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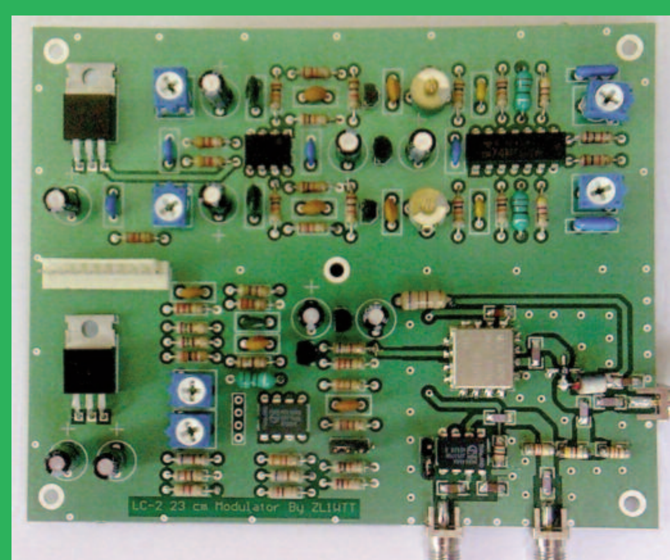
Amateur Television Quarterly

KY4TV ATV Repeater

Low Cost ATV Modulator

FM ATV for 3.4 GHz ATV



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Amateur Television Quarterly

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Sync Buzz Editorial

- Bill Brown WB8ELK and Mike Collis WA6SVT

Lots of ATV fun so far this year. The Dayton Hamvention was well attended this year and the weather was perfect. The ATV Forum and ATV Dinner saw a big turnout and it was great seeing everyone.

At press time we just received a report of a massive band opening across the Midwest with ATV contacts on 70cm of 579 miles or more with excellent signal quality. Bryan KC8LMI in MI reports that his bext DX was KD0FW in Kansas City ,MO and Hank W4HTB in Bowling Green, KY.

The photos have just started to come in from this amazing event and we will have the full story and photos in the next issue of the Q.

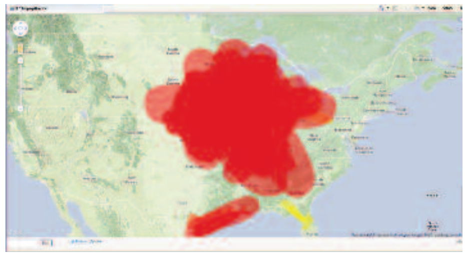
More Articles

It's been difficult finding enough material to fill the pages of ATVQ this past year, but we are finally now receiving some great new construction articles and operating news which will put us back on schedule.

Our Fall issue is shaping up nicely with some great new construction and special event articles.

To get back on schedule, this will be the combined Spring/Summer issue. All subscriptions have been increased by one issue so that you won't be missing out on anything.

Stay Tuned *- Bill and Mike*



Massive band opening over the Midwest - photos in the next issue.

from:
aprs.mountainlake.k12.mn.us

KC8LMI in MI as received by W4HTB in KY at 496 miles

KY4TV ATV Repeater

- Hank Cantrell W4HTB

The Kentucky Chapter of the Amateur Television Network now has a functioning repeater.

W4HTB has had a repeater running at various times since 1992 and at various sites. The first was an in-band located on the Channel 40 tower just east of Bowling Green near I-65. It was moved to the present location as a X Band 70cm in /1.2 ghz out in early 2000.

Because there are several active ATV'ers in the area of south central Kentucky, it was decided to join ATN – CA and re-engineer the repeater. As it turned out this process took about a year, and allowed us to obtain and incorporate some commercial equipment.

The most recent repeater site was still available which had two communication towers about 300 ft apart. We were given access to both towers. On the original tower site which we share with a Wi-Fi antenna and a commerical repeater, we established the main cross-band equipment . The antennas shown below, are a rib cage slot (built by Brian KC8LMI) for 421.25 MHz and a Comet GP-21 1.2 GHz vertical.

Main Rack for the 1.280 MHz receive to 421.25 MHz transmit.

The equipment rack as shown contains a Scientific Atlanta sat receiver tuned to 1280 MHz , preamp and filter and a SA cable modulator for chan 57 (421.25mhz). This drives an amplifier from Downeast Microwave (p/n 7025PA) giving about 18 watts to the RX-TX and DCI filters.

The controller is an Intuitive Circuits ATVC-4. Input control is via a Radio Shack Scanner on 2 meters 144.34 MHz.

The second tower and building contains the remote crossband repeater . This consists of a PC Electronics ATVR-4 receiver on 439.25 MHz AM feeding a

Comtech 1.2 GHz board which drives a homebrew 15 watt amplifier on 1280 MHz. The antennas consist of a dual wheel for 439.25 and a Diamond 1.2 GHz vertical.

The site of the KY4TV repeater is on the WKU campus Cherry Hall. Also shown is a view from the roof of this building looking toward a Bowling Green landmark, the "red white and blue water tower"

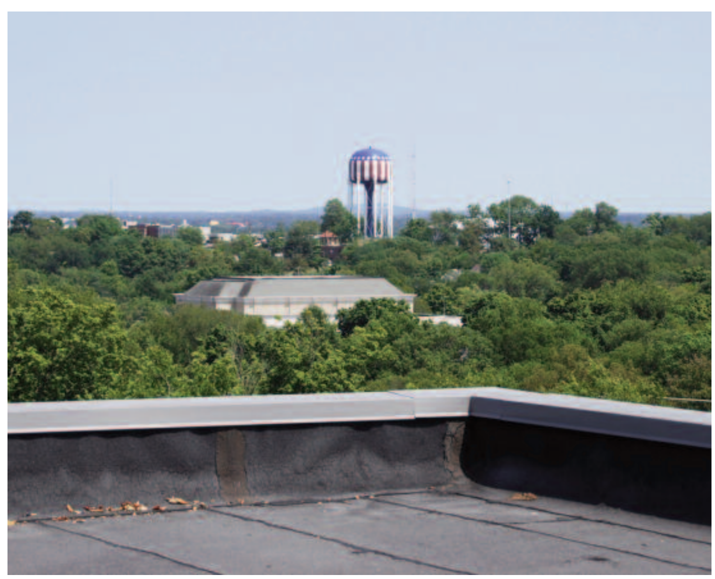
There has been lots of support from the local ATN chapter. ATVers and members in this area are:

Marshall KC4WFN, Fred KA4CFW, Ben W4WSM, John W4JHT and Claire KF4IWX (Claire has equipment but is not on the air yet).

We want to thank Mike Collis WA6SVT for his assistance and advice. The ATN – CA group provided us with a LP filter to be put on the 70cm amplifier to help keep the 3rd harmonic out of the 1280 MHz bandpass.

Antennas for 1.2 GHz receive and 421.25 MHz xmit
The rib cage slot was produced by Brian KC8LMI.

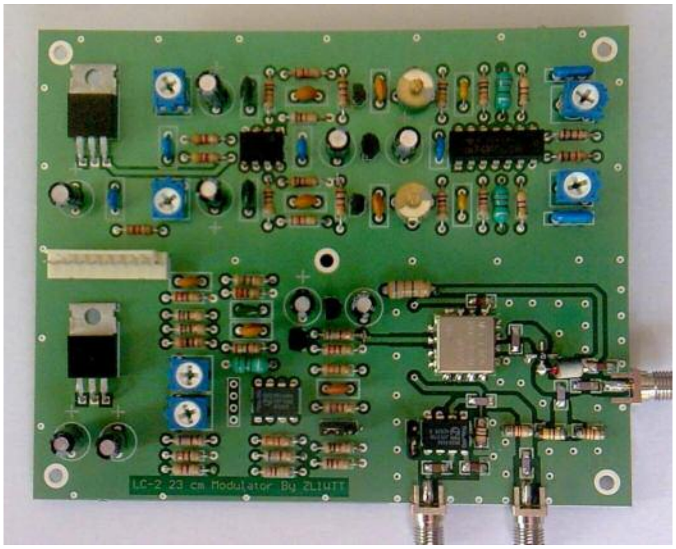
One of the ID screens of the KY4TV ATV Repeater



View looking east from roof of repeater bldg.

LOW COST ATV MODULATOR

By Grant ZL1WTT



ATV (Amateur Television) on 23cm:

This band is used mainly for repeater inputs and simplex contacts. All ATV repeaters in New Zealand use FM modulation for analog inputs. This is because it provides improved signal to noise performance over the older AM modulation.

The modulation bandwidth used on the Auckland ATV repeater is 18MHz is the best compromise for video quality and signal to noise. Therefore, the receiver needs to be aligned for this bandwidth as well. It's like trying to use a wide-band FM broadcast receiver to demodulate narrow-band FM voice; it will work but not very well. This is why it is important to set up the receiver to match the transmitter.

In the mid 1990's we started to move away from AM on 70 cm and above. The 23 cm FM Auckland, New Zealand ATV group decided to use a dual carrier system for sound. The 6.0 MHz channel became left audio and the 6.5 MHz was the right audio channel. The 6.0MHz and 6.5MHz sub-carriers came about for this reason with most video senders widely available on the local market. It is important when using inter-carrier sound to shift these carriers to highest IF frequencies possible. In my case this is 6.0 and 6.5 MHz. It is clear that if there is any inter-modulation it will start from the fundamental frequency and move out from there. If the sound IF is to low it will create noise in the picture at a lower level and if it is too high it will increase the over all bandwidth of the transmitter.

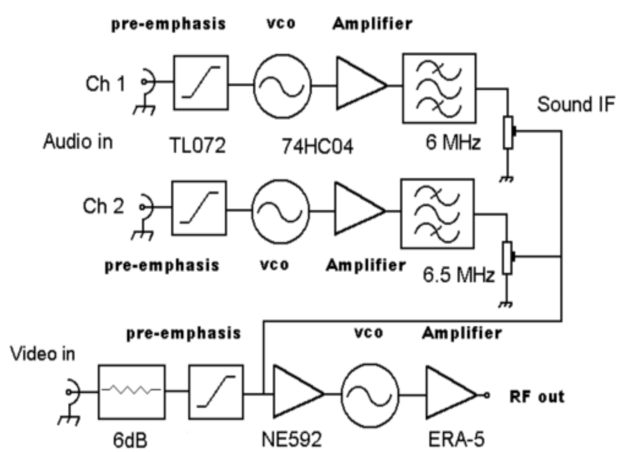
Introduction:

ATV modulators are simple things to build. Basically, it is accomplished by frequency modulating a Voltage Controlled Oscillator, (VCO) as described here.

This project is based around finding a way to provide an ATV transmitter for those who would like to try ATV and still keep the overall cost low. But it is also very important to create a modulator design that has low distortion as well. This design meets both of these requirements.

Features:

- Most of the components are leaded to make assembly easer.
- Wide video bandwidth DC to 5.8 MHz.
- The modulator can do positive or negative modulation.
- Simple to place on frequency with the aid of the built-in prescaler chip for the 23 cm band.
- Frequency agile oscillator.
- Dual sound sub-carriers set at 6.0 and 6.5 MHz.
- Can connect to external PLL and PA stages.
- Works over three bands 23, 13 and 9 cm.

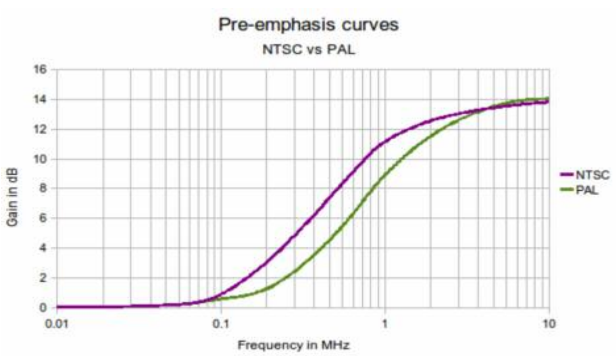


Circuit Description:

The incoming video signal passes through a PAL pre-emphasis network which is DC coupled to pin 1 of IC3 (NE592-N8). Pin 1 is biased to approximately half supply rail voltage by means of two 680 ohm resistors connected to it. The 6 MHz sound sub-carriers are AC coupled to pin 1 of IC3after the pre-emphasis network. The second input, pin 8 is the tuning supply rail that adjusts the VCO bias voltage. VR6 alters the amount of FM signal gain / deviation by changing the amount of internal feedback inside the NE592-N8. Pins 4 and 5 of IC3 are the positive and negative going outputs, one of which is connected via JP1 to the BC559 transistor Q1. There is also an external negative feedback resistor R29 for improved linearity.

For NTSC users:
Change the following components in the pre-emphasis network:

- R20 (300) to 270 ohm
- L3 (10uH) to 18uH
- C22 (680pF) to 2.2nF polyester



VR5 sets the IC3 bias from 0.5 to 5 volts on Q1output. This sets the IC4 tuning range (MAX2754). The bias voltage on the input to pin 8 of IC3 should be in the range of 2.5 to 6 volts. The VCO oscillator consists of IC4 in an SMD uSOT package. This simplifies the oscillator design.

IC6 (SAB6456) is a divide by 256 or 64 pre-scalar IC that can be used for a test output, i.e. for a frequency counter or oscilloscope to measure output frequency. This output should read between 4.7MHz and 5.3MHz when set to divide by 256. JP2 sets the divide by ratio, closed for 256 and open for 64. Omit this IC if not required.

IC5 (ERA-5) is a pre-driver MMIC amplifier after the VCO stage. It drives two RF outputs. One has an 8dB pi attenuator. This is the PLL pick off point to make sure there is isolation between RF outputs. From the 9 Volt supply, R38 is the current setting resistor for ERA-5 power.

The dual sound sub-carrier circuits use two IC's: IC1 (TL072) and IC2 (74HC04) plus two ceramic filters at 6.0 MHz and 6.5 MHz. The TL072 op-amp has the 50uS pre-emphasis (PAL) or 65uS pre-emphasis (NTSC) and provides the gain. The 74HC04 hex inverter has two inverters that make up the oscillator and the third is the buffer stage. The ceramic filters feed via 560 ohm resistor to clean up the waveform. This simple circuit works well and provides more then enough drive for the video stage.

IC's 11, 12, 13 and 14 are linear regulators (78L05, 7809, 78L05 and 7809) for all needed voltages. IC13 supplies 5 volts for the pre-scalar IC and the VCO IC4. IC14 supply the NE592-N8 and the BC559 transistor. IC11 and 12 supply the sound IF stages.

Note: C23 is a polyester capacitor. All trimpots are sealed mini standard size. Do not use open carbon trimpots on this project!

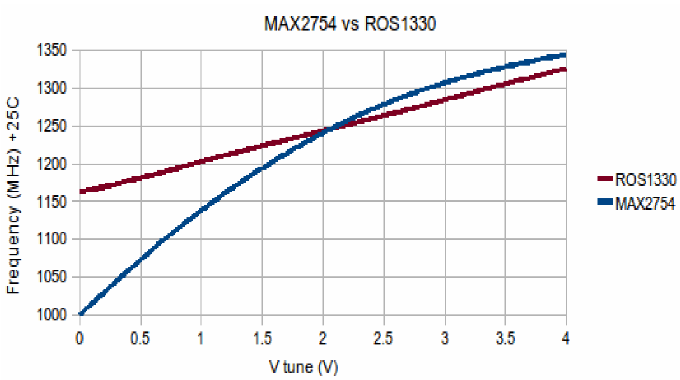
Prototyping:
It is very important to remember the time that goes into designing a project like this. From the initial idea to a working prototype this has taken about 120 hours. But the end product is worth it. It will provide very good service and it will get more operators on the air and enjoying ATV.

Problems that I ran into on this project:
Cost is always a problem. I needed to cut back this design where possible keeping the component count to a minimum. Therefore there are a few areas where compromises are made. I provided simpler sound IF layout.

Non linearity video distortion is the next big problem. This design keeps the total harmonic distortion down below 5%. Most of it is in the VCO. Many FM TV modulators tested are somewhat poor in this area. I compared two VCOs, a Mini-circuits POS-2000 and a Maxim MAX2754. The overall performance was far better with the POS-2000, but this VCO did not cover the 23cm band. So I made the best of the MAX2754 and its non-linear response. This VCO has a gain adjustment up to 4dB at the top end of the band so I used the PWM function from the PLL board Micro-controller as a gain control offset. The sound sub-carrier levels were –18dB down on the video level with no noticeable inter-modulation. With the POS-2000 I could run these sub-carriers at –14dB with the same amount of inter-modulation. With improvements over time and a more suitable VCO (ROS-1330) I could get my sound IF levels up to 20% of the video input level with minimal inter-modulation.

Below there are the two voltage tuning graphs showing both types of VCOs tested.

VCO Tuning curves
This is why I moved away from the MAX2754 based VCO and now using the LC-2 modulators with ROS 1330 Surface mount devices. By doing this I now can operate this modulator on three bands with far better linearity.



Bands:
23 cm 1200 to 1330 MHz
13 cm 2250 to 2550 MHz
9 cm 3280 to 3550 MHz
It is simple to change a VCO for any of these bands.

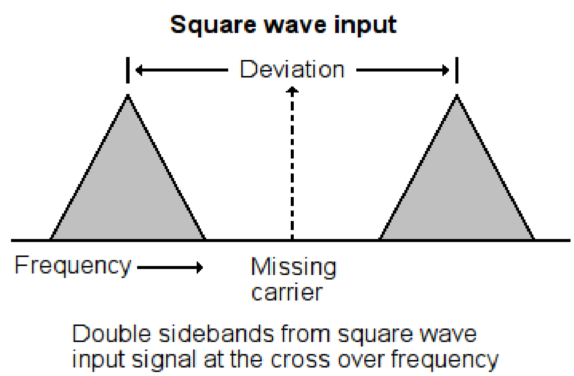
Debugging this circuit:
I did this by using a test de-modulator and went through each stage of this circuit. On the sound side I had a TDA9821 PLL dual FM receiver that could test the sub-carriers at their IF frequencies. This is how I work out the component values. On the video side I made a test de-modulator on a vero-board and went through the stages in the same way. I found that I only needed to change a relatively small number of component values. I also discovered that there was a requirement to provide additional 6dB attenuation to the video input, otherwise there would have been problems across the 23 cm band with over modulation.

Another thing to look out for is what is being used on the receiving side. All FM receivers are not created the same! For example, the bandwidth could be fixed for wide band settings as used by satellite services. They may not output the needed one volt into a 75 ohm load. The FM de-modulator could be of a poor standard. This could be on the video or the sound side. In many cases I had to test and modify them on my workbench before placing them in service at the ATV repeater site. But I am a perfectionist when it comes to television in general.

FM Deviation if unknown:
If you know the bandwidth then you can calculate it this way to arrive at a peak deviation estimate. With video modulation there is more involved because you need to take into account the different modulating waveform parts. The overall deviation is found by Carson’s rule. The waveform video component will have the largest impact. The sound carriers may be at higher frequencies but represent only 10% of the video level. Carson's rule for calculating the deviation is:

OD =1/2 [BW – (2 x MVF)]
Overall deviation = 1/2[RF bandwidth – (2 x maximum video frequency)]

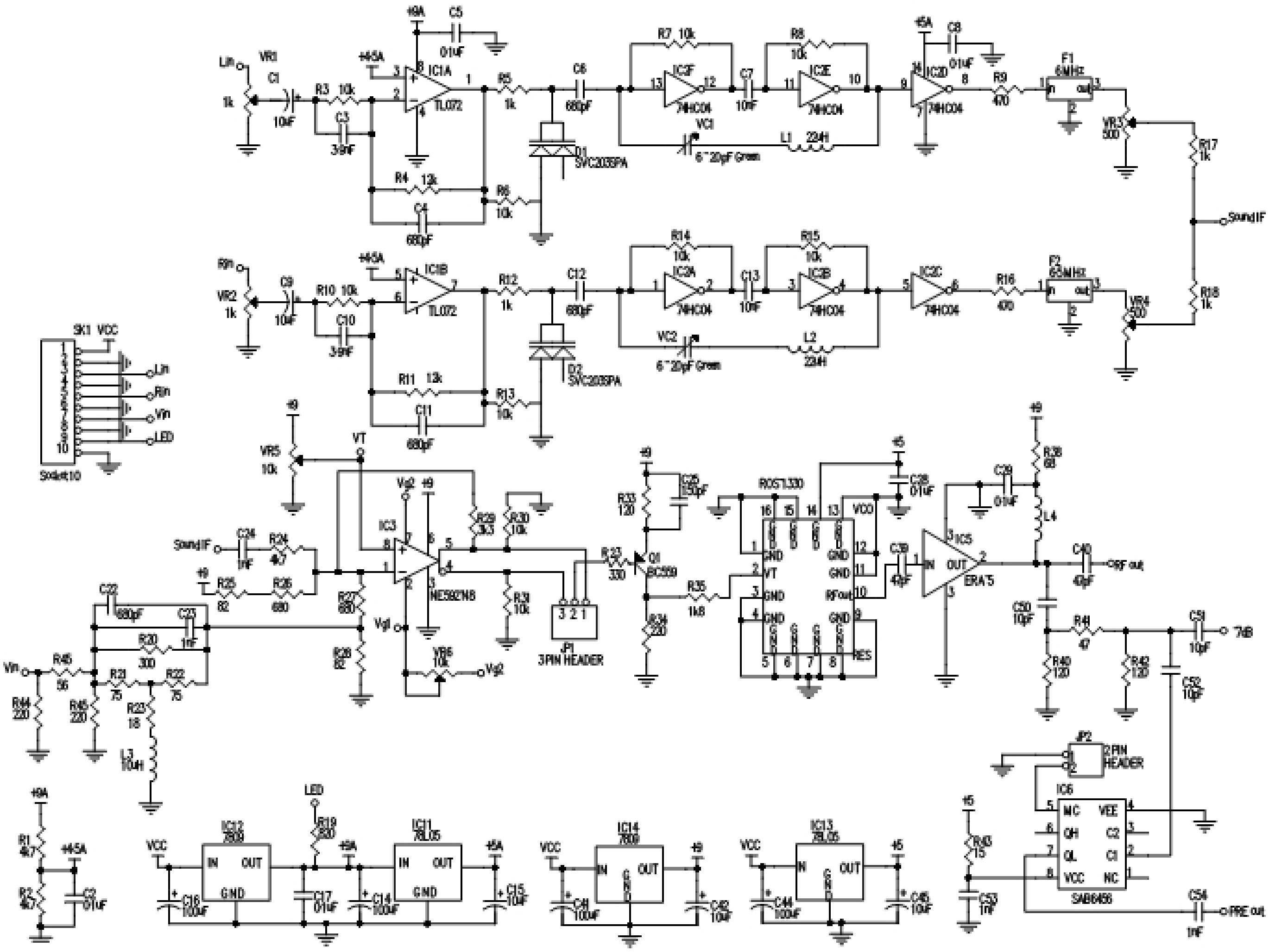
The diagram below shows the ± deviation from the missing carrier as would be seen on a spectrum analyser.



The square wave frequency should be set to the pre-emphasis cross over frequency of about 750KHz for PAL or 500 KHz for NTSC with an input level of one volt peak to peak into 75 ohms.

For 18MHz bandwidth Carson's rule says there will be a maximum 2.5 MHz deviation with the sound carrier frequency at 6.5 MHz. This is only partly true because 250 kHz is the maximum deviation that sound sub-carriers generate. Therefore, for given bandwidth a wider deviation is possible than Carson's rule indicates when using FM TV.

Final alignment:
An HF frequency counter good up to 10MHz or an oscilloscope is needed for the following steps.



- At R9 and the input of the 6MHz ceramic filter is the test point for the 6MHz oscillator. Adjust VC1 for the desired frequency. Repeat this process for R16 on the 6.5MHz ceramic filter and adjust VC2.
- Connect the frequency counter to the prescaler output, set to divide by 256 by shorting out JP2 with the header jumper. Read the output frequency and multiply that by 256 for the TX frequency.
- Set VR6 for minimal gain and then adjust VR5 for the VCO range.
- Apply a 1 volt P-P video signal to video input. Use a color bar pattern if possible. Adjust VR6 to set the deviation and trim VR5 for the operating frequency.
- Apply audio signals at the inputs and adjust VR1 and VR2 to set the sound deviation.
- Set VR3 and VR4 for sound injection level and adjust until it's just below the point of inter-modulation displayed by wavy lines appearing across the video.

That's it! You're now ready to go on the air. Give FM ATV a try!

I also have a 23 cm power amplifier board available for those who interested using a Mitsubishi RA18H1213G FET based power block.

ED note: Grant has details of a similar FM modulator on his web pages. See *http://www.qsl.net/zl1wtt/pdf/manual.pdf for more information.*

SOARA Field Day ATV

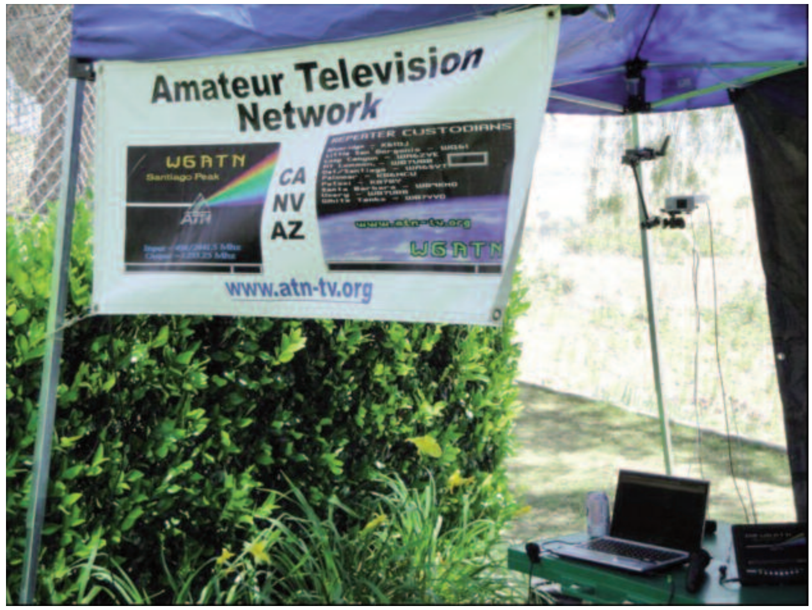
- Don Hill KE6BXT

The station was manned by Don Hill, KE6BXT (Amateur Television Network, CA Chapter past President) and his brother, Norman Hill, KD6OMV. The portable ATV transmitter was mounted in a toolbox.

A laptop was used to monitor video that was streaming to the internet. A cordless mic provided much appreciated freedom of movement

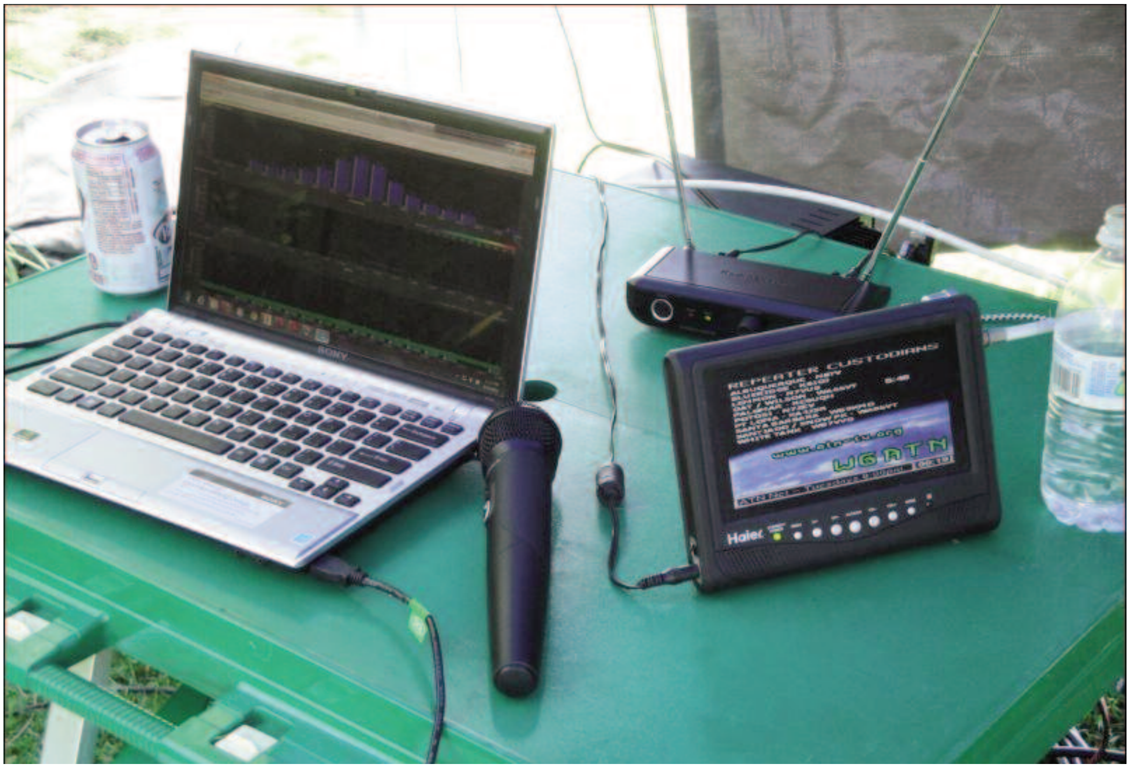
The Amateur Television station at the SOARA Field Day site operated well into the night and was the only station operating remotely on Sunday.

Antenna placement is always a challenge for the SOARA Amateur Television station because Santiago Peak is behind a hill and water tank forcing the antennas off the park's grass and into the ravine.



ATV at the South Orange Amateur Radio Association (SOARA) Field Day site

Portable ATV transmitter mounted in a toolbox. The laptop monitored streaming video sent to the Internet.



The ATV station was operated well into the night.

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In past years the SOARA Amateur Television station used two antennas: a 70cm beam antenna to transmit to the ATN repeater on Santiago Peak on 434MHz and a 1.2GHz beam to receive from the repeater.

This year we used a single Conifer antenna with dual feeds to transmit on 2.4GHz and receive on 1.2GHz.

One of the tripod legs had to be extended since it was sitting on the slope of a ravine.

The photos on the next two pages show some of the ATV contacts that were made from our Field Day site.

Closeup of the dual-feed system. The black box contains the 2.4 GHz transmit element and the wire loop is for the 1.2 GHz receive feed.

More photos on Page 16 →


MARK FISCHER
W6MAF
Haier


NORM - KN6CU
NORCO CA
Haier


Haier

W6KGE


Haier


Haier

W6IST


Haier

Field Day ATV at N6R

- Bob Miller W6KGE

Bob Miller, W6KGE, on the left, and Spencer Smith, N6IWY on the right

We demonstrated ATV during Field Day at the Ronald Reagan Presidential Library and Museum again this year. We used the Southern California ATN network repeaters to show visitors video communications with several other Field Day sites and many ATV home stations. This year over 1800 visitors saw our setup and 130 signed the guest book at the PIO table.

You can check out additional details by searching the N6R call sign at the 'qrz.com' website. N6R is the special events call sign that we use for events at the Reagan Library.

USING 3.4 GHZ FOR FM AMATEUR TELEVISION
By Bob Miller, W6KGE

These days, building a 3.4GHz FM ATV transmitter is cheap and receiving it is surprisingly easy! The FM pictures look great compared to AM.

Do you remember the old ten foot dish antennas that many people used for satellite TV? Do you remember the LNB and the set-top box that went along with these big dishes? Maybe you still have yours! We use these "C band" receivers for ATV. In order to receive 3.4 GHz, you'll need the LNB and set-top box. As I write this article, you can buy a new LNB on eBay for less than 25 dollars. Often the used 'set-top' receiver portion of the equipment is available for as little as 30 dollars.

Before you rush out to buy this stuff, or dust off your old receiver, you'll need to check a couple of things regarding the LNB and receiver.

Here are some commonly used identifiers:

LNA = Low Noise Amplifier used near the antenna.
LNB = Low Noise Block. This is a device that includes a low noise amplifier, a local oscillator, and a mixer. A broad range of signals are amplified and "block" down converted to a lower intermediate frequency and then boosted with a couple of gain stages so that they can be sent down inexpensive coax to a separate receiver.
LNBF = Low Noise Block with Feed horn. Sometimes used for LNB's with attached feed horn.
LNC = Low Noise Converter. A low noise amplifier with a down converter that does not convert a 'Block' of signals, but only tunes and down converts a single signal.

If you have an 'old' LNA or LNC, it is probably not going to work without modification. The 'new' LNB's are so cheap, it's probably not worth your time to attempt to modify your old stuff.

The 'new' LNB's come ready to use for ATV if they are C band with an input frequency of 3.4 -4.2 GHz. (3.4 GHz is the 'important number' here. The upper frequency doesn't really matter.) This type of LNB is often called "extended range" …. and, yes, I know our ATV frequencies are slightly below 3.4 GHz. That's ok.

Some of the 'oldest' receivers are not compatible with the new LNB's. So if you are buying a used receiver, don't get one of these. The oldest receivers were configured to vary the voltage that was supplied to the old LNC or separate down converter. The variable voltage was used to tune the local oscillator. The single signal was then sent down the coax to the receiver's intermediate frequency input.

The 'newer' LNB and receiver combinations use a different approach. The receiver provides one or two fixed voltages to the LNB, often by sending dc voltage to the LNB via the coaxial cable that is also used for the intermediate frequency, I.F., signals from the LNB. The LNB contains a local oscillator that is tuned to 5150 MHz. The LNB converts all signals within it's receiving range and sends them down the coax to the receiver's intermediate frequency, I.F. range. The receiver is then tuned to select the desired signal.

So, how can you tell which "C Band" or combination "C Band"/"Ku Band" receiver to buy? The best way is to check the specifications or look at the back of the receiver. Most of the I.F. input connectors are marked with the range of frequencies that the I.F. will cover, or the back of the receiver is stamped with the range.

There are basically three ranges that the 'newer' receivers will tune.
The best and newest receivers for ATV cover the 950-2150 MHz. range. Some receivers cover 950-1750 MHz. These are often called 'extended range' but are not 'extended' enough to cover all of the

ATV frequencies without an additional down-converter. The older receivers cover only 950-1450MHz. All of these will tune the entire 1240-1300MHz Ham band without modification but an additional downconverter will be required FOR 3.4GHz. These receivers were designed to use both “C Band” and “Ku Band” LNB’s.

Many receivers, like the *Pico HR-100* and the *Standard Agile 24 PC* shown in the photo above cover 950-1450 MHz. Receivers like the *Drake Model 1255* were produced with several I.F. ranges, so always be sure to check the I.F. frequency coverage. Don’t assume any brand or model will cover the most desirable range of 950 to 2150 MHz without checking.

“Downconverters” such as the *Sony EAC-DCD1* are occasionally available as shown below.

I would encourage you to look for a receiver that has a tunable audio sub-carrier feature. Most receivers are tunable from around five to seven MHz, but some have only two fixed frequencies of 6.2 and 6.8MHz. Often the same make and model receiver has different options for the audio sub-carrier installed, so check this too.

Remember that while the LNB’s are new, some of the receivers are thirty or more years old. Unless you know, or have a guarantee that a receiver is working, don’t spend a lot of money for one.

RG-6 type coax can be used for most installations, where the distance between the LNB and receiver is one hundred feet or less.

I haven’t talked much about the parabolic reflector that you might want to use, in conjunction with the feed-horn and LNB. The fact is that if you are closer than twenty miles from a repeater like ours, you probably will not need anything other than just the feed-horn. We use a fifteen watt RF amplifier and a gain antenna at the transmitter site. (Remember these LNB’s are pretty good low noise receivers.) If you’re planning something with less power, or greater distances, you’ll want to do some experimenting with parabolic reflectors.

Above is a photo of mobile equipment receiving 3.4 GHz. ATV picture at ground level from 25 miles away from repeater, with just the LNB/Feedhorn.

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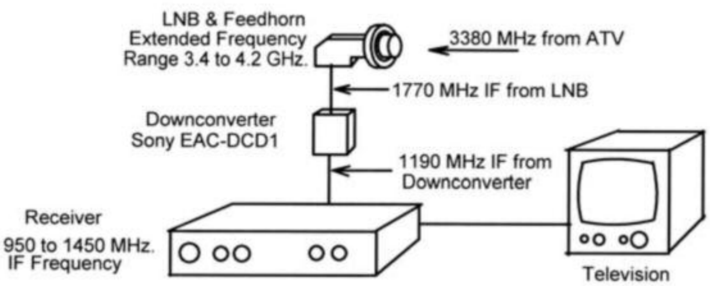
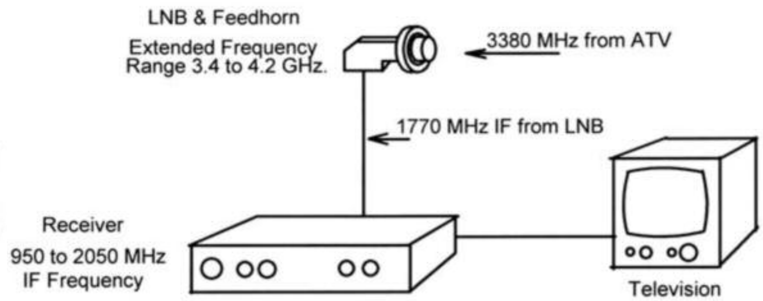
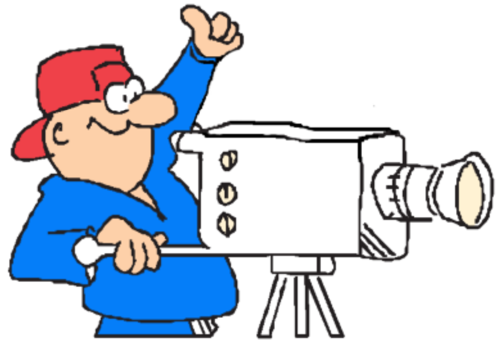


Receiving Diagram with Added Downconverter



Receiving Diagram with Extended Range Receiver

ATVQ



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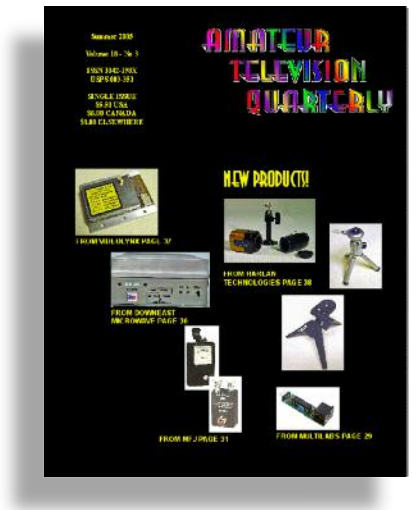

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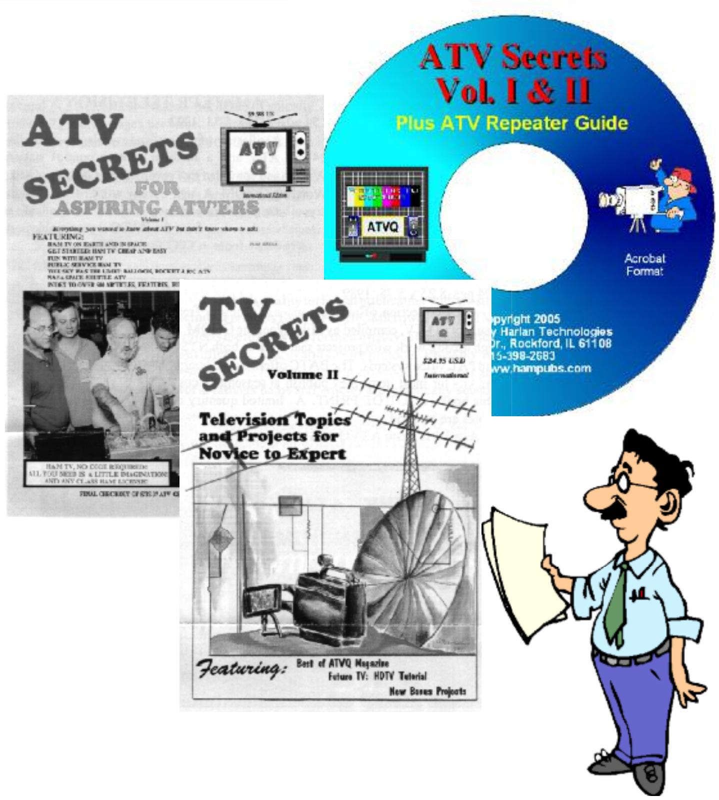

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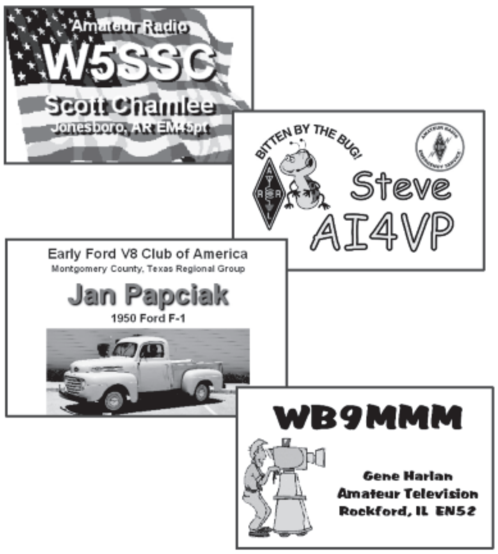

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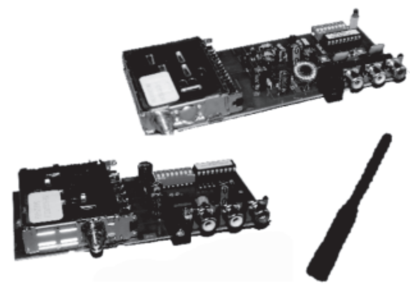

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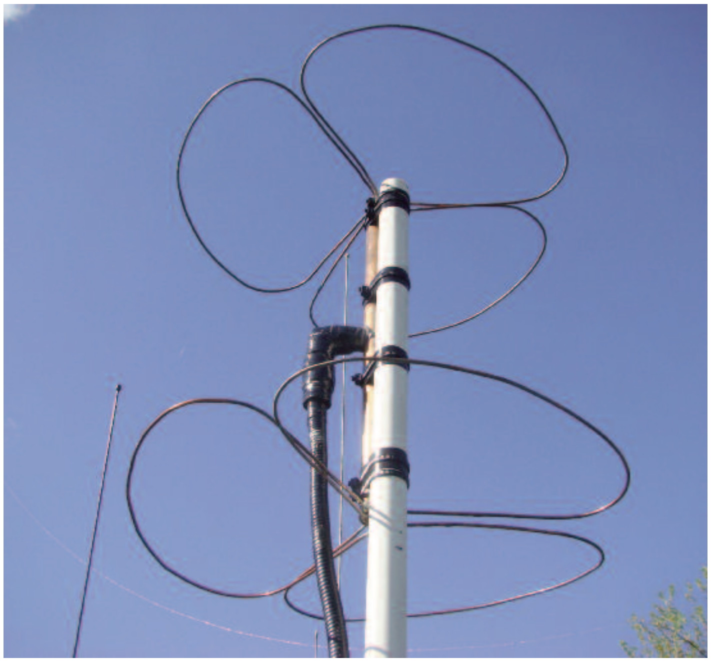
KC8LMI Mobile ATV

- Bryan Dygert KC8LMI

Here are some photos of my 439.25 MHz mobile ATV setup. It isn't pretty but it works. Stacked homemade wheels (made from romex) mounted on a quad 5" magnet mount and is fed with 6 feet of 1/2" heliax.

The exciter is a PC Electronics TC70-1 fed into a modified D1010 amplifier running 90 watts. Video is supplied with a 12 volt color camera and overlay board for ID.

This setup works flawlessly. I have driven over 30 miles away and my dad could still see me.



Homebrew stacked wheel omni-horizontal ATV antennas are held in place on top of the car with a quad 5" magnet mount.

THREE STAGE LINEAR 23CM AMPLIFIER

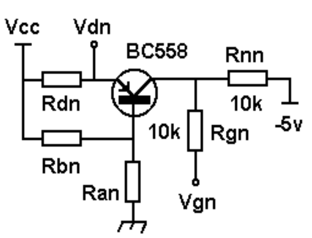
By Grant ZL1WTT

Background:
Basic theory states that not all amplifiers are created equal. They have different characteristic types. At this stage I will not be going into “classes of operation” differences but lets say it helps to have a good understanding of class of amplification vs. the job it's to be used for. For this project I needed to have very good amplifier linearity. Most 23 cm power blocks were ok for SSB and FM but a poor choice for digital ATV because they were designed to work in class B or C. For this application I needed it to be in class A.

Introduction:
I can clearly remember asking your average HF operator how linear is your amplifier? The response I got was this “It's linear because it's a Linear”. I walk away shaking my head. I hope by reading this article you have better understanding of amplifiers.

Back in 2006 I saved up all my pocket money and imported in my first bit of digital ATV equipment. I soon found by using QPSK modulation through the current FM TV amplifiers that I had a very high intermodulation level in the order -20 dBc. The Mitsubishi power blocks I was using were a M67715 driving a M57762. By looking up the specifications I found they were made for mobile radios using FM or SSB. I needed to rethink on how I was going to operate digital ATV on this band. At one of our markets days I met with Kevin ZL1UJG who suggested that I look at power GaAsFET's. He had a number of these devices that were unused so I decided to see what I could do with them.

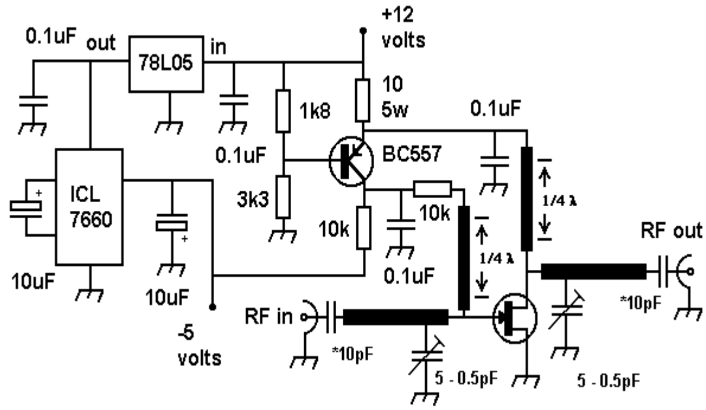
Circuit description:
Bias conditions were calculated out for the power GaAsFET's that I used. There are two equations used to calculate components for different bias conditions. This must be done before looking at an FET amplifier based on these designs.



$$Rdn = \frac{Vcc-Vdn}{Idn}$$

$$Rbn = \frac{Ran(Vbe+Vcc-Vdn)}{Vdn-Vbe}$$

The stages 1 and 2 use similar bias circuit layouts. The LM78L05 regulates a +5 volt input to the 7660 negative 5 volt generator. This provides -5volts for both bias circuits. The class A PNP transistor circuit is the same for stage 1 and 2 amplifiers.



For the Stage 3 power amplifier I needed to add voltage protection. The expense of the power GaAsFET used required extra components to be fitted to protect this device. The NE555 oscillator is connected to two transistors BC337, BC327 (NPN, PNP). The output is then rectified via the two diodes as well as the 10uF capacitors. The LM79L05 regulator provides the -5volts. The IRF4905 P-channel power MOSFET is turned on when there is -5 volts present on the output of the LM79L05 regulator. Therefore no current is provided to the drain of the GaAsFET when there is no negative bias on the gate and again a class A bias circuit was used for this device. It's important to make sure that the 1.2 ohm drain resistor has the right amount power dissipation. In this circuit I used two 2.4 ohm five watt resistors in parallel.

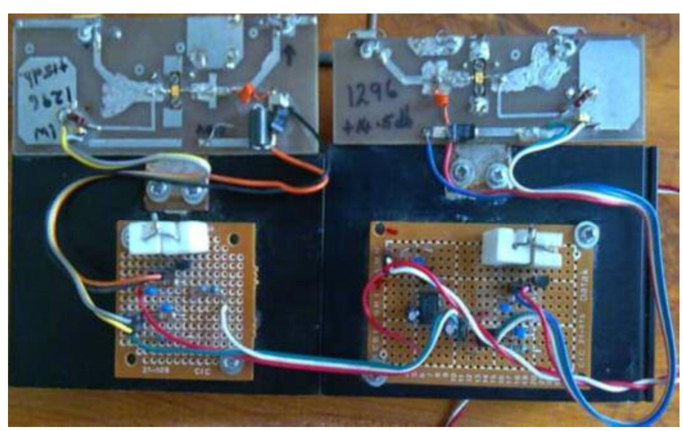


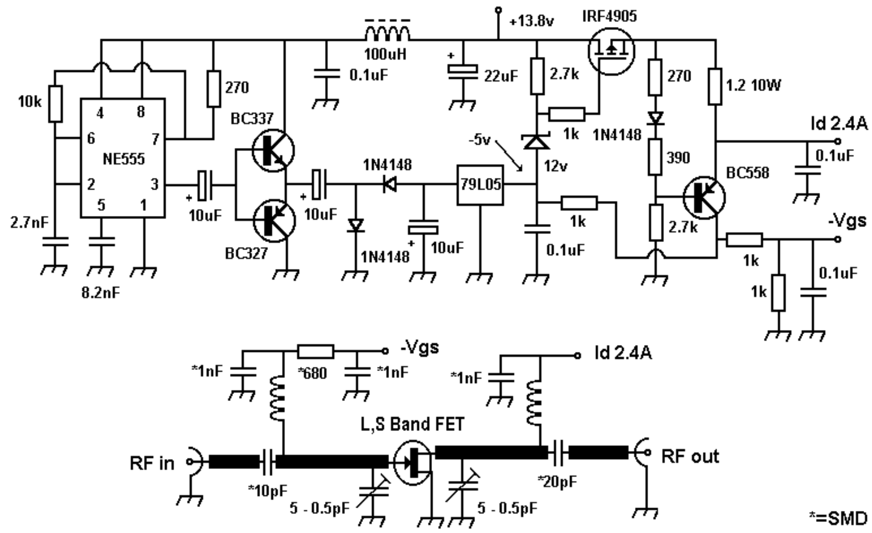
Photo of stage 1 (right) and stage 2 (left) amplifiers with their corresponding bias circuits below them.

SMA connectors were used for the RF input and output which are fitted onto 50 ohm lines. The trim-capacitors are used to tune out the internal reactance of the device. SMD capacitors are on the input and output. The inductors used are one turn of wire through a ferrite bead. This power amplifier is made on a standard prototyping board and the RF prototyping board came from the Waikato VHF group. I cut a hole large enough to fit the RF stage to provide direct contact to the heat-sink panel mounted on back of the Aluminium die-cast enclosure.

Photo of the stage 3, 10 W power amplifier and associated bias control PCB.

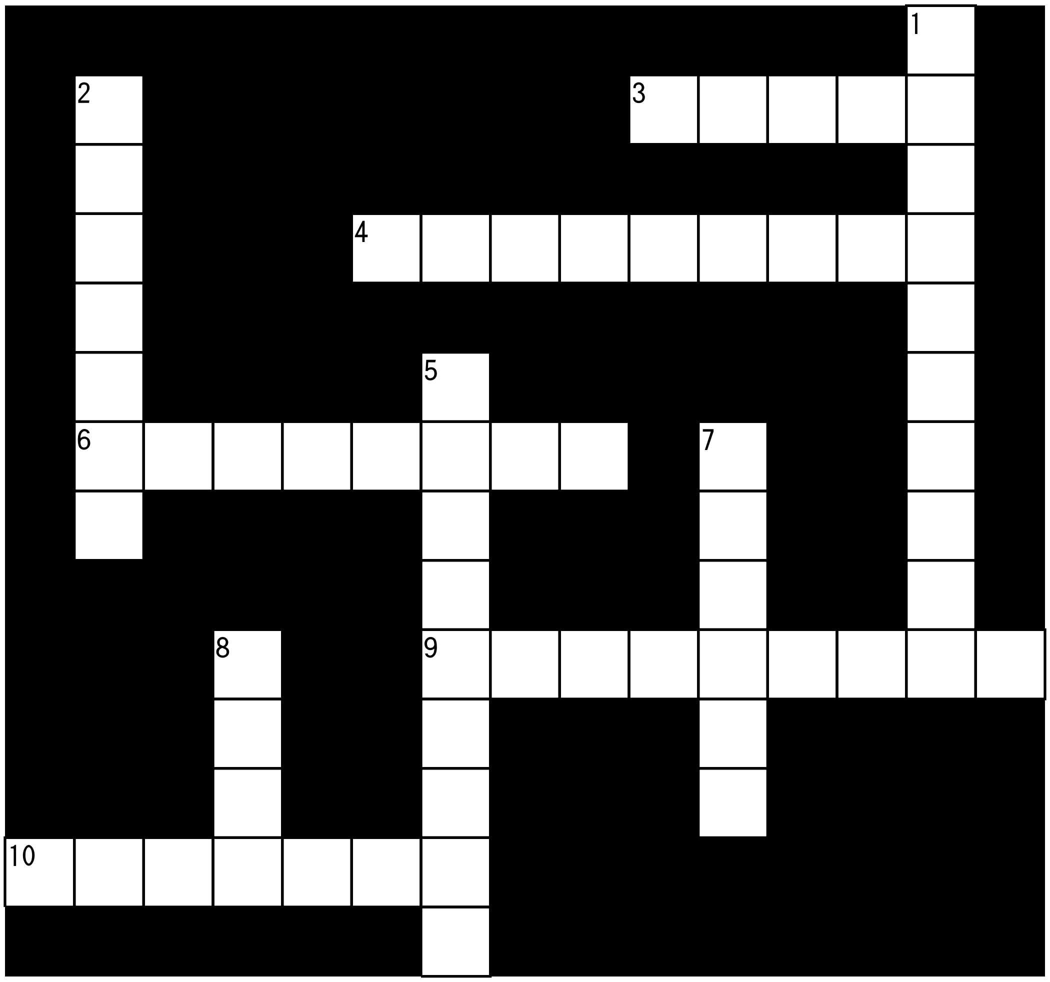
Stage 3 Power output (dBm)		IM distortion below carrier (dBc)	Comments
30	(1W)	-62	OK for digital DVB
35.7	(3.7W)	-50	OK for digital DVB
37.7	(6W)	-40	OK for digital DVB
39.3	(8.5W)	-28	Use for analog FM/SSB only

3 Stage 10 watt UHF Amplifier +12 volts supply, 2 tone test @ 1MHz spacing



Operating ATV

- Bill Brown WB8ELK



Across

3 Band opening when the weather is just right

4 It can microwave your food or transmit video

6 Getting ATV from point A to B may need this

9 Give your signal a boost

10 Before the CCD there was this

Down

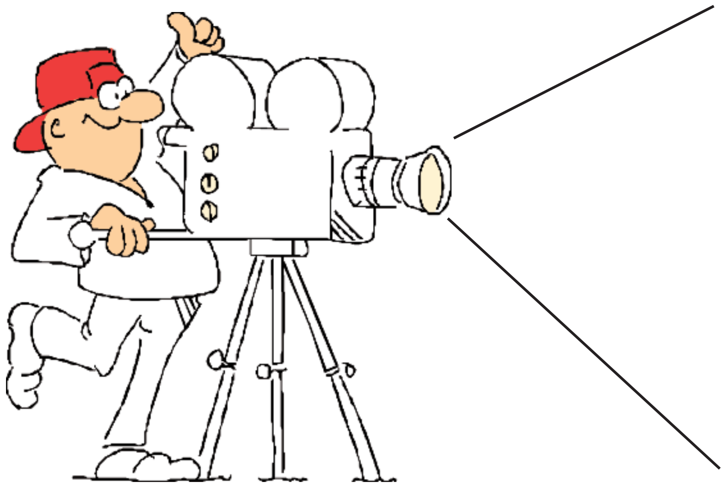
1 SSTV was recently sent via EME also known as?

2 The N in ATN

5 Video on the Internet

7 Taking ATV to the road

8 Elemental way to see those weak ones



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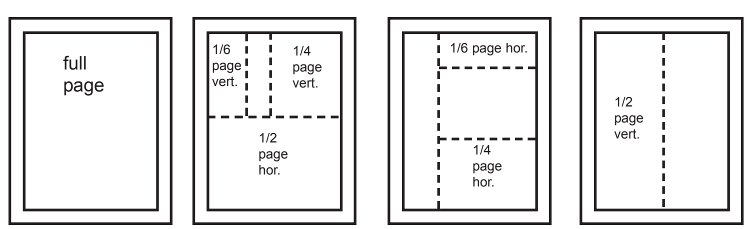

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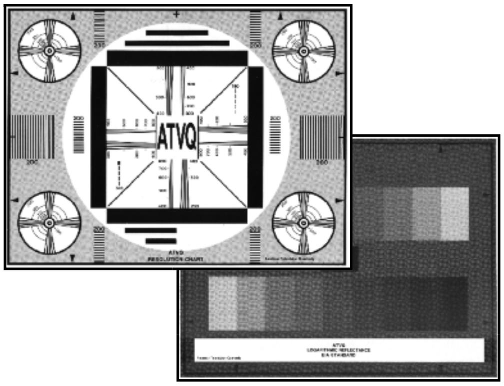

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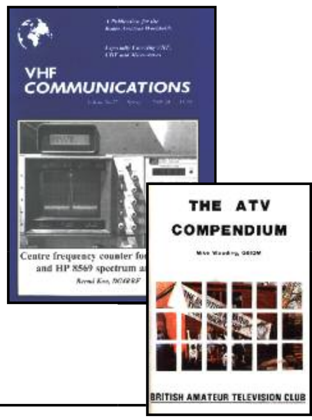

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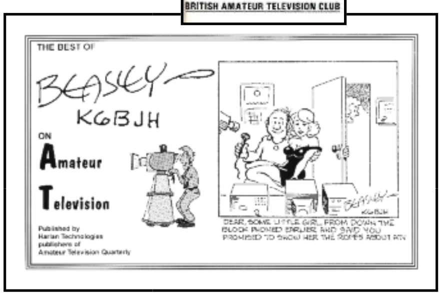

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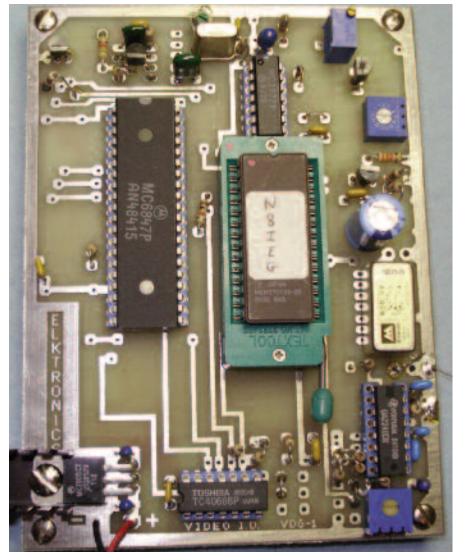

Tech Guy is In

-Mike Colllis WA6SVT

A biasing question came up the other day for an amplifier used for an ATV repeater. The amplifier was damaged and needed rebuilding I offered to take a look. After replacing the final transistors, the bias supply had to be rebuilt. This amplifier was a surplus UHF 28 volt 150 watt amplifier with no schematic or manufacture information.

The bias was derived from a device labeled BD01 and had two leads, one inputting 28 volts and the other the output connected to the base bias choke and resistor network to ground, the bias device was mounted to the heat sink next to the final transistors. After getting no were finding out about the device I decided to make up my own.

Due to limits of space on the board, I chose to tap into the 28 volt main power and add a 7805 5 volt regulator. This would stabilize the voltage used for bias no matter what supply voltage range of 24-28 volts was at. Base bias for high power RF bipolar transistors need to be stiff and not change as the RF drive level changes. Also I wanted to have good thermal tracking.

I have seen many amplifiers use a 1 amp diode placed near or on top of the final transistor to pick up the heat for tracking. I wanted to get the tracking even closer to the heat and used a 3 amp diode soldered to a lug with less than a 1mm lead length and a three amp diode has a much larger lead that can conduct the heat better. This lug is installed were the old bias BD01 was located.

I used the same 10 ohm ¼ fixed and 10 ohm ¼ watt pot in parallel (5 ohm-0 ohm adjustment) for setting idle current for each final (separate bias for each final). I used 20 ohm 1 watt resistors one from each bias input to the single 5 volt regulator, the regulator was also screwed down to the heat sink.

The idle current was set at 200ma for each transistor then I applied the RF and heated up the amplifier till it was good and warm about 120 degrees. The idle current had increased a bit as is normal as a bipolar transistor heats up. I then set the current per the manufacture's recommended value for class AB.

I have heard some concerned ATVers talk about the idle bias increasing after a long transmission when the amplifier is very warm . This is normal for most ham amplifiers or any amplifier for that matter that has a bias supply without temperature compensation (most ham amplifiers). In this case, I would recommend after heating up the amplifier adjust the idle current for the manufacture's recommended value for class AB. You can also look up the transistor's data sheet for this information too.

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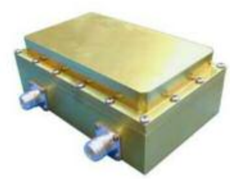

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