ATCO NEWSLETTER

ATCO SPOTLIGHT TOPIC

Thanks to Beasley, K6BJH (SK) and ATVQ Magazine 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.
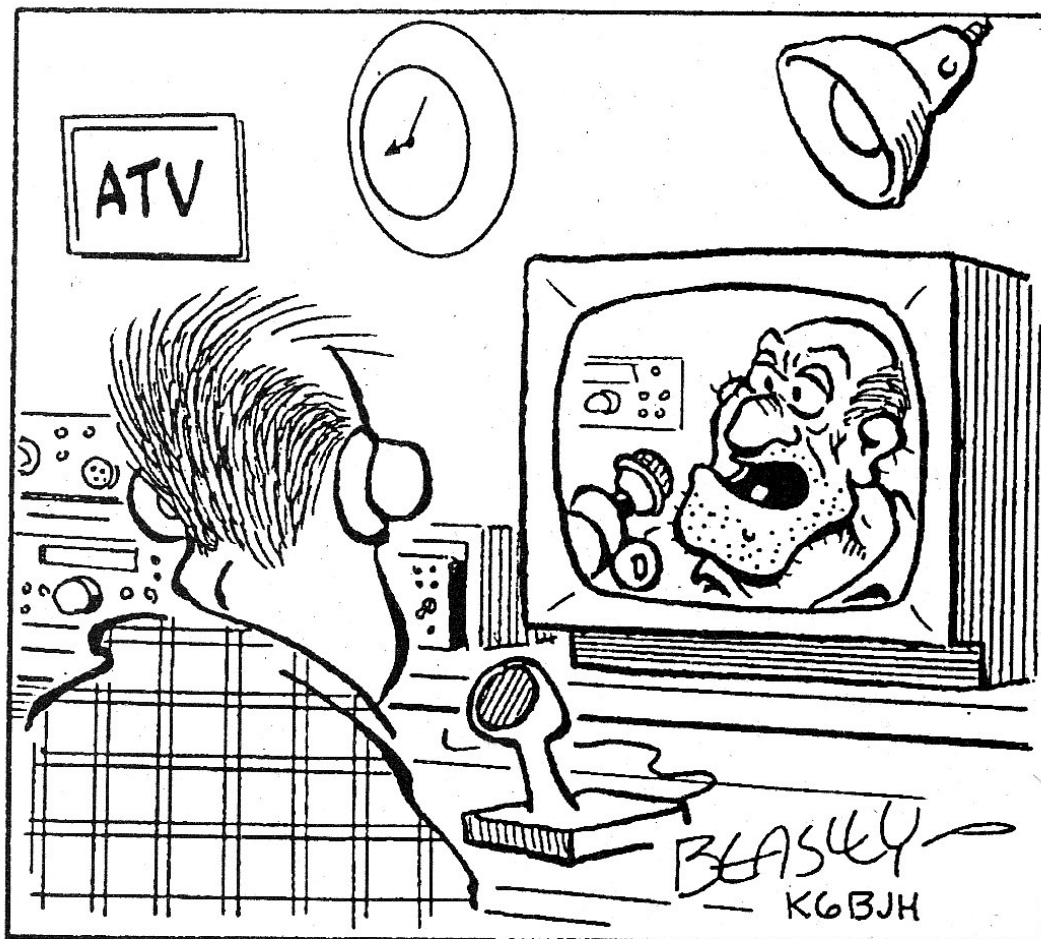
ACTIVITIES ... from my Workbench

No, I'm NOT going to start out by saying, "Well,…………" this time. Everyone knows we all have other things to do now that the weather is cooperating.

I will start out by saying it was a quite unusual winter. Nothing needed maintenance at the repeater and not much to report at home here either. However, there is some annoying repeater video interference on 439MHz analog. It shows up as herring bone type bars across the received picture and quite possibly is coming from someplace in the downtown Columbus area. Signals from Bob, W8RWR, and Mark, N8COO, have these bars but a received signal direct to me doesn't seem to be bothered. It's interference directly on 439.25MHz but when I took my spectrum analyzer to the repeater site, I couldn't identify it. Actually, I could see something that looked like interference but it was at such a low level that I am surprised it caused the noticeable herringbone that it does. It will take a portable analog ATV receiver cruising the downtown area to possibly locate it. I don't have the proper equipment at this time to do that. Possibly, sometime this summer I can put something together.

On the list of things that need to be done this year is the replacement of the 439 transmit and receive slot antennas. I have a Lindsay antenna in need of repair that could be used for one of those antennas. As soon as I clear some of my "in process" projects, I can repair it and make it ready for replacement service. Question is, which one? I'm thinking about replacing the transmit slot antenna with the Lindsay then repairing the 427 slot by installing a new radome and retuning it for 439MHz. Then we can remove the existing 439 receive slot and install the repaired slot in its place. Then I will have a spare slot antenna I can repair to make available for 427 Tx service if the Lindsay antenna is not good enough. (An identical Lindsay is now in service for the DVB-T transmitter on 423MHz so I know it works. If it is better or worse than the slot is to be determined).

The Delaware County mesh network is now operational and growing. There are 5 operational tower installations with reliable communication through the node at our ATCO repeater location. The downtown Delaware location can connect direct all the time so far. An additional tower close to the Delaware and Franklin County line will come on line soon to provide an even better link. (I can connect to the downtown Columbus link at my QTH when I point my antenna toward it). Because of this, I will soon install a computer/hard drive/hub module there so we can have a mesh link for a roof cam, repeater output and other video sources. The thinking behind this is to be able to operate the ATCO bulletin board directly from there so Dale, WB8CJW, won't need a live computer at his place. Dale, don't think you will be relieved of your bulletin board duty any time soon. I'd like to install a mesh node on your tower so you will have mesh access for this. How about that, Dale?

So, do you guys have any more ideas? Come to the Spring Event and discuss where we go from here. Also, at the Spring Event we will have a special broadcast professional person talk to us. I'm sure you will enjoy his material.

Our membership is shrinking so we must do something. I'm hoping that the mesh activity will help stir up new interest but other new ideas are welcome also. Additionally, we need to have more "emergency preparedness" activity and "public service" projects to keep us alive. We don't do the "Red-White-Boom" security service anymore because the Police Dept. now has high tech equipment but I'm sure our "low resolution" cameras can be put to use for other functions. I need ideas and most of all, VOLUNTEERS! I can't do it all myself.

Finally, I will elaborate at the Spring Event but I wanted to say here briefly that the International Space Station astronaut school program, now in full swing in Europe, will expand to the USA as NASA has agreed to support this effort. As a result, we will need ground stations to relay ISS video from the astronauts in communication with the schools. Anyone willing to help and set up a station at their home location to stream data to the internet will be welcome. Contact me for details if you're interested.

That's all for now guys. Remember, the Spring Event is May 8. Yes, I know it's Mothers Day but is it possible your wife will understand if you show up for a brief visit? Or, even better, bring her along for a free lunch so she won't have to cook on that day!
73,
…WA8RMC

A NEW PROJECT – DIGITAL FAST SCAN AMATEUR TELEVISION

<u>FEBRUARY 19, 2016</u> BY <u>FKEMMERER</u>

We've been doing some work and testing on a Digital Fast Scan ATV setup for 70 cm. We've had some good results. I've written an article on what we're doing and posted a video showing how Digital ATV equipment and QSOs work on the 70 cm band. I thought that the readers in this forum might be interested in this.

You can view the article and video at:

http://stationproject.wordpress.com
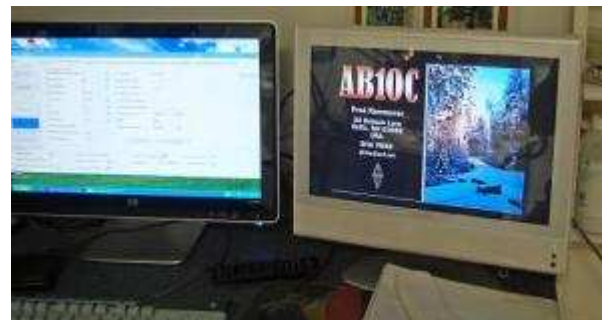
We are interested in finding other Amateurs in the NH/MA area who might be interested in ATV.

… Fred (AB1OC)

Digital ATV CQ Call

Skip, K1NKR a local friend and VHF/UHF expert and I began talking about the idea of building a Fast Scan Amateur Television (ATV) System some time ago. Our early research and the antenna equipment which we had in place at our stations led us to plan our ATV project around the 70 cm band. The 70 cm band plan in the United States has allocations for Fast Scan ATV transmissions with a bandwidth of up to 6 MHz. Our research led us to Jim Andrews, KH6HTV's excellent website where we discovered that it was possible to build a Digital ATV station using reasonably priced commercially available DVB-T format Modulators and De-modulators. Jim's site has a wealth of great Applications Notes on Digital ATV and its a great place to start to learn about this technology. A combination of a DVB-T Modulator and Demodulator from Hi-Des was chosen as the heart of our Digital ATV System. We also worked with Jim to secure the needed Wideband Linear Power Amplifiers for the 70 cm band. We began receiving the equipment to build our Digital ATV Stations late last year. We've done quite a bit of testing on the air and some custom development work which has resulted in a pair of excellent performing Digital ATV stations. The picture above shows a Digital ATV "CQ" that I sent to initiate one of our early QSOs.

Digital ATV Transceiver

Here's a picture of Skip receiving my "CQ" at his end. The picture quality produced by the equipment that we're using and the DVB-T format is phenomenal. The Hi-Des Modulators which we are using have a large number of parameters which can be set to determine the format and bandwidth of the signals we generate. After some experimentation, we have settled on using QPSK modulation and a 6 MHz signal bandwidth. This combination delivers excellent picture quality with more that adequate motion performance. We see very few if any picture artifacts using our current format. We've also done some experimentation with QPSK and a 4 MHz signal bandwidth. I plan to share more on signal formats in a future article on our blog.

Digital ATV System User Interface

We are both using HD Digital Camcorders as our primary video signal sources and 1080p monitors to display our received signals. I opted to include an HDMI Video Switch from Gefen in my setup which also allows me to send video and graphics from a variety of different sources including my PC over the air. The monitor in the picture above on the right is a touch screen display which I use to control my ATV Transceiver system.

AB1OC Digital ATV Transceiver

Early on, I decided to build a Transceiver like setup. I wanted to create a unit which was simple to use just like the HF Transceivers available today. Some of the key capabilities that I wanted to create include:

- Real-time selection/switching between multiple HD sources
- Transmission of PC sourced Video and Graphics over the air

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- Preview and cueing of the next video transmission while receiving
- Simultaneous display of both receive and pending transmit video
- Built-in Transmit/Receive (T/R) switching with termination and protection of the Tx power stage
- Sequencing of T/R stages including my tower mounted pre-amplifier system
- Power and SWR monitoring with automatic trip on high SWR
- An internal low-noise RF preamplifier to provide additional receive signal gain if needed
- Touch screen graphical interface for configuration and operating the system
- Recording of both sides of on-air video QSOs to an attached PC

To achieve these goals, I decided to build a Raspberry Pi 2 based Linux controller of my ATV Transceiver and to package all of the ATV components and video switching/conversion gear needed in a small rack mount enclosure. Many of the components in the system communicate with each other over an Ethernet LAN and the transceiver is networked to computers and other devices via an external Ethernet connection. More on the details of the Transceiver design to come in a future article. Skip and I recently produced a short video to demonstrate how Fast Scan Digital ATV works and to show the quality that these systems are capable of producing. Our project is still a work in progress and I expect that we will continue to learn as we perform more tests and continue development of our systems. I plan to post additional articles here to share the details of our designs and learning from our on-air testing as we proceed.
…Fred (AB1OC)

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WIRELESS EXTENSION CORD

A friend of mine said he had a great idea for a wireless extension power cord. It gathered my interest so he said he would send me a picture of his prototype. Here is what he sent! My guess is that we need a better antenna.

…WA8RMC

MAINTAINING DIGITAL TV SIGNAL QUALITY

From TV Technology Magazine. http://www.tvtechnology.com/expertise/0003/maintaining-eng-signal-quality/275216 *CTRL Click on above link for complete article.*

Digital transmission puts extra demands on amplifier linearity. TV transmitter engineers are well aware of this, but operators of terrestrial and satellite digital transmitters might not always realize when signal problems are caused by nonlinearity in mast-mounted ENG amplifiers or satellite uplinks. Analog transmission of video over satellite or terrestrial microwave used frequency modulation, and except for intermodulation between the sound carriers, amplifier non-linearity wasn't a major problem.

High-speed digital transmission requires more complex signals. Simple QPSK modulation, which carries the digital data as shifts in the phase of the carrier in one of four quadrants (Fig. 1), is quite robust, but doesn't provide the data rate needed for HD video after forward error correction is added.

Digital satellite uplinks typically use 8PSK—the data is coded into one of eight different phases (Fig. 2). Fixed digital microwave links often use 16QAM or 64QAM, which is an even more complex signal (Fig. 3). For ENG microwave, COFDM provides more robustness through modulation of thousands of carriers typically modulated with QPSK, 16QAM or 64QAM. From these diagrams you can see it wouldn't take much distortion for one symbol to be confused with another.
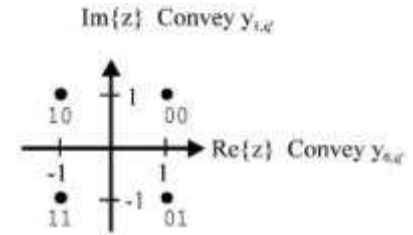

Fig. 1: QPSK Constellation

OVER-POWERED AMPLIFIERS CREATE INTERFERENCE

When ENG microwave links fail, the temptation is to up the power. That can help, until the amplifier is driven into nonlinearity, where increasing input level doesn't increase output level by the same proportion. One clue the amplifier is overdriven is a decreasing signal-to-noise ratio (SNR) at the receiver even though the received signal strength is increasing. The noise and distortion is occurring in the amplifier and there is nothing that can be done on the receive end to remove it.
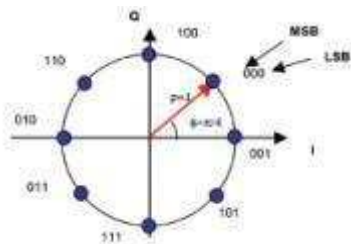

Fig. 2: 8PSK Constellation

If the required SNR can't be achieved even with a power reduction, then the only option is to select a more robust transmission mode and live with the lower data rate. The amplifier nonlinearity also leads to spectrum regrowth, which can be seen on a spectrum analyzer.

Before being transmitted the digital data is coded with additional bits that are used to reconstruct the signal if some of the bits are lost. The "coding rate" is the ratio of original data bits to the coded data bits.

For example, in three-quarter-rate coding, four bits are transmitted for every three data bits. Lower rates are more robust— for half-rate coding, twice as many bits are sent as in the incoming data.

That document describes the modulation and coding and Annex A shows simulated system performance for 8 MHz-wide channels. For example, a half-rate (1/2) QPSK signal can carry around 5 Mbps if the carrier-to-noise (C/N) ratio is 4 dB or better. If a 15 Mbps data rate is required, the required C/N increases to around 15 dB. The exact rates depend on the guard interval and channel conditions.

Mast-mounted amplifiers originally designed for analog (FM) do not work well for digital transmission. Phase and amplitude nonlinearity in the amplifiers limit usable power to less than half the rated analog power. Microwave modulator and amplifier technology has improved significantly since the Sprint/Nextel 2 GHz digital conversion, and it might be time to upgrade those older amplifiers! Since Nextel did not cover the cost of replacing mast amplifiers for 6.5 GHz and 7.0 GHz spectrum, stations may be tempted to use their new digital modulators with these older amps. Results are likely to be disappointing.

The same problems can occur in satellite links. While typically less of a problem due to the sensitivity of today's satellite transponders, solid-state or TWT amplifiers in the uplink can be over-driven if the device is failing or when compensating for rain fade. As with terrestrial microwave links, indications of too much power include spectrum regrowth (visible on the downlink spectrum) or SNR and BER worse than expected for the link. Too much signal into the satellite transponder is another concern. It will affect other users and incur the wrath of the satellite operator

Fig. 3: Q64-QAM Constellation

DIFFERENCE BETWEEN CABLE AND DSL BROADBAND ACCESS
Major technological differences produce roughly equivalent Internet performance.

Feb 19, 2013 Lou Frenzel | Electronic Design

Download the complete article in .PDF format
It includes high resolution graphics /schematics when applicable.

A comparison of the two major types of Internet access, cable TV and DSL. Technical details and specifications are reviewed. Most people use cable TV or digital subscriber line (DSL) for high-speed Internet access at home. In fact, 50% of all broadband customers use cable, 42% use DSL, and 8% use fiber-optic cable, satellite, or a wireless system. However, DSL dominates in Europe and the rest of the world. Cable and DSL both have been around for years with steady upgrades and improvements, though their methods for delivering high-speed data are very different.

Cable TV Systems
Cable TV systems were developed to provide reliable TV service to local communities. Along with the hundreds of TV channels available, cable companies offer services such as high-speed Internet access. Some even offer voice over IP (VoIP) telephone service. Cable companies usually offer a "triple-play" package that bundles TV, phone, and Internet services.

Systems have been upgraded from pure analog transmission to digital. Early systems were based on coax cable, but today the most common configuration is fiber-optic cable and coax. Hybrid fiber coax is one of the most common configurations *(Fig. 1)*.

1. The typical hybrid fiber coax (HFC) cable TV distribution system used throughout the U.S. consists of fiber-optic cable to neighborhood nodes that then distribute the signals to homes with RG-6/U coax.
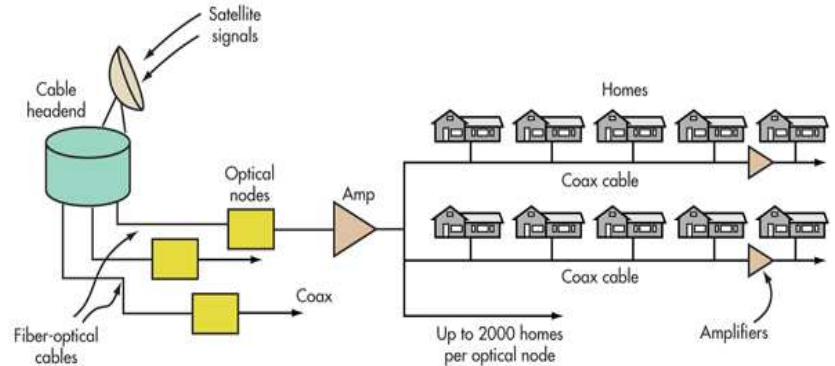
All of the services originate from the cable company's facilities, known as the headend, where the company collects the video from local TV stations and cable TV programming suppliers via satellite. The company then packages multiple channels into bundles for basic cable as well as two or three other options of premium movie and/or sports channels. The headend also has an interconnection to the Internet, where it can supply Internet services or connect to a separate Internet service provider.

The headend connects to the end user via a network of fiber-optic and coax cables. The TV channels and Internet channels are frequency multiplexed and modulated on to the main fiber-optic cable for transport out to distribution hubs that rejuvenate the signals over longer cable runs. From the one or more distribution hubs, the signal travels to multiple optical nodes located in various city or suburban neighborhoods. In a typical configuration, a single fiber is split to serve four fiber optical nodes. Most fiber nodes serve up to 500 homes. With this arrangement, each fiber serves up to 2000 homes, although not all homes passed have a cable modem or service.

The optical nodes convert the optical signals into electrical signals for the final distribution via coax cable. The most common cable is RG-6/U 75-ohm coax using F-type connectors. All of the homes receive the same signal, just like a bus network topology. In some areas with longer distances, amplifiers are added along the way to mitigate the large cable losses that are common.

All of the TV signals and Internet data are transmitted in a spectrum of 6-MHz wide channels. Since a coax cable has a bandwidth as wide as 850 MHz to 1 GHz, the system can accommodate from 140 to 170 downstream channels of 6 MHz each. The TV signals or Internet data are modulated on to carriers in each channel. There are also upstream channels that allow the consumer to transmit data back to the headend. This communication takes places in 6-MHz channels as well that occupy the cable spectrum from 5 MHz to 40 MHz or in some systems up to 65 MHz.

The composite video signal is developed in equipment called the cable modem termination system (CMTS). In older systems, the video information is modulated on to the 6-MHz channel carriers and then all channels are combined or linearly mixed to form the composited cable signal *(Fig. 2a)*. However, today it's possible to synthesize a full block of modulated channels digitally. The digitized video is sent to an ASIC or FPGA programmed to produce the desired quadrature amplitude modulation (QAM) for each channel *(Fig. 2b)*. The signals are then digitally upconverted to the final frequency and sent to a wideband digital-to-analog
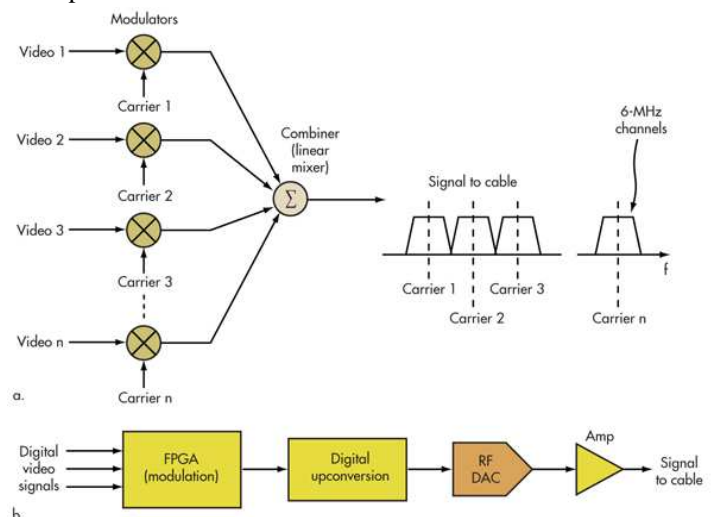
converter (DAC) that produces the composite multi-channel signal to be sent to the cable.

2. In older cable TV systems, individual modulators add the video to the channel carriers that are linearly mixed to form the composite signal for transmission over the cable (a). Modern cable TV systems are beginning to use direct digital synthesis of the composite signal for transmission (b). The digital video signals are fed to an ASIC or FPGA, where an inverse FFT and other techniques implement the QAM modulation and upconversion. A fast RF DAC develops the final composite analog signal for transmission on the cable.

Maxim Integrated's MAX5880 modulator/digital upconverter (DUC) can generate from eight to 128 QAM modulated channels. It is a 14-bit RF DAC with a 4.6-Gsample/s rate that produces the final signal. Figure 3 shows what the output signal looks like in the frequency domain.

3. This illustration shows a spectrum analyzer output display of 128 QAM channels generated by the MAX5882 and MAX5880 combination. The full bandwidth is 1 GHz with a center frequency of 525 MHz. The resolution bandwidth is 1 MHz. You can just make out the 6-MHz channels, 16 per 100-MHz segment.
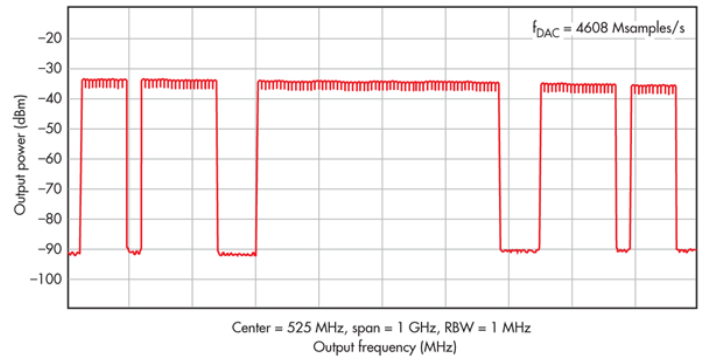
In older analog systems, each TV signal occupied one 6-MHz channel. Modern digital signals may have one TV signal per channel or more. Digital TV signals can be compressed using MPEG compression algorithms to reduce the amount of channel space required for transmission, allowing multiple signals per channel. Downstream modulation is usually 64-state QAM (64QAM) or 256-state QAM (256QAM), meaning each channel can deliver a data rate up to 38 Mbits/s. Higher speeds can be achieved by using channel bonding, which transmits the data stream in two or more 6-MHz channels.

Users do not usually get the full download speeds mentioned above. Because the coax line is a bus shared by many homes, the data speed is divided up amongst those who are using the connection. A single user will get the full speed but with multiple users each will get a proportionally slower connection.

Upstream modulation is quadrature phase-shift keying (QPSK) or one of several variations of 16/32/64/128QAM. Upstream rates are typically less than 27 Mbits/s.

The downstream data is routed through the cable wiring in the home through splitters that divide the signal for multiple room connections. One or two devices then recover the signals. A cable box or set-top box (STB) selects the desired television channel with a tuner and directs the signals to the TV set for presentation. In some cases, a cable-ready TV can recover the signals without the STB.

Internet service and VoIP telephone service use a cable modem, which connects to the Ethernet port on a PC or laptop. In many homes today the cable modem connects to a wireless router that distributes the service by Wi-Fi to PCs, laptops, tablets, or cell phones.

Most cable modems also have a telephone option where the digital VoIP is converted to be compatible with the standard telephone wiring in the home so standard phones can be used. A standard RJ-11 connector connects the cable modem to the home wiring.

Most cable systems are based on the Data Over Cable Service Interface Specification (DOCSIS). Developed by CableLabs in cooperation with the industry, DOCSIS defines the operating system and the hardware specifications. Version 1.0 was introduced in 1997. DOCSIS 2.0 came along in 2001, and DOCSIS 3.0 was released in 2006. Most systems use the latest version, which is IPv6 capable. DOCSIS also provides multiple security options including a Baseline Privacy Interface (BPI) or security (SEC) option. The 56-bit DES and AES 128 encryption methods are available, as is public key infrastructure (PKI) authentication.

DSL
DSL is one of the oldest forms of high-speed Internet access. It had its start in the 1990s and has since evolved into a very stable and capable platform. It uses existing telephone wiring, generally known as the plain old telephone system (POTS). The in-place unshielded twisted pair (UTP) telephone lines form the backbone of the legacy wired telephone system. Thanks to technological developments, this wiring that was installed to handle voice telephone calls can now deliver high-speed digital data at 50-Mbit/s rates and beyond in some cases.

In a typical system, the telephone central office is connected to each subscriber by one or more #24 or #26 copper wire unshielded twisted pairs, with one for each telephone number. The lines are not shared. The cable runs vary from a few hundred feet to a maximum of 9000 to 18,000 feet (2.7 to 5.5 km). The system was designed to carry voice in the 0- to 4-kHz range. Early in the Internet era, dialup modems were designed to carry digital data over these analog lines. Special QAM modulation and encoding schemes allowed data to be carried at rates to about 56 kbits/s maximum. Then the DSL system was developed to carry much higher speeds.

The original DSL system was designed to produce data rates of 1.5 Mbits/s to 8 Mbits/s downstream from the telephone company to the subscriber and a lower rate upstream. Most Internet access involves more downloading and less uploading of data. The resulting design is referred to as asymmetrical DSL or ADSL. Most DSL formats are asymmetrical, although there are DSL variations that deliver the same rates in both directions.

The great attenuation, noise, and crosstalk problems of bundling multiple twisted-pair lines are the primary limitations of the POTS. These lines are effectively long low-pass filters with upper frequency limits that reduce the bandwidth of the line and limit the data rate that can be achieved. Line bandwidth is a function of the length of the UTP. Shorter cable runs have wider bandwidths, so they are clearly more capable of high data rates than longer runs. But despite this limitation, developments in digital signal processing have made this once limited communications medium capable of high-speed data delivery.

The telephone companies (telcos) have upgraded this basic system to include neighborhood terminals called digital subscriber line access multiplexers (DSLAMs). The DSLAM shortens the distance from the subscriber to the central office, so much higher speeds can be delivered. For shorter cable runs, the DSLAM may be in the central office. The DSLAM aggregates the data from multiple subscribers and connects them back to the central office by fiber-optic cables. This arrangement is generally known as fiber to the node (FTTN). Older systems used T1 or T3 lines, but today most DSLAM connections are fiber.

On the consumer end of the telephone line is a DSL modem generally called the customer premise equipment (CPE) that is used to demodulate the signals from the DSLAM and modulate any upstream transmissions. A low-pass filter separates the 0- to 4-kHz voice spectrum from the higher frequencies used for data transmission.

Most DSL systems use a modulation scheme similar to orthogonal frequency division multiplexing (OFDM) called discrete multitone (DMT). It divides the cable spectrum into subchannels or bins that are 4.3125 kHz wide *(Fig. 4)*. The original basic DSL uses 256 subchannels for a bandwidth of 1.1 MHz. The lower subchannels from approximately 26 kHz to 138 kHz are used for upstream transmissions from the subscriber to the central office. Above 138 kHz to about 1.1 MHz are the subchannels used for downstream transmission.

4. This is the spectrum of the unshielded twisted-pair cable showing the subcarriers and the upstream and downstream allocations for ADSL, ADSL2, VDSL, and VDSL2.

As in OFDM, the high-speed serial data to be transmitted is divided into many slower parallel streams, each of which modulates a subcarrier in each subchannel. Modulation can be from QPSK to 64QAM. In DSL, the maximum bit rate per carrier is 60 kbits/s. The modulation is accomplished digitally in a digital signal processor (DSP) using the inverse fast Fourier transform (IFFT) for modulation and FFT for demodulation.
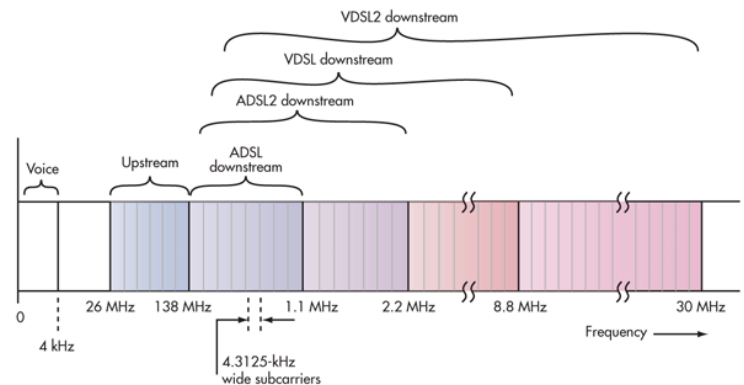
The actual data rate depends not only on the modulation method used but also on the number of subchannels used—and, of course, the distance between the central office or DSLAM and the CPE. Noise is another limiting factor. The DSLAM and DSL modem can adapt to noise conditions by examining the spectrum and blocking channels with excessive noise content. This reduces the speed but maintains the link with accurate data.

There are many different versions. ADSL is the most common, although some newer and more advanced versions are widely used. For example, ADSL2 extends the line bandwidth to 2.2 MHz and 512 subchannels, extending the maximum data rate to 12 Mbits/s. Another variation, ADSL2+, further extends the maximum rate to 24 Mbits/s.

Then there is video DSL (VDSL). Designed to carry compressed digital video for HDTV, it achieves even higher rates by using more of the cable bandwidth and further restricting its length. There are multiple versions including VDSL2 with a variety of specifications.

One version uses the UTP cable bandwidth out to 8.832 MHz with 2048 subcarriers to achieve a maximum rate of 50 Mbits/s. Other versions use 12, 17, or 30 MHz of bandwidth. With the 17-MHz bandwidth and 4096 subcarriers, the maximum possible data rate is 100 Mbits/s. Another version uses 30 MHz of bandwidth with 3479 subchannels that are 8.625 kHz wide instead of the usual 4.3125 kHz. Maximum data rate is 200 Mbits/s. The range is usually restricted to 1000 to 3000 feet. Unlike cable TV connections, DSL gives the full speed to each user.

To make VDSL2 even faster, companies like Broadcom, Ikanos, and Lantiq are implementing VDSL2 chips with a feature called vectoring. This digital signal processing technique cancels noise and far-end crosstalk (FEXT) between bundled twisted pairs, enabling high speeds. These new chips also implement channel bonding that permits two twisted pairs to be used simultaneously to further increase speed to 200 Mbits/s downstream and 100 Mbits/s upstream. For example, the Ikanos' Vx185-HP communications processor chipset implements VDSL2 as well as vectoring and channel bonding in a home gateway *(Fig. 5).*

5. The Ikanos Fusiv Vx185-HP home gateway chip implements ADSL2 and VDSL2. A MIPS 600-MHz processor is the host. Interfaces include two 1-Gbit/s Ethernet ports, PCI Express, USB 2.0, SATA, and the usual UART, SPI, I²C, and GPIO ports. VoIP processing is included.
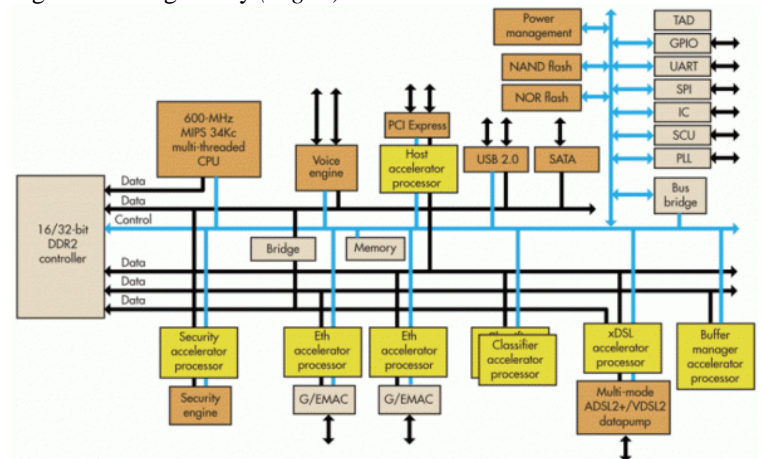
AT&T's popular U-verse system uses VDSL2. It sends video signals by fiber to a neighborhood DSLAM and then distributes the signal to homes over the installed UTP wiring. The U-verse system provides cable TV-like service with IPTV as well as VoIP and Internet access.

The International Telecommunications Union-Telecommunications (ITU-T) standardizes DSL specifications. The ADSL standard is G.991 and G.992. The ADSL2 standard is G.993 and G.994. ADSL2+ is specified in G.995. The standards G.993.1 and G.992 define VDSL and VDSL2. The vectoring standard is G.993-5, and the channel bonding standard is G.998.1.

Alternate Systems

Most consumers use cable TV or DSL for Internet service. However, there are instances where other methods are desirable or necessary. In many areas where new homes are being built, installing fiber-optic cable directly to the home (FTTH) is no more expensive. For example, Verizon's FIOS system isn't widely available but does provide services with typical rates from 50 to 100 Mbits/s.

Some rural systems use wireless methods. Clearwire's system uses the WiMAX standard (IEEE 802.16) to deliver data rates from 1 to 5 Mbits/s over several miles. For even more remote service, a few companies offer satellite downstream data at rates to several Mbits/s.

References
Broadband Forum: www.broadband-forum.org
CableLabs: www.cablelabs.com

DARA ATV REPEATER UPGRADE

Just a few snapshots of the latest in the continuing new equipment/upgrades at the DARA ATV Site.

Thought you would like to see what is happening in DARA's ATV repeater equipment room.

Attached is a photo of the old CRT Monitor prior to removal at the DARA ATV repeater site, in Cabinet #1. The CRT monitor was still functional, but obviously obsolete. The second photo is the first pair of replacement Liliput monitors I have installed tonight... The plan is that the DARA site will have a total of four separate in-rack monitors that will allow simultaneous checking of the Analog and Digital video sources at the site.

Cheers,
Dave P
AH2AR

70CM BAND OPENING

February 20, 2016. Great 70cm band opening today. I got this screenshot from Farrell Winder of my ATV signal. Farrell is in Cincy, and I am in Vandalia.

Also worked Dale (WB8CJW) on DVB-T ATV, (two way), two way with Al (W8KHP) in Hebron KY, Bill (W8URI), Ross (KA8MFD), Charlie (WB8LGA) and Gary (W8PU) in Midland on A5.

My antenna and mast is in a 5 gallon bucket on my 2nd floor deck of the house, here, HI HI. When the band is open, it's open!
Also, DVB-T video was making it through the DVB-T receiver at the Dayton ATV repeater site.
Cheers,
Dave P

P.S. Sure wish your ATCO DVB-T ATV repeater input was on 439.000 MHz. I have the DVB-T input on 439 MHz and it works out well. There is such little activity going on, you should consider moving it. It's a pain to continually change the freq, and the majority of the DX folks aren't going to bother changing it, so when the band is hopping, you guys would be aware of it.

The ATCO repeater DATV input on 70cm must stay on 438MHz in order to use the same filter we use for 439MHz analog ATV. We use lower sideband for the analog ATV to stay away from the FM repeaters on 440-450. DATV 439 would require separate filters.

Al, W8KHP, also shares these band opening pictures:
These are all the pictures I have. These include the ones you already received but here they are all together. As you see I have the date 20 Feb 2016 on each of them. These are between 7:45 and 8:15 AM on the 70 cm band. The digital are of course DVB-T. I have also included a propagation map for the time period involved.
 73 Al W8KHP

"HAM TV" USED FIRST TIME DURING ARISS UK SCHOOL CONTACT

Thursday 11th February 2016, at 18:11 UTC, an educational ARISS radio contact took place at the Royal Masonic School for Girls, Rickmansworth, UK. The school contact was operated by Tim Peake, KG5BVI in the frame of the Principia mission. It was a historic event: the radio contact was enhanced with video! Tim Peake activated the Ham Video transmitter on board Columbus.

As far back as the year 2000, a proposal for an ATV system on the International Space Station was submitted to the ARISS Project Selection and Use Committee by Graham Shirville G3VZV. November 2002, a request for amateur radio facilities on the then under construction Columbus module was submitted by Gaston Bertels, ON4WF to Mr Jörg FeustelBüechl, Director of Manned Spaceflight and Microgravity Directorate of the European Space Agency (ESA).

The request was to install wideband amateur radio antennas on the nadir of Columbus, facing the earth. With such antennas, the on board amateur radio facilities could be extended to amateur TV. In 2003 the request was examined in detail and finally accepted. ARISS would pay for the development, manufacturing and qualification of the antennas. ESA would support the installation cost.

ARISS Europe started a funding campaign, all donations being published on the website. In 2004 coaxial feed throughs were installed on the port cone of Columbus. This was needed for accessing the antennas with feedlines from inside the module. In 2005, the Royal Belgian Amateur Radio Society (UBA) signed a contract with the Wroclaw University of Technology, Poland for the development and manufacturing of the antennas. Whereas initial plans were for UHF, Lband and Sband antennas, only Land Sband antennas could be ordered by lack of funding. The cost of the project was 47.000 Euro. Early 2006 the antennas were delivered to ESA. Meanwhile main Columbus contractor EADS and subcontractor Alenia Spazio had reviewed mechanical and thermal constraints.

Wroclaw University proceeded with qualification tests (cost 3,000 Euro) and the antennas failed. In 2007 an additional contract was signed with the Wroclaw University for the development of modified antennas. This amounted to 36,000 Euro. These antennas were accepted and installed on Columbus, October 2007. The cost of the antennas finally amounted to 86,000 Euro and was covered by a wordwide funding campaign. ESA supported the total installation cost of the antennas, including feed throughs and coaxial cables. After the successful launch of Columbus and its integration into the International Space Station complex, an ARISSEurope working group started a study for the development of an amateur television transmitter on Columbus, using one of the the Sband antennas. A debate started between the supporters of analog television (ATV) and the proponents of digital television (DATV). The working group, which met monthly per teleconference, made progress, but was stuck by the lack of funding. As time went by, the debate on ATV versus DATV evolved as to the advantage of the latter, but no funding was in sight…Then, suddenly, supported by the enthusiasm of Italian astronaut Paolo Nespoli IZ0JPA, who had performed many ARISS school contacts during his 20102011 expedition aboard the Space Station, at the initiative of AMSAT Italia, an Italian manufacturer, Kayser Italia, presented a project for an amateur radio DATV transmitter to ESA's educational services. In 2012, this proposal was accepted and ESA signed a contract with Kayser Italia for the development and the manufacturing of a DATV transmitter on Sband. This transmitter, dubbed 'Ham Video', was installed on Columbus and ESA transferred custodianship of this equipment to ARISS. It was a long way, spanning sixteen years, from the initial proposal to the first ever HamTV school contact.
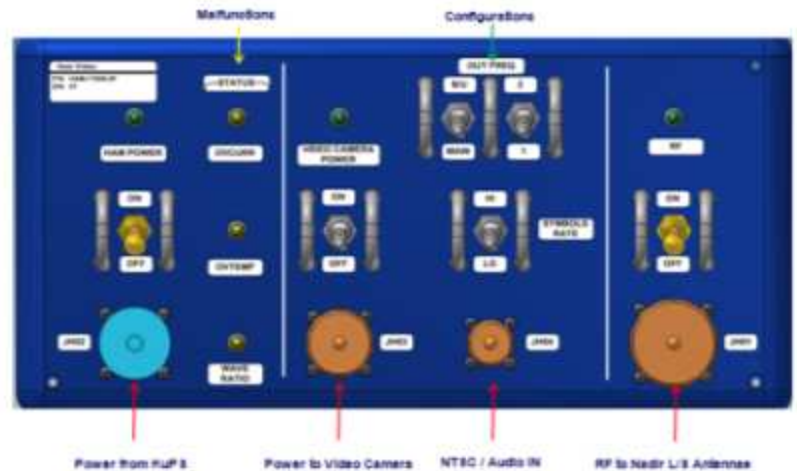
A new era opens for ground station operators, interested in receiving digital amateur television from the International Space Station. A technical challenge already met by a few ground stations in Europe, USA and Australia. Long life to HamTV and success to the pioneering ground stations, world wide!

"It was a historic event!" enthused past ARISS-EU Chair Gaston Bertels, ON4WF, who helped shepherd the DATV system into existence after it was first proposed more than 15 years ago. As students at the all-girls school looked on, Peake's image appeared on a large viewing screen before a fully packed auditorium. The Amateur Radio on the International Space Station (ARISS) program is seeking proposals from schools and formal or informal educational institutions and organizations -- individually or working together -- to host an Amateur Radio contact next year with an ISS crew member. The window to accept proposals opened on February 15, and the deadline to submit one is April 15. ARISS anticipates that contacts would take place between January 1 and June 30, 2017. Crew scheduling and ISS orbits will determine the exact contact dates. To maximize these radio contact opportunities, ARISS seeks proposals from schools and organizations that can draw large numbers of participants and integrate the contact into a well-developed education plan. Each FM-voice contact lasts about 10 minutes.

Because of the nature of human spaceflight and the complexity of scheduling activities aboard the ISS, organizations must demonstrate flexibility to accommodate changes in contact dates and times. Contact ARISS for more information.
…Gaston Bertels, ON4WF ARISSEurope past chairman

W8RVH SK

[*Intro by Bill Brown WB8ELK*]: Last September we lost Richard Goode W8RVH who was one of the true pioneers of Amateur Television. Richard's distinctive ATV logo never changed over the decades and was viewed by many. He was one of the very first ATV contacts I made when I first got involved with ATV in 1969. He lived in New Carlisle, Ohio and at 60 miles distance from my home, Richard was just beyond my local reception range. However with his amazing array of homebuilt high-gain antennas, I could always see his ATV image no matter what the band conditions. He even could rotate the whole array by 90 degrees to accommodate horizontal or vertical polarization.

Before his retirement, he worked at WPAFB in Dayton, Ohio engineering Airborne Radar systems. He applied his engineering techniques throughout his amazing ham shack. It was always a treat to visit him to see what new innovations he was working on. Those of you who have attended the annual ATV dinner at the Dayton Hamvention know that he usually found a way to attend and was a fixture at these events for many years. He will be greatly missed by all the many ATVers that held a daily sked with him spanning decades. Farrell Winder W8ZCF and Hank Cantrell W4HTB wanted to share the following two stories about Richard that really show his ability to engineer a solution to tough problems and really highlight his innovations.

Remarkable ATV Operation in a Restrictive Location

It is remarkable what can been accomplished by an Amateur Radio Operator moving from his home base farm to a part time residence. This was the case with Richard Goode, W8RVH who moved to his part time location, a Senior living facility which was 11 miles SE of his farm home location at New Carlisle, Ohio. In this instance, the plan was to set up the inside radios and connect to outside antennas in a "stealth" arrangement. This arrangement was finished in December, 2011 and demonstrated some remarkable operational results.

For HF, 2 antennas, a 160 meter and a 75 meter were constructed with the help of Dave Pelaez, AH2AR using a "sling shot", to establish a "stringer" over limbs of a 50-60 ft tree. A #22 copper wire with an insulator was then put in place covering a distance of about 130 feet. These antennas operate as basic long-wire slopers. It was nearly impossible to spot their existence. The antennas could be relay switched on the outside of the residence. They were fed with an older model Clipperton L Amplifier with four 572B tubes feeding an MFJ tuner providing 300- 350 watts output.

W8RVH's ATV (Fast Scan) setup consisted of only 1/3 (11 elements) of a K1FO antenna. The shortened length was done to conceal the presence at a location on the outside of the building. The antenna was mounted on a rotatable pole only 17 feet high.

The ATV transceiver was a PC Electronics unit with 3 watts out which fed a surplus TV line type distribution amplifier providing 22 watts output. With this setup, the W8BI Dayton repeater could easily be worked with a display of W8RVH's callsign transmitted to any station receiving W8BI, normally out to about 70 miles. A 439.25 MHz input yields a 421.25 Repeater Output. The most notable achievement is that W8RVH **Spring 2016 Amateur Television Quarterly 21** http://www.atvquarterly.com managed to exchange 2 way contact with stations such as WB8LGA, W8URI and KA8MFD in the Columbus, Ohio area, at distances up to 70 miles. Contacts have also been made with W8PU, Midland Ohio, 42 miles, and KB8GUE Leesburg, Ohio, 43 miles. This achievement shows what can be done with Amateur Radio type innovation using limited equipment and restricted outside equipment.

Photos courtesy of Mike Bowlus, K8KDM, St.Paris, Ohio

One Event in the History of W8RVH

From the many of us who were in regular contact with Dick Goode, W8RVH it was apparent that he was never one to brag or write much about his many innovative accomplishments and technical assistance to many other Amateur Radio Operators.

However, there was one Outer Space event in November, 1997 to which W8RVH contributed much innovative analysis. This event was the launching of Sputnik 40, a 1/3 size replica of the original Sputnik 1 launched in October 1957. The replica was hand launched from the MIR Space Station to celebrate the 40th anniversary of the first earth artificial satellite, Sputnik 1. Both W8RVH and W8ZCF had listened to the beeps of Sputnik 1.

Sputnik 40 RS-17

Sputnik 40 also named RS 17 was built by two groups of high school students, one from Reydellet School on Reunion Island (French) for the radio transmitter, and the other from Naltchik in Russia that supplied the mechanical structure with antennas. The radio was set up to issue beeps and also had provision for tone modulation to convey day to day internal temperature of the satellite.

W8RVH became immediately interested in the event and set up to measure temperatures of the audio beeps from the satellite beginning November 3, 1997 through December 30, 1997. W8ZCF also listened each day and compared notes with W8RVH.

A contact was made with F6FAO in France, who provided detail of the satellite electronics along with a frequency vs temperature chart which could be used to measure accurate temperatures from the beep tones. W8RVH proceeded with a unique technical arrangement to make temperature measurements. He observed some 200 readings over the life of the satellite. On December 27, 1997 the beep tones ceased as the satellite entered the earth's atmosphere to an extent that the electronics at the acquired high temperature became electronically dead.

The Miami University Twelfth Annual South West **22 Amateur Television Quarterly Spring 2016** Ohio Digital Symposium learned of W8RVH's Beep Recordings and Analysis and persuaded him to give a presentation on January 17, 1998. In W8RVH's words this is some of the details of his presentation:

Quote:
A method of measuring the frequency of the transmitted beep was required. While expensive laboratory equipment might do the job, no equipment was available. Therefore an innovative method of using Amateur Radio equipment was devised.
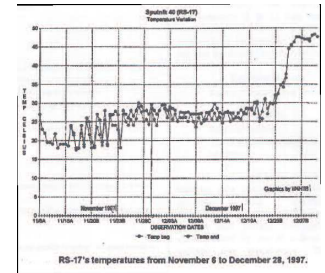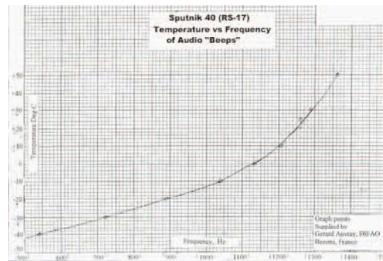
Since direct readout by a frequency counter failed due to the intermittent nature of the beeps, it was decided to try to synchronize a locally generated audio signal with the beeps and then measure the frequency of the local signal. Aural attempts to establish a zero-beat did not deliver the necessary accuracy.

As a result a third method which compared the beep signals and the audio fed to an oscilloscope proved to be very satisfactory. The classic Lissajous patterns of 2 frequency comparisons allowed easy and steady synchronization of the 2 audio tones.

The ratio of temperature change to audio frequency was established as approximately 3 to 1, thus a temperature accuracy of 1/3 degree C would be possible if the audio frequency could be resolved to 1 Hz.

Equipment used:

2 meter all-mode receiver with an 11 element yagi, stable audio generator, frequency counter and an oscilloscope with vertical and horizontal inputs. The audio generator was a vacuum tube capacity- type Wein Bridge generator with constant-current stabilization of the oscillating circuit. Further line voltage stabilization was accomplished by use of a Sola constant voltage line transformer.
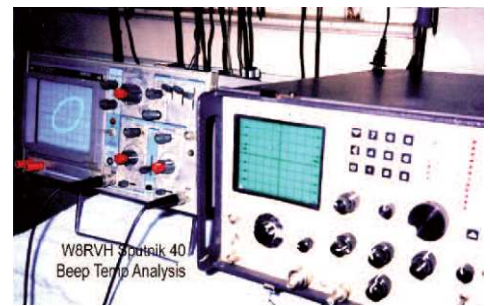
The only modification needed was to install a small capacitor vernier to the audio oscillator which allowed 180 degree angle rotation to sense a 20 Hz change in audio frequency. This made the setting to 1 Hz easy and practical.

The frequency counter was a Motorola Model 2006 service monitor, chosen because the internal time base is an oven controlled 10 MHz crystal which could be adjusted exactly zero beat with WWV, insuring accuracy to 1 Hz with sampling time set to 1 second.

A 5 inch dual 20 MHz oscilloscope was used allowing the operator to observe the scope while adjusting the frequency vernier for the Lissajous circle. After holding this pattern steady for 1 second or more, a reading could be made of the incoming frequency to within 1 Hz! Incremental changes were readily detectable. *End of Quote*

P. S.
A note of humor emerged while Dick, W8RVH and I were originally reviewing the temperature data plot. Since the dinosaurs all disappeared from Earth, with a little imagination the temperature plot takes on a definite image of a Dinosaur skeleton.
We had in our group, Don Miller, W9NTP, a renowned archaeologist who did examine the plot and confirmed that it indeed resembles a Dino skeleton. So perhaps some of the Dinosaurs went to Outer Space?!

Richard will be sorely missed.
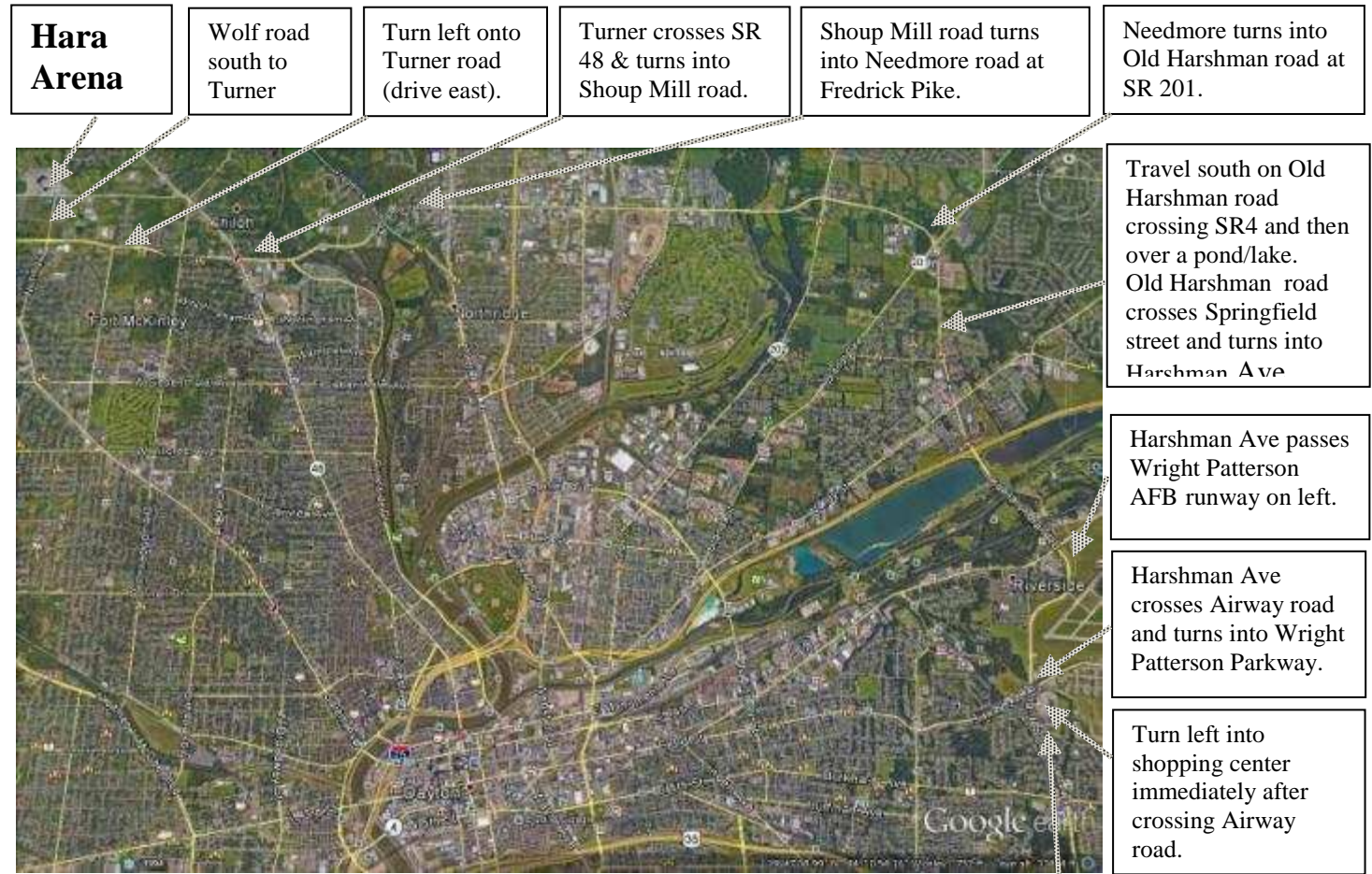73,
Farrell Winder W8ZCF
Hank Cantrell W4HTB
Bill brown WB8ELK

ATV ACTIVITIES SCHEDULE - DAYTON HAMVENTION 2016

Friday ATV Dinner

Friday Night dinner will be held on Friday May 20th at a new location; China Garden Buffet, 112 Woodman Way, Dayton, OH. 937-781-9999. It is near the southwestern tip of Wright Patterson AFB. Time will be 6:30 PM till 9:30 PM. See map for details to our new location. The buffet price is $11.99 per person. Join us for dinner and catch up on what is happening in ATV across the country!

Hara Arena	Wolf road south to Turner	Turn left onto Turner road (drive east).	Turner crosses SR 48 & turns into Shoup Mill road.	Shoup Mill road turns into Needmore road at Fredrick Pike.	Needmore turns into Old Harshman road at SR 201.

Travel south on Old Harshman road crossing SR4 and then over a pond/lake. Old Harshman road crosses Springfield street and turns into Harshman Ave.

Harshman Ave passes Wright Patterson AFB runway on left.

Harshman Ave crosses Airway road and turns into Wright Patterson Parkway.

Turn left into shopping center immediately after crossing Airway road.

Directions to the ATV Friday Night dinner and conference 2016.

Dinner is $11.59 buffet and starts approximately 6:30PM. After dinner we will have speakers and a round table discussion and wrap it up at 9:30PM. Call me on my cell at 614-580-4793 if there are any questions. **SEE YOU THERE!! Art…WA8RMC**

China Garden Buffet
Located in Airway Shopping center at:
112 Woodman Drive
Dayton, Ohio 45431
937-781-9999

ATN Booth

We will have a booth sponsored by ATN again this year in our regular spot in the North Hall, booth number 0236. We plan on a demo of ATV Friday and Saturday during the convention. ATVQ Magazine will also be there handing out magazines to those interested and take renewals or new subscriptions.

ATV Forum

The forum will be held Saturday May 21st in room 2 starting at 12:15 PM. Art Towslee WA8RMC will be our moderator again this year. Art has a great line up of speakers this year!

Schedule:
12:15-12:20 "Introductions" by Art Towslee WA8RMC
12:22-1232: "Gordo on Tropo" Gordon West WB6NOA describes his tropo ATV experiences from California to Hawaii.
12:34-1259: "High Definition ATV the Easy Way" Mel Whitten K0PFX shows the easy way to create high definition ATV.
1:02-1:32: "ATV uses and ATN Update" Mike Collis WA6SVT and Dan Bozin KB8RCU will show how fun ATV can be. Update on the Amateur TV Network including drone video site views.
1:35-2:00: "DATV Repeater Design" Grant Taylor VE3XTV (ZL1WTT) Will show the results of his experimenting with possible ways to create a DATV repeater.

THE ATSC 3.0 PHYSICAL LAYER BOOTSTRAP BASICS

From TV Technology Magazine Dec 2013. http://www.tvtechnology.com/atsc3/0031/the-atsc-30-physical-layerbootstrap-basics/277638
The ATSC 3.0 is the next television transmission standard to be released. It will address the details of how multiple digital TV programming is transmitted over a single RF channel. It will probably not be compatible with the existing standard so, "Here comes the set top box?". How that will be implemented is still up in the air and an implementation timetable is still far off…maybe 5 to 10 years. I wouldn't put off buying that new TV set quite yet though. See web page for complete article… WA8RMC

The ATSC 3.0 standard is nearing completion. Candidate standards have been released for system discovery, or "bootstrap," and the physical layer. Broadcast engineers will have to understand how ATSC 3.0 works if they want to take advantage of the improved performance and flexibility it offers. Most readers know that ATSC 3.0 uses OFDM (orthogonal frequency division multiplexing), which divides data among thousands of carriers (8K, 16K or 32K); versus the legacy ATSC standard that uses 8-VSB (eight-level vestigial sideband modulation), which puts all the data on a single carrier. All other DTV standards around the world, including DVBT, DVB-T2, ISDB-T, ISDB-Tb and DTMB use OFDM, although DTMB also supports a single-carrier mode.

ATSC 3.0 provides an improvement over existing OFDM-based DTV standards through use of the latest LDPC FEC (low-density parity-check forward error correction) codes and optimized constellations ranging from QPSK (quadrature phase shift keying) through 4096QAM (quadrature amplitude modulation). Different combinations of codes, pilot patterns and constellations can be selected to allow data rates ranging from less than 1 Mbps in an extremely robust mode working at less than zero dB SNR (signal-to-noise ratio) to over 57 Mbps when a much higher SNR is available.

A key requirement for ATSC 3.0 is the ability to change the transmission format while continuing to support legacy receivers. This is accomplished through a framing structure that includes a "System Discovery and Signaling" signal, referred to as the "bootstrap" signal before each frame. This signal has a fixed physical configuration, but carries data identifying the version of the frame following it. This could be ATSC 3.0, a future ATSC 3.1 or some other variation; even one using a different waveform.

Frames carrying ATSC 3.0 data and those with different formats can be combined in the same RF channel. When it is time to transition to a new standard, the bootstrap will allow older receivers to ignore the new ATSC 3.1 frames, but continue to demodulate the ATSC 3.0 frames.

Figure 7.10 shows the frame structure of an ATSC 3.0 frame. The bootstrap at the start of the frame provides the information necessary to demodulate the preamble, which in turn provides the information necessary to demodulate the rest of the data in the frame and its subframes.
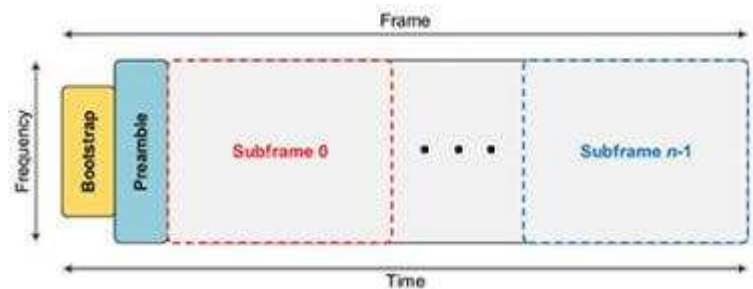

Fig. 7.10: ATSC 3.0 Frame Structure

The bootstrap is the most robust part of the signal. The preamble is less robust than the bootstrap, but more robust than the data in the frame. The bootstrap signal uses a Zadoff-Chu sequence combined with a PN (pseudo-noise) sequence to create a robust signal that allows detection and decoding at a SNR of around –10 dB or less. The Zadoff-Chu root defines the major version number and the PN sequence defines the minor version number. Once this frequency domain sequence is translated to the time domain using a 2048 point IFFT (inverse fast fourier transform), cyclic shifts can be applied in the time domain to encode information in the bootstrap symbol.

The bootstrap signal has a fixed bandwidth of 4.5 MHz, regardless of the actual RF channel bandwidth. The sampling rate is fixed at 6.144 Msamples per second with an FFT size of 2048, resulting subcarrier spacing of 3 kHz. Each bootstrap symbol has a duration of 500 microseconds. The number of bootstrap symbols is set at four. The first is a synchronization symbol. Symbols that follow contain emergency alert wake-up information, system bandwidth, the minimum time to the next frame with the same major and minor version, and a value for one of the defined preamble structures. Annex K of "A/322" defines 119 different preamble structures.

BOOTSTRAP BENEFITS
Mathematics, beyond the scope of this article, is required to fully describe the bootstrap signal. To learn more, search Google "Zadoff Chu." See "A/321 Part 1—ATSC Candidate Standard: System Discovery and Signaling" for a mathematical description of how the signal is generated in ATSC 3.0. Zadoff-Chu sequences are also used in LTE cellular transmissions.

The ATSC bootstrap signal provides benefits beyond those I mentioned earlier. In addition to providing a universal entry point to the ATSC 3.0 waveform and any future waveform, the robust signal gives the receiver a head start on frequency offset and RF channel estimation, making it easier to decode the preamble and the rest of the frame.

The bootstrap is integral to reception. The time required to complete a DTV channel scan is a major frustration for viewers. Worse, channel scans often have to be repeated if the desired signal wasn't received on the first scan and the antenna is relocated. The bootstrap

signal should help solve both of these issues. The receiver only has to detect the bootstrap signal to know there is a DTV signal on a channel. The bootstrap signal is much more robust than the payload data, so antenna positioning isn't likely to be a problem.

The spacing of the frames will determine how long a receiver will have to remain on a channel to detect the presence of an ATSC 3.0 signal. Although the ATSC 3.0 standard will allow frame lengths up to about 5 seconds, such long frames are not likely to be used for conventional broadcasting because it will greatly slow the time required to change programs, even on the same channel. A more realistic frame length is around 250 ms. At this frame length, a scan of 49 channels would take less than 15 seconds! While this won't provide the call letters or program information on available stations, that information can be easily obtained after the identified channel is selected, on a more detailed follow-up scan, or from a listing of stations in an area transmitted by one or more of the stations.

The bootstrap signal also will play a key role in emergency alerting. For example, a portable receiver in a tablet or cell phone only has to turn its receiver on long enough to pick up the bootstrap signal (2 ms). The receiver does not need to decode the preamble or the rest of the frame or turn on additional demodulation circuitry until the bootstrap signals that an emergency alert is available, reducing power consumption and thus providing longer battery life. When an alert is received, it can switch on the demodulator and receive and display the emergency message and supplemental data.

The ATSC 3.0 standard offers broadcasters unparalleled flexibility. If broadcasters fail to utilize this flexibility, they may find consumer electronics manufacturers reluctant to support it in their products. Understanding the options is the first step.
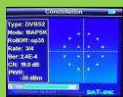
_____

A T C O
2016 SPRING EVENT
12 Noon – SUNDAY (For hamfest)
(Lunch starts about 12:30 PM)
May 8, 2015
ABB PROCESS AUTOMATION CAFETERIA
579 EXECUTIVE CAMPUS DRIVE, WESTERVILLE
FOR MORE DETAILS, CONTACT
ART – WA8RMC - 891-9273
FREE LUNCH PROVIDED – DOOR PRIZES
BRING A FRIEND AND SEE OLD BUDDIES
**MINI HAMFEST – SHOW AND TELL**

DIRECTIONS TO THE ATCO EVENT

From I-70 WEST Bound:
Take I-270 Northbound around and turning to the west to Cleveland Ave. Exit north onto Cleveland Ave and travel north about 2 miles to Executive Campus drive. (It's the next street past Westar Crossing Street). Turn left (west) to the ABB building at the end of the street.

From I-70 EAST Bound:
Take I-270 Northbound around and turning to the east past SR 315 and past I-71. Get off on the Cleveland Ave second exit and travel north (to Westerville). Continue north on Cleveland past Schrock road and then past Main Street. Continue north about ½ mile past Main Street to Executive Campus Drive. (It's the next street past Westar Crossing Street) Turn left (west) to the ABB building at the end of the street
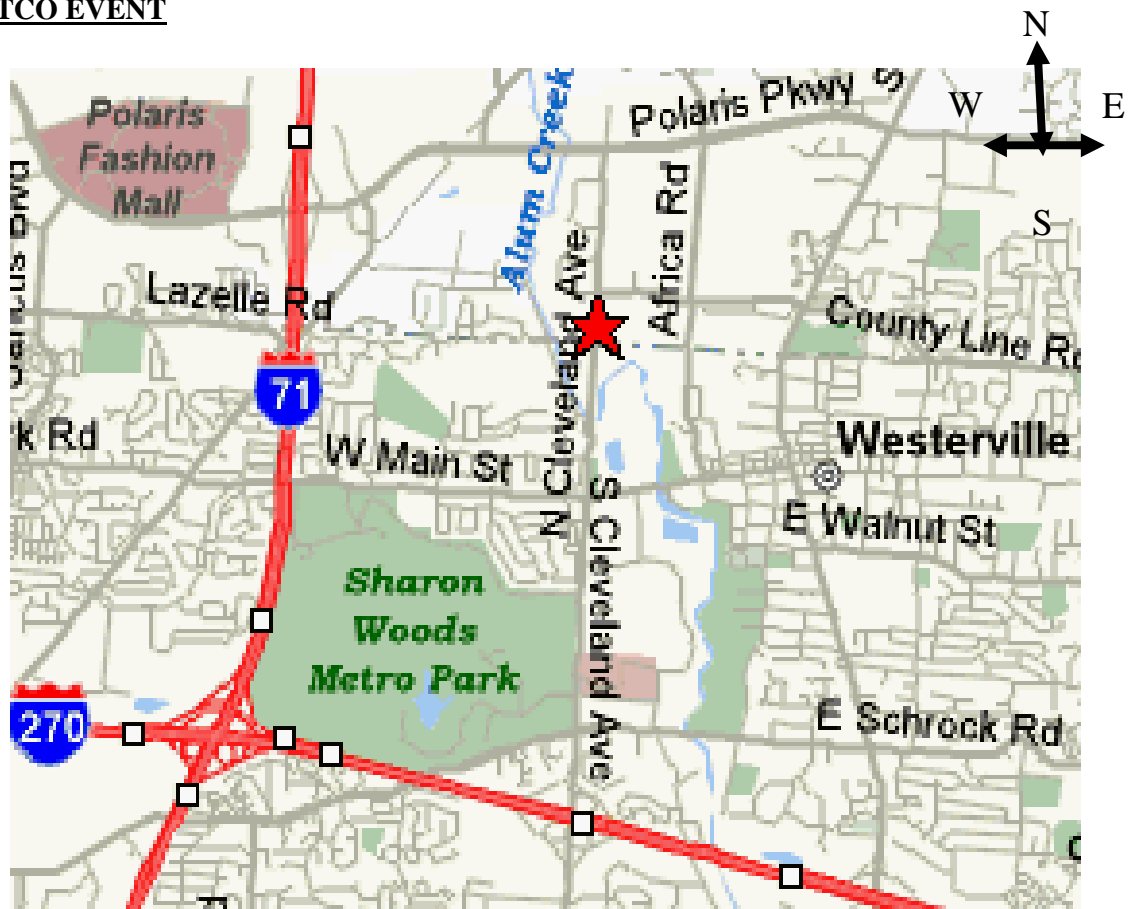
From I-71 NORTH bound toward Columbus:
Drive through Columbus on I-71 to I-270 on the north side. Take I-270 east to the first exit, Cleveland Ave. Get off the Cleveland Ave second exit and travel north (to Westerville). Continue north past Schrock road and then past Main street. Continue north about ½ mile past Main Street to Executive Campus Drive. (It's the next street past Westar Crossing Street) Turn left (west) to the ABB building at the end of the street.

From I-71 traveling SOUTH bound toward Columbus (North of I-270):
Exit the Polaris Ave exit and travel East about 1 mile to Cleveland Ave. Turn right on Cleveland Ave to Executive Campus Drive. Turn right again on Executive Campus Drive. ABB is on the right side of the street about half way around the semi-circle.

CONSTRUCTION ARTICLE INDEX

The following list is an index of all construction related material that has appeared in the ATCO Newsletter since its inception in the early '80's. This is a handy reference for that particular construction article that you knew existed but didn't want to wade through each issue to find it. All Newsletters below are also listed in order in the ATCO homepage under "Newsletters".CTRL Click on www.atco.tv. Once you locate the Newsletter section, the displayed list can then be re-sorted as needed by clicking on the "date" in the header.

…Bob N8OCQ

This is the complete list for construction articles shown in past ATCO newsletters. The page numbers listed may not match the actual page in the Newsletter. They are the numbers shown in the PDF file. Some early issues are missing. Art did not have a copy of every year. This list is complete through Volume 33 II.

…Bob N8OCQ

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.

04/23/2016 | Jackson County ARC Hamfest
Location: Jackson, OH
Type: ARRL Hamfest
Sponsor: Jackson County Amateur Radio Club
Website: http://jacksoncountyarc.org/page3.html

04/24/2016 | Athens Hamfest
Location: Athens, OH
Type: ARRL Hamfest
Sponsor: Athens County Amateur Radio Association
Website: http://ac-ara.org/

05/20/2016 | Dayton Hamvention
Location: Dayton, OH
Type: ARRL Hamfest
Sponsor: Dayton Amateur Radio Association
Website: http://www.hamvention.org

06/04/2016 | Fulton County ARC Outdoor Flea Market and Hamfest
Location: Tedrow, OH
Type: ARRL Hamfest
Sponsor: Fulton County Amateur Radio Club
Website: http://k8bxq.org

06/05/2016 | Portage Hamfair
Location: Ravenna, OH
Type:
Sponsor:
Website: http://hamfair.com

06/18/2016 | MILFORD HAMFEST
Location: Milford, OH
Type: ARRL Hamfest
Sponsor: Milford Amateur Radio Club
Website: http://www.w8mrc.com

07/10/2016 | 20/9 Radio Club Hamfest 2016
Location: Austintown, OH
Type: ARRL Hamfest
Sponsor: 20/9 Radio Club, Inc.
Website: http://20over9.org

07/16/2016 | NOARSfest 2016
Location: Elyria, OH
Type: ARRL Hamfest
Sponsor: Northern Ohio Amateur Radio Society
Website: http://www.wp.noars.net/

07/17/2016 | Van Wert Hamfest
Location: Van Wert, OH
Type: ARRL Hamfest
Sponsor: Van Wert Amateur Radio Club
Website: http://w8fy.org

08/06/2016 | Columbus Hamfest
Location: Grove City, OH
Type: ARRL Hamfest
Sponsor: Voice of Aladdin Amateur Radio Club (W8FEZ)
Website: http://www.columbushamfest.com

08/21/2016 | Cuyahoga Falls ARC's Eighth Annual Tailgate Hamfest
Location: Stow, OH
Type: ARRL Hamfest
Sponsor: Cuyahoga Falls Amateur Radio Club
Website: http://cfarc.org/tailgate.php

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 www.BATC.tv then ATV repeaters thenWR8ATV.

ATCO TREASURER'S REPORT - de N8NT

OPENING BALANCE (01/16/16)...…..…………..…..$ 1793.19
RECEIPTS(dues)…..……………….....$ 128.00
License fee for ATCO web database………………………………………………………………......…..$ (52.00)
Secure database fee for SSL certificate (Starlight Technology) Systems LLC)…………………………….. $ (55.00)
Postage stamps…………………………………………………………………………………………….$ (10.65)
PayPal fee……………………………………………………………………………………………...…..$ (7.46)
CLOSING BALANCE (04/23/16)…………………………………………………………..…….…..$ 1796.08

ATCO REPEATER TECHNICAL DATA SUMMARY

Location:	Downtown Columbus, Ohio
Coordinates:	82 degrees 59 minutes 53 seconds (longitude) 39 degrees 57 minutes 45 seconds (latitude)
Elevation:	630 feet above the average street level (1460 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=4MHz, PMT=4095, PCR=256, Video=256, audio=257
427.25 MHz Analog VSB AM, 50 watts average 100 watts sync tip (Analog TV on 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)
2395 MHz Mesh Net transceiver 600mw output (channel 1 -2). ID is WR8ATV-2
10.350 GHz: 1 watt continuous analog FM

Link transmitter: 446.350 MHz: 5 watts NBFM 5 kHz audio This input is used for control signals.

Identification: 423, 427, 1258, 1268 MHz, 10.350Ghz 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 6dBd 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
2395 MHz   - Comet Model GP24 vertically polarized 12 dBd gain omni (Used for experimental Mesh Net operation)
10.350 GHz - Commercial 40 slot waveguide slot horizontally polarized 16 dBd gain omni

Receivers: 147.480 MHz - F1 audio input with touch tone control. (Input here = output on 446.350)
438.000 MHz - DVB-T QPSK, 2K BW. Receiver will auto configure for FEC's and PID'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)
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 digital SR=4.167Msps, FEC=7/8. PIDs: PMT=133, PCR=33, Video=33, Audio=49 (Input here feeds all TV
    transmitters and also goes directly to 1268 MHz DVB-S digital output channel 2.)
2398.00 MHz - F5 video analog NTSC. (Input here = output on all TV transmitters)
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)
2395.00 MHz - Comet Model GP24 vertically polarized 12 dBd gain omni (Used for experimental Mesh Net operation)
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)**
	003	Select room camera **(Always exit by selecting 001)**
	002	Select roof camera. Select room cam first then 002 for roof cam. **(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 439.25analog /438digital receiver (if video present on digital, it is selected. Otherwise analog)
	00* then 2 for Ch. 2	Select 1280 digital receiver
	00* then 3 for Ch. 3	Select 1280 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#	C1* to turn off 438 MHz DVB-T Tx, C1# to enable it (Must be in manual mode to enable this function).
	C2* or C2#	C2* to turn off 423 MHz DVB-T Rx, C2# to enable it (Must be in manual mode to enable this function).

Note: The DVB-T Tx and Rx units can lock up when they lose video or see bad video. When this happens, power must be cycled. To do this select C1 or C2* to turn off power. A few seconds later select C1# or C2# whichever appropriate to restore power to selected unit. Wait about 15 to 30 seconds to see restored operation. (Example: To reset the DVB-T receiver enter C2*,wait a few seconds then C2#)*

ATCO MEMBERS as of April 2016

Call	Name	Address	City	St	Zip	Phone
KD8ACU	Robert Vieth	3180 North Star Rd	Upper Arlington	OH	43221	614-457-9511
AH2AR	Dave Pelaez	1348 Leaf Tree Lane	Vandalia	OH	45377	937-264-9812
W8ARE	Larry Meredith III	6070 Langton Circle	Westerville	OH	43082-8964	
NN8B	Don Kemp	6384 Camp Blvd.	Hanoverton	OH	44423	
VK3BFG	Peter Cossins					
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	
W8DMR	Bill Parker	2738 Florbunda Dr	Columbus	OH	43209	
WA8DNI	John Busic	2700 Bixby Road	Groveport	OH	43125	614-491-8198
K8DW	Dave Wagner	2045 Maginnis Rd	Oregon	OH	42616	419-691-1625
WB8DZW	Roger McEldowney	5420 Madison St	Hilliard	OH	43026	614-405-1710
KB8EMD	Larry Baker	4330 Chippewa Trail	Jamestown	OH	45335-1210	
KC8EVR	Lester Broadie	108 N Burgess	Columbus	OH	43204	
N8FRT	Tom Flanagan	6156 Jolliff St.	Galloway	OH	43119	
W8FZ	Fred Stutske	8737 Ashford Lane	Pickerington	OH	43147	
WA8HFK,KC8HIP	Frank & Pat Amore	P.O. Box 2252	Helendale	CA	92342	614-777-4621
WA8HNS	Mike Gray	5029 St Rt 41 NW	Washington Ct Hs	OH	43160-8740	740-335-5133
WB2IIR	Michael Anthony	370 Georgia Drive	Brick	NJ	08723	
K8KDR,KC8NKB	Matt & Nancy Gilbert	5167 Drumcliff Ct.	Columbus	OH	43221-5207	614-771-7259
W8KHP	Allan Vinegar	2043 Treetop Lane	Hebron	Ky	41048	
WA8KQQ	Dale Waymire	225 Riffle Ave	Greenville	OH	45331	937-548-2492
N8LRG	Phillip Humphries	30856 Coshocton Road	Walhonding	OH	43843	614-3543744
W8MA	Phil Morrison	154 Llewellyn Ave	Westerville	OH	43081	
KA8MFD	Ross McCoy	227 S Boundary St PO Box 9	Edison	OH	43320	
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
WU8O	Tom Walter	15704 St Rt 161 West	Plain City	OH	43064	614-733-0722
N0OBG	Jim Conley	33 Meadowbrook C C Est	Ballwin	MO	63011	
W6ORG,WB6YSS	Tom, Maryann O'Hara	2522 Paxson Lane	Arcadia	CA	91007-8537	626-447-4565
N8OCQ	Bob Hodge Sr.	3750 Dort Place	Columbus	OH	43227-2022	
KC8QJR	Adam Burley	931 West High Street	Mount Vernon	OH	43050	
KE8PN	James Easley	1507 Michigan Ave	Columbus	OH	43201	614-421-1492
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	1941 Red Forest Lane	Galloway	OH	43119	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	
KB8SSH	Mike Cotts	3424 Homecroft Dr	Columbus	OH	43224	614-371-7380
KD8TIZ	Bob Holden	5161 Goose Lane Rd	Alexandria	OH	43001-9730	614-562-8441
K8TPY, K8FRB	Jeff & Dianna Patton	3886 Agler Road	Columbus	OH	43219	
NR8TV	Dave Kibler	243 Dwyer Rd	Greenfield	OH	45123	937-981-1392
W8URI	William Heiden	5898 Township Rd #103	Mount Gilead	OH	43338	419-947-1121
KB8UWI	Milton McFarland	115 N. Walnut St.	New Castle	PA	16101	
WA8UZP,KD8YYP	James & Anna Reed	818 Northwest Blvd	Columbus	OH	43212	614-297-1328
KC8WRI	Tom Bloomer	PO Box 595	Grove City	OH	43123	
AA8XA	Stan Diggs	2825 Southridge Dr	Columbus	OH	43224-3011	
KB8YMQ	Jay Caldwell	4740 Timmons Dr	Plain City	OH	43064	
KC8YPD	Joe Ebright	3497 Ontario St	Columbus	OH	43224	
WB8YTZ	Joe Coffman	233 S. Hamilton Rd	Gahanna	OH	43230-3347	
N8YZ	DaveTkach	2063 Torchwood Loop S	Columbus	OH	43229	614-882-0771
KA8ZNY,N8OOY	Tom & Cheryl Taft	386 Cherry Street	Groveport	OH	43125	614-202-9042
W8ZCF	Ferrel Winder	6686 Hitching Post Ln.	Cincinnati	OH	45230	
N8ZM	Tom Holmes	1055 Wilderness Bluff	Tipp City	OH	45371	

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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

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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 payable on January 1 of each year. 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.

The membership period is from January 1ST to December 31ST. New members joining before August will receive all ATCO Newsletters published during the current year prior to the date they join ATCO. For example, a new member joining in June will receive the January and April issues in addition to the July and October issues. For those joining after August 1ST, they can elect to receive a complementary October issue with the membership commencing the following year or get the previous (3) Newsletters. Your support of ATCO is welcomed and encouraged.

Membership expiration notices will be sent out in January in lieu of Newsletters for those with an expired membership.

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. The actual expiration is on January of the following year to keep the dues clock consistent with the beginning of each year.

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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_____
_____
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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.

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ATCO CLUB OFFICERS

ATCO Newsletter
c/o Art Towslee -WA8RMC
438 Maplebrooke Dr. W
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 EXPIRED.