

Boulder Amateur Television Club TV Repeater's REPEATER

April, 2023
3ed edition, issue #129

BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com



Jim Andrews, KH6HTV, editor - kh6htv@arrl.net www.kh6htv.com

Ramblings from Great DATV Pioneer in Maryland ! -- John, KOZAK

Hi Jim --- Great newsletter this week! lots of stuff that I can comment on this time.

WA6NUT - Feed-Back: Thanks for posting WA6NUT's exploits. They mirror what I've been doing here north of Baltimore in a lot of ways. I've been experimenting with both narrowband DVB-T & DVB-S signals with an Adalm-Pluto and now a HackRF One as the modulators. I'm using a Knucker tuner & Portsdown 4 software from the BATC website for receiving the DVB-T, and SDRAngel software with cheap RTL-SDR's for DVB-S decoding. I've been holding off building the Minituner DVB-S tuner (which would be a good companion to the Knucker) but only because I've been waiting anxiously for Art's new DATV-Express VersaTune-Express receiver that's about to be shown at the Dayton Hamvention. I'm hoping to mount that receiver on one of the local repeaters in order to run some comparison tests between DVB-T & DVB-S using narrow bandwidths and low power.

Unfortunately, I haven't gotten anyone else in the local Baltimore area to build the equipment necessary for any of this narrowband stuff yet. So for the moment, I'm the only one in the sandbox. A couple of people have duplicated my 29 MHz DVB-S receive setup to try and catch the guys from across the pond, but 10 meters hasn't been cooperating for that lately.

10 meter - Trans-Atlantic DTV: Oh yea, in reference to your comments on that. I was actually able to receive a very short burst of **full motion video** from Mike, G0MJW back in December. I was getting numerous single frame decodes from him one morning, then all of a sudden he got out of his chair and walked across his shack. I doubt that it was longer than 5 to 10 seconds in duration, but it was full motion and showed that it is possible with better equipment. It is a shame that I wasn't set up to record it as it was totally unexpected.

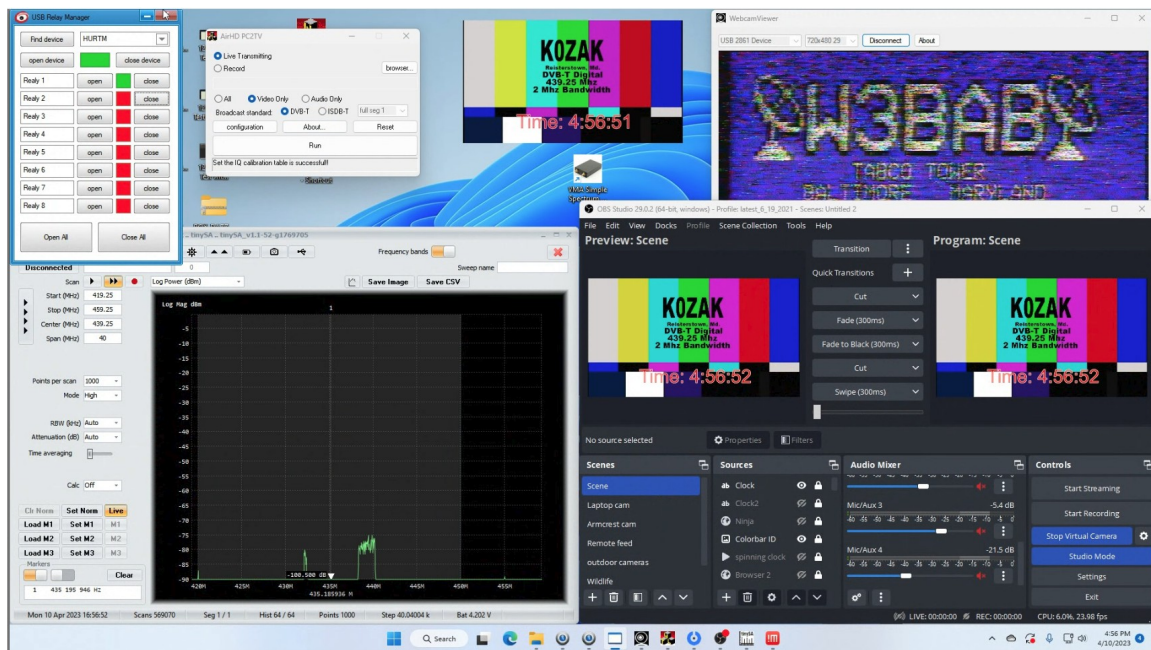
"Live" DTV Video Required: In regards to your comments about motion and picture freezes on Beacon transmitters, what I have done to assist in that, is to put a running clock that displays down to the second on the bottom of my full frame video. It sets up in OBS easily. I use a program called Snaz to generate the digital clock (other text as well if needed) and feed it as a source to OBS. I can make it transparent and any size, then overlay it on top of any



video I want. Another trick I've used is to do a small PIP of an analog wall clock with a sweep second hand in the corner of the otherwise un moving picture. I make it just big enough to make it obvious but not intrusive

TinySA: And the last comment is in regards to the TinySA you are selling. Instead of selling it that cheap, use it in your repeater! I have one at my remote base and when I log into it, I can observe my waveform and see if there are any problems at a glance.

I need the remote base to access (and see) the local ATV repeater. So I cobbled together this thing. Transmitter consists of a HiDes UT100 dingle driving a RA60 brick amplifier. I provide the video with OBS, and can stream my local camera from my house to the remote base using VDO-Ninja to OBS.



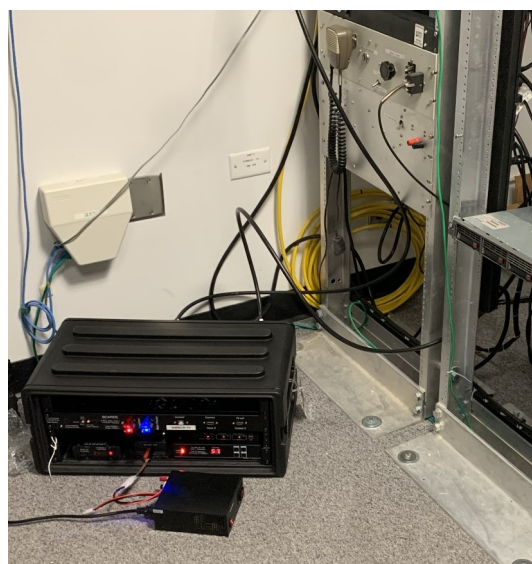
I can power up the Amp and key it by applying bias voltage with the USB Relay manager. I control the modulation parameters with the HiDes PC2TV software (which sucks royaly) I monitor the repeater output via a 1291 FM satellite rx feeding into the remote base in a webcam viewer window. I have the TinySA feeding its PC software via USB to allow me to monitor the tx. What is being displayed in the picture is just the UT100 modulator output with no bias or power output from the amp. The signal gets quite ugly when I power up the amp mainly as I have taken no real effort to filter or attenuate the signal being picked up by the TinySA. It is there more as a reference to show that I am actually transmitting

something rather than as a quality monitor. It is just using a small antenna as a proximity coupler. I just threw this whole thing together quickly in order to assist with the changes going on at the repeater site, so it can definitely be improved upon If it becomes permanent.

Well that was way more rambling than I expected to do. As usual you can clip and use any of this however you want in your newsletters. Thanks again. 73 de John Kozak, K0ZAK
(editor's note -- Thank You John. We are always interested in your latest DATV activities !)



W0BTV STATUS: On Tuesday, April 11th, Don, N0YE, and Jim, KH6HTV, made a trip to the repeater site to remove the repeater for repair and modification. While on the roof, Don took the above photos. The antenna photo on the left shows the two BARC, 4 bay co-linears for 2 m & 70 cm. We share the 70 cm antenna with BARC as our transmit antenna. The white, vertical pole antenna in the lower right and also the center photo is our own Diamond X-6000, 2 m, 70 cm & 23 cm receive antenna. The blue box seen in the right photo is our 5.9 GHz, FM-TV transmitter and antenna. Don removed it for repair.



The radio room is located on the floor beneath the roof. In it, Jim removed the W0BTV repeater rack. He replaced it with a temporary repeater. It was borrowed from BCARES. It is their portable, 70 cm, in-band, DVB-T repeater (441 in / 423 out). Pete, Steve and Larry tested it from their homes to verify it worked before Jim and Don departed the site. The W0BTV repeater is now at Jim's QTH for repair and modification.

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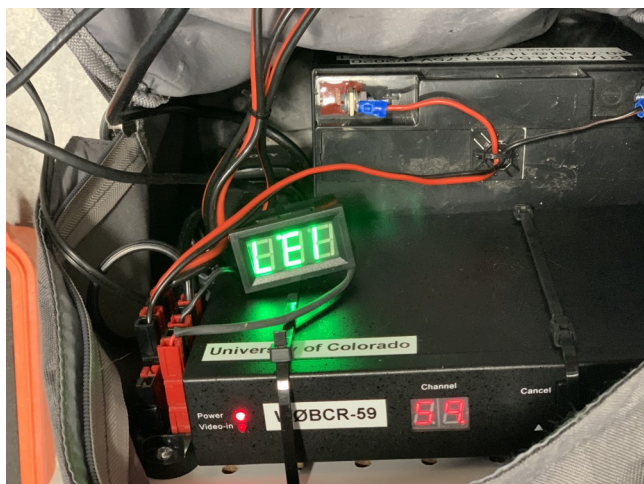
Boulder ATV Frequencies:

The ATV hams in Boulder, Colorado, USA have made a complete shift from analog to digital now. We are all using the European digital broadcast TV standard, DVB-T. We are using the conventional USA, 6 MHz wide, TV channels. On the 70 cm band, we are using cable channels 57, 58, 59 & 60 (center frequencies of 423, 429, 435 & 441 MHz). Ch 60 is our TV repeater's secondary, 70 cm input. Ch 57 is its output. For BCARES operations, it is sometimes necessary to have up to four ATV cameras and transmitters in operation simultaneously. They then will also use simplex Ch 58 & Ch 59. On the 23 cm band, we also do DVB-T with 6 MHz channels. There we use ARRL channels ATV#1 & ATV#2 (center frequencies of 1243 & 1255 MHz). The primary input to our W0BTV repeater is ATV#1 (1243). For microwave experimentation, we do have an analog, FM-TV transmitter on 5.905 GHz. It runs as a 24/7 beacon. On 70 & 23 cm bands, we are using vertical polarization. On the higher microwave bands, we are using horizontal polarization.



K0DVB - ATV pack-set

CU-PD - ATV pack-set



Hi-Des HV-100, DVB-T modulator & battery



KH6HTV Video model 70-7B, 3 W Amplifier

BCARES DATV EQUIPMENT:

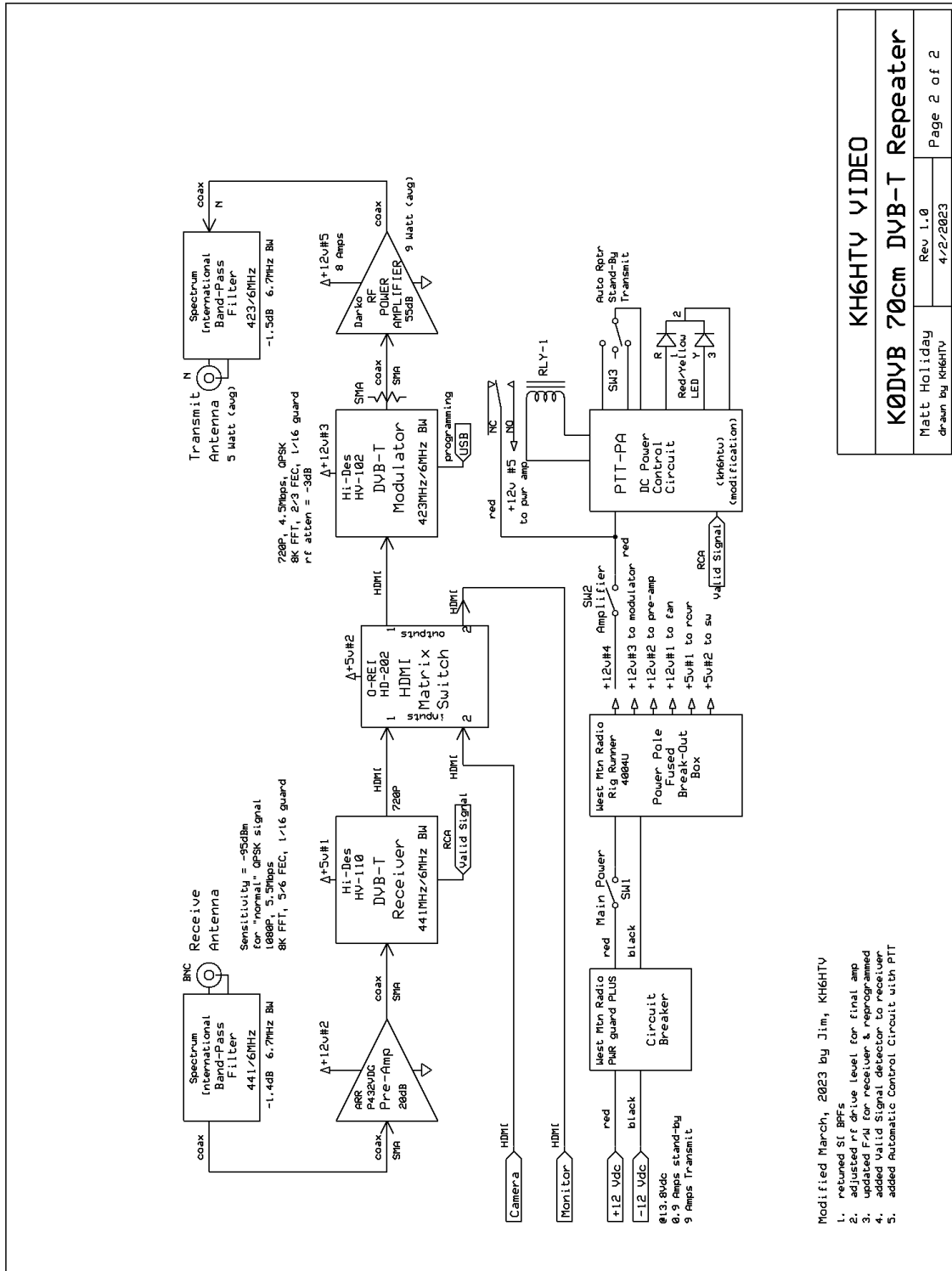
The Boulder County ARES group (BCARES) has quite an inventory of digital ATV gear for immediate deployment in an emergency. It is all for operation on the amateur 70 cm band using DVB-T modulation with 6 MHz

channels (57 - 60). Since 1995, BCARES provided ATV coverage for the University of Colorado Police Dept. (CU-PD) for all home football games, plus other major campus events, such as visits by important dignitaries, protest rallies, etc. BCARES provided up to 4 TV channels simultaneously using cable channels 57 through 60. Up to 2014, this was done using analog, NTSC equipment. In 2014, CU made a grant of \$10K to transition to all digital TV. This included four back-pack, portable ATV pack-sets. A typical pack-set included: Sony camcorder, camera tripod, Hi-Des HV-100 DVB-T modulator, KH6HTV Video 3 Watt Amplifier, rubber duck antenna, and a heavy duty battery to provide several hours of continuous operation. A custom bracket was built to mount the rubber duck directly on the camera tripod. A two man/woman crew were used for each pack-set. One ham as the camera operator and the other ham as a safety spotter and communicator with net control via 2 m HT. In the police command post, BCARES had another crew with a Quad DVB-T receiver. This was an assembly of 4 receivers for each of the channels (57, 58, 59 & 60). Their HDMI outputs all feed into a quad processor to provide a single TV image with each channel displayed. This was all packaged in a 19" rack, rugged carrying case and included a 2 m, FM base station radio. The Quad Receiver is documented in the KH6HTV application note, AN-24a (available at www.kh6htv.com).

More recently, with a new CU police chief, BCARES ATV services have no longer been requested. So, CU donated all the gear they had purchased to BCARES and it is now all stored in the BCARES equipment cache at the Boulder County EOC / 911 center. More recently, Matt Holiday, K0DVB, has built and donated to BCARES two additional, DATV pack-sets along with a portable, 70cm, 5 watt, DVB-T repeater. Now BCARES owns six DATV pack-sets, a Quad-Receiver, and a portable repeater. BCARES equipment officer (& active ATV ham), Pete Goldman, WB2DVS, has done an excellent job for many years now maintaining all the various pieces of equipment and keeping the multitude of batteries fully charged. This includes many other items, in addition to the DATV gear.



Matt's 70cm, 5 Watt, DVB-T Repeater



As seen in the above photo, Matt did a bang-up job of packaging a very nice DATV repeater for BCARES. It's key performance parameters are: Modulation = DVB-T, Input = 441 MHz (6 MHz BW), Output = 423 MHz (6 MHz BW), RF Output Power = 5 Watts (average), Receiver Sensitivity

= -95dBm (for QPSK, 5/6 FEC, 1/16 guard, 1080P, 5.5Mbps), DC power @ 13.8Vdc 0.9 A stand-by & 9 Amps transmit.

The repeater is intended for use with two separate 70 cm antennas. It has provisions for accepting video from a local camera in addition to being a repeater. It also has provisions to provide an HDMI output for a video monitor, as seen in the above photo. As designed by Matt, it was intended to be operated manually by a control operator. More recently, we needed to borrow the repeater for temporary use while the W0BTV repeater is being repaired. It thus needed to be able to operate automatically without a resident control operator. Jim, KH6HTV, designed and installed a simple auto PTT circuit to add this function.

“VersaTune” DVB-S / DVB-T RECEIVER UPDATE

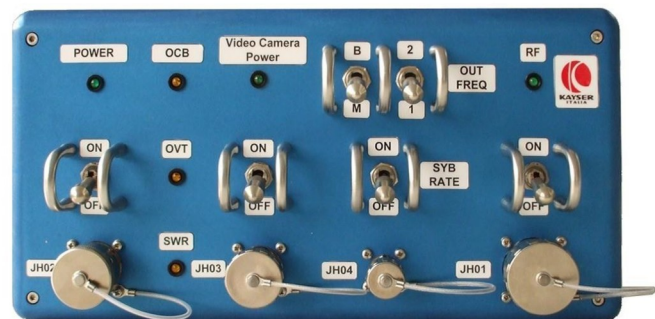
We are working on a new dual mode DATV receiver to be available by mid-summer 2023. This receiver is designed primarily for digital Amateur Television reception operation as a stand-alone complete scanning receiver / DATV repeater controller. It can be used as a simple self-contained

receiver for individual use or as the receive portion of an Amateur Television repeater. It can be programmed to scan up to 7 separate frequency selections from up to 5 selected RF sources

.... 73 de Art, WA8RMC, Columbus, Ohio



International Space Station HAM VIDEO RE-FLIGHT DETAILS



The unit at right is the repaired HamVideo transmitter module ready to be flown back to the ISS on a Cignus rocket now targeted to launch at the end of this May. The original schedule was mid-April but other NASA priorities prevail. As you may remember, this transmitter was installed in the ISS Columbus module in ~2016 and was used for many ISS to earth communication sessions with school students until an electronic failure halted operation. After determining the failure was not repairable within the ISS, it was returned to earth in a Space-X return mission. A terrestrial inspection determined that the defective item was an FPGA programmable IC. It was replaced which made the transmitter operational again. However, a software error in the original transmitter allowed only a blank video screen to be transmitted. It was “fixed” with special software in the ground station receivers but that

was “messy”. Now, back on earth, they had the opportunity to fix the software in the ISS transmitter so standard receivers could be used. The scary part is that the repairs might cause the whole unit to require re-certification which would take 6 months or more. Fortunately, that was not required, only an operational check to make sure there were no RF interference issues with other ISS equipment.

So much for the main HamVideo transmitter but the ID Generator that I designed for use with HanVideo is another story. Because this item is a newly designed part, it must undergo a complete analysis and safety check. Therefore, it was decided to ship the HamVideo transmitter as soon as possible and upload the ID Generator later when it has been flight certified. I have high confidence the unit will pass as I conducted an anechoic chamber pre-certification test here in Columbus, Ohio to make sure it will pass NASA’s radiated RF tests.



Another reason to upload the HamVideo as early as possible was because an older camera with only NTSC video capabilities is being kept in the ISS until the ID generator is available. The new cameras NASA is beginning to use are \$6000 units with “HDMI only” outputs. The ID Generator is required to convert the camera HDMI output to NTSC composite video for the HamVideo transmitter. In addition to the ID generator HDMI to composite video conversion, I added a special message scrolling banner at the bottom of the screen so it will be known that the message is “live” and not frozen. I’m keeping the message content a secret so I’ll know if someone actually was able to see it.

A picture of the ID Generator is shown above. The labeling was not complete at the time I took this picture so the inscriptions are absent. NASA had not yet approved the actual wording yet. YES, THEY MUST APPROVE EVERYTHING!!! The connectors on the ID Generator cable have protective covers installed in the photo but will be removed and plugged into the HamVideo unit JH01 and JH04 connectors in operation.

When the completed system is available for communication, the following parameters will be used.

ISS transmit frequency: 2395 MHz

RF Mode: DVB-S (the same used for commercial worldwide satellite broadcast)

Symbol rate: 1.3MegSymbols / second

Forward Error Correction (FEC): ½

Antenna polarization: circular left hand

After the DATV capability is restored, I believe it’ll become very popular with many USA school contacts.

... 73 de Art, WA8RMC, Columbus, Ohio

Reprinted from ATCO Newsletter, vol. 40, #2, April, 2023

QST -- SMDs, PCBs & Assembly Techniques

Yesterday, I received in the mail the latest, May, 2023 issue of QST. One article caught my attention. "*Surface Mount Design and Assembly for the Everyday Amateur*" by Scott Lentz, AG7FF.

While the SMD/PCB article by Mr. Lentz is well written, I feel that his assembly technique, instead of encouraging hams to make their own PCBs will in fact scare them away for doing so. I agree that yes, solder paste and hot air is used in commercial PCB assembly houses, but it is not necessary for us hams. We can still use our soldering skills to assemble our own PCBs, installing one part at a time. Here are some "*Hints & Kinks*" of mine to hopefully help other hams.

1. **Design Phase** --- When I design a PCB (Printed Circuit Board), I try to avoid extremely tiny SMD (Surface Mount Device) parts such as are now used in our cell phones. They are much too small for humans to assemble reliably and must be placed by robots. I limit the size of my parts to be no smaller than the 0805 size *. Still large enough to be seen by the naked human eye and picked up by human hands with small tweezers.

(* Note: The standard designator for SMD dimensions is in 1/100th of an inch and is expressed as the length x width. Thus an 0805 is 0.08" x 0.05" My personal preference is to design with 1206 components.



2. **PCB Supplier** --- Scott, AG7FF, listed a couple of suppliers he uses. There are also others. For the past 10+ years, I have been using a company Tom, W0IVJ, put me onto. ExpressPCB (www.expresspcb.com) They give away free PCB CAD design software which I use. It consists of two programs. One to design schematic diagrams. The other to layout printed circuit boards. They will fabricate small, non-production, quantities at reasonable prices. They are a USA supplier and offer fast turn arounds.

3. **Assembly Tools** --- I use a small bench vise to firmly hold the pc board. I use small fine point tweezers to pick up each individual SMD component. I solder each component in place, one at a time. I use a very sharp, pointed soldering iron tip on an adjustable, controlled temperature soldering iron station. I use a Xytronic iron and fine tips available from Jameco Electronics. Weller also makes suitable soldering irons. I use very small, 0.015" diameter, tin/lead solder.

4. **Assembly Process** -- I take extreme exception to one statement made by Scott, AG7FF. He said in his article "SMD components come in plastic or paper strips. Peel off the film a little at a time and **dump** the components out ..." A major word of caution here. No bulk "**dumping**" of parts ! Many SMD components have absolutely no marking at all on them, especially capacitors. So once you have a dumped pile of them in front of you, you have no way of knowing what you have. The only marking is typically on the package they came in from the parts distributor. Even the paper strips

they are packaged in typically have no markings on them. I thus only handle one part and value at a time. Say a 1 K Ω , 0805 resistor. I then only remove the number of 1Ks I need from the paper strip and solder them to the PCB before moving on to the next value.

5. **Soldering Technique** --- I have found the best procedure for soldering a single SMD part to a PCB is to --- (a) First with my soldering iron, apply a tiny dot of solder to just one of the pads for a part. Leave all of the other pads bare, flat and clean. (b) Using my tweezers, carefully pick up the part and place it on the PCB close to where I want to attach it. Orient it properly. (c) Now touch the fine tip of my soldering iron to the pre-tinned pad to make the solder molten again and with the tweezers carefully slid the SMD component across the board into the molten solder. Remove the iron tip and let cool. (d) Now with the tiny iron tip and the tiny diameter solder, carefully solder the other pads in place. Use only the minimum amount of solder necessary to wet the pad and part.

Note: I was bothered enough by the QST article, that I wrote the above article and sent it to the QST editor. I hope they publish it in their "Hints & Kinks" section of a future QST. --- 73 de Jim Andrews, KH6HTV

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ICOM IC-905 Update: More details are emerging from ICOM on their new, microwave transceiver, the IC-905. Two new documents are now available. The Basic and Advanced detailed instruction manuals. They don't however have much, if at all, info about it's FM-TV capabilities.

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WOBTV Details: **Inputs:** 439.25 MHz, analog NTSC, VUSB-TV; 441MHz/6MHz BW, DVB-T & 1243 MHz/6MHz BW, DVB-T
Outputs: Channel 57 --- 423 MHz/6MHz BW, DVB-T, or optional 421.25 MHz, analog VUSB-TV. Also, secondary transmitter, FM-TV output on 5.905 GHz (24/7).
Operational details in AN-51a **Technical details in AN-53a.** **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.

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 \$150 which includes free shipping via USPS priority mail. Interested? -- contact Jim, KH6HTV via email kh6htv@yahoo.com

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For Sale: \$180
Hi-Des HV-120-1.2G
DVB-T Receiver

Receiver tunes 100-950 MHz & 23 cm band (1212-1308 MHz). Purchased new in Oct. 2022. Hi-Des price is \$259. Reason for selling -- I now have my own, home-built 23 cm down-converter to use with my Hi-Des HV-110 receiver. Included accessories: remote control, composite A/V cable, 12Vdc cable & CD disc with manual & F/W. Price includes free shipping via USPS priority mail. Interested ? -- contact Jim, KH6HTV via email kh6htv@yahoo.com



ATCO
2023 SPRING EVENT

1:00 PM Lunch/meeting
Sunday May 7, 2023
GENOA TOWNSHIP HALL
(Same hall used for CORC meetings)
5111 S Old 3C Rd, Westerville, OH 43082
FOR MORE DETAILS, CONTACT
ART - WA8RMC 614-891-9273
LUNCH PROVIDED - DOOR PRIZES -
MEETING
BRING A FRIEND AND SEE OLD BUDDIES
BBUDFRIENDS
Possible MINI HAMFEST - SHOW AND TELL