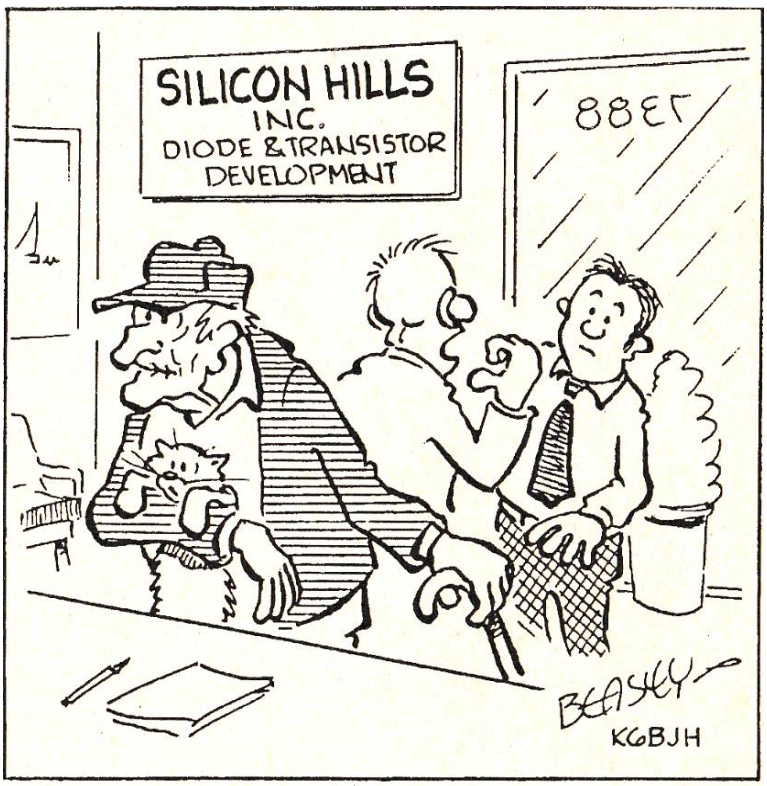
ATCO NEWSLETTER

VOLUME 37 NUMBER 3 **July 2020**

The ATCO newsletter is the official publication of a group of amateur television operators known as "AMATEUR TELEVISION IN CENTRAL OHIO Group Inc" published quarterly (January, April, July, and October)

ATCO SPOTLIGHT TOPICS

Thanks to Beasley, K6BJH (SK) for allowing us to share his cartoons. For the complete book on "The Best of Beasley" go to the ATVQ Magazine web site (http://atvquarterly.com/) available for purchase.



SAYS HIS NAME IS MR. GALENA --- CLAIMS HE INVENTED THE FIRST SOLID STATE DEVICE AND HIS CAT DEVELOPED THE JUNCTION

ACTIVITIES ... from my Workbench

Well, here I am again, folks! It's my turn to impress you with all of the wonderful things I've been doing in this trying time. But, if "**wonderful**" is the goal, I've got disappointing news for you. I'm just trying to cope and do my thing to stay safe. Sorry about that!

Now, that's not quite true either for I **HAVE** been cleaning the shack area and throwing things out that I haven't touched in years. My wife says that definitely qualifies as WONDERFUL in her opinion. I do have a basic rule: pitch the stuff untouched in 20 years and could be replaced with a trip to the store. Only the stuff that has potential value and can't be replaced at any cost shall not be discarded. The only problem with that strategy is that the old stuff classified to be tossed out normally gets put in a staging area that is later re-classified as not replaceable. As a result, a lot of that stuff just gets shuffled back onto another shelf so it looks like **new** stuff. Sound familiar???

Now, what's going on in the ATV world? The ATCO repeater could use some upgrades and minor repair but since the start of the COVED-19 issue started, it's been really hard to get there except in an emergency. I DID make one trip there in early March just after the start of COVED-19 to test for the existence of our infamous interference and also check on why the MESH bullet was not working. Yes, the interference IS there, but at a much lower level. Then I checked the power to the MESH bullet and found it OK. I checked the cable to it on the outside and found nothing disturbed. However, the roof on top of the communication room was so cluttered with cabling and temporary beams, it would have been very difficult (and unsafe) to try to climb the ladder to the MESH Bullet location. Also, I was advised to stay away from that area. If a trip there was absolutely needed, I would have had to have a full climbing body harness and assistance from one of the workers. Needless to say, my visual observation was enough to tell me to stay away! The social disturbances later prevented me from returning as I feared for my safety on the street downtown.

In the meantime, I constructed a rib cage antenna to replace the defective one at the Jones Road site. The antenna is done but nothing tested yet as it's too hot in my driveway to drag everything out and set it up. It REALLY has to cool down a little.

I'm also working on a possible DATV standalone receiver design. I made a hardware prototype already in order to write code. He's doing a feasibility study at this time. No promises yet but things look good so far. I'll give more details when the design is farther along but, if implemented, it will give DATVers access to an affordable combination format DATV receiver. Hopefully, we can then convert more of you to digital ATV.

That's all for now. It's too bad most, if not all, Hamfests will be cancelled this year. However, at this time the Findlay Hamfest is still ON. They say they have complied with the State of Ohio requirements as long as everything is outdoors. We'll see, but September is a way off yet so many things can change by then. Stay tuned!

The way it looks, the ATCO Fall Event will be cancelled also. That's not until the end of October so let's keep our fingers crossed. Stay safe!!!
…WA8RMC

ATV NEWS FROM OTHER CLUBS

Baltimore Radio Amateur Television Society B.R.A.T.S.

- The BRATS W3WCQ/R ATV repeater came on the air just after launching of the Metrovision ATV repeater in Washington, DC in the early 1970s. Since Metrovision is now off the air, BRATS claim to have the oldest ATV repeater remaining on the air in this country.
- A new feature is the DVB-T beacon (ID hourly for ten minutes) as the BRATS ATV repeater is being rebuilt to retain NTSC input along with DVB-T input and replacement of the NTSC output with DVB-T. Preliminary results show that the lower power DVB-T output provides a more significant area footprint than the former NTSC output in the 440 MHz band.
- The ATV repeater system has replaced historical discrete components for operation with a LINUX-based bus that features a home-written video selector/controller. The selector/controller remains under development while in use.
- With Wi-Fi available at the ATV repeater site and another site, capture of off-the-air signals from the ATV repeater are intended to be streamed to the Internet. Eventually other Internet source inputs will be considered.
- Early discussions with the Chesapeake Amateur Television Society (CATS) are proceeding toward capture of the CATS 1.291 MHz FM satellite-format signals as input to the BRATS ATV repeater. A first step toward linking.
- Hardware progress has been slowed since most BRATS sites are covid-19 restricted.

The Chesapeake Amateur Television Society

- The CATS club operates two Amateur Television Repeaters. One repeater is located at the Laurel Hospital in Laurel, MD. It has an analog input frequency of 434 MHz and an output frequency of 421.25 MHz. The polarization is horizontal for both the input and output.
- The CATS also operate a FM output repeater in Towson, MD. It is on the roof of the Tabco Building, one of the tallest buildings in Towson. The output frequency is 1291 Mhz. The repeater has an AM input frequency of 434 MHz analog. Antenna polarization is vertical for both input and output frequencies. The repeater has a range of approximately 20 miles. The club is planning to link the two repeaters. The linking may use a combination of FM and DVB-T modulation schemes.
- The CATS have a weekly 2-meter net. Each Wednesday evening at 9 PM there is a regular group of club members who check in. The net helps to keep the local amateur community aware of club activity.

Wilmington, Delaware repeater

The Wilmington repeater has been active since around 1985.
Inputs: 434.0 MHz NTSC 438.0 MHz DVB-T 2 MHz bandwidth. 2.418 GHz FM link from Darby
Output: 423.0 MHZ DVB-T 2 MHz bandwidth 1.255 GHz FM link to Darby

Darby, PA

Input: 439.250 NTSC 1.255 GHz FM link from Wilmington
Output: 421.250 NTSC 2.418 GHz FM link to Wilmington
NTSC inputs / outputs are Horizontal
The Darby repeater has been active about five years. It replaced the Philadelphia repeater in 2009.
…73, Dave KC3AM

Boulder, Colorado Amateur TV Club, W0BTV

We still have not been able to gain access to the govt. building where we have our ATV repeater located. Thus, we have been unable to install our newest transmitter. This past winter, we built another ATV transmitter for our repeater. It was to operate on 5.905GHz, with FM-TV modulation. The rf output power is 2 watts and the antenna is omni-directional, horizontally polarized with 10dBi of gain.

When the corona-virus pandemic started and everyone was staying home, we added a second, weekly ATV net on Sunday afternoons. More recently with things opening up, the participation in that net dropped considerably. We

have discontinued that net and are now only holding one ATV net a week on Thursday afternoons, starting at 3pm local time. The net typically runs for about 1 1/2 hours. We stream our ATV nets over the BATC server in the U.K. To watch, click on either KH6HTV-TVR or N0YE. The major ATV activity going on here in Colorado at present is on microwaves, both the 5cm and 3cm bands. The 5cm (5.8GHz) band, with FM-TV, is a really inexpensive way to play with microwaves. The equipment cost is under $100. We are using the really low-cost transmitters and receivers marketed for video from drones. The models TS-832, +28dBm transmitter and RS-832 receiver combo can be purchased for a low $30 from Amazon. Most Boulder ATV hams are using a BBQ dish antenna with +23dBi gain. We buy these from L-Com for < $70. To date the farthest distance has been 22 miles.

The other microwave activity here is on 3cm (10GHz) band with hi-def, digital TV, using DVB-T. We are using transverters built by Don, N0YE. They are Down-East Microwave 2m to 3cm or 70cm to 3cm transverters for SSB. Don has modified them for use with DVB-T. Most put out about +17dBm rms (50mW) of rf power on DVB-T. The ATV hams are using either 12" (+27dBi) or 18" (+32dBi) dish antennas. So far, the longest distance contact between two of these has been 24 miles. There will be more 5 and 10 GHz microwave DX-peditions this summer trying to push the distance envelope.
…73 de Jim Andrews, KH6HTV, trustee for W0BTV

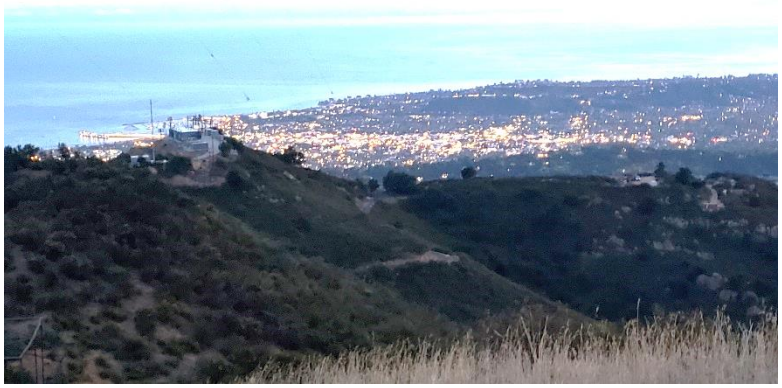
Saint Louis, Mo Amateur Television Society

SLATS recently changed their weekly nets from evenings to 10AM on Wednesday to avoid intermittent in-band QRM. We have not been able to locate the source, "yet". A couple changes in transmission parameters for both the repeater and users has virtually eliminated intermittent data errors on HD full motion videos and sound. Our club interest is in local exchange of the best possible video and stereo sound rather than lower res DX video. We swap a lot of 1920x1080p small font PC screen and HD videos. With limited BW due to frequency coordination of our in-band 70cm repeater, the DVB "quasi-error-free" requirement is a real challenge but reward is great! 4K is coming.

A 50w Comark commercial TV amplifier modified for SLATS by Mike, WA6SVT and will be installed sometime this summer along with an improvement in the repeater antenna. We are looking forward to these changes that will extend our reach across the St Louis metro area.

Speaking of amplifiers, I just finished a new station digital interface controller using an amplifier from Darko OE7DBH. This amp has over 50dB gain on 70cm. I tested the amp up to 75watts out while still maintaining acceptable shoulders and 100 percent reported quality on a weak signal into a HiDes receiver. I am not sure who made the amp or where it came from (suspect Russia) but I think it is a winner. A picture of it may be found here http://dl1mfk.de/Sonstiges/Darko/ I don't know if Darko has found any more but if not, eBay would be a good place to watch for one. Here is a picture of it (see attachment) packaged up to make interfacing easy with the station controller.
…Mel, K0PFX

Los Angeles, Ca ATN Group



Finally, Mike, WS6SVT, sends us this picture just so we can drool about his "primitive" ATV repeater location overlooking Los Angeles and the ocean to the west. Their "shack" location occupies a position situated so as to take best advantage of the view!

Mike searched hard and long to secure this location.
…WA8RMC

REPEATER DETAILS FROM VK3BFG IN MELBOURNE, AUSTRALIA

We have been around ATV since about 1975 or so and a longtime member of the BATC. I have built and re-built the Melbourne ATV Repeater and most of its Antennas for over 40 years now. Unfortunately, three years ago we lost our prime location but have just about re-installed the repeater in another.

VK3RTV has been digital since 2009 with Analogue FM and DVB-S inputs and two channel multiplexed DVB-T output. (VK3RTV1 and VK3RTV2) Inputs have been on 23 cm and 10G and output on 70cm. In the new location inputs will be 1246, 1255 and 1278 MHz DVB-S (no analogue) and the output on 445.5 MHz DVB-T.

I have attached a picture of the new tower and the current rack. Down from the top of the rack are Humax Satellite Receivers with Pre-amps, VK3RTV1 and VK3RTV2 monitors, VK3RTV2 Controller, Video Machine, VK3RTV2 Controller, VK3RTV DVB-T Exciter, PA Controller, 500-watt PA (run @100 watts), Tangential Fan System, Power Supplies and Pen-Ultimate PA Driver. The Satellite Receivers and the Video Machine are controlled by IR LEDS with commands derived from a microcontroller synthesizing a remote. Tracks are selected on the Video Machine and also users can access the internal signal report from the receivers by DTMF Command. Other facilities such as 0 dB sound levels can also be selected. Back in the analogue days, signal reports were video tracks recorded by my daughter. She would come up after a DTMF command and personally advise users of their signal strength.

Update on the VK3RTV repeater rebuild.
The rack is not yet fired up, but this will happen soon as we were missing some cables to complete the installation. In the past the DATV QSO Party has started here in Australia on Friday night and then continued on Saturday. Contacts on Saturday morning would be through the Columbus, Ohio Repeater and then later through the ATN Network in California. For a couple of years, we moved later to the UK although interest waned for some reason.

All equipment is in the racks but I have not done any of the connections at the back. Progress has been slow as this site is high security. It is a part of Melbourne's water supply. Our antennas are right up the top of the tower in prime locations. The DVB-T output antenna the highest of all but this location is not as good as we had previously, I changed the modulation from QAM16 to QPSK to get a bit more headroom. As you can see, most of the equipment is homebrew and has been built in my backyard.

I am hopeful that we can re-start the DATV QSO party in late August and we may have IRLP for you to get in direct. If we do, I would still want all stations to use their repeater, however and only one station feed in.

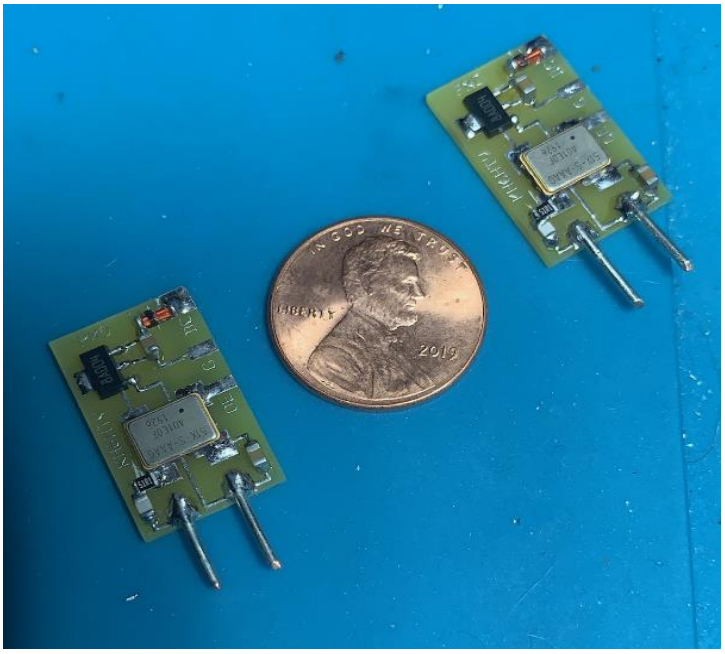
There are 3 separate panels up the tower: 1246, 1255, 1278 @ 4 Ms/s DVB-S in and 445.5 MHz DVB-T QPSK multiplexed (two channels in 7 MHz) out. The final PA is a 500-watt W6QPL with ultra linear FETS. We run that at 100 watts with the commercial CommTech Filter.

I have attached a picture of the new tower and the current rack. Down from the top of the rack are Humax Satellite Receivers with Pre-amps, VK3RTV1 and VK3RTV2 monitors, VK3RTV2 Controller, Video Machine, VK3RTV2 Controller, VK3RTV DVB-T Exciter, PA Controller, 500-watt PA (run @100 watts), Tangential Fan System, Power Supplies and Pen-Ultimate PA Driver. The Satellite Receivers and the Video Machine are controlled by IR LEDS with commands derived from a microcontroller synthesizing a Remote. Tracks are selected on the Video Machine and also users can access the internal signal report from the receivers by DTMF Command. Other facilities such as 0 dB sound levels can also be selected.

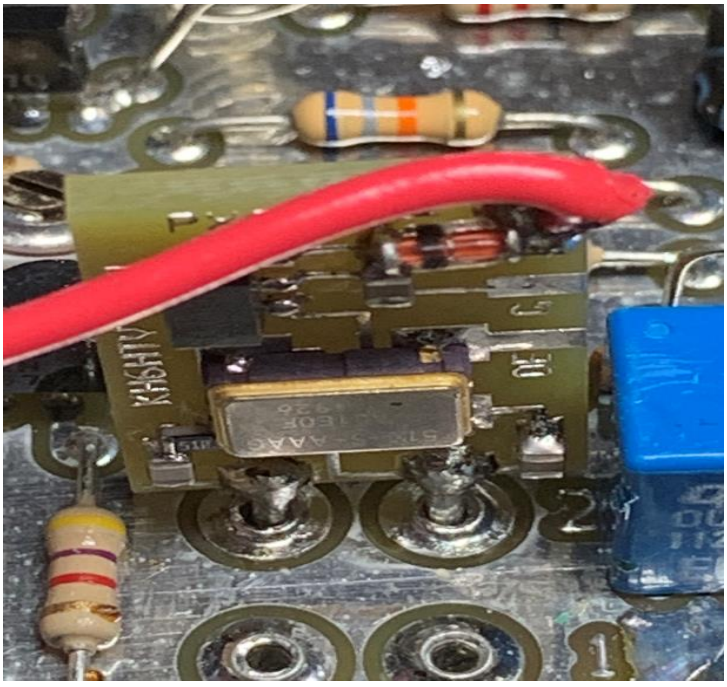
…Regards Peter Cossins VK3BFG

PC ELECTRONICS CRYSTAL ALTERNATE

Silicon Labs Crystal Replacement from KH6HTV.
Jim KH6HTV sent me two Silicon Labs Programmable Crystal Oscillator (PXO) units that he completed and has available. Initially, these crystal replacement circuits were created primarily for crystal-bound PC Electronics ATV transceivers. His Application-Note AN56a provides a description and explanation about these completed boards. These PXOs have proven to be an outstanding alternative for hard-to-obtain crystals for needed frequencies. I asked Jim to send two of the completed units my way, the pictured units replace the hard-to-find crystals found in the TC70-1 and TC70-10 ATV transceivers. Of course, if there is a need for other programmable frequencies for other ham-related projects, this alternative may potentially be an answer as a crystal replacement. More information can be found at Jim's website-- https://kh6htv.com/ Jim Provides these units for sale and he will need the frequency of interest beforehand as the Silicon Labs units are programmed at the manufacturer.



Completed PXO Units available from KH6HTV



ABOVE: Installed PXO board in the PC Electronics TC70-10 Crystal socket

…Dave Pelaz AH2AR

70CM BAND OPENING

Excellent Early Morning 70cm Analog ATV Contacts Between Michael Glass N9BNN, WB8LGA, W4HTB and W8KHP on Tuesday, 30 June 2020.

The 70 cm Band was open for excellent propagation between Indiana, Kentucky and Ohio this morning. I took a few snapshots of the activity that was being streamed through Zoom. Looks like I somehow missed getting a snapshot of WB8LGA receiving N9BNN...sorry Charles! Interestingly, The Hebron Kentucky station (W8KHP) was transmitting only 20 watts and was able to be received by N9BNN in Indiana with a P3 Signal. N9BNN has been working on experimenting with a commercial TV amplifier (800 watts) and it's still a work in progress. He is currently running about 300 watts.

PHOTO 1 Below: N9BNN in Lebanon (300 Watts average), Indiana as received by W8KHP in Hebron Kentucky.

PHOTO 2 Below: W8KHP in Hebron Kentucky (20 watts average) as seen by N9BNN in Lebonon Indiana.

Photo 3 BELOW: N9BNN in Lebanon Indiana as seen by W4HTB in Bowling Green, Kentucky.

…Dave Pelaz AH2AR

YET ANOTHER 70CM BAND OPENING!

Provided are photos below of the July 4 Dayton Band opening from at least four random points of the compass (no ATVers were North of Dayton). Analog ATV signals into the DARA Repeater included N9BNN, WB8LGA, WB8CJW, W8ZCF, and W8KHP. Even though most of the ATV signals were marginal into the W8BI repeater located in Huber Heights, Ohio (P1 to P-3), it's good to note that the relatively weak analog A5 ATV signals were faithfully re-transmitted through both the analog and digital outputs on 70 cm, and the FM output on 1258 MHz.

W8ZCF in Cincinnati, Ohio

N9BNN in Lebanon, Indiana

WB8LGA in Morrow County, Ohio

WB8CJW in Powell, Ohio

W8KHP in Hebron, Kentucky

…Dave Pelaz AH2AR

ADD A DISPLAY TO YOUR HV-110

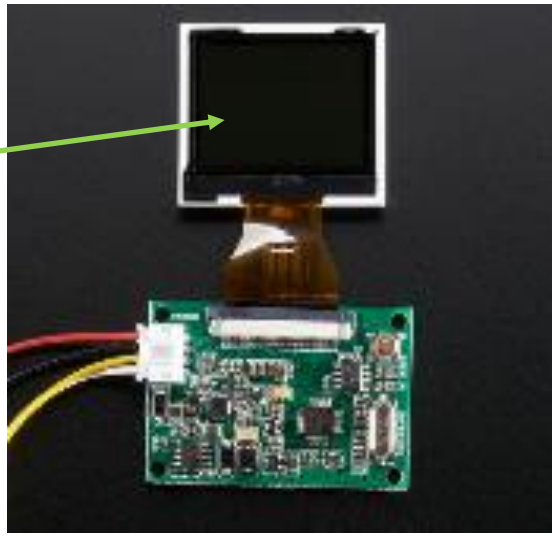
Within the realm of the bizarre and unusual, this might take honorable mention... My intention was to mount a 1.5-inch TFT display inside an HV110 DVB-T receiver as a means to create a simple test receiver so an external monitor would not be needed. The TFT display was obtained from the following website: https://coolcomponents.us/products/ntsc-pal-television-tft-display-1-5-diagonal

After cutting a window out of the aluminum chassis of the HV-110 Receiver, I went ahead and doubled up the TFT display and its PCB with insulated tape, and then mounted the display flush inside of the top of the HV-110. I used copper foil tape to completely overlay and position the composite video monitor package to the interior of the chassis. This technique proved to be a very secure way to marry the display up with the chassis. Once in position, the copper tape provides an extremely sturdy method to permanently hold the display in place. The copper tape works so well in keeping the display positioned correctly, it's critical that the display is properly aligned with the window as there is only one chance to get the alignment right since there is no repositioning opportunity once the tape is applied over the package. Note I removed the RCA plug hookup from the TFT display and ran the display input to the point on the HV-110 receiver circuit-board that provide analog video output. Doing so is obviously not good engineering practice without the use of a video distribution amplifier. However, I found that it's possible to run this internal display at the same time that a composite video external display is used with no perceived display degradation. However, please note that the HV110 receiver also has an HDMI output, and this additional output also provides simultaneous video output from the HV110. Typically, the HDMI output is used when running these receivers, and the standard HV-110 configuration will allow the user to use the HDMI output and composite video analog video outputs simultaneously.

The HV110 receiver uses 5 VDC USB power. The TFT display also requires 5 VDC. The supply voltage is available for the TFT by tapping into the receiver's PCB power supply input circuit tracings. The appropriate PCB connections were accomplished through using a volt-ohm meter to find the correct wiring hookup placement and then routing and soldering the wiring to the correct solder junctions. There are several through-hole "routes" that can be used on the HV-110 PCB that allows an insulated wire pass-through, since the TFT display sits above the HV-110 PCB and such a route will be necessary for wiring access to the bottom of the HV-110's PCB.

The TFT display provides excellent resolution...so much so that the OSD characters are quite readable (if your unaided eyeball is able to discern that level of detail). The receiver alone draws 580 Ma. When it's piggybacked with the TFT display, it draws 820 Ma, well within the current handling limits of the supplied 2-amp ac adapter that is normally included with the HV110.

Internal mounted display receiving DVB-T signal. Off-axis optical performance of the TFT display is typical of what can be expected with this type of display so it's best to use this HV110 standing on its face-plate.



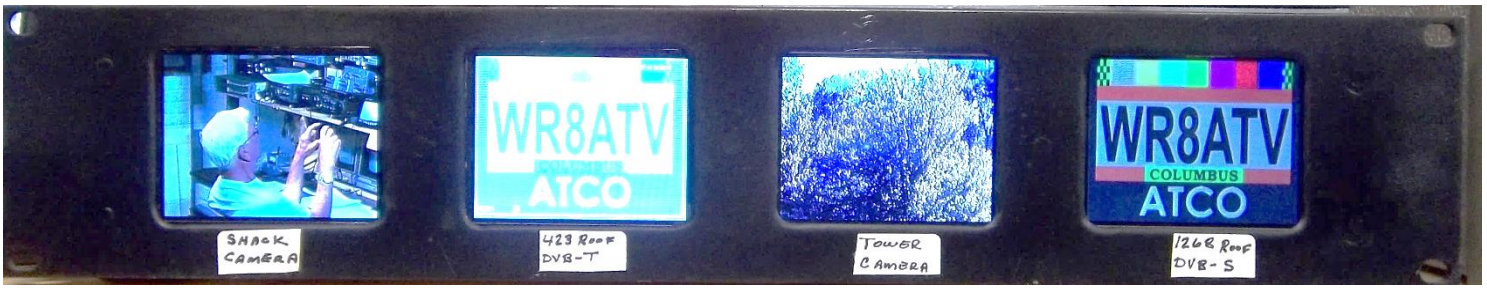
1.5 Inch TFT Color Display prior to mounting inside HV110

The HV-110 receiver is positioned here with its face-plate on the blue matt.

The paralleled Composite video signal from the HV110 is shown simultaneously driving the internal and an external video monitor. Note splitting video without a distribution amplifier will decrease the video signal. However, there's no noticeable degradation of the split video on either monitor. The HDMI output from the HV110 will remain unaffected (not shown).

ANOTHER APPLICATION FOR MINIATURE TFT DISPLAYS

Here's another option for the NTSC TFT displays. Adafruit makes 1.5" 2", 2.5" and 3.5" displays. Look at https://www.adafruit.com/?q=3.5%22%20TFT%20 for details. The displays below are (4) 3.5" displays I built into a 3 ½" rack panel. I bought a few of these for ~$20 each about 5 years ago but now obsolete. Today, the 3.5" version is also available at DigiKey for $44.95 each. The 1.5" and 2.0" versions are $39.95 at ADAFRUIT.



If you look closely above, you can see me taking the picture in the left most display. Pardon me about the second display as it is a bit washed out. (need to fix that). The third picture is from my tower cam looking at trees because the tower is at its lowest position. The far-right picture is of the ATCO repeater. When I get time, I will re-work the rack panel to add a display as I can just squeeze one more in the panel……. Or redesign the whole thing and use 2" displays so I can get at least 6 on it! Wait a minute, that's $240 just for the displays. I'd better use the money for something else, or find a cheaper supplier!

…Art WA8RMC

INTERNATIONAL DATV QSO PARTY IS BACK

The VK3RTV DATV repeater is again active at long last. I intend to run the DATV QSO Party again as a celebration. It seems like you all have picked up Zoom as a common platform in the US so I will work with that. I have set Friday 28th and Saturday 29th for the event. (Melbourne Eastern Standard Times. We are UTC +10)

Friday the 28th here will be a local event and Saturday 29th hopefully a trip across the US. We are all in some form of lockdown with social distancing etc. so a DATV QSO Party will be a good way to go. The date/times are local here but we would start on our Saturday morning (which would be your Friday night), first with Art in Ohio then working across the time zones hopefully ending on the west coast. I will need an anchor at each location to work with. The role of the anchor is to orchestrate operators in to Zoom. The idea is that all will transmit to a local repeater and the anchor then passes the signal on via zoom. I want to maximize the use of AR and minimize the use of IT. Art WA8RMC would be the Columbus anchor, Jim KH6HTV in Boulder and Roland KC6JPG on the west coast.

I understand that there may be better ways, but Zoom is a common denominator. We will need to do a bit of practice beforehand, and with Art's permission, I will use their weekly net to polish up. Please advise any other groups we should be approaching and when / how we can have a rehearsal(s). Any suggestions welcome.
…Regards Peter, VK3BFG

Don Nelson, N0YE, (don80303@gmail.com) has agreed to handle the ZOOM operation from the Boulder, Colorado area, with the input from our local ATV repeater, W0BTV.
Don is our local Zoom expert, as he hosts every week a ham radio teleconference using Zoom. I will publish this letter in the next Boulder ATV newsletter to let others know about your plans.
…73 Jim, kh6htv

I am very excited to be a part of one of the most WONDERFUL events within our Amateur Television community throughout the world. Thank you so much Peter for bringing back the DATV QSO Party!

Our Amateur Television Network is also using Zoom Video-conferencing system and this system would be the perfect platform to link ATV repeaters into Zoom. This would be the perfect opportunity for ATVers that are unable to access their local repeaters (vacations, out of town, don't have RF TX equipment, moved out of the area) can access Zoom and check in.

Our Zoom "ATN Room" is open (no meeting host required) 24 Hours / 7 days a week and ready to access anytime. If you are interested in having just 1 "account" for everyone to access during the DATV QSO party, you are more than welcome to utilize our ATN Zoom account. The Meeting ID is 295 009 2473.

Peter, I will be more than happy to be your Anchor to represent the West Coast. As a matter of fact, I am planning to participate with you during the entire DATV QSO party. I am planning to take 2 days of vacation so we will be able to air and record the DATV QSO party in its entirety. Also, we will stream the entire "party" LIVE on our YouTube channel (https://www.youtube.com/AmateurTelevisionNetwork). We have over 375 subscribers on the channel and our subscriber list continues to grow every day. The DATV QSO party will be a GREAT way to announce and demonstrate the mode of amateur television to the amateur radio community and to the general public throughout the world, especially for those hams that are unable to view the ATV repeaters directly.

Yes, I totally agree that we need to schedule a rehearsal to coordinate our resources in order to work out any technical issues (mix minus, RF to streaming interfacing) as we work towards a very smooth "celebration" during

the "party". I am open most weekends throughout the summer. Peter, please pick a primary date and a secondary date and time (your local time and UTC time) you like to host a rehearsal on the 1st week or 2nd week in August and see if we can coordinate with you on the dates you have chosen. We can turn our rehearsal time into a "worldwide DATV net!"

Everyone, please feel free to join us every Tuesday evening at 7:30pm Pacific Daylight Time, USA (every Wednesdays at 0230 UTC) for the Amateur Television Network's "The Weekly Net". Our nets are "show formatted" as we have a LOT of fun bringing in our "ATV Superstars" throughout the country, including ATVers from the states of Arizona, Florida, Massachusetts, Colorado, Nevada, and California. Mel and Art, please join us as we would love for you to link up your repeater system into our Zoom account and check-in with us on Tuesdays! On occasion, we have Grant VE1ATV from Canada joining us. I will reach out to him in hopes he will be able to join us during the DATV QSO party.
Take care my friends and if you need anything from me, please reach out anytime. I am looking forward towards our rehearsal times together and our BIG event at the end of August.
…73, Roland KC6JPG

How do we orchestrate such an event?

An ATV QSO party can be structured in a number of ways. Discussions with Peter, Jim, Roland and myself will take place in a week or so but in the meantime let me just think out loud my some of my thoughts for a while. If any of you have suggestions, jump in! The main goal is to bring together, discuss ATV topics and share ideas with an international group of Hams in a common setting. These are trying times globally in which we have been held captive during an unfortunate crisis but there still is a need to socialize, but in a safe manner. *(NO HAMFESTS)*

The introduction of the ZOOM teleconferencing system has created a good pipeline for which all can get together safely. I can't even begin to picture what we would be like without it! No, Zoom is not "Ham Radio" per se but let's put that argument aside and just concentrate on the communication part of it for now. Let's picture how we can use ZOOM:

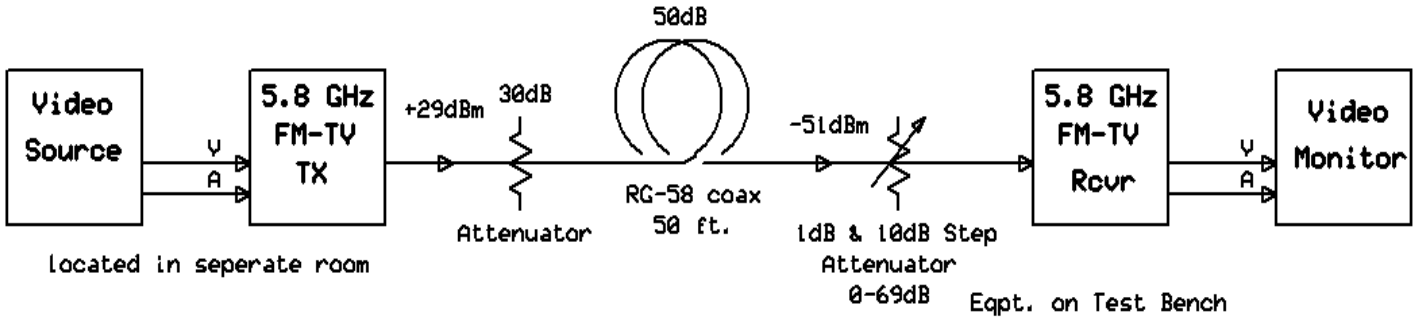
A. Use Zoom as a single pipeline between the USA and Australia with all repeater outputs each feeding it in singular fashion so it's one-on-one between the single host in Australia and participants in each of the USA groups.
B. Don't use the repeater outputs at all but put everyone on ZOOM with one host controlling the participant and length of talk.
C. Make it a ZOOM free-for-all where everyone talks to everyone. (This could get messy).
D. Use 2 ZOOM channels with multiple hosts where one channel is for host communication only and the other channel is connected directly to each repeater output in each region. The host in each region would introduce each participant on the repeater.
E. I sense that there will be many more participants using ZOOM than there will be on each repeater. Therefore, we must have a method to seamlessly use both. To do both with one ZOOM channel will require an easy way for each host to switch from ZOOM video to repeater video.

That's it for me. I'm sure there are other possible better arrangements that we need to discuss. More later.

…WA8RMC

MEASURING ATV RECEIVER SENSITIVITY & RECEIVED SIGNAL STRENGTH (From Boulder ATV Newsletter June 2020)

…Jim, KH6HTV



How to measure your ATV receiver's sensitivity? ---- The key to a successful measurement is preventing rf leakage from the test signal source getting into your receiver, except via the desired rf path. RF Signal Generators from companies such as HP, Agilent, Rhode & Swartz, etc. are extremely well designed with multiple layers of rf shielding to prevent any radiation leaking out from the box, except via the rf output connector. With such a rf generator, it is ok for it to be sitting on the same test bench as the receiver to be tested. For our ATV gear, we don't have such suitable TV test signal generators. We instead will be using our own ATV transmitters, or exciters as our test signal source. Our ATV transmitters do not have the same level of rf shielding that is found in professional test equipment.

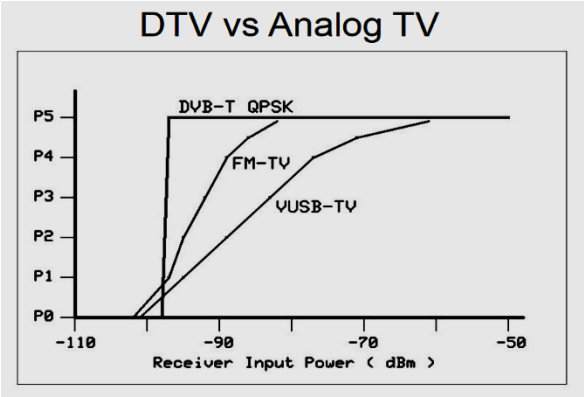
The above block diagram is how I do it. For my example, I am measuring the sensitivity of a 5.8 GHz, FM-TV receiver and its associated video monitor. I physically remove my ATV test signal generator from my ham shack. I place it in another room and then run a long coax cable from there back to my test bench. I am thus relying upon the radiation path loss to severely attenuate any rf leakage from my signal source.

5.8GHz, FM-TV Receiver & Transmitter

SMA fixed & rotary, step attenuators

For accurate measurements of sensitivity, one needs to calibrate all of the components in the rf signal path. I first measured the rf output of the TS832 transmitter using my HP-432A RF Power Meter. It put out +28.8dBm. I then measured the loss in the 50 ft. run of RG-58/U, SMA, coax cable. I used my Wiltron 5447A, 10MHz - 20GHz scalar network analyzer. At the operating frequency of 5.685 GHz, the loss was -49.7 dB. I put a high

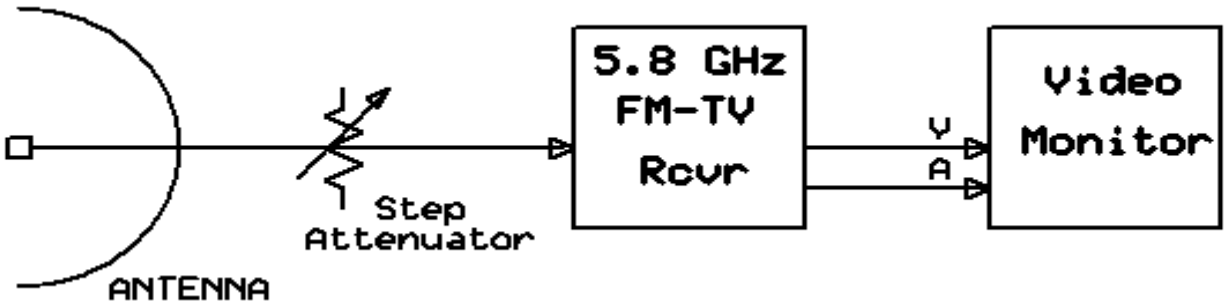
quality, DC-18GHz, SMA, 30dB attenuator on the output of the transmitter. Thus, the signal arriving at my test bench at the end of the 50 ft. cable was about -51dBm. To adjust the rf signal level into the RC832 receiver under test, I used a Weinschel, DC-18GHz, SMA, rotary step attenuator. It has 1dB and 10dB steps for a total attenuation of 0 to 69dB.



I have used this same basic setup to measure ATV receivers on the 70cm, 23cm, 13cm, and 5cm bands. I have used it for VUSB-TV, FM-TV and DVB-T receivers. It is how I arrived at the above plot of picture quality, P units, vs. RF input power. Note: for VUSB-TV, do not use a conventional power meter. You need to measure the peak-envelope-power. This can be done best with a spectrum analyzer. For a discussion of P units, see AN-5a, "P5 - TV Signal Quality Reporting" at www.kh6htv.com https://kh6htv.files.wordpress.com/2019/09/appnote5a-p5.pdf

So, what were the results for the RS-832 receiver? It was quite sensitive, coming in at about -101dBm for a P1 picture. It actually depended somewhat also on which video monitor I used with it. I tested it with two older, CRT TVs and three, newer, small, flat screen monitors. Two of the flat screen monitors had built-in, blue screen, video squelches. These were the results:

1. Toshiba 14", CRT TV receiver/monitor (last of the breed): P1 = -101dBm, P2 (color threshold) = -99dBm
2. JVC, 5", CRT, color studio monitor: P1 = -101dBm, P3+ (color threshold) = -92dBm
3. Unknown brand, 7" flat screen monitor, 12Vdc, no blue screen, video squelch: P1 = -101dBm, P3 (color threshold) = -93dBm
4. Haier, 7" flat screen TV receiver / monitor, 12Vdc, includes internal battery & video squelch: Video Squelch turn-on threshold = P2 (color) = -100dBm
5. Unknown brand, 7" 1080P monitor with HDMI, composite, & VGA inputs, 12Vdc, plus video squelch: Video Squelch turn-on threshold = P1/P2 (color) = -100dBm



The measured receiver sensitivity results can then be used for in the field measurements of received signal strength. Simply insert your step attenuator between the antenna and the receive input. It is especially easy, and more accurate, if you use a video monitor with a calibrated, built-in video squelch. Simply crank in attenuation until you reach the video squelch threshold. For example, the threshold of the two monitors tested above was -100dBm. If as with Don's (N0YE) field test reported earlier, he found he had a 36dB margin, then his received signal strength was -100dBm + 36dB = -64dBm.
…Jim KH6HTV

COMMENTS ON HDMI AUDIO ISSUES

(Reprint from Boulder Amateur Television Club TV Repeater's REPEATER Newsletter June 2020)

We here in St. Louis have found the audio portion to be the most difficult part of our digital television. We lose our audio much more often than our video. The issues are numerous. Especially aggravating are HDMI hick-ups. Also getting our audio signal levels proper seems to be a challenge.

Windows can make audio for DVB a challenge if the PC is used for other applications between sessions of DVB. I am sure you have noted this. But the real issues of "no immediate" sync of audio to "no audio at all" when Win 10 is configured properly is something no one here has figured out why. Maybe it is a receiver firmware problem?

Audio appears to be a lower priority than video is the scheme of all things too. We found the worst issues of audio come from You-Tube videos probably due to the codecs they use are not compatible with the what Hi-Des is looking for (mpg2 which we leave as default here) Sample rate? That really has not shown to be an issue. We have tried different rates with no conclusion the robustness changed. Different modulators have not shown any difference in robustness. Now, obviously if the SNR is not good, the sound will not be either. Picture "always" decodes first. When the sound does work, it can work very well... for hours on end. Then, next day with same set up, no changes and no sound or intermittent. It must be on the "cliff" all the time. On the repeater, I have had to "toggle the power" when a station comes on and tries to play a YouTube video. It can be caused by the HDMI not syncing which normally is fixed by toggling the power on the HDMI switch.

I think I mentioned that I have tried audio "extractors" to pick off the sound or audio "inserters" to add sound. They work 'most of the time' but perhaps it is because the sound just cannot be inserted or extracted due to the HDMI issue at the HDMI firmware level. I don't know. We just live with it.
…Mel Whitten, KOPFX For more info about the St. Louis ATV repeater - www.slatsatn.net

EDITOR's Note: When we redesigned our ATV repeater to include DTV, we took to heart, Art's, W8RMC, advice regarding the need for being able to remotely Re-Boot the repeater. As Mel has noted, we too in Boulder encounter HDMI audio issues and find it necessary to often re-boot. We control our repeater via a separate radio control frequency using touch-tones (DTMF). We are able to activate features such as a Beacon with an ID slide show, quad display of all receivers, etc. Included is a RESET command which disconnects DC power for 10 seconds to all the repeater digital devices. Anyone building a DATV repeater should include such a remote RESET capability.
… Jim, KH6HTV

DARA ATV REPEATER ROOM AIR CONDITIONING FAILURE

During last week's net, we noticed that the repeater output was cycling through a low power to high power condition. The next day, I went down to the site and the problem was immediately evident. The interior thermostat for the central air conditioning for the room was pegged at 99 degrees Fahrenheit. The thermostat could only measure up to 99 degrees, but the temperature within the room was easily over 110 degrees. A temperature gauge on an idling 23cm amplifier read 138 degrees, and the Comark ATV digital and analog 70cm repeater amplifiers were both in temperature warning conditions. A quick call to Rob Lundsford, who provides volunteer facility maintenance oversight resolved the A/C problems within a few hours with a temporary fix of an air conditioner timing relay, whereas the temperature of the room was restored to 63 degrees. No equipment was damaged during this "thermal" event.

Inside temperature of the room pegged out at 99 degrees (the temperature gauge could go no higher!)

LOCAL HAMFEST SCHEDULE

This section is reserved for upcoming Hamfests. They are limited to Ohio and vicinity easily accessible in one day. Anyone aware of an event incorrectly or not listed here; notify me so it can be corrected. This list will be amended, as further information becomes available. To see additional details for each Hamfest, Control Click on the blue title and the magic of the Internet will give you the details complete with a map! To search the ARRL Hamfest database for more details, CTL click ARRLWeb: Hamfest and Convention Calendar …WA8RMC.

The following are the only Hamfests listed that are not officially cancelled. Before assuming these are active, please check the web sites indicated. It is a good bet they too will be cancelled if not already done so.

09/13/2020 - Findlay Hamfest **This one is shown as approved for opening by the State of Ohio so it's a "go" at this time 7/15/20.**

Location: Findlay, OH
Type: ARRL Hamfest
Sponsor: Findlay Radio Club
Website: http://findlayradioclub.org

09/27/2020 - Cleveland Hamfest and Computer Sh

Location: Berea, OH
Type: ARRL Hamfest
Sponsor: Hamfest Association of Cleveland
Website: http://www.hac.org

12/07/2019 | Fulton County ARC Winterfest

Location: Delta, OH
Type: ARRL Hamfest
Sponsor: Fulton County Amateur Radio Club
Website: http://k8bxq.org/hamfest

TUESDAY NITE NET ON 147.48 MHz SIMPLEX

Every Tuesday night @ 9:00PM WA8RMC hosts a net for the purpose of ATV topic discussion. There is no need to belong to the club to participate, only a genuine interest in ATV. All are invited. For those who check in, the general rules are as follows: Out-of-town and video check-ins have priority. A list of available check-ins is taken first then a roundtable discussion is hosted by WA8RMC. After all participants have been heard, WA8RMC will give status and news if any followed by late check-in requests or comments. We usually chat for about ½ hour so please join us locally or via internet at https://batc.org.uk/live/wr8atv/. Click on WR8ATV.

ATCO TREASURER'S REPORT - de N8NT

OPENING BALANCE (05/20/20)	$ 3786.48
Receipts (dues)	$ 10.00
Bank fee reversal	$ 36.00
PayPal fee	$ (0.59)
Postage stamps	$ (7.00)
Bank fees	$ (36.00)
ATCO Website fee	$ (193.00)
CLOSING BALANCE (7/24/20)	$ 3595.89

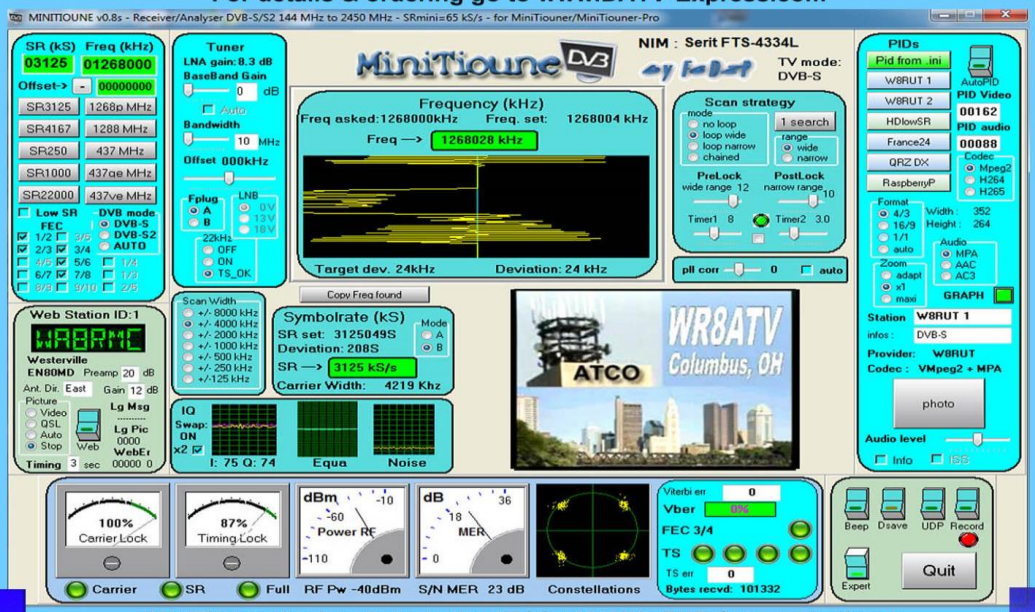
MiniTiouner-Express

Digital Amateur Television DVB-S/S2 Receiver / Analyzer

Available at DATV-Express.com

- Operates with Windows PC using free MiniTioune software from Jean-Pierre F6DZP
- Smaller than a stack of 2 decks of cards (picture above is full size)
- Two independent simultaneous RF inputs with internal preamps
- High sensitivity -100dBm @1288MHz – at 1/2 FEC
- Fully assembled/tested in aluminum enclosure
- Covers 144-2420MHz (ideal for Space Station DATV reception)
- Symbol rates from 75 KSymb/s to >20 MSymbols/sec
- Uses external 8-24VDC supply or +5V from USB-3 port (with small modification)
- Real time signal modulation constellation & dBm signal strength display
- Price: US $75 + shipping – order with PayPal

For details & ordering go to www.DATV-Express.com



(MiniTioune display above is the ATCO 1268MHz DVB-S repeater signal at WA8RMC QTH 15 miles away).

ATCO REPEATER TECHNICAL DATA SUMMARY

Location:	Downtown Columbus, Ohio
Coordinates:	39 degrees 57 minutes 47 seconds (latitude) 82 degrees 59 minutes 58 seconds (longitude)
Elevation:	630 feet above the average street level of 760 feet (1390 feet above sea level)

TV Transmitters:	423.00 MHz DVB-T, 10 W cont. FEC=7/8, Guard=1/32, Const=QPSK, FFT=2K, BW=2MHz, PMT=4095, PCR=256, Video=256, audio=257
	427.25 MHz Analog VSB AM, 50 watts average 100 watts sync tip (cable channel 58)
	1258 MHz 40 watts FM analog
	1268 MHz DVB-S QPSK 20W continuous. SR=3.125MS, FEC=3/4, PMT=32, Video=162, Teletext=304, PCR=133, Audio=88, Service =5004) **Two** video channels in this output: Channel 1 is fed from all receivers. Channel 2 is fed direct from 439.25 analog receiver only.
	2397 MHz Mesh Net transceiver 600mw output (channel 1 minus 2). ID is WR8ATV-2
	10.350 GHz: 1watt continuous analog FM
Link transmitter:	446.350 MHz: 5 watts NBFM 5 kHz audio. This is an output used for control signals and to repeat the 147.48 MHz and 449.975 MHz inputs..

Identification:	423, 427, 1258, 1268 MHz, 10.350 GHz transmitters video ID every 10 min. with active video and information bulletin board every 30 minutes.
	423 MHz digital, 1268 MHz digital & 10.350 GHz analog - Continuous transmission of ATCO & WR8ATV with no input signal present.

Transmit antennas:	423.00 MHz - 8 element Lindsay horizontally polarized 5 dBd gain "omni"
	427.25 MHz - Dual slot horizontally polarized 7 dBd gain "omni" major lobe east/west, 5dBd gain north/south
	1258 MHz - Diamond vertically polarized 12 dBd gain omni
	1268 MHz - Diamond vertically polarized 12 dBd gain omni
	2397 MHz - Ubiquiti dual polarity omni 13dBi gain slot for channel 1 minus 2 MESH Rx/Tx operation
	2397 MHz - Comet Model GP24 vertically polarized 12 dBd gain omni (Used for experimental Mesh operation)
	10.350 GHz - Commercial 40 slot waveguide horizontally polarized 16 dBd gain omni

Receivers:	147.480 MHz - F1 audio input with touch tone control. (Input here = output on 446.350)
	439.000 MHz - DVB-T QPSK, 2MHz BW. Receiver will auto configure for FEC's. (Input here = output on all TV transmitters)
	439.250 MHz - A5 NTSC video with FM subcarrier audio, **lower sideband**. (Input here = output on all TV transmitters & also direct to 1268 MHz DVB-S output channel 2.)
	449.975 MHz - F1 audio input aux touch tone control. 131.8 Hz PL tone. (Input here = output on 446.350).
	1288.00 MHz - F5 video analog NTSC. (Input here = output on all TV transmitters)
	1288.00 MHz - DVB-S QPSK SR=4.167MS, fec=7/8. PIDs: PMT=133, PCR=33, Video=33, Audio=49 (Input here=output on all Transmitters)
	2398.00 MHz - F5 video analog NTSC. (Input here = output on all TV transmitters) (inactive at this time because of MESH on 2397)
	10.450 GHz - F5 video analog NTSC. (Input here = output on all TV transmitters)

Receive antennas:	147.480 MHz - Vert. polar. Diamond 6dBd dual band (Shared with 446.350 MHz link output transmitter)
	438.00/439.250 MHz - Horizontally polarized dual slot 7 dBd gain major lobe west (Shared with 438 & 439 receivers)
	1288.00 MHz - Diamond vertically polarized 12 dBd gain omni (shared with analog and DVB-S receivers)
	2398.00 MHz - Comet Model GP24 vertically polarized 12 dBd gain omni (inactive at this time because MESH is on 2397)
	10.450 GHz - Commercial 40 slot waveguide horizontally polarized 16 dBd gain omni

Auto mode Input control:	Touch Tone	Result (if third digit is * function turns ON, if it is # function turns OFF)
	00*	turn transmitters **on** (enter manual mode-keeps transmitters on till 00# sequence is pressed)
	00#	turn transmitters **off** (exit manual mode and return to auto scan mode)
	264	Select Channel 4 Doppler radar. (Stays on for 5 minutes) Select # to shut down before timeout.
	004	Select 10.450 GHz receiver. **(Always exit by selecting 001)**
	001	Select 2398 MHz receiver then 00# for auto scan to continue

Manual mode Functions:		
	00* then 1 for Ch. 1	Select 439.25 analog /438 digital receiver (if video present on digital, it is selected. Otherwise analog)
	00* then 2 for Ch. 2	Select 1288 digital receiver
	00* then 3 for Ch. 3	Select 1288 analog receiver
	00* then 4 for Ch. 4	Select 2398 receiver
	00* then 5 for Ch. 5	Select video ID (17 identification screens)
	01* or 01#	Channel 1 439.25 MHz scan enable (hit 01* to scan this channel & 01# to disable it)
	02* or 02#	Channel 2 1288 MHz digital receiver scan enable
	03* or 03#	Channel 3 1288 MHz analog receiver scan enable
	04* or 04#	Channel 4 2398 MHz scan enable
	A1* or A1#	Manual mode select for 439.25 receiver audio
	A2* or A2#	Manual mode select for 1288 digital receiver audio
	A3* or A3#	Manual mode select for 1288 analog receiver audio
	A4* or A4#	Manual mode select for 2398 receiver audio
	C0* or C0#	Beacon mode – transmit ID for twenty seconds every ten minutes
	C1* or C1#	No function at this time
	C2* or C2#	No function at this time

ATCO MEMBERS AS OF July 2020

Call	Name	Address	City	St	Zip	Phone
KD8ACU	Robert Vieth	3180 North Star Rd	Upper Arlington	OH	43221	614-457-9511
KC3AM	Dave Stepnowski	735 W Birchtree Ln	Claymont	DE	19703	
AH2AR	Dave Pelaez	1348 Leaf Tree Lane	Vandalia	OH	45377	937-264-9812
W8ARE	Terry Meredith III	6070 Langton Circle	Westerville	OH	43082-8964	
K9BIF	Charlie Short	415 West Pike Street	Goshen	IN	46527-0554	
VK3BFG	Peter Cossins	14 Coleman Road	Melbourne	Au	03152	
N9BNN	Michael Glass	6836 N. Caldwell Rd	Lebanon	IN	46052	
WB8CJW	Dale Elshoff	8904 Winoak Pl	Powell	OH	43065	614-210-0551
N8COO	C Mark Cring	2844 Sussex Place Dr.	Grove City	OH	43123	614-836-2521
N3DC	William Thompson	6327 Kilmer St	Cheverly	MD	20785	301-772-7382
K8DMR	Ron Fredricks	8900 Stonepoint Ct	Jennison	MI	49428-8641	
WA8DNI	John Busic	2700 Bixby Road	Groveport	OH	43125	614-491-8198
WB8DZW	Roger McEldowney	5420 Madison St	Hilliard	OH	43026	614-405-1710
KB8EMD	Larry Baker	4330 Chippewa Trail	Jamestown	OH	45335-1210	
WB4IR	Bob Holden	7725 Tressa Circle	Powell	TN	37849	865-314 - 4285
WA8HFK,KC8HIP	Frank & Pat Amore	P.O. Box 2252	Helendale	CA	92342-2252	760-503-8106
W8KHP	Allen Vinegar	2043 Treetop Lane	Hebron	Ky	41048	
WA8KKN	Chuck Wood	5322 Spruce Lane	Westerville	OH	43082-9005	614-523-3494
WB9KMO	Rod Fritz	8334 E. Culver Street	Mesa	AZ	85207	
WA8KQQ	Dale Waymire	225 Riffle Ave	Greenville	OH	45331	937-548-2492
WB8LGA	Charles Beener	2540 State Route 61	Marengo	OH	43334	
W8MA	Phil Morrison	154 Llewellyn Ave	Westerville	OH	43081	
KA8MID	Bill Dean	2630 Green Ridge Rd	Peebles	OH	45660	
N8NT	Bob Tournoux	3569 Oarlock Ct	Hilliard	OH	43026	614-876-2127
W8NX, KA8LTG	John & Linda Beal	5001 State Rt. 37 East	Delaware	OH	43015	740-369-5856
KB8OFF	Jess Nicely	1888 Woods Drive	Beavercreek	OH	45432	
W6ORG,WB6YSS	Tom, Maryann O'Hara	2522 Paxson Lane	Arcadia	CA	91007-8537	626-447-4565
AE6QU	Ron Phillips	2227Via Puerta unit N	Laguna Woods	CA	92637	
WA8RMC	Art Towslee	438 Maplebrooke Dr W	Westerville	OH	43082	614-891-9273
W8RUT,N8KCB	Ken & Chris Morris	2895 Sunbury Rd	Galina	OH	43021	
KB8RVI	David Jenkins	100 Miller Ave Apt 108	Ashville	OH	43103	614-853-0679
W8RWR	Bob Rector	135 S. Algonquin Ave	Columbus	OH	43204-1904	614-276-1689
W8RXX, KA8IWB	John & Laura Perone	3477 Africa Road	Galena	OH	43021	614-579-0522
WA6RZW	Ed Mersich	34401 Columbine Trl West	Elizabeth	CO	80107	
WA6SVT	Mike Collis	PO Box 1594	Crestline	CA	92325	
NR8TV	Dave Kibler	243 Dwyer Rd	Greenfield	OH	45123	937-981-1392
KB8UWI	Milton McFarland	115 N. Walnut St.	New Castle	PA	16101	
WA8UZP	James Reed	818 Northwest Blvd	Columbus	OH	43212	614-297-1328
KB9VGD	Gary Oaks	472 Storle Ave	Burlington	WI	53105-1028	
KC8WRI	Tom Bloomer	PO Box 595	Grove City	OH	43123	
AA8XA	Stan Diggs	2825 Southridge Dr	Columbus	OH	43224-3011	
AC8XP,KE8GTT,KE8HPA	Troy,Seamus Bonte	5210 Smothers Road	Westerville	OH	43081	
AC8YE	Larry Howell	4080 Dill Road	Centerburg	OH	43011-9771	
KB8YMQ	Jay Caldwell	4740 Timmons Dr	Plain City	OH	43064	
KC8YPD	Joe Ebright	3497 Ontario St	Columbus	OH	43224	
KD8YYP	Anna Reed	818 Northwest Blvd	Columbus	OH	43212	
WB8YTZ	Joe Coffman	233 S. Hamilton Rd	Gahanna	OH	43230-3347	
N8YZ	DaveTkach	2063 Torchwood Loop S	Columbus	OH	43229	614-882-0771
W8ZCF	Farrell Winder	6686 Hitching Post Ln.	Cincinnati	OH	45230	513-218-3876
N8ZM	Tom Holmes	1055 Wilderness Bluff	Tipp City	OH	45371	

ATCO CLUB OFFICERS

President: Art Towslee WA8RMC
V. President: Ken Morris W8RUT
Treasurer: Bob Tournoux N8NT
Secretary: Mark Cring N8COO
Corporate trustees: Same as officers

Repeater trustees: Art Towslee WA8RMC
Ken Morris W8RUT
Dale Elshoff WB8CJW
Statutory agent: Stan Diggs AA8XA
Newsletter editor: Art Towslee WA8RMC

NEW MEMBER(S)

Let's welcome the new members to our group! If any of you know anyone who might be interested, let one of us know so we can flood them with information. New members are our group's lifeblood so it's important we aggressively recruit new faces.
No new members this time.

ATCO MEMBERSHIP INFORMATION

Membership in ATCO (Amateur Television in Central Ohio) is open to any licensed radio amateur who has an interest in amateur television. The annual dues are $10 per person. Additional members within an immediate family and at the same address are included at no extra cost.

ATCO publishes this Newsletter quarterly in January, April, July, and October. It is sent to each member without additional cost. All Newsletters are sent via Email unless the member does not have an internet connection. Dues payments are as of the date paid and will expire on the same month/year on the due date year.

Your support of ATCO is welcomed and encouraged.

Membership expiration notices will be sent out via Email starting 30 days prior to expiration date.
NOTE: Dues records on your individual portion of the ATCO website are listed as the date money is received and shows due one year from that date.

ATCO MEMBERSHIP APPLICATION

RENEWAL ○ NEW MEMBER ○ DATE _____
CALL _____
OK TO PUBLISH PHONE # IN NEWSLETTER YES ○ NO ○
HOME PHONE _____
NAME_____
INTERNET Email ADDRESS_____
ADDRESS _____
CITY _____ STATE _____ ZIP _____-_____
FCC LICENSED OPERATORS IN THE IMMEDIATE FAMILY
_____
COMMENTS_____
_____
_____
ANNUAL DUES PAYMENT OF $10.00 ENCLOSED CHECK ○ MONEY ORDER ○

Make check payable to ATCO or Bob Tournoux & mail to: Bob Tournoux N8NT 3569 Oarlock CT Hilliard, Ohio 43026. Or, if you prefer, pay dues via the Internet with your credit card. Go to www.atco.tv and fill out the “pay ATCO dues” section. Alternately, you can use the ATCO web site www.atco.tv/PayDues.aspx directly. Credit card payment is made through "PayPal" but you DO NOT need to join PayPal to send your dues. Simply DO NOT fill out the password details and there will be no “PayPal” involvement.

ATCO Newsletter
c/o Art Towslee -WA8RMC
438 Maplebrooke Dr. West
Westerville, Ohio 43082

FIRST CLASS MAIL

REMEMBER...CLUB DUES ARE NEEDED.
CHECK THE
MEMBERS PAGE OF ATCO WEBSITE FOR THE EXPIRATION DATE.
SEND N8NT A CHECK OR USE PAYPAL IF MEMBERSHIP IS EXPIRED.