Boulder Amateur Television Club

TV Repeater's REPEATER

July, 2023
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BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com

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

Merelda, VP6MW & Mike, VP6MC (WA6SVT)

ATV HAM Installs DTV Transmitter on Pitcairn Island

Mike Collis, WA6SVT (VP6MC)

Aloha Jim ---- My family and I are back from our recent trip to Tahiti and Pitcairn Islands. The above photo is of Merelda Warren, VP6MW, and I wearing our Amateur Television Network (ATN) shirts at the Picairn boat landing. Merelda is the resident ham on Pitcairn. He was born and raised on the island and is a 7th generation Bounty descendant.

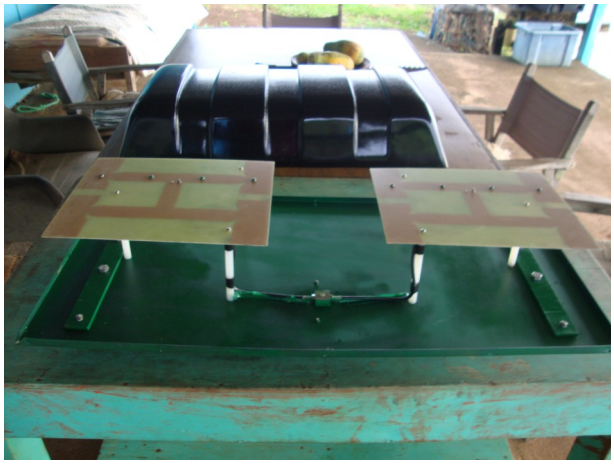
Ran HF at times. Very good DXing especially to Europe. I also met up with some of the VP6A, DX expedition from Ducie Island. They stopped by Pitcairn on their way back home.

ZBTV is Pitcairn Island's first Digital TV station. UHF channel 25 (506.0 MHz) DVB-T at 8 MHz bandwidth. Power output is 8 watts and covers Adamstown. Programming is ABC-Australia on IS-18 satellite using a 6 meter dish. I donated the transmitter and my time working with Jay Warren and Kerry Young. Improvements planned will be an upgrade from a coax feed line to Heliax.

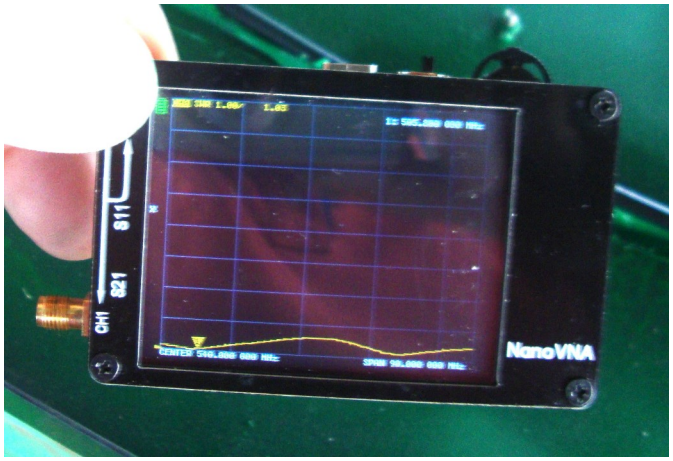
Many years ago the pastor of their church at the time installed a home satellite dish and a 5 watt analog channel 21 TV transmitter for the Hope channel. The old system was hit by lightning and the dish was rusting to the point it was no longer usable. The system lay idle for several years. I took the four bay panel antenna apart and performed a full rebuild including modification for the tropical environment to reduce the chance of internal and external corrosion. The old feedline is LMR-400. I had to cut off 45 feet as the end of the line was left to the weather and it took it's toll on the coax. Loss is still not so good at 7 dB for 160 ft run. The old run was 205 ft.

New heavy duty pole is now located closer to the equipment vault and high enough to clear the ridge to see into Adamstown. New Heliax is ordered from New Zealand. Transmitter is a Hi-Des HV-320 and an RA45H4452M, LDMOS power module. The amplifier has over temperature, voltage and SWR protection circuit.

The old defunct TV system was never licensed. This is the first commercial communications license issued since just after World War Two when Pitcairn had ZBP marine ship to shore and a government shortwave radio station. I helped the Pitcairn government with generating a license for their TV station. The ITU designates the prefix for various countries and ZB is for commercial licenses. The county then selects the suffix.

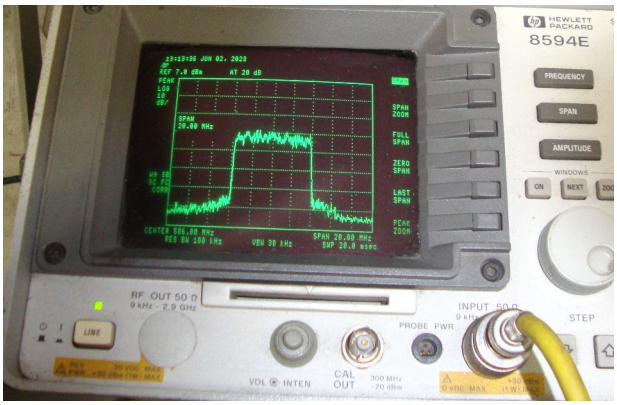


Refurbished UHF Transmitter Antenna



Antenna VSWR after rebuilding

Since this is a TV station, then TV is what we chose for the suffix. The Pitcairn government has issued ham radio licenses for years but this is the second commercial license in a century. The vault is shared with USGS earthquake monitoring station. The vault is mostly underground with one side open. The 6 meter dish is new and was installed about two years ago. We finished the install by connecting the feed system LNB and conduit - IF cable run.

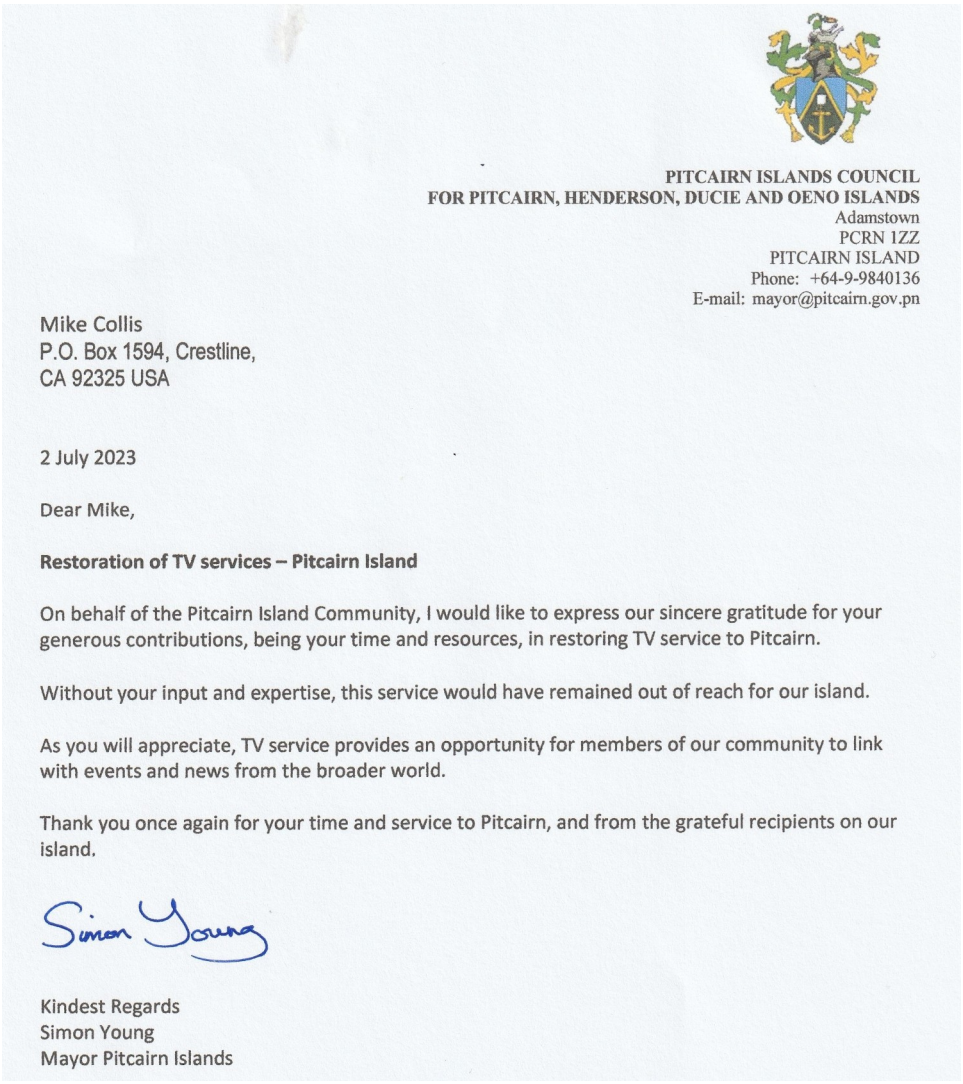


RF Spectrum of New Transmitter

Most of the residents have smart TV sets to stream online video. Although this worked, it tended to clog up the internet. With the addition of ZBTV, there is much less clogging of the internet now. The general store had several new in the box, UHF TV receive antennas from old times and when ZBTV came back on the air and the word was out that it worked, the antennas sold out in an hour's time!

73, de Mike, WA6SVT (VP6MC)

ZBTV transmitter antenna on crest of hill as seen from the boat landing



PITCAIRN ISLANDS COUNCIL
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Mike Collis
P.O. Box 1594, Crestline,
CA 92325 USA

2 July 2023

Dear Mike,

Restoration of TV services – Pitcairn Island

On behalf of the Pitcairn Island Community, I would like to express our sincere gratitude for your generous contributions, being your time and resources, in restoring TV service to Pitcairn.

Without your input and expertise, this service would have remained out of reach for our island.

As you will appreciate, TV service provides an opportunity for members of our community to link with events and news from the broader world.

Thank you once again for your time and service to Pitcairn, and from the grateful recipients on our island.

Simon Young

Kindest Regards
Simon Young
Mayor Pitcairn Islands

SUCCESS at LAST !
70 cm RFI is Gone !
(maybe ?)

6 July - Boulder, W0BTV Repeater, ATV Net Well, we finally, after a long spell have good news to share with our readers. Our ATV net today was flawless. Everyone got into the repeater with great signals and NO Freeze Frames ! Everything worked well on all three of the repeater's inputs of 23cm (1243 / 6 MHz) and the troublesome 70 cm inputs of 439 / 6 MHz and also 439 / 2 MHz.

We started with Don, net control, on 439/6 with a perfect 23dB s/n and -58dBm signal strength at the repeater's input. Pete & Debbie on 439/6 with a perfect 23dB s/n signal of -70dBm. Steve, from up on Sugar Loaf Mtn., then followed via his WA0TQG-TVR (23/70cm) repeater with a 439/6, 23dB s/n signal of -56dBm. Next up was Jack with a narrow-band 439/2 of -70dBm, but still 23dB s/n. Don then tried 439/2 MHz and put -60dBm, 23dB s/n into the repeater. Then Jim from way out east of town tried 70cm instead of his usual 23cm input. On 439/2, he put in -79dBm with 20dB s/n, while on 439/6, he put -78dBm with 17dB s/n into the repeater. Everyone's digital picture was P5 perfect with Q5 CD quality audio and no break ups, nor freeze frames. Yeah ! ! !

So what changed ? ? ? --- We don't know at this point. As long as the RFI stays away, I guess we now don't care. At least we proved the basic repeater is still working fine.

73 de Jim, KH6HTV, & Don, N0YE, W0BTV Trustees

WB0CMC -- Omaha, Nebraska
ATV Repeater Update

ATV BACK ON THE AIR. All the equipment was put in the rack on July 3 and mostly hooked up. I discovered that there was only one outlet not used so had to go back on the 4th with a plug strip. I finished hooking everything up and re-checking all of it and turned it on. No breakers popped, an important test since the power supply for the amplifier has a 0.1 FARAD filter capacitor at 50 Volts and

a 0.025 Farad at 16 Volts. Big in-rush. The system still works pretty much like it used to but with some nice additions. One of the color bars (*) now has a 400 HZ tone audio with it at 25 KHz deviation. There is also a camera available with a mic that's hot when the camera is on (Lots of noise from the FM transmitter blowers). The camera is inside the building so it's just more of a security thing. There is an important addition to the 434 MHz receiver. It is either analog like it used to be or digital. The digital format is DVB-T, a European format used by nearly all US digital ATVers. It's a good format and one of the cheapest around for the equipment. Both recievers use the same antenna and input filter. There is a priority switch that selects the A-V signal (both analog) and transmits it in NTSC. The repeater is running right at 200 watts sync power. The digi RX has an analog output: NTSC with stereo audio if desired (both channels combined, so watch audio phasing if you're using both audios.) The pattern generator (just a "jim-crack"but kind of neat) has a crystal controlled time base instead of the original R-C one. Control freq is still the same. NO PL required. If you want to see if you can receive the repeater, key in the access code. This should get you color bars with ID super-imposed. Don't forget to ID on the voice repeater when you're done. # shuts every thing back off or it will time out in around 15 or so minutes as well. The repeater IDs itself every 10 minutes or so by a video super-imposed. With ATV a legal ID can be either audio (voice) or video (hold up a sign or put it in the back ground of your picture or use a super if you have the equipment) or both. Take your pick. If anyone wants the digi format parameters, I'll be happy to send them your way. For more on this and digi stuff see www.atn-tv.com and www.kh6htv.com . All three antennas are about 350 feet above ground and on the highest hill within the city limits so coverage should be good for quite a long way's away. It was before so coverage won't change much if at all.

73 de John, WB0CMC

In a seperate location on the cable tray is the receiver's ATV channel filter. Not visible in the photo are the analog and digital receivers. The 435.5 MHz channel filter has 0.5 dB insertion loss in the pass

band, 7 MHz band-width and 70 dB rejection ± 1 MHz on either side of the pass band. Note the size of the coax cables coming out of the ceiling which are going to the antennas !

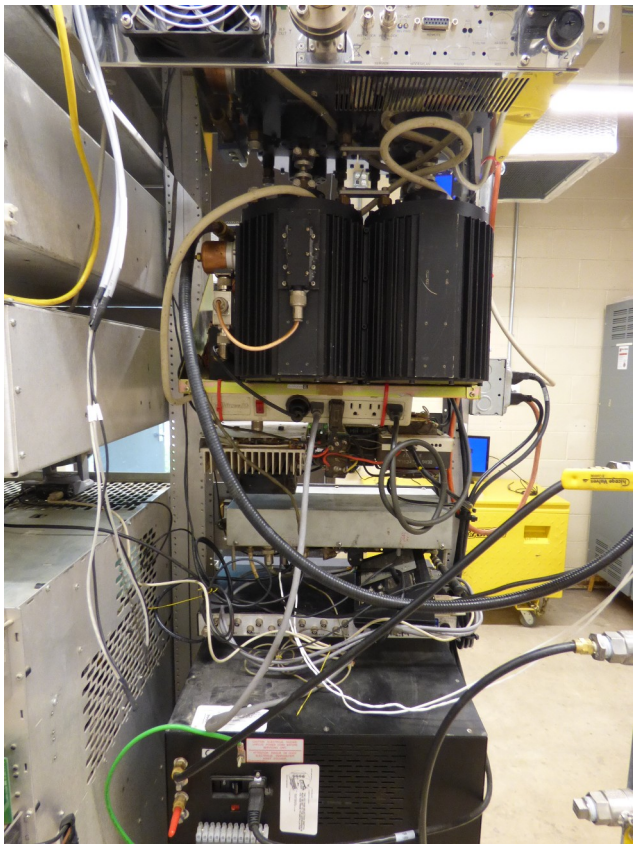

Photo on the left is the front view of the Omaha, Nebraska, 70 cm, WB0CMC-ATV repeater. The equipment in the rack from top to bottom consists of: top, ATV channel filter with 1/2 dB insertion loss and 6 MHz pass band. Next down is the 250 Watt amplifier set for 200 Watts NTSC, analog sync power. Next rack i s the controller and 5 Watt exciter. At the bottom is the color bar generator with ID superimposed.

Photo on the right is the rear view of the repeater rack. At the top is the ATV channel filter with an isolator. Next down is the rf power amplifier. Next is the controller and the bottom is the color bar generator.

Editor's Note: *Whow ! What an impressive repeater. Plus it's location is to die for.*

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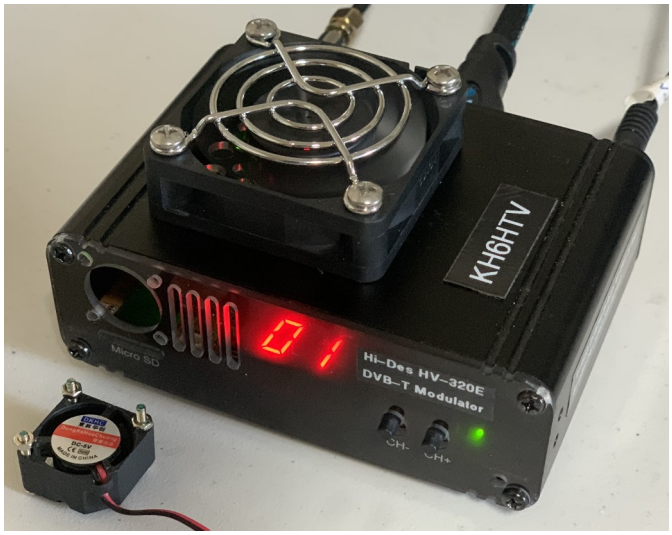
Thermal Study and Cures for HV-320E Modulator

Jack, K0HEH & Jim, KH6HTV



Back in 2017, when Hi-Des had come out with some of their newer products, including the HV-320 modulator and their HV120 receiver, we had purchased them and then discovered that they really didn't like to work outside of an air conditioned, lab environment. Taking them out in the field and exposing them to direct sunshine caused them to mal-function. At the time, our solutions were to add rubber feet on the bottom of the metal enclosures to allow air to circulate under the boxes, plus add a muffin fan to the top of the box. This was documented in the app. note, AN-37 "Thermal Issues with Hi-Des, DVB-T Equipment". Shortly after AN-37 was published, Hi-Des then modified the design of the HV-320. They added rubber feet and drilled ventilation holes in the plastic front cover and installed a miniture 20x20mm muffin fan in the front cover. Current production HV-320s come with this fan installed. We thus withdrew our AN-37 from our web site as it was no longer necessaray.

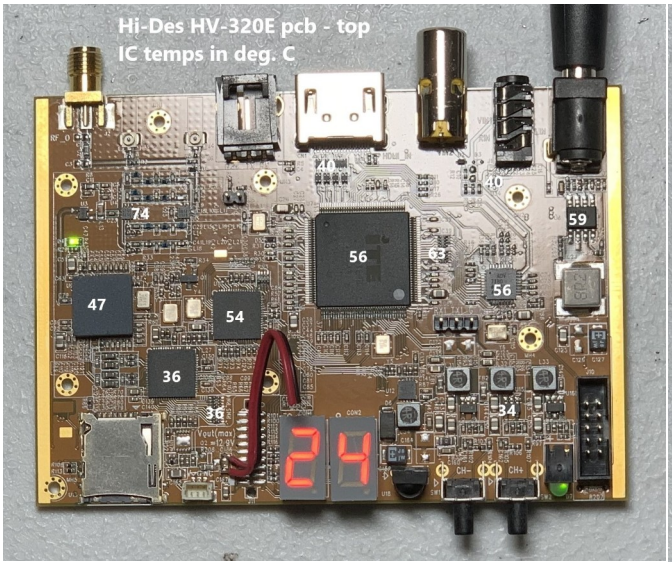
In the more recent past, Jack, K0HEH, began to have considerable grief with his old Hi-Des, model HV-100EH, DVB-T modulator. It put out very intermittant signals. Essentially unusable. Jack then invested in an infa-red thermal measuring gun. The inexpensive ($20) gun he found at Harbor Freight included a spoting LED red dot projector and a very narrow measurement beamwidth. (bar code# 92363-69465, spot size = 8:1)

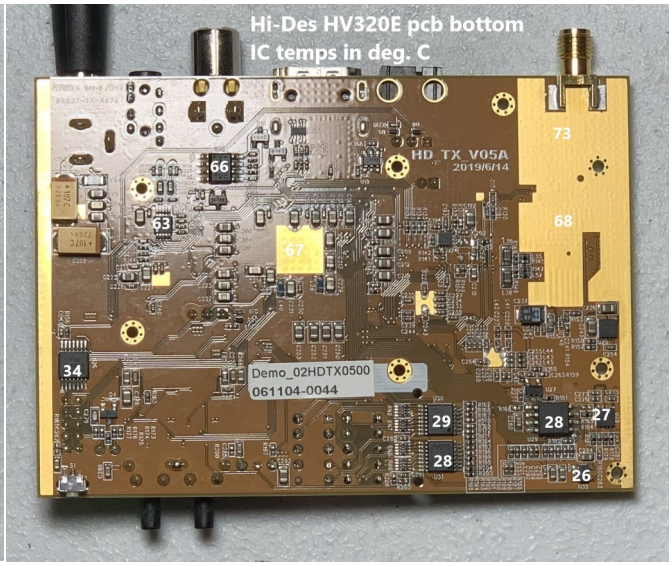
Jack was thus able to determine the actual case temperature of each and every IC in his HV-100. With this he was able to ID which devices were running the hottest and thus was most suspect to be causing his trouble. Jack then found at MPJA.com some extremely tiny finned heat sinks intended to be attached directly to ICs. They included thermally conductive adhesive strips for attachment. Jack did a wholesale treatment adding heat sinks to several ICs. Using these solved Jack's HV-100 thermal problem. Jack purchased both 8x8mm and 14x14mm finned aluminum heat sinks. MPJA sells them for $3 for a package of 10. (8mm p/n 35610-HK, 14mm p/n 35615-HK)

Last year, Jim, KH6HTV, had purchased a new HV-320E. Recently the 20x20mm muffin fan failed in it. Jim, removed the fan and attempted to run the unit just relying upon natural convection via the front panel holes. But the case ran quite hot and after some time of operating (in normal ham shack

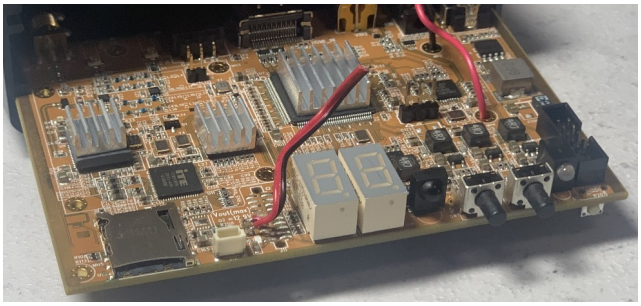
temp), the output became flaky and unusable. So Jim, checked with Digi-Key. A 20x20mm muffin fan replacement cost about $16. But Jim thought as long as I am replacing it, why not go with a larger, less expensive fan. Maybe it might also be quieter. The tiny 20x20mm fan created an annoying level of noise in the ham shack. Discussing this on the W0BTV weekly ATV net, Jack than suggested Jim also try his heat sink solution. So now, the HV-320 will be cooled both using added mini heat sinks and also a larger muffin fan. The 50x50mm muffin fan creates a "hurricane" level of air flow, but also considerable noise when run off of the normal (12-13.8Vdc) supply. It was found that using a series 150 Ω resistor slowed the fan down and made it much quieter and still gave a nice flow of air, much more than with the original tiny 20x20mm fan. A circular pattern of holes were drilled in the top surface of the metal enclosure. The fan was mounted, along with a finger guard using 6-32 screws. The above photo shows the HV-320 with the new 50mm fan installed along with the tiny 20mm fan sitting in front.

Before making any mods to the HV-320 pc board, we first used Jack's IR temp gun to study the temperature of individual ICs on the HV-320 pc board. The board was operated out in free air, laying on the work bench. The two photos of the top and bottom of the pcb show the measured temperatures. One IC, U9, in particular had an extra hard thermal radiatior pad already attached to it by Hi-Des. It was near the SMA output jack and was probably the RF output stage ?? Even with this radiator, it's temperature measured 47ºC. Several other ICs on the board were also running quite hot. Hot enough to burn your fingers ! It should be noted that ICs are mounted on both the top and bottom of the pc board. On the bottom of the board, there were some large metallized areas used as ground planes and also heat radiators. The one in the center of the board, underneath the largest IC, U7, measured 67ºC. The larger ground plane near the SMA RF output connector measured the hottest at 73ºC. With this much heat on the bottom of the board, we than also decided we needed to add a few ventilation holes to the bottom of the HV-320 metal enclosure.





We added the aluminum, finned heat sinks to three of the ICs. The largest, custom ITE IC, U7, in the center of the board got a 14x14mm heat sink. Smaller ICs, U9 & U10, got 8x8mm heat sinks. The remaining hot ICs and transistors were too small to attach even the 8x8mm heat sink.



The 50x50mm, 12Vdc fan, plus the 150 Ω resistor were wired directly to the +12 Vdc power input jack. With the series resistor, the fan only pulled about 30 mA of current. The previous large hole on the plastic front panel where the original tiny fan was mounted was left open as an exhaust hole for the circulating fan air. Now in operation, the fan noise is very quiet and the metal enclosure runs very cool to the touch. The modified HV-320 was then run for 24+ hours as a burn-in test and performed flawlessly.

Advice for Repeater Builders: If you are planning to build a DVB-T repeater using the Hi-Des modulator or receivers, then we advise you to take extra special precautions relating to thermal cooling. Repeaters are most often in out of the way, un-attended locations, sometimes in unheated or uncooled shacks exposed to weather extremes. Plus all of the equipment in a repeater rack is running continously 24/7 for months/years on end. Failures can be costly. So, we suggest that you add these extra heat sinks and larger cooling fans to the Hi-Des gear. Plus any other suspect parts that develop any appreciable heat in normal operation. Such as a Raspberry-Pi, etc.

73 de Jack, K0HEH & Jim, KH6HTV, Boulder, Colorado

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International ATV QSO Party: On the last Friday and Saturday of August, I will anchor a DATV QSO Party based out of Melbourne Australia. Our local DATV Repeater VK3RTV has an SRT input which is a superior technology to RTMP. It is also possible to use Zoom as a mechanism. Zoom will be used as a Back Channel for event control. The best option is for an Anchor to manage inputs to a local Repeater and then forward the output of the Repeater either by direct SRT or Zoom. The international component initially starts on the east coast of the USA and moving with the timeline to the west coast. Later in the day stations in Europe can also participate. I am looking for any individual stations that may like to participate and also anyone that could act as a local Anchor.

VK3RTV is the Melbourne DATV Repeater in Australia with a two channel, multiplexed, DVB-T2 output on 445.5 Mhz. VK3RTV also streams via the BATC when it is active. 23 cm Inputs are both DVB-S/S2 and DVB-T.

Anyone interested please contact myself, Peter, VK3BFG, at ***pcossins@bigpond.com***

MICROWAVE ATV: Don, N0YE, is getting cabin fever now that nice weather has finally arrived in Boulder, Colorado. So at our July 6th ATV net, he started talking up our taking our microwave ATV gear out in the field once more for ATV-DXpeditions. He did an on the air survey of what bands folks had gear available for. At this point, the most number of ATV hams have gear for 5.8 GHz, analog FM-TV. So, it looks like our first outing will be using this gear. Don has thus scheduled next Saturday morning, the 22ed for the first one. For future outings, later this summer, we will explore using DVB-T on one or more other bands of 1.2, 2.4, 3.4, 5.8 or 10 GHz. As a reminder, you can check out ahead of time your 5 GHz, FM-TV receiver and antenna with our W0BTV repeater's beacon on 5.905 GHz. It transmits an NTSC analog signal 24/7.

FEED-BACK:

W0BTV - RFI: Nice newsletter Jim! At your repeater site, are there any 2 meter repeaters? If so, if close mounted antennas to your 440 MHz ATV antenna takes place the 3rd harmonic of a 2 meter repeater will kill your ATV RX. I had the issue years ago at Santiago Peak and gave a LPF to the 2 meter repeater owner and that stopped the issue.

73, Mike, WA6SVT, ATN-S.California

Vertical vs. Horizontal Polarization (the never ending debate !): Jim --- There really is nothing stopping you from switching to horizontal polarization and also being able to still support public services. The 20dB isolation that you will achieve from the other 70cm users would actually help greatly in creating a useable link during emergencies. There are several omni-directional horizontally polarized portable antenna designs that are easily fabricated. But much more importantly, if someone was really serious in supporting emergency services, they should, at minimum, be using a tripod and Yagi antenna out in the field. Trying to depend on a whip antenna to close the ATV repeater link, especially when it is unknown at what location an emergency will occur is extremely sketchy at best. Whips are fine for FM repeaters but will fall short for ATV if the path has much obscura. I would think that the more likely reasons for not switching to horizontal polarization is the trouble people will have in changing their local antenna installation, for non-emergency ATV repeater use. Of course, it also takes some planning and metal bending to fabricate an efficient slot (or rib cage) antenna for the ATV repeater site. Such a project is doable.

Cheers, Dave, AH2AR, DARA

W0BTV Reply: Dave --- Thanks for your comments. Much appreciated. Our Boulder ARES group does in fact have and uses YAGI antennas when needed. They along with antenna tripods, masts and coax are all stored in our equipment cache along with all our other emergency comms gear at our 911 center with 24/7 access. Our gear also includes a portable, 10 Watt, 70cm, DVB-T repeater. BUT for many operations it is roving feet on the ground moving around, not stationary, hence the need for vertical whip antennas. The whips are not buried in back packs with the transmitters, but are attached to the camcorder tripods up in the clear away from rf absorbing bodies, etc. There have been some operations when net control wanted the TV camera crew moving quite rapidly from one location to another. Not enough time to redeploy a complete yagi system. ------- 73 de Jim, KH6HTV

RE: Hi-Des Receiver's HDMI Your issue with HDMI output "might be" resolved with firmware version https://www.dropbox.com/sh/u4qknjize785xzw/AAB95PgWJJHk7rf6n5lsfmLEa?dl=0 (V0.0.1.72.165_high HDMI driving value) for the HV-110. Have you tried it? I assume you have, but if not, maybe it would work with all your monitors. I also assume too you have "Low Latency mode" set to OFF. ON is the default for the low latency firmware only and it can (dependent on video being received) seriously degrade the video. However, even with it ON, the video out should never go "black.." ☹ Another thing to try assuming you have not already… connect an analog monitor up and hit the "SUB" button on the remote. It should switch you to the analog CVBS port and display 480p. You have to toggle power as it looks for that port first on boot up (I think). If it does not output video right away, try repeated button pushing of the SUB button. I have had the -110 and 120 output video at the same time with different resolutions. Maybe the receivers always would do this as I have not played around with CVBS much in the past. The "latest" production -110s I have are a couple I received after the $99 ones were no longer available. These were bought at the current price of $119.

Thanks again for the newsletter. Always look forward to reading it. 73 de Mel, K0PFX, St. Louis, MO

W0BTV 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 439 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/***

W0BTV 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/***

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***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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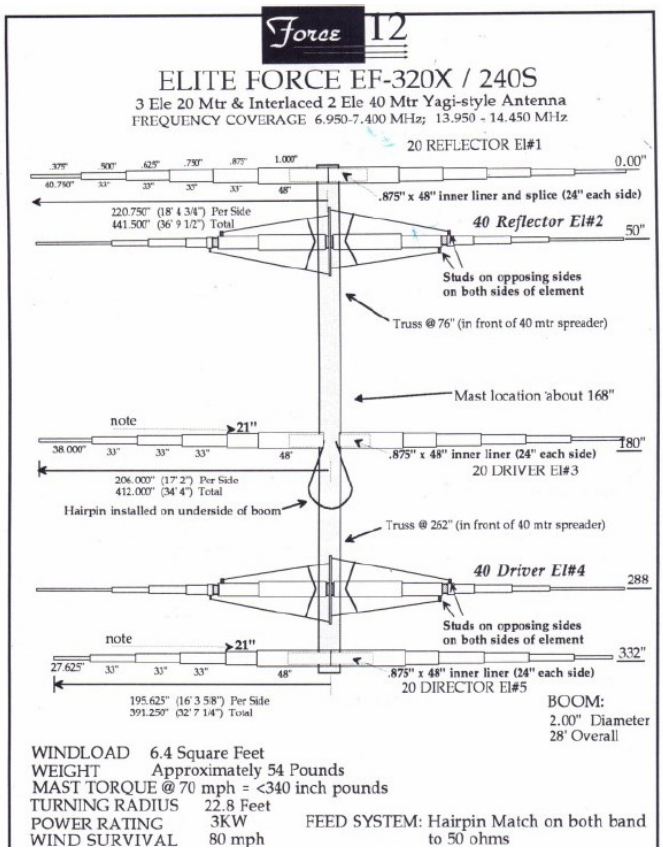
Here is a Selection of Some Items Listed For Sale or Give Away
For details, see the SLATS' web site

Icom ID-1 23cm Digital Transceiver

PTZ Controller & Control Head



Rocky Mountain Ham Radio

2023 ARRL Rocky Mountain Division Convention

August 11-13 | Albuquerque, NM

Registration is now open for the 2023 Rocky Mountain Division Convention in Albuquerque, NM August 11-13, 2023. The Very Large Array (VLA) tour is going to be phenomenal !
General Convention Information:

https://www.divisionconvention.org