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FALL 1991
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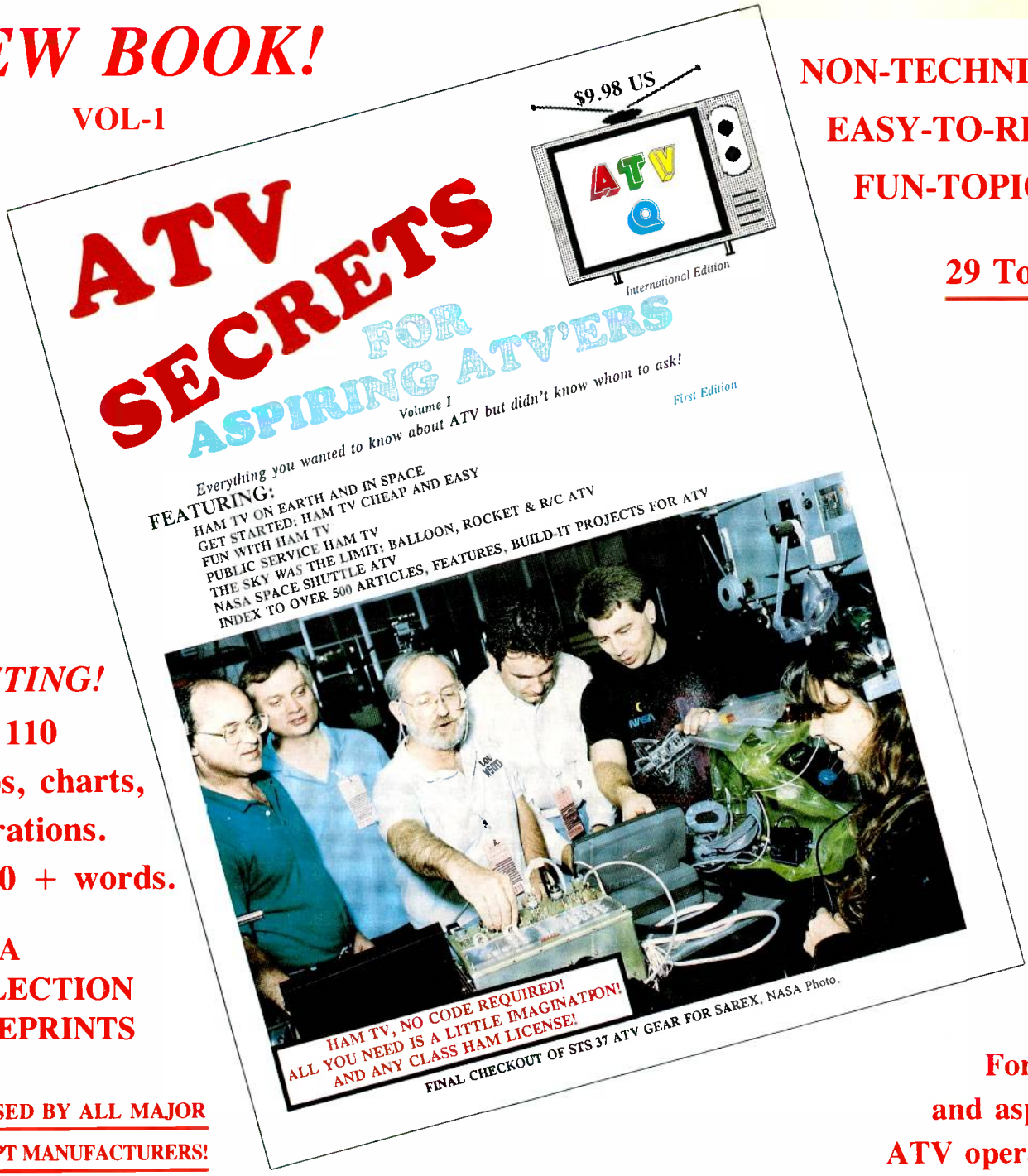
$4.95

NEW BOOK!

VOL-1



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A FIRST: ALL REQUEST MAGAZINE!
Have it your way!

I can't recall anyone ever doing this before. Over the years we have received many letter from our readers. We enjoy that as it keeps ATVQ in touch with the reality outside our office walls. Among the letters and phone calls we have had several requests for a few items. Last issue we provided an extra 16 pages to include the cumulative index, an item which had many requests. This issue we are providing you with more requested material. After all, we are here to serve your needs!

Among this issue's offerings is a new P chart courtesy of Dave Williams WB0ZJP. Also an article on what your watt meter is actually telling you. Both highly requested items. Also the NASA Select letter of authorization which is legally required for any ham station which retransmits the NASA mission audio or video. The authorization is now included in the latest FCC part 97 rules, 47CFR, 97.113 (e) should anyone question your right and authority to retransmit the NASA select signals!

3 SPECIAL SECTIONS

The most desired, according to your comments, item for the ham shack is a waveform monitor for watching your video. We can't send each of you a Tektronics 528 scope but we did the next best! Inside this issue is a set of scope graticule drawings. Copy these on overhead projection transparency sheets using the copy machine zoom control to make it the size you need. Put the new transparency over the face of your scope and taadaa... instant waveform scope! Also a complete guide to what a real wave from scope (WFM) does should you be lucky enough to find one in a flea market.

GET MOTIVATED!

An item which comes up in conversation is the lack of something to hand to a perspective ham or perspective ATV'er which would succinctly tell them what fun and excitement there is with ham TV. Sure, many of you hand over your coveted copies of ATVQ, then write in for a replacement because you couldn't get it back! Wouldn't it be good if you had an inexpensive pre printed handout which also had your local ATV information included that you could give away to a perspective ATV'er to get them motivated to get on the air? Sure it would!

ATVQ to the rescue. To help individuals and clubs or anyone recruit new ATV'ers and generate new activity and motivate folks, we have included in this issue a special 8 page pull out section. This was written to motivate the recipient to get involved in ATV and has a pre-printed page for you to add your local ATV information. Remove the pre printed section. Fill in the back page. Hand it to your non ATV friends. Motivate them to become ATVers! We printed 13,000 copies, one for each copy of this issue and a couple thousand for direct distribution. We mailed out more than 1500 copies to clubs individuals and stores. You can order additional copies for $5 for 20 copies (post paid) or you can reprint the pull out section yourself provided you do it in its entirety. Be sure to add your local info first so you don't have to write it in each copy! If you want to make a bulk printing for hamfests, let us know and we can supply you with the photo halftones for best reproduction quality.

BUT WAIT, THERE'S MORE!

ATV SECRETS ... THE BOOK!

Written entirely from scratch.

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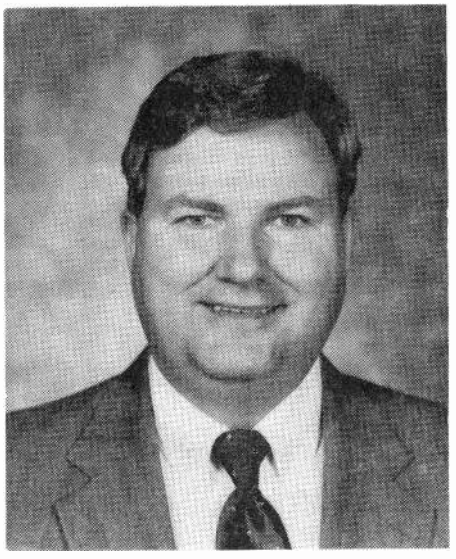
A completely new book for the non or new ATV'er. More than 2400 copies ordered before it was printed! More than 20,00 words, 110 diagrams, photos, illustrations and charts. Pure TV, no old reprints, no trivial or obscure topics, just the essence of ATV today.

Preview copies were reviewed by all major ATV manufacturers and ham educators including Gordon West, the NARA and BATC. All hail the ATV SECRETS book as "fantastic" "A winner" "absolute cracker." Written by Henry KB9FO, in clear easy to read style. More than 29 topics which cover the spectrum. ATV Secrets is endorsed by AEA, ATV Equipment, AV Products/Stewart Electronics, Pauldon Associates, PC Electronics, Wyman Research, NARA, Gateway Electronics, and International Crystal Manufacturing. Editorial input and review received from more than a dozen active ATV'ers including Bill Parker W8DMR, John Spaeth KD0LO, Dave Williams, WB0ZJP, Gordon West WB6NOA, Tom O'Hara W6ORG, Robert Beasley K6BJH and Andy Emmerson G8PTH.

Many of the photos were supplied by Dave who also did all the half tone work. Robert Beasley provided original cartoons to match the topic material. Even the ARRL has requested a copy for review!

So here you have it: A new ATV Book and an all request ATVQ issue! Sit back and enjoy!! The most requested items are in this issue of ATVQ and in ATV SECRETS the all new ATV book! 73 Henry



Spread the word!
Bulk reprints of the 8 page pull out section are available from ATVQ (only) for $5/20 copies, $20/100, $80/500.

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BACK ISSUES

ATVQ has sold out of every issue published. We have no back issues available. Back issues may be available at some retail ham stores.

REPRINTS

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ESF COPY SERVICE,
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ADVERTISING INDEX

ATV Net Uplinked Weekly on Satellite

Every Tuesday night, the 75 M ATV net on 3.871 MHz. is uplinked from Syracuse, NY to Spacenet-3 (S3), transponder 21 using the 6.2 MHz. audio subcarrier. Jim Bass of Syracuse, NY links the net up via his satellite audio service between 9 to 10 p.m. Eastern time on Tuesdays. Following the net (between 10 to 11 p.m.) is an ATV talk show hosted by Bill Brown WB8ELK. Jim's satellite service is known as Let's Talk Radio and features a lineup of folks who host nightly shows to discuss various topics about amateur radio, shortwave listening and satellite dish systems. His service operates continuously from 6 p.m. to 2 a.m. during the week and 6 a.m. all the way through 2 a.m. the following day during weekends. When not airing a talk show, Jim has been tuning into several other nets or special events and links them up to the TVRO satellite. It's always entertaining to tune in and hear what is going on at any time during his operating hours. If you can be heard in Syracuse, NY then you have a good chance of being uplinked during the ATV net. For those of you who have always wanted to check in to the ATV net but were too far away, now you can at least listen to it if you live in the Northern Hemisphere!

Jim would like to uplink your special event or net free of charge if there is an unused slot of time during his access hours. For further information call him at (315) 673-3752.

Note: This is an audio show, you will probably see a scrambled picture or occasional unscrambled picture that is unrelated to the show. To tune in the audio show, you must first turn off your VideoCipher unit if you have one. To do this, just reach behind the Cipher unit and flip the switch that is farthest to your right. Then just tune in the 6.2 MHz. audio subcarrier for some real fun!

Earthwinds Flight Imminent

The Earthwinds manned round-the-world flight is just about ready to fly on its non-stop voyage. It will carry three people in a pressurized gondola on a two-week record-breaking journey. Larry Newman KB7JGM will have a unique amateur radio telemetry system on board if all goes well. Current plans include a 10 meter CW telemetry transmitter which will periodically send out the balloon's Latitude, Longitude and Altitude (using onboard GPS receivers) in a Morse Code message. In addition, if he is not busy with the details of keeping the balloon aloft, he may operate on voice as well. You can find the 10m telemetry signal just below 28.321 MHz. throughout the flight.

In addition, work is underway to include an ATV transmitter on 434 MHz. which will switch between a computer ID and live camera. The Latitude, Longitude and the Altitude will be overlayed via a High-Technology Flight computer and video overlay card.

Current plans are for a mid-November to early December lift-off. The flight path should take the balloon from its launch point in Akron, Ohio over Pennsylvania, New York, New England, Europe, the Soviet Union, Japan and back across the Pacific Northwest to land east of Akron to completely circumnavigate the globe! From their constant altitude of 35,000 feet their ATV range should be more than 260 miles to each side of the flight path. Look for packet bulletins, the AMSAT net and, of course, the ATV net every Tuesday evening starting at 9 p.m. Eastern on 3.871 MHz. for further updates.

Rockoon Flight now scheduled for November 10

The next attempt to launch the Southeastern Community College Rockoon on its brief flight into space is now scheduled for November 10th. Liftoff of the balloon should occur around 6 a.m. and the rocket will be ignited about 1 to 1.5 hours later at an altitude of 80,000 feet. It could reach a peak altitude of 350,000 feet resulting in a radio range of 700+ miles. The Rockoon will lift off from just south of Wilmington, NC.

The SCC group tried to fly earlier this summer, but encountered very high winds during the inflation process which destroyed the balloon. The Rockoon will transmit live video on 439.25 MHz., 1255 MHz. FM ATV (both vertically polarized) as well as packet occasional packet telemetry on 144.440 MHz.. A tracking and information HF net will operate on 7.155 MHz. throughout the flight.

Photo A. Ben Frink KC4BFG stands next to the Rockoon as the large plastic balloon is inflated.

Photo B. High winds tear holes in the large balloon as the SCC crew attempt to hang on.

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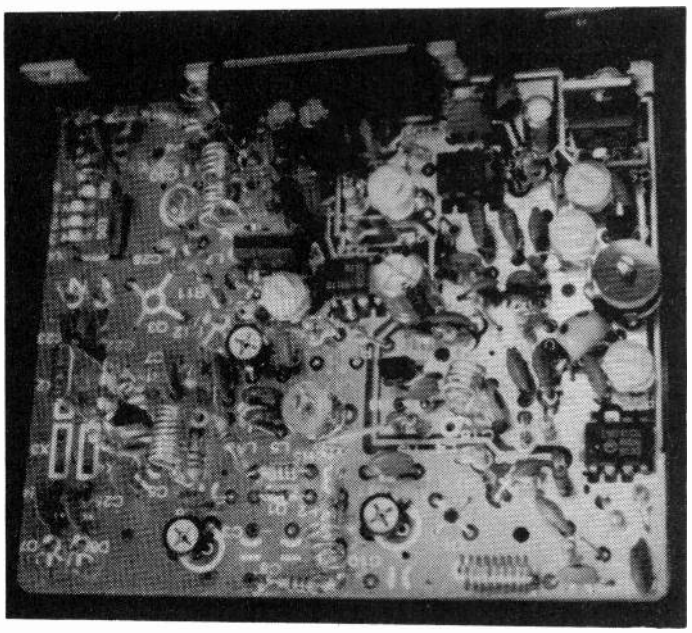

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Calls accepted after 6 pm M-F (local) Please specify frequency of 434 or 439.25 MHz. Additional frequencies $15 ea. Include $5 for shipping and handling. AZ residents add 6.7% sales tax.

ATV ELECTRONICS
16807 N. 46LN
GLENDALE, AZ. 85306

NASA SELECT
Goddard Space Flight Center
Building 8, Room N-3, Code 543.8
Greenbelt, Maryland 20771
September 11, 1991

To the Amateur Radio Community at Large:

Pursuant to 47CFR, 97.113(b) of the Federal Communications Commission Rules and Regulations regarding the retransmission of Space Shuttle Communications on amateur radio frequencies for use by amateur radio licensees, permission is granted for such retransmission of audio and video from NASA Space Shuttle and General Mission Coverage only over NASA SELECT Television. Space Shuttle Missions and other missions conducted under the auspices of The National Aeronautics and Space Administration are in the Public Domain.

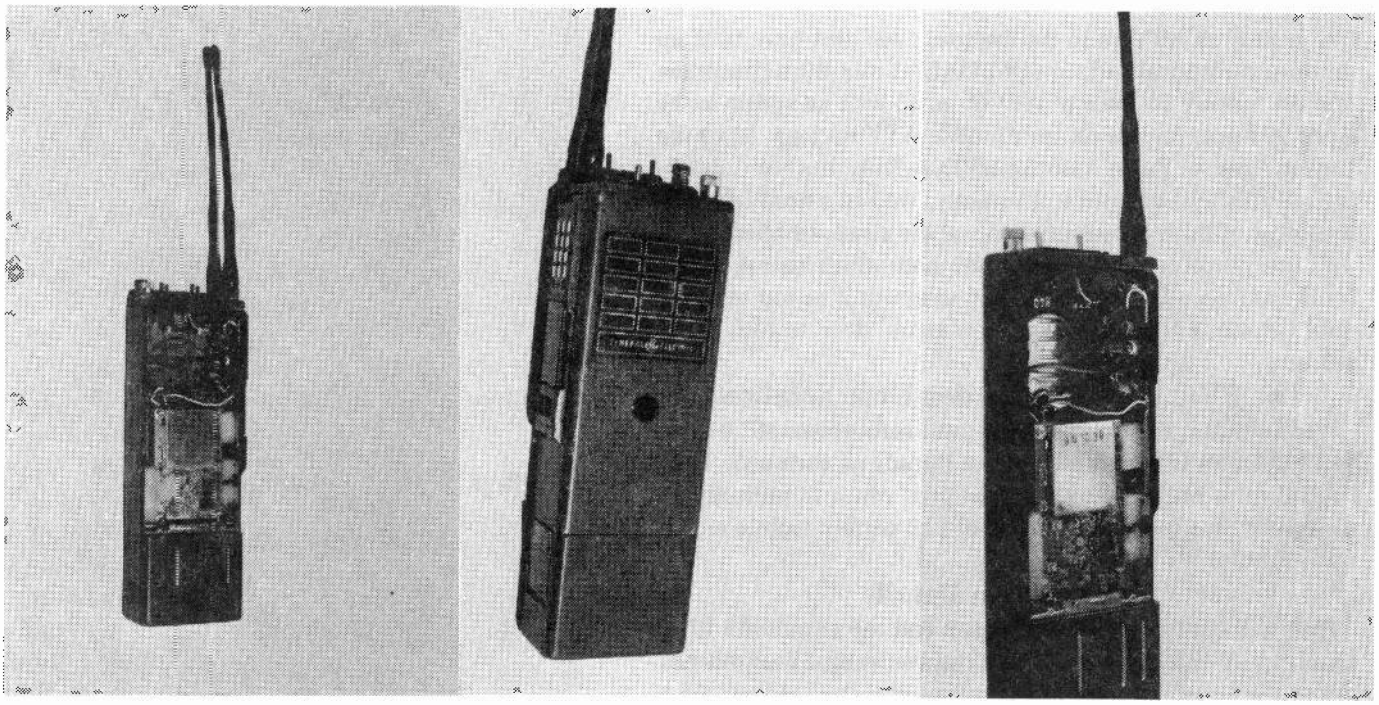
This permission shall remain in effect for the duration of Space Shuttle and General Mission flights launched under the auspices of NASA.

Sincerely,

Jeffery Elliott
NASA SELECT, Senior Field Engineer
Bendix Field Engineering Corporation

ATV HT

BY MIKE COLLIS, WA6SVT



How it all started.. Last April, I was looking for a small transmitter plus camera to build a video HT to take on my Dayton Hamfest trip. I remember Bill Brown, WB8ELK, had a micro camera last year at Dayton.

A call was placed to Bill and he gave me some info on it. Bill also told me about a SAW oscillator near 434 MHz. and that he would send me a sample if I wished. Bill also suggested I call Mike Henkoski, KC6CCC, to see how he has progressed with his sample.

I called Mike and he had already prototyped a circuit to use in his RC aircraft. We spent the next hour comparing ideas on the SAW oscillator and arranged for a visit to Mike's QTH to see how it worked. A few days later I visited with Mike and he had already reduced the micro transmitter PC board size by 10 percent using surface mount components. Mike gave me a board and parts to assemble to get an opinion on ease of assembly. I offered Mike a HT case to install a transmitter and camera to make a video HT line I was doing. Mike and I discussed different packaging techniques and he said take my prototype and camera and put it in your HT case as Dayton Hamvention time is fast approaching. (See 73 magazine July issue for KC6CCC's micro ATV transmitter.)

Building your HT

While digging through the junk box at home, a General Electric MPX HT was found. To make the case suitable, first unscrew the back cover. The PC board-module assembly is then removed. Most of the amber ribbon cable is removed except the part from the battery connector to the side power switch. Next remove the speaker from the front panel and drill a 7/16" hole in the front panel approximately 1" below the speaker grill (see photo). The camera lens will stay inside the HT case with a view through the hole. Attachment of the camera is with small solder lugs attached to the camera mounting screws (see close back photo). The lugs are adjusted to line up with the HT case lower cover studs. The end of each lug is bent at a 90 degree angle to parallel the stud and soldered in place. A few strips of styrofoam are used to wedge the camera in for a snug fit.

The micro transmitter is installed on the HT case side panel. To attach the transmitter, take #18 buss wire or a lead from a 1/2 watt resistor and solder to each corner of the transmitter. Next bend the leads down for 1/8," then bend at a 90 degree angle to form a foot to solder to the metal strip on the side panel. Other HT cases may require double sided sticky foam tape for attachment. I chose to use the HT's antenna mount and added a 6 1/2" rubber duck antenna. The HT uses an 8 volt battery that works well as the maximum continuous power the micro transmitter can use is 9V. If your HT case is designed for 12V or 15V battery, a 9V or 8V three terminal regulator will work. The power switch is used to supply power to the camera, PTT switch and toggle top switch. Micro transmitter power comes from the PTT and the toggle switch, the latter used for continuous transmit. The red lead on top of the HT can be wired in via a 680 ohm 1/4 watt resistor for transmit indication. The low volume pot would make a good subcarrier audio control. Rumor has it that Mike, KC6CCC, has a micro subcarrier audio board under development. Another improvement would be a 100 MW to 1 Watt amplifier for increased range. The range at 100 MW with the HT has been a one-half mile ATV contact from a third story hotel room at the Dayton Convention to Bill, WB8ELK's, portable TV set he was monitoring at a Denny's Restaurant on the far side of I-75.

Live candid camera action can be done with this HT as no one expects a camera is inside. This HT has made its way into many virgin video areas. Well, I will leave the rest to your imagination!

EASY MOBILE MOUNT ATV ANTENNA

by Dave Pelaez AH2AR/8

A number of ATVers in the Dayton, Ohio area have built up the omni-directional horizontal W6OAL "Little-Wheel" antenna (see the January 90 issue of ATVQ, p. 45 with an update in the April 90 issue) for use on their mobile ATV stations. Since the Dayton Amateur Radio Association (D.A.R.A.) has been launching ATV balloon experiments recently, we had a need to install a number of these antennas on top of the chase vehicles. Since the Little Wheel consists of three wire loops which meet at a BNC connector, there isn't any easy way to mount it on top of a car, until I made a trip to the local hardware store to look for a solution!

The PVC Pipe and Garden Hose Solution.

While perusing through the store I came across some 10" lengths of 1" O.D. PVC pipe that had hose threads on each end. Then I found some brass garden hose end caps which fit perfectly on the ends of the threaded PVC pipe. The perfect mobile mount was a reality!

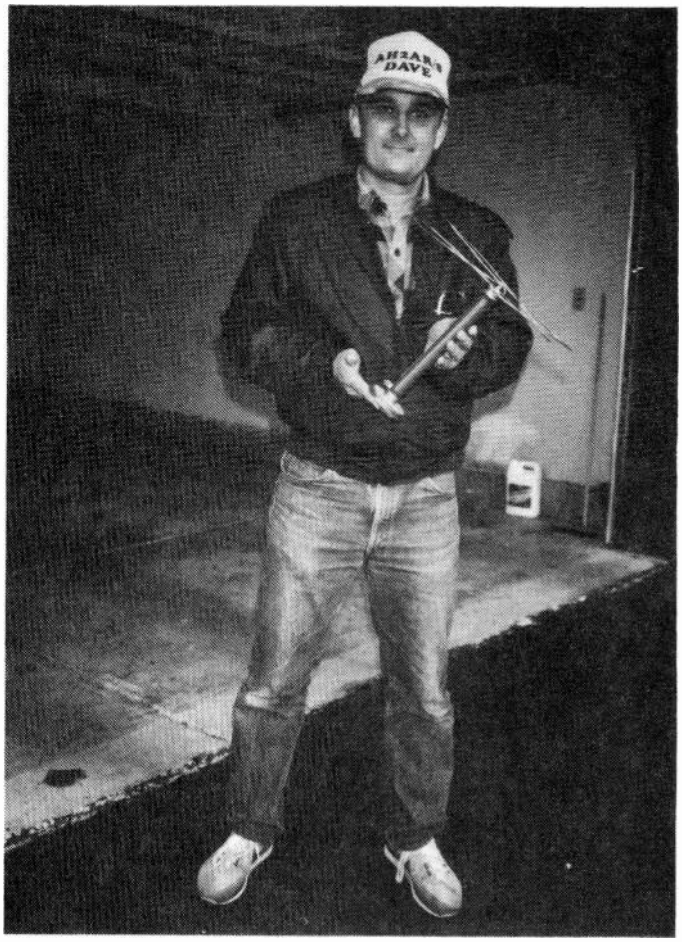
Construction Details

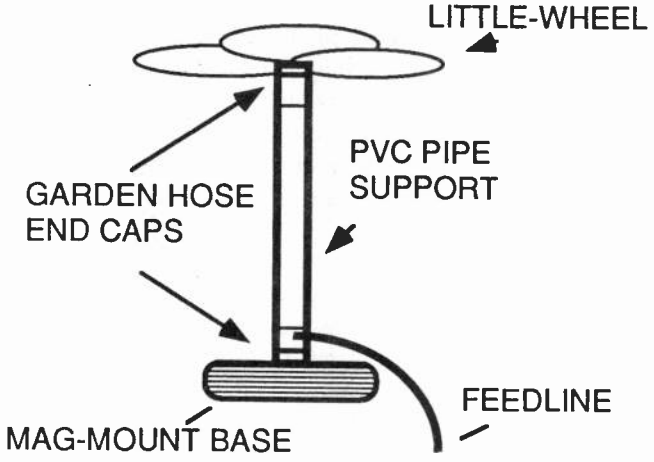
First drill out a hole in the top brass end cap to mount a BNC connector. When I built my Little Wheel antenna, I used this end cap as the bottom support for the wire loops and soldered them directly to the cap with a large soldering iron or gun. [Ed. Note: When using the Olde Antenna Labs assembled version of the Little Wheel, you just need to drill a hole big enough for the BNC connector. Then solder or epoxy the antenna to the end cap. In this case its probably best to use a plastic end cap - although you should still use a brass cap for the bottom support.]

Next hacksaw a slot into one end of the PVC pipe to allow the feedline to come out just above the bottom brass end cap (see the Figure). The width of this slot will depend of the type of feedline used, of course. Now just run your feedline through the PVC pipe and attach it to your Little Wheel/end cap assembly. Screw this assembly onto the PVC pipe and push the coax into the slot.

I found any number of places that sell mag-mount bases. You need to remove any special connectors from the mag-mount and use either the existing hole or drill a 1/4" hole in the middle of the mag- mount. Next drill a 1/4" hole in the center of the bottom end cap and attach it to the mag-mount base with a 1/4" diameter, 1/2" long bolt. Use the appropriate nut and washer. Now just screw the antenna/pipe assemble into the bottom washer. You now have a complete and very sturdy mobile array.

This arrangement is a great way to mount just about any type of antenna on your car for some real ATV mobile fun!





HELP NEEDED

Inexperienced ham just getting started in ATV purchased two Telrex 440 15 element yagis with 300 ohm driven elements at local hamfest. Model and Serial numbers not available at this time. Telrex is currently out of business and has discarded all files. Looking for anyone with previous experiences or who is currently using this antenna for suggestions, literature, and moral support. Please respond by mail to Doug Garber N9JRK, 509 North Main Street, Morton, Illinois 61550.

The Radio Channel

Every Monday Night on SpaceNet I, Channel 15

PO Box 5832 - St. Louis, MO 63134 - 314-831-6464 - FAX 314-895-3608

October 16, 1991

Dear Friend;

I want to thank you for your support of The Radio Channel during the past few months. It's always nice to hear from viewers, especially those with comments that help us improve the show.

As you may have heard by now, we are officially "off the air" for an indefinite period. We ended the series at the end of September. We simply were not able to find sufficient financial backing to allow us to continue.

Let me assure you that, even though we are no longer broadcasting via Spacenet I, we are by no means completely "dead". We are negotiating to continue the show using a variety of distribution methods that may be less expensive than satellite. It will probably take us a few months to complete the plans, but we hope to bring the show back early in 1992.

Again, thanks for your support. If you have suggestions or contacts that may be useful in helping us revive the show, please let me know.

73,

Walt Garrett, NØMAL

BLT To The EDGE OF SPACE!

Andy MacAllister, WA5ZIB, 14714 Knightsway Drive, Houston, TX 77083

On December 8, 1990, the South Texas Balloon Launch Team (BLT) successfully sent a two-meter transmitter to the edge of space. Telemetry was relayed to earth for decoding and study by interested hams in Texas, Louisiana, Arkansas and Oklahoma.

The package was retrieved 30 hours later, still transmitting data. A BLT package "with everything" was sent up twice on May 11, 1991. Here's the "why" and "how" of the South Texas efforts.

Video tapes and presentations of other amateur-radio balloon efforts provided the impetus to our AMSAT-Houston group to create and launch a small two-meter transmitter with analog telemetry. At an informal AMSAT-Houston lunch in mid-1990 it was proposed that we develop our own program to send some gear to the edge of space. Nobody backed down. The campaign would become a two-stage operation.

The first balloon package (BLT-1) was a simple inexpensive system. We needed to learn about weather balloons, balloon-flight prediction programs, project coordination and hostile-environment electronics design. With advice from Bill Brown WB8ELK and other balloonatics the system took shape.

Styrofoam computer packing material housed the electronics. The transmitter operated on 147.435 MHz and was built from a design in the August 1990 issue of 73 Amateur Radio. Analog telemetry was generated by a custom system interfaced to temperature sensors inside and outside the package and to the pressure circuitry. The pressure detector came from John Fleischer of the Transolve Corporation. His design was published in the October 1990 issue of Radio-Electronics. It was originally meant to be used for small rockets flying to 20,000 feet. We used the analog portion of the circuitry and calibrated the unit for a flight to over 100,000 feet. Lithium batteries were used for power, a ground-plane antenna was attached to the top of the package and heat-packs were included to keep the low-power system warm at upper-atmosphere altitudes.

Project coordination was handled by Burns Cleland WB5HLZ. Hardware and software came from several hams, all members of the BLT. On the morning of December 8, 1990 we launched from the Huntsville, Texas Municipal Airport. Thirty hours later after a long and difficult chase the package was found hanging at nearly 90 feet from the upper branches of a large pine tree on private land near Magnolia, Texas. Retrieval was Texas style. A local resident shot the line holding the electronics package with a rifle. We won and had learned a lot.

BLT-2 & 3

We were now ready for a serious package incorporating ATV, packet telemetry, active mirror control, digital voice and even a HF beacon. Planning began immediately for the May 11, 1991 flight. With titles like Captain Video, Payload Master and Computer Wizard, the participants whose ranks had grown since the first phase of the program took on the tasks of a system costing nearly $1000.

Bigger batteries were needed for the complex circuitry. The first package had used sulfur dioxide lithium cells rated for 3 Amp Hours at 12 VDC. The new system utilized similar lithium cells, but at 15 VDC and 7 Amp Hours. A back-up package employing 10 Amp Hour Thionyl Chloride cells was also available.

A custom on-board computer using the Motorola 6802 microprocessor allowed the analog telemetry to be digested and presented as ASCII text for the packet downlink and MCW output. The computer also watched the pressure changes for increasing values during balloon descent for mirror control. During ascent and shortly after balloon burst the mirror automatically cycled every 50 seconds between horizon views and ground views. After burst the computer would command the mirror to provide only ground views for possible impact determination.

The ATV transmitter on 439.25 MHz by PC Electronics had audio input so a digital-voice storage board was added to send messages on the 4.5 MHz audio subcarrier. Net information and operating frequencies were announced continuously during the flight by the digital-voice system.

A video identifier board and sequencer from Elktronics provided color and great graphics to go with the black-and-white GBC CCD-100 camera. A stabilizing fin on the package kept the spin to a minimum. Without the fin the view from above would have constantly rotated.

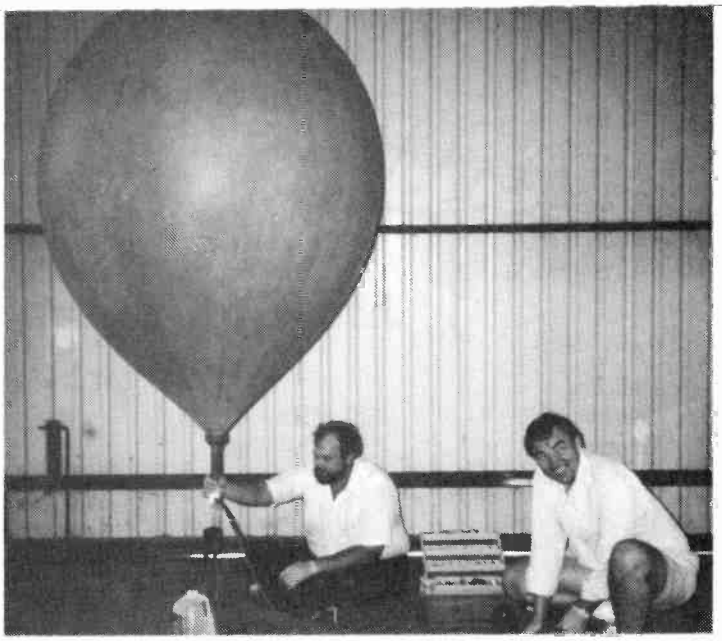
On the morning of May 11th winds were about 10 MPH. The launch did not go smoothly and the package slammed into a building at the Wharton Municipal airport just southwest of Houston. The ten-meter Fireball beacon on 28.322 MHz by K7IRK was ripped off along with most of the ATV antenna. The computer reset to a dormant mode and the stabilization fin fell to the ground while the balloon and what was left of BLT-2 went into the sky.

Spirits were not high. At 27,000 feet the balloon burst prematurely and the direction-finding team went into action. Within 45 minutes the package had been found 12 miles away in a field near Egypt, Texas and powered down. It was only noon. A quick vote was taken and we headed back to the airport to try again.

The ATV antenna was repaired, the stabilization fin was reattached, the computer was reset properly and the digital voice was reprogrammed. An hour later the back-up balloon was ready to go and so was BLT-3. This time the launch team was more organized. The winds were just over 10 MPH, but like a carefully choreographed dance team the crew went through the release sequence allowing the balloon, parachute, main package and 10-meter fireball to be freed in the proper order.

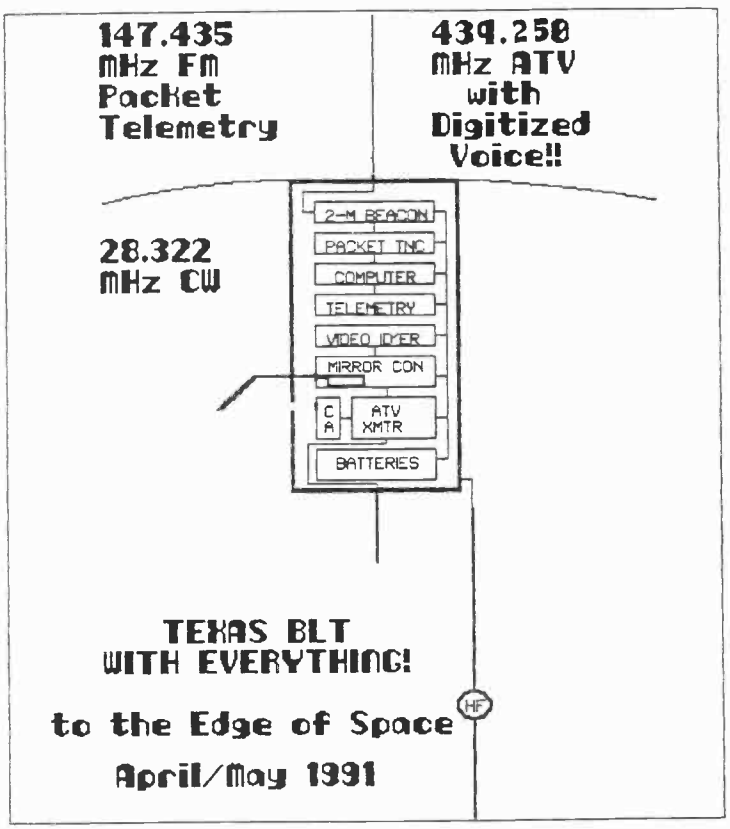
The fun began. Pictures from the on-board ATV system delighted everyone. Telemetry packets were received and displayed using laptop computers (Note Table 1) while the CW

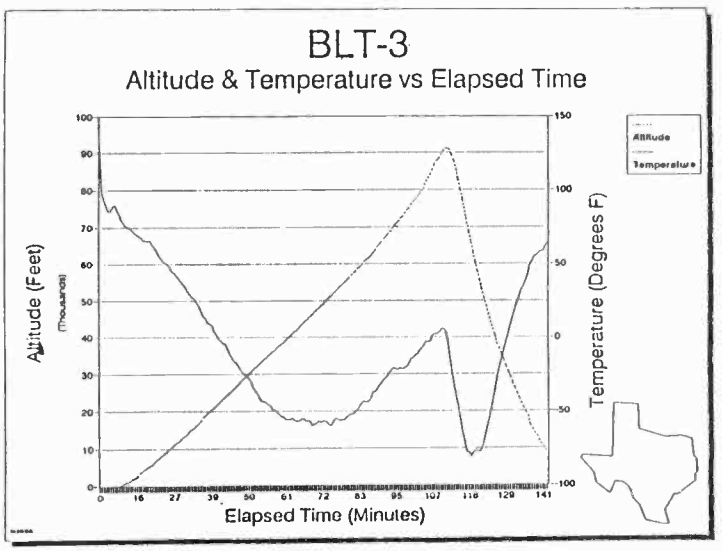
BLT TO THE EDGE OF SPACE



Computer wizard Steve WB5TTS and high coordinator Burns 2B5HLZ gas up BLT-3.

BLT3 ready for the second launch in one day. Noye Servo controlled mirror on side of payload.





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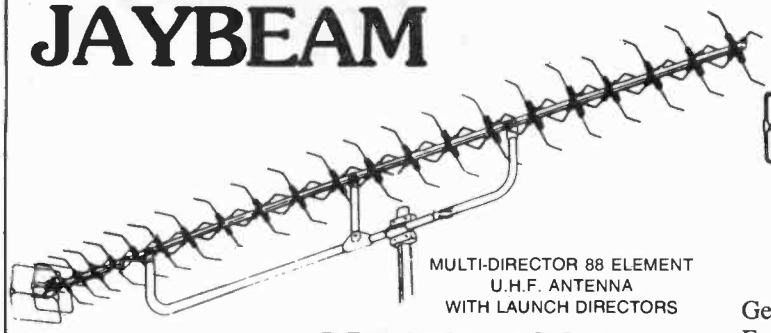
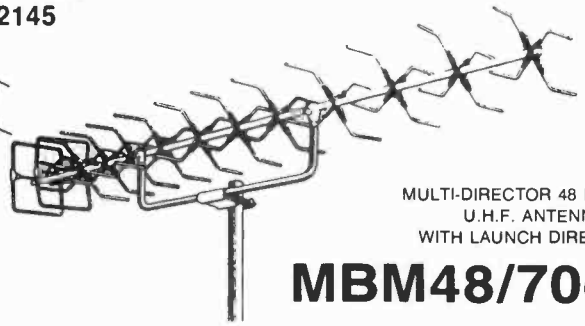


MULTI-DIRECTOR 88 ELEMENT
U.H.F. ANTENNA
WITH LAUNCH DIRECTORS

MBM88/70cm



MULTI-DIRECTOR 48 ELEMENT
U.H.F. ANTENNA
WITH LAUNCH DIRECTORS

MBM48/70cm

MULTI-DIRECTOR 28 ELEMENT
U.H.F. ANTENNA
WITH LAUNCH DIRECTORS

MBM28/70cm

General Specs:-

Frequency Range	420 MHz - 450 MHz
Impedance	50 Ohms
(Built-in Balun)	

	MBM28	MBM48	MBM88
Gain	11.5dBd	14.0dBd	18.5dBi
Beamwidth (E)	40 deg	28 deg	23 deg
(H)	45 deg	35 deg	28 deg
Boom Length	4 ft	6 ft	13 ft
	$ 60.00	$ 115.00	$ 160.00

VHF/UHF BANDPASS FILTERS

KNOCK OUT INTERFERING
QRM OR SELF-DESENSE!

BNC Standard
TNC or Type 'N' optional
(slightly higher prices)

The PSf . . . series of Band Filters are for receiver pre-selector and transmitter use. The filters are 3 pole, 7% bandwidth, 0.1 dB ripple designs with 30 dB shape factor of 4:1.

The PSf . . . ATV series of TV Channel Filters are 5 pole, 6 MHz bandwidth designs. They are used to protect your TV receiver from inband QRM and to "strip-off" the unwanted sideband of your transmitted vestigial sideband signal.

Model	PSf144	PSf220	PSf432	PSf900	PSf1296	PSf1691
Freq (MHz)	140-150	216-228	420-450	890-940	1250-1340	1650-1750
Loss (typ)	0.1 dB	0.1 dB	0.15 dB	0.2 dB	0.25 dB	0.25 dB
	$190.00	$160.00	$105.00	$105.00	$105.00	$105.00

Model	PSf421-ATV	PSf426-ATV	PSf439-ATV	PSf910-ATV	PSf1253-ATV
Loss (typ)	2.0 dB	2.0 dB	2.0 dB	2.5 dB	3.0 dB
Std conns.	BNC	BNC	BNC	N	N
	$155.00	$155.00	$155.00	$180.00	$180.00

All prices FOB Concord, Mass.

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BLT TO THE EDGE OF SPACE

enthusiasts wrote down telemetry data or just copied it in their heads. The 1.5 Watt TV signal was received in Dallas and Tyler to the north and the two-meter telemetry was heard on HT's out to 250 miles. The 50-mW ten-meter beacon could be heard in Tulsa, Oklahoma.

This time the balloon traveled about 18 ground miles to a hay field near Wallis, Texas during its flight to over 90,000 feet. The recovery team found BLT-3 still operating with plenty of power left. During demonstrations at the Arlington, Texas Hamvention in early June, it could still operate from its original battery pack!

The BLT project of South Texas was a success. Plans continue for more exotic experiments this year and next. More ATV will be sent to the edge of space and improvements are expected in antenna design, packet operation, HF beacons and launch procedures.

Fig. 1. The Balloon Launch Team of South Texas

THE B.L.T.

High Coordinator: WB5HLZ
Payload Master: WA5ZIB
Payload Integrator: WA5TWT
Captain Video: N5JXO
Computer Wizard: WB5TTS
Earth Software: N5LCO
Analog Telemetry: WA5ZIB
Antennas: N5EM
ATV System: N5JXO
Back-up power: N5SUA
Balloon System: WB5HLZ
Camera System: WA5LHM
DF Leader: KC5CP
Digital Voice: N5JXO
Flight Computer: WB5TTS
Flight Plan: WB8ELK & WB5HLZ
Flight Software: WB5TTS
Mirror System: N5RPQ
Net Control: WB5HJV
Power System: WB5HLZ
Telemetry Software: N5LCO
Thermal Control: WA5TWT
Tracking Software: WB8ELK
VHF Transmitter: WA5ZIB
Video ID: WB8ELK
Video Sequencer: WB8ELK
Weatherman: KA3BKU

BALLOON LAUNCH TEAM CREW

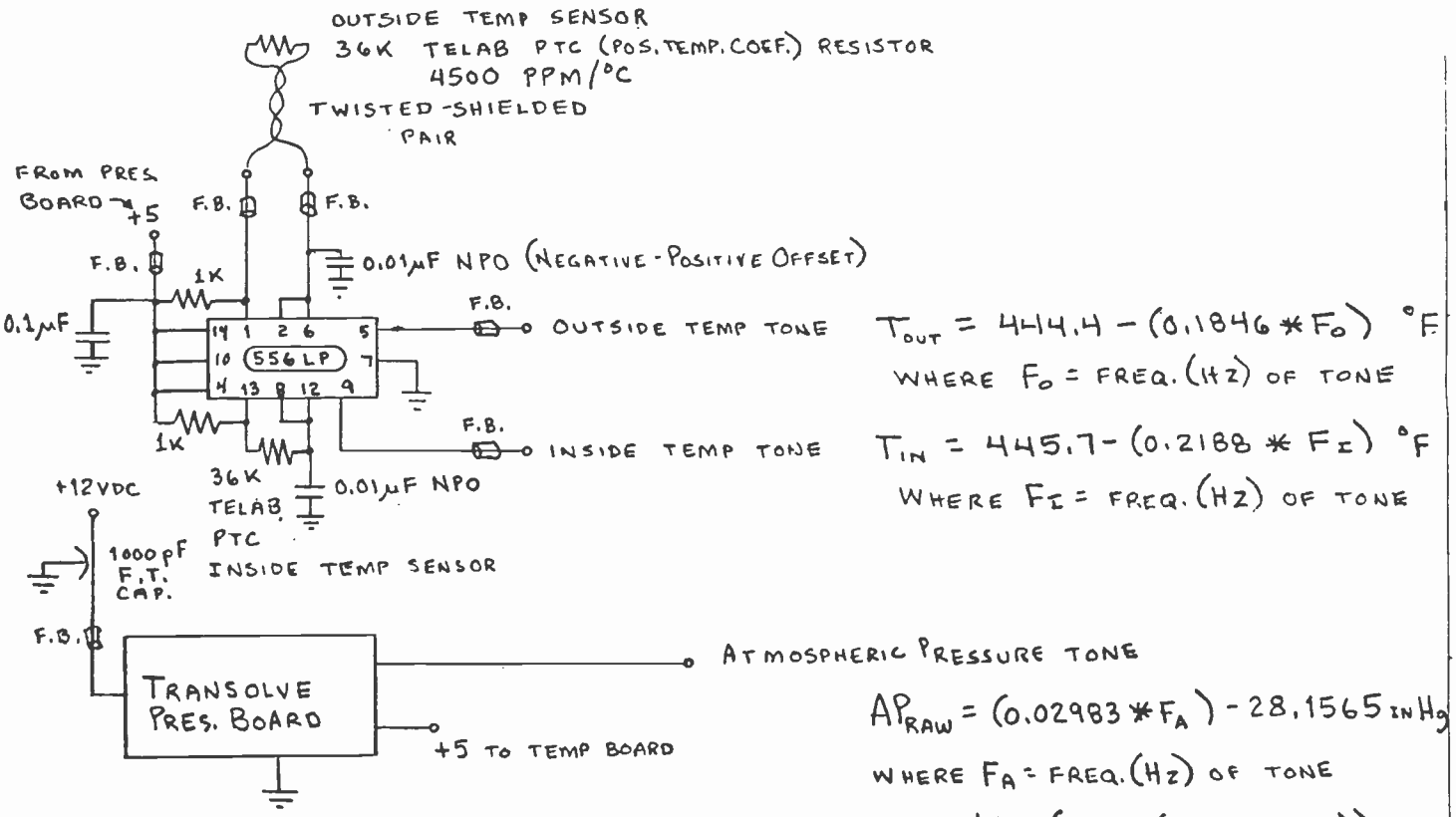
WD5BDX
WB5BGQ
KA3BKU
KC5CP
WD5DZC
WB8ELK
N5EM
WB5HJV
WB5HLZ
N5JXO
WD5JRD
N5LCO
WA5LHM
N5LKJ
N5MPN
WA5PCD
N5QMG
N5RPQ
N5SUA
WB5TTS
WA5TWT
WB5UUK
WA5WOD
WA5ZIB
A. Alexy
J. Edinburgh
J. Johnson
J. McKelvy
J. Mock
S. Ross
C. Summerville
Civil Air Patrol
Brazos Valley ARC
Electronic Parts Outlet

This sample of BLT-3 telemetry data was recorded by Bob, N5LCO, and Ben, N5SUA, on 11-May-91 at the Wharton Municipal Airport, Texas.

Time (UTC)	Alt (ft)	Pressure (in.Hg.)	Inside Temp (F)	Outside Temp (F)	Velocity (ft/sec)
19:15:10	0	29.98000	158.000	84.000	0
19:15:48	259.3	29.64200	150.000	80.000	-8.3
19:16:28	538.1	29.34400	147.000	78.000	-7.0
19:17:05	933.1	28.92600	144.000	76.000	-10.7
19:17:43	1174.5	28.67300	142.000	75.000	-6.4
19:24:05	5078.4	24.82300	122.000	65.000	-12.7
19:31:04	10367.8	20.28500	109.000	45.000	-16.8
19:43:21	20474.4	13.47900	97.000	8.000	-13.7
19:54:32	30040.7	8.86900	86.000	-28.000	-14.0
20:06:58	40429.1	5.42500	73.000	-56.000	-13.7
20:18:00	50028.4	3.42000	66.000	-58.000	-14.8
20:29:02	60444.7	2.07300	73.000	-43.000	-21.7
20:38:15	70087.5	1.30500	62.000	-21.000	-19.0
20:47:33	80274.2	0.80500	82.000	-6.000	-17.3
20:55:23	91337.3	0.48000	68.000	5.000	-0.0
21:00:01	80038.1	0.81400	68.000	-57.000	69.7
21:01:59	71396.1	1.22600	67.000	-78.000	74.9
21:04:38	60454.8	2.07200	65.000	-77.000	62.7
21:07:13	50708.6	3.31000	72.000	-70.000	61.2
21:10:29	40579.2	5.38600	56.000	-34.000	46.3
21:14:23	30682.0	8.61300	49.000	2.000	38.5
21:18:52	20988.7	13.19000	46.000	34.000	33.2
21:25:13	10237.6	20.38800	50.000	58.000	23.3
21:26:27	9019.6	21.37200	54.000	64.000	9.7

Table 1. BLT-3 telemetry data as received via the two-meter packet transmissions from the package.

BLT TO THE EDGE OF SPACE



MAST-MOUNTED PREAMPS AND FILTERS

Patrick McGuire, WA8PLR

The ability to receive weak is always the greatest problem in ATV simplex work. While your transmitted signal can be improved considerably by adding high power amplifiers, receive capability depends on antenna gain and low feedline loss.

In my experience, a low-noise preamp located in the shack offered only very slight advantages when used in conjunction with the TC-70. Since the TC-70 uses a GaAsFET front end, the gain provided by the preamp was imperceptible although I did notice that broadcast TV birdies were reduced a little, probably because of the additional tuned stage.

A mast-mounted preamp made by Tokyo HyPower was purchased for $130 from Encomm in Plano. Because of the demise of Encomm, I don't believe these are available now. These units are capable of sensed T/R switching up to 125 W so you cannot accidentally transmit into the GaAsFETs! Installation is very simple. Power is supplied by a length of single conductor hook-up wire, approximately 28 ga. In my shack, I take power from the TC-70 when it is on. The feedlines from the antenna and transmitter just connect to the Type N connectors on the bottom of the unit. Static discharge protection is greater with this preamp since the circuitry itself is totally bypassed by the twin T/R relays when the preamp is not powered up.

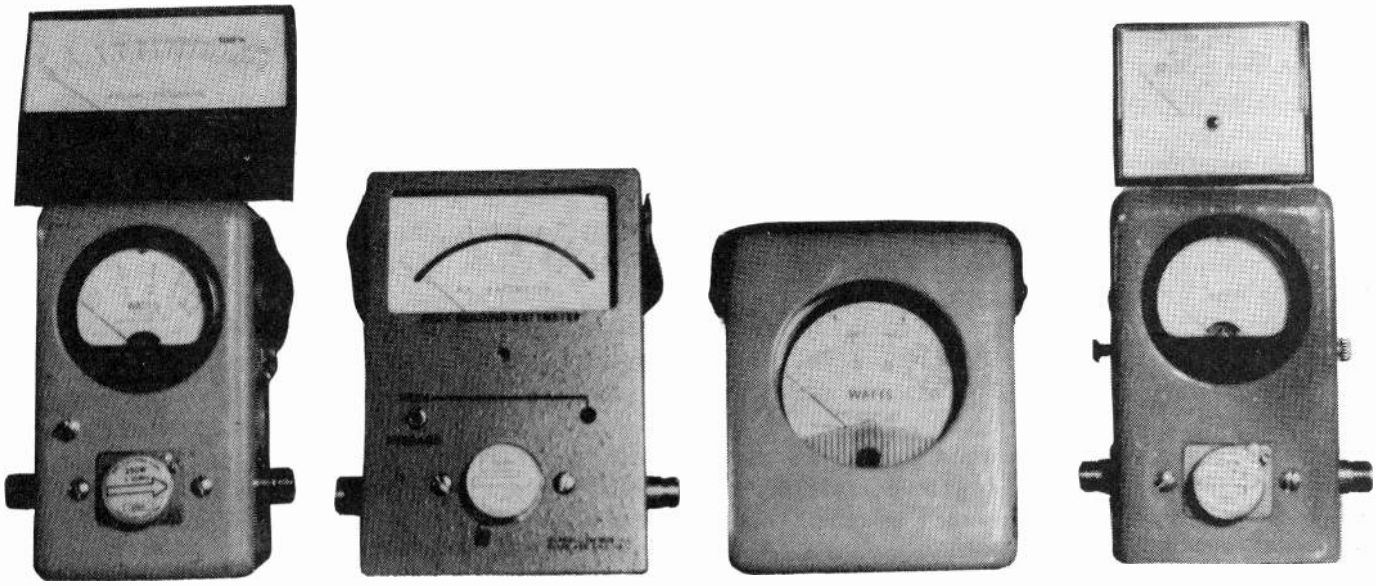
At my QTH broadcast TV birdies have always been a problem, particularly when the antenna is aimed near the tower clusters west of Austin. When I would stay up late and watch the sign-off announcement, I would choke at the 5 million watt ERP announcement. Multiplied by the number of TV and FM stations out there and my proximity (3 miles) to them, it is easy to understand why desense and birdies occur. My solution was to mount a Spectrum International filter on the mast, between the antennas and the preamp. Previously, this filter was located at the shack end of the feedline and had very little effect. When mounted on the mast, however, I have no birdies whatsoever and signal qualities are noticeably improved.

The preamp virtually eliminates the feedline attenuation of the received signal, and when using amplifiers in the antenna to transceiver path, the losses from the T/R relays and sensing circuits are not noticeable. With 100 feet of 9913, about 2 P-units of gain can be expected. With the same length of 7/8" Heliax, the gain differential is less but still 1/2 to a full P-unit.

The mast-mounted preamp is not a substitute for a good antenna system, but in my experience it provided more bang for the buck then any other component in my receive system.

MY WATT METER SAYS....

There is probably more confusion about measuring TV power than any other topic, except understanding the opposite sex..



We measure RF Power two ways, average and peak. Unless you have sophisticated equipment, every meter you use to measure your RF power is measuring average power. The exception being a SSB (VOICE) peak reading RF power meter. Actually none of these measure POWER, which requires a caloric measurement. They all measure VOLTAGE.

We should all remember Ohm,'s law. $P=I^2R$ and similar equations. In AC circuits, substitute Z (impedance) for R (resistance). We can also solve for Power using E (voltage) rather than I (current).

The meters we use, regardless if they use a coax line probe, toroid core or capacity coupled sensor, all measure incident voltage on the coax line. Because we know the characteristic impedance of the line (typically 50 ohms) we can calibrate the meter with a scale called WATTS and we let the instrument do a simple conversion from volts into a resistance to indicated watts.

Because the meter and the meter circuits do not respond to fast changes in signal amplitude, the system has a time constant. This time constant is very long compared to video and even to most voice modulations. Thus, the meter at best can respond to a steady state RF carrier level, and the sideband energies if they are also significant and reasonably constant. Thus, the repair shop habit of saying FFFFOOOOOOUUUUUURRR (FOUR) loudly to check modulation or deviation.

If you transmit a steady carrier wave into a dummy load, using short coax cables, your power meter will give a close reading of the power your transmitter is emitting. Again, remember it is really measuring voltage on the coax cable. If the impedance changes, the value read from the meter is bogus. If there is a large reactive component to the impedance (not just mere resistance) the reading is also bogus since you have changed the voltage and current phase relationships, thus the actual power must now also accommodate the power factor caused by the reactive component. In scientific and technical terms (which we have avoided in this publication whenever possible) we have a complex impedance. Impedance is resistance and reactance.

Likewise, at best your power meter may be accurate to within 5% of its FULL RANGE indication. Thus, a reading at the bottom part of the scale is likely to be of little value and highly inaccurate compared to a reading in the top 10% of the scale.

Meters with plug in elements (slugs) can be more accurate than a fixed range meter since the effects of frequency can be accommodated. These sensor elements have been calibrated over a selected power and frequency range. Calibrated against what you may ask? A real power meter!

The FCC accepted (and most accurate method) to measure power is the use of a thermal measurement device. This can be a thermocouple sensor connected to a resistive dummy load, or the accurate temperature measurement of the inlet and outlet water under a measured flow rate (temperature compensated).

The transmitter or signal source is connected to a dummy load which has been made to exacting standards and calibrated using special analyzers which measure impedance at the frequency of interest. The dummy load is cooled in any manner but distilled water is used most often, followed by mineral oil then air. It depends upon the power levels involved.

The steady signal is applied to the dummy load which is allowed to reach a stable temperature. When the temperature is stable (after several minutes or hours) the temperature increase is determined by digital thermometers. The temperature increase is plotted on a chart which has been drawn for the heat transfer characteristics of the cooling medium (air, water, oil). From this chart the average power is determined! Phew! To measure true peak power, this average power is used mathematically if the waveform and peak duration are known (common constants are published for these) to determine the peak power. The peak power can also be determined indirectly using a spectrum analyzer and observing the peak VOLTAGE of the signal on a calibrated display. However, this does not accommodate the sideband powers generated from the modulation products caused by the pulse which created the peak. Again fudge factors, sorry, calibration constants, are used.

MY WATT METER SAYS....

For HAM radio and ham tv purposes, we don't usually have or need lab grade equipment. A TV signal has certain characteristics which are well documented in the standards of what makes a TV signal. For instance, the most power our or most any TV transmitter (except in France which is upside down) will generate is during the sync portion of our signal. We also use a clamping system which maintains this power at a constant level for the duration of the sync pulse. If we didn't there would be visual problems from sag and lack of clamping.

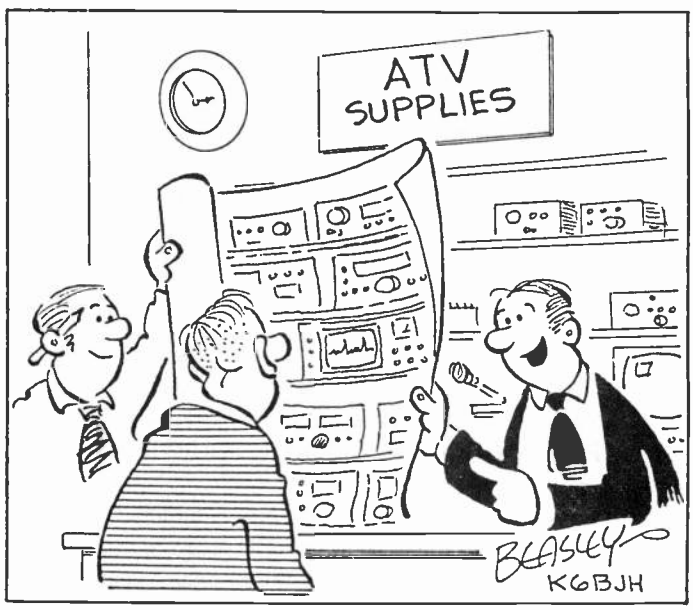
What this means. The maximum power our transmitter can put out is also the PEAK power for TV signals as long as we have a clamp circuit. A clamp circuit is simply a diode , (it can be more complex in broadcast equipment) which retains a DC ground during sync which, since the signal is inverted in modulation makes it equal to the maximum power.

To measure Peak Power on your transmitter, unplug the video. Make sure the pedestal or sync control is set for normal operation (usually an internal adjustment) and key the transmitter. Your 1 watt transmitter should be about 1 watt! For some commercial units, such as an AEA FS430A, you can turn the video down but for most units you will need to unplug the video. On a PC Electronics, unplug the video, turn the pedestal pot to max power out (refer to owners manual for location on the circuit board) then read meter. This is PEP output. Now return the pedestal pot to about 60% of the full power reading for proper sync to video ratio. Use the same procedure for setting the sync level (pedestal control) to correct for amplifier compression. Now turn on the video and increase the video gain pot. You will notice the power meter decreases. THIS IS NORMAL! Since you only have maximum power for the sync time, the average power is a lot less! Horizontal sync only lasts 5 microseconds while the video is 58 microseconds. So you only have maximum power for about 10% of the time. The remainder you have less than 75% power and during white video, as little as 10% power.

Rule of thumb: If your no video power is 10 watts, your average power as read on your power meter will be 3-4 watts. You can convert these numbers for what ever power level you have. A more complete description of this is in issues of ATVQ.

So, what does your power meter tell you? It can approximate your peak power when you have no video. It can approximate your average power (30-40% of peak) when you have video. If you do not see a power drop there is no modulation. If the power drop is not as large, chances are the signal is under modulated, not enough video contrast. If it reads zero .... plug in the transmitter.

All complex AM modulation waveforms can only be compared by peak envelope power (PEP) since the modulation varies in frequency, time and amplitude.



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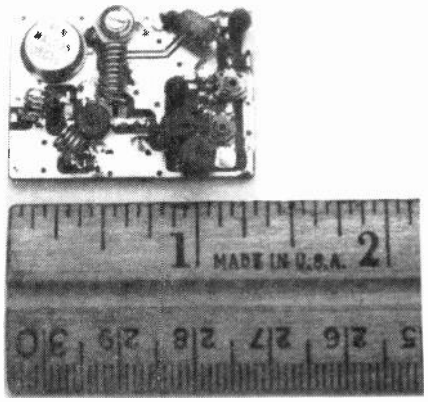
TWO NEW MODULES FROM P.C.

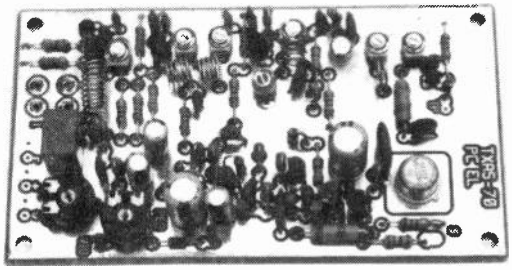
MINI TRANSMITTER BOARD AS INTRODUCED AT DAYTON



MICROTEK ATVM-70 Mini ATV Xmtr Board.....$119

Wired and tested board is only 1.0 x 1.3 inches! See article in July 91 73 Magazine page 9. Great for building a Handie Lookie, R/C models, robots, demos, check out downconverters or short links. Nominal output 80 mw. Capable of driving the PA5 for higher power, but no audio input. Blanking pedestal pot, but no sync stretching. Requires 7.0 minimum to 10.0 Vdc maximum at <100 ma (9 volt battery). Weight <1 oz. Snow free line of sight DX is 1/4 mile dipole to dipole or up to 5 miles with KLM 440-16X's at both ends. Small size is due to the use of a SAW oscillator module that eliminates multiplier stages, but makes it available only on 434.0 MHz presently. Check your areas frequency coordination & usage before ordering.

SORRY, NO MORE TXA5-5 ATV EXCITERS!



TXA5-70 70cm ATV Exciter Board.....same $89

Yes, we have finally retired the TXA5-5 work horse after 20 years. It, along with the PA5, got may of you on ATV. The new TXA5-70 is actually the TXA5-5 re-layed out on a smaller 2.25 x 4 inch board with a few minor improvements. If your old board is working OK, no need to replace it with the TXA5-70 until it quits, you have a -4 or earlier board without 2 freq. or sync stretching, or you want to re-package it. The TXA5-70 will now not only allow building a smaller 10 Watt basic module ATV transmitter, but give two frequency capability for low power portable or R/C applications. Weight is 2 oz. Requires 12.0 to 14.0 Vdc at 70 ma. Nominal 80 mw power output. One crystal included, add $15 for second crystal. 426.25, 427.25, 434.0 and 439.25 crystals stocked. 421.25 also available if a VSB filter is used in the antenna line for a repeater transmitter.

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NOW YOU CAN SEE THESE DEALERS FOR THE 70cm TC70-1d TRANSCEIVER, TX70-1 TRANSMITTER & TUNEABLE DOWNCONVERTERS FOR ALL THREE BANDS:

A-Tech	Bill or Tony	2210 Magnolia Blvd	Burbank	CA	91506	(818) 845-9203
The Base Station	Art	1839 East ST.	Concord	CA	94520	(415) 685-7388
IRC	Juan	5001 NW 72nd Av	Miami	FL	33166	(305) 594-4313
Honolulu Electronics	Richard	819 Keeaumoku St	Honolulu	HI	86814	(808) 949-5564
Stewart Electronics	Dale	1411-C 1st Capital Dr.	St. Charles	MO	63303	(314) 949-8890
Oklahoma Comm Center	Glen	9500 Cedar Lake Av	Oklahoma City	OK	73114	(800) 765-4261
ECI	Mike Moody	2809 Ross	Dallas	TX	75201	(214) 969-1936

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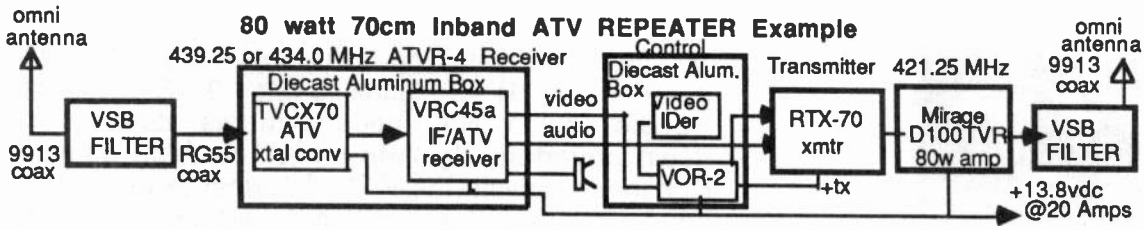
READY FOR AN ATV REPEATER OR LINK IN YOUR AREA?

WE HAVE THE MODULES AND SOURCES FOR INBAND OR CROSSBAND



Select an ATVR Receiver & a RTX Transmitter for the bands you want, add the appropriate linear amp,VSB filters & antennas, ID & VOR-2, power supply and coax for your own repeater. We suggest low in / high out for crossband. Ask for a copy of our ATV Repeater article before you start to do it right the first time and also listed are recommended sources of filters, antennas, IDers, etc. Most can put together a good working ATV repeater for under $2000.

TRANSMITTERS ready to go in a 7.3x4.7x2 die cast aluminum box for tight RF shielding. >1 Watt p.e.p. output for proper drive to companion amplifiers. Adjustable sync stretcher. Independent mic and line audio inputs. Requires 13.8 Vdc at 500 ma.

RTX-70 specify repeater or link output frequency, 421.25 MHz most popular for inband output.....**$299**
MIRAGE D100ATV-R 90 Watts p.e.p on ATV continuous duty 70cm repeater amp.....**$499**
RTX-33 specify frequency - 923.25 MHz is the most used crossband repeater or link frequency.....**$329**
RTX-23 specify frequency - 1253.25 MHz best first repeater output crossband freq., then 1277.25 MHz.....**$329**
We suggest Downeast Microwave for 900 and 1200 MHz repeater amps to match our transmitters.

RECEIVERS ready to go in a 7.3x4.7x2 die cast aluminum box for tight RF shielding. Contains a TVCX crystal downconverter and VRC-45a receiver. Two composite video outputs, squelched speaker and line audio outputs. Requires 13.8 Vdc at 300 ma.

ATVR-4 specify frequency - 439.25 or 434.0 most popular for inband or crossband.....**$299**
ATVR-9 specify frequency - 910.25 most popular, 923.25 also available.....**$309**
ATVR-12 specify frequency - 1253.25 link, 1277.25 or 1289.25 rpt input.....**$329**

VOR-2 Video Operated Relay board...$45, keys RTX upon detection of horizontal sync plus 10 min. & end of transmission momentary relay for switching to video ID to meet FCC regs. See review in July 91 73 Magazine page 26.
LMB CAB 247 die cast aluminum box. Great for housing VOR-2 and video ID boards.....**$20**

DOWNCONVERTER DISCOUNT of 10% is available to Repeater groups and clubs if you order 5 or more per item of the downconverters below. The order must be sold and shipped to one person at one time. It helps to have some extras available for new people to try out your repeater or use at demos at other clubs and schools. All downconverters have a GaAsfet preamp and mixer for low noise and high dynamic range. Get a board if you want to package your own. You will need a shielded cabinet with knob, switch, connectors and 11 to 14 Vdc power supply. Or get one ready to go.

TVC-2G tunes 420-450 MHz down to TV ch 2, 3 or 4. Wired and tested board, put in your own cabinet..**$49**
TVC-4G ready to go in a cabinet with AC to 12V wall plug supply - contains TVC-2G.....**$89**

TVC-9 tunes 902-928 MHz down to TV ch 2, 3 or 4. Wired and tested board, put in your own cabinet...**$59**
TVC-9G ready to go in a cabinet with AC to 12V wall plug supply - contains TVC-9.....**$99**

TVC-12G tunes 1240 to 1300 MHz to TV ch 7 or 8. In cabinet with wall plug AC to 12V supply.....**$109**

ANTENNAS

440-6X KLM 8.9 dBd gain 420-450 MHz 6 el beam. 28" boom, end mounted.....**$59**
440-10X KLM 11.2 dBd gain 420-450 MHz 10 el beam 64 " boom, end mounted.....**$72**
440-16X KLM 14.2 dBd gain 420-450 MHz 16 el beam 10.5 ft boom, center mounted.....**$129**

3318LYARM Downeast Microwave 14.2 dBd gain 902-928 MHz beam. 6 ft boom, end mounted....**$82**

2424LYRM Downeast Microwave 16.2 dBd gain 1240-1300 MHz beam. 6 ft boom, end mounted..**$82**

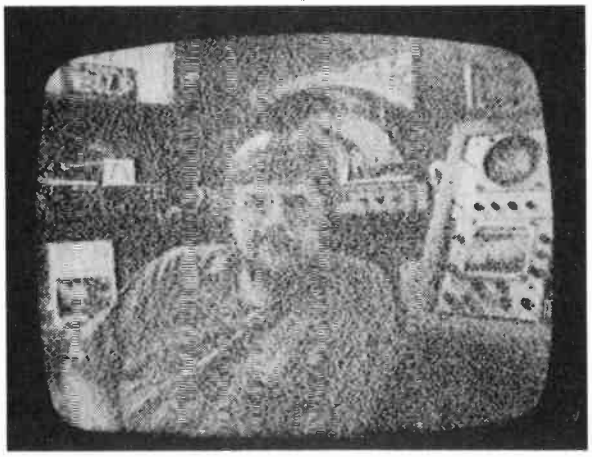
SIGNAL REPORTING

Video mode transmissions generated its own signal reporting system. We generally describe the signal as being snow free, some snow, lots of snow or sync bars. With some variation which we use to interpret the quality of a received signal. Closed Circuit is the best signal moniker. Since one station's lots of snow may be another station's a little snow depending on individual tolerance, a signal reporting system was developed in England which was adopted by the rest of the world. It is called P Level (for picture) and ranges from P0 (no picture) to P5 (closed circuit. P1 is visible sync bars, P2 is lots of snow, P3 is some snow, P4 is nearly snow free and P5 is broadcast quality, closed circuit. You can also indicate color or sound as in, "Your signal is P4 with color and sound." Or "I'm getting a P3 with occasional color and no sound" etc. Snow is the word we use to indicate noise in the picture. The system is more subjective than scientific although P5 is about 200 microvolts whereas 1 microvolt is full quieting in FM mode. EXAMPLES:

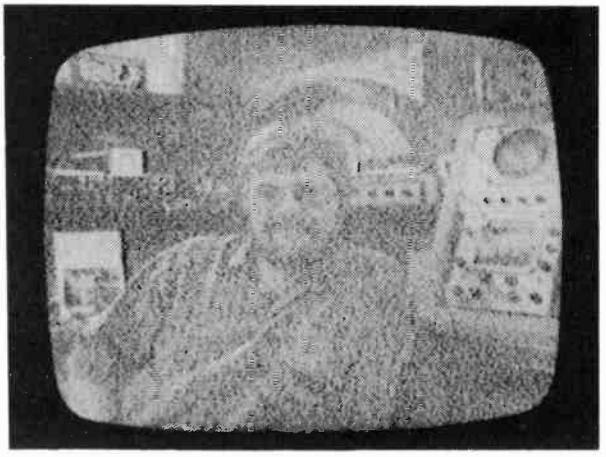
P5

P4

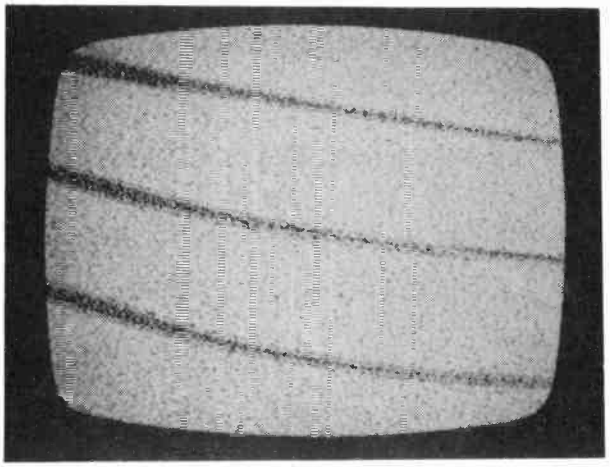
P3



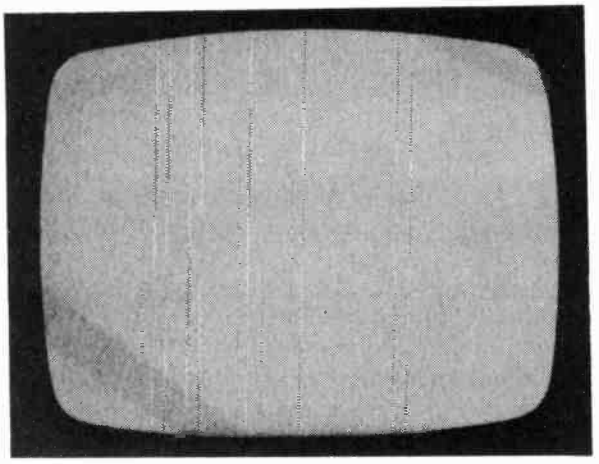
P2



P1



P0



This series of pictures show the progressive degradation from a strong "closed circuit" picture to a barely recognizable sync bar. Thanks to Dave Williams WB0ZJP for his efforts to produce these pictures for exclustve use in ATVQ/ATV Secrets.

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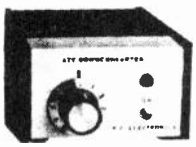
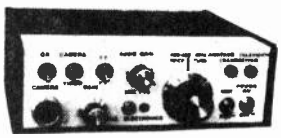
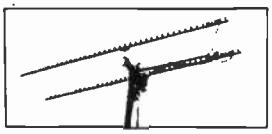
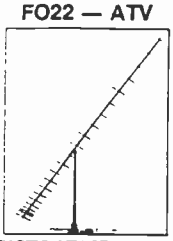






FO22 — 432
&
FO22 — ATV



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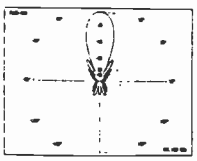
MODELS: FO22-432 & FO22-ATV

ELECTRICAL SPECIFICATIONS:

Measured gain	15.8 dBd
E-Plane beamwidth	23 deg
H-Plane beamwidth	24 deg
Bandwidth	> 30 MHz
Sidelobe attenuation	
1st E-Plane	– 17.5 dB
1st H-Plane	– 15.5 dB
SWR	1.14:1 typical
ATV version	<1.33:1 415-450MHz
F/B ratio	22 dB
Impedance	50 ohm
Maximum power	1500 Watts



MECHANICAL SPECIFICATIONS:

Length: 14 ft.
Turning radius: 8.5 ft.
Boom: 6061 T-6 Aluminum
Center section 1"OD x .058"wall
End sections 7/8"OD x .049"wall
Elements: 3/16" Aluminum rod
Driven Element: Brass & Copper
All Stainless Steel Element Hardware
Mast: up to 1.5" diameter
Wind survival: 90 + MPH
Wind surface area: .78 sq. ft.
Phasing line: .141" teflon-copper hardline
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Ham TV is fun and inexpensive. You probably own most of the items which you need to start operating on ham TV right now. Don not confuse fast scan TV with slow scan TV. You do not need expensive converters. The pictures you send and receive on fast scan tv are exactly the same as you watch at home on TV right now. Unlike regular TV you have several advantages. You can pick the program material. You can show it to your friends. You can visit your friends without leaving home. You can watch the program sent to you by your friends--sound and pictures, in color. Its REAL LIVE TV!

You can also tune into NASA live video in many areas, thanks to ATV repeaters and individual stations who relay this information via HAM TV. Watch the space shuttle and other NASA programming, not what the news at 6 broadcasts in a few seconds.

You can DX via several modes with 500 miles being common and more than 1,000 miles having been done several times. The opportunity for DX increases as the number of operators increase. And the numbers are now well into the thousands throughout the country and the world. Or the ultimate DX, send your video to a space shuttle HAM TV station as was done on STS 37.

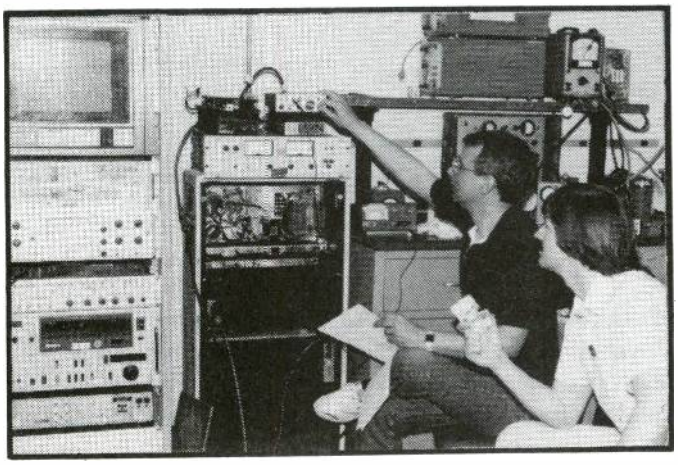
Portable and mobile operation are a breeze. HAM TV operators have already found out how easy and fun it is to operate in a variety of styles including hot air balloons, helium balloons, kites, cars, trucks, vans, planes, gliders, back packs, canoes, boats, ships, mountain tops, and city scapes. Instant DX from 1 watt transmitters at 125,000 feet allow stations to see live video from a camera slung under a helium balloon up to 500 miles in any direction.

Ham TV also provides valuable public service assistance. You can windshield survey disaster scenes back to public safety officials. Parades and athletic events, boating contests, mountain marathons, Santa visits and much more are all easily and more effectively done with your video signal.

If flying is your love, you can put your Ham TV station in your R/C aircraft (or helicopter, boat, etc) and fly from the pilot's seat! Add real adventure to your earth bound self as your vehicle takes you places you can't go yourself.

If home construction is your forte, there are many opportunities to get excited with Ham TV. This is one area where the commercial rigs still play catch-up to what you can build yourself. Besides transceivers, antennas, preamps, and power amplifiers, you can build a host of station accessories to create special effects, start video recorders, remote control cameras, switch to weather radar signals, do computer graphics, audio/video switchers, signal analyzers, monitors, filters and much more.

All you need to start is a little curiosity, a ham license, and a desire to enjoy your hobby. The following pages include all the information you need to get started in Ham TV.



Top Left: Marshall ARC as they sent their live video to space shuttle Atlantis April 71991. Story about this and other ATV uplink stations in the July 1991 issue, ATVQ. Bottom left: Club members after fixing the "Mother of all amplifiers" test the uplink equipment. Below: Goddard Space Center uplink video. Video was sent and received in color.

HOW DO I FIND OUT ABOUT HAM TV?

* **Ask a CB'er**
* **Ask your local Radio-TV Shop**
* **Ask your local TV station**
* **Read CQ, QST, 73, TV Guide, McCalls, Videography, Video Maker**
* **Subscribe to ATVQ**

The correct answer is:

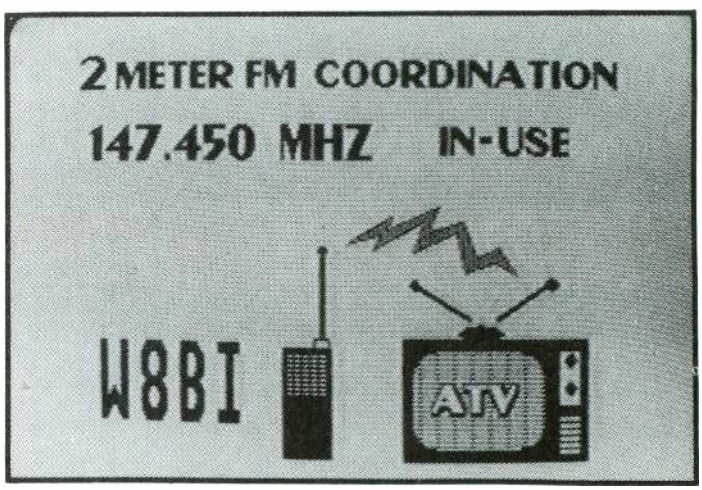
The first three will get you a lot of blank stares. CQ, QST rarely publish any ATV material. Henry Ruh, KB9FO authored articles in McCalls, Videography, Video Maker and persuaded TV Guide, Aug. 1988, to publish it's third article about ham TV, (others were in 1952 and 1974) and under the editorship of Bill Brown WB8ELK, 73 magazine has a regular ATV Column. You will also find regular ATV material in Radio Scan Magazine.

There is only one source of consistent accurate ATV information. That one prime source is ATVQ, Amateur Television Quarterly. Each issue contains an assortment of articles and features covering technical topics in both beginner and advanced versions, build-it projects, station operations and repeater news. Co-publishers, Bill Brown WB8ELK and Henry Ruh KB9FO have more than 50 years combined experience in ATV operation from the very simple to great first efforts. Further in depth information may be obtained from articles and items in issues of ATVQ. There is also a book available, ATV SECRETS for Aspiring ATV'ers. Written entirely from scratch, no reprints of old obsolete articles, the book is a complete guide to everything you ever wanted to know about Ham TV but didn't know whom to ask.

ATV SECRERTS book is a condensation of essential information gained from real life, articles and personal experiences during actual ATV ham radio operation and experimentation. The essence of ATV is presented here for any ham or would be ham, to become part of a very exciting area of ham radio. This was also written to provide this information in a non-technical way so no prior TV or ham radio knowledge is necessary to understand the topics.

Ham TV can do more than any other mode of operation. It offers all the fun, thrills, excitement, learning opportunities and public service that ham radio offers, plus the added advantage of visual communications.

Video is the communications medium of the present and future. You can come to grips with video, interactive television, digital information, and more in a way that is easier, more intuitive and less expensive than any other ham radio mode. Yes, voice (SSB, FM, AM) digital (CW, RTTY, PACKET, AMPTOR) DX, contests are all good and valid forms of communications. But if you add pictures, its a whole new ball game. Nothing communicates like a good picture and ham TV lets you control the picture like never before!



The Dayton, OH ATV repeater in action.

NOTE: ***Readers should also note there are three European ATV magazines, Der TV Amateur, VHF Communications and CQ-TV. These are available from England via KM Publications, 5 Ware Orchard, Barby, Nr. Rugby, Warks, England CV23-8UF. Subscriptions for CQ-TV and VHF Communications are also available to US readers from ATVQ Subscription services. See form in this publication for ordering. CQ-TV and VHF Communications are English language publications, Der TV Amateur is in German.***

WHAT FREQUENCIES ARE USED FOR HAM TV?

Ham TV, live television as you watch at home is mostly in the 420-450 MHz. band, (70 cm), with some activity in the 902-928 Mhz. band (33 cm) and activity in the 1240-1300 MHz. band (23 cm). Differences exist because of frequency use limitations and local coordinations. In addition, there are 2 meter frequencies and HF frequencies used for voice coordination of ATV activity. Details are in the book ATV SECRETS in the section called Making Contact.

70 CM ATV ACTIVITY

Video carrier	Audio carrier		Use
439.25	443.75	(438-444 MHz.)	simplex and repeater inputs also a few repeater outputs
434.00	438.50	(433-439 MHz.)	simplex and repeater input
426.25	430.75	(425-431 MHz.)	repeater output and some repeater input
421.25	425.75	(420-426 MHz.)	repeater output

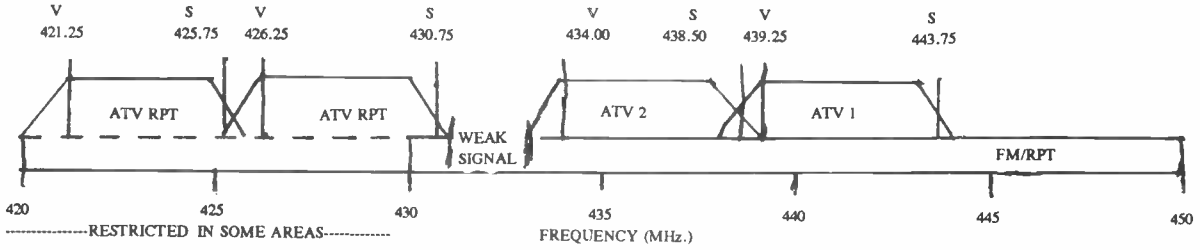
OTHER FREQUENCIES OF INTEREST, TO AVOID CONFUSION

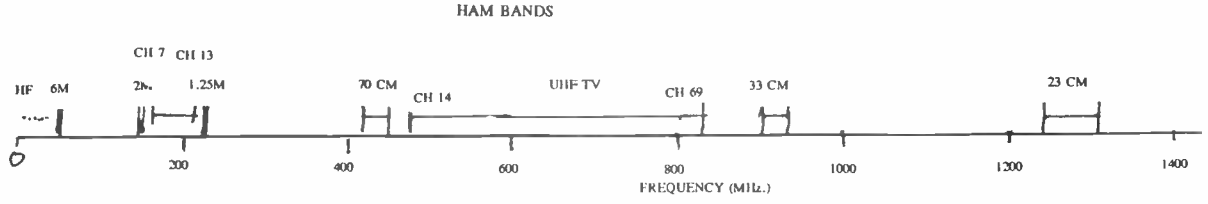
There is often confusion between CABLE TV channel frequencies and over-the-air BROADCAST TV frequencies. Here is a chart and listing of selected CABLE and BROADCAST frequencies and their respective channels. Note the wide difference between TV channel 60 and CABLE TV channel 60. This is explained in more detail a little later in Equipment: Cheap and Easy.

CABLE TV (CATV) channel 60 439.25 (438-444 MHz.)
CABLE TV channel 59 433.75 (432-438 MHz.)
CABLE TV channel 58 427.25 (426-432 MHz.)
CABLE TV channel 57 421.25 (420-426 MHz.)
Broadcast Channel 60 747.25 MHz. (746-752 MHz.)
Broadcast channel 14 471.25 MHz. (470-476 MHz.)
Broadcast channel 13 211.25 MHz. (210-216 MHz.)

As can been seen, the ham TV frequencies we use in the 70 cm band are very similar to the CABLE TV channel frequencies. This allows the use of any cable ready TV or VCR to receive ATV signals. However, the sensitivity of the VCR/TV and the typical home UHF antenna used for UHF broadcast reception is not nearly as good as equipment made for ham use. However, it is handy for short distance work, portable or mobile work where you might not want to carry extra equipment and are willing to sacrafice performance or to work short distances for demonstration purposes.

SPECTRUM USAGE AND 70 CM. BAND USAGE





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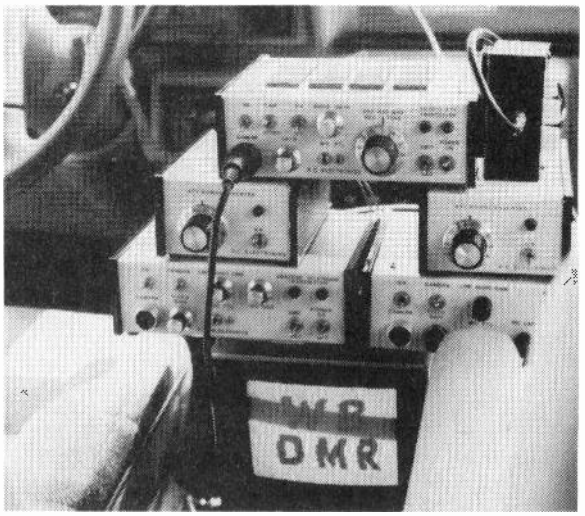

Three different mobile ATV stations. The family wagon for weekend conversions, a cast off commercial TV news truck, and a KB9FO's 3 band (440, 900, 1250) mobile with actual off-air reception of a 35 mile distant signal from W8DMR. The dark bar is from the camera shutter, not a video defect.

The sky WAS the limit! Bill Brown WB8ELK, co-publisher of ATVQ and editor of 73 Magazine, started a trend when he got the idea to put an ATV transmitter in a helium balloon. The weather bureau has been launching radio balloons for decades. The ATV balloon launches started with a simple ATV transmitter on 439.25 MHz., a computer ID board and a 2 meter CW ID beacon on 144.34 MHz. We earth bound humans got to watch the signal from up to 400 miles away as the 1 watt TV signal sent back a series of graphic ID's.

Soon this evolved into a fully fledged area to experiment. It wasn't long before telemetry was added to indicate altitude and temperature. Next added was a live camera to look at the ground or clouds below. Soon a video display of temperature, altitude, battery condition was added.

The Balloons soon sported stabilizer fins, a flipping mirror to get both a horizon and straight down shot, a packet repeater, and HF beacons. Not content, a photo camera to get quality pictures from space as well as the transmitted video. 125,000 feet in a balloon wasn't high enough! Plans for a rocket launched from the balloon when above the atmosphere were added. Finally, video was sent from earth stations to the Space Shuttle, more than 200 miles altitude and as much as 2500 miles range!

These experiments, documented in pages of ATVQ and reproduced in part here, give you an idea of what you can do when you look above your feet. Your transmitter does not have to be connected to a ground mounted antenna!

Other ATV hams have experimented and regularly elevate their TV signals in R/C models and sometimes, not so controlled models! Pictured on the following pages are kite mounted ATV transmitters, model aircraft ATV transmitters and a few views from space.

You don't have to fly your model plane from the ground view either. By transmitting back the picture, you fly the aircraft from the pilots point of view (POV). You can extend this flight simulation by constructing a flying box as Carl Berry W5MWN did. He sits in a flight simulator watching the TV picture with more realistically positioned controls. This is the ultimate in flying from the ground. I suppose a tilting seat or pitch controls for the box are next!

There is no age limit to ham radio, likewise for ATV fun. Students from the Franklin (Indiana) High School launched their own ATV balloon as a class science project. They designed their own flying experiments with help from their instructors. This is a great way to get non-ham students involved in ham radio as an exciting and fun hobby.

Of course public service is also a vital part of ham radio and also enhanced by ham TV. Annual events in many areas are aided by ham TV portable operations. The most extensive is the Pasadena Rose Parade. This typically has 16 portable camera ATV locations including a couple on motorcycles, a ham helicopter and a couple portable ATV repeaters. Other uses have been for marathons, parades, boat races, hot air balloon races, Santa visits to hospitalized children, and the usual array of disaster assistance be it tornados, floods, chemical spills, train wrecks, hurricanes and other severe weather dangers.

Mobile operation can be as simple as a windshield mounted camera and a car seat transmitter feeding any manner of antenna. More elaborate mobile stations can also be assembled. Pictured here is a three band ATV mobile station of KB9FO, and a complete broadcast TV van converted to ham TV (the hamcam-van) used by WB8BJN.

If you are shy or the YL objects, you don't need a permanent antenna mount. Magnet mount antennas including a cubical quad have been published in ATVQ issues. Or use a quick to assemble wood boom beam with coat hangers cut for elements!

Portable operations may be in any package you can dream of. From small handheld lookie-talkies which have been built into standard H-T boxes to various home brew packages, with power from 100 milliwatts to 50 watts (come on, don't you carry a die-Hard with your Blaster?) Here are a few examples of these by their owners.

No matter how YOU do it, it adds up to ham radio FUN with the added bonus of video excitement!

TRANSMITTING

Video sources and uses.

ALLRIGHT, JUST WAIT AND SEE IF I EVER LET YOU BE ON CANDID ATV AGAIN!

AH2AR's quick & easy mobile set-up.

You can use any video source for your ham TV operation. This includes the video output from your computer, WEFAX, any camera, camcorder, VCR, satellite receiver or test signal generator. You can create graphics with the computer, or programs which play back from the computer. Or draw graphics and use a camera to capture the image. Most often you will be in QSO with another live ham, so the video usually starts with an ID sign, such as your car call sign license plate or your QSL card. Then its shack tour time. Besides sitting before the camera as a talking head, give a tour of the shack.

It is a good idea to have your video ID large enough to fill the entire picture and use bold black letters on a white background. This or similar contrasting combinations are easiest to see especially on weak signals.

It is easy to put together a video brag tape which tours your shack, antenna farm, home, family or other hobby activities. If your hobby is travel, you can put together a concise collection of travel clips of exciting adventures you've had. Or if its trains, a tour of your model train set or excerpts of your train videos. Like flying, R/C models, hot air ballooning, sky diving? Videos from any of these and other activities can be shown. Your imagination is the limit. This isn't Hollywood, and Siskel and Ebert are not going to give you a thumbs down or up on your work. This is to enjoy the experiences you have with your new ATV friends.

You can video record the ham picnic, field day, public service activity or friends antenna raising party and show it to the other ATV'ers who missed the fun. Many ATV repeaters have weather radar as a function. With the radar map on screen you can see where the severe weather is and take appropriate action. This may be participating as a weather watcher (storm spotter) or as part of public safety efforts.

Remote storm spotting is also done via ham TV. Many stations have put remote cameras on their towers, or on tall commercial towers and buildings to scan the sky. Stations often transmit the video which the National Weather Service and others view to take advantage of eavesdropping on our ham TV activities. The Omaha, NE ATV repeater is a good example of this type of operation. They have a video tape available explaining their system and their severe weather functions.

Another couple of videos you can get: The Western Washington ATV Club ATV video, and the AEA video. These are good to attract new hams like yourself to ATV.

You can also operate mobile in any sort of vehicle including putting your ham TV transmitter in the R/C model and driving/flying it by watching the video at your control point. You will find several articles and how-to-do-it information in the ATVQ index in this book.

Mountain topping has always been a sport for the VHF/UHF ham. ATV'ers have devised back pack ATV systems, and handheld lookie-talkie units for this and other portable use. These have are detailed in ATVQ issues.

Many stations also transmit the NASA select video which is available via home satellite reception. A current list of NASA Select re-transmitting stations is available from the ARRL or PC Electronics. There have also been TV programs originated by hams and sent via satellite which you can retransmit. The limit is reached at commercials or making a program and broadcasting it to the public. That is reserved for other licensed services.

MY LOCAL ATV INFORMATION

VOICE COORDINATION FREQUENCY

_____

NET TIME AND FREQUENCY

_____

ATV REPEATER _____
INPUT _____ **OUTPUT** _____
H/V ____ **CONTACT** _____
LOCAL CLUB _____

_____

MEETS _____
AT _____

_____

OTHER INFO: _____

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REGULAR ACTIVITIES:

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HAMFEST INFO:

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ACTIVE STATIONS

CALL/NAME **QTH**

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INSTRUCTIONS

This page is to record information about the local ATV activity. It is intended to allow a club or person handing out this book to fill in the spaces with local information for you, the reader. This of course could also be filled out by you the reader, after contacting a local ATV station or from information gathered from a NET or manufacturer. There is also room for logging your first contacts.

ATV LOG

STATION	DIRECTION	DATE	SIGNAL	QTH

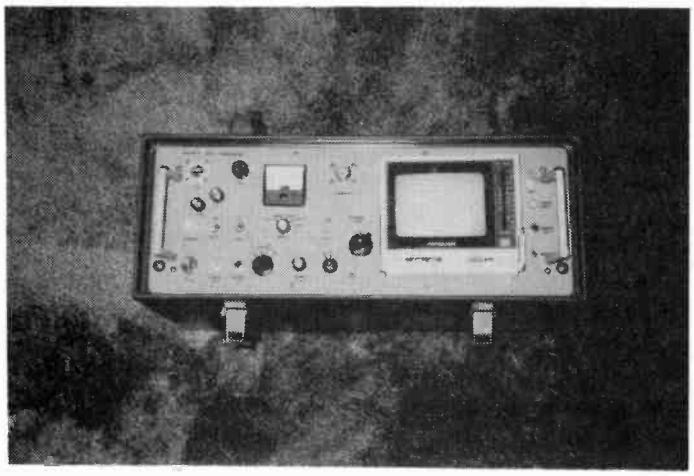
PORTA LOOKIE

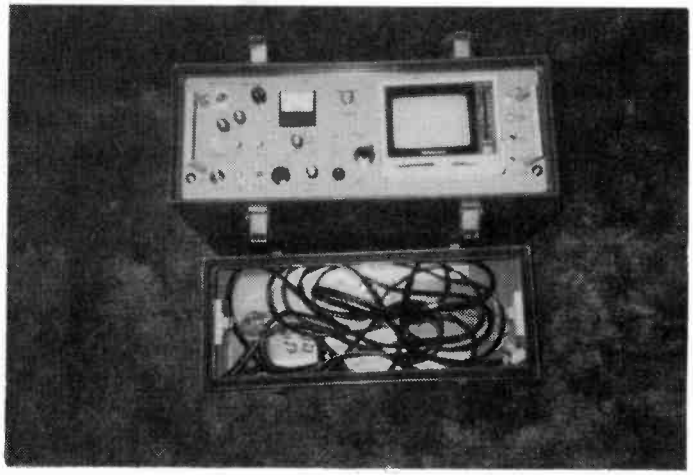
WD5BJW, Southern Louisiana UHF TV Society

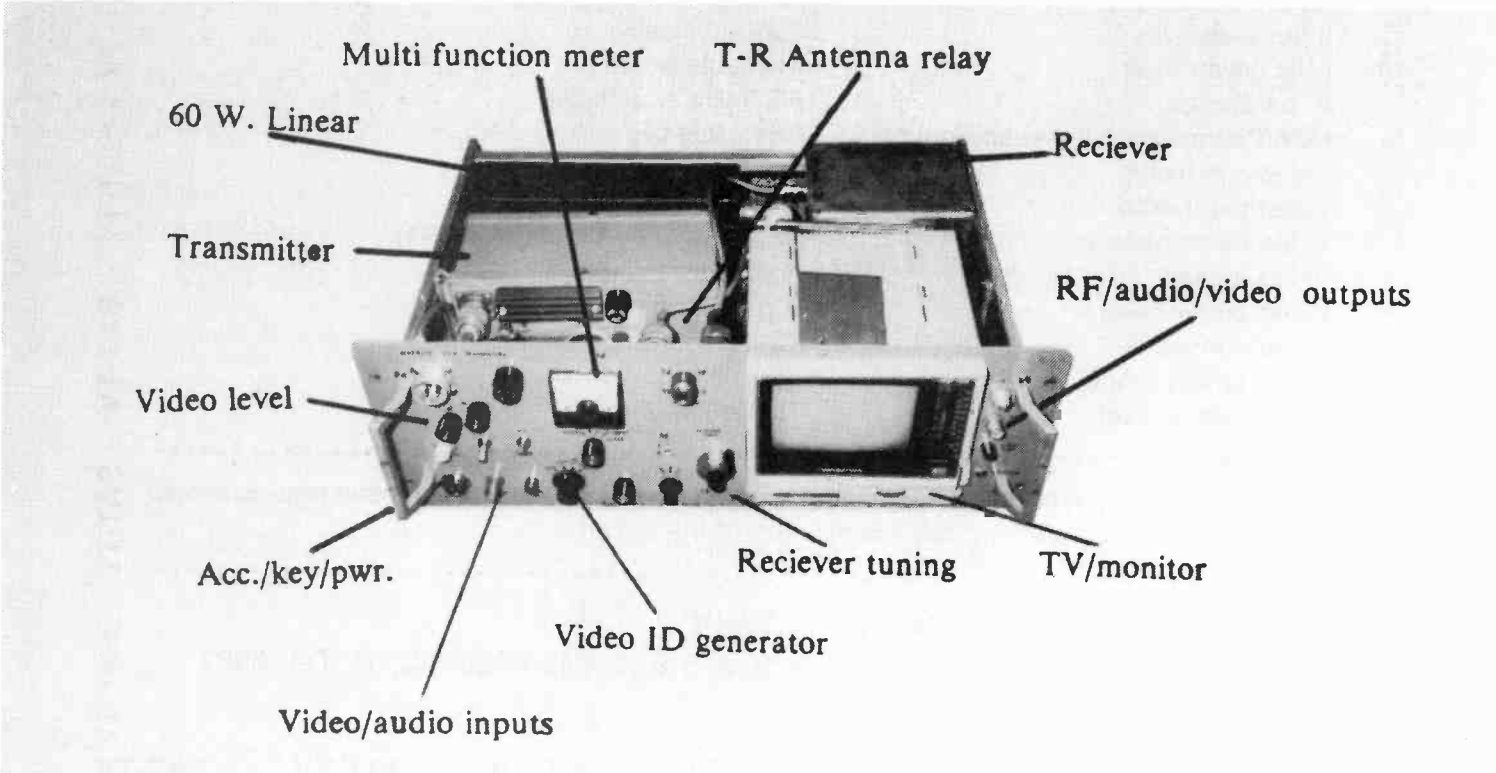
Interest developed for ATV in my area so I decided to go in the field for a live remote ATV demonstration. Lugging boxes of equipment and cables around got old fast. In response I built it all into one box -- the Porta-Lookie.

The Porta-lookie is a full ATV transceiver with selectable 10 or 60 watts output. It has front panel monitoring of voltage, current and other necessary signals. A built in video monitor is equipped with outputs for larger external monitors, handy for hamfests and displays. It carries three video ID's in EPROM. The only external equipment needed is a 12 volt power source, camera and antenna. The 12 volt source has been a pocket sized gel-cell and a large car battery. Choose what you need for the duration of the event. The cover provides cable storage.

I use a 6 el KLM antenna mounted atop a 25 foot telescoping painters pole. This collapses to about 8 feet. I created two ways of mounting the antenna mast. For field use I have stakes and guy strings that store in the base unit. For portable use near a vehicle, park the car with the tire on the base flange. This also allows for the nearby acquisition of power from the vehicle battery! I also use a basketball antenna on a mag mount for mobile operation. This has now been on-the-air in four states.
73 de Bob WD5BJW.







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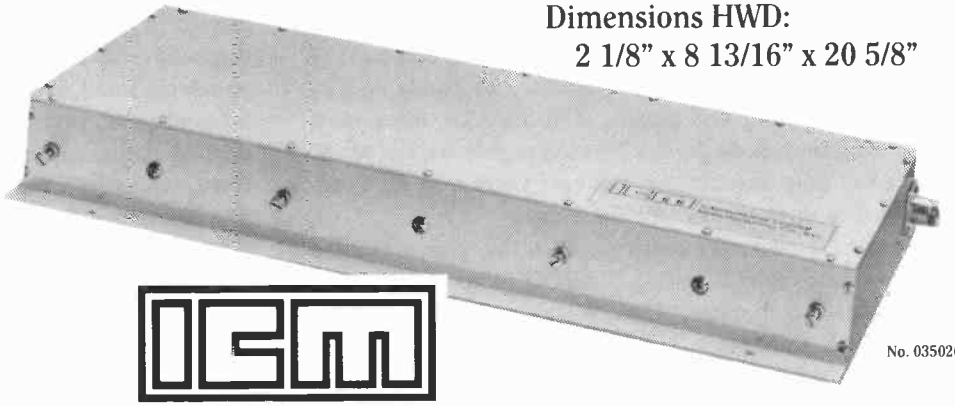
Heavy duty construction insures stable operation and long life.



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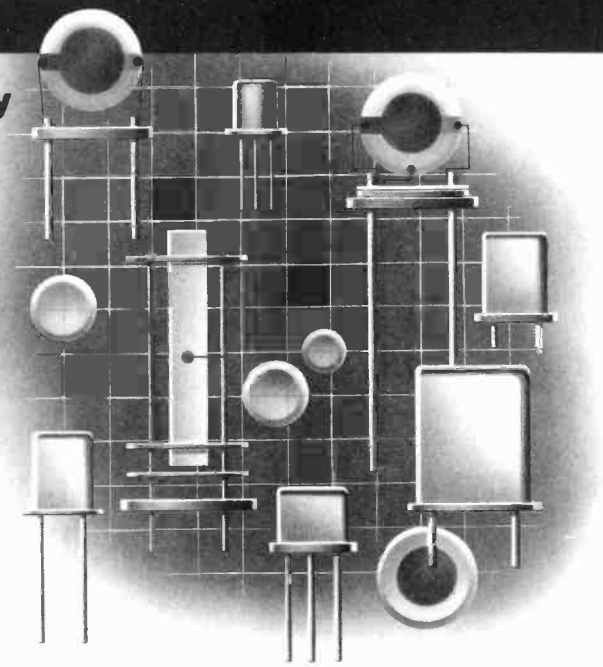

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BRATS USE ATV

COVER TOWSON, MD JULY 4TH PARADE

The Baltimore Radio Amateur Television Society (BRATS) used ATV this past July 4th to provide for the public health and welfare during the annual Towson Independence Day Parade.

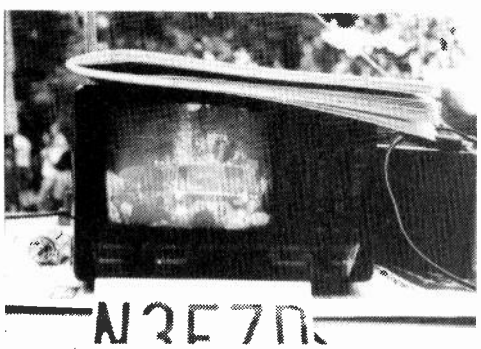
The event was two hours long and included several public figures. Tom Clancy, the author of The Hunt For Red October, Patriot Games, and several other popular novels was the Grand Marshal. The Governor of Maryland, Senator Barbara Mikulski, and other political dignitaries were present at the event. Some groups traveled long distances to participate in the parade. "Orlando Magic" came from Florida, and "The Burlington Teen Tour Band" came from Ontario, Canada. There were several thousand participants in the parade. The procession consisted of 100 units, including clowns, floats, horses, 15 bands and 20 pieces of fire fighting equipment. The BRATS have been providing communications for the Towson parade for ten years, although it has only been in the last two years that ATV has been included in their support for the event.

Six active ATV operators participated in this year's Towson parade. They were Bob Bennett, W3WCQ (who was also the chair of the parade committee), Heru Walmsley, W3WVV, Fred Merker, K3TAZ, Ellis Eisen, N3IDV, Mike Dees, N3EZD, and Maurice Cahill, KA3EJJ. Two transmitter sites were used along the parade route. Authorities, in charge of the event, used the pictures to determine if it might be necessary to hold back the crowd for a particularly wide unit, horse unit, or other potential danger. Mike, N3EZD, set up his equipment at a point just preceding the final turn before the reviewing stand. This position furnished a good view of units just before their being announced by the Master of Ceremonies. Two frequencies on the 450 MHz. band were used. Signals from KA3EJJ were on 426.25 MHz., the input frequency of the BRATS ATV repeater. It was thus possible for anyone watching the repeater to see participants as they progressed from the starting point.

Maurice used a camera set-up which included a remote controlled pan/tilt head on the roof of his car. The transmitter was a PC Electronics KPA5-E which was used to drive a D1010 amplifier to about 10 watts P.E.P. A ten-element KLM antenna was pointed toward the reviewing stand so direct as well as repeated signals could be used. Maurice is an excellent machinist, and all of his equipment is custom installed in his vehicle.

Mike, N3EZD, used a one-watt PC Electronics TXA5-RC transmitter. From his location the only antenna necessary was a rubber duck. Mike used an unusually high tripod which proved to be an effective way of getting over the heads of the thousands of people surrounding the parade route. At the reviewing stand, Heru was using a PC Electronics TC70-1d with a ten-element yagi to receive the signal from Maurice at the starting point, and a folded dipole for the close link to Mike. Heru was using a ten-inch color television that he had recently purchased at a flea market for $1.00. The television had been diagnosed as having a bad CRT and not worth repairing. Heru did some trouble shooting and determined that for about another $1.00 he could repair a damaged printed circuit board. So, for a total investment of $2.00, he had a good looking color television (with a perfectly good CRT)!

All of hams who participated, as well as the parade committee, were enthusiastic about this application of ATV. Later in the day, Maurice planned to cover a second parade in Catonsville, MD! Plans are already being made for next year's event. There were a few problems with police passes and interference from the many public service band radios in use. We will overcome the first problem by mailing passes well in advance of the event. It might be interesting to try some FM television on the 23 cm band next year, to get the ham signals well above the interference. Overall, the problems were not insurmountable, the equipment performed well and the reaction of the parade committee was enthusiastic. ATV will certainly be an important part of the Towson Independence Day Parade in future years!



From left to right: Jay Merker N3HBN, Mike Dees N3EZd, Ellis Eisen N31DV.

Heru Walmsley
W3WVV

US NAVAL ACADEMY BALLOON

At 1027 UTC on April 27th, 1991, the Naval Academy amateur radio club launched a helium balloon carrying a 5-channel telemetry payload designed by Midshipman first-class Stohs.

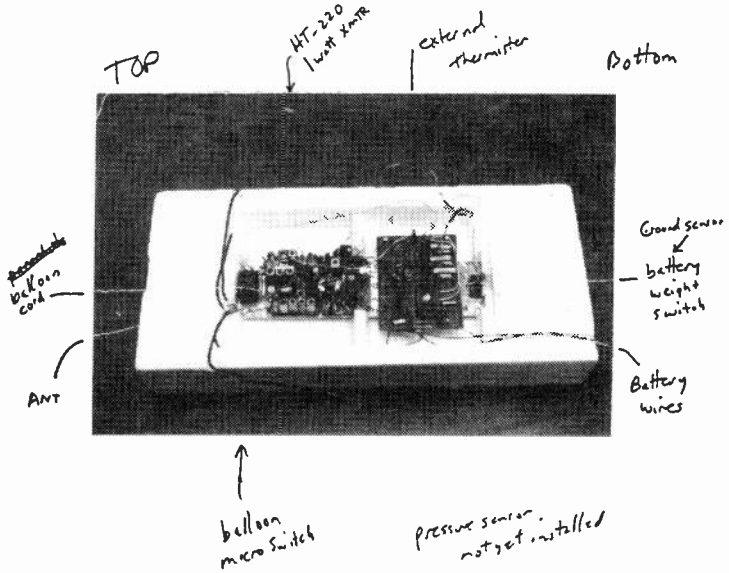
The telemetry consisted of three tones reporting the altitude, outside temperature and the temperature inside of the battery pack. The pressure sensor was donated by John WB4LNM but was only calibrated up to 18,000 feet. Two additional channels reported the status of the balloon. Four different CW messages were transmitted depending on the condition of the balloon and the ground contact switches. When the balloon was in flight it sent out the following sequence: GO NAVY (Tout tone), (Tbat tone), (Pressure tone) W3ADO. The three tones were measured and recorded at the ground station. During the flight a contact switch remained closed due to the tension on the balloon string (the string went through the parachute). After balloon burst, the string lost tension and the switch changed the CW message to say: POP (Pressure tone) W3ADO. A ground contact switch was used to detect touchdown. If the parachute got hung up in a tree, the ground switch wouldn't be closed and the message would say: HUNG de W3ADO. If the package was on solid ground, then it would relay: QRT W3ADO.

A unique design of this payload was a solar battery pack to protect the batteries in the -60 degree F. environment at high altitudes. Since alkaline batteries become inefficient at low temperatures, and because this payload was operating on a low duty cycle to conserve battery power, the solar heating was necessary to keep the batteries warm.

Three concentric hemispheres made out of clear plastic provided a triple glazed solar window for the top of the battery compartment which was suspended below the telemetry payload so as to receive full solar illumination. Unfortunately, the solar heating worked too well!. The battery temperature rose far beyond our calibrated temperature range. We estimate that the batteries were heated to more than 100 degrees centigrade!

The flight was successful and reached an estimated altitude of 70,000 feet (using a KAYSAM 70G balloon). Telemetry was received throughout the flight. The descent by parachute was about twice as fast as the ascent rate of 270 meter/minute. Signals were received as far away as Long Island and Connecticut. Unfortunately, at about the same time as the balloon burst, the antenna wire parted due to fatigue from the flexing of the antenna in the winds. With only about 1/2 inch of antenna left, all stations could still copy the telemetry, but at a significantly reduced signal level. The signal was lost at touchdown. However, the valiant chase team continued the search for 8 hours!

Two days later, 8-year old J.B. Bunting found our payload floating about 10 feet from shore in the Bay. It was only 1/2 miles short of the Atlantic Ocean in the Ocean City, Maryland area. After 52 hours in saltwater, the batteries were completely corroded, but the telemetry and transmitter still barely worked after a thorough cleaning.

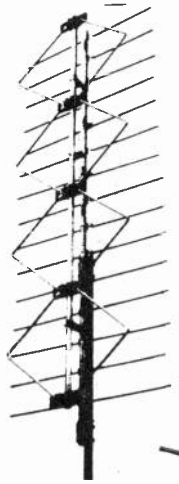


W3APO US Naval Academy Balloon payload Noye balloon and battery microswitch detector. 2m transmitter is an HT-220 HT. CW ID and sensor board to the right.

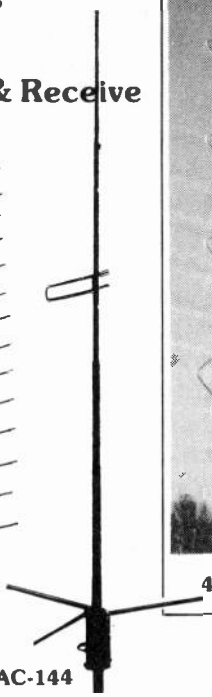
Launch site of the US Naval Academy balloon. Note the 40 foot dish in background. Left to right: Mion Grasdock, Prof. Pieper, Mion Stohs, Brian KA3WWI, John Bartley KA3SCY, Bill Boston N3DCI, Professor Albert (back), Bob Bruninla WB4APR, Graig Ruckenbauch WA3TID, Mel Seyle WA3KZR, John Klimelhoffer WB4LNM, Glen Kilar KA4RHS.

ANTENNAS by Lindsay

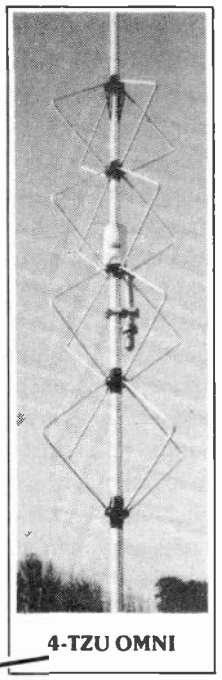
Amateur TV Repeaters, Verticals and Yagis Transmit & Receive Antennas



4ZZ-420



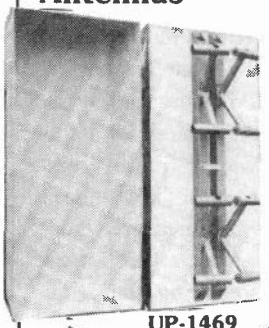
AC-144



4-TZU OMNI

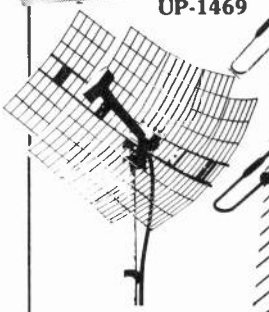
ATV-8 SLOT

LPTV & MMDS Transmit & Receive Antennas

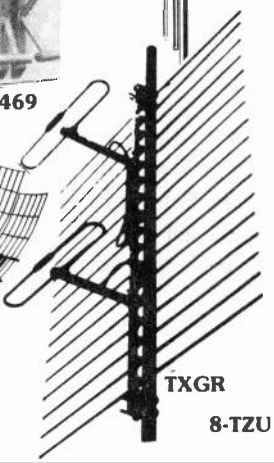


UP-1469

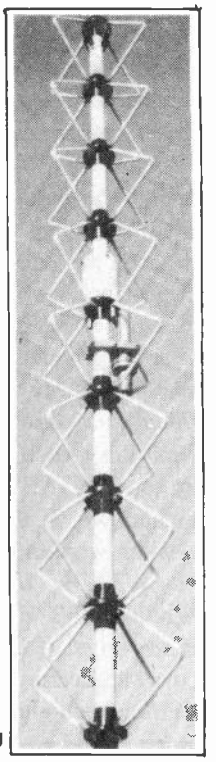
LS4
LS8
LS16
SLOT



MDG-2717

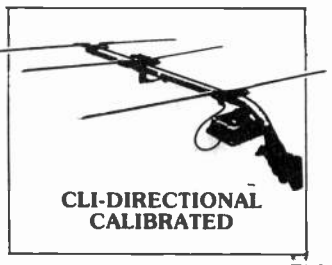


TXGR

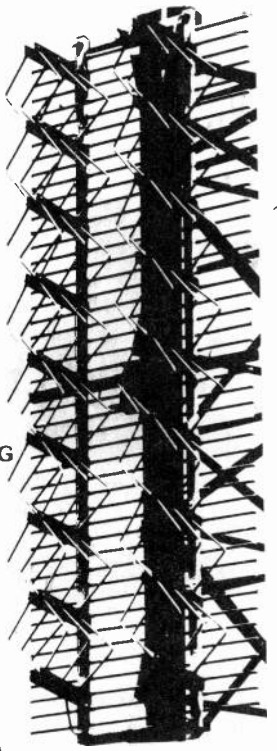


8-TZU

Cable TV & SMATV Headend Yagis, Log Periodics, Pre Amps and CLI Antennas

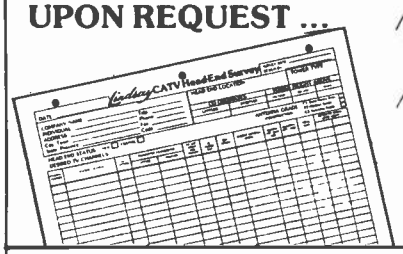


CLI-DIRECTIONAL CALIBRATED

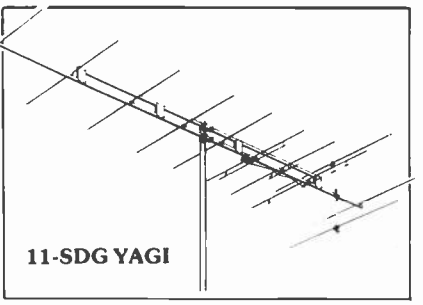


ZIG-ZAG SERIES

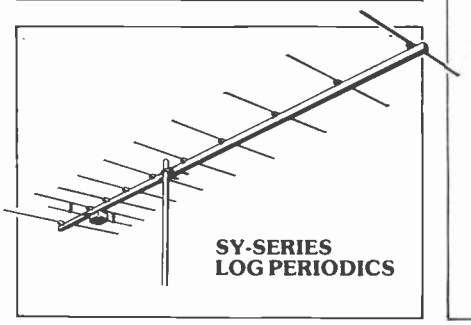
***'FREE'* SITE SURVEYS UPON REQUEST ...**



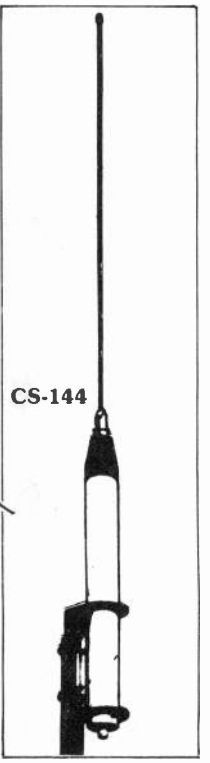
Commercial 2 Way Cellular Base Station and STL Antennas



11-SDG YAGI



SY-SERIES LOG PERIODICS



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900 MHz. BAND PLAN CHANGES PROPOSED

Recently a several node and BBS sysops in the MD, VA, PA and DE areas made a group purchase of an entire cellular phone site. We now have 96 radios ready to be converted to high speed digital networks in the 900 MHz. band. While looking at the existing ARRL bandplan, an idea came up that would simplify our future exploitation of the band. As the cellular industry continues to grow without bound, the piles of last year's models is also building, ready to transition into the new HAM band in the next year or so (rumored to be about $10.00 each).

The question is, what is the limit to a 12 MHz. repeater split in a band that is 26 MHz. wide? This 12 MHz. split applies to all future voice repeaters as well as digital links. Looking at the band plan, it is easy to see how the sandwich was made. The two ATV channels separated by 12 MHz. which are the kingpin on which the rest of the band falls into place. With those two channels separated by 12 MHz., there is no other way to provide greater splits for the other modes.

As a proponent of 900 MHz. ATV and the owner-operator of an ATV repeater on 923 MHz., I am not volunteering to give up one of those two channels. However, as an experimenter wanting to see us take advantage of a windfall of cheap radios, I do want to look for a way to increase the repeater split to make proliferation of repeaters easier.

Since all three ATV repeaters in the Washington, DC, Baltimore and Annapolis areas have ATV repeater outputs on 900 MHz., together we have a pretty good idea how we want to use this band. Our present cross band repeating works very well and none of us, to my knowledge have proposed putting up a full duplex ATV repeater with co-site input and output within the 900 MHz. band. If we do not intend to operate an in-band repeater in the 900 MHz. band, will we be willing to forgo the 12 MHz. split which screws up the band for everyone else?

As an ATV'er and member of all three ATV clubs in the area, I would suggest to TMARC that they take advantage of our local use of the band and deviate from the ARRL band plan to get an 18 MHz. split for all other users. The details of this proposal are shown in the enclosed band plan summary. Please note that any split which plans to take advantage of modified cellular equipment must be a multiple of 30 Khz. (12, 15, 18 and 21 MHz. are good round numbers.)

I recognize that the coming vehicle location service makes all present band plans useless, but by placing this idea on the street now, maybe we can begin to discuss it and all of its ramifications. When we finally do find out what frequencies will be blocked out for that service, we can think of a way to let the pieces fall back into place with at least 18 MHz. splits. Please send me your comments. Bob Bruninga, (301) 267-4380 (W)

	Existing ARRL Band Plan	Suggested Band Plan to Increase Splits
902	weak signal	weak signal
903	weak signal	weak signal
904	digital	digital
905	digital	digital
906	FM simplex	FM simplex
907	rptr inputs	rptr inputs
908	rptr inputs	rptr inputs
909	rptr inputs	rptr inputs
910	atv channel 1	atv channel 1
911	atv channel 1	atv channel 1
912	atv channel 1	atv channel 1
913	atv channel 1	atv channel 1
914	atv channel 1	atv channel 1
915	atv channel 1	atv channel 1
916	digital	atv channel 2
917	digital	atv channel 2
918	FM simplex & cntrl	atv channel 2
919	rptr outputs	atv channel 2
920	rptr outputs	atv channel 2
921	rptr outputs	atv channel 2
922	atv channel 2*	digital
923	atv channel 2*	digital
924	atv channel 2*	FM simplex and cntrl
925	atv channel 2*	rptr outputs
926	atv channel 2*	rptr outputs
927	atv channel 2*	rptr outputs

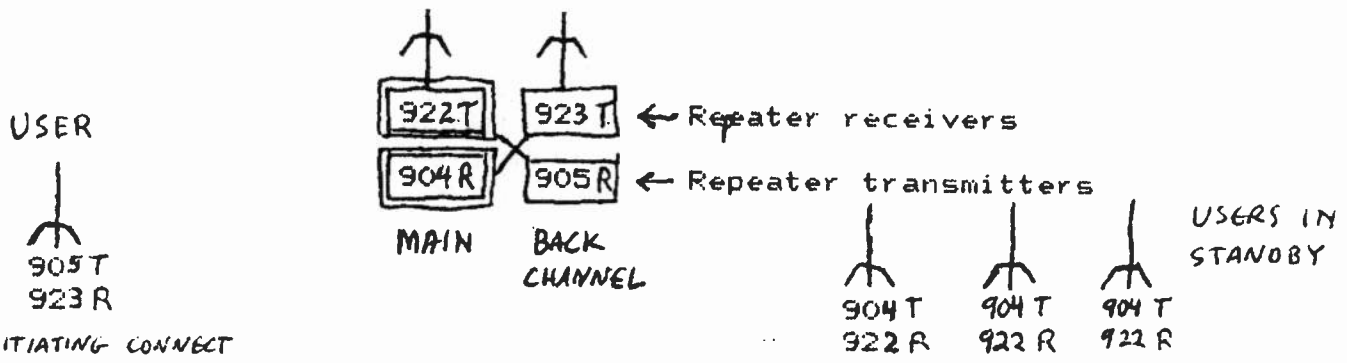
* ATV channel 2 is shared with wide bandwidth experimental stations and and is not recommended for repeater operations.

A BETTER FULL DUX REPEATER

As a continuation of the idea of using full dux 900 MHz. dumb repeaters as a first stage in our evolving high speed backbone, there is a better way to build a full dux repeater than we are used to. For discussion, I will use the term USER to mean any end points of the links through a dumb full dux repeater. These full dux repeaters will provide 19.2 KBps point to point links for high speed exchanges/forwards, files, etc., between major servers in the area. To avoid the requirement for a T/R relay at each USER, and to avoid the key up, turn arounds, the repeater should permit full dux data between the two USERS involved in a link. To do this, my proposed repeater splits are at each site. For simplicity, I will use whole number freqs in the following sketch.

Continued next page > > > >

A BETTER FULL DUX REPEATER



Each repeater has two receivers and two transmitters. In this example, 922 is the main repeater output frequency. This is where all idle USERS sit, awaiting a connect request. When any USER desires to link through the repeater, the user uplinks on the repeaters back channel freq of 923. The second R/T pair at the repeater site (called the back channel) then provides the full duplex connection through to the main channel.

The advantages of a true full dux end-to-end link cannot be over emphasized. The sex of the end points is easily determined by who initiates the connect. This way, everyone stands by on the repeater main output.

Rptr Receive	Rptr Xmt	
904.02	922.02	main channel xmt 1
904.05	922.05	main channel xmt 2
904.08	922.08	main channel xmt 3
..	..	
904.26	922.26	main channel xmt 9
904.29	922.29	main channel xmt 10
904.32	922.32	back channel xmt 1
904.35	922.35	back channel xmt 2

As noted in the previous NETWORK bulletin, receive freqs are cross connected between the main channel and the back channel. The labels above refer to the xmt frequency only. This plan takes several items into consideration:

1. An 18 MHz. split is used (must be multiple of 30 Khz due to Hrdwre)
2. Starts on first 30 Khz available in the digital portion of band
3. Back channel offsets of 300 Khz are easy to remember
4. User xmits low, rcvs high (like millions of cell phones)

4.5 This also makes our "user" use of our cell site radios easy since xmt low is closer to 895 where they started, and rcv high is easy just by flipping LO injection and moving LO even less. So it makes our short term effort easy, as well as being future compatible with converted cellular phones. (Cell site hardware will always be harder to get.)

The more I think about it, the more I am convinced that super switches at remote sites will never be viable. If we provide the RF links via dumb repeaters then the digital gurus can generate miracles of network code with all the creature comforts of their shacks, and maintenance of the network in the long run will be much better. So following on my suggestion of dual channel full duplex digital repeaters, and the suggested revised 900 MHz. band plan to permit 18 MHz. repeater splits, the following frequency plan is suggested in the digital portion of the band:

Rptr Receive	Rptr Xmt	
904.38	922.38	back channel xmt 3
..	..	
904.56	922.56	back channel xmt 9
904.59	922.59	back channel xmt 10
904.62	922.62	main channel xmt 11
904.65	922.65	main channel xmt 12
..etc	..etc	..etc

5. Making the receiver transposition at the dual full dux repeater keeps the dialed up channelization of the user on the "standard" proposed 18 MHz. split which would be compatible with other repeaters on the band. I know this is not IAW the present ARRL band plan, but did they really think of the legacy of the 30 Khz cellular phone channels when they came up with their plans?

* While looking at the chip sets used in the cellular radios, it also becomes obvious that 30 Khz channels must be used in the voice repeater portion of the band. They also must start on multiples of 30 Khz. This means the channelization of voice repeaters should start at 907.020 MHz. paired with 925.020 MHz.

HAMS WITH CLASS

Lights, Camera, ATV.

One of the fun times about being an instructor of an amateur radio class is that you can never run out of exciting and informative demonstrations to bring into the classroom. The "sparkle" component (see the October 1990 "Hams with Class") of your program is what will have your students remembering the course years after completion.

Since many youngsters today are over stimulated and under worked, they've got to be approached with something of obvious benefit to them right off the bat. Remember always that the way the instructor presents the topic is of critical importance. Children are the best at reacting to a teacher's sense of excitement. If you are genuinely enthusiastic about your presentation, you'll have them at complete attention, anticipating something special. Don't disappoint them. Hit them right up front with what's in it for them.

Recently, for a demonstration of amateur TV at my school. The children in my 6th, 7th, and 8th grade ham radio classes have often heard members of the Bayonne Emergency Management Amateur Radio Club on the air discussing ATV. They were looking forward to the morning when my fellow club members would be arriving to set up an ATV demonstration in our school auditorium.

Plenty of Participation.

Filled with anticipation, my students quickly spread the word to their other schoolmates and teachers. Before I knew it, I had several requests from other staff members to bring their classes to the auditorium to see the demonstration. Of course, I arranged for the additional seating and enjoyed the idea of non-ham students being exposed to amateur radio in a fun way.

When the big day came, we weren't disappointed. John WA2QYX, Mike KB2EQQ, Danny N2EHN, Lee WA2JWR, and 12-year-old Walter KB21OZ provided us with an outstanding experience. John, Mike and Danny interacted with the children in a thoroughly professional and well-coordinated manner. Their own obvious enjoyment and expertise with this media came through loud and clear. Even passersby on the street were impressed with the way the event was being handled. Lee and Walter worked behind the scenes to make sure everything went smoothly.

Used with permission of and re-edited from a story in 73 Magazine.

The children learned about how enjoyable ATV can be. Also how terrific it is that hams can rely on each other for help, resources, and fun.

John and Mike KB2GVJ, his son, submitted the following write-up to me. Mike is 14 years-old, and he has been a ham for two years. He loves going along with his dad and the others whenever he can, to help demonstrate ATV.

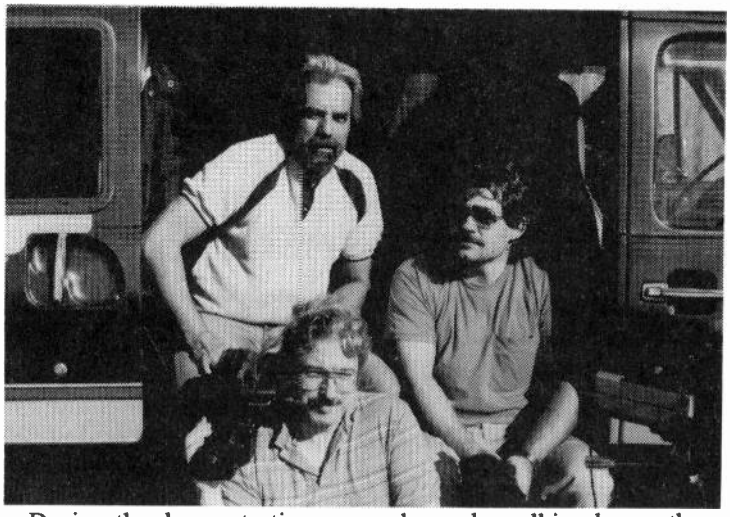
John Anzivino WA2QYX's Report..

A television appearance can bring out the "ham" in all of us. Imagine what fun it was to let a group of 6th, 7th, and 8th grade students get into the action. On October 15 several members of the Bayonne Emergency Management Amateur Radio Club, BEMARC, demonstrated the ATV mode of amateur radio to the students of Staten Island Intermediate School #72. Six club members participated in the live TV demo, complete with a fully equipped mobile van and a small downconverter connected to a large screen TV set in the school auditorium.

Preparation began early in the morning, when John WA2QYX, Mike KB2EQQ, and Danny N2EHN met for coffee near the school. The other two club participants, Lee WA2JWR and his 12-year-old son, Walter KB21OZ, met them at the school at 8:00 a.m. The camera equipment, a basic camcorder, was set on a

tripod in front of the school. The antenna was a simple 440 MHz. vertical. The output of the camcorder was fed into a small 20-watt ATV transmitter, and we were ready to go! A mobile 440 MHz. vertical antenna was connected to the downconverter inside the school auditorium, and the output was displayed on the school's large screen TV.

As the students watched live TV pictures transmitted via amateur radio, the club members explained how easy it is to have fun with your own TV station. Imagine sharing live television pictures all summer long with your friends all over town; doing homework together on two-way television, sharing videotapes of your vacation; showing each other your gifts during the holiday vacation; or putting your parents, brothers, sisters, and the family pet on your own TV show!



During the demonstration, several people walking by on the street were put on television. Most stopped to say hello to the students, and all were impressed with the idea of personal television. The next step was to put some teachers on the screen. We asked one teacher, who teaches a drama class, to come outside and become a star on amateur television. She saw an immediate advantage in ATV for her students. Perhaps we have another prospective ham at I.S. #72.

Finally, we took several students outside and made them ATV stars. The creativity of the students came out in full force. A group of three students said hello to their classmates and told us what they would do with their own amateur TV station. Among the second group of student ATV stars was a budding comic who made the auditorium laugh with his antics and funny faces. When the bell rang, signaling the end of the class period, many students were disappointed; they wanted more ATV action. After the demonstration, many students asked for information on how to get their own amateur radio license. Their teachers explained the school program, and the members of BEMARC promised to return for another television event.

When the BEMARC mobile TV crew arrives at a club meeting site, we usually park the van in a nearby parking lot or other interesting location. If possible, we park on a busy local street and capture people shopping and the colorful scenes in the small store windows. Mike KB2EQQ sets up inside the club. Mike shows all the equipment used for ATV, and removes the covers on the units to explain the function of each board.

We use HTs on simplex for audio between the mobile van and the club meeting room. This way, any club member who has a question for the outside crew can see the mobile member answering over the TV. Full duplex is possible in that manner.

The demonstration starts with the video tape transmitted from the camcorder in the mobile van. Next we switch to live action and show all the outdoor scenes in the area. Before we complete our demonstration, we usually ask some of the club members to come outside and we transmit their picture back to the club. Since December 1989, our club has completed 14 demonstrations. We've received many comments about our ATV activity, and several more hams have purchased ATV equipment in our area.

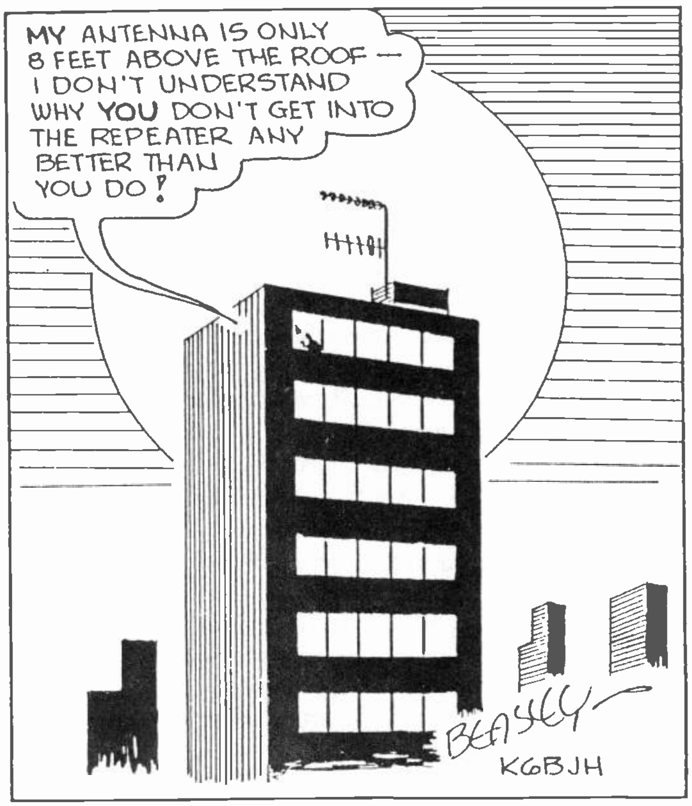
If your club is located in the New York City/Northern New Jersey area, and you would like the BEMARC ATV road show, contact our club president, Mike KB2EQQ.

A Coming Attraction..

Any instructor who is searching for an innovative and exciting demonstration for the classroom should consider an ATV event. Most schools and clubs today have access to standard video equipment. A basic ATV station consists simply of an ATV transceiver, an antenna, a TV camcorder, a monitor, and a VCR. If you don't have the equipment yourself right now, you can make your desire for a presentation be known to your local radio clubs. Some ham will know of another ham who is involved in ATV. You'll probably be delighted with the response you get. I know you'll be delighted with the reaction you'll get from your audience of students. Amateur TV is a fun way to motivate prospective hams and to capture people's attention.

As a result of the wonderful presentation at our school, five more students had their programs changed so they could be in the ham radio class. I certainly became convinced of the value of adding ATV to my curriculum. Only a few weeks after the initial ATV demo, our school is well on its way to having its own TV station. Thanks to the generosity of AEA and Mike Lamb, and the help of local hams, we expect to be on the air, seen as well as heard, very soon.

Give it a try and let me know what results you get.



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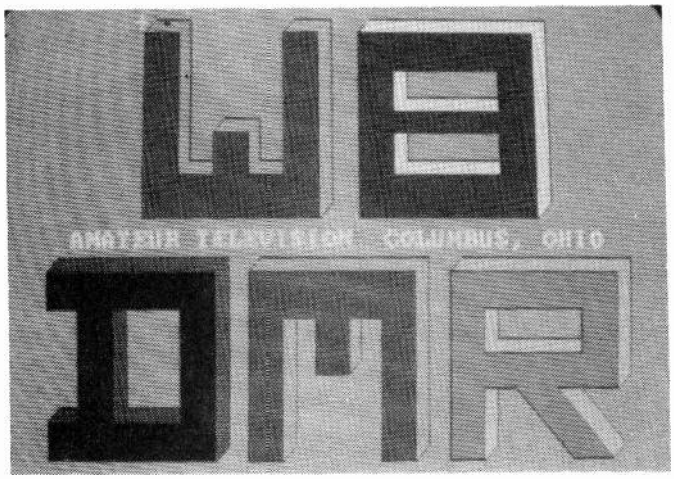
11. I certify that the statements made by me above are correct and complete. Henry Ruh, Publisher

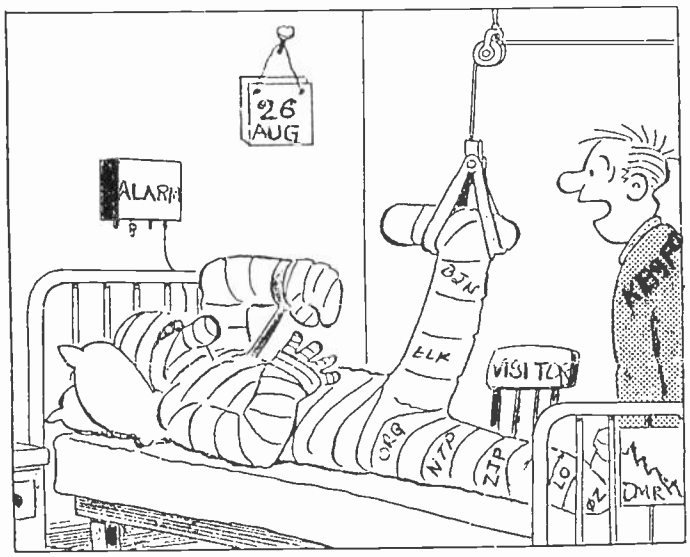
PS Form 3526, Feb. 1989

MARYSVILLE, OH

The hamfest was a success. The HAM CAN VAN was on display along with a lot of Gene's TV goodies. The van attracted attention in the main exhibitor building. Gene Kirby was busy most of the hamfest with official duties but he did manage to sneak in a few ATV QSO's and served some fine hospitality to the ATVQ folks in attendance.

Bill Parker W8DMR out did himself by hosting FOUR sessions on ATV during the hamfest. Under the influence of a hot summer day, Bill made his presentations in one of the fair ground buildings. Attendence was good at all sessions.. His topics included how to get started in ATV and FM TV. His presentations were the hit of the day. Bill mixed humor with excellent home made slide shows of the material to the delight of those attending. Bill must have worn out ham of the year award for his 4 hours presentation and obviously weeks of preparation.

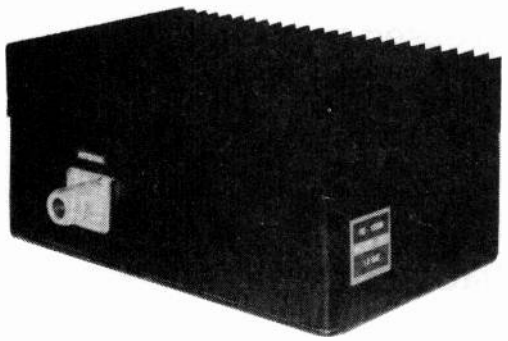


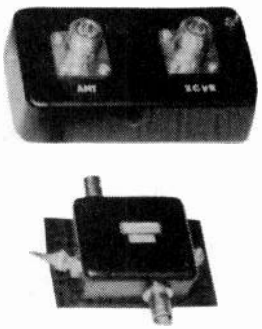


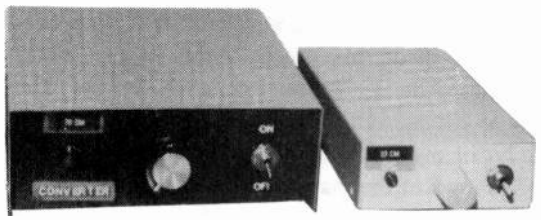
I TRIED TO TELL YOU TO MAKE-A-GET-AWAY AFTER THE FIRST PROGRAM AT MARYSVILLE.

pauldon ASSOCIATES

210 Utica Street Tonawanda, NY 14150 (716) 692-5451







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SAU-11 902-928 Mhz. for FM use or ATV at reduced output ½ W. = 10 W. $25.00
W57762 1.2 Ghz. Linear use for FM, ATV, or SSB. 18 W. ½ W. = 18 W. 99.00
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OTHERS — INQUIRE.

POWER AMPLIFIERS:
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PD-440N P.A. ½ W. drive (T/R) = 18 W. output. We custom build for your input $119.00
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NOT T/R SWITCHED (For Repeater Use) 10 W. = 80 W. 199.00
ABOVE: Large Heat Sink & Diecast Box
PD-440N-3 10 W. drive = 80 W. output T/R 235.00
ALL OF THE ABOVE USE POWER GAIN BLOCKS

MINI POWER AMPLIFIER FOR 420 - 450 Mhz.
PD-440N (Mini) 100 MW. = 2 W. & ½ W. = 6 W. $85.00
PD-900N 902 - 928 Mhz. ½ W. = 10 W. output FM or ATV with reduced power 65.00
PD-33LP 902 - 928 Mhz. linear P.A. ½ W. = 7 W. output (2 stage) 119.00
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ABOVE are for 906 to 928 Mhz. band
PD-33VLP linear P.A. ½ W. = 1.5 W. out 49.00
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PD-1200N P.A. 1 W. = 18 W. (linear) $165.00
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DUPLEXED POWER AMP. for 70 cm. & 2 meters
PD-270-1 2-4 W. drive on either band = 35 W.
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ATV DOWNCONVERTERS
GaAs Fet transistor used in both the 70 cm. & 33 cm. models TV channel 3 or 4
Tunes from 420 - 450 Mhz.
Board & all parts wired $60.00
Mounted in cabinet 73.00

Downconverter for the 902 - 928 Mhz. band TV channel 3 or 4
Board & all parts wired $68.00
Mounted in cabinet 80.00
Mounted in a diecast box 88.00

PREAMPLIFIERS
PD-440S 70 cm. 426 - 450 Mhz. preamplifier is a SINGLE GATE type using either a NEC 2SK-572 or a Mgf 1302 transistor. Noise figure is 0.6 db. and has a gain of 16 db. or better. It operates from a 12 - 13.8 volt supply, is diode protected and has a 5 volt regulator for stability. The source leads are by-passed with disc capacitors and the input uses a high "Q" piston Trim Pot. The output is not tuned so that the noise figure is consequentially low. A Toroid is used in the output, with capacitor coupling to the output. In this model either BNC or "N" connectors are used. $51.00
PD-440TRL is a tower mounted 70 cm. preamplifier whose description is similar to that of the PD-144TR-L except has "N" connectors 150 Watt thru capacity 119.00
FOR VOLTAGE FEED THRU COAXIAL CABLE 150 Watt thru capacity 129.00
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PD-1200 — SAME AS THE PD900 except 1.2 Ghz. ..... 65.00 and 70.00
PD-1200TR 1.2 Ghz. preamplifier with R.F. sensed T/R switching (20 W.) 119.00
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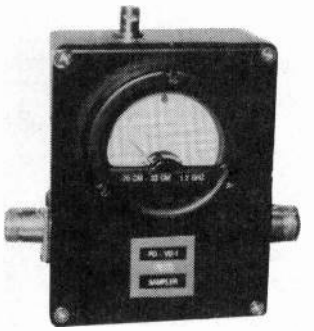
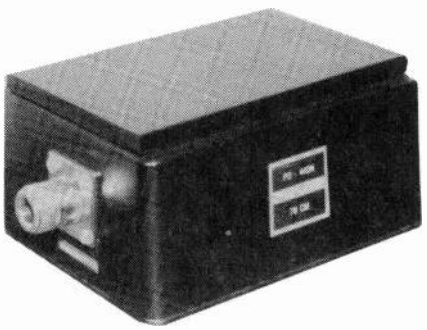
OTHER PRODUCTS AVAILABLE: FM TRANSMITTERS AND RECEIVERS, SAMPLERS (VIDEO), Etc.
CALL OR WRITE FOR ADDITIONAL INFORMATION OR CATALOGUE.



The PAULDON ASSOCIATES Model PD-VID-1 ATV VIDEO SAMPLER unit picks up your transmitted Fast Scan TV signal by sampling the transmission line with near negligible insertion loss It employs 2 type 'N' connectors for input and output connections The furnished BNC mentioned on the top of the unit is used as a video output port, useful for connections to a CCTV monitor or scope (for adjusting proper video and sync levels). Transistors included in the electronic circuit design are. Q1-ECG 123, Q2-ECG 123 and Q3-ECG 159

$63.00.



INTERDIGITAL FILTERS
PD-1002 439.25 MHZ.
$150.00
PD-1004 910.25 MHZ.
$145.00
7 pole, 7 adjustable tuning rod design. Freq. adjustable to 6 MHZ. by rotation of the screws at the end of each rod. Insertion loss less than 1db. Out of band attenuation 80 db. +/12 mhz. from theVSB passband.Atten. at the LSB sound sub. carrier 30db.
OTHER FILTERS AVAILABLE
WRITE OR CALL

JACKSONVILLE, FL

ATV in Jacksonville has more than doubled since 1987. ATV'ers now have a 50 watt ATV repeater to use that facilitates full coverage of Duval County. The repeater is on top of the Southern Bell Tower. CATS (Coastal Amateur TV Society) has 20 members who meet on the air every Monday night at 8 pm (local). In addition, to the ATV repeater CATS utilizes the 146.955) AA4QI repeater. Net control usus the FM repeater to call the ATV net and coordinate the video portion. Be sure to check 144.34 MHz. also for ATV simplex activity on other than NET nights.

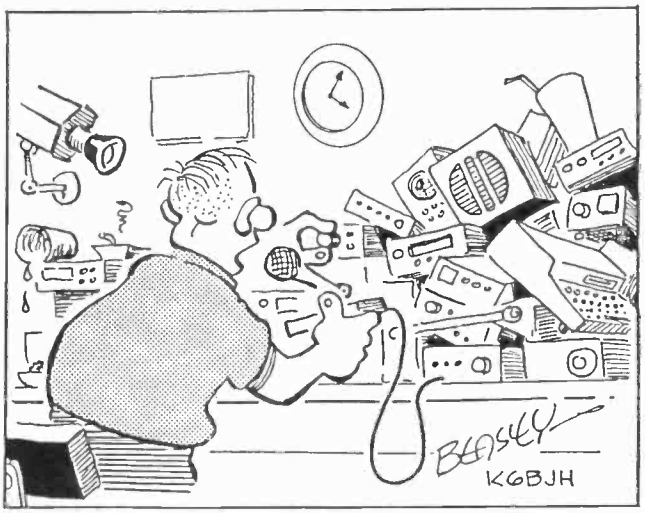
A live camera televised the Jacksonville hamfest with a camera mounted on the arena wall viewing the entire trading floor. The repeater also carries NASA Shuttle video, watch for STS 43. Atlantis TDRS-E launch.

More than 100 attended the ATV forum at the Jacksonville hamfest. Most indicated they were new to ATV or not yet on ATV and were there to find out more about it. The ATV display featured various equipment and live video.

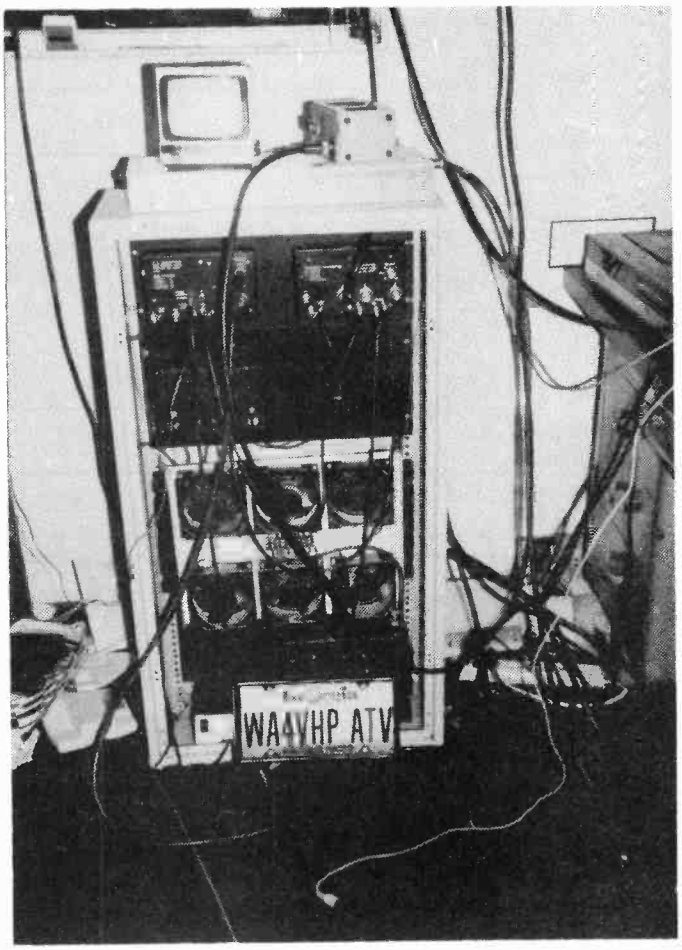
Also shown here is the WA4VHP ATV repeater located in Savannah, GA. David's system operates on 439.25 in and 426.25 out. The net is Wednesday nights at 9 PM. Typically 10 stations check in with best DX 30 miles to date. System improvements will improve sensitivity for receive. Currently there is some RF interference between the transmitter and receiver.

ST. LOUIS. MO

Activity has increased in the St. Louis area with many new stations on the air since the KDØLO repeater went active. The system uses 33 cm band input and 70 cm band output from a good location on the northwest side of the city. Local voice coordination is on 144.38. Helping local activity is a new ham store, Stewart Electronics in St. Charles, MO which is stocking PCE ATV Equipment and K1FO ATV antennas. Reports are that they are having a hard time keeping up with demand. Pictured here is Stewart Electronics store in St. Charles, MO.

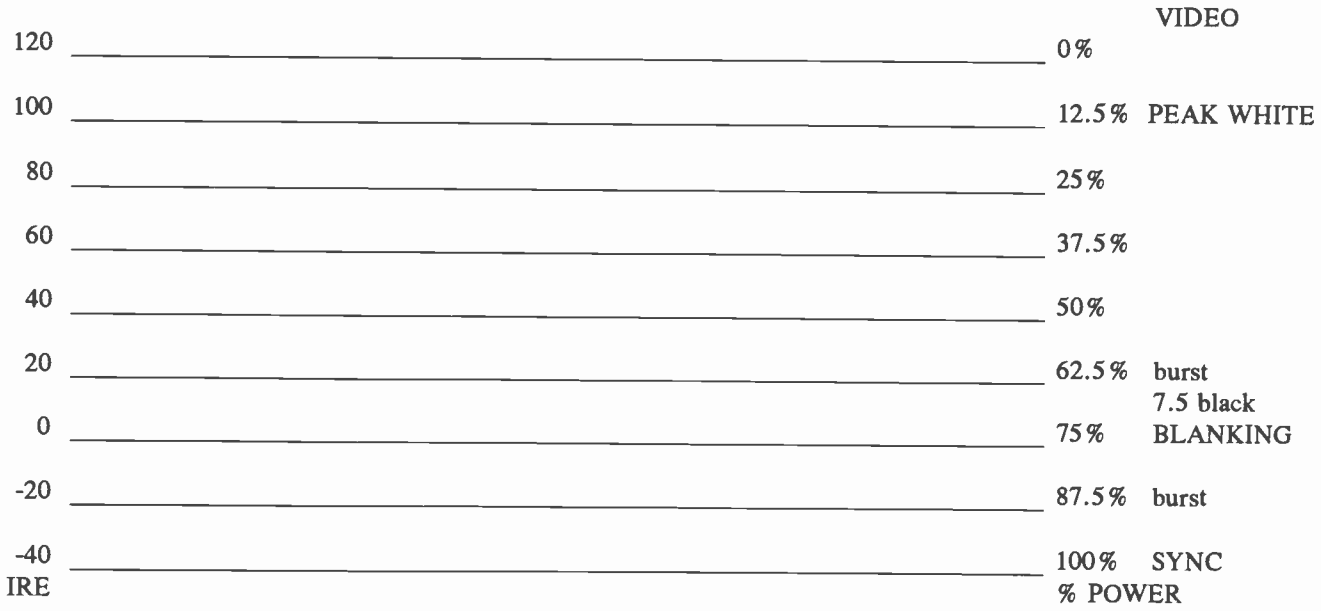


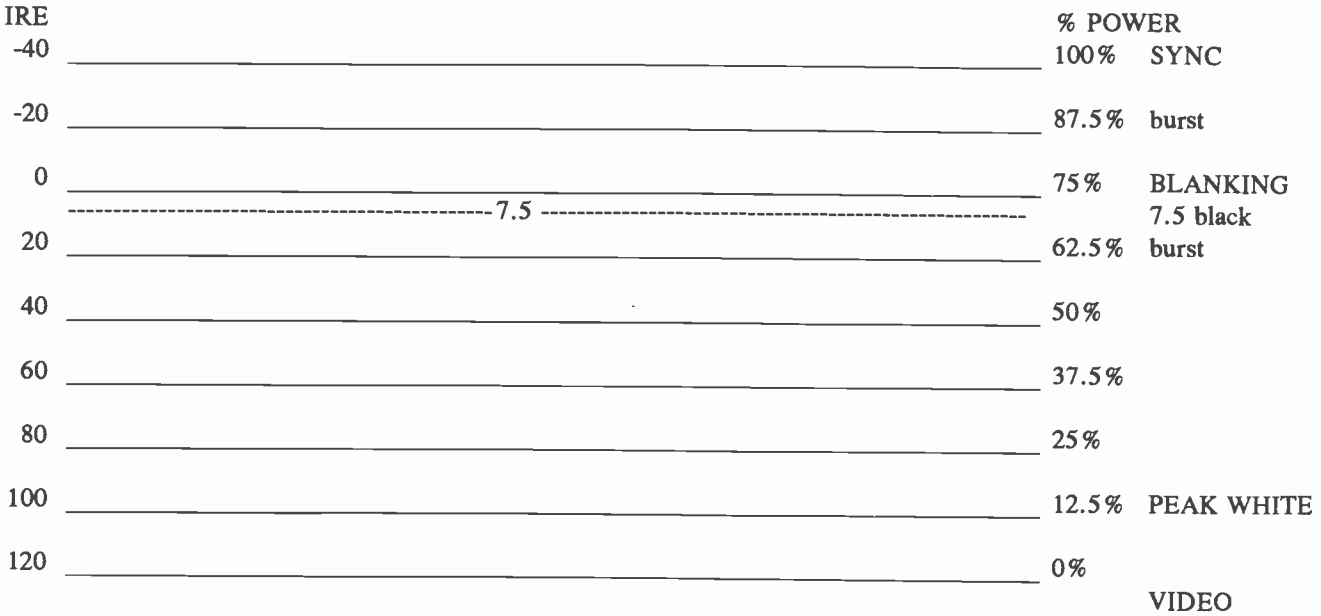
GIVE ME A PICTURE AND SOME AUDIO, ED, SO I CAN LOCATE THE MONITOR--- IT'S GOTTA BE HERE SOMEWHERE.



SCOPE GRATICULES FOR VIDEO WAVEFORM MONITORING

Any scope can be converted to read in IRE units for video/sync measurement. Here are two charts which you can use to convert your home general purpose scope to a waveform monitor for about 50 cents! Take these diagrams to any copy machine. Insert an overhead projector transparency sheet in the paper supply. Now adjust the copy size to produce a copy on the transparency which will fit over your scope tube face in place of the graticule you now have. Adjust the gain of the scope so that 1 volt p-p exactly equals 140 IRE units. You now have a calibrated waveform monitor. By adjusting the trigger and horizontal scan rates you can observe at a field rate or line rate to watch your video. If your scope does not have a TV SYNC separator, you can build a simple one to provide H and V triggering of the scope, or use the "slope" or polarity controls of your scope to obtain a stable display. To be a true waveform monitor you would also need a DC restorer which prevents the display from moving up and down with different picture brightness levels (APL) and a calibrated horizontal scale for time measurements. Note the left side is calibrated in IRE units and the right side is calibrated in % power! One diagram is video level oriented, the second is inverted to be RF power level oriented. To prevent audio buzz, video white levels should be limited to 100 IRE units. Chroma components are allowed to exceed 100 units in this display because the chroma signal is not directly additive (it is a subcarrier) to luminance. For a more detailed explanation of video and waveforms see the article in ATVQ V4 #4.





TELEVISION FUNDAMENTALS
WAVEFORM MONITORS

The basic piece of equipment to check the quality, legality and phasing of video signals is the waveform monitor.

While the graticule charts provided in this issue will provide you with a basic display for video waveform monitoring, you will still be missing the valuable features unique to a genuine TV waveform monitor. For those of you who have managed to find a used WFM or would like to have one, here is what the units do and what they measure.

I have chosen a current model which has all the features you are likely to find in a used unit. The basic difference is that most used units are likely to have mechanical vs touch screen controls, and likely do not have all the features listed.

GRATICULES

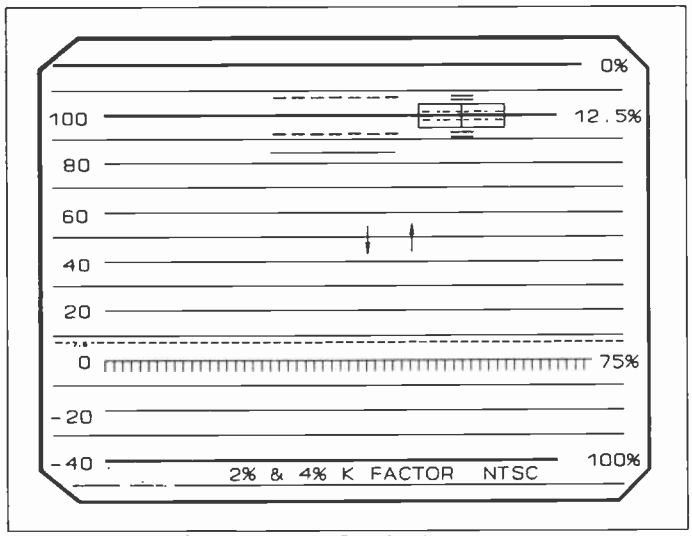


Figure 1 NTSC Waveform Graticule.

The internal graticule in figure 1 is on the same plane as the CRT phosphor it eliminates viewing and photographic parallax errors. The graticule is illuminated, using a front panel SCALE adjust control, so the level of graticule brightness can be adjusted to optimum for viewing or photographing needs. It is made up of vertical and horizontal lines. Let's consider how a signal should be read on the monitor.

VERTICAL GRATICULE SCALE

The NTSC graticule has two main vertical scales to facilitate typical measurements. The left side scale is marked in IRE units and extends from -50 to +120 IRE in 10-IRE increments. An IRE unit is equal to 7.14 millivolts. Black level setup is denoted by a dashed line at 7.5 IRE.

There are +2 IRE and +4 IRE markings at the center of the -40 IRE line (sync tip) to assist in measuring sync amplitude. This scale is designed to be used with the 2 Line or 2 Field Sweep rates.

The scale on the right side of the graticule is for measuring depth of modulation or power. The scale extends from 0% power at the 120 IRE line to 100% power at sync tip, -40 IRE line.

The boxed area slightly to the right of center at the 100 IRE level scaled in 2% and 4% increments is to measure tilt. This structure is designed to work with an 18 uS, half-amplitude duration (HAD) 2T Bar.

The set of solid and short dashed lines to the left of the Bar tilt measurement structure is used to measure pulse-to-bar ratio; they are weighted to include K-Factor ratings of 2% and 4%.

MAKING THE VERTICAL MEASUREMENT

The active video of the signal occupies the range between 0 units and 120 units. The white parts of the video generate the highest parts of the waveform display. The horizontal line near the top of the graticule which is defined as TV white is 100 units. The darkest part of the signal, or TV black, is defined as 7-1/2 units, a dashed line just above the zero base line. Black or white levels which exceed these limits are not legal NTSC signals. Color information may exceed these limits and still be NTSC legal. A description of color signals (composit video) will likely be in the next issue of ATVQ.

The color burst portion of the signal should reach from minus 20 IRE units to plus 20 IRE units. Burst totals 40 IRE units. A proper video signal will measure 140 units on the graticule scale form sync to peak white. Again, sync takes the portion between -40 and 0 units, while the active video image extends form 0 to 100 units on the scale. The 140 unit video signal is equal to one volt. Thus, you will see video measurement expressed as one volt peak-to-peak. One IRE unit equals 1 volt/140 IRE or 7.14 millivolts.

HORIZONTAL SCALE GRATICULES

The Horizontal reference line is the baseline at 0 IRE. This timing line is 12 or more major divisions long and takes on different time values depending on the sweep rate selected. In 2H Line Sweep each major division is 10 uS, and when magnified (X10), major divisions equal 1 uS. Minor divisions are thus 200 nanoseconds (nS). In 1H Line Sweep each major division is 5 uS, and when magnified (X25), each major division equals 0.2 uS. In 2 Field Sweep the timing scale is of no real value. This is a monitoring mode. When 2 Field Sweep is magnified (X25), the entire vertical interval can be displayed.

WAVEFORM CALIBRATION

One of the basic internal functions that the WFM has is a calibration pulse. This is a square wave signal generated inside the scope. In the calibration mode you will see the square wave pulse, or two horizontal lines, of exactly 140 units. This is the calibration pulse used to make sure that the scope is reading true. Put the bottom of the calibration pulse on the -40 line. With the bottom trace on -40 units, the top of the calibration pulse should level off at exactly 100 units.

TELEVISION FUNDAMENTALS
WAVEFORM MONITORS

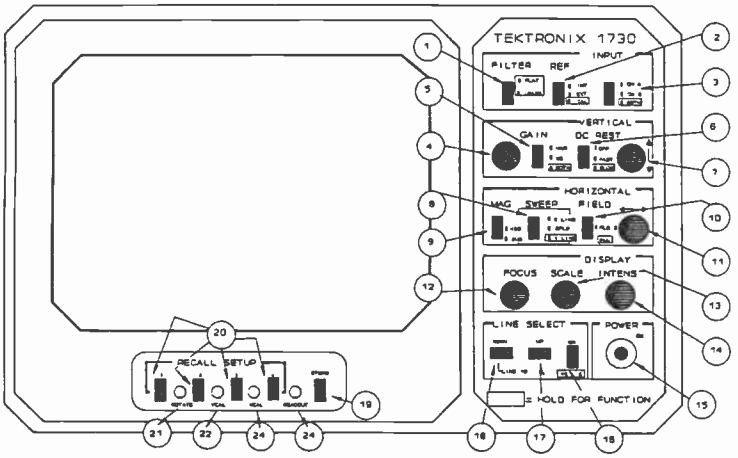


Figure 2. The Tektronix 1730 Waveform Monitor.

TEK 1730 - OPERATING FUNCTIONS

Information about the front-panel controls, rear-panel connectors, graticules, and an Operator's Familiarization/Checkout Procedure, along with measurement discussions.

The terminology is the same for any waveform scope although the location and number on controls will vary with model and manufacture. The Tektronics 1730 model was chosen for this discussion because it incorporates controls found on several models. If your waveform monitor does not have the function listed simply skip that paragraph. The callout numbers on the diagram correspond to the paragraph numbers.

FRONT PANEL CONTROLS / INDICATORS

The front-panel controls and indicators consist of switches, variable controls and indicated switch selections. When Line Select is being used, the field and line numbers are displayed. For field rate sweeps, a strobe pulse is applied to identify the selected line.

There are eight push-button switches that have functions that re accessed by holding the switch down for approximately one second. The DC Restorer switch toggles between FAST and SLOW when pushed and held. This is also called fast and slow AGC on older units.

When exiting held modes the selection reverts to the top of the list at the touch of a push button, except for the REF switch, which returns to its previous setting.

INPUT FILTER

WFM's have a selector to choose flat, IRE rolloff, chroma and perhaps differential filter and low pass modes. The filter mode switch in this unit toggles through three positions, FLAT, IRE, and CHROMA. In 2 Line or 2 Field Sweep a combination filtering routine, consisting of Low Pass and Flat for alternate lines or fields, can be accessed by holding the FILTER push button in. In the dual filter mode the low pass filtered line, or field, will always be on the left in 2 Line or 2 Field Sweeps. Lines are overlapped in 1 line Sweep. Filtering always returns to FLAT when exiting the combination filter routine. If AB switching or LINE SELECT is chosen after the dual filter mode, IRE filtering will be selected.

2 REF toggles between internal and external reference. A calibrator is accessed by holding the REF switch. Instrument status is held in memory when CAL is selected and restored when the button is pushed again.

3 CH A-CH B. This switch toggles between Channel A and Channel B input. When held, the 1730-Series goes into an AB (BOTH) alternate mode, with the A input on the left and the B input on the right in 2 Line or 2 Field (overlapped in Line 1 Line).

4 VERTICAL GAIN. Toggles between VAR, X5, and off. A BOTH mode consisting of VAR and X5 is accessed by holding the push button until both LED indicators are lit.

5 GAIN (CONTROL). Enabled when the GAIN switch is in VAR. This adjusts amplifier input gain to make any signal, between 0.8 and 2.0 V peak-to-peak equal a full scale display.

6 DC REST. Toggles the DC Restorer on and off. When turned on the restorer comes up as previously selected, in either the slow or fast position. Pushing and holding the switch in toggles the restorer between FAST and SLOW. Once the restorer speed has been selected, pushing the DC REST button turns the DC Restorer on, at the selected speed, or off..

7 POSITION Positions the trace vertically for alignment with amplitude graticule to measure amplitude.

8 HORIZONTAL SWEEP. Toggles between 2 LINE and 2FLD sweep. 1 Line sweep accessed by holding the SWEEP push button in until recognition occurs. The MAG is automatically turned off if SWEEP is changed.

9 MAGnification. Toggles between normal and magnified. Operates with SWEEP mode to provide usable sweep rates as follows: 2LINE + MAG = 1us/div
2FLD + MAG = 1 full vertical interval
1 Line + MAG + 0.2 us/div

10 FIELD Toggles between FLD 1 AND FLD 2. The ALL mode is accessed, in the LINE SELECT mode, by holding the FIELD push button in until the word ALL appears on the CRT readout for 2 Line or 1 Line Sweep or a bright-up strobe appears in both fields for 2 Field Sweep.

This switch determines which field triggers the 2 FLD Sweep. The selected field trigger is the first (left) field from which the selected line is displayed (field 1, field 2, or ALL fields). When exiting ALL fields, switching defaults to FLD 1.

11 POSITION. Positions the trace horizontally to align with time scale for time or interval measurements.

12 FOCUS. Adjusts CRT beam for optimum definition.

13 SCALE. Controls the level of graticule illumination.

14 INTENSITY. Controls trace brightness.

15 POWER ON-OFF

16 LINE SELECT ON. When ON Line and field number are displayed. This allows viewing of a single line of video usually to measure single line test signals (VITS) or to examine unusual video levels.

ELKTRONICS

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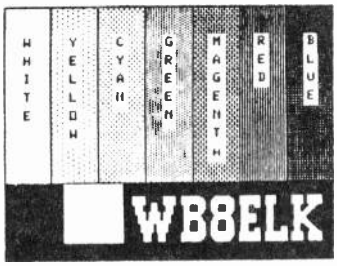

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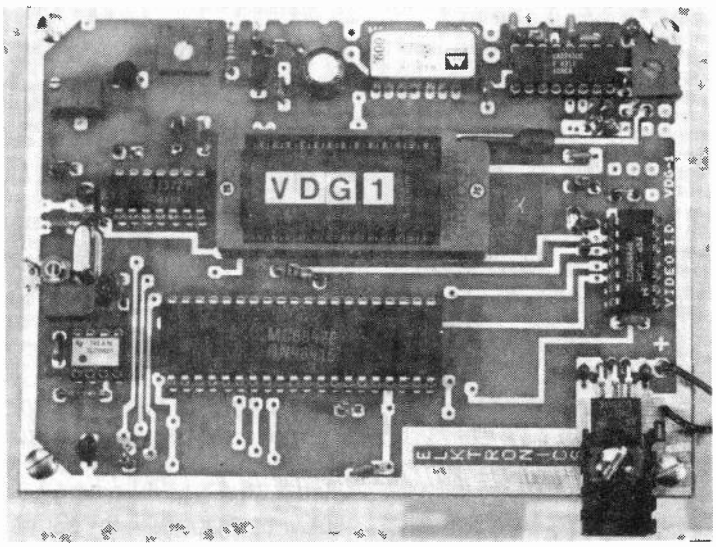

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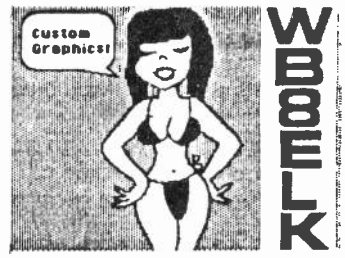

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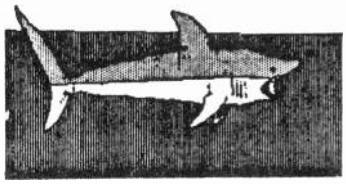

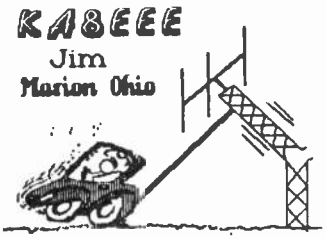

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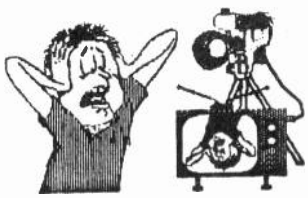

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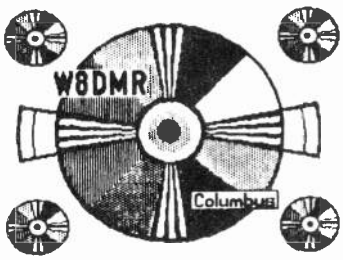

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17 UP 18 DOWN Increments the line count (when enabled). Used to select the line desired to be examined.

18 RECALL SETUP

19 STORE Enables the storage of front-panel settings, including line number, in four different memory locations. To store a front-panel setup, the STORE switch is pushed and then one of the four RECALL SETUP switches is pushed. When STORE is pushed, all front-panel lights cycle off and on (approximately 15 times) to indicate that the front-panel, as it is currently set up, can be stored. If the current selection is not the desired setup, pushing any front-panel, button, except a RECALL SETUP, will cancel the STORE mode. If one of the RECALL SETUP switches is pushed while STORE is active, the current front-panel setup will be stored in the selected RECALL position. CAL position. CAL cannot be stored.

20 (1-2-3-4) RECALL. Recalls from memory, or causes the storage in memory of (1-2-3-4) front-panel setting. Each of the four switches operates with a memory location and the STORE push-button switch.

21 ROTATE A screwdriver adjustment that aligns the display with the graticule.

22 V CAL A screwdriver adjustment that sets the vertical amplifier pain. Is normally used with the CAL position of the REF switch.

23 H CAL A screwdriver adjustment that set the time base. Can be used accurately with the CAL position of the REF switch in the SWEEP.

24 READOUT A screwdriver adjustment used to change the brightness of the readout portion of the CRT display, relative of the waveform intensity

AMPLITUDE AND TIME MEASUREMENTS

This section deals with two fundamental properties of the signal: amplitude and time. In these two dimensions, problems are more frequently caused by operator error than by malfunctioning equipment. Correction of amplitude and pulse width problems often simply involves proper adjustment signal equipment.

Two kinds of amplitude measurements are important. Absolute levels, such as peak-to-peak amplitude and the relationships between the parts of the signal. For our purpose relation of signal parts is not as important as amplitude.

Composite NTSC video signals are 1 volt peak-to-peak. Strictly speaking the IRE scale is a relative one, and can be used to compare parts of the signal regardless of overall amplitude. In practice, however, the IRE scale is an absolute with a direct relationship to volts.

When setting video amplitudes, it is not sufficient to adjust the output level of the final piece of equipment in the signal path. Every piece of equipment should be adjusted to transfer the signal from input to output. Video equipment is not designed to handle signals which deviate much from the normal 1 volt amplitude. Signals which are too high can be clipped or distorted. Signals which are too low will suffer from degraded signal-to-noise performance.

AMPLITUDE MEASUREMENTS

Video amplitudes are most frequently measured to verify they conform to normal values. Adjust the signal level if signals are high or low. This will help maintain proper transmitter video levels and keep your video looking good. Measurements of the peak-to-peak amplitude of video signals are sometimes known as insertion gain measurements.

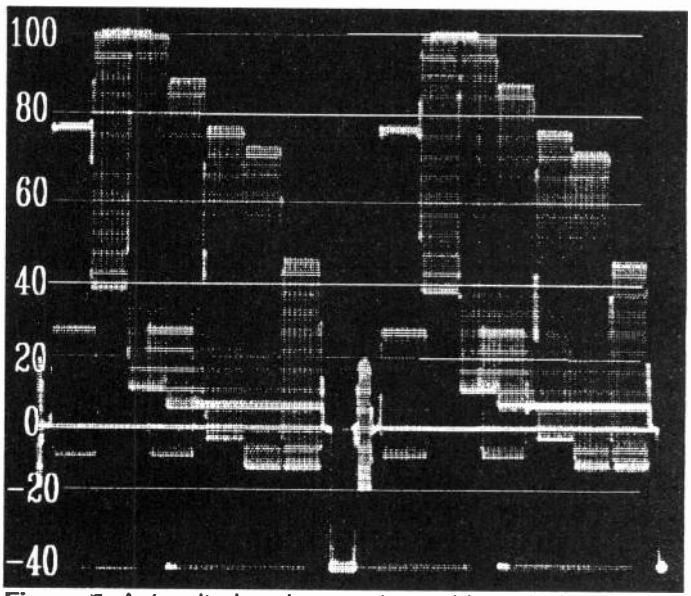


Figure 5 A 1-volt signal properly positioned with respect to the graticule.

MEASUREMENT METHODS

Figure 5 shows a properly adjusted signal. Since the waveform monitor vertical gain does not need to be calibrated in this mode, the gain can be increased for greater resolution.

Sync to Picture Ratio

If the signal amplitude is wrong, it is a good idea to verify that the problem is really a simple gain error rather than a distortion. this can be accomplished by checking the ratio of sync to the picture signal (the part of the signal above blanking), which should be sync 40: video 100.

Sync and Burst Measurement

Sync and burst should each be 40 IRE (286 Millivolts for a 1-volt signal). If you are looking at the output of a consumer tape machine this will be dificult to read because of the distortion of the shape and noise level of the burst signal. Sync level is very important and should be maintained at 40 units. Sync level controls received stability, black level and contrast of the video.

White levels

When checking the amplitude levels make sure you are using an IRE display (chroma removed). Levels above 100 IRE will cause buzz in audio when transmitted.

TELEVISION FUNDAMENTALS
WAVEFORM MONITORS

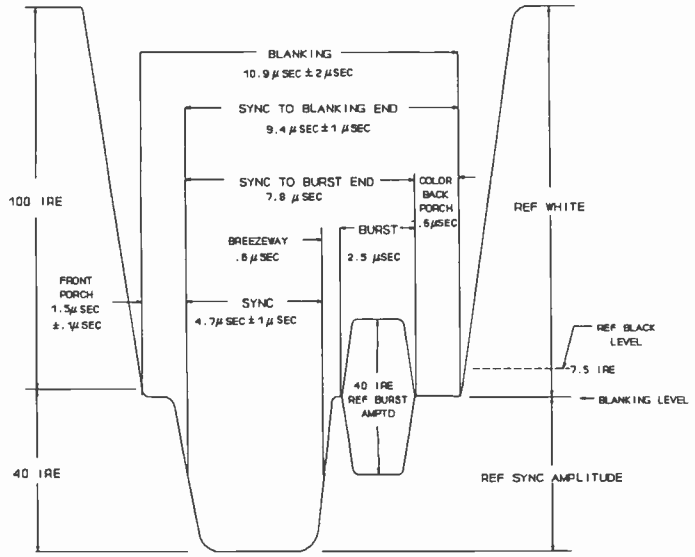


Figure 6 RS-170A pulse width requirements.

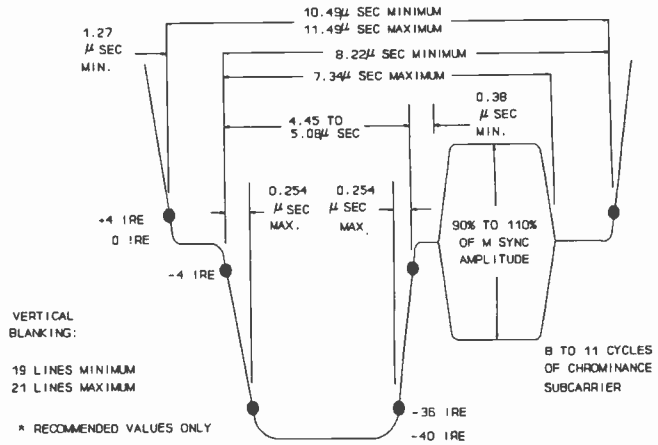


Figure 7 FCC pulse width requirements.

SETUP Most NTSC signals use "black level setup", which is simply referred to as setup. In a signal with setup, video black is 7.5 IRE above the blanking level. The peak-to--peak amplitude and sync amplitude, however, do not change, the peak ite level therefore remains at 100 IRE.

LUMINANCE FILTER is used to enable the LUMINANCE filter, also called LOWPASS or IRE, to make amplitude gain measurements with a live signal rather than a test signal with a white bar. This filter removes the chrominance (color) information allowing observation and measurement of only the luminance portion of the composit NTSC signal.

TIME MEASUREMENTS Horizontal and vertical synchronization pulse widths are measured to verify that they fall within specified limits. Rise times, fall times, and the position and number of cycles in burst are also specified.

Both RS-170A and the FCC provide recommended limits for these parameters, but the two standards have different definitions for the various time intervals. See figure 4 and 5. For example, the FCC specifies sync width between the 90% (-4 IRE) points for the two transitions, while RS-170A specifies sync width between the 50% (-2 IRE) points. Be sure to confirm the definition for each parameter as you measure it.

Time intervals can be measured by comparing the waveform to the marks along the horizontal baseline of the waveform monitor graticule. Use as much horizontal magnification as you can while still keeping the interval of interest entirely on the screen. The scale factor, typically microseconds per major division, changes with horizontal magnification.

RISE TIME MEASUREMENTS Both the FCC requirements and RS-170A include specifications for the rise time and fall time of sync pulses. These measurements are indicators of how fast the transitions occur. They are made between the 10% and 90% points or 50% points depending on if you are using FCC or RS170 standards.

BURST The position of burst with respect to sync and the number of subcarrier cycles in burst are specified for broadcast use. You can verify these parameters. RS-170A calls for 9 cycles of burst. Because consumer tape machines do not regenerate burst, you may only see 3 or 4 cycles on tape playback. This is because of the frequency conversion of the color signal in consumer video tape recorders.

VERTICAL INTERVAL The number of pulses and the widths pulses are specified in FCC and RS170A definitions. It is unlikely you have control of these parameters unless you have a sync generator or video processing amplifier (proc amp) with internal adjustments. This is of interest to us mainly to see if we have line sync (a solid sync level signal which lasts about 6 lines) industrial sync (looks like broadcast sync but may not have equalizing pulses to cause line interlace) or RS170 sync which is broadcast sync. The difference between RS 170 and RS170A (RS stands for recommended standards) is the relationship of the burst signal to horizontal sync. RS170A specifies that the phase of the burst signal is constant with relation to horizontal sync. (There is a procedure involving the measurement of line 10 burst and H sync described in the standard which is unimportant here)

For amateur use while it is better to conform to FCC specifications, we are frequently unable to make adjustments because of the nature of the equipment. Consider the specifications listed here as guides for good operation. They are not FCC requirements for ham radio use.

One final topic: maximum modulation frequency. Computers and other digital video devices often generate signals with high frequency components (rise times) which are in excess of the 4.2 MHz. NTSC limit. These frequencies can cause out of band modulation products if not filtered and also cause buzz in the audio. It is highly recommended that a 4.2 MHz. low pass filter be used in the video input of your transmitter to prevent these NTSC illegal signals. Video is defined as having an upper frequency limit of 4.2 MHz. in the NTSC system. If you have problems with buzz or video interference when using any digitally generated signal, put in a video low pass filter (a simple R/C circuit). This will cure the problem almost every time.

433.05 MHz. PACKET VS ATV ON 434 MHz.

This issue united the Southern California ATV community this June. SCDCC had proposed using 56 KB links on the 433.05 channel as this was published in an ARRL publication as a national standard. As usual national band plans do not work well in the crowded Southern California area.

A letter was generated with over 75 signatures that pointed out the technical incompatibility of the 433.05 MHz. packet and 434.00 MHz. ATV. This letter was presented to the SCDCC chairman by Mike WA6SVT. When the subject was brought up at the SCDCC meeting, Mike WA6SVT informed the group about ATV and our band pass on ATV receivers. The 100 KHz. wide data channel at 439.0 MHz. was brought up and Mike informed the group that this would not bother most ATV operations as long as the 439.0 links were not on the same hill top as the ATV repeater's 434.0 receiver.

Another subject came up at this meeting to resolve the alternate **ATV calling channel** (used by many of the ATV'ers that experiment with home built equipment and simplex operations.) The old **frequency was 144.90 and the new frequency is 144.39 MHz.** This move was necessary because of the QRM from the packet activity on 144.91 MHz. The primary ATV calling frequency of 146.43 MHz. is unchanged by the actions in the above paragraph.

When you thought we were large enough, we are adding another repeater to the network. N6VLV Paul, and Mike WA6SVT are putting one up on 7,500 ft. Brecken Ridge, 18 miles East of Bakersfield. Coverage is the San Joaquin Valley and some areas of the Mojave Desert. Frequencies will be 434 in 1277.25 out with a 1289.25 MHz. FM link to the Crestline repeater.

ATV Frequencies are as follows:

146.43 ATV primary calling and coordination
144.39 ATV simplex calling and coordination for simplex ATV
426.25 Simplex video/ATV repeater input
434.00 Primary repeater input
913.25 Simplex ATV (VSB req.)
1265.25 Simples ATV

**Please do not use 144.90 as it is for packet communications in Southern California.

ATN Repeaters 434.00 input:

1253.25 Santiago
919.25 Crestline
919.25 Oat Mt.
1253.25 Mt. Potosi/Nevada
1277.25 Santa Barbara
1241.25 Quartsite Mt
913.25 Santa Cruz
1277.25 Mt. Brecken Ridge

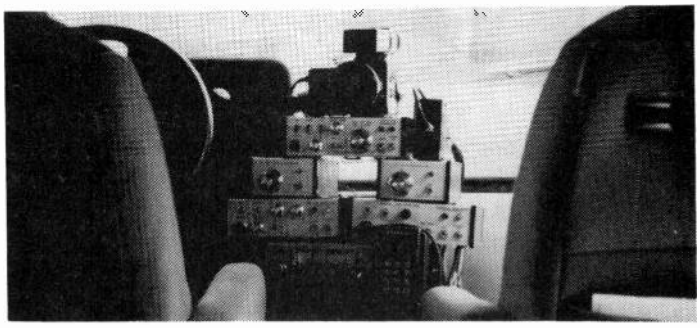
Other So. California repeaters

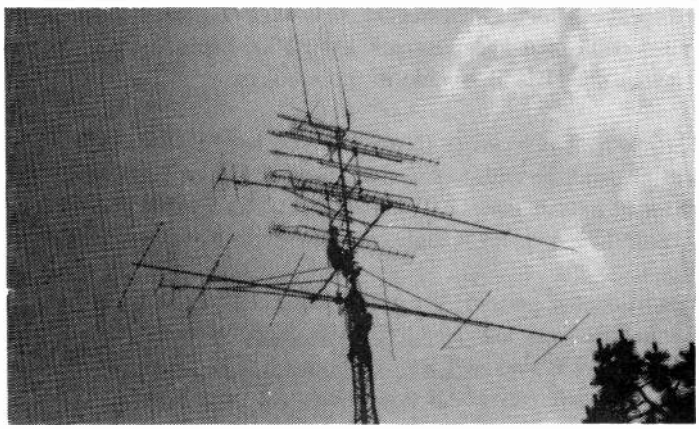
1241.25 Mt. Wilson
1277.25 San Miguel Mt.
1253.25 Sulphur Mt.

KB9FO'S THREE BAND ATV MOBILE REPEATER

Tired of the same old 1000 mile ATV DX?! Try a little mobile action, then suprise your contact when you duples their signal back to them! Always willing to try something new, Henry KB9FO, set up a three band (440, 900, 1260) ATV mobile station by stacking PC gear on top of his other mobile ham equipment. Using his Elk ID and PC VOR-2 unit (see Jan 90 ATVQ) and a 1 x 3 rf switch for receive, any of the receivers can be seen on the TV set. The video of the TV set is fed to the VOR, which then feeds all the transmitters. By selecting rx/tx combinations any band can be repeated into other band! Mobile antennas include a KLM 1300 Mhz yagi (bottom) a KLM 18cy yagi (circular) (top) and a home made (by KDØLO) 900 Mhz 6 db gain "baseball bat" vertical. Now I can work all the crossband repeaters mobile as well as at home!.

Looking for 900/1200 midwest DX? I just added 4 Downeast Microwave 1200 Mhz loop yagis, using 1/2 heliax for splitter feeders and 1 5/8" feed for 1200. Beaming a 1 watt beacon east over the lakes with 200 watts in reserve for QSO's. Also on 900 Mhz using 2 F9FT's one for tx one for RX. Want a SHF QSO?





For size comparison, there are 2 men working on the tower in the picture!

TIPS ON INSURING A SUCCESSFUL BALLOON LAUNCH

BY DAVE PELAEZ AH2AR/8

The following list is to help clubs or individuals in preparing for an ATV balloon flight. There is certainly more than one way to organize this kind of activity, and the information provided here can be tailored to suit the needs of this type of project.

(1) Plan the event far enough in advance so you can get the word out to the many Ham magazines before their cutoff dates.. Consider sending a news release to some overseas publications if you will be launching a beacon on one of the HF frequencies.

(2) Use 1 or 2 active 2 meter repeaters in the local area for launch site or Radio Direction Finding coordination operations. This will alert more local Hams of the activity who might not have word of the flight.

(3) Assign Hams to the following tasks to break up the work. (A team effort makes for a smoother operation.)

(a) Lifting body coordinator
(b) HF net controller
(c) Electronics integration
(d) Crew chief for Fox Hunting
(e) Event organizer
(f) Site communications to HF net and RDF crew
(g) Computer tracking program coordinator
(h) Power supply fabrication
(i) Package fabrication
(j) Launch site coordinator (insures critical times are logged and the power supply is switched on before liftoff!)

(4) Have a back-up balloon and enough helium available to fill another balloon in case of a balloon failure.

(5) Video tape historians should be taping the launch and the recovery operations.

(6) Configure the package so the package power up switch can be accessed by only those who are familiar with the package. This could buy the Fox hunter crew the time they might need if the package is picked up by a non participant A reward sign posted on the container should also help aid in the package's recovery if the package lands in a remote location.

(7) It takes about 20 minutes to fill up a weather balloon using a standard party balloon regulator. Plan lift-off time to coincide with the filling operation, with some padded time if balloon number one fails.

(8) Try to launch on-time. This is the biggest irritant to hams who have to plan to be around for the launch. It also irritates the DXing stations if you have delays or last minute schedule changes. Prepare the package the night before the launch to insure an on-time lift-off. There is no excuse for a delay of launch (except bad weather).

(9) Eliminate the package spin problem by installing a marine swivel above the parachute and place an uncut three foot piece of balsa wood as a vane outside the package.

FOR SALE

Crush the competition! Work that DX Now! Motorola/Eimac 300 watt out for 5 watt in amp. Uses single 8874 in air cooled cavity. Tuned to 426.25. Amp is brand new with Motorola test sticker which says 298 watts out! With companion used base HV supply and bias supply. Variable bias and filament control with auto filament cutback during transmit. Also Motorola matching meter and speaker panel with 4 meters, new with original meter protect shunts still on. All rack mount. First $600 takes it! Buyer ships or picks up. UPS shippable in three boxes.

Start your own repeater (Now that you have the power!) PC 1 watt transmitter with subcarrier sound in Dicast Hammond box mounted to rack panel. TX talley light. Ready to go on 426.25 with BNC video, XLR audio and DC with N output. $200

Remote control your ATV repeater using our Regency UHF single channel receiver and Heath DTMF decoder. Now on 448.650 MHz. There is also a GLB programmable CW ID'er all mounted on a nice rack panel. All three items for only $200.

Get some serious remote control going with a Connect Systems CS100 DTMF decoder with 16 output relays. Beautiful rack mounted solid state item with terminal strips for function connections. Was over $500 when purchased. Will take $300.

New, PC downconverters. One 900 one 1200 (Tuneable) and 1 1200 mast mounted downconverter. 20% off new price.

Telemet test signal generator. Solid state. Broadcast grade. Multiburst, ramp, stairstep, modulated ramp, etc, does not have color bars. Gen-lockable, lots of ins/outs to play with. $300.

Consumer style video enhancer, noise reducer. RCA connectors. Does what it says! Includes a/v 4 output da. $50.

All items FOB Des Plaines. 708 803 8443. 6-9 PM CDST

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450 TRANSMITTER

- POWER OUTPUT IS 3 W PEAK
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- SYNC STRETCHER FOR OPTIMUM COMPOSITE VIDEO
- STANDARD CRYSTAL FREQUENCY: 439.25 MHZ or 434.00 MHZ
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- REQUIRES 13.8V DC AT 600 MA PLUS CAMERA POWER (1 amp)
- RF TIGHT ALUMINUM CABINET WITH BRUSHED ALUMINUM PANEL CUSTOMED DESIGNED BY W9YL
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- INCLUDES SEND-RECEIVE RELAY

FACTS 450 TRANSCEIVER

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- 10 PIN CAMERA CONNECTOR ON BACK PANEL, BNC OR RCA CONNECTOR ON FRONT PANEL
- MONITOR VIDEO FROM CAMERA OR DETECTED VIDEO OUTPUT
- ALL NEW VIDEO AND AUDIO CIRCUITRY WITH SYNC STRETCHER
- NEW TWO CHANNEL AUDIO SYSTEM ON TRANSMIT (SEE OPTIONAL RECEIVER BELOW)
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- REQUIRES 13.8 V DC AT 2 AMPS
- LARGE HEAT SINK

900 MHZ OR 430 MHZ

- 915 OR 430 MHZ FM-ATV TRANSMITTER
- POWER OUTPUT IS 8 WATTS
- 4.5 MHZ AUDIO SUB-CARRIER
- USES NEW PHASE LOCK LOOP CRYSTAL CONTROLLED EXCITER

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- 1255 MHZ FM-ATV TRANSMITTER (Any optional freq.)
- POWER OUTPUT IS 4-5 WATTS
- 6 MHZ AUDIO SUB-CARRIER (Requires 1 V PP Audio)

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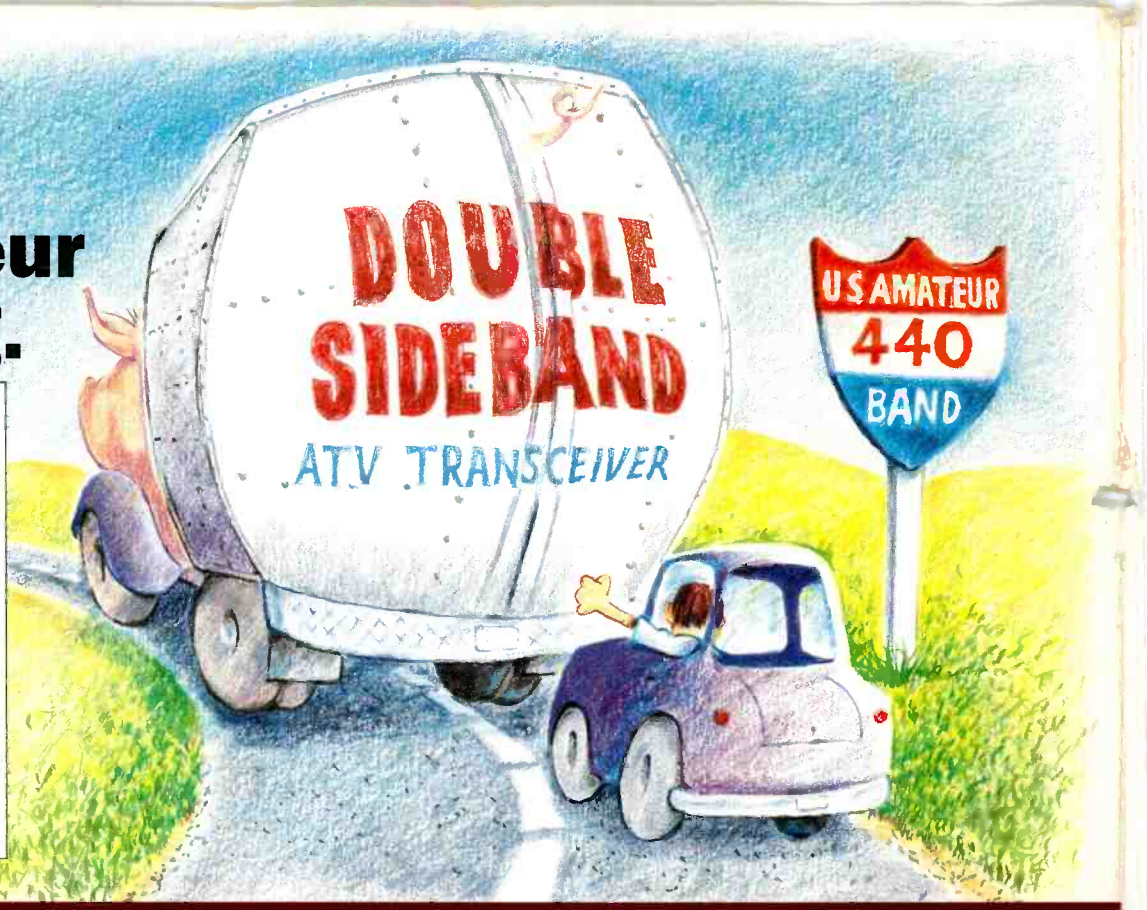
Don't Be An Amateur Band Hog.

If you're using a traditional double-sideband (DSB) Amateur Television transceiver, you're, in effect, hogging the band. DSB not only wastes power on the unused sideband, but uses almost twice the spectrum necessary. Not good, considering how limited the spectrum is to begin with.



VSB-70 with Vestigial Sideband

The VSB-70 from AEA is the only amateur television transceiver that uses Vestigial Sideband (VSB), the same modulation method used by commercial TV stations. Our VSB technology reduces the unwanted sideband over 40dBc! More power where it should be and less wasted spectrum space.

Also available is the RLA-70 mast-mount linear amplifier (with power supply), which boosts your signal while preserving the characteristics of VSB.

Be a good spectrum neighbor. Use the AEA VSB-70 ATV System.

For a complete specification sheet on the VSB-70 or any other product, call 1-800-432-8873.

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