THE WEST RAND AMATEUR RADIO CLUB

July 2003
Volume 3, Issue 12

ANODE

Inside this issue:

Editor's Comments

July 5th [AGM day—just nine more days to Bastille Day]

I am typing this to keep my fingers warm. Its around 13C in the 'shack'. I did switch the radiator-heater on a while ago, but its not yet warm enough. Just like a galaxy, there is a 'black body' associated with the heater. I am sure that its fur is absorbing all the heat.

I was going to have a fine article about clandestine radio building in a Japanese prisoner of war camp. Unfortunately the owner of the site has not replied to my emailed request for permission to re-publish in the Anode.

Most sites on the Internet today have some sort of copyright message. Whilst the Anode is a 'not for profit' and in-house publication, we shouldn't ignore the legal restrictions on the material that's out there. Some sites recently have adopted the GNU license which basically places the intellectual property in the public domain and free for all to use for any purpose. It disallows the sale of that material for profit. This lines up pretty much with the aims of amateur radio.

"Any club that will have me as a member….."

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The Tayloe detector

by Sakari Mattila, VK2XIN / OH2AZG (sam@isd.canberra.edu.au)

The Tayloe detector is a direct conversion detector, which appeared on several mailing lists in mid October, 1998. The inventor, Dan Tayloe, (N7VE) is switched integrator. It bears close resemblance to switched capacitor filter.

The basic idea is to store average voltage of each four parts of a cycle of incoming RF into four capacitors. If the RF is pure carrier, constant voltages will be produced. Modulated RF produces slowly variable voltages, which corresponds I (phase) and Q (quadrature) signals in a quadrature detector. If the RF is audio modulated, I and Q signals will be audio signals.

It is known, that all modulation types can be decoded from I and Q signals within detectors bandwidth. A stereo DSP processor will be needed for universal detector. Dan Tayloe used phasing type decoder for SSB signals.

The minimum detectable signal depends on audio amplifiers, like in any direct conversion receiver. The dynamic range is much better than in commercial receivers. Thus Tayloe detector seems to be good for measuring instruments.

The electronic switch must be fast enough to

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Special points of interest:

- Contact details on back page

Editors Comments

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At the AGM a minor modification was made to the constitution and passed by the assembly. This action appears to have opened a 'can of worms'. We don't have an electronic version of the constitution and more seriously it has some paragraphs which violate the constitution of this country. I am capturing the printed version and will have it for general viewing in a couple of weeks. However members will have to be called to special meeting in the near future to correct the constitution.

Remember; "Amateur Radio is for everybody" - quoted at the AGM

PERTH HAMS JAMMED OFF 2.4 GHZ

A cloud of radio frequency interference has settled in on the 2 point 4 Gigahertz in the city of Perth Australia. For many hams it is making satellite operations impossible. Felix Scerri, VK4FUQ, reports from the cityof Ingham – down under:

You may not hear many VK6 hams on AO40 for a while. Many are suffering from interference from some form of wide band data transmission centred on 2.4GHz.

The signal covers much of the Perth metro area and is very strong. So strong in fact that it does not matter where you beam you can still hear it - mainly from reflections.

The signal, which runs continuously, sounds like a 100Hz buzzing sound and has a bandwidth of about MHz. Looking at the signal on a spectrum analyzer it has a flat top and very steep sides. The signal started about 6 weeks ago and one suggestion is that it might be an image response of S band down converters to the 2.1GHz G3 mobile phone service that have just started tests.

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The Tale of the Radioactive Boy Scout

FROM HARPER'S MAGAZINE BY KEN SILVERSTEIN

Golf Manor, a subdivision in Commerce Township, Michigan, some 25 miles outside of Detroit, is the kind of place where nothing unusual is supposed to happen, where the only thing lurking around the corner is an ice-cream truck. But June 26, 1995, was not a typical day.

Ask Dottie Pease. Cruising down Pinto Drive, Pease saw half a dozen men crossing her neighbour's lawn. Three, in respirators and white moon suits, were dismantling her next-door neighbour's shed with electric saws, stuffing the pieces into large steel drums emblazoned with radioactive warning signs.

Huddled with a group of neighbours, Pease was nervous. "I was pretty disturbed," she recalls. Publicly, the employees of the Environmental Protection Agency (EPA) that day said there was nothing to fear. The truth is far more bizarre: the shed was dangerously irradiated and, according to the EPA, up to 40,000 residents of the area could be at risk.

The cleanup was provoked by the boy next door, David Hahn. He had attempted to build a nuclear reactor in his mother's shed following a Boy Scout merit-badge project.

Grander Ambitions

David Hahn's early years were seemingly ordinary. The blond, gangly boy played baseball and soccer, and joined the Boy Scouts. His parents, Ken and Patty, had divorced, and David lived with his father and stepmother, Kathy, in nearby Clinton Township. He spent weekends in Golf Manor with his mother and her boyfriend, Michael Polasek.

An abrupt change came at age ten, when Kathy's father gave David The Golden Book of Chemistry Experiments. David became immersed. By age 12 he had digested his father's college chemistry textbooks; by 14 he had made nitro-

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The Tale of the Radioactive Boy Scout

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glycerine.

One night his house in Clinton Township was rocked by an explosion in the basement. Ken and Kathy found David semiconscious on the floor. He had been pounding some substance with a screwdriver and ignited it. He was rushed to the hospital to have his eyes flushed.

Kathy then forbade David from experimenting in her home. So he shifted his operations to his mother's shed in Golf Manor. Neither Patty nor Michael had any idea what the shy teenager was up to, although they thought it was odd that David often wore a mask in the shed, and would sometimes discard his clothing after working there until two in the morning. They chalked it up to their own limited education.

Michael does, however, remember David saying, "One of these days we're gonna run out of oil."

Convinced he needed discipline, David's father, Ken, felt the solution lay in a goal that he didn't himself achieve, Eagle Scout, which requires 21 merit badges. David earned a merit badge in Atomic Energy in May 1991, five months shy of his 15th birthday. By now, though, he had grander ambitions.

Concocted identity

He was determined to irradiate anything he could, and decided to build a neutron "gun." To obtain radioactive materials, David used a number of cover stories and concocted a new identity.

He wrote to the Nuclear Regulatory Commission (NRC), claiming to be a physics instructor at Chippewa Valley High School. The agency's director of isotope production and distribution, Donald Erb, offered him tips on isolating and obtaining radioactive elements, and explained the characteristics of some isotopes, which, when bombarded with neutrons, can sustain a chain reaction.

When David asked about the risks, Erb assured him that the "dangers are very slight," since "possession of any radioactive materials in quantities and forms sufficient to pose any hazard is subject to Nuclear Regulatory Commission (or equivalent) licensing."

David learned that a tiny amount of the radioactive isotope americium-241 could be found in smoke detectors. he contacted smoke-detector companies and claimed that he needed a large number for a school project. One company sold him about a hundred broken detectors for a dollar apiece.

Not sure where the americium was located, he wrote to an electronics firm in Illinois. A customer-service representative wrote back to say she'd be happy to help out with "your report." Thanks to her help, David extracted the material. He put the americium inside a hollow block of lead with a tiny hole pricked in one side so that alpha rays would stream out. In front of the block he placed a sheet of aluminium, its atoms absorb alpha rays and kick out neutrons. His neutron gun was ready.

The mantle in gas lanterns, the small cloth pouch over the flame, is coated with a compound containing thorium-232. When bombarded with neutrons it produces uranium-233, which is fissionable. David bought thousands of lantern mantles from surplus stores and blowtorched them into a pile of ash.

To isolate the thorium from the ash, he purchased $1000 worth of lithium batteries and cut them in half with wire cutters. He placed the lithium and thorium ash together in a ball of aluminium foil and heated the ball with a Bunsen burner. This purified the thorium to at least 9000 times the level found in nature, and up to 170 times the level that requires NRC licensing.

But David's americium gun wasn't strong enough to transform thorium into uranium.

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The Tale of the Radioactive Boy Scout

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More Help From the NRC

David held a series of after-school jobs at fast-food joints, grocery stores and furniture warehouses, but work was merely a means of financing his experiments. Never an enthusiastic student, he fell behind in school, scoring poorly on state math and reading tests (he did, however, ace the test in science).

Wanting radium for a new gun, David began visiting junkyards and antique stores in search of radium-coated clocks. He'd chip paint from them and collect it.

It was slow going until one day, while driving through Clinton Township, he says he came across an old table clock in an antique shop. In the hack of the clock he discovered a vial of radium paint. He bought the clock for $10.

Next he concentrated the radium and dried it into a salt form. Whether he fully realized it or not, he was putting himself in danger.

The NRC's Erb had told him that "nothing produces neutrons from alpha reactions as well as beryllium." David says he had a friend swipe a strip of beryllium from a chemistry lab, then placed it in front of the lead block that held the radium. His cute little americium gun was now a more powerful radium gun.

David had located some pitchblende, an ore containing tiny amounts of uranium, and pulverized it with a hammer. He aimed the gun at the powder, hoping to produce at least some fissionable atoms. It didn't work. The neutron particles, the bullets in his gun, were moving too fast.

To slow them down, he added a filter, then targeted his gun again. This time the uranium powder appeared to grow more radioactive by the day.

"Imminent Danger"

Now 17, David hit on the idea of building a model breeder reactor, a nuclear reactor that not only generates electricity, but also produces new fuel. His model would use the actual radioactive elements and produce real reactions. His blueprint was a schematic in one of his father's textbooks.

Ignoring safety, David mixed his radium and americium with beryllium and aluminium, all of which he wrapped in aluminium foil, forming a makeshift reactor core. He surrounded this radioactive ball with a blanket of small foil-wrapped cubes of thorium ash and uranium powder, tenuously held together with duct tape.

"It was radioactive as heck," David says, "far greater than at the time of assembly." Then he began to realize that he could be putting himself and others in danger.

When David's Geiger counter began picking up radiation five doors from his mom's house, he decided that he had "too much radioactive stuff in one place" and began to disassemble the reactor. He hid some of the material in his mother's house, left some in the shed, and packed most of the rest into the trunk of his Pontiac.

At 2:40 a.m. on August 31, 1994, Clinton Township police responded to a call concerning a young man who had been apparently stealing tires from a car. When the police arrived, David told them he was meeting a friend. Unconvinced, officers decided to search his car.

They opened the trunk and discovered a toolbox shut with a padlock and sealed with duct tape. The trunk also contained foil-wrapped cubes of mysterious grey powder, small disks and cylindrical metal objects, and mercury switches. The police were especially alarmed by the toolbox, which David said was radioactive and which they feared was an atomic bomb.

The discovery eventually triggered the Federal Radiological Emergency Response Plan, and state officials would become involved in consultations with the EPA and NRC.

At the shed, radiological experts found an aluminium pie pan, a Pyrex cup, a milk crate

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Editors Comments

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At airtime, the interference is still there and hams in Perth are wondering what to do to make the problem, go away. (Q-News—from the alt.rec.amateur newsgroup)

AGM results
Well the AGM is over and the winners are …..the same as last year. See the back cover for details and contact numbers. If you wish to complain, become a member by paying your R75 subscription! See you at the meeting on the 14th of July.

73
JohnB

OM Dave ZR6AOC - the new Chairman

The Tale of the Radioactive Boy Scout

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and other materials strewn about, contaminated at up to 1000 times the normal levels of background radiation. Because some of this could be moved around by wind and rain, conditions at the site, according to an EPA memo, "present an imminent endangerment to public health."

After the moon-suited workers dismantled the shed, they loaded the remains into 39 sealed barrels that were trucked to the Great Salt Lake Desert.

There, the remains of David's experiments were entombed with other radioactive debris.

"These are conditions that regulations never envision," says Dave Minnaar, radiological expert with Michigan's Department of Environmental Quality.

"It's simply presumed that the average person wouldn't have the technology or materials required to experiment in these areas."

David Hahn is now in the Navy, where he reads about steroids, melanin, genetic codes, prototype reactors, amino acids and criminal law. "I wanted to make a scratch in life," he explains now. "I've still got time." Of his exposure to radioactivity he says, "I don't believe I took more than five years off my life."

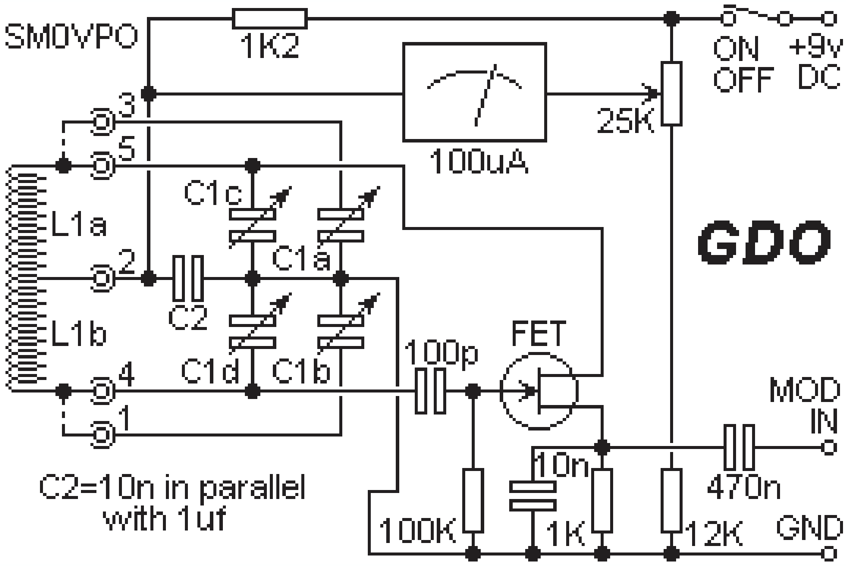
GRID DIP OSCILLATOR

by SM0VPO - Harry Lythall - SM0VPO

I have built a valve GDO in the late 60's, but today I use a smaller unit based upon a BC245 Field Effect Transistor. In reality it is a Drain Dip Oscillator.

Whilst I was working in Saudi Arabia I built several of these instruments & assisted 14 of my tech's to build their own. In doing so I also learned a few new tricks as the Phillipino technicians in my workshop were very inventive.

Here is the circuit of the unit, which is based upon a Wheatstone bridge circuit; the oscillator being one resistor of the bridge. This technique greatly improves the depth of the dip observed. The battery is a simple "PP3" 9v battery, which will last a year (or more) in this application. For this reason I soldered the battery terminals instead of using battery clips.



The meter is a cheap 100uA unit robbed out of an old stereo radio. The tuning capacitor is also robbed out of the same radio. The radio had VHF FM and MW AM, so the tuning capacitor had 4 capacitors, 2 x 270pf (C2a + C2b) and 2 x 20pf (C2c + C2d). All four capacitors are used in this circuit.

Coils are plug-in type using a 5-pin DIN socket on the GDO unit. The coils are centre-tapped and wound upon coloured plastic formers robbed from those cheap children's felt-tipped colouring pens. Old credit-card plastic sheet was used to make formers for the larger coils by cutting out a 2cm disk with a 1cm hole for the pen-tube. Three disks are used for each coil. Each coil is connected to the 5-pin DIN plug pins 2, 4 and 5. This selects the smallest tuning capacitors, C2c and C2d. Short together pins 1-4 and 3-5 on the coil plug to select the larger tuning capacitor for the lower frequency bands (above 50 MHz).

COILS

150 - 460MHz = 0 turns 2mm Dia., No centre-tap. Add 470

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GRID DIP OSCILLATOR

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ohm pins 2-5

70 - 200MHz = 2 turns 2mm Dia., No centre-tap. Add 470 ohm pins 2-5

30 - 75MHz = 5+5 turns 18 SWG single layer close-wound

14 - 35MHz = 9+9 turns 22 SWG single layer close-wound, short 1-4 3-5<

7 - 20MHz = 20+20 turns 22 SWG double layer close-wound, short 1-4 3-5

3 - 8MHz = 50+50 turns 28 SWG pile wound using formers, short 1-4 3-5

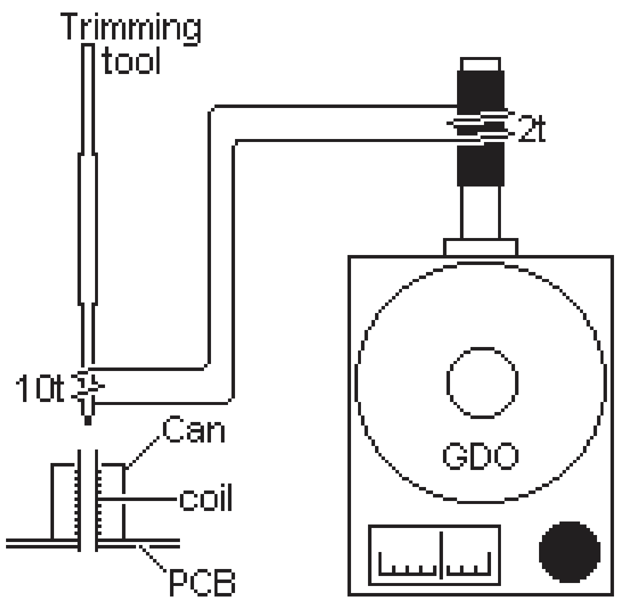
1 - 3.5MHz = 120+120 turns "thin" pile wound using formers, short 1-4 3-5

0.3 - 1.4MHz = 300+300 turns "thin" pile wound using formers, short 1-4 3-5

80 - 310KHz = 750+750 turns "thin" pile wound using formers, short 1-4 3-5

"Thin" wire I used was robbed from a low voltage relay. I am not sure what gauge it was, but it is "pretty thin" (C:A 40 SWG - ish!!). All coil windings and formers were "tacked" in place with super-glue then "gunged up" with epoxy resin (Araldite) after testing. Fix formers to the DIN plug using more epoxy. I passed all coil wires down the inside of the formers and poured a little epoxy down the inside to set every-thing solid. The majority of the former was left hollow so that I can stuff coils inside it for VERY close coupling. You may have to "play" with the coils a little to get the correct coverage.

Mount the tuning capacitor about 1cm above centre of an aluminium box, 8cm x 6cm by about 3cm deep. Connect the four tuning capacitors to the DIN socket by means of 2mm Dia copper wire (robbed from a bit of house wiring cable). Connect the DIN socket earth (chassis) pin to the earth tag of the tuning capacitor. Connect both C2's (10n + 1uf) between the DIN socket pin 2 and the earth bar. Mount the components for the FET oscillator in "rat's-nest" fashion as close to the tuning capacitor as possible. All component leads must be clipped as short as possible in order to get performance up to 460 MHz. See above for the layout and front view of the unit.



Here is a picture (above) of one of my original prototypes. This one has travelled around the world and has seen many happy radio sites in the Middle East. The switch inserts a sub-audio tone for opening tone-squelch operated communications equipment at 10.7 MHz and also injects a 1KHz tone so that I could always get a -10dBm signal to line out for setting up radio systems. This way I avoided the need for signal generators and other bulky equipment on site whilst I was working.

CALIBRATION

Several methods; Use a frequency counter, or general coverage receiver or scanning receiver. With a 144MHz receiver you can also find some of the harmonics (eg 72MHz, 48MHz, 36MHz, 28.8 and 24MHz). A Ham-band RX can be used to locate HF frequencies and HF harmonics.

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The Tayloe detector.

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switch at four times the received frequency. Internal resistance of the switch must be small, much less than 50 ohms. The suggestion is 74CBT3253, which should work up to 100 - 150 MHz. The original detector did not have any RF amplifier, but I would add it, because there is high-level noise coming out of the switch at four times received frequency and harmonics.

This is partial quote from the original mailing list message:

Dan Tayloe, N7VE, Phoenix, AZ, Az ScQRPions, QRPL # 696 was quoted in the original message as the inventor of the Tayloe detector.

The message appeared on these mailing lists: bpsk@ qth.net; laser@ qth.net; rsgb_lf_group @ blacksheep. org;

The original design article by Dan Tayloe appears on the rf design site :-

http://rfdesign.com

Radio	MDS	2TDR	Blocking
	dBm	dB	dBm
Tayloe	-136	111	+30 (3rd) <--- without RF amplifier
FT101E	-142	60	
TS520	-132	63	
R390	-136	82	
7553B	-146	88	<--- Collins 'S' line radio
Corsair	-128	90	
GQ40	-126	90	125
NN1G	-132	90	
Nor. 40	-136	88	108
Sierra	-132	88	100
FT1000	-125	95	125
TS930	-133	95	
Breed	-120	70	90
Hayward	-128	95	125 <--- Hayward's criteria for contest
Mini R2	-136	96	<---- from QST article

MDS Minimum Detectable Signal

2TDR Two Tone Dynamic Range

3rd Third order intercept

Information for other radios is from Jim Duffy, KK6MC & Az ScQRPion, Kent Torell.

GRID DIP OSCILLATOR

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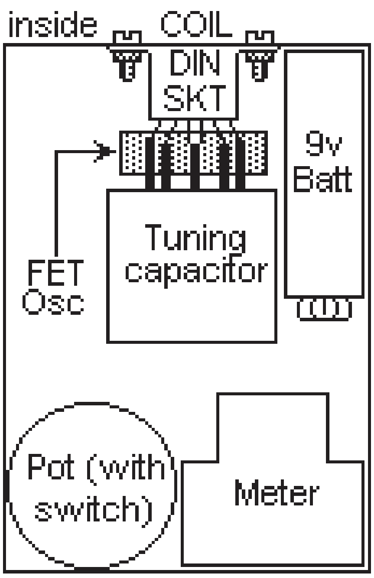
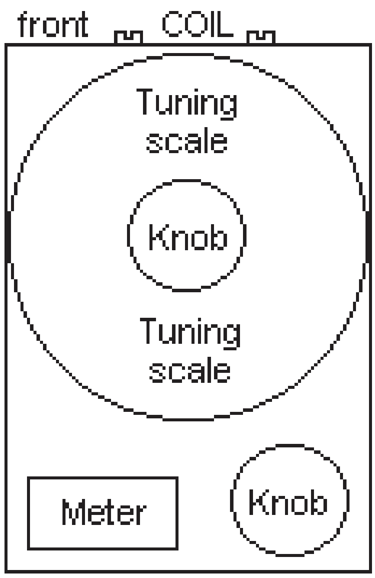
OPERATION

Use the pot to set the meter to (about) mid-scale and position the GDO coil beside the tuned circuit you want to test. "Sweep" the GDO tuning until you see a "dip" and read the frequency from the tuning scale. It can be useful to set the frequency to that which you want, then adjust the tuned circuit under test for a dip. In this way it is possible to align a QRP TX or RX before power is applied.





When space is limited you can take a length of thin enamelled wire and solder the two ends together. Form two loops in the wire and couple one loop to the GDO coil. The other loop may be placed close to the inaccessible tuned circuit. It can for example, be placed round a thin plastic knitting needle or trimming tool.

"PRUNING" ANTENNAS

The unit is shirt-pocket sized so you can use it up the mast. To check a vertical 1/4 wave (for example) disconnect the feeder, and short the antenna with a bit of wire about 5-10cm long. Twist the wire to form a single turn loop and check this loop with the GDO as above. If the ANT is too short the DIP will be higher than the frequency you want.

CUTTING CO-AX BALUNS

If (for example), you wanted a bit of CO-AXIAL cable 1/2 wave long for 145MHz, then cut the cable to "Velocity factor x 150/freq" +5%. Strip and short-circuit both ends of the cable, and form one end into a loop about 1/4" Dia. Apply the GDO coil to the loop and check the resonant frequency. It will be a little low, so cut a bit off the other end and repeat. If the tuning scale is a bit too cramped then you can open-circuit the other end and cut the CO-AXIAL cable for 72.5MHz (1/4 wave at 72.5 is a 1/2 wave at 145 MHz).

SIGNAL GENERATOR

A GDO is always a good quick handy device for generating a signal when checking out receivers. I have added a "MOD IN" socket to my GDO which will give 75KHz deviation at 100 MHz from a high output dynamic microphone. I also have an internal 1KHz oscillator (so that I could open a receiver squelch at 10.7 MHz and send a -10 dBmO signal to line as an aid to my job as a Service Engineer).

FUN WITH "MOTHERCARE"

Stand outside the shop EXIT and tune the GDO between 80-310 KHz, every time someone leaves the shop. This triggers the "anti-theft alarm". If you are seen, RUN LIKE HELL! (NO - only kidding!!).

Have fun, de HARRY, Lunda, Sweden.

Taken from his web pages at :- http: //w1.859.telia.com/~u85920178

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Bulletins (Sundays at …)
11h15 Start call in of stations
11h30 Main bulletin start

Frequencies
439.000MHz 7.6MHz split
(West Rand Repeater)
145,625 MHz (West Rand Repeater)
10,135 MHz (HF Relay)

Radio Amateurs do it with more frequency!

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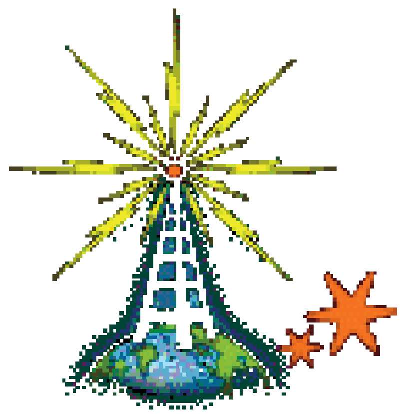
West Rand members - we need your input!

To make this the best ham radio magazine in South Africa we need your input. Please submit articles, comments, suggestions etc.

Please send plain text with no formatting to the email address below.

In July 2003, we re-published an Anode Compendium on CD. It has the issues from July 2000 until June this year. This included the new Adobe reader. It has been updated, check with the chairman for details.



We need your input! Email us articles, comments and suggestions please. john.brock@pixie.co.za