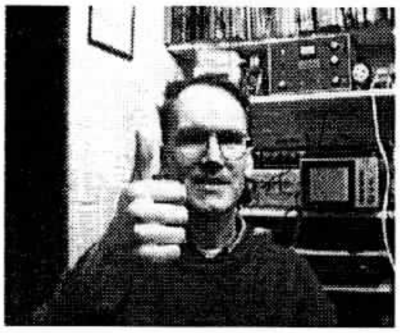
MAR 1999

P5 NEWSLETTER

AGM



The AGM will take place on Thursday 29 April 99, at Filton Park Pavilions, Filton, Bristol. (Where we have the socials) starting at 7:30 pm lasting no more than an hour. Please find the enclosed details and nomination forms. We hope you will attend and join us for a drink afterwards in the bar.

During the year it was announced that the following officers wished not to be re elected. They are :-

1) Paul Stevenson (G8YMM) Chairman

2) Allan Tink (G7DRU) Treasurer

Alan and myself have been on the committee for approximately 8 years and decided that due to family and work commitments it was time we had a break. This may seem daunting, but from experience a change of committee is essential to allow new ideas and a fresh approach. However, I will be volunteering my services as your Membership Secretary and will be helping out in the back ground as I am sure Allan will do.

I would like to thank everyone who has supported Allan and myself during the years and hope that our successors will follow on with enthusiasm. The committee meets about six times a year, usually at a members house over a few drinks and a bite to eat. Should you decide to join us, then you might be surprised about the benefits and fun you can have.

PLEASE NOTE:-
Although the above posts have been declared, you may nominate any member of the group to stand for election provided the nominee accepts the nomination. Use your forms and send them to Mike Stevens (Secretary).

GENERAL NEWS

- The group will be exhibiting at the following rallies:-

BATC:-	Sunday 25 April 99
Longleat:-	Sunday 27 June 99
Bristol:-	Sunday 5 September 99

If you can help at the rallies contact your committee so we can arrange your entry passes in advance.

- We have the following talks/demonstrations planned. They provides opportunities to invite new members and promote the ATV activities. Please attend if you want.

Cheltenham Radio Club:-	Friday 9 April 99
Bristol RSGB:-	Tuesday 29 June 99

- Please be advised that GB3XG is temporary off the air due to the DTI band plan re-allocation on 10GHz. We are currently engineering the changes and hope to back on air ASAP.

- Mike Stevens G6GTN has been busy composing a new Web Page for committee approval, along with a Technical CD-ROM to introduce people to ATV and the Severnside TV Group. The CD-ROM is only on trial at present but we hope to demonstrated it at the BATC Rally. Mike has spent many hours compiling the CD-ROM which contains many technical issues, descriptions and pictures which I have found interesting and useful. The price has not yet been finalised but should be under £10.

73 Paul Stevenson G8YMM

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E-mail g8ymm@cableinet.co.uk
E-mail paul.g.stevenson@westsig.co.uk

Have a go at 13cm?

There are already a handful of Group members in the Bristol area with 13cm ATV capability, which was put to good use during the contest last September. It's also good fun to have a full duplex ATV contact on 23/13cm (see last June's ***P5***).

In addition to G6TVJ,s synthesized transmitter, fully covered in a recent *CQ-TV*, G0WJR, G7JZP and G4BVK have been experimenting with a very simple design based on a free-running VCO. We hope to make some PCB's for this project available.

I recently followed up the advert in *CQ-TV* and obtained a commercial synthesized 2.3-2.5GHz TV transmitter module, from a German company called *Picotronic.* This includes stereo sound sub-carriers (6.0 and 6.5 MHz), and costs around £35. G6TVJ is doing an evaluation of this unit at present.

The VCO-based and Picotronic units give an output power of around 10mW, which is quite sufficient for a line-of sight path of 50km, but if you want some more power, kits for a 1 watt PA is available from Phillip Prinz DL2AM, of *Modultechnik* for around £90. This only requires 1mW input, so if suitably weatherproofed, it can be mounted at the masthead, and fed with a 10dB loss feeder.

AFT (formerly *Tonna*) make yagi antennas for the band. The 25-ele version is only about 1.5m long and costs around £70.

The *RSGB Microwave Handbook* includes designs for loop-yagis for the band. The elememts are so small that they can easily be made from 16swg tinned wire!

On the receive side, some imported American S-band satellite LNB's have been used successfully. These convert to the 1-1.5GHz band, but the frequencies are reversed, so you'll need to invert the video signal before demodulating it. These receivers are very sensitive (0.7dB NF), but may be desensed by nearby terrestrial signals.

Picotronic also sell a matching receive module, again for around £35, but this just produces baseband output, so you'll need to add your own video processing, and sound demodulator(s). Why not try out G6TVJ's design in the last ***P5***?

G4BVK and G0WJR are also experimenting with custom-built downconverters which would work with an ordinary satellite receiver without frequency-reversal. If this is successful, PCBs will be available.

We would like to hear from anyone who's keen to have a go on this band: it'll be something to play with while XG is off-air (see below)!

Changes to GB3XG

Another change in the amateur 10GHz bandplan came into force on February 1st 1999. Although this resulted in an increase of 25MHz in our allocation, the part which was lost included the output frequency for our 3cm ATV repeater GB3XG.

This will result in another rebuild of the tramsmitter hardware and antenna system, and so the repeater will be off-air for some time. We shall also take this opportunity to make some other improvements to the system, including new testcards.

The new output frequency should be **10.065GHz.** This is 70MHz below the current channel, so may cause problems if your IF will not tune down far enough. One solution is to change the dielectric resonator in the LNB. The last ***P5*** gave details of a supplier of 9.0GHz resonators.

While XG is off, why not take the opportunity to try some simplex operation on 3cm: a number of Group members already have portable equipment for the band, and may be interested in a sked.

G0WJR, February 1999.

<u>September Contest Results: G7ATV/P first in UK on 4 bands!</u>

THE BRITISH AMATEUR TELEVISION CLUB

70cm International 1998 Contest Award
Fast Scan TX Section for the U.K.

This is to certify that G7ATV/P participated in the above event.
Gained 1446 points and was placed

FIRST

THE BRITISH AMATEUR TELEVISION CLUB

24cm International 1998 Contest Award
Fast Scan TX Section for the U.K.

This is to certify that G7ATV/P participated in the above event.
Gained 3300 points and was placed

FIRST

THE BRITISH AMATEUR TELEVISION CLUB

13cm International 1998 Contest Award
Fast Scan TX Section for the U.K.

This is to certify that G7ATV/P participated in the above event.
Gained 1510 points and was placed

FIRST

THE BRITISH AMATEUR TELEVISION CLUB

3cm International 1998 Contest Award
Fast Scan TX Section for the U.K.

This is to certify that G7ATV/P participated in the above event.
Gained 4100 points and was placed

FIRST

Thanks to all who helped to make it such a success. Stand by for June and September!

Pulse operated Ni-Cad Zapper by Brian Kelly, GW6BWX

A recent P5 carried an article about bringing apparently dead Ni-Cd batteries back to life. This design uses a similar technique but instead of leaving the timing to chance it gives visual indication of the state the battery is in. I have concerns about the safety of the original design as it is quite possible for the switch contacts to weld making it impossible to break the circuit if the battery starts to overheat. Even removing the battery assuming that was possible if it was hot, leaves the danger that the rectifier could have gone short circuit and would then probably explode the reservoir capacitor. To overcome all these hazards, this design uses short, controlled current pulses which should be safe if left on for long periods even if the battery remains shorted. An LED illuminates as soon as the battery has accepted charge to signal the battery should then be transferred to a normal charger. Although this design can be used to charge batteries, I strongly advise that a proper constant-current charger is used instead.

So what causes the battery to die in the first place? Like most cylindrical cells, Ni-Cd batteries are constructed from a metal container, filled with active chemical compounds and a centre electrode suspended from a plastic "bung" at the positive end. In a healthy cell, the internal chemical reactions between the centre electrode and the casing produce about 1.25V which is available for use in the outside world. As a Ni-Cd starts the deteriorate, the chemical filling starts to separate out and conductive paths between the centre electrode and case start to form. The are analogous to the formation of stalactites and stalagmites between the ceiling and floor of a cave. As these tracks grow, they provide a leakage path which progressively reduces the cells efficiency. When the case and centre electrode become completely linked, the cell totally fails, in fact measuring the batteries resistance will show an absolute short circuit. In order to revive the battery, the short must be persuaded to break, rather like a fuse going open-circuit and over as much of its length as possible.

The easiest way to "blow" the short is to force enough current through it that it heats rapidly and disperses the conductive path as widely as possible. Unfortunately, to produce enough current it is necessary to apply quite a high voltage, usually several times the cells natural terminal voltage. As the short goes open circuit it leaves the cell being overcharged by a factor of maybe 100 times its safe limit and this will likely cause further problems if left too long. Having witnessed a small "AAA" cell launch itself 6 feet and embed itself in a wall I cannot stress enough just how dangerous they can be.

To overcome the overcharging problem, the design described here uses very short high current pulses and enables a voltage monitor circuit between the pulses. Because the pulses are limited to 2 Amps and are only 1mS long in every 10mS, the average power dumped into the cell is only about 0.25W which is well within safe limits. During the 9mS between pulses a monitoring circuit is turned on which will light the LED as the cells voltage reaches about 1.1V. Trials with a selection of dead cells showed them all recover within 5 seconds. Leaving the circuit running for a long period only caused a slight warming of the battery.

Circuit description:

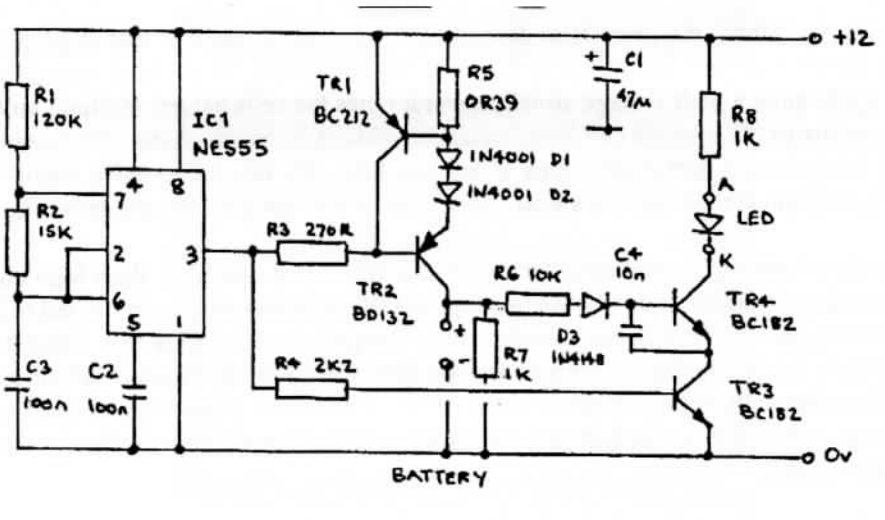
R1, R2 and C3 form the timing components for the NE555 timer IC. With these values the IC oscillates with a 10mS period (100Hz), the output on pin 3 going low for 1mS and high for 9mS. While high it lifts the base pin of TR2 close to the +ve supply rail, the two diodes in TR2 emitter ensure the base goes more positive than the emitter therefore turning the transistor off. At the same time, TR3 is provided with base current and turns on, bringing its collector voltage close to 0V. If a voltage is present across the battery connections at his time, it will provide bias via R6 and D3 to turn TR4 on and light the LED. When the output of the 555 goes low, TR3 turns off preventing the TR4 and therefore the LED conducting. TR2 turns on and allows current from the positive supply rail to reach the battery, this is the current pulse that "blows" the short out of the cell. The current is limited to about 2 Amps by R5 and TR1. As current flows through R5 it drops a voltage which at about 0.6V makes TR1 conduct. As Tr1 conducts it provides an alternative path for the bias to TR2 and reduces the current it can pass. An equilibrium point is reached with Tr1 just starting to conduct, with R5 at 0.39 ohms this is about 2A. Capacitor C5 is simply a filter, because of the delays inherent in fast switching circuits like this, very short pulses may occur during the on-off-on current transitions. These pulse are very short, typically only a few microseconds, C5 ensures the LED doesn't light dimly as these spikes occur.

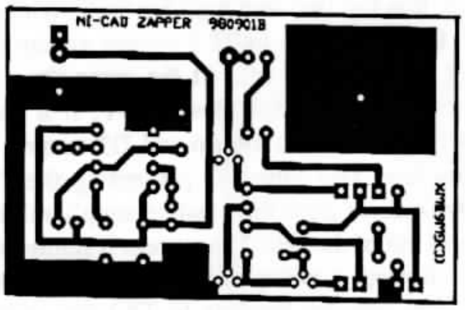
Construction:

A PCB design is provided but the layout is not critical. R5 should be rated at 1 Watt and TR2 should have a small heatsink. The types of other components are not too important but keep to the values for the timing components or the 1:9 pulse ratio will not be accurate. D1 and D2 are rated at 1A continuous current but actually carry pulses of about twice that amount. This shouldn't cause any problems as the short duty cycle will prevent them overheating. Note that the circuit will draw short 2 Amp bursts of current from the power supply, if measured it will appear much lower but the PSU must be capable of at least 2A at 12V.

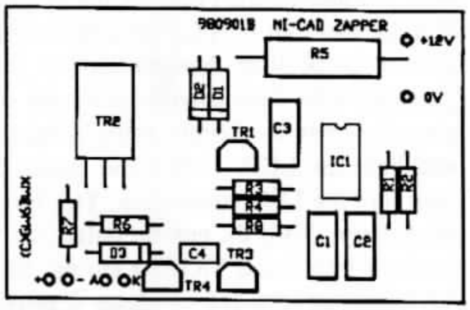
Testing:

After checking for construction problems, apply 12V from the PSU. The LED should NOT illuminate except maybe very dimly due to leakage currents. Connect a capacitor of about 100nF across the battery connections, the LED should light but be fairly dim. Change the capacitor for one of 10uF, this time the LED should be fairly bright. The capacitors are holding charge between the pulses as though they were a working battery. If all looks OK it should be safe to try the circuit on real Ni-Cd batteries. Only use this design on single cells, never on packs containing more than one cell in series. Some batteries will be dead beyond recovery so I make no guarantees that this design will work every time but at a cost to build of only about three cells it could save lots of money for you.





COPPER SIDE



COMPONENT SIDE

SUGGESTED PCB LAYOUT (ACTUAL SIZE)

Test- Picotronic 13cm Transmitter and Receiver Modules

by Ian F Bennett G6TVJ

Performance ***
Ease of use ****
Value *****

The Severnside TV group has purchased a couple of "Picotronic" 13cm modules which were advertised in a recent addition of "CQTV". I was tasked with getting them going and checking out their performance. Here's what I found.-

Both modules basically consist of small metal "Tuner" type enclosures measuring just a couple of inches square. The modules are synthesised units which employ a serially controlled device via an I squared C bus. Data is basically loaded into the device as a set of instructions which tell the synthesiser what frequency to operate on. Both modules use the same device a Plessey (Now Mitel) SP5055 2.6 GHz surface mount IC. An external PIC type microprocessor is required to control the synthesiser, Picotronic supply a couple of pre-programmed PICs to go with the units which allow operation on a number of spot frequencies in the 13cm amateur band.

Both modules are powered from 5 and 12V. Each module uses an "F" type RF connector which sticks out the side.

Transmitter

The transmitter is very simple to operate, the PIC device is connected up to it as per some supplied instructions. The PIC runs on 5V so a regulator is needed but apart from this and some decoupling you have a complete transmitter. The output frequency is selected by DIP switches connected to the PIC, these are set according to a table written in the literature supplied. The transmitter is supplied directly with a 1V PP video signal, I found the deviation to be rather high so I adjusted it down to 8 MHz/V, which I believe is the correct figure to match the receiver. A potentiometer is visible through a hole in the top of the module which allows easy adjustment of the deviation. The module contains two subcarrier generators set to 6 and 6.5 MHz respectively, the input sensitivity for audio is approximately line level at about 0.5V PP.

Performance

I tested the transmitter into two devices, firstly I used my own home built receiver which comprises of a 13cm "S" band LNB and a satellite tuner module. Secondly I used the Picotronic receiver module which is obviously designed to work with the transmitter. The transmitter was connected directly to the receiver through a number of attenuators totalling about 70 dB. I passed a number of video test signals through this combination and the results were viewed on a oscilloscope. I also used my own G6TVJ 13cm MK11 transmitter as a standard to compare the results with.

The results are a little mixed, the transmitter appears to lack HF, and the chrominance is reduced to only about 40% (7dB). This is not the end of the world but in certain difficult conditions the colour may appear noisy or it may drop out. HF is a measure of the overall quality and sharpness of the picture. It is possible to boost the video high frequencies by adding more pre-emphasis but this requires extra circuitry at the video input. When using a Pulse and Bar test signal there was also some mid frequency lift but this would not be noticeable to amateurs. On a monitor a reasonably sharp picture will result.

I tested the low frequency response with a 50 Hz squarewave half white half black test signal. The results where unfortunately disastrous, the flat squarewave signal is bent by about 65% of its amplitude which means the robustness of a signal will be very poor. Any sync detector in a monitor may struggle to recover the syncs and the picture may tear and roll with some picture content.

The culprit is almost certainly the synthesiser. The units uses the SP5055 IC which is intended for use with local oscillators in satellite receivers, the loop filter characteristics will not be optimised for video modulation. The synthesiser effectively filters out the video low frequencies. By peering inside the module a resistor/capacitor network can be seen next to the IC, this is probably the loop filter. It is possible to modify and "Slow down" this network to improve the transmitted modulation. I have investigated several modifications which will improve the video LF characteristics, I will publish these at a later date.

It's a shame, poor LF performance is the bug bear of most amateur TV designs but it seems to crop up in commercial stuff too. My own 13cm MK11 shows it the way! (See CQTV)

I also used an all white/ all black signal to check for any crushing effects and there were no such problems. Field rate distortion accepted there was no other detrimental effects on the syncs, ie no clamping in the transmitter.

I didn't take any measurements off the audio subcarriers, but I tuned into them on my test receiver and they sounded OK.

The output power of the transmitter measured 40mW, A few dBs adrift of the claimed 100mW but still ample for short hops or for driving an amplifier. The module runs warm after a while, but I don't know how much the PA stage contributed to this.

Receiver

The receiver is very similar to the transmitter, the PIC is wired up in the same way but different DIP switch settings are required. This is because the modules use identical synthesisers, the receiver however requires an IF offset of 479.5 MHz, this is given in the programming table.

The receiver requires more in the way of external circuitry to get it working. The module supplies a base band signal only, so an external video de-emphasis network, video amplifier and audio demodulators are required. The literature supplied gives a circuit diagram but I chose to use my own circuit. Looking at the diagram supplied, a suspicious looking DC restorer is apparent which could spell trouble.

Results
The receiver works well, it gives acceptable results with the transmitter module but if I feed my own 13cm transmitter into it the results are much better. The video equalisation looks OK and there was little attenuation of chrominance frequencies so the receiver should give excellent results.

Luckily the receiver does not suffer the poor LF results of the transmitter. My own transmitter yields very low levels of distortion, better than 5% compared to the awful 65% of the transmitter. There are no crushing effects but that would be more dependant of any subsequent video circuitry used. The receiver is very good and in terms of video performance limited only by the external circuitry. Even in difficult conditions the receiver should be capable of noisy but locked colour pictures.

The bandwidth of the receiver is quoted to be about 19 MHz, I don't know how this is achieved, it may be that there is a saw (Surface Acoustic Wave) filter in side it.

The receiver proved to be quite sensitive, I set up my transmitter in another room and operated it in standby mode so that it radiated a very weck signal on 2.4 GHz. I then compared the Picotronic receiver module with my own 13cm LNB/receiver combination. It's a bit subjective but after playing around with various small antennas and attenuators I reckon the module is only about 6dB less sensitive than the 0.7 dB NF "S" Band LNB. The bandwidths of the two receivers are not matched so it's not a completely fair test but basically the Picotronic module was impressive. I believe it to be more sensitive than the average satellite tuner. I may go out portable some time and test the thing out for real and see how it fairs out there in the real world.

Frequencies
As I mentioned before the modules are tuned using an external PIC device. A number off odd frequencies are available though out the band and a list is given in the literature. The highest possible frequency is 2.535 GHz and the lowest is 2.319 GHz. The only round number frequency is 2.4 GHz so this one was chosen for the video tests as it matches my own transmitter. The channel spacing appears to be 27 MHz. It may be possible to operate the modules on other frequencies but that would require knowledge of the PICs programming which is beyond me. Manufacturers data is readily available for the SP5055 synthesiser so if you understand I2C and PICs away you go.

There are a couple of tricks that one can play on the synthesiser to allow it to tune other frequencies which don't involve PICs. The SP5055 synthesiser uses a 4 MHz reference crystal which is mounted inside the module. This crystal could be replaced with another unit on a proportionally different frequency. This will only work over a limited range but is useful if a particular spot frequency is required, e.g. changing 2346 to 2330 GHz. This then requires a reference of 4.027468 MHz.

A second trick is to do away with the crystal altogether and feed an external reference into the module. An external crystal oscillator can be used which may be easier to get crystals cut for. I also successfully tuned a similar 13cm module by feeding the

SP5055 synthesiser from a programmable signal generator. Pin 2 on the SP5055 should be fed with the external signal at about -10 dbm, the only problem is that it is "Brain Surgery" to access the pin from inside the module.

Conclusion

Well at £70 a pair you can't really grumble much, you certainly cannot build anything as sophisticated for the money or the physical size. The receiver is better than the transmitter but does require some processing circuitry. The transmitter is let down by a slight lack of HF but this could be corrected for by adding extra HF boost. (The G6TVJ chrominance booster equaliser will do just that see CQTV). The real problem is the transmitters lack of video low frequencies, (Although no worse than many other amateur designs) this is a shame because it doesn't require complicated electronics just values which are appropriate for video modulation. The modules are an ideal way to get onto the band, some home brew work is required but all the difficult stuff has already been done. The modules will operate from 12V so ideal for portable operation. Welcome to 13cms ATV!

The Picotronic modules are available from-

Picotronic Communication Inh. H. Boertzler,
Kaiserstrasse 115,
D-66862 Kindsbach,
Germany.

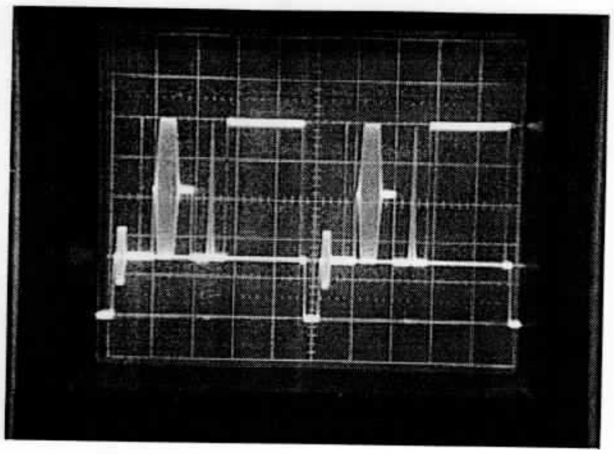
Tel ++49 177 447 3022 Fax ++49 40 3603 256 629

E-mail picotronic@aol.com

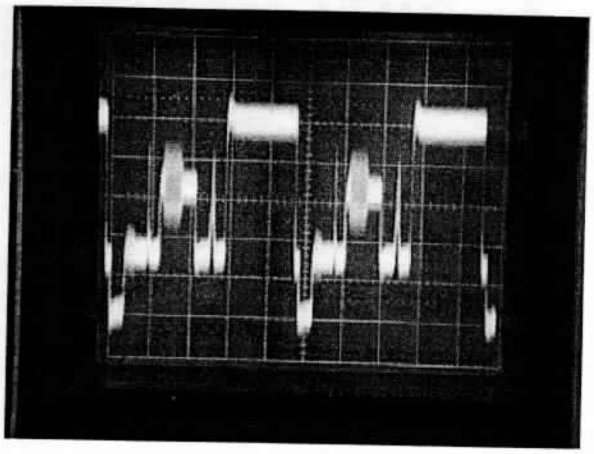
More on the SP5055 synthesiser can be found at -

http://www.mitelsemi.com/products/index.htm

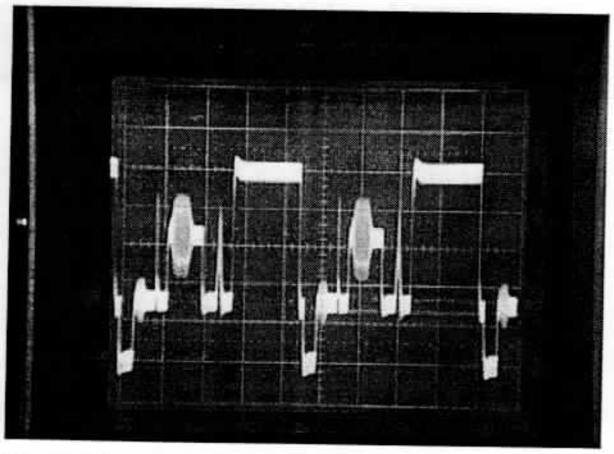
Picotronic 13cm Modules: Test Results (Line rate Pulse and Bar signal, 2 x TV lines)



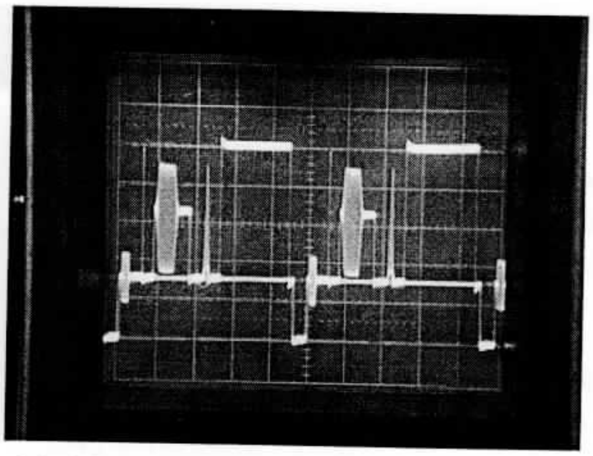
Undistorted Output from Generator



Two Modules connected back to back. The signal is OK but the chroma amplitude is reduced by about 6dB. The display appears blurred due to the presence of the audio subcarriers.

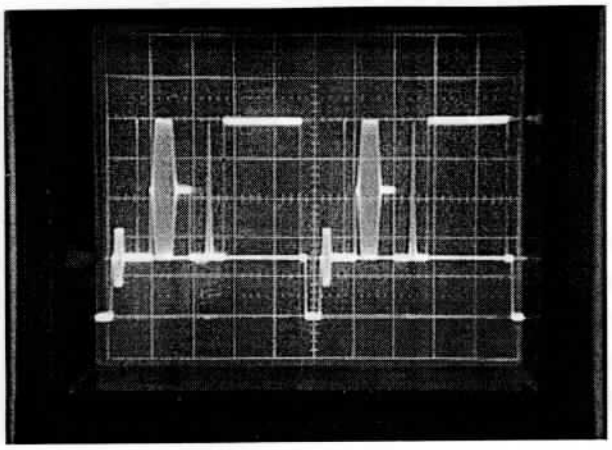


Transmitter module operated into my own test receiver. The chroma amplitude is still reduced. The subcarriers are filtered out but the display is thickened due to LF distortion.

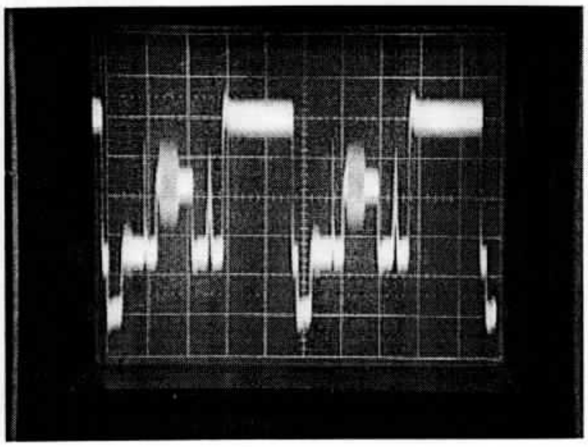


My 13cm MK11 transmitter feeding the receiver module. The chroma amplitude is increased. The lack of simitry in the chroma is due to intermodulation which is not a problem for amateur use.

Picotronic 13cm Modules: Test Results (Line rate Pulse and Bar signal, 2 x TV lines)



Undistorted Output from Generator



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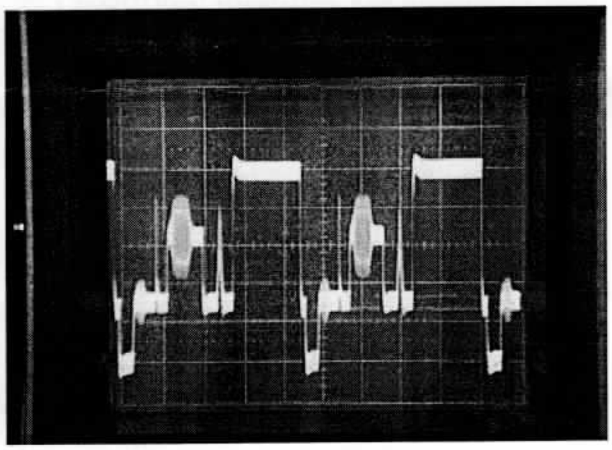
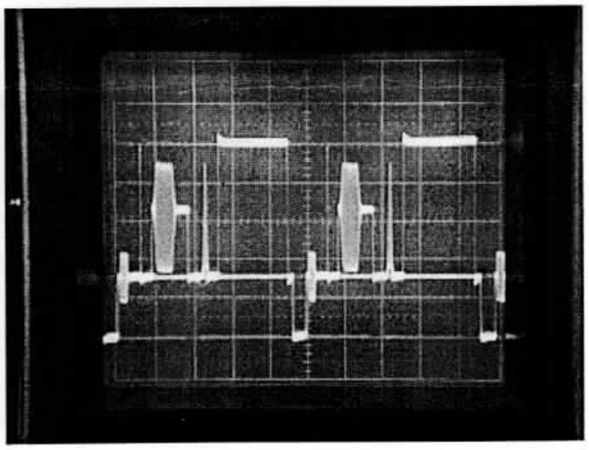


Transmitter module operated into my own test receiver. The chroma amplitude is still reduced. The subcarriers are filtered out but the display is thickened due to LF distortion.



My 13cm MK11 transmitter feeding the receiver module. The chroma amplitude is increased. The lack of simitry in the chroma is due to intermodulation which is not a problem for amateur use.