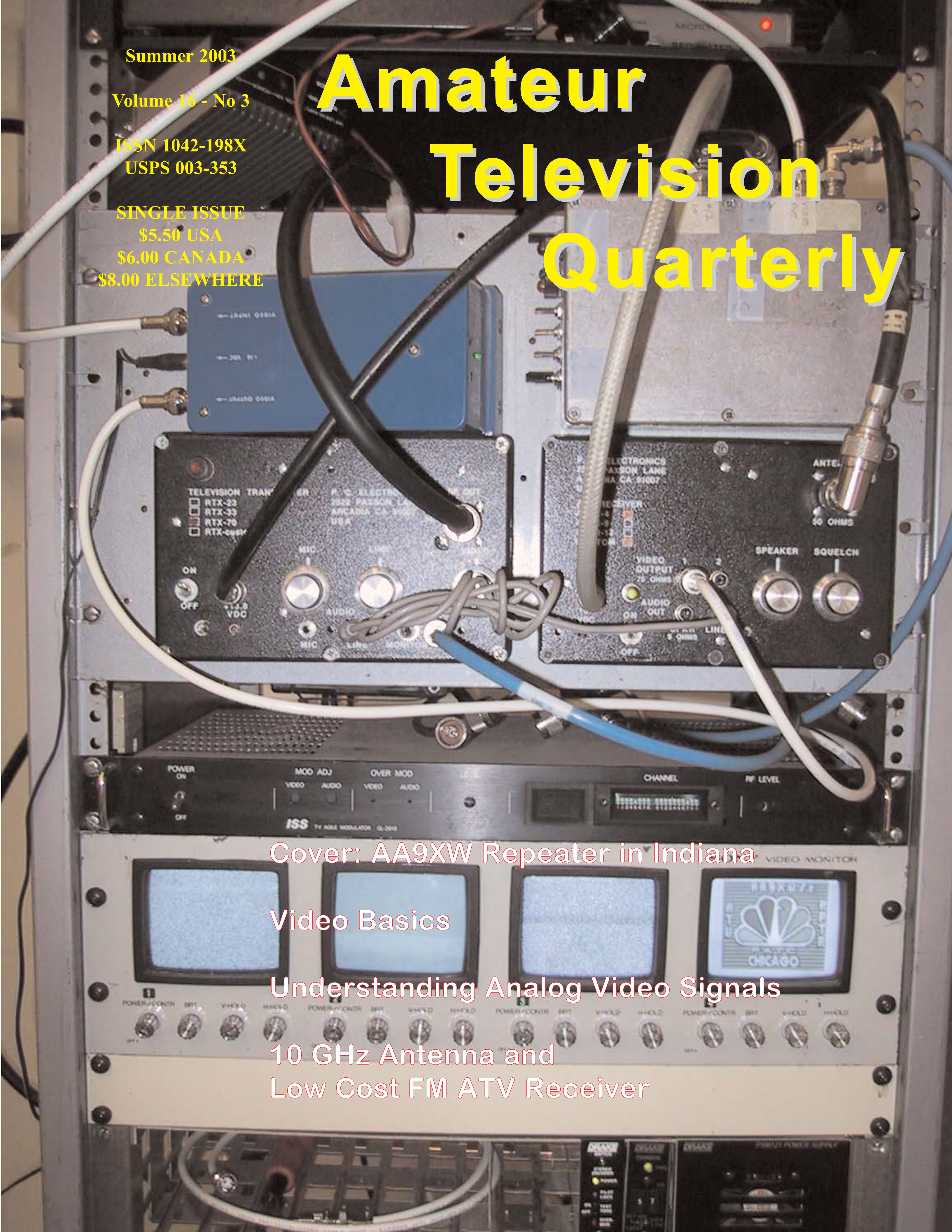
Summer 2003

Volume 16 - No 3

ISSN 1042-198X
USPS 003-353

SINGLE ISSUE
$5.50 USA
$6.00 CANADA
$8.00 ELSEWHERE

Amateur Television Quarterly



Cover: AA9XW Repeater in Indiana

Video Basics

Understanding Analog Video Signals

10 GHz Antenna and
Low Cost FM ATV Receiver

P. C. Electronics 2522 Paxson Lane Arcadia CA 91007-8537 USA ©2003
Tel: **1-626-447-4565** m-th 8am-5:30pm pst (UTC - 8) Tom (W6ORG) & Mary Ann (WB6YSS) O'Hara
24 hr FAX order line 1-626-447-0489 Email: tom@hamtv.com

Web site: www.hamtv.com

ATV Application notes, links, catalogue, price list, etc.

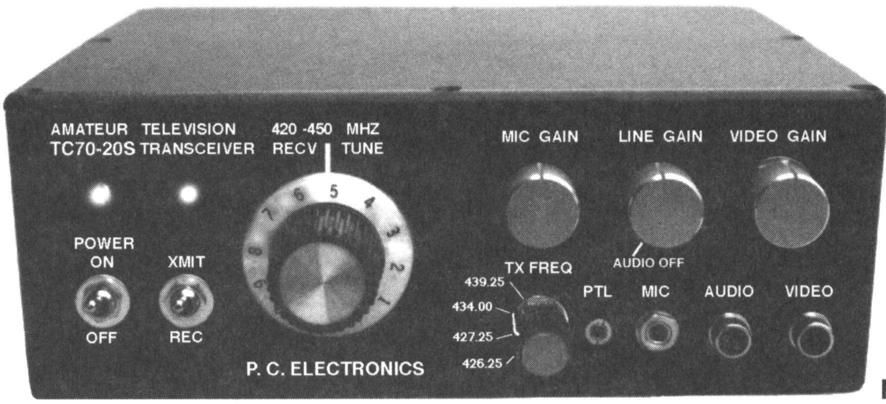
PC ELECTRONICS Est. 1965

AMATEUR TELEVISION TRANSCEIVER

Got the ATV Bug ?

***NOW* with Synthesized Transmitter TC70-20S ONLY $549**

Total price shipped within 24 hrs of your call via UPS surface in the contiguous USA, Visa/MC



All you need for 420-450 MHz ATV in one box!
Plug it in and you are ready to play with this fun mode, Just add camera, TV, 13.8 Vdc @ 5A and 70cm antenna and you are on the air!

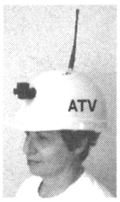
≥20 Watts p.e.p. Output -Adjustable, down to 2 watts pep to drive 100 watt amps like the Mirage D1010N-ATV

Made in USA.
Sales only to licensed Radio Amateurs and for legal Part 97 applications.

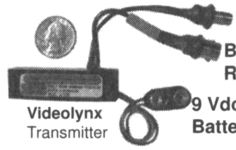
Front panel select 426.25, 427.25, 434.0 or 439.25 MHz transmit frequency, no more extra crystals to buy - other freq. by special order. Sensitive low noise GaAsfet downconverter tunes whole 420-450 MHz 70cm band down to your TV channel 3 or 4 for receiving. The rear panel has a type N antenna jack, type F jack to the TV set for receiving and phono jack for optional tx camera video monitor. Front panel phono jacks accept composite video and line audio from your camcorder or VCR. Requires 12-14 Vdc @ 5 Amps. 100% duty cycle. Line of sight DX is over 100 miles with DSFO ATV-25 ($169) antennas at both ends, 21 miles with OAL 5L-70cm's ($75).

Hard Hat Cam, R/C Vehicle, Rocket, Balloon ATV

App notes available on our web page 3



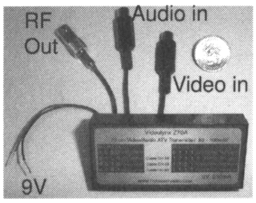
LB-1000



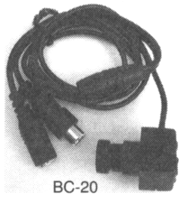
LB-1000 mini color camera.$99
1.5" sq., 3oz., *380* lines, 6mm lens, Sony CCD, mic/line audio output, takes just 9Vdc @40ma. RCA A/V jacks.

Videolynx 434 MHz Video Xmtr.$99
50-100 mW, .6x.8x2.3", 1.5 oz., 9V@40ma
Great for line of sight up to 1/2 mile. Use LB-1000 or BC-20 color camera.

Video ID Boards from Intuitive Circuits
See page 7 of our catalogue and at www.icircuits.com
Overlay your call, GPS or other info on your camera video
$99 to $139

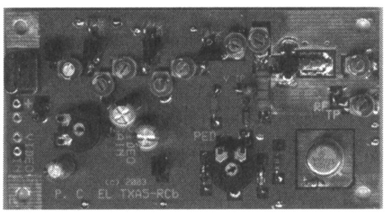


Videolynx Z70A 4ch ATV Xmtr with sound.$149
Now you can plug in the line audio from the LB-1000 color camera and have audio with your hat cam. Digi-switch select 439.25, 434.0, 427.25 or 426.25 MHz as well as internal video and audio test generator. 50-100 mW RF out, .75x1.5x3.25", 4 oz., 9V@250ma.- run two 9V alkalines in parallel for the Hard Hat Cam or R/C vehicle.



BC-20

Micro-mini color Camera...$99
BC-20 is perfect for R/C vehicles weighing only 1 oz. & 1.0 x .75" sq. Runs on supplied 12Vdc PS or 9V alkaline battery. RCA phono jack video output. lens included. 330 line resolution. Use with Videolynx transmitter for 1/2 mile radius around a flying field.



***NEW* Smaller TXA5-RCb 1.5W TX........$139**
We have reduced the size of our popular 1.5 watt 70cm ATV transmitter board to 1.8x3.5 inch size and 2 oz. weight to accomodate more R/C vehicles. Adjustable RF out - 1.5 p.e.p. to 100 mW. Draws 350 MA @ 13.8 Vdc at 1.5 Watt p.e.p., 200 ma at 100 mW, runs on 11 to 14Vdc. Has adjustable sync stretcher and provisions for sound from the FMA5-F board. Comes with one xtal.

NEW!
23/33FMR-3 Receiver
RCA A/V jacks. Digi-switch select frequency. 5x3x1" Imported.

FM ATV RECEIVER 23/33FMR-3....$169
Dual band synthesized 5 ch 33cm, 11 on 23cm including 910, 915, 920, 1252, 1255, 1265, 1280 and others. Very sensitive, doesn't require a preamp in the shack. 12V 300 ma PS, F to N jack adaptor and opt. video de-emphasis parts included.

FREE UPS surface shipping in the Cont. USA on orders over $70

http://www.hamtv.com 7/2003

Hams, ask for our free ATV catalogue or download from our web site - AM, FM, 70cm to 10GHz
Application notes can be downloaded or requested from page 3 of the web site - We have it all!

Name Tags by Gene

New from Harlan Technologies - beautiful, colorful, plastic name badges! Available with locking safety pin, magnetic bar, luggage strap, or lanyard.

These colorful badges can be made from our sample artwork, or if you like to be creative, you can make your own. Great to have a club badge with your club logo, or for proper identification with group such as ARES.

Prices

Badge with safety pin....................................$10.00
Badge with magnetic bar $12.00
Badge with luggage strap $10.00
Badge with lanyard......................................$10.00

You must see our many designs on our web page: www.hampubs.com
Order your new name tag today!

Name Tags by Gene

Beautiful COLOR name tag / badges with photos, artwork, or plain colored backgrounds.

Design # from book ____________________ or
Background color ____________________ or
Picture file name ______________________

Picture insert #1 ________________________
Picture insert #2 ________________________
Picture insert #3 ________________________

TEXT
Line #1 ________________________________
Line #2 ________________________________
Line #3 ________________________________
Line #4 ________________________________
Line #5 ________________________________
Line #6 ________________________________

Name _____________________ Call _______
Address __________________________
City ________________State ___ Zip ______
Phone _____________________________
QTY _______ @ $10 = $ _________________
QTY _______ @ $12 = $ _________________
QTY _______ @ $10 = $ _________________
QTY _______ @ $10 = $ _________________

Credit Card #___________________________
Expires ____________________

Signature ______________________________
SPECIAL
Shipping FREE in the USA till December 31, 2003

Harlan Technologies
5931 Alma Dr.
Rockford, IL 61108
815-398-2683 voice --- 815-398-2688 fax
www.hampubs.com

AMATEUR TELEVISION QUARTERLY

Published by
Harlan Technologies

Publisher/Editor
Gene Harlan - WB9MMM

Contributing Editors
Ron L. Sparks - AG5RS
Mike Collis - WA6SVT

Editorial Office
5931 Alma Dr.
Rockford, IL 61108
(815) 398-2683 - voice
(815) 398-2688 - fax

Internet:
http://www.hampubs.com
email: **ATVQ@hampubs.com**

Amateur Television Quarterly (ISSN 1042-198X) is published quarterly, in January, April, July, and October for $20.00 per year by Harlan Technologies, 5931 Alma Dr., Rockford, Illinois 61108-2409. Periodicals Postage Paid at Rockford, IL and additional mailing offices. POSTMASTER: Send address changes to: Amateur Television Quarterly, 5931 Alma Dr., Rockford, IL 61108.

Amateur Television Quarterly is available by subscription for $20.00/yr in the USA; $22.00/yr in Canada; $29.00/yr elsewhere. Single issues $5.50/USA; $6.00/Canada; $8.00 elsewhere.
Send all address changes to: Amateur Television Quarterly, 5931 Alma Dr., Rockford, IL 61108

Amateur Television Quarterly

TABLE OF CONTENTS

Editors Notes

I hope everyone is getting lots of contacts for the ATV contest. I have heard that there have been a couple of band openings that may have helped. It will be interesting to see what everyone gets.

I am excited about the ATV repeater that we are putting up here in Rockford, Illinois. This is a first for me as I have never tried to put up any kind of repeater before. I will try to let you know our trials and tribulations as we go along. You can read more on page 40.

It sounds like Henry, AA9XW, has his ATV repeater up and running. Have you used it? If so, write me a note and tell us what you think.

We had one heck of a storm go through on the morning of July 5th. I can not believe that we went out and bought a 5 KW generator three weeks before. It got it's workout as we were without power for 4 days. Shari and I were lucky that we did not appear to have any damage as others right next to us did. Our friends next door lost a nice, huge, hard maple that split twice vertically down the trunk. And we have large trees in back of our house that just laid over like toothpicks, all going the same direction. They say that we had a micro-burst with winds sustained at 60-80 mph and gusts to over 100 mph. I must say that when it went through at a little after 4 AM on July 5th, it woke most of us up! We must have had over 30 trees down in our neighborhood alone.

Shari tried to use our Ham IV the other day and it has decided to stop turning. I was up the tower once just to check wires and they seem to be OK, so I will have to drop the rotor and check it out. The electrical measurements do not check out when I check per the manual.

ATVQ

Gene Harlan - WB9MMM

ATV Mailing List

I've not received any traffic from the Tallahassee reflector in ages. I miss it!

I don't know what has caused this to happen, but I'd like to know what's going on around the country in the ATV space. Please consider posting your ATV-related information and comments to the reflector I've set up for that purpose. Surf to http://www.k4ttt.tv and click on the ATV Mailing List link.

If you have any concerns, comments, or questions, you can contact me from that web site.

Rik Albury - K4TTT-TV rik@ticnet.com

ATVQ

10 GHz Antenna And Low Cost FM ATV Receiver

by Ken Morris, W8RUT - ken.morris@us.abb.com
3181 Gerbert Rd., Columbus, OH 43224
& Bill Parker, W8DMR - Email: w8dmr@cooper.net
2738 Floribunda Dr., Columbus, OH 43209

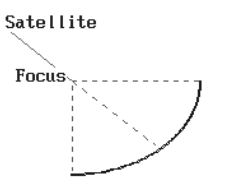
The Antenna

Axial-fed parabolic antennas are not presently as available as the offset-fed dish antennas. Offset-fed antennas have advantages, namely, (1) less expensive and (2) increased gain because of less prime aperture blockage.

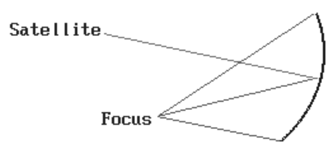
Knowing how to correctly aim the offset-fed assembly is not immediately apparent. With a bit more information, the aiming alignment and focal length can be determined.

Examples of the axial-fed and the offset-fed parabolic reflector type of antenna are shown aimed above the horizon to receive satellite signals.

The offset-fed dish reflectors, beige or grey in color, measure about 18 by 21 inches, weigh about 8.5 pounds including the sturdy mounting brackets and clamps.



Axial-fed Antenna.



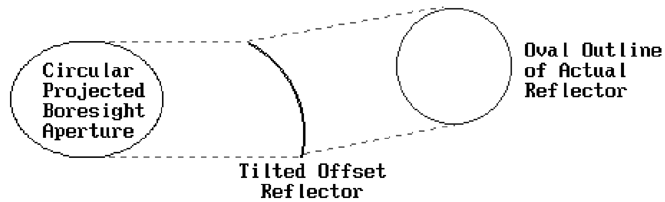
Offset-fed Antenna.

New, wire-mesh, not solid, axial-fed antennas of comparable size, cost about $100. Discarded, solid metal, like new, dish reflectors are $5 to $10 at local garage sales, hamfests and flea markets.

From Oval to Round

The tilt angle and the focal length with relation to the offset reflector need to be determined.

Many offset parabolic reflectors are oval in shape. When viewing along the RF boresight, the reflector appears circular and not oval in shape. The top of the reflector must tilt forward if the beam is to be aimed toward the horizon.



The Tilt Angle

The tilt angle between the horizon and the cord of the offset parabolic reflector is equal to the inverse sine (arcsin) of the short length divided by the longer length dimensions of the reflector.

The horizontal width is 18 inches and the vertical height is 21 inches. The arcsin of the ratio of 18/21 (or 473/538 mm) equals about 0.879 and converts into an angle of 61.6 degrees.

With the reflector tilted 61.6 degrees above the horizon the aim point of the feed assembly may be calculated. Assuming the offset reflector is a section of a conventional asial-fed dish and offset by the amounts of Xo and Yo, then the focal length, F, and can be determined from:

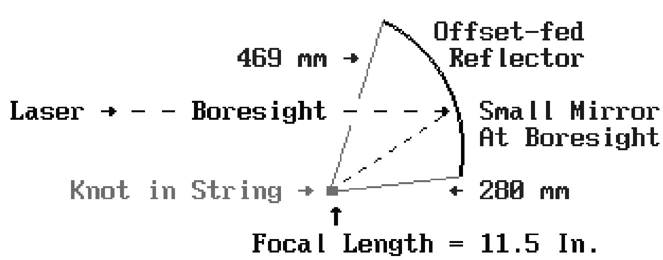
$$F = (Y + Yo)^2 / 4(X + Xo)$$

The Focal Point

The focal length is 280 mm from the bottom and about 469 mm from the top of the reflector along the vertical axis.

N1GHZ, Paul Wade, used a piece of string with a knot tied in it to aid in determining the focal point.

Place the knot 280 mm from the lower end to help locate the focal point. The total length of the string I used was 749 mm (29.5 inches). Allow 2 inches more to permit using tape to tem-



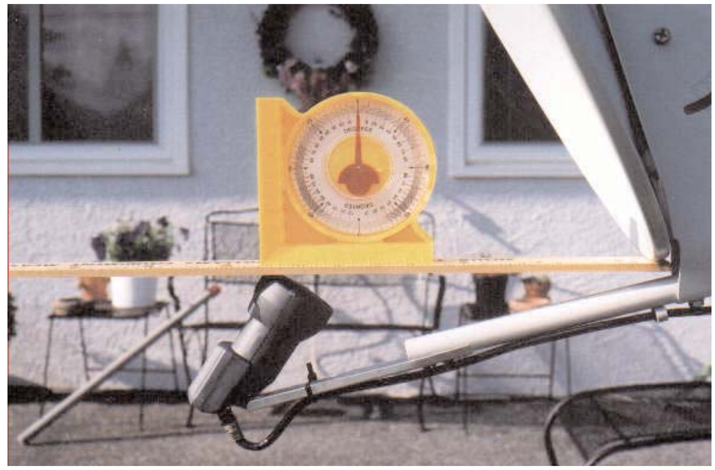
10 GHz (3 cm) oval shaped reflector with ruler temporarily in place to indicate horizontal plane. The offset feed is below and not in the boresight aperature. The reflector is tilted forward to cause the RF beam to be aimed toward the horizon.

Cord shows where the focal point is located. Cord is attached at the top & bottom centers on the vertical center line of the oval shaped reflector. Cord is removed after the focal distance is determined. RG-6 cable exits at the right.

porarily fasten the string.

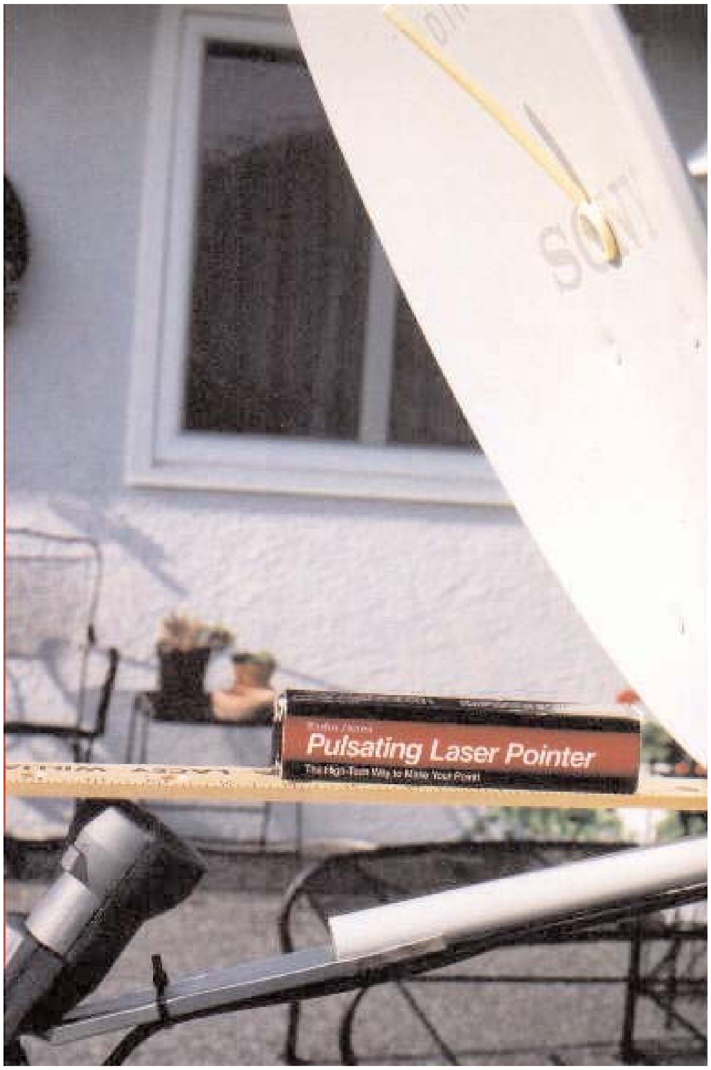
Aiming a laser pointer toward a small mirror placed at the boresight of the reflector, the coherent light was reflected back onto the center of the face of the LNB.

The approximate f/d ratio is 0.7. The illumination angle is about 76 degrees and 78 degrees for the short and long axis, respectively.



Inclinometer indicating "0" degrees as the horizontal reference.

Inclinometer indicating 61.6 degrees, the tilt forward angle.



Small round mirror temporarily taped to the offset reflector. Carton showing type of low power laser used in boresighting (see text).

Offset reflector and LNB downconverter connected to satellite receiver and small television monitor for a complete 100 GHz FM ATV receiver.

Gain To Expect

Gain in the range of 30 to 32 dBi minimum should be obtained if reasonable care is exercised.

The dish assembly was originally designed for use between 12.2 and 12.7 GHz. It was used for DirectTV reception and has the Sony brand name.

Low Cost 10 GHz FM ATV Receiver Components

A low noise block (LNB) downconverter for 10 GHz (3 cm) is available from G8OZP, Bob Platts for about $57. The low noise figure (NF) of the downconverters greatly aid in extending the length of transmission paths.

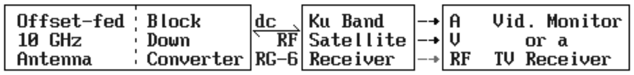
The LNBs permit propagation via tropo, scatter and other surface ducting modes to be utilized. In conjunction with offset-fed parabolic antennas, FM-TV signals in excess of the short line-of-sight (LOS) are possible.

Converters using 9.0 GHz local oscillators with 10.0 to 10.5 GHz inputs provide an IF output in the 1000 MHz to 1500 MHz range. Connected to a KU band satellite receiver (IF = 950-1450 MHz input), excellent audio and video baseband recovery can be obtained.

The LNBs offer noise figures of 0.7 dB, operate on 11-14 VDC (Vert. Pol,) and 16-19 VDC (Hor. Pol.). A single F-type connector accommodates both the IF signal output and the DC power input. The LNB also employs a low noise local oscillator. Case is die-cast aluminum.

Block Diagram

The 10 GHz FM ATV receiver consists of the offset-fed parabolic antenna and the block downconverter, with a KU-band satellite receiver to demodulate the wide-band IF signal for recovering the audio and video signals.



The satellite receiver tunes 950-1450 (24 channels). If a video monitor is connected, audio and video cables are needed. When a TV receiver is used, the satellite receiver provides RF (Ch. 3 or 4) to the antenna input of the TV set. One RG-6 cable with F connectors, one each A/V cable, and no soldering is required. Just plug and play!

ATVQ

Second Digital ATV Test At DB0HEX Brocken Mountain, Northern Germany

End of January 2003 once again digital ATV was activated at DB0HEX, and the next day already in Verden at DB0VER a digital Sat-TV-receiver was installed in order to forward the signal in analog ATV to DB0OZ in Bremen. Because of some "linking" these digital activities were to be seen also via DF0HHH (Hamburg) in Schwerin and in Timmendorf (Baltic Sea) as well as via DB0WTV at DB0LTC (North Sea). The distance from DB0HEX to DB0VER is approx. 164 km.

At first we tried two simple Sat-receivers for home use at DB0VER, one of them being a HUMAX F1-Fox. The signal strength from DB0HEX was a bit "thin" resulting in "blocking" effects now and then. In the evening conditions went down and brought up a black screen until next day. After a mains blackout at DB0VER the HUMAX receiver lost his frequency setup, as with its software the LO is set to 9750 MHz automatically after power on (and not to 0 MHz as preset).

Some days later a commercial Philips Sat-TV-RX was tried, but it showed no picture from DB0HEX. On 21. of February the digital picture reappeared again after exchanging the receiver with a "DR-1000". There were no blocking effects at all until the 6. of March in the evening, when the picture "froze" for about three quarters of an hour and once again later for some minutes.

All in all this experimental transmission was a fine success, and we have to thank the crew at DB0HEX. Some "glitches" should be noted: there were regular interruptions (every 10 or every 30 sec.) with a black screen and no sound. A noisy picture from the analog input at DB0HEX was transmitted without additional digital side effects. Another question is mobile reception using DVB-S (QPSK) modulation...

My Sat-TV receiver has a display for signal strength and one for quality (bit rate error). Above 17 percent of quality a full picture is shown, which can be different with other receivers. The rf preamplifier plays an important part here. Another astonishing effect was the audio delay resulting in multiple echoes if someone replayed his relayed signal, also the delayed movement on the repeater output picture!

End of February even some direct digital ATV contacts between OM in the Hamburg area could be observed via DF0HHH. After the end of digital experiments at DB0HEX we were able to see the difference - colour noise on strong reception signals and on the camera picture with analog FM-ATV! Besides the noise free digital signal there is an advantage in the possibility to choose from up to four "channels". This is state of the art after my observation - an additional analog output would be fine (for some time), but is not possible everywhere.

Jürgen, DL3FY

ATVQ

TV-AMATEUR 128, Page 34
translation by Klaus, DL4KCK
AGAF e.V.
www.agaf.de

INTERNATIONAL - IRELAND: FIRST ATV REPEATER ON THE AIR

Northern Ireland's first amateur television repeater is now on the air.

GB3TX has been built and installed by the Amateur Repeater Group of Northern Ireland at 1000 feet above sea level. The repeater receives on 1249mhz, transmits on 1310MHz and and reverts to beacon mode when not repeating. Coverage should extend to south-west Scotland and northern parts of the Isle of Man. (GB2RS)

ATVQ

Understanding Analog Video Signals

Used with permission from
Dallas Maxim
http://www.maxim-ic.com

This paper describes the analog video signals used in both broadcast and graphics applications. Topics covered include video signal structure, video formats, standard video voltages, gamma correction, scan rates, and sync signals.

This paper describes the analog video signals used in both broadcast and graphics applications.

There are two forms of video in general use today: broadcast and graphics. While broadcast is based on terrestrial television, the graphics format was developed to meet the needs of workstations and PCs without regard for the formatting and bandwidth limitations needed in TV signal transmission. The broadcast graphics format is specified by government agencies such as the FCC in the US and the ITU in Europe, while the graphics format is specified by industry or company standards. Originally, both formats shared a common baseband signal structure, specified in EIA-RS-1701, but that changed when color was added to broadcast TV in 1953.

Monochrome TV required a single luminance signal and the required transmission bandwidth was moderate. A simple conversion to color, with the requirement for three video signals — one for each of the additive primaries of red, green, and blue (RGB) — would have tripled the required bandwidth. To circumvent that need, broadcast invented NTSC, PAL, and SECAM — analog encoding methods employed to squeeze color into the original monochrome channel bandwidth. In the process, broadcast invented all of the analog baseband formats used in video today. Graphics didn't require the limited bandwidth, and remains as three separate RGB channels.

The three formats for baseband video signals — native primaries, component, and composite — form a hierarchy that is the basis of all video, whether analog or digital, broadcast or graphic. We'll see how the formats are derived, and what sort of problems there are in handling them, and why. The issue of video quality is also discussed as a function of format.

Broadcast and graphics have other differences that are not immediately obvious. Broadcast video has a property called gamma (), which graphics lacks. Broadcast uses interlaced scanning while graphics uses progressive scanning. Two types of video displays developed because of these differences; one for TV and another for the PC. We'll look at why they are different and how they can share a display.

Broadcast and Graphics Analog Video Signal Structure

The signal structure of broadcast video is more complex than a graphics video signal because of the analog encoding process used in converting it to the composite signal2 needed for modulating a TV transmitter. In this process, all the other video formats are created, starting from the native format3. The formats are native primaries, component, and composite video. Only broadcast video uses encoding. There are no component or composite video signals in a PC today.

Originally the PC used a TV format in the display. Graphics only has a single RGB format, but it has evolved to include multiple scanning rates for increased resolution. The need for higher resolution was driven by the short viewing distance, typically between one and three screen heights, compared to TV which is typically observed from six or more screen heights away. Based on a minimum resolvable area of one arc-second in the human eye, a graphics display is enhanced greatly by increased resolution, while the TV wasn't until larger displays became available.

NTSC4, PAL5, and SECAM6 are the names of the broadcast video formats developed in the US, Germany, and France to encode color video and sound into a single signal. All reduce the quality of video in two ways: bandwidth reduction, and artifact generation. Bandwidth reduction reduces the resolution7, while artifacts are the crawling, or hanging, dots on an edge. The latter is the most objectionable to viewers, while the former is seldom noticed.

The broadcast video formats have these characteristics in common:

⇨All use amplitude to encode the "Luma" portion of a signal (Y') as the weighted sum of R', G', and B'.
⇨All have a reduced-bandwidth component-video form.
⇨All use subcarrier(s) phase or frequency to encode color or "Chroma".
⇨All include sound subcarrier(s).
⇨All result in a single wire form called composite video, suitable for terrestrial RF transmission.
⇨Video formats can be viewed as a hierarchy8 (Figure 1):

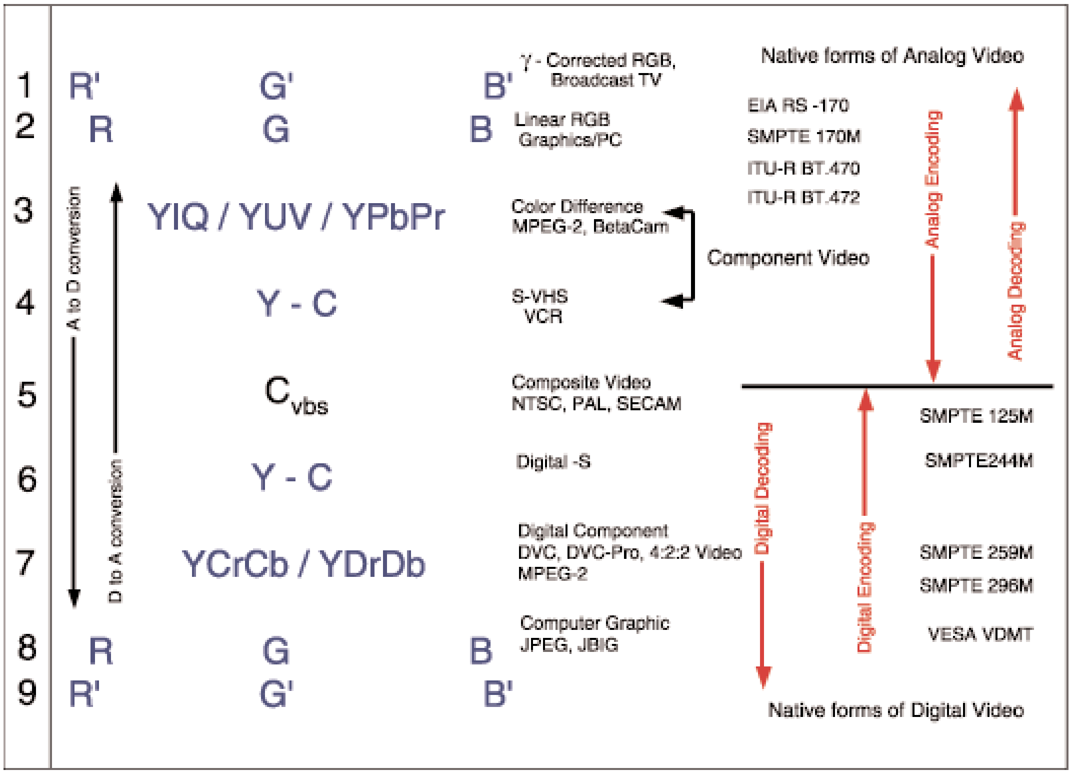


Figure 1. The Hierarchy of Video

Native Primaries

The first line in the hierarchy is R', G', B', where the prime mark (') indicates gamma () correction. This is the native form of broadcast video. The second line is linear RGB, the native form of graphics, with no prime mark. This convention is misused in some texts, making it difficult to follow through the literature. Here, we'll use a prime to indicate the -corrected form, in accordance with the SMPTE and ITU standards in Figure 1.

The bandwidth of the signals RGB and R'G'B' are equal and determined by the video resolution9. This is as good as it gets. Any further signal processing degrades the video quality, which is why graphics stuck with RGB. A viewer may not perceive this degradation if human vision or the display can't resolve it. Broadcast used human perception factors to design the composite signal for TV. HDTV, PAL plus, and MPEG all later rejected composite and native primaries, and decided to use the next form — called component video — to improve video quality.

Component Video

The third and fourth lines are the two forms of component video, color difference (Y'PbPr/Y'UV/Y'IQ) and Luma-Chroma (Y'-C)10. Sometimes, there is confusion about the terms used. Some texts use the terms Luminance and Chrominance, which are from Color Science. Here we'll use Luma and Chroma where the Luma term is written with a prime (Y') to indicate the non-linear video form.

The Color Difference form is produced by the linear addition and scaling of R'G'B' to implement the well-know equations;

Y' = (Kr Er') + (Kg Eg')+(Kb Eb')

Pb, U, I = Kcb (B' - Y')

Pr, V, Q = Kcr (R' - Y')

The coefficients for Luma (Kr,Kg,Kb), are the same for NTSC, PAL, and SECAM, but the coefficients for the difference terms (Kcr and Kcb) vary according to the process. It is important to remember that the equations apply to the active video portion of the signal and not the sync. They must be separated prior to this process, and combine them again afterwards.

One of the challenges with multiple video signals is that of controlling delay. In order to display an image, the video voltages must be correctly aligned in time. Two types of delay prevent this, flat delay caused by the transmission path length and frequency-dependent delay caused by filters. This applies to R'G'B' and component video. Flat delay is seldom a problem at video frequencies, and any required compensation can be made either by coax cable or delay lines. Frequency-dependent delay is another matter.

Because the R', G', and B' signals all have the same bandwidth, flat delay is seldom a problem, but the Chroma portions of the component signals (Pb, Pr & C) are filtered to reduce the occupied bandwidth. To compensate for the delay associated with this filtering, the Luma signal (Y) must be delayed the same amount.

The Chroma filtering is considered "visually lossless", based on a model of human vision that says the eye doesn't detect small details in color. The analog videotape format of Beta11 is an example of a scaled color-difference format, and S-VHS12 is an example of the Y-C form.

MPEG uses a digitized form of the color-difference signals, designated YCbCr, and shown on the seventh line, where the bandwidth reduction is done by sampling Cb and Cr at half the rate of the Y channel. This is called 4:2:2 sampling, and is based on ITU-R BT.601.

The Y-C component form is produced by phase- or frequency-modulating color subcarrier(s) with the color-difference components, and then adding them together depending on which process is used. The Y channel is the same as in YPbPr, but the Chroma signal is an FM or PM subcarrier that is band-pass filtered, further truncating the color bandwidth.

This is an important point in the encoding process. It's the last place where Luma and Chroma information are separate. Once Y and C are combined, they will never again be totally separated, and that produces the artifacts that give composite its reputation for compromised quality.

Composite Video

The fifth, and center, line is composite video (Cvbs), formed by adding the Luma and Chroma components together with monaural audio, NTSC, PAL and SECAM are composite video signals.

The Cvbs signal is the lowest quality video on the chart and suffers from cross-color artifacts. These are bits and pieces of Chroma and Luma information that remain after we try to separate Cvbs back into R',G', & B' for display. These artifacts became more noticible as broadcast began to use larger, higher-quality displays. Today, Cvbs is more of a legacy format, and will probably disappear as single-wire digital forms of component video take its place.

One odd thing about NTSC Cvbs is something called "setup." This is a voltage offset between the "black" and "blanking" lev-

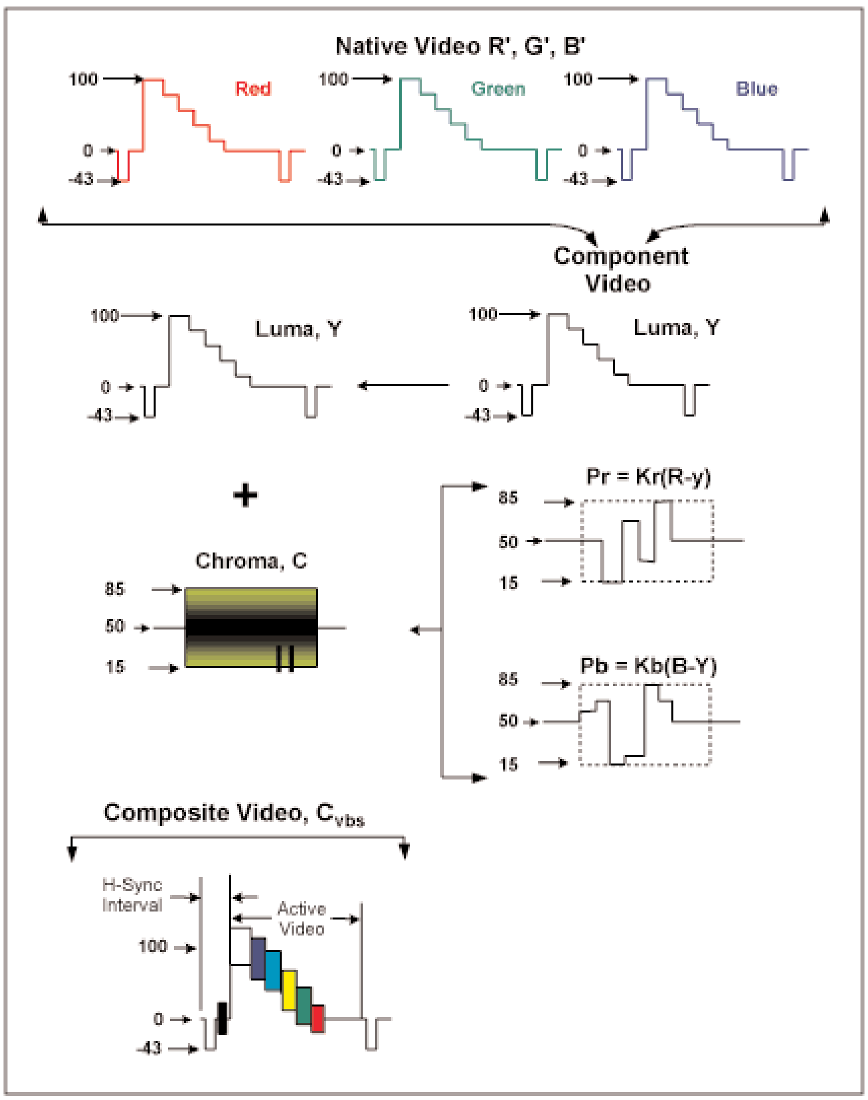


Figure 2. Analog encoding from R'G'B' to Cvbs

els, and is unique to NTSC. As a result, NTSC is more easily separated from its sync portion, but has a smaller dynamic range when compared with PAL or SECAM.

The Video formats are also called color spaces in digital literature, and the encoding/decoding process is called color-space conversion to distinguish it from the analog process. Don't be confused by this — digital video uses the same formats as analog video. The signals produced by the encoding process are shown in Figure 2, along with approximate amplitudes, in percent. Exact amplitudes are given in Table 1 for several of the formats, based on a 1V p-p R'G'B' set of native primaries, across a 75 load. These are the signal values you will see going into or out of video equipment like displays, VCRs, and DVD players.

Linear and Gamma Corrected Video

Originally, video signals were created in cameras using vacuum tube sensors. The output voltage (V) of a tube camera isn't linear in relation to the incident light (B). It's exponential and the exponent is called gamma (). This relationship can be mathematically expressed as

B = K V.

where B is light flux, in lumens per square meter. K is a constant; and V is the voltage generated, in Volts. Since the CRT is also a vacuum tube, with inverse non-linearity (1/) similar to that of the camera tube, the light output is linear with respect to the light input — that is, the inverse gamma of the picture tube compensates for the gamma function of the camera's pickup tube. However, the voltage is non-linear compared to the luminance level. This poses a challenge when superimposing two

R'G'B' Video			
NTSC		**PAL**	
Setup	53.6 mV	Setup	0 mV
R'G'B'	714 mV (Peak Luma, 100% White)	R'G'B'	700 mV (Peak Luma, 100% White)
Sync	-286 mV	Sync	-300 mV
NTSC Japan		**Graphics Linear RGB**	
Setup	0 mV	Setup	0 mV
R'G'B'	714 mV (Peak Luma, 100% White)	R'G'B'	700 mV (Peak Luma, 100% White)
Sync	-286 mV	Sync	-300 mV
Color Difference Component Video			
NTSC BetaCam		**PAL BetaCam/EBU N10**	
Setup	53.37 mV	Setup	0 mV
Y	714.29 mV (Peak Luma, 100% White)	Y	700.00 mV (Peak Luma, 100% White)
Pb/Pr	700.00 mVp-p (75% Color Bars) 933.34 mVp-p (100% Color Bars)	Pb/Pr	525.00 mVp-p (75% Color Bars) 700.00 mVp-p (100% Color Bars)
Sync	-286 mV	Sync	-300 mV
NTSC BetaCam Japan			
Setup	0 mV		
Y	714.30 mV (Peak Luma, 100% White)		
Pb/Pr	756.80 mVp-p (75% Color Bars) 1009.0 mVp-p (100% Color Bars)		
Sync	-286 mV		
Y-C Component Video			
NTSC S-VHS		**PAL S-VHS**	
Setup	53.57 mV	Setup	0 mV
Y	714.29 mV (Peak Luma, 100% White)	Y	700.00 mV (Peak Luma, 100% White)
V	626.70 mVp-p (75% Color Bars) 835.60 mVp-p (100% Color Bars	C	663.80 mVp-p (75% Color Bars) 885.10 mVp-p (100% Color Bars
Sync	-286.00 mV	Sync	-300.00 mV
Composite Video			
NTSC		**PAL**	
Setup	54 mV	Setup	0 mV
Video	714 mV (Peak Luma, 100% White) 934.15 mV (Peak Luma with 100% Color Bars)	Video	700 mV (Peak Luma, 100% White) 933.85 mV (Peak Luma with 100% Color Bars)
Sync	-286 mV	Sync	-300 mV
Burst	286 mVp-p	Burst	300 mVp-p
NTSC-EIA-J			
Setup	0 mV		
Video	714.0 mV (Peak Luma, 100% White) 908.2 mV (Peak Luma with 100% Color Bars)		
Sync	-286.0 mV		
Burst	286.0 mVp-p		

Table 1. Standard Video Voltages

images since you cannot do simple linear addition of, say, a title or other graphic. Video mixers deliver odd results with broadcast signals because of their non-linear luminance. Special-effects generators use linear signals when layering, compositing, titling, etc. Graphics video is linear, which makes it easy to mix graphics video signals. The linear signal is gamma corrected at the display, so it will appear correctly on the display, to allow for the display's gamma.

A beneficial side effect of gamma is that it reduces the effect of additive noise.

Gamma is specified as 2.22 for NTSC and as 2.8 for PAL and SECAM.

Originally, the camera and CRT were thought to be exactly complementary, but they are not. Later it was found that intentionally under-compensating for in the display improved the contrast ratio. Because of that, Sun and Apple, optimized their displays with values of 1.7 and 1.45, respectively, while others use broadcast values. Today, TV and PC display manufacturers all undercompensate for to some degree to improve the appearance of the display.

One thing is certain. You'll need to be able to add, remove, or change to fit the video signal. This is called correction in some texts, which is the addition of to a linear RGB signal. It's really more in the nature of a modification.

Gamma Modification

The addition, removal, or change of can be done in either the analog or digital domain. In analog, it takes the form of a non-linear amplifier where one of the gain resistors around an op-amp is replaced by a real or a piece-wise equivalent to a non-linear impedance. This is non-trivial in terms of design. Analog

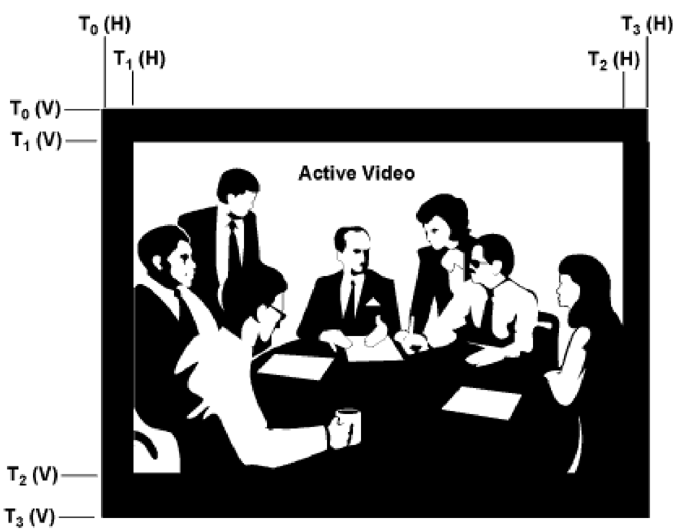


Figure 3. Display raster with horizontal and vertical flyback time

correctors are seldom accurate, and they require trimming adjustments. A side effect of modification is distortion. For these reasons, correction is best done digitally. Note that this only applies to the active video, not to the sync.

The digital process uses substituted values from a look-up table (LUT) stored in software. It's as accurate as the stored value, and trivial in terms of its design. Obviously if the signal is digital, this is the preferred method to use. In either case, we need a formula for the voltage in terms of the light flux (B). Broadcast video has two, one used for standard-definition TV (SDTV), and another for HDTV.

For NTSC/PAL per SMPTE170M and ITU-R BT.709;

E'x = [(1.099 B (0.45)) - 0.099] for 0.018 > B > 1.0

E'x = [4.5 B] for 0> B > 0.018

For HDTV per SMPTE240M;

E'x = [(1.1115 B (0.45)) - 0.1115] for 0.0228 > B > 1.0

E'x = [4.0 B] for 0 > B > 0.0228

Scanning and Sync

Video signals have two parts: the active video and sync. We have so far only looked at the active video. The proper name for sync is Image Reconstruction Timing, and it's used to reconstitute the image. The sync portion doesn't interfere with the active video because it's below the black level and can't be seen. Any signal below the black level is said to be blanked. The black and blanking level are the same in every format except NTSC composite. Originally, the black, or blanking level was at 0Volts, with active video above and sync below, to simplify separating them based on level and timing.

If you could spread out the active video and sync interval on a flat surface, you would get a raster, which looks like Figure 3. The unused portion, T2(H) to T3(H), originally allowed magnetically-scanned CRTs to "fly back" to their starting point for the next line, and settle during T0(H) to T1(H). The vertical deflection works in a similar manner. The sync interval is "dead time" as far as the active video is concerned. Consequently, there are two resolutions for a video format, the active-video resolution we see, and the total resolution13 of the raster. This is true for both broadcast and graphics. The image quality is a function of the active-video resolution14 and the bandwidth through which the signal is transmitted.

A raster is created by scanning, both horizontally and vertically, starting at the upper left corner of the display. These "scan lines" are synchronized by the horizontal sync pulse, or H-Sync, so that they all start at the same place on the display. The frame, or V-Sync, indicates when the scan is finished and when to start the next. This means the image is sampled at the frame rate, and any motion that's faster than 1/2V-Sync will produce "aliasing" in the reconstructed image.

In RS-170, the frame rate was split into odd and even fields — a process called interlaced scanning — to conserve bandwidth. Visually this has the effect of re-sampling the displayed image faster and avoids flicker without increasing the frame rate — and bandwidth — in broadcast. The addition of a color subcarrier modified this sequence. In NTSC, the phase of the color subcarrier reverses every field, and in PAL, it indexes 90° per field. This gives rise to the 4, and 8 color field sequences for the NTSC and PAL composite signals. Graphics uses progressive scanning, since the increased bandwidth isn't a problem.

A side effect of the vertical sampling is that if you AC couple a video signal, you must still have good square-wave response at the field (broadcast), or frame rate (graphics). If you don't, you'll get brightness variations across the raster. This can be seen in a vertically-split black and white screen pattern. Very large capacitors (>330µF) are required to maintain good square-wave response when AC coupling an output because of the 75 circuit.

Scan Conversion

The scanning method and rate varies between the different types of video. In order to share a display, the Multi-Sync™ concept was invented. Originally, these displays had a deflection system that could respond to the different rates by switching component values. As long as the display had sufficient resolution to display the highest scan rates, this worked fine. It displayed each type of video with its native scanning format, but this can be expensive since the display must be sized to the highest resolution and speed.

The alternative is to scan the display at a constant rate, and convert the incoming video to the display rate. This is called scan conversion. It allows the display to operate at a single resolution, making the deflection simpler. Scan conversion is best done in the digital domain using dual-ported video RAM.

Video Groups and Specifications

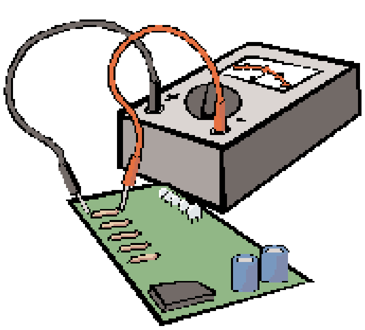
NTSC: National Television System Committee. The US form of standard definition TV.
PAL: Phase Alternating Line. The system of standard definition TV implemented in Europe and elsewhere.
SECAM: Sequential Couleur avec Memoire. The French form of standard definition TV.
ATSC: Advanced Television Systems Committee. The US form of high definition TV (HDTV).
VESA: Video Electronics Standards Association. Proposes and publishes video standards for Graphics.
ITU: International Telecommunications Union. Proposes and publishes video standards for Broadcast in the EU.
SMPTE: Society of Motion Picture and TV Engineers. Proposes and publishes video standards for Broadcast in the US.
JPEG: Joint Photographic Experts Group. Proposes and publishes video standards for Still Images.
MPEG: Motion Picture Experts Group. Proposes and publishes video standards for Broadcast.
EIA RS 170 & 170A The original specs for Monochrome and Color TV in the US. Has been replaced by SMPTE 170M.
EIA 770-1: The US spec for Enhanced Component video, similar to ITU-R BT1197/ETSI 300 294 for PAL-Plus.
EIA 770-2: The US specs for Standard Definition TV (SDTV) Baseband Component Video.
EIA 770-3: The US spec for High Definition TV (HDTV) Baseband Video.
ITU-R BT.470: Harmonized spec for SDTV world wide, including NTSC, PAL, and SECAM.
ITU-R BT.601: Universal Sampling spec for SDTV and HDTV Broadcast Video. Similar to SMPTE125M.
ITU-R BT1197/ETSI 300 294: Spec for PAL Plus Enhanced TV in Europe.
SMPTE 125M: Similar to ITU-R BT.601.
SMPTE 170M: Has replaced EIA RS 170A, color spec for NTSC.
SMPTE 253M: RGB Analog Video Interface spec for SDTV Studio applications.
SMPTE 274M: Component spec for 1920x1080 HDTV.
SMPTE 296M: Spec for 1280 x 720 RGB and YPbPr Baseband Video. Similar to PAL Plus.

Notes

1. RS-170 was replaced by SMPTE 170M.
2. Cvbs usually means "composite video, with blanking and sound."
3. The native form is that in which the signal was created. Usually it is R'G'B', the g-corrected primaries.
4. NTSC is the National Television Systems Committee system of analog encoding.
5. PAL is the Phase Alternating Line system of analog encoding.
6. SECAM is the Sequential Couleur avec Memoire system of analog encoding.
7. Bandwidth versus video resolution
8. The exact form and process information for Terrestrial Broadcast can be found in ITU-R BT.470.
9. Bandwidth versus Video Resolution
10. The Y Component is often called "Luminance," and confused with the color science term. We use the term Luma, and designate it with an accent, Y'.
11. Trademark of Sony Corp.
12. Trademark of JVC.
13. Total resolution is also called format resolution.
14. Bandwidth versus Video Resolution
15. This is the Nyquist frequency of the image-sampling process.

120 San Gabriel Dr., Sunnyvale, CA 94086 USA
408-737-7600; http://www.maxim-ic.com/

ATVQ



Sparks from the Bench

by Ron L. Sparks - AG5RS - Email: atvq@sparkles.com
P.O. Box 945
Katy, TX 77492

"Babbage Syndrome"
Regular Featured Column!

One of the fortunate things about living in Texas, particularly in the Houston area is that there are so many opportunities for Ham radio activities that it is difficult to focus on one. We have active QRP clubs, very active microwave groups, active ATV groups and, amazingly, a very active balloon launch program. This year when the jet stream moves to the north and the winds aloft turn inward from the gulf, the South Texas Balloon Launch team (BLT) will do their 19th balloon launch. I have been fortunate enough to participate in the ground crew for several of the previous launches. However, this year I will be assisting in preparing the ATV payload. One the most of the exciting things you can do with a balloon launch is ATV. So I am feeling not just a little pressure. As you have probably noticed from reading some of my previous columns, I suffer from an affliction, which is politely known as the "Babbage Syndrome".

Babbage?

If you have any interest in history, I strongly suggest that you read the fascinating story of Charles Babbage, Ada Lovelace, and the Analytical Engine. Many credit the invention of the computer to Charles Babbage in 1832. It could be argued that Blaise Pascal's calculator (1642) or Gottfried Wilhelm von Leibniz's widely accepted automatic calculator (1692) were the first computers. But, they were not programmable and Babbage's was. His Calculating Engine sits in the Museum of Science in London to this day. Ada Byron, also known as Lady Lovelace, was his patron and financier in the computing engine endeavors. At that time, all fundamental engineering and navigation calculations relied on log and trig tables which were meticulously calculated by hand. As a result, they were often fraught with errors.

Babbage decided to build the Calculating Engine to mechanically calculate the values required for common trig tables. He successfully did this and that is the machine that sits in the British Museum of Science. His next project was much more ambitious. He intended to make a general purpose calculating machine which he called the Analytical Engine. For some 30 years he labored at this endeavor, and ultimately died without success. While there is some question as to whether or not the machine could have actually been constructed using the mechanical skills of the era, it is generally thought that one of the major failings of the project was the "Babbage Syndrome."

The Babbage Syndrome was the nickname that arose due to Charles Babbage's great tendency to continue adding improvements and advances to his design, and thereby never finishing it. For those of us who enjoy problem solving and design, finding a place to lock down your design and start construction is a very difficult activity.

One way I have learned over the years to avoid being victimized by my tendency to the Babbage Syndrome is a technique I call incremental design. In this method I start with the absolute minimum design required to meet the critical objectives. Then, once that is a functional I begin adding features to the design in a step-by-step fashion ensuring that each feature operates correctly before moving on to the next one. I may continue this process all the way up to a few moments before the deadline. As I write this column, I am in the process of doing the actual construction on the minimum payload package. So for my next column you will get a detail of what actually worked and how well it functioned.

The Basic System

Since there have been 18 previous balloon launches, we have a pretty good idea as to what ATV equipment works and what doesn't. It is from this point I will start my initial design work. In the past we have used varied ATV transmitters of both 70 centimeter and 23 centimeter transmit frequencies. The best combination of weight and efficiency seems to have occurred with the 23 centimeter (1.2 GHz) transmitter that was developed a number of years ago by the Houston Amateur TV Society (HATS). Coupling this transmitter to an omni-directional inverted ground plane antenna seems to be a simple and proven design. On the receive side a number of different approaches have been taken. One of the most successful has been a coffee can feed coupled with a 5 ft dish. While various 1.2 GHz Yagi antennas have been tried, their gain often seems to be right at the edge of acceptable reception, especially at the end of the return portion of the flight.

As I mentioned above, this part of the system is quite critical to having an enjoyable and successful balloon launch. Therefore I intend to use a 5 ft dish with a "tried and true" feed. We just finished field day with the Houston AMSAT group and had very good success on 1.2 GHz using my 5 ft. button hook feed dish coupled with a patch feed developed by Jerry Brown, K5OE. This combination was very effective when working the AO40 uplink.

For a 1.2 GHz receiver, I have elected to use a Bensat receiver that I obtained from Tom O'Hara, W6ORG a few years ago. While nearly any satellite downconverter can be modified to operate as a 1.2 GHz FM receiver, many of them do not have the controls and gain necessary to be a good choice. I have recently made the modifications that Tom described in his ATVQ articles (summer 1999). These involve boosting the video gain, changing the compensation to NTSC (from PAL), reversing the tuning direction, and converting to 12 volt operation. As a "just in case" sensitivity improvement, I have obtained a C-band LNA that is broad enough that it will work at 1.2 GHz (L-band). Photo 1 shows the transmitter, antenna, receiver, patch and pre-amp ready for testing.

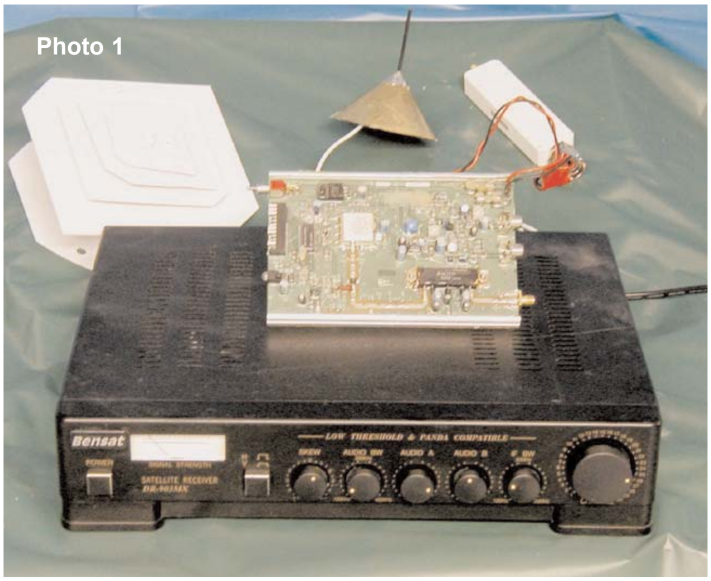


Photo 1

The final critical component in this setup is the camera. Cameras have proven to be slightly problematic in previous launches due to the extreme difference in light and dark portions of the scene. If you think about it, a lot of what the camera in a balloon launch sees is very similar to looking into a brightly backlit scene. This is especially true at the edge of space near 100,000 ft. and many cameras cannot handle it. For this launch I have obtained 4 cameras (so far) and will test each of them in both dim light and strong backlit situations. Photo 2 shows the

Photo 2

selection of cameras currently on hand. Once I have decided which one operates best in this wide range of lighting conditions, I will combine that with the transmitter to form the basis of the ATV payload.

One other area that will need some attention is power. The power bus supplied by the balloon's lithium ion batteries is 15 volts. That may mean that some pieces of the ATV package will need low dropout voltage regulators on the input to hold the power at a constant 12.0 volts throughout the launch. Since lithium ion batteries are similar to nickel metal hydride in that that they have a discharge curve with a sharp fall off at the end rather than a gradual decline like gel cells, boosting regulators will not be necessary for this package. Photo 3 shows the remaining equipment that will need to be checked and tested. This equipment has been used in previous balloon launches and may or may not prove to be useful in this package.

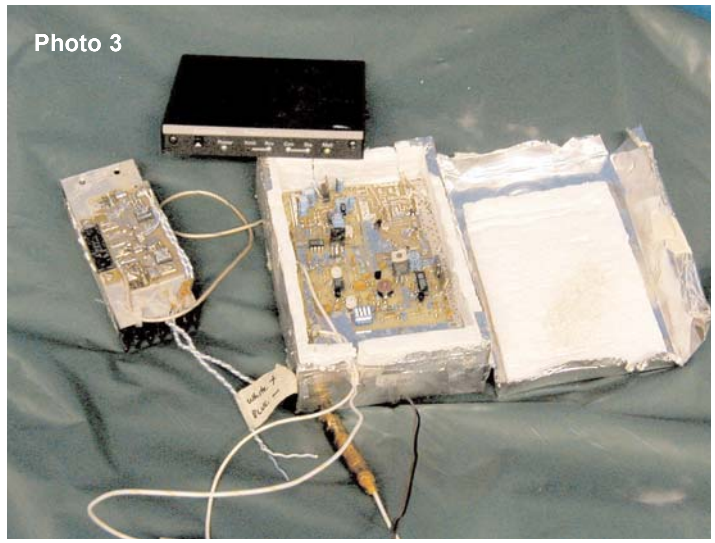


Photo 3

The Rest of the Story

So where does the Babbage Syndrome begin to effect this project? Well, what I've described thus far is the basic equipment necessary for a minimal system. By simply taping a little call sign label in view of the camera, the package would be complete, but minimal. The next obvious improvement would be some form of onscreen display. Because of weight and power limitations, this will need to be a simple microcontroller chip with one or two additional integrated circuits (IC's). One good option would be to utilize already designed systems from Intuitive Circuits (**http://www.icircuits.com/products.htm**) or Decade Engineering (**http://www.decadenet.com/start.html**). Both of these companies make excellent onscreen display units for a reasonable price. However, I happen to have a few of the same IC's that are used in many of these circuits lying in the junk box just begging for a place to be used. So because of budget constraints (at least that will be my excuse), I will use my existing junk box to build the onscreen display rather than purchasing a pre-made package.

Here is where the Babbage Syndrome really bites me. In order to control the display chip, I will be using a Microcircuits PIC called the 16F877. This beautiful little chip contains a fully functional microcontroller and has 4 analog to digital converters, I²C, 3 independent timers, and 3 full parallel ports all in one neat 40 pin chip for just a few bucks. This controller will allow me to add features until I run out of time.

So here's where the incremental design comes in. First, I will build the basic transmit and receive package and test it. While I am doing the testing on this basic package, I will also begin work on the onscreen display. This microcontroller and onscreen display circuit will be fashioned so that if it is inactive or hung, then a main bypass relay will drop out and connect the camera directly to the transmitter (yes we will have an ID visible, just in case).

Once the onscreen display circuit and microcontroller for it are working, then it should be a reasonably simple matter to add sensors for things such as temperature, humidity, and barometric pressure. Additionally a GPS interface will be developed on the microcontroller. If all of that is accomplished by the August launch date, I will consider the project a complete success.

More Fun Things

If by some strange miracle Mr. Murphy goes on holiday this summer and I finish all of the above circuits with some time to spare, there are certainly many more things which would be fun to include in the payload. A simple timer driven switching circuit would allow changing between cameras to have different views, other sensors such as direction, acceleration, oxygen, carbon monoxide, other pollutant gases, and UV, would all be fun to measure. Hmm, also what about that spare TNC lying in the box? Maybe that could be hooked into the audio sub-carrier to allow digital telemetry to be sent and recorded along with the video.

Oh yeah, it all needs to be recorded; now lets see where did I put that 300 watt power inverter and old VCR...

One final item: a recent project at the British Museum of Science used Babbage's blueprints and period construction methods to build the Analytical Engine he didn't have time to finish. It worked! So I guess the Babbage Syndrome is not really such an awful affliction after all.

Next time I'll give you the results of the project and include some block diagrams and further information on the various components. In the meantime, stay tuned and keep building.

ATN ATV Repeater Lost To Fire

The repeater site where the ATV repeater on Mt. Lemmon, K7AED, was located caught fire in the ceiling (the building walls were block) the site owner said most of the equipment melted or burned up inside. The tower has major structural damage, feedlines melted and antennas are probably burnt up too.

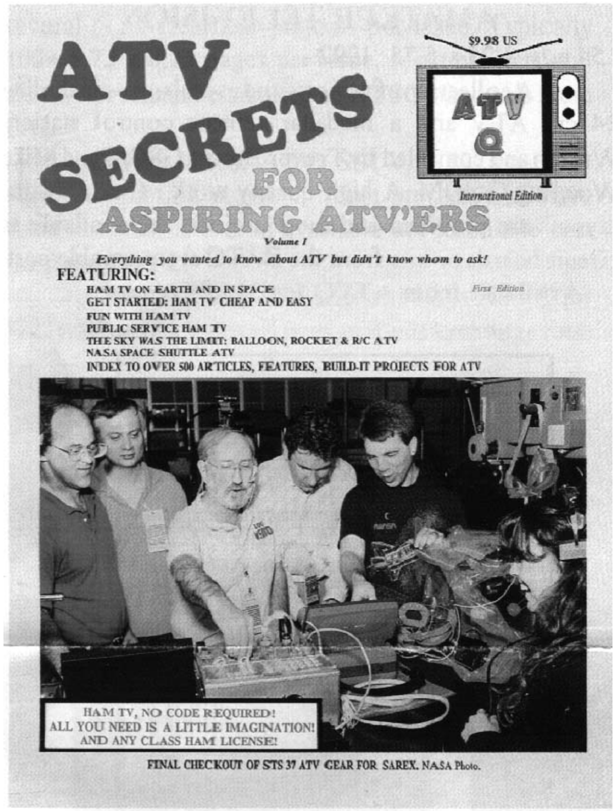
So far we have not been allowed up to see if any of the equipment like the filters that were in a steel equipment closed rack are salvageable. In my opinion, if we are to have an ATV repeater back in operation, the collection hat needs to be passed around. I have the main 434 receiver in my shop for upgrades and the voice repeater was getting a link receiver added and it was not on the mountain during the fire.

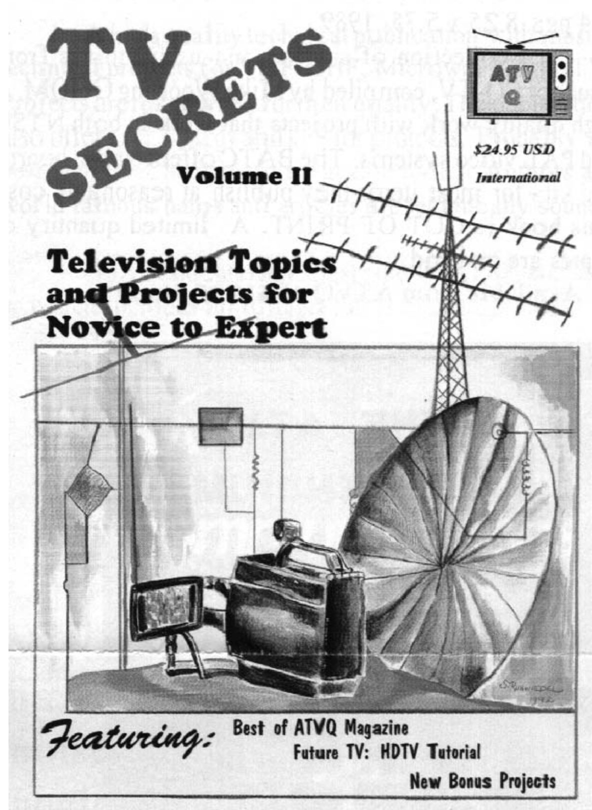
We may need to raise about $1500 to get back in operation. What does the group want to do?

Mike WA6SVT
wa6svt@aol.com

Pictures of before and after

Do you have these yet?





ATV SECRETS volume one

ATV SECRECTS is a great place to start your ATV adventure. Its 64 pages are are tightly packed with information that covers all aspects of getting started, where to find activity, equipment, how to DX, and answers frequently asked questions of power, antennas, vestigial sideband operation and more. Everything you need to know to enjoy ATV in one place!

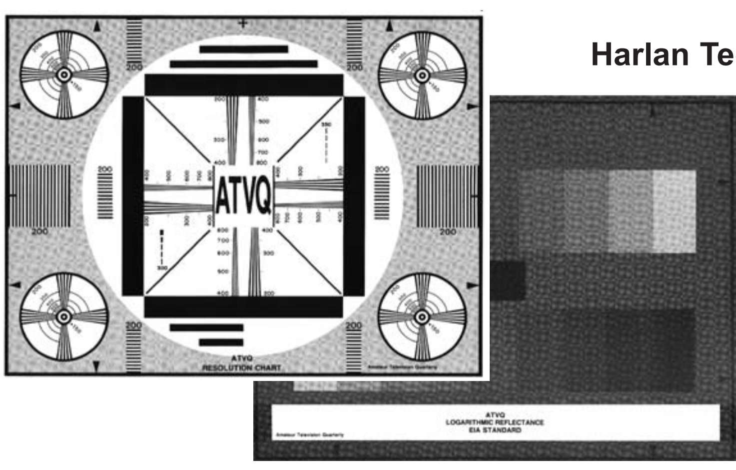
$8.95 plus $4.50 shipping

TV SECRETS volume two

A mammoth book, with 292 pages of technical material. More than 40 authors present over 90 technical projects and theory topics to fully acquaint anyone from novice to expert in the how and what of TV, video, and ham TV. Divided into 11 chapters, the book presents tested projects for all areas of interest in ham TV including antennas, amplifiers, repeaters, receivers, transmitters, video accessories, and more!

$24.95 plus $4.50 shipping

BOTH for only $29.95 plus $6.00 shipping

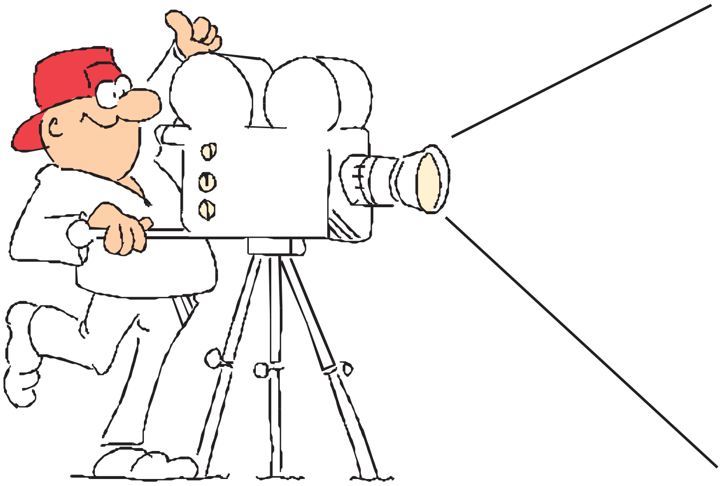


Just CALL 1-800-557-9469 or write
Harlan Technologies - 5931 Alma Dr. Rockford, IL 61108

FULL COLOR TEST CHART

4 Charts including COLOR BARS
RESOLUTION
GREY SCALE
REGISTRAITION

ONLY $5.00 plus $3.00 shipping



ADVERTISE IN ATVQ!

ATV'ers are hams that build projects more than other hams. They have a varied background ranging from technicial to engineer, and just might see a need for your product in their regular job as well as in their hobby. I hope to hear from you soon.

Please call TODAY!

Gene Harlan - WB9MMM - Editor/Publisher

ADVERTISING RATES AND DEADLINES

DEADLINES

COVER DATE	COPY DEADLINE	TO Printer	MAILING DATE
WINTER	January 1	January 15	Febuary 1
SPRING	April 1	April 15	May 1
SUMMER	July 1	July 15	August 1
FALL	October 1	October 15	November 1

While we will try to adhere as close as possible to the above dates, we reserve the right to adjust as needed.

If material is going to be late, please call to check if it will meet our schedule. We will try to accommodate everyone as best as we can.

Camera ready art or negative film right reading down are acceptable.

Trim Size:	8 1/2 x 10 7/8
Bleed Size:	1/8" beyond trim
Live matter:	1/4" within border

Harlan Technologies reserves the right to reject any advertising which is not in keeping with the publishers standards. Previous acceptance of any ad will not prevent Harlan Technologies from exercising the right to refuse the same advertisement in the future. Advertising orders are subject to the terms on the current rate card. Advertisers assume all responsibility and liability for any claims arising from advertisements and will protect the publisher from same.

Harlan Technologies will position ads in ATVQ at its discretion except in the case of preferred positions specifically covered by contract or agreement.

If, for any reason, the publisher fails to publish an advertisement, it will not be liable for any costs or damages, including direct or inconsequential damages.

Terms: All accounts not pre-paid are billed net 30 days. All accounts over 30 days are billed at 1 1/2% per month. Prompt payment is always appreciated.

RESERVE YOUR SPACE TODAY!
1-815-398-2683

AD RATES

Effective 1-1-2002

	INSERTIONS PER YEAR	
SIZE	1-3	4 up
FULL PG COLOR	$650	$500
FULL PG B&W (Covers II, III, IV $30 extra) (2nd color add $75 per page)	$160	$140
ADDITIONAL COLORS/PAGE	$100	$100
1/2 H or V	$110	$80
1/4	$85	$55
1/6	$55	$38

Multi-page ads are billed at the combined rate based on frequency.

Covers are reserved for COLOR ads.

All typesetting and layout charges for non camera ready ads will be added.

Amateur Television Quarterly

published by Harlan Technologies
5931 Alma Dr., Rockford, IL 61108
tel (815) 398-2683 fax (815) 398-2688
Internet: http://www.hampubs.com email: ATVQ@hampubs.com

Harlan Technologies

ATV Secrets VOL. 1. A 100 page beginners book, non technical, answers all those FAQ's. **$8.95** .... ________

ATV Secrets VOL. II. A 300 page technical compendium with everything you need to know about every aspect of ATV and UHF operation. Over 90 technical projects, plus theory and more. **$24.95** . . . . ________

Secrets Now On CD!

BOTH V1 & V2- $29.95 Shipping **$6.00** for both (USA - Overseas more) .... ________

BOTH V1 & V2 on CD- $25.00 (Includes ATV Repeater Shipping **$6.00** for both (USA - Overseas more) .... ________

IMPORTED BOOK:
The ATV Compendium from BATC. A great technical book applicable to UK and US systems **$16.95** .... ________

Special $10.00

NEW! "The Best Of Beasley - K6BJH - On Amateur Television" A collection of all the cartoons that have appeared in ATVQ over the years plus many more! Reg. $8.95 SPECIAL Only **$5.00** (shipping $3 US - $6 Overseas) .... ________

Special $5.00

Many issues of ATVQ are now available on CD ROM.
CD 1 contains 1988 & 89 (6 issues), CD 1 is $15.00 .... ________
CD 2 contains 1990 & 91 (8 issues), CD 2 is $15.00 .... ________
CD 3 contains 1992 & 93 (8 issues), CD 3 is $15.00 .... ________
CD 4 contains 1994 & 95 (8 issues), CD 4 is $15.00 .... ________
CD 5 contains 1996 & 97 (8 issues), CD 5 is $15.00 .... ________
CD 6 contains 1998 & 99 (8 issues), CD 6 is $15.00 .... ________
CD 7 contains 2000 & 01 (8 issues), CD 7 is $15.00 .... ________
plus $5.00 shipping ($6 for two, $7 for three, $8 for all four - Other than USA - higher). .... ________

NEW LOW PRICE!

NEW CD YEAR 2000 & 01

Previous ATVQ issues that are still available (most from 1994 to present) sell for **$4.95 each** (postage included for USA). Quantities are limited. Some real good articles exist in these issues! .... ________
Color Test Chart including Color Bars, Resolution, Grey Scale, Registration **$5.00** (shipping $3) .... ________

SUBSCRIPTIONS :

CQ-TV, the quarterly ATV publication of the BATC 1999 rate **$29.00** .... ________
VHF COMMUNICATIONS, a super quarterly publication from KM Publication in England - **$37.00** .... ________

Amateur Television Quarterly .... ________

RATE	USA	CANADA	DX
1 yr.	$20	$22	$29
2 yr.	$38	$42	$57
3 yr.	$55	$61	$84
4 yr.	$71	$80	$111
5 yr.	$87	$99	$136
LIFE	$399	$439	$579

PLEASE NOTE the EXPIRATION DATE on your mailing label. Please re-new early!

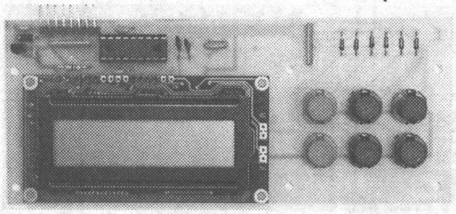
NAME:________
STREET:________
CITY:________
STATE:________ POSTAL CODE________ Country________
PHONE:________ HAM CALL________
VISA/MC/AMEX # ________
EXPIRES:________ SIGNATURE________
E-MAIL ADDRESS ________
ARE YOU CURRENTLY ON ATV ? _____ YES _____ NO
ARE YOU CURRENTLY ON SSTV ? _____ YES _____ NO
DO YOU USE AN ATV REPEATER ? _____ YES _____ NO
IF SO, CALL OF THE REPEATER ________ LOCATION ________
DOES THE REPEATER HAVE A WEB PAGE ? http:// ________

ATVQ, 5931 Alma Dr., Rockford, IL 61108

SUBSCRIPTIONS TO ATVQ 1-815-398-2683

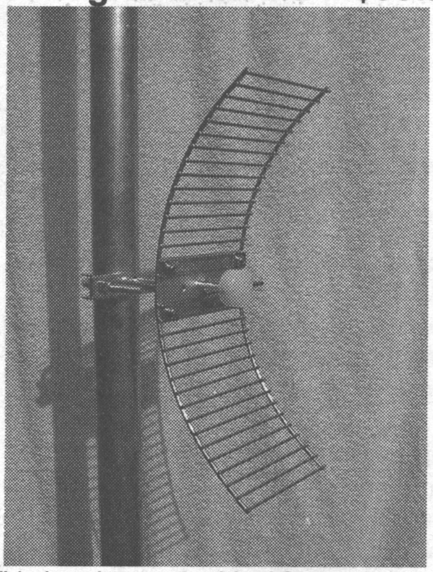
FAX 815-398-2688 E-MAIL ATVQ@hampubs.com

13cm LCD transceiver controller $89.99



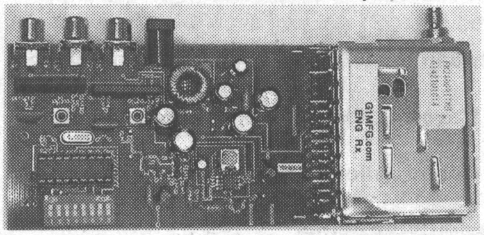
Connects to our Rx & Tx for pushbutton frequency control. Features like our 23cm controller but receives 2.200 - 2.700GHz. Built & tested.
Will not work a transmitter without a receiver.

13cm grid antenna $99.99



Wide band antenna, ideal for use with our transmitters and receivers *or wireless networking*. Transmits great across the **whole** 13cm band, OK for receive 2200-2700MHz! Approximately 13dB gain in 13cm band. Connection is via an integral SMA socket.

'ENG' FM TV receiver 2.20-2.70GHz $109.99



Incredibly sensitive, fully synthesized, receives 2.2-2.7GHz in 2MHz steps. Covers a lot of the outside broadcast frequencies, video senders and lots of other interesting stuff. All other specs similar to our 13cm Advanced receiver. Runs on 12-18V DC. Supplied built & tested.

NEW Microwave Video Receiver

Redefining the state of the art...

• Highly sensitive • Extended frequency ranges • 10 memories •
• Memory scan • Band Scan • Random frequency tuning • FM TV •

Our new Microwave Video Receiver re-defines the state of the art for sensitivity and ease of use. Simple, clear controls operate in conjunction with an easy to read backlit LCD to provide an unparalleled level of performance.

Two versions are available:

- **Low Band** (800MHz - 1800MHz, no gaps) - for 33cm, 23cm and beyond
- **High Band** (2200 MHz - 2700MHz, no gaps) - for 13cm and beyond

Brief specifications

Frequency step size : 125kHz
Power requirement : 12-14V DC
RF input : SMA female
Video and audio outputs : RCA female
Minimum detectable signal: typically -94dBm (in 20 MHz bandwidth))

Only $249.99 each including shipping and handling

Special ATVQ Offer: save $50 and buy a high & low band pair for just $449!

<u>Full review in the next issue of ATVQ!</u>

Miscellaneous bits and pieces (minimum order $15)

Belden 1671A semi-flexible microwave co-ax (good to over 20GHz) $1.49/ft
MA/COM (or equivalent) SMA plugs for 1671A (large qty available) ....$2.19 ea
Short cable SMA - N adapter....... $9.99 Short cable SMA-BNC adapter ..$9.99
3 metre (~10ft) SMA-SMA aerial cable (see web site for attenuation data) ..$21.95
As above 5 metre (~15ft) ....$27.95 As above 10 metre (~33ft)........$34.95
70cm (435.5 MHz) ATV Tx, crystal controlled, 100mW output, to clear........$99.99
70cm ATV power amplifier kit, 100mW in for 10-15W output, to clear..........$99.99
Transco (or similar) 4 port transfer relay, SMA, good for microwave use $79.99

HOW TO ORDER

The best way to order is to buy online from our web site at **www.TVHAM.com.** We aim to dispatch within 24 hours, and delivery usually takes 4-6 working days. All prices include shipping and handling.

We can accept personal checks, subject to a $20 processing fee. *<u>Please email us for details before sending a check.</u>* Our mail address is PO Box 12, Hedge End, SO32 2AA, UK. We give a full one year parts & labour warranty on all our built & tested products (return to base basis), excluding damage caused by misuse.

Email any inquiries to info@TVHAM.com.

Visit our web site at www.TVHAM.com

Video Basics

Used with permission from
Dallas Maxim
http://www.maxim-ic.com

This article covers many of the fundamentals of analog video. It is divided into four sections: “Picture Basics” covers how a video picture is generated; “Resolution: Visual versus Format” discusses the different resolution formats and how resolution is specified and measured; “Formats and Interfaces” includes different types of video signals, waveforms, and interfaces; and the glossary at the end defines terms specific to video.

This article covers many of the fundamentals of analog video. Video is defined for our purposes here as “moving pictures.” Still imaging, like what is found in digital still cameras or scanners, is not covered. The requirements for still imaging do have a lot in common with those for video, but the differences are significant enough to be dealt with as a separate discipline.

This article is divided into four sections: “Picture Basics” covers how a video picture is generated; “Resolution: Visual versus Format” discusses the different resolution formats and how resolution is specified and measured; “Formats and Interfaces” includes different types of video signals, waveforms, and interfaces; and the glossary at the end defines terms specific to video.

Picture Basics

A picture is “drawn” on a television or computer display screen by sweeping an electrical signal horizontally across the display one line at a time. The amplitude of this signal versus time represents the instantaneous brightness at that physical point on the display. Figure 1 shows the signal amplitude relationship to the brightness on the display.

At the end of each line, there is a portion of the waveform (horizontal blanking interval) that tells the scanning circuit in the display to retrace to the left edge of the display and then start scanning the next line. Starting at the top, all of the lines on the display are scanned in this way. One complete set of lines makes a picture. This is called a frame. Once the first complete picture is scanned, there is another portion of the waveform (vertical blanking interval, not shown) that tells the scanning circuit to retrace to the top of the display and start scanning the next frame, or picture. This sequence is repeated at a fast enough rate so that the displayed images are perceived to have continuous motion. This is the same principle as that behind the “flip books” that you rapidly flip through to see a moving picture or cartoons that are drawn and rapidly displayed one picture at a time.

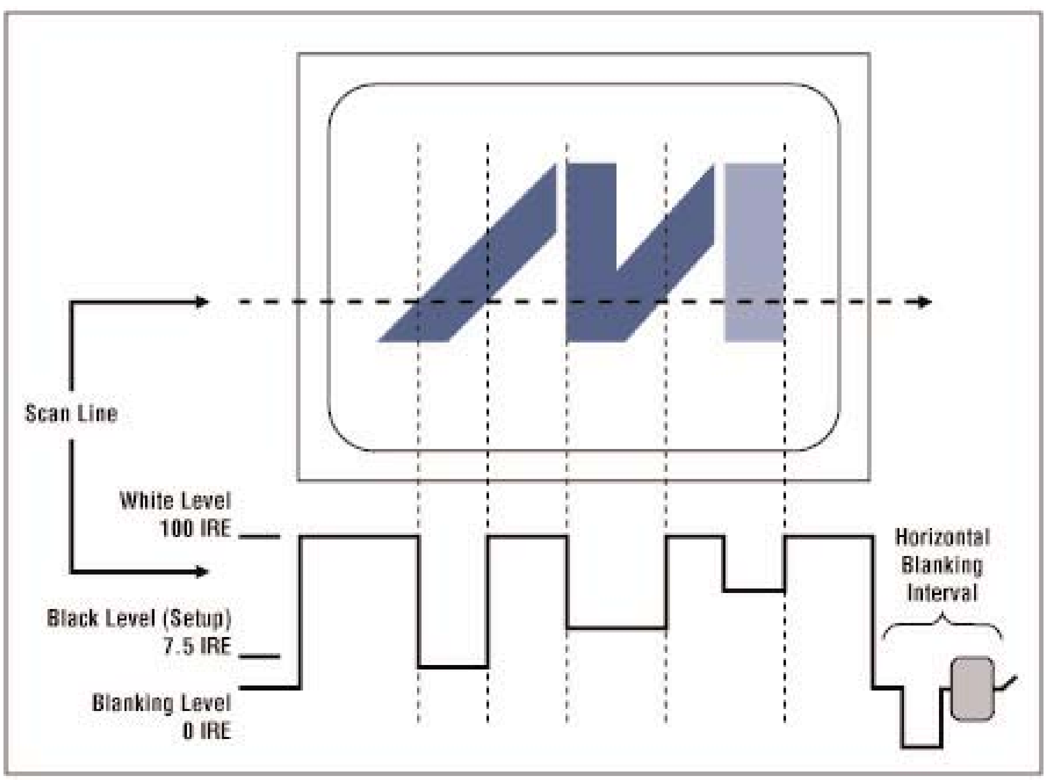


Figure 1. Horizontal scan versus display brightness

Interlaced versus Progressive Scans

These are two different types of scanning systems. They differ in the technique used to “paint” the picture on the screen. Television signals and compatible displays are typically interlaced, and computer signals and compatible displays are typically progressive (non-interlaced). These two formats are incompatible with each other; one would need to be converted to the other before any common processing could be done. Interlaced scanning is where each picture, referred to as a frame, is divided into two separate sub-pictures, referred to as fields. Two fields make up a frame. An interlaced picture is painted on the screen in two passes, by first scanning the horizontal lines of the first field and then retracing to the top of the screen and then scanning the horizontal lines for the second field in-between the first set. Field 1 consists of lines 1 through 262 1/2, and field 2 consists of lines 262 1/2 through 525. The interlaced principle is illustrated in Figure 2. Only a few lines at the top and the bottom of each field are shown.

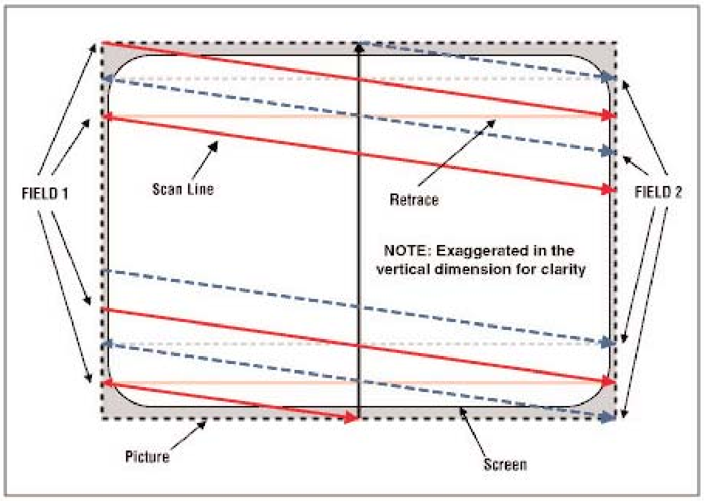


Figure 2. Interlaced scanning system

A progressive, or non-interlaced, picture is painted on the screen by scanning all of the horizontal lines of the picture in one pass from the top to the bottom. This is illustrated in Figure 3.

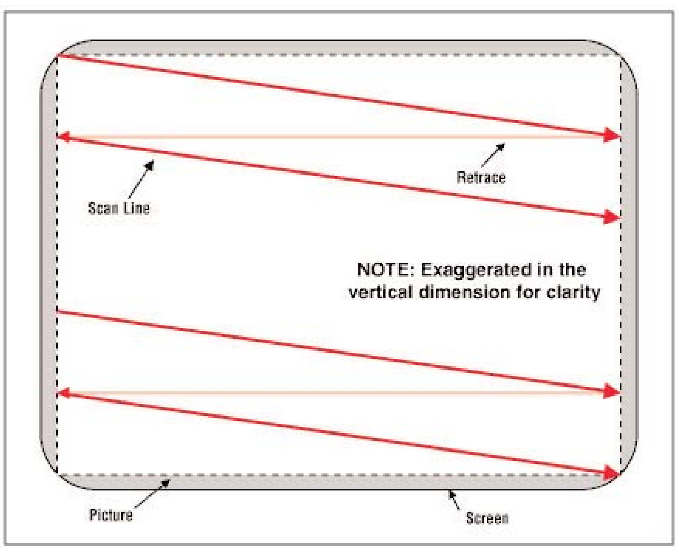


Figure 3. Progressive (non-interlaced) scanning system

Resolution: Visual versus Format

The visual resolution of a video signal or display is the amount of detail that can be seen. This is different from the resolution format of a signal or display. For example, in a computer application, a XGA signal has a format resolution of 1024 horizontal pixels and 768 vertical pixels (lines), and is the implied visual resolution. However, if the signal or display has any limitations that can degrade the performance, it may not be possible to actually view all of this detail.

Visual Resolution in Television Systems

Visual resolution in television systems is accurately specified in terms of a parameter called “TV lines.” This parameter is typically used to indicate horizontal resolution, but the same technique can be used for vertical resolution. TV lines are determined by viewing a test pattern consisting of alternating black and white lines that are placed closer and closer together. The pair of lines with the closest spacing that can be distinguished as separate lines determines the resolution. The lines that can be extrapolated across the screen to a width equal to one picture height are the TV lines of resolution. Figure 4 shows a representative picture for determining resolution.

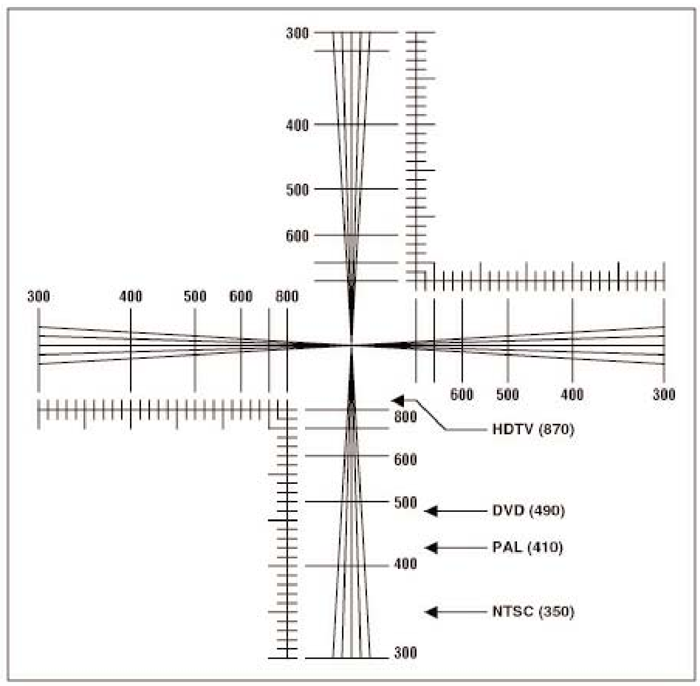


Figure 4. Representative visual resolution test pattern

Visual Resolution in Computer Systems

Computer resolution formats are typically specified by the visible number of pixels in the horizontal and vertical dimensions. For example, a VGA format signal has 640 visible pixels in the horizontal direction and 480 visible pixels in the vertical direction. An XGA format signal has 1024 visible pixels in the horizontal direction and 768 visible pixels in the vertical direction. In a well-designed computer system that is specified to reach a

Video Format	NTSC	PAL	HDTV/SDTV	VGA	XGA
Description	**Television Format for North America and Japan**	**Television Format for Most of Europe and South America**	**High Definition/ Standard Definition Digital Television Format**	**Video Graphics Array (PC)**	**Extended Graphics Array (PC)**
Vertical Resolution Format (visible lines per frame)	Approx 480 (525 total lines)	Approx 575 (625 total lines)	1080 or 720 or 480; 18 different formats	480	768
Horizontal Resolution Format (visible pixels per line)	Determined by bandwidth, ranges from 320 to 650	Determined by bandwidth, ranges from 320 to 720	1920 or 704 or 640; 18 different formats	640	1024
Horizontal Rate (kHz)	15.734	15.625	33.75-45	31.5	60
Vertical Frame Rate (Hz)	29.97	25	30-60	60-80	60-80
Highest Frequency (MHz)	4.2	5.5	25	15.3	40.7

Table 1. Typical Frequencies for Common TV and Computer Video Formats

given maximum format resolution, all of the signal processing would be designed such that the visual resolution would be at least as good as the format resolution. If any circuit in the chain does not have the required performance, the visual resolution will be less than the format resolution.

Formats and Interfaces

There are many different kinds of video signals, which can be divided into either television or computer types. The format of television signals varies from country to country. In the United States and Japan, the NTSC format is used. NTSC stands for National Television Systems Committee, which is the name of the organization that developed the standard. In Europe, the PAL format is common. PAL (phase alternating line), developed after NTSC, is an improvement over NTSC. SECAM is used in France and stands for sequential coleur avec memoire (with memory). It should be noted that there is a total of about 15 different sub-formats contained within these three general formats. Each of the formats is generally not compatible with the others. Although they all utilize the same basic scanning system and represent color with a type of phase modulation, they differ in specific scanning frequencies, number of scan lines, and color modulation techniques, among others. The various computer formats (such as VGA, XGA, and UXGA) also differ substantially, with the primary difference in the scan frequencies. These differences do not cause as much concern, because most computer equipment is now designed to handle variable scan rates. This compatibility is a major advantage for computer formats in that media, and content can be interchanged on a global basis.

There are three basic levels of baseband signal interfaces. In order of increasing quality, they are composite (or CVBS), which uses one wire pair; Y/C (or S-video), which uses two wire pairs; and component, which uses three wire pairs. Each wire pair consists of a signal and a ground. These three interfaces differ in their level of information combination (or encoding). More encoding typically degrades the quality but allows the signal to be carried on fewer wires. Component has the least amount of encoding, and composite the most.

Composite/CVBS Interface

Composite signals are the most commonly used analog video interface. Composite video is also referred to as CVBS, which stands for color, video, blanking, and sync, or composite video baseband signal. It combines the brightness information (luma), the color information (chroma), and the synchronizing signals on just one cable. The connector is typically an RCA jack. This is the same connector as that used for standard line level audio connections. A typical waveform of an all-white NTSC composite video signal is shown in Figure 5.

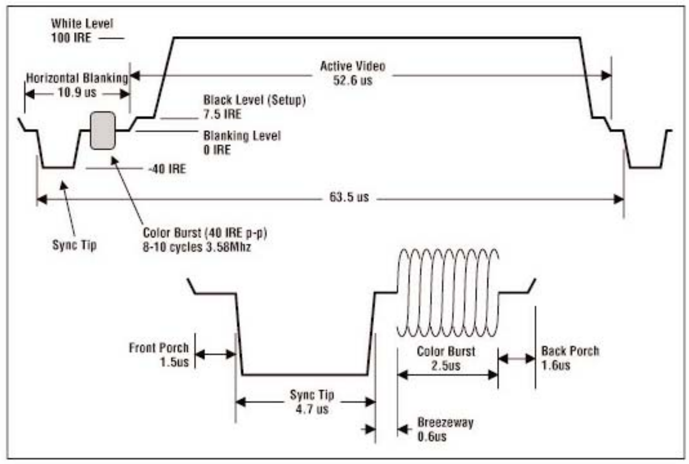


Figure 5. NTSC composite video waveform

This figure depicts the portion of the signal that represents one horizontal scan line. Each line is made up of the active video portion and the horizontal blanking portion. The active video portion contains the picture brightness (luma) and color (chroma) information. The brightness information is the instantaneous amplitude at any point in time. The unit of measure for the amplitude is in terms of an IRE unit. IRE is an arbitrary unit where 140 IRE = 1Vp-p. From the figure, you can see that the voltage during the active video portion would yield a bright-white picture for this horizontal scan line, whereas the horizontal blanking portion would be displayed as black and therefore not seen on the screen. Please refer back to Figure 1 for a pictorial explanation. Some video systems (NTSC only) use something called “setup,” which places reference black at a point equal to 7.5 IRE or about 54mV above the blanking level.

Color information is added on top of the luma signal and is a sine wave with the colors identified by a specific phase difference between it and the color-burst reference phase. This can be seen in Figure 6, which shows a horizontal scan line of color bars.

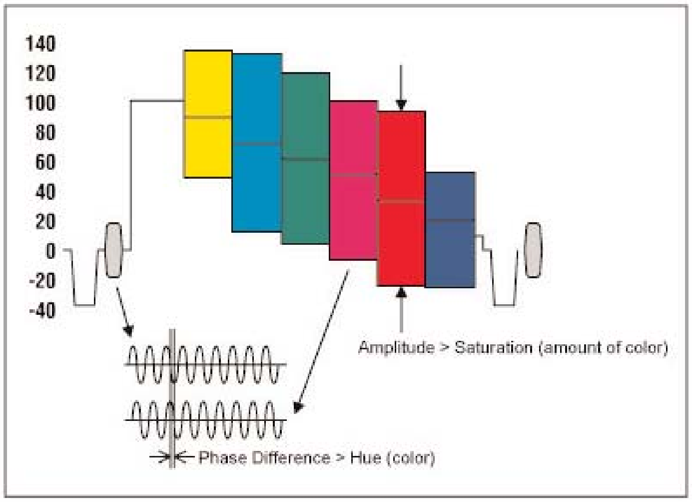


Figure 6. Composite video waveform: color bars

The amplitude of the modulation is proportional to the amount of color (or saturation), and the phase information denotes the tint (or hue) of the color. The horizontal blanking portion contains the horizontal synchronizing pulse (sync pulse) as well as the color reference (color burst) located just after the rising edge of the sync pulse (called the "back porch"). It is important to note here that the horizontal blanking portion of the signal is positioned in time such that it is not visible on the display screen.

Y/C Interfaces

The Y/C signal is a less encoded video signal. It is often incorrectly referred to as "S-video." S-video actually refers to a VCR tape recording format and not a signal interface. Brightness (luma), which is the Y signal, and the color (chroma), the C signal, are now carried on two separate sets of wires. The connector is a mini DIN type and resembles a small version of a keyboard connector.

Component Interfaces

Component signal interfaces are the highest performance, because they have the least encoding. The signals exist in a nearly native format. They always utilize three pairs of wires that are typically in either a luma (Y) and two-color-difference-signals format or a red, green, blue (RGB) format. RGB formats are almost always used in computer applications, whereas color-difference formats are generally used in television applications. The Y signal contains the brightness (luma) and synchronizing information, and the color-difference signals contain the red (R) minus the Y signal and the blue (B) minus the Y signal. The theory behind this combination is that each of the base R, G, and B components can be derived from these difference signals. Common variations of these signals are as follows:

Y, B-Y, R-Y: Luma and color-difference signals.
Y, Pr, Pb: Pr and Pb are scaled versions of B-Y and R-Y. Commonly found in high-end consumer equipment.
Y, Cr, Cb: Digital-signal equivalent to Y, Pr, Pb. Sometimes incorrectly used in place of Y, Pr, Pb.
Y, U, V: Not an interface standard. These are intermediate, quadrature signals used in the formation of composite and Y/C signals. Sometimes incorrectly referred to as a "component interface."

Computer Signal Interfaces

Virtually all computer interfaces utilize RGB format signals. The picture information is carried separately by the three base components of red, green, and blue. Synchronizing information is typically carried as separate horizontal (H) and vertical (V) signals. The five signals, R, G, B, H, and V, are carried on one cable consisting of a shielded bundle of wires. The connector is almost always a 15-pin D-type connector. Sometimes the H and V sync information is merged with one of the RGB signals, typically the green component, but this is becoming less common. This is referred to as "sync on green." In rarer cases, the sync information is on the red or the blue signal.

Glossary

Aspect Ratio
The ratio of the visible-picture width to the height. Standard television and computers have an aspect ratio of 4:3(1.33). HDTV has aspects ratios of either 4:3 or 16:9(1.78). Additional aspect ratios like 1.85:1 or 2.35:1 are used in cinema.

Back Porch
The area of a composite video signal defined as the time between the end of the color burst and the start of active video. Also loosely used to mean the total time from the rising edge of sync to the start of active video.

Blanking Interval
There are horizontal and vertical blanking intervals. Horizontal blanking interval is the time period allocated for retrace of the signal from the right edge of the display back to the left edge to start another scan line. Vertical blanking interval is the time period allocated for retrace of the signal from the bottom back to the top to start another field or frame. Synchronizing signals occupy a portion of the blanking interval.

Blanking Level
Used to describe a voltage level (blanking level). The blanking level is the nominal voltage of a video waveform during the horizontal and vertical periods, excluding the more negative voltage sync tips.

Breezeway
The area of a composite video signal defined as the time between the rising edge of the sync pulse and the start of the color burst.

Chroma
The color portion of a video signal. This term is sometimes incorrectly referred to as "chrominance," which is the actual displayed color information.

Clamp
A circuit that forces a specific portion (either the back porch or the sync tip) of the video signal to a specific DC voltage, to restore the DC level. Also called "DC restore." A black level clamp to ground circuit forces the back-porch voltage to be equal to zero volts. A peak clamp forces the sync-tip voltage to be equal to a specified voltage.

Color Bars
A standard video waveform used to test the calibration of a video system. It consists of a sequence of the six primary and secondary colors plus white with a standard amplitude and timing. The color-bar sequence is white, yellow, cyan, green, magenta, red, and blue. There are several amplitude standards, the most common being 75% amplitude (brightness) with 100% saturation (intensity of the color).

Color Burst
The color burst, also commonly called the "color subcarrier," is 8 to 10 cycles of the color reference frequency. It is positioned between the rising edge of sync and the start of active video for a composite video signal.

Color Saturation
The amplitude of the color modulation on a standard video signal. The larger the amplitude of this modulation, the more saturated (more intense) the color.

Color Subcarrier
See Color Burst.

Component Video
A three-wire video interface that carries the video information in its basic RGB components or luma (brightness) and two-color-difference signals.

Composite Video
A video signal that combines the luma (brightness), chroma (color), burst (color reference), and sync (horizontal and vertical synchronizing signals) into a single waveform carried on a single wire pair.

Differential Gain
Important measurement parameter for composite video signals. Not applicable in Y/C or component signals. Differential gain is the amount of change in the color saturation (amplitude of the color modulation) for a change in low-frequency luma (brightness) amplitude. Closely approximated by measuring the change in the amplitude of a sine wave for a change in its DC level.

Differential Phase
Important measurement parameter for composite video signals. Not applicable in Y/C or component signals. Differential phase is the change in hue (phase of the color modulation) for a change in low-frequency luma (brightness) amplitude. Closely approximated by measuring the change in the phase of a sine wave for a change in its DC level.

Fields and Frames
A frame is one complete scan of a picture. In NTSC it consists of 525 horizontal scan lines. In interlaced scanning systems, a field is half of a frame; thus, two fields make a frame.

Front Porch
The area of a composite video waveform between the end of the active video and the leading edge of sync.

Horizontal Blanking
See Blanking Level and Blanking Interval.

Horizontal Line Frequency
The inverse of the time (or period) for one horizontal scan line.

Interlaced Scan
The process whereby each frame of a picture is created by first scanning half of the lines and then scanning the second set of lines, which are interleaved between the first to complete the picture. Each half is referred to as a field. Two fields make a

If You Move

Please send us your NEW ADDRESS! We pay 70 cents for each returned ATVQ. And we are usually nice and send another copy to your new address which costs us $1.29. Please help us from having to do this. Thanks!

frame.

IRE
An arbitrary unit of measurement equal to 1/100 of the excursion from blanking to reference white level. In NTSC systems, 100 IRE equals 714mV and 1-volt p-p equals 140 IRE.

Luma
The monochrome or black-and-white portion of a video signal. This term is sometimes incorrectly called "luminance," which refers to the actual displayed brightness.

Monochrome
The luma (brightness) portion of a video signal without the color information. Monochrome, commonly known as black-and-white, predates current color television.

NTSC
National Television Systems Committee. A group that established black-and-white television standards in the United States in 1941 and later added color in 1953. NTSC is used to refer to the systems and signals compatible with this specific color-modulation technique. Consists of quadrature-modulated color-difference signals added to the luma with a color subcarrier reference of 455/2 times the horizontal line rate, typically 3.579545MHz with an H rate of 15.75kHz. Commonly used in 525-line, 59.94Hz scanning systems.

PAL
Phase alternate line. PAL is used to refer to systems and signals that are compatible with this specific modulation technique. Similar to NTSC but uses subcarrier phase alternation to reduce the sensitivity to phase errors that would be displayed as color errors. Commonly used with 626-line, 50Hz scanning systems with a subcarrier frequency of 4.43362MHz.

Pixel
Picture element. A pixel is the smallest piece of display detail that has a unique brightness and color. In a digital image, a pixel is an individual point in the image, represented by a certain number of bits to indicate the brightness.

Progressive Scan
The process whereby a picture is created by scanning all of the lines of a frame in one pass. See also Interlaced Scan. The process of converting from interlaced to progressive scan is called "line doubling."
Raster
The collection of horizontal scan lines that makes up a picture on a display. A reference to it normally assumes that the sync elements of the signal are included.

Refresh Rate
See Vertical Frame Rate.

RGB
Stands for red, green, and blue. It is a component interface typically used in computer graphics systems.

Setup
A reference black level 7.5% (7.5IRE) above blanking level in NTSC analog systems. It is not used in PAL or digital or HDTV systems. In these systems, reference black is the same level as blanking.

Subcarrier
See Color Burst.

S-Video
Commonly incorrectly used interchangeably with Y/C. See also Y/C. Technically, a magnetic-tape modulation format.

Sync Signals/Pulses
Sync signals, also known as sync pulses, are negative-going timing pulses in video signals that are used by video-processing or display devices to synchronize the horizontal and vertical portions of the display.

Vertical Blanking
See Blanking Level and Blanking Interval.

Vertical Field Frequency
The inverse of the time (or period) to produce one field of video (half of a frame). In NTSC it is 59.94Hz.

Vertical Frame Rate
The inverse of the time (or period) to produce one frame of video. Also called "refresh rate" or "vertical refresh rate."

Video Bandwidth, Minimum
The minimum analog bandwidth required to reproduce the smallest amount of detail contained in the video signal.

Y Cr Cb
A digital component video interface. Y is the luma (brightness) portion, and Cr and Cb are the color-difference portions of the signal.

Y Pr Pb
An analog-component video interface. Y is the luma (brightness) portion, and Pr and Pb are the color-difference portions of the signal. Typically used on high-end consumer video equipment.

Y/C
An analog video interface in which the chroma (color) information is carried separately from the luma (brightness) and sync information. Two wire pairs are used, denoted Y and C or Y/C. Often incorrectly referred to as "S-video."

120 San Gabriel Dr., Sunnyvale, CA 94086 USA
408-737-7600; http://www.maxim-ic.com/

ATVQ

Amateur Television Contest

Contest period 00:00z 06/01/03 to 00:00z 09/01/03

Contest goal: To raise activity and promote *long haul* contacts on ATV.

Participants must hold at least a Technician class license and be within the boundaries of North America, Alaska or Hawaii.

In case of multiple Ham occupants, they may share equipment during the contest so long as the intent is not merely to manufacture points. All occupants who enter must submit their own log.

Schedules: The use of schedules is allowed, and can be made by any means available. The use of 144.340 mhz national ATV calling frequency is also allowed and encouraged.

REPEATER CONTACTS DO NOT COUNT, Distance calculations will be between both stations in the QSO with no relay allowed.

Exchange: Callsign with at least P-1 video on any amateur band 70cm and above.

MOBILE or **PORTABLE** stations must exchange their location at the time of contact as determined by portable GPS or other verifiable means.

VIEWER: Station does not have to exchange any video but must be a licensed amateur and confirm at least a P-1 reception report to the transmitting station via 2 meters or another amateur band.

CLASSES:

There will be 4 classes for participants:

HOME: Primary location of residence with Fixed Antenna structure. Minimum distance for repeat contacts (75 Miles)

PORTABLE: Station can be set up just for the contest and may not operate from any other location during the contest period. Minimum distance for repeat contacts (50 Miles)

MOBILE: Station can operate stopped or while moving but all antennas must be affixed to the mobile unit and capable of transmit while in motion. Minimum distance for repeat contacts (25 Miles)

VIEWER: Station must be able to receive video at P-1 signal level and relay report to the transmitting station. Minimum distance for repeat contacts with this class is determined by the transmitting stations type or class.

Scoring System: Each valid contact will be awarded points for the mileage between the two stations on an ever-increasing difficulty per frequency basis as follows:

70cm = 2 points per mile

33cm = 4 points per mile

23cm = 6 points per mile

13cm and above gets 10 points per mile!

A station can be worked for points only once unless they are a minimum distance apart as specified by the class of entry. (See CLASSES) and then they may be worked once in a calendar month through the contest period.

The distance between stations will be calculated by the Maidenhead Grid and sub grid identifier coordinates listed on QRZ.com and rounded down to the nearest mile. Every effort should be made by entrants to verify or update their information before the contest starts. If you do not have Internet to look up a stations coordinates please ask the other station, if they do not know then leave the mileage column blank and it will be determined by the verifier. No changes can be made to coordinates once the contest starts unless you move.

Distance will be calculated with the (Bearing and Distance) DOS program by W9IP that is used by the ARRL for distance records.

LOG's: All logs must be in a standard format as specified below:

STATION WORKED RPT UTC DATE FREQUENCY DISTANCE CLASS

Your log information should also include your Name, Address, your Maidenhead Grid and sub grid identifier coordinates, and a list of equipment used.

Logs can be submitted by email or regular mail and must be received by September 15th to be eligible for contest Awards. Send the logs to:

ATVQ Contest
5931 Alma Dr.
Rockford, IL 61108

or to: ATVQ@hampubs.com

AWARDS:

All Scores will be published in ATVQ and certificates will be awarded for the top three scores in each class. The highest overall score of the contest (The one who covers the most miles on ATV) will receive the OVERALL WINNER PLAQUE

Thanks to Bob Delaney, KA9UVY, for putting this contest idea together!

ATVQ

Hawaii ATV DX

Gordon West, WB6NOA in Costa Mesa, California, reported on the Mt. Wilson ATV repeater net tonight (Monday, July 14, Los Angeles area) that the video test pattern from Paul Leib KH6HME on the big Island of Hawaii was coming in on 434.0 MHz about 4 PM PST Sunday for about a half hour. The video was very noisy but the map of Hawaii could plainly be seen. For a few minutes the sync bars could be seen in both the Santiago Peak W6ATN and Mt. Wilson K6KMN ATV repeaters which is surprising since the polarization is opposite.

Paul operates CW beacons on a number of bands from 2 meters through microwave beamed east from a site high up on the side of the Mauna Loa Volcano. When he gets word from the main land that the beacons are being heard, he jumps in his car and drives up to the site to see if he can work anyone on the mainland, about 2400 miles away. After making as many SSB contacts on 432 as he can, he switches the 70cm horizontal beams over to the 100 Watt 434 transmitter system consisting of a P. C. Electronics ATV transmitter driving a Mirage 100 watt amplifier.

Temperature inversions that are continuous enough over this long distance occur briefly in June and July between Hawaii and the mainland but it has been 11 years since it has been good enough for ATV to be seen. On July 2, 1992, Gordon was first to see the video and alerted other ATVers in Southern California. Mike, KC6CCC, then turned his gear on to see it the farthest; his QTH in San Clemente, California a few dozen miles down the coast from Gordon.

Tom O'Hara W6ORG TOMSMB@aol.com

ATVQ

DC-DC Converter For High Tuning Voltage In Sat-Receivers

Author: Guenter Sattler, DJ4LB
TV-AMATEUR 128, page 4
translation by Klaus, DL4KCK
AGAF e.V.
www.agaf.de

For the average receiver (for Sat-TV) the tuning voltage is taken from the on-board switching supply without much effort. So stand alone DC-DC converters are not much in use, and special chips like TCA720 (34V/1mA) or TL497 (adjustable) are not commercially available any more or out of production.

There are ATV "do it yourself" modules designed to use a 12 volt supply and needs a stable tuning voltages up to 33 volts also. These are i.e. high speed tunable Sat tuners, Gunn oscillators with varactor tuning and FM oscillators for 23 or 13 cm. Also standard PLL circuits are fed with 30 - 33 Volt. Stability is not very important, but should be kept in mind with varying currents from 0 - 1.5 mA depending on the needed PLL frequency.

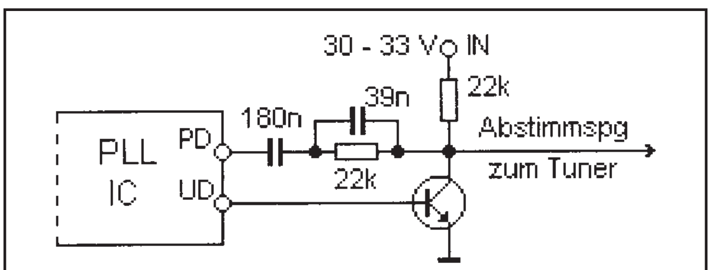
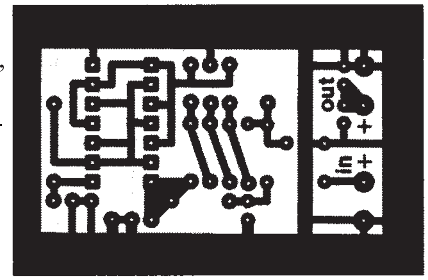


Bild 1 **Standard-PLL-Stufe**

The following DC-DC converters are sufficient for self construction as they do not contain special IC and transformers.

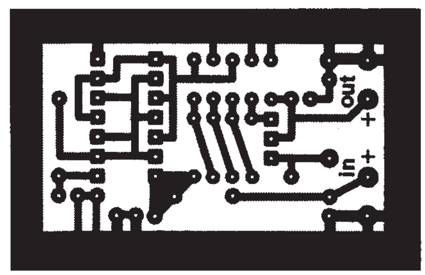
Voltage Multiplier With Capacitors

Here several capacitors are loaded with supply voltage repeatedly and toppled onto the supply rail. This principle includes that the output voltage is not variable but only available in multiples of the supply voltage. You can add a voltage regulator but this is not a clever solution. Variations of the power supply are multiplied too, and so the minimum input voltage of the regulator as well as its maximum voltage (40 V) could be exceeded. With constant supply (12 V) triplers are able to produce up to 30 Volt tuning voltage.



Construction

The diagram "Bild 2" is showing a voltage tripler with commercially available components. The unregulated version "Plan 1" produces about 32 Volt (with a protection diode at the input only 30 V) for PLL devices. Under a load of 1 mA the output decreases by 1 Volt. Adding a regulator (low power 317, own consumption 3 mA) like shown with "Plan 2" it is possible to get 1.2 - 30 volts stabilized. Four Schottky-diodes (BAT48) as multipliers can deliver 1.6 V more than universal diodes (1N4148), and instead of the internal 10 K ohm potentiometer an external 10 K ohm fader can be connected.
The main IC 40106 (6 inverters with Schmitt-Trigger inputs)



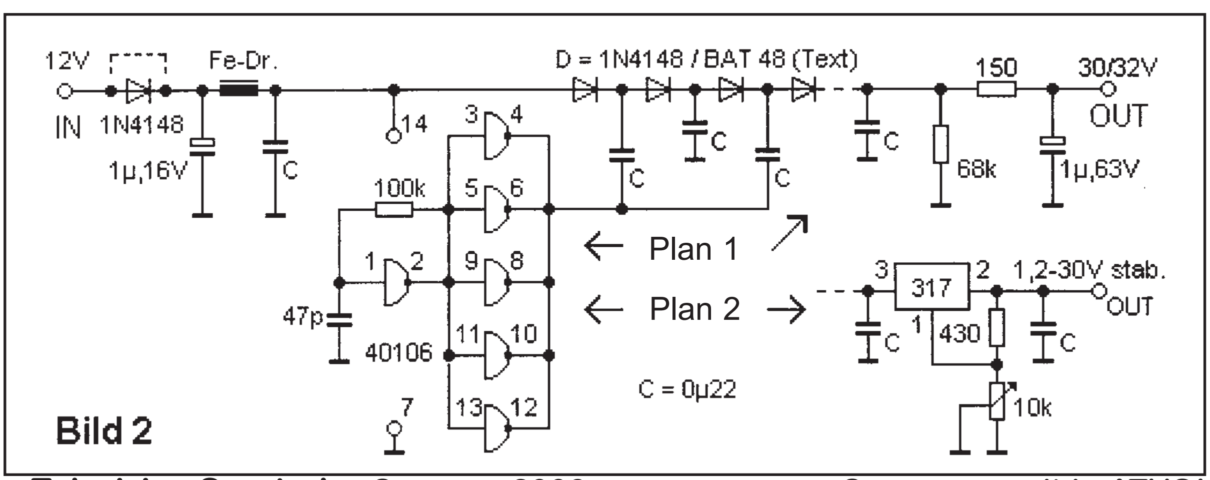


Bild 2

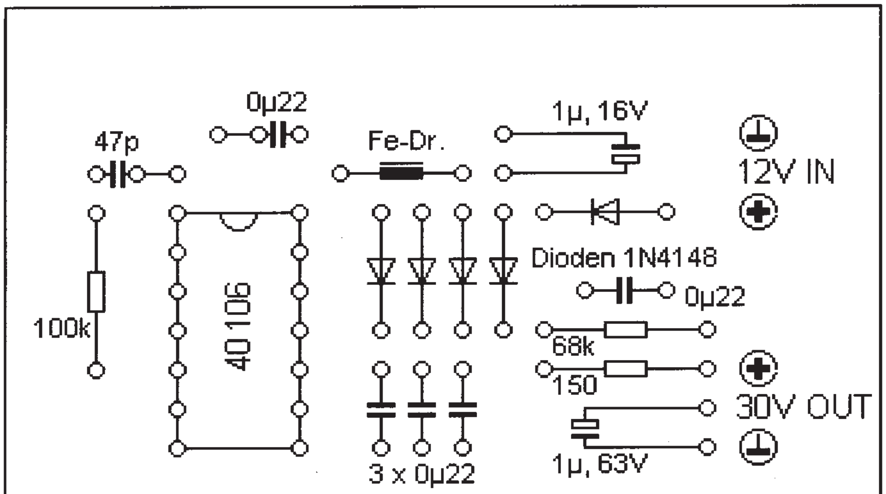


Bild 3

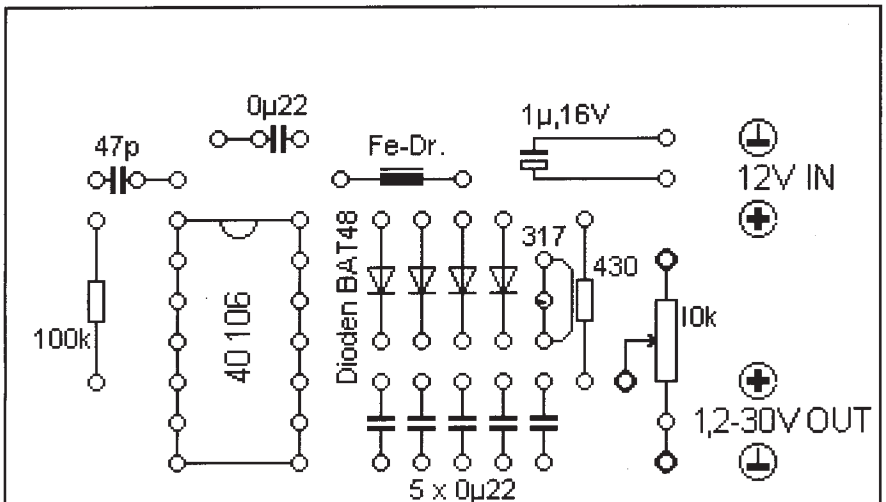


Bild 4

generates switching pulses with a 250 KHz rate. At higher frequencies the efficiency factor decreases because of more own consumption in the chip, while lower rates would afford bigger capacities in the multiplier chain. For building the device it is wise to take the shown layout of "Plan 1" or "Plan 2". Diagrams "Bild3" and "Bild4" show the equivalent stuffing. Photograph "Bild5" shows both boards fully stuffed. An alternative layout with wire-wrapping would produce high switch pulses because of wire inductance which can add to the output signal and radiate the switching frequency.

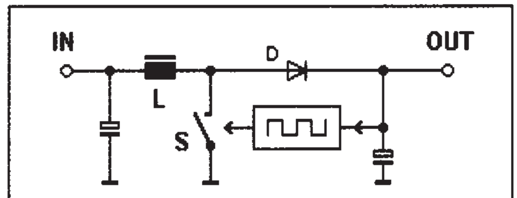


Bild 6

Voltage Multiplier With Coils

In diagram "Bild7" the details are shown. Transistor BC546 switching the coil is controlled by an astable multivibrator (ICM7555, TS555CN). Its' special wiring allows adjustment of the on and off time independently. If the output voltage of the converter decreases because of low supply voltage or high load current, the resistor R2 needs a higher value in order to increase the loading time at the coil, and vice versa. This regulation is done by photocoupler PC817 being shunted in series with Z-diode Z-30 (Z33). The output voltage is derived from the Z-diode`s rated voltage and the voltage drop at the IR diode inside the photocoupler.

Construction Details

A successful construction depends on a suitable coil and associated resistors R1 and R2. Two commercially available types of coils have been selected: a miniature inductance with 2.2 mH, 21 ohm, maximum 105 mA produced by NEOSID (www.conrad.de) and a universal coil with 33 mH, 80

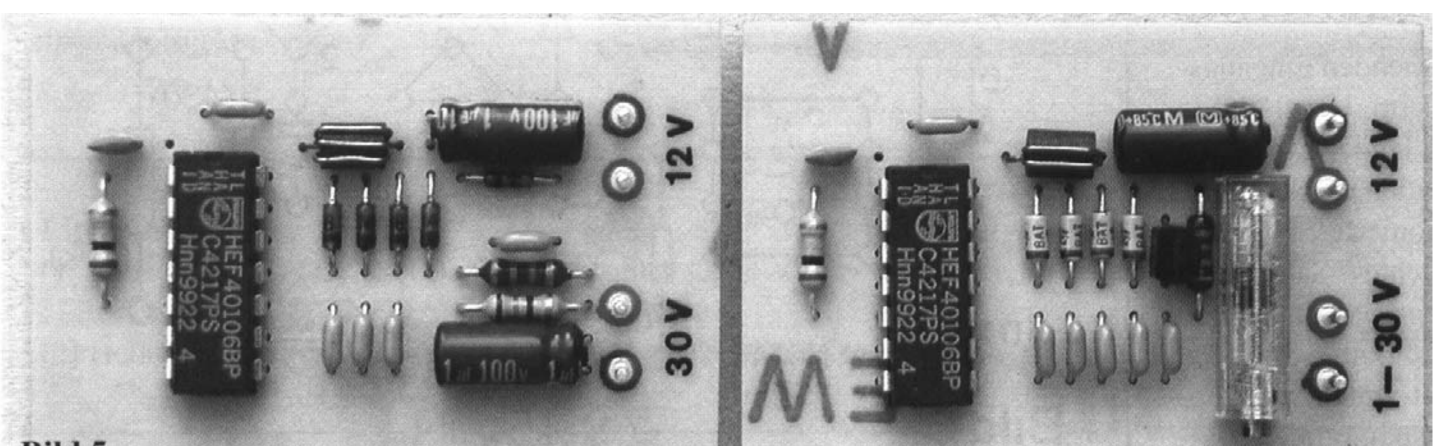
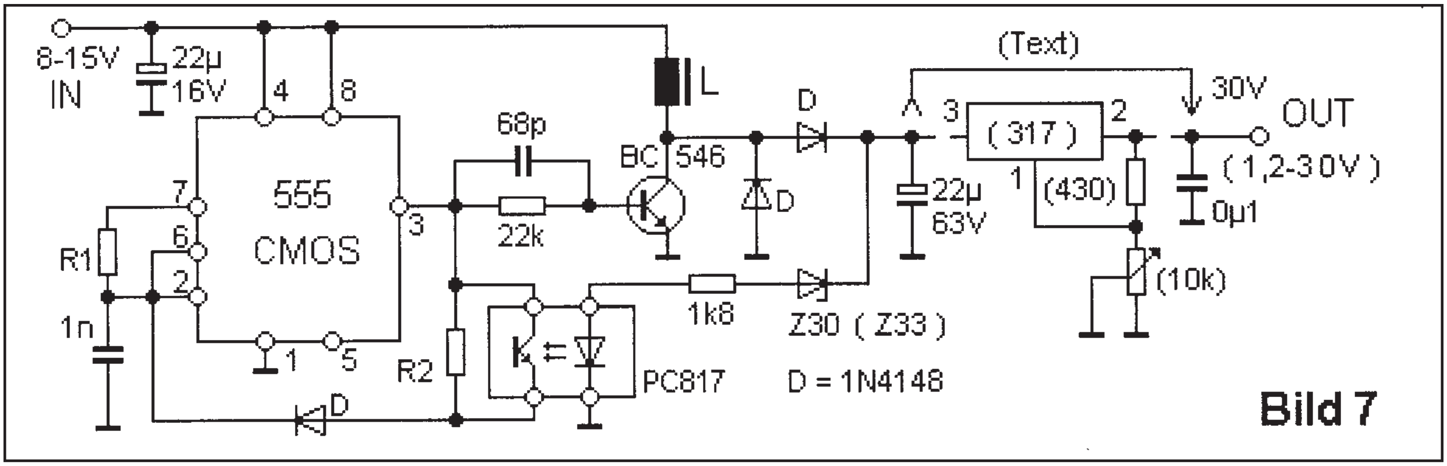


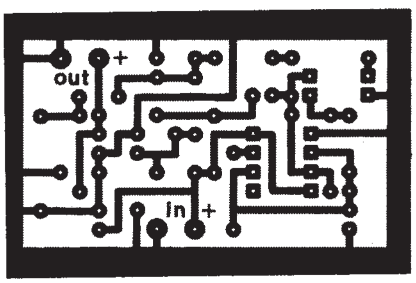
Bild 5



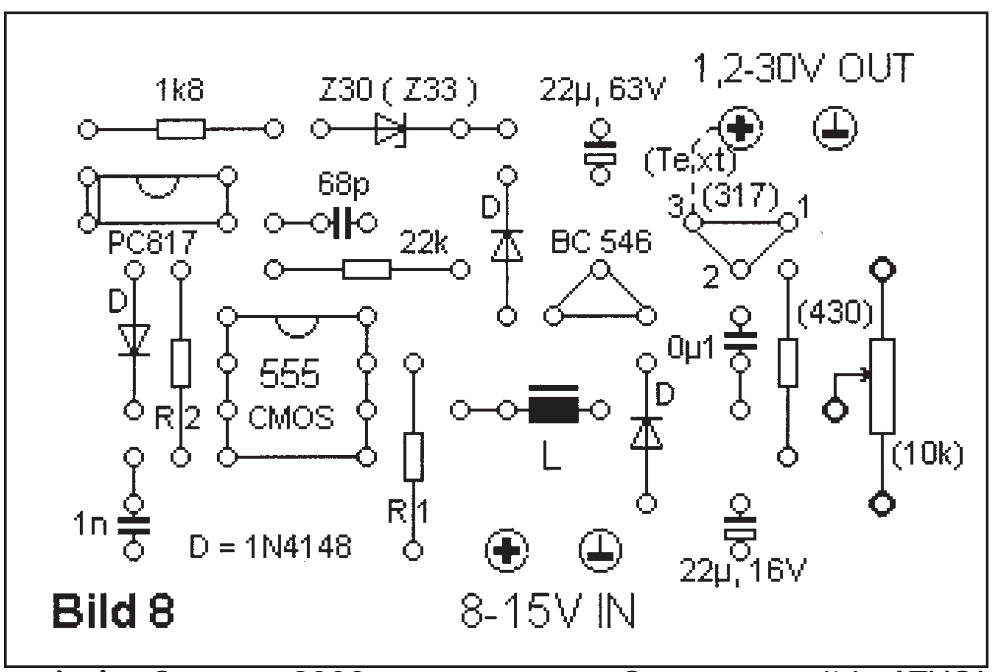
ohm, maximum 30 mA (www.elv.de). The table (page 35) shows possible resistor values with a load current of 1.5 mA (PLL) and 4 mA (added 317LP regulator). Trying other coil types the R2 value should be chosen in a way, that with a lowest possible supply voltage the maximum allowable coil current value is not exceeded. A well designed circuit behaves like a "real" switching power supply. An increasing supply voltage will decrease the input current - overall power consumption is about constant. With input voltages between 8 and 15 Volt the output only changes by 0.3 Volt, a similar behavior is seen with varying load currents in the mA region. For exactly adjustable output voltages you need to insert additional components (values in brackets) including the 317LP regulator. The layout is shown with "Plan3", according stuffing is shown in diagram "Bild8". Photograph "Bild9" shows four different types of boards, each fitting into tinplate housings 37x55 mm.

Commercially Available DC-DC Converters

These converters are designed for much higher power output than needed as tuning pots or PLL devices. With such low currents they do not reach the efficiency factor of 80 percent given for 1.5 W output. Their electrically isolated in and outputs can be a benefit, especially with very long cables supplying external devices where a changing voltage drop across the common ground can modify the tuning voltage sent along the cable.



The small DC-DC converter NMA1212S (www.conrad.de) produces two 12 Volt outputs, plus a 24 V sufficient for many tuning circuits. Varying load currents do not matter much, but an unstable supply voltage is not regulated! In contrast to this the DC-DC converter made by "Cosel" compensates for load variations as well as changing supply voltage. The 12 volt dual



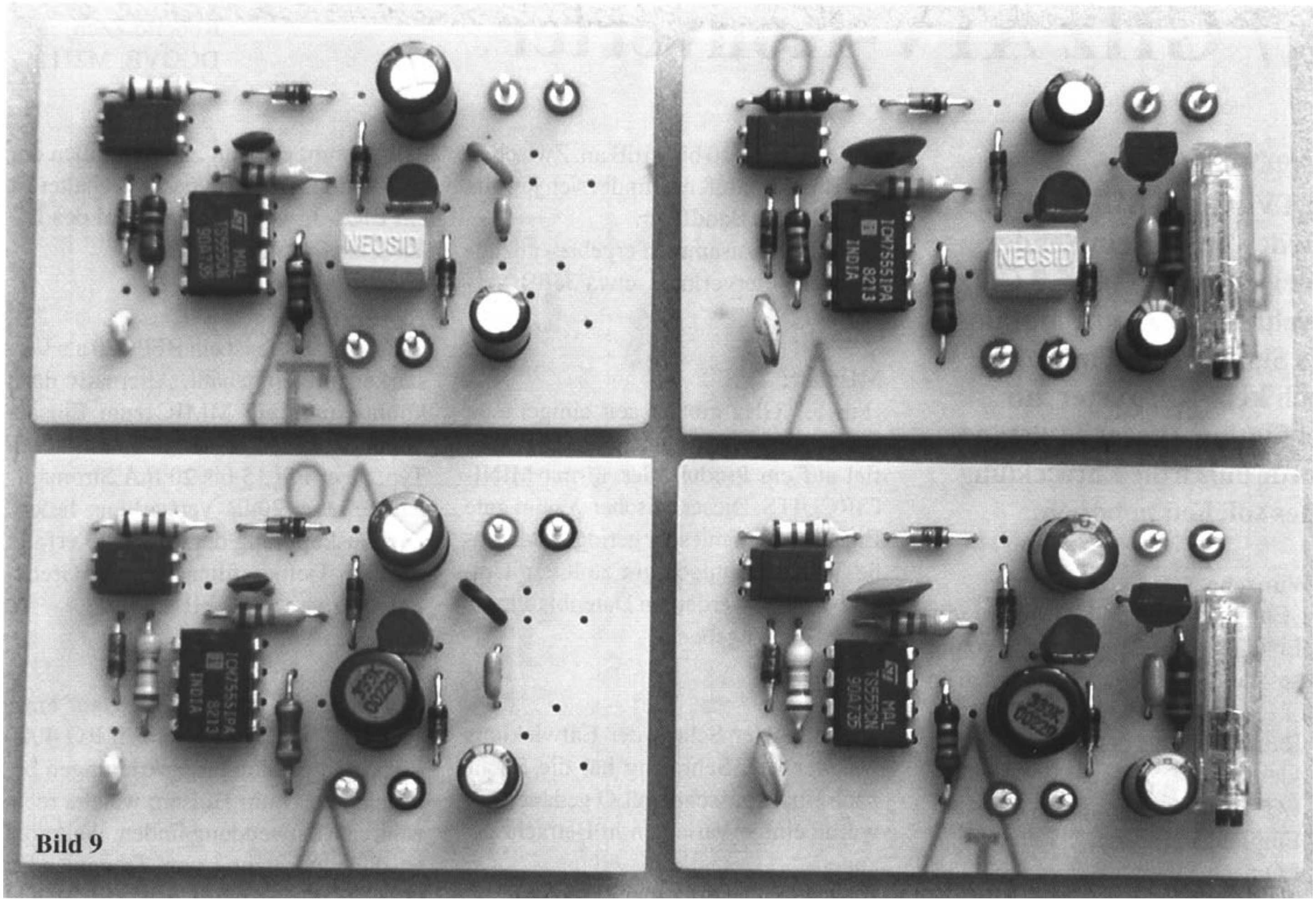


Bild 9

type "ZUW 1R5 12/15" (www.conrad.de) produces stable 15 V twice = 30 Volt, with the tiny load from tuning pots or PLL devices even at supply voltages down to 5 V. Photograph "Bild10" shows both modules upon an unstuffed do it yourself converter board for comparison.

Author: Guenter Sattler, DJ4LB

TV-AMATEUR 128, page 4
translation by Klaus, DL4KCK
AGAF e.V.
www.agaf.de

ATVQ

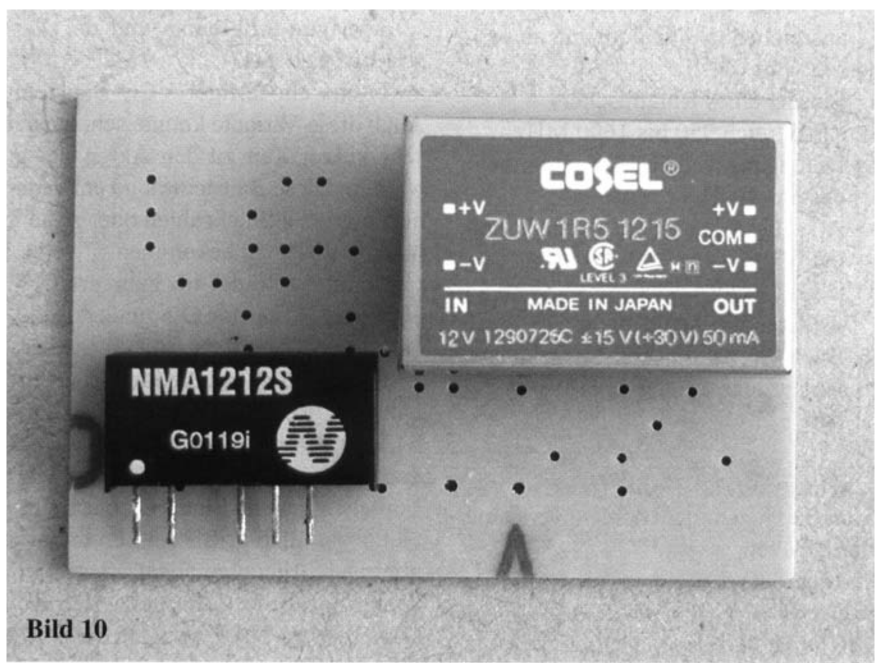


Bild 10

Table

	L = 2.2 mH		L = 33 mH	
	R1	R2	R1	R2
1.5 ma	82k	27k	56k	100k
4 ma	27k	27k	27k	100k

AGAF at HAM RADIO 2003

Our common AGAF/DARC booth was as large as never before, so Mr. Kraemer from “Deutsche Welle” radio was able to demonstrate DRM (digital radio mondial) the new high quality broadcast standard for medium and short wave. DM2CKB and DM2CMB found many interested OM for the new home made wobbler “WOB31” with PC interface covering 100 to 3000 MHz. DL4KCK demonstrated 3D-TV without special glasses on a 15 inch “3D-DTI” TFT monitor from VHS cassettes and live with a “NuView” camcorder adapter.

Main attraction was of course digital ATV by the developer group around DJ8DW and DJ8VR from University of Wuppertal. All three days a QPSK signal (DVB-S) with live video from OE9/DL0DTV in Austria at Pfaender mountain (26 km away from Friedrichshafen) was sent without problems to a large TV monitor at the booth. On a smaller TV set a first OFDM demo application (DVB-T) for amateur use was shown with live video provoking people to test handwaving the typical MPEG delay. Questions on technical details came from European, but also North American and Asian OM.

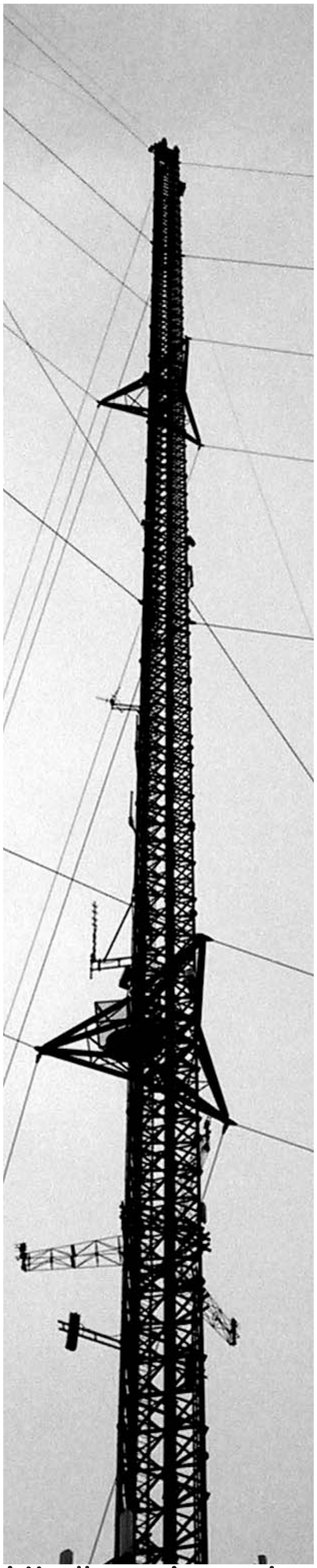
On Sunday morning the big project was due - DATV live from a flying 10 passenger Zeppelin above Lake Konstanz. DJ8DW had fitted DATV boards, battery and ventilator into a small aluminum suitcase and had it accepted by the aeronautical experts. A home made circular omnidirectional antenna was to radiate the 200 mW TX power hanging below the cabin. PA3HCZ, son of DJ8DW, did the camera work on board. Soon after takeoff the crisp video vanished from the big monitor as our directional antenna team on the roof could not see the Zeppelin any more - it headed west to Konstanz instead of east to Bregenz where line of sight would have been sure. Really democraticly the passenger’s majority had voted for Konstanz and Isle of Mainau.

DJ3DY and DK5DF at our remote DATV station OE9/DL0DTV in Austria (350 m above lake level) where lucky to receive the live Zeppelin video nearly all the time, and also HB9/DH6MAV in his van near St.Gallen at the swiss alps got the pictures fine with his digital Sat-TV-Receiver. Returning to Friedrichshafen the DATV Zeppelin presented beautiful views from above for all spectators again. It was a successful event including more than 120 issues of the new TV-AMATEUR 129 magazine sold.

Klaus, DL4KCK (AGAF e.V.)

AA9XW Chicago ATV Repeater Pix

Tower:: Andrew ALP antenna used for repeater 439.25 input located at the 580' level, seen side mounted at the right of the photo if you zoom in. Three yagi's at 530' used for transmit on 421.25.



Rig: repeater workings. PC receiver, PC exciter, Alinco RF amplifier, VM771 automatic video level corrector. Monitors left to right:

1 - Off-air demod, monitors transmitted signal

2 - Future receiver

3 - 439.25 (lower side band) off air receiver

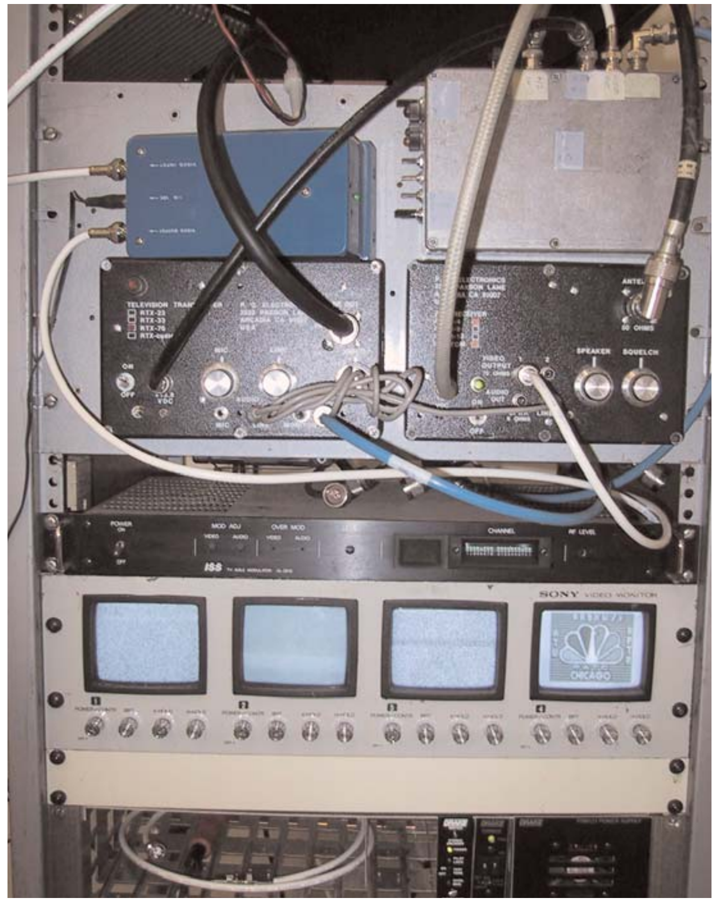
4 - Video after video AGC box as it is sent to transmitter (transmitter input)

1 5/8" coax feed both antennas.

Mirage D100N ATV amp not being used at this time.
Cable modulator to replace PC transmitter in the future.

Astron power supply runs everything except receiver, which has its own Radio Shack power supply.

AA9XW ATV Repeater has gone from two antennas, to operation on the one Andrew slot antennat at 550 feet in full duplex mode as of June 27th. A new RF amplifier was added that had lower IM and allowed single antenna operation. The old receive antenna was three KLM 440-6 antennas which produced a lower gain semi omni pattern. The Andrew transmit antenna has 12 dBd omni gain and near nothing VSWR and now serves receive and transmit. This should improve receive sensitivity about 5 dB. The old antennas will stay as a back-up. The system uses a TX-RX interdigital combline filter.



John Fox WB2LLB SK

Dr. John Fox WB2LLB/4 of Huntsville, Alabama passed away on June 25th after a lengthy bout with cancer. He was the mainstay of our local ATV activity and he would host the weekly ATV net for the Tennessee Valley Amateur Television Society (TVATVS) from his fully equipped home TV studio that rivaled many commercial TV studios. He received a "Good Image" award from A5 Magazine in 1983 for his efforts in both ATV and SSTV and has been active in both modes for many years and helped many an interested ham get involved with ATV. He was in constant contact with ATV groups around the world exchanging video tapes with them and translating the different formats on his multi-format, multi-VCR video wall. He also held a weekly schedule on CU-SeeMe internet video with fellow ATVer John Ingham VK5KG in Australia. I first met John on 20 meter SSTV and after making the move to Huntsville became one of the regular ATV net co-controllers at his house on Tuesday nights along with fellow ATVers Barry Lankford N4MSJ and Gary Dion N4TXI. Although the net still meets every Tuesday night (145.33 repeater at 8:00pm)...there is one callsign we shall truly miss.

- Bill Brown WB8ELK

ATVQ

June 24th ATV Band Opening

I've been working on my ATV station on top of my new mountaintop QTH south of Huntsville, Alabama.

On the morning of June 24th I decided to get up at the crack of dawn (6:00AM) and see if I could hear anything from the daily schedule of ATVers from Ohio, Indiana and Kentucky. I was surprised to see the band in excellent shape and managed to see sync bars from Dick, W8RVH, in Ohio (411 miles), Bill, KB9JGF, in Indiana at 370 miles and was amazed to see Don Miller, W9NTP, in Indiana at a solid P3 (354 miles). Hank, W4HTB, in Bowling Green, KY was also a P2 at 178 miles.

Also heard was Farrell, W8ZCF, in Ohio on 2m.

I decided to make the trek back up the mountain that evening after work and was amazed to hear Andy, N9AB, and Roland, KB9PWQ, in the Chicago area booming in on 144.34 FM....I saw Andy's ATV signal at P1 (549 miles) and sync bars from Roland at 529 miles. Although they heard my ATV carrier on SSB (guess you could call this a CW contact on 70cm) it wasn't strong enough for a picture.

Bill Brown - WB8ELK
WB8ELK@aol.com

ATVQ

Editor: Bill, did you fill out the CONTEST FORM with these great contacts?

Elktronics Is Back!

Elktronics has moved to Alabama. They make the famous ATV ID'ers that uses a group of graphics to identify your ATV station or repeater. It has taken a "little" time to unpack since Bill arrived there, but he is not up and ready to make new boards and/or to program new graphics for your ID'er.

Check the new Elktronics website at :
http://www.elktronics.com

New address:

Elktronics
Bill Brown WB8ELK
107 Woodlawn Dr.
Madison, AL 35758

email: wb8elk@aol.com
Phone: (256) 772-6000

Video ID chip changes are $20. New graphics can be selected from the website...also I still have the VDG-1 video ID's for $150.00.

ATVQ

Newbie FSATV Question

In a message dated 3/21/03 5:25:31 PM, k8jwt@ntelos.net writes:

I have noticed from my internet searching so far that ATV is done in AM mode on 70cm and FM mode on the higher bands. I was wondering why there isn't any 70cm FM ATV? Or is there and I haven't found out about it?

Answer:

Depending on the sound subcarrier frequency, FM ATV occupies 17 or more MHz. There just isn't room in the 70cm band without interfering with, as well as receiving, other mode users. Standard TV is AM. Sure some will tell you you can slope detect FM, but it is very poor and other drawbacks.

Tom O'Hara, W6ORG
P. C. Electronics
www.hamtv.com
Phone 626-447-4565
m-th 8AM to 5:30PM Pacific time

ATVQ

ATVQ TO PAY FOR ARTICLES!

Payment for Technical Articles

ATVQ will pay for certain articles that it publishes. I will outline the policy here, but it will be subject to change as needed to make sure that ATVQ continues to be an ongoing publication. ATVQ will pay $25.00 for technical articles that are published and are a minimum of 2 pages. While this is not a great amount, I hope it will encourage more technical type articles to be written. Exceptions will be articles that are written by a manufacturer/seller of equipment that is being written about. While I do not want to discourage this type of article, the article itself is an advertisement of the product. Articles from clubs will be encouraged, and I would expect they would like to share their information with the ATVQ readership. Information gathered from the Internet will not be paid for and is mostly small filler items.

Ideas

Do you have an idea for an article that you've said to yourself that you wanted to write, but never did. Feel free to check with us to see if it is of interest, or write and send it in. No guarantees that it will get published, but if you don't try, you will never know. I'll be looking to see what you can do!

ATVQ

CONTRIBUTORS GUIDE

Preferred method of receiving articles is from **Microsoft Word**, however **Wordperfect** is OK too. Next preference would be **ASKII text**, followed by **typewritten** or **hand written** (clearly). Diagrams or pictures (B&W or Color) can be sent in hard copy, or if you scan them in, save to PCX or JPG formats (actually I can read about anything). If you send a computer disk, make sure it is PC (not MAC) format.

When sending in articles in Microsoft Word, please SAVE with FASTSAVE OFF and save in Word 6 format. Also, articles written in any word processor, consider what will happen when it is re-formatted to fit the style that I might put it in. An example would be setting up tables or adding figures into the article. They can be very hard to strip out. If possible, put the tables, figures, each in a file by itself. This will help me to be able to import into the magazine format.

Articles can be sent to:
ATVQ, 5931 Alma Dr., Rockford, IL 61108

or to our email address: **atvq@hampubs.com**
Also note our web page address: **http://www.hampubs.com**

ATVQ

ATN - Illinois
New ATV Repeater Going Up In Rockford, IL

W9ATN

A group of Rockford Amateur Radio Association ATV'ers in Rockford, Illinois have started putting together an ATV repeater for the Northern Illinois area. We have had a lot of encouragement and advise from the ATN group, in particular Mike Collis, WA6SVT. We decided to join the ATN group as did AA9XW and others.

While this group of hams interested in ATV has been meeting once in a while for a couple of years, the repeater idea did not really get going until our April 19 meeting THIS YEAR. Since then, we decided what we wanted to do, evaluated several sites, started looking for equipment and started collecting money for the support of the repeater. I can not believe that we have acquired almost all the equipment that we need to get started, and it is only July. Chuck Blum, N9XUG, is wiring up the controller and 1.2 GHz receiver and almost has that unit ready for test.

Our plan is to receive on 1253.25 MHz and transmit on 421.25 MHz (cable channel 57)with a second receive on 434 MHz to be turned on as needed.

Some of the equipment came from donations, such as the transmitter shown below from ATN and Mike Collis, WA6SVT. The unit itself puts out about 10 mw on 421.25 MHz, but Mike added a brick amp so we have about 7 watts out of the unit shown.

The 440 rib cage antenna shown in the picture was purchased a year ago from the flea market at the Dayton Hamfest for $10. I must have known that we would need it someday! It was minus the balun, but I made one and it works just fine.

While we have most of the equipment, it will still be a few months before we are officially ON-THE-AIR. Putting everything together takes more time, in this case, than raising the money and getting the pieces.

We should cover the Winnebago County area quite well as well as into the surrounding area which includes a portion of Wisconsin up into Beloit and Janesville. ATN was nice enough to run several elevation plots so we could see what we "should" get based on out transmit height, power and the terrain in this area.

Your editor, Gene, WB9MMM, holding the rib cage antenna for 421.25 MHz transmit (cable channel 57) and the Diamond 1.2 GHz / 440 MHz antenna for the 1.2 GHz ATV receive and 440 control signals.

We also applied for a club call, and got KC9EFU, which we quickly changed for the vanity call of W9ATN!

I will be bringing updates in future issues to let you know how and what we did. This has been quite an experience for me, never having put up a repeater before. Lots of stuff to learn!

Gene - WB9MMM

The 440 MHz transmitter with a brick added to give about 7 watts out to a yet to be aquired amplifier in the 100 watt range.

Thanks to all the fine stores that carry Amateur Television Quarterly

Amateur Accessories
PO Box 7333
Champain, IL 61826

Amateur Radio Toy Store
117 West Wesley Street
Wheaton, IL 60187

Burnaby Radio Comm Ltd.
4257 E. Hastings St.
Burnaby, BC Canada V5C 2J5

Ham Radio Outlet
1939 W. Dunlap Ave.
Phoenix, AZ 85021

Ham Radio Outlet
6071 Buford Hwy
Atlanta, GA 30340

Ham Radio Outlet
224 N. Broadway
Salem, NH 03079

Ham Radio Outlet
2492 W. Victory Bl.
Burbank, CA 91506

Ham Radio Outlet
933 N. Euclid St.
Anaheim, CA 92801

Radio City
2663 County Rd I
Mounds View, MN 55112

Texas Tower
1108 Summit Ave. Suite 4
Plano, TX 75074

The Radio Place
5675 A Power Inn Rd.
Sacramento, CA 95824

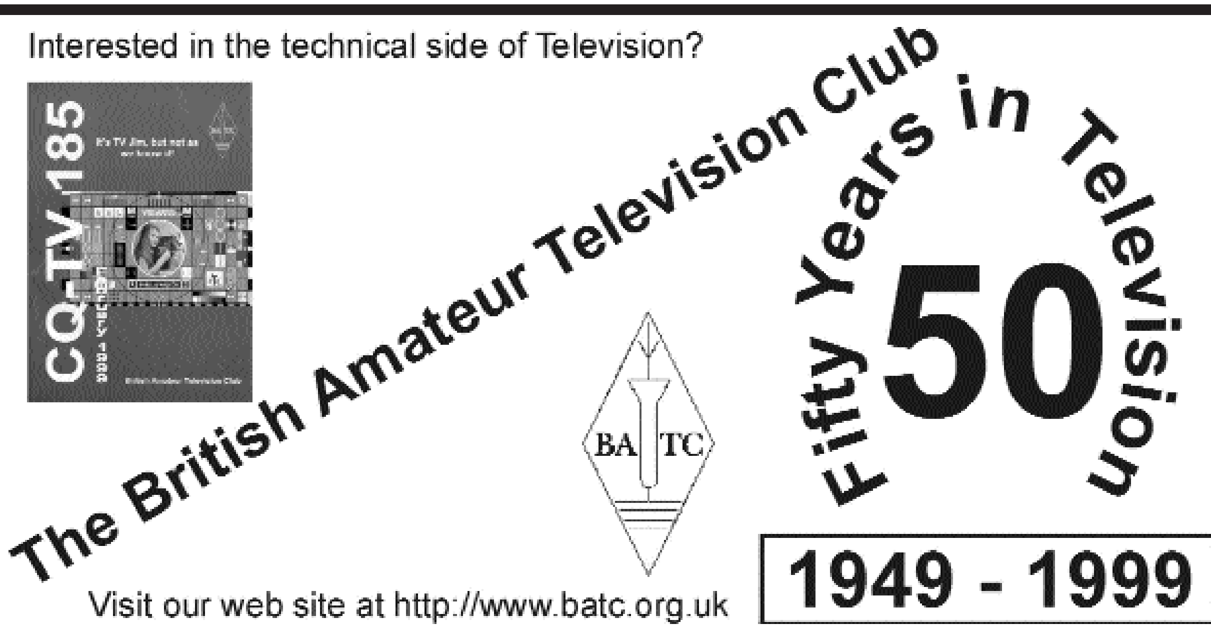
Do you know of a store that would like to carry ATVQ? Please let us know and we will contact them.

ADVERTISERS INDEX

Please mention that you saw it in
Amateur Television Quarterly!

ATVQ on the Newsstands

If you find a store willing to carry ATVQ on their shelves, we will extend your subscription by one year. In the case that two people turn in the same store, the first one wins! Offer subject to change at any time, but not likely to!

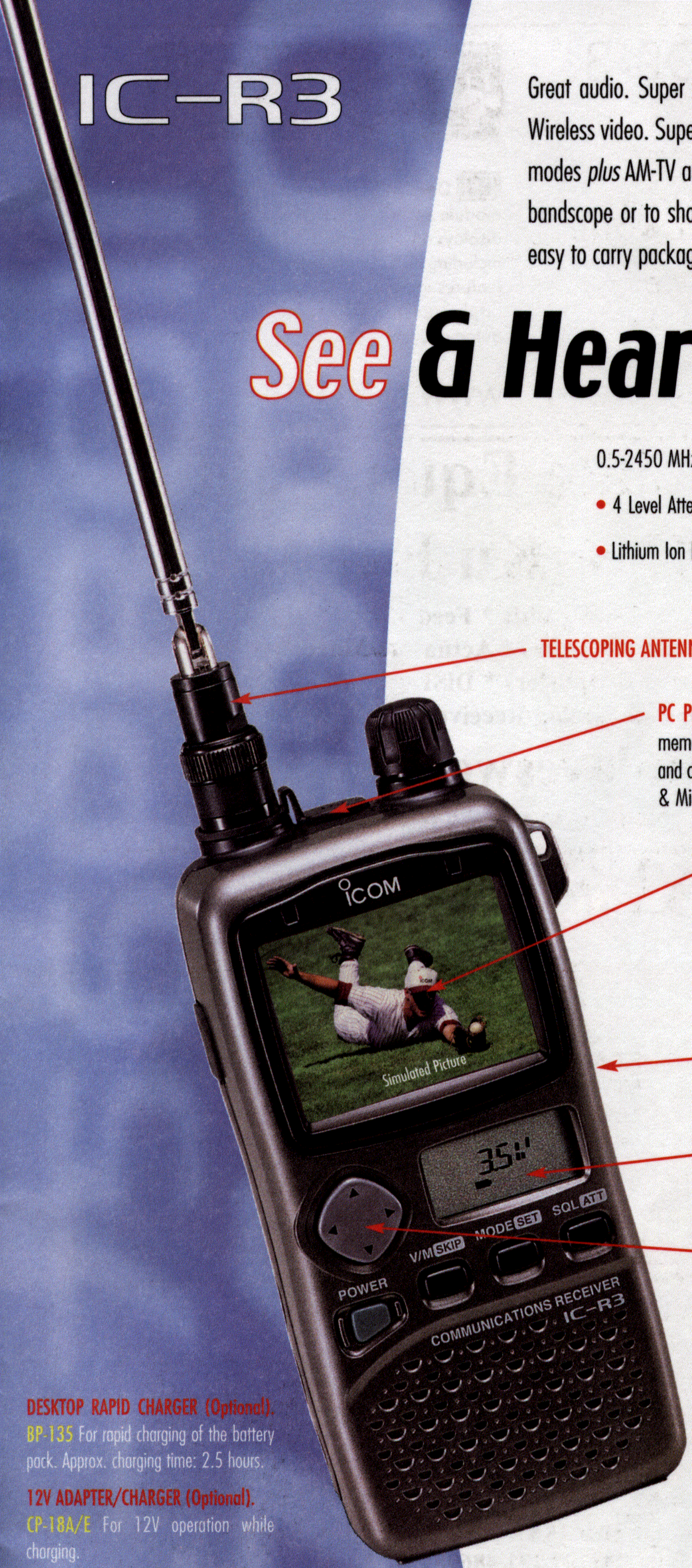


IC-R3

Great audio. Super wide tuning range. Receive video. Imagine! Amateur TV. Broadcast TV. Wireless video. Super wide coverage, from 0.495 to 2450.095 MHz - monitor AM, FM, WFM modes *plus* AM-TV and FM-TV! Large, easy to read, color display can also be used as a simple bandscope or to show information like operating status or signal strength. All in a compact, easy to carry package. Visit your authorized dealer today - you'll see and hear the difference!

See & Hear the Difference.

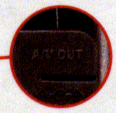
0.5-2450 MHz* • 450 Memory Channels with Alphanumeric Names • CTCSS with Tone Scan • 4 Level Attenuator • Telescoping Antenna with BNC Connector • Four Way Action Joystick • Lithium Ion Power • 2" Color TFT Display with Video/Audio Output • PC Programmable**



TELESCOPING ANTENNA. With BNC connector.

PC PROGRAMMABLE. For quick and easy setting of RX frequencies, memory names, and more. Requires optional cloning software (CS-R3) and cloning cable (OPC-478). Works with Microsoft® Windows® 95/98 & Microsoft® XP® (Home & Pro versions).

2" COLOR TFT DISPLAY. Amateur TV without the hassle of wiring! Monitor amateur TV frequencies at 420-440, 902-928, and 1240-1300 MHz, as well as broadcast TV and wireless cameras. The display can also be used to show operating status, incoming signal strength and much more!



AUDIO/VIDEO OUTPUT. Conveniently located output jack allows you transfer images to a TV monitor or recording device.

BACKLIT MONOCHROME LCD. Displays frequency, battery voltage, and other operating conditions. Auto off timer helps conserve power.

MULTI-FUNCTION JOYSTICK. Quick & easy access to operating band, AF volume, LCD settings, and more.

DESKTOP RAPID CHARGER (Optional). BP-135 For rapid charging of the battery pack. Approx. charging time: 2.5 hours.

12V ADAPTER/CHARGER (Optional). CP-18A/E For 12V operation while charging.

SUPER WIDE FREQUENCY COVERAGE. 0.495 - 2450.095 MHz*

AM 0.495-329.995 MHz • FM 1.625-2450.095 MHz (816-901.995 MHz is blocked) • WFM 76-769.995 MHz • AM-TV NTSC M, PAL B, or PAL G System • FM-TV 900-1300 MHz and 2250-2450 MHz

*Cellular frequencies blocked; unblocked versions available to FCC approved users. **Optional equipment required.

Setting a new standard

www.icomamerica.com

ICOM®

ATV Research Inc.

Wholesale Only

Video Catalog
2003A

CCTV * MATV * SMATV
since 1964

Innovative Products for the 21st Century Market of Applied Television

* Competitive pricing
* Friendly service
* Quick delivery

Exciting Video Products from A-Z Featured in our New 2003A Full-Color CCTV-MATV-SMATV Catalog.

Call, Fax, Email, or Write for a FREE Copy!

Available only to licensed amateurs and businesses

1301 Broadway - Box 620, Dakota City, NE 68731-0620
(800) 392-3922 or (402) 987-3771 24 hr fax: (402) 987-3709
Website: www.atvresearch.com Email: sales@atvresearch.com