ATCO NEWSLETTER

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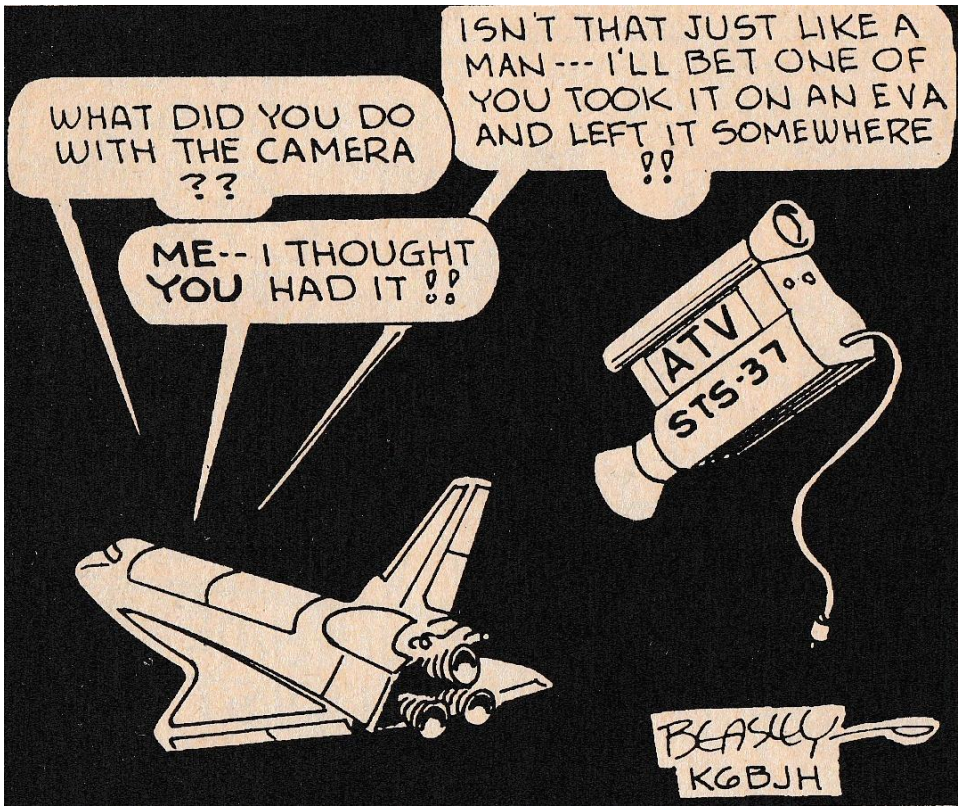
The ATCO newsletter is the official publication of a group of amateur television operators known as "AMATEUR TELEVISION IN CENTRAL OHIO Group Inc" published quarterly (January, April, July, October)

ATCO SPOTLIGHT TOPIC



ACTIVITIES ... from my Workbench

It's Newsletter time again! As I recall, it was snowing hard the last time I sat down to write this. Then, it was an easy choice to compose the Newsletter rather than "play in the snow" so to speak. Today, it's slightly different but the result is similar. Instead of snow, it's the grass that needs attention. Oh, well…

There's **not** a lot of ATV activity lately. That's disappointing but expected. I too, have spent time with other activities and put Ham Radio in general on the back burner. That's mainly because there is little ATV activity so I seem less motivated to work on my projects. I really wish some of you would show more interest for that would inspire me to do more with this hobby. I know there are more people with interest out there but don't speak up. That's too bad for if I knew of someone needing help, I'd be there to offer support in a flash. Maybe there are a number of you saying to yourself, "If someone would contact me to help repair my antenna, fix my transmitter or re-tune my receiver, I'd be encouraged to be more active". Is that the case? I don't know. I'm waiting for my phone to ring because it's not fun talking to myself!

Ok, now on to other matters. The ATCO repeater is, as far as I know, working properly. However, I'm told the 439-input sensitivity may be low. I need to check on that. Mike Collis WA6SVT, volunteered to assist me during his visit here during Hamvention. We'll use my spectrum analyzer or VNA to check antenna, feedlines and some housekeeping activities. I haven't been to the repeater for over a year now so at the very least; I need to make sure the vent fans are still running properly. We used to have 439 MHz interference that shows up in the evening but don't know if it is still present. The 10 GHz input and output are still running OK but to my knowledge, there is no one around to see it or transmit to it. Should I shut it down or is there someone out there that could use it? Let me know.

My newest project is to design and build a new 70 cm DATV receiver to replace the VersaTune design that I stopped working on because of obsolete parts. This new design, I'll call it "VersaTune Mini", is an adaptation of the standard HDHomerun European set top box with a firmware modification. It is currently in production from Silicondust Inc. That model receives a DVB-T/T2 signal on the 420-450 MHz band, de-modulates it and outputs it through the Ethernet port. (European unit is needed because it uses the DVB-T/T2 mode). See more detail later in this Newsletter. The output can then be viewed on any TV receiver with an Ethernet port. So far, the unit receives the ATCO repeater on 423 MHz without issues. In fact, when I connected the unit to an antenna and my local Ethernet in my basement workroom, it was automatically identified on the TV in the family room as an extra channel. I can now click on the channel identifier and receive the ATCO repeater signal while sitting in my easy chair enjoying normal TV programming at the same time by selecting the quad display mode. This unit has 4 tuners so up to 4 programs can be viewed simultaneously.

So far, I only have preliminary software for it. Amazingly, I created the software needed by telling Gemini Artificial Intelligence on the internet to create the software for me. I described what I want with a 2-paragraph human summary and it spit out the COMPLETE code ready to use. I didn't have to write even one line of code!!!!!! I now need to refine it by adding needed comments but it is amazing to me that with 1/2 hour of work on my part telling AI what I want, I received the completed code <1 minute later. (**Software engineers, look out. Your job could be on the line**)

That's about it for this time guys. 73 for now,
…WA8RMC

ATSC 3.0-BASED BPS DEVELOPMENTS

From TV Tech Magazine March 2026.
Let's watch this, guys! The BPS System is a way of doing the same job as our existing GPS Global Positioning System. It's a way to use a triangulation system with TV broadcast towers spaced appropriately to measure distances accurately. I'm told it is as good or better than our global satellite-based system. It's being promoted to use the technology as a backup or actually replace the existing GPS in order to justify the creation of the ATSC 3.0 system. (commonly called the NextGen Broadcast System). The software is already built into the ATSC system so all we need are transmitter and tower upgrades. It's called a GPS backup so if something happens to the GPS system, we are not literally shut down in distance measurement applications. It's a security issue! We'll see if it becomes reality. Is it actually all its hyped up to be? We'll see!!!! Stay tuned.
WA8RMC

WASHINGTON—The National Association of Broadcasters in December realigned its technology-focused leadership to advance development and deployment of the Broadcast Positioning System (BPS), which can complement and backup the Global Positioning System that is increasingly recognized as a potential single point of failure for delivery of precise timing and positioning data critical to national security.

NAB shifted Sam Matheny, former executive vice president for technology and chief technology officer, to his new role as executive vice president for BPS. At the same time, it transitioned Tariq Mondal from his role as vice president of advanced technology to vice president of BPS. Clearly, BPS is a major thrust for NAB and the industry alike.

In this Q&A, Matheny discusses the strategic personnel realignment, U.S. Transportation Department-funded BPS testing, whether BPS may turn out to be the killer app for ATSC 3.0 and other BPS-related issues.

TV Tech: *Last month, NAB announced a strategic realignment of senior technology leadership focused on BPS. Why has NAB made this move?*

Sam Matheny: NAB made this move to accelerate development of the Broadcast Positioning System (BPS) and to put dedicated senior leadership behind an initiative that has clear public safety, critical infrastructure and national security implications. BPS has progressed from concept and early demonstrations into a phase where sustained focus, coordination and execution matter. This realignment allows NAB to concentrate technical leadership on advancing BPS while continuing to support broadcasters as they deploy and invest in NextGen TV infrastructure.
TVT: *Last year, the Department of Transportation awarded a $744,000 contract to NAB to move forward with BPS field testing. How has that factored in?*

SM: The DOT award in August was another validation that BPS is aligned with broader federal efforts to strengthen resilience for position, navigation and timing services. It signaled the continued shift from discussion to real-world evaluation, but importantly, it was part of a larger series of events. In January of 2025, BPS's time transfer stability was declared "comparable to or better than GNSS [Global Navigation Satellite System]" and a "viable complementary PNT [Positioning, Navigation and Timing] solution" by scientists at the National Institute of Standards and Technology (NIST) in a peer-reviewed paper presented at the Institute of Navigation (ION) International Technical Meeting. These events, coupled with other indicators, helped drive NAB's decision to align leadership around BPS so the organization can support field testing, data collection and engagement with government and industry partners in a more focused and sustained way.

TVT: *For readers who aren't familiar with BPS, briefly bring them up to speed.*
SM: BPS, a technology invented and developed by NAB, uses NextGen TV broadcast signals to deliver resilient, terrestrial-based timing and location services. One can think of BPS as the terrestrial equivalent of GPS. It is

designed to complement GPS. It can provide a backup when satellite signals are disrupted, jammed or spoofed, but it can also be integrated to work with GPS as a hybrid solution. Because BPS leverages high-power broadcast infrastructure that already exists across the country, it has the potential to scale nationally and provide a reliable layer of resilience for public safety, critical infrastructure and other essential services. Other nations that are deploying ATSC 3.0 have also expressed interest in BPS.

TVT: *Tell us about the new testing funded by the DOT contract. What will you be looking at?*

SM: The field trial supported by the DOT contract is focused on evaluating BPS performance in real-world environments rather than controlled demonstrations. The work is intended to assess how BPS can support critical infrastructure operations when GPS is unavailable or degraded, as well as how the system performs in terms of reliability, coverage and operational integration. NAB has partnered with Dominion Energy with a focus on energy grid resiliency. This testing is a key step in understanding how BPS could function at scale.

TVT: *Can you tell us a little more about partnering with Dominion Energy and the broader role of BPS for U.S. industry?*

SM: Electric utilities rely heavily on precise timing to operate safely, manage load and maintain grid stability. Power enters the grid from multiple sources and has to be time-aligned for effective distribution. Precision time also plays a huge role in fault detection and helps grid operators identify and fix problems quickly should they occur. Partnering with Dominion Energy allows NAB to evaluate how BPS could help sustain timing and synchronization for electric grid operations during GPS disruptions. More broadly, BPS is being evaluated as a terrestrial complement to GPS that could support a wide range of industries that depend on precise timing, including energy, cellular communications, data centers, financial systems and transportation, where even short disruptions can have significant consequences.

TVT: *Is BPS the killer app for ATSC 3.0 that could accelerate deployment by giving the federal government a national security incentive?*

SM: BPS is a strong example of how NextGen TV infrastructure can enable services that go well beyond video and entertainment. While ATSC 3.0 supports many new consumer and business applications, the ability to deliver GPS-level resilient timing and positioning highlights its potential role in public safety and national resilience. That broader value proposition reinforces the importance of completing the transition to NextGen TV and ensuring the underlying broadcast infrastructure is fully deployed nationwide.

TVT: *Is precise timing or precise positioning the initial priority for BPS? Why?*

SM: The near-term priority is accurate, traceable time delivery. Many critical infrastructure systems depend on accurate timing to function properly, and timing disruptions can cascade quickly across networks and services. A 2019 study by NIST estimated the economic impact of a loss of GPS at $1 billion per day. BPS is designed to provide resilient timing as a foundational capability, while positioning and additional services will continue to be developed and refined over time.

TVT: *Some in the industry have expressed concerns about the geographic distance between towers affecting positioning. What are your views?*

SM: A minimum of three geographically diverse transmissions is needed to perform the multilateration required to determine location, with more towers being better and providing greater accuracy. Our analysis estimates that a typical (median) location in the contiguous U.S., BPS signals from 17 NextGen TV stations might be received at 1.5-meter antenna height. This analysis excluded stations within a kilometer of one another and used only the highest power station from each cluster of stations. So, we believe that BPS can provide a useful service for position and navigation. We're also excited that professors and graduate students at the University of Alabama have begun studying the position and navigation possibilities of BPS and will present early findings at the Workshop on Synchronization and Timing in May.

TVT: *At the 2025 NAB Show, there were presentations on the leader-follower architecture and clock configurations for BPS. Can you tell us a bit about what's being considered?*

SM: BPS is designed to be an independent self-synchronizing network that doesn't rely on the Internet, cellular networks or other connectivity. We've designed it as a mesh network where stations listen to one another in a leader-follower configuration. This design is similar to how EAS works. A leader station has a direct connection to UTC traceable time and is equipped with a cesium clock for long holdover, so system integrity can be maintained for months even if there is a total loss of connectivity to traceable time. Follower stations receive time

from leader stations and have less expensive rubidium clocks that offer some holdover protection. The result is a network where each station is listening to multiple other stations, and we can monitor individual station health at our network operations center (NOC). A “health bit” is part of the system and can be transmitted if a station is known or suspected to be impaired for maintenance or other reasons, so that it will be ignored until it is healthy again.
TVT: *Transmitting BPS addresses the vulnerability of relying solely on GPS, but what is happening on the receiver side?*
SM: Reliance on a single timing solution, GPS, is why our nation is at so much risk. GPS has become an invisible utility that has evolved into a single point of failure for critical infrastructure and day-to-day consumer applications. BPS is the terrestrial equivalent of GPS and has been declared to be a “viable complementary PNT solution” by scientists at NIST. We are working with timing solution vendors that want to integrate BPS into their products to offer multiple sources of reliable time in a single product. This lays the foundation for hybrid solutions where BPS and GPS can be used together, not just BPS as a backup. A hybrid approach also offers the ability to use BPS to monitor the health of GPS and detect if there is jamming or spoofing taking place.
TVT: *Is there anything else you would like to add?*
SM: BPS demonstrates how broadcasters are using their existing infrastructure to support national resilience in new and meaningful ways. This work reflects a broader shift toward viewing broadcast networks as critical infrastructure. NAB is focused on validating that role through real-world testing, partnerships and collaboration with government and industry.

VARIOUS ATV GROUP LISTINGS

NEVARC ATV NEWSLETTER

magazine@nevarc.org.au
The down-under Aussies are quite active with ATV, in particular Digital ATV. Want to find out more? Contact Mick Ampt, VK3CH, editor and ask to be put on their mail list.

WESTERN WASHINGTON AMATEUR TELEVISION SOCIETY

www.qsl.net/ww7ats
Club Call Sign: WW7ATS --- The Western Washington Amateur Television Society (WWATS) is an ARRL affiliated ham radio club in the Puget Sound area with a focus on digital amateur television (DATV). We use DVB-T modulation. We transmit and receive digital video using our DATV repeater on Cougar Mountain east of Seattle. The output is on the 23cm band at 1255 MHz with 6 MHz band-width, vertical polarization. We have two inputs on the 70 cm band at 435.25 MHz and 437.75 MHz with 2 MHz band-width, horizontal polarization. The DATV repeater output is automatically turned on during when detecting a DVB-T signal on the input frequency or a RTMP authenticated stream, and produces wonderful HD signals on the output frequency. We hold our ATV nets on Wednesday and Saturday evenings at 20:00 Pacific. We use our 2m voice repeater WW7ATS on 147.08 MHz (+ , 103.5 PL) to coordinate the net. Visitors are welcome. We would be delighted to have you join our Wednesday and Saturday evening nets. For those who have a hard time receiving us over the air video broadcasts, we also live stream our nets. Check the streaming page! WWATS email address: info@wwats.net

ST. LOUIS AMATEUR TELEVISION SOCIETY

www.slatsatn.net
Welcome to SLATS --- This is our growing website where we share all kinds of great information about the exciting hobby of Amateur Radio. The emphasis, here, however, will be the world of Amateur High Definition Digital Broadcasting, specifically, DVB-T. Digital Video Broadcast – Terrestrial. SLATS owns and operates an open repeater located in Maryland Heights, MO., under the call sign WØATN. The input frequency is 440.00 MHz and the output is 426.00 MHz. We regularly meet on air every Wednesday evening at 7 pm on 144.34 MHz.

Everyone is invited to check in and check us out! Our 426 MHz transmitter puts out 25 Watts average power on DVB-T with 16QAM and 4 MHz band-width. Our receiver is on 440 MHz again with 4 MHz band-width for 16QAM. We have two New-Tronics Hustler Spirit antennas with 9dB gain. Vertical polarization. They are mounted on a 90 ft. Rohn tower at 671 ft ASL.

THE BOULDER AMATEUR TV CLUB

(BATVC) has an "open" TV repeater. The repeater is tri-band (70, 23 & 3cm) DVB-T, digital. Input frequencies are primary, 1243 MHz, 6 MHz BW, and secondary 441 MHz and 10.380 GHz. The repeater automatically switches to any incoming TV signal, but 23 cm has priority. The 70 cm digital output is on 423 MHz, 6 MHz BW. The DVB-T signals are in 1080P high definition. We also have a 24/7 beacon transmitter on 5.905 GHz (FM-TV). The repeater has a wide coverage area, extending from the Wyoming border on the north, DEN airport to the east and to south east metro Denver. BATVC holds a weekly ATV net every Thursday afternoon starting at 3 pm (local Mtn. time). The net typically runs for about 1 1/2 hours. The ATV net is streamed over the British TV Club's server, https://batc.org.uk/live/ (click on AB0MY or N0YE).

The Boulder W0BTV - ATV repeater supports the local ARES (BCARES). It is used to provide TV coverage of major public safety events such as forest fires, etc. BCARES is in the process of acquiring additional 70 cm DVB-T repeaters to enhance ATV coverage of Boulder County, especially in the western, mountainous half of the county. These new repeaters will be linked to the W0BTV repeater.

SAN DIEGO DIGITAL TELEVISION BROADCAST SOCIETY

This is an amazing technology group. We are moving Amateur Communications to the next generation to go beyond terrestrial boundaries. Education and Innovation are the keys to success. We are still in the experimental and demonstration phase of FSOC in LEO

Free Space Optical Communications, is a technology that the ITG Team uses to modulate beams of light (lasers) to transmit data wireless through the atmosphere and in space offering very high bandwidth (50 GHz spacing), 80-90 channels. It is a license-free communications transporting reliable voice, data and HD video. (DWDM Network). 50 GHz CS| 34.5 Channels | ITU CH. 1549.72nm| Freq. 193.30 THz.

LOTNR 6U, is a compact laser optical communication system for high-speed data transmissions. This terminal takes up 3U on this 6U CubeSat. It enables Tb-class data, Gbps-level inter-satellite links (ISL), and secure, low-latency communications, transporting voice, data and video. The system uses infrared laser and (PAT) precise pointing, acquisition, and tracking to overcome the limitations of RF systems, enabling efficient data transfer over long distances.

Our four FSOC LEO CubeSats near-earth network demonstrations have achieved 200 Gbps downlink speeds in a single pass and 2 Tbit/s transmission rates. Modulation used is (PPM) Pulse-Position Modulation. We use Commercial-Off-The-Shelf (COTS) components which is cost effective to our research group.

LEOIN, Sat-27 LOTNR is scheduled to enter lunar orbit with other experimental CubeSats in early 2027. NASA STPSat-6 (LCRD) Satellite, serves as a long-term technology demonstration platform for optical communications and relay operations in a geosynchronous orbit approximately 22,000 miles (35,000 km above Earth). It was launched on December 7, 2021 and is currently active relaying experimental data communications.

BOULDER'S LATEST 5/10 GHZ MICROWAVE ATV STATION

On our March 26th weekly ATV net, long time active ATVer, Steve, WA0TQG, gave us a slide show tour of his recent completion of his new 5 & 10 GHz microwave station. This has been a long labor of love for Steve which has finally been installed and functional. He has been waiting for the winter weather to clear before installing the antennas and top end electronics on his tower. Steve said it was a very labor-intensive project requiring several

hours atop his tower to complete. Steve is a retired RF design engineer who is unwilling to stop designing equipment. So, he designed and built totally from scratch his complete all-mode (including DVB-T ATV), all-band, transceiver system. We have written about it in previous issues of this ATV Journal. His latest addition to it added the 5 and 10 GHz bands. The photo above shows the tower mounted electronics package which contains the 5 and 10 GHz LOs, mixers, pre-amps and rf power amplifiers. Steve uses an 825 MHz IF for going to/from the ham shack to the top of the tower. Plus, a separate control cable. Tower Mounted Electronics Ham Shack IF Electronics So what are the key specs. for Steve's new station? 5 cm, 5.8 GHz: Transmitter Power = 400 mW (DVB-T) Receiver Noise Figure = 2.63 dB Antenna Gain = 31.3 dBi 3 cm, 10 GHz: Transmitter Power = 540 mW (DVB-T) Receiver Noise Figure = 1.92 dB Antenna Gain = 27 dBi Results: Ham Shack Transceiver Radio Controller So far, Steve has only made one contact with his new station. It was on 10 GHz with Bill, K0RZ, at his home station. Steve said they were able to make a solid SSB contact, but were unsuccessful with DVB-T. It is a 20 km path between their QTHs. However, it is not a true line of sight path as the signals must get over the top of Flagstaff mountain. From Steve's QTH on Sugar Loaf Mountain in the western part of Boulder County, he has a relatively narrow field of view out onto the eastern prairies Our Challenge! OK, now you other Boulder ATV micro-wavers --- Steve has thus challenged us to now get out in the field on the eastern prairies and setup up our roving microwave dish antennas and exchange our digital ATV signals with his new station. With spring weather approaching we need to start planning our first microwave DX-pedition.

ATV IN CHICAGO?

Karl, KD9TVQ asks, Are you aware of DTV activity in Northern Illinois or the Chicagoland area? I live in Arlington Heights in a third-floor apartment facing essentially due North. I have no interest in legacy analog TV. I was aware of local AM and experimental FM video on 70 cm activity in the late 80s and the “war” that ensued over a proposed repeater that would not crossband. I was 14 at the time, so I didn’t have the money to invest. Relicensed 40 years later, I’m interested once again. Any help would be appreciated.
73, Karl

CHESAPEAKE AMATEUR TV SOCIETY

www.qsl.net/w3bab
An Amateur Television (ATV) repeater is hosted by us in the Greater Baltimore, MD area. A major tenet of Amateur Radio is public service. We meet each Wednesday evening on the air with both audio and video to maintain our communications "network" of area hams for communications. We can be called upon to share information and video in support of area emergency and disaster recovery operations. The CATS repeater is located in downtown Towson, MD. Input is NTSC on 434 MHz or DVB-T video on 439.25 MHz. Output is on 421.25 MHz NTSC (analog) video). If you are close-in to the Towson area, an analog-capable television on cable channel 57 -AND- connected to a separate antenna will enable viewing. A second output of FM satellite television format is on 1.291 GHz. Scientific Atlanta 9660 receivers are an inexpensive and quick way to view the repeater output in high quality. We have a small supply of these devices for sale at $10 each. They are pre-programmed for our repeater. For farther away viewers, a pre- amplifier is needed. The repeater features receiving antennas on both the north and south sides of the building. The Towson ATV repeater is live from 9:00 am. to midnight daily. Fred K3TAZ and John K0ZAK continue to provide DVB-T signals to the CATS Towson ATV repeater. Many raves over the quality of their signals Who will be next with DVB-T signals? John K0ZAK has written up some implementation notes of his experiences with DVB-T transmitting and reception.

NEXTGEN TV THREATENED BY `UNCERTAINTY'

News By George Winslow

The current `voluntary framework has reached the limits of what it can accomplish' the NAB told the FCC (Image credit: FCC)

WASHINGTON—The NextGen TV transition could be "stranded indefinitely in a regime of regulatory uncertainty and half-measures" without 3.0 tuner mandates, must carry provisions and a sunset date for 1.0 broadcasts, the NAB has told the Federal Communications Commission.

The reply comments by the NAB were made in an ongoing proceeding by the FCC to assess and develop a regulatory framework for the rollout of NextGen TV. That proceeding has produced wide ranging arguments about tuner mandates, must carry provisions, digital rights management and sunset dates for the current ATSC 1.0 broadcasts.

"The record developed here confirms that the Commission's central task is no longer to debate whether NextGen TV is worth pursuing – stakeholders across the ecosystem recognize that it is – but to decide whether the transition will be allowed to succeed through an orderly, coordinated framework, or instead be stranded indefinitely in a regime of regulatory uncertainty and half-measures, all to the detriment of the viewing public," the NAB said. The creation of an "orderly, coordinated framework," the group added, will require four "core actions" that the FCC needs to adopt if the transition is going to be successful and provide consumers with continued access to free, over-the-air broadcasting.

The four areas are: "(1) establish clear, date-certain sunsets for ATSC 1.0 that provide the focal point necessary for marketplace coordination; (2) modernize the receiver standard so consumers can continue to access broadcast service reliably and consistently as the transition proceeds; (3) ensure continued MVPD carriage of ATSC 3.0 signals and associated advanced features so viewers are not deprived of NextGen TV capabilities through distribution bottlenecks; and (4) protect broadcasters' ability to deliver high-value programming in a video marketplace where content protection and modern technical capabilities are increasingly prerequisites to obtaining and sustaining premium content."

The NAB also stressed that "the record also makes plain that the Commission has broad support for taking these steps now. Broadcasters, technology providers, and public-interest stakeholders converge on a simple reality: a voluntary framework has reached the limits of what it can accomplish, and further progress depends on regulatory certainty and coordinated action."

"Against that record of support, opponents' submissions are notable for what they do not provide: a workable alternative path to completing the transition," the NAB added. "Instead, the principal opponents offer a familiar mix of classic delay advocacy: resisting receiver modernization, resisting regulatory certainty, resisting any step that would move the transition from pilot to scale, all while recasting the Further Notice as a forum for collateral disputes and speculative anxieties. In short, these opponents reject any modernization that would impose even minimal effort or adjustment on their part. That is not a serious transition plan. In reality, it is an effort to keep free, over-the-air broadcasting tethered to legacy constraints while other segments of the video marketplace move forward unencumbered and without having to worry about broadcasting as a viable competitor."

ARRL WANTS EVERY HAM TO HELP PASS THIS BILL

Does your neighborhood prohibit outdoor TV antennas? If it does, you REALLY need to help pass this Bill! I sent in my response. You should too! *It's not too late to enter your call into the list supporting the passage of this bill.WA8RMC*

ARRL needs every radio amateur in the United States to send letters to Washington as we continue our nationwide grassroots campaign to pass the Amateur Radio Emergency Preparedness Act (H.R. 1094 / S. 459) to secure antenna rights. The process is simple: click the button at **www.arrl.org/HOA**, put in your call sign, and press the red **SEND MY LETTERS** button. **That's all you need to do!**

The letters will automatically be sent to your elected officials encouraging them to support the bipartisan bills. This legislation is intended to prevent restrictive homeowners' association (HOA) rules that currently prohibit or severely limit the installation of amateur radio antennas. Passage would give amateur radio operators the same rights to install antennas on their property as those enjoyed by users of TV antennas, wireless internet, and flagpoles.

Spreading the Word

ARRL CEO David Minster, NA2AA, was the guest on the Ham Radio Crash Course YouTube channel. Host Josh Nass, KI6NAZ, talked with Minster for 45 minutes about this important letter writing campaign.

ARRL West Gulf Division Director John Robert Stratton, N5AUS, shared insight into the importance of getting every ham to send a letter on the W5KUB Amateur Radio Roundtable podcast with Brett Glass, WY7BG, and Glen Popiel, KW5GP. See that discussion on YouTube, listen to it on Podbean, or view it on Facebook.

"You don't have a be a member," said Stratton. "Any amateur radio operator in or out of an HOA should go to the website." Go to **www.arrl.org/HOA**.

ARRL is also encouraging radio clubs to provide letters of support, and is urging each club officer to sign the letters. There are instructions for clubs on how to complete the letter [PDF] and a sample letter that each club can customize with their information [DOCX].

Send your letters now.

CONGRESS URGE FCC TO SET A FIRM ATSC 3.0 TRANSITION DATE

From Broadcast Engineering Magazine April 3, 2026
By George Winslow March 27, 2026

"A firm transition date would catalyze the entire ecosystem," members of Congress told the agency.
(Image credit: NAB)

WASHINGTON—In a sign that momentum for setting a firm transition date for NextGen TV/ATSC 3.0 may be building, a large group of 91 members of Congress sent a March 27 letter to the Federal Communications Commission highlighting the importance of NextGen TV and the need to set a firm date for the transition.

NAB president and CEO Curtis LeGeyt immediately praised the move in a statement that said the NAB "applauds the 91 members of the U.S. House of Representatives , led by the bipartisan co-chairs of the Congressional Broadcasters Caucus — Reps. Mark Alford (R-MO-04), Brendan Boyle (D-PA-02), Mike Flood (R-NE-01) and Darren Soto (D-FL-09) — for urging the Federal Communications Commission to take the next steps toward advancing the transition to ATSC 3.0 (NextGen TV). Their leadership reflects a clear understanding of the immense consumer benefits that a modernized broadcast infrastructure will deliver to communities across the country."
The FCC has acknowledged the importance of the rollout of the next generation broadcast standard by seeking comment from various players on how it can streamline rules to speed along the transition. While FCC Chair has repeatedly highlighted the importance of NextGen TV but he has not committed publicly to setting a firm date when current ATSC 1.0 signals would sunset.

- NAB Urges Swift Action by FCC on NextGen TV Transition
- APTS, PBS Tell FCC Not to Set a Firm Date for ATSC 1.0 Sunset
- Pay TV Groups Rebut NAB's ATSC 3.0 Transition Plans

The NAB and a wide variety of broadcast groups and larger station owners have urged the FCC to set a cutoff date of 2028 for many markets and 2030 for all markets. But some smaller and mid-sized station groups, many LPTV station owners and the Consumer Technology Association have opposed a government mandated sunset and ATSC 3.0 tuner mandates.
In their March 27 letter, lawmakers highlighted the benefits of ATSC 3.0 in terms of better image quality, advanced emergency alerts, interactivity, hyperlocalized content and the development of a terrestrial alternative to GPS.
"We now urge the Commission to take the next steps to bring this transition to completion and unlock the full range of benefits enabled by the Next Gen TV platform," the letter noted. "It is of utmost importance that local broadcast stations throughout the country are able to serve our constituents not only with the improved pictures, sounds, and interactive features that Next Gen TV provides, but also with expanded local news capabilities, advanced emergency alerting, and the ability to deliver hyper-localized content that is the fabric of our local communities."

“Yet while local markets continue to launch, the lack of a firm transition timeline threatens the broad availability of these benefits to rural and urban markets alike and slows market momentum,” the letter warned. “Broadcasters and device manufacturers alike need regulatory certainty to make long-term investments and fully realize the potential of this technology. Manufacturers may hesitate to scale device production while consumer demand for Next Gen remains limited, yet broadcasters cannot spark that demand until they regain access to their full channel capacity and can showcase the full capabilities of ATSC 3.0.”

“By establishing a clear path forward, the Commission can help overcome these natural market hesitations and ensure that free, over-the-air television continues to thrive and evolve to meet viewers’ needs, rather than risk gradual erosion through inaction,” the letter concluded. “A clear signal from the FCC that the transition is moving forward will unlock greater manufacturer investment in the consumer device marketplace – a win-win that fosters competition and ensures that viewers benefit from a vibrant marketplace of affordable, Next Gen TV-ready products. A firm transition date would catalyze the entire ecosystem, focusing technical development, accelerating deployment, and creating a predictable path forward.”

ATV NEWS FROM MICHIGAN.

The Jackson ATV repeater is still on the air. Jackson is on lower VSB, 439.25 MHz input, AM-TV. Horizontal polarization using a rib cage antenna for receive and a vertical commercial 900 MHz stick for transmit. It has a Hi-Des, DVB-T receiver set to 439 MHz and a 2-way splitter and preamp (angle linear) There is a VSB filter and 2 additional cavities in the receive line to get rid of an adjacent 442.500 ham repeater that is in the same rack. The 900 MHz output is currently only AM mode using a TX33-1, 1 watt exciter padded down and a Glenayre paging PA about 250 watts out. I have a newer IP video streaming device/server I was going to install in the input but life changed and put a lot on hold. There is no local activity. I tried giving away equipment to get some users but they all want to play FM and be on DMR and other voice modes. I have not spoken to Ron, K8DMR, in a long time. Hoping he is doing ok. I should call him and check in. I didn't know Hank passed away. I actually built the rib cage for 421.250 for their repeater there in Bowling Green. He was always willing to try working us up here. We were close to 400 miles I think and I did work him once or twice on morning openings on UHF. I have also worked on the Flint, MI ATV repeater a few times. It is currently in a box in my shed! Its last problem was a bad power connector on the DEMI amp. I rewired it with power poles and it was fixed. It used to work very well from about 200 feet on a hospital rooftop. The home QTH was about 53 miles so could not work it every day but most mornings it didn't take much to get in and see it well. The same issue up there, no activity. There were 2 or 3 guys with equipment but were not on much and think they got bored with it. It has an ATVR-4 receiver, xtal controlled. We modified it for lower VSB years ago and retuned the DCI filter due to many UHF FM repeaters in the 442-range wiping out their input. I will try to keep in touch but unfortunately not much new and exciting here.
…73, Bryan KC8LMI

"*VERSATUNE*" UPDATE – HERE COMES VERSATUNE mini!

As many of you know, we were working on self-contained DVB-T / DVB-S scanning receiver design for DATV. However, progress came to an abrupt halt because when we finally developed software, we found the tuner is obsolete. All tuner parts have been liquidated and no parts available. No alternate sources so we declared the project dead.

What to do now? Well, I stumbled upon an existing DVB-T/T2 digital receiver in current production for Europe. It is a "set top box" 4 channel design used to interface a local network to local television channels. I found that the received frequency range could be easily modified to receive our 70 cm Amateur Radio band so this is definitely a possible 70 cm alternate to VersaTune! The box has 4 independent tuners from one antenna input so up to 4 separate signals can be received simultaneously. The existing software can display all 4 channels in a quad display if desired. This is definitely something we can use for 70 cm DATV.

I am currently evaluating the product. Its amazing features allow custom application software for it using Artificial Intelligence! This is truly amazing! I fed the manufacture's development guide document to Gemini AI, stated what I wanted the receiver to do and asked it to create software for that. Voila, after less than 1 minute of "think time" it created complete operational software that WORKED!!!!! It needs tweaking for sure but the hard work is done. The overall time from research to working software was an hour or less and **I didn't have to write even one line of code**! (That's going to put a lot of software developers out of a job).

Now that I've got the basics complete, I foresee it easy to create documentation for even the most novice of users to create their own custom applications for this product. That's exciting. I will bring a prototype unit with me to Hamvention. We will be at booth 1003 and 1004 in the first westmost building. See it there and again during the Fast Scan ATV Forum in building 4 on Saturday at 11 AM.
….WA8RMC

HAMVENTION AMATEUR TELEVISION FRIDAY NIGHT DINNER

! ATTENTION !

The ATV Friday Night Dinner will be on Friday May 15 at 6:30 PM at the China Garden Buffet Restaurant (937-781-9999), 112 Woodman Drive in Dayton, Ohio 45431 (Airway Shopping Center). The all you can eat Buffet Dinner is $18. We will have dinner and then ATV presentations concluding at 9 PM. All are invited. Door prizes will be awarded.

If you are planning to attend the Dayton Hamvention this year, be sure you reserve time for our Friday night dinner. It's a good way to sit down, cool off after a day of "flea market walking" and enjoy a good dinner buffet. Afterwards, we will have an informal meeting to recognize everyone then draw for door prizes. Some items, including a Sony PTZ HDMI camera are shown below. Also, there is an ARRL Handbook. Your participation will be rewarded. All are invited.

USA ATV REPEATER DIRECTORY July 2025

NOTES:

1. All repeaters are NTSC, VUSB-TV, 6 MHz channel, unless otherwise noted. Some repeaters use non-standard lower sideband inputs VLSB to reduce interference with FM repeaters in upper portion of band. The frequency listed is the video carrier frequency.
2. Digital TV lists center frequency. 6 MHz channel, unless otherwise noted.
3. For full details, go to the listed web site, or send an e-mail to the contact person.
4. Some ATV groups also post repeater info on www.qrz.com under their call sign.

Location	Call Sign	Output(s)	Input(s)	Modes	Web Site & Contact for info
ARIZONA					note: AZ is linked to W6ATN in S. CA & NV www.atn-tv.org
Phoenix, White Tank	W7ATN	 1253.25	434.0 434 / 2 2441.5	VUSB FM DVB-T FM	wb9kmo@gmail.com kwjacob@icsaero.com
Mesa	W7ATN	421.25 1289.25	 434.0 434 / 2 2441.5	VUSB VUSB FM DVB-T FM	wb9kmo@gmail.com kwjacob@icsaero.com
Tucson, Mt. Lemmon	W7ATN	1277.25	 434.0 434 / 2 2441.5	FM VUSB DVB-T FM	wb9kmo@gmail.com kwjacob@icsaero.com
CALIFORNIA					W6ATN rptrs linked to AZ & NV
Orange Santiago Peak	W6ATN	 1253.25 5910	434.0 434 / 2 2441.5	VUSB FM DVB-T FM	www.atn-tv.org wa6svt@gmail.com
Los Angeles, central Mt. Wilson	W6ATN	1265.25	 434.0 434 / 2 2441.5	FM VUSB DVB-T FM	www.atn-tv.org wa6svt@gmail.com
Los Angeles, north Oat Mtn.	W6ATN	919.25 3380	 434.0 434 / 2 2441.5	VUSB DVB-T FM FM	www.atn-tv.org wa6svt@gmail.com
Jobs Peak	W6ATN	 1253.25	434.0 434 / 2 2441.5	VUSB FM DVB-T FM	www.atn-tv.org wa6svt@gmail.com
San Bernardino Snow Peak	W6ATN	1242 / 4	 434.0 434 / 2 2441.5	DVB-T VUSB DVB-T FM	www.atn-tv.org wa6svt@gmail.com
Santa Barbara	WB9KMO	1289.25	434.0 434 / 2 2441.5	VUSB, DVB-T FM	www.atn-tv.org wb9kmo@gmail.com linked with W6ATN
San Diego	KD6ILO	423 1243 1268	441 1286 5885	DVB-T DVB-T DVB-S FM	kd6ilo@yahoo.com also AREDN mesh
San Jose	W6SVA	427.25	 910 1255	VUSB FM FM	www.k6ben.com :w2nyc@pacbell.net
Clayton	W6CX	1244.5	1292.5 1273 915	DVB-S, FM	www.mdarc.org info@mdarc.org
Palomar	W6NWG	 1241.25	915	FM VUSB	w6nwg@palomararc.org mountain.michelle@gmail.com
COLORADO					
Boulder	W0BTV	423 / 6 421.25 5905	1243 / 6 441 / 6 439.25	DVB-T, DVB-T VUSB VUSB FM	www.kh6htv.com kh6htv@arrl.net
Pueblo	W0PHC	423 / 6t	441 / 6	DVB-T	billn@billnicoll.com www.puebloradio.org
DELAWARE					

Wilmigton	KC3AM	423 / 6	439.25	DVB-T VLSB	KC3AM@verizon.net
Location	**Call Sign**	**Output**	**Input**	**Mode**	**Web Site & Contact info**
FLORIDA					
Cape Coral	W1RP	421.25	439.25	VUSB	paul@cardlink.com
Cocoa Beach	K4ATV	427.2	439.25	VUSB	www.lisats.org
Panama City	KV4ATV	434.0	919.25	?	kv4atv@gmail.com
S.W. Idaho	WI7ATV	1257	426.25	FM VUSB	ka7anm@yahoo.com
IOWA					
Davenport	W0BXR	421.25	439.25	VUSB	http://www.arcsupport.com/drac/

KANSAS					
Wichita	KA0TV	421.25	439.25	VUSB	k0wws@arrl.net
KENTUCKY					
Bowling Green	KY4TV	421.25 423.0 /2	439.25 1280	VUSB FM DVB-T	w4htb@ieee.org www.qrz.com www.atn-tv.org
LOUISIANA					
New Orleans	WD0GIV	421.25	439.25	VUSB	wd0giv@att.net
MARYLAND					
Laurel	W3BAB	421.25	434.0	VUSB	www.qsl.net/w3bab
Towson	W3BAB	1291	434	FM VUSB	www.qsl.net/w3bab
Baltimore	W3WCQ	439.25 911.25	426.25 1253.25	VUSB	http://bratsatv.org/ brats@bratsatv.org
MICHIGAN					
Jackson	KC8LMI	923.25	439.25	VLSB	KC8LMI@hotmail.com
Grand Rapids	K8DMR	421.25	439.25	VUSB	ron_fredricks@att.net
Flushing	KC8KCG	1253.25	439.25	VLSB	kf8ui@mscginc.org
Flint	KC8KGZ	1253.25	439.25	VUSB	www.mscginc.org kf8ui@mscginc.org
MINNESOTA					
Wabasha	KD0HWX	421.25	439.25	VUSB	jonmcpete@yahoo.com
MISSOURI					
St. Louis	W0ATN	426 / 4	440 / 4	DVB-T	k0pfx@arrl.net
NEBRASKA					
Omaha	WB0CMC	421.25	434.0	VUSB	wb0cmc@cox.net
NEVADA					
Las Vegas	N7ZEV	1253.25 912	434.0 434.0 / 2 2441	VUSB FM DVB-T FM	frank.n7zev@gmail.com linked to W6ATN S. CA & AZ
NEW JERSEY					
Vernon	W2VER	5885	5665	FM	jaythienel@yahoo.com
OHIO					
Columbus	WR8ATV	423 / 2 427.25 1258 1268 2397 10350	439 / 2 439.25 1288 1288 10450	DVB-T VLSB AM DVB-S MESH FM	www.ATCO.tv gkenmorris@gmail.com art.towslee@gmail.com
Dayton	W8BI	421.25 428 / 2 1258	439.25 439 / 2 1280 1280	VUSB DVB-T FM DVB-S	www.w8bi.org dpel@aaahawk.com
Van Wert	W8FY	434.0	923.25	VUSB	ka8zge@w8fy.org
OREGON					
Portland	W7AMQ	1257	426.25	FM VUSB	belles73@comcast.net
Portland	WB2QHS	426.0	910 fm	FM VUSB	emellnik@emavideo.com
PENNSYLVANIA					
Delaware County	KC3AM	421.25	439.25	VLSB	KC3AM@verizon.net
PUERTO RICO					
Aguas Buenas	KP4IA	426.25	439.25 1252	VUSB FM	kp4ia@yahoo.com
WASHINGTON					

Seattle	WW7ATS	1253.25	434.0	VUSB	https://www.qsl.net/ww7ats/ ww7ats@gmail.com qrz.com

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.

04/25/2026
Tusco Amateur Radio Club's 2026 Hamfest, Computer
Location: Dover, OH
Type: ARRL Hamfest
Sponsor: Tusco Amateur Radio Club W8ZX
Website: http://www.w8zx.net/hamfest

04/26/2026 - Athens Hamfest
Location: Athens, OH
Type: ARRL Hamfest
Sponsor: Athens County Amateur Radio Association
Website: http://ac-ara.org

05/02/2026 - Lucas County ARES Hamfest
Location: Toledo, OH
Type: ARRL Hamfest
Sponsor: Lucas County Amateur Radio Emergency Service, Inc.
Website: http://WWW.LUCASARES.ORG

05/15/2026 - 05/17/2026
Dayton Hamvention
Location: Xenia , OH
Type: non-ARRL Hamfest
Sponsor: Dayton Amateur Radio Association
Website: www.hamvention.com

06/06/2026 - FCARC SummerFest
Location: Delta, OH
Type: ARRL Hamfest
Sponsor: Fulton County Amateur Radio Club
Website: https://k8bxq.org/hamfest

07/11/2026 - Intercity Amateur Radio Club Hamfest
Location: Ontario , OH
Type: ARRL Hamfest
Sponsor: Intercity Amateur Radio Club
Website: http://W8WE.ORG

05/14/2026 - 05/17/2026
Four Days In May
Location: Fairborn, OH
Type: ARRL Convention
Sponsor: QRP Amateur Radio Club International
Website: http://qrparci.org/fdim

06/06/2026
FCARC SummerFest
Location: Delta, OH
Type: ARRL Hamfest
Sponsor: Fulton County Amateur Radio Club
Website: https://k8bxq.org/hamfest

07/19/2026
Van Wert Hamfest
Location: Van Wert, OH
Type: ARRL Hamfest
Sponsor: Van Wert Amateur Radio Club

08/01/2026 - 2026 Columbus Ham Fest
Location: Grove City, OH
Type: ARRL Hamfest
Sponsor: Aladdin Shrine Audio Unit
Website: http://www.columbushamfest.com

08/15/2026 - Cincinnati Hamfest℠ , ARRL Great Lakes Division Convention
Location: Owensville, OH
Type: ARRL Convention
Sponsor: Milford Amateur Radio Club
Website: https://cincinnatihamfest.org/

08/16/2026 - Warren Hamfest
Location: Cortland, OH
Type: ARRL Hamfest
Sponsor: Warren Amateur Radio Association
Website: http://w8vtd.com/hamfest

09/13/2026 - Findlay Hamfest
Location: Findlay, OH
Type: ARRL Hamfest
Sponsor: Findlay Radio Club
Website: http://findlayradioclub.org

ATCO TREASURER REPORT - de N8NT

OPENING BALANCE (1/24/26)……..……..……..…..…$4339.05
CLOSING BALANCE (4/20/26)……..$ 4339.05

ATCO CLUB OFFICERS

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

Repeater trustees: Art Towslee WA8RMC
Ken Morris W8RUT

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.
Your support of ATCO is welcomed and encouraged.

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 average street level of 760 feet ASL (1390 feet above sea level)
TV Transmitters:	423.00 MHz DVB-T, 10W FEC=7/8, Guard=1/32, Const=QPSK, FFT=2K, BW=2 MHz, PMT=4095, PCR=256, Vid=256, Aud=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 SR=3.125MS, FEC=3/4, PMT=32, Video=162, Teletext=304, PCR=133, Audio=88, Service =5004)
	Two video channels on this output: Channel 1 is fed from all receivers. Channel 2 is fed from 439.25 analog receiver.
	2397 MHz Mesh Net transceiver 600 mw output (channel 1 minus 2). ID is WR8ATV-2
	10.350 GHz: 1W continuous analog FM
Link transmitter:	446.350 MHz: 5W NBFM 5 kHz audio. This output used for control signals & to repeat 147.48 MHz and 449.975 MHz input.
Identification:	423, 427, 1258, 1268 MHz, 10.350 GHz transmitters video ID every 10 min. with active video.
	423 MHz DVB-T, 1268 MHz DVB-S & 10.350 GHz FM - Continuous Tx of ATCO & WR8ATV with input signal present.
Transmit antennas:	423.00 HHz - Single slot rib cage horizontally polarized 5 dBd gain "omni"
	427.25 MHz - Dual slot horizontally polarized 7 dBd gain "omni" major lobe east/west, 5 dBd 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, Upper sideband. (Input here = output on all TV transmitters & also direct output 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, Vid=33, Aud=49 (In here=out on all Transmit.)
	10.450 GHz - F5 video analog NTSC. (Input here = output on all TV transmitters)
Receive antennas:	147.480 MHz - Vert. polar. Diamond 6 dBd dual band (Shared with 446.350 MHz link output transmitter)
	439.00/439.250 MHz - Horizontally polarized dual slot 7 dBd gain major lobe west (Shared with 439 digital & 439.25 analog 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 /439 digital (if video 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 analog /439 digital rec. scan enable (01* to enable & 01# to disable)
	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 Newsletter
c/o Art Towslee -WA8RMC
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Westerville, Ohio 43082