



The Minuteman Repeater Association

The Minuteman

Volume 34, Number 4

March 2005



MMRA Board Minutes — by Bob Evans, N1BE

The MMRA Board met at 7:30 PM in Chin's Restaurant, Marlboro MA on February 17th. Present were K1IW, K1KWP, N1BDA, W1BRI, and N1BE. The following summarizes the items discussed.

Buzz-buzz on the '61 input is back. Consequently, 61 was de-linked from the hub. K1IW found the same house as before causing it — Bob is attempting to contact the owner to resolve.

With a controller upgrade at Stoneham and a replacement of 147.27, a year-long project of system improvements is complete. All repeaters are now using new control codes that K1IW distributed to control operators. By placing contributed equipment into service and selling equipment we took out of service, this project incurred no cost to the club.

K1IW reported the eBay sales of the old 147.27 controller, PA and duplexer.

In agreement with the projection at the last board meeting, K1KWP's Treasurer's report projects ~10% increase in our balance over the entire fiscal year. Kevin is working to resolve the MMRA's Federal tax and corporate status. Although we are non-profit, we will not be a 503c tax exempt organization. Hence, contributions to the MMRA are not tax deductible.

With concern about declining membership, we looked at a list of members who have not renewed. The board approved wording of two letters, one to be sent to members who have not renewed and the other to non-members who frequently use our repeaters.

The board approved disposition of the following items:

- SCOM 5K controllers; one to Tom Muise, W1CDA; one to keep as a spare; one additional 5K not allocated.
- Micor base station from of old 147.27; power supply, receiver, exciter, and rack to CPSG — as a CPSG officer, K1IW abstained from this vote.
- eBay sales of old Stoneham and Quincy repeaters; (Hamtronics TX/RX, Z80 controller).

We also discussed items from Weston to sell at the Algonquin flea. (Our table brought in a new membership and \$35 from sale of these items.)

Stoneham was cleaned up during the site visits for the controller upgrade. The board began discussion of a June work party at Weston.

We are seeking a nomination committee for the May election. MMRA requires a few members to volunteer for this short-term activity. If no one has volunteered a committee will be appointed at the April board meeting.

N1BE announced, that after over 4 years in the post, he would like to resign from the role of newsletter editor.

The board considered the requirements for a life member and voted to approve life membership for N1BHI.

Usage of the Weston repeaters by Walk For Hunger on May 1st were approved.

Use of 146.61 and 148.82 during the March 12th SET and ARES repeater linking training were approved.

Congratulations

Recognizing his many contributions to the club, at the February board meeting **Andy Morrison, N1BHI** was voted in as a life member.

An article by **Bryan Cerqua, W1BRI** covering technical analysis and cure of

Buzz-Buzz was published in the *ARRL March 2005 QST*.

MMRA President **Bob DeMattia, K1IW** has been named ARRL Technical Coordinator in the Eastern Massachusetts section.

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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 newsletter@mmra.org. 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 maintains a web site at: <http://www.mmra.org/>

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

MMRA requests that no part of this newsletter be copied or posted elsewhere without prior approval from the club. Your cooperation in this matter is greatly appreciated.

Repeater and Frequency Information

Location	MHz	PL	Call	Note
Bolton	29.620	131.8	W1OJ	Affiliated, FTL
Marlboro	53.810	71.9	W1BRI	PTL
Belmont	145.430	67.0	WA1RTT	Affiliated, 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	N1NOM	FTL
Marlboro	224.880	103.5	W1MRA	FTL (to 10 Meters)
Stoneham	446.725	88.5	N1NVK	NA
Milford	446.825	100.0	WA1QGU	Affiliated, PTL
Brookline	447.875	136.5	K1IW	Affiliated, FTL
Shrewsbury	449.575	88.5	W1BRI	FTL
Belmont	449.650	67.0	WA1RTT	Affiliated, 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
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Notes: FTL = Full Time Linked (usually to the Hub).
 PTL = Part Time Linked (on schedule or demand).
 NA = linking is Not Available.
 Additional repeater information is on the MMRA web site.

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.

President's Corner — by Bob DeMattia, K1IW

When I was first licensed in 1979, BPL was a good thing. Of course, at that time it stood for Brass Pounder's League, something to do with the National Traffic System. I guess it is a sign of the times that BPL now stands for something else - Broadband over Power Lines. For those who may have somehow missed this issue, BPL is a newly introduced technology that allows consumers another option for broadband Internet access. The information is placed on multiple "low level" RF carriers and then transmitted over everyday power lines.

I've read with some amusement the ongoing discussion as to the viability of this. On one side are corporate interests saying BPL won't cause any interference. On the other side are a myriad of groups concerned about pollution in their part of the RF spectrum.

The ARRL has created a very compelling technical analysis that shows that BPL does cause interference. I'd like to put aside the technical details for a minute and ask a very basic question: If I connect an RF generator to a pair of unbalanced conductors with all sorts of unknown terminations, will the signals get radiated, or will they stay tightly within the transmission system?

The FCC seems to have come to the incredible decision that BPL will not cause interference. Of course, this decision is conflicted: In its report and order it excluded certain frequency bands that would affect government services. I ask, if BPL is not going to cause interference, then there should be no need to safeguard any frequencies, right?

In general, I'm not in favor of too much government regulation, and I'm not much of a conspiracy theorist. But the progression of events leading to the October 2004 FCC decision has made even me suspicious. As the league points out again and again in its 25-page petition for reconsideration, the FCC decision is rife with conflicting logic in order to make the case for permitting BPL.

Another aspect that should be considered a problem is the mechanism that the FCC has created to resolve BPL interference problems. Essentially, the afflicted party has to carry the weight of finding the problem and resolving it. If you think you are going to get the power company to shut down its BPL service when it starts interfering with your operation, think again. Some groups unfortunate enough to be in BPL trial areas have had problems for months and months. If you think the FCC is going to jump right up to your side, I have my doubts about this too. If our experience with the '61 [buzz-buzz] battery charger problem is any clue, amateurs are in for a long uphill battle when BPL moves into their area. The battery charger problem was resolved through the sweat and frustration of club members, with little help from anyone else. Even when the problem was found to be widespread, and not an isolated incident, no help was to be had.

The ARRL Petition for Reconsideration pulls no punches. You can take a look at http://www.arrl.org/announce/regulatory/et04-37/recon_petition/ and file your own comments.



Do you have a two meter hand held radio? Six hours of time? On Sunday May 1st, we can use your help to support the 40,000 walkers participating in the Walk for Hunger. Project Bread will be depending on the skills of hams to tie together the walk coordinators, volunteers and managers. The twenty mile route starts in Boston, goes out to Newton, continues through Watertown and then back to Boston Common. This is the major fund raising event for Project Bread which provides assistance to nearly 400 feeding agencies across the Commonwealth. Last year over \$3 million was raised thanks in part to our efforts.

Assignments include both stationary and mobile positions. You can sign up on line at the Crocker Public Service Group web page, <http://cpsg.amateur-radio.net/>. For more information call Bruce KC1US, at 781 275-3740, or send an email message to wfh2005@amateur-radio.net.

MMRA Leaders

President	Bob DeMattia	K1IW
Vice President	Steve Telsey	N1BDA
Secretary	John McGovern	W1JMC
Treasurer	Kevin Paetzold	K1KWP
Clerk	Bob Evans	N1BE
Technical Officer	Bryan Cerqua	W1BRI
Director	Larry Banks	W1DYJ

Director	Tom Muise	W1CDA
Director	Steve Schwarm	W3EVE
Director	Bill Thorpe	WA1NLR
Emergency Coordinator	Bill Northup	N1QPR
Net Manager	Tim Nau	W1NAU
Newsletter Editor	Bob Evans	N1BE
Public Service Coordinator	Kevin Paetzold	K1KWP
VEC Liaison	Bill Wade	K1IJ
Web Page Editor	Bob DeMattia	K1IW

Repeater Report — by Bryan Cerqua, W1BRI

New 147.27 repeater: Thanks to Andy, N1BHI for another fine GE MASTR II 220W solid state base station acquisition. It even came with an SCOM 7K controller. This repeater is like one that I configured for Lands Towing of Marlboro last summer. The repeater arrived in two six foot cabinets, one cabinet contained the repeater and the other held the duplexers and isolator panel. Since the Slygo shelter is only about five feet tall, the cabinets would not fit into the shelter. This was solved thanks to Keith Wheeler of Lands Towing. Keith got the cabinet cut down, re-welded and he even repainted it for us. All I needed to do is re-rack all the components into the modified rack. All the components including the isolator panel and SCOM 7K controller just fit into the modified rack. Once the entire system was racked up it was transported to my home in Milford for further construction.

I decided that this system would use only a wiring harness and no custom breakout box. The wiring harness was the most time consuming part of building this repeater. Using Excel the entire job was first figured out on paper. This system uses a mini-GE repeater panel so I had to figure out just how to tap off the RX and TX audio. The panel also provides the regulated 10 volts so I didn't want to totally remove it. The wiring harness, which uses RG-174 coax for all the audio connections, ties together the controller, receivers and transmitters for the UHF link radio, 147.27 and 224.88 repeaters.

The UHF link radio is a GE Phoenix two channel 20W radio that I picked up at Horsetraders. We need the two channels, one for connecting to our 449.925 hub repeater and the other channel for linking to the W1OJ ten-meter repeater. The link radio uses an NVRAM memory chip that Roger, WA1NVC programmed for us. The Phoenix has built in PL encode and decode which makes the job much easier. To prevent short 10 meter noise bursts from constantly keying up the repeater, a custom board was built and placed inside the radio. This board requires that a valid signal be present for about 2.5 seconds before bringing up the repeater. Once this 2.5 sec. requirement has been met the system will key without delay. After about 5 minutes of inactivity the system will then revert back to requiring the 2.5 sec. key down. This board greatly helps prevent wear and tear on the repeater and also saves the club money due to unwanted keyups. The link radio is mounted inside the GE MASTR II radio box.

A two stage high power isolator came with this system. The isolator is used for two reasons. It prevents transmitter damage due to open or shorted feedline and it prevents strong RF signals from other transmitters at the site from mixing in the 2-meter power amplifier producing noise that could desense the receiver. The isolator was measured in the lab at work using a network analyzer and found to have a 1.8 dB insertion loss. This was too high; I decided to see if I could retune it by adjusting the trimmer capacitors on the isolator. After an evening of trimmer cap twisting I could not reduce the insertion loss. I took the isolator home that night and pulled apart. I was surprised to see how this thing is built and how strong the magnets were holding it together. I first tried pad-



Inside the Isolator

ding the trimmer capacitors with 10 pF high voltage ceramic chip caps. The next day I re-measured and saw things were better but the IL was still too high. I took it home again and changed the padding capacitors to 5 pF. Back to work it went the next day. Our new 8 GHz four port network analyzer allowed me to look at all RF paths at the same time. After carefully adjusting the trimmers I got the IL down to about 0.8 dB and had good isolation on the other ports. Finally this part of the system was ready.

The home made copper cans from the old 27 system really were not adequate for this new system. The duplexer that came with this new repeater was only a pass type duplexer, which is ok for commercial service with 5 MHz of frequency separation. But for a two-meter repeater we only have 0.6 MHz of frequency separation so this duplexer would not work for us. Actually I had two duplexers, each having 4 cans. The Lands Towing repeater already had a working duplexer the unused duplexer that came with their MASTR II stations was also available for use on this new 27 repeater. These duplexers were manufactured by Telewave. Looking at a Telewave catalog, I realized it might be possible to convert the pass only cans to pass-reject. A call to Telewave verified that this was possible. All that was needed was to order the correct inserts and remove the original ones. For \$19 each I ordered six inserts. Six custom N to N cables were also ordered to connect up the duplexer for operation in the two meter ham band. In a few weeks the inserts arrived and quickly were installed. The modified duplexer was taken to work for a ride on the network analyzer. I the receive side of the duplexer tuned up just fine.

The transmit side was another story. I could not get the notch frequency in close to the bandpass frequency without suffering too much insertion loss. I called Telewave back and explained my situation. Lucky enough the gentleman that I contacted at Telewave was also a ham and understood what I was trying to do. Mentioning to him that I had bottom out the trimmer caps he asked if the inserts used padding caps across the trimmer caps. I explained that they did not and said I just called up Telewave and asked them what I needed. The Telewave gentleman said he would send me the padding caps. After waiting a few weeks without getting these caps I called back a few times to remind the guy. I gave up on him and just

(Continued on page 5)



Grainger Power Control Relays



Phoenix UHF Link Radio



Wiring Harness



Power/Fan Control



Completed Duplexer



Anti-Glitch Circuit for power to 7K



Celwave Isolator



ARR Receive Preamp



Old & New 147.27



Rear of 147.27



224.88 Repeater



Two more cans for Preselector



449.575 bandpass filter



Installed at Slygo:
147.27 rack, 449.925 rack, 224.88 on bench

Repeater Report (cont.)

(Continued from page 4)



Duplexer Insert

figured out what caps I needed. I used some good quality ceramic capacitors and was able to get the TX side of the duplexer to tune up just fine. Of course that night when I came home I found the caps in my mail box. I decided I would try them but the value was not high enough and I ended up with my original cap values. The final result was better than what was specified in the Telewave catalog.

The previous 147.27 repeater had battery backup so I decided to make the new system also run off battery upon loss of AC power. This uses relays with 50A contacts from Grainger supply. The relay coils run off of AC so when the power fails the relays will switch over and run the system on the battery. Two relays were used because this system has two power supplies, one for the radio and lower power amplifier and the other supply for the two other power amplifiers. The lower PA is used to drive the two upper power amps, the two upper power amps are combined to create the final output. When the AC power fails the lower PA output power is reduced by shunting the arm of the power setting trimmer resistor to ground via a previously unused pole of the fan control relay. The output power is about 20 Watts when running on the battery. The power control and fan control circuit are housed in a small plastic box with a trimmer pot to set the low power output. The fans stay on 5 minutes after activity, this keeps the fans off when the system is not in use. There are a total of three AC fans, one each for the two upper power amps and a third to keep the link radio cool.

The controller was easy since Bob, K1IW already figured out all the code for the new system. Like other MMRA repeaters, one controller supports 3 radios. A small anti-glitch box was constructed using a large electrolytic capacitor and diode to keep supplying power to the controller during the moment when the relays switch over upon AC power fail. This prevents the controller from re-booting.

All the audio levels were adjusted in the comfort of my garage, much easier than doing it onsite. A nice feature of this new repeater is that PL encode is dropped before the transmitter drops. This eliminates the squelch crash for users with tone squelch enabled.

During the daytime hours, excluding the morning and evening commutes the two meter repeater is linked to the 29.62 FM repeater. The 224.88 repeater is linked full time to the 10

meter repeater except for the Tuesday night net and other special events. The system has the capability to link the 224.88 directly to the 147.27 without linking to the hub if so desired.

A Plexiglas sheet covers the front of the top half of the system to keep mice and spiders from getting in. The system ran dummy loads in my garage for a few weeks while W1NAU and I checked things out before installation.

Installation was delayed until January 15, 2005 due to bad weather. Special thanks to Wayne N1XXI, Andy N1BHI, Tim W1NAU and Keith Wheeler for coming to my place to help lift this beast into the back of Wayne's truck. The weather was sunny but cold. Installation only took a few hours. Thanks to Keith for lending us his propane heater so things were toasty warm in the shelter.



Delivering 147.27 to Marlboro

After a quick SWR check and adjusting the antenna matching boards on each PA, the repeater was on the air for the first time.

The repeater has an ARR preamp installed in the GE MASTR II receiver compartment. As I feared after about a week of operation I noticed that the receiver/preamp was getting overloaded by other transmitters in the area. I actually heard Keith on his commercial repeater bleed through one morning while chatting with Kevin, K1KWP. You could hear weak signals getting de-sensed by these other RF sources in the area; we needed to add some pre-selection. Using the two left over Telewave pass cavities, at work I tuned them on the network analyzer. The cavities in cascade provided more than enough pre-selection with about 0.5 dB of insertion loss. The following weekend I met up with Andy and Keith for breakfast before installing the preselector, this time it was very cold and without the propane heater I would have frozen to death. The preselector did the trick.

(Continued on page 6)

Repeaters (cont.)

(Continued from page 5)

I heard a lot of crunchies on 147.27 the morning of February 15th. I think this is caused by water dripping on a hardline connector and lightning arrestor in the shelter. I will replace the jumper cable between the cans and the arrestor. Also I will waterproof the connection where the hardline connector comes into the shelter.

After a few weeks of testing and careful listening to users on the system, 147.27 definitely is working much better than the old system. Users are getting in from their mobiles and HTs from all over the place. I can work the repeater on my entire commute without any problems and others are also working the repeater where they could not have done so on the old system.

Stoneham 146.715 & 446.725: Stoneham has now been updated to the new controller methodology. Bob, K1IW did a great job on software and hardware upgrades to this system. He constructed a new front display panel for this system that really makes testing very easy. Bob and I had visited the site on January 28th to make the changes. The following week Kevin, K1KWP and I re-visited the site to make the final audio level adjustments. For the first time, the 446.725 repeater is linkable to the rest of the system. The 446.725 repeater now uses a PL of 88.5 in and out. I got a chance to go up on the roof and take many nice photos in all directions. I could see Revere beach from the top of this building. 446.725 is a very nice repeater, I've actually worked this repeater many times from Provincetown just with my HT and rubber duck when the conditions are right.

Shrewsbury 449.575: Kevin, K1KWP and I spent a Saturday working on this system. We discovered that the exciter was very spurious when connected to the Johnson mobile power amp. I later built a bandpass filter to solve this spur



Stoneham Display Panel

problem. The filter worked as desired and the system was placed back on the air. It still didn't seem to play that well so I went back up to the repeater room the following week and checked the SWR of the antenna using a Bird watt meter. I discovered the SWR is 2.2:1 and this is not good. The repeater hardline and antenna will be inspected in the spring to see if something got damaged. For now the repeater is hearing fine and no signs of any strange noises due to the spurious signals de-sensing the receiver have been heard.

Quincy 146.67: The anti-kerchunk feature has been turned off due to improper and undesired operation.

FARA to hold Tech License Class

The Framingham Amateur Radio Association announces its License in a Weekend Class for entry-level Technician class March 11-13, 2005 at the Danforth Museum in downtown Framingham. Everyone is welcome. The \$40 fee includes the text book, lunch on Saturday and Sunday, and the FCC exam fee. For more information, call Ed Weiss, W1NXC at 508-881-2301, visit <http://www.fara.org/liaw05.html> or e-mail at w1nxc@arri.net.

AMSAT Net on the Internet — by Rick Meuse, N1HID

Did you know that you can get the latest news about amateur satellites every week from the shakers and makers in the amateur satellite community? You can interact with them and as a bonus learn the how's and don'ts about working the birds!

This net meets every Tuesday night at 9PM and is broadcast live via the Internet. As well as listening to the net you are able to chat with some of the satellite experts via a chat room they have setup in the irc. The net control operator is Andy Mac Allister, W5ACM, a satellite expert for many years who has written many articles in various amateur radio magazines. As well as being broadcast over the Internet, the net is also carried on the N5JNN repeater system in the Houston area.

<http://www.amsatnet.com/> is the home of the Houston AMSAT Net. All the info you need to setup and listen to the net plus how to set up to chat on the irc is on the web page. It also has a wealth of information about the amateur satellite program. If you don't have a chance to listen to the net on Tuesday nights, you also can download the last two nets at the web page. If you check into the net during its broadcast via the irc, you are able to hear your call being sent over the 2 meter repeater link they have setup via the Internet.

This net is about 15 years old and before the Internet came along, George W1ME would broadcast this over the NETARC Repeater system on 446.575. This is no longer on the air and has been off since 1998. I hope this is some help and that I may hear you on the net some Tuesday.

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 18	Hopkinton to Boston	MA Boston Marathon	Register at http://bmarc.info	baa05@bmarc.info
Apr 24	Groton	MA Groton Road Race	Ralph KD1SM	978-582-7351 kd1sm@arrl.net
May 1	Boston	MA walk for Hunger	Bruce KC1US	781-275-3740 wfh2005@amateur-radio.net
May 1	Milford & Amherst	NH Crop Walk for Hunger	Russ K1TSV	603-673-9217 k1tsv@arrl.net
May 15	Devens	MA Parker Classic Road Race	Stan KD1LE	978-433-5090

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. AR

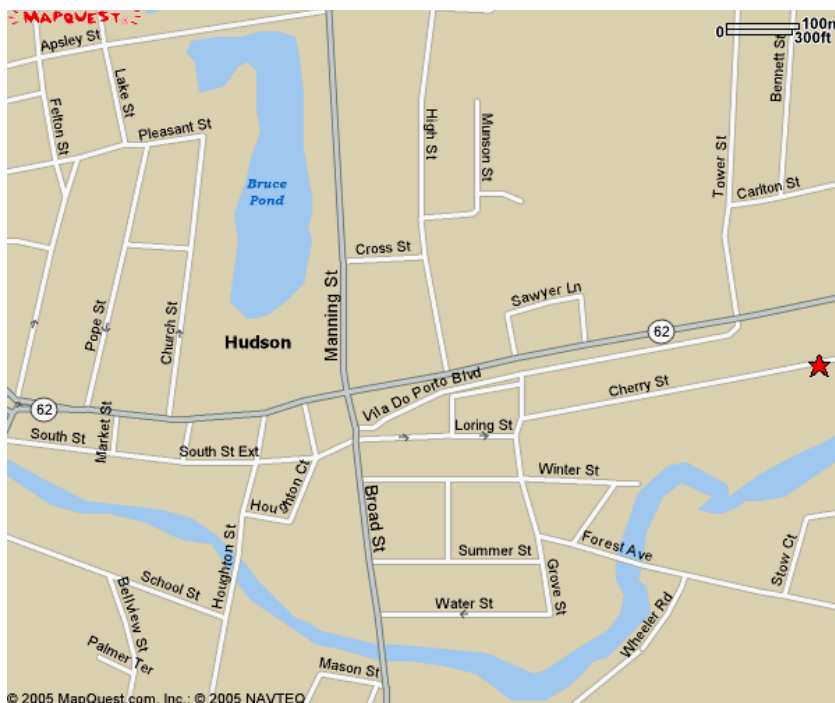
Directions to the Hudson Power Station

From other directions:

- Take Rte 495 to Rte 62 East.
- Stay on Rte 62 into Hudson and through the rotary in the center of town. At the first light after the rotary turn right onto Broad St.
- Take the first left onto Vila Do Porto Blvd.
- Take the first right onto Grove Street and continue as below at **.

From the East:

- Take Rte 62 into Hudson and turn left onto Vila Do Porto Blvd at the traffic light.
- Take the first left onto Grove St.
- ** Take the first left onto Cherry St.
- Go about 0.25 miles and park at brick power station building on the right (Just after passing a playground.).



Next Meeting — Wednesday March 16, 2005

Field Trip to Hudson Light and Power

The Hudson Light and Power department supplies electricity to Hudson and Stow. They run their own generating station and own a portion of Seabrook. They have a web site at <http://www.hudsonlight.com/>

Daniel Murphy, Power Station Superintendent, will be our host for the next MMRA meeting. We will tour the power station and learn about generation, distribution, and the new radio-read electric meters being installed. Bring your questions about other areas of interest.

We meet at **Hudson Light and Power Department Power Station, 77 Cherry Street in Hudson MA.** Directions and a map are available on the preceding page.

The meeting will start at 7:30PM.
Talk-in will be on 147.27.

Calendar of Ham Radio Events

Mar 12: EMA ARES SET
Mar 16: **MMRA meeting @ Hudson L+P**
Apr 3: FARA Flea, Framingham MA
Apr 17: Flea at MIT, Cambridge MA
Apr 18: Boston Marathon
Apr 20: **MMRA board meeting**
Apr 29: **MMRA Newsletter Deadline**
May 1: Walk For Hunger
May 18: **MMRA annual meeting**
Aug 17: **MMRA board meeting**
Aug 26: **MMRA Newsletter Deadline**
Sep 21: **MMRA meeting**

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



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

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WE'RE ON THE WEB!
[HTTP://WWW.MMRA.ORG/](http://www.mmra.org/)
