

Boulder Amateur Television Club TV Repeater's REPEATER

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BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com



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BOULDER DATV REPEATER W0BTV BACK ON THE AIR ! (ops! almost)

On Friday, May 19th, Don & Jim were able to gain access to our repeater site and reinstall our W0BTV, DATV repeater. It has been off the air for some time now for repairs and modifications. The DTMF controller and also the 5.9 GHz, FM-TV transmitter had failed. They were both repaired and are functioning normally again.



For modifications, the unused 439.25 MHz, NTSC receiver and 421.25 MHz NTSC analog transmitter and associated control circuits were removed. In place of the analog receiver, a Hi-Des model HV-110 receiver was installed. It is programmed to receive 439 MHz with 2 MHz band-width. Hopefully, going to 2 MHz BW will be less prone to RFI than our 441 MHz, 6 MHz BW receiver.

So What Went Wrong ? --- Initial on-site tests showed all ok. Several hams off-site were sending input test signals and monitoring the repeater's output. Chris, K0CJG, suddenly reported "NO RF!". We then confirmed, yes no rf output. The transmitter had failed. Subsequent bench tests showed the Hi-Des model HV-100EH modulator had failed. No rf output. It had been in continuous service 24/7 since 2016. Guess we were lucky it failed while we were present. At least that saved us a return trip to the repeater site.

We have since replaced the HV-100EH with another old unit. Further bench testing shows it to be working normally. So, Don and Jim will be making another trip back up to the repeater site to re-install the DVB-T, 70 cm transmitter. Hopefully, in the next ATV newsletter, we will be able to report W0BTV is finally back on the air.

DVB-T, 2 MHz Band-Width Recommend Digital Parameters

Jim, KH6HTV

Up to now, all DTV activity here in Boulder has been done using the USA commercial broadcast TV standard of 6 MHz TV channels. We have experienced a lot of RFI on our Channel 60 (438-444 MHz) input to our W0BTV repeater. ATV hams elsewhere, including southern California and Ohio, have had good luck going to a narrower, 2 MHz channel for their DVB-T transmissions. So, we have added a 2 MHz receiver to our DATV repeater. Our repeater configuration already has a 6 MHz TV channel 60 receiver setup with an inter-digital band-pass filter for 438-444 MHz, followed by a low noise pre-amp and a 3 dB power splitter. So our plan is to try using the existing hardware and put a Hi-Des, HV-110 receiver in it set to 439 MHz center frequency with 2 MHz BW (438-440 MHz). Hopefully, we will encounter less RFI in this slice of frequencies.

So, how should we setup our Hi-Des, DVB-T modulators to work with the narrower BW ? I have tried several variations and these are my recommendations:

For the Best Luck in hitting the repeater --- Use 480 line resolution and QPSK. The repeater keys up with -94 dBm (s/n = 9 dB)

Media Config: Video encoding H.264, 640x480 video resolution, 1.5 Mbps, 60 GOP, 30 fps
Audio encoding MPEG2, 96 Kbps
Trans Config: QPSK, 8K FFT, 2/3 FEC (code rate), & 1/16 Guard

For High-Definition --- Use 720P and 16QAM. The repeater keys up with -87 dB (s/n = 15 dB)

Media Config: Video encoding H.264, 1280x720 video resolution, 3.5 Mbps, 60 GOP, 30 fps
Audio encoding MPEG2, 96 Kbps
Trans Config: 16QAM, 8K FFT, 5/6 FEC (code rate) & 1/16 Guard

Don't forget to set your modulator's internal attenuator properly to avoid overdriving your amplifier. For the 70 cm band, with the internal attenuator set to 0 dB, these are the rf output power levels I measured for my Hi-Des, model HV-320E. I used my HP 432 thermistor power meter for the measurements.

+7.6 dBm (2 MHz, 480i, QPSK), +9.4 dBm (2 MHz, 720P, 16QAM) and
+7.3 dBm (6 MHz, 1080P, QPSK)

I think you will be pleasantly surprised and pleased by the high quality digital video and audio you will get with this narrower band-width. Give it a try. Then send your signal reports to me for reporting in a future ATV newsletter.

Why I Hate HDMI !

Jim, KH6HTV

First let me qualify myself. I am definitely NOT an expert on HDMI, simply a technical consumer. I don't pretend to understand the internal workings of the very complex HDMI. What I do understand is how it bites me in the A--- many times ! To be blunt, I am not a happy camper being forced to use HDMI for my A/V needs.

HDMI stands for High-Definition Multimedia Interface. It is a proprietary audio/video interface for transmitting uncompressed video data and compressed or uncompressed digital audio data from an HDMI-compliant source device, such as a display controller, to a compatible computer monitor, video projector, digital television, or digital audio device. It is quite complex and requires a total of 19 wires in it's cables. It was created back in 2002 by the various TV manufacturers along with the movie and cable industry. I feel the biggest problem from a consumer point of view was the participation of the movie industry (including Sony, Fox, Universal, Warner Bros & Disney) and their insistence on protecting their movie copyrights. This was implemented in HDMI via a scheme called HDCP which stands for High-bandwidth Digital Content Protection. It only allows certain devices to send A/V data to other authorized devices. The intent was to prevent unauthorized use of copyrighted material, such as movies.

So why my Hate ? --- I have just spent the whole last month tearing my hair out trying to modify our Boulder W0BTV - ATV repeater. My problems all revolved around unpredictable HDMI behaviour. My HDMI problems are not unique. Other Boulder ATV hams have also complained many times about HDMI issues. They don't usually seem to be a problem when a TV camera is plugged directly into a Hi-Des modulator. But, whenever we try to fancy up our A/V gear in our shack by adding multiple video sources, multiple monitors, and various switch gear (all using HDMI), then things start going to hell rapidly. All sorts of incompatibilities, leading to quirky behaviour and lots of frustrations.

The **W0BTV repeater** is a device using digital A/V gear with lots of HDMI in it. I simply wanted to add an additional DVB-T receiver to the repeater. Should have been really simple, like falling off a

log. It was definitely not. The basic A/V flow in our repeater was (1) three DVB-T receivers (with HDMI output) ---> (2) going to a 4 input, 1 output HDMI switch / quad processor ---> (3) going to a 1 in / 2 out HDMI splitter (one to drive digital transmitter, other to drive analog FM-TV transmitter) ---> (4) DVB-T Modulator (for 70cm digital transmitter). The receivers were made by Hi-Des, Taiwan (HV-110 & HV-120). The modulator was also made by Hi-Des (HV-100EH). The HDMI switch/quad processor was made by OREI. It was their model HD-401MR. We had bought it specifically because it was the only one we could find back in 2019 which had an RS-232 control port. This allowed us to use an Arduino mini-computer as our controller to select the desired A/V stream. (*note: OREI still makes and sells the HD-401MR, but it no longer includes the RS-232 port.*)

So, back in 2019, Don, N0YE, and I rebuilt the W0BTV-ATV repeater using the HD-401MR quad/switch. Don wrote the computer code to control the Arduino. We had two Hi-Des HV-120A, DVB-T receivers, one for 1243/6 MHz and the other for 441/6 MHz. We also had an analog, NTSC, receiver for 439.25 MHz which then feed it's A/V to a composite video to HDMI converter as the third receiver. The fourth port of the quad/switch received HDMI video from a Raspberry-Pi mini-computer playing a short video slide show as our repeater's ID. The system worked almost flawlessly. The only issue was intermittent loss of audio under certain switching conditions. (*note: Don, now (April, 2023) has since discovered the missing lines of code and corrected that issue.*)

So, fast forward to spring 2023 --- We had a couple of failures in the repeater. One, the 5.9 GHz, FM-TV transmitter was putting out badly distorted video. Two, the 2 meter control link suddenly failed. Per the FCC that is a "no-no". We must be able to remotely disable the transmitters if needed. So, it became necessary to jerk the repeater off the mountain site and repair it. This then was our golden opportunity to make a simple (at least we thought simple ?) modification. The mod was to remove the old, unused, analog TV receiver and transmitter modules and their associated circuitry. Install in place of the 439.25 MHz analog receiver a narrow band (2 MHz BW), DVB-T receiver for 439 MHz. No big deal - right ? Wrong !

Repeater Mods: I purchased new from Hi-Des a couple of their HV-110, DVB-T receivers. One to use for 439/2 MHz. So I also pulled out the 441/6 MHz, HV-120A receiver thinking I could reuse it for myself and replace it with a lower cost HV-110 (\$120 vs. \$250). The new HV-110s were both modified to add the simple open collector transistor circuit to provide the "Valid Signal" necessary to key up the repeater. Slapping the new HV-110s in place and the repeater should have been ready to take back up the mountain. But wait, first we need to test it out completely in the ham shack. Run it through all the possible conditions it might encounter. Did it pass ? NO! Sometimes it worked and sometimes it didn't. When it worked it repeated excellent video and audio. Then sometimes, one or the other of the new HV-110s would balk and then give a blank screen with no video. At other times, the repeated video would cycle every couple of seconds from good video to blank screen and back to good video.

In the original design of the digital repeater, we had intentionally added a 2 meter DTMF control code to do a master RESET. The Reset removed DC power to every digital device in the repeater to do a master Re-Boot. Reset/Reboot did not clear the issue with the new HV-110s. To clear the issue, I

had to do some special button pushing on the remote control in the HV-110 menu. This was totally unacceptable for a repeater intended to be used at a remote, un-manned location.

We felt the issue was being created by the HDMI quad/switch being switched back and forth between various A/V sources. Some spurious control signals were somehow making their way back to the new HV-110s and upsetting their internal menu parameters. Probably the darn HDCP! Gurr!

One thing which we thought would be a cure and did seem to work for a couple of days was to insert a "buffer" HDMI amplifier between the DVB-T receivers and the quad/switch. What we used was an OREI 1in / 2 out splitter HDMI amplifier. It seemed to work. So, I spent \$75 to buy three of them. One for each receiver. Installed them. Seemed to work. But only for a little bit. Then, darn it, the A\$&@*Y\$ failure again!

Finally a Solution! (We HOPE!) ---- In desperation, Don, N0YE, suggested "If the old system worked, why don't we try using some OLD Hi-Des equipment?" "Maybe something has changed in the current Hi-Des production?"

(note: I must admit, I had encountered some similar issues in 2022 with new Hi-Des receivers which I purchased to replace those I had lost in the fire. Hi-Des Receivers refused to work with some video monitors. But other DVB-T receivers from other companies worked fine. I had many e-mail communications with Calvin at Hi-Des about the problems and we tried many different versions of firmware. None were completely satisfactory.)

So the solution --- One, I reinstalled the old (2017), expensive HV-120A receiver (f/w 0.0.72.156) as the 441/6 MHz receiver. Don graciously donated his very old (2016) HV-110 (f/w 0.0.1.72.101) for the 439/2 MHz receiver. This old HV-110 ran off of +5 Vdc, not 12 Vdc like the newer HV-110s. So, we added a 12V/5V switching regulator for it. Modified Don's receiver to add the "Valid Signal" output for PTT control.

Now, with the OLD Hi-Des receivers, the W0BTV repeater seems to be working flawlessly. Let's hope and pray it stays that way. Heaven help us if any of these three old receivers ever die. Using new receivers will not work as replacements.

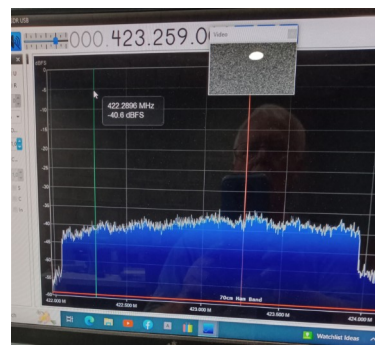
73 from a very frustrated Jim, KH6HTV, Boulder, Colorado

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More Mid-West, 70 cm, DATV DX !

Hi Jim ---- Just wanted to let you know your friends in Southeast Ohio are having success making ATV contacts. Today I was able to see the Columbus repeater, which is 86 miles away. Here are some Hero photos to show the results. I am able to work the Mid-West ATV-DX group almost everyday. We now have 4 local hams on ATV and 3 are using your preamps.

Thanks, Bill WB8YIF, Little Hocking, Ohio



Hero photos from WB8YIF

Reports from 2023 Dayton Hamvention

Popularity of the Host PC Electronics Transceiver Digital Interface

The ATN booth at Dayton Hamvention had four different types of digital ATV- related projects out on display at the booth, and surprisingly, we had literally hundreds of hams wanting the documentation for the Host PC Electronics Digital TV interface Modification article (see attached). Throughout the Hamvention, we continued to run out of copies of the article. We also provided a number of ATVers a PDF version via email for those wanting an electronic copy. We ended up handing out 300 hard copies of the article. This is

Integrating Digital ATV Capabilities Into Older PC Electronics A5 ATV Transceivers

Written by Dave Pelaez AH2AR



Re-purposed A5 transceiver transmitting a DVB-T ATV signal

highly indicative that there still is a demand for these obsolete transceivers, as they can be put to use as a T/R interface for the separate HiDes transmitter/receiver combination. eBay still continues to be a good source for the TC70's.

Cheers, Dave, AH2AR, Dayton, Ohio

[editor's note: Dave' article first appeared in the electronic magazine, CQ-DATV. April, 2019 issue, pp. 20-26. For a .pdf copy of the article, send your request to Dave Dave's modification to the PC Electronics analog ATV transceiver adds in/outputs to use it with external DVB-T receiver and modulator to add digital ATV capability.]

P.S. Dave promises to send us more photos, etc. from the Dayton Hamvention for our next newsletter.

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ATN-Arizona News: Join us Sunday nights at 7pm on whereby.com/atn1. We can socialize there and we have lots of ATV news to discuss.

Mike Collis told me he coordinated with Ed and is coming to Phoenix to work on White Tank ATV repeater on June 10th. That's great news!

We're checking the status of our new Mt Lemmon repeater site and will proceed with that installation as soon as possible. Mike has tested and adjusted all of the old equipment and Joel is assessing the addition of new digital ATV gear. That's something really exciting to look forward to.

We welcome more ATV and FM RF activity on the repeaters as we make our improvements. If you can't do that, please join us on whereby.com/atn1. We have ATV nets now on...

Sunday at 7pm - Arizona ATN

Monday at 7pm - Worldwide ATV plus DMR

Tuesday at 7:30pm - Southern California ATN

Thursday at 8pm - Northern California

Keep smilin'. And while you're at it, put that smile on ATV, on the air to everywhere!

Regards, Rod Fritz WB9KMO, wb9kmo@gmail.com, ATN-AZ Vice President and Self-Appointed Cheerleader



HAPPY ROD with his NEW IC-905

---- looking forward to publishing Rod's evaluation

Liquid metal for cooling NXP and AMPLEON power transistors

I wanted to share this with all of you as I have been working on repair circuit issues with our DSN station in Spain.

New high power RF transistors pack an amazing amount of power into a very small footprint. This requires very good thermal transfer to the heatsink. The best possible cooling is obtained by soldering the transistor directly to the copper base. Unfortunately this is not so easy and such transistors are hard to replace.

Having a solution that is just as good but does not require soldering. Liquid metal ensures equally good results and transistors can be removed at any time. Liquid metal is not toxic (this is not quicksilver), but does react/corrode with aluminum so this solution can only be used with copper substrate!

Best regards, Mario, KD6ILO - San Diego, currently on assignment for NASA in Spain



Boulder County ARES (BCARES) member, Joey, NV0N, has just published on You-Tube a very interesting 30 minute video about the new technology LoRa Mesh. Here is the URL link:

<https://www.youtube.com/watch?v=VBTfXXEA-ig>

The intro reads -- Let's have a quick look at Lora and Meshtastic and see if the functionality is something that could be used as an adjunct to packet and APRS by ARES teams during emergencies. Bonus points: Public Mesh community service project and STEM!

Joey has been active in BCARES for many years and is our local digital expert for D-Star, Mesh, etc. He formerly served as a volunteer on the Boulder Sheriff's SWAT team for technical support, including ATV video coverage of SWAT operations. Joey is also an active member of Rocky Mtn Ham Radio. (www.rmham.org)

FEED-BACK

1.2 GHz Future Restrictions ? Aloha Jim, ---- Nice newsletter Jim, The 1.2 GHz news not so good. If we get most of the band pulled and 4 MHz only for ATV, our linked repeater system is doomed. (915 MHz band is not so good, 2.4 GHz band has lots of QRM down in the cities and not so good for receiving. Perhaps if they do not take any more of 3.3 to 3.4 GHz we could move there.

This June my family and I are going on a cruise to Tahiti, Moorea, Mangareva and Pitcairn Islands. I also have a DX call of VP6MC to use both MM and on Pitcairn. For French Polynesia FO/WA6SVT can be used, some sort of agreement between EU countries and their territories and north american countries. (*note: Mike may have inter-net access for e-mails on the cruise. Contact him to make your HF DX skeds.*)

73, Mike, WA6SVT, S. California ATN

HB9AFO's ATV-DX Records - Feedback:

Rudi, S58RU, has written disputing the 24 GHz record. Rudi questions "I would like to know, if there is any difference between DVB-S, DVB-S2, DVB-T, DVB-T2. If there is any difference if you transmit in 333KS, 500KS, and other parameters? From HB9AFO's record page on i 24 GHz DATV there are no differences, everything »makes soup« DATV. p.s. And I am convinced that I have made the first DVB-T connection in the world in 24 GHz."

S58RU in JN65WM with S5/IW3WSJ in JN65VL on 16.05.2022 --- for more details, see our ATV newsletter, issue #102, June, 2022.

WOBTV Details: **Inputs:** 23 cm Primary (CCARC co-ordinated) + 70 cm secondary all digital using European Broadcast TV standard, DVB-T 1243 MHz/6 MHz BW (primary), plus 441 MHz/6 MHz BW and 439 MHz/2 MHz BW
Outputs: 70 cm Primary (CCARC co-ordinated), Channel 57 -- 423 MHz/6 MHz BW, DVB-T Also, secondary analog, NTSC, FM-TV output on 5.905 GHz (24/7 microwave beacon).
Operational details in AN-51c **Technical details in AN-53c.** **Available at:**
<https://kh6htv.com/application-notes/>

WOBTV ATV Net: We hold a social ATV net on Thursday afternoon at 3 pm local Mountain time (22:00 UTC). The net typically runs for 1 to 1 1/2 hours. A DVD ham travelogue is usually played for about one hour before and 1/2 hour after the formal net. ATV nets are streamed live using the British Amateur TV Club's server, via: <https://batc.org.uk/live/> Select *ab0my or n0ye*. We use the Boulder ARES (BCARES) 2 meter FM voice repeater for intercom. 146.760 MHz (-600 kHz, 100 Hz PL tone required to access).

Newsletter Details: *This is a free newsletter distributed electronically via e-mail to ATV hams. The distribution list has now grown to over 500+. 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/>*

ATV HAM ADS

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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Click on the MENU tab "Want Ads"

CATV, NTSC, Analog TV - Modulator & Demodulator for Sale

These items were recently removed from the Boulder, Colorado, W0BTV, ATV repeater. In good working order. They are ideal for someone wanting to assemble a 70 cm, analog ATV repeater.



Modulator



Demodulator / Receiver

The Pico-Macom model MPCM45 modulator is a fixed channel unit working on only Ch 57, 421.25 MHz. It puts out a perfect vestigial, upper-sideband TV signal. (VUSB-TV). It also includes the 4.5 MHz sound sub-carrier. The rf output is at the milli-watt level. It thus needs to be followed with an rf linear power amplifier. The W0BTV repeater used a KH6HTV model 70-9 amplifier to boost the output to 25 Watts (pep).

The Pico-Macom model MPCD demodulator is a frequency agile, NTSC analog TV receiver covering all standard broadcast and cable TV channels. We used it on Ch 60 (439.25 MHz).

These are in the CATV industry standard "Mini-Mod" package. They both require +12Vdc & +5Vdc for power. A/V outputs and inputs are composite video and line level, mono audio.

Both items have been discontinued by Pico-Macom. New demodulator units can sometimes still be found on the internet but now at very high prices in the \$350 range. ATV Research is selling new the Holland HMMS, single channel modulator, similar to the MPCM45 for \$148. We are willing to sell the pair for \$130 which includes free shipping via USPS priority mail. Interested ? -- contact Jim, KH6HTV via email kh6htv@yahoo.com