The Minuteman

Volume 30 Issue 1 **September 2000**

This is Volume 30...The Minuteman is Thirty Years Old!

The first issue of the Minuteman was published in 1971...and it has been going strong ever since. Excerpts from Volume One are featured inside this issue...it was a rough looking newsletter, but its content was outstanding. The contributors had a lot to say... only the publishing tools were rudimentary.

By the early 80's, the MMRA had ***500 members!*** It was a dynamic and active group. VHF repeaters were young, and everyone wanted to be a part of it...we only wish that we could generate that kind of interest today.

Our history as a club is a proud one. We've been involved in many public safety and emergency communications efforts...and some of then even won us formal commendations from the Governor and Commander of of the Massachusetts National Guard.

We must not let that die...your continued support will ensure that it does not.

So, read on...and get some of the flavor of what the MMRA was like 30 years ago. We think you'll find it interesting.

It's time to Renew your membership...keep the MMRA able to provide one of the best repeater networks in the country!

September MEMBERSHIP MEETING

Wednesday, Sept 20, 1999 - 1930 Hrs
Campion Center, Weston MA

Program:

Digital Communications
Steve Schwarn, W3EVE

Raffle
Other Stuff

Items of Interest

From the ARRL Letter

IARU REGION III CONFERENCE CALLS FOR MORSE EXAM PHASEOUT

The 11th International Amateur Radio Union Region III Conference ended September 1 by resolving to seek the ultimate removal of Morse code proficiency as an International Telecommunication Union licensing requirement for HF operation. As "an interim measure," the conference agreed to support the reduction of all Morse code testing speeds to 5 WPM.

"IARU Region III strongly supports Morse code as an effective and efficient mode of communication," the resolution said in its preamble. "However, it believes that the position of Morse as a qualifying criterion for an HF amateur license is not relevant to the healthy future of amateur radio."

The resolution urged IARU Region III member societies to seek an interim 5 WPM Morse code testing requirement while looking toward eventually eliminating the Morse requirement altogether. "We recommend that, setting aside any previous relevant decisions of earlier Conferences, a policy of the removal of Morse code testing as an ITU requirement for an amateur license to operate on frequencies below 30 MHz be adopted by IARU Region 3," the Conference resolution declared.

Voting in accordance with ARRL Board policy, International Affairs Vice President Rod Stafford, W6ROD, cast the lone dissenting vote on the League's behalf, although he voted in favor of an earlier motion to support 5 WPM as the top code speed for testing. The Hong Kong Amateur Radio Transmitting Society abstained. The Asian and Pacific region's other member societies favored the resolution.

The Region III Conference, meeting in Darwin, Australia, recommended that the IARU Administrative council adopt its position as IARU policy. Meeting September 3-4 in Darwin, the Administrative Council declined to act on the policy recommendation, however, until after the Region II conference next October in Guatemala.

Conference delegates addressed another concern related to ITU Radio Regulation S25, which requires that applicants demonstrate Morse proficiency to operate below 30 MHz. Some delegates worried over wording in a preliminary draft recommendation that includes reference to "radio telegraphy" among amateur license operating skills. Delegates were told that the ITU defines "radio telegraphy" to mean all digital modes, not just Morse. In a motion proposed by the Radio Society of Great Britain and seconded by the ARRL, the conference requested that the IARU Region III representatives to the IARU Administrative Council propose replacing the term "operating skills"

(Continued on page 8)

MMRA VE Sessions

2nd Saturday of Each Month
Marlboro Public Library, 9AM
Contact: Bill Wade, K1IJ
617-891-9079 Evenings 6 to 10 PM,
Weekends 8 AM to 10 PM.
Accredited - ARRL VE Program

The President's Corner

Clark Conti, N1NVK

Fall has arrived, at least in spirit, if not officially. Summer was great, at least for me. I spent a lot of time getting acclimated to my new job, it required many hours working "OT". This cut into my time for leisure activities, like fox hunting, and just being on the radio. My new schedule is different, but in all I am spending fewer hours than I did at the two jobs I had before. I hope to soon be back to my old self, checking into the Tuesday NET and playing regular Saturday morning foxhunt.

I did get to take time off to go to the ARRL convention and had a wonderful time seeing many of you there. I attended a few lectures, and bought some little stuff at the flea market, but mostly stayed at the booth doing Talk-In with Bill, Eddie, Frank, Andy and Kevin. Thanks to all of you who stopped by and visited, and especially to those who helped out and/or renewed memberships. (The names are too numerous to list here.)

Labor day is behind us and our club Fiscal year has begun. As usual I have to remind everyone that all membership dues are due in September. If you haven't renewed this year, please send your check along with the form in this issue as soon as you can. We have a full year of membership meetings coming up and are looking forward to some new and exciting stuff going on this spring. Hopefully there will be some changes (list as IMPROVEMENTS) in coverage of some of the machines. Brian W1BRI is working on some improvements to the amplifiers (atta boy, Brian) and Bill N1QPR is working on a better site for the 449.575 machine that will expand our system coverage to the northwest. We will talk at meetings and this newsletter, about these and other programs as they develop.

See you all at the meeting !

30 Years Ago, It Looked Like This:

This is what the very first newsletter of the MMRA looked like. Look at the list of officers below...The first trustee of 146.82 was Bob Waters, also the Vice-President. George, W1AQI, then President, is the guy whose efforts made this material available to us. Steve Rudin, W1WSN, gave a talk at one of our meetings about the early days of the MMRA.

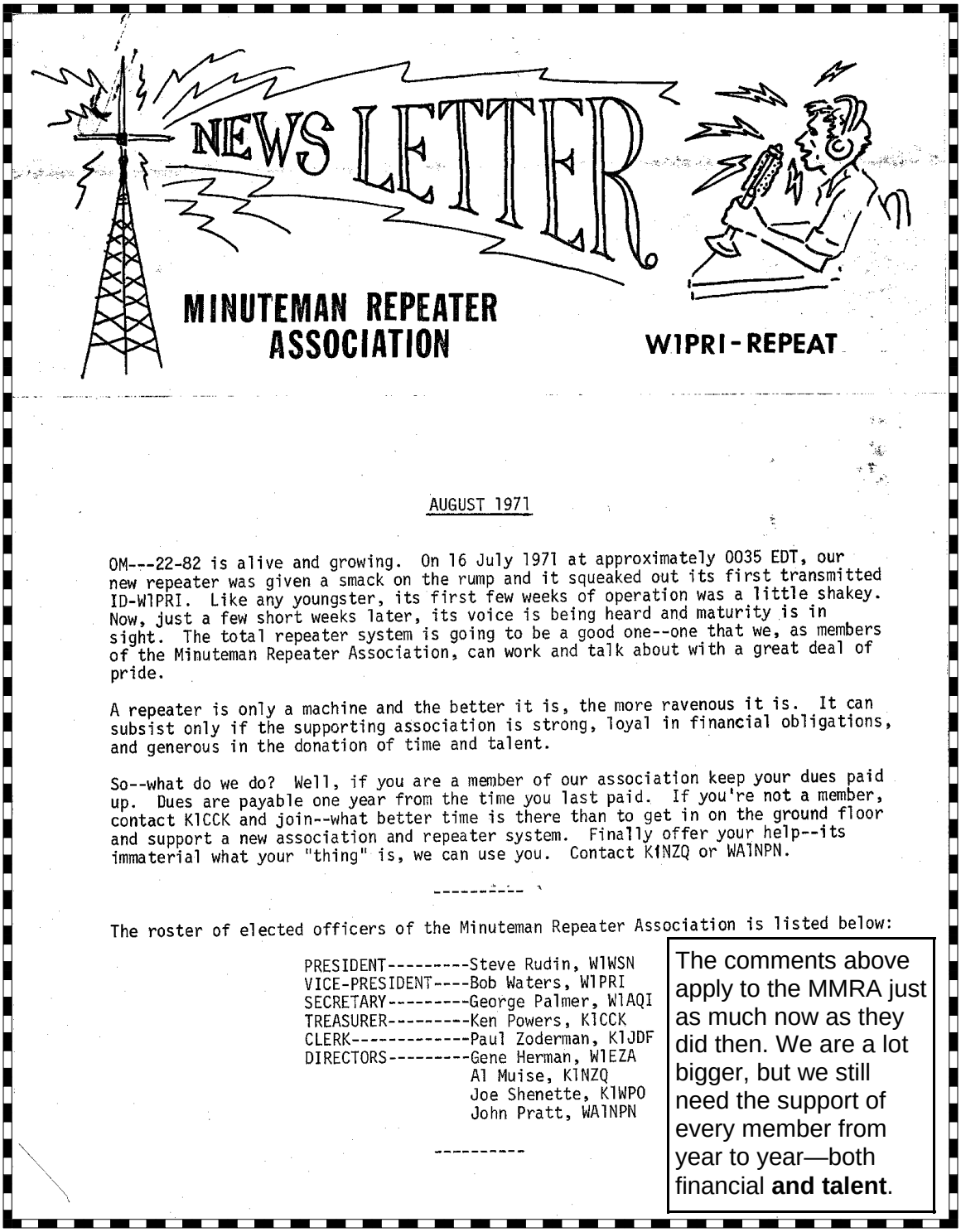
It was a different back then....repeaters were relatively new, and guys used re-furbished commercial VHF rigs — Motorola, GE and others. They were big — mobile boat anchors. Most had to be trunk mounted with remotes mounted under the dash. The remotes were as big as some of the rigs we use today, and they only switched a few channels. The rigs were all crystal controlled, and those who used them had to get crystals and retune transmitters and receivers to work down on the amateur two meter band. The repeaters also were cludged together from mobile or base transceivers.

In the early days, CW id generators were often made sort of like a player piano. physical motion was translated into varied duration switching to generate a CW identifier. Back in those days people built their own duplexers — the large cylindrical "cans" that allow a transmitter and receiver working simultaneously to share the same antenna.

Just about everyone was very much involved in the work to build and maintain the repeater systems. It was new, and everyone was eager to be in on the fun.

If you were around during the late 70's and early 80's, you may have been at MMRA election meetings and listened to guys actually give speeches, campaigning for office!

There was a lot of participation in the newsletter....just about every issue had a couple of technical articles from members. On the next page is one written by Bob Waters. We'd like to see more of this from everyone!



NEWS LETTER

MINUTEMAN REPEATER ASSOCIATION

W1PRI-REPEAT

AUGUST 1971

OM---22-82 is alive and growing. On 16 July 1971 at approximately 0035 EDT, our new repeater was given a smack on the rump and it squeaked out its first transmitted ID-W1PRI. Like any youngster, its first few weeks of operation was a little shakey. Now, just a few short weeks later, its voice is being heard and maturity is in sight. The total repeater system is going to be a good one--one that we, as members of the Minuteman Repeater Association, can work and talk about with a great deal of pride.

A repeater is only a machine and the better it is, the more ravenous it is. It can subsist only if the supporting association is strong, loyal in financial obligations, and generous in the donation of time and talent.

So--what do we do? Well, if you are a member of our association keep your dues paid up. Dues are payable one year from the time you last paid. If you're not a member, contact K1CCK and join--what better time is there than to get in on the ground floor and support a new association and repeater system. Finally offer your help--its immaterial what your "thing" is, we can use you. Contact K1NZQ or WA1NPN.

The roster of elected officers of the Minuteman Repeater Association is listed below:

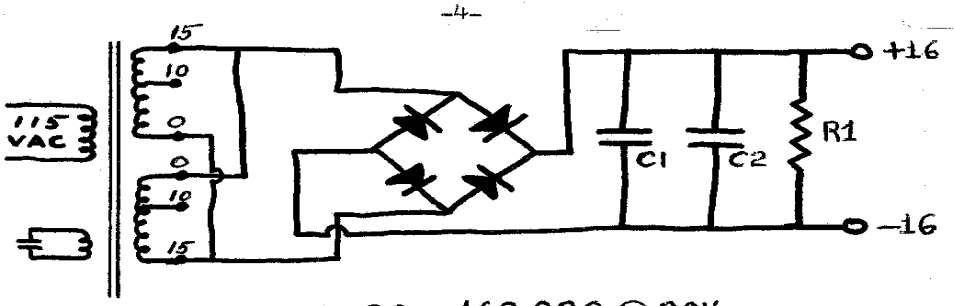
PRESIDENT---------Steve Rudin, W1WSN
VICE-PRESIDENT----Bob Waters, W1PRI
SECRETARY---------George Palmer, W1AQI
TREASURER---------Ken Powers, K1CCK
CLERK-------------Paul Zoderman, K1JDF
DIRECTORS---------Gene Herman, W1EZA
Al Muise, K1NZQ
Joe Shenette, K1WPO
John Pratt, WA1NPN

The comments above apply to the MMRA just as much now as they did then. We are a lot bigger, but we still need the support of every member from year to year—both financial **and talent**.

POWER SUPPLIES

FROM BOB WATERS, W1PRI

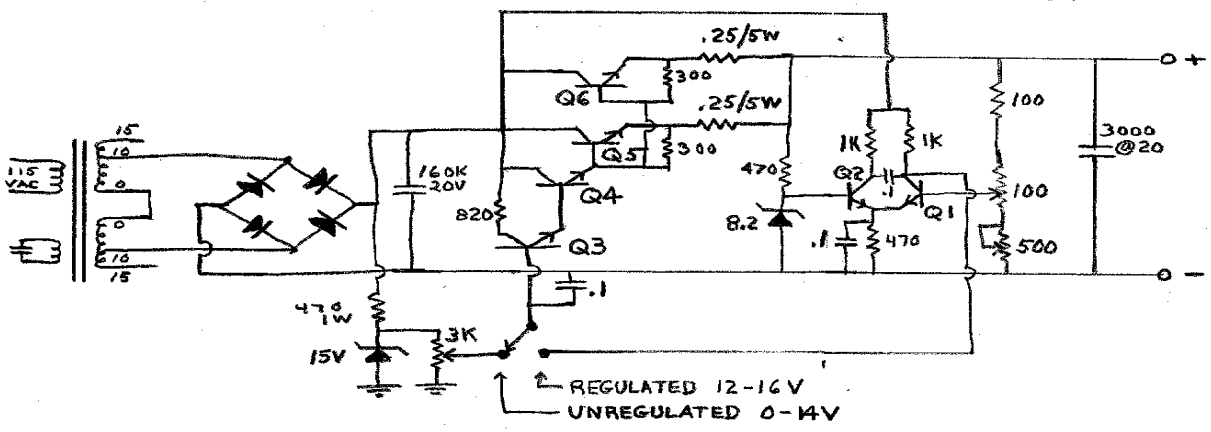
"Two meter FM, transistors and logic all seem to have come together at one time, making us aware of the need for good low voltage, high current regulated DC supplies. After all, who wants to be bothered with a storage battery in the shack.. they're never charged and the acid puts water in the rug! MMRA has been able to obtain some very good "surplus" AC/DC supplies. These units have a resonant type regulating transformer that has two separate secondary windings...0-10, 15 volts at 8 amperes. In addition, the supplies have a rectifier that has four diodes with connections available to permit use as either 2 full-wave rectifiers or as a bridge. In the simplest form, the supplies are used as brute force, bridge rectifiers with an output of plus 16 volts and a current rating of 8 to 10 amps. The regulation is good enough to run the usual transistor type transceiver such as Regency, IC-20, etc.



C1, C2 - 160,000 @ 20V
R1 - 15Ω, 25W

On receive, the voltage is just under 16V but don't worry about your rig; it has Zener regulation that drops the voltage on the transistors. On transmit, drawing 2 or 3 amperes, the voltage of the supply is about 14.5, a totally safe value for all cigar boxes. For those who like to experiment in the shack with the new logic packages, it is possible to reconnect the taps to get 5 volts, and for the op-amp boys, you can have both plus and minus 15 volts simultaneously.

Here in my shack, I wanted to have a super-regulated job with variable voltage output (for some of my screwdriver experiments). Using the MMRA special, here's how it came out.



Construction of the regulator is simple. All resistors are 1/2 watt carbon, unless marked otherwise. The output transistors, Q5 and Q6 must be on a large aluminum heat sink, 4" x 4" using insulating washers and silicone grease. The other transistors and resistors can be made up on a circuit board or on perforated vector board."

The above article was originally published in Volume 1, Issue 5, December, 1971. The design is still applicable today, and would serve just as well now as it did for Bob 25 years ago....

MMRA Information - Repeaters, Officers and Board Members

Marlboro	146.61	N1BHI/R	FTL	P	PL – 146.2 out, none in
Marlboro	449.925	N1HBR/	FTL	P	PL - 88.5 in and out
Quincy	146.67	K1ML/R	PTL	P	PL - 146.2 out, none in.
Quincy	224.40	N1KUG/	FTL	L	PL - 103.5 in, none out
Weston	146.82	KA1AL/R	PTL	P	PL - 146.2 out, none in
Weston	224.70	N1HBR/	FTL	L	
Hopkinton	223.94	N1BHI/R	FTL	L	PL – 103.5 in, out
Stoneham	146.715	N1NVL/R	PTL	P	PL - 146.2 out, none in.
Stoneham	446.725	N1NVK/	PTL	L	PL - 88.5 in, none out
Marlboro	449.575	N1NVL/R	FTL	L	PL - 88.5 in, none out
Marlboro	53.81	W1BRI/R	PTL	L	PL - 71.9 in, none out

MMRA Officers:

President:	Clark Conti, N1NVK
Vice President:	Kevin Paetzold, K1KWP
Secretary:	Bill Thorpe, WA1NLR
Treasurer:	Ian MacLennan, AF1R
Clerk:	Ed Mulhern, N1NOM
Director:	Bryan Cerqua, W1BRI
Director:	Al Kunian, KA1AL
Director:	Chris Conti, N1NVL
Director:	Wayne Foley, N1XXI
Director	Andy Morrison, N1BHI
Newsletter Editor:	Andy Morrison, N1BHI
Technical Directors	Chris Conti, N1NVL
	Bryan Cerqua, W1BRI

- **Email: mmra@mmra.org**
- **Web Page:**

www.ultranet.com/~mmra

Minuteman Articles — Solicitation

If you have ever built anything, fixed something, or have an experience that you want to share, then you should submit an article to the MMRA Minuteman. Contact Andy Morrison, N1BHI, if you want to talk about it. We can scan artwork and schematics to make an article more interesting and useful. Give it a try!

Important MMRA Club Information:
Membership Meetings: 3rd Wed of Sept, Nov, Jan, Mar, May at Campion Center, Weston at 7:30 PM
Board Meetings: 3rd Wed of Oct, Dec, Feb, Apr. Meetings are open and members are welcome. If a visiting member wants to be on the agenda, please contact Clark Conti beforehand.

Newsletters are mailed one week before each meeting; article submissions are due one month before each meeting.

The MMRA is dedicated to Amateur Radio and the public service. The MMRA is a registered non-profit Massachusetts corporation. Membership is open to all amateurs. Annual dues are $25.00 individual, $35.00 family.

It's Time To Renew Your Membership!

The new membership year starts September 1. We know this sounds like a broken record...but we want to keep your involvement and support for the MMRA. Remember that your dues, along with a lot of hard work, keep a major public safety and service resource up and running. Our network of repeaters provides a significant emergency communications resource to Massachusetts, not to mention a source of fun for us all. So, please renew. Use the form on the other side of this page...Thanks!

Minuteman Repeater Association, Inc.
P. O. Box 1127
Berlin, MA 01503

A Non-Profit Communications Organization Serving the Public in Time of Emergency.

-Application for Membership-

☐ *New* or ☐ *Renewal*
☐ *Individual Membership (Dues $25 per year)* ☐ *Family Membership (Dues: $35 per year)*
☐ *Novice Membership (1st year dues: $10)*

I hereby apply for Membership in the MINUTEMAN REPEATER ASSOCIATION, INC. I agree to abide by the rules and regulations of the Association as stated in the by-laws, and understand that acceptance of this application entitles me to all rights and privileges of membership as provided under the by-laws.

Signature: _____ Date: _____

Name: _____ Callsign: _____ Class of License: _____

Home Address: _____

E-Mail Address: _____

Occupation: _____ Employer: _____

Work Phone #: _____ Home Phone #: _____

Member of: ARRL? _____ Other Clubs? _____

I can and am willing to assist/serve the Association and/or help maintain the Repeaters in the following ways (check all appropriate boxes)

- ☐ Antennas
- ☐ Flea Market
- ☐ Receiver
- ☐ Publicity
- ☐ Transmitters
- ☐ Newsletter
- ☐ Logic
- ☐ Public Service
- ☐ Telephone
- ☐ Legal Aid
- ☐ Education:
- ☐ Technical Documentation
- ☐ Shelters
- ☐ Medical Aid
- ☐ Equipment Construction
- ☐ Meeting Set-up
- ☐ Equipment Transportation
- ☐ Social Events
- ☐ Technical Documentation
- ☐ Refreshment
- ☐ Schematic Drawing
- ☐ Technical Library
- ☐ Teach Code
- ☐ Teach Theory
- ☐ Repeater Tech Committee
- ☐ Special Projects
- ☐ Repeater Control Operator
- ☐ Association Officer
- ☐ Board of Directors
- ☐ Field Day
- ☐ Emergency Communications
- ☐ CW Operation

Other-Specify:

Send this form with your Dues to:
MMRA, P.O. Box 1127, Berlin, MA 01503

Float Charge Controller for Lead-Acid Storage Batteries

By Clark Conti - N1NVK

Here is another one evening project anyone can build.

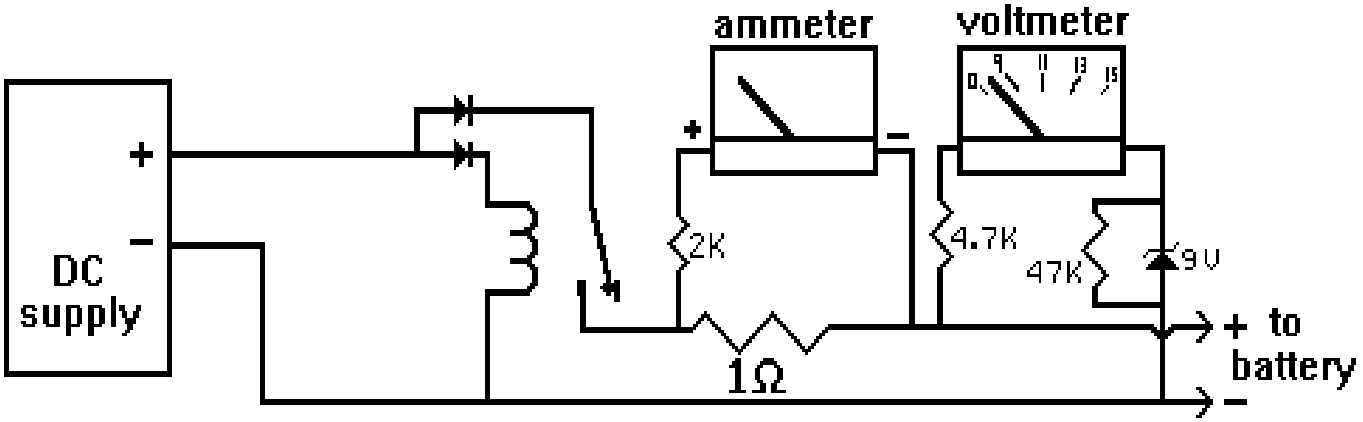
This circuit is designed to maintain a float charge on storage batteries like marine deep cycle and sealed gel/lead types. I originally built the circuit without the meters for my cell phone, but it worked so well that I built more for my home back-up radio supply, and one with a lighter plug and 2Ah for my fox hunting gear. At home I am using a small charging supply with a 100Ah 12v storage battery to power my rigs.

The 1 ohm resistor limits the charging current to about 2 amps since the battery rarely drops below 10 volts, but just in case I included a 2.5A fuse. The diodes prevent the relay from holding in when the charge source drops out. Without the relay providing full isolation, the battery can drain into the charger. I first discovered this because the lighter in my new car is not live without the ignition on. The first time I got everything hooked up and switched the car off, the AM/FM radio kept playing by drawing current from the transportable phone's internal battery through the lighter socket. It was a confusing moment to say the least, but if I hadn't stopped to figure it out, I probably would have ruined the phone battery by draining it dry.

In the home version the meters have been added. To monitor charging current I measure a 0-2 volt drop across the 1 ohm limiting resistor, and the volt meter has had the scale expanded from 9-16 volts by adding the zener diode / resistor combination shown. I used 1mA meters because I always have plenty of them around, (I build them for a living) I added resistors of 1000 ohm/volt, 2K for the current, and 4.7K +47K parallel with the zener for the split range. If you don't have this type of meter you can recalculate for whatever you have, or skip them altogether, but don't leave out the 1 ohm resistor unless the charging source is current limited!

Remember this circuit was designed for float charge only, and will not provide equalization, or run hi/low charge configurations. DO NOT use this with NiCad batteries as they don't like float chargers. As for equalization, lead-acid cells occasionally like to be charged at a slightly higher voltage, usually 14.5 to 15.5 for about half an hour a month, which balances or equalizes the charge across all the cells. This should be done manually for longest battery life. Failure to do so will cause individual cells to break down an become weak. (I also make battery cell testers, just in case you want to check old batteries.)

CUL de Clark, N1NVK



Give the MMRA World Wide Web Home Page a try..... let us know what you think.... any ideas are welcome. We are looking into things like an MMRA list server. We now have our own domain name - mmra.org. The Web Page keeps getting better.....

WWW Address:

http://www.mmra.org/~mmra

Here's a construction article published in 1995, by Clark Conti. This kind of stuff is in the pure tradition of ham radio...even if you cannot build rigs that can do what the modern equipment can, there are a zillion little projects that can provide useful tools for the ham shack. This is an example of one of them—not unlike that described by Bob Waters' article from 1971, on page 4. We'd like to see more of this from the membership!!!

Items of Interest...Continued

From the ARRL Letter

with "methods of communication."

The conference also reaffirmed the IARU's determination to obtain an exclusive worldwide allocation of no less than 300 kHz in the vicinity of 7 MHz. Region III IARU directors were instructed to "treat achievement of this objective as a matter of the highest priority." The conference also supported seeking an Amateur Radio HF allocation in the vicinity of 5 MHz and a low-frequency allocation in the vicinity of 136 kHz or 160 to 190 kHz.

In addition to Stafford, those attending the conference from the US included IARU President Larry Price, W4RA; ARRL Executive Vice President and IARU Secretary David Sumner, K1ZZ; and ARRL Technical Relations Manager Paul Rinaldo, W4RI.

The next IARU Region III Conference will be held in Taipei, Taiwan, in September 2003.--IARU; WIA

Editors Note: *It looks like it won't be too long before the morse requirement will be gone altogether. I'm sure that there will be a fair number of hams who will not be happy...but I think that overall it is a positive move. Those of us who are code buffs can still take pride in the achievement of knowing and using morse.*

ATLANTIS FERRYING INITIAL ARISS HAM GEAR INTO SPACE

The space shuttle Atlantis blasted off on schedule September 8, bringing Amateur Radio operation from the International Space Station a giant leap closer to reality. On board Atlantis is the initial Amateur Radio on the International Space Station equipment as well as other supplies needed by the Expedition 1 ISS crew members.

As part of the multinational ARISS project, the gear will be stowed aboard the ISS until the Expedition 1 crew comes aboard in late October. The Expedition 1 crew will consist of US astronaut Bill Shepherd, KD5GSL, and Russian Cosmonauts Sergei Krikalev, U5MIR, and Yuri Gaidzenko, whose call sign was not available.

Although astronaut Dan Burbank, KC5ZSX, is aboard Atlantis, there will be no Amateur Radio operation from the shuttle or the ISS during this mission, STS-106. Atlantis will deliver the ARISS VHF and UHF hand-held transceivers as well as a TNC for packet, a specially developed headset and signal adapter module plus power adapters and interconnecting cables.

The ARISS initial station gear will be installed temporarily aboard the Functional Cargo Block module and use an existing antenna that's being adapted to support FM voice and packet on 2 meters but not on 70 cm. The ARISS gear will get a more-permanent home aboard the Service Module next year, once VHF and UHF antennas can be installed.

During the nearly two-week STS-106 shuttle mission, the seven-member crew will unload space station supplies from both the shuttle and from a Russian Progress cargo ship that's now docked at the ISS.

NASA and the Russian space organization Energia have signed agreements that spell out the place of Amateur Radio aboard the ISS. A technical team, called ISS Ham, has been officially set up to serve as the interface to support hardware development, crew training and operations from space.

A Russian call sign, RZ3DZR, has been issued for the ISS ham radio station. A German call sign, DL0ISS, also has been issued, and a US call sign will be applied for.

The $60-billion International Space Station is being built jointly by the US, Russia, the European Space Agency, Canada and Japan. NASA this week extended the deadline to complete the ISS to 2006. The ISS partners have agreed to spread out the assembly missions.

For more information about Amateur Radio on the ISS and SAREX, visit the ARISS Web site.

146.82 Repeater Logic Description — September 1971 Minuteman

John, WA1NPN

By now most of our members are aware that the repeater is controlled by some form of logic. It is my attempt in this short article to familiarize you with the present logic system.

The initial control circuitry began to take shape in the basement at 715 Winter St. over 2 months ago. It has grown since then, and with the help of others has blossomed into a relatively large solid state controller.

The prototype system, consisting of the ID control, timers, and logging control was debugged as much as possible in Holliston and then on the big day (16 July) was transported to Derby Lane where it was placed in W1PRI's (Bob's) shack. Many hours were spent interfacing the logic to the RF gear but at last we had a system we could call a repeater.

Since the prototype began functioning many problems have been eliminated and some of the control circuits modified to provide more efficient operation.

The system as it stands today consists of a logging control circuit, an ID generator, an ID control with timer, and soon to come, a 4 digit access code for the autopatch with protection against toll calls billed to the repeater, a deviation monitor and an off frequency indicator.

A brief description of some of the controls follows to show you what happens when you key the repeater.

As you drop your carrier a 30 second timer starts and if there is no additional keying for 30 seconds the logic assumes the repeater to be idle. The next carrier received is examined for 1 second (hence the button pusher delay). The recorder is then activiated and will record providing the carrier remains active for up to 10 seconds. If you should drop your carrier in 5 seconds it will shut off the recorder after the station called has been recorded. The logic remembers that it has recorded a transmission and it waits for the CHU marker pulse and restarts the recorder to log the time of day. After the recorder shuts down the logic waits for the idle repeater condition again and again restarts the recorder to log the time. The operation records the initial call and time, and sign off time.

The ID generator assembles the code word W1PRI and keys the oscillator to provide the signal. The ID control contains a 3 minute timer which starts after the ID has played. The timer runs for 3 minutes irregardless of repeater activity. When it times out the logic waits for the next drop in carrier, to start the ID generator. The carrier operated relay logic turns the 82 transmitter on when a signal is present on 22. The tail timer controls the width of the squelch tail.

The auto-patch control has been temporarily modified so that it can be keyed on with a 1477 Hz signal of 1-1/2 seconds duration. However, when the touchtone decoder and associated logic is debugged, the 4 digit access code will be neccesary to use the auto-patch. Presently a 1 1/2 second burst of 1477 Hz (3 & 6 on the touchtone pad) will activate the auto-patch.

If the patch is active a timer is triggered when a carrier is dropped. This timer will timeout if the repeater is not keyed for 30 seconds. The timer is defeated if keyed within this period. If you make a call and the telephone party holds a conversation approaching 30 seconds you can recycle the timer by keying the repeater. If for any reason the logic terminates the call, the ID will play before the transmitter shuts down. If the operator should intervene do not give her the repeater telephone number——any 891XXXX will do.

The future holds many things for the control logic...remote receivers, transmitters, selective telephone exchange, and many more.

Ralph, WA1DNG, has done a great deal of circuit design and has also spent time on the touchtone decoder which will make our 4 digit access possible in the near future. Ray, W1IRH, has made the audio throughput the repeater as clean as with his audio summing board. There is still a large amount of work to be done documenting the logic. Anyone interested in drafting some logic schematics can get in touch with me, your help would be appreciated.

In closing, I will offer my training services to anyone who desires to learn more about the logic. Contact myself or Ralph, WA1DNG.

Our controllers today are somewhat more sophisticated than the one described above....but all that sophistication began back then. Just look at what that controller did — all built with TTL (transister to transistor logic). Today we have it easy....if something in the controller program isn't right, we just change the program. But in 1971 if you had a problem you had to re-wire a board to make the logic behave differently to correct it.

We wonder if any of the original documentation that John referred to is still around...it might be interesting for some of the more technically minded guys to see it. The functions performed by that design were built into a series of controllers conceived and implemented by Bob Clements, K1BC. For years three of them — 146.82, 146.61 and 449.925 — served without a glitch. They were bullet proof, surviving extreme temperature swings, lightening hits — you name it. They were based on Z80 processors; their programs were "burned" into Eprom chips. We still have the original source code; Bob's programs were soundly designed and well documented.

In the last 5 or so years, we have moved up to a series of controllers manufactured by SCOM Industries in Colorado. These controllers have integrated autopatches, voice synthesis, multiple logic inputs and outputs and a sophisticated Macro programming capability. Scott Bullock, KA1CLX, implemented the first SCOM 7K at 449.925, building the macros that formed the basis of the programs that run our controllers today. Enhancements have been made by Walter, N1HBR, Chris, N1NVL, and Andy, N1BHI. And recently, Bryan, W1BRI, reworked the programs for all the controllers.

All this makes one wonder....what will it be like in 2020? What will ham radio be like then? What will the technologies we use look like.....it's gonna be interesting.

The Minuteman

Volume 30 Issue 1 **September 2000**

In this issue.....

- **Front page, First Minuteman**
- **Construction Article - W1PRI**
- **Early Controller Logic-WA1NPN**
- **Float Charge Controller-N1NVK**
- **Items of Interest**

***Meeting Program*:**

Digital Communications
Steve Schwarn, W3EVE

Renew Your Membership!

Hang with the MMRA for another year. If your information has changed, fill out the form in the middle of the newsletter... otherwise, you can send your dues check with your call on it. It's the best deal around...$25 for individual or $35 for family membership.

Return Address:
MMRA
P.O. Box 1127
Berlin, MA 01503