

# Boulder Amateur Television Club TV Repeater's REPEATER

September, 2020



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)

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

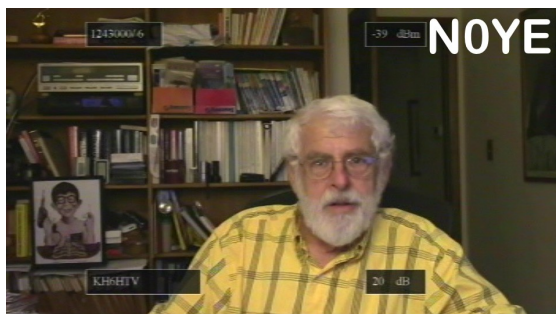


**World-Wide ATV QSO Party:** On Friday, August 28th, the Melbourne Australia, VK3RTV ATV repeater group hosted an ATV QSO party. The organizer was Peter, VK3BFG. The international party lasted for five hours (6 - 11pm local Boulder time). It was streamed world-wide via the BATC server in the U.K.

<https://batc.org.uk/live/> ATV hams in the USA and Australia participated. Here in the USA, there were hams from Maryland, Pennsylvania, Ohio, Colorado, Arizona and California participating. In Australia, hams from New South Wales, Victoria and South Australia participated. Local net controls took the video from their local repeaters and sent it via Zoom over the internet to Peter where he coordinated the operation and then sent the selected video out over the VK3RTV repeater and then on to the BATC.



Here in Boulder, we re-transmitted over our local ATV repeater, W0BTv, the stream from the BATC, except for the times when we were "live" on the QSO party. Then local Boulder hams input their video to the QSO party, where Don, N0YE, then sent it via Zoom to Peter in Melbourne. Locally, N0YE, KH6HTV, K0JOY, WB2DVS, WB2DVT & AB0MY participated live. Others were watching our local repeater. For our presentations, Don had asked Jim, KH6HTV, to lead off with a history of Boulder ATV dating back to the 1970s. Ed, K0JOY, then followed telling about his home-brew antennas for 70cm & 23cm. Pete & Debbie, WB2DVS & WB2DVT discussed the use of ATV in ARES. Bill, AB0MY, talked about his ATV projects, including microwaves.

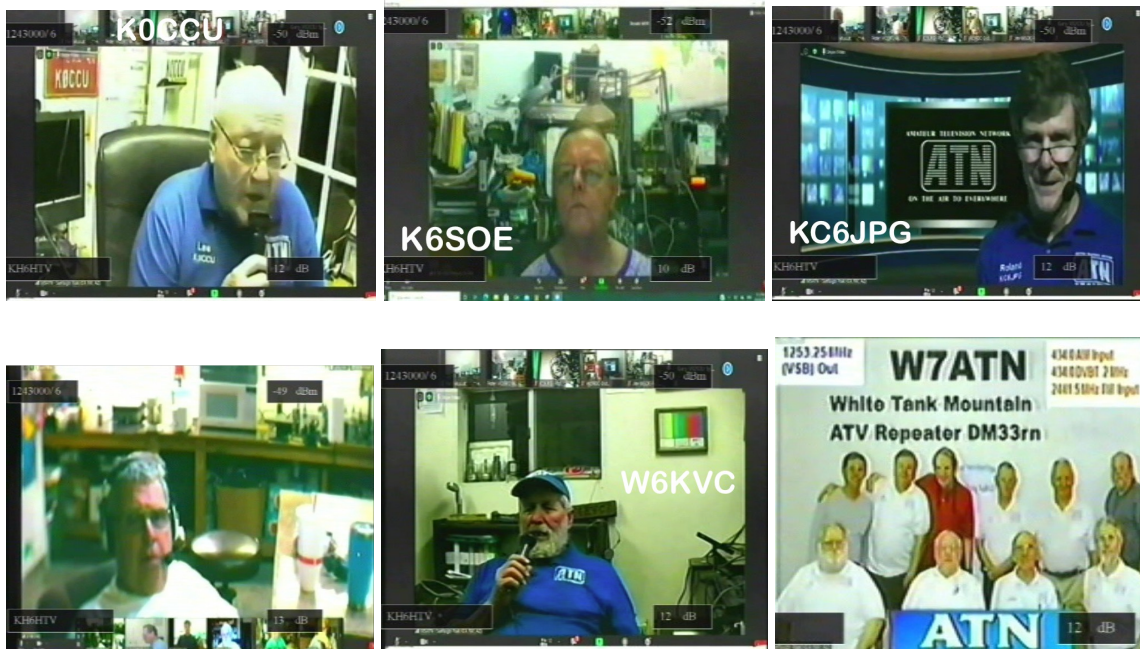






Most participants have been in ATV for a very long time. Most all told their ham radio histories. Some had prepared ahead of time video presentations. There were tours of ham shacks and also ATV repeater sites. Some were extremely impressive, but in different ways. Some looked like miniature TV broadcast studios and/or commercial broadcast transmitter sites, some like a test instrument retail store, some were very neat and proper and others looked like a rat's nest. The following photos are screen grabs of some of the many participants.

### Yank ATV Hams





### Aussie ATV Hams





The operation went off surprisingly well. There were a few glitches. The video quality ranged from fair to poor. This was even though some, such as the Boulder, Colorado repeater run full 6 MHz bandwidth, hi-definition, 1080P quality video. Some repeaters were analog and some were digital with various bandwidths. But after the images had been grabbed, processed and sent several times over the internet, even 1080P hi-def images still showed graininess. We also had some audio issues. Actually audio issues seem to be a bigger problem for most ATV operations, than video. The audio levels were all over the place. And sometimes garbled. Another issue was the BATC stream carrying the actual QSO party was not always on the same channel. Sometimes it was on VK3RTV-1 and sometimes on VK3RTV-2.



**LIME SDR-Mini:** Mario, KD6ILO, has sent in this news item.

Members of the British Amateur TV Club (BATC) have celebrated a milestone achievement. A successful 'barefoot' transmission of digital TV signals using an unamplified LimeSDR Mini over a 16km signal path. The test was on the 23cm band with a 15 element yagi antenna. They were running DVB-S2 at a symbol rate of 250kS. The Lime rf output power was +7dBm (5mW).

Mario also writes -- "I've also been experimenting with this unit also for our members of the San Diego, Oceanside and Vista ADTV Network. Currently we have 6 units operational."

Editor's Comment: *I am getting similar performance here in Boulder with "barefoot", low power, DVB-T on 23cm band. I normally run only +11dBm into a 14 element, loop yagi antenna to access our local ATV repeater, W0BTV. The repeater is 7.9km from my QTH. I am able to put a -90dBm signal into it with a 15dB s/n. Running 6 MHz bandwidth, QPSK, 6Mbps, 5/8 FEC, etc.*



**The Next Ham Frontier -- THz ?** Mario, KD6ILO, has also called our attention to a news item from Germany. **First Ham QSOs on 725 GHz Band** This is a report from Michael, DB6NT. He and Andreas, DB2NP, reported on July 20, 2020, making contacts over distances up to 42 meters. They report that antenna alignment is super critical, similar to dealing with laser beams. They needed micrometer adjustments on their antennas. They have posted a couple of YouTube videos about their efforts. They can be accessed via Michael's web site: <http://www.db6nt.de/en/home.html>

Discussion of this ham radio landmark event on our W0BTV ATV net, got our local antenna guru, Ed, K0JOY, to start reminiscing about his days as an EE professor at Georgia Tech. It triggered Ed to prepare an 18 slide lecture for us on millimeter wave antennas. He then told us of his experience with their antenna range playing with 500 GHz antennas. He said they obtained some 4 ft. diameter, WWII search light reflectors (previously used in

London's defense) and tried them out as antennas for 500 GHz. Ed said it took he and his graduate students over a week to even find the extremely narrow beam. Ed's antennas were separated by one mile.





**Consider a 4 foot Diameter WWII Searchlight  
Converted to a 500 GHz Reflector Antenna**

$$D = 4 \text{ ft} = 1.2192 \text{ m} = 1,219.2 \text{ mm}$$

$$\text{Physical Area} = 1.167 \text{ m}^2$$

$$\lambda_{500\text{GHz}} = 0.6 \text{ mm} = 0.0006 \text{ m}$$

$$D = 2032 \lambda_{500\text{GHz}}$$

**Effective Area (Assuming 72.72% Overall Efficiency)**

$$A_e = 0.725 \text{ m}^2, A_p = 0.846 \text{ m}^2$$

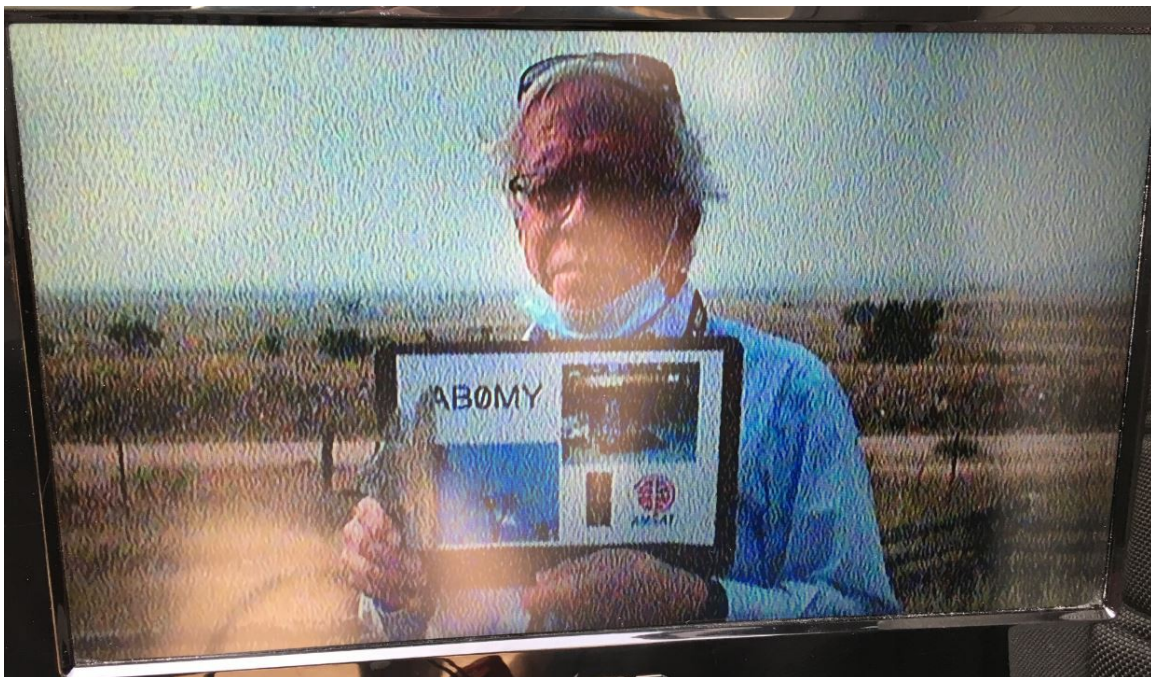
$$\text{Gain} = 2,953,0971 = 74.7 \text{ dB}_i$$

$$\text{Far-field Distance} = R_{ff} = 2D^2/\lambda = 4955 \text{ m} = 3.1 \text{ miles}$$

$$\text{Beamwidths (Assuming } BW_{AZ} = BW_{EL}) = 0.03187 \text{ Degrees}$$

**(It took about one week to find the main beam  
using the Georgia Tech Far-field antenna range.)**

Ed Joy, KØJOY



Bill, AB0MY, 5 cm, FM-TV signal as received by Gary, WB5PJB -- **53 miles !**

## **53 miles ATV with Low Cost, 5 cm, Drone, Microwave Gear !**

The Boulder ATV hams were out again on Sunday, August 23ed trying to push the distance frontier with their microwave gear. This time, they returned to the 5 cm, 5.8GHz band with the el-cheapo, drone, FM-TV gear. The hams participating this time were: N0YE, WB2DVS, WB2DVT, N0FZB, KH6HTV, AB0MY and WB5PJB.

AB0MY and WB5PJB were the farthest separation. Bill, AB0MY, was at Rabbit mountain open space, north-west of Longmont. Gary, WB5PJB, was in the Cablea's parking lot on I-25 at the extreme south part of the Denver metro area. The distance between the two of them was 53.4 miles (86 km). The above photo is Bill's FM-TV signal as received by Gary. Other hams at intermediate locations also were able to successfully exchange FM-TV pictures. Unfortunately, Dr. Murphy again showed up. Pete & Debbie's transmitter went up in a puff of smoke. Their Banggood 2 Watt, amplifier burned out. They ended up in receive only mode. Bill ended up in transmit only mode as he lost the dc power cable for his FM-TV receiver.

We have discussed this FM-TV equipment and it's use in several earlier newsletters dating back to last fall, 2019. The typical 600mW transmitter & companion receiver sells for only \$30 on Amazon. Most are using the L-Com, 23dBi, BBQ grill dish antenna which sells for about \$65. Gary, WB5PJB, was using a 25", 30dBi, Ubiquiti RD-5G-30 dish antenna (\$150). Some were also using the Banggood 2 watt "after-burner" amplifier which sells for \$25. Thus the total cost of only about \$100 for the basic microwave components of transmitter, receiver and dish antenna.

**Caution:** The Banggood 2 Watt amplifiers are quite unreliable. All of us have blown out at least one or more of them. Failure mechanism ? Obviously in some cases too much input rf. But others ? Their reliability rate is fast approaching ZERO ! We are analyzing the dead units and we seem to be pointing our fingers at improper heat sinking, in at least some of them. We hope to report in a future issue of this newsletter our findings -- and hopefully our corrective measures.



## A Portable Test DVB-T Receiver with Monitor and Power Supply

Dave Pelaez, AH2AR, Dayton, Ohio



There are many ways to provide portability for DVB-T receive capability when the need arises at remote sites or during Field Day Operations. One idea for configuring a DVB-T Test Receiver/monitor for such requirements is presented here. Keep in-mind that this approach can use the same hardware as presented, or you could opt to use other hardware items that could easily serve this same purpose. This configuration integrates an FT-817 Lexan stand, a TalentCell Rechargeable Lithium battery pack, and a Liliput HD test monitor along with a Hi-Des, DVB-T receiver.



Key Components for the AH2AR, DTV Receiver  
FT-817 stand, Battery, Hi-Des DVB-T Receiver & HDMI monitor

**LEXAN STAND:** Note that the Lexan stand is available either through Amazon or E-bay. Using the search terms --Support Bracket Mount FT-817 Black Stand-- will provide a number of links where this bracket can be purchased. Typical cost is about \$18. A photo of the stand by itself is provided here:

**POWER SUPPLY:** The power supply being used for this application is a TalentCell 12vdc/9vdc/5vdc Rechargeable Lithium Power Bank. Note that there are a number of different TalentCell models that can be employed. For this project, I opted to use a

YB1208300-USB Power Bank with a capacity of 12Vdc & 8.3 Amp/hours. The 12Vdc power output connection is used to power the HV122A and the 9VDC output is used to power the Liliput video monitor. For this application, the 5Vdc USB output isn't needed, but still could be used to power an HV110 receiver that requires 5Vdc. Typical cost is about \$50.

**DVB-T RECEIVER:** For the DVB-T Receiver, an HV122A is used in this configuration as I needed a DVB-T test receiver that would provide receive capabilities on 23cm at 1 MHz bandwidth. The receiver requires 12Vdc, and for this application, the HDMI output is ported into the 7", Liliput HD (1920 x 1080) monitor. Typical cost for the HV-122A is \$300 (or \$170 for an HV-110). Typical cost for the 7" Liliput monitor is \$160 (new). Note there are a large number of used Liliput monitors for sale on eBay since the units are used in the videography and movie industries and they are continuously upgrading them or dumping them after a certain amount of use. The prices of the new Liliput usually scare the hobbyist away, but there are normally some reasonably priced used monitors available for sale on eBay.



**INTEGRATED CONFIGURATION:** Coincidentally, the “side wings” on the Lexan stand that normally is supposed to center a QRP transceiver on the stand, ended up perfectly cradling the Lithium Battery pack. Keep in mind that this “coincidental fit” to the lexan stand will only work with the YB1208300 Power Bank. Other power banks will work but the power banks would have to be afixed to the Lexan stand in a different manner. I secured the HV-122A with Velcro hook-and-loop tape to the back of the monitor, and also used a very short six inch HDMI cable to interface between the monitor and receiver. Lastly, all Liliput monitors normally come with a ¼ inch threaded tripod mount interface. A ¼ inch bolt used in tripods afixed the monitor securely to the Lexan stand.



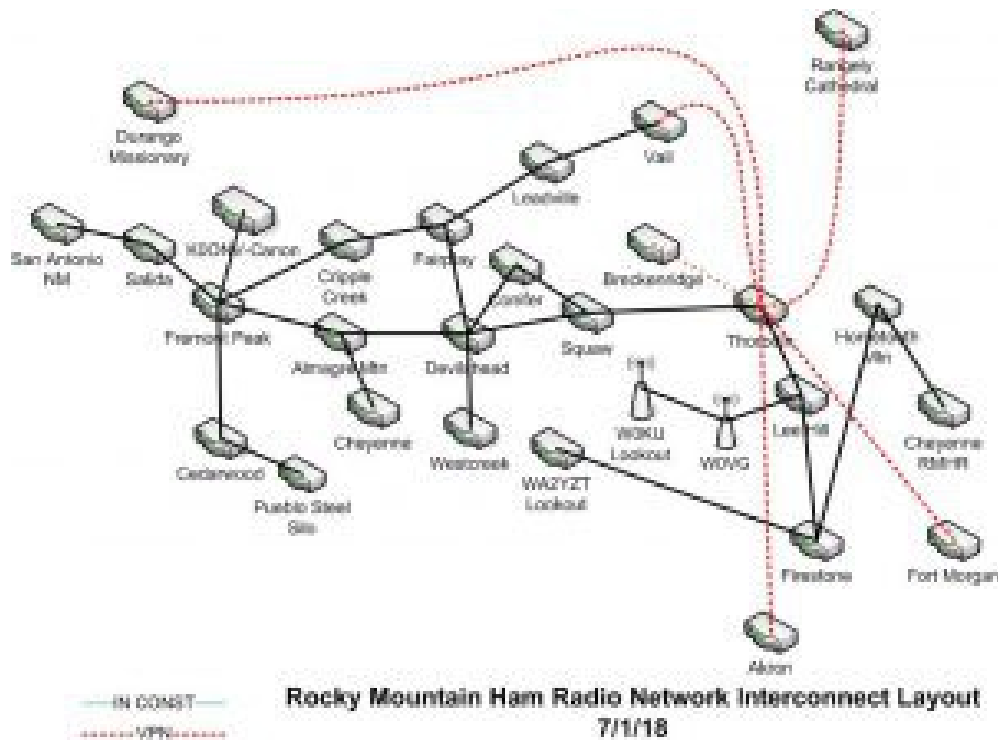


## **BCARES tests Microwave Wi-Fi**

### **Pete, WB2DVS, Boulder, Colorado**

Our local ARES group (Boulder County ARES) has been looking into what new services we could offer the Boulder County Office of Emergency management. One of our board members suggested that we could provide high speed data over microwaves that could be deployed to connect county buildings in the event that the internet is not accessible or as a network that could be set up in the field between sites. Using equipment owned by a ham club in the county, we set up a demo to show the officials in the Office of Emergency Management (OEM) and IT dept. what our capabilities could be and to see if they are interested in funding several endpoints.

The system end points (deployed at buildings or in the field) minimally consist of a 5.8 GHz, dish antenna with built-in Wi-Fi transceiver, a router and an Ethernet switch as well as a laptop that is used to set up the system and provide a client for email and chat services. Optionally you can add IP phones and an IP camera. The two endpoint locations for the demo were the Boulder County Fairgrounds in Longmont and the Emergency Operations Center parking lot in Boulder. They are 10 miles apart and were not line of sight with each other, so we used a router on top of a nearby mountain, Lee Hill.



The router is operated by Rocky Mountain Ham (<https://www.rmham.org/amateur-microwave-network/>) and is part of their backbone 3 and 5 GHz microwave network along the foothills of the Rockies. It uses commercial equipment on the amateur bands. The RM Ham network connects three states of Wyoming, Colorado and New Mexico.

Since each end point for us could see the mountain router, we could connect them together through the mountain location. It was 13 miles from Longmont to Lee Hill and 7 miles from the EOC to Lee Hill. That gave us a microwave datalink from the Fairgrounds to the EOC.

But what could we do with it? We needed an application server to provide things like a PBX (phone system), an email and chat server and a video application. This small server was located not at the endpoints, but at a third place in Longmont. This too was connected to the rest of the system via a microwave link to the router in the mountains. As you can see, that mountain router was the hub of the system, allowing the end points and the server to communicate with each other. We provided a live demo of closed-circuit video, PBX telephone and computer data links. The demo was a fun and successful experience and produced a lot of interest on the part of our served agency and others. We'll see where it goes from here.

73 de Pete, WB2DVS



**Newsletter Details:** This is a free newsletter distributed electronically via e-mail to ATV hams. The distribution list has now grown to over 350. 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. The past 54 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.**

### ATV Repeater -- For Sale

We are an ATV group here in the TWIN CITIES. We have a good working, new digital repeater. Both AM and digital inputs on 427MHz with a output of 1.249 GHz digital.

I have the old 70cm in-band repeater 421/439 MHz for sale. Works well and Ron, WA9NJR tuned it up, just last year. I have had it in my basement for awhile since I got it back from Ron. It's in a nice cabinet. I think it would work great any where. I have all documentation for the repeater. Can supply more info on request. I guess I couldn't put a price on it until I get others opinion. I wouldn't part it out unless I don't get any offers. Feel free to contact me at any time at [n0mnb@comcast.net](mailto:n0mnb@comcast.net)

73's Bill, N0MNB



# W6ORG Surplus

Hey, we are still around and you can ask us for any of the **P.C. Electronics** Manuals and data sheets by dropping us an email to [W6ORG@HAMTV.com](mailto:W6ORG@HAMTV.com)

Products are long gone since 2015, but we have kept up the [hamtv.com](http://hamtv.com) web site with all the app notes, ATV Info, Videolynx, and a lot of parts left over that I would rather have in your garage than mine - Check out the Surplus page.

## Building an amp?

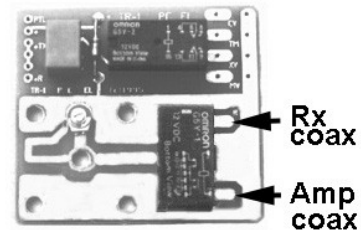
Use our TR-1b Antenna relay board - \$15

Mounts on a Type N UG58 Jack

Switch between Amp and receiver

Switch up to 25 W 70cm but can be modified for 33 and 23cm.

Download  
data sheet  
on [hamtv.com](http://hamtv.com)



## Parts, we got parts:

Make us an offer we cant refuse for larger quantities.

2N5770 NPN used in most all of our gear. Great general purpose transistor to 70cm. Similar to 2N918, 2N2222 and 2N3904 - 5 for \$1, bag of 100 \$10

2N2907 PNP also used in our gear, general purpose - 10 for \$1, 100 for \$8

MM3725 Motorola TO39 NPN used as the video modulator in our KPA5, TX, TC, RTX, and TXA5-RC transmitters and replaces 2N3734 and 2N3553 - \$3 ea, 25 for \$2ea

100 Ohm Pot, Carbon, Panel Mount - Used for video gain control in our P. C. Electronics TC-1, TC70 transceivers, TX70 transmitters, etc.

100 Ohm carbon panel pots are hard to find, most pots at this resistance are wire wound which are too inductive at higher video frequencies. 3/4" shaft length half of which is the 3/8" bushing, 1/4 inch dia round shaft, 1/2W - \$1.50 ea, 25 at \$1.25 ea

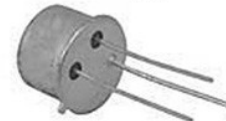
Ceramic Trimmer Capacitor, tuning range 2-8 pF - Sprague GKU6R000 RF peaking cap (red top) used in our transmitters and downconverters. \$1ea, 10 for \$8, 100 for \$65

Feed Through Capacitor - .001 mF.

Used to keep RF from riding in/out on DC, audio and control lines in shielded enclosures such as repeater transmitters, receiver and control boxes - \$2ea, 10 at \$1.50 ea.

Data sheets on the web page

Email Tom at [W6ORG@hamtv.com](mailto:W6ORG@hamtv.com) if interested in any of the items listed on the W6ORG Surplus web page - [www.hamtv.com/surplus.html](http://www.hamtv.com/surplus.html). Ship USA only, USPO flat rate box add \$8.







## Low Noise Pre-Amps & Wide-Band Amplifiers



KH6HTV VIDEO offers a line of modular amplifiers. It includes low noise pre-amplifiers for 70cm & 23cm band and broad-band preamps. Also offered are ultra-wide bandwidth amplifiers with low frequency cutoffs extending down to 1 kHz. These are general purpose amplifiers suitable as instrumentation amps, driver amps, etc. They all are packaged in the same die-cast aluminum enclosure shown in the photo with SMA connectors and feed-thru capacitor for DC power. They all operate from +12 Vdc and include internal voltage regulators. The pre-amps can optionally be built to be powered via dc coming in on the output rf connector. All amplifiers come with an individual test report.

Model #	Bandwidth	Gain	Noise Figure	P(-1dB)
70-LNA	390 - 470 MHz	21 dB	0.5 dB	+21 dBm
23-4LNA	1220 - 1320 MHz	16 dB	0.9 dB	+19 dBm
WB-LNA-3	0.05 - 2.4 GHz	23 - 10 dB	0.8 dB	+20 dBm
UWBA-101	1 kHz - 1.5 GHz	22 dB	2.5 dB	+12 dBm
UWBA-102	1 kHz - 5 GHz	11 dB	5 dB	+14 dBm
UWBA-103	250 kHz - 3 GHz	20 dB	4 dB	+20 dBm

note: see individual spec. sheets for complete specifications

KH6HTV VIDEO    [www.kh6htv.com](http://www.kh6htv.com)    e-mail [kh6htv@arrl.net](mailto:kh6htv@arrl.net)  
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