MRAC Hamateur Chatter

The Milwaukee Radio Amateurs Club

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

Dress for Public Service Success

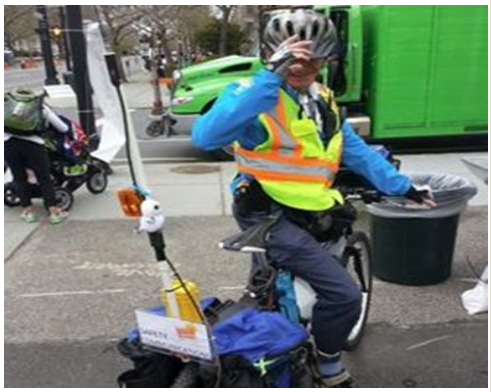
Visiting this year's ARRL New England Convention in Boxboro, Massachusetts, I was delightfully surprised at the level of care most attendees, and in particular exhibitors, speakers and volunteers, exercised in their choice of attire. Snazzy uniform shirts worn by vendors were in abundance. Business attire infused the exhibit hall. It was as if I were attending a professional conference.

There I met new ARRL CEO, Tom Gallagher, NY2RF, whose sharp business attire transmitted an easy-on-the-eyes message, one that clearly respected the first impressions of his constituents. Among the subjects discussed was my contention that our community must take better care to present ourselves as organized professionals when serving in a public service role, most especially in how we look.

As a leader of public service teams, and an advocate for better leadership, innovation and national unity in our public service communications role, I make sure every volunteer has the opportunity and support that encourages their personal success. Not only are my teams well trained and fully integrated into the organization or agency we serve, they also look (and smell) good.

That's because expectations for attire are part of the pre-event preparations. I urge volunteers at some events to be "smartly dressed with a clean white shirt and blue uniform pants, or equivalent." A volunteer T-shirt is sometimes needed as an added bit of identification and to unify us as members of a larger team, so I request that we "wear the supplied volunteer T-shirt in combination with uniform or EMT cargo pants to present a professional appearance." I also caution that we must not be confused with public safety or law enforcement personnel. "Professional" does not mean that we have license to impersonate, however innocent our first intention!
I have first-hand experience to suggest that those who present themselves professionally are invited back for the next event service opportunity. While some of us grumble about how disorganized the organization we're serving may be -- how little they understand about the value of our "superior" communications service -- we are ultimately responsible for an invitation back to a repeat performance. So what happens when we're not? Some of us lean upon that tired "when all else fails" excuse: "When all else fails you'll call upon us, and you won't care how we look." Weak. Irrelevant. Arrogant. Please throw those rags in the laundry (or incinerator) and come back civilized.

This is not a mud wrestling match.
At each public service event I've had the privilege and fun to work as



Author Mark Richards, K1MGY, dressed for public service success! (photo courtesy K1MGY)

a communications volunteer, the event organizers, public safety, vendors, and participants arrive dressed for the occasion. We are not exempt. If your leadership fails to set a minimum standard, that doesn't mean you can't arrive on time and ready to go with a professional, smart, confidence-inspiring appearance. You'll look good, feel great, and be amazed how receptive your team mates, the organizers, participants and the public will be when you dress for public service success.

-- *Mark Richards, K1MGY, Littleton, Massachusetts* [Richards is a member of the Boston Athletic Association's Boston Marathon Communications Committee, with an extensive history of leadership in numerous public event communications efforts. Richards is a frequent contributor to the ARRL *ARES E-Letter*. -- ed.]

MRAC Officers:

Terms Expiring in 2016

- President – Dave, KA9WXN
- V-President– Dan, N9ASA
- Secretary – MBH, KC9CMT
- Treasurer – MBH,,KC9CMT

Terms Expiring in 2017

- Director – Al, KC9IJJ
- Director – Vacant
- Director – Tom, W9TJP
- Director--Dale, AB9DW

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(414) 332- 6 7 2 2

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www.w9rh.org

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Board of Director's Minutes

Board of directors meeting called to order at 7:01 pm by Dave Shank, KA9WXN club president.

Director's present: Michael KC9CMT, Dave KA9WXN, Dan, N9ASA, Tom W9TJP, Dale AB9DW.

Absent: Al KC9IJJ, one vacancy

Preliminary Discussion: The Treasurers report for August 2016 was presented by Michael, KC9CMT. The treasurers report was approved as read by KC9CMT, a motion to accept was made by Tom, W9TJP, seconded by Dale, AB9DW. The August balance ended with $19,763.91 in Club accounts. It has been speculated that more interest can be made through the Bond Market rather than Cd's. New member certificates will be mailed if not handed out when they become available. Club dues increased to $20 per year effective April 1st, 2016. The annual budget has a negative balance expected for the year of 2016.

Meeting Presentations: October's presentation could be on Wires X, given by Dale AB9DW. K9XT has said he would do a program on feed lines. The November meeting will be moved up to the 17th, a week earlier due to the Thanksgiving holiday. There will be no raffle at the November meeting, the topic will be, what would you do different if you were rebuilding your ham shack. The January presentation will be conducted by Dave, WB9BWP. February may be our food meeting, depending on whether the club has swapfest. Kermit Carlson will be the guest speaker for our March meeting. The April meeting will be our annual election, in addition to a presentation on Radio Astronomy. May 2017 will be the annual club auction. The people from Milwaukee solar energy have said they would be willing to do another presentation. The Ham Outlet retailer has taken over the AES location and is willing to have a out-of-trunk swapfest during May of 2017.

Field Day: Field day went well at the MATC facility. MATC has both port-a-potties and hand wash stations at the location. It's a good location, but may not be available in 2017. The board would like to have a working committee for the field day 2017 effort.

Special Project Committees & Committee reports:

Repeater Report: The club would like more than one repeater control operator. A club repeater control operator should be a extra class operator to have the kind of privileges that are necessary to operate field day to its fullest extent. The D-Star repeater has been experiencing some issues lately, which Dave, KA9WXN has been correcting as they occur.

New Business: The Board will have to decide by the end-of-year where we will be holding our Board meetings for 2017. The activities director of MakersFaire has asked if someone could give a program on Amateur radio to her fifth grade class. Dave, KA9WXN is continuing discussions regarding events for the clubs' 2017 100th anniversary. Tom, W9TJP reports that Ham Radio Outlet is open from 10am-5:30pm, Monday through Saturday. Locations and dates are still being discussed as to the 100th anniversary Banquet. The banquet would have to be catered. Kermit Carlson will be the featured speaker at the banquet, tentative date October 17th, 2017. Some type of 100th year commemorative item is being discussed, for the banquet.

We need to start planning special event stations for the entire year of 2017. Dave, KA9WXN will attempt to generate interest among the membership in forming a committee to handle planning. Dan, N9ASA has arranged with Milwaukee Harley Davidson to have a special event station during their annual bash during June 2017. MakersFaire 2017 will be a special event station from the State Fair Park. It is important that the club gets going on the planning for 2017 events.

Swapfest Committee: The club is looking at April 1st as the new MRAC/MAARS swapfest date. There are a number of places and dates being considered, such as the Zoo and The nearby Elks club. The Zoo has a banquet room with 25 tables, that would be inexpensive, additional tables can be acquired. There has been some discussion about having a out-of-trunk event using the now HRO grounds sometime during the warm weather months. The idea was forwarded to move the Swapfest to April as a guard against losses due to inclement weather. Name suggestion: "Spring Fling", 2017 will be our 7th annual swapfest.

Special Projects: A special event station will be June 1st, at Greenfield House of Harley dealership. The special event will run during the dealerships hours of operations. The club needs someone to take over the FM simplex contest for February of 2017. The club really needs PR and recruitment, business cards have been printed and will be handed out at all club activities. The club should send out invitations for the banquet. A special event station at the War Memorial has been discussed. Does the club want to do a lighthouse special event. The club wants a special event callsign to use during the 100th year events. Dave WB9BWP the club trustee would have to request the callsign from the FCC. The club would also like to have a membership drive during 2017. There would be a special certificate for the any new member of the club. There could also be an award for anyone in the club that attracts a certain number of new members. This is still being discussed. The club needs to have some special QSL cards, or ridged certificates printed up for contacts during the calendar year of 2017. The club would like to query members about working on projects for the 100th anniversary.

Website update: The club maintains a PayPal account for the payment of dues. The club also has a Wiki page. Dave, WB9BWP is continuing to work on the club history Wiki page.

Clubs throughout the country need to use the spectrum that they have been given. The 220mhz band is not used very often in the Milwaukee area. A Club calendar is a project that the Board of Directors' would like to pursue. Dave, KA9WXN has been working on this idea. A schedule of upcoming events should be printed in the chatter each month.

A motion was made to adjourn the meeting at 8:47 pm by Dan N9ASA, seconded by Tom, W9TJP. Meeting adjourned at 8:50 pm.

Change in season: Fall weather hazards

by LT Sarah Janaro, Monday, September 26, 2016

Pumpkin spice lattes, apple picking, and football are all people seem to talk about these days. Yes, fall is here! While it is a beautiful and usually mild time of year, it can also bring unusual weather. Since fall is a transitional season, weather hazards seen during both warm and cold months, including hurricanes, wildfires, intense winds, flooding, droughts, fog/reduced visibility, hail, early season snow and more, can occur. One day the temperature might be in the 60s, while the next day it is in the 80s, and then it shoots right back down to the 60s.

Floodwaters – In short, never drive through floodwaters! Fall can often times bring with it rainy weather, and heavy rains can be a common occurrence since hurricane season continues until November. If you encounter fast moving water or a flooded roadway as you are driving or walking, it's best to turn around and find another route. Abide by the "Turn Around, Don't Drown" adage. You do not know the conditions under the water. All it takes is six inches of moving water to make you fall. Also, keep children and pets from playing in floodwater.

Reduced Visibility – With the days getting shorter, visibility when driving in the fall can be a challenge. Many people walk along the side of the road at dusk with dogs, on horses or riding bicycles, and they can be difficult to see. School is also back in session, so kids might be getting off of a school bus or crossing the street. Mornings tend to be foggy because the ground is still warm, but the air is cool. Additionally, fall is a time when wildlife is more active and on the move. Slow down when driving, especially on curvy or narrow roads where visibility around corners is difficult, pay attention to postings for animal crossings, and obey school zone speed limits.

Weather Changes Quickly – Fall foliage hikes are fabulous, but always check the weather before heading to an outdoor activity. If you take a hike, be prepared for weather changes as you increase elevation. It may be sunny at the base of the mountain, but it could be cold and rainy or even snowy at the summit. Dress in layers, and bring a wind breaker or waterproof shell, plenty of water, and never hike alone.

Water Safety – Many people also like to take fall boat rides to see peak foliage or get out on a kayak a few more times before the weather gets too cold. Even if things seem calm on the water, always wear a life jacket. File a float plan and make sure you have the required safety equipment. Being submerged in water of any temperature for any length of time can cause hypothermia and even the strongest swimmer can be weakened. But you don't have to be submerged in water to experience signs of hypothermia. Small open boats combined with cold, wet weather can lead to possible hypothermia.

Using the Coast Guard mobile app for boating safety is a great way to quickly and easily check marine weather from your phone. With it, you can check the weather at nearby NOAA buoys, which can give you wind speed and directions along with wave height. If you're a boater, make sure you check the weather each and every time you head out and continue to monitor it throughout your time on the water. NOAA's National Weather Service (NWS) provides weather, water and climate data and forecasts and warnings to protect life and property.

Check out Weather-Ready Nation to learn more about how to ensure you are safe this fall!

NOAA's National Weather Service leads Seasonal Safety Campaigns to prepare the public for seasonal weather hazards. NOAA warns the public about severe weather through Wireless Emergency Alerts and NOAA Weather Radio. NOAA's Storm Prediction Center issues Fire Weather Outlooks to help local officials prepare for potential wildfires.

NOAA's Space Weather Prediction Center provides space weather forecasts, watches, warnings and alerts.

NOAA's Weather Prediction Center provides snow and ice forecasts from September 15 – May 15.

NOAA's Climate Prediction Center issues a Winter Outlook (coming in October) to help the nation prepare for the upcoming season. It also monitors drought and El Niño conditions.

Resource: The Official Blog of the U.S. Coast Guard

Transistor Basics - MOSFETs

Transistors are arguably the most important electronic component in use today. They are nearly everywhere, in nearly every electronic device we use. Radios, phones, computers, game consoles, TVs, cars, toys ... the list goes on. Without them, life would be drastically different.

The idea of the transistor was first developed and patented in 1925 by Julius Edgar Lilienfeld, but manufacturing techniques for the required materials weren't good enough to produce a high enough quality crystal and so development and testing came much later. William Shockley, John Bardeen and Walter Brattain of Bell Labs spent many years and LOTS of money researching and developing what became the point-contact transistor, which was a PNP type transistor and was successfully demonstrated as a voice amplifier on 23 Dec, 1947. It wasn't until 1950 that Shockley developed the bi-polar transistor (BJTs) that became so ubiquitous, and still is today.

Julius Lilienfeld had actually described what we know now as the field effect transistor, or FET (more specifically he predicted the JFET), in his patent of 1925, and it was the FET that the guys at Bell Labs were trying to produce when they developed the point-contact transistor. It wasn't until 1960 that the first MOSFET was introduced by Dawon Kahng and Martin Atalla.

MOSFETs differ from BJTs in that BJTs require that a current be applied to the base pin in order for current to flow between the collector and emitter pins. On the other hand, MOSFETs only require a voltage at the gate pin to allow current flow between the drain and source pins. MOSFETs actually have a very high gate impedance by design, which makes them very good at reducing the amount of wattage a circuit requires to run. One of the first transistor based computers required 150 watts, but it used point-contact transistors. That doesn't seem like much compared to now, but it only had 200 transistors and 1300 diodes. My dad's Casio watch from 1990 had more computing power and didn't require nearly that much power. (Thank goodness. Can you imagine the burn marks?) Thankfully computers now use MOSFETs almost exclusively in their designs, so they don't require as much power.

As indicated by the title, I will be going over some uses for MOSFETs in this Tutorial. This is not intended to be an exhaustive resource, simply a "get started" point so you can get on building.

Parts and some Theory

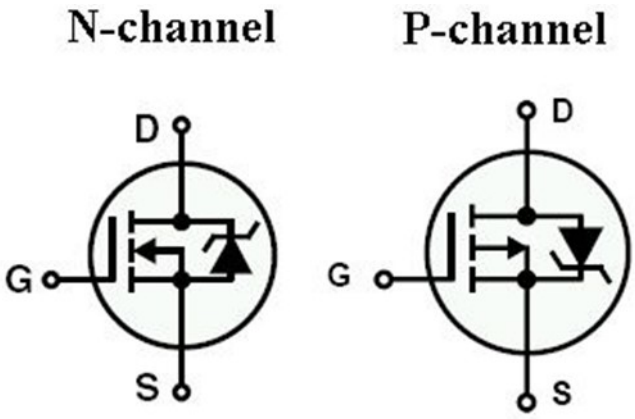
There are lots of different types of MOSFETs out there, so picking a specific one to use can be a little bit overwhelming. For the projects here I will be using ZVP2110A (datasheet) and ZVN2110A (datasheet) for pretty much everything. They are a bit outdated, but more than adequate for our purposes here. The ZVP is P-channel, meaning that it requires a relatively negative signal at the gate pin to function. The ZVN is N-channel, requiring a relatively positive signal to function. I know it seems backwards, but if you think of negative as "holes" and positive as "plugs", you can't make "holes" and "holes" work, you need "holes" and "plugs" to have a smooth "surface" over which the electrons can flow.

You will need:

P-channel and N-channel MOSFETs - I happen to have the ZVP and ZVN MOSFETs lying around, so I used those. The package type for these is known as E-type (image below), and is very similar to the TO-92 package but the rounded side is flatter. More often than not you will find MOSFETs in the TO-220 package or similar (image below). MOSFETs in the TO-220 package are usually power MOSFETs and are designed to handle higher current loads. Either package will work for the following examples. I also found a 2N7000 in my parts bin, which has a TO-92 package, so they come in all shapes and sizes. **Note -** there is no set standard for pin assignments between package types! Always double check your datasheets to make sure you know which pin is which.

E-type package TO-220 package

various resistors - nominal values from 100? - 100k? will be fine. Exact values will be given as needed.
various electronic bits - motors, LEDs, switches, etc. Stuff that can be switched on or amplified.
breadboard, jumper wires, 9V battery & battery clip.
Logic ICs. These are totally optional, but MOSFETs find their best application in logic circuits. Specific ICs will be listed as needed.
There are also depletion type, and the difference is that enhancement "turn on" when voltage is applied, whereas the depletion type "turn off". We will deal only with enhancement types here.) The three pins are labeled **G**ate, **D**rain, and **S**ource. (FYI - for BJTs, these are labeled **B**ase, **C**ollector, and **E**mitter and serve the same basic functions). Carefully note the orientation of the three pins. It's very easy to switch the MOSFET around backward, so always double check your datasheets for the MOSFET you are using to ensure the correct pin orientation. The ZVNs and ZVPs that I'm using have a different pin orientation than most MOSFETs that use the TO-220 package.

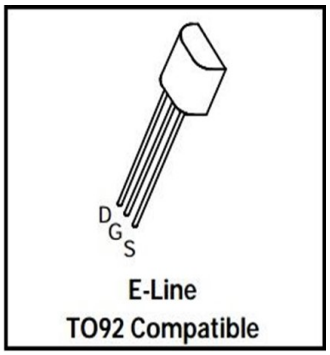


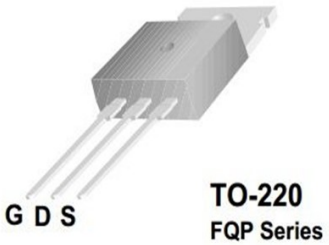
Take a look at the datasheet again for the ZVN2110A. As always there is a lot of information on the datasheet. Pay close attention to maximum ratings. Always give yourself some room between operating and max values and stay well away from max values. When you operate near max values, you generate more heat than is needed, and you will lose performance as well as shorten the life of the transistor. Get a transistor with a higher rating if needed.

In order for N-channel MOSFETs to work, the gate voltage (VG) must be more positive than the source voltage (VS). This is often noted as VGS and a frequent minimum value for VGS is 0.6-1.0V. Note that according to the datasheet, the ZVN can handle a VGS of +/-20V, but it only takes between 0.8V (min) and 2.4V (max) to open the gate. This means that you can apply the same supply voltage to the gate as well as the drain of your MOSFET without worrying about performance issues. That will make more sense later on.

Another factor to keep in mind is the drain-source voltage (VDS). VDS cannot be less than VGS or the MOSFET simply won't work. For P-channel MOSFETs, we need to invert all of the above. VDS should be the most negative value, VS should be the most positive value, and VGS should be less than VS but higher than or equal to VDS. For more on MOSFETs, check out these pages at electronics-tutorials.ws and allaboutcircuits.com

The image below shows the two types of schematics symbols associated with MOSFETs. (It should be noted here that the schematics shown are only for enhancement)

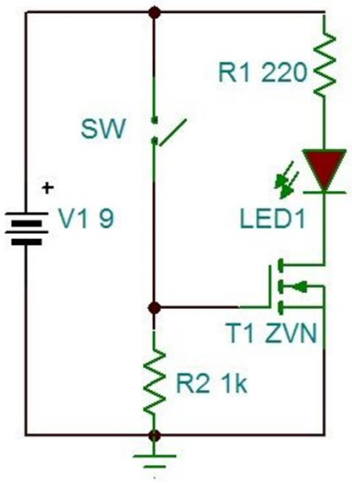


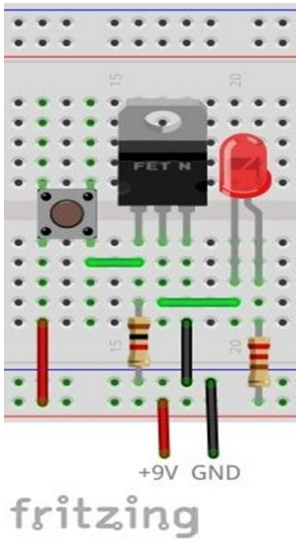


A simple switch

MOSFETs are really easy to "saturate", which just means that they are fully open, and they are dead reliable for very fast switching between their saturation and cut-off regions (fully on and fully off regions). This makes them wonderful switches, especially for high power applications like motors, lamps, etc. In most cases, you can use the same power supply that you are using for your high power device to operate the MOSFET as well, using a mechanical switch to apply the gate voltage. (Alternatively, you can also use an electronic signal, like from a microcontroller, to activate the MOSFET. This is extremely common, and useful, since the output pins on microcontrollers are not designed for high power applications. Also, be sure to check the gate threshold voltage for the MOSFET and compare it to the microcontroller output pin voltage. Some MOSFETs require more voltage than some microcontrollers can output.)

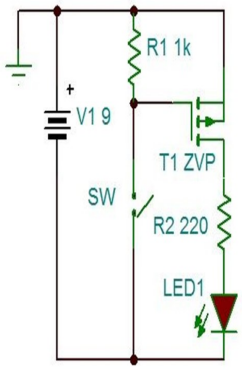
Build: Place the N-ch MOSFET on the board. Connect the 1k? resistor between the gate and GND. Connect the switch between the gate and +9V. Place the 220? resistor and LED in series between +9V and the drain. Tie the source pin directly to GND. **See image below.**

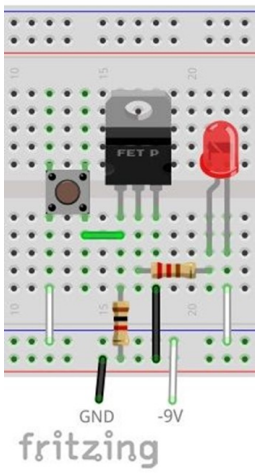




Push the button and the LED should light up. The1k? resistor acts as a pull-down resistor, keeping the voltage at the gate at the same potential as the negative battery terminal until the button is pushed. This puts a positive voltage at the gate, opening the channel between the drain and source pins and allowing current to flow through the LED. Note that the gate voltage is +9V and there are no negative side effects.

Now let's see how we connect a P-ch MOSFET. Remember that the relative positive/negative values for the gate, drain, and source are inverted here.





Build: Place the P-ch MOSFET on the board. Connect the 1k? Resistor between GND and the gate. Place the switch between -9V and the gate. Place the 220? Resistor and the LED in series between the source and GND. Connect the drain directly to -9V. Allow me to digress for a moment because the connections here seem weird, I know. (If this already makes sense, just push the button.) Instead of using the positive side of a 9V battery as +9V, we are using it as GND and the negative as -9V. But remember, GND is arbitrary and relative, which can be really confusing. You get to set it where you want it so that it makes sense. So let's look again at what we are building.

Remember that for a P-ch MOSFET, we need the source to have the highest relative value, the drain should have the lowest relative value, and the gate lower than the source, but greater than or equal to the drain. We know that the positive terminal on a 9V battery is 9V more positive than, or relative to, the negative terminal. By saying "more positive" we can start to get out of the +9V/GND box and start to think more relatively. We can also correctly say that the negative terminal is 9V more negative relative to the positive terminal. We can now give either terminal any value we want and the relation between the two stays the same. That's the important part. As long as the more negative terminal on the battery is connected to the pin that needs the more negative value (the drain), and the more positive terminal is connected to the pin that needs the more positive value (the source).
Anyway, back to the circuit. Push the button, the LED comes on again.

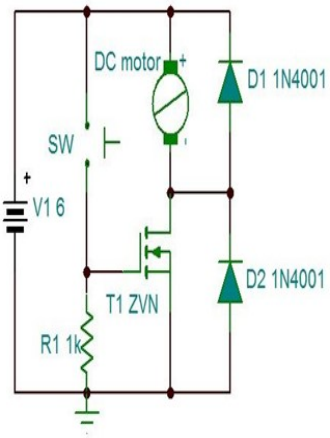
Again, using these with a microcontroller, all you need is the correct relative signal paired with the correct MOSFET and you get very useful high current drivers

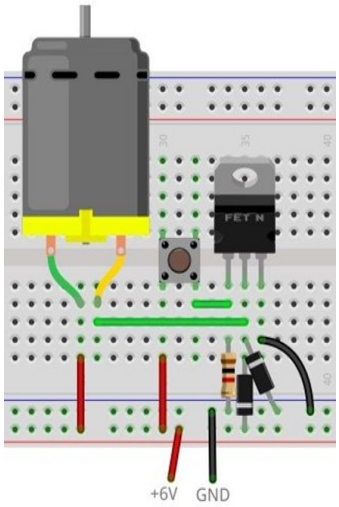
Motor drivers

Building off of Step 1, we can use the ZVN as a DC motor driver. To avoid over-current damage to the ZVN, I'm using a small 6V DC hobby motor, much like the kind you find inside of small hobby servos. With a higher current N-ch MOSFET, you can drive larger motors with larger current needs.
Looking at the schematic below you'll see two diodes placed backward (reverse biased) across the motor contacts and across the MOSFET drain/source pins. Any electrical component that has a coil in it (inductors, relays, solenoids, motors, etc.) can generate a very large voltage spike in the reverse direction when it is turned off. (This is a common problem in airsoft, and it can lead to premature wear on the trigger contacts that turn on the motor. An easy fix for this is to add an "airsoft MOSFET", and this is a similar example. It should be

noted that the parts used here are nowhere near capable of handling the voltage/current needs of an airsoft motor, so don't use this specific example.) The diodes give that spike a place to go so that the components are not damaged.

Build: Place the ZVN on the board. Connect the 1k? Resistor between the gate and GND. Connect the switch between +6V and the gate. Connect the source to GND. Connect the drain to the negative motor lead. Tie the positive motor lead to +6V. Place one diode between the drain and source pins, with the stripe on the diode facing the drain pin. Put the other diode across the motor leads, with the stripe toward +6V. See image below. Once everything is connected, double check it. And again. It's really easy to get things switched and even though it probably won't matter with this circuit, it's a good habit to already have when it does matter. Then push the button and your motor should run in one direction. To switch direction, we can simply swap the leads to the motor, but that would be impractical in a real project. Well, if an N-ch MOSFET turns the motor in one direction, a P-ch MOSFET should turn it the other way, right? Let's see what that looks like below.

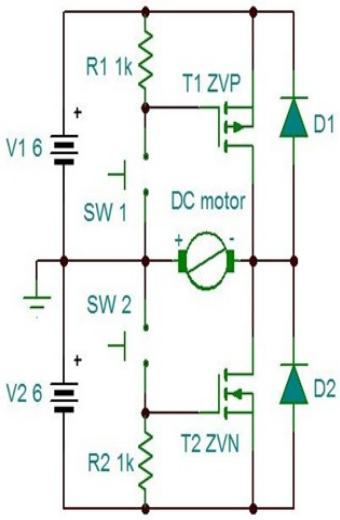


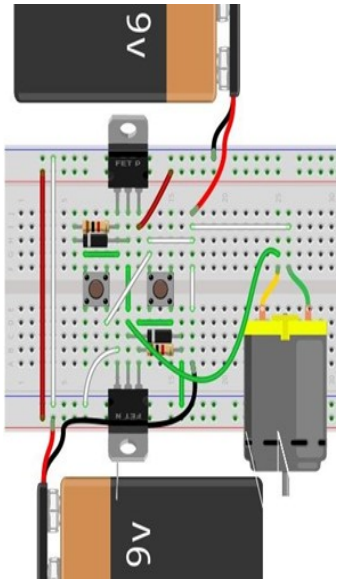


Build: Place the ZVP on the board. Connect the 1k? Resistor between the gate and +6V. Connect the switch between GND and the gate. Connect the source to +6V. Connect the drain to the negative motor lead. Tie the positive motor lead to GND. Place one diode between the drain and source pins, with the stripe on the diode facing the source pin. Put the other diode between GND and the drain, with the stripe toward he drain.

Push the button and the motor should spin in the opposite direction. This would allow for speed control instead of just fully on/off.

What happens if I move the GND reference from the negative battery terminal to the positive? How does it change the build instructions? The answer is that it doesn't change the build sequence one bit, just how you look at the reference voltages. Specifically, we replace all "GND" references with "-6V" and all "+6V" references with "GND". We can do the same thing with the schematic and instructions associated with image 1. It's important to remember that the idea of "more positive" and "more negative" don't change if we do that. The reason I bring that up is this. What if we need a motor controller that can go in both directions? We already have two circuits that can each go in one direction, opposite to each other. How do we combine them? We are going to need +/- power supplies, but images 1 and 3 show only +6V. How do we resolve this? (For this circuit you will need + and - power supplies, with a GND reference equidistant between them. Since my motor is 6V, I have +/- 6V. The build image shows 9V batteries, but fritzing doesn't have 6V battery images, so I made do.)





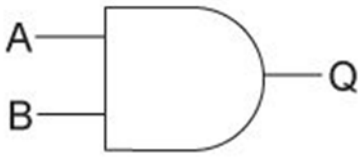
Build: Connect one positive battery lead to the positive power rail. Connect the negative battery lead from the other battery to the negative power rail. You should have a loose positive lead and a loose negative lead. Connect them together in the same row on the breadboard. This point is now your GND reference. Now place the ZVN and ZVP MOSFETs on the board with no pins connected. Connect both switches separately between GND and each gate. Connect one 1k? resistor between -6V and the gate of the ZVN. Connect the other 1k? resistor between +6V and the gate of the ZVP. Tie the source of the ZVN to -6V and the source of the ZVP to +6V. Tie the two drain pins together. Place one diode across the ZVN source/drain pins, with the stripe toward the source pin. Place the second diode across the ZVP source/drain pins, with the stripe toward the drain pin. Connect the negative lead on the motor to the drain pins, and the positive motor lead to GND. Now push each button, but not both at the same time. The motor spins one way for one button, and reverses direction for the other button. You can swap the momentary switches with slide switches so the motor stays on, but again, do not turn on both switches at the same time. Another bi-directional motor controller is called an H-bridge, and I will leave you to explore that idea more.

Logic gates

Now let's look at how MOSFETs are used in logic computations. Well, let me back up a step. In order to understand computing, you must have a basic knowledge of boolean algebra. If you are unfamiliar with boolean algebra, stop here and do some research. I'll try and simplify it, but electronics-tutorials.ws has a great set of lessons on it specifically targeted to electronic, or digital, logic. The BBC has a cool interactive site for learning digital logic as well. Digital logic is what we use to design computer logic processors. You may also want to learn more about K-maps, which allow you to see complex truth tables in a different (and often easier) way, and De Morgan's theorems, which are the foundation of boolean algebra. In a broader sense, reference material in discrete mathematics, which covers logic but also set theory, recursion, and relations, may also come in handy. Wikipedia has a list of operators that are commonly used for logic expressions. Also, by way of clarification, in digital logic we use

1's (on) and 0's (off) to indicate the state of the input or output. NOW let's look at how MOSFETs are used in logic computations, shall we.

First some theory, The first logic gate I want to introduce is the two-input AND gate because it's probably the easiest logic to understand. The image below shows the schematic symbol for an AND gate.



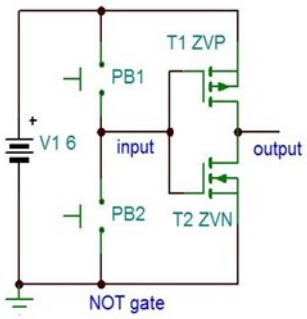
The output of the AND gate will only be high if BOTH of the inputs are also high. If either input is low, the output is also low. The symbol (in digital logic) is "?".
See the table below for the AND gate truth table.

A B A ● B
0 0 0
0 1 0
1 0 0
1 1 1

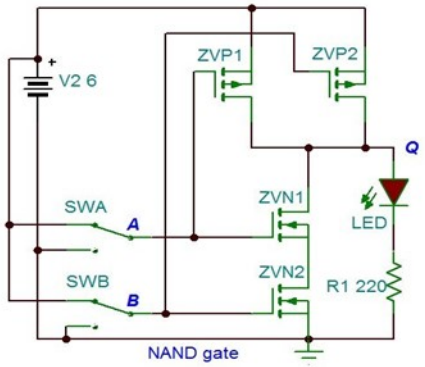
When looking at truth tables, the number of possible outcomes in the far right column is related to the number of inputs by raising 2 to a power equal to the number of inputs. In other words, if you have two inputs, you have 22 = 4 outputs. With 3 inputs, you get 23 = 8 outputs, and with 8 inputs your get 28 = 256 possible outputs. The second gate to consider is the NAND gate, or Not AND. NOT is the way we describe negation, or saying something is the opposite. The negation of true is false, and the NOT of AND is NAND. The symbol for NOT (in digital logic) is the tilde, "~". The NAND truth table is similar, but opposite to the AND truth table. See below.

A B ~(A ● B)
0 0 1
0 1 1
1 0 1
1 1 0

The output column is the complete opposite of the AND truth table output, isn't it? Other truth tables (and gates as well) are OR, NOR, XOR, XNOR, and NOT. Now some application; So how do MOSFETs come in to play with logic gates? Well, since MOSFETs are so easy to saturate (turn fully on) with a low voltage and almost negligible current, we can build the logic gates above with them and in turn build extremely reliable digital logic systems to process data. Let's look at how a NOT gate looks on the inside and see if we can make some sense of this. I'm starting with the NOT because it takes the fewest number of MOSFETs to build and should therefore be less confusing.

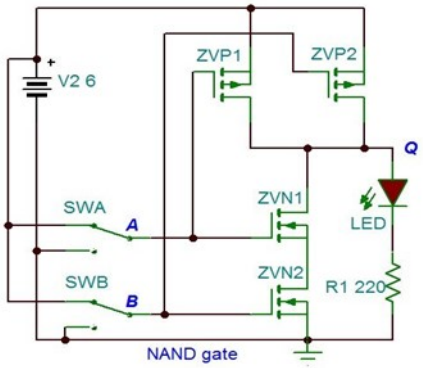


Now some application:
So how do MOSFETs come in to play with logic gates? Well, since MOSFETs are so easy to saturate (turn fully on) with a low voltage and almost negligible current, we can build the logic gates above with them and in turn build extremely reliable digital logic systems to process data. Let's look at how a NOT gate looks on the inside and see if we can make some sense of this. I'm starting with the NOT because it takes the fewest number of MOSFETs to build and should therefore be less confusing.
Now let's see what a NAND gate looks like inside. This time we are using 4 MOSFETs. **See the schematic below**.



The NOT gate is used, as its name implies, to negate or invert the input signal. PB1 connects the two MOSFET gates to +6V, but only the ZVN will open with positive voltage. When it opens though, it connects the output to GND, so the + input becomes GND at the output. Conversely, when we apply GND to the input through PB2, only the ZVP opens, which connects the output to +6V, again inverting the signal. (When neither button is pressed, the output can 'float' and be either +V or GND, so it's common to force the input to one state to guarantee that you know what the output is at that moment in time. A simple way to do this is to replace either of the buttons with a 1k? Resistor, forcing the input to that potential when the remaining button is not pressed. You get to choose which state is your idle state this way.) I encourage you to build this, but I won't detail the instructions.

Now let's see what a NAND gate looks like inside. This time we are using 4 MOSFETs. See the schematic below.

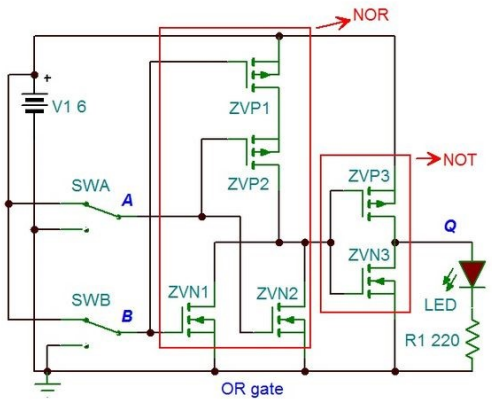


The LED will only turn off (logic 0) when both SWA and SWB are high (logic 1). (Notice how the LED symbol in the schematic is nearly black, indicating off? Remember that.) Compare this result to the NAND truth table. Again I encourage you to build this, but I will not be including build steps. What do we get when we mix the two? If the NAND is a NOT AND, and we combine it with a second NOT, what do we get? Isn't that just a double negative? So the NOTs cancel, logically, and we're left with an AND gate. In boolean algebra, the equation looks like ~(~(A?B))?(A?B). Pretty neat. Below is the truth table for that in case that makes it easier to understand. Also below is the schematic, to which I've added some labels for clarification.

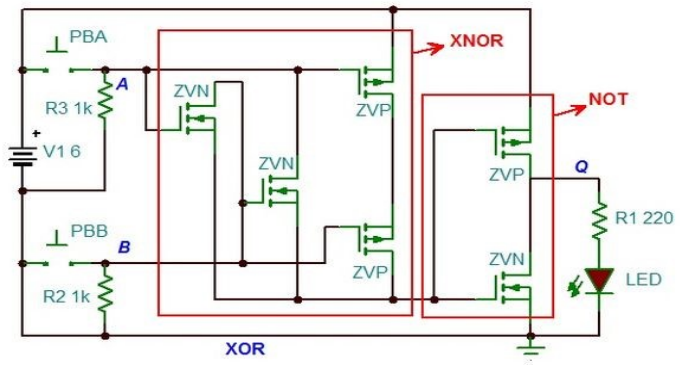
A B (A ● B) ~(A ● B) ~(~(A ● B))
0 0 0 1 0
0 1 0 1 0
1 0 0 1 0
1 1 1 0 1

If you compare the schematics for the AND, NOT and NAND gates, you'll see that even though on the outside the NAND is the negation of AND, on the inside the AND gate is actually made of a NAND gate followed by a NOT gate. So like I said above, the AND gate is actually a NOT NAND. Don't worry, it took me a while to catch on to that one too. Also, notice how the LED in the schematic is bright red, indicating that it is on when the switches are on. Compare that to the NAND gate schematic image above.

Below are schematics for the OR and XOR gates. Notice that both are actually a combination of their respective inverse (NOR and XNOR) with a NOT gate.



In truth it can be proven that any logic gate, and therefore any logic circuit, can be built with some finite number of NAND gates. Also, FPGA chips and the boards designed around them allow you to write code (using VHDL or Verilog) that will connect the gates as needed in order to complete the circuit and are a very easy way to start building and implementing digital logic circuits. Considering how difficult it can be to wire up just one logic gate, can you imagine trying to wire up an entire logic circuit using discrete MOSFETs? It's only been possible in the last few years for students and hobbyists to be able to build circuits like adders, which are simple in theory but complex to build, because of the advancement of technology and the miniaturization of the parts involved. Anyway, I digress. I'm just so grateful for the technology that is at our fingertips, when not



that long ago it was only a wish.

So now that it's as clear as mud, let's move on. Now that we have gates, what can we do with them?

Logic Circuits
The circuits here will be very simple, but will require either a LARGE number of discrete N-ch and P-ch MOSFETs or logic ICs. Logic ICs are cheap and easy to find, so it won't be too difficult. The circuits came from Forrest Mims book Digital Logic Projects: Workbook II. Here's a link to the PDF from RadioShack, or to Amazon.com for purchase.

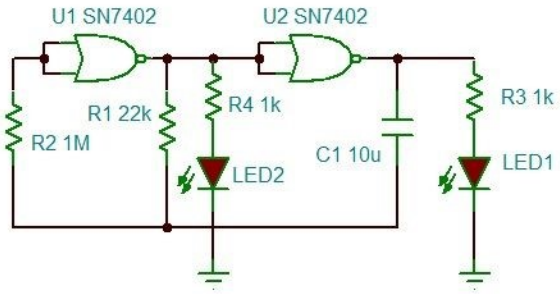
Some things to remember when working with logic ICs:

Be sure to avoid any static buildup or discharge to avoid damaging the chips.
Each chip has a common pin for +V and a common GND pin. These are not shown on the schematics, but should be easy to find on the datasheet (7402 datasheet).

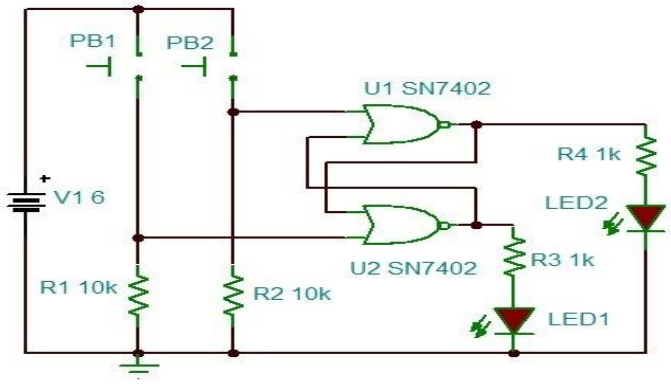
Any input pins that are not being used should be connected to GND. Logic chips are not meant to be high current drivers for large loads like motors and such. However they can be used for small loads, like an LED, or to provide the signal for such drivers.

For the following schematics, note the SN74XX number above each gate. That is the IC number I used to build the circuits if you want to get some ICs and build these on your own. Most of these chips come with 4 of the specific gate, so the SN7402 below would have 4 NOR gates.

OK, let's begin with a simple LED flasher. Using just two NOR gates, we can build an oscillator. See schematic below. LED2 and R4 are optional if you want to have two LEDs that flash back and forth. Otherwise LED1 will flash on/off at a rate determined by the values of R1 (try a potentiometer here) and C1.



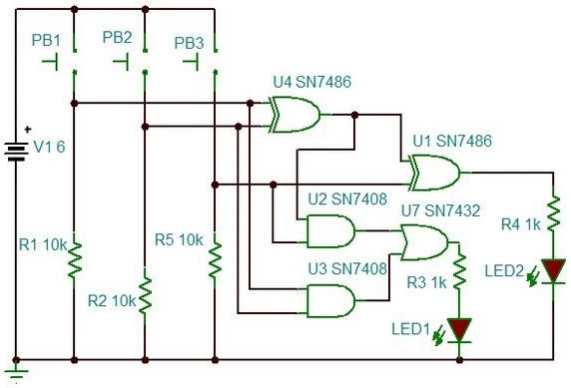
The next circuit is a set/reset latch, which is a key component of sequential logic. Latches form the basis of computer memory, since the output remains on/off even after you release the switch. A group of 8 latches would form the core structure for an 8-bit memory cell. In memory, the SR latch is known as a D latch (data) and is used with the system core clock to determine when to latch. (There is more to it, but it's beyond the scope of this Tutorial. This circuit is more of a demonstration of concept since we are usually only interested in one output from the latch because as the outputs flip-flop between states as the buttons are pressed, they will always be at opposite states to each other. You can tie one of the outputs here to a second circuit and use the latch as a "push on/push off", non-mechanical switch for the second circuit.



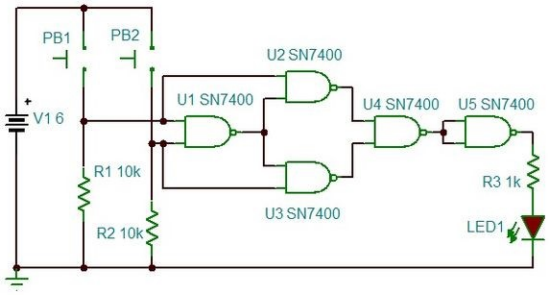
But if we try to conserve space and costs by using specific gates, we are limited by the number of each gate we have. from a finite number of NAND gates. Here's an example of an OR gate made with 3 NAND gates. To change the OR to a NOR, add a fourth NAND between the output of U3 and the LED, with the two inputs of U4 tied together. we can make... anything.

It seems like it would be more costly to use a lot more MOSFETs to do the same thing (4 for 1 NOR gate, 16 for 3 NAND gates) and when you are designing a new chip, space and the number of parts in that space is the most important thing regarding the cost of the chip. Well, here is the benefit. Remember the FPGA chips I mentioned before? These are generic chips that can be programmed for any situation. If we have a huge bin of NAND gates that can make anything, then What happens when we need more OR gates?

Sounds like a redesign to me, and that costs money too. The point is that if you have a specific design already in mind, it may be better to use the exact gate needed and not a bin of generic NAND gates. But if you are prototyping and designing from scratch, you need flexibility and that is where NAND gates shine. Anyway, back to it. Again using only NAND gates, we can build an XNOR gate.



By removing U5 and tying the output of U4 to R3, we get an XOR gate.

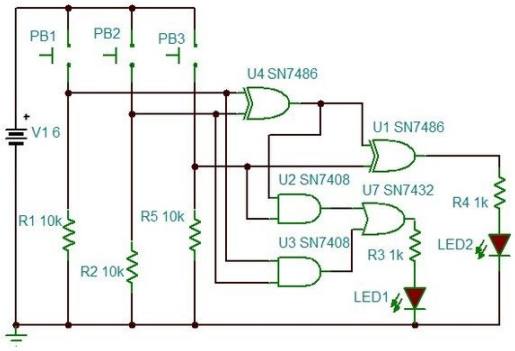


A single XOR gate can be used as a 1 bit binary adder. By adding two NAND gates (which is just an AND gate if you remember), we get a half-adder with a two bit output.

If we then press PB3 and add 1 more, we get 11b, and both LEDs light.

Below is a block diagram for a 4-bit adder using 4 full-adder blocks. The first block on the right (with A0 and B0) can be swapped with a half-adder with no effect on the output. It simply removes the the carry-in (Cin) on the first full-adder, which is connected to GND anyway.

In this example we are adding two, 4-bit numbers A and B. The first bits of each (A0 and B0) are added on the right, with the result sent to S0 and any carry bit (C1) sent to the next adder. A1 and B1 are then added, along with C1 from the



A full-adder requires a couple of changes (add an XOR, two NANDs, and an OR gate), which add an input to handle carry-in signals from a previous adder. Several adders are then stacked together, one adder for each bit, to build an adding machine. It's actually pretty elegant. Below is a full-adder circuit.

PB1 is bit A, PB2 is bit B and PB3 is the carry bit from the previous adder block. If we only press PB1 or PB2, we are adding 1+0 and only LED 2 will light to indicate a value of 1. If we press PB1 and PB2 together, that indicates a binary addition of 1+1, which is 10 in binary (indicated as 10b). That will light up LED1 and leave LED2 off. If we then press PB3 and add 1 more, we get 11b, and both LEDs light.

Conclusion

As you can see MOSFETs are extremely useful. They are arguably the most important electronic component in use today when you look at how much we rely on them for our everyday electronic devices. There isn't a day that goes by that you don't use several million transistors just to do something simple, like look at what time it is. Or make your coffee, check your email, watch a movie, listen to music, or read this bible. You may have noticed that there is no mention of MOSFETs as amplifiers here. I did that on purpose, but that isn't to say that they can't be used as such. My experience has been that analog signal amplification duties are best handled by BJTs, and fast, high current switching is best done by MOSFETs. I realize that is a generalization, as there are plenty of examples for both transistor types working both ways very well. I encourage you to do the research yourself if you wish to learn more on those applications.

Early Radio: Military Communications

Ninth Marines in Vietnam

On March 8th, 1965, Battalion Landing Team 3/9, commanded by Lt. Colonel Charles E. McPartlin, landed on the sandy beaches of Da Nang, South Vietnam, to spearhead the landing of the 9th Marine Amphibious Brigade. Upon landing the Marines immediately took up the mission of providing security for the Da Nang Air Base and the first of many Marine units commenced heli-lifting into the immediate area until relieved by 1/9 on June 17 when the battalion returned to Okinawa.

On July 4, 1965, the 9th Marines regimental headquarters, commanded by Colonel Frank E. Garretson, and 2/9, under the command of Lt. Colonel George E. Scharnberg, arrived in Da Nang from Okinawa. 3/9, under the command of Lt. Colonel Robert J. Tunnell Jr., returned to Vietnam in the midst of August, thus the entire regiment was committed against communist insurgent forces in Vietnam.

Early Radio: Military Communications

During the following four years in Vietnam, the 9th Marines would distinguish themselves wherever they fought. They set precedents that Marines and units throughout Vietnam would emulate, precedents in protecting Vietnamese rice crops, in fighting the Viet Cong and in the heavy fighting with the North Vietnamese main force units in and near the DMZ.

In retrospect the 9th Marines history in Vietnam covered three distinct periods and areas of operations. From their initial landing until early in 1967, they operated in an area south of Da Nang amidst a large Vietnamese population. Then they moved north to Dong Ha, where for more than a year they made headlines in operations such as Hickory, Kingfisher, Buffalo, and Kentucky in "Leatherneck Square" and places like Con Thien, Camp Carroll and Gio Linh. Then in the middle of 1968, they played an important role in the 3rd Marine Division's new mobile posture as the primary maneuver regiment. For the next year they constantly moved throughout the divisions area in operations such as Lancaster II, Scotland II, Dawson River, Dewey Canyon, Apache Snow, Cameron Falls, and Utah Mesa.

One significant note during its many operations throughout I Corps, is that at one time or another the regiment was in operational control of virtually every single battalion in the 1st and 3rd Marine Divisions, while for an eight month period it was also under control of the 1st Marine Division.
The regiments first area of operation being south of Da Nang, covered a large area of 257 square miles, consisting of 27 villages, 150 hamlets and more than 88,000 Vietnamese civilians. Contiguous to this zone of action was the An Hoa industrial light complex, an area of considerable economic potential to the people of Da Nang and the surrounding Quang Nam Province.

During this period of time, the regiment initiated and developed several tactics and techniques that would, because of their success, become adopted by units throughout Vietnam.
The first of these new techniques was a means of protecting the rice harvest. Code named "Golden Fleece," these operations, which began in September, 1965, was designed to protect the Vietnamese in harvesting their rice and denying the enemy of a source of food and income. Emphasis was placed on controlling the movement of rice by conducting search and clear operations in the vicinity of the harvest and also provide security for the villages.

This type of operation was successful both militarily and politically and was instrumental in establishing Marine - Vietnamese rapport throughout the regiments area of operation.
As the regiment advanced south of Song Cau Do, contact with the enemy rose sharply. The zone of activity was increasingly characterized by intense short-lived encounters on the small unit levels. And so, in January, 1966, the 9th marines developed a quick response, highly maneuverable, small reaction force with adequate fire power to handle any situation at hand. Named "Sparrow Hawk," the force consisted of 22 men, who in addition to their normal arms were equipped with four M-72 (LAWS), one M-60 machine gun, one 3.5 inch rocket launcher and one 60mm mortar. This force later rose in number to the present day platoon size reaction force.

In October, 1965, the area to the rear of the 2nd Battalions area was chosen by the Government of Vietnam as the location for a priority pacification program.

Civic action as a "new weapons system" gained importance as the program, supported by the 9th Marines, picked up momentum. In an effort to provide maximum assistance to the program and at the same time accomplish one of its priority missions, the destruction of the Viet Cong, the 9th Marines developed "County Fair" in February, 1966.

County Fair was a combination of military, civic and psychological warfare actions to reestablish the Vietnamese government control over the populace of a given area. It was designed to flush the Viet Cong from the community in which they were a parasite, while at the same time insuring that the populace was not alienated towards the government. Military actions were accompanied by a vigorous civic action program which attempted to convince the population that the government was interested in the welfare of the people and that a governments victory over the Viet Cong was inevitable.

The 9th Marines participation in County Fair operations consisted of cordoning a target area (village or hamlet) in order to isolate it for the duration of the operation and providing limited medical treatment to the people.

Throughout the remaining months of 1966 and early 1967, the 9th Marines conducted numerous search and clear operations to search out the enemy while strengthening their civic action programs to secure relations with the Vietnamese people, and free the people from the constant threat of Viet Cong terrorism. Noteworthy operations during this period were Macon, Shasta, Sterling, Mississippi, Cleveland, Pulaski, Independence, Yuba and Gulf. Of significance was Operation Mississippi in the Antenna Valley where 9th Marine units captured 50 tons of rice and relocated 2,300 Vietnamese refugees.

In April, the regiment moved to Dong Ha, where elements of the regiment became involved in some of the bitterest fighting of the war, in areas near Khe Sanh, Gio Linh and Con Thien. In one such operation near Con Thien, 9th Marine Leathernecks killed 991 enemy soldiers during Operation Buffalo while being almost constantly bombarded by enemy artillery and rockets. Later in September of that year, the outpost at Con Thien near the DMZ came under one of the heaviest artillery poundings of the war, lasting for 12 straight days. Elements of the regiment who manned the outpost during the siege turned back several NVA assaults inflicting heavy casualties on the attackers. With the aid of air and artillery support the 9th Marines turned the enemy attack into an enemy disaster.

Late in January, 1968, an element of the regiment was dispatched to the Khe Sanh area where it participated in Operation Scotland. There under the operational control of the 26th Marines, Leathernecks of 1/9 joined three battalions of the 26th Marine Regiment to hold the besieged Khe Sanh Combat Base, as North Vietnamese soldiers, firing from artillery bases at Co Roc across the Laotian border, rained thousands of shells into Khe Sanh daily. When the siege lifted in early April, the enemy had failed to take the base and had lost more than 1,000 men in the process. For their part in this action, the battalion, along with the 26th Marines, received the Presidential Unit Citation.

Early Radio: Military Communications

Following the fierce fighting after the break out at Khe Sanh, the regiment began conducting operations around the Rockpile and Vandergrift Combat Base where they met with heavy resistance. The first of these operations was Operation Lancaster II July Action, a major 9th Marines multi-regimental helicopter assault. During this operation the Marines captured several 75mm pack howitzers which had been firing at Camp Carroll.

In late August, the 9th Marines conducted Operation Lancaster II Trousdale, in an area northwest of the Rockpile, never before entered.
Enemy resistance was heavy as Marines found large enemy weapons and ammunition caches. To further exploit the area, the Marines struck farther north and on September 17 they landed on the banks of the Ben Hai river in the DMZ. In these two operations the Leathernecks accounted for more than 1,000 enemy dead.

The final months of 1968 produced little enemy contact as the NVA had been forced back across the DMZ to try an reorganize their forces after staggering losses.
In January, 1969, intelligence reports indicated a large enemy buildup in the Ashau Valley south of Vandergrift Combat Base. The 9th Marines, commanded now by Colonel Robert H. Barrow, were given the task of denying the enemy access of the valley. It marked the kick-off of Operation Dewey Canyon which was to become one of the most successful operations in the regiments history in Vietnam.

The 56 days of Operation Dewey Canyon were marked by unparalleled Marine successes and constant frustration and defeat for the enemy. The largest enemy munitions and arms cache of the war, over 500 tons of communist arms and ammunition, were uncovered by the Marines. Among the 215 crew served weapons captured and destroyed were 12 Russian-made 122mm field guns. When the operation ended March 18th, 1,617 of the enemy had been killed. It was a superb display of the effectiveness of the Marine Corps air and ground team in combat. During the operation, the Leathernecks utilized both artillery and air in this now famous operation.

Operation Dewey Canyon was not to be the 9th Marines farewell to the Ashau Valley however. In early May, Operation Apache Snow was initiated in the valley as the regiment, commanded by Colonel Edward F. Danowitz, served as a blocking force for Army and ARVN units driving north. Although enemy contact was light for the Marines, the operation served to verify the effectiveness of the units previous thrust into the area.

Elements of the regiment next participated in Operation Cameron Falls, south of Vandergrift where a large enemy force was utilizing a nearby mountain for observation of the combat base and Route 9. In this operation the Marines accounted for 110 enemy soldiers killed with nearly 100 weapons being captured.

At the same time, elements of the 9th Marines were involved in a joint American and ARVN search and clear operation in the area of the old Khe Sanh Combat Base. During the first three weeks of Operation Utah Mesa, 148 enemy soldiers had been killed.

During this operation it was announced that the regiment would be part of the 25,000 man withdrawal from Vietnam, ending more than four years of combat actions in Vietnam for the 9th Marines.

The Mayaguez incident between the Khmer Rouge and the United States from May 12-15, 1975 was the last official battle of the Vietnam War. On May 12, 1975, just days after the U.S. withdrawal of troops from Vietnam, the American merchant cargo ship SS Mayaguez was seized by the Cambodian Khmer Rouge in international waters. A battalion-sized Marine rescue team was airlifted from Okinawa to U-Tapao Airforce Base in the Gulf of Thailand, about 300 miles from Kho-Tang. The Marines were air lifted to Kho Tang Island to rescue the crew of the merchant ship. Although the mission was a success, eighteen Marines and airmen were killed or missing in the assault and withdrawal from Kho Tang. Twenty-three others were killed in a helicopter rash in route from Hakhon to U-Tapao.

The Tiger Lady

Her exploits were legendary, even in the war torn region of South East Asia. She marched and fought with one of the most respected military units in Vietnam: the South Vietnamese 44th Ranger Battalion-"The Black Tigers".

Madame Ho Thi Que, or "The Tiger Lady", had earned her reputation the hard way, and her fame had spread throughout South Vietnam.

Her husband, Major Le Van Dan – the commander of the 44th Rangers-was also a warrior. He had been awarded almost every South Vietnamese military medal that was issued. His 44th Ranger Battalion had been awarded the US Presidential Unit Citation – the first South Vietnamese unit to be so honored.

It was during the beginning of the American troop build-up in an unconventional war that would take thousands of American lives before it drew to a close. It was a war where American advisors fought side-by-side with their Vietnamese counterparts, often dying in the process. It was a war where the field advisor spent as much time trying to understand the nature of the people, their culture and his own existence, than he did his mission of containing Communist insurgency.

It was a war in which stories would emerge of great warriors and their performances on the field of battle; some apocryphal, some true. The story of the Tiger Lady was just such a story, a courageous and remarkable woman and soldier.

In 1965 the South Vietnamese people were shocked when they heard the news that Madame Ho Thi Que had been shot and killed by her husband, Major Le Van Dan. Major Dan was quickly arrested and jailed in connection with the death of his wife. On 5th May 1966, after a quick trial, he was sentence to serve one year in prison for the 'murder.'

In court he had testified that Madame Que had attacked him with a knife when she had found him with a younger woman

in the tiny village of Vi Thanh, a village often used by the 44th Ranger Battalion as a forward support base during their operations in the U Minh Forest.

He claimed to have shot her in self-defense, stating, "her jealousy was as fierce as her courage in combat." The prosecutor had countered that the Major hated his wife and had killed her because he though her jealousy had ruined his career.

Other ranking South Vietnamese officers believed that Dan was distraught over the fact that he had been replaced as battalion commander of the 44th after the unit had suffered a disastrous defeat after being ambushed by two Viet Cong battalions. The rangers had lost 58 KIA and over 70 wounded, including all of the American advisors attached to the battalion. Shortly afterwards, while a full investigation was underway, he had been quietly transferred to a lesser position as a security officer in another area of operations.

There was a general consensus among many of his fellow officers that the Saigon government had been looking for an excuse to relieve Major Dan. A great deal of resentment had arisen against him because of the many heralded victories of the 44th Ranger Battalion, the reputation of the Tiger Lady, and his own personal success. Like his wife, Le Van Dan was a colorful figure. He had led his rangers on many successful combat operations, which made his fellow commanders pale in comparison. Wearing his maroon beret in place of a helmet, and armed only with a .38 caliber revolver, he was an inspiration to his men. He carried a lacquered swagger stick, which he used with dramatic flair in the heat of battle to exhort his rangers in the attack. But his success was not enough to protect him from petty jealousies of his fellow officers.

After the trial, Dan stated, "I accept the verdict. It was inevitable." He showed no remorse for the death of his wife and long time companion.

Known as 'Big Sister' by the Vietnamese rangers who fought by her side, they remembered her for both her temper and her kindness. Many ranger had felt her wrath when she caught them stealing a chicken or looting a village's belongings. She often reverted to swearing, shouting and sometimes even slapping the culprit to drive her point home. But at other times, her compassion and understanding were the soothing balm that comforted a wounded or dying soldier. She felt a deep sense of responsibility for all her ranger brothers.

Caring for the wounded on the battlefield, or approaching stubborn government bureaucrats to insure that a dead ranger's family received the benefits due to them, as much a part of her personality as the open hate she harbored for the enemy. She would not hesitate to lend or give money to the wives and families of wounded or slain rangers to tide them over during their period of grief. She felt their pain, sometimes shaving her head in a sign of mourning. She attended the customary burials conducted for the dead, and through her mask of grief watchers stated that they could see her determination to settle the score. She set the standards for morale and esprit de corps in the unit during her service with the rangers, and her reputation became legendary and inspired the rangers until the cease-fire in 1975.

After her death in mid-December 1965, one of her daughters came to Soc Trang (the home base of the 44th Ranger Battalion at the time), trying to collect some of the debts owed to her mother by a number of the rangers. The family was having a difficult time making ends meet with the mother gone, and the father in jail.

Little is known of the Tiger Lady's childhood except that she lived for a time in the Imperial City of Hue. In the war against the French, she served as an intelligence agent for the Viet Minh until the later part of 1953, just prior to the French disaster at Dien Bien Phu. During this period she met and married her husband, Le Van Dan. When the two of them saw that the Communists were taking over the Viet Minh, and that they were determined to rule the nation, the couple left the movement.

Within a year, Dan had joined the Vietnamese Army. Madame Que joined, too, rising to the rank of master sergeant during the remainder of the colonial period.

But her legend was built on her deeds on the battlefield with the Biet Dong Quan (Rangers) in the early sixties. She was often seen at the height of battle, moving forward under intense enemy fire to aid wounded rangers. The Tiger Lady led by example, almost always up front with the lead company. She often charged headlong across open rice paddies with the assaulting rangers, inspiring them to victory. Her courage and sincerity were never questioned. She stalked the battlefield armed only with a pearl handled Colt .45, wearing a helmet with black and yellow stripes and the black tiger head – the symbol of the 44th Vietnamese Ranger Battalion.

The Viet Cong knew her well. Stories were told that they had named her "Madame Death". It was reputation well earned and richly deserved, for she could be as dangerous as any combat soldier. She had seen war as few Americans would ever see it. She wore numerous medals testifying to her courage and her prowess in combat. Just a few months prior to her death, she had survived a ferocious battle with a guerrilla estimated at a thousand strong. An American advisor was killed in that fight and another severely wounded. She came out without a scratch.

The mystique and legend of the Tiger Lady continued to grow long after her untimely death. She was a warrior bigger than life and a heroine of unparalleled magnitude. Among the rangers and ranger advisors who served with her, her memory will never die.

Our MRAC MakersFaire Booth was a big success , again this year.

Name of Net, Frequency, Local Time	Net Manager
Badger Weather Net (BWN) 3984 kHz, 0500	W9IXG
Badger Emergency Net (BEN) 3985 kHz, 1200	NX9K
Wisconsin Side Band Net (WSBN) 3985 or 3982.5 kHz, 1700	KB9KEG
Wisconsin Novice Net (WNN) 3555 kHz, 1800	KB9ROB
Wisconsin Slow Speed Net (WSSN) 3555 kHz, Sn, T, Th, F, 1830	N1KSN
Wisconsin Intrastate Net - Early (WIN-E) 3555 kHz, 1900	WB9ICH
Wisconsin Intrastate Net - Late (WIN-L) 3555 kHz, 2200	W9RTP
ARES/RACES Net 3967.0 kHz, 0800 Sunday	WB9WKO
* Net Control Operator needed. Contact Net Manager for information.	

These are the worst passwords in the world – do you use any of them?

Each year, security solutions provider SplashData releases a

list of what it has determined to be the most commonly used passwords on the Internet. In other words, these passwords are the worst possible options you can choose to safeguard your accounts, because they're all ridiculously common and are likely among the first options people with any know-how will try when attempting to gain access to your online accounts.

Are you looking to get hacked and you want to make it as easy as possible for anyone and everyone to gain access to your accounts? Feel free to choose any of the 25 options below as your new password.

DON'T MISS: Apple confirms bug that makes the iPhone's most frustrating problem even more frustrating

Here are the world's worst passwords as of 2016, along with notes on how their current positions compare to last year's rankings.

Rank	Password	Change from 2013
1	123456	No Change
2	password	No Change
3	12345	Up 17
4	12345678	Down 1
5	qwerty	Down 1
6	123456789	No Change
7	1234	Up 9
8	baseball	New
9	dragon	New
10	football	New
11	1234567	Down 4
12	monkey	Up 5
13	letmein	Up 1
14	abc123	Down 9
15	111111	Down 8
16	mustang	New
17	access	New
18	shadow	Unchanged
19	master	New
20	michael	New
21	superman	New
22	696969	New
23	123123	Down 12
24	batman	New
25	trustno1	Down 1

"Passwords based on simple patterns on your keyboard remain popular despite how weak they are," SplashData CEO Morgan Slain said in a blog post. "Any password using numbers alone should be avoided, especially sequences. As more websites require stronger passwords or combinations of letters and numbers, longer keyboard patterns are becoming common passwords, and they are still not secure."

Many sites, especially banking sites, now require a combination of letters, numbers and special characters in newly created passwords, and we always recommend using a password management app like 1password to create complex passwords that are very difficult to crack.

Next Regular Meeting

The next meeting will be on **Thursday, September 29th, 2016,** 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:

October 27th, 2016 7 pm

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)-459-9741

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: W9rhmrac@Gmail.com

or by Post to:

Michael B. Harris

807 Nicholson RD

South Milwaukee, WI 53172-1447

VE Testing:

October 29th, 9:30am— 11:30am

No testing: June, August or December

Location: Ham Radio Outlet Time: 9:30 AM (Walk-ins allowed)
ALL testing takes place at: Ham Radio Outlet 5720 W. Good Hope Rd. Milwaukee, WI 53223

Area Swapfests

Nov. 5th,| MRC91 Radio Fest Location: Milwaukee, WI
Type: ARRL Hamfest
Sponsor: Milwaukee Repeater Club
Website: http://www.mrc91.org

Nov. 12th, Indiana State Convention (Fort Wayne Hamfest & Computer Expo) Location: Fort Wayne, IN
Type: ARRL Convention
Sponsor: Allen County Amateur Radio Technical Society
Website: http://www.fortwaynehamfest.com

MRAC Working Committees
100th 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

Newsletter Editor

- Michael-KC9CMT
- Pancho– KA9OFA

Webmaster

- Dave, KA9WXN

Refreshments

- Open

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)-459-9741**

Address correspondence to:

MRAC, PO Box 26233, Milwaukee, WI 53226-0233

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 MRAC HamChatter is a monthly publication of the Milwaukee Radio Amateurs' Club. Serving Amateur Radio in Southeastern Wisconsin & all of 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. 8:00 PM 442.100+ Railroad net, also on EchoLink

Mon. 8:45 PM 147.165- ARRL Audio News

Mon. 8:00 PM 442.875+ WIARC net also on EchoLink 576754

Mon. 8:30 PM 146.820 Waukesha ARES Net —

on the 1st, 3rd, and 5th Monday of each month.

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

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

Wed. 9:00 PM 145.130+MAARS SwapNet, Allstar FM-38

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

Thur. 8:00 PM 443.800+ Tech Net

Thur. 9:00 PM 146.910+ Computer Net

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

Fri. 9:00 PM 145.390+ W9RH 2 MTR. FM Net

Sat. 7:30 AM MW Classic Radio Net , Freq.—3885 AM

Sat. 8:00 PM 146.910+ YL's Pink HAMsters Net

Sat. 9:00 PM 146.910+ Saturday Night Fun Net

Saturday Night Yaesu Fusion Net 7:00 P.M., W9RH Repeater, C4FM digital mode, using "DN"', digital narrow mode

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

Tue. 9:00 PM 145.130+ MAARS Hand Shakers 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 28.365Mhz 10/10 International Net

Sun 8:00 AM, State ARES Net 3967/3977.5/145.470

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 146.910+ Information Net

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

Sun 9:00 PM 146.910+ Swap Net

Daily: Milwaukee — Rag Chew Net: 7:00 AM, 3850 SSB + Florida Net 7 am, 14.290 mhz.

2 meter 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.

Minnesota/Wisconsin Yaesu System Fusion, Wires-X Technical Net.
Monday Evenings 7:30 P.M. Local Time.

Sponsored By
BARS -Bakken Amateur Radio Society.
Where: On the MRAC repeater,
145.390MHz, Offset -600KHz, PL Tone encode of 127.3.
The Net is carried via a RF Node Link to Wires-X Room (21493) .
The net is held in the Digital Narrow (DN) mode.