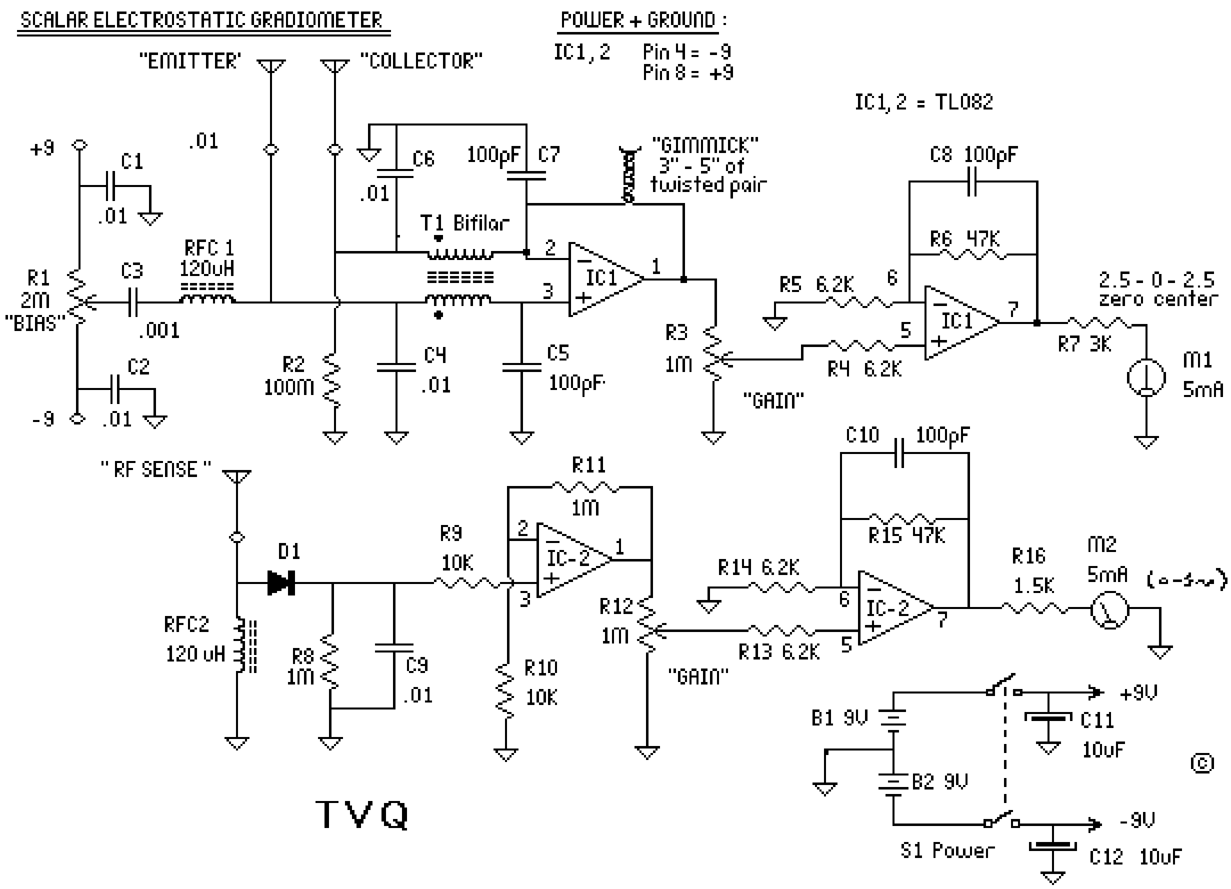
SCALAR ELECTROSTATIC GRADIOMETER

Thanks to Bob Shannon, TVQ, Boston MA



PARTS:

2 - TL082 dual JFET op amp (Tex. Inst)

1 - .001uF 50V ceramic disk capacitor

5 - .01uF 50V ceramic disk capacitor

3 - 100pF 50V ceramic disk capacitor

2 - 10uF 25V electrolytic capacitor

1 - 2M ohm potentiometer (lin. taper)

2 - 1M ohm potentiometer (aud. taper)

1 - Diode 1N914, 1N4148, or similar

1 - 100M ohm resistor (or five 22M in series)

2 - 120uH RF choke coil

1 - Ferrite toroid (T1, see text)

Resistors, 1/8W 5%

2 - 1M

2 - 47K

2 - 10K

4 - 6.2K

1 - 3.0K

1 - 1.5K

1 - 5mA panel meter

1 - 5mA panel meter, center zero (+-2.5mA meter.)

1 - DPST power switch

2 - Telescoping radio antenna

3 - Knobs for pots

1 - Silica gel dessicant bag (baked to dry it)

1 - proto circ. board

1 - Metal enclosure

Buy from Digi-key or Mouser, see MAIL ORDER CATALOGS

Please leave COMMENTS!

The Scalar Electrostatic Gradiometer. Robert A. Shannon ,rshannon@nectech.com
November 1995

The Scalar Electrostatic Gradiometer is a device which measures the interaction of environmental electrostatic fields and gradients with an artificially generated electrostatic field. This interaction is displayed on an analog meter, along with a separate electromagnetic field strength meter, so that the user may compare the relative activity of electromagnetic and electrostatic phenomena.

The user may control the polarity and magnitude of the artificially generated electrostatic field, which is used to sense environmental fields and phenomena by direct electrostatic field to field interference. By noting the response to changes in this reference field, a great deal of information about the environmental fields may be deduced. Normal electromagnetic phenomena are indicated separately, to clarify the nature of the electrostatic effects.

By mapping non-linearities in the ambient environmental electrostatic fields, an area may be scanned for "congruences" of bioelectric and exotic fields, and anticipate probable sites for future activity as well as locations of present or past events.

This surprisingly simple device has proven to be highly sensitive and accurate. By noting environmental non-linearities in the electrostatic field interactions, a broad range of formerly subjective phenomena now becomes hard, cold, objective data. New patterns of interaction between environmental field sources can shed some light on the nature of these phenomena.

This device is suitable for the study of an enormous range of subjects, such as: investigations into Paranormal phenomena of all types, geomantic and divination studies, study of standing wave phenomena, both electromagnetic and scalar, and the detection and mapping of telluric currents.

In a short time, users with no technical understanding of the device are able to detect and collect useful data in practical studies.

Notes on Component Selection:

By convention the electromagnetic field strength meter is a standard meter movement, while the electrostatic meter uses a zero centered meter that deflects right for positive and left for negative currents. Full sized meters in the 0 to 5 milliamp (-2.5 to 0 to +2.5 ma. for the electrostatic meter) range are recommended. The meters selected should be rugged, and have easily readable faces and good mechanical damping. Use the highest quality meters available, as the nature of the meters' actions convey a great deal of information in most situations.

It is possible to use a normal meter movement for both sections without circuit modifications other than selecting the correct value for the series resistor. The value of the current limiting resistors in series with each meter must be selected so that full range deflection occurs one to two volts below the positive supply voltage.

If you prefer to use a LED or LCD bar graph type display, substantial circuit modifications will be needed to prevent false readings induced by power line frequencies. These have no effect on the mechanical meter movements in the circuit as presented. Several stages of active filtering may be needed.

Digital displays should not be used, as the trend of the meter reading is often important. This is an analog device in nature, and should remain so. If computerization is mandatory, a graphical display should be used.

Construction:

Assemble the circuit according the schematic diagram. Use proper component layout techniques to minimize stray capacitance. To minimize microphonics, use either "pad per hole" copper clad breadboard, or fabricate a printed circuit board. Pay close attention to grounding. As the circuit is quite simple, the board may be mounted directly to the connections on the rear of the meters, using the electrical connections as the mechanical mounting for the circuit board as well.

The Gradiometer MUST be built in a metal box to prevent the user's body capacitance from severely limiting the sensitivity and performance of the unit. All connections for the three sense antennae should use BNC or similar connectors.

By convention, the two meters are placed side by side, with the RF sniffer on the left, and the "Delta Es" or electrostatic meter on the right. The sensitivity control for the sniffer should be located on the left, under the meter or on the left hand side of the unit. The sensitivity and bias controls for the electrostatic meter circuit are placed under or beside the meter on the right hand side of the unit. The two electrostatic antennae connect on the top side of the enclosure.

The antennae themselves should be simple straight antennae. Telescoping sections may be used, so that the operator may control the field interaction area. The electrostatic antennae should be parallel, or slightly divergent. The RF sniffer antenna may take any reasonable form, but should not intrude between the electrostatic antennae.

To wind L1, select a small toroid core with high reactance at lower frequencies. Twist a foot or so of small diameter insulated wire, and then wind this twisted pair onto the core in the normal manner for a toroidal coil. Use two different colors of insulated wire, and make sure the correct connections and phasing are used.

If you cannot locate a 100 megohm resistor, use a small number of the largest value resistors available. This resistor provides a path to ground for excess charge deposited onto the collector antenna by electrostatic field interaction and greatly enhances the stability of the device. The exact value is not critical, but it should be as high as practical.

The "gimmick" is a short length of the same twisted pair as is used in L1. This forms a small value capacitor to stabilize the electrostatic meter amplifier. Start with five inches or so. This will be trimmed in the checkout and calibration section. Do not substitute a variable capacitor here, use the old fashioned "gimmick" from the old days of radio.

As always, verify that there are no wiring errors, check that all grounding points and connections are of good quality.

Checkout and Calibration:

With the unit fully assembled, and fresh batteries in place, verify by moving the bias control that the "Delta Es"`meter will move throughout its full range. If the meter will not deflect evenly in both directions, check that both batteries are in good condition and that the bias potentiometer is working correctly, and does not have any non-linearities or other problems.

Check that the sensitivity control also works well. If the electrostatic meter "pegs and sticks" easily, and cannot be brought back by changing the bias control alone, trim a few millimeters of the "gimmick" device, and repeat the testing. This must be dome by trial and error. Be comfortable with the operation of the device before each interaction of the trimming and testing process. If you have trimmed too far, tighten the twisted pair just a bit.

Verify that the RF sniffer section and its sensitivity control also work correctly. Use a radio source such as a small wireless mike or garage door opener for testing. The RF sniffer should be able to detect low powered RF signal sources at a good range, and CB transmitters many tens of yards away. Background electromagnetic radiation levels should be easily visible at the highest sensitivity settings. This value should be noted first in each field survey or measurement.

Note the effect of RF transmissions on both meters. There should be only a small electrostatic effect unless standing waves are present.

If you travel with the device, it may be wise to make allowances to alter the gain of the sniffer amplifier stage itself. Ambient RF levels vary over a wide range; make sure that this background level may be measured in "quiet" areas. At full sensitivity, there should always be a reading on this meter.

Local effects which produce a lowering of this background level and anomalous electrostatic effects deserve special attention, as do higher than usual EM signal areas, with and without electrostatic anomalies.

The combination of such EM nulls with electrostatic-effect anomalies, along with localized endothermic effects (such as cold spots, or high heat loss zones) confirms "exotic" phenomena.

If the device is built in a humid environment, allow the unit to stabilize in an air conditioned area before calibration of the gimmick. Seal the unit well and include a small packet of dessicant inside the unit, secured so that it will not move about. New England winters are ideal times for gradiometer calibration.

Theory of Operation:

The electrostatic section consists of a differential electrometer and an associated electrostatic field source designed to have high rejection of RF and ambient electromagnetic signals. The high gain configuration limits the frequency response to a few Hertz only.

The bias control presents a DC voltage to C3, and the electrostatic leakage through this capacitor charges the emitter antenna until C3 has reached equalibrium. RFC1 prevents ambient RF from entering the power supply. The two capacitors shown on the bias potentiometer should be physically on the bias control itself to minimize lead length.

L1 and its associated capacitors form a pi network RF filter. The bifilar winding of L1 helps common mode RF signal rejection, and enhances the electrostatic field interaction.

IC-1 forms a differential electrometer, and produces an output in proportion to the electrostatic differential between the antennae. This first stage is kept stable by the electrostatic "gimmick". The second stage of IC-1 forms a simple meter driver and integrator.

The RF sniffer is conventional in its operation. A simple detector drives an amplifier stage. The 1 megohm resistor from output to inverting input may be changed to alter the gain. If the ambient RF levels in your area are low, you may wish to raise the value of this resistor to increase the maximum sensitivity of the RF sniffer section.

Operation and Use:

Once you have completed and calibrated your gradiometer, spend some time familiarizing yourself with its operation and behavior. In a dry environment try moving different types of plastics around the antenna area and note the reaction. Try this with differing amounts and polarities of charge on the emitter element by adjusting the bias control and watching the meter.

Watch how fast the electrostatic meter reacts to changes in the bias control, note any differance, or preferance to one polatiry or the other. Watch the reaction of the meters as you move along the electorstatic gradients. Be aware that large concentrations of ions will also be detected.

Try placing insulators with large free electrostatic fields some distance from the unit, and move the unit around the bit of plastic. Repeat this with a conducting electrostatic shield near the plastic object, and note how the electrostatic "shield" effects the readings.

Once familiar with your gradiometer, take it out for a walk. Note how objects effect the electrostatic field locally, and note any patterns of interaction. Pay attention to areas with higher than ambient RF fields, as there may be electromagnetic standing waves present with associated electrostatic fields.

If possible, take your new gradiometer to a site with known "exotic" phenomena activity. You will find that the gradiometer is quite sensitive to a wide range of effects. If at times the gradiometer appears to be suffering from some form of external interference, not electromagnetic in nature, shut the unit off for a few minutes. Shorting the electrostatic antenna briefly may also help. Wait a few calm minutes, and then resume your measurements. If this becomes common in a specific location, check for the presence of any ionizing radiations.

This gradiometer design has been used sucessfully in measurements of neolithic sites. It detected faulty reconstruction at the site, as well as standing stones not shown on maps of the site, and the original locations of stones which had moved due to frost-thaw cycles. Measurements of anomalous electrostatic fields associated with quartz crystals which had been "charged" by shamantic processes have been made. Areas reported to have experienced paranormal phenomena, also verified by "sensitives", have been independently found and measured by gradiometer survey.

In more than one case, hidden objects were found by use of a gradiometer. The person who owned and hid the objects was present during the test, and as the operator moved closer to the hidden objects, the owner of the objects would experience some anxiety. Electrostatic anomalies would then be manifest around the objects, givng away their position. There was no way for the owner of the hidden objects to cue the gradiometer operator.

If in doubt, try it yourself. Objective experience expands the mind.

Objects that had been "protected" from detection by alleged psychic means were also easily detectable without the hider being present. This should be tested with lost objects as well!

I hope this starts a few lines of inquiry into any of the many apparently different types of reported exotic phenomena. The general utility of this device might suggest that these apparently different phenomena may actually all be quite closely related. This simple device allows us to open the door to a much larger world.

I look forward to hearing of your adventures with this device. For years I've wanted to see what readngs might be collected from a "genuine" crop circle, as well as several other such subjects.

EMAIL, NOTES FROM BILL B., 7/2001

WARNING: IC1 IS EASILY DESTROYED BY 'STATIC'

This instrument can easily be wrecked by electrostatic voltages. If you build up static body potenitals on a dry day, then "zap" either of the antennas, you'll kill IC1. To greatly reduce this possibility, build the whole device into a metal case. That way the body of the person holding the instrument will not be able to deliver huge voltages to the antennas. Just avoid bumping the antennas against large metal objects and other people. And buy some extra op-amp chips so you have replacements for IC1 when it gets zapped.

TRY THIS QUICK AND DIRTY VERSION FIRST

To make yourself familiar with electrostatic field detectors, I suggest building the Ridiculously Simple Charge Detector from the kids' projects pages.

Bob Shannon's Gradiometer differs from this one-transistor FET detector in that it measures the strength of LOCAL FIELD DIRECTION of environmental voltage, rather than directly measuring the environmental voltages (relative to ground.) One large benefit is that the Gradiometer should mostly ignore the charge of the human being holding the device. For example, the simple charge detector goes crazy if you walk across a carpet with rubber-soled shoes. The gradiometer instead measures the difference in the voltage picked up by the two antennae, and unless the input is overloaded, this difference would not change enormously as you touch your shoes to the carpet.

CENTER-READING METER

If you can't find a +- meter, some kinds of 5mA meters can be modified to move the needle to the center position. If the usual adjusting screw won't go far enough, then remove the plastic cover plate and carefully turn the adjustment by hand. Then simply make a paper meter scale label and glue it in place.

TL082 OP AMP, VERSUS TL072

While it is always a bad idea to alter a "weird science" device, you might wish to try using TL072 op amps instead of the one used above. TL072 were sold in later years, and create less circuit noise than TL082. Try both, and if TL072 does not improve things, stick with the original parts list.

MIGHT DRIFT AND LOSE GAIN ON HUMID DAYS

Note that the whole circuit around pins 2 and 3 of IC1 is dealing with thousand-megohm resistances. For this reason, surface leakage of all components becomes significant, and the gain may go way down during high humidity. Provide an airtight enclosure for the instrument so the bag of silica gel dessicant won't fill up with water and stop working.

If you make a printed circuit board for the gradiometer, it might be best to NOT make any traces for the conductors attached to pins 2 and 3 of IC1, or the conductors attached to the two antennas. Instead, solder the terminals of these components directly to each other, so the wires are hanging in space and aren't touching the moist surface of the PCB. This includes the terminals of RFC1, T1, and one lead each of C3, C4, C5, C6, C7, and R2. You might even want to bend pins 2 and 3 of IC1 up into the air, and solder wires directly to them, rather than letting them touch the conductive plastic of a proto board or an IC socket. It might even be wise to paint the plastic case of IC1 with red GLPT high-voltage paint (corona dope), to limit the surface leakage across the IC1 plastic package, ESPECIALLY any surface leakage between the -9v on pin 4 and the adjacent pin 3. If humidity is high and meter M1 seems to constantly drift negative, it probably is caused by surface leakage between pin 4 and 3 of IC1.

T1 BIFILAR CHOKE

T1 and the four surrounding capacitors appear to form a "common mode" filter which rejects high frequency (such as radio signals and the continuing electrical noise from nearby power lines caused by light dimmers and motor brush sparks.) Any small toroid core should work, although a larger core would give larger inductance and better filtering.

"GIMMICK" TWISTED PAIR

The "gimmick" probably functions as a resistor. Note that the first section of IC-1 is wired as a conventional op-amp differential amplifier, but it lacks a feedback resistor. If we wanted to make it be a high-gain DC amp, we'd need a 10,000 megohm resistor across pins 1 and 2, in order to form a 100x divider network with the 100 megohm resistor R2. The tiny conductance of the plastic of the twisted-pair 'gimmick' (as well as the conductance of surface leakage across that plastic) probably forms an ultra-high-value resistor. The capacitance of the 'gimmick' probably forms a capacitive divider with C7, which prevents overload by signals at frequencies too high for the meter needle to respond.

Note that there is no resistor anywhere connected to pin 3 of IC1. Pin 3 is electrically "floating," except for the ultra-high resistance of capaictors C3, C4, and C5. These capacitors probably provide an invisible voltage divider (just assume they act as resistors with values much higher than 1000 megohms.) If these capacitors were perfect insulators, the output of the op amp would drift all over the place and would not respond to the R1 "bias" control. If your meter DOES drift uncontrollably, try swapping out C3 with other types of .001uF capacitor until you find one with the right kind of internal leakage. Or, if you can locate a 10,000Megohm resistor, wire it across C3.

Date: Mon, 13 Aug 2001 10:19:51 -0700 (PDT)

From: William Beaty <>

To: Freenrg-L <freenrg-l@eskimo.com>

Subject: Re: [FG]: Gradiometer again

C. Ford mentioned one problem with battery power: meter drift is caused by the way the R1 "bias" pot is connected. Since the gain of the electrostatic section is probably over 100x, then whenever the voltage of the 9v batteries drift, the meter needle will wander rapidly. To stop this, rather than feeding +-9v to the legs of R1, we should feed them regulated power. To make a simple 6.2v voltage regulator, connect a 6.2v zener across the load being regulated, then put a resistor in series with the incoming supply. On the above schematic, we'd connect a 100K resistor in series with each leg of pot R1, then use two 6.2v zener diodes (number 1N4735A), connecting each zener to ground and to one leg of R1, with diode polarity chosen for correct operation.

LOL! Brainstorm!

If we aren't dead certain about how this device really works, maybe we shouldn't change it. What if the most interesting readings are ACTUALLY USING THE 9V BATTERIES AS AN ANTENNA?!! If some "weird physics" signals are slightly altering the output voltage of the 9v batteries, then this device is actually a "differential detector" where simultaneous changes of battery voltages are ignored, but if one battery voltage goes up while the other goes down, the meter needle strongly responds. :) Don't forget, the voltage of a battery comes right from quantum mechanics; right from the microscopic layer of aligned electrolyte molecules which coats the battery electrodes. In that case, we could get rid of the antennas, and instead improve the sensitivity by putting each 9v battery on the end of a long rod!

If anyone here has already built this device, try adding zeners to make regulated +-6volts, then add a DPDT switch that lets you connect R1 either directly to the batteries, or to regulated 6V. Then, when using the device, see if the voltage regulation makes it behave better. Or see if the voltage regulation REMOVES the interesting signals.