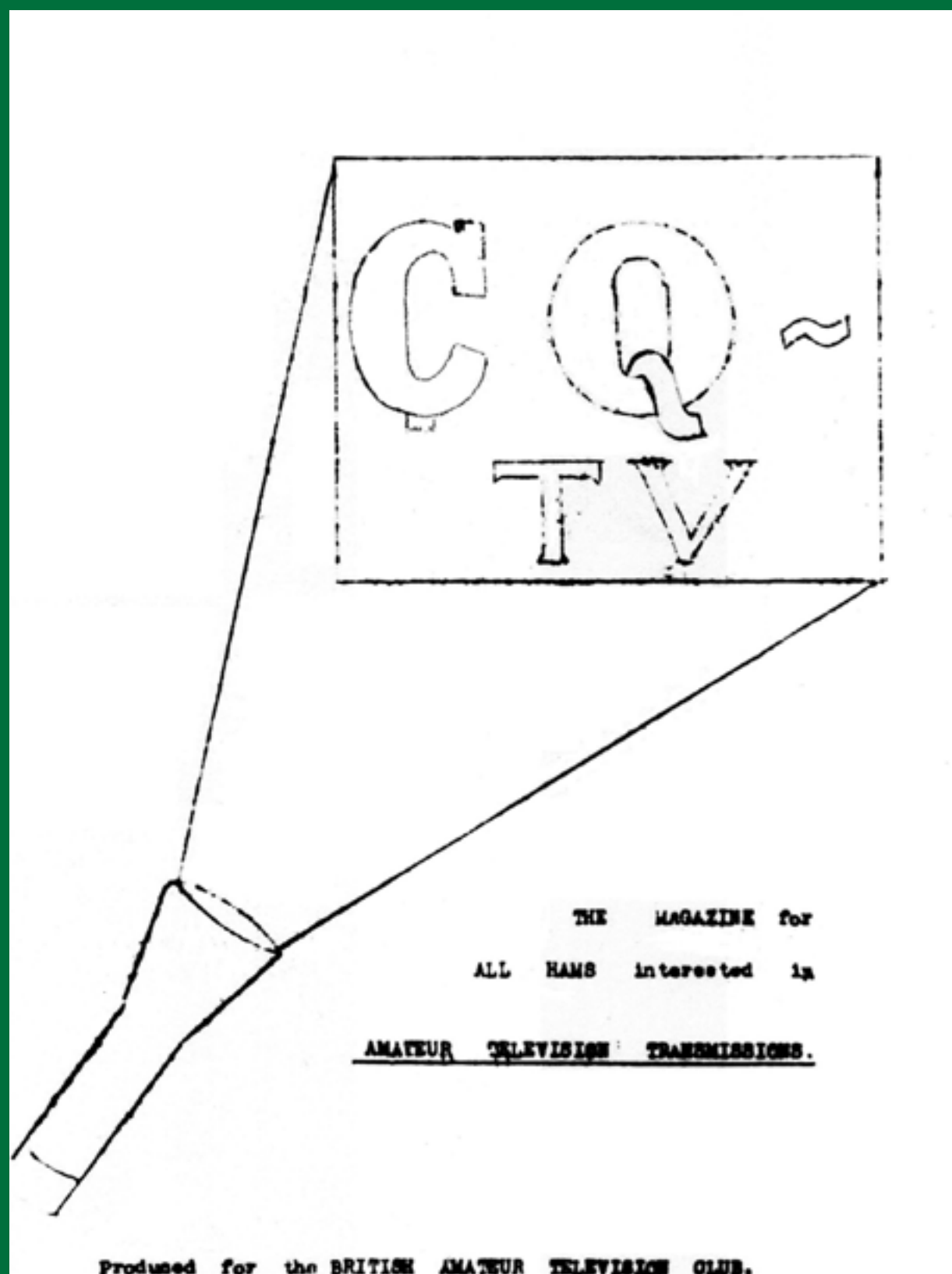




# CQ-TV

# 226



# PIC On Screen Display Project Board




- 4 text pages
- Real time clock
- Counter input
- PS/2 connection
- UK or US key layout
- Colour / mono video
- PAL and NTSC
- Board only option

The BlackBoxCamera™ Company Ltd. sponsors the CQ-TV caption competition. The winner will receive a keyboard text overlay unit.

## GPS video overlay units

Display GPS data on any composite video signal






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## Caption Contest

Here are the entries for last issues picture (shown below):

“Surely with all this equipment I should be able to find someone to work?” David G8TNE

“I see birds, winged ones of course.” Brian a G3KJX

“Are you sure the contest is NEXT weekend?” Bill Shepherd PA3FDK



“Having four spare antennas seemed like a good idea but failed to make up for forgetting to bring the radio.” Don Hill, KE6BXT

and the winner is..... David (G8TNE), congratulations - a caption generator will be on its way shortly. Please send in your suggestions for the image below, by email to [editor@cq-tv.com](mailto:editor@cq-tv.com) or by post (see committee contacts for address)



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E-mail: [publications@batc.org.uk](mailto:publications@batc.org.uk)

## Advertising Rates

Size	Mono	Colour
Quarter page	£45	£75
Half page	£90	£125
Full page	£150	£200

**Discounts available for multiple issues.**  
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## Deadlines

CQ-TV is published quarterly in February, May, August and November each year. The deadlines for each issue are as follows: -

February	-	please submit by	December	31st
May	-	please submit by	March	31st
August	-	please submit by	June	30th
November	-	please submit by	September	30th

Please send your contributions in as soon as you can prior to this date. Don't wait for the deadline if you have something to publish as the longer we have your article, the easier it is for us to prepare the page layouts. If you have pictures that you want including in your article, please send them, in the highest possible quality, as separate files. Pictures already embedded in a page are difficult to extract at high quality but if you want to demonstrate your preferred layout, a sample of your finished work with pictures in place is welcomed. Please note the implications of submitting an article which are detailed on the contents page.



# Editors Preamble

In case you were wondering, the front cover is a copy of the very first CQ-TV ever to be produced, 60 years ago. It just got better and bigger from that point on, but it seems that we have peaked and the future doesn't look as rosy as it could be for CQ-TV, and the reason? Well, to put it bluntly - You, the reader!

Let me explain: CQ-TV has always been a magazine to communicate news and ideas about ATV to like minded individuals, so we can all share new ideas, circuits, hints and tips, etc. When I did this job over ten years ago you, the members, would send in so much interesting copy that I was spoilt for choice and often had to discard the (slightly) less interesting copy - CQ-TV was packed with good stuff.

Nowadays it is a different story, there has been a steady decline in copy for CQ-TV from the membership, each quarter it gets more and more difficult to fill the pages and it takes longer, so this May edition won't hit your doormats until June.

We have nearly 800 members (792 when I looked last), that's 792 people that are interested in ATV in one form or another, surely some of you could put pen to paper, or fingers to keyboard and send me something that other ATV enthusiasts would find interesting? Even if you're not convinced it is worthy of inclusion in CQ-TV, I would rather have the choice of discarding material because I have too much than scrabbling around trying to fill the pages of your magazine.

So please, if you buy something interesting, make something, manage a contact with someone you've not worked before, have a question, have an answer - if it's related to ATV in any way, let me know. Drop me an email, write me a letter, FTP an article - whatever, because if you don't, no-one else will and your magazine will cease to be the interesting publication that it has managed to be to date.

I'm the editor, but if I have nothing to edit, I can't produce a magazine for you.

I hope you enjoy CQ-TV 226, it has a lot more in it than usual, I had problems fitting in the contents table it was so long! There are more articles, but each is shorter than usual - some of them were written by volunteers at the last minute and I am particularly grateful to Brian Kelly, Brian Summers, John Lawrence Paul Marshall and Bob Robson for their last minute efforts!

I have asked the printers to get it on your doormats as soon as they possibly can and in particular I hope it arrives before the weekend of our 60th anniversary celebrations on the 13th and 14th June.

Speaking of which, I hope lots of you will be attending and I am looking forward to meeting you all there (yes I will be accepting articles for publication over the weekend!!)

73 de G1FEF

Chris Smith

[editor@batc.org.uk](mailto:editor@batc.org.uk)



We have produced a DVD containing electronic versions of CQ-TV and the CQ-TV articles index. Also included are electronic versions of our three most recent handbooks, 'Slow Scan Television Explained', 'Amateur Television Handbook' and 'An Introduction to Amateur Television' as well as the Lighting eBook.

The archive contains all past issues of CQ-TV and is updated 4 times a year, to include the current issue of CQ-TV.

The DVD is playable in a standard (domestic) DVD player (and on a PC with a DVD player) and the data files will 'auto-run' when the DVD is put into a PC.

The video section was prepared by Brian Kelly and contains videos from Bletchley Park 1999, one from Shuttleworth 2002 and one from 2004. The DVD is available to members for just £5 inc. postage to the UK and EEC.

[http://www.batc.org.uk/club\\_stuff/pubs.html](http://www.batc.org.uk/club_stuff/pubs.html)

Note: This DVD is supplied on +R media only.

# Chairman's Column

by TYrevor Brown, G8CJS

So we have reached the grand old age of 60 our numbers may have been higher, but is that how you judge the success of a club by the number of members? I think not. Being a technology based club I also suspect we have seen more change than many other organisations of our size.

When I joined the club the first issue of CQ-TV to fall on my mat was CQ-TV 68, 17 pages including circuit notebook no1, history in the making, and circuit notebook 2 in the same magazine. The late Gordon Sharpley also started to explain logic, but I am afraid that was well over my head at the time. There was also an apology for the increase in subscription charges which were now £1 per year.

By issue 74 Dave Lawton was building Electronic Caption generators, and I felt the pace was moving quicker than my learning process. I did apply for an ATV license and became G6AGM/T. I still have the call sign badge, if I can find it I will wear it for the 60th, I notice Dave Lawton was G6ABE/T, obviously been there long before me. By CQ-TV 75 Arthur Critchley was using TTL logic to build Sync pulse generators, digital engineering was not going to go away and I had to get to grips with it, I did and I built his TTL SPG, this

was also my first attempt at making a PCB, it was lot of work just to get black, I cannot even say black and burst as it was monochrome. What I needed was a picture or test signal to sit on this digitally generated black, and this was going to be my own work, well almost. The test signal was a cruciform (black cross on a white background) used to detect poor LF response among other things, but the problem with my unit was the LF response was poor before you started using it to evaluate kit. Fortunately the old adage of not what you know but who you know kicked in. I had a job in broadcast by then and down stairs we had a brilliant engineer called John Ryan, who moved on to bigger and better things including copyright protection, which led to Macro vision. My cruciform generator was redesigned and free of tilt in less than a few minutes by John, and was used in the BATC yellow handbook, which is long gone. Flushed with success and determined to get something of my own running I put a key generator together and made the front cover of CQ-TV 103, and displayed my own digitally generated call sign from a circuit I designed for the Amateur Television Handbook, two lines of on screen text (eat your heart out Dave Lawton).

The handbook was one of our best selling publications but not for my innovation, it featured an electronic test card



designed by Richard Russell. This was again completely engineered digitally and in colour, the output was RGB and needed a PAL coder to interface with other ATV equipment (component TV was not quite with us) I was rescued by David Ellis Jones and John Lawrence with a suitable design to complete the book, It sold around 5000 copies, but John Woods artwork and editing skills also had a lot to do with it.

The challenges are still with us and still include circuit design, but I think the next 60 years are going to belong more to the software developers. The first development in that direction came from our editor Chris Smith with the BBS, no internet in those days you



had to dial up the hardware at Chris's house. You could leave messages and download software and on line chat with Chris all via a 1200 baud modem. This later moved to Brian Kelly's home and ran until BT pulled the plug on his telephone line. By the time the internet arrived and Ian Pawson generated our first website the internet speeds had improved and "Pictures came and broke my heart" to quote the song, but not really, being able to watch six TV repeaters at the same time on a single screen multiplex, was mind blowing. My thanks to Dave Mann and Chris Smith, for this innovation.

We might indeed be 60 years old, but certainly not over the hill, we are on top of the technology and as it moves so do we, things just keep getting better and better. My thanks to all the people who have contributed and made the club what it is today.



The subscriptions might now be £4 to have a colour magazine electronically sent to your PC, compared to £1 for a black and white 17 page A5 magazine

delivered to your door mat, but then I think the Mini car was also selling new for around £500 back then, does that put it in perspective...

## Turning back the pages anniversary special

*A special anniversary look at the issue of 60 years ago.*

CQ-TV 1 - "October 1949"

*"Hi there oms, here is no. one of what I hope will be a series of issues of your mag. Note that I say your mag - well, so it is..... I'm sorry this has taken so long to be produced, but I've had some trouble in obtaining spares for the duplicator."*

That was the 'Editor's Note' from the very first issue of this magazine. The Club had been in existence for a little while, with Mike Barlow co-ordinating activity, but as he wrote *'to be honest chaps, I'm just about browned off with writing and re-writing the same things over and over again, hence the Circular Letters'*. These letters took some time to get around the members, however, which is why CQTV was born. The frequency of its publication would *"depend on how much material you blokes send in .... please note that I must have contributions from every one of you - what you are doing, how and why you're doing it, results obtained, etc. A*

*few notes, an article, circuit diagrams, photos .... so ring write or QSO anything you have"*.

The previous 'circular letter' had been written in August 1949, and the main news since was the Radiolympia exhibition, where *"the accent we are told was on TV"*. On the Marconi stand, two cameras were on view, one of which *"was being used to show The British Public its beautiful face"* on a 12" tube just below the camera. .... The cameras were actually 625 line jobs of the latest type, and had been put back to 405 lines so as 'not to embarrass the B.B.C....'

*"The camera tube was of the image orthicon type - "an RCA 8867 costing a mere 6600 each before devaluation"*.

The best production figures obtained for these tubes was a 45% reject. EMI had built four - and rejected the lot. Pye also had a TV camera on view - but was little different physically to the Marconi model. Pye also had a "colour

*tv demonstration - claimed to be the first public demonstration in England - previous efforts by Baird etc presumably counting as Trade shows."*

Technical articles included *"a wideband modulation system for ham tv work"* and *"that transitron timebase"* (the quality of the duplicated copy is not sufficient to reproduce here) and there were several pages of the activities of members.

60 years on, CQTV is a professional looking publication, with clear diagrams, a mix of technical topics - and an editor who might still say "please note that I must have contributions from every one of you - what you are doing, how and why you're doing it, results obtained, etc. A few notes, an article, circuit diagrams, photos .... so ring write or QSO anything you have" !!

*(If I had contributions from 5% of you each quarter I would be happy!!! ed)*



# Circuit Notebook 101

by John Lawrence GW3JGA

## A Video/Audio Switch-box

This switch-box is intended mainly for use when working /P, but of course it could be used in the shack too. It provides input signal selection and extra outputs to avoid the need to un-plug, change over and plug in cables. On the front cover is an external view of the Switchbox and to the right is the inside view during development. The circuit is shown below right.

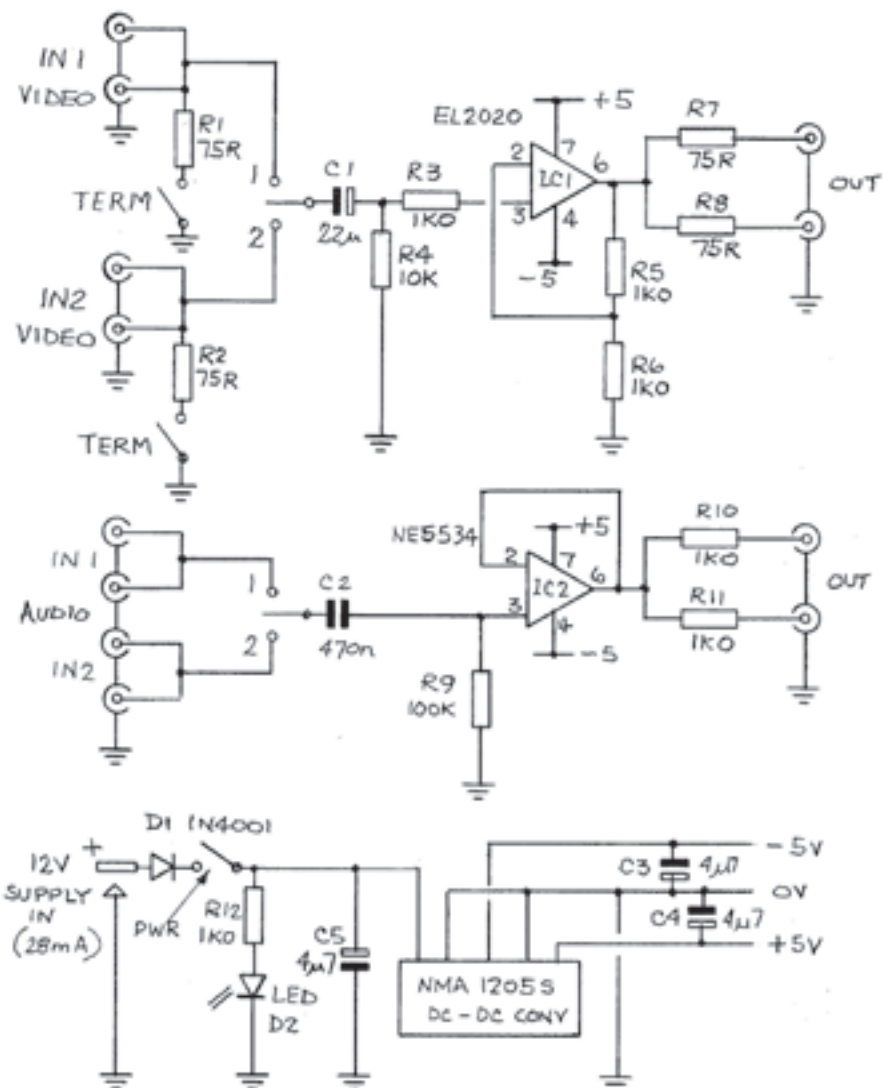
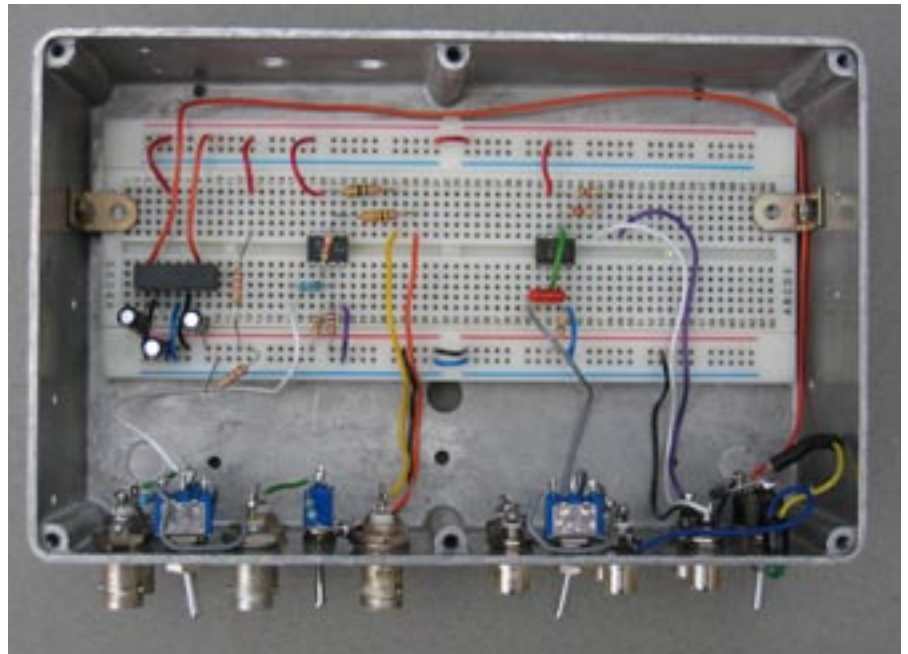
It has two video inputs, each of which consists of two BNC coax connectors 'looped through' with a 'TERM' switch to terminate the input in 75R if required. The desired input is selected by a toggle switch which feeds the selected video signal to a video op-amp, IC1 (EL2020). The op-amp has a gain of x2 (defined by R5 & R6) and feeds two separate outputs, each through 75R sending resistors – thus providing unity gain from each output into a 75R load.

The switch-box has two audio inputs, each has two coax connectors (phono this time) 'looped through' to allow a signal to be tapped off. The desired audio input is selected by a toggle switch and fed to a unity-gain buffer amplifier, IC2 (NE5534). The amplifier feeds two independent audio outputs.

The switch-box is powered from 12 volts and contains a 12V to +/-5V dc-dc converter (Type NMA 1205 S) to provide the positive and negative supply rails. The usual reverse polarity protection diode is included in the positive input line. The total drain at 12V is 28mA

## Construction

As this is an experimental unit, I have drilled the box for the connectors and switches, but the internal circuitry has been built on a plug-block, Rapid Electronics 'Protobloc 2' 34-0655 (similar to Maplin FD31J but with power line strips). I can then modify or add to the circuit without soldering

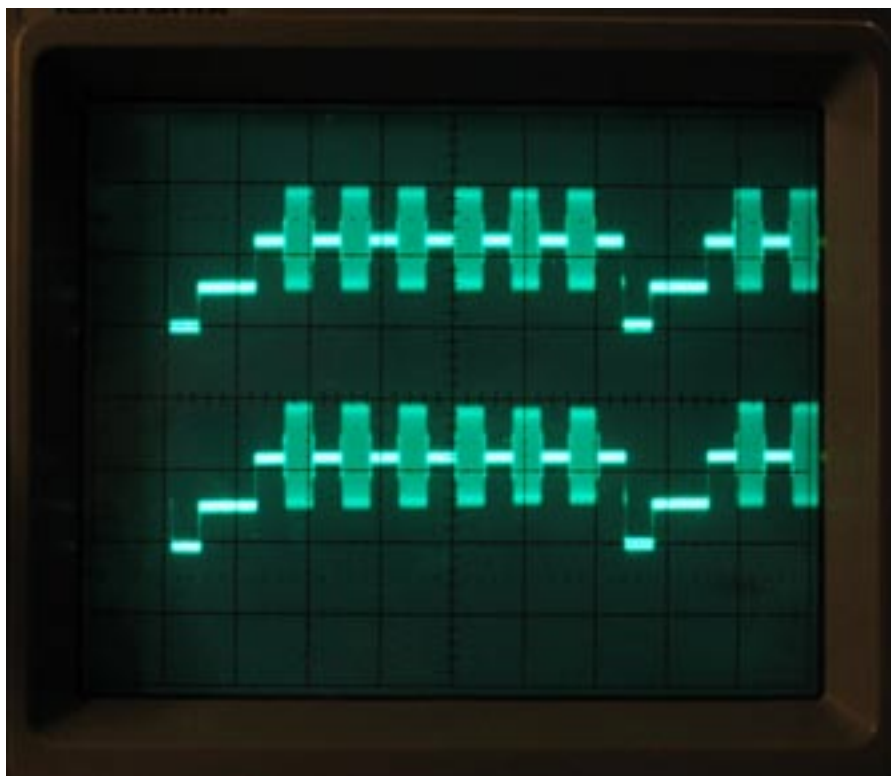


or scrapping components. In fact, since taking the photographs I have added a 12V (7812) voltage regulator, so that the unit can also be powered from an unregulated plugtop power supply.

The video amplifier performance does not seem adversely affected by the stray capacitance between contact strips on the plug-block and has a reasonably flat response to 6MHz. The image to the right shows the performance using a frequency burst signal (1 to 6 MHz), the upper trace is the input and the lower, the output.

### Operation

One arrangement might be for a camera and associated microphone to be connected to one set of inputs, and a caption generator and sound ident to the other. Video and sound sources could then be crossed over independently and fed to the outputs.



## Members Ads

I have a JVC S100-E camera complete with canon 10x zoom lens, flight case, operation and service manuals.

It was fully working when last tried. I would wish to dispose of it less its zoom mic plus associated small pcb containing the "zooming mixer" but otherwise complete and in clean condition.

Wouldn't mind "a bob or two" for it but no reasonable offer refused.

Email: [johncbales@yahoo.co.uk](mailto:johncbales@yahoo.co.uk)

I found this in my garage when I had a clear out, I had forgotten all about it, but now I have my VT4 it is surplus to requirements.

It is a Datavideo VP-275 "Video Special Effects Generator" and does various wipes and fades to black/colour. A tenner will do it if anyone is interested. My email is : [editor@batc.org.uk](mailto:editor@batc.org.uk)

Chris - G1FEF



I have for disposal free of charge EKCO tv pattern gen ISE/2 405 / Freq 38-64megs. Someone might be interested?

Email: [frank.judge@mvguide.net](mailto:frank.judge@mvguide.net)

## !!! Your Club Needs You !!!

If you do something, anything, related to ATV please drop your editor an email so it can appear in CQ-TV, if you can write an article about your latest project even better!

Repeater groups or individuals, CQ-TV needs your input.

# The 50p Sync Pulse Generator

By Brian Kelly, GW6BWX

While preparing an ATV demonstration for a local club recently, I realised that one of my converted ex-satellite receivers would not display its on-screen menu unless it had sync pulses to lock to. I only had one of my test card generators to hand so an alternative portable sync source had to be found quickly. The simple designs featured in early copies of CQ-TV either were impractical to build quickly or didn't produce the interlaced scans I needed. For some time I had been bouncing the idea in my mind of using a very simple microcontroller to produce sync patterns in software rather than the usual method of using counter chips and logic gates. After much head scratching and some challenging software writing, the design shown here was born.

The syncs are for 625 line 50Hz television, unfortunately, it isn't possible to produce 525/60Hz scans with sufficient accuracy from such a simple circuit because the smallest time interval that can be produced in software is inadequate for the fractional microsecond timings that NTSC needs. In fact some liberties have been taken with the PAL timings but they are better than 99.9% correct and should be good enough to fool almost all video equipment. An NTSC version can be produced but the cost is significantly higher because a quartz crystal and slightly more complicated microprocessor would have to be used. All the parts in the PAL design can be purchased for less than 50 pence, that's about 70 US cents!

The prototype used an 8-pin DIL chip and wire ended resistors but an SMD version of the chip with 6 pins (two are unused in the 8-pin package) and SMD resistors will work equally well. If SMD parts are used, the whole SPG will fit inside a normal BNC plug!

The chip can be either a PIC10F202 or a PIC10F206, the only difference between these devices is that the '206 has an internal voltage comparator which is not present in the '202 version. The comparator is not used in this design and instructions are present in the code to disable it. The disabling instructions are ignored in the '202 so the same code work in both devices.

## How it works:

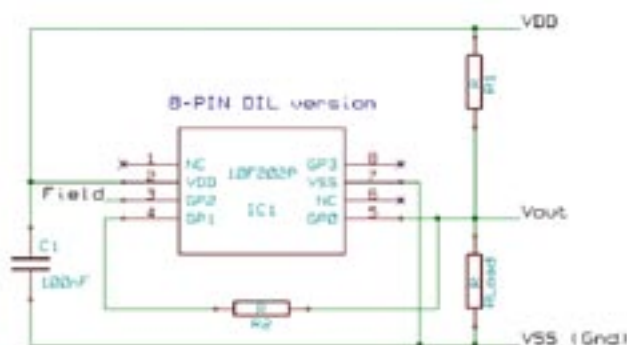
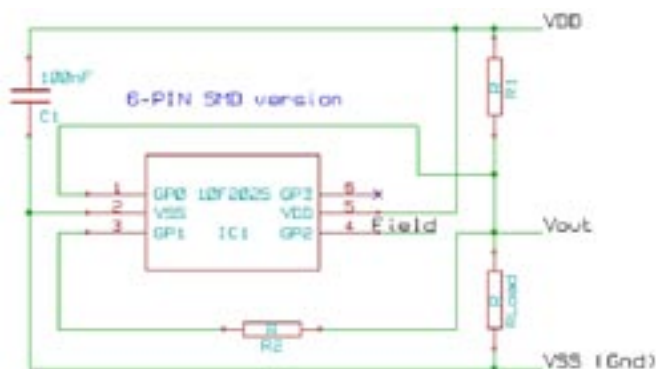
Buried inside the PIC is a 4MHz oscillator, it isn't crystal controlled but it is very stable and tunable to make it very accurate. The output from the oscillator is divided by four to produce an instruction clock. One instruction, with the exception of jump and some compare instructions, is executed per instruction clock. The frequency instructions are executed is therefore  $4\text{MHz}/4$  or 1MHz and each instruction takes  $1/1\text{MHz}$  of a second to execute, in more meaningful units this is 1 microsecond.

If you imagine an instruction to drive a pin high followed by an instruction to drive it low, you would take two 1MHz cycles, going high for 1uS then low for 1uS and produce an output signal at 500KHz.

To make video sync signals, a string of instructions has to be used to drive a pin

high or low at the correct time intervals. In a 625 line system, each horizontal sync pulse is 4.7uS long and the rest of the line takes 59.3uS making a total of 64uS. Because of the instruction clock speed, the best that can be achieved in this design is 1uS resolution so the timings are approximated as 5uS and 59uS. So each line starts with the output pin being driven low for 5 instructions then driven high for 59 instructions. While this sounds easy, it would take exactly 40,000 instructions to complete one picture scan but the chip only has 512 memory addresses to hold them! Several program loops in which the same instructions are repeated several times are used to keep the memory requirements down to a practical size. In fact by using delay loops the memory requirement is reduced from 40,000 bytes to just 285 bytes.

By far the most complicated timing to get right was the vertical sync pulses. Although simple SPGs usually use single broad pulses, I decided in this design to follow the specifications as closely as possible. Vertical sync pulses are actually a complicated sequence of different pulse widths and are different on alternate scans. They alternate so that there is a short delay on every second scan so that lines are aligned slightly differently to produce interlacing. This design does produce interlaced syncs and one of the pins is used to indicate which of the two fields is currently being produced. The pin is low (0V) for lines 1 to 312.5 then high (VDD) until the end of line 625. I can't think of a practical use for this at the moment but it costs nothing and it uses a spare pin so I included it in the coding.





The field output on GP2 is actually the only signal that is driven high and low, the other two outputs are permanently driven low but they are changed from being inputs to outputs to simulate a switch to ground. When the pin is set to be an input it draws negligible current and the external resistors wired to it will decide the voltage present on it. When switched to output mode, being driven low, they sink current to ground and pull the voltage close to zero. In essence a very simple two-bit digital to analogue converter is implemented with the output voltages representing sync tip (0V), black level (0.3V) and a single video level which you select yourself from 0.3V to 1V (black to peak white).

The two resistors, in conjunction with the load will, depending on which output pins are sinking current, set the video and black level voltages. GP0 is the pin carrying sync information and GP1 carries a signal very similar to the visible part of scan lines. When both are outputs, they pull the voltage across the load down to almost zero, this sets the bottom of the sync pulses. When GP0 and GP1 are inputs, the voltage is set solely by the potential divider formed by R1 and the load resistance. This is your selected white level. If a resistor (R2) is fitted between GP1 and the load, and GP1 is sinking current, it will pull the output voltage lower than peak white level so any 'brightness' between black and white can be set. Lower values of R2 will increase the sink current and reduce the video voltage. The actual values of R1 and R2 depend on the supply voltage and the load resistance. The chip will run quite happily from a supply of 2V up to 5.5V although at the lower end of the range you will find the resistor values become quite low and there is a risk of exceeding the current rating of the pins on the chip during sync periods. The chip manufacturer quotes the absolute maximum current allowed is 75mA which equates at 2V

supply to R1 being just 27 Ohms when the load is 75 Ohms. If the supply voltage is kept at or above 3V there is no risk of exceeding the ratings. Trying to produce a standard 1V video signal from a supply of just 2V isn't a likely scenario anyway.

To keep costs down the bottom resistor in the potential divider is the load resistor which should be present across the input of the device being driven, typically this would be 75 Ohms. Slightly better linearity can be achieved by adding a buffer amplifier after the potential divider. When higher load impedances are fed, the values of R1 and R2 can be made much larger which improves linearity and reduces the overall current consumption. The downside to this is the extra expense which would break the 50p budget. It may still be possible to build the SPG and a discrete transistor buffer for under £1 but I leave that to your ingenuity. Unfortunately, the outputs of the chip have a small but measurable resistance so there will always be a residual voltage on them when sinking current to ground. This voltage is proportional to the current in R1 and the load so minimising it is another good reason to use larger values and a buffer stage. The tables show suggested resistor values when using 5V or 3.3V supplies and standard resistor values for the load. Very few values for R1 and R2 are available off the shelf but using the nearest standard value will still give a very good approximation to the desired levels. As mentioned earlier, the internal resistance of the chip drivers also have some influence on the output voltage but for practical purposes they can be ignored. For a normal 5V supply and 75 Ohm load, using 300 Ohms for R1 and 27 Ohms for R2 will give good results.

For the purist, this is how the values of R1 and R2 are calculated:

1. Pick Rload according to your requirements.

2. Calculate R1 with the formula:  

$$R1 = ((VDD - Vout) * Rload) / Vout$$

3. Work out the value of R1 and R2 in parallel needed to set black level ( $Vout = 0.3V$ ) with the formula:  

$$R_{parallel} = (Vout * R1) / (VDD - Vout)$$

4. Extract the value for R2 with the formula:  

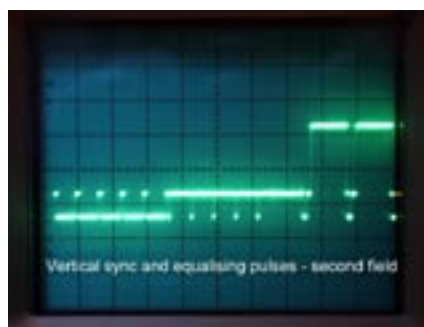
$$R2 = 1 / ((1/R_{parallel}) - (1/Rload))$$

$R_{parallel}$  isn't a real component, it is only used to simplify the calculation.

### Programming the PIC.

I use a device called "PICkit 2" from the chip manufacturer. It cost £9.99 including postage and VAT as part of a special offer in a magazine recently. Microchip have recently introduced a new model called "PICkit 3" so the older devices are being discounted to empty the shelves. If you really want to make a programmer on the cheap, the complete design for PICkit is on the Microchip web site at [www.microchip.com](http://www.microchip.com) and it includes all the software inside the PICkit and the program to drive it from a PC. It connects through a USB cable and programs hundreds of different microcontrollers and memory devices, in most cases drawing power from the computers USB port itself. The SPG program was written in assembly language using MPLAB which is also free of charge on Microchips web site.

I would caution you over the chip calibration. The internal clock is trimmed by the manufacturer to be 4MHz with better than 1% accuracy. To calibrate it, a number has to be loaded into the OSCCAL register inside the chip. Normally, this would be done by the first instruction in a program and that is exactly what is done in this SPG. While testing the chip the manufacturer



determines the best value and leaves it in the chips memory so it can be picked up and moved into OSCCAL. That is where you can run into problems if you are not aware of the calibration value. If you inadvertently erase the chips memory, you lose the calibration value as well. The PICKit automatically reads the value before erasing or re-programming the chip and puts it back afterwards but some other programmers may not do this. What I do is read all the chips as I get them and write the value

on the underside of the chip just in case it gets erased. If all else fails, PICKit has a facility to write a test program into the chip, analyse its output and recalculate the calibration value for you. I'm not sure how far off frequency a chip could be if isn't calibrated but my guess is it would be pretty close to correct no matter what value you used. The value is an eight-bit number in which the least significant bit is always a zero. Setting all bits to zero puts it in the centre of its adjustment range.

The code for the PIC is available on my web site at [www.atv-projects.com](http://www.atv-projects.com). The PIC devices are available from Farnell, Crownhill Associates, Microchip Direct and many other sources at prices around 35p +VAT.

While not perfect, this should make a useful addition to your video toolkit and I don't think you can grumble at the price!

VDD=5V, Vout =1V (100% Video)		
Rload	R1	R2
10000	40000	3429
9100	36400	3120
8200	32800	2811
6800	27200	2331
5600	22400	1920
4700	18800	1611
3900	15600	1337
3300	13200	1131
2700	10800	926
2200	8800	754
1800	7200	617
1200	4800	411
1000	4000	343
910	3640	312
820	3280	281
680	2720	233
560	2240	192
470	1880	161
390	1560	134
330	1320	113
300	1200	103
270	1080	93
220	880	75
180	720	62
150	600	51
75	300	26
50	200	17

VDD=5V, Vout =0.825V (75% Video)		
Rload	R1	R2
10000	50606	4771
9100	46052	4342
8200	41497	3913
6800	34412	3245
5600	28339	2672
4700	23785	2243
3900	19736	1861
3300	16700	1575
2700	13664	1288
2200	11133	1050
1800	9109	859
1200	6073	573
1000	5061	477
910	4605	434
820	4150	391
680	3441	324
560	2834	267
470	2378	224
390	1974	186
330	1670	157
300	1518	143
270	1366	129
220	1113	105
180	911	86
150	759	72
75	380	36
50	253	24

VDD=5V, Vout =0.65V (50% Video)		
Rload	R1	R2
10000	66923	7457
9100	60900	6786
8200	54877	6115
6800	45508	5071
5600	37477	4176
4700	31454	3505
3900	26100	2908
3300	22085	2461
2700	18069	2013
2200	14723	1641
1800	12046	1342
1200	8031	895
1000	6692	746
910	6090	679
820	5488	611
680	4551	507
560	3748	418
470	3145	350
390	2610	291
330	2208	246
300	2008	224
270	1807	201
220	1472	164
180	1205	134
150	1004	112
75	502	56
50	335	37

VDD=3.3V, Vout =1V (100% Video)		
Rload	R1	R2
10000	23000	2987
9100	20930	2718
8200	18860	2449
6800	15640	2031
5600	12880	1673
4700	10810	1404
3900	8970	1165
3300	7590	986
2700	6210	806
2200	5060	657
1800	4140	538
1200	2760	358
1000	2300	299
910	2093	272
820	1886	245
680	1564	203
560	1288	167
470	1081	140
390	897	116
330	759	99
300	690	90
270	621	81
220	506	66
180	414	54
150	345	45
75	173	22
50	115	15

VDD=3.3V, Vout =0.825V (75% Video)		
Rload	R1	R2
10000	30000	4286
9100	27300	3900
8200	24600	3514
6800	20400	2914
5600	16800	2400
4700	14100	2014
3900	11700	1671
3300	9900	1414
2700	8100	1157
2200	6600	943
1800	5400	771
1200	3600	514
1000	3000	429
910	2730	390
820	2460	351
680	2040	291
560	1680	240
470	1410	201
390	1170	167
330	990	141
300	900	129
270	810	116
220	660	94
180	540	77
150	450	64
75	225	32
50	150	21

VDD=3.3V, Vout =0.65V (50% Video)		
Rload	R1	R2
10000	40769	6883
9100	37100	6264
8200	33431	5644
6800	27723	4681
5600	22831	3855
4700	19162	3235
3900	15900	2684
3300	13454	2271
2700	11008	1858
2200	8969	1514
1800	7338	1239
1200	4892	826
1000	4077	688
910	3710	626
820	3343	564
680	2772	468
560	2283	385
470	1916	324
390	1590	268
330	1345	227
300	1223	206
270	1101	186
220	897	151
180	734	124
150	612	103
75	306	52
50	204	34

# Progress report on 720P Sync/Test Generator

by Mike Cox

Some of you may have seen the Generator at the Stow cum Quy BGM; if you did, feel free to read something else!

When we left it [CQ-TV 223, pp33, 34], it was very much a bench top lash up. It has now been put in a case, with proper pattern selection buttons on the front, and proper BNC connections for pulse and clock outputs. The output card is mounted directly to the rear panel via the 15HD connector [VGA].

A standard switch mode power block is mounted within the case to supply +5 volts, 2.5A. These particular blocks have “figure of eight” 2 pin mains input sockets, with of course, no earth connection. Equipment connected to these without a separate earth connection can float at around half the a.c. input voltage due to the input filters. This is enough to give you a nasty tickle if you touch the case without grounding it.

To avoid this, the power is via filtered and switched IEC 3 pin input socket, which has an earth connection.

Progress on the electronics has been a bit slow; the Y output now bears Tri-sync, and the next phase is to complete the matrix section up to 3 ADCs sampling at 74.25 MHz for Y, and 37.125 MHz for Pb and Pr. The ultimate aim is generate an HD-SDI stream. Watch this space!

The picture shows front of unit, with Y waveform as corner insert. Note the difference between this and “normal” SD Y waveform. The Green-Magenta transition is larger.



We have now merged the old cq-tv.com website with the clubs primary website: <http://www.batc.org.uk>  
**Please update your bookmarks!**



# An Even Simpler Y/C Splitter

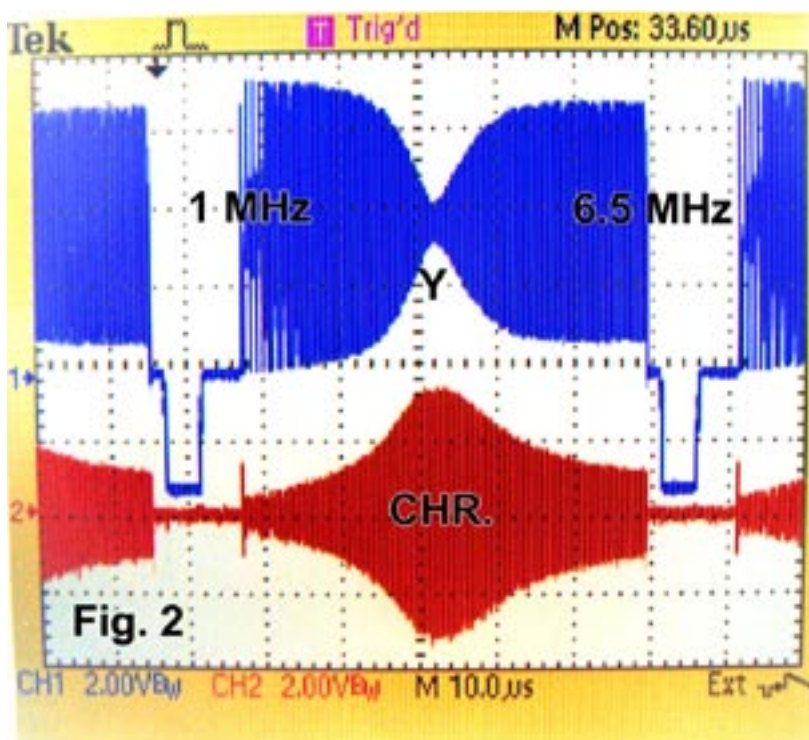
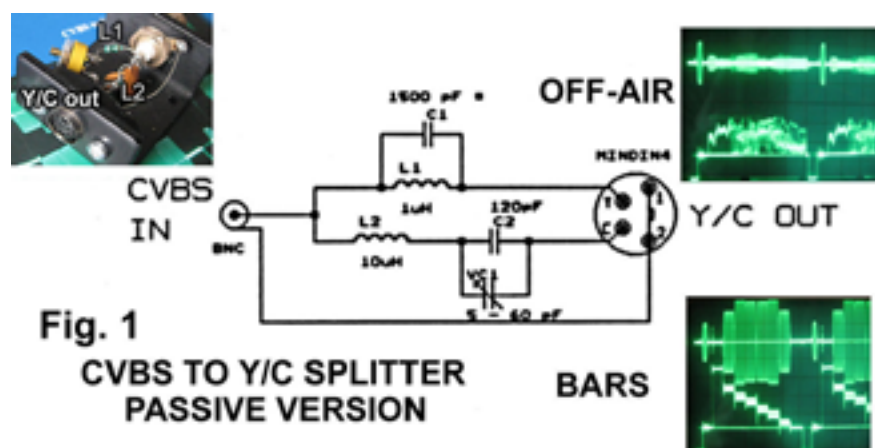
by Mike Cox

In CQ-TV 217, Tony Jacques showed a fairly sophisticated CVBS to Y/C splitter, which produced some excellent waveforms. However, it uses seven transistors, and requires power. I have an edit suite that works on the basis that all the sources are Y/C, except for those that are not, so it would be very useful to have an in-line splitter.

The edit switcher is Y/C and audio [L/R], and has 4-pin mini DIN input and output connectors, including a break out for a keyer. [also Y/C] I had experimented earlier with a simple passive splitter, using 1 capacitor and 1 inductor. It worked but was not too clever.

Putting on thinking cap suggested that 2 capacitors and 2 inductors might be rather better. The limitation is that the splitter works from a single 75-ohm source to 2 x 75 ohm loads for Luminance and Chrominance, whereas Tony's device could have a looping input, and could drive at least a second set of outputs.

Luckily, I have a stock of small alloy boxes already punched for BNCs. The device fits into such a box, and would probably, using SM components, be made to fit into a mini DIN plug. The circuit, and the typical outputs are shown in Fig. 1, together with the completed box. Fig. 2 shows the frequency response of the Y and C outputs with a line rate sweep input.



My device probably would not pass the old IBA Code of Practice for Return Loss, but luckily they are not around these days.

Some words about Y/C may be appropriate. It can be described as the poor man's component connection. If the C component comes from a decent PAL coder, the bandwidth is 1.3 MHz, or higher depending on the filters used. This makes a fair comparison with the 2.75 MHz band limiting of Pb and Pr components before the ADCs used in CCIR 601 digital processing.

There are some cautionary words however; beware of some cheap Y/C cables. They are not made with individually screened cores for Y and C, but probably with 4 cores. Some of these cables have severe cross talk from C to Y, and are not to be recommended. Mini-DIN 4 pin connectors are available from suppliers such as Rapid Electronics, or Maplins, so it is not difficult to make your own cables. I have made a number of short patch cords using twin screened audio cable very successfully. I have just made two in around 20 minutes.

If ever there is a need to turn Y/C into CVBS, there is a useful chip called the ML6428. It takes in Y and C, buffers and filters them, with a gain of 2 so it drives 75-ohm loads. A separate channel adds Y and C together to give a clean CVBS output. It is in an 8-pin SO8 package and requires a +5 volt rail. Google it, to get a data sheet.

In CQ-TV 224, I mentioned a new sync separator chip, Maxim MAX9568, and that Kevin Hempson had donated a number of samples and two evaluation boards to the Club. Please apply to the Editor if you want any of these.

# Plotting coverage the GB3KM 10 GHz Antenna

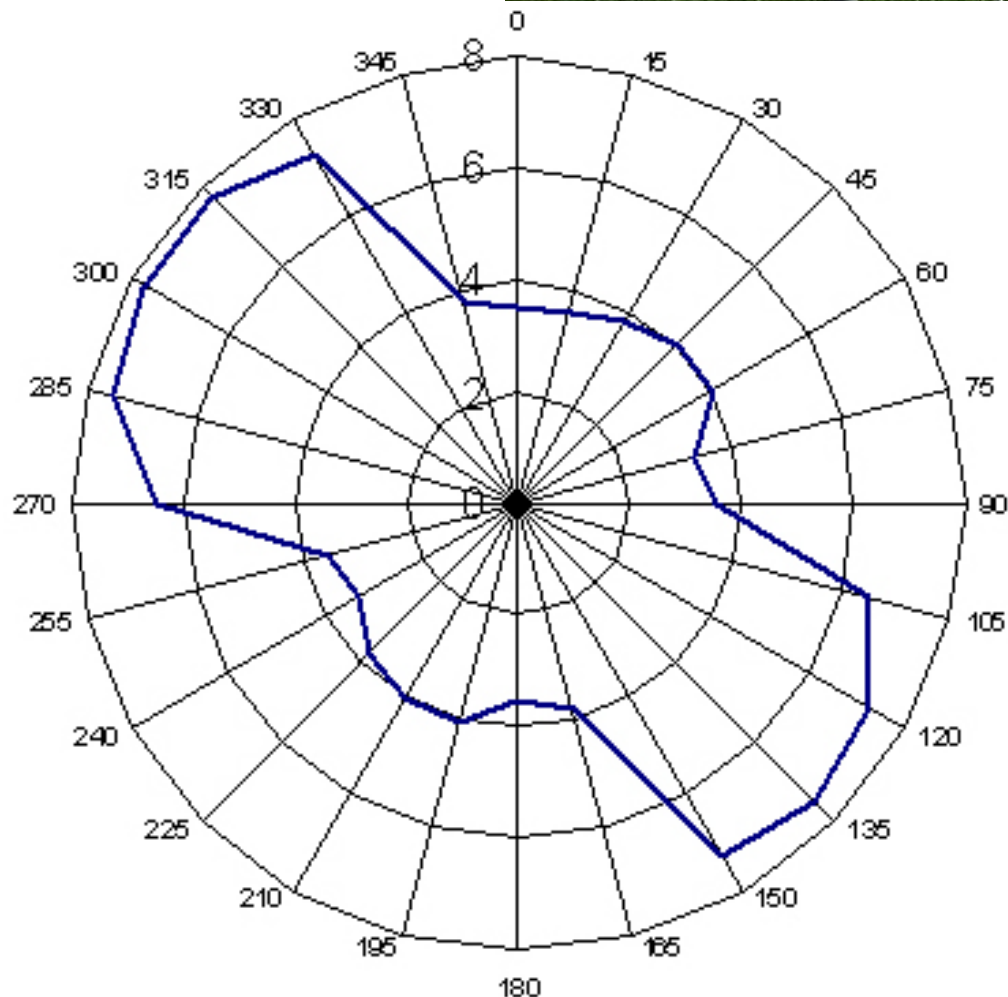
by Eddie, G0EHV

GB3KM is located in County Durham at the QTH of Terry G1LPS. It was originally designed as multi input, however until the 10 GHz equipment was constructed it was exclusively on 13 cms.

After construction of the 10 GHz Alford Slot and associated transmitter, it was required to test the possible coverage of the antenna.

The antenna and transmitter were mounted in the clear on the rotatable mast at the QTH of Rob M0DTS. A test station, Eddie G0EHV/P was established about 15 Km away with good line of sight to the transmitter.

Contact was easily established between the test stations on 10 GHz. As the antenna was rotated in 15 degree



steps at the transmitter site, a series of simple S meter measurements were taken at the receiving site. It was noted that the antenna although designed to operate as omni-directional, appeared to have a variation in performance off the sides. The measurements were recorded and input to a Microsoft Excel spreadsheet and a polar plot obtained, see image left.

As can be seen there are two major and two minor lobes. This test was very much a "quick and dirty" attempt but has produced useful data. The antenna is now installed at GB3KM and has been found to match the test results obtained.

For interest, the portable antennas used are shown above.



# West Coast Marathon

by Peter Blakeborough G3PYB and John Lawrence GW3JGA

The aim of this event is to concentrate as large a number of stations as possible in one geographical area by running a contest/activity day.

The West Coast of England and the North Wales area is well suited to offer practical fixed and portable sites with reasonable radio path opportunities between EI,GI,GW,GM,GD and G stations.

ATV activity and narrow band microwave voice will be promoted by encouraging groups with suitable equipment to combine their activities. If you are an experienced operator please take along a new member and provide the opportunity for them to gain experience of ATV and or microwave equipment.

Portable operation demands a much wider set of skills, add to this the extra skills needed to produce an ATV signal, plus camera work, presentation skills for station identification and you soon need some additional pairs of hands.

We have purposely selected a summers day in July which is concurrent with a microwave contest. A separate date might have offered benefits but we are conscious that the pressure on summer hobby times is always pressing. Many ATV stations have an interest in narrow band operation and have the antennas and equipment for the microwave bands.

*GB3TM Repeater equipment and Alford slots on the tower near Amlwch*



*An example of a simple small 10Ghz ATV unit*

Very small stations and more complex stations will be promoted. If you have an older simpler 10Ghz link and it could be used to link into a second station, dust it down, fire it up and teach a newcomer how to operate it and put it on the air on the 26th July.

We are seeking to concentrate as many stations on the West coast above Wales as possible but the activity day and contest is open to all. We especially need stations in EI, GI and GD. The hills in Dumfries offer excellent locations for GM stations.

The 23cm band is the most popular band with 3cm and 13cm to lower extent, but we do have other bands and we would like to promote the other bands such as 3.4, 5.7 and 24Ghz. Put the thinking caps on and see how existing narrow band transmitters and receivers could be adapted to send ATV.



*At the other end of the scale is the adapted ambulance built by Phil GD1HIA on the Isle of Man*

Streaming on the internet through the BATC.tv portal has been a great success enabling many more interested parties to follow the proceeding from outside the near geographical area.

GB3TM on the North East corner of Anglesey is a superbly sited repeater and will form a key station for many users. The North Wales ATV group will be streaming the output of GB3TM throughout the day, look on the "Live" streamer section on [www.batc.tv](http://www.batc.tv)

Several other repeaters also have a streamer attached, if you can provide a streamed feed from your own station please let us know and we will publish a list of active devices along with a our list of stations and sites which will be active on the day.

Please check the BATC forum web pages [www.batc.org.uk/forum](http://www.batc.org.uk/forum) for the latest list of participants and updated news as we approach the 26th July.





### Key categories for the competition:

1. Maximum number of radio path kilometres for any one station, any band, any number of hops.
2. Paths through repeaters are all valid.
3. Maximum number of hops for any one contact.
4. Maximum number of countries/prefixes.
5. Most novel caption design or station 'ident' used.
6. Largest number of newcomers at any one site.
7. Receive only: As above, but for stations unable to transmit ATV on that band

One feature of the points system will be to transmit over as many hops as possible, that includes repeaters, and we will devise a special award for the maximum number of hops achieved.

Please take as many pictures as possible, as stills and/or video clips and we will publish a compilation after the event. This should include portable equipment, newcomers and that all important caption used for the station 'ident'.

We have three coordinators for the event, please send an indication of the location you are considering and the band(s) you plan to use, to any one of the following:-

John Lawrence GW3JGA  
Peter Blakeborough G3PYB  
Peter Day G3PHO.

john.lawrence14@btinternet.com  
peter.blakeborough@pop3.hiway.co.uk  
microwaves@blueyonder.co.uk (for the UK microwave Group).



# About Camera Cables

by Brian Summers G8GQS

The recent live streaming events and the communication difficulties with the cameraman led me to an exploration of how camera cables began and where we are now.

The very first electronic television cameras, by necessity split the camera system into two parts, the camera head and the processing electronics with power supply. As technology developed more of the camera system was in the camera head, but the camera was still joined to the CCU (camera control unit) and PSU (power supply unit) by a thick multi core cable.

This cable had typically 37 conductors for a monochrome camera of the 1950s and early 1960s. These valve cameras used a "wire per function" with only a limited amount of doubling up of the controls, perhaps a DC function and an AC function would share the same wire. Talkback and shifts controls were favorites for combining.

The BICC Mk4B cable illustrated is



typical of the period being used on Marconi, Pye & EMI cameras. It has a heavy rubber strain relief boot and the rear of the connector was potted in araldite, defiantly not rewirable but very reliable!

It was preceded by Mk3 & Mk2 cables and before that the very first UK TV electronic camera, the EMI Emitron used a specially developed connector with 18 pins and two co-ax connectors. It is worth listing some of the signals and circuits to be found in a camera cable. The 37 cores of a typical cable are soon used up! I should also state the obvious that the pins go to the CCU and the socket the camera.

## Colour cameras

The arrival of colour cameras posed a big problem and the first 3 tube ones used 3 monochrome cables to get the necessary number of circuits, they could be considered as 3 cameras in the one box. Later more practical cameras used cables with even more cores, the BICC G101 being a popular choice. 101 being the number of pins in the

### 3 x Co-ax

Video out  
Line drive in  
Viewfinder return

### 3 x Quads

AC power  
Frame scan  
Talk back  
Cue Lights/ call cam.

### Pairs and singles

HT+ 1, HT+ 2, HT-  
Alignment and shift controls  
Lens exposure servo  
Turret and focus servo  
Tube voltages



connector. These were expensive, heavy and sometimes fragile cables, especially on outside broadcasts. 2000ft of G101 colour camera cable would be 10 drums of cable, each drum being at least a two man lift! The chances of it working in the mud and rain were poor!

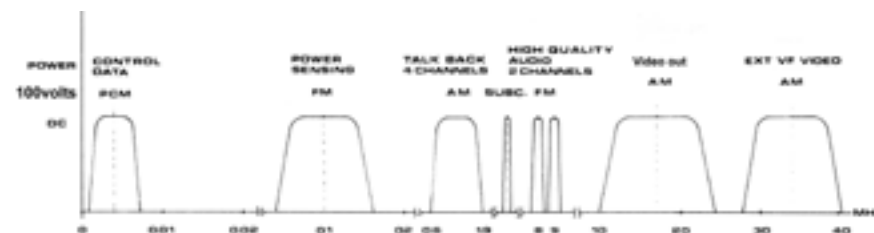
The next generation of colour cameras took a step back and used the earlier monochrome cables. There were two good reasons for this! First they could do it, the arrival of integrated circuits meant the multiplexing of controls was much easier and that digital control of systems was possible. In this way a single circuit could carry a digital word containing the data value for a particular function to be stored in the camera and the next word, with its address, a different control function. The second reason? There was a LOT of redundant monochrome cable awaiting a use and using it made your camera much more saleable! There were many other reasons as well but that has a certain ring to it....

## Triax was the next big step forward

Technology came to the rescue again with a system called "Triax". This was

a much simpler and lighter cable. Triax is similar to Coaxial cable, but with an extra overall screen. In the triax system the power for the camera is sent on the center conductor and the return on the inner screen as DC or AC in the 100 to 240 volt range. The outer screen being the safety conductor to maintain the camera body at earth potential. The pictures and digital control signals were carried on radio frequency carriers on the inner co-ax section. These much expanded digital control systems were developed from the previous generation cameras that used the monochrome cables. For OB use triax was marvelous, light, reliable and it went much further than multicore ever could, the Norelco PC-100 (LDK5) claimed 1 mile.

Below is the spectrum of a typical triax camera of one of the first triax cameras from the 1970s (LDK5). The power when to the camera at 100volts DC and the triax range was limited by the dc voltage drop and the falling off of the cable response at the HF end. The cameraman would complain his reverse viewfinder no longer worked! On important feature of this was radio working, by powering the camera



locally the Data and video could go on radio links and “cable free” operation was possible.

### Fibre

Today’s HD cameras use a cable based on optical fibres. This has a connector that looks very much like a triax one, hence it is loosely called “fibre triax”. It has 2 single mode fibres, 2 power conductors and 2 for signaling. It is light in weight and the length that can be used is governed by the voltage drop in the power conductors and the attenuation of the fibre joints. Lengths of 10,000ft are suggested and, with local camera power and few joints it has the potential for very long runs of cable. It does suffer the disadvantage that contamination of the fibre connectors will stop the camera working, scrupulous cleanliness is essential! Fibre is needed for HD cameras if any distance is required because triax is unable to handle the stupendous<sup>1</sup> bandwidth involved. The HD digital camera has many, adjustments and nested menus that can be accessed through the viewfinder or more conveniently from the MSU (Master Setup Unit) connected to the camera via the CCU.

The fibre is described in SMPTE specification<sup>2</sup> 304M and more information can be found from the EBU<sup>3</sup> . <http://tech.ebu.ch/docs/r/r100.pdf>

### A second life?

As new cameras replaced old, there was a mountain of old cable looking for a new application and this was found in “on site vision” or OSV in BBC speak. Breakout boxes were made to go on the far end and the near end would connect to the OB van systems directly. This provided, all in the one cable, mains power, 3 video feeds, sound and talkbacks, a telephone circuit<sup>4</sup> , and selector buttons for matrix control. BBC outside broadcast made extensive use of BICC Mk4B cable and to a lesser extent G101 cable. It was so successful that when the cable wore out it was replaced with a purpose made cable with 7 co-ax cores and 7 quads for audio, this was known as Mk7 cable (from the number of circuits). There was a standard pin layout to ensure compatibility across the BBC. The ITV companies and BBC news used the same idea but with TV 36 camera cable.

### What’s needed?

It is worth thinking about what signals and controls are needed at the camera in a multi camera studio or OB setup and why.

Camera output:	Obvious reasons
Cue light/call camera:	You don’t appreciate how important this is until you haven’t got one.
Production talkback:	To follow the directors instructions.
Viewfinder return:	So that the cameraman can frame his shot with reference to the current shot on the mixer. (V/F return could also be used to genlock the camera).
Programme sound:	To follow the flow of the programme <sup>5</sup> .
Engineering talkback:	Separate from production talkback so that problems can be cleared whilst the programme is underway. This assumes you have the luxury of a separate engineering control area.
Camera call:	Flashes a light/buzzer on the camera control panel.
Camera reply:	To production or engineering as required.
Iris control of the lens:	To make the cameras exposure match each other.
Remote control of filter:	A luxury to help with extremes of exposure control.
Remote colour control:	To match the cameras so they look the same colour.
Programme microphones:	Modern cameras have two quality circuits back to the CCU.
A second return video:	Used for a prompt monitor or second V/F return.
A power outlet:	Less common these days, good for a prompt monitor or similar.

The above list is by no means exclusive and all to do with production use and I haven’t started on the electronic controls, another long list. You can see why the camera cable is so busy and a vital part of the camera chain.

Useful links: [www.lemo.com](http://www.lemo.com) [www.fischerconnectors.com](http://www.fischerconnectors.com)

1. You may be interested to know the uncompressed bandwidths involved. In an SD (standard definition) camera the rec. 601 serial data rate is 270Mb/s and for HD (1080i) it is 1.485Gb/s. On copper it does not travel well at all.
2. SMPTE, Society of Motion Pictures and Television Engineers (USA)
3. EBU European Broadcast Union.
4. If your OB van has a mall automatic telephone exchange, this can be a very useful communication tool.
5. There is some discussion in learned circles about the spelling of this word, in my book Program is something that is done to a computer and a Programme is something that you watch or listen to.

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# A Load of Local Bells

*Dicky Howett gets roped in*

It's like this, I'm not a church-goer, but the village I inhabit is small enough for one not to be able to hide for too long. Anyway, it's like this. Our village church (11th century or thereabouts-bits earlier) was having a re-dedication of the bells (new bells in- old bells out) and wouldn't it be nice for the congregation to actually SEE the vicar up aloft as it were, doing his dedication business? Anyway, along comes I (the chap wots got all that tv stuff) with my little Sony HAD ('Hole-Accumulated Diode'-always makes me laugh, that acronym) colour camera and up to the belfry goes I. Strapping the camera onto a (no-vibrating) beam and with half a mile of BNC cable trailed down the spiral stairs, all was plugged in (somebody lent a very nice little DLP video projector) ready for the service. Well, success of course. Congregation gasped at the sight of vicar (his holy words were relayed via mobile phone into the church's PA system-I don't do audio). So all in all Mr Sony and his handy little HAD scores again. Handshakes all round. But hang on a minute, somebody here's just mentioned an old local historic disused mineshaft they want looking at..... Camera anybody?



## Off The Box

Dicky Howett writes, "The late John Cura wasn't the only person 'telly snapping' away. I plonked my box brownie in front of my tv screen many times. However, can 1950s BBCtv OBs have been quite so out of focus? I suppose we just all got used to it: The indifferent resolution of domestic receivers. Nowadays, the reverse seems to apply. HD pictures are just too 'sharp' for me."



# BATC Publications and Members Services

Publications	Each	Qty	Total
<b>An Introduction To Amateur Television (225gm)</b> The latest handbook full of detailed information on how to set up your ATV station, plus lots of new video and RF construction projects. The BATC handbook featuring construction articles on video units, 24cm and 3cm ATV, a Digital Frame Store, and much more.	£2.50	.....	.....
<b>The Best of CQ-TV (150gm)</b> A compilation of the best construction articles from CQ-TV's 133 to 146	£3.50	.....	.....
<b>CQ-TV Back Issues:</b> The following issues are still available. Please circle those required: 185, 186, 187, 188,189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210,211,212,213,214,215,216,217,218,219,220,221	£1.50	.....	.....
<b>Special Offer: Any four of the above issues</b>	£5.00	.....	.....
222,223,224,225	£3.75	.....	.....
<b>The BATC DVD</b>	£5.00	.....	.....

**All publications can be ordered, with a credit card, via our online shop - [www.batc.org.uk](http://www.batc.org.uk)  
Or by sending a cheque made out to 'BATC'**

*All items appearing in Members Services from previous editions, can still be ordered (subject to availability). Please see page four for contact details. Several items are still on sale, so please check for the latest pricing before sending a cheque.*



[www.nonanet.co.uk](http://www.nonanet.co.uk)  
[sales@nonanet.co.uk](mailto:sales@nonanet.co.uk)

**Nonanet (UK) Limited are a UK Internet Services Provider**

We specialise in providing bespoke hosting solutions, some of our services include:

- Web design & hosting
- Programming
- Consultancy
- Email services
- DNS hosting
- SEO work
- VoIP Services
- Send/Receive text messages from your desktop
- SMS short-codes (premium or standard rate)
- SMS API via SMPP/HTTP/SOAP/Email
- Bespoke SMS services
- Low cost bulk SMS
- Low cost premium route SMS

Contact us on: 0845 8622322 or [sales@nonanet.co.uk](mailto:sales@nonanet.co.uk)  
We will provide free hosting services to any project involving ATV  
whether for the individual, club or repeater group  
Contact us for details

# Contest News

by Dave Crump G8GKQ

## March Repeater Contest

I received 4 entries for the March Repeater Contest and I know of at least 2 other stations that were active (M0DTS and G8BYI with G8DRK) but had no contacts. Thanks to all those that participated, the results are below.

Unfortunately, activity seemed to suffer because GB3HV is off the air. Congratulations to M0SAT and GW3JGA, and thanks especially to M0DTS for providing the great photo for RadCom (see the May 09 issue).

## BATC Repeater Contest 21/22 March 2009

### 23 cm

Place	Call	Points	Locator	QSO	Repeaters
1	GW3JGA	680	IO83HI	2	GB3TM
2	MW0AQZ	628	IO73QH	4	GB3TM
3	GW4KAZ	512	IO73VE	2	GB3TM

### 13 cm

Place	Call	Points	Locator	QSO	Repeaters
1	M0SAT	1185	IO91SR	5	GB3BH

## Contest Calendar

1200 UTC 6 June 2009	1200 UTC 7 June 2009	BATC Summer Fun Contest
1800 UTC 12 September 2009	1200 UTC 13 September 2009	International ATV Contest
1200 UTC 12 December 2009	1200 UTC 13 December 2009	BATC Repeater Contest
1200 UTC 20 March 2010	1200 UTC 21 March 2010	BATC Repeater Contest

## Contest Times

I have been asked to consider starting contests earlier so that Portable stations can operate in daylight on Saturday afternoons. This seems very sensible, so I have amended all future BATC Contests times to start at 1200 UTC. Note that the September IARU Contest will start at the original time of 1800, as the timings are set by the IARU.

## Repeater Contest Scoring

A number of participants have asked me how to score repeater contacts involving Internet linking. Well, although it seems complicated, it is actually very simple.

Only the RF portion of the path gains points, and that portion attracts the relevant multiplier for the band used. Crossband contacts should be scored using similar rules - possibly with different multipliers. If in any doubt, leave the scoring to me!

## Future Contests

Don't forget the conventional contests: the BATC Summerfun in June, and the IARU Contest in September. Please try to get on the air in at least one of these!

## Conclusion

I can be contacted through e-mail ([contests@batc.org.uk](mailto:contests@batc.org.uk)), or through my BFPO address: Wg Cdr D G Crump, Mailbox Number ACT, BFPO 63, London.

## ATV Newsletter

The ATV Newsletter is a weekly publication covering World ATV News that I find interesting as well as events, projects and activities sent to me by my readers. You also get the latest Local ATV News from the repeater networks here in Southern California. And it's free. Plus information on Digital-ATV/ATV GUIDE, for weekly scheduled ATV events via Streaming Video/ATV Website Links/and more. To subscribe send me an email with your first name and call to [atv-newsletter@hotmail.com](mailto:atv-newsletter@hotmail.com) and I will add you to the mailing list. You can also include any info about your ATV activities in your email, if you wish. I just might put it in the newsletter!

Bryon Foster - N6IFU  
Editor & Publisher of the ATV Newsletter



# ATV Contests - Hints and Tips Part 2

by Dave Crump G8GKQ

In CQ-TV 225 I described general operating procedures. In this article I will discuss how you can develop your equipment to give you the best chance in contests

## Transmitter

You should optimize your transmitter for narrow-band, long distance transmissions. First of all, the video should be low-pass filtered. I use an old Toko 237LVS series filter (with 1Kohm matching circuits) that limits my video bandwidth to about 2 MHz. Not only does this put all the energy where you need it, it is more sociable should the band get crowded with TV stations (I wish!).

Next, turn off your sound sub-carrier – transmitting this just wastes power. You can always turn it back on to talk to the locals. Lastly, check your modulation level. On AM, you can probably increase it slightly from normal – you don't need the linearity, but you need to make sure that your syncs are not crushed. For FM, just use your normal level.

## Receiver

The first thing to check is your masthead preamp. Do you have one? Seriously though, it is worth trying to check its gain and Noise Figure at the frequencies that you will be using for Contest contacts. It is all too easy to peak for best performance on a repeater output, or at the narrow-band segment of the band both of which may be many MHz away from the ATV simplex frequencies. Not any easy measurement or adjustment to make, but worth the effort.

The next step, assuming that you took my advice in the previous article and can accurately set your receive frequency, is to look at your IF strip. I will deal with 70cm AM first.

Narrow-band (500KHz) filters for around 39 MHz are difficult to source or construct. The approach I have taken is to mix the TV IF from the tuner (or scanning receiver) down to 10.7 MHz and use readily available filters here. You can arrange relay switching of the filter for wide/narrow bandwidth. After filtering, you can mix the signal back up to 39 MHz and feed it to the detector.

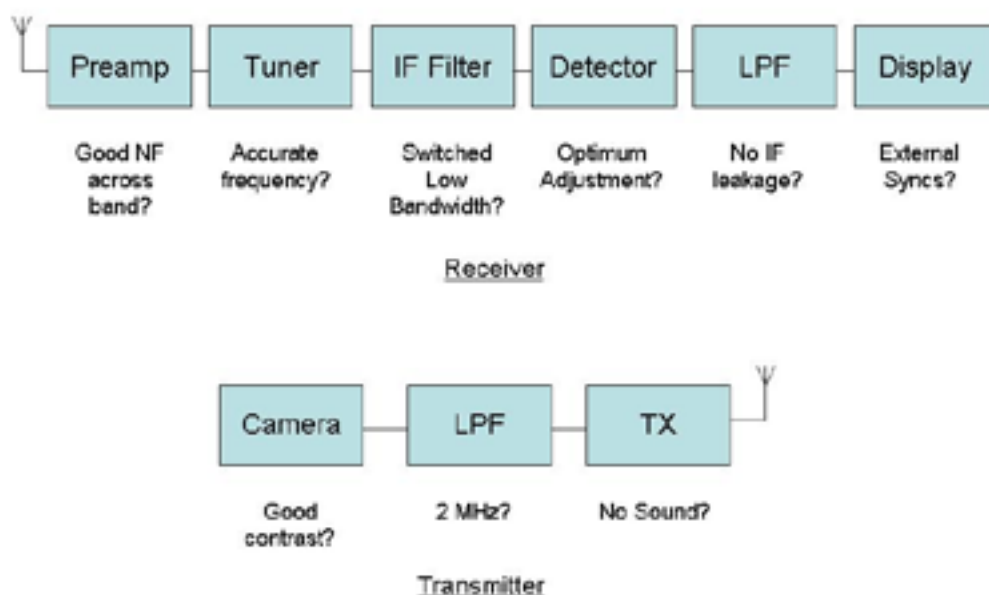
For FM IFs, filtering is slightly easier, as you are looking to achieve 2-4 MHz bandwidth. I have achieved the best low-signal results with PLL demodulators after filtering – there is some adjustment of the effective bandwidth available by adjusting the input level to the demodulator. One thing to check is that you low-pass filter the video after the FM demodulator – many detectors leak high levels of IF out of the video output. This can cause instability and apparent loss of sensitivity. Again, I use one of the Toko 237LVS series filters here.

## Display

The final element in the chain is a properly synchronized display. I have been tempted to experiment with 15,625 Hz filters, but have not had the time. What I have used is local syncs, which now that many stations use crystal-controlled cameras, can give reasonable results.

I hope that these ideas might encourage you to enter the next contest (the Summer Fun contest in June). In the next article, I will outline some ideas that I have for a digitally-enhanced analogue TV set-up...

## Contest Station Checklist



# WDR DMB test in Cologne

by Klaus, DL4KCK

In October 2008 I got a call from "GfK" (marketing research) to take part in a field test of a new mobile digital radio/TV receiver with an experimental broadcast by WDR Cologne. My reward would be to own the receiver afterwards. Although I do not find "mobile TV" to be a necessity, I agreed out of technical interest. Soon a parcel arrived with a questionnaire and the tiny receiver, an "Iriver B20" with a 2,4 inch display and a plastic casing not much bigger, weighing 75 grammes. The internal Li-Poly-accumulator supplies 8 hours of power with DAB reception but only 4 hours with DMB (digital multimedia broadcasting) reception. A 4-part-telescope antenna fits into the casing edge, and a small speaker fires backwards (earplug socket available).

There is a built in VHF-FM, a DAB radio and a DMB receiver with an internal memory for MP3 and video files, attainable via the USB2.0 socket, also serving as charger port. With a PC software provided on a CD-ROM besides the PDF manual it is possible to convert multiple media data file formats to the MPEG4 format needed for the B20. Another 2 GBs are available on an optional Mini-SD card. A unique control system called "Direct Click" uses the tiltable plastic cover on top of the QVGA TFT screen for switching the OSD menu in four directions besides some small buttons in the casing.

The field test in Cologne was primarily to watch the special WDR DMB

programme "WDR-Mobil-TV", consisting most of the time of the regional TV channel WDR-FS converted to MPEG4 QVGA (320x240 pixels), 30 fps, and broadcast with 384 Kbit/s on VHF channel 12 within a DAB/DMB multiplex from a high-rise building. In the DMB part another three A/V streams are sent like "Das Erste" (ARD TV programme 1:1), "WDR-DMB-Test" (WDR2 radio with still images in a rotating loop) and "EinsLive" (popular youth radio with live still image informations like a webcam, music titles and local temperatures). During three full weeks spread over November and December the testers had to write down their evaluation of "WDR-Mobil-TV" in different questionnaire sheets which were retrieved by phone some days later.

My technical view found some odd video artefacts: in spite of the small screen it was easy to see missing lip-sync with speakers on camera (sound ahead of video), and with slowly moving objects sometimes stuttering emerged - both effects did not appear on the other DMB video channel "Das Erste". Some time after the testing period at least the lip-sync fault was removed. Because of the tiny screen many usual graphical inserts with names and titles were not decipherable, but to prove it better some special productions like a "100 seconds news show" with live informations and extra big text inserts alternated with regular programmes. Fast moving horizontal information text bands were unreadable, and with usage outside in the bright sunlight the reflecting plastic

cover on top of the screen added to this.

My positive valuation goes to the good contrast TFT screen with lively colours and a wide viewing angle. The enclosed earplugs have a good sound, but the internal speaker only delivers high pitched sound. With a converted video file, played from the internal memory, no moving-artefacts are to be seen. An interesting observation involves the difference of noise and sound artefacts between DAB and DMB reception (same VHF channel) at critical places (ground level in city buildings, narrow streets): DMB with MPEG4 sound is nearly noise-free and mutes more seldom. In a real mobile testing approach with the receiver behind the windscreen of my car there was stable video reception even at 130 kmh and up to 20 km line of sight from the transmitter. Behind this area the video movement sometimes stopped, and the rf level display above the active picture zone on the screen decreased more and more. Similar on-screen indicators show real-time clock, accumulator level and station name.

One advantage of modern multimedia equipment is the updating function at firmware-level - the Iriver B20 update 1.04 is made online at the korean manufacturer's website with the receiver connected to a PC USB socket. After this the all new DAB+ broadcasts are in reach too...

(Translated by Klaus, DL4KCK with permission from TV-AMATEUR 151 page 7)

**Don't forget as a member you are entitled to a free email BATC address.**

**Contact your Editor or visit [www.batc.org.uk](http://www.batc.org.uk) for details on how to apply.**

# Treasurers Report for 2008

As this year is a non BGM year, I was going to just published the accounts on our web site:

[www.batc.org.uk/club\\_stuff/accounts.html](http://www.batc.org.uk/club_stuff/accounts.html)

This saves two pages of CQ-TV for something more interesting. *(Unfortunately nothing more interesting landed on my desk... ed)*

The club has made a modest surplus last year and is in a financially strong position. After a number of years of slow reductions in membership, I am pleased to report that numbers are on the increase again. We feel that this is due to the new "cyber" membership rate (£4) and the new streaming facilities at [www.batc.tv](http://www.batc.tv)

This service is funded by sponsorship and donations, when you visit the streamer do click on the sponsors links, their sites are well worth exploring and their support is appreciated. The club has funded some of the peripheral equipment associated with the streaming of events. A few members have questioned if this is an area that we should be involved in? In answer to that I can state that it is

an overwhelming success, it is a service available to all, licensed or not and it has world wide penetration bringing your club to the forefront of ATV in the 21st century.

## Members services and publications

The sale of DVDs to our members produced a surplus of £133. The DVD incorporates much of the written archives of the BATC, including back issues of CQ-TV and the "Television and Lighting" book. Paper back issues of CQ-TV are also available.

Member's services had a sale, and this produced a surplus of £54.85 after last years stock value readjustment. Badges and test cards etc are still available along with some of the components for older projects. Enquiries to Chris Smith, details are in older CQ-TVs.

## PayPal

We have changed the provider of our credit card services. We now use PayPal as our provider, the most visible aspect of this is the secure PayPal interface used for our web based payments. This

is available to all, you do not need a PayPal account to use it, and it works with credit/debit cards just fine. Overall it will work out to be less costly than our previous provider. If you are in the UK a cheque in the post is very acceptable. There are a number of other payment methods, if you have problems contact me, Brian Summers.

## Committee business

There is always a need for committee members to take on tasks and we need new volunteers to take on some of these jobs, like publicity, rally and radio club lectures. If you feel you are able to contribute to the work of the committee or just able to give a lectures to radio clubs, please get in contact with the BATC chairman or secretary. Your committee does most of its work by Email, and meetings are infrequent. The cost of the 2008 BGM was a very modest £167. The BATC 60th meeting is not a BGM, the next one being in 2010.

Brian Summers Hon. Treasurer  
May 2009

# Something for Nothing

Yes, you read correctly! I am offering free web hosting and email to any individual or club who requires an online presence.

This is commercial webhosting, it does not have any "advertising" associated with it, all that I ask is that it has something to do with ATV. If you want to say "thank you" then you can place a small link to the BATCs website and/or my website but there is no requirement to do so.

How am I able to do this? Well, for those of you that don't know, I own a company whos business it is to design and host

websites, we have our own racks in the Telehouse East datacentre in Londons Docklands where we house our own hardware and connect to The Internet via multiple gigabit connections, so we are fast !!

So if you are looking to setup a website, or you already have one but you're paying for it, get in touch and I will sort you out with a free account - we won't charge you to transfer an existing domain across either.

If you don't have a domain name, then we can register one for you, but that bit won't be free I'm afraid as we have to

pay for fomainns just like anyone else, but it's only a tenner for two years, so that won't break the bank.

We also have several domains that we can create sub-domains on and we give those away free of charge, so if you're on a really tight budget and don't even want to buy a domain name it will be totally free of charge.

You can contact me via email:  
[editor@batc.org.uk](mailto:editor@batc.org.uk)



# Accounts for 2008

## THE BRITISH AMATEUR TELEVISION CLUB

<b>Income and expenditure account at 31 December</b>	<b>2007</b>	<b>2008</b>
<b>Income</b>		
Subscriptions	10,388.26	9,275.83
Members services	-1,463.74	54.85
Publications surplus	74.65	133.90
Advertising	0.00	0.00
Bank & Building society interest	1,147.11	1,368.46
Rally or Covention surplus/loss	0.00	-166.50
Donations recieved	1.40	122.00
Postages, Airmail	72.00	66.00
Miscellaneous	.00	205.33
	<b>£10,224.68</b>	<b>£11,059.87</b>
<b>Expenditure</b>		
CQ-TV printing	4,432.54	4,278.24
CQ-TV postage	1, 866.83	1,975.89
CQ-TV production	0.00	170.97
General Office expenditure	46.73	38.87
General Postage	42.04	31.33
Internet Web Site expenses	261.51	318.81
E- Mail, ISP expenses	89.96	25.00
RSGB affiliation fee	44.00	44.00
Committee meeting attendance exps.	0.00	0.00
Insurance, legal & fees	0.00	24.99
Rally attendance	0.00	0.00
Recruitment	148.04	195.92
Adverts and publicity & Projects	0.00	639.97
Refunds	0.00	18.36
Bank charges, VISA & PayPal costs	354.24	501.83
	<b>£7,285.89</b>	<b>£8,264.18</b>
<b>Surplus for the year</b>	<b>2,938.79</b>	<b>£2795.69</b>

Notes for 2008/9

The figures in "Income" for members services, publications, the rallies and conventions are the net contributions or loss to club funds.

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## THE BRITISH AMATEUR TELEVISION CLUB

<b>Balance sheet at 31 December</b>	<b>2007</b>	<b>2008</b>
Fixed assets		
Office equipment Additions	0.00	169.33
Less Depreciation	0.00	-169.33
Current assets		
Stock: - Members services	322.23	299.54
Publications	0.00	0.00
Back issues of CQTV	100.00	100.00
Nationwide Building Society	144.19	1544.19
HBOS (Halifax bank) deposit a/c	11,171.95	11,451.09
GiroBank Alliance & Leicester account	287.85	399.35
HBOS** current account	20,404.95	18,867.99
HBOS** investment a/c	31,839.34	32,724.04
PayPal account		607.67
Less Current liabilities		
Subscriptions received in advance	11,137.90	10,065.57
	£53,132.61	£55,928.30
Represented by accumulated fund		
<b>Balance brought forward</b>	<b>50,193.82</b>	<b>53,132.61</b>
<b>Surplus</b>	<b>2,938.79</b>	<b>2,795.69</b>
<b>Balance carried forward</b>	<b>£53,132.61</b>	<b>£55,928.30</b>

\*\* HBOS previously the Bank of Scotland

I have examined the books and records of the British Amateur Television Club and confirm that the balance sheet and the income and expenditure account are in accordance with those books and records.

Brian Summers  
BATC Honorary treasurer  
May 2009

Cyber-membership: CQ-TV beamed directly to your PC  
four times a year for only £4  
Visit: <http://www.batc.org.uk> for details

# Oh No, not another CAT5 Project!

by Bob Robson, GW8AGI

This is the fourth project using CAT5 cable. It was born out of necessity. What's different about it?

Lets go back to the BGM. The event was the first time that the lectures and other events were sent to the BATC streamer site for all the world to see. In all there were four cameras covering the event. Chris Smith was manning the vision mixer and for a while things went according to 'plan' and he was able to select the shots he liked. BUT when one of the speakers held up a piece of kit, what happened. All the cameras swung round and zoomed in on the object. Net result was that Chris had no alternative picture to cut to until the camera men came back to life and started to show 'normal' shots.

What was the root cause of the problem? There was no communications between the desk and the camera men, and the camera men didn't know when they were 'on air'.

I belong to a 'Camcorder Club' and from time to time we get asked to video events like Band concerts and Choirs. We use at least three cameras, which run independently, and record the performance on all cameras. The Editor then has the job of selecting shots from the taped results to produce the final 'Film'. The 'master' camera is normally set up as a head on shot of the stage, with the other cameras at either side of the auditorium.

Whilst normally the shots from the 'side' cameras provide good shots there are time when the Editor could have liked a perhaps, tighter shot on



a performer. Again the 'fault' is the lack of communication between the 'producer' and the cameramen. How do we go about solving this problem?

What do we need to provide. – A Coax feed from camera so 'producer' can see what the cameraman is seeing, Audio to the cameraman (none in the reverse direction so cameraman not tempted to 'natter', and a Cue light to let the cameraman know his is the 'on air' camera. – At least three cables, and perhaps a fourth if there is a mike set up near the camera position. Quite a lot to set up and test!

As articles in CQTV have shown 'CAT5' cable can be used to transmit video over some 600 ft successfully so if we decide to go that route what is needed? The camera end box will need power for the amplifier to convert the video to a balanced signal (1 pair) one pair for the video, one pair for the 'cue' light and one pair for the comms to cameraman. Another pair for an audio feed from a mike on or near the camera.

All that adds up to five pairs of wires, BUT cat5 has only 4 pairs ! How can we get round this problem? The Que light is a 12V LED so we can use the pair that feed it as the power feed to the camera end. In that box a bridge rectifier is fed from the Que feed, the output will always be the correct polarity (one pair saved)! The +5 & -5 volts for the balancing amplifier can be obtained from a miniature power supply block. If the audio feed to the cameraman is unbalanced one leg of the pair will be the used as the 'earth' connection.

The connectors on CAT5 are normally IDC (Insulation Displacement Connectors) with lightweight connections and are not ideal for multiple connection/disconnections, so an eight pole locking connector has been adopted for the system. The basic cable length is 100ft but extension cables of 25ft and 50 ft have been made up so most set-ups can be achieved. The extension cables have an inline plug at



one end so they can be plugged together to achieve the length required.

So what's in the camera end box? As well as the balancing amplifier there is an audio amp to feed the cameraman's headphones, the Que LED, and a connector to allow a remote LED to be clipped to the camera. This connector also has a dry pair of changeover contacts that can connect, if possible, to the camera's own Que light.

The astute among you will recognise the Amplifier circuit as the one Mike Cox used in his article on the use of CAT5 in CQTV 220.

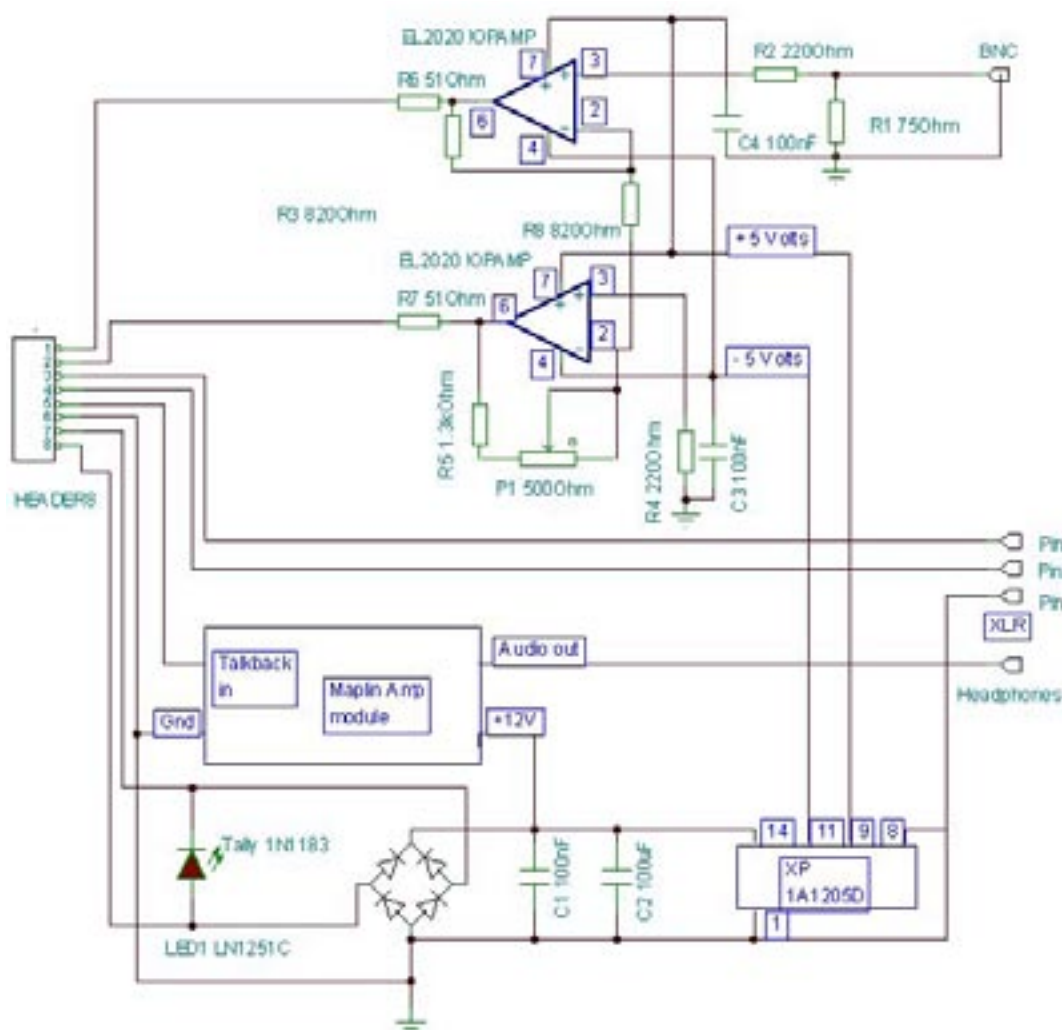
So, what about the other end?

## Control Box

The picture shows the rear of the box. It is 18" in length (44cm in newspeak) and the connectors, from left to right are:- Power in (12V), Que interface input, followed by four groups of connectors for the CAT5 in, XLR out and BNC out. On the sloping top are four black buttons to allow the Producer/Director to talk to each cameraman independently, and a red button which connects to all cameras at the same time. On the vertical front face is a connector for the Producer/director's microphone.

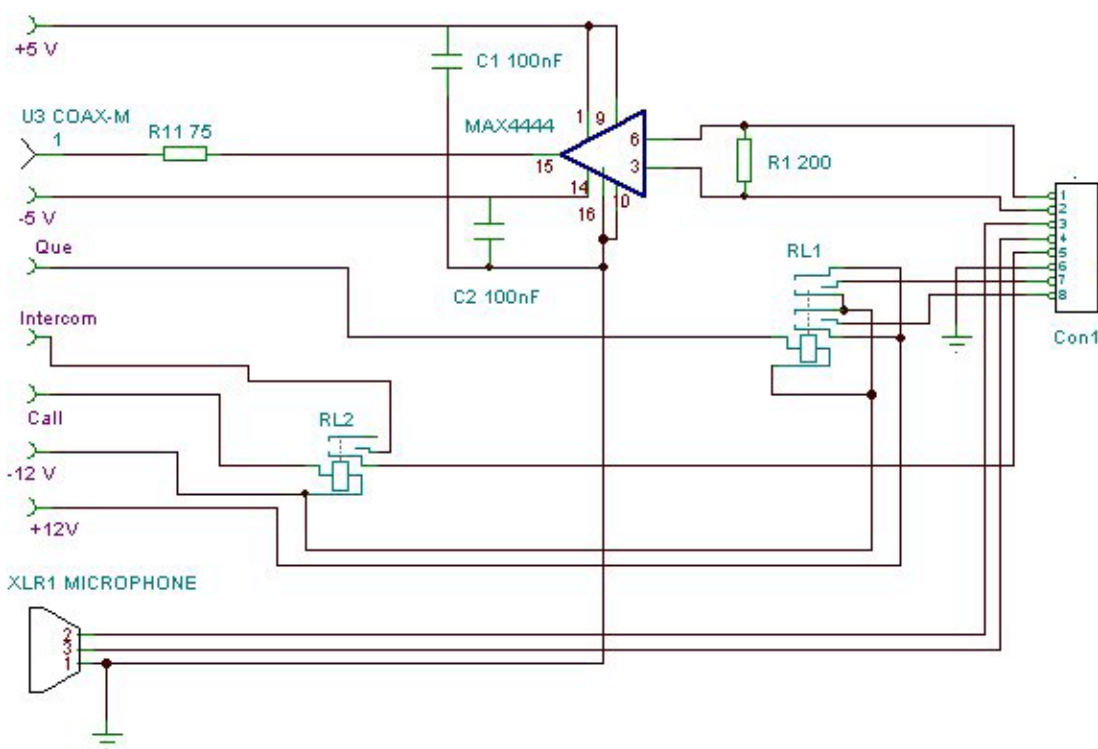
There are four channels, the circuits of which a shown below. The active component is the MAX4444 I/C which converts the balanced video to a single ended output to send to the video mixer. The first of the two relays switch on the Audio to the cameraman whilst the second reverses the polarity of the Que signal lines to light the 'On Air' LED at the camera end. The XLR is connected to the CAT5 connector.





The other circuits in the Control Box are the Power supplies (+ & - 5V) generated by small Murata power units to power the MAX444 i/cs, the mic preamplifier and the Que interface. The system is powered by a 'plugtop' 12V power unit. The 12 Volts are 'free floating' as earthing one side would cause many problems, so the system 'earth' is derived from the Murata power units throughout the system.

This project started well but, as with other projects I've embarked on, obsolescence rears its ugly head. For example I used MAX 435 and MAX436 ics for the balanced video transmit & receive. When the ones in my junk box ran out I found that they are no longer manufactured. The MAX 436 has been replaced with a Max 4444. Fair enough BUT the 4444 is surface mounted beast! I have found an adaptor that you can solder the SM device on and it has 16 pins that convert it into a DIP package. Back to the drawing board! This has delayed the project, so this article is incomplete and will have to have a second article for Chris to put in the next CQTV.



# The BATC 60<sup>th</sup> Anniversary Weekend

## SATURDAY 13 JUNE

Check in to the hotel.

Settle in, look around, check out all they have to offer and enjoy – everything is available to hotel guests!

Setting up day for OB and other exhibits and demonstrations

Swimming pool

High Tech 10 pin Bowling

- Gym
- Golf
- Golf Simulator
- Country walks

\* \* \*

8.00 pm - 60th Anniversary Celebration Dinner

Relax afterwards in the bar.

If it's a nice evening take your drinks out onto the terrace, view the lake and the rolling country as the sun sets, mull over old times with old friends.

Anticipate tomorrow's events.

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The Helidon Lakes Hotel is near Daventry, Northamptonshire, the postcode for satnav is NN11 6GG this will get you as far as the road on which the hotel is located, just continue down the road for another half mile to reach the hotel itself.

**Directions by road from the M1:** Exit at Junction 16 and take the A45 towards Daventry. After approximately eight miles take the A361 towards Banbury. Approx. five miles from Daventry (just before Charwelton) turn right towards Hellidon and Priors Marston. After approx. 2.2 miles take the second turning on the right towards Hellidon. The hotel is on the left.

**Directions by road from the M40:** Leave Junction 11 (Banbury) and take the A361 towards Daventry. After passing through Charwelton, turn left towards Hellidon and Priors Marston. After approx. 2.2 miles take the second turning on the right towards Hellidon. The hotel is on the left.

## SUNDAY 14 JUNE

### PROGRAMME OF EVENTS

#### ALL DAY

- Outside exhibits in the car park
- Indoor exhibits and traders
- Bring & Buy Stall (10.00am until 2.00pm)
- Refreshments in the lounge/bar
- Cash Bar (main Hotel Bar)

*Lunches available from the hotel's day-time menu in the restaurant or bar*

#### LECTURE/DISCUSSION PROGRAMME (provisional – see website for latest)

10.00am	Digital Television TBC
10.30am	Thanks for the TV memorabilia! Dicky Howett A light-hearted trawl around boot sales & eBay
11.00am	“Hit the road Jack!” Richard Harris A brief look at the history of Outside Broadcasts
11.30am	NBTV Jeremy Jago
	LUNCH PAUSE
1.00pm	Analogue repeaters in a digital world Dave Mann & G8ADM Mike Sanders G8LES
1.30pm	Club history and nostalgia Bob Robson GW8AGI (Origins of the club, historical tapes)
2.00pm	The club streamer project TBD
2.30pm	The club at 60 – The Next 60? Trevor Brown G8CJS
3.00pm	Discussion - Open to all
3.30pm	Finish

# Interlacing - RCA's invention?

*The hidden story of 1920s video compression technology by Paul Marshall*

Pick up any worthwhile book on the history of television and turn to the index to look up the word 'interlace' or 'interlacing'. Look at the referenced pages and somewhere you will find an established 'fact' that Randall Ballard of RCA invented the 'clever' technique of interlacing in 1932. It doesn't matter whether the book is American, British, German, French or Russian – Randall Ballard invented interlacing. Is this 'fact' completely sound though? As with so many issues in the history of the technological development of television the rights to precedence have become distorted over the years by manipulations of corporate image, tweaking for reasons of national pride or just plain acceptance of the status quo.

Interlacing is now viewed by most professionals as a curse – but usually a necessary curse for 1920x1080 HD formats. 1080i (interlaced) is now relatively commonplace but try finding 1080p (progressive) equipment and programming. It exists, but it's not being received in British living rooms. The well known problems of interlace inter-line twitter and the difficulties that it causes particularly with moving objects are well known<sup>1</sup>. Readers of CQ-TV should not need too much of an introduction about why interlace is still used today. It's a versatile technique, a kind of video compression technology, squeezing more information down a transmission chain than is possible than with the 'ideal' progressive scanning. There is a point of note here though, the technical issues of today are different to when television images were produced by camera tubes and displayed by CRTs. The lag associated with camera tubes tended to mask some of the issues of inter-line twitter at the camera end and at the display end the CRT with its phosphor decay between fields effectively flashed up two discrete but decaying images. This is ideal for motion blur reduction, unlike the so-called zero-order hold

displays of today that don't decay as they are essentially 'sample and hold' devices<sup>2</sup>. To most 'traditional' television engineers interlace is a flicker reduction technology that enables a given number of lines to be displayed with an effective doubling of frame rate with no penalty in line speed and video bandwidth. Two half frames (fields) combine the odd and even lines time sequentially to ensure that the area of phosphor observed by the viewer is refreshed at twice the rate, thus avoiding flicker. This is not the case with zero order hold displays – there is no decay – so today it is simply about bandwidth and data rate reduction. In effect, a first pass video compression system.

Going back further in time, to beyond the 'traditional' television engineers of the mid 1930s to 1980s, interlacing was a much more ill-defined principle and Ballard was far from being the first to wonder about non-progressive scanning. In the electro-mechanical era of television, when Nipkow discs and mirror drums spun out a few dozen lines with frame periods of around 15 frames per second or less, the technology was still looking for a viable application. The idea of adding 'pictures to wireless entertainment' was taken up in the late 1920s when famous figures such as John Logie Baird in Great Britain and Charles Francis Jenkins in the United States of America, began television broadcasting over the air-waves. There was excitement about the images despite, to our eyes, severe technical limitations and restrictions. For a long time, certainly as early as the 1900s when the idea of television was still firmly theoretical, the need for more lines and more frames was fully appreciated. What was not clear, and this is very hard for us today to understand, is what kind of bandwidth would be needed for television. The idea of bandwidth for speech and music was just about understood but what of the strange television waves? Experimenters around the world began to understand that television needed a lot more space than audio, but how much more?

The answer is that nobody really knew, even by the late 1920s. It needed more, a lot more for better pictures than those of Baird at 30 lines and 12.5 frames/second. Baird managed with a sound transmitter – just about – but the pictures flickered terribly and the low resolution was inherent.

Unknown, or at least unappreciated by Baird, was the fact that he had already stumbled upon a method that could have doubled, or even tripled his picture quality at a stroke either in terms of lines per frame, or effective frames/second or a compromise between the two. All this could be achieved without adding extra bandwidth and with little extra system complication. Did anybody else pick up on this at the time? The answer is yes, and it wasn't Ballard, at least not at first.

## Ulises Armand Sanabria

Who? Or is that a 'what'? It's a 'who' and the name is obscure to anybody but the most avid reader of television history. Arguably the most well respected book on the international history of television is *Television - an International History of the formative years* by Prof. Russell Burns, but even he fails to mention Sanabria<sup>3</sup>. It's likewise for almost every other television history book. If mentioned at all he only warrants a couple of sentences. The conclusion has to be reached that he wasn't very important and that he has no legacy that should interest us but the facts of Sanabria's achievements actually put him alongside Baird and Jenkins as being at the forefront of electro-mechanical television development and deployment. There is only space here for a very brief résumé of his life and work, but his television systems of the late 1920s and 1930s exceeded both technically and commercially, those of his contemporary, Baird. Baird has had dozens, if not hundreds of books written about him but Sanabria's story has yet to be told anywhere except in snippets from the web and as a chapter in a very rare privately published book<sup>4</sup>.



Sanabria was born in 1906 in Chicago to a Canadian mother and a Puerto Rican father. Little is known about his early life until the final year of High School where in a brief autobiographical note that he wrote 3 years before his death in 1966 he says<sup>5</sup>:

*Hired by Hearst Newspapers to direct project to create television in six months during last year of high school because television inventions appealed to the publisher's technical advisers.*

This was in 1924, at the age of 17 or 18. Some details about his staff and photoelectric cell construction follow in various sources but then this dramatic claim for 1926 appears<sup>6</sup>:

*First to produce television using interlaced scanning on January 26, 1926 - financed by Illinois Publishing & Printing Company. Demonstrated successful television to 200,000 people attending Chicago Radio Show from October 10th through 17th, 1926 at Chicago Radio World's Fair, Chicago Coliseum.*

This is a significant claim, not just because of the claimed (and documented) demonstration of television, but the mention of 'interlaced scanning'. It's also in the same date range as Baird's significant early demonstrations. Sanabria's interlace system is not like anything that we normally think of as interlace but the principle is identical.

His system was a 3:1 scheme (rather than the virtually universal 2:1 of today). It was accomplished using three offset spirals on the sending and receiving Nipkow discs. It worked, and it worked well, with 45 line 15 frames per second images being transmitted. With 15 frames per second and a 3:1 interlace the effective frame rate was 45 fields per second yielding (for the time) a very steady image. Strangely, a patent for his interlaced scanning was not applied for by him until May 1931.

His other major innovation utilised the synchronised mains electricity grid system used in the mid west, then already locked to 60 c/s. By using synchronous motors both at the transmitter and receiver rock steady synchronisation was achieved requiring only an initial phasing by applying a brake to the disc until phase synchronisation was achieved. Jumping forward and glossing over much important further work, Sanabria formed Western Television Corporation and by 1932 had as many as 7 broadcasting stations all using his 45 line, 15 frame 3:1 interlaced system.

Under the brand name 'Echophone' receiving sets were made for the general public called 'Visionettes' and, like Baird's 'Televisors', were relatively expensive for what they offered. The picture quality would quite likely have been somewhat better on one of Sanabria's sets compared to those of Baird and potentially owners would



**Figure 2 Western Television Corp. Visionette domestic television display manufactured by Echophone Inc.**  
Picture source:

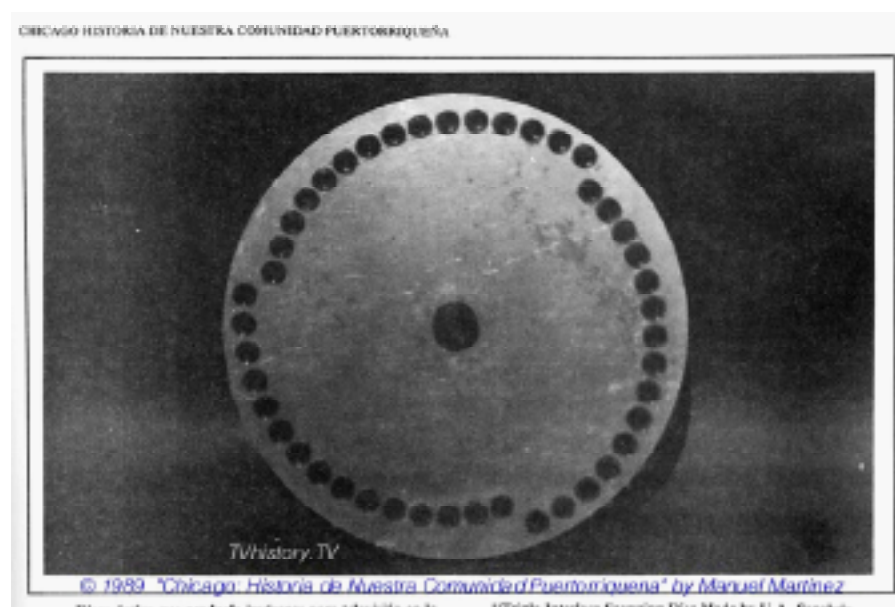
<http://www.radiolaguy.com/Showcase/Western%20Television.htm>

have had a choice of 'station', unlike the BBC 30 line transmissions with just the one. Figure 2 shows a 'Visionette' – note the ship's wheel in the middle used for the manual phasing operation.

Sanabria and his associates went on to develop all-electronic television systems and one of his companies became a significant pre and post World War II CRT manufacturer. After the war mass production of television sets became the main focus of Sanabria's operations but alongside this was a television engineering school. Ultimately his businesses collapsed in the mid 1950s because of tax irregularities. Sanabria always maintained that technically and commercially the businesses remained sound but the truth of that claim is something yet to be investigated.

### The Sanabria claim to interlace

Undoubtedly Sanabria had invented a viable kind of interlacing by 1926, using it regularly by the late 1920s and patented in 1931. Our RCA man, Ballard, did not patent his system (based on a Nipkow disc based film scanner device) until July 1932. It wasn't actually granted until 1939 which suggests that there were legal issues. Sanabria's patent would likely have been a major obstacle but there was other prior art too that could have caused problems. I have already mentioned that Baird had had ideas about interlacing. He called his method 'intercalated scanning' patented in January 1925. His system was more about increasing resolution



**Figure 1 Sanabria's triple interlace Nipkow disc with three spirals**

Picture source: Sanabria family

using a mechanical offset control applied to the Nipkow disc and it is highly unlikely to have worked. Other patents stretch back even further to that of Samuel Lavington Hart in 1914, William Samuel Stephenson & George William Walton in 1923 and Marius Latour in 1926. Examination of these patents reveals only tenuous links to interlacing as a technique as understood today, but another inventor, Russian Lev Sergeyevich Termen, much better known for his musical instrument, the Theremin, claims an interlaced scanning demonstration in 1926. This has yet to be substantiated.

On current information Sanabria would appear to be the true inventor of interlacing but then he spoils it a little himself with a very strange description of his invention in his patent:

*I propose to eliminate (sic) this objectionable interference caused by the side-bands by interposing dissimilar wave forms so that no particular wave form will be repeated a sufficient*

*number of times to overcome the inertia of the circuit having selective frequency characteristics, therefore, a signal is not permitted to build up to sufficient strength to be a factor within the range of practical perceptibility.*

The meaning is far from clear, but it seems that he was worried about sidebands from his transmissions interfering with other users. It must be remembered that they were using the medium wave broadcast band initially before moving up into the 2 mc/s range under Federal Radio Commission orders. This suggests that bandwidth reduction was his aim, not flicker reduction. Whatever his intended use for the invention was it appears that Sanabria was there first – unless Terman's claims can be substantiated.

Interlacing is still with us and likely to be so for a long time to come yet. Sanabria's idea is one of the few surviving television technologies from the earliest of days and Ballard probably needs to at least share his crown with

Sanabria, if not surrender it.

1. Wikipedia <http://en.wikipedia.org/wiki/Interlace> Accessed 30-05-09 This account of interlacing describes the technical method and problems well but misses or misinterprets most of the historical issues.

2. Newer LED backlight LCDs and certain Plasmas do not exhibit this behaviour utilising black field insertion and some even add active predictive inter-fields.

3. Burns R W (1998) Television - an International History of the formative years, IEE

4. Martinez, M. A. (1989) Chicago: Historia de Nuestra Comunidad Puertorriqueña The History of Puerto Ricans in Chicago, Private.

5. Ibid

6. Ibid

## Digital Ramblings

by Brian Kelly, GW6BWX

It's easy to lose sight of the target when it comes to digital ATV.

Historically, the amateur TV fraternity have strived to achieve the performance of professional broadcasters but without investing millions in research and design and utilising less than 'state of the art' equipment. Following the professionals is a reasonable route to take, let the big guys iron out the problems then adapt their work for our more modest requirements. After all, there is no point in re-inventing the wheel or duplicating the work of experts, who undoubtedly have access to better design facilities, just to reach the same ends. The change to digital broadcasting has strengthened our dependency on following the experts, the leap in technology has made it difficult for us to innovate and narrowed our options for alternative digital systems. Whereas in the past we were able to compromise, we are now

blinkered to all but the standards of commercial broadcasters.

I'm going to step out of line and say we should be looking at other digital broadcast methods, ones which DO compromise quality but are still adequate for amateur needs. I think it is possible to send live, colour pictures and sound, in a narrow bandwidth and at a price that most can afford. Here, I'm going to outline my reasoning and at risk of being exposed as technologically incompetent (which is undoubtedly true!) request debate about my ideas.

Convention dictates we transmit starting with a camera, tape or TCG, squash the signal in an MPEG encoder then put the resulting numbers into a digital modulator to produce a stream suitable to send. At the receiving end we pick up the stream, extract the numbers from it, stretch them back to reality with an MPEG decoder and feed the analogue result to a TV monitor. If

we analyse the cost of each of these steps we can easily see why digital ATV is still very expensive compared to its analogue sibling. The source material is exactly the same cost as analogue and will almost certainly already be in the hands of an ATVer so that isn't an issue. Similarly, the display at the receiving end will already exist or be available at almost no cost. That leaves the MPEG encoder and decoder and the digital modulator and demodulator. These are the high cost and highly complex stages that make home construction impractical and therefore undesirable. Of course, domestic digital receivers are now very cheap and already abundant on the second-hand market so we could adapt them for our use but doing so forces us down the route of following commercial transmission methods so it simply shifts the costs to the broadcasting end.

To keep costs reasonable, I propose we look at eliminating the MPEG encoding hardware completely. Not only are

there better alternatives such as H264 but modern computers are fast enough to encode video on the fly these days using purely software methods. The BATC video streamer is testament to this. These computers will also have USB hardware that can be used to 'capture' the video and sound source, almost all streamer users will be doing this already. There are many analogue to USB adapters on the market, some costing less than £20 which are perfectly suited to our needs and many modern camcorders can now play tape or live pictures through a USB (or Firewire) link. When you consider that a modern laptop computer is significantly cheaper than a dedicated MPEG encoder board it starts to make sense.

For receiving and expanding a digital stream we can again dispense with a hardware MPEG decoder and use software to do the job. Of course the computer will have a monitor screen, either built-in or external so the need to convert back to analogue is also eliminated and by switching or reconfiguring software it can serve as both encoder and decoder. It may be possible to do both simultaneously to work full duplex. My modest computer can send over my BATC stream and watch an incoming stream at the same time. Admittedly, it causes me some problems but they are due to ADSL speeds, not limitations of the computer or software.

This leaves the problem digital modulator and demodulators to solve. It isn't unreasonable to put aside existing modulation methods and invent our own. We are generally constrained by bandwidth rather than quality so we can to some degree, trade one for the other. Most commercial broadcasts are optimised to use the same band 'slots' as their analogue counterparts so that existing band plans can be retained. With this end in mind, commercial sense says pack as many 'adequate' channels in the space available, and that's exactly what domestic broadcasters have done. They could increase quality but only by reducing the number of different program channels available. They did a pretty good job of drawing the line

between customer satisfaction and maximising revenue. From an ATV point of view, the criteria is different, we are not faced with needing to make profit or maintain high picture standards but we are constrained by limited band space and the inevitable restrictions of home construction.

Based on our relaxed needs, we can look at a far wider range of options than our commercial counterparts but first we need to draw a 'minimum specification' that satisfies our ATV needs. If we exceed the specification, all's well and good, if we don't, at least we have a usable system. For example, how much data do we actually need to send in order to satisfy an ATV viewer? The amount we need to send depends on the video bandwidth, frame rate and sound sampling rate as a minimum. We may also have to accommodate some 'housekeeping' data to ensure the data can be decoded successfully. It might be worth considering what should be allowed to happen if the signal degrades, do we for example, sacrifice data rate in preference to error correction codes or is there a method of modulating which allows for 'graceful' loss rather than an abrupt stop when things get bad.

We can learn a lesson from domestic broadcasters who have already faced and overcome the perils of signal path degradation. The biggest problem facing digital transmission is multi-path distortion, that's ghosting in mortals talk. Our eyes are remarkably good at recognising images in ghosted pictures so we can get away with quite severe distortion using analogue modulations. Digital streams faced with the same corruption start to look like random noise and can't be decoded. That's why we use two different systems for satellite and terrestrial broadcasts. Satellite broadcasts are literally 'line of sight', even if it takes a large telescope to see where they are coming from, the point is there are no obstructions. On the other hand, terrestrial is very much influenced by objects either in line or close to the transmission path. DVB-S used for satellite broadcasts has lots of data and little error protection, DVB-T used in ground based broadcasts has to

be far more robust so much of the data is dedicated to ensuring it's integrity. Very little ATV activity is satellite based, (perhaps something from the ISS can be arranged) it is almost entirely point-to-point across ground and therefore will probably need some mathematical assistance in line with DVB-T.

So which kind of modulation should we adopt and how high is the technology hurdle that home constructors can still jump over? I'm no expert in digital modulation although I do basically understand how QAM and QPSK work, I think one of them is the answer but I'm not sure which it is. I'm going to suggest that we experiment with low bit-rate QPSK initially and use software generated MPEG-1 signals. I have in mind that very good quality video can be stored on CD media using the VCD standard at 1.15Mb/s (note CD and not DVD!) and at that such a low data rate shouldn't be too difficult to broadcast. Several free software packages are available that will stream at VCD rates so digitising shouldn't be a problem. I think a simple digital transmitter can be built using a fast (>40MHz) microprocessor and a cheap PAL device and still give acceptable quality in a bandwidth of less than 4MHz. If trials are successful, we could then try H264 instead of MPEG-1 which should significantly increase the quality without hardware change. If that also proved to work, we could move on to experimenting with different modulation methods.

Those in the know will appreciate I have my hands tied for the foreseeable future so I can't be involved on a practical level so please don't ask for progress reports. What I want to do is stimulate discussion on my ideas with a view to some real tests being carried out in the future. I believe we can build digital ATV stations at home, using conventional construction methods and still keep the cost below say £100. Please get involved, even if to tell me to shut up.

I can be reached by leaving messages on [www.batc.org.uk/forum/](http://www.batc.org.uk/forum/) or by private email as 'brian@atv-projects.com'.



# GB3TM Streaming Notes

by John Lawrence GW3JGA

GB3TM is about 60 kilometers (37 miles) line-of-sight, over a sea path from my QTH. The received signal is normally P5 but is sometimes affected during the summer months by ducting and other troposphere disturbances.

There are no streaming facilities or internet connection at the site. In order to stream GB3TM, I set up a satellite receiver at my home QTH to provide video and audio feeds. The receiver was fitted with a MOSFET pre-amp and tuned to GB3TM. The receiver A/V outputs were taken to an A/V distribution box (Circuit Notebook No.101) to provide two separate outputs, one to feed an A/V monitor (TV set with phono inputs) and the other to feed an Audio/Video Capture Device.

The A/V capture device I used was by EasyCAP. It has two audio channel inputs, a composite video input and an S Video input. It has a USB 2.0 output and is powered from the USB port. I bought it new on EBay for £11. The EasyCAP device comes with a USB connecting lead and a Driver CD. I connected it to my PC and loaded the driver software. I had some difficulties at first because I was trying to be too helpful, once I let it do its own thing it loaded successfully.

I then went to the Adobe web site [www.adobe.com](http://www.adobe.com) and downloaded Adobe Flash Media Live Encoder version 3. The programme recognized the EasyCAP encoder and I was able to feed in Video and Audio and see the video displayed in the two on-screen monitor windows. Shown below right.

I contacted GW8PBX, the GB3TM Repeater Keeper for permission to obtain the password information from Chris Smith G1FIF. I loaded the information, clicked on 'connect' and then 'start'. I monitored the result by logging on to [www.batc.tv](http://www.batc.tv) and then username, password and begin. I went to ATV Repeaters, scrolled to GB3TM and clicked video stream, then watch. And, there it was, the received picture

with about 3 seconds continuous delay. I then experimented with the Video and Audio setting whilst monitoring the received signal.

The best settings for my system were:-

Video format VP6  
Frame rate 10fps  
Input size 352x288  
Bit rate 100kbps  
Output size 352x288  
Audio MP3 mono  
Sample rate 11025  
Bit rate 20kbps  
Total Video+Audio bit rate 120kbps

## Operating problems

When encoding GB3TM whilst live contacts were taking place (one transmission followed by another e.g. normal repeater operation) the encoding would regularly freeze. It was only possible to return to normal operation by exiting the encoder programme and then reinstalling it.

At GB3TM when an incoming signal drops out there is a burst of video receiver noise before a 'K' is sent and before the next signal takes over. It was thought that this burst of noise was causing the problem.

I remembered that I had a 'Real Time Screen Splitter', a box that allows you

to see four camera inputs on one screen, as used with video cameras for security monitoring in shops. The box contained a field store and had a single input facility. If the single input dropped out then the output continued producing immaculate syncs but changed to 'blue screen'.

This box was connected between the receiver A/V output and the input of the A/V capture device. Any burst of video noise now appeared sitting on immaculate syncs and the encoding process was not affected. We have not experienced any freezing since routing the signals through the box. Problem solved.

## Audio/Video Delay

This delay exists between the time the encoded signal is sent down the internet to the BATC server and the time it is received and displayed. This delay is around 2 to 4 seconds when starting up. However, over a period of time at this location, this delay increases by about 2 seconds per minute to over a minute. It is possible to get back to the shorter delay by closing the [batc.tv](http://batc.tv) programme and then reloading. This delay is different at different locations. It is not clear where or how the delay occurs and this is being investigated. My broadband speeds are typically 3-4 Mbps download and .350 Mbps upload.



# Letters to the Editor

On the letters page of CQTV 225, I read with great interest the account by Arthur Critchley of the Matilda era!! I gather that some of our members do enjoy reading the 'column' that I write each time, and it is good to have the account described in more detail by 'one who was there'.

What Arthur has not included in his activities with the Club is that he wrote a long series on integrated circuits -- initially on op amps, and later covering the logic series of the time -- initially RTL, and then the TTL series of (largely) 74 series logic. I feel sure that this series is the 'source material' for many projects and articles that appeared subsequently - and they are still a 'point of reference' that is helpful today. I, for one, learnt my 'logic' from that series!

In a similar way, John Lawrences look back through his Circuit Notebook brought back memories! -- the quadrant fader - Fig 3 - made with Meccano parts showed how to make a 'look alike' for the 'peroper' studio faders of the time, and the vidicon blanking generator was a 'neat trick' for solving that need.

Thank you, to Arthur and John, for inspiring many of us to 'try something'!!

Peter Delaney

In September G4ERP will be taking part in a hill climb at Prescott near Cheltenham. I would like to invite any individual or group who has experience of linking live tv from mobile sources to contact me with a view to televising the various runs he makes.

We have been officially approved by the organisers and are seeking equipment and experienced people. I did this sort of work for BBC tel OBs in the past.

Help!

73  
Giles Herbert  
G0NXA

Email: g0nxa@hotmail.co.uk

*Please keep your letters and emails coming in, remember that "Members Ads" are free if you're having a clear out and a "letter to the Editor" may help put you in touch with someone that can help you find information or equipment you are looking for, ed.*

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# Turning back the pages

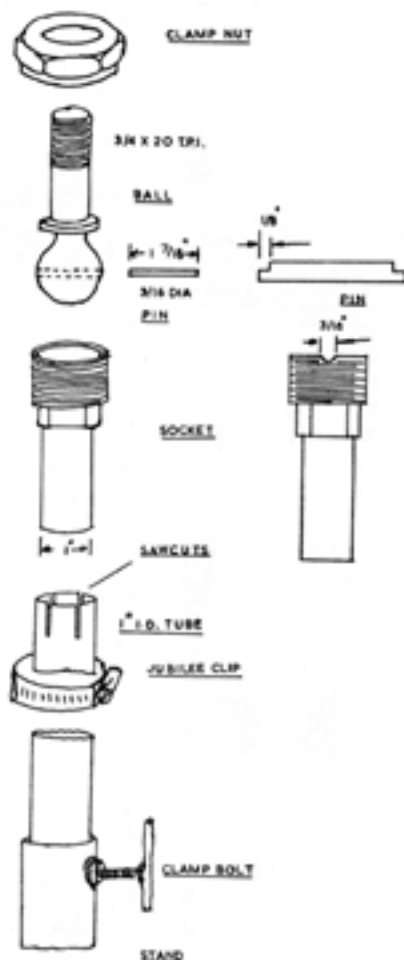
A dip into the archives of CQ-TV, looking at the issue of 50 years ago.

by Peter Delaney

CQ-TV 40 - "Summer 1959"

The magazine editor, John Tanner, commented that an 'outstanding feature' of CQTV 40 - and issue 39 - was that the only photograph was that on the front cover. For CQTV 40, this was an off screen shot of John, GW3JGA/T's flying spot scanner. The back cover had two diagrams held over from the previous issue relating to Mike Barlow's article on the design of a microwave link using CV67 klystrons.

There were three major articles - on building a pan and tilt head, on colour television, and on slow-scan. Mike Cox's article began "A problem that besets most of us who are building live camera channels is that of finding a suitable mounting for the camera. Such a mounting is a pan and tilt head, and this device provides a means of rotating the camera about a vertical axis and at the same time tilting it about 30 degrees above and below the horizontal. Professional heads are usually very complicated pieces of machinery and have provision for clamping the camera



in any desired position, they are also very heavy, in fact two men are required to lift the type used on some of the colour cameras!" Mike's design was intended for use with a camera weighing about 20 lbs, and was based around a ball joint used for motor cycle side-car fixings. A pin was fixed through the centre, so it would rest in grooves in the socket, to provide a tilt axis. The diagrams showed the constructional details - a further clamp bolt through a tapped hole onto the ball could allow for the tilt axis to be locked as well. The whole weight of the camera was taken by the top of the 1" i.d. tube, so it was recommended that this be of walls as thick as possible.

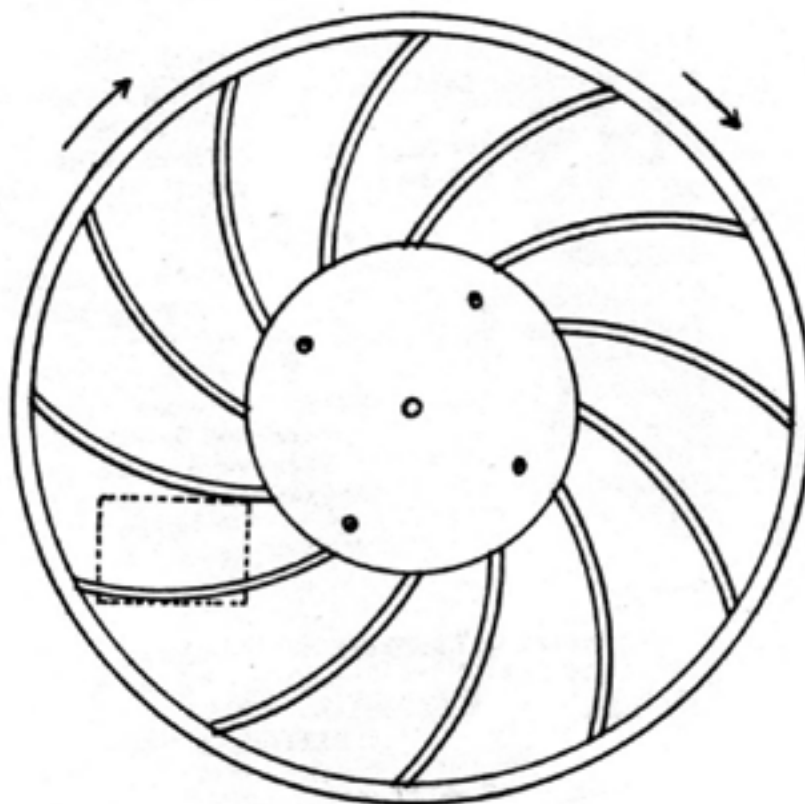
*(At the time, of course, television cameras were much too heavy for a tripod built for a still photograph camera, whilst the now common-place tripods for home video cameras were a far off dream! - amateur television involved building not only the electronic equipment, but the hardware too).*

The section on colour television was contributed by Grant Dixon, who had been experimenting with frame sequential colour for 5 or 6 years. This was achieved by a 12 sector disc in front of a camera's photo-cathode. The shape of the spokes was related to the position of the axle relative to the sensor, and the diameter such that the width of a sector corresponded to the vertical height of the photo-cathode. The disc was driven by a synchronous motor with a chain drive - to eliminate 'slip', so that the disc ran at exactly 500 rpm. The disc had to be non-metallic, so that there were no eddy currents set up which could disturb the focussing field near the camera tube photo-cathode. Similarly, perspex could not be used for the filters, as when it was spun, the friction with the air generated static electricity. The electronics also had to generate gating pulses to pass the 3 colour gain control signals in sequence in the video amplifier. A ring counter based on 3 triode valves drove a further 3 triodes as phase splitters, and these in turn controlled three valve bridge diodes between the respective R, G and





B gain controls. For cameras without a stable black level, separate 'lift' controls were also needed for each colour. For the monitor, 'as the special colour tubes are not generally available', a standard black and white tube was used with a mechanically rotated disc, with a servo controlled synchronous motor drive. The phase, Grant commented, was not as critical as in the camera. Jack Terry had built a 14 inch monitor the cathode ray tube inside a colour drum. An alternative method was to use three projection tubes all producing an image on the same screen, but this had the problem of matching the three scanning waveforms, and the need to add keystone correction to two of the channels so that the images aligned correctly. Dichroic mirrors to combine the images from a 3 tube system were too expensive for amateurs to contemplate - hence the adoption of the rotating filter wheel method.

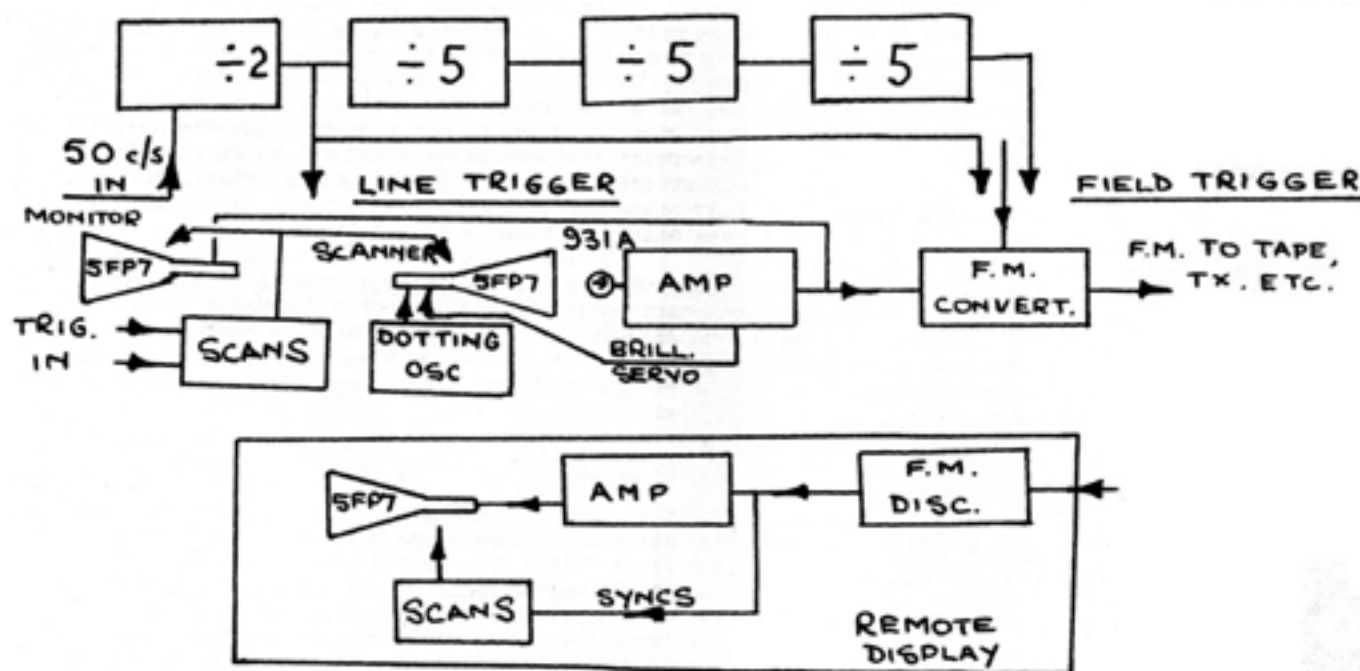


Slow scan television offered the prospect exchanging video signals over much greater distances than fast scan, either by means of short wave radio or a domestic sound tape recorder. J A Plowman proposed ways to implement 5 major sections of the circuitry :- (a) an FM converter, to convert the AM signal to wide band FM, with a maximum deviation of 5 kHz either side of the 9 kHz carrier frequency; (b) an FM discriminator - driven from the recorder loudspeaker output through a speaker transformer used 'backwards' would

give reproduction that was described as 'surprisingly good'; (c) a set of line and frame sweep generators - which had to be arranged to give a linear sawtooth waveform at 25 Hz into 5 ohm scanning coils. A large amount of negative feedback was incorporated, but even so 'the circuit (was) rather critical'; (d) the trigger generators and divider stages - which were still to be developed; (e) scanning circuits based on two 5FP7 flat face crt's - one for scanning and the other for monitoring. The scanning crt

signal was picked up by a 931A photomultiplier and amplified by two pentode stages, a long-tailed pair, and then an output stage. The block diagram shows the general arrangement.

The magazine also included the usual 'what the other chap is doing' page, and an article on designing video amplifiers, and the effects of stray capacity on its performance.



**The Mk4B cable socket, the camera end**



**Close up of the near end, the fibres are the two white "pins"**

**BICC G101 colour camera cable with fast thread for Marconi MkVII**



**About Camera Cables**  
**Page 18**



**The Lemo Triax connector**

**Lemo 3K.93C HDTV series**



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