Indoors and out, we are surrounded with Electromagnetic Fields (EMFs). While some are natural, many are not, and in one way or another they will interact with any entity that is electrically based. Humans fall within that category. EMFs are us.

Environmental EMFs

Commonly, the primary concern revolving around EMFs is "How many milliGauss (mG) are bad?", or "I read 0 mG on my meter, yet I still react, to something . . ."; however, Magnetic field strength (mG) is NOT the only consideration for those that want the full picture. EMFs, by its nomenclature implies that something Electric and something Magnetic are involved (interestingly either one will cause the other).

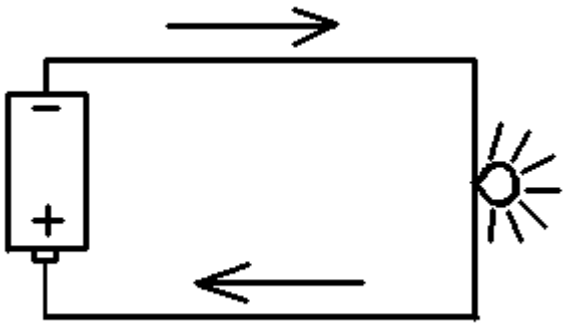
EMFs by definition also include Electric Fields, Transient Phenomena, "High Frequency (HF) Electrical Noise", and Radio Frequency (RF).
All of the bad contributors are Alternating in quality. That is, they continuously change in size and orientation with time. Ideally, a Healthy habitat should be free of all Alternating fields. However, reality is far from this ideal.

To produce a framework where everyone has a similar knowledge level, a beginning from basics is paramount.

Electromagnetic fields are by definition created by motion of elemental charges (electrons (e-)), either in free space, or constrained within a wire. When that motion or flow is relatively constant, we define it as **Direct Current (DC)**. When it is changing with time, we define it as **Alternating Current (AC)**.

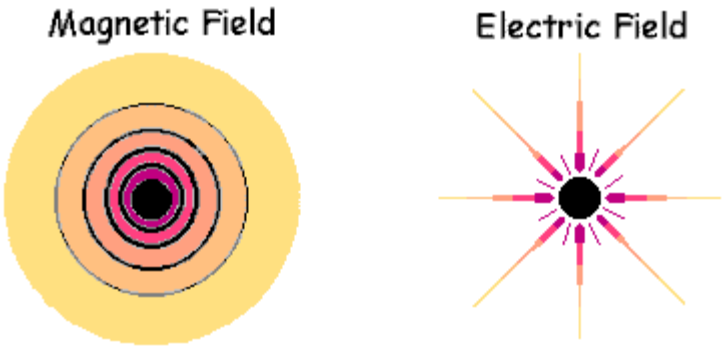
The motion of these elemental charges is created by a difference of charge distribution wanting to come to equilibrium relative to each other, akin to having two containers of water with different levels in them, connected by a tube at the bottom. If the charge distributions are prevented from equalizing by any form of Electrical Resistance, then the difference is measurable as a **potential difference, or Voltage**. Any voltage source will produce an **Electric** field in free space. Allowing a limited amount of current flow will allow the Voltage to remain fairly constant, and yet provide useful output, or work. If the Voltage is relatively constant, we define it as **DC Voltage**. If the Voltage is changing with time, we define it as **AC Voltage**.

In DC, a current is produced when a resistance is placed across a source as follows:



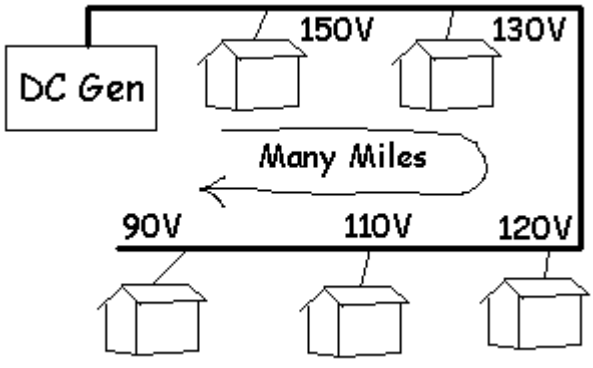
The chemical reaction drives a passage of Electrons (Current) through the connections until the chemistry has exhausted its driving mechanism (Voltage). [9, 10] The proper convention is that current exits the source from the Negative terminal and returns into the Positive terminal. During this passage of current, a **Magnetic Field** is formed around the current path, resembling a series of concentric sleeves, with the strongest field present nearest the current path. An **Electric Field** is similarly established around the conductors, which resembles rays emanating out from the wire.

Both fields will have directional properties that depend on the direction of current flow. [8, 10] **While it may be comforting to think that these fields remain constrained within the insulation surrounding the wire, unfortunately they do not. That is the reason why these fields impact biological systems, and the pressing question becomes not "IF", but "how much" and "for how long". Below is a sketch of the fields as seen from the end of the wire.**



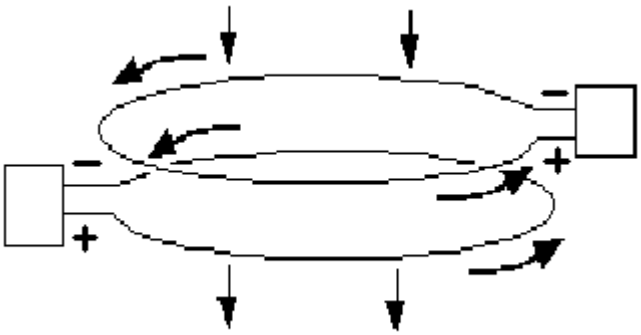
This comprises the majority of electrical wiring schemes in an automobile. The Ignition wiring requires additional explanation. Because there is no connection between the automobile's electrical system and the Earth, we describe the wiring system as "Floating". That is, touching any "ONE" connection in the 12 Volt system, there is no chance of shock. Similarly, trying to measure the voltage of any one point in this system, relative to "Earth ground", will render an unstable and unpredictable value.

When DC was employed for public and long distance domestic usage, it became a dismal failure, because of **Wire Resistance.** While most wire is made of Copper and Aluminum, and its resistance is quite low, over a considerable distance of several or many miles, the resistance becomes a limiting factor. In a DC scheme, the generating station would have to feed the customer at the required voltages without conversion devices. So if a customer next to the station needed 120 volts, the station would produce 120 volts. If another customer several miles away needed 120 volts the station would produce 120 volts, plus the voltage required to overcome the wires' resistance. **This situation spelled the end of the DC distribution system.** This is where standard formulas begin to fit in, as the current needed (I) times the wire resistance (R) would produce a Voltage Drop (E), **(E=I x R)**, over the length of the wire. In an automobile this length/wire-resistance issue does not exist, so it can function quite well.



A normal electromagnetic system exists within and around our planet that is necessary for our survival. It produces DC voltage and current. These steady-state Magnetic and Electric fields have been our normal everyday setting, from before recorded history until the late 1800s. [1, 6] The planetary Magnetic field, and the gently changing Electric field have connected us to the Earth's periodic rhythms. [1] However, this was soon to change.

In the mid 1800s, experimenters noticed that when a current was pulsed through a wire coil (the Primary), it would produce a similar pulse of current through a nearby coil of wire (the Secondary). (The process which produces effects at a distance is now known as **Induction**. This process can create currents and voltages within any system (biological or inanimate) in reach of its fields. These time-varying fields are of biological interest because they have been shown to produce an increase in various forms of illness.)



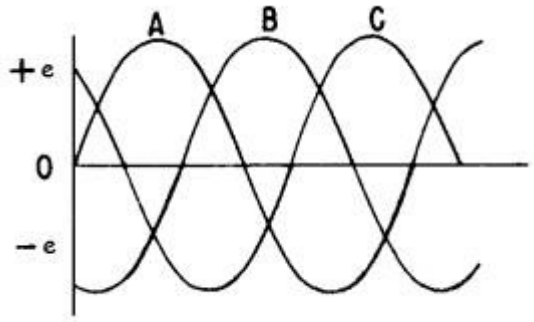
Further experiments with different numbers of turns allowed them to increase or decrease the voltage on the Secondary coil. The applicable law of physics is that **a changing magnetic field will produce a changing electric field, and vice versa**. [8] So if a continuously changing source of voltage/current could be produced, a flexible voltage and current transfer system could be engineered.

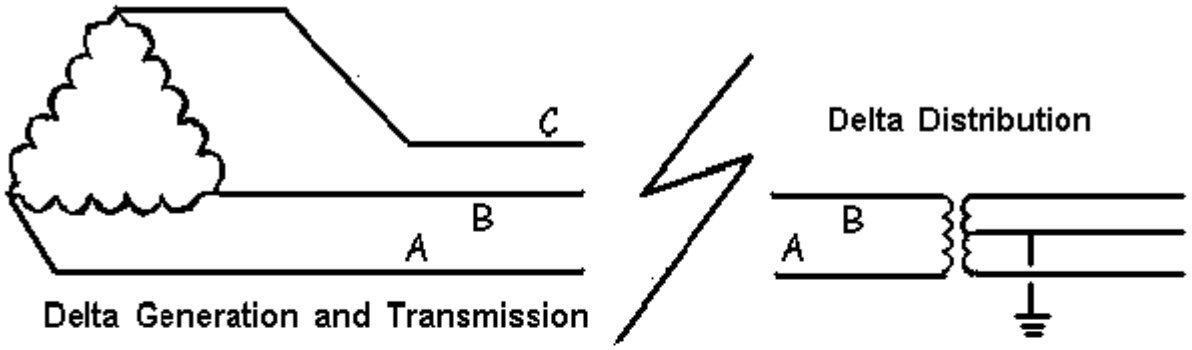
Enter Nikola Tesla.

This gentleman realized that if a coil with DC current flowing through it could have Relative Motion (such as spinning) nearby another coil, the secondary coil would experience a continuously changing flow of current, or Alternating Current (AC). The beauty of this concept is that power can be transferred long distances at High Voltage, *eliminating the problem with wire resistance because of reduced currents, (since the voltage drop is directly proportional to the amount of current passed)*[5] and the voltage reduced (*via the two coil assembly, or Transformer*) to the required voltage where needed (**W = E x I** (*that is, for the same power (W), with a higher voltage (E) the current (I) can be reduced*)).

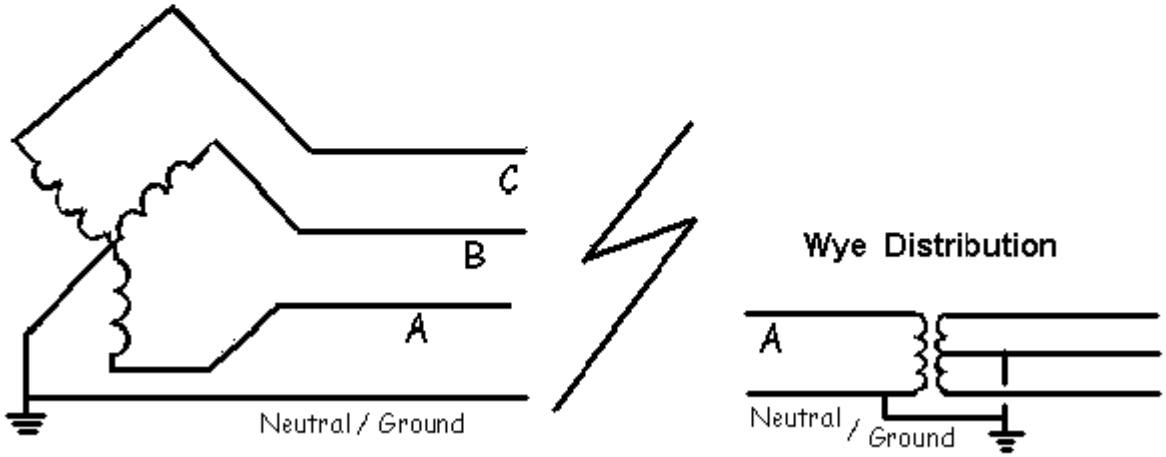
To further improve the efficiency of the spinning machine, he identified and produced the modern three-phase system, where three alternating voltages are produced from a single machine. Depending on either of two types of systems, one ungrounded (Delta), and the other grounded (Wye), voltage can be taken between any two energized wires, or between one energized wire and the grounded reference. In the US power system one cycle occurs each 16.6 ms (or 60 cycles / second (60 Hertz (Hz))), elsewhere one cycle occurs each 20 ms (or 50 Hz).

The sketches below indicate the three-phase waveforms, how the two different types of AC are produced, and how the two types of AC are distributed. Note the inherent isolation from the primary to secondary in the case of each individual transformer for the Delta system, and the inherent solid tie (a major cause of Stray Current and Voltage) in each WYE transformer:

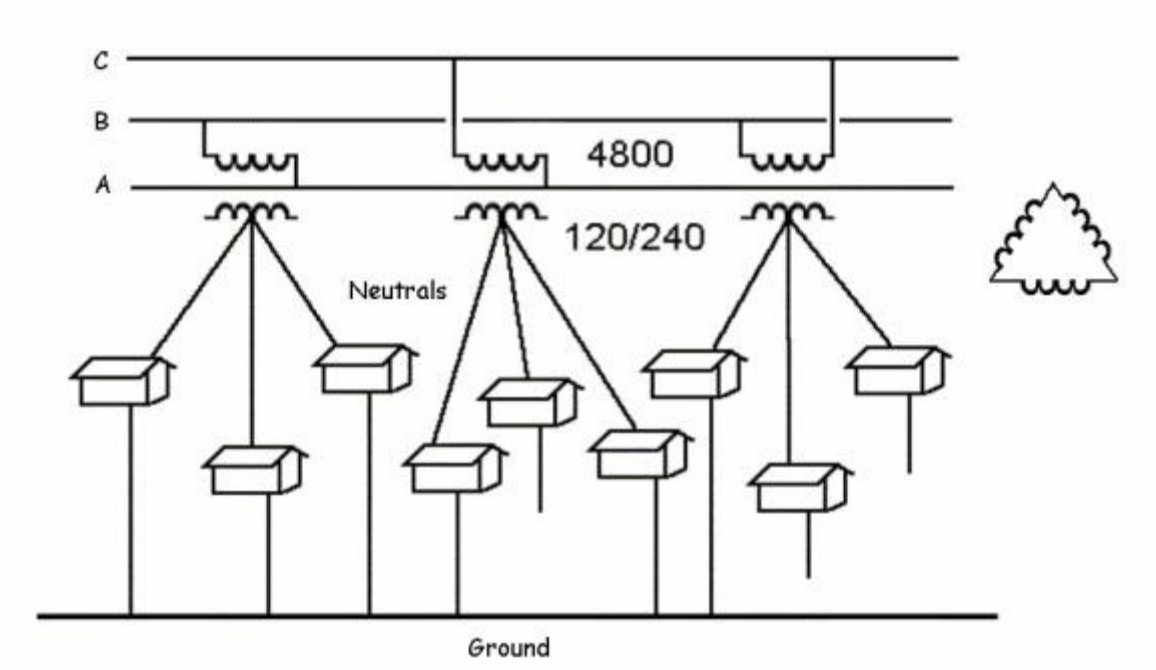




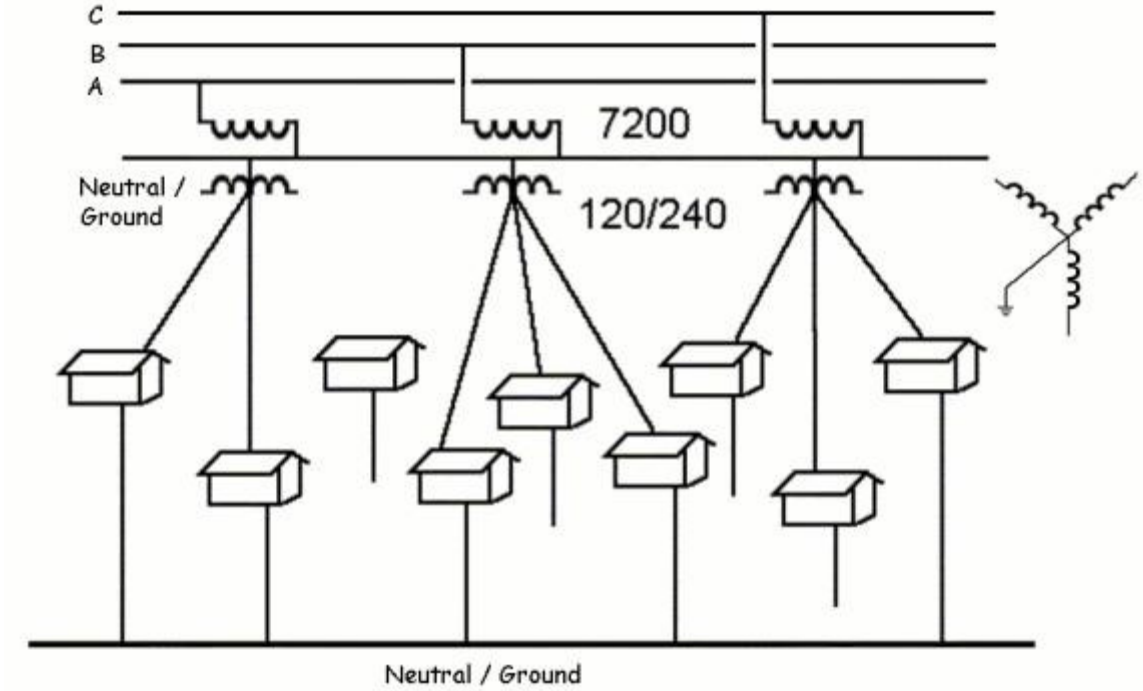
Delta Generation and Transmission



Wye Generation and Transmission



Simplified Distribution arrangements

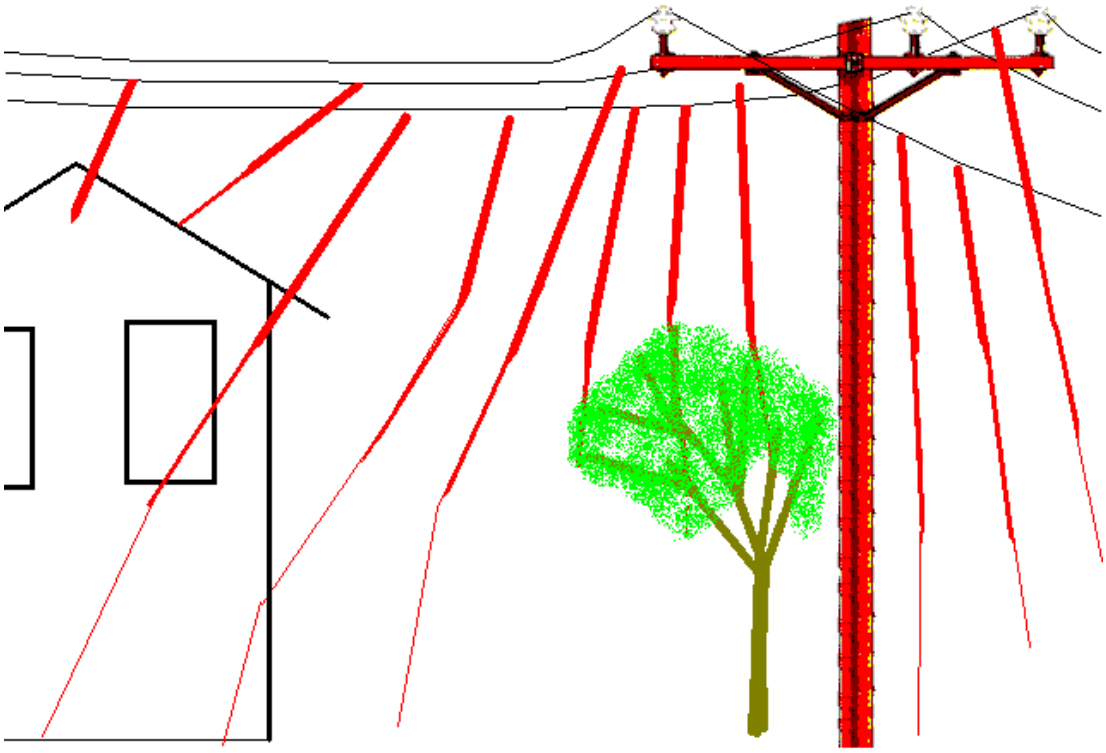


Note in the last of the sketches above that a single home is not connected to the grid. That is, it is using other forms of energy. However, because it is in proximity to the grid, it may experience Electric and Magnetic fields that are related to that grid, without receiving any benefit from it.

Now having the barest essence of the modern power distribution systems, we can cover the effects of it.

Since the power distribution uses High Voltage (**HV**), there is a pervasive presence of Alternating Electric fields anywhere near Aerial power lines. These lines are supplied with devices (regulators and/or capacitor banks) to raise or lower their voltage depending on load, causing **Transients** when they are swithced on or off. These transients are expressed over many miles of wire as a step-change in Electric and Magnetic field,

with subsequent oscillations that may last a few seconds. The Alternating Electric field may be present for several hundred feet to either side of the wiring, but is partially or fully absorbed by conductive structures such as trees, or fully absorbed by the moist soil when the wiring is underground. **This Electric Field phenomenon is most pronounced in the grounded WYE system, because in the Delta system there is no ground and the fields are limited to interaction between the wires.**



While many studies have been conducted that implicate the presence of an Alternating Magnetic field presence with diseases (and it is beyond the scope of this document to enumerate them), there is a recent study that implicated a **Leukemia peak with children** as being **synchronized with the appearance of electrical distribution systems**. This primarily implicates Alternating Electric (or Voltage) fields. *That is because when electrification was initiated in the various communities, the Electric field was always available at 100% value 24 hours a day, while the Magnetic field was only beginning to exist, as many of the electric gadgets we know of today, did not exist then.* [3]

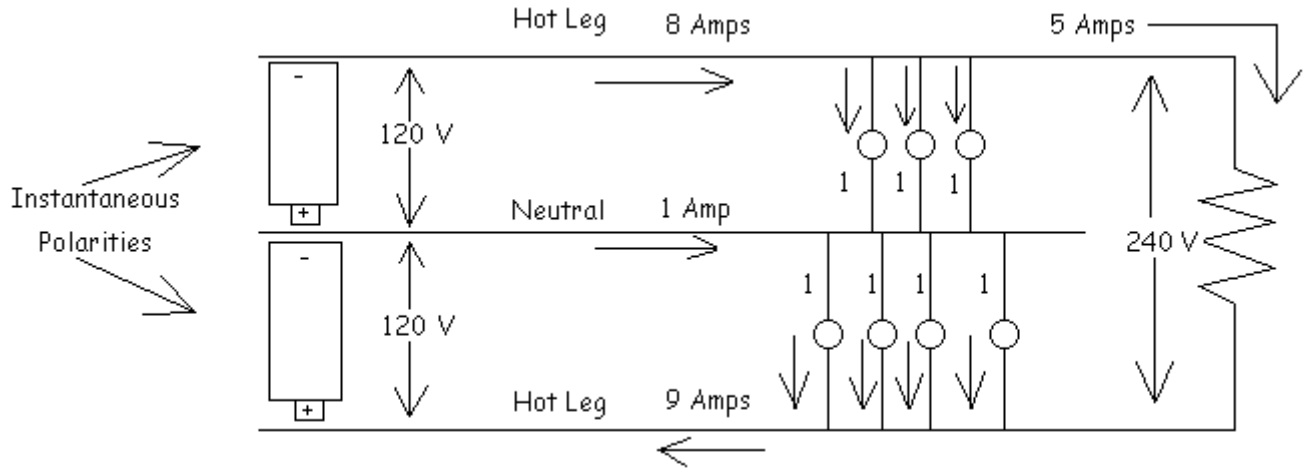
In a properly wired system all current passing through a wire returns via a nearby wire. Magnetic Fields cancel, and nearby exposure is reduced. When they do not, a **Net Current** is produced which causes a Magnetic field that extends for substantial distance (perhaps several hundred feet). In a three-phase system, an attempt is made to keep the three energized wires (**phases**) balanced, but any divergence will cause net currents, and a Primary Magnetic Field. Bear in mind that because the Primary operates at High Voltages (HV), the currents in use are much reduced. Thus **for any HV power system the impact from alternating Electric fields is always present at 100%, and depending on load, then also from the alternating Magnetic fields.** A lightly-loaded line will still be energized to 100% voltage, similar to residential wires within walls, ceilings, and floors.

To add to the complexity of the matter, the two forms of distribution (Delta and Wye) have differing problems. Delta systems are not referenced to Ground, so if a wire breaks and falls to the ground, it remains energized. In a Wye system, usage of multiple grounds to Earth, whose electrical conductivity varies, can cause elevated ground references bringing about **Stray Currents and Voltages** (at locations distant from the

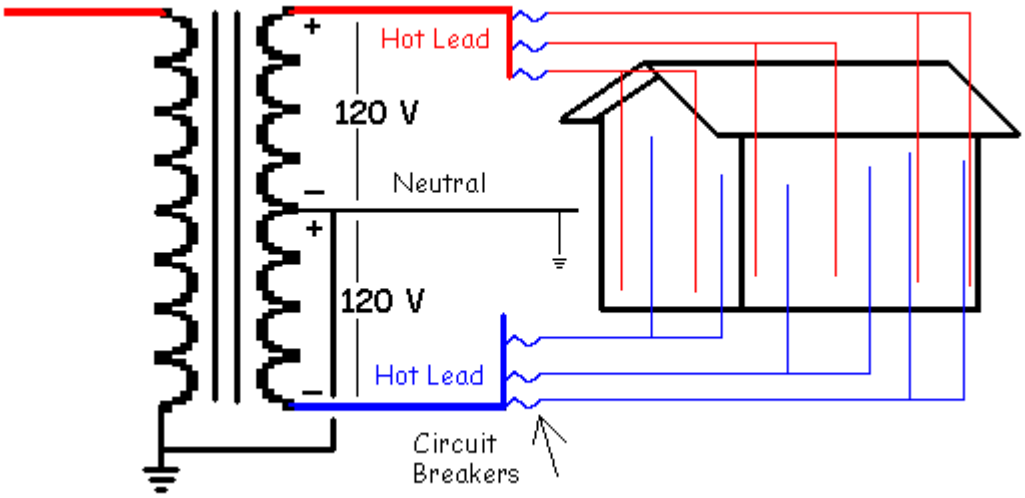
substation due to wire resistance). In situations of **Stray Currents**, metallic equipment "grounded" to the Electrical System Ground will have a voltage above the Earth's zero reference that can be as much as 10-25 VAC. This voltage will change through daily cycles depending on the circuit load, and cause shock on contact to animals, or humans walking about with bare feet.

That is the exterior power distribution system in a nutshell, and now we can discuss the domestic setting.

A typical North American residence is supplied with a three-wire electrical feed. One of these wires is tied to Earth Ground (that is, in contact with the soil, and often to metallic water piping) and is referred to as the Neutral. The other two wires individually provide 120 Volts to Ground, or 240 volts between them. In essence two separate power supplies are provided with only three wires, and this scheme is commonly referred to as an "Edison Circuit". While this feat may seem slick, that very feature is its Achilles' heel.



The wiring is scattered about the home to provide power at every available point of use.



There are three types of residential wiring schemes:

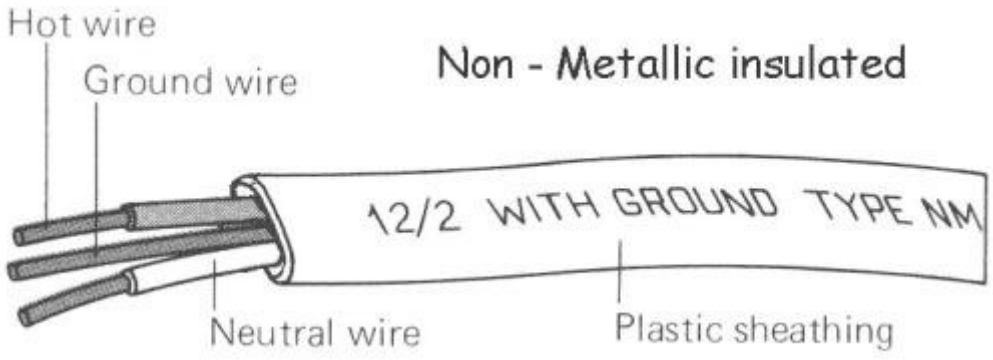
1) Knob-and-Tube, the oldest, worst, and still approved, (the wires are separated by 6 - 16 inches)
2) Romex, where the wires are insulated in PVC and fabric (older type), or a dual PVC jacket

(newer type), and
3) BX/MC, where the wires are insulated in a PVC jacket, and then shielded by a metallic armor.

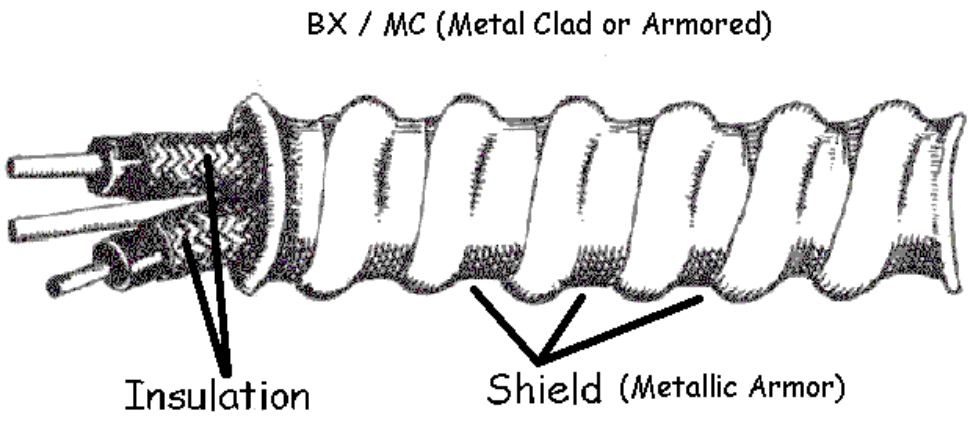
Knob-and-Tube wiring uses supply and return wiring that are separated by 6 to 16 inches, depending on travel direction relative to installed structural lumber. **This separation causes the greatest residential availability of Magnetic and Electric fields.**

> **In contrast, the inherent cancellation of magnetic fields when wires are brought close to each other occurs because the magnetic fields associated with the supply and return currents are identical and flowing in opposite directions. The two are balanced.**

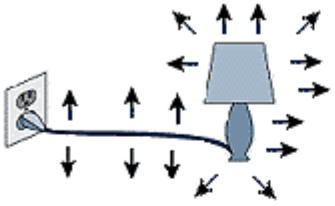
Romex has adjacent supply and return wiring allowing for significant reduction of Magnetic fields. Not so with Electric fields, because with voltages one wire is theoretically at 0 volts where the other wire is at 120 volts (equating to a single wire having a net of 60 volts). **The voltage available on Romex is not fully canceled by the adjacent Ground and Neutral wires, and radiates Electric fields into the adjoining spaces, right through the insulating jacket and walls/floors/ceilings.** This produces a residential Alternating Electric ambiance that is curiously reminiscent of the inside of an electrified birdcage. The greatest majority of North American homes are wired with Romex. **If you are environmentally sensitive in any fashion, and have not considered the Electric Field environment as an immediate biological irritant, you are deceiving yourself.** Many individuals the author meets, point out that their Gaussmeter reads zero, and yet they are reacting to "something". They never considered the Electric Fields.



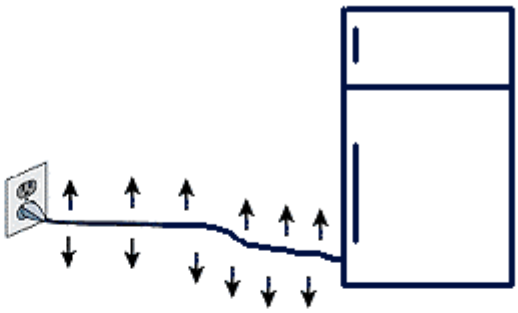
BX/MC is constructed similarly to Romex with the exception that there is a Metallic Armor around the wires. **The Metallic Armor is connected to Ground and eliminates all Voltage emissions from associated wiring,** other than voltage on the ground as in Stray Voltage.



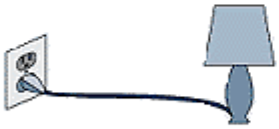
Adding to the complexity of the types of wire employed, there is the presence of **appliance and lighting cordage. This wire is simply encased in a plastic jacket and introduces AC voltage further into the living space.**



Conventional Cord (2-wire) -
Cord AND Appliance Emit Voltage



Conventional GROUNDED Cord (3-wire) -
Cord Emits Voltage but Appliance Does NOT



Shielded Cord (3-wire) - NO Emissions
from either Cord or Appliance

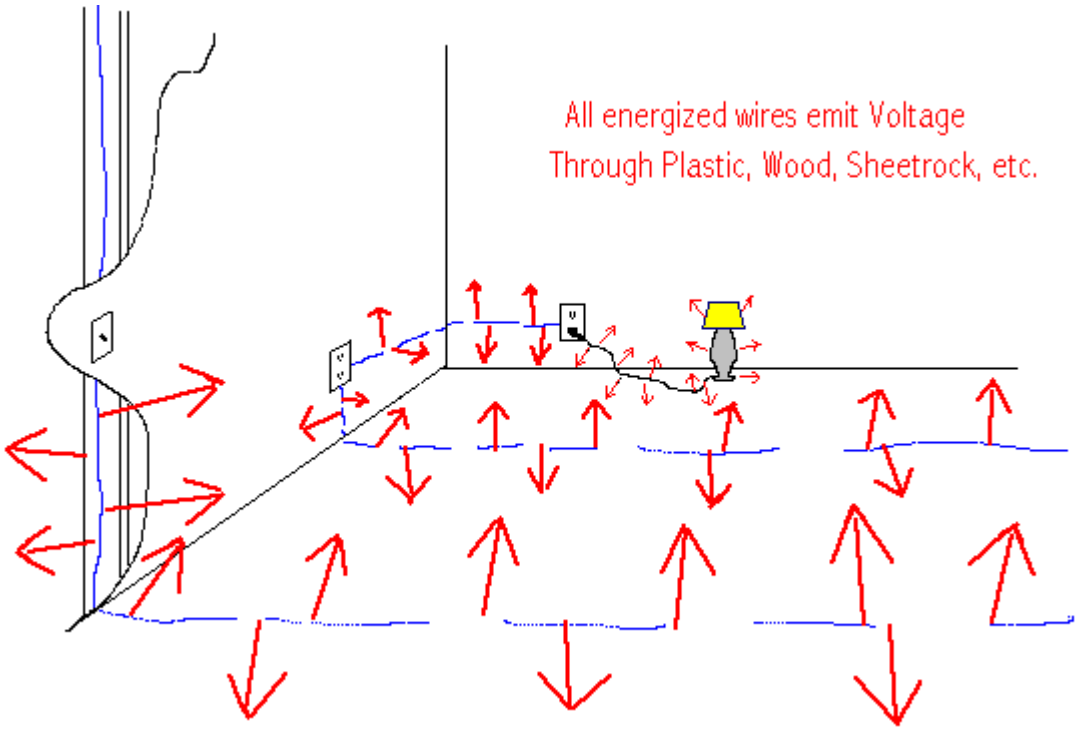
In all cases Magnetic field effectively cancels
within the first few inches from the cord

With Shielded cords and Correct wiring -
Voltage and Magnetic fields exist as Point Sources only

When one is exposed to Static Magnetic fields, as from the Earth (which is mostly static), a resonant vibration of all **Ions** is induced throughout the body,[8] and this is normal. **When that same person is exposed to an Alternating Magnetic field, internal currents are produced in the various structures of the body, whose strength will vary with the conductivity of the specific organ. [7] These currents produce direct and indirect Ionization and subsequent abnormal chemistry.** Frequency-related effects also occur, which are beyond the scope of this document. [2]

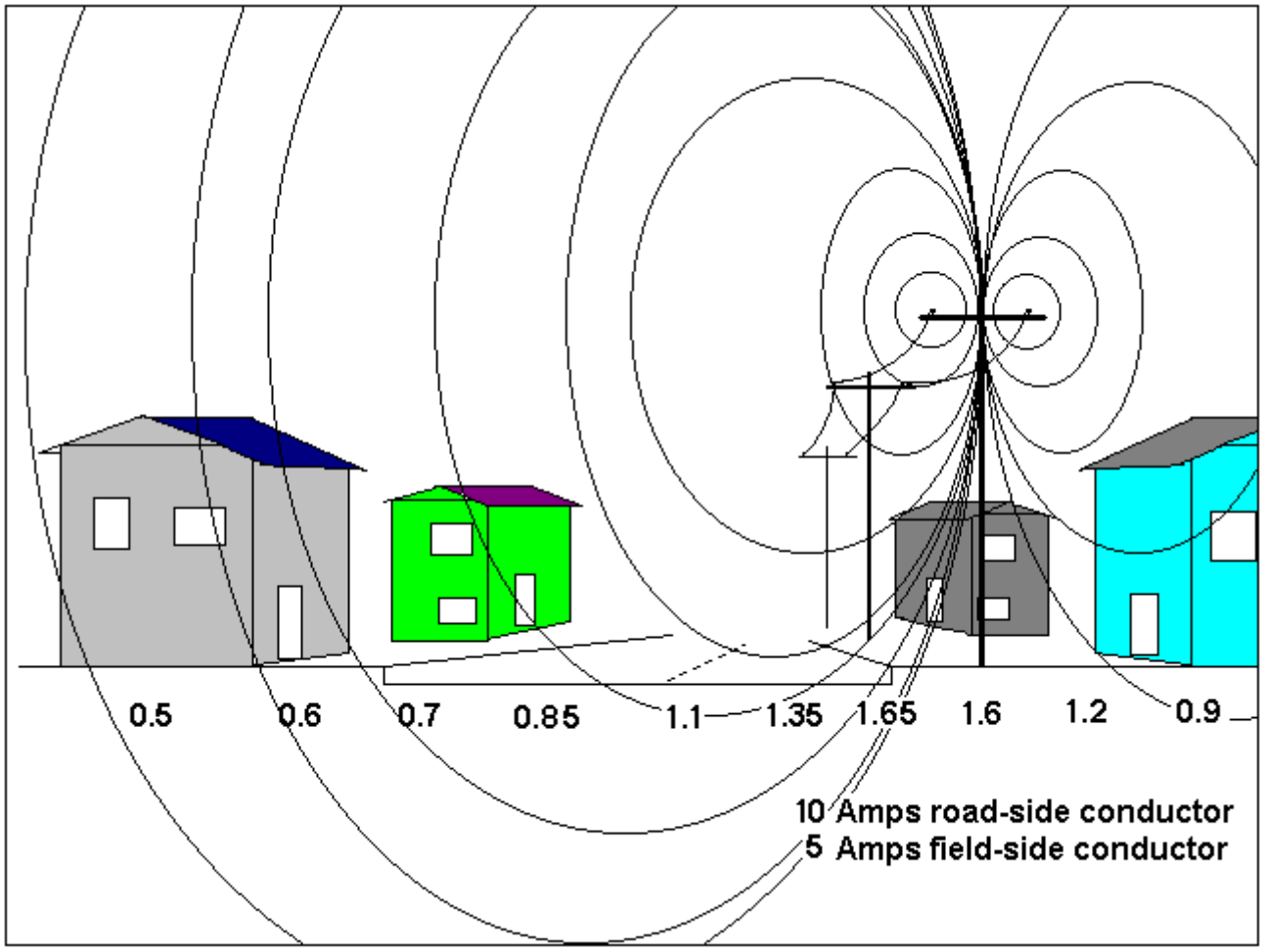
When one is exposed to Static Electric fields, as from the Earth (which is mostly static except for very low frequency oscillations (Schumann Resonances) associated with electric storm activity anywhere on the planet, which help us maintain normal cycles), a whole body electrical alignment stress is produced, and again, this is normal. This is generally quite low in intensity. **When that same person is exposed to Alternating Electric fields, two things happen: 1) a surface (body) voltage develops that can easily be measured, and 2) an internal whole-body alignment of all charged or polarized molecules occurs, which changes with the applied voltage (incidentally, humans are about 75% water, a polarized molecule).** The alignment effects can bring about abnormal chemistry.

In a contemporary properly wired setting there will be lots of voltage (electric fields), if not from wiring internal to walls/floor/ceilings, then from appliance and lamp fixture cordage, or both. The most significant impact is suffered in the bedroom, where the body is attempting to rest, recuperate, and possibly heal.



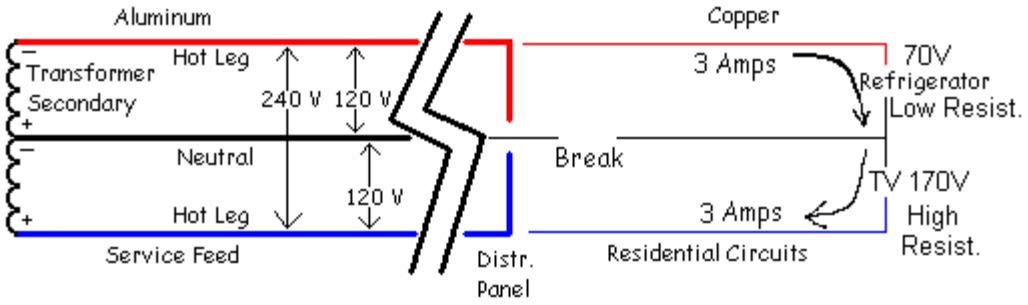
The typical bedroom setting entails a mattress with a metallic spring base, nightstands, various light fixtures, alarms, telephone, etc. In such a setting the sleeping area is rich with Electric fields. A variety of discomforts, irritations, and illness can ensue, especially so for anyone that is Environmentally Sensitive. **The easiest remedy in the bedroom is to remove all electric fixtures from the vicinity of the bed.**

Magnetic fields become manifest as a whole-house phenomenon when problems occur in a residence's electric system. The fact aside that external fields may exist (as from power lines, as shown below (with field levels in mG)), by opening the main breaker, all internally-caused fields should stop. They may not, if there is a common tie to a public water-main system. In this case Net Currents produced at one home can be shared between all neighbors on the same transformer feed (which may be 5-10 residences) if fed from a Delta system, or shared between many more transformers and many more residences, if fed from a Wye system. In this scenario, many problems may simultaneously exist which confound logical and straightforward troubleshooting attempts.

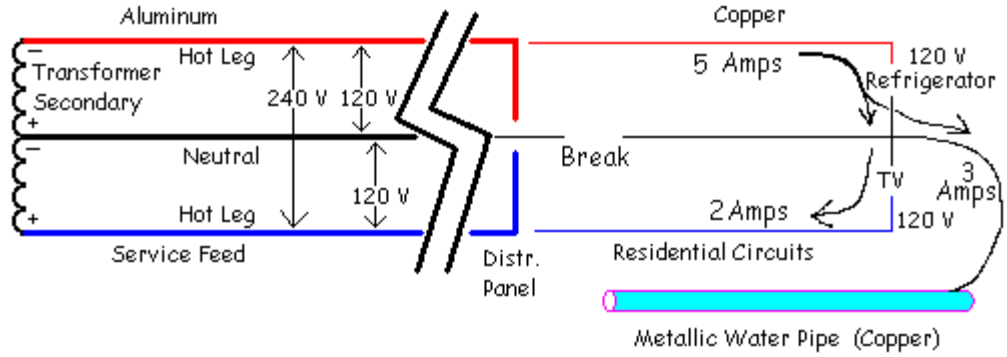


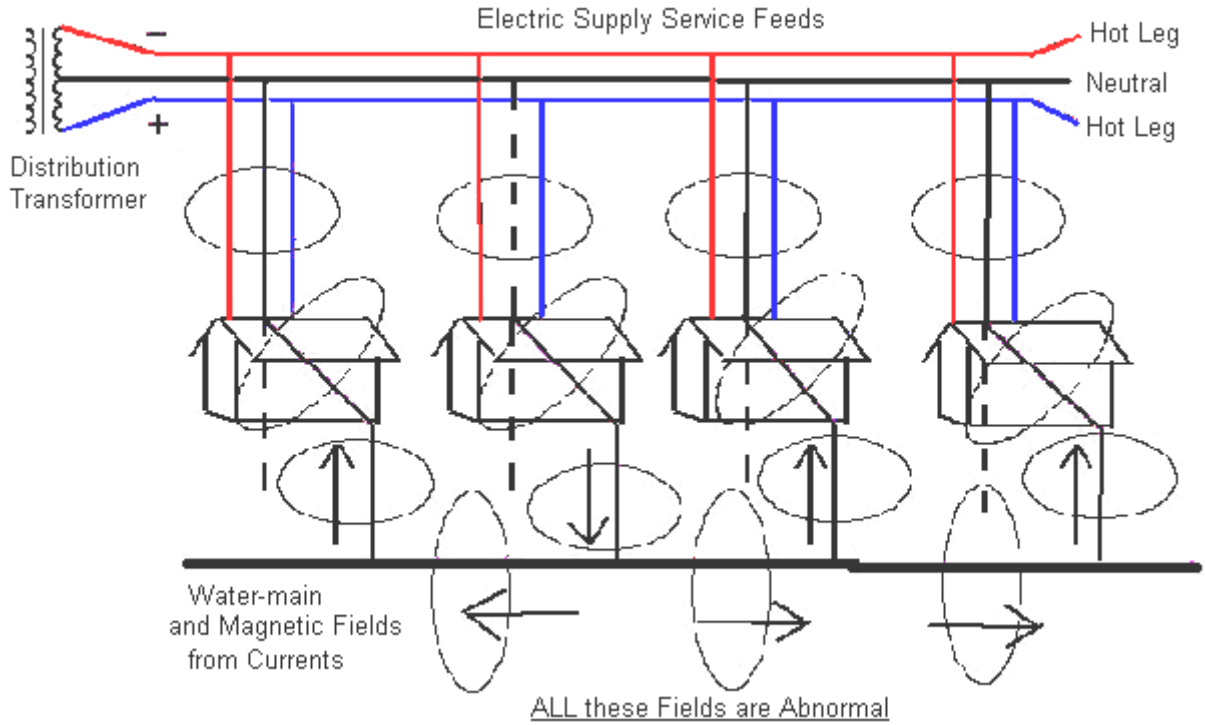
A failure-prone connection generally going unnoticed is the one behind the electric meter, and many problems exist without the affected parties knowing, until their curiosity is aroused and someone acquires a Gaussmeter (alternating Magnetic field meter). The reason this connection is crucial is that an electrical system is not generally considered to need regular maintenance, and the connections are made with dissimilar metals, which causes oxidation to reduce the tightness of the junctions over time. These loose connections cause currents to increase through all other available paths, producing Net Currents, a Magnetic field generally engulfing the entire residence, and a possible electrocution hazard when the weekend plumber cuts piping.

The sketches below depict an isolated home with loose connections and resultant voltages that are a fire hazard, the "official" solution, and the resultant effects over a neighborhood.



Voltages developed without a Ground reference at the residence.
These are a fire hazard, which prompted the added use of metallic water pipes.





Transient Phenomena are caused whenever a step-change in energy is brought about. [5] An excellent example is Lightning. Other classic examples are: 1) the firing of spark plugs within an automobile, 2) a dimmer switch in use, 3) the HV sweep circuits within a television, 4) turning a light bulb on or off, etc. **Since the typical breaker panel has many circuits, one source can broadcast its electrical content to all other wires on the same energized Buss within the panel, and similarly, since a typical transformer feeds 5-15 customers without any buffering devices, electrical Transients produced by one will be broadcast to all, unreduced.**

Transient Phenomena have at least two peculiar characteristics:

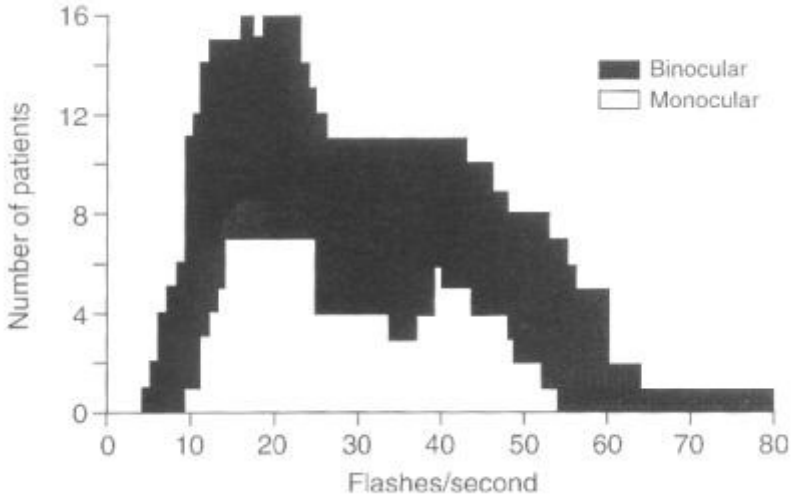
1) each burst will produce a ringing of the EMF spectrum, whose Frequency extent will vary with the energy content of the burst, and
2) they are able to penetrate insulating barriers more easily.

This latter feature is employed in Transcutaneous Electrical Nerve Stimulators (**TENS**) that are used to alleviate pain. This is an example of a controlled and beneficial biological electrical application. Many Transient Phenomena produced by common residential electrical devices ride on the 60 Hz Voltage [5] and can likewise penetrate the skin and interfere with the Central Nervous System (**CNS**). The CNS performs Muscle control by electrical pulses (Action Potential) that are characteristic to the electrochemical messages constantly occurring within the body. [9] When an electrical pulse (or pulses) of similar waveform is (are) able to enter the highly conductive structure below the skin, interference in the form of irritation, pain, or outright failure to control physical activity may occur. Other pulses wholly within the brain can similarly be interfered with. These are examples of uncontrolled and detrimental biological electrical applications.

High Frequency (**HF**, not from the traditional frequency region designation, but simply implying rapidly changing Electric and Magnetic fields) can usually be detected with an AM radio. Events as simple as operating a light switch will produce transients that can be easily detected anywhere in the AM spectrum. That is because any step-change in current flow will excite the EMF spectrum like a spark discharge. A dimmer in use will produce this type of electrical emission continuously, throughout the AM spectrum, blanketing all frequencies in an otherwise quiet background.

While HF is easily controllable at the source, or by appropriate filtering, some unscrupulous marketers are selling filters of various sizes with the claim to "clean" "dirty" electricity. While "clean" electricity is continuously varying with time, and in and of itself is an irritant, HF riding on the AC can be especially irritating. However, indiscriminately installing filters without investigating the residence's electrical system, and verifying there are no wiring errors, will cause more harm than good. Read more at Capacitive Filter recommendations.

Irritating Cyclic (HF) or Transient Phenomena can manifest themselves through the Auditory, Visual, Tactile senses, or directly by EMF interaction with the CNS.



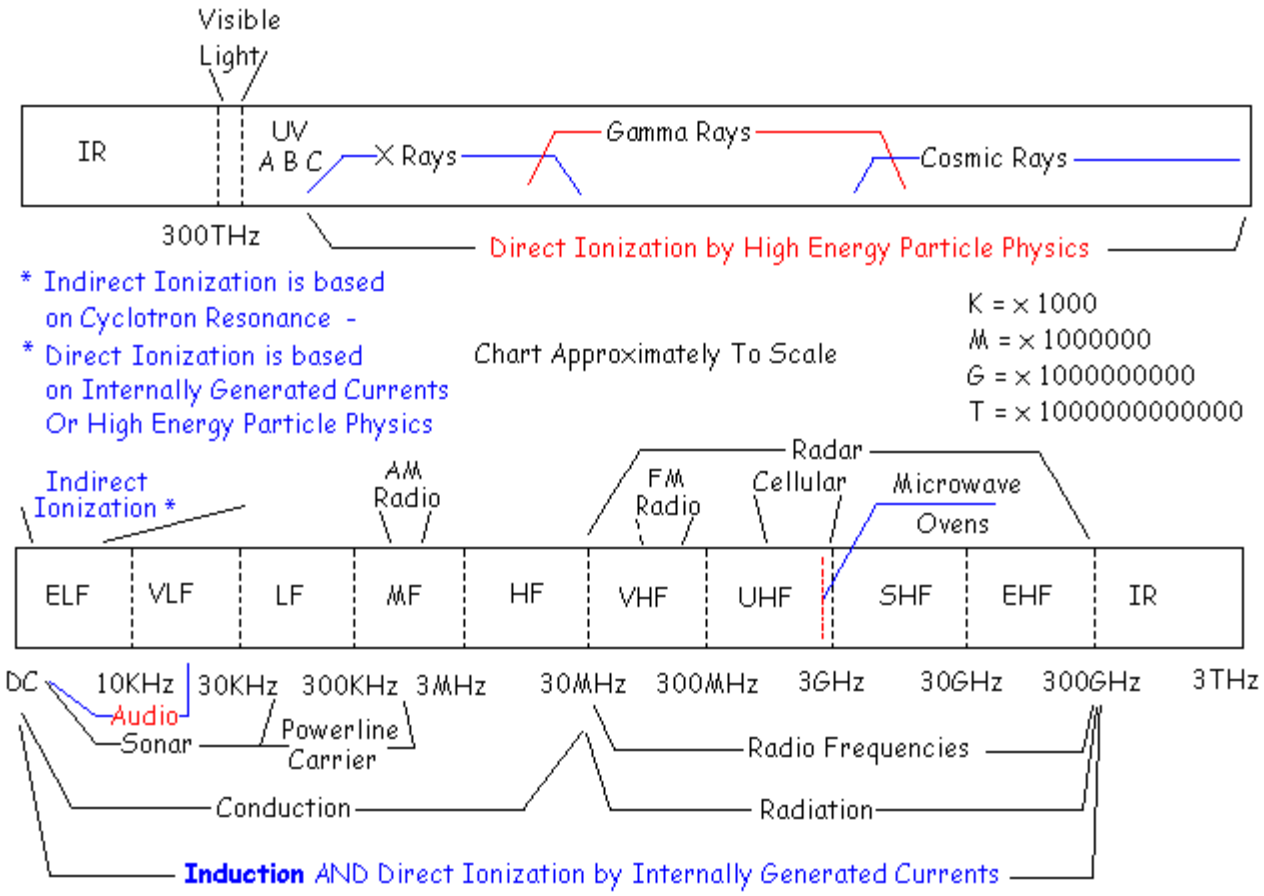
** © PHOTOSENSITIVE EPILEPSY [4]

The study associated with this close-up of a portion of the frequency spectrum, involved Photosensitive stimulation of epileptic and/or convulsive behavior. Although the study noted involved only a small group of primarily young individuals, Environmentally Sensitive individuals may suffer sensitivity and irritability when exposed to these frequencies at any age, be they produced visually, or otherwise, in any form.

> **The 120-Volt power distribution system within a home needs to additionally be considered as a "permanently energized grid" of wires, because even though there are many loads connected to it, it is still and always essentially at 120 Volts (within the limits of its engineered design).**

This "permanently energized grid" will absorb and echo impinging **Radio Frequencies (RF).** RF has properties that behave differently with biological systems primarily due to the frequencies involved, and the energy or information associated with that frequency (a windowing property). As the frequency involved becomes progressively faster the energy becomes more directional to the point where, like light frequencies, it can be "beamed".

The EMF Spectrum (of which RF is only a small part) is a continuous grouping of frequencies. This continuum encompasses frequencies from 0 (DC) to infinite variations/second. Within this realm are energies that **Conduct** through a physical medium (wire), and energies that **Radiate** through space. **The transition area between Radiation and Conduction occurs at about 30 MHz (Megahertz (MHz), or millions of cycles/second).** [6]



Below 30 MHz, Voltage and Magnetic components (which Radiate into the space surrounding the conductor at the speed of light) need to be considered and treated as separate entities. The predominant entity can be either Electric or Magnetic.

Above this frequency the two components are so intertwined as to be inseparable, and require a different treatment. The predominant entity is Electric.

The general consideration is that energies slower than Visible Light do not have enough energy to produce physical changes in matter such as Ionization. Ionization, however, can easily be produced when even a minuscule amount of electrical current is involved.

The primary interaction with matter from RF, as with all electric fields, is a polar molecular alignment that is forced to change with each cycle.

As the electric field becomes more intense, even atomic orbits become distorted.[10] At certain frequencies this manifests itself as a molecular friction that is known as heat (a classic example occurs within a microwave oven). Although this is the basis for Thermal Biological effects (and exposure recommendations), there are other effects that are more subtle that interfere with normal body chemistry. At faster frequencies chemical changes can be brought about directly, forming such compounds as cataracts. [6]

> **An additional consideration with RF impinging on a biological system is that the latter is not Linear. That is, biological systems have certain behavioral characteristics that resemble semiconductors [2], allowing for Heterodyning, where the impinging energies are combined to form sum and difference frequencies. [11] These can provide for avenues of interaction not considered when only the original frequencies are considered. This mixing and**

combining can produce synergies that are beyond the scope of this paper, as well as beyond the scope of most studies to date.

There are certain low frequencies that occur naturally, such as Lightning-induced Atmospheric Schumann Resonance, and Lunar and Solar cycles that are very low in frequency. These various frequencies are needed by humans, animals, and plants to synchronize with normal and periodic cycles characteristic of growth and good health. [1] The encroachment of this frequency region by artificial means is especially troubling.

When one considers the benefit of shielding from artificial sources, one needs to consider the detriment of also shielding from the Natural Electrical Background.

To answer the first question of how many milliGauss is bad, when one takes into perspective that we exist in a sea of **non-alternating** Planetary Magnetism whose value ranges around 500 mG in most places on this planet, and that many studies have already shown an association with various illnesses with a background of as little as one or two (1 - 2) mG of **alternating** field, it should seem obvious that **any Presence should be cause for concern**. That is, any presence that is a wide-area field that you cannot walk away from, to an area of much lower intensity, or a field whose duration spans a substantial part of your day.

For the other aspects of EMF components, being Voltage, Transients / HF, and RF, the answer is more difficult, if indeed an answer can be given. When one considers that every day new applications are found for wireless or other electrical devices, it is obvious that the RF and Transient / HF background is on a rapid increase. Voltage, on the other hand, is the more insidious of irritants, as it is a given that if a voltage environment is not additionally created from wires within the walls/floors/ceilings, it will Always be created by appliance cordage within the living space. **When one considers that the frailest humans are infants, the elderly, and the injured, it is just a matter of time before one falls into one of those categories and obvious consequences follow.**

For infants especially, the reality of the connection can be dramatic. This author is familiar with a child that moved into a fairly new home and within a few days developed a sleep dysfunction that lasted for the entire time of exposure (eight months). When the author learned of it, and convinced the parents to relocate the crib away from energized power cords, the child's sleep pattern reverted to an expected full night's sleep within a few days. [12] Had the conditions not been changed, the child could have possibly suffered life-long repercussions

"Since the early 1980s about 100 occupational and 40 residential epidemiological studies have been published (*NIEHS - Health effects from exposure to power line electric and magnetic fields. Research Triangle Park. US GPO Publ. No. 99-4493*). Interestingly, of the approximately 500 separate risk ratios published in these studies, **six are elevated for every one that is reduced.**" [3]

While the major emphasis in most of the published studies has been on Magnetic fields exclusively, the confounding factor of not including Electric fields, and not including the interaction with the Earth's background Magnetic field, which in most cases dwarfs the Alternating contribution required to produce statistically significant incidence of diseases (500 mG vs 2mG), has rendered most of the associations weak.

The author of the present document contends that Electric fields are the more ominous factor to consider. Electric fields are present in a living environment 100% of the time, at 100% intensity. Additionally, ALL

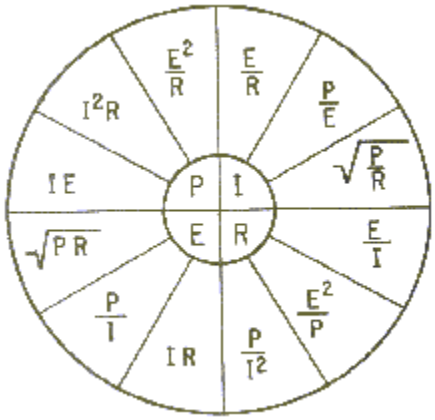
appliance and light fixture cordage, grounded or not, is manufactured **unshielded** and becomes a prolific emitter of voltage. Magnetic fields, on the other hand, are caused by wiring errors, multi-grounding arrangements (to "protect" an innocent and ignorant public), and wiring separation in HV Power Distribution wiring. These may almost be considered minor, compared to the prevalence of Electric fields in the living environment. Magnetic fields, are most difficult to shield from, and field reduction is a source-reduction engineering task. Electric fields, however, are present in ALL residences, and are easiest to shield from.

The advent of Transcutaneous Electrical Nerve Stimulation (TENS) devices clearly depicts that very sharp and small voltage waveforms can easily penetrate the skin barrier and interact directly with the Central Nervous System (CNS). There is an uncanny similarity between these waveforms and electrical "noise" produced by intermittent contacts, which is broadcast between consumers without reduction due to the common ties to supply transformers. This electrical "noise" may be small in value, but when it is brought directly to the skin surface of every occupant due to the ambient Electric fields it rides on, the potential for harm can be (and has been) woefully underestimated. Environmentally hypersensitive individuals who may have progressed to Electrical Sensitivity are especially at risk.

Every individual is electrically sensitive to some degree. The awareness of this sensitivity is not always obvious, but objectivity about various forms of irritation can make for a quick association. When one's immune system has been damaged or compromised from injury, the sensitivity becomes enhanced, and the irritation can become extreme. It is at this point that the association becomes too obvious, and it is at this point that drastic field reduction measures achieve only partial relief. The individual is then left to regress to a non-electric living environment. A radical departure from the electrical "conveniences" one has become accustomed to.

Why are recommended exposure limits thus?

Resources:



Common formulas applicable to single phase and DC systems.
**** © BASIC ELECTRICITY** [10]

P = Power in Watts I = Current in Amps

E = Voltage in Volts R = Resistance in Ohms

Alternation - Cyclic change between arbitrary reference points.

Conductivity - Electrical characteristic that allows easy passage of charged particles on its surface or within its structure. A human's skin is primarily a non-conductor, unless wet or moist, whereas the interior organs are generally conductors.

Electric Field - Volumetric (3-D) property brought about by a difference of charged particle distribution (Potential Difference, or Voltage).

EMF - Classically defined as an ElectroMagnetic Field, a volumetric property brought about by a combination of inseparable Magnetic and Electric fields. At lower frequencies the two fields need to be treated separately.

Faraday Cage - Metal-clad enclosure for Electric isolation (some non-metallic, but electrically conductive, materials may also be used).

Gauss - CGS (English) measure of Magnetic field density.

Gaussmeter - Generally an instrument used to detect Alternating Magnetism.

Hertz - Measure depicting Cycles/second.

Ion - Atom that is electrically charged due to imbalance between its + (Protons) and - (Electron) charge distribution. The imbalance may occur as an unequal sharing between the atom and the molecule (or another atom) it is attached to. This generally leads to a Polarized Molecule as described below.

INT - Induction Neutralizing Transformer, device used to remove unwanted alternating electric components from specific wiring, such as Telephone.

Magnetic Field - Volumetric property brought about by a flow of charged particles (Electrons), or Atomic Alignment.

MC / Metal Clad, wire type that uses a metallic armor as part of its protective cover. **BX** is a common trade name for this type of wire.

Net Current - Difference between the current supplied and the current returned in any particular circuit.

NM / Non Metal-clad wire type that uses a soft PVC jacket for insulation. **Romex** is a common trade name for this type of wire.

Polarized - Uneven charge distribution about a molecule that allows it to interact with any environmental Electric (Voltage) field. Humans are about 75% water, a polarized molecule.

RF / Radio Frequency, generally alternating fields faster than about 30 MHz.

Tesla - MKS (Metric) measure of Magnetic field density.

1 Gauss = 0.0001 Tesla
10,000 Gauss = 1 Tesla
1 milliGauss (**mG**) = 0.1 microTesla (uT)

10 mg = 1 uT

1) ENERGY MEDICINE: The Scientific Basis - James L. Oschman, Candace Pert - Publisher: Churchill Livingstone, Inc., - 2000, ISBN: 0-443-06261-7.

The above highlights newer material that has become obvious by recent biophysical research.

2) CROSS CURRENTS, The Perils of Electropollution, The Promise of Electromedicine - Robert O. Becker M.D., - Publisher: James P. Tarcher Inc. 1990, ISBN 0-87477-609-0.

The above is a foundational book that elaborates on the electrical aspects of anatomy and physiology.

3) Historical Evidence that residential electrification caused the emergence of the childhood Leukemia Peak S. Milham, E. M. Ossiander - 2001

Available on the Internet as a PDF file.

While the authors for the above, make a subtle inference to Magnetic fields as the causative agent, the author of this paper contends that the occurrence of the Leukemia Peak was primarily due to exposure to Voltage, not Magnetism. Early electrification did not immediately drive everyone to the electrical appliance store (as most of today's appliances did not then exist), which would have resulted in the Magnetism they claim. However, immediately upon electrification, there was an ambient voltage that was present at 100% strength, 100% of the time.

4) PHOTOSENSITIVE EPILEPSY - Graham F.A. Harding, Peter M. Jeavons - Publisher: Cambridge University Press 1994 - ISBN 0 898683 02 6.

5) AC POWER HANDBOOK, Problems and Solutions - Authors and Publishers: RTE Deltec Corp. San Diego CA - 1984.

6) RADIO-FREQUENCY AND ELF ELECTROMAGNETIC ENERGIES, A Handbook For Health Professionals - R. Timothy Hitchcock, Robert M. Patterson - Publisher: Van Nostrand Reinhold - 1995, ISBN 0-442-00945-3.

The above follows the "accepted" standards and guidelines.

7) Questions and Answers about EMF, Electric and Magnetic Fields Associated with the Use of Electric Power - 1995 - National Institute of Environmental Health Services and U.S. Department of Energy - -DOE/EE-0040- - USGPO.

8) FUNDAMENTALS OF PHYSICS - David Halliday, Robert Resnick - Publisher: John Wiley and Sons Inc. - 1970 - SBN 471 34430 3.

9) CHEMISTRY, A Conceptual Approach - Charles E. Mortimer - Publisher: Van Nostrand Reinhold Company - 1971 - Library of Congress Catalog Card No.78-133428.

10) BASIC ELECTRICITY - Bureau of Naval Personnel, Rate Training Manual - Navpers 10086-B - 1969 - Stock No. 0500-030-0010.

11) BASIC ELECTRONICS, Vol. 1 - Bureau of Naval Personnel, Rate Training Manual - Navpers 10087-C

- Stock No. 0500-031-0110.

12) ELECTRICAL SENSITIVITY NEWS, Vol. 5, No. 3, May-June 2000, A Wordless Electrical Sensitivity Case, Sal La Duca.

13) Evidence that Electromagnetic Radiation Is Genotoxic: The Implications For the Epidemiology of Cancer and Cardiac, Neurological and Reproductive Effects Dr. Neil Cherry June 2000, available for purchase as a PDF file at www.neilcherry.com, or free as an HTM file (with a few typos) on the Internet.

The above is an excellent paper and is recommended for nursing, doctoral, or other health-related professionals, as well as those individuals with the patience to peruse detailed technical matter. Read about damage at the cellular and molecular level with detailed drawings. Also read how RF is simply a faster application of the same concepts discussed above.

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Stray Voltage from Stray Currents

Services and Resources