CQ-TV

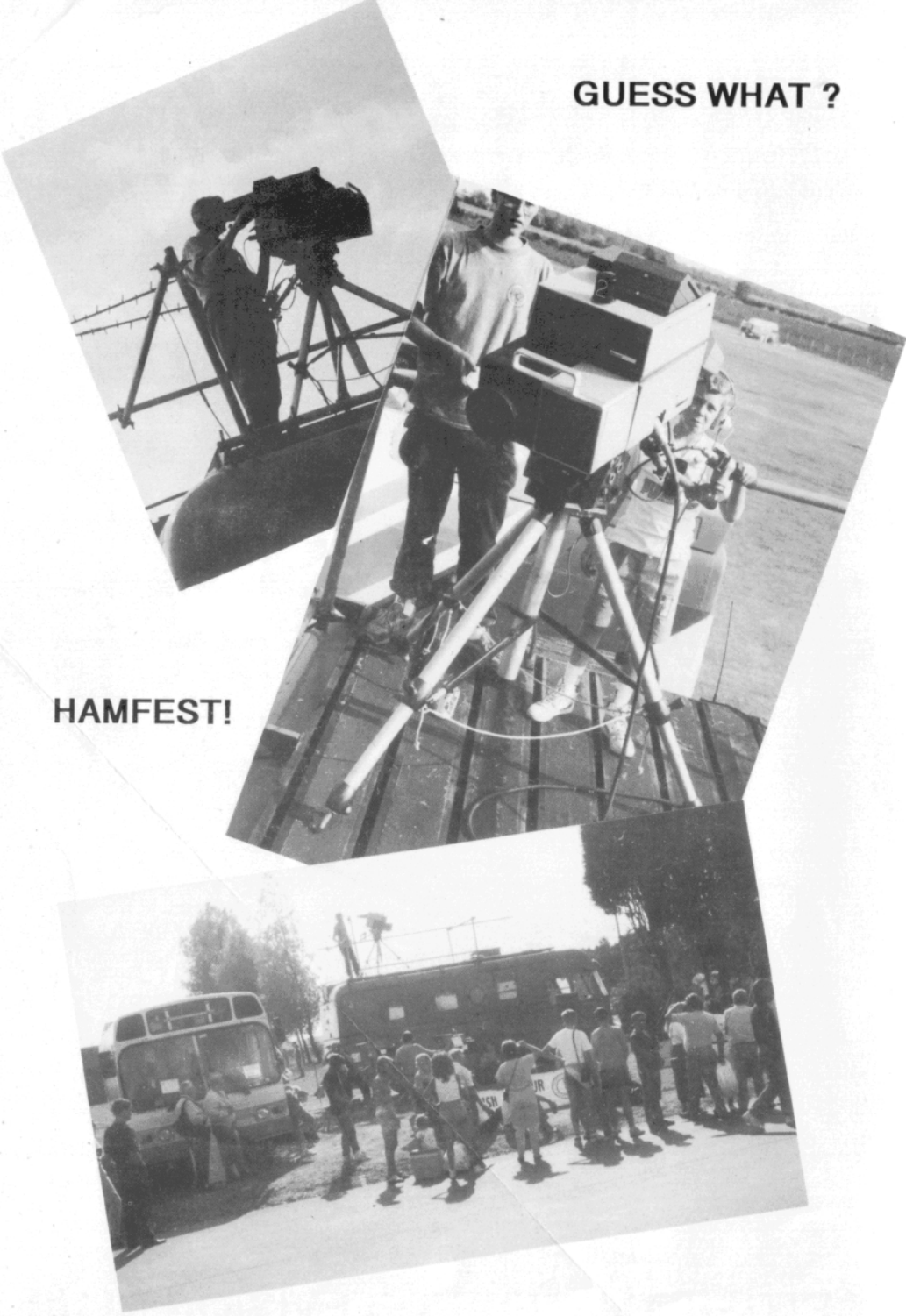
No. 156 NOVEMBER 1991

LINCOLN

HAMFEST

BRITISH AMATEUR TELEVISION CLUB

GUESS WHAT ?



HAMFEST!

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CLOSE FOR PRESS FOR THE NEXT ISSUE ..... **20th DECEMBER 1991**

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WHO TO WRITE TO

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

CQ-TV MAGAZINE - Anything destined for publication in CQ-TV magazine or forthcoming BATC publications. Articles; review items; advertisements; other material. EDITOR: MIKE WOODING G6IQM, 5 Ware Orchard, Barby, Nr. Rugby CV23 8UF Tel: (0788) 890365 (Answerphone). FAX: 0788 890365.

CLUB AFFAIRS - video tape library; technical queries, especially related to handbook projects: TREVOR BROWN G8CJS, 14 Stairfoot Close, Adel, Leeds LS16 8JR. Tel: (0532) 670115

MEMBERS SERVICES - PCB's; components; camera tubes; accessories etc. (other than publications); queries related to such supplies: PETER DELANEY G8KZG, 6 East View Close, Wargrave, Berkshire RG10 8BJ. Tel: (0734) 403121

MEMBERSHIP - Anything to do with membership including new applications; queries and information about new and existing membership, non-receipt of CQ-TV; subscriptions; membership records; data protection: DAVE LAWTON G0ANO, 'Grenehurst', Pinewood Road, High Wycombe, Bucks HP12 4DD: Tel: (0494) 28899

GENERAL CLUB CORESPONDENCE & LIBRARY - Any general club business. Queries relating to the borrowing or donation of written material. PAUL MARSHALL G8MJW, Fern House, Church Road, Harby, Nottinghamshire NG23 7ED: Tel: (0522) 703348

PUBLICATIONS - Anything related to the supply of BATC publications. IAN PAWSON G8IQU, 14 Lilac Avenue, Leicester LE5 1FN Tel: (0533) 769425

EXHIBITIONS AND RALLIES - also arrangements and information about lectures and talks to clubs; demonstrations etc: PAUL MARSHALL (address as above).

CLUB LIAISON - and anything of a 'political' nature; co-ordination of ATV repeater licences: GRAHAM SHIRVILLE G3VZV, The Hill Farm, Potsgrove, Milton Keynes, Bucks MK17 9HF. Tel: (0525) 290 343

PUBLIC RELATIONS AND PUBLICITY - IAN SHEPHERD, Grosvenor House, Watsons Lane, Harby, Melton Mowbray, LE14 4DD. Tel: (0949) 61267

TVI & RADIO INTERFERENCE - problems of this nature to: LES ROBOTHAM G8KLH, 38 Ennerdale Avenue, Stanmore, Middx. HA7 2LD. Tel:(01 907) 4219 (not committee).

CONTESTS - BOB PLATTS G8OZP, 8 Station Road, Rolleston-on-Dove, Burton-on-Trent. Tel: 0283 813181.

CQ-TV AWARDS - BOB WEBB G8VBA, 78 Station Road, Rolleston-on-Dove, Burton-on-Trent, Staffs, DE13 9AB. Tel: 0283 814582

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

POSTBAG

THANK YOU

Dear Mike

Joining the BATC some 5 months ago, my wife and I ventured north to the Harlaxton Manor convention.

The point of this letter is to say thank you on behalf of Joyce and myself for this excellent first prize of a VCR as we bought the winning ticket in the raffle. Thanks also to the trader who donated the machine.

My first ATV rally and a good day it was.

Thanks again .. 73 Morris G1PIB

THE FORGOTTEN ONES!

Dear Mike,

I read with great interest the two very good articles in CQ-TV 155 regarding the 1991 Spring Vision Contest. Both articles referred to the splendid efforts of Clive G8EQZ and Richard G4YTV and how they won the 70CM section with 2468 points. Bob was quite right with his comments about being noticed with so much ERP.

Our effort, with ONLY 200W into 4 x 16ele, was obviously not noticed according to the magazine. But in fact it was noticed by the 20 stations that we worked, giving us a total of 4127 points, which I believe makes us winners on 70CM, a fact proved by receipt of printout and certificate sent to me by Bob, also, the results of our 24CM entry which was not published either.

Whilst on the subject of contests, what has happened to the results of the 1990 Autumn Vision? I have not received them from Bob, neither have they been published in CQ-TV.

Perhaps we should have stayed at home for these two contests, or maybe we did and only dreamt that we went /P on a mountain in Wales.

May I take this opportunity to thank all the stations that have worked us in past contests, helping to make us a successful group.

73 ... John G4ZJY - GW7ATG/P

AT LAST - A LIFT!!!

Hi Mike,

after waiting patiently for conditions to lift on 70CM following the lift on 2M a few days earlier, at last it came. On 28 August at 2203 GMT IT HAPPENED, with a P1 both ways with Jeff F1IFR. My first ATV from France.

This was followed by a receive only at 2341 GMT from PA3DEE (JO33TT) on 24CM - some very nice shack shots.

On 30/08/91 at 1933 GMT a P5 both ways with PE1HXD (JO33CF) on 70CM - excellent pictures from Holland. Then at 2033 GMT PE1LRS (JO33CE) and at 2218 GMT PA3DEE both P2-3 receive only on 24CM.

PA3DEE and PE1LRS both accessed GB3RT (Coventry 24CM FM ATV repeater)with very good quality through pictures - a first for GB3RT since its move to Coventry from your QTH.

The Dutch stations were worked by a number of Coventry stations on both bands, including G8ONX, G1IJT, G0HOV and G1MSA.

73 ... Steve G6WLM, Manager GB3RT

24CM DX IN HAMPSHIRE

Dear Mike

Whilst on holiday this August on the Sandbanks peninsula just beyond Bournemouth, I decided to try out my 24CM equipment. I had a 39-ele loop yagi and a preamp -well two preamps in cascade actually - but didn't hold out much hope as the aerial was only 15 feet above sea level. I beamed hopefully towards Brighton, tuned to where I thought 1318.5MHz might be on the RX and was rewarded with some almost locking line syncs on the monitor. A little further

adjustment of the aerial and tuning revealed fully locked pictures occasionally trying to lock in colour as well,

I sat through a considerable quantity of 'home video' type material on which the call sign G1SBZ was superimposed, and then finally in full colour lock at P5 came the Brighton ident caption.

Pictures were received throughout the evenings of most of the two weeks that I was at Sandbanks and the picture would come up and down from total noise usually to a P4 or so, with brief periods of P5. During the daytime there was nothing most of the time, but occasional watery syncs.

I also saw pictures from G8KOE (Littlehampton) via GB3VR, but as the repeater seemed to be in use solidly by its regulars, I did not get a chance to transmit into it. Also, it seems that SU18 was being monitored for talkback and I had no 70CM gear available.

I did however raise G8LES at Four Marks on 144.750 and received about a P3 from him (simplex).

Considering the distance of some 120kM between Sandbanks and Brighton and the unfavourable height for the aerial I was not altogether disappointed.

73 ... John Bales G0HAT

AN EXPEDITION TO 'ZZ' LAND

August Bank Holiday weekend approached and as usual there were LOTS of things I could do with it. One of those could be to drive down the M5 with a car load of ATV gear and attempt to receive what was claimed to be the busiest and most advanced ATV Repeater in the country.

First questions were, how far out of Bristol did ZZ's signal extend and where would I actually go with the car? My map marked a viewpoint a few miles west of Junction 14, about fifteen miles from where I understood the repeater site to be, but a call to the Severnside Group contact number only gave their answering machine. Never mind, go anyway and try it!

All the gear was thrown into the Capri, (I use a long checklist now, but still stopped twice before the M42 the make sure that connector was REALLY packed) and only an hour and a half later I had found a spot commanding at least a clear view to the south.

DAY 1 (Sunday): I erected the beam on a short mast attached to the roof rack and sorted out the power leads to the Wood and Douglas receiver and portable 5" monitor. I was not expecting much, if any, success at a pot luck location, but powered up and tuned around.

WOW! A P5 picture straight away!

I couldn't believe it! Clean colour test card, followed eventually by another. Then, after a colour bar screen a page of text. Oh dear, a lot of words for a 5" screen, then more test cards.

During the next hour or so, some aerial views of the city came through and several pages filled with text. These were almost impossible to read on the small screen so I recorded them.

I returned to the sight later in the afternoon and rigged up once more. Again a P5 picture and a studio discussion in progress! Looked like John Wood(?) (*Andy Emmerson ... Ed*) talking test cards with a BBC chap. I began to watch this with interest, was this programme coming in from somewhere or was it on the repeater VCR???? (*Yes, contact Andy Emmerson for information concerning this tape, or see his advert in market place ... Ed*). Unfortunately, sound and vision cut off in mid sentence to be replaced with one of the cards. I am still wondering what happened ?

I went back to Birmingham eager to replay the tape, only to find nothing on it! I had left the camera plugged in, which had disabled the video input socket! Was it worth going down on the Monday to have another look?

DAY 2 (Monday): Yes it was. Same place, P5 again, loads of test cards. Waited about half an hour then up came the first page of text. This time managed to record them all

... WHAT a clever repeater! Well done the Severnside Group. I'll have to get myself a DTMF keypad before my next visit.

Graham Hankins G8EMX

If you have any stories such as Graham's with 'ZZ, or any other repeater, or whatever, retelling your exploits in the search for the ultimate ATV picture, then send them into me ... Ed.

STILL ACTIVE!

Dear Mike,

This is the first letter I have written for over 2 years, due to my eye troubles. I have had an operation on my right eye and that is much better, but I am still carrying on with ATV etc. with Maud's help.

I have recently built a 70CM TX for G4JSR and I am helping G8HHR, so you can see I am still active. Incidentally, I think I am amongst the oldest members of the BATC. I joined in 1951 when I was service manager at Yorkshire Electricity Board and just to remind the Club I am 80 in 2 months.

I have CQ-TV Bronze, Silver and Gold No.2 and Diamond Awards now. I am still active on 24CM but I don't have anyone to cooperate with. We have a good 70CM net on Tuesdays at 2000 hours and Sundays at 1100 hours comprising of: G1UGD, G1TBL, G4JSR, G8HRR, G5KS (me!) and G0KJG. Soon G4DYP will be rejoining us after 8 years QRT!

I wonder if it is possible to publish a list of 24CM ATV repeaters that are active (see the Repeater Affiliation news page 75 ... Ed) and I suggest that it would be a good idea if it was known how many BATC members have what awards. It might help to increase activity!

73 Arthur G5KS and wife Maud

NEWS ROUNDUP

MEMBERS SERVICES

Members Services are offering a SPECIAL OFFER in this issue - see the Market Place pages, and look out for a different special offer in the next CQ-TV.

Included in the Members Services lists will be found the items for the I2C project available when the CQ-TV list was prepared. The I2C relay board is expected shortly. Those who want details, or advance information on future items for the I2C project, should send a suitably stamped and addressed envelope to Members Services. (The components for the I2C CPU PCB are not stocked by Members Services as they are readily available elsewhere.)

BATC Members Services does not hold stocks of BATC publications, and vice versa. Please note that only the items listed in the CURRENT "Services for Members" leaflet are available - a description of most the various PCBs and components can be found, in the "What's What" supplement sent with CQ-TV 149. The postage rates are for a single item -please estimate the correct sum if ordering more than one item. Overseas members requiring surface mail, or in Europe should double the U.K. rates listed.

Members requiring airmail postage to outside Europe should write to Members Services for a quotation for postal costs. To avoid delay and inconvenience, please be careful to include the correct amount of VAT with your order, currently 17.5% of total goods AND postage, unless an overseas member. Payment should be by cheque or crossed postal order in favour of BATC - do NOT send cash or stamps please.

Members are advised to check the availability of items limited to stock BEFORE placing their order.

VIDICONS

Tubes available include electrostatic focus or deflection, and low light types not previously available to club members. Prices vary depending on the size, type and grade of tube. A tube guide appears in CQ-TV 149 and 150. Please contact Members Services for further information. The stripe filter tubes used in domestic type colour cameras are not available through BATC, and normally must be ordered direct from equipment supplier.

RF DEVICES

We are sometimes asked where semiconductors suitable for use at 70cm, 24cm, or beyond, are available. The following suppliers are known to supply useful ranges of devices:-

Bonex, 12 Elder Way, Langley Business Park, Slough, Berkshire, SL3 6EP. Tel 0752 49502.

Mainline Electronics, PO Box 235, Leicester, LE2 9SH. Tel 0533 777648.

Piper Communications, 4 Severn Road, Chilton, Didcot, Oxon, OX11 0PW. Tel 0235 834328.

Raedek Electronics, Bannerley Road, Garretts Green, Birmingham, B33 0SL. Tel 021 784 8655.

Transistor International Corporation, 18 West 21 Street, New York, NY10010. Tel (212) 675 6722.

The first three companies mentioned attend amateur radio rallies from time to time, and stock RF power devices as well as small signal ones for receivers etc. Bonex and Mainline also stock the Avantek GaAsFet devices, including MMICs, whilst Mainline also include the 24cm 10 watt 'black brick', and items for 10GHz. In addition, of course, is J Birkett, 25 The Strait, Lincoln, LN2 1JF (Tel 0522 520767) who deals in 'surplus' RF devices. They attend many of the rallies, and also advertise regularly in 'RadCom'. There are, no doubt, other suitable suppliers. If you can recommend a firm, please share the details in CQ-TV.

AMATEUR TELEVISION TEST BEACON OPERATIONAL

A fast scan television beacon operating on a 24hr basis using the callsign of G0NAA is now on air on 1318MHz running 25w ERP from Aldbrough, East Yorkshire.

The purpose of the beacon is to assess the coverage area of a proposed 24CM television repeater for the East Yorks/North Lincs area to be located at the QTH of G0NAA. The site, which will be shared with the relocated GB3HA (70CM, RB6), is very close to the North Sea coast and about 15 miles ENE of Hull. The QTH Locator is IO93WT.

The screen display is generated using part of a teletext chip set and contains colour bars and an information panel. The TX is a Solent driving a Mitsubishi brick to 17W output. The aerial is a G3JVL Alford Slot with about 6dBd gain at 75 feet AGL, fed by 90 feet of Pope H100. The site is 70 feet ASL.

So far P5 reports have been received from Bridlington and Skirlaugh, P4 from Hull and intermittent reception peaking P4 in Mablethorpe. Further reports are most welcome and should be sent to G8EQZ or G4YTV QTHR or by packet to G8EQZ @ GB7GBY.

The beacon is also serving to judge the support for the project. Should there be little interest the project is likely to be scrapped as the pockets of G8EQZ AND G4YTV have a finite depth! If you are unable to receive 24CM TV, but are interested in supporting the project, assistance is available to help you get going on 24CM TV. Contact G8EQZ/ G4YTV.

QUAD LOOP YAGIS

Whilst at the Telford rally I found a new manufacturer of the ubiquitous qaud loop yagi aerial.

The models presently made are an 18-element at £35.00 and a 38-element model at £70.00.

Both models are quoted as covering the whole 23-24CM band, which makes them ideal for ATV use.

The quoted gains are approximately 12-13dB for the 18-ele and 15-16dB for the 38-ele.

Further details can be obtained from: VK Antennas, Four Winds, Walton Hill, Deerhurst, Gloucestershire, GL19 4BT. Tel: 024 268 0540.

BSkyB VERSUS FILMNET

British Sky broadcasting is stepping up its attempt to stamp out illicit viewing of Belgian-based film channel Filmnet in the U.K.From August, BSkyB plans to plans to strip its dish dealers of the 'Sky authorises' status if they are found selling decoders for FilmNet.

There are no accurate figures on the number of pirate viewers FilmNet has in this country, but Sky is concerned that it is losing potential subscription revenue to its own two movie channels.

FilmNet decoder owners pay a one-off fee of about £125 for the black box, but avoid paying further monthly subscription fees because the channel is not legally available to viewers living outside Scandinavia and the Benelux countries.

SATELLITE TV NEWS

Trevor Brown G8CJS

Steve Roberts is the proud USA owner of a bicycle called Behemoth. What has this to do with Satellites? Well, Steve's bicycle is equipped with a Qualcomm terminal, a GPS receiver, cellular phone, micro computer, and ham radio station, but as yet no ATV equipment. The whole system including trailer weighs 350 pounds, compared to an expensive racing bike which weighs in at 22 pounds. It may not be the ultimate in pedal performance, but it may be hard to find a more expensive bike. Valued at $1.2 million Steve's Behemoth enables him to tour the USA whilst making a living writing books, articles, and a newsletter called Nomadness. Anyone out there got a copy? I would love to read it. Sorry I don't have his callsign, but if you should work an out of breath stateside mobile station with the handle of Steve, be sure and ask him to send me a QSL card.

Real-World Technology The electronics and design consultancy of our long standing member Steve Birkhill is on the move to new larger premises in Derbyshire to accommodate an even larger dish farm. Good luck Steve.

ASTRA 1A & 1B (19.2 deg East)

Doubts are continuing about the reliability of Astra 1B. The problems seem to be centred on earth lock, a problem with connections to the momentum wheel. It is believed that the earth sensor may be unlocking from the edge of the earth, causing the momentum wheel to fail to keep the craft pointing correctly. Some

sources suggest that the craft is being pointed manually, this could possibly account for the complaints about signal strength.

Sky News (transponder 12: 11.3765GHz V) has been noted broadcasting its normal audio on the additional subcarrier of 7.56 MHz. The channel normally broadcasts audio on 6.50MHz mono and 7.02 and 7.20MHz for stereo.

Sky Movies (transponder 16: 11.43550GHz V) is now carrying a new music service for the ASDA supermarket chain on a 7.74 MHz subcarrier. This is the first such service in the UK, and at the moment is just an experiment. The service will move to transponder 18 (11.47900GHz V) at the end of October, alongside Sunrise Radio, which is to be found on a 7.38 MHz subcarrier.

Filmnet is reported to have begun test marketing of decoders capable of both RTL4 and Filmnet. Sky Television is to charge for Sky one, Sky News, and Sky Sport, from the end of next year. Sky has also announced that it is withdrawing authorised Sky Agent status from dealers who sell Filmnet decoders. Filmnet has recently introduced digital audio encryption so these pirate decoders are now of little value.

TV1000 is now on Astra 1A (transponder 7: 11.30275GHz H) although it is intended that this channel will use Eurocrypt in the near future, at the moment is is using the inversion option of D2 MAC, with clear D2 MAC for programme trailers in the morning.

EUTELSAT II F1 (13 deg East)

Transponder 46: 12.584GHz V has been broadcasting 16:9 aspect ratio pictures using D2 MAC. Demonstrations have been clear and in Eurocrypt. Transponder 47 (12.625GHz V) has also been broadcasting wide screen D2 MAC pictures. Clear HDTV (Eureka) demonstrations have been broadcast during the day. Transponder 49 (12.708GHz V) has been used by TV sport to provide alternative programming for France.

Sept 18th saw MBC (Middle East Broadcast Centre) open up on transponder 32 (11.5544GHz H) at 1800 BST, with readings from the Koran in Arabic. The studio operation is London based. Transmissions are in clear PAL and the test card is certainly worth a look.

The upper half of transponder 20 (11.012GHz H) is being used for occasional material from Scandinavian television. Feeds are in clear PAL.

EUTELSAT II F2 (10 deg East)

Transponder 37: 11.575GHz V has been seen active with clear PAL test bars.

EUTELSAT 1 F4 (7 deg East)

Worldwide soccer continues on the upper half of transponder 6 (11.676GHz H) the transmissions are in PAL with raw audio at 7.40 MHz and commentary added at 6.60MHz Transponder 3 11.178GHz H has been used for occasional feeds from Yugoslavia. Live feeds for Sky News have also been seen along with Starbird SNG all signals are in clear PAL.

TELECOM 1A (8 deg West)

Now seems to be carrying Eurosport on transponder R4 (12.648GHz V) in clear PAL.

OLYMPUS 1 (18.8 deg West)

The European Space Agency has now regained control of this satellite and hopes it will be back in service by late autumn.

Please send any information you may have relating to satellite TV to: Trevor Brown, 14 Stairfoot Close, Adel, Leeds, LS16 8JR.

S-VHS/CVBS to RGB CONVERTER

This article first appeared in the September and October 1990 issues of Elektor Electronics and we wish to thank the Editor for permission to reproduce it in CQ-TV.

H.Reelen

Although the technical advantages of the Super-VHS video system are well proven, many owners of a S-VHS video recorder balk at the expense of a compatible monitor or TV set with separate luminance and chrominance inputs. This article describes an obvious missing link in the apparently ever-incompatible field of video equipment connections. An advanced circuit is discussed that converts S-VHS or CVBS (composite video) signals into RGB components.

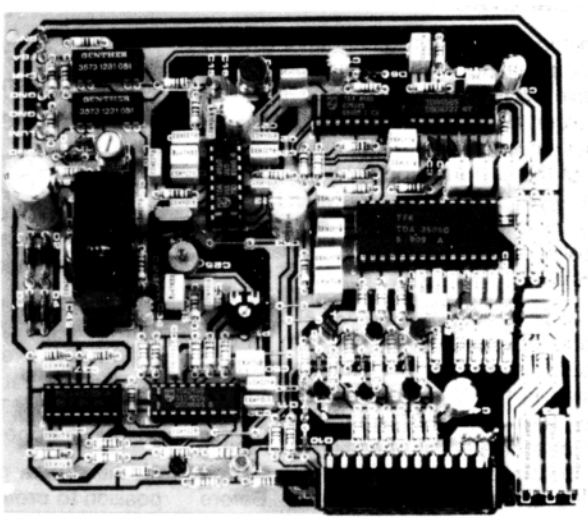
The upshot is that you can use your existing monitor with an RGB input (i.e. SCART or Euro-AV connection) to benefit from the improved picture resolution offered by an S-VHS video recorder. We shall begin this project with a discussion of the basics of the video standards involved.

A point worth repeating is the fact that this unit will convert standard composite video to RGB and composite sync ... ED.

The compatibility issue has played a significant role in the development of both the NTSC and the PAL TV transmission systems. In both cases, there were two conflicting aspects: on the one hand, existing monochrome TV sets were not to be affected by colour transmissions; on the other hand, existing bandwidths of about 5MHz for the luminance (brightness) signal were to be maintained.

The compatibility requirement automatically dictates that the black-and-white information (luminance or "Y" signal) must also be conveyed in colour transmissions. The Y signal forms the sum of all basic colours, red (R), green (G) and blue (B), but only as far as their relative brightness is concerned.

From perception experiments, the brightness appears to determine the overall sharpness of the picture. Hence, the luminance bandwidth must be as large as possible (up to 5MHz) for monochrome as well as colour TV sets. However, this raises the problem of where to put the colour information.



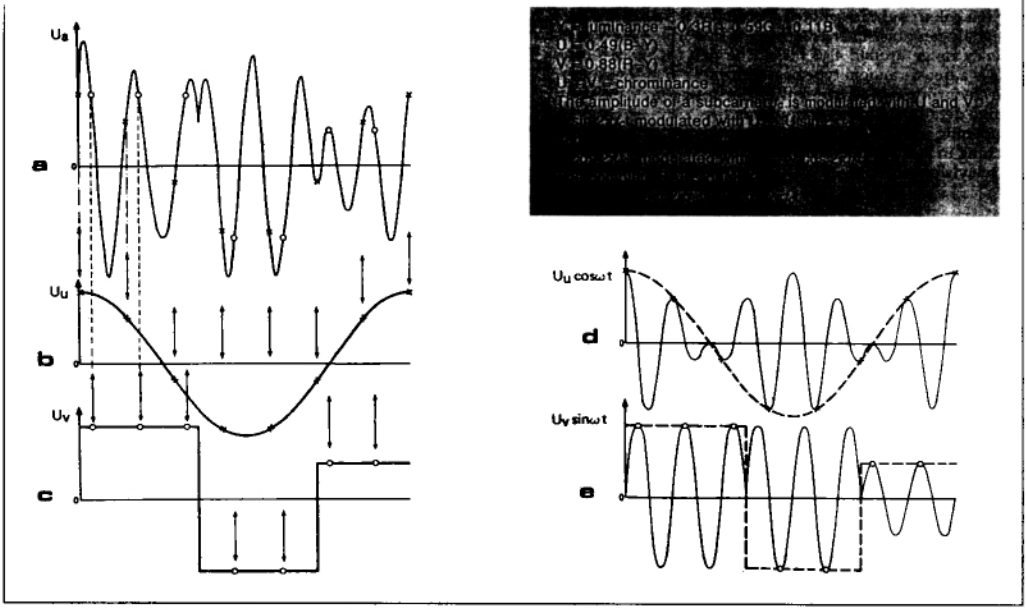


Fig. 1. Signal waveforms resulting from quadrature modulation of the colour difference signals $U_u = 0.49(B-Y)$ and $U_v = 0.88(R-Y)$. Drawing 'a' shows the quadrature-modulated signal U_a, while 'b' and 'c' show the modulation signals U_u and U_v, which for clarity's sake are formed by a sinusoidal waveform and a rectangular waveform respectively. Drawings 'd' and 'e' illustrate how these signals are modulated on to the 90-degrees shifted carriers. The waveform shown in drawing 'a' is the result of adding the signals in 'd' and 'e'.

COLOUR COMPONENTS AND TRANSMISSION

Any colour can be reproduced on a picture tube by actuating in the correct proportion the basic colours it is composed of. The final colour is obtained by controlling the intensity at which the RGB pixels at the inside of the picture tube light up. To the human eye, the three individual basic colours in a pixel group appear as one, composite, colour or hue at a particular saturation.

The need to convey R, G and B is, therefore, obvious. Since the sum of the equivalent levels of all three is already contained in the Y signal, only two further signals, R-Y and B-Y are generated by means of a differential operation with the Y signal. R-Y and B-Y are therefore referred to as the colour difference signals. Before these signals are transmitted they are given relative brightness factors. the resulting chrominance signals may be written as:

$$U = 0.49(B-Y)$$

$$V = 0.88(R-Y)$$

and the luminance Y as:

$$Y = 0.3R + 0.59G + 0.11B$$

The RGB intensity information required to control the respective electron guns in the picture tube is obtained from the R-Y, B-Y and Y information with the aid of an addition operation in a matrix circuit.

A problem that remains to be solved is how to include the colour difference signal in the bandwidth already occupied by the Y signal, without causing interference on monochrome TV sets, or reducing the picture sharpness on colour sets.

At this point design engineers are in a position to profit from a characteristic of the human eye, namely its reduced ability to

resolve colour contours as compared to brightness values. This means that the colour information may be transmitted at a relatively low bandwidth without significantly degrading the overall sharpness of the picture. In the PAL system, the colour (or chrominance) bandwidth is about 1MHz.

The colour difference signals are readily embedded in the frequency spectrum of the Y signal by making use of the fact that the spectral lines of the Y signal occur at even multiples of the line frequency (15,625Hz). Also, the amplitude of these spectral lines decreases with frequency.

The colour difference signals modulate a subcarrier of which the frequency fc is an odd multiple of the line frequency divided by four, plus the picture refresh frequency:

$$fc = 1135 \times (15625/4) + 25\ Hz$$

This causes the spectral lines of the colour difference signal to be slotted in between those of the Y signal. The colour subcarrier frequency is set at 4.43361875MHz, and the colour difference signals are quadrature-amplitude modulated (QAM). The B-Y and R-Y components modulate the amplitude of the colour subcarriers of 0 degrees and 90 degrees respectively (see Fig's.1d and 1e).

The carrier itself is suppressed so that it has an amplitude of nought in the absence of a colour difference signal. This is done to keep the picture free from interference caused by the otherwise continuously present subcarrier. In order to eliminate the risk of phase shifts in the transmission path, the phase of the R-Y component is inverted every other picture line.

The use of amplitude modulation with suppressed carrier requires a phase and frequency synchronised subcarrier at the receiver side. In a TV set the modulated R-Y and B-Y components are recovered from the chrominance subcarrier with the aid of a 4.433MHz quartz crystal oscillator whose phase and frequency are corrected every 64us by a 2us long burst signal slotted into the rear porch in the blanking period at the beginning of every picture line. The burst consists of 8 to 11 cycles of the colour subcarrier frequency and follows the line sync pulse, as shown in Fig.2. A phase comparator is used to keep the crystal oscillator synchronised to the received burst, which also contains the PAL switch signal for the line-by-line R-Y phase reversal. This arrangement ensures that the R-Y signal in the receiver is inverted in synchronism with that at the transmitter side, to ensure that the demodulation operation can work correctly.

PITFALLS

In practice, the "packaging" of the luminance and the chrominance information into a single CVBS (Chrominance-Video-Blanking-Synchronisation) signal is not without problems. Since the colour subcarrier falls in the spectrum of the luminance signal it causes a finely patterned type of interference known as "MOIRE".

Luminance circuits in all modern TV sets are therefore fitted with a "colour trap", which is a relatively simple filter that removes most of the moiré effects with the exception of those occurring at areas with sharp colour transitions. Here large phase jumps give rise to subcarrier sidebands that fall outside the stop band of the 4.43MHz colour trap.

Unfortunately, Y signals in this stop band are also suppressed, which results in reduced picture resolution, because some

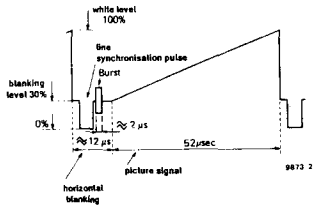


Fig.2 Structure and Timing of a PAL Composite Video signal

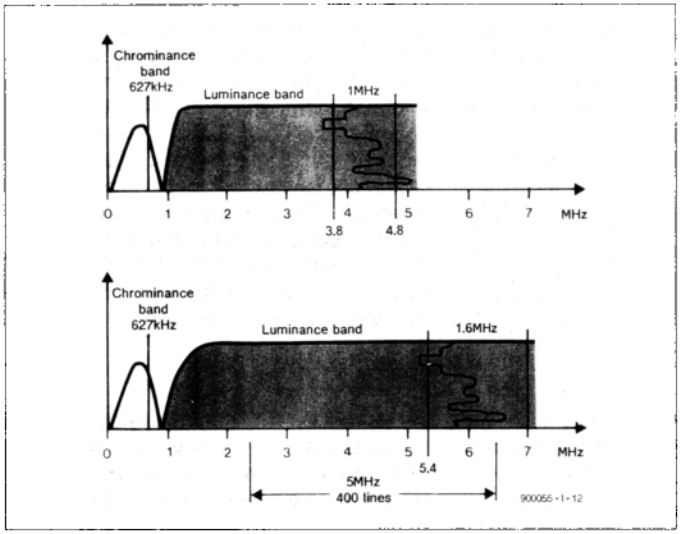


Fig. 3. Typical standard-VHS and S-VHS spectra. In both cases, the quadrature-modulated colour signal is recorded with the aid of a carrier which is mixed down to 627 kHz, while the luminance signal (Y) is recorded in FM. S-VHS recorders use a luminance carrier frequency of 5.4 MHz and a frequency sweep of 1.6 MHz. This offers a bandwidth of 5 MHz for the Y signal, as opposed to about 3 MHz for the standard-VHS video recorder.

of the high frequency components disappear. Incidentally, most monochrome sets also contain a colour trap to eliminate moiré.

The (possible) interference between chrominance and luminance also works the other way around: since the luminance band includes the frequency range for the colour subcarrier, high frequency Y signals can cause interference in the frequency range around 4.43Mhz. The result is a quasi-random type of patterning and colouring around picture areas of fine detail. Notorious examples of this happening can be seen virtually every evening in jacket, shirts or ties of people on television.

STANDARD VHS VIDEO RECORDERS

Some fifteen years ago, during the development of the VHS video system, a luminance bandwidth of 3MHz was deemed satisfactory for VCRs, considering the technical limitations imposed by the drum head speed and the tape consumption rate.

In the original VHS system the colour subcarrier is mixed down to 627kHz to keep it well away from the lower end of the spectrum of the Y information, which is recorded as a frequency modulated signal.

Fig.3 illustates the spectra of both standard and super VHS recordings

The FM recording improves the signal-to-noise ratio of the luminance signal and makes it, largely independent of amplitude variations of the tape signal. The frequency sweep ranges from 3.8MHz to 4.8MHz.

Returning to the colour information, this is recorded as an analogue signal in "helical scan" mode. The different frequencies used allow ready separation of the two signals. However, the bandwidth of the colour information is inevitably reduced to about 500kHz. The result is noticed as "smeared" colour transitions to which the reduced (3Mhz) luminance bandwidth adds an impression that then picture is blurred.

These imperfections of the original VHS system were soon recognised by VCR manufacturers. Their answer, the HQ video recorder, was based on small improvements to the recording method, and a better edge definition of the Y signal. The resultant picture quality improvement was marginal and not really a step forward. It was, however, the best that could be

achieved given the need for continued compatibility. Clearly, real improvements to the picture quality offered by some VCRs could be achieved only by changing some of the standards.

THE SUPER-VHS SYSTEM

The bandwidth of the recorded video signal was increased significantly (at the existing relative speed of 4.85 metres/s between the tape and the head) by virtue of two technological developments.

First, new metallurgic techniques allowed the size of the air gap of the video head to be reduced. Second, tapes with a very high magnetic particle density became available.

To maintain compatibility with older VHS recorders, the S-VHS system is based on the same method of colour recording (see Fig.3). However, the frequency sweep of the Y signal is shifted up to a band from 5.4MHz to 7.0Mhz, to give a much higher noise margin. At the same time, the frequency of the FM subcarrier allows the luminance signal to be recorded at its full bandwidth of about 5MHz.

In most standard VHS video recorders, the chrominance and luminance signals are processed separately until they are combined to give a CVBS signal with all the previously mentioned risks of running into trouble with interference.

By contrast, the S-VHS system is based on separate chrominance and luminance signals right up to the two associated outputs on the VCR. Evidently, this separation is not perfect when, for instance, a TV programme is recorded, since then the chrominance and luminance components must be extracted from the composite signal before they can be recorded, played back, and fed separately to a monitor.

The process of extracting the components has pitfalls as described before. Not so, however, with video sources that do supply the components separately. Examples include S-VHS cameras, some prerecorded S-VHS tapes and MAC decoders.

CONNECTION PROBLEMS

So far so good. A look at the rear panel of the TV set, however, reveals that there is, at best, a SCART connector, which does not allow luminance and chrominance signals to be taken in separately. The TV set is, therefore, not S-VHS compatible. This unfortunate discovery forces owners of S-VHS recorders to connect the monitor and the recorder via a CVBS link, forgoing most of the advantages of better picture reproduction offered by the new video system.

Considering the cost of an S-VHS compatible monitor, the only way to benefit from the separate chrominance and luminance signals supplied by the S-VHS recorders, and other video sources, is to convert these to RGB signals that can be applied to the existing monitor or TV set via its SCART input.

The circuit described here does just that and in addition, the circuit provides a colour transition improvement (CIT) function and is capable of converting standard CVBS (composite video) to RGB and composite sync.

FROM COMPOSITE TO RGB

Although most modern standard video recorders have a SCART socket this rarely supplies RGB signals. Likewise, most set-top TV tuners and indoor units for satellite TV reception supply a CVBS signal only. A problem arises when this equipment is to be connected to a high resolution colour monitor with analogue RGB inputs, or a TV set with a SCART (Euro-AV) input.

In both cases, the converter described can link this equipment and ensure optimum picture quality.

CIRCUIT DESCRIPTION

As shown in Fig.4 the converter has three video signal inputs:

- CVBS with an input impedance of 75 ohms. This input is suitable for connecting to video sources (VCRs, cameras, camcorders and home computers) that supply the standard composite video signal at around 1V peak-to-peak (p-p).

- Y (luminance, or brightness) with an impedance and sensitivity of 75 ohms and 1V p-p respectively. The Y signal is processed without a colour trap, at a bandwidth of up to 7MHz.

- U/V (chrominance, or colour information) with an input impedance and sensitivity of 75 ohms and 0.5V p-p respectively. This input feeds the colour signal to the PAL decoder in the circuit.

LUMINANCE PROCESSING ... The Y and U/V inputs are used with S-VHS equipment. The CVBS input may be connected to equipment that supplies a composite video signal. Two relays, Re1 and Re2, are used to switch between S-VHS and CVBS operation. The convertor is switched to CVBS operation by applying +12V to the S-VHS/NORM control input. S-VHS operation is selected by leaving the input open circuited. Relay Re1 then feeds the Y signal to IC2 via coupling capacitor C2.

As shown in the block diagram in Fig.5, the TDA4565 device contains a colour transient improvement (CTI) circuit and a delay line for the Y signal.

This delay line is an essential part in any colour TV set because the luminance signal has a much greater bandwidth than the chrominance signal, and hence requires a delay of about 800ns.

A number of gyrators in the TDA4565 allow delay times between 690ns and 960ns to be set in steps of 90ns, with the aid of a control voltage applied to pin-15. In the present circuit the delay is set to 780ns by potential divider R9-R10. Coupling capacitor C56 feeds the delayed Y signal supplied by pin-12 of the TDA4565 to pin-15 of the colour matrix circuit, a TDA3505 (IC7). The delayed Y signal has an amplitude of about 0.5V p-p.

CHROMINANCE PROCESSING ... The chrominance signals are passed to the decoder via the contact of Re2. Before they arrive at the PAL decoder, a TDA4510 (IC4) the U/V signals are attenuated by R16-R17, and taken through a high-pass filter composed of C15-C16-L2.

The TDA4510 was originally designed for use with a glass delay line which serves to store the chrominance signal of the previous picture line. In the present circuit the TDA4510 works without this crucial part, whose delay time of one picture line

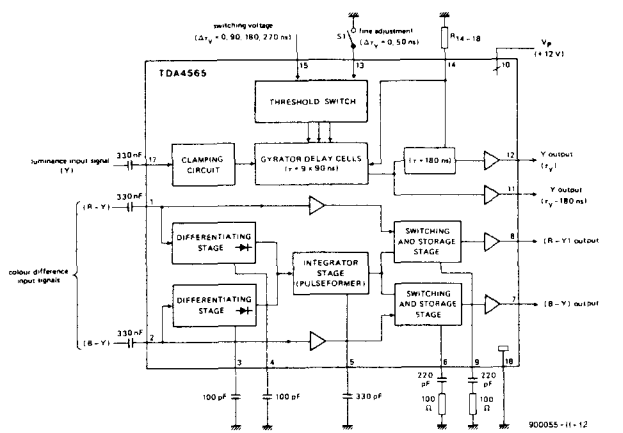


Fig.5 Block Diagram of the TDA4565

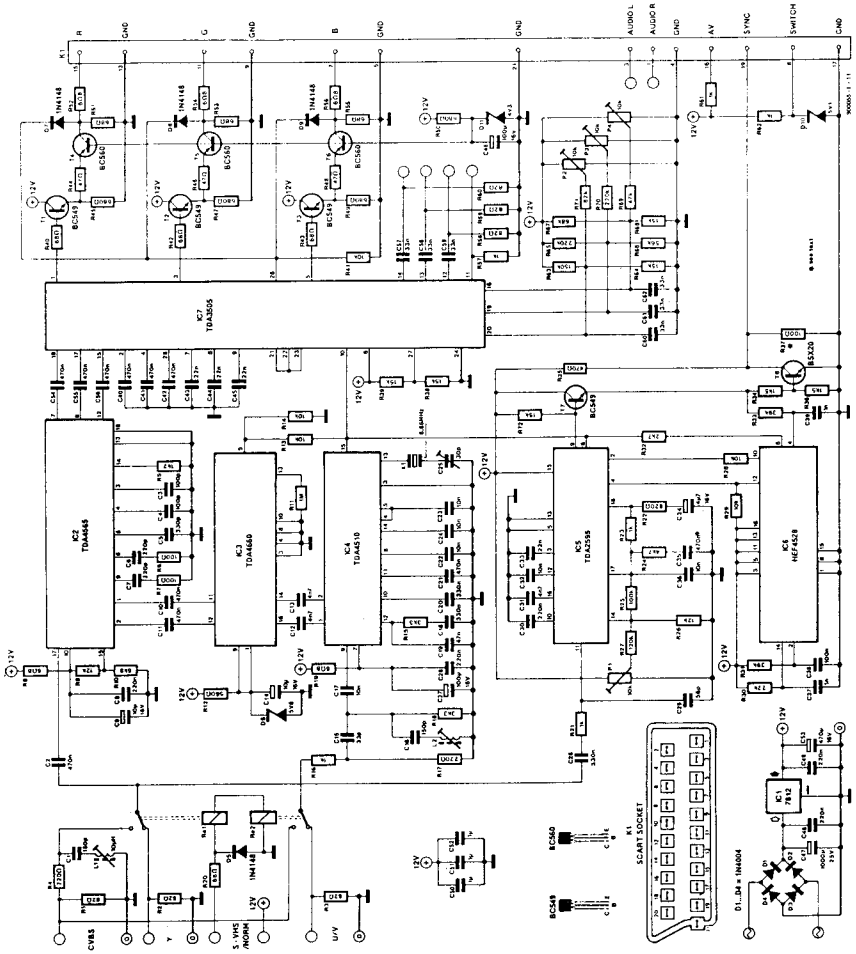


Fig.4 Circuit Diagram of the S-VHS/CVBS to RGB Converter

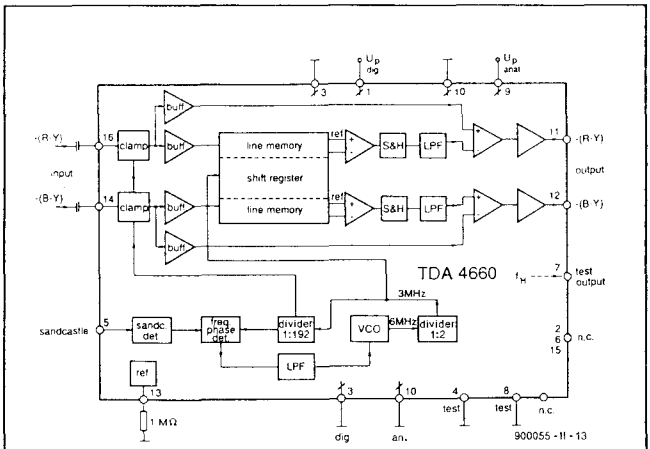


Fig.6 Block Diagram of the TDA4660

components. The clock for the CCD register is provided by a PLL (Phase Locked Loop) circuit contained in the TDA4660. The reference clock of the PLL is formed by the line frequency, obtained from the super-sandcastle pulse applied to the chip via R13-R14. The origin and the function of the super-sandcastle pulse is discussed further on in this article.

CTI FUNCTION

The colour difference signals R-Y and B-Y are applied to the inputs of the baseband delay chip IC3 at pins-11 and 12

The typical signal levels are 1V p-p at the R-Y input (pin-11) and 1,3V p-p at the B-Y input (pin-12). An oscilloscope connected to these IC pins will reveal sluggish rise and fall times of the colour difference signals as a result of, say, the standard colour bar test chart. This is caused mainly by the limited bandwidth (about 1MHz) of the chrominance signal.

The bandwidth is reduced even further (to about 0.5MHzx or smaller) when a normal VHS tape is played back. Obviously, this makes the signal edges even slower and results in degraded colour transient definition, or, in other words, a picture that is not very sharp. In not a few cases the picture quality from a VCR is degraded further by moiré effects in the already blurred colour transients. As already explained earlier, this moiré is caused mainly by insufficient suppression of the colour subcarrier sidebands.

Fortunately, the picture quality can be improved considerably by a colour transient improvement (CTI) chip. Here, the TDA4565 (IC2) is used in a standard application circuit. The device detects a

enables the colour correction operation in the PAL TV system to correlate the colour information in two successive picture lines.

In a PAL TV receiver the R-Y and B-Y components modulated onto the 4.43MHz colour subcarrier are delayed and subsequently added to the undelayed signals. Since this addition is critical in respect of phase and amplitude, a preset and a small inductor are fitted to optimise the adjustment which, unfortunately, requires a calibrated PAL signal source.

The recently introduced TDA4660 provides a welcome alternative to the glass delay line, and at the same time eliminates the associated complex phase and amplitude adjustments. The baseband delay element in the TDA4660 may be used by configuring the PAL decoder as shown in the circuit diagram. The demodulated colour difference signals at output pins-1 and 2 of IC4 are applied to the respective inputs of the CCD-based (Charge Coupled Device) analogue shift register in the TDA4660 (see the block diagram in Fig.6).

After the shift operation, the delayed signal and the undelayed signal are added in the IC to give the conventional R-Y and B-Y

colour transient by differentiating the colour difference signals. This is achieved by an internal difference amplifier and capacitors C3 and C4. When a transient is detected an internal pulse shaper, which uses C5 as an external component, is actuated. The pulse shaper in turn causes the input signal to be stored in a sample-and-hold circuit, which retains the current signal level until the transient is over. Next, 100ns pass before the new level is supplied.

The sample-and-hold function is implemented by external components R6, R7, C6 and C7. The re-shaped colour difference signals at output pins-7 and 8 of the TDA4565 are fed to the matrix circuit via a pair of coupling capacitors C54 and C55.

RGB OUTPUT CIRCUIT

The colour matrix circuit is based on another video IC from Philips Components: the TDA3505 (IC7). In this, the luminance and chrominance signals meet (in S-VHS mode) or meet again (in CVBS mode). The basic colours R, G and B are recovered by a summing operation from the colour difference signals, and the luminance (Y) component.

The picture settings, contrast, brightness and colour saturation, are adjusted by direct voltages that determine the bias and the gain at a number of points in the matrix. Here, the relevant components are R63-R71 and presets P2, P3 and P4. The presets are used to adjust the brightness (P2), the contrast (P3) and the colour saturation (P4). The multiturn presets on the circuit board may, of course, be replaced by front-panel mounted potentiometers, to give a continuous control range rather than fixed settings.

Two-stage level shifters/buffers are required at the outputs of the matrix because these do not supply levels down to 0V, and are not capable of driving a 75 ohm load direct. The buffering and level shifting are achieved with three combinations of an emitter follower and a common-base amplifier (T1-T6). The output impedance of the three drivers is 75 ohms.

Each colour output driver has a diode which allows the operating point of the two-transistor stage to be monitored via pin-26 of the TDA3505. The operating point is monitored and, if necessary, corrected, during the vertical blanking interval, i.e. when the scanning beam in the TV set is quenched. The direct voltage required for this function is stored in capacitors C40, C41 and C42 during the current picture. The matrix circuit recognises the vertical blanking period with the aid of the super-sandcastle pulse.

The SCART socket that supplies the RGB output signals also carries the (stereo) sound signals via pins-3, 1 and 4, and the AV and SWITCH voltages (+12V and +5V for automatic switch-over to AV and RGB mode respectively).

CVBS MODE

The operation of the circuit in the CVBS mode is much simpler. When the S-VHS/NORM input is connected to +12V both relays are actuated. Like the chrominance signal in S-VHS mode, the CVBS signal is applied direct to the colour filter, so that the PAL decoder receives the colour components, which, obviously, the Y channel must be not be allowed to "see". The filtered composite signal is applied to IC2 after passing a colour trap composed of R4 and tuned circuit L1-C1. The CVBS (or Y) signal is also fed to the sync separator IC5 via a low-pass filter R21-C29.

POWER SUPPLY

The 12v power supply on the board is conventionally based on a rectifier, D1-D4, a smoothing capacitor, C17, and a voltage regulator, IC1. The input of the supply may be provided with an alternating voltage between 10V and 12V.

SYNCS AND SANDCASTLES

The horizontal sync generator and sync separator is formed by IC5, a TDA 2595. This IC also generates the previously mentioned super-sandcastle pulse.

When pin-9 of the TDA2595 is connected to +12V via a 15k resistor, the complete synchronisation signal is available as positive-going pulses with a swing of 12V p-p. Inverter T8 is driven by T7, an emitter follower. The open-circuited signal level at the SYNC output of the SCART socket is set to about 2V p-p by voltage divider R35-R37 at the collector of T8. When this output is loaded the signal level drops to about 1V p-p. When a multi-sync monitor with a TTL-compatible sync input is used, resistor R37 must be changed to 390 ohms.

The TDA2595 requires the horizontal and vertical blanking pulse to generate the super-sandcastle pulse. This four-level pulse contains the following timing information:

- 0V = picture period and reference level
- +2.5V = vertical blanking
- +4.5V = horizontal blanking
- +11V = burst gate

The burst gate is obtained from the PLL-controlled line frequency generator on the TDA4660. It enables the PAL decoder to time the insertion of the 4.43MHz colour burst in the horizontal blanking period. Since the horizontal and vertical blanking pulses are normally generated in the deflection circuits of the TV set, they must also be generated separately in the converter. This is achieved by a dual monostable IC6.

The positive-going composite sync signal at the emitter of T7 is passed through low-pass filter R33-C39, so that the vertical sync component remains. It triggers one of the monostables via pin-4. At the output a 1.2ms long pulse appears, which is mixed with the sandcastle pulse via R32. The output signal of the horizontal sync oscillator (pin-4 of IC5) is fed to a second monostable in IC6. This supplies a 10us long pulse which is fed back to the TDA2595 for use as the horizontal blanking level in the sandcastle pulse.

CONSTRUCTION AND ALIGNMENT

Although the circuit is relatively complex, its construction on the single-sided printed circuit board is straightforward (*owing to the complexity of the PCB and its availability from Elektor I have decided not to show the layout in the article. For details of how to obtain the PCB see the end of this article ... Ed).* Start the construction by fitting the five wire links on the board. The voltage regulator, IC1, must be bolted to a fairly large, vertically mounted heatsink before its terminals are soldered.

If the SCART socket has mounting holes in the flanges they must be used to secure the plastic body to the PCB with the aid of two short M3 nuts and bolts. Some SCART sockets have snap-in arms at the sides for which holes must be drilled in the PCB.

Do not forget to set the three multiturn presets to the centre of their travel, otherwise strange picture effects may occur when the converter is first switched on, and you may have a hard time finding the cause of the problem, when there is nothing wrong with the circuit.

On completion of the solder work inspect the PCB very carefully. Check the orientation of all the ICs, diodes and electrolytic capacitors against the overlay printed on the PCB.

Apply power to the converter and check that its current consumption is about 350mA at 12V. next, adjust preset P1 until the PLL runs free at the line frequency 15,625Hz, which can be measured at pin-4 of IC5. Apply a colour input signal and adjust trimmer capacitor C25 until the monitor switches to colour. In most cases the colour will already be present with the

trimmer set to roughly half of its travel. Check the 8.86MHz oscillator starts properly by switching the converter on and off a few times. The colour should come on immediately after switching on. If it does not, carefully readjust the trimmer.

Finally, adjust the colour trap L1. Apply a CVBS signal and adjust the inductor for minimum chrominance subcarrier amplitude. This measurement is best carried out using an oscilloscope connected to pin-12 of IC2. When an oscilloscope is not available adjust L1 for minimum moiré interference in the colour picture.

A printed circuit board for this project can be obtained from Elektor Electronics (Publishing), Down House, Broomhill Road, London, SW18 4JQ at a cost of £15.09 including VAT and p&p.

COMPONENTS LIST

Capacitors:

2	150pF	C1;C16
11	470nF	C2;C10;C11;C21;C35;C40;C41;C42;C54;C55;C56
2	100pF	C3;C4
1	330pF	C5
2	220pF	C6;C7
5	220nF	C8;C26;C30;C48;C49
2	10µF 16V radial	C9;C14
3	4n7	C12;C13;C31
1	33pF	C15
6	10nF	C17;C22;C23;C24;C32;C36
3	330nF	C18;C20;C28
1	47nF	C19
1	30pF trimmer	C25
2	100µF 16V radial	C27;C46
1	56pF	C29
4	22nF	C33;C43;C44;C45
1	4µ7 16V radial	C34
2	1nF	C37;C39
1	100nF	C38
1	1,000µF 25V radial	C47
3	1µF	C50;C51;C52
1	470µF 16V radial	C53
6	33nF	C57–C60

Semiconductors:

4	1N4004	D1–D4
4	1N4148	D5;D7;D8;D9
1	5V6 0.4W zener diode	D6
1	5V1 0.4W zener diode	D10
1	4V3 0.4W zener diode	D11
4	BC549B	T1;T2;T3;T7
3	BC560C	T4;T5;T6
1	BSX20	T8
1	7812	IC1
1	TDA4565	IC2
1	TDA4660	IC3
1	TDA4510	IC4
1	TDA2595	IC5
1	HEF4528	IC6
1	TDA3505	IC7

Inductors:

1	10µH adjustable; Toko 119 LN-A3753	L1
1	50µH adjustable; Toko 119 LN-A5783	L2

Miscellaneous:

2	12-V SPDT DIL reed relay	Re1;Re2
1	PCB-mount SCART socket	K1
1	quartz crystal 8.867238 MHz (HC18/U)	X1
1	heat-sink for IC1	
22	solder pins	
1	printed-circuit board	900055

COMPONENTS LIST

Resistors:

6	82Ω	R1;R2;R3;R58;R59;R60
2	220Ω	R4;R17
1	1k2	R5
3	100Ω	R6;R7;R37
5	6Ω8	R8;R19;R52;R54;R56
2	12kΩ	R9;R26
1	6k8	R10
1	1MΩ	R11
1	560Ω	R12
5	10kΩ	R13;R14;R28;R29;R41
2	3k3	R15;R18
6	1kΩ	R16;R21;R23;R57;R61;R62
7	68Ω	R20;R40;R42;R43;R51;R53;R55
1	820Ω	R22
1	4k7	R24
1	100kΩ	R25
1	120kΩ	R27
1	22kΩ	R30
2	39kΩ	R31;R33
1	2k7	R32
2	1k5	R34;R36
1	470Ω	R35
5	15kΩ	R38;R39;R64;R68;R72
3	47Ω	R44;R46;R48
4	680Ω	R45;R47;R49;R50
1	150kΩ	R63
2	220kΩ	R65;R70
1	56kΩ	R66
1	68kΩ	R67
1	47kΩ	R69
1	82kΩ	R71
1	10kΩ preset H	P1
3	10kΩ multiturn preset	P2;P3;P4

PULSAR

A DIGITAL LOGIC CIRCUIT SIMULATOR FOR THE PC

REVIEW

Mike, Wooding G6IQM

INTRODUCTION

Designers of digital equipment are fully aware of the difficulties of testing their designs to confirm that the logic of the design works according to plan.

Even more difficult, rather as with computer programs, is the ability to conduct the infinite number of tests to prove that there are no bugs or glitches in the design - some of which may only appear when an unusual set of conditions exists, or perhaps only once every billion clock pulses or so.

Furthermore, it is very expensive in time and labour to build breadboarded prototypes to conduct the tests on. The probability of destroying expensive digital devices is even more off-putting!

However all is not lost! A recent addition to the professional software packages produced by Number One Systems Ltd. is 'PULSAR' - a digital logic circuit simulator program.

Pulsar is a full featured simulator that allows designs to be tested without the need for constructing those expensive breadboards and prototypes.

The circuit design can be tested on your PC and modifications made until the circuit functions as required - all without using a soldering iron in anger, or blowing up any expensive ICs.

PULSAR

Pulsar is a digital logic circuit analyser program that runs on PC/XT/AT/286/386/ or 486 computers running under MS-DOS 3.0 or later and with either EGA or VGA graphics, preferably colour. The minimum RAM requirement is 512K, and the software is supplied on both 5.25" and 3.5" format floppy discs.

It is almost imperative to have a hard drive, as the program keeps a high proportion of its temporary data on disc during operation, and if using a floppy only based machine the operation of Pulsar will be extremely slow.

The program also supports the use of a mouse and a choice of either 9 or 24-pin dot-matrix printers or HP Laserjet II printers.

THE USER MANUAL

The comprehensive user manual is packaged in an A5 ring binder, which will allow for the easy insertion of upgrade instructions, personal notes, etc. The opening pages of the manual deal with the installation and running of the program.

The next section in the manual is called 'First Impressions' and gives an overview of the screen presentations and some of the basic commands used to manipulate these screens and move around in them.

Once the user is familiar with these basic commands then it's on to the next section – 'The Grand Tour'.

'The Grand Tour' comprises the greater part of the user manual and takes the user through a step-by-step simulation; from entering the initial design netlist, to the final proven circuit. To assist with the instruction a predesigned divide-by-three circuit is used as a practical example, from which a netlist is composed.

N.B: A netlist is a simply a file of logic connections between the various devices within a digital circuit and their relative logic states. The libraries available within Pulsar contain netlist outlines for basic logic gates, 74LS series and 4000 CMOS series devices.

After the chapter dealing with the netlist editor and the making of a netlist for the circuit, the section explaining how to actually run the analyser is reached. Firstly, selecting a signal source, or generator, for the input is dealt with and then a detailed look at the simulated circuit follows.

'The Grand Tour' then goes on to deal with modifying the circuit to correct any faults, creating generators, selecting printers, combining circuits and using the libraries.

The remaining sections of the user manual deal with customising Pulsar to your exact requirements and using DOS within the program and using the DOS shell. Finally, there are lists and explanations of the three built-in libraries of Pulsar, which will be discussed later.

THE ANALYSER

Once a circuit netlist has been created and a suitable generator selected, Pulsar simulates the circuit operation and displays on the screen a timing diagram, such as one sees on a conventional logic analyser. As with a conventional logic analyser, one can also see if any spurious signals are present on the timing waveforms. However, here the similarity really ends.

The display screen is divided into three main areas. The top of the screen contains the main menu, showing Pulsar's top-level commands, with the currently active mode highlighted. The program defaults to the analyser mode on start-up. The other modes are:

Configuration	Customises Pulsar.
Generators	Sets up Pulse Generators.
Libraries	Maintains Component libraries.
!DOS	Manipulates Files and Directories
F1Help	On-line help information.
Quit	Leave Pulsar.

Also shown in the menu area are the file name and cursor control characters.

- **CONFIGURATION:** This command selects a set of menus which allow the default parameters for Pulsar to be set according to the users choice. The default search paths for files, the time and date format, etc., can all be preset by the user and the configuration saved.

- **GENERATORS:** This menu allows generators (input signals) to be modified or developed according to the requirements of the simulation.

- **LIBRARIES:** The library command allows the various libraries to be scanned and manipulated.

- **!DOS:** Selecting this command displays a menu of basic DOS commands which are available for use without leaving Pulsar. Also selectable is a DOS Shell, which allows you to exit Pulsar to the DOS prompt, but without losing any data currently held in Pulsar. Quitting the DOS Shell returns you to Pulsar, exactly where you left it.

- **F1HELP** and **QUIT** are self-explanatory.

The main area of the screen is devoted to the analyser display, with the two moveable cursors.

At the bottom of the screen is a sub-menu of control commands and the time readouts for the cursor positions and the time scale factor of the display area.

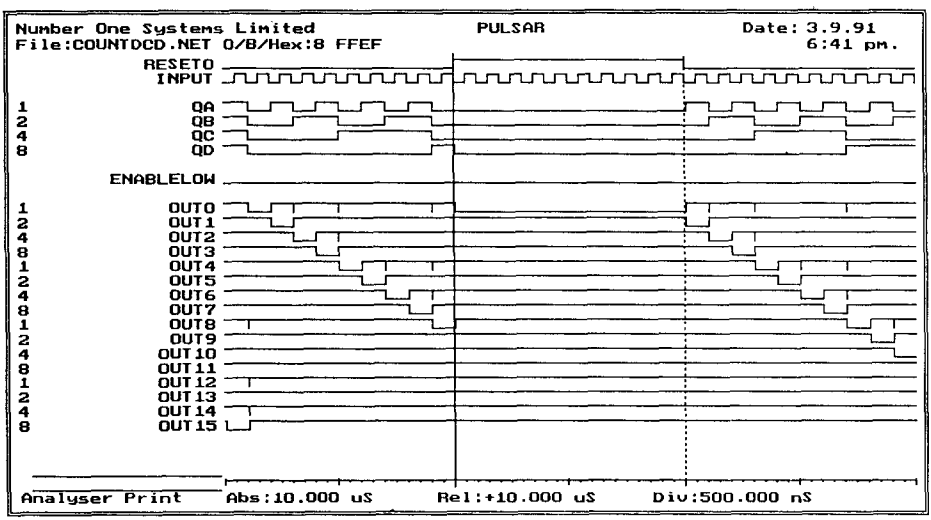
With Pulsar you are not limited to how many pods (connecting ports) are available (conventional logic analysers have 8 or 16, sometimes 32, but we're talking expensive here!), as the display shows all the input, clock and output waveforms detailed in the netlist. If you want to see the timing diagram at a particular point in the circuit you simply add it to the netlist.

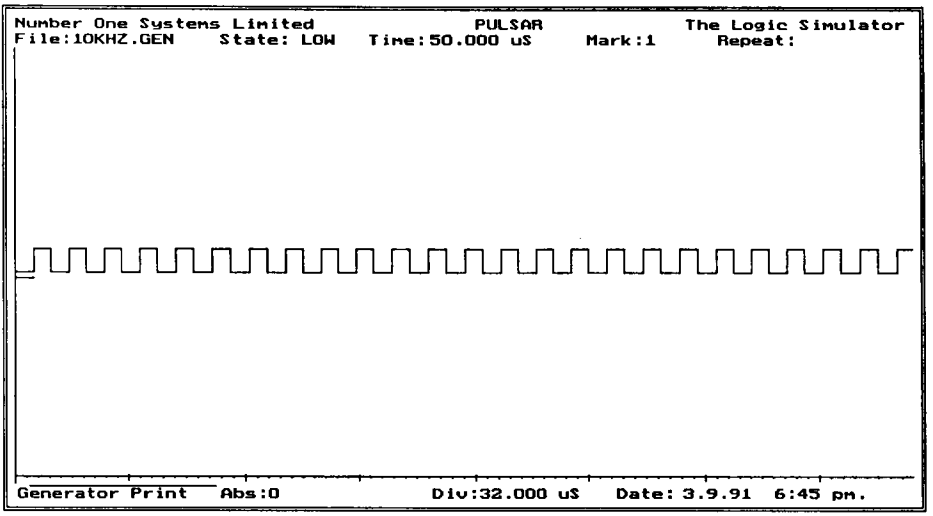
Furthermore, another feature of Pulsar which makes it superior to a conventional analyser, is that it is not limited to a window in time; i.e: conventional analysers are, to all intents and purposes, not real-time machines, the display is limited to a particular period of time. However, with Pulsar the simulation is continuous, and you can zoom in or out in time, so that even glitches that occur very seldom can be captured.

An essential feature of the zoom facility is that, because you can expand the displayed time zone down to a few nanoseconds if you wish, then the actual widths of any glitches or pulses can be measured accurately. To enable this to be achieved Pulsar has two moveable cursors on the display; an Absolutes one and a Relative one. Both cursors are easily positioned anywhere on the display by simple keyboard/mouse actions, and at the bottom of the display time values for each cursor are displayed.

The Absolute cursor time display is given as the cursor position in time from the start of the simulation. The Relative time display is given as the difference in time, positive or negative, between the two cursors.

Thus, by positioning the Absolute cursor at the start of a pulse or whatever, and then positioning the Relative cursor at the end of the pulse or zone to be measured, then the pulse width or the elapsed time can be read directly. Facilities to enable quick positioning of the cursors are available. A 'Snap' command will ensure that the cursor being moved will align itself exactly with the nearest rising/falling edge to the mouse/keyboard pointer when moved. A 'Scroll' facility is also available to quickly move the active cursor (the one selected for moving)





across the display. A 'Pan' command always centres the display around the currently active cursor, so that when zooming in or out the selected area of the display will always be visible.

An important aspect of Pulsar is the ability to define the signal source, or generator. From a simple 50:50 mark:space square wave at any defined frequency, to an extremely complicated pulse train can be used. When specifying the generator simply typing anything beginning with a number and containing the letters HZ is interpreted as a simple frequency generator. Typing in anything else will prompt Pulsar to search for a generator file with that name.

Complex generators can be created in the Generator screen and saved with an appropriate file name for use whenever required. Generators in use at any time can be modified in the generator screen, and the effect of the changes on the. circuit under analysis displayed immediately on the analyser display screen.

There are more features of Pulsar than I have covered here, but to attempt to explain them and their uses here is somewhat pointless as you really need to have Pulsar 'live' in front of you to understand their actions. Suffice it to say that they are well explained in the user manual.

THE LIBRARIES

As I mentioned earlier there are three inbuilt libraries in Pulsar, which make the creating of netlists much quicker. The libraries are:

1) PRIM.LIB; a library of primitive logic elements, such as buffers, inverters, AND gates,, OR gates, latches, etc.

2) 74LS(1).PLB AND 74LS(2).PLB; a library of over 120 component models covering the low-power Schottky TTL family.

3) 4000.PLB; a library of over 90 component models covering the 4000 CMOS family.

When building up netlists for a circuit, then by naming the component type being used, Pulsar responds by reading the pin and parameter information from the library for the device, all you have to do is enter the various connection details.

Circuit blocks previously designed and tested can be added to the libraries, which is a useful feature if you are using a common circuit time and time again.

A useful feature of the basic logic elements found in the PRIM.LIB is that the transition delay through an element can be varied to emulate circuit and design conditions. A sub-menu from the Generator menu gives various delay parameters that can be modified.

A feature of the delay modifiers is that the delays, both minimum and maximum, can be set to values which exceed the nominal values for the device(s) in the circuit.

Another useful feature is that the delays can be modified on a global basis, thus allowing the simulation of the circuit to show the results of using different families of logic devices.

CONCLUSIONS

Creating a netlist for a circuit design is not as daunting as it may first appear, and never having done such before I followed the instructions, and in a very short time got to grips with the concept and created the netlist for the example circuit. Following the instructions I then connected my generator and Pulsar simulated the circuit and presented the results on the screen.

Upon running the analyser and playing with the many and varied features, it soon became evident that the facilities available are quite extensive. The versatility of the package as a design testing tool is unquestionable.

Having used conventional logic analysers in the past I can imagine that in a development environment Pulsar would be far more ideal. The fact that a design circuit does not actually have to be built would be one great advantage. That, coupled with the ability of Pulsar to detect glitches down to 1 picoSecond per week for example, must prove that the system is a must for digital designers.

Although I barely scraped the surface of Pulsar's capabilities I can recommend it to anyone engaged in digital design and testing work. Armed with his/her trusty PC and this software a designer should be able to clear all but the most deeply nested bugs in any complex logic circuit. Highly recommended.

I wish to thank Mr.Espin and the staff of Number One Systems Limited for their help and advice, and for the review software.

PULSAR is priced at £195.00 + £4.75 p&p + VAT and is available from: Number One Systems Limited, Harding Way, St.Ives, Huntingdon, Cambridgeshire, PE17 4WR. Tel: 0480 61778. International: + 44 480 61778. FAX: 0480 494042.

OBITUARY

It is with great sadness that I have to report the death of a good and valued friend of mine Fred Smith G6FK. Fred passed away on July 21st after suffering poor health for some time. Fred came to amateur television late in life, after spending many years as a microwave enthusiast. Fred had many friends and proved a source of innovation and technical expertise to all who encountered him.

On behalf of myself, the Committee and the Club I wish to extend my deepest condolences to his widow Tilly and his family.

CONSTRUCTING AERIAL PHASING LINES

This article first appeared in the July 1991 issue of 'Spectrum', the journal of the Auckland UHF Group Inc., new Zealand, and I wish to thank the editors for their permission to reproduce it here.

Ron Neyens N0CIH

If you are going to stack aerials you will probably use a power divider, for which you will need to manufacture phasing lines (a phasing harness). Phasing lines need to be of equal lengths to evenly distribute and combine the RF energy that is sent to and received from the aerials. Remember that RF likes things that are symmetrical or balanced.

The phasing lines from the power divider to each aerial should be odd multiples of 1/4 wavelengths of the centre frequency in use. This will ensure that 50 ohms is 'seen' at both ends of the phasing line. the formula to determine a 1/4 wavelength piece of coaxial cable at a particular frequency is shown below.

The velocity factor (VF) of the cable must be known, since this is part of the electrical length of the cable. The velocity factors for different types of coaxial cable can be found in the ARRL Handbook and the RSGB Handbook.

1/4 wavelength (in inches) =
2950 / (frequency (in MHz) x VF)

A LITTLE HEAD SCRATCHING

Before you start cutting up your nice coax you need to determine a few things. decide where the power divider will be placed on the mast structure and measure the shortest length of cable needed to connect one aerial to the power divider. This length should include a drip-loop at the aerial and another at the power divider.

Now divide this length by the result obtained using the above formula. Round this up to the first whole number that is not divisible equally by 2. (Remember that you are looking for an odd multiple, i.e: 3, 5, 7, 9, 11, etc.).

As a example, let's say that the minimum cable length needed is 130 inches and that a quarter wavelength is 13.5 inches. Dividing 130 by 13.5 gives a result of 9.629. Rounding 9.629 up to the first whole number not divisible equally by 2 produces 11. 11 times 13.5 inches equals 148.5 inches. Thus, that is the length required for each phasing harness.

PUTTING IT ALL TOGETHER

Now that the mathematics is complete you can start cutting, however, a few helpful pointers should be mentioned before you continue. To ensure that the velocity factor is the same in each phasing line, the phasing lines should be cut from the same roll of cable.

Also, when measuring the cable it should be done on a cool floor inside a garage, or on the floor in a basement. This will help to ensure that all phasing lines have the same physical length.

The only thing left to do is put the connectors on the ends and seal them.

MORE CROPREDY BOARD TIPS

Brian Kelly GW6BWX

ADDING MORE TEST CARDS

Most people add more testcards by using another PCB holding more 2732 EPROMs. This uses lots of space and experience teaches me that the connections to the original board tend to be unreliable, particularly if ICs are changed frequently.

It's a simple matter to utilise EPROMS with greater storage capacity. A 2764 will hold two cards, a 27128 holds four and a 27256 will hold eight, in fact any number can be stored if the EPROM is big enough. If you have access to an EPROM programmer, simply load normal 4k test card data blocks end to end and store them in one chip.

To select which card is displayed, the top address lines of the EPROM have to be switched between logic high and low in the required combination. Fig.1 shows the general idea.

All EPROMs above 2732 size have more pins so will not fit the original socket. I used a 28-pin socket pushed in the old one with pins 1,2,27 and 28 overhanging and bent outward. Wires to the selector switch being soldered to those pins.

BLANK SCREEN BUG

It's possible to lock-up the timing chain by coding the EPROMs wrongly or by switching cards while a control character is being read. The result is a blank screen without syncs. Sometimes selecting another card will restore normal operation.

The problem seems to be worse on some generators than others, seemingly dependent on the speed of the EPROM and 'LS377 ICs.

A complete cure is made by adding three components as shown in Fig.2. These convert the reset signal to the timing chain to a short pulse which does the same job but can't remain active.

Only one connection has to be cut, on the Cirkit PCB it is a track on the under-side

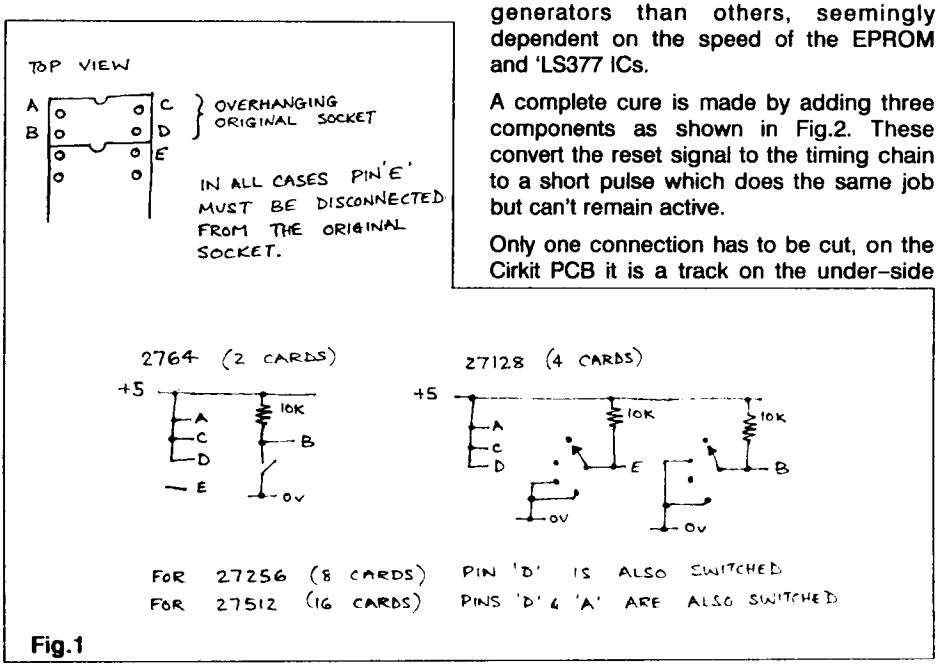


Fig.1

leading to IC10 pin-2. The new components are then added on the top side, soldered between IC pins.

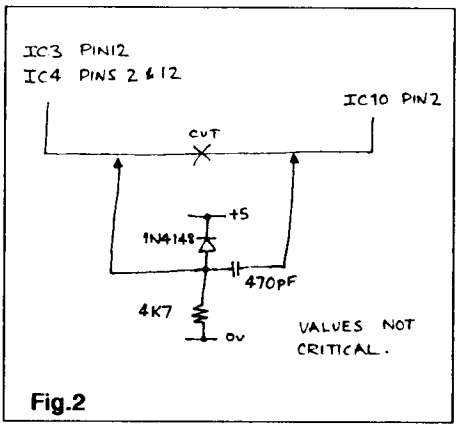


Fig.2

CHROMA LEAKAGE IN SYNC

If a TEA2000 is used to add colour to the test cards, this simple modification will remove sync glitches caused by noise on the input pins of the chip. OK, there shouldn't be that much noise present, but I've seen it on the 'scope and the intermittent tearing effect it has on the picture.

Remove the ground connection from pin-17. Rewire pin-17 to the INPUT of the sync inverter that feeds pin-16.

This kills all the chroma information during sync periods.

INTERMITTENT START-UP

I've seen lots of problems caused by hyperactive crystal oscillators. If the unit gives a badly tearing picture or seems to lack horizontal lock, try reducing the 10nF capacitor in the oscillator circuit to 470pF. This "tames" the feedback and makes the oscillator more stable.

Similar symptoms can be seen when the output from the 'LS169 upsets the address latches, try a 120pf capacitor between either pins 12 or 13 of this chip down to ground.

INTERMITTENT COLOUR

This again applies to boards wired to TEA2000 encoders. Some of these chips produce misplaced colour bursts. The burst position is controlled by a ramp signal on pin 15 of the IC. Usually this has a 33K resistor up to the supply rail and a capacitor of around 390pF to ground.

Try increasing the value of the capacitor to 470pF or replace the 33K resistor with a 27K one and 10K variable in series. A 'scope can then be used to set the delay from sync to burst precisely.

Not a modification but worth noting: If you plan to add a colour encoder when building the test card generator, there is no need to build the monochrome output circuits, negative voltage generator or the output buffer. All the following parts can be omitted:

All resistors except R1 & R2

All transistors

All diodes

Capacitors C3, C4, C5, C6 & C18

IC11

If you are careful, you can fit the TEA2000 colour encoder in the space left by omitting these parts but be warned, it isn't easy. The part numbers above refer to the CirKit PCB.

Finally, if building the circuit without the CirKit PCB, note that in The ATV Compendium pins-6, 7, 9 of IC7 should read 9, 6, 7 respectively.

A NEW SSTV STANDARD ?

Mike Wooding G6IQM

The current glut of colour SSTV 'standards' can hardly be good for the mode. It is very off-putting for the newcomer, particularly as they all seem to be implemented only on equipment costing several hundreds of pounds (or more!).

There are many people who would love to try SSTV if only the entry price was reasonable. It is also one of the best ways to attract new blood to the hobby as a whole - one picture is worth a thousand words, as they say. But who is going to fork out that sort of money just to have a look?

It is surely time that some order was brought to the present chaos. There is absolutely no need for all these different variations on a single theme. As the current favourite mode (G3OQD) is in essence just a variant of the Wraase line sequential mode from years ago, we seem to have ended up chasing our tail.

As is often said about the weather, everyone complains but no-one does anything about it. In this case, perhaps the fact that these new modes have been produced by people hoping to make a bob or two out of the fact that they are different from the others has not exactly helped. I do not have an economic interest in this rush to be different so I put forward this modest suggestion.

The desirable features for an SSTV standard are:

1) Can be easily implemented on as many different types of equipment as possible. Some systems will be capable of better quality than others but the signal should be able to be displayed as well as the receiving and transmitting equipment will allow.

2) Compatibility. Colour transmissions should be easily decodable on mono displays and all transmissions should be compatible with existing mono standards.

3) The benefits of a synchronous system (like Fax) are clear for maintaining accurate synchronisation in the presence of noise, QRM and fading. The SSTV standard should provide for this type of transmission but not insist on it, to maintain maximum flexibility of equipment. The line frequencies should preferably allow synchronisation by existing Fax line speed generators, for maximum flexibility and compatibility.

4) Colour transmissions should have inherent colour synchronisation.

5) The method of colour encoding should not be unduly sensitive to noise, QRM or tuning errors.

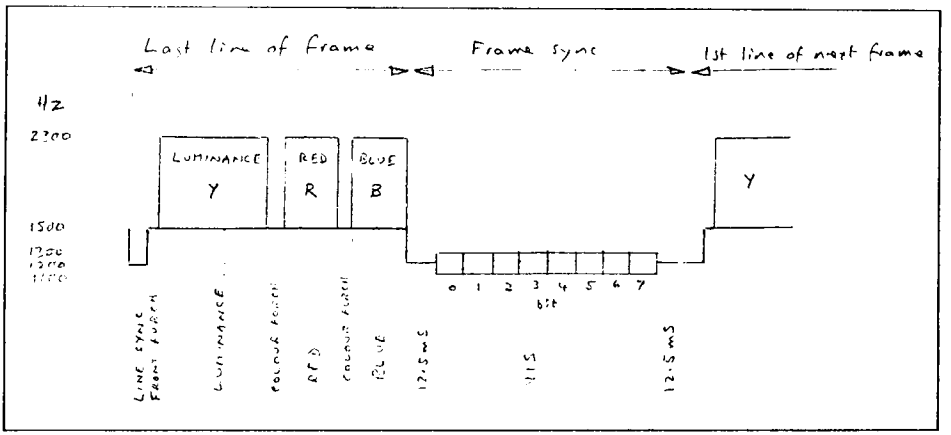
6) The method of colour encoding should strike a reasonable balance between transmission time and picture quality.

7) Provision for automatic reception (like the Robot VIS system).

For those who don't know, the VIS is a digitally encoded signal, transmitted during the frame sync pulse, which gives information about the speed etc of the following frame, so that the receiving equipment can automatically select the correct settings for it.

The existing colour modes all fall down on one or more of these criteria, often because they were designed around one specific piece of equipment and so lack compatibility. I feel that items 1 and 2 in the list above are very important and that the lack of these qualities is the main reason stopping the further popularity of SSTV.

The system described below meets all of the criteria mentioned above:



- No complicated hardware or software requirements which would restrict the type of equipment it could be used on.
- Mono receive systems can display a colour signal by just ignoring the chrominance part.
- The line frequency for both mono and colour transmissions is 2nHz, enabling Fax generators to be used for synchronisation and to keep compatibility with existing mono SSTV standards.
- Line and frame sync pulses are included for flexibility and compatibility.
- Fixed order of signals for each line ensures inherent colour sync.
- Tuning errors just cause a change in brightness and colour saturation but no change in hue.
- VIS included for automatic operation

The basic timing diagram is given in Fig.1. For a mono transmission, the line ends immediately after the Y signal and takes exactly half the time of the corresponding colour transmission. I suggest that the sync pulses and porches take the same time regardless of the timing for the transmission as a whole. The times for the four available speeds are given in Table 1 in mS.

A synchronous transmission is one where the line frequency has a maximum error of 10 ppm, corresponding to an error of just under 1 pixel in an ordinary 60-second transmission. If this bit is set, receiving equipment with similarly accurate timing

Speed number	0	1	2	3
Line sync	6.00	6.00	6.00	6.00
Front porch	1.50	1.50	1.50	1.50
Luminance	55.00	117.50	242.50	492.50
Colour porch	3.75	3.75	3.75	3.75
Red or Blue	27.50	58.75	121.25	246.25
Frame sync	125.00	125.00	125.00	125.00
VIS (8 bits x 12.5mS)	100.00	100.00	100.00	100.00
Total line time (mono)	62.50	125.00	250.00	500.00
Total line time (colour)	125.00	250.00	500.00	1000.00

Table 1

The composition of the VIS is 8 bits, transmitted bit 0 first:

bits	designation
0,1	speed
2,3	number of lines
4	0 = mono, 1 = colour transmission
5	0 = asynchronous, 1 = synchronous transmission (see text)
6	odd parity of bits 0-5
7	complement of bit 6 (see text)

Table 2

can receive the signal synchronously, otherwise it must be received asynchronously (i.e. using the line sync pulses). Transmitted signals should take care to give this bit its correct value, to avoid skewed or unnecessarily broken up pictures at the receiving end.

The purpose of sending the complement of the parity bit, as well as the parity bit itself, is twofold. Parity is a fairly crude method of detecting reception errors, being reliable only where there is a very low probability of more than one bit being in error. If only 14.23 MHz were like that! The double parity bit provides some increased security against wrong selections being made under poor conditions or by tune-up tones. Secondly, the fact that bit 7 is the complement of bit 6 ensures that there is one known transition in the VIS, which will provide extra information for initial synchronisation (see Table 2).

I have deliberately not left some spare bits in the VIS for 'future expansion'. In the past, these have been used only to specify all the new modes and this is exactly what we want to avoid.

The format and resolution of the picture needs to be considered. The original SSTV used a square format as that was the most appropriate for the technology of the time but nowadays everyone is so familiar with the 4:3 screen shape that it seems pointless to use anything else.

The 40 and 80 column screen has become the standard, with 320 and 640 pixel horizontal resolution. Applying the 4:3 ratio to this, we get a vertical resolution of 240 and 480 lines. If we add a 160/120 combination for short transmissions and 1280/960 for a Fax-like resolution, we get a set of speeds which are an excellent match for the timings given above. The fact that, say, 320 pixels is specified does not, of course, mean that all the equipment must have a 320 pixel display.

Systems will continue with the present method of dividing the time allotted for the signal among the number of pixels that it uses. It looks as if we could now usefully drop the existing distinction between FAX and SSTV and treat them as just one mode, which in essence they are, anyway. Perhaps a completely new name is called for?

It appears from this that the 'number of lines' selection in the VIS is redundant, as each horizontal speed will have its corresponding setting for this. However, this would mean that each mode would take 4 times as long to send as the preceding one and this seems too much of a step to make obligatory.

Also, different equipment and purposes may well find other combinations more suitable, e.g. sending a half or quarter screen. It seems better to leave the choice available to the user.

The rest is up to you. Firstly, your technical response is needed to refine the specification given above so that it ends up as good as possible. Then, it is a matter of trying to persuade everyone to give up all these different, mutually incompatible modes and settle on one standard. As the only people who stand to benefit from the status quo are the producers and as they are heavily outnumbered by the potential users, who stand to gain considerably from a standardisation, it shouldn't be too difficult, should it?

The old QRA locator was changed to the Maidenhead one because the need for a new standard was recognised and those with influence gave a push. If the BATC could get together with their counterparts in other countries to get international agreement, if an SSTV contest organiser could specify 'new standard mode only', if the RSGB could be persuaded to lend a hand (could do wonders to attract novices), if ....

Best of luck, lads.

CONTEST CALENDAR

AUTUMN VISION

Sunday November 10th

0001 - 2359 GMT

Slow Scan & Fast Scan ATV all Bands

WINTER CUMULATIVE 1992

Thursday Jan 2nd, Friday Jan 10th, Saturday Jan 18th, Sunday Jan 26th

1900 GMT to 2359 GMT each session

Slow Scan & Fast Scan ATV all bands

Three best logs out of the four to be entered

SPRING VISION

Saturday March 14th to Sunday March 15th

1800 GMT Sat to 1200 GMT Sun.

Fast Scan ATV all bands

MAYDAY MICROWAVE

Sunday May 10th

0001 GMT to 2359 GMT

Fast Scan ATV 24CM and above

A 5-ELEMENT VIDEO FILTER

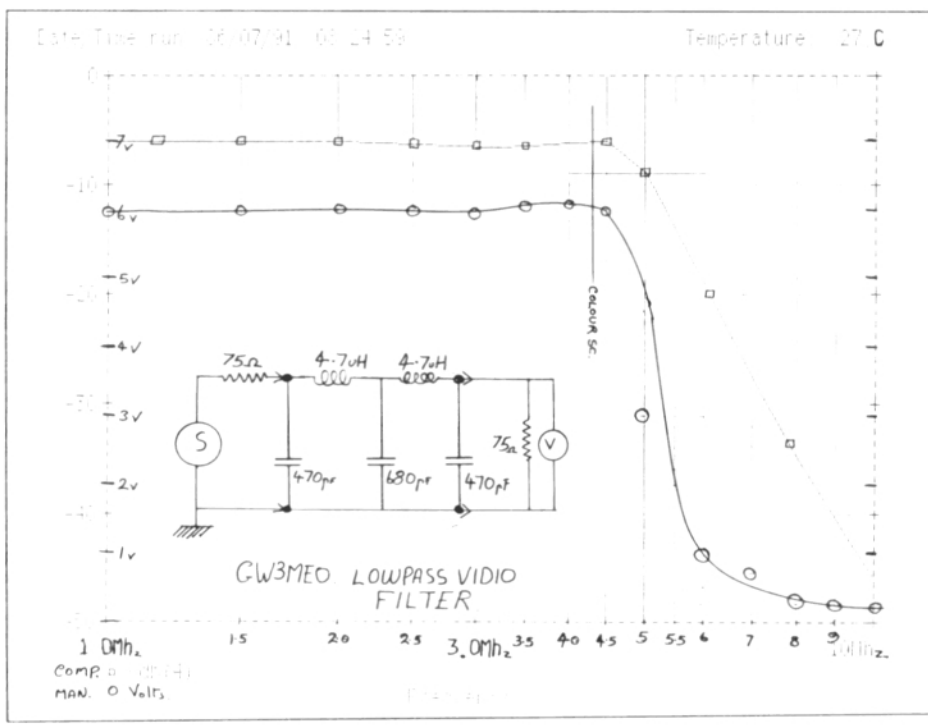
John Cronk GW3MEO

The need to limit video high frequencies especially on FM when using digitally generated video is well documented. This filter is designed for 75 ohms and therefore easily applied to a modulator input or a caption generator output with almost no insertion loss in the pass-band. However, it can cause slight ringing if used with a long coax. Normal tolerance components are sufficient were used, but it may be as well to avoid the use of ceramic capacitors.

The curve marked * was plotted manually with a signal generator and oscilloscope and the voltage scale is liner. Curve * compares remarkably well with the computer generated theoretical curve marked * which has a decibel scale. There is a slight peak around 4.5mHz which if anything, ensures the colour burst is not attenuasted.

If the filter is to be on monochrome only, the 680pf capacitor can be increased to 1000pf which will cause the filter to cut off more abruptly but would have attenuated the colour burst by 50%.

On transmit there is no obvious loss of quality or definition. Although I have not tried yet, it looks likely it could effect some improvement on a noisy received signal and as if that is not enough, it should cost less than a pound.



IN THE STUDIO

Part–13

John Goode

VIDEO FADERS & EFFECTS AMPLIFIERS

"Fading down","fading out", or "fading to black" are all terms we are familiar with, and, as far as video is concerned, they all mean the same thing. However, when compared with audio faders which simply reduce the signal to zero, the video fader is more complicated, as it has to reduce only the video part of the signal leaving the sync and burst unchanged.

A second difference between audio and video faders is in the transfer characteristic – an audio fader should change with a logarithmic law, whereas a video fader should change linearly.

Both of these requirements can be met using good-quality "signal-carrying" faders, but it is much better if a voltage-controlled amplifier is used, with the fader carrying only the control signal. In the case of video, as well as acting as a fader, by applying different waveforms as control voltages the VCO can be made to operate as half of a split-screen or keying circuit; two such VCOs suitably coupled are known as an "Effects Amplifier".

The chief difficulty in making a simple electronic video fader is in getting really good linearity – with very simple circuits it's just not possible to do it predictably.

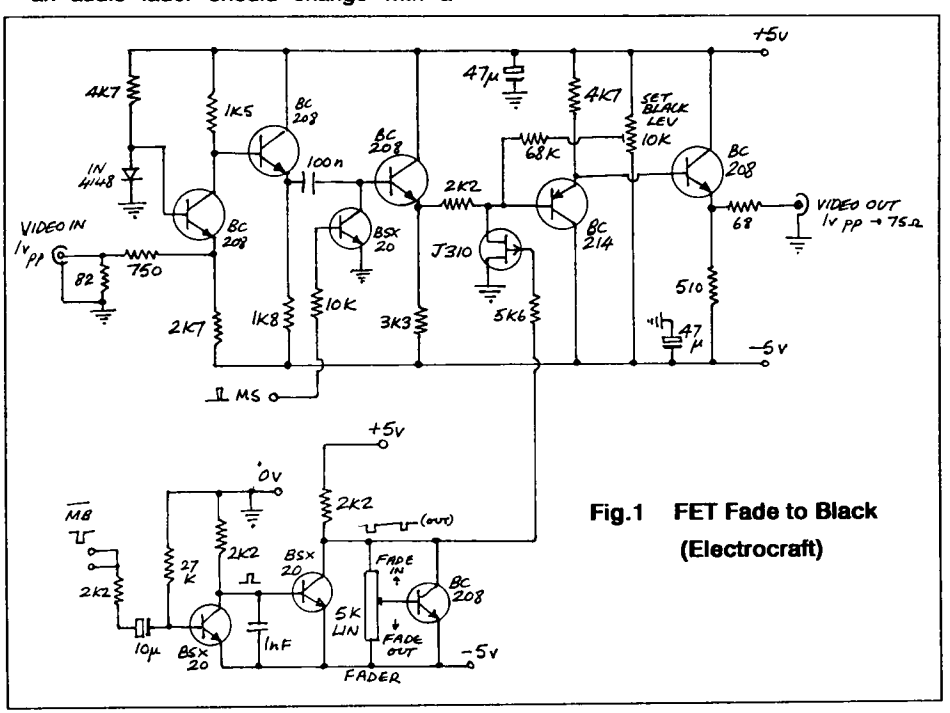


Fig.1 FET Fade to Black (Electrocraft)

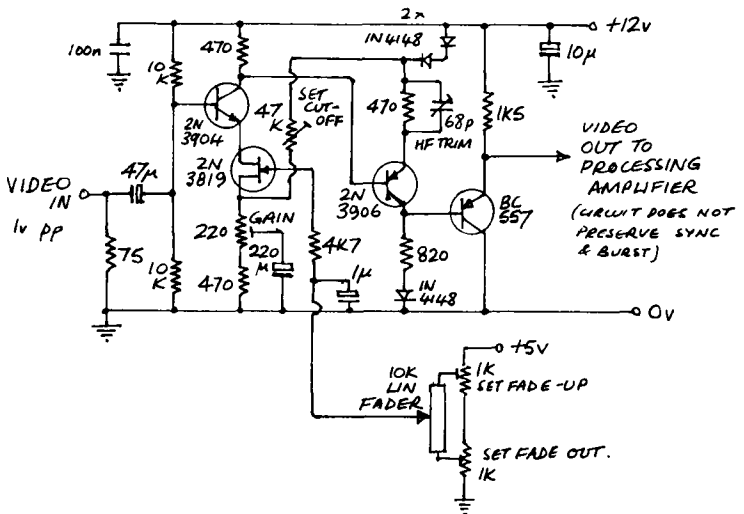


Fig.2 FET Fade to Black (J.G.)

Another area of difficulty when handling colour signals is in getting good differential-phase performance.

An ideal fader will cause zero chroma phase-shift with respect to the burst as the signal amplitude reduces - most simple circuits will cause anything up to 20 or 30 degrees as the gain changes - professional standard is 5 degrees or less.

Nevertheless, for amateur use 20 degrees phase change during a fade will not be noticed, due to the hue-correction built into PAL decoders. Anyway, here are some circuits that I've come across over the years.

FET CIRCUITS

Figure 1 is a circuit originally designed as an "add-on" to the Electrocraft PE-76 PAL Encoder to give a fade to black option at the output. I have taken the liberty of adding an input circuit and clamp to it as in original form it used that within the PE-76. The gain element is the J310 FET, which forms a potential divider with the 2K2 resistor at its drain. Mixed blanking (-MB) is amplified and used as the control voltage in this circuit. With the fader in, the adjacent BC208 conducts, pulling the control voltage to -5v; the FET is turned off (high resistance), and the signal passes normally. With the fader out, -MB is passed to the FET so that it is at low resistance (on) during the active line period, but off during blanking, allowing sync and burst to pass. The "black-level" preset is used to set the active period to match sync and burst when faded out.

The performance is not bad for such a simple circuit. The law is not very linear - like many simple circuits it is poor at the extreme ends of the control travel - it is necessary to use the full travel to completely suppress the signal. Differential phase is about 10 degrees - pretty good really.

Figure 2 is a circuit that I used for many years as the master fade-to-black at the

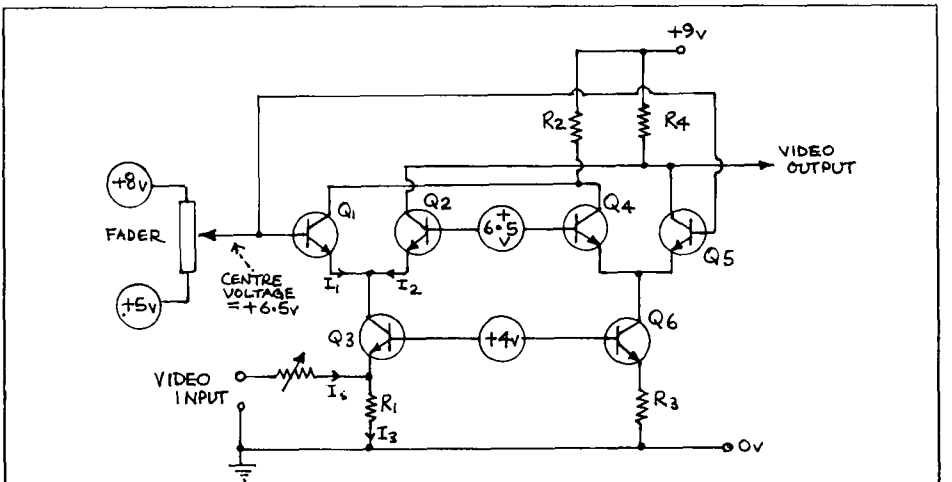


Fig.3 Balanced Linear Fader

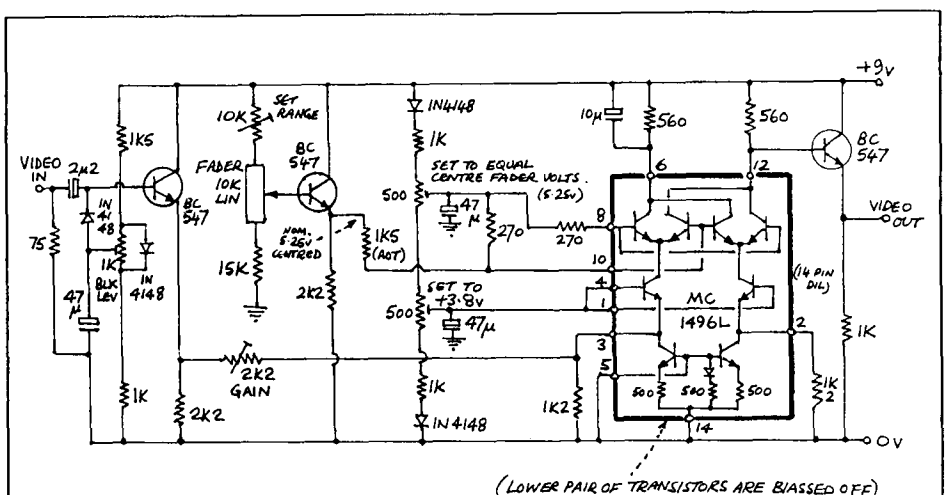


Fig.4 Using 1496 Balanced-Mod. IC

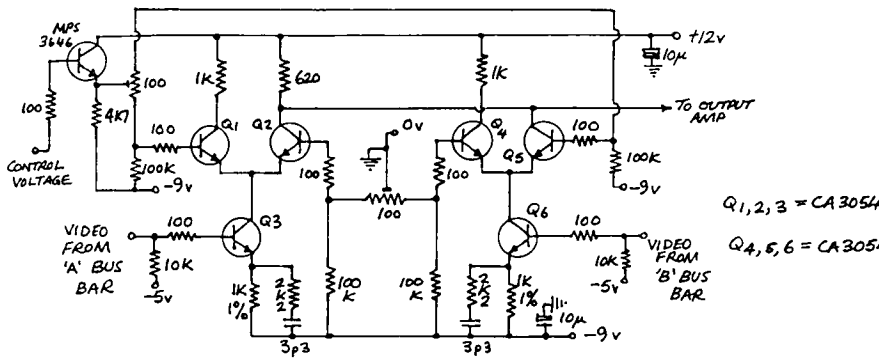


Fig.5 Simplified Effects Amplifier (Viscount 1107 Vision Mixer)

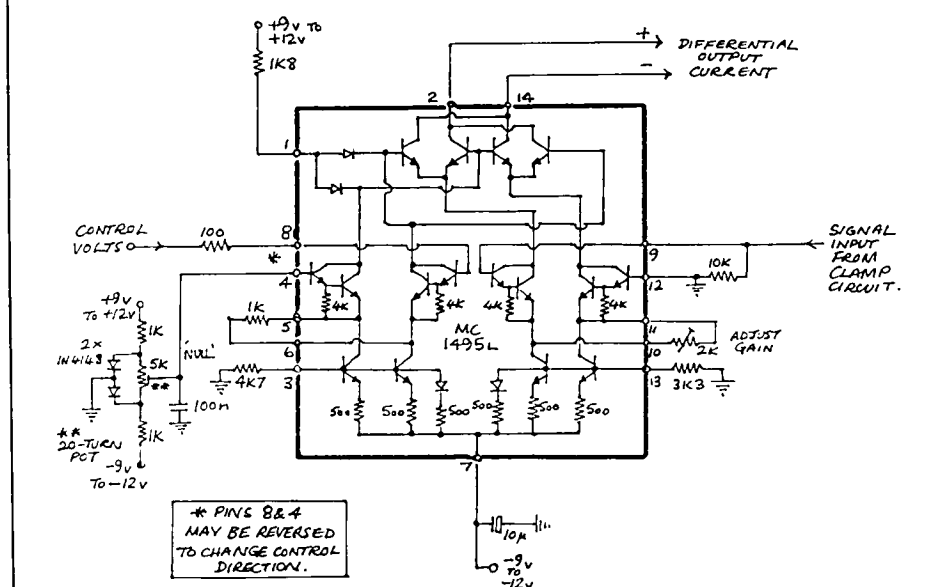


Fig.6 Basic 1495 Fader/Effects Amplifier Configuration (G8FNR/G8GLQ)

output of an 8-channel Vision Mixer in a Semi-Pro U-Matic Edit Suite. Basically, the 2N3819 FET is used as a variable resistance in the emitter circuit of the 2N3904 common emitter amplifier, thus varying the current feedback, and hence the gain. The following 2N3906 transistor (x2 gain) restores the signal polarity, and the BC557 is an output buffer.

The circuit requires some adjustment for optimum results, when the overall gain should be 1 to 1.25. Set the "cut-off" pot to max resistance whilst setting up. Fades are not quite linear, but follow an slight "S" curve either side of the nominal straight line - as does the differential phase, about 10 degrees either side. Too extreme a setting of the "cut-off" pot will cause the signal to suddenly disappear, so use caution.

In the above vision mixer I use a professional fader with built-in microswitch that operates at fade-out (to work the tally lamps). I have therefore arranged for the tally logic to additionally operate a blanking transistor in the output proc. amp, thus giving complete suppression (better than -60dB) when faded to black.

MULTIPLIER TYPE CIRCUITS

For a more professional approach to faders and effects amplifiers it is necessary to use "linear-multiplier" type circuits to achieve good linearity. This is very important if smooth cross-fades, true linear keying and soft-edge wipes are required. In Figure 3 I have shown the basic configuration of the balanced linear fading circuit; consider first the left-hand triple Q1, 2 & 3.

Q3 has its base connected to a fixed voltage (+4v), and is therefore known as a "constant current source" because its emitter will be 'regulated' to 3.3v defining the current (I3) that flows through R1. The signal input is applied via a series resistance to Q3 emitter, and the signal current must all flow through Q3 as the emitter has to maintain constant current through R1; the current at Q3 collector is therefore the sum of the standing current I3, and the signal current Is.

Consider now Q1 and Q2. The base of Q2 is held constant at +6.5v; the base voltage of Q1 is variable, but its centre voltage is made equal to Q2 base. Under these conditions the current at Q3 collector (I3+Is) must be split equally between Q2 and Q3, as (I1+I2) = (I3+Is). The signal output is taken from the collector of Q2 across R4, and therefore no signal inversion will occur.

Now consider the effect of varying the fader voltage. With the slider set at the positive end (+8v), more current will flow in Q1, but, because Q3 is a constant current source, it can only do so if the current in Q2 is correspondingly reduced; this is true of both the standing current I3, and what is more important, the signal current Is. The signal at R4 therefore decreases, and that it R2 (which is not used) increases. Similarly, reducing the slider volts below 6.5v will divert (I3+Is) from Q1 to Q2, thus increasing the output at R4. What is more, with a suitable control voltage, very good linearity is achieved.

But what about Q4,5 & 6? Well, they are there to cancel out the signal caused by the standing current I3, leaving only the wanted signal -that caused by Is. Without the right-hand triple, the signal voltage output will sit upon a DC that varies with fader setting. The second triple, which has the fader control voltage, but no signal input, is arranged to generate an equal and opposite DC that is subtracted from the signals across R2 and R4.

From the foregoing explanation it will be realised that accurate matching and good thermal tracking of the transistors is important, and that transistor array ICs rather than discrete transistors should be used in these circuits. Alternatively, balanced modulator or linear multiplier ICs may be used.

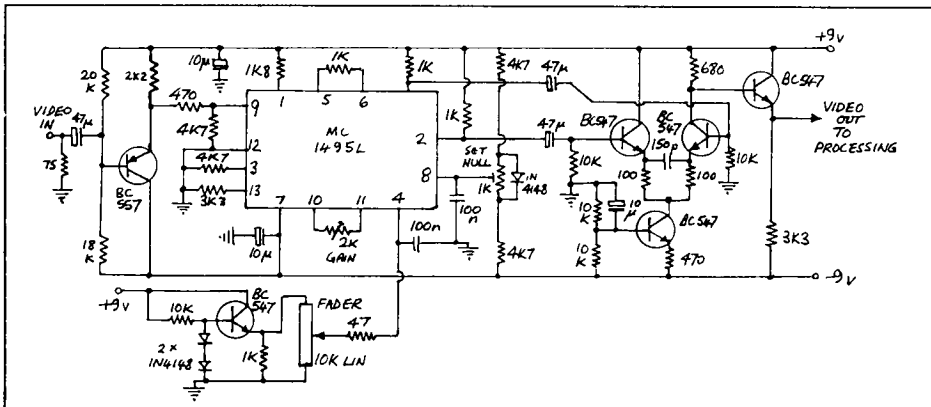


Fig.7 Video Fader using 1495 IC

USING THE 1496 BALANCED-MOD. IC

Examination of the interior circuit of the 1496 Ic shows a strong "family resemblance" to the fader circuit just described, and in Figure 4 I have shown this together with the peripheral circuitry needed to realise a fader circuit.

Grounding pin-5 of the IC cuts off the lower pair of transistors, and the mid pair are wired as the constant current sources with the signal injected at pin-3. This circuit has only been "bread-boarded" by me experimentally, and, although it works it does need some more refining (better clamp, etc). The fades ARE linear, and differential phase is better than 5 degrees.

SIMPLIFIED EFFECTS AMP.(Viscount 1107 Mixer).

Figure 5 shows a circuit that is an interesting compromise between complexity and performance. The Viscount 1107 is a semi-pro vision mixer, offering a relatively large number of wiping and keying effects at a (relatively) modest price. Note that the signals are injected into the bases of Q3 and Q6 (rather than the emitters), and that these transistors are in common emitter configuration. They will only partially act as constant-current sources if the signal current is small compared with the standing current.

Theoretically, the effect of this is to reduce the linearity of the fade function, and actual use of the mixer confirms this. The mixer does not offer soft-edge wipes, so the effect on these is unknown. The other simplification is to dispense with the DC-balancing triple - Q4,5 & 6 in this circuit form the other half of the effects amp. It should be noted that, unlike fig.3, this circuit causes signal inversion.

THE 1495 LINEAR MULTIPLIER

The basic 1495 circuit by G8FNR & G8GLQ as published in the Handbook Vol.2 (and elsewhere) is shown in fig. 6, together with the "innards" of the IC so that, once again, a "family resemblance" is illustrated.

The multiplier relies on accurate constant-current sources to give a highly linear operation. I do not propose to try and explain its operation in detail, (the Data Sheet has fourteen pages!), but to give some alternative peripheral circuitry, as I

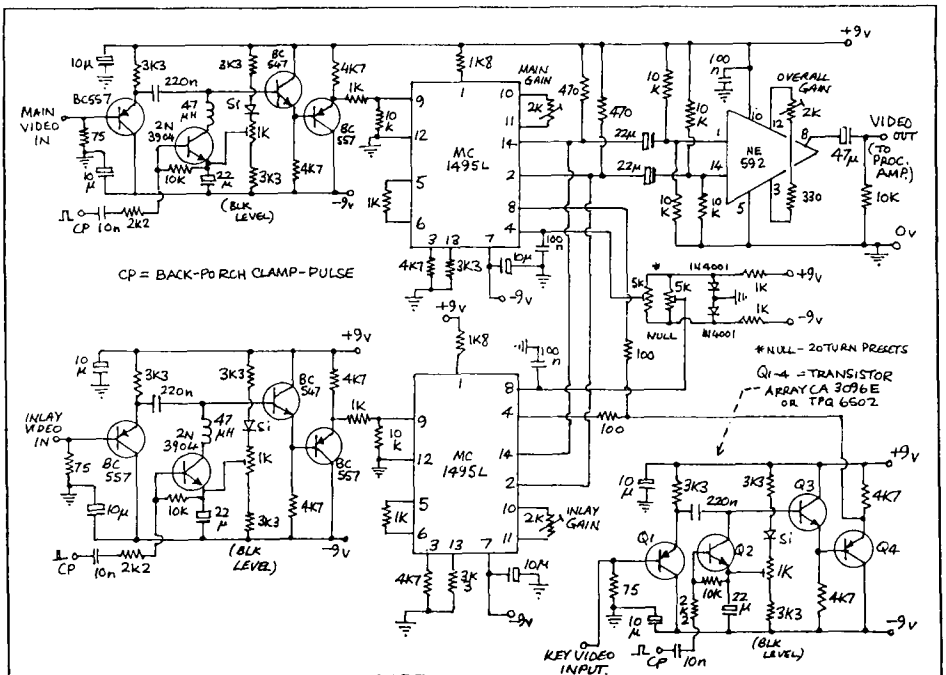


Fig.8 Effects Amplifier using 1495

have used the basic circuit many times. Incidentally, I have found (empirically) that it is possible to reduce the supply lines as low as +9v & -9v without any apparent loss in performance. The ICs run cooler at the lower supply, and the critical "signal null" adjustments seem more stable.

Figure 7 is the fade-to-black circuit that I used to supersede the FET fader in figure 2. This circuit is completely linear, and has very good differential phase performance. Nevertheless, I still use the fader microswitch circuit to ensure good signal suppression at fade-out!

Finally, in figure 8 I have shown a complete effects amp. using different peripheral circuitry to that of the Handbook. It is not claimed to be better, just more appropriate to the application - I used three of these within an 8-input vision mixer.

USING OSCILLOSCOPES

Part–9

Mike Wooding G6IQM

In this final part of this series I shall conclude the explanation of measurement techniques and conclude the series with an overview of oscilloscope performance.

MEASUREMENTS AT TWO SWEEP SPEEDS

(As this is a continuation of the section dealing with sweep measurements it should ideally be read in conjunction with the last section in part–8 of this series in CQ–TV 155).

Looking at a signal with two different sweep speeds makes complicated timing measurements easy. The A sweep gives you a large slice of time on the signal to examine. The intensified zone will show you where the B sweep is positioned, and the faster B sweep speeds magnify the smaller portions of the signal in great detail. You will find this capability useful in many measurement applications, two examples are shown in Fig.1.

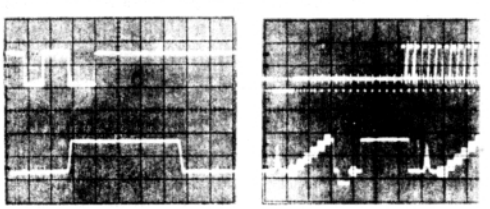


Fig.1 Alternate Delayed Sweep Measurements

Alternate delayed sweep measurements are fast and accurate. One use, examining timing in a digital circuit, is demonstrated in the first photograph in Fig.1. Suppose you need to check the width of one pulse in a pulse train like the one shown. To make sure which pulse you are measuring, you want to look at a large portion of signal. But to measure the one pulse accurately, you need a faster sweep speed. Looking at both the big picture and a small enlarged portion of the signal is easy with alternate delayed sweep.

Another example is shown in the second photograph in Fig.1. Here one field of a composite video signal is shown in the upper trace. The intensified portion of that field is the lines magnified by the faster B sweep shown in the lower trace.

With a dual timebase oscilloscope you can walk through the field with the B DELAY TIME POSITION dial and look at each line individually.

Because you can use the oscilloscope to show A and B sweeps from both Channel 1 and Channel 2 you can display four traces. To prevent overlapping traces, most dual time base oscilloscopes offer an additional positional control. On the Tektronix 2215 it is labelled ALT SWP SEP, for alternate sweep separation. With it and the two vertical channel POSITION controls, you can place all four traces on–screen without confusion.

SEPARATE B TRIGGER

Jitter can prevent an accurate measurement any time you want to look at a signal that is not perfectly periodic, but with two timebases and delayed sweep you can solve the problem with the separate trigger available for the B sweep. You trigger the A sweep normally and move the intensified zone out to the portion of the waveform you want to measure. Then you set the oscilloscope for a triggered B sweep, rather than letting the B sweep simply run after the delay time.

On a Tektronix 2215 the B TRIGGER LEVEL control does a double duty. In its fully clockwise position it selects the run-after-delay mode. At any other position it functions as a trigger level control for the B sweep.

The B TRIGGER SLOPE control lets you pick positive or negative transitions for the B trigger.

With these two controls you can trigger a stable B sweep even when the A sweep has jitter.

INCREASED TIMING MEASUREMENT ACCURACY

Besides examining signals at two different sweep speeds and seeing a jitter-free B sweep, you get increased timing measurement accuracy with a dual timebase oscilloscope.

Note that the B DELAY TIME POSITION dial is a measuring indicator as well as a positioning device. The numbers in the window at the top of the vernier drive are calibrated to the major divisions of the oscilloscope screen graticule. The numbers around the circumference of the vernier dial divide the major division into hundreds.

To make timing measurements accurate to 1.5% with the B DELAY TIME POSITION dial setting:

- use the B runs-after-delay mode.
- place the intensified zone (or use the B sweep waveform) where the timing measurement begins, and note the B DELAY TIME POSITION dial setting.
- dial back to where the measurement ends and note the reading there.
- subtract the first reading from the second and multiply by the A sweep SEC/DIV setting.

We will now go through an example of this in Exercise 1, again using the probe calibration signal as the waveform to be measured.

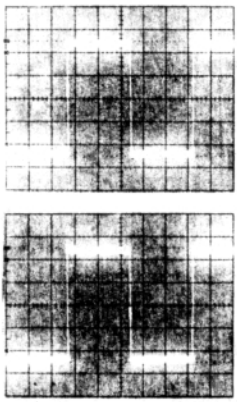


Fig.2 Pulse Width Measurement

Exercise 2 Pulse Width Measurement

1 ... Connect your probe to the Channel 1 BNC connector and the probe adjustment jack, hook the ground strap onto the collar of Channel 2 BNC, or any convenient earthing point, and make sure that the probe is compensated.

2 ... Use these control settings: SH 1 VOLTS/DIV on 0.1; CH 1 input coupling on AC; VERTICAL MODE is CH 1; A TRIGGER MODE is NORM; A TRIGGER SLOPE is negative (-); A TRIGGER SOURCE is INT (for internal) and INT trigger switch is either CH 1 or VERT MODE; HORIZONTAL MODE is A; A SEC/DIV is 0.2 mS while B SEC/DIV is 0.05 uS. Check the variable controls.

3 ... Centre the first complete pulse of the waveform horizontally. Switch to the ALT display with the HORIZONTAL MODE switch and move the B waveform to the bottom of the screen with the ALT SWP SEP control.

4 ... Centre A sweep waveform vertically. Turn down the intensity so that it is easier to see the small intensified zone.

5 ... Move the intensified zone to the 50% point of the rising edge of the waveform with the DELAY TIME POSITION control as in the first photograph in Fig.2.

Note the delay time reading from the vernier control, the number in the window first then

the outer dial number second, for example 3 in the window and 6 on the outer dial gives a delay time of 3.62.

Move the intensified zone to the 50% point of the trailing edge as shown in the second photograph in Fig.2 and note the delay time reading again, for example 8.46.

6 ... The time measurement, in this case the pulse width, is equal to the second dial reading minus the first reading multiplied by the A sweep speed. From our example readings: (8.46 - 3.62) x 0.2 mS = 0.968 mS. In other words, the B DELAY TIME POSITION dial indicates screen divisions for you, 1 complete turn of the vernier dial for every major division.

The delayed sweep controls of the dual timebase Tektronix 2215 oscilloscope are shown in Fig.3. They include: HORIZONTAL MODE (under HORIZONTAL POSITION control); B TRIGGER SLOPE A and LEVEL and a concentric A and B SEC/DIV control. The B DELAY TIME POSITION vernier dial is at the bottom of the column of horizontal system controls.

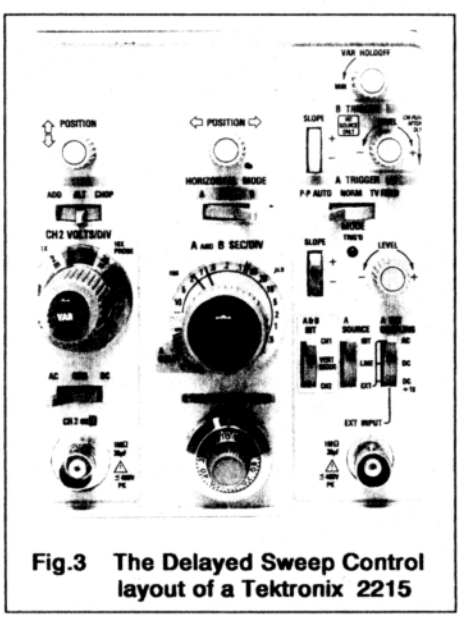


Fig.3 The Delayed Sweep Control layout of a Tektronix 2215

OSCILLOSCOPE PERFORMANCE

There are two aspects to oscilloscope performance: the design parameters of the instrument and its conformance to those parameters at the time of making the measurements. The latter is encompassed under the term the *uncertainties of the measurement.*

Making the instrument conform to its design parameters simply means calibration - including making sure that the probe is properly compensated, as you should have done many times already. However, even with correct calibration there will be some effect of the designed performance on your measurements.

Square Wave Response and High Frequency Response

In the design of amplifiers like those in the oscilloscope's vertical channels, there is always some compromise between the circuit's high frequency response and its handling of signals with square transitions. Extending the frequency response can be accomplished with high frequency compensation, but too much compensation results in an overshoot on a step. Too little extends the measured rise time. The best rise times without overshoot are achieved when the high frequency response is critically damped; the frequency response then falls off smoothly. The diagrams in Fig.4 illustrate the effects of high frequency compensation.

The effect of too much HF compensation is shown in the top two drawings, with the waveform exhibiting overshoot and possible ringing. Too little HF compensation produces the results shown in the second two drawings, with the waveform exhibiting roll-off on the edges of the squares. The bottom set of drawings show the results with a critically damped response.

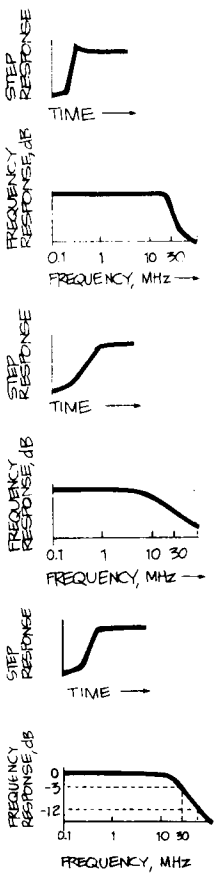


Fig.4 High Frequency Compensation

Instrument Rise Time and Measured Rise Times

The rise time of an oscilloscope is a very important specification, because the measuring instrument's rise time affects the accuracy of your measured rise times as expressed by the following approximation:

$$Tr(measurement) = \sqrt{(Tr(signal)^2 + Tr(measuring\ system)^2)}$$

In practical terms this means that the accuracy of a measured signal will be predictable, and will be dependant upon how much faster the oscilloscope is than the rise time of the signal being measured.

The chart in Fig.5 plots the relationship between the measuring oscilloscope's rise time, and that of the observed signal.

If the rise times are equal the error will be in then order of a 41% increase!

However, if the measuring oscilloscope is five times faster than the observed signal the measurement error CAN be as low as 2%. For measurement accuracies of 1%, it takes an oscilloscope with a rise time seven times faster.

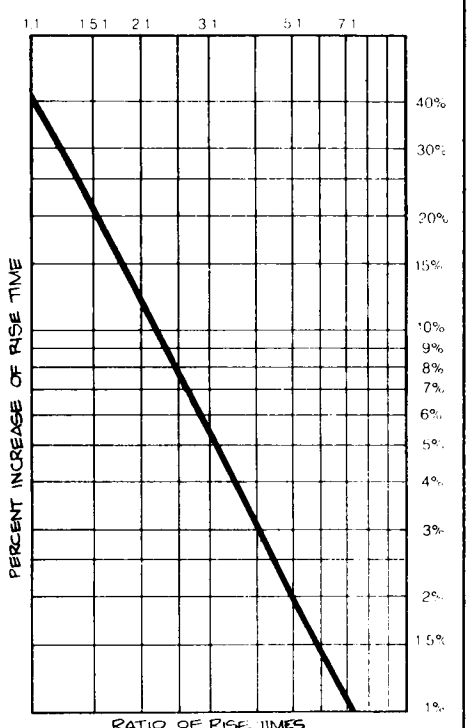


Fig.5 Measured Time Errors

Bandwidth and Rise Time

The vertical channels of an oscilloscope are designed for a broad bandpass, generally from some low frequency (DC) to a much higher frequency. This is the oscilloscope's bandwidth, specified by listing the frequency at which the amplitude of a sinusoidal input signal has been attenuated to 0.707 of amplitude of the middle frequencies of the band. This is called the -3dB point.

For older instruments specifications cited both a low and a high -3dB point. Modern instruments, however, have a relatively flat frequency response down to 0 Hz (DC), so only the upper number is quoted as bandwidth.

A bandwidth specification gives you an idea of an instrument's ability to handle high frequency signals within a specified attenuation (i.e. within 3dB). However, bandwidth specifications are derived from the oscilloscope's ability to display sine waves, a 35 MHz oscilloscope will display a 35 MHz signal with only 3dB attenuation, but the effects on a square wave at, or near, the oscilloscope's upper bandwidth limit will be much more severe. This is because high frequency information in the square wave will not be accurately reproduced by the oscilloscope. An example of this is shown in Fig.6.

Square waves have a great deal of high frequency information in their rising and falling edges that will be severely attenuated and thus lost as the upper bandwidth limit of the oscilloscope is approached.

The top photograph in Fig.6 shows a 15 MHz square wave reproduced by a 35 MHz bandwidth oscilloscope. Note that even this far from the upper bandwidth limit the square wave is being rounded off.

However, when the same signal is displayed on an instrument with an upper bandwidth limit of 60 MHz the trace is quite different, as shown in the lower photograph in Fig.6.

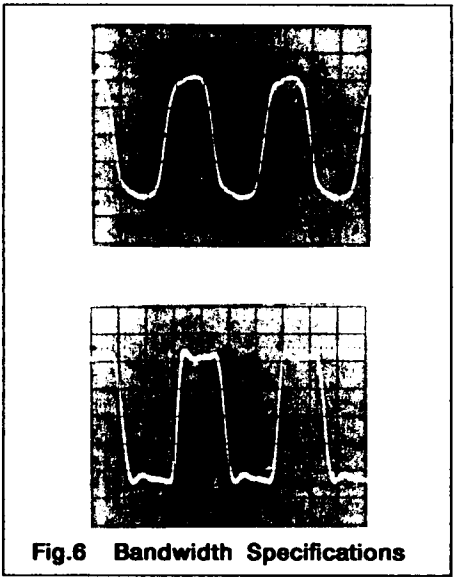


Fig.6 Bandwidth Specifications

The frequency response of most oscilloscopes is designed so that there is a constant that allows you to relate the bandwidth and rise time of the instrument. This constant is 0.35, and the rise time and bandwidth are related by this approximation:

$$Tr = 0.35 / BW$$

A simple way to apply the formula is:

Tr(nanoseconds) = 350 / BW(megahertz)

For the Tektronix 2200 series instruments with a bandwidth of 60 MHz, the rise time is 5.8 nanoseconds.

This concludes our investigation into the use oscilloscopes and the measurements that can be made using them. However, all I have been able to do is introduce the concepts and measurement techniques, there is no substitute for practical experience

I wish to thank Tektronix Inc for their help and advice, and for their permission to use material, diagrams and photographs from their publications.

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I²C Part-5 - SOFTWARE V2.27

This is the documentation that goes with version 2.27 of the I²C firmware. It is supplied in a 32k Byte EPROM (27C256) and contains all the code necessary to run the new Teletron CPU card, the new teletext display card and vision switcher. Future upgrades will be made available as the hardware appears in the I²C booklet, attached to CQ-TV.

The software provides a menu driven environment enabling full access to all of the I²C projects. For those of you who require more control than the menu system provides, there is an operating system called TOS (Teletron Operating System). This is accessed by the first selection from the main menu and provides a machine code monitor type environment, with the more familiar command line entry and prompt.

The commands recognised from TOS are as follows :-

CALL	CLS
DATE	DISASSEMBLE
EXAMINE	FILL
IN	DOWNLOAD
MENU	MODIFY
OUT	REGISTERS
SEARCH	TIME

Each of these commands are described in full at the end of this document.

The menu system is very easy to use, simply press the key indicated by the menu options. From the main menu, you have seven choices:-

- **1** - Exit to TOS. This places you in the machine code monitor, described at the end of this document.

- **2** - Set date and time. This option allows you to set the correct date and time for the real time clock chip. You simply enter the correct date and time then press return. If you want to exit without altering anything, press ESCape.

- **3** - Enter TELETYPE mode. This places you in the teletext editing mode. You are presented with a blank screen. At this point you can start typing, anything you type will appear on the screen. The cursor keys allow you to move around the screen without disturbing anything. There are also some control characters available, these are generated by holding the CONTROL key down whilst pressing a letter from A-Z.

The control characters available are:

CTRL-D	Turn cursor on
CTRL-E	Turn cursor off
CTRL-H	Move cursor left (same as left cursor key)
CTRL-I	Move cursor right (same as right cursor key)
CTRL-J	Move cursor down (same as down cursor key)
CTRL-K	Move cursor up (same as cursor up key)
CTRL-L	Clear screen and cursor home
CTRL-M	Move cursor to start of current line (Carriage return)

If you press the ESCape key at any time, a menu will appear at the foot of the page. If you press ESCape again, you will be returned to the main menu, Otherwise you may now enter one of the following commands:

Save - Save the current screen to RAM

Load - Load from RAM to screen

Hex - Enter a two digit HEX number, which will be deposited at the current cursor position. This allows you to generate colour and graphics.

Top - Displays the top half of the screen in double height

Bottm - Displays the bottom half of the screen in double height

Norm - Returns the display to normal height

Graphics - Allows easy generation of graphics. If the cursor is at a position on the screen that is in graphics mode, this command will let you build up the graphics block. You toggle the pixels on/off by pressing '1' and '2' for the bottom row, '4' and '5' for the middle row, '7' and '8' for the top row. If you see characters appearing when you use this command, then you where not in graphics mode. Use the Hex command described above to place a graphics colour code at the start of the current line.

For further reference on how to produce graphics on a Teletext system, see CQ-TV 154 Page 23.

• **4** - Display inbuilt test card. There is a test card programmed into the operating system, with your callsign in. Press ESCape to return to the main menu.

• **5** - Enter system control menu. This displays another menu, each option on the new menu allows you access to the IIC projects. A detailed description follows later.

6 - Teletext acquisition. This option allows you to capture teletext information off air. When you first enter, page 100 will be requested. After a short delay, if all is well, this will be displayed. The menu on the bottom line is always present and the following commands may be entered at any time:

ESCape - Return to the main menu

Hold - Places the current page on hold.

Page - Enter a new page request. This is in the form of a three digit number. The software will accept full HEX numbers, although the broadcasters only transmit the decimal pages normally. You may also enter the letter 'X' in any digit position, this will set that digit to 'don't care' the result being that the acquisition circuits will accept any page number for that digit. The results of this are quite spectacular if you enter 'XXX' in other words, display ANY page.

Save - Save current page to RAM. *NOTE - The area of RAM used to 'save' is the same area used by the TELETYPE option. Thus you can save a teletext page, then 'load' it into the TELETYPE screen and edit it.*

Timed-page - Enter a four digit HEX number to request a timed page. IE: When teletext transmits a page, it may send page 1 of 4, then 2 of 4, etc. If you enter 0001 here, it will only display page 1 of 4. This will contain all X's by default, which means all timed pages will be shown.

Ident - Displays the broadcasters identification packet on the status line. The menu disappears while this is being done, press any key to get the menu back.

• 7 - Morse code decoder. This option is a full morse code decoder, it looks for morse on bit 2 of port C of the 8255 chip. You can connect a morse key and practice your morse, or attach a tone decoder and 'read' Morse off air. The port should be normally high (3K3 pull-up resistor) and go low when the key is down, or tone present.

Option 5 on the main menu, takes you to another menu. This new menu allows access to the IIC projects appearing in CQ-TV. The options are as follows:

1 - Return to main menu

2 - Relay control. This allows control of the eight channel relay card. When selected, you are presented with another menu, with the following options:

1 - Return to previous menu. This option takes you back to the previous menu

2 - Redefine inputs. This option allows you to give each relay a unique label. The default labels are 'RELAY 1' 'RELAY 2' etc. You may alter these with this selection. After pressing '2' you will be asked which relay you wish to alter 1-8. Press a number between 1 and 8. You will then be prompted for the new text, up to a maximum of 29 characters. When you have entered the new text, press RETURN. The text you have just entered will appear next to that relay.

A-H. Pressing each of these letters toggles the appropriate relay on or off. You will see the colour of the letter alter as you press the key. Red means that relay is off, Yellow means it is on.

3 - Audio switcher control. This will allow control of an eight input, two channel audio switcher, yet to appear in CQ-TV.

4 - Vision switcher control. This allows control of the eight input, two channel vision switcher. When selected, you are presented with another menu, and the following options:

1 - Return to previous menu. This option takes you back to the previous menu

2 - Redefine inputs. This option allows you to give each input a unique label. See the description above, for the relay card.

A-H. These are the letters corresponding to the first channel. The letter 'A' is input 1, 'B' is input 2, etc. To select input 4 to this channel, press the letter 'D' Input 4 will now be connected to the first channel.

I-P These are the letters for the second channel. They work in exactly the same way. You should see the colour of the letter change as you press it. This indicates the current choice.

5 - External test card control. This option gives computer control to the electronic test card that appeared in the CQ-TV handbook. The options are as follows:

1 - Return to previous menu

A-J These letters allow you to select the pattern you require. They are all labelled on the screen. See the previous IIC booklet for information on how to connect this option.

If you still require manual control as well, the computer control connections can be wired in parallel with the existing decade switch. Turning the decade switch to the full test card option will allow computer control. Selecting the full test card on TELETRON, or turning TELETRON off, will give manual control.

THE MACHINE CODE MONITOR COMMANDS

There now follows a detailed description of the machine-code monitor commands:

CALL: This allows you to call a machine code routine held anywhere in the Z80's memory map. Typically, you will enter a routine into RAM and use this command to start running it. The syntax for this command is:

CALL xxxx. Where 'xxxx' is a four digit hexadecimal address. IE: 0000 to FFFF.

Example: CALL 9A00. This command will transfer control to the address at 9A00h.

Tips: If your code keeps the stack tidy, you may return control to TOS by executing a RETurn instruction. The registers are saved on return to TOS and may be examined using the REGISTERS command - see later.

CLS: Perhaps the simplest of the commands, this will clear the screen and return the cursor to the top left hand of the screen. The syntax for this command is:

CLS. There are no parameters.

DATE: This command will display the current date (Providing you have the Real Time Clock chip fitted on the VDU card) and depending on whether you passed any parameters, will either set the date or return the READY prompt. The syntax for this command is:

DATE [dd/mm/yyyy]. Where dd is a two digit date (01-31), mm is a two digit month (01-12) and yyyy is a four digit year (1900 - 2999)

The fact that the date is in square brackets means that this is optional and if omitted, the current date will be displayed then you will be returned to the prompt.

Example: DATE 24/11/1990. This will set the current date to 24th November 1990.

DISASSEMBLE: This command will disassemble machine code from the address passed, this part of the system has only just been written and may still contain some bugs, but on the whole it will disassemble machine code in the Z80's memory map quite effectively. To get the prompt back, press ESCape. The syntax for this command is:

DISASSEMBLE xxxx. Where 'xxxx' is a four digit hexadecimal address. IE: 0000 - FFFF.

Example: DISASSEMBLE 0000. This will start disassembling the machine code at 0000h. (The start of the operating system EPROM).

Tips: Try disassembling from address 0000 and follow the code through, the first instruction should be 'DI' then 'IM 1' and 'JMP xxxx' after you see the JMP instruction press ESCAPE and start disassembling from the address after the JMP instruction. This is the start of the operating system itself. Don't look too hard though, you'll see all my bugs !

EXAMINE: This command allows you to dump area's of memory to the screen for examination. This command will display the area of memory you pass it, so if you ask it to display more than one screenful at once, it will do so. The display will scroll when the bottom of the screen is reached. The syntax for this command is:

EXAMINE xxxx yyyy. Where 'xxxx' is a four digit hexadecimal start address and 'yyyy' is a four digit hexadecimal stop address.

Example: EXAMINE 1200 12FF. This will display 256 bytes of data from 1200h to 12FFh (Part of the EPROM) the display is in the following format:

```
Add      Hex data bytes      Characters
1200  41 53 43 49 49 20 54 65  ASCII Te
1208  78 74 2E 00 01 02 03 04  xt.....
```

If the data is a valid ASCII character then it will be displayed on the right if the data is not an ASCII character, then a dot will be displayed instead.

Tips: Use this command to look at the text in the EPROM, you never know what you'll find !

FILL: This command fills an area of memory will the value you pass it. The syntax for this command is :

FILL xxxx yyyy zz. Where 'xxxx' is a four digit hexadecimal start address, 'yyyy' is a four digit stop address and 'zz' is a two digit hexadecimal value to fill the memory with.

Example: FILL 9800 9900 AA. This will fill the area of RAM from 9800h to 9900h (256 bytes) with the value AAh.

Tips: Remember you can only alter the contents of RAM, if you try to fill the EPROM nothing will happen. Try to keep away from the areas of RAM between 8000h and 97FFh as this is used by the operating system and altering values in that range can cause the CPU to crash, or produce some strange results.

IN: This command will display the data at a port on the I/O map. The syntax for this command is :

IN xx. Where 'xx' is a two digit hexadecimal address.

Example: IN 00. This will input the data at I/O address 00h (Port A of the 8255 chip - What the keyboard is connected to) and display it on the screen.

Tips: Use this command in conjunction with the OUT command to control devices on the CPU's I/O map. IE: Port B and C of the 8255 can be connected to external devices and these commands will allow you to control them.

DOWNLOAD: This command is used to download data into the CPU's RAM, at a high rate of knots. It has no parameters. Unless you have a program that will output parallel data in the INTEL HEX format (GB3ET repeater group have such a program) I suggest you don't bother with this option. I use it to download and test machine code programs compiled on my PC with a cross-assembler, before committing them to EPROM.

I would be happy to supply further information on this command if anyone is interested - G1FEF.

MENU: This command has no parameters and once executed will transfer control back to the menu driven system, leaving TOS.

MODIFY: This command allows you to modify data in the CPU's RAM. Data at the current address is displayed, you may then alter it or scroll forwards or backwards through the memory map.

The syntax for this command is:

MODIFY xxxx. Where 'xxxx' is a four digit hexadecimal start address.

Example: MODIFY 9800. This will display the contents of RAM at address 9800h and allow you to alter it, or move forwards or backwards through memory, one byte at a time. The above command will produce a display something like this:

9800 00. The '9800' is the current address, the '00' is the contents of RAM at that address (this will vary), the '.' means the data byte is not an ASCII character (If it was an ASCII character, it would be displayed), finally the '_' is the cursor and is waiting for you to enter some data. At this point you have four options,

1) Enter new data as a two digit hexadecimal byte.
2) Press the 'full stop' key - This will take you back to the command line
3) Press the 'PLUS' key - This will move to the next address, without altering the contents of memory.
4) Press the 'MINUS' key - This will move to the previous address, without altering the contents of memory.

Tips: Use this command to enter machine code programs that you write. Then execute them with the CALL command.

OUT: This command is the opposite of the IN command and allows you to output data to the CPU's I/O ports. The syntax for this command is:

OUT xx,yy. Where 'xx' is a two digit hexadecimal address and 'yy' is a two digit hexadecimal data byte.

Example: OUT 01,55. This will output the value 55h to port 01h (Port B of the 8255 chip).

REGISTERS: This command will display the contents of the CPU's registers, as they were on return from the CALL command. If you have not used the CALL command yet, the displayed values will all be zero. The syntax for this command is:

REGISTERS. This will produce a display on the screen as follows:

HL	DE	BC	0000 0000 0000
IX	IY	AF	0000 0000 0000

Meaning that the contents of all registers were zero (Usually only seen when the CAll command has not been used yet).

Tips: See the memory map at the end of this document and locate the address of the RAM where these values are held. If you then use the MODIFY command to alter them, when you next use the CALL command, the registers will be set to the

values you have entered BEFORE your routine is called.

SEARCH: This command allows you to search through the entire memory map for a particular sequence of hexadecimal bytes, or for a particular sequence of ASCII characters. The syntax for this command is:

SEARCH xxxx yyyy aa bb cc. Where 'xxxx' is a four digit hexadecimal start address, 'yyyy' is a four digit hexadecimal stop address and 'aa' 'bb' 'cc' are two digit hexadecimal data bytes.

or:

SEARCH xxxx yyyy "STRING". Where 'xxxx' is a four digit hexadecimal start address, 'yyyy' is a four digit hexadecimal stop address and STRING is a string up to 80 characters long of ASCII characters, enclosed in double quotes.

Examples: 1) SEARCH 9000 FFFF 55 AA. This will search for the sequence 55h AAh in memory from 9000h to FFFFh

2) SEARCH 0000 7FFF "BATC". This will search for the string "BATC" in memory from 0000h to 7FFFh

If the search is successful, the message 'Match found at xxxx' will be displayed, where xxxx is a four digit hexadecimal address corresponding to the address at which the search succeeded.

If the search was not successful, the message 'No match found' will be displayed.

TIME: This command works in the same manner as the DATE command, but allows you to display and alter the time. The syntax for this command is:

TIME [hh:mm:ss]. Where 'hh' is a two digit decimal number depicting the hours, 'mm' is the minutes and 'ss' is the seconds.

Example: TIME 19:55:00. This will set the time to 'five to eight pm'. If you omit the parameters, the current time will be displayed, you will then be returned to the prompt.

MEMORY MAP

ADDRESS DESCRIPTION

0000 Start of EPROM containing the code to run the CPU board.
7FFF End of the EPROM. It is 32K bytes long, not all of it is used.
8000 Start of RAM
9FFF End of RAM if only 8K is fitted
FFFF End of RAM if the full 32K is fitted.

Within the first 4.5K of RAM are the variables used by the operating system, these can be safely looked at with the EXAMINE command, however it is not advisable to alter any of them, apart from the area used to store the registers before using the CALL command. For completeness the locations used are as follows :

8000 Two byte temporary storage
8002 Length and frequency of the beep
8004 Copy of the contents of the 8255 control register
8005 Maximum length of string input

The following locations are those used to hold the register values:

8006 AF Register
8008 HL Register pair
800A DE Register pair
800C BC Register pair
800E IX Register
8010 IY Register
8012 RAMTOP Variable, holds the current top of RAM
8014 FLAGS Holds various system flags
8018 Flash rate for cursor
801A Temporary storage for interrupt routines
801C Cursor row
801D Cursor column

The following locations are variable used to control the I²C bus:

801E Teletext chip register 1 RAM copy
801F register 2
8020 register 3
8021 register 4
8022 register 5
8023 register 6
8024 register 7
8025 register 8
8026 Page zero row position (For the cursor)
8027 column
8028 Page one row
8029 column
802A Page two row
802B column
802C Page three row
802D column
802E Page four row
802F column
8030 Page five row
8031 column
8032 Page six row
8033 column
8034 Page seven row
8035 column
8036 Keyboard buffer start address
8038 Keyboard buffer end address
8078 Vector for INT
807A Vector for NMI
807C Vector for error handler routine
807E Vector to error table 8080 I²C message buffer (1K Bytes long)
8480 String input buffer (7Fh bytes long)
8500 Disassembler workspace
8500 Teletext acquisition buffer
8600 Operating system buffer
8A00 Real Time Clock buffer
8B00 Keyboard buffer
8B80 Machine stack, up to 8FFF
9000 4 pages of checksum protected RAM
9000 Video switcher NVRAM space
9100 Relay card NVRAM space
9400 Teletext and Teletype 'save' area
9800 From here on up, is clear for user applications.

INPUT/OUTPUT MAP

The I/O map has only two devices connected to it (at the moment !) and there is plenty of free space to add your own devices, i.e:

- Speech synthesisers
- Music synthesizers.
- Control ports to switch other items of equipment on and off.
- Input ports to monitor activity in the outside world.
- Printer ports.
- Serial ports.
- – the list is endless.

The address's used so far are:

00 Port A of the 8255 chip
01 Port B
02 Port C
03 Control port for the 8255 chip.
60 I²C I/O Port.

A SIMPLE TEST PROGRAM

Here is a short Z80 machine- code program for you to type in and try, just follow the instructions listed below:

Exit to TOS by selecting Option-1 from the main menu, then type in:

MODIFY 9800

followed by **RETURN** (or ENTER). Type in the following Hex. digits exactly as they appear:

CD 45 17 0C 05 00 3E 0E 32 1C 80 3E OF 32 1D 80

CD B1 14 CD 7F 18 3E 0A 32 1C 80 3E 10 32 1D 80

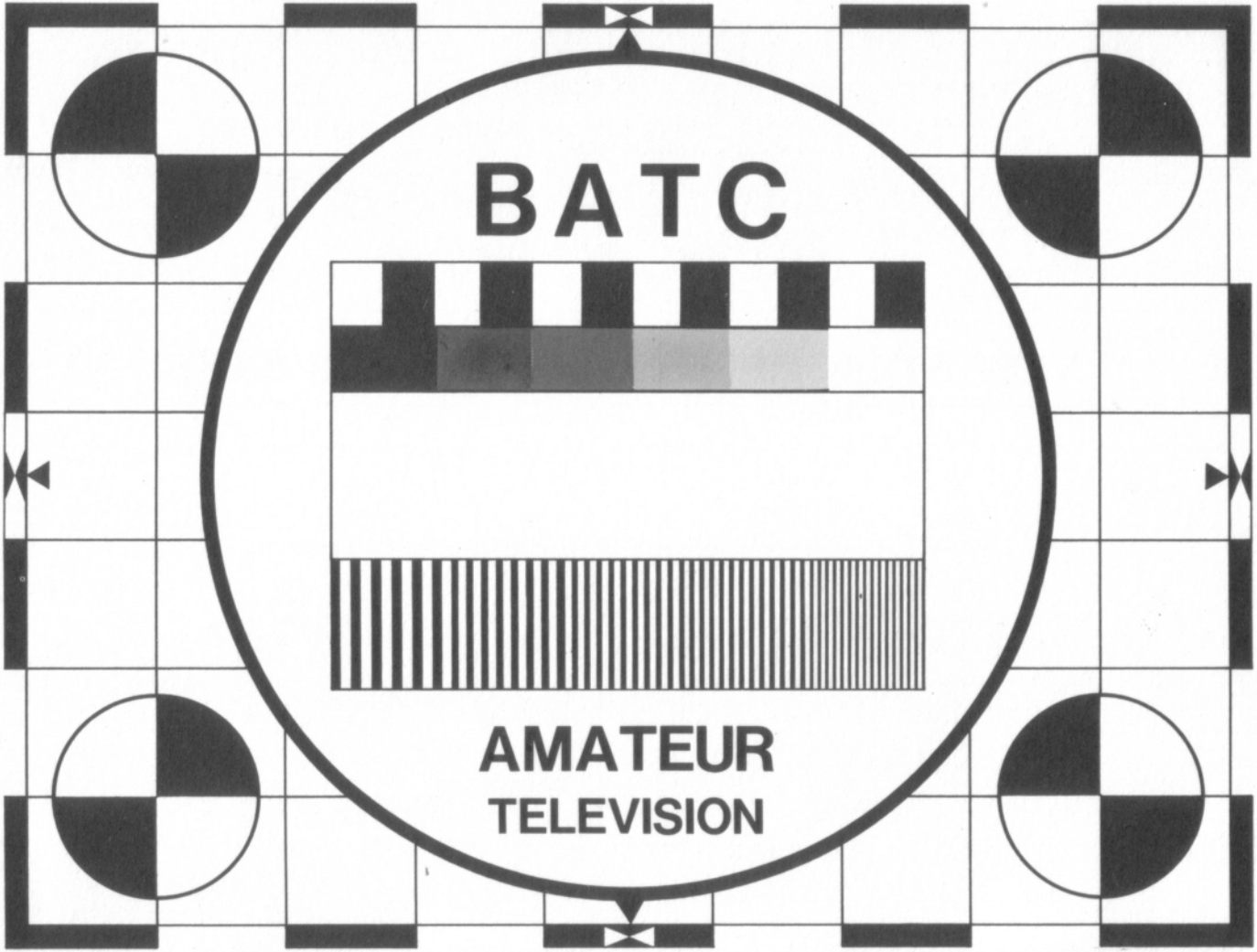
CD B1 14 CD 24 18 D7 30 DD CD 45 17 04 0C 00 C9

After entering the last set of Hex. digits (C9) enter a full stop. This will take you back to the prompt. You can then run the program by entering:

CALL 9800

followed by **RETURN** (or ENTER).

If anyone would like the source code for this program then send an SAE to Chris Smith G1FEF, 107 Hitchin Street, Biggleswade, Bedfordshire, SG18 8BL.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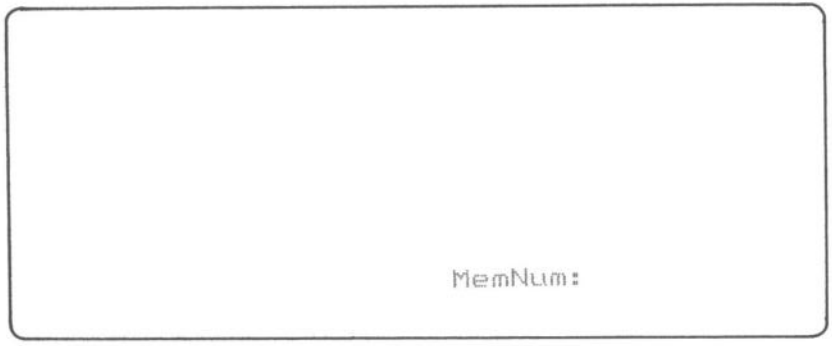

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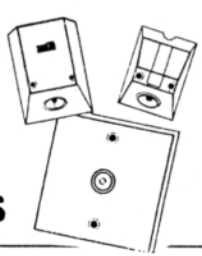

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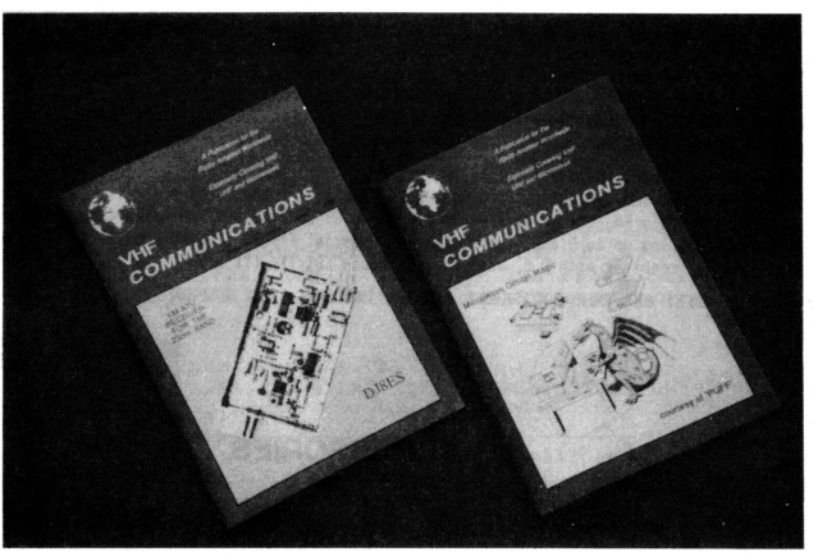

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THE DAYTON HAMFEST REPORT

Andy Emmerson G8PTH

The best laid plans of mice and men ..., well suffice to say that although several BATC members were planning a trip to the USA's premier amateur radio event this year, it didn't work out that way. In the end yours truly was the only one out of the group who made it. Next year it will be different, of course.

Whether you have been to Dayton or not, you are probably bored by the superlatives used to describe what is the biggest amateur radio rally in the world. But it is still a bit awe- inspiring to find a seven acre outdoor fleamarket, especially one with a pub that opens specially for the lunatic hams at 04.30 in the morning.

RAIN, RAIN, RAIN

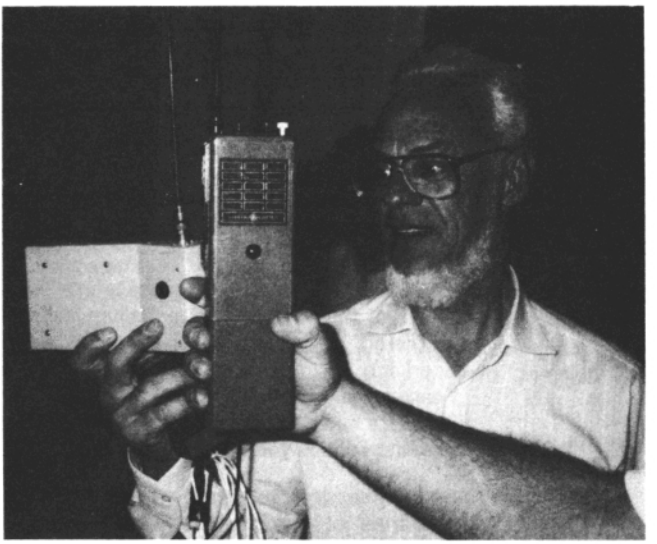
Mind you, you have to be up early in the morning to catch the bargains. By going at that time you would also have avoided the torrential rain that beset the hamfest this year. A few traders were selling raincoats and did good business; also a tilt roof had been erected over some of the stalls this time, and this was well appreciated by the unfortunates without jackets.

ATV was promoted energetically this year. One of the traders had a helium balloon tethered way above his flea-market stand and the ATVers asked of they could tie a camera to the balloon. Sure, why not?!? So viewers had an interesting aerial view of the fleamarket this year.

MINE'S SMALLER THAN YOURS

Kreepy-peepies (little CCD camera chips built into hand-held radios) were the flavour of the event this year. Well, two people independently thought of the idea and brought them to the show. Together with a Casio or Radio Shack two-inch screen portable TV, you could have a very handy 70cm portable ATV station (the TVs

World's biggest flea market – and food and drink from 4.30 in the morning to boot!



Mine's better than yours! Two hand-held CCD camera/TV transmitter combinations are brandished at the ATVQ party.

conveniently tuned 70cm) and these TVs were even used to get into the Dayton ATV repeater from the hotels.

HOSPITALITY GALORE

There are two ATV magazines in the USA, ATV QUARTERLY and SPEC-COMM. Most people find this a case of unhealthy rather than healthy competition, since the two publishers are involved in an expensive circulation battle.

Main beneficiaries were the hams, who had a choice of ATV parties to attend. These events were lecture streams and demonstrations held in nearby hotels: the accommodation was sumptuous, food and drink were laid on and ATVers could eat, drink and talk the whole evening about ATV – at no cost to themselves. Paradise? Well, very nearly!

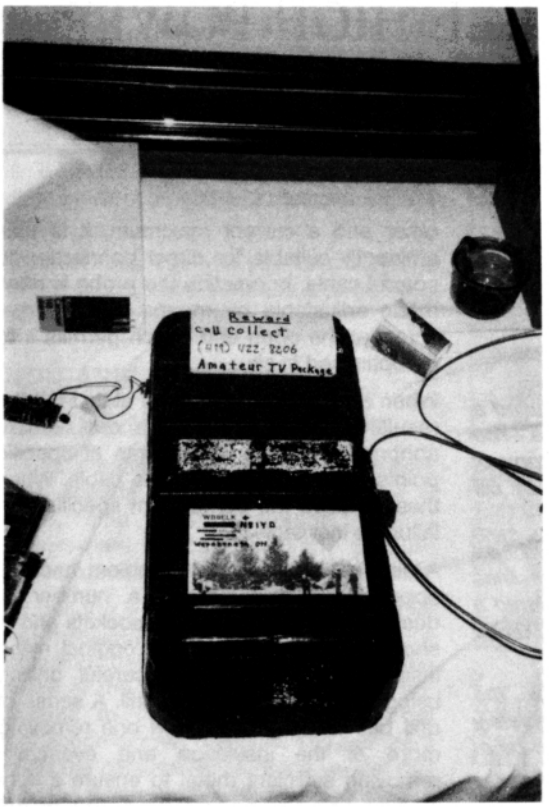
In common with 350 others, I attended ATVQ's event in the Holiday Inn North, where I understand the facilities, food and drink cost the best part of $1,000. No wonder they will be looking for donations next year to defray costs. Even at a few dollars, the entertainment would be worth it.

There was no single highlight of the evening: Bill Brown WB8ELK showed some breath-taking video recordings made of the signals from his balloon- mounted ATV transmitter. This reached the edge of space and the pictures looked very much like the shots you see from the Space Shuttle.

OUT OF THIS WORLD

Speaking of which, several hams were ecstatic that they had managed to get their fast-scan TV signals up to the Space Shuttle vehicle on the 10th April. The lucky few were: KC6A (Long Beach, California), KA4NZD (Marshall Space Centre, Huntsville, Alabama), N9AB (Mundelein, Illinois) and WA9GVK (Naval Academy, Washington DC). All were successful in getting video up to the Space Shuttle but KA4NZD had the best signal. The shuttle crew were receiving the signals with an indoor antenna and were not in a position to transmit any pictures back. They did, however, record all the signals they received on a portable VHS recorder, and these same recordings were played back at the ATVQ party.

For the record, the chief operator on board the shuttle was Ken Cameron, who used his own call KB5AWP. Other hams aboard were Steve Nagel N5RAW, Linda Goodwin



Bill Brown's edge-of-space transmitter parachuted to Earth and was recovered safely.

N5RAX, Jay Apt N5QWL and Jerry Ross N5SCW. Well done, and here's to the two-way next time!

NEW GOODIES

There weren't many new ATV products on show at the Hamvention this year, possibly because the recession has hit the USA significantly worse than Britain (yes, it's true).

International Crystal Manufacturing Co. showed a new seven-pole interdigital filter designed specifically for ATV operators. It can be ordered on any frequency between 420 and 440MHz and combines a 6MHz bandwidth with low loss. How it does this or at what price were not revealed in the literature.

An organisation called Micro Computer Concepts announced a video repeater controller with built-in DTMF decoder and video switcher. The specification looks good and the price of $400 (say £235) did not seem unreasonable for a quality commercial product.

AEA re-launched its vestigial sideband 70cm transmitter and masthead-mounted linear, though it failed to convince me and others that the high level signal could be truly VSB. Oh well, they had a nice promotional video, which showed ATV in a very positive light.

Icom had sponsored one on ham radio in general but it was a mawkish affair, strong on sentimentality and low on subtlety. You'd collapse laughing if you saw it, and even though Icom were generously giving away VHS copies of it, you couldn't see people paying money for it or indeed why Icom paid money for it. This is not to say a lot of effort was not put into it, just that it was 24 carat yuk.

A DETACHABLE HIGH POWER E-PLANE PROBE

Dr.J.A.Share MSc Phd,
Geomagnetism Laboratory,
University of Liverpool

Dear Mike,

as part of a research project we required a high powered 2.5GHz signal source. You were kind enough to send me a copy of CQ-TV 146 which detailed a design by Bill Parker.

Subsequently we have modified an Industrial Microwave Oven along the lines suggested in the article, but encountered a major problem in extracting the 500/600 Watts of RF.

The enclosed article shows how the problem was resolved in a completely satisfactory manner and may prove to be of interest to your members.

A DETACHABLE HIGH POWER E-PLANE PROBE

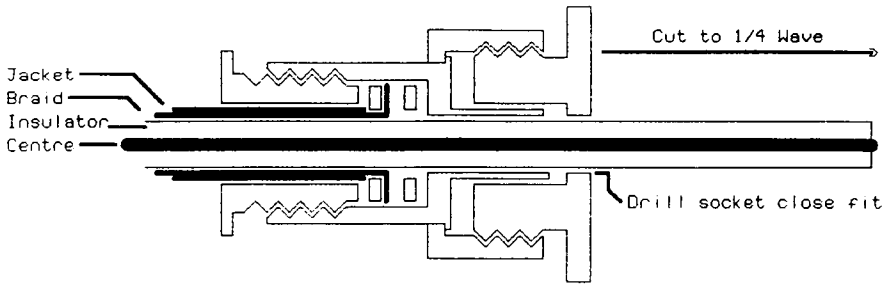
The development of a 600 Watt 2.5Ghz RF source led to a serious breakdown problem which was encountered when connecting the source waveguide to a transmission cavity by means of a length of RG8U Coaxial cable with N type Connectors. Due to a number of reasons associated with the cavity development the N type plug and socket at the waveguide E probe experienced catastrophic failure.

An E probe is a quarter wave resonator, one end is open, the other connected to the centre of the socket. When excited the open end becomes a voltage maximum and the other end a current maximum, it is thus eminently suitable for direct connection to coaxial cable. In practice the probe is often made adjustable by means of a trimmer screw at the open end which permits it to be optimised in situ.

When a cable is mismatched at its load the resulting standing waves can create abnormal voltages or currents at specific points along the length of the cable. When these exceed the component specification failure is inevitable.

A simple solution to the problem became apparent whilst surveying a number of destroyed N type plugs and sockets and is shown in the diagram. The original nylon insulation is removed by careful drilling using a drill vice and pillar drill. A series of drill bits are required, each one removing more of the insulation and eventually removing sufficient metal to ensure a tight fit over the centre core insulation of the RG8U. If the operation is repeated for the socket in the same manner ensuring that the final operation results in a tight fit over the RG8U centre insulation. The rough edges must be deburred, a larger diameter drill bit twisted between the fingers results in a good finish.

The cable end which is to become the E probe should be cut back with a generous allowance for the length of centre conductor which is to become the eventual probe. The first washer is fitted over the braid which is fanned out and soldered. The second washer is fitted and excess braid ends are trimmed and the edge dressed with a fine file. The plug cable end may now be assembled using the correct spanners.



The High Power E-Plane Probe

In order to set the probe to its correct length it is necessary to assemble the plug and socket together as shown in the diagram. It is then obvious that the cable centre conductor protrudes beyond the socket and becomes the probe. It is advisable to cut overlength, when the socket is mounted permanently onto the wave guide, the probe fits in the same manner as an N type connector and can be readily removed as required. Trimming the probe to length is a simple procedure and the positional repeatability has been found to be excellent.

In operation the detachable probe has proven itself to be very reliable and no failures due to breakdown have been experienced even under high standing waves on the cable.

Ref: Parker, W8DMR-"A Microwave Oven FM ATV Transmitter" - CQ-TV 146.

BEYOND TTL

Part 1

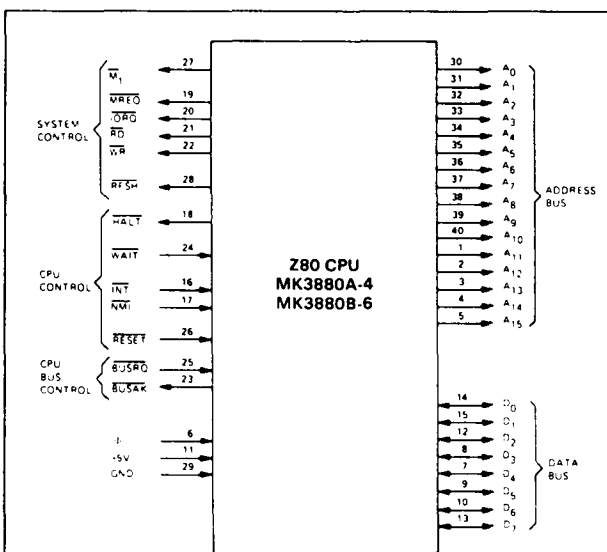
Trevor Brown G8CJS

This series of articles is designed to build on and extend the basic blocks of logic that have been described by John Wood in the previous set of articles (Logic Circuits, CQ-TVs 145 to 155). Beyond TTL will deal with the dreaded microprocessor in a TTL fashion, with a strong emphasis on practical applications. Software instructions will be covered as they are an integral part of the system, but by programming at machine level. TTL analogies to the instructions are possible and will be used where ever possible.

The term Microprocessor is derived from the earlier term Central Processor unit, or CPU for short. The word Micro merely indicates that it is a piece of hardware that has been scaled down using micro electronics. The CPU we will be covering in detail will be the Z80 as used in the clubs own micro computer I²C. In practice it is not too difficult to modify your learning to other CPU's. I will start by looking at the connections on the CPU; some are inputs, some are outputs, and in case of the data bus some are inputs and outputs (bidirectional).

ADDRESS BUS

All CPU's have an address bus, and in the case of the Z80 this is a 16 bit bus, which is to say it is composed of 16 parallel conductors marked A0 to A15 on the CPU pin out.



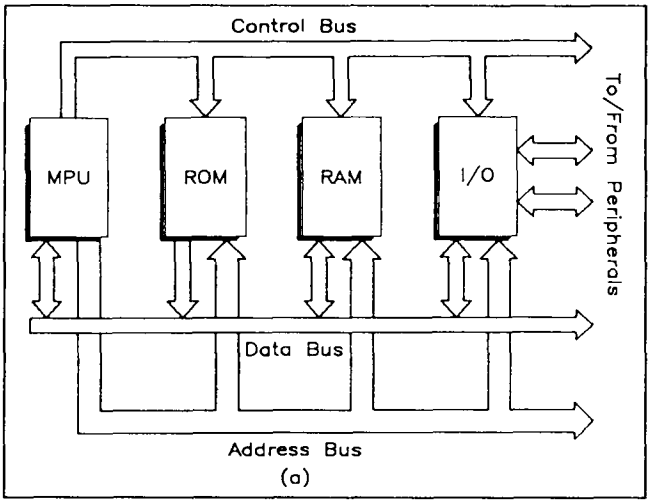
Z80 Pin Connections

The address is generated by the Z80 and used to select memory locations for the data bus to communicate with.

DATA BUS

The Z80 has an 8 bit Data bus, but unlike the address bus, this bus is bidirectional, so the Z80 will send out data along this bus, but will also take in data along these 8 conductors, the two operations being called read and write.

The address bus by comparison only sends information out (unidirectional).



CONTROL BUS

This is where CPU's take on some of their individuality, the Z80 has separate read and write connections which are active low, and are controlled by the Z80.

In this way, it is possible to indicate to the addressed memory location if it should take in the data on the bus and store it in the addressed location, or retrieve and send out the data in the addressed location.

The Z80 also generates two other important signals, called IORQ and MREQ. The two signals expand the address bus, by allowing duplicate addresses to exist, one with the IORQ pin low and one with the MREQ low. By using IORQ to enable one device and MREQ to enable another, they can share the same address.

In practice the MREQ is routed to the memory chips, and the IORQ is routed to other hardware, usually associated with conveying information back and forth between the outside world, and is called I/O, meaning input output.

CLOCK

In common with all CPU's, the Z80 requires an external clock, to which all activity is synchronized. It is one of the most forgiving CPU's on clock performance. The mark space ratio should be 50/50, but if you keep the speed down, this becomes less critical.

The Z80 does require some sharp edges to the clock, and the simplest way to sharpen up TTL is with a pull up resistor.

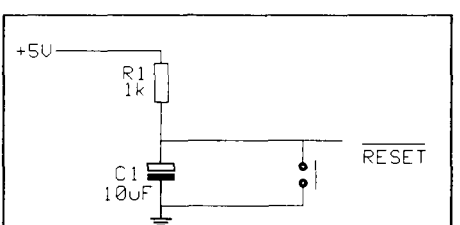


Fig.2 The Reset circuit

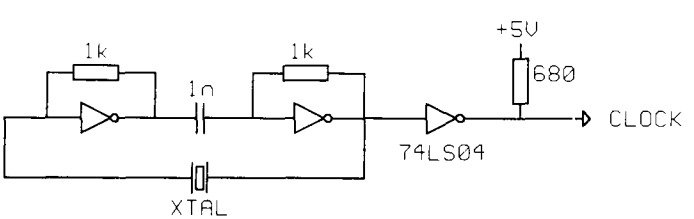


Fig.1 A simple TTL Clock

Fig.1 shows a simple TTL clock with a pull up resistor that is capable of driving a Z80 up to about 4MHz.

The slowest clock you can use with a Z80 is about 100kHz.

RESET

This pin is active low and can be driven with the simple circuit in Fig.2. At switch on C1 is short circuit and resets the CPU, as C1 charges via R1 the reset is removed and the CPU will start to run.

The push button provides an external reset on the CPU. The reset command will cause the Z80 to read the first byte of memory addressed by address 0000 and act upon it. The memory is arranged so that this is EPROM.

ADDRESS DECODING.

This is where we come to the number crunching, please bear with me and don't turn to the next article. I promise to keep it simple.

The bus is broken down into bunches of fours, A0 to A3, A4 to A7, A8 to A11 and A12 to A15, and a single digit is chosen to express the sixteen possible logic states that can occur on 4 wires.

The table below shows how to calculate that digit for A0 to A3, the process is repeated for A4 to A7, A8 to A11 and A12 to A15. In this way any address can be represented by four digits.

A3	A2	A1	A0		
0	0	0	0	=	0
0	0	0	1	=	1
0	0	1	0	=	2
0	0	1	1	=	3
0	1	0	0	=	4
0	1	0	1	=	5
0	1	1	0	=	6
0	1	1	1	=	7
1	0	0	0	=	8
1	0	0	1	=	9
1	0	1	0	=	A
1	0	1	1	=	B
1	1	0	0	=	C
1	1	0	1	=	D
1	1	1	0	=	E
1	1	1	1	=	F

Sorry about the letters, it's to avoid double figures and is called Hex.

Now lets get back to TTL, where I promise to stay when ever possible. The example in Fig.3 shows how to decode a 4 bit address so that two chips which both require a low on their chip enables, are enabled by an address 2 for chip A, and an address C for chip B.

In practice the address bus has 16 wires and covers the address's 0000 to FFFF. Either IORQ or MREQ will be Anded in with the decoded address.Address decoding is also applied to the high end of the address bus to give a range of addresses that correspond to a single valid logic state. This is so that the address bus can control more than one chip , to enable a mix of RAM and PROM memory, and also to enable a range of small chips to be accommodated.

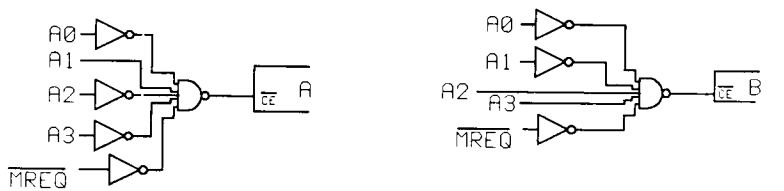


Fig.3 Decoding a 4-bit Address

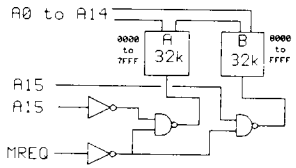


Fig.4 Decoding A15

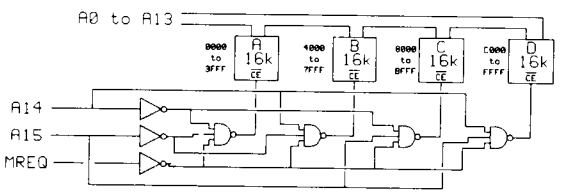


Fig.5 Decoding for smaller chips

The enable signals derived from the address bus are Anded with MREQ and used to enable RAM chips. The range for which the enable is valid is called a page. If A15 is decoded as Fig.4, then chip A will be enabled for addresses 0000 to 7fff and chip B will be enabled for addresses 8000 to ffff. This would break the memory map up into two 32k pages, so a 32k EPROM and a 32k RAM chip could easily be accommodated.

If you wish to use small chips and require smaller pages, then Fig.5 shows how to decode A15 and A14 into 4 16k pages. The decoding of a range of addresses as pages is usual applied to the memory map, i.e: Anded with MREQ, and the decoding of single locations is more usually in the I/O map, i.e: Anded with IORQ, but there are always exceptions.

It is not unusual to find holes in the memory map, where an 8k or 4k chip is in a space decoded to 16 or 32k. This is because the smaller the hole the more complex is the decoding logic, and we all try to keep circuits as simple as possible. In practice large chips are now at realistic prices, so the days of putting 6116 (2k Static Ram) into 32k holes to save cost and keep the decoding simple now seems in the distant past. It is worth mentioning at this point that the term 'k' means 1024 bytes in computing. The Z80 can address 64k or 65535 bytes, if you must lapse into decimal counting.

OTHER Z80 CONNECTIONS

The other pins on the CPU are:

INT and **NMI:** active low inputs and should be pulled high when not in use. They are called interrupts and instruct the CPU to stop running the current programme and execute the programme stored at hex 38 and hex 66 respectively, the INT can be disabled in software. The NMI can not be disabled. An example of its use can be found in the I²C project, where it is connected to the keyboard strobe, and as such runs the keyboard service routine when ever a keyboard key is pressed.

BUSREQ and **BUSACK:** these are used to send the Z80 Tri-state, so that external hardware can take possession of the memory without the CPU interfering.

WAIT: this is an input to pause the CPU when working with slow memory and is seldom used as speed is not a problem with modern RAM.

HALT: this is an output that goes low when a software halt is encountered and is useful for debugging a programme.

RFSH: this pin is also seldom used. It is to do with servicing Dynamic memory, which uses capacitor storage and has to be constantly read or the data will leak away. I2C uses static memory, which is the set and reset of a flip flop and does not need refresh.

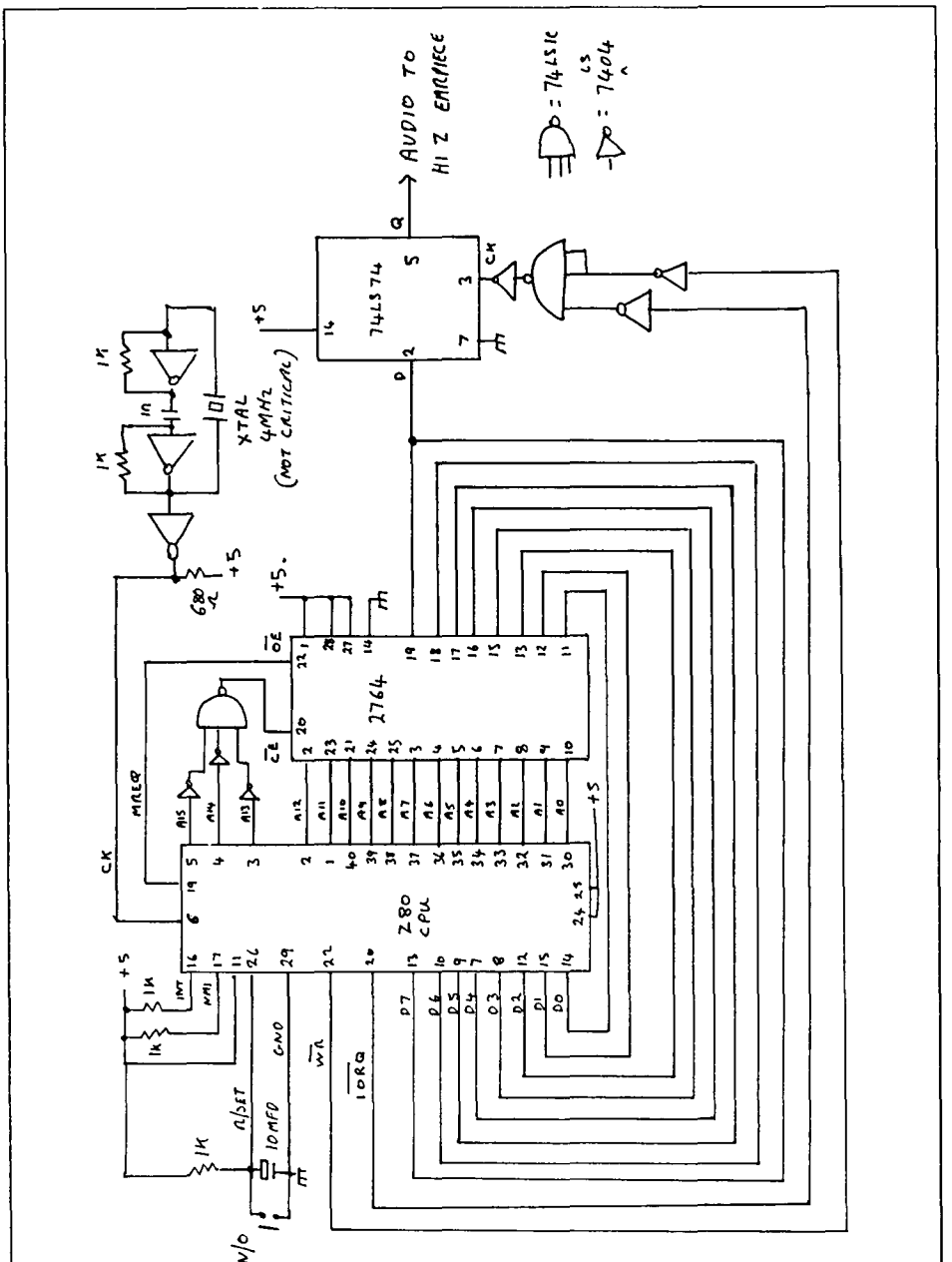


Fig.6 The 'Roger Beep' circuit

M1: this pin is an output, which denotes that the Z80 is fetching an op code (op codes will be explained later).

ROGER BLEEP

I am going to finish with a practical example of a circuit you can all build, using the techniques so far. The circuit in Fig.6 has an EPROM in the bottom of the memory map 0000 to 1FFF. For this range of addresses the chip enable will be held low by the address bus.

In the I/O map is a D-type flip flop that is addressed by all the I/O addresses. When it is enabled by the address bus, it will latch what ever data is on D7 of the data bus. D types were covered in the previous articles, but just in case you have forgotten whatever logic state is on the D input when the clock input is strobed high (74LS74) is latched onto the Q output.

The software in the EPROM will generate a "K" in CW whenever it is run and will then pause and wait for a reset. The software is shown below as hex data and should be programmed into a 2764 EPROM.

There are many EPROM programmers about, the spectrum EPROM programmer covered in CQ-TV 143 is still a viable option and a club PCB (flex) is still available for it. If you are really desperate then I will programme one for you at a nominal cost.

SOFTWARE

```
16 90 3E 80 26 02 2E 40
01 01 00 ED 79 2D 20 F8
3E 00 25 20 F1 15 20 EA
01 00 50 0B 78 B1 20 FB
16 30 3E 80 26 02 2E 40
01 01 00 ED 79 2D 20 F8
3E 00 25 20 F1 15 20 EA
01 00 50 0B 78 B1 20 FB
16 90 3E 80 26 02 2E 40
01 01 00 ED 79 2D 20 F8
3E 00 25 20 F1 15 20 EA 76
```

EMULATOR

One way of testing software without programming EPROMs is to emulate the EPROM.

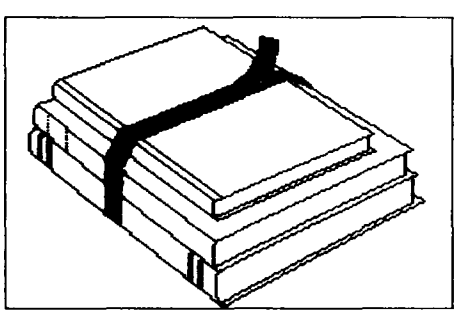
EPROM emulators are units which plug into the circuit in place of the EPROM and have a keyboard and display so you can type in the hex data and try it.

The *Softy 3* is an excellent example of such a unit that will I am afraid set you back around £500. If you have been putting together the club's I²C project, then you can type the software in and run it.

You will need to choose a part of the memory which is RAM, say 9800, enter the code using modify, and call 9800 to run it. The earpiece on the circuit diagram needs connecting to pin-B17 of the edge connector Port B bit-7.

The beauty of this sort of hardware is its flexibility. All that you have to do is replace the programme with another and you can change the K to your own callsign, or that of a beacon or repeater you may have under construction.

The limit is endless, all you need is a working knowledge of the Z80 instruction set in order to be able to work out your own programmes. This we will be covering in the next issue, but if you are hooked then there are some excellent books around on the subject, my favourite is by R.Zack and will set you back £20. *Good learning never comes cheap!*



10GHZ ATV THE EASY WAY !

Part 4

Jim Toon G8FNY

In part three I said that I would show you how to make a wavemeter but on reflection I think first it would be best to show you how to make an attenuator.

This is a very simple, but very useful device to make, its uses are many:

1) For setting up your RX, by fitting in front of your RX system you can tweak for best results and work out the gain of your receiver.

2) Turning down the power on your TX when setting up the frequency, and many other uses. Fig.4 shows how the attenuator would be used when setting up the frequency.

So then lets get down to making one. The details are shown in Fig's.1, 2 and 3 and for the construction you will need the following:

1) Two flanges. (see CQ-TV Nos.153/154)
2) A 3/8" length of brass tube from your local hobby shop.
3) A 6BA length of brass screwed rod.
4) A 2" length of waveguide.
5) Two 6BA nuts, two washers, and a small spring out of an old Biro pen. (See Fig.2).

Cut a length of waveguide 2" long and make sure it's nice and square and then fit on your flanges. Now mark off the centre on the small side of the wave guide and carefully drill a small hole 1/8" dia.

Next, cut a small length of brass tube $^3/_8$" dia. x 1 & $^3/_8$" long and carefully solder over the small hole.

You will now need a small piece of PCB board cut to the dimensions in Fig.1. Remove the copper by using soldering iron and small sharp knife, then coat carefully with graphite and glue (see CQ-TV 153). When dry, carefully smooth down with fine sand paper, then drill and tap a 6BA hole as shown in Fig.1.

You will now need a small length of 6BA threaded rod 2" long. From one end mark up $^9/_{16}$" and screw on a small brass 6BA nut and solder in place. Now slide the rod down the $^3/_8$" brass tube and into the waveguide and put a small amount of Araldite on the hole of the PCB.

Now, with the aid of a pair of tweezers, place into waveguide and screw the brass rod into the PCB, making sure that it is square and leave to set. Also make sure that the rod is just flush with the PCB.

Now slide down the brass rod a small 6BA washer and then the spring, slightly

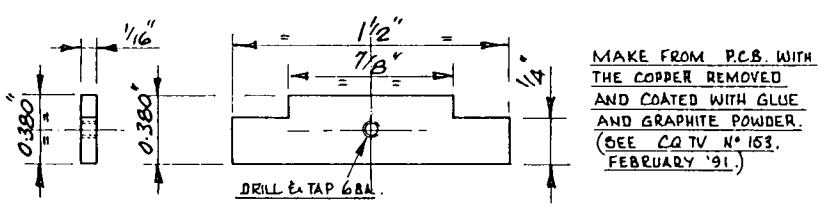


Fig.1 PCB dimensions

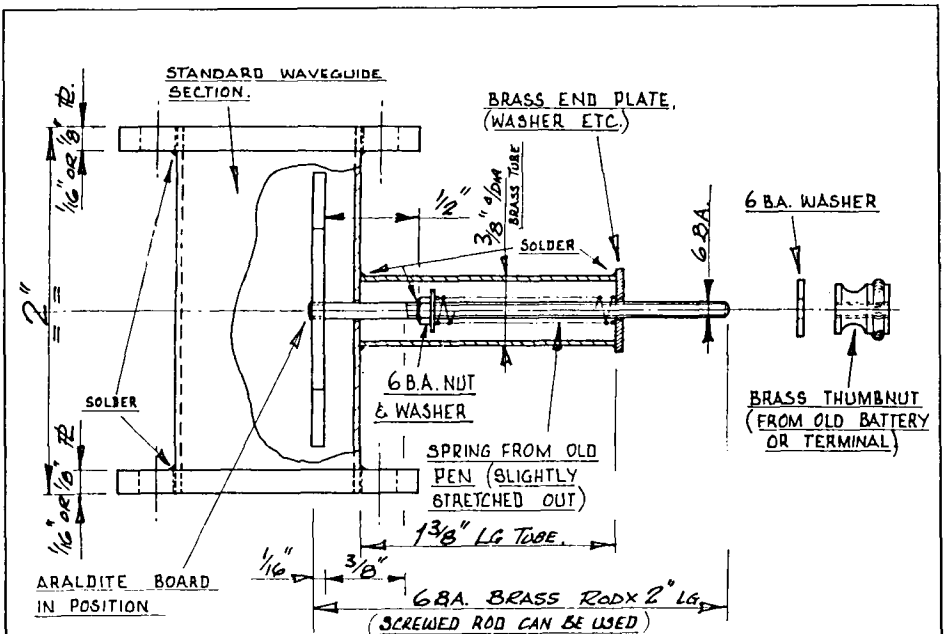


Fig.2 Details of the Attenuator

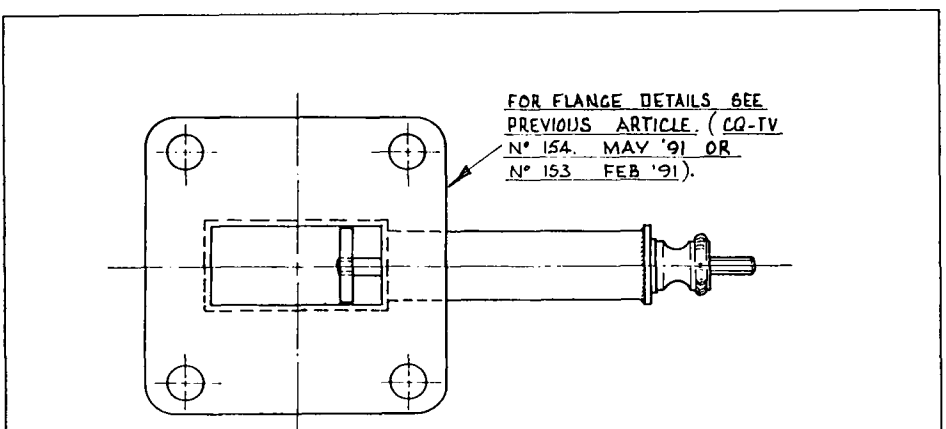


Fig.3 View through Flange

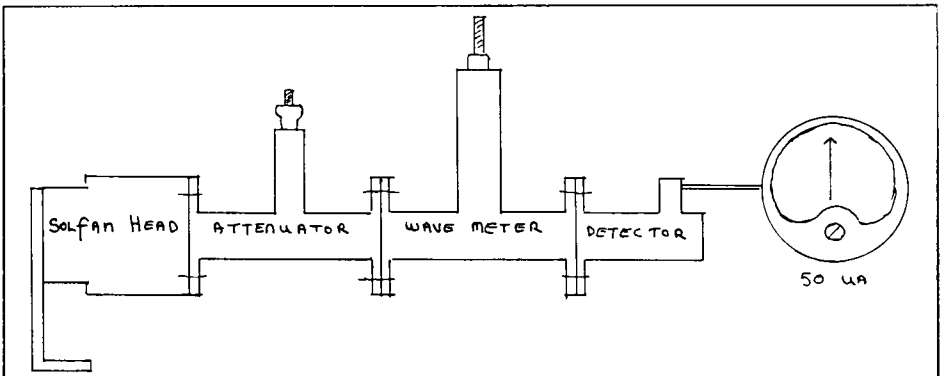


Fig.4 Basic set-up for measuring frequency

stretched, so that it is just sticking out of the tube. Solder on to the end of the tube a slightly larger brass washer. This is a bit tricky as the spring is pressing against it, use a small clamp then it is easy.

Finally, screw on your brass terminal and the job is done.

You will notice that as you tighten up the nut the PCB goes to wall of the waveguide, and as you slacken of the nut the PCB goes towards the centre of the waveguide, so increasing the attenuation. You will find that the attenuator is about 20d maximum.

In part-5 I hope to show you how to use it, and how to make a wave meter.

FEEDBACK - THE TDA3590 AGAIN

Tom Mitchell G3LMX

Having read the articles by Bill Mercer CQ-TV 154 p50 and John Goode CQ-TV 155 p59, I would like to add a few comments which may prove of some use to readers, as the TDA3950 is still available from advertisements in Practical TV at a reasonable price. I first used the chip in a prototype BLO for the Project 100 SPG some years ago and believe it was a conversation at a BATC Convention that led to the version published by David GW8PBX in CQ-TV 129.

I first came across the chip in a series of Decca TV's, and my information is taken from the appropriate handbook and subsequent change modification, when the TDA3950 was superseded by the TDA3950A version. At the time I developed the unit there was only one other possibility, the TDA540, which requires a tapped inductor.

Recent TV developments have led to the use of chip decoders, which in general make access to the VAS waveform and subcarrier even more difficult. There is one possible modern chip, the Sony V7020, which as well as decoding to RGB, provides output of MS, BG, SC and VAS. However, it is produced on a shiny-dip package 28 pins at 0.07" spacing, making it difficult to produce a suitable PCB by hand. So for ease of construction I still recommend the TDA 3950.

POINTS TO NOTE

A) Power Supply (pin-2)

The chip has an internal 8.5V shunt stabiliser between pin-2 and ground, which means that the series resistor between pin-2 and the supply rail will depend on the supply voltage. It may be of interest to note, that tests recently made on my prototype indicated that the BLO would work with as little as 6 volts, which may have advantages for use with the Philips SAA1043/SAA1044 SPG combination.

B) Subcarrier Output (pin-9)

The internal buffered subcarrier on pin-9 is not used, as it is blanked by the burst gating pulse, hence the use of the externally buffered feed from the Xtal oscillator.

C) Burst Gating (pin-5)

This is the one that appears to have caused the most confusion. What is required is a supply of positive going line rate pulses (these should not be field blanked or contain extra pulses during field period) wide enough to pass the the colour burst. Note, that if the gate is open for longer than required, the noise immunity will be impaired. The Decca circuit used pulses derived from line fly back, narrowed to produce a gate pulse in back porch.

The pulse amplitude being set by a Zener diode between pin-2 and earth see Fig 1. ZDI was originally 3.9V for the TDA3950, which appeared to be quite happy with the 3.6V or so swing out of TTL Logic. However, when the TDA 3950A was introduced,

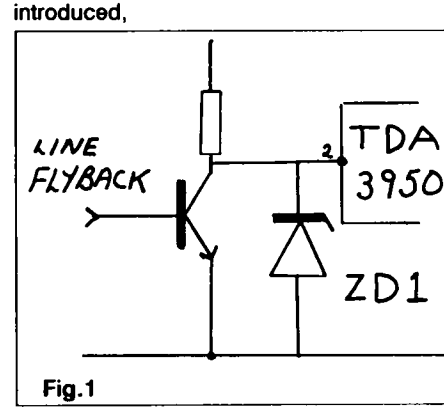


Fig.1

Decca changed ZDI to 6.8V and it will no longer operate from TTL levels, a transistor amplifier being required. However, I have found that it will work quite well from 74HC series logic running on a 6V rail.

D) VAS/PAL Square Wave (pin-13)

Providing the gating pulses on pin-5 are at line rate as described above, the output on pin-13 will be a correct polarity VAS/PI waveform. If you need to invert it there is a design problem with the equipment it is driving. However there are two problems in using this waveform.

1) Amplitude: output swing is up to about 8 volts and the low value does not go low enough to switch TTL, hence the AS coupling and amplitude limiting in the published BLO circuits.

2) Timing: yes Bill Mercer's observation is correct (if not his suggested cure). The output on pin-13 switches at the start of the burst gating period, rather than at line sync start, but please note that it you are reprocessing colour, as in Bill's case, as long as the line rate pulse starts before the re-inserted burst and chrominance, you won't be aware that it is delayed.

If the BLO is part of a colour SPG system, the VAS timing has to be set to the output of the SPG and not that of the reference input. Bill's method has the advantage of saving a monostable delay, but opens the gate to noise in the sync period.

E) Clock Indication (pin-11)

This goes high when BLO is colour locked again, its low value will not drive TTL directly and needs a transistor interface.

COLOUR LOCKING SPG's

Having looked at the TDA 3950 in general, let us now investigate the requirements of a colour locked SPG for amateur use. In the non genlocked condition, all timings are derived from a very stable oscillator, normally running at fsc or a multiple thereof.

International Standards for PAL specify a tolerance of +/-10Hz. UK broadcasters use Rubidium Standards, which give a stability of +/-1Hz in about 20 minutes.

This is well beyond what can reasonably be expected from Amateur equipment, which is only switched on when required. There is, however, a cheap and easy alternative. Instead of attempting to build a high stability oscillator, why not use the SPG BLO as the subcarrier source, locking it to an off air broadcast subcarrier when not genlocked to a local source.

Note, that in this mode your SPG is not line locked to the off air signal and will not be disturbed by changes in picture source.

THE BLO and SYNC SEPARATOR

In order to genlock the SPG it is necessary to provide:

a) a Sync Separator. This provides mixed syncs and acts to correct to monochrome (i.e: 2 field sequence) and line timing.

b) Burst Lock Oscillator. This provides (i) Subcarrier reference locked to the external colour signal, and, (ii) VAS/PI information to set SPG four field sequence to that of the external colour source.

In addition the BLO requires pulses to gate out the colour burst.

PRACTICAL IMPLEMENTATION

Burst Gating Pulses

The simplest method of doing this is to produce pulses from the trailing edge of Line Drive from the SPG. This was the method used by David GW8PBX which John Goode published in CQ-TV 129. I think John must have overlooked the delay

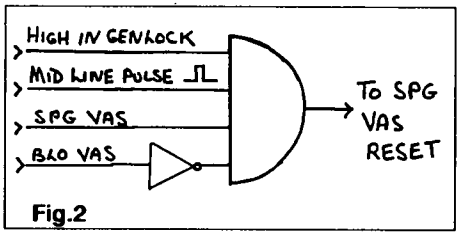


Fig.2

introduced by the boxcar transistor and attempt to use LD direct to the TDA 3950.

This method works, but has a big disadvantage it will only colour lock once the SPG is in monochrome lock and phased in to the video source -should a phase shift be required between input and output of the SPG, part or all of the burst will be outside the burst gate period. It is much better to produce suitable gate pulses from the reference video sync, using a series of three non-retrigerable mono stables.

The first having a period of around 3/4 lines removes half line information, the second produces a line rate pulse slightly wider than line syncs, the trailing edge of which is used to trigger the final monostable. The third monostable produces the burst gating pulse. This could be simplified by omitting the third monostable and widening the second to include the burst period into the BLO. By producing the BLO gating pulses from the input video, the BLO subcarrier oscillator will be locked whenever reference video is available.

VAS/PI Reset

The final consideration is how to correct the SPG VAS to match that from the incoming video. In a stand alone SPG, VAS is produced by dividing line drive by 2. This means that in addition to considering the odd/even field (1 and 2) sequence of monochrome source we now have to consider a four field colour sequence, as the VAS is different on field 1 & 2 (and 2 & 4).

If a monochrome genlock is enabled the pictures will pull into line and field phase and all will appear correct on a monitor (using internal syncs) or on a simple interfield cut between sources.

However, if we now attempt to mix or insert station burst, we have a 50/50 chance that the VAS sequence will be out and the colours wrong, in which case the R-Y switching will be out and the colours wrong (subcarrier phase adjustment will correct B-Y but not R-Y).

The solution to the problem is to compare the SPG VAS divider if they are out of step, a method of doing this was covered in my P100 series back in CQ-TV 111 p18, we require a system that will recognise that VAS/PI is wrong, that genlock is enabled and will ignore any phase differences between input VAS (from BLO) and SPG VAS.

This sounds difficult, but requires no more than an And gate with an invertor in one of the VAS feeds and a narrow line rate pulse near centre of line (outside range of SPG line phase control) see Fig.2

Inspection of Fig.2 will show the gate can only produce a narrow mid line output pulse if the genlock enabled line is high and the VAS signals are in antiphase, so that inputs C x D go high at the same time.

Having covered the basics this time I intended to show how to apply these ideas to the Philips (Mullard) SAA1043 SAA 1044 SPG chip set, the basic circuit of which was shown in Peter Delaney's article in CQ-TV 141 p12.

I have rescued my Vero Board prototype from the junk box, it is up and running again, but there is no time to produce drawings suitable for publication before this issue goes to press, with luck and the editors permission they should appear next time.

BROADCAST BAND DX-TV RECEPTION

Garry Smith and Keith Hamer

The 1991 Sporadic-B season was only average according to many enthusiasts. In fact, conditions were so bad at the start of the season that many enthusiasts felt the urge to check their aerial and receiver system for faults!

Collective logs show that Sporadic-E activity was present on most day throughout the summer and well into August but the number of intense all-day openings, where Band I eventually becomes unwatchable, was well down on previous years, June was by far the most active month for long-distance reception.

The weekend of June 15th and 16th was particularly eventful, especially for Simon Hamer, who observed Arabic, transatlantic and Band III Sporadic-E signals. The Arabic reception consisted of Jordan on channel E3 and Morocco E4 on the 15th. During the afternoon of the 16th RUV E4 was well received in various parts of the UK and it was during this opening that Simon also located signals on E2, E6 and E7!The E2 reception is somewhat of a mystery - this low-power relay is no longer officially listed. Band III signals also came from the USSR when the evening news programme 'BPEMR was resolved on channels R6 and R7. Even more rewarding, transatlantic signals were monitored on channels A2 and A3 'several times' during the early evening.

Chris Howles of Lichfield logged Arabic signals on channel E3 on two occasions during June and July. Dalibor Frkovic (Croatia) reports Sporadic signals from Iran on channel E2. During one opening a co-channel signal was present throughout the reception so maybe Iraq's channel E2 outlet is still on air.

The following logs are edited highlights of those which appear in TeleRadio News (issue 54). Many thanks to the following enthusiasts who have forwarded reception reports: Simon Hamer, Janet Bridgman, Chris Howles, Garry Smith, Peter Chalkley, Ian Hohnson, Kevin Bolger, Marc Vissers, Stephen Michie and David Glenday.

JUNE LOG

01.06.91: A fairly intense tropospheric lift in which Bob Brooks noted the 'YLE TV1' FuBK from Finland on channel E6 at 0620UTC. Later he resolved the 'hrl FFTM' test pattern from Hessischer Rundfunk (Germany) on channels E7 and E8.

10.06.91: Mainly Yugoslavia and Italy from 1600UTC onwards. An Italian private transmitter, or the RAI UNO 40W relay at Campione d'Italia (overlooking Lugano, Switzerland) wad resolved on channel E2 during the opening.

10.06.91: An excellent day for Sporadic-E reception with USSR, Spain, Sweden, Italy, and Portugal present for a large part of the day. Rumania and Albania also showed. In addition, a few Arabic stations were identified, i.e. Jordan E3, Morocco E4 and Tunisia E4.

16.06.91: A corked of a day! Exceptionally high m.u.f.s. were present during the late afternoon and evening. The FM band became extremely active for well over an hour. The Icelandic PM5544 test card (RUV ISLAND) was noted over a large part of the UK on channels E3 and E4 around 1725UCT before going onto programmes. One enthusiast also

noted an unlisted RUV relay on channel E2 plus Band III on channels E6and E7! At 2000UCT USSR was identified in Band III on channels R6 and R7. Transatlantic pictures were also present from 2000UCT on channels A2 and A3. The full collective log for the 16th is as follows:-

0550 R1,R2 and R3 TSS (USSR) with progs (also in the evening)
0800 E3 Unid ballet performed by youngsters
0810 E2 Unid pattern or caption from SE-Italian private TX?
0813 R2 Unid folk dancing
1015 E2, E3 and E4 TVE-1 (Spain) progs
1030 IA RAI UNO (Italy) prog about birds
1050 E3 TVE-1 Bullfight
1100 E3 TVS (Slovenia) with 'TV Slovenija' PM5544
1130 E4 HTV (Croatia)
R1 and R2 TVP (Poland)
R1 and R2 CST (Czechoslovakia)
R1 and R2 MTV-1 (Hungary)
1140 E2 TVE-1 'The Avengers'
1145 E2 ARD-1 (Germany) adverts and film
R1 and R2 TSS-OIRT FM band also active
1200 IA RAI UNO progs
1350 E2, E3 and E4 SVT-1 (Sweden) PM5534
1400 E3, NRK (Norway)' Hemnes' PM5534 until 1500 then progs
1415 E4 NRK 'Hadsel' PM5534 until 1500 then progs
E3 SVT-1 prog R3 Unid opera TVP or TVR (Rumania)
1445 R1, R2 and R3 Unid progs - all different
R4 Unid progs - different from above
1450 E2 K 'Televerket' PM5544 then 'NRK' PM5544
E4 SVT-1 prog 1526 E4 RUV (Iceland) PM5544 (two TXs)
1725 E3 and E4 RUV PM5544 then progs
1830 E2, E6 and E7 RUV
1830 E3 and E4 DR (Denmark) 'TV Avisen
1930 E3 RUV clock
2000 R1, R2, R3, R4, R5, R6, and R7 TSS with 'BPEMR'
A2, and A3 Unid signals a few times during early evening

17/09/91: A quieter day with Sporadic-E activity from Italy and Spain. An Arabic FM station on 87.90MHz was also heard but not identified.

18/06/91: Widespread opening throughout the day with pictures from Denmark, Italy, Spain, Iceland, Sweden, Norway, Estonia (with EESTI TV test pattern), Slovenia, Croatia, Czechoslovakia, Hungary and Tunisia.

21/06/91: An all-day Sporadi-E opening, commencing with TVS (Slovenia) at 0902 on E3 showing 'TV Novi Sad' programmes. Italy, Czechoslovakia, Sweden and Norway were identified by their respective test cards around noon. During the afternoon reception from the south produced Spanish regional programmes from TVE-1 and also Tunisia on channel E4. Mid-evening reception consisted of Germany, USSR, Italy and Iceland.

22/06/91: Reception from the south included Tunisia on channel E4, with a live report from Mecca at 1328.

JULY LOG

08/07/91: An opening from Scandinavia producing Swedish PM5334 test pattern on channels E2, E3 and E4, and Finland on E3 and E4. Several Norwegian test patterns were noted with the following transmitter identifications: 'Melhus' and 'Gulen' on channel E2; 'Hemnes', 'Bagn' and 'Gamlen' on channel E3. The Estonian test card and station opening was also logged during this opening on channel R2.

14/07/91: A tropospheric lift produced pictures in Band III and at UHF from Denmark, Sweden and Norway (Band III only).

18/07/91: A short-lived but interesting Sporadic-E opening from the south east gave signals from Italy and Greece on channel E3. The latter transmitter is only 100W and its reception is relatively rare – it is usually blocked by Yugoslavian transmitters operating on the same channel.

26/07/91: A mid-morning opening from Scandinavia occurred with Norway, Sweden and Finland identified by their test cards. Finland was also resolved on channel E2 – YLE deny that a channel E2 relay is still operational, so maybe this was a leak from an over-enthusiastic
cable system!

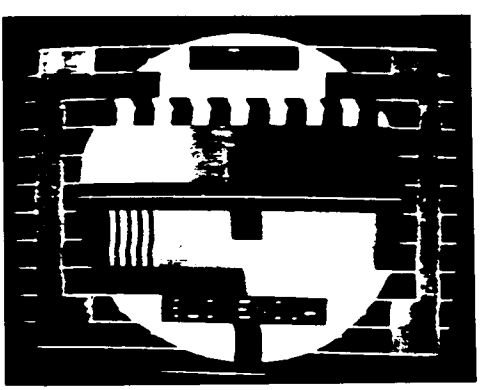
EURO NEWS

GIBRALTER: GBC are to restrict their output to local news and programmes during weekdays only. At other times the BBC TV Europe/TV World Service will be transmitted and at weekends airtime will be made available for purchase by outside programme makers. The Gibralter government are not increasing the subsidy and as a result the GBC will take the BBC satellite programme feed from 27.5 degrees west and insert local programmes where necessary. the relayed programmes will remain scrambled and viewers will need to pay for a decoder – this will be bad news for viewers along the Costa del Sol who receive GBC for free!

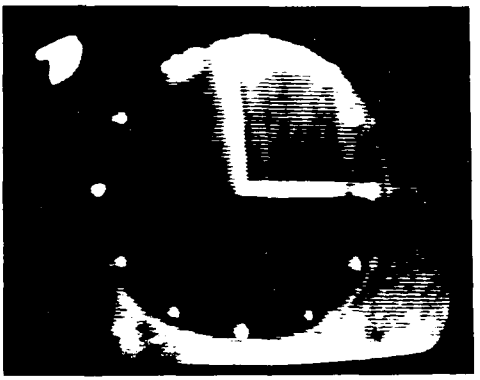
HUNGARY: Since 1989 TV-S has broadcast throughout the summer from Siofek in the Lake Balaton region. This year transmissions began on 14/06/91 and ended on 27/08/91. The station broadcasts in the German language and is aimed at mainly at the tourist industry. The station operates on channel R34 with 150W ERP. Programmes commence at 1800 local time.

CZECHOSLOVAKIA: NTV, the independent TV station, has stopped its broadcasts after nine days without a licence. The station staff hope that this approach will make it easier to obtain one!

A new TV transmitter relaying OK-3 programmes has entered service in



Test card of 'TV Slovenija;' received from the high-powered KUM transmitter on channel E3. Until 1990 the identification read 'RTV Ljubljana'. Note that the very dark test card background has been retained.



Sporadic-E reception from the Bayerischer Rundfunk outlet at Grunten on channel E2

Teplice-Trnovany on channel R50 with 500W ERP. test transmissions from a new high-power transmitter on channel R52 at Chomutov, close to the old East German border, were noted on 14/04/91.

In Slovakia the introduction of a new TV programme, TA3, was delayed due to technical reasons. It originally planned to go on air on 01/04/91, but finally went on air on 06/06/91, via the channels of the former OK-3 network, which is broadcast in Bohemia and Morava only.

TA3 is a composition of various satellite programmes with comments and subtitles in the Slovak language. Throughout the night CNN is relayed with original sound.

USSR: A new TV programme was introduced on 13/05/91 called 'Televideniye Rossiyi' - television of Russia. It is on the air daily between 1135 and 1335, 1700-1900 and 2145-2400 (varies) Moscow time via the CT-2 network. the newscast 'Vestiti' (news) is broadcast between 2000-2015 and 2300-2315 Moscow time.

POLAND: A three day meeting of the heads of television from Poland and the three Baltic republics resulted in two important decisions. The four TV organisations are to initiate a project to cooperate in joint TV programme making. Also, Polish TV (TP) is to extend its assistance for Lithuania in the production of Polish language programmes.

The recent unrest in Vilnius led to temporary suspension of broadcasting programmes from TP and when broadcasts were resumed they were subject to censorship by the Soviet authorities. Polish TV can be received by 60% of Lithuanians. The management of independent Lithuanian TV has set its hopes on the planned launch of a new transmitter at Suwalki (north-east Poland, near the Lithuanian border) which will allow Lithuanians to receive TP-2 programmes.

Well over 270 applications for private and commercial radio and TV stations have been received by the Polish government and already the plans for frequencies to be used are being discussed. Between now and 1996 programmes on channels R1 to R5 will be reorganised to make way for the new commercial channels, two of which will operate in Warsaw. CT-1 broadcasts will also be phased out.

The 700M TV mast at Lodz recently collapsed during renovation work. the transmitter normally provides TP-1 programmes on channel R7.

GERMANY: DXers may have noticed that the ARD/ZDF Breakfast TV programme has disappeared from the schedules. It was originally introduced on a temporary basis during the Gulf War. Contrary to earlier opinion polls that there was only minimal interest for such a service, the ARD/ZDF venture did indeed attract a large audience. the service will continue later this year. Both organisations feel they need time to develop a format that will ensure a large audience every day.

The 'SAT-1' FuBK is no longer shown. It has been replaced by a selection of Teletext pages between close-down and

the start of programmes. Almost every page of text carries some kind of advertisement, even the news pages! No sound accompanies the text, but SAT-1 are currently negotiating with a number of satellite radio stations for a relay of their sound.

British Forces TV (SSVC) have introduced a Breakfast TV programme. It commences at 0630 (local time) with a relay of 'Sunrise' from 'Sky News'. During the commercial breaks on Sky TV, a 'Sky News will continue' caption is shown. At 0730 the whole of 'BBC Breakfast News' is shown, including 'Newsroom South East' inserts before the main news portions. Later, the whole of ITV's 'This Morning' is relayed, apart from the commercial breaks which are bridged by a 'Will continue' caption.

ITALY: A new Italian Pay-TV channel called 'Telepui' commenced on 01/06/91 without a licence. Transmissions are encrypted and viewers need to buy or hire a decoder.

Three other Pay-TV channels are transmitting programmes from terrestrial outlets. These are:

Tele+1 - a movie and entertainments channel encrypted since 01/06/91
Tele+2 - sports. This will be encrypted from June 1992 Tele
+3 - cultural and educational channel to commence encrypted in 1992. At present a film is shown 5 times a day.

BELGIUM: The inscription 'NICAM-STEREO: zia Teletekst p.429' is shown on the PM5544 by all BRT TV1 transmitters. BRT Teletext page 428 gives a list of transmitters equipped for NICAM stereo sound, i.e:

BRT TV-1: Genk E44
BRT TV-2; Brussels-RAC E25, Egem E46, Genk E47, Schoten E62

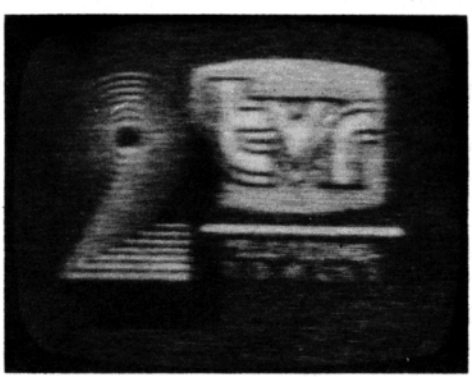
UNITED KINGDOM: BBC West is displaying a small circular logo in the lower left corner of the screen during local news bulletins. The name 'Points West' has been changed to 'News West'.

Euro News information kindly supplied by: Gosta van der Linden and the BXDC, Netherlands; Sandor Rottenbacher, Hungary; Thomas Pahlke, Germany; Pertti Salonen, Finland; Roger Bunney, U.K.; Garry Smith, U.K.

RECENT PUBLICATIONS

'TV Graphics Review' is a quarterly publication for all those who are interested in the development of TV and radio graphics used over the years, with particular emphasis on BBC Television and Radio. Test card music and other aspects of trade test transmissions are other topics planned. Annual subscription is only £7.50 (including p&p). The 4th issue is now available and back copies are available.

'The World At Your Fingertips' by K.Hamer and G.Smith. This expanded publication covers the benefits of DXing with reduced IF vision bandwidth, a summary of propagation modes, common causes of interference that DXers often encounter and has a section on aerial and amplifier selection. The price is only £3.60 inc p&p. Both publications are available from HS Publications, 7 Epping Close, Derby, DE3 4HR.



Rumanian second network identification caption received on channel R2

CONTEST NEWS

Bob Platts G8OZP

Just a brief contest news this time around (did I hear a sigh of relief), mind that's a good thing, what with lawns to mow, hedges to trim, barbecues to go to, sunshine to sit in, pools to swim in and holidays in California there doesn't seem much time for anything else. Well nights are drawing in so it's plug in the soldering iron, dust of the word processor, and back to normal.

This yearis Summer Fun returned a good selection of logs with the portable stations returning some very good scores. John and Andy G8MNY and G4WGZ went to their usual spot amongst the PMR masts to gain a first and a third. The Telford group being relegated to second place for a change. Charles EI2EM enjoyed a good contest and returned a respectable score, though a minor infringement of the general rules was noted (watch those code numbers). The Severnside group made the top slot again on 24 and even found time for lunch. Viv did however comment that they found it rather quiet afterwards (a little to much good food, wine and sunshine maybe?).

Logs, entry forms etc. can be obtained from and should be sent to:

BOB PLATTS G8OZP, 8 STATION ROAD, ROLLESTON-ON-DOVE, BURTON-ON-TRENT, STAFFS., DE13 9AA.

SUMMER FUN 70CM

Callsign	Points	QSO's	Best DX	@ Km
G8MNY/P	6719	17	G8EQZ/P	295
GW7ATG/P	5707	31	G8MNY/P	289
G7ATV/P	4457	25	F6IFR	341
G8EQZ/P	3422	15	G7ATV/P	319
G7ETK/P	1253	13	G7ATV/P	259
G0IMP/P	1070	9	GW7ATG/P	193
EI2EM	369	7	GW7ATG/P	209
G6WLM	171	2	G8MNY/P	161

SUMMER FUN 24CM

Callsign	Points	QSO's	Best DX	@ Km
G7ATV/P	2129	24	G8EQZ/P	319
G8EQZ/P	1111	5	G7ATV/P	319
G4WGZ/P	814	8	G3NNG	117
GW7ATG/P	411	4	G8EQZ/P	184
G6WLM	10	1	G8ONX	5

TV ON THE AIR

Andy Emmerson G8PTH

AROS?

Yes AROS, the Amateur Radio Observation Service. Back in the August issue I mentioned the difficulty people were having with an unlicensed TV transmissions in Kent. I had a phone call from the DTI's investigation branch who advised that thanks to reports received, this pirate had been silenced. A letter of thanks was sent to the Kent Television Group.

The DTI pointed out that any abuse of the amateur spectrum should be reported to them either direct or better, via AROS. It is essential that precise details of dates, times, frequencies, modes and nature of transmissions be given, otherwise the authorities cannot investigate. Reports to AROS should be sent to G3STG (QTHR), marked "AROS -Confidential".

MORE NEWS FROM KENT

The latest KTG newsletter notes that following the recent tests from G4CZJ's QTH at High Halstow, it has been decided to seek a site on the Hoo peninsula. A suitable building 60 metres ASL has been located and discussions are under way with the owners. In the meantime the repeater will continue as a manned facility from High Halstow.

Construction of new equipment for the repeater GB3KT (to replace items borrowed to get the project off the ground) is proceeding apace. Nick G8NAV has donated a power supply for the transmitter. The transmitter driver is a Solent unit, with a crystal-controlled PLL unit donated by Ian G4MLY. The receiver is being built by Chris G8GHH, complete with interdigital filter, GaAsFET pre-amp and crystal-controlled local oscillator. A Camtech video IF board is also being used. The control logic is based around BATC Teletron and Cropredy modules; video and audio switching is being prepared by Brian G6PKS. Further news can be had from G4AYT, G4CZJ or any other members of the Group.

SOFTWARE MATTERS

Remember the plea from Mr Everall G6FTA asking about the Amiga computer package called "AVT Master"? He was inclined to order it from the States but was told by the American distributor that the US version wouldn't work in the UK. As a result he paid nearly twice the price for the UK version ... only to find that (you guessed) it is a raw NTSC product and identical to that sold in the States. So you -but not G6FTA - can save your pennies by ordering direct from an American retailer (the distributor refused to sell direct).

Notwithstanding all this, it is a marvellous program by all accounts. G6FTA says the picture quality is breathtaking and the resolution is so good that you have to use the enlarge mode to see all the detail (zooming in on part of the image). He has now sent off for an Overview board from Florida, which has an interface for picking up microwave weather fax pictures. He says you should be aware that these programs gobble up the computer's memory and you will probably have to add 2 megabytes of RAM to make them work. Finally, he says a fellow Amigan rang him from Scotland and offered some other programs but then never got in touch. Tsk tsk! If you're reading this sir, would you please ring G6FTA on 0992-27166? And anyone else interested in swapping public domain software for weather, Fax and SSTV applications you know please give him a ring on 0992-27166 - and tell us as well!

MODESMANSHIP

We don't get to mention narrow-band television here very often, so it is perhaps worthwhile giving them a plug. They deal with systems of narrower bandwidth than slow-scan TV but it's not all Nipkow discs and the like. In fact some of the members use state-of-the-art technology to get their picture on the screen. Jeremy Jago of the NBTVA (Narrow Band Television Association) tells me people have even copied broadcast television's sound-in syncs technique. There is room during the frame suppression signal for a little bit of tone-burst, leading to the development of (wait for it) Morse in syncs! They will, however, strive to avoid being submerged under a flood of naturally incompatible individual modes.

If you'd like to learn more about how much can be achieved with NBTV, send a SAE to NARROW BANDWIDTH TV ASSOCIATION: Mr N Reynolds, 6a Collingbourne Road, London, W12 0JQ.

LETTER FROM POLAND

Our regular correspondent from Warsaw, Stanislaw Pazur seems to caught the sun while basking on the shore of the Baltic Sea. However, he has acquired a 130cm aluminium offset satellite dish and looks forward to installing this soon Already he can receive Astra 1A, 1B (H polarisation), ECS II F1 and ECS II F2. He says he has also seen transmissions via the ECS I F5 satellite at 21.5 degrees E from Lomia during the visit to Poland of Pope John Paul II.

DUNSTABLE DOINGS

Lots of goings on in the world of amateur television repeaters this time and we start in the south Midlands with GB3TV at Dunstable. Its callsign recalls that this was the first television repeater to be conceived in Britain, though it was many years before it became a reality. Much of the original equipment was built by Graham G3VZV, who also donated the PA block now in use. The repeater still uses his original receiver. G6JFN built the new transmitter, while Tom G3LMX produced the video switching equipment. Willing labour was supplied by G8IFF and G1YEB, so GB3TV is very much a team effort.

The "spinoff" of GB3TV is GB3TG, the 10GHz television gateway, which is now fully linked to 'TV. The power on the 23cm link has been increased to the full legal 14dBW limit in order to ensure noise-free pictures and Dave G4NJU (whose baby GB3TG is) tells me he can now get better pictures into Dunstable through 'TG than by 'TV. His home in Bletchley is located 4km from the gateway and he needs to run just 10mW (or -25dBW) on 10GHz, whereas he requires 12 watts (12dBw) to achieve almost the same results on 23cm. X-Band is clearly "greener" than L-Band.

The coverage of GB3TG has been checked and improved by giving the antennas a 2 degree downward tilt - a similar technique is often used at cellular radio base stations. Take a look next time you pass one of these - they call it "tilt and fill". The range of 'TG is exceeding expectations, too; it has been received 25km away at Whittlebury, Northants.. According to path profiles it should be line-of-sight also to the proposed Northampton repeater, which means that interlinking of these two boxes should be feasible.

MORE REPEATER NEWS

Yes, Northampton may well be the next town to have a TV repeater, on 23/24cm and possibly also on 10GHz. A small team headed by Phil G4IIO and Tim G4WIM is negotiating with a site owner, while the 23cm hardware is already complete. Enquiries to Phil on 0604-643056. Northampton might also become a staging point towards other repeaters in time; anything is possible!

The Severnside TV Group have acquired a 10GHz TV repeater. No, it didn't fall off the back of a lorry but was released from its previous existence as GB3RV near Rugby. Circumstances prevented its continuance there, so it has been overhauled by Ted G3JMY ready for installation (it is hoped) together with the 23cm TV repeater GB3ZZ at Filton.

Two repeaters are now reading the GB2RS amateur radio news on the air in sound and vision. This is an interesting development and could lead, perhaps, to all kinds of educational broadcasts. Clearly a set of guidelines is necessary and the RSGB is looking into this. Let's hope the outcome is positive and gives us some interesting possibilities.

FROM DOWN UNDER

Our regular correspondent from New Zealand, Mike Sheffield ZL1ABS, kindly sent a copy of "Break-In", the national radio club's monthly magazine. The issue in question was for August 1991 and it has become an institution since 1987 that the August magazine is an ATV special. The front cover is in colour and the content is an excellent showcase of amateur television technology.

As Mike points out, this is an achievement unequalled by "RadCom", "QST" or the Australian "Amateur Radio". The compiler, Wayne ZL1UJK, is confident he can repeat the effort again next August. Mike will probably contribute an article on the transmitter he is making from a Worthing group kit and a Mitsubishi PA module. He is also evaluating a Camtech transmitter and sub-carrier board (which he will re-tune to 5.5MHz to suit New Zealand standards). Mike has also recently finished a teletext-based video callsign and pattern generator with 8-page auto-cycler.

Several ATVers in the Auckland area were plagued by QRM on their 70cm simplex TV reception, caused by FM stereo stations (88-108MHz) and the three Sky channels on UHF broadcast TV. Mike decided to do something about this and read up the chapter on filters in the RSGB VHF-UHF handbook. He writes: "The first one I built used a quarter-wavelength tuned line with coupling lines and a piston trimmer capacitor, all put inside a copper-clad PCB box. On the regular Sunday night ATV net I tried it out receiving Bruce ZL1BLB. As the beam heading is right at the main commercial TV transmitter site, the QRM is very bad. The receiver pre-amp is a bipolar one (MRF901) and there is no tuned circuit to the base, only a simple T-type high-pass filter I put in earlier to reduce the 88-108MHz signals. With the filter the QRM is now barely there and I get good sound and colour, so the filter is not too sharp. Makes me think, why didn't I do it sooner?"

SCOTTISH SLOW-SCAN

Thomas GM4CAU writes from Aberdeen that he had a letter from G0KYL who was interested in an SSTV two-way on two metres. "A week past Saturday (31st August) I had a three-hour QSO (with lots of pictures) with Johnny G0KYL, thanks to a tropo opening. We had solid 5-9 signals both ways. Unfortunately Johnny is only operational on 8-seconds mode, so I was unable to "air test" my other speeds, although I have tested them on receive in the HF bands.

"Other news on the SSTV front. In recent weeks I have been having a regular Sunday sked on 40 metres with G3MTQ and G4EYD (Birmingham), both of whom are QRV on SSTV. Now this sked is at 14.00 local time on 7.095MHz plus or minus QRM; it is intended primarily for those who have built the G3WCY/4ENA system, given up after running into problems or have added modifications. In other words a regular place to meet and exchange ideas on the G3WCY/4ENA (and other hardware) systems.

"One Sunday we were joined by Jack

ON5NM, so the net is international. This evening I have been watching some good 32 sec. pictures on 20 metres from CT1ANO in QSO with several EU stations."

NEWS FROM NORTH WALES

Finally a letter from John GW3MEO in Prestatyn. "On behalf of John GW3JGA and myself, we thought a short activity report might be welcome from this part of the UK.

"I have been building 23cm gear for the last few months and now have the bits and pieces for a low-power FM TV station. Due to the lack of signals to receive, my enthusiasm was on the wane and then I discovered I could receive GB3MC, which is an NBFM repeater and beacon on 1267MHz (RM0) for which I would like to thank the owners. GB3MC has proved ideal for my antenna and pre-amp development and opened my eyes to the devious ways of RF at 1.2GHz.

"John GW3JGA has been very busy at work lately and apologises for the lack of 'Circuit Notebook' contributions, but nevertheless has produced a 1 watt 23cm TX and an FM TV receiver based on the Wood & Douglas modules. So you can imagine that when John and I realised we were both ready to do tests, 23cm soon warmed up. Although we are not far apart there are plenty of houses in the way, and for a couple of weeks I received the best signal from John by pointing the antenna upwards to receive his signal reflected off a tree. But raising my aerials 12 feet solved the path problem and I was very pleased to receive my first good FM TV pictures from John.

"The picture noise is now even less than our local broadcast BBC reception, P5++ if that's possible, both ways. FM is really impressive with regard to picture quality and picture-to-noise. The Colwyn Bay amateur radio club is likely to be in for a demonstration soon, and a local repeater would be nice one day - watch this space!"

And that's it once more. Please keep your reports coming in so that we can all keep up with what's going on in amateur radio's most highly developed mode!

HOW TO GET INTO SAT TV - WITH A MELON INSTEAD OF A DISH !

Andy Emmerson G8PTH

Few of us can claim to be experts on every subject. While many readers of CQ-TV probably consider themselves minor authorities on amateur television, they may secretly admit they are rank beginners when they start off in some other field. At times like that it's handy to have a guide to hold your hand, so to speak, and give you an honest-to-goodness entry-level introduction to the subject.

One such subject which can be an absolute minefield for the unwary is satellite television. Many ATVers may well be considering branching out into this area but would like a quick rundown on what's involved first. If so, a new video tape called "The Dish Doctor's Guide to Satellite TV" should be of interest.

Actually, I don't consider myself a beginner in this area, in fact I was playing around with (other people's) satellite systems ten years ago. But the point is this: even I (and a satellite-fiend friend who was also watching) found something we could learn from this tape.

The Dish Doctor's Guide is different from most tapes you can buy on satellite TV. For a start, it does not tell you how even a novice can save hundreds of pounds by installing your own system -instead it suggests you leave it to an expert (wise advice for beginners!). Second, it is not a stuttery shambles knocked together on a flickery, fuzzy camcorder; this is a professional broadcast-quality job with two cameras and a professional lighting and sound crew (and it shows!).

Finally, it does not have some nerd you've never seen before trying out unfunny Alan Whicker impersonations. Instead you are treated to James Whale, who is billed as a cult TV personality. Whether you share the producer's opinion of him is debatable, but at least he's someone you've probably seen on TV. Even if you can't stand him, he is funny in an objectionable kind of way, and you can snoop on the lifestyle he enjoys. That is because on this 60-minute tape we are taken through having a satellite TV outfit installed at his home, through choosing the best location for the dish to setting up the equipment for best picture (and minimum patterning on the TV screen).

Providing the serious content of the tape is the well-known writer Peter Pearson (the Dish Doctor of Satellite TV Europe magazine), who consistently writes sane reviews and articles in my opinion. He comes over very well, and we are also treated to a visit to his dish farm in rather more down-to-earth surroundings than JW's pad. Explanations are all practical, using melons and hatpins plus computer graphics to illustrate the points.

All in all, it's an absorbing hour's viewing. Some of the presenters' fluffs are left in and turned into jokes, and the programme loses its authority somewhat when the crew start joining in the interview (but JW upstages them). There are also some rather unsubtle plugs for products and publications, which make you wonder if this was originally intended to be a sponsored video. It's not a freeby, though, and at L14.95 it's fair but not outstanding value for money. Specialist interest videos can never be as cheap as sell-through films, though, and I suspect you won't regret parting with your cash for this tape.

The Dish Doctor's Guide to Satellite TV - Volume 1, starring James Whale and Peter Pearson, is released on 1st November 1991, price L14.95 plus L2 post and packing. Available by mail order only from 3P Video, 6 Greenhow Park, Burley-in-Wharfedale, Ilkley, Yorks., LS29 7LZ.

THE BATC AT THE HAMFEST

Brian Summers G8GQS

This year's Llincoln Hamfest was the biggest and best yet! A bit of a cliche really, but it was good and we will have problems bettering it next year. Paul Marshall's display bus made it's first appearance, it's a 38ft Leyland National 1 with viewing theatre at the rear and display stands and benches in the middle and front.

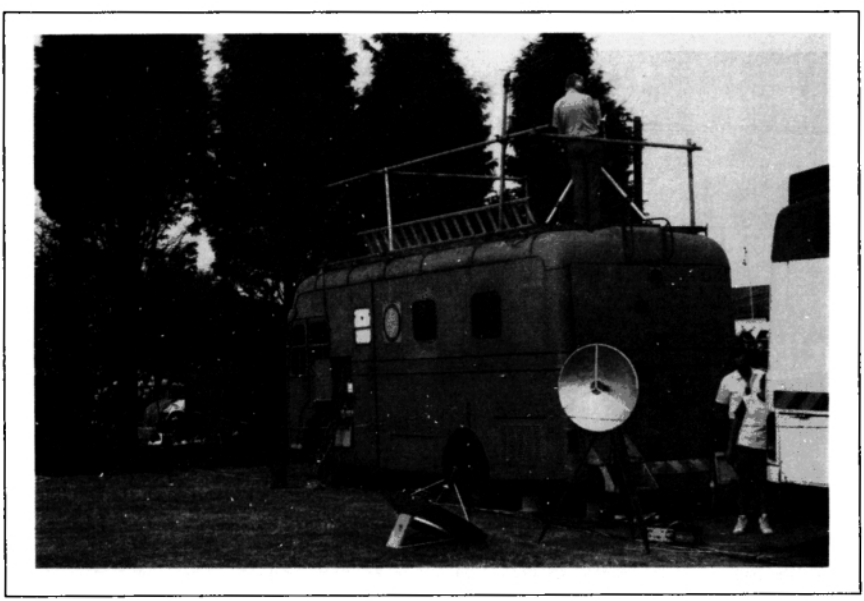
Live colour pictures where transmitted from the top of Lincoln Cathedral tower to the receiver at the showground on a 3CM link provided by Bob Platts. The view shown by the camera was spectacular! It's 366 steps up a mediaeval spiral staircase to the top. The transmitter used a small horn and the receiver used a 2ft dish on a tripod outside the O.B. van.

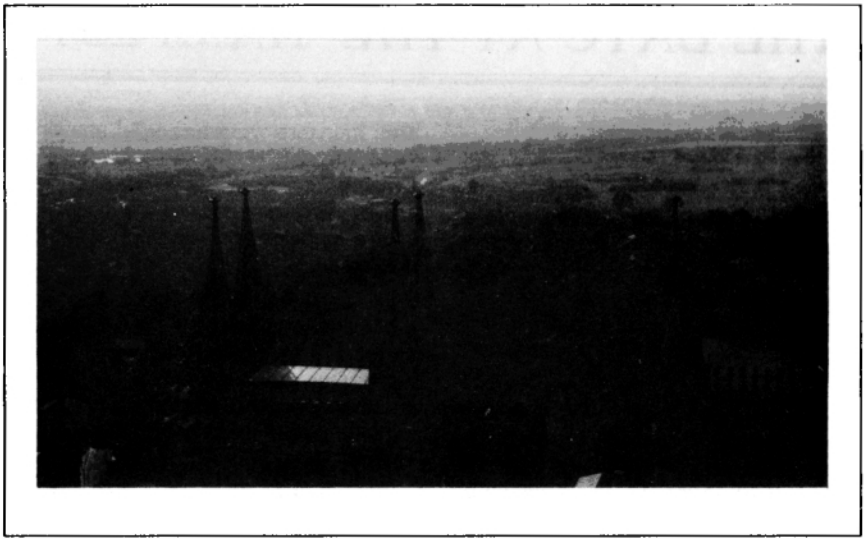
In the viewing theatre BATC the movie was on continuous play and in the main display area monitors were arranged showing, the 3CM link, 24CM RX, a local camera, the Outside Broadcast van's mixer output and Trevor Browns caption generator. The Club's publications were on sale on the display area.

Four cameras from the O.B van were deployed to record the "Journey-Men" a rock group organised to preform during the event. One camera went on the roof of the van, two in front of the group and the forth camera was a "handheld" (Lead Parrot, lead not dead).

I thought the day was a great success! Paul says that it's a good day if 75% of things work and 95% worked so it was wonderful.

One of the minor problems in putting a video demonstration on at radio rallies is EMC it's awfully hard to keep high power 80M SSB out of the video as it falls in the





video passband. The rock group had EMC problems as well. I won't forget the look on their faces when 80M. SSB came thundering out of their P.A. gear.

Making the day a success were; Paul Marshall G8MJW, Bernard Golland G1GMR, Bob Platts G8OZP, Dave Hill G8MGP, Richard Oakley, Simon Gough, Trevor Brown G8CJS, Tom Mitchell G3LMX, Matthew Keyes, Jill Marshall G8MLH, and Freddie G3FJV.

REPEATER GROUP AFFILIATIONS

Repeater	Channel	Location	Contact	Telephone	Meetings
GB3ET	RMT2	Emley Moor	B.Keedy G6LIC	0924 822605	Irregular
GB3GT	RMT2	Glasgow	A.Beale GM1FML	041 445 3060	Thursdays
GB3HV	RMT3	High Wycombe	M.Sanders G8LES	0420 63859	4th Tuesday
GB3KT*	RMT3	Kent	B.Jenkins G4CZJ	0634 253850	Monthly
GB3RT	RMT3	Coventry	S.Simmonds G6WLM		Irregular
GB3TN	RMT2	N.Norfolk	M.Farnsworth G4WVU		Irregular
GB3TV	RMT2	Dunstable	D.C.Asquith G4ENB	0582 27907	Every Friday
GB3VI	RMT2	Hastings	E.C.Vast	0424 424845	Wednesdays
GB3VR	RMT2	Brighton	D.Stewart G4HSY	0903 212373	No
GB3ZZ	RMT2	Bristol	S.O'sullivan G8VPG	0225 873098	Quarterly

* Proposed

BATC contact B. Summers G8GQS 081 998 4739

Brian Summers G8GQS

First let me welcome the 5 new affiliated repeater groups added to the above list. A map showing the locations and approximate service areas of the repeaters has been made. This has been to a number of rallies and it's next appearance will be at the Leicester show.

The BATC supports Television Repeaters

All of the repeater groups have said that they welcome visitors and guests at their meetings and reception reports are also most welcome.

Repeater Profile

GB3VR run by the Worthing and District Repeater Group is located near the summit of Race Hill in Brighton. Signals have been seen on the Isle-of-White and stations worked as far away as Waterlooville in Hampshire. The repeater has many regular viewers including a TV shop in Brighton.

Recent innovations are a DTMF (dual tone multi frequency) tone decoder which controls a local colour camera with zoom. Plans are in hand to install a remote control pan and tilt head. Additional switches control a video AGC system, a test card with scrolling information pages. There is also a weather station which displays wind speed and direction.

All of the above is financed by the sale of computer software and kits including the popular 24 CM TV TX. See advert elsewhere in CQ-TV.

TRANSMIT:

Solent Tx into small PA

TX ERP 25W

TX Aerial Direction - WEST

Sound subcarrier 6MHz

RECEIVE:

RX Wood & Douglas

RX AE Gain 10dB

RX Aerial Direction - West

System control is by a Z80 micro (Spectrum 48K)

THE BATC BULLETIN BOARD SYSTEM & TELEPHONE HOTLINE

We have set up a special telephone number for you to ring, which is:

0767 313292

This numberhas two functions:

Firstly, a computer will be on-line from 7pm every evening through untill 3pm the following afternoon.

Secondly, an answering machine will be on-line at all other times.

The computer will provide a bulletin board system, with free access to anyone. Within the system, there is a special area for members of the BATC. All you have to do is call the above number using your modem and fill in the on-line registration form. Have your BATC membership number handy. Once your details have been verified (around 24hrs later) you will have full access to the BATC area.

This area will allow BATC members to leave electronic mail for other members. The mail can be either private (only the addressee may read it) or public (any BATC member can read it).

This area also can hold files for members. Members can use it to pass a program from one member to another, or to upload a program of general interest for all members to download. The file area will also be kept 'topped up' by the sysop (SYStem OPerator) with interesting programs and files.

You may upload items for inclusion in CQ-TV (articles, adverts, etc), which will be down-loaded to the Editotial office, or send messages requesting help or advice on ATV topics. In addition, any private message addressed to a committee member will be forwarded to that person immediately.

The answering machine will provide a similar service for those members without a computer and modem. There will be a short introductory message, giving details of any forthcoming events or activities. This introductory message is followed by the option for you to leave a message. This message may be a request for help or advice on an ATV related topic. Alternatively, you may leave short messages for inclusion in CQ-TV, e.g: an advert, whixh will be sent on to the Editorial office.

The BBS can accept calls from modems conforming to the following standards :-

V21 300 - 300 Baud

V22 1200 - 1200 Baud

V22bis 2400 - 2400 Baud

V23 1200 - 75 Baud (Prestel format)

The BBS is also a general purpose BBS and has many other areas, other than the ATV one. It is also a member of FREENET, which is an amateur E-mail network within the UK. This means you can send E-mail to other FREENET users, free of charge.

Please use this facility and let either the Chris Smith G1FEF the BBS SysOp or Editor Mike have your suggestions and comments concerning the system.

MORE ON *THAT* VIDEO FILTER !

Peter Grannell G4TQB

The piece in CQ-TV 155, 'In Retrospect' page 53 intrigued me. I hurriedly built up the BATC PCB that had been in the "queue" for some time. On the 'scope with my ATARI STFM computer as signal source, I could see little, if any, difference between the performance of the two versions, and little difference between input and output, apart from the inevitable ringing of the filter. Note that I built the 4.5MHz version as that was the only filter I had to hand. Perhaps the ATARI STFM gives a cleaner output than G1COI's Commodore 64!

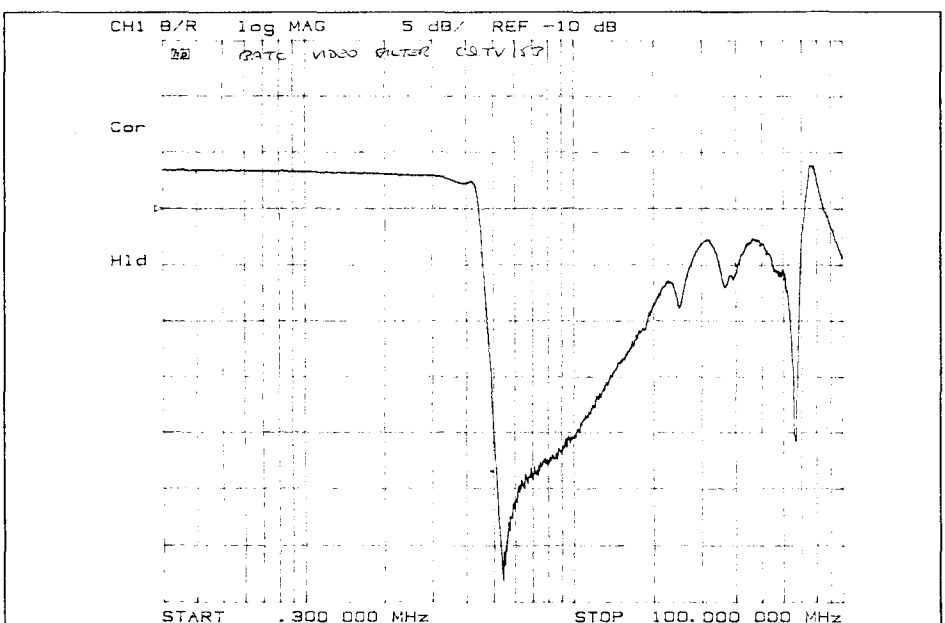
Measurement on an HP4753B vector network analyser:

This is a 50 ohm system, so I put a 50-75 ohm 6dB pad at input and output of the filter (AC coupled for the purpose), and used the calibration facilities of the analyser to remove the insertion loss of the pads. Signal level into the filter was -6 dBm.

The frequency response plots do show a difference - the modified version shows greater attenuation above 5.5 MHz, see plots attached.

Why the improvement?

The changes increase the collector currents of Tr2 and Tr3 from 0.27 and 2.7 mA to 0.82 and 15 mA. The 68 ohm resistor in the emitter lead of Tr3 reduces the voltage gain of that device from 43 dB to 11 dB, reducing the signal current drawn from the collector of Tr2. The "open-loop" gain of Tr2 and Tr3 is 47dB, compared with 65dB for the unmodified circuit. Feedback by R5 and R8 bring the gain down to 11 dB, about 1 dB less than the unmodified

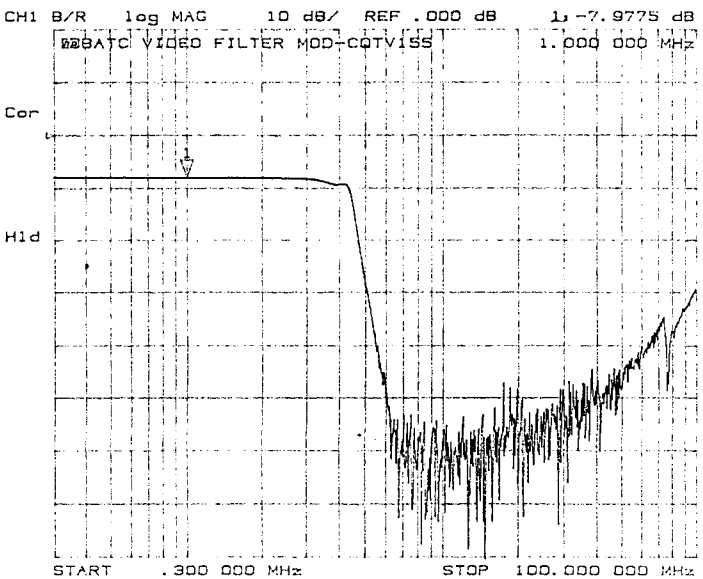


Pre-modified Filter

circuit, and giving the filter an overall insertion loss of about 1dB between 75 ohm source and load.

The net result is that the 3dB bandwidth of the post-filter amplifier is almost doubled to about 8.4MHz and the impedance seen by the Toko filter remains at about 1000 ohms resistive to higher frequencies (about 6.5MHz). It would seem that the stop- band performance of the Toko filter deteriorates if the termination impedance departs from the nominal value. I will explore that with some more measurements. I retained the value of 1000 ohms for R4.

I cannot say that I noticed any improvement in linearity as such, although the current-series negative feedback applied to Tr3 must have improved this aspect as G1COI notes.



Post-modified Filter

MEMBERSHIP

FULL YEAR: Subscription to the club is £9.00 per year. All subscriptions fall due on the first of January. Membership application forms are available by sending a stamped addressed envelope to Dave Lawton, whose address may be found on page-2 of this issue.

OVERSEAS MEMBERS are asked to send cheques bearing the name of the banker's London agent. Postage stamps are not acceptable as payment. Overseas airmail is extra – please enquire from Dave Lawton or see the rates list with your last subscription reminder form.

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

The BATC is registered under the DATA PROTECTION ACT – all queries to Dave Lawton, and VAT registered – number 468 3863 01.

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

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The BATC is a non-profitmaking club run by a committee elected from the mebership for the benefit of the membership.

Please note that any opinions expressed in this magazine are those of the writers, and do not necessarily reflect the opinions or official policy of the Committee or the Editor.

BATC DONATED EQUIPMENT FOR SALE

Marconi Mk4 picture and waveform monitor, compete, handbook, valve, 405/525/625 capable, will need some rewiring ... £30.00.

Marconi Mk3 effects gen and vision switch, rack mount, does not look much but historically interesting (50's) Free to a good home.

Marconi Industrial vidicon camera Head only, valve, circa 1960 Marconi I.O scanning yokes...offers

Vintern Mk 2 pan and tilt head and heavy duty tripod £80.00. The first one has a non vinten skid included.

Rank bush Murphy Monitors 9" solid state 405/625 autoswitch handbook, Mains/Batt., early 60's fair condition ... £25.00

EMI 301 14" monitor, valve complete withhandbook, big, green case, 405/625 capability circa late 50's ... £25.00

EMI switching matrix, big, circa late 60's ... offers.

Rank Aldis Slide projector "Tutor Two" with film strip adaptor working nice ... £10.00.

Automatic slide projectors ... £35.00.

Bell & Howell 16mm film projectors "Filmsound" some very modern some not so modern optical sound or mag/opt. sound,from ... £40-150.

Thorn Transistor SPG circa early 60's WG61 rack mount 405/525/625 capable with plug in boards ... offers.

Reliance studio vidicon camera with viewfinder, clean but viewfinder tube has spots, no data, quite big ... £20.00.

BBC grille gen and pluge gen ... £10 each.

Audix 50 Watt power amps, 2U rackmount, line in 8ohms/100v O/P ... £15 each or Pair for ... £25.00.

Image Orthicon tube P811G unboxed condition unknown ... £5 collect.

Ditto Boxed ... £15 collect or + post at buyers risk.

Contact Brian Summers. Tel: 081 998 4739 answerphone, leave a message.

Just Released New video

THE DISH DOCTOR'S GUIDE TO SATELLITE T.V. VOL. I

STARRING JAMES WHALE AND PETER PEARSON

Enthusiast or Newcomer...
...There's something for you in this 1 hour (approx) video.
See satellite problems solved on screen.

PATTERNING PREVENTED
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For the first time complex theories explained :-

POLARISATION EXPLAINED WITH SUNGLASSES.

ORBITS ILLUSTRATED WITH A MELON

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(SPECIAL GLASSES REQUIRED)

ALL THIS AND MUCH MORE AVAILABLE BY MAIL ORDER FROM:

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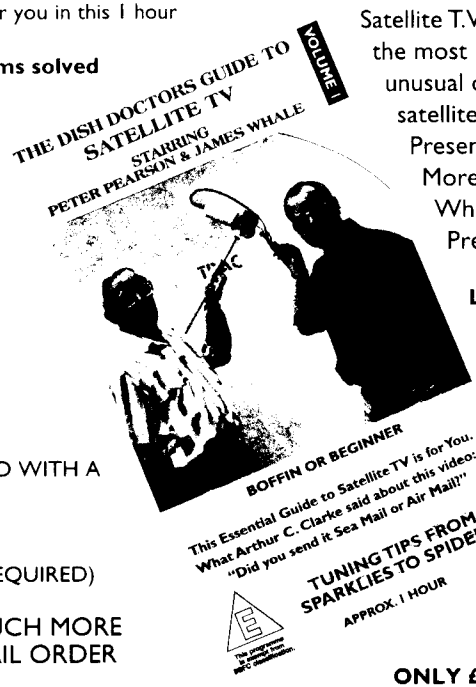


The Famous Dish Doctor from Satellite T.V. Europe answers the most common and unusual questions about satellite T.V.
Presented by the Even More Famous James Whale, cult T.V. Presenter.

Learn with a laugh about:

SATELLITE RADIO WITH MULTI - LINGUAL SERVICES

FRIENDLY DISH POSITIONS

DECODERS

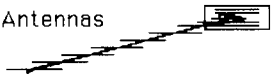
ONLY £14.95
plus £2.00 postage and packing

I wish to pay by Visa/MasterCard, please charge to my account. My card number is (13 or 16 digits) BATC
VISA
MasterCard
Signature
Expiry date
/
Name (on card)
Address
Postcode

I enclose my cheque for £14.95 plus £2.00 post & packing made payable to 3P VIDEO.
PLEASE ALLOW 28 DAYS DELIVERY

Severnside Television Group

STG 24cm Antennas

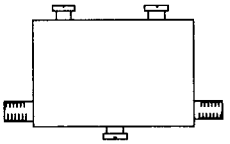


Our ever popular 24cm 18 element wideband Yagi is a must for all ATV stations. Specially designed to cover the whole band for repeater working. Look at some of the features....

* Frequency coverage 1240 - 1325 MHz
* Gain is 10db across the band
* SWR about 1 :1.5 across the band
* Length only 900mm weight 300gm
* Neat and unobtrusive, looks like a small UHF ant.

Price still only £14.00 + £3.50 p&p
(UK delivery only, for export please write in for delivery and air freight charges, enc SAE)

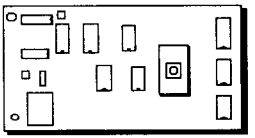
3 Pole & 5 Pole 24cm Filters



Precision made 3-pole and 5-pole interdigital filters for 23/24cm. Low insertion loss of 0.5db and 1db respectively. Wide passband of 60MHz, and -30db/-60db stopband at 70MHz offset. To order, state lower frequency of pass-band, and either BNC or N type connectors.

Price £49 (3pole) £79 (5pole)
plus £2.50 p&p

Colour Test Card Generator



New!! The STG now offers a ready built and tested TEST CARD GENERATOR. Displaying up to 4 test cards ready programmed with your CALLSIGN and QTH. The cards cycle automatically or can be manually displayed. The output is 1 vpp PAL comp. COLOUR. Please supply your CALLSIGN and QTH with order

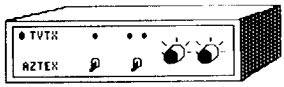
Price £75.00 + £1.50 p&p

Severnside Television Group

15 Witney Close Saltford Bristol BS18 3DX
(0225 873098) after 7pm & weekends
Please allow 28 days for delivery

Aztex Electronics

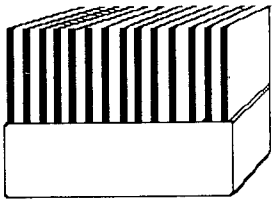
24 cm Transmitters



This state of the art FMTV transmitter gives a solid 2.5 W on either of the two switchable channels,1249 & 1255 MHz. This ready assembled and tested unit accepts both line and mic inputs for intercarrier sound and front panel audio and video gain controls are provided. See CQTV 150 for review.

Price £245.00 + £5.00 p&p

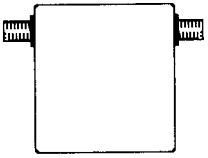
24cm Power Amplifiers



A 20 Watt PA using the SC1040 module is now available to accompany the AZTEX TX

Price £150.00 + £5.00 p&p

24 cm Pre-amplifiers



This GaAsFET pre-amp offers a gain of 17db with a noise figure of only 1db. Designed to go between the RX antenna and your receiver The gain is flat across the 23/24cm band but has an 8db roll-off at around 700MHz to help reduce broadcast TVI. A highly stable deign based on the ATF10135 GaAsFET utilises SMT components and is boxed and aligned. NB the device does not contain RF switching.

Price £52.00 + £1.50 p&p

AZTEX Electronics

Ken Stevens G4BVK 20 Coberley Footshill Rd
Hanham Bristol BS15 2ES (0272 677005)
SAE for full details. Delivery is 28 days.

THE WORTHING AND DISTRICT VIDEO REPEATER GROUP

GB3VR ATV REPEATER BRIGHTON

1W FM-TV 24cm TRANSMITTER THIS TRANSMITTER GENERATES ITS SIGNAL DIRECTLY AT THE WANTED FREQUENCY WHICH MAY BE SET ANYWHERE IN THE BAND. ON-BOARD INTERCARRIER SOUND AND FIXED PRE-EMPHASIS ARE STANDARD FEATURES. THE KIT INCLUDES THE DIECAST BOX AND COSTS £80.00

23/24cm ATV CONVERTER THIS UNIT BLOCK CONVERTS THE 1.3GHz TO THE DOMESTIC UHF TV BAND. USE THIS KIT WITH A STANDARD TV TUNER AND BATC IF PCB, FOR A COMPLETE FM RX SYSTEM. APPLICATION NOTES INCLUDED. £40.00 INC DI-CAST BOX.

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Copy should be sent to the Editor at 5 Ware Orchard, Barby, Nr.Rugby, CV23 8UF before 20th December. Tel/Fax: 0788 890365.

FOR SALE

FOR SALE: GX-2 SSTV/FAX TRANSCEIVE unit for C computer, c/w manual and software in ROM and on 5.25" disc; cost £99, sell ... £50. Also 4 user port expansion kit for C complete but requires constructing, c/w instructions and software ... £20 ono. Frank G4OSN. Tel: 0889 586354.

PHILIPS PM 5334 Colour Pattern Generator, SECAM, for broadcasting or advanced amateur purposes. Unique chance to get the most recognised test pattern in the world at a fraction of the normal price. PHILIPS PM 5632 Colour Generator, SECAM, very modern version, only 1 ru high, 19", 83 patterns, six syn signals at BNC outputs (S.P.G.). PHILIPS PM 5631 M Colour Generator, as above but NTSC 525/60. PHILIPS PM 5576A EBU-Insertion Signal Generator, PAL 625/50, PM 5560 TV-Demodulator PAL-G and many others. All checked and OK, with manuals. Write or phone: M.Rudolph DL2OU, Krefelder Str.20, W-1000, Berlin 21, West Germany. Tel: 010 49 30 393 2131 (Complete number from UK).

SONY BETAMOVIE CAMCORDER BMC500P, latest model featuring CCD, IR autofocus, 6:1 zoom lens, date/time superimposer, 2 batteries, multicharger, hard carry case, manuals, etc. All as new ... £250. JVC GZ-S3 COLOUR CAMERA, 6:1 zoom lens, mains adaptor unit, various cables, manuals, etc. ... £100. HITACHI HV-62K MONOCHROME CAMERA, 16mm, C-mount lens ... £45. COSMICAR 8.5mm WIDE-ANGLE LENS, C-mount, variable iris ... £25. Shaun G8VPG. Tel: 0225 873098.

HITACHI COLOUR CAMERA GP5AE/K with 16mm f1.6 C-mount lens and built-in microphone, complete with PSU and cables ... £75.00 ono + p&p. B&W CAMERA, 12V operation with 25mm f1.4 C-mount lens ... £30.00 ono + p&p. R.J.Bennett, 67A Harbourne Avenue, Paignton, Devon, TQ4 7EQ. Tel: 0803 558817 (evenings).

FORTOP 15W 70CM TV Transmitter ... £70. Ex Surveillance 4-wat VIDEO SWITCH, manual or variable-speed auto-scan ... £10. 200MHz laboratory type CHANGEOVER RELAY; brass coaxial lines incorporating 50 ohm terminating resistors and 3-stage isolation in each leg; BNC connectors, low power ... £10. FORTOP ATV upconverter, 432MHz/Ch.36 ... £12. MM423/50 PA c/w preamp ... £85. Microwave Modules 144/50-S PA c/w preamp ... 85. 2", 1MHz OSCILLOSCOPE ... £20. All include p&p, insurance, etc. Mr.M.Perry, 216 Marlpool Lane, Kidderminster, Worcs., DY11 5DL.

FORTOP TVT532 + TVC S 435/40 15W PSP 70CM TV TRANSCEIVER; 435 and 437 MHz crystals fitted ... £80. EMI WM26 OSCILLOSCOPE, 40MHz single trace, 24MHz dual trace and differential input modules. Full service manual and circuit diagrams ... £40. YAESU FT200 5 band 100W HF TRANSCEIVER. New PA valves fitted. Complete with manual, circuit diagrams and a new set of PA valves as spares ... £140. Sharp PC1500 POCKET COMPUTER; 8k memory, 4 colour printer, cassette interface and manuals ... £50. Contact Jamie G0JNK. Tel: 0773 857386.

TEST CARD VIDEOS FOR SALE: 55 minute video presentation made for the BATC "The Development of the TV Test Card". Andrew Emmerson interviews George Hersee, designer of Test Card F. Lots of old test cards included. And also ... "Exotic TV Idents", which covers East Germany, USSR, Poland, Czechoslovakia, Estonia and Romania and other exotic locations such as Mongolia, Libya, Algeria, New York, "BBC London". Plus many west European countries, as well as satellite channels. In all there are over 80 test cards, station idents, news programmes and start-of-day recordings, lasting 49 minutes in all. Explanatory captions describe each segment and the recordings were made on broadcast equipment in a TV studio "somewhere in Eastern Europe". Wages there are a tenth of what we earn and the recordist desperately wants a dual-standard colour TV, so all profits on this remarkable tape will go to him. If DX-TV is your hobby here are the rare test cards in living colour, like you've never seen them before! Both tapes are VHS/PAL and cost £9.99 including postage. Please allow 14 days for delivery. Andy Emmerson G8PTH, 71 Falcutt Way, Northampton, NN2 8PH. Tel: 0604-844130.

At last - an affordable telecine service! If you want 16mm films (only 16mm) transferred to VHS but cannot afford the customary #25 an hour charges, how does #15 per item sound? VAT, tape and postage extra, but you can collect/deliver and supply your own tape to save money if you prefer. Quantity prices are negotiable, too. Equipment has 430 lines resolution (better than S-VHS!) and handles optical and magnetic sound. Ring or send SAE for details. Andy Emmerson G8PTH, 71 Falcutt Way, Northampton, NN2 8PH. Tel: 0604-844130.

FOR SALE: Dressler EVV700GaAs masthead 70cm pre-amp and interface. 0.7dB NF. Bought second-hand and never used (by me), nice piece of kit. New price £120, sell for £70. Periswitch (automatic three-input, one output SCART switch). New price about £100, brand new unused and boxed with all paperwork £75. Manual two-input SCART switch, unused £10. Illuminated diascope for I.O. camera, new condition, with power supply for lamp. Slides onto lens, takes two 2" x 2" slides. £50 or swap. Postage at cost on both items. Andy Emmerson G8PTH, 71 Falcutt Way, Northampton, NN2 8PH. Tel: 0604-844130.#

"405 Alive" magazine, now in its third successful year, covering 405-line technology and programming from the 30s to the 80s. Subscribers find it irresistible! Four 64-page issues for £10 or have a sample copy for £2.50 post paid. Andy Emmerson G8PTH, 71 Falcutt Way, Northampton, NN2 8PH.

MEMBERS SERVICES SALE: Teletron project – CPU and VDU PCBs, with 2716 and 2764 EPROMS usual price, £21.15... SPECIAL OFFER just £9.50, or both boards with the 2764 EPROM, usual price '15.04...SPECIAL OFFER just £8.00. This offer is limited to stock, please phone to check availability. Prices quoted include full reprint of data, circuits etc, post and VAT – orders please to BATC, 6 East View Close, Wargrave, Berks. Tel 0734 403121.

74150 ICs. Brand new. Maplin price is £1.80 ea. Stock up now at sensible prices. £5 for a tube of 15, or 10 tubes for £40 (i.e less than a sixth of list price!). Carriage extra at cost. Peter Delaney G8KZG, 6 East View Close, Wargrave, Berks. Tel 0734 403121.

YAESU FT-290R fitted with Mutek SLNA 145 sb preamp, Nicads and charger (home brew); TOKYO Hy-Power Labs HL-35V power amp; Welz SP-430 SWR and power meter; 13.5V/10A power supply in case. All in as new condition ... £450.00. John Baraclough, Caldon Cottage, Stockiemuir, Killearn, Nr. Glasgow, G63 9QW. Tel: 041 332 9999 x4786 (daytime), 0360 50951 (evenings).

FOR SALE – PC XT MOTHERBOARDS. These motherboards have everything, built in. They contain 640K of RAM, a floppy disc controller, a colour graphics adapter, a serial port and a parallel (Centronics) printer port. The CPU is an NEC V40 (NEC's version of the 286), but although the CPU is a 286, the board is an XT, because the expansion slots are only 8 bit ... £35-00 each. Chris Smith G1FEF. Tel: 0767 313292 between 6pm and 8pm.

FOR SALE – COLOUR MONITOR, Good working condition, 20 inch colour monitor. Built from a kit. £20. Buyer collects or arranges transportation. Chris Smith G1FEF. Tel: 0767 313292 between 6pm and 8pm.

FOR SALE: Illuminated diascope for I.O. camera, new condition, with power supply for lamp. Slides onto lens, takes two 2" x 2" slides ... £50 or swap. Postage at cost. Andy Emmerson G8PTH, 71 Falcutt Way, Northampton, NN2 8PH. Tel: 0604-844130.

Pair Sony BAND U-MATIC RECORDERS, edit controller, Lowband U-Matic PORTABLE RECORDER, Sony DX1610 COLOUR CAMERA and transit case, Sony Lowband U-MATIC PLAYER and chargers ... £450 the lot, or may split. 1 recorder requires slight attention, player requires new loading belt, otherwise all good. Bob Platts G8OZP. Tel: 0283 813181 or 40742 (7-9pm).

FOR SALE: 1 Rack Link VDA, Cox Colour filler/edger, JVC audio/video switcher, Marconi audio compressors (with PPMs), Rediffusion 22" colour cable monitors, GPO type audio patchfields, Systems Video waveform monitor tube, 5.25" disc drive, ABC TV misc audio/video PCBs, BVU U-MATIC video tapes (including 20 minutes for portables), BNC plugs and sockets, PL259 plugs and sockets, adaptor plugs, 75 ohm terminators, cables, etc. Simon Gough. Tel: 0234 852789.

Marconi TF2360R TV sideband analyser 32-68 & 172-228 Mhz. Free to a good home contact GW3IVK QTHR.

FOR SALE: 19" rack mount 526 VECTORSCOPE ... offers. Tel: 0883 622159

SPECTRUM INTERFACE 1 (gives RS232 O/P) ... 2 for £10.00. QL MICRODRIVES, were removed from new Q/Ls for project, motors soiled appearance ... 2 for £5.00. Quantity of scrap Spectrum PCBs, some useful parts ... 3 for £10.00. Please add 50p towards p&p. E.Glover, Rose Lyon, Grove Hill, Mawnan Smith, Falmouth, Cornwall, TR11 5ES. Tel: 0326 250048.

FOR SALE: Sony Remote control RM420 ... £10.00. Sony U-Matic Vo 2630 Recorder working order ... £125.00. Used U-Matic cassettes, 30min ... £1 each or 8 for £5. Link 104 precision camera, electronics unit, CCU, cable , circuits, no lens ... £30.00 collect. Zoom Lens, 10:1, servo amps, controls etc. for TV88 mount Image Orthicon format (35mm) circa 1965, Two wooden travelling cases, in good condition ... £75.00. American vibrator inverter unit 24v. DC to 115v AC ... £5.00. Fi-cord portable tape recorder nice condition, collectible ... offers. Marconi pulse & Bar generator ... £20 or offers. Qnty 0.25" recording tape 5" spools Agfa PER368 box of ten ... £5.00. Prowest/Neve sound amps and relay units, Decca colour monitor, 26" Shadow mask, based on television chassis BNC & XLR vision & sound i/ps. heavy, working when last used, circuits, two for ... £50 and some spares. or ... £30 each. Pye Westminster rack mount TX RX units cheap. Bench H.T. PSU variable 300v. nice ... £10.00. RCA Victor colour television circa 1960, 21" round tube, metal case with wood finish, big, heavy, collectible ... offers. 2 Spembley Loop transmitter 150Kz. two headsets for talkback (inductive loop system) ... offers. Link Pal coder and spare NTSC modules ... £10. BBC WHITE UNITS: Twin stabilising amp, Dual Vertical Aperture corrector, Digital Phase shift unit, GE4/513 Crosshatch Generator, GE4/523 Colour bar gen (RGB), TE1/503 Gain & Delay corrector AM1/516 Cut fade amp, AM4/517 6 o/p DAs nice ... £5.00 each. Ex BBC TV News mixer, BIG, Old,will need work doing ... offers. GE4/520M Non Lin test set nice ... £30. Pair Audio compressor units AM6/3A, meter, nice, circuits. Anchor caption equipment, keyboards, etc, could be collectible. LOTS of other white units please enquire. Brian Summers G8GQS, QTHR. Tel: 081 998 4739.

EMI 2001 CAMERA, complete system comprising: Camera head, 2 lens, lens hood, viewfinder, Zoom demand unit, Power supply unit, camera control unit, G101 Camera cable, other cables, remote control panel, EMI coder unit, 4 Plumbicon tubes, set of three handbooks, Pan & tilt head and tripod, some spares, this camera was working when removed from service in June 1991 and is in fair condition, price ... £150.00. Aircraft inverter made by Ferranti, solid state 28v DC to 115V AC 400HZ modern unit with control unit with meter ... £20.00. Central Dynamics, Special Effects Unit with W/F Gen W/F proc. Key proc. and video switch modules, two off.. Video Processing Amp. with o/p amp, Video clip, remote gain, Burst proc., pulse proc. modules.. power supply unit +24v, +10v, -12v. all 3u high units nicely built ... £15 each or all for ... £40. Ampex timecode gen/reader unit for Quad VTR no details possible stand alone use ... £20. Tektronix Vectorscope 520 NTSC in nice condition and working ... £100. Tektronix waveform monitor RM 529 ... £100. Set of three Coltron ? 5" monitors in 3u rackmount frame + 2 spare monitors (5 in all) will need some maintenance ... £65.00. Television Engineering by Amos & Birkinshaw. Vols 2, 3 & 4 circa mid 50's, The definitive BBC training manuals ... £4.00 each or the three for £10 plus post. Contact B. Summers G8GQS QTHR 081 998 4739

7 off Pye 15" mono monitors type LDM 1915....Offers. 1 Sony Vo2630 U-Matic recorder/player Top Loader...£100.00. 2 off Pye LDK14 Portable Colour Cameras + accessories + Spares. P.O.A. Tel: 081 766 7228 Answerphone. Quantity of Marconi Talkback Equipment, very good condition, please phone to discuss requirements. P.Marshall 0522 703348

Ikegami ITC 350 3 tube ENG camera, Fujinon 10:1 lens, genlock, 1" viewfinder, Working ... £220 or a pair for £400. D43 rack mount 'scope offers. Contact R.Harris 0749 343876.

Sony U-Matic edit suite, 2 * Vo 2850, convergence edit controller, PC3 frame computer box, complete and working with cables and manuals.... £350 ono. Bob Robson 0633 892182.

EXCHANGE & WANTED

WANTED: Information and/or circuit diagrams or ideas on how to convert a Sony Prestel Terminal colour monitor model no: KTX9000UB (9" Trinitron) into a composite video monitor. The set has separate RGB and syncs from the Prestel board and I expect that the conversion could be done using one or two ICs, a crystal and a delay line, plus a few other bits. I would welcome any info or circuits which may help me with this project and will pay any reasonable costs for photocopies etc. Also, a circuit diagram for a B&W video camera (8" x 4.5" x 3") with the name 'Inelco' on the side (no other identification inside or outside). All replies to Frank Dimmock G0CFD, 13 Stephenson Way, Bourne, Lincs., PE10 9DA. Tel: 0778 423433.

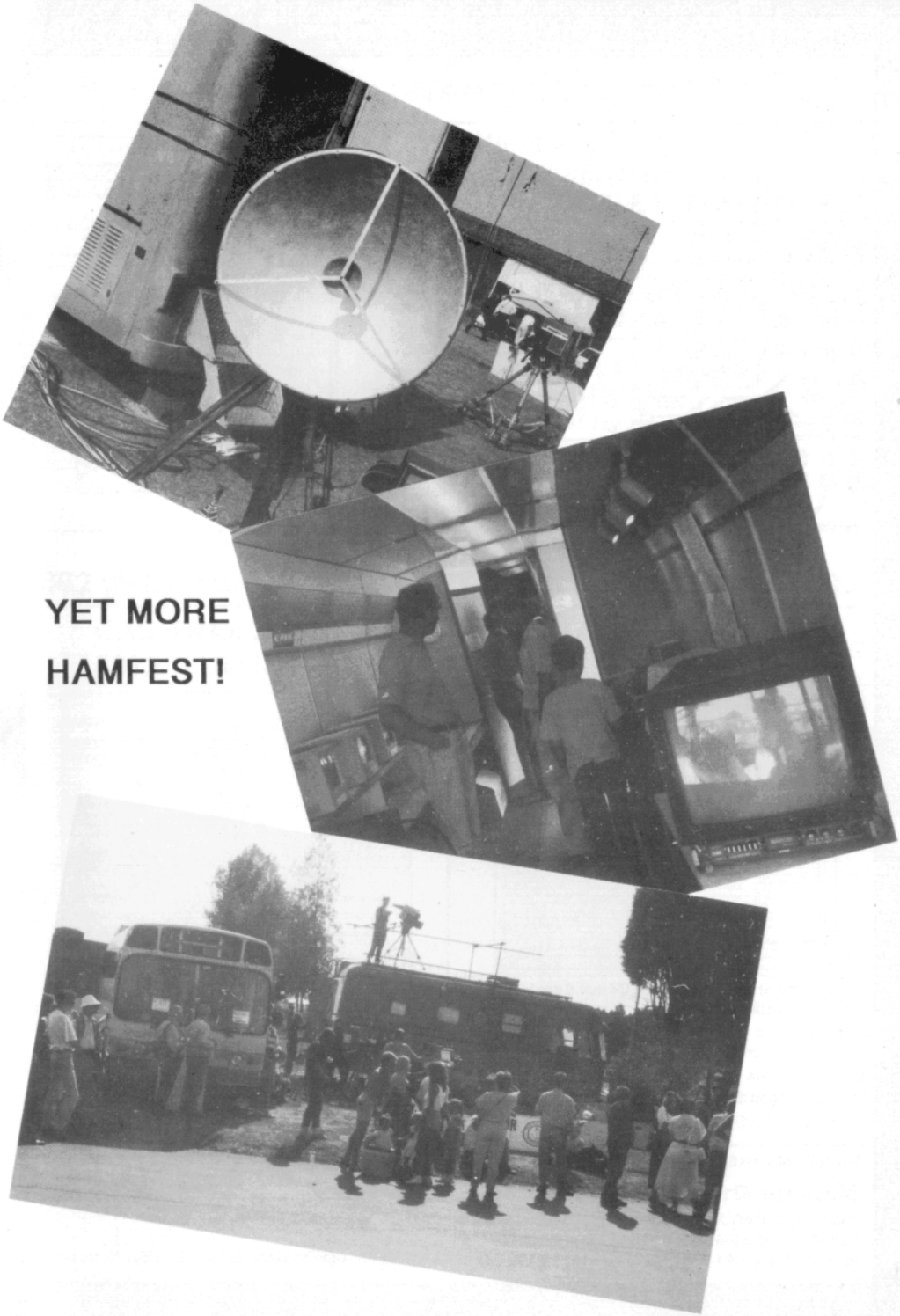
WANTED: buy/borrow/swap old TV programmes on 16mm film. I'm gradually building up an interesting archive! Andy Emmerson, 71 Falcutt Way, Northampton, NN2 8PH. 0604-844130.

HELP WANTED! I am putting the final touches to a demonstration set-up of Sony's first home video system, circa 1966. Yes, it's a high definition 405 line system, in glorious black and white and uses the latest reel-to-reel technology! I'd be very pleased to hear from anyone who can lend or donate original sales literature, carrying case for camera, two-camera switcher, also the little accessories such as oil, cleaning tools, splicing tape, microphone etc.. A thousand blessings on you if you can help. Andy Emmerson, 71 Falcutt Way, Northampton, NN2 8PH. Tel: 0604-844130.

OLD CAMERA TUBES, (and similar imaging devices) of various type and age, and related data etc, for historic (!) collection. Particularly welcome would be an Orthicon, EMI 9831 Vidicons, an Ebitron, an Image Isocon or a 1.5" Vidicon Tubes that are not operable, are suitable, so if you replace tubes in cameras, don't throw the old ones away, but please contact: Peter Delaney G8KZG, 6 East View Close, Wargrave, Berks. Tel 0734 403121.

HELP WANTED! I am putting the final touches to a demonstration set-up of Sony's first home video system, circa 1966. Yes, it's a high definition 405 line system, in glorious black and white and uses the latest reel-to-reel technology! I'd be very pleased to hear from anyone who can lend or donate original sales literature, also the little accessories such as splicing tape, microphone etc.. A thousand blessings on you if you can help. Andy Emmerson, 71 Falcutt Way, Northampton, NN2 8PH. Tel: 0604- 844130.

WANTED: buy/borrow/swap old TV programmes on 16mm film. I'm gradually building up an interesting archive! Also keen to buy old general and technical interest brochures on TV issued by BBC, ITA, etc. before 1970, also manufacturers' literature on closed circuit TV equipment. Andy Emmerson, 71 Falcutt Way, Northampton, NN2 8PH. 0604-844130.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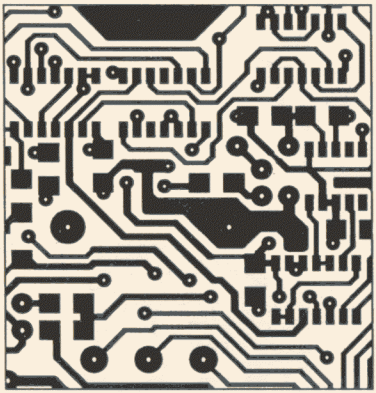

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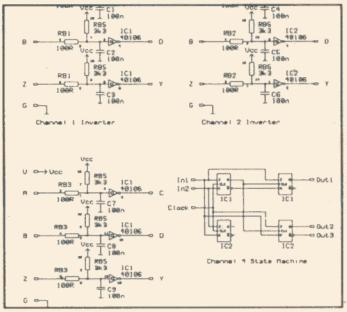

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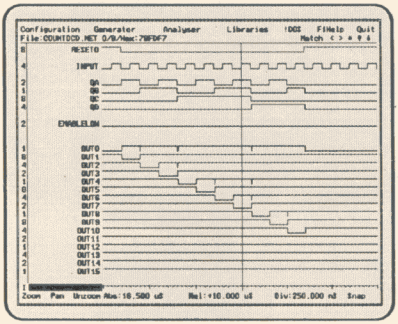

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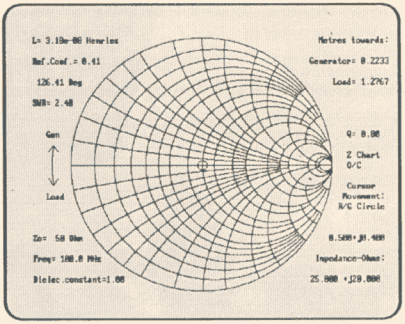

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