CQ-TV 185

Contents

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Editorial

Welcome to the 50th year of the BATC as our older members will realise there has been a lot of changes in the past 50 years and another one is about to take place we have now produced the first ever A4 CQ-TV. We talked about it, we asked the membership what they wanted, we asked the printer what it would cost to produce and then eventually its crunch time and a decision has to be made perhaps one of the most difficult decision the committee and I have been part of. The membership input was to stay A5, but there again there was less than 1% of the members that replied. The printer said it would cost no more to produce 48 pages of A4 than 96 pages of A5, it would give use head room to produce more pages if we ever needed to as 96 pages is the limit of a staple binding. Last but not least we have to think about our editor, he has been wrestling with the software from the start, its all designed for A4 and actually produces A4 pages with the A5 copy compressed to the central area. With all the other ATV magazines producing A4 magazines any subsequent reprints have been re-drafted by Alan Robinson, to fit our compressed format. So the inevitable change has happened we moved to A4 as we moved from 405 to 625 at least in the UK, we moved from AM to FM and so far I think you would all agree we got it right lets hope this also applies to our new magazine format.

Other changes have been taking place around us - the 10GHz allocation for example. We are also being asked by the Data Communications Committee to furnish proof that the ATV on 70cms is ACTUALLY BEING USED BY ATVers! We need evidence of photocopied logbooks, worn out 4CX250B's etc. Graham, G3VZV, will be assembling our response so please forward the data to him at the address on page 2. It is now "Use it (and prove it) or lose it".

Our website is also growing and we have just had the annual bill from Clearlight, it does not seem a year since we took out domain registration and http://www.batc.org.uk became a reality. The number of hits often runs at 1,900 per week and come from all over the world often resulting in 2 to 3 new members a week joining via the internet. If you are not connected to the Internet but have a PC you can still see our site by purchasing the club CD. This has also undergone some changes in that all the files have been locked to prevent the copy being edited. This was a request from one of our contributors and one that we are happy to comply with, the pages can still be printed out, this function has not been inhibited.

This year is also a BGM year and the BATC's 50th Anniversary year, to mark this we are organising a gala event, award ceremony and combined BGM, as always we are anxious to have your input as to what you would like to see or include in the event. Paul Marshall and myself are doing the organising, the date and time have been set for August 8th at Shuttlworth College part of Cranfield University Nr. Bedford remember the Cat 94 venue, apologies in advance if this interferes with your family holiday, but for this popular venue it was the only available date.

I am going to close with another obituary of one of our members. On October 8th Robert Atkinson G3PUU passed away. He was a member and life long friend to my family and me, without his help I doubt if I would have ever mastered Television engineering. It was only a few weeks before he died that we were sat down at his kitchen table puzzling our way through the 24cms/13cms ATV transmitter in the Dutch magazine Repeater, as a result the circuit and translated text is reproduced in this magazine.

Let me finish on a positive note I hope you will all sit back and enjoy the first A4 CQ-TV, it is something of a landmark to start 1999 with a whole ew look magazine and I hope you will enjoy it as much as you have enjoyed the last 184 magazines in A5 format. Let me wish you all a Belated Happy New Year to each and everyone of you.

Trevor Brown BATC Chairman

And, sent in by Andrew Emmereson:-

"Someone noticed then"...

I always like to see the oddities at IBC, even if (as with the Dutch bulb and clog stands) they look like booth spaces that nobody else wanted to buy. In the 'new technology campus' on a stand run by the British Amateur Television Club, there was a demonstration of the original Baird 30-line television from the 1930s. Now I know I shouldn't say this but it seemed to my weary eyes (on my last day in Amsterdam) to be a little better than many MPEG systems at the show. -- From the Editorial of the December 1998 issue of International Broadcast Engineer magazine. Well done Grant!

I feel that I have been instrumental in this change in size of CQ-TV, but, as Trevor has mentioned, modern software is geared to the A4 size. I have tried several desktop publishing packages in the last few months but they all favour the A4 page size. I hope that this issue does not disappoint any of you too much. If you have any helpful comments, then please let me know. My contact details can be found on the committee contacts page above.

Ian Pawson, editor CQ-TV.

An Introduction to Test Card 'M'

Test Card M is a DTI funded collaborative project under the Digital Test Bed programme between Snell & Wilcox, the BBC, the ITC, Channel 4 and the ITVA.

By now the world is becoming familiar with the Test Card 'M' image, but what is behind that image, and how does it reflect the needs of the bright new digital age?

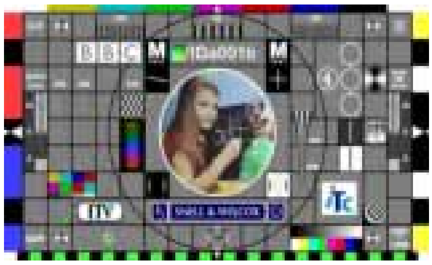
Test Card 'M' is a sort of carrier – a container full of digital tests that can exercise and prove all the different aspects of digital TV delivery, from video and audio performance right through to the multiplex structure. The visual image is the public face of the test card. Behind this image is a raft of different bit sequences and structures, each of which tests a different aspect of the digital delivery chain.

The Test Card 'M' programme was launched in the UK, with support from the UK DTI, to create a "test card" for digital television. The work being performed on this programme will ensure that simple to use, intuitive tests are available when digital television installations and first transmissions need them. The programme is led by UK TV equipment manufacturer Snell & Wilcox, who are responsible for identifying the requirements of the test card as well as creation of the digital sequences that will be used.

The programme is supported by all the UK free to air broadcasters (BBC, ITV, Channel 4) and the ITC (Independent Television Commission). They consider that, without such test sequences, a fragmentation of standards in the broadcast industry may be unavoidable, and there will be no guarantee that viewers will receive satisfactory service from digital television.

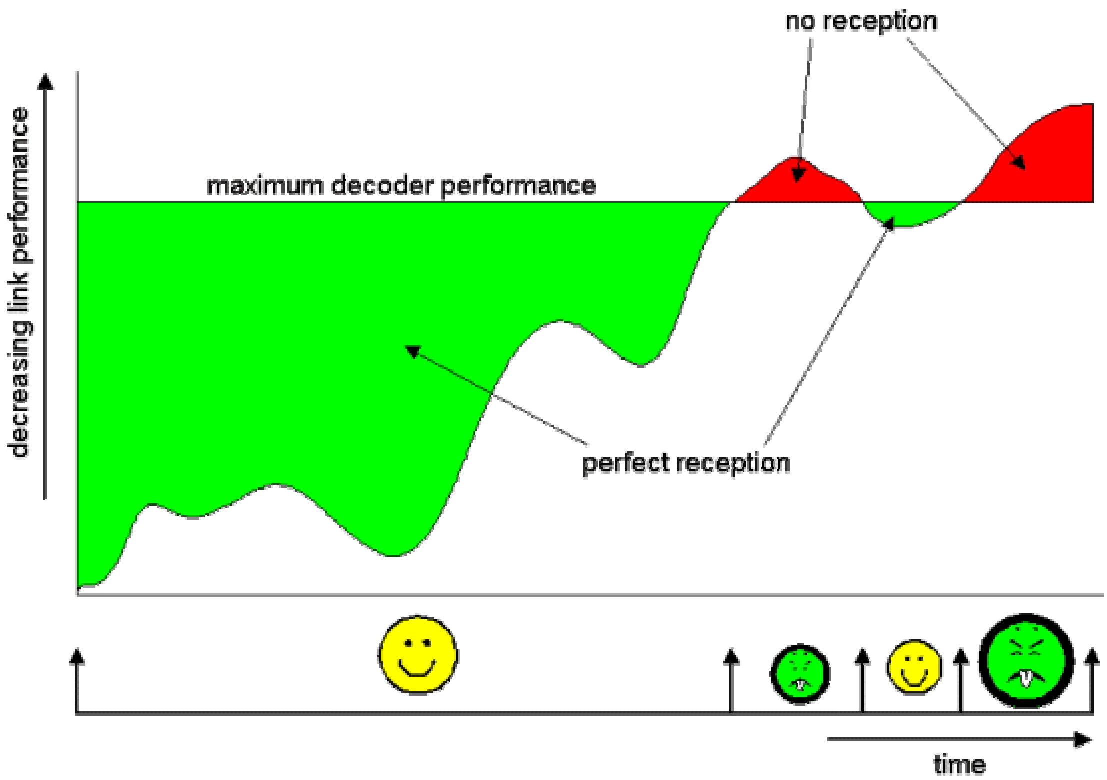
The programme has already produced the first release of test sequences, and the requirements capture process is underway, in which the needs of broadcasters, multiplex operators, transmission operators and receiver manufacturers are being collected to ensure that the test sequences are as universally applicable as possible.

The need for a digital Test Card



Unlike analogue service, digital transmission is characterised by its ability to appear perfect even in the presence of errors or poor delivery channels right up to the point where errors become too hard to conceal or correct, at which point the transmission fails completely. This is a "cliff-edge" effect, and makes it very hard to anticipate when there is a problem until it causes a complete break down. The corollary to this, of course, is that a viewer using a digital television receiver will not notice any degradation in the service when reception conditions are varying until the signal fails – the service is either there or it isn't!

The task of a test card, then, is to show what is going on in the delivery chain in a way which is easy and quick to use and unambiguous in operation. It needs to be able to show how near to the edge the service is operating, so that the effect of changes or degradations in the delivery conditions can be assessed before they become critical. Use of the test card is not limited to monitoring in-service delivery by broadcasters (indeed, the current analogue service no longer transmits a test card, and when full 24 hour operation is established it is unlikely that digital services will either). Set-top box manufacturers and digital TV equipment manufacturers will need to test the operation of their product using a recognised industry yard-stick, just as the multiplex operators will wish to test



The "Cliff Edge Effect" – a viewer's perspective!

and monitor the complete broadcast chain. Test Card 'M' will provide universally accepted test bit-streams that can be used to give providers and regulators the confidence they need that the viewers are getting (and will continue to get) the best possible service out of digital TV.

How Test Card 'M' is designed to be used

Although a digital television transmission is made up of more than just audio and video, these are still the easiest formats to use to try to see quickly what is happening. It is easier to "see" or "hear" an effect than to deduce subtle multiplexing effects from a string of numbers! The "Cliff Edge Effect" diagram on the previous page gives an illustrative idea of what is happening in the transmitted multiplex.

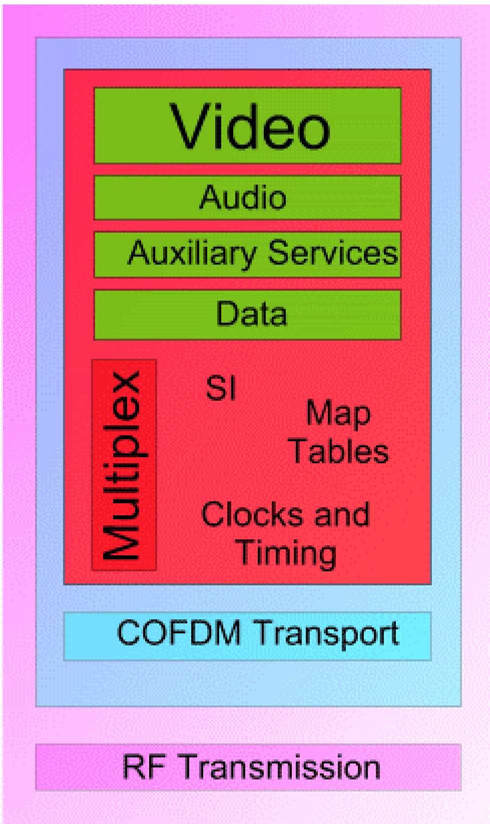
The Video and Audio content are easy to see on a monitor or standard TV receiver, but are only one component of the multiplex, which also carries other services, data and all the housekeeping needed to make the multiplex work. This multiplex is encoded into a COFDM format for transmission, which is itself carried as an RF signal from the transmitter. Test Card 'M' does not test either the RF transmission or the COFDM encoding, neither does it test the compression or encoding process, since these are proprietary and can be carried out in any way which is compatible with the DVB standards. The test card is designed in such a way that it uses the video and audio to indicate the health of the entire multiplex layer. This is done by "stressing" individual multiplex parameters, and using the video to indicate whereabouts in this sequence the test has reached. If the delivery chain or decoding fails at any point in the stress cycle, then it is clear from the video what that level of stress actually was. A typical video screen from the Test Card 'M' suite is shown below. This is the most familiar image of Test Card 'M', and is used for video decoding and display performance, audio/video synchronisation and video/sub-title synchronisation.

Traditional line-up elements are included, since this is a video test (indicated by the VID part of the identifier), but of course this is a moving image, and contains a number of elements that can be seen to be moving (such as the rolling cube, rotating colour phase, rotating clock hand and synch meters), to demonstrate that decoding is continuing (and the decoder has not crashed or "frozen").

Other, more specific screens exist for certain functional tests, which are characterised as video tests (VID), audio tests (AUD), data tests (DAT) or multiplex tests (MUX). The severity of the test (or stress level) is indicated by the final letter of the identifier, where 'a' means 'easy', 'c' means 'just at the maximum without being illegal', 'x' means 'illegal' (in the DVB sense) and 'b' means 'somewhere between 'a' and 'c'. Of course, a test that is very easy for a video decoder may be very difficult for the multiplex, so this definition only applies to the element defined for that test. This unique identifier is essential for showing which test is being performed since the same video screen may be used for a number of different test sequences.

The role of Test Card 'M' in Conformance, Compliance and Certification

Conformance, compliance and certification could be called the three "C" words of testing. They are what users and manufacturers of digital TV equipment will want to do, and they want to know how Test Card 'M' will help them to do it. Because of the complexities and the evolving nature of digital transmission, it is not possible to create a definitive "conformance" test, since it is impossible (given a finite testing time) to provide an exhaustive test of all elements of the MPEG, DVB and DTG specifications. Nonetheless, although it will never be possible to definitively prove that a piece of equipment is conformant with all the specifications, it will be possible to show if the equipment is non-conformant in some way, and where that non-conformance lies. The use of Test Card 'M' can then be incorporated into compliance testing, by which an equipment or equipment chain which supports and displays the Test Card 'M' bit-stream correctly can be deemed to be compliant with the test specification. It is the role of Test Card 'M' to ensure that it reflects accurately the compliancy needs of the relevant specifications. Once the equipment has been tested against a compliance specification that invokes Test Card 'M' it can be certified in a certification document as having conformed to the specifications. Test Card 'M' has been accepted as one of the test methodologies that will be specified by DTG in the UK to show interoperability of the components of the digital television system.



The Pyramid of Content in a Digital TV Transmission

The Continuing Development of Test Card 'M'

The test card project has now released the first CD-ROM of test sequences, which are available on a commercial basis from Snell & Wilcox. The work of specifying and producing other test sequences, which will extend the range of tests available, is continuing, and will lead to further test card releases over the course of the next 12 months. As time goes on so more and more users are adopting Test Card 'M' as an aid to conformance. Test Card 'M' is being established as the principal benchmark against which transmissions and receivers need to be validated. As the horizontal digital television market develops, the use of this common measurement yardstick will ensure that continued interoperability of all elements of the delivery and receiver chain can be achieved.

Snell & Wilcox Heads up UK Digital Test Card Program

Snell & Wilcox have been chosen to direct the recently launched programme to create a “test card” for the UK’s digital television broadcasts.

The first sample test sequences have already been produced, and the requirements capture process is under way, in which the needs of broadcasters, multiplex operators, transmission operators and receiver manufactures are being canvassed to ensure that the test sequences created will be as universally applicable as possible.

Snell & Wilcox is a world leader in the design and manufacture of digital image processing products for television broadcast and post production applications. The company has won many awards for its innovation and engineering excellence including five Queen’s Awards for Industry, two Emmy awards from the National Academy of Television Arts and Sciences and the European Information Technology Prize. Snell and Wilcox products are in use worldwide by many of the most prestigious broadcasting and post facilities in the industry.

For further information on the development and availability of Test Card ‘M’, visit the web-site at www.snellwilcox.com

Or contact Paul Walland at paul.walland@snellwilcox.com

Snell & Wilcox Ltd, Durford Mill, Petersfield, Hampshire GU31 5AZ, UK. Tel: +44(0) 1730 821188, Fax: +44(0) 1730 821199

Snell & Wilcox Inc., 1156 Aster Avenue, Suite F, Sunnyvale, CA, 94086, USA, Tel: +1 408 260 1000, Fax: +1 408 260 2800

ATV Contest Records

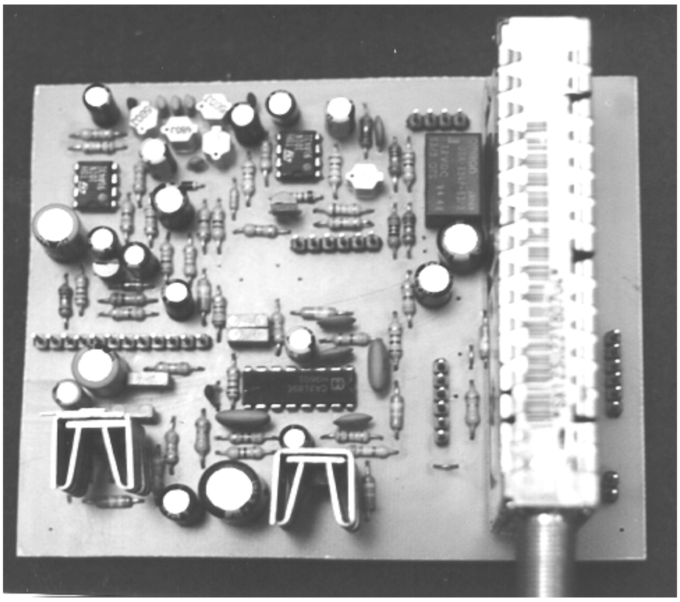
Here is the updated list of ATV records. If you have some new details or additional information, please let me know at mvonlanthen@vtx.ch. You will find all details of each QSO, the chronology of all registered records and the methodology used at: http://www.cmo.ch/swissatv (in French and in English)

Thank you for your co-operation in helping me to maintain this list up-to-date, for the full benefit of all ATV hams. Its goal is not to promote competition itself and only but to encourage the ATV traffic and experimentation.

Michel Vonlanthen, HB9AFO, SWISS ATV President.

GB3XT KITS & BITS

NEW DOVE TUNEABLE IF / RX KIT.



The Dove ATV Tuneable IF./ RX. forms the ideal heart of an ATV receiving system for either 24CMs (pre-amp recommended) or the higher bands when used in conjunction with a suitable Low Noise Block converter.

The flexible design concept allows for expansion to suit your needs for now and the future.

Easy to construct requiring no adjustment, setting up or alignment. The kit contains all board mounted components and full instructions.

Brief spec. Size.105mm wide x 97mm deep x 50mm high. Power. 12vDC @ 400mA. Frequency range. 925MHz - 1800MHz. Audio subcarrier. 6MHz. Video bandwidth. Variable.

Video outputs. 1v PK/PK + Base band. Audio output. 1.5Watts. Controls. (all 10K pots) Main tuning, Volume, Video gain, Video bandwidth. LNB power on/off switch.

DOVE RECEIVER KIT £42.00 all-inclusive.

GUNNMOD2 3CMs ATV. TX. kit. Very popular full feature Gunn diode TX. Complete with pre-tuned oscillator head. £30.00. PCB. kit less oscillator head £20.00

3CMs LNB's. All with 9GHz Local oscillators**.** New 0.7db nf. with dish feed horn. £43.00. With 22mm circular W/G input £45.00. Others and second hand units available. Please contact.

WG16 to 22mm Circular transition. Converts 22mm circular to WG16 and vica verca.

24CMs LOW NOISE HIGH GAIN GASFET PRE-AMP kit. 40db gain 1db NF. band pass helical filtering. 12-18vDC feed via co-ax. Designed specifically for ATV. but good for all modes £60.00

DTMF DECODER kit. Very high quality decoder IC. All o/p's buffered. Will directly drive TTL/CMOS or relays. Can be used to control whatever your imagination thinks of. £12.00

Prices are all inclusive of P&P etc. (+ 10% abroad) PCB's are available assembled and tested at extra charge. **SAE. (to take A4 paper) for further details or call.**

Orders and enquiries to:- BOB PLATTS G8OZP. 220 ROLLESTON ROAD. BURTON UPON TRENT. STAFFS. DE13 0AY. PHONE 01283 531443 7 - 9PM WEEKDAYS PLEASE

CQ-TV Commercial advertising rates

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Half page	£40	£50
Full page	£80	£100

Discounts of 5% for 2-3 insertions and 10% for 4 and above apply to the above prices.

If you would like to advertise in CQ-TV, then please contact our advertising manager, Chris Smith (G1FEF), 25 Dando Close, Wollaston, Northants, NN29 7QB. Email: adman@batc.org.uk

Sales of the Century

By Dicky Howett

Dicky Howett rummages in a few bargain basements and uncovers the busy world of video second-hand selling.

Used, previously operated, second-hand. Whatever it's called, good quality TV broadcast equipment will always find a market.

Whether it`s cameras, monitors, microphones or lights, they can be yours at a special price. Just ignore the scratches and don't worry that the kit was probably once used on the 'plane crash' episode of 'Emmerdale'! But who actually buys old TV kit and how does the business operate?

It's been going on for years, (and not only Emmerdale). Surplus broadcast kit has always found its way into the public domain. In the 1960s the original commercial TV channel, Rediffusion, had four surplus American RCA TK11 monochrome 3" I.O. studio cameras stored in a basement room at Television House, Kingsway in London. Unfortunately the basement flooded and the cameras got wet. Undaunted, Rediffusion refurbished the four cameras (rugged valve types in those days) back to working condition and sent them to Yugoslavia to provide facilities for Yugoslavian Television after the 1963 Skopje earthquake. By all accounts it was kit gratefully received.

The BBC also operated a second-hand sell-through outlet. This was their 'Redundant Plant', (of fond memory) down at Power Road in Chiswick and it was stocked to the chocks with surplus TV studio and o.b. equipment. Usually, every ten years or so BBC Television re-equipped, which meant that there could be a small mountain of, used telly cameras to shift. (Once, a single buyer for £200 purchased eight Marconi Mk II's the lot!). The BBC was quite sanguine about this process and flogged regularly its spare kit to grateful recipients, (typically universities or foreign TV stations) especially if they had ready cash.

For example, during the nineteen sixties several cartloads of ex-BBC cameras were dispatched to a TV station in Greece. Kit also found its way to South America and New Zealand. Some cameras even ended their days down the siding, shunting with British Railways. The cameras were installed in a studio presumably to teach B.R. staff the proper way to tell customers which train would not be arriving at which platform. Later, in 1969 when all-channel colour arrived, the ever-resourceful BBC sold some well-used Marconi Mk IV monochrome cameras out of Television Centre to Australian TV. Australia didn't colourise until 1975. The mono cameras were used as a stopgap. But you'll be out of luck these days if you want to buy any ex-BBC equipment. The final sale was in April 1996 when the BBC's redundant plant was itself made redundant.

Closer to home, as a result of the great Tory inspired 1992 ITV franchise debacle, several broadcasters found themselves well and truly out on their collective TV ear. Thus, big sales of TV kit were heralded. Down in the West Country at Plymouth, Television South West emptied the contents of it's Derry's Cross studio with the help of Liverpool-based auctioneers Elston Sutton. An 'all comers' auction was held throughout three days in May 1993. Amongst the thousands of Lots on offer, a studio-set of Hitachi 110 cameras, an AMS digital/stereo 48 channel audio mixing desk (only used for three programmes) and a white Bosendorfer Grand Piano. The TSW sale was a success, but apparently the weather influenced bids. Better prices were obtained on sunny days than on rainy days

Thames TV sale organiser Bob Warren.

Also hitting the 1992 lost franchise fan was Thames Television. During 1993, Thames publicised several large sales of broadcast equipment. One of the sales organisers was Thames engineer Bob Warren. He recalls, "Like most other big broadcasters, Thames Television habitually disposed of redundant equipment, and we had our own Redundant Equipment Officer at Teddington. By the end of 1991 we knew we'd had it as a broadcaster, and when the time came to sell the studio kit, we had two choices, either a great big auction like TSW or a sealed bid with a reserve price system. We chose the latter. We had several sales during 1993. Our biggest sales were at our O.B. base at Hanworth and our London studios at Euston Road"

Typical Thames reserve prices

throughout the sales were for the following; an Acron 502 SPG (£300) and some Ikegami HL95 cameras at £1,700 each.

Bob Warren, "In 1993 we disposed of our LDK 5 O.B. cameras priced at £1000 for all six. They went to BATC members or people wanting souvenirs of Thames. On the other hand, our RCA TK47 studio cameras like much totally obsolete and valueless tv equipment went to worthy causes and in this case as a gift via the Foreign & Commonwealth Office to Lithuania. Thames Television kept for a while, the three studios at Teddington but the Hanworth O.B. base was demolished and now is home to a couple of superstores. The Euston Road site has been re-developed but not as TV studios."

Currently, the second hand market is serviced by a large number of firms and individuals, working either as auction houses, commissioned agents or able to provide an immediate choice from stock.

HENRY BUTCHER has been around for over 100 years. As valuers and auctioneers, the company has been involved in the audio-visual industry for at least twelve years. Associate partner Jeff Hill comments, "We at Butchers offer a whole range of services but we only started auctioning tv and audio kit about four years ago. We have three primary means of selling: By private treaty, tender or auction. In fact our latest sale is by private treaty for a complete digital post-production facility located in Benelux."

Twelve years ago Butchers valued the whole of HTV. Since then the company has been involved in most major (and some minor) asset sales. Jeff Hill, "Changes in TV technology will obviously imply redundant equipment somewhere. People who come to our auctions are a very broad range, dealers, end-users and people off the street. The newer equipment tends to remain in this country, the older stuff ending up in the far-flung corners of Europe or even museums. Museums sometimes contact us to buy or ask our clients to donate. We always pass on requests like that and it is really up to our clients if they want to donate anything. We seem to get on quite well with the main second hand dealers and we often auction their own stock if it sticks on their shelves. Our last big asset sale was for Central TV in Birmingham where we auctioned edit suits, transmission equipment, film

Checking the Steenbecks.

transfer and studio kit. It's all sold as seen. We don't provide any warranties. Some of the equipment can be quite old, especially tube tv cameras. The previous Central sale offered ten Hitachi SK11OA cameras that went for £150 each, mostly to individuals who I guess wanted them to play with. That type of camera is of no use in production. In fact I heard recently that some of those cameras are now used in a London pub as bar stools!"

Down at Acton, D. S. (Dingle Star) VIDEO FACILITIES can offer videotape recycling. Salesman Martin Joannou, 'We buy used Beta SP, clean it, erase it and evaluate it. The rest of our business involves buying and selling new and used broadcast equipment. Big broadcasters or other dealers will offer us packages or we'll go to sales. We give a warranty on all our stuff, in fact we can't sell it without guarantees.

Prior to working for D.S. Video Facilities, Martin Joannou worked at the BBC's Redundant Plant. He knows the business. Martin$_1$ "We have in our warehouse currently everything that we're advertising. Some firms don't do this and will only buy to order. This we do also. If, for example a customer wants a Vinten Osprey pedestal, I'll first ring Vintens, or check with our competitors, or even ring my broadcaster contacts to see what they've got. Lately we've had a lot of enquiries from African broadcasters. For example they will ask for a Beta SP system but only want to pay about £500. In fact it turns out that all they really need is a low-band outfit, mainly because all the local village stations are low band anyway. Someone had sold them on the idea that the digital revolution is here, but it's not. At least not for them".

Martin Joannou has to know his way around the regulations concerning the export of goods. Martin, "For export our usual system is that once the goods have been paid for and packed, if the customer is going to take the goods through customs as personal luggage we insist they complete two C.A.88 Customs forms. This form proves the goods are leaving the country legally and are VAT exempt. The only problem is that we have to spend time and send someone down to the departure point to retrieve the second copy once it has been stamped by Customs. You can imagine the problems we can have without these little forms.

The second hand market continues to thrive. If you're looking for a tie-clip microphone, a non-linear distortion analyser, a Barco monitor or a mobile recording studio (ex-Rolling Stones 1979-one off) then raise your hand, place your bids and pass the cash please.

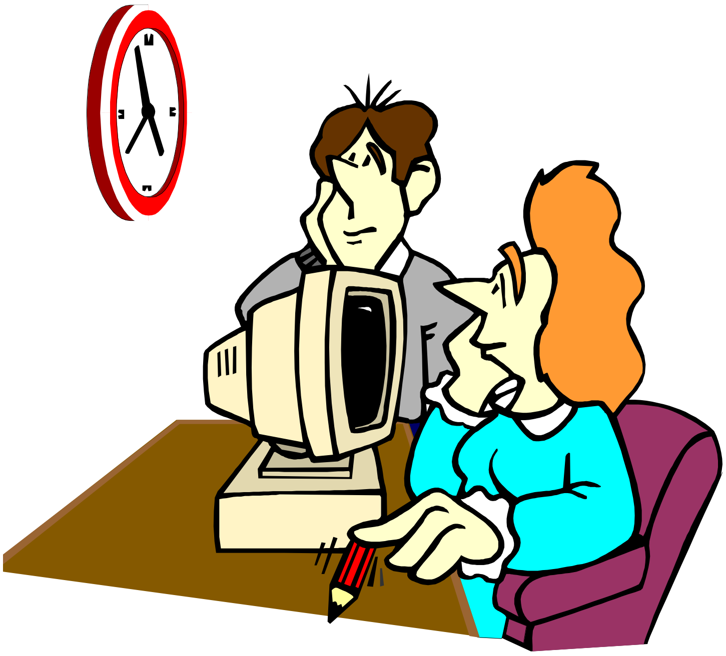
For more information contact:-
ELSTON SUTTON & CO. 0151 255 0951.
HENRY BUTCHER. Jeff Hill. 0171 405 8411
D..S. VIDEO FACILITIES. Martin Joannou. 0181 965 8060

TV on the Air

By Graham Hankins G8EMX.

It's been some while since TVOA has mentioned the New Zealand scene, so I had better open with some recent E-mails from Michael Sheffield ZL1ABS. Mike tells me: "The ZL1BQ ATV repeater in Auckland (operated by the Auckland VHF Group Inc. branch no66 of N.Z.A.R.T.) has had a facelift for the 1998 Spring season (Southern hemisphere) in New Zealand. The main callsign, information & test card video generator has been expanded to produce 32 pages (was 16). It is the design from the B.A.T.C.s' "ATV Compendium" book by Trevor Brown G8CJS, using the teletext chipset SAA5020 & SAA5050. All the old pages have been refreshed with new formatting & updated texts. A host of new pages were designed by Grant ZL1WTT & Ian ZL1VFO (with a little technical support on programming the Teletext EPROM formats from Michael ZL1ABS) using graphical images & flashing text headings. Quentin ZL1QF modified the microprocessor software & hardware in the repeater controller to handle the automatic page cycling of a larger EPROM. Almost all facets of Amateur Radio, as well as ATV, get a "page" explaining their particular mode. Since the repeater beacons these pages 24 hours a day, apart from when an ATV QSO is in progress, there is a good opportunity to recruit viewers to the hobby".

The New Zealand ATV repeater output frequency allocation (614 to 622 MHz) affords easy reception on any TV or VCR equipped with a UHF tuner and UHF aerial. Whilst the major broadcasters in New Zealand use VHF low band (45 to 68 MHz) and VHF high band (170 to 220 MHz) there is a pay TV network and low power regional community stations on UHF band (550 to 800 MHz). Many people have installed UHF aerials to receive these commercial transmissions with the resulting bonus of reception of the Amateur station ZL1BQ. The repeaters' site is nearby Auckland's main TV transmitting tower called "Waiatarua". Those in the "trade" report using ZL1BQ as a good "weak" signal for testing as its transmitter is 20dB less powerful than the weakest commercial UHF TV transmitter.



When they can get ZL1BQ well the others should be P5+.

The UK summer and autumn season lived up to usual expectations, I think October became the windiest and wettest on record. So ideal conditions, really, in which the Beacons Repeater Group decided to raise the height of the Alford-Slot antenna for their 24cm ATV repeater.

With a near-gale already blowing, and rain likely, Alan Kendal G6WJJ and Graham Hankins G8EMX carried two, 3 metre triangular mast sections, a 6 metre length of pole, and a telescopic mast just in case, up to the site for the proposed repeater. The first 3-metre mast was quickly bolted to a concrete base, then secured to the adjacent radio hut. The tricky bit would be to lift the second 3-metre mast onto the top of the first.]

Who dares, wins (sometimes). Would we win? Well, Alan was going to do the lifting and bolting, Graham would add stability and positive comments from the top of a scaffold tower! With dark clouds now racing across the heavens, the second mast was heaved on end, lifted vertically with shouts of "nearly there, now slide the BOLT!". The deed was done, the long pole sections added and the Alford-Slot raised triumphantly aloft. Was it too high for the conditions...we had no means to 'guy' it at the time. Well, it was still up there some weeks later, so maybe ok! I have particularly taken pictures of the present set-up, so please find some space, Ian!

A short TVOA this time. I would really like to hear of, and publish here, times and periods of simplex activity ie ATV 'nets' and any 70cm ATV activity,

Invite to the Microwave Round Table, BT Research Labs, near Ipswich.

I was invited by E-mail to give an ATV talk as part of the Lecture Stream at the Microwave Round Table meeting, which meant a 5.30AM start from Birmingham on a Sunday morning!

I was timetabled as 'first on' so delivered my usual overhead slides and 35mm projections to a satisfactorily large audience. The chairman kept the programme strictly to time, so an hour flashed by. I always begin with 70cm, then 24cm, and repeaters. Unfortunately there was no space for my video of repeater test cards, but I was at least able to put ATV on the agenda.

On the ground floor, traders were selling microwave 'bits' and a 'microwave clinic' was handling a veritable queue of amateurs wanting their transmitters and receivers testing. One pair had brought along a home-brew dual Alford-Slot, which they had meticulously machined from reliable, published dimensions. What would its performance be like? Unfortunately, they E-mailed me a few days later, that their home-brew slot had been a failure, but that they would be going 'back to the drawing board'. Better luck next time, gents!

12GHz Prescaler

By David Wrigley, G6GXK

Background and design aspects

This unit is a practical way of extending the range of a 1.5GHz frequency counter It uses the Fujitsu FMM110VJ chip to divide the input frequency down by a factor of eight. Working over the frequency range of approximately 1 to 12 GHz, it was built to fit directly onto the input socket of an inexpensive frequency counter, successfully extending its range up to 12GHz.

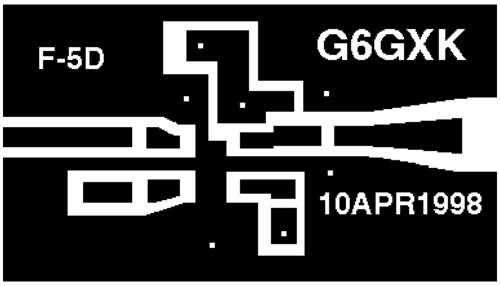


Fig 2, PCB artwork

The circuit (fig.1) follows that shown in the Fujitsu data sheet for test purposes and a decision made at the outset was that no exotic components would be used if they could be avoided. All the other components were in fact SMD's salvaged from old LNB's or other microwave boards. They were all examined for good solder connections and checked for value prior to fitting. New SMD's can be obtained from Maplin in 25-off minimum quantities. The circuit is laid out on a tiny PCB using ordinary glass fibre insulated double sided copper clad board about 1.5 mm thick. The PCB layout is shown in figure 2 at four times full size (actual length 30mm). The back plane is almost all copper with only clearances being required for the 5volt link and connection – these can be cleared with a drill – the backplane doesn't need to be etched. It was decided to put in four link pins using short lengths of wire to bond the earthy parts of the component side to the backplane as in good microwave practice.

The overall assembly can be seen in figure 3 and is governed mainly by the size of the BNC connector to the frequency counter. The box was formed from 0.5mm tinplate.

The LM78M05CV regulator had to be used because the high current taken by the prescaler chip couldn't be supplied from the frequency counter's internal regulator. It should be noted that the Fujitsu chip gets fairly hot when in use – it is dissipating around 0.65 Watts in that tiny case. For this reason and in order to obtain good grounding it is wise to ensure that it is soldered down to the PCB and that both sides of the PCB are soldered to the tinplate box. The regulator chip will also get hot, especially if it is fed from 10 volts or more, so it is best to mount it on the tinplate box. The prototype had its regulator bolted to a piece of tinplate soldered across the back of the box.

Construction

The PCB is small and simple enough to be cut with a modellers knife if an etching facility is not to hand. There should be nothing very critical about the tracks provided the basic layout is followed. Drilling the PCB was accomplished by hand using a 0.8mm PCB drill (ex-radio rally) mounted in the chuck of a pin vice. With a sharp drill this is a speedy process.

The author's eyesight is not as good as it used to be and he has found it necessary to use a headband mounted binocular magnifier to carry out fine work such as this. These are useful devices and are strongly recommended.

Since starting to construct microwave units the author has made himself a low electrostatic field assembly area which consists of a sheet of 0.5mm tinplate over the working surface, with wires soldered to it, to the earthing point of a low voltage temperature controlled soldering iron and to a wrist strap. This was used to assemble the unit and has been used successfully in the past to assemble discrete GaAs FET devices. Of course, modern IC's are tremendously robust but it isn't wise to take unnecessary risks.

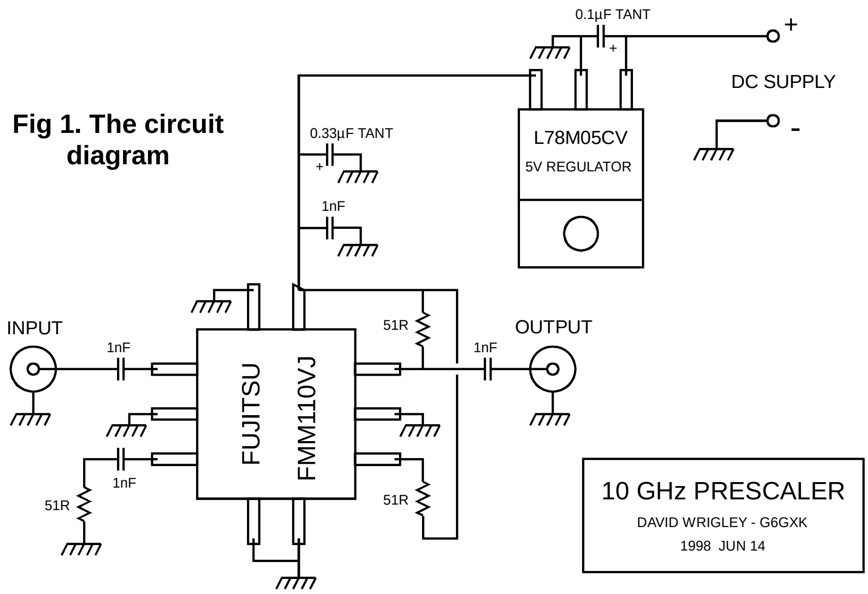
Mounting the Fujitsu Integrated Circuit

The first component to be mounted onto the PCB was the IC package. It should be noted that the Fujitsu IC package is very small and the connections are very close to adjacent connections and also to the case, which is ground. It is very easy to bridge these connections with solder, or by poor alignment to the wrong part of the PCB, either of which would of course prevent the chip from working. The important points are:-

Mount the PCB in a small vice or other holding device to keep it steady.

Try the IC in place and make sure that the IC connections, which go under the IC package, are clear of other tracks.

Fig 1. The circuit diagram



Tin both the underside of the IC package and the PCB area and connections leaving the minimum of solder on the PCB. Use solder wick to remove any excess.

Use a clean finely pointed temperature controlled soldering iron with the minimum of solder on the tip.

Hold the IC in place with tweezers, carefully aligning all the pins and gently dab one of the ground pins to attach it to the pcb at it's tip, you will find the top left one is the most convenient in the long run. This will locate the IC and minimise misalignment whilst giving sufficient flexibility to enable the underside of its body to be soldered down.

Hold the iron close to the chip touching the PCB and the two ground pins which are together at the bottom of the IC so that the heat will melt the solder under the chip. Press it down with tweezers when the solder is melted and hold for a few seconds until set. It is important that the IC doesn't move out of alignment during this part.

The pin connections can now be completed using very fine cored solder wire and with the iron away from the IC to avoid bridging. Use solder wick to clear away excess solder if things go wrong

After successfully mounting the Fujitsu IC, the rest of the components can be mounted, along with the wire links. The PCB is then soldered into the tinplate box, constructed in the same style as TV tuner unit, with lids either side. (For source of tinplate see ref. 3)

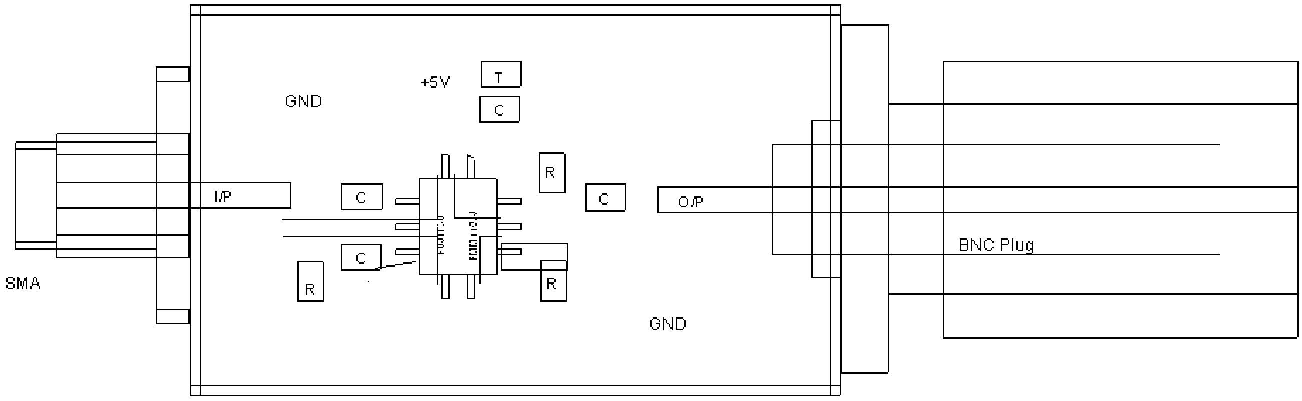


Fig 3, Assembly drawing

Completing the assembly

The DC supply is fed through a 1nF feed-through capacitor soldered into the tinplate wall alongside this the return lead is soldered to a bent up 6BA solder tag soldered to the tinplate wall. At the back of the PCB the regulator was bolted with cut down leads (4mm) to a piece of tinplate which was soldered across the box so that the leads of the regulator were close to the feed-through cap. and the 5volt connection to the PCB. It is important to fit the 0.1uF capacitor across the input to the Regulator – otherwise it may oscillate. It was soldered directly across the regulator leads. The output of the regulator goes to the 5volt input and this is then linked across the back of the PCB to the other 5volt point. A view of the completed unit with its lid off is shown in Figure 4.

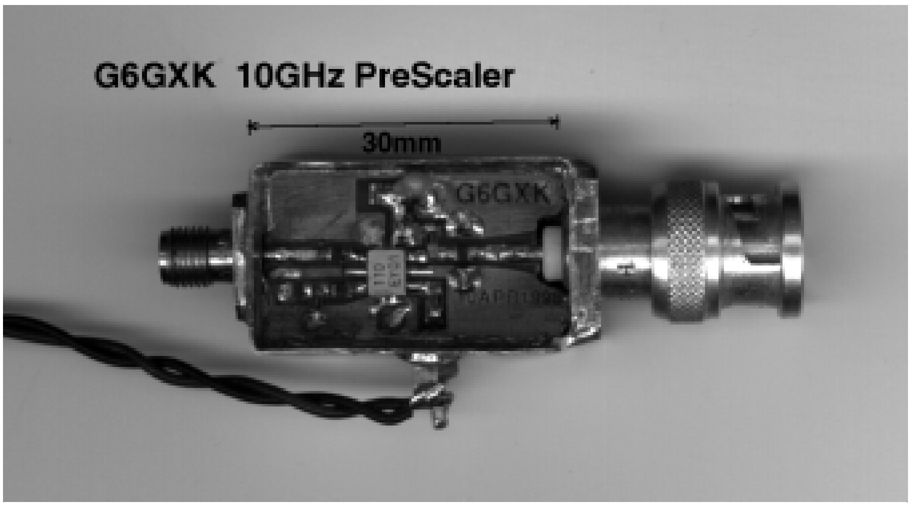


Fig 4, A view with the lid off

Testing

The unit is very easy to test. Firstly spend some time checking visually the soldered connections. Apply power and check current consumption (about 130 mA). With no input there will be a high level of output at about 870 MHz. This is because the chip oscillates when not driven and this is normal - just remember that if you think that you are seeing 6GHz or so - it may be because the output has fallen to too low a level to trigger the prescaler. Find a source of RF at a level of about 1mW and frequency of 800MHz or more. Apply this to the input and check the counter. It should work without any problem, giving a reading of one eighth of the input frequency. It should also be checked using a 10GHz source such as a Gunn diode. For measurements like this, one useful technique is to feed the prescaler from an SMA to waveguide transition and a small diecast horn. This can then be pointed at the end of a waveguide or at a horn feed and adjusted until a good steady reading is obtained.

Conclusions

Overall a very satisfying project, which continues to prove its worth on a daily basis.

Two prototypes have been built so far with a third one in process. No problems have been experienced in their construction or operation.

There are some limitations and possible improvements.

1. It needs to remembered that a strong reading of about 870MHz (6900MHz) will most likely be a “no signal” or “low signal” input condition. As the signal falls off the effect is to move fairly quickly to the 870MHz condition but it doesn’t jump there and if measuring frequency by tuning a rapid increase in tuning rate can be noticed. Please don’t think that you have discovered a new way of generating 6.9GHz.

2, You need a calculator to multiply the result by 8, not quite as convenient as a direct reading device. There is no easy solution unless the counter you use has provision for prescaler multiples to be input. Any other solution would either require extensive modification to the counter or a worsened resolution.

3. The power-input limitations could be improved by using an input buffer amplifier that could both improve sensitivity and provide some limiting against higher powers. Perhaps two opposing diodes across the input would provide some protection against possible overload as available power levels increase.

Future developments using this prescaler will be a 10GHz PLL using possibly a Gunn or DRO as the 10GHz source that will be locked against a 10MHz or so Xtal oscillator.

Ref .1, A 12GHZ Prescaler 1:8.by Angel Vilaseca, HB9SLV and Serge Riviere, F1JSR, DUBUS TECHNIK IV 1995.

Ref. 2, Fujitsu Microelectronics Ltd, Compound Semiconductor Division, Network House, Norreys Drive, Maidenhead, Berkshire, SL6 4FJ. Tel 01628 504800, Fax: 01628 504888.

Ref. 3, Source of 0.5mm tinplate sheets approx. 860mm by 800mm about £5.00 each (as at June 98): Lancaster & Winter Ltd, Steel Stockholders, Bradford, West Yorkshire, BD8 9AE, Tel: 01274 498454.

Experimenting with Video - part 2

This article first appeared in ETI magazine, Volume 26 No. 2, March 1997.

In this article, Robin Abbott presents the first half of the video mixer/fader to accompany last issues sync separator.

This issue we will look at a project based on the CQ-TV 180 video sync separator article. This is a video mixer and fader. The specifications for this project are as follows:

It offers 12 different slide wipe and fade patterns, with considerable scope for other patterns to be generated by further development of the control program. Selection of pattern and fade control by four-button keypad and dual seven-segment display.

Automatic fade/wipe by push button control. Control of fade/wipe speed from less than 1 second to around 20 seconds.

All effects controllable by a PC on a standard serial port, allowing programmed fade/wipe effects.

Uses a PIC microcontroller to reduce costs.

This project is interesting, not only in its own right, but also for the insight it can offer into the use of real-time computer-controlled systems, particularly those for video control. All the software in the project is available in source code commented form to assist those who wish to understand its operation, or for further development.

Operation of the mixer

The standard mixer offers 12 fade/wipe patterns. These are illustrated in figure 1. The black area on the figure shows the direction that the wipe will take. For example, fade pattern 4 wipes a black area from the right of the screen towards the left; if there is an input on channel B then channel A will wipe to channel B from right to left. If there is no input on channel B then the screen will wipe to black from right to left.

The mixer/wiper has four pushbutton controls and a rotary speed selection control. The four pushbuttons are: pattern up, pattern down, start fade, and start unfade. To select a pattern the pattern up and pattern down buttons select the pattern number which is displayed on the two-digit display.

Once the required pattern is shown, then the start fade button will put the screen to full brightness and then will start the fade. Similarly, the start unfade button will black the screen and then return it to full brightness using the selected fade/wipe pattern.

During a fade or unfade the pattern up and down buttons may be used to stop the current action, which can be used, for instance, to set black bars at the top and bottom of the screen to give a letter box wide screen effect. Another possibility is to set a black horizontal border at the extreme top edge of the screen to disable copy protection on commercial videos (for legal uses only).

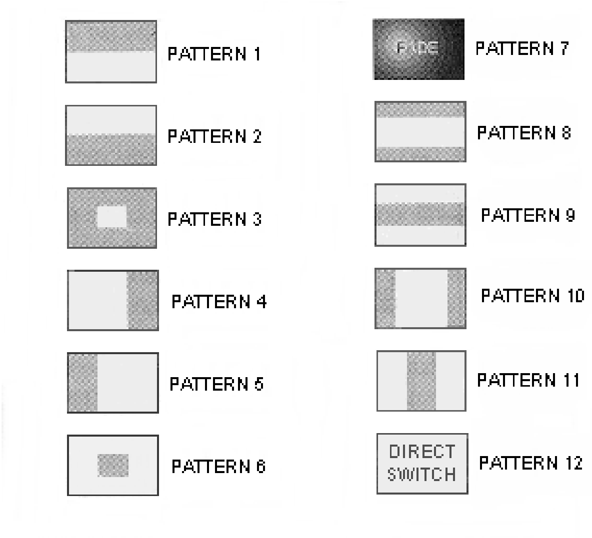


Figure 1: fade and wipe patterns

The decimal points on the displays are also used, as shown in figure 2.

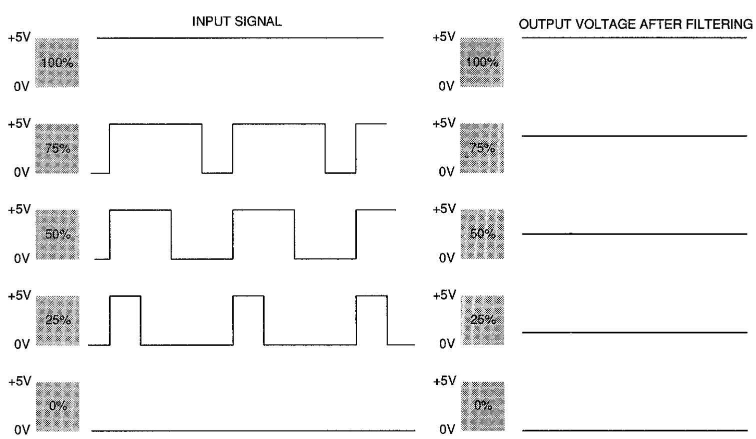
The rotary speed control is used to select the fade speed. The actual speed of the fade depends on the chosen effect. For example, pattern 1 which is a line by line fade will be twice as fast as pattern 8, which fades two bars from each end of the screen at the same time. The reason for this is that it achieves the maximum resolution of fading at any speed (resulting in the smoothest fades), and in practice is also easier to program.

The use of a PC control for the display is shown later in this article.

Circuit and theory

The circuit diagram of the project is shown in figure 3. The heart of the project is the PIC 16C74 microcontroller, described below. This device controls the analogue paths used in the project, handles the display multiplexing, and provides two analogue voltages used for control of fading and side to side sliding. The serial interface is also

Figure 4: pulse wave modulation (PWM) waveforms. The PWM output changes duty cycle from 0 percent to 100 percent in single steps (PIC16C74 allows up to 10 bit resolution in some applications)



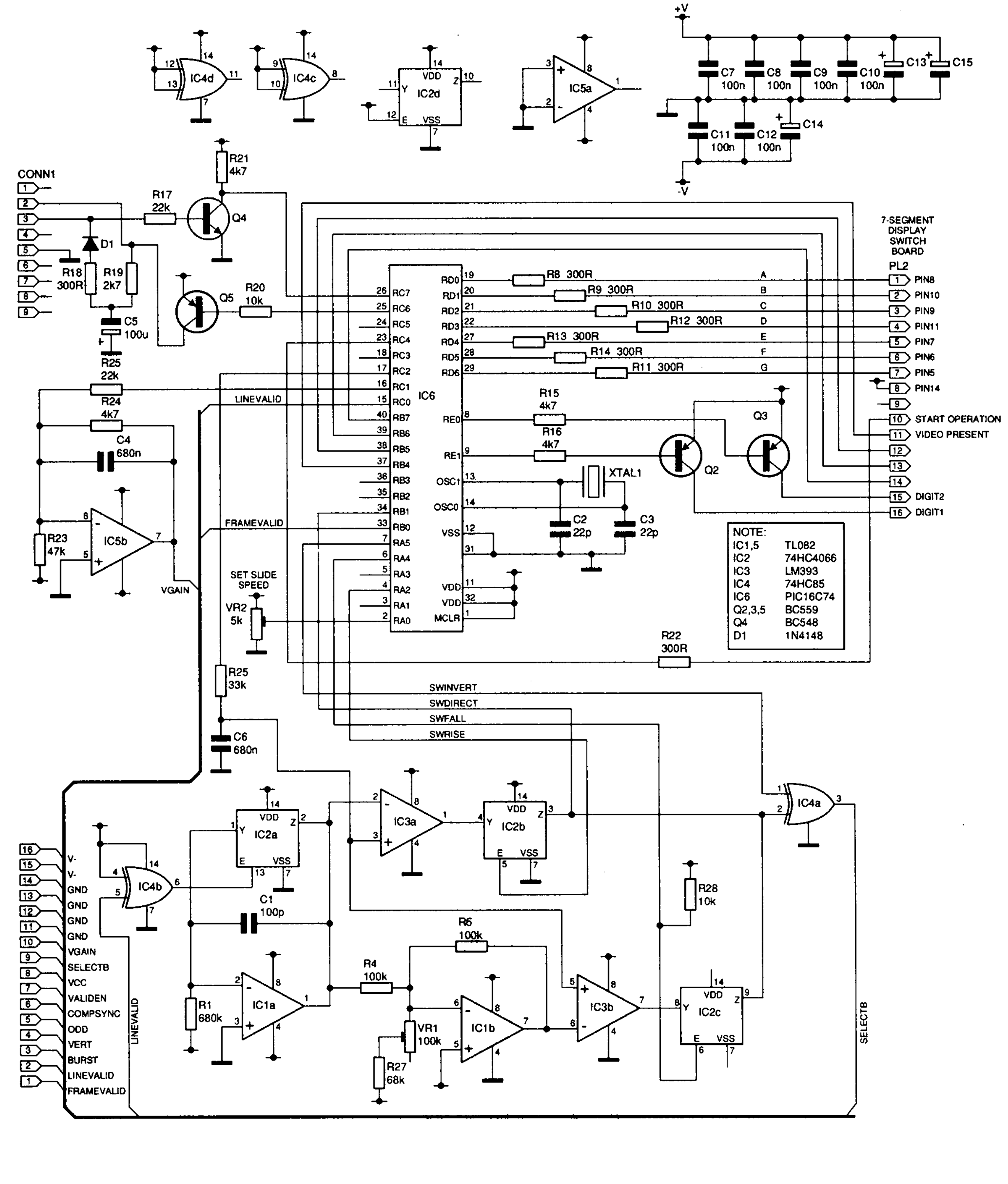


Figure 3: the circuit

handled through the 16C74.

The sync separator board

The sync separator board shown in last month's article forms the switching and fading capability for this project. The frame and line valid signals are used to indicate the position within the line and frame of the video signals to control the switching. The VGAIN input to the board is used to control the fading of the input channels, and the direct select B input SELECTB logic signal is used to switch between signals for the wipe effects.

The direct control of the video signal, accomplished through the SELECTB input on the sync separator board goes low to select input A, or high to select input B. The PIC has two direct controls over the video signal using SELECTB. These are called SWDIRECT and SWINVERT. SWINVERT simply turns on an inverter on SELECTB. The SWDIRECT signal is wire-OR'd with the signals produced by the horizontal effects circuitry, to achieve this the SWDIRECT signal is only ever driven low, or to a high impedance state, this is achieved using the tri-state control port on the PIC.

Vertical wipes

The vertical effects require the video signal to be switched on and off during the frame. For example to produce a black bar along the top of the screen (pattern 1) then the video signal must be turned off at the start of the frame, and then turned on at some point during the frame. For effects with a bar at the top and bottom of the screen, such as pattern 8, then the video signal must be turned off again further down the frame. This effect is handled entirely within the PIC. To look in detail at a particular pattern, we will consider pattern 8 (the letterbox effect).

You may recall that the sync separator project shown in part 1 (CQ-TV 180) provides a line valid signal which goes low during the period of the line sync pulses and colour burst signal. This signal may be used as a line counter during the frame, and is connected to a 16-bit counter (TIMER 1) inside the PIC, the PIC may be set to produce an interrupt when this counter overflows. At the start of the frame, TIMER 1 is set to a negative value, and the video signal is turned off. During the frame TIMER 1 increments once on each incoming video line, eventually it overflows and causes an interrupt. The interrupt handling routine turns the video signal on, and loads another negative value into TIMER 1. When the timer overflows again, the video signal is turned off for the lower black bar. No further action is taken until the next frame.

To cause the bars to slide up and down, the values loaded into TIMER 1 during the frame are changed at the end of each frame. Slower slide effects are created by changing the value in TIMER 1 less often.

Horizontal wipes

The horizontal effects have to be generated much more rapidly as video switching must occur during the 64µs available during a line. Although a software solution may be possible, it would require a fast processor and would occupy a very significant amount of processor time in line timing. For this reason the horizontal effects are generated by analogue based techniques. In part 1, we looked at horizontal wipe effects using a monostable. This would be possible in this project, but the monostable would have to be voltage controlled. In addition to this, the effects with bars at each edge of the screen require two switches operating symmetrically across the line. This is not easy to accomplish with monostables.

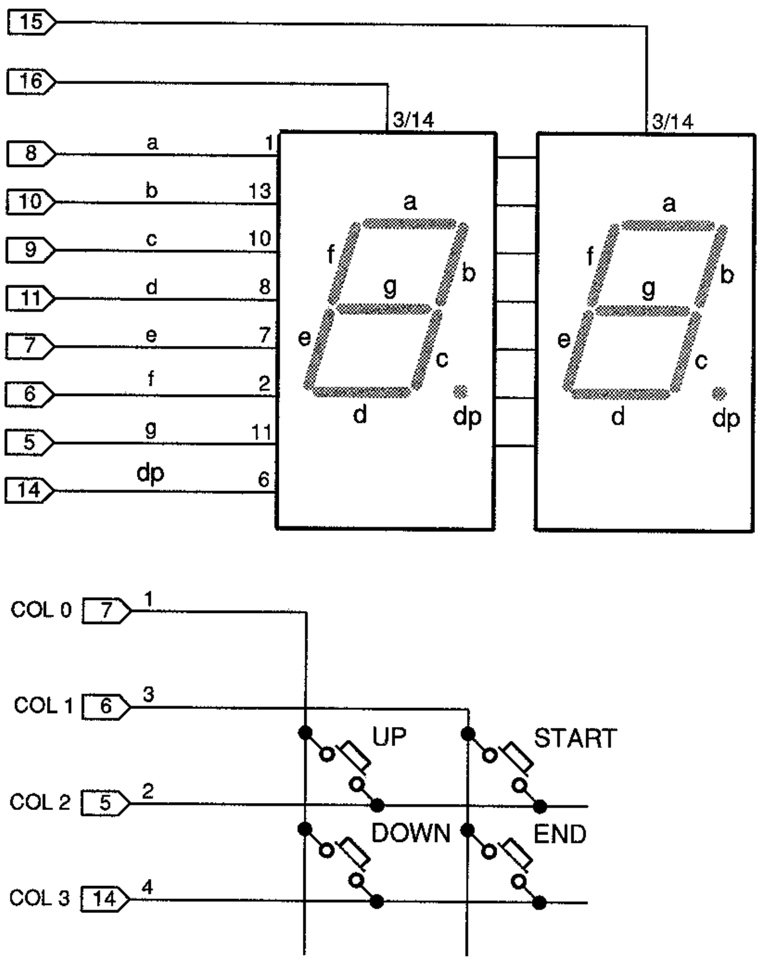


Figure 6: display and keypad

An alternative method was chosen for this project. A triangle wave is generated, which is reset to 0V at the start of the line, and which then rises through the period of the line. This is achieved by using an integrator, which is reset, at the start of each line by using an inverted form of the line valid signal from the sync board. This is used to short out, and reset the integrator capacitor. The components which achieve this are IC1a and IC2a. To obtain a symmetric switching effect, the output of IC1a is fed to an inverter and summer, IC1b which produces an inverted triangle wave. The symmetry of the signal is controlled by variable resistor R6 - the only preset control in the project.

To switch during the line period, two comparators (one for each triangular waveform) are employed. The comparator used is the LM393, which is a dual device with a common collector output. A fixed reference voltage is used by the comparators, which switch the video signal when the triangular waveforms reach the same level as the fixed reference voltage. By changing the reference voltage, the switching point may be controlled, and the wipe effect is generated across the line.

The voltage used on the comparators is generated by the PIC, and uses one of its pulse width modulation outputs. The

DISPLAY 1 DECIMAL POINT	DISPLAY 2 DECIMAL POINT	MEANING
OFF	OFF	NO VIDEO SIGNAL PRESENT
ON	ON	VIDEO SIGNAL PRESENT, NO FADING UNDERWAY
OFF	ON	FADING (OR UNFADING) OPERATION UNDERWAY
ON	OFF	FADING (OR UNFADING) OPERATION PAUSED

Figure 2: use of decimal points on the 7-segment display

use of a PWM signal to generate a variable voltage is shown in figure 4. The PWM output is used in 8-bit mode to give 256 voltage levels across the screen, which provides a smooth wipe effect. The PWM output is smoothed by R25 and C6, which are chosen to filter the 20kHz PWM signal, but to allow the voltage to change in steps at frame intervals.

The outputs of the waveform comparators are wire OR'd with the SWDIRECT signal from the PIC. The outputs of the comparators are enabled when required using analogue switches IC2b and IC2c. These enabling signals are driven directly by the PIC on signals SWFALL and SWRISE. Figure 5 shows the waveforms in the horizontal switching circuit.

Direct frame fade

To fade the entire video frame up or down the VGAIN input on the sync board is used. The second PWM channel on the PIC is used to provide this voltage. Note that it would have been possible to use the same PWM channel for the horizontal wipes but this wood preclude the use of combined horizontal wipes and frame fades simultaneously. The circuitry around IC5b is an active low pass filter, which also scales the PWM voltage which normally varies from 0 to 5V, and converts it to a level suitable for the VGAIN input of the sync board - from -0.5V to +0.5V.

Keypad and display

The keypad and display are as simple as possible to keep the cost as low as possible. A 2-digit 7-segment display is used with a multiplexed drive. The segments are driven directly from port D of the PIC which can drive up to 20mA per bit (although there is a limit of l00mA per port). The digit drive is taken via drive transistors Q2 and Q3.

The 4-button keypad is driven very simply on a 2 by 2 matrix. The PIC selects the columns one at a time, and reads the rows to determine which button is pressed. As port B is used then the built in pull ups on this port are enabled to avoid the need for external pull up resistors. The keypad and display circuit diagram is shown in figure 6.

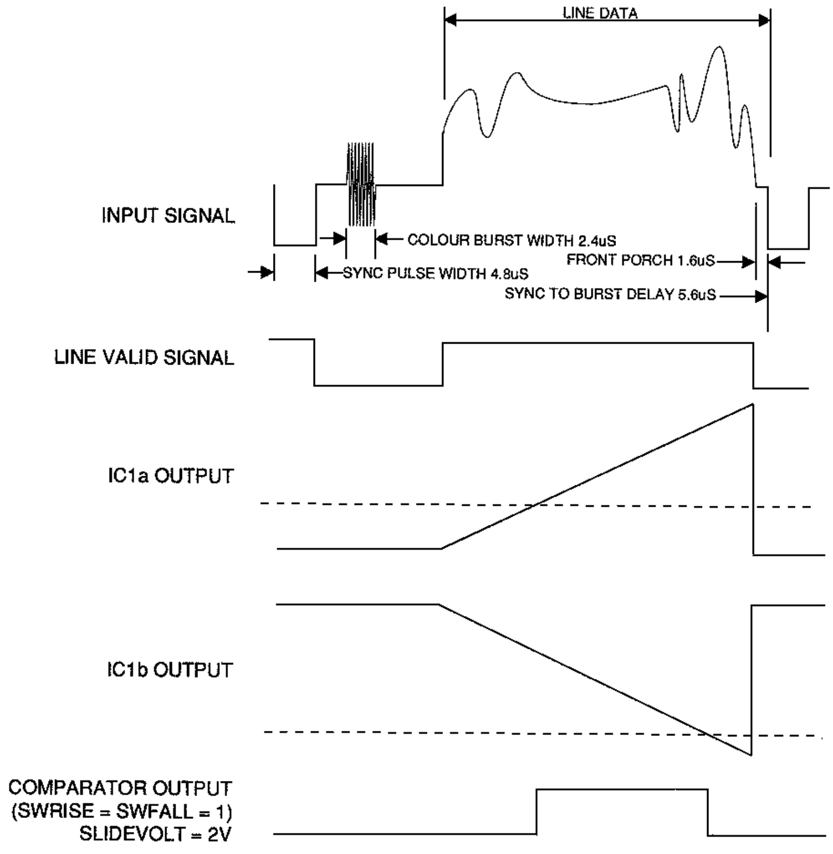


Figure 5: horizontal switching waveforms

Serial interface

The serial interface is a very simple and cheap design. The input is tapped and filtered to provide a negative supply for the output voltage. The performance of this circuit is adequate for any application that does not involve large-scale duplex data transfer.

Other features

The control of the speed of the fade or wipe is through a variable resistor on one of the A to D converter inputs of the PIC. This varies between 0V and 5V with a resolution of 8 bits, although the software divides this by 16 to give 16 independent fade speeds. The fastest speed is virtually instantaneous, the slowest is up to around 20 seconds for the fade.

Software operation

It is instructive to consider the operation of the software for this project, which is a mixture of real time control techniques and background operations. In this section, some familiarity with the architecture of the PIC 16C74 is assumed, however, understanding it is not necessary to successful construction of the overall project.

The software consists of a main schedule loop, which calls subroutines to perform keypad, display, and fading/wiping processing. The actual switching of video signals is performed on interrupts.

The heart of the control operation is the use of the 8-bit and 16-bit timer/counters in the PIC. The 8 bit timer is TIMER 0, and the l6 bit timer is TIMER 1. TIMER 0 is set to count on an internal clock which is the cycle clock (in this design the cycle clock is at 1MHz), divided by 128. Therefore the timer increments once every 125µs, and overflows every 33ms. TIMER 1 is set to count on each line increment as described in the section above on vertical wipes.

The frame valid signal from the sync board is used to cause an interrupt, and this drives the edge triggered interrupt input on bit 0 of Port B. This interrupt is set to trigger on the rising edge of the frame valid signal, and therefore all the processing related to the frame is undertaken at the top of each frame. To guarantee that processing is exactly synchronised to the frame, then the interrupt routine waits for the end of line (using the line valid signal) before performing further processing. This is important to ensure that TIMER 1 is written at the same point in each frame - if not then the vertical wipes will have an unpleasant juddering effect when held stationary.

Interrupt processing is limited to writing the correct value to TIMER 1, switching the video signal on or off, and setting a flag to indicate that a new frame has been processed. After this processing returns to the main loop. The interrupt processor also deals with the serial port using the built in serial hardware of the PIC. The serial port interrupt is only enabled at the top of the frame to avoid any chance of serial interrupts breaking into video switching interrupts.

To enable processing to continue while there is no video signal then the TIMER 0 interrupt is used. If TIMER 0 overflows (when it counts from 255 to 0), it causes an interrupt which is used to set the new frame flag, this will occur every 33ms. However, if a video signal is present then the frame interrupt will always occur within 20ms. This is used to reset TIMER 0, and it will not overflow. Therefore a TIMER 0 interrupt will only ever occur in the absence of a video signal. This is used to set the decimal points on the display as shown in figure 2, and to disable the fader/wiper in the absence of an input signal.

The main loop handles the keypad and display, and calls the routines to deal with the progression of fading and wiping. The display operates on a 4ms multiplexing cycle and is driven from TIMER 0. The multiplexing routine is called every time that there is a change to the top three bits of the timer.

The keypad is read every time that there is a new frame by using the flag set by the interrupt routine. The keypad routines directly call the appropriate action subroutines if a key is pressed.

When a fade or wipe is not under way, the display may be in one of two states, either fully on, or fully off (Channel A selected or Channel B selected). This may be achieved in a number of ways. However to ensure that all fades/wipes start from the same condition the display is set into a known state at the end of any fade/wipe or unfade/wipe. For example, “fully on” has VGAIN set to +5V, SLIDEVOLT set to 0V, SWRISE and SWFALL set to 0 (disabling the outputs of the comparators), SWINVERT set to 1 and SWDIRECT set to high impedance (and therefore pulled high by the PORT B pull-ups on the PIC). Timer 1 interrupts are disabled.

When a fade or unfade starts, a routine is called to set the display into an initial state which is the same as the current state, but is ready to undergo the fade or wipe. For example, in the case of a horizontal fade the SWRISE/SWFALL switches must be set together with the correct state on the SWINVERT signal and the correct voltage on SLIDEVOLT

Through the period of the wipe or fade the voltages on the PWM outputs, or the values pre-loaded into TIMER 1, are changed at the start of the frame, values are changed more rapidly with faster slide speeds.

The fade or wipe routines are called indirectly through a look up table, which enables straightforward addition of further routines for additional patterns.

The PIC 16C74

The PIC 16C74 is the largest device of the 14 bit series of PIC controllers. It contains 4k of EPROM, and is housed in a 40-pin package, which allows three 8-bit ports and additional 5-bit and 3-bit ports. The microcontroller has 192 bytes of ram available for use by application programs. The microcontroller holds a large number of peripheral devices detailed below. Despite the size and versatility of the device it is reasonably cheap, and is a very cost effective embedded control solution.

The device contains an asynchronous serial interface and baud rate generator. The serial interface is interrupt driven. Unlike a software implementation the asynchronous interface operates during program running, and caches up to three received bytes before they may be read by an interrupt service routine (ISR). The transmitting routine holds a byte currently in transmission together with a cache register which holds the next byte to be transmitted, this allows continuous transmission at the current baud rate without interruption for the ISR to write the next byte.

The 16C74 has three timers and a capture compare register. The first timer is an 8-bit timer, which causes an interrupt on overflow. In this project the timer is used for display multiplexing and provides a replacement for the frame interrupt in the absence of a video signal. The second 16-bit timer (TIMER 1) is used to count lines within the frame, and provides 16-bit resolution. The third timer is 8-bit, and has a preset register, which may used for providing any output frequency in the timer range, which is used for the PWM outputs. The capture/compare register is used for capturing the time of events.

In common with all the devices in the 16C7X range the 16C74 contains an A/D converter. This is switched by an 8-way multiplexer to up to 8-analogue input ports, the reference voltage is selectable internally, or again from an external source. The A/D converter contains an internal sample/hold circuit and has a maximum conversion frequency of 50kHz for 8-bit resolution.

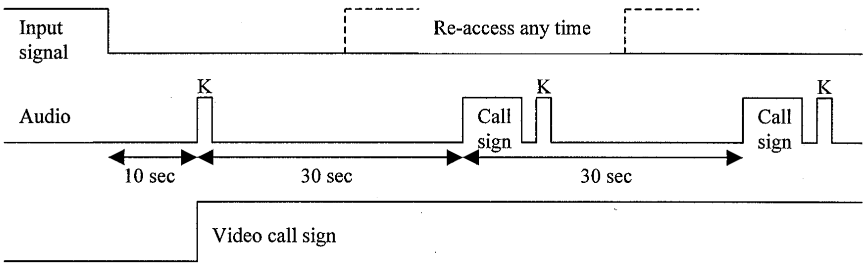
The 16C74 runs the standard PIC assembly language, and can be programmed serially both out of circuit and in-circuit by most PIC programmers.

In the next article, which completes the fader/mixer, ~ will look in further detail at the setting of the various signals in the circuit to achieve each of the fade and wipe patterns. We will also look at changes required to provide additional patterns, and the detailed electronic and mechanical construction of the project. We will also look at providing PC control of the mixer for programmed effects.

Simple TV Repeater Ident and Controller

By Alan Kendal, G6WJJ

A simple controller was required for the Sedgley 3cms repeater GB3BG, so being a big fan of PIC controllers I set about modifying the Picdream software.



Simple Repeater Controller

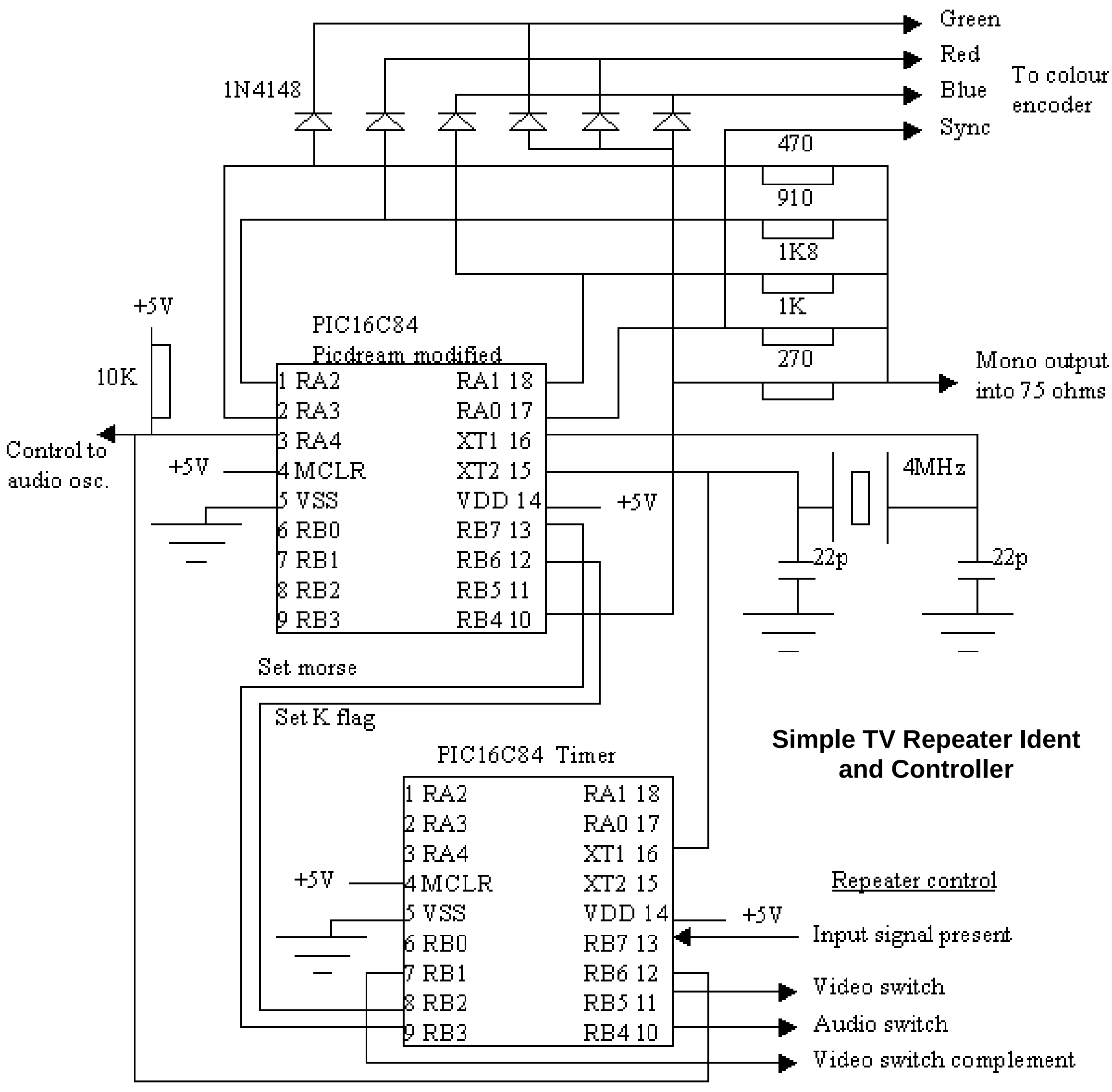
The Picdream article featured in a previous CQ-TV gives scrolling text on the top third of the screen, a greyscale pattern across the middle and a digital clock display at the bottom. The clock display is easily modified to give a fixed call sign, as used by a number of the Beacons Repeater Group members. The greyscale code was shortened to free up some of the program memory and an audio morse routine written that runs during one of the black lines of the original Picdream programme.

Two look up tables were included to store the coding for the call sign and the 'K'. The timing is derived from the fact that the Morse routine is repetitively accessed fifty times per second. The processor is too busy to be able to generate the audio tone so an external oscillator is keyed to generate the morse.

Although the repeater timing routines could have run in place of other black lines, a lack of program memory dictated that a second PIC16C84 was used for repeater timing. This second processor could be programmed to generate the Morse audio but lack of development time has prevented this so far.

The control line to the audio oscillator is an open drain output and is high to enable the oscillator. The monochrome output, if used, needs to be terminated in 75 ohms to achieve correct levels. The input signal present on the timer PIC needs a high level to indicate signal present, opposite to that available from an NE565 phase lock chip.

The simple controller thus consists of only two PIC chips and an audio oscillator. To generate colour bars instead of a greyscale pattern only requires the addition of a colour encoder chip. The software listings are available on the BATC website or from me, telephone 01384 894512 weekdays 7-9pm only please.

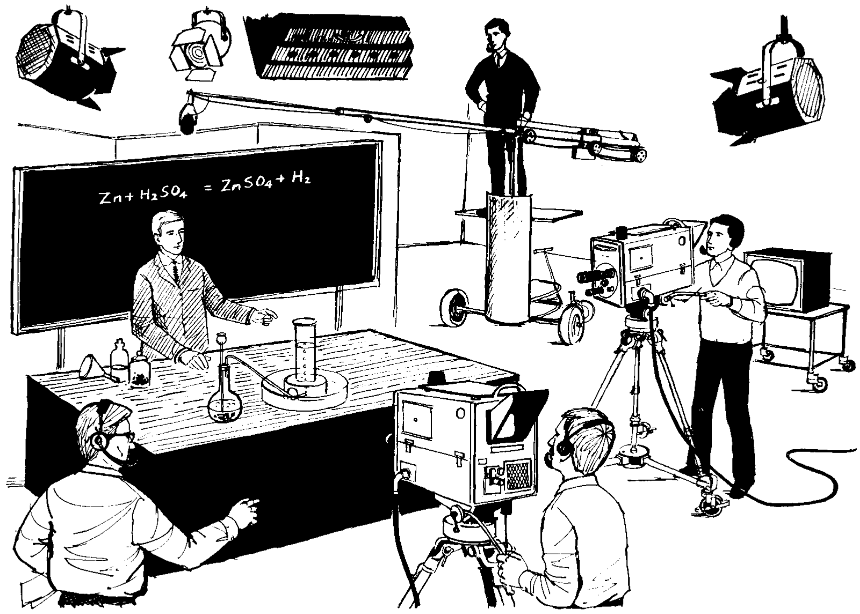


Simple TV Repeater Ident and Controller

Recreating the Cambridge Studio

By Andy Emmerson G8PTH

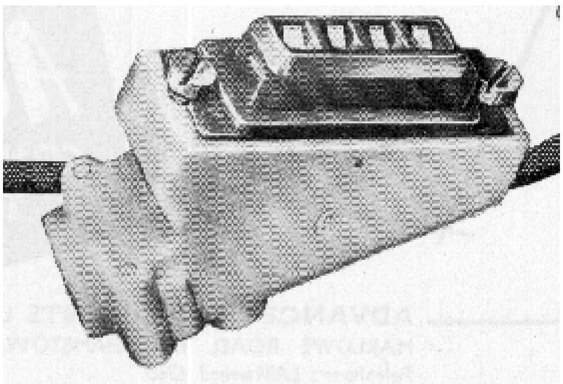
Equipping a television studio is no big deal if you have the budget; it's just a matter of placing orders and writing cheques. The task takes on another dimension when you decide that the studio you're building is to use forty-year old equipment, all from the same manufacturer and period.



Classroom scene with the Cambridge Studio equipment in action

That, however, is the challenge I have set myself over the past ten years or so; it's also the reason for the sometimes cryptic small ads I have placed in *CQ-TV*. Now, with the project coming much closer to fruition, I thought an explanation and description might be of interest. There are some people who see little value in harping on about old television cameras in this magazine; my only excuse is that these cameras are rather different from the usual image orthicon types described and more than just cameras are involved.

My project is in fact re-creating the Pye Cambridge Studio, designed around 1960—by BATC member Ian Waters G3KKD as it happens—as a low-cost 'packaged' television station for educational use and developing nations. To contain costs to the minimum, vidicon cameras (called 'staticon' cameras by Pye) were substituted for image orthicon jobs, whilst other facilities were fairly simple and basic. Back in 1962, £17,000 would buy you the complete station, with four cameras, two 16mm telecines, 100 watt transmitter, mast, aerial and everything else.

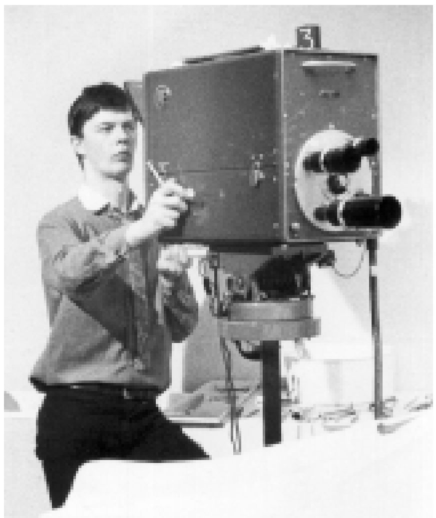


Connector made for Pye by Power Controls

I can't say I have spent that much on my own Cambridge Station, although the hours spent hunting down and restoring the equipment feels like it. Nearly all items have been acquired at BATC swap meets or though fellow enthusiasts. It started with one camera, then a second and an array of 8.5" picture monitors. The sound and vision mixers followed later and more recently I acquired the 14" station monitor. Most recently I have been very fortunate in finding the Master Control panel and talkback console.

None of these items was complete or in working order, although most are now approaching that state. Some had to be re-sprayed in the proper colours, others needed new parts made. Only one camera control unit has turned up so a solid-state replica is being made. Even finding the right Dallmeyer fixed-focus lenses was a quest in itself but was finally sorted out earlier this year. Finding spare valves has never been a problem but if any more line output transformers die (the weakest point of Pye equipment) there will be problems!

It's remarkable how self-sufficient the Pye group of companies was; within their ranks were Cathodeon (making camera tubes and crystals), Newmarket Transistors (semiconductors), Labgear (amplifiers), Magnetic Devices (relays) and Power Controls (multiway connectors). Many of these parts feature in the Cambridge Studio, whilst other items were left to the customer to buy in (such as studio lighting and microphones—Reslo ribbon types were commonly used).



Pye Mk4 camera

I think Pye would have claimed the Cambridge Studio was reasonably successful; there were some showpiece educational installations in Glasgow and London, whilst a few systems were shipped out to Commonwealth countries as well. Subsequently a solid-state educational camera was developed around the Pye Lynx; this was called the Tele-Tutor. The heart of the camera used in the Cambridge Station was an all-valve Mk 4 industrial camera; this normally had a barrel-shaped case but this was concealed inside the 'studio' style case that also housed a standard 8.5" picture monitor used as a viewfinder. This also illustrates the modularity of the concept; if a viewfinder failed, you could rob a picture monitor from stores or from the control room!

In appearance the cameras are essentially scaled-down versions of normal studio cameras, complete with focus handle and four-lens turret (see drawing). In fact ABC and Thames Television also used these models for cameraman training at Teddington. I have two in the collection but I'd willingly augment this number; that said, they don't turn up very often. I am also missing the 'transcription unit', Pye's rather grand name for a grams deck console, and the telecine equipment using a Philips EL5001/88 projector. Also needed are two female four-way connectors (see photo) and larger plugs and sockets of the same design. If you can help with any of these, I'd be very pleased to hear from you. Finally, for those who may be interested, I hope to bring part of this equipment to the BATC's 50th anniversary display this summer.

A tribute to Barry Keedy, G6LIC

Barry died suddenly in June 1998. He was to many, a constant friend and enthusiast for whom nothing was too much trouble. He combined his technical communication skills with the comfort of his personality. Even the most serious subject became punctuated with the laughter that filled his life. We are all the poorer for his passing.

I met Barry on 70cms in the early 80's. Over the years we met infrequently but spent hundreds of hours working simplex, duplex and 'multiplex' on bands through to 3cms. For everyone, Barry was always the Pal ready to answer the CQ or pop up P5 on any band. He would range wide to test from a new mobile site or drop in some vital component for a comrade.

The Yorkshire net knows that Barry was pivotal in our most enjoyable nights on the air. His quick wit and spontaneous laughter are irreplaceable. Tony G1EFF describes our loss exactly when he said "Our shacks are empty Pete!"

Not many people appreciate the extent of his work in developing and keeping the GB3ET repeater. From the start he toiled to make this a possibility, in construction, organisation and fund raising opening the door to many on 24cms. He always spoke of results, not his own dedication applied to make things happen.

Barry over filled the church at his passing. Condolences were passed to his family from a large group of hams, too numerous to mention and bewildered by sudden loss.

It is not possible to think of Barry without a smile to meet memories of the man who laughed so readily. We almost heard him chuckle as the priest misread his call sign from the pulpit.

Barry Keedy G6LIC spoke little of his achievements but they do speak for him. Not in material terms, but in his humanity and personality. This is everlasting in the minds of all that knew him.

Peter G4RNA and ATV pals.

Tuneable TX for 23 and 13cm

By Rob Krijgsman, PE1CHY

To build a good FM-tuneable transmitter for 23 or 13cm is in theory not very difficult. A number of circuits have been published in amateur magazines. Practice, however, is a different story. Often, the most difficult part is the oscillator (VCO) which usually has a vague three-dimensional structure and needs a lot of patience and the right measurement facilities to be made to work. Another source of trouble is the PLL that is occasionally used (does not want to lock, spurious products, etc.).

Commercial VCOs

The heart of this tuneable transmitter, the VCO, is an off-the-shelf module from Z-Communications. This company supplies VCOs for a wide variety of applications and frequency bands. By choosing the right type of VCO, a transmitter can be built for 23cm (VCO 800 - 1600MHz), that can also be used as a tuneable transmitter for 3cm, by mixing, or for 13cm (VCO 2000 - 2500MHz), that can be used as well via multiplying to 3cm.

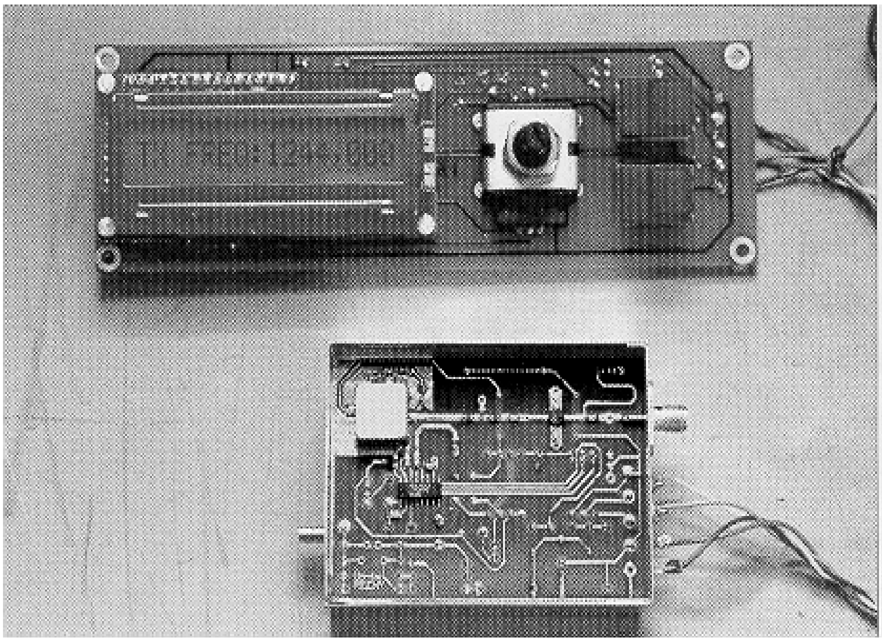


Fig. 1. The completed transmitter shown fitted with a VCO/PLL for 23cm

The circuit diagram

The VCO U1 works on a 12Volt supply and the tuning voltage is between 0 and 20Volts. The output is an RF signal of about +7dBm. The VCO output signal first passes through a T-attenuator comprising of R15 - 17. The attenuation has to be chosen in accordance with the desired output power. With the MMIC IC1, the output power can subsequently be increased to 10 - 50 mW. Tuning is accomplished via a Philips I^{2}C device, type TSA5055 (or SP5055). This IC includes a complete PLL-synthesiser, including a prescaler up to 2.6GHz. With a directional coupler a very small part of the output power of the signal (around -10dBm) drives the sensitive prescaler input of the synthesiser. The crystal X1 controls the reference signal. With the crystal for 4 MHz used here, a minimum step size of 125kHz is possible though, for practical reasons, the control software cannot go below 250kHz. R3/C1 and C2 form the PLL loop filter.

The video signal (including sound sub-carrier if present) is superimposed via the pre-emphasis filter on the tuning voltage and in this way produces the desired FM-modulation. C22 compensates for the attenuation of the higher frequencies due to the input capacity of the VCO. The frequency modulation characteristic for video is linear up to about 5MHz. The commercially produced VCO, free of phase noise is much better than the ‘floating’ BFR91 type of construction often used by amateurs. The ready made VCO-module is built in SMD technology and so the complete VCO/PLL unit can be kept very compact.

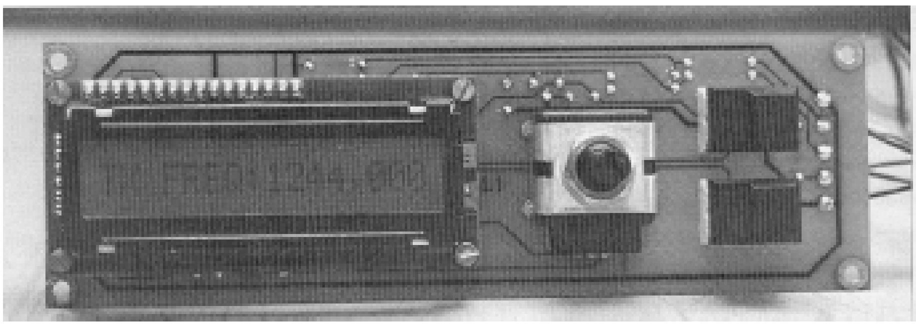


Fig. 13 Photograph of the completed control unit

Pre-emphasis

The transmitter uses a standard CCIR-405 video pre-emphasis, so that a video source can be connected directly. To transmit sound along with the signal, a baseband circuit is necessary with the sound oscillator(s). Check there is no pre-emphasis in the baseband. If this is not the case, and it is difficult to disconnect, then the pre-emphasis in the transmitter can be removed by leaving C3, C4, R7 and L1 out of the circuit.

Control unit

Setting the division factor of the synthesiser, and hence the generated frequency, is done via the I^{2}C bus. The control unit (with the dial, LCD display and microcontroller PIC16C84) is located on a separate PCB that is connected to the transmitter section with only a few leads. With the included software, tuning in steps of 250kHz is possible.

Use of the control unit

The microcontroller software has the following features:

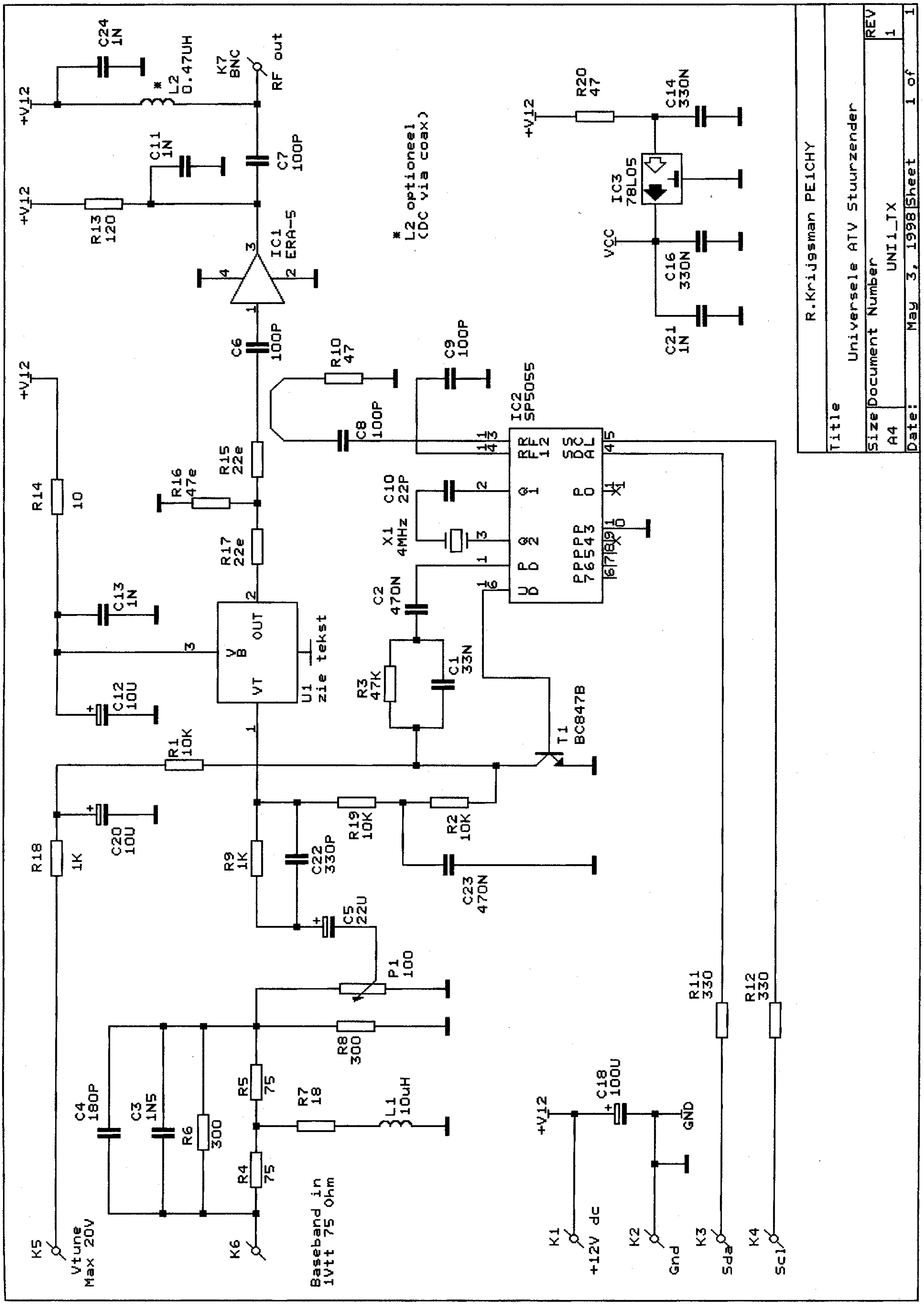


Fig. 2 The circuit diagram for the VCO/PLL unit

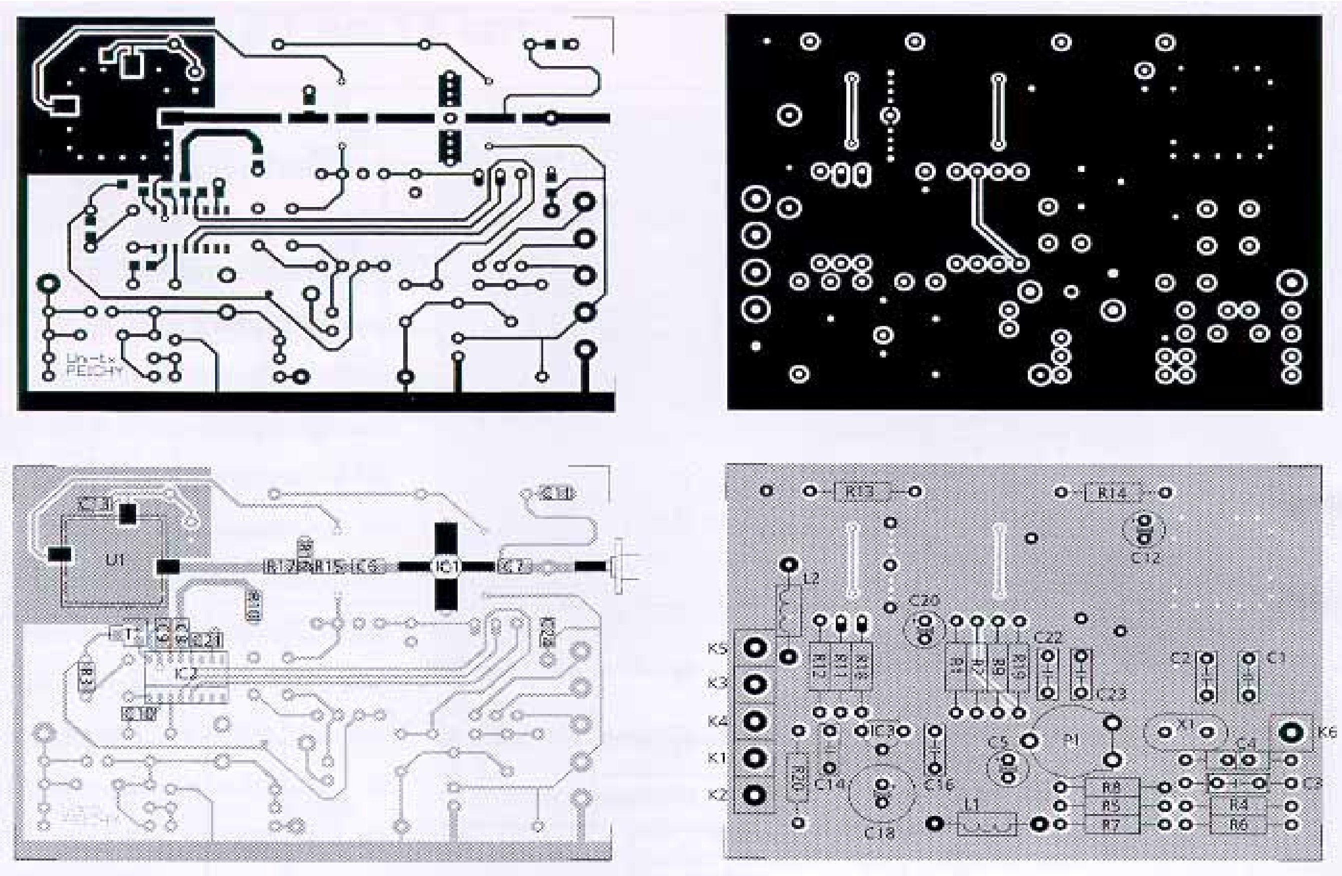


Fig. 3-6 PCB layout and component positioning for the PLL/VCO unit

Adjustment of frequency step (small and large)

By pressing S2 while turning the dial, the step size is increased to be able to tune faster over the band.

Auto save function

If the frequency is changed, the new frequency is stored automatically. When the transmitter is switched on it is set to the last used frequency.

TX-PTT button

The transmitter can control a coax relay, a modulator stage and a power amplifier. By pressing the S1 (the PTT button) the coax relay, the modulator and the power stage are switched on in that order. A programmed small time delay disables the power amplifier until the coax relay has changed over. When the PTT button is pressed a second time, everything is switched off in the reverse order. To be able to use this function, the hardware has to be extended a bit (fig 12).

Set-up menu

With the set-up menu, the following things can be set:

The minimum frequency

The maximum frequency

The step size (large and small)

Pressing S2 while switching on the transmitter enters the set-up menu. The text ‘Set-up Menu Vx.x’ appears. Release the switch and press it again. Now the text ‘Fr min: 1240’ (the number may be different!) appears. The minimum frequency can be adjusted with the dial in steps of 10MHz. The lowest value that can be chosen is 800MHz, the highest value is 2500 MHz. Obviously, the minimum frequency can not be higher than the maximum frequency that is set. When the value is OK, press S2 again. The chosen value is stored automatically.

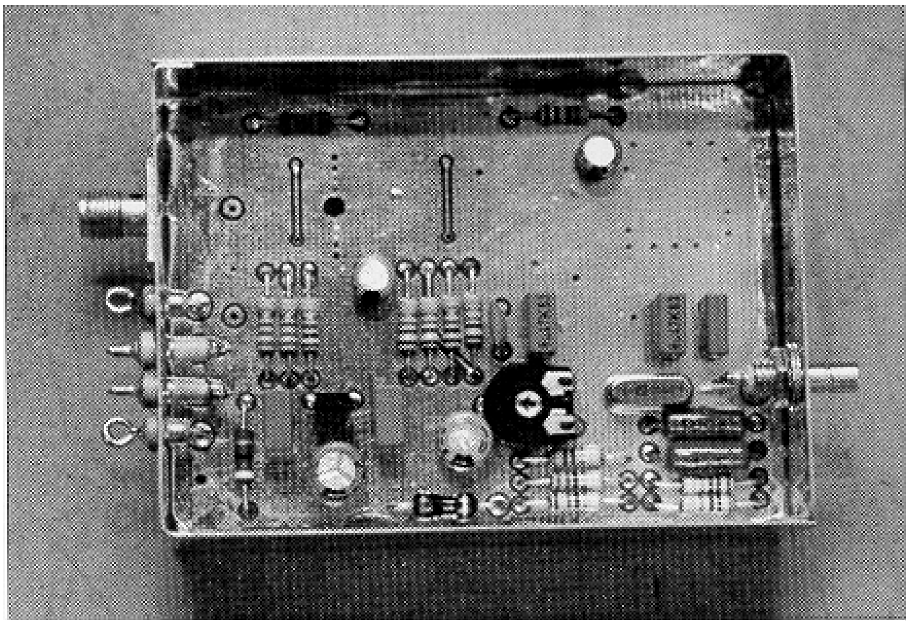


Fig. 11 Photograph of the completed VCO/PLL unit

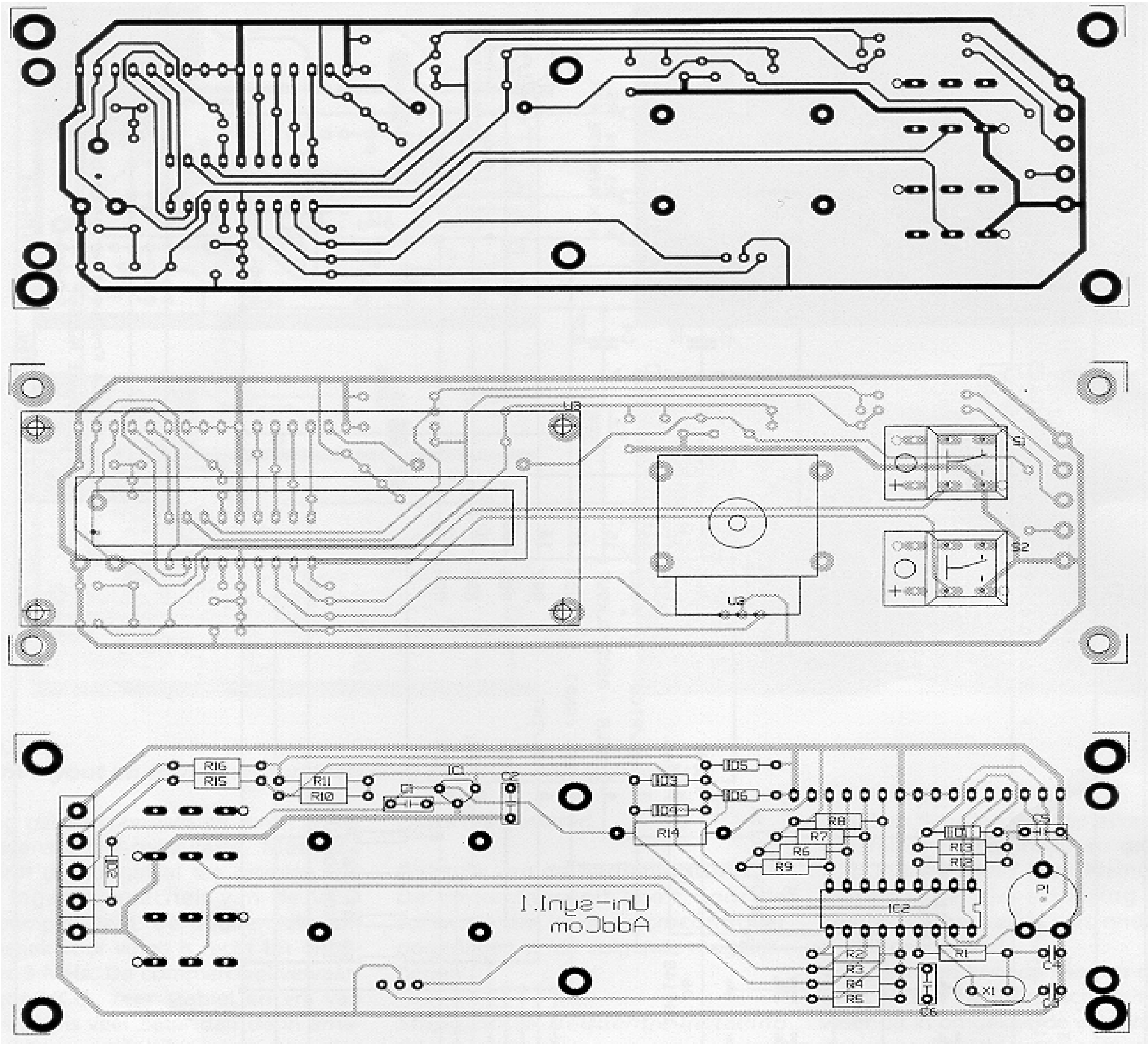


Fig. 8-10 PCB layout and component positioning for the control unit

Now the text 'Fr max: 1300' (the value may be different!) appears. The maximum frequency can be set in the same way as described above. Finally, the step size can be set; first the small step size and after that the large step size. The step size is adjustable from 1 - 40 (250kHz per step, so from 250kHz to 10MHz). When S2 is now pressed for the last time, the normal program is entered.

Software tests

To make searching for possible errors easier, a number of tests have been built in:

I²C bus short circuit test.

When the I²C bus, SDA line or SCL line is shorted to ground, the error message 'I2C Err: bus low' appears.

I²C communication test.

During the communication between the microcontroller and the TSA5055 the acknowledge pulse from the TSA5055 is tested. If something is wrong with the communication, this pulse will not arrive and the error message 'I2C err: on adr C0' appears. (C0 is the hex address of the TSA5055)

Construction

File a bit of copper away from the edge of the PCB, where the VCO has to fit (only on the soldering side). When the VCO is in place, it is not easy to move the soldering iron around it to solder the groundplane to the enclosure. This can result in a noisy contact, and it is better to have no contact at all in that case. Make the PCB and the enclosure the right size. Drill the holes for the RF output connectors (SMA) and the feedthrough capacitors. Use 10pF feed-throughs on the I²C bus. For the baseband input a phono connector can be used. Drill a hole for this connector as well. After this, drill the hole for the MAR or ERA MMIC in the PCB (MAR = 4mm, ERA = 2.5mm). Place the SMD components, first the resistors and then the capacitors, then T1, the PLL-IC and finally the VCO. IC2 and the VCO are static sensitive! Now solder the PCB into the enclosure (only the copper side) and fit the normal components.

The inductor L2 is used to supply DC to the RF output port for powering transverters or LNBs used as up-converters to 10GHz. When used as a 13 or 23cm transmitter, L2 is not necessary. Finally, attach the leads from the PCB to the feedthrough capacitors.

Control unit

First, the display must be made to fit (on the soldering side). If necessary, the 2.5mm holes have to be adjusted a bit. After that, the print with the display, the rotary-encoder and the buttons can

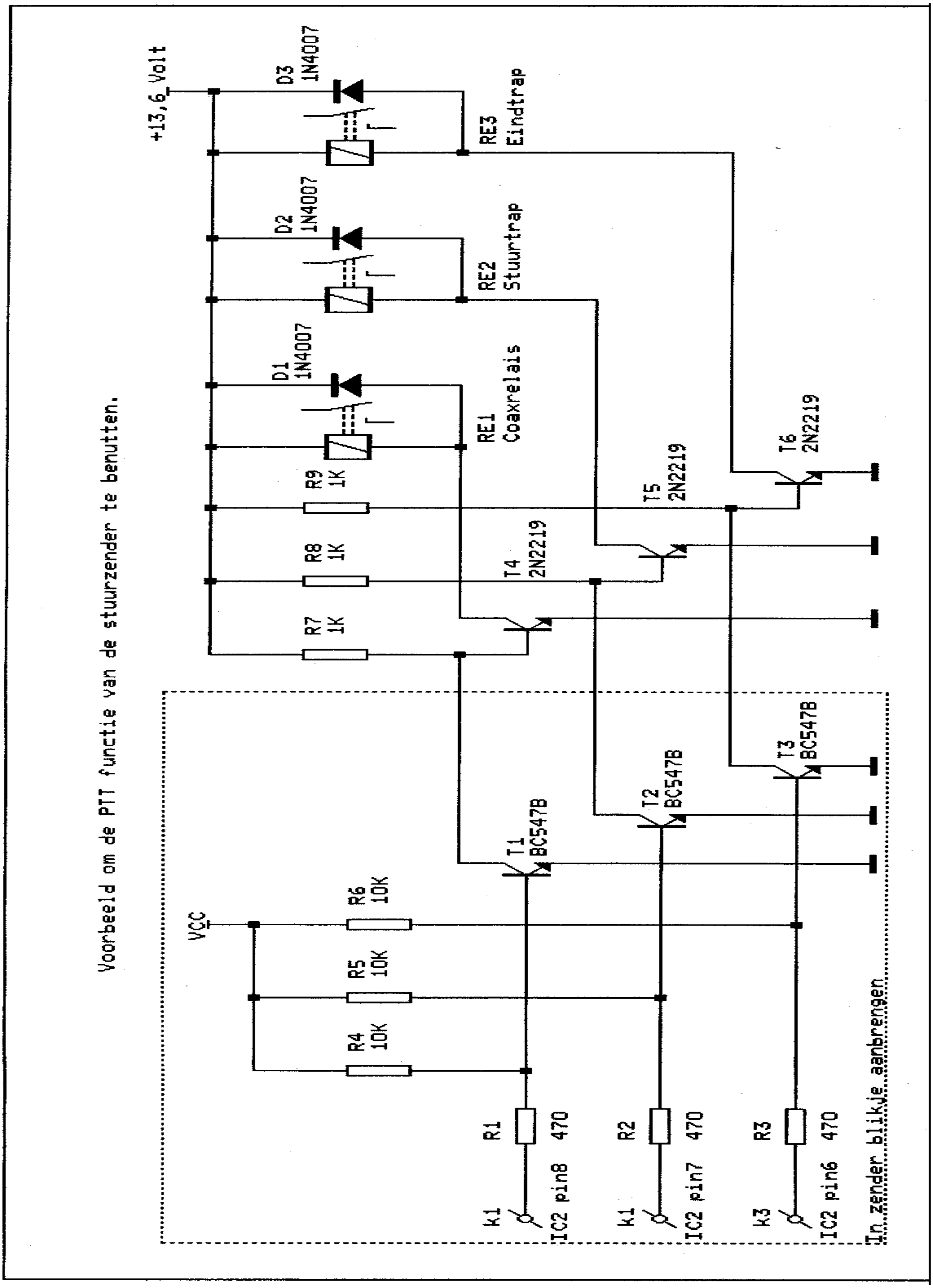


Fig. 12 Circuit diagram of the optional PTT control

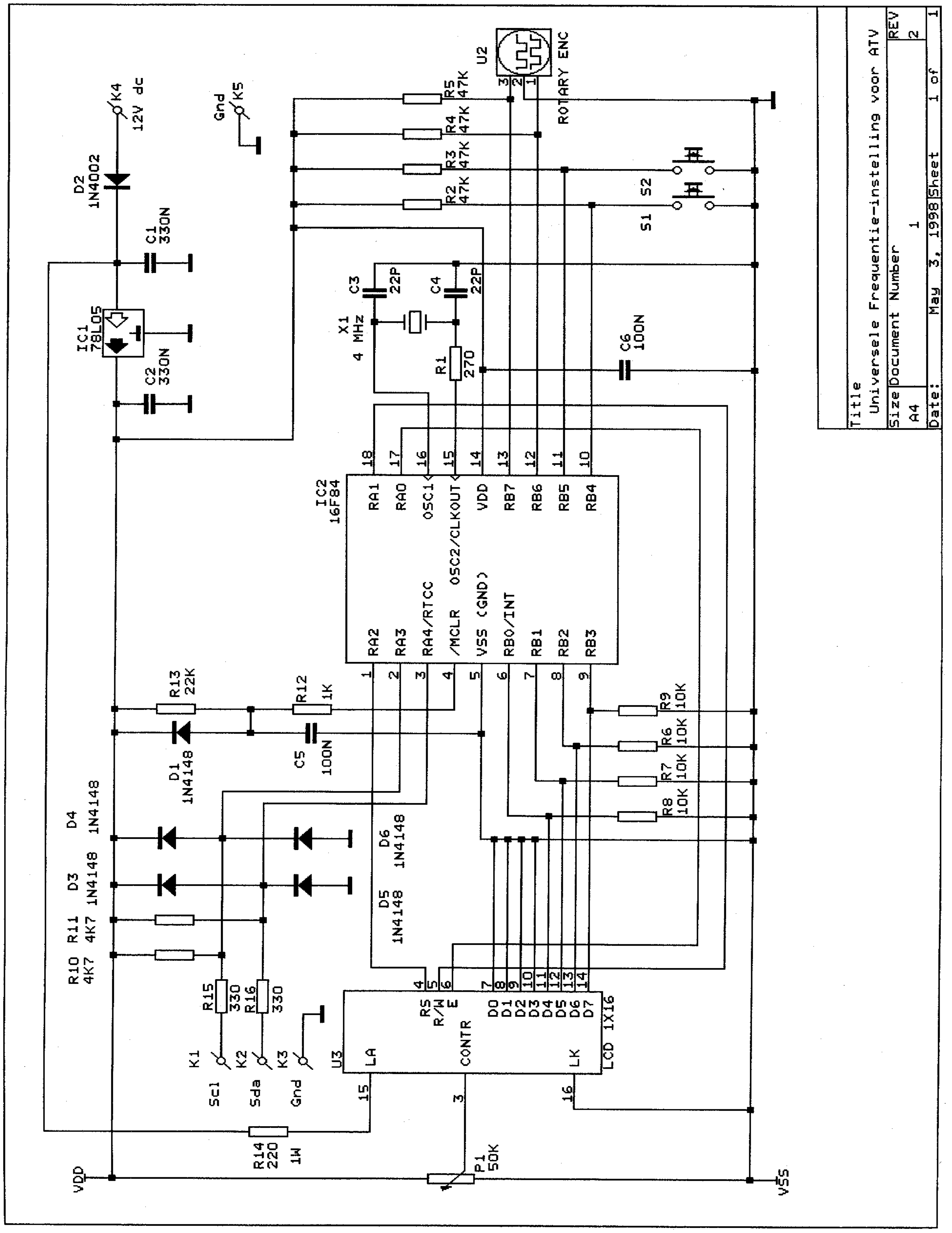


Fig. 7 Control unit circuit diagram

be made to fit in the enclosure.

Make the holes for the front panel and drill the holes to attach the PCB on the corners via spacers to the front. The illustration of the soldering side can be used as a template. First, place the components on the component side. This will later become the back. Use an 18-pin IC socket for the controller. The rotary-encoder, buttons and the display are going to be on the soldering side. The display can be attached with 5 mm nylon bushes and M2.5 bolts.

Making it operational

First, test the control unit without the microcontroller. The display should light up. Turn the trimpot completely to the right. A number of dark squares should be visible. Switch off the unit and fit the microcontroller. The IC is static sensitive! Reconnect the power supply. The display should show: 'I^2C err: on adr C0' and a moment later the frequency. Adjust the contrast, as you wish, to suit the brightness of the background. The range of adjustment is not very wide, most of the time the trimpot is nearly on 0. Now connect the transmitter. Avoid static discharges when soldering the I^2C lines. When switched on, the error message 'I^2C err' should not appear, even momentarily. The transmitter needs about 20V tuning voltage in the 13cm version. In the 23cm version the tuning voltage can be connected to the 12Volt line.

Resistor values for attenuater

Attn.	R15 = R17	R16
6dB	16	66
7dB	19	55
8dB	22	47
9dB	24	40
10dB	26	35
11dB	28	30
12dB	29	26
13dB	32	24
14dB	33	21
15dB	35	18

Now call the Set-up menu. Set the minimum and the maximum frequencies, keeping in mind the range of the VCO in use. For the V1200 type the minimum frequency is 800MHz, the maximum is 1600MHz. For the V2250 the minimum is 2000 MHz and the maximum is 2500MHz. Most of them go slightly outside these boundaries, but this is not guaranteed. Now measure the collector voltage of T1. For the 13cm transmitter this should be around 13 Volts at 2350MHz and for the 23cm transmitter around 9Volts. Now turn the dial. The voltage should change with the frequency. If everything works OK, then the video baseband signal can be applied. Adjust the deviation control, P1 until the right swing is obtained. The circuit needs no further tuning.

Output power

The attenuater network R15 - 16 - 17, can set the output power. For optimal stability of the VCO the manufacturer recommends a pad of 6dB minimum. The output power of the VCO is about 7 dBm. A MAR11 still produces approximately 6dB gain for 13cm. With a minimum attenuation (with R15 = R17 = 16ohm and R16 = 68ohm) this gives 7 – 6 + 6 = 7dBm or 5mW output power. An ERA5 has a maximum out power of 80mW (19dBm) with 18 dB gain. The VCO produces 7dBm. With a minimum pad of, say 8 dB, we arrive at 7 – 8 + 18 = 17dBm or 50mW. These values can be obtained by taking the nearest standard values or by putting resistors in parallel. I advise 8dB pad (22 and 47ohm). With a MAR11 you will have about 5dBm (about 4mW) or with an ERA5 about 17dBm (50mW).

Note

The tuneable transmitter will normally be used together with a power amplifier. This amplifier has to reject the produced harmonics further, to comply with licence regulations.

A complete kit of parts for the project is available from AddCom MicroWave for 275 Guilders (about £85).

Their address is: Hazendonk 18, NL 5103, GH Dongen, The Netherlands. Email to: sales@addcom.demon.nl

Specification of the 23/13cm tuneable ATV transmitter project

Frequency range: 2320 – 2450MHz (max 2000 – 2500MHz)

Tuning step : 250KHz minimum

O/P power : Pre-set up to 50mW max

Harmonic level : -15dB or better

Supply: 12V DC at 200mA (including control unit) and 20V at 2mA

Modulation : FM Deviation 20MHz max

Mod bandwidth : 10Hz – 6MHz at 3dB points

Information about 'Repeater' magazine can be found on their web site at http://www.euronet.nl/users/rulrich, email: repeater-nl@rocketmail.com

Deadline

Will all contributors please note that the deadline for articles for CQ-TV 186 is February 18th 1999. Please send your contributions in as soon as you can ***prior*** to this date.

If you would like to contribute an article for publication in CQ-TV, then please send it to the editor, either by post, or preferably by email. If you don't use a word processor, plain ASCII text is fine. Please see page 2 for address details.

Will all prospective contributors please be sure to read the 'Notice to Contributors' on page 1 so that you understand the implications of submitting an article for publication.

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All adverts, both members and commercial, should be sent to Chris Smith, the advertising manager, at 25 Dando Close, Wollaston, Northants, NN29 7QB.

Email: adman@batc.org.uk by no later than the 12th February 1999.

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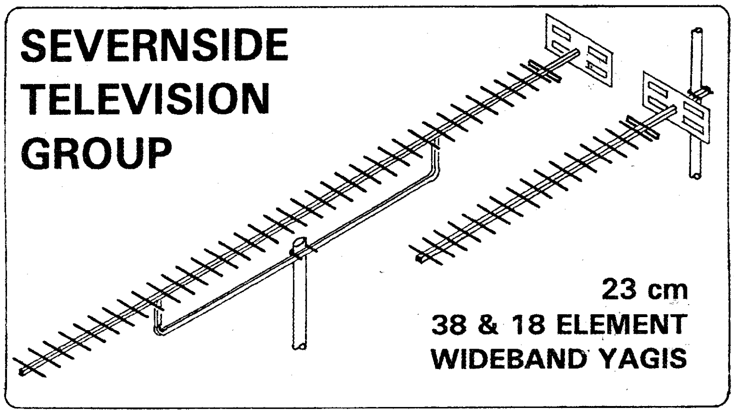

All of our 23cm Aerials are specifically designed for ATV use - although they can be used for other modes as well. Wideband characteristics mean that you need only one aerial to cover the repeater input and output channels. Our famous wideband yagis come fully assembled in two versions:

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

By Paul Holland, G3TZO.

Gazing into the crystal ball.

A new year dawns yet again with interest in Satellite Television continuing to shift from analogue to digital transmission and reception. In 1998 we saw little growth in analogue services but an explosive growth in the number of digital feeds and DTH services.

The new year will see an acceleration of this trend with many familiar analogue services closing in favour of a digital alternative. This year should see the first of what could be called "2nd generation" digital receivers. At last we should see true multi-satellite capability with seamless switching between analogue, DVB and ADR formats.

For the satellite DX 'er we will see the continued trend in higher powered C Band Satellites allowing reception in the UK with more modest sub 2m dishes. Look out also for lower cost services for high speed Internet access via satellite as Internet Service Providers and satellite operators compete for the continuing explosion in Internet traffic.

With transmission costs reducing it is likely that we will see an increase in the number of both national and niche broadcasters. The success of Eutelsat's Skyplex may see the introduction of independent "bouquets" comprised of a variety of special interest channels.

Although Satellite TV reception is never going to satisfy the amateur purist philosophy of build and operate your own equipment there is much fun still to be had in assembling systems and scouring the ether to see what is new in the world of Satellite TV. Happy New Year!

Eutelsat News

Eutelsat has plans for 7 more orbital slots with new satellites at 12.5, 14.8, and 19 Deg W aimed at audiences through-out Europe, North Africa, and the Middle East. Further applications have been launched for 70.5, 76, 83.5, and 88.5 Deg E to reach Asia. Following Hot Bird 5 replacing Eutelsat II-F1 at 13 degrees East, II-F1 replaced I-F5 at 21.5 Deg E. Eutelsat I-F5 will co-locate with TV SAT 2 at 12.5 Deg W providing data services for the Moscow region. Eutelsat II-F3 is being repositioned to 36 Deg E.

Nilesat

Negotiations are underway with Matra Marconi to build Nilesat 102, which will be co-located with Nilesat 101 at 7.0 Deg W. The satellite will carry, 12 transponders covering Africa, the Middle East and South Europe. Using digital compression the satellite will be able to offer up to 84 TV channels.

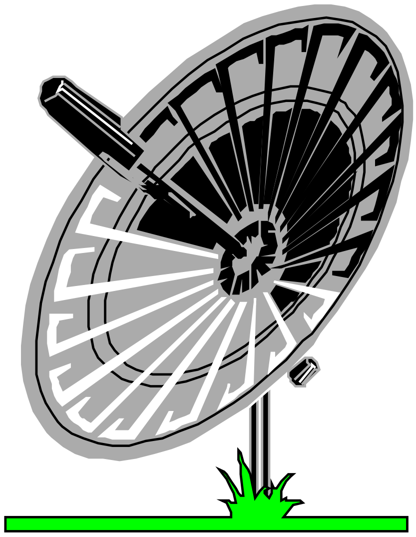
Astra 2A

A new digital free-to-air platform started on Astra 2A, 28.0 Deg E on December 7. Called "Multiplex No. 1", it includes the new shopping channel Shop! (from Granada and Littlewoods), The Travel Channel, QVC, CNN International, Cartoon Network, and TNT. The Welsh language TV channel S4C Digital is likely to be the first broadcaster to use "Multiplex No. 2", starting in early 1999. Eurosport is also likely to join one of these FTA multiplexes early in the year.

Sky Digital plans to add at least 10 channels in coming months.. E!Entertainment, originally planned for October, planned to start in January with Studio Universal and "13th Street starting in February or March.. Hallmark will follow by early spring, and BET on Jazz will make an announcement about a launch date, also thought to be in the spring. The launch of 6 new themed channels from The Christian Channel has been pushed back from last October to February or March.

Telecom

France Telecom has decided not to replace its four Telecom satellites (Telecom 2A, 2B, 2C and 1C) when they end their service lives. The two alternatives are to launch a new satellite in 2005 or use Eutelsat. No final decision is likely before 2001.

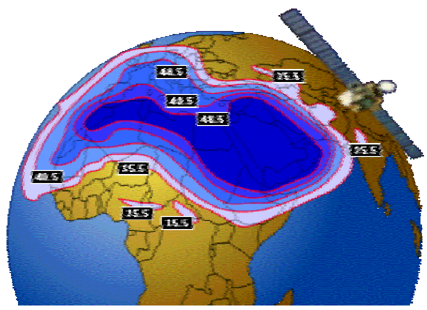


Sirius 3

Here's the official transponder line-up for SIRIUS 3:

- 11.785 GHz v
- 11.804 GHz h
- 11.824 GHz v
- 11.842 GHz h
- 11.862 GHz v
- 11.881 GHz h
- 11.900 GHz v
- 11.919 GHz h
- 11.938 GHz v
- 11.958 GHz h
- 11.977 GHz v
- 11.996 GHz h
- 12.015 GHz v
- 12.034 GHz h
- 12.053 GHz v

As we closed for printing there were no channel allocations announced.



Launch News

Arabsat 3A

Due to be launched on Ariane V116 around now Arabsat 3A will be co-located at 26.0Deg E with Arabsat 2A. Arabsat 3A will carry 20 Ku Band Transponders in the 11.7 – 12.1 GHz range.

Date	Satellite	Position	Launcher
9812	PAS6	43.0W	Ariane
9901	Arabsat 3A	26.0E	Ariane
9902	Eutelsat SESAT	36.0 E	Proton
9902	Astra 1H	19.2 E	Proton
9903	Eutelsat W3	7.0 E	Atlas
9903	Express A1	11.0W	Proton
9904	Astra 2B	28.2 E	Ariane
9904	Eutelsat W4	36.0 E	Ariane
9906	Orion 2	12.0 W	Atlas
9907	PAS 1R	45.0W	Ariane
9908	TDRS 8	47.0W	Atlas
9909	Hispasat 1C	30.0W	Atlas

Digibox Corner

For those owning or contemplating buying an official Sky Digibox there are a few things you will not find in the handbook. Internet News Groups are already buzzing with information on how to do the things Sky never intended you should. So with the usual disclaimer for liability I am reproducing a couple of potentially useful tips.

Launch Plan for 1999.

As usual these dates will change for a variety of reasons – not the least being the success or failure of preceding launches.

Installers Menu.

Normally hidden this can be accessed by;

Pressing "Services", then Key,4,0,1 Select. This will then reveal the Installation menu.

Updating Software

To force an update to software;

- Unplug the receiver at the mains.
- Press and hold in the "Backup" button on the front of the receiver while you reconnect the mains.
- Hold the "Backup" button in until "Download in progress" appears on the screen.

A normal update can take 8-10 minutes. Please note that this only works when you are connected via a scart to the TV receiver.

From the Post Bag

Barry Gunstone writes from Sweden to ask a few pertinent questions about the potential use of FTA Digital receivers for reception of services from 28.2 Deg E. Unfortunately I had to be the bearer of bad news in that it will be impossible for the foreseeable future to use anything but an authorised Sky receiver (Digibox). The reasons for this are that the Mediaguard CAM used in the Digibox is not supplied separately. Even to receive so called FTA services such as Sky News it is necessary to have a valid smart card. These are available either by subscribing to Sky or by ringing the BBC to obtain a card to receive BBC services for your area. If you live in England you will not be able to receive BBC Wales or BBC Scotland.

A reply provided by the BBC to some questions I asked about BBC Digital Services is reproduced below;

Q. Will all BBC services be widescreen (16:9) or standard (4:3) format.

A. Around 25% of programmes will be in 16:9 widescreen now, increasing to around 90% within five years. There will always be some archive material in 4:3 for many years after that.

Q. Will regional versions such as BBC North West be available

A. No.

Q. If the answer to the above is yes will I be able to receive all regional services

A. See above

Q. If I do not have a smart card from B-Sky-B will I be able to get one from the BBC - if so when and where will they be available.

A. To receive BBC Digital services, there is no need to subscribe to any Pay-TV services, but you may have to pay more for an un-subsidised set-top box. The satellite box unsubsidised cost around £360, I understand, compared to £199 for a box subsidised by British Interactive Broadcasting (who also demand connection to a telephone line for 12 months). Any digital satellite retailer should be able to sell you one. Once you have the box you will need to obtain a smartcard from the 'non-pay TV customer access' number 0870 243 8000.

Q. If I have a smart card from B-Sky-B will I need a separate smart card for receiving BBC services or will the Sky card include access to BBC and other Free To Air services.

A. No. The non-pay services should be automatically enabled along with your chosen Pay-TV channels,

Roderick Duncan, BBC Reception Advice.

Internet: http://www.bbc.co.uk/enginfo/

Channel News

Venezuela's Puma TV is now on Hot Bird 2, 12.092 GHz.(H) SR 27500 – FEC 3/4 Also here can be found Cadena Sur, Sólo Tango, and a promo channel for Vacaciones TV. All are FTA.

CNBC Europe ceased broadcasting on 11.265 GHz at 13 degrees East at the end of November. It will continue in PAL on Astra transponder 50.

Ski Channel- The International Ski Federation says it will start its own Ski Channel within two or three years. It will carry programming that other channels are reluctant to carry.

Deutsche Telekom will launch its own digital package consisting of Kanal D, a-tv2, RTP International, TVP, ERT Sat, and Zee TV. on Hot Bird 5. They will be joined by RAI Uno, RAI Due, RTS, HRT Sat, RTV, NTV, Antenna, and CNE. The package will be encoded in Irdeto from 1999 July 1

RTL's digital package launched in November on Hot Bird 5 on 11.054 GHz. It includes RTL, RTL2, Super RTL, and Vox.

Ring TV has started on Hot Bird 1 at 13.0 Deg E on 11.280 GHz in clear PAL, 13:00-18:00 hrs CET.

Euronews has confirmed that it will close down its analogue transponder on Hot Bird 5 11.585 GHz) on March 31.. The ITN-owned broadcaster began digital transmissions on Hot Bird 3 in January.

Sima-yeh Moghavemat has moved from Eutelsat II-F1 to II-F2 at 10 Deg E on 11.163 GHz, in clear PAL.

Pakistan's **Prime TV** has launched a 6 hour a day European service, soon to be expanded to 24 hours, on Intelsat 707 at 1 Deg W in MPEG-2 (SR 26000, FEC 3/4) on 11.014 GHz. It is currently clear, but will switch to Conax encryption soon.

Brazil's TV Record is on Intelsat 605 (27.5 degrees West) in clear MPEG-2 (SR 7000, FEC 3/4) on 4.055 GHz..

New Products

Nokia 9800

Around now you should be seeing the first Nokia 9800 receivers appearing in dealers shops. The Mediamaster 9800 is the next generation of Nokia receiver with much improved software for organising digital services across a number of satellites. The 9800 is equipped with Satscan for multisatellite reception and has both a CI slot and an embedded Viaccess Conditional Access Module.

Main features are;

- Symbol rates - 1-42 Ms/s
- SCPC & MCPC
- RAM 2.0 Mbytes
- SDRAM 4.0 Mbytes
- 1 x F Connector
- DiSeqC 1.0
- Satscan
- 2 x Scart

Praxis Digimaster 9800 AD+P

Although the Nokia 9800 is undoubtedly a big improvement on its predecessors the Praxis 9800 would appear to be entering a league of its own. This receiver can handle up to 700 analogue channels and 2900 digital channels (1500 TV / 1400 Radio). Reviewed in the January issue of Tele-Satellite Magazine this receiver has true multisatellite capability with motorised control and polarity skew. The key features are as follows;

- 3 Scarts
- 3 LNB inputs (+1 for loop through)
- SVHS
- Positioner (36v) 50 satellite positions
- Sensor (Hall or Reed)
- Mechanical (pulse) or 13/18V polarity control
- DiSeqC
- 22kHz and 12v switching
- 2-45 Ms/s symbol rate selection
- RAM 2Mbyte / DRAM 2 Mbytes
- 18/27 MHz bandwidth
- Decoder socket (i.e. D2Mac)
- 2 CI slots

It seems likely that when the weather warms up enough to support a foray out to the dishes that this receiver could while away many a happy summer afternoon.

Which LNB is which ?

I no that many people are still confused by the terminology used to describe various LNB's. For those still unsure here is a quick glossary of common terms;

Normal LNB - Fixed voltage single band LNB requiring a separate polariser.

Voltage Switching – Single band with 13/18V switching of H/V polarity

Standard LNB – Same as voltage switching but infers the use of a 10.0Ghz local oscillator.

Enhanced LNB – Can be either Voltage Switching or Normal and uses a local oscillator of 9.75 Ghz (Astra 1D use).

Universal LNB – Uses 13/18V switching for polarity and a 22Khz tone for switching between higher (11.7-12.75 Ghz) & lower (10.7-11.7) frequency bands.

Triple Band – Usually cover FSS, DBS and Telecom frequencies using 13/18V switching to select high or low bands. Requires a separate polariser.

Quad Band – As for triple but includes Astra 1D frequencies and requires a receiver with a 2Ghz tuner.

Twin LNB – LNB with two separate outputs capable of switching independently between H&V polarities.

Dual LNB – Has separate ouputs for H & V polarities and is used with IF switching devices usually TV in distribution systems.

Conclusion

That's it again for this edition of Satellite TV News. As usual the e-mail address is paul.holland@btinternet.com or QTHR for any news and views you may have on the Satellite TV scene.

Micro transmitters

A German company is offering miniature television transmitters for use on frequencies from 900MHz to 2.4GHz, aimed at surveillance, amateur and radio-control aircraft users. The website, in English and German, can be found at www.videobug007.com

Digital Terrestrial TV Arrives in the UK

By Garry Smith

Another notch in TV history was made on Sunday November 15th when the World's first digital terrestrial TV service was launched in the United Kingdom. The service allows viewers equipped with a set-top box to receive several free-to-air channels plus subscription channels delivered by ONDigital that is a consortium spear-headed by Canton and Granada.

Unfortunately, launching such a service has not been without hiccups because terrestrial reception is unpredictable in many areas, unlike signals delivered by satellite where, unless the dish cannot see the satellite, the reception is guaranteed.

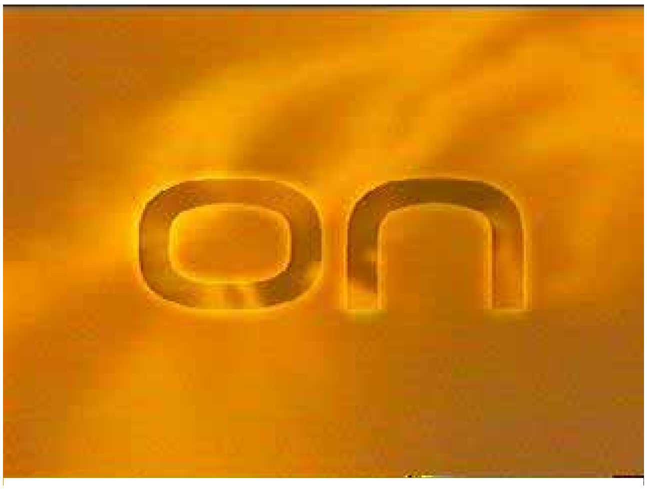


Fig. 1: ONdigital logo used during field trials. The background constantly changes colour.

Channel Allocations

In the Sixties, a UI-IF channel plan was drafted for the United Kingdom allowing a maximum of 4 channels per transmitter. This was carefully engineered to avoid interference problems resulting from transmitters sharing the same channels.

Shared frequencies were assigned to transmitters located geographically as far apart as possible in order to minimise the risk of co-channel interference under tropospheric conditions.

When Channel 5 hit the airwaves, unoccupied channel 37 (and later, channel 35) was used to support a 'national' TV network. Unfortunately, this created a serious interference potential particularly where transmitter footprints overlapped.

Initially most main transmitters to be used by the new service were assigned Channel 37 (Croydon, Lichfield, Emley Moor, etc.) while later on Channel 35 was used by 'fill-in' transmitters (Waltham, The Wrekin, Ridge Hill, etc.). Note that Channel 5 sites were not owned by the BBC, hence there are high-power transmissions from sites such as Black Mountain which is used only as a low-power relay for BBC and IBA broadcasts.

As a result, frequency sharing means that many viewers are in reach of two or more Channel 5 outlets but are unable to view interference-free pictures!

Digital Interference

The introduction of digital terrestrial television has increased the interference potential dramatically because each main transmitter has been assigned six additional analogue channels each containing the digital multiplexes. Examining the digital channel allocations reveals many instances where channels are shared by digital and analogue signals from neighbouring transmitters. For instance, the channel allocations of Emley Moor and Sutton Coldfield provide mutual interference potential in areas just to the north of Derby where their footprints overlap. Although the E.R.P. (effective radiated power) of the digital signal is some 20dB down on its analogue counterpart, it is easy to be misled into thinking that the interference problem will be minimal and pose little threat to DX reception on the same channel.

In practice, the digital multiplexes have as much destructive power as the higher level analogue signals. Some viewers served by relays are now finding their analogue pictures have deteriorated due to digital interference from distant main transmitters sharing the same frequency. Tim Bucknall (Congleton) mentions this is affecting some viewers tuned to the Congleton relay who are suffering digital interference from the main Sutton Coldfield transmitter.

In mild cases the interference effect shows as fine patterning over the picture, resembling that of a mis-aligned decoder or IF strip. In extreme cases a good colour picture as been reduced to heavy snow with lack of chroma. It is difficult to perceive a digital signal on a normally blank channel; the snow effect appears brighter or more intense depending upon the type of TV receiver used.

Advantages of Digital

Although digital transmission is more cost-effective and efficient in terms of bandwidth used, it is unlikely to have got off the ground unless there was money to be made from it. Basically it is packaged TV - the more channels there are, the higher the revenue for the programme providers.

Many viewers were under the false

Fig. 2: Logo used by Carlton Cinema via digital terrestrial television (DTT).

impression that digital TV would provide 'high-definition' pictures. Not so, although it could have been used for that purpose at the expense of bandwidth and hence a reduction in the number of channels. The over-critical TV fanatic (i.e. the ones who measure the squares on the test card with a ruler for correct geometry) may find fault with the digital picture if they are used to an exceptionally crisp and clean analogue display. MPEG-2 encoding means that digital bits of information required for fast moving scenes are 'borrowed' from slow-moving p arts of the picture which means that the background of say a football match may look unreal to the discerning eye.

However, the overall picture quality is consistent as correction is provided which eliminates ghosting normally created by multi-path reception. In other words, if your existing analogue picture from a main transmitter (relays are not distributing the signal since there are no spare frequencies) has severe ghosting then a switch to digital could be the cure. The digital picture is either there or it isn't which means that a fluctuating signal-level may result in the picture breaking up into squares and then freezing until the digital signal resumes a certain threshold With analogue the picture would have gone snowy.

Digital Tests

Some digital transmitters went on test during the summer, if only to assess the interference potential to analogue broadcasts using the same channel. Only carriers were transmitted since digital receivers were not available at the time to decode the signal. Pre-production units were launched for test purposes and these were used to provide off-air pictures at the Earls Court Exhibition Centre towards the end of September. However there were problems with the off-air reception during the event which resulted in picture break-up. As a result, some of the gutter-press reporters had a field day condemning the new technology outright!

Using pre-production models meant that the only way the channel could be changed was by updating its technical parameters via an on-screen menu! Later pre-production units became available and with these the channels could be changed by using the remote control. There were disnlay models by various manufacturers but as one thief soon found out, 'his' unit was only a casing without innards!

Fig. 3: Alternative logo radiated by Carlton Cinema.

Plug and Play

The set-up menu is the same for all makes of receiver, so if you can work one unit you can work any. Simplicity is the key word because of the 'Plug and Play' concept in which the customer takes home the box, connects it to the aerial and TV and hey presto! Success within minutes, or at least that's the idea. A help-line is available which will assist viewers in carrying out basic checks in the case of not having any success.

Dealers have access to postcode mapping which allows them to tell the customer whether coverage is applicable to their address. Of course, someone will live in a sheltered dip along a street where the signal is insufficient yet at each end of the road the signal will be fine.

Excessive Levels

Although the digital signal has to be a certain level otherwise dropout occurs, too much amplification can stop the decoder from working if the adjacent analogue ones become too high in signal strength as a result. Using high-gain antennas with lots of amplification will be asking for trouble because the digital multiplexes are some 20dB down on the adjacent analogue signals. Boost the digital signal and you will boost the analogue too. When adjacent analogue signals exceed 80dBµV the digital receiver may go into overdrive thus affecting the weaker digital signals!

Fault Diagnosis

With analogue we know that if the signal is too high, cross-modulation occurs and this will show as lines across the picture or ITV floating mixed in with the BBC signal. A weak signal will result in a snowy picture. A ghost image on the picture tells us that multi-path reception is present.

Unfortunately, if intermittent break-up of the digital picture occurs no real clues can be obtained by examining the picture. It will be necessary to ensure that signal strength readings are within tolerance on both digital and analogue channels. Generally speaking, a minimum level of 32dBµV is required for the digital receiver to work but a minimum level of 38dBµV is recommended to take into account signal variations.

Future aerial installations for digital reception will be extremely hit-and-miss without the aid of a digital signal-strength meter. My own experience suggests that this will be an invaluable tool for the DX-er, otherwise we might be misled into thinking that the blank channel we see is void of signals when in reality there is a thumping big digital signal present!

Future Plans

Within the next two years, ONDigital hopes to accommodate six further channels within its existing three digital multiplexes once unproved digital compression techniques become available. At the moment, five channels are contained within each multiplex at an average data rate of 4-4.5Mb/sec. Finally, the Crystal Palace signal is 3-4dB higher than it was originally.

All photo's supplied by Keith Hamer and HS Publications (Derby).

BATC Publications

Publication	Each	Qty	Total
An Introduction To Amateur Television (225gm)	**£5.00**	....	....
The latest handbook full of detailed information on how to set up your ATV station, plus lots of new video and RF construction projects.			
Slow Scan Television Explained (275gm)	**£5.00**	....	....
The latest SSTV handbook detailing all the information you need to enter the fascinating world of Slow Scan Television: Basic principles, explanations of all the modes to date, commercial hardware and computer-based SSTV systems. Also various construction projects for SSTV equipment.			
The Amateur TV Compendium (155gm)..	**£3.50**	....	....
The BATC handbook featuring construction articles on video units, 24cm and 3cm ATV, a Digital Frame Store, and much more.			
The Best of CQ-TV (150gm)	**£3.50**	....	....
A compilation of the best construction articles from CQ-TV's 133 to 146			
CQ-TV Back Issues:	**£1.50**	....	....
The following issues are still available. Please circle those required: 142, 143, 144, 147, 150, 153, 154, 156, 158 159, 162, 163, 164, 166, 167, 168, 169, 170, 171, 173, 174, 175,176, 177,178, 179, 180, 181.			
Special Offer: Any four of the above issues	**£5.00**	....	....
182, 183, 184, 185	**£2.50**	....	....
Index on a PC format disk (25gm)			
This item has now been discontinued, as this index is included on the BATC CD.			
CQ-TV Binders (A5 sized)	**£3.50**	....	....
The BATC CD (IBM type PCs only)	**£5.00**	....	....
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Members' Services

A description of the various PCB's and components can be found in the 'What's What' guide, or on the BATC Internet pages. URL http://www.batc.org.uk (A printed copy available on request, if you send a S.A.E.). Components for club projects are not available from Members Services unless contained within these lists. All club crystals are HC18/U (wire ended). To avoid delay and inconvenience, please be careful to include the correct payment with your order – please do **NOT** send stamps or cash. Post and packing costs are for despatch of one item to United Kingdom members.

Circuit Details can be found as follows:

Revised ATV Handbook (vol. 2): PCB's 21, 22. **An Introduction to ATV**: PCB's 10, 25, 36, 40, 41, 47, 85, 86. **TV for Amateurs:** PCB 19. Slow Scan TV Explained: PCB's 59, 60, 61, 62. **Amateur TV Compendium:** PCB's 12, 27, 54, 55, 56, 57. **CQ-TV (Issue No. in brackets):** PCB's 7(174), 13(128), 16(134), 20(130), 26(142), 58(139). Item 46 is supplied with circuit details, etc

CAMERA TUBES A tube guide appears in CQ-TV 149 and 150. Tubes are now difficult to obtain and members requesting information on availability, prices or other types of tubes or equivalents are asked to send a stamped addressed envelope for their reply.

	All prices in UK pounds (£)	Each	P&P	Qty	Total
Camera Tubes, Scan Coils, Bases & Lens Mounts					
3	One inch Vidicon base	£1.20	£0.30	....	....
4	2/3 inch Vidicon base	£0.80	£0.30	....	....
6	Camera tube (see note above)	*	£1.20	....	....
Video and I^2C Circuit Boards/Components					
7	Sync pulse generator PCB	£12.00	£0.43	....	....
12	Teletext pattern PCB**	£3.50	£0.43	....	....
13	Greyscale/Colour bar generator PCB	£3.50	£0.43	....	....
16	PAL colour Coder PCB**	£7.00	£0.43	....	....
19	Video filter PCB	£1.20	£0.30	....	....
20	Video processing amplifier**	£4.70	£0.43	....	....
21	Vision switcher matrix**	£4.70	£0.43	....	....
25	4 input TEA5114 vision select PCB**	£3.50	£0.43	....	....
26	Video level indicator PCB	£5.90	£0.43	....	....
40	I^2C CPU PCB	£10.00	£0.43	....	....
41	I^2C VDU PCB	£10.00	£0.43	....	....
42	13.875 MHz crystal	£4.70	£0.30	....	....
70	6.0 MHz Teletext crystal	£1.75	£0.30	....	....
43	SAA5231 genlock IC	£8.80	£0.30	....	....
44	SAA5243PE Teletext IC	£14.70	£0.30	....	....
45	PCF8583 Clock IC	£7.00	£0.30	....	....
39	LM1881N Sync separator IC	£3.50	£0.30	....	....
81	I^2C 27256 EPROM	£9.70	£0.30	....	....
36	I^2C Video switch PCB	£8.80	£0.43	....	....
37	GX414 Video switch IC	£8.80	£0.30	....	....
38	PCF8574P Input expander IC	£4.70	£0.30	....	....
10	I^2C Relay PCB	£6.50	£0.43	....	....
9	PCF8574A Input expander IC	£4.70	£0.43	....	....

	All prices in UK pounds (£)	Each	P&P	Qty	Total

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		Each	P&P	Qty	Total
47	70cm up converter PCB	**£13.50**	**£0.43**	....	....
50	108.875 MHz crystal	**£8.20**	**£0.30**	....	....
86	24cm solid state amplifier PCB	**£10.50**	**£0.43**	....	....
55	Gunn diode modulator PCB	**£3.00**	**£0.43**	....	....
56	10Ghz head unit PCB set**	**£3.00**	**£0.43**	....	....
57	Tuneable IF PCB**	**£3.00**	**£0.43**	....	....
58	6MHz audio subcarrier generator PCB**	**£3.00**	**£0.43**	....	....
88	XR215 phase locked loop IC	**£5.00**	**£0.30**	....	....
60	G4ENA colour etc. SSTV mod PCB set	**£5.90**	**£0.43**	....	....
61	G4ENA SSTV transmit mod PCB	**£7.00**	**£0.43**	....	....
62	G4ENA auxiliary PCB	**£2.35**	**£0.30**	....	....
68	4.433618MHz crystal	**£3.25**	**£0.30**	....	....
69	5.0MHz crystal	**£3.25**	**£0.30**	....	....
46	4 Rail power supply PCB	**£3.50**	**£0.43**	....	....

Stationery & Station Accessories

		Each	P&P	Qty	Total
73	BATC blue diamond clutchpin badge	**£1.75**	**£0.30**	....	....
74	BATC cloth badge	**£4.00**	**£0.30**	....	....
75	BATC equipment label (6)	**£0.25**	**£0.30**	....	....
76	BATC square windscreen sticker	**£0.10**	**£0.30**	....	....
78	BATC test card	**£0.50**	**£0.43**	....	....
79	BATC reporting chart	**£0.10**	**£0.43**	....	....

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Address:			

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The indicated **P&P** prices are for postage within the EEC. Will members outside the EEC please either try to estimate the extra postage required, or write for a quotation. All cheques **MUST** be drawn on a UK bank. (Eurocheques, in £ sterling, are acceptable). Items marked thus: ** are available only until present stocks are exhausted.

PLEASE MAKE CHEQUES PAYABLE TO 'BATC'.

The Empire Strikes Back!

Dicky Howett *enters his personal TARDIS, returns to 1958, visits the BBC Television Theatre and meets a few buskers*.

TV Theatre 1960s

I was a telly-mad kid in the 1950s (not a lot has changed!) Back then, I applied regularly for free audience tickets to BBC TV variety productions. (ITV shows had a lower audience age limit of 16 years-I was then too young to enter commercial portals-so BBC shows it had to be). They included 'The Ted Ray Show' and 'The Billy Cotton Band Show'. These creaky concoctions were produced live and dripping from an old converted West London theatre named the Shepherd's Bush Empire, on Shepherd's Bush Green.

A visit to the Empire (re-named in 1953, the BBC Television Theatre) was always an adventure - a trip to the Big Bad City and a chance to see real TV cameras in action! For an impressionable nipper, it was an exciting time, full of mystery and wonder.

On arrival at the Television Theatre I would join the queue, clutching my dedicated BBC ticket. I always liked to arrive early, because it was first come-first served in the allocation of seats. I hoped for a front-row pew from whence I could ogle all the technical telly action. In those far-off days I nursed youthful dreams of becoming a TV cameraman so these trips to TV studios, I considered as an educational outing; a learning curve.

Outside the Television Theatre, during the 40 minutes or so queuing time, the programmes 'stars' would sometimes wander out for a breather, or perhaps to size up the audience? (More probably they were hoping to elicit admiring stares). Ever on the lookout for excitement, I once took my Box Brownie camera and photographed comedian Terry Scott and singer Alan Breeze (of the Billy Cotton Band Show). Also, I snapped a surprised BBC technician who got his picture taken just because he happened to look famous.

Marconi Mk III cameras during 'Crackerjack!'

Buskers Galore

Another feature of the Television Theatre queue was the professional beggars. In those days there were two of them. The-Busker-With-The-Trumpet and The-Blind-Man-With-The-Matches. The-Blind-Man-With-The-Matches did absolutely nothing, but instead, shuffled along the queue (with the help of his wife) muttering "Blind, blind", and offering from his tray, matches in exchange for donations. Not very entertaining. Then came The-Busker-With-The-Trumpet. He would suddenly blast out, more-or-less in key, several excruciating and totally unrecognisable tunes. When he'd finished his act, he also proceeded along the queue in search of funds. The routine was always the same. Blind man first, then the totally Tone Deaf. It was a great relief to get inside the theatre.

At the time of my visits, (approx 1958/1960) The BBC Television Theatre was equipped with four Marconi Mk III 4 ½ inch image orthicon cameras. These large TV cameras produced dynamic pictures with comparatively little light. I had anticipated vast searchlights dazzling everything in the studio. In fact the illumination was quite restrained and logically directed using Mole *Solar Spots* and scoops.

Camera 'One' rode on a Mole Richardson counter-balanced crane down the central stage 'runway'. Cameras 'Two' and 'Three' were mounted respectively on a Vinten HP 419 pedestal (tiller steered only) and a Vinten Pathfinder dolly, both on or around the stage. Camera 'Four' was mounted at the front of the dress circle. This camera displayed a prodigious Taylor-Hobson Mk I zoom lens. Of course, at the time I had no idea of exactly what all the equipment was. All of it looked to me, innocent sprog that I was, like arcane gadgets in a science fiction movie. Also, in my childish ignorance I assumed that all tv cameraman needed to be super-strong because the cameras--as I saw--were enormous and intractable. These days I know it was all too true!

and flashy ITV. However, most noticeable and most startling to anyone new to the sight of a television studio was the sheer colour of it all; also the clear, vibrant quality of the live audio. Unfortunately, in 1959 both those technical factors were missing from the average cheapo 405-line domestic telly.

In fact, strange to relate, those old-time monochrome TV stars were not instantly recognisable in the flesh, so used as we were to viewing them in 'glorious' black and white. My mum (who accompanied me to several shows) was utterly convinced that a handsome BBC stagehand was Russ Conway. Whereas all the while, the **real** Russ Conway, (known for his twinkling smile and full front set) was

Terry Scott strolling past the queue.

sitting dumpy, hunched and unglamorous at the side of the stage awaiting his cue. When Russ come on to play a tune, my Mum actually thought he was an impostor, because he didn't 'look' anything like his appearance on the home screen! Such was the power of television in those days, performers were regarded reverentially, as some sort of super-beings from outer space, and not like real people at all. Things haven't changed much.

Those early TV shows, however, appeared far *better* in the flesh than they appeared on the home screen. At the time, BBC light entertainment (as opposed to BBC *heavy* entertainment) ran a very poor second - with less than 30% of the audience - to the glamorous

Curse of Wogan

The BBC vacated the TV Theatre in 1993 and as a parting gift they gave us Terry Wogan who, as we all know, finally killed the early evening chat show, (until the next time that is). Fortunately, the old Theatre avoided the fate of some other BBC premises (ie: converted into ghastly theme studios, or worse, total demolition). The Theatre has now reverted back (under new ownership) to its original incarnation as a 'live' venue for performances of all kinds, including trumpet involuntary and busking for matches.

New Cable Preparation Tools for Reliable On-Site Cable Preparation

New automated tools give consistent cable preparation in just 10 seconds.

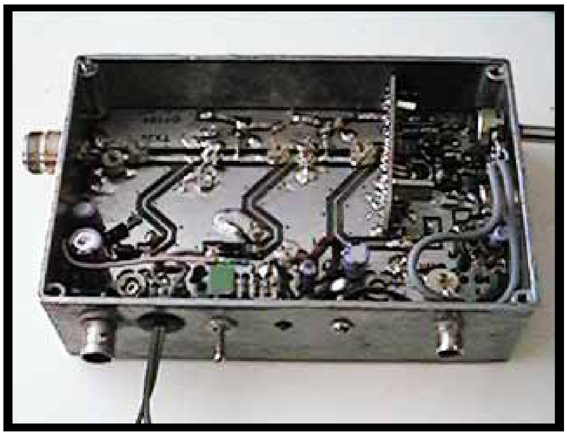
16th October 1998 - Andrew introduces EASIAX? PLUS automated cable preparation tools for 7/8-, 1-1/4- and 1-5/8-inch HELIAX coaxial cable. These new tools attach to an electric drill and quickly cut the cable jacket, outer conductor and foam core to give consistent and reliable on-site cable connections in 10 seconds or less.

EASIAX PLUS automated cable preparation tools create fast, efficient cable connections for Andrew Corporation's family of standard and RingFlare? connectors. The tools are made from aluminium for ease of handling, reduced weight and resistance to corrosion. Each tool has three cutting blades that provide approximately 300 cuts before they need to be changed. Replacement blade kits are available and cutting blades are easily replaced using the socket wrench included.

For further information contact Andrew and request bulletin number 10267 or visit the website at http://www.andrew.com.

Worthing & District Video Repeater Group

GB3VR GB3RV & GB7VRB



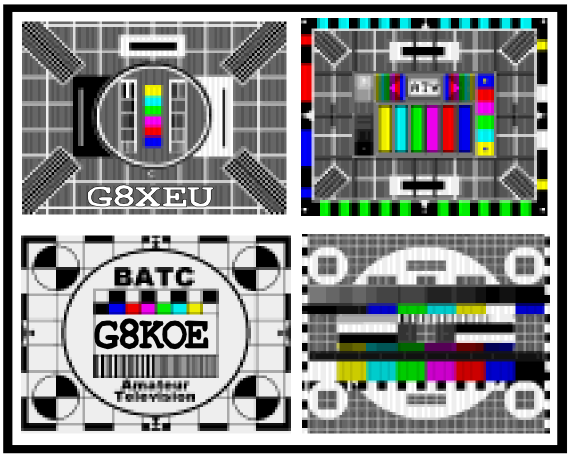
1Watt FM-TV 24cms Transmitter

The 1 watt transmitter generates its signal at the wanted frequency which can be set anywhere in the band, colour or B/W. On board intercarrier sound and fixed pre-emphasis are standard features. The kit includes the PCB all the on board components, pre-drilled heat sink, an Eddystone Di-cast box and full and comprehensive instructions. Building time is three evenings work. The new price for this kit is £80.00, P&P £2.50. Over 750 units sold to the Amateur market alone.

Two channel phased locked loop kit.

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

Amiga ATV Program-2



The New Amiga ATV program has more features than ever, up to 56 testcards, 20 wipes, superb text control, 30 screens of text messages, QRA calc, Testcard music, selectable displays, and this version has a DTMF tone pad to control your repeater. All testcards are over-scan i.e. the whole screen is used, Load in your own customised testcards, Extra large text, scrolling text, clock, callsign extensions, Hot key operation, Doc reader, ATV Cli, Cross Hatches, Purity and a comprehensive section for genlock users. For any Amiga with 1meg or more, state callsign and QRA (if known) when ordering, this three disk set is now only £10.00 P&P 75p

Spectrum ATV Program

Still selling after all these years, why, its good, its cheap and it works on all spectrum based machines. The 48k version has over 60 commands which include 7 Testcards, Memo pad, clock, maps, tones, QRA locator, various size printing, plus disk transfer routines and much more. Now only £5.00 P&P 75p

Visit the all new GB3VR-RV web site at: - http://www.g8koe.demon.co.uk/

Orders should be sent to:-

Treasurer of GB3VR, R. Stephens, 21 St. James Ave., Lancing, Sussex, BN15 0NN. Cheques payable to "W&DVRG" Tel (01903) 765760, 7 to 8pm.

Oscillators Using Logic Gates

By Graham Baker, ZL1TOF

A while ago I measured the line timebase frequency on the Auckland amateur TV beacon and found it to be about 312 parts per million (ppm) low. On the same day I tried my Tandata Td4000 and found the line timebase to be 624 ppm low. Amateurs commonly use the Td4000 to provide test patterns and reports on their television transmissions.

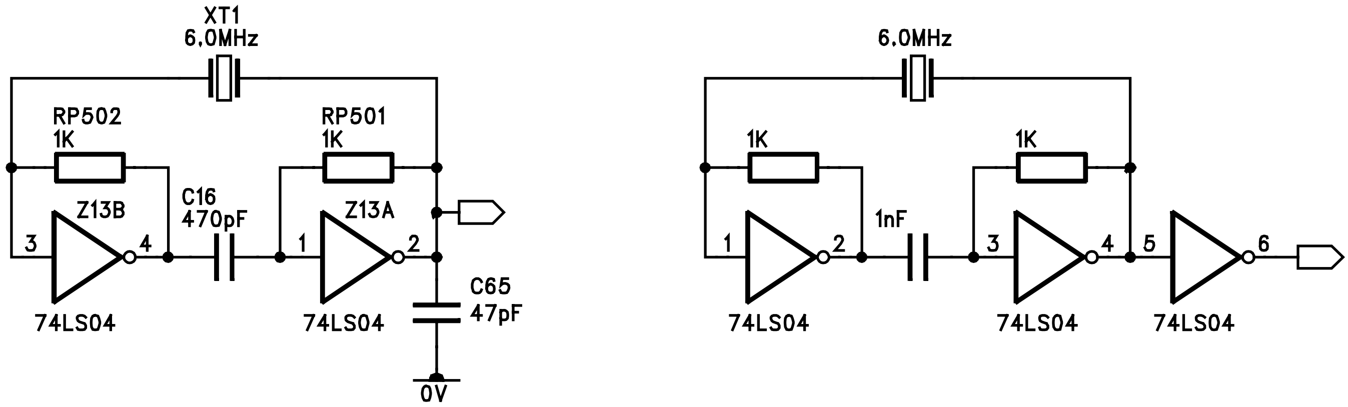


Figure 1. Oscillators: Left - Tandata, Right -Teletext.

When the video in TV transmissions is very close to the correct frequency and has the correct number of lines per field more information can be recovered. The timebase may be locally generated to lock the display to the received signal. This means that during contests, reports may be given for signals much closer to the noise floor and thus greater distance for the available transmitter power. Digital signal processing (DSP) may be used to average a noisy signal to reduce the noise. Video recordings of very weak signals are possible with local synchronisation.

To measure the line timebase frequency I use a counter calibrator[1] fed noise free video or a 15 kHz aerial inductively coupled to the line deflection of a TV receiver receiving the broadcast being investigated. The counter calibrator has a 10 MHz output that is measured by a frequency counter. Normally the counter calibrator is used to determine the frequency counter offset error and may be used as the timebase for a suitable counter. This method gives better than ± 0.001 ppm when using TV1, TV2 and Sky channels but not TV3, Max, ATV or Amateur TV - check out TV signals in your locality. When the signal is "far" off (> ± 30 ppm) frequency I use the 15 kHz aerial directly into the counter on multiple period mode to get better resolution (± 0.2 ppm for 7 second multiple period instead of ± 7 ppm for 10-second frequency).

At 6 MHz general-purpose crystals have a calibration tolerance of ± 30 ppm and a temperature stability of ± 50 ppm between -20 and +70°C. At room temperature, 25°C, I expect these oscillators to be within 30 ppm without adjustment[2]. The published oscillator designs for the Tandata Td4000[3] and the Teletext pattern generator[4] are shown in figure 1. Both designs use two 74LS04 buffers biased into their linear region by a 1 kΩ resistor from output to input of each gate and coupled as an oscillator with the crystal in the feedback path. The same type of circuit is widely used in personal computers.

Integrated Circuits (IC) were first developed by Texas Instruments in 1958 and by 1965 were being used in computers. IC logic gates quickly developed from the Resistor Transistor Logic (RTL) used in the first solid state computers of the early 60's to Diode Transistor Logic (DTL). When the input diodes were made as a transistor, the stored charge was quickly removed from following transistors providing increased speed for no extra cost. These gates are called Transistor Transistor Logic (TTL) and became available in 1964. Each manufacturer had a different numbering system for basically the same TTL gate, so an FJJ131 = DM8510 = SN7474!! Users demanded a rationalised type numbering system. Other improvements gave the H, L, S, LS, ALS, AS, and F varieties. The basic idea has not changed; outputs use a saturated switch to ground and a weak pull up, inputs have a weak pull up and a threshold of about 1.5 volts up from ground.

The first MOSFET ICs appeared in 1964 and since then they have continued to increase in popularity because of their high packing density, small power consumption, and low cost. In 1983, after a series of improvements, High Speed CMOS gates began replacing the common LSTTL and offered a turbo charged version of the original 4000 series CMOS. Two types are produced: HCT, with a LSTTL compatible input; and HC, with a CMOS compatible input and a threshold of about half supply. In 1986 the AC and ACT families with higher speed and power became available. Now the supply voltage and switching noise are being reduced while maintaining speed.

The earliest crystal oscillator design I can find uses two sections of a SN7400 quad TTL NAND gate for a frequency calibrator.[5] This design uses both input to output and input to ground resistors, R_f and R_b in figure 2. The references to this article refer to Texas Instruments 'Series 54 Crystal Controlled Oscillator' *The Network News*, No 102 (Dec. 1966). This looks like the source data for designing TTL crystal oscillators.

This design suffers from unreliable starting, which is largely a function of the two bias resistors and variation from gate to gate.[6] The crystal is hammered rather hard which causes high phase noise and long term drift and possible failure with fragile crystals. The frequency is trimmed with a capacitor in series with parallel resonant crystals. Series resonant crystals will be more or less on frequency without a capacitor. Power supply bypassing is essential - a 10nF capacitor directly between the IC power pins.

When the supply voltage increases slowly noise within the linear amplifier starts the oscillations. When the supply voltage rises quickly, with the CMOS logic gate in figure 2, R_f and C_{L2} form a delay from power application. When the gate threshold voltage is reached the output voltage begins a high to low transition. This is like the initial push you give yourself on a swing. The amplifier gain overcomes the losses and the oscillation builds up until clipping reduces the loop gain to unity.

The most detailed account I have seen of logic gate crystal oscillator design is an RCA application note.[7] This application note begins by stating the Barkhausen criteria for oscillation then gives a mathematical analysis of crystal characteristics and COS/MOS buffers in linear mode. The Philips Designer's Guide[8] gives some solutions for instability at higher frequencies where the amplifier phase shift is much less than 180^{o}.

The Pierce oscillator shown in figure 2 is a recommended replacement for those in figure 1. For 4000, HC and HCT series CMOS gates R_f is between 1 MΩ and 10 MΩ and R_b is not used. For frequencies up to about 4 MHz a resistor is used for X_s to increase the gate output resistance and reduce the drive level to the crystal. The resistor value is adjusted to provide between 4 and 5 volts peak to peak across C_{L2}. At higher frequencies a capacitor about the value of C_L is used. Scope the voltage across C_{L1} and C_{L2} - if these are not a smooth sine wave then instability is possible.

If you have to use LS gates I have found R_f = 10 kΩ and R_b = 4.7 kΩ works well. X_s is selected to give a peak to peak voltage of 2 to 3 volts and is a capacitor above about 8 MHz.

For an economy 4 MHz crystal with a specified load capacitance (C_L) of 30pF and maximum resonance resistance (R_r) of 75Ω. (These values are obtained from the crystal maker or estimated from statistical analysis of a measured sample of crystals).

$C_{L1} = C_{L2} = 2C_L$ less strays = 56pF.

If frequency adjustment is required the trimmer capacitor should have a maximum value of about 30% of C_{L2}. In the above example a 2 to 22pF trimmer would be used with a 47pF fixed capacitor.

For higher frequency oscillators a coil should be used in parallel with C_{L1} to make a tuned circuit at the required overtone frequency.

More detailed design would adjust the ratio of C_{L1} and C_{L2} to match the gain of the amplifier, and adjust X_s depending on the maximum value of R_r for the crystal. These calculations are beyond the scope of this article.

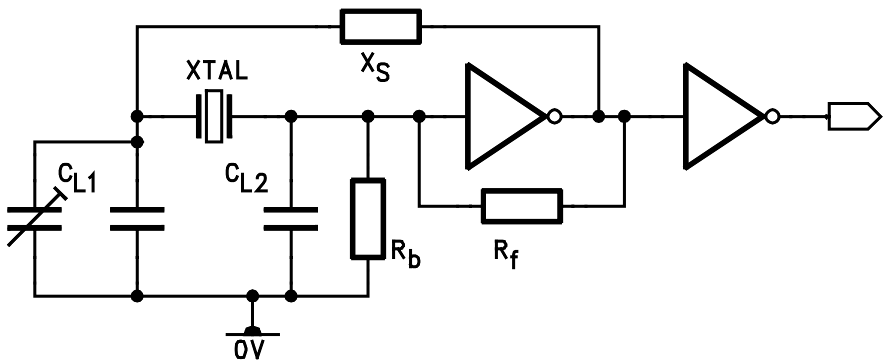


Figure 2, Improved oscillator design, see text for details.

Testing is very important. For a single oscillator test for reliable starting at the highest expected temperature and reduced voltage. At high voltage and low temperature check for uncontrolled or overtone operation. For a kit or production measure your prototype crystal R_r and increase it with an external series resistor to about 10% above the manufacturers R_r max figure then conduct starting tests.

The ARRL has published 'The Amateur's Code' for many years: 'The Radio Amateur is: ... Progressive with knowledge abreast of science, a well-built and efficient station and operation above reproach. ... - Paul M. Segal, W9EEA, 1928.'

We should keep this notion in mind when we design or re-engineer kits. In particular we should change digital circuits towards the new families for the benefits they offer - lower power consumption, greater tolerance to supply voltage variation, greater noise immunity, and lower noise radiation. Many IC manufactures have already or are planning to stop making the old logic families, so, new parts offer a much longer kit production life as well.

References:

1. Jim Rowe. 'Low Cost TV-Derived Frequency Reference'. *ELECTRONICS Australia*, October 1993, pg 58 ff & November 1993, pg 58 ff.
2. 'RAKON Quartz Crystals Product Guide'. c 1989.
3. 'Tandata Service Manual, LC2 Series'. Fisher & Paykel, December 1985.
4. Trevor Brown, G8CJS. 'Teletext Pattern Generator'. *The ATV Compendium*, ed. Mike Wooding, G6IQM, British Amateur Television Club, March 1989, pg 25 ff.
5. D.D.Schmitzer, DJ4BG. 'A Digital Calibration-Spectrum Generator'. *VHF Communications*. November 1971, Pg 196.
6. Roger Harrison, VK2ZTB. 'Survey of Crystal Oscillators'. *Ham Radio*, March 1976, pg 17 & 18.
7. S.S.Eaton. Application Note ICAN-6539 'Micropower Crystal-Controlled Oscillator Design Using RCA COS/MOS Inverters'. *Digital Integrated Circuits* - , RCA 1971.
8. Philips Electronic Components. 'Crystal Oscillators'. *Designer's Guide - High-speed CMOS*. Jan 1986, pg 113.

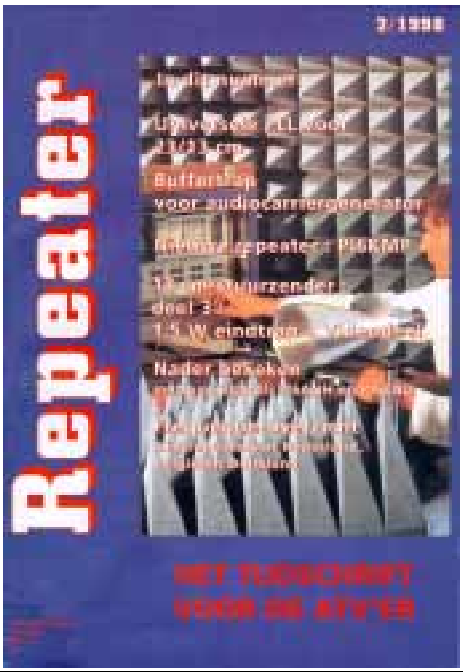
Shuttleworth 99

By Trevor Brown

The BATC was founded in 1949 by Mike Barlow and CQ-TV No. 1 was subsequently printed. Now we are in 1999 it means that we have been in existence for half a century, and in order to commemorate this special occasion we will be holding a rather unique event, *Shuttleworth 99*. This will be on Sunday 8th August 1999 at Shuttleworth College part of Cranfield University Nr.Bedford. (remember the venue of CAT 94)

The rear cover of this issue shows a picture of the college venue and inside the front cover is a map of how to get there. All members and guests are welcome. The event will include Lectures and Demonstrations on all topics of Television. Presentations of various awards, and of course the BATC BGM where the accounts for the year will be presented, a committee to run the Club for the next two years will be elected and any other business will be concluded

The Plans for the event are still unfolding, and I hope we can all make this an event to remember. If you have any different ideas, be it a demonstration, something you would like to discuss, or an award you think we should present then please contact Paul Marshall or myself Trevor Brown as soon as possible.



‘Repeater’ is the premier ATV magazine in Holland.

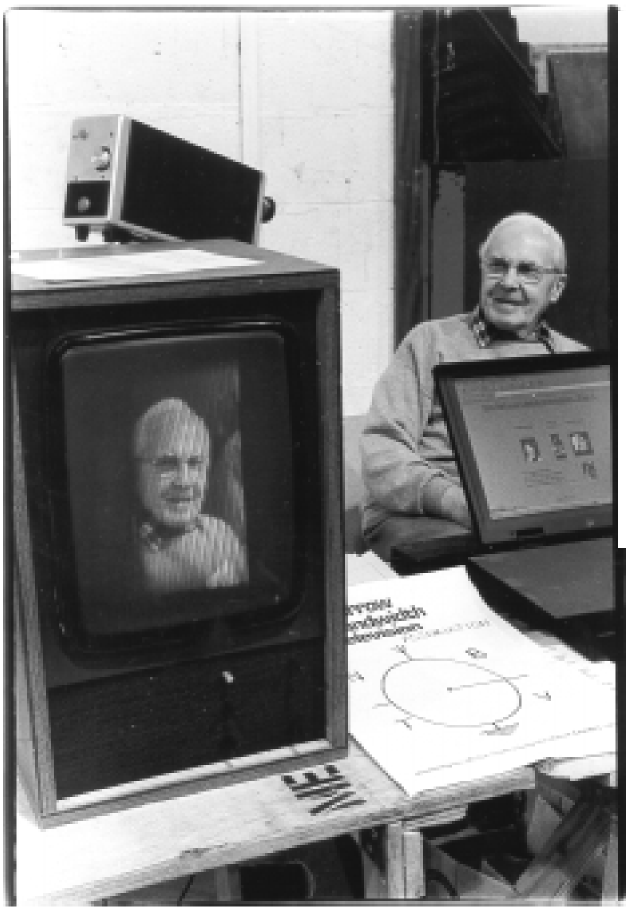
Repeater is a new ATV magazine published in the Netherlands in Dutch. The 13/24cms TX in this issue is reprinted from Repeater with the kind permission of the Editor Rob Ulrich PE1LBP. I hope we can from time to time bring you other extracts as we do with all the ATV magazines.

Information about ‘Repeater’ magazine can be found on their web site at http://www.euronet.nl/users/rulrich, email: repeater-nl@rocketmail.com

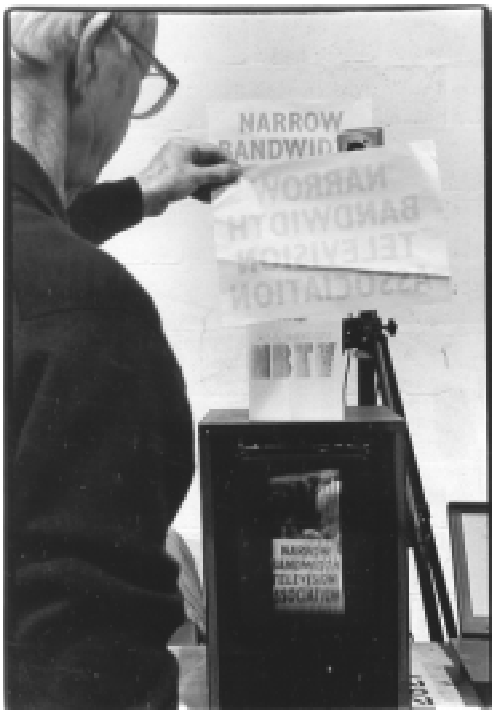
Snail mail:- Gibbon 14, 1704 WH Heerhugowaard, Netherlands.

Photo Gallery

On October 21st 1998, Grant Dixon was persuaded to climb to the top of the Emly Moor transmitter mast by our illustrious chairman who managed to find the time to take these photos.

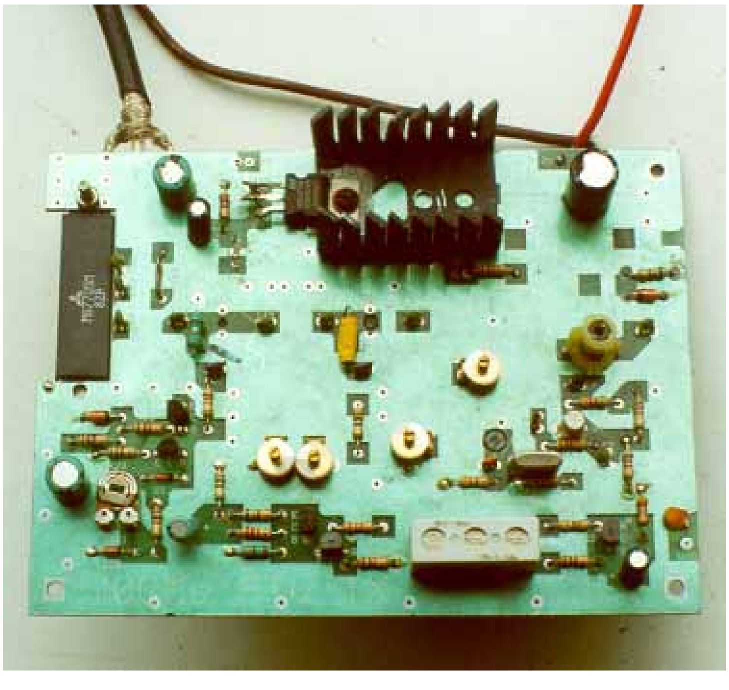


Left:- Large CRT display of signal from electronic camera built by Jeremy Jago as exhibited at the BATC Rally Subject is former Association President and web— master) C. Grant Dixon. This is a good example of a high signal/noise 32-line picture.



Above, right:- Doug Pitt dangles a rather creased paper poster before the camera. A rigid caption card with the camera properly focused would have given better results of course. All the same, the legibility is quite good when you consider that the minimum criterion for recognition of a *625* line picture is just four digits (BATC contest rules) (Photos by Jeremy Jago)

Two views of the dual Alford slot antenna used by the Beacons repeater groups' 1.3GHz ATV repeater. See 'TV on the Air' for more details.



Left: A 'Bob Platts' designed 70 cms transmitter.

Photos on this page by Grahan Hankins

Accuracy of Recovered H. P. 478A Thermistor Power Sensing Units

By George W. Allen, N1BEP

An attempt has been made to evaluate the accuracy of damaged HP 478 thermistor power sensing units. When these units are overpowered beyond a nominal 10 milliwatts, the resistance of the sensing thermistor pair changes and the units will no longer balance with the H. P. 432A power meter. The reference and sensing thermistors form two legs of a d. c. bridge circuit. As can be seen from Fig. 1, two thermistors in each leg of the bridge are in series to make a resistance of about 200ohms DC at balance. The sensing thermistors are in parallel for RF however, giving a nominal 50ohm RF impedance. When damaged, the resistance and the RF. impedance change somewhat. In two units tested, this resistance was reduced, and adding a series resistor to the sensing leg of the bridge enabled balancing the power meter. This resistance (Rx) was approximately 10 to 15ohms. (Fig.1)

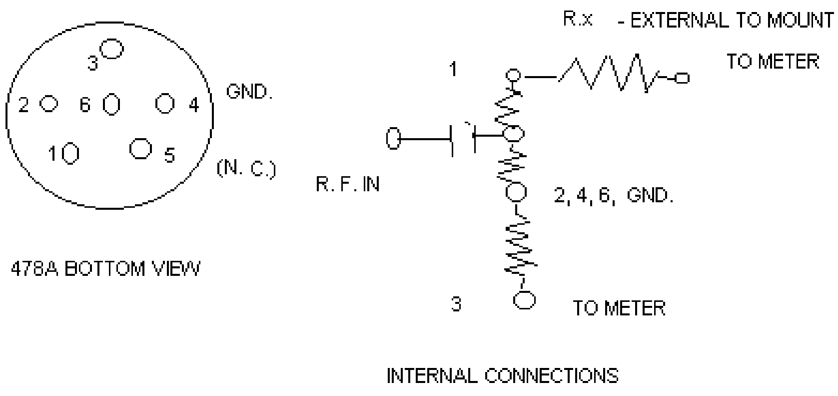


FIG. 1

Checking Power

The HP 432 meter uses a DC bridge which has an open circuit voltage of about 7.95 volts d. c. applied to each leg of the thermistor bridge. At balance, this drops to about 2.45volts DC on each leg and the current is about 10 milliamperes. By measuring the voltage across the series resistor (Rx), the current can be calculated, and by measuring the voltage across the sensing thermistors, the power can be calculated, (W = I x E.) This power is measured for zero input power to the sensing element, and again with RF power applied. The difference in DC power is equal to the RF power applied, which can be compared with the meter reading.

Results

Measurements were made at 10 MHz, 30 MHz, 1152 MHz, 3150 MHz and 10368 MHz. From 10 MHz through 3150 MHz the two power mounts read almost exactly the same RF power. Voltage measurements were taken at each frequency and the DC power was calculated for each unit, and then compared with the power meter scale reading. Heavy attenuation was used on each RF source to bring the impedance close to 50ohms

Frequency	Unit I	Unit II	DC meas.
10 MHz.	1.84 mw.	1.83 mw.	1.84 mw.
30 MHz	4.205 mw.	4.205 mw.	4.205 mw.
1152 MHz	2.0 mw.	2.0 mw.	2.0 mw.
3150 MHz.	7.0 mw.	7.0 mw.	7.0 mw.
10.3 GHz	5.0 mw.	5.0 mw.	5.05 mw.

Comparison Results

The results were surprising since both unit I and unit II has been damaged to the point where no balance could be obtained.

The DC and the comparison measurements are very consistent through 3150 MHz within measurement accuracy. Above 1152 MHz the measurements were very difficult because of drift and voltage measurements. It was necessary to use a bias reference voltage with a digital voltmeter to get reproducible results. It appears that the main effect with overpowering the heads may be with the RF impedance, which must have changed above 3 GHz. With the DC power measurements available, a correction factor can be made to thermistor mounts for each frequency of interest.

Conditions

Cables for these power meters are almost impossible to find, so a cable with connectors was fabricated. The cable length for each leg of the bridge was made equal by cutting a length of 3[a]wire electric cord and making sure that each leg was the same length. Some cables may be microphonic on the most sensitive scale of the meter. Since the measurements are DC, this worked to good accuracy. A precision resistor was used for the Rx resistance, and accurate voltage measurements were made, since the errors in the power calculation will multiply. The value of the series resistance was determined by setting the coarse zero of the 432A power meter (10-turn potentiometer) to midpoint, and zeroing the meter by adjusting the resistor in series with the sensing thermistors. The resulting value of resistance is used for the final fixed resistor.

Conclusions

With care damaged thermistor power mounts for the H. P. power meters can be recovered and used with reasonable accuracy.

The DC measurement technique is cited in literature for the HP power meters as a means of making measurements beyond the accuracy of the meter scale.

I'm sorry to say that I made an error in my article "Using Damaged Thermistor Power Mounts" (CQ-TV 184 page 31). The illustration (bottom view of the mount) and the resistor string diagram both have the connections "A" and "B" reversed. Damage to the two units tested caused the r. f. thermistors to be lowered, necessitating a series resistor to balance. George Allen, N1BEP.

Circuit Notebook No. 66

By John Lawrence GW3JGA

Recent editions of Circuit Notebook have covered the modification and use of the Maspro SRE-90R satellite receiver for the reception of 24cms ATV signals. The main advantages of this receiver are its good sensitivity and the ability to tune the sound section to 6 MHz from the remote control.

The receiver, when first switched on, comes up in stand-by mode. This is not a problem when using it in the shack, but it makes it unsuitable for use in an ATV Repeater where mains dropout is likely to occur.

GW3FDZ has provided this modification to overcome the problem and his circuit is shown in Fig. 1. GW3FDZ explains - After the application of power and the Maspro has loaded itself, the Standby LED comes on. This is now in series with the Opto-coupler that turns on and pulses the standby button through the 68µF capacitor, thus turning the receiver on. After that the Standby push button will work normally.

The 1N4148 diode ensures that any charge that might be in the capacitor, upon loss of mains input, will be discharged so that it will work correctly upon restoration of power.

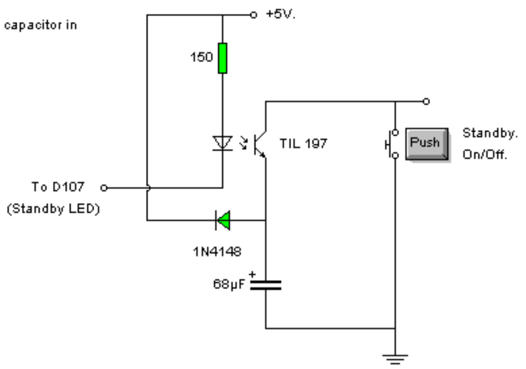
Modification.

On the front panel circuit board:-

1. Remove R122 that is connected between the Standby LED and +5V.
2. Connect the circuit shown in Fig. 1 below in place of R122.
3. Connect collector of TIL 197 and negative end of 68µF capacitor in parallel with Standby On/Off push button.

On front panel circuit board:-
Remove R122 (330R) which is connected between the Standby LED and +5V.
Connect below circuit in place of R122.
Connect collector of TIL 197 and negative end of 68mfd capacitor in parallel with Standby On/Off push button.

Auto Switch-on for Maspro SRE-90R



BBS Closure

By Brian Kelly, GW6BWX

Regrettably, the club BBS has had to close down. It has been out of action for a year now, since BT withdrew the telephone service. Since then all the accounts and mailboxes have been kept intact despite the £20.00 a month charge for doing so. It was expected that CableTel would have provided new telephone lines by now but their latest estimate for reaching Betwixt Mansions is "not for at least 12 months", a date that slips further into the future each time I call them. In view of the uncertain but distant restart date and the ongoing running costs, I have decided to close the UUCP mailbox accounts and call it a day. I have the complete BBS software and database backed up on CDs in case the situation changes favourably but I think this is quite unlikely. I can only offer apologies to those members who used the BBS regularly, I know that in excess of 7,000 e-mail messages were lost when the mailboxes were deleted. Many of the ATV files have been made available on the BATC CD but the vast majority of non-ATV related ones now only exist on the BBS backup tapes and CDs.

I would like to thank all those members and other BBS users who supported me throughout my fight with BT, unfortunately they won. It's a sad fact of life that little fishes like me don't stand a chance against big sharks like BT!

Brian Kelly. GW6BWX, (ex) SysOp of BetWiXt BBS.

Intuitive Circuits, LLC is very proud to announce four new inexpensive on-screen display products for Amateur Television! Here's one of them:-

OSD-ID (SA) is a standalone on-screen display id board that overlays user defined text onto an incoming NTSC video source. The text area consists of a 28 column by 11-row character grid. Every position on the 28 x 11 screen (308 characters total) can contain a user-selected character. OSD-ID doesn't require battery backup to retain its memory because all information is stored in a non-volatile EEPROM. The on-board four-button keypad allows users to program the screen with up/down/left/right cursor movements. An on-screen menu allows users to clear the screen, select the text triggering method, and toggle the translucent mode (a unique feature that allows video to pass through the text like the major networks do with their logos). The text triggering method is how, and when, the user defined character screen is displayed. $99 Other products include a "deluxe" id version, RS-232 interface version, and GPS version.

All products are in stock and ready for shipment. For detailed information including board photo's and screen shots or to place an order visit our web site at http://www.icircuits.com or call us at 00 1 248-524-1918. We can also be reached at sales@icircuits.com. We accept visa and master card. (Products will also be available through our dealer, P.C. Electronics, very soon).

TELETEXT Pattern Generator Improvements

By Graham Baker, ZL1TOF

After complaining about the local amateur TV repeater / beacon line timebase frequency being 312 ppm off frequency I got the job to put it right. Fortunately the TV repeater was built in modules most of which have one or more spares.

Line Timebase Frequency

I modified the first Teletext pattern generator module by putting a 27 pF capacitor in series with the 6 MHz crystal and returned it to service. Other work was done but that is the subject of another article. The second module was a little more difficult as the oscillator was unstable after a basic modification. So, I replaced the 74ALS04 with a 74HCU04 and built a circuit known to work reliably.[1]

75% Colour

I was asked to modify the video for 75% amplitude 100% saturated colour. This would then correspond to European Broadcasting Union (EBU) colour bar levels used widely for testing. Since the Teletext pattern generator modules use an MC1377 linear video encoder, it seemed possible to modify the video to the new standard. In a composite video signal the EBU colour bars have a special characteristic, the yellow and cyan chroma reach the same level as white, and red and blue reach down to the same level, see figure 1. It is easily possible to broadcast 100% amplitude 100% saturated colours, but this is uncommon.

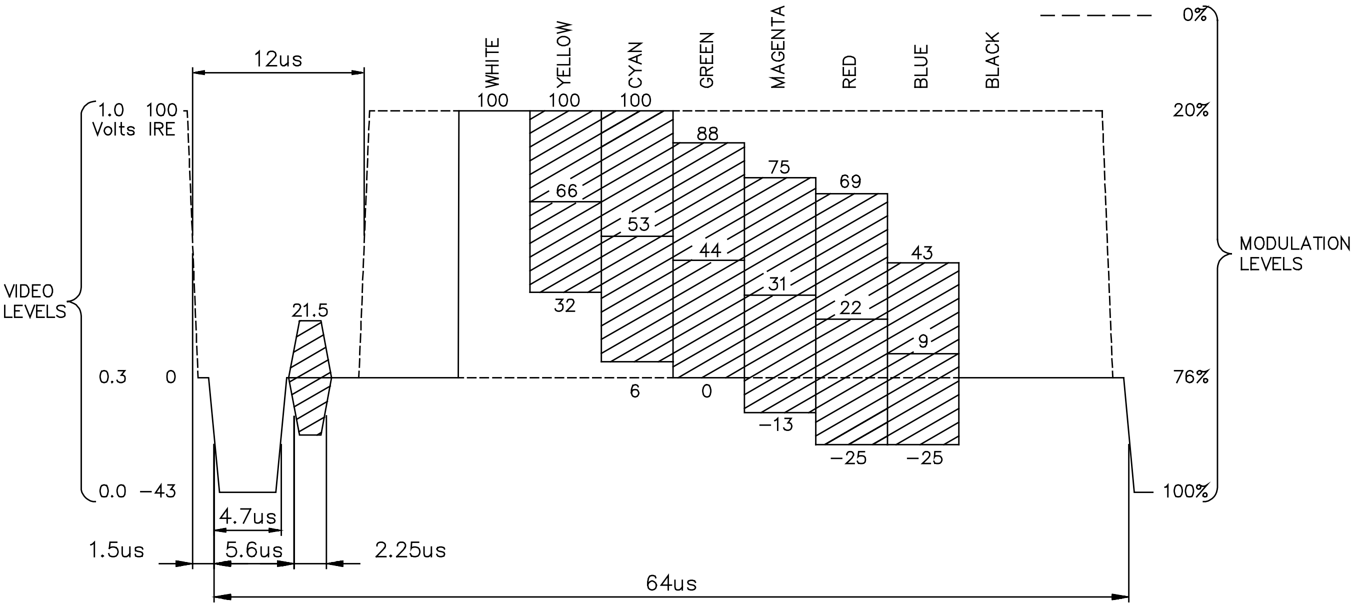


Figure 1. IRE Values of EBU Colour Bars for Composite PAL Video Signal (75% Amplitude 100% Saturation).

In New Zealand, according to NZS 6605:1988, we use television system B for VHF and G for UHF. New Zealand differs from strict characteristics of system B and G in that the sound carrier is displaced by 5.4996 MHz ± 0.5 kHz from the vision carrier, and the modulation levels are identical to those of system I. It is sensible to use this standard for amateur TV.

The article[2] about the Teletext pattern generator is ambiguous about the SAA5050 video outputs. Neither is absolutely correct - the Philips data sheet describes the outputs as open drain. To make 75% we need to make the analogue output 750mV for coloured parts and 1000 mv for white. It so happens that all outputs are high for white, all outputs low represents black, and any other combination represents a colour. I first thought of a system of diodes a bit like the old diode OR gate but realised that this was a bit complicated.

The final system is shown in figure 2. When all the FETs are off, resistors R4 to R8 and the RGB level setting pots form a voltage divider providing 1 volt at the sliders (the RGB output). The base - emitter junction of Q2 is slightly reverse biased. When any one FET is on, the regulator formed by Q1 and Q2

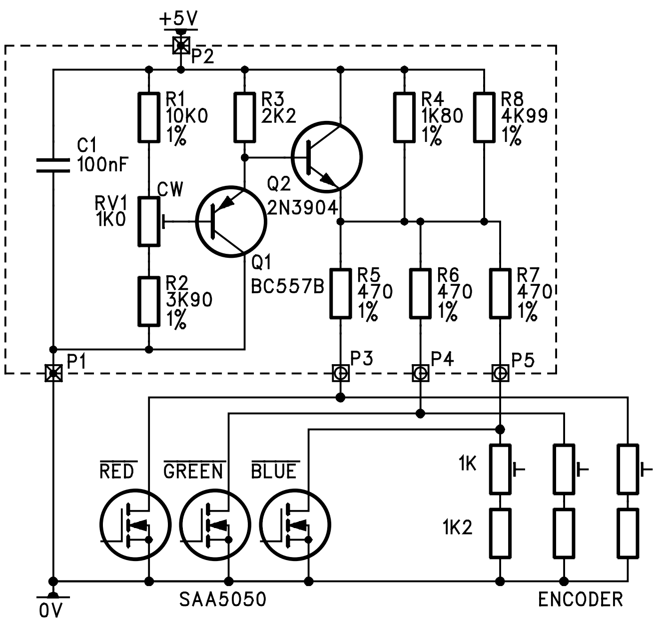


Figure 2. Teletext 75% Colour Adaptor.

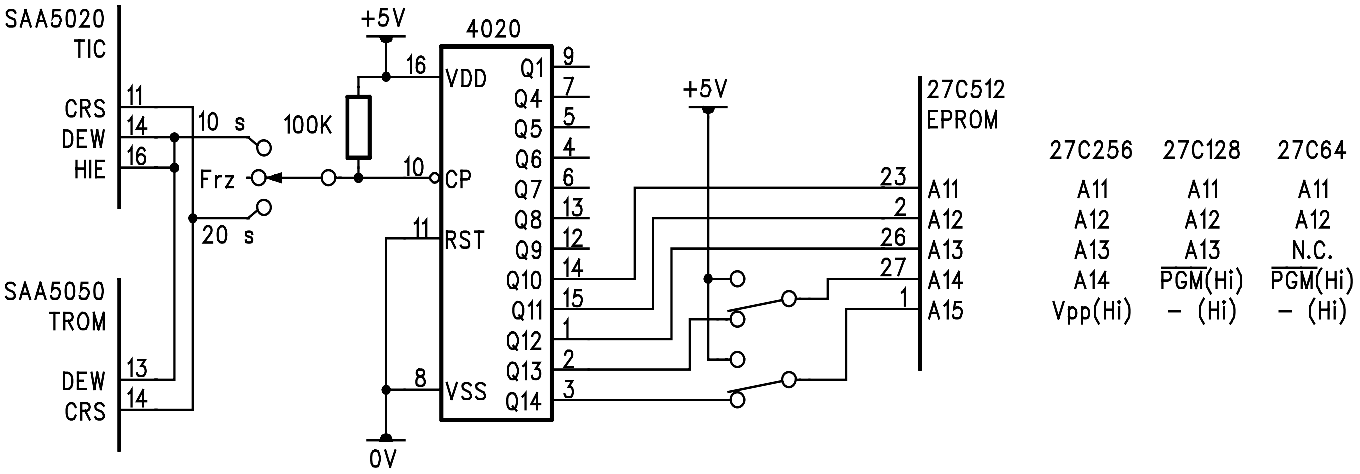


Figure 3. Teletext paging timer.

holds the voltage up to 750mV at the output. If two FETs are on, the regulator works a bit harder to keep the remaining output just below 750mV. The output resistance of Q2 causes the difference. I started with one transistor in the regulator, but, this made the temperature effect on the 75% level about 8% over the temperature range of 0 to 70 °C.

The component values have been chosen so the adjustments will be near the centre of their limited range. I have specified 1% metal film resistors but any high quality resistors will be satisfactory. The transistors are chosen for their similar die size to reduce temperature coefficient. Noise on the 5 volt supply finds its way on to the video signal through this circuit but no more than the original 100% amplitude design.

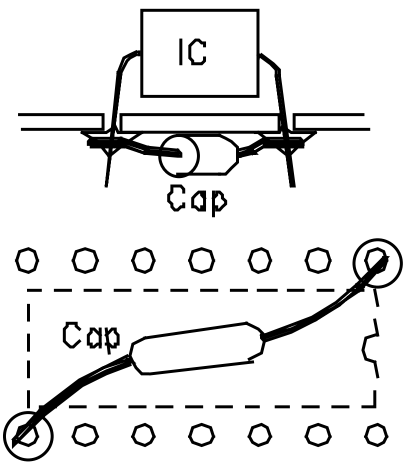


Figure 4. IC decoupling.

I made a special adapter PCB about 45 x 20 mm to fit the 75% colour circuit to the Teletext pattern generator card. The circuit could be made on strip board or could be added to a new revision of the Teletext card. Whatever you do, keep the wiring as short as necessary to reduce signal degradation and interference.

Adjustment will depend upon the encoder used. Basically: -

1. Set all the pots to the centre of their travel.

2. Adjust RGB pots to give 1 volt peak to peak at the input to the encoder.

3. Adjust RV1 to give 750 millivolts peak to peak on colours at the input to the encoder. This should be the same on all three channels.

Paging Timer

There have been a number of articles describing ways of adding paging to the Teletext pattern generator. The first uses a thumb-wheel switch to select the high order address of a large EPROM - good for the shack and as a test instrument. For beacon use, pages could be programmed with information about the radio club or whatever just like Teletext. A binary counter used to select the high order address automates page turning. The first uses a 4040 and a 555, a simpler and cheaper version uses a 4060.

I discovered two signals in the Teletext chipset that could be used with a 4020 counter to give further cost reduction and page switching on the vertical retrace, not that there is any interference from the random timers. A switch could be installed to select the paging speed (10 and 20 seconds). A 'centre off ' switch provides a page freeze function but a resistor is required on the open CMOS input to prevent continued counting on noise. This would be a good modification for the next revision of the Teletext card. Figure 3 shows the added circuit.

RFI / EMI Reduction

Finally, the Teletext pattern generator card used in our repeater /beacon has no provision for high frequency decoupling at the IC power and ground pins. This does not appear to be a problem on this design, but, standard practice is to fit 10 nF or 100 nF multi layer ceramic capacitors directly between the supply pins of each IC. Radio Frequency Interference (RFI) generation and reducing the loop area enclosed by the decoupling capacitor leads and IC internal wiring reduces susceptibility. IC sockets just add to the loop area. Coupling to the power/ground system is reduced if the capacitor is directly connected to the IC pins. I used axial capacitors fitted under the ICs as shown in figure 4.

References

1. Graham Baker, ZL1TOF. "Oscillators Using Logic Gates", SPECTRUM, July 1995.

2. Trevor Brown, G8CJS. 'Teletext Pattern Generator'. The ATV Compendium, ed. Mike Wooding, G6IQM, British Amateur Television Club, March 1989, pg 25 ff.

Note: SPECTRUM is the Auckland VHF Group monthly magazine.

Digital-ATV - today and tomorrow

First part of a series in the magazine TV-AMATEUR of AGAF (German ATV Club), written by Prof. Uwe Kraus, DJ8DW

Translation by Klaus Kramer, DL4KCK@t-online.de

Introduction

A lot of radio amateurs have been used to digital data transmission with a PC and radio for a long time, such as RTTY and Packet Radio.

The two level impulsive data signals from a digital machine are modulated onto the radio carrier by amplitude or frequency or phase or a combination of these. The result is a carrier with few discrete states. In the receiver the demodulated signal has corresponding discrete states accordingly. Because of bandwidth reductions necessary in the radio channel, the signal does not change rapidly from one state to the next but in a slower continuous way. The discrete, nearly constant, parts of the signal represent the valid information - the transitory parts carry no information. Sampling the valid signal parts and testing if the level is above or below one or more thresholds reconstructs the data, without counting how far from the threshold the signal is. Interference (noise peaks) just above or below the threshold are suppressed and the data signal is regenerated completely.

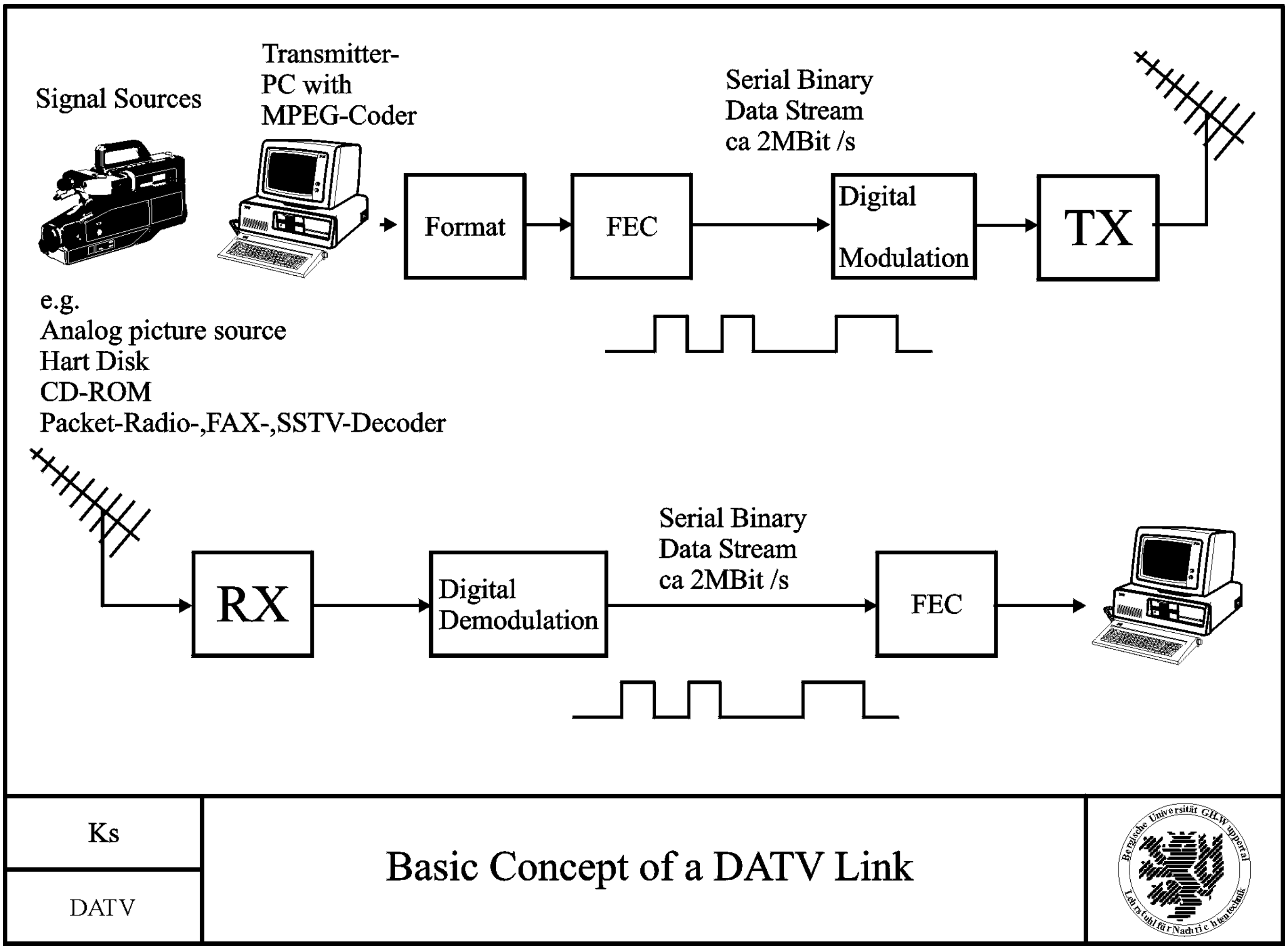
Sampling and thresholding are criteria of the robustness in digital transmissions. On the other hand, with analogue transmission interference in the channel cannot be removed, as the receiver is unable to distinguish between wanted signal and noise.

The advantages of digital transmission can be used for pure analogue signals (video and sound). At the transmitter end there is an A/D conversion and then a digital modulation onto the RF carrier; at the receiver end after reconstruction of the digital signal there is a D/A conversion and then reproduction on a screen and loudspeaker.

Digital transmission technology on voice signals has been state of the art with mobile communications for a long time; DAB (digital audio broadcasting) is being tested by public radio. With television, there are digital transmissions on satellite and cable world-wide, and digital modes of terrestrial broadcast that will remove the present analogue technology has recently begun.

After successful propagation of Packet Radio among amateurs the Digital Amateur Television (DATV) is the next big challenge. This mode is of course interesting to all who practised analogue ATV until now, but essential too for all who are experienced in PR, with PC and multimedia systems and who want to involve in this modern and futureful technology.

DATV shows a wide field of activity for the experimenting OM. This series of articles will try to give an



Basic Concept of a DATV Link

introduction to the new technology and then get to concrete circuit proposals. The author has been working on DATV with some others for more than three years now; in the autumn of 1995 the first still pictures were transmitted on the 70 cm band with 1.5Mbit/s over a 50 km distance. Some weeks ago we succeeded in transmitting digital test signals with 2Mbit/s on the 70 cm band with 15 Watt RF power into a 15 dB antenna over a 100 km distance. The quality of the regenerated data signals made us hopeful of being able to transmit digital video signals too.

On September 9th 1998 Prof. Uwe Kraus, DJ8DW, and his team succeeded in firstly transmitting moving colour pictures with sound via a digital amateur television link over a distance of 100 km with 2MHz bandwidth on 434MHz. The transmitter at the Bergische Universitaet in Wuppertal (near Cologne) sent 44 seconds of a car race from Video-CD in MPEG-1 using GMSK modulation via directional antennas to Someren in the Netherlands. There at the home QTH of DJ8DW the signal was received clearly in spite of rain on the way and was saved on hard disk (about 10 Mbytes); software decoding of MPEG-1 video and sound is possible under Windows 95/98.

Analogue ATV transmission

On the 70 cm band vestigial side band AM is used with an RF bandwidth of up to 7 MHz, so the band is nearly filled up. As some other modes with equal rights are located there, this huge bandwidth mode has no future here. On 23 cm and up, frequency modulation is used with a channel bandwidth of about 20 MHz, with similar considerations valid to 70 cm.

The advantage of analogue ATV is that it is based on familiar and reliable technology and is simple to start. The disadvantage lies in the big bandwidth, the high RF signal-to-noise ratio needed, the signal is susceptible to interference with low RF levels, and distorted signals cannot be regenerated. At multi-hop services (repeaters) the noise is multiplied.

DATV

Before involvement in any new technology it seems advisable to be clear about the goals and about the possible difficulties to overcome.

Targets for DATV:

- distinctive smaller bandwidth
- wider range with the same RF power and the same picture quality
- robust on channel interference
- spectrum shaping for minimal interference to other modes
- combination with other digital modes (i.e. high speed PR)
- combination with modern multimedia technologies

New key technologies

Data reduction on video and sound signals

Digitising of video and sound signals gives a data stream that needs considerably more channel bandwidth on direct transmission than analogue signals. Modern data reduction technologies make it possible to reduce digital data to such an amount that the required bandwidth is far narrower than the original analogue bandwidth with similar or even better picture quality. Very high reduction factors give a loss in quality, of course. World-wide standards for moving pictures are MPEG-1 and MPEG-2. MPEG-1 gives the well-known Video-CD quality with a 1.5Mbit/s data stream that is really sufficient for DATV, at the start at least. MPEG-2 is used for higher quality television broadcast facilities.

There are hardware modules for real-time data reduction in MPEG-1 which are put into the parallel port of a PC and are able to process PAL video signals from a normal analogue source. In the future it would be desirable to have a solution without a PC.

Error correction coding

If the threshold in the digital decoder of the receiver is crossed irregularly by a noise peak we get a wrong decision. The amount of wrong decisions compared with the sum of all decisions, the error rate, depends upon the signal-to-noise ratio and affects the received signal quality. Digital technology provides error correction coding that is not possible with analogue technology. To the wanted signal data stream are added some correction data derived from the wanted data. This increases the overall data rate and the required RF bandwidth, but it makes possible for the receiver to detect and correct errors for the most part.

Digital modulation on the RF carrier

There are different procedures to be explained later and examined for their usefulness for DATV.

Channel correction.

Multipath reception causes distortion by reflections from mountains and buildings and leads to overlays of differently timed signals at the receiving antenna. With analogue transmission ghosting (double images) would appear, with digital transmission the received sum signal would be rendered useless without correction efforts. The channel correction circuit contains a digital filter that optimises its transfer characteristic automatically and cancels the signal distortions. In many cases “training sequences” are added to the transmitted signal, which are known to the receiver. Comparing the received distorted sequence to the nominal sequence the receiver is able to adjust the correction filter in the best possible way and react to the varying conditions.

Historical Achievement for Amateur Radio and the Mir Space Station!

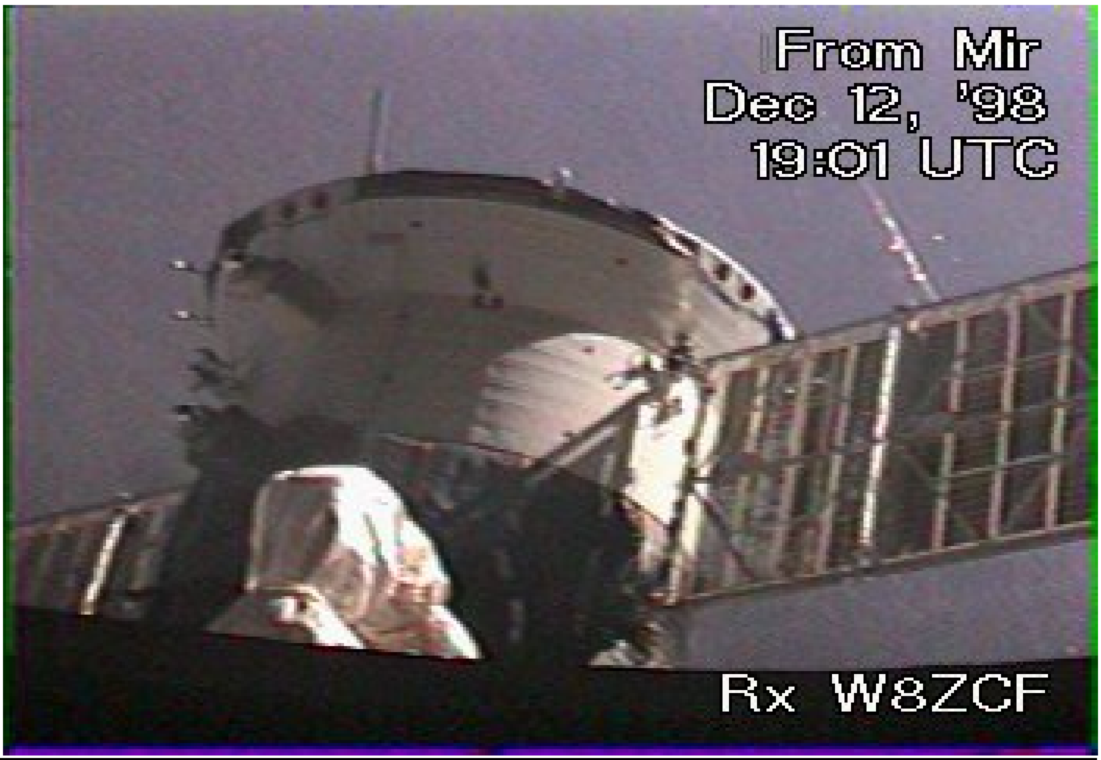
By Don Miller, W9NTP

The rewards of success are now a reality for a group of Experimental Amateur Radio Operators and are currently being shared around the world!

Almost 2 years ago an idea was discussed among Don Miller, W9NTP, Farrell Winder, W8ZCF, Hank Cantrell, W4HTB, Dave Larsen, N6CO and Miles Mann, WF1F, about the possibility of putting a small, lightweight Amateur Radio SSTV System aboard the Mir Space Station.
On Saturday, Dec 12, 1998 exciting rewards were received after obtaining, assembling and getting the equipment aboard Mir. Beginning around 17:25 UTC a series of perfect pictures were recorded, 3 of which are shown here:

The 1st picture shows Cosmonaut Gennady Padalka (Flight Engineer aboard Mir) with the SSTV equipment in the background. This equipment was sponsored by Tasco Electronics, Kenwood Corp, PictureTel Corp, Apple Computer, and assembled by W9NTP, W8ZCF and W4HTB .

The 2nd picture shows both Flight Engineer Gennady Padalka and Commander Sergej Andeyev aboard Mir in front of the camera.



The last shot is a typical picture being received from the Piroda Module showing a part of Mir and the Earth in the background. A very detailed history and narrative of the evolution and progress of this story can be found at the MAREX(NA) web at: http://www.geocities.com/CapeCanaveral/Hangar/7355/sstv_proj.htm

Initial tests were set up on 145.985 MHz FM, being shared with the Mir PMS frequency. At the conclusion of tests, the frequency set aside for SSTV from Mir is 437.975 MHz(+/- Doppler). SSTV Mode is Robot 36, pictures every 2 minutes, with the possibility of 720 pictures/day.

Earth Stations should now be able to become closely aquainted with the Mir Space Station and share in the excitement of receiving pictures from Outer Space. Schools who schedule contacts with Mir will especially benefit in educational aspects by being able to see who is actually speaking to them.

Left: picture 1, above: picture 2.

Post and News

Please send all correspondence for **Post and News** to the CQ-TV Editor. Ian Pawson, 14 Lilac Avenue, Leicester, LE5 1FN, England.

Tel: 0116 276 9425.

E-mail editor@batc.org.uk

Members sales and wants should be sent to the editor at the above address.

Trade adverts should be sent to the advertising manager,

Chris Smith,

E-mail adman@batc.org.uk

Dear Ian,

I have just put up a new ATV repeater here just north of Brisbane in Australia 1250 FM input and 426.250 VSB output We have 50watts output into 2 horizontally polarised folded dipoles and works extremely well considering. I am some 50km from the site and can get it P5 and most ppl within 50km can get it at that level. We are currently making 2 of the 4 bay 1250 panel antennas in the BATC book #182 to be used as the receive antennas as we really only have about a 180 deg look angle from the site and only about 20km straight out at 90 deg to cover so we hope to get enough off the side of the 2 panels to cover most ppl here. The repeaters callsign is VK4RKC

Regards, Mark Kyle, VK4KZK

From the Internet

While surfing the web earlier tonight I came across a fantastic new TV and

FM DX site from Finland. It can be found at; http://www.sci.fi/~bkl/ and yes there's loads of European tv logos, testcards etc on it! ... and another one, this time from the Netherlands. This one's at http://www.cybercomm.nl/~hpl/index.htm and not only features a Test Card Gallery but also lots of transmitter/frequency lists and links.

New websites (from Andy Emmerson

A superb history of early broadcast video technology can be found at the address http://www.dmg.co.uk/ibex/museum/

Contents include Magnetic Recording Development Prior to 1956, VERA: An Experimental Broadcast VTR, The Development of Ampex Quadruplex and Helical Scan: the Early Years.

Steve Ostler (of Radiocraft and Retrovisor fame) now has a website. Clicking on. http://www.users.globalnet.co.uk/~vytek/vintage%20television.htm will take you to a superbly illustrated treatment of vintage television and don't forget to click on the 'More Info' button as well.

I have just redone the LIST of ATV'ers located at:-

http://www.stevens.com/atvq

It is now in PDF format and contains ATV'ers from all over the world, not just the USA. The file is large, 577K, so will take a little download time. Make sure to turn on BOOKMARKS after you have the file on your screen, as you can jump to any country or state by clicking on a bookmark. If ANYONE wants his or her name not published, make sure you tell me and I will take it off. It goes if you want it on and it is not or if there are any errors. Thanks for everyone's support! It's great working with such a great bunch of people! Gene Harlan - WB9MMM, ATVQ magazine.

Just look what our American neighbours get up to (and who said that 70cm ATV was dead?)...

This is to alert you all to a balloon flight that will be flown to look at the Leonid Meteor Storm that will be happening on November 17th. As a result it will be an unusual NIGHT flight....or rather a "wee hour of the morning flight". There will be an light intensified camera onboard to look at the meteor trails from the stratosphere

and will be carried aloft by a 3000 gram balloon (which may reach as high as 120,000 feet.

Onboard:

426.25 MHz ATV (horizontal) KE4ROC callsign - you'll see stars, meteors and his callsign overlay periodically

144.39 MHz APRS packet GPS - also check out http://www.aprs.net for live tracking or your usual web site or on air APRS frequencies.

28.322 MHz (or 28.800 MHz) CW....a series of fast continual beeps to track on...

NOTE: if you are close in, you can use the 5th harmonic of the 10 meter signal to track into the balloon payload...either 141.61 MHz (for 28.322) or 144.000 (for 28.800). There will be a web site offered through the Marshall NASA pages that I'll email to you before the flight. it will show the digitized images coming down from the balloon.

Lift off time is 2:30 AM EST early in the wee hours of Tuesday morning, Nov 17th. Flight duration will be about 3 hours....landing expected around 5 or 5:30am EST. Preliminary landing site prediction: 40 miles north of Atlanta.

73s de Bill WB8ELK

Contributions

If you have any snippets of news or information, then please send them in to my the editor either by snail mail or email

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To anyone, a Heathkit O-12-U oscilloscope including build specification and circuits. When last powered up the spot was the size of a golfball! Also an Advance OS2200A storage oscilloscope with instruction manual and circuits. This unit is faulty and will need a bit of work to get going. Could possibly deliver if not too far from Eltham in S.E. London. ***Stephen McGuigan G8MFI E-Mail:*** gigamunc@clara.net

For Sale

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JVC GRS707 S-VHS-C camcorder, auto & manual everything, complete with 4 batteries, discharger, and hard case. £500 Olympus VX-303 camera, with separate VHS recorder (12v), and separate tuner. £115 (ish) Merlin vision mixer, 2 built-in frame-stores, needs attention. £150 Panasonic Character Generator VW-CG1E, designed to mount on a camcorder and connects between the viewfinder and camcorder itself, also has BNC in & outs. £15 Marconi picture/waveform monitor, Big and Old, £1. Buyer collects! ***Contact Jeremy Power G1WVK (01442) 384716. E-Mail jjpower@media68.nildram.co.uk***

Complete fully operational 70cms ATV system consisting of:- VHF Comm ATV-7010 ten watt Vestigial sideband Vision transmitter with 6.0Mhz fm sound channel. (Uses low level modulation for sound and vision.) Microwave Modules MML 432/100 linear 100 watt amplifier. R.N.Electronics inline masthead GaAs FET Pre-Amplifier. Microwave Modules up converter from 70cms to Channel 37 UHF TV band. Two, twenty one element Tonna 70cms antennas. One thirteen element 70cms antenna. £299.00. Buyer collects. ***Contact Derek Whitehead, GW3FDZ on 01 341 247343 after 6.00PM or Email*** dgwhite@enterprise.net

JVC GC-3300E colour camera with zoom lens and Power supply unit. Complete, but faulty (EHT?). No investigation of fault or attempt to repair, since fault developed. Boxed. Free to anyone who waould like to pick it up or pay carriage. ***Contact Colin Redwood, G6MXL. Tel 01202 665284 or Email colin.redwood@lineone.net***

JVC 707 Camcorder King of S-VHS

complete with accessories and three batteries - immaculate. All functions manual or auto (including time lapse!). I have two on offer with instruction books (one is boxed) £425 or £750 for the pair. Ideal for studio cameras. Panasonic VMX50 video/audio mixer (boxed with manual)- brilliant £1500 ***Contact Keith Friday on 01203 502500 after 6:30 open to sensible offers***.

Radio and Television Servicing manuals published by MacDonalds. Complete set from volume 1 to volume 1086-1087. All in excellent condition, most of them completely unused. Sensible offers please for the complete set. Regret that we cannot split the set. ***Contact Dave Edwards, G8NEO on 01263 513640 (tel / fax) anytime.***

Wanted

Wanted: ZNA234E, ***contact Peter Waugh on 01691 718597***

Collector of CCD imager IC's would like to obtain obsolete or dead CCD's for small collection. Anyone else interested in collecting these?, please contact me: - ***Robert Norris, 01252-674941 Emali:vision.engineering@net.ntl.com***

10 GHz transverter suitable for upconverting a 145 MHz FM TV IF to 10 GHz. Exact input frquency not critical but output must be crystal controlled. ***Contact Ian Bennett G6TVJ Tel 0117 9793883 E-mail ian.bennett@cableinet.co.uk***

Used (but not TOO much) U-Matic tapes for portable Sony VO 4800 etc. ***Contact Dicky Howett 01245 441811. Email: dicky.howett@btinternet.com***

Service manuals for a Panasonic WJ 5500W/B special effects generator and a JVC JX-SV77 video editting processor. Please contact Phil Marrison on 01283 790747 (phone / fax) if you can help.

I collect calculators - If you have any old calculators, any type - any condition, working or not. Manuals, books about calculators, etc. ***Please get in touch: Anthony King Tel: 0161 231 2024***

STOP! Before you throw away that old (15-20yrs) Sony Trinitron RX/Monitor, please check and see if it has an IC marked "Sony 104A" in it. It has 18 pins and a heatsink tab at one end, and is the sync sep/line/frame osc etc. I need one! Also wanted please, Gen-lock adapter type AD36E for Panasonic F10 camera. Valves:- type ECL85/6GV6, and E810F / 7788 for my Tektronics monitorscope.

Circuit/manual for ACE PAL CODER. (single large PCB in deep 1U rack). ***Chris, G8GHH. 01843 224700. Eves. Or Email*** chrisg@icomuk.co.uk

WANTED: Canon EP-3 audio connectors (same size as EP-4 mains connector but with three pins), four male and four female for cable (not chassis) mounting. Also two Pye/Power Controls connectors (four female contacts in cast aluminium 'Toblerone' housing). ***Andy Emmerson G8PTH, 71 Falcutt Way, Northampton, NN2 8PH. Telephone 01604-844130.***

Can anybody tell me the equivalent UK Panasonic model number of a continental VCR N9003T? It is the hi-fi version fitted with 220V transformer and two-pin mains plug. I wish to replace the head but the part number is partially rubbed away and head suppliers and National Panasonic do not know which model it could be. ***Contact Brian Theedom, G8LYW, 83 Caulfield Road, Shoeburyness,Essex, SS3 9LP.***

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