

# Boulder Amateur Television Club TV Repeater's REPEATER

January, 2024  
2ed edition, issue #152

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

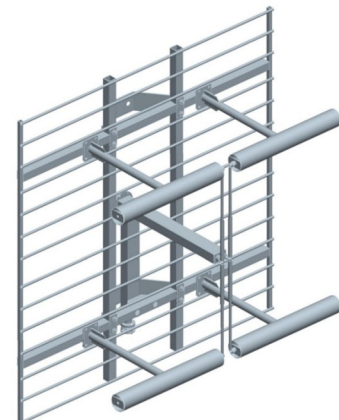
ATN web site: [www.atn-tv.com](http://www.atn-tv.com)



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

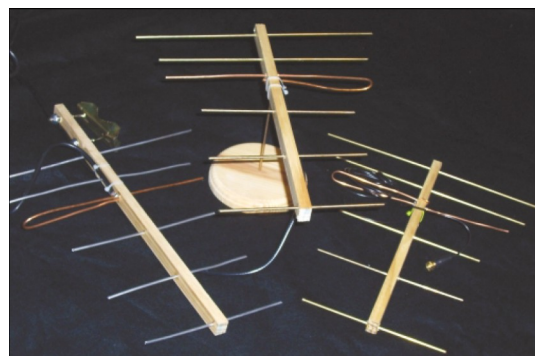
## ATV ANTENNAS --- continued ---

In our previous, Dec. 2023, issue #150, we started discussing antennas for ATV. We encouraged feed-back from our readers. Yeah ! We have gotten it and are reprinting it here. We still encourage others to also write to us and tell us about your favorite ATV antennas.



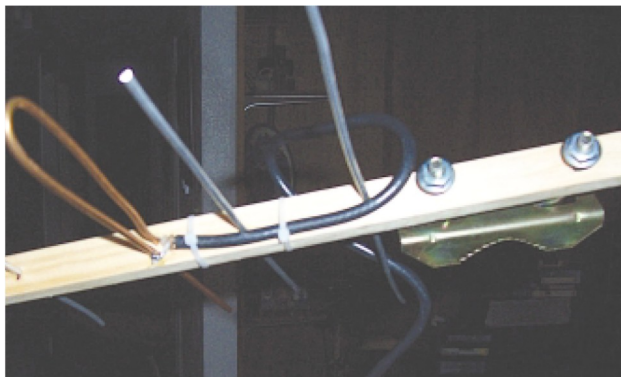
## Cheap ! Yagis

Doug Reed, N0NAS writes --- "Regarding your ATV antenna tests, have you ever looked at the WA5VJB "Cheap Yagi" wooden beam antennas? Kent Britain is an antenna designer among other things and wrote a column in CQ magazine for quite a few years.



His "Cheap Yagis" are near zero cost and have been duplicated many thousands of times. They will work if built according to directions, and will fail if "improved" by the builder. His original designs were for SSB, but since then he has published FM, ATV, HDTV, and antennas for other bands.

Use copper wire for the driven element and just about anything for the other elements. Try to stay with the diameter or wire gauge specified. To tune it, you mostly adjust the driven element loop and spacing from the reflector and director elements. Stay with wood of the thickness he specified. Build it to spec and it will have the specified gain. We use a series of these antennas as gain reference standards on the NLRs antenna range and during CSVHFS conferences. Here are some good references to Kent's Yagis."



<http://wa5vjb.com/yagi-pdf/cheapyagi.pdf>

<http://wa5vjb.com/references.html>

<https://www.repeater-builder.com/antenna/pdf/cheap-yagis.pdf>

Doug writes further --- "I'm slightly surprised if none of your group have heard of "Cheap Yagis" before! Kent is pretty famous in the VHF-Microwave weak signal world for these antennas and his PCB antennas for the microwave bands. He also usually runs the antenna measurement range at whatever weak signal conference he attends. Beyond 420 MHz, I expect most antennas are broadband enough not to need a special model. It really worked nice to use a NanoVNA to adjust the SWR of a newly built antenna."

73 de Doug Reed, N0NAS, St. Paul, Minnesota

*Editor's Note: Check out Kent's web site at ( [www.wa5vjb.com](http://www.wa5vjb.com) ). I have in the past purchased Kent's microwave PCB antennas and they do work.*

## Pneumatic ATV Antenna Mast Project

The antenna mast project that I have been working on is nearing completion. The pneumatic mast, extends to 25 ft, and folds over for stowage in the horizontal position. I modified a "traffic bollard" for the fold-over base. It takes about two minutes to inflate the extendable mast using a portable tire inflator. A remote flux-gate compass has been added to this configuration. The remote compass employs a magnetometer is used for accurate antenna orientation. See the photos below.

73 de Dave, AH2AR, Dayton, Ohio - DARA

*photo shows Pneumatic Mast prior to Inflation  
(70cm Antenna and 23cm Antenna used for ATV)*





## 'Aussie' DATV Repeater Antennas

Peter Cossins, VK3BFG, writes to tell us what the Melbourne, Australia, ATV repeater group is using for antennas.

"Hi Jim .. on the antenna theme .... VK3RTV has four 23 cm horizontally polarized Dual Quads each oriented towards main service areas. The 70 cm transmit antenna is a vertically polarized omni.

The dual quads are easy to manufacture once you develop a means of bending that results in an accurate profile. VK3RTV's quads are fed with hardline inside the panel enclosure. The enclosure is type used for electrical switchboards. A check on any attenuation occurring when sealed up resulted in no measurable effect. The matching sections are brass tube available

from hobby shops with the inner being the stripped out sections from 75 ohm cable which just fits. This means that all the hot soldering can take place and then the inner 75 ohm cable inserted. Using this overall technique the line lengths can be very accurately determined for the operating frequency. Looking at the frequency response plots show that the whole assembly is broadband however. The vertical is also broadband so both types ideal for ATV. ---- Performance figures are attached.

I have in hand a slotted omni vertical for 2.4G . The plan is to install this with a masthead down converter to 23 cms. A Combo DVB/S/S2/T can then be used as a receiver. Will undergo testing of



the system before installation. I have yet to undertake any performance figures for it but it is rated at 15dBi."

Regards Peter Cossins, VK3BFG



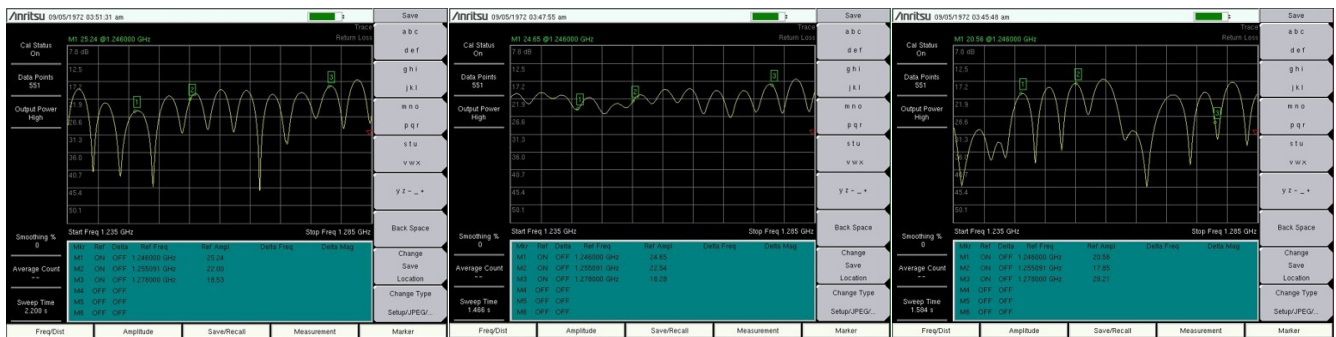
Front with radome attached



Rear Panel



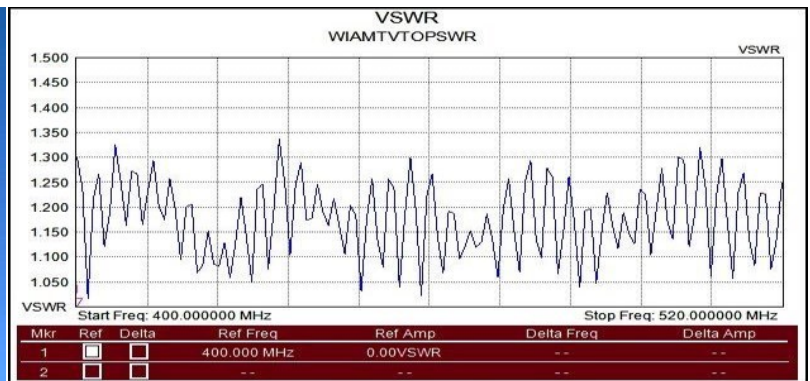
Dual Panel Matching Network



1246

1255 MHz Dual-Quads

1278



Measurement Parameters			
Cal Status	On	Fixed CW On/Off	Off
Data Points	130	Serial Number	634118
Date	4/27/2020	Firmware Version	V5.34
Time	1:32:25 PM	Model	S331D

VK3RTV 70cm Transmitting Vertical Antenna



## ANTENNA TRIPOD MOBILE ANCHOR

Jim, KH6HTV

How many of you fellow ATV hams like to go out in the field for ATV DXing ? We want to be able to set up on a temporary basis a big, bulky antenna such as a high gain Yagi. But we don't want it to then fall over and break, or worse yet fall on someone and injure them. We need some support arrangement. Guy wires are one obvious solution. But they are a pain to set up and are also a tripping hazard. Here is a very simple solution. Let your automobile be the anchor for your big Yagi. I typically use a standard roof mount, antenna tripod and some sections of standard 1 1/4" antenna mast for my portable, in the field ATV operations. I built very simply an automobile anchor for the tripod/mast using two planks of 1x6" wood. I made a simple "T" with them and bolted them together with (3) 1/4-24 bolts/nuts. I then also drilled 1/4" holes for more bolts to attach the three legs of the antenna tripod. Now, after it is assembled, simply drive one wheel of your automobile over the extended plank to firmly anchor your antenna assembly.

---

## Test Results for 23 cm Antennas for ATV Service

Jim Andrews, KH6HTV & Don Nelson, N0YE

The Boulder, Colorado ATV group has undertaken a project this winter to characterize 70 cm and 23 cm antennas to determine which are most suitable to recommend to other hams for broad-band, ATV service. We are preferably looking for commercial antennas which are "**Broad-Band**" and work well across the entire band. Unfortunately, most manufacturers provide very skimpy specs. and some actually give out no information at all about the actual performance of their antennas. Some simply

list the mechanical dimensions, etc. We have had several false starts on our testing, but finally have hit upon a suitable antenna range and procedure. Here is a summary table with our test results on the commercial 23 cm antennas which we have tested. We also tested some home-brew antennas but they are omitted from this table. The results were only shared with the builders. We will publish the results for 70 cm antennas in the next newsletter. The complete details of the antennas and tests will be published soon in an application note posted on our web site. Obviously, not all commercially available antennas were tested, only those which various members owned and contributed to the test. We tested four categories: Yagis, Base Station Omnis, Mobile and HT. We were quite encouraged by the results and how close some of them came to manufacturer's specifications. Others were quite far off, with some even showing negative gains. The reference antenna we used was a 1/4 wave ground plane with +2.2 dBi gain.

## 23 cm ANTENNA GAINS in dBi

ANTENNA	Mfgr's Gain Spec	1243 MHz	1255 MHz	1267 MHz	1279 MHz	1291 MHz
<b>YAGI ANTENNAS</b>						
Antennas-Amplifiers 70cm23WB11 (70/23cm, 4/7 elements, 20" boom, rear mt)	11.4dBi	10.7dBi	11.8dBi	12.1dBi	12.2dBi	11.0dBi
Directive Systems DSE2414LYRMK ( 14 elements, 36" boom, rear mt )	15dBi	14.5dBi	16.2dBi	16.9dBi	16.6dBi	15.5dBi
<b>BASE STATION - OMNI</b>						
Diamond X6000A (2m/70cm/23cm, 126" tall)	10dBi	8.2dBi	7.1dBi	6.6dBi	6.0dBi	4.0dBi
<b>MOBILE ANTENNAS</b>						
Diamond NR2000NA (2m/70cm/23cm, 41" tall)	9.7dBi	<b>-1.9dBi</b>	<b>-1.0dBi</b>	2.9dBi	7.1dBi	6.1dBi
<b>HAND-HELD ANTENNAS</b>						
Diamond SRH999 (6m/2m/70cm/23cm, 19.5" tall)	none	3.2dBi	4.2dBi	3.7dBi	3.2dBi	2.8dBi
KH6HTV Reference 1/4 $\lambda$ GP	2.2dBi	2.2dBi	2.2dBi	2.2dBi	2.2dBi	2.2dBi

=====

# DIAMOND X50NA



A Division of

[Home](#) • [Products](#) • [Technical Info](#) • [Sample Photos](#) • [Warranty](#) • [Dealers](#) • [Contact Us](#)

## X50NA Dualband Base/Repeater Antenna

The X50NA and X50A are excellent choices where ruggedness is required in dual-band application.

### Special Features:

- Fiberglass radomes
- Overlapping outer shells for added strength
- Strong waterproof joint couplings
- Stainless steel hardware
- Wide band performance
- Factory adjusted - no tuning required
- High wind rating
- DC grounded

### Specifications:

Band:	2m/70cm
Gain (dBi):	4.5/7.2
Max Power Rating:	200
Wind Rating:	135 MPH (no ice)
Height (feet):	5.6
Connector:	Type-N
Element Phasing:	3-1/4", 3-5/8"



We plan to feature in each issue of this ATV newsletter some of the antennas which we have tested and we recommend for use for ATV.

The favorite base station, omni-directional, vertical antenna with the Boulder ATV hams is the Diamond X50NA. We have found that it gives decent gain and a flat response across the entire 70 cm band.

The X50NA is dual-band for both the 2 meter and 70 cm bands. It has a reasonable, manageable height of 5' 7". It also has a reasonable cost of \$100. The image shown on the right is the total information given about it by Diamond.

Diamond says the X-50's gain is 4.5 dBi on 2 m and 7.2 dBi on 70 cm. They do not specify over what frequency range. We did major antenna tests in 2011, 2017 and once again here in 2023-24. The previous tests were documented in KH6HTV application notes, AN-4 & AN-40. For each of the test sessions, the X-50 was one of the antennas tested. In earlier tests, we also tested two other Diamond omni antennas, their X-200 and X-6000. The X-200 was also a dual-band (2m/70cm) and was taller at 8' 4" and supposed to have 1 dB more gain. The X-6000 was a tri-band (2m/70cm/23cm) and considerably taller at 10' 6" and supposed to have 2 dB more gain.

While we got different gain values (in dBi) for these antennas in different test sessions, they all definitely showed similar frequency response trends across the entire 70cm band from 420 to 450 MHz. The X-50 always showed a good, uniform gain across the entire 70cm band. Both the X-200 and X-6000 showed gain similar to Diamond's specifications, but only at the very high end of the band in the top FM portion of the band (445-450 MHz). They showed very poor gain on the lower portion of the band.

The tests run in 2011 and 2017 were done using CW signal sources. Our most recent tests were performed using actual, 6 MHz, DVB-T TV signals. Thus, the most recent results are the average gain across a wide, 6 MHz TV channel. Here is our most recent test results for the Diamond X-50 antenna on the 70 cm band. Diamond's spec. was 7.2 dBi, which was hit at the top end of the band.

423 MHz	429 MHz	435 MHz	441 MHz	447 MHz
5.4 dBi	5.5 dBi	6.5 dBi	6.8 dBi	7.6 dBi



Return Loss of the Diamond X50NA Antenna: center freq = 435 MHz, span = 50 MHz  
5 dB/div & 5 MHz/div. The 0 dB reference line is 1 division down from the top.

We also measured the Return Loss (RL) for every antenna tested. We use a Rigol DSA-815 spectrum analyzer with its built-in tracking generator and an external 20dB directional coupler. The plot was calibrated and normalized using a short circuit at the far end of the test cable. Return Loss is the same as measuring VSWR, just expressed differently. For comparison to vswr --- -14 dB RL ==> 1.5:1 vswr, -10 dB RL ==> 2.0:1 vswr, & -6 dB RL ==> 3.0:1 vswr.

The Diamond X50NA return loss was measured and showed an excellent match with a minimum return loss of -32 dB at 448 MHz. It was better than -14 dB from 436 to 453 MHz and better than -10 dB from 426-455 MHz.

73 de Jim, KH6HTV, Boulder, Colorado

## ANTENNAS - AMPLIFIERS

### model 70cm23WB11

This is a NEW antenna from Serbia. We originally reported on it in our December, 2023 ATV newsletter, issue #149. Colin, WA2YUN, had found it while surfing the internet. He purchased one for evaluation and kindly let us test it.

Bottom Line ---- This is an excellent antenna. Very rugged construction. Very well documented with very detailed specs. on their web site.





<https://antennas-amplifiers.com/dualband-70cm-23cm-antenna-two-connectors-70cm23wb11/>

Plus, their specs. are accurate. We found that it really does meet spec. for gain. They claim 8.1 dBi for 70 cm band and 11.4 dBi for 23 cm band. Here is what we measured:

70 cm Band	423 MHz	429 MHz	435 MHz	441 MHz	447MHz
Gain	8.8 dBi	7.9 dBi	7.2 dBi	7.2 dBi	7.6 dBi
23 cm Band	1243 MHz	1255 MHz	1267 MHz	1279 MHz	1291 MHz
Gain	10.7dBi	11.8dBi	12.1dBi	12.2dBi	11.0dBi

We also measured the Return Loss for this antenna and found it to be extremely well matched across both the 70 and 23 cm bands. *note: -14dB RL ==> 1.5:1 vswr; -10dB RL ==> 2.0:1 vswr*

Return Loss	fo (MHz)	RL(fo)	> 14 dB RL	> 10 dB RL
70 cm Band	432	-39dB	417-437 MHz	411-455 MHz
23 cm Band	1281	-35dB	1220-1317 MHz	NA

We feel this is an excellent antenna for any ham wanting a yagi for both bands. It would be ideal for ARES groups as an addition to their ATV pac-sets for out in the field, portable operations.

Plus this antenna is definitely not a wallet buster. It's price is 139 € (Euros).

73 de Jim Andrews, KH6HTV, Boulder, Colorado

---

## Computer Control of the Hi-Des HV-110 Receiver

**John Kozak, K0ZAK**

I'm still in the testing phase here for rebuilding one of the local repeaters. I was in the need for some sort of remote receiver I could set up anywhere and control it remotely.

I wanted to use the Hi-Des HV-110 receiver but needed to figure out a way to remotely control it. (controlled via IR remote only as you know) While Calvin at Hi-Des says it is somewhat controllable via onboard pins, he didn't go into detail and I didn't want to engineer a way to do that.

I'm using a microPC running Win11 (more on that later) connected to the internet for control.

Standard Hi-Des HV-110 for receiver. Cheap USB connected relay board for powering HV-110 on & off, as well as changing bandwidth switch between wide & narrow settings as I am still testing 6 MHz vs 2 MHz bandwidth on range and quality.

Software called IRCommand2 that allowed me to create a GUI version of the Hi-Des remote control. The Lite license for \$10 was all that was needed to do what I needed rather than the more expensive full license.

I was hoping to use one of the many old MCE IR dongles I had laying around from my old Microsoft Media Player days. Software has a special driver written for these. HOWEVER, no go. I got an immediate response from the software author after I e-mailed him from his contact button on the webpage. Turns out that Microsoft just broke the MCE drivers in one of the latest Win 11 updates, and since they abandoned Microsoft Media Player a while back, aren't interested if fixing it. Everything would still work if I was running Win 10 however. He suggested I purchase a USB-UIRT module which he still uses for his software updates. I ordered that and it works fine.

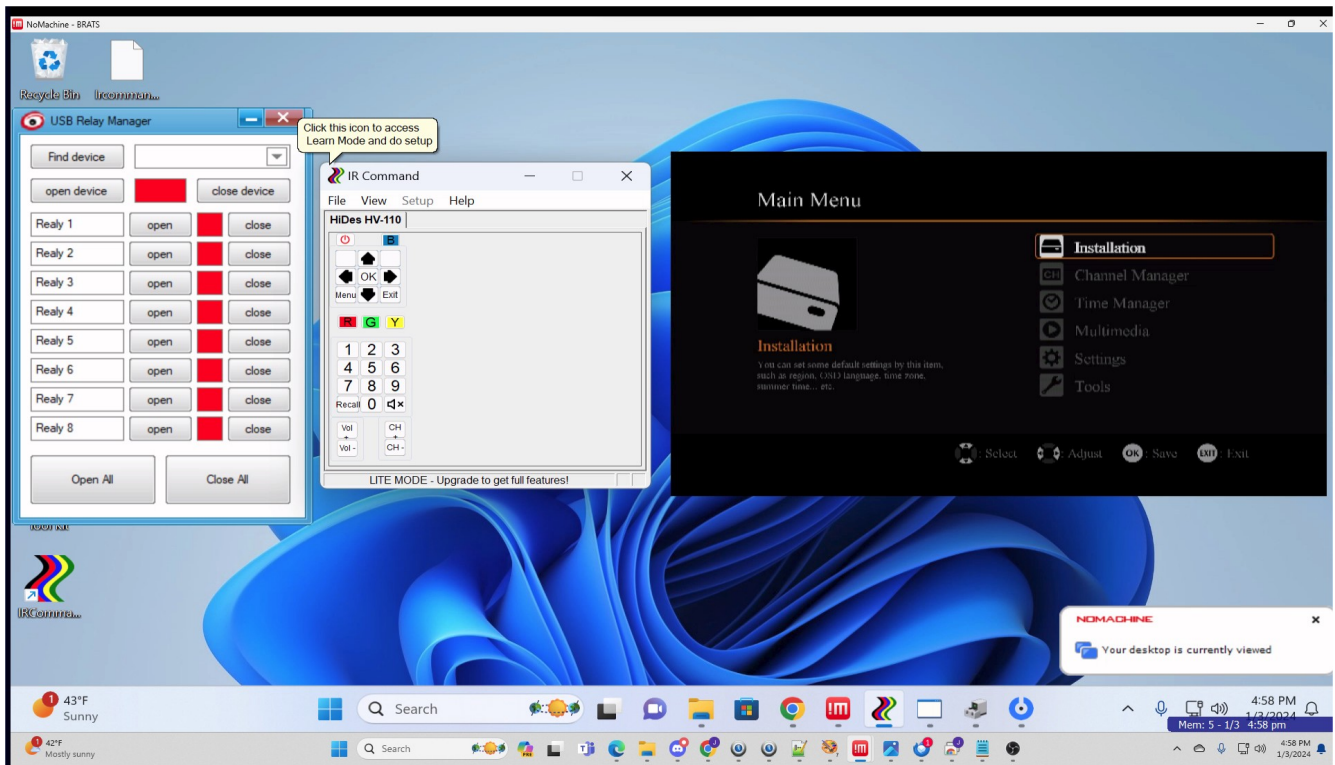
I then ran the HV-110 HDMI output through a HDMI Splitter to feed both the local monitor and the MicroPC via a USB dongle. The hardest part was capturing the actual IR signals and setting up the GUI buttons. The remote uses NEC1 IR protocol but the software wants RAW ir info. So I ended up capturing the NEC codes and converting them to RAW then editing my buttons manually.

With this setup, I can remotely control and change all of the functions of the Hi-Des HV-110, power it on and off, even upgrade its firmware if I'm brave enough :). Oh yea, I also stream the HV-110 output from the microPC using VDO-Ninja so I can monitor the video without even logging in to the MicroPC.

Next is to try to replicate this using a Raspberry Pi and not tie up my MicroPC. But for now, this will do. I'm more comfortable with windows anyway.

I hope this will prove useful to someone in case they want to remotely control their HV-110 receivers. It took me a few weeks of head scratching to get all of the IR stuff working correctly.

73 de John Kozak, , KOZAK, Reisterstown, Maryland



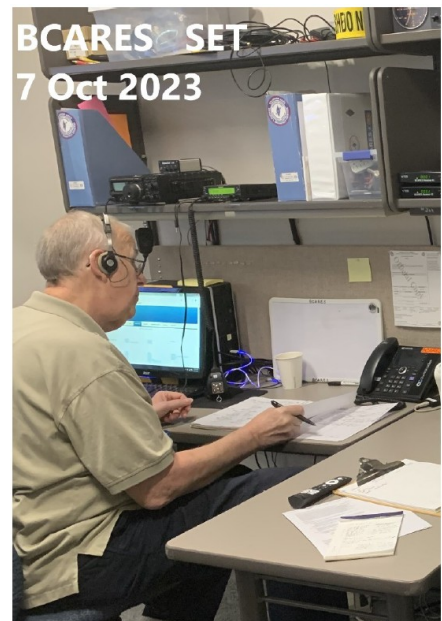
# *Silent Key - NOORUN*

To all BCARES, LARC & BARC Members:

It is with a very heavy heart that I inform you of the passing of Jerry Schmidt this morning (January 4th). He was at the hospital undergoing a medical procedure when he passed.

Jerry was the epitome of a “Gentle Giant” and his commitment to BCARES and the communities he served will surely be missed.

Allen Bishop, K0ARK  
BCARES Chairman & Emergency Coordinator



## FEED-BACK:

**ESA-AMSAT** --- Hello Jim -- best wishes for 2024 from Germany and many thanks for your ATV newsletter. that is my best source remaining for our german ATV webpages !

One correction is needed for your most recent newsletter, issue #151, as you can see in the attached picture name from it: -- The person in front of the camera is not PD0AP from ESA, but Graham, G3VZV, from AMSAT-UK and BATC...

73 Klaus Kramer, DL4KCK, Cologne, Germany

**WOBTV Details:** **Inputs:** 23 cm Primary (CCARC co-ordinated) + 70 cm secondary all digital using European Broadcast TV standard, DVB-T 23cm, 1243 MHz/6 MHz BW (primary), plus 70cm (secondary) on 441 MHz with 2 receivers of 6 & 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).

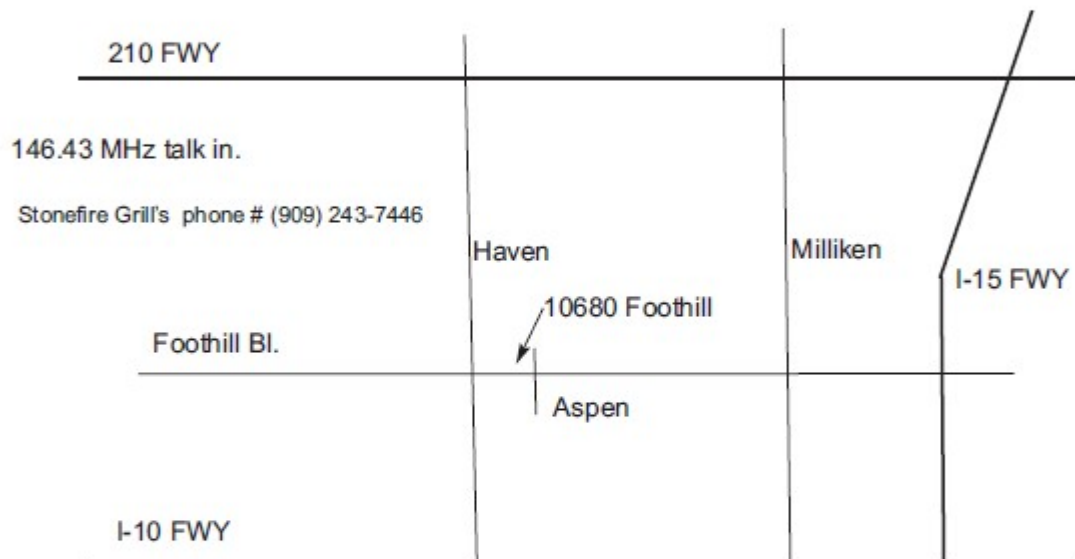
**Newsletter Details:** This is a free newsletter distributed electronically via e-mail to ATV hams. The distribution list has now grown to over 500+. News and articles from other ATV groups are welcomed. Permission is granted to re-distribute it and also to re-print articles, as long as you acknowledge 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.**



*ATN Winter Meeting February 17, 2024 at 12 noon*

*Stonefire Grill, 10880 Foothill Bl, Rancho Cucamonga, CA*



Please join us for lunch about 11:30 in the Stonefire Grill's private dining/meeting inside patio room. We have reserved the patio from 11:30-2 PM, our business meeting will start at noon.

1. 12:00 Tom WB6HYH our president will open the meeting.
2. 12:05 Repeater update by the technical committee.
3. 12:30 Mike WA6SVT will give the treasurer's report.
4. 1240 Discussion of ATN promotion and our ATN truck.
4. 12:50 Roland will discuss our ATN net and how to get more RF check-ins.
5. 01:00 Break and renewing your dues.
6. 01:20 Nomination of officers and elections.
7. 01:35 New business.