etc., etc.

Interested? For further details send 52p in stamps (refundable against first purchase) and we'll send you a copy of our DX-TV starter guide which discusses the hobby of long-distance TV in general, the pros and cons of narrow-band DX-ing, propagation and the much acclaimed D-100 DX-TV Converter system. We'll also send details of our latest range of publications.

We can also supply the latest book by Roger Bunney ('A TV DXers Handbook') at £5·90 including P&P (UK only). Also available is 'TeleRadio News' at a subscription rate of only £6·00 (UK only) for 6 bi-monthly issues. Details of export prices for all items available upon request.

SPECIAL OFFER TO BATC MEMBERS

'TeleRadio News' or 'A TV DXers Handbook' will be supplied absolutely FREE with the purchase of a D-100 Converter if ordered before July 1st., 1987.

HS PUBLICATIONS

7 EPPING CLOSE DERBY DE3 4HR ENGLAND

A DIGITAL FRAMESTORE

With all this digital technology creeping into television these days it has only been a matter of time before it crept into the amateur field. We've all seen those dazzling tumbles, wipes and other effects from units such as the Quantel system, wouldn't it be great if we too could aim towards that sort of picture manipulation. Of course the first requirement for such a system is the digitisation, in real time, of the televesion picture. Once the picture is in a digital frame store then it is relatively (?) easy to manipulate. Now there is a company - Oggitronics - who specialises in digital framestores, including some in the lower price bracket.

The one which I have been trying out was serialised as a project in 'Electronics Today International' magazines for September, October and November 1986. As described the unit operates as a 4-bit (16 level) framestore although the ADC/DAC chip which forms the heart of the system is an 8-bit device.

The whole unit is laid out on a single printed circuit board and it has sufficient memory to store two frames of video at a time, selection of these 'pages' being by a simple switch. Due (presumably) to the requirement of the double page feature as well as a wish to keep the number of memory chips to a minimum, the design has sacrificed some of the visible frame area and chopped off a bit of the bottom of the picture. This wasn't evident from the articles although the described mathematics did indicate such a limitation. I contacted Oggitronics and found their Dan Ogilvie very helpful indeed. He realised my problem and sent me modification details so that I could achieve a full sized picture, this did however mean that the two-page facility was lost.

The unit has some extra features which enable some very wierd but interesting effects, this is all possible because of the simple ability to manipulate the image. An internal sync generator provides sync drive pulses which can be used to lock an external video source to the framestore. Provision is

included however to lock the framestore to an incoming composite video signal. I have to say that I found this mode of operation a little susceptible to sync disturbance caused by wide video excursions, nevertheless it proved a very useful facility. The displayed picture derived from internal syncs was, of course, very stable indeed.

Pictures are stored by pressing a single button at the required moment, however, it is also possible to continuously digitise the incoming picture and display it in real time.

The 16-level picture, although perfectly watchable, does show a considerable degree of 'digitisation'. But, according to Mr.Ogilvie it should be possible, by adding some extra circuitry) to quite easily increase the sampling rate to 6-bit (64 levels). Obviously this would improve the resolution dramatically. I hope to be trying this as soon as time permits.

I am pleased with my framestore and as a first entry into this field I consider it to be a very worthwhile project which is full of potential. I am awaiting the release of an add-on RS232 interface which provides a comprehensive, albeit slow, access to the store. This should increase its versatility considerably.

A kit of parts is available as is the PC board by itself. I believe that a built and tested version is also available. Oggitronics also make commercial framestores in a variety of types and sizes for applications in security and industrial markets. Full details can be obtained from: Oggitronics, Poole House, 37 High Street, Maldon, Essex CM9 7PF. Tel: (0621) 50378

SCANNING & SYNCS

Part-2

By John Goode

SYNCHRONISATION

Having considered the various types of scanning that are likely to be encountered, we should now consider the function of the sync pulses in accurately conveying the system's timing information. In Figs.2 & 4 (CQ-TV 136) I have shown the sync-trains necessary for generating the rasters shown in Figs.1 & 3 respectively. Fig.2, the interlaced signal, has field sync occurring every 5.5 lines, giving odd and even fields, whereas Fig.4 has all fields identical. In fact, the type of sync shown in Fig.4 is only likely to be encountered at the video output of some computers, and I do not propose to pursue this further, as I want to concentrate on the function of the syncs in "normal", interlaced TV.

It must be remembered that the fundamental design of the sync waveform is now 50 years old, and the complications that are included in the generation of full-spec. sync are part of the broadcaster's philosophy that seeks to allow the receiving apparatus to be as simple (and therefore cheap) as is consistant with reliable operation. Naturally, the waveform was designed with the available receiver techniques of that period in mind. In the very early days, they could not even count on techniques in the receiver as basic as flywheel line oscillators! It will therefore be instructive to start with the basic sync-train as illustrated in Fig.2, and consider step-by-step why it was refined to the broadcast waveform.

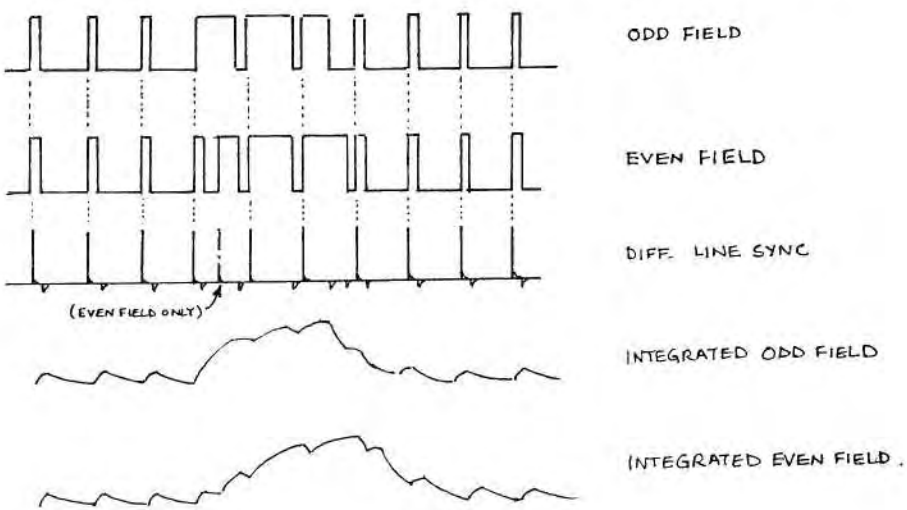

Fig.8 MAKING THE LINE SYNC CONTINUOUS.

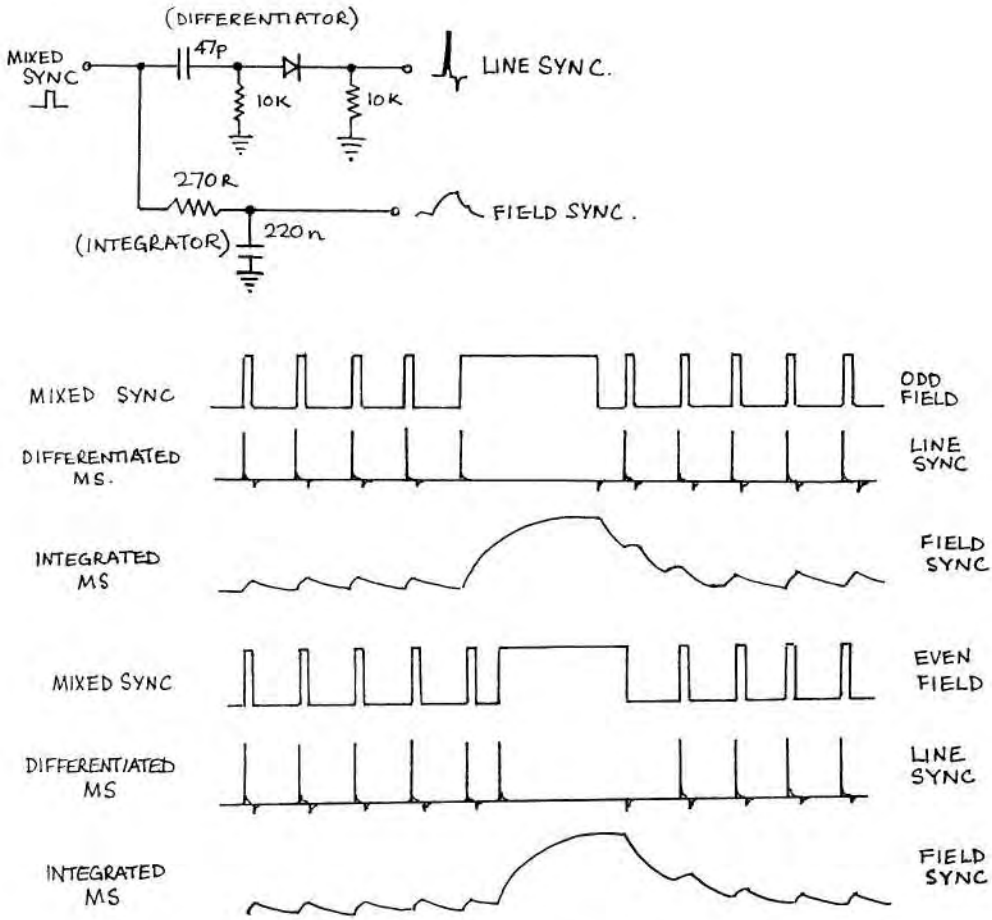

Fig.7 SEPARATING LINE AND FIELD SYNC.

Referring to Fig.2, several observations can be made. Note that each line period starts and ends at the leading edge of the appropriate sync pulse; similarly the leading edge of the field pulse indicates the boundary of each field. From this it can be stated that the leading edges of the sync pulses indicate the timing data for the receiver to lock to. Secondly, the difference between line and field sync pulses is one of duration, the field pulse being much longer. This was done so that differentiating the mixed sync waveform produces line pulses, whilst integrating it gives field sync only. See Fig.7. For clarity I have shown the field sync in Fig.2 as only 1 line long; in practice to give reliable separation it needs to be 2 to 4 lines long. In the UK system it has a duration of 2.5 lines, so I shall use that figure from now.

Having a field sync pulse that is 2.5 lines long (2.5H), causes a problem with our differentiated line sync output, as the line sync that would have been occuring during that period will be lost; also at the start of the even field the leading edge of the field sync will produce an additional pulse at a half line spacing, see Fig.7. No problem for a modern receiver with flywheel sync, but what about a direct locking system? Surely it would be better if the line sequence could be continued through the field pulse? In Fig.8 I have shown this. However, this makes the odd and even field sync pulses quite different, and they will produce unequal responses at the integrator output.

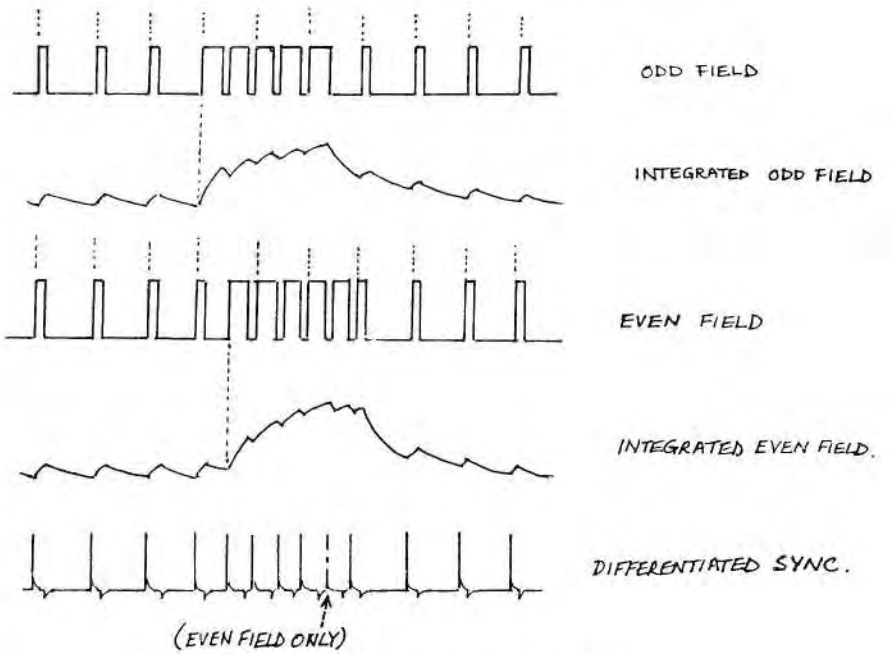

Fig.9 BROAD PULSE FIELD SYNC.

The next step is to adopt 5 "broad pulses" (occurring at half-line intervals) as the field sync. This is shown in Fig.9, together with the resulting integrator output. Although both the odd and even field pulses are now identical, the response from the integrator differs slightly between fields, due to the variation in timing of the preceding and following line sync pulses. At the start of the odd field the preceding line sync pulse occurs a whole line before the first broad pulse, whereas the first broad pulse of the even field is only a half-line after the previous line sync pulse.

Consider this in more detail. In order to achieve a properly interlaced picture, it is important that the odd and even rasters are accurately displaced by half a scanning line - see Fig.1. If an integrator is used to separate field sync it is obvious that it will not be possible to detect the leading edge of the first broad pulse, as the charge on the integrating

capacitor will take some time to build up to triggering level. This doesn't matter, so long as this delay is identical on both odd and even fields, ensuring the accurate half line displacement. Returning to Fig.1, if you imagine line 1 starting a quarter of the way across the raster (representing the delay in the integrator), then providing that the even field starts with a half-line offset, (i.e., three-quarters across the raster), a good interlace will result.

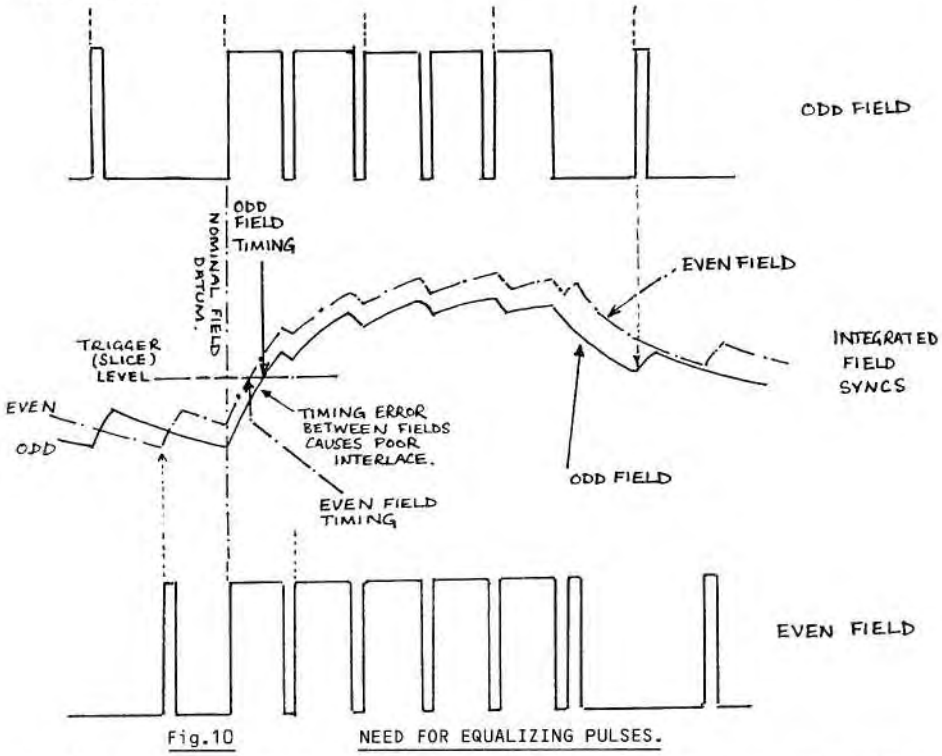

Fig.10 NEED FOR EQUALIZING PULSES.

Fig.10 shows that these conditions are not met. Each of the line sync pulses charges the integration capacitor to a small degree, this charge gradually leaking away during the normal line period. However, at the start of the even field, the capacitor will have had only half a line period to discharge, and so the standing charge on the integration capacitor at the start of the even field will be higher than at the start of the odd field. The result of this is shown in Fig.10 - the trigger timings for the two fields show an error, which, although it looks quite small on the drawing, can be a significant proportion of the half-line period.

This problem is overcome by the addition of a series of narrow pulses at half-line intervals before and after the broad pulses - these are known as "equalizing pulses", as they ensure equal charge on the integration capacitor prior to the start of both odd and even field sync pulses. In the UK system there are 5 pulses before, and 5 pulses after, the field sync broad-pulses; see Fig.11. As they are set at half-line intervals, it is arranged that they

be half the width of normal line sync - this so that the integration capacitor is discharged to the same degree in half a line as it would be in a whole line when line-sync is present. These pulses could also be thought of as "isolating pulses", as they effectively isolate the field sync from the "odd/even" variations of line sync, allowing equal response from the field sync integator. The choice of 5 pulses is to make sure that there are enough charge/discharge periods prior to field sync to negate any effects from line sync. The full European spec mixed-sync waveform is illustrated in Fig.11; this is also referred to as C.C.I.R. Spec. sync.

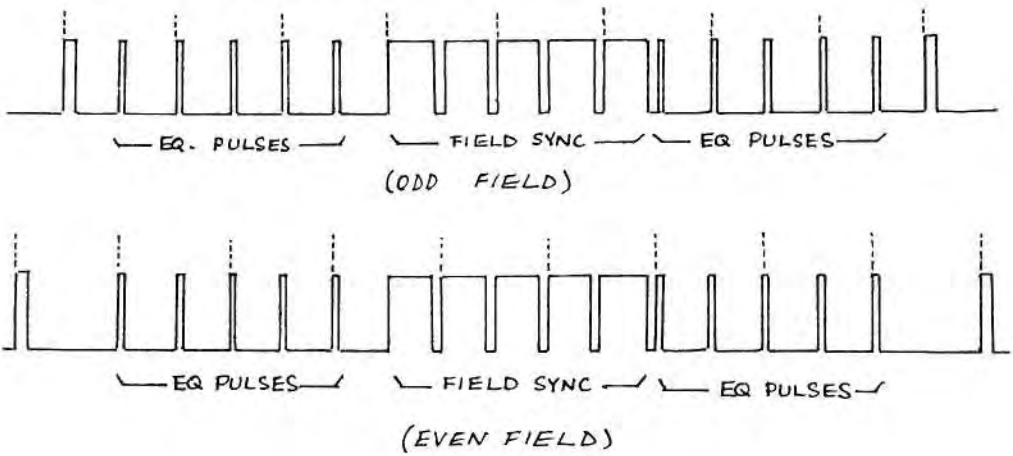

Fig.11 FULL SPEC. SYNC. (C.C.I.R.)

BLANKING.

The basic function of the blanking signal is to suppress the picture information during the periods when the scanning spot is flying-back to the start of a line or field. By modern receiver standards the blanking periods allowed are very generous - particularly the 25 lines allowed for field-blanking. Consider Fig.12 in which I have shown a line blanking period. It can be seen that it is divided into two parts - the FRONT PORCH and the BACK PORCH, situated either side of the sync-pulse. The function of the back-porch is to allow flyback time and provide a known point for sampling black-level; however, it also proved a very convenient place to put the colour synchronising burst, but this was a much later addition. The front porch is to allow time for the picture information to fall to black-level without affecting the timing of the leading-edge of line sync - see Fig.13.

The timing of field blanking is such that it starts at the first equalising-pulse (to be strictly accurate, a "front-porch" before it), and continues for 25 lines (25H) - this means that the top of the picture occurs 22.5H after the start of field-sync. Although this period is much longer than that required for actual flyback, it is quite useful to have an "invisible" interval in which all sorts of test, teletext, VTR head-change dropouts, etc. can be put.

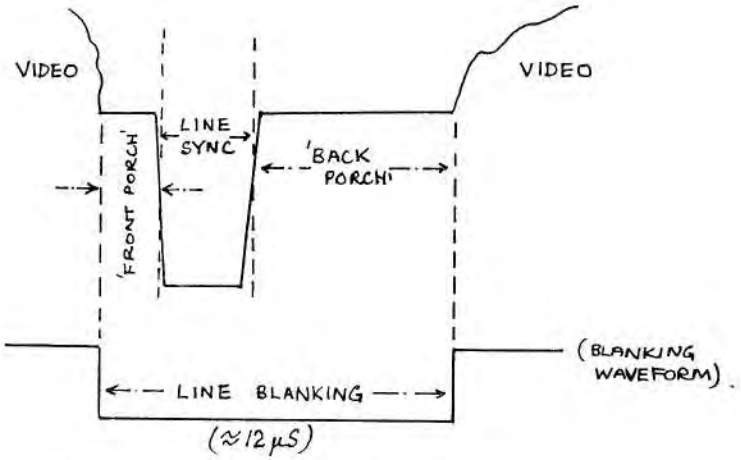

Fig.12 LINE BLANKING PERIOD.

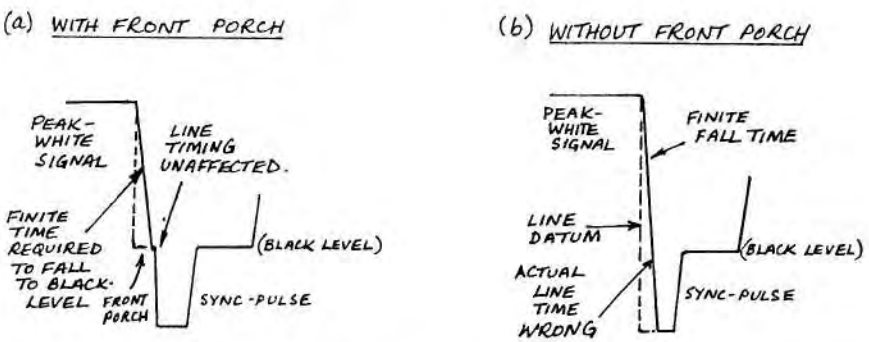

Fig.13 NEED FOR FRONT PORCH.

SOME PRACTICAL CIRCUITS

It always seems to "sweeten the pill" of these slightly academic articles if I can end by giving some circuit ideas that I have come across over the years that give a practical incentive for reading the more theoretical bit! First of all, in Fig.14, there is a sync separation circuit that I have always found to be reliable. The sync separator itself requires a feed of 12-15 volts, but it has a "sliding bias" arrangement that means that it can adapt itself to a variation of input levels, and is not upset by sudden variations in video level (cuts from white to black, etc). The diode at the 2N3906 base DC restores the input signal to a level determined by the collector - if this rises due to some video getting through with the sync, the DC restoration

level rises, correcting this. The second transistor matches the pulses to TTL level, and the 470pF capacitor at its base acts as a chroma shunt. Field sync is separated using the 270R/0.22uF integrator. The 74LS221 dual monostable is used to form continuous line sync from full spec mixed-sync. The first half is arranged to have a duration greater than a half line, and, since it is NOT retriggerable, it will "ignore" every other half-line pulse in the field group. The leading-edge of this "line only" monostable output can then be used to trigger the other half of the '221, generating line sync only.

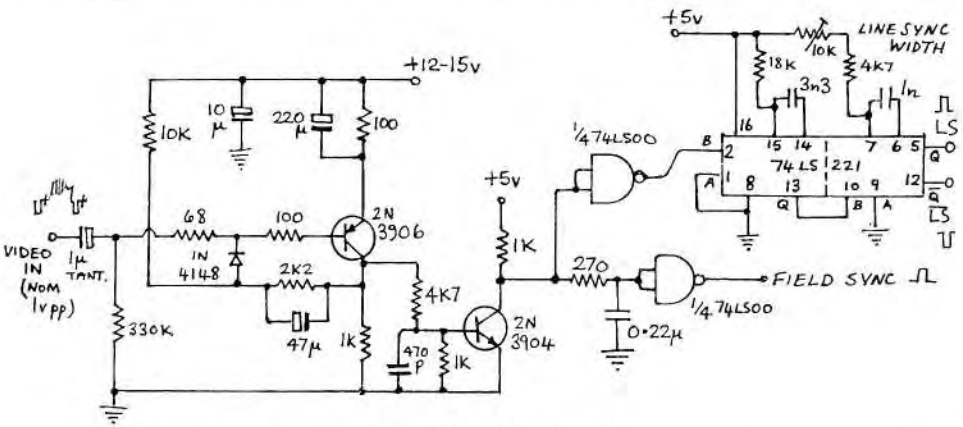

Fig.14 SYNC SEPARATION CIRCUIT.

In Fig.15 I have shown an alternative method of field sync pulse separation that doesn't rely upon integration, and works equally well for simple or CCIR spec sync. It uses a D-type latch and a non-retriggerable monostable. The monostable has a period just longer than line-sync - in this case 6.8uS - and it is triggered by MS. The trailing-edge of the output is used to clock the D-type, with MS as the data (D) input. The effect is to give a field pulse output that is accurately delayed by 6.8uS (the period of the mono), and that is shorter and more predictable than by the integration method.

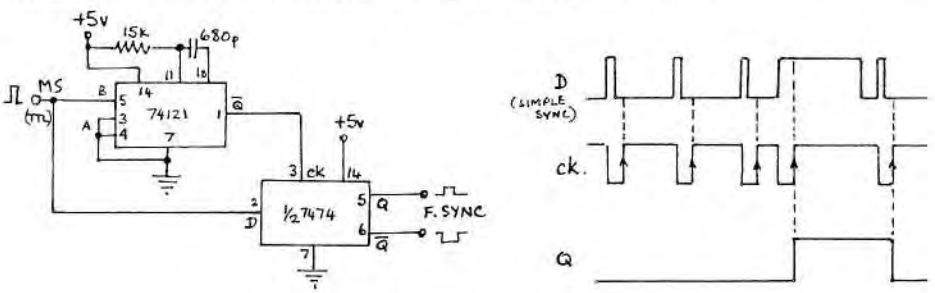

Fig.15 ALTERNATIVE FIELD SYNC SEPARATOR. (CCIR & simple sync)

Fig.16 is basically the same circuit, but adapted to detect the first equalizing pulse - this is useful as it is the field-blanking start point. In this case the D-type has to detect a narrower, rather than a broader pulse,

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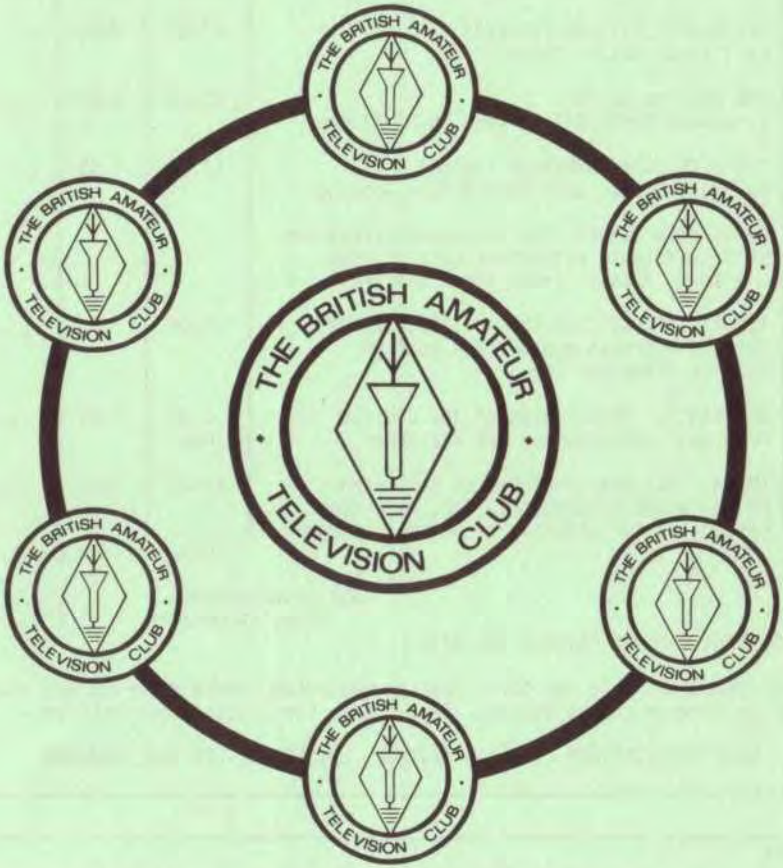

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and so the period of the mono is reduced to 3.5uS, and arranged so that the data will be changed if a pulse of less than this duration is detected. A problem here, though, is that if the circuit is used wth noisy sync, or with a taped signal with a noisy head changeover, any negative-going noise spikes could be detected as narrow pulses. A possible solution is to buffer the mono input, and include an AOT filtering capacitor so that a clock pulse is not generated. This is the kind of circuit that may well be included in some studio equipment, as it is expected that it will only be used with clean, full-spec. sync; an ATV user with a simple-spec. SPG would find that it just wouldn't work.

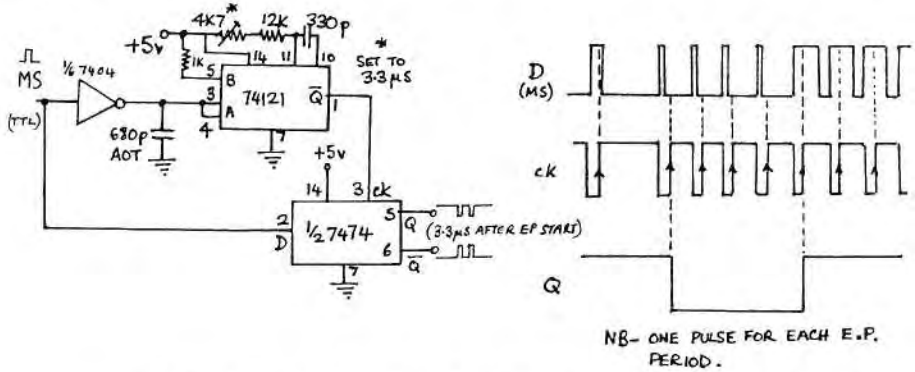

Fig.16 1st EQUALIZING PULSE DETECTOR (CCIR sync only)

Finally, in Fig.17 a frame-detection circuit is illustrated. This produces one pulse every 2 fields, occurring about 10H after the field pulse. This kind of circuit is useful in genlocking, and in VTR servos, for comparing two signals to see if they are FRAME synchronous, rather than just FIELD synchronous. The circuit works by generatng field pulses 0.5H long, and then gating for coincidence with line sync. Because the field-pulse is only a half line long, coincidence should only occur once per frame. So that the circuit will work with all types of sync, a delay of approx 10H is included to move the comparison point beyond the field sync period.

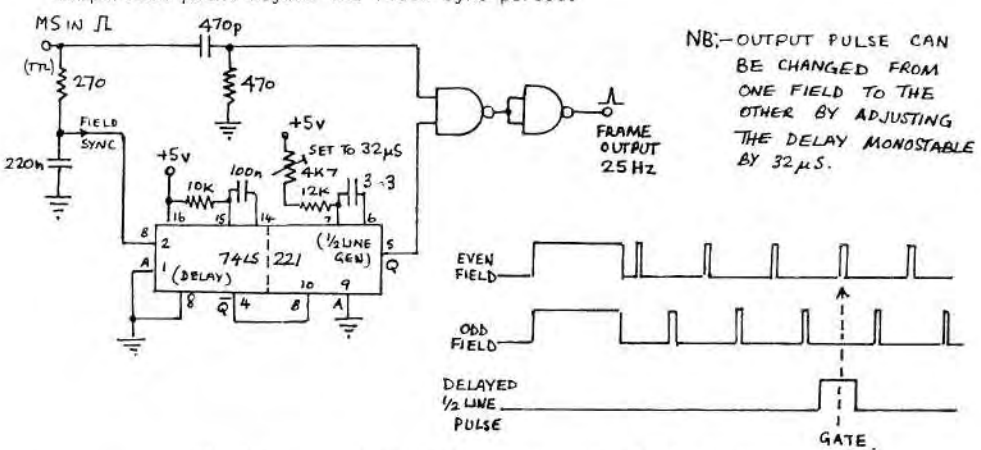

Fig.17 FRAME DETECTOR CIRCUIT (simple or CCIR sync)

A VOGAD AMPLIFIER FOR INTERCARRIER SOUND

By John Wood G3YQC

This circuit was put together in order to operate the Wood & Douglas intercarrier sound generator (TVSG1) from a microphone. The generator requires 1v p-p to drive it and this unit has been designed to produce more than 1-volt, thus leaving a bit in hand.

Instead of making just a straight audio amplifier though, I felt it would be much nicer to incorporate a Voice Operated Gain Adjusting Device (VOGAD) so that, no matter what level of input is applied (within limits), the output level remains constant and no gain control is required. A wide variety of microphones and other audio sources may be connected.

CIRCUIT DESCRIPTION

Pins 4 and 5 of the VOGAD are balanced microphone inputs with an impedance of around 150-ohms, this circuit however is wired to accept the more usual unbalanced microphone input. The AGC time constant is set by the components on pin-1 and the circuit exhibits fast attack and slow decay.

The 2.2uF capacitor between pins 2 and 7 limit the LF response, whilst the 22n connecting pins 7 and 8 cause the HF to start rolling off at around 20KHz. Power is obtained from a 3-terminal 6-volt regulator and adequate decoupling of the supply rail is provided on pin-3.

The levelled audio output is of the order of 100mV rms and this is applied to a two-transistor amplifier using shunt feedback. This amplifier is extremely useful in audio, video and RF work up to 30MHz or so, depending on the transistors used.

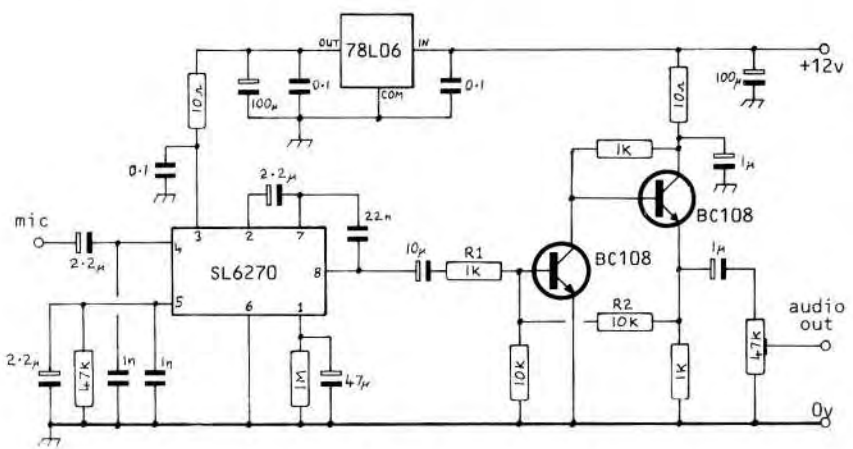

Fig.1 VOGAD amplifier circuit diagram

The input impedance at the base of the first transistor is virtually zero, this means that a very well defined input impedance is produced by the value of R1. The gain is approximated by the ratio of R2 to R1 (in our case R2 = 10k, R1 = 1k and the gain is therefore 10). Output impedance is low and, due to the shunt feedback arrangement, loading of the output has virtually no effect on the input impedance, therefore the amplifier exhibits excellent isolation qualities (useful as a buffer, say, for a VFO).

When connecting this amplifier to the TVSG1, the input terminating resistor (R1 - 680-ohm) should be removed from the board. A short length of screened audio lead is used to connect the two modules together, and the input level (audio deviation) is adjusted by the 47k preset. Once set for your own transmitter this control will not need further adjustment.

CONTEST NEWS

By Mike Wooding G6IQM

Not a great deal in the way of contest news in this time, due mainly to the low level of entries for the Autumn Vision and SSTV contests. As stated in the last CQ-TV the total for the Autumn Vision contest was six entries for 70cm and one for 24cm, and the total for the SSTV was one! However, after reading your comments I feel that part of the reason for this is that both contests were staged for the first time and could have been advertised more in the magazine. Before anyone else asks 'why don't you advertise the contests in Radcom ?', as also stated in the last issue, if anyone knows the secret to getting information in that publication perhaps they would advise me!

Another question that has been raised recently concerns the closing dates for contests. I have cogitated on this and, I hope, come up with a simpler method for you to determine the date.

THE CLOSING DATE FOR ANY CONTEST WILL BE THE LAST DAY OF THE FIRST FULL MONTH AFTER THE CONTEST.

For example: the last session of the Winter Cumulative was Feb 1st, therefore the closing date was March 31st. The last session of the SummerFun will be on June 21st, thus the closing date for entries will be July 31st.

Owing to my moving house during the period of the Autumn Vision and SSTV contests I was unable to participate in either. Apparently conditions were as usual quite flat, although my memory tells me that the weather was rather good. (In fact our worthy Editor reckons I must have a direct line upstairs, because the day I moved was one of the best for a long time!).

Before I close with the contest results I would like to take this opportunity to congratulate the team of Andy, Fred and Ron who operated the last session of the Winter Cumulatives MOBILE as G4HCO. They travelled down the M6, M1 and M25 as G8LIR/M (yes it's them again!) during the afternoon and then worked back again as G4HCO/M during the contest. They showed great expertise and a very high standard of operating during the exercise. It is worthy of acclaim when any station handles a 'pile-up' in such a manner, but when one takes into account that they were fully operational whilst mobile, then it is praiseworthy indeed. On behalf of myself and the committee well done and thank you for representing the club in such style. (There will be a full report of the contest in the next issue).

No anecdotes this time so it's straight to the results. Congratulations to John and Dave, GW4ZJY/P for winning the Autumn Vision on 70cm and to Ian G4VTD on 24cm.

Thank you Peter G4ENA for entering the SSTV contest and for coming last in both sections HI!

The address for contest information, log sheets and entry forms (large SAE please), and also for contest entries is: Mike Wooding, BATC contests, 5 Ware Orchard, Barby, Nr.Rugby, Warks, CV23 8UF. Telephone Rugby 890365.

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0001 to 2359 Hrs. -- 24cm and above FAST SCAN

SUMMERFUN 1987
SATURDAY JUNE 20th 1200hrs to SUNDAY JUNE 21st 1600Hrs
ALL BANDS --- ALL MODES

OUR REPEATER

By Geoff Mather G8DHE

With the expanding interest in television repeaters being shown by many groups, it seems an appropriate time to examine in some detail one of the well known established machines; GB3VR. GB3 Video Repeater is situated at Brighton and is operational on RMT2, 1249Mhz input and 1318.5MHz output. The mode of operation is FM with full intercarrier sound and colour.

The hardware is based around Wood & Douglas modules and the video processing and control systems are either modified units or home brew. The repeater has been built in a modular format and comprises Receiver, Transmitter, Vision Ident generator, Processor, Vision Switch and miscellaneous circuits. Each of the modules is housed in an identical aluminium cabinet, with individual diecast boxes mounted inside holding the sub-units that require screening. All RF, video and sound signals are routed between the modules via BNC terminated coaxial leads, whilst all power and control lines are via multicore cables, terminating in D-type plugs and sockets. Further screening is achieved by the liberal use of ferrite beads on all power lines, ferrite sleeves on coaxial inners carrying audio or video signals and 1000pF feedthrough capacitors where such signals enter or leave the diecast boxes.

RECEIVER

The aerial feeder is fed into a three pole interdigital filter (CQ-TV 120, pp 34-35) tuned to a centre frequency of 1249MHz. The output of the filter is connected to a Wood & Douglas 1250DC50 down-converter using a female-to-female BNC adaptor. Converter tuning is by a preset potentiometer mounted inside the module, and connected between the stabilised output voltage and tuning line on the converter. The 50MHz output from the down converter is routed directly to a Wood & Douglas VIDIF FM video demodulator. An AFC output from the demodulator is fed back to the down converter, this helps to ensure that everyone is 'spot-on' frequency. A future modification will be to use the AGC line of the TDA2540 on the VIDIF to drive an S-meter. The video output from the demodulator is divided into two

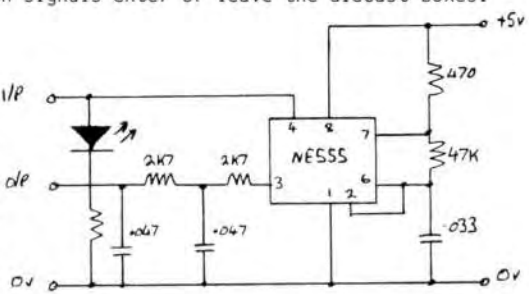


Fig.1 Morse tone generator

paths: one is passed through a de-emphasis network (CQ-TV 131 pp 74-76) and on to the switching unit. The other path is taken out for local monitoring. The 6MHz sound sub-carrier, extracted from the VIDIF, is fed to a standard commercial TV demodulator, from which two outputs are taken. One output goes to the switching unit and the other to an audio amplifier and loudspeaker, again for local monitoring. A squelch unit, obtained from Cirkit Distribution Ltd (formerly Ambit), is fed from the volume control and the output fed to the Processor unit.

TRANSMITTER

The video signal from the receiver (or local test signal) passes through a 4.5MHz low pass filter and then a pre-emphasis network (CQ-TV 131 pp 74-76). The 6MHz audio signal is then injected and the combined signal passed into a Wood & Douglas UFM01 power oscillator, producing approximately 500mW. This output is fed via a 10dB pad into a W&D 300mW to 3W power amplifier, followed by a 3W to 10W power amplifier. This high level 439.5MHz signal is then fed into a home brew varactor tripler, producing approximately 5W at 1318.5MHz which is routed to the aerial feeder via a three-pole interdigital filter. At present the sound subcarrier is continually present in the transmitted signal, although a control line is available to inhibit it. A modification is planned to provide the facility to switch between 6MHz and 5.5MHz subcarriers so that French stations may be able to access with intercarrier sound. (This is not as silly as it may sound if you remember that the repeater is only a few km line of sight from the French coast.)

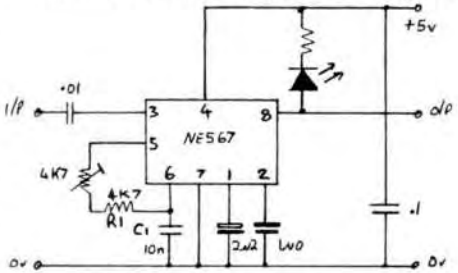
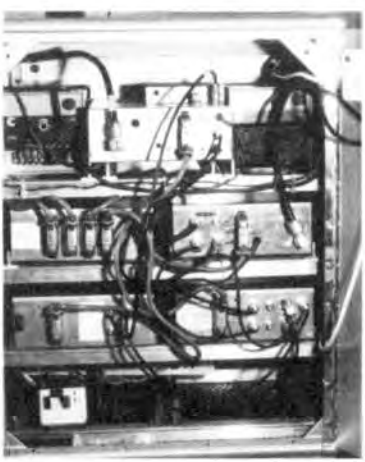


Fig.2 Basic tone detector



The main equipment cabinet showing the modular construction tecnique.

VISION IDENT GENERATOR

The vision ident is sourced from the Cropready Electronics test card generator, as advertised in CQ-TV 123. Kits are available from Cirkit. The original has the facility for only one E-PROM, thus only one screen. To overcome this a home built expansion board has been added which allows up to eight E-PROMS to be fitted, with a 74LS138 line decoder to switch between them under control signals from the processor. It is intended in the near future to replace one of the E-PROMS with a RAM expansion, which will enable us to include a status and message page that can be regularly updated. The video output from the generator is fed to the video switching board.

VISION SWITCH & MISC. CIRCUITS

The present audio/video switching system is based around CMOS 4066 logic switches, with buffer stages at the inputs and outputs. However, a replacement is being designed that

The main cabinet houses the complete repeater.

will provide more inputs and, instead of using a 4066, the vision will be switched by an MC1445L. This will allow easier tailoring of the signal and will also dispense with the need for buffer stages. Anyone requiring details of the existing system is invited to send an SAE to the address at the end of the article.

The Morse generator is built around an NE555 timer and is shown in Fig.1. The two tone detectors are based on the circuit in Fig.2 using the NE567 integrated circuit. The line frequency tone detector is preceded by the sync processing circuit of Fig.3. This limits and clamps the incoming signal to ensure that sync pulses and not video are detected. The second tone detector is used to sense the audio tone bursts, used to switch between the vision ident screens. The control lines for the switching, tone detector outputs and the Morse generator keying lines are all routed to the processor module.

PROCESSOR

The processor board used was obtained from Display Electronics in London. Due to the board not having been designed specifically for our purpose it is somewhat more complex than required. The unit controls all the video switching, screen selection, Morse keying and ident sequence. The transmitter can be remotely switched off as can the sound sub-carrier under processor control. This automatic switching is achieved by inputting the vision, tone burst, sub-carrier and carrier detect circuit outputs. From this information the program assesses the required action and selects the appropiate control line.

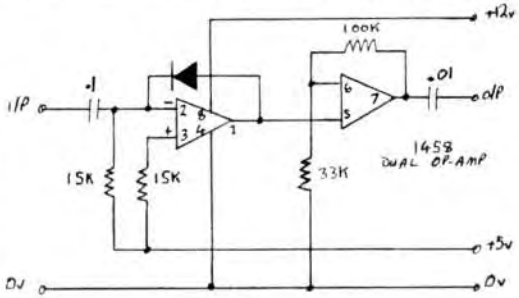


Fig.3 Sync detector

The ident sequence of the repeater is also controlled by the processor. The full ident, lasting about thirty seconds is sent at the beginning of a transmission period. If a station accesses during this period his picture will not appear at the output until the end of the ident sequence (this is a requirement of any repeater licence - idents must not be interrupted). Once vision has been detected at the input the repeater switches from beacon to repeat mode. Whilst in repeat mode the Morse ident lasting about 5 secs is sent every ten minutes. At the end of a transmission a 'K' is sent in Morse and the beacon test card transmitted. After thirty seconds of test card, if no signal is detected at the input, then the full ident sequence is started, with a one minute off period and nine minutes of test card and idents. An automatic delay in the 'K' generation of up to 5.12 secs is implemented if a very weak signal appears at the input but drops in and out. This is to stop a constant stream of 'K's being sent.

This completes our look at a typical television repeater. If anyone requires further, more detailed information then please contact me on Worthing (0903) 32161.

STANDARDS CONVERTERS

You will no doubt have noticed a new advertisement appearing in CQ-TV recently. The company - Universal Electronics - produces a range of standards transcoders and interfaces which are ideal for those moving from country to country, for tape swapping or for watching satellite TV.

As well as the PAL/SECAM converters and satellite transcoders shown in the ad., the company hope soon to produce an NTSC to RGB plus sync transcoder - the American standard. Members who have been enquiring about a PAL composite to RGB decoder recently might like to consider the SP2020 unit. Although CQ-TV magazine is hoping to bring out a BATC design we are at the moment having a little trouble with it and therefore it could be delayed somewhat. Those who can't wait now have an alternative. To be honest, if all the parts for the BATC design were purchased new the cost would not fall far short of the complete unit price of the Universal product. I also understand that an assembled PC board decoder only is to be made available soon. Although the price has not yet been fixed, it is likely to be around £30.

The SP series are stand alone units and are complete with case, PSU and cables. The UNI series are an improved version with 2 outputs. Other UNI modules are available for converting video recorders and TV's to receive or playback other standards automatically. A professional range is also available.

Since these products are despatched directly from France, members are advised to allow up to 28 days for delivery, although the actual time is usually much shorter than that.

The sole U.K. Distributer is 'Thomson Electronics' whose address is shown in their advertisement. All orders should of course be sent there.

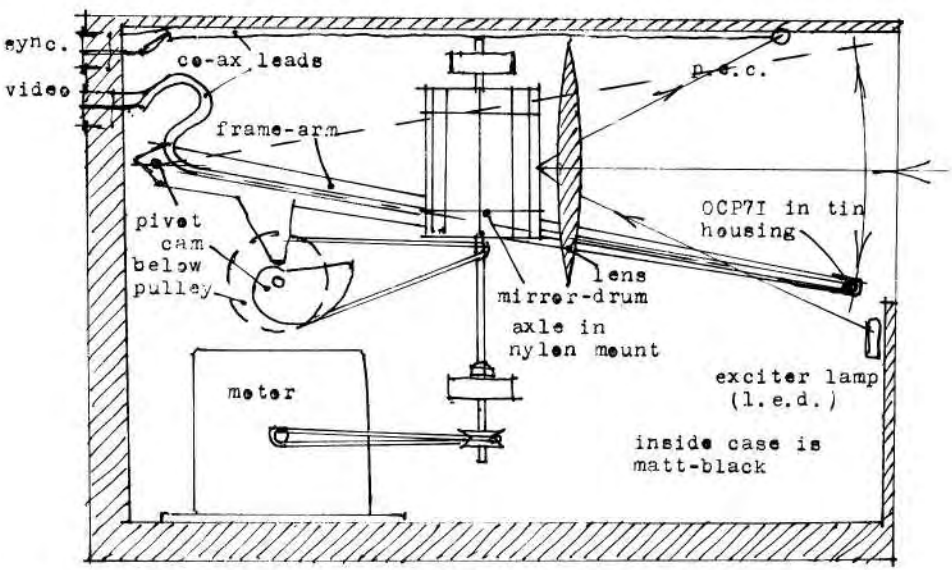
Anyone using these modules might like to consider writing a review or user report for CQ-TV.

A MECHANICAL CAMERA FOR SSTV AND NBTV

By Alan Short

The mechanical camera design that I submitted in CQ-TV 132, whilst being very easy to construct, can prove rather difficult to get working well. Also that design is not as sensitive to dull-lit objects as may be required. This second design, shown below, is equally simple to construct, easier to get working well and much more sensitive to low-light subjects. The basic operation of the camera is the same in that an oscillating arm housing a photo-sensitive device is scanned across a subject.

The camera is constructed in a light-proof box matt-blackened on the inside. The motor drives, via a pulley and belt system, a shaft running vertically through the box. A 12-sided mirror drum is mounted onto the shaft with a simple lens placed in front and very close to it. A cam is also driven from the shaft to operate the oscillating arm, the pulley and belt system being selected to drive the arm at the required frame speed. Thus, selecting different ratios allows for different frame speeds. Light from the subject is collected by the lens and focussed onto the mirror. The light is then reflected back through the lens which produces focussed images which are picked up by the photo-cell on the scanning arm, as it moves through the focal plane of the lens. A thin coaxial lead connects the photo-cell to a socket at the rear of the camera.

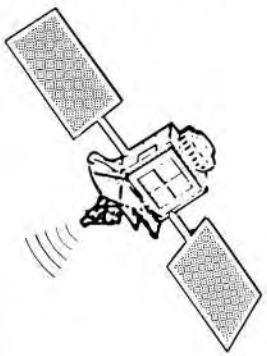


In order to generate sync pulses an LED is mounted at the front of the box, so that light emitted from it is reflected by the rotating mirror onto another photo-cell. The position of the LED is such that when the oscillating arm

reaches the bottom of its travel it interrupts the light path from the LED, causing the photo-cell to generate a pulse. This method of generating sync pulses has the advantage of compensating for discrepancies in mirror setting, because the mirror is common to picture and sync. Also, this system automatically corrects wide capture angles.

The results from this camera are very good and easily outstrip those obtained from my Nipkow disc system. Also, due to it's simplicity in design, the camera lends itself to experimentation for use on both SSTV and NBTV.

SATALITE T.V. SERVICES



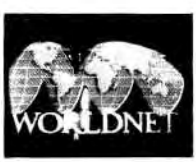
A company specialising in TVRO equipment has sent us a fact file on their range of products. Satalite T.V. Services, (yes, the spelling IS correct!) based in Worksop, offer a quite comprehensive range of dish aerials, mounts, low noise block converters and receivers.

The dishes range from 90cm to 2m (ex stock) in one piece spun aluminium, with prices ranging from £45. Larger 2.4m and 2.7m dishes are available to order.

The range of LNB's, all for the broadcast 11GHz band, start from £175, with three of the range being made to their own specifications. The down converters all have IF outputs in the range 950 to 1700MHz and feature GaAsFET low noise front ends, giving noise figures ranging from 1.8dB to 2.3dB according to the model.

A receiver kit is available for home constructors at £175, commercially built units are priced from £200. All receivers have the basic facilities on board, with the higher end of the range featuring remote control and stereo sound options.

A wide range of accessories is also stocked including feed horns, mounts and tripods, through tuners and demodulators to inclinometers. Special offers are available to club members. For further information contact Mr.G.Ford, Satalite T.V.Services, P.O.Box 26, Worksop, Nottinghamshire, S80 1XW, Phone 0909-722437.



IN FRONT OF THE TUBE

Part-6

By Peter Delany G8KZG

We have looked at the basics of lenses in front of the television camera tube, (parts 1 & 2), at colour separation systems, (part 3), optical special effects, (part 4), and lighting (in part 5). We now look further at lenses.

Firstly, there are some simple equations that are useful if you want to experiment with lenses:

$$1/u + 1/v = 1/f$$

$$m = u/v = (u/f) - 1$$

where u = distance of object from lens
v = distance of image from lens
f = focal length of lens
m = magnification

These measurements are taken from the optical centre of the lens, which may not be the exact physical centre of a complex lens. The focal length of a lens may be marked on its mount or package. For an unmarked convex (converging) lens it can easily be measured. Use the lens to focus a distant object as sharply as possible onto a piece of white paper and measure the distance of the paper from the (optical) centre of the lens. This is the focal length.

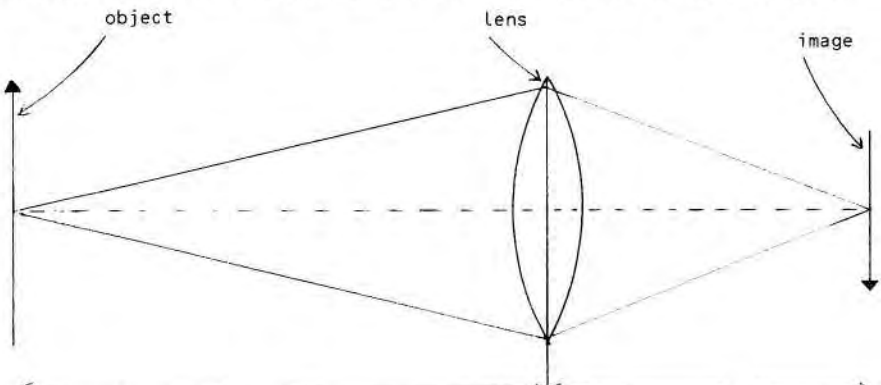


Fig.1

One aspect of TV optics that usually needs to use these calculations is in scanning film or slides. In the simplest method, both the camera and projector lenses are removed, and replaced by a single lens placed between the film and the camera tube faceplate. In effect, the lens projects the image directly onto the camera tube. (Fig.2). The height of the image needs to be 6.6mm for a 2/3" tube, 9.6 mm for a 1" tube and 12.8mm for a 30mm tube. A 35mm slide is 24mm high, super-8 film is about 4mm high, and 16mm film about 9.5mm high. The magnification, m, is image height divided by film frame height.

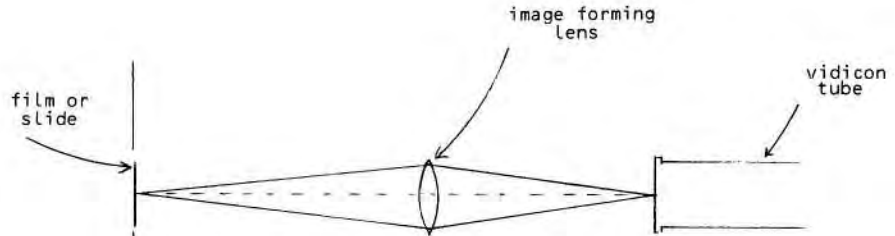


Fig.2

For example, to display 35mm slides using a 2/3" vidicon needs a magnification of 6.6/24 = 0.275. Using a 25mm focal length lens, the film will need to be 31.87mm from the lens, and the camera tube target placed 115.91mm the other side of the lens. This results in a space of almost 15cm between the camera and projector - for many cases this distance will be rather greater - and so both items and the intervening lens must be mounted as rigidly as possible, to avoid the effects of vibration.

Of course, it is not always practical or desirable to remove the normal lens from one or other, or both, pieces of equipment. In this case a relay system must be used. The projector lens forms an image in the usual way which is then 'relayed' by the camera lens on to the tube target. (Fig.3). However, if put just like this, part of the projected image is not seen by the camera lens. This can be corrected by putting a screen, usually of ground glass, at the position of the intermediate image. In effect, the camera is looking at a back projected scene - which is exactly what it is. Unfortunately, there is a side effect to this as the screen tends to diffuse the light. The vidicon, as a result, receives a picture that is less bright than otherwise. More importantly, the light is not passed evenly, so there is distinct shading of the image on the camera tube target.

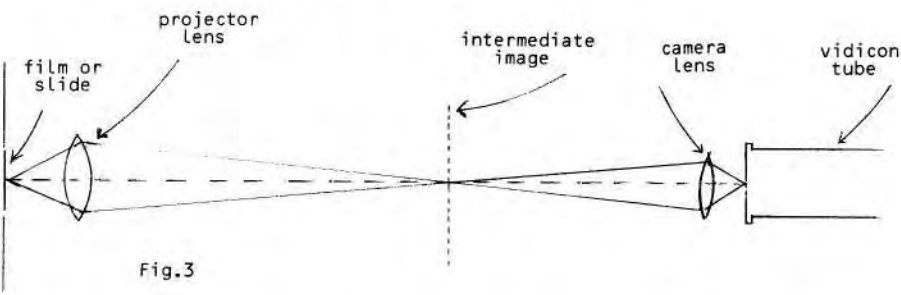


Fig.3

The solution to this problem is to use a lens called a field lens. This is placed in the same position as the screen would have been. It works by passing the light through the centre of the lens unaltered, but bending the outer rays of light in, so that they can be captured by the camera lens. The lens does not scatter the light, and so the picture is both brighter and more even on the camera tube target. (Fig.4). The field lens must be selected so as to be strong enough to bend the outermost rays of light from the projector lens into the camera lens. However, if it is made too strong, the rays of light will be bent so much that they pass in front of, not into, the camera lens. To

calculate the most suiitable value for the field lens, we need to return to those equations we used earlier.

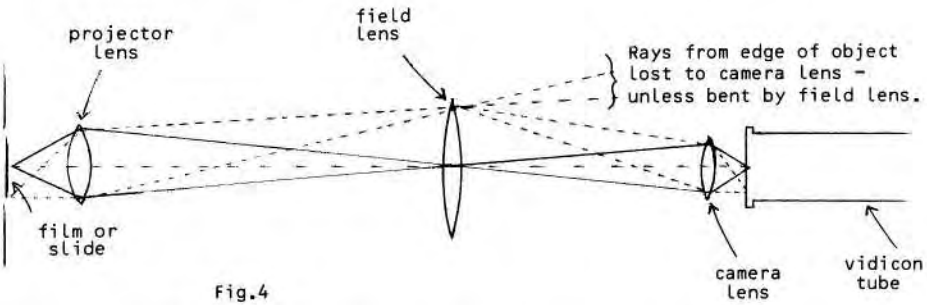


Fig.4

For example, using a 35mm slide in a projector with a typical 85mm focal length projection lens, to make an intermediate image 50mm wide, to be accepted by a 2/3" camera tube fitted with a standard 16mm focal length lens (Fig.5) :-

$$m = (u/f) - 1 \quad \text{gives}$$

$$24/50 = (u/85) - 1 \quad \text{so} \quad u = 125.8\text{mm}$$

$$1/u + 1/v = 1/f \quad \text{gives}$$

$$1/125.8 + 1/v = 1/85 \quad \text{so } v = 262.1\text{mm}$$

Similarly, for the 16mm lens,

$$U = 137.2\text{mm} \quad \text{and} \quad V = 18.1\text{mm}$$

But v and U also apply to the field lens, for which:-

$$1/U + 1/v = 1/F \quad \text{gives}$$

$$1/137.2 + 1/262.1 = 1/F \quad \text{so} \quad F = 90\text{mm}$$

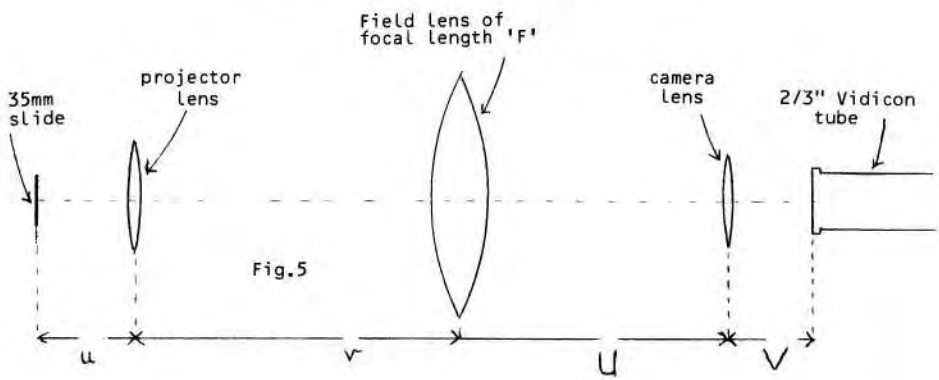


Fig.5

The maths may look difficult, but is similar to the familiar resistors in parallel equation.

The lens power is often expressed in diopters, being 1000/f (if f in mm). So the field lens needs to be 11.1 dioptres, and at least 50mm in diameter. It is preferable to use a field lens of rather lower power, say 4 diopters, to reduce distortions, but this results in a need for a much longer optical system, with consequent problems of rigidity. As always, a compromise is needed.

It is sometimes useful to bend the path of the light in such a system - either to fit the available space, or to turn the image round without altering the camera scan connections. Although any mirror could be used for this, the results are far better if either a prism or a front silvered mirror is used. This is the type of mirror used in many of the small camera viewfinders, and avoids distortiom from the light passing throught the glass to the silvering. The usual position for the mirror(s) is between the projector and field lens. With care, two or more sources can be multiplexed by the mirror arrangement - if suitably illuminated - rather like "Peppers Ghost". (Fig.6).

In part 7, some ideas for captions to put in front of the lens, 'in front of the tube'.

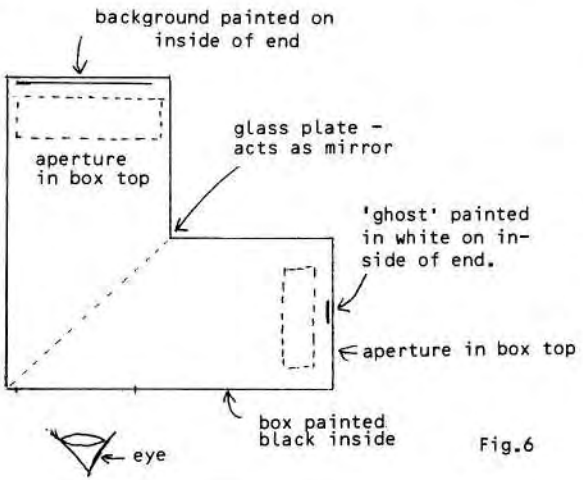


Fig.6

The eye sees the background, illuminated by larger aperture in top. So long as small aperture is covered, no light reaches 'ghost', but on uncovering the aperture, the ghost is illuminated and appears, by reflection in glass plate. Removing illumination makes ghost disappear again.

SSTV ON THE BEEB

Part-2

By the Rev. R.P.Butcher

EDITORS - This article appeared originally in RAMTOP, a private publication which concerned itself with applications for microcomputers in amateur radio. The magazine is alas no longer produced however we should like to express our thanks to Rev. Butcher for permission to reproduce this article in CQ-TV.

Now you have to read in a line. Most of this part is very BBC based, but I will try to explain it so that you can alter it for your own micro.

```
610   .group     here begins a group of four double lines
620   .line      and here each of those double lines
630   LDA &80    get the low order byte of the correct
       screen address from the look-up
640   STA &82    and put it by because we're going to
       change it as we go across the screen
650   LDA &81    now do the same with the high order
660   STA  &83   byte
670   LDY #0     we shall use indirect addressing
       but without Y adding anything to the
       indirection
```

Right! locations &80 and &81 contain the screen address of the left of the line. Here we go!

```
680   .pixel     label for a pair of pixels
690   .go2b      wait for CB2 to indicate 1/120th of a
700   JSR cb2wt  line
710   .wait4     label
720   LDA #&10   now wait for CB1 to go high indicating
730   BIT &FE6D  that valid data is available at
740   BEQ wait4  the user port
750   LDA &FE60  and then get it
760   BEQ wait4  go back if it's 0 (a false reading)
```

We now have valid data in the user port location &FE60. There are all sorts of ways we could now handle it. Here we are going to display it straight up onto the screen. But in BBC Mode 2 we need to interlace two successive pixels into one byte of screen memory. If we do just that, each pixel will display a colour related to the value read at the User Port. We are only interestd in frequency read-out values between 8 (about 2275Hz) and 110 (about 1500Hz), so we can ignore bit-7 and bits-3 to 0, and just put bits-6, 5 and 4 into screen memory. This will give us an 8-point grey-scale when we turn the 'colour' control down on the VDU.

```
770   LSR A      shift bit-6 across to bit-5 position
780   STA &88    put the result away for later
790   AND #&20   test bit-5
800   STA &89    store the result
810   LDA &88    get back the result of the first shift
820   LSR A      and do another to put bit-5 of the
       original value into the bit-3 position
```

```
 830   STA &88     put that result away for later
 840   AND #8      test bit-3
 850   ORA &89     combine the result with the earlier one
 860   STA &89     and put it away
 870   LDA &88     get back the result of the second shift
 880   LSR A       shift again for bit-4 in bit-1 position
 890   AND #2      test bit-1
 900   ORA &89     combine the result with the others
 910   STA &89     and store it away
```

We have now spread the three required bits of the pixel value through a byte of memory. We repeat the process with the next received pixel.

```
 920   .go2c       label
 930   JSR cb2wt   go get another CB2 high
 940   .wait5      label
 950   LDA #&10    set a mask for CB1 on the IFR
 960   BIT &FE6D   test it
 970   BEQ wait5   go back if not ready
 980   LDA &FE60   read the port
 990   BEQ wait5   go back if value 0
1000   LSR A       to get bit-6 of value into bit-4 for
1010   LSR A       screen, we must do 2 shifts
1020   STA &88     and store the result for later
1030   AND #&10    we now test bit-4
1040   ORA &89     and combine the result with that for
         the earlier pixel
1050   STA &89     and store the result
1060   LDA &88     get back the shifted value
1070   LSR A       and shift again for bit-5 in bit-2
1080   STA &88     and store the result for later
1090   AND #4      test bit-2
1100   ORA &89     and combine with the rest
1110   STA &89     and store
1120   LDA &88     and get back the shifted value
1130   LSR A       line up bit-4 with bit-0
1140   AND #1      test bit-0
1150   ORA &89     and combine with the others
```

We now have a pixel value in &89 representing the level of brightness of two successive pixels. We can store this on the screen, but for the moment it will give two dots of very odd colour! Because of the shape of each screen pixel we need to print two, one under the other, to get a tiny square. This will keep the whole picture square too.

```
1160   STA (&82),Yput the pixel on the screen
1170   INC &82     get the address of the line below
1180   STA (&82),Yand put it there again
1190   DEC &82     restore the original screen address
```

Now we must do the maths to get the next pixel address.

```
1200   CLC         clear the carry flag
1210   LDA #8      the address of the next screen pixel
         is 8 further on in screen memory
1220   ADC &82     so we add that to the old address
1230   STA &82     and store the result
```

```
1240   LDA #0      in case that created a carry
1250   ADC &83     we add the carry to the high order byte
1260   STA &83     and store that too
1270   DEC &73     now knock one off the pixel counter
1280   BEQ endl    and get out if it's counted out
1290   JMP pixel   otherwise go back for another pixel pair
```

Right! That little loop will keep putting pixels on the screen until 120 readings have filled up a line of picture. At the end of a line we need to make sure that nothing happens during the sync pulse, so we count that out.

```
1300   .endl       label
1310   LDX #10     sync pulse is about 11 CB2 pulses
         so use 10 plus a fine adjustment
1320  .cb2d        so we label a loop
1330   JSR cb2wt   and wait for a CB2 pulse
1340   DEX         and knock one off the counter
1350   BNE cb2d    and go back if we've not waited 10
```

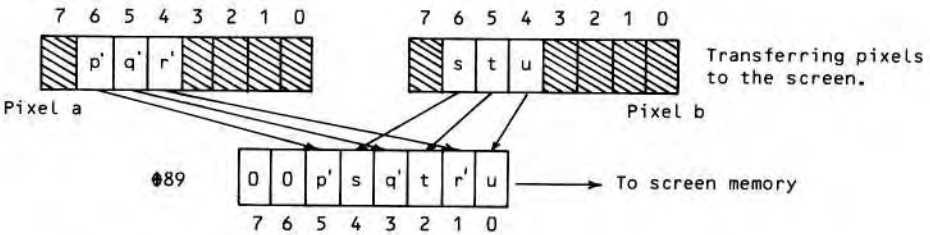
If our timing is not perfect we shall begin to read each successive line a little early, or a little late. This will result in the picture appearing to slope across the screen. The way round this is to introduce an additional adjustable delay for 'fine tuning'. We can use the comparatively fast CB1 clock for this.

```
1360   LDX &79     first get the number of pulses to count
1370   .tweek      then label the loop
1380   LDA #&10    mask for IFR bit-4 (CB1)
1390   BIT &FE6D   test it
1400   BEQ tweek   go back if it's not high
1410   LDA &FE60   clear the IFR by reading the port
1420   DEX         knock one off the counter
1430   BNE tweek   and go back if it's not finished
```

Now we can get the next line. First we need to replenish the pixel pair counter.

```
1440   LDA#60      so, load 60
1450   STA &73     into the look-up address
1460   DEC &70     and also record that a line was read
1470   BEQ next4   if we've read four (double) lines
         we need to change the screen addressing
         as listed below
1480   INC &80     otherwise we just add two
1490   INC &80     to the start address of the last line
1500   JMP line    and go back for another one
1510   .next4      if we are to get the next four lines
1520   DEC &71     we must record one group of four less
1530   BEQ fini    and go home if we've read all of them
1540   CLC         otherwise maths! so clear the carry
1550   LDA &86     get the start address of the last 4 lines
1560   ADC #&80    and add &280 : &80 first
1570   STA &86     storing the result for next time
1580   STA &80     and for the very next line
1590   LDA #2      now add two together with any carry
1600  ADC &87      to the high order byte of the last 4
1610   STA &87     and store the result for next time
```

```
1620    STA &81     and for the very next line
1630    LDA #4      now replenish the four line counter
1640    STA &70     in it's look-up address
1650    JMP group   and go back for another group
         of four lines
1660    .fini       if we've had a complete frame
1670    RTS         we can go back to basic
```



The routine to read CB1 has to be written out every time we use it because it takes six 1MHz cycles to get into a subroutine and another six to get out. With only 28uS in each CB1 cycle there's not much time left to do anything! Each CB2 cycle, on the other hand, is nearly 500uS long, so it makes sense to use a subroutine to detect one of those.

```
1680    .cb2wt      this labels the routine
1690    LDA #8      mask all but bit-3
1700    BIT &FE6D   test bit-3 of the IFR (set by CB2
         going high)
1710    BEQ cb2wt   go back if it's not set
1720    LDA &FE60   read the port, but only to reset the IFR
1730    RTS         end the subroutine
```

And that ends the machine code part of the program.

```
1740    ]indicate end of assembly
1750    NEXT        for the second assembler pass
```

A few bits of BASIC are now require to implement the above on the BBC micro.

```
1760    ?&78=60     poke the delay at the start of the frame
1770    ?&79=20     poke the tweek between each line
1780    MODE2       160 x 256 display (we use 120 x 240)
```

We now need to arrange things so that the logical colours recorded on the screen are changed to actual colours in the right orders for shades of grey. Unfortunately green and magenta come out just the same in monochrome on the BBC. It might be better to lose definition at the white end of the scale and miss out green altogether, thus:

```
1790    VDU19,0,7,0,0,0     make 'black' come out white
1800    VDU19,1,7,0,0,0     make 'red' come out white too
1810    VDU19,2,3,0,0,0     make 'green' come out yellow
1820    VDU19,3,6,0,0,0     make 'yellow' come out cyan
1830    VDU19,4,5,0,0,0     make 'blue' come out magenta
1840    VDU19,5,1,0,0,0     make 'magenta' come out red
1850    VDU19,6,4,0,0,0     make 'cyan' come out blue
```

```
1860    VDu19,7,0,0,0,0       make 'white' come out black
1870    VDU28,15,31,19,0      make a text window to the right of
         our picture screen
1880    COLOUR135:COLOURØ     and reset the printing colours in it
```

It will help if we wipe clear the screen below our picture.

```
1890    FOR B%=0 TO 15:
        MOVE0,B%*4:
        DRAW1279,B%*4:
        NEXT
1900    CLS          clear the text window
1910    PRINT''''"PRESS"'"<S>TO"'"SAVE"
1920    PRINT''''"PRESS"'"<F>TO"'"RESET"'''"FRAME"
1930    PRINT''''"> RT"       just a reminder about fine tuning
1940    PRINT''''"< LT"
1950    CALL CODE% go and read in a frame
```

At the end of a frame we can check for any key pressed while it was being received. (The keyboard interrupts will have shown up as a dislocation in the picture).

```
1960    K%=INKEY(0)has a key been pressed
1970    IF K% =-1THEN 1950    if not get another frame
1980    IF K%=&2C
        THEN ?&79=(?&79)+1:  if the key was '<', change the tweek
        GOTO1950    before going back
1990    IF K%=&2E
        THEN ?&79=(?&79)-1:  if the key was '>', do the same
        GOTO1950
2000    IF K%=&3C
        THEN ?&78=(?&78)+4:  if SHIFT + '<', reset the frame edge
        GOTO1950    and go back
2010    IF K%=&3E
        THEN ?&78=(?&78)-4:
GOTO1950if SHIFT + '>', then the same
2020    IF K%=70:  if 'F' pressed
        TIME=0:    make a delay of 1sec
        REPEATUNTILTIME>100: before looking for the start
        GOTO1950    of the next frame
2030    IF K%<>83 THEN 2110  go to a controlled pause
2040    PRINT''''"FILE"'"NAME"'  to save the picture we need a name
2050    INPUT F$    which we save in F$
2060    CLS         we don't want the text saved
2070    M%=&2F80    point to an address clear of screen
2080    $M%="SAVE "+F$
        +" 3000 7FFF"         put this command there
2090    X%=M% MOD 256:
        Y%=M% DIV 256         put the location in X & Y registers
2100    CALL &FFF7 and force the command into O S
2110    CLS:
        PRINT''''"<C>TO"'''"GO ON"
2120    REPEAT:
        UNTILINKEY(0)=67
2130    GOTO1900
```

Well, that will implement an SSTV reader. However, the results are pretty awful! But, there are many options we could take to improve the picture. With higher resolution graphics (e.g. BBC modes 0 or 1) we could further limit our grey scale and read in twice or four times as many pixels. To do that we could use another pin of 74LS93 'A' to clock CB2 and determine the 'read in rate' (pin-11 gives 4369Hz, this equals 240 pixels per line: pin-8 gives 8738Hz, this equals 480 pixels per line). However, such speeds will not give us time to do much with the readings within each CB2 cycle, even so, it is possible to have three or four lines of program between successive CB1 cycles (34952Hz = 28uS = 28 BBC clock pulses). You may have noticed that I've ignored all the injunctions to use vectors in the BBC operating system to read and write data. The reason is that we save time by doing things direct (even if you have to unplug your Tube!) and leave time for little bits of program.

I haven't yet worked out whether there's time to read say 240 pixels into a table and then put them out to a disc file during the 5mS sync pulse at the end of the line. If there were, then we could save the frame that way and reassemble it any way we wished when it was complete. That would probably mean getting alternate frames off the air.

The best answer of course is to go to the trouble and expense of building on-board memory to store the readings. But, if we're going to blow the very low cost limit on this project, can we afford a sufficiently fast A-to-D to enable us to capture a Fast-Scan picture? The Radio Spares 3300 (stock no: 302-069) costs approximately £60, but that still leaves the cost of a complete Fast-Scan digitiser well under £100.

24CM - WHAT GEAR?

By John Wood G3YQC

It's been several years now since 24cm ATV really got going in this country, users of the band now being counted in hundreds rather than tens as they used to be. Such an increase in activity has naturally encouraged manufacturers to design and produce specialised equipment, so I thought it about time we had a look at some which is currently available. Any comments or observations made in the text reflect my personal opinion based on several years experience on the band.

RECEIVERS

There are several approaches to the problem of receiving TV in the 23/24cm band, each of them having their own particular merits, so let's first establish the requirements of an amateur receiver.

First one must consider bandwidth. The 1.3GHz allocation is wide - 1240 to 1325MHz - and if you intend using a TV repeater your receiver must be capable of covering the whole of the band. The most-used repeater channel is RMT-2 which operates 1249MHz in and 1318.5MHz out, this means that your receiver must perform adequately at 1318.5MHz in order to receive the repeater. But, since most people working through repeaters will only have a single channel available (1249MHz), it follows that any simplex working is likely to be done on that frequency. Coupled with that the commonly used UK simplex and continental operating frequency of 1255MHz also lies at the bottom of the band, therefore your receiver (and aerial of course) must also perform satisfactorily there as well.

FM-TV is almost universally used these days on 1.3 and above and so any receive converter must exhibit suitable bandwidth to accommodate a wide signal (15 to 20MHz typical). This of course means that system noise is degraded considerably (when compared to narrow-band receivers), so that must be kept in mind as well. Although 1249 and 1255MHz seems to be the most often used frequencies, there are stations who work higher in the band as well, so we must not forget them. Another consideration regarding the reception of an FM-TV signal is that of providing adequate RF gain, in order to ensure that even weak signals reach the limiting threshold of the demodulator.

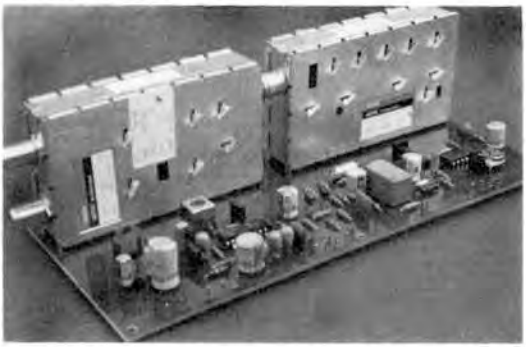
So it seems clear then that we should ideally look for a fully tunable wideband receiver having plenty of low noise front end gain.

SOLENT CONVERTER - This is a fixed IF converter in the traditional style. It has some RF pre-amplification but will need additional amplifiers in order to realise maximum performance. The IF output falls in the domestic UHF TV band (around ch-32) and is therefore suitable for feeding into a broadcast TV tuner. It is of only limited use connecting this to a domestic TV set since the demodulator is AM and not FM, therefore a separate tuner and demodulator must be provided as well. Available only as a kit and reviewed in CQ-TV 129 (Ref-1).

1250DC50 W&D TUNABLE CONVERTER - This is a superb piece of equipment. It is fully tunable over the entire 23/24cm band, has a good low-noise signal

amplifier built-in and a very respectable noise figure. Tuning is via an external 10k carbon potentiometer and a regulated tuning voltage is provided for this purpose. AFC control is available when used with the companion FM-TV demodulater. The IF output is fixed at around 50MHz which is suitable for the more usual FM demodulators around at present. The overall performance can be improved by the addition of a low-noise pre-amplifier. Not available as a kit - highly recommended and reviewed in CQ-TV 129 (Ref-2)

ASTEC AT1020 TVRO TUNER HEAD - made especially for the reception of satellite TV transmissions, this converter tunes over the band 950 - 1450MHz, comfortably covering the amateur 1.3GHz band. A useful conversion gain of 30dB is provided and the whole tuner is broadbanded for FM reception, therefore the noise performance is no better than about 7dB. The fixed IF output is at 612MHz and is intended to drive a companion demodulator module, nevertheless the IF can be fed to a domestic TV tuner fixed-tuned to that frequency which in turn drives a 'standard' demodulator. Tuning is via a carbon potentiometer and the unit requires both +12 and +18-volt supplies. Its performance may be considerably improved by using a low-noise pre-amplifier. Original article in CQ-TV 135 (Ref-3)



The Astec tuner and demodulator modules on a Comex receiver board.

DEMODULATORS

W&D VIDIF - this FM demodulator kit is intended to follow their tunable converter. It has considerable IF gain which is AGC controlled. Some bandpass filtering is included and the demodulator itself is a NE564 phase locked loop. Composite video output is adjustable in level and is suitable for driving a monitor. A good performer this unit is recommended. Reviewed in CQ-TV 129 (Ref-2)

BATC FM DEMODULATOR - not actually a product this one, but is included here because of its great popularity and the fact that a printed circuit board is available from BATC. This unit also employs a NE564 PLL demodulator, reasonable IF gain is provided and it is equally appropriate for 36MHz and 50MHz IF frequencies. Video output is adjustable and intended to feed a monitor. Original article CQ-TV 122 then 'Best of CQ-TV'.

ASTEC AT3010 TVRO IF/DEMODULATOR - this is a truly wideband demodulator which is intended for use with the AT1020 tuner. IF input is 612MHz and the unit incorporates SAW filtering of the IF signal. Because of the bandwidth and the use of a quadrature detector, the performance seems a little less sensitive than the PLL ones described. However it was designed for performance and quality which it certainly does very well indeed. Original article in CQ-TV 135 (Ref-3).

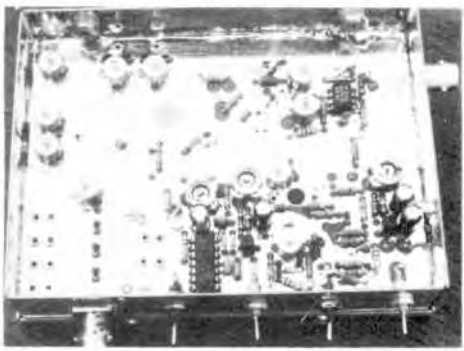
PRE-AMPLIFIERS

COMEX CX250WB WIDEBAND PRE-AMPLIFIER - this is a single stage bipolar amplifier having a useful gain of 13dB and a typical noise figure of around 2dB. Supplied as a kit this unit is recommended for preceding a 24cm converter. (Ref.3).

CAMTECH ELECTRONICS 23cm PRE-AMPLIFIER - a new one on the market, this amplifier is available as a kit or ready-built and may be used at mast head. An excellent performer it has a useful gain and good noise figure. Review in the last issue (Ref.4)

MICROWAVE MODULES 23cm PRE-AMPLIFIER - not intended for wideband use this amplifier incorporates a bandpass filter. Nevertheless it is a good performer and to the usual high quality expected from this company. Useful if you only want one end of the band. (Ref.5).

W&D 1250PA2 TV PRE-AMPLIFIER - if this is the same as one I tried out some time ago, it has been spoilt by various bandwidth limiting filters. A useful gain and noise figure, this amplifier is certainly suitable for working over a relatively narrow portion of the band. It may need tuning to suit your own requirements. (Ref.2).



Inside the W&D 1250DC50 tunable ATV down-converter.

SILVERSTONE LINE AMPLIFIER - Intended for First IF amplification in a satellite TV receive system this one is wideband (750 - 1750MHz) and should work fine on 24cm. It has around 20dB of gain. Supplied complete with BNC connectors it may be powered via the coaxial cable - just right for mast-head applications. (Ref.8)

AERIALS

Like receivers one must consider what is required from the band. If you wish to use both ends and use only one aerial, then it must be a wideband design. Of course high gain and good VSWR are also important. All amateur TV is vertically polarised (including TV repeaters at present).

JVL LOOPQUAD YAGI - WIDEBAND - Reviewed in CQ-TV131 this aerial is a good performer having useful gain and good overall performance. A wideband feed is available which, when fitted, ensures that the aerial covers the whole band nicely. I thought the overall construction was a bit flimsy but believe that a more robust version may be available. A bit on the expensive side but very good. (Ref-11).

SANDPIPER 20-TURN HELIX - The helical aerial is a very well tried and tested design and is ideally suited to wideband operation. Circular polarisation means a theoretical maximum loss of around 3dB against linear polarisation, however polarity changes with signal propogation may reduce this somewhat, and even in some cases make the helix better overall, particularly on long-haul contacts. A useful gain, rugged and well engineered this aerial stood up very

well against the best under test. Good value. (Ref.6).

TONNA 1269MHz 23-ELEMENT - A well known make this one with quite a good reputation. I tried one of these when they were first in the country and was a bit disappointed. The aerials are not wideband (at least not as wide as we require) and were out-performed by both the Helix and the Loopquad. (Ref.7).

The business end of the JVL Loopquad

BRISTOL GROUP WIDEBAND YAGI - This is a small aerial having only around 10dB gain, which is intended for test and local working only. Based on commercial aerial designs the aerial is very light and compact and should find favour with small groups and individuals who don't expect to work long distances. All proceeds go towards GB3ZZ ATV repeater project, details in last issue (Ref.9).

TRANSMITTERS

Not much to choose from here but you should find something to tempt you:

SOLENT 1W FM-TV TRANSMITTER - A well tried and tested transmitter this, having been around for some time now. It has proved quite popular and still forms the conerstone for 24cm TV transmitting. The single-board unit has a signal frequency oscillator which is varactor tuned to the required frequency. Stripline RF amplifiers provide around 1-Watt output. The unit includes a video modulator and an intercarrier sound generator as well. It is available as a kit but takes a bit of putting together. It shouldn't be attempted by the inexperienced although, with care, satisfactory results are not difficult to achieve. A backup service is available to constructors. Recommended (Ref-1).

W&D 1240TVT FREQUENCY LOCKED TRANSMITTER - this transmitter delivers 20mW out and incorporates both video and sound modulators. The video needs to be somewhat more than the usual 1v p-p for reasonable deviation and the audio input level is 1v p-p across 600-ohms. The transmitter is frequency locked to an internal crystal reference and is superbly stable. Not really very applicable to amateur applications and rather expensive. Reviewed in CQ-TV 136 (Ref-2).

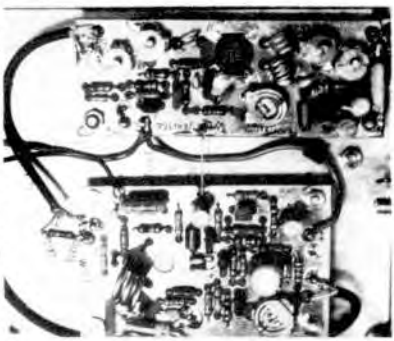
W&D UFM01 420MHz FM-TV EXCITER - this is a small power oscillator board which has provision for video modulation. It is intended that the resulting 420MHz signal be amplified (70LIN3/LT) to about 0.5W, then amplified again (70FM10) to over 10W then frequency tripled in a varactor multiplier to the 24cm band. This system works well but seems a bit messy these days, nevertheless it represents quite a straightforward way of getting onto the band. (Ref-2).

Other than these you are down to making it yourself! Several designs have appeared in past issues of CQ-TV, and you may like to consider the article describing a 24cm solid-state PA in this issue before deciding which way to go.

Of course you could adopt a traditional approach and use a modified 2m to 23cm

transverter. The 2m transmitter will have to be replaced by an FM-TV generator on a suitable frequency (typically 97MHz for 1249MHz out and 103MHz for 1255MHz). A suitable generator is described in CQ-TV 132, the 70MHz tuned circuit being modified to the required frequency.

Modules to put together your own transverter are available from Piper Communications (Ref-10), and you will surely discover several other modules in their catalogue which could help you with your ATV station.



W&D UFM01 exciter (bottom) and 70LIN3/LT amplifier modules.

Members often contact me asking what I would recommend as a general purpose, high performance 24cm ATV station, and this is what I tell them at present: W&D 1250TV50 converter, W&D VIDIF or BATC demodulator, at least one Comex or Camtech wideband pre-amplifier. This may be used at the shack end provided decent coaxial cable is used (Pope H-100 or better) and not more than about 10 metres long, otherwise mast-head amplifiers for best performance. Sandpiper 20-turn helix or JVL loop Yagi. Solent 1W FM-TV transmitter and possibly one of the new PA's described elsewhere in this issue.

REFERENCES:-

1. Worthing & District Video Repeater Group, "Toftwood", Mill Lane, High Salvington, Worthing, Sussex. Tel: (0903) 67228.
2. Wood & Douglas, Unit 12-13, Youngs Industrial Estate, Aldermaston, Reading, Berks RG7 4PQ. Tel: (07356) 71444.
3. Comex Systems Ltd., Comet House, Unit 4, Bath Lane, Leicester LE3 5BF. Tel: (0533) 25084.
4. Camtech Electronics, 8 Wortham Place, Haverhill, Suffolk CB9 0HP. Tel: (0440) 62779.

5. Microwave Modules Ltd., Brookfield Drive, Aintree, Liverpool L9 7AN. Tel: (051-523) 4011.
6. Sandpiper Communications, 40 Trehafod Road, Trehafod, Nr.PontyPridd, Mid Glamorgan. Tel: Porth 685515.
7. Randam Electronics, 12 Conduit Road, Abingdon, Oxon OX14 1DB. Tel: (0235) 23080.
8. Silverstone Electronics, 78 High Street, Whittlebury, Towcester, Northants NN12 7XJ. Tel: (0327) 857350.
9. Bristol FM-TV Group, 15 Whitney Close, Saltford, Bristol BS18 3DX. Tel: Saltford 3098.
10 Piper Communications, 4 Severn Road, Chilton, Didcot, Oxon OX11 0PW. Tel: (0235) 834328.
11. JVL Electronics, 26 fernhurst Close, Hayling Island, Hampshire PO11 0DT. Tel: (0705) 464482.

SOFTWARE NOTEBOOK

No.9

By Derek Anderson G6YBC

This program for the Spectrum 48K computer calculates the critical dimensions for dish aerials and feed horns.

```
  1 CLS
  5 PRINT "DISH AND FEED HORN DESIGN PROGRAM"
  7 GO SUB 300
 10 PRINT "PARABOLIC DISH DESIGN PROGRAM"
 15 PRINT : PRINT
 20 INPUT "DESIRED DIAMETER IN FEET:";D
 30 INPUT "DESIRED F/D RATIO";Z
 40 PRINT : PRINT "THE FOCUS IN FEET IS";Z*D: LET F=Z*D
 45 PRINT "INPUT RATE OF PLOT ALONG Y AXIS. EVERY ? INCHES": INPUT M
 50 PRINT : PRINT "COORDINATE VALUES FOR HALF DISH SIZE ARE AS FOLLOWS:"
 60 PRINT TAB 15;"Y";TAB 30;"X"
 70 FOR Y=0 TO .5*D*12 STEP M: LET X=Y*Y/(4*(F*12))
 80 PRINT TAB 15;Y;TAB 30;X
 90 NEXT Y
100 LET S=(D/2)↑2/(4*F)
110 PRINT "THE SAGITTA OF THE DISH IS ";S ;"FEET"
114 INPUT "INPUT DISH OPERATING FREQ IN MHZ FOR GAIN FIGURE";T
115 LET L=11811/T
116 LET G=.59*(((3.14159*D*12)/L)↑2)
117 LET H=LN (G)/LN (10)*0
118 PRINT : PRINT "THE GAIN AT ";T;" IS ";H;"dB
119 GO SUB 300
201 PRINT : PRINT "THIS PROGRAM CALCULATES THE PARAMETERS FOR A "
202 PRINT "CIRCULAR WAVEGUIDE TO CO-AX TRANSMISSION DEVICE"
203 PRINT : PRINT "ALL OUTPUTS ARE METRIC"
208 INPUT "INPUT DESIGN FREQ OF OPERATION IN MHZ";F
210 LET O=30000*(10)↑6/(F*(10)↑6)
212 LET D1=O/1.71: LET D2=O/1.31
214 LET CS=(D1+D2)/2: LET D3=CS*1.71
216 LET G=O/(SQR (1-((O/D3)↑2)))
218 PRINT "CUTOFF DIA. FOR DOMINANT MODE IS:";D1;"cm"
220 PRINT : PRINT "CUTOFF DIAMETER FOR NEXT LWR MODE:";D2;"cm"
225 PRINT : PRINT GUIDE DIAMETER SHOULD BE BETWEEN";D2;" & ";D1
228 PRINT "AVERAGE IS";CS
230 PRINT : PRINT "THE PHYSICAL GUIDE LENGTH, (G/2) IS:";G/2;"cm"
235 PRINT : PRINT "THE FREE-SPACE WAVELENGTH AT";F;"MHz IS";O;"cm"
240 PRINT : PRINT "THE PROBE LENGTH IS:"O*10/4;"mm"
245 PRINT "THIS IS ALSO THE DISTANCE FROM PROBE TO CLOSED END": GO SUB 300
246 PRINT "TO FIND THE CUTOFF FREQ OF A CIRCULAR GUIDE "
247 INPUT "INPUT DIAMETER IN cm";X: LET Z=X/2.54
260 LET Y=X*1.71: PRINT "CUTOFF FOR DIA";X;"cm" IS";Y;"cm OR";Y/2.54;"inches"
261 PRINT "FREQ IS:";30000/Y;" MHz"
300 PRINT "INPUT A FOR DISH PARA, B FOR HORN DESIGN, C FOR DIA vs CUTOFF FREQ"
301 INPUT A$: IF A$="A" THEN GO TO 10
302 IF A$="B" THEN GO TO 201
303 IF A$="C" THEN GO TO 246
304 RETURN
```

GENLOCKING THE 'HANDBOOK-2' SPG

By Trevor Brown G8CJS

In "The Revised Amateur Television Handbook 2" a design for a colour Sync Pulse Generator was produced, which has all the correct PAL offsets and Bruch blanking signals. A single Euro-card pcb is available through Members Services. Since publication of the original design I have had many requests to produce a Genlock system for this very popular design, so I have at last set my brain to work and come up with the following design.

In the original circuit of the SPG an error signal was derived from the subcarrier lock and used to modulate a varactor diode. The diode was placed across a crystal such that the error signal could be used to pull the crystal oscillator onto frequency. The problem that arises from this method is that crystals can only be lowered in frequency. So that unless the crystal is higher in frequency than the locking point, then the SPG may not always correctly synchronise the picture. The Genlock system described overcomes this problem by replacing the error locking system with a voltage controlled oscillator, locked by a TTL reference sync. It must be noted here that if the reference pulse disappears the SPG may stop, so that an auto-changeover system to non-genlock mode may be desirable.
In this design the input signal is treated as being monochrome and is synchronised to a two field lock, that is the odd and even fields of the SPG are locked to the reference pulse. This type of synchronising uses a hard reset and causes momentary disturbance to the picture before locking is achieved. (An alternative method of overcoming this picture bounce would be to use a slow field slide, but this would increase the complexity of the circuit beyond the capacity of a single pcb). Once in field lock the VCO maintains the picture in line lock by comparing each line and adjusting itself accordingly. Fine adjustment of the VCO allows for line phasing of the SPG for optimum picture quality.

The circuit diagram of the genlock unit is shown in Fig.1. The TTL reference sync and the sync from the SPG are fed to separate halves of a dual monostable (U1) with an unstable period, the duration of which is longer than half of one line of picture information. The outputs of the monostable are two square waves devoid of any vertical information (Fig.2). To improve phase advance one of the square waves is inverted using the bar Q output of U1. The two square waves are compared in U2 and the resultant error used to drive a VCO (U3). (The internal VCO in U2 cannot be utilised as it will not run at the desired 2.5625MHz). The output from the VCO is connected to pin-8 of the ZNA234 in the SPG via a changeover switch, allowing pin-8 to be connected to either the output of the VCO for genlocking, or to its original circuitry.

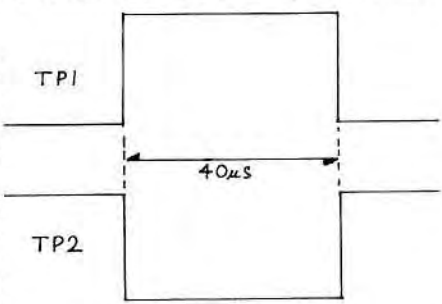


Fig.2 SQUAREWAVES

This first part of the circuit will result in the SPG being line locked to the reference sync, but it still requires bringing into frame phase by resetting the ZNA234 with an even field reference pulse. The TTL reference sync is fed

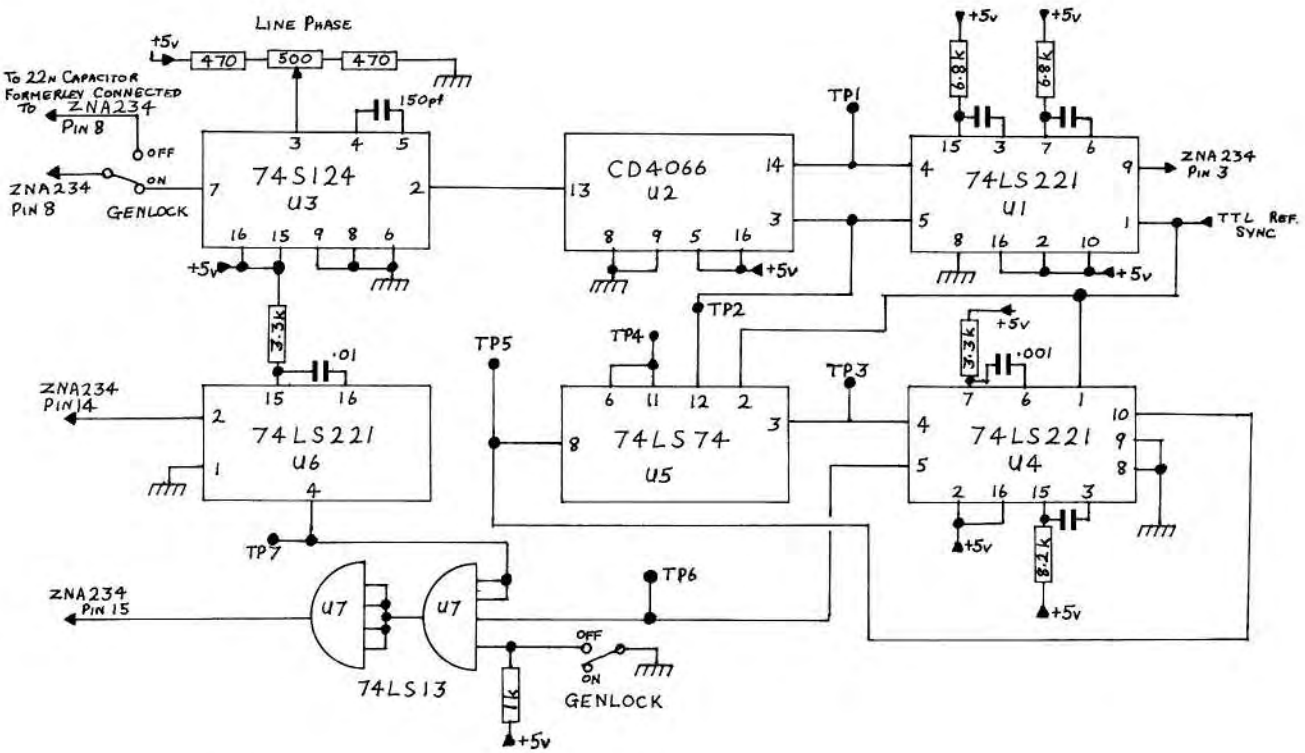


Fig.1 GENLOCK CIRCUIT DIAGRAM

to another monostable (U4) whose period is set at 12uS. The monostable is triggered by the leading edge of the reference sync and the output pulse (Fig.3a) is used to clock a D-type (U5), which also has the reference sync on its D input. The resultant output from U4 is a field pulse (Fig.3b), caused by the long duration broad pulses in the TV waveform. This field pulse is used to clock the other half of the D-type, which is also fed with the square reference pulse produced by U1 on its D input. The output of this second half of the D-type is a 25Hz square wave (Fig.3c), which is positive going at the start of even fields. This is due to interlace in the TV sync waveform, where the first broad pulse occurs halfway through a line on alternate fields. The 25Hz square wave is fed to the other half of the monostable U4, where its rising edge triggers a 2uS even field reset pulse (Fig.3d).

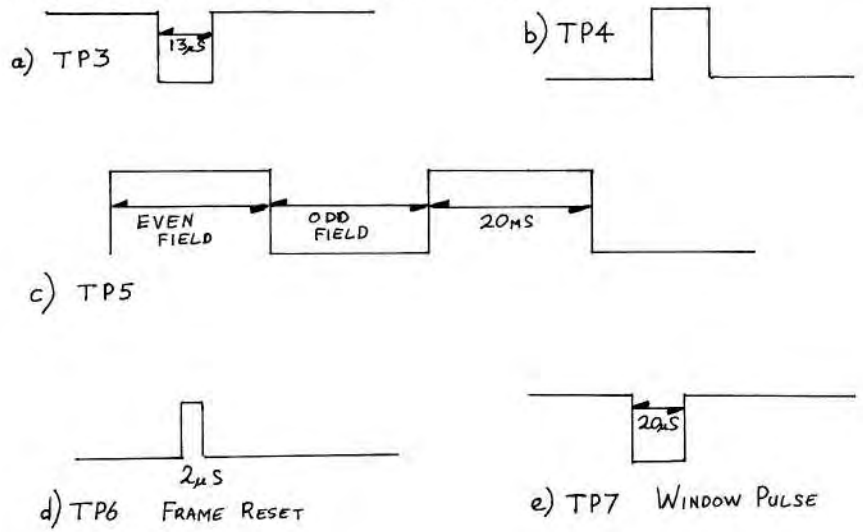


Fig.3 WAVEFORMS

A 20uS window pulse (Fig.3e) is generated by triggering another monostable (U6) with the even field output of the ZNA234. This window pulse and the 2uS field reset pulse are 'ANDed' by U7 and the result fed to the ZNA234. In this way the frame is only reset when the reset pulse is outside the 'window' and in practice this only occurs when the system is switched on, or as a result of a change of reference signal. Because the genlocking system is free of all other reset pulses and lock is maintained by a smooth VCO, the performance of the SPG is not degraded.

At the present time there are no plans for a circuit board to be produced by the club for this unit, but due to the small number of components it should not prove difficult to construct. The only setting up required is fine adjustment of the line phase control for optimisation of picture quality. The waveform diagrams included should help in fault location should problems be experienced with the unit.

AN ALTERNATIVE COLOUR ENCODER

By Trevor Brown G8CJS

A problem being experienced with the very popular G4BAU electronic test card generator (Amateur Television Handbook (blue)), is that the accompanying Pal coder circuit uses the now difficult to obtain TBA520 integrated circuit. An alternative coder was described in CQ-TV 134 and, whilst this circuit offers superior performance to the original, it is far more complex in it's design. The coder described here is much simpler, uses readily available components and requires a minimum of setting-up.

CIRCUIT DETAILS

The circuit is designed around the LM1886 Video matrix D-A converter and the LM1889 Video modulator. The LM1886 requires 3-bit digital inputs, each for red, green and blue, from which the internal digital-to-analogue converters and video matrix provide luminance (Y) and colour difference (R-Y and B-Y) outputs. The chip also has an on-board R-Y polarity switch for PAL working, requiring an inverted burst gate trigger input. The mixed sync (MS) and mixed blanking (MB) trigger inputs also need to be inverted. The LM1889 video modulator is capable of interfacing audio, luminance and colour difference signals into a low band VHF or, minus the audio, a composite video output. It is in the latter mode that it is employed in this coder.

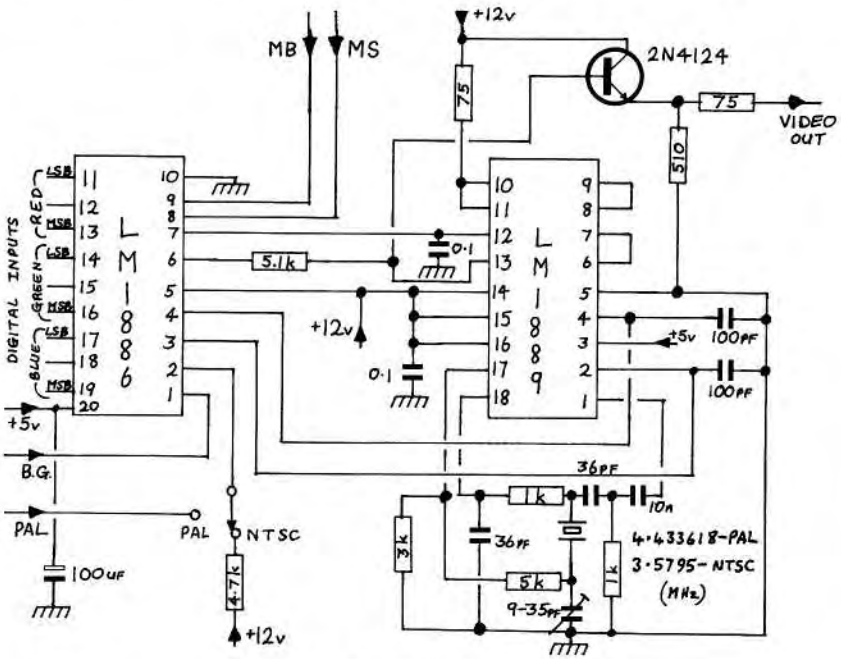


Fig.1 PAL ENCODER CIRCUIT DIAGRAM

The circuit is shown in Fig.1. The 3-bit binary coded colour signals are fed to the LM1886 at pins 11, 12 and 13 for red, pins 14, 15 and 16 for green and pins 17, 18 and 19 for blue. Inverted mixed blanking and mixed syncs are fed to pins 9 and 8 respectively, inverted burst gating to pin 1. The inverted PAL axis switch pulse is routed to pin 2 via a changeover switch, giving the facility to feed either the PAL signal to pin 2, or a logic 1 (5v) for NTSC working. The luminance and colour difference outputs of the LM1886 are fed to the LM1889. A sub-carrier at 4.433MHz for PAL, or 3.576MHz for NTSC, is provided by a simple crystal oscillator, the frequency required being determined by the crystal fitted. The composite video output at pin 13 is fed to a single transistor buffer, the output of which is 1-volt at an impedance of 75 ohm.

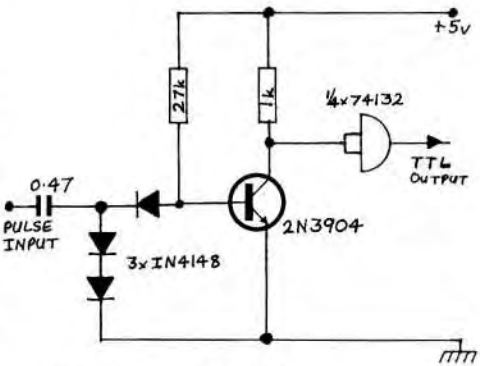


Fig.2 TTL BUFFER

CONSTRUCTION AND SETTING UP

Due to the simplicity of design the coder can be constructed on Vero-board, if producing a printed circuit board is not convenient. No particular attention need be paid to the exact placement of components, but it is suggested that the digital inputs to the LM1886 be kept separate from other signals on the board.

Before connecting the power supplies check for short circuits etc. Switch on and check the supplies at the appropiate pins of the integrated circuits. Connect the video output to a monitor and, if no picture appears, confirm with the aid of an oscilloscope that the digital colour signals and trigger signals appear at the appropiate pins of the LM1886. If the picture on the monitor has incorrectly registered colour the trimmer capacitor in the sub-carrier oscillator should be adjusted to correctly place the colour component in the picture. Once this small adjustment has been made the coder should be producing a perfect colour picture on the monitor.

MODIFICATIONS TO TEST CARD GENERATOR

If it is intended to use the coder with the G4BAU test card generator the following modifications to the generator will need to be carried out.

The 3-bit digital inputs to the coder are taken from board 3 of the generator, IC38 pins 8, 3 and 6 for red, IC39 pins 8, 3 and 6 for green and IC40 pins 8, 3 and 6 for blue. The summing resistors associated with the three pins on each IC should be removed. As there are not enough spare edge connector pins available on board 3, further pins may be inserted in the holes previously occupied by the resistors on the printed circuit tracks from the IC's.

The mixed sync and mixed blanking signals required for the coder can be sourced from the generator at the edge pins, but will need to be transformed to TTL level signals by incorporating the circuit shown in Fig.2. One circuit will be required for each signal.

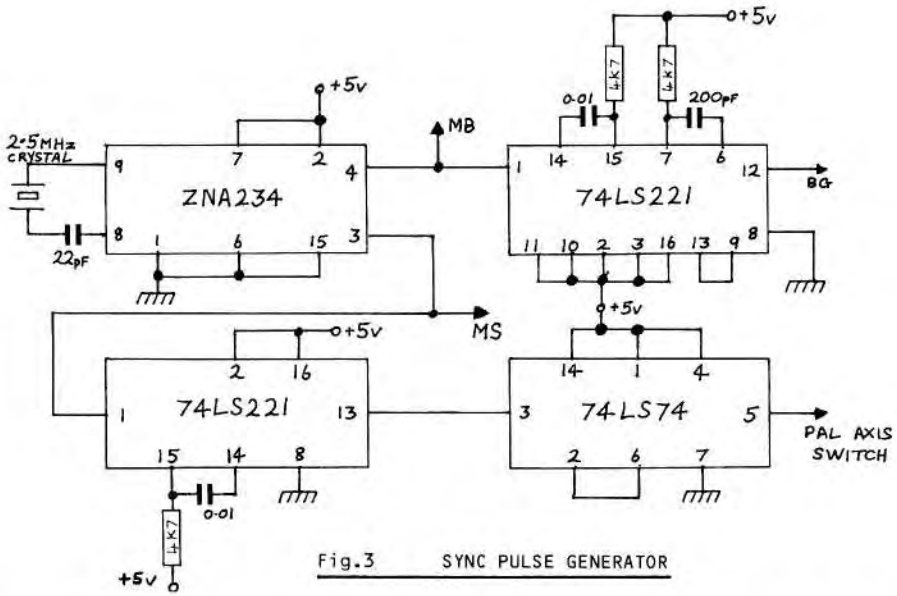


Fig.3 SYNC PULSE GENERATOR

Alternatively the timing signals MS and MB, plus the PAL axis switch and Burst gate pulses, may be provided by the circuit in Fig.3, which previously appeared in 'Best of CQ-TV'. This circuit, which is easy to construct requiring only a minimum of external components, could also usefully serve as a station sync pulse generator. The only setting-up required is select-on-test adjustment of the value of Rx (nominally 18k) and/or Cx (nominally 200pf). This is to place the burst gate component of the composite video waveform output from the coder in it's correct time slot, see Fig.4.

The performance of the coder and the associated circuits discussed, whilst perhaps not meeting the severe requirements of broadcast TV, will suffice extremely well in the Amateur TV station. They provide a relatively simple answer to the problem detailed at the beginning of this article.

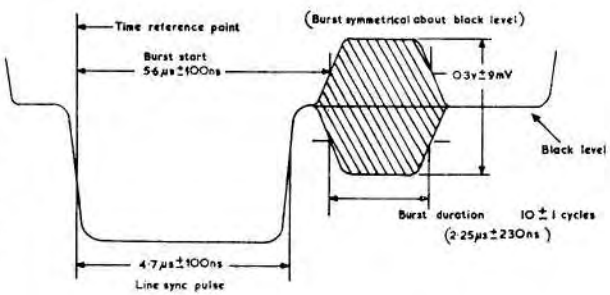


Fig.4 COLOUR BURST POSITION

IN RETROSPECT

'BEST OF CQ-TV' - 2C39 VARIABLE BIAS SUPPLY

Page 48 of this publication illustrates a variable bias supply for controlling the 2C39 power amplifier previously described. Unfortunately the 1N4148 diode in the base circuit is shown the wrong way round.

SLOW-SCAN COMPANION

One or two loose ends here: Page 63 Fig.13; pin 11 of IC1 should connect to a -12v rail and not to the + as shown. Page 7 fig.1; the '60ms' should refer to a whole line including the sync pulse, not just the video portion of the line. Page 49 Fig.2; pin 7 of the 74LS74 should connect to ground. There should have been a few minor changes to the G3WCY scan converter (p52), unfortunately these were omitted from the final artwork. Details will be published here next time meanwhile they are detailed on the paperwork with the PC boards from Members Services.

24cm INTERDIGITAL FILTER - CQ-TV120 & 'Best of CQ-TV'

Nothing wrong with this one, just one or two useful comments which might help out:

The centre tuning screw sets the frequency whilst the outer two set the passband response, symmetry and insertion loss. The line lengths originally described will not allow the filter to quite tune to 1320MHz (repeater outputs). Reducing the line lengths by 1/16" (to 2 1/16") will overcome this.

When building this design use PLENTY of screws in the top and bottom covers, at least 12 per side. You should see the effect on a Wiltron RF analyser of removing screws! Typical insertion loss is around 0.6dB and typical 3dB bandwidth is 35MHz. That's assuming you have built it as it says.

CROPREDY TEST CARD GENERATOR

Not actually a BATC project this one, nevertheless many members have built the unit so I feel that any notes are worth putting in here.

There have been one or two modifications recently, one of which concerned the oscillator and its derived signals. If you remember we slugged the 1MHz line with a 100pF or so, this 'cleaned up' the signal and made it work correctly. It's interesting to note that the mod is now 'official' in that it is included in the Cirkit kits. However, member John Wiggins has found that the problem usually stems from the oscillator itself, and that by simply removing the existing 33pF capacitor (C1) the usual problems are solved. The capacitor on the 1MHz line is therefore no longer required.

This has been tried out here on the new generator for GB3RT and does indeed work as suggested. Thanks John.

UNIVERSAL SYNC RE-PROCESSOR - CQ-TV136

Couple of odments here: Fig.2, N1 pins 1 and 6 should be reversed. N2a the bar-Q output is on pin 4 and not 14 as shown.

EXPERIMENTER'S CORNER

By Bob Platts G8OZP

Whilst developing a television station for the 10GHz band I have been playing around with various receivers. The NE564 demodulator, although very good is nevertheless a bit on the expensive side, so I thought I'd have a go at FM demodulation using some other chips. The following is a brief description of the results so far:

The first one to be tried out was the TDA2540, which is an AM TV IF and synchronous demodulator. The circuit I used is shown in Fig.1. The AFC output is buffered with an FET as it is at a fairly high impedance. The quadrature coil (L3) is damped with a resistor and, after tuning L2 to the centre carrier frequency and L3 for best recovered video, reasonable quality could be obtained when deviation levels were below about 1MHz. A useful feature of this device is that it has internal AGC and an external AGC output which can be used to drive an "S" meter. Users of Wood & Douglas VIDIF demodulator boards might like to take note of this fact as the same chip is used there as an IF amplifier.

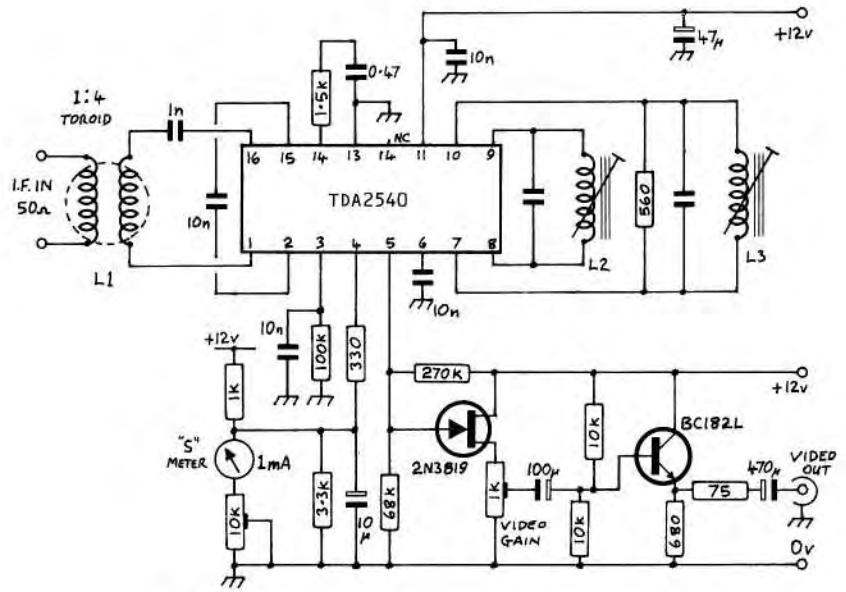


Fig.1

I think that further improvement could be made by adjusting the value of the 560-ohm damping resistor across L3. The fitting of a small (1-2pF) capacitor between pins 7 and 8 and a second one between pins 9 and 10 may also prove beneficial.

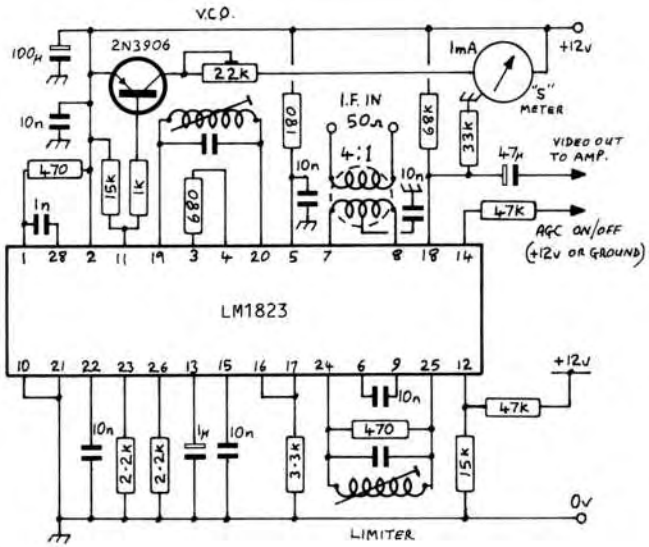


Fig.2

Another similar device which I looked at was the LM1823. This again is intended for AM TV reception however it does have some useful features.

Firstly it contains a high gain IF amplifier (55-60dB), the gain of which may be altered by adjusting the value of the resistor between pins 3 and 4. AGC is included as well as an external AGC drive for an "S" meter. The most interesting feature however concerns the synchronous demodulator. The IF signal is fed to a limiting amplifier and then to an internal PLL which generates the reference carrier for the demodulator. Fortunately the output of the phase detector is available on pin 18. I have not tried one of these chips yet but it looks promising. It will work OK up to around 60MHz.

Has anyone else been experimenting with alternative FM-TV demodulators I wonder?

G4ENB (Luton) as seen by G6SKO (Nr.Nottingham) via GB3TV repeater during some lift conditions in 1986.

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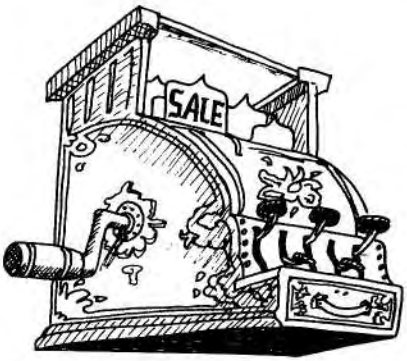

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HANDBOOK/CIRCUIT DIAGRAM for Sony Tektronix oscilloscope model 3SS. HANDBOOK/CIRCUIT DIAGRAM for Advance signal generator type E model-1. BACK ISSUES of Radio & Electronics World, January, February and March 1982.
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PLUG-IN remote control unit for Ferguson 3V16 VCR. Also operating manual to loan for copying.
George Mayo G4EUF, Carlton House, Broad Lane, Markfield, Leicester LE6 0TB. Tel: (0533) 242378.

405-LINE flying-spot-scanner, 35mm, c/w EMI MX29S tube, 25kv supply, scanning generators, di-chroic box, photomultipliers, built in 1965 by GW3JGA and demonstrated in 1966 at the BATC Convention - free to good home.
John Lawrence GW3JGA, 40 Aberconway Road, Prestatyn, Clwyd LL19 9HL. Tel: (07456) 3255.

PAST ISSUES OF CQ-TV MAGAZINE wanted for private collection. All issues prior to No.123. Also 'TELEVISION' magazines prior to 1983 wanted urgently. Good prices paid.
David Norrell, 51 Cairngorm Walk, Larne, Co.Antrim, Northern Ireland BT40 2JP.

SMALL PAN/TILT unit wanted to carry a Hitachi NV6212 camera and remote lens. ALSO any circuit for HV62K or details to modify for external sync input.
Eric Simpson, G3GRX, 16 Monnington Way, Penrith, Cumbria. Tel: (0768) 64890

CIRCUIT DIAGRAMS or workshop manuals for Grundig VP100GB portable video recorder and Grundig colour camera FAC1900. This camera is the same as the Sony HVC4000P. All expenses paid.
David Jones G6FEO, 8 kenilworth Road, Lighthorne Heath, Leamington Spa, Warwickshire CV33 9TH. Tel: (0926) 641347.

FREE TO A GOOD HOME; Ampex V7003H 1" colour VTR, mod/demod, believed to be OK, problem with servo system. I ALSO have a VR7003 B/W model (in bits!) for mechanical spares. Complete manual included, must be collected.
Andrew Stringer, G1CWO, 39 Hurst Road, Longford, Coventry CV6 6EL. Tel (0203) 361269 (evenings).

Satellite

READY-BUILT SATELLITE TVRO EQUIPMENT

Comex CR100 receiver	301.30
Comex CC25 SMATV receiver	phone
Comex SF1000 sync processor/decoder	143.75
Connexions CX2460R infra-red remote receiver	345.00
Connexions CX2460 rotary tune receiver	225.00
Connexions CXP6000 motorised dish drive (inc. cable)	225.00

SATELLITE TVRO KITS

TVRO receiver motherboard kit	35.00
AT1020 tuner module	35.10
AT3010 IF/demodulator module	54.65
New wideband tuner modules	phone
Polarotor kit (inc. feedhorn, polarotor and electronics)	85.00
Power supply kit	32.50
'S' meter kit	17.00
Tunable sound demodulator kit	30.00
RF modulator kit	25.00
Digital tuning and display kit	56.75
6.5MHz I/C sound kit (modification for receiver kit)	1.10
Video clamp kit	2.75
Low-noise IF pre-amplifier kit	35.00
Case for TVRO kit receiver	20.00

LNB's & FEEDHORNS

STS LNB (2.1dB noise, 56dB gain)	178.25
Connexions CX132 LNB	225.00
SPC LNB	182.00
NEC 2021 LNB	183.54
Comex scalar horn	49.00
Comex polarotor (pulse type, inc. feedhorn)	72.00
Connexions polarotor (inc. feedhorn)	75.00
Mitsubishi heterodyne converter	37.00

DISHES & MOUNTS

Kord 1.6m GRP dish (43.5dB gain)	97.75
Kord 1.2m GRP dish	phone
Connexions CX120 1.2m offset dish, polar mount and stand	290.00
Connexions CX180P 1.8m petalised dish with polar mount	484.00
Kord polar mount	109.25
Comex polar mount (takes up to a 2.1m dish)	128.00
Kord LNB tripod assembly	16.68

ACCESSORIES

20dB inline amplifier	22.00
Comex low-noise inline amplifier	46.50
2-way passive signal splitter	10.00
2-way active signal splitter	27.00
4-way passive signal splitter	17.00
Site survey inclinometer	25.00

TVRO MODULES

Astec AT1020 tuner	35.10
Astec wideband tuner module	phone
Astec AT3010 IF/demodulator	54.65
Mitsubishi heterodyne converter	37.00
Astec UM1289 RF modulator	11.05
Astec UM2301 RF modulator	11.90
Astec UM2302 RF modulator (PAL B)	12.20

PLUGS & ADAPTORS

'F' type plugs	0.50
'N' type plugs	3.50
BNC plugs	1.75
'F' plug to BNC socket	1.70
'F' plug to 'N' socket	3.00
'F' socket to 'N' plug	3.00

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RG58 50-ohm, 100pF/m, 7.6dB loss per 10m @ 1000MHz	28p/metre
RG213 50-ohm, 100pF/m, 2.5dB loss per 10m @ 1000MHz	85p/metre
Pope H100 50-ohm, very low loss	£1.00/metre
Motor drive cable - 5-core	£1.57/metre
Multi-cable (motor drive, polarotor and RF)	£3.20/metre

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Order value below £30 please add 0.60
Order value £30-£100 please add £1.50
Order value over £100 please add £2.50

Carriage on dishes is extra; £28 for the U.K. mainland. Dishes can only be delivered to a registered business address.
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