



THE VOICE OF AMATEUR RADIO IN MISSISSAUGA COMMUNICATOR



VE3MIS/VE3RCX

Vol 9.12

December, 2006

From the Gavel...President's Message

Legacy and endurance



Greetings to you all. I hope you're ready for the upcoming holiday season. If I don't get a chance later to express so, have a good one!

When the newsletter committee met several months ago, we outlined topics for the next several issues. December was planned to be the topic of Repeaters. It is also interesting that The Canadian Amateur magazine also chose December for the same topic. Together with the information contained in both our newsletter and the TCA, we expect that you will come to have a

better understanding of repeaters, their history, and how to use them more effectively. While on the subject of repeaters, it goes without saying, that we could not have such a great repeater if it were not for the tireless and well appreciated efforts our repeater manager Michael VE3TKI and his various elves. Our heart felt thanks goes to them each and every time we click up the microphone to use one of our VHF or UHF repeaters.

The Mississauga Amateur Radio Club owns and operates two repeaters for the benefit of all amateurs in the Mississauga area. The VHF Repeater is at 145.430MHz (-600 kHz) and the UHF repeater operates on 444.575MHz (+5.0MHz) each have CTCSS tone squelch access using the standard Greater Toronto Area tone of 103.5Hz (1A), as recommended by the Western New York and Southern Ontario Repeater Council (WNYSORC). Both repeaters are backup powered by the building diesel generator. In the event of a power failure, emergency power will enable the repeaters to operate up to forty eight hours before refuelling the generator.

We now have a link to IRLP on the Internet working on the VHF repeater, currently being upgraded with a more reliable UHF link. Our node number is 2382. The "on" code is #67 and the "off" code is #76.

Come on out to our (only) December Club meeting on December 14th 2006 – it is a Pot Luck dinner. There will be a brief “meeting” to discuss a few club items and then lots of time for food, fellowship and fun. Bring out the family, bring out some visitors as well – introduce them to the life of your fellow amateurs.

It amazes me how the time has flown by. We are about to celebrate Christmas 2006, and HamEx is around the corner ... Events like HamEx and Field Day, take planning and preparation – to which we all benefit – but we all need to invest in through time and effort. I urge you to contact those who are in the planning committees to volunteer your time to assist in making those upcoming events the success they should be. Remember, the revenues from HamEx really provides us with our “play money”, the membership fees just pay the bills so to speak.

While on the subject of changes and planning, we should also be thinking of the upcoming elections – yes that is also upon us shortly. As I have been the president for

This Month

3. Commentary
4. Club Calendar
5. VE3MIS repeater system
8. A Beginners Guide to Repeaters
13. Once Upon a California Hilltop
18. Camp Nemo Demonstration
19. Jamboree on the Air 2006
20. RAC Application Form

Sunday Brunch

Sunday brunches are held on the first Sunday of each month. Time is 9:30AM at Shopsy's, 6986 Financial Drive Unit 5 Mississauga (at the corner of Mississauga Rd and Derry Rd). All are welcome to come out and have an opportunity to chat in an informal setting.

Club Nets

2 Metre Tuesday Night Phone Net

Join in on the chatter starting at 8:30PM every Tuesday on the club repeater. Hosted by various net controllers.

The VHF net Manager position is currently vacant. If you are interested, contact William, VE3WPJ. 145.430MHz Tone 103.5 Minus (-) offset

75 Metre Sunday Night Net

Starts at 8:30PM every Sunday. Hosted by various net controllers. Contact our HF Net Manager, Michael (VE3TKI), if interested in becoming a net controller.



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two years, the constitution requires me to step down at the next elections. I have already been thinking of what I will do next within the club. What about you? Do you see yourself being the next president? Maybe another executive position would be to your liking? One of the clear messages I get from the people who have been in the club for years is that they have been saddled with the job of running the club and are clearly wanting to have some time to sit back and enjoy what they have actually built for us to participate in. I do want to say a public thank you to all those who worked in building the Mississauga Amateur Radio Club to the point it is today. Instead of people saying "Find someone else...", we need people to step up and say "I'll do it!". I can understand that we are all busy, so have I been – but this hobby, this club, only will function if we put our minds and our effort into keeping what we like, and building on it. So, how about thinking about what you can do in the next year for the club. Talk to me (or the soon to be formed election committee members) to step up and announce yourself. You will actually enjoy it!

I have also been doing some updating to the web page. The two major changes that are now up and running on the site are (1) emails formatted to prevent SPAM and (2) downloadable vCalendar files. Let me take just a moment to discuss these two enhancements.

All email addresses now on the club web site are formatted so that the programs that search the web for email addresses (SPAM robots) will no longer see any valid ones on our site. You the user though have a simple task each time you do click on an email address. You simply remove the two spaces on either side of the at sign (@) and then the email address you selected is then valid.

The other change is that with lots of our members now using things like PDAs and various calendar programs to schedule their time, we now have a link beside each and every event that will allow you to download and merge the event into your local calendar. Because each program that does this is slightly different, if you are having difficulty in doing it – speak to myself or one of the other computer savvy members. Oh, if you find you can not download the file, then you probably need to set the "Download Unsigned ActiveX" security setting to either "Prompt" (or the less secure "Enabled").

More web site enhancements are currently in the works, and you will hear more about them over the next few months. Also, we will be distributing the newsletter from the web site directly to your email box in the new year. Make sure that any email from VE3MIS@RAC.CA is not blocked by your spam filter. A test message or two maybe sent to your email account between now and then.

Keep the airwaves busy and we will talk to you further down the log...

Dave VA3DFH



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Commentary...



Albert Einstein once said “Things should be made as simple as possible, but no simpler.” The inventions by some radio hams, notably that of the repeater, so aptly demonstrates his wisdom. What an elegant solution to one of the most basic problems? When we use a 2m transceiver from our car to routinely talk to others well beyond the reach of VHF signals, we probably take the repeater for granted. In fact, if today we decided to shutdown all repeaters, we’d probably lose many hams around the world!

It amazes me to think of the different solutions hams would have come up to reach greater distances. Probably higher power radios, more sensitive receivers and perhaps even different ways of modulation were tried to make VHF go further. But, as we read in the article “Once Upon a California Hilltop” Art Gentry, W6MEP changed our experience forever with one simple idea. He conceived and developed the idea of a radio repeater. One of its earliest appearances was in a blockhouse just above the famed “Hollywood” sign overlooking Los Angeles. And lo and behold we have our own version sitting atop the apartment building in Mississauga, 40 years later. That is not all. It is really fascinating to witness how our inventions benefit the world. For example without repeaters, there would be no cell phones! Keep looking and you will see ham inventions at the core of almost all technology today. Simple everyday people making big contributions to society. That is what we are. And in our ever unassuming attitude, there is no gloating over the fact, no patents to protect our discovery. Just a little celebration maybe. Most probably, Art Gentry went on to look for more challenges, once the repeater was up and running. Let’s celebrate the fact that we have made a difference and keep that spirit of discovery and curiosity glowing. Happy holidays!

- Thomas

Mississauga Amateur Radio Club Directors and Managers

PO Box 2003, Square One Post Office, Mississauga, Ont., L5B 3C6

Website: www.marc.on.ca

Email: ve3mis@rac.ca

Directors

President..... :	Dave Harford	VA3DFH	1st Vice President ... :	William Bressette	VE3WPJ
2nd Vice President. :	Tom Godden	VE3TWG	Treasurer	John Lorenc	VA3XJL
Secretary	Tony Champion	VA3QC	Past President	Robin Stubbs	VE3VVS

Managers

Membership	Reg Vertolli	VA3JQA	Education	Earle Laycock	VE3XEL
Ed. Asst (Theory).... :		Ed. Asst (Theory)	Ed. Asst (CW)..... :		
Ed. Asst (CW)..... :			Repeater Asst 1	OPEN	
Repeater Mgr	Michael Brickell	VE3TKI	VHF Net	OPEN	
Repeater Asst 2	Asim Zaidi	VE3XAP	Public Service	Bob Boyer	VE3XBB
HF Net..... :	Michael Brickell	VE3TKI	Club Station Asst		
Club Station	Robin Stubbs	VE3VVS	Contests..... :	Rick Brown	VE3IMG
House	Bob Humphreys	VE3HOW	Contests Asst 2..... :	Asim Zaidi	VE3XAP
Contest Asst 1	Alex Malikov	VE3MA	Special Events..... :	Bob Boyer	VE3XBB
Newsletter	Kim Cheong	VE3KTC	QSL	Michael Brickell	VE3TKI
Special Events Asst :	Bob Giddy	VE3IAB	Field Day Asst 1..... :	Tony Champion	VA3QC
Field Day..... :	Tom Godden	VE3TWG	Field Day Asst 3..... :	John Duffy	VE3DRZ
Field Day Asst 2 :	Jody Levine	VE3ION	FSV Mgr	Robin Stubbs	VE3VVS
Field Day Asst 4 :	Michael Brickell	VE3TKI	Webmaster (1)..... :	Alex Malikov	VE3MA
Programmes	Lorne Jackson	VE3CXT	Webmaster (2)..... :	Dave Harford	VA3DFH
Document Mgr	NOT REQUIRED THIS YEAR				

Public Service Events/ARES

Emerg Coordinator :	Sean Conlin	VA3MED	Assistant EC 1..... :	William Bressette	VE3WPJ
Assistant EC 2..... :	Michael Brickell	VE3TKI	Assistant EC 3..... :	Lorne Jackson	VE3CXT
Assistant EC 4..... :	Bob Boyer	VE3XBB	Assistant EC 5..... :	Robin Stubbs	VE3VVS
Assistant EC 6..... :	John Duffy	VE3DRZ			

Audit Committee

Auditor 1: John Duffy VE3DRZ	Auditor 2: Robert Humphries VE3HOW
Auditor 3: Lorne Jackson VE3CXT (database)	Auditor 4: Sohail Anjum VE3ITU



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CLUB CALENDAR FOR 2006-2007

December, 2006

01 Friday ARRL 160 Meter Contest
03 Sunday Sunday Brunch - Shopsy's
03 Sunday HF - 75/80 Metre Net
04 Monday Basic Class 10
05 Tuesday VHF/UHF - 2 Metre Net
07 Thursday Exec Meeting
08 Friday ARRL 10 meter Contest
10 Sunday HF - 75/80 Metre Net
11 Monday Basic Class 12
12 Tuesday VHF/UHF - 2 Metre Net
14 Thursday Club Meeting - Pot Luck Dinner
17 Sunday HF - 75/80 Metre Net
19 Tuesday VHF/UHF - 2 Metre Net
24 Sunday HF - 75/80 Metre Net
26 Tuesday VHF/UHF - 2 Metre Net
28 Thursday Club Meeting - NO Meeting Tonight
29 Friday RAC Canada Winter Contest
31 Sunday HF - 75/80 Metre Net

January, 2007

02 Tuesday VHF/UHF - 2 Metre Net
04 Thursday Exec Meeting
07 Sunday Sunday Brunch - Shopsy's
11 Thursday Club Meeting
13 Saturday North American QSO Party
18 Thursday ARES Meeting
20 Saturday North American QSO Party
25 Thursday Club Meeting
26 Friday CQ WW 160-Meter Contest

Provisional schedule below...

February, 2007

01 Thursday Exec Meeting
04 Sunday Sunday Brunch - Shopsy's
08 Thursday Club Meeting
16 Friday ARRL International DX Contest
22 Thursday Club Meeting
23 Friday CQ WW 160-Meter Contest

March, 2007

01 Thursday Exec Meeting
02 Friday ARRL International DX Contest
04 Sunday Sunday Brunch - Shopsy's
08 Thursday Club Meeting
17 Saturday Russian DX Contest
22 Thursday Club Meeting
23 Friday CQ WW WPX Contest
31 Saturday Ham-Ex 2007

April, 2007

01 Sunday Sunday Brunch - Shopsy's
05 Thursday Exec Meeting
12 Thursday Club Meeting
26 Thursday Club Meeting

May, 2007

03 Thursday Exec Meeting
06 Sunday Sunday Brunch - Shopsy's
10 Thursday Club Meeting
24 Thursday Club Meeting

June, 2007

03 Sunday Sunday Brunch - Shopsy's
07 Thursday Exec Meeting
14 Thursday Club Meeting
21 Thursday ARES Meeting
28 Thursday Club Meeting

NOTES

1. Meetings start 7:30PM at St. Thomas A Becket Church Hall, 3535 South Common Court unless otherwise noted.
2. Brunch is at 9:30AM unless otherwise noted.
3. Classes are from 7:00PM - 9:00PM at Meals On Wheels at 2445 Dunwin Drive

Visit our website: <http://www.marc.on.ca> for any updates of the calendar.



VE3MIS REPEATER SYSTEM

By Michael Brickell, VE3TKI

Our club operates two repeaters for the use of members, and for that matter for the use of any licensed amateur wishing to use them. In this article we will explore our repeater system a bit.

Let's start with why bother with repeaters at all, after all, hand-helds have lots of range don't they? Well, in theory this is true, given that vhf and uhf signals can travel a long way provided the signal path is unobstructed. The reality is that our hand-helds are usually close to the ground, and signals from them are reflected off various objects, and absorbed by some things. The end result can be somewhat limited range.

Enter the repeater, which has a very sensitive receiver and is usually located high up with an antenna with significant gain. A repeater receives a signal on one frequency, amplifies it considerably and virtually instantaneously retransmits it on a slightly different frequency. The combination of height, receiver sensitivity, and high power output means that it can hear hand-helds and mobiles from some considerable distance and can produce a significant signal at long ranges, thus multiplying the effectiveness of our radio equipment. Our hand-helds and mobiles can be set up to listen on the repeaters transmit frequency (its output) and transmit on its receive frequency (its input). The difference in the input and output frequency is termed the "offset". Offsets can be negative or positive. Typically offsets on the 2 meter band are - 600 KHz below 147.000 MHz, and + 600 KHz above 147.000 MHz. Offsets on uhf are usually + 5 MHz. So, on our vhf repeater with a - 600 KHz offset, the repeater's receive frequency is 144.830 MHz, 600 KHz below its transmit frequency of 145.430 MHz.

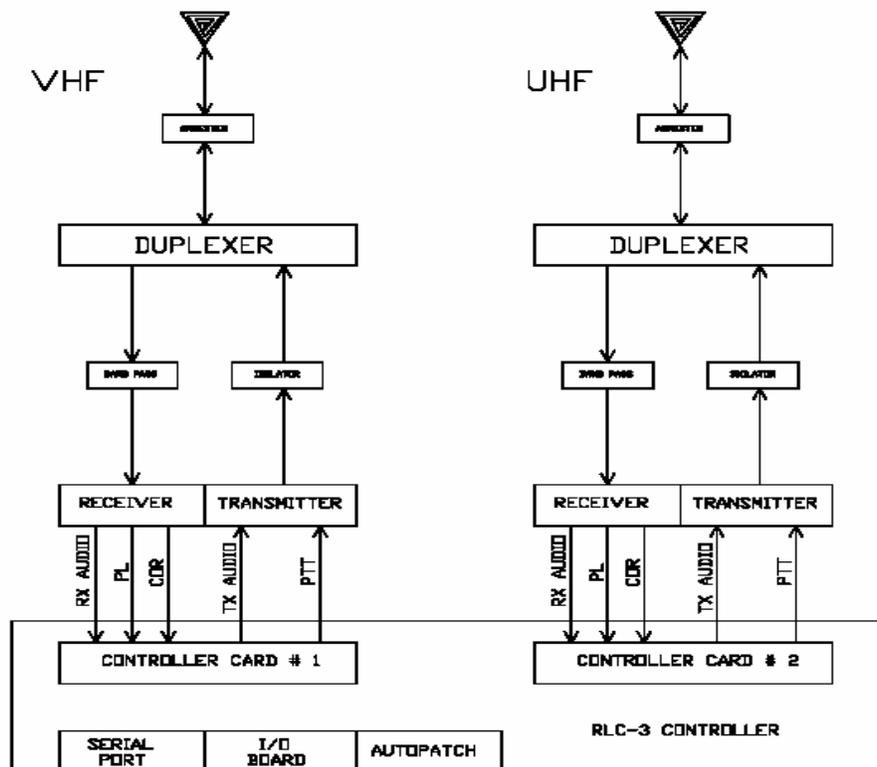


Figure 1

The club's vhf and uhf repeaters are both GE Mastr II repeaters. These are 1980 vintage solid state units, each consisting of a transmitter, receiver and associated power supply. They are capable of 100 watts continuous output, although we run them at less than this to keep them somewhat cool.

A repeater is really a complete system, consisting of the repeater itself, a duplexer, a lightning arrester, coaxial cable (in our case very low loss cable called "heliac"), a controller, and of course an antenna. Figure 1 shows our repeater system in block diagram form.



Figure 2

A duplexer is a device to permit the use of one antenna for both transmit and receive. The duplexer prevents the transmitted signal from ending up in the receiver input (which would cause overloads and probably severe damage). The duplexer is a set of band pass and notch filters in one box arranged in such way as to provide a great deal of isolation. For example, our vhf duplexer (see Figure 2) provides at least 100 db of isolation, so any transmitted signal which finds its way to the receiver is enormously attenuated, to the point where it can do no harm.

Each of the VE3MIS antennas is a four element collinear array. Each element is a dipole, and the four dipoles are connected together using a wiring harness. The harness length is such that the transmitted signals leaving each of the four elements are exactly in phase (collinear), in effect increasing the antenna's effective gain. The radiation (coverage) pattern of our antennas is not quite circular, being more roughly a football shape, with the long axes of the football (the maximum gain directions) being parallel to Lake Ontario. The gain to the north is somewhat higher than the gain to the south. Figure 3 is a photo of our VHF and UHF antennas, with the VHF antenna being the larger one on the left (the UHF antenna has since been moved off the mast).

Our controller is a Link Communications model RLC-3. The controller does a number of things for us. It turns the repeater transmitter on when it hears an appropriate signal in the receiver, generates automatic identification signals, looks after various scheduling functions, runs the autopatch, and generates the courtesy tone you hear the repeater make when you unkey your microphone. As well, it has an internal digital voice recorder, which we use to make announcements which are beyond the very limited vocabulary of our built-in announcers, Romeo, Romeo Junior, and Juliette.

Each repeater is connected to its own "radio card" in the controller.

In order to activate our repeater transmitter, your transceiver must include a sub-audible tone as part of its transmitted signal. The sub-audible tone is known as a "CTCSS" tone, or "PL" tone. (CTCSS is the abbreviation of continuous tone coded squelch system, and PL stands for private line, a Motorola proprietary term for the same thing.) If the repeater receiver detects the presence of a PL tone, it sends a PL control signal to the radio card. The repeater also sends



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a second control signal, a “COR” signal, to tell the controller that the receiver has heard a good signal. (COR means carrier operated relay).

When the radio card gets both the PL and COR signals, it turns on, and passes the received audio output through the card and back out to the transmitter, along with a PTT (push to talk) control signal to turn the transmitter on.

Most repeaters, especially in built up areas, are set up to require sub-audible tones. In the GTA, a 103.5 Hz tone is used. Different tone frequencies are used depending on the particular geographic area involved.



Figure 3

The repeater controller automatically generates a courtesy tone, which is transmitted when you unkey your radio. The courtesy tone lets the person you are talking to know that it is their turn to talk. You should always wait for the courtesy tone before transmitting.

Our repeater has an IRLP connection. The IRLP (Internet Repeater Linking Project) system allows you to connect to other repeaters around the world, simply by entering a control code and the “node number” for the remote repeater. When our repeater hears the control code and node number, it turns on the IRLP connection and links to the other repeater via the internet. The remote repeater detects the link and announces there that an IRLP connection has been made. You can then carry on a conversation with someone at the other end of the link. Details on how to use the IRLP system are on the MARC website (www.marc.on.ca). A detailed description of the IRLP system itself, and a list of remote node numbers, is at www.irlp.net.

We are currently working on some upgrades to the IRLP system, to make it more user friendly.

We have an autopatch system on the repeater. The autopatch allows you to make a local telephone call using your radio and the repeater. For details on using the autopatch, check the club website. Please note that anything you say on the autopatch is public, as it is being transmitted over the air.



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A Beginners Guide to Repeaters, Questions and Answers...

By **Kevin K. Custer W3KKC** (<http://www.repeater-builder.com/rbtip/repeater101.html>)

For the sake of the complete beginner I'm going to cover all the parts, even those which may seem obvious.

What is a Repeater?

A duplex repeater, in concept, is not really a complicated device. It's a 'duplexed' two-way radio set that listens on one frequency, then re-transmits what it hears on another; and does it simultaneously. These systems are usually located in places of high elevation (on mountains and tall buildings) and are equipped with large - efficient antennas, extremely low loss feedlines, and a transmitter and receiver that is very durable and rated for continuous duty. The end result? People using a repeater get much greater range from their radio equipment than would be possible talking simplex. This is how an individual with a portable walkie-talkie (handheld) transceiver can communicate with people many miles away with good clarity. A ham (Amateur) repeater is often times referred to as "a machine" or "the machine". Repeaters are used in Commercial (Business) Communications, Emergency Communications (either by 'hams' or by Federal or Local Government agencies), and even Pleasure Communications. These machines might have multiple sources of power, including batteries and/or generators for when commercial power is lost. Repeaters can be built that are extremely power efficient, and may run exclusively from batteries; recharged by solar, wind or water power.

What is Simplex?

Simplex is point to point communications without the use of a repeater. Simplex operation utilizes the same frequency for receive and transmit, like a CB radio. I.E. Portable to Portable or Mobile to Mobile. The commercial 2-way world calls Simplex operation "Talk Around" because you are talking around the repeater, not through it.

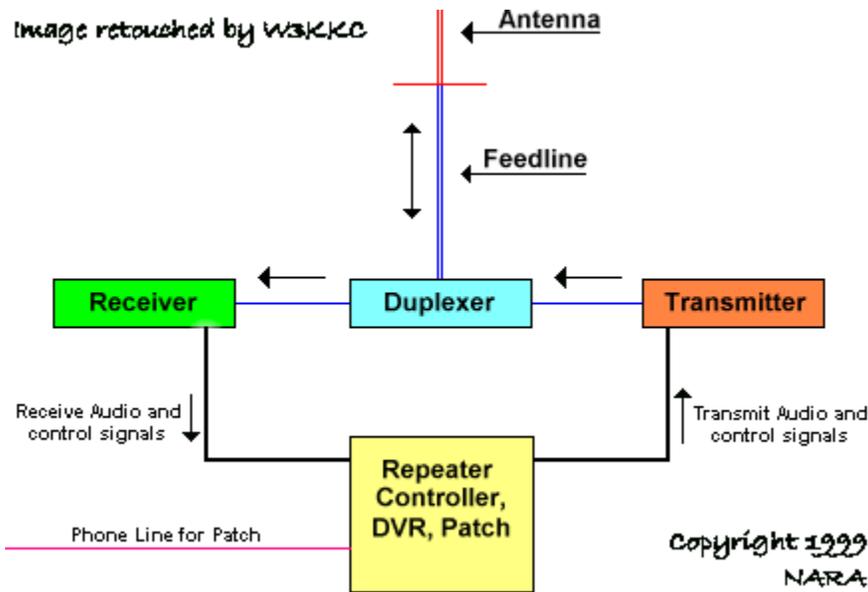
There are such things as Simplex Repeaters. These machines listen on the frequency for activity, when it recognizes something it will begin to record that activity for a pre-determined time; usually 1 minute. A slang term for these is a "parrot repeater". After the activity ceases or the time has expired, the unit will repeat what it has recorded. This method of communications is somewhat cumbersome over a conventional repeater; because you are forced to listen to what you said earlier in time; however it should not be discounted as these types of systems can be very beneficial.

What is Duplex?

The simple explanation of full duplex operation is like the telephone, where both people can talk at the same time. In contrast, a pair of handhelds operate in half-duplex mode because only one person can talk at a time. Since the 'repeater' listens and talks at the same time in relaying your message, it operates in full duplex mode. Here is another explanation.

How does a Repeater work?

At first glance, a repeater might appear complicated, but if we take it apart, piece by piece, it's really not really so difficult to understand. A basic repeater consists of several individual pieces that, when connected, form a functional system. Here's a simple block diagram of a repeater:



Antenna -

Most repeaters likely use one antenna. The antenna serves both the transmit and receive RF (Radio Frequency) signals that are going in to and out of the repeater. It's generally a high performance, durable, and rather efficient antenna located as high on a tower or structure as we can get it. Antenna systems of this type can easily cost \$500 or more, and that's not including the feedline.

Feedline -

The feedline on most repeaters isn't just a piece of standard coax cable, it's what's called Hardline. This stuff is more like a pipe with a center conductor than a cable. It's hard to work with and expensive. So why do we use it? Performance! The signal loss is much lower in hardline than in standard cable, so more power gets to the antenna and weaker signals can be received. A hard rule is that once any percentage of a received signal is lost that you can't get it back. Remember, the signal at a repeater site doesn't just travel a few feet to an antenna like in a mobile rig. It may go hundreds of feet up the tower to the antenna. Just for fun check out the specs on a roll of coax some time and see how many dB of loss you'll get from 200 feet of cable. Hardline also tends to be more durable than standard cable, which increases reliability and helps us minimize tower climbs to replace it.

Duplexer -

This device serves a critical role in a repeater. To make a long story short, the duplexer separates and isolates the incoming signal from the outgoing and vice versa. Even though the repeaters input and output frequencies are different, the duplexer is still needed. Why? Have you ever been in a place where there's lots of RF activity, and noticed the receive performance of your radio degrades to some degree? This is called desensitization, or desense, and it's a bad thing on a repeater. The receiver goes deaf or gets desensitized from the strong RF signals being radiated in its vicinity and confused about which signal it should receive. The result is poor receive quality, or in extreme cases, complete lack of receive capability. Keep in mind that in this example, the radios are picking up radiated power from one another and that's enough to cause trouble. Now imagine how much trouble there will be if you not only have the transmitter and receiver close together, but connect them to the same antenna! Transmitting only a few hundred kHz away in frequency would blow away the input to the receiver if the equipment was simply connected together with a Tee. That's where the duplexer comes in; it prevents the receiver and transmitter from 'hearing' one another by the isolation it provides.



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A duplexer is a device that is referred to by several different names like cavities or cans. A duplexer has the shape of tall canisters and is designed to pass a very narrow range of frequencies and to reject others. There is some loss to the system because of the duplexer, however, the advantage of being able to use a single antenna usually outweighs the drawbacks.

Receiver -

Receives the incoming signal. This receiver is generally a very sensitive and selective one which helps weaker stations to be heard better by the repeater. It's also where CTCSS (Continuous Tone Coded Squelch System) or "PL" decoding takes place. More on this later.

Transmitter -

Most machines have a transmitter composed of an 'exciter' and a power amplifier. The exciter created low level RF energy on the proper frequency and then modulates it with the audio. The power amplifier stages simply boosts the level so the signal will travel further.

The "Station" -

The term "Station" is used to describe a stationary two way radio set; which includes the transmitter, receiver and sometimes the control circuitry. A 'Repeater Station' is a station designed to be used as a duplex repeater.

Controller -

This is the brain of the repeater. It handles station identification (through either CW or voice), activates the transmitter at the appropriate times, controls the autopatch, and sometimes does many other things. Some machines also have a DVR (Digital Voice Recorder) for announcements and messages. The controller is a little computer that's programmed and optimized to control a repeater. The various models of controllers have different useful features like speed-dial for phone patches, a voice clock, facilities to control a remote base or linking, etc. The controller gives the repeater its 'personality'. Whenever you're using a repeater, you're interacting with its controller.

What is a Phone Patch or Autopatch? AKA "The Patch"

Many repeaters have a feature that allows you to place a telephone call from your radio. Phone calls are generally restricted to the local calling area of the repeater to avoid long distance charges to the repeater's sponsors. If in doubt, ask if the repeater has an open patch and how to access it. When using the patch it is common courtesy to announce your intentions, e.g. " This is N3XZY on the patch". This may help to prevent anyone from keying up while you are trying to use the function.

DVR -

A DVR is a Digital Voice Recorder, or modern terms "voice mail".

Repeater Operation -

Operating using a repeater isn't difficult. A good source of info is the ARRL Repeater Directory. It's an inexpensive book with repeater listings all over the US. It contains frequency, offset and whether the repeater is + or - in shift (see "offset" below), whether or not it requires a PL tone, and other features (like repeater-to-repeater linking).

What is Offset?

In order to listen and transmit at the same time, repeaters use two different frequencies. On the 2 meter ham band these frequencies are 600 kc's (or 600 kilohertz) apart. As a general rule, if the output frequency (transmit) of the repeater is below 147 Mhz then the input frequency (listening) is 600 kilohertz lower. This is referred to as a negative offset. If the output is 147 Mhz or above then the input is 600 kilohertz above. This is referred to as a positive offset.



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Virtually all ham radios sold today set the offset once you have chosen the operating frequency. As an example one repeater output is 145.270 Mhz. The input, or the frequency it listens on is 144.670 Mhz (600 kilohertz below). If you have your radio tuned to 145.270 Mhz with the offset enabled, when you push the PTT switch (Push-To-Talk) your radio automatically transmits on 144.670 Mhz. When you release the PTT to listen, the radio reverts back to 145.270 Mhz to listen on the repeater's output frequency. Note: There are exceptions to the rule so check local repeater listings.

Why do Repeaters use an Offset?

To use a repeater a user station must use a different transmit frequency than receive frequency. This is a form of duplex, or two frequency operation. It is known as half-duplex as you do not receive and transmit at the same time but normally use the push-to-talk button on your microphone to switch between the two.

Most repeater installations use the same antenna for transmit and receive. Without having an offset of 600 kHz the repeater would simply hear itself when it was transmitting on the same frequency it was listening on. Even with the offset, the two frequencies are close enough that some isolation is required. Again, this isolation is afforded by the Duplexer.

What is CTCSS or a PL Tone?

PL, an acronym for Private Line, is Motorola's proprietary name for a communications industry signaling scheme call the Continuous Tone Coded Squelch System, or CTCSS. General Electric uses the name "Channel Guard" or CG. Other names, such as Call Guard or Quiet Channel are used by other manufacturers. No matter what the name, the system is used to prevent a repeater from responding to unwanted signals or interference. Tone Squelch is an electronic means of allowing a repeater to respond only to stations that encode or send the proper tone. Any station may be set up to transmit this unique low frequency tone that allows the repeater to operate. If a repeater is "in PL mode" that means it requires a CTCSS tone to activate the repeater. In days of old, repeaters that used PL were considered to be closed or private. This is no longer the case as tone operation has become more the rule instead of the exception. CTCSS is often referred to as PL, Channel Guard, and others.

How do you call someone on an Amateur Repeater?

First, listen to make sure that the repeater is not already in use. When you are satisfied that the repeater is not in use, begin with the callsign of the station you are trying to contact followed by your callsign. e.g. " W3ABC this is N3XYZ". If you don't establish contact with the station you are looking for, wait a minute or two and repeat your call.

If you are just announcing your presence on the repeater it is helpful to others that may be listening if you identify the repeater you are using. e.g. " This is N3XYZ listening on 6-2-5". This allows people that are listening on radios that scan several repeaters to identify which repeater you are using.

If the repeater you are using is a busy repeater you may consider moving to a simplex frequency (transmit and receive on the same frequency), once you have made contact with the station you were calling. Repeaters are designed to facilitate communications between stations that normally wouldn't be able to communicate because of terrain or power limitations. If you can maintain your conversation without using the repeater, going "simplex" will leave the repeater free for other stations to use.

Repeater Etiquette

The first and most important rule is LISTEN FIRST. Nothing is more annoying than someone that "keys up" in the middle of another conversation without first checking to make sure the repeater is free. If the repeater is in use, wait for a pause in the conversation and simply announce your callsign and wait for one of the other stations to acknowledge your call.

When you are using the repeater leave a couple of seconds between exchanges to allow other stations to join in or make a quick call. Most repeaters have a "Courtesy Tone" that will help in determining how long to pause. The courtesy tone



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serves two purposes. Repeaters have a time out function that will shut down the transmitter if the repeater is held on for a preset length of time (normally three or four minutes). This ensures that if someone's transmitter is stuck on for any reason, it won't hold the repeater's transmitter on indefinitely.

When a ham is talking and releases the push-to-talk switch on their radio, the controller in the repeater detects the loss of carrier and resets the time-out timer. When the timer is reset, the repeater sends out the courtesy tone. If you wait until you hear this beep (normally a couple of seconds), before you respond, you can be sure that you are pausing a suitable length of time. After you hear the beep, the repeater's transmitter will stay on for a few more seconds before turning off. This is referred to as the "tail". The length of the tail will vary from repeater to repeater but the average is about 2 or 3 seconds. You don't have to wait for the "tail to drop" before keying up again, but you should make sure that you hear the courtesy tone before going ahead.

Note: If you don't wait for the beep the time-out timer may not reset. If you time-out the repeater, hams that are listening may expect a free coffee from the offender at the next meeting.

What is Doubling?

When two stations try to talk at the same time the signals mix in the repeater's receiver and results in a buzzing sound or squeal. When you are involved in a roundtable discussion with several other stations it is always best to pass off to a specific person rather than leave it up to the air. e.g. "W3ABC to take it, this is N3XYZ" or "Do you have any comments Fred?, this is N3XYZ". Failing to do so is an invitation to chaos and confusion.

It is for this very reason that when groups hold scheduled Nets (network of hams meeting on air at a predetermined time), they assign a Net Control station. The Net Controls job is to make sure there is an orderly exchange and that all stations get a chance to speak. Listen to a local net and you will get an idea of the format and how the Net Control juggles the various stations and traffic. It's a job almost anyone can handle, but as you will discover, some are much better at it than others. A well run net is both informative and entertaining!

What is a Control Operator?

The Part 97 of the FCC Rules requires all stations in the Amateur Service that are capable of operating unattended must be monitored for proper operation while in the unattended mode. This monitoring function is accomplished by a control operator. The Control Op can be the licensee of the station or anyone he or she chooses. In many cases, he or she also ends up being the person that answers questions about the repeater.

What is White Noise?

White noise is a term used to describe a spectrum of broad band noise generated in a receiver's detector and sampled to control the receiver's squelch. When you open the squelch control and hear the rushing noise from the speaker, this is white noise. The receiver squelch circuit uses the presence of that noise to decide that the squelch circuit should mute the receiver speaker.

I hope this article has explained the Repeater in enough detail that you understand what it is and how to use it. If there is any part of this article that seems vague or confusing, please write me and I'll do my best to explain it better



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Once Upon a California Hilltop

The story of repeater pioneer Art Gentry, W6MEP.

By Bill Pasternak, WA6ITF

Every day, tens of thousands of hams around the world slide into their cars and turn on a 2 meter, 1.25 meter, 70 cm or dual-band FM transceiver and drive off. They may be headed to work, headed home, headed to the market or where have you. No matter, friends and emergency assistance are never more than a microphone click away. Today we take FM and repeaters for granted. The mode and the relay devices sitting on hilltops or tall buildings are seemingly there at our command, 24 hours a day. Communication is crystal clear and there always seems to be someone to chat with, but it was not always that way.

The Way It Was

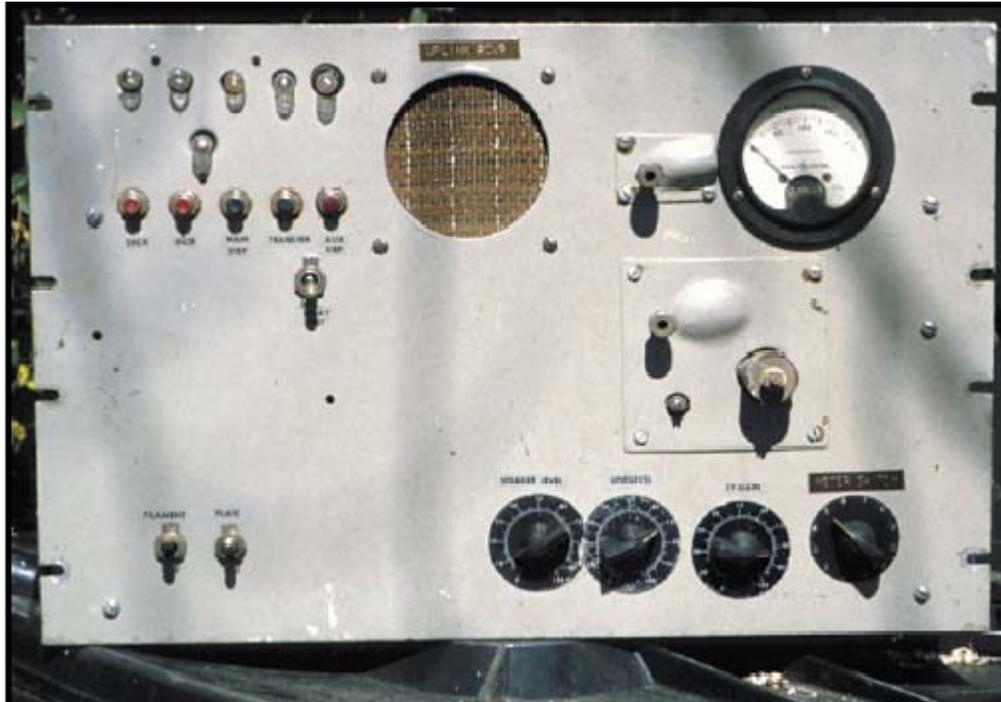
About a half-century ago, in the “Neanderthal” days of ham radio mobile operation, radio amateurs struggled for contacts. Back then, all VHF communication was point-to-point. If you were running mobile, you hoped that the station you were talking with had a good directional antenna and the ability to rotate it to track you. It wasn’t unlike the way we operate ham satellites today. Of greater consequence, from the 1940s through the late 1960s the majority of hams on the VHF and UHF bands operated Amplitude Modulation—AM. AM and other modes that rely on varying the amplitude of a carrier wave (or suppressed carrier SSB) are prone to interference from natural and man-made noise sources. From the dawning of the ham radio mobile era, hams worked to devise noise-elimination schemes. Some installed shielded ignition systems. Others modified the noise-elimination circuits in their radios in hope of better performance. Each worked to varying degrees, but none were foolproof. Something better was needed—a way to extend the range of mobile-to-base and mobile-to-mobile contacts, and eliminate the noise inherent to mobile operation. The adoption of Frequency Modulation (FM) would solve the noise problems for VHF/UHF mobile operators. A device that was new to Amateur Radio would solve the range issue. One of its earliest appearances was in a blockhouse just above the famed “Hollywood” sign overlooking Los Angeles. It was a radio relay system called a repeater, and it was the brainchild of a broadcast engineer named Arthur M. Gentry, W6MEP.

From Garage to Mountaintop Site

The first documented Amateur Radio repeater in regular operation was AM, not FM. It received weak 2 meter AM signals and retransmitted them at high power. This particular repeater, developed by the late Arthur M. Gentry, W6MEP, was licensed as “Remote Station” K6MYK. It first took to the air in 1956 from his home in Northridge, California as an experiment in radio-relay technology with roots going back two years prior. W6MEP told me about it in a tape-recorded March 1979 interview. Gentry: “We went to the present site in October of 1958, but there were sites in-between. The original license for K6MYK was issued in 1954 for a site in Burbank, which we never used. It went remote control—I think it was June of ’57 when we finally got onto a hilltop.”

A Trip Back in Time

Art Gentry never laid claim to “inventing” the repeater. If he was still with us, he would be the first to tell you that he was the one lucky enough to make a remote-control ham station work for the masses. Gentry: “I can’t say that we were the first because in 1954—I think it was in San Jose—a group of people put up a 2 meter AM repeater in the Berkeley Hills and they left it. Later that year—along around August—we went on a vacation to Colfax above Sacramento and we worked through the repeater from Colfax down to Lemoore. That’s about 300 miles total distance and, of course, that was unheard of on 2 meters.” According to W6MEP, that machine was K6GW. In its original incarnation, it was on-site controlled and stayed on the air for a few months before it fell by the wayside. Gentry believed that this was because it was not an “open” machine, and because it only operated intermittently. Gentry: “If you were lucky enough to get in there when the guys had it up, it was fine.”



The K6MYK repeater control receiver. It was on 421.28 MHz and was built around an old military ASB-7 receiver with light- house tubes in the front end.

So why did Art Gentry decide to build a repeater of his own? Because it was a way of extending the range of amateur VHF communication. Gentry: "I have operated VHF mobile since probably about 1940 when I went to 112 Mc [the old pre-World War II 5 meter band—what today would be called 112 MHz.—Ed]. I was on 112 Mc at one time running quite high power, running a 35T-modulated oscillator. The receivers were all regenerative. After World War II, when the 2 meter band opened up—which if I remember right was January of '46—I had acquired an ARC-4, which I made into a crystal-controlled tunable (receiver) unit. It had a crystal-controlled transmitter with 10 W power output. "That was a mobile rig and I can remember going up to Mt Wilson one time for a drive. I came on the air and I was like a foreign country. We talked our lungs out going from one station to another as fast as we could for over two hours. This pointed out the advantage of high elevation." Gentry immediately contemplated putting up a voice repeater, but back then there was little information on how to do it. As a result, necessity became the mother of invention. Gentry: "I would look for remote-controlled transmitter articles, but I would find very little. In the late '40s and '50s, the only thing you ever found was information on how to remote control a transmitter. Nobody had ever thought of a remote-controlled station. Only a transmitter somewhere. Never was there a receiver around." So, W6MEP set to work to make it happen. Gentry: "Marrying of a receiver to a transmitter to become a repeater took a lot of long, hard work and a lot of channel separations. A lot of megacycles in-between and a lot of tinkering and puttering to try to get things so that you didn't get interference and desense." Making it happen in that era also meant rolling your own. Gentry: "We built a whole new receiver. You couldn't buy anything. You couldn't find anything on how to do this. So, we used our ingenuity. We had to find ways of getting rejection on the receiver to get away from desense."

Steps Forward And Steps Back

While California had repeaters since the 1950s, the proliferation really began after the first low-cost radios began arriving from Japan around 1969. When I conducted this interview a decade later, there were already thousands of hams



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on over 250 open 2 meter repeaters in Southern California, and the local repeater coordinator had a list that was close to 200 more waiting. The same percentages were found in most other populated regions, and I asked Art if he ever dreamed that his early experiments would revolutionize the way hams communicate on the bands above 50 MHz. Gentry: "I think I can say yes to that question. Logic told me that this was a good way to get better communication. If you can imagine a 10-W AM mobile running all over the greater Los Angeles area in the early 1950s and never being out of communication range with somebody, you'll understand why I had faith in the future of this technology. "I observed the growth of commercial radio at elevated sites. Having seen that growth, I knew what eventually would happen with amateurs. I knew that this would be a very widespread thing, and with the adoption of FM (by both commercial and amateur communicators). I knew this would happen because I knew what the performance of FM was as compared to AM. For my own personal communications, I went to FM in the early '60s." Even so, the original K6MYK repeater was an AM device and remained so into the early 1970s. Gentry: "It did so because it served a great many people using AM. It was still 'their repeater,' if I may use the term. When the activity dropped to where there were no customers, then there was no sense in staying on AM. "We knew that there would be new repeater rules out and we did not want to make a change until they were announced. Concurrent with that was the channelization of Southern California repeater frequencies. We applied for, and got, a (coordinated) repeater pair at that time with the intention of going FM. "So it wasn't necessarily my personal desire to remain with AM. The control system has been FM since the beginning, and some of the original control equipment is still in operation because it is reliable." K6MYK, by then on its way to becoming WR6ABN, began its conversion to pure FM operation in the early 1970s. Not long afterward it was assigned a frequency pair, and Art added a second receiver to detect FM signals and an FM exciter to the plate-modulated AM repeater. For a while, K6MYK was a one-of-a-kind dual-mode repeater, accepting and retransmitting both AM and FM signals. When the last AM signals disappeared from the 2 meter repeater sub-bands, so did the AM portion of the K6MYK/WR6ABN repeater.

The Man, His Life and His Career



Art Gentry, W6MEP (left) and Bill Arens, N6NMC.



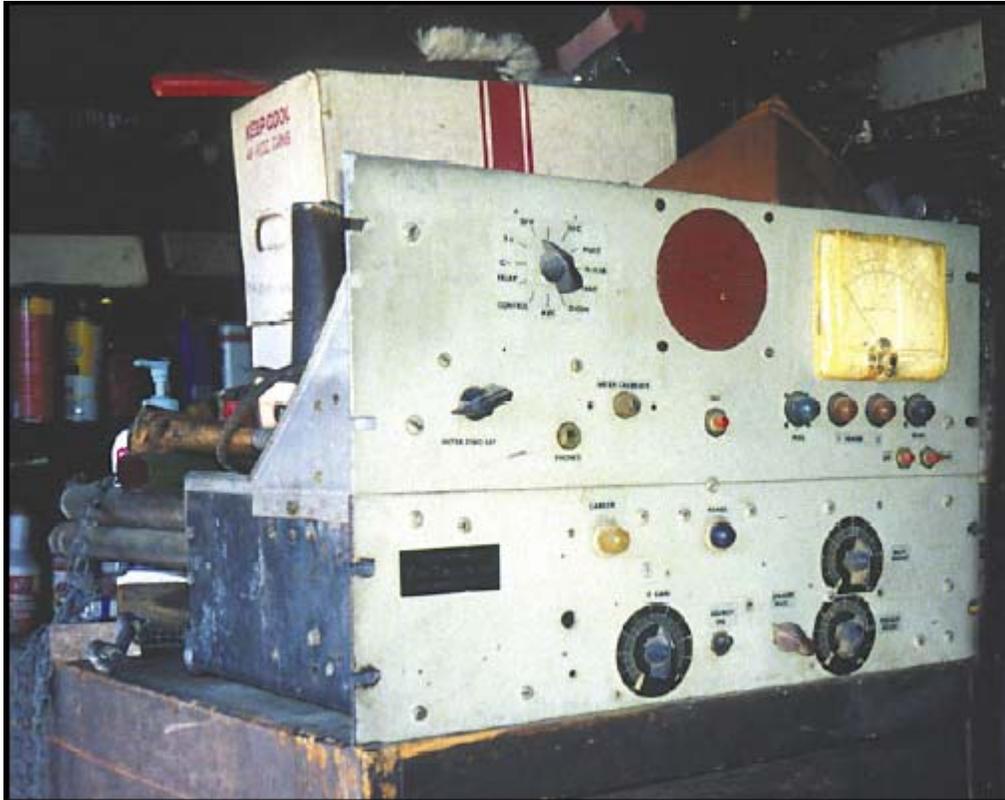
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The original K6MYK AM repeater receiver.

If the repeater rules enacted in the early 1970s were meant to stifle growth of FM relay systems as some claim, the effect on California in general and Southern California in particular was insignificant. While some hams to the East made lots of anti-FCC “noise,” those in the Golden State pooled resources to make sure that every “i” was dotted and every “t” was crossed in their repeater license applications. Little did the people in DC know that much of the help in preparing these applications was coming from hams involved in the two-way and/or broadcast professions. These hams were used to dealing with the Washington bureaucracy and its myriad of paperwork. By profession, Art Gentry was one of them. He started his career at Channel 13 (now KCOP a Fox-owned UPN affiliate), but spent most of it at KTLA channel 5, a station then owned by Gene Autry’s Golden West Broadcasting. Gentry: “I did not get into the broadcast industry until about 1951, but I got into it because of the extensive knowledge I have of communication and television. The people who hired me at channel 13 had known me for a good many years. I’ve been with Golden West for 10 years now, and was with this same channel for two years on an earlier tour of duty. I have about 12 years with that station.” His contributions while at Golden West are legendary. Working under the aegis of broadcast pioneer Klaus Landsberg, Gentry had the opportunity to be involved in many firsts. This included the first live telecast of an atom bomb test in the Nevada desert, the first live coverage of an actual police investigation, the first color telecast of the Tournament of Roses Parade and helping in the design and fabrication of the first helicopter-mounted TV news camera system, the “KTLA Telecopter.” But in his off hours, his two main loves were his wife Millie, K6JJN, and the K6MYK repeater. Art and Millie were a team united not only in marriage, but in the world of Amateur Radio repeaters as well.



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A Champion of the Little Guy

W6MEP was also the first advocate of the repeater user. In an age when many repeater owner-operators were setting strict user rules, Gentry placed his faith in his fellow man. Gentry: "Very early in operating K6MYK I learned that 'users' are paramount for the simple reason that if they do not grant you permission to use the air, you have got a lot of trouble on your hands. "We went through some very bitter battles to prove this to people—that you just could not come on (the air) as one individual and say 'I don't like what you are doing and I have the right to use the channel 3 kilocycles away.' "And while we still have battles, it's the people who made the repeater stick. It's not the ownership of a repeater that enforces anything. It's the users, and this is particularly true in an open-channel machine."

Art's Essay on Repeater Growth

One of the questions I asked Art was why repeater growth in California had outpaced that of the rest of the country. He said there were two reasons he could think of: altitude and attitude. Gentry: "I think an example is worth more than anything else. Take WR6ABN (the call sign that replaced K6MYK under the authoritarian 1970s repeater rules). At about 1800 feet above sea level, there were probably 5 to 7 million people within reach of that signal at the time. Today there are probably 20 million people. I doubt if there is any other repeater that covers a larger group of people. We happen to be roughly in the center of a heavily populated area with an ideal site. "Also, California has unusual geography. It has lots of elevated sites. The early people (hams) who got into repeaters were the people in commercial two-way radio. Commercial relay systems led the way. Not so much as repeaters, but rather remotely controlled base stations. A telephone line would control them. This showed what the amateurs could do and it only took a few sharp ones to find that they could couple a receiver to a transmitter. This brought about the tremendous growth. "Repeaters in the West have line-of-sight ranges of a couple of hundred miles. You go back East, or in the Plains states, and if you can get 500 feet up you are doing good. New York City has a few sites at 1000 feet, but look at what you have to contend with. The 'concrete canyons' are one of the worst things in the world to try to get signals through. "And it's a fact that the West has always been innovative. The West is a big, wide-open country with a strong sense of individualism. People bring that Western spirit to radio and do what they've always done—innovate. We're pioneers. The pioneer spirit that came West in the beginning is still here."

Honors to the Mind that Created the Medium

In April 1987, the Dayton Amateur Radio Association recognized Gentry's contributions to Amateur Radio by honoring him with its Hamvention Special Achievement Award. The proclamation published by DARA in the souvenir program that year read in part: "The technical achievements of Arthur M. Gentry, W6MEP, have touched the lives of more Amateur Radio operators than any other in the history of the hobby. Although Art lays no claim to being the first to put up a repeater, his research and development led to the operation as we know it today. A man of vision, Art foresaw the need for rulemaking and was instrumental in forming the first VHF Repeater Advisory Committee."

Passing On the Flame

On April 4, 1996, Art Gentry, W6MEP and his wife Millie, K6JN, left the smog of Los Angeles to be near their children in Beaver, Oregon. Art was now 89 years old and Millie, 83. Both were in failing health. He passed away a month after the move; Millie followed in August. Art's repeater lives on. About two years before his death he turned the day-to-day operation of the system over to Bill Arens, N6NMC. After Art passed on, Arens petitioned the FCC and obtained W6MEP as a club call for the machine. That's how it identifies these days. Arens says that this is a lasting tribute to the man who made repeaters available to all hams, many of whom have never even heard the name Art Gentry or the call sign W6MEP.



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Camp Nemo Demonstration

By Michael Brickell, VE3TKI

In late spring, the leaders of a cub group in Milton asked the club if we were interested in demonstrating amateur radio to a group of cubs at a cub camp in September. We agreed, and so, on September 30, a rather rainy day, club members John VE3DRZ, Bryan VA3BLJ, Dave VA3DFH, and Michael VE3TKI duly appeared at Camp Nemo, which is a quite large Scout and cub camp on the Niagara Escarpment. John and Michael had gone out the previous week to survey the scene, so we knew more or less what to expect. We took with us one of the club's antenna masts, a borrowed G5RV antenna, and, fortunately, as things turned out, a couple of the club's dipole antennas. We did remember to bring the club's TS480 SAT, a power supply, and various connectors, plus an MFJ259B antenna analyzer.

We were able to set up in a small building with electricity, so we were out of the rain. We put up the mast and strung the G5RV from it to a conveniently located flag pole, using very fancy knots magically provided on the spot by John, the resident knot expert. With eager anticipation, we connected the antenna to the analyzer, only to find an infinite SWR on all the bands. Astutely realizing this would not do, after much thought and under some pressure to perform, we took down the comatose G5RV and replaced it with a 40m dipole. This was a resounding success, except the band was dead as a doornail. We phoned Rick VE3IMG to see if he could hear us, but noise levels were far too high to carry on a qso.

Much gnashing of teeth ensued, as we trooped outside to replace the 40m dipole with a 20m one. Success!! Wall to wall signals! Great we thought, we're in business. So we got the leaders to bring the cubs in small groups, and went looking for contacts. Unfortunately for us, most of the activity on the air was from Europe, and it was difficult to get people to talk to us. We did find a ham in the Midwest US setting up to call CQ, who was kind enough to talk to 6 or 7 cubs (who took the mike) before we let him go.

At this point, inspiration struck! Dave and Bryan went out to one of the vans, and took turns talking to the cubs via simplex on 2 meters using Dave's Kenwood D700 mobile. Inside, we used a VX-5R hand held. We explained a bit about radio to the cubs and then handed over the VX-5R. The cubs enjoyed answering questions put to them over the radio, and in fact it was sometimes difficult to get them to share the radio.

What did we learn from this? By far the most successful activity was having the cubs talk on the hand held. The hf bands were really too busy, and trying to find someone to talk to us was very difficult. It might have been easier if we had made prior arrangements to have someone from the club on standby on hf.

If we are invited to do this again, we would set up a mobile inside the building, and have cubs inside talk to others outside in a van. This is probably enough complexity for the cub age group.



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Jamboree on the Air 2006

By Michael Brickell, VE3TKI

It's been a while since the club has participated in the Scout Jamboree on the Air. The last time we were involved was a few years ago at our former meeting place, which was also a scout hall. This year, Jamie Holmes, VE3GXQ, who is a Scout leader, called me to ask if we would be interested in doing a JOTA event. We agreed to participate.

JOTA is a worldwide event, in which Scouts in different countries are able to talk to each other via ham radio. This year JOTA took place on October 21. Jamie's scouts were part of a larger group camped at the Camp Goodyear Scout Camp just outside Orangeville. This camp is the one that the club used for Field Day for several years in the early 1990s.

We set up the radios in a small unheated shelter at one end of a large field. We brought a generator, as there was limited electricity on site, and the club's TS480 SAT, plus two antenna masts and the club's G5RV. Jamie brought his venerable FT101, and set up on 20m to do PSK31. Unfortunately, Murphy intervened in the form of a dead FT101, and Jamie was off the air. However, we had considerable success on 20m and 40m SSB, and the Scouts were able to chat with other Scout groups, primarily in the US.

We had made arrangements to use the IRLP node on the Orangeville 2m repeater. This turned out to be very successful, as we were able to use a 2m mobile in a van to connect reliably to the repeater's IRLP node. The Scouts took turn squeezing into the van in small groups. They talked to a Scout Troop on an air force base in Phoenix, Arizona, and they were able to talk to a ham in Trinidad, and also a ham in the Netherlands who was mobile on his way home from work.

Jamie reports that the Scouts really enjoyed using the radios. If we go back next year, we would set up in much the same way, although we will likely set up the mobile in a separate tent, so the Scouts have easier access.

Operators from marc were John VE3DRZ, Bob VE3XBB, Bryan VA3BLJ and Michael, VE3TKI.



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