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***Close of Press for the Next Issue.....20th June 1996***

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## **Committee Contacts**

The BATC committee are available to help and advise club members on ATV related subjects. Please remember that all club work is done in spare time, so try to keep questions to a minimum. It is better to telephone rather than write (SAE essential if you write). Please do not telephone at unsociable hours, as a guide try to call between 1830 & 2130 hours and not before 1130 at weekends. Thank you.

### **BATC Chairman Trevor Brown G8CJS**

Club affairs, Video tape library, Technical queries, especially relating to handbook projects. 14 Stairfoot Close, Adel, Leeds, LS16 8JR. Tel: 01132 670115. E-mail: trevor.brown@betwixt.dircon.co.uk

### **BATC General Secretary Paul Marshall G8MJW**

General club correspondence and business. Library queries relating to the borrowing or donation of written material. Fern house, Church road, Harby, Notts., NG23 7ED. Tel: 01522 703348

### **BATC Hon. Treasurer Brian Summers G8CQS**

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### **CQTV Magazine Editor Trevor Brown**

Anything for publication in CQ-TV, Articles, Review items, Advertisements, Letters to the editor, and other material except as below.

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Email: vhf-comm@g6iqm.demon.co.uk

**CAT 96:-** General arrangements and information about talks to clubs, demonstrations, lectures, etc. Paul Marshall G8MJW - Details above.

## **CLUB SALES**

**MEMBERS SERVICES:-** PCB's, components, camera tubes, accessories, etc. (NOT PUBLICATIONS). Peter Delaney G8KZG, 6 East View Close, Wargrave, Berkshire, RG10 8BJ. Tel: 01734 403121

**PUBLICATIONS:-** Handbooks, Back copies CQTV, and anything related to the supply of BATC publications. Ian Pawson G8IQU, 14 Lilac Avenue, Leicester, LE5 1FN. Tel: 0116 276 9425. E-mail: ipawson@cix.compulink.co.uk

## **MEMBERSHIP**

Anything to do with membership, including new applications, queries about new and existing membership, non-receipt of CQ-TV, subscriptions, membership records, data protection act. Dave Lawton G0ANO, 'Grenehurst', Pinewood Road, High Wycombe, Bucks., HP12 4DD. Tel: 01494 528899

**CLUB LIAISON:-** And anything of a political nature, co-ordination of ATV repeater licences. Graham Shirville G3VZV, The Hill Farm, Potsgrove, Milton Keynes, Bucks., MK17 9HF. Tel: 01525 290343

**CONTESTS:-** Richard Guttridge G4YTV, Ivy House, Rise Road, Skirlaugh, Hull, HU11 5BH. Tel: 01964 562498

**BATC BBS SYSOP:-** Brian Kelly GW6BWX, 12 Cotswold Way, Risca, Gwent, NP1 6QT. Tel: 01633 614376, BBS: 01633 614765

**REPEATER LIAISON:-** General enquiries and repeater affiliation. Graham Hankins G8EMX, 11 Cottesbrook Road, Acocks Green, Birmingham, B27 6LE. Tel: 0121 707 4337

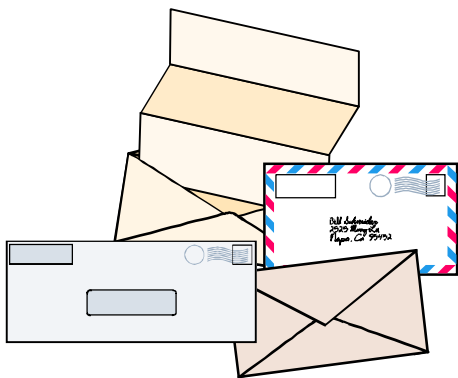
## Post and News

Please send all correspondence for **Post and News** to the CQ-TV Editor. Trevor Brown, 14 Stairfoot Close, Adel, Leeds, LS16 8JR, England. Tel: 01132 670115.

E-mail:

trevor.brown@betwixt.dircon.co.uk

Date: 13 Feb 96 18:14:23 EST



From: Michel Vonlanthen

<100755.3054@compuserve.com>

To: Mike <vhf-comm@g6iqm.demon.co.uk>

Subject: GreetingsMessage-ID:  
<960213231422\_100755.3054\_GHV75-  
1@CompuServe.COM>

Dear Mike,

I have read your e-mail address in the CQ-TV. I am also on the information highway, via CompuServe. It's good if we, European ATV amateurs, find a way to communicate quickly in case of necessity. Until now, we have very

few, if none at all, E mail contacts, Internet can give us this opportunity.

If you have other ATV'ers e-mail (or other) addresses, send them to me. It may help one day.

I can also send you some news by this way from time to time. Today's news is that an ATV expedition we organise in Corse Island (France) from 12 to 19 mai 1996. F1JSR will be there QRV on 1200MHz, 2300MHz, 10GHz and 24GHz ATV with some very good equipment. Some people, like me for example, participate in going in the French coast in order to break the km barrier. Perhaps a good opportunity for the G ATV enthusiasts to go in France and have a QSO with us and the French local people.

We have to-morrow a meeting here to decide to organise Swiss ATV contests "euro compatible" in order to promote ATV traffic.

Best 73's Mike.

Michel Vonlanthen  
SWISS ATV President  
Compuserve: 100755,3054

Blue Hills  
Coombe Cross  
Bovey Tracey  
Devon  
TQ13 9EU

Dear Dave,

**G8NJX is now G0WTU**

I don't know if such are usually mentioned in CQ-TV but it might help to find the odd OM I haven't remembered to tell.

Yours,

David F. Baldwin

Dear Mr Brown

Thank you for the kind loan, of the German TV. Amateur Magazine.

It is a pity that so little time and space is devoted to the SSTV mode of operation, in the AGAF, and the CQ-TV Magazines. German is one of my languages, and if at least 50% of space had been devoted to SSTV, I would join the AGAF, but at present it appears, that the IVCA, seem to be the only body, which truly serves and supports, the rapidly growing SSTV fraternity.

As prices of computers are falling, and numerous SSTV Computer programs are nearing perfection, I am already finding it difficult to imagine how ? Radio Amateurs hearing the description of picture content, quality of colour etc., will be able to resist taking the one small step further, towards full participation.

I further wonder, how many ? B.A.T.C. Members like myself, are entirely 100% SSTV operators, that would welcome the choice of CQ-TV or B.A.T.C. SSTV Magazine, such a choice I feel would cater for members across the board, or alternatively an equivalent of the IVCA News letter to accompany the CQ-TV, or reasonable proportion of present magazine. the SSTV section, could well increase the membership figures.

As for myself, I shall continue supporting the B.A.T.C., in hope that it becomes less biased, and devotes more time, to the High Quality, "WORLD-WIDE PICTURES BY RADIO" mode of operation.

## *Post and News*

yours sincerely M.Puncer G0BLV.

**(only edited one mag and on the carpet already, I included all the SSTV contributions, Honestly Editor).**

Dear Trevor

CQ-TV arrived this morning and I see you have come to the rescue again very many thanks for your efforts. I hope to see you at one of the gatherings through the year, and thank you in person. As yet I haven't had time to read CQTV but hope to manage that over the weekend. I will be contacting you by 'phone about I2C, but as spring has arrived at our house all amateur activities are at a standstill !!. On behalf of Tony G8FLV and myself a big thank you for your good work. Brian Alderson G3KJX

**(second letter, 15 all Editor)**

Dear Trevor

Viewers in the HTV Wales area will be able to see a programme on ATV on 4 June at 7.30. The producers have been working close with myself and Brian Kelly GW6BWX. one of the inserts covers the Breen Down to Lavernock Point link made famous by Marconi and recreated on 24 CMS ATV. The programme producers also hope to shoot some material at the B.A.T.C. rally (28 April). Perhaps that should increase attendance.

Bob Robson GW8AGI

**(I hope they cover SSTV or they may hear from G0BLV Editor)**

Dear Trevor re your comments on the phone last week about importing circuit diagrams into Winword. EasyPC files can be imported as follows :-

- 1 With Easy-plot after setting scale etc., save the file with the same file name. It will be stored in EasyPC with extension .001
- 2 With File manager Rename file with .HGL as the extension.
- 3 Insert drawing into Word document by inserting .HGL file from EasyPC

Bob Platts G8OZP

**( It clipped one edge of the diagrams when I tried it, otherwise it worked for me. It also helps if you save two versions when in EasyPC one version rotated by 90° as I have not found out how to rotate in Winword Editor)**

Dear Trevor

Just a quick note about the video titler project that featured in CQ-TV 173

Do you know of a source for the following two IC's X9C103 , NMJ2244. This has got to be one of the best circuits in CQTV for sometime, so I hope that a source of pre-

programmed micro controllers can be arranged. Congratulations on the Editors Job !  
Mike G7GTN.

**( I have had one or two letters like this, if anyone out there comes up with a source let me know and I promise not to keep it to myself Editor)**

Delayed report from the Danish Microwave.

June 17 was Danish Microwave week.

In order to get frequency stability for this event. DF9LN We have designed a temperature controlled oscillator, known as an OCXO (Oven Controlled Xtal Oscillator) which we in the group decided to attach to the instruments which we made earlier as building projects, Solectra, LMT1-24 and J1T 47. Fifty oscillators had to be produced for this purpose, which does not sound discouraging, but factors, such as problems with the X-tal deliveries, prevented us being ready for Danish Microwave week.

ON6UG, who had built the same OCXO into his 47 Ghz equipment, provided an excellent demonstration of the stability that can be achieved with this oscillator.

More than one hour of listening to a beacon with the same type of OCXO without having to adjust for frequency drift at any time. Quite Impressive (A malicious rumour has it that Freddy had managed to build two OCOX's which were drifting in the same direction at the same rate.)

Another project was a Micro Wattmeter built by OZ1UM to a design by DJ4GC. We have been lucky in getting some HP3333 probes and as a result have an instrument that will work from 1 Mhz to 24 Ghz with reasonable accuracy and with an output contrast of approximately 70dB. Without this instrument we would have had difficulties in measuring the equipment we have produced during the last couple of years. One of these Microwave Wattmeters was presented to each of the foreign participants, at the end of Microwave week. The probe was not included, but can be collected next year. OZ1UM was also presented by DC0DA a pewter plate with an inscription, with thanks for the first 10 years of Danish Microwave Activity Week.

During the weekend the longest QSO on 10GHz between OZ2FF and LA/DC0DA (CW) 350Km and OZ/PA0EHG, and OZPA0JGF (JO47F) made contact on 24 Ghz with SM/OZ1JLA and SM/OZ1FPN (JO67CC) a distance of 110Km.

Of course we had planned on being QRV on 10,24,76,145, and 241 Ghz with SSB , CW and ATV. Unfortunately the weather gods were not in a very good mood, just like last year, so we had problems with the very high frequencies over 24 Ghz.

The French participants made a special contribution to the week. They had decided that since they were banished to a (desert) island anyway, they might as well establish themselves on all bands 50 Mhz and upwards. They managed to occupy the islands only

## *Post and News*

community TV system so effectively that radio silence was imposed from 6pm to midnight every day. And yet the four of them managed to make more than 1000 QSO's from 50mhz and upwards.

**I have extracted this information from a much longer report. This year's Danish Microwave Activity Week is the last full week in June so look out for them the weather gods may be kind Editor.**

Dear Trevor

CQ-TV 172 page 86 shows my Video AGC unit unfortunately an error crept into the design in that the capacitor between pins 9, and 10 of the AN302 IC is drawn the wrong way around i.e. the positive end should go to pin 10. There is also a chroma loss associated with the unit, which can be minimised by putting a small 39pf capacitor across the 10k resistor which is in the feed to the base of the BC107 transistor. The AN302 is now obsolete but "Willow Vale Component Supplies have some in stock.

Eric Edwards GW8LJJ.

**( Eric also supplied a redrawn circuit and PCB design for those of you that require a copy send me an S.A.E marked AGC Editor)**

Dear Trevor

I have to say how disappointed I was to read the five and half lines that you gave my report on the ATV activities around the Nottingham repeater. (CQ173). I note that it was mentioned that I had submitted two full pages that I had hoped to see published, giving a little publicity not only on fast scan, but also on sstv too.

My report was sent in response to CQ appeal for more information to be sent for publication, so it would appear that my effort was not considered worth while.

In future I will ignore any requests made, and perhaps those who may contemplate making similar reports, will make sure that their work and effort will not be ignored!

Harold Bent G0EZW

**PS GB7NV is not on the air at the moment, been off since August 95.**

**(Another rocket I do not edit TV On The Air Graham Hankins is the man.)**



Dear Trevor

Can I update you on the position of the S.C.A.R.T. group (Solent Club for Amateur Radio and Television).

23cm:- This area is shielded from most others (and itself!) by ranges of hills, indifferent conditions have therefore meant that only those few stations in good locations have been able to work outside the Solent Basin recently, nevertheless, local activity has been fairly high.

3cm:- This will always be a difficult band in this area but a small core of enthusiast continue particularly on portable equipments.

Repeaters:- HV and VR are usually accessible to a small minority but a lot of time and effort has been made by the team of club members to produce a “state of the art” 23cm repeater (GB3AT) to serve the Solent Basin, but it cannot be used due to the licensing delays! The licence application for GB3AT is now over two years old and the wrath of many members is aimed at the RSGB due to (amongst other things):-

1. Their failure to convince the authorities that other repeater/radar problems do not affect GB3AT esp. because the site has been proved (during tests with CAA) to be totally “clean”.
2. Their repeated failures to keep us informed about progress/problems (like the RA used to).
3. The additional delays created by trying to change all repeater specs to deal with isolated problems (e.g. on one repeater on a unique frequency).
4. Allowing our application to lie dormant in a filing cabinet at Potters Bar for six months (until we locate it!).

It is the unanimous opinion of our club members (plus other clubs who have contacted us) than an effective licensing procedure be immediately introduced and we are taking positive steps to bring this about.

70cms:- The lack of a local repeater has stimulated 70cm ATV activity and we are in the throes of a mini-revival; at least five SCART members have either just started on 70, or are improving their 70cm AM stations, plans are also being made to develop new narrower ATV modes for this band.

**( I have put repeater application bottle necks on the agenda for the next B.A.T.C committee meeting “17 March” Editor )**

## **Guides Tdota at Cudham**

**By John Stockley G8MNY**

As this years TDOTA did not clash with the Home Counties ATV Display on the BATC Stand at Sandown Rally, we were able to put on an ATV station for the 2<sup>nd</sup> Chelsfield Girl Guides station GB4CGG, at their Cudham Camp near Biggin Hill. This was in addition to the usual 2m, 70cm and 2 HF stations. ATV linking was planned to a nearby Guides Group GB4WGV (Bromley & DARC, ATV by Ian G4VTD) at West Wickham for Saturday.

At the camp a small 1255MHz Tonna Yagi was erected on a lightweight 54ft guyed telescopic mast in a very wet and muddy field alongside the hut. The aerial was connected with 80ft of LDF450, which only just reached the shack. In the shack we had an AZTEX GaSFet pre-amp feeding a homebrew Rx and a 14" Colour Video Monitor. For Tx we had only a 20W Tx system with some long patching coax. Video sources were:- 2 CCD cameras, a VCR and a Cropredy Text Card Generator, with a 5" colour preview monitor.

The computer predicted radio path showed the link to West Wickham

group was possible but with not too many dBs to spare. We actually achieved P5 Colour and Sound, half duplex link, once both the beams were accurately aligned and locked fast in the wind. Talk back to the ATV sending end was on 144.75MHz. The only problem was the high ambient noise level from both Guide groups, making the fully quieting sound very noisy!

At one point we had about 30 Guides looking at the pictures, and all of them individually sent greetings to the other group.

Later Saturday evening once the Brownies were asleep, we looked for GB3HV 67km away, and indeed we saw it under slight lift conditions at P3C with some sound. The repeater reported P4 from our signal. The difference being due to a narrow band 1255MHz aerial.

Through the repeater we worked G8LES in Alton Hampshire for a few hours. But 2m sound with 9el beam and 25 Watts failed to get any talk back most of the time.

## ATV at Sandown 96

**By John Stockley G8MNY**

Once again the Home Counties Amateur Television Club has put on an ATV demo on the BATC stand.

This year the setup crew started at 08:00 putting up the 2 by 6 ft display racking, and then the 160' long ceiling cable run of LDF450, UHF TV coax and UR67, to the three outside aerials on the racecourse stand. The aerials pointed to high Wycombe's GB3HV 40 km away, and consisted of a 24 element 23cm Tonna on Rx with its own coax powered converter, a 24 cm version on Tx and a 24 element 70 cm beam. These were set up on 10 ft poles as far apart as possible (about 60') and lashed to the racecourse stand. The vertical polarised 70 cm beam was for the DTMF command system, only 200 mW was needed for this. The aerials gave a good repeater look through at nearly P5, with up to 45 Watts of Tx power, and no local de-sense was detectable.

The display stand had 3 monitors showing GB3HV. Two large screen ones on top of the racking showed the picture, and the recovered teletext. A 14" colour display was frame-rolled to show the actual eight interfield data lines.

Mike G8LES provided a high quality camera for the transmitted pictures. His variable power ATV Tx, demonstrated just how well GB3HV's genlocked vision reprocessor circuit holds on to a weak signal, in full colour lock.

Another 14" colour monitor, provided the walkabout display, Harry G8SBV brought his 24 cms walkabout hat aerial system. The stand had a double figure of flatplate aerials for Rx.

On the BATC table as well as all the books and forms etc, was Tom G3LMX's demonstration of his 3 cms ATV which complimented the display well.

The Home Counties ATV club would like to thank the BATC for providing the Table and Power. The whole stand was very popular this year, and many people wanted to know more about the ATV modes.

**Editorial**

CQTV 173 was late but the Printer turned it around in a week and Paul Marshall packed and posted it in two days, thank you to everyone for your help. This edition closed on the 16 March not the 28th as published, sorry but it needs to be on your door mat in time to invite you to the BATC Rally and give you directions.

CQTV 173 did have one or two minor problems the worst being the top of the diagram on page 57. The complete circuit diagram has been included in the information pack available from Grant Dixon. The video titler which used a programmed 87C055 caused one or two questions, the software is available on the BBS, but as yet I do not have a source of pre-programmed chips, if you can programme them keep me informed.

I am hoping to move to a more electronic production process for the bulk of the magazine, with diagrams being imported to the word processor so that CQTV can be moved down a modem to enable an editorial team rather than a single overloaded individual to do the work. So far EasyPc and DXF files can be imported, CADPAK for Windows is under investigation.

Dave Smith has joined the team as Draughtsman and p54 of CQTV 173 shows an example of his handiwork. Patrick White has taken over production of the front covers and fly-leaves making his debut with CQTV 174.

If possible I would like PCB's as EasyPc files or 1:1 print outs of separate foil pattern and component placement diagrams, with the PCB foil shown from the component side so that it can be photocopied for photo etching. I appreciate that dialo pen users would prefer the view from the other side of the board.

I hope use of the Internet for contributions, correspondence and ads, will help get your copy to us, because where ever you are in the world we are only a local phone call away. I hope also to be able to make available articles from past CQTV's in electronic form (remember the film strips).

I am hoping to cover the PIC micro controller in the next issue with programming and projects for home construction so if any of you out there can help then get in touch with me. **TREVOR BROWN CQ-TV 174 EDITOR**

**([trevor.brown@betwixt.dircon.co.uk](mailto:trevor.brown@betwixt.dircon.co.uk))**

# **RALLY 96**

## **Sunday April 28th**

### **SPORTS CONNEXION**

#### **Coventry**

Doors open at 10.00 (09.30) for disabled  
Entrance £1.00 & 50p for OAP and under 14

All the usual features of BATC Rallies: over 200 trading tables, Bring & Buy, large outdoor flea market, specialist mode television displays, ex-broadcast vehicles, etc.

GB6ATV talk in on S22 and GB3CV (RB9)

Full refreshment facilities available - licensed bar

All enquiries: Mike Wooding G6IQM  
Tel: 01788 890365 Fax: 01788 891883  
Email: [vhf-comm@g6iqm.demon.co.uk](mailto:vhf-comm@g6iqm.demon.co.uk)

## *Editorial*

The Sports Connexion lies approximately 3 miles south of Coventry city centre and is at the junction of the A445 and the A423. It is within easy reach of the M1, M6, M40, M42 and M45. The major road links to and from Coventry and the bypasses around the City make the location very easy to get to.

For those who wish overnight accommodation in the area the nearest hotel/motel is the Coventry Knight Hotel (01203 301585) which is approximately 2 miles from the venue and is located at the junction of the A45 and the A445.

For those who wish to camp or caravan as usual the site at The Bull and Butcher (01203 301400) on the A445 1 mile south of the venue is ideal. The pub does good meals too so book in advance - I shall be there Saturday night so you can buy me a pint!

Coventry Amateur Radio Society will be providing the talk-in station again on S22 and GB3CV using the call sign GB6ATV.

There will be a specialist area in the Banbury Room (adjacent the bar) where displays of working ATV equipment will be staged and also where some of the specialist groups will be found (NBTV Group, etc.). I am hoping that a working link into GB3RT will be in operation - but don't hold your breath, I have tried to get this organised for the past 2 years as well!

Finally, as usual the plea for help. I shall be on site on Saturday from around 1800 setting up the hall and from 0630 on Sunday morning. If anyone can spare an hour or two on either day please come and help. Last year there were only three of us setting out the tables on Saturday afternoon, and this year we have less time available.

I hope to see you *All* there!

73 ... Mike

## Transmitter/Exciter for 13cm

by Jack Geeraerts ON5NM

This project, which I have modified from an original German design, produces 40mW at 2335MHz and is useful as transmitter, or exciter for a small power amplifier. Some SMD components are used - these together with a single-chip PLL, crystal oscillator and two MMIC broad-band amplifiers produce a very stable Tx for the 13cm band.

### Construction

Start by mounting resistor R6 (Fig 2), this will determine the exact place for T1 (keep the wires VERY short, <1mm). The PLL chip SP5070 (see book "Microwave" part 3 page 18.96, next page for the oscillator) divides the final frequency by 256 thus locking T1 to the crystal (4.12109MHz). T1 output is loose-coupled into the PLL chip via a small cap. in series with a resistor. Baseband signals go via the VCO varicap diodes and so via the emitter follower at pin 7 of the PLL. The PLL emitter follower transistor is a 2N2222 but a BC547/548 would also work. The error voltage is buffered by T2, applied to the varicap diode thus locking the oscillator on frequency. Do not use an IC holder for the PLL-soldering direct to the board is a must for this band. The rf output socket can be a bnc or sma, tightened to the tinplate box then soldered all round. Now mount the capacitors and resistors. All wiring must be VERY short; R6 and R7 are for stabilisation, C2 (470pF) ceramic disc without wires decouples the collector. The osc. signal goes from the emitter follower to the MMICs and the wires of the 10R resistors couples to the next stages. The osc. has a maximum frequency of 2.6GHz.

I used two MMICs from Avantek, which provide about 50mW output. The first MMIC is MSA0885, a broadband amplifier with 12dB gain, loose coupled from the oscillator. The voltage with 120R resistor is 4.4v and on the MSA1104 is 7v.

The formula is  $Rc = \frac{Ecc - Ed}{Id}$

Rc = the bias stabilisation resistor

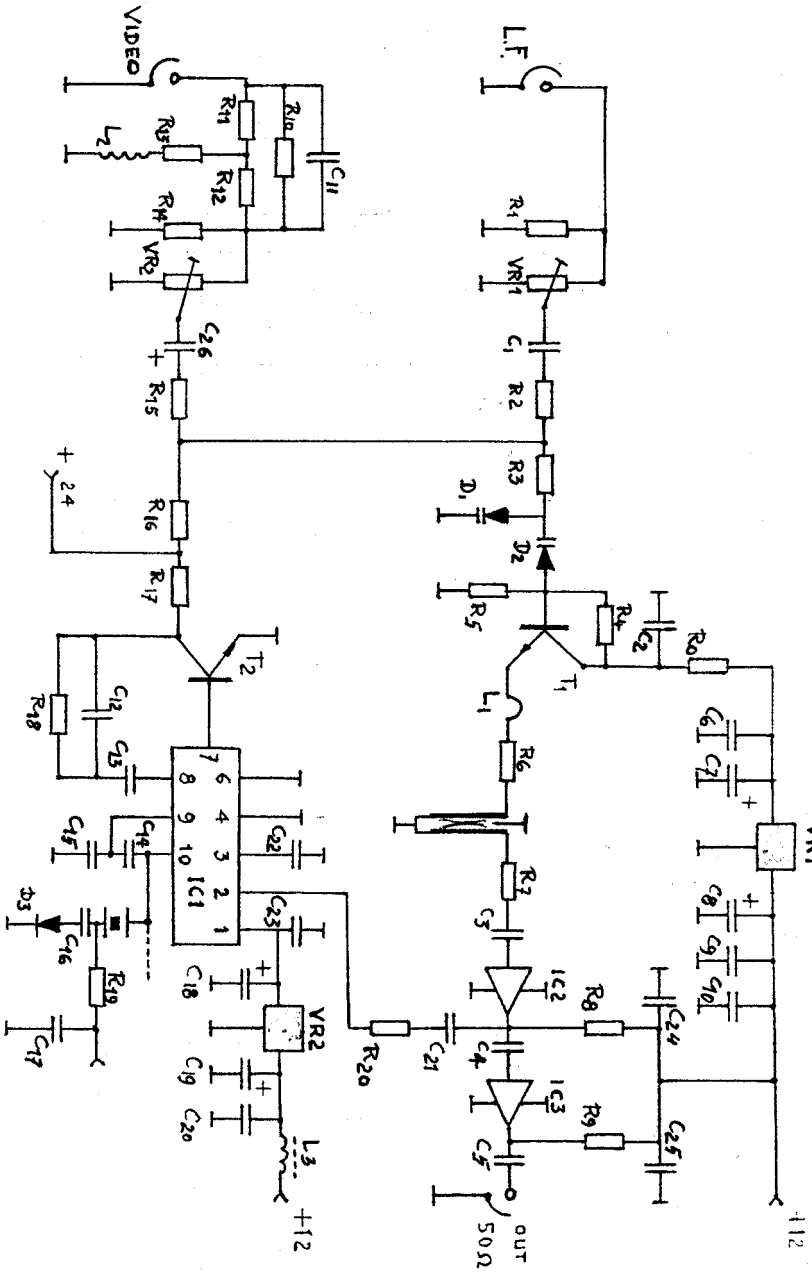
Ecc = power to Rc in volts

Ed = DC input to MMICs

Id = quiescent bias current drawn by the MMICs (in Amps)

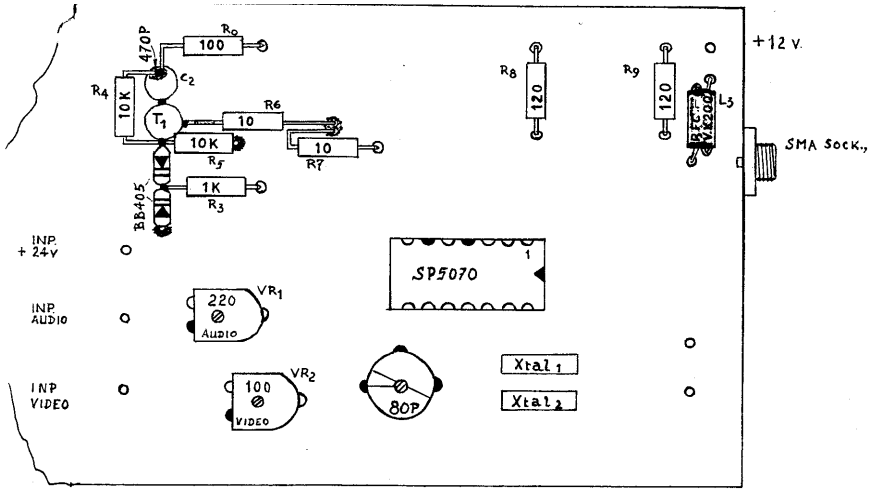
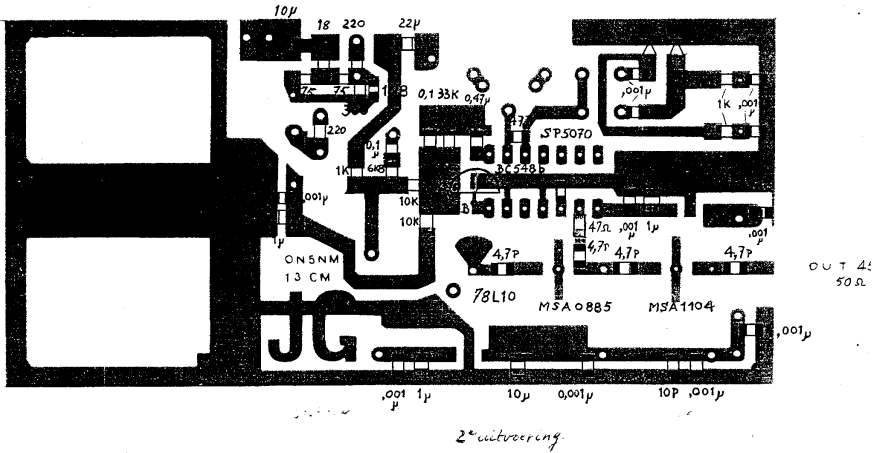
Transmitter/Exciter for 13cm

TX 2.335 GHz





# Transmitter/Exciter for 13cm



Full Copper Side

The dissipation of this resistor is  $P \text{ (diss)} = I_d \times R_c \text{ (W)}$  and a notice for sure that the amplifier may self destruct at high temperature if no bias resistor is used.

The input video (pre-emphasised) and audio are cinch type RCA sockets.

The PCB is 1.6mm epoxy. This works fine for me but 0.8mm would achieve better output matching.

This transmitter has been on test for some weeks and works fine; our repeater in the south of Antwerp has an output on 23cm (1,255MHz) and 13cm input (2,335MHz), all horizontally polarised.

## *Transmitter/Exciter for 13cm*

That's all folks, 'till next time when, maybe a 500mW or 5W power amplifier, who knows....

### **Component List**

Tin plated box 53 x 110 x 30mm

1000pF feedthro' 2

Teflon feedthro' 2

BNC socket with square base or SMA socket

Cinch socket

BFR90 (T1)

2N2222 (BC548) (T2)

IC SP5070

78LO10 (VR1)

78LO5 (VR2)

MMIC MSA0885

MMIC MSA1104

Varicap BB405

Switching diode 1N4148

Xtal(s) of your choice

Trimpot VR1 220R

VR2 100R

Resistors 0.5W, low noise : R0 100R; R4/5 10k; R3 1k; R6/7 10R;

R8/9 120R

All other resistors are SMD type. All other capacitors are SMD type Phillips trimmer 80pF. Capacitor C2 ceramic without wire 220pF.

## Vision Switcher

**By Dave Webb G8VSJ**

Having spent the last year swapping video sources by plugging and unplugging B.N.C. connectors I decided the time was right to build a video switcher.

I started by looking through back issues of CQTV, but although designs for video switchers were to be found, I could not find one that I liked. I remembered that a high performance video switcher was designed as part of the club I<sup>2</sup>C project, but my copy of that project had long ago, been mis-filed (lost). After a phone call to the club for help, a copy of the missing article was kindly mailed to me. It was soon apparent that the I<sup>2</sup>C switcher project was indeed a high spec, and complex project (for me). I wanted something simple and easy to build.

O.K, what do I really need? When I asked myself that question, a specification started to form. It went a bit like this.

- Four video inputs - one output.
- Simple to build.
- Low cost.
- Using easy to find, common components.
- Black level clamp.

I turned to my component collection in an attempt to find a suitable heart to the switcher and finally settled on the CMOS analogue multiplexer/switcher chip type 4051B.

The voltage supply for the 4051B is quoted as from 3 to 15 volts for  $V_{DD}$  so a positive supply of 12 volts was settled on. In my reference book of CMOS devices, the term " $V_{DD}$ " is defined such -  $V_{DD}$  - (Drain Voltage) - The most positive potential on the device.

It may be a good idea to mention the other voltage terms in use with CMOS chips, i.e. -  $V_{SS}$  and  $V_{EE}$ . Well,  $V_{SS}$  is defined as -

$V_{SS}$  - (Source Voltage) - For a device with a single negative power supply, the most negative power supply, used as the reference level for other voltages. Typically ground.

$V_{EE}$  - (Source Voltage) - One of two ( $V_{SS}$  and  $V_{EE}$ ) negative power supplies, the most negative power supply used as a reference for other voltages.

Quite simply, all this means is,  $V_{DD}$  is the term given to the positive supply - in this project, 12 volts.  $V_{SS}$ , is the term used for 0 volts - or ground. It is between these potentials that the digital logic, used to control the analogue switch operates.

## *Vision Switcher*

The analogue signal being switched, can swing between  $V_{DU}$  as a positive limit, and  $E_{VE}$  as a negative limit. The total potential difference of  $V_{DU} - E_{VE}$ , **MUST NOT EXCEED 15 VOLTS**.

In this project  $E_{VE}$  is connected to  $V_{SO}$  (0 volts) and the analogue signal sits on a D.C. level of about 6 volts.

So, how does this very simple circuit work?

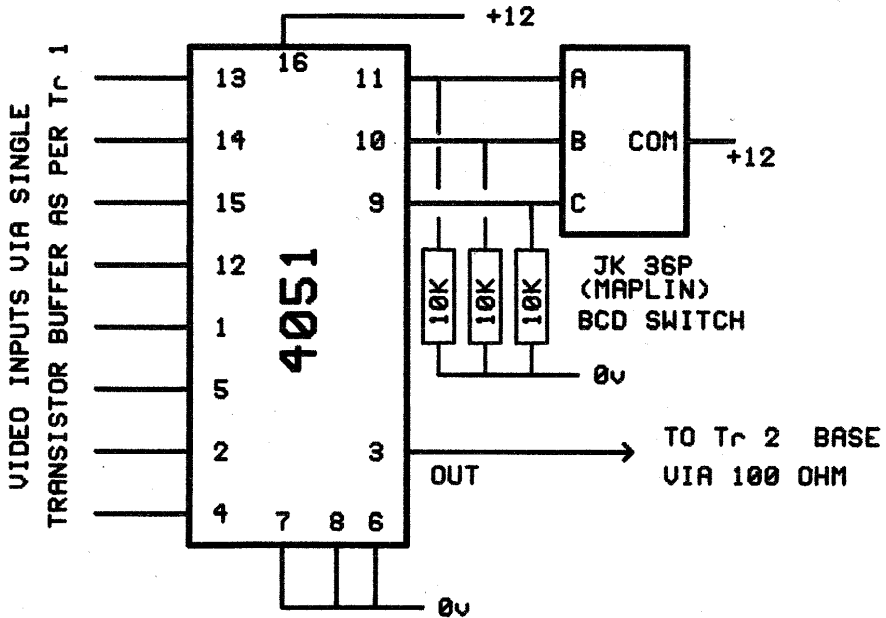
The video signal first encounters a 75 Ohm resistor whose job it is to correctly "terminate" the coax video cable, and prevent reflections (ghosts). An emitter follower (Tr1), biased from a common voltage reference, provides a low impedance drive for the analogue switch which, being a bi-directional device, sits in the D.C. bias path of Tr2.

The job of the black level clamp is to hold the "black level" portion of the video waveform at a pre-determined, D.C. level - regardless of the picture content. To achieve this, the D.C. associated with the video waveform has to be fixed, (clamped,) to the video black level reference - the back porch, and the electronics has to be told exactly when the black level reference part of the signal is present. The use of a LM 1881 sync separator chip greatly simplifies this task by presenting us with a "colour burst gating pulse" on pin 5. As its name implies, its prime function is to provide a timed pulse that can be used to extract the colour burst for use in chroma circuits. The colour burst sits symmetrically on the back porch, or black level reference so, we can use this pulse as a timing source. In practice, I have used a 4098B dual monostable to delay and shorten this pulse to increase the circuit tolerance to non-standard, or distorted syncs.

Tr.2 is a PNP transistor wired as a second emitter follower and driving both the LM 1881 and a capacitor, (C clamp) which forms part of the clamp. D.C. bias for the clamp transistor (Tr 3), is supplied from our reference voltage (V Ref). Every 64 micro seconds, Tr 4 is switched hard on by our reference pulse, which charges C clamp to a fixed voltage thereby setting the D.C. conditions of the output stage.

The output stage has a gain of two and is of a type seen several times in these pages before.

A common voltage reference was chosen in order to avoid any slight jump in D.C. level in the post switch circuit and to make life easier for the black level clamp. It is a simple voltage stabiliser that needs no circuit explanation. It is used to set the D.C. level at the input stages and the black level clamp.



The 4051B, Analogue switch, is in fact an 8 input device, so if anybody wanted to expand the circuit, all it would take is to build additional input stages. It is good practice to connect unused inputs to 0 volts for protection against static build up.

The 4051 has three pins connected as a B.C.D. decoder and are used to select the output channel. I have used a low cost B.C.D. thumbwheel switch (Maplin Catalogue ref JK36P) to generate B.C.D.

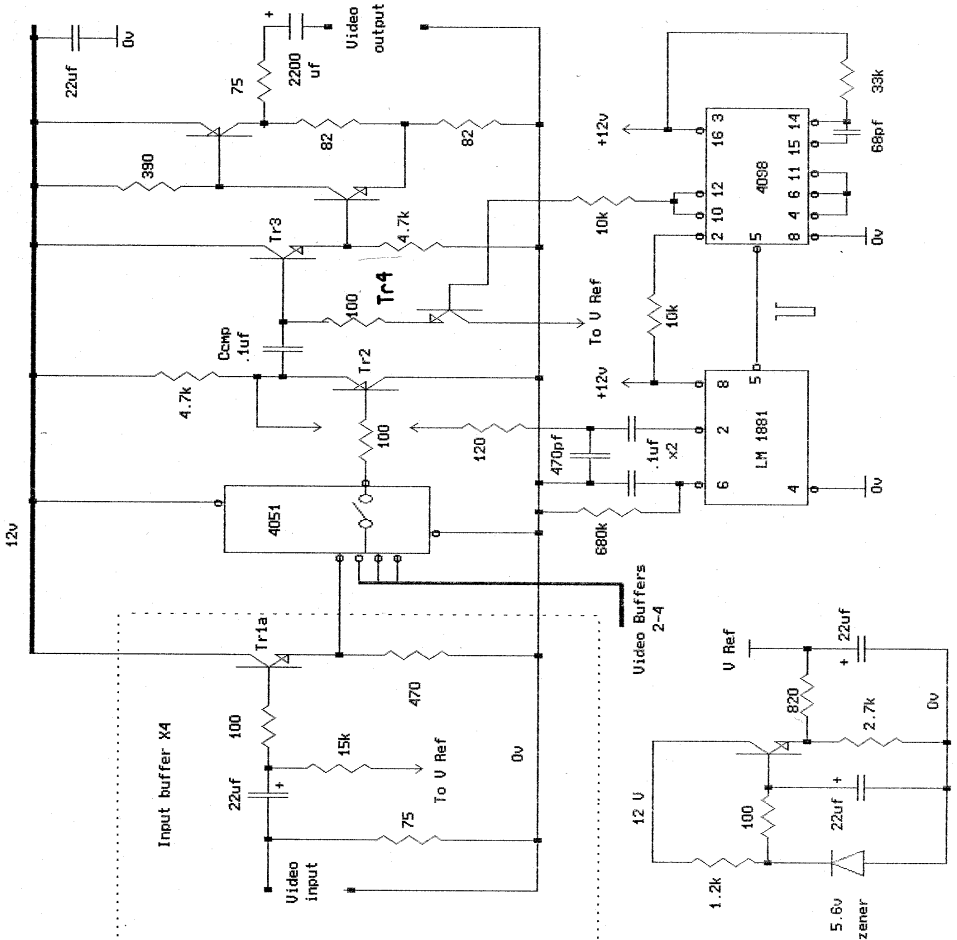
Now, I am sure somebody somewhere is going to say "what's the point of a black level clamp if you are going to A.C. couple the output". The answer is that for my original requirement, the switcher was built with an R.F. modulator connected to the D.C. side of the output stage. I have not included details in this article because the modulator was found in a rally junk box and is of an unknown manufacture.

I make no apology for the simplicity of this article or that you may not agree with my choice of components. The switcher was built for my needs, out of components I happened to have to hand. Construction was found to be non-critical and performance found to be good with no obvious detrimental effect on the displayed picture. The transistors were nothing special BC 548 NPN and BC558 PNP

# Digital Digest - All About MPEG 2

By Paul Holland G3TZO

In CQTV 172 I reproduced some edited excerpts from the Frequently Asked Questions (FAQ) on MPEG 1, available from the World Wide Web. The following edited text originally written by Chad Fogg (E-mail: cfogg@chromatic.com ), also from the WWW, explains some of the differences between MPEG 1 & MPEG 2 as well as describing how



MPEG 2 has been implemented for satellite DTH broadcasting in the US. Although the US Direc TV's Digital Satellite System (DSS) is linked to the current NTSC analogue

standard it is possible to translate the information here to work out how DSS broadcasting will be implemented for European standards.

## **1. Advantages of MPEG-2 over MPEG-1**

MPEG-2 offers little benefit over MPEG-1 for programs which were initially recorded onto film. In fact, nearly all movies and television programs with high production values (budgets) are shot on 24 celluloid frames per second. What MPEG-2 does offer is a more efficient means to code interlaced video signals, such as those which originate from electronic cameras (vacuum tubes or CCDs). The language of MPEG, or syntax, represents the traditional digital samples of video information in the form of more compact tokens, hence achieving compression.

The MPEG-1 syntax was frozen in 1991. At that time, it was intended only for progressive (non-interlaced) video types. MPEG-2 was initiated that same year with the goal of defining a syntax suitable for interlaced video. MPEG-2 video syntax froze in April 1993. Finally in 1995, the three primary documents (Systems, Video, Audio) which comprise the MPEG-2 standard reached International Standard status.

Although MPEG-2 encoders may be primarily geared for interlace video coding, they often possess more mature and powerful coding methods which can be applied to create better MPEG-1 bitstreams. Due to the greater decisions that need to be made, MPEG-2 encoders are typically endowed with at least 50% more computation power with respect to the same sample rate ("resolution").

In any event, MPEG-1 and MPEG-2 can be applied to vast combinations of bitrates and sample rates. White Book video (on standard 650 Mbytes Compact Discs) has created the widespread connotation that MPEG-1 has picture dimensions of only 352 pixels/line \* 240 lines/frame. On Digital Satellite Systems (DSS), both MPEG-1 and MPEG-2 are applied to encode all 480 lines/frame...the convention of North American and Japanese televisions systems (NTSC).

There are no true gray levels between MPEG-1 and MPEG-2, such as "MPEG++", or MPEG 1.5, or MPEG 1.8. There is only MPEG-1 and the defined Profiles and Level combinations of MPEG-2, like the all-time popular Main Profile @ Main Level (MP@ML). These phantom shades were created to help executives understand that the MPEG-1 under consideration is not the same "low-resolution" MPEG associated with 650 Mbytes compact discs.

Since MPEG-2 encoders had not yet reached maturity (read: delayed) when the US DSS service began in Spring 1994, DSS courageously applied MPEG-1 to code interlaced video for its first year of operation.

## **2. Video quality**

Video quality is a function of:

1. source material: how much information (motion and spatial details) is contained within a video sequence.
2. encoder quality: how well the encoder applies MPEG syntax to code a video sequence, and how intelligently it distributes bits over said coded video sequence.
3. bit rate: the higher the bitrate, the higher the quality (as per Rate-Distortion theory).

LaserDisc picture quality encapsulating complex (rapid motion, lots of details) film programming can be approximated at around 4 Mbit/sec. Interlaced LaserDisc video-quality can be achieved transparently around 6 Mbit/sec. Studio quality video would be 8 Mbit/sec.

Many experts agree that the picture quality of a majority of current DSS channels is indeed inferior to the best performance a laserdisc player or a reasonable analogue home satellite receiver system. However, the quality of DSS signals (during at least its first year of operation) exceeded that provided by typical US cable TV. While DSS pay-per-view programming is coded at the lowest bitrate (3M bit/sec) of all programming, it is still capable of rendering more spatial detail and greater colour resolution than standard VHS. The pictures are less noisy, but some artifacts from digital compression may arise.

Comparing compressed digital video to analogue is like comparing apples to oranges, for the multitude of independent factors which contribute to picture quality in the digital and analogue universes are very different. In the analogue world, for example, attributes such as Signal-to-Noise ratio(SNR), bandwidth, time-base accuracy, and frequency response can be used to objectively assess picture quality. In the digital world, the number of variables are far greater, yet bitrate remains the single greatest indicator of quality potential.

## **3. "Resolution" of DSS**

Most DSS video programs are encoded at 544 pixels/line and 480 lines/frame. All 24 or 30 frames/sec are coded. The exact number of coded frames/sec depends on the exact sequence composition of progressive (film) and interlaced frames. The MPEG-2 Main Profile @ Main Level video decoder chips present in DSS receiver boxes are capable of reconstructing pictures of virtually any size, as long as the pixel dimensions are restricted to 720 pixels/line and 576 lines/frame. However, for Display purposes, the pixel dimensions of DSS bitstreams are restricted to a small set of practical, implementation-friendly sizes:

Horizontal: 720, 640, 544, 480, and 352 pixels per line



Vertical: 240 or 480 lines per frame.

The Direc TV DSS uplink facility in Castle Rock, Colorado currently extracts its signals from traditional analogue NTSC satellite C-band feeds, much like cable television head ends having been doing all over the continent since the 1970s. Because the positive lobe of these analogue NTSC signals are bandlimited to roughly 5 MHz, a sample rate of 544 pixels/line is sufficient to capture their full spectrum.

Sampling rate is not a direct measurement of video quality, however. On the other hand it does provide an upper bound to the amount of detail that can be present in the quantized video signal. Equivalent "resolutions" for various media are presented below:

	<b>Line density</b>	<b>Samples/Line</b>
Cable & Broadcast TV	~335	~450
Laserdisc	~425	~560
VHS	~250	~330
MPEG-1 (SIF class)	264 (upper limit)	352
MPEG-2 (MP@ML)	540 (upper limit)	720

Samples/line is derived as  $4/3 * \text{Line density}$ . Line density is the traditional measurement used to rate the resolving ability of TV monitors and storage formats.

[Note: LaserDisc's advertised "resolution" of 425 lines may be a more liberal interpretation of the usual -3 dB frequency response point.]

## **Decoders produce identical video**

From the onset, all DSS decoder boxes manufactured by Thomson and Sony have been fully capable of decoding MPEG-2 video bitstreams. It is the encoders at the uplink facility, for example, which determine whether a bitstream is MPEG-1 or MPEG-2. MPEG compliance implies that any two decoders shall produce numerically identical pictures when fed the same bitstream. Only the lowly Inverse Discrete Cosine Transform (IDCT) stage of the video decompression pipeline is allowed to introduce small statistical variances. These variances should never account for more than an occasional least-significant-bit of discrepancy between any two Decoders. Encoders can significantly reduce bitstream patterns which trigger the most dramatic discrepancies.

MPEG samples have by definition 8 bits of precision. Three colour components comprise each pixel, so it is appropriate to say that MPEG belongs to the familiar 16.7 million simultaneous colour class. The Display Process, which rests outside the conformance scope of MPEG, may introduce additional and far more apparent discrepancies among decoders systems. For example, decoders may employ different methods to convert MPEG's native

## Digital Digest - All About MPEG 2

YCbCr component 4:2:0 video format into the 4:2:2 component format which is the intermediate format proceeding the Y-C (S-video) or Composite NTSC output formats.

If there are any differences in perceived video quality between two boxes, the mostly likely culprit is the NTSC video generator chip, not the MPEG decoder chip. In the future, some MPEG decoder chips may attempt to reduce artifacts through post-processing methods such as block filtering, edge enhancement, etc. However, it should be the responsibility of the Encoder to ensure a balance between video content and bitrate, resulting in artifact-free pictures in all Decoders.

## 5. Bits per program channel

Currently, Direct TV assigns about 3 Mbit/sec towards the video bitstreams of Pay Per View programs. Some sports channels are given 6 Mbit/sec. Most other programs are coded at 4 to 5 bit/sec. The 240 watt/transponder-class DSS bitstream has a payload rate of 30 Mbit/sec. On average, six programs share the bitstream. A typical breakdown would be:

2 pay-per-view movies	@ 4 Mbit/sec
2 variety channels	@ 5 Mbit/sec
2 sports or high priority channels	@ 6 Mbit/sec.
Total 6 programs	@ 30 Mbit/sec.

The MPEG-1 stereo audio bitstream is typically coded at 224 Kbit/sec. Prior to compression, the 2 discrete channels (Left&Right) may be Dolby Pro-Logic encoded to convey surround-sound. This is not the same discrete surround sound offered by Dolby AC-3 or MPEG-2 audio.

## 6. Aspect ratio

MPEG video decoders are capable of reproducing video in a wide variety of aspect ratios, often eliminating the need for letterboxing prior to video compression in the encoder. This makes it possible for the source video to be represented in its native aspect ratio, leaving the decoder box to perform any necessary format conversions for the target display device.

For example, a program coded at 16:9 aspect ratio can be represented anamorphically with 720 pixels/line x 480 lines/frame. For 4:3 displays, the MPEG decoder will perform an internal Pan & Scan operation by extracting 540 pixels/line ( $(4/3)/(16/9) * 720 = 540$ ) followed by a scaling of the 540 pixels via a simple interpolation process to match the display rate of, e.g., 720 or 640 pixels/line.

Thanks to Pan & Scan operations embedded within MPEG decoders and/or display devices, potential vertical detail need not be lost to the black horizontal bars of letterboxing. Video can be coded for the greatest common denominator display (e.g. 16:9),

yet be rendered for a narrower aspect ratios (e.g. 4:3) from the same bitstream with little or no penalty in terms of compression efficiency.

## 7. Frame rate of MPEG

Currently, all legal MPEG-1 or MPEG-2 Main Level video bitstreams must embody 23.976, 24, 25, 29.97, or 30 coded frames per second. MPEG decoders have a built-in frame store which makes it possible for the decoder to perform 3:2 pulldown itself, relieving the encoder from having to include redundant fields or frames in the bitstream. For example, a progressive video bitstream coded at 24 frames/sec will be mapped by the Decoder to the constant interlaced 30 frame/sec Display Rate via the (on average) replication of every 4th coded field. ( $5/4 * 24 \text{ frames/sec} = 30 \text{ frames/sec}$ ).

During limited motion sequences, an unfledged Encoder (located at the uplink facility) may occasionally confuse a frame or field as being a redundant picture created from the 3:2 pulldown process. A decoder chip is, on the other hand, deterministic: it does what the bitstream tells it to do. Encoders attempt to identify and eliminate redundant fields synthesised by the 3:2 pulldown telecine process in order to improve coding efficiency. For refreshers, 3:2 pulldown creates an extra 6 frames/sec to pad out the 24 frames/sec rate of film to the 30 frames/sec rate of TV.

## 8. Phases of video

The digital video delivery pipeline consists of three distinct phases.

### Phase 1: Source video format

By convention, source video, regardless of picture content, will originate from tape or analogue satellite feed in an interlaced format. Redundant fields or frames may be present (3:2 pulldown).

*Example: a D-2 video tape contains a film program with 24 progressive frames/sec of inherent material. However, the D-2 tape can only record video in the 60 fields/sec format, and the signal is composite.*

### Phase 2: Coded video format

The MPEG encoder must translate the source video into the "normative" MPEG Decoder format, namely 4:2:0 YCbCr component pictures. The coded frame rate may be different from the Source and/or Display rate.

*Example: the encoder eliminates redundant fields, de-interlaces each frame, producing a 24 frame/sec sequence, whilst the composite video signal is converted to the 4:2:0 YCbCr*

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component signal. The newly converted video signal is then compressed into a bitstream, and then decoded by downstream Decoders in people's homes.

### Phase 3: Display video format

The 4:2:0 YCbCr MPEG decoder format is converted into a format acceptable by VCR and TVs.

**Example:** the decoder repeats fields and frames (3:2 pulldown) and de-interlaces each frame picture to form a 60 field/sec video signal. At the same time, colour space conversion maps the 4:2:0 YCbCr signal into the Y/C component or NTSC composite interchange format.

60 fields/sec    24 frames/sec    60 fields/sec

Composite    4:2:0 YCbCr    NTSC

[VCR] -----> [Encoder] ----->[Decoder]----->[TV] (bitstream)

## **9. Interpolated frames**

All 24 or 30 frames/sec are coded in legal MPEG bitstreams. None are skipped or interpolated. Frame interpolation is one of several methods MPEG can use in combination with other compression methods to exploit redundancy in video sequences. However, MPEG's "interpolation" process can be accompanied by "interpolation error" information which will fill in the gap between the interpolated information and the original picture.

MPEG frames are not homogeneous. They are broken into non-overlapping 16x16 pixel regions known as "Macroblocks". Each macroblock can be arbitrarily coded from scratch or can be predicted from 16x16 regions extracted from one or two reference pictures previously decoded and stored in the Decoder's frame buffer. As the example described above, macroblocks which employ temporal prediction can add refinement detail (prediction error). Refinement information may propagate into future frames, reinforcing the strength of the video signal.

## **10. Statistical multiplexing**

Statistical multiplexing allows video programs multiplexed onto a common data carrier to share bandwidth. For example, when a scene change occurs in one sequence, it is assigned a high instantaneous bit allocation priority. A scene in another program at the same time with limited motion would be assigned a lesser priority.

The coding gain of statistical multiplexing is, by nature, statistical. If all the video programs of a common carrier exhibit a thirst for bits at nearly the same time, then statistical multiplexing would be of little benefit. For typical scenarios, research groups have reported gains between 1 and 2 dB (10 to 30 percent).

The Digital Video Disc (DVD) format lead by Toshiba and Sony achieves a more predictable form of statistical multiplexing. Since the sustained data delivery rate of this new high density Compact Disc itself can be controlled within a range of 1-10 Mbit/sec, the bit allocation can be spread, or normalised, over the entire program length (e.g. 135 minutes for a movie). The video stream may have an average coded rate of only 5 Mbit/sec, but it can for a necessary time, sustain 8 Mbit/sec during more difficult scenes. Naturally, the encoder must pre-analyse (via look-ahead/forward analysis) the frames which correspond to the time period in which the bitrate is to be averaged over.

## **and There's More !!**

In the next edition of CQ-TV we continue with more MPEG2 information covering;

- **Composite vs. component**
- **Artefacts**
- **Deriving channel count**
- **Macrovision chip**
- **Number of satellites**
- **DSS and standards**
- **DigiCipher II vs. MPEG-2**
- **Components of a DSS decoder system**
- **Bitstream breakdown**
- **Measuring bitrate**

### **BATC on the Internet**

The Internet address is ...

**<http://ourworld.compuserve.com/homepages/ipawson/>**

You may gather from the address, the pages are being edited by our very own Publications Officer, Ian Pawson.

It is experimental at the moment, we have information on publications, sales items, who to contact, general information about the Club and latest news.

Ian would be pleased to hear any comments about the pages, you can E-mail him via a link from the BATC's homepage.

## **A Television Sync Pulse Generator**

**By Peter Delaney**

The heart of any television system is the sync pulse generator (spg), which generates the various timing pulses and the reference subcarrier for colour signals. There are several designs available for full broadcast specification systems, but these cannot be justified for the smaller studio or amateur station. Existing BATC designs have been based around the Ferranti ZNA134 or the Philips SAA1043/SAA1044 devices. The former enables a genlock to be implemented fairly easily, whilst the latter offers easy subcarrier to line lock. Although the added facilities could be incorporated, this greater complexity invariably required much more board space, power consumption and cost. The objective for this new design was to offer both facilities - i.e. full colour genlock in the presence of a valid video signal, or subcarrier to line lock otherwise. To facilitate operation away from mains supplies, it was also considered desirable to use only a single supply rail of less than 12 volts (for regulation from vehicle batteries) - a +5 volt rail is used here.

The basic spg is built around the Philips SAA1101 device, which provides CMOS level inverted outputs for the six standard pulses and subcarrier. It can be programmed to several TV standards, PAL and NTSC being catered for here, and to work in several locking modes. The dividers are programmed to a 5MHz clock, to match the tuned circuit based around L11 and the BB409 varicap diode. The 6 identical pulse output stages each invert the signal, then buffer the signal to the low impedance cable (75R). A filter is included to limit the risetimes of the pulses, and a T attenuator serves to terminate the filter and match to the cable, so that the standard 2V pulses appear across a 75R cable termination.

The subcarrier output is first passed through an appropriate bandpass filter, then two common emitter stages of amplification, to preserve the correct phase of signal, and a buffer to give 1V of subcarrier across the standard 75R load. For operation in stand alone mode, fit the \*d components (Y2, R86, C32 and C40) at pins 1 and 2 of the SAA1101. Links should be added to tie the SAA1101 pins 10,11,13 to ground in this version - the unused holes for the collectors of Q17 and Q18 and R95 provide convenient points. The following components are not required for this version:-

IC1, IC2, IC4, Q17, Q18, Q19, DL1, L8, L10, L12, Y1, RV1, RV2, RV3, D2, D3.

R's 49, 50 - 56, 59 - 62, 66, 69 - 71, 74 - 78, 80 - 82, 85, 88, 89, 91 - 95

C's 22 - 31, 34, 35, 38, 39, 41, 43 - 46, 49, 52, 59, 60

However, one of the principal objectives was to create a full colour genlock capability. Simple or low cost studios cannot afford the exceptionally stable master oscillators such as

## *A Television Sync Pulse Generator*

used by the broadcast stations. By locking the local spg to a stable source such as this, however, a cost effective stable source can be attained (many tv receivers, and all current VHS recorders, for example, include a suitable baseband video output of 1V p-p across 75R, in the absence of a dedicated source). The extraction of the appropriate reference signals may appear straightforward, using a standard television receiver decoder integrated circuit. These, however, do not provide access to the internally regenerated burst gate, PAL line ident or subcarrier - the latter may be available, but blanked during line and frame blanking time, and hence not suitable for this application. The Sony CXA1228S, however, does provide all the required signals mentioned above - moreover, it works on a +5 volt supply.

The incoming video passes through DL1 and L8 to provide separate luminance and chrominance inputs to the device, programmed to work in PAL mode. TTL sync pulses appear at pin 2, and are inverted to pass to pin 11 of the SAA1101. Burst gate appears at pin 3 of the CXA1228S. This is fed to an NE567 tone detector, set to switch pin 8 low in the presence of a line rate signal. This signal is used, inverted, to change the lock mode of the SAA1101 from subcarrier to external video when a valid signal is detected. It is also used to switch the subcarrier oscillator of the CXA1228S into free run mode when a valid video signal is not detected. The continuous subcarrier from pin 14 of the CXA1228S is amplified and inverted by a single transistor stage, and fed to the SAA1101 pin 1 - the output at pin 2 is inverted, so restoring the correct sense. The PAL line ident may appear in either the correct phase or antiphase. A correction pulse is therefore derived from the CXA1228S pin 7 and the inverted line ident signal at pin 15 of the SAA1101 - if these coincide, a short pulse (local burst gate) is passed to the SAA1101 (pin 13) to reset the sequence. This operation, and production of a pulse of correct sense, is carried out by IC2. IC2b inverting the white measurement pulse that occurs midway along a line. IC2a then gates this with the inverted internal line ident, so that the WMP pulses only occur during the 'low' part of ident.

This signal is inverted by IC2c, and IC2d gates the result with external line ident. As with gate b, this only outputs a pulse during its 'low' time. As the internal signal is inverted ident, an output is only generated when the 2 line ident signals are out of phase. As the wmp pulse 'samples' the ident signals mid-line, slight phase differences of the two ident signals do not create false reset pulses.

Normally this pulse will occur only once at switch on, as once the correct sequence is established no further resets are needed. If no video is present at the CXA1228S input, the diode gate inhibits the reset pulses, and holds the SI pin (13) of the SAA1101 in the required low state. For operation in genlock mode, do NOT fit the \*'d components (Y2, R86, C32 and C40) at pins 1 and 2 of the SAA1101.

For operation on NTSC standards, the following should be changed:-

The crystal, L8, L9 and DL1 should be the equivalent 3.58MHz components.



L8 is TH314 BSJS 3253, L9 is H286 BAIS 5053 DCD and DL1 is TG314 ENKS 3255.

C16 is changed to 82p.

SAA1101 pins 13, 25 and 27 connect to OV, and pin 26 connects to +5V.

CXA1228S pins 19 and 20 connect to 0V, and pin 21 connects to +5V.

The components at CXA1228S pins 9 and 20, may be omitted, and IC2 and associated diodes should also be left out.

Construction is on a double sided through hole plated printed circuit board, that will be available from Members Services. To build an NTSC version, the track between SAA1101 pins 27 and 28 needs to be cut, and the ground plane cleared around pin 26, before making the links as above. The CXA1228S is a 'skinny DIP' package, and so care is needed when soldering to these pads. For those who require a socket at this point, Maplin can supply a 30 pin version (JM97F) from which the end can be carefully cut off, removing pins 15 and 16. Sources of special components are as follows:-

The Toko inductors, filters and delay line can all be obtained from Bonex Ltd, Elder Way, Langley, Slough, Berks.

The SAA1101 is available from Grandata Ltd, KP House, Unit 15, Pop in Commercial Centre, Southway, Wembley, Middlesex HA9 0HB, or Gothic Crellon Ltd, 3 The Business Centre, Molly Millars Lane, Wokingham, Berkshire.

The CXA1228S is a stock item from RS Components/Electromail.(Stock no. 170-418), from whom the miniature multi turn preset resistors were also obtained .(Stock no.s 187-191 and 187-220)

Alignment is straight forward, and requires the use of an oscilloscope, and a frequency counter if available. Terminate each output with a 75R resistor. The power supply needed is 5V, about 275 mA being drawn by the full board.

Adjust L11 to give a clock pulse frequency of 5MHz for 625 lines (for 525 lines, 5.034964MHz) at SAA1101 pin 6. If a frequency counter is not available, set the horizontal drive output onto one trace of the oscilloscope, with the other trace, and timebase, driven from a stable sync pulse source, such as the broadcast signal at a video recorder video out socket. Adjust L11 for the minimum possible drift between the two traces. Confirm that the various pulse outputs appear correctly as 2V p-p pulses.

For the non genlocking version, adjust C32 for a 4.433 MHz PAL (for NTSC 3.58MHz) subcarrier output at SAA1101 pin 2. Monitor the subcarrier output, and confirm the 1V p-p signal.

For the genlocking version, adjust RV3 for a 4.433 MHz PAL (for NTSC 3.58MHz) subcarrier output at SAA1101 pin 2. If a signal generator is not available, set mixed sync

## *A Television Sync Pulse Generator*

pulses on one trace of oscilloscope, and the external video signal to the other trace, but not to the spg board, and adjust RV3 for minimal drift between the two traces. Monitor the subcarrier output, and confirm the 1V p-p output signal. Connect the video signal to the video in (the 75R termination is on board as R56), and display this on one channel of the oscilloscope. Adjust RV2 so that the burst gate pulse at the CXA1228S pin 3 starts 5.6 uS after the start of the incoming video line sync pulse. Monitor TP1 at R53, and adjust RV1 for a frequency of 15.625kHz for a 625 line input signal (15.734 kHz for 525 line systems). Monitor pin 8 of the NE567, and check it is so 'low', but that on removing the incoming video it goes 'high'. A final slight adjustment to L11 with a genlocked source enables the outgoing composite sync to be aligned to the phase of the incoming line sync pulses.

**NOTE** - if the oscilloscope is triggered by vertical drive, and line rate signals, such as sync pulses, displayed on one trace, and incoming video on the other, there appears to be a half line difference between the input and output. This is not an spg error, but a feature of the oscilloscope. At slower speeds it displays first trace A after the first trigger point, and then trace B after the next trigger pulse. Trace A therefore shows the odd fields, and trace B the even fields, which are, correctly, with a half line displacement - as can be seen by feeding the same signal to both traces when triggered in this mode.

For NTSC systems, the voltage at the CXA1228S pin 10 can be made variable between 1.8V and 2.2V, to act as a hue control. The edge connector pins X, Y, and Z provide the Y, B-Y and R-Y signals derived from the incoming video signal, which are not used in this application, but may have other uses in the system. (As a line delay line is not incorporated between the CXA1228 pins 19, 20 and 21, this is not available to PAL systems).

The SAA1101 and CXA1228S together make a cost effective way of producing a genlockable spg, including full subcarrier to line lock (with 25Hz offset in the case of PAL), all on a single 100mm x 160mm Eurocard using conventional components. In the absence of an incoming video signal, the full board will switch to a stand alone mode with subcarrier to line lock.

Thanks are due to Bob Robson for taking my circuit diagram and PCB layout and creating neat and professional drawings. A through hole plated PCB will be available shortly (item 7 from Members Services).

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## **Parts List**

<b>Qty</b>	<b>Package</b>	<b>Value</b>	<b>Components</b>
4	TANT0.2	10U	C1,C33,C47,C9
12	C0.2	47P	C10,C11,C12,C13,C14,C15,C3,C4,

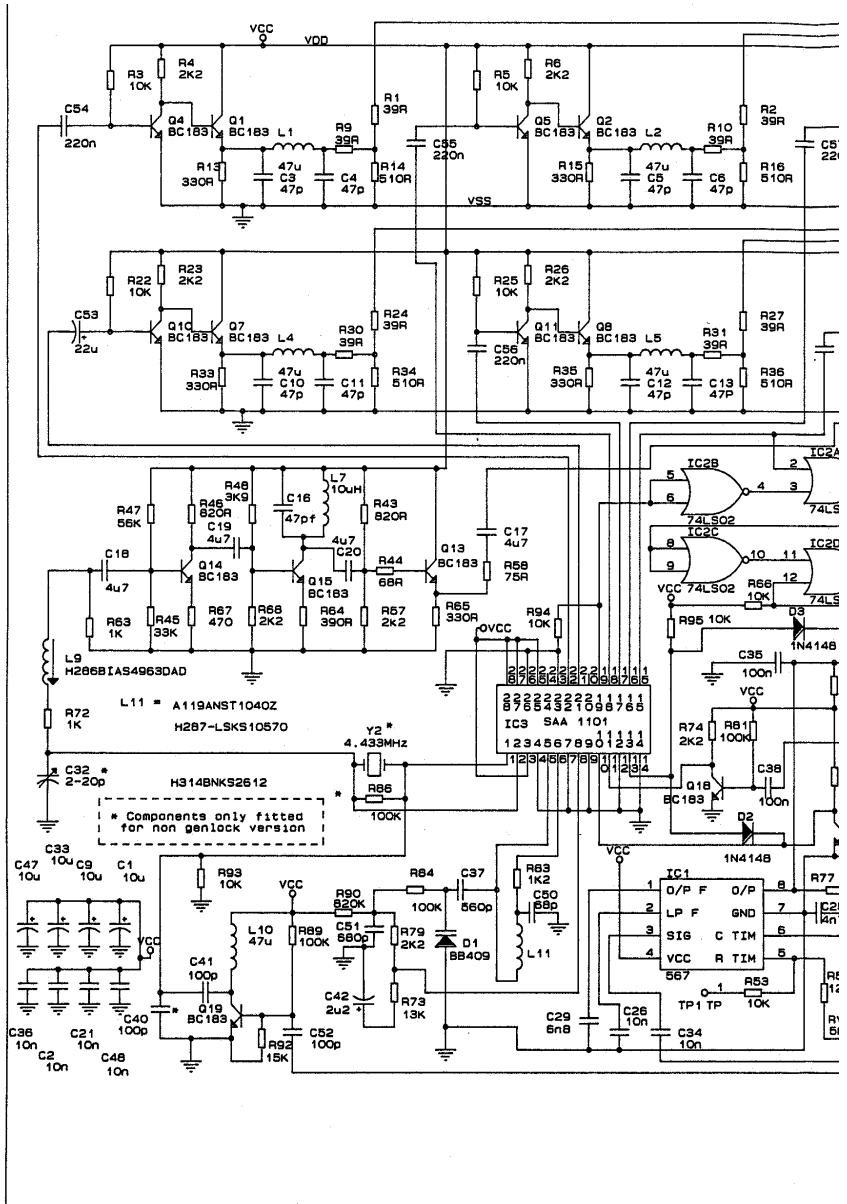
*A Television Sync Pulse Generator*

			C5,C6,C7,C8
1	CAP 0.1	47PF	C16
5	TANT0.2	4U7	C17,C18,C19,C20,C43
7	C0.2	10N	C2,C21,C24,C28,C36,C46,C48
1	TANT0.2	22U	C22
1	C0.2	82P	C23
1	C0.2	4N7	C25
1	MONBLOCK 0.2	1u	C26
2	MONBLOCK 0.2	47N	C27,C30
4	TANT0.2	2u2	C29,C53,C55,C56
1	MONBLOCK 0.2	U47	C31
1	CAP VAR	2-20P	C32
2	C0.2	100n	C34,C60
1	MONBLOCK 0.2	100N	C35
1	C0.2	560P	C37
1	C0.2	100N	C38
2	C0.2	22P	C39,C49
3	C0.2	100P	C40,C41,C52
1	TANT0.2	2U2	C42
1	C0.2	1U	C44
1	MONBLOCK 0.2	330N	C45
1	C0.2	68P	C50
1	C0.2	680P	C51
3	C0.4	220n	C54,C57,C58
1	C0.2	1n2	C59
1	AB_EURO	AB_EURO	CON1
1	D0.3AN/CK	BB409	D1
2	D0.3AN/CK	1N4148	D2,D3
1	DUAL TOKO FL	H287-LSKS10570	DL1
1	DIP8	567	IC1
1	DIP14	74LS02	IC2
1	DIP28	SAA 1101	IC3
1	SDIP28	CXA 1228 S	IC4
7	AXIAL0.5	47U	L1,L10,L2,L3,L4,L5,L6
1	7P VAR IND	A119ANST1040Z	L11
1	TOKO 10RB	82mH	L12
1	AXIAL0.5	10UH	L7
1	5VFW FILTER2	H314BNKS2612	L8
1	5VUS FILTER	H286BAIS4963DAD	L9
19	TO92N	BC183	Q1,Q10,Q11,Q12,Q13,Q14,Q15, Q16,Q17,Q18,Q19,Q2,Q3,Q4,Q5,

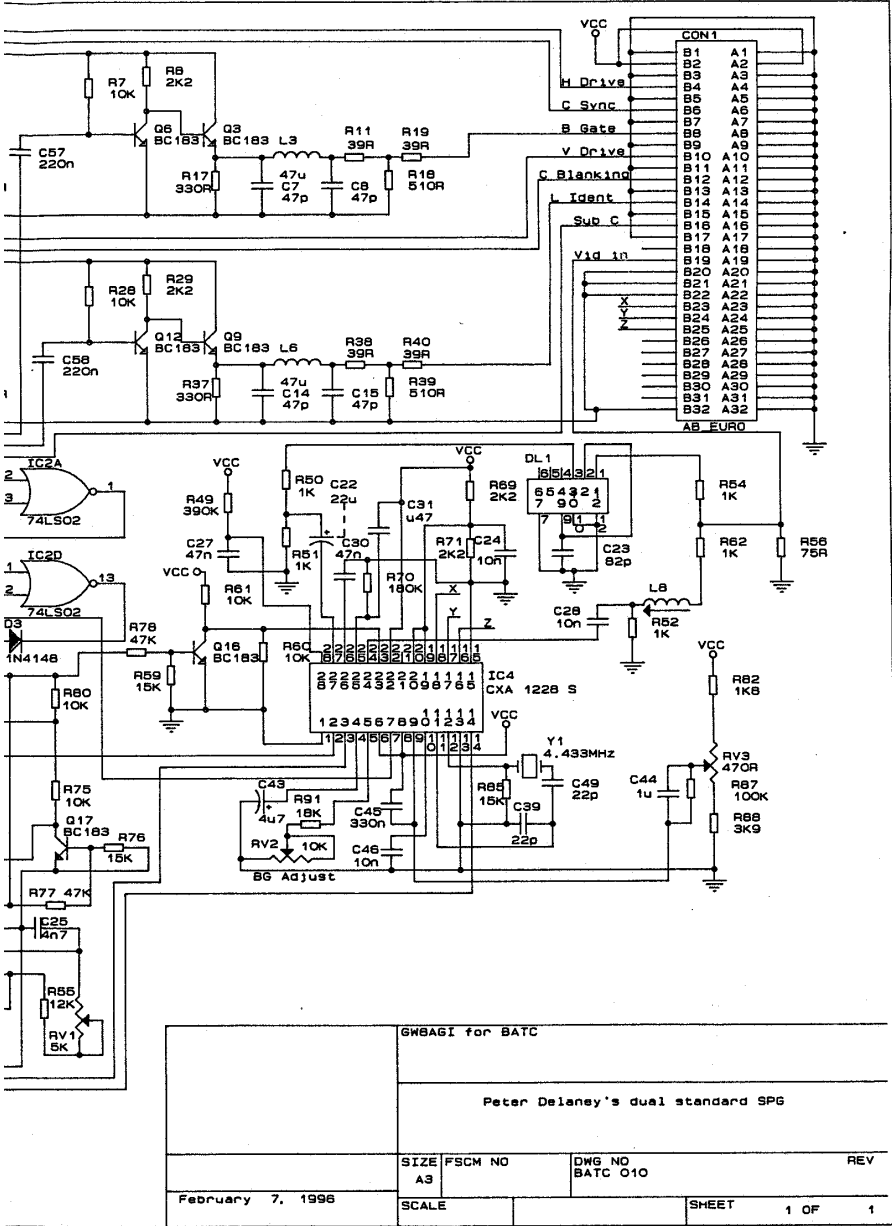
## A Television Sync Pulse Generator

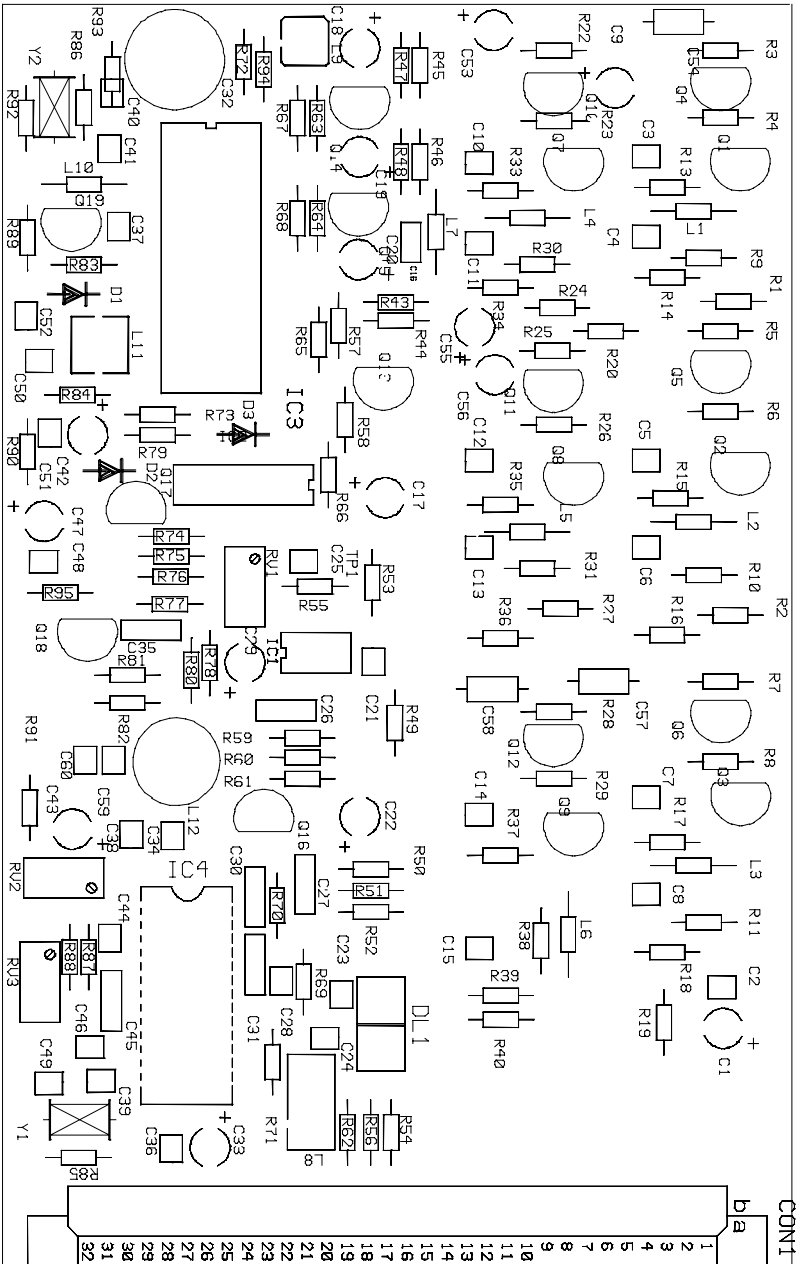
			Q6,Q7,Q8,Q9
12	AXIAL0.4	39R	R1,R10,R11,R19,R2,R24,R27,R30, R31,R38,R40,R9
7	AXIAL0.4	330R	R13,R15,R17,R33,R35,R37,R65
6	AXIAL0.4	510R	R14,R16,R18,R34,R36,R39
1	AXIAL0.4	10R	R20
13	AXIAL0.4	2K2	R23,R26,R29,R4,R57,R6,R68,R69, R71,R73,R74,R79,R8
2	AXIAL0.4	820R	R43,R46
1	AXIAL0.4	68R	R44
1	AXIAL0.4	33K	R45
1	AXIAL0.4	56K	R47
2	AXIAL0.4	3K9	R48,R88
1	AXIAL0.4	390K	R49
7	AXIAL0.4	1K	R50,R51,R52,R54,R62,R63,R72
15	AXIAL0.4	10K	R53,R60,R61,R66,R75,R80,R93, R94,R95 R22,R25,R28,R3,R5,R7
2	AXIAL0.4	75R	R56,R58
4	AXIAL0.4	15K	R59,R76,R85,R92
1	AXIAL0.4	390R	R64
1	AXIAL0.4	470	R67
1	AXIAL0.4	180K	R70
2	AXIAL0.4	47K	R77,R78
5	AXIAL0.4	100K	R81,R84,R86,R87,R89
1	AXIAL0.4	1K8	R82
1	AXIAL0.4	1K2	R83
1	AXIAL0.4	820K	R90
1	AXIAL0.4	12K	R55
1	AXIAL0.4	18K	R91
1	TRIMPOTA	5K	RV1
1	TRIMPOTA	10K	RV2
1	TRIMPOTA	470R	RV3
1	TP_N	TP	TP1
2	XTAL0.4	4.433MHZ	Y1,Y2

# A Television Sync Pulse Generator



# A Television Sync Pulse Generator





Component overlay

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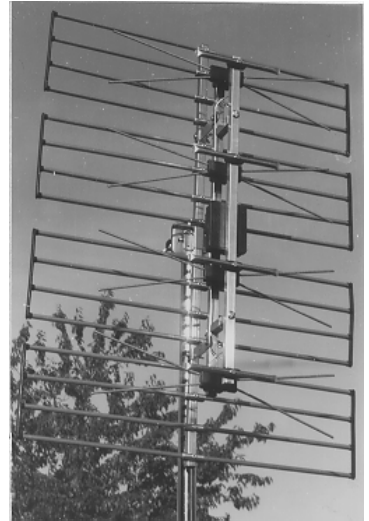
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The JJB/4 GRID is a special type of aerial consisting of FOUR STACKED DIPOLE assemblies which can provide improved results over a conventional 'Yagi' TV aerial. In some difficult reception areas where local signals are scattered and arrive at slightly different heights (with ghosting, signal imbalance, etc) the use of a grid can improve results,

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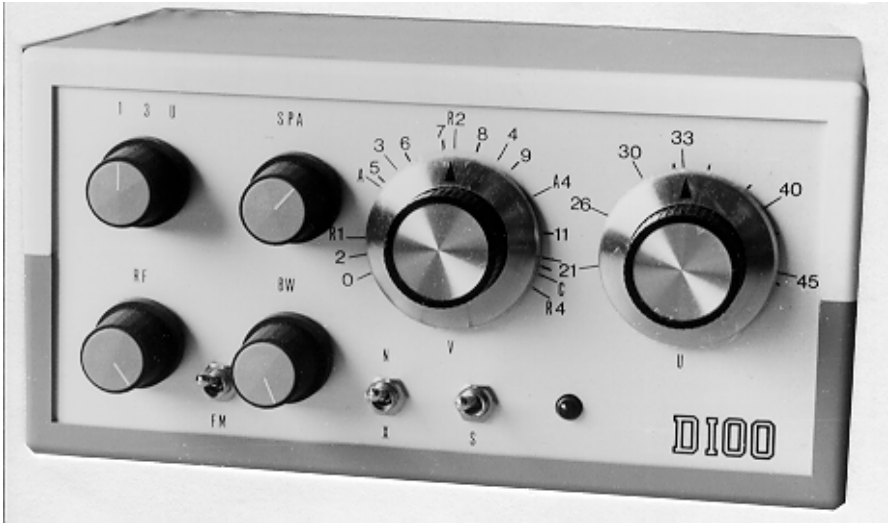
The JJB/4 is ruggedly constructed and features a 16-element reflector (not a mesh as found on other makes) providing excellent front-to-back ratio characteristics,



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## Satellite TV News

**By Paul Holland G3TZO**

This issue of Satellite TV news is a little earlier than usual to meet the need to get CQTV to you before the BATC Rally. Despite the early deadline there is still plenty to report on. Almost as one channel or satellite fades away a crop of new and usually digital replacements arrive. Once again this month we reflect the rush to digital transmissions and what the satellite operators are doing to meet the ever increasing demand for Satellite TV capacity.

### Launch News

As you will probably know Intelsat 708 failed to get into orbit aboard its Chinese Long March 3B rocket (or should it be short March now? ) earlier in the year. This was the 6th out of 40 launches which have failed for the Chinese launcher and may throw into question its continued use by Western satellite operators.

The launch schedule for this year now looks like this.

Launch Date	Satellite	Launch Vehicle	Position
March	Astra 1F	Russian Proton	19.0 Deg E
March	Intelsat 707	Ariane 44LP	50.0 Deg W
May	AMOS 1	Ariane 44L	4.0 Deg W
July	Turksat 1C	Ariane 44LP	31.0 Deg E
July	Arabsat 2A	Ariane 44LP	30.5 Deg E
December	Intelsat 803	Ariane 44P	64.0 Deg E

### New Satellites

More information has been given on the planned Hungarian satellite called CERES (Central European Regional Satellite) which is now planning to launch in 1998. Owned by Magyarosat, Antenna Hungary and Israeli Aircraft the satellite will be based on the same design as the Israeli AMOS 1 satellite which will carry 8 Ku band transponders.

Providing capacity for up to 16 analogue TV channels CERES will probably operate from either 1.5 Deg E or 4.0 Deg W (co-located with Amos 1) with spot beams covering the Middle East and Central/Eastern Europe.

An Egyptian satellite to be called Nilesat will be launched towards the end of next year aboard an Ariane 4 rocket. The high powered Nilesat will carry 12 transponders utilising 100 watt TWTA's and will be capable of carrying up to 56 digitally multiplexed TV channels. The footprint will extend from Morocco to the Arabian Gulf states.

## **New Channels**

The Danish TV1+ Channel is set to launch in early October however no details of which satellite will carry the service have yet been announced.

With the launch of Hot Bird 2 later this year the Italian State Broadcaster RAI will start its own digital multiplex service. The channel line-up will include RAI Gold, a 24 hr music channel, a news channel plus a channel for Italians living in the rest of Europe.

## **Intelsat News**

The increasing lack of orbital positions for satellites has caused Intelsat to move from 3 to 2 degree spacing as part of their long term planning. This is particularly acute over the Indian & Pacific Ocean regions although we can expect a similar strategy to be adopted in the Atlantic Ocean Region. An example of movements which will take place to allow new satellites to slot in is shown below;

Satellite	Current Deployment	Future Location (early 1997)
Intelsat 604	60.0 Deg E	60.0 Deg E
Intelsat 602	63.0 Deg E	62.0 Deg E
Intelsat 803	Launching Dec '96	64.0 Deg E
Intelsat 704	66.0 Deg E	66.0 Deg E

## **Transponder News**

### **Turksat 1B 42.0 Deg E**

New Turkish channel Samanyolu TV is now operating from Tp 7, 11.091 GHz (V) using the Turkish beam. Canal D has started a "Euro D" service on the European beam at

## *Satellite TV News*

11.181 GHz (H). Following the planned launch of Turksat 1C in June it is intended that all services will be transferred from IB to 1C with Turksat 1C then being reserved for telecommunications services.

### **DFS-3 Kopernikus 23.5 Deg E**

The German Reise und Wetter TV service (Travel & Weather TV) has commenced operation on 11.675 GHz (H) in clear PAL.

### **Astra's 1A, 1B 19.0 Deg E**

Predictions about the close of the three D2Mac TV3 services (Tp's 3,27 &31) still persist. They say there is no smoke without fire - Summer is the latest rumour!

### **Astra 1C 19.0 Deg E**

Galavision is to close on Tp 44 11.125 GHz (V) . This will leave the only clear PAL feed available on PanAmSat at 45.0 Deg W, 11.515 GHz (H).

### **Astra 1D 19.0 Deg E**

The Dutch SBS6 channel is to close its analogue service on Tp 53, 10.773 GHz (H) with the launch of its MPEG 2 service on Astra 1E (see below). SBS 6 will be replaced with the Racing Channel which will move from its current timeshare with Sky Movies Gold on Tp 60.

### **Astra 1E 19.2 Deg E**

A surprise addition to Astra on 1st March was the launch in D2Mac Eurocrypt (soft encryption) of FilmNet's Super Sport Channel on Astra 1E Tp 65, 11.720 GHz (H)- audio is in Swedish, Norwegian, Danish and Finnish. Both Tp 65 and Tp 66, 11.739 GHz (V) fall within the tuning range of most receivers and provide some additional capacity to expand analogue services prior to the expected growth of digital transmissions.

The first digital multiplex service from ASTRA could start this month by the Dutch Nethold Company. Nethold, owner of FilmNet, plans to include MTV Europe, Discovery, SBS6 in the basic package with FilmNet's 1 & 2, Supersport and Hallmark Entertainment TV in the premium package. The services will operate from Tp 73 (11875.5 Mhz H), Tp 77 (11953.5 Mhz H) and Tp 80 (12012.0 Mhz V).

### **Eutelsat's II F1 13.0 Deg E**

The French Broadcaster AB SAT has taken Tp 34, formerly Polonia 1's Tp, for its planned digital multiplex service. This 72 Mhz Transponder can support up to 16 channels. Eurotica operating in the lower half of this Tp may well have to move when the service becomes operational.

France Television, the state owned broadcaster, should by now have launched its own digital multiplex service on Eutelsat II F1 on Tp 46 12.584 GHz (V). The mix of services to be broadcast in unencrypted MPEG 2 will include TF1, France 2, France 3, France Supervision, ARTE, M6, TMC, Euronews (French only) and possibly La Cinquieme. Additional channels, including some subscription services, will be added later in the year.

RTL 2 on Tp 21U 11.095 GHz (H) is converting to a digital MPEG 2 feed.

### **Eutelsat II F6 (Hot Bird 1) 13.0 Deg E**

The continued use of Hot Bird 1 Tp's 14 and 16 by Polonia 1 and RAI TRE respectively is unsure after August this year. Both transponders are then on a rolling 1 month lease and could revert back to their primary owner CLT for other services.

### **Eutelsat II F2 10.0 Deg E**

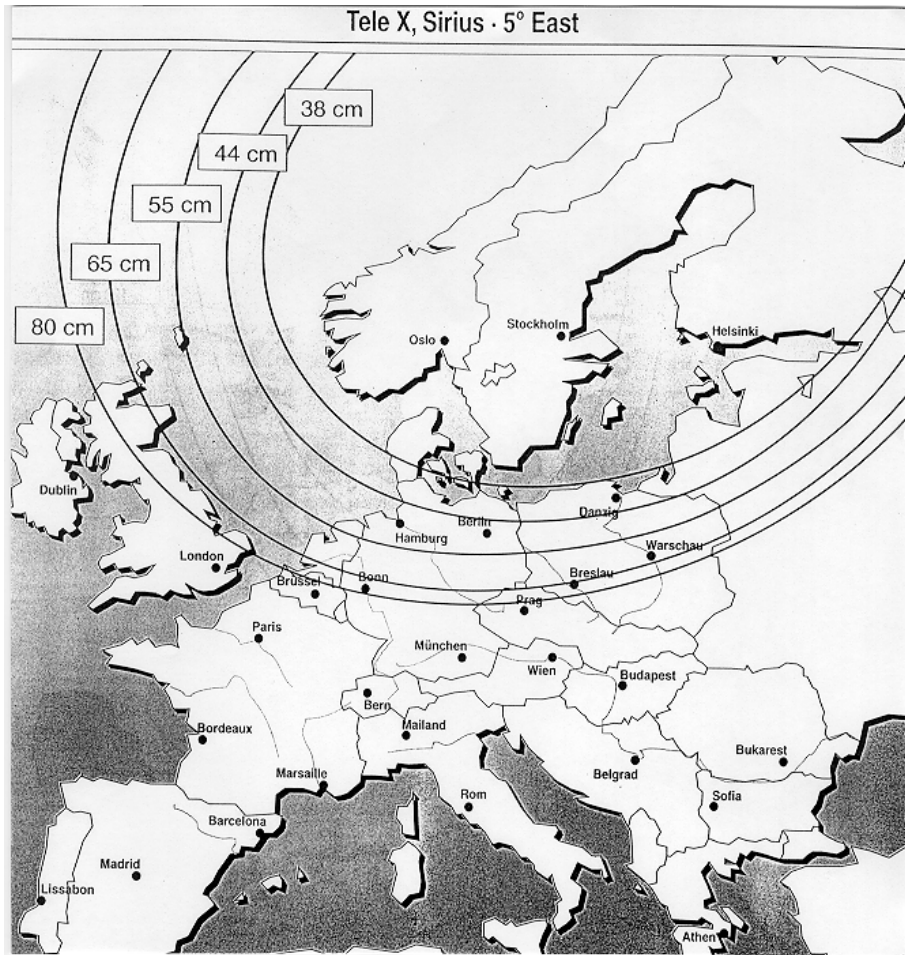
The Greek language ET1 Channel on Tp 33 11.596 GHz (H) was due to be replaced by a new more International service as we closed for press.

### **Eutelsat II F4 7.0 Deg E**

Expect to see both RTS Sat (Serbian TV) and RIK 1 to move from their current slots on Tp 22 which has been taken over for occasional and regular feeds by a company called Global Access Communications.

### **Sirius 5.2 Deg E**

TV3 Sweden looks set to be replaced by a new Sports Channel from Kinnevik (TV1000's owner) on 11.785 GHz (RHC) and using D2Mac Eurocrypt. A footprint for Sirius showing its coverage for the UK is reproduced below.



### Telecom 1C 1.0 Deg E

Telecom 1C is re-positioned here from 3.0 Deg E and will carry Business TV and telecommunications services for France Telecom.

### Intelsat 601 27.5 Deg W

TV 1000 Cinema appears to have closed here and can now only be found on TVSAT2 at 0.6 Deg W , 11.900 GHz (H)

### Hispasat's 1A & 1B 30.0 Deg W

The Andalusian regional channel Canal Sur has launched in clear Pal on Tp 2, 12.591 GHz (V) with audio at 6.60 Mhz. Uplinked from Seville, Canal Sur is promised to carry some PAL Plus programming.

Antenna 3 is now using 12.456 GHz (LHC) in MPEG 2 replacing the PAL transmission of Tele Noticias. The digital multiplex also includes Cinecolor, Cine de Siempre, Canal Fiesta and the displaced Tele Noticias.

### **Orion F1 37.5 Deg W**

Performance, The Arts Channel, has joined Channel 1's MPEG 2 feed from this satellite utilising NTL's DVB compliant System 3000.

### **TDRS 4 41.0 Deg W**

The UK armed forces TV service SSVc is now using 3.720 GHz (H) in MPEG2.

### **Panamsat 3R 43.0 Deg W**

Test Transmissions were observed on this new satellite from early March. Check Tp 12 on 12.728 GHz (H) with audio on 6.6 & 7.20 Mhz for PAL feeds. Panamsat 3R is intended to deliver digital services between N & S America, Africa and Europe including a digital MPEG 2 DTH package for Spain.

## **From The Postbag**

David Long, G3 PTU, has written with an interesting tale of persistence in the face of official complacency and indifference. David writes ... " I have been using TV5 (Hotbird 1) for an attempt to learn French, therefore it was with some dismay that about a year ago the vision related sound on 6.6 Mhz became very distorted. The radio channels on other sound carriers were OK. To cut a long story short, after telephoning them in Paris, writing and sending tapes, I approached the French Embassy in Liverpool. The sound has now been corrected and I have received a letter from the Minister concerned informing me of the matter being taken up with TV5 and offering me his thanks ". As David goes on to say it seems odd that it takes so long for such a problem to be rectified when it is assumed that TV5 monitors its own transmissions .....??

Bob Knight, ex G8YDA, has written querying the potential for receiving Music Choice Europe's (MCE) digital audio transmissions from Intelsat K. The answer to Bob's question is possibly - but at some difficulty and some cost. There are currently few domestic Satellite Receivers in the UK that can receive digital audio transmissions. The standards used by France (on TDF) are different to those used by the Deutsche Telekom on Kopernikus for the German market. DMX's ASTRA DTH service uses ADR (ASTRA DIGITAL RADIO) and MCE's cable delivery uses its own proprietary system (CD-X) making each service incompatible with each other.

## *Satellite TV News*

The ability to receive MCE direct from Intelsat K will depend on the ability to lay hands on some expensive hardware supplied by companies such as General Instrument (GI) and Jerrold and reproduce the headend capability of existing Cable Companies. Notwithstanding all this there have been some rumours indicating that MCE might join DMX in delivering an ADR service to the UK. DMX themselves have announced a planned launch at this years Cable & Satellite exhibition in London. DTH Receivers are to be priced at well under 400 pounds. Smart cards will cost 6.99 per month.

## **Smart Card Problems**

Some users have been experiencing problems with Sky's latest series 010 smart card (the real ones not the others!). Problems have ranged from an annoying audible tone to erroneous "card invalid" messages. A fix described in Satellite Trader Magazine confirms the problem lies with the smart card rather than the receiver. One of the smart card contacts has a mysterious black spot printed on it. Investigations proved that if tape is placed over the spot then a "card invalid" message appears on every receiver. The "black spotted" contact apparently carries the 3.5 Mhz clock pulses and acts as a resistor with a value of somewhere between 1k & 2k ohms. If the black spot starts to wear away the problem gets worse. The fix is made by cutting the circuit track which leads to the relevant "black spot" card contact in the receiver/decoder and soldering a 2.2k ohm resistor across the cut track.

## **Decoders for all**

Those interested in receiving Videocrypt II encrypted services intended for continental Europe will probably have seen adverts in the Satellite TV press for conversion kits. These kits allow Videocrypt II cards (and presumably their clones) to be used in standard Videocrypt IRD's. A legitimate application for this in the UK is where subscribers to the Asian Zee TV are now receiving VCII cards. The kits are compatible with most receivers except the Echostars 8700, in which the the kit will not fit. The conversion is achieved by removing the IWO3 and IWO5 IC's , inserting the new PCB and then replacing the chips into two new positions on the PCB. Once fitted it is possible to continue viewing channels using either VC I or VC II. Where channels use both codes (currently Eurotica on Eutelsat II F1 does this) then the converted IRD will always opt for the Videocrypt I codes.

For those interested in receiving the Italian Jessica Rizzo Television (JRT) service (previously known as Satisfaction Club TV) there is now a source of the requisite Nokia LS256 decoder. Contact Media Satellite on 0171 537 1010. JRT broadcasts on Wednesday, Friday and Saturday from 11.0pm GMT from Eutelsat II F2 11.575 GHz (V).



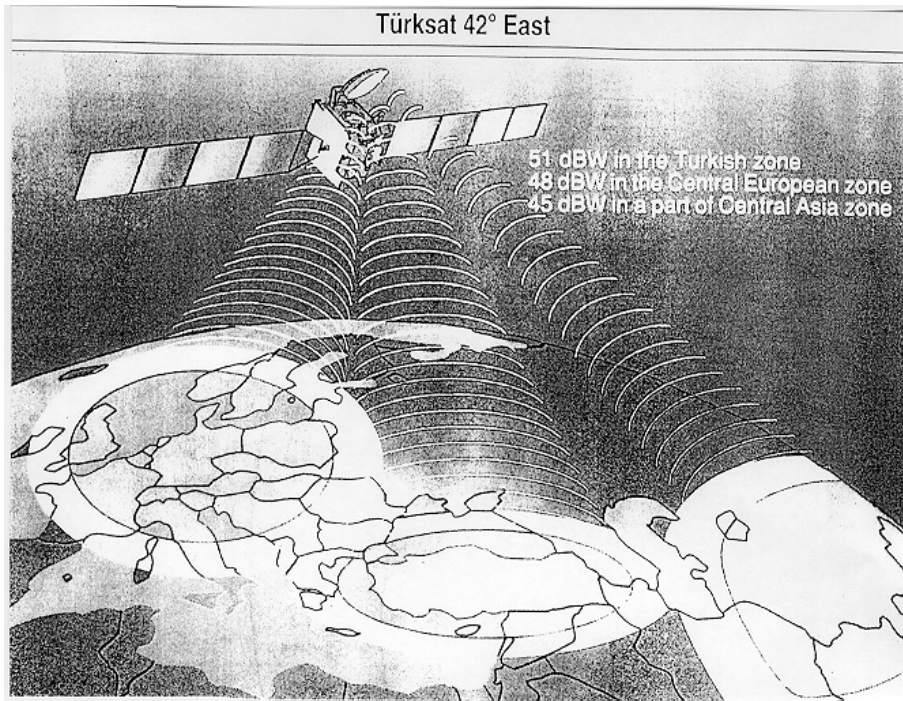
## **Turksat 1B**

Those with the necessary clear path to the east may be interested in swinging their antennas around to 42.0 Deg E for Turksat 1B.

### **Satellite Profile**

Launched	11th August 1994
Operator	Turkish PTT
Frequency Range	10.95 - 11.2 GHz 11.45 - 11.7 GHz
Transponders	16
Tp Bandwidth	10 x 36 Mhz and 6 x 72 Mhz
Power	55 watt TWTA's
EIRP	Turkish beam 51.0 dBW European Beam 48.0 dBW Asian Beam 45.0 dBW

The following footprint map for Turksat 1B shows that the Central European beam gives 48.0 dBW over much of the UK.



## Inclined Orbit Satellites

Many references are seen to satellites which are in an inclined orbit and the various techniques adopted to track them as they move about the sky. An inclined orbit satellite is one which is not fixed within a position about 100km from its nominal location. The reason for this can be deliberate design, to save station keeping hydrazine fuel, or because this fuel is nearly exhausted. Allowing a satellite to enter an inclined plane can extend its operational life for several years. A satellite which is not re-positioned every few weeks through use of its onboard station keeping propulsion engines will, through the natural gravitational forces of the sun and the moon, enter an inclined orbit at the rate of about 0.8 Deg per year. The following table provides a summary of the inclination of satellites over European/ UK skies.

Position	Satellite	Incline	Position	Satellite	Incline
40.3 W	Intelsat 502	+/- 6.0	25.5 E	Eutelsat I F4	+/- 2.1
31.4 W	Intelsat 506	+/- 4.0	26.0 E	Gorizont 20	+/- 3.0
21.3 W	Intelsat 512	+/- 1.4	34.0 E	Gorizont 17	+/- 4.3
11.0 W	Gorizont 26	+/- 1.2	40.0 E	Gorizont 22	+/- 2.7
1.0 E	Telecom 1C	+/- 0.3	47.0 E	Intelsat 507	+/- 4.5
20.0 E	Arabsat 1DR	+/- 1.7	48.0 E	Eutelsat 1 F1	+/- 5.2
21.5 E	Eutelsat I F5	+/- 1.2			

## Conclusion

That's it again for this issue of Satellite TV news. Following the annual pilgrimage to the London Cable & Satellite exhibition there should be much to report on next time. As usual please do write in about any Satellite TV activities in which you are involved and share any news or ideas you have.

*Paul Holland, G3TZO, Chatterton, Chapel Lane, Threapwood, Near Malpas,  
Cheshire, SY14 7AX. Tel : 01948 770476*

## **Aerials for 24cm ATV**

### **by Len Smith G7GNA**

Please find enclosed some aerial designs for the 24cm ATV band. The first design is a two-looped ring plate aerial and, as you can see, simplicity is an understatement here. The aerial is made from junk found in the scrap metal/pcb box.

FIG 1. shows the layouts for the elements, the reflector and the construction. The reflector is made from double-sided PCB, cut to 260mm x 150mm (metal version is the same). The WINGS as I call them are cut off the main piece of pcb at each end 30mm in, then resoldered at 45 degrees or at 25mm from the tip - see Fig 1 (under reflector).

For the metal version, the wings are bent upwards to 45 degrees. When this is complete, the next stage is to drill a hole in the centre of the main central reflector (200mm x 150mm) plate to fit the socket - either N type or bnc.

After drilling the centre hole and the fixing holes for the socket, make sure that the upper and lower surfaces are clean and free from grease, then roughen with sandpaper so ensure good contact on both sides. If using the pcb version, the socket is also soldered on both sides of the board; the metal version is just bolted together. After fitting the socket to get the sizes correct, remove the socket from the reflector. Clean the socket both sides and the centre protruding outwards (holding the centre pin) and tin with solder.

### **The Active Element(s)**

Each of these is made from 2.5mm copper wire or brass rod, 216mm long and shaped into a circle. Clean both ends of the ring(s) and tin with solder.

The support arm is a piece of broken chrome-plated telescopic aerial, 45mm long and 6mm diameter. The end that will have the connections for the active elements is cut at 45 degrees; the other end is splayed outwards by about 1mm, to fit over the bnc socket (nipple and centre pin end). See Fig 2.

Next stage. Take a piece of 75 ohm satellite cable (double-screened type) 60mm long and remove the insulation about 5mm from one end.

remove about 1.5mm from the inner core and solder this to the centre pin of the bnc socket. Insulate the inner pin connection with tape, the outer screening (braid) is then soldered over the top and to the earth part of the socket. Now fit the support arm over the cable and also solder this to the socket, taking note of the position of the angled element connection, see Figs 1, 2 and 3. You should have the socket soldered to the support arm with 15mm of cable protruding out of the other end (active element connections). Now

mount and fit the above support arm and socket to the main reflector plate (bolted if using the metal version) and/or solder to the pcb version after bolting together.

Now solder the two ends of the rings together as in a figure-of-eight (one circle above the other), see Fig 2 under looped elements. Return back to the support arm, the end for the active elements, we now remove the top part of the insulation of the cable that is protruding from the top of the support arm and pull it back on itself and solder to the top of the angled end and remove the remainder screening.

The copper screening is removed and the inner core is cut flush to the highest part of the angled cut on the support arm. Remove about 1mm of insulation from then inner core and solder the rings to the support arm connections (one pair of open ends of the rings to the high point top of angled cut and the other to the inner core connection). This now completes the construction of the plate aerial.


## **Testing**

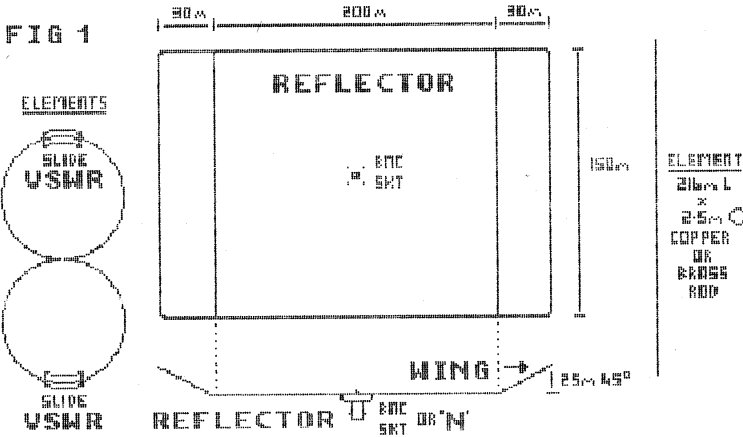
Mike G8LES helped me test the aerial. After some minor adjustments to the rings the aerial was found to have a vswr better than 1.3:1 throughout the band, with a gain of c. 10/12dB. Next test was portable from my highest point, Portsdown Hill; results working to Mike were P4/5 both ways.

If you build this aerial and experience bad swr, a small hint...if the top part of the ring(s) are cut, a small piece of tubing could be fitted over one end of the cut ring and then soldered. Adjustments can then be made see Fig 1 Elements (Slides).

## **More Aerials**


After designing the plate aerial, other ideas started to pop into the "grey matter between the ears". Looking at an aerial by JVL, I thought (and it hurts hi) that an aerial for testing transmitters and receivers would be useful. It would have to be small, cover the whole band and easy to make. So was born the 3 element active aerial:-

23cmS TWO RINGED PLATE AERIAL PT1.  15 ©

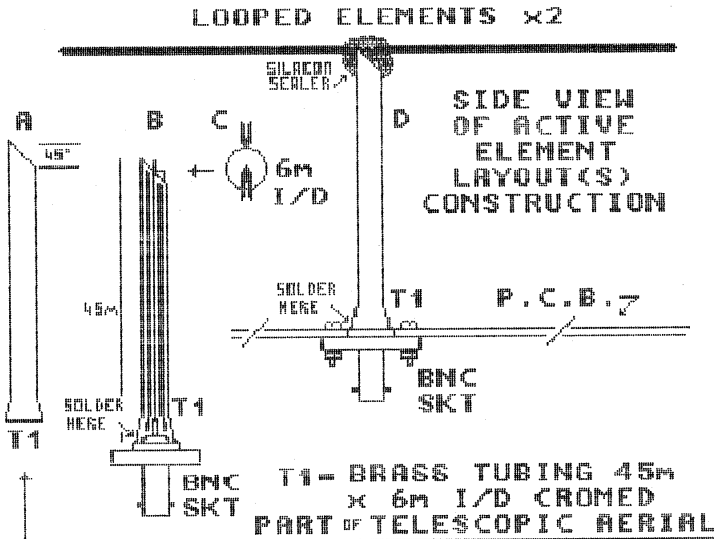


REFLECTOR MADE FROM D/SIDED P.C.B.  
1/16th INCH THICK OR METAL.

ELEMENT MADE FROM 2.5mm COPPER OR  
BRASS ROD SHAPED AS SINGLE LOOP.  
SEE ABOVE THEN JOINED TOGETHER.

23cmS TWO RINGED PLATE AERIAL PT2  15 ©

**FIG 2**




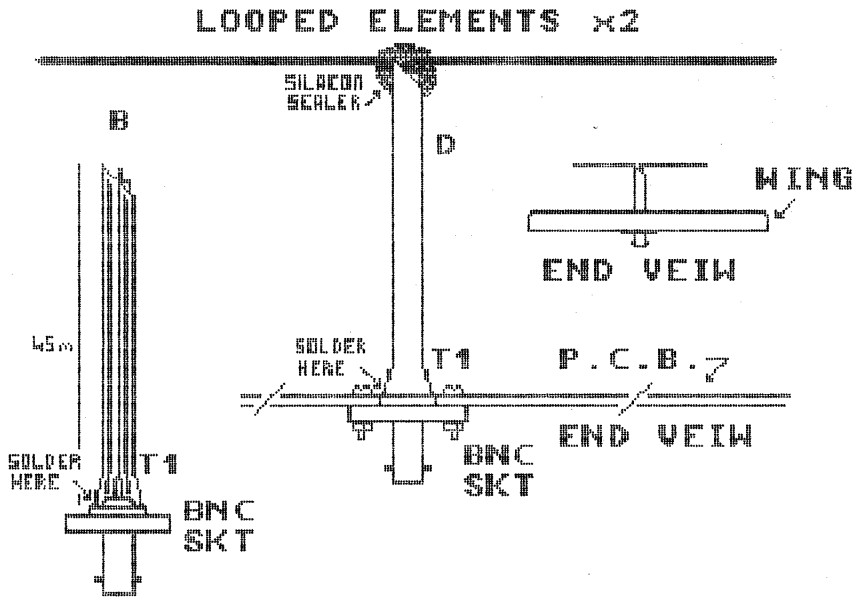
23cms TWO RINGED PLATE AERIAL PT3. 

FIG 3



The whole aerial was constructed of 2.5mm copper wire and takes the shape close to JVL's design but with a difference - the stub is a closed stub with a centre connection instead of the end version. The rings are also of 2.5mm copper wire, 75mm, 79mm, 85mm respectively [ARE THESE DIMENSIONS LENGTHS, DIAMETERS OR WHAT, TREV? GJH]

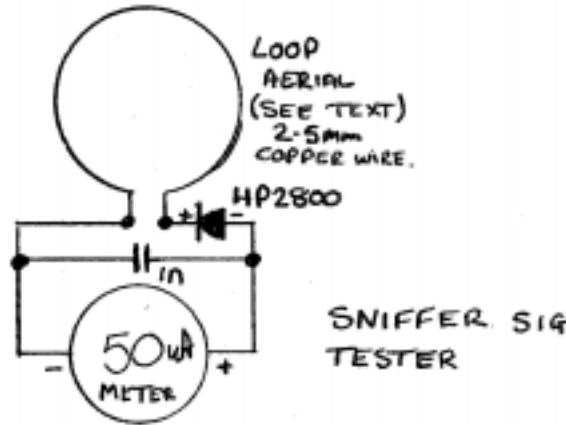
The stub is 80mm long, 5mm internal diameter on the bends (ends), the supporting arm is 85mm long x 4mm Mico tubing. One end is soldered into the nut part of a bnc socket; the inner cable is 50 ohm screened co-ax pushed up inside the tubing (use the very small thin type co-ax) [A TYPE NUMBER AND SOURCE WOULD BE USEFUL GJH] soldered to the inner pin of the bnc. The braid is soldered to the tubing and nut of the bnc.

The other end is stripped back, the braiding is soldered to the top of the tubing and the inner core is approx. 3mm protruding from the top of the support arm; remove the inner core insulation about 1mm from the end, then tin with solder.

Connections to the stub are shown in the layouts, together with the mounting of the rings, also the connection of the support arm. There is nothing hard in the construction of this aerial; if the layouts are followed it should take about an hour to build.

## Testing

With a sniffer (wavemeter) the aerial is fitted to a transmitter, sending the lowest frequency ie 1240MHz. Adjust the largest ring for maximum sniffer indication. Move the transmitter output to the centre frequency, tune centre ring for maximum indication. Likewise for the highest frequency and smallest ring. Finally, fine tune all the rings over the whole band for no nulls as indicated by the sniffer. The "sniffer" is a simple 50uA meter/diode with a loop ring aerial dimensioned for the centre frequency.



## 1.3GHz Sniffer Design

The whole unit is made from double-sided pcb, with the loops etched on one side only. A 50uA meter with screw terminals closely fits a die-cast box with enough depth to take the pcb.

The pcb loops were calculated, then transfers were used to draw the layouts of the rings, these are equal to the following EQLTs 75/79/85mm. [TREV - TYPED VERBATIM]. The stub was added to aid tuning the rings, this includes the trimmer (0-5pF) for fine tuning.

## Testing

All adjustments are easily accessible. Make sure there are no shorts between the loops and that the pcb is clean. It is advisable to solder over all the exposed copper, then assemble the unit, switch on the transmitter at the lowest frequency, and place a few feet from the sniffer.

Adjust the outer loop V.C fro maximum meter reading. Short out he stub at its link points to see if more signal results; if not, cut the next link from the pcb stub, continue with



similar adjustments for the other loops and frequencies for optimum results. If the gain appears weak, replace the 1N4148 with an HP2800 diode.

If anyone who has an AMIGA computer with the art package De-lux Pint III/IV and would like a copy of all the designs I would be pleased to send these on disc.

Best Wishes from Len G7GNA



## **Chrominance Equaliser/Booster**


**by Ian F Bennett G6TVJ**

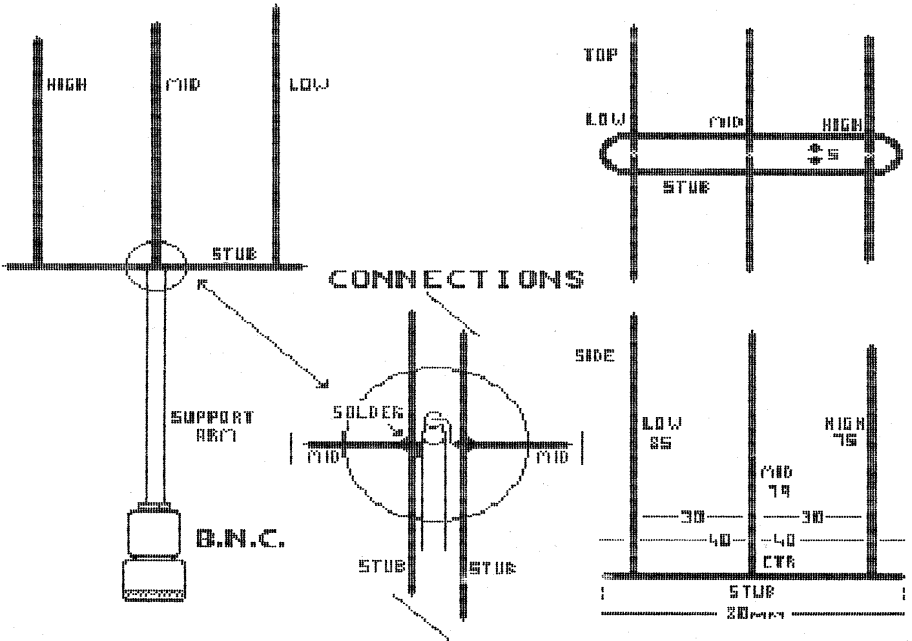
Here is a unit, which is capable of equalising or boosting the chrominance content of a PAL video signal with a minimum of disruption to the rest of the signal. It is often difficult with home built ATV equipment to maintain a flat video frequency response, particularly transmitters often exhibit losses at the colour subcarrier frequency. Attenuating the chrominance signal will result in excessive colour noise on a received ATV signal, further attenuation will eventually result in a black and white picture due to the action of the colour killer circuitry in the received picture monitor. The unit described, with care, can significantly improve the received picture quality when used at the transmitter end of an ATV microwave radio link.




### **How it works**

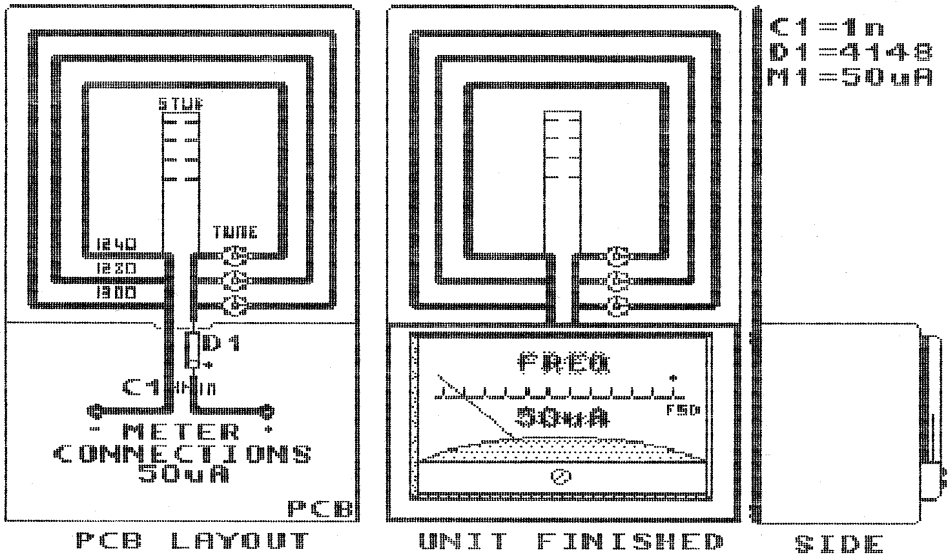
Firstly ICI buffers the incoming video signal and then drives two different paths. The video signal is passed through a passive delay line which forms path one. The delay line is the key to how this unit works, it delays the video signal by 110 ns which is approximately equal to half a cycle of colour subcarrier at 4.43 MHz. The delayed video is then applied to the inverting input of IC2 a video opamp. The non delayed path two video is applied to the non-inverting input of IC2. Due to the action of IC2 it can be seen that at low frequencies the two signals cancel out, however as the frequency approaches 4.43 MHz the two signals add together boosting the chrominance, it is possible by adjusting the levels at IC2 to completely cancel out the luminance component of the signal and leave just the frequencies at 4.43 MHz. This unit is adjusted so at the output of IC2 the luminance is reduced but not completely cancelled thus providing a source of chrominance enhanced video. The enhanced video is then fed to one end of a potentiometer the other end is fed with normal video with the same luminance level. By advancing the potentiometer the video fed to IC3 will increase in chrominance level but remain static in luminance level thus providing a continuously variable chrominance level from unity to the max output of IC2 which is about 8db. IC3 buffers the output video and will drive two 75R terminated loads.

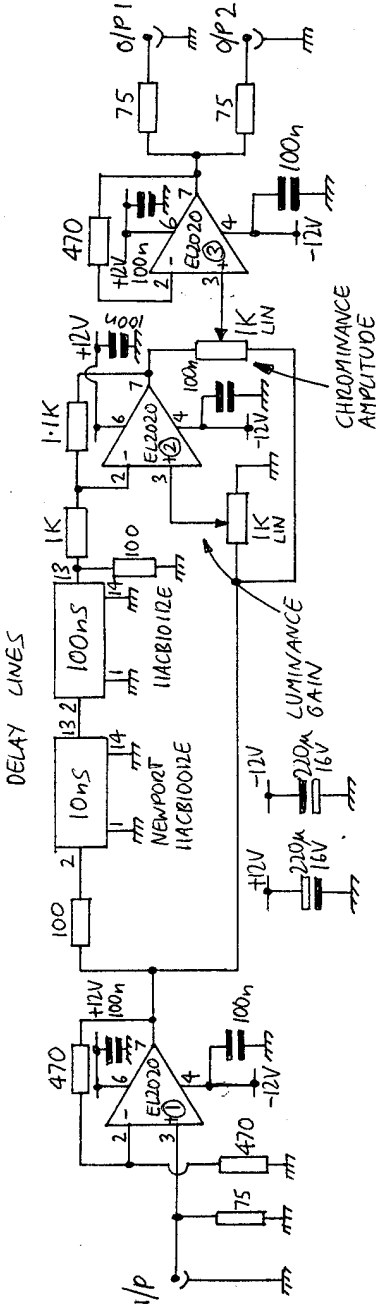
DC coupling is used through out this design so a split rail supply is required. The unit is mains powered with regulators and a split transformer secondary to provide the negative and positive supplies. A portable version should be possible by using a DC-DC converter to provide the negative supply rail. Good decoupling should be used as DC-DC converters can be noisy when used in video circuitry.

ATV TEST LOOP TYPE AERIAL 

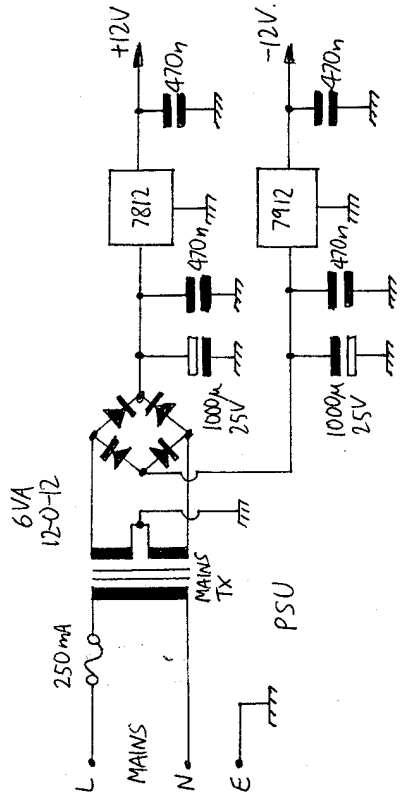


1.36Mhz AERIAL SNIFFER UNIT   





66TVJ CHROMINANCE EQUALISER/BOOSTER



© 66TVJ 1995



IB ELECTRICS

## Components

The delay lines used are actually manufactured by Newport components and are types 11ACB10012E and 11ACB10112E available from Maplins. The video op-amps are of course EL2020s at a fiver each a tad expensive perhaps but a dual version is available which will save a little, other op-amps may be ok provided they can handle the bandwidth, can drive a 200R load and don't create odd DC conditions. I.e. I don't think an NE592 will work!

## Use

This unit should be used with care, only sufficient boost should be used to give an acceptable picture and reduced colour noise, excessive chroma will over modulate the transmitter, intermodulate with the luminance and may cause buzzing on the sound. NEVER USE THIS DEVICE ON 70 cms as it can cause a lot of energy away from the carrier and cause interference to other users. The unit will only improve colour when placed in a transmit chain of equipment, due to the automatic action of the chroma agc in colour picture monitors it will do nothing on the output of a receiver. By increasing chroma on TX it helps combat the noise added to the signal by the ATV link. This unit has been tried at G0UMPs and G1HIAs QTHs with encouraging results. There is' no substitute for well designed and aligned equipment but ATV is often in operation with far from ideal circumstances so this unit will help to produce colour pictures when otherwise black and white may be all that is possible. I have built a more sophisticated equaliser with multiple frequency bands which has been installed in our TV repeater GB3ZZ.

## Other Uses

In the broadcast industry equalisers are used to correct or equalise signals in transmission systems, also equalisers can correct for losses in long cable runs, the unit described can also be used to equalise long cable runs for instance from a remote cctv camera. Cables can be pre-equalised or post-equalised as is convenient.

# Rally 96

Sunday April 28<sup>th</sup> 1996 at the Sports Connexion,  
Coventry.

## **Home Made Video Delay Lines**

G0UMP has kindly pointed out to me that a home made delay line might be possible. CQTV no.143 page 81 details how this could be achieved. 26swg enamelled copper wire is wound around a 6mm former, 10 tappings are made every 17 turns and 470pf capacitors ground the tappings. 270pf capacitors terminate the ends of the unit. This design I understand produces a delay of 200ns so it would have to be modified for our application. The characteristic impedance I believe to be about 50R, so the driving and terminating resistors of my unit will need to be changed from the current value of 100R. Provided the impedance of a delay line could be correctly ascertained the driving and terminating resistors can be of a reasonable wide range.

## **NTSC Version**

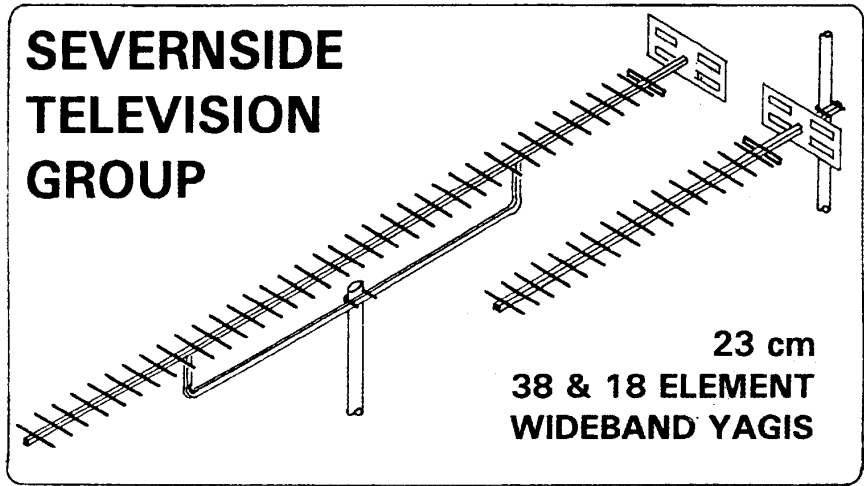
I don't know how much a problem colour subcarrier losses are at 3.58MHz, but an NTSC version is certainly possible by increasing the delay to 140ns. Two 100ns units can be used in series with the second tapped off at 40ns, the 100R terminating resistor must remain at the end of the delay line.

### **Notes from the Membership Secretary.**

As you all know, the first two digits of your membership number indicate the year that your Subscription is paid up to. For example 97-xxxxx shows that you are paid up for 1997 and your subscription is next due on the 1st January 1998.

The year 2000 approaches which means that membership numbers will start to appear with the first two digits 00-xxxxx. These are valid membership numbers. In fact we already have several members who have paid for the year 2000.

Before anyone wishes to make the comment about computer programs could do better and give a better indication of the year, this note was prompted by a flyer from a major credit card company informing me that this is how things will appear on their credit cards.



All of our 23 cm Aerials are specifically designed for ATV use - although they can be used for other modes as well. Wideband characteristics mean that you need only one aerial to cover the repeater input and output channels. Our famous wideband yagis come fully assembled in two versions :

**38 ELEMENT HIGH GAIN** : 14 dB gain, 1.8 m long, £26.00 plus postage.

**18 ELEMENT STANDARD** : 10 dB gain, 0.9 m long, £15.00 plus postage.

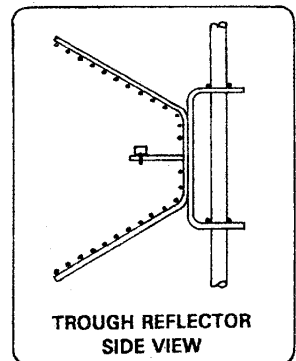
Don't forget our **20 ELEMENT CONVERSION KIT**, which converts your existing 18 element aerial to the full **38** element high gain specification : £13.00 plus postage.

Our 23 cm **TROUGH REFLECTOR** is quite unique, combining 11dB gain with wide bandwidth *and* wide beamwidth. It's also compact, just 0.55 m high, 0.35 m wide and 0.3 m deep. Supplied as a kit of predrilled and preformed parts, for easy "Screwdriver" assembly : £19.00 plus postage.

All aerials feature an SWR of less than 1.5:1 and are supplied with mast clamps suitable for masts up to 55 mm diameter. Mast poles shown are not supplied.

**POSTAGE**: £3.75 for one aerial, £5.00 for two or more. Telephone orders with cash on delivery: £2.75 supplement per order, Orders from outside of the UK - please write for carriage quotation.

**CHEQUES** payable to "SEVERNSIDE TELEVISION GROUP" and send to 18, Linnet Close, Patchway, Bristol BS12 5RN. Telephone ( evenings & weekends only please ) 0117 969 8136. Please allow 28 days for delivery.



## **A 10GHz Gunn Diode Controller**

**By Brian Kelly GW6BWX**

As many people have found out, it is very simple to produce a carrier from a Gunn diode but very difficult to modulate it with high quality pictures and sound. This design overcomes many of the problems experienced with simpler circuits yet is still easy to construct and set up. All the components with the exception of the PCBs are available from Maplin Electronics. The boards can be home made, the track and component layouts are included in this article.

Changing the voltage across a Gunn diode causes the frequency and amplitude of its oscillations to shift. Since most receivers can effectively ignore amplitude variations at video rate, only the frequency modulation effect will be used. To see how this design was developed we must first analyse the deficiencies and merits of each method of driving Gunn effect devices and then utilise the most suitable method in a way that allows home construction.

The goal is to present the video information, sound subcarrier and adjustable DC supply voltage to the Gunn device simultaneously. This isn't too difficult to achieve if the mixing of these signal can be done very close to the Gunn diode and sufficient video and sound drive can be produced to feed the low impedance at this point. In the real world, the Gunn diode may be located up a mast or high on a wall where accessibility is poor and long cable runs would be needed. Apart from the requirement for separate audio, video and DC feed cables, the load impedance for each is quite different and matching components would be necessary with the inherent losses they would introduce.

Three options are open: 1. run three cables to a modulator unit collocated with the Gunn oscillator 2. mix all the signals together and feed then to the oscillator via a single cable 3. mix the audio, video and a tuning signal together, feed them through a single cable and add the DC supply at the oscillator end.

Option 1 is most expensive in terms of cabling, also losses in the impedance matching networks require that considerable modulating signal power is generated. Option 2 is least expensive to implement but the complex and varying impedance of the Gunn diode make matching to coax very difficult. The mismatch would show as video ringing, ghosting and probably missing frequencies due to phase cancellation in the standing waves along the cable. The missing frequencies could well include the sound or colour subcarriers. Option 3 is technically most complicated but requires only one coax cable to carry the signals and a separate unscreened cable to carry the DC supply. The third option is the one chosen in this design.



## **Circuit description:**

Overall, the design occupies two small PCBs, one mounted at the "shack end" of the cable which deals with the signal processing, the other is located close to the Gunn diode and provides the adjustable DC supply. The coax cable is driven and loaded with 75 ohm impedance to correctly match the cable and prevent signal distortion, even when long lengths are used. Changing the values of R26 and RIOI to 51 ohms will allow 50 ohm impedance cable to be used instead but the supply current will be slightly increased. Looking at the main PCB (95-0001) first, the circuitry around U1 is a two stage audio amplifier giving sufficient gain to allow direct connection to a microphone. It also provides high frequency pre-emphasis necessary to give an overall flat response when received through a satellite receivers de-emphasis circuit. The audio signal is the DC blocked by C6 and fed to a varicap diode which has a steady 4v reverse bias to centralise its capacitance swing. As the varicap changes capacitance it frequency modulates the subcarrier oscillator formed from components around TR1.

The oscillator and varicap supplies are stabilised by D2 to prevent frequency drift if the power source fluctuates. Video arriving at J3 is fed through a pre-emphasis network and 6MHz trap. The trap slightly upsets the video phase response but with the values suggested its phase shift passes through 0 degrees at almost exactly 4.4MHz so colour distortion is minimal. If desired the trap can be omitted by not fitting L2 and C1 6. The video and sound are mixed with the tuning voltage at pin 3 of U3 which is configured with a gain of 2 to offset the halving of the signal in the coax feed and load resistors R26 and RIOI. In order to reduce current flow through the coax and hence its load resistor, the tuning is achieved by sitting the combined sound and vision signals on a DC offset of between +1 and -1 volts. If adjusted correctly the offset should be zero and no load current will flow. To generate the negative voltage a modular DC-DC converter is used (U2). This gives +12 and -12 volt outputs which track each other fairly closely.

By using the +12 output from U2 instead of the main power rail, any variation in supply is balanced and has no effect on tuning voltage. Pin 3 of U3 is a high impedance point and therefore offers little loading to the sound or vision signals and permits isolating resistors R22 and R23 to be used. C17 filters noise from the tuning potentiometer wiring and is returned to the +12 rail so its switch-on charge momentarily raises the Gunn voltage, this has been found necessary on some diodes to "kick start" them into oscillation. On the second PCB (95-0002), the coax cable is matched into load resistor RIO I.

If the tuning is correctly set there will be no DC voltage across this resistor. D101 and R102 lift the signal from the cable so it sits 8.2v above its previous level. TR101 is used as a current amplifier to drive the Gunn diode itself.

As the emitter voltage will sit about 0.7v below that at its base pin, the Gunn should have 7.5v across it, nicely central in its operating range. By adjusting the tuning control, the voltage across RIOI should swing approximately +1 to -1 volts so the gun voltage will

## *A 10GHz Gunn Diode Controller*

swing approximately 6.5 to 8.5v which are about its safe limits. D 1 02 and D 1 03 prevent the Gunn voltage dropping more than 6.8v below supply or 9. 1 v above ground should the tuning voltage exceed safe limits. RI 03 and C 104 form a 470 ohm shunt which helps the Gunn diode appear less reactive and reduce its tendency to oscillate in undesirable modes. If the wires to the Gunn module are longer than about 10cm (4") fit them at the diode instead of on the PCB. As a protective measure, relay RLYI will only close and connect the Gunn voltage if the supply exceeds about 9.5 volts. A voltage low enough to bias the diode below its negative resistance region can cause excessive current to flow.

### **Assembly:**

All PCB holes are 0.8mm except the fuse clips which are 1.5mm, TRIO1 and the LI can legs which need 1mm holes. All resistors, diodes and fixed inductors are mounted on 0.4" spaced holes, 0.1 $\mu$ F capacitors are on 0.3" spacing and ceramic capacitors are on 0.2" spacing. preforming the leads before assembly will greatly speed construction. Assembly order isn't critical but I suggest fitting the two fuse clips first as these need their pins folding together on the track side, a job more easily done before fragile components are fitted. Fit U2 and LI last as these are the tallest parts and are easily damaged during handling. The only awkward soldering is around TR1, be careful not to short its pins together.

### **Alignment:**

There will be a small amount of interaction between the adjustments, it was felt that the addition of buffer stages would make the design considerably more complicated and expensive while offering little advantage. In particular the sound frequency (LI) and intercarrier level (VR2) will affect each other, it may be necessary to repeat adjustments two or three times to achieve optimum results.

The sound and video levels are set by VRI and VR3 respectively, they do not interact and should be set to give best modulation levels. Initially, the transmitter frequency should be set. As the tuning control will only allow adjustment over about 60MHz (varies widely according to the Gunn module), it should be set to give equal shift above and below the desired centre frequency. Connect a voltmeter between J5 and J6 and adjust the tuning control for zero voltage, then adjust the tuning screw on the Gunn module until its frequency is correct.

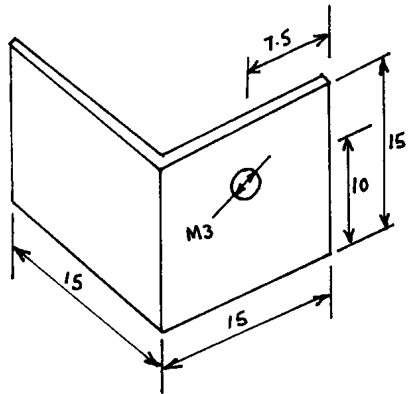
If testing through a repeater you can adjust the screw until best picture is rebroadcast. The voltage at J5 should swing approximately 1 v positive and negative as the tuning control is turned from end to end. The exact voltages are not critical but should not exceed 1.5v with the coax connected. To adjust the sound subcarrier oscillator, set VR2 to mid position and adjust LI to achieve most quietening of the background hiss while monitoring on a receiver or a repeater. If a frequency counter is available, disconnect the cable from J5 and attach

the counter in its place, set VR3 to minimum and adjust LI for 6.00MHz. The intercarrier level is a little more difficult to set, the object is to provide sufficient carrier to fully quieten the sound channel but no more. Excessive level will do nothing to improve sound performance but may cause pattering on colours. Find the level that kills receiver noise and set VR2 just beyond that point. Repeat the adjustment of LI to make sure it hasn't pulled too far off frequency.

### **Hardware notes:**

Both PCBs have one mounting hole attached to ground through a narrow track. This hole can be used to ground the board to a screened box if a suitable conductive pillar and washer are used. If for any reason you do not wish to ground the board this way, simply cut the track with a sharp knife to isolate the mounting. TR101 runs fairly warm without any heatsink. If desired, a small angled aluminium heatsink can be fabricated to the dimensions below. Mount the heat sink to the transistor before soldering it in, it should sit flush to the PCB surface to give it mechanical stability.

TR101 heatsink details.



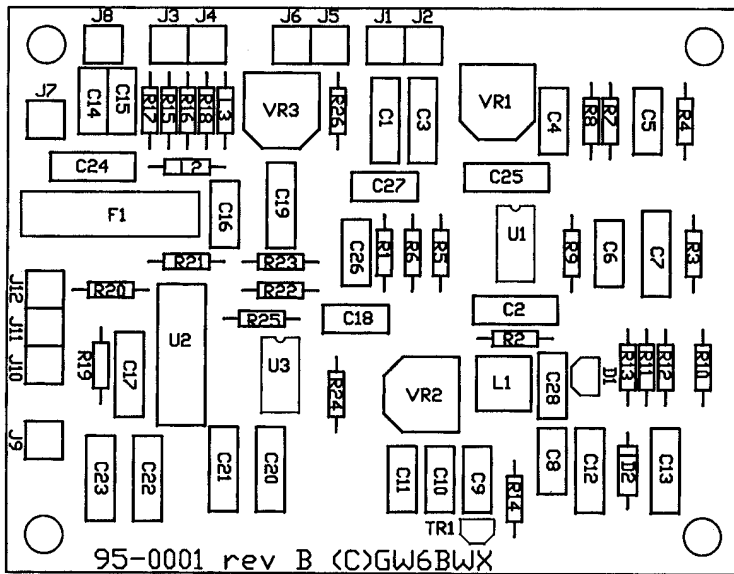
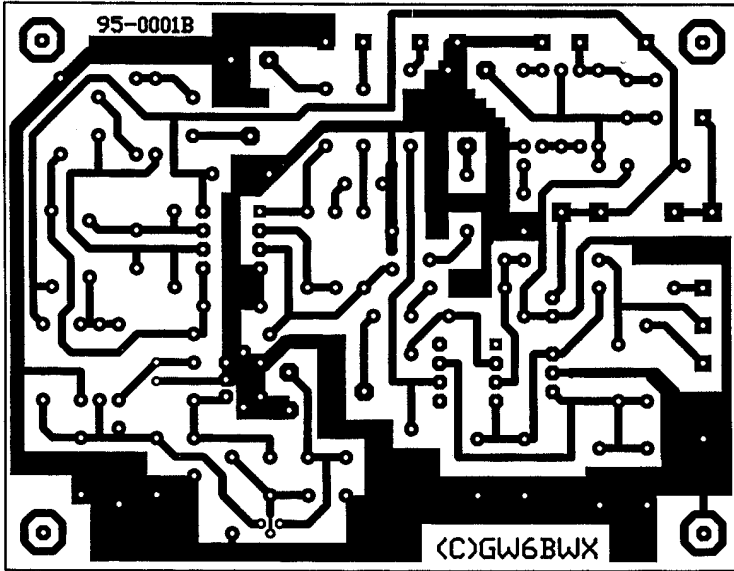
This article is reprinted from the March 1995 issue of The Severnside Television Group newsletter "P5". The help and constructive criticism given by Carol Webb who assembled the prototypes is gratefully acknowledged.

## A 10GHz Gunn Diode Controller

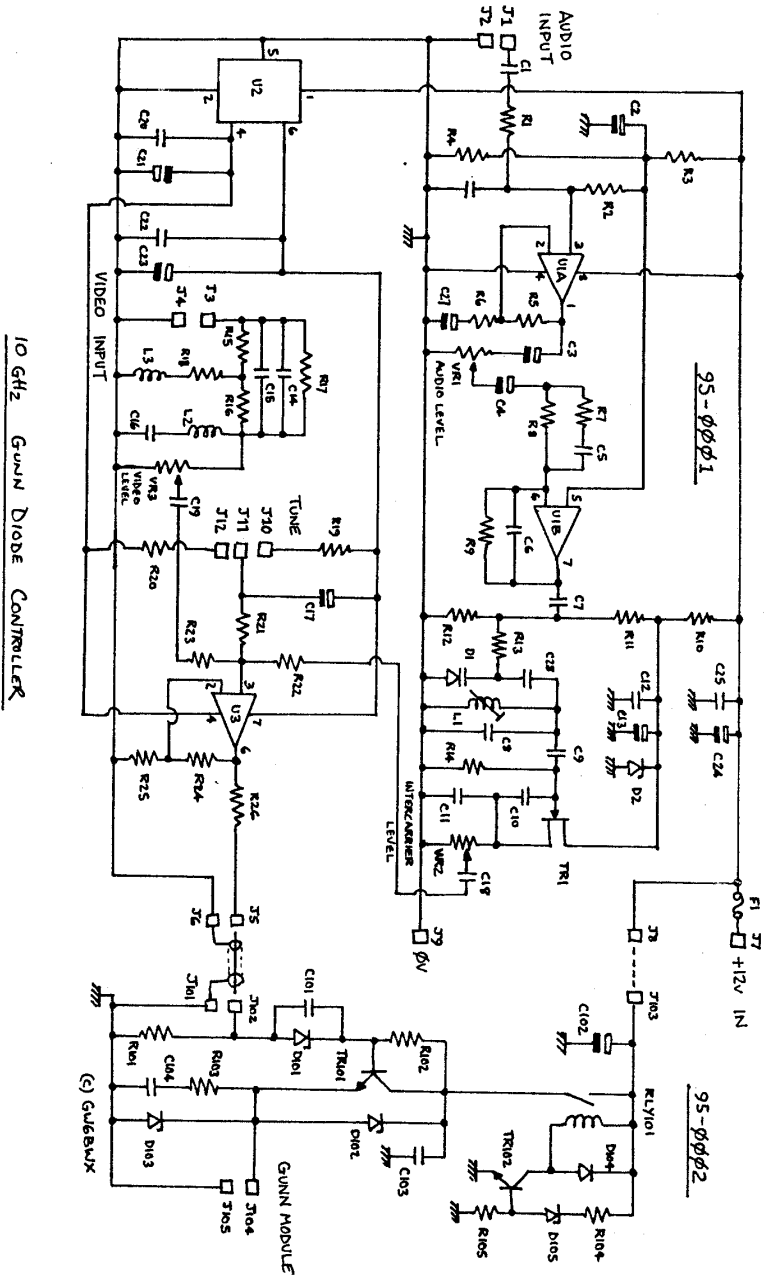
### Parts List: (codes are for Maplin Electronics orders)

18R	(M18R)	Qty	1	R18
75R	(M75R)		3	R15,R16,R26 (R26 may be M51R - see text)
82R	(M82R)		1	R101 (R101 may be M51R - see text)
300R	(M300R)		1	R17
390R	(M390R)		1	R10
470R	(M470R)		1	R103
560R	(M560R)		1	R104
1K	(M1K)		5	R1,R23,R24,R25,R102
2K2	(M2K2)		3	R6,R7,R22
10K	(M10K)		5	R3,R4,R5,R13,R21
47K	(M47K)		1	R2
56K	(M56K)		2	R19,R20
68K	(M68K)		1	R8
100K	(M100K)		3	R11,R12,R105
330K	(M330K)		2	R9,R14
1K	(UH00A)		3	VR1,VR2,VR3
22pF	(WX48C)		3	C6,C8,C18
33pF	(WX50E)		2	C10,C11
68pF	(WX54J)		1	C16
100pF	(WX56L)		1	C28
680PF	(WX66W)		2	C15,C26
1nF	(WX68Y)		4	C5,C9,C14,C101
0.1uF	(WW41U)		9	C1,C7,C12,C19,C20,C22,C25,C103,C104
2u2	(YY32K)		2	C4,C27
10uF	(YY34M)		3	C2,C3,C17
47uF	(YY37S)		5	C13,C21,C23,C24,C102
10uH	(WH35Q)		2	L2,L3
15uH	(UH86T)		1	L1
6V8	(QF49D)		1	D102
8V2	(QF51F)		2	D2,D101
9V1	(QF52G)		2	D103,D105
1N4148	(QL80B)		1	D104
MV2108	(QY81C)		1	D1
BF244	(QF16S)		1	TR1
BD131	(QF03D)		1	TR101
BC337	(QB68Y)		1	TR102
TL072	(RA68Y)		1	U1
NMA1212	(AH17T)		1	U2
EL2020	(UR06G)		1	U3
RELAY	(DC52G)		1	RLY1

The tuning control MUST be 10K and preferably linear track, use a type that suits your preferred box or enclosure. Veropins (Maplin code FL24B) can be used for connections to the PCBs, note that an FL24B is a bag of 100 pins.

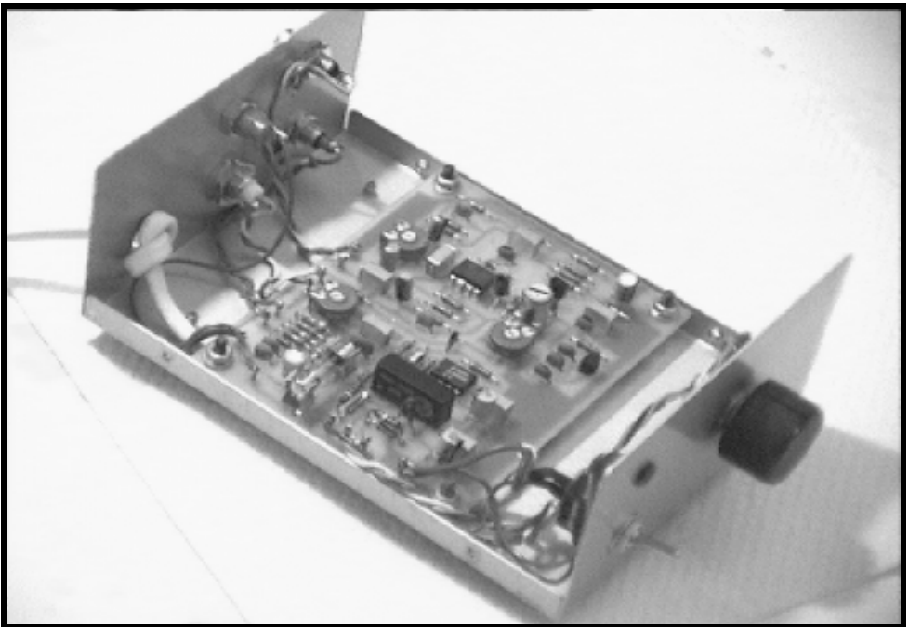
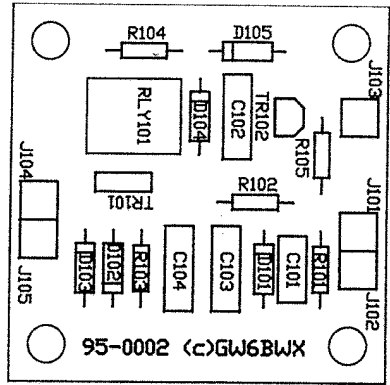
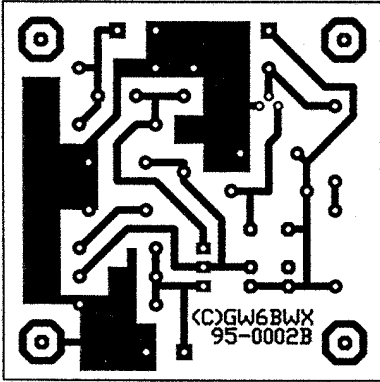


# A 10GHz Gunn Diode Controller



10 GHz GUNN DIODE CONTROLLER

PCB track layout (actual size) and component placement overlay



The authors unit with its lid off. The front panel houses a power switch and an “on the air” LED as well as the tuning control.

## Notes from the Membership Secretary.

### By Dave Lawton

Thank you to all of you who returned your renewal forms promptly, if anyone reading this is not sure if they still have not paid, do not worry the fact you have this magazine means you have paid.

I know this has been said before but here are a few points to help us give you a good service .....

Let us know in plenty of time if you are moving, we always have CQ-TV's returned with the comment on the envelope ' Gone Away ' or ' No longer at this address '. and it helps if you give your old address when notifying us of a change of address.

When writing to ANY Committee Member, please **PRINT CLEARLY IN CAPITALS** your name and address ( including postcode )

The important point is that we want to retain you as a Member. Remember you can read your own handwriting but can I, that is why we say **PLEASE PRINT CLEARLY IN CAPITALS**.

It is also important to check your address label to make sure I have the address correctly, postcode missing etc. Please let the Membership Secretary know of any corrections that are needed, after all I am not perfect and have been know to make the odd mistake.

On a general note it is important to write to the correct Committee Member, each person deals with their own section and only their section and if for example someone writes to me concerning Publications or Sales Items all I do is forward the letter on to the appropriate person when I next have cause to write to them, this causes a delay in you receiving a reply.

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## **Reprinted from March E.T.I.**

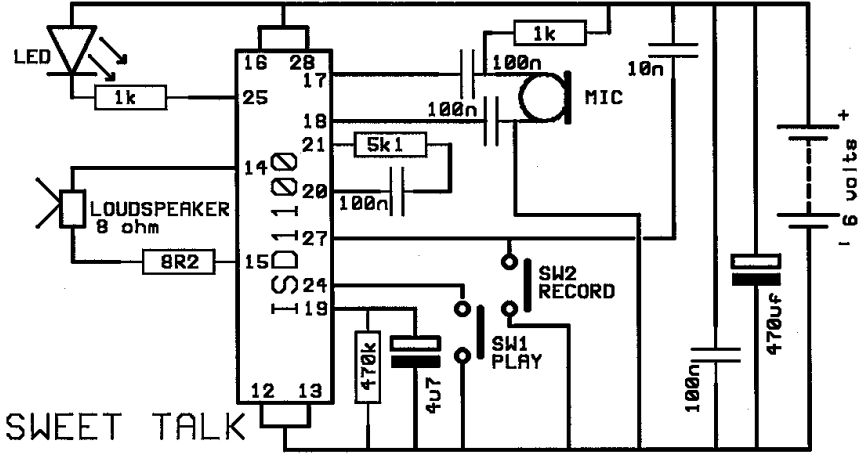
This circuit first appeared in E.T.I. and is reprinted here with the kind permission of the editor.

In CQTV 154 we covered the SP0265 digi talker chip, which was programmed by hex data programmed into an EPROM. While the SP0256 could be used for repeater idents, the programming was a little difficult and the speech quality at best sounded like a Darlek with a soar throat.

The ISD 11100 is programmed by pressing the record push-button and speaking into the miniature electret mic. The button must be kept pushed for the duration of the recording and the LED will illuminate to indicate the record state. The recording will only last 10 seconds but this would be sufficient for a repeater ident. Replay is by momentarily closing the play button. The message will be retained in the event of a power failure. The output is designed to drive a 16 ohm loudspeaker, but as the original article points out these are a little thin on the ground and so an 8 ohm resistor has been used in series with an 8 ohm loudspeaker. The circuit diagram is reproduced as the original using a 6 volt battery for the power supply. In order to use the circuit for a repeater logic some small changes would be necessary i.e. TTL inputs and low level output.

The principle component is a 28 pin sound recording chip. Built on the chip is an array of 64,000 non-volatile EEPROM memory cells, a 6.4KHz oscillator, filtering circuitry, microphone pre-amplifier and a low-power speaker output stage. While the record button is pressed, the incoming sound is picked up by the microphone and the resulting electrical signal boosted by the on chip pre-amplifier. An AGC circuit provides compression. Thus, sounds having a wide range of volume levels will be recorded correctly and without distortion. The result is sampled at clock frequency and, on each pulse, the amplitude of the wave is stored in successive memory locations. There is no digital conversion - points on the wave are stored directly as voltage levels. Since there are 64,000 memory cells, and because sampling takes place 6,400 times each second there is a maximum recording time of ten seconds.

Sweet Talk



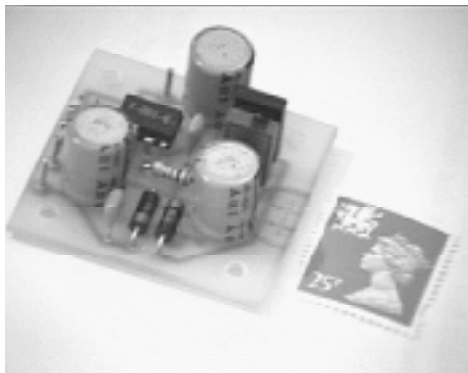
Sweet Talk 1

When the play button is pressed, the contents of the memory cells are read in the same order as when the recording was made and the information retrieved. The result is boosted by the power amplifier which operates the speaker. At the end of playback the device reverts to standby mode (ready to read from the beginning of memory) so that the replay begins instantly when the play button is pressed again. Note that if the full available time is not used, a marker is inserted in memory at the end of the recording. On playback, the chip will revert to standby mode when it reaches the marker. When making a recording the LED will go off when the memory is full. The process then stops and any sound made after that is ignored.



## **A Step-up voltage converter for powering LNBs from 12V**

**By Brian Kelly GW6BWX**



Most LNBs are designed to work on supply voltages greater than 12v. Older ones prefer a fixed voltage of about 18v while newer ones use either 14v or 18v the change in voltage being used to switch from horizontal to vertical polarisation or sometimes to switch between high and low sections of the satellite bands. To power them from a 12v battery supply a voltage "booster" such as this design is needed.

Several different types of DC-DC converters were tried with varying success but in the end this design gave best value for money.

Flyback inverters gave higher efficiency under load but were more expensive, needed transformers winding and had the drawback that their off-load voltage reached unacceptable levels. This design uses a charge pump, a pair of diode switches alternately charging a capacitor from the incoming supply and then sit it on top of the supply so it has twice the voltage at its top end. A second capacitor acts as a reservoir for this increased voltage. Theoretically, the output voltage is twice the supply voltage but in practice there are voltage drops between the collector-emitter junctions of the transistors and in both the diodes.

The prototype gave an output of 22v (off-load) with a 12v supply and this dropped to 18 under 150mA load. Input current under full load is about 300mA which makes the unit a respectable 75% efficient. Under no load it draws about 15mA. The transistors do not need heatsinks, they run quite cool even under full load but they will overheat if the output is shorted out. I strongly suggest a 500mA fuse is wired in line with the supply if there is any chance of a short occurring. The component values are not critical but the diodes must be fast switching types, normal rectifiers may overheat and will seriously reduce the units performance.

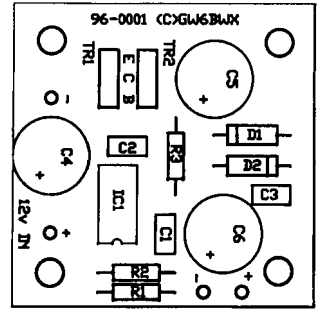
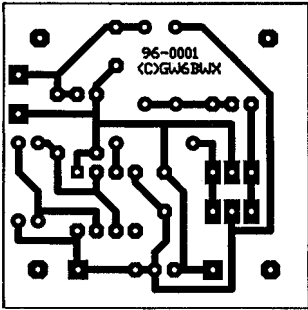
The electrolytic capacitors should be low ESR types to prevent switching spikes appearing on the output and supply voltages. The PCB layout will accept electrolytics with 2.5mm or 5mm pin spacing.

*A Step-up voltage converter for powering LNBS from 12V*

**Parts list (Maplin order codes)**

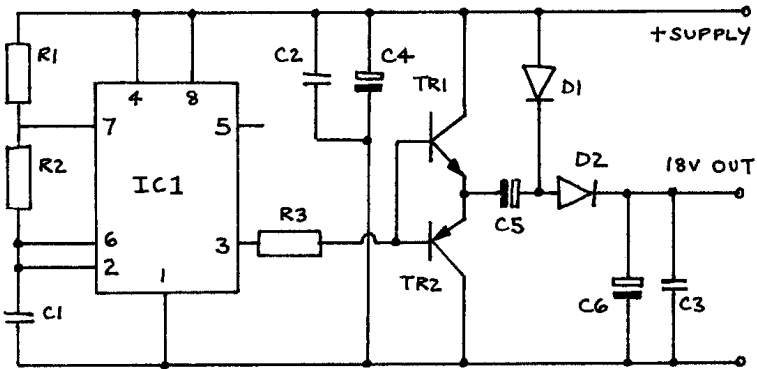
R1,R2	1K	(M1K0)
R3	100R	(M100R)
C1,C2,C3	22nF	(WW19V)
C4,C5,C6	100µF	(JL49D)
TR1	BD131	(QFO3D)
TR2	BD132	(QFO5F)
D1,D2	MUR120	(GX40T)
IC1	NE555	(QH66W)

The total cost of components is less than £5.00



PCB layout (copper side)

PCB component placement



Schematic

# **Worthing & District Video Repeater Group**

## **GB3VR & GB7VRB**

### **1996 Prices**

#### **1W FM-TV 24cm Transmitter**

This 1watt transmitter generates its signal directly at the wanted frequency which can be set anywhere in the band, colour or B/W. On board intercarrier sound and fixed pre-emphasis are standard features. The kit includes the PCB, all on board components, pre-drilled heatsinks, an eddystone di-cast box and full and comprehensive instructions. Building time is three evenings work. The new price for this kit is **£60.00**. With over **550** units sold to the Amateur market alone, this is probably the biggest selling TX kit in the world!!

#### **Two channel phased locked loop kit.**

This add-on kit vastly improves the overall stability of the 1 watt transmitter. Two crystal locked channels and a third free running tuning position are available. Kit price **£30.00**.

#### **AMIGA ATV Program-2**

The New Amiga ATV has even more features 56 testcards, over 20 different wipes, even better text control, including 30 screens of text messages, QRA calc, testcard music, selectable displays, and now with a DTMF tone pad to control your repeater (including security tones if required). All test cards are over-scan ie the whole screen is used. Load in your own customised testcards (uses your palette), Super Large Text, Silky smooth scrolling text, 24Hr clock, callsign extensions, Hot key operation, Doe reader, ATV Cli, Cross Hatches, Purity, and a comprehensive section for genlock users.

If you have an Amiga then this is the program for you, if you don't, go and buy one. This is a three disk set, the program, extra testcards, and the music disk. 1 meg min required, state callsign and QRA (if known) when ordering. Now only **£15.00**.

## **The Spectrum ATV Program.**

Still selling after all these years, this 48k version has over 60 commands which include 7 testcards, memo pad, clock, maps, tones, locator calc (old & new), UK flag, X-Hatch, various size text printing plus disk transfer command and more. Now only **£5.00**.

We still have a few add-ons for the cropready test card generator, phone for details.

## **Orders Should Be Sent To:-**

Treasurer of GB3VR, R. Stephens G8XEU, 21 St. James Ave., Lancing, Sussex, BN15 ONN, UK.

**Telephone (01903) 765760 7 to 8 pm. Cheques payable to:- "W&DVRG"**

# **VHF COMMUNICATIONS**

**VHF COMMUNICATIONS** magazine is published quarterly and is available from **KM Publications**, 5 Ware Orchard, Barby, Nr. Rugby, CV23 8UF, UK.

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Email: 100441.377@compuserve.com

The yearly subscription is **£16.00** for cash or personal cheque (drawn on a UK bank, or bearing the name of a UK banking agent), postal orders or bankers draft made payable to VHF Communications. Payment may also be made by any major credit card at **£16.80**. The subscription included surface mail charges, airmail is extra qt £6.00 per year (£6.30 by credit card). The magazine is a **MUST** for the radio amateur and professional engineer interested in VHF, UHF and Microwave working, containing, as it does, detailed construction articles for equipment operating in these bands.

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**URL USA Site** <http://clearlight.com/~vhfcomm>

# **CAT'96**

**1<sup>st</sup> September 1996 at the Post  
House Hotel, Crick.**

**Traders, Lecturers, Exhibitors,  
Demonstrations etc, etc are  
most welcome**

**Accommodation and Saturday  
evening dinner**

**Hope to see you there!**

## **Graham Hankins G8EMX.**

Soon after closing my first TVOA, I made a start on my "other job" - repeater affiliations. Most of the groups affiliation details and subscriptions were way out-of-date, so there was some work to do.

Every ATV Repeater Group that I know of was sent a revised Affiliation Form (now two pages) at the beginning of February. The new paperwork asked for some additional information about each repeater, eg. what type of filters used, method of logic control, user facilities. More than twenty forms were sent out.

Of the six currently returned, some points for comment. The top line asks for the affiliation fee; some returns have a box ticked, but no cheque payable to BATC! Can groups please include the money in with the form? If neither box is "ticked" - do you wish to lapse your affiliation? For "Type of Tx/Rx" we are after the make, model in use, eg. Worthing with PA, W &D, not just "FMTV". One group states "home brew" as the repeater logic; great, how about some circuit details for this mag? GB3UD (Stoke) report a 3cm link (10.3GHz) into the 24cm receiver.

There have been snags, of course; the last known individual is, sometimes, no longer involved so another set has to be sent out. One group is concerned about the requirement to comply with BATC rules, so I shall be raising this at the committee meeting in March.

I did ask for photographs too; of the aerial system, transmitter set-up - anything which shows the hard work put in by your group. If this is why so many have not been returned yet (somebody's waiting to finish their roll off on holiday), don't worry. Please return the form anyway, I have some information and pics. "in hand" so the photo's can wait.

The point I am going to make is this. ATV news also appears in "Practical Wireless" as a bi-monthly feature called "Focal Point".

I would like to show YOUR repeater in future issues of PW, in addition to TVOA. To this end, I am able and willing to visit most UK Repeater Groups. New TVOA scribe, new circumstances. Have caravan, can travel, so I can easily spend a week or so in different parts of the country, taking some pics.(my film, my time) of the local repeater during my stay, after liaison with the keeper or someone in the local group. I've been to the Severnside Group more than once!

Before that, though, I will be "chasing" by phone the outstanding affiliation forms. Reply quickly or be phoned at midnight (well, not quite - 23.59 perhaps hi!) Negative returns (eg. repeater off air) wanted if applicable. Please, though, do not just write "no changes" - there is very little existing information on file about the hardware at each site.



In the "TV NEARLY On Air" department, while "surfing" the Internet Worldwideweb (at East Birmingham College) for anything ATV I came across the Solent Club for Amateur Radio and Television (SCART).

Ian Bennett G6HNJ writes:

"Many of our members are active mostly on 1200MHz, but we also operate on 430MHz and 10GHz. Most of our equipment is home-brew and we have a range of kits designed to help home-construction.

We have recently provided live tv coverage of several local events and are keen to participate anywhere that will put our skills and resources to practical use.

We are currently building an ATV Repeater which should have its output on 1316MHz (24cm). Facilities will include a computer-generated menu and information system, recording and playback of input pictures, and a graph of the current local weather. The necessary licence has been approved by the RSGB and is now passing through the Radio communication Agency."

When I visited the VHF Convention at Sandown, to see the Home Counties Group (who put out the GB2RS News in vision over HV, presented by Roy) I spotted the almost-built SCART hardware for GB3AT (pics included) and picked up their Club Newsletter "IN SYNC". It's undated but labelled "Special Issue" with the following news: - "The Club has bought a 20ft mast section which has been erected at the proposed site - the Royal British Legion Club, Park Gate. Credits for the initial test go to Steve G7BVK (mounting brackets and transmitter), Mike Walters G3JVL (Alford slot), Ian G6HNJ (20W PA). Results were very promising - P4 reports from Frank G0LFI Portsmouth, Charlie G0LPP Gosport and Ricky G0SBV New Forest. A P3 in colour was seen by Alan G1APD Hedge End and a mono P2 by Charlie G7RVN in Swaythling".

SCART meets on the first and third Tuesday each month at the Royal British Legion Club, 366 Brook Lane, Park Gate, Southampton.

Ian can be Emailed at [g6hnk@inside-info.co.uk](mailto:g6hnk@inside-info.co.uk)

Also seen at Sandown, for "TV on Head", was Harry Bellfield G3SBV, pictured. Harry is sporting 24cm ATV/P with 450mW!

Here in Birmingham yes, we are still pushing for an ATV repeater here! After asking my "contact" for something positive about Brum for this issue, my latest info. is that, subject to confirmation, we will get site access for a test in mid-March.

I appreciate that ATV activity is certainly not just repeaters; there are many active individual callsigns, on 70, 24 and higher bands. But, obviously, I cannot come visiting your private home station! SO, I have to continue to rely on appeals via this column for contributions, reports, shack or aerial farm pics (any form or quality, but best possible).

## *TV on the Air*

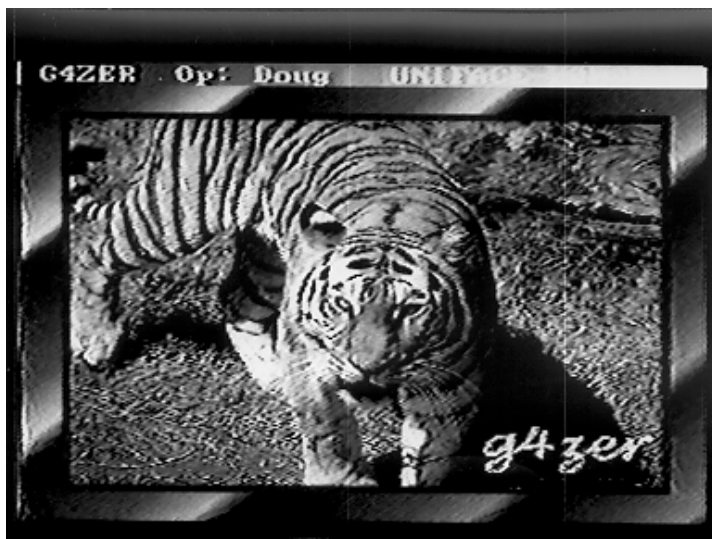
You may not think you have much to tell TVOA; but, have you built a new bit of kit (especially if it's BATC) - is it ok, does it work etc. Any regular local nets - if so, times, callsigns on-air etc please?

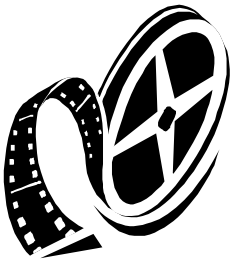
So, as I need to get this in the post, closing. The title of this column MAY change eventually, to reflect future content (I'll see what the committee says). My internet address is no longer valid - it was only temporary while I was on a course - but I'm still at GB7SOL, or by post (typed, PC ASCII disc, script - careful with callsigns, phone numbers etc) to me at

11, Cottesbrook Road  
Acocks Green  
Birmingham  
B27 6LE

0121-707 4337 (with ansafone)

73 and P5 , oh...don't forget the BATC Rally, Coventry. See you there, I hope!





Non trade advertisements are placed in this column free of charge to paid up members only, please quote your membership number. Addresses will be included unless otherwise stated. Trade adverts appear on separate pages and are chargeable - please contact the editor for details.

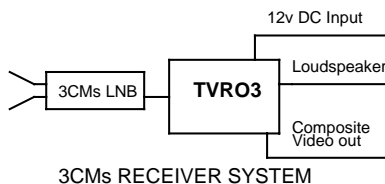
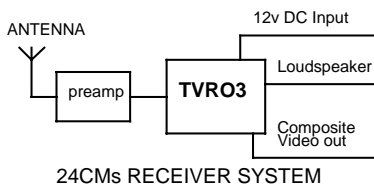
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The kit is simple to construct and due to the nature of the design, absolutely no alignment or setting up is required. Once assembled you're ready to receive.



The kit contains all parts except case, panel mounted components (4 pots and 4 switches plus meter(s) if required) and associated hardware.

**TVRO3 £50 all inclusive.**

### 3CMs LNBs

Low Noise Block converters have been the main contributive factor that has opened up the 3CMs band to ATV. With the low noise figures now available, transmissions are no longer restricted to short clear line of sight paths. Test transmissions have conclusively shown that over the horizon transmissions by various propagation modes are possible. None line of sight transmissions by means of scatter from rain clouds has also been achieved. When equipped with a suitable antenna (dish) operation well in excess of 100Km is readily achievable.

**Brand new converted 3CMs LNBs (JRC)      1.2 - 1.4db Nf      £35 all inclusive**

**S/hand or higher noise figure units as available      £20 to £30 "**

All fully tested with the local oscillator set to either 9 or 9.1GHz +/- 0.01%

## **GUNNMOD2 GUNN DIODE ATV. TRANSMITTER KIT.**

Gunnmod 2 PCB. forms the heart of a compact, fully featured FM. Gunn diode PAL. SECAM. or NTSC. ATV. transmitter with 5.5, 6.0 or 6.5MHz intercarrier sound. The PCB. is suitable for most types of 3CMs and other frequency Gunn oscillators up to 25mW. (300mW with modification)

Equipped with a suitable antenna and RX. L.O.S. transmissions in excess of 100Km are to be expected.

The single 3" by 2" quality PCB. incorporates a stable adjustable Gunn diode, modulator with video pre-emphasis and adjustable deviation, a stable intercarrier sound generator with selectable pre-emphasis, audio limiting, input level control and output filtering.

The PCB. requires a single 10 - 15V DC unregulated supply and consumes only 20mA, excluding the Gunn diode. This makes it ideal for portable or mast head use.

**PCB. with full instructions. You supply components, Gunn osc. case, connectors etc. £5.50**

**PCB. kit with full instructions. You supply Gunn osc. case, connectors ect. (Note 1) £20**

**PCB. kit with Gunn oscillator. You supply case connectors etc.(Note 1 & 2) £30**

Prices are all inclusive.

Note 1. Please state 5.5MHz. 6.0MHz or 6.5MHz audio subcarrier frequency. (6MHz standard)

Note 2. At present Gunn oscillators are good tested surplus units. Supply is limited. Please contact before ordering. Gunn oscillators are pre-tuned to 10.278GHz. Other frequencies at request.

For assembled and tested units, please contact.

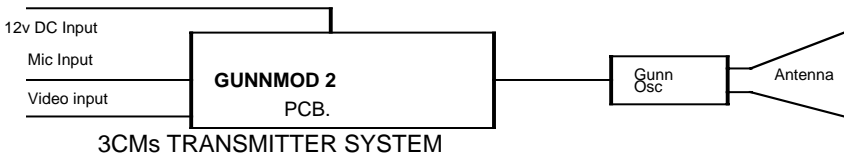
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Wanted

**Wanted:** To complete restoration of NEC 100 camera; A pal encoder board No.11 and a suitable lens. A scrap camera or any other bits would also be most welcome. Bosch KCN portable camera circa 1975 to match the CCU I have already got. A Marconi MKIII camera or parts to make my incomplete camera whole again, any bits most welcome.

A Circuit for Cossor Scope CD130. A Co-processor for a 80286 and some memory in 30 pin format? VPR5 portable video recorder. B. Summers G8GQS 01895 810144/0850 014892

**Wanted:** The following back issues of CQ-TV to complete my collection: 1 ... 93, 95 ... 117, 119, 142, 156 & 157. Either the originals if anyone has spares or borrow, so I can photocopy. All expenses covered. Contact Chris Smith G1FEF, 19 Spital Terrace, Gainsborough, Lincolnshire DN21 2HD. Tel/Fax: 01427 614788, Mobile: 0589 631104

**Wanted:** Philips Colour Video monitor 9" or one similar with a smaller screen, working and in good condition. Colour bar pattern generator with PAL output.

Contact Bob Copeland G4PDF on 01673 857420 (Lincs).

**Wanted:** Dallmeyer 'Super Six' 4" f1.9 lens. Other lenses required: Watson, Taylor Hobson in any condition for Turret Image Orthicon cameras. (ie fixed focus). Also required any old books/brochures on (guess what) Television (technical or otherwise). Contact Dicky Howett 01245 441811 or write 23 Micawber Way Chelmsford Essex CM1 4UG.

**Wanted:** Grundig 2 x 4 super or similar V2000 machine in good working order. Buy, rent or borrow. If you can help please contact Wyn Fieldson on 01923 776792 (Rickmansworth Herts)

**Wanted:** Motorola P210 walkietalkies - any condition John Logie Baird letters etc. contact Piers Bedford 0181 747 0069