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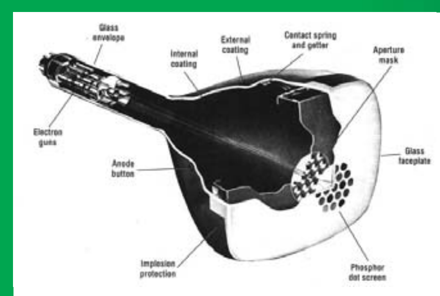
100 MILE ENDURANCE RUN WITH ATV



HOW MONITORS WORK

IS THIS CAR GOING OFF THE ROAD? YES, IT IS = CAUGHT ON ATV. SEE WHY INSIDE.

CHEAP & EASY 2.4 GHz FEED

AMATEUR TELEVISION QUARTERLY

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Publisher/Editor
Gene Harlan - WB9MMM

Editorial Office
5931 Alma Dr.
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(815) 398-2683 - voice
(815) 398-2688 - fax
Internet:
http://www.hampubs.com
email:
ATVQ@hampubs.com

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Amateur Television Quarterly

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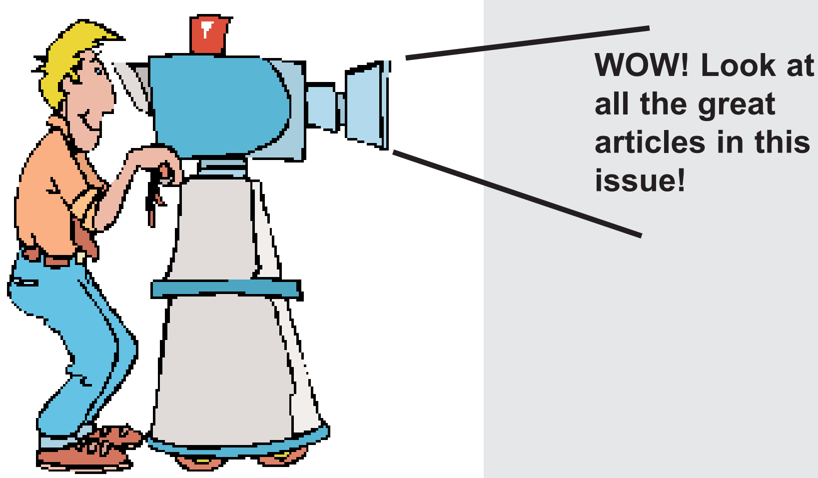

Discovery Project: Which Mission Next?

The following was taken from the amsat-bb sig. Lots of good thoughts. I only printed what I had room for.

There has been talk of landing a rover that could be remote-controlled on the moon about a year ago. There was even recently a hint of doing a space-based telescope that would orbit the moon. What about a moon-based repeater system?

Your post wasn't what I was referring to. One poster specifically stated a telemetry only system the main use of which would be for education. That is what I have a beef about.

.

This is why I brought this up as a possible idea for discussion and why I think that we have personally done almost everything possible LOCALLY i.e. Low Earth Orbit except for one thing and that would be Fast-Scan ATV. But on that note, I understand why we haven't yet.

KD4LDA

Enlighten me. Why don't we have a Fast Scan ATV satellite? That would be cool! Much more interesting than talking to the same old farts in one's local area. Too much bandwidth? Power requirements too severe? Inquiring minds want to know!

Jon - NA9D

How big of disk do you want on the ground to receive the signal and how big and how much power are you willing to send up to the satellite?

We could put a FM ATV signal on the up coming "Non-AMSAT" OS-II satellite.

We will have video cameras on board and could pipe the signal down on S-Band. The hardware would cost us about $5,000 extra. The problem is the 5-watt transmitter we are looking at will draw 56 watts of DC, the 10 watt draws 84 watts dc and a 20 watt draws 140 watts dc. As you can expect, we could not run them for very long and maybe only be able to run it once a month.

We will have an S-band 153 kbps downlink but I have not decided what the output power will be yet. If we fly a 5 watt transmitter it might be able to be received by what most people have on S-Band now but we will not be able to have it on that often. If we fly a 2 watt transmitter we may be able to have it on more often but it will require a bigger antenna on the ground.

73, Randy N7SFI

Analogue ATV?

Anyone got a satellite band 7 MHz wide and a good power budget? FM would need even more bandwidth. I suspect this is the main problem. Digital technology should help to create useful ATV birds, by allowing narrower bandwidths.

Would love to beam TV pictures around, but we may have to be creative to get it working within amateur constraints. :-)

Tony, VK3JED

As everyone points out, the bandwidth of FSTV is horrendous and takes at least 24 dB greater than FM for any satellite link, probably the best compromise would be the FAST-FM mode now used between Kenwood radios an the VC-H1 SSTV converter. I think this takes only 15 seconds for a pretty good image. But still, that is awfully slow.

But on a LEO bird, what value is anything more than that? Everyone in the whole USA would have to share just 15 minutes, and we have demonstrated that that is difficult to do on LEO's

What I think we need is something like about a 1 second frame rate. This would only take 12 dB more than FM and about 250 KHz instead of the 6 MHz for FSTV.. But rather than inventing another wheel, I suspect the more universal approach will be just to have a high data rate digital transponder, and then JPIG images can be exchanged just as easily... And with the possible compression, this will be far more efficient that either FSTV or FAST-FM SSTV....

In any case, what would be a good target? 1 Image a second?

de WB4APR, Bob

Well, with digital technology, it has already been proven that a useable (~1fps) video channel can be obtained on a data stream less than 30kbps. Many people do it everyday on the Internet! So, it's not unreasonable to expect a moderate bandwidth video link via satellite. At 30kbps, this is within current bandwidths and modem technology.

By the time you get to 64 kbps, you're at ISDN speeds, for which there are a number of commercial videoconferencing systems capable of excellent performance. My point is that your idea is achievable. Could be especially good for SAREX and similar programs.

The real clever part will be in keeping the cost down to "amateur budgets", to ensure widespread adoption of the technology (oh, and might need to coax a few soldering irons out of mothballs ;)).

Tony, VK3JED

Next question is how long does it take to sync-up such a digital link? Some of the fast speed is due to synchronous protocols which might take a few seconds to synchronize? I'm outta my league here... IE, can very fast (off the shelf) digital links be

Continued On Next page

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, it is a starting point and 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!

AUTHORS 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 FASTSAVEOFF 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**

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exchanged between many in a round-table QSO type format?

de WB4APR, Bob

You need a full duplex data stream. We would need a completely new bird in order to do this (and some new radios):

1.) High Earth Orbit (just not enough time for video sharing on a LEO)
2.) Dedicated to high speed data
3.) Linear transponder based (more than one blooming channel!)
4.) Uses Microwave bands (preferably 10 GHz and up) - at 10 GHz, we in the US have a 500 MHz allocation! That's a LOT of high speed channels (no, we wouldn't use the WHOLE band!).

So with P3D still not in orbit yet, perhaps we have the next satellite concept being born! :-)

Jon NA9D

Wavecom 2.4 GHz Control Board

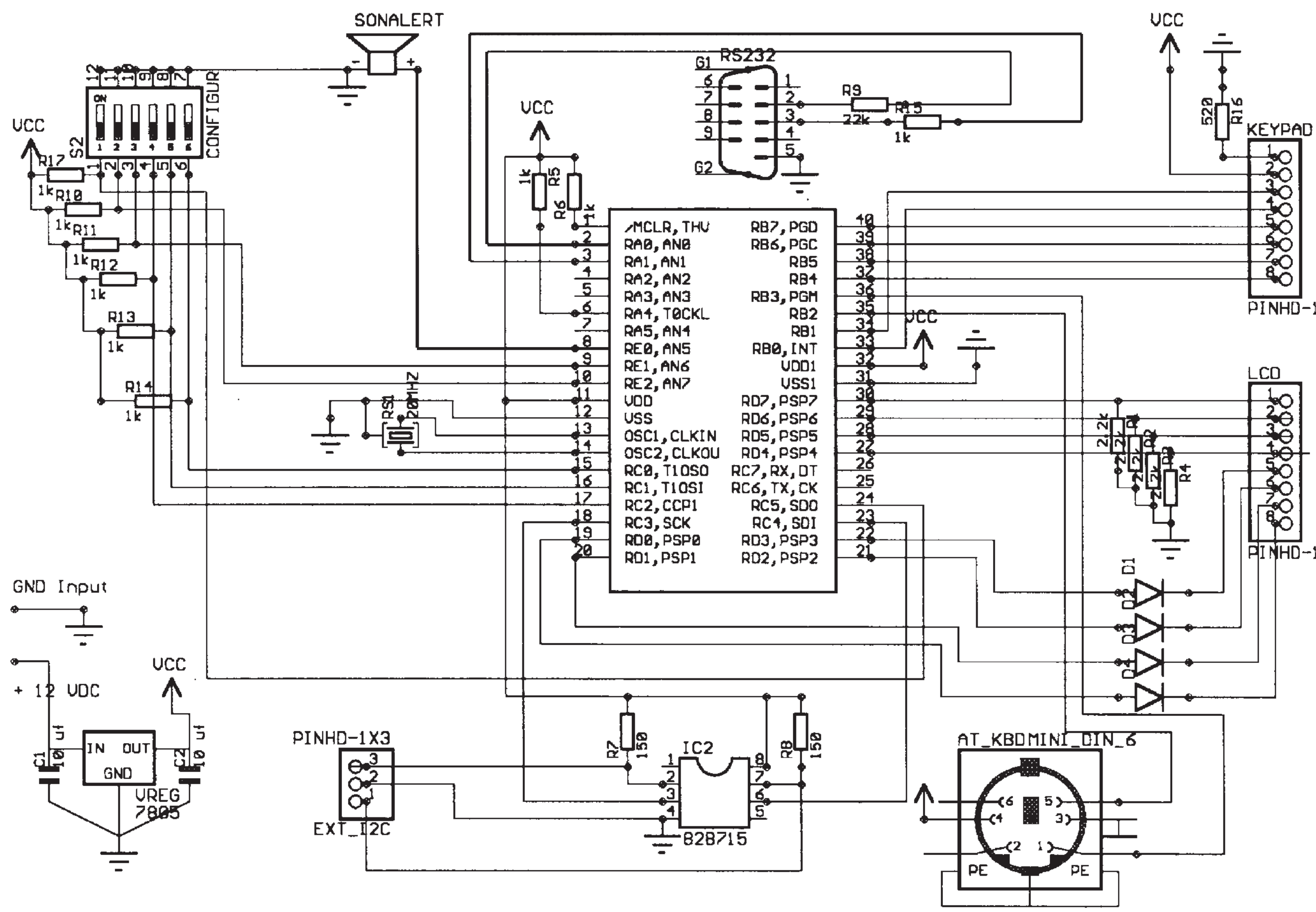
by Earl Campbell N8TV - email: n8tv@w7atv.com
6110 W. Michelle Dr.
Glendale, AZ 85308
(602) 938-7926

and programming mainly by
Steve Egbert N7XSQ - email: n7xsq@w7atv.com

How would you like to control the Wavecom 2.4 Ghz transmitter AND receiver with ONE circuit ? Well, presented here is such a circuit. A little explanation is in order first.

The Wavecom 2.4 Ghz Tx and Rx are frequency controlled by a Philips synthesizer I2C Bus chip. This chip is controlled by a PIC chip in each of the units. Well guess what! The 16F877 PIC chip has the ability to control an I2C Bus device ! All we now have to do is set two unique addresses in each of the units for the I2C control and disable the built in PIC chip in the Tx/Rx. Once we have done this, the new PIC chip can address each unit independently. The I2C Bus normally can only run a short distance. What if we want to put the Tx or Rx or both units at the antenna ? Philips makes an I2C Bus extender chip made to extend the I2C Bus several hundred feet. Now we can have the controller in the shack and the Tx/Rx at the antenna to minimize feed line loss. VERY important at these frequencies !

The controller has a 16F877 PIC chip. We program it for you if you buy the chip from us. Otherwise, you may send us your chip and we will program it for you for a $10 fee. The controller has ten transmit and ten receive frequency storage capability. With the included 16 button keypad and 2 line by 16 character display you can enter the frequency by memory location (0-9) or by



direct entry. The transmit and receive frequencies are independent and may be different. You may also scan the receiver by programmable increments of .125 Mhz to 15 Mhz steps. You can also do a channel scan, with the ability to lock out one or more channels. Error beeps and entry conformation tones are generated by the controller. The controller will notify you if the frequency synth goes out of lock and/or if the I2C Bus connection is good or not. There are many other features that this controller has. Another feature is that you can control it from a serial terminal or a PC running a terminal program. An external PC or terminal is not required as the unit has a keypad and a display. Why did we do both ? Well, cost. If you don't want to have the keypad and display (a substantial part of the cost) and you already have a PC to control things you can build it without the keypad and display. This controller is a very versatile and programmable device. It is not hard to build and a printed circuit board, kits, assembled units, or parts are available. A preprogrammed PIC chip is $ 25 with shipping. A complete kit is only $ 99.

Let's get to explaining the circuit.

IC1 is the PIC chip 16F877. This chip does all the calculations, scans the keypad, stores the frequencies, looks for input on the RS-232 line, outputs data on the RS-232 line, listens to and outputs data to the I2C bus, formats and displays characters on the 2 line by 16 character display, checks the set of configuration switches, outputs beep tones to the sonalert, and generally works its butt off !

IC2 is the I2C Bus extender chip. This chip allows the normally short I2C Bus to be run in excess of 200 feet. For long lines, shielded cable should be used. I have over 200 feet on my control lines!

D1-D4 and R1-R4 are part of the keypad scanning circuit. The PIC chip can tell which button is pressed on the 4 by 4 keypad by this method.

The 520 ohm R16 is a contrast control resistor for the 2 by 16 LCD display. A 1k pot may be used here for adjustable contrast control.

The 6 position dip switch is used for configuration data input. This allows you to use different types of keypads and change other operating parameters.

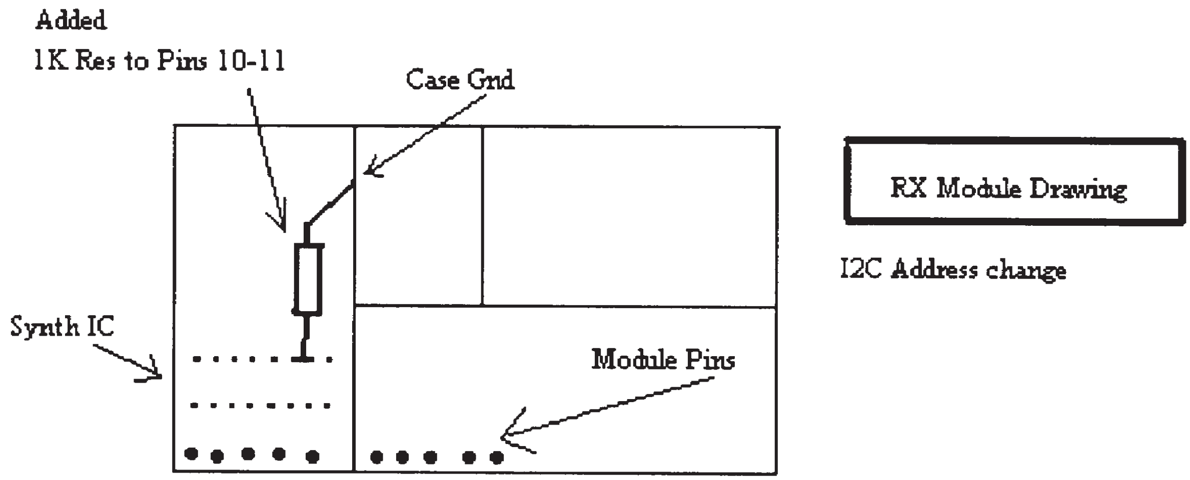
The EXT-I2C connector is for the clock and data signals to the TX/RX combo. The center pin is ground. You must connect clock to clock and data to data at both ends.

2X16-LCD connector is for the LCD display. Pin 1 is the red stripe on the cable.

4X4-KKPAD is the keypad connector. You can't get this wrong. Any way you hook up the four row and four column connections is ok because the configuration part of the program figures out what button generates what key scan code.

RS-232 is the standard DB-9 RS-232 serial connector for connecting to a computer or terminal. While it is not necessary if you are just using the keypad and LCD display, it is another feature we built in.

R10-R14 and R-17 are pull up resistors for the configuration switches.
R5-R6 are pull up resistors for the CPU reset circuitry.



Rx Module Drawing

Ok, now to explain what mods need to be done to the Wavecom Tx and Rx. Please refer to the drawings for the following steps.

RX >>>>>>>>>>>> See Rx Module drawing

1. Change the I2C address of the synth chip. To do this you need to ground pins 10 and 11 of the synth chip inside the square Rx module through a 1k resistor. The ground end of the resistor may go to the case of the module.

RX >>>>>>>>>>>> See Rx Ckt Board Bottom View drawing

2. Lift pins 8 and 9 of the pic chip on the bottom of the Rx board.

3. Identify the I2C bus pins on the Rx board. Solder two wires from these pins. The free ends of these wires are the I2C Clock and Data lines.

4. Place the 8 pin I2C bus extender chip near the Rx module connectors on the rear of the board. Solder pin 4 to ground and pin 8 to + 5 vdc.

5. Solder the I2C Clock wire from step 3 to pin 3 of the I2C Bus extender chip.

6. Solder the I2C Data wire from step 3 to pin 6 of the I2C Bus extender chip.

7. Solder one wire of a 2 wire shielded cable that you plan on running up your tower to pin 2 of the I2C Bus extender chip.

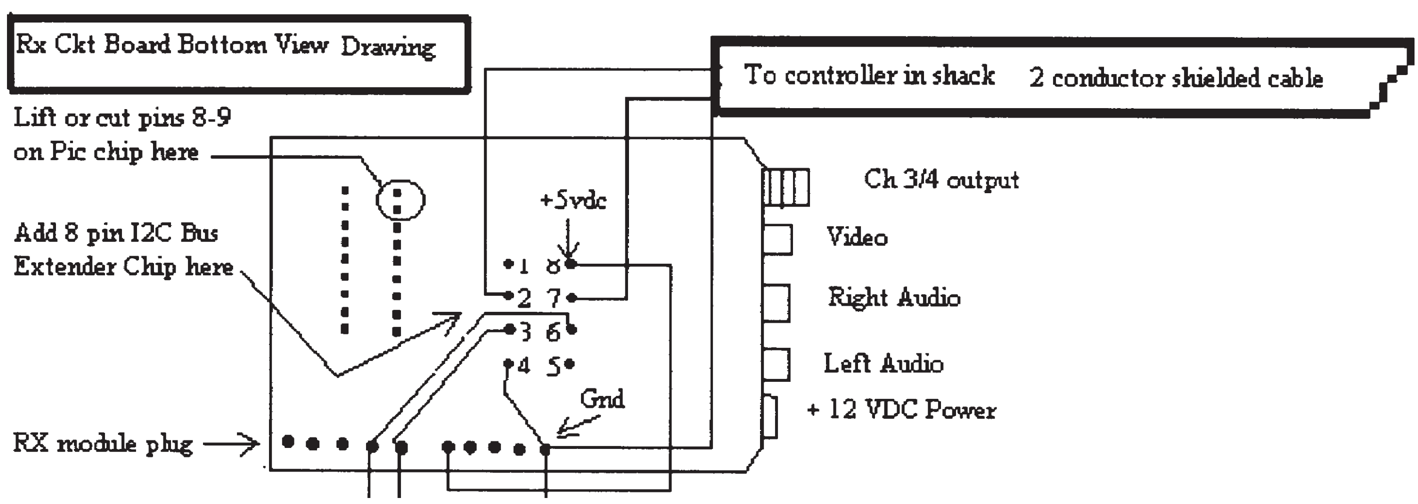
8. Solder the other wire of a 2 wire shielded cable that you plan on running up your tower to pin 7 of the I2C Bus extender chip.

9. Connect the shield of this cable to ground in the Rx unit.

TX >>>>>>>>> See Tx Module drawing

1. Remove the two resistors between the pic chip in the TX module and the synth chip in the Tx module. One resistor is in the Data line, the other resistor is in the Clock line.

2. Solder two wires from the pad of the resistors nearest to the synth chip. The other end of these wires is the Tx I2C Clock and Tx I2C Data lines.



RX Circuit Board Bottom View Drawing

3. Connect a short (less than 3 feet) 2 wire shielded cable between the Tx unit and the Rx unit. Ground shield of cable at each unit to ground at each end of the cable.

4. At the Tx unit end of this cable, connect one shielded wire to the Tx Data line and the other shielded wire to the Tx Clock line from step 2.

5. At the Rx end of the cable, connect the Tx Clock wire to pin 3 of the I2C Bus chip and the Tx Data wire to pin 6 of the I2C Bus chip.

6. Make sure the shield of this cable is connected to ground at both ends.

Controller end of cable >>>>>>>>>>>>>> See Controller drawing

1. The shield must be connected to ground (center pin of the EXT-I2C connector)

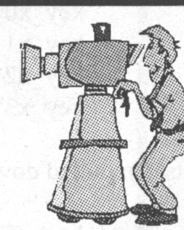
2. Clock wire to clock pin of the EXT-I2C connector on the controller.

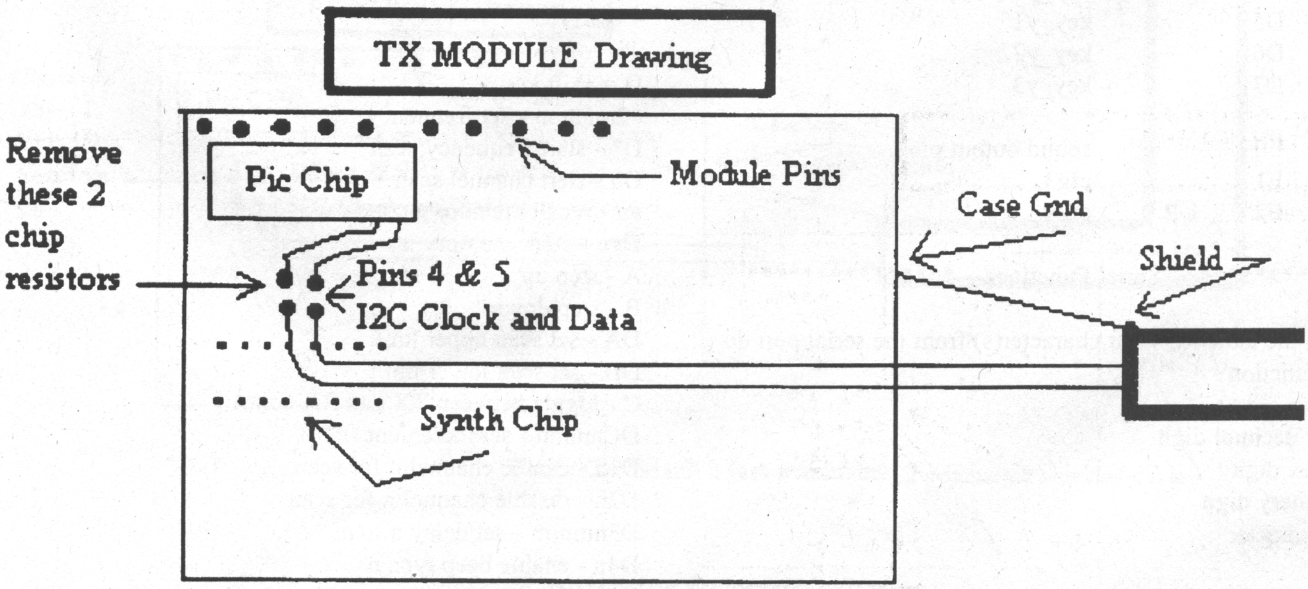
3. Data wire to data pin of the EXT-I2C connector on the controller.

Controller >>>>>>>>>>>>>>>>>>>>>>>> See Controller drawing

1. + 12 VDC
2. Ground
3. LCD module
4. Keypad
5. Serial PC interface
6. AT PS2 Keyboard

*********** PINOUTS for 16F877 ****************





TX Module Drawing

Pic Pin#	Pic Reg	What it is used for
2	A0	Reset
3	A1	unused
4	A2	AT Keyboard Clock
5	A3	AT Keyboard Data
6	A4	pulled up
7	A5	unused
33	B0	LCD register select
34	B1	LCD enable
35	B2	AT Keyboard Clock
36	B3	AT Keyboard Data
37	B4	LCD data 0
38	B5	LCD data 1
39	B6	LCD data 2
40	B7	LCD data 3
15	C0	cfg0 (config jumper 0)
16	C1	cfg1
17	C2	cfg2
18	C3	Clock I2C
23	C4	Data I2C
24	C5	unused
25	C6	unused hardware TX data pin
26	C7	unused hardware serial RX data

keypad scan outputs(X): pic pin—-|>|——-keypad pin

19	D0	key_x0 (keypad scan output 0)
20	D1	key_x1
21	D2	key_x2
22	D3	key_x3

keypad scan inputs(Y): pulled down

27	D4	key_y0 (keypad scan input 0)
28	D5	key_y1
29	D6	key_y2
30	D7	key_y3
08	E0	sound output pin
09	E1	cfg3
10	E2	cfg4

************* Serial Functions ***************

This is the table for what character(s) from the serial port do what function

n,m = decimal digit
h = hex digit
b = binary digit
x = character

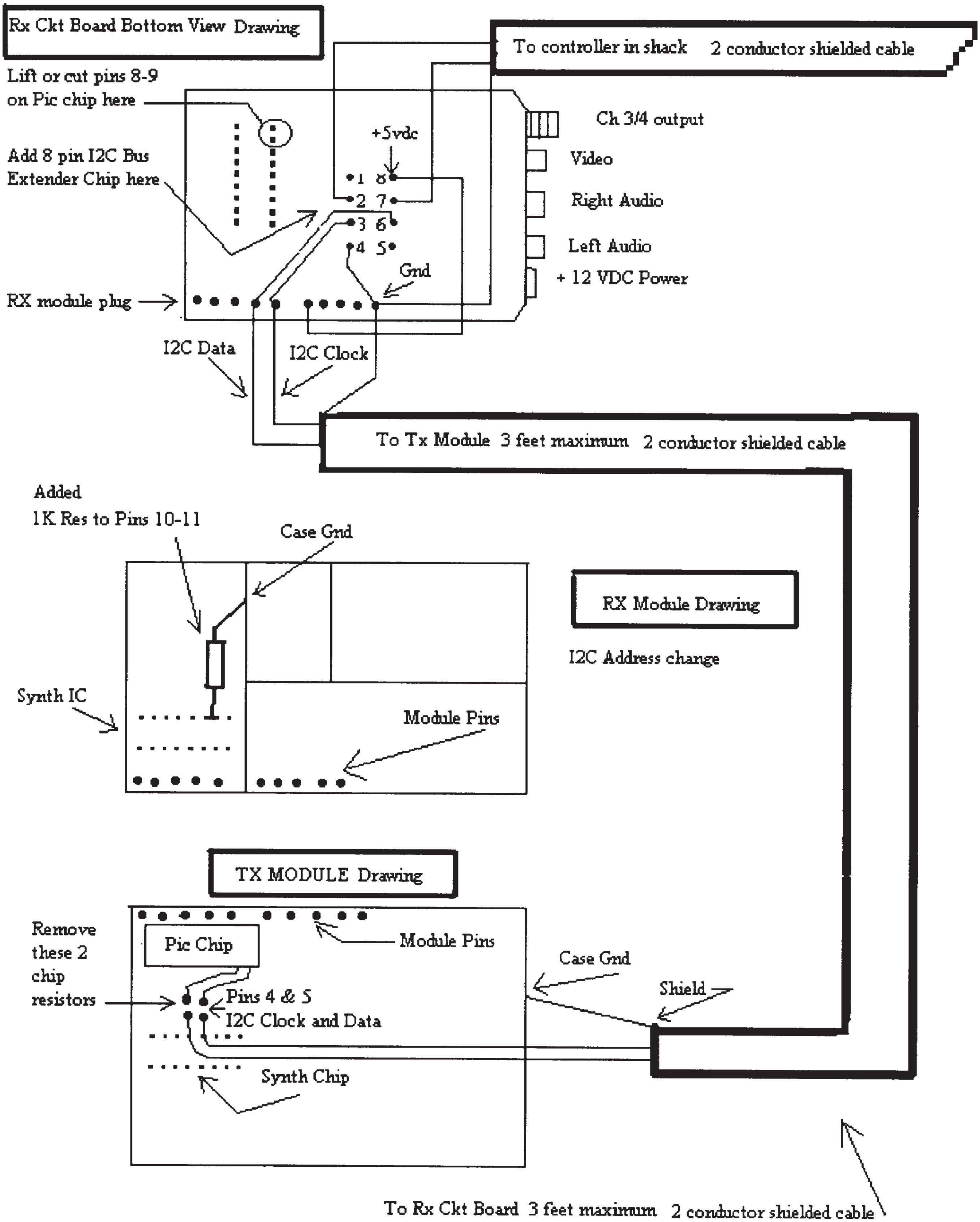
T - select Transmitter control
R - select Receiver control
B - select Both control
F=2nnn.nnn - set Frequency
Pn - set Preset n
Mn - recall Memory n
SF - Scan (Freq)
SC - Scan (Chan)
> or . - step up
< or , - step down
I=nn.nnn - set increment
U=2nnn.nnn - set Upper scan limit
L=2nnn.nnn - set lower scan limit
EBn - Enable Beep n
DBn - Disable Beep n
ECn - Enable Chan n for chan scan
DCn - Disable Chan n for chan scan
Whh:hh - Write eeprom adr:data (hex)
XThh-hh - eXercise Tone#-duration
XUnn - eXercise tUne nn
XBn - eXercise Beep n
Z - snoZZZZe (set current -> startup)
Gxxxxxxxxxxxxxxxxxxxx - set Greeting message to x
Cbb - set whether TX,RX Connected
?E - display Eeprom contents
?F - display Frequencies
?Rn - display Register bank n
?D - display delays
?B - display beeps
DLn,mmm - set delay n to m
SBn,mm - set beep n to tune m

*********** KEYPAD Functions **************

This is what character(s) from the keypad do what function

1 2 3 A
4 5 6 B
7 8 9 C
* 0 # D

D = shift key
*2nnnnnn - set frequency
D* - start frequency scan
D0 - start channel scan
#n - recall memory n
D#n - store memory n
A - step up
B - step down
DA - set scan upper limit
DB - set scan lower limit
C - toggle between TX and RX control
DCnnnnn - set increment
D1n - enable channel n for scan
D2n - disable channel n for scan
D3nmmm - set delay n to m
D4n - enable beep type n
D5n - disable beep type n
D6nmm - set beep n to play tune m



Controller Drawing

D7 - sound beep#7
D8bb - set whether TX,RX attached
D9 - set current state as startup state

Beeps:
0 - Keypress
1 - Greeting
2 - Tx PLL not there
3 - Rx PLL not there
4 - Signal detected
5 - Good command
6 - Bad command
7 - PLL not in lock

Delays:
0 - Key debounce (1 us)
1 - Greeting (.1 s)
2 - Loop (10 ms)
3 - Scanf (10 ms)
4 - Scanc (10 ms)

I have been asked to release the source code, but I won't for this reason:

1. It is in the Pic Basic Pro language
2. The Pic Basic Pro compiler costs $250 so most won't want to go this route
3. You need to buy a pic programmer at another $100
4. Learn to program the pic and learn the Pic Basic Pro language
5. We offer a pre programmed pic chip at a reasonable cost.
6. The authors of the code want to make some money for their efforts.
7. Take into account the cost and time the authors expended to do items 1-6
8. Buying the pre programmed pic is cheap and easy

I would like to thank Steve Eggbert N7XSQ for his excellent help in programming the device. He spent many hours on the code for this project.

EXTRA EXTRA ...... Late news ! EXTRA EXTRA ....

We have added a PS2 AT Keyboard connector to the circuit. If you don't want to buy the expensive ($12.50) keypad, you can use a cheep (usually under $5) PS2 AT Keyboards. The new software should be finished by the time this goes to press.
Earl - N8TV

Parts List from Digi-Key	Part Number	Cost	Page
4 x 4 keypad	GH5004-ND	12.50	457
Pizo Speaker	P9924-ND	1.80	405
16F877 Pic	PIC16F877-20P-ND	10.23	159
RS-232 Connector	182-09M-ND	.81	79
Mini-Din Socket	CP-2460-ND	.90	113
6 Position Dip Switch	CT2086-ND	.81	475
20 Mhz Resonator	X909-NP	.81	296
1/4 Watt Resistors (17)	(value)EBK-ND	1.00	407
10 Uf Caps (2)	P5134-ND	.42	340
7805 Voltage Regulator	NJM7805FA-ND	.63	215
Switching Diodes (4)	1N4001GICT-ND	.16	266
LCD Cable	C1AXT-1436G-ND	2.05	18
Leypad Cable	A9BAG-0802F-ND	3.27	32

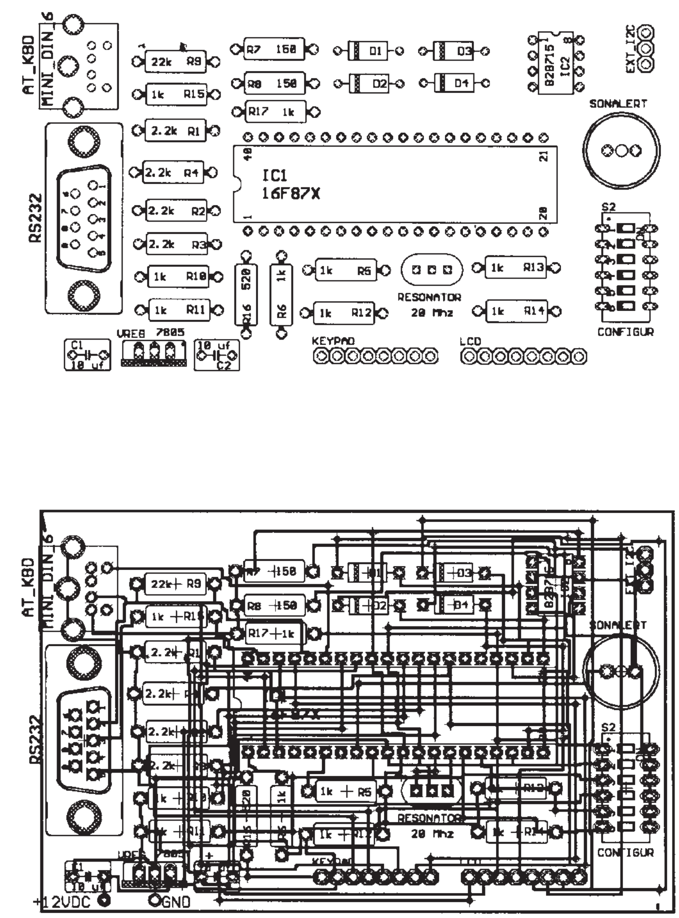
Other needed parts

2 x 16 LCD Module	Internet Item	6.00 - 12.00
82B715 I2C Chips (2)	Avnet (50 min. order!)	6.34
Printed Circuit Board	N8TV	15.00
Program Pic Chip	N8TV	10.00

Plus Plus Plus Postage, Shipping, Phone calls, Minimum orders, Multiple suppliers, and on, and on......

——— OR ———

Kit of all Parts From N8TV	$99.00 + $ 6 s&h
Assembled and tested	$ 149 + $6 s&h
PIC chip preprogrammed	$ 25 includes s&h



Controller Board Layout

HOW MONITORS WORK

By Randy Fromm - Email: randy@randyfromm.com
http://randyfromm.com

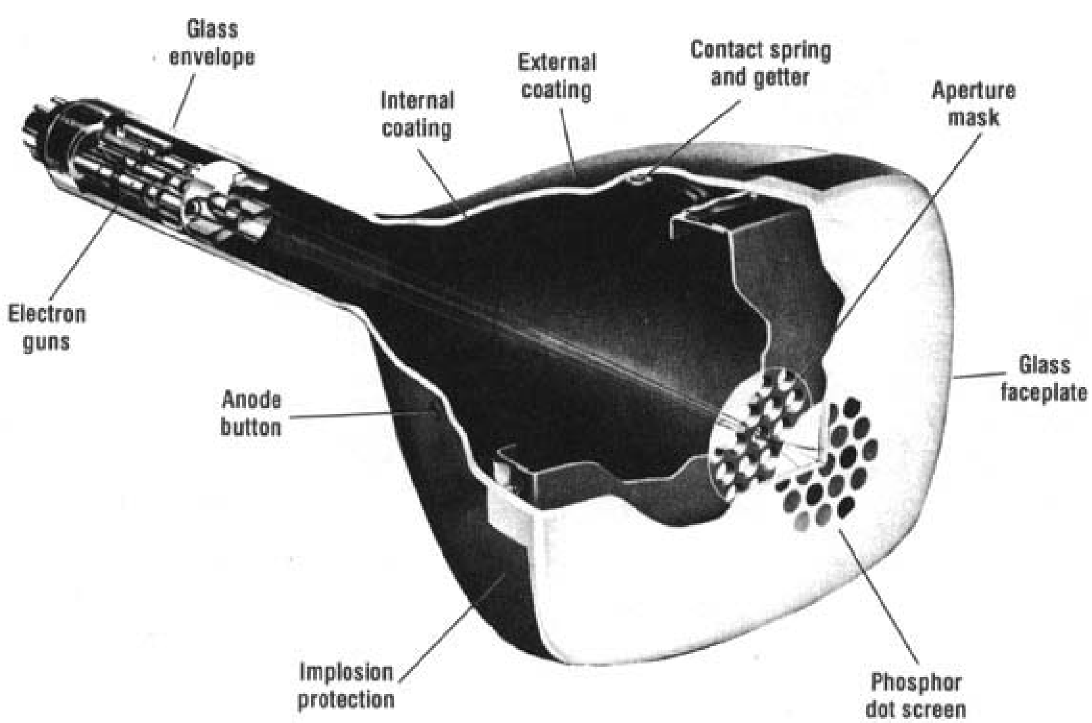
Video game monitors (also known as "raster scan" monitors) are easy to troubleshoot and to repair. Once we have a basic understanding of how monitors work, the vast majority of monitor problems can be isolated and repaired in well under an hour.

The Picture Tube

We can get a good idea of how a monitor works by looking at the picture tube. In the neck of the picture tube, there's a device called the "electron gun assembly." The electron gun does exactly what its name implies. It shoots out a stream of electrons. Electrons are the tiny, sub-atomic particles that surround the nucleus of an atom. The electron gun assembly actually consists of three, individual electron guns. There is a separate gun for each of the three primary colors: Red, green and blue.

In order to get an electron gun to emit electrons, the "cathode" of the electron gun must be heated red-hot. The cathode is actually the source of electrons in the picture tube. In fact, the technical term for a picture tube is "cathode ray tube" or "CRT." When you see the reddish-orange glow in the neck of the picture tube, you're looking at the heater doing its job. To keep the heater from burning up, all the oxygen is removed from the picture tube. In fact, all gas is removed from the CRT during manufacturing. A picture tube is a "vacuum tube."

Coating the inside of the glass screen of the CRT is a substance called "phosphor." There are actually three different types of phosphor. The three different types of phosphor are laid down in alternating vertical stripes across the face of the picture tube. The spacing between two stripes of the same color is called the "pitch." The smaller the pitch, the higher quality the image will be.



RED	**GREEN**	**BLUE**
CYAN	**MAGENTA**	**YELLOW**

When struck by an electron from the electron gun, each phosphor glows a different color. Each electron gun is precisely aligned so that its electrons strike only one color phosphor, hence the guns are referred to as the "red gun" the "green gun" and the "blue gun." By combining red, green and blue in different proportions, we can create any color we want.

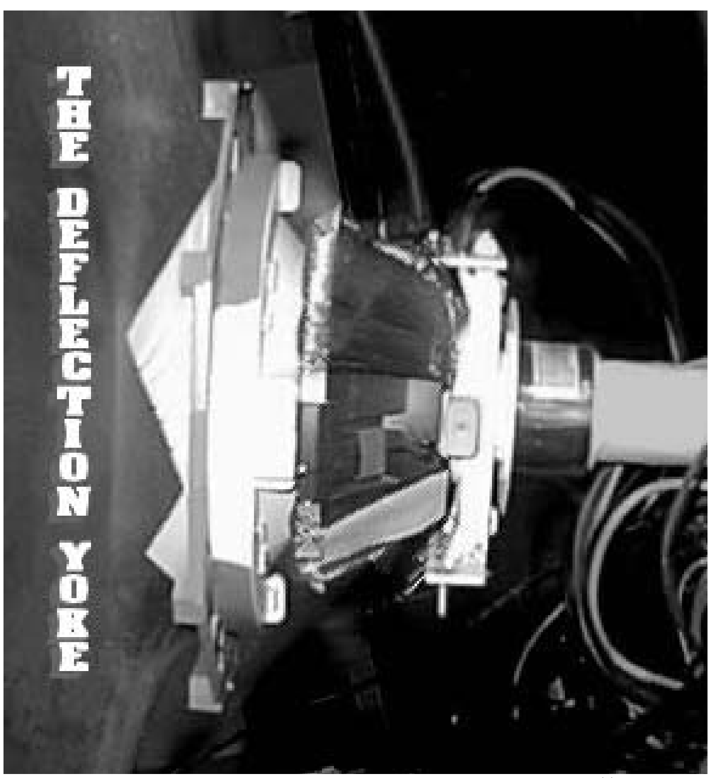
For example, red and blue create magenta when combined. Adding red and green makes yellow. Blue and green mix to create a kind of turquoise color called "cyan." When all three colors are added together, we get white.

Conventional televisions and computer monitors work in exactly the same way.

Note that the electrons do not pass through the glass front of the picture tube (glass is an insulator and will not allow the electrons to pass through) but bounce off and back into the picture tube. In doing this, the electrons have traded their "kinetic energy" (the energy of a moving object) for the light energy that we can see with our eyes.

Horizontal and Vertical Deflection

Because the electron gun is securely fitted in the neck of the picture tube, Its aim is fixed at the center of the face of the CRT. We need a way to move the electron beam or our picture will be limited to a just a single bright spot in the center of the screen! To move the electron beam(s) on the phosphor-covered screen of the CRT, we use an electromagnet assembly called the "yoke."



The yoke is made of two pairs of coils of wire. When current is passed through the coils they create a magnetic field that "deflect" the electron beam(s) causing the spot to move on the screen of the picture tube.

One pair of coils is used to move the beam to the left and right. They are called the "horizontal deflection coils." The other pair of coils move the beam up and down. They are the "vertical deflection coils." By working together, the spot can be moved all over the front of the picture tube.

Let's see how the raster scan monitor creates the images on the front of the picture tube. When the electron gun is first turned on, the electron beam starts in the upper left corner of the CRT. The horizontal deflection coils (and the horizontal deflection circuitry of the monitor that drives them) cause the beam to move from the left edge of the monitor to the right edge. This draws a line across the top of the screen, called a "raster line." When the beam gets to the right edge of the CRT, it is turned off and quickly returned to the left edge again. This is called the "horizontal retrace."

While the horizontal deflection circuit of the monitor is making the beam move from left to right and back again, the vertical deflection circuit is driving the vertical deflection coils in the yoke, dragging the beam down from the top. When the horizontal retrace is completed, the beam ends up in a slightly lower position than before. The next horizontal line will be drawn just slightly below the first one. The process is repeated until somewhere around 250 individual, horizontal lines have been drawn.

It's important to note that the lines are drawn only from left to right. During the horizontal retrace time, all three electron guns are turned off. There is a circuit in the monitor called the "blanking" circuit that turns off all three electron guns during the retrace. This is important because if the guns were allowed to turn on during the horizontal retrace (as the magnetic field of the yoke resets to start the beams on the left side of the screen) we would see a thin, diagonal line sandwiched between raster lines.

At this point, the electron beams are down in the lower right corner of the CRT. They have drawn one screen full of raster lines. A single pass of the beams from the upper left-hand corner at the top of the screen to the lower right-hand corner on the bottom is called a "field."

After drawing a field, the beams must now return to their starting point at the upper left corner of the CRT. This is called the "vertical retrace." But we cannot allow the beams to draw a line as they return from the bottom to the top of the screen. Remember the blanking circuit? The same circuit that is used to turn off the electron guns during the horizontal retrace is now used to turn off the guns during the vertical retrace as well. In fact, the blanking circuit is probably most important during the vertical retrace as we'll see below.

Once the beams have returned to the upper left corner of the

CRT, they are turned back on and the process is repeated, 60 times a second. Note that the horizontal deflection circuit has to make the beam travel back and forth across the screen some 250 times before the vertical deflection circuit completes a single trip from the top to the bottom. Consequently, the frequency at which the horizontal deflection circuit operates is much higher than the frequency of the vertical circuit. The horizontal deflection circuit operates at approximately 15,750 hertz (cycles per second) while the frequency of the vertical deflection circuit is 60 hertz.

Because the horizontal deflection circuit is operating so much faster than the vertical deflection circuit, an interesting but hidden phenomenon occurs during the vertical retrace. As the magnetic field in the vertical deflection coils reverses polarity (to begin each field at the top of the CRT) the quickly scanning horizontal deflection circuit actually makes the beam move back and forth a dozen or so times before the beams reach the top of the screen. Turning up the brightness will often reveal these hidden "vertical retrace lines" that zig-zag their way across the screen. This is actually the path the beams take as they make their way from the bottom of the screen back to the top. Naturally, these lines are normally hidden from view. They are concealed by the blanking circuit as it is activated during the vertical retrace. Remember the blanking circuit turns off all three electron guns during the retrace time. If you see these vertical retrace lines, you may have a problem with the blanking circuit.

Video

Now we have a way to fill the entire screen with "raster," but we still do not have any kind of image. At this point, all we can make is a solid field of white, gray or colored raster. How can we make the images appear on the face of the CRT? It's easy! All we have to do is turn the electron guns on and off at the right times! When an electron gun is turned on, its electrons hit the colored phosphor and we see that color on the screen. When the electron guns are off, the screen appears black.

A group of three signals is sent from the computer in the game to the circuits in the monitor that control the three electron guns. These signals are called the "video" signals and the circuits in the monitor that control the electron guns are called the "video amplifiers." By controlling the amounts of red, green and blue on the screen we can make any picture we want. This is known as the RGB system. The three electron guns are driven by the three video amplifier circuits.

When the computer wants something to appear red, it sends a signal to the red amplifier. If the computer wants something to appear blue, it signals the blue amplifier, and so on. The higher the voltage, the brighter the color will be. Typically, the color will begin to appear on the screen when the video input signal is at 1 volt and the gun will be fully turned on at around 4 volts.

Other colors are made from combinations of the three primary colors. For example, to make the color yellow, the same signal is sent to both the red and green amplifiers. Because the phosphor stripes are so close together, our eyes and brain combine the colors and we see yellow!

Let's draw something on the front of the screen. For example, suppose we want the monitor to display a red box in the center of the CRT. As the horizontal section of the monitor is "sweeping" across the screen from left to right, and the vertical section is "sweeping" down, the red electron gun remains turned off until it reaches point A. The gun is then turned on and kept on until the horizontal deflection circuit brings the electron beam to point B. At point B, the electron gun is turned off again. It stays off until it reaches the right edge of the screen, retraces back to the left edge of the screen and returns to the point just below point A (the next "raster line" down). The electron gun is then turned on again, and a second line drawn just below the first, ending just below point B. The process is repeated until the entire box has been drawn. Although the box has been drawn with individual horizontal lines, the lines are so close together that we see it as a solid red box.

Synchronization

In order for the monitor to display the images properly, it has to be "synchronized" with the computer that is generating the video signal. Without synchronization, the box that we just looked at would be completely scrambled. It would appear something like a pay TV channel on cable television. In fact, the most common method used to scramble a pay

TV channel is a scheme called "sync suppression" where the synchronization signal is removed from the channel and you pay to get it back. What you're doing is buying the sync! In addition to the three video signals for red, green and blue, the computer also generates two "sync" signals. There is a "horizontal sync" signal that comes at the end of each line. The horizontal sync signal tells the monitor to stop drawing the horizontal line and quickly retrace to the left side of the CRT to begin the next line.

The "vertical sync" signal occurs when the beam is down in the lower right corner. The vertical sync signal tells the monitor to start the vertical retrace sequence, turning the electron gun off and returning it to the top of the CRT.

The sync signals have their own separate input to the monitor. In some cases, there is a separate connection for both the vertical and horizontal sync. Most of the time, the vertical and horizontal sync signals are combined at the computer to form something called "composite sync."

Computers may produce either one of two types of sync signals. The vertical and horizontal sync signals may be "positive sync" or "negative sync" Positive sync starts at around +5 volts, and pulses briefly down to 0 volts and back to +5 volts. Negative sync does just the opposite. It's normally at 0 volts, pulsing briefly to +5 volts and back down to 0 volts in order to synchronize the monitor. Both sync systems are equally effective. The designer of the game's hardware simply chooses one system or the other. In order to make their monitors compatible with any computer system, most monitor manufacturers have designed their monitors to accept both positive and negative sync inputs. The negative sync is usually connected to the monitor through a separate connector. Some monitors use a switch to select either positive or negative sync, others are designed to accept either sync polarity at a single connector; automatically detecting its polarity.

The best way to understand sync is to see what happens to a monitor without sync. If a monitor loses vertical sync, the picture will roll from top to bottom or from bottom to top EXACTLY AS IF YOU NEED TO ADJUST THE VERTICAL HOLD (also known as "vertical frequency") CONTROL. Naturally, if you see a rolling picture you will try adjusting the vertical hold control. If you can get the picture to slow down but it never locks in place, you have a problem with vertical sync.

Loss of horizontal sync can be a bit more difficult to recognize until you know what to look for. If the horizontal sync is just barely out of wack, the picture may be seen as shifting from left to right or vice-versa.

Generally, the picture will be completely scrambled (worse than a scrambled pay TV channel) with little segments of diagonal lines all over the screen. Nothing will be recognizable on the screen. Again, try adjusting the frequency control (this time the "horizontal frequency" or "horizontal hold" control) to see if you can lock the picture in place. If not, you most likely have a problem with horizontal sync.

High Voltage

So, the picture is actually made from electron beams that are scanning across the screen from top to bottom, being controlled by the three video signals and two sync signals that come from the computer. Although we now have a way to control the electron beams, we still have another problem to overcome before our monitor will work properly. Remember when we looked at the beam of electrons as they left the electron gun and struck the glass front of the picture tube? The electrons struck the phosphor coating the inside of the glass, and bounced back into the picture tube.

But what happens to the electrons now? An electron is a real, honest-to-goodness physical particle of matter, so it cannot just disappear! If we leave the electrons alone, however, our monitor will not work. If left to themselves, the electrons will form a negatively charged cloud inside the bell of the CRT. Because equivalent charges repel each other (just as the north poles of two magnets would if held near each other) this negatively charged cloud will repel the beam of negatively charged electrons as they try to get from the electron gun to the front of the picture tube, preventing them from reaching the phosphor and producing an image.

This problem is solved by a part of the monitor called the "high voltage unit." The high voltage unit is also known as the "flyback transformer."

All monitors and television sets have a high voltage unit. When they say "high voltage," they are not kidding! The high voltage unit in video game monitors can produce +20,000 volts DC or more!

The inside of the bell of the picture tube is covered with a metallic coating that conducts electricity. It's called "aquadag." On the top of the picture tube there is a small metal plug called the "second anode" of the picture tube. The second anode is connected to the aquadag that coats the inside of the CRT and the high voltage is connected to the second anode.

Now, an electron that has struck the front of the CRT and bounced off is immediately attracted to the positively charged aquadag and literally sucked out of the second anode by the high voltage. The high voltage is essential to the operation of the monitor. If you lose the high voltage power supply in a monitor, the screen will be completely blank.

Monitor Sections

A monitor can be broken down into seven basic sections. Armed with a general understanding of how these sections work, we can often observe the symptoms of a bad monitor and have a pretty good idea which sections are operating properly and which are not. Once we have the problem isolated down to a single section, troubleshooting is often a simple matter of testing the parts in that section with a meter.

MONITOR SECTIONS

1. Power supply
2. Video
3. Blanking
4. Sync
5. Vertical deflection
6. Horizontal deflection
7. High voltage

Important thing to know about monitors: There is a very close relationship between the horizontal section and the high voltage. In fact, the horizontal section is actually used to drive the high voltage unit!

Can you hear the high frequency "squeal" that comes from the monitor as it is operating? Some people can, others cannot. That high frequency squeal is the sound of the high voltage unit in operation, as it is being driven by the 15,750 hertz horizontal deflection circuit. If you can hear the squeal of the high voltage, the high voltage unit must be working properly. If the high voltage is okay, the horizontal section must also be working properly, since the horizontal section is used to create the high voltage. If the high voltage and horizontal sections are working normally, chances are extremely good that the power supply circuit is good as well.

So just by listening to the monitor as we turn it on, we can verify that three of the seven sections of the monitor are probably working okay.

Identifying Problems

Let's take a look at some common monitor problems and see if we can determine the source of the problem just by looking at the symptom. Often, the best way to approach the problem is to look at the symptom, eliminate the monitor sections that cannot possibly be the cause of the problem, and test the components in the remaining section(s).

Horizontal Line

What if we have just a horizontal line on the screen? It's certainly not a high voltage problem! If you see any brightness at all on the screen (in this case, a bright, horizontal line) your high voltage is okay!

It's not a horizontal problem either. We can see a horizontal line on the screen, so the horizontal deflection section must be making the beam sweep left and right. Besides that, the fact that we have any kind of display at all means that the high voltage is working and if the high voltage is working, the horizontal section must be working too! Of course, if the horizontal section is working, the power supply is working as well! Can the video circuit be the cause of this problem? No way! In order to draw a line on the screen, the electron guns must be turning on. If you were seeing this symptom on an actual monitor connected to a game, you would see colors in the horizontal line as well.

It can't be a sync problem because the picture is not rolling or shifting. In fact, we don't really have a picture at all, just a horizontal line across the screen!

We know it's not a blanking problem because a blanking failure will reveal the zig-zag, vertical retrace lines and that's not our problem here. By process of elimination, that leaves only the vertical deflection section as the possible cause of the symptom! You can see that it's pretty logical once you know how the monitor works.

Missing Color

What if you are missing a color? Perhaps you have a video game and the blue sky has disappeared. Naturally, this cannot be a problem in the power supply, blanking, sync, vertical deflection, horizontal deflection or high voltage. A missing color has to be a video problem. In fact, it has to be a problem in the blue video amplifier or the blue gun in the CRT itself. So by a logical process of elimination, we have not only eliminated six out of seven sections as being the possible cause of our missing color problem, we have eliminated two-thirds of the remaining circuits as well. Neat, huh?

Raster and Retrace Lines Only

What if you get to a monitor whose symptom is a screen filled with raster and vertical retrace lines but you do not see any images? Assuming that a good video signal is getting to the monitor from the computer, the problem is likely to be in the blanking section of the monitor! All of the other sections in the monitor must be working to produce raster.

Shrunken Picture

What can cause the raster to shrink in both the horizontal and the vertical direction? Is there any section of the monitor that is common to both the horizontal and the vertical sections? How about the power supply?

This symptom is typical of a "low voltage" power supply problem. There is enough voltage from the power supply to allow the monitor to function, but just barely!

The point is this: ONCE YOU HAVE DETERMINED WHICH SECTION IS BAD, TURN THE MONITOR OFF AND USE YOUR METER TO CHECK ALL OF THE COMPONENTS IN THAT SECTION!

Start with the semiconductors first. The diodes and transistors are the most suspect to failure because they are the active components in the circuits. They are switching on and off, or otherwise controlling the current in the circuits.

Capacitor failure is a common problem in monitors that are a couple of years old. Bad capacitors often cause distortion in the picture. Curved sides and squished pictures are generally caused by bad capacitors. The best procedure here is to replace any suspected capacitors (suspect all electrolytic capacitors that are two or more years old) with new ones. Testing capacitors is not always a good way to go here as hand-held capacitor meters will often give bogus results if you don't know what to look for.

Resistors are the next thing to check. When resistors fail, they will open circuit or increase markedly in resistance. Resistors will not short circuit.

By determining the section of the monitor that is bad, and then using a meter to test the parts, we do not have to know exactly how the circuits operate to be able to fix them. It's also a lot safer to troubleshoot a circuit with the power off than with the power on! It's not so much a concern about getting shocked as you might imagine. The main advantage to troubleshooting without power applied to the monitor is that you don't have to worry about accidentally slipping with your meter probes, shorting things together and causing additional damage to the monitor.

ATVQ

ATV Band Openings

Must have been some real good band openings over the weekend - check out these two reception reports we received:

The following form contents were entered on 30th Aug 00
Date = 30 Aug 00 - 15:39:39
subject = ATV Reception Report
resulturl = http://www.shopstop.net/bats/thankyou.htm
Name = Bob Davis
email = redavis@dpc.net
call = AA9MY
city = Tremont, IL
lat/long =
Date = 8-30-00 central
Time = 10:30 pm central
P2 = on
Q3 = on
C0 = on
Antenna = Cushcraft 449-11s 45' 9913 Flex
Receiver = Pc Electronics TC70-10
comments = Please make ID letters larger

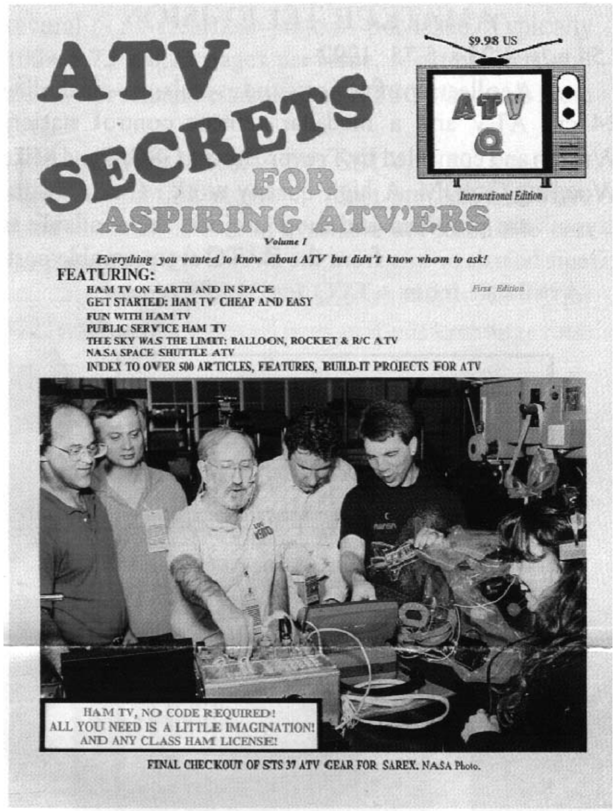
The following form contents were entered on 5th Sep 00
Date = 5 Sep 00 - 04:44:45
subject = ATV Reception Report
resulturl = http://www.shopstop.net/bats/thankyou.htm
Name = Michael L. Bogard
email = kd0fw@microlink.net
call = kd0fw
city = Independence Missouri.
lat/long = lat 94* 27. lon 39* 5.
Date = 9/1/00
Time = 8:00 till about 10:00am
P2 = on
Q3 = on
C0 = on
Antenna = 21 elements at 70' ldf4 hardline 65'
Receiver = P.C.Electronics TC70-1
comments = I have been in contact with Tom Weeden about the reception report.

I have replaced most of the audio, video, control, and powers cables and connectors on the repeater with RG6 double sheilded cable and F connectors. We still are having problems getting color reception from WJ9H-TV but we're working on it.

73 de N9LKY, Jim
jim@shopstop.net

ATVQ

Do you have these yet?



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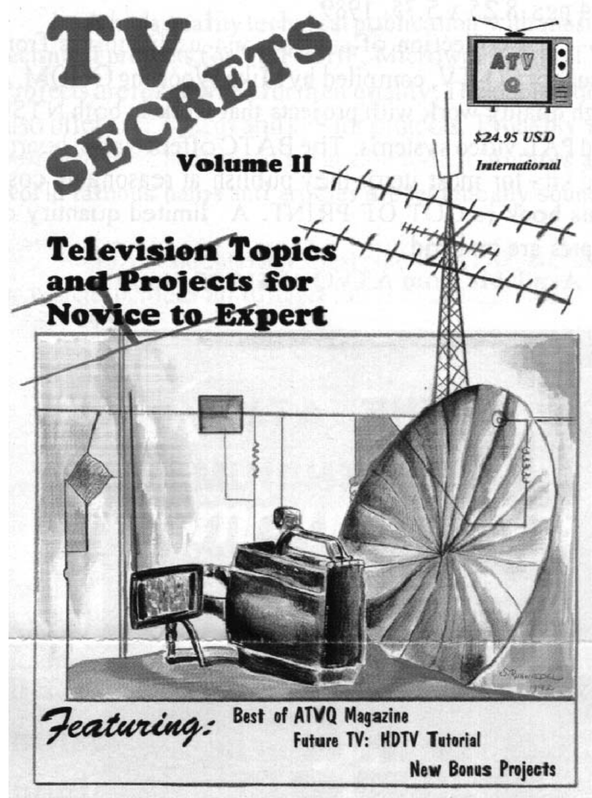

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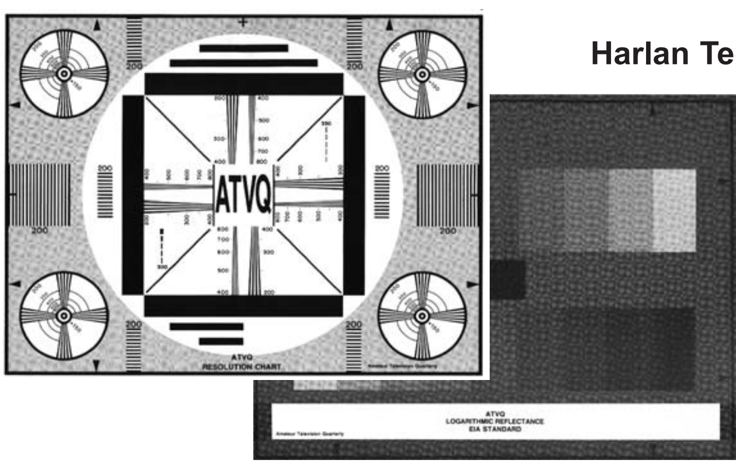

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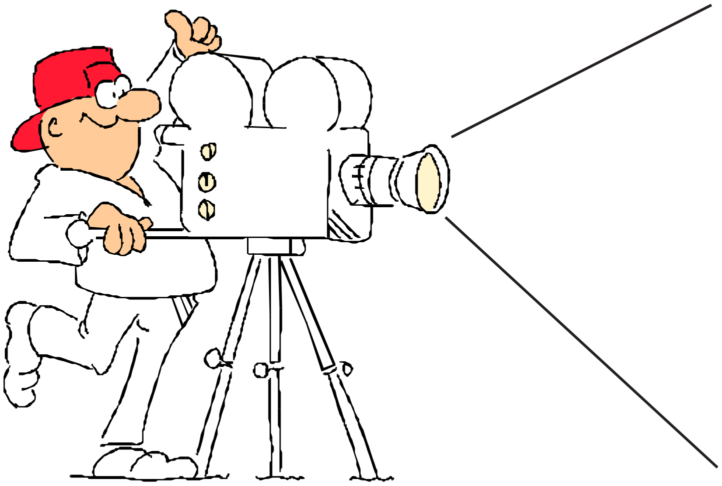

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Digital Ham TV

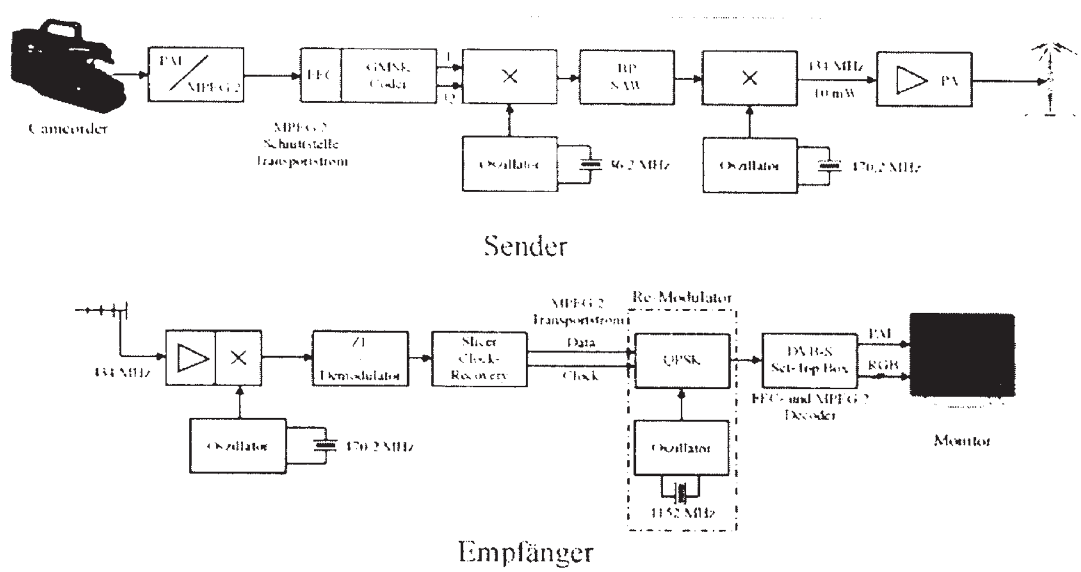
by Uwe E. Kraus - DJ8DW - email: krausue@uni-wuppertal.de
translated by Klaus Kramer - DL4KCK - email: DL4KCK@t-online.de

During HAM RADIO 2000 fair in Friedrichshafen, Germany, we had a live Digital ATV demonstration. This text describes present and future developments of the DATV working group.

All day long we transmitted a camera view in hall 9 at the DARC-Distrikts stand with 10 mW into an eleven element yagi antenna on 434 MHz with 2 MHz hf bandwidth. DF2DS, DJ3DY and DC5QC supervised the transmitter devices and answered on questions from many interested visitors. The receiving devices were installed in hall 9 too about 20 m away at the AGAF stand. There DJ8VR, DJ1CU, DL4KCK, DC6MR and DJ8DW cared for equipment and visitors. Two colour TV monitors showed the scene at the camera side in realtime, and many german as well as foreign radio amateurs payed much interest. The highlight of the first day was a visit by the DARC administrative committee accompanied by prominent guests.

Present DATV Technology

The second generation transmitter and receiver devices are shown in the block scheme below. A video camcorder supplies a PAL signal to the PAL/MPEG converter where a MPEG-2 transport stream with 2 Mbit/s is produced including FEC (error handling). The effective usable data rate is varying around 1,2 Mbit/s, the rest is FEC and adaptively added stuffing packets. This is not sufficient but the used single-chip MPEG encoder does not allow a better solution without huge additional effort. The chip produces only a variable data rate elementary stream without full MPEG-2 standard elements (no B-frames). The next development steps will add better video quality maintaining the overall data rate.



Blockbild der DATV-Live Station während der HAM RADIO 2000

The GMSK coder comprises of a digital part supplying the I- and Q-signals depending on the input bitstream and a following analog I/Q modulator that produces the GMSK signal at 36.2 MHz. This IF was chosen in order to use commercially available SAW filters with 2 MHz bandwidth deriving from the Digital Audio Broadcasting (DAB) development. For steeper filtering edges and better selectivity two filters with buffers are cascaded. A step-up-mixer with a SBL1X converts the IF signal to 434 MHz with the aid of a 470.2 MHz oscillator. Next is a helical-filter bandpass PA producing 10 mW on 50 Ohm, and a 30 dB power module with 10 W output is useful for middle range tests or driving bigger PAs.

The receiver uses lambda/4 tubular tuned circuits at the input and between preamplifier and mixer (SBL1X). As IF stages two limiter/FM-demod ICs are used with SAW filters in front and between them. From the demodulated signal a slicer produces the serial data stream and a 16 MHz crystal PLL with divider the appertaining 2 MHz clock signal. For error handling, MPEG decoding and PAL signal processing a commercial set top box with digital satellite TV standard (DVB-S) is used. Therefore, the received serial MPEG-2 transport stream is remodulated on a 1152 MHz carrier as narrow band QPSK modulation (SCPC). The set top box must be able to process a symbol rate of 1 Megasymbols where some devices have difficulties because of their internal oscillator`s phase noise. Other boxes only allow 2 Megasymbols minimum.

Transmitter and receiver are built on modular Europe-format printed circuits. Digital signal processing is done mostly in programmable logic ICs.

Third generation DATV

The next generation is formed clearly at least on the transmitter side. Here the modular concept is left in favour of a compact, cheaper and homebuilder friendlier construction. The aim is one Europe-format printed circuit processing an MPEG-2 transport stream and producing 10 mW hf on 434 MHz. Discussions at the HAM RADIO fair especially with DJ3OI resulted in the plan for a built-in test pattern generator for long time test set-ups. After a first analysis it should be possible to integrate a programmable permanent storage device containing moving MPEG-2 sequences 10 seconds long which are repeated cyclicly.

The compact and extended construction is reached by highly integrated programmable ICs, a digital I/Q modulator and digital filtering of the GMSK spectrum making SAW filters and drivers obsolete. The PAL/MPEG transcoder will be constructed with an encoder IC that includes sound coding, B-frame processing, MPEG-1 and MPEG-2 capability and complete transport stream processing.

The third generation receiver will maintain it`s modular design temporarily. The converter circuits are prolonged, and the mixer oscillator is crystal controlled with frequency multiplier (no synthesizer). IF, slicer and clock regenerator remain unchanged, between IF and Slicer a channel equalization is planned in addition.

The current solution of MPEG decoding by set top box and QPSK remodulator is driven by time pressure and seems to be problematic in a future view. Maybe the boxes are getting cheaper, but the cheaper ones are not able to handle the low data rate of 1 MS/s. A self made improvement of the boxes internal is impossible due to lack of proper documentation. One possibility could be enlarging the received transport stream with stuffing packets producing a wider and box friendlier QPSK. This requires complicated error decoding before and standard error handling after the procedure.

Maybe it is better to use a self built MPEG-decoder in the long term with a newer MPEG decoder IC that processes the transport stream and delivers RGB or even PAL/NTSC. Such decoder IC have more on board storage capabilities reducing the overall construction expense. The error handling could be simplified because of unneeded DVB standards compatibility.

Higher bands and data rates

The higher amateur radio bands allow transmissions with higher data rates giving a better video quality. An effective data rate of 5 or 6 Mbit/s provides the excellent quality known by digital satellite and cable broadcasting. An overall data rate of 7 Mbit/s with GMSK means hf bandwidth of about 8 MHz. Following the technological development FM-ATV could be replaced by the digital transmission concerning a transition period with both modes. DATV would allow more parallel channels and duplex traffic at the same ATV allocations in the end.

Devices of the second and third generation DATV are able to use higher data rates. The GMSK coder clock frequency can be higher, filters in step-up mixers and amplifiers and in the converter are wide enough, only the SAW filters must be exchanged against 8 MHz wide filters with 36 MHz center frequency. The wider GMSK signal on 70 cm is converted to the higher bands, the 70 cm receiver can be used as broadband receiving end.

Another modulation scheme could be QPSK, on 23 cm this would enable direct reception with a set top box provided that a DVB standard signal is transmitted. Furthermore QAM (from DVB-C cable networks) and especially OFDM from DVB-T (terrestrial digital TV) are possible, the latter reducing problems with hf multipath reflections. These modes allow data rates of several MBit/s in 2 MHz hf bandwidth but require very linear amplifiers and higher signal to noise ratios at the receiver front end.

Low usage of amateur frequencies will give reason for others to take our frequencies. For modern digital broadband modes like DATV suitable segments in all amateur radio bands above 430 MHz are important. This was discussed in Friedrichshafen also using a diagram with the presently allocated ATV segments from 70 to 3 cm. It would be useful to reach a European agreement on DATV frequencies on each band. OM who are advocating our interests at frequency conferences would be in a better position. Happily more and more knowledge is found that digital broadband modes will be essential working fields in a future amateur radio world. These are very suitable to get young people into modern communication and multimedia technology and direct their interest to appropriate engineering careers.

Starting and Testing

First considerations and experimental tests on Digital ATV began about five years ago. Most important was the appropriate modulation for the starting period, and GMSK (Gaussian Minimum Shift Keying) was chosen. GMSK is successfully used with mobile phones (GSM), it has a compact spectral density and a constant amplitude even after bandpass filtering. Similar to FM an effective power output is possible with class-c amplifiers.

Demodulation in the receiver is simple with an FM demodulator, a costly coherent demodulation would give 3 dB more. A GMSK disadvantage is the relative low data rate of 1 bit/s per Hertz bandwidth. Until now experiments took place only on 70 cm (433-435 MHz), this band is interesting for propagation tests (long distances without repeaters). Antennas give much gain here with moderate dimensions, cable losses are relatively low and middle range power output is produced easily. 2 MHz bandwidth for DATV on 70 cm gives sufficient space for other modes, each of them has equal rights and is used by amateurs according to their personal liking and possibilities. AM-ATV on 70 cm covering most of the band has no future any more.

For data compression MPEG1 or MPEG2 was chosen because of worldwide standardization and in view of cheap ICs for coding and decoding from consumer electronics. So the first generation DATV was developed setting an emphasis on evaluations of the digital modulation and of propagation effects. MPEG1 data files were sent from a Video-CD through a specially developed PC slot card to the digital modulator and stored at the receiving end through a similar slot card on the PC hard disk. An MPEG1 software decoder displayed the video on the PC monitor. These devices were shown and explained in a lecture at the HAM RADIO 1999. First successful transmission tests were performed in the nearfield area, over 50 km and at last over 100 km (with 80 W and stacked 19 element yagi antennas). The development got speeded by support coming from DARC, AGAF, DARC districts G, L, O and R, some private sponsors and by foundation of the DATV working group in december 1998. Four DATV stations should be built within a year and used for tests by the district teams, and they were distributed in time in december 1999. Hermann, DF2DS, reported results of the field trials in district O in his lecture at the HAM RADIO 2000 fair.

References:
(1) Projektgruppen DATV gegründet: Uwe Kraus, DJ8DW, CQ DL 2/99, S. 92
(2) Modulares DATV-Konzept läuft: Uwe Kraus, DJ8DW, CQ DL 11/99, S. 904

(from TV-AMATEUR 117 and CQ DL 9/2000)
translation: Klaus, DL4KCK, AGAF e.V.

Internet infos:
http://www.darc.de/distrikte/g/datv/datvindex.html

Videoconferencing At The AC100

by Gerry Walsh - KB6OOC email: gwalsh@kilroy.jpl.nasa.gov
410 West Linda Vista Avenue
Alambra, CA 91801-4753

Over the weekend of September 30th, the 15th annual Angeles Crest 100 Mile Endurance Run took place in the mountains above Los Angeles. This ultramarathon begins deep in the Angeles National Forest at an elevation of 6,000 feet in the small town of Wrightwood and finishes 100 miles later just North of the Rose Bowl in the city of Pasadena. There is 21,610 feet of cumulative elevation gain, and 26,700 feet of cumulative elevation loss resulting in 48,310 feet of total elevation change. The highest point on the course is Mt. Baden-Powell at the 9,210 foot level.

Looking North back towards the Shortcut checkpoint. Notice the switchback raods coming down the hill. Shortcut is at the top of the hill.

With such dynamic terrain, this event is a perfect opportunity to showcase several modes of amateur radio while providing seriously need runner safety communications that cannot be provided by cellular phones or other common communication methods in this mountainous environment.

An overview of the Newcomb Saddle checkpoint. Runners enter at the top of the photo and exit just below the photo.

The race begins at 5:00 A.M. on Saturday and officially ends at about 3:00 P.M. on Sunday. It takes about 80 amateur radio operators to staff 16 checkpoints over the course of about 34 hours. We have a difficult time staying awake and we aren't even running a race!

With anywhere from one to twelve miles between checkpoints, it's vital to keep accurate records of "in" and "out" times for each and every runner. These times are relayed between adjacent checkpoints by 2-meter simplex. Each checkpoint has a computer that is used to enter these times into a master database (kept at a central location outside the forest) by packet radio. This allows the data to be available to other checkpoints who have families standing by waiting to hear where their runners are currently located. Both the simplex voice and packet radio communications provide excellent runner safety!

This year we decided to try and showcase an additional aspect of amateur radio that most of the runner folks aren't aware of - amateur television. ATV can be an excellent tool for the safety and enjoyment of the runners. For this event, we hoped to provide enjoyment and utility by using ATV for two-way full-duplex videoconferencing between two checkpoints that are separated by 6.6 trail miles about two-thirds of the way through the race.

Tom O'Hara (W6ORG) suggested giving ATV a try during this years run. He has a pretty good supply of ATV gear and offered to fly some of this gear, by helicopter, to the remote checkpoint I was working at. After a quick setup and few lessons, Tom was

ATV gear being set up with the helicopter in the background.

Harlan Technologies

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

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

off into the wild blue yonder to return the helicopter and drive to the checkpoint after mine to setup the other side of the ATV link.

Although we did have a weak transmitter in one direction, it still worked pretty well and we had a solid signal in the other direction. The system was up and running quite easily and we were ready for some runners, and their support crews, to give it a try!

If you build it, they will come! Several runner support crews arrived at Tom's checkpoint to wait for their runners to arrive. Tom was able to find out the runner numbers for some of these crews and tell me to watch for them at my checkpoint. When they arrived, we would direct them to the ATV station (or bring the camera to them if they were resting in the aid station chairs) and tell them that, "someone wanted to talk to them". After some 65 miles of running and walking, many of these runners were pretty tired and the crews at Tom's checkpoint could clearly see that while conferencing with their runners over the ATV system. The runners really enjoyed being able to talk with their crews and tell them what they would need when they got to the next checkpoint about 2 hours later. In fact, Tom later found out that at least one runner was feeling pretty run down at my checkpoint. When he used the ATV system to see and talk with his crew, he was rejuvenated and made it to the next checkpoint in excellent time!

By the time our checkpoints closed, we had really showcased amateur television to the runners, their support crews, and the public that stopped by to see the race! The race directors even stopped by at one point and were very impressed with our ability to provide two-way live video conferencing between these two strategic checkpoints late in the race. We hope to get more checkpoints interested in ATV in future races.

As amateur radio operators, we enjoy communicating with one another. Many of us enjoy sharing our communications abilities in events like this. With cellular phones and Family Service Radios these days, it sometimes seems like amateur radio isn't necessary to support local community events. However, with trained radio operators showing good radio discipline, and with additional tools such as amateur television, we can provide public safety communications that many event organizers couldn't dream of!

ATVQ

A photo of the TV set at Chantry Flats of the video being transmitted from Newcomb Saddle (photo courtesy W6ORG).

Mark (N6KES) installs the last antenna on the Newcomb Saddle communications checkpoint shelter.

Randy Hammock (KC6HUR) reviews runner data at our "paperless" checkpoint. Notice the standard spread of "ham radio" snack foods!

Here's our ATV station (courtesy W6ORG). The left TV is our "local" video. The TV on the right is the picture from Chantry Flats (we had a weak signal from Chantry for some reason).

A “Cheap & Easy” 2.4GHz Feed

By James H. Wolfe, KI7CX - Email KI7CX@qsl.net
5754 W. Tierra Buena Ln.
Glendale, AZ 85306

When the AATV group in Phoenix added a 2.4 GHz FM input to the ATV repeater, it provided hams a way to get on ATV “cheap and easy”. The 2.4 GHz Wavecom(types of audio/video transmitter/receiver sets are certainly a reasonably priced unit for ATV use. The transmitters are easily modified for more power, and kits and add-ons are showing up to boost the power even more. The only thing that seemed to be lacking was an inexpensive antenna.

We know that when frequencies get above about 900 MHz, a parabolic dish is the real ticket for maximum gain. At 2.4 GHz, it is easy to get 20 to 25 dbi or more with a dish & feed that is manageable in size. Occasionally I have seen 16” to 20” inch obsolete HBO, (type dishes at hamfest’s and recently the larger Primestar(and other digital TV dishes are showing up.

We also know that a parabolic dish is not frequency dependent. It is the feed for the dish that must be constructed for a specific frequency range. We also found that we could home brew a feed using common materials. Here is a “cheap and easy” circular waveguide feed that can be built for the 2.4 GHz ATV band. While it is not an ultimate ATV DX antenna, it is simple to construct, affordable, broadbanded and has about 10dbi gain right out of the can!

Required Materials

(1) Tuna can, 3.25”D x 1.45”L
(1) Tall bean can, 3.25”D x 5.70”L
(1) Chassis connector of your choosing: SMA, TNC, BNC, or type N. (UHF connectors don’t do well at these frequencies)
(1) 3/32” tube or #10 copper wire 1.125”L
(1) Candy or Cookie tin, 5”D x 1.5”L

Construction

Solder the open ends of the two cans together to form a 7.15” tall cylinder. After soldering the cans together simply use a can-opener to remove the end of the bean can.

Measure 1.82” (46.21mm or 1-13/32”) from the closed end of the can. (Measure inside the can to the open end and transfer this measurement to the outside). This is the center of the probe, (chassis connector). Drill a hole large enough for the insulated portion of the chassis connector to pass through.

Solder a piece of 3/32” tube or #10 wire to the center conductor of the chassis connector, creating a probe 1.125” or 1-1/8” long. Solder the chassis connector in place. The body of the chassis connector remains outside the can. The probe extends into the can and remains isolated from it. (This is a driven element, or a waveguide quarter wave antenna at 2.4 GHz.) We now have a complete circular waveguide feed that can be used as a stand-alone antenna.

The Scalar Ring

While an open ended circular waveguide makes a simple feed for a parabolic dish, the illumination pattern is not as ideal as it first appears. We have too much energy in the center and too little at the edge. A satellite television antenna feed uses a unit made up of a series of shallow cavity rings surrounding the waveguide. This is known as a Chaparral feed and it is so named for the originator. The Chaparral feed alters the illumination pattern and improves the efficiency of the feed. This type of feed is also well suited to the small HBO dishes with f/D in the range of 0.35 to 0.45. When scaled to our 2.4 GHz feed, the first of these rings is 5” in Diameter and 1-1/2” deep. For a larger dish application, additional concentric rings would be used. We used only one ring to avoid blocking too much of our small center fed dish.

Cut the Candy or Cookie tin down to a 1.5” depth to create the scalar ring.

Draw two concentric target circles on the bottom of this shallow can, the first a 2” diameter bull’s-eye and the second 3.25” diameter.

Cut out the 2” bull’s-eye to make a hole in the bottom center of the can

Cut from the edge of the 2” hole to slightly past the 3.25” circle a series of 1/4” wide ‘teeth’ all the way around.

Bend these teeth at the 3.25” circle away from the bottom of the can 90 degrees. This forms the scalar ring for the feed.

Slip the scalar ring onto the feed. This will need to be adjusted in or out for maximum gain. After fine-tuning, the scalar ring should be fastened or soldered in place.

Mounting

The position of the scalar ring is relative to the f/D ratio, or focal length to diameter ratio of the dish. The focal length or position of the feed horn is easy to calculate. Here is a quick primer to determine the characteristics of a round parabolic dish. The focal length is simply the Diameter squared and divided by sixteen times the depth at the center. To determine the f/D ratio

Amateur Television of North America(ATNA)

What are you doing to help advance the technology and popularity of ATV operation in your community?

Are you a member of an active ATV club that needs more clout with the local frequency coordinating body?

Do you have questions about the legality of transmitting some specific type of video via ATV?

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Who is your liaison to the FCC or local coordinating body for technical ATV related issues?

Who is working to tie together all the regional ATV groups to combine forces for a common cause?

If you aren't doing these things yourself then you need to join us and become a member of the national ATV organization that can provide all of these services and more !

You, and your club can become a member and affiliated member club of Amateur Television of North America (ATNA), the national organization dedicated to the future of Amateur Television in North America. ATNA will be the central focus to promote ATV operations and technological advancement for North America. Among other activities ATNA's members will support ATV presentations at amateur conventions around the country, including the Dayton Hamvention.

Our Mission:

* Protect our ATV interests and frequencies.
* Use video transmission methods to support public service.
* Plan for the amateur radio adoption of new technology.
* Advance the state of the art of video and video transmission methods.
* Work with National Frequency Coordinators as the official coordinating body for Fast Scan ATV in North America
* Associate in an equal role with other like minded societies

If you want ATV to prosper in North America, please fill out the application on the other side of this form and join us as members of ATNA.

More information about ATNA can be found on the Internet at World Wide Web page http://atna.ampr.org, by email to atna@qsl.net or by regular mail to:

ATNA c/o Harry F. DeVerter Jr., N3KYR 303 Shultz Road Lancaster, PA 17603-9563

Email messages about ATNA operations will be distributed on the following Internet list server atv@atv.tallahassee.net

Please see the instructions on the ATNA web page about subscribing to the ATV Tallahassee list server.

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Category "A" Club is 3-9 members and dues are $10.00 per year.
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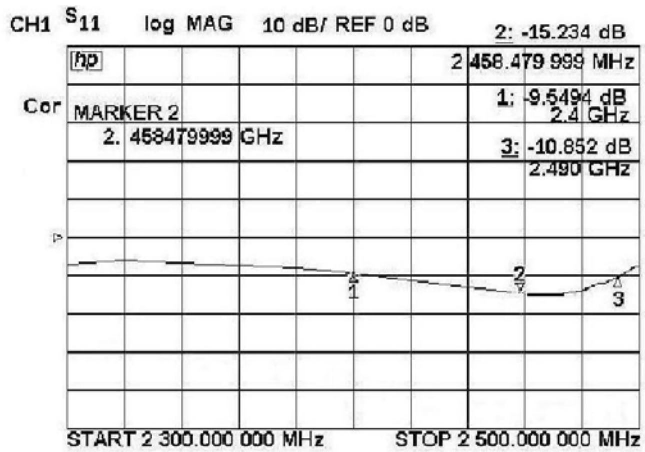
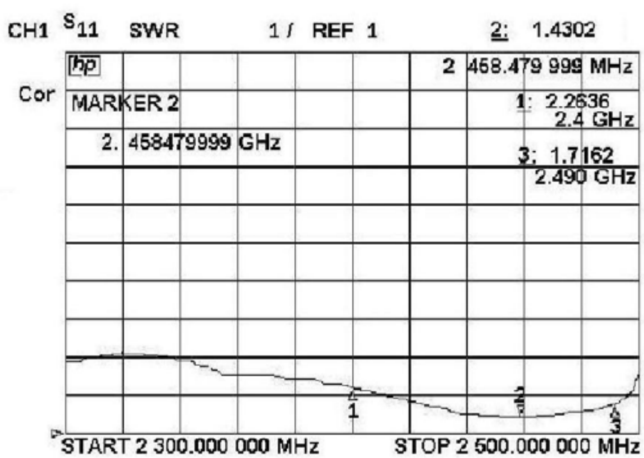
FOR ATNA USE ONLY: ATNA #________ CLUB CATEGORY _______ CHECK# __________ AMT. ___________

Membership card sent___/___/___ Certificate sent___/___/___ (ORG. ONLY) simply divide the focal length by the dish diameter. Here are two examples. One of my HBO dishes is 18” in diameter. With a straight edge across the dish, it measures 2.5” deep at the center. (fl=Dý/16d) The focal length is 18(18=324, 16(2.5=40, 324/40 or 8.1”, and the f/D ratio is 8.1”/18”, or 0.45. Another dish is 20”x 3.5” which has a f/D of 0.35 and a focal length of 7.14”. In these examples the 18” dish would have the mouth of the feed positioned approximately 7-3/4” from the center of the dish. (The feed point is slightly inside the open end of the wave-guide.) The 20” dish would have the feed mounted approximately 6-3/4” from the center of the dish. The position of the scalar ring will differ between the two dishes due to the difference in f/D ratio. The position will also have a very slight variation between transmit and receive.

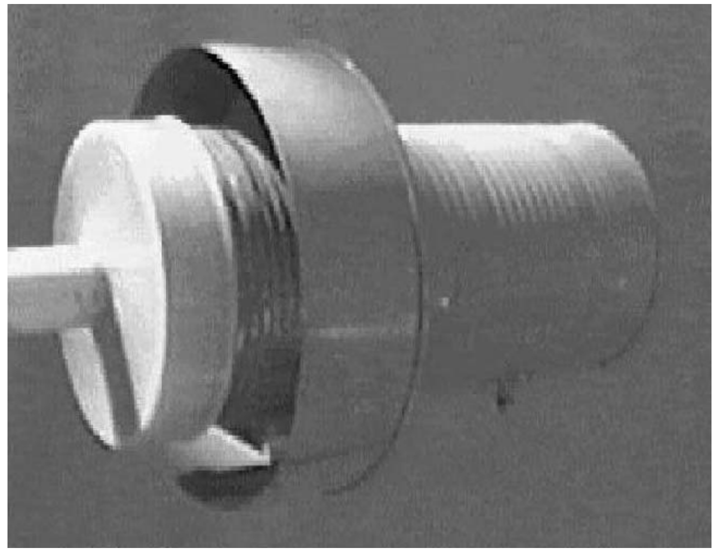
To use the scalar ring and the feed horn as an antenna, (no dish), position the back of the scalar ring approximately 1” from the mouth. This will place the outer rim of the scalar ring slightly forward of the open end of the feed. Fine-tune the position from this point. When mounting the feed on a dish, peak the feed horn, then add and adjust the scalar ring.

Note: Polarization is determined by the probe orientation. I.e.: Horizontal probe is horizontally polarized and a vertical probe is vertically polarized.

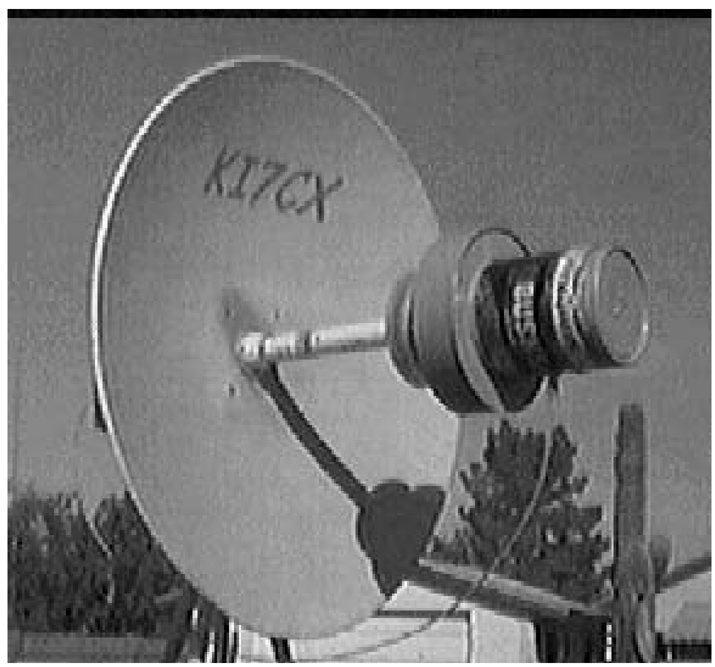




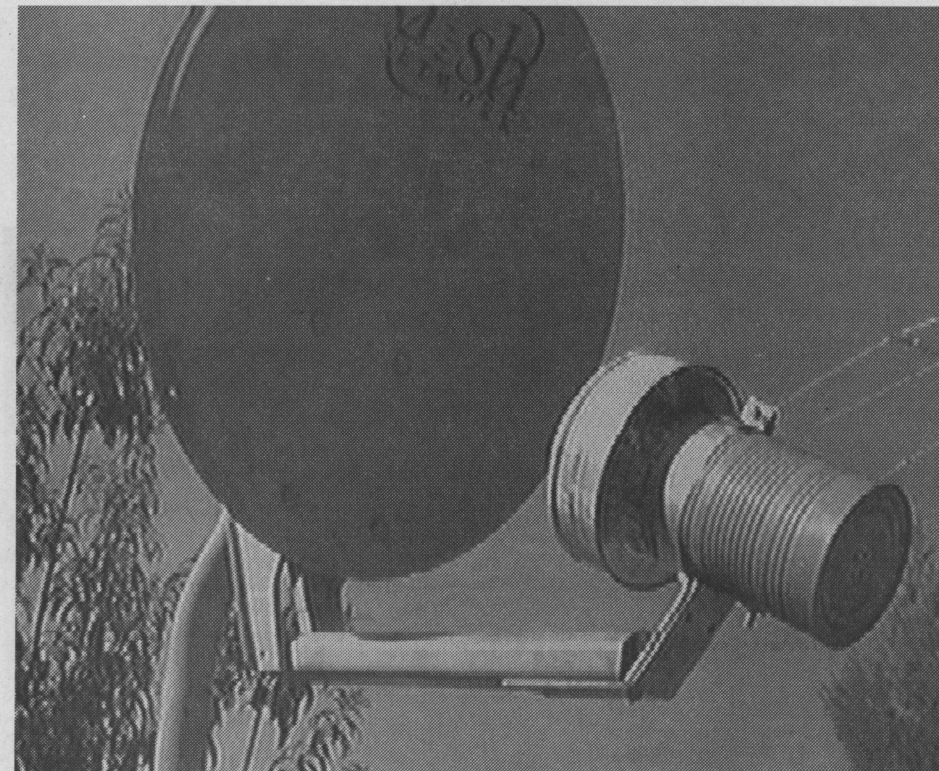
“Microwave Mike”, N7QYH used a Hewlett Packard 8353B network analyzer with an S-Parameter test set to plot the return loss, or SWR for the feed.



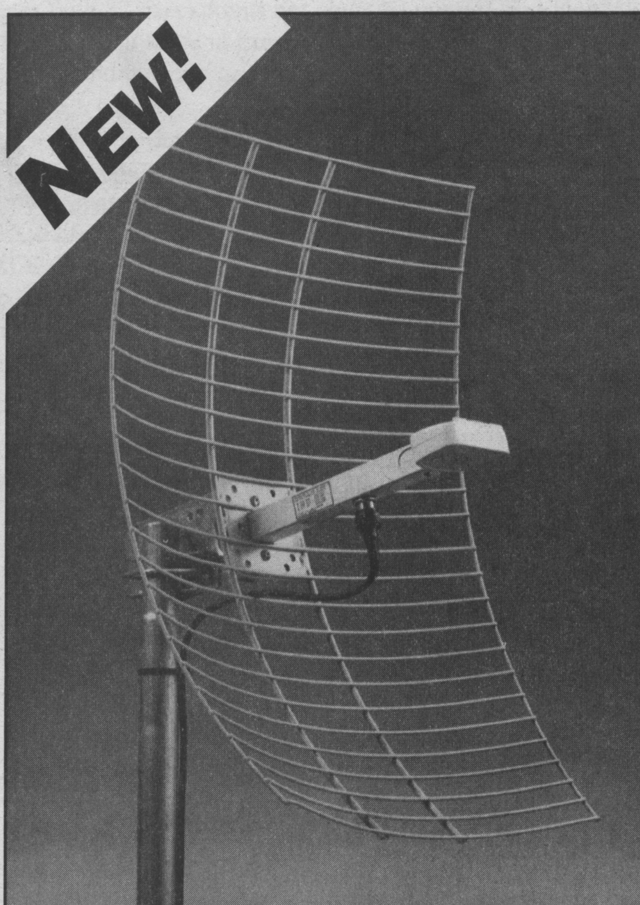
A completed feed ready to be mounted on a small HBO dish. The center support is made from a 1/2” PVC pipe with a wooden dowel inserted in it for additional support. A PVC cap fitting is glued onto the pipe and screwed to the inside center of the feed. The “bug-shield” or radome is the cover from a plastic electrical tape container that was cut out and slipped over the center support prior to fastening it in place.



This feed is mounted with a PVC to a male threaded adapter at the center of the dish. The male adapter has been drilled out to allow the PVC to slip in and out for final adjustment or to allow the feed to be used on another dish

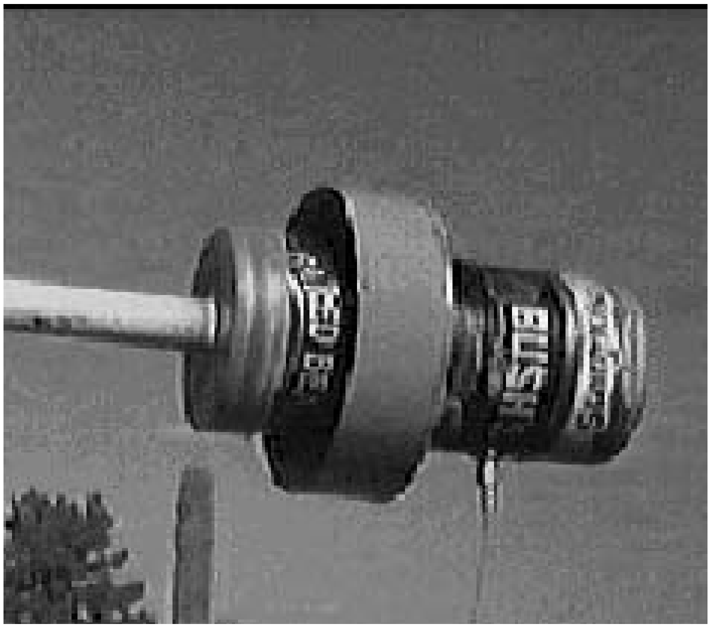


Dale - KA7ATV spent $5 at a local hamfest for this dish, and another 25c at a yard sale for an empty 5" Diameter cashew' can. The original feed was removed and a new mount was fashioned from scrap aluminum. Now that is "cheap and easy."



With a set of Wavecom's, and a polaplexerý feed, operation of full duplex ATV with another station having the same set-up, seems possible. The Wavecom has two of the stock frequencies in the ham band. Each station can transmit on the other stations receive frequency. Just think; full duplex and no repeater! So satisfy that craving for tuna and beans for lunch. Hunt up the big soldering iron, and you could be on ATV before supper.

73. . de KI7CX - Jim "See you on the radio"



Another feed constructed with the same details.

NOTES

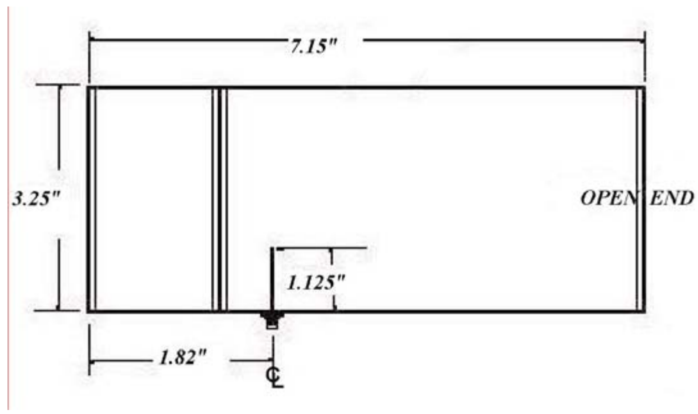
Note 1: Paul Wade - W1GHZ has a website that contains a wealth of technical information related to microwaves including information on determining feed points for offset dishes. His web page can be found at, **www.tiac.net/users/wade**.

Note 2: Polaplexer Design and Construction, The Polaplexer Revisited by Ed Munn - W6OYJ,
www. ham-radio.com/sbms/sd/ppxrdsgn.htm

Parabolic Reflector Antennas and Feeds by Dick Turrin - W2IMU, ARRL UHF/MICROWAVE EXPERIMENTER'S MANUAL

Another excellent source of information on this subject is DUBUS articles on line, **www.mrs.bt.co.uk/dubus**

ATVQ



A proper engineering drawing.

United States Postal Service

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PS Form **3526**, October 1999 *(Reverse)*

Mt. Washington 2000 Auto Hillclimb

by Jim Evans - N1HTS - email: n1hts@mediaone.net
90 10th Street
Tewksbury, MA 01876

The Mt Washington (NH) Automobile Hillclimb - Climb to the Clouds begun in 1904 and is considered the nation's oldest motorsport event. The auto road is 7.4 miles long and is traveled in 6 minutes and 41.99 seconds. An event of this size takes many volunteers from hams to spectator marshals to corner workers to safety personnel to timing and scoring to registration to +++. With 32 checkpoints not counting control, finish and safety vehicles it takes in excess of 40 hams. We have 60+ cars competing and they are generally spaced out at one minute intervals.

I've done this now for 11 years and this group from our Billerica Amateur Radio Club was the largest yet. We had Mark, AB1X, Rob, N1ICB, Dave, W1TQ, Chris, KB1EJR, Peter, N1ACT, Niece, KA1ULN, Mike Boucher, Bruce, W1LUS, Bruce, KB1CIC, Erik, KA1RV and myself Jim, N1HTS. Mary Beth, N1FER had to back out at the last minute but said to plan on her next year. In addition to these, there were 30+ other hams, not including all of the other volunteers to make the event run smoothly. The one issue holding some local hams back is it is always Field Day weekend.

Since this is a three day event and these days start early, we head up on Thursday to set up HF antennas at the campsite. Basically our FD involvement is to give out leisurely points Saturday afternoon and evening when we are off the mountain and back at the campgrounds. We've had our ladderline dipole up about 90' one year and have yet to repeat that. This year we brought two antennas for the campsite. The usual ladderline dipole and an R7 vertical. The R7 ended up being the only one we used but the other was ready if we needed it. This year's $29 screenhouse went up but we hoped for no rain since it wasn't quite waterproof, but it was good enough to keep out the bugs.

The alarm goes off at 4:30 Friday morning since we have to be at the base of the mountain to have breakfast for just after 5:30. Since we practice on the lower half on Fridays, I was with Rob at station 3, which is about the only station on the lower half we

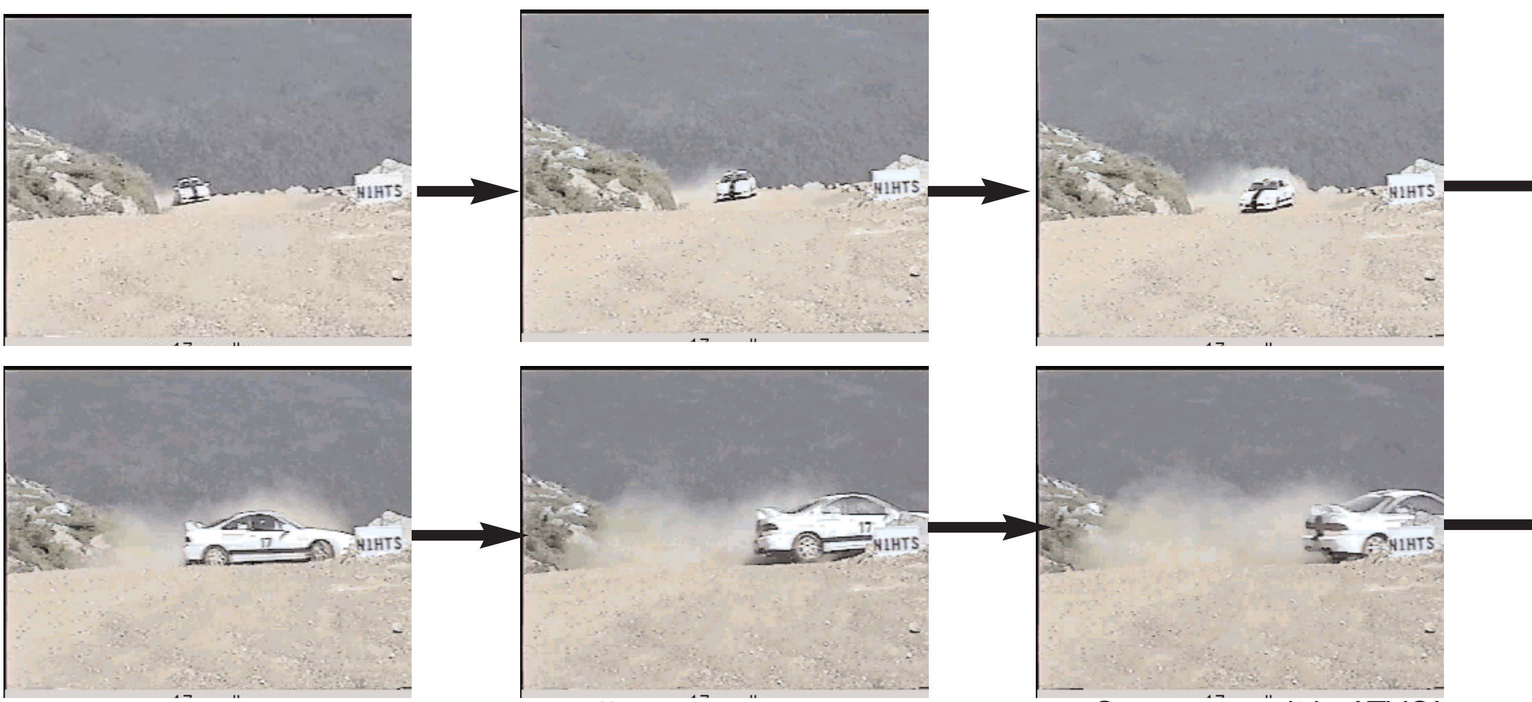
can run ATV from through the trees. Since I bring the motorhome, I get a ride up the mountain due to all the aluminum, etc needed to set up. I forgot the camcorder in Mark's truck so I could only use the color camera I had. Control really appreciates being able to see the cars going by at a couple of stations.

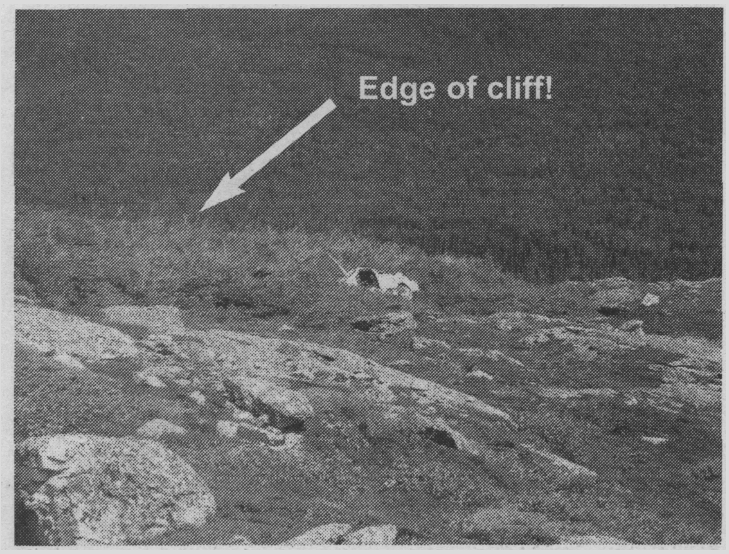
The driving was decent with cars pulling over in a safe place if they couldn't continue which meant a yellow flag was held out to warn other drivers that they can get by. We knew it wouldn't set the stage for the other two days.

Saturday morning I'm at 24 with Mark. This station is well above treeline and has a clear shot to the base where control is. Weather was great! We get to our stations and it's t-shirt weather. I've also done this event wearing two sets of thermals, winter jacket, sweaters underneath, wool hat and warm gloves and it was just bearable for a couple of hours. 45 degrees F and 40 MPH winds go right through you. One camera on my 439 Mhz gear and one on Ian AF1R's 900 Mhz gear. This way control can see the cars coming into 24 and leaving 24.

Since the first run was pretty quiet, I switched cameras around and face the camcorder downhill. Towards the end of the session I get Bert Cox's car 17 getting launched off a rock. As an SCCA flagger I'm the first responder and grab the firebottle before running downhill through the rocks and brush while Mark calls in the emergency. Bert did side-to-side rolls then nose-to-tails, then every which way until the car stopped before he got to the second ledge. I'm half way down between the first and second ledge and Bert starts to climb out. WHEW! I have him sit down until I get to him to see how he is. Bert's says he's ok and I ask "so, was it a code brown?" Bert didn't understand so I said "check your shorts?". Bert said with a big smile "OH YEAH!" I knew then that Bert was fine albeit shaken up.

By now Mark has arrived and the other response folk have made it to the first ledge. Bert and I head to the car to check out the smoke coming from the engine compartment. The smoke was just from fluids on the hot engine and the smoke stopped shortly. Bert is escorted to the road with the ambulance personnel. Mark estimates to control the car is down about 300 feet. I went up to get the camcorder to shoot some video to help the Auto Road manager in control determine what he'll need to get it out.

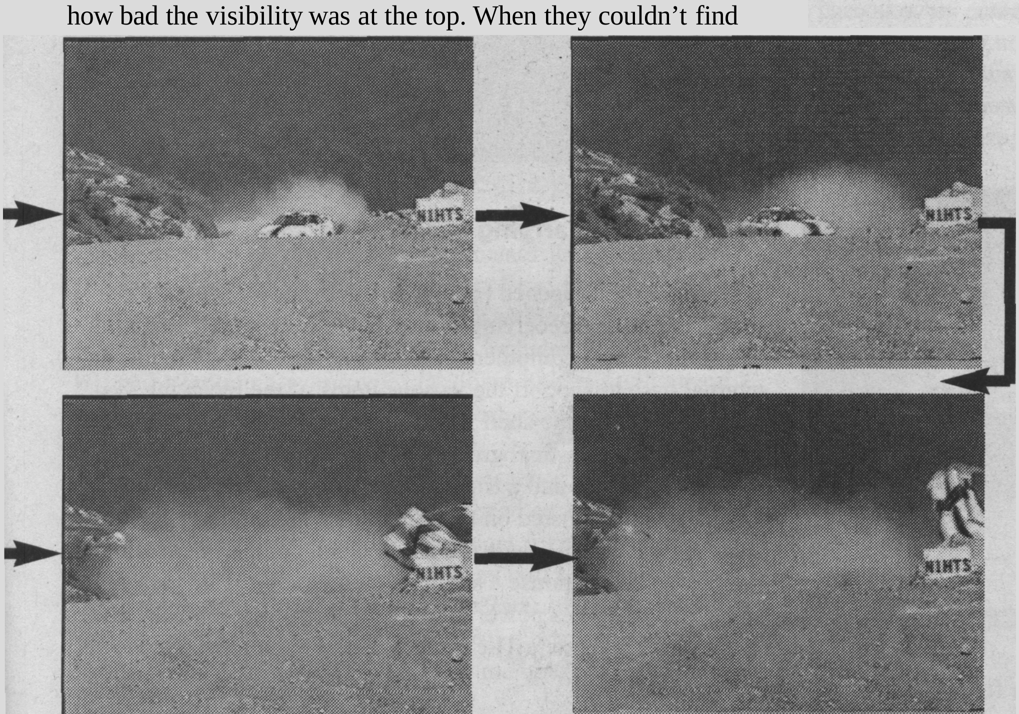




We were close. The LARGE wrecker used 380’ of cable.

That evening we had the usual festivities under the big tent at the base of the mountain. This was the first year I got to show any video on the big TV’s. People wanted to see it a few times. For those who have internet access you can see the car coming around the corner, then getting launched off the mountain at http:llwww.eggo.org, then follow the links to the Mt Washington page. You’ll also notice the high tech ID, made up of a plastic clipboard with stick on decals. There are jpg’s of a lot of the cars there as well, plus a few campground shots. We have yet to capture the audio portion to a wav file but when we do it’ll be posted there as well. Back at the campground Field Day points are given out by Mark, Dave, Bruce-LUS and Niece.

Sunday we get to sleep late until 5:30. We get our assignments and this group is spread out all over the mountain. They put Mark and myself at 24 again for the video. Wx was very questionable so the Chief Steward sent the vintage cars up first to see how bad the visibility was at the top. When they couldn’t find the parking lot in the fog, the finish had to be moved further down, which ended up at 30 which was where Dave was.



This day saw a lot of red flags which means stoppage. By the time we got one complete run finished it was about 4PM and bad weather was close so the organizers had to call an end to the event. This year’s overall winner is Frank Sprongl with a winning time of 5:07:92 for the **6** miles. Rob, Erik and myself decided to stay at the campground instead of driving back 4 hours after a long day. Driving home Monday without weekend traffic made it a very nice weekend. We’re all set for next year.

For those interested in the event itself, go to: **http://www.climbtotheclouds.com.**

ATVQ

PORTABLE AIRBORNE ATV GROUND STATION

By Louis Hutton K7YZZ - Email: K7YZZ@aol.com
12235 SE 62nd St.
Bellevue, WA 98006-4401

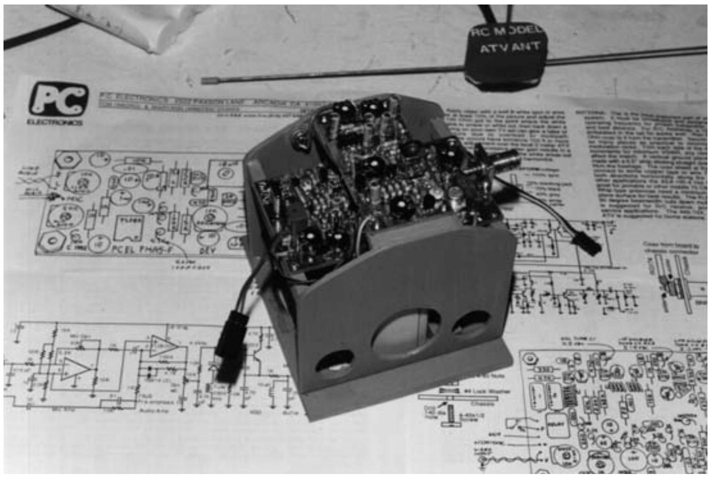


Photo 1 -New audio/video electronics inside the plane.

After the "incident" with the left wing departing my Butterfly ATV model plane during acrobatics, I built a new plane called the Senior Telemaster, and installed all new audio/video ATV electronics inside the plane. (Photo #1) The ATV transmitter's PC Electronics boards and a new camera's PC board are all mounted in a small rack that is loaded into the airplane's cargo compartment via the bottom of the fuselage. The camera head is located in the lower part of this equipment rack and is extended and retracted from underneath the fuselage just ahead of the rear tricycle landing gear. (Photo #2) A model airplane servo is used to actuate the camera's extension and retraction which is controlled by the un-used Landing Gear function switch on The R/C transmitter. The camera head electronics came enclosed in a protective plastic case and is now part of the extension/retraction system. The ATV transmitter battery is located forward of the cabin front bulkhead along with the R/C receiver battery. I figure if another "incident" happens that battery will not wreck everything like it did in the old configuration ! The Senior Telemaster is a much more rugged airplane and is capable of hauling up to 9 pounds of cargo. And, the wings do not collapse!

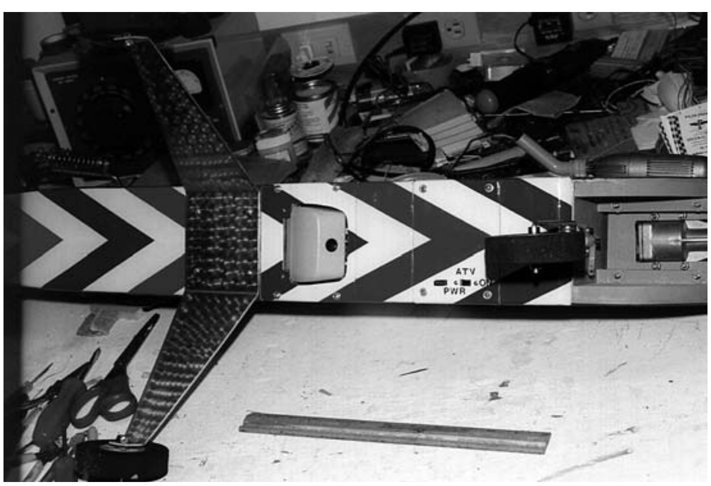


Photo 2 - The camera head showing in front of the landing gear.

The next step in the re-construction was to re-package the ground receiving station into a more portable form. The old station was assembled on site from the contents of three large card board boxes. Several years ago one of the members of our ATV group acquired some very nice foam padded equipment cases used to carry camera equipment. I bought one and figured at that bargain price I should not pass up the deal ! Now I finally found a very good use for it. (Photo #3)

Photo 3 - ATV carrying case.

With the case lid opened (Photo #4) you can see what I did to shrink the ground receiving station from three large cardboard boxes into a neat equipment case. I built up a wood shelf as an internal base to support the various items of the receiving system. The back of the shelf forms a long compartment to house the 5/8 th wave vertical ground plane antenna Darts aloha with the coax feed line and a tripod stand. The parts assigned to that compartment are listed on the lettering shown on the back of the shelf. In front of the shelf is a small wood compartment with a lid that is used to house a small gel cell battery of 12 volts at 1.2 amps. This supplies power to the PC Electronics 434 Mhz and CH-3 downconverters The current drain on the small battery is 175 ma.

Looking at the front of the unit, beginning on the left side is the 434 Mhz to Ch-3 output down converter. RF signals from the ground based tripod mounted antenna are fed to that converter's input and the CH-3 RF output is connected to a cable splitter. One output port from the splitter goes to a little Radio Shack 3.5 inch B/W TV set that is tuned to CH-3. The cable splitter's other output port is fed to the PC Electronics down converter that generates audio and video outputs. Those signals are fed to a Sony Hi-8 camcorder. The camcorder and the small TV set have their own self contained battery supply. The all up weight of the portable ground ATV receiving station is 22 lbs.

When the system is turned on and a 434 Mhz ATV signal is to be monitored, the down converter is carefully tuned to the incoming ATV signal while watching the viewfinder on the camcorder. This assures you that both down converters are working and are supplying readable signals to the camcorder. Then, with the picture appearing OK in the camcorder's viewfinder, the little TV set is turned on and adjusted to CH-3 to display the incoming video picture and sound. Yup, it really works..!!! A description of the old system may be found in ATVQ Volume 9 #1, Winter 1996 R/C ATV Page 30.

ATVQ

ISS Crews Trained On New Amateur Radio Equipment

ISS Expedition 1 Crew trained on Amateur Radio equipment. ISS crew members from E1 and E3 received training this week on the operations of the new ARISS/SARE amateur radio station. A partial list of the participants included Sergej Krikalev E1, and Vladimir Dezhurov E3 (William Shepard will attend a different class this week). The AIRSS/SAREX team delivered a complete set of equipment to Star City for the training session. The equipment included Erickson Transceiver, Packet TNC, cables, power supplies, adapters and head set. The ISS crews had the opportunity to use the equipment for a few hours, in preparation for their mission when they will use the equipment for public access from ISS. Amateur Radio stations on earth will be able to send the crews a form of electronic Email called Packet-Mail, directly to the ISS crew members. The ISS crews will also have the ability to have regular voice contacts directly from ISS to amateur radio stations around the world (crew work load and time line permitting). Sergej Krikalev also took time to note the differences between the Amateur Radio station on Mir and ISS and will submit his comments to ARISS for review. Krikalev reiterated that he does plan on using the equipment during his mission. Sergej is very experienced at amateur radio operations from both earth and in space.

On each ISS mission there will be one crew member who will be in charge of the Amateur Radio station, this position is usually called Control Operator or Chief Operator. Each control operator has passed the extensive Russian amateur radio testing program and holds the highest level issued amateur radio license. Sergej Krikalev will be the control operator for expedition 1.

International Space Station has currently been issued the amateur radio call sign RZ3DZR. However, this call sign may change in the near future. A request has been submitted to the Russian Telecommunications Department for a new vanity call sign. The new requested vanity call has not been issued, but I can give you a hint. The Mir call sign is R0MIR, the ISS call sign may be R0??? The reason for submitting license requests to the Russian Telecommunications Department is because there is no special UN category for "Space Stations" radio license. The ISS is considered a Russian Ship At Sea and since the Amateur Radio equipment will be in the Russian module, it will need a Russian license.

Mir:
The Mir Station is currently unmanned and all of the amateur radio equipment is turned OFF. The next manned mission to Mir is scheduled for December/January. There are two Mir crews currently training for Mir missions in 2001 and possibly a third Mir crew. This would fill out the whole year for Mir. There are big plans for a 15th birthday of the Mir space station in February 20, 2001. I was informed by the Sergei Samburov chief of the Cosmonaut Amateur Radio Department at RSC Energia, that the new Mir crews will be trained on the operations of the Amateur Radio equipment (packet, SSTV, etc).

Mir Survivor:
I have not seen any new information since the press release last month.

DOSVIDANIYA Miles WF1F
MAREX-NA (Manned Amateur Radio Experiment, North American Division)
Miles.Mann@ind.alcatel.com

ATVQ

Subject: 2.4 GHz DX!

On Saturday 9/22, Jim N9LKY and Tom WJ9H spanned a 32.3 mile path using modified Wavecom Jr video sender units on 2.4 GHz. We were attempting to see if these units might be usable on a Madison-to-Baraboo (27 mi) path at some point.

N9LKY transmitted from Owen Park in the Baraboo Range just east of the Sauk-Columbia County line. WJ9H received atop the east observation tower at Blue Mound State Park just west of the Iowa-Dane County line. The transmitter was modified by taking out the 9 dB internal pad, adding an MMIC amplifier (about 100 milliwatts Jim?) into various external antennas. The receiver was modified by adding an external antenna jack and using an 18 x 36 inch, 23 dB gain Conifer dish antenna.

On most of N9LKY's transmit antennas, we had P-5 signals and a full quieting audio subcarrier when WJ9H was oriented for horizontal polarization. One transmit antenna was the patch antenna which came with the unit mounted at the focal point of a solid dish, about 18" diameter, originally designed for 10 GHz. When transmitting with that one, WJ9H got equally good signals on both horizontal and vertical polarization.

The patch antenna by itself on the transmit end didn't quite make the path...only about a P-1 on the receive end.

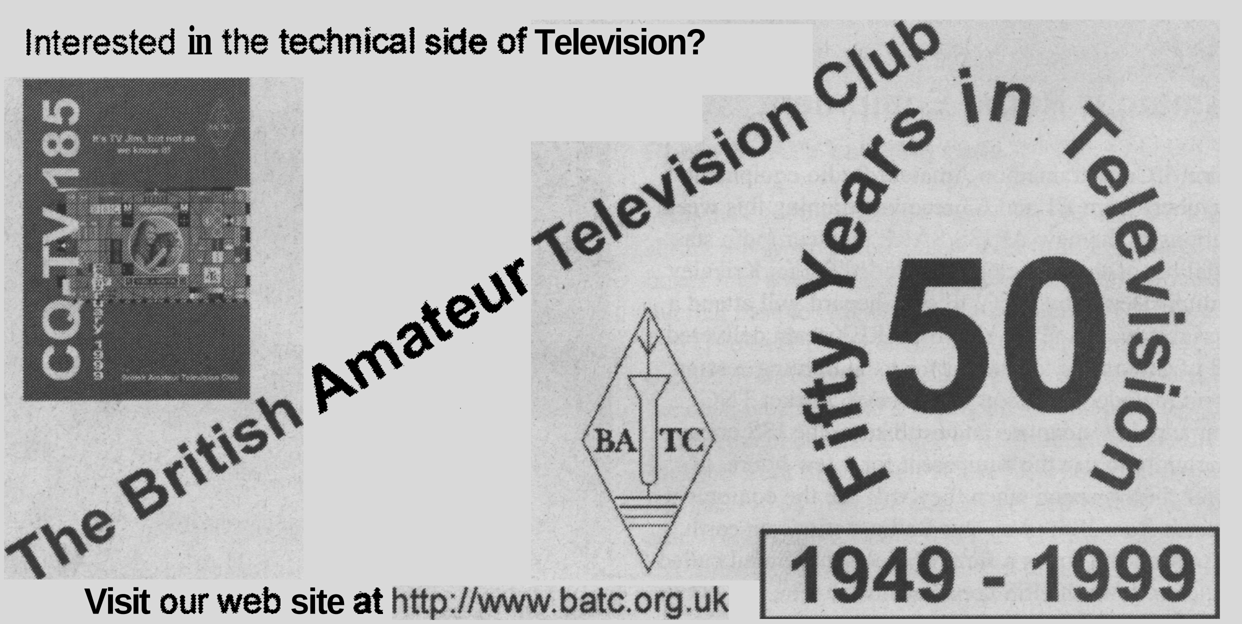
Both ends appeared to have about 15 degrees of beamwidth on the antennas before the signals became unusable.

Our best DX before today was 4.3 miles. You have to have absolute line of sight for these things to work. That means NOTHING in the path, trees, buildings, quartzite bluffs, etc. Finding two spots on the ground with no trees in the way was getting frustrating.

The Wavecoms are Part 15 consumer units and have 4 channels, 2.411 GHz, 2.434 GHz, 2.453 GHz, and 2.473 GHz. The amateur radio allocation for this band is 2.390-2.450 GHz, so the first two channels are fair game for anyone Technician class and up to modify the units for higher power!

If you're interested, you can find more info about the Wavecom Jr units at: **http://www.ipass.net/~teara/atv4.html** ...including modification instructions. You can find the Wavecoms on eBay all the time for $100-200 for the pair.

—Tom Weeden - Amateur radio WJ9H
tcweeden@execpc.com



Portable ATV Repeater In A Milk Crate

by Tom O'Hara - W6ORG - Email: TOMSMB@aol.com
2522 Paxson Lane
Arcadia, CA 91007-8537

I built the portable ATV repeater in a milk crate because of its sturdiness, built in handles, and requirement to also be an antenna mast anchor, as compared to some of the plastic tote boxes I could have used. Total weight came out to 42 Lbs which is less than the maximum weight and size to fit in the Enstrom F28C helicopters baggage compartment.

The components are sitting on a matrix of 1x2 and 1x3" wood cut to fit each CAB247 box, filters and battery to hold them above the bottom of the milk crate in order to accommodate the connector protrusions as well as in place. The repeater uses a 17 Ahr gel cell 12.6V battery which when fully charged will operate continuous key down in repeat mode for over 12 hours. There is also in parallel through a 3 Amp diode a Radio Shack 13.8 Vdc regulated 3 Amp AC supply which can be used to charge the battery as well as run off of the AC mains if available at the public service event site. The TX33-1 33cm 1 watt transmitter and ATVR-4 70cm receiver each have their own two cavity wide band pass filters made by DCI connected to their respective antennas. For this cross band repeater application only the much smaller and lighter 2 cavity bandpass filters are required to prevent desense vs. the more standard VSB filters necessary for inband repeaters or use at a communications site to prevent intermod generation. For the AC100 we used a OAL 5L-70cm 5 element beam and half of a 33LYARM beam on 33cm. Both antennas are small enough to easily fit in a car or helicopter but provide some gain and directivity for plenty of signal strength and minimize multipath ghosting over paths up to 10 miles.

The three 5 ft sections of Radio Shack TV masting had to be cut down to 4.5 ft to fit inside the helicopter. Mast Clamps are attached to the milk crate for quick and easy erection of the antenna system. The repeater controller box contains a VOR-2 video operated relay and a OSD(PC) video ID overlay board. If duplex independent transmit and receive are required as we did at the AC100 race, the video and audio to the transmitter is switched from the receiver to the camera plugged into the controller box.

Any cross band combination of frequencies could be used by selecting the transmitter, receiver and respective filter, but I picked 426.25 input and 913.25 output for local band plan considerations, but more importantly, the greatest DX for least power consumption and therefore longest battery life. The primary application I envisioned was to get the longest distance possible from low power hat cams or portable ATV transmitters line of sight distance over a hill or obstruction to an Emergency Operations Center (EOC). Since the farther the distance the lower the frequency given the same power and antenna gain, I chose the 70cm band for the input and the next band up for the transmit side. The input side is more likely to have to use small omni's to transmit to the repeater or much lower gain vs. it being easier to have one high gain beam or omni at an EOC.

The portable ATV repeater in a milk crate came in handy for use at the AC100 race and let me have some fun flying it in at the same time. Set up time is quick, no more than 10 minutes, mostly the setting up the antennas with a few of the right sized nut drivers left in the crate. In a true emergency communications situation this can be crucial to the event commander getting the right assets rolling to the scene or making proper evaluation back at the EOC.

ATVQ

P. C. Electronics 2522 Paxson Lane Arcadia CA 91007-8537 USA ©2000
Tel: 1-626-447-4565 m-th 8am-5:30pm pst (UTC - 8) Tom (W6ORG) & Mary Ann (WB6YSS) O'Hara
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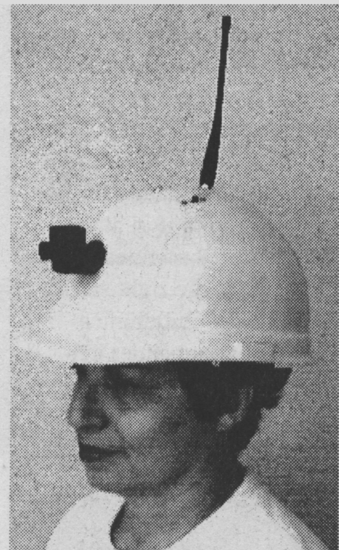
ELECTRONICS

ATV Hard Hat Cam

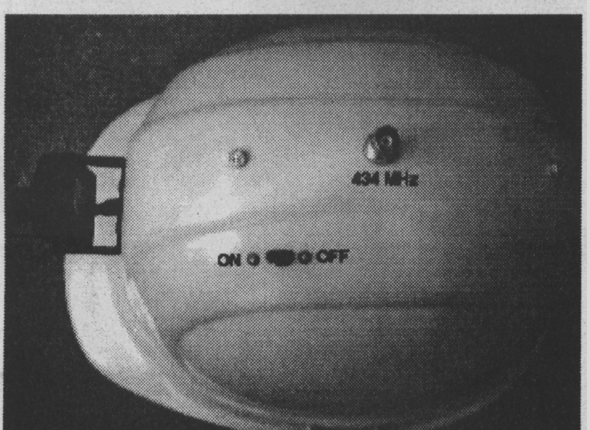


There are many emergency service applications where the on site commanders must remain in an emergency operations vehicle but would love to see what others are seeing. This is especially true when decisions must be made quickly and cannot wait for a voice description or interpretation. The Hard Hat Cam is ideal for transmitting to a portable repeater back to an emergency operations center. A picture is worth a thousand words.

This application note describes how to build into a hard hat a 50-100 milliwatt 434 MHz battery operated ATV transmitter and color camera. One should note, however, that by building this ATV gear into the hard hat, it can reduce the amount of impact protection, eventhough there is lots of room between the straps and top, and therefore the user should take that factor into account if used in a dangerous area. Snow free line of sight DX from the hard hat to a 8 dBd omni or 5 element beam is about 1/2 mile. Both the Videolynx ATV transmitter and CG-35 mini color camera are powered by two 9V alkaline batteries in parallel which can give over 10 hours of continuous operation.

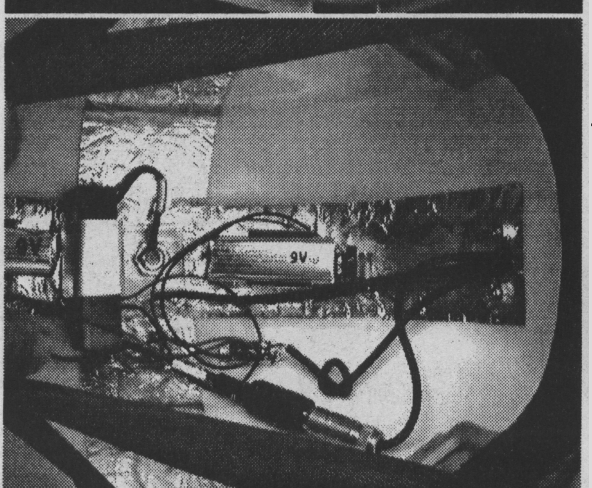
I purchased a plastic hard hat at Home Depot because I could not find a metal one. Metal would make a much better ground plane, but instead, I glued two 1.5x13 inch strips of aluminum foil in the shape of an X inside the plastic hard hat after drilling.

A 3/8 diameter hole is drilled in the top center for the antenna Radio Shack BNC connector. This jack is preferred because it has a ground solder lug on the end. Next drill 1/8" diameter holes for the 9 Volt battery holders with one 3" to the rear of the BNC and the other 2" to the front. I used 4-40x3/8 screws with the nut and lock washer on the outside of the hard hat to mount the battery holders. 1/16" holes are drilled for the slide switch approximately 1.5" forward and to one side from the BNC.



Drilling for the CG35 mini color camera is a little more involved. A hole must be drilled in both the camera bracket and hat with a .312 dia. drill so that the cable plug can be fed through from inside the hat. Drill 1/8" holes for the two camera bracket mounting holes, mount the bracket using two 4-40x3/8 screws, lock washers and nuts, then drill out the bracket and hat thus insuring good alignment of the holes. Remove the bracket. Remove the connectors on the camera cable.

Next, cut two 1.5x13" strips of aluminum foil and glue to the hat inside and centered on the antenna jack hole. Let it completely dry then cut the holes free with an Exact-0 knife.



Make a 1" wide sheet aluminum or brass bracket for the Videolynx transmitter by first drilling a 3/8" diameter hole centered and 1/2" from one end. Make a right angle bend 1" from the drilled end. Loosely mount the bracket on the BNC jack. Then place the Videolynx against the bracket with the leads pointing toward the BNC and bend the metal tight around the transmitter module.

Mount the power slide switch, battery holders, and camera. Connect the camera red power cable and Videolynx power leads to each side of the dpdt slide switch on one end. Connect both of the 9V battery clip leads to the respective center lugs - red +9 V on one side, black or ground on the other. Rather than splice the yellow video coax I put a RCA plug on the cable and plugged into the Videolynx video jack. The line audio cable is not used. Use a good resonant 50 Ohm antenna plugged into the BNC jack such as the Diamond RH519 available from us. You can also take the hard hat off and plug in a small beam like the OAL 5L-70cm to more than double the distance for fixed portable applications.

Parts list and sources:

Videolynx transmitter - P. C. Electronics $99
CG-35 mini color camera - P. C. Electronics $99
Diamond RH519 whip antenna - P. C. Electronics $28
BNC jack - Radio Shack 278-105
RCA Plug - Radio Shack 274-339
DPDT slide switch -Radio Shack 275-403
9V battery clips - Radio Shack 270-324
9V battery holders - Radio Shack 270-326

W6ORG
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ATV RFI Filters

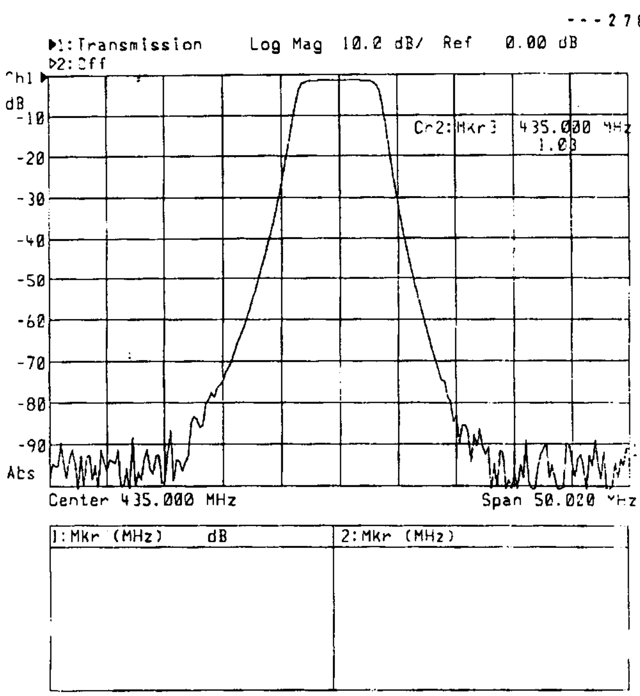
Custom tuned to your video carrier frequency

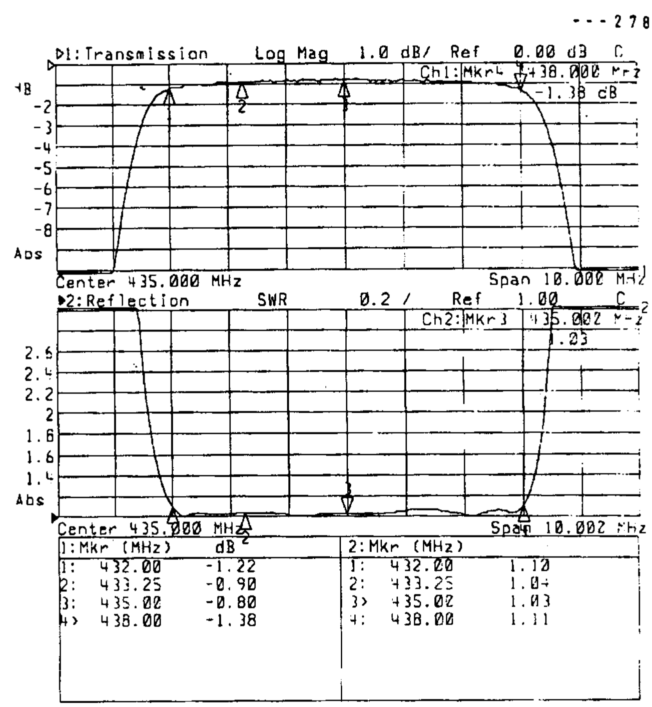
Improve your picture quality by reducing interference from pagers and other sources of RF near your reception frequency. On transmit, your signal bandwidth will be reduced so you don't interfere with other services.

DCI bandpass filters are solidly constructed from extruded aluminum and brass. DCI filters are passive and can be used in both the TX and RX pass. They are DC grounded on both inputs and outputs for additional lightning protection. Power rating is 200 watts for a 6 MHz bandpass.

Configuration	8-pole In-line	8-pole Folded	8-pole Rack-mount
Weight (approx)	12 lbs.	12 lbs.	14 lbs.
Dimensions (inches)	24 x 3 x 8	12 x 6 x 8	19 x 6 x 8

The graphs below show the characteristics of a typical DCI 8-pole ATV filter with a video carrier frequency at 433.25 MHz. We make similar filters for 900 and 1200 MHz.





DCI DIGITAL COMMUNICATIONS INC.

(306) 781-4451 voice
(306) 781-2008 fax

Box 293, 29 Hummingbird Bay
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