OCEC/RACES SIGNALS

For the support of County Government during emergencies

Oswego County Emergency Communicators/RACES
200 North 2nd Street
Fulton, NY 13069

Oswego County Repeaters

147.150 mHz PL not req'd
146.850 mHz PL not req'd
442.350 mHz 103.5 PL

Other repeaters of interest

146.670 mHz PL 151.4 Syracuse
147.345 mHz No PL Phoenix

Packet FlexDigi User Ports

EOC Fulton 145.090 mHz K2QQY
Scriba 145.690 mHz KA2AON
Hannibal 145.770 mHz K1YHR

NETS

OCEC/RACES The 1st and 3rd Sunday of the month at 2000 Hrs. 147.150 mHz

NYS RACES Net Every Sunday Morning at 0900 local on 3993.50 kHz

WEB SITES

OCEC/RACES
www.oswegoraces.org

Fulton Amateur Radio Club
www.fultonhamradioclub.org

Go to our web page for more links to interesting places.

A monthly meeting is held in the lower level of the County Building on Route 481 North, Fulton, across form Mimi's restaurant. Access is through the west door until the meeting starts. Door is secured after that. Use the after hours button if late. Someone will come up and let you in. Meeting sign in is at 1850 hours local.

Up coming meetings:

May 20 Radiological training

June 17 Radio GO Boxes

July 15 REPP Drill review

OFFICERS

Radio Officer John K2QQY
ARO Admin. Keith WB2NVY
ARO Comms Jim N2MGU
ARO Logistics Mark KC2JNI
ARO Ops & Plan Bob WA2AFF
ARO EC ARES Tom W2TQF
Unit Ldr. Packet John N2MKH
Unit Ldr. IT Steve KC2QXE
Unit Ldr. Skywarn Judy KC2SUM

UPCOMING EVENTS

May 6 Mock DWI at APW

August 19 REPP State Observed drill/

September 22 REPP Federal observed drill

Skywarn™ training occurred in March. Judy Levan, N2TEZ and Bob Hamilton, N3QOT provided the coarse material to a class of 30. Amateurs and non-amateurs attended this informative and enjoyable session.

The Buffalo National Weather Service in Buffalo has their own amateur station, WX2BUF, operating on all bands and includes an APRS monitor.

Bob and Judy are the best team in addressing severe weather and the need for "ground truth".

April 6.   The Local Human Needs Committee met at the JIC and a Table Top exercise was conducted. RACES was in the EOC contingent and the Transportation/Communications group to respond to the various problems that were arising in the scenario. Major groups, or sub-committees were located in different parts of the building to see how inter communications would be handled.   A severe weather ice storm had hit the northern part of the county and taken out most of the power and land line phones. After a week went by and things had started to look up, a spring snow storm came along and dumped a couple feet of snow.

As needs arose, solutions had to be worked out and implemented. Access to most areas were practically impossible and therefore communications was very sparse. Fire departments were about the only form of communications for the first few days.

Many questions and observations were made and we came away with areas to explore that would help in such an event. Other groups got an appreciation for our abilities and a member from one of the power plants made a general statement that everyone should make themselves aware of what amateur radio can do and that he was looking for a stronger tie with his facility.

Participating were Bob, WA2AFF and Judy, KC2SUM witht he EOC, Brien, KA2AON, Henry, KC2SUL and Dave, WD4EKB with the Transportation/Communication sub-committee.

Our April meeting was for recognizing a member for his or hers contribution to the program over the years. This year we just could not arrive at one, so we decided that we would make this a twofer. John, N2MKH was recognized for his years of participation, being part of a team that brought Oswego County into the digital world and has become a fixture for drills. Bob, WA2AFF, was also recognized for his service and his contribution to mothering the van, being active in the various drills and participating in the Soil and Water field days held at Selkirk Park. Bob is an ARO handling the Operations end of things. He also is part of the LEPC and LHN Committees.

We also saw Judy, KC2SUM accept the position of Skywarn™ Coordinator for Oswego County from Brien, KA2AON, our standard bearer for many, many years.

Left to right
John, N2MKH, Group Leader Packet
John, K2QQY RO
Pat Egan Dir. EMO

Left to right
John, K2QQY RO
Bob, WA2AFF ARO Operations
Pat Egan Dir. EMO

Left to right
John, K2QQY RO
Judy, KC2SUM Skywarn™ Coordinator
Brien, KA2AON, retiring Skywarn™Coordinator

What's happening in your shack?

A fella in a red suit, no, not the one in the picture, made a stop in Baldwinsville last December and left off a Heil Icm mic with boom and foot switch for Keith, WB2NVY to connect into his Icom 706MKIIG. An LDG AT-700 and RS-20M complete the radio lineup.

Keith is shown logging a net using the Excel program that adds time automatically as you entered an event.

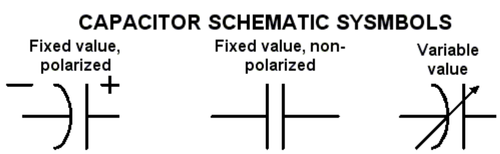
By Dave Anthony WD4EKB

Brushing up on some of the technical aspects of ham radio

<u>CAPACITORS</u> or condensers for the ole folks.

Capacitors are used in a great number of applications in electronics. They are used to store energy, to block D.C. While allowing A.C. To pass, they are used as filters passing specific frequencies while blocking others. They are used in resonant circuits which are the heart of almost all rf applications.

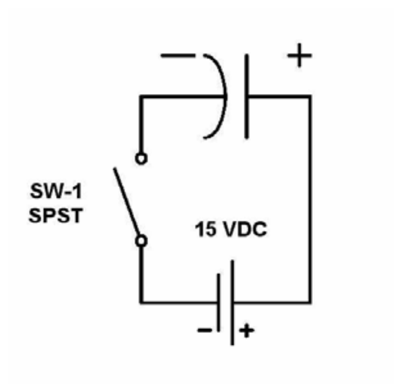
A capacitor is simply two metal plates separated by a dielectric (insulating) material. The size of the plates and the quality of the dielectric material will determine the capacitance in Farads and the maximum voltage that can safely be applied across the plates. The design of capacitors has to take into consideration the intended operating frequency, the material used may be great for Low Frequency but useless for VHF or UHF.



The schematic symbols for capacitors is shown above. The vertical lines represent the plates and the space between them the dielectric. Physically the capacitor can take on many forms. It can be as simple as two strips of aluminum foil (the plates) rolled up with a piece of wax paper in between as the dielectric, or they can be a ceramic dielectric with two high tech plates dipped in epoxy. A few types of dielectric you may be familiar with are: Mica, Ceramic and air.

For the drawing below we will establish the following conditions.

- There is no charge (electrostatic field) on the capacitor.
- The switch is open.
- The battery voltage is 15



When the switch is closed the electrons from the negative side of the battery rush to the left side of the capacitor, which at this instant, is seen as a short circuit because there is no charge on the capacitor and the electrons on the right side of the capacitor are being repelled back to the battery at the same rate as the build up on the left side of the capacitor. It is important to realize that the electrons are not flowing thru the capacitor but building on the left and repelling those on the right. The rate that this is happening is determined by the internal resistance of the battery, the internal resistance flow of electrons will slow as the capacitor is charged to the same voltage as the battery (15 VDC). At this time the capacitor will act as an open circuit and no current will flow in the loop. If you were to open the switch and the capacitor was perfect, with no losses it would hold the 15 VDC charge forever. This would be the electrostatic charge across the capacitor.

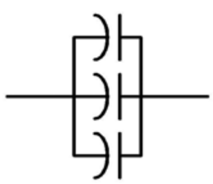
If you have a parallel circuit comprised of capacitors, you add the individual capacitor values, just as you do with resistors in series. C total = C1 + C2= C3 etc. As in parallel resistive circuits, the voltages across each capacitor is the same as the applied voltage to the circuit. A rule of thumb is that the voltage rating of each capacitor should be at least twice the value of the applied voltage. This is important, if you have different voltage rated capacitors in parallel, the voltage rating of the lowest rated capacitor must be at least twice the applied voltage.

TECH NOTES

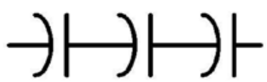
If you have a series circuit comprised of capacitors, the total value of capacitance is calculated the same way as for parallel resistance.

For two capacitors the total capacitance will be: C1 X C2 divided by C1 + C2. If you have more than two capacitors, you determine the total capacitance by the following formula (same as for parallel resistance),

$1/C_{total}$ = 1/C1 + 1/C2 + 1C3, etc. As with parallel resistors you can calculate total capacitance in the following was: C1 X C2 divided by C1 + C2, call this Ca. Then multiply Ca X C3 and divide it by Ca + C3. You can continue on in this fashion but it's clear that this will become cumbersome and the reciprocal method is much better.

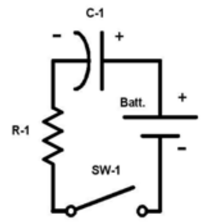


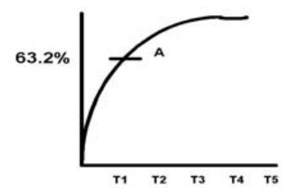
In a simplistic explanation, the capacitance is determined by the size of the plates and how close they are together (and of course the closer together the better the dielectric needs to be to prevent breakdown from the applied voltage). In a parallel circuit the dielectric remains the same thickness but the size to the plates effectively gets larger, creating a larger capacitor.



In a series circuit the plates stay the same but the dielectric ow extends from the left side of the first capacitor to the right side of the third capacitor. This will decrease the size of the effective capacitance for all three capacitors.

We have found that the rate of charge on the capacitor was only restricted by the internal resistance of the battery, the internal resistance of the capacitors plates and the resistance of the wires. When you add a series resistor you change the characteristics of the circuit.





The drawings above represent, on the left, a capacitive charge circuit now with a resistor in series with the battery and capacitor. On the right is a drawing of voltage build up across the capacitor after SW-1 is closed. The drawing on the right is a plot using percentage of applied voltage on the vertical axis against time on the horizontal axis. It is not totally accurate since it is drawn free hand, but represents a natural logarithm exponential plot. Again, interest in the finer details in constructing this plot can be found in a vast number of locations on the internet looking under “RC time constants”.

We will attempt to gain an understanding of the relationship between the values associated with the circuit and different points on the plot. The intent is a basic understanding without getting bogged down with natural logs needed to create this plot.

The term associated with the above drawing is “RC Time Constant” and is expressed by the formula, T (Time in seconds) = R (Resistance in ohms) X C (Capacitance in Farads).

Using the plot above, you see that there is a reference to value of 62.3%. This is an accepted value, determined by massive calculations, of “charge” that the capacitor will reach within the time found from the formula. This is called 1 Time Constant. So if you had a 100K resistor and a 10 Microfarad capacitor, your time constant will be 1 second. (100,000 X 0.000010 = 1) Note how nicely T1 intersects the applied voltage at 62.3%. Another hypothesis is that the capacitor will take 5 time constant to be fully charged. Theoretically that does not happen because it is a logarithmic function and just keeps closer and closer to “charged”. Accepting the 5 time constant concept, the charge curve results as follows:

TECH NOTES

There is a huge amount of data about capacitors on the internet showing the materials that they are made of and associated applications. You will come across a term called Coulomb which discusses the rate of accumulation of electrons on the plates of the capacitor and its relationship to the value in Farads of the capacitor. Th information presented above is intended to give a basic, working , understanding of capacitors.

On the graph, A represents the intersection of T1 on the bottom and 62.3% on the side.
After 1 time constant the capacitor will be charged to 63.2% of the applied voltage.

After 2 time constants:	86.5%
After 3 time constants	95.0%
After 4 time constants	98.2%
After 5 time constants	99.3%

Capacitor is now fully charged.

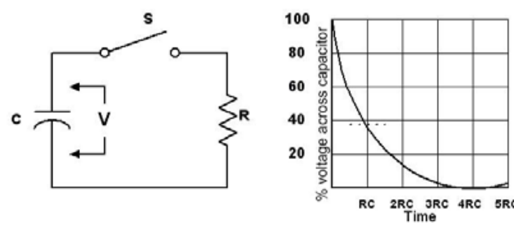
Note that the charge on the capacitor after the second time constant is equal to the initial 63.2% of the voltage after the first time constant plus 63.2% of the remaining voltage needed for a full charge. This sequence continues through the remaining time constants.

Going from T3 to T4 assuming that 100 Volts was applied: At the end of T3 you will have a 95 volt charge on the capacitor. That means you have 5 volts to go for a full charge. 63.2% of 5 volts would be 3.16 volts. Add this to the 95 volts on the capacitor after T3 and you have 98.16V (round off to 98.2).

For a circuit with the following values: R1 = 20Kohms; C1 = 25 Microfarads and an applied voltage of 75 VDC.
One time constant would be: 20,000 X 0.000025 = 0.5 seconds.
After 1 time constant charge on the capacitor would be: 47.5 Volts (63.2 X 75)
After 2 time constants the charge on the capacitor would be: 64.87 Volts.
After 3 time constants the charge on the capacitor would be: 71.25 Volts.
After 4 time constants the charge on the capacitor would be 73.65 Volts.
After 5 time constants the charge on the capacitor would be 74.48 Volts.

The values above can be obtained by either learning the natural log sequence and mathematically calculate the values or by memorizing the percentages for the five time constants or by remembering the first percentage, 63.2%, and calculate the additional charges for the remaining time constants based on the remaining voltage to a full charge.

In a similar fashion, if you start with a fully charged capacitor it will discharge through the resistor at the same logarithmic rate. The rate of discharge will be exactly the same as the charge rate. One time constant to decrease to the 63.2 % level and then 63.2 % of the remaining charge for each additional time constant. Fully discharging after 5 time constants.



Using the values in the previous example: A resistance of 20K Ohms and a capacitor rating of 25 Microfarads would result in a time constant of 0.5 seconds based on T = RC. (20,000 X 0.000025 = 0.5 seconds). We will assume that the capacitor is fully charged to 75VDC and the switch S is open.

The instant the switch is closed the capacitor will start to discharge at a rapid rate, determined by the resistance of the wire, the internal resistance of the capacitor plates and most significantly, the value of the resistor in series in the circuit.

After 1 time constant, the capacitor will discharge 63.2% of its full charge. This means that with the given values the charge remaining on the capacitor would be: 75V – (0.632 X 75) resulting in 27.6V remaining on the capacitor.

Again, using the technique for charging an RC circuit, we can either work with logs, memorize the percentages, which are the same for discharge, or calculate the values as described above. The remaining voltage will decrease at the rate of 63.2% of the remaining charge for each time constant with the total charge considered reaching zero after 5 constants.

TECH NOTES

After 1 time constant (0.5 seconds) the charge on the capacitor would be 27.5 Volts.
After 2 time constants (1.0 seconds) the charge on the capacitor would be 10.13 Volts.
After 3 time constants (1.5 seconds) the charge on the capacitor would be 3.75 Volts.
After 4 time constants (2.0 seconds) the charge on the capacitance would be 1.35 Volts.
After 5 time constants (2.5 seconds) the charge on the capacitor would be 0.52 Volts.

This concludes the information on Capacitors and RC time constants. Again, in-depth information can be found on the internet under Capacitor or RC time constants.

73 Dave WD4EKB