ATCO NEWSLETTER

VOLUME 16 NUMBER 2 **April 1999**

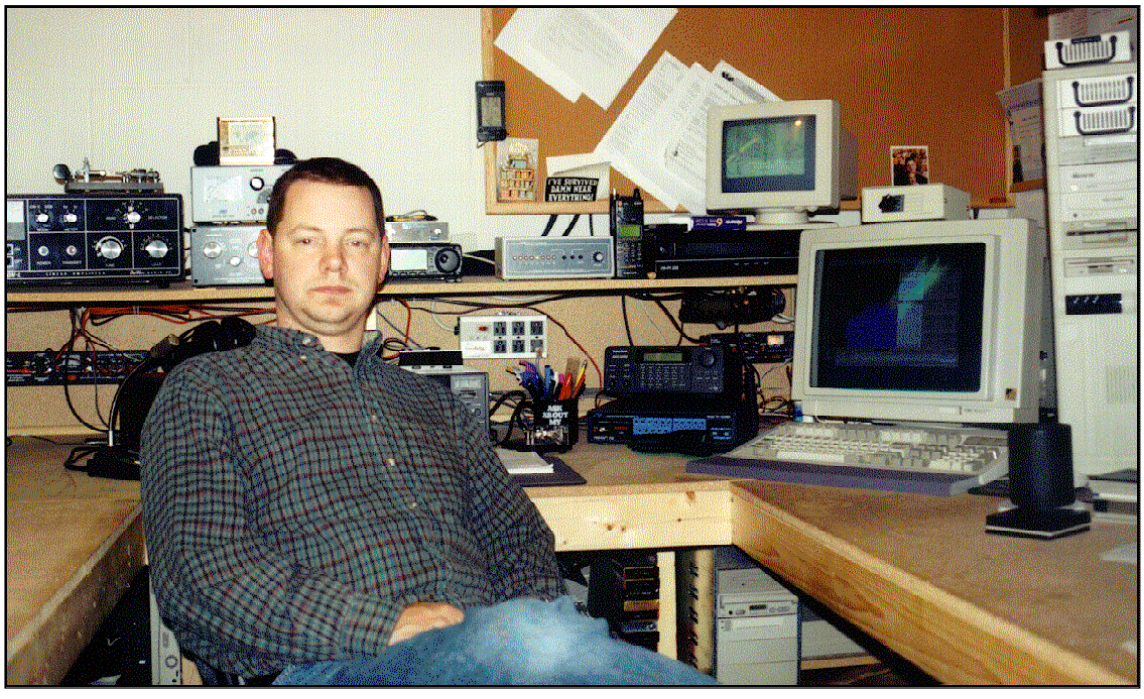
The ATCO newsletter is the official publication of a group of amateur television operators known as AMATEUR TELEVISION IN CENTRAL OHIO Group Inc." and is published quarterly (January, April, July, and October)

ATCO WA8RUT REPEATER UPDATE

Gosh! So much activity is present I don't know where to start. A lot of repeater changes are being made…some good and some not so good but, hey, that's what amateur TV is all about. This gives us a chance to turn the pages and read all about them. In general, I'm sure that as you read on, you'll agree that we're making progress! Check out the new radar access we've added.

ATCO HAM IN THE SPOTLIGHT

This time I visited the home of Matt Gilbert K8KDR. Matt's hamshack, neatly tucked among other basement items, is well laid out to accommodate both his ham and weather satellite reception facilities. Since Matt's antenna situation is the same as KF8QU's (they both live in Hilliard not allowing outside antennas) he has cleverly invoked the "stealth" procedure. I can't say just what this is or how he deploys it (Hilliard city officials may read this) but I know that his signals are heard in Westerville loud and clear. Good job, Matt!



ACTIVITIES ... from my “workbench”

Well it's that time of year again where our attention turns toward outside activities and I'm no exception. As soon as I can find some 7/8" Heliax and enlarge the "cable tube" into the house, a new 900 MHz antenna will be installed. But first, I must move the workroom to another basement location. To do that, I must move my wife's laundry machines. But wait, before that can happen, I must have my son remove his pool table that's occupying the "staging" area. But hold it, I must…well I'm sure you get the idea…it's a constant circle. Too many activities holding up other activities. Right now, at the present pace, I plan to have the workroom totally relocated sometime after the Y2K crisis is over. After all, I don't want to be caught in a blackout. Now on to the ATV stuff!

As you may know, we have been having a significant amount of headaches with the VS100 repeater controller. No, the vendor didn't create a bad product. It's just that it doesn't do all of the things we would like it to. Additionally, we just like to "play" with it. After all, we're Hams too and it isn't enough to accept it the way it's manufactured. Given enough time and effort, I KNOW we can make it better. Dale has been fiddling with the sync recognition circuit to make it more responsive to weak and poor sync signals. It's much better than the original but he feels there *has* to be a way to improve it more. In the midst of the twiddling, it failed completely. It would still receive 439 inputs but wouldn't respond to any commands or enable the identifier. Back to the repeater once more with the VS90 unit as a replacement till the VS100 was fixed. Dale found that it lost all of the calibration data with no explanation as to why. He replaced a few parts, refined the sync circuit and reprogrammed it. Now it's back with all of the original codes and has been working fine for a couple months.

We have been looking into the features of the repeater controller made by the Detroit Michigan group, N8UDK. Here again, that unit has some of the features we want but we loose some of the features we had. No free lunch I guess! Alas, I think we found a solution! The manufacturer of the VS100 unit was willing to give me the source code so we can make the modifications we need. (Did you pick up on that one Bob, KF8QU?) Bob is our resident software expert so I might be making a trip over there soon. It may take some time but this might be the solution that will give us all we want. Bob, what do you mean "there is absolutely no spare code space left?" Go figure!!!

Another unit we've been playing with is a video enhancer made by FM Systems in California. This little guy actually works quite well to restore poor received sync levels, low level video, color burst correction and a few more. We purchased one (about $450) to find that it held up to claims but…had a number of drawbacks. First, if no video is present, and only noise, the AGC amp decreases the "video" level as far as it will go. When video is received, it takes about 4 to 5 seconds for the AGC to react so until then we have very washed out video. Besides that, it didn't help that much to the various signals received. About the same time we bought the unit, our friendly TV station gave me one to try on a somewhat indefinite loan. I will try to add a "video squelch" to it so the signal won't be washed out during the first 5 seconds. Oh yes, I do believe we were able to return the other unit. There will be more news on that one next time.

The radar link is now fully operational. When you key the tones 264, the radar signal will be active after a 3-second delay for 5 minutes. The video signal that is controlled by the TV station, will be on the 120 mile radius range most of the time and will switch to a closer range during severe weather. Later if we are able to connect to the new "super duper" radar, the existing radar will be left on the range of our choice. Details next time. Presently, however, we are experiencing an unusual interfering signal on the 915 MHz link frequency that, if left in the full scan mode, the repeater would be held ON all the time. As a result, we disabled the scan mode so it will only repeat incoming 439 signals. So till we locate the source (W8DMR and I went snooping in downtown Columbus last week and found nothing) the repeater must first be put into the manual "open window" mode by keying *77, pausing for 2 seconds then 92 (to enable the 915 MHz input) then 264 to bring up the radar. Confusing isn't it? To turn it off, key # to shut off the radar then *22 to restore the repeater to 439 repeat mode. When we fix it, it will be simply 264 to bring it up and # to take it down. My bet is an oscillating 915 MHz preamp at the repeater is the problem. We'll see on the next repeater trip.

Bob, KF8QU, has finished the rooftop camera software and delivered it to me for the shakedown tests. I realize the ball is now fully in my court but I felt that Uncle Sam was more important so taxes took a front seat for a while. Now that I made that trip to the mailbox, work will resume. Full rotation mode is just over the horizon. Stay tuned.

Well, if all the above actions weren't enough, we now have a poor 2.4 GHz transmitted signal. I'm sure I know what the problem is here. Last fall when we installed the 2.4 GHz antennas, we were forced to mount the transmit antenna upside down and directly below the receive antenna. This gave us good electrical isolation but…that antenna wasn't meant to be mounted that way. We knew that so we sealed it the best we could hoping it would be ok. It lasted ***almost*** all the way through the winter. As soon as the weather warms up a bit, we'll recover it and make the necessary repairs. Till then, work on your Wavecom modifications so you'll be ready when it's back to normal.

I know I can dig up other activities but that's enough for now (did you notice that I'm almost at the bottom of the page?) so until next time, this'll have to do. Remember, the Spring Event is coming up on May 2nd then Dayton and finally the Columbus Franklin County hamfest on May 31st. I think we're all going to be busy till after June 1st.
73…
…Art, WA8RMC

WAVECOM TIDBITS…more details and hints about a popular subject!

Attenuator removal: I removed the attenuator and bypassed its location with a 0 ohm chip resistor. I also installed SMA connectors on both the TX module and the antenna coax pigtail. Power output after the mod was +8dBm (6mW). I found though that since the output comes directly from the oscillator, with certain antennas and hand capacity the oscillator will unlock from the PLL. For this reason, I put attenuator values back in for 3dB. Its output is now unconditionally stable and still offers about 10dB improvement over the stock attenuator. Values for the 3dB Pi pad are: 300/18/300 ohms. The TX drives my 1W Pacific Monolithics PA just great!

Performance: Looking at the end to end video performance using a Tek 1410 test pattern generator and a Tek 1480 waveform monitor, the video frequency response is great. Well beyond 5MHz! Only problem I notice is window tilt, sometimes called line-time distortion. This is usually caused by not enough capacitance in interstage coupling or poor values in the pre-emphasis/de-emphasis networks. I am going to try and figure out which is the biggest culprit, the transmitter or the receiver by using a commercial FMTV modulator and demodulator to look at the RX and TX respectively. Unless someone else has already done this work???

Datasheets: I've been web searching for datasheets for the various ICs in the units. So far, I've found the synthesizers, PIC processor, receiver demodulator and the 592 video amplifier. I'm not having much luck with the audio subcarrier generators or subcarrier demodulators. Any pointers are appreciated.

Channel Control: I'd like to build a channel control circuit for making sure the unit powers up on the desired channel, not just the ch-1 default. I am thinking a 555 timer with a sense lead tied to the appropriate channel LED terminal would be the way to go. Has anyone played with this idea? Maybe the guy doing the custom PICs can figure out a way to make it read a pair of external dip switches. (Look in the ATCO Newsletter July 1998 …Volume 15 #3…for WB8CJW's solution to this problem. It's available on our web page under "Newsletters". ED)

So far, I found the price-performance of these things just great and am thinking of all kinds of interesting ATV applications, as I'm sure others have. If I come up with anything original, I will post it in the W6YX ATV web pages.
…Steve Muther WF6R

Wavecom Questions/Observations
I had no stability problems with the attenuator jumpered out with the coax connected to my WCI-2.4 board. Could be something about putting SMA connectors in the line that affected it. With WB7UBB's PIC the transmitter always comes back on with the channel last selected.
…Tom W6ORG tom@hamtv.com

Wavecom Questions/Observations
The SMA I put on the TX was captive to a short length of .085 rigid coax. The coax is grounded along the PCB and box wall all the way to the LPF output. I'm sure that was not the problem. What I typically do in a case like this is put a sliding stub tuner in line so I can walk the termination anywhere on the smith chart. If any Z load causes instability I put attenuation or an isolator in line. That was the case here. Your WCI-2.4 board probably presents a reasonable return loss to the Wavecom where this is not a problem. I always hate getting out into the field and finding that one of my transmitters takes off screaming like the only woman on a pirate ship because my PA is not unconditionally stable).
…Steve M.

Wavecom WCI-2.4 errors
Don, KD7BU, correctly pointed out an error on the schematic and one on the board. The schematic has the Left and Right audio output reversed labeled O-L and O-R, just pencil O-R off pin 1 of the TL084CP and O-L off of pin 8 of the TLO84CP. The board has a trace error which essentially bypasses the pre-emphasis on the line audio inputs and boosts the whole gain. This is not really important enough to change unless you want to boost the audio response above 2 kHz for running digital data or high frequency tones. Note that the mic amp does not have the 75 microsecond pre-emphasis since it has little effect on normal voice tones. To make the change, cut the trace between the 1K and 10K line audio pre-emphasis resistors on both the top and the bottom of the board. Run a jumper from the other side of the 10K resistor across to the 1K solder pad on the side where the trace was cut. That blows my one mistake for the year way too early.
…Tom W6ORG

Wavecom Questions/Observations
The Audio FM modulator in the Wavecom Transmitter is a Sanyo device type LA7058R I have the data sheet in a .PDF file I got it off the Sanyo site. Seeing the website is in Japanese it is hard to deal with. If anyone would like a data sheet email me a request and I

will email it to you. There are also two piezo filters or resonators F4 and F6.5. I don't know what these are for. If someone wants to add it to their website that would be best.
…Norman Gillaspie" norman@pcseng.com

Wavecom TX power increase
A power increase from our WCI-2.4 Wavecom transmitter interface board was reported to me by Brian, WB7UBB, as a result of some playing around with some chip caps on the MMIC strip lines by, Dons KD7BU. They said they got 100 to 144 mw out after the addition of the caps. I played around with mine and found that the output really did jump up, especially on the output side by 3-4 dB. Input side added cap got another 1 dB. The position and cap value is not particularly sensitive either. I experimented with both the 39 pF value they used and the 10 pF I normally use and found no difference. So I would say it is safe to use any value of 1206 or 805 size chip cap from 10 to 39 pF. The output side chip cap is placed between the center zig zag of the stripline RFC and adjacent ground plane on the board edge side and angles slightly to give more room away from the mounting nut. This RFC goes from the N connector center pin to the antenna mounted power amp DC feed wire. The input side chip cap goes from the junction of the zig zag stripline RFC and the 47 Ohm 1/2
watt resistor and adjacent ground plane. I found that the larger1206 size chip caps a little easier to handle (and to see). All WCI-2.4 boards shipped in March will have the increased power out caps in them. Thanks Brian and Don for the input.
…Tom O'Hara W6ORG P. C. Electronics

Wavecom general Info
There seems to be some newbies to the Wavecom ATV phenomenon that have not seen the articles in ATVQ or previous threads on this re mailer. So here is some of the basic info as regards to our conversion and repackaging: The Wavecom Jr. is a wireless FM video transmitter and receiver that can be used as is license free under FCC Part 15 rules. As is, it is good for 150-300 ft. depending on line of sight and patch antenna alignment. The transmitter or its antenna cannot be modified in any way to remain license free, but one can change the antenna on the receiver and increase the range to over 1000 ft. For non-amateur applications where more distance than the license free are capable of, we refer people to Microtek for legal part 90 FCC type accepted TV systems (714-855-0332) at reasonable prices and good quality. PC Electronics does not sell (and often does not respond) to non-licensed people or for non-amateur purposes.

There are many sources and clones of 2.4 GHz TV gear, but the reliable one we suggest is ATV Research (800-392-3922 for catalogue and they also have a variety of low cost cameras, www.atvresearch.com). If you buy the transmitter and receiver at the same time its $120. Separate transmitter is $65. Repackaging with the interface boards with all parts should not cost you more than $100 additional for each unit. Parts list and suggested sources come with each interface board.

The Wavecom Jr. is made by RF-Link Technology in Torrance CA. There are some similar under different names, but if made by RF-Link, their ID sticker will be on the bottom. Those not made by RF-Link may be similar but the conversion info connections may be different or not apply.

The P. C. Electronics WCI-2.4 Wavecom Jr. transmitter interface board is designed to add two variable gain mic amps, line audio mixing, a 50 - 144 mw MMIC power amp and provisions to power through the coax an external antenna mounted preamp. Stuffed and soldered board is $39 and comes with complete repackaging info, parts list and includes a drill template for the CAB247 ($22) die cast aluminum box. This info also appears in the Fall 98 issue of ATVQ magazine. The board is also described on page 8 of our printed catalogue
which may also be down loaded from page 4 of our web site www.hamtv.com The WCRI-2.4 Wavecom Jr. Receiver Interface board is designed to add two squelched speaker amps, S-meter output and DC power up the coax to power an antenna mounted 13LNAH low noise preamp ($125). The WCRI-2.4 is also a stuffed and soldered board with complete info and is $35. The conversion info appeared in the winter 1999 issue of ATVQ Magazine.

Only two of the 4 channels are within the 2390-2450 MHz ham band and upon turn on channel 1 comes up. Brian, WB7UBB, can supply a replacement PIC for both units that has all 4 channels in the ham band and will come on with the last channel selected. The PIC's are $15 each plus $5 s/h - email wb7ubb@home.com

For Antennas, I suggest the Conifer dish and feed for about $80 available from R. Myers Comm (602-465-0936, www.primenet.com/~bmyers) which has about 23 dB gain and has gotten 25 miles to a Comet GP-24 Omni at the Columbus OH ATV
repeater site. The GP-24 is available from us for $199.

Some of the original work done by Bill Parker, W8DMR, can be found in the Fall 1997 issue of ATVQ. There is also a web site with additional info by Dave Hockaday, WB4IUY: www.ipass.net/~teara/atv4.html

I am sure there will be more in the continuing saga of the Wavecom as more hams discover improvements and applications then put their info and experiences on the ATV internet remailers. Have fun on 2.4 FM ATV,
…Tom O'Hara W6ORG P. C. Electronics tom@hamtv.com

NOT ATV, BUT FUNNY ANYWAY! …Helicopter malfunction

A helicopter was flying above Seattle when an electrical malfunction disabled all of the aircraft's electronic navigation and communications
equipment. Due to the clouds and haze, the pilot could not determine the helicopter's position and course to steer to the airport. The pilot saw a tall building, flew toward it, circled, drew a handwritten sign and held it up in the helicopter window. The pilot's sign said, "Where am I?" in large letters. The people in the tall building quickly responded to the aircraft, drew a large sign and held it to the window of their building. Their sign read, "You are in a helicopter." The pilot smiled, waved, looked at the map, determined the course to steer to the SEATAC airport and landed safely. After they were on the ground, the copilot asked the pilot how the "You are in a helicopter" sign helped determine their position. The pilot responded, "I knew that had to be the Microsoft building because, similar to their help-lines, they gave me a technically correct but completely useless answer!"
wa8dni@juno.com

VIDEO RESOLUTION…questions & answers. Henry to the rescue!

Henry,
I was hoping you might answer a couple of questions for me. I'm wondering how video resolution makes its way through the chain of devices and how to interpret the specs of the different devices. Consider this chain: Color CCD camera into Wyman 1.2GHz FM TX, Wyman RX into a VHS VCR and finally into a monitor, possibly a miniature color display set up as a headset. Now, I understand that a VHS VCR normally has 400 lines of resolution. Would I be wasting my money by getting a camera with greater resolution? And how does the transmitter come into play in resolution - are there limits? Concerning monitors, I have seen specs such as "250H x300V resolution" for a composite miniature color display and "537 dots (H) x 222 dots (V)" for miniature LCD display. Is the first one talking about lines or what, and if so can these two be compared? Finally, would I be wasting my money by getting a monitor with better than 400 lines of resolution if my VCR is (presumably) 400 lines?
…Larry Mitschke N5LND

Larry,
Resolution means something if you can see it, and doesn't if you can't. (Profound, I know)

An NTSC TV system can't have more than 262.5-21 lines of resolution (vertical) and generally 80 lines per MHz of bandwidth horizontal. That's because the cutoff frequency of your TV set is 4.5 MHz, minus a little for the sound that is notched out and if its the old bandpass filter Vs a true chrome deinterlace demod, it ain't gonna be over 2.5 MHz horizontal resolution. Now the low vertical resolution looks better because of interlace, but in DTV interlace will go away if Master Microsoft has his way. So you get into arguments about temporal and spatial resolution, which is better and so forth between interlace and non interlace and static image Vs dynamic (i.e. moving) image.

What we poor humans interpret as resolution more often is actually contrast. Back in the days of tube cameras (tube image devices) the resolution was specified as where the black to white transitions were down to 10% of full modulation. In other words, a low frequency image (big wide black and white bars) would provide a full 100 IRE depth of modulation, and this decreased in more or less a nice S curve to where thin lines were barely visible in the gray mush at 10 IRE or 10% depth of modulation. The higher resolution cameras looked better because an 800 line camera has a much higher depth of modulation at 400 lines than a 400 line camera....about 500% more.

Now CCD image devices came along. You have a fixed number of points since each CCD element is a sensor and there is no fudging how many you have on the chip. Either 300,000 or 1 million or how many you managed to squeeze on the chip. But now you have Nyquist entering the picture. Since the sensor array has elements at fixed distances, and real life does not fit exactly over those exact spots, big stuff covers several and you get full modulation, smaller stuff starts to cover only parts of some elements and thin stuff only covers part of a single element, or falls in between elements and disappears completely. So now you have alias elements that didn't show up before. To make matters more difficult, the CCD elements began to change shape, some square, some rectangle, and some with lenses. Some were in deep "wells" so you have side wall reflections trying to fill in the gaps, etc. Like all good sales departments, the guys in the $$ green visor hats began to sell numbers, the more bits the better. Well sort of.

The eyeball has a limit on resolution. Way back in the dark ages of the 30's when we had 250 line TV, there was talk of high definition TV (440 or more lines). CBS and others did a bunch of tests and found that an eyeball had a finite limit of resolution, but you could fool the viewer into thinking there was more if you pumped up the contrast ratio on the signal. So enter signal enhancers, brighter CRT's. Sony said, hey, we can make it look sharper if we put black lines on the face of the tube to break up the image all the time. The truth was the black stripes covered a lot of info, like tape scratch, so the engineer looking for tape scratch couldn't see it on his Trinitron, but the home viewer on an RCA could! Zenith added black dots to their CRT's and lots of other variations. Anyway,

the bottom line is, whatever is the lowest resolution in your system of gadgets and goodies is what will limit the resolution, no matter what you look at it on. As for what to buy… plug in a typical image and if you see what you want to see, buy it. The sales guys play with the numbers to the point where the specs mean little.
…Henry

Henry,
I have spent wasted time on the web looking for information that lays out the basics of determining system resolution. It had occurred to me that if I had an "old time?" resolution chart and knew how to use it, determining system improvements and making comparative measurements would be relatively easy. What is the most economical source for various resolution, grey scale, color, etc. charts?

What are the web urls for sites that describe the uses of the charts and procedures to determine comparative resolution? I am interested in determining real world specs of equipment I may use or consider for purchase. I am not interested in determining lab specs for scientific research.

Is there an economical, comprehensive paperback (or hardback) bible that considers such concerns relative to new (for us ham ATV weenies) video technology. State of the art "star wars" technology is of no interest to me.
…Pete WA4HEI

Pete,
For only $24.95 plus postage you can get a nice 300 page book with full color test charts and info on how to use them from ATVQ. Its called ATV Secrets Vol. II.

With CCD cameras there is little to do with live test charts. You can adjust the mechanical focus, and check the H and V resolution, even linearity, although your TV/monitor is likely less linear than the CCD by 100:1.

The resolution chart will show where your camera falls apart. Look for alias responses on the horizontal wedges and "astigmatism" on the circle charts showing how the horizontal and vertical resolution diminishes in the diagonal planes. Also look for ringing and smear. Beyond that CCD's have little to test. The charts are mostly for tube cameras where you can get resolution better by proper beam and target voltage settings and adjust the electrical and mechanical focus. If nothing else, adjust the MONITOR focus! The ball chart is for linearity, and little else.

The gray scale is close to a RETMA log scale, but is mostly just to look for proper exposure levels, shutter speeds, agc, etc. A true gray scale has calibrated REFLECTANCE levels that test the black to white range, gamma (how non linear the transfer curve is) and allow settings in complex cameras for "knee" detail threshold, low frequency equalization, black and white clip or "zebra" settings.

The color bar chart was printed in 8 colors, and the first four were dead on the NTSC vectors. The reflectance level is off on the last 4 although the vector is correct, the dot won't be in the box, it will be between the vector scope box and the center origin. Just can't do it on glossy paper, unless you paste actual pallet colors on it for correct hue and reflectance. Most simple cameras cannot reproduce the NTSC rainbow faithfully because the cameras use simple matrix arrays and often only one chip, older cameras had striped tubes using the Land 2 color system to derive three colors, so saturation is always low, hue is usually only close on red and green, and there is no equal I and Q capability and RGB matrix or cyan magenta matrix can't hack it. So if you want full spectrum color, you have to have three chips and a true I Q encoder. What you can do is take the camera when it's new, note where the dots fall on the vector scope, and when the camera ages, compare it to day one and maybe there are some tweeks to bring it back. But don't expect a red fireplug to look red on TV or a yellow street strip to look yellow. Cheap cameras just can't do it. The best I've seen a single chip camera do is the Sony CCDV5000 hi-8 camcorder which was $2500 a pop (discount) a few years ago. These were used by CNN in the Gulf war and other venues. They make good pictures and reasonable color, and if it got shot to hell or blown up, $2500 is a lot less to lose than $35,000 for a broadcast Betacam. It also had a lot of nifty effects built in including editing (I bought 2).

And for History buffs, Andy Emerson G8PTH produced a half hour BBC program on the history of the test pattern. I have an NTSC copy.
…Henry KB9FO

ATV TEST PATTERNS ON THE INTERNET

You will pleased to know that PC-ATV has been written and is available for free down load from:
http://www.arcadeshop.demon.co.uk/atv/

The program generates dozens of different test cards, to brighten up any amateur ATV broadcast. Program size is 1.5megs and can run on any PC with Win 3.1 or win 95 or win 98 or NT.

THE COPS ATV TRANSMITTER…an easy way to get on 1250 MHz ATV

There are a number of people buying the Jameco COPS transmitter for ATV. Chech the Internet and you will find numerous comments about modifications. I believe that at this time, Jameco has no more units to sell but PC Electronics is going to order more from the original manufacturer. Check with them before ordering. In any case, the following two articles, first a summary by W6ORG, and then in more detail by W8DMR, should give you a good idea of what to expect from this device. ED

…As reviewed by Tom O'Hara

I ordered one of the Jameco/COPS FM TV Transmitters and checked it out. With WB7UBB's PIC change, this can be an inexpensive way to get on 23cm FM ATV quickly. The package would make a nice portable short distance cordless ATV link for public service work back to the car to repeat back to the ops center. The unit comes in a plastic case measuring about 4x3x1.5" (see: www.jameco.com.cfm/viewdesc.cfm?part_num+157489).

A 15 VDC wall plug power supply comes with the unit but goes through a 12V regulator to the board and camera power jack so it can be run on an external 12VDC battery. Actually I ran the DC voltage at the 12V camera jack from 15V down to 9 volts and while the power output varied, the transmitter was stable. Current draw at 12VDC to the board was just 140 mA.

But first I have to say, don't even think about putting it on the air as is even just to check it out, especially if you are anywhere near an airport. These units put out between 50 and 100 mw on 4 channels in the TACAN and DME band (1080, 1120, 1160 and 1200 MHz). This is way above the FCC Part 15 limit and illegal to sell or use in the USA. I don't know if Jameco is aware of that or not, but I intend to inform them that they could be selling a product that could be hazardous to flight as well as illegal to sell (2.803) or use (15.207) as is, but could be used by hams with WB7UBB's PIC. You might want to order one before I do that in a few days just in case they take them off the market.

Power output was about 100 mw on ch 1, 1080 MHz, and about 75 mw on ch 4, 1200 MHz. Soon as I get the PIC I'll check it out on in the ham band. 1252 MHz is the frequency suggested in areas that elect to have one FM channel instead of 2 AM channels in the bottom part of the 23cm band plan. If there is enough interest, I might make a AM interface board for those that want the capability of both modes and WB7UBB says he can program a replacement to the 16C54A PIC for any frequency in the 23cm band.

The antenna jack is a type F to match their rubber duck and can easily be changed to a BNC for use with a good 23cm antenna.

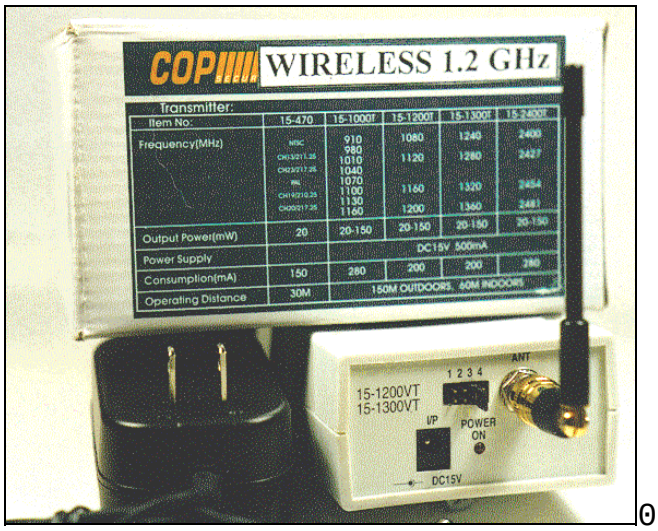
Deviation seems to be right for the 4 MHz standard - the -26 dB down bandwidth with a fully modulated video signal was 21 MHz as expected with the 5.5 MHz sound subcarrier. There is a deviation pot for the video - yellow marked 102 - if you need to adjust it. Also there is a slug tuned variable inductor in one corner that sets the sound subcarrier frequency and comes as 5.5 MHz. Audio input is line level and takes about 2 volts peak to peak for the full 50 kHz deviation. Sound subcarrier injection was -20 dBc.

I'll be digging into this little unit some more, but for now, I recommend it for ham use and only fire up with the replacement PIC. Contact WB7UBB for the PIC (WB7UBB@home.com), I believe it is $20 including shipping and with this one, it is a plug in DIP package so no going cross-eyed unsoldering and soldering the surface mount versions. For the transmitter itself call Jameco and ask for their part number 157489 which is the COPS product number 15-1200VT. Price was $69.95 plus $6.50 shipping. Buy 5 and it drops to $62.95.

…Tom O'Hara W6ORG P. C. Electronics

…As reviewed by Bill Parker (including Wavecom details)

Now offered for sale is a compact 23 CM RF unit using FM modulation for audio and video transmission. It features four selectable frequencies via an external jumper plug and is identified as the COP Model 15-1200-VT Security A/V Sender. The Jameco Part No. is 157489 listed for $69.95 complete with a 15 volt DC power supply and a clever 1/4 wave antenna.



The COP transmitter power supply provides 150 milliamperes for the transmitter and a spare 250 milliamperes for an optional B&W or a Color TV camera. See the Block Diagram and Specifications at the end of this article. The 4 frequencies provided are NOT in the 23 CM amateur band, but do not be alarmed.

Available from WB7UBB, Brian, is a plug-in 18-pin DIP IC that provides four different frequencies between 1240-1300 MHz. The cost

is $15 plus $5 shipping. Not only does he offer the HAM PIC Chip for the 23 CM units, he also offers the HAM PIC IC for the 13 CM (2.4 GHz) Wavecom transmitter and receiver. The NEW Wavecom Tx & RX pair provide 8 frequencies instead of four. He has ICs for the 4-channel units as well as for the newer 8 channel Wavecom 2.4 GHz transmitter and receiver.

A word of caution, the Wavecom ICs are not plug-in DIP packages; they are surface mount (SOIC) units and must be soldered-in once the original surface mount IC has been successfully removed. It takes patience and skill to perform this task. The 8 frequency Wavecom SOIC ICs cost $20 plus $5 S & H, Brian reports. His E-mail is wb7ubb@nome.com. He includes simple instructions with each HAM PIC IC to help make the task easier.

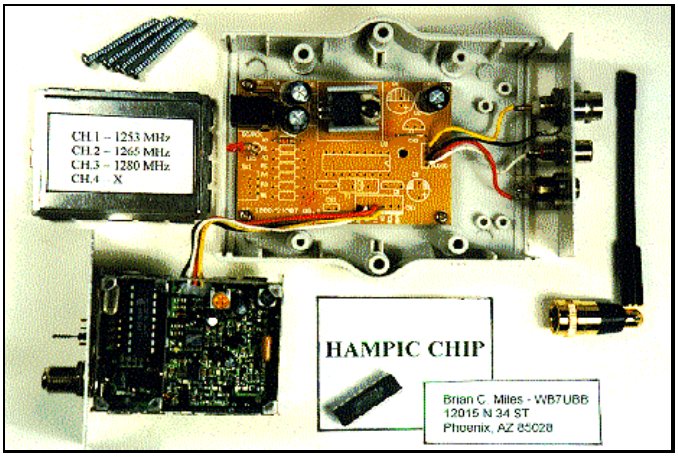
When inserting a HAM PIC Chip into a COP unit, be careful to ascertain where Pin 1 is located BEFORE you remove the original IC. When you insert the new HAM PIC IC, again be sure Pin-1 is correctly determined BEFORE insertion. Simple common sense.

A reasonable choice of frequencies for the COPS unit would be 1252, 1255, 1265 and 1280 MHz for 23 CM FM ATV repeater and simplex usage. The minimum resolution frequency step for the Tx unit is 50 KHz and 125 KHz for the Rx unit.

A selection of frequencies for the Wavecom unit could be 2411, 2418, 2434 and 2441 MHz for 13 CM ATV repeater and simplex usage. The minimum step in frequency for the Wavecom Tx and Rx units is 125 KHz.

The COPS output power level is listed as 20 to 150 milliwatts but several units measured by W60RG, KA8ZNY and others have proved to provide 65 to 100 mW. WA8RUT, Ken Morris, can cause the Columbus, Ohio ATV repeater to respond from a distance of 7 miles using a tower mounted loop yagi antenna. The video picture when repeated is P5 color when using the COP video transmitter.

A COP 4-frequency receiver is also offered by Jameco supplied with a 15 VDC power supply and cables. Both the Rx and Tx carry a 1 year warranty. The receiver has a built-in muting sound feature, channel auto-scanning, screen time controller, a channel lock function and with the same cute 1/4 wave antenna with a gold plated F-connector and swivel joint. The Jameco Part No. is 157497 and lists for $149.95.



The pictures of the COP transmitter shown at right with various covers removed illustrate the easy access to the various connectors should any custom modifications arise. Located inside is the video gain adjustment control just left of the four input wires. The yellow wire is the video input; the white wire is the audio input; the red and black wires are +12 VDC and ground, respectively.

Again a word of caution, be SURE to plug-in the 15 VDC power connector into the 15 VDC input to the COP transmitter. DO NOT PLUG the 15 VDC power connector into the CAMERA 12 VDC OUTPUT connector. To do so would cause 12 volt regulator damage!

The HAM PIC Chip, a 16C54, is between the 114 MHz crystal and the RF shield partition. The manufacturer, using a hot soldering iron, chose to stroke the top of the two ICs, perhaps to make the identification part numbers very difficult to read. The rear of the PWB does not contain any components even though the rear cover is removable. The top and bottom plastic case covers are constructed so they are interchangeable and identical. Do not let the plastic Phillips head screws fool you, they do not rotate on either the top or bottom case covers.

The RF output (without adding an ERA-5 MMIC as is needed with the Wavecom) is between 65 to 100 milliwatts. Since the COP Tx unit frequency is jumper selected, it does NOT scan and stop on the last frequency position as the Wavecom units do without adding a modification to prevent it. The Cop unit stays on the frequency the jumper selects on a power-up situation.

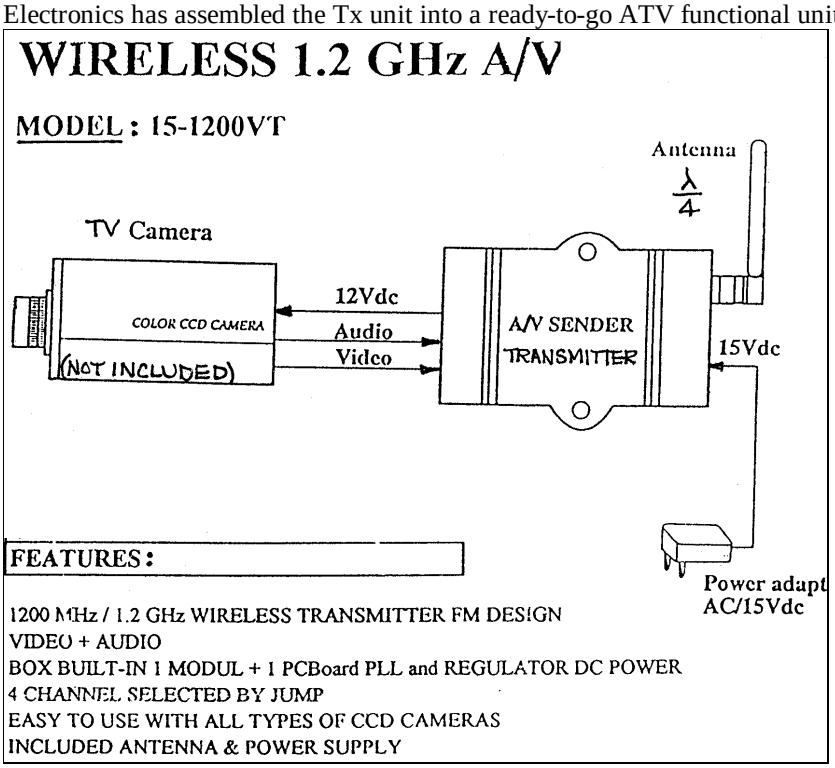
The COP unit power output level is enough to drive a 23 CM Class-C FM amplifier to the 1 to 2 watt level. This is sufficient to drive a second CM FM amplifier to the 15 to 20 watt level.

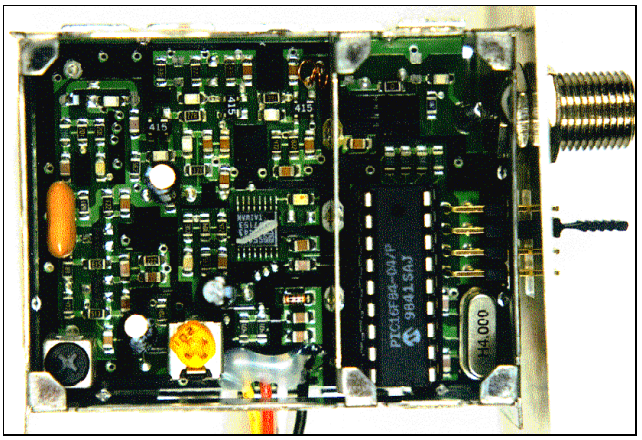
Upon special order, Jameco can supply COP units that operate in 1240 to 1300 MHz band. They charge $74.95 for the special order plus $20 for the IC, plus S & H, or about $100 per unit.

Also available, but on 2.4 GHz is a Wireless Camera System known as the AS-1000T and the AS-1000R. The units may be purchased without any enclosures, and identified as the ASK-2000T and the ASK-2000R. A detailed specification and price list can be downloaded from Matco, Inc. at http://www.mat-co.com/as1000.htm. With a color printer, the pictures of the AS-1000 &

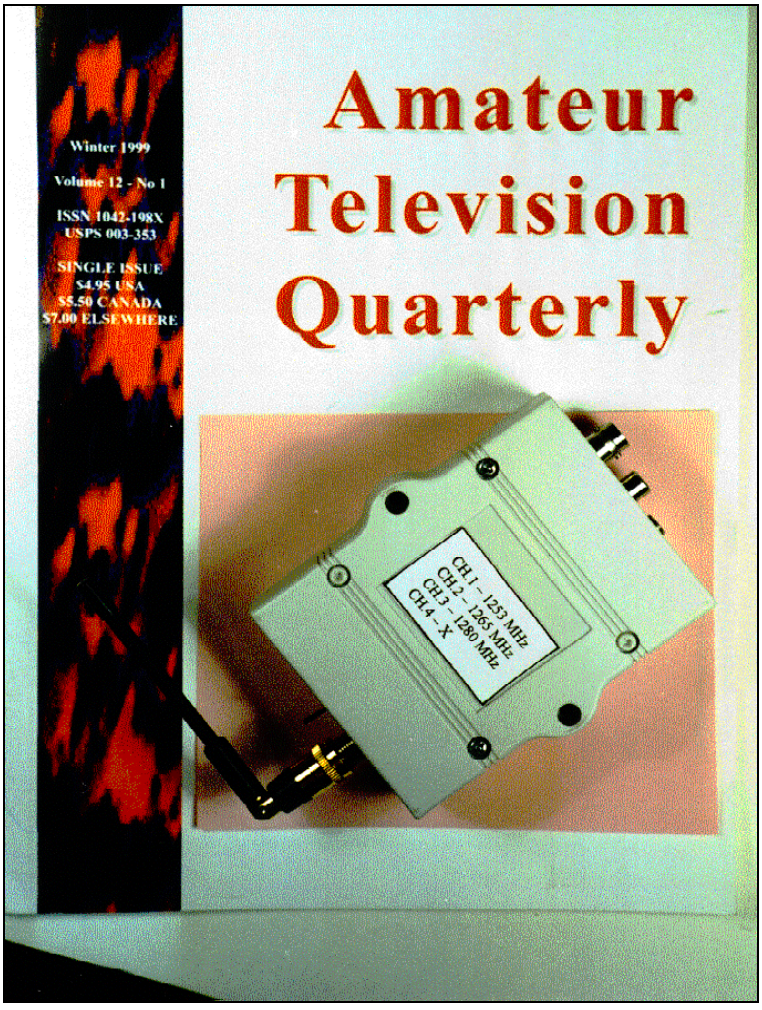
ASK-1000 will be in color. The AS-1000R can accommodate up to three cameras. A high gain 3 dB rubber duck antenna is included.

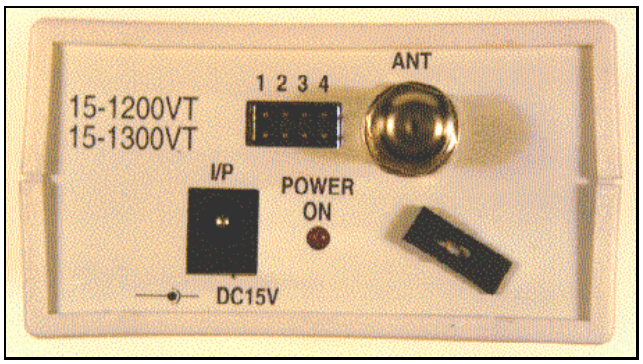
The Wavecom units are available from ATV Research, Inc. and ATV operators are permitted to purchase at dealer pricing. The Wavecom units, Tx and Rx are normally sold together. The ATCO group made purchases of 5, 10 and 10 units (total of 25). PC Electronics has assembled the Tx unit into a ready-to-go ATV functional unit.





The picture above is an internal view of the PCB itself while the diagram at the left illustrates the connections to an optional video camera. Note that the 15VDC supply included with the COPS unit drops it to 12VDC to supply power for the camera.





The picture at the left is an early preview of what will appear in ATVQ magazine later this month. Further details of this transmitter will be featured there with additional information. If you don't presently subscribe to this great magazine you are missing out on lots of valuable ATV

information. (Advance hint: come to the Dayton Friday Night forum and just maybe a few free subscriptions could be available as door prizes).
…Art, WA8RMC

OK FCC! WHAT ARE YOU DOING TO 900 MHz NOW?

FCC Press Release, March 5, 1999 FCC's Location and Monitoring Service Auction Closes.
Today the Commission's Location and Monitoring Service (LMS) auction, which began on February 23, 1999, closed after 54 rounds, raising a total net revenue of $3,438,294.00. The auctioned spectrum is located in the 904.000 - 928.000 MHz Band.

"Today's results can only mean good things for American consumers. The Commission has added new competitors to this exciting marketplace," said FCC Chairman William E. Kennard. "These licensees have the opportunity to make our highways safer as well as
improve productivity in transportation."

A total of 528 multilateration LMS licenses were simultaneously auctioned. One license for each of the three spectrum blocks in each
designated Economic Area (EA) was auctioned: Block A has a total bandwidth of 6.00 MHz; Block B has a total bandwidth of 2.25 MHz; and, Block C has a bandwidth of 5.75 MHz. 289 licenses, representing 84.8 % of the population were sold in the auction.

"The LMS auction is another example of the way the Commission is opening up opportunities and helping the industry deliver new products," said Thomas Sugrue, Chief, Wireless Telecommunications Bureau. "These entrants should create a competitive environment with the development of diverse and alternative technologies providing consumers with a variety of locating services."

LMS refers to advanced radio technologies designed to support the nation's transportation infrastructure and facilitate growth of Intelligent
Transportation Systems. LMS systems are designed to improve the efficiency and safety of the highways of the United States. LMS systems are permitted to transmit voice or non-voice status and instructional messages as long as such messages are related to location or monitoring functions.

License winners must make the downpaynment on their licenses ten business days after the release of the Wireless Telecommunications
Bureau's Public Notice announcing the close of the auction. Winning bidders must also file their long form applications with the FCC within the same time period.

439 MHz PREAMPS…which ones are good for ATV?

I have found the overall performance of GaAsFET preamps to be quite good over the entire 70cm band if they are tuned, say, for 432 MHz: "Good" in that they will make a noticeable difference pretty much anywhere in the band without retuning.

Optimum performance, on the other hand, is much more affected. The Noise Figure should be lowest at the tuned frequency and will usually rise away from that frequency (the maximum gain and minimum noise figure do not have to occur at the same frequency.)

I have used and built several different GaAsFET, JFET, and Bipolar) preamps over the years and in the instance of going between 439.25 MHz and 426.25 MHz, I have always seen an improvement if I tuned the preamp specifically to the frequency at which I was receiving. It wasn't a "night and day" difference and it is most notable for preamplifiers that are mounted at the antenna (or with very low loss feedline in front of them) because every dB of feedline loss in front of the preamplifier will add that number of dB to the receive system noise figure. Most preamplifiers that I have seen (especially those that are built into a piece of equipment already) don't have particularly heavy
conductors on the input matching network, which can result in lower Q and wider bandwidth (and slightly higher noise figure...)

For my money, I would tune the preamp for best performance on the frequency that is likely to have the weakest signals on it (a simplex
frequency, say) if I can see a repeater well. When I have built my GaAsFET preamps, I do not have a tuned output on the preamplifier: I either use a 4:1 balun (often using the core from a TV splitter) or just a 100 ohm resistor for power supply decoupling on the source lead.

This generally yields a more stable preamp and one with slightly lower gain (unless you have a LOT of lossy feedline between the preamp and your demodulator you will likely end up much more gain that you need...) This also makes them a bit "broader banded" as well.

If it is a broadband preamplifier that you want, then you can often tune the preamp input's matching network for a wider response, usually
sacrificing noise figure and gain somewhat. If you have a local channel 14 (we have both 14 and 16) then you may find that signal overloading your preamp and/or tuner and you may not be able to tolerate a wider preamp response.

You could use a 1/4 wave stub to rid yourself of that signal, or build a double-tuned preamp. An example of one of these may be found at:
http://uugate.ampr.utah.edu/utah_atv/rpt_dm1.html. Depending on the quality of the components, the degree of coupling, and the way it is tuned, you can make various tradeoffs between bandwidth, center frequency, and insertion loss. Unfortunately, this sort of filter requires test equipment to sweep it in order to properly tune it. In the case of this preamplifier, I used a homebrew noise source and a spectrum analyzer, but it could just as well have been a sweep generator and diode detector. We are still constructing the various parts of this ATV repeater so it is still on the drawing board, but once the system is operational, one of the first upgrades of the receive system will be to add a two-cavity GaAsFET preamplifier. This should provide very low noise figure along with significant off-frequency rejection of other signals and excellent lightning protection. It's topology will be a combination of the above-mentioned preamp and those cavity-based preamps that have been making their appearance at recent VHF/UHF conferences.
…Clint Turner" <turner@vsat.ussc.com>

"KLUB KORNER"…ATV club activity across the USA!

*I'm trying to start a regular ATV club activity section where we can report other club activities. I usually report what **we're** up to in the "From the workbench…" column but we rarely find out what other groups are doing. I'm sure their interests are the same as ours so we should be able to share our thoughts and combine resources. At the very least, it's interesting to see what others of similar interests are up to so I will try to keep it going from this end. If any of you hear of other club activities, let me know so I can follow up. WA8RMC.*

Arizona Amateurs On TV by Mike Baker K0QZ

The AATV group was formed in the late 80's by a group left over from the original AAA5 club which just faded away in the early 80's. There are about 20 lifetime members and a total of about 50 paid members at this time. We are a Non-profit 501,c,3 organization and have a web page, sponsored by the Carl Hayden High School at the following address...http://www.hayden.edu/Guests/AATV/. Our web page master is Larry Dillie N7NOU. Our current manifestation of the ATV repeater has the following configuration:

421.25 VSB AM TV output using a cable TV modulator feeding a DEMI 70cm amp to drive a TELETEC amp to a TX RX industries interdigital filter system. Output to the antenna is about 50 watts with NO sync compression. Oops, forgot to mention the circulator and load. Must comply with the Hill requirements.

434.00 AMTV input using the same filter to a GasFET preamp and then to a cable TV demodulator to the master video/audio distribution system and the VT-100 controller.

1241.25 VSB AM TV output is via a DEMI 40 Watt linear amp thru a homemade filter system and the signal source is from a cable TV modulator to a DEMI transverter.

1277.25 AM TV input/optional FM input via a DEMI receive converter to a cable TV demod or homebrew modified satellite receiver to the controller. 70cm nbfm controller freq. for the system. VT-100 system controller Aux inputs available for future use including 2.4Ghz fmtv, 3.4Ghz, 5.6Ghz, 10.3Ghz, link to the proposed East Valley machine. On the same site, we also have our current 2 meter voice machine on 146.840, Pl 162.2 and will eventually have a 70 cm voice machine as well. All of this equipment is located atop Shaw Butte, at about 1100 feet asl, and some 700 feet higher than average terrain, on a 70 ft tower at a site with aux power and AC. On a second site, 61st Ave and Michelle in north Phoenix, on a 50 ft tower we have an experimental FM TV machine which has been up for about 6 years now that uses 1.2Ghz FMTV input and 916.37 output also FMTV at about 50 watts. This has been a test bed for the FMTV stuff and has been quite interesting to use. The Shaw Butte site produces a usable picture thru about 2/3 of the valley, to a range of about 40 miles with little problem. We are shadowed by a few other mountains to the east and northeast but that will be fixed when we get our new East Valley machine built in about a year and a half (and $6000) from now.

Although not a large club, we have a dedicated core of people who just can't wait to try something new. Over the past 2 years now we have been experimenting with the Wavecom 2.4Ghz consumer grade TV stuff and have come up with several (including the original info) modifications to them that enable different channels to be used, power output increases, (the latest is to the one-watt range) antenna feed systems and antennas. (My favorite area.)

Our resident expert, Don KD7BU, a retired Honeywell engineer, has been the glue that binds it all together and is our "if he can't fix it, its broke" guy for many years now, along with Greg, NT7L and Earl, K1ATV (former KS8J), Al WG7L and Brian, WB7UBB (myself included) as the club tech guys doing the bulk of hands on electrical work, our next best resource has been Gary, WA9TJV an aerospace machinist who works miracles in metal and has made some of the nicest looking filters and various metal parts to drool over. I wish I had 10% of their talent.

There is a song that includes the line, "the future's so bright I need sunglasses" and I think we are headed that way. In the past two years we have started to develop a chapter of AATV in Tucson and have plans to put on a demo at Flagstaff in May for several of the northern Arizona radio clubs hoping to generate enough interest there to get a few dedicated guys active and use it to build on as a northern chapter, truly to make it the "Arizona Amateurs on TV" not just a Phoenix metro club. Our motto/credo "AATV, a step above dead air!"
…Mike Baker K0QZ

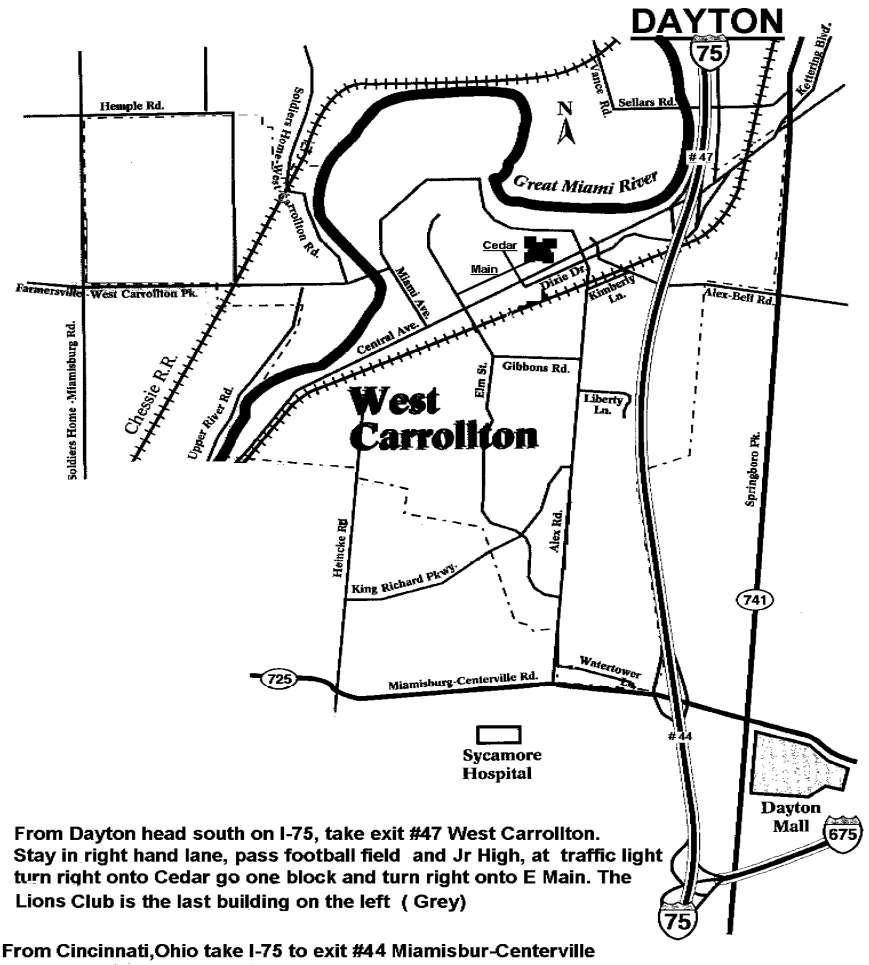
NEW MEMBER SECTION

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 him or her with information. New members are the lifeblood of our group so it's important that we actively and arrressively recruit new faces.

K8KDR Matt Gilbert - Columbus Ohio
W8RRF Paul Zangmeister - Canal Winchester, Ohio
KB8RVI David Jenkins - Grove City, Ohio

DAYTON ATV AGENDA

Again this year the Dayton Hamvention will be jam packed with topics of interest to the ATV'er. Besides the fleamarket where all sorts of bargain ATV goodies are found, will be the regular ATV fourms.



On Friday night the ATV forum at the West Carrolton Lions Club (map at left) will host a number of speakers talking on ATV related topics. Hosted by ATNA, the gathering will include a large number of door prizes so even if you don't find anything at the flea market earlier that day, you could pick up a great prize just for showing up. There is no charge so how can you resist? Festivities will start around 7:00PM.

Next, on Saturday from 2:00 PM till 4:00 PM Bill Parker, W8DMR, will host the FAST SCAN ATV FORUM in room #1 at Hara Arena. The topics include:

Spectrum Management for UHF & Microwave ATV by Tom O'Hara, W6ORG Owner of PC Electronics

Amateur Television in North America by John Jaminet, W3HMS president of ATNA

ATV 70 CM in Remote controlled Blimp by Cris Oesterling, N8UDK from Intuitive Circuits Inc.

ATV 2.4GHz in a remote controlled car by Jeff Basting, N8QPJ

Topics covered will include fast scan ATV with high tech color CCD cameras, microwave FM PLL transmitters, computer generated super imposed alpha numerics, actual flying and racing demos of car and blimp.

TRY THIS "CHEAP" B/W CAMERA

If you are looking for small cheap video cameras, look at the Tyco video camera. Many stores including Toys-R-Us are closing these out for under $30.00 and you can find them at swapmeets for much less. Inside the large ugly case is a small single board camera that runs on 7-12VDC. We use these cameras in our robots and I wrote up a complete article for our webpage: http://members.tripod.com/RoBoJRR Look under Gary's Tech Corner for Robotic Vision Part 1.

This little item hit the retail market about 2 years ago and was aimed at kids around 12 years old. The timing for this product was bad as Christmas buying was off and the bottom had fallen out of the camcorder market. Most people were not excited about the prospect of paying $120.00 for a B&W video camera that was not portable because it still had to be cabled to the family VCR. At the time, full feature camcorders could be purchased for as little as $299.95. While this was bad for Tyco, it is great for us. They began slashing the price and thousands of cameras suddenly became very affordable for the hobbyist. Toys-R-Us is probably the easiest place to find this camera today and at last check it was only $29.95. What do you get for your money? You get a single board camera in a large ugly case, a cheap tripod, and a set of cables.

The case is easily disassembled with a screwdriver revealing the single board camera and lens hiding inside. There are 4 wires coming from the camera to a Molex connector. The actual camera is in a black plastic housing about 2" square with the lens attached to the front. There is a nice lip on each side of the case that can be used for mounting. The lip is easily drilled and can be mounted using stand-offs.

The camera is a single chip design using a VLSI Vision CMOS imager which can produce composite video directly. The chip used is the VV5400C001EB, which is no longer being produced. However, the more recent VV5402 is very similar and has the same pinout. A full data sheet for the VV5402 is available from the VVL website in .PDF format.

The video output quality is fairly good. It is not as sensitive to low light levels as a CCD camera, but works well under normal lighting
conditions. It's also quite sensitive to IR, but once again, not as much as a CCD camera.

Camera specifications are as follows:
200 x 243 pixels in NTSC mode, Pixel size is 12um square, Min. illumination 0.5 lux, S/N ratio 52dB, Exposure control automatic to 146000:1, Gain control automatic to +20dB, Power supply +5vdc internally regulated, Power consumption less than 300 mw, Usable temperature range 0 deg. C to +40 deg. C, Application notes: The module has 4 leads and the color code is as follows: Green +6 to +12vdc input, Yellow video output (normal NTSC composite), Black (2) ground for power and video
The module has NO REVERSE POLARITY PROTECTION, so be careful!
The output video is un-terminated and needs to work into a 75 ohm load to provide the proper level of 1 volt P/P
Changing logic levels on the control pins can alter some operations of the camera.
-SIN on pin 17, resets the video logic
-RESETB on pin 29, resets the entire camera
-AEC on pin 21, high = automatic exposure control on, low = off
-AGC on pin 22, high = automatic gain control on, low = off
-AGC LIN on pin 19, high = linear output, and low = gamma corrected
-BKLIT on pin 28, high = backlight on, and low = off
-ODD on pin 37, goes high during odd fields and low during even fields

The chip for this camera was developed by VLSI Vision Ltd. of Edinburgh, UK and their website provided much of the data for this article.
…Gary Croll (KE6GHS) gary.croll@ucr.edu

IT'S ATCO SPRING EVENT TIME

Once again we will get together have lunch, pass out door prizes and discuss our ATV experiences since the Fall Event last year. Since we have swapped places with the Dayton Hamvention, we can discuss our plans for that event. Come one, come all. Lets see if we can break an attendance record this year. Check out the "poster" on the next page for details. See you there!
…Art WA8RMC

ATCO

1999 SPRING EVENT

1:00 PM - SUNDAY
MAY 02, 1999
ABB PROCESS AUTOMATION
(ACCURAY)
*** SHELTERHOUSE ***
650 ACKERMAN ROAD
FOR MORE DETAILS, CONTACT
RICK - WA3DTO 877-0652

LUNCH PROVIDED - DOOR PRIZES -
BRING A FRIEND AND MEET OLD
SHOW AND TELL

DIRECTIONS TO THE ATCO EVENT

From I-70 either EAST or WEST Bound:

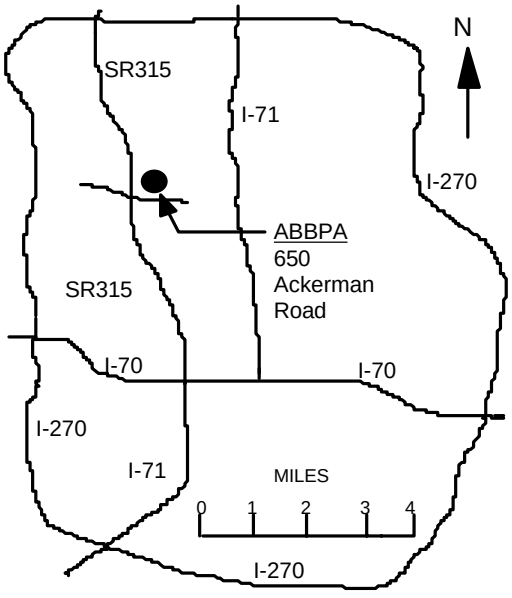
Take Route 315 (runs north and south and is just west of Columbus) and head NORTH. Get off at the Ackerman Road Exit and turn RIGHT on to Ackerman Road. Turn LEFT just beyond the first traffic light at the ATCO sign.

From I-71 traveling NORTH bound toward Columbus:

While traveling north on I-71, watch for the split to Route 315 just south of Columbus. Take 315 NORTH to the Ackerman Road Exit. Get off at this exit and turn RIGHT to Ackerman Road. On Ackerman Turn LEFT at the first driveway.

From I-71 traveling SOUTH bound toward Columbus:

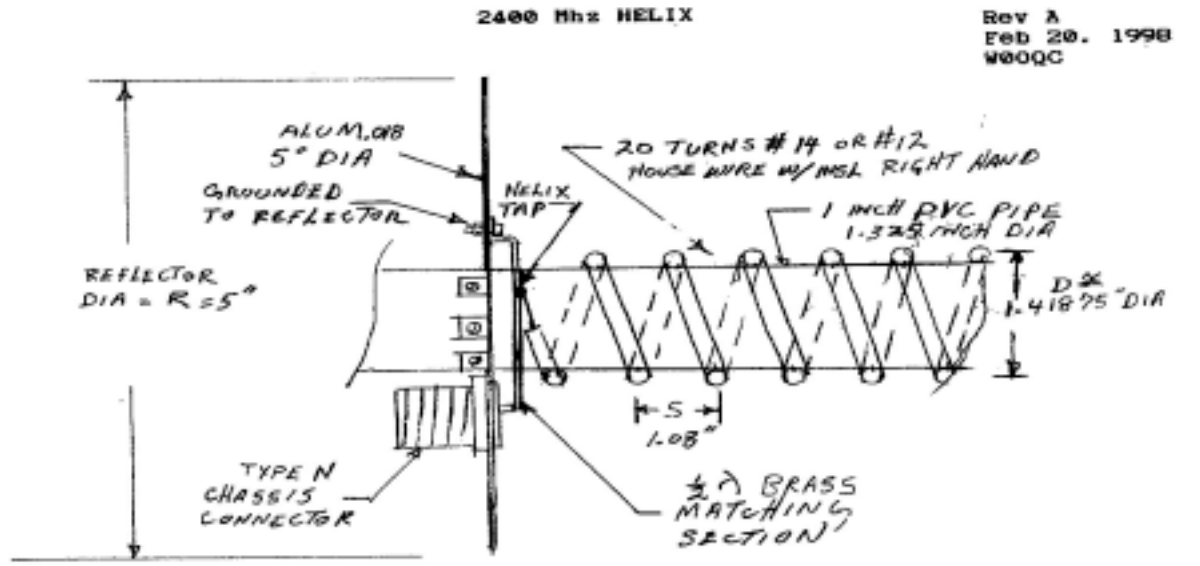
(DIRECTIONS IF YOU'RE "NORTH" OF I-270).
Take I-71 SOUTH to I-270 Bypass Loop & head WEST on I-270 to SR 315. Take SR 315 south about 5 miles to Ackerman road. Turn east on Ackerman (under SR 315) about 200 yards to first driveway to left.

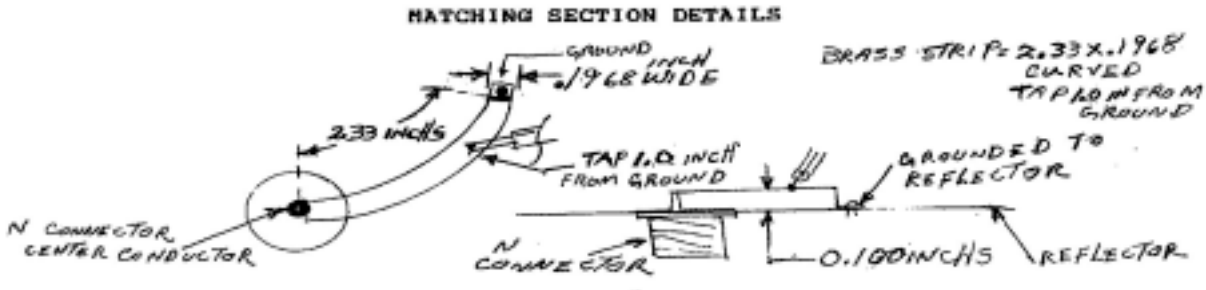


2.4 Ghz HELIX ANTENNA…the prefect "repeater watcher"

Helix Antenna

Greg, N0ZHE, (http://www.havilandtelco.com/homepages/gregwycoff) describes the following 2.4 Ghz helix antenna on his web page which I felt was noteworthy and is similar to the one I described in the ATCO newsletter last year. Now that the warm weather is upon us, I hope someone will build one of these (or both) and report the results. Remember that the helix antenna is circularly polarized which will yield about 3dB less gain than an equivalent vertically polarized antenna but there IS a bonus. You will be able to view the horizontally polarized signals also (the commercial studio to transmitter links and the Goodyear blimp signals during football season). The 3dB sacrifice will not lower the 2.4 Ghz repeater signal enough to produce a noticeable change. …Art WA8RMC





1λ = 11800/2400 = 4.91666 inch D = 4.91666/π = 1.565 inch

With the dia of 1 in PVC pipe of 1.325 in and the house wire insulation of 3/32 in D for the helix is 1.41875.

Spacing S = 0.22λ = 1.08 inch Turns n = 20

Reflector dia = greater than 0.6 (I used 5 inchs)

Approx. Gain ≅ 11.8 + 10 log (.22 X 20) ≅ 18.23 dbi

HAMFEST CALENDAR

This section is reserved for upcoming hamfests for as far in advance as we know about them. 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. I maintain some fliers that compile this list so for additional info Email me at towslee@ee.net. This list will be amended as further information becomes available.

April 25 Twenty Over Nine RC, Canfield, OH Don Stoddard, N8LNE 55 South Whitney Ave., Youngstown, OH 44509 330-793-7072
April 25 Athens, OH Drew McDaniel, W8MHV 61 Briarwood Dr., Athens, OH 45701 740-592-2106
May 14-16 Dayton, OH Dick Miller, N8CBU PO Box 964, Dayton, OH 45401-0964 937-427-3109 E-mail: chair@hamvention.org http://www.hamvention.org
May 30 Franklin County Hamfest, Hilliard, OH Chris Lind, KC8BUO PO Box 14281, Columbus, OH 43214 614-267-7779 Fax: 614-263-7934 E-mail: FKLN-CNTY-HFST@prodigy.com
June 6 Medina 2 Meter Group, Medina, OH Mike Rubaszewski, N8TZY 4264 Alpine Hill Ct., Brunswick, OH 44212-2166 330-273- 1519 E-mail: m2mgroup@aol.com http://members.aol.com/M2MGroup
June 13 Goodyear ARC, Akron, OH Robert J. Taylor, KB8ZEC 845 Hampton Ridge Dr., Akron, OH 44313 330-836-3282 E-mail: rjtaylor@akron.infi.net
June 19 Milford ARC, Milford, OH Chris Reinfelder, KB8SNH 3691 Charter Oak, Amelia, OH 45102 513-753-5066 E-mail: RAC_Reinfelder@FUSE.NET
June 20 Cuyahoga ARS, Macedonia, OH Rich James, N8FIL 7620 Crestwood Ln., Northfield Ctr., OH 44067 800-404-2282 http://www.cars.org
July 17 Northern Ohio ARS, Elyria, OH John Shaaf, KC8AOX PO Box 432, Elyria, OH 44036-0432
July 18 Van Wert ARC, Van Wert, OH Bob Barnes, WD8LPY 411 North Walnut St., Van Wert, OH 45891 419-238-1877 E-mail: barnesrl@bright.net http://www.bright.net/~barnesrl/w8fy.html
July 24 OH-KY-IN ARS, Cincinnati, OH Dana Laurie, WA8M 280 Hillcrest Dr., Cincinnati, OH 45215-2610 513-761-7388 E-mail: wa8m@arrl.net
August 1 Portage ARC, Randolph, OH Joanne Solak, KJ3O 9971 Diagonal Rd., Mantua, OH 44255 330-274-8240 E-mail: ljsolak@apk.net http://parc.portage.oh.us
August 7 Voice of Aladdin ARC, Columbus, OH Jim Morton, KB8KPJ 6070 Northgap Dr., Columbus, OH 43229-1945 614-846-7790

LOCAL RADAR ACCESS IS ADDED TO REPEATER

After over two years of work, we now have a replacement for the defunct Columbus airport National Weather Service radar. Local TV station WCMH ch 4 has given us permission to re-transmit their radar signal for use during weather emergencies. The radar image shown at left is accessible 24 hours a day and usually set on the 120 mile range when no severe weather is in the area. It is manually switched by Channel 4 personnel to other closer ranges when severe weather is likely. We must accept the range they select but is usually the most desired range anyway.

The signal originates from the channel 4 studios on Twin Rivers drive and is fed to our repeater on demand via 915.00 MHz FMTV identified with my call letters in the lower left corner and out from the repeater simultaneously on 427, 1250 and 2411 MHz. The command to activate the channel 4 uplink is touch-tone 264 on 147.45 MHz (264= CMH and stands for the Port Columbus airport symbol) is retransmitted to Channel 4 on our 446.350 MHz link frequency. This will hold the signal on the air for 5 minutes. If it is desired to terminate the signal before that, simply press the # key. In the near future it is hoped added radar features will be available via different activation sequences. Reminder: This signal is available for ham viewing only. Commercial and general public use is prohibited

During severe weather warning conditions identified by the 146.76 MHz weather net, the radar signal will usually be activated on a continuous basis and viewed by the operators in the severe weather watch center at right. The center is coordinated with facilities at Port Columbus airport with a standby operations center at Channel 4. Please cooperate with these efforts and do not intentionally try to override the radar signal. As time advances, we would like to improve the

signal quality and flexibility for the weather spotters so if you know of something, let us know. Already it has been suggested that we add the 146.76 audio to it during weather warning conditions.
…Art WA8RMC

ATV EQUIPMENT SUPPLIERS

Below is a list of manufacturers of ATV equipment that I have found. There is no endorsement of any of the manufacturers listed below so buyer beware. If I or anyone else that I know of, has had any trouble with a manufacturer, it won't be listed. As I get more info, I'll add manufacturers. Likewise, if I hear of any trouble, it'll be removed. Good luck and keep me advised. **NOTE:** My apologies to Don Miller at Wyman Research who was left off the list last time. I was erroneously informed he was out of the ATV business - **not true!**
…WA8RMC

Michael Kohlstadt, KD6UJS
has a limited supply of used but working Pacific Monolithics 2.4ghz downconverters and power supplies which will work fine for the repeater.
Phone: 408-926-0430.

Down East Microwave
Antennas, Power Amplifiers, Deluxe Downconverters, microwave parts.
954 Rt. 519 Frenchtown, NJ 08825
Phone: 908-996-3584
Fax: 908-996-3702

PC Electronics
ATV Transmitters, Receivers
Manufacturer/Reseller
2522 Paxson Ln.
Arcadia, CA 91009-8537
Phone: 626-447-4565
Fax: 626-447-0489
tom@hamtv.com
www.hamtv.com

Phillips-Tech Electronics
MMDS, ITFS downconverters and antenna systems
P.O. Box 8533
Scottsdale, AZ 85252
Phone: 602-947-7700
Fax: 602-947-7799

ATV Quarterly (ATVQ)
ATV magazine publisher
5931 Alma Drive
Rockford, Il. 61108
Phone 815-398-2683
FAX 815-398-2688
Email: atvq@aol.com
http://www.cris.com/~Gharlan

Black Box
1000 Park Drive
Lawrence, PA 15055-1018
(800)552-6816 Voice
(800)321-0746 Fax
Email: info@blackbox.com
http://www.blackbox.com
Electronic Connections

R. Myers Communications
Good source for 2.4GHz dishes
P.O. Box 17108
Fountain Hills, AZ 85269-7108
Phone: 602-837-6492
Fax: 602-837-6872

Allied Electronics
7410 Pebble Drive
Fort Worth, TX 76118
(800)433-5700
http://www.allied.avnet.com
Electronic Parts House

Cable X-Perts
416 Diens Drive
Wheeling, IL 60090
800-828-3340 Voice 847-520-3444 Fax
http://www.cablexperts.com
Wire and Cable

SHF Microwave Parts Company
10GHz Gunn oscillators and Antennas
7102 W. 500 S.
LA PORTE, INDIANA, 46350
Fax: 219-785-4552

CCI Communications Concepts, Inc.
508 Millstone Drive
Beavercreek, OH 45434-5840
(937)426-8600 Voice
(937)429-3811 Fax
Email: cci.dayton@pobox.com
http:://www.communications-concepts.com ATV Equipment

GEKCO Inc
TV test signal circuit boards
PO Box 642
Issaquah, Wa 98027-0642
Phone: 425-392-0638
Email: sales@gekco.com
www.gekco.com

DCI Communications
Interdigital filters and cavities
Box 293, 29 Hummingbird Bay
White City, SK, Canada
S0G5B0
Phone: 306-781-4451

ATV Research Inc.
TV cameras & related parts
1301 Broadway PO Box 620
Dakota City, NE 68731-0620
Phone: 402-987-3771
Homepage: www.atvresearch.com
Email: atc@pionet.net

Directive Systems
RR#1 Box 282 Dixon Road
Lebanon, ME 04027
(207)658-7758 Voice
(207)658-4337 Fax
Antennas

M²
Antennas
7560 N. Del Mar Ave.
Fresno, Ca 93711
Phone: 209-432-8873

E. H. Yost & Company
2211-D Parview Road
Middleton, WI 53562
(608)831-3443 Voice
(608)831-1082 Fax
Email: ehyost@midplains.net
Battries

Fair Radio Sales
1016 E. Eureka P.O. Box 1105
Lima, OH 45802
(419)227-6573 Voice
(419)227-1313 Fax
Email: fairadio@wcoil.com
http://alpha.wcoil/~fairradio
Electronic Surplus Equipment

Herbach and Rademan
16 Roland Avenue
Mount Laurel, NJ 08054-1012
(800)848-8001 Voice
(609)802-0465 Fax
Email: sales@herbach.com
http://www.herbach.com
Electronic & mechanical
Surplus

Jameco Electronic Components
1355 Shoreway Road
Belmont, CA 94002-4100
(800)831-4242 Voice
Email: infor@jameco.com
http://www.jameco.com
Electronic Parts

Mat Electronics
400 Pike Road
Huntingdon Valley, PA 19006-1610
(800)628-1118 Voice
(800)628-1005 Fax
Email: sales@matelectronics.com
http://www.matelectronics.com
Radio & TV Parts House

MCM Electronics
650 Congress Park Drive
Centerville, OH 45459
(800)543-4330 Voice
(800)765-6960 Fax
http://www.mcmelectronics.com

Mouser Electronics
958 North Main Street
Mansfield, TX 76063-4827
(800)346-6873 Voice
(817)483-0931 Fax
Email: sales@mouser.com
http://www.mouser.com
Electronics Parts House

Nemail Electronics, Inc.
12240 N.E. 14th Avenue
North Miamo, FL 33161
(800)522-2253 Voice
(305)899-0900 Voice
(305)895-8178 Fax
Email: info@nemal.com
http://www.nemal.com
RF Connectors

Hosfelt Electronics Inc.
2700 Sunset Boulevard
Steubenville, OH 43952-1158
(800)524-6464 Voice
(800)524-5414 Fax

Pauldon Associates
210 Utica Street
Tonawanda, NY 14150
(716)692-5451 Voice
ATV Receivers and Transmitters

Jensen Tools Inc.
7815 S. 46th Street
Phoenix, AZ 85044-5399
(800)426-1194 Voice
(800)366-9662 Fax
http://www.jensentools.com

Sauder Electronics
261 Mountain Drive
Fredericksburg, PA 17026
(717)865-5001 Voice
(717)865-9470 Fax
Email: sauder@leba.net
Surplus Electronics

Surplus Sales of Nebraska
1502 Jones Street
Omaha, NE 68102
(800)244-4567 Voice
(402)346-2939 Fax
Email: grinnell@surplussales.com
http://www.surplusales.com
Electronic Parts

Tech America
P.O. Box 1981
Fort Worth, TX 76101-1981
(800)877-0072 Voice
(800)813-0087 Fax
http://www.techam.com
Electronic Parts House

Spectrum International
J-Beams, KVG, Micromodules,VSB
John Beanland
Phone:978-263-2145.
Email:
Spectrum@ma.ultranet.com
filters

Techni-Tool
5 Apolio Road P.O. Box 368
Plymouth Meeting, PA 19462-0368
(800)832-4866 Voice
(610)828-5623 Fax
Email: sales@techni-tool.com
http://www.techni-tool.com
Tools

Tessco Electronics
34 Loveton Circle
P.O. Box 5100
Sparks, MD 21152-5100
(800)472-7373 Voice
(410)472-7575 Fax
http://www.tessco.com
Test Equipment-Antennas-Etc

Typetronics
P.O. Box 8873
Fort Lauderdale, FL 33310-8873
(954)583-1340 Voice
(954)583-0777 Fax
Vacuum Tubes

Webster Communications, Inc.
115 Bellarmine
Rochester, MI 48309
(800)521-2333 Voice
(810)375-0121 Fax
Electronic Parts

TE Systems
P.O. Box 25845
Los Angeles, CA 90025
(310)478-0591 Voice
(310)473-4038 Fax
RF Power Amplifiers

The Wireman, Inc.
261 Pittman Road
Landrum, SC 29356
(800)727-9473
(864)895-4195
Wire and Cable

Wyman Research Inc.
8339 S 850 W
Waldron, In 46182-9608
765-525-6452
http://www.svs.net/wyman
wyman@svs.net
ATV transmitters & transceivers
SSTV equipt.

INTERNET ATV HOME PAGES **(list verified 4/10/99)**

If you have access to the INTERNET, you may be interested to know of some of the HAM related information that is available. Most addresses listed below are case sensitive, so type exactly as shown. (for comments or additional listings contact me at towslee@ee.net).

Domestic homepages

http://psycho.psy.ohio-state.edu/atco	Ohio, Columbus, ATV home page (ATCO)
http://www.radio-amateurs.com	Ohio, Dayton ATV group (DARA)
http://users.erinet.com/38141/atv.htm	Ohio, Xenia KB8GRJ
http://www.hayden.edu/Guests/AATV	Arizona, Phoenix Amateurs (AATV)
http://www.citynight.com/atv	California, San Francisco ATV
http://www.qsl.net/atn.	California, **A**mateur **T**elevision **N**etwork in Central / Southern
http://w6yx.stanford.edu/~stevem/atv	California, South Bay ATV Group Stanford University
http://www.qsl.net/wb6izg	California, southern ATV Sights and Sounds
http://home.tampabay.rr.com/k4lk/	Florida,Tampa Bay Amateur Television Society (TBATS)
http://www.nfds.net/~kb4oid/atv.html	Florida, Emerald Coast Amateur Television Society (ECATS)
http://www.qsl.net/scats/	Florida, Melborn Space Coast Amateur TV Society (SCATS)
http://www.BSRG.org	Georgia, Atlanta ATV
http://ww2.netnitco.net/users/stealth/kens.htm	Indiana KB9I homepage
http://www.mychoice.net/fminton/silatvg.htm	Illinois, Southern, Amateur Television group
http://www.ussc.com/~uarc/utah_atv/id_atv1.html	Idaho ATV
http://www.premiernet.net/~hcantrl/	Kentucky, Bowling Green (CKATS)
http://ourworld.compuserve.com/homepages/wd0giv/ATVPAGE.html	Lousiana, New Orleans
http://www.smart.net/~brats	Maryland**,** Baltimore Radio Amateur Television Society (BRATS)
http://www.icircuits.com/dats	Michigan, Detroit Amateur Television Ststem (DATS)
http://www1.minn.net/~n0mnb/	Minnesota Fast Scan Amateur Television (MNFAT)
http://www.intecnet.net/vidking/	Missouri, St Louis Amateur Television
http://www.mt.net/~erhardt/atvrptr.htm	Montana, Helena Amateur Television
http://www.njin.net/~magliaco/atv.html	New Jersey, Brookdale ARC in Lincroft
http://www.qsl.net/~no3y	New Mexico, Farmingham
http://www.lloydio.com/oatva.html	Oregon, Portland ATV (OATVA)
http://www.webczar.com/atv	Oklahoma, Tulsa Amateur TV (TARC)
http://www.usaor.net/users/ka3fzf/	Pennsylvania, Pittsburg Amateur Television in Pittsburg
http://www.voicenet.com/~theojkat/w3phl.html	Pennsylvania, Phila. Area ATV
http://www.geocities.com/Hollywood/5842	Tennessee, East ATV
http://www.stevens.com/HATS/home.html	Texas, Houston ATV (HATS)
http://www.hamtv.org/	Texas, North Texas ATV
http://www.ussc.com/~uarc/utah_atv/utah_atv.html	Utah ATV
http://www.qsl.net/w7twu	Washington, Western Washington Television Society (WWATS)
http://www.shopstop.net/bats/	Wisconsin, Badgerland Amateur Television Society (BATS)

Foreign homepages

http://www.ecn.net.au/~sbloxham/index.html	Australia, ATV, VK4GY (large list of other ATV & ham radio sites)
http://ourworld.compuserve.com/homepages/batc	British ATV club (BATC)
http://www.sfn.saskatoon.sk.ca/recreation/hamburg/hamatv.html	Saskatoon, Canada ATV
http://www.gpfn.sk.ca/hobbies/rara/atv3.html	Regina, Canada ATV
http://www.inside.co.uk/scart.htm	UK,Great Britain ATV (SCART)
http://www.cmo.ch/swissatv	Swiss ATV

INTERNET MISCELLANOUS HAM RELATED HOME PAGES (list verified 4/10/99)

The following addresses are helpful in searching for many different Ham Radio items on the INTERNET.

http://www.stevens.com/atvq ATVQ Magazine home page. ATV equipment & article references.
http://www.hamtv.com PC Electronics Inc. Lots of proven ATV equipment for sale.
http://downeastmicrowave.com Down East Microwave Inc. Lots of uhf/microwave parts & modules.
http://www.yahoo.com/Entertainment/television/Amateur_television Listing of some of the available ATV home pages.
http:/www.acs.ncsu.edu/HamRadio General ham radio info- satellite track, call sign database etc.
http://www.arrl.org/hamfests.html Current yearly hamfest directory.
http://amsat.org AMSAT satellite directory/home page.
http://www.arrl.org ARRL home page
http://www.ualr.edu/doc/hamualr/callsign.html Search by call sign or name.
http://hamradio-online.com Ham Radio Online "newsletter" Lot of Ham related information.
http://www.qsl.net/atna/ ATNA homepage
www.qth.net ATNA members list server (click "select list" to subscribe to listserver)
http://www.ham-links.org Ham Radio collection database
http://bro.net/explorer/part97.htm FCC part 97 details. Look up the FCC regulations.
http://fly.hiwaay.net/~bbrown/index.htm Tennessee Valley Balloon launch information (Bill Brown
WB8ELK) **http://www.ipass.net/~teara/atv4.html** Arizona ATV 2.4Ghz Wavecom page (Wavecom mod.
information) **http://www.ham.net/lisats.html** Space Shuttle Launch Info Service & Amateur
TV System (LISATS**) http://www.svs.net/wyman/** Wyman Research Inc. W9NTP Don Miller ATV
equipment **http://www.m2inc.com/** M^2 Antenna Systems Inc.
http://www.dci.ca/AMATEUR.htm DCI Digital Communications Inc. Bandpass filters
http://scott-inc.com/wb9neq.htm Kentucky, Airborn ATV from WB9NEQ in Bowling Green

ATCO REPEATER TECHNICAL DATA SUMMARY

This space of each publication includes the technical information of our repeater. Each time a new feature is brought on line it's added here. Use this as a quick reference for up/down access codes as well as some of the more important parameters of our system.

Main repeater: Location: Downtown Columbus, Ohio

Coordinates: 82 degrees 59 minutes 53 seconds (longitude)
39 degrees 57 minutes 45 seconds (latitude)

Elevation: 630 feet above average street level
1460 feet above sea level

Transmitters: 427.25 MHz AM modulation, 1250 MHz FM modulation and 2433 MHz FM modulation.
interdigital filters in output line of 427.25 & 1250 transmitters
Transmitter Output Power - 40 watts average 80 watts sync tip (427.25)
50 watts continuous (1250)
8 watts continuous (2433)
Link transmitter - 1 watt NBFM 5 kHz audio (446.350 MHz)

Identification The 427, 1250 and 2433 transmitters identify simultaneously every 10 minutes with video showing ATCO and WA8RUT with four different screens. Audio identification is 4 sequences of Morse Code.

Transmit antennas: 427.25 MHz - Dual slot horizontally polarized 7 dBd gain major lobe west
1250 MHz - Diamond vertically polarized 12 dBd gain omni
2433 MHz - Comet vertically polarized 12 dBd gain omni

Receivers: 147.45 MHz for F1 audio input control of touch tones
439.25 MHz for A5 video input with FM subcarrier audio (lower sideband)
915 MHz for F5 video link data from remote sites
1280 MHz for F5 video input
2411 MHz for F5 video input

Receive antennas: 147.45 MHz - Vert. polar. Hi Gain "Comet" 12 dBd (also for 446 MHz output)
439.25 MHz - Horiz. polar. dual slot 8 dBd gain major lobe west
915 MHz - Vert. polar. dB Products 10 dBd gain
1280 MHz - Horiz. polar. single slot 3 dBd gain major lobe west.
2411 MHz - Comet vertically polarized 12 dBd gain omni

		UP	DOWN
Input control:	Major Touch tones: beacon (1 min)	*439	#
	regional weather radar	697	#
	Local radar (5 min)	264	#
	User repeat 1 minute	*45	*22
	Touch tone pad tester	#0	#5
	Manual mode (ID)	*77 pause 90	*22
	(439 input)	*77 pause 91	*22
	(910 input)	*77 pause 92	*22
	(1280 input)	*77 pause 93	*22
	(cabinet cam)	*77 pause 94	*22
	(roof cam)	*77 pause 99	*22
	5 second ID	#9	*22
	Bulletin board	285 pause 92	286
	Reset to scan mode	D37 or #437	

Remote sites: Local radar (from TV channel 4 - WCMH) (915 MHz link output 8 watts)
Aux link at WA8RUT QTH (915 MHz link output 1 watt)
Aux link at WB8CJW QTH (915 MHz link output 1 watt)

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 $10.00 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 the ATCO newsletter quarterly in January, April, July, and October. The newsletter is sent to each member without additional cost.

The membership period is from January 1ST to December 31ST. New Members 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. Your support of ATCO is welcomed and encouraged.

ATCO CLUB OFFICERS

President:	Art Towslee WA8RMC	Repeater trustees:	Art Towslee WA8RMC
V.President:	Ken Morris WA8RUT		Ken Morris WA8RUT
Treasurer:	Bob Tournoux KF8QU		Dale Elshoff WB8CJW
Secretary:	Rick White WA3DTO	Statutory agent:	Rick White WA3DTO
Corporate trustees:	Same as officers	Newsletter editor:	Art Towslee WA8RMC

ATCO MEMBERSHIP APPLICATION

RENEWAL O NEW MEMBER O DATE _____ CALL _____

OK TO PUBLISH PHONE # IN NEWSLETTER YES O NO O HOME PHONE _____

NAME _____INTERNET Email

ADDRESS_____

ADDRESS _____

CITY _____ STATE _____ ZIP _____-_____

FCC LICENSED OPERATORS IN THE IMMEDIATE FAMILY

_____

COMMENTS_____

_____

_____

ANNUAL DUES PAYMENT OF $10.00 ENCLOSED CHECK O MONEY ORDER O

Make check payable to ATCO or Bob Tournoux & mail to: Bob Tournoux KF8QU 3569 Oarlock CT Hilliard, Ohio 43026

TUESDAY NITE NET ON 147.45 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 would like to 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. Then a second round follows with periodic checks for late check-ins. We rarely chat for more than one hour so please join us if you can.

ATCO TREASURER'S REPORT - de KF8QU

OPENING BALANCE (01/10/99).....	$ 645.61
RECEIPTS (dues).....	$ 250.00
OTHER INCOME (bank interest).....	$ 5.02
EXPENDITURES (Postage for January Newsletter).....	$ 42.58
CLOSING BALANCE (04/10/99).....	$ 858.05

ATCO MEMBERS AS OF 10 APRIL 1999

K8AEH	Wilbur Wollerman	672 Rosehill Road	Reynoldsburg	Oh	43068	614-866-1399	wilbur.w@juno.com
KC8ASD	Bud Nichols	3200 Walker Rd	Hilliard	Oh	43026	614-876-6135	
WB4BBF	Randall Hash	212 Long Street	Bluefield	Va	24605		
W4/F5BJV	Marcel Pitzini	443 Eastland Drive	Decatur	Ga	30030	404-378-2772	
KC8BNI	Fred Stutske	8737 Ashford Lane	Pickerington	Oh	43147		kc8bni@amsat.org
WB8CJW	Dale Elshoff	8904 Winoak Pl	Powell	Oh	43065	766-5823	dale.elshoff@usiny.mail.abb.com
WA8DNI	John Busic	2700 Bixby Road	Groveport	Oh	43125	491-8198	wa8dni@juno.com
K8DW	Dave Wagner	2045 Maginnis Rd	Oregon	Oh	42616	419-691-1625	
WA4DFS	Ed Walker	PO Box 150	Mountain City	Tn	37683	423-727-9611	ebwalker@preferred.com
WA3DTO	Rick White	5314 Grosbeak Glen	Orient	Oh	43146	877-0652	wa3dto@aol.com
WB8DZW	Roger McEldowney	5420 Madison St	Hilliard	Oh	43026	876-6033	wb8dzw@aol.com
KB8EAA,KB8VBF	Rick, Judy Hesket	6261 Maple Canyon Dr	Columbus	Oh	43229	891-3887	rjheskett1@worldnet.att.net
W8EHW	Foster Warren	P.O. Box #32	No. Hampton	Oh	45349		
KB8FF	Dave Tkach	2063 Torchwood Loop S	Columbus	Oh	43229	882-0771	tkack@copper.net
KS4GL	John Barnes	216 Hillsboro Ave	Lexington	Ky	40511	606-253-1178	ks4gl@juno.com
K8GCS	Harry Covault	4820 Archmore Dr	Kettering	Oh	45440	937-434-5412	k8gcs@megsinet.net
W8GUC	Reuben Meeks	428 Lewiston Road	Kettering	Oh	45429	937-294-0575	rmeeksjr@megsinet.net
KA8HAK	Jim Reese	1106 Tonawanda Ave	Akron	Oh	44305		
WA8HFK,KC8HIP	Frank, Pat Amore	3630 Dayspring Dr	Hilliard	Oh	43026	777-4621	
W8JND	Richard Knowles	573 Plaza Drive	Circleville	Oh	43113	477-8132	
K8KDR	Matt Gilbert	5167 Drumcliff Ct.	Columbus	Oh	43221-5207	771-7259	mjgilbert@wcom.net
N8KQN	Ted Post	1267 Richter Rd	Columbus	Oh	43223	276-1820	n8kqn@juno.com
WA8KQQ	Dale Waymire	225 Riffle Ave	Greenville	Oh	45331	513-548-2492	
N8LRG	Phillip Humphries	3226 Deerpath Drive	Grove City	Oh	43123	614-871-0751	phumphries@iwaynet.net
KA8MID	Bill Dean	2630 Green Ridge Rd	Peebles	Oh	45660		ka8mid@qsl.net
KB8MDE	Shaun Miller	5061 County Rd 123	Mt Gilead	Oh	43338	419-768-2588	kb8mde@bright.net
K8MZH	Leland Hubbell	7706 Green Mill Road	Johnstown	Oh	43031	967-8412	
WD8OBT,KB8ESR, Tom Camm & sons		1634 Dundee Court	Columbus	Oh	43227	860-9807	
N8OCQ	Robert Hodge	3689 Hollowcrest	Columbus	Oh	43223	875-7067	
N8OOA	Jeff Clark	9894 Fincastle-Winchester	Sardinia	Oh	45171	937-695-1229	
N8OPB	Chris Huhn	146 South Hague Ave	Columbus	Oh	43204	279-7577	
W6ORG,WB6YSS	Tom O'Hara & family	2522 Paxton Lane	Arcadia	Ca	91007	626-427-4565	tom@hamtv.com
WB8OTH	Perry Yantis	1850 Lisle Ave	Obetz	Oh	43207	491-1498	pyantis@compuserve.com
WA2PCH	Craig Stoll	PO Box 1117	Orchard Park	Ny	14127		
KE8PN	James Easley	1507 Michigan Ave	Columbus	Oh	43201	421-1492	jeasly@freenet.columbus.oh.us
W8PGP,WD8BGG	Richard, Roger Burggraf	5701 Winchester So. Rd	Stoutsville	Oh	43154	474-3884	
KF8QU	Bob Tournoux	3569 Oarlock Ct	Hilliard	Oh	43026	876-2127	rtournou@columbus.rr.com
WA8RMC	Art Towslee	180 Fairdale Ave	Westerville	Oh	43081	891-9273	towslee@ee.net
W8RRF	Paul Zangmeister	10365 Salem Church Rd	Canal Winchester	Oh	43110		w8rrf@copper.net
WA8RUT,N8KCB	Ken & Chris Morris	3181 Gerbert Rd	Columbus	Oh	43224	261-8583	wa8rut@aol.com
W8RVH	Richard Goode	9391 Ballentine Rd	New Carlisle	Oh	45334	513-964-1185	w8rvh@glasscity.net
WB8RVI	David Jenkins	4230 Lemert Drive	Grove City	Oh	43123	875-0664	
WD8RXX	John Perone	3477 Africa Road	Galena	Oh	43021	740-548-7707	wd8rxx@juno.com
WA8SAR	Gary Obee	3691 Chamberlain	Lambertville	Mi	48144		
N8SFC	Larry Campbell	316 Eastcreek Dr	Galloway	Oh	43119	851-0223	larry@psycho.psy.ohio-state.edu
WA8SJV	John Beal	2899 Castlebrook Ave	Columbus	Oh	43026	876-9412	
W8STB	John Hey & family	894 Cherry Blossom Dr	West Carrolton	Oh	45449	937-859-5295	heyjo@netzero.net
K8STV	Jim Carpenter	823 Quailwood Dr	Mason	Oh	45040		
N8TBU	Ed Latham	8399 Fairbrook Ave	Galloway	Oh	43119		
KB8TRP,KB8TCF	Tom, Ed Flanagan	1751 N. Eastfield Dr	Columbus	Oh	43223	272-5784	ed.flanagan@ohcolu.ang.af.mil
WA8TTE	Phil Morrison	154 Llewellyn Ave	Westerville	Oh	43081		
KB8UGH	Steve Caruso	39 South Garfield Ave	Columbus	Oh	43205	461-5397	scaruso@freenet.columbus.oh.us
WB8URI	William Heiden	5898 Township Rd #103	Mount Gilead	Oh	43338	419-947-1121	
KB8UU	Bill Rose	9250 Roberts Road	West Jefferson	Oh	43162	879-7482	
WB8VJD	Rick Morris	203 Merton Street	Holland	Oh	43528		
KA8VUQ	Jack Wolff	2682 Hiawatha Ave	Columbus	Oh	43212	263-3092	
W8WAU	Jake Fuller	PO Box 117	No. Hampton	Oh	45349		
N8WLT	James Neymeyer	2879 East Moreland Drive	Columbus	Oh	43209	237-2331	
KB8WBK	David Hunter	45 Sheppard Dr	Pataskala	Oh	43062	740-927-3883	dhunter147@aol.com
KB8YIO	Ric Wise	1465 25th Ave	Columbus	Oh	43211	291-6508	rwise@columbus.rr.com
KB8YMN	Mark Griggs	2160 Autumn Place	Columbus	Oh	43223	272-8266	mmgriggs@aol.com
KB8YMQ	Jay Caldwell	4740 Timmons Dr	Plain City	Oh	43064		
KB8ZLB	Dave Kibler	243 Dwyer Rd	Greenfield	Oh	45123	937-981-4007	k154@bright.net
KA8ZNY,N8OOY	Tom & Cheryl Taft	386 Cherry Street	Groveport	Oh	43125	836-3519	ka8zny@copper.net

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FIRST CLASS MAIL

REMEMBER...CLUB DUES ARE NEEDED.
CHECK MAILING LABEL FOR THE EXPIRATION DATE AND SEND KF8QU A CHECK IF EXPIRED.