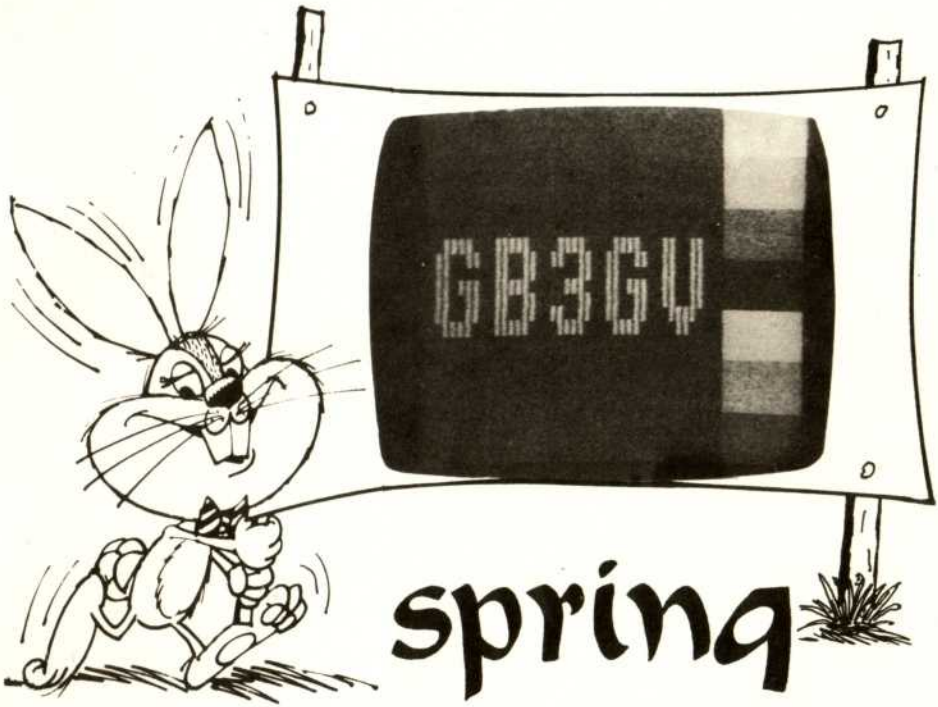
CQ-TV MAGAZINE No. 126

BRITISH AMATEUR TELEVISION CLUB

MAY 1984



....TIME FOR THE UK's FIRST A.T.V. REPEATERS

EXTRA

LATEST NEWS INSIDE . . . .

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MEMBERSHIP

FULL YEAR: £4 or £1 for each remaining quarter of the year. All subscriptions fall due on the first of January.
OVERSEAS MEMBERS are asked to send cheques bearing the name of the bankers London agent. Postage stamps are not acceptable as payment.

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The British Amateur Television Club is affiliated to the Radio Society of Great Britain.

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CLOSE FOR PRESS DATE FOR THE AUGUST ISSUE.....20th June 1984

EDITORS POSTBAG

Dear Ed,

Regarding Andy Emmerson's comments in 'TV on the Air' (CQ-TV125) about his recent activities on ATV. The masthead pre-amp he had to unpower because F1EDM was too strong probably accounts for the fact that he did not see much local activity. As you are new to the Northant's area we forgive you Andy and have a message: "Beam Northeast", we are here. Switch your pre-amp back on and here's looking for you looking for us.

C.Peacock G6CZE (Wellingborough), Kerry G4GGK (Rushden), Dave G4NAC (Kettering), Kevin G6IGG (Corby). Also watching and listening are Alex G6PBX and Bill, a shortwave eyewig! in Kettering.

Corby Amateur Radio Group.

(The following letter was passed on to me by the Membership Secretary and is typical of enquiries received by the club regarding SSTV. Despite numerous requests for slow-scan material in these pages, it is a sad thing that very little is received. To those newcommers seeking more information on this mode; perhaps you will remember that it is largely to those whose ranks you wish to join that you should atribute your disappointment, and when you become more experienced perhaps YOU will write about SSTV so that everyone may benefit from your knowledge). Ed.

Dear OM,

I am already equipped to receive SSTV and am obtaining very good results but wish to expand and develop the transmit side. With this in mind I obtained copies of your two publications via the RSGB and, on receipt, was rather disappointed as 95% of the articles therein apply to fast-scan. In fact the article entitled SSTV did little to help my situation.

I already have a fairly good technical library but the info I have on SSTV is sparse. I am now joining your Club hoping that you will be able to put me in touch with constructional items for the transmit side. The subjects I am particularly keen to study prior to construction are as follows:

Camera circuitry and construction.
Vidicon tubes and lens assemblies.
Conversion of fast to slow-scan.

A.G.Edwards G3HNP
Lyndhurst, Trelowth Road, Polgooth, St.Austell, Cornwall PL26 7BE

Dear Ed,

Although claiming a certain notoriety among locals as Chairman of the unsuccessful Constructors Club, I too decided to have a crack at the G3WCY SSTV slow-to-fast converter.

Many happy hours were spent, urged on by G4EGR, ruining my eyesight during board preparation and component mounting. The links on the digital board presented no real problem; I used insulated vero-wire which fitted neatly under the IC holders used - several of which proved unsuitable due to bad contacts, they had been purchased at rallies!

A real problem was found in obtaining capacitors small enough to fit into their places, as no stockist, either mail order or in Bristol seemed able to help and who but a favoured few can gain access to RS Components?

Switch-on came at last: No bars; no picture; then, after six weeks of trying and on Christmas Day no less, a visiting 'whizz-kid' soon located a faulty IC. I re-soldered the inevitable dry joint and since then, pictures from all round Europe and even from 'W' have arrived via 20-metres and a dipole.

Thanks G3LPB for your notes - I look forward to your ideas on fitting a tuning indicator.

C.A.Watkins G3TTZ

Dear Ed,
I used to be a member of the BATC in the late sixties when I lived in Cambridge, but I let my membership lapse around 1971. I also used to be G8EZV but have also let that lapse too. I seem to be having a renewal of interest in ATV and my main field will be in restoring and running 405-line sets when the broadcasts cease. This may sound a retrograde step to you but I think it is an important and nostalgic piece of history which should not be just cast aside.
I have now re-joined the BATC.

Graham L.White,
Luton.

Dear Ed,
Further to the letter from Ken Walker G8DIR, (Editors Postbag CQ-TV125), regarding the use of 435MHz in amateur TV transmitters. Whilst I agree entirely with all the points Ken made I would like to point out that as amateur TV transmitter manufacturers, we have to ensure that operators of our equipment do not transmit vision signals which fall out of band. A large number of users now make colour TV transmissions and it is a requirement that to remain in-band the vision carrier frequency should be near the band centre of 70cm. We are very concious of possible interference problems to the FM repeaters and, to this end, we shall be supplying all new transmitters crystalled-up for 435.5MHz. To operate much higher in frequency with colour would result in 'out of band' operation. We have always offered the option to purchasers of having a 437MHz crystal fitted (435MHz was fitted as standard) and pointed out the limitation if colour transmissions were to be made.
The Fortop TVT-435 TV transmitter is the only commercially made amateur unit to incorporate a switchable video filter (2.5MHz as standard) to reduce the transmitted bandwidth. Even with the filter out the video response is 'rolled off' to reduce the spread of video sidebands into the phone end of 70cm whilst still allowing colour operation. A competitor fits a 20MHz wide test facility to their product! I know that someone will write-in complaining that the output from the transmitter is double-sideband, as are all the others, and not VSB, and then maybe transmitting part of the lower sideband in the restricted section of 70cm. I know, but we can't have everything can we? I for one would be willing to exchange the bottom 2MHz of 70cm for an extra 2MHz on the top, up to 445MHz would be lovely.
Incidentally, the video filter in CQ-TV120 (page 10) should work OK with the 2.5MHz block filter, Toko part No. 237LVS1109, but fit 2.2k damping resistors across each filter element otherwise ringing may occur.
73 All.

Steve Whalley G4DVN.
FORTOP Ltd.

PS. All dead simple designs for 20W VSB transmitters to.....!

Dear Ed,
I thought your readers may be interested to know of the activity of amateur television in the London area. The Home Counties Amateur Television Group meet at Richings Park Sports and Social Club, Iver Buckinghamshire, at 8.30pm every fourth Wednesday in the month. Talk-in is provided on 145.2 MHz.
We operate both slow and fast-scan monochrome and colour television on HF, as well as 70cm, 24cm and 10GHz.

P.W.Andrews G6MNJ
Secretary H.C.A.TV.C.

Dear Ed,

For some years now I have had the idea of fitting a TV camera and transmitter into a model helocopter, before I knew much about radio in fact!. Well, a few months ago I decided that it had to be done and I soon got the project off the ground - so to speak!

I purchased the machine of my dreams. With it's 22cc petrol engine it is capable of lifting some 6-pounds of payload. I have built the Wood & Douglas transmitter, which delivers about 320mW peak to the aerial (via a band-pass filter). This seems sufficient for my needs as I have achieved approximately 1-mile range with a $\frac{1}{4}$-wave dipole on the TX and a 3dB whip at the RX. This matches the safe range of the radio control - no use having a P5 picture if you have lost control of the model! 'still it might make a spectacular video tape.

This set-up, plus ni-cad's weighs-in at $1\frac{1}{4}$lb and it is at this point that I wish to enlist the help of your readers. I am looking for a suitable camera of similar weight and voltage requirement. I stripped down my old Akai VC100 to the bare electronics and put it in a lightweight case but it still came out rather on the heavy side, and anyway it soon died of shock. So if anyone knows of a source, at a reasonable price, I would be glad to hear from them.

I know that TV has been fitted into model aircraft before and I would like to get in touch with anyone who has first-hand experience.

I hope to have this working (and licenced) at the BATC Convention in May but I can make no rash promises.

Brian Parkin, 5 Hillview Court, Oaks Avenue, London SE19 1QX. Tel: 01 275 3305 (day) or 01 761 2967 (evenings)

NEWS ROUNDUP

NEW 24cm CONVERTER?

You may have recently seen advertised by THE CQ-CENTRE a 24cm ATV converter. As soon as I spotted it I sent off an enquiry post-haste. What have I received? Nothing - not even an acknowledgement. Another shining example of British entrepreneurial expertise. ('Course it's bound to be the Governments' fault!) We shall just have to wait for the professionals; at least they will get it right - try the Fortop ad.

SUBSCRIPTION RENEWALS

Dave from our records and sub's department has been on to me recently concerning an outbreak of forgetfulness.

It seems that some of you are writing to Dave enclosing your 1984 subscription and complaining that you never had a renewel form with your magazine. Is the computer going wrong, he asked? Not a bit of it. Upon investigation, it transpires that the reason you didn't receive a reminder was because you had already paid for the year. Now you have paid twice and Dave is having to credit you for next year.

If you go back to CQ-TV123, on page 15 it explains how the system works, and it also tells you that the number, in the top left-hand corner of your magazine address label, indicates the year for which your subscription has been received, eg: 84 means that you have paid-up to the end of 1984 etc. There's a moral here: If you reckon it's wrong; think first before shouting - It would help us poor long-sufferers; (ahh!).

CQ-TV125 ERRATA

No matter how hard one tries, there always seems to be some errors in a magazine only spotted AFTER it has been printed.
I am indebted to several members for pointing out the following clangers:

VIDEO OUT FROM AN 'RF' ONLY MICRO

The 470pF capacitor is shown in the main output line but should have been in the RF output line only. The capacitor should therefore be connected between the RF modulator output and the junction of the main output and the 100-ohm resistor. (The circuit was given to me as drawn - honest!)

A 'BEEB' TEST-CARD

The assembler part of the programme will not run. If all the £signs from line 610 on are changed to 'hash' signs, there should be no further problems. The trouble here was caused by my not remembering about different embedded commands for my particular printer.

THE 'Q-STUDIOS' SHOW

I have to apologise to FORTOP Ltd., for inadvertantly omitting them from my report. Fortop were very much in evidence as usual and were showing (among other things) their excellent new TVT1300 24cm FM-TV transmitter. The two Steve's were there dispensing helpful advice and discussion to would-be 24cm'ers.

Now that we have a news 'Hotline", I will try to ensure - where possible - that any important corrections to the current CQ-TV magazine are notified to that service. This means that you won't have to wait 3-months for a correction.

MEMBERSHIP APPLICATIONS - CHANGE OF ADDRESS.

Please note that due to some re-arrangements within the committee, all applications for membership to the BATC should now be sent to:- Membership Secretary, 'Grenehurst', Pinewood Road, High Wycombe, HP12 4DD. Tel: 0494 28899. Any members holding membership application forms may like to amend them accordingly.

COPY-COPY-COPY

I'm getting short of magazine copy again! Since I received such a nice response to my last request, I am trying again.
I bet there's lots of you who have a favourite gadget or tip which could be passed on. I know there are many who can write articles; either long or short. Please feel free to 'phone me on Rugby (0788) 69447 if you want to discuss an idea.
I would also welcome suggestions for topics which you would like to see covered in CQ-TV. Even if you can't write it I may be able to get it done. Try me.

ARTISTS TO THE FORE

In recent issues you may have noticed the odd drawing or cartoon inserted either to fill up a space or to enliven a dull page of text. Most of these I draw myself - although a few are 'poached' from magazines.
As you can see I am not very good at it and anyway it takes up a fair bit of time. Is there anyone with an artistic bent who could provide me with sketches of a similar ilk? I can provide most of the ideas (if necessary).
I'm afraid I can't pay for the work, but after all, STYX had to start somewhere, and you would be helping the old mag.

1000MHz FOR MOBILES!!!!

'John Carlton, chairman of the Mobile Radio Group of the European Conference of Radio and Electronic Equipment Associations', (try that handle after a heavy night!), 'has called for a major reallocation of the frequencies available for mobile radio services. Nearly 1000MHz of radio spectrum should be reserved for mobile use, he believes'. So runs a column in the January issue of 'Communications International'.
It seems that Mr.Carlton would like to set aside frequencies between 30

and 1000MHz for mobile applications only.
He argued that fixed services could be transferred to wire or optical fibres or to other frequencies that were inappropriate to mobile use.
If Mr.Carlton were to do only a teensy bit of homework, he would find that you can't just lump all those not actually mobile into one category and bung them on the land line. There are many services and applications where this would be not only inappropriate but downright impractical. The radio amateur, whose pioneering work made mobile radio possible, would certainly suffer greatly.
'Course he's not really asking for much is he? assuming a 12.5KHz channel spacing all he wants is about 77,600 channels. Still, it's nice of him to leave all that space below 30MHz for others. Lets just hope that Mr.Carltons' proposal ends up where it belongs...re-cycled into a parking ticket and stuck on his windscreen.

DIGITAL TV CHIP

In the April 1984 issue of Elektor, there appeared a piece describing a new memory chip from Philips of Eindhoven which digitises and processes the complete composite information for a TV picture.
'....The technique employed makes possible modifications to the video signal during processing. This would, for instance, mean the eradication of flicker, 'snow', and the cross-effects of inadvertent mixing of the brightness and colour information. Furthermore the television memory offers the facility of stopping the picture at any moment, or zooming in on a detail of the image.... The attraction of the chip is that it does not require any modification to either the receiver or the transmitter, which will simplify its introduction greatly'.

MINI MONITOR

Thandar Electronics are offering a new lightweight, low-power miniature monochrome monitor using a 2" diagonal CRT.
The TV2S operates from a standard 1 volt video signal and is powered either from an internal ni-cad battery pack, from an external 5 to 7v DC source or from an unregulated 12v DC supply through the ac adaptor/charger supplied.
Front panel controls are provided for brightness and contrast. Rear controls include 525/625-line switch, 75-ohm termination switch and focus and line and field controls.

Thandar Electronics Ltd,
Huntingdon, Cambridgshire.

TV RECEIVER - CQ-TV121

Tandy no longer make the part quoted for T1 on page 34. It seems that the Eagle part LT44 works well and fits the board as shown. The winding marked 'primary' as supplied is used as the secondary in this application, and vice versa. The LT44 has an impedance of 20k (primary) to 1k c/t. and is designed as an audio driver. Distributors such as Maplin should be able to supply these.

THE 2732 EPROM IS...

NOT suitable for the BBC micro. That's in answer to the questions being asked of Members Services. The chip is used for the SSTV sync pulse and pattern generator described in Handbook 2 for which a PCB is available.
Demand for the SSTV scan-converter boards have been particularly heavy and it is difficult to kep up with demand at times. If your order is slow to arrive, please be patient as Peter is doing his best to please everyone.

Malcolm Chambers' impressive TV mast which towers over his garden.

Radio 'ham' turns to TV

JUST being a radio ham is a bit old hat nowadays, says King's Lynn maintenance engineer and electronics fanatic Malcolm Chambers.

He uses his broadcasting licence to achieve the ultimate in communications with his fellow enthusiasts — through a television link!

Malcolm, a 27-year-old bachelor, took his radio exams and then became more interested in electronics and started buying equipment.

"Once you do that you're hooked," he said.

Now his bedroom is crammed with sophisticated electronics equipment which he uses every spare moment trying to achieve the best quality TV links.

Aerial

A 50-foot aerial in the garden provides the essential link with other TV 'hams.'

"We are classed as radio 'hams' but instead of the voice we send picture signals. We have to send sound separately," said Malcolm.

"Apart from the transmitter, everything else is available domestically on the home market. It doesn't need a big outlay to be able to transmit pictures."

Transmission range varies enormously depending on atmospheric conditions.

"After 15 or 20 miles it gets more difficult but we have been able to receive pictures from Northern France in ideal conditions," he said.

Plug

Malcolm spends much of his airtime in contact with Andrew Green, of nearby West Winch, and his brother Laurence.

"We're into anything electronic," he said. "We plug into a computer to generate test cards and show each other films we have taken.

"The only limit to our hobby is money. Some people are only interested in getting in contact with as many people as possible, but we devote time to getting the best possible quality," said Malcolm.

Malcolm Chambers in his 'studio.' On screen is fellow electronics enthusiast Andrew Green.

There has been a 'rash' of publicity lately about amateur TV. This piece was spotted in the March 1984 issue of 'Telecom Today' which is the British Telecom staff newspaper.
The piece is reproduced by kind permission of British Telecom.

BATC ON PRESTEL

As reported last time, we have secured a number of 'club' pages on the British Telecom Prestel service. At the time of writing there are only brief general details displayed but as soon as Paul Elliot G4MQS, who is to have access to the computer input, has completed the Prestel course, the full news and information service will commence. Members wishing to download pages should use the BATC's page number: 8008 2002.

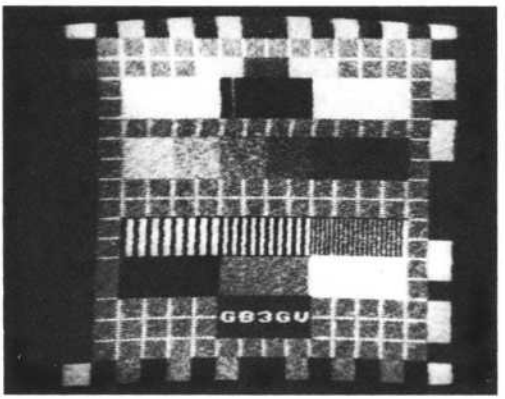
CQ-TV AWARD

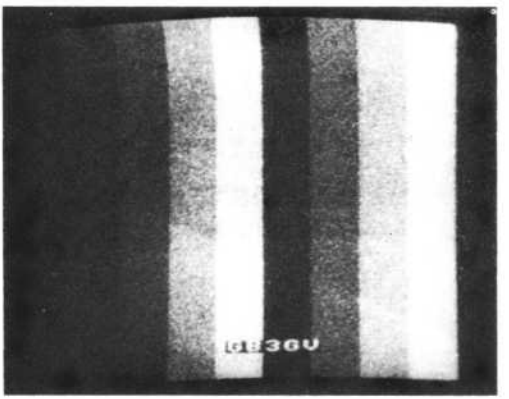
NEW RULE: Contacts through repeaters will not be acceptable for points when claiming any of the awards.

Compiled by John Wood G3YQC

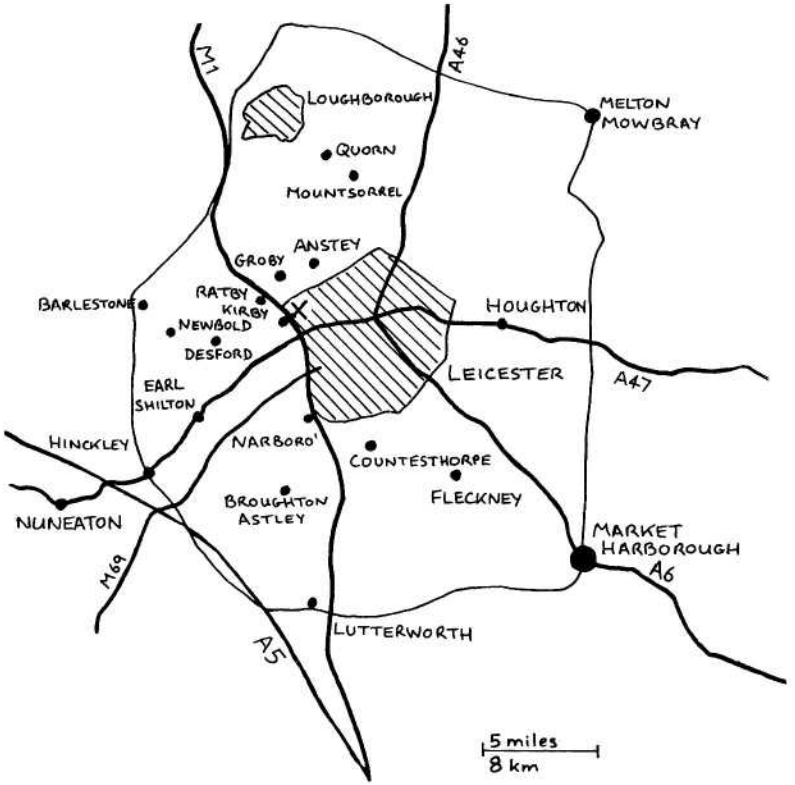
I trust that you all read the newsletter circulated to U.K. members announcing the licensing of our first five ATV repeaters on the 16th of February 1984. This certainly marks a milestone in the annals of ATV history and should serve to encourage even more amateurs onto television.

Some repeaters are already on the air whilst others are still in the process of construction. In order that you may have an idea of the present situation, I contacted each group shortly before the magazine closing date to find out how they are coming along. The results of these talks are shown below together with a map of each area indicating the actual repeater site and its predicted coverage. It should be borne in mind though that these maps were originally drawn on the assumption that considerably more power than the permitted 25W erp was to be used, however they should at least give a guide.





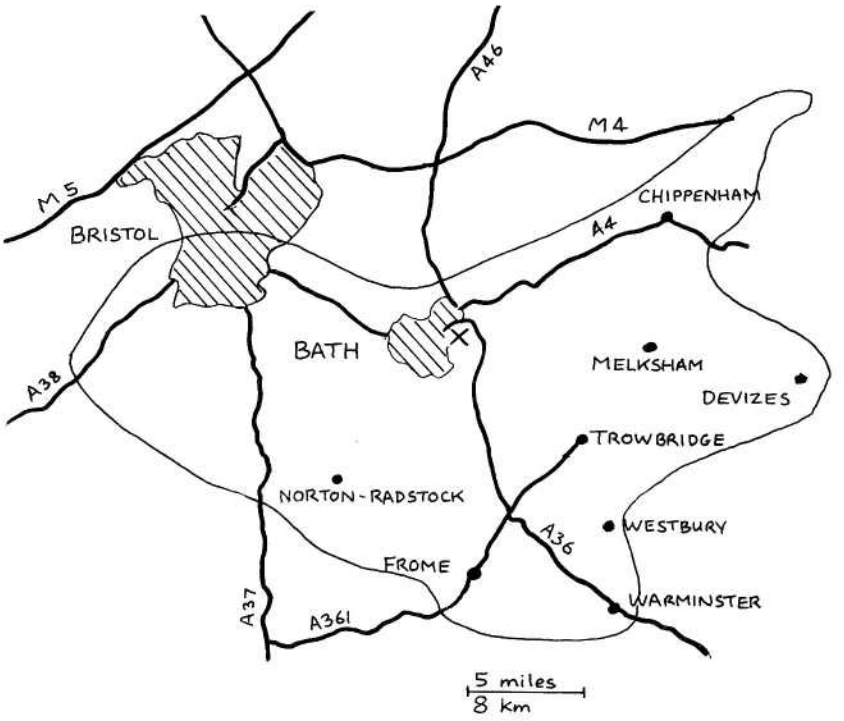
These two photographs were taken off-screen by Deryk Wills G3XKX, as was the one on the front cover.
The pictures were taken on the second day of GB3GV's operation from a distance of about 12Km. A 15/15 aerial was used into a Fortop converter and a Rigonda TV. They are believed to be the first ever pictures of a British amateur television repeater transmission.



☆ GB3GV ☆

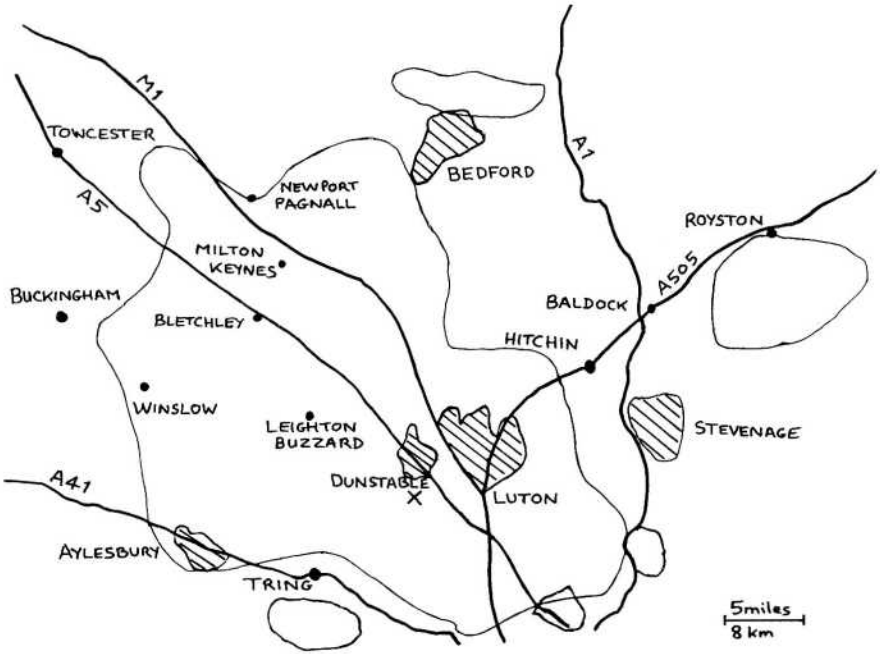
LOCATION: Glenfield, North West of Leicester, (temporary).
CHANNEL: RMT-1. Input: 1276.5MHz - Output: 1311.5MHz.
POWER: 25W erp.
AERIAL: 2 x Alford slots - omni-directional.
MODE OF OPERATION: FM input and AM output. (FM output is available and may be introduced later.
ACCESS: By receipt of a valid 625-line transmission.
IDENTIFICATION: By morse code on a 6MHz inter-carrier sound channel and by 'Teletext' style pages and computer graphics on vision.
OPERATIONAL STATUS: Fully operational in repeat mode. Beacon transmissions and station identifications take place at approximately one minute intervals and last for around one minute.
FURTHER INFORMATION:
GB3GV was first on the air. The switch-on date was Sunday the 26th of February although due to a problem with the receiver it was not put into the repeater mode until a couple of weeks later. Coverage is limited due to the temporary site although at least one station in Nottingham (23 miles away) has reported receiving a P2 picture.

Anyone wishing to assist in the project or subscribe to the group should contact Paul Elliott G4MQS (QTHR).



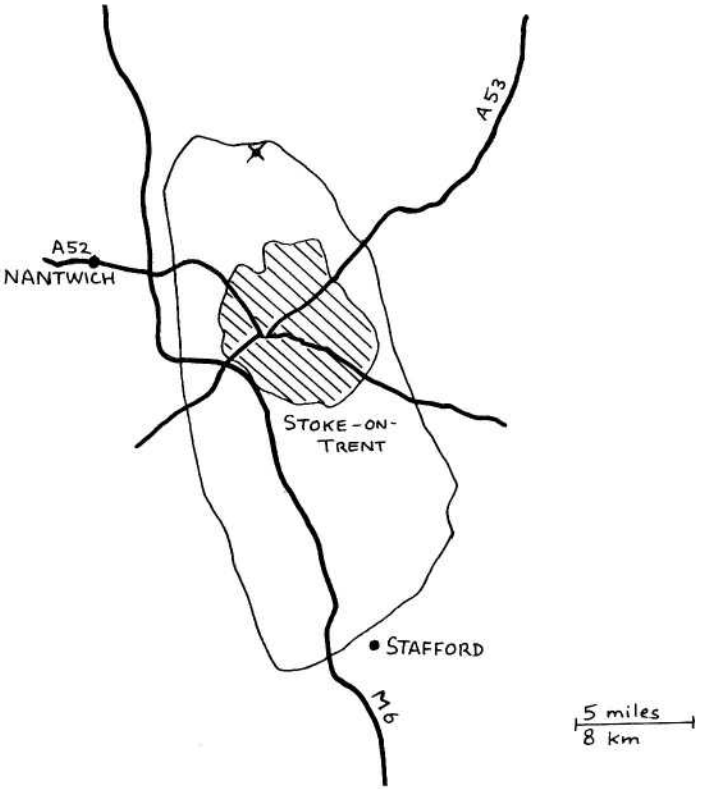
☆ GB3UT ☆

LOCATION: East Bath.
CHANNEL: RMT-1. Input: 1276.5MHz - Output: 1311.5MHz.
POWER: 25W erp.
AERIAL: Stacked dipoles (or similar) - omni-directional.
MODE OF OPERATION: AM input as priority and FM; AM output.
ACCESS: By receipt of a valid 625-line transmission.
IDENTIFICATION: By morse code on a 6MHz inter-carrier sound channel and by computer graphics on vision. Beacon mode will transmit every 7.5 minutes with 30 seconds of identification.
OPERATIONAL STATUS: Not operational. Expected to be 'on-air' by August.
FURTHER INFORMATION:
This machine is interesting since it differs somewhat from the other four. A single aerial is to be used (rather than two separate ones as chosen by the other groups). The repeater will transmit AM only and will accept an AM TV signal as priority although an FM transmission will be accepted as an alternative.
The project is being sponsered by the Mendip Repeater Group who would be pleased to hear from anyone wishing to help or join. Contact: S.Gardner G4PSP, 191 Charlton Park, Midsummer Norton, Bath, Avon. Tel: 0761 413902



☆ GB3TV ☆

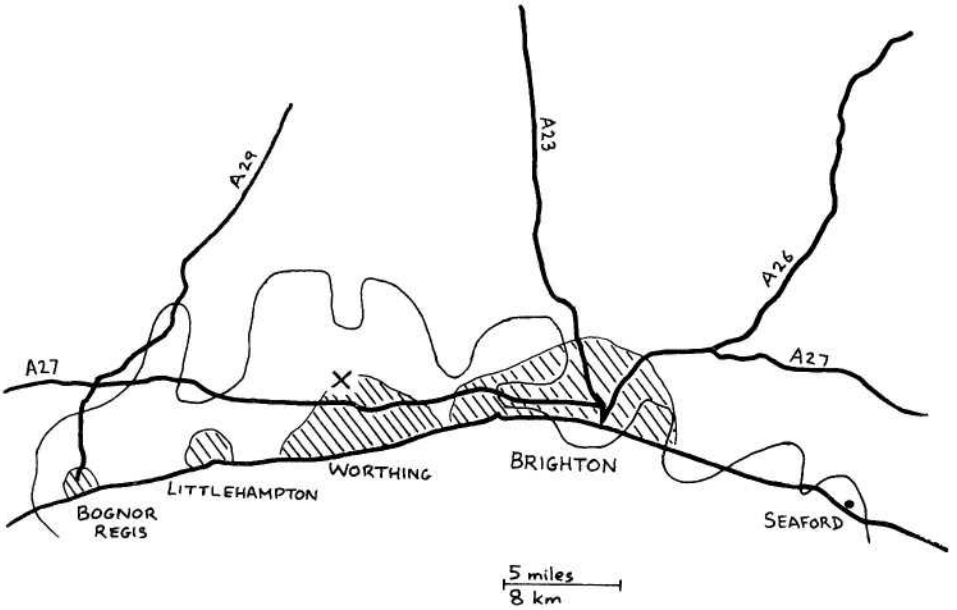
LOCATION: Dunstable downs, (permanent).
CHANNEL: RMT-2. Input 1249.0MHz - output 1318.5MHz.
POWER: 25W erp.
AERIAL: 2 x Alford slots - omni-directional.
MODE OF OPERATION: FM input and output.
ACCESS: By receipt of a valid 625-line transmission.
IDENTIFICATION: By morse code on a 6MHz inter-carrier sound channel and by computer graphics on vision.
OPERATIONAL STATUS: Should be operational in repeat mode by publication date.
FURTHER INFORMATION:
G4CPE (already a notable 24cm operator) is masterminding this entire project under the wing of the Dunstable Amateur Radio Club. Anyone wishing to contact the group should direct their enquiries to: C.A.Asquith G4ENB, 25 Wychwood Avenue, Luton, Beds.



☆ GB3UD ☆

LOCATION: Mow Copp. North of Stoke-on-Trent, (permanent).
CHANNEL: RMT-2. Input 1249MHz - output 1318.5MHz.
POWER: 25W erp.
AERIAL: 2 x Alford slots - omni-directional.
MODE OF OPERATION: FM input and output.
ACCESS: By receipt of a valid 625-line transmission.
IDENTIFICATION: By morse code on a 6MHz inter-carrier sound channel and by computer graphics on vision.
OPERATIONAL STATUS: Not operational. Expected to be 'on air' by June or July.
FURTHER INFORMATION:
The hardware is nearing completion for this project curtesy of Fortop Ltd. The location, although high, is quite well screened to the North West but should provide good coverage to the South East.

The licence is held by the UK FM Group Western and the project is being conducted by the Stoke-on-Trent TV Club.
Any further information may had by contacting Steve Whalley G4DVN, 13 Cotehill Road, Werrington, Stoke-on-Trent, Staffs. Tel: 078 130 2607



☆ GB3VR ☆

LOCATION: Worthing, West Sussex. (temporary).
CHANNEL: RMT-2. Input 1249.0MHz - output 1318.5MHz.
POWER: 10W erp. (to be increased at a later date).
AERIAL: 2 x Alford slots - omni-directional.
MODE OF OPERATION: FM input and output.
ACCESS: By receipt of a valid 625-line transmission.
IDENTIFICATION: By morse code on a 6MHz inter-carrier sound channel and by computer graphics on vision.
OPERATIONAL STATUS: Fully operational in repeat mode.
FURTHER INFORMATION:
Control for this repeater is by a 6800 micro-computer. 7-pages of 'Teletext' style information is also available.

There are a considerable number of stations active in the area and it is hoped that the repeater may be worked from the Continent during lift conditions.

Anyone wishing to contact the Worthing and District Video Repeater Group may contact Roy Humphreys G4WTV, 106 Willow Crescent, Durrington, Worthing, West Sussex, BN13 2SY.

The proceeds from the ATV Program, advertised on the inside back cover, all go to help the repeater fund.

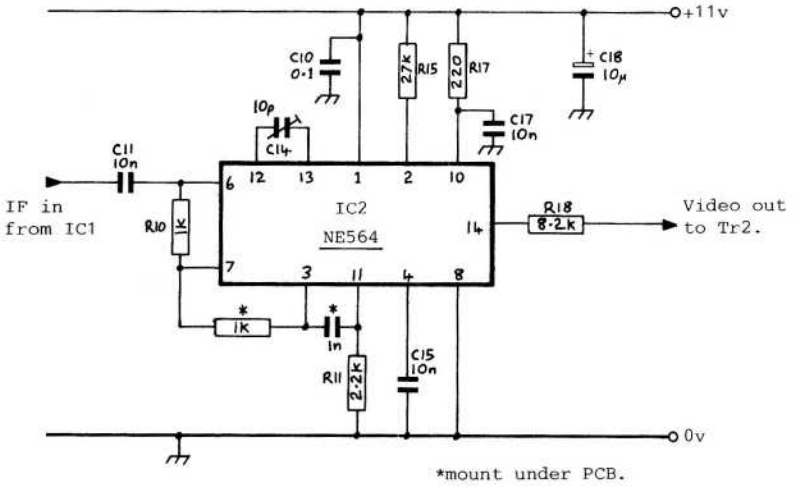
IDEAS FOR 1.3GHZ

Compiled by John Wood G3YQC

It has been found by one or two members that the NE564 PLL FM-TV demodulator described in CQ-TV122 (p.6) can be a little touchy and consequently - under certain conditions - may need a slight re-tune now and again. G8CMQ found this to be so and has re-configured the circuit so that it operates using a free-running VCO set to the average IF frequency, rather than the more widely used method whereby the VCO tracks the incoming signal.

The modified circuit diagram is shown below and, for those using the printed circuit board available from Members Services, the following sequence of operations may be followed:-

Remove R's 12, 13, 14 and 16.
Remove C's 12, 13 and 16.
Disconnect pin 9 from pin 3 by cutting the track; leaving pin 9 disconnected.
Replace C15 with a 10n.
Install a 1n capacitor between pins 3 and 11 (fit under the PCB).
Install a 1k resistor between pins 3 and 7 (fit under the PCB).



MODIFIED CIRCUIT FOR PLL FM-TV DEMODULATOR (CQ-TV122)

G8CMQ has also discovered that the NE564 does not like too high a supply voltage. He says that 11v is about right. There is no reason why the whole board shouldn't work quite happily on this voltage so a suitable dropper resistor and a 11v zener diode may be used to good effect.

It has been found that the L1 tuned circuit is not really necessary. It was included initially to tailor the IF bandwidth in order to achieve best noise performance. In practice its removal has a negligable effect on circuit operation and will allow the use of different IF frequencies. Remove L1, R5, C5 and C6 and connect R6 to the drain of Tr1 using an insulated wire link.

For those members who joined the club after CQ-TV 122 and therefore don't have the article referred to, they may either purchase a back-issue or a photo copy of the article from BATC Publications (3-pages). The article is entitled 'An FM-TV Receiver' and ordering details may be found in the Publications price list at the centre of this issue.

A SIMPLE FIXED-TUNED CONVERTER

A good looking idea for a converter has come from G4WTV (ex G6AIW). The idea uses more-or-less any 'domestic' 23cm converter with a 28 - 30MHz IF.

If you care to work it out, you should find that the local oscillator is on 1268MHz. Now RMT-1 repeater output frequency is 1311.5MHz therefore, selecting the difference frequency results in an IF of 43.5MHz. The FM demodulator referred to above will operate cheerfully at that frequency. Similarly, for RMT-2, the resulting IF would be 50.5MHz so, for those who wish to work through their local TV repeater, this method is a rather easy way of getting going, (at least until purpose-built units become readily available).

A couple of points should be borne in mind however when using the converter in this way; the 10M IF coil(s) will have to be altered to resonate at the new IF. In most cases this will mean removing a few turns from the existing coil and reducing the value of its fixed capacitor. The front-end will need to be re-peaked to the new input frequency. If you are using the CQ-TV FM IF board, don't forget to remove the IF tuned circuit (or exchange it if you prefer).

Roy has used this technique to good effect so why not dig out that unused converter and have a go?

A NEW WIDE-BAND AERIAL

In these early days of 23 and 24cm ATV operation, there is a particularly important piece of essential gear which we need but which has not so far been available commercially. I refer of course to the aerial. The main problem for ATV'ers is that the range of operation can be anywhere between about 1249MHz (RMT-2 input) to 1318.5MHz (RMT-2 output). The relatively narrow-band aerials so far available have a considerable falloff in performance outside their specified frequency limit, which becomes progressively worse the further away you get.

As I have said many times in these pages, the most appropriate aerial for our use would seem to be the helix. This aerial has a very wide bandwidth indeed, easily encompassing the range of frequencies required for ATV working, and the gain actually increases as frequency rises. The fact that polarisation is

circular does mean a theoretical gain decrease of about 3dB when used against a linearly polarised signal however, over distances of more than a few miles, it is well known that the polarity of a signal at these frequencies may well alter considerably therefore a signal which starts off as (say) horizontal, may be anything but that by the time it arrives at the receiving aerial. It will thus be appreciated that an aerial having a maximum loss to ANY polarity signal (other than circular of course) of no more than 3dB must be very good news for us.

A small family firm; Sandpiper Communications, has recently released a 20-turn helical aerial on the market for 23/24cm. The gain of the aerial is 17dBi and its overall length is only about 50".

I have just purchased a helix from them, which came by return of post! but as yet I have only assembled it. First impressions are that it is very nicely made, is strong and assembles easily and without problems. During the next few weeks G8VBC and myself will be evaluating the aerial and will be reporting back on our findings in the next issue.

Meanwhile anyone who is interested should consult the Sandpiper advertisement elsewhere in this magazine.

Alinco EC-270 Scan Converter

By A.P.Marsden G6JAT

The EC-270 Scan Converter by Alinco Electronics is a fast-slow/slow-fast scan converter ideally suited to amateur purposes. It offers a comprehensive range of facilities to enable one to transmit and receive slow-scan TV pictures, and record and playback from tape. The input signal may be any normal video source, and the unit offers control of both contrast and brightness, as well as a 'negative picture' switch (i.e. black and white reversed). Pictures may be transmitted continuosly, or a single frame 'frozen' in the memory for transmission, and a 'shot change' switch enables one to interrupt part way through the transmission of one picture to substitute another. Controls are also provided for contrast and brightness of the slow-scan signal, and a grey-scale is available to facilitate setting-up. Full monitoring facilities are available, with both video output, and RF via a modulator. The unit is internally linkable for either 525-line/60Hz or 625-line/50Hz operation, and conforms to the slow-scan picture standard of 128 x 128 pixels with 4-bit grey scale and output frequencies of 1200Hz, 1500Hz and 2300Hz for sync tip, black level and peak white respectively.

This unit would appear from the description in the operating manual to be well-designed for operation at the centre of the slow-scan outfit.

DC CONVERSION FOR 'MAINS' CAMERAS

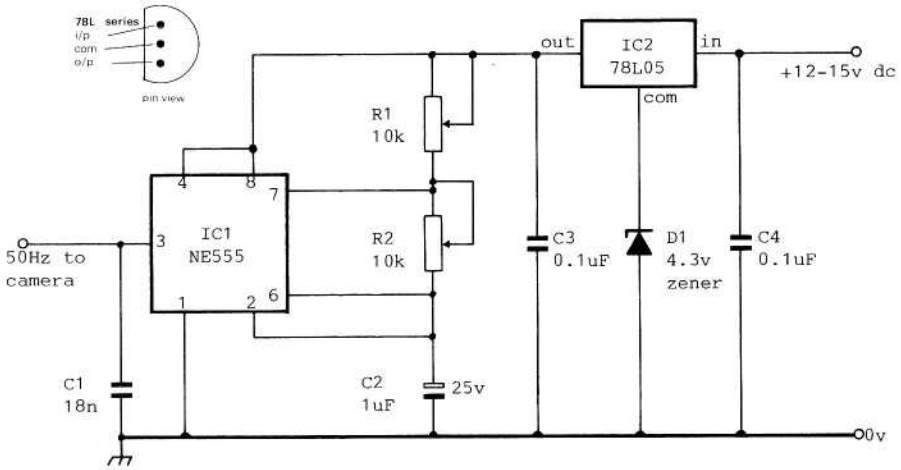
By Shaun O'Sullivan G8VPG

Like myself, many ATV'ers use ex-surveillance cameras as their primary vision source. Such cameras usually have an internal mains power supply, which is convenient for shack use but can cause problems if portable operation is envisaged. Although most solid-state cameras employ a 12 - 15v dc supply, they frequently need a source of 50Hz to derive the frame syncs. This signal is usually taken from the low-voltage ac supply before the rectifier diodes.

The circuit shown here will produce a suitable 50Hz signal which, when used with a 12 - 15v dc supplied camera, will enable correct operation for portable use, (provided of course the tube voltages are derived from the 12v supply).

IC1 is an NE555 timer wired as an Astable oscillator. R1 and R2 allow the frequency and mark/space ratio to be adjusted. This may be done using a 'scope or by trial and error on the camera itself. C1 eliminates any spurious oscillations which may be present and which could cause noise on the picture; this may need adjustment on test. IC2 produces a stabilised supply voltage of around 9v.

The circuit was developed for use with my Hitachi HV62 and works very well. Doubtless other cameras will be able to use the circuit to good effect as well.



50Hz OSCILLATOR FOR 'MAINS LOCKED' VIDEO CAMERAS.

CONTEST NEWS

RESULTS

1983 WINTER CUMULATIVES

POSITION	CALL	POINTS	LOCATION	POWER/ANT	BEST DX(K)
1	G8MNY	7127	ZL60A	300/19	G8DIR-232
2	G8DTQ	6618	ZL60E	250/2X21	G8DIR-237
3	G4CRJ/A	6292	ZL37H	150/88	GU8FBO-273
4	G3UMF	6247	ZL15F	10/46	G3LIS-219
5	G8DIR	5279	ZM27J	150/23	G6MPE-270
6	G8LKW/P	4437	YM50D	15/48	G6MPE-221
7	G6YLG	3709	YM40E	100/88	PA0AAQ-227
8	G8GLQ	2174	YL48H	400/48	G8JMJ-174
9	G4VBS	1142	AM649		PE1DWA-265
10	GM4BVU	1082	XP20E	60/88	GM3RVK-89
11	G2BM1	586	ZL38J	12/18	G8DTQ-43
12	G4CRJ	363	ZL38J	150/46	G1BTF-52
13	G8VPG	154	YL48C	10/19	G8UUE-13

Congratulations to John G8MNY for gaining first place from Brian G8DTQ not far behind.

Although the number of entries has dropped somewhat the level of activity each night appears to have been as high as ever - G8MNY worked 28 stations during the 3-hour session when we had the best conditions on December 2nd.

SUMMERFUN CONTEST Sunday May 20th.

Don't forget this years SUMMERFUN contest which is thoughtfully being held the weekend after the BATC Convention - gives you a chance to try out all those goodies purchased at same.

Rules on page 29 of CQ-TV 125. Could we have a lot more entries this year please.

INTERNATIONAL ATV CONTEST September 8-9th.

This is the big one of the year so now is the time to get your holiday plans sorted out. You wouldn't want to be away for the International, would you?, and besides, we're going to win it this year.

RESULTS
RESULTS
RESULTS

1983 INTERNATIONAL ATV CONTEST

70cm SECTION-A TRANSMIT/RECEIVE STATIONS:

POS.	CALL	SCORE	QTH	QSOs
1	ON4JS	6863	CK40J	47
2	ON7ZI	5558	BK17F	55
3	ON5ID	5457	BK38G	54
4	DL0PT/P	5029	FH34C	28
5	G8GLQ/P	4907	YL57G	30
6	G6WOR/P	4585	ZK09F	44
7	G8CMQ/P	4572	ZL53A	36
8	G8DTQ	4464	ZL60E	43
9	ON7MB	4346	BK50E	45
10	PE1BZM/A	4008		30
11	G8MNY/P	3845	ZL26F	35
12	G8MLA/P	3701	ZM54J	32
13	ON5VW	3512	BK10F	45
14	PA0ERW	3474		27
15	PA3CGN	3433		32
16	DK2DB	3019	EI03G	19
17	PE1HMA/A	3016		32
18	F3YX	2992	BI21F	22
19	ON1WW	2904	CL78F	33
20	DF2BY	2897	DM35I	26
21	G3UMF	2761	ZL15F	26
22	ON7LT	2667	CL62D	38
23	F6BGR/P	2638	BI03F	27
24	PE1DEO	2575		30
25	G3WSC	2515	ZL80H	31
26	G4EUF/P	2367	ZM24J	21
27	G6HCT/A	2238	ZL38E	32
28	DF0CG	2228	DL12H	29
29	PA0SON	2078		33
30	DL3ZAA/P	1973	EK27E	15
31	DL3ZAU	1969	EK37F	15
32	ON4ABC	1911	BK17C	28
33	ON1KRW	1735	CK23C	26
34	PA0AWI	1671		27
35	PA0HVB	1653		25
36	F6FZU/P	1632	BJ51C	18
37	ON7WR	1600	CK23H	24
38	G6CUQ	1552	ZM51F	14
39	G4CRJ	1359	ZL38B	24
40	PA3ANB	1354		20
41	PE1HVX	1309		19
42	DJ4LB/A	1300	EK47A	9
43	ON7NI	1275	CK31B	27
44	G8CQE	1254	ZL50D	19
45	ON5NK	1241	BK29D	26
46	PE1EXY	1235		28
47	G4RSB/P	1189	ZM53C	14
48	ON4KTO	1161	CK31B	28
49	PA2ENG	1158		17
50	F1AID	1144	AF21D	6
51	G6MNJ	1126	ZL39D	17
52	G4LXC	1100	ZL39H	15
53	DC9QT	1055	EL11G	13
54	PE1BFD	1054		25
55	PA3CZY	1009		17
56	G3SQQ	929	ZN74B	13
57	ON1KBG	860	CK11D	19
58	G4TEP	794	ZL29D	14
59	PE1ITR	770		18
60	G4NGS	747	ZL48D	14
61	PE1AME	740		12
62	ON4AAW	734	CL79B	14
63	FIFRG	690	BI03F	16
64	G8GKQ	643	ZL50C	14
65	DL6SL	634	FI41H	5
66	DB5MJ	611	FI67E	7
67	PA3CHH	605		25
68	F1EJK/P	518	DH15J	3
69	PA2WDO	477		12
70	G8VBS	477	ZL60E	6
71	PE1CHY	429		12
72	PA2AAD	408		10
73	G2BMI	406	ZL38J	8
74	DL8SBD	349	EJ67F	4
75	GM4BVU	320	XP20E	8
76	DF3GT	320	EI37F	3
77	DJ4SA	290	FI31A	2
78	G8ZQF	240	YL38F	6
79	DF5EQ	217	DL44D	4
80	PE1HGO	185		9
81	DL9EH/P	116	DL45B	7
82	PE1DWA	101		3
83	DF2SS	45	EJ72C	2
84	HB9AP/P	0	Log received late	
85	PA3AOG	0	Checklog	

70cm SECTION-B RECEIVE-ONLY

POS.	CALL	SCORE	QTH	QSOs	POS.	CALL	SCORE	QTH	QSOs
1	PE1GDN	2401		23	15	NL8553	283		13
2	ON4L4220	1042	CL77H	21	16	ON1KEY	237	CK42H	7
3	NL5184	978		18	17	PA0GBE	201		10
4	K Liebermann	970	DL38C	18	18	PE1JAM	196		7
5	ON1ANR	903	CL62E	16	19	ON1CM	141	BK37B	5
6	R Muntjewerff	660		7	20	DL5MCM	120	FI67D	4
7	ON4SKI	559	BK30J	16	21	PD0MCL	111		5
8	F1DBN	491	AK19A	5	22	PD0LID	98		7
9	DG8FBQ	478	EK55C	7	23	PE1HIC	84		5
10	PE1JRX	458		9	24	DB6FA	61	EK55C	2
11	PE1HFD	447		14	25	PA3ANW	49		3
12	NL8506	422		14	26	PE1DWO	37		3
13	ON5ZM	315	CK42J	8	27	PA2ELS	20		3
14	NL6996	294		13					

23/24cm SECTION A TRANSMIT/RECEIVE STATIONS:

POS.	CALL	SCORE	QTH	QSOs	POS.	CALL	KM	QTH	QSOs
1	DJ4LB/A	612	EK47A	5	7	PA2AAD	130		4
2	F3YX	493	BI21F	7	8	G8MLA/P	116	ZM54J	2
3	DF2BY	314	DM35J	6	9	PE1CHY	56		2
4	PE1EXY	221		8	10	G6WOR/P	26	ZK09F	1
5	F6BGR/P	206	BI03F	5	11	G6HCT/A	2	ZL38E	1
6	PA3AOG	138		4					

23/24cm SECTION-B RECEIVE-ONLY

POS.	CALL	KM	QTH	QSOs
1	DC9QT	91	EL11G	2
2	NL5184	67		5
3	K Liebermann	65	DL38C	5

13cm SECTION-B RECEIVE-ONLY

POS.	CALL	KM	QTH	QSOs
1	K Liebermann	10	DL38C	2

Congratulations to G8GLQ/P for being top 'G' and for coming fifth overall.

It is very nice to see so many British entrants this time, especially so since many are very well placed in the table. I reckon we have the Continentals in our sights now and it won't be long before a 'G' station wins outright.

Well done lads.

MORE COLOUR-BARS

By Norrie Macdonald GM4BVU

CQ-TV 124 carried a reprint of G8AYC's colour bar generator design from an earlier handbook. I built this unit several years ago, and found thermal instability problems with the gated Schmitt clock. I found that the width of the bars drifted fairly obviously after switch-on, and I was unable to cure this other than by a partial re-design.

I found an idea in 'Electronics Today International' magazine for December 1980, which used an MC14046B Phase Lock Loop chip by Motorola, and which proved suitable for this application.

The amended circuit is shown in Fig.1. You will notice that,for reasons stated later, preset controls are provided for gain adjustment of the R,G and B buffers. I also fitted a small helical preset for accurate bar adjustment.

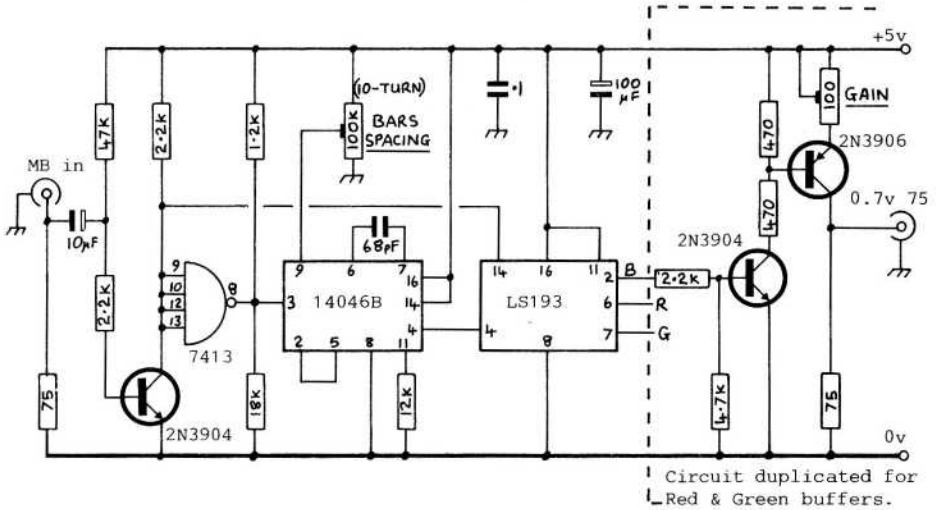


Fig.1 MODIFIED COLOUR BAR GENERATOR

Having built two of these units, I have found an identical problem on both. Namely; spurious extra bars. This was found to be due to the BC184 transistor in each buffer specified in the original article. When these were replaced by another NPN transistor (unmarked), the bars were perfect. Presumably the 2N3904 recommended in the CQ-TV 124 version avoids this problem, although I have not tried it.

I built one generator into a box in order to correctly align the GW8PBX coder (Handbook Vol.1). The other unit is fed through a simple C-MOS Vertical Interval Switch designed by GM6HFH, and allows bars or background colour from my GW3JGA 'Pretty Colour Generator' (CQ-TV 114) to be selected and passed via a single coder to the transmitter.

For completeness the VIS circuit is shown in Fig.2. It is easily added to a printed circuit board at the layout stage, and enables two colour sources to be constructed on a single board but delivering only one RGB output at a time to the coder.

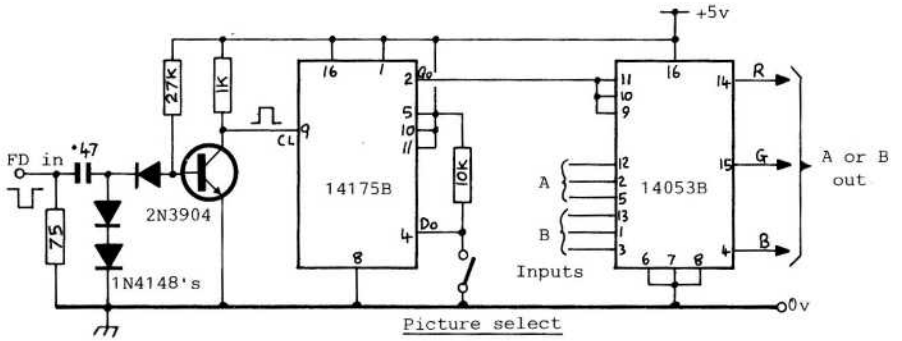


Fig.2 VERTICAL INTERVAL RGB SOURCE SWITCHER CIRCUIT

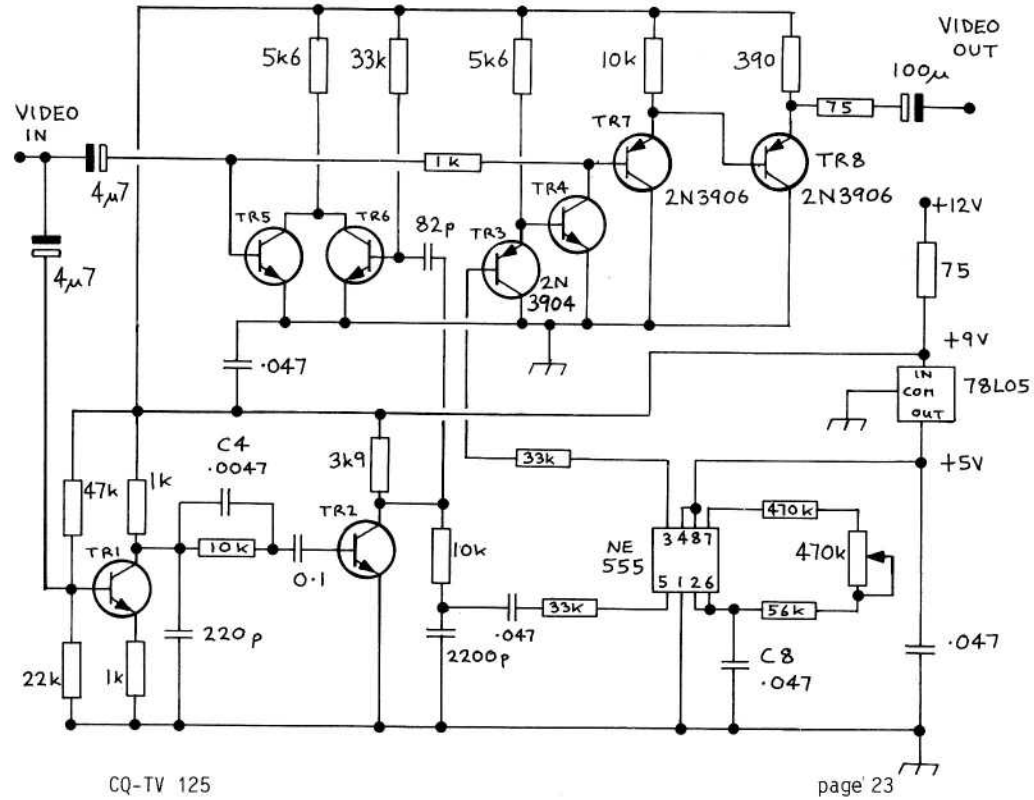
VERTICAL SYNC PROCESSOR

From a circuit idea by Henry Ruh KB9FO published in April '83 'A5' Magazine

This circuit is designed to 'clean up' noisy or distorted vertical sync pulses resulting from DX-TV reception, for example, in order to be able to record these signals on a video tape recorder, which, although tolerant of defective line sync pulses, will lose servo lock unless presented with a consistent train of field sync pulses.

An inverter stage TR1 is followed by a sync separator TR2 which triggers the 555 multivibrator IC, to produce a 'false' vertical drive pulse which is inserted back into the video path at the base of TR7. In the event of a missing pulse, the 555 will free-run ensuring that the output pulse is maintained. It should be noted that this circuit only produces a single broad field pulse, instead of the usual serrated pulse - in practice this should not be a problem. As this circuit was originally designed for the American 60Hz system, some experimentation may be needed to optimise the values of C4 and C8. The NPN transistors shown without type numbers may be any general-purpose type, or possibly even a 3046 transistor array, which would furnish all five in one DIL package.

In use, the only adjustment required is to set the 470k pot for correct locking.



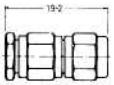
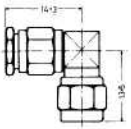
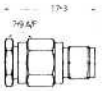
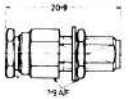
COAXIAL CONNECTORS

Having covered in previous issues the more popular coaxial connectors found in amateur shacks, we now turn to miniature types used for, among other things, the interconnection of modules where RF power is fairly low and miniature cables are necessary.

Series SMA and series SMB/SMC/SMD will be considered, but this time we look at the largest in this group; the SMA.

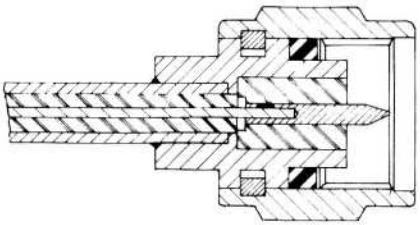
SMA connectors are suitable for use on both flexible and semi-rigid cables, optimum results being achieved with RG-402/U semi-rigid cable with excellent VSWR performance to 18GHz.

These connectors are available for semi-rigid and flexible cables and in cable clamping and crimp styles; however only cable clamp types for flexible cables will be described here. Information on other types may be obtained from Greenpar stockists.

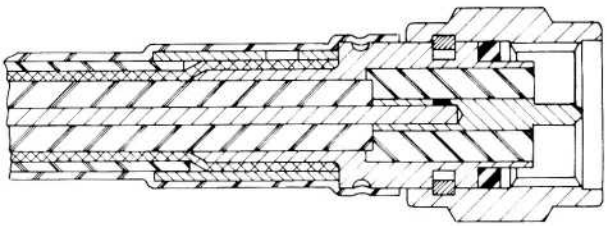
Connector outline	**Series SMA** CLAMP PLUGS AND JACKS		Assy data fig.	G.E. No.	Cable clamp	Cable groups 10 22 60
	Plug – Straight captive contact		1	65161	K	● ● ●
	Plug – Right angle, captive contact solder access cap		2	65162	K	● ● ●
	Jack – Straight captive contact		1	65166	K	● ● ●
	Jack – Bulkhead mounting, captive contact	 Panel piercing 	1	65165	K	● ● ●

CABLE CLAMPING STYLES

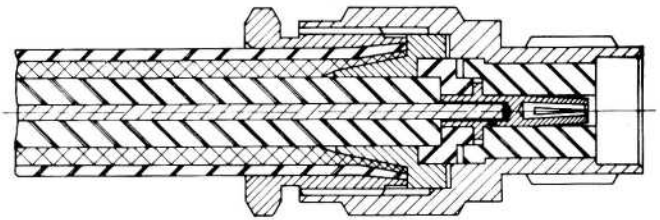
There are three basic methods of assembling SMA connectors to coaxial cable and each has its own advantages and disadvantages. The cross sectional drawings on this page illustrate the methods and their general usage.



The SMA connectors offer optimum electrical performance when attached to semi rigid cables. To achieve this performance the connector body is directly soldered to the outer sheath of the cable. Due to the heat involved in the soldering operation tooling is required to restrict extrusion of the cable dielectric. The general limitations of this style of attachment are the tooling and skill requirements necessary to perfect the assembly.



The crimp style SMA connectors are ideally suited to large quantity useage and give a repeatability acceptable to modern line production techniques. The crimp connectors are available with either captive or non captive contacts. For development and breadboard work as an alternative to crimping the crimp sleeve may be soldered with the braid to the connector ferrule. This is not recommended for production work and may give an inferior electrical performance.



To allow for field servicing without the aid of specialised tooling the pressure clamp was developed, utilising a tapered ferrule to give excellent braid connection and cable retention. A captivated contact ensures correct positioning for intermating with other SMA connectors.
This method of assembly is recommended where successive cable trimming is necessary, e.g. phase trimming.

Assembly Instructions

Fig.1

1. Slide clamp nut over cable and trim to dimensions shown.
2. Flare out braid and insert ferrule over dielectric and under braid slitting outer sheath as necessary until outer sheath seats against rear face of ferrule. Trim braid to ferrule outer diameter and dielectric flush with front face of ferrule taking care not to damage centre conductor.
3. Trim centre conductor and push fit rear insulator into ferrule. Solder centre contact to pretinned inner conductor ensuring contact flange is firmly seated against rear insulator.
4. Insert contact assembly into connector body and wrench tighten clamp nut to retain cable (1.7 – 2.3 Nm; 15 – 20 inch pounds).

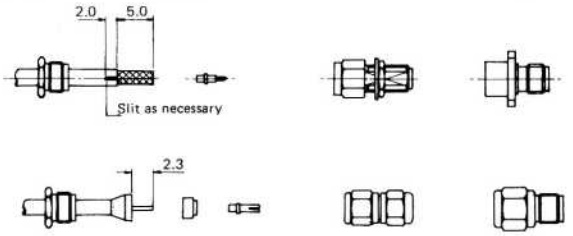
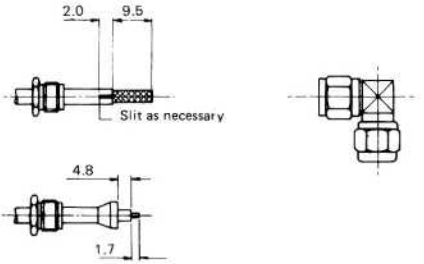
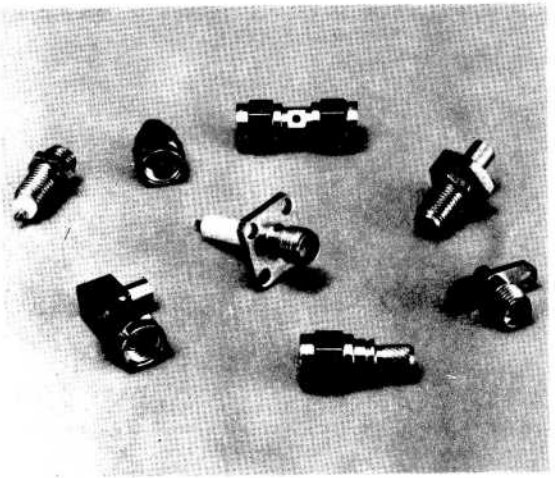


Fig.2

1. Slide clamp nut over cable and trim to dimensions shown.
2. Flare out braid and insert ferrule over dielectric and under braid slitting outer sheath as necessary until outer sheath seats against rear face of ferrule.
3. Trim braid to ferrule outer diameter and cut dielectric, centre conductor to dimensions shown taking care not to damage centre conductor.
4. Tin centre conductor and contact.
5. Insert ferrule assembly into body and wrench tighten to retain cable (1.7 – 2.3 Nm; 15 – 20 inch pounds).
6. Solder centre conductor into slot of contact and soft solder access cap into connector body.





Cable Group Cross Reference

Group	Nom. Impedance (Ohm).	Cable Type numbers
10	50	UR/URM 43, 76; RG58 C/U, 141 A/U 142 B/U; BICC T3010 DAVU UR 5604
22	50	UR 95, 109; URM 95, 109, 116; RG 174 A/U 188 A/U, 316/U
	75	UR 55, 111; URM 111; RG 179 B/U; BICC T3289, EC60
60	50	URM 301; RG 55 B/U, 223/U
73	50	UT141, 141A; SEALECTRO PT119.141–HP
285	50	UT 85C; PRECISION TUBES BA 50 085
350	75	RG 180/U, 195/U SURPRENANT #9872

BIASSING THE 2C39

By John Wood G3YQC

Now that the TV repeaters are here I know that many of you will be looking forward to getting going on 24cm. Unless you live very close to a repeater or are content with only local contacts, you will be wanting to build a high-power amplifier.

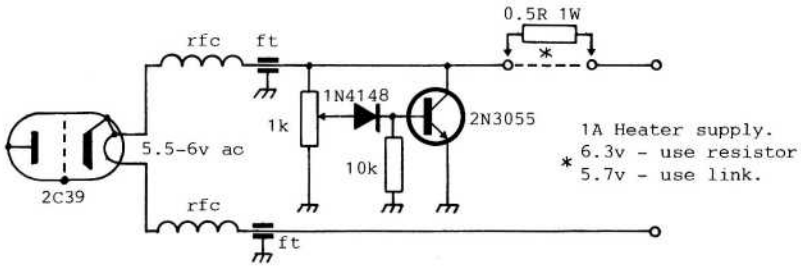
At powers of more than a very few Watts at 24cm you will almost certainly need to use valves. The choice of suitable valves which are available to the average amateur is rather limited, therefore the ubiquitous 2C39 series is almost certain to be chosen.

If you are to operate on FM-TV then a power amplifier run 'flat out' in a non-linear mode with fixed bias should be, strictly speaking, all that is necessary. However, as with 70cm there are times when you do not need to run full power, particularly when tuning-up or just working the guy down the road, and similarly there are times when you need as much as you can get from the amplifier. In the interests of valve conservation it is normally advisable to under-run the valve by 25% or so particularly if the transmission is left on for long periods.

Where is all this leading? Well, there are several designs for suitable 23/24cm amplifiers (CQ-TV119 has a particularly good one) but unfortunately few of them offer more than a fixed bias system. The simple little circuit shown below provides a completely variable cathode bias potential which is simply introduced through one of the heater connections. The circuit will provide full control of the output level over the range: Off to severe limiting. One can immediately see that not only does this little circuit enable you to control your RF output level, but it also allows the amplifier to be set for use in other modes such as SSB for 23cm.

The transistor specified in the original German design is a 2N1613 TO-5 can device however, for the heavy use that the amplifier gets in my shack, I prefer to use something larger like a 2N3054 or 2N3055. The 1k pot may be panel mounted but try not to use excessively long leads in the vicinity of the power amplifier.

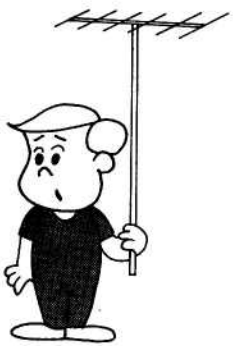
REFERENCE: VHF Communications 4/1976 "A Power Amplifier for the 23cm Band Equipped with the 2C39 Tube."



BIAS CIRCUIT FOR 2C39 TYPE POWER AMPLIFIER

PAGHAM PERAMBULATIONS

By E.A.Brodie G6HTB



In the usually sleepy village of Pagham in West Sussex, a certain annual event rejoicing in the title; 'Pagham Pram Race' is held. Custom dictates that the race be run on Boxing Day, presumably to aid the digestion of the previous days excesses.

The contestants are in pairs; one a 'pusher' and the other a baby in a pram! The race is to find who can push the baby over a two mile course the fastest; - seems innocent enough! There's a catch! - There are three check-points, each conveniently situated at a local pub where, according to the rules, a pint of beer must be consumed by each competitor. As an added attraction a prize is given to the best fancy dress outfit worn by the pram.

Believe it or not this extraveganza is treated with veneration in certain circles and, no doubt, a quantity of hard cash also hinges on the result.

For last years' race four local ATV stations got together and provided a 70cm ATV portable unit in order that the race itself may be monitored from one pub to the next. This allowed the public and contestants to, so to speak, watch over their shoulders.

Myself and G6FDU ran the transmitter and control from the Kings Beach Hotel, whilst G6AII and G8OCN ran the transmitter at the Lamb Inn. G3IDX and G3UPQ looked after progress reporting and the talkback on 2-metres.

Both transmitters were home brewed by myself and are roughly based on the CQ-TV114 G4DYP circuit and delivering around 150mW to the 48-element aerials. A Sony HVC2000P camera was used at one end while G6AII used a JVC GX78E camera which was very kindly loaned for this event by Jaysound Audio of Bognor Regis. The transmissions were recorded on VCR machines which drove a Sony Projection TV at the Kings Beach Hotel end. A Commodore 64 micro was used for graphics and titling and both machine and specially written software were loaned by Caroline Butterworth.

Some 500 man hours went into getting both stations operational, and included much time spent on various 'weird' problems.

However Boxing day dawned sunny but very cold and windy, and found the crew hard at it setting up. All was ready for the eleven O'clock start and they were off without a hitch.
Some two hours of live pictures were recorded and televised to spectators and the tapes were subsequently played to other amateurs over the air.

G3UEQ who gave a great deal of time and technical expertise, received P3 pictures six miles away in Chichester. A P2 report was also received from G5NBX off the side of the beam.

The tapes have now been edited and will be shown to contestants on Pram Race Presentation Night as well as to hospitals and local homes for the handicapped.

FERGUSON TX-9 TV CONVERSIONS

CQ-TV 119 DIRECT VIDEO INTERFACE PROJECT.
Some important notes by the designer Alan Warne.

When building this project a mains isolating transformer was recommended which is fitted inside the plastic television cabinet to provide a fully isolated chassis suitable for modification. The type of transformeer suggested was a 240v 80VA for the 14-inch model and a 240v 120VA for the 18 or 20-inch. A report of a cabinet becoming buckled by heat when using a 80VA transformer with 14" conversion prompted an immediate investigation by the author.

The manufacturers of the 14" television give a power consumption of 43 Watts at zero beam current (no brightness) and 58 Watts for a normal picture. By multiplying 58 by 1.414 the peak was found, which is 82 Watts.

Tests have shown that if the receiver has the brightness and contrast turned to maximum, giving maximum beam current for long periods of time, some transformers become hot, even though the metal mounting plate recommended in the article was used to help dissipate the heat.

Some transformer manufacturers do not publish the temperature at which these transformers operate when stipulating VA, which could mean a transformer running close to 80%C.

Core material varies considerably between manufacturers which adds another contributary factor. A further factor found was that a transformer manufacturer normally, when specifying VA, refers to the primary winding and not the secondary. Therefore the losses (typically 10VA) must be deducted on the secondary rating. Saturation may also occur if the mains input voltage exceeds the normal transformer rating.

The conclusion has been reached that any transformer being used with the projects should be monitored for excessive heat and replaced by the higher rated 120VA transformer if necessary.

COLOUR SUBCARRIER - LOCKED OR UNLOCKED?

By John Goode.

INTRODUCTION

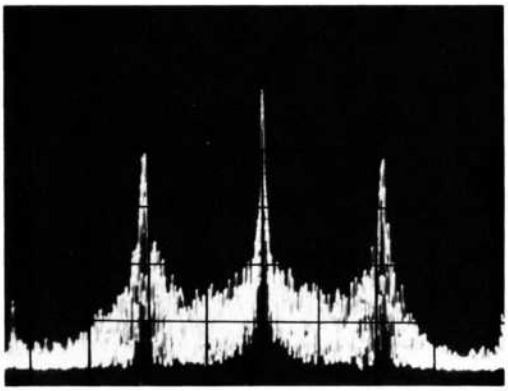
An aspect of colour television systems that can appear difficult and obscure to newcomers is the relationship between the colour subcarrier frequency (fsc) and the horizontal line frequency (fh) of the system being considered.

A number of seemingly arcane terms are often bandied about, such as "half-line offset', "three-quarter line offset", "25Hz offset", etc. and they are frequently left unexplained. Why is it necessary to lock the line frequency to subcarrier? For amateurs, IS it really necessary? If so, in what circumstances is it an advantage?

These are practical questions, and I will try to examine the problem in a way that will shed some light on the subject.

THEORY - CODING.

To begin at the very beginning, let us consider the frequency spectrum of a monochrome television signal. Assuming it to be of 625-line, 50Hz broadcast standard, it will have components extending to about 5.5MHz, the energy of these components tending to decrease with increasing frequency. Thinking for a moment about how a television signal is formed, it is fairly obvious that the scanning frequencies (line and field) must figure prominantly in the spectrum. In fact, the line frequency is dominant, and the spectrum of the signal is not continuous, but is grouped into 'packets' of energy around multiples of the line frequency (fh). (See Fig.1.)



Spectrum analyser photo' of a double-sideband TV signal modulated with 100% saturated colour bars.
The colour subcarrier can be clearly seen and the picture illustrates the energy dispersion within an amateur TV colour transmission.

Horiz resolution: 2MHz per div.
Vert resolution: 10dB per div.

Photo: G8CJS

☆MEMBERS SERVICES☆

Items from these lists are available to club members only.
This list supercedes all previous ones.

QTY	PRINTED CIRCUIT BOARDS	EACH	P&P	TOTAL
	'Project 100' sync generator (CQ-TV100)	£3.00	0.30	
	TX-9 video/audio in/out (CQ-TV119)	£2.25	0.30	
	FM-TV demodulator (CQ-TV122)	£3.00	0.30	
	Wide-band 70cm ATV tuner (HB1)	£3.00	0.30	
	Amateur television receiver (HB1)	£1.50	0.30	
	Electronic character generator (HB1)	£3.00	0.30	
	Colour test card (set of 3-double-sided)	£15.00	0.60	
	Horizontal aperture corrector (HB1)	£3.00	0.30	
	PAL colour coder (HB1)	£3.00	0.30	
	Vision switcher matrix (HB2)	£4.00	0.30	
	Vision switcher logic (HB2)	£4.00	0.30	
	Vision mixer (HB2)	£4.00	0.30	
	70cm VSB transmitter-7 boards (HB2)	£15.00	0,40	
	SSTV pattern/sync generator (HB2)	£3.00	0.30	
	Character colourizer,(printed legends HB2)	£5.00	0.30	
	Piggy-back keyboard (HB2)	£2.25	0.30	
	70cm TV transmitter (TVA and CQ-TV122)	£3.00	0.30	
	ATV up-converter (TVA and CQ-TV112)	£2.25	0.30	
	Video filter (TVA and CQ-TV122)	£1.00	0.16	
	*HB1 & 2 = Handbooks.TVA = TV For Amateurs			
	SPG, greyscale, char gen (Ham Radio Today)	£4.set	0.60	
	SSTV to FSTV converter & reprint (Rad Com)	£10.set	0.60	
	STATIONERY,ACCESSORIES AND COMPONENTS			
	BATC test card - with data sheet	0.50	0.24	
	BATC reporting chart (illustrated)	0.12	0.20	
	BATC lapel badge - diamond - button hole	0.40	0.16	
	BATC lapel badge - round - pin fastening	0.50	0.16	

____	BATC callsign* lapel badge-pin fastening *Write callsign CLEARLY. Sent by supplier	£1.50	nil	____
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____	BATC windscreen stickers - 2.5" round	0.10	0.16	____
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____	1" Vidicon scan-coils (high Z focus coils)	£6.00	£1.20	____
____	2/3" Vidicon scan-coils	£6.00	0.80	____
____	Vidicon bases - 1" or 2/3" (state which)	0.50	0.16	____
____	TV camera lens mounts - 'C' type	£1.00	0.24	____
____	13.14MHz TV TX crystal (Hbk 2)	£5.00	0,16	____
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____	TBP28122 PROM. Pre-programmed for colour test card circle. (eqt.74S471)	£10.00	0.25	____
____	2732 EPROM. Slow-scan program	£12.00	0.16	____
____	4.433618MHz PAL colour subcarrier crystal HC18-U (wire leads), NEW	£2.75	0.16	____

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Members requiring EEV Leddicon, EMI 9777 Ebitron, 9728, 9706, 9677 (1" EMI) vidicons or 9831 (2/3" EMI) vidicon should enquire for the latest prices and delivery. ALL enquiries needing a reply should include a SAE or IRC. OVERSEAS MEMBERS should ask for a quotation of postage costs before ordering. PUBLICATIONS must be ordered separately from the Publications Department. CHEQUES are payable to "The BATC" and should be for English banks only please ORDERS TO:- Mr. P.Delaney. 6 East View Close, Wargrave, BERKS RG10 8BJ, England. Tel: 073 522 3121

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	PUBLICATION	EACH	P&P	TOTAL
	AMATEUR TELEVISION HANDBOOK vol.1 by J.Wood G3YQC and T.Brown G8CJS	£1.50	0.40	
	AMATEUR TELEVISION HANDBOOK vol.2 by T.Brown G8CJS	£2.00	0.40	
	TV FOR AMATEURS by J.Wood G3YQC	£1.50	0.25	
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	RE-PRINTS. Photocopies of any article from past issues of CQ-TV are available. Payment (if ordered separately) in UK postage stamps please.	0.20 per sheet	0.20	
	INDEX. All main articles in past issues of CQ-TV and 4 Handbooks. Inc. page count, (essential for ordering re-prints).	£1.00	nil	

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Would Australian members please note that the "AMATEUR TELEVISION HANDBOOK" Vol.1 is available direct from the Wireless Institute of Australia at: PO Box 300, South Caulfield, Victoria 3162. (Only available to WIA members) Please enquire for volume 2 and "TV FOR AMATEURS".

All other orders please to:- BATC PUBLICATIONS, 14 LILAC AVENUE, LEICESTER LE5 1FN.

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CLUB LIBRARY

The BATC library, though not huge, may well contain that article or paper that you have been searching for.

A duplicated list of the libraries contents is available to members upon receipt of a stamped addressed envelope, or you may send or telephone your specific requests for information. Should the material required not be to hand the librarian will try to obtain it for you.

At present the library contains a large number of manuals for Marconi, Pye, E.M.I. etc., broadcast equipment, back-issues of CQ-TV, A5, Der TV Amateur etc., and a vast amount of Mullard publication notes. There are some historically interesting letters and photographs from the very early days of the Club. Also included are some (mostly early) audio tapes and lectures which are available for loan.

Paul Marshall G8MJW, 62 Rutland Road, Chelmsford, Essex. Tel: 0245 57681.

EQUIPMENT REGISTRY

The BATC Equipment Registry exists to help members who have equipment for disposal, or who wish to purchase some specific item. Send a list of your 'wants' or 'disposals' to the address below and, during the six months for which your application will be held, the registry will attempt to put you in touch with someone who may be able to help.

Alan Watson, "Somerby View", Bigby, Barnetby, Lincs.

VIDEO LIBRARY

There are a number of video tapes available for free loan to groups and societies. The tapes include BATC demonstrations and exhibitions, programmes on ATV plus a good selection of material from other countries showing how they operate amateur television and demonstrating ATV repeaters.

If you have any ideas or material for future programmes, Trevor Brown would be pleased to hear from you.

Trevor Brown G8CJS, 25 Gainsbro Drive, Adel, Leeds LS16 7PF. Tel: 0532 670115

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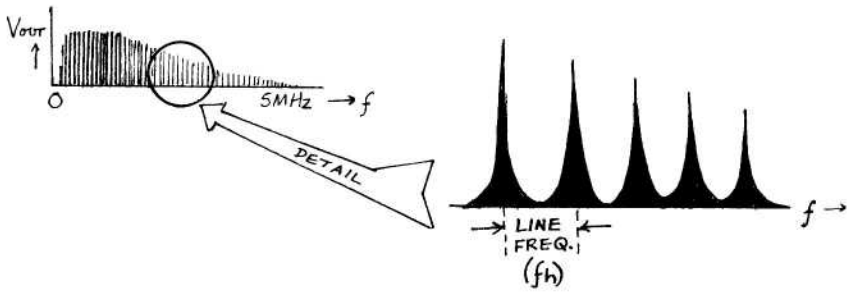


Fig.1. MONOCHROME TV SPECTRUM

This discontinuity of energy within the signal spectrum was siezed upon by the developers of the original (N.T.S.C.) colour system when they were looking for a method of transmitting the additional information required for colour, without exceeding the bandwidth limitations of existing (monochrome) transmission channels. Before seeing how this occurs, let us recapitulate some fundamental theory.

All colour systems transmit the following signals:-

Y	=	LUMINANCE = BLACK & WHITE COMPONENT
R-Y, B-Y	=	COLOUR-DIFFERENCE = COLOUR COMPONENT SIGNALS

The following facts about these signals should be remembered:

(1) Each of these are 'scanned' signals, and so have discontinuous spectra 'bunched' about multiples of line frequency.

(2) Because the human eye cannot resolve fine detail in colour, the bandwidth of the colour-difference signals is reduced to about one fifth of that of the luminance signal without apparent loss of quality.

(3) On scenes without colour content, the colour-difference signals reduce to zero.

The above facts are fundamental to all colour systems, and are stated as reminders to the reader. We can now go on to consider the choice of subcarrier frequency for both the N.T.S.C. and P.A.L. systems. (The method of transmission used in the SECAM system is not related to NTSC and PAL, and is not considered in this article.)

In the NTSC and PAL systems the (R-Y) and (B-Y) signals are modulated on to a colour subcarrier using a form of quaderature modulation with suppressed-carrier. The effect of this method is to vary the subcarrier in

phase and amplitude; at any time the phase represents hue, amplitude represents saturation. The basic difference between the two systems is that in PAL the (R-Y) subcarrier component is reversed in phase on successive lines - this as a means of correcting differential phase distortion. (NTSC does not correct for differential-phase distortion.)
Considering the NTSC case first, modulating the colour difference signals on to a subcarrier will produce a sideband spectrum with energy 'packets' at line-frequency intervals, as shown in Fig.2.

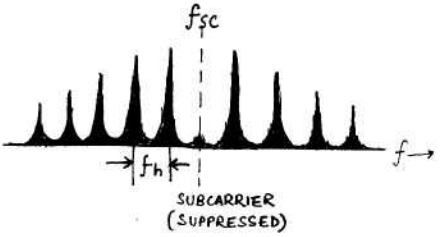


Fig.2. NTSC COLOUR SIGNAL SPECTRUM

As this sideband distribution has the same frequency spacing as that of the luminance signal, it should be possible to select a subcarrier frequency such that the colour sidebands fall into the gaps in the luminance spectrum. This technique is known as 'frequency interleaving', and allows both signals to occupy the same frequency band with a minimum mutual interference. See Fig.3. The subcarrier frequency should be as high in the spectrum as is possible without causing the upper sideband to fall outside the upper limit of the luminance channel.

From Fig.3 it can be seen that for interleaving to occur, the subcarrier frequency must be 'so-many-and-a-half' times the line frequency. A more formal way of saying this is that in the NTSC system the subcarrier is 'an odd multiple of half the line frequency'. In the 525-line 60Hz NTSC system, the 'odd multiple' is 455; this gives a colour subcarrier frequency 227.5 times the line frequency (3.579545MHz). (See Appendix.)

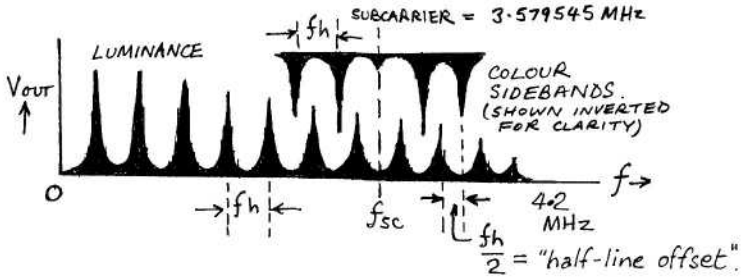


Fig.3. NTSC INTERLEAVING (DIAGRAMMATIC)

Referring again to Fig.3, it can be seen that the colour sidebands are offset from the luminance components by half the line frequency. This relationship is referred to as having a 'half-line offset subcarrier'.

This relationship confers other advantages on the NTSC system with respect to monochrome compatibility. Coloured areas of the picture will have superimposed subcarrier, and this is reproduced on monochrome monitors as a fine dot pattern. With the above subcarrier offset there is an odd number of subcarrier cycles per field, and so the dot pattern will be antiphase on successive fields, tending to visually cancel.

With PAL (625-lines, 50Hz) the phase reversal of the R-Y subcarrier component introduces an additional 7.8KHz (half-line frequency) term into the sidebands of the modulated subcarrier. The sidebands are therefore spaced at half-line frequency intervals. See Fig.4.

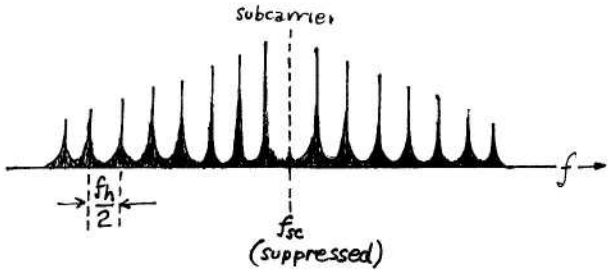


Fig.4. PAL COLOUR SIGNAL SPECTRUM

This means that in order to achieve interleaving, the half-line offset will have to be changed. With PAL it is necessary to adopt either a one-quarter or a three-quarter line offset. Also, interleaving does not occur quite so readily with PAL sideband spacing as it does with NTSC spacing. See Fig.5.

In the European PAL system a three-quarter line offset is adopted, the subcarrier being 283.75 times the line frequency. However, that is not quite all there is to it, due to the subcarrier phase alternation causing difficulties with dot-pattern cancellation. It can be shown that by adding a further 25Hz to the above subcarrier frequency (the so-called 25Hz offset), dot pattern cancellation will be improved. The additional 25Hz offset will have a negligible effect on the sideband interleaving, and would hardly show in Fig.5. Summarising, the full PAL relationship is given by:-

$$f_{SC} = 283\tfrac{3}{4}fh + 25Hz = 4.43361875\ MHz$$

In the above explanation I have concentrated upon only one aspect of theory - that of the subcarrier-to-line frequency relationship. For a more rigorous treatment, see the 'further reading' list at the end of the article.

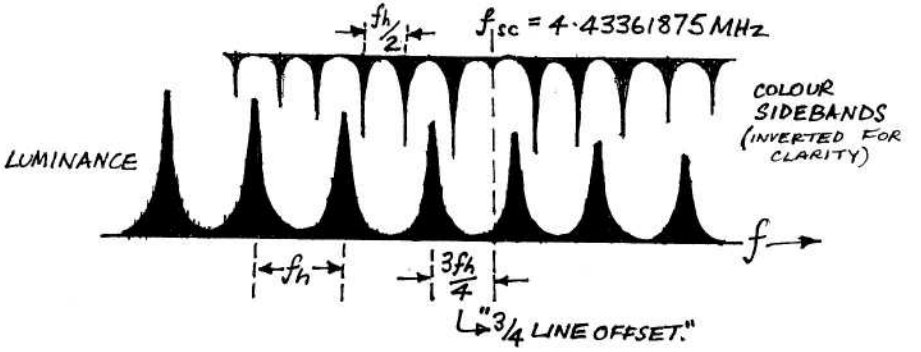


Fig.5. PAL INTERLEAVING (DETAIL OF SPECTRUM)

THEORY - DECODING

From Fig.5 it will be obvious that in order to design a 'perfect' decoder, a filter with a characteristic shaped like a comb would be required to separate the colour sidebands from the luminance signal. Although this is technically possible, and is sometimes employed in studio equipment, the necessary circuitry is too complex and expensive to be included in 'normal' receivers and monitors. (Also, it would only work for signals with a correctly offset subcarrier.)

In the majority of colour decoders a notch filter centred on the subcarrier frequency is used to separate colour and luminance. See Fig.6.

Using a notch filter is obviously a compromise, as some luminance will be included in the colour pass-band, and some colour sidebands will be left in the luminance channel. This leads to the well-known problem of spurious colour appearing on areas of fine luminance detail - an example of this is when a TV presenter wears an item of clothing that is finely patterned.

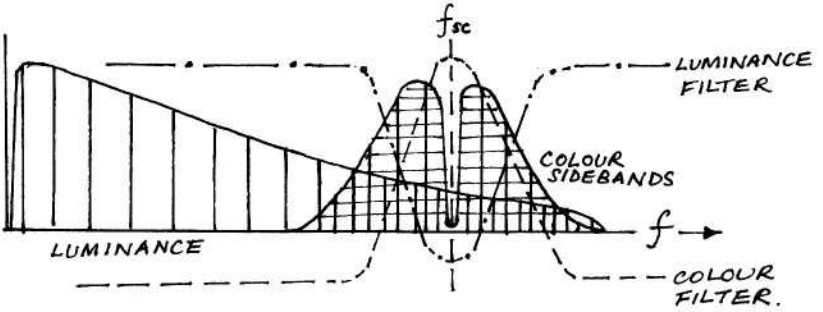


Fig.6. COLOUR NOTCH FILTER

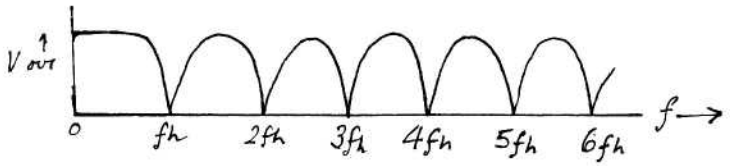


Fig.6a. PRACTICAL COMB FILTER RESPONSE

High luminance frequencies, with extensive colour sidebands are also generated when rapid movement in the picture takes place. In fact, even with comb-filtering some 'cross-colour' can occur with rapidly moving pictures, as the luminance and colour sidebands expand and overlap. Readers of the Technical Press will be aware of the recent adoption in this country of the M.A.C. (Multiplexed Analogue Components) system of colour coding for Direct Satellite Broadcasting (D.S.B.). The pressure to adopt an improved coding system has come about because of the desire of the Broadcasters to have a system that allows proper separation of luminance and colour, so that high definition pictures without cross-colour are possible. The additional bandwidth available on D.S.B. channels allows such a system to be adopted. This is recognition of the fact that current colour systems are a compromise, forced upon us because of the necessity of transmitting colour over channels designed for monochrome signals.

Having spent the last paragraphs pointing out the shortcomings of present systems, it is appropriate to come back down to earth (!) and say that the quality the Broadcasters achieve with PAL, NTSC (and SECAM) is good enough to satisfy all but the most critical of viewers. The shortcomings are really only apparent under fairly limited conditions. Admittedly, cross-colour patterning can be annoying - however, it can be eliminated from any amateur system by restricting the luminance bandwidth to about 3MHz, so that no luminance frequencies encroach on the colour band (3.5-5.5MHz).

PRACTICAL CONSIDERATIONS

From the previous discussion, it can be seen that a correctly locked subcarrier allows frequency interleaving of the luminance and colour sidebands. This minimises mutual interference between the fine luminance detail and the colour signal. If the subcarrier is not interleaved, the upper luminance frequencies will be decoded as colour, causing spurious colour patterning.

In a system using an unlocked subcarrier, the only way to prevent objectionable cross-colour interference is to restrict the signal bandwidth so that the luminance and colour sidebands occupy separate parts of the spectrum. This is the method used in colour-under video recorders such as the domestic formats and U-Matic. The luminance occupies the band up to 3MHz, whilst the band from 3 to 5 MHz is occupied by the colour subcarrier (4.43MHz) and its sidebands. See Fig.7. Because of the frequency-heterodyning necessary in the colour recording process, it is not possible for the replay subcarrier to be related to off-tape syncs.

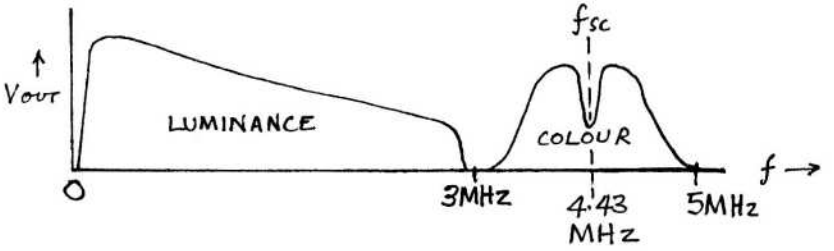


Fig.7. TYPICAL PAL 'COLOUR-UNDER' VTR SPECTRUM

With professional video recorders the colour signal is recorded directly with the luminance so that any subcarrier to line frequency relationship in the input signal will be retained. Indeed, with most professional VTRs it is only possible to record with a full-specification signal, as the timebase correction system looks for the correct sync-to-subcarrier phasing in order to lock-up on playback. However, not being able to record on a 2" Quadruplex or 1" (BCN or C-Format) VTR is not a real problem for most amateurs!

The advantages of a locked subcarrier are only truly realised if a wide-band luminance signal can be generated. With captions and most low-cost cameras the likelihood of the luminance spectrum exceeding 3MHz is not very great. This is also true of colour bars. The fundamental luminance frequency of the bars sequence is about five times line frequency. Even allowing for harmonics up to the 20th, this gives a maximum luminance frequency of 100 times line frequency, 1.5625MHz.

If required, a filter could be built into the luminance path of any coder in a system with unlocked subcarrier. This would completely iliminate the cross-colour problem.

There IS one wide-band source that is widely used by amateurs, however - the BATC Electronic Test Card from the Handbook, Vol.1. This includes a multiburst generator giving high-level outputs up to 6MHz. If this is encoded without using an interleaved subcarrier severe colour patterning will occur on the frequency grids lying within the colour band.

CONCLUSIONS

Due to the complexity of achieving the full PAL subcarrier to line frequency relationship when building an S.P.G., there is a great temptation to use an unlocked colour system. Provided that the drawbacks of this strategy are realised, and the luminance bandwidth restricted to about 3MHz, this is the easiest way of converting to colour. However, it will not be possible to transmit the high frequency components of the test card.

The most difficult part in achieving the full PAL colour lock is the final 25Hz offset. However, as we have seen, this plays no part in providing frequency interleaving - this is provided by the three-quarter line offset. I would therefore conclude that it is probably worthwhile to use an SPG with three-quarter line offset, the final 25Hz offset being ignored. It is then possible to have wide-band luminance, although dot-pattern cancellation will not be optimised. Such a system is employed in the original Project 100 SPG, (although a system with 25Hz offset was described later in the series).

FURTHER READING & REFERENCES

1. PRINCIPLES OF PAL COLOUR TV & RELATED SYSTEMS by H.V.SIMS NEWNES-BUTTERWORTHS

2. VIDEO HANDBOOK by RU VAN WEZEL NEWNES TECHNICAL BOOKS

3. VIDEOTAPE RECORDING by JOSEPH F.ROBINSON FOCAL PRESS

4. "PROJECT 100" by ERIC PUTT & TOM MITCHELL G3LMX CQ-TV 100 to 111

5. "FEEDBACK" COLUMN by TOM MITCHELL G3LMX CQ-TV 105, CQ-TV 109

6. CQ-TV 118, P.36, "HANDBOOK NOTES"

7. "25Hz OFFSET" by TREVOR BROWN G8CJS CQ-TV 120, P.7

8. "IMPROVED COLOUR TV DECODING" by D.READ B.Sc (Hons), M.I.E.E. WIRELESS WORLD DEC. 1983 P.74

APPENDIX - THE 525-LINE NTSC SYSTEM

In the foregoing article it was stated that the NTSC subcarrier frequency (3.579545MHz) is 227.5 times line frequency. Simple arithmetic will show that the line frequency given by 3.579545 ÷ 227.5 is 15.734KHz, and by extrapolation, the field frequency is 59.94Hz. This differs from the nominal line and field frequencies (15.75KHz, 60Hz) by 0.1%. This difference occurs with broadcast signals so that line, field, subcarrier and sound carrier frequencies are all mathematically related. If this is not done, mutual interference between colour subcarrier and sound carrier can occur. For further information, see further reading list, ref (1).

TV ON THE AIR

Thanks once more for all your letters and news; as ever we start on 70 cm and go progressively higher, finally returning to the lower frequencies for a bit of slow-scan. We seem to have been well served with openings during the past winter season, and reading the Benelux DX Club magazine (kindly passed on by Arthur Milliken) I see that our signals have been making it over to the Netherlands. Noted in despatches so to speak are:

G3DFL, G4NPS, G4RNA, G4SRF, G8CTT, G8LES, G8SKO, G8VBS, G6LIC, G6YLG (29.9.83 & 26.10.83 at Beemster); G4NPS (23.10.83 in Texel); G3DFL, G4PSX, G6YLG, G8VBS (26.10.83 in Bergum); G4RNA & G6AVB (27.10.83 at Driebergen); G4RKP and GU8FBO (4.12.83 in Rotterdam).

Gordon Hunter GM3ULP is prompted to write from Motherwell to tell us about the large ATV net which operates every Monday. His setup is a MM transmitter and 48 element Multibeam at 35 feet in a less than perfect location. Licenced first in 1969 as GM6ADR/T, he used to work GM6AEG/T across the Clyde. Nowadays his most regular contact is Norrie GM4BVU, also 'just across the Clyde'. Gordon is also QRV on slow-scan, but finds little activity; how about some skeds?

In downtown Newport Pagnell Jon G4MDU and Andy G6LTZ recently gave an impressive talk and demonstration of ATV to members of the Milton Keynes radio club. Not content with the usual talk and slide show, the pair went on to mount a live outside broadcast from the pub across the road! A portable camera and backpack transmitter/aerial combination made this all possible, and the results made the audience extremely aware of the possibilities of ATV.

We can confidently expect an increase of ATV activity in the district as a result! Already hooked are G3TGE/A (the Pagnell emporium), G4WIM (QRO TX/RX in Bletchley, ex-G8GIW), G6ALU, G6GCM (Newport Pagnell), G6ILP (Olney, now constructing TX) and G6WXM (Wolverton). Also G8JBQ, who took pix from Jon and Andy when they tried mobile TV recently; they have also been seen operating portable TV in the Central Milton Keynes shopping malls, to the amazement of patrons ...

G4MDU surprising shoppers at Milton Keynes.

From Kerry G4GGK I have had a nice letter detailing activity in the Wellingborough district. Transmitting stations number G4GGK in Rushden; G6CZE (Clive), G6TEF (Tony) and G8SBF (Steve) in Wellingborough; G4NAC (Dave) and G6PBX (Alex) in Kettering; G6IGG (Kevin) in Corby and G8MLA (Phil) in Raunds.

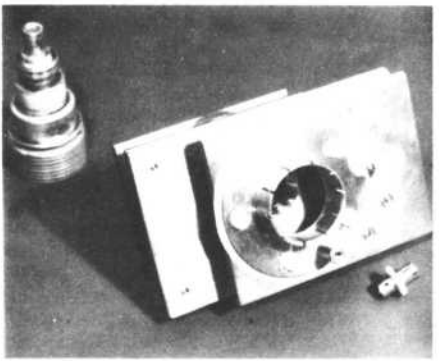
G6DYU (Les) often gives vision reports from his qth in Irthlingborough. Activity time is early Sunday evenings, with vision around 436 MHz and sound arranged on 144.75 or GB3CI (Corby, RB2). Like most other groups they are looking for new faces, and I must try and beam a signal in that direction.

The aforementioned openings which favoured 70 cm gave equal or better possibilities on 24 cm. On the 29th December Rod G8VBC saw P5 pictures from F3LP on 24 cm. Given that Rod is located near Derby and F3LP is in Le Havre (nearly 400 km), this is most encouraging. Unfortunately Rod was unable to get through on 2 metres, no doubt because lower bands were not so favoured.

From Southampton Allan G8CMQ writes about 24 cm activity in the Solent area. Two stations are on the air, himself and Sid G4JQU, with Mike G8LES in the role of visiting advisor and source of encouragement. Sid built the first tx: W&D oscillator on 429 MHz, home-made 70 cm PA with 3-5W into a homebrew tripler and Tonna 21 element 1296 yagi. Operating frequency is 1285 MHz FM. Allan made the first rx from an Ambit 23 cm converter (modified), a TV tuner and BATC IF board. With a double 15 slot antenna results were P3 over 2.5 miles.

Mike suggested mods to the converter, retaining just the oscillator chain and results shot to P5. Further mods and a GaAsFet front end mean P5 every time now, and P3 even when Sid runs 10 mW from the BATC free-running oscillator. Sid has a W&D FM IF, which works well, fed by the BATC converter but is plagued by UHF broadcast breakthrough. Allan's tx is now up to 10W input to the tripler. Allan is off the air but hopes for even better results from his new QTH.

Even over non line-of-sight paths they have been surprised with the capability of the 24 cm band; best DX was over 25 miles when Allan took the rx to Nick G8MCQ's place, giving P4 despite long cable run and no preamp. Activity is expected to increase and Allan's new QTH has a clear takeoff for at least 10 miles in all directions. So point your beams towards ZK04g!



WA9HUV design cavity for 13cm - an example of G3VVB's handiwork.

A letter from Cyril James G3VVB bemoans the price of varactor diodes, saying that Mullard quoted £36 each for BXY36s. I must say I am glad I bought a Microwave Modules unit while they were still available; if you are not the happy possessor of one of these look out for them at bring and buy stalls or the Wood & Douglas substitute may well be available by the time you read this. Cyril does a very nice line in cavities, dish feeds and filters for 23 and 13 cm (see photo) and if you have any special requirements you could do worse than write to him QTHR. I bought one of his 23/24 cm interdigital filters and it is a work of art.

SSTV

This time we seem to have more SSTV letters - is there a slow-scan revival perhaps? Dick G3LUI from Hullbridge in Essex counts at least 16 stations in the two metre net he organises on Wednesday evenings. Stations from London, Cambridge, Kent and Essex take part, and the old problem of shifting beam headings (and non-SSTV QRM) has been overcome by splitting into two or more QSOs and QSYing HF of the calling frequency. Two stations, G3WW and G4GZN, are producing good quality colour with the new SC1 scan converter from Wraase. Roddy G3CDK has perfected his instant colour SSTV playback of commercial TV transmissions, while Dick has found it extremely bad luck to replace all the fixing screws on any piece of shack equipment!

Another regular correspondent, Richard G3WW tells of a two way SSTV contact with 16GK1 on 26th February. Frequency was 14227.4 kHz, with 5-9-5 signals; Richard received six pictures on his SC1 converter which were displayed on a normal Sony TV set. Richard has now added a GP-250X dot-matrix printer to his setup, enabling him to produce permanent pictures on paper; a sample was enclosed with his letter, unfortunately it was not sufficiently contrasty to reproduce in CQ-TV.

A lot of Richard's contacts have callsigns which look distinctly exotic to me, such as 5N8HEM (listen on 14230+5 at 1745-1800 GMT) and ZL2AUJ on 14229.7. G4NJI has a 'print out' board for the SC1 and with G4DYB can be found almost nightly on 144.5 FM or 144.23 SSB around 2100 GMT. Apparently an FM voice net congregate on the SSTV calling frequency and refuse to move because their licences don't mention 144.5 as the SSTV calling frequency. Such crassness beggars belief; my response would be to run QRO (whoosh, over the top!) but that is not 'the ham spirit' either. I suppose the simplest idea is to have a pre-arranged fallback frequency and hope you don't upset some other special-mode users!

Our final SSTV letter is from John Hibbert G3YCV in Ramsgate. He too is a member of the Essex net on Wednesdays, and has lately made contacts to South Africa, north and south America and Europe. He has replaced nis Pye Lynx camera and got colour filters, so can now produce smart colour pictures.

John and a colleague have also devised a colour caption generator program for the Dragon computer, producing four lines of eight characters to the page. The computer's video output is fed to the SC-160 scan converter's camera input. If anyone else is interested they can send a SAE to John

QTHR or to Aphros Software, Hawley Square, Margate, Kent. John also gave a talk to the Thanet club recently; the demo went well and seemed to impress those present, especially the way you can get colour pictures from a black and white camera! Look out for more SSTVers in Kent ...

Finally, a plea from Bob Valder G4RRU in Peacehaven, Sussex. He has built the 'RadCom' SSTV receive converter and BATC character generator and is looking for ideas for a fast-to-slow scan converter. He will be pleased to hear from others in his area, so that he can try out the receive converter.

So there we are: once again you have sent plenty of letters, so apologies if I had to abbreviate your news just a little. I always enjoy reading your letters and printing your news even if I don't get a chance to reply to each. Let me have more news for next time and send it to me at 71 Falcutt Way, Northampton, NN2 8PH. Many thanks - Andy Emmerson, G8PTH.

NBTVA – Newsletter Resumé

By A.P.Marsden G6JAT

Included in Vol.9 No.1 of the 'Narrow Band TV' Newsletter is a very helpful article by Jeremy Jago on tape-recording NBTV signals. Jeremy outlines some of the pitfalls encountered, and describes the a.m. carrier system he uses to overcome them. Also included is an article by Doug Pitt which seems to refute the idea that mechanical TV is dead, or at least confined to a bunch of enthusiastic amateurs. Doug reveals the workings of a full-bandwidth projection television system developed by Dwight Cavendish Ltd., and featured on the BBC's 'Tomorrow's World' programme in Autumn 1982. Perhaps surprisingly for today, mechanical scanning is employed to deflect the modulated laser light source. Another article, by Roy Prescott, gives further constructional details on the Beginners Camera/Monitor which was described in an earlier issue.

In issue 2 of Vol.9 of the 'NBTV' Newsletter, an article by Deryck Aldridge describes his design for a hole-punching jig to make accurate punching of scanning drums easier. Full constructional details are given, and there are also some interesting descriptions of other people's ideas for mechanical scanning. Amongst a number of other useful circuit ideas featured in this issue is a design by Dave Sumner G3VPH for an all-valve 29MHz transmitter capable of about 40W output.

NBTV ON THE AIR - Reported in this issue is the successful transmission of 48-line NBTV signals by Allan Short and Edwin Thorne GB8HVF. Transmission of a taped signal took place over a path of a couple of miles via a 70cm FM link. Alan was surprised that success came so easily, the only really critical factor being the adjustment of the transmitted black level to suit the modulation depth, to ensure solid sync. at the receiver.

THE MC1377 COLOUR ENCODER

This article is re-produced from the January 1984 issue of 'Radio & Electronics World' magazine.

The Editor expresses grateful thanks to R & EW for giving permission to use the material here.

One of the last remaining discrete areas in 'consumer' electronics has succumbed to integration with Motorola's new MC1377 colour signal encoder device that claims to operate to standards that permit quality TV camera applications, as well as the current fad products of colour computers and TV games consoles. There have been such devices available from National for some years past based on 3-bit switched levels – LM1886/LM1889. These devices were essentially somewhat crude, dating back to the introduction of some of the first integrated 'Tele-tennis' devices. The advent of the latter devices now seems like an aeon ago.

The MC1377 *(Figure 1)* is everything any computer, video games or TV manufacturer needs in a low cost colour encoder. It accepts red, green and blue (RGB) signals, and encodes them into a composite video signal in either PAL or NTSC formats. The IC contains an on-board reference Colpitts oscillator (which may optionally be slaved from another 'master' oscillator in the system), a voltage-controlled 90-degree phase shifter, two double sideband modulators and blanking level clamps.

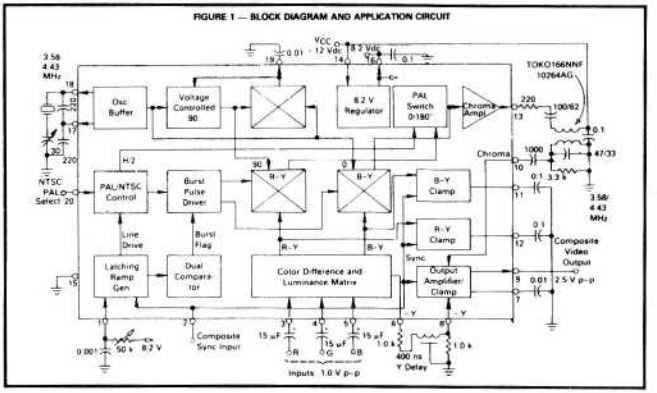
The chroma signals saturate at 1.0V p-p. (R-Y), (B-Y) and (–Y) signals are generated in the input matrices and are DC clamped to the 'black' level by a sync driven clamp. Burst generation is provided by a sync triggered ramp on pin 1, combined with two internal level sensors. Only a small portion of the ramp is used (at the beginning) with the result that sufficient accuracy is achieved with using fixed components on pin 1. Burst amplitude is internally fixed to correspond to sync level, allowing for a 3dB loss in the chroma bandpass filter. *Figure 2* shows some typical waveforms.

Working in conjunction with the MC1374 *(Figure 3)* enables a complete encoder/modulator to be built to operate to standards hitherto only achieved with nearly five times as many parts. US pricing is quoted at $2.35 for 100–999: however, deliveries are already 10–14 weeks and they will probably get worse as this part is likely to be adopted very quickly by computer and games manufacturers.

The spec is listed in the table alongside.

The chroma bandpass filter (out of

FIGURE 1 — BLOCK DIAGRAM AND APPLICATION CIRCUIT



Rating	Symbol	Value	Unit
Supply Voltage	V_{CC}	15	Vdc
8.2 Vdc Regulator Output Current	I_{REG}	10	mAdc
Operating Temperature	T_{AMB}	0 to +70	°C
Storage Temperature	T_{stg}	–65 to +150	°C
Junction Temperature	$T_{J(max)}$	150	°C
Power Dissipation, package Derate above 25°C	P_D	1.25 10	W mW/°C

RECOMMENDED OPERATING CONDITIONS

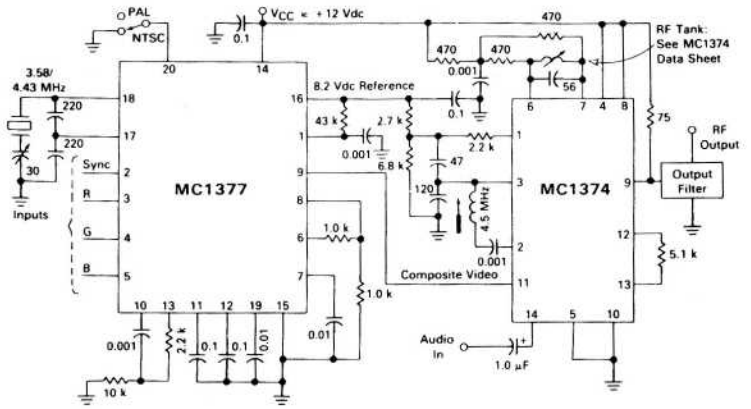
Supply Voltage	12 ± 2	Vdc
Sync Tip Level Sync, Blanking Level	–0.5 to +1.0 +1.7 to +8.2	Vdc
Red, Green, Blue Inputs (Saturated)	1.0	V_{p-p}

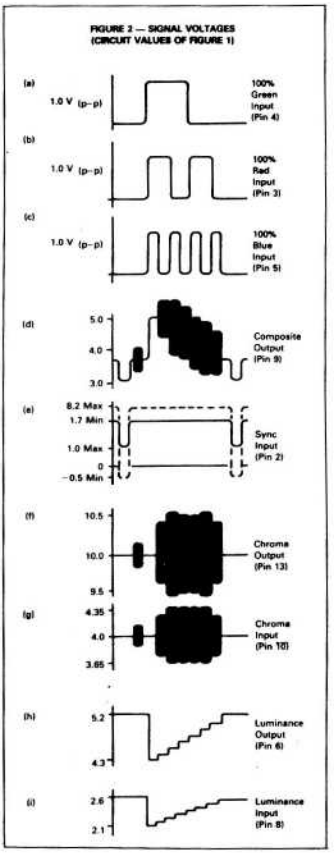
ELECTRICAL CHARACTERISTICS (V_{CC} = 12 Vdc, T_A = 25°C, Circuit Of Figure 1 Unless Otherwise Noted.)

Characteristic	Pin No.	Min	Typ	Max	Unit
Supply Current	14	—	32	—	mAdc
Oscillator Amplitude	17	—	0.5	—	$V_{(p-p)}$
External Subcarrier Input (Oscillator Components Removed)	18	—	0.25	—	V_{RMS}
Subcarrier Input: Resistance Capacitance	18	— —	5.0 2.0	— —	kΩ pF
Modulation Angle (R–Y) to (B–Y)	—	87	90	93	Degrees
(R–Y) Angle Adjustment	19	—	0.25	—	Deg/µA
R, G, B Input For 100% Color Saturation	3, 4, 5	0.95	1.0	1.05	$V_{(p-p)}$
R, G, B Input: Resistance Capacitance	3, 4, 5	— —	10 2.0	—	kΩ pF
Sync Threshold (See Figure 2e)	2	—	1.7	—	V
Sync Input Resistance (Input > 1.7 V)	2	—	10	—	kΩ
Chroma Output Level At 100% Saturation	13	—	1.0	—	$V_{(p-p)}$
Chroma Output Resistance	13	—	—	80	Ω
Chroma Input Level For 100% Saturation	10	—	0.7	—	$V_{(p-p)}$
Chroma Input: Resistance Capacitance	10	— —	10 2.0	— —	kΩ pF
Composite Output, 100% Saturation (See Figure 2d): Sync	9	—	0.6	—	$V_{(p-p)}$
Luminance		—	1.4	—	
Chroma		—	1.7	—	
Burst		—	0.6	—	
Output Impedance (See Note 1)	9	—	—	100	Ω
Luminance Bandwidth (3 dB), Less Delay Line	9	—	8.0	—	MHz
Subcarrier Leakage In Output	9	—	—	40	$mV_{(p-p)}$

Note 1: Output impedance can be reduced to less than 10Ω by using a 150Ω output load from Pin 9 to ground. Power supply current will increase to about 60 mA.

FIGURE 3 — COUPLING THE MC1377 TO THE MC1374 RF MODULATOR





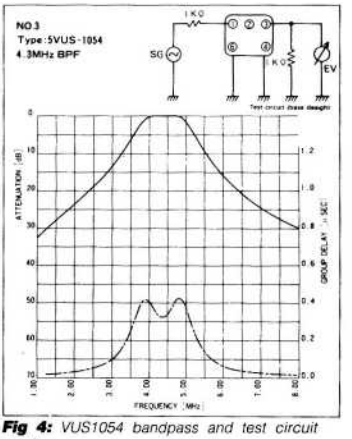


Fig 4: *VUS1054 bandpass and test circuit results*

pin 13, into pin 10) can be accomplished with a standard bandpass coil arrangement. Alternatively, it is quicker and easier to adopt a standard TOKO video block filter, such as the VUS1054, whose bandpass and test circuit results are shown in *Figure 4*. The 400nsec delay line is of the same standard as that found in a colour TV: however it performs the opposite function in the encoder.

For those of you who are not familiar with the operation of NTSC and PAL, the June '82 issue of *R&EW* contained a useful piece on the workings of colour TV systems within a feature entitled *'Video Recorders Explained'*. Back issues still available!

BRIGHTEN UP YOUR IMAGE

Part 2

By Norrie Macdonald GM4BVU

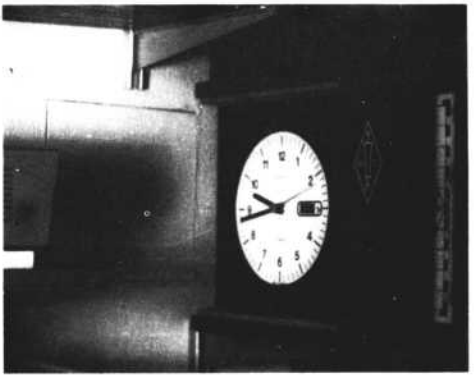
Last time I tried to persuade you that graphics can be fun. Now I want to pull together a selection of picture sources which in some cases are useful, and others that capture the attention of the receiving station.

Featured extensively in CQ-TV already is the electronic signal source, whether it be colour bars, chequer board, crosshatch or whatever, it serves a dual purpose. First, it is ideal for serious discussion about signal quality, but equally it provides a video source to radiate while you discreetly 'frame-up' the next camera shot off line, a graphic caption or a shack shot, it doesn't matter, the key point is that the viewer does not see your efforts to frame or focus the picture. It all adds to the image you put over; after all you normally don't see the broadcast cameraman frame his shot!

The ultimate electronic 'hardware' source must be the excellent colour test card featured in volume-1 of the 'Amateur Television Handbook' published by the BATC. I must admit to having had all the bits for a year, but am only just managing to put it together!

However, nowadays a cheaper way to generate a test card is to use the ubiquitous microcomputer. This I have done using the software published in CQ-TV 122 (page 25), but as I do not have a BBC micro, I asked a friend who does to generate the test card on his machine. Once I saw the picture, I decided the colour bars needed a border round them. Dead easy with software, and not only that but my name runs round the edge of the frame to.

What next....? Well there are other electronic sources such as alphanumeric character generators, but these are already adequately covered by BATC articles, so let me concentrate on moving images. At the moment I use three cameras in the shack, each with a particular job to do. The oldest is at least 20-years old, a Pye monochrome monstrosity, but it works and is set up with a 25mm lens for a wide shot of me plus the gear, and a 37mm lens for a head and shoulder shot. These are changed remotely from the Camera Control Panel. This camera was free, a good reason for having it, but the CCU is bulky and uses a lot of juice, so maybe I'm still paying!



Next source, also black-and-white, is an Ikegami VR622 set up on captions arranged to slide in to a caption holder as shown in the photograph. A station clock is made by mounting a Keinzle clock (from Boots) onto a piece of 16swg aluminium covered in black card and with suitable lettering applied. Digital clocks are all the rage, so I selected this analogue one to be different.

And so to the main station camera - the Hitachi VKC600 - bought as part of a package deal from Lasky's last year. It is not a 'good' camera when compared to even the better domestic ones such as the JVC S100 or Hitachi GP61M, but in my station it sources shack shots and mug shots in colour (usually for tape programmes), captions galore, and even film (Super-8) and 35mm colour slides as shown in 'El-Cheapo Telecine' in CQ-TV 122 (p32). It IS amateur TV after all!

'Moviemaker' magazine for October 1983 has part 6 of an excellent series by Ron Prime, a 'Cine and Video Course for Beginners', and this covers proper lighting, so important for good results. Again let me say that articles such as these and the shelves of your local library are good reading for the keen ATV'er. But in the shack I cheat....again! I use Par-38 100W spot and flood lights which screw into ES type fittings, readily available and relatively cheap from any good electrical shop, and they last for ages unlike photofloods and other 'proper' lights. Just remember the key phrase 'colour balance', read your camera instruction booklet.

Finally, the Video Cassette Recorder (VCR). I use a Hitachi VT6500 portable in the shack and out and about for compiling material, but more of that in a moment. For domestic use I have the latest Hitachi long play Dolby stereo machine, and, used together, these machines allow basic editing of material, although admittedly only to a standard acceptable to the amateur.

So what kind of material I hear you ask? The answer to that I suppose is really up to you; I can cite some examples which may help show you the usefulness of a VCR. In fact when I started building up my station I used an old Philips monochrome reel-to-reel video recorder which was so heavy the joists in the attic visibly bent. The tiny machines of today were undreamed of and now that they have arrived,must surely have a major impact on ATV operating practice.

I sometimes go away during the summer months and stay in a caravan, then, using this as a base, visit some of the local attractions, recording as I go. But with some thought given to editing the shots to produce watchable material. The other spin-off to this approach is that it lets you pursue your hobby and still spend some time with the family.

This year has seen some interesting sequences such as the Prestwick Air Show, the Glasgow Marathon, scenic views in the galloway hills, BATC Convention at Leicester, the Woodstock Festival (Morris dancers and all), a steam rally near Deddington, Inveraray Castle and so on. Of course the VCR can be used for preparing set sequences for either transmission or tape swapping. The assemble, edit and insert features of the machine allow captions, slides, film, talking head or whatever to be edited at leisure, so producing a slicker product than normally possible when 'live'.

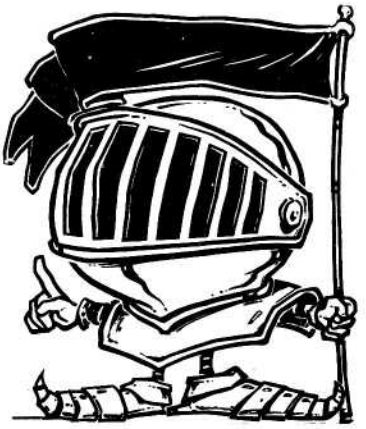
All in all, the results will more than repay the initial capital cost, and the programme production is really fun. Obvious subjects are: (1) The facilities in your shack, (2) the station aerials and (3) closeups of your pet constructional projects etc.

Then we come to my favourite aspect of ATV....Tape-swapping. Despite the nil response to my idea of formalised tape swapping in a recent CQ-TV, I still believe this has to be the bridge between isolated pockets of ATV activity.

Apart from the obvious attractions of seeing what the other guys are up to, it is also yet another source of programming for transmission.

Again some examples: An excellent sequence from GW8PBX in Anglesey showed his shack and BBC micro in operation. Another sequence, this time from GM4BVD in Perth demonstrated his interest in radio-controlled aircraft. In fact GM4UBJ in Motherwell came across these pictures whilst tuning his telly and is now a regular P5 viewer in colour.

But the coup-de-grace has to be International tape exchange. Dr.John Fox WB2LLB/4 in Mobile, Alabama, together with Mike Stone, runs the US ATV Society's tape exchange scheme where some excellent tapes are available. I have shown the local ATV'ers how the US TV hams have repeaters and relay some very ambitious TV such as Saturn pictures from JPL in Pasedena, shots from aircraft and hot air balloons, yacht races, parades and even some Secam from Paris TV'ers, all courtesy of WB2LLB/4.



Please accept this as my invitation to send a cassette, preferably on VHS to me (QTHR). I will then eventually dub over some of my material on the tape (or another) for your use.

So there is a selection of picture sources which will add variety to your presentation, next time a few ideas to help switch between these quickly and cheaply. Also some thoughts about cine in the shack, yes film!

ANOTHER FM DEMODULATOR FOR MICROWAVES

From an article by Mike Veldman WD0CTA in 'A5' Magazine, June 1983.
Edited by Tony Marsdon G6JAT.

This article describes a useful application for the Motorola MC1357 IC as a quadrature detector for FM-TV on the microwave bands.

The MC1357 was originally designed for commercial applications and consists of a three-stage limiter and a balanced product detector. The detector has a threshold of 400uV and a gain of approximately 40dB up to 50MHz. Fortunately, its frequency response extends high enough to be useful for video.

Steve Birkill published a circuit using the MC1357 (see fig.1) in the journal 'CATJ'. Experiments with this circuit have proved that the device is more stable running at 70MHz than the NE564 PLL, and that it only requires 100mV to drive it to full limiting. However, to obviate possible problems with sensitivity, oscillation, inherent video noise and occasional glitches in the picture, it is better to avoid the direct 70MHz approach and use a divide-by-two system instead. Fig.2 shows a simplified circuit originally published in '73 magazine. A divide-by-two circuit should be provided at the input, which could use a 74S... TTL IC. Alternatively the circuit may be fed from the 35MHz output of a varicap TV tuner. In this case a variable gain IF amplifier such as the NE592 will probably be required although care should be taken not to overload the demodulator IC.

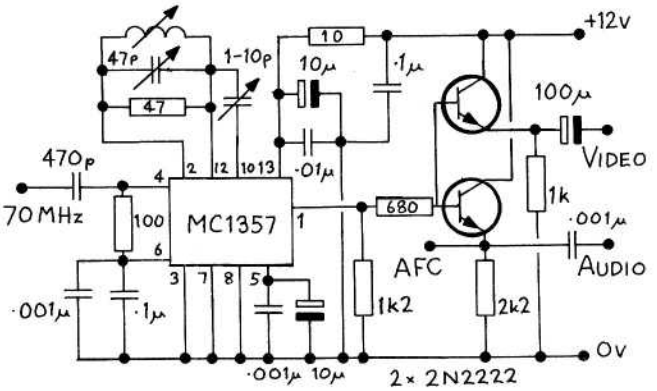


Fig.1 70MHz DEMODULATOR CIRCUIT

CONSTRUCTION

Certain points of construction should be noted which apply equally to other similar types of FM demodulator. The MC1357 may have a tendency to oscillate, so good RF construction techniques are a must, with particular attention paid to lead dressing and de-coupling. Ideally, a double-sided PCB with a top groundplane should be employed. Good quality decoupling capacitors should be connected close to pins 5 and 13. To prevent the output of the detector oscillating at deviation extremes, pin 14 should be decoupled with a 10pF capacitor, to roll off the higher frequencies a little, but not enough to be seen or to interfere with the colour and sound subcarriers. The DC supply should be well filtered, especially if the receiver is to be used in an area of high RF field strengths. 10uH chokes or ferrite beads should be used on the supply leads and on the detector board. It might even be necessary to build a screened box around the detector, using feedthrough capacitors where appropriate.

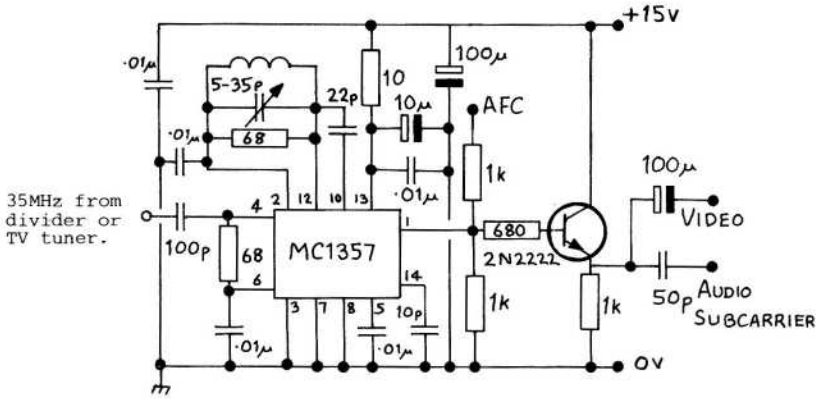


Fig.2 35MHz DEMODULATOR CIRCUIT.

The MC1357 has a differential input, but for this application it is simplest to decouple one input to earth and apply the other signal to the other. Since the IC has more gain than is required, a swamping resistor is used on the input. The quadrature phase-shift network connects between pins 2 and 12 and has proved to be non-critical. The following coils have all been used successfully: a 1uH choke; 4 turns of 26swg wire wound on a 4.5mm former with core; and 6 turns of 30swg on a small ferrite bead (FX1115 or similar). The capacitor between pins 10 and 11 also seems not to be critical - both values shown in the circuits have been successfully tried.

As the IC has a wider 'S' curve than the bandwidth required, tuning is not very critical. Some control over the deviation width may be acheived by altering the value of the parallel resistor across the tuned circuit. If AFC is to be used, the AFC output is best buffered by an op-amp circuit with the facility to adjust out the DC offset.

With attention paid to the foregoing points, the MC1357 is a useful IC capable of excellent performance and well worth trying out.

BOOK REVIEW

EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT AMATEUR TELEVISION*

By A.P.Marsden G6JAT

* but were afraid to ask

Editor: Mike Stone WB0QCD Publisher: QCD Publications.

112 pages. Soft bound. Revised 3rd edition

Not to be confused with another book with a similar title, but on a totally different subject! This American book is in the familiar large format of 'A5' Magazine and is from the same publisher. The standard of reproduction overall is only reasonable, unfortunately circuit diagrams tend to be the first things to suffer from poor reproduction, and the presentation is not generally up to 'CQ-TV' standards. Some downright quirky spelling and numerous typographic errors could also give rise to confusion at times.

The book comprises fifteen chapters, starting with an historical background, and then a guide to getting started in ATV. Chapter 3 deals with the video signal and its terminology, whilst chapters 4 and 5 cover cameras and lenses, and station operation. Further chapters cover reception, antennae, repeater operation, a directory of ATV activity and repeaters, slow-scan TV, information on 'A5' Magazine (including a master index 1967-'83) and an advertisement section. Except for the chapter on SSTV, the book confines itself almost exclusively to 70cm fast-scan, with brief references to 24cm.

Well-illustrated throughout with photographs, sketches, diagrams, and cartoons, this book contains a liberal sprinkling of circuits, with something to suit all tastes. There are simple and complex circuits for RF, video and audio, straightforward down-converters and pre-amp's, and various 'station accessories' - enough to keep anyone busy for hours.

Certainly, this book gives a comprehensive view of ATV, albeit from an American point of view, and much of the information given is of little use outside the States. The main trouble is that all descriptions refer to the American TV standard, and very little attention is paid to pointing out the differences from the European TV standards. For this reason, I would scarcely recommend this book for an absolute beginner, as it is likely to cause confusion. There is only minimal discussion of colour theory, and none at all on the PAL system.

In spite of its rather intrusive (at least to this English reader!) American style of writing, 'Everything You Always Wanted To Know...' is probably worth the cover price of $9.95 (plus postage) for the circuits alone.

QCD Publications, Inc.,
P.O.Box H,
Lowden,
Iowa 52255

HOME COUNTIES ATV MEETING

At a meeting of the Home Counties ATV Group in November 1983, a panel representing the various and sometimes conflicting users of the 70cm band discussed the way in which the band is used and how possible difficulties could be avoided. The panel comprised:

Cris Young G4CCC (a member of the RSGB Repeater Working Group and the Berkshire Downs Repeater Group)

Richard Limebear G3RWL (National Committee, AMSAT UK)

Mike Kipp G4FBK (Contest Manager, Radio Society of Harrow, and a keen exponent of SSB on 70cm)

Mike Saunders G8LES (Technical Committee Chairman, Home Counties ATV Group)

The panel was chaired by the Home Counties Chairman; John Betts G4HMG.

To summarise the main points of the discussion: It is apparent that all modes of activity on 70cm are increasing, necessitating greater co-operation between all users. It was agreed that the most helpful suggestions to emerge had been the need for SSB and ATV operators to recognise each others difficulties and to try to use the 2m calling frequency to iron out the problems. It was suggested that it would be necessary to wait and see whether satellite and ATV operators would experience mutual interference, but that the use of vertical rotators to give elevation to aerials for satellite operation should substantially reduce the likelihood of such interference. It was also proposed that repeater groups could significantly reduce interference to ATV by following the recommendations in the RSGB 'Guide to Repeater Licencing', i.e. callsigns to be transmitted at intervals of not less that five minutes, and ATV operators should, wherever possible, avoid pointing their aerials directly at repeaters.

It was generally felt that this discussion had helped to clear the air between the 'rival factions', and, it is hoped, will have contributed to the greater enjoyment by all operators on the band.

MICROWAVE STUB TUNING

By Bob Atkins KA1GT

Impedance matching is necessary for optimum transfer of power from a generator to a load. In practical terms that means that if the output of your power amplifier is not matched to your transmission line, or if your transmission line is not matched to your aerial, then you will be losing power. If a power amplifier is mis-matched, the low power may take the form of heat dissipated in the valves, causing reduced valve life and increasing amplifier thermal tuning drift problems (which are quite common in high power amplifiers at 1296 and 2304 MHz).

At lower frequencies impedance matching transformers are often constructed in coaxial lines using 'Q sections' or $\lambda/4$ transformers, and open-wire feeders are often matched using short-circuited tuning stubs. These techniques can also be used at microwave frequencies, perhaps with greater ease since the physical dimensions of the hardware involved get smaller as the wavelength involved gets shorter. For example, a two-slug tuner (described later in this article) for 1296MHz is about 1 foot long. An equivalent device for 144MHz would be 9 feet long, a bit bigger than is convenient for use in most amateur shacks!

TWO-STUB TUNER

The two-stub tuner is shown schematically in Fig.1. It is analogous to stub tuners used on owen-wire feeders. I don't want to go into any great detail of the theory of operation of this tuner, except to say that as the lengths of the shorted stubs are changed, different values of capacitive or inductive susceptance are added to the 50-ohm line section. The addition of these susceptances combined with the spacing of the stubs can cancel out standing waves present on the 50-ohm line. The range over which standing waves can be cancelled depends on the number and spacing of the stubs. Theoretically a three-stub tuner with $\lambda/4$ spacing between the stubs can cancel out standing waves of any magnitude and phase. However, such a tuner is very difficult and sensitive to adjust, and is seldom used. The most

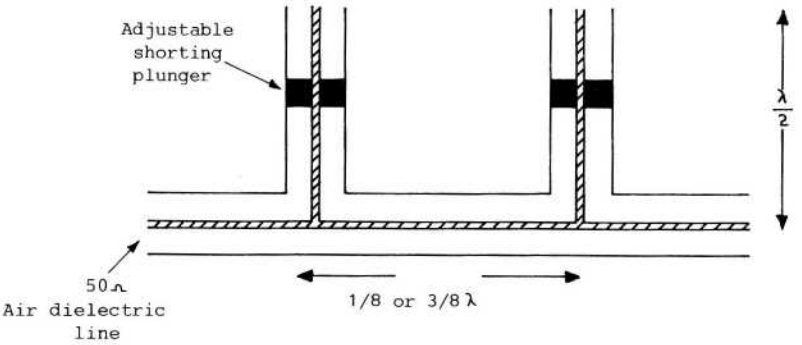


Fig.1 TWO STUB TUNER

commonly used arrangement is that shown in Fig.1 with two stubs (which must be capable of adjustment over a half wavelength in length) spaced 3/8 λ apart. The adjustment of such a tuner is easy, though its matching range is reduced. The tuning procedure is to set the shorted stubs at $\lambda/4$ initially (in this position they do not affect the 50-ohm line). One of the stubs is then adjusted to minimise the SWR on the line. When a minimum is reached, the other stub is then adjusted for more improvement. The first stub may then be further trimmed and so on until no more improvement is seen. This tuner can match out any SWR up to 2:1 and can often match out higher SWRs depending on their phase.

The greatest potential problem of such a tuner is the construction of the sliding shorts. The contact points of the short are high-current points and any resistance can cause power losses and erratic tuning. A $\lambda/4$ finger-type short as shown in Fig.2 moves the contact point to a low current position and can give more reliable results. Those interested in the construction of a two-stub tuner are referred to an article by George Hatherell, K6LK in the December 1978 issue of 'Ham Radio' magazine.

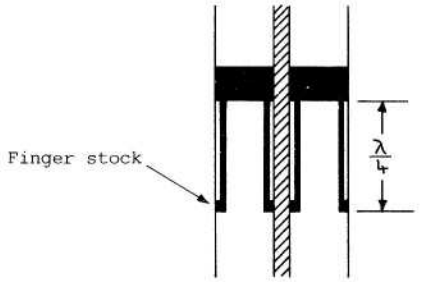


Fig.2 IMPROVED $\lambda/4$ SHORTING PLUNGER

TWO-SLUG TUNER

A two-slug tuner is shown schematically in Fig.3. The principle of operation of this tuner is that the 'Q section' or $\lambda/4$ matching transformer. It is well known that a $\lambda/4$ section of transmission line of characteristic impedance Z_m will match together two impedances, Z_{in} and Z_{out}, when connected between them and when the impedance values are related by the formula

$$Z_m^2 = (Z_{in} \times Z_{out})^{\frac{1}{2}}$$

It is also well known that the insertion of a $\lambda/2$ section of any impedance transmission line into a second transmission line will not affect the impedance of that second line.

Bearing the above in mind the tuner in Fig.3 can be analyzed. It consists of a length of 50-ohm air-dielectric transmission line into which two movable $\lambda/4$ dielectric slugs are introduced. For use at frequencies above 1GHz, Teflon is probably the only suitable material for these slugs. The presence of these slugs modifies the impedance of the line by a factor of $1/(E)^{\frac{1}{2}}$ where E is the dielectric constant of the slug material (E is 2.1 for Teflon). Thus using Teflon, the dielectric slugs constitute two movable $\lambda/4$ sections of 34.5-ohm line. Note that the presence of the dielectric modifies the length of the slug. The length of a $\lambda/4$ section with the Teflon dielectric is $1/(E)^{\frac{1}{2}}$, that of a $\lambda/4$ section of air dielectric line

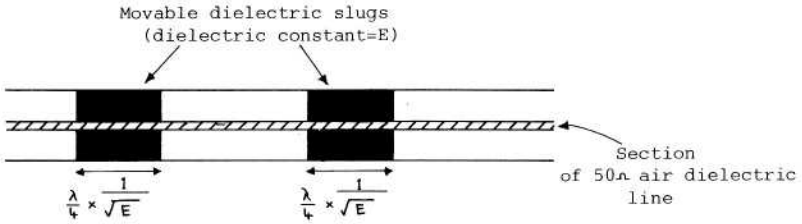


Fig.3 TWO-SLUG TUNER

(e.g. at 1296MHz $\lambda/4$ in air is 5.79cm, while $\lambda/4$ in Teflon is 3.99cm).

When the two Teflon slugs are moved so that they are touching they constitute a $\lambda/2$ section of 34.5-ohm line and, as a $\lambda/2$ section, they do not affect the impedance of the 50-ohm line section as sensed by any devices connected to it. When the slugs are moved apart, however, they act as $\lambda/4$ impedance transformers. Depending on their spacing and position in the line, the tuner can match out standing waves of up to E^2 (4.4 in the case of Teflon slugs) of any phase, provided they can move over a sufficient length of air line (more than $3\lambda/4$).

The slug tuner is somewhat easier to construct than the stub tuner, principally because there are no current-carrying sliding contacts to make. The only difficult part of the construction is the cutting of a long slot (about 10") in the outer of the 50-ohm line section, to permit the movement of the dielectric slugs. (Unfortunately space does not permit details of the construction of a two-slug tuner at this time).

After building a tuner as described above, it occurred to me that since it consists of a section of slotted coaxial line, it is in principle quite easy to put a pair of small coupling loops into the line and thereby construct a device which is not only a tuner but which will give information on forward and reflected power as well! Initial tests on such a system indicate that it does indeed work quite well. One further point to note is the possibility of some RF radiation from the slot in a two-slug tuner. Although such radiation is expected to be at a low level, it is nevertheless advisable to be aware of it and perhaps incorporate shielding if high-power operation is anticipated.

This article first appeared in QST magazine, April 1981, and is reproduced here by the kind permission of Laird Campbell, W1CUT, Managing Editor.

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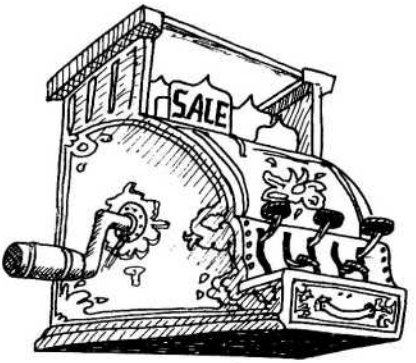

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R.Rowe, 1 Summit Terrace, Dinsdale, Hamilton, NEW ZEALAND.

SERVICE SHEET wanted for Jennings Univox J6. For loan, sale or copy, postage re-imbursed.
H Haden G4GWF, 28 Welch Hill Street, Leigh, Greater Manchester WN7 4DU

MONITORS, colour or B&W wanted. Also contact with other ATV'ers in the West Midlands area.
B Dandy G8MGH, 21 Summerhill Avenue, Kidderminster, Worcs. DY11 6BY. Tel: Kidderminster 4265 (home) or; Stourbridge 75525 (office).

IKEGAMI CTC-4000 CCTV camera information wanted to enable me to repair mine.
T Baldwin G6EQY, 33 Sherwood Gardens, Ramsgate, Kent. Tel: Thanet 55739

MK Products SSTV filter board us
ing 7 741 IC's wanted. Also Eddystone 770U VHF/UHF receiver, MM receive converters for ATV & 136MHz, Plustron TVR5D VHF/UHF TV. Will collect larger items.
Graeme Wilson, 65a Gypsy Lane, Nunthorpe, Middlesbrough, Cleveland TS7 0DR. Tel: 0642 318451

I HAVE an elderly Pye 2780 405-line monitor which is looking for LOPT and scan-coils from the 2788 625-line version. Alternatively can anyone offer a good home to a nice old 405-line monitor?
John Hoare G3PJI, 4 Thrush Close, High Wycombe, Bucks HP12 4RJ. Tel: 0494 22108

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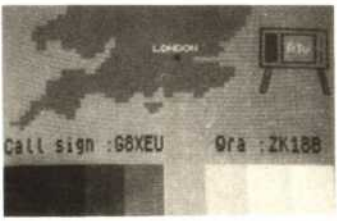

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