HAMATEUR CHATTER

The Milwaukee Radio Amateurs Club

June 2012, Volume 20, Issue 5

One of the World's Oldest Continuously Active Radio Amateur Clubs—since 1917

Presidents Letter

"Great googly moogly!" - Frank Zappa (and others)

Well, we had a pretty good auction for the May meeting. The club started having raffles at its meetings in about 1926. The raffles turned into full blown auctions sometime after that. In fact the club got thrown out of the Milwaukee Public Museum for a meeting place due to our conducting "business" during an auction. I guess only the museum itself can do business on their property (actually with apologies to the Milwaukee Public Museum, that was their policy then - I don't know what it is now). For a number of years during the 1950s into the 1980s auctions happened twice every year.

Other people learned from us. We had a number of big items donated to the club this year, many from non-members. As a result I'm sure we will be reporting a record income from the auction. Many thanks to all who donated and all who brought stuff to sell and who bought stuff. I hope everyone who bought anything enjoy their purchase. I know some visitors didn't like some items going for more than pocket change. I think the items they complained about were items that were donated to the club. I guess that's why they aren't club members. Oh well. Start looking through your collection of stuff for items for next year (after trying our hamfest of course).

Because of things like this year's auction and our growing hamfest, it may appear that we are stockpiling money. In today's economy, I don't know if one can have too much money.

Thinking about money leads into a couple of things which need member input. One item is the club owns some antennas and radios which see action at Field Day. I would like to see a committee make some decisions on what equipment we should have and if we should be buying something else and selling anything. I've talked about this before, but we must make some decisions this year. We also need to figure out where to store anything we own (since, if we will not be doing Field Day at Pioneer Village, we will lose our storage location).

Also, I would like to hear from people about a project we could embark on "if we had some money". Something that has been discussed among the board is a radio loaner program for new hams. What ideas do you have?

Have you thought up a new excuse why you aren't participating at the MRAC / MAARS Field Day? With it being in the middle of the county, distance is no longer an excuse.

Finally for club business, the board has been kicking around some license classes for a while now. We would like to do a Technician class starting in September and then a General sometime in the spring. The club first held classes in 1922. I was involved in a continuous string of classes from fall of 1976 through the fall of 1996. We have done classes for all license grades at various times in the 2000s, but nothing for a few years. Would you like to help? Do you know someone who could use a class? Do you have a line on a good location (we can always get AES)? Spread the word!

MRAC Officers:

Terms Expiring in 2012

- President – Dave,WB9BWP
- V-President– Vacant
- Secretary – Mike, KC9CMT
- Treasurer – Joe, N9UX
- Director – Mark, AB9CD
- Director – Dave,KA9WXN

Terms Expiring in 2013

- Director – Al, KC9IJJ
- Director – Hal , KB9OZN
- Director – Dan, N9ASA

The Club Phone Number is: (414) 332-MRAC or

(414) 332- 6 7 2 2

Visit our website at:

www.w9rh.org

Mail correspondence to:

M. R. A. C.

P.O. Box 240545

Milwaukee, WI 53223

Letter From The President, Continued….

Right after I sent off my President's column to Michael in May I learned of the passing of Brian White K9LCQ (originally KB9LCQ). Brian joined the club in 1996 and soon (1998) joined the board as 2nd VP. In fact Brian was the last person to hold the office of 2nd VP (we eliminated it in 2002). In 2003 he moved to Director and then Secretary in 2004. He left the board in 2006 only to return in 2008 as an appointed Director and then taking over as VP when Brian Bieger KC9HEK took over as President when Howard Parks AB9FH stepped down (follow that?). When Brian B. then moved out of town the next month Brian W. took over as President until a special election was held for someone to fill out the existing term. Brian also participated in every Field Day with MRAC since his joining (until about 2008) including setting up packet and APRS stations and providing APRS demos.

He also did a number of club programs on APRS and model rocketry. He took care of Chatter emailing when the club went to electronic newsletters in 2000 as well as producing the Chatter himself in 2009. He did a redesign of the club web site and took care of the web administration from about 2007 to 2010. I think being on the board through some turmoil during the 2000's took its toll (Brian often had to run club meetings, without much advance notice, in the absence of then Presidents and VPs) and Brian left the club after 2009.

He was very active in public service activities throughout his entire time as a ham (including being signed up for an event during this month). He was certainly a unique personality (not like most of us aren't) and he was even elected a Waukesha Alderman for Waukesha's 6th District in April 2011. He will be missed.

"And Now for Something Completely Different"

"If you can't annoy somebody, there is little point in writing." - Sir Kingsley Amis

OK, this is the June newsletter. During the business portion of the June meeting I will turn over the bridge to the new Captain er President. I won't be pounding on all of you to do your part for the club every month.

Actually I haven't been doing much pounding the last few months anyway. I have just been trying to get the point across of what this club has done for amateur radio in the Milwaukee area. The city of Milwaukee understands our importance based on the plaque presented to the club for our 95th anniversary this year. Before I pass the torch, allow me a few thousand words on my thoughts about Amateur Radio and MRAC. You may think some of the following is just more of my complaining, ranting, irritations, whatever. It really is not. Take the time to read it all and reflect on my comments with your own amateur radio history and pursuits (and I welcome any discussion you may wish).

"Audio was a hobby and then a profession, but I still consider myself an amateur in that an amateur is one who practices his art for love." - Paul W. Klipsch

I decided I wanted to become a ham around the age of 13. I got a couple of books and dabbled around but didn't get a license. At Summerfest number 1 in 1968 I learned about the club (the club had a station there). Well sort of learned as even back then the club stumbled in its PR attempts (that is a story in itself that would make this tale too long). I attended my first MRAC meeting (at MSOE) in September 1968 (brought by my mother) where Travis Baird W9VQD was President (one of his numerous stints on the board). In November, the MRAC meeting was a fall auction (there were 2 auctions per year back then). The room was packed and I was sitting next to Ken Eggert ex W9MOT. As the new kid in the club after only a couple of months I really didn't know any people yet including Ken. One of the items up for auction was a number of bags of resistors. They ended up going for $1 per bag. Ken bought a bag and then promptly gave it to me saying if I was going to be a ham I needed to start building my junk box.

When I thought I was ready to take my test, Walt Glish W9YYW offered to give me the Novice test and in March 1969 I went to his house (driven by my cousin) and took the code test. About a month later I returned to take the written test (that's how it worked back then). I was there on a Monday night and Walt showed me his station and checked in to the club 10M net (yes, back in the 60s and 70s there was the Milwaukee Lakeshore Net, run by club members) as well as the 2M ARES (then AREC and on simplex) net.

Finally by the end of May I received my Novice license (having already received advertising with my new callsign before I actually got my license), WN9BWP (that is also how things worked back then, you received an "N" call sign which would turn into a A or B or whatever when upgrading from Novice).

While many people who became hams during their early years say ham radio guided them to a career in electronics, I had already made that choice by the time I wanted to become a ham. Amateur Radio was just another facet to my electronics education. Nowhere in any school did they teach me how to tune up an antenna, how to load up a transmitter, how to configure a TNC, or what a temperature inversion is and how it can affect VHF propagation.

Schools never taught me how to actually solder or build things, to fix things, to operate things or to certainly understand (or attempt to understand) RF (though they did try in college). I always felt engineering is not about remembering formulas but a philosophy, a state of mind, the ability to understand and look for solutions to a problem. That also applies to amateur radio. The desire to experiment - be it electronics, antennas, anything related, and the desire to explore - how far can I talk, how many stations can I contact, can I send signals where they maybe shouldn't go, can I make an antenna work in this space?

"Basic research is what I am doing when I don't know what I am doing." - Wernher von Braun

Presidents Letter Continued..

Just because someone is not an electrical engineer or young does not mean they cannot explore the technical side of amateur radio. Some of the best experimenters I've known had little or no formal electronics training (that includes my first engineering boss). During the early days of the personal computer revolution in the mid 70s, a group of retired guys (all well over 60) in the club were some of the first to build their own computers (and back then building really meant building, not just plugging in boards). One high power PhD I have worked with once told me he would hire someone who was a ham over someone who has some advanced degree and doesn't know how to actually "do" anything. Just to contrast some of that one other PhD I worked with couldn't design anything that could be easily produced and he didn't consider that a problem (he didn't have a job long either).

I sometimes wonder about our future (amateur radio and maybe even America) when I hear things like "you can't use a marine antenna on a house", or "how can you possibly get a low SWR on an antenna in an attic" or "how can I have a bad signal, I'm using a repeater" or even "how can we get someone like Gordon West to come to a club meeting?" (and no I didn't make any of those phrases up).

"The best way to predict the future is to invent it." - Alan Kay, Computer Scientist

Recently the ARRL has been promoting amateur radio as the original social network. That is very true. However, I perceive that to a number of newer hams, that is all amateur radio is to them. I have heard more than one person say that they are perfectly happy just talking on a repeater as their total amateur radio experience. Some have even said they tried HF and don't see any real reason to do that. I've heard someone say "why should I try 220 when it isn't that much different from 2M". Now before some of the 2M critics say I told you so, I also don't see the person who does nothing except work 10 second DX contacts on 20M using spotting help as any different. Amateur radio is a very unique pursuit. No other hobby offers the sheer number of opportunities to explore, to experiment, to learn. Yes repeaters and DX are some aspects of the hobby, but only 2. So is public service, contests, electronics experimenting, antenna experimenting, different operating modes, satellites, APRS, microwaves, QRP, portable operating, and much more as well as some things that haven't even been invented yet.

Clarke's Third Law: "Any sufficiently advanced technology is indistinguishable from magic." - Arthur C. Clarke

Remember, not quite 100 years ago, when the government started to regulate the radio spectrum, hams were given all frequencies below 200 meters (above about 1.5 MHz) because the "experts" of the day considered them useless. Where do you think mobile data terminals in Police cars came from? Even cell phones can trace their development to multi-site repeaters (after all, there were "mobile" phones back in the 60s). If everyone buys their $150 HT (now $69 from China) and doesn't go beyond that, who will develop the next APRS, the next PSK (or other mode). Who will build and maintain repeaters when no one considers the technical side of things. Then what will your HT do for you (no matter how little or how much you paid for it)?

"Above all, try something." - Franklin Delano Roosevelt
It sometimes seems that we (people, not just hams) have lost our drive, our passion. As I started to write this the first commercial space launch vehicle was on its way to the International Space Station (it then successfully docked and then returned to earth with a successful recovery).

Government couldn't seem to do it anymore. Or want to. Luckily a bunch of crazy people had some drive, some passion, some willingness to experiment and explore (and before you say it, yes some money) and designed and built a space vehicle.

Many of the same thoughts apply to radio clubs.

"It's not whether you win or lose it's how drunk you get." - Homer Simpson

In August 2010 I posted a question on the eHam.net club forum about what people want in a radio club. I received all sorts of weird responses. Actually eventually the comments were pretty good, just the early responses were pretty weird. Were those people trying to be jerks or are they just weird people? I don't know. But maybe that is an indicator of what is really out there. Anyway...

"Go ahead and do it. You can always apologize later." - Rear Adm. Grace Hopper

Why bother with a club? Or the bigger question, why get involved with club activities? If not for clubs there might not be any amateur satellites, packet radio and its offshoots, wide coverage repeaters, DX-Peditions, contests, hamfests, license classes, special event operations, even Field Day would be a lot less interesting. What about supporting public service activities? A real big club example is if you got a license or upgraded your license within the last 28 years you took a test prepared and administered by a group of volunteers with some sort of club behind it (like MRAC). The list could go on and on. Joining and supporting a club with dues is just one step. How about getting involved with organizing some club activity. Even having a club meeting requires the work of a number of people. How about helping someone new to the hobby learn their way around (see "you can't use a marine antenna on a house" above). You say you're too old or don't get out, well do you get on the air? Talk up the club, help to get new members. Be in the FM simplex contest (or other contests). Be net control for one of our nets. Answer questions. Don't just depend on "the other guy". What happens when "the other guy" isn't around anymore (see Brian White, above). This problem is not just an amateur radio one. All types of organizations have the same problem. Amateur Radio is a very unique hobby. Let's show the world how unique we are (I don't mean just in our appearance).

Let's all work together, not to prove how important any individual is, but how important amateur radio is and how important amateur radio clubs are.

Presidents' Letter Concluded:

"Only the mediocre are at their best every day." - Jonathan Winters

While I soon will not be the President, I am still the license trustee, historian, one of the repeater tech guys, sometime janitor and who knows what else now and in the future. I don't do any of those things to prove how important I am (most hams I meet outside of club meetings didn't even know I was the President), I do them to help MRAC be important to its members and the amateur radio community. A couple of months ago I listed the things which other area clubs may brag about but which MRAC did first.

Don't you want to be part of the future? I do some stuff. I do some radio.

Want to join me (or for those who may know this movie quote, "Wanna take a ride?")? If so find me at a club activity (Field Day, hamfest, contest, net, etc) or on the air (1.8 MHz - 440 MHz, sorry no 220 right now).

"Do you still love with a passion?
Can you feel it burning and alive?
It's a positive force so embrace it
It's a gift we all have inside." - Brett Kull and Ray Weston of Echolyn from the album Suffocating the Bloom copyright 1992

73,
'BWP

Board of Director's Meeting Minutes

Board of directors meeting called to order at 7:18 pm by Dave DeFebo WB9BWP, outgoing club president.

Director's present: Mark, AB9CD, Al KC9IJJ, Dave WB9BWP, Michael KC9CMT, Dave KA9WXN, Hal, KA9OZN, Dan, N9ASA, Joe, N9UX.

Absent: None.

Preliminary discussions:

April was the annual club election, as a result, the Board of Director's has decreased from 9 to 7 director's. The positions of club officers has yet to be determined. So far, Michael, KC9CMT will be the club secretary and Joe N9UX will continue as club treasurer.

This months' meeting is the annual MRAC auction. It will start promptly at 7pm. The club has a number of excellent items that were donated to the club. Radios, antennas' coax & misc. items. The club has promoted this event for a number of months. The club will be putting minimum prices on some items. The question of method of payment was discussed with some decenters as to the question of accepting checks and promises of future payments.

April meeting minutes were accepted as published in the HamChatter by motion of Al, KC9IJJ and seconded by Joe, N9UX.

Joe, N9UX reported that there was not much activity in the treasurer's accounts this past month. A very brief report was given.

Brian White, passes away this last week and a discussion was undertaken on what he brought to the club as a member and past Vice-President. The club has had over 25 past members pass on in the last ten years. The club BOD briefly discussed what to do when a member/ former member becomes deceased. Brian had not been a member of the MRAC since 2009. He was also an alderman in Waukesha, serving his first term. The last time he had been seen was at a hamfest in January.

The club does not normally make a donation to the members family, but this will be discussed on an individual basis in the future.

Our June meeting this year comes after field day this year. There is no program scheduled so far. The club may just have a recap of field day. The club does not meet in July & August. Septembers' meeting program will be West Mountain Radio giving a program on there power products. The rep from West Mountain has been invited to field day and the MRAC/MAARS annual picnic. During the annual picnic, the club will be running a special event station. This years picnic is the same Saturday as the Racine Megacycle club out-of-trunk swapfest down at fireman's' park in Sturtevant.

Mark, AB9CD has been actively scanning historical documents for the club historian Dave, WB9BWP. Dave reports that many things have been scanned in the last month. The suggestion was made to have the club purchase a Harddrive to store this material on. Dave states that it is not yet a problem.

FM Simplex contest certificates have been delivered and the results published in the May HamChatter. Over a hundred logs were submitted to Joe this year. The special event station at this years AES SuperFest was a success. Gordon West took the mic for a while and created a pile up of stations wanting to answer his call. He did use the clubs callsign, W9RH.

Dave, KA9WXN will be coordinating the joint club picnic on August 11th this year.

Dave, KA9WXN will be working the clubs' field day station again this year. There are plans for a GOTA station this year, along with two HF stations, towers and accessories. ARRL T-shirt and hat purchases will be available at the MRAC field day encampment. The club still needs to find another location for the material that the club stores at Pioneer Village. Since we have not been using the facility for a couple years now, we must vacate their basement storage rack. Decisions have to be made as to what the club should own as to radio gear. A crew from the MRAC painted the pioneer village machine shed one year, so they still like us.

Interclub Hamfest: We should have flyers available for the South Milwaukee Swapfest. We still have to nail down a date for the event. The attendance is expected to increase in 2013.

Club offered classes: No classes are being offered at this time. More discussion will be given to this subject during future meetings. The club in the past has offered Amateur Radio classes. ITT has been mentioned as a venue for classes. James A. Markstrom, KB9MMA is teaching there part time. In the past classes ran six weeks, each Saturday for three hours. Teaching participants how to pass the test should not be the objective. Learning how to set up and operate your radio and proper radio procedure are necessary to being an Amateur Radio operator.

The Milwaukee VEC has decided to no longer contribute to the phone bill that the club pays for the voice messaging system. Someone on the club Board of Directors' should approach the VEC on this again in the future.

Board of Director's Minutes Concluded

Club officers: Who are going to be the club officers for 2012? There will be seven director's beginning this year. From that group, club officers will be appointed by vote of the Board. Officers will now serve a one year term, down from two years. Joe, N9UX will continue as treasurer, and Michael, KC9CMT will continue as Recording Secretary.

Join us!

Join the **Milwaukee Radio Amateurs' Club** at it's annual Field day.

Again this year, the Milwaukee Radio Club and the Milwaukee Area Amateur Radio Society will take part in a joint Field Day effort this weekend June 23&24. This year we will setup our operation in Konkel Park located at 51st and Layton Ave. We begin our setup at 1pm on Friday and stay until we are packed up on Sunday afternoon. On Friday evening we plan on checking into the MRAC 10 meter net on 28.490MHz at 8pm. This year we will have two HF plus a GOTA station on the air. We will also have a 6 and 2 meter station setup.

We invite everyone to attend and check out the setup. Our goal is to setup working stations for people to operate. Don't worry if you are not a contester, this is for fun. We just want to get people out and on the air. There will be plenty of time for sitting around and socializing. We also want to demonstrate to the general public what Amateur Radio is all about. So please join us this year and help make this a great time.

Dave Schank KA9WXN

Next Regular Meeting

The next meeting will be on Thursday, June 28th at 7:00PM. We meet in the Fellowship Hall of Redemption Lutheran Church, 4057 N Mayfair Road. Use the south entrance. Access the MRAC Yahoo group for important details about the February Meeting.

Please do not call the church for information!

Club Nets

Please check in to our nets on Friday evenings.

Our ten meter SSB net is at **8:00 p.m.** at **28.490 MHz USB** Our two meter FM net follows at **9:00 p.m**. on our repeater at **145.390 MHz** with a minus offset and a **PL of 127.3 Hz.**

Visit our website at: **www.w9rh.org**

Or phone (414) 332-MRAC or 332 - 6722

Chatter Deadline

The **DEADLINE** for items to be published in the **Chatter** is the 15th of each month. If you have anything (announcements, stories, articles, photos, projects) for the 'Chatter, please get it to me before then.

You may contact me or Submit articles and materials by e-mail at: **Kc9cmt@earthlink.net**

or by Post to:

Michael B. Harris

807 Nicholson RD

South Milwaukee, WI 53172-1447

Transistors

Transistors are active components and are found everywhere in electronic circuits. They are used as amplifiers and switching devices. As amplifiers, they are used in high and low frequency stages, oscillators, modulators, detectors and in any circuit needing to perform a function. In digital circuits they are used as switches.

There is a large number of manufacturers around the world who produce semiconductors (transistors are members of this family of components), so there are literally thousands of different types. There are low, medium and high power transistors, for working with high and low frequencies, for working with very high current and/or high voltages. Several different transistors are shown on 4.1.

The most common type of transistor is called bipolar and these are divided into NPN and PNP types.
Their construction-material is most commonly silicon (their marking has the letter B) or germanium (their marking has the letter A). Original transistor were made from germanium, but they were very temperature-sensitive. Silicon transistors are much more temperature-tolerant and much cheaper to manufacture.

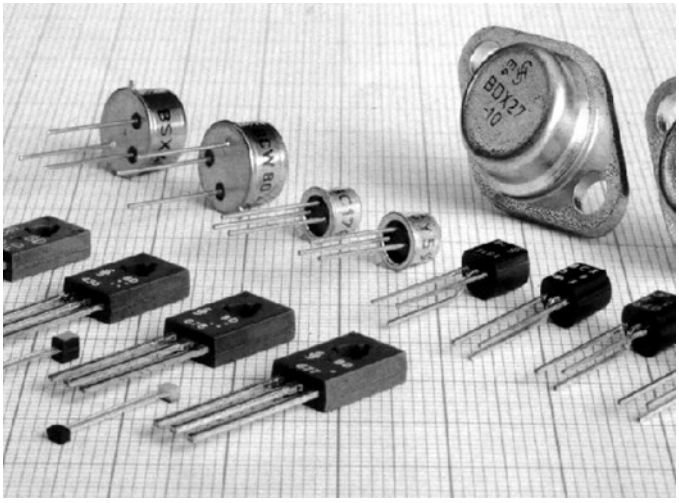


Fig. 4.1: Different transistors

The second letter in transistor's marking describes its primary use:
C - low and medium power LF transistor,
D - high power LF transistor,
F - low power HF transistor,
G - other transistors,
L - high power HF transistors,
P - photo transistor,
S - switch transistor,
U - high voltage transistor.

Here are few examples:
AC540 - germanium core, LF, low power,
AF125 - germanium core, HF, low power,
BC107 - silicon, LF, low power (0.3W),
BD675 - silicon, LF, high power (40W),
BF199 - silicon, HF (to 550 MHz),
BU208 - silicon (for voltages up to 700V),
BSY54 - silicon, switching transistor.
There is a possibility of a third letter (R and Q - microwave transistors, or X - switch transistor), but these letters vary from manufacturer to manufacturer.
The number following the letter is of no importance to users.
American transistor manufacturers have different marks, with a 2N prefix followed by a number (2N3055, for example). This mark is similar to diode marks, which have a 1N prefix (e.g. 1N4004).
Japanese bipolar transistor are prefixed with a: 2SA, 2SB, 2SC or 2SD, and FET-s with 3S:
2SA - PNP, HF transistors,
2SB - PNP, LF transistors,
2SC - NPN, HF transistors,
2SD - NPN, HF transistors.
Several different transistors are shown in photo 4.1, and symbols for schematics are on 4.2. Low power transistors are housed in a small plastic or metallic cases of various shapes. Bipolar transistors have three leads: for base (B), emitter (E), and for collector (C). Sometimes, HF transistors have another lead which is connected to the metal housing. This lead is connected to the ground of the circuit, to protect the transistor from possible external electrical interference. Four leads emerge from some other types, such as two-gate FETs. High power transistors are different from low-to-medium power, both in size and in shape.

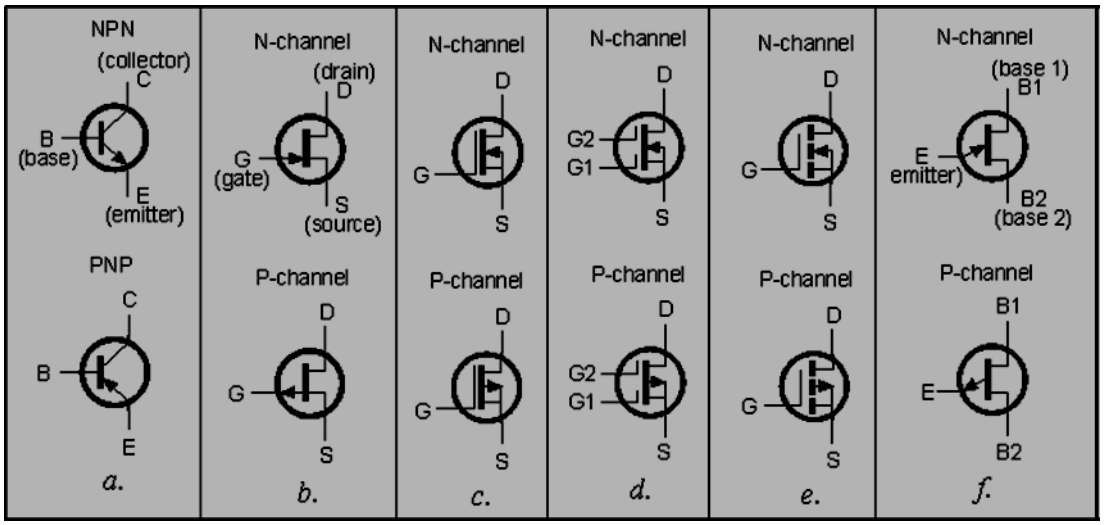


Fig. 4.2: Transistor symbols: a - bipolar, b - FET, c - MOSFET, d - dual gate MOSFET, e - inductive channel MOSFET, f - single connection transistor

It is important to have the manufacturer's catalog or a datasheet to know which lead is connected to what part of the transistor. These documents hold the information about the component's correct use (maximum current rating, power, amplification, etc.) as well as a diagram of the pinout. Placement of leads and different housing types for some commonly used transistors are in diagram 4.3.

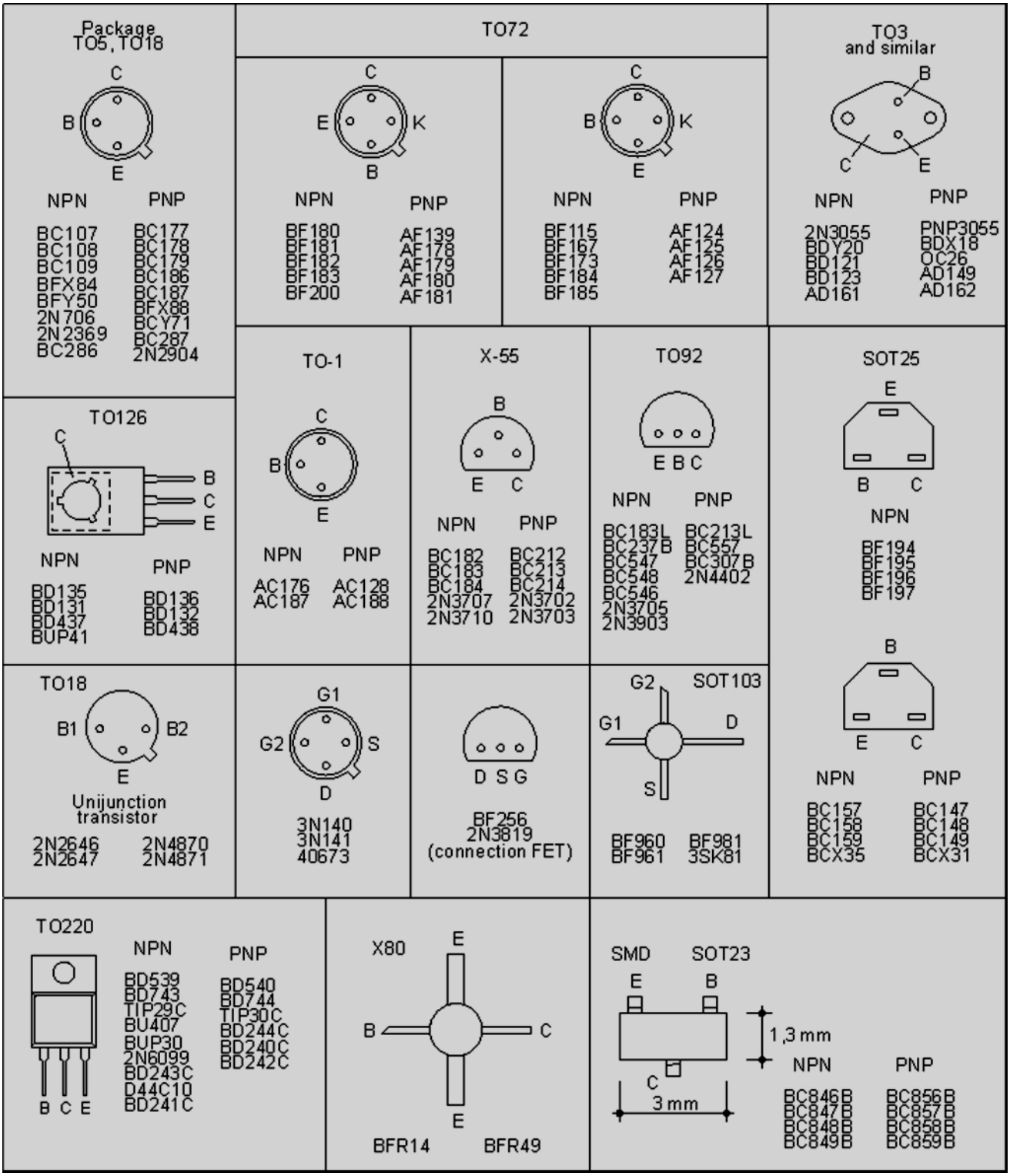


Fig. 4.3: Pinouts of some common packages

The Experimenters Bench Continued

It might be useful to remember the pinout for TO-1, TO-5, TO -18 and TO-72 packages and compare them with the drawing 4.2 (a). These transistors are the ones you will come across frequently in everyday work.

The TO-3 package, which is used to house high-power transistors, has only two pins, one for base, and one for emitter. The collector is connected to the package, and this is connected to the rest of the circuit via one of the screws which fasten the transistor to the heat-sink.

Transistors used with very high frequencies (like BFR14) have pins shaped differently.
One of the breakthroughs in the field of electronic components was the invention of SMD (surface mount devices) circuits. This technology allowed manufacturers to achieve tiny components with the same properties as their larger counterparts, and therefore reduce the size and cost of the design. One of the SMD housings is the SOT23 package. There is, however, a trade-off to this, SMD components are difficult to solder to the PC board and they usually need special soldering equipment.

As we said, there are literally thousands of different transistors, many of them have similar characteristics, which makes it possible to replace a faulty transistor with a different one. The characteristics and similarities can be found in comparison charts. If you do not have one these charts, you can try some of the transistors you already have. If the circuit continues to operate correctly, everything is ok. You can only replace an NPN transistor with an NPN transistor. The same goes if the transistor is PNP or a FET. It is also necessary to make sure the pinout is correct, before you solder it in place and power up the project.
As a helpful guide, there is a chart in this chapter which shows a list of replacements for some frequently used transistors.

The working principle of a transistor

Transistors are used in analog circuits to amplify a signal. They are also used in power supplies as a regulator and you will also find them used as a switch in digital circuits.
The best way to explore the basics of transistors is by experimenting. A simple circuit is shown below. It uses a power transistor to illuminate a globe. You will also need a battery, a small light bulb (taken from a flashlight) with properties near 4.5V/0.3A, a linear potentiometer (5k) and a 470 ohm resistor. These components should be connected as shown in figure 4.4a.

Resistor (R) isn't really necessary, but if you don't use it, you mustn't turn the potentiometer (pot) to its high position, because that would destroy the transistor - this is because the DC voltage UBE (voltage between the base and the emitter), should not be higher than 0.6V, for silicon transistors.

Turn the potentiometer to its lowest position. This brings the voltage on the base (or more correctly between the base and ground) to zero volts (UBE = 0). The bulb doesn't light, which means there is no current passing through the transistor.

As we already mentioned, the potentiometers lowest position means that UBE is equal to zero. When we turn the knob from its lowest position UBE gradually increases. When UBE reaches 0.6v, current starts to enter the transistor and the globe starts to glow. As the pot is turned further, the voltage on the base remains at 0.6v but the current increases and this increases the current through the collector-emitter circuit. If the pot is turned fully, the base voltage will increase slightly to about 0.75v but the current will increase significantly and the globe will glow brightly.

If we connected an ammeter between the collector and the bulb (to measure IC), another ammeter between the pot and the base (for measuring IB), and a voltmeter between the ground and the base and repeat the whole experiment, we will find some interesting data. When the pot is in its low position UBE is equal to 0V, as well as currents IC and IB. When the pot is turned, these values start to rise until the bulb starts to glow when they are: UBE = 0.6V, IB = 0.8mA and IB = 36 mA (if your values differ from these values, it is because the 2N3055 the writer used doesn't have the same specifications as the one you use, which is common when working with transistors).
The end result we get from this experiment is that when the current on the base is changed, current on the collector is changed as well.

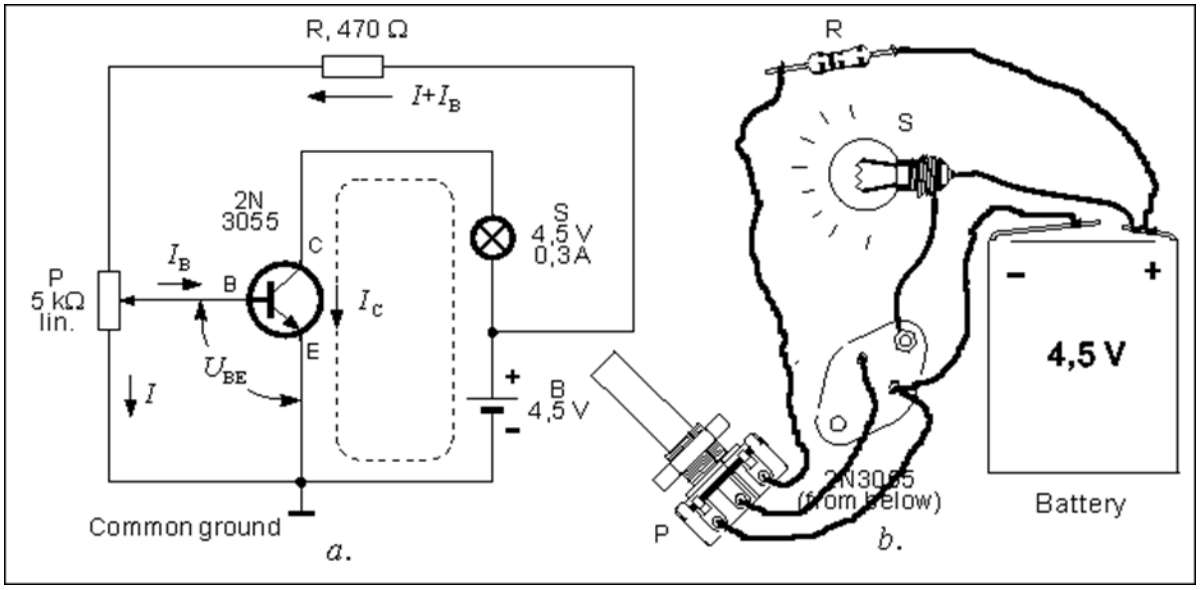
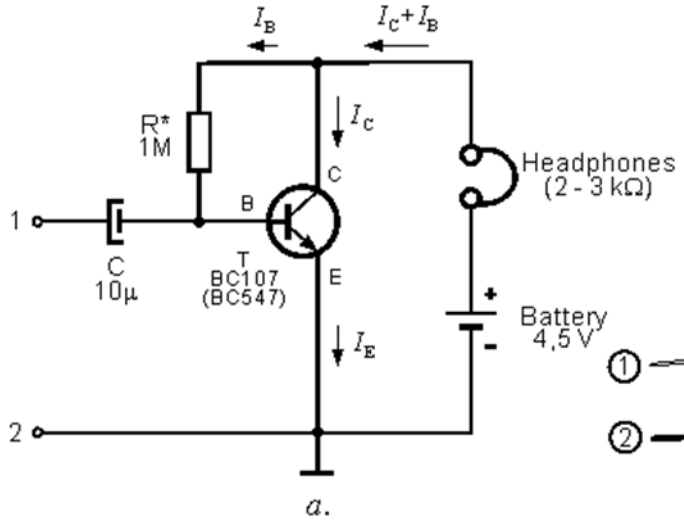


Fig. 4.4: Working principle of a transistor: potentiometer moves toward its upper position - voltage on the base increases - current through the base increases - current through the collector increases - the brightness of the globe increases.

Let's look at another experiment which will broaden our knowledge of the transistor. It requires a BC107 transistor (or any similar low power transistor), supply source (same as in previous experiment), 1M resistor, headphones and an electrolytic capacitor whose value may range between 10u to 100µF with any operating voltage.
A simple low frequency amplifier can be built from these components as shown in diagram 4.5.



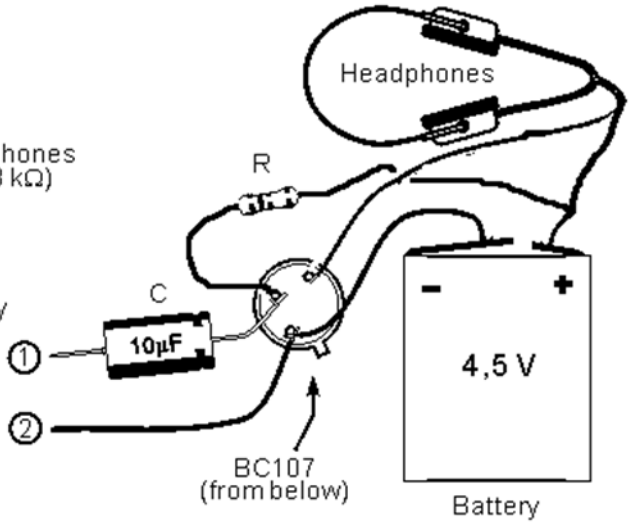


Fig. 4.5: A simple transistor amplifier

It should be noted that the schematic 4.5a is similar to the one on 4.4a. The main difference is that the collector is connected to headphones. The "turn-on" resistor - the resistor on the base, is 1M. When there is no resistor, there is no current flow IB, and no Ic current. When the resistor is connected to the circuit, base voltage is equal to 0.6V, and the base current IB = 4µA. The transistor has a gain of 250 and this means the collector current will be 1 mA. Since both of these currents enter the transistor, it is obvious that the emitter current is equal to IE = IC + IB. And since the base current is in most cases insignificant compared to the collector current, it is considered that:

$$I_C = I_E.$$

The relationship between the current flowing through the collector and the current flowing through the base is called the transistor's current amplification coefficient, and is marked as hFE. In our example, this coefficient is equal to:

$$h_{FE} = \frac{I_C}{I_B} = \frac{1mA}{4\mu A} = \frac{1 \cdot 10^{-3} A}{4 \cdot 10^{-6} A} = 250.$$

Put the headphones on and place a fingertip on point 1. You will hear a noise. You body picks up the 50Hz AC "mains" voltage. The noise heard from the headphones is that voltage, only amplified by the transistor. Let's explain this circuit a bit more. Ac voltage with frequency 50Hz is connected to transistor's base via the capacitor C. Voltage on the base is now equal to the sum of a DC voltage (0.6 approx.) via resistor R, and AC voltage "from" the finger.

This means that this base voltage is higher than 0.6V, fifty times per second, and fifty times slightly lower than that. Because of this, current on the collector is higher than 1mA fifty times per second, and fifty times lower. This variable current is used to shift the membrane of the speakerphones forward fifty times per second and fifty times backwards, meaning that we can hear the 50Hz tone on the output.
Listening to a 50Hz noise is not very interesting, so you could connect to points 1 and 2 some low frequency signal source (CD player or a microphone).

There are literally thousands of different circuits using a transistor as an active, amplifying device. And all these transistors operate in a manner shown in our experiments, which means that by building this example, you're actually building a basic building block of electronics.

4.2 Basic characteristics of transistors

Selecting the correct transistor for a circuit is based on the following characteristics: maximum voltage rating between the collector and the emitter UCEmax, maximum collector current ICmax and the maximum power rating PCmax.

If you need to change a faulty transistor, or you feel comfortable enough to build a new circuit, pay attention to these three values. Your circuit must not exceed the maximum rating values of the transistor. If this is disregarded there are possibilities of permanent circuit damage. Beside the values we mentioned, it is sometimes important to know the current amplification, and maximum frequency of operation.
When there is a DC voltage UCE between the collector (C) and emitter (E) with a collector current, the transistor acts as a small electrical heater whose power is given with this equation:

$$P_C = U_{CE} \cdot I_C.$$

Because of that, the transistor is heating itself and everything in its proximity. When UCE or ICE rise (or both of them), the transistor may overheat and become damaged. Maximum power rating for a transistor, is PCmax (found in a datasheet). What this means is that the product of UCE and IC should not be higher than PCmax:

$$U_{CE} \cdot I_C = P_{C\max}$$

Experimenters Bench Concluded:

So, if the voltage across the transistor is increased, the current must be dropped.
For example, maximum ratings for a BC107 transistor are:
ICmax=100mA,
UCEmax = 45V and
PCmax = 300mW
If we need a Ic=60mA , the maximum voltage is:

$$U_{CE} = \frac{P_{C\max}}{I_C} = \frac{300\,mW}{60\,mA} = 5\,V.$$

For UCE = 30V, the maximum current is:

$$I_C = \frac{P_{C\max}}{U_{CE}} = \frac{300\,mW}{30V} = 10\,mA.$$

Among its other characteristics, this transistor has current amplification coefficient in range between hFE= 100 to 450, and it can be used for frequencies under 300MHz. According to the recommended values given by the manufacturer, optimum results (stability, low distortion and noise, high gain, etc.) are with UCE=5V and IC=2mA.

There are occasions when the heat generated by a transistor cannot be overcome by adjusting voltages and current. In this case the transistors have a metal plate with hole, which is used to attach it to a heat-sink to allow the heat to be passed to a larger surface.

Current amplification is of importance when used in some circuits, where there is a need for equal amplification of two transistors. For example, 2N3055H transistors have hFE within range between 20 and 70, which means that there is a possibility that one of them has 20 and other 70. This means that in cases when two identical coefficients are needed, they should be measured. Some multimeters have the option for measuring this, but most don't. Because of this we have provided a simple circuit (4.6) for testing transistors. All you need is an option on your multimeter for measuring DC current up to 5mA. Both diodes (1N4001, or similar general purpose silicon diodes) and 1k resistors are used to protect the instrument if the transistor is "damaged". As we said, current gain is equal to hFE = IC / IB. In the circuit, when the switch S is pressed, current flows through the base and is approximately equal to IB=10uA, so if the collector current is displayed in milliamps. The gain is equal to:

$$h_{FE} = 100 \cdot I_C$$

For example, if the multimeter shows 2.4mA, hFE = 2.4*100 = 240.

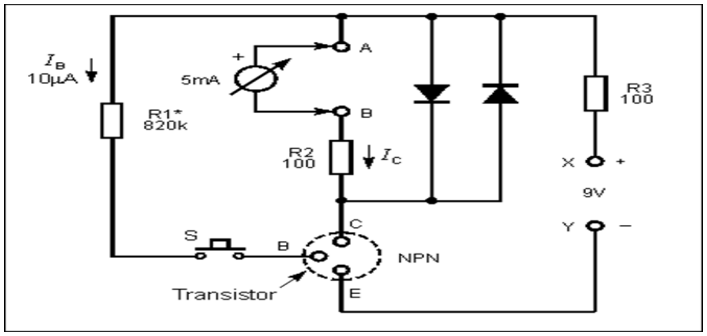


Fig. 4.6: Measuring the hFE

While measuring NPN transistors, the supply should be connected as shown in the diagram. For PNP transistors the battery is reversed. In that case, probes should be reversed as well if you're using analog instrument (one with a needle). If you are using a digital meter (highly recommended) it doesn't matter which probe goes where, but if you do it the same way as you did with NPN there would be a minus in front of the read value, which means that current flows in the opposite direction.

4.3 The safest way to test transistors

Another way to test transistor is to put it into a circuit and detect the operation. The following circuit is a multivibrator. The "test transistor" is T2. The supply voltage can be up to 12v. The LED will blink when a good transistor is fitted to the circuit.

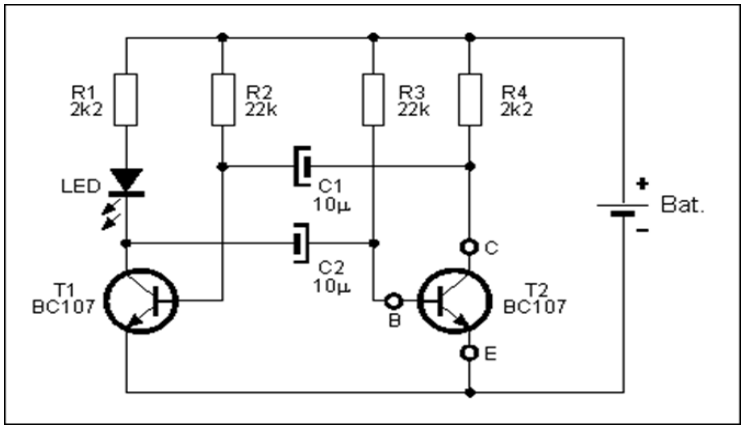


Fig. 4.7: Oscillator to test transistors

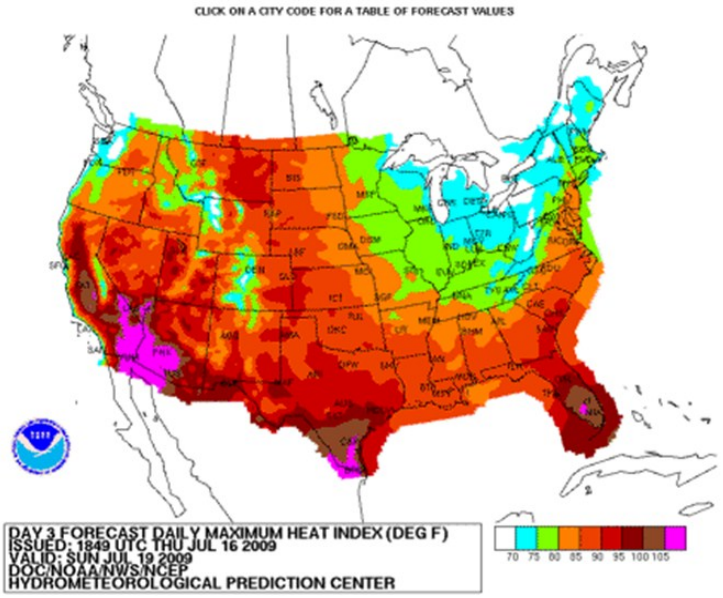
To test PNP transistors, same would go, only the transistor which would need to be replaced is the T1, and the battery, LED, C1 and C2 should be reversed.

Heat: A Major Killer

Heat is the number one weather-related killer in the United States. The National Weather Service statistical data shows that heat causes more fatalities per year than floods, lightning, tornadoes and hurricanes combined. Based on the 10-year average from 2000 to 2009, excessive heat claims an average of 162 lives a year. By contrast, hurricanes killed 117; floods 65; tornadoes, 62; and lightning, 48.
In the disastrous heat wave of 1980, more than 1,250 people died. In the heat wave of 1995 more than 700 deaths in the Chicago area were attributed to heat. In August 2003, a record heat wave in Europe claimed an estimated 50,000 lives. North American summers are hot; most summers see heat waves in or more parts of the United States. East of the Rockies, they tend to combine both high temperature and high humidity, although some of the worst heat waves have been catastrophically dry. Additional detail on how heat impacts the human body is provided under "The Hazards of Excessive Heat" heading.

NOAA's Watch, Warning, and Advisory Products for Extreme Heat

Each National Weather Service (NWS) Weather Forecast Office (WFO) can issue the following heat-related products as conditions warrant:
Excessive Heat Outlook: are issued when the potential exists for an excessive heat event in the next 3-7 days. An Outlook provides information to those who need considerable lead time to prepare for the event, such as public utilities, emergency management and public health officials.
Excessive Heat Watch: is issued when conditions are favorable for an excessive heat event in the next 12 to 48 hours. A Watch is used when the risk of a heat wave has increased, but its occurrence and timing is still uncertain. A Watch provides enough lead time so those who need to prepare can do so, such as cities who have excessive heat event mitigation plans.
Excessive Heat Warning/Advisory are issued when an excessive heat event is expected in the next 36 hours. These products are issued when an excessive heat event is occurring, is imminent, or has a very high probability of occuring. The warning is used for conditions posing a threat to life or property.
An advisory is for less serious conditions that cause significant discomfort or inconvenience and, if caution is not taken, could lead to a threat to life and/or property.



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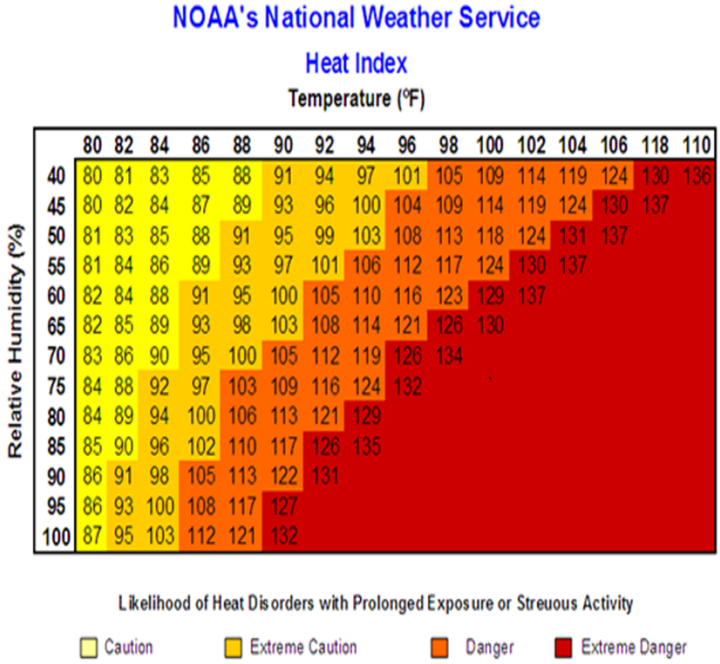
How Forecasters Decide Whether to Issue Excessive Heat Products

NOAA's heat alert procedures are based mainly on Heat Index Values. The Heat Index, sometimes referred to as the apparent temperature and given in degrees Fahrenheit, is a measure of how hot it really feels when relative humidity is factored with the actual air temperature.

To find the heat index, look at the Heat Index Chart. As an example, if the air temperature is 96°F (found on the top of the table) and the relative humidity is 65% (found on the left of the table), the heat index--how hot it feels--is 121°F. The National Weather Service will initiate alert procedures when the Heat Index is expected to exceed 105°- 110°F (depending on local climate) for at least 2 consecutive days.

This Article was produced as a cooperative effort of the National Weather Service, the Federal Emergency Management Agency and the American Red Cross.



IMPORTANT: Since heat index values were devised for shady, light wind conditions, **exposure to full sunshine can increase heat index values by up to 15Â°f.** also, **strong winds**, particularly with very hot, dry air, can be extremely hazardous.
The Heat Index Chart shaded zone above 105°F shows a level that may cause increasingly severe heat disorders with continued exposure and/or physical activity.

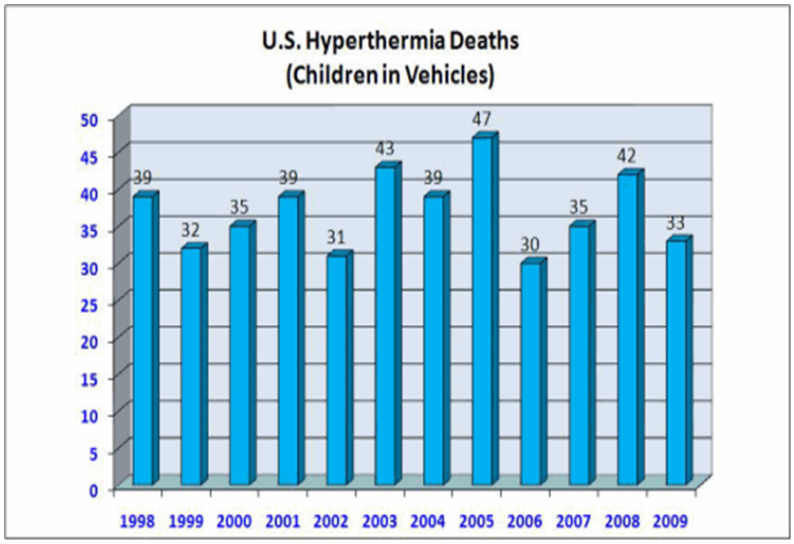
The Hazards of Excessive Heat

Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating or a chemical (salt) imbalance caused by too much sweating. When the body heats to quickly to cool itself safely, or when you lose much fluid or salt through dehydration or sweating, your body temperature rises and heat-related illness may develop. Heat disorders share one common feature: the individual has been in the heat too long is exercised too much for his or her age and physical condition.
Studies indicate that, other things being equal, the severity of heat disorders tend to increase with age. Conditions that cause heat cramps in a 17-year-old may result in heat exhaustion in someone 40, and heat stroke in a person over 60.
Sunburn, with its ultraviolet radiation burns, can significantly retard the skin's ability to shed excess heat.
Acclimatization has to do with adjusting sweat-salt concentrations, among other things. The idea is to lose enough water to regulate body temperature, with the least possible chemical disturbance/salt depletion.

Children, Adults and Pets Enclosed in Parked Vehicles Are at Great Risk

Each year children die from hyperthermia as a result of being left in parked vehicles. Hyperthermia is an acute condition that occurs when the body absorbs more heat than it can dissipate. Hyperthermia can occur even on a mild day. Studies have shown that the temperature inside a parked vehicle can rapidly rise to a dangerous level for children, adults and pets.

Leaving the windows slightly open does not significantly decrease the heating rate. The effects can be more severe on children because their bodies warm at a faster rate than adults. Shown below is a time lapse photo of a thermometer reading in a car over a period of less than an hour. As the photograph shows, in just over 2 minutes the call went from a safe temperature to 94.3 degree F. These photos demonstrate just how quickly a vehicle can become a death trap for a child.



Hyperthermia deaths aren't confined to summer months. They also happen during the spring and fall. Below are some examples.

- **Honolulu, HI, March 07, 2007:** A 3-year-old girl died when the father left her in a child seat for an 1.5 hours while he visited friends in a Makiki apartment building. The outside temperature was only **81 degrees**.
- **North Augusta, SC, April 2006:** A mother left her 15 month old son in a car. He was in a car for 9 hours while his mom went to work. She is now serving a 20-year prison sentence.

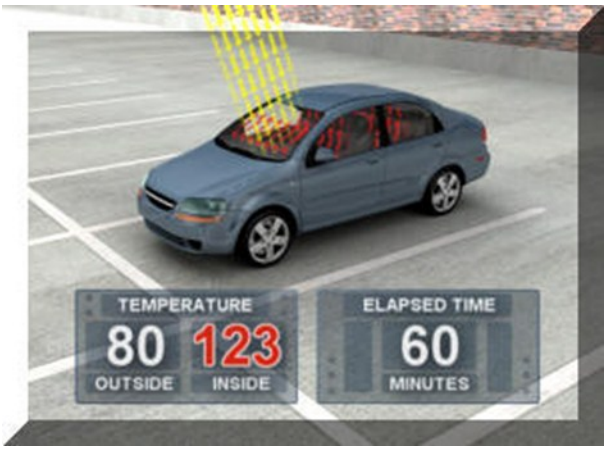
Denver, CO, August 2008: Two kids that died in an overheated car may have been on their own for more than **3 hours** as their mother slept after working a night shift. The kids died in a closed but unlocked car. Investigators believe the temperature in the car may have reached 123 degrees F.

Adults are in danger too. On July 12, 2001, a man died of heatstroke after falling asleep in his car with the windows rolled up in the parking lot of a supermarket in Hinds County, MS.

How Fast Can the Sun Heat A Car?

The atmosphere and the windows of a car are relatively "transparent" to the sun's shortwave radiation (yellow in figure below) and are warmed little. Â This shortwave energy, however, does heat objects it strikes. Â For example, a dark dashboard or seat can easily reach temperatures in the range of 180 to more than 200 degrees F.
These objects (e.g., dashboard, steering wheel, child seat) heat the adjacent air by conduction and convection and also give off longwave radiation (red) which is very efficient at warming the air trapped inside a vehicle.

Objects Heated by the Sun Warm Vehicle's Air



Heat Safety

Child Safety Tips

- **Make sure your child's safety seat and safety belt buckles aren't too hot** before securing your child in a safety restraint system, especially when your car has been parked in the heat.
- **Never leave your child** unattended in a vehicle, even with the windows down.
- **Teach children not to play** in, on or around cars.
- **Always lock car** doors and trunks--even at home--and keep keys out of children's reach.

Always make sure all children have left the car when you reach your destination. Don't leave sleeping infants in the car ever!

Adult Heat Wave Safety Tips

- **Slow down.** Reduce, eliminate or rescheduled strenuous activities until the coolest time of the day. Children, senior and anyone with health problems should stay in the coolest available place, not necessarily indoors.
- **Dress for summer.** Wear lightweight, light-colored clothing to reflect heat and sunlight.
- **Put less fuel on your inner fires.** Foods, like meat and other proteins that increase metabolic heat production also increase water loss.
- **Drink plenty of water or other non-alcohol or decaffeinated fluids.** Your body needs water to keep cool. Drink plenty of fluids even if you don't feel thirsty. Persons who have epilepsy or heart, kidney, or liver disease, are on fluid restrictive diets or have a problem with fluid retention should consult a physician before increasing their consumption of fluids. **Do not drink alcoholic beverages and limited caffeinated beverages.**
- **During excess heat period, spend more time in air-conditioned places.** Air conditioning in homes and other buildings markedly reduces danger from the heat. If you cannot afford an air conditioner, go to a library, store or other location with air conditioning for part of the day.
- **Don't get too much sun.** Sunburn reduced your body's ability to dissipate heat.

Do not take salt tablets unless specified by a physician.

Heat Disorder Symptoms

SUNBURN: Redness and pain. In severe cases swelling of skin, blisters, fever, headaches. **First Aid:** Ointments for mild cases if blisters appear and do not break. If breaking occurs, apply dry sterile dressing. Serious, extensive cases should be seen by physician.

HEAT CRAMPS: Painful spasms usually in the muscles of legs and abdomen. Heavy sweating. **First Aid:** Firm pressure on cramping muscles or gentle massage to relieve spasm. Give sips of water. If nausea occurs, discontinue water.

HEAT EXHAUSTION: Heavy sweating, weakness, skin cold, pale and clammy. Pulse thready. Normal temperature possible. Fainting and vomiting. **First Aid:** Get victim out of sun. Once inside, the person should lay down and loosen clothing. Apply cool, wet cloths. Fan or move victim to air conditioned room. Offer sips of water. If nausea occurs, discontinue water. If vomiting continues, seek immediate medical attention.
HEAT STROKE (or sunstroke): High body temperature (106° F or higher). Hot dry skin. Rapid and strong pulse. Possible unconsciousness.

First Aid: HEAT STROKE IS A SEVERE MEDICAL EMERGENCY. SUMMON EMERGENCY MEDICAL ASSISTANCE OR GET THE VICTIM TO A HOSPITAL IMMEDIATELY. DELAY CAN BE FATAL. White waiting for emergency assistance, move the victim to a cooler environment Reduce body temperature with cold bath or sponging. Use extreme caution. Remove clothing, use fans and air conditioners. If temperature rises again, repeat process. Do not give fluids. Persons on salt restrictive diets should consult a physician before increasing their salt intake.
For more information contact your local American Red Cross Chapter. Ask to enroll in a first aid course

Community Guidance: Preparing for and Responding to Excessive Heat Events

The Excessive Heat Events Guidebook was developed by the Environmental Protection Agency (EPA) in 2006, in collaboration with the National Weather Service, the Centers for Disease Control and Prevention, and theDepartment of Homeland Security. This guidebook provides best practices for saving lives during heat waves in urban areas, and provides a menu of options that communities can use in developing their own mitigation plans.

TUNNEL RATS

By Martin Tingey.

How it all began:
Friday 7th of January 1966. The 1st Battalion of the 28th Infantry, itself part of the 3rd Brigade of the 1st Infantry (Inft) Division - "The Big Red One"- was engaged in operation "Crimp". The first search and destroy sweep into the VC held area's Northwest of Saigon. Operation "Crimp" was intended to be a massive strike against the VC in South Vietnam; in and around the Ho Bo woods just west of the Iron triangle.

Even as the men from the 1st Battery 28th Inft touched down on LZ (landing zone) "Jack" they could see their comrades in the 1st Battery 16th Inft were already in trouble and engaging the enemy in small firefights. The men quickly de-assed their helicopters and moved into the nearby tree line hoping to find, engage, and destroy the VC that had been harassing the soldiers of the 16th Inft.

Just inside the tree line at the edge of a rubber plantation, the men of the 28th discovered a large trench - but no enemy. Where had they gone? How could the VC who had been firing at the men of the 16th Inft just disappear apparently into thin air? As the Battery moved forward it began to find large caches of rice, and enough food to feed a Regiment. As the operation continued, over the next couple of days foxholes, trenches, and caves were discovered. Still no enemy were being engaged in running firefights, or surrendering, and all the time US casualties were mounting through sustained enemy sniper fire.

By the 10th of January the 28th had reached the banks of the Saigon river. So far during the 3 days of the operation only a couple of brief glimpses of the enemy had been seen. Late in the afternoon of the 10th word came through via the radio that elements of the 173rd Abn Bgd, and the Ausies to the North had made contact with the VC and - found tunnels. The next day the 11th of January the 28th began to retrace it's foot steps. It had finally dawned on the Battery Commander LTC Robert Haldane what had happened - they had literally walked right over the VC! Searches were begun for the tunnel entrances but nothing much was discovered. By now hot and tired, and waiting for further instructions some of the GIs began to sit down for a quick rest. Sergeant Stewart Green did the same, but only momentarily, as he suddenly leap to his feet cursing that something had bitten him on the ass. Thinking he'd been stung by a scorpion, or worse bitten by a snake, Green searched through the layer of dead leaves that covered the ground looking for the creature that bitten him. Only to discover it was a nail sticking up from the ground. Upon further careful inspection it was discovered that the nail was part of a small wooden trap door - Haldane's men had found their first tunnel!

The Tunnel System:
Originally the tunnels were started during the war against the French, but which were rapidly expanded upon when the Americans arrived. They were constructed by volunteer(!) village laborers using simple hoe's and baskets.

The Laterite clay in which the tunnels were dug has a dull reddish appearance and dries rock hard during the dry season. During the wet season it is very soft and much easier to work. Because of the very nature of the Laterite clay's ability to dry rock hard it made a very good (if a somewhat difficult substance to work) soil in which to carve out a tunnel. The passages themselves were not cut in dead straight lines, rather they were made with corners that had between a 60 - degree and a 120 - degree angle to them. In other words the corners were constructed with no less than a 60 - degree angle and no more than a 120 - degree angle. This made shooting in a straight line impossible, and helped to deflect explosive blasts from grenades that might be thrown down.

The tunnel systems (where the water table permitted) had several levels, each level was separated by a watertight trap door which would seal the rest of the system against gas, flooding, etc. The trap doors themselves were virtually undetectable and could fool a person into believing that the tunnel finished in a dead end, when in reality it led into a huge system of other passages. These passages would in turn lead to underground ammo dumps, kitchens, air raid shelters, hospitals, store rooms, workshops, latrines, and even theaters for the performances of political plays.

All the tunnel systems had smaller thin (drain pipe sized) ventilation shafts leading from the surface down to the 1st level. These vents were constructed with an oblique angle so as to prevent the monsoon rains flooding the system. Vents were placed so as to face east and the light of a new day, whilst others were placed toward the wind so as to provide a constant cooling draught. Despite these efforts the tunnels were still hot, dark, and claustrophobic, even at the best of times.

The VC also dragged the bodies of its dead comrades underground in order to inter them in temporary graves when it became impossible to bury them above ground due to the presence of American troops. Once they had been dragged underground they were buried in the fetus position in the tunnel walls and covered with a thin layer of clay.

A Special Breed of Man:

Originally called "Tunnel Runners" by the 25th Inft Division, and "Ferrets" by the Australian Army, the term "Tunnel Rat" soon became their official accepted name. The US Army soon realized that trying to destroy the tunnels was a short-sighted policy that wasn't going to work. Moreover this was also a loss as the underground networks could yield vital intelligence on the VC in the form of plans and documents. A chemical officer of the 1st Inft Div., Capt. Herbert Thornton a Southerner, was charged with setting up the first tunnel team.

The kind of man that Thornton sought for his tunnel team had to be a special breed. He had to have an even temperament, an inquisitive mind, a lot of common sense (in order to know what to touch and what not to), and to be exceptionally brave.

All of Thornton's men were volunteers, most (not all) were small men of slight build who could squeeze through the tight trap doors and crawl along the narrow passages with relative ease. No dead tunnel rats were left in a tunnel, dead or wounded they were all dragged out with commo. wire, ropes, or by a comrade using a fireman's crawl. It was a very stressful, nerve racking job, pushing the rat's mental state to its limits. Crawling through narrow, pitch black tunnels, sometimes for hours looking for a heavily armed enemy who would if he got the drop on you not hesitate to kill you. Occasionally under the strain a mans nerves would break and he'd be dragged from the tunnel screaming and crying. Once this happened he would never be allowed down a tunnel again.

If going down into a tunnel posed a threat, then coming up again could be just as dangerous. Upon emerging from a tunnel a rat would often whistle "Dixie" just to let the troops on the surface know he was on their side. A little guy stripped to the waist and covered in dirt could easily be mistaken (particularly if he was oriental looking) for a VC and shot by his own side.

Traps and Creepy Crawlies:

Going down into a tunnel system was a very risky business fraught with danger. Usually armed only with a pistol or a knife and a flashlight. The tunnel rat would descend into a pitch black, claustrophobic, dank hell, to play a deadly game of hide and seek with the enemy. Carefully probing the floor, sides and roofs of the tunnels became second nature to the tunnel rat as he gently inched and probed his way along. Feeling for wires or tree roots that didn't quite feel right, knowing that anyone of them could detonate a booby trap and blow him to smithereens.

Tunnel entrances were sometimes mined or covered by concealed firing positions. On other occasions an entrance would drop into a punji stake pit which would be covered by two rifle men, one either side. Another way in which the unsuspecting tunnel rat could meet his death was by garotting him or cutting his throat as he came up through a connecting trap door.

Besides the booby traps the tunnels also held other nasty surprises. Living along side the VC was a whole plethora of animals which had also made their homes in the dark confines of the tunnels. Bats (the cave dwelling nectar eating bat and the black bearded tomb bat) would use the tunnels as a roosting ground during the daylight hours. A tunnel rat crawling through a tight tunnel would wake them from their rest causing them to fly right at him, getting tangled in his hair and running and crawling all over him. Snakes were also encountered underground. Two of the most deadly being the bamboo viper and the Krait. Sometimes the VC would deliberately tether a snake in a tunnel to use it as a sort of natural booby trap. Scorpions were also used as booby traps, the VC would take boxes of them into the tunnels. The box would be rigged with a trip wire, the tunnel rat tripped the wire and the scorpions would fall on him stinging him in the process. Being stripped to the waist and slowly crawling along on their stomachs also exposed the rats to bites from fire ants that inhabited the underground labyrinths.

Other nasty's to be encountered in the tunnels were real rats, and spiders like the giant crab spider. Sometimes whole chambers were crawling with a thick black mass of tiny spiders the size of a thumb nail, giving the illusion that the walls were moving!

Tools of Their Trade:
It was soon discovered early on that to fight in the tunnels the tunnel rat had to do away with most of the infantryman's basic load. In fact the total lack of equipment carried by a rat was a distinct advantage, which greatly increased his chances of survival. The basic tools of the tunnel rat were the knife, the pistol, and a flashlight.

The pistols that were carried by the tunnel rats were varied, the .38 Smith and Wesson was a favorite. Other tunnel rats procured their own personal firearms to suit their own needs. One of these was Master Sgt Flo Rivera who acquired and used a 9mm German Luger. The one weapon everyone agreed about was the Colt .45. It was too big, with a silencer it was to cumbersome and when it was fired underground without a silencer its bark was deafening. Making it impossible to hear the enemy.

One of the tunnel rats golden rules was you never fired more than 3 shots underground without reloading, as the VC would know you were out of ammo.
The flashlight was the standard Army issue type and every rat carried one. These were carried in a way so as not to make themselves a nicely illuminated target. If the bulb in the flashlight went it had to be changed. This was practiced so it could be done in pitch darkness by touch alone, and done quickly, lying prone, squatting, or kneeling down.

The Tunnel Exploration Kit:

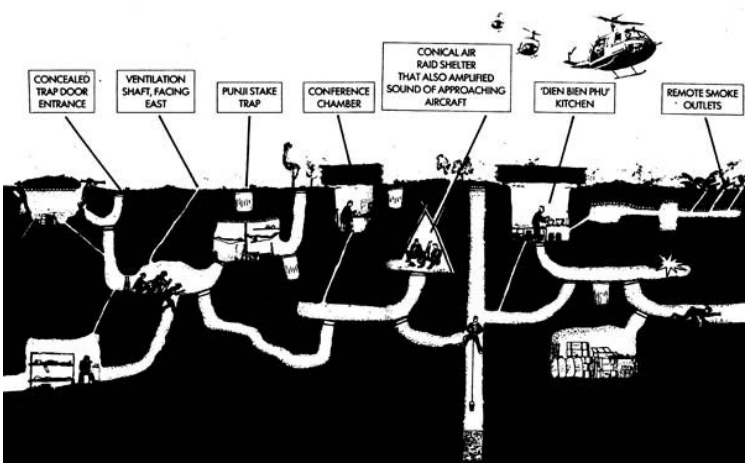
Due to the specialized nature of tunnel warfare, priority was placed with ENSURE (Expedited Non-standard Urgent Requirements for Equipment) program for the development of special "Tunnel Exploration kits". Six kits were requested by USARV on the 29th of April 1966, and then passed on to ACTIV (Army Concept Team In Vietnam) on the 7th of August. ACTIV then distributed the six kits, two went to the 1st Inft Div at Di An, a further two were dispatched to the 25th Inft Div at Cu Chi. Of the remaining kits one was given to the 1st Cav at An Khe, whilst the last remaining kit went to the 173rd Abn Bd at Bien Hoa.

Each kit cost 728 Dollars and consisted of a .38 caliber pistol which was fitted with a suppressor and a spotlight sighting device. This was all carried on a standard pistol belt in a specially designed holster. On the wearers head was a baseball cap which had a miners lamp mounted on it which was switched on and off via a mouth operated bite-switch. At the back of the cap was a bone conduction microphone communication system which was connected to a small ear piece. The power pack for the lamp and a communication wire reel were also hung on the pistol belt, but were situated on the wearers back.

Early Radio: Military Communications

Tests on the exploration kit in Vietnam soon revealed its short comings. The silenced .38 caliber pistol was not liked because of its length with the suppressor, and because it lacked balance and was awkward to handle. The special aiming light was found to be unnecessary given the tight confines and short ranges the tunnel rats were operating in. The huge pistol holster was also a failure as it was too big and unwieldy to be used in the tight confines of a tunnel. The head mounted miners lamp fared no better! This was obstructed by the baseball cap's visor and could be shorted out by switch malfunctions rendering it useless. Furthermore the lamp tended to slip down over the wearers eyes. The earpiece part of the communication system was also troublesome as it kept falling out of the wearers ear!

USARV requested 250 tunnel kits on the 21st of March 1967, but because of a mix up in the ordering quantity (500 instead of the original 250) and year end budget problems, immediate funding was slow in coming. Natick labs were not asked to produce the sets until the 30th of September, this situation was further frustrated by problems in the communication equipment for the kits. Eventually the requested 250 sets were delivered to Dover AFB between the 22nd and the 29th of May 1968, and from there immediately flown to Vietnam. With their patch with it's nonsense Latin motto "Non gratum anus rodentum - Not worth a rats ass" the tunnel rats were among the bravest in Vietnam, doing a job that not many others could, or would care to do.



A "Tunnel Rat" in a tunnel opening.

VE Testing:

Saturday, July 28th, 2012 - AES - 9:30 AM

ALL testing takes place at: Amateur Electronic Supply 5720 W. Good Hope Rd. Milwaukee, WI 53223

Area Swapfests

July 7th, 2012 SMARC Swapfest 12
Location: Oak Creek, WI Type: ARRL Hamfest
Sponsor: South Milwaukee ARC
Website: http://www.qsl.net/wa9txe/

July 22, 2012, 8 to 11 a.m. - Wisconsin Antique Radio Club free at The Terminal, 5917 S. Howell Ave., Milwaukee. Radios, tubes, parts, books.

August 11, 2012, 7 to 11 a.m. - Lakes Area Amateur Club Hamfest at the Lyons Town Hall, 6339 Hospital Rd., Lyons. Michel Bartolone, NX9A, 262-210-8652.

MRAC Working Committees

95th Anniversary:

- Dave—KA9WXN

Net Committee:

- Open

Field Day

Dave—KA9WXN, Al—KC9IJJ

FM Simplex Contest

- Joe – N9UX
- Jeff – K9VS

Ticket drum and drawing

- Tom – N9UFJ
- Jackie – No Call

Newsletter Editor

- Michael-KC9CMT

Webmaster

- Mark Tellier—AB9CD

Refreshments

- Hal—KB9OZN

Membership Information

The Hamateur Chatter is the newsletter of MRAC (Milwaukee Radio Amateurs' Club), a not for profit organization for the advancement of amateur radio and the maintenance of fraternalism and a high standard of conduct. MRAC Membership dues are $17.00 per year and run on a calendar year starting January 1st. MRAC general membership meetings are normally held at 7:00PM the last Thursday of the month except for November when Thanksgiving falls on the last Thursday when the meeting moves forward 1 week to the 3rd Thursday and December, when the Christmas dinner takes the place of a regular meeting. Club Contact Information

Our website address **http://www.w9rh.org**

Telephone **(414) 332-MRAC (6722)**

Address correspondence to:

MRAC, Box 240545, Milwaukee, WI 53223

Email may be sent to: **w9rh@arrl.net .** Our YAHOO newsgroup:

http://groups.yahoo.com/group/MRAC-W9RH/

CLUB NETS:

- The Six Meter SSB net is Thursday at 8:00PM on 50.160 MHz USB
- Our Ten Meter SSB net is Friday at 8:00PM on 28.490 MHz ± 5 KHz USB.
- Our Two Meter FM net follows the Ten meter net at 9:00PM on our repeater at 145.390MHz - offset (PL 127.3)

An ARRL Affiliated Club

The HamChatter is a monthly publication of the Milwaukee Radio Amateurs' Club.
Serving Amateur Radio for Southeastern Wisconsin & Milwaukee County Club Call sign – W9RH
MRAC Website: http://www.W9RH.org
Editor: Michael B. Harris, Kc9cmt, kc9cmt@Earthlink.net

Milwaukee Area Nets

Mon.8:00 PM 3.994 Tech Net

Mon.8:00 PM 146.865- ARES Walworth ARRL News Line

Mon.8:00 PM 146.445 Emergency Net

Mon.8:00 PM 146.865- ARES Net Walworth

Mon.8:45 PM 147.165- ARRL Audio News

Mon. 9:15 PM 444.125+ Waukesha ARES Net

Mon.9:00 PM 147.165- Milwaukee County ARES Net

Tue.9:00 AM 50.160 6 . Mtr 2nd Shifter's Net

Tue. 7:00 PM 145.130 MAARS Trivia Net

Tue. 8:00 PM 7.035 A.F.A.R. (CW)

Wed. 8:00 PM 145.130 MAARS Amateur Radio Newsline

Wed. 9:00 PM 145.130 MAARS IRLP SwapNet d FM-38 Repeaters (IRLP 9624)

Thur. 8:00 PM 50.160, 6 Mtr SSB Net

Thur. 9:00 PM 146.910 Computer Net

Fri. 8:00 PM 28.490 MRAC W9RH 10 Mtr Net SSB

Fri. 9:00 PM 145.390 W9RH 2 Mtr. FM Net

Sat. 9:00 PM 146.910 Saturday Night Fun Net

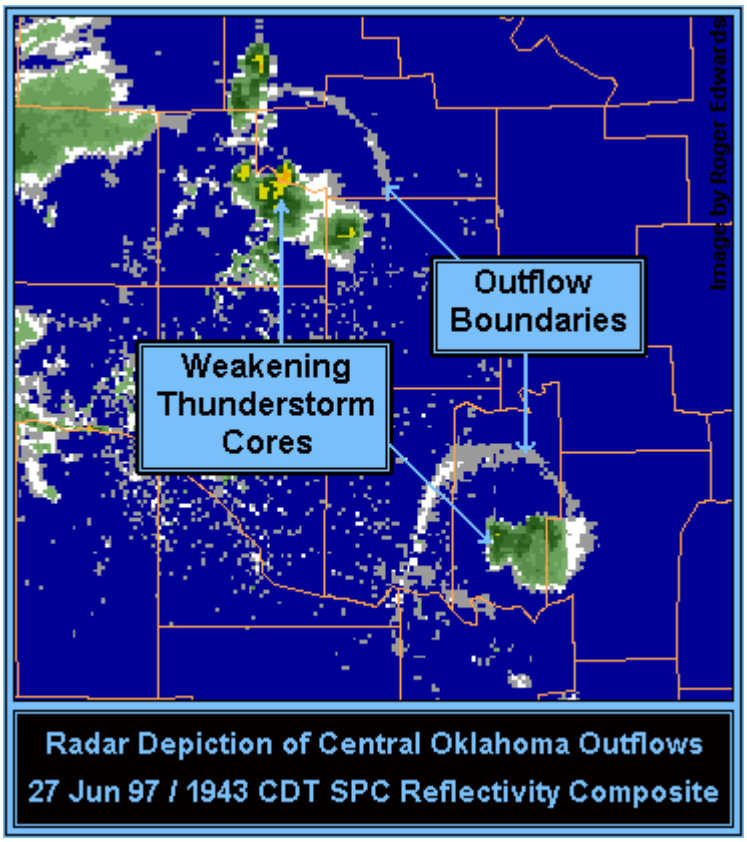
Sun 8:30 AM 3.985 QCWA (Chapter. 55) SSB Net

Sun 9:00 AM 145.565 X-Country Simplex Group

Sun 8:00 PM 146.91 Information Net

Sun 8:00 PM 28.365 10/10 International Net (SSB)

Sun 9:00 PM 146.91 Swap Net



Radar Depiction of Central Oklahoma Outflows
27 Jun 97 / 1943 CDT SPC Reflectivity Composite