December 2011
Volume 12, Issue 6

ANODE

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Anode Editor's Comments

Volume 12, Issue 6
December 2011

Fox Hunting on 403 MHz

Its in the news again! Thieves are jamming the car security remotes, so you can't lock your car/garage/gate.

The jamming of the car remotes by the 'bad guys' is going on all the time in South Africa. Mostly at busy shopping malls. These car thieves are well organised with medium power jamming devices. Which should be easily detected by Doppler or RDF receivers. It doesn't matter how 'secure' the code is, these 'jammers' work by blocking the receiver from getting the code to lock the car doors.

Having had some personal experience in this field as well as the previous ZS6WL, it would be simple to make a 403 MHz receiver.

How about 'we' as a club, make a project that serves the community by detecting these thieves. As Radio Amateurs 'we' could use our experience in 'Fox Hunting' and assist the police and security firms in catching these crooks.

In the late 80's an 'incident' was recounted to me by Anti-Car-Rob. They were in the process of developing a local car security system. All the previous versions were of Italian manufacture and imported illegally as they did not comply with local radio regulations.

They also had a minimal set of

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Repco / PYE UHF Portable Transceivers

Special points of interest:

- **Contact details on back page UPDATED 2011-11-14**
- **Ham - Comp Latest on web site. Still under construction...**

I was "given" these by the club chairman with the expression "Nobody else wants them!", several years ago. Well after a lot research, I have had to do some 'digging' into the 'guts'. Some disassembly was required and some notes and pictures taken. It has proven to be quite rewarding.

These ex-commercial handie-talkies were obviously used by the Escom power station security personnel. As they were manufactured in the early 1980's, not much is known about them. PYE and Repco have 'disappeared' from the market. Doing a few searches on Google turns up no technical information and certainly no service manuals. However it did turn up adverts for the batteries. They surely cannot be still in service can they?

These 1980's walkie talkies came in two versions. One was a single channel and the other a six channel. Both had positions and places for all the modules. So modules could be substituted. But not the chassis as it had the six pole switch.

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Repco / PYE UHF Portable Transceivers

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I started disassembling some of the modules. The method used would have given my mother grey hairs! I used a plate on the electric stove to heat a module up. Using a pair of pliers I then held the pins joined to the PCB inside the module and pulled the PCB free of the surrounding case. I quickly dropped the PCB and components into a small bowl of water to cool the components and the PCB. A harsh smell of burnt nylon and resin pervaded the kitchen. But I had some modules to investigate.

As you can see from the picture above, the 20.945 MHz second local oscillator converts the first I.F. to 455 kHz for the MC3357 chip to demodulate. That blue 'block' is the ceramic filter. I was getting quite pleased with myself as I now had a 'source' of MC3357's, even if I didn't get anything else from these transceivers.

Working out the technical side

Fortunately for me, one radio still had its receive crystals in five of the six positions. I had already established that the first I.F. was 21.4MHz as I had removed the crystal filter as module. I could read the frequency and details on the can. The one 'long' module contains the second I.F. Which is 455 kHz.

Taking one of the crystals and placing it the "crystal checker", I got a fundamental frequency for the crystals. These are "third overtone" types and run in the transceiver around 48-52 MHz. But when in the "crystal checker" they run at a third of that frequency. Typically around 16 to 17 MHz.

The receive and transmit frequencies are embossed on the rear panel of the transceiver. So it was fairly easy to work out the multiplier ratio for the chain. This resides in two modules – now called 'TX x9 multiplier' and 'RX x9 multiplier'. Both have test points on them. So you can adjust the circuitry. But connecting a meter to them is another matter. Not much wire is available at these point. Touching them with a test prod produces a reading on the meter. But if you also want to adjust something, you need another pair of hands.

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Repco / PYE UHF Portable Transceivers

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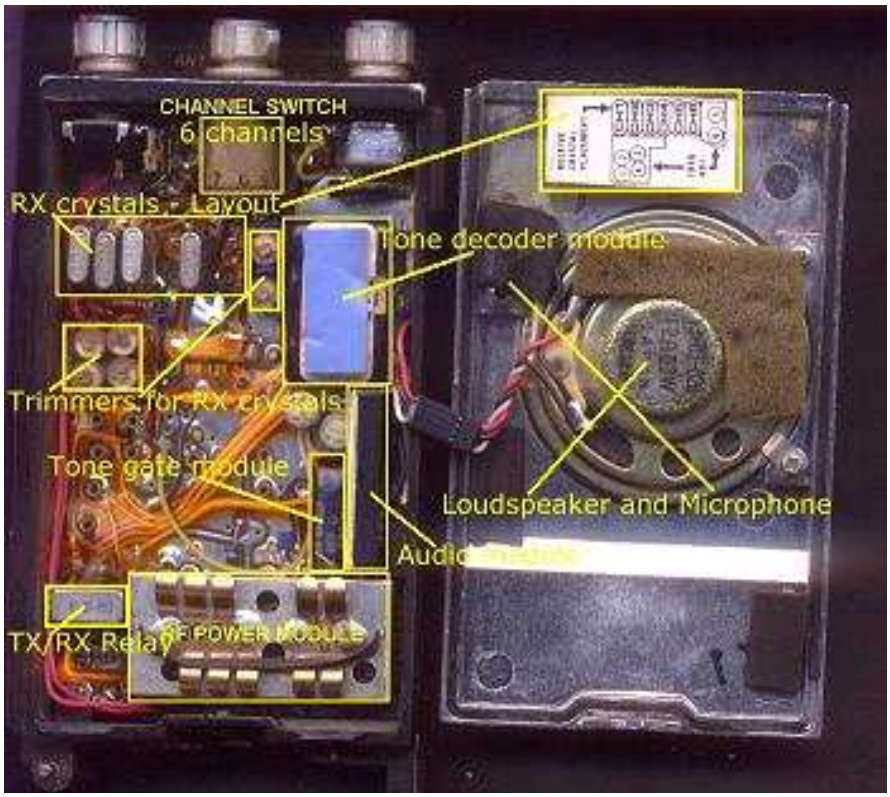
Why 'times nine'? Well its fairly easy to make a times three multiplier amplifier with a transistor. Ironically it is not so easy to make a times two without using a diode or similar. So the overall multiplier is 'times nine'. Thats two stages of 'times three' giving 'times nine'.

sides worked, I could adapt them to suit, knowing that the circuitry worked.

The first crystal I found to be 'close by', was a 46.275 MHz crystal. This when multiplied by nine gives a local oscillator of 416.475 MHz. Subtracting the I.F. of 21.4 MHz, gives an input frequency of 395.075 MHz.



I then had to work out which position the switch was in for the first channel. Whilst the diagram on the plate gives the position of the crystal, the switch has no markings! Fully counter-clockwise is the correct position. Plugging one of the existing crystals in, I checked for noise on channel. And much less noise on the 'dead channel'. That is the one without a crystal and therefore no local oscillator. All good there. So I switched on the signal generator and tuned carefully across the 457 MHz region. I got an output blip and zeroed in. Finally I got it spot on. With the output from the signal generator at full output, transmitting into a piece of wire a centimetre long, I reduced the output level. I went down in level a long way. Boy was the receiver sensitive!

Making them work for a living

After a long pause in this project, I took them up recently as I could use a 403 MHz receiver. Of course I don't have a suitable crystal. But I do have crystals that could be persuaded to work 'close by' in frequency. Then I could adjust or order a suitable crystal. The thought did occur to me that the DDS project could providide an accurate "Local Oscillator". Or I could try and make a voltage controlled oscillator at the right frequency. But the first thing to do is to get the transcievers to work using the crystals I had found. If the receive

So I plugged the 46.275 MHz crystal in to the second position. I switched the switch to channel two. I got a very quiet radio...

The adjustment of the receive multiplier module requires a small (< 3 mm) blade screwdriver. Preferably of non-ferrous nature. Of course when you look for one, they all hide. So I picked up a watchmakers screwdriver of the 'right sort' and used that. The noise level jumped up. I carefully tuned the signal

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Repco / PYE UHF Portable Transceivers

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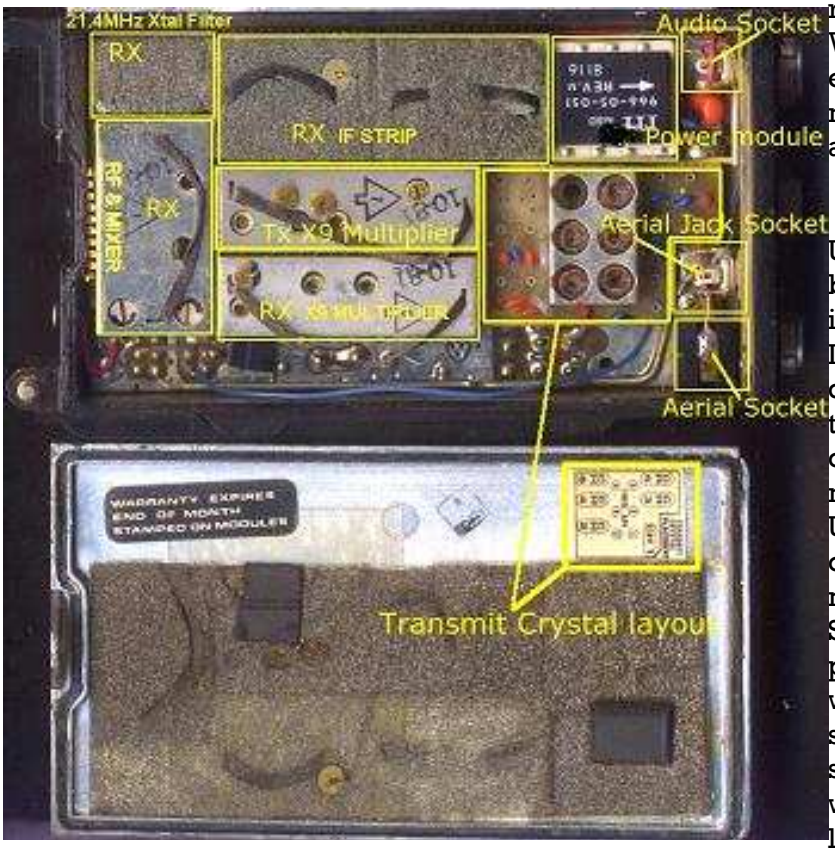
generator at full output and got a blip. Then I tuned it in for a clean tone at 400 Hz. 1 kHz is ok, but not for long periods. Carefully tuning the multiplier, I got the order of sensivity that I desired. So the receiver can do the job!



I went to the garage to get a few more units to test. I then set them up on the bench with a small 12 Volt power supply. The first one I tried to get working was very quiet. (Of course!)

So was the second one. What I had I done wrong? I checked everything carefully but nothing said to me that I had done them wrong. You can see from the picture above, I came across the tone decoder/encoder and gate modules after I had compared the one working set I had. This one had a wire link where the 'Tone gate module' was. When I prised loose the module and substituted a wire link between sockets, I was rewarded with a lot of noise.

Getting to transmit at UHF

None of the transceivers had crystals for transmitting. Over the years, I have never thrown a collected crystal away. So I went looking in the container marked "Crystals". From a UHF hand held many moons ago, I had retrieved some transmit crystals. Well one of them was 'close by'. It even had 467T075 on it in microscopic numbers and letter. It also fitted the socket...

Using a signal strength meter I had built last century, I tried transmitting into a short piece of wire. Whoopee! I had a working transmitter that could make the meter read two thirds of full scale. A careful tune up of the x9 transmitter multiplier gave me a maximum reading. Unfortunately this is not realistic. For one the piece of wire was nowhere near a real quarter wave monopole. Secondly the output aerial – probably was a "rubber ducky" - was missing on all the radios. The screw fitting inside the radio is soldered to a 2.5mm jack socket which has the short length of hard-line coax feed from the transmit/ receive relay, it is about a 5 or 6mm thread. I had no means of connecting a power meter to this output. So I removed the aerial mounting for inspection. I shall be connecting a 'real coax connector' some time soon. I shall be letting you know in a later article how I got on.

A PCB module removed from its casing.

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codes. Most cases this was less than 4096 possibilities. A 'person' who had an axe to grind went around all the car installers with a small coded transmitter. The transmitter went through all the codes in about 3 minutes, opening all the car's doors on the lot! He went round all of them in a matter of a few days. I believe he convinced most to sign with his 'new and improved' security system.

Later on these 8 bit coded systems were recorded and 'played back' to the systems. Thus opening the cars, gates and garages.

While (my long time friend) John Whitfield was working at M.S.I., he introduced both a 'frequency hopping' system and a pseudo random sequence code. Also he produced and got approval from ICASA for a superheterodyne design working on 403 MHz. This had better 'selectivity' thereby could be immune to 'blocking' than any of the previous receivers. Most current (approved) systems work on this frequency at low power (milliwatts).

On the 'down side' of this, it appears that most insurance companies will repudiate claims of theft. Especially when the car has not been broken into.

So make sure that your car/garage/gate is locked when you press your remote.

I got a very quick response from my friend...

I always walk 10 metres away and relock the car. Always have done and always will. The Crooks will think they got you first time so be surprised at the second lock and not catch you.

Best regards
Peter Greaves

The remote transmitter in your hand is very low power (milliwatts) and the interfering transmitter may be medium power (Watts). The chances of you getting your signal through, 10 metres further away from the receiver are not in your favour!

Rather make sure when you are close to the car.

From:
http://jbcs-blog.blogspot.com

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Global solar observatory flares into life

Home-built e-CALLISTO network provides real-time data on Sun's radio emissions.
By Nicola Nosengo

It may have begun as the hobby of a Swiss lab technician but, ten years on, the e-CALLISTO network of spectrometers now encircles the globe, recording solar radio emissions around the clock. The nineteenth instrument in the ground-based, low-cost system was set up in Anchorage, Alaska, last week--completing a chain of stations around the globe.

The CALLISTO (Compound Astronomical Low-cost Low-frequency Instrument for Spectroscopy in Transportable Observatory) spectrometers, designed and built by electronics engineer Christian Monstein of the Institute for Astronomy of the Swiss Federal Institute of Technology Zurich (ETH Zurich), record the intensity of electromagnetic radiation at radio frequencies, between 45 and 870 megahertz. The instruments can be connected to almost any kind of antenna, and send their data to an ordinary computer.

Monstein, an amateur radio astronomer, began working on the CALLISTO prototype in 2002, when digital radio tuners became available on the consumer market. "For the first prototype I adapted the tuner of my own television set," he recalls. "I used to call it PMS, 'poor man's spec-

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trometer'."

In 2003, working in his spare time and using just €200 (US$270) worth of equipment, he assembled the first observatory. Despite its low cost, researchers think the system will provide useful data through studying the Sun's activity.

Early warning

Arnold Benz, an astrophysicist at ETH Zurich, quickly realized that the instrument was particularly useful for studying the large explosions in the Sun's atmosphere known as solar flares. The radio emissions from these events are important for understanding the dynamics of the solar corona. Solar flares are also often associated with coronal mass ejections, huge fluxes of charged particles from the Sun that are a hazard to orbiting satellites and can disrupt mobile phone and television signals.

A network of radio telescopes providing information on radio bursts is run by the US Air Force's Radio Solar Telescope Network. "But the coverage is not complete, and the data are not available in real time for researchers," says Nat Gopalswamy, an astrophysicist who studies solar flares at NASA's Goddard Space Flight Center in Greenbelt, Md.

Benz and Monstein thought that the cheap and easily transportable CALLISTO spectrometers could fill this gap. During the International Heliophysical Year in 2007, they received funding from the United Nations, NASA and the Swiss National Science Foundation, and began distributing CALLISTO instruments around the world, trying to cover as many longitudes as possible. "We were doing science and politics at the same time," says Benz. "We wanted 24-hour coverage, but we also wanted to take radio astronomy to countries that could not afford it."

Over the past four years, CALLISTOs have been installed as far a-field as Egypt, Siberia, Costa Rica and Mongolia. Some of the instruments have been set up by official astronomy institutes; others, by volunteer engineers or radio astronomers. Monstein traveled to most of the stations as they were set up, to assist with installation and training. "The instrument takes about six hours to build, but some training is needed to make sure it is used properly and gives good data," he explains.

Open 24 hours

The last blank spot was the eastern Pacific. The 19th and newest station was set up last weekend by Whitham Reeve, a telecommunications engineer in Anchorage. The new station recorded its first solar flare on Tuesday, and the network can now scan the Sun 24 hours a day--at least during the Northern Hemisphere's summer as there are still gaps in the coverage of the Southern Hemisphere. "This is important because solar flares often last longer than one day, and we are now able to observe whole events," says Benz.

Benz and Monstein hope to add a few more stations that could provide cover if other stations stop working, with Kazakhstan and Peru the next candidates.

The data from each instrument are stored in a shared database and made available in real time through the project's website. A few papers based on e-CALLISTO data have already been published.

Because radio signals travel faster than particles, the completed e-CALLISTO can also work as an early-warning system for radio bursts, alerting space mission control centres to upcoming disturbances caused by coronal mass ejections from the Sun. "This will become very important in a couple of years," says Benz. "The Sun is relatively quiet now, but by 2013 it will reach a new peak in its 11-year activity cycle."

The network's data have also caught the attention of scientists who observe the Sun in other

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wavelengths. "I look forward to comparing CALLISTO data with mine in X-rays and ?-rays," says Brian Dennis, a mission scientist who works on NASA's Reuven Ramaty High-Energy Solar Spectroscopic Imager (RHESSI) satellite, which studies solar flares.

From:
http://www.scientificamerican.com/article.cfm?id=global-solar-observatory-flare

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The Club gets an eMail!

hi mi George I2GSI,
attached I send you photos of my works about transmitting antennas made since 1995.
The little antenna is functioning on 6 metre band (length 20 cm.) ,another one on 15 meter band (length) 60 cm.
The configuration are helical (elicoidal) dipole with ferrite rods NI-ZN.
On 15 metre band was made qso via long path on 23 October 2000 with J3WUK duk in KOBE.

power out about: 12w.
i'm sorry,but my problem is:
the English language hi-hi!!!!!!!!!!.
the best 73
George I2GSI

[I just had to correct this! But the pictures are great!]

Anode Editor's Comments

The Club's Birthday List for this month
December 2011

Dec 01		Tallane'	Child of ZS6PVT Philip / Beverly Van Tonder
Dec 02		Johan	Child of ZS6JVV Johan / Lynette van Vuuren
Dec 02	ZS6BR	Bryn Ronald	
Dec 02	ZS6JBG	Johan Botha	
Dec 02		Charl	Child of ZS6JBG Johan/ZS6MMZ Hettie Botha
Dec 03	ZS6RDI	Rudi Sygo	
Dec 05		Petro	Spouse of ZR6JDD Greg Jarrett
Dec 06		Steven	Child of ZS6GRL Geoff / Sharon Levey
Dec 06		Desmond	Child of ZR6JDD Greg Jarrett
Dec 07		Susan	Spouse of ZS6RVC Ronald Verweerdt
Dec 07		Martinettte	Spouse of ZR6I Jaques Mostert
Dec 08	ZS6NCK	Nick Dreyer	
Dec 10		Yvonne	Spouse of ZR6AOC David Cloete
Dec 12		Jannie	Spouse of ZS6ENK Henk Veenendaal
Dec 13		Daphne	Child of ZS6NCK Nick / Judy Dreyer
Dec 13	ZS6DVV	Dirk	Child of ZS6JVV Johan / Lynette van Vuuren
Dec 19	ZS6GRL	Geoffrey Levey	
Dec 21		Carole	Spouse of ZS6RLM Roy McKay
Dec 21		Kim	Child of ZS6CJB Chris / Lindsay Botham
Dec 28	ZS6MJP	Mark Pollock	
Dec 30		Sharon	Spouse of ZS6JNB Willem Weideman
Dec 31		Charlotte	Child of ZS6WL John Brock

The West Rand Amateur Radio Club
Established in 1938
KG33XU 26.14122 South - 27.91870 East

P.O. Box 5344
Weltevreden Park
1715

Phone: 083 267 3835 (Chairman)
Email: zs6wr.club@gmail.com
Web page: www.zs6wr.co.za

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

Frequencies
Output: 439.000 MHz 7.6 MHz split
Input: 431.4 MHz (West Rand Repeater)
145,625 MHz (West Rand Repeater)
(HF Relay when possible)

Radio Amateurs do it with more frequency!

Chairman (technical)	**Phillip van Tonder**	**ZS6PVT**	**083 267 3835**	**zs6wr.club@gmail.com OR zs6pvt@gmail.com**
Vice Chairman	**Geoff Levey**	**ZS6GRL**	**082 546 5546**	**glevey@gmail.com**
Secretary	**Rory Crouch**	**ZS6RBJ**	**082 448 4445**	**rorycrouch@mweb.co.za**
Treasurer	**David Cloete**	**ZR6AOC**	**083 449 8991**	**zr6aoc@mweb.co.za**
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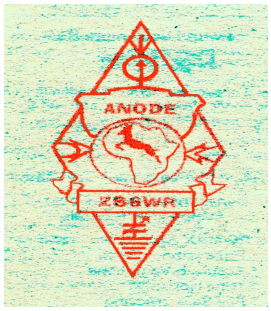
West Rand members - we need your input!

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.

See Club website at www.zs6wr.co.za for all ANODE back issues.



We need your input! Email us articles, comments and suggestions please.
zs6wr.club@gmail.com