The Minuteman Repeater Association

The Minuteman

Volume 33, Number 4 March 2004

President's Corner by Kevin Paetzold, K1KWP

On Feb 18 there was an MMRA board meeting in Southborough. At this meeting K1IW demonstrated his new controller firmware. As you should recall this is the project for which the club approved the purchase of a 7K controller at the November meeting. I believe that everyone at the demo was very excited by this project because when the rollout is complete it should bring a lot of additional functionality to the MMRA system (e.g. linking of 446.825 and 147.270, local linking of repeaters at a given site, outbound Echolink connections, and much more). These changes will also simplify the system by reducing the number of link radios and removing most of the 5K controllers. Before you read this it is planned that W1BRI and K1IW will have already converted the first site, Weston, over to the new firmware/configuration.

Another action taken at the February board meeting was some planning for the upcoming MMRA officer elections. These elections take place at the May meeting. A nomination committee has been formed with K1IW as the chair. It is already known that there are some officers who **will not** be available for re-election. In my own case I was reluctant to serve as President again this year (2003-2004) and I expect to be even more reluctant to serve as President in the upcoming (2004-2005) year. If you would be willing to serve on the nomination committee please contact Bob, k1iw@mmra.org.

How important is it to you that the MMRA and its repeaters stay alive and well? A VHF/UHF mobile would be a lot less useful if the repeaters were not there to allow more than just line of sight contacts. However, it requires more than just the dues of members to keep the organization alive. It requires some people to make periodic time commitments and be willing to serve as an officer of the organization.

Whether you are a longtime member or a new member, a long time ham or a new ham I ask you to seriously consider making yourself available to serve in one of the club's elected positions, especially if you have not served previously. If additional people do not make themselves available to help, the existing officers will eventually burn out; the organization and the system will suffer.

In the last couple years the MMRA operations have been streamlined and almost completely automated. The actual time commitment to be an officer is mostly the time to attend four or five board meetings per year. Offices such as treasurer and secretary probably only take a hour or two a month at this point in time due to automation. If you have any questions about any of the officer positions you can ask any of the existing officers/board members or you could send email to mmra@mmra.org.

In addition to knowing that you have done your part to help keep the MMRA operating there are other benefits from being an officer. Some that come to mind include gaining in depth knowledge of the MMRA system, helping the club to make decisions such as how we spend funds, and rubbing elbows with some of the very excellent and capable people that are also serving. I have learned a great deal from people like W1BRI, N1NVK, N1QPR, WA1NLR, and N1BE, and that would not have happened if I was not an officer of the organization.

In closing I would like to remind members that the MMRA repeaters are scheduled to be in use during various upcoming public service events. Stay tuned to the Tuesday night net and the email lists for advance notice of these activities.

Inside this issue:

About the Minuteman Repeater Association

The Minuteman Repeater Association (MMRA) is dedicated to Amateur Radio and public service. The MMRA has built a large system of repeaters in Eastern Massachusetts.

The Minuteman newsletter is mailed one week before each meeting. Members are encouraged to submit articles. Articles may be sent to the editor via email to n1be@arrl.net. The deadline for articles is the last Friday of the month preceding the meeting.

The MMRA meets on the 3rd Wednesday of September, November, January, March, and May. Meeting time, locations and talk-in frequency vary. These are announced in the newsletter and on weekly nets. Meetings are open to all interested parties.

Each Tuesday evening at 8PM the MMRA links most of the repeaters for an open net. The topic is "Technical Information and Other Stuff". Feel free to join us.

Membership in the MMRA is open to all radio amateurs. Annual dues are $25 per individual or $35 per family. See our website for details.

Email to the club leadership should be sent to mmra@mmra.org. The MMRA web site is: http://www.mmra.org/

An email distribution list for club members named "MMRA" has been established on: http://www.yahoogroups.com/

Repeater and Frequency Information

Location	MHz	PL	Call	Note
Marlboro	53.810	71.9	W1BRI	PTL
Marlboro	146.610	146.2	N1BHI	FTL
Quincy	146.670	146.2	W1BRI	PTL
Stoneham	146.715	146.2	N1NVL	PTL
Weston	146.820	146.2	N1BE	PTL
Brookline	146.985	88.5	W1FCC	Affiliated, PTL
Marlboro	147.270	146.2	W1MRA	PTL (to 10 Meters)
Hopkinton	223.940	103.5	N1BHI	FTL
Quincy	224.400	103.5	N1KUG	FTL
Weston	224.700	103.5	N1HBR	FTL
Stoneham	446.725	88.5	N1NVK	NA
Brookline	447.875	88.5	K1IW	Affiliated, PTL
Shrewsbury	449.575	88.5	W1BRI	FTL
Marlboro	449.925	88.5	W1MRA	Network Hub
Marlboro	144.390	none	N1QPR-2	APRS Digipeater
?	145.630	146.2	W1MRA	Fox Box
Internet	Echolink node 94940 connects to the Network Hub			

Notes: FTL = Full Time Linked to the Hub.
PTL = Part Time Linked (on demand).
NA = linking is Not Available.

PL: PL is now required on 2 meters to prevent interference. The code **750** will temporarily disable the PL requirement.

Using the Autopatch: Only the hub has a telephone line.
(1) Link to the hub if necessary.
(2) Then bring up the patch using the 449.925 autopatch codes.

Control codes are sent to members upon receipt of dues.

MMRA Leaders

President	Kevin Paetzold	K1KWP
Vice President	Steve Telsey	N1BDA
Secretary	Bob DeMattia	K1IW
Treasurer	Bill Northup	N1QPR
Clerk	Jon Titus	KZ1G
Technical Officer	Bryan Cerqua	W1BRI
Director	Larry Banks	W1DYJ
Director	Shelley Northup	N1VJE
Director	Steve Schwarm	W3EVE
Director	Bill Thorpe	WA1NLR
Emergency Coordinator	Bill Northup	N1QPR
Public Service Coordinator	Kevin Paetzold	K1KWP
Newsletter Editor	Bob Evans	N1BE
VEC Liaison	Bill Wade	K1IJ
Web Page Editor	Bob DeMattia	K1IW

How Long Will My Battery Last? by Bruce Pigott, KC1US

Calculating how long your HT battery pack will run during an event is a question that comes up frequently. The calculations are relatively easy and linear with available data. However, how to estimate the data is the puzzle.

The three conditions of battery drain to consider are: radio squelched; with received audio; and transmitting. These values are usually found in the radio user's manual. Here is an example using a Yaesu VX-150 running for eight hours set at two watts transmit power:

Function	Duty Cycle		Hours	Drain		Total
Squelched	50%	*	8	* 0.052A[1]	=	0.208 Ah
Receive	40%	*	8	* 0.130A	=	0.416 Ah
Transmit	10%	*	8	* 0.800A	=	0.640 Ah
[1] with battery saver mode on 1:1						1.264 Ah

Now where did those duty cycle percentages come from? An estimate based on a typical event time line. During set up, stations are checking in and there is some reporting going on, but at a low level. Once the event gets underway and more stations have items to report, the receive time increases. The transmit time is low because other than checking in and giving status reports, you are not transmitting. If your station does have a lot of activity, you will be transmitting more. But 10% of eight hours is talking continuously for 48 minutes! Or six minutes out of every hour. If you are at a station with much activity, others will be with you, using their radios, reducing your transmit duty cycle.

In order to be conservative, double this estimate. **Thus for an eight hour event at two watts, you need 2.5 Ah of battery capacity**. The standard battery pack that came with the radio plus a high capacity pack will get you close to this number. For more capacity, consider gelled battery packs, or a manufactured assembly.

A few more battery concepts: Capacity measurements are based on a twenty hour discharge rate, which is termed C/20. Going above that rate will cause some loss in apparent capacity due to internal I2R drops. Typically, at the 1C rate, a loss of greater than 40% is experienced. So, a one Ampere Hour battery will only appear to give .60 Ampere Hours. The 1C or greater drain comes into play when you are transmitting for extended periods.

Other considerations include - do you need to run other power levels? Which type of cells are you using? If you run alkaline cells, your radio will receive long after there is not enough current to transmit with. This is due to the higher internal resistance compared to NiCds. Nickel Cadmiums and Nickel Metal Hydride rechargeable cells have a flat voltage discharge curve, but then drop off real fast. Your radio may just shut down with minimal warning. Lead Acid cells have a very linear slope that the user can check the voltage to determine remaining capacity. As cells age, capacity is also lost.

Newer radios have a battery saver mode that allows lower average receive current. But if you get carried away with a high off ratio, you may miss the first part of transmissions. The use of headphones will permit less current drain by not having to power the speaker.

See http://cpsg.amateur-radio.net/ for a multi level list of recommended items for Public Service Events.

New Controller Online At Weston

As this issue of the Minuteman is being edited, K1IW and W1BRI are busy reconfiguring the Weston repeaters to use a single SCOM 7K with new firmware to control all the radios at that site. Some details of this were explained in an article that appeared in the January 2004 Minuteman.

This is a large project that motivated a new release of firmware from SCOM. In addition, K1IW wrote new repeater "personality" macros, and a new macro compiler.

We are seeing an exciting evolution of ideas developed in the MMRA by people like Walter, N1HBR, who pioneered the earlier controller macros and compiler.

The MMRA is fortunate to receive contributions from such top notch talent. **Thanks to all past and present MMRA repeater builders!**

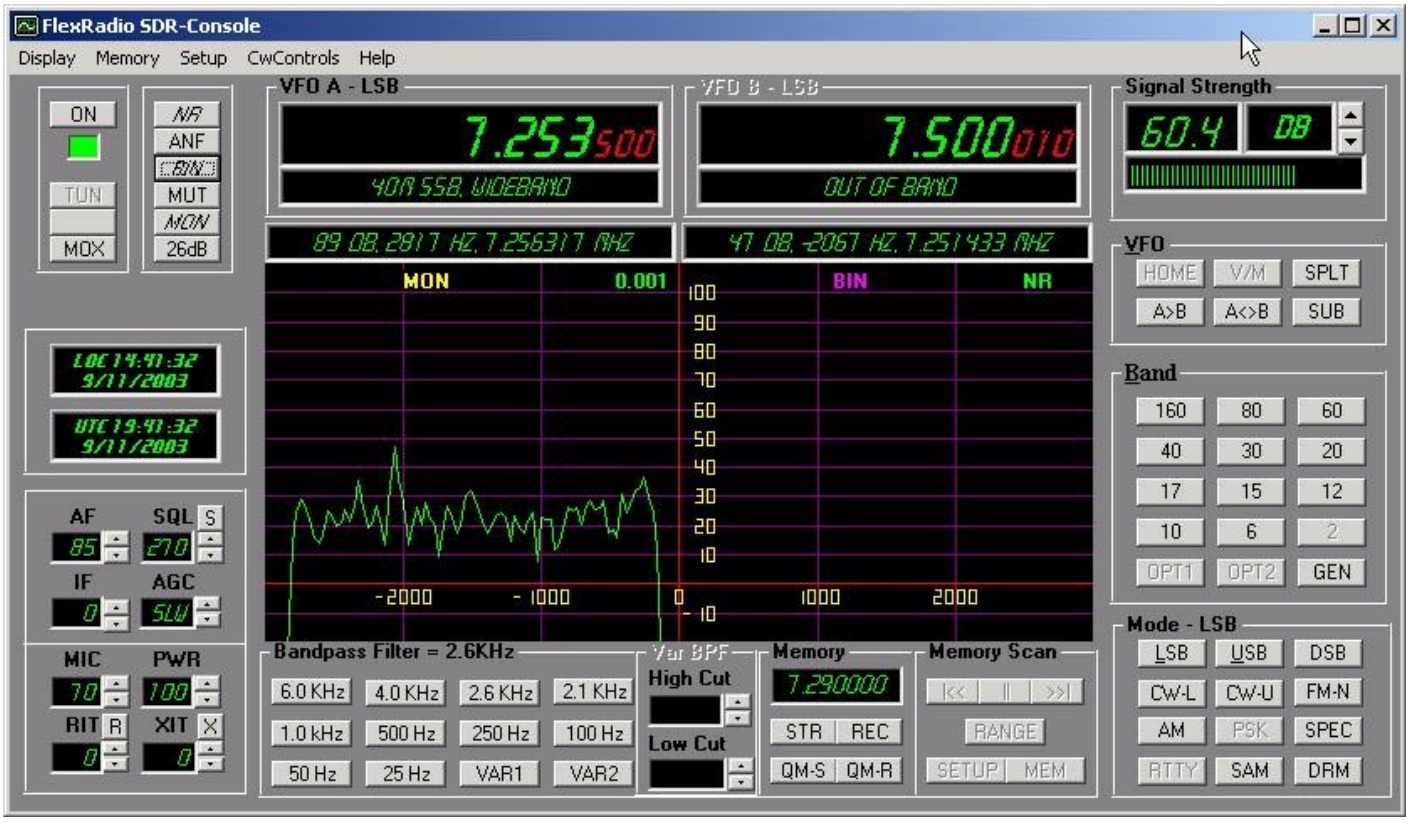
Software Defined Radio — by Pete Thompson, N3EVL

Introduction The marriage of the personal computer and amateur radio was inevitable: the applications are practically endless. Typical applications include using the available computing power to help in our modeling calculations, chasing DX via web-based lists, interfacing to our transceivers via sound cards to make use of the digital modes, or using the PC's graphical capabilities to control our rigs. In parallel with this, our rigs themselves have benefited from the now widely available microprocessors and DSP chips, giving our radios incredible capabilities and performance. Transceivers with IF-based DSP are now common, to some extent replacing the earlier generation of AF-based DSP radios. More recently, yet another milestone development in radio technology has begun to creep into the realm of amateur radio: Software-Defined Radio or SDR.

So, What is it and Why do I Need it? In a Software-Defined Radio, functions that have historically been performed by analog hardware can be performed in software. Note that we're not talking about software that controls the radio's behavior, we're talking about software that is the radio's behavior. Many of us are familiar with the improved performance resulting from incorporation of DSP techniques into our conventional radios. SDRs take this to the next logical level by implementing the basic functions of the radio in ones and zeros, introducing a level of flexibility and performance gains that were previously only dreamed of. The flexibility is inherent in the dynamic nature of software: it is highly amenable to change to accommodate new, more, better applications and designs without throwing away the supporting hardware. The performance gains are derived from new and exciting capabilities of DSP algorithms that can manipulate signals in ways that their analog counterparts cannot.

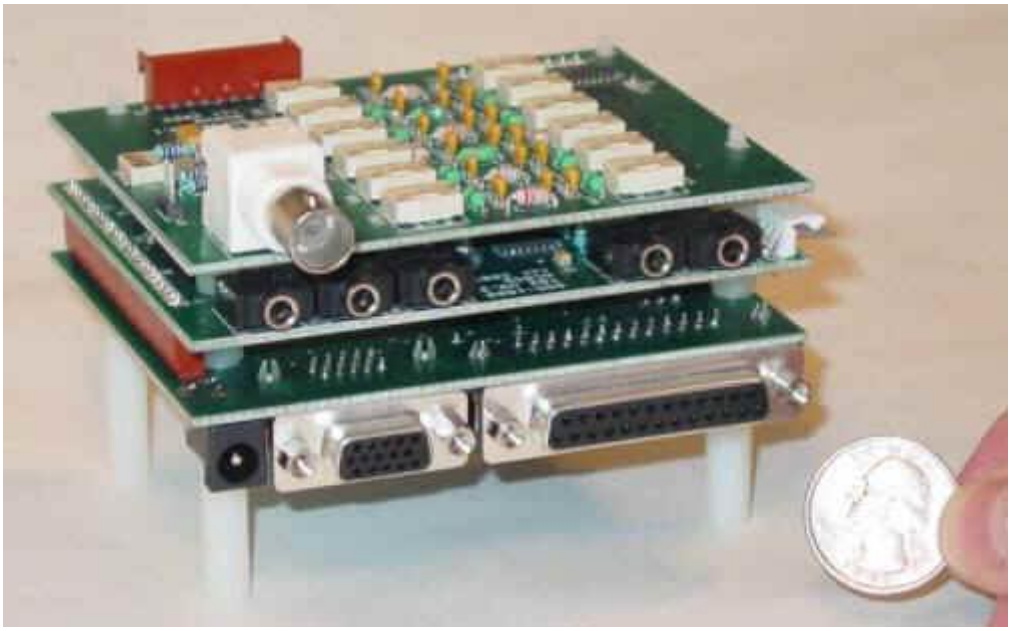
How Can I Get it? Several commercially available SDRs are or have been on the market recently. These include the now defunct Kachina and several models by Ten-Tec including the Pegasus/Jupiter and the new Orion (see the recent review in QST). Another SDR that is rapidly gaining a following is the Flex-Radio SDR-1000. See http://www.flex-radio.com for their latest information. The SDR-1000 and the ideas and theory of its operation was originally introduced by Gerald Youngblood, AC5OG, in a series of four articles in QEX. These articles are available for download at the web site and are well worth reading and have references to many other interesting articles and books that can help with understanding to DSP and SDR concepts and techniques.

(Continued on page 5)



Controls of the FlexRadio SDR-1000 — on the screen of the associated PC.

Software Defined Radio (cont.)



These boards comprise the basic SDR-1000.

SDR-1000 Overview For around $500, one can purchase the basic SDR-1000. This consists of a set of three vertically stacked boards and the necessary software to make the radio work and provide a user interface from the PC. One of the boards has a parallel port that connects to the PC and is the control interface. The buyer provides antenna, PC with approved sound card, power supply, microphone, keyboard, key etc.

The result is a state of the art transceiver that covers 160 thru 6 meters using a variety of available modes. Admittedly, this is definitely a QRP radio in this form, having a transmit output power of only 1W. However, the web site lists several power amplifier stages that can be used to increase the power sent to the antenna and it appears that a 40W add-on stage will soon be available along with some other goodies including a nice enclosure with space for future expansion.

One feature of the SDR-1000 that will probably appeal to most hams is that it permits us to assemble and tinker with the radio, a feature that has been missing in most commercial equipment lately. We can actually assemble a state of the art transceiver and we can fiddle with the internals!

How Does it Work? The much simplified goal of the receiver is to get a digital representation of the desired signal into the PC where the processing power can be applied to extract the intelligence from the signal and, in the case of phone and CW, convert the resulting digital information back to analog form and send it to the speaker. The transmit goal is essentially the reverse of this and the resulting RF is sent to the antenna. The receiver portion of the SDR-1000 hardware uses an interesting technique to perform direct conversion of the incoming RF to a baseband IF of 11.025-KHz.

The receiver uses a phasing approach-reminiscent of early SSB designs-that generates two baseband components 90 degrees apart. These two signals, called inphase (I) and quadrature (Q), are fed to the PC's sound card via the right and left inputs. The sound card acts as an analog-to-digital converter, sampling the signals at 44-KHz or higher depending on your sound card. Now, the PC can apply a variety of software algorithms to process the numerical representation of these two signals and perform the necessary manipulation to work the DSP magic.

The supplied software works with the DirectX sound card interface using Microsoft Visual Basic but other languages such as C++ are supported and other sound card interface libraries can be used. The DirectX interface allows us to get at the digitized I and Q signals, manipulate them to perform the type of required demodulation, and finally put the modified data back into the sound card where it is converted back to analog audio.

The key here is that having both the I and Q components available means we can demodulate anything — just substitute the appropriate algorithm and the radio will deliver AM, SSB, FM, CW, etc. The algorithms are based on Fast Fourier Transform (FFT) techniques that convert between the time domain (think oscilloscope view of a signal) and the frequency domain (think spectrum analyzer view). Fortunately, there are off-the-shelf implementations of this function so we don't need to write our own! Again, transmit is essentially a mirror image of the above.

Net Result The resulting radio has impressive performance figures, especially for a radio in this price range (see tables on the web site).

DSP techniques excel in pulling weak signals out of the noise even in the presence of nearby strong signals. An added benefit is that the internals of the radio are constantly being revised and improved and these changes are available simply by downloading the latest software or rolling your own.

While the SDR-1000 is not the only radio of its type available, it offers a convenient way to jump into SDR and get your feet wet with this exciting technology for the price of a used HF rig. A web search on the subject will undoubtedly turn up many other ways to obtain information and there are several e-mail and discussion groups focused on this subject including an active group on the Flex-Radio web site.

Public Service Volunteer Opportunities in the New England Division

Listing public events at which Amateur Radio communications is providing a public service and for which additional volunteers from the Amateur Community are needed and welcome. Please contact the person listed to identify how you may serve and what equipment you may need to bring.

The most up-to-date copy of this list is maintained as http://purl.org/hamradio/publicservice/nediv

Every event listed is looking for communications volunteers.

Date	Location	Event	Contact	Tel/Email
Apr 19	Hopkinton MA	Boston Marathon Start	Steve K1ST	k1st@arrl.net
Apr 19	Hopkinton to Boston MA	Boston Marathon Course	Steve W3EVE	baa2004@amateur-radio.net
Apr 19	Boston MA	Boston Marathon Finish	Paul W1SEX	w1sex@arrl.net
Apr 25	Groton MA	Groton Road Race	Ralph KD1SM	978-582-7351 kd1sm@arrl.net
Apr 25	Boston MA	March of Dimes WalkAmerica	Bruce KC1US	781-275-3740 kc1us04@amateur-radio.net
May 2	Boston MA	Walk for Hunger	Bob K1IW	413-647-3111 wfh2004@amateur-radio.net
May 15	Portsmouth NH to Ogunquit ME	Lung Association bike trek	David KA1VJU	603-581-2602 ka1vju@dmegin.com
May 16	Ogunquit ME to Portsmouth NH	Lung Association bike trek	David KA1VJU	603-581-2602 ka1vju@dmegin.com
May 16	Devens MA	Parker Classic Road Race	Stan KD1LE	978-433-5090 kd1le@arrl.net
May 23	Boston MA	ALA Asthma Walk	Bruce KC1US	781-275-3740 kc1us04@amateur-radio.net
Jul 4	Westminstr MA	Fitchburg Longsjo Classic	Ralph KD1SM	978-582-7351 kd1sm@arrl.net
Jul 5	Fitchburg MA	Fitchburg Longsjo Classic	Ralph KD1SM	978-582-7351 kd1sm@arrl.net

This list is published periodically as demand warrants by Stan, KD1LE, and Ralph, KD1SM. Our usual distribution is via packet to NEBBS, via Internet mail to the arrl-nediv-list and ema-arrl distribution lists, and on the World Wide Web (see URL above). If other mailing list owners wish us to distribute via their lists we will be happy to oblige. Permission is herewith granted to republish this list in its entirety provided credit is given to the authors and the URL below is included. Send comments, corrections, and updates to:

(via packet) KD1SM@K1UGM.#EMA.MA.USA,
(via Internet) KD1SM@ARRL.NET.

We make an attempt to confirm entries with the coordinator unless the information is from another published source. We very much appreciate the assistance we have been receiving from our 'scouts'; everyone is welcome to send us postings.

Refer to http://purl.org/hamradio/publicservice/nediv for the most recent version of the PSLIST.

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More Public Service events (from http://cpsg.amateur-radio.net/)

CPSG, the Crocker Public Service Group is seeking amateur radio operators to assist in the following events. You can sign up at their web site. The web site also has helpful hints for participation in any public service event.

Date	Event	Description
June 13, 2004	Positive Spin for ALS	Scenic bicycle tours to benefit the Massachusetts Chapter of the ALS Association for patient care and research. Starts in Wayland and heads west, with four different routes of 10 to 100 miles.
June 27, 2004	Tour de Cure (South Shore)	Assistance with multiple bicycle routes starting in Marshfield is needed. Raises funds for the American Diabetes Association.

March 13 CEMARC Meeting by Frank Murphy, N1DHW

CEMARC, the council of eastern Massachusetts amateur radio clubs will hold their first meeting of the year on March 13 from 9:00 AM until 1:00 PM at the Marlborough EOC — Central Fire Station, 215 Maple St. (Rte. 85) Marlborough. Ma. The Algonquin Amateur Radio Club has gracious offered to host this meeting and provide coffee, donuts, and a pizza lunch.

The proposed agenda items include: the CEMARC Youth Net, use of the CEMARC mail list, Local Emergency Coordinators, the 2004 NE (Boxboro) Convention, Swap Nets, scout activities on the USS Salem, and regional "Beginners Classes".

Since this is the first meeting of the year, all clubs are requested to have at least one delegate in attendance. Any club member is welcome to attend and participate in discussions at CEMARC meetings; but only one vote is allowed per club on any voting issues.

More details of the preliminary agenda items, a request for additions, and directions to the EOC are on the CEMARC Web Page at: http://www.qsl.net/cemarc

Please direct any questions to: n1dhw@ema.arrl.org

Directions to the March 17th MMRA Meeting

The next MMRA meeting will be at the Waltham Weston Corporate Center, 201 Jones Road, Waltham, MA. Jones Road connects to Rte 117 about one eighth mile West of Rte 128. It is an industrial park with a 6-story office building. (The building is located about 1 mile south of the Waltham Uno's.) **Talk-in is on the Weston repeater, 146.82 MHz**.

From Rte 128 (I-95): Take the Rte 20 exit. Head East on Rte 20 and follow the signs to Rte 117. Turn left onto Rte 117 West at the intersection, then follow the directions "From the East", below.

From the East: Take Rte 117 West. Shortly after passing over Rte 128 and just past the Mobil station, turn left into Jones Road at the flashing light. Continue at Step 2 below.

From the West: Take Rte 117 East. Shortly after crossing the Weston/ Waltham line, turn right into Jones Road at the flashing light. Continue at Step 2 below.

Step 2: Follow Jones Road to the bottom of the hill. As you approach, there is a right turn before the building. Take this road and park on the North side of the building. You should enter on the North side of the building.

The exterior entrances are locked at 7PM, but there will be someone at the North entrance to open the door for you.

Next Meeting — Wednesday March 17, 2004
N1HID & KD1NX: The New Amateur Radio Satellites

The MMRA will meet at the Waltham Weston Corporate Center, 201 Jones Road, Waltham, MA 02451. Directions and maps are on the previous page and on the http://www.mmra.org/ website.

Bill Foster, KD1NX and Rick Meuse, N1HID will give a presentation on amateur radio satellites. They will talk about the currently in use satellites including AO-27, SO-50, FO-29, AO-7, and ISS. Bill and Rick will show a portable AO-40 station and talk about that satellite too. The presentation will conclude with ongoing plans and developments for what amateur radio satellites may be launched in the next few months.

Some of you may remember the N1HID packet BBS Rick ran with orbital information about RS-10.

The meeting will start at 7:30PM. A ground floor conference room has been reserved for the MMRA. **Talk-in is on the 146.820 Weston repeater**.

Calendar of Ham Radio Events

(Flea market info from W1GSL list. http://mit.edu/w1gsl/Public/ne-fleas)

Mar 13:	CEMARC meeting, Marlboro
May 17:	**MMRA meeting**
Mar 20:	ECARC Flea. Pomfret CT
Mar 28:	FARA Flea. Framingham
Apr 17:	Antique Radio flea, Nashua NH
Apr 18:	Flea at MIT, Cambridge MA
Apr 21:	**MMRA board meeting**
Apr 30:	**MMRA Newsletter Deadline**
May 1:	Hosstraders, Hopkinton NH
May 19:	**MMRA meeting & election**

MMRA VE Sessions

3rd Saturday of each Month
9 AM at the Marlboro Public Library
Contact: Bill Wade, K1IJ
781-891-9079 Evenings 6 to 10 PM,
Weekends 8 AM to 10 PM.
Accredited by the ARRL VEC

THE MINUTEMAN REPEATER ASSOCIATION

MMRA
P.O. Box 669
Stow, MA. 01775-0669

Email: mmra@mmra.org

WE'RE ON THE WEB!
HTTP://WWW.MMRA.ORG/

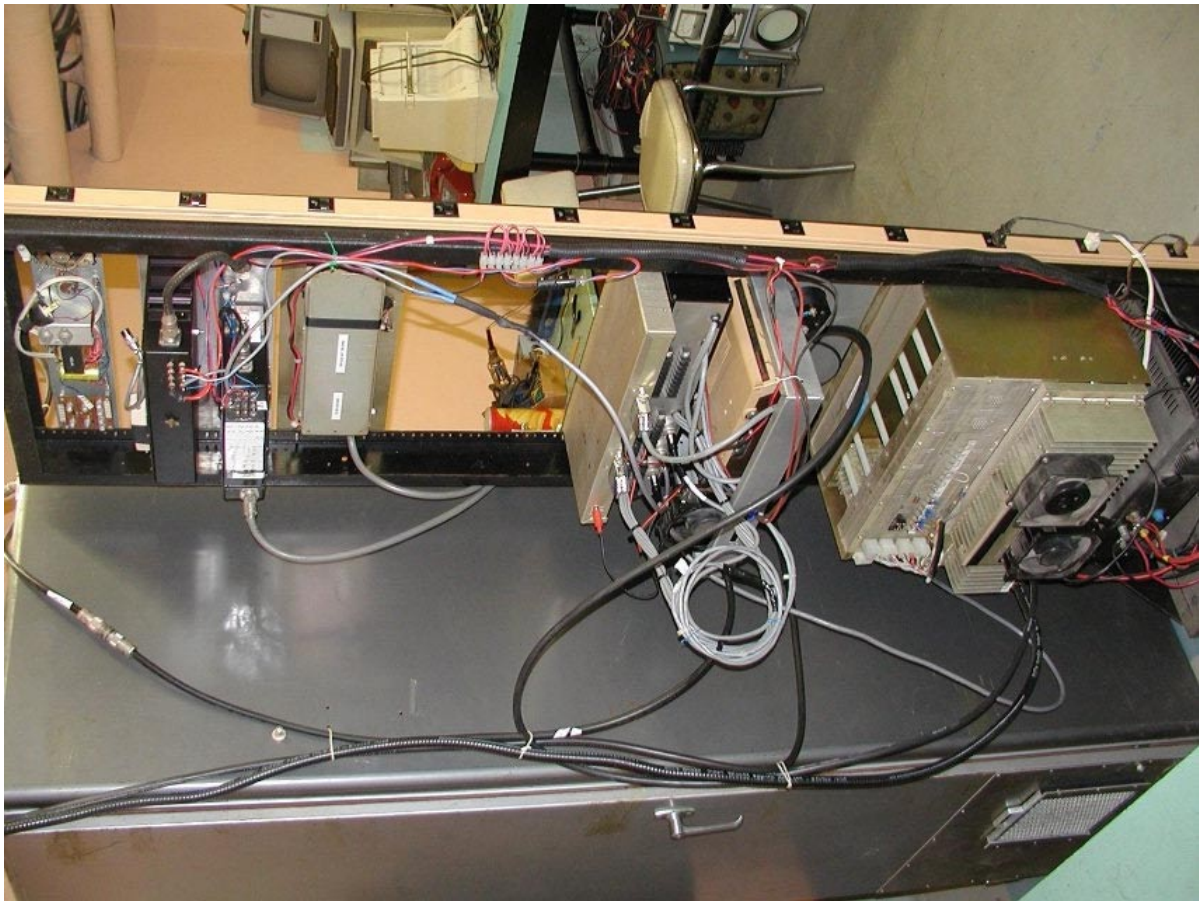
Front of-Weston racks before the new Controller was installed

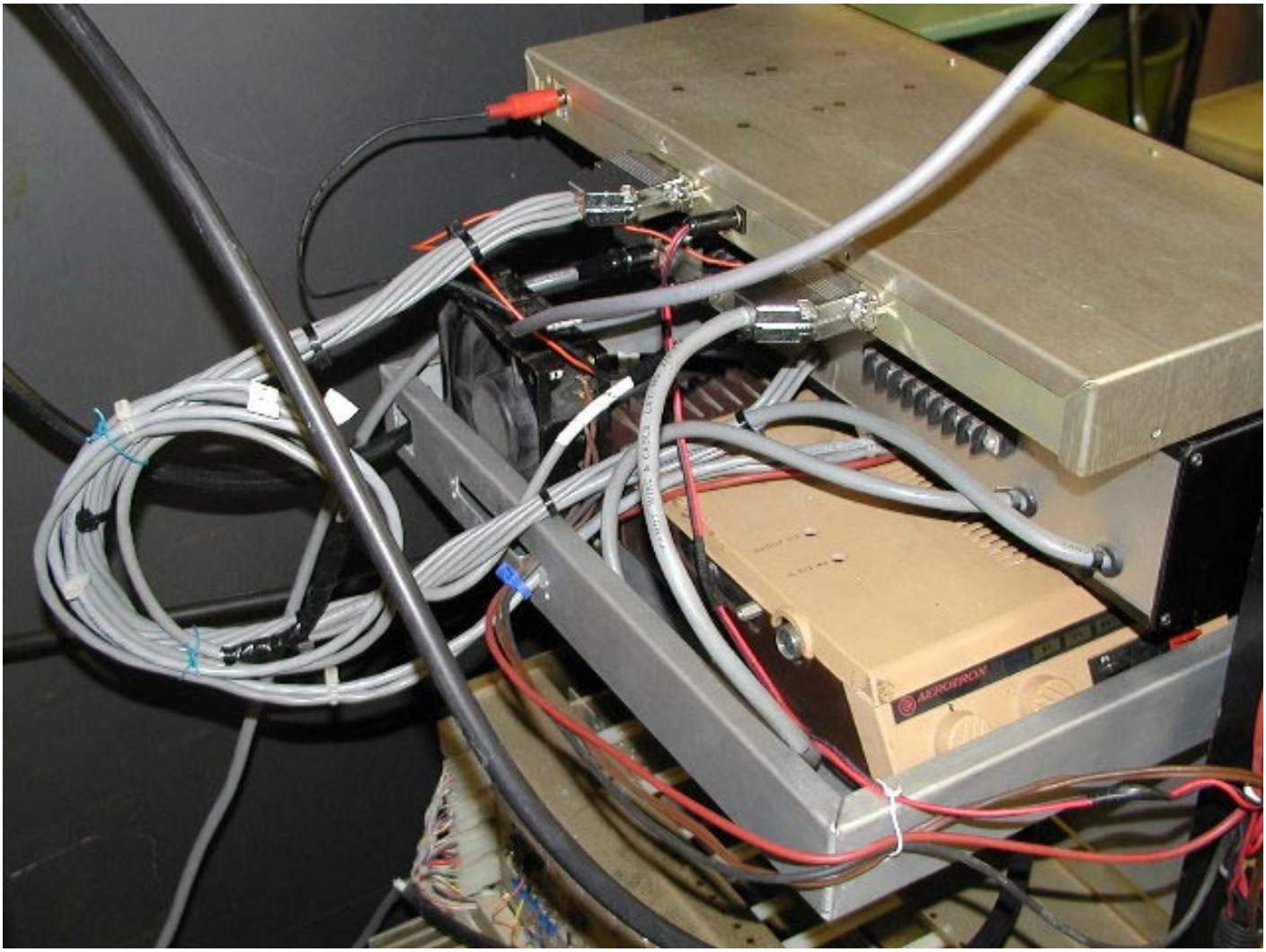
Excess rack here got removed

Cleaned up Weston rack after new controller installed

Rear of Weston racks before the new Controller was installed

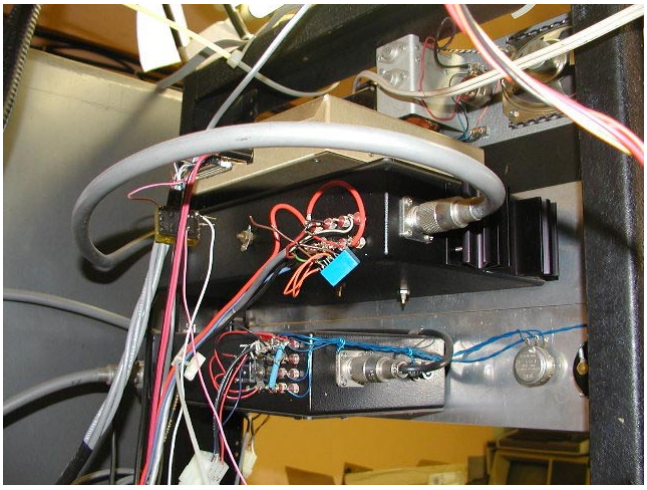
Cleaned up Weston rack with new controller installed





Above is a close up of the link radio shelf after the rack was cleaned up.

What was a rats nest before (below) ...



Has been cleaned up — no more blue relay hanging by connecting wires. (below)