

BOULDER TV Repeater's REPEATER

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REPEATER STATUS: The TV repeater was again functioning normally. The issue last month with the video ID failure was solved simply by a master DC power reset. This rebooted the Raspberry-Pi which generates the video ID slide show.

On the May 9th ATV net we had difficulty getting into the TV repeater on 23cm DVB-T. Only very strong signals were able to key it up. Why? snow ? wind damage to antenna? Looks like we might need to make a service call soon.

Both Don and Jim are now streaming the TV repeater's weekly, Thursday afternoon, ATV nets over the BATC server under the call signs N0YE and KH6HTV-TVR. Details about the repeater are available on our web site: www.kh6htv.com AN-43 gives all the technical details. If you have any questions about the current operations or status of the repeater, contact either Jim, KH6HTV or the assistant. trustee, Don, N0YE.

ATV in Pueblo --- Mike Derr, N3DIF, is the BARC representative to the Colorado Council of Amateur Radio Clubs (CCARC). At a recent CCARC meeting, the rep. from the Pueblo ham club, Bill Nicoll, K0CGQ, asked Mike about ATV in Boulder. Mike put Bill in touch with Jim, KH6HTV. Jim offered to give a talk about ATV to the Pueblo ham club. They thus invited Jim to their May meeting on Monday, the 13th. Jim took along his 3 watt, 70cm, DVB-T transmitter and receiver for a live demonstration. He also gave an hour and half, power-point slide show to introduce the Pueblo hams to ATV and DATV in particular. Part of the emphasis of his presentation was on the application of ATV to ARES and how it would be of assistance to their local Sheriff, Police and Fire departments. There were about 20 members in attendance at the meeting. The talk was well received and a lot of questions were asked. The Pueblo club seemed to be serious about adding ATV to their ARES capabilities. They hold their meetings in the new, state-of-the-art, Sheriff's dept. building in downtown Pueblo. It also houses the 911 dispatch center and the EOC. They gave Jim a tour of the ARES ham station which is in a room immediately adjacent to the EOC's central command room. They had an impressive setup with many VHF/UHF radios, and an HF operating position. Their actual HF transmitter and antenna was remotely located 18 miles away to prevent it's strong HF sig-

nals from interfering with all the electronic systems in the building. Their interest is genuine as they immediately ordered some Hi-Des DVB-T equipment along with a 3 watt, 70cm, power amplifier from Jim on the following day.



General Coverage - Dual Band Mobile Radio My son-in-law recently asked me to find for him a mobile radio that he could use in the upcoming Baja-500, off-road, desert, motor race in Mexico and also for off-road ATV trips to Utah, etc. He also did not want to pay an "arm & leg" for a radio. Mike will be driving a race car in the Baja and he definitely wanted to be able to talk to his pit crews. The Baja-500 race frequencies were in the VHF, 150-160 MHz range. I told him they would not be legal to be used here in the US. However, there is the GMRS band at UHF that could be used for his off-road, US activities. Mobile radios up to 50 watts are allowed in the GMRS band. An FCC license is required for GMRS, but it only means paying a \$70 application fee and no exam is required.

I then proceeded to do a google internet search for suitable radios. I did find several, low cost, Chinese radios that might do the trick. The one I purchased was the BTECH, model UV-50X2 from Baofeng for \$170 (<https://baofengtech.com/uv-50x2>) It was advertised as a 50 watt VHF/UHF radio. Baofeng also is selling a similar 25 watt radio, their model UV25X2, for even less at \$115. The web site specs. say the radio covers VHF 136-174 MHz and UHF 400-520MHz. It was not clear whether this meant receive only, or also transmit, but I took the chance and ordered one. Upon receipt, the instruction manual lists the technical specs. only for the amateur 2m & 70cm bands (144-148 & 420-450MHz). Upon testing the radio, I found that it in fact would both receive and transmit from 130 to 178 MHz and also from 400 to 520 MHz.

I performed several other tests on the radio. I tested the receiver sensitivity and found it to be acceptable and it did meet specs. It typically took about 0.2 μ V to open squelch. The radio will function in either the wide band or narrow band FM mode. In the wide-band mode, I tested the off channel rejection. To do this, I moved off channel and in-

creased the rf signal level until squelch opened again. At 15 kHz, the rejection was 55dB; at 30kHz, 69dB; at 45kHz, 73dB; and at 60kHz, 105dB.

I actually then had 5 of these radios to test for Mike. I also tested the RF power output and DC current draw (13.8Vdc supply). The stand-by, squelched, current draw was 0.2 Amps. I found that the RF power output varied a lot over the wide frequency coverage ranges. The advertised spec. was High Power = 50 watts and Low Power = 10 watts. In VHF High Power the actual output ranged from 25 watts to as high as 85 watts with current draws from 8 to 14 amps. The VHF Low power setting was way off. It always put out a lot more than 10 watts in low power, typically 15 to 33 watts, with current draws of 4 to 11 amps. In UHF High Power, the rf output ranged from 13 to 63 watts with current draws from 6 to 12 amps. In UHF Low power, the rf output ranged from 13 to 30 watts and 4.5 to 8 amps of current draw.

In the 2m & 70cm ham bands, the results were: 2 meters = 75 watts (13A) & 25 watts (11A) 70cm = 45 watts (11.5A) & 20 watts (7A).

I also looked at the spectrum on my Rigol DSA-815 spectrum analyzer. The spec. for harmonics was >60dBc. It met spec. For both 2m & 70cm, I measured 67dB.

This radio has a whole lot of "bells & whistles". It is capable of operating either in channel memory mode -- or -- VFO mode. It is very easy to set a VFO frequency using the supplied hand-held microphone, key pad by just punching in the desired frequency. For programming the memories, it is best to do this with a PC computer. The free, program CHIRP is used. It is obtained from the Baofeng web site. It is easy to use. A special programming cable is required. It is the model PC04 FTDI Cable and available from Baofeng for \$20. The programming cable plugs into a 1/8" phone jack on the front panel. Caution - it looks like a headphone jack but it is not. There is a 1/8" jack on the rear panel to plug in an external speaker.

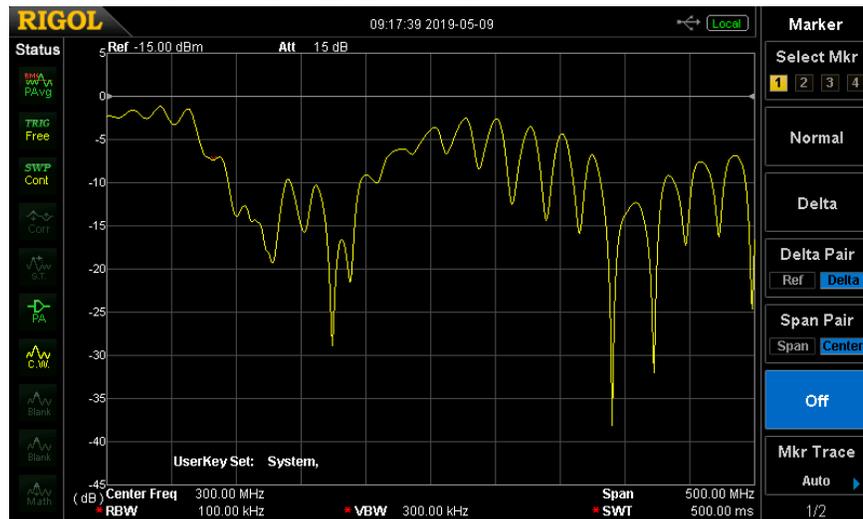
In addition, to normal carrier squelch, the radio is capable of a whole lot of different selective calling options. They include: CTCSS (i.e. PL tones), DCS (digital), and Tone Bursts. There is no front panel squelch control. It is an internal menu setting. The front panel display is useful. Up to four different VFO frequencies - or - channel memories can be displayed for easy access. The one in use is indicated by an arrow on the left side and the arrow is moved up/down by the ABCD button. The top line of the display also indicates the H or L power, W or N bandwidth, repeater + - offset, etc. The radio also has the ability to monitor 2, 3 or 4 of the displayed channels. However, this feature must be accessed via the menu. Not necessarily an easy task. The radio can also scan a few or many channels. However the choice of which channels are scanned is determined at

the time you program the radio. It is one of the columns in CHIRP that is set to either scan or skip. Not easy to change later. The menu for the radio can be intimidating. There are 60 menu settings. They can all be preset however using CHIRP.

2m/70cm ANTENNA: My son-in-law also needed a dual-band mobile antenna to go along with the radio. After searching the internet, I found a potential candidate antenna at HRO. It was the Comet model CA-2X4SR-NMO for \$70 plus \$21 for the optional CA-SPR spring assembly. (mandatory for off-road use ! !) The HRO write-up sounded ideal for his use. It said " The CA-2x4SR is a broad-band antenna designed for those needing voice communications on the ham radio, land mobile, and FRS frequency ranges. When the amateur radio community is working together with local search and rescue and other public service agencies, the CA-2x4SR antenna allows TX and RX capability in both bands! The coverage area and gain provided by the CA-2x4SR is remarkable. Whether used on VHF or UHF or both, it is an asset to the communications needs of amateurs and land mobile users simultaneously."

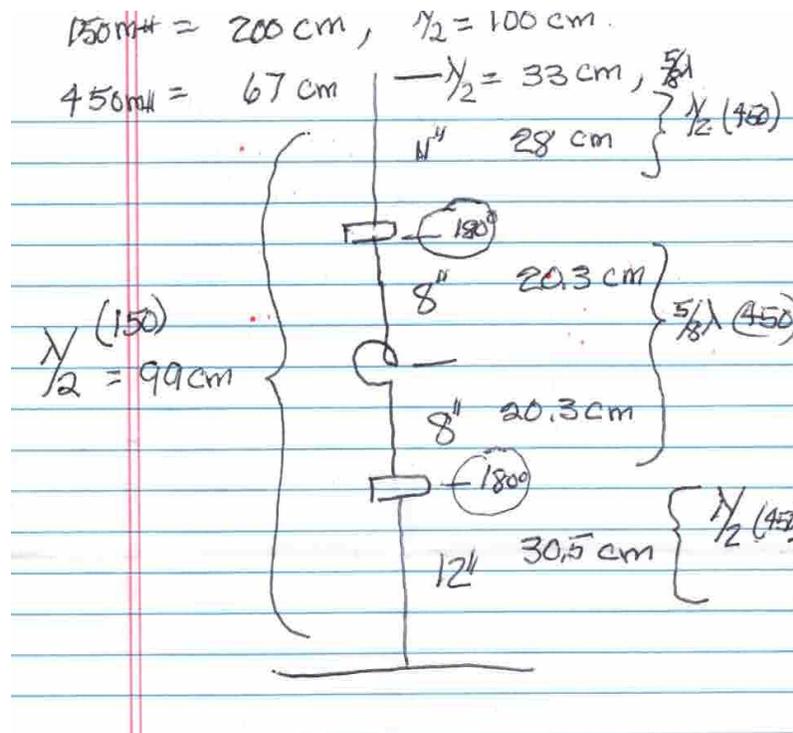


The Comet specs. for the antenna were: VSWR < 1.5:1 144-148 & 440-450 MHz, VSWR < 2:1 140-160 & 435-465MHz, Gain = 3.8dBi (2m) & 6.2dBi (70cm), 150 watts max., length = 40", NMO or PL-259 connectors available. The optional spring, model CA-SPR was ordered and installed in the antennas.



Return Loss of Comet CA-2X4SRN-NMO 2m/70cm mobile antenna. Sweep from 50 to 550 MHz, 50MHz/div & 5dB/div. Note: -14dB RL = 1.5:1 vswr, -10dB RL = 2:1 vswr & -6dB RL = 3:1 vswr

The antenna was tested and found to have $< 2:1$ vswr from 144 to 188 MHz at VHF and from 432 to 480 MHz at UHF. The above plot shows the results. A Rigol DSA-815 spectrum analyzer with built-in tracking generator was used along with Mini-Circuits ZFDC-20-5, 20dB, directional coupler.



On the May 9th ATV net I showed this antenna and demoed the measurement of return loss. One ATV ham asked "How did they get the wide bandwidth?" My reply was we need to ask our Georgia Tech antenna expert, Professor Ed, K0JOY. Ed said bring the antenna to the next Friday ham breakfast and he would analyze it. Here is Ed's results. A typical "back-of-the-envelope" restaurant table analysis. Ed said the black nodules $1/4$ & $3/4$ up the antenna were small 180° phase shifters, no doubt made with a small $1/2 \lambda$ (450) wire coil. The antenna was apparently a 3 section co-linear at 70cm (450MHz). The bottom section and top section being $1/2 \lambda$ and the center section being $5/8 \lambda$. The single turn coil in the center being for Z matching. Then for VHF (150MHz), the overall length of the antenna was about $1/2 \lambda$. The bottom fat piece with the NMO connector, no doubt contained a Z matching network for the $1/2$ wave, 2m antenna. For anticipated gain, Ed said the antenna would be about 4dBi for the $1/2$ wave, 150 MHz and $2 + 5 + 2$ dBi for the 70cm co-linear. He further said 9dBi was optimistic for 70cm due to losses in the various matching networks, etc. He said the numbers of 3.8dBi (VHF) and 6.2dBi (UHF) claimed by Comet were probably about right.



W6ATN -- MOBILE ELECTRONIC NEWS GATHERING VAN

The ATN group in southern California now have their own ATV-ENG van. Thanks to Frank, N7ZEV for arranging the donation of the truck by the Red Rock search & rescue. The equipment bays were filled mostly with equipment donated by Roland, KC6JPG, Gary, W6KVC, and Mike, WA6SV. The three of them also put in a lot of hours of work bringing the truck back to good working order. The next task is to add a mast mounted 2.4GHz amplifier and give the truck a custom paint job. The truck is capable of transmitting 2.4 GHz FM, 434 MHz DVB-T digital, and receive in the 1.2 and 5.8 GHz bands. 2019 plans are to outfit the truck to receive IP-video via the MESH and the internet to connect with other ATV systems around the world.



reprinted from ATN spring 2019 newsletter

ATN, the Amateur Television Network, (<http://atn-tv.org/>) is trying to recruit other ATV groups to join them as affiliated ATN Chapters. The Dayton, Ohio and Panama City, Florida clubs are affiliated with ATN of California, Nevada & Arizona.

OTHER APPROACHES TO DATV TRANSMITTERS

While we ATV hams in Boulder have relied solely upon Hi-Des for our "Appliance Operator" (i.e. no building required, no software to write, just "plug-n-play") DTV modulators and receivers, ATV hams elsewhere are taking other approaches. These typically involve using SDR pc boards, using a PC for support, and writing their own software.

Following postings on the Yahoo DATV users group site, (<https://groups.yahoo.com/neo/groups/DigitalATV/info>), there seems to be a lot of interest, particularly in Europe, to cut costs and "roll your own" DATV transmitter using SDR boards and support with an auxiliary computer (PC, Raspberry-Pi, etc.) An earlier, multi-year project by Art, WA8RMC, Charles, G5GUO, and Ken, W6HHC, produced and sold for \$300 a populated pc board called the DATV-Express (<https://www.datv-express.com/>) It has now been discontinued The DATV-Express hams have now focused on selling for \$75 a DVB-S receiver called the MiniTiouner-Express. The BATC (<https://batc.org.uk/shop/>) had also previously developed some stuff called their Ports-down transmitter. Now the interest seems to be focused on a couple of new, low cost, SDR boards called the Lime-Mini and the Analog Devices Pluto. Both SDRs sell for about \$150. Charles, G5GUO, in the U.K. seems to be the key ATV ham developing and writing code for these SDR boards. There seem to still be a lot of "bugs" to be eliminated, as it is a work in progress. Ken, W6HHC, recently posted a comparison of what can be achieved with the two SDR boards.

<u>Parameter</u>	<u>Lime-Mini</u>	<u>A-D Pluto</u>
Symbol Rates		
DVB-S	175K to 20M Symb/sec	175K to 2M Symb/sec
DVB-T	2 to 7 MHz BW	2 MHz BW
Frequency Range	70MHz to 3.5GHz	70MHz to 6GHz
RF Power Out (at 23cm)	1 to 10mW	0.1 to 1mW



FREE: Fluke 6060B/AK RF Signal Generator 100kHz to 1050MHz, +13dBm to -127dBm, AM & FM modulation. Needs repair. The RF section was working ok. The front panel push button controls have failed. I was unable to fix it. Free to a good home. You pick it up. No shipping. Interested ? -- contact Jim at kh6htv@arrl.net

Do You Have Something to Sell, Give Away, etc.? ? -- if so, post it here in the newsletter.

Future Newsletters: If you have contributions for future newsletters, please send them to me. Jim Andrews, KH6HTV, email = kh6htv@arrl.net