

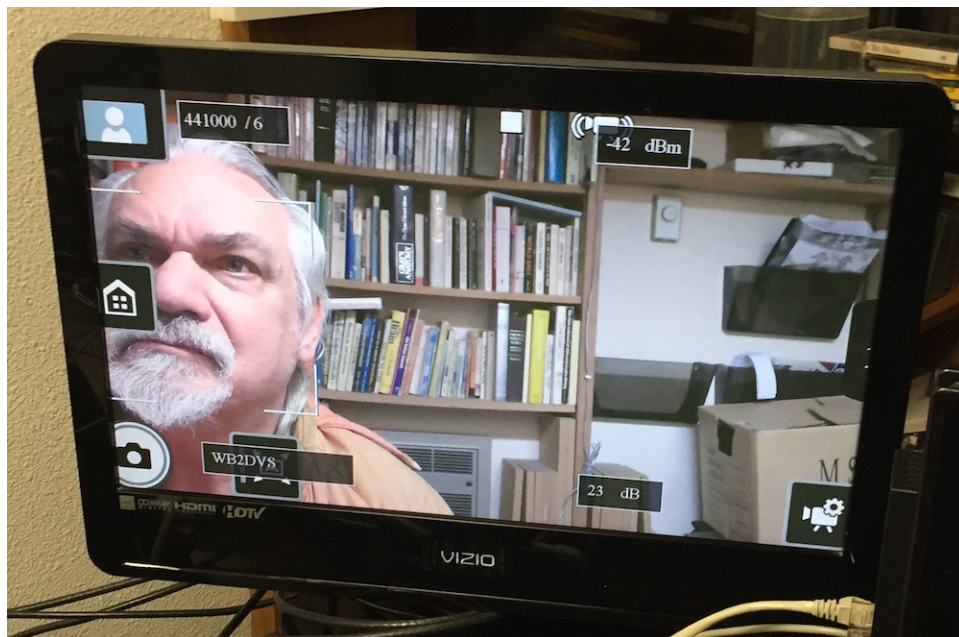
# Boulder Amateur Television Club TV Repeater's REPEATER

December, 2020  
2ed edition

BATVC web site: [www.kh6htv.com](http://www.kh6htv.com)

ATN web site: [www.atn-tv.com](http://www.atn-tv.com)

Jim Andrews, KH6HTV, editor - [kh6htv@arrl.net](mailto:kh6htv@arrl.net) [www.kh6htv.com](http://www.kh6htv.com)



New ATV Ham -- Chris, K0CJG, first DVB-T transmission through W0BTV repeater

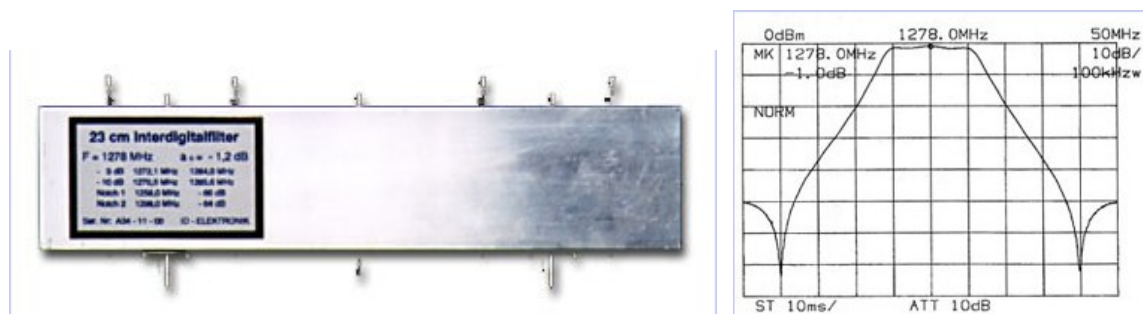
**INCENTIVE PLAN for New ATV Hams:** The BATVC has started a new incentive plan to enable prospective new ATV hams to try out this aspect of ham radio without first investing a lot of \$\$\$\$. With the newly found, el-cheapo (\$42) combo DVB-T & DVB-S receivers as the "kick-starter". (see Nov. issue #62 of this newsletter). We are first offering to interested hams, these receivers, pre-programmed, and at cost. When they pick up the receiver, we actually demo to them it receiving a live TV signal from the ATV repeater. The first step then for them is to take one home and connect it to a 70cm antenna and prove to themselves that they are in a good rf location to actually receive the TV repeater's signal. If they are able to receive

the TV repeater, we know they will then also be able to hit the repeater with their own TV signal.

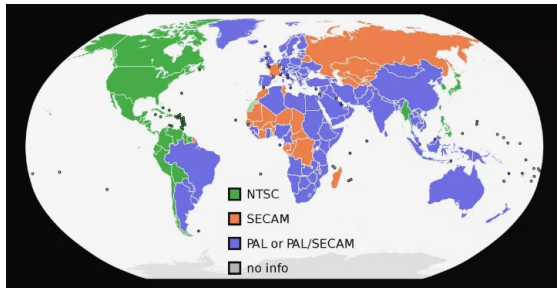
We also do *Radio Mobile* rf path predictions for prospective ATV viewers to see if a good rf path exists from the ATV repeater. We are also offering to do on-site testing with a yagi antenna on a 20ft. mast, if they don't have a suitable antenna. Our on-site testing is however, covid safe, and done with masks on and strictly outdoors on the street or in the driveway.

With repeater signal reception proven, we are then offering to prospective ATV hams an ATV transmitter loaner package. This is thanks to Bill, K0RZ, who has kindly donated a Canon, hi-definition camcorder and a Hi-Des model HV-320E, DVB-T modulator. Jim, KH6HTV, is also including in the package either a 70cm or 23cm rf linear power amplifier, plus antennas. We are offering the transmitter loan for a period of up to one month.

So far, of the hams that have purchased the new combo receiver, three of them have been able to successfully receive the TV repeater at their QTH. They are Mike, WF0M, Heimir, W1ANT, and Chris, K0CJG. Chris was the first to jump at the offer of the ATV transmitter loaner package. He picked it up on Sunday and was on the air with it by Monday, the 14th. The photo above was taken when we first saw Chis' smiling face coming over the air waves from the ATV repeater. He had a good signal into the repeater with a perfect 23dB S/N.



**Another ATV Supplier:** Following up on a lead in CQ-DATV, we have found another ham in Germany supplying equipment for the ATV market. He is Ewald Gobel, DK2DB, in Karlsruhe. His web site is: [www.id-elektronik.de](http://www.id-elektronik.de) He has lots of interesting products listed, but most of them say in the fine print, "no longer produced". He does however, still offer for sale some interesting Filters. He has band-pass filters for the 23cm and 13cm band for 80 €. He also has duplexers for the 23cm and 13cm band for 130 €



## NTSC & PAL in HDTV:

Michael, KD0FDJ, has sent us a link to a short article on why NTSC & PAL still matter with HDTV. It is:

<https://www.lifewire.com/why-ntsc-and-pal-still-matter-1847856>

Michael is the president of the Boulder Amateur Radio Club & loves QRP on 10m.



## ATV and DMR A Great Match Up

By Roland Hoffman – KC6JPG



With the galore of technologies being used within the amateur radio service, the exotic mode of amateur television (ATV) continues to be an excellent communications mode. Come to think about it, ATV is the original “social media” network! ATV’ers are unique breeds as we are seen and heard, transmitting video and audio into the amateur radio spectrum and becoming instant “television celebrities” within our amateur television community. Furthermore, ATV has been an indispensable technology within the public service and the emergency operations sector, especially during the “firestorms of 2020” as we utilized our mountaintop cameras at our repeater sites to aid our emergency personnel and first responders in the affected regions.

If you remember during the early days of ATV, amateur television was used as a simplex operation. ATV’ers would announce themselves on a designated 2 meter simplex voice frequency to announce they are monitoring the ATV frequency in their area. Once a contact is made on 2 meters, they would rotate their yagis to one another and operate ATV simplex and the 2 stations are communicating from their video cameras and microphones on their TV monitors. If a station doesn’t have audio capabilities, they will use the 2 meter simplex frequency as their audio source. The downside to ATV simplex is the ATV’er are limited to communicate with a single contact unless another ATV

station happens to be located within the beam-width of the other station's antenna systems.

Today, ATV repeaters are in abundance throughout the country and the world. Repeater operations enable the ATV'er the ability to fix their beam antennas to the direction of the repeater system and enjoy video QSO's with many other ATV'ers within the repeater's coverage area. A lot of these repeaters today are linked by RF or TCP-IP, furthering our ATV communications with other hams across the region, country, or in some cases, the entire world. Even with these incredible advancements of linking these ATV repeater systems, we still have the problem of being able to communicate reliably on the voice modes on a global scale . . . until now.

Back in 2017 during my 50 mile commute from work to home, I announced my presence on the WA6SVT - ATN 1.2 GHz voice repeater on Santiago Peak. Bob Kneebone – N6AZV in Long Beach, CA, acknowledged my QSO as he began to talk about an H/T radio he won during a raffle at his ham club. When he asked me if I knew about "Anytone", "DMR", and "codeplug", not only he wanted to know about the radio he has graciously won, I had no idea what he was talking about. After our 1 hour QSO, I was quite intrigued about our conversation regarding DMR. I decided to dive in the DMR "pool" and learn this new "language" that Bob was describing during my drive, as I promised I would get back to him towards helping him use his new radio once I gain the knowledge about DMR and understand the technology.

When I arrived home, I downloaded a wonderfully written article about Digital Mobile Radio within the amateur radio service by John S., Burningham – W2XAB.

([http://www.trbo.org/docs/Amateur\\_Radio\\_Guide\\_to\\_DMR.pdf](http://www.trbo.org/docs/Amateur_Radio_Guide_to_DMR.pdf))

After reading his article, I immediately proceeded to apply for my Radio ID (mind you I haven't obtained a DMR radio yet). Within an hour, I received my new Radio ID. The next day, I decided to take the "long way" to work and stop at one of my favorite ham radio vendors to check out the Anytone AT-D878UV H/T (the same radio Bob won at his ham club). Acting like a kid in a candy store anticipating on the new chocolate bar to try out, I decided to buy the radio, an extra battery, and a soft case. Yep, I dove in to the deep end of the DMR pool, but I am looking forward in learning how to "swim" with this new technology I am about to learn and able to help out Bob.



After work and during my commute home the same day, I have contacted N6AZV – Bob and told him I have acquired an Anytone AT-878U handheld transceiver. When I arrived home, I have downloaded the compatible codeplug for the Southern California area from a local radio club. Bob did the same. Bob applied for a Radio ID. After receiving his ID, I remote into his computer and begin to fill out the needed info into his codeplug software while at the same time, I was editing my info too. Once completed, we wrote our codeplugs into our radios. Once our radios rebooted, we both set our “Talk-group” to the “SoCal” talk-group. Bob set is “Zone” to the Santiago Peak DMR repeater, and I set my “Zone” to the Sunset Ridge DMR repeater. I called Bob’s station on my DMR H/T. He replied back announcing my call sign and acknowledging my call. WOW!! Instant SUCCESS! Bob and I are having a QSO on 2 different repeaters using the same talk-group. Even better, the audio quality from Bob sounded like he was next door to me. What a great experience it was.



Bob continued to talk to me, “What did we just do?” With a chuckle, I replied, “Welcome to the new world of DMR radio!”

In the course of several days, I continued to learn about DMR, especially the technology being used with the 2 DMR repeaters both Bob and I were using during our QSO’s. The data link these 2 repeaters have in common are tied into a dedicated DMR network, in which the Brandmeister network was being used with these repeaters Bob and I were using. There are quite a few network systems dedicated for DMR within the amateur radio service, but the Brandmeister network seems to be the network of choice for many DMR repeaters (and hot-spots) today. I checked out their website and I was amazed as there are over a THOUSAND DMR talk-groups listed on the site (<https://brandmeister.network/>). During my browsing, I have encountered “9410 - ATVtalk.” This talk-group is a world wide group dedicated to amateur television. I decided to add 9410 – ATVtalk into my codeplug and write into my Anytone radio. After rebooting my radio, I selected and began to monitor the new talk-group. I would monitor the talk-group during my morning commutes, evening commutes, weekends, bedtime, or anytime when I am in the shack. Other than hearing a few occasional QSO’s of hams in France and Belgium, this talk-group is mostly quiet about 23 of the 24 hours on the clock. Now I am swimming! ATVtalk would be the perfect talk-group to establish an ATV voice communication on a global scale for our ATV community. I began to incorporate DMR and ATVtalk within our ATV fraternity.

Once I got comfortable with DMR operations, I began to include a DMR check-in during the Amateur Television Network’s (ATN) “The Weekly Net” on Wednesdays at 0330 UTC (Tuesday evenings at 1930 / 7:30pm Pacific Standard Time). During my preamble, I insert lower third graphics at the beginning of the net announcing to our ATV’ers about

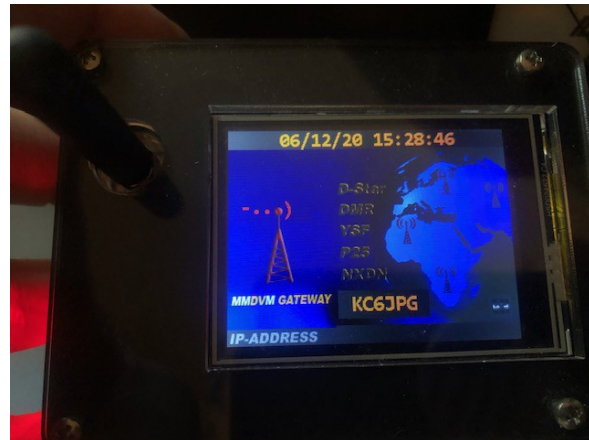
the many ways they can check into “The Weekly Net” including the announcement of 9410 – ATVtalk. Bob – N6AZV was my first check-in to the ATVtalk – group. Other ATV’ers during our net were curious about DMR as they were quite intrigued, just like I was when Bob introduced this digital voice mode to me.

After a few weeks from introducing DMR into our nets, I was beginning to receive QSO’s on my DMR radio from other ATV’ers. WOW! I received calls from Jim – K6SOE in Northern California, Keith, N6GKB from Yucca Valley, CA, and Gary – W6KVC from Ridgecrest, CA. Even better, the QSO’s on the ATVtalk group continues to grow as our ATV’ers from Arizona including Lee – K0CCU and Ed – K5OLA are checking in. Our ATV community is accepting and utilizing DMR and ATV talk not just during our nets, but throughout the day. My commutes have become much more enjoyable listening to 9410 – ATVtalk.

Now we fast forward to January, 2018 during our annual ATN Winter meeting, Ed – K5OLA demonstrated his DMR “hot-spot.” WOW! I was blown away! Not only you can communicate using DMR equipped repeaters, but you can build, program, and operate an RF hot-spot that links from your DMR radio directly into a DMR network via the internet. It’s like having a low power personal repeater system. Even more fascinating, Ed and I are listening on the Worldwide talk-group on his radio. QSO from all around the world are coming out of his H/T’s speaker. Now, I am about to enter the black hole within the deep end of the DMR pool as Ed gave me his hot-spot's frequency. After inputting the frequency in VFO mode in my Anytone H/T, I pushed the pickle. The WOW factor succumbed me even more when Ed and I were communicating on his hot-spot directly.

The following Monday, I went back to my favorite ham radio vendor and purchased a hot-spot based on the Raspberry Pi and included a beautiful 3.5” LED color touch screen. Arriving home that evening from work, I configured the ZUMSpot Nextion 3.5 and programmed the hot-spot to monitor the ATVtalk group. When a station transmits into ATVtalk, the 3.5” LED display will noticeably change as the display will identify the transmitting station. If my

DMR H/T is in operation and tuned into my hot-spot’s frequency, their audio would be coming out of my H/T’s speaker. The ZUMSpot’s display will show the transmitting station’s RadioID, callsign, name, and country they are from, including a graphic flag of their country. The changing colors of the 3.5” display is a great “cue” feature in the event if my DMR H/T is off, I would turn on my DMR radio and either monitor the QSO, or reply back to the station if there is no other traffic. Having the large screen on the hot-spot is such a great way to monitor traffic within the DMR’s talk-group of your choosing without having the DMR radio in operation or computer screens to look at. I have to



admit, incorporating a hot-spot in my studio / shack has been a great add-on to my DMR equipped station. With the big screen on the hot-spot, it is a fantastic feature to be able to SEE who is on-the-air on the DMR bands. It is just like seeing our ham friends on our ATV screens!

In closing, utilizing DMR technology into our ATV community has been a welcome addition as ATV'ers from around the world are able to announce themselves on our nets, have great QSO's with other ATV'ers (and other hams curious about amateur television), and able to communicate to other ATV operators from anywhere in the world towards linking up their systems into the Amateur Television Network system. If you haven't taken the plunge, I invite you to jump in to the DMR pool (the water is great) and communicate with us at 9410 – ATVtalk – the amateur television global talk-group. I have been having some wonderful QSO's with our ATV friends from Australia, France, Germany, and especially here in the states. Even better, incorporating our NEW digital technologies into our network recently with our digital video input and conference system (<https://whereby.com/atn1>) and especially deploying a global voice communication system using DMR, it is certainly a fantastic addition within our Amateur Television Network system and throughout our ATV community from around the world.

**ATV and DMR. We are truly “On the Air to Everywhere!”**

## **NEW, Low Cost, Test Instruments from China**



**Spectrum Analyzer / Signal Generator / RF Power Meter:** Chris, K0CJG, has been surfing the internet and has hit on a new item from China that looks real interesting. The cute little box shown above sells for only \$43 and just might be the next hit like the NanoVNA. The specs. on the E-Bay web site are almost non-existent except to say it covers 35 MHz to 4.4GHz and is controlled via PC program over USB. Considering the advertised frequency range, I suspect that this unit is built around the Analog Devices ADF-4351 frequency synthesizer. There are several vendors listed on E-Bay.



**0.1 - 960 MHz Spectrum Analyzer:** While checking out Chris' lead on the above instrument, I also stumbled upon a couple more of interest on E-Bay. This spectrum analyzer also has a tantalizing low price of only \$53. Specs. say it has a 2.8 inch LCD screen, two ranges of 100kHz to 350MHz & 240 to 960MHz, adjustable bandwidth from 3kHz to 600kHz, noise floor of -102dBm at 30kHz BW, adjustable input attenuator of 0 to -31dB in 1dB steps, & USB interface.



**3GHz, 4" NanoVNA:** This latest NanoVNA pushes the upper frequency limit to 3 GHz in the larger package size of 4". It sells for \$94 and includes a calibration kit.

Has any of our newsletter readers out there bought any of these new devices and tested it? If so, send us a note about it and we will publish it in a future newsletter.

## 70cm, Vestigial Sideband, TV Transmitter

Jim, KH6HTV

I used to build and sell analog TV transmitters, prior to the current digital TV craze. I recently got an order from a ham in New York for one of my model 70-10 analog TV transmitters. It was the first one I have sold since 2014. After building it, I thought it might be of interest to readers of this ATV newsletter.

Back in my pre digital TV days dating from the mid 70s, I have designed and built several TV transmitters. The first were AM-TV. But, early on here in Boulder, Colorado, we realized the importance of spectrum conservation and the need to confine



our TV spectrums to the FCC standard channel width of 6 MHz. The AM-TV transmitters easily consumed 20 MHz of bandwidth. This meant adopting the commercial broadcast system of using Vestigial Upper Side-Band (VUSB). In the 1990s, we accomplished this by using 6 MHz channel filters made by Spectrum International on the output of our AM-TV transmitters to filter off the unwanted lower sideband.

By 2007, I decided to do a major redesign of our Boulder ATV repeater. I felt there must be a better way to come up with a quality VUSB-TV transmitter than starting with an AM transmitter. I knew the cable TV folks used VUSB so, it was an obvious step to adopt a cable TV, VUSB modulator to generate a truly clean TV spectrum that occupied only 6 MHz of bandwidth. I thus purchased a CATV modulator from Macom and proceeded to design an RF linear power amplifier to boost the 0dBm



level available from the modulator. The amplifier I came up with used a Toshiba S-AU4 brick module as the final amplifier. With this module, I was able to achieve a linear 10 watts (PEP), NTSC output. However, the S-AU4 only had 20dB gain. To achieve +40dBm output required +20dBm of rf drive power. This was 20dB greater than what was coming out of the modulator. As the driver amplifier, I then settled upon a very linear amplifier from RFHIC which was designed for use as a cable TV line amplifier. It was an RFC-041 which had 20dB of gain, and capable of +30dBm output.

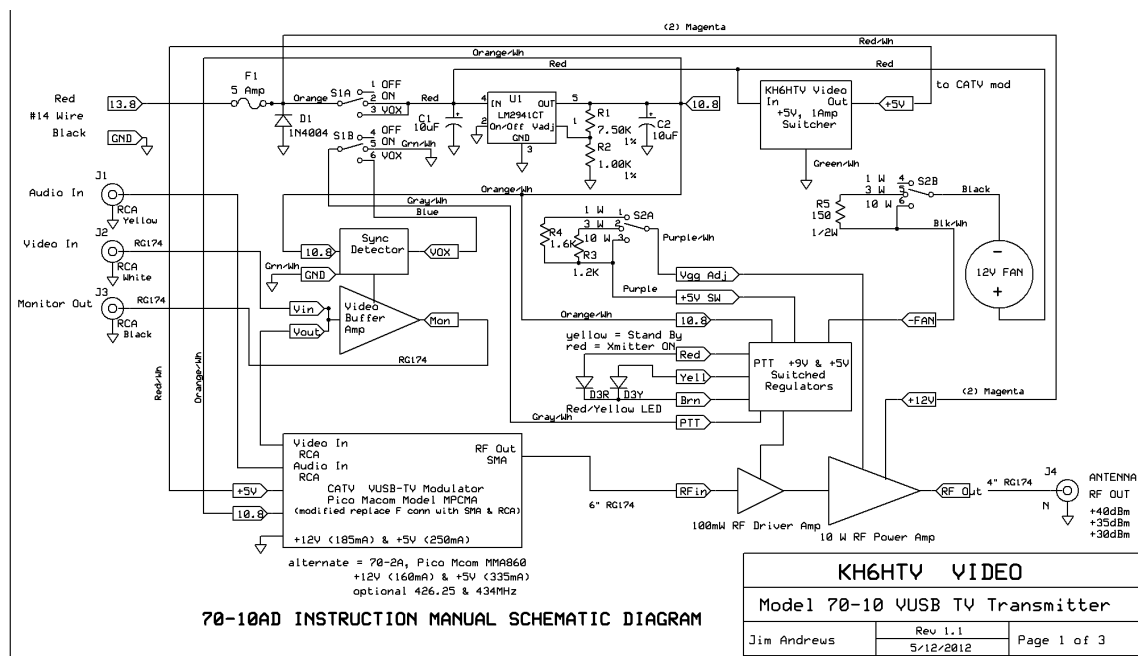
This VUSB-TV transmitter was then installed in our ATV repeater. I then built about a dozen more of them for other Boulder ATV hams. In 2011, I wrote a paper for QST advocating VUSB-TV vs. AM-TV and the concept of using a CATV modulator along with a linear rf power amplifier. The paper was finally published in the Feb. 2013 issue of QST. The QST article also included the schematic diagram of my rf linear amplifier using the S-AU4 brick module. Unfortunately, by the time the QST article finally appeared in print, Toshiba had discontinued the S-AU4.

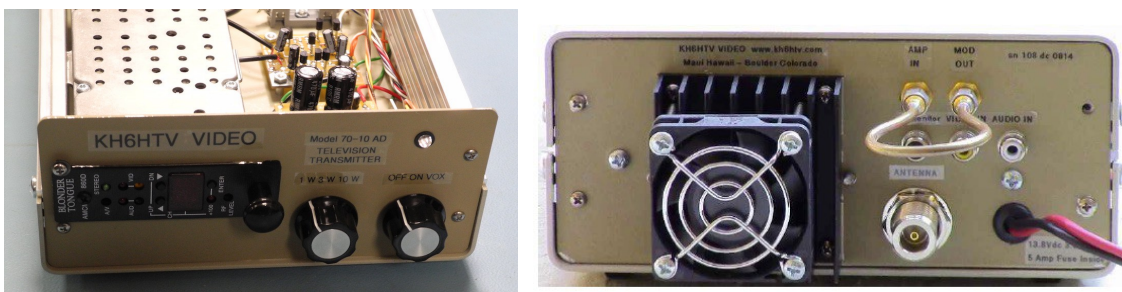
In 2011, as I started experimenting with DATV, I realized I needed a more linear amplifier than was possible with the S-AU4. I thus switched from using bipolar transistors to MOSFETs. I soon developed several 70cm linear amplifiers using MOSFET modules with various RF output powers. The most significant were my models 70-7 and 70-9 which were capable of producing linear 10 Watts and 25 Watts (PEP) in analog, NTSC, VUSB-TV service.

The next obvious step was to incorporate a CATV modulator with the 70-7 amplifier. The result was my model 70-10 developed in the spring of 2012. This time, I decided to package it in a much more attractive (but considerably more expensive) enclosure. I selected the Hammond model 1402F clam shell enclosure. I researched several CATV modulators from various companies and

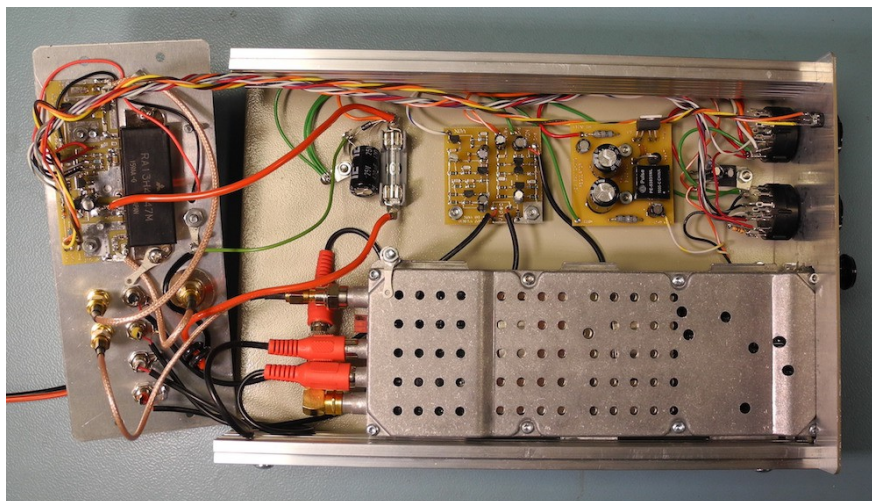


decided the best one was the model MPCMA from Pico-Macom. I then mounted it into the front panel of the clam shell enclosure. I installed my model 70-7, 10 watt amplifier on the rear panel. Other features I added included adjustable RF power levels of 1 W, 3 W & 10 W. This was accomplished by adjusting the bias voltage on the 1st MOSFET gate in the power module. Another feature I added was a VOX circuit. In this case VOX stands for Video Operated Xmit. Also as part of the VOX circuit was a video buffer amplifier to provide a video output which could be viewed on a monitor. I discussed this VOX circuit in the previous newsletter. (Dec. 2020, issue # 64 pp. 6-7). The block diagram, schematic of the 70-10 is shown below along with photos of the interior.

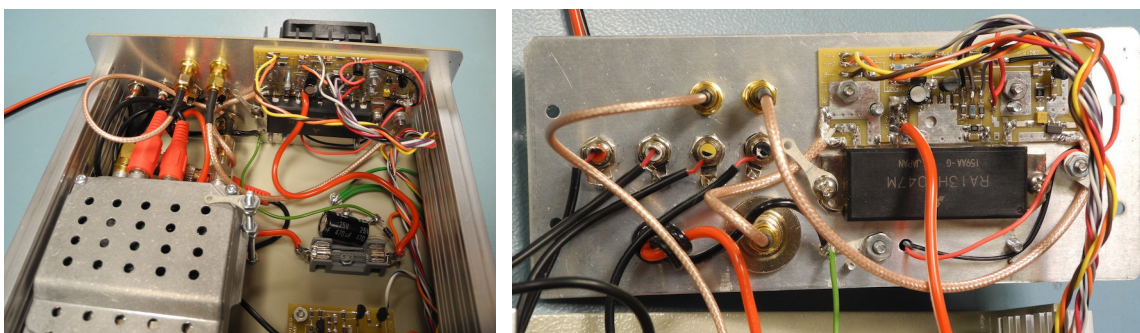




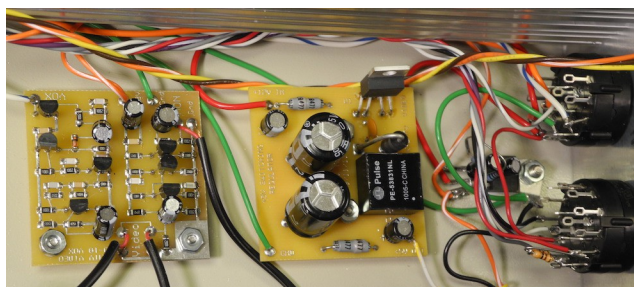
Front & Rear Panels



Top View with cover removed and rear panel laid flat

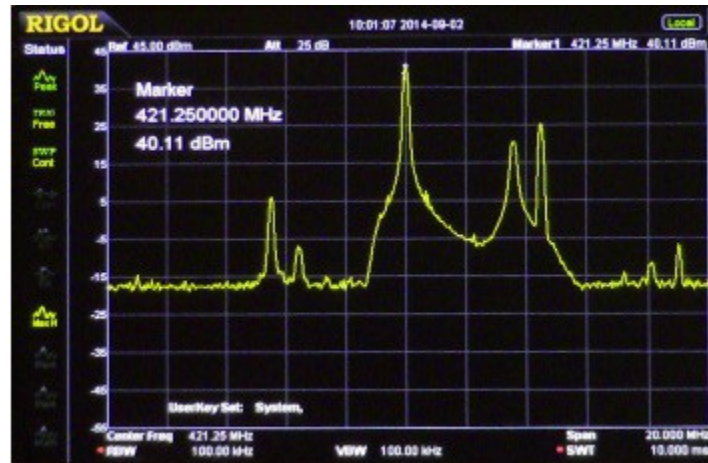


Views of the rear panel with the 70-7, 10 Watt amplifier



VOX pc board (left), +5V switcher (center), 10.8V regulator and front panel controls





Model 70-10 RF Spectrum when tested with NTSC color bars. 10dB/div & 2MHz/div. The center spike is the video carrier. The spike 4.5MHz above the video carrier is the sound sub-carrier. The spike 3.58MHz above the video carrier is the color sub carrier. The mirror image spikes below the video carrier are the undesired lower sideband -CSC & -SSC. They are the result of amplifier non-linearities which cause regrowth of the lower sideband. The rf drive was adjusted to limit them to -20dB below the upper sideband +SSC & +CSC. At this level of rf drive, the rf output power was +40dBm (i.e. 10 watts). This is the Peak Envelope Power (PEP) as measured on the TV signal sync tips.

**W0BTV Details:** Inputs: 439.25MHz, analog NTSC, VUSB-TV; 441MHz/6MHz BW, DVB-T & 1243MHz/6MHz BW, DVB-T Output: 423MHz/6MHz BW, DVB-T, or optional 421.25MHz, analog VUSB-TV. Operational details in AN-51a Technical details in AN-53a. Available at: <https://kh6htv.com/application-notes/> We hold a social ATV net on Thursday afternoon at 3 pm local Mountain time and an ATV activity night on Wednesday evenings at 7pm. ATV nets are streamed live using the British Amateur TV Club's server, via: <https://batc.org.uk/live/kh6htvtvr> or n0ye.

**Newsletter Details:** This is a free newsletter distributed electronically via e-mail to ATV hams. The distribution list has now grown to over 400. News and articles from other ATV groups are welcomed. Permission is granted to re-distribute it and also to re-print articles, as long as you acknowledge the source. All past issues are archived at: <https://kh6htv.com/newsletter/>



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**Free** advertising space is offered here to ATV hams, ham clubs or ARES groups. List here amateur radio & TV gear **For Sale - or - Want to Buy.**



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