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Amateur Television Quarterly

Modified Harris LDMOS PA for 70 CM Band

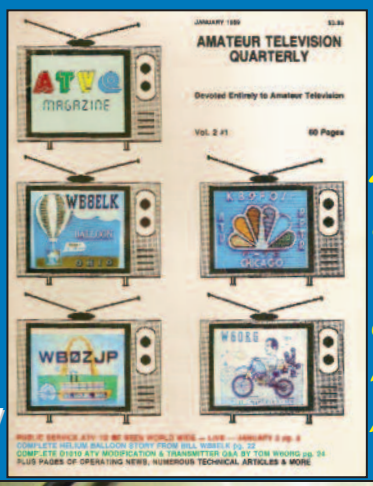
Looking back 25 years

WR8ATV has a new QAM-64 DATV Output

ATV Audio Processor & Controller

DVB-T testing for DATV

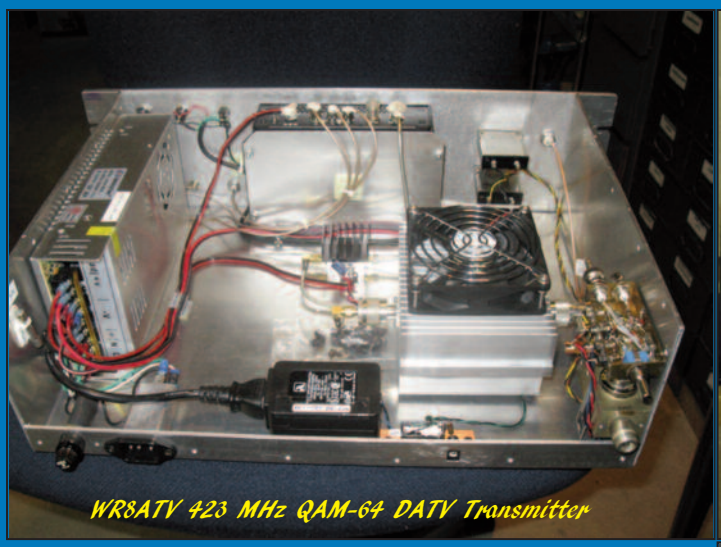
Holland HDD QAM-64 demodulator for DATV



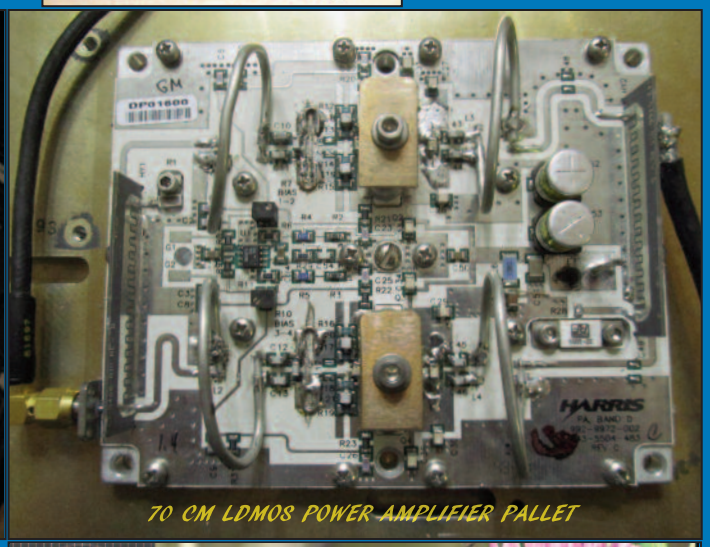
ATVQ

25 YEARS Serving the ATV community

On the left is our first Full size color covered magazine



WR8ATV 423 MHz QAM-64 DATV Transmitter



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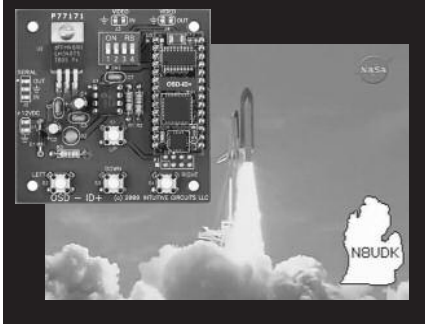

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Amateur Television Quarterly
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Sync Buzz Editorial

- Bill Brown WB8ELK and Mike Collis WA6SVT

25 years of ATVQ

Our first full size ATVQ was produced January 1989 after two small proof of concept versions were sent out to various ATVers across the country. Henry KB9FO (now AA9XW) and Bill WB8ELK were the original publishers, a lot of traveling to promote the magazine and ATV was done. The next publisher was Gene WB9MMM, then Bill and I are at the helm. A lot of changes over the years have taken place. some of you have been with us since the early years and have seen ATVQ evolve into what it is today.

In today's world some ham radio magazines are out of production or have switched to cyber versions only, ATVQ is still growing in subscribers, adding advertisers and finding more articles. In the future we plan to make it even better. Many thanks to our subscribers, advertisers and authors for your support the last 25 years. See pages 9 and 10 for the story.

New Advertiser

ATVQ welcomes our newest advertiser North Country Radio, see their ATV products ad on page 8, please let them know you saw their ad in ATVQ.

ATV Secrets Vol I & II

We received a few hard copies of each volume from Henry AA9XW, see page 35 for details.

Hollywood

ATVQ is now on the ABC TV show "Last Man Standing"See the ham shack views in the show for ATVQ, the complete story is on page 25.

New Repeater & Club Directory?

It has been many years since the last ATV repeater directory. It is out of date. If you have or know of an ATV repeater, please send us a letter or email, we need call, sponsor, location, frequencies, is it operational or under construction, if the latter, the expected operational date. If linked, please include the repeater it is linked to. Please let us know about your ATV club, we want to include all of them in the directory.

Dayton Hamvention ATV Activities

Friday evening is the ATV dinner at Roush's restaurant in Fairborn at 6-8:30 PM. Saturday ATV forum is in room 2 but an earlier time slot of 11:45 to 2 PM and will feature Gordon West WB6NOA's comical opening, Mike WA6SVT's linear amplification for ATV, Bill WB8ELK's RC aircraft with ATV, Whats new in ATVQ, Art WA8RMC's DATV express board details.

In the Next Issue

Dayton activities, ATV audio console, ISS DATV commissioning, DATV express board evalulation, ATV club news.

Stay Tuned – Bill & Mike

Digital ATV testing with COFDM (DVB-T)

-Grant Taylor ZL1WTT

Background

Coded Orthogonal Frequency Division Multiplexing (COFDM), this format is used for terrestrial broadcasting on VHF and UHF frequencies outside of North America. With the cost of digital television modulators coming down. There are now far better ways to transmit digital amateur television (DATV). The bad old days of last century are now behind us and we now can move on with these new digital modulation systems.

In New Zealand we have so little UHF spectrum available to use, we now need to share 10MHz at 70cm with low power devices and Amateur narrow band uses. Now we have a real problem trying to fit 20MHz of spectrum down into just 10MHz.

Testing

I wanted to find out what was possible with COFDM and how it would be affected with narrow bandwidth signals. The first problem was finding an amplifier that was linear enough to work with the 8k mode. The only module that I had that I could make use of was a Harris UHF driver amp, that I got from Mike (WA6SVT). This driver operated at 32v at 2A DC to provide 1.2 watts out of RF, as you have already worked out, it gets quite warm. So the simple rule to remember with COFDM works out something like 10 to 1 ratio for VSB rated amplifiers (ie 2kW analog amp would provide 200W of average power with digital modulation). To compensate for the low RF power output I needed to design a high gain Yagi to maximize effective radiated power (ERP).

The impact of COFDM to a FM voice receiver is that you don't know that anything is there, it just sounds like white noise. FM voice repeaters use tone access blocking any noise from being retransmitted. Weak narrow carriers don't have any real impact on a DATV signal, the forward error correction (FEC) rebuilds the missing data.

A strong FM or other narrow carrier nearby can overload the receiver causing distortion of the DATV signal with loss of receiption. Cross polarization between DATV and narrow modes that share the same part of the band will greatly reduce QRM.

Our testing frequency was 434MHz that falls within the center of the New Zealand 70cm band (standard 8MHz channel). COFDM allows several modulation levels to be used, I tried out a number of with Ian (ZL1VFO) to get feel for how much carrier to noise that we would required over the three modulation levels. The signal to noise I measured at Ian's home location was about 16dB, he had good success with both QPSK and 16QAM level, but the 64QAM level signal was just holding in on my set top box with a few break ups.

Televisions and set top boxes normally cover the frequency range of 174MHz to 860MHz, all new televisions sets on the market outside North America now have COFDM built in and therefore making it easy to receive DATV on 70cm. Some of the problems we ran into were from older Set top boxes that would only work with Mpeg2 the current broadcast format and standard definition. Using my Sunray DM-800SE 3 in 1 (DVB-T, S, S2 and C) with this receiver I could transmit high definition using h.264 and AC3 sound without any problems. h.264 is the new format that broacast is starting to use with higher data throughput. (*Editor's note, dongles are available in North america for COFDM).*

The next step

When a 70cm RF pallet power amplifier arrives from Mike (WA6SVT), I would expect about 25W of RF power output for COFDM. Then I plan to repeat these experiments with Ian at this higher power level, to see what impact this will have on the 70cm band DTV signal range.

Aerial Design

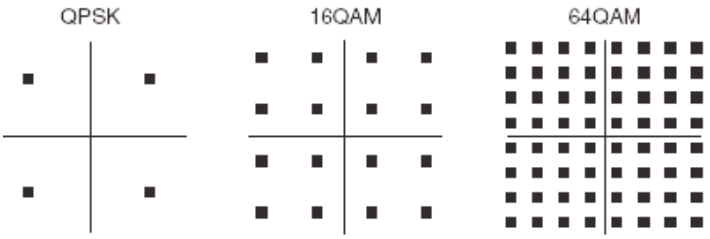
As well as designing a 12dBi Yagi, I am in the process modeling a 13dBi Bi-Quad as a possible repeater transmitter array that has a wide pattern.

The one on the left is what I'm currently working with, made up out of parts from a old VHF high band TV antenna. On the right is the panel for the repeater RX and TX antennnas that I plan to put together for testing at a later date. A Bi-Quad as the name suggests is just two Quad dipoles stacked with reflector behind and fed via a 50 ohm quarter wave balun.

Digital modulation modes used within COFDM

There are three formats used, as shown below. Where information is modulated in both the phase and in amplitude domains. Two bits of data is sent per symbol (change of state) for QPSK, four bits for 16QAM and six bits with 64QAM.

Constellation Patterns for different levels



With COFDM alongside these three levels of modulation you also have different carrier modes such as 2k, 4k and 8k. This sets the number of modulated carriers to transmitted in a set channel bandwidth, this is where the term orthogonal comes from (more then one carrier being sent). Guard band between the carrier intervals operate within the time domain by leaving a space for any reflections to fall within. This is why COFDM has very good multi-path characteristics.

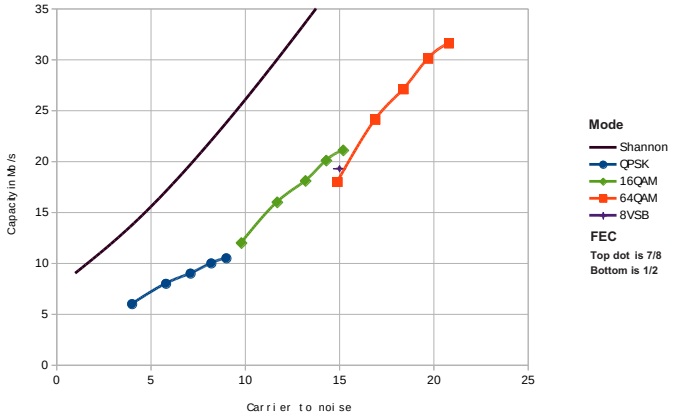
Usable bit-rates within 8MHz channel

Modulation	FEC	Guard interval			
QPSK	1/2	4.976	5.529	5.855	6.032
	2/3	6.635	7.373	7.806	8.043
	3/4	7.465	8.294	8.782	9.048
	5/6	8.294	9.216	9.758	10.053
	7/8	8.709	9.676	10.246	10.556
16QAM	1/2	9.953	11.059	11.709	12.064
	2/3	13.271	14.745	15.612	16.086
	3/4	14.929	16.588	17.564	18.096
	5/6	16.588	18.431	19.516	20.107
	7/8	17.418	19.353	20.491	21.112
64QAM	1/2	14.929	16.588	17.564	18.096
	2/3	19.906	22.118	23.419	24.128
	3/4	22.394	24.882	26.346	27.144
	5/6	24.882	27.647	29.273	30.160
	7/8	26.126	29.029	30.737	31.668

The interesting thing is that not all digital modes are equal, as you can tell from the graph below. The factors you need to take into account for a DATV repeater is the amount of data you would like to send vs the carrier to noise. The colored dots show FEC ratios of 1/2, 2/3, 3/4, 5/6, 7/8 and the impact this has on the data throughput vs signal to noise ratio

COFDM that has an advantage of setting the mode for your data requirements as compared to 8VSB that has a fixed 19.2 Mb rate. A 10 dB carrier to noise ratio could be the difference between 100W and 1kW of RF power that needs to be transmitted for DATV with fixed higher data rate.

Signal to noise ratio performance for different modes and FEC



Continued on page 8

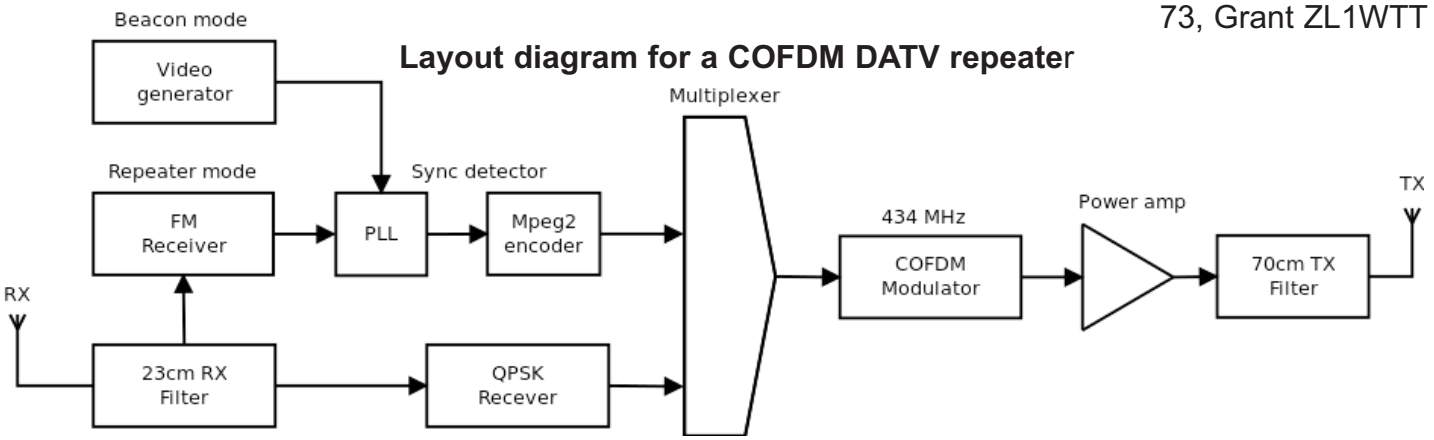
Shannon–Hartley theorem tells the maximum rate at which information can be transmitted over a communications channel of a specified bandwidth in the presence of noise. The closer you can get to this line the greater the efficiency of data vs bandwidth. This is where the next generation of COFDM will provide improved performance (DVB-T2 16k and 32k modes).

In summary

ATV is all about finding the best way to receive noise free pictures, with digital it comes down to how close you can get to the noise floor and finding the best modulation system do this. Out of all the digital modulation systems I have experimented with, COFDM has had by far the best overall performance for the transmit side of a DATV repeater. Sending DATV from the home station DVB-S (QPSK) has advantage due to the fact that you only working with one modulated carrier. By doing this, the power amplifiers does not need to have the same amount of linearity as you would with COFDM. With the 70cm band in the US been 30MHz wide and 20MHz in Canada, this form of DATV repeater would provide greater coverage over current ATV repeater designs.

73, Grant ZL1WTT

Layout diagram for a COFDM DATV repeater



WB8LGA DVB-T DATV

Charles WB8LGA and Ross KA8MFD are running DVB-T DATV tests running a few milliwatts over a 9 mile path using the Hides CT100B dongle every morning. Ross reports they cost about $230 from TW.

73, Ross KA8MFD

Thanks to the ATCO Newsletter for this news clip.

ATVQ 25 YEARS OLD

-ATVQ Staff

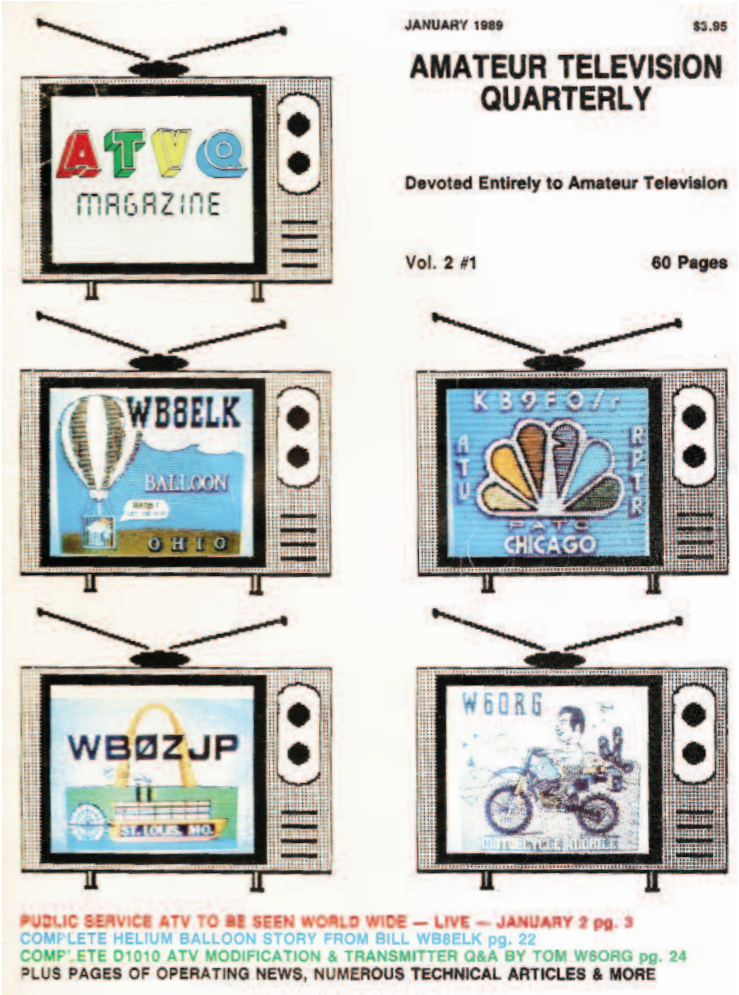
It seems like it was yeasterday when I met Henry KB9FO now AA9XW. Going back 25 years ago it all started with two small format test issues that were produced and mailed out in late 1988 as proof of concept that was well received by the ATVers who received them. Henry Ruh KB9FO and Bill Brown WB8ELK decided to launch ATVQ as a full size ATV magazine. There were four prior ATV magazines over the years but they did not last.

During our first year many technical articles were published and a regular author was Tom W6ORG, by the next year he had a column "W6ORGy Notes" in most issues. Henry KB9FO, Bill WB8ELK, Art WA8RMC, Mike WA6SVT, Bill W8DMR, Don, W9NTP, Dave WB0ZJP and many other authors' submitted technical articles and ATV activity news. With so many articles to publish, allowed for a larger page count back then. ATV was very popular In those days and the only way to send a live video picture. Subscriptions came fast and soon we signed up several advertisers.

Henry and Bill rented a booth for the 1989 Dayton Hamvention and asked me and Andy G8PTH to help, this was my first Dayton Hamvention and meeting so many ATVers from around the county. I recall I was so busy taking subscriptions, passing out sample ATVQs and selling some of Henry's old broadcast gear that I had only one walk through the flea market. Henry and I took in over 400 subscriptions by Sunday morning. I manned the booth for six more years.

Bill started his ATV balloon series of articles and soon after had taken a job as editor of 73 Magazine, this new position soon took a lot of his time away from ATVQ and Henry became a solo editor and publisher.

From our first full size issue we had a professional looking cover. The cost of color back then kept the internal pages in black and white with an occasional color centerfold. Bob Beasley K6BJH a Southern



Henry left, Andy & Mike right at Dayton 1989

Henry & Bill Dayton 1989

California ATVer and cartoonest sent in cartoons with an ATV theme to be published and they were regularly featured in most issues. In 1991 Henry published ATV Secrets Volume I, a basic ATV handbook with good information for new ATVers. Henry followed up with TV Secrets Volume II in 1992, with over 90 ATV projects and ATV topics for novice through expert level ATVers. *Continued on Page 10*

By the late 1990s printing costs rose, the front cover had to be printed in black and white. Henry sold ATVQ to Gene Harlan WB9MMM, the summer 1997 issue was Gene's first as the new publisher.

The magazine was still black and white but Gene was able to switch printers to reduce cost. He also signed up ATV Research as a new advertiser and by years end 1998 their ad was moved to the back cover. Thanks to ATV Research's new color ad, Gene was able to bring back a full color cover. ATV Research has retained the back cover for their ad and support of ATVQ since.

Gene and his wife Shari N9SH added "Name Tags by Gene" and Comtech board sales to help offset the booth and travel expense for the Dayton Hamvention, they needed another helper and I was asked to help out. I have been to Dayton every year since helping with ATVQ and submitting articles.

Late in 2007 Gene became ill and by the winter 2008 issue he was diagnosed with ALS and announced it in his editorial. Dayton 2008 was his last Hamvention. Gene and I talked after the ATV dinner and I offered to continue the magazine, having no experience as a publisher I had asked Gene about bringing Bill Brown in as a partner. Gene Bill and I talked about the future of ATVQ and taking over publishing of ATVQ. The balance of Harlan Technologies and all funds were to remain for Shari. A trip was planned for early December to make the transfer of publisher.

A week before my arrival at Gene and Shari's QTH, Gene passed away. Shari asked me to continue with my trip, this was a sad time and I miss him.

Bill and I restarted ATVQ almost as a new magazine, we had a mailing list, back issues and ATVQ CDs, Bill purchased Quark 8 publishing software and soon started the winter layout. I obtained the business license and set up our business office. Our friend Don KE6BXT set up a website for ATVQ and talked to us about adding a cyber version of ATVQ. We contacted our advertisers about the change of ownership.

We personally funded the cost of the first issue and into the next one till ad and subscription revenue came in to cover the costs. Bill and I wanted to upgrade the paper stock to magazine quality and add color to about a 30% of the pages, although this increased printing costs substantially we felt it was needed. Thanks to our friend Don Hill KE6BXT we added a cyber option for ATVQ.

A couple of years later we decided to try a couple of full color issues at our expense for the extra color printing charges prior to the Dayton Friday Night Dinner at the Hamvention. We took a survey asking how they liked the color, we said we could continue with full color at a $2 increase in subscription price. A unanimous yes vote was our answer and full color has remained.

With Bill's busy government work schedule and assignments out of area, timing for the publishing of some issues was less then desirable and it was time for a change. I was able to get a great deal for upgrading to Quark 9 publishing software with a double license that would allow both Bill and I to both work on the layout. We have been on time since and renewals have increased as well as new subscriptions.

It is a pleasure communicating with our subscribers, advertisers and authors about ATVQ, we plan to continue and improve the quality of ATVQ and to increase subscriptions. This is not easy these days as several other specialty Ham Radio magazines have closed down or gone to only a cyber version. Thank you for your support and please tell your friends about ATVQ.

73, Mike WA6SVT

WR8ATV ATV repeater installs a QAM-64 DATV output

-Art Towslee WA8RMC

In late November 2013 we installed a QAM transmitter at the ATCO repeater in Columbus, Ohio. This was basically an experiment to see what reception capabilities exist. Since we already have an analog transmitter on 427MHz and our existing digital transmitter is QPSK on 1258MHz, some discussion took place as to how we wanted to implement this new signal. All other frequencies in the 70cm band were spoken for and replacing the 427MHz transmitter wasn't a good idea either.

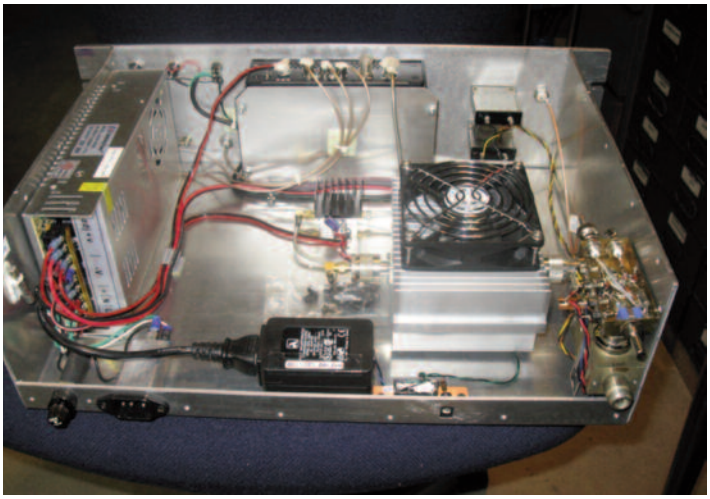
However 421MHz presently used by the Dayton, Ohio group 75 miles away seems far enough away, that if we use a vertical antenna and stay at relatively low power we wouldn't interfere. Since we already have a spare vertically polarized 70cm antenna in place, it seemed like a no-brainer. if someones complains, we would certainly move it.

So far, interference hasn't been an issue. The QAM signal is centered at 423MHz, which is the same as 421MHz an analog signal and digital cable channel 57. The beauty of QAM on 423MHz is that all modern flat screen TV sets can receive a QAM signal on that frequency without modification. The only requirement is the antenna be vertically polarized. However I can receive the signal 15 miles away with my horizontally polarized M2 yagi antenna. Since the output is 2 watts, that's pretty good.

The transmitter is a Thor model H-VQAM-SD and cost about $500. The output is quite low at -27 dBM so an intermediate amp is needed A Minicircuits ZFL-2500VH followed by a Downeast Microwave DEM 7525PA to bring the output to 2.75 watts. After the Interdigital output filter less than 2 watts makes it to the 8dBi antenna. It remains to be seen if the signal will be good enough to eventually replace the 427MHz analog system!

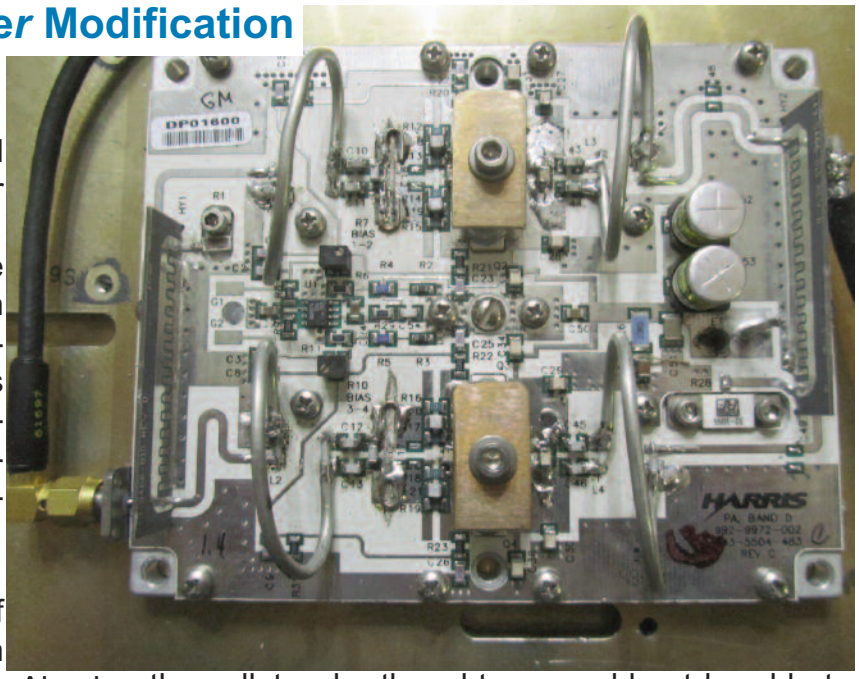
In any case, An should be I believe we are now the second repeater with an QAM output, ATN-CA is the first, however since we were the first with a QPSK output, we are the first in the USA to have multiple DATV outputs on a single repeater.

73, Art WA8RMC



70cm LDMOS Power Amplifier Modification

-Mike Collis WA6SVT



After the cut over from analog to digital broadcast TV a few years ago the upper UHF broadcast band above channel 51 had to be vacated to make room for the 700 MHz communications band. In crowded areas these upper UHF channels had been used and a few stations found themselves having to replace relatively new transmitters due to the amplifier pallets not working on or below channel 51.

I was able to pick up a complete set of amplifier drawers with seven pallets from a Harris Diamond series DTV transmitter. Also in the drawer is a vector modulator/predriver and a control board. Up until last year this was a current production model. The pallets have two sets of push-pull MRF-373 LDMOS transistors. Each pallet has it's own bias supply and runs on 32 volts producing about 300 watts peak sync each or about 100 watts DTV. They also will work at 28 volts at 25% lower output.

The stock frequency range is 736-806 MHz (band D). Harris also has pallets on bands A, B and C with A band's frequency starting at 470 MHz. The MRF 373 transistors are rated for 470-870 MHz, 75 watts. There are also two different data sheets for these devices with one sheet rating of 60 watts CW based on 28 volt operation and the another one rated at 75 watts for 32 volt operation.

I have sold several pallets tested at band D frequency range prior to shipping but have not yet received any reports of modification to the 70cm band. After getting several other ATV projects off my bench I decided it was time to try to modify one. After an afternoon and evening, I was able to get one to produce reasonable power on 70cm. The power output is lower than the stock design frequency on band D. In 2012 Art Towslee and I were invited to Harris Broadcast's transmitter RD facility in Macon Ohio a few days prior to the Dayton Hamvention. We even met the designer of the pallets who thought we would not be able to successfully modify the pallet because the microstrip was to short. The primary differences between the A and D band pallets are microstrip length on the gate matching section, input and output hybrids, baluns and chip capacitor values.

My first thought was cut the traces on the transistor side of each hybrid and solder test coax on each leg except for the termination legs. I swept each hybrid for it's frequency response and was surprized that they would work down so low in frequency. Below 410 MHz however they no longer do. My next step was to make new 1/4 wave coaxial baluns (looks like a wire loop), the new ones are 10 cm long. Before hooking the hybrids back into the circuit I moved my test cables to one push pull set with the longer baluns. I was able to extend the frequency response down about 50 MHz with just the balun change.

I then changed the capacitor values in the drain matching section to that of the A band unit and the gain increased and I could see the swept response had a peak just above the ham band. I changed the values slightly larger and the peak response was now over the ham band, so far so good. Testing was with small signal levels to keep the transistors safe while tuning but later some capacitor values will need additional adjustment with large signal testing due to the transistor

capacitance change under full drive. I next changed the gate matching section capacitor values and made some improvement in but nowhere close no matter the values chosen. Was the pallet designer right? Yes he was but I was not going down with out a fight. So the thought came to me that a combination microstrip and lumped componet (caps) was nothing more than a matching section like the antenna tuner we use at HF.

All you need is C and L components. I can also use a lumped L component if the microstrip was not long enough. The existing matching section was double tuned to take the input impedance down in two steps rather than one. This is done to provide lower Q in each matching section and lower Q gives wider bandwidth. The existing bandwidth was about 60 MHz, our ham band is less than. With the limited space on the board, I pulled the center capacitor out to clear off the short microstip and cut it across with a Dremel drill with a grinding disc.

I then tried different sizes of loop coils until the gain came up and centered over the ham band, the input and output capacitor value was the same as a band A pallet. Return loss back to the driver was now lower too. Taking the testing to the next level, I added my lab amplifier in line and a higher power through line termination to protect the analyzer/sweep generator. I was able to get about 100 watts with just the small signal tuning. Large signal tuning helped with about 140 watts output.
The amplifier would produce about 25 watts of DATV power. This with a 28 volt power supply. 32 volts should yield 20% more power. With the smaller size output hybrid, I would not want to push much more power through it so near the cutoff and overheat it.

I tested a band A pallet and adding a larger value capacitor to the last two capacitor locations in the input matcher, I was able to get 200 watts. I did not make any other changes as this was a barrowed pallet. The amplifier works great for analog and digital just not to the power level I was hoping for but I was able to make it work on 70cm.

Construction

To modify the pallet you will need the following parts from Digi-Key:
8, 56pf chip capacitors, P/N 1284-1301-1-ND
2, 27pf chip capacitors, P/N 1284-1287-1-ND

The chip caps are high Q microwave power 500 volt rated. They are between $2 to $3 each depending on quantity ordered. You will also need some small diameter 50 ohm formable or simi ridged coax to make the baluns, one half meter (19 inches). I would suggest The RF Connection, their ad is on page 5. You will reuse some of the removed chip caps. You can also order new ones if you prefer.

LDMOS transistors are static sensitive so it is best using a grounded wrist strap. The pallet, soldering station and strap should connect to the same ground point.

Remove the following capacitors; C16 and 17 and set them aside.

Using a Dremel drill with thin black grinding/cutting wheel or exacto knife cut a 1 mm wide moat across the center of the input microstrip near the area of the removed caps. Now remove the following; C10,11,12,13,
and keep them for use later in the project.

Remove and set aside C37,38 (one across the gates), C32,35, (one across the drains), C43,44,45,46 and set aside.

Cut four 10 cm (3.9”) lengths of coax then strip off the outer conductor about 3 mm (1/8”) then 2 mm of dielectric. The lengths are not that critical but what is critical is that they all need to be equal. Bend it into an oval one turn loop similar looking to the orignal balun. I would also suggest replacing one at a time to keep track of the connections to maintain the correct phasing.

Install the gate to gate capacitor with the the 24pf (C10-13) caps removed from the input matching section. Replace C14 and 15 (input of matching section connecting to the balun).

Continued on PG-14

Install the input matcher balanced input caps C14&15 with new 27pf chip capacitors. You can use one of the removed 24 pf chip caps with nearly the same result.

Install new 56pf chips cap into the C10,11,12 & 13 positions, these are the input tuning/dc blocking caps removed earlier.

Install the drain to drain chip cap with one of the 24pF caps removed earlier, this is done for each push-pull transistor pair.

Install new 56pf chip capacitors in the positions of C43,44,45,&46 these are the output caps to the balun.

Make four small half turn hairpin loops of #20 or 18 solid wire, I used a couple of wire leaded1/4 watt resistors for the wire source. Bend the wire over a small screwdriver shaft or drill bit so the spacing between each of the strait sections of wire is 1.5mm wide and cut the length to about 4mm (1/4") the loop will lay flat on the board with the strait part of the wire straddling the moat cut in the input microstrip with just the top part of the loop curve past the microstrip. The loops later will be adjusted for maximum output power and low return loss to the driver by moving the loop slightly in or out from the microstrip. All loops should be done the same to maintain phasing and balance.

The bias supply is on board and set to 300 ma per device. Each push-pull section has it's own bias supply and adjustment (R7 & 10). I check the pallet bias before shipping for proper IDC for each device The bias output from each potentiometer has a small trace that parallels each side of the board and it is safe to ground one side at at time and to set IDC for 600 ma total current draw each side and 1.2 amps total for the pallet. These pallets were also used in the driver drawer in the exciter cabinet with the bias set for class A service of 2.5 amps idle for each side, five amps total for the pallet in class A service. Power output is 20 watts digital 60 analog peak sync. In final amplifier service class AB is used for better efficiency.

Tuning

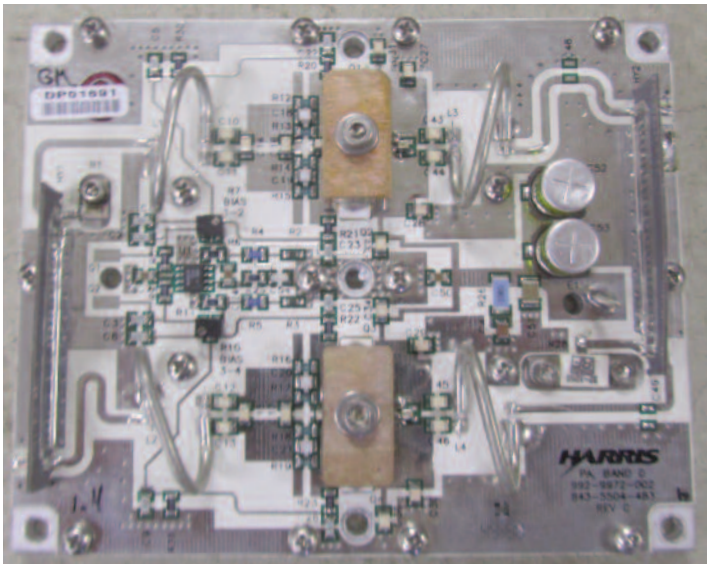
The pallet MUST be attached to a good size heat sink prior to tuning and usage! A thin film of white heat sink compond is spread evenly to the bottom of the pallet and heat sink and please make sure all mounting holes in the heat sink that have been drilled and tapped (size 6/32 or metric size 6) have been cleaned of burs and the surface is flat and clean. The screws should first be snugged then tighted evenly in two steps to minimize any chance of warping the pallet.

Now check the current draw without any RF drive for 1.2 amps. I prefer to use a variable voltage supply with current limit set to two amps. This will check for shorts or other issues that may have happend during modification. You should have about 3.9 volts on each gate of the LDMOS transistors. Next turn off the supply or disconnect it from the pallet. Connect up a low power signal source, A 440 MHz HT in low power mode and set to your operating frequency will work good for this. The prefered testing method is to have a quality UHF watt meter, Bird 43 or equivilent with a 5 watt slug in the input, another wattmeter in the output line with 100 watt slug. A 250 watt slug can be used too.

With no more than a few hundred milliwatts drive connected, turn on the power to the pallet with the power supply current limit set to 5 amps, if you do not have one then a fixed 28 volt supply with a five amp fast blow fuse will do. Key the HT and note the output power and the input return power should be low 5% or less. Output power should be 13 to 14 dB more than the input. If this is not met, then turn off the power and RF source and move the hairpin loops slightly, tuning is sharp. It may help to try frequencies about 5 to 10 MHz above and below to see what direction the loops need to go. If the better match and output power is lower in frequency then shorten the loops. If the other way then lengthen the loops.

Now try 2 watts drive and change the fuse or current limit to 10 amps. You should have around 60 to 80 watts and about 5 to 6 amps draw. Limit the input to 4 watts peak power AM and 1 watt digital.

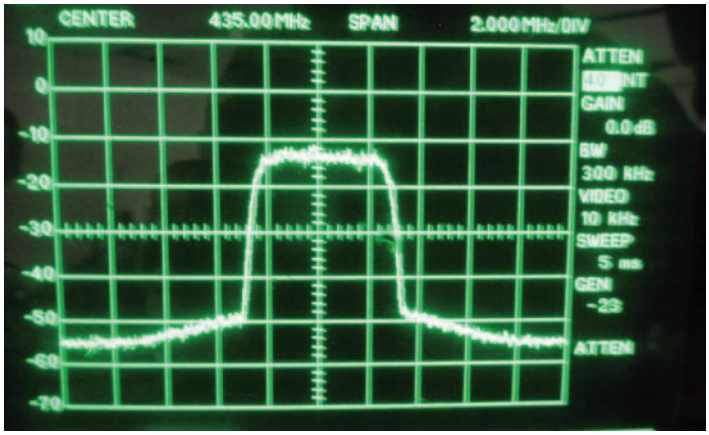
You should be able to obtain 150 watts peak sync and 25 to 30 watts DATV depending on the modulation used. A or B band pallets have the longer hybrids and can support more output power safetly to near pallet factory limits. For those who want full power, a new board layout designed for 70cm would allow nearly double the power for the four MRF373 LDMOS transistors but I will leave that for someone else to do. My task was to do the best I could with the exsisting pallets. I have one set on 33 cm but it is not as stable due to the capacitor values causing high circulation currents in the drain to drain capacitor and as such is not worth suppling that modification in this article.

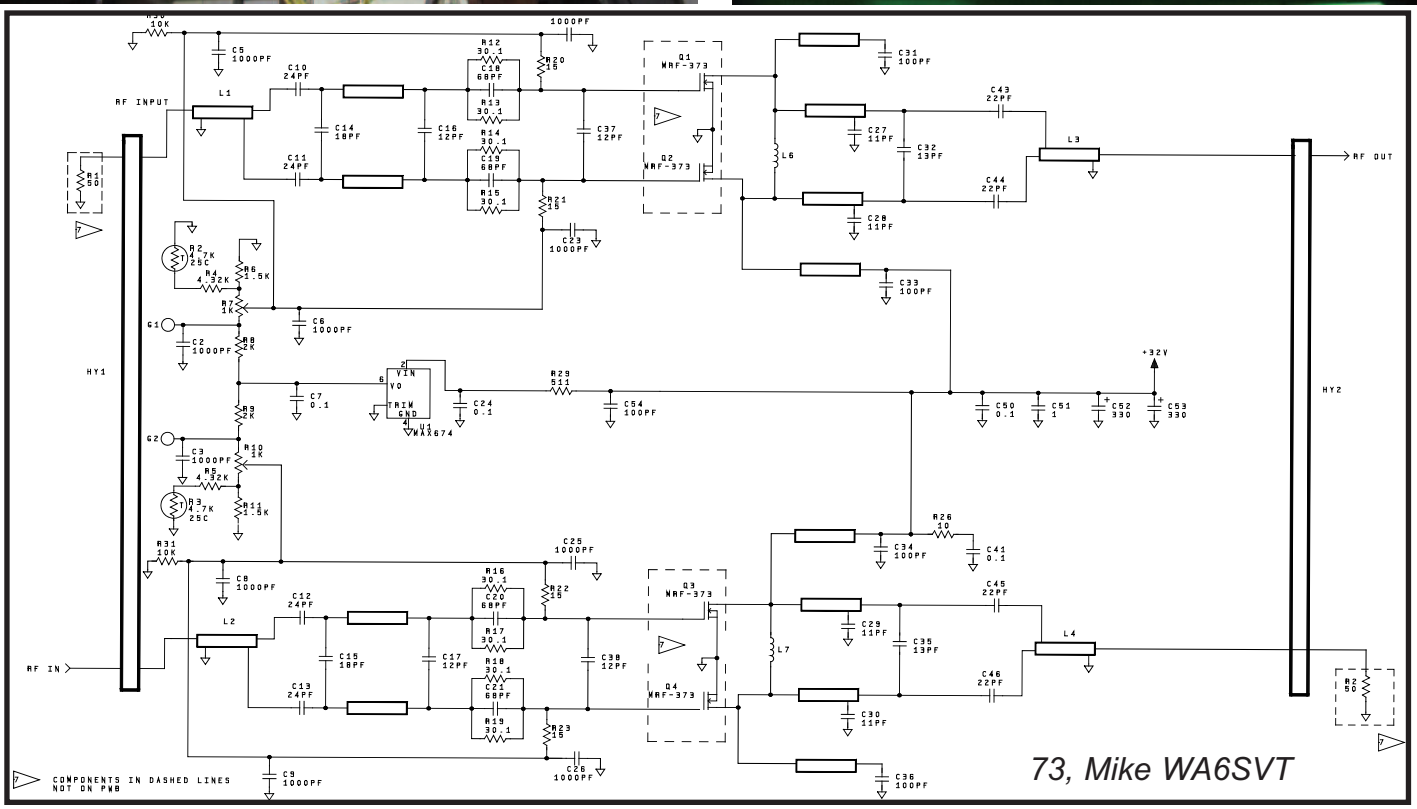


Above is the unmodified Pallet

Test setup for the modified pallet

Below spectrum regrowth with QAM-64, 25W





A 70cm Band Loop Yagi Antenna

-ATCO Newsletter

Construction

For the boom of my 16 element antenna, I used a 10 foot length of ½" aluminum conduit. All spacing measurements were made from the back end of the boom, and #9 wire was used for the elements. This wire was stripped from surplus ¾" aluminum TV cable which turned out to be #9 copper wire and soldered very well.

The reflectors and directors were cut to length, flattened ½ inch on either end, and formed into a circle. The ends were soldered together and then ground or filed down to wire size. One-half inch conduit clamps (the kind with a bolt through them) were used for the element mounts. I used a file on edge to file a notch across the top of each clamp for the wire ring to set in and soldered the ring to the clamp with a propane torch. This provided a sturdy mount that looked quite decent. The bolt through the bottom of the clamp provides for easy adjustment for tuning the antenna.

The driven element was made using the same #9 wire flattened on either end and also in the center. A piece of brass tubing from a hobby shop was used for a feed. Drill a hole in one end and in the middle of the #9 wire to pass the brass tubing through and a small hole on the other end of the #9 wire for the center conductor. Form the circle then pass the brass tube through the two large holes and solder. Then set the ring on top of a conduit clamp with the tube passing down through the hole and solder.

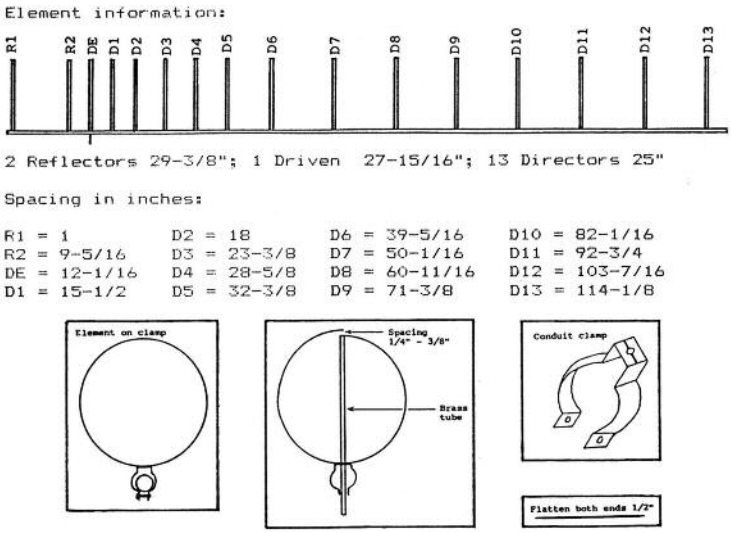
Make the measurement for the spacing of the driven element on the boom and then drill a hole through the boom to snuggly pass the brass tube. Slide the tube through the hole and let the clamp spread to snap on the boom. Drill tiny holes on either side of the clamp through the boom and set with two small metal screws. Two different sizes of brass tube can be used. One size will pass the center conductor with insulation (RG-58) or the next size will pass with ground braid, also. I tried both ways and each worked okay.

Pass the center conductor of the coax through the small hold of the driven element and solder. Then solder the braid to the top of the brass tubing. A coax fitting under the boom may be used or a balun may be used if using twin lead as I do.

This antenna is on a test stand at 22 feet and my normal 48 element collinear is at 55 feet. Dick, W8RVH, 42 air miles away on the morning we tested the antennas gave me a P-4.5 on the collinear and a P-3.5 on the loop yagi.

This was a very good report considering the difference in height of the two antennas. I also found that on 70 cm the loop tunes differently than on 1.2 GHz. At 1.2 GHz, the loop can be tuned by changing the shape of the driven element.

On 70 m, this did not make much change at all, but moving the first director made a considerable change. I think this is a good antenna, and I have just finished the second one. I am going to stack a pair to see what happens.
…WA8KQQ



Ed; Thanks to the ATCO Newsletter for this article

ATCO ATV HISTORY IN COLUMBUS, OHIO

-Art Towslee WA8RMC

Well, reflecting back, we've been working with ATV activities quite a long time. Those memories were brought to the surface when we realized it's been 10 years since we installed the DATV transmitter in our repeater. Time flies! It's been in operation 24/7 since then! Think about it, 10 years ago we were the first in the USA to provide digital. Today, I believe there is only one other DATV repeater transmitter in operation. It's been a slow transition but things are speeding up now so watch out and be prepared for new and exciting things to come soon.

I believe the most significant factor is COST. Then and today still, it costs about $1000 to put a 10 milliwat signal on the air. There are very few people willing to part with that much cash in order to do so. Even if we did, what could we do with the signal? Transmit it to whom? You would need to find a buddy with the same amount of spare cash. However, thanks to Ken, W8RUT who pushed the envelope and convinced the rest of the ATCO group that it was a worthwhile

I remember the "early days" when Fred Yost, K8JGY, was our treasurer and he organized our first informal club meeting. That first meeting was held at a restaurant (I thing Bob Evans) near his house which was way back in the early 1980's. Even before that Dale, WB8CJW and Ken, W8RUT, were playing around with a primitive repeater on the Hyatt hotel in downtown Columbus. But I can't remember everything, especially dates, so a trip through past ATCO Newsletters was required to help clear the air. Here's what we found.

1981 – An informal meeting of a small group of Hams meet at a fast food restraint to discuss forming an ATV club. WA8RUT suggested forming club called Amateur Television in Central Ohio.

June 1982 - ATCO group ha a thirtd meeting at the QTH of WA8RMC. 22 people attended. Discussed the new repeater WB8LGA is building. Discussed creation of a newsletter. Established a weekly net on 147.48 MHz. WB8LGA's repeater intended to be installed on Labor Day 1982. 439.25 input / 425.25 output Located in Westerville on a 106' tower, 875' ASL, 200' HAAT... Desense was a major obstacle.

Sept 1982 – ATV repeater site selected. Found a 106 foot tower in northern Westerville.

July 1983 – WA8RUT (Now W8RUT) created a special; edition Newsletter with many construction projects and design tips. Ken asked for help for BancOne marathon on October 16, 1983.Mobile stations transmit to repeater on building downtown Columbus.

October 1983 – 439.25 to 1278.75 crossband repeater on the air on the Hyatt-Regency Hotel. Receive antenna is WA8RMC stacked turnstile. Transmit antenna is 5-section vertical collinear for 23 cm. that WB8CJW built from the "1265 MHz omni gain repeater antenna by W6ORG. Coverage of BancOne marathon is a success. Art, WA8RMC, joins Newsletter staff for a total of two. Ken, WA8RUT is editor at this time. WB8LGA hosts first antenna party at his QTH. 14 people attended.

February 1984 – ATCO by-laws are created. Very little activity occurred between 1984 and 1987.

Summer 1985 – WB8LGA hosts another antenna party at his QTH.

January 1987 – Newsletter re-starts after many months as Volume 4 number 1. Warren Duemmel, KA8GZQ is new editor. There are now 19 members of ATCO. Bill, W8DMR, is technical editor.

September 1987 – Antenna party at WB8URI's (now W8URI) house in Plain City. 35 people attended. Approximately 30 antennas tested. W8DMR provides party leadership!

Continued on PG-18

July 1988 - 3-D ATV - Three-D color ATV transmitted by Bill, W8FRQ, Received in 3-D by Wilbur, W8AEH, and Dave, KB2ARL. Accomplished by offsetting the RGB colors at the proper angle and viewing the video with 3-D glasses containing suitable filters.

October 1989 – Technical editor W8DMR resigns. WB8LGA and WA8RUT given "Certificates of Appreciation" for their ATCO involvement.

October 1990 – First formal Fall Event is held at the ABB shelter house on Ackerman road. 35 members attended. WA3DTO, Rick, provided all food and arranged the meeting.

April 1991 – ATCO now has over 40 members. Newsletter articles are needed. Few are contributing.

January 1993 **–** New treasurer and Newsletter editor named. Warren Duemmel resigned from acting treasurer/editor post for health reasons. Fred Yost (K8JGY) agreed to take over treasurer duties and WA8RMC will take over Newsletter publication. It's been about ten years since the subject of an ATV repeater first surfaced and about six years since we had one. Even when the Columbus repeater was operational, it was a toy at best. Much pioneering was required and much was learned but the lack of a good antenna site and limited funds make true success very difficult.

Investigated possibility of broadcasting the Weather Service radar real time video on an ATV frequency which has been met with a great deal of excitement on the part of the National Weather Service and the 2 meter Severe Weather Net. Weather Service gave their approval to use both their facility and video source as long as we use the video for non commercial purposes.

April 1993 – ATV repeater for Columbus is in the works. During a meeting at WA8RMC's QTH on January 17, 1993 the majority of us (16) decided that a new repeater was a very good idea. WB8URI was the only one initially opposed (But now we feel he's OK with it).

A NEW CONSTITUTION AND BYLAWS FOR ATCO is formed**.** Because we are working on a repeater that will be placed on other owner's property, among other things, it has become time for us to incorporate as a non-profit organization. In order to do this, we must have a constitution and by-laws formally registered.

Repeater progress- Most important factor is location. A spot verbally promised on top of the State Office Tower Building. Rebroadcast of weather radar is a powerful asset to the severe weather net so they support our effort. We'll have to deal with RF floating around. Mainly for that reason a split site repeater is planned.

July 1993 – The new repeater site has not been formally approved yet. A decade ago, Central Ohio had two ATV Repeaters! One in-band (439.25/426.25) and one cross band (439.25/1278.25). The in-band 70cm machine was spearheaded by Charlie, WB8LGA with WA8RMC and others assisting. The Cross Band machine efforts were provided by WB8CJW and WA8RUT.

Both repeaters were single site, one (the in-band machine) located in North Westerville and the Cross Band machine located downtown . Both machines proved to be an experimenters delight; both had lots of problems to be solved! Both machines eventually went off the air because of the time pressures of the people involved.

We now have formal approval from the State to locate our repeater on the State Office Tower. Must meet with officials to iron out the formal details. I hope that by the time you read the next newsletter, an operating system will be in place.

October 1993 - We finally got formal approval to locate the repeater on the roof of the State Office Tower in downtown Columbus!!! WA8RMC finished construction of two dual slot antennas, one for 439.25 MHz receive and the other for 427.25 MHz transmit. Work continued on equipment for repeater.

November 1993 - ATV repeater finally installed on State Office Tower! Operation in beacon mode on 427.25 MHz is good but other modes need to be improved upon. The 1258.25 MHz transmitter is finished, installed and running. This signal follows the 427 signal so both are viewable at the same time. The main purpose for this is to provide a secondary signal viewable by the originator of the 439 signal to the repeater while he is sending it.

April 1994 - We felt that our existing get together once a year (Fall Event) was not enough. We are planning a "Spring Event" also. This seems like a good time being that it is after Dayton and into mild weather. Plans to install the repeater receiver and antenna on Channel 10's tower underway. We have permission to put the antenna at the 400 foot level. Since coax is already run, all we have to do is install the receive antenna and preamp and connect it to the existing Belden 9913. ATCO is now formally incorporated as non profit organization as "Amateur Television In Central Ohio Inc."

July 1994 - Fred Yost, K8JGY, moves to South Carolina. Bob Tournoux KF8QU has graciously agreed to take over this post. Columbus airport ATV radar link to repeater is now working.

January 1995 - The repeater is fully functional in the 439 to 427 repeat mode. It was a rocky road getting there but it's now reality. The 1280 input is another story. Also, the major rebuild talked about before is yet to happen. Most important item to get installed is the DS100 repeater controller. It is now fully functional scanning the inputs for a signal and sending out an ID on both the video and audio channels every 10 minutes. Ken just delivered our new rack cabinet for use when we rebuild the equipment.

April 1995 - The contact between K5YWL in Harrison AR just south of Springfield, MO. and K8AEH near Columbus, OH is over 628 miles. This is a new land path ATV DX record. This is also the first Arkansas to Ohio ATV path. CONGRATULATIONS, WILBUR!! A contact between WB0ZJP (west of St. Louis) and KA3FZF also broke the previous records of W0IMA in Moscow, IA, W3POS in Erie, PA, KB9FO in Des Plains, IL, and W2RPO east of Buffalo, NYApril.

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July 1995 - John Chapman, WB8INY, (area Director for the ARES) contacted WA8RUT in mid-June to ask if ATCO would be interested in providing video surveillance of the Columbus Ohio 4th of July celebration called "Red, White & Boom" for the Columbus Police. After a discussion on the following Tuesday night net, WA8RUT called Sgt. Art Baker, the **E**mergency **O**peration **C**enter (EOC) coordinator and arranged for Art, WA8RMC and myself to visit Police Headquarters to review the request and plan. That was the first participation for the ATCO group to provide surveillance video for RWB. We have been doing it every year since then.

January 1996 – The 446.350 link transmitter is added to the repeater. An RF shielded enclosure added to 427 transmitter to help contain the sporadic RF generated by the Mirage D1010 amplifier.

July 1996 - Dale (WB8CJW) and WA8RMC went to the repeater and improved things quite a bit! Three major improvements were made.
1) We installed my dual 2 meter cavity. This removed the 146.76 MHz interference when trying to do touch-tone access on 147.45 MHz. Now access can be made when the 146.76 MHz repeater is on the air at the same time.
2) We installed hard line for the 439.25 MHz and the 446.35 MHz link transmitter runs within the cabinet. This eliminated the desense we were getting when the link transmitter was on while receiving a weak ATV signal on 439.25 MHz.

Continued on PG 20

3) we retuned the 439.25 MHz receiver. This was nessisary quite by accident because while we were installing the cables, we apparently bumped the 439.25 MHz receiver and the oscillator quit. By the time we found the problem, we had essentially retuned the whole receiver. It needed it too.

October 1996 - Replaced the 15 watt 1250 MHz amplifier at the repeater with a 75 watt unit from Downeast Microwave.

April 1997 - Bill Parker, W8DMR, introduces us to the Wavecome TX and RX modules for operation on 2.4 GHz.

April 1998 - We tried to move the repeater output to 421.25 MHz to get away from the receiver desense. The guys on 421 complained so we moved back to 427. We added more filters on TX and RX lines to correct the problem. A new 2441.5 MHz repeater output was added.

April 1999 - Channel 4 weather radar is added to the repeater functions. It is accessed via the 446.350 MHz link by sending 264.

April 2000 - Dale replaces the VS100 video controller with one from Intuitive Circuits ATVC-4.

October 2000 - Replaced the plastic radomes on the 427 and 439 repeater slot antennas. They have been in place since 1993.

July 2001 - New repeater roof camera installed. This one lasted only a year. Bad design for the application.

January 2004 - The 10 GHz transmitter is installed at the repeater on December 18, 2003.

October 2004 - ATCO repeater club call of WR8ATV assigned to us by the FCC. It was in error but we are allowed to keep it. Only about 150 such calls were assigned. No new “WR” calls will be assigned. DATV transmitter installed at the repeater January 9, 2005. The first in the USA.

July 2005 - Spring event moves to a new location at the ABB cafeteria in Westerville. The ATCO-DARA link on Jones road in South Vienna is up and running. Partial 2 way communication is accomplished.
July 2007 - Digital receiver now active for QPSK (DVB-S) on 1280 MHz.

October 2007 - September 26 through October 1, Rickenbacker Airport was the site of a very large air show. I believe the last one was in 1996 so it has been quite some time. This year proved to be much larger than the last one but some military planes were absent. ATCO provided crowd observation video surveillance. 1250 MHz power amplifier dies after 10 years of service. Temporary repairs made top put it back into service.

February 17, 2009 - Official shutdown date for commercial broadcast analog television.

October 2009 - New 427 MHz power amp installed at repeater. A Comark unit replaces the Mirage D1010 that was installed in 1993. Power output is about 90 watts. A terrific improvement.

January 2010 – We were informed by the FCC that we were again interfering with the ODOT GLONOS GPS transmissions. We moved the analog transmitter from 1250 to 1245 MHz and the digital transmitter on 1268 MHz. The 1280 MHz input for both analog and digital remains the same. Also, a new 1258 MHz analog transmitter goes on line. Its output is about 80 watts using an LDMOS transistor.

January 2011 – 147.48 to 446.35 to 147.45 FM link to Jones road is added. Dayton and vicinity can input on 147.45 and it repeats out in Columbus on 446.35. Those in Columbus inputs on 147.48 and it outputs on Jones road on 147.45 for a duplex link. This is added mainly so Dick, W8RVH, can talk to the locals in Columbus. We added an LDMOS amplifier to repeater digital output. It now outputs about 20 watts.

January 2013 – New repeater roof camera is operational. Also, the 10GHz receiver is installed and operating. *Art WA8RMC*

Modifying a Holland HDD DTV Demodulator for DATV

- Mike Collis WA6SVT

The Holland receiver model HDD is a DTV frequency agile rack mount CATV and broadcast QAM 64 and 8VSB demodulator available from ATV Research (ad on back cover). The CATV mode activates the QAM demodulator and CATV channel lineup and allow 70 cm band QAM 64 DATV receive. Other bands too if a PLL or crystal controlled down converter is added.

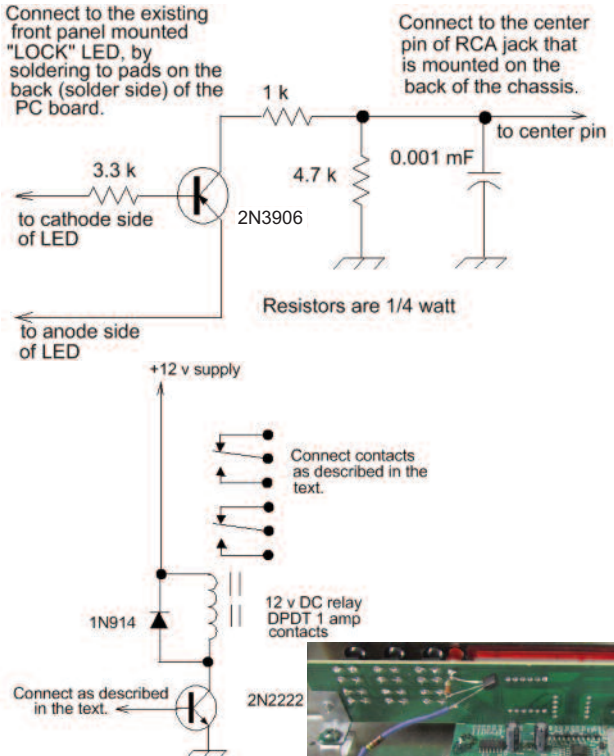
Circuit description

The output is only analog composite NTSC video and stereo (L & R) audio. This is great for use in existing analog ATV repeaters so your user group can start DATV transmitter experimenting. The only problem is the analog video output is always producing sync with or without an input signal. There is a fix to this and the rest of the article covers the fix and how to add it to your repeater.

There is no on screen display so Holland has a LED channel indicator on the front panel and a lock light to indicate reception of a valid signal has been decoded. I decided to open the case and take a look at the lock light circuit. I found it was easy to tap across the LED part of the circuit and add two resistors and one transistor to form a DC switch. The switch is used to drive either an added internal relay circuit or solo to an added RCA jack on the back to drive an external A/V switch or into a repeater controller box. I purchased two receivers and modified one for external A/V switching and the other for internal A/V switching.

The internal relay also taps into the power supply for 12 volts to power the relay coil. The DC switch can be used instead of a sync detector to add your input control to the repeater controller. The internal A/V relay modification allows use with an existing analog repeater input without taking up additional sync detector inputs on your repeater controller. The modified receiver has new input and output connections to allow the internal relay to switch between analog ATV and DATV signals. Connect the analog receiver's A/V connections to the new input jacks and the new output jacks are then connected to the ATV controller. Input RF is split to feed both receivers by adding an LNA and splitter. This allows both to share the same receive frequency, antenna and bandpass filter.

It is a good idea to make sure your bandpass RF filter is flat across the entire 6 MHz wide ATV channel. When a QAM-64 DATV signal is received, the relay activates and you get a picture equal to or better than the best FM ATV signal you have seen all this and only using a 6 MHz wide channel. Sensitivity is about the same as FM TV -85 dBM for a good lock if no other QRM is within the channel. With a stronger DATV signal, QRM can be tolerated up to a few db below the DATV signal as is the case with FM ATV.



73,

Mike WA6SVT

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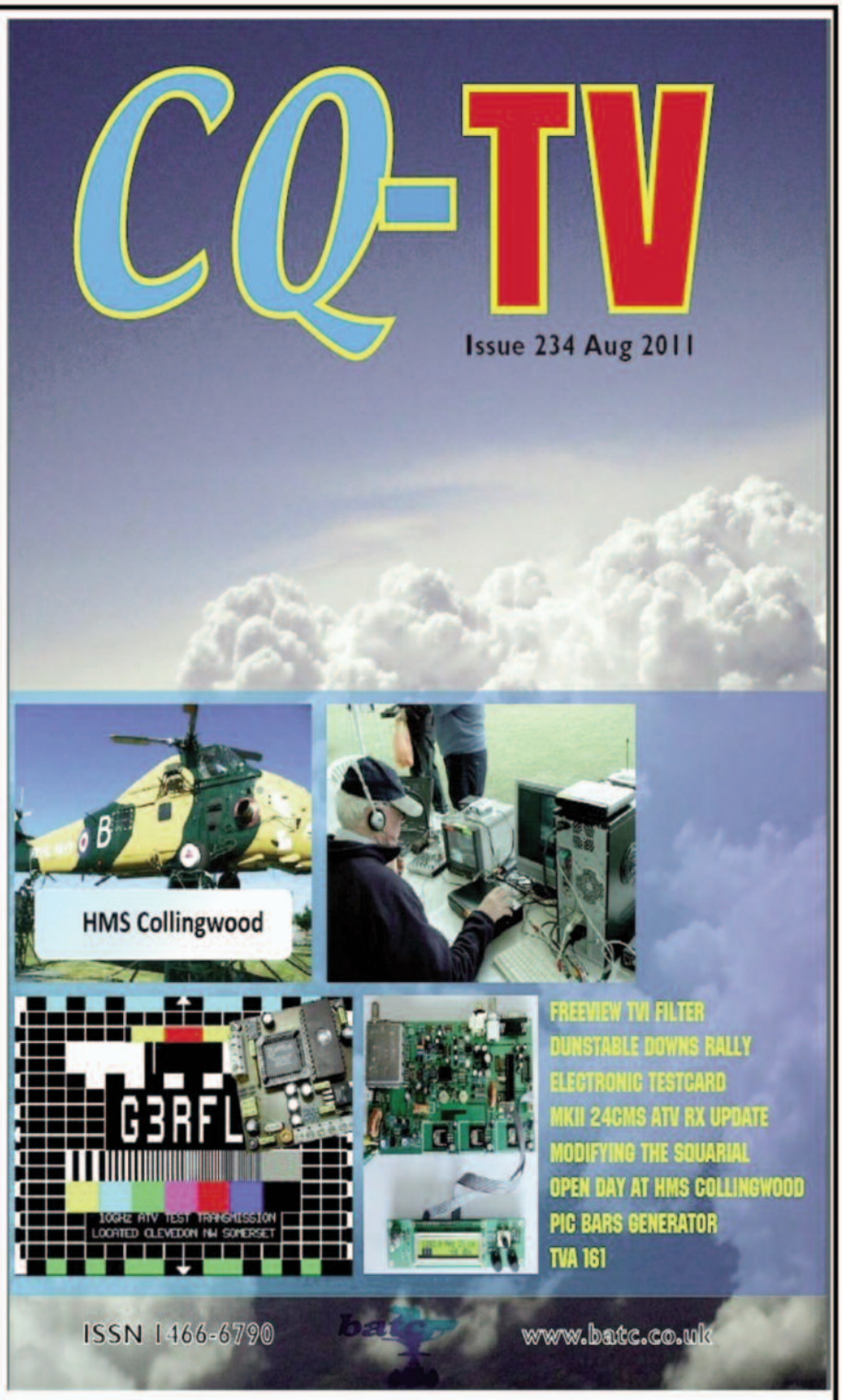

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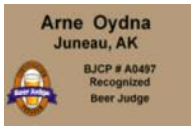


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AUDIO PROCCESSING FOR ATV

-Mike Collis WA6SVT

Background

There has been a lot of attention to video in ATV but not so with audio. Most subcarrier systems on ATV transmitters build my dedicated ATV manufactures had a soft limiter this produced clipping distortion if the audio is turned up to high. PC Electronics came out with the FMA5-G subcarrier board with an audio AGC or compressor that is a step forward. As FM ATV became common using the video sender type units, most if not all have no limiter or compressor at all.

ATV audio is not the same as two-way FM radio. Two-way is designed for a 5 KHz deviation with an audio band pass of 300 Hz-3 KHz using a constant 6 dB per octave pre-emphasis, this is then passed through a hard limiter or clipper then through a 3 KHz splatter filter (LPF).

The pre-emphasized audio's higher frequencies are the main ones clipped and the resulting harmonics are usually above 3 KHz that the splatter filter strips off. Audio dynamic range is somewhat limited. The processing is to emphasize voice clarity and loudness to overcome noise in a NBFM system that is not present with WBFM with it's higher modulation index. 12 dB SINAD is the standard for threshold of quality with NBFM.

Lets contrast this with Television audio; on VSB or AM TV the deviation is 25 KHz for mono and 50 KHz for stereo with 75 microsecond pre-emphasis for NTSC and 50 microseconds for Pal based television both with 20 Hz-15 KHz audio bandwidth and much higher dynamic range of 60 dB. The stereo subcarrier is 2X the horizontal sync frequency and special circuits sync the subcarrier phase to the horizontal sync to reduce sync buzz.

Broadcasters have multiple audio processing to address over modulation of the audio. FM TV uses 50 to 75 KHz deviation on discrete subcarrier(s). Typical subcarrier frequencies used are 4.83 MHz, 5.2 MHz, 5.8 MHz, 6.2 MHz, 6.8 MHz 7.2 MHz and 7.5 MHz usually two to four subcarriers are used. Most video senders use 6.0 MHz and 6.5 MHz subcarriers.

Audio Processing

Broadcasters usually use a multistage approach for smoother audio control with less distortion; first stage is AGC with no more than a 10 dB range is used with medium attack time and long release time. This is followed with a compressor (similar to AGC) but with faster attack, shorter release, usually more gain reduction and a soft knee with the threshold set at a higher audio level (see graph 1). The analog multiband processing was generally replaced by digital processing in the past 20 years but many of the analog processors are still in service and many audiophiles prefer the analog "sound" saying it is more natural.

Audio compressor controls

Threshold: The point along the audio amplitude when gain reduction occurs.

Knee: The sharpness of the change from linear to compressed audio.

Ratio: The amount of compression from mild to infinity to one (AKA limiting).

Attack: The time it takes gain reduction to take place.

Release: Time to return the gain to normal.

Output: Adjustment to return to a desired level after the gain reduction.

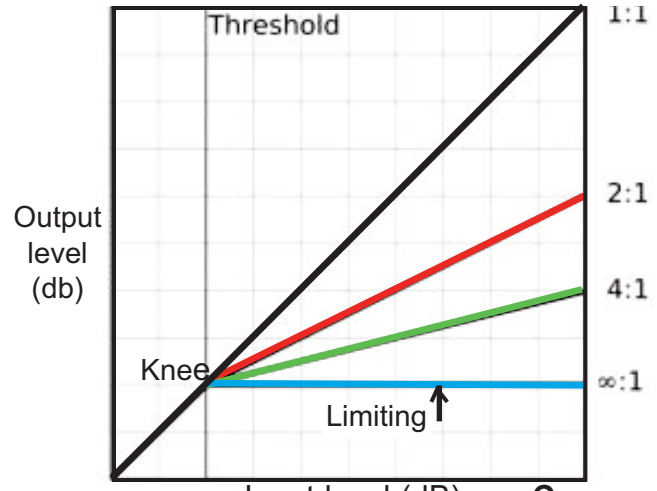
Continued on page 26

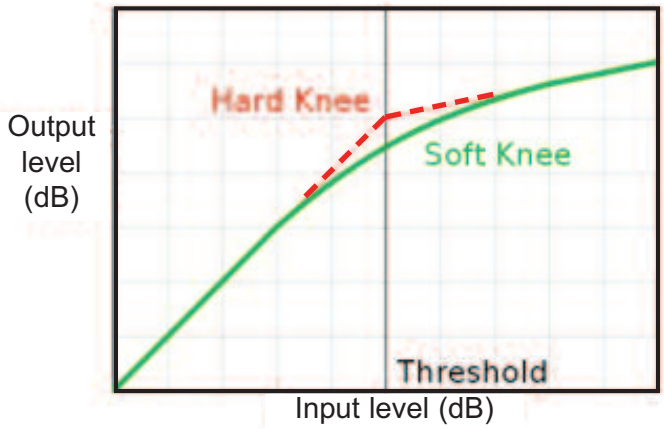
Last Man Standing

Mike WA6SVT showing the latest set material ATVQ Magazine in Mike Baxter's (Tim Allen) office ham shack.

Look for Last Man Standing TV series on ABC Television Friday evening.

Several cast and crew members are ham radio operators including the show's producer John Amodeo NN6JA who is also a new ATVer. ATVQ may be seen in some of the episodes.





Compression Ratios and Knee

ATV on the other hand doesn't need all that bandwidth and dynamic range as most audio is voice. However trying to use two-way radio based audio limiting is not a good idea due to the harmonics falling within the HIFI audio channel. Improving ATV audio can be done with a two stage approach of gentle audio compression with attack and decay times optimized for voice and a medium limiter with fast attack and medium release to catch momentary overshoots that make it past the compressor. Inexpensive audio processors with good performance like the DBX's 166XL and 286 rack mounted or RDL's "stick on series" ST-CL2 mini size compressors are great for ATV audio.

Other audio issues

Other issues for ATV audio are; lack of a microphone preamp in video senders and CATV modulators. Some microphone and ATV transmitter combinations occasionally produce audio hum or buzz. Audio feedback due to lack of separation of the ATV receiver set and microphone or no RX audio mute during transmit. Use of a good a good musical/vocal microphone vs. a rig mic helps because the typical HF VHF-UHF ham radio mics are very frequency limited, and the TV audio allows full fidelity.

Analog VSB or AM television a video white clipper circuit is desirable because audio is derived by intercarrier detection: the difference between the

DBX 166XL Professional Compressor

aural and visual carriers. If the visual carrier drops below 10% there is not enough carrier and buzz results. This is often called sync buzz but it is really the white peaks causing the buzz and because of the scanning rate, occurs at the sync frequencies. ATV Secrets Vol II has a technical explanation of analog and digital signal parameters.

For those who would like to have a broadcast style audio system the price of microphone(s), preamp or microhone mixer, and compressor units are inexpensive. There are also more sophisticated equipment for a higher price but would not be necessary in my opinion for ATV.

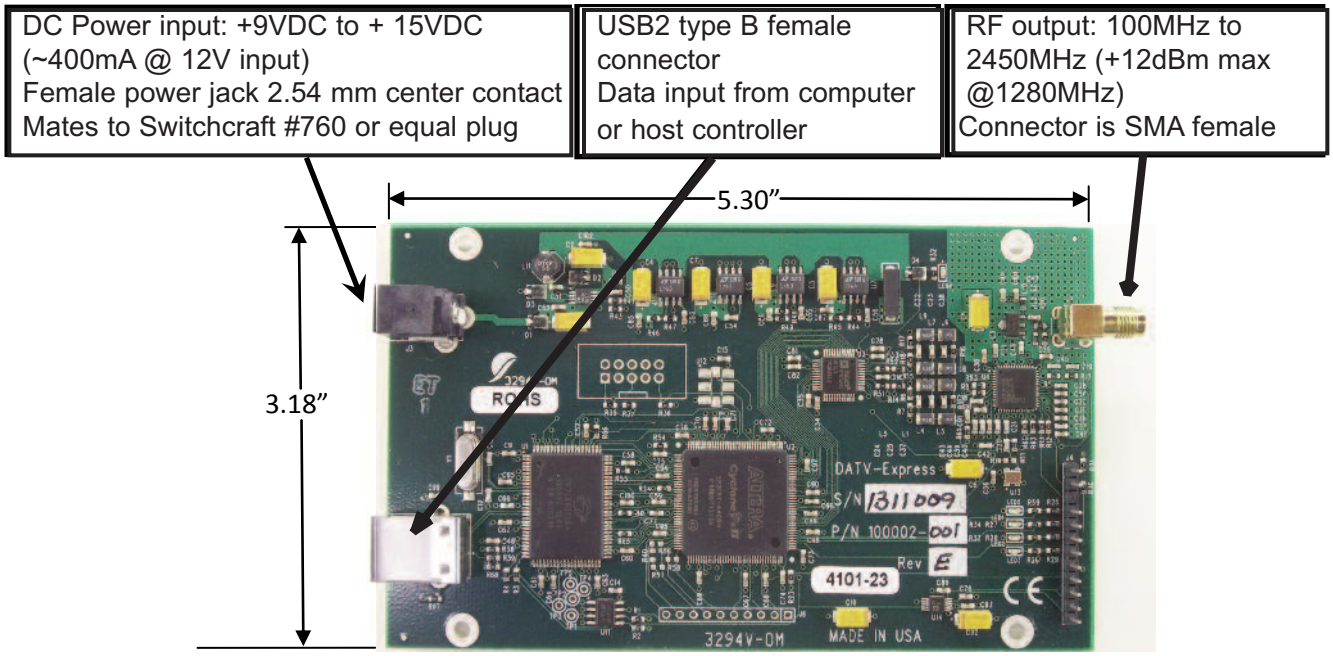
A relay can be added to the push to look circuit to act as a mute for a TV receiver during transmit to eliminate feedback. I plan to finalize design of a ATV audio control unit with basic preamp, line level input, simple compressor and RX speaker muting circuit in the next issue.

73,

Mike WA6SVT

DATV-Express PROJECT UPDATE

-Art WA8RMC



As many may know by now, the DATV-Express project team has been working hard to create a low cost, advanced feature, simple DATV RF modulator board that, with the help of a computer and video capture card, high quality affordable digital television signals are produced. Presently it’s capable of QPSK (DVB-S) modulation with others on the horizon. Check the web site for detailed specifications. Work is progressing at good pace with a number of production boards now available. However, we don’t want to release it to the general population until the minor bugs in the software are eliminated.

QPSK operation exists now and the DVB-T code is functional but not tested. QAM modulation is planned but not started as well as a number of other SDR possibilities. Since this board is basically a Software Defined Radio product, it is capable of almost any modulation scheme, limited only by the software program to drive it. We have successfully been able to replace the PC computer with a Raspberry Pi computer board but only at low symbol rates. Code conversion from Linux to Windows® is planned but not implemented. HDTV transmission is also possible and has been demonstrated. The software programmer is working hard to finalize the initial goat of QPSK operation but it’s a huge undertaking.

So, in addition, we’d like to enlist the help of willing and qualified software programmers to assist with applications described here and beyond.

We decided that general sales to hams will begin as soon as the last known bug is resolved but sales to programmer/developers willing to volunteer work with additional software will continue. Interested and qualified programmers should contact G4GUO by e-mail at chbrain@btinternet.com if they can assist expanding the software. We are asking serious software developers to buy the board at $200 (~ our cost) to participate in software development. The board will then sell for $300 plus shipping/handling when available for general Ham use which we hope will be this February. This is similar to a “Kickstarter” project where early developers get the first run boards and buy them at a discount from general sales. This is not a money making project! Our goal is to make a high quality low cost digital TV transmitter board available for the general Ham population significantly cheaper and better than any current commercial product. Check on project progress and order boards via PayPal on our web site at: WWW.DATV-EXPRESS .COM.

Art WA8RMC

ATN-AZ Annual Winter Meeting

- Kevin Jacobson AD7OI

Our annual meeting was held at my company's meeting room. We had members show up from all over Arizona and one from California too.

Following a tasty lunch and ATV microwave equipment demonstration by Peter KD7OIW we started the meeting.

ATN-AZ Group Photo

Meeting Agenda:

Repeater status for each of our three ATV repeater sites were discussed along with some improvements planned over the next two days.

Promotion of ATV in Arizona and increasing membership was discussed. We gained a new member Robert KA6PSD at the meeting. We will contact other ham radio clubs in the area to provide an ATV talk at their meetings and provide more demos at hamfests.

Bob W8ARZ provided the financial report and discussion of club finances. We also took care of renewing our membership at the meeting.

Last on the list was nomination of officers and elections. Ron AE6QU made a motion to re-elect the current board of officers and seconded by Bob W8ARZ and a unanimous vote of the members approved the action.

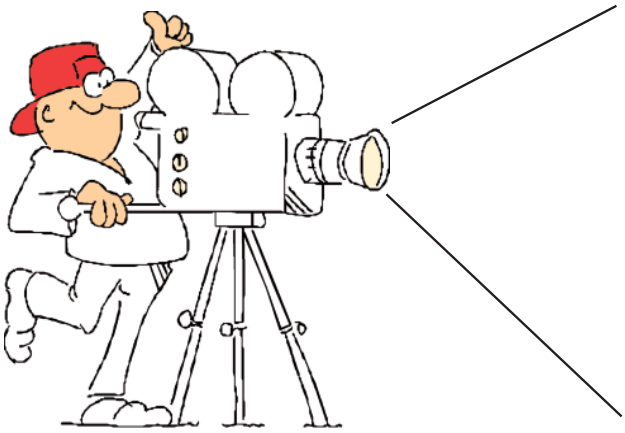
A discussion of an ATV relay system for the community of Wickenburg to tie into the White Tank ATV repeater. This relay would re-transmit the 1253.25 MHz White Tank repeater output on 916 MHz FM with a five watt transmitter on a short hill northeast of Wickenburg that is line of site to both White Tank Mt. about 30 miles distance and Wickenburg a few miles away that is blocked by hills from a direct path. 434 MHz receiver will pick up the local ATV signals and re-transmit them into White Tank's 2441.5 MHz FM input. This type of relay extends the reach of the White Tank ATV repeater, it is not intended as a stand alone repeater. Pat N7FHB is heading up this project,

ATN-AZ President Peter KD7OIW, (right side)

Pat also heads up search and rescue utilizing ATV in the Wickenburg and surrounding country side.

The meeting was adjourned by 3PM to allow the White Tank work party headed out to the repeater site before it was dark.

Kevin AD7OI



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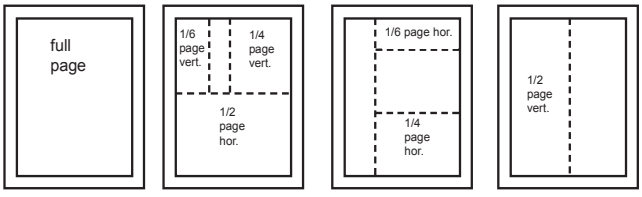

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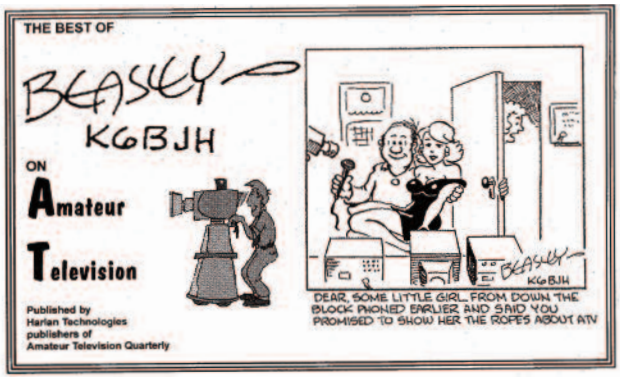

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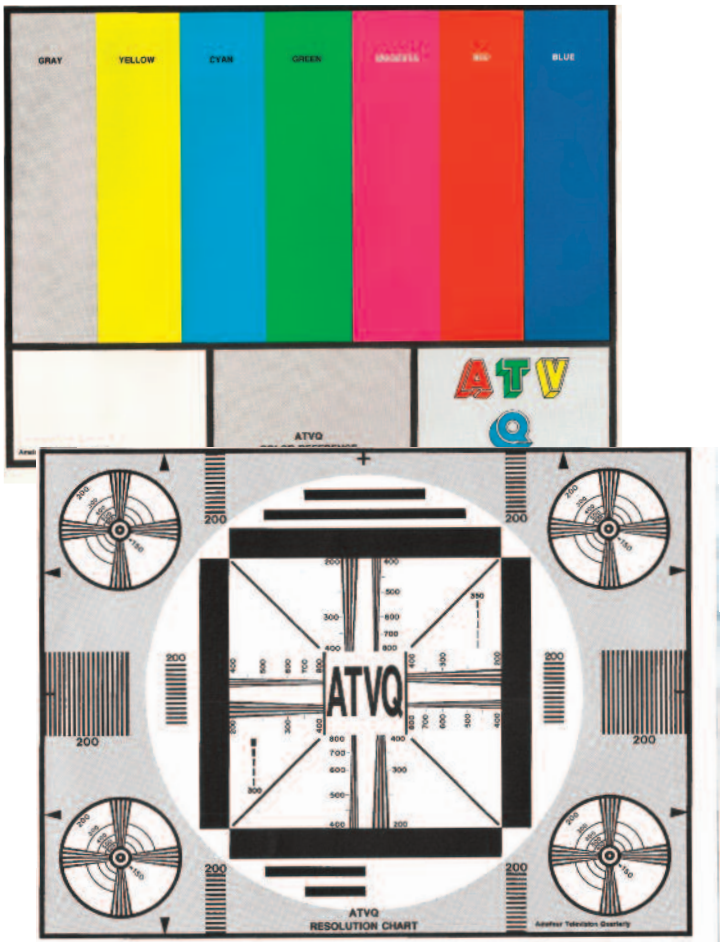
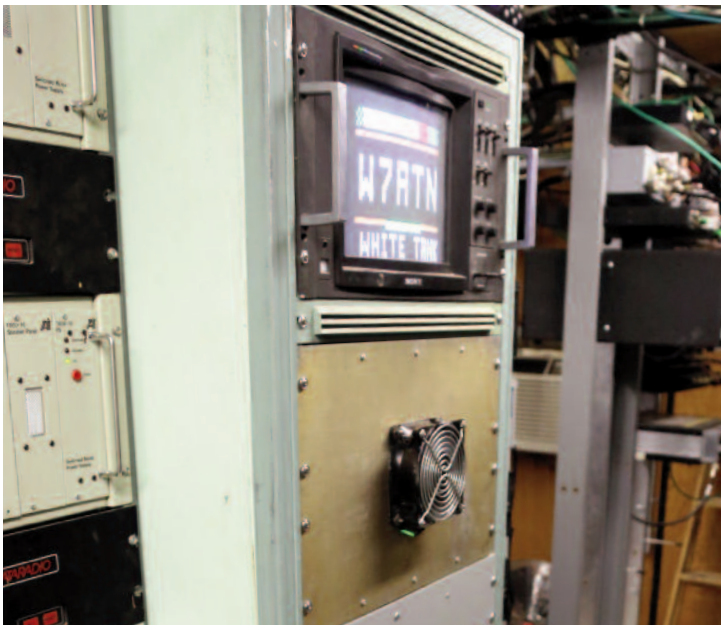


White Tank and Mount Lemmon ATV repeater work parties

-The ATN-AZ site crew



White Tank Repeater

Mt. Lemmon

Jerry N7QVU, Kevin AD7OI and Mike WA6SVT drove up to White Tank after the ATV meeting to cleanup the room and cut weeds at the site. We cleaned up the ATV equipment and replaced a fan on the power amplifier.

We have a voice repeater on 448.4 MHz and another voice repeater on Mt. Lemmon 445.225 MHz. We added a receiver donated by Jerry N7QVU that allow the voice repeater at White Tank to repeat the Mt. Lemmon voice repeater. The ATV microwave link back to Mt. Lemmon has a spare audio channel that is used to supply the White Tank voice receiver audio and CTCSS tone to the Mt. Lemmon voice repeater.

The following day Kevin AD7OI, Lee K0CCU and Mike WA6SVT drove the long three hour drive to Mt. Lemmon at 9000 ft above Tucson. Usually there is deep snow but most of it had melted and the weather was in the high 50s. We cut weeds, cleaned up the site and fixed the site security camera system for the site owner then worked on the voice repeater. We checked out the ATV repeater and made prepreations for the new power amplifier to be installed. Modulator aural to visual ratio needed adjustment while on site.

2.4 GHz QRM measurements were taken and direction finding using Mike's spectrum analyzer and a small hand held dish. The result was locating a WiFi hot spot and notifying the owner of the issue and asking him to change channels.

The following morning back at Kevin's shop we tuned up a mast mounted 8 pole filter and preamp donated by Kevin AD7OI who plans to drive back down and install it and the new 1277 MHz PA.

73, Kevin KD7OI, Jerry N7QVU, Lee K0CCU & Mike WA6SVT

Mt Lemmon Tower

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Ideas

Do you have an idea for an article that you've said to yourself that you wanted to write, but never did. Feel free to check with us to see if it is of interest, or write and send it in. I o guarantees that it will get published, but if you don't try, you will never know. I'll be looking to see what you can do!

ATN
The Amateur Television Network

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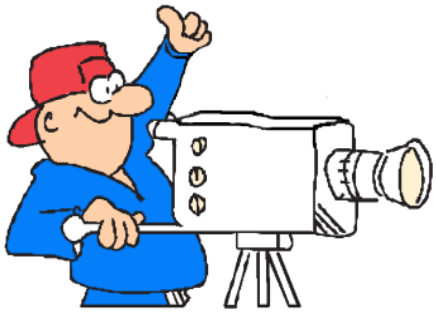
ATCO NEWSLETTER

ATV In **C**entral **O**hio is an ATV club in Columbus and our repeater WR8ATV was the first in the USA to add DATV. The club newsletter is sent not only to the local area but to several ATVers across the country. Check out our website www.atco.tv



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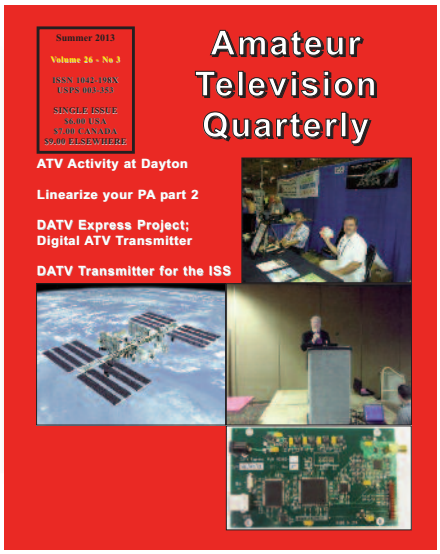

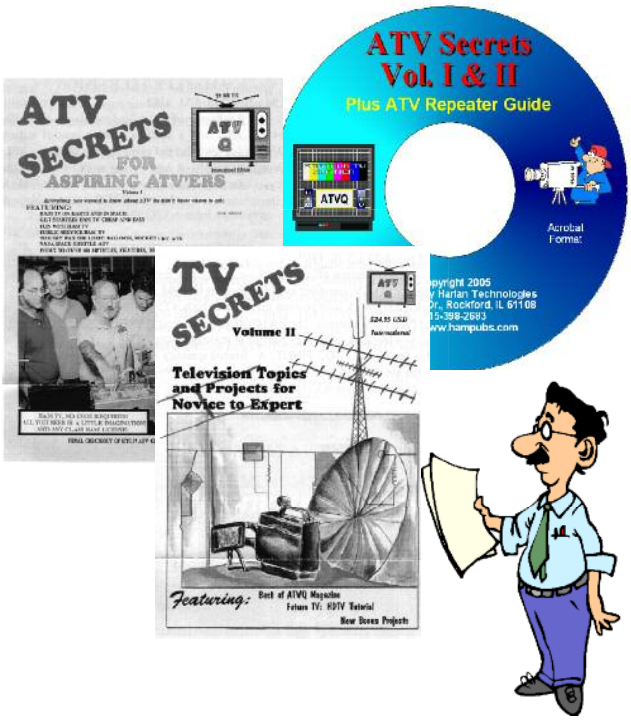

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