



ATCO NEWSLETTER

VOLUME 6 NUMBER 1

JANUARY 1989

RENEW YOUR ATCO MEMBERSHIP NOW!

Check the mailing label on this ATCO Newsletter. If "12-88" appears after your name and call, this will be the last issue of the newsletter you will receive unless you renew your ATCO membership promptly!

BEST WISHES FOR A HAPPY 1989!

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The ATCO Newsletter is the official publication of a group of television amateurs known as "AMATEUR TELEVISION IN CENTRAL OHIO" and is published in January, April, July, and October.

Membership in ATCO is open to any FCC licensed radio amateur who has an interest in amateur television.

Any reproduction of material printed in the ATCO Newsletter without the written consent of ATCO is prohibited.

HISTORY OF ATCO

By Bill, W8DMR

HOW IT ALL BEGAN - Amateur television activity in Columbus and Franklin County reached a peak in 1981. During an informal gathering of ATV hams at a fast-food restaurant, those in attendance decided to have semiregular meetings every two to four months. The idea of an ATV repeater became popular, and W8BRUT thought that the Central Ohio Amateur Television group should be formed.

AND SO IT WAS - A couple of meetings were held. At the 26 June 1982 meeting at W8BRMC's QTH, more ideas about the repeater were discussed. W8BLGA was instrumental in designing and assembling the ATV repeater. Most hams could only transmit black and white video. Color ATV generated mostly by computers was becoming popular with W8FRQ and W8DMR.

A NAME CHANGE AND A NEWSLETTER LATER - A decision was made to call the group Amateur Television in Central Ohio (ATCO). Ken, W8BRUT, prodded the group into developing an ATV newsletter. Ken published the first newsletter with very little assistance.

ATCO NEWSLETTER HIGHLIGHTS FROM THE JUNE 1981 THROUGH FEBRUARY 1984 ISSUES - The following is a review of ATCO Newsletters for this period.

ISSUE 1, VOLUME 1 JUNE 1982 - A list of ATV stations was included and a net time was established. The acronym "ATCO" first appeared in this issue.

ISSUE 2, VOLUME 1 SEPTEMBER 1982 - Two black and white photos on the cover showed video received from the Dayton ATV repeater and W8RVH calling CQ. In this issue our repeater status was listed, K8JGY gave a report on our very low funds, and W8BRUT needed support in getting articles, material, and publishing help.

ISSUE 1, VOLUME 2 JANUARY 1983 - A meeting was held at K8AEH's QTH 29 January. Articles by W8CCW, W8CJW, W8BRMC, and W8BRUT kept the publication glued together. Photos in the newsletter pictured the ATV repeater, W8BLGA, and the ATCO group. The pictures were taken by Joe, W8SNBA.

ISSUE 2, VOLUME 2 JUNE 1983 - A1, N8CNB, gave us a cartoon cover that brought tears to my eyes, only Everett, N8CNP, could truly appreciate it! But wow, this issue had twelve full pages. Our first antenna measuring party was held at W8BLGA's QTH on 16 July. W8BLGA described how he fed his homebrew six foot dish antenna. Even at this time, AS Magazine was using much of our material! Again several black and white photos were included.

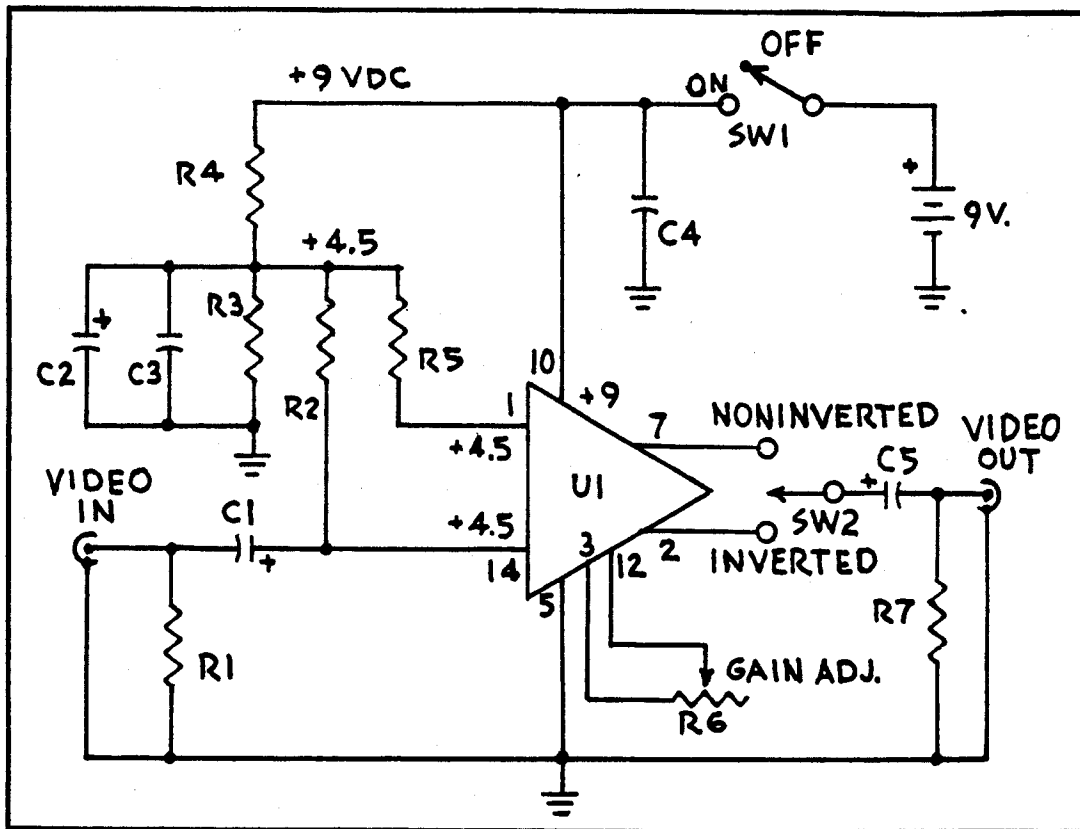
SPECIAL EDITION JULY 1983 - This was a 16 page special 23 cm newsletter published by W8BRUT. During this time, Ken also
(continued on page 6)

VIDEO LINE AMPLIFIER

Now and then the need for more video gain arises for the ATV enthusiast. A very low cost IC, the Signetics NE-592, is ideal for this purpose. This chip can be made to have a 75 ohm input and a 75 ohm output; therefore, it is suitable for insertion directly into a video line that needs a boost in level.

The gain of this video line amplifier is readily adjustable from 0.5 to 10 depending on the resistor that is chosen, or a 5000 ohm potentiometer can be used for variable gain control.

Frequency response of the amplifier is excellent and was measured to be flat to 8 MHz, which is quite adequate for ATV. Output is switchable from noninverted to inverted video, a very useful feature.



VIDEO LINE AMPLIFIER SCHEMATIC

R1 - 75 ohms	R7 - 10 k ohms	SW1 - SPST switch
R2, R5 - 10 k ohms	C1, C5 - 100 uF, 25v	SW2 - SPDT switch
R3, R4 - 4.7 k ohms	C2 - 100 uF; 10v	U1 - NE-592
R6 - 5 k ohms pot	C3, C4 - .01 uF	

A two inch square piece of vector board was used for construction and enclosed in a 2-1/4" by 2-3/4" Bud box with a nine volt battery. The Signetics NE-592 IC is not available at Radio Shack, but can be found at electronic wholesale houses such as Pioneer Electronics and Avnet at approximately \$1.90 each. (Submitted by Dick, W8RVH.)

1.27 GHz FM ATV RECEIVER (PART TWO)

Several changes and modifications have been incorporated and are described below. Some of the changes may not be required for ATV usage.

1. METER SENSITIVITY - 3.3 k ohm resistor added in series with the 10 k ohm resistor (R11) located near the meter.
2. AUDIO TUNING VERNIER - A voltage divider to lower the 12 V was added. From 12 V to ground, connect a 3.9 k ohm and 2.7 k ohm resistor in series. Connect the resistor junction to the top of the pot (R49). Cut the foil to remove the 12 V connection.
3. SUBCARRIER AUDIO FILTER - The 7.2 MHz filter is changed to 6.0 MHz by adding a 100 pfd capacitor in parallel with the 150 pfd capacitor (C29).
4. VARIABLE DE-EMPHASIS - The 100 pfd capacitor (C26) is removed. Use a 7-60 pfd variable capacitor (Radio Shack part number 272-1340) with a 33 pfd in parallel instead.
5. QUADRATURE ADJUSTMENT - The 39 pfd capacitor (C21) is removed. A 7-60 pfd variable capacitor is used.
6. FILTER TERMINATION (45 MHz) - A 100 pfd capacitor must be added in series between the filter output and the transistor. Parallel a 68 ohm resistor with the 68 pfd capacitor (C8).
7. IF STABILITY - A 10 ohm resistor is placed in series with the emitter lead of the second transistor after the filter.
8. VHF TUNER BANDPASS - The normal 6 MHz bandwidth should be increased to 12 to 18 MHz. Place a 10 k ohm resistor in parallel with the slug-adjustable output IF coil. The antenna and mixer coils (CH-7 or CH-8) are adjusted for broad banding.
9. AUDIO BOOST - Place a 270 ohm resistor in series with a 15 ufd from the emitter to ground of the audio transistor after the NE-564 IC.
10. CENTER TUNE METER - Connect from Pin 6 of the MC-1496 IC through a 10 k ohm resistor to a base of a NPN transistor; collector to +12 V; emitter to ground through a 10 k ohm resistor. Connect a 100-200 uamp center scale meter from the emitter to a voltage divider consisting of a 4.7 k ohms and a 2 k ohms pot. Connect the negative meter lead to the arm of the pot. Adjust pot for center scale reading. With a tuned video signal, set the quadrature capacitor for a center scale reading. The AFC amp, Q4, was used for this purpose.

(continued on page 9)

ATV NEWS ITEMS OF INTEREST

By Bill, WBDMR

HAM TV ON GALAXY-2 - Time on a discount satellite TV transponder has been acquired to televise about two hours of ATV. On Monday 2 January 1989 at 11 a.m., the California ATV Group will display some of their efforts on transponder 9. Included will be Tom, W6DRG, transmitting from a helicopter above the Tournament of Roses Parade. Most likely one of several ATCO members will rebroadcast the event on 439.25 or 434.0 MHz both live and later from tape.

AMATEUR TELEVISION QUARTERLY MAGAZINE (ATVQ) - Many ATCO Newsletter readers have received a subscription card for ATVQ Magazine. Obviously someone has forwarded the ATCO list of members to the publisher. In case you didn't get an invitation to join, here is the mailing address: ATV Quarterly Magazine, 1545 Lee Street, Suite #73, Des Plaines, IL, 60018. Be sure to include a check for \$15.

MORE ON THE MICROWAVE OVEN ATV TRANSMITTER - It is rumored that RF Design Magazine will publish very soon all the details of how the oven was converted to a 13 cm ATV transmitter. The output on 2304 MHz was greater than 250 watts average. RF Design editor, Gary Reed, has received many request from ATVers for additional information.

WABKQQ FABRICATES 90 ELEMENT COLLINEAR ANTENNAS FOR 33 cm - Using one of Dale's antennas, Dick, WBRVH, reports he sees WBVSY's video. Jack transmits 10 watts from West Milton, Ohio. It is about 25 miles line of sight (LOS) between the two stations; the pictures are P5 plus. KBHVA in Plymouth, Ohio, is another ATV station now operating on 33 cm.

CUSTOM VIDEO DISPLAY GENERATOR (VDG) EQUIPMENT REPORT - KABZNY, Tom, used a prototype VDG for the video source during the 17 September ATCO Hidden Transmitter Fox Hunt. Tom's custom made pattern consisted of a profile of a fire engine on the way to put out a fire with Tom riding in the truck. The unit was built and tested by Bill, WBBELK, who has used the VDG as a source of video for several balloon flights. Both Tom and Bill are ATCO members.

WABE0Y RECEIVES NEW FM ATV 23 cm TRANSMITTER - John has installed his 15 watt amplifier at the top of his tiltover antenna mast. He sends 15 VDC at about five amps up the mast to operate the amplifier. His exciter in the ham shack provides 2.5 watts drive to the amplifier.

WDBOBT DEMONSTRATES ATV TO CARA AMATEUR RADIO CLASS - An ATV converter, quagi antenna, and a color TV receiver placed in a classroom at DeVry by Tom provided his ham radio beginners class a rare opportunity to see ATV in action. The test video along with sound was provided by WBDMR. Tom reported that the students were very enthusiastic about the 70 cm operation.

HISTORY OF ATCO

(continued from page 2)

performed some ATV public service support. The BancOne Marathon was on 16 October 1983. WABRUT and WB8CJW with some help from Tom (now KABZNY) got the job done somehow.

ISSUE 3, VOLUME 2 OCTOBER 1983 - Our first color newsletter cover (paper that is). WABRMC helped WABRUT publish the ATCO Newsletter. The ATCO meeting on 22 October was held at AccuRay Corporation. WABRUT's crossband repeater (70 cm in / 23 cm out) was active. WABRUT reported that he worked WB8UGV on 23 cm, a 65 mile path, with P3-P4 pictures!

ISSUE 1, VOLUME 3, FEBRUARY 1984 - On 18 February, a meeting was held at K8JGY's QTH. WABRUT and WABRMC continued to publish the newsletter. ATV repeater was located in Westerville on a 110 foot tower. The octopole antenna was replaced with a WB8LGA antenna to improve desensing. No less than six new ATVers joined ATCO. KABGZQ proposes a new cover design for the newsletter.

AND SO IT WAS...PUBLICATION CEASED WITH THAT ISSUE.....

SO WHAT HAPPENED FROM 1984 TO JANUARY 1987? - Several things happened. WABRUT's occupational workload grew and needed attention. No one else stepped up and took over publication of the newsletter. The Tuesday Night Net continued. Having the same net manager may not have been a good idea. A lot of us spent time with our computers, and many of us improved and changed our equipment.

THEN ONE HAM VOLUNTEERED TO DO SOMETHING - Warren, KABGZQ, suggested that the ATCO Newsletter be restarted. The remaining \$70 in the ATCO Treasury was transferred, and with a revised ATCO logo the newsletter was revived. Postage increased 25 percent, but ATCO has held together for eight quarterly issues of the newsletter. We have had three social events and there's enough money remaining in the treasury to publish the January 1989 issue. Every issue of the ATCO Newsletter has been on time since the resumption of publication!

BUT WILL THE NEWSLETTER SURVIVE TO 1990? - Without our dual purpose editor (he is also our acting treasurer), ATCO might just fade to black, sync pulses and all. Vanish. Without article contributions throughout the next couple of years, ATCO may again go into hibernation, or worse perish.

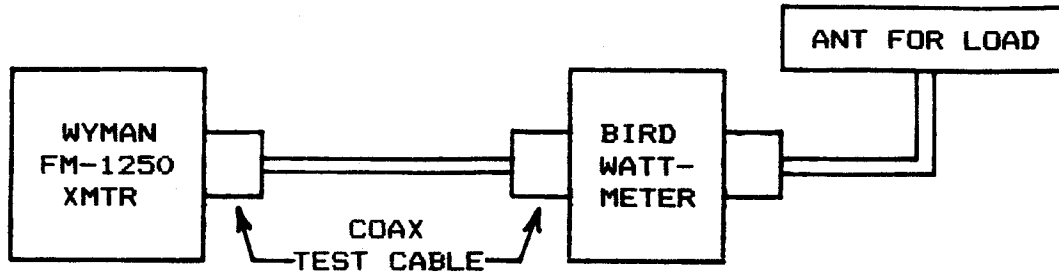
WHAT CAN WE DO TO PREVENT THIS? - See to it that all of us, not just a few members, keep our editor supplied with articles, diagrams, news, photos, technical ideas, and suggestions for social events. We need more humor, clear photos of our projects and activities, and A-R-T-I-C-L-E-S from one-liners to those involving several pages. Our editor will be happy to receive your contributions.

CONNECTOR LOSSES ON 23 CM

This test was conducted to determine and confirm suspicions about dielectric insulation losses for various coax fittings at 1200 Mhz. It is not implied that the findings are absolute, but it is felt this information should be shared with others. Unless otherwise noted, all fittings are Amphenol brand.

A block diagram, equipment used, and test results are below.

Block Diagram:



Equipment Used:

Wyman FM-1250 transmitter, 7 watts output on 1258 MHz.
 Test Cable, Columbia C1180/9913, 11.5 inches long.
 Bird Wattmeter, model 43 with SO-239 connectors.

Test Results:

<u>TEST NO.</u>	<u>INPUT FL-259</u>	<u>OUTPUT SO-239</u>	<u>PWR IN WATTS</u>	
			<u>REF</u>	<u>FWRD</u>
1.....	Output w/o test cable.....		0.13.....	7.0
2,....	Plastic 278-205*.....	Teflon.....	0.25.....	6.5
3.....	Plastic 278-205*.....	Phenolic.....	0.25.....	6.0
4.....	Phenolic.....	Teflon.....	0.25.....	6.5
5.....	Phenolic.....	Phenolic.....	0.25.....	5.0
6.....	Teflon.....	Teflon.....	0.25.....	6.5

*Radio Shack part number

Using Test 1 as a reference (without any cable), Test 2 (with a length of cable and two decent fittings) shows that a reasonable insertion loss plus an impedance mismatch does occur.

Tests 3 and 5 (using one or two phenolic fittings) yields the poorer results. The worst offender is the phenolic SO-239.

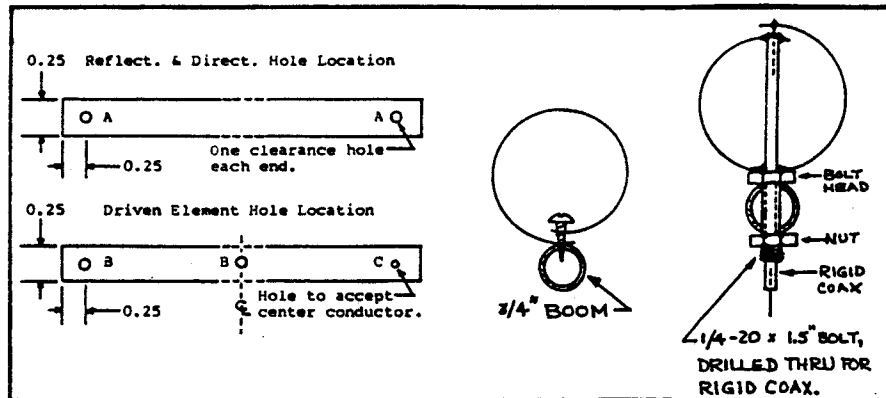
As a rule of thumb, always use a minimum number of fittings with a dielectric insulation of good quality, such as teflon or better. (Submitted by John, WABE0Y.)

25-ELEMENT 910 MHz LOOP YAGI

Shown below are the lengths, spacing, and hole requirements for a 25-element 910 MHz loop Yagi ATV antenna. The loops are essentially one wavelength in circumference; the reflectors are about five percent longer; the directors vary from five to seven percent shorter. When end mounted, the antenna has nearly 17 dB gain with a boom length of approximately 7.5 feet.

ELEMENT	LENGTH	SPACING	HOLE SIZE
Reflector 2	12.63	0.00	A
Reflector 1	12.63	4.10	A
Driven Loop	12.07	6.05	B,B,C
Director 1	11.51	7.17	A
Director 2	11.51	9.00	A
Director 3	11.51	11.08	A
Director 4	11.51	13.16	A
Director 5	11.51	15.11	A
Director 6	11.51	17.12	A
Director 7-11	11.25	4.10	A
Director 12-22	11.05	4.10	A

Hole Code: A = Clearance for screw used, 2 per element.
 B = Rigid coax outer dia., 2 each
 C = Center conductor wire size, 1 each.



The loops are made of brass or copper stock which permits soldering the overlap together. Metal gauge from 0.025 to 0.062 is satisfactory. Dip the loops in clear polyurethane to retard oxidation.

Boom mount a downconverter behind the last reflector. With an i-f of 45-175 MHz, RG-58/59 will work. Another antenna for transmit eliminates an expensive rf relay and associated connector loss, but not feed line loss.

To obtain about 3 dB more gain, lengthen the boom to 15 feet and add 21 more directors spaced 4.10 inches. However, end mounting the longer boom is impractical. Loop Yagi antennas have approximately 2 dB more gain than comparable straight-element Yagi antennas. (Prepared and submitted by Bill, W8DMR.)

1.27 GHz FM ATV RECEIVER (PART TWO)

(continued from page 4)

11. POWER SUPPLY - Add a 10 ohm, 2 watt WW resistor in series with the 19 V AC supply. If a 220 ohm resistor is connected from +12 to Pin 10 of the NE-564 IC, the +5 V regulator is not needed and may be removed.

12. SUBCARRIER AUDIO - The resonant circuit is lowered to 6.0 MHz by placing a 6-60 pfd variable capacitor in parallel with the 3.3 uH inductor (L9).

13. VIDEO DISCRIMINATOR - The 75 ohm resistor (R21) connected between pin 1 and pin 4 of the MC 1496 is changed to 220 ohms.

THANKSGIVING DAY BAND OPENING

Bill, WB8URI, reports that a 439.25 MHz band opening occurred during the morning of 24 November. Although it did not measure up to the one on Thanksgiving 1986, Bill says the DX video was a welcome sight. Voice coordination was on 2 and 80 meters. ATV stations received included the following: KA9TGX, Lafayette, IN; KA9SZX, Champaign, IL; K9KKL and WB9LHD, Springfield, IL; and KDOLD, St. Louis, MO. All signal reports averaged P0 to P2.

EDITORIAL POLICY

ATCO members are encouraged to submit articles which are related to amateur television for publication in the ATCO Newsletter.

Technical articles should be accompanied by necessary schematic diagrams and illustrations. Finished artwork is not required, but schematics and sketches should contain sufficient detail to facilitate the preparation of finished drawings.

Contributions may be typed or handwritten and may be edited for meaning and clarity. Manuscripts will not be returned to contributors unless requested.

Articles, letters, cartoons, or other material containing profane language or obscenities will not be accepted for publication.

ATCO accepts no responsibility for technical errors or any damage to amateur equipment arising out of any published modification or construction article.

Material for the ATCO Newsletter should be submitted to the ATCO Newsletter Editor, KA8GZQ, to arrive prior to the 10th day of the month preceding date of publication. The newsletter is planned to be published on 1 January, 1 April, 1 July, and 1 October.

CALCULATE YOUR ATV ERP

Here's a computer program that will let you do just that. The first version can be modified to suit any computer; the second is especially for those who have a Commodore 64.

```
10 CLS REM: ENTER COMMAND TO CLEAR SCREEN.          5 REM FOR COMMODORE 64
20 PRINT "*** CALCULATE YOUR ATV ERP **"           10 PRINT "[CLR]"
30 PRINT " (EFFECTIVE RADIATED POWER)"            20 PRINT "*** CALCULATE YOUR ATV ERP **"
40 PRINT                                           30 PRINT " (EFFECTIVE RADIATED POWER)"
50 INPUT "WATT METER READING (W/VIDEO) : ",WA     40 PRINT
60 PRINT                                           50 INPUT "WATT METER READING (W/VIDEO)";WA
70 INPUT "ESTIMATED FEEDLINE LOSS (DB) : ",FL     60 PRINT
80 PRINT                                           70 INPUT "ESTIMATED FEEDLINE LOSS (DB)";FL
90 INPUT "ESTIMATED ANTENNA GAIN (DBD) : ",AG     80 PRINT
100 PRINT:PRINT:PRINT                             90 INPUT "ESTIMATED ANTENNA GAIN (DBD)";AG
110 VP=WA*1.6805                                  100 PRINT:PRINT:PRINT
120 EXPD=10^(FL/10)                               110 VP=WA*1.6805
130 FLL=1/EXPD                                    120 EX=10^(FL/10)
140 PA=VP*FLL                                     130 FL=1/EX
150 GAIN=10^(AG/10)                               140 PA=VP*FL
160 ERP=GAIN*PA                                   150 GAIN=10^(AG/10)
170 ERP=INT(ERP*10+.5)/10                         160 ERP=GAIN*PA
180 PRINT "ERP IN WATTS (SYNC TIP) :";ERP        170 ERP=INT(ERP*10+.5)/10
190 PRINT:PRINT:PRINT                             180 PRINT "ERP IN WATTS (SYNC TIP):" ERP
200 GOTO 40                                       190 GOTO 40: REM (OR CHANGE TO GOTO 190)
```

ATV NEWS ITEMS OF INTEREST

By Bill, W8DMR

WABRUT REPAIRS 23 CM ANTENNA ARRAY - No longer does the 1278 MHz antenna at Ken's QTH point down toward the base of his tower. All signs indicate he will be active this winter 23 cm and other bands.

STRONG WINDS DOWN TOWER - Andy, N9AB, in Mundelein, Illinois, recently had his 120 foot tower blown down. He said, "The wind on 15 November 1988 broke the eyebolts on my tower guy-posts." A 4-element quad, a two meter antenna, and an ATV array were damaged beyond repair; his house sustained minor damage, also. It took several days to gather the bent hardware. Luckily, his EME array damage was minor. A new tower will be erected when weather permits.

K8AEH INSTALLS ROBOT 1200 COLOR SLOW SCAN GENERATOR - Among other things, Wilbur has added a new SSTV R-1200 scan converter to his well-equipped ham station. Watch for Wilbur, he will be frame snatching soon.

W8EHW HAS COMPLETED HIS FM ATV RECEIVER - Foster can now copy 70 cm and 33 cm (910 MHz) FM ATV! Foss, after adding a power supply to his converted satellite R-5100 circuit board, now has it neatly installed in a case.

WBVMS HAS ATV RECEIVE CAPABILITY AGAIN - Bob has his homebrew Yagi antenna installed on the mast at the top of his tower. His converter is working, and he is ready to view ATV video.

NEW ATCO MEMBER

Welcome to Bob, W8BLN, in North Hampton, Ohio, who recently joined ATCO.

KB2ARL UPGRADES LICENSE

Our congratulations to Dave who now has his Advanced Class ticket.

SOLUTION TO OCTOBER ARITHMETICKLER

Here's how Bob, W8TV, solved the two part problem printed in the October ATCO Newsletter.

Solution to first part:

$dB = 10 \log P_1/P_2$	
$-60 = 10 \log P_1/100,000$	or:
$-6 = \log (P_1/10^5)$	$-6 = \log P_1 - \log 10^5$
$10^{-6} = P_1/10^5$	$\log P_1 = -6 + \log 10^5$
$(10^{-6})10^5 = 10^{-1} = P_1$	$\log P_1 = -6 + 5$
$P_1 = 1/10 \text{ watt ERP}$	$\log P_1 = -1$
	$P_1 = .1 \text{ watt ERP}$

Solution to second part:

$P_{AV}(1.68) = P_{PEAK}$
 $.1/6 = .0166666 \text{ peak watts at transmitter output}$
 $.0166666/1.68 = .009920 \text{ watts average}$

[Editor's note: The print-out from the word processor shows log 10⁵ and P_{PEAK} which should be read as "log 10 superscript 5" and "P subscript PEAK" respectively.]

ROSTER CHANGE

KE8SV, Bob Mills, is now WM8P.

HAVE YOU HEARD?

Ten percent of our members own and operate R-7000 receivers in the ATV mode. They are W8BLN, W8EHW, W8KQO, W8RVH, and W8BUGV. Who's next?

THE ATCO TUESDAY NIGHT NET MEETS EVERY WEEK AT 8 PM ON 147.45 MHZ

ATCO FINANCIAL STATEMENT

CASH BALANCE:
As of 28 September 1988.....\$305.21

RECEIPTS:
Dues.....\$140.00
Cash donation.....\$ 5.00
Total receipts.....\$145.00

EXPENDITURES:
Printing charges for October 1988 ATCO Newsletter....\$ 43.56
Postage for October 1988 ATCO Newsletter..... 18.90
Misc. costs incidental to publication of newsletter.. 23.97
Total expenditures.....\$ 86.43

SUMMARY:
Cash Balance as of 28 September 1988.....\$305.21
Receipts..... 145.00
Expenditures..... 86.43
Balance as of 31 December 1988.....\$363.78

Note: Refer to ATCO Financial Statement appearing on page 13 of the ATCO Newsletter for October 1988. The first line under Summary should read as follows:

Cash balance as of 30 June 1988....\$415.87

The above financial report was prepared as of 31 December 1988 by Warren G. Dummel, KA8GZQ, Acting ATCO Treasurer.

OUR CONTRIBUTORS

Thanks to the following ATV hams for their contributions to the January 1989 issue of the ATCO Newsletter.

Dick, WBRVH, for his "Video Line Amplifier."

John, WABEY, who reports the results of his tests in "Connector Losses on 23 cm."

Bill, WBDMR, for "History of ATCO," "1.27 GHz FM ATV Receiver (Part Two)," more "ATV News Items of Interest," "25-Element 910 MHz Loop Yagi," and his computer programs so you can "Calculate Your ATV ERP."

AMATEUR TELEVISION PHONETICS

A = Aural	H = Horizontal	N = Nonlinear	T = TV
B = Brightness	I = Interlace	O = Overshoot	U = UHF
C = Contrast	J = Jitter	P = Pulse	V = Video
D = Deflection	K = Keyed	Q = Quadrature	W = Waveform
E = Equalizing	L = Lens	R = Raster	X = Xtra class
F = Focus	M = Monochrome	S = Sync	Y = Yoke
G = Ghost			Z = Zoom

ANNOUNCEMENT

ATCO is extending an invitation to FCC licensed spouses and children of ATCO members to join our group without payment of additional dues.

Children must be under 18 years of age.

Only one copy of the quarterly ATCO Newsletter will be mailed to each household.

Spouses and children will be considered as members of ATCO, but will not be eligible to vote in any ATCO election.

Names of spouses and children will be published on the roster of ATCO members.

Those wishing to join ATCO under the above conditions should complete the application below.

ATCO FAMILY MEMBERSHIP APPLICATION

NAME.....CALL.....
ADDRESS.....HOME PHONE.....
CITY.....STATE.....ZIP.....
HAM INTERESTS.....LICENSE CLASS.....
RELATIONSHIP TO MEMBER:
[] SPOUSE.....[] SON - AGE [].....[] DAUGHTER - AGE []
MEMBER'S SIGNATURE.....DATE.....

Mail to Warren G. Duemmel, Acting ATCO Treasurer, 3488 Darbyshire Drive, Hilliard, Ohio 43026.

ATCO MEMBERSHIP APPLICATION
(PLEASE CIRCLE CHANGES)

RENEWAL [] NEW MEMBER [] CHARTER MEMBER [] DATE.....
NAME.....CALL.....
ADDRESS.....HOME PHONE.....
CITY.....STATE.....ZIP.....
HAM INTERESTS.....LICENSE CLASS.....
I WILL TAKE ATCO NET-CONTROL TWICE A YEAR.....[YES].....[NO]
I WILL SUBMIT NEWSLETTER MATERIAL TWICE A YEAR.....[YES].....[NO]
COMMENTS.....
.....
ANNUAL DUES PAYMENT OF \$10 ENCLOSED.....CHECK [].....CASH []

Make check payable to Warren G. Duemmel, Acting ATCO Treasurer. Mail to K886ZQ, 3488 Darbyshire Drive, Hilliard, Ohio 43026

NOW'S THE TIME
TO RENEW YOUR ATCO MEMBERSHIP!
PLEASE USE APPLICATION FORM ON PAGE 13

ATCO NEWSLETTER
c/o Warren G. Duemmel
3488 Darbyshire Drive
Hilliard, Ohio 43026

FIRST CLASS MAIL

Editor: Warren, KA8GZQ