HAMATEUR CHATTER

The Milwaukee Radio Amateurs Club

January 2013 Volume 21, Issue 1

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

AES Superfest 2013

The MRAC is Invited to Participate

WHEN: Friday, April 5th (2:00 p.m. to 6:00 p.m.) & Saturday April 6th (8:30 a.m. to 3:00 p.m.)

WHERE: AES Milwaukee, 5710 W. Good Hope Road (All inside)

WE PROVIDE: Free tables with electrical hook-up in a large area where you can interact with other clubs and recruit new members while you enjoy the show.

There is NO Admission, your entire membership (and others) are invited to attend FREE!

We will have a large participation from **major Ham equipment manufacturers**, clubs and organizations. There will be VE testing, interesting forums, a fox hunt, prizes, the Gordon West show and more!

CLUB ACCESS/SET-UP:

Friday 4/5: 9:00 a.m., show opens at 2:00 p.m. Saturday 4/6: 8:00 a.m., show opens at 8:30 p.m.

INFORMATION & SPACE RESERVATION: Club Representative, please contact Ray Grenier, K9KHW at AES A.S.A.P. (414) 375-1162 or 414-881-3528 (cell), or e-mail rayk9khw@aol.com

MRAC 95th Anniversary

2012 Marked the 95th Anniversary of the Milwaukee Radio Amateurs' Club. The club had a number of events throughout the year (including operating a special event station at Superfest 2012, making a couple of hundred contacts, even having Gordon West spend some time at the microphone). In the fall MRAC received a plaque from the City of Milwaukee commemorating our anniversary. In November the State of Wisconsin issued a proclamation declaring Thursday January 17, 2013 as Milwaukee Radio Amateurs' Club Day in the state of Wisconsin. If you attended recent MRAC meetings or the West Allis hamfest Jan 5, you may have seen the proclamations. While it does not do it justice, below is the text from the state proclamation regarding January 17 being our recognition day. Whereas The Milwaukee Radio Amateurs' Club, Inc. (MRAC) is celebrating its 95th anniversary throughout the latter part of2012 and early 2013 with a variety of events; and Whereas MRAC was founded in January 1917, to serve Federal Communications Commission licensed radio amateur operators located in Southeastern Wisconsin; and Whereas MRAC has had more than 1,100 members in the group's 95 years of operation; and Whereas MRAC is the oldest organization affiliated with the American Radio Relay League, the National Association for Amateur Radio; and Whereas MRAC supports various public service and amateur radio activities throughout Southeastern Wisconsin, including education and license testing; Now Therefore I, Scott Walker, Governor of the State of Wisconsin, do hereby proclaim Thursday, **January 17, 2013, as MILWAUKEE RADIO AMATEURS' CLUB, INC. DAY** throughout the state and I commend this observance to all of our citizens.

73, Dave WB9BWP

MRAC Officers:

Terms Expiring in 2014

- President – Dave, KA9WXN
- V-President– Dan, N9ASA
- Secretary – Mike, KC9CMT
- Treasurer – Joe, N9UX
- Director – Vacant

Terms Expiring in 2013

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

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

Milwaukee Radio Amateurs' Club

FM Simplex Contest

Purpose: To promote FM simplex operation and VHF/UHF contesting while giving new hams an opportunity to develop their contesting skills.

Date: Sunday, February 10, 2013

Time: 2m (1PM – 2 PM), 70cm (2PM – 2:30PM) ,

6m (2:30PM – 3 PM), 1.25m (3PM - 3:30PM)

Region: Southeastern Wisconsin (Grids-EN52, EN53, EN62, EN63) Contacts with other grid squares are also welcomed.

Bands: 2 meters, 70 centimeters, 6 meters, 1.25 meters

Categories: Base, Mobile, HT, and Club

Awards: Certificates given for 1st in each category and individual band with 2nd and 3rd awards based on committee discretion. Limit one award per person. Winning club is recognized on a plaque at AES Milwaukee.

Points: 2 meters-(1 point), 70 centimeters-(2 points), 6 meters (2-points), 1.25 meters-(3 points)

Special Multiplier: 1.5 score multiplier for Technician Class participants.

Bonus Points: Make a contact with the MRAC station W9RH (any band), and receive a 10 point bonus on your score.

Log Information Required: Call sign of station worked, frequency, time.

Detailed Contest Information: Detailed contest information and entry forms can be downloaded from the MRAC web site at www.w9rh.org.

Noise interference In the Handiham Shack "This device complies with Part 15 of the FCC rules."

Last week we had a run of cold weather here in Minnesota, and the AA batteries in one of our remote reading thermometers failed as the voltage dropped below the operating threshold. Since these cells depend on chemical reactions to produce DC, they are susceptible to failure in cold conditions when reactions can slow considerably. Bring the remote sensor back indoors and let it warm up, and it will work just fine. Of course that would not make much sense for a remote reading thermometer!

So I stepped outdoors and retrieved the sensor and brought it down to my shop, where I could put it under a shop lamp and use a small Phillips head driver to get the four tiny screws out of the battery cover plate. That's when I noticed the ubiquitous FCC Part 15 statement:

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

> **This device may not cause harmful interference, and**
>
> **This device must accept any interference received, including interference that may cause undesired operations.**

Seeing the statement reminds me of the growing cloud of radio frequency energy that surrounds us, emanating from consumer devices of every shape, size, and description. These wireless thermometer devices are intentional radiators in that they are designed to use RF energy to communicate with other devices by exchanging data or other information.

Some devices are so small as to make the FCC statement impractical, so a simple FCC logo may be visible instead to indicate compliance. Part 15 also covers "unintentional" and "incidental" RF radiation. Some devices, while not specifically designed to communicate wirelessly like the thermometer, may produce RF radiation anyway because of the circuit design . This kind of energy is incidental to the purpose of the circuit, but could still cause interference. One example I located in our kitchen is a little 4-cell battery charger. Oddly enough, it is MUCH noisier than the wireless thermometer could ever hope to be when I bring a Yaesu VX-5 HT close to it while listening on 1.895 MHz AM, my tool of choice for noise sniffing.

Last night I checked in with a group of friends on 160 meters, but was stymied by the noise level on the band. Although most everyone else was having no problem hearing the weaker stations, my noise level made it pretty difficult. I switched from the wire antenna I was using to the ground-mounted vertical way back in the yard, and the noise level dropped like magic. I was able to hear everyone!
The wire antenna clearly tuned well on 160 and had more capture area. Its high angle of radiation should have suited the situation perfectly, but yet the shorter vertical was better for receive.

Why was this the case?

I can't say for sure, but I have a theory. The wire antenna is about 200 feet long. Most of its length is far out into our large back yard, running far past the vertical antenna, but part of it runs between our house and the neighbor's house. It is likely that in this crucial part of the run that the antenna picks up noise from "incidental" radiators like plasma TV sets and whatever other nearby devices might be radiating from our house or the neighbor's. When radiating devices are plugged into the AC mains the house wiring may even act as an antenna to increase the range of the interfering signal. Generally the interfering signal levels are low and the vertical antenna, fed with underground coax and far away from any buildings, was not nearly so susceptible to these short-range interfering signals and instead was able to "hear" the desired signals from amateur stations.

Fortunately the noise level is not high every evening, so no further action need be taken right now - but if the situation should get worse, it might mean figuring out a plan to fix the problem. This could take several directions:

1. Search for strong interfering signals the traditional way, with portable receiving equipment. This takes skill and patience, and may require listening and tracking data over time, including recording the dates and times of the interference. When a suspect device is identified, try disabling it and checking the results with the receiver. This can be challenging if you determine that the interference is coming from outside your own home since you must then put on your good neighbor diplomat hat! Once located, measures are taken to filter or otherwise lessen the interfering signal. This could include relocating or replacing the offending device, turning it off while you are operating (if it is under your control), or trying to add filtering to the device to limit radiation. Turning off unused switching power supplies can be helpful. Sometimes interference comes not from Part 15 devices but from defects in power lines. Notify your power company if you locate such interference.

2. Change your own operating schedule to a time of day when there is less interference. For obvious reasons this is not always desirable or practical - you really should be able to operate your station when you want to!

3. Relocate or redesign your own antenna system to minimize near-field interference. This is actually a really good plan, but not always practical if you must fit an antenna into a city lot. Many of us do, however, have some antenna options. For example, I could beef up my vertical antenna system and make it better with more radials or a different radiator altogether. This is in the works for Spring 2013. I might even try running the wire antenna in a different location, but that is not my first choice just yet.

Finally, you can make use of the noise-reduction technology in your existing radio. Learn to use the filtering and pass band tuning options. Check out the noise blanker and the noise reduction controls, and learn to set the noise reduction level - often a hidden menu item.

MFJ makes a noise-reduction device that uses phase reversal to "cancel" noise. It is the "MFJ Noise Canceling Signal Enhancer", model MFJ-1026.

This device takes an entirely different approach to noise reduction. It "listens" for noise, then feeds the noise back to the radio 180 degrees out of phase, which theoretically provides up to a 60 dB null to cancel the noise. The null is sharp and the device must be tweaked to get the exactly perfect phase reversal. It can be quite effective, but the preferred method is still to locate and eliminate the noise source in the first place.

The MFJ-1026 is a choice when the noise source cannot be identified or if it is not in your own home. The tuning is a bit fussy, but it can be effective when nothing else will help. A caution is that the device can be damaged by transmitting through it - after all, it is connected right in your feedline. There is a transmit/receive control jack in the back of the unit, and it is important to have this wired properly. Follow all the installation and operating directions carefully.

There is also a built-in T/R switch that senses RF, but use with caution. We have burned out one of these in the Handiham shack! The MFJ-1026 needs a second receiving antenna to "hear" the noise signal, and there are connectors for this external second antenna on the back of the unit. A built-in telescoping antenna is included, but unless the noise source is really right in your ham shack, it isn't going to be effective. I recommend a second, dedicated receiving antenna located outdoors.

Want to learn more about Part 15? No problem - the ARRL website is an excellent source:
http://www.arrl.org/part-15-radio-frequency-devices

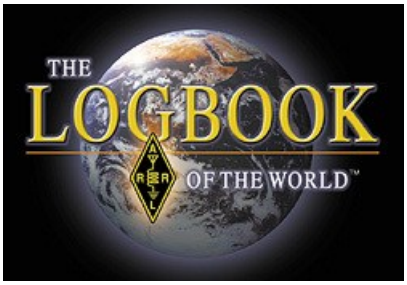
Idea! Part 15 would make an excellent topic for a club program. If there is someone in your radio club who is technically-oriented and willing to give a program on Part 15 and Part 15 devices, we strongly recommend it as a very relevant learning experience. One thing we have not covered here is that Part 15 devices must accept interference from our licensed and properly-operated amateur radio transceivers. This is not always easy to explain to a grumpy neighbor, so the club program might address how to deal with this aspect of interference.
Patrick Tice, WA0TDA
Handiham Manager

IARU Welcomes Two New Member Societies

Earlier this year, the International Amateur Radio Union (IARU) notified its Member Societies that two new national Amateur Radio organizations wished to join the IARU and would need to be voted in: the Federation of Radio Sport of Azerbaijan (FRSA) and the St Vincent and Grenadines Amateur Radio Club (SVGARC). Ballots from all the Member Societies that responded were counted on November 1 and adopted.

Based in Baku, Azerbaijan, the FRSA was formally organized on December 30, 2001. There are 50 licensed members of the FRSA out of a total amateur population of approximately 50 in Azerbaijan. The SVGARC is based in St Vincent, St Vincent and the Grenadines and was formally organized in 1951. There are 21 licensed members of the SVGARC, out of a total amateur population of approximately 134 in the country. Both organizations have confirmed to the IARU that they have the ability to meet financial obligations as members of the IARU, are legally able to act in the furtherance of IARU objectives within their respective countries and will adhere to the Constitutions of both the IARU and its respective Regional Organization.

Logbook of The World Web Page Now Features Daily and Hourly Status Updates



The ARRL has created a new informational page to issue daily status updates and information of interest to the Logbook of The World (LoTW) user community. These updates will include planned downtime and changes that will impact LoTW operations. In addition, LoTW's processing queue is now updated hourly, telling how many logs and QSOs have been uploaded to the LoTW system and are awaiting processing. New hardware that will improve LoTW's throughput is on order and is expected to be running in six to eight weeks.

Rick Murphy, K1MU, and Dave Bernstein, AA6YQ, have been charged with rebooting the Trusted QSL open source project. If you have demonstrably strong *C++* development skills that you're interested in applying toward improving LoTW's usability and efficiency, please contact Bernstein **via e-mail aa6yq@ambersoft.com.**

ICE STORMS: HAZARDOUS BEAUTY

Last night, a thin wedge of a major winter storm crawled across the county. For ten hours the rains fell, but these were not ordinary rains, for when they struck, the water began to freeze. By morning, the freezing rain had deposited several centimeters of clear ice on all exposed surfaces. The in its aftermath, the skies. When dawn broke, the first rays of the sun struck the tops of the leaf-less maples along the ridge to the west, shining back in a dazzling light. As the sun rose further, its brilliance reflected and refracted off ever more of the crystal garden which covered the countryside. Barbed wire fences sparkled like diamond necklaces. Weeds rising from the snow resembled the stems of crystal goblets. Rough wood shone while gentle breezes played branches like wind chimes; stronger gusts breaking long ice chains, sending them tinkling and crashing as they hit the ground.

Periods of freezing rain like this one may fall in any winter storm crossing eastern North America. When the fall of freezing rain persists and ice accumulates, meteorologists classify the storm as an *ice storm*. Ice storms transform roads into huge skating rinks and leave downed power lines and broken trees in their wake. However, like a heavy snow storm, the damage and inconvenience are often tempered by dazzling beauty.

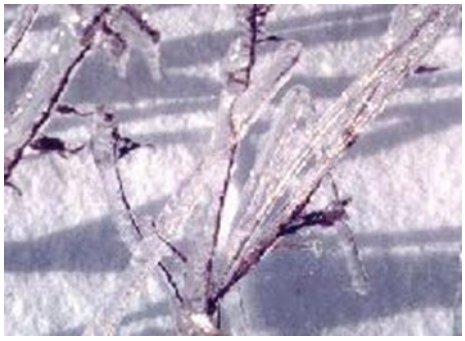
Residents of the eastern United States and Canada may experience freezing rain any time between late October and early May. Storm systems that produce freezing rain generally move across eastern North America from the southwest bringing warm, moist air from the Gulf of Mexico into collision with the very cold Arctic air of a high-pressure ridge to the north.

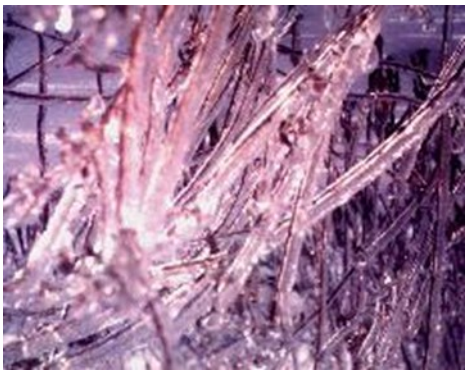
(For details on the Great Ice Storm of 1998 in the southeastern Canada and northeastern US, see The Great Ice Storm of 1998)

Ice storms most commonly develop along a line stretching from northern Texas to Newfoundland in slow-moving low-pressure systems where there is a large temperature difference between the warm Gulf air and cold Arctic air. Local accumulations of ice may be heavy if the storm stalls over a region for an extended period.

Ice storms lasting 12 hours or more generally produce ice accumulations several centimeters thick and affect an area that may range from a few square kilometers to areas covering several states/provinces. The typical ice storm swath is 50 km (30 mi) wide and 500 km (300 mi) long. Ice storms generally warrant major headlines only one year in three.

Ice storms may be comprised of either *glaze ice* or *rime ice*. Meteorologists classify transparent and homogeneous ice forming on vertical and horizontal surfaces as *glaze*. Glaze ice resembles ice-cube ice in appearance. Its amorphous, dense structure helps it cling tenaciously to any surface on which it forms. In contrast, if the ice is milky and crystalline, like sugar, it is termed *rime*. Rime ice is less dense than glaze ice and clings less tenaciously, therefore damage due to rime is generally minor compared to glaze ice.





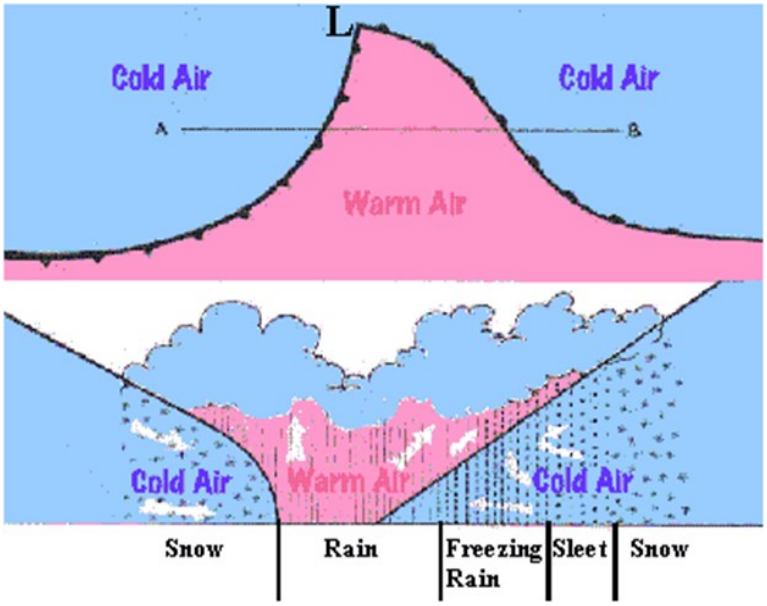
Ice storms typically begin with snow and strong easterly winds conditions well ahead of an approaching warm front. The snow, however, changes briefly to sleet and then to rain that freezes on impact, coating all exposed surfaces with a growing layer of ice.

(Often, freezing rain is mistakenly called *sleet*. Technically, however, sleet is composed of already frozen droplets — ice pellets — whereas freezing rain is still liquid until it hits a surface, freezing after impact. Freezing rain may often be mixed with sleet.)

Freezing Rain Formation

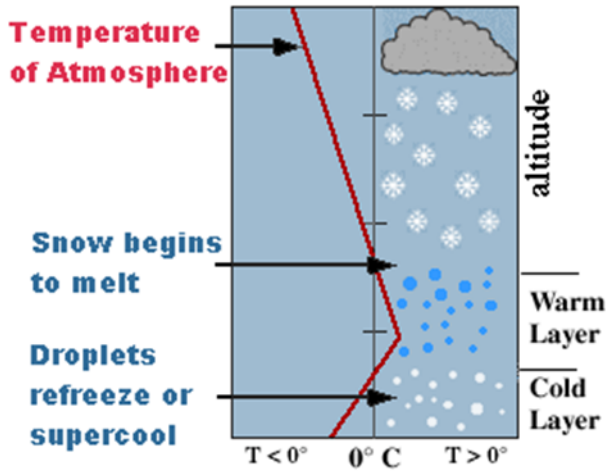
In advance of the warm front of an ice storm, warm, moist air moving in from the warm sector overruns the surface cold air ahead to produce the characteristic vertical temperature layering (a low-level *temperature inversion* of warm air above and cold below) of the pre-warm front atmosphere. As this air rises in altitude over the cold air, it cools and its vapor begins to condense. By the time it reaches the upper levels of the clouds, its temperature has dropped below freezing, and much of its condensing vapor forms into ice crystals.

Severe Weather Preparedness



In this very moist environment, the ice crystals quickly grow into snowflakes. Now too heavy to remain suspended in the air, they begin to fall into the air below. If the temperature of this air is below freezing (0°C = 32°F), the flakes remain frozen and fall to the ground as snow. However, if the air layer is sufficiently warm and deep, the snowflakes melt and continue their descent as raindrops. To reach the ground as freezing rain, however, the raindrops must be supercooled as they fall through a cold air layer near the ground before striking any surface.

[*Supercooling* of the water drops means that the temperature of the water in the raindrops must fall below 0°C (32°F) without freezing. Although we commonly speak of 0°C as water's freezing point, water, especially in the droplet form, rarely freezes at this temperature. Pure ice, on the other hand, melts at 0°C, thus, this temperature should be more correctly called the *melting point* of ice.) The temperature of freezing will vary with the size of the water droplet and the concentration of any impurities in it. Very small droplets of pure water may not freeze spontaneously until the temperature has fallen to around -40°C (-40°F).]



Whether freezing rain forms from the cold rain or not depends critically on the characteristics of the surface cold air layer. If the layer is too thick or too cold, it will refreeze the rain into ice pellets (sleet). .

If the cold layer is too warm or too shallow, the rain will continue to the ground as normal rain and will not freeze unless the temperature of the ground or some other surface it contacts is well below freezing. Often small temporal or spatial differences in air temperature and in droplet size result in freezing rain mixed with sleet, snow or non-freezing rain. The sensitivity of freezing rain formation to the temperature of this lower air layer makes precise forecasting of formation, amount and ice accumulation rate difficult, particularly since sites measuring the vertical temperature distribution are few and widely spread across the affected region.

In most cases of glaze formation, the temperatures of the air, the rain water, and the surface are at or slightly below 0°C, especially in those events where icing is extensive. Glaze ice usually forms when the air temperature near the surface is in the narrow range of -4°C to 0°C (25°F to 32°F). Once the water droplet strikes a surface, the violent impact triggers a rapid transformation of the supercooled liquid water to ice.
For heavy glaze ice formation, the rain should fall rapidly as large, slightly supercooled drops, and the rate of freezing on the surface must be slower than the rainfall rate. With small drops and rapid freezing, the resulting ice is *rime ice* having a more crystalline, sugar-like texture and lacking the transparency of glaze.

Freezing Rain Impacts

When transportation depended on foot power and beasts of burden, moving along dirt or gravel roads, glaze storms were generally considered more inconvenience than hazardous, except perhaps for those who travelled through wooded areas where falling branches and trees were a danger. Pavement and the automobile brought new travel hazards to both drivers and pedestrians. On relatively, smooth horizontal surfaces such as road pavement and sidewalks, glaze ice forms rather uniform, smooth slippery sheets which do not break when weight is applied to the ice. For drivers, the consequences of icing can be serious, for stopping distances on glaze ice are ten times greater than on dry pavement, and double that on packed snow.

Power and communication systems using overhead lines are perhaps hardest hit by ice storms, as the great ice storm of 1998 in New England and Quebec attests. Hanging wire cables collect ice until the cable breaks or the rain stops. Diameters of these ice-coated cylindrical cables may reach five centimeters, adding a weight of 15 to 30 kilograms per meter (10-20 pounds per foot) to the wire. Lines not broken directly under the ice's weight may succumb to the combined forces of ice and wind, or by trees and branches falling across them.

Severe Weather Preparedness

Even days after the storm has abated, lines may break when they react to the sudden change in their load as the ice falls from them. Vibrations, often violent, may also occur as the ice falls, snapping weak points in the line under the added strain.

Freezing rain, however, affects more than just human technology. Animals and plants -- both wild and domestic -- may be killed or injured by ice accumulation. Ice damage to trees rivals disease and insects as destructive agents. Like power cables, tree branches and trunks collect ice in vast quantities. Conifers are the most resistant trees owing to their great flexibility, tapered shape, and lack of trunk branching — evolutionary adaptations which permit them to survive winters in heavy snow regions. A 15-m (50-foot)conifer can accumulate as much as 45,000 kg (99,000 lb) of ice during a severe storm.

Deciduous trees exhibit a wide range of vulnerability to ice. Elms and fruit trees are among the most vulnerable while oak and beech are among the most tolerant of ice loading. In general, younger deciduous trees are better able to survive than older ones due to their more supple nature and limited branching. Multiple large branches in a tree generally leads to more breakage; heavy ice accumulation on a multi-branched trunk may even cause a tree to split in two.

Icing damages plants by sealing leaves, stems and buds from the air, thereby suffocating these parts. Similarly, ice sheets formed over snow surfaces, should they persist, may suffocate or poison overwintering species such as winter wheat.

Animals active in the winter must also cope with the effects of an ice storm. Many animals starve when they are unable to reach seeds, buds, or other food locked in the ice. Deer, for example, find it difficult to browse when young shoots become encased in ice. Birds unable to find a sheltered perch during the storm may have their feet frozen to a branch or their wings covered in ice making them unable to fly. Grouse buried in snow drifts are often encased by the ice layer and suffocate.

While a walk through a forest after an ice storm may give the impression of large-scale destruction amid crystalline beauty, an ice storm also provides several vital functions. The same mechanical action that downs branches also releases seeds, promotes regeneration, prunes dead or dying branches, and indirectly provides nesting and sleeping cavities for birds and other animals.

Although ice storms are generally disliked by most of the population, they provide weather watchers with hours of entertainment as each additional look reveals new beauty. One of the most awesome sights I have ever witnessed was the ice-encrusted, mixed deciduous woods atop the Niagara Escarpment near Milton,

Ontario back-lit by the setting sun. As the sun's rays emerged from below the cloud base, the surrounding ebony cloud deck provided the perfect backdrop for the dazzling crystal ice clinging to the trees.

Question:

What is the difference between your Raw Snowfall and Depth? Which is the accurate accumulation I should be using to find out how many inches fell in a storm?

NOAA's answer:

"I've got a CoCoRaHS rain gauge and snowboard in my back yard. In the winter, I go out at 7am for a measurement. I stab my yardstick straight down into the snowpack to get the *Depth*.
I measure the depth of any new snow fallen on the snowboard; that is the *Raw Snowfall*. Then I scrape off the previous day's accumulation, to start fresh for tomorrow.
The snow fallen in the rain gauge gets dumped into a Pyrex bowl, to be melted and measured. This is the *Raw Precip Observation*, the quantity of Liquid Water contained in the previous day's snowfall.
The final measurement is the *SWE*, the snow water equivalent contained in the snowpack. I thrust the rain gauge straight down into the snowbank, slip a spatula under the opening and lift it to the surface. The contents are dumped into another bowl, to be microwaved and melted. The SWE is the primary statistic we model at NOHRSC.
So, the Raw Snowfall is a measurement of snow fallen since the last reading. It is a rate, rather than an amount. Many are taken daily, but some airports and NWS offices check it in six or twelve hour intervals. Snowstorms don't always fall into neat 7am-7am timeframes. We often have to split a single event into, say, midnight to 7am, sent today, and 7am-10am, reported the next day.
Check other nearby sites in the 'Observations Near' list for overall agreement. Other sources are http://www.cocorahs.org, http://gis.ncdc.noaa.gov/maps/snowfall.map?view=daily, and http://www.srh.noaa.gov/ridge2/snow.
Your local NWS Forecast Office usually issues all the station measurements, as well as one-time reports from police and Skywarn spotters that get radioed in, along with amounts from the public posted to their NWSFO websites.
On the NOHRSC front page, follow the 'Organization' link at the top to locate the NWSFO that serves your area. Many have summary pages that post reports as they come in and final tallies after the event."

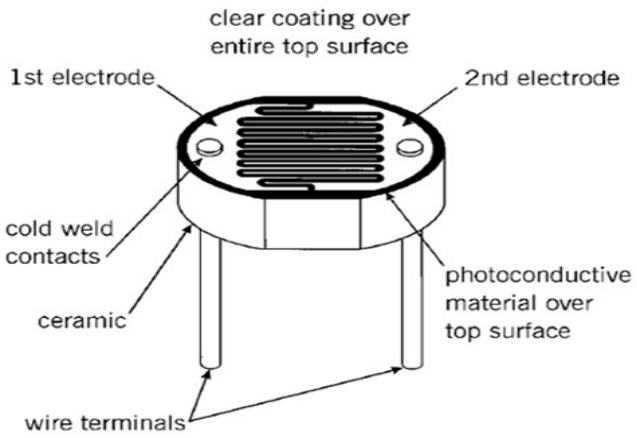


Figure 3
Typical Construction of a Plastic Coated Photocell

What is a photocell?

Photocells are sensors that allow you to detect light. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they often appear in toys, gadgets and appliances. They are are often referred to a CdS cells (they are made of Cadmium-Sulfide), light-dependent resistors (LDR), and photoresistors.

A Photocell is basically a resistor that changes its resistive value (in ohms) depending on how much light is shining onto the squiggly face. They are very low cost, easy to get in many sizes and specifications, but are very inaccurate. Each photocell sensor will act a little differently than the other, even if they are from the same batch. The variations can be really large, 50% or higher! For this reason, they shouldn't be used to try to determine precise light levels in lux or millican-dela. Instead, you can expect to only be able to determine basic light changes

For most light-sensitive applications like "is it light or dark out", "is there something in front of the sensor (that would block light)", "is there something interrupting a laser beam" (break-beam sensors), or "which of multiple sensors has the most light hitting it", photocells can be a good choice!

Some basic stats

These stats are for the photocell in the Adafruit shop which is very much like the PDV-P8001. Nearly all photocells will have slightly different specifications, although they all pretty much work the same. If there's a datasheet, you'll want to refer to it

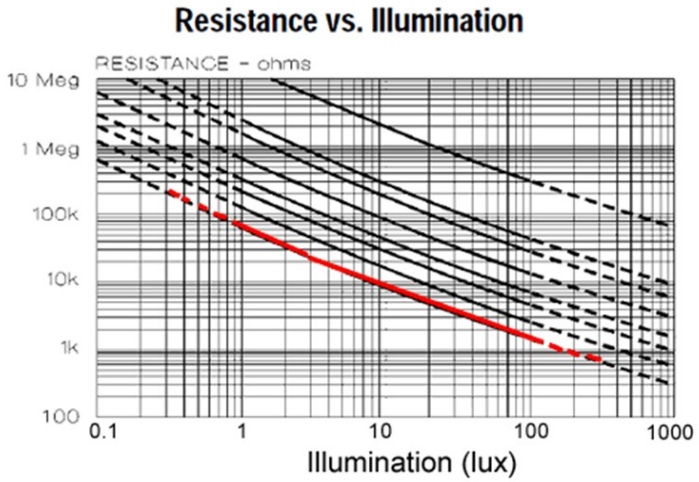
- **Size:** Round, 5mm (0.2") diameter. (Other photocells can get up to 11mm/0.4" diameter!)

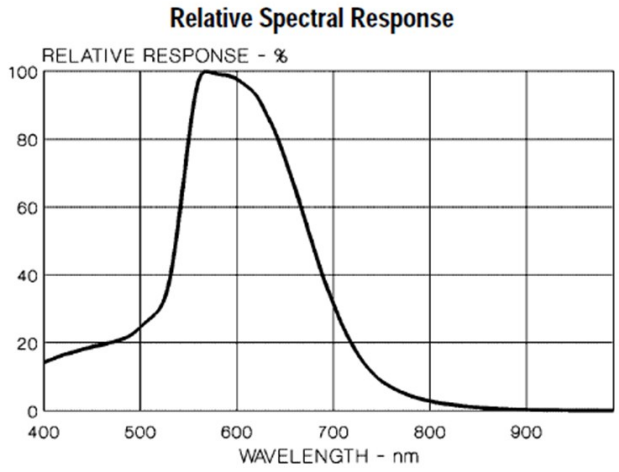
Price $1.50 at the Adafruit shop
Resistance range: 200K ohm (dark) to 10K ohm (10 lux brightness)

- **Sensitivity range:** CdS cells respond to light between 400nm (violet) and 600nm (orange) wavelengths, peaking at about 520nm (green).

Power supply: pretty much anything up to 100V, uses less than 1mA of current on average (depends on power supply voltage)

How to measure light using a photocell





Illuminance	Example
0.002 lux	Moonless clear night sky
0.2 lux	Design minimum for emergency lighting (AS2293).
0.27 - 1 lux	Full moon on a clear night
3.4 lux	Dark limit of civil twilight under a clear sky
50 lux	Family living room
80 lux	Hallway/toilet
100 lux	Very dark overcast day
300 - 500 lux	Sunrise or sunset on a clear day. Well-lit office area.
1,000 lux	Overcast day; typical TV studio lighting
10,000–25,000 lux	Full daylight (not direct sun)
32,000–130,000 lux	Direct sunlight

The Experimenters Bench

As we've said, a photocell's resistance changes as the face is exposed to more light. When it's dark, the sensor looks like an large resistor up to 10M ohms, as the light level increases, the resistance goes down. This graph indicates approximately the resistance of the sensor at different light levels. Remember each photocell will be a little different so use this as a guide only!

Photocells, particularly the common CdS cells that you're likely to find, are not sensitive to all light. In particular they tend to be sensitive to light between 700nm (red) and 500nm (green) light.

Basically, blue light wont be nearly as effective at triggering the sensor as green/yellow light!

What the heck is lux?

Most datasheets use lux to indicate the resistance at certain light levels. But what is lux? It's not a method we tend to use to describe brightness so it's tough to gauge. Here is a table adapted from a Wikipedia article on the topic!
(See Illumination table below)

Testing and Connecting your photocell

Testing your photocell

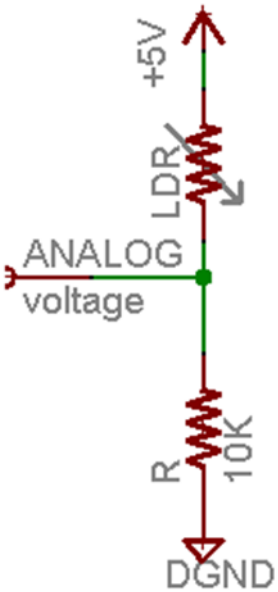
The easiest way to determine how your photocell works is to connect a multimeter in resistance-measurement mode to the two leads and see how the resistance changes when shading the sensor with your hand, turning off lights, etc. Because the resistance changes a lot, an auto-ranging meter works well here. Otherwise, just make sure you try different ranges, between 1M ohms and 1K ohms before 'giving up'

Connecting to your photocell

Because photocells are basically resistors, they are non-polarized. That means you can connect them up 'either way' and they'll work just fine!

Photocells are pretty hardy, you can easily solder to them, clip the leads, plug them into breadboards, use alligator clips, etc. The only care you should take is to avoid bending the leads right at the epoxied sensor, as they could break off if flexed too often.

Analog voltage read method

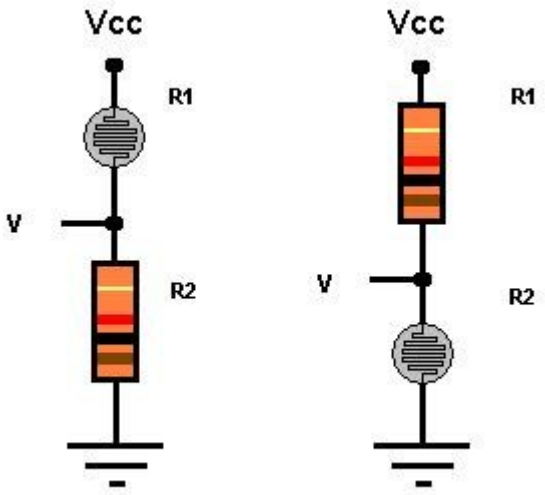


Connecting a Photo resister to a circuit

A photoresistor is a sensor whose resistance varies with light intensity. Most decrease in resistance as the light intensity increases. In a typical microcontroller application, this resistance must be converted to a voltage so that an A2D converter can measure it. The easiest way to do this is with a voltage divider circuit.
A voltage divider is just two resistors in series connected between a voltage supply and ground. If R1 is connected to the voltage supply and R2 is connected to ground then the voltage at the junction between the two resistors is:

$$V = Vcc * \frac{R_2}{R_1 + R_2}$$

If R1 is the photoresistor, the voltage will increase with increasing light intensity. If R2 is the photoresistor, the voltage will decrease with increasing light intensity.



Sample Photoresistor Circuit

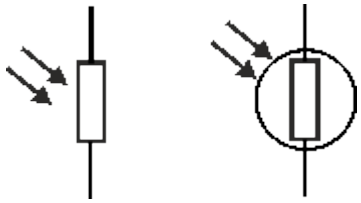
Light dependent resistor, photo resistor, or photocell - Notes on the basics of a photoresistor, light dependent resistor or photocell including its construction, operation, circuit symbol, and circuit applications
Resistor types includes:

- Resistor types summary
- Variable / adjustable resistor
- Thermistor
- LDR light dependent resistor

See also: SMT resistor MELF resistor
The light dependent resistor, LDR, is known by many names including the photoresistor, photo resistor, photoconductor, photoconductive cell, or simply the photocell. It is probably the term photocell that is most widely used in data and instruction sheets for domestic equipment.
The photo resistor, or light dependent resistor, LDR, finds many uses as a low cost photo sensitive element and was used for many years in photographic light meters as well as in other applications such as flame, smoke and burglar detectors, card readers and lighting controls for street lamps. Often within the literature the photoresistor is called the photocell as a more generic term.

Photoresistor discovery
Photo-resistors, or light dependent resistors have been in use for very many years. Photoresistors have been seen in early forms since the nineteenth century when photoconductivity in selenium was discovered by Smith in 1873. Since then many variants of photoconductive devices have been made.
Much useful work was conducted by T. W. Case in 1920 when he published a paper entitled "Thalofide Cell - a new photo-electric cell".
Other substances including PbS, PbSe and PbTe were studied in the 1930s and 1940s, and then in 1952, Rollin and Simmons developed their photoconductors using silicon and germanium.

Light dependent resistor symbol
The circuit symbol used for the light dependent resistor or photoresistor combines its resistor action while indicating that it is sensitive to light. The basic light dependent resistor symbol has the rectangle used to indicate its resistor action, and then has two incoming arrows - the same as those used for photodiodes and phototransistors to indicate its light sensitivity.



Light dependent resistor symbol used in circuit diagrams
For most applications, the light dependent resistor symbol used will be that with the resistor with arrows, but in some instances those drawing circuit diagrams prefer to encase the resistor in a circle. The more commonly used photoresistor symbol is the resistor without the circle around it.

Photoresistor mechanism
A photoresistor or photocell is a component that uses a photoconductor between two contacts. When this is exposed to light a change in resistance is noted.
Photoconductivity - the mechanism behind the photoresistor - results from the generation of mobile carriers when photons are absorbed by the semiconductor material used for the photoconductor. While the different types of material used for light dependent resistors are semiconductors, when used as a photo-resistor, they are used only as a resistive element and there are no PN junctions. Accordingly the device is purely passive.
There are two types of photoconductor and hence photoresistor:

- ***Intrinsic photoresistor:*** This type of photoresistor uses a photoconductive material that involves excitation of charge carriers from the valence bands to the conduction band.

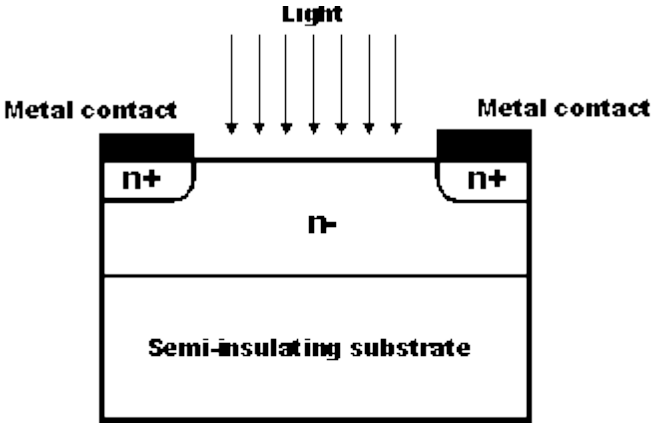
Extrinsic photoresistor: This type of photoresistor uses a photoconductive material that involves excitation of charge carriers between an impurity and the valence band or conduction band. It requires shallow impurity dopants that are not ionized in the presence of light. Extrinsic photoresistors or photocells are generally designed for long wavelength radiation - often infra-red, but to avoid thermal generation they need to be operated at low temperatures.

The Experimenters Bench

Summary: Basic photoresistor structure

Although there are many ways in which light dependent resistors, or photo resistors can be manufactured, there are naturally a few more common methods that are seen. Essentially the photoresistor or photocell consists of a resistive material sensitive to light that is exposed to light. The photo resistive element comprises section of the material with contacts at either end.

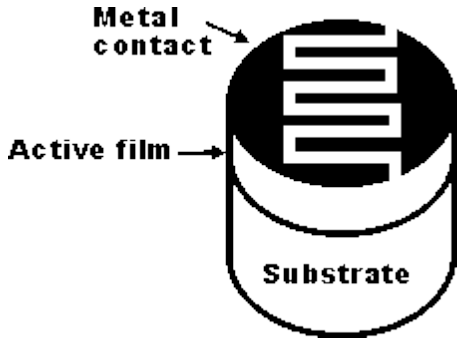
A typical structure for a light dependent or photo resistor uses an active semiconductor layer that is deposited on an insulating substrate. The semiconductor is normally lightly doped to enable it to have the required level of conductivity. Contacts are then placed either side of the exposed area.



One form of photoresistor structure

Within the basic photoresistor or photocell structure, the resistance of the material itself is a key issue. To ensure the resistance changes resulting from the light dominate, contact resistance is minimized. To achieve this, the area around the contacts is normally heavily doped to reduce the resistance in this region.

In many instances the area between the contacts is in the form of a zig zag, or interdigital pattern. This maximizes the exposed area and by keeping the distance between the contacts small it reduces the spurious resistance levels and enhances the gain.



Photoresistor or photocell with interdigital contact pattern

It is also possible to use a polycrystalline semiconductor that is deposited onto a substrate such as ceramic. This makes for a very low cost light dependent resistor

Photoresistor applications

The photoresistor or light dependent resistor is attractive in many electronic circuit designs because of its low cost, simple structure and rugged features. While it may not have some of the features of the photo-diode and photo-transistor, it is ideal for many applications. As a result the photo-resistor is widely used in circuits such as photographic meters, flame or smoke detectors, burglar alarms, card readers, controls for street lighting and many others.

The properties of photoresistors can vary quite widely dependent upon the type of material used. Some have very long time constants, for example. It is therefore necessary to carefully choose the type of photoresistor for any given circuit or application.

Early Radio: Military Communications

R

Alley on Ben Cui Freeway (Narrative)

What I am about to tell you is actually the last story I should tell. However, after reading John Eberwine's story of March 13, 1968 I am compelled to tell the "last" story first because there may be others among you who have carried guilt or have unanswered questions about the events of September 19, 1968.

After the Battalion left Dau Tieng in August "68 the 1/5 took over convoy escort. The relationship that I had with LT Skrove and the Recon Platoon was not present with the 1/5. My attempts to warn them of what was going on the morning of August 21 fell on deaf ears. What happened over the next few days is another story. However, someone was listening to what I was saying because I was moved, within a week, to Cu Chi to be the convoy officer for the Division. When I arrived the G-4 told me that General Williamson wanted me in the Division TOC and I was to have all the support I needed. I was under the impression that Command wanted all of their convoys to run the way LT Skrove and LT May ran the Dau Tieng convoy.

I soon found out that politics play a big role in what goes on the closer one gets to the top. I no longer could talk directly to the security on the ground. I had to talk to the MPs. Even though they might not be directly involved in security they were responsible for running convoys.

For the first two weeks things were quite. The CG would come in about 0800 and ask how things were going. Procedures were set up and I was feeling good about being able to keep truck drivers out of ambushes. The worst place to be in an ambush is in the front seat of a truck. Those guys were defenseless and wouldn't have a chance of getting out.

On the morning of September 19th I began to get some sense that there would be trouble on the Dau Tieng convoy. The room I was in was filled with radio monitors, I was able to monitor radio traffic between the ground units and the MPs, but I was not allowed to talk directly to those units.

Early Radio: Military Communications

I had to ask the MPs to ask questions for me. It was just a bad way to do things. I did find out that there were no "Little People" following the guys sweeping the road. There were "Little People" at the bridge, but they were staying at the bridge. I made the call, as I had done for six months. No convoy today.

Anyone in the Recon Platoon could have made the call. There was going to be an ambush. When I was in Dau Tieng I would radio the Bde XO, LTC Ford, and he would ask a few questions and say "OK." LT Skrove would post the road just like there was going to be a convoy and then bring the tracks back to the bridge firing their 50 MGs into the most likely spots for an ambush to take place. LT Skrove called this "Recon by Fire." The convoy was safe the Recon Platoon was safe and maybe Charlie suffered some losses and was frustrated by not being able to pull and ambush.

I thought this day would be like one of those days. I was there to keep the convoys out of ambushes and this was my first "No Convoy" call. I went looking for the G-3, a COL Black, to tell him that I thought the Dau Tieng convoy should be cancelled. He wasn't there, but I had no sooner returned to my area when he came in and asked about the convoy. I told him why I wanted to cancel the convoy and he said, "You're the guy whose suppose to know." And then he said he would cancel the convoy. He seemed pleased about how things were happening. About ten minutes later COL Black came back into my office and said, "The General said the convoy will run." He didn't look pleased now. I protested but he said there was nothing he could do and he had to go to get ready for the ambush.

I sat next to that radio for what seemed like days hoping I was wrong and that the last track would clear CP 26, the laterite pit beyond the Ben Cui Rubber, but it didn't happen that way. The convoy got to RPG Alley and the ambush was sprung. Eleven men died right there, Triple Deucers and truck drivers. I don't know how many others were wounded. And all because a General wanted a fight and was willing to use defenseless truck drivers and unsuspecting escorts. From a tactical point of view I can think of no worse way to engage an enemy with Mechanized Infantry, but the tracks were not part of the tactics. They were, along with the trucks, bait. The air cover was there waiting for the convoy to get hit. The plan was to chase Charlie down through the rubber and catch him coming out the back side. That part worked. I remember one of the pilots saying that it was a turkey shoot. The General was pleased.

I did not know that the unit involved in this action was "A" Company until a few weeks ago. The constant change in call signs and the lack of direct contact with escorts caused me to think that the escorts were 1/5 Guys. I did not know that any Triple Deuce units were back in Dau Tieng.
If you were there and have felt in any way responsible for the losses of that day I want you to put that burden down. It is time to rethink what went on. What I have told you won't bring anyone back, but you should understand that it wasn't your fault that your friends were killed together with those defenseless truck drivers.
The fault lies squarely upon the shoulders of Ellis W. Williamson.
Neither the General nor COL Black ever came back into that office again. A few weeks later I was moved to the Division Support Command. Politics.

Jim May-Convoy S-4 2/22nd

August 19, 1968 Narrative of Events

Guys,
That tank left behind was mine. It was Rick Avant's tank but he was in base camp on orders as his tour of duty was over. He was listening to all this happening on the radio while it was going on.
Earlier in the day, the 2nd and 3rd platoons went up the road towards Tay Ninh and ran into an ambush that was 1-1/2 miles long on both sides of the road. The Rome ploys were in there (previously) and had knocked down all the trees. They had NOT removed the trees yet so this afforded the enemy excellent cover. The idea was to get rid of the trees near the roadside to alleviate the ambush problems. When the 2nd and 3rd platoons were engaged, I was the lead tank of the last platoon (1st Plt) going in. A helicopter landed in the middle of the road in front of me. The pilot jumped out and told me "don't go in, the ambush sight kill zone is 1-1/2 miles long." He asked for the radio frequency and I gave it to him. He called on the radio, and that is why the 1st platoon did not go in after the 2nd and 3rd plts. We sat and held up at that intersection until about 4 PM that I recall. At that time, we heard the gunfire coming from (towards Dau Tieng) the 5th Mech who was heavily engaged in a perimeter off the road to the north side. Our platoon went in and bailed them out. They were not even returning fire! The gooks were running around the perimeter and were picking off APC's at their leisure with RPGs. Our Plt Sgt (Sammy Jenkins) took over their unit. They had about a 19 year old 2nd LT who was either in the state of shock, or was in his first battle. He was totally dis-functional. We put them on our frequency and got them organized into a convoy to get out of there. It was getting dark. We started towards Dau Tieng and there was an ambush along this road also that must have been about 1 mile long. On both Sides of the road.

The APC immediately in front of us was knocked out. We were on the radio trying to find out what was going on. This was after we had got the 5th Mech organized and on the way out of there heading towards Dau Tieng. On the tank were Roy Harbaugh (the driver who I only knew by the nickname of "Tate"), Cushirella or Kucherrella (spelling?) was the gunner loader, and I was the TC.
I got on the intercom and told Tate to ram the APC and push it out of the way. An RPG had hit immediately under the gun tube shield which killed Tate and knocked the main gun out of battery. The 50 (M-2) was malfunctioning as I had put about 10,000 rounds through it and the receiver was warping. We had the 2nd barrel in it also. Kuch and I did not know Tate was dead. After he did not respond I told Kuch to go down and tell him to ram the APC and push it out of the way. It was on fire also. Kuch came back up topside in the state of shock telling me that Tate was dead. I told him to remove his body, lay it on the fender and to Ram / push the APC out of there. The rest of the convoy was gone in front of us.

He went down and removed his Tate's body. He came back up to tell me the drivers compartment was on fire and that the steering was knocked out as well. I told him to take a bamboo pole and mash it on the throttle and just get us the hell out of there. This seemed to take forever. All the while I was up top cooking 5 rounds with the 50 then recharge the handle. We finally got both vehicles off to the side of the road. Kuch had only a .45 pistol and he had Tate in the fireman's carry. We were standing there alongside the road and watched EVERYBODY PASS US BY. We were LEFT BEHIND!!!

Kuch put Tates body back on the fender. By the way, before we unassed the tank, I threw two incendiary grenades inside to make it so the dinks would not be able to get any ammo or anything. Kuch and I jumped in the ditch along side the road.

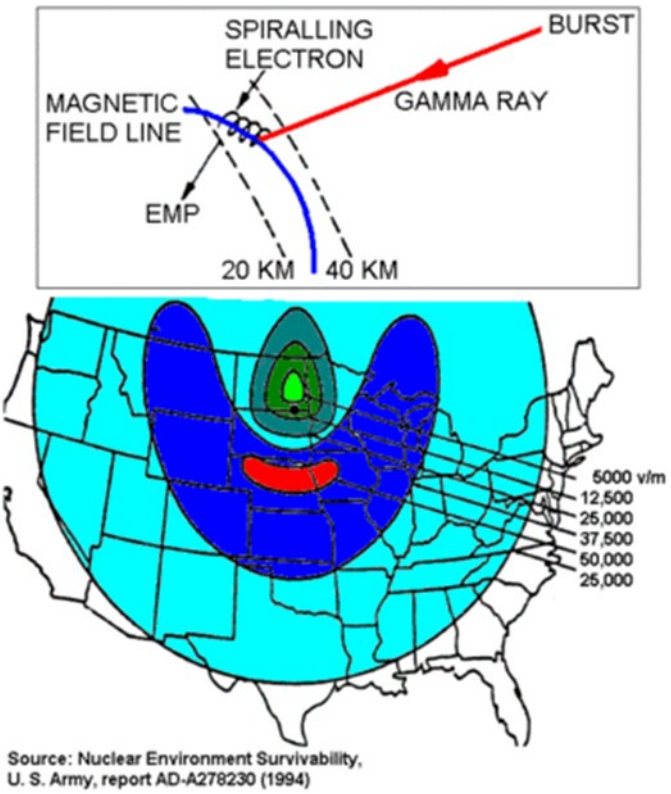
He had his .45 and 1 clip of ammo, I had my m-16 and one magazine. We crawled, walked slowly as their were VC all around us and we did not want to engage them. Nor did we want to fire and give away our position especially with the limited ammo we had. It seemed to be forever….I have no idea how long it was, but we had moved about 300 yards from the tank towards Dau Tieng when Kuch said he heard an APC. I thought he was losing it and I told him was gonna kick his ass if he didn't straighten up. He said to me "get your ass up here and tell me if you don't hear an apc". I crawled up to the side of the road and there was ONE APC (with James Hale on it) that had picked up all the stragglers and had about 15 guys in it and on it. There was a guy down inside from the 5th mech (I think) who was gut shot.

His buddies were administering marijuana to him. Normally I'd kick someone's ass for using that around me, but under the circumstances I looked the other way. Kuch wanted to go get Tates body!! Hale said, no way, I'm leaving. Just then an RPG went through the road wheels. Luckily, that is all it did was put a hole in the road wheels and didn't hurt the track. We got out of there and dropped the guy off at the hospital. Where we all unassed the APC. Me and Kuch got a ride from the MP's to where the rest of our troop was. Everyone was ripping apart 50's and mixing parts to make one work. It was a very long night. The next two days we went to try and get back. The gun fire and RPG fire was so heavy that we retreated. This was right outside the main gate of Dau Tieng. Called in Arty and Air all day and night.

Seems to me there was day in between leaving the vehicle and Tates body and coming back and getting his body. It was still on the fender unmolested thankfully. His wallet was still on him. He had some pictures that the heat had fused to his other stuff in his wallet.

On one of those days going back, James Hale's vehicle (19er I think) got hit by an RPG. Hale got 3rd degree burns over 65 % of his body. I took him to the hospital. I was on an APC that day as I had lost my tank. When I reached out to grab him, the skin and meat came off of him. We had to open the ramp so he could walk in. I could feel the heat radiating off his body from 5 feet away.

I got to quit writing now!!
Pray!!!
Bob Schneider 2/22nd



EMP Burst Affect

Wisconsin Traffic Nets

Name of Net, Frequency, Local Time	Net Manager
Badger Weather Net (BWN)	W9IXG
Badger Emergency Net (BEN)	NX9K
Wisconsin Side Band Net (WSBN)	KB9KEG
Wisconsin Novice Net (WNN)	KB9ROB
Wisconsin Slow Speed Net (WSSN)	N1KSN
Wisconsin Intrastate Net - Early (WIN-E)	WB9ICH
Wisconsin Intrastate Net - Late (WIN-L)	W9RTP
ARES/RACES Net	WB9WKO
* Net Control Operator needed. Contact Net Manager for infor-	

Next Regular Meeting

The next meeting will be on Thursday, January 31st 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.

Meeting Schedule:

January 31st, 2013

February 28th, 2013

SwapFest: February 16th, 2013

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

VE Testing:

January 26th, 2013 Testing 9:30— 11:00 am

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

Area Swapfests

February 16th, 2013 **Mid-Winter Interclub SwapFest**

Location: Brookfield, WI Type: ARRL Hamfest
Sponsor: Milwaukee Radio Amateurs Club & Milwaukee Area Amateur Radio Society Website: http://www.w9rh.org

February 23, 2013 CABIN FEVER HAMFEST Location: LaPorte, IN Type: ARRL Hamfest
Sponsor: LaPorte County Amateur Radio Club
Website: http://lpcarc.org

May 5th, 2013 AES SUPERFEST 2013 Location: Milwaukee, WI Type: ARRL Hamfest
Sponsor: Amateur Electronic Supply
Website: http://www.ashram.com

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)

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- ARRL Newsline

Mon.8:00 PM 146.445 Emergency Net

Mon.8:00 PM 146.865- Walworth County ARES net

Mon.8:45 PM 147.165- ARRL Audio News

Mon. 8:00 PM 442.100+ Railroad net, also on EchoLink

Mon. 8:00 PM 442.975+ WARC W9CQ net also on EchoLink 576754

Mon. 9:15 PM 444.125+ Waukesha ARES Net on the 1st, 3rd, and 5th Monday of each month.

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

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

Tues. 8:00 PM 145.390– General Class

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. 8:00 PM 147.045+ West Allis ARC net

Wed. 8:00 PM 147.270+ Racine County ARES net

Wed. 9:00 PM MAARS SwapNet on AllStar link to FM-38

Thur. 8:00 PM 145.130– General Class

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

Sun 9:00 PM 146.91 Swap Net

First Thursday of the month 8:00 PM 442.200+ Round Table Tech Net

2meter repeaters are offset by 600KHz - - 70 centimeter repeaters are offset by 5 MHz

SSB frequencies below 20 meters are LSB and for 20 Mtr and above are USB.