

ANODE

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Editor's Comments

Volume 7 Issue 4 November 2006

Club Admin - part 1 of xxx

The Club Member Database

The member list and birthday list as well as the contact details have up till now been stored on Dave's pc in the form of an MS Excel spreadsheet. This spreadsheet has not been available for others such as Willem (senior), the club membership manager to use. Also the email list (contact details) has not been readily available for the Anode either. Delays in updating this list has meant certain members have not received the Anode for a couple of

months.

Please note that your personal details, such as home address and telephone numbers and ID number etc are now covered by the ECT act of parliament (South Africa). This probably doesn't mean too much to you. But these details, stored in a database, such as your local Video/DVD store, are private and may not be used for any other purpose. This is your right to privacy under the South African constitution. Whilst looking for the PDF containing the ACT [ELECTRONIC COMMUNICATIONS AND TRANSACTIONS ACT, 2002], I found several other very interesting articles that I

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A 'simple' Crystal Checker

A simple Crystal Checker

I had occasion to check OM Chris' crystal hoard recently. And on seeing the number of crystals to check for closeness to the frequency desired, I looked out my old crystal checker. This circuit was built last century to test some crystals I had acquired. The output was connected to a frequency counter and it was powered from a bench power supply of 12 to 18 Volts.

By connecting the crystal to the socket it was apparent that the counter indicated both the activity of the crystal and it's fundamental frequency of operation. This managed to weed out about five crystals that

were dead. It also managed to sort the remainder very quickly into three containers; 'less than 10MHz', 'higher than 20MHz' and 'greater than 10 but less than or equal to 20MHz'. Most crystals have fundamental frequencies less than 25MHz and are cut for operation as triple or quintuple their fundamental frequency. So they can be used at three times or five times their fundamental frequency in a tuned oscillator circuit. So when I put the circuit together, I didn't put any resonant part into the circuit.

Some circuits shown in magazines don't even have outputs, using a light emitting diode (l.e.d.) to show the crystal and active device is oscillat-

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Special points of interest:

- Contact details on back page (updated)
- New email address for Anode and ZS6WR. See back page

Editors comments

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had forgotten about. Which led me to the next article section in the Editor's Notes...

So the first point about this "database" should be that there would be limited access for members. There will be fewer limits on access for the committee members and no limit on access for the database administrators such as the chairman and vice-chairman or the database administrator. The last is probably going to be me, as I shall be designing the database for the club.

The design is what I intend discussing with you, both in the Anode and at the Club. There are several functions that you and the committee expect of the database which at present are manually done and are prone to error or invalid data. The first one I came up with is the 'birthday list'. The second was 'family membership'.

Language system. MS SQL on the other hand has never lived down the aftermath of the 'slammer' and sql-worm.

I propose placing the database onto the clubs Linux machine that can be accessed from the other machines in the clubhouse. External access at the moment is not desired but could be added later. Secure external (radio) access would contravene the radio regulations regarding encryption. Which also means that WEP and any other forms of encryption is not allowed on amateur radio Wi-Fi networks in the shared 2.5GHz band.

To move such data as the club's database to MySQL was a two-step process. First I took Dave's spreadsheet in MS Excel and exported the sheets to MS Access. Then I used MS Access' export function to 'export' the tables and data to MySQL using the free ODBC driver for MySQL. Fortunately this was quick and easy with none of the usual mis-steps inherent in MS' software.

ForeName	Surname	Birthday	Spouse_DOB	Child1_DOB	Child2_DOB	Child3_DOB	Paid-up
Peter	Bosman	5	2000-01-01				<input checked="" type="checkbox"/>
Rowen	McHarry	10					<input checked="" type="checkbox"/>
Neville	De Gruchy	15	2000-07-21				<input checked="" type="checkbox"/>
Willem	Weideman	16	2003-04-18	2003-10-27			<input checked="" type="checkbox"/>
Janos	Sajer	17					<input checked="" type="checkbox"/>
Ray	Liepa	18	2005-12-02				<input checked="" type="checkbox"/>
*							<input type="checkbox"/>

In the past database management systems have cost serious amounts of money. Way beyond the average user and certainly not within the allowance of an amateur radio club. With the advent of Open Source Software, a lot of office functions that used to cost money now are available for free. Only the support of such software costs the user. The database I am proposing to use is the MySQL software system, which has large following in the web-based community. It is 'cross platform', which means that it works just as well on MS Windows as it does on Unix/Linux. It has already established itself as a 'secure', reliable and 'standard' Structured Query

I then used the MySQL manager (Open Source) to create some new tables and transfer the data to them. I also used a Visual Basic program to test some of the queries and tables now containing data. Having the free ODBC driver for MySQL meant that any program on any MS Windows platform could access the database over a network connection. Even a VBScript program written on Windows 98 could get at the data and generate such things as the 'birthday list' for next month.

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Editors comments

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Birthday List for this month

Birthday	ForeName	Surname
5	Peter	Bosman
10	Rowen	McHarry
15	Neville	De Gruchy
16	Willem	Weideman
17	Janos	Sajer
18	Ray	Liepa

Most new users of any database program start out with one or two tables of data, which after a while become cumbersome and unwieldy. Especially as the outputs from such a database change with the user requirements as soon as the boss can think them up. The better way of doing this is to start by thinking of what is required as outputs from the database.

With the requirements in mind, you can decide what information you need and if you can write it down, you (yes you!) can even write the query. That is why it is called "Structured Query Language".

The other concern is for the 'Family Membership' aspect of our club. This is quite common these days as clubs usually are part of family life and not only one person in the family. You can take that statement several ways. The wife used to ignore the other club members and the husband who "disappeared" to the club on Monday nights. Or the wife is "dragged" to the club on special occasions to help with the cooking. Or the XYL takes an interest in the husband's hobby as it has led to the meeting of new and interesting people. I hope you (and your XYL) get what I am trying to say here.

Full text searching of Portable Document Files

Wow! What a mouthful. It means to be able to search all the Anode's on the cd or web site for a word. At present no such facility exists in Adobe's software other than the search function built-in to the pdf reader. Well I now have the means of doing this both on the Anode Compendium CD and any web site that has both text, html and PDF's. The search-

ing capability is part of 'htdig' and MySQL, both open source software. The display of the search is however my problem. I am hoping to have this is a workable form next month. So watch this space!

Internet Explorer 7

Well that was a mistake. I installed IE7 this morning and my WebChecker script stopped working. Fortunately the de-installation was a simple matter of 'Add/Remove programs'.

IE7 came through as an update to MS Windows. No real option of 'not upgrading' at this time. So I like most people clicked on the update button without cause for alarm. So like most of my additional programs that relied on MS office programs, that expired when the upgrade was installed, IE7's scripting engine has had itself 'hamstrung'. I wonder what this will do to my clients with their in-house intranet data entry system?

I see a little Java update is ready to be installed on this pc. I wonder if that could stop me from getting the Anode out? Click-.

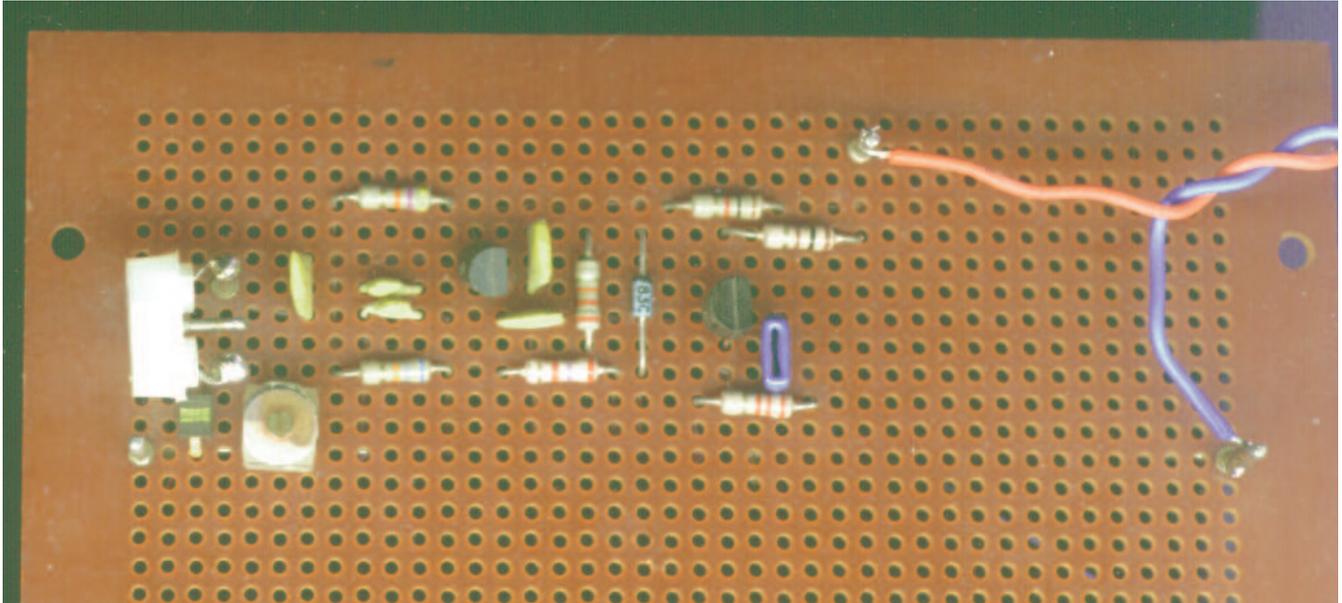


A 'simple' Crystal Checker

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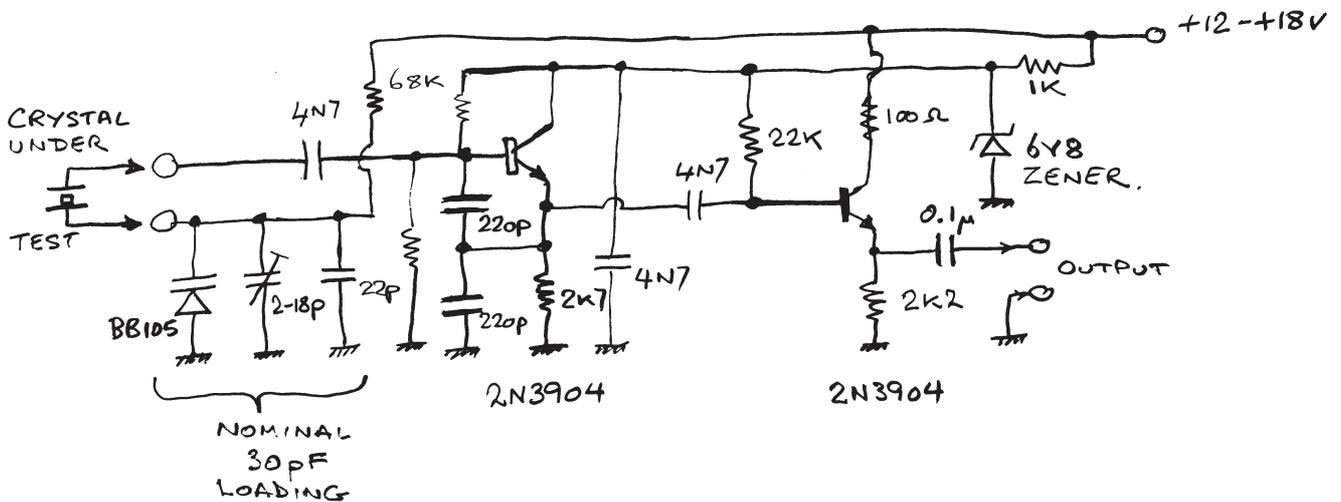
ing. Of course if you are like me afflicted with 'Murphy's law' syndrome, your amplifier will oscillate and your oscillators won't!

The components are easy to find general purpose types and can be substituted with generally easy to find or easy to rob from older transistor radios, blown answering machines, blown remote phones etc.



If your counter has a BCD output, which can be connected to a PC, you could log the frequency to a database. But this is going a bit far, unless you have hundreds of crystals to check. Just writing the frequencies down on a piece of paper is usually good enough for the average amateur. (You can lose the piece of paper later)

The circuit (shown below), is a Colpitts oscillator using a 2N3904 transistor. The BB105 varicap diode can be replaced with that other well known varicap diode, a 1N4007. This you can rob/acquire from a blown "energy saver" light bulb (globe in local parlance). Please unplug blown bulb before working on it. The varicap, trimmer and 22 Pico Farad (pF) capacitor represents a



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A 'simple' Crystal Checker

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nominal loading of 30pF. So you can play around with these items as much as you desire. The varicap is there to check for "pulling" of the crystal and is a subject for a later article.

By now you have probably noticed the 6.8 Volt Zener diode. You are wondering where you can find one of those. This item 'dates' the circuit as these zeners were common in the seventies and eighties for regulator duty. If you wish you can replace the zener with a 7805 with a l.e.d. in series with the common/earth leg of the regulator. This will give you 5 Volts plus 1.8 Volts, or approximately 6.8 Volts. It also gives

you a power on indicator.

The emitter follower, another 2N3904, economises on resistors by having only one bias resistor. That is 22k to the 6.8 Volts supply. The 100 Ohm resistor is there in the collector circuit to limit the collector current in the event of a short circuit on the output.

As stated on the diagram, the circuit can be powered from 12 Volts to 18 Volts without trouble.

JB 2006

Your Bridge over Troubled Antenna Tuning

The popularity of resonant antennas fed by "flat" coax lines has led to the development of bridges of various types to aid in antenna tuning, line selection, and the design and adjustment of stubs and impedance matching networks. The proper adjustment of an antenna system requires that a signal be radiated for considerable lengths of time. If you use an appreciable amount of power, this signal may create needless and annoying interference.

The bridge I'll describe here supplies only 2.5 milliwatts to the feed line; it regains sensitivity by employing a dc amplifier between the rectifier and the meter. The internal crystal oscillator will operate at any frequency from 160 through 10 meters on either fundamental or overtone modes. It is crystal-controlled because antenna systems are frequency-sensitive; quartz is the simplest and probably the least expensive way to insure stability.

The entire unit, including batteries, is housed in a cabinet so that it can be moved to "where the action is."

The Bridge

A resistance bridge is simpler than an imped-

ance bridge. It shows its deepest null in the absence of reactance. Reactance at the antenna end of a line is never desirable. Hence a resistance bridge is adequate for matching antennas to line provided that it is always used with a repeating line (See Note 1). Referring to Fig. 1, the bridge uses a pot for "differential resistance" balancing. This arrangement yields an open scale in the range 0-5 Ohms, characteristic of low antennas and close-spaced arrays, and an increasingly compressed scale extending to over 1,000 Ohms. In this way, a large range is achieved by a low-resistance pot. It's important to minimize bridge resistances to reduce errors, particularly at high frequencies. It also is important to minimize the capacitance of the pot to ground; this is done by mounting it off ground and using an insulating shaft coupling. The usual precautions of minimizing lead lengths, orthogonal mounting of parts, shielding, and so on, are observed.

The Oscillator

For accuracy, this type of bridge requires a closely sinusoidal exciting voltage. Clean waveforms are easily produced only with tuned-circuit oscillators. A link winding is a simple way to

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Your Bridge over Troubled Antenna Tuning

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match the oscillator to the low bridge resistance. The Pierce circuit will operate with crystals of highly variable activity. The "Tuned Pierce" circuit will excite the fundamental or odd overtone modes of most crystals, regardless of their labelling-hence the choice of this circuit.

encourages oscillation to start. Transistor dissipation is within rating at zero bias.

The DC Amplifier

I selected a dual J-FET op amp because it has high input impedance, low offset voltage, low

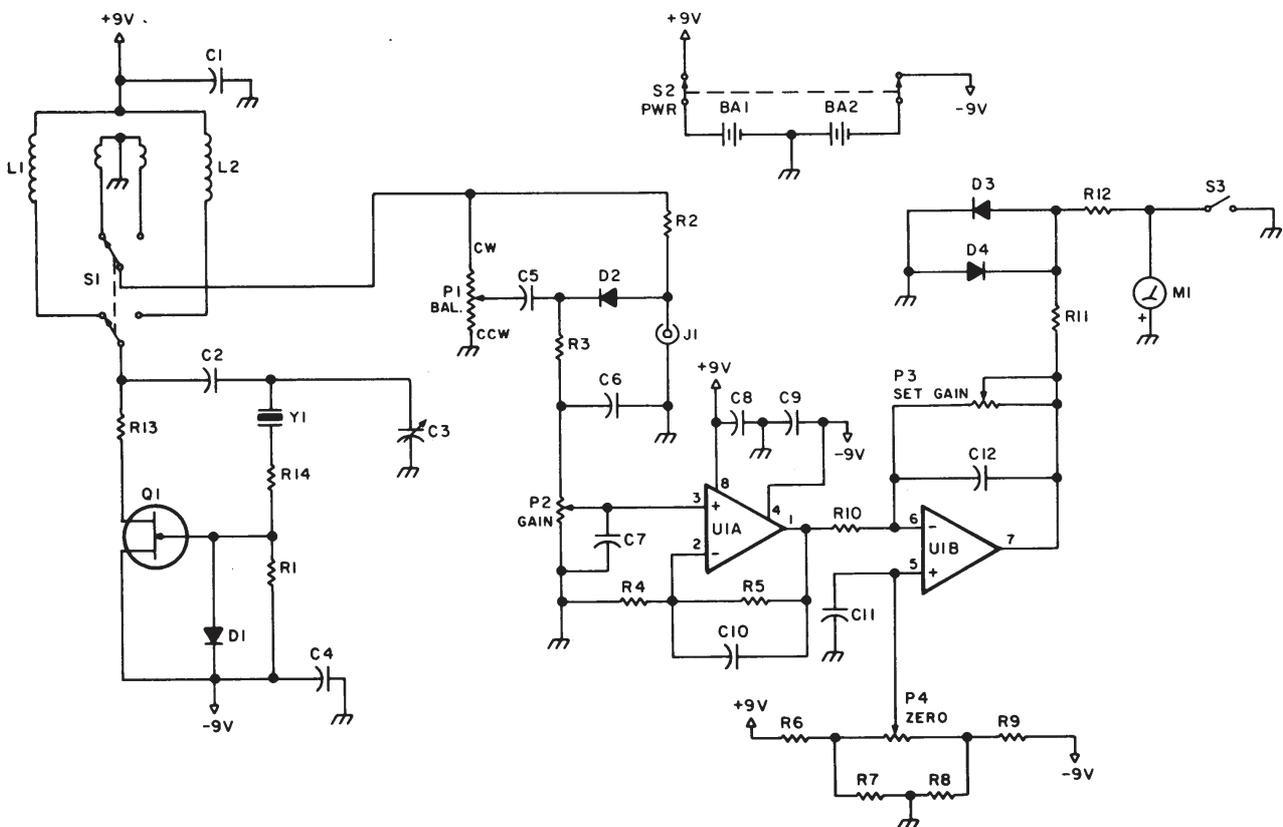


Fig. 1.

Two ranges are switch-selected: 1.75-7MHz, and 7-30 MHz. The large ranges are made possible by maximizing the ratio of maximum to minimum capacitance shunting the coils. This is done by the use of a large variable capacitor having a large inherent-capacitance ratio, coils with low distributed capacitance, and care in reducing strays, such as mounting the switch and crystal socket off ground and minimizing lead lengths. The gate is biased by the dc-restorer action of the diode. No source resistor is used because the large g. at zero bias

input current, and internal-drift compensation. The first stage uses the non-inverting circuit so that the gain pot may operate into a virtually open circuit, ensuring that the gain of the entire amplifier varies upwards linearly from zero. The gain from pin 3 to pin 1 is fixed at 11. Large capacitors are used throughout the circuit to reduce the gain for all frequencies except dc; limiting the bandwidth suppresses the oscillator signal and reduces noise.

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Your Bridge over Troubled Antenna Tuning

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The second stage uses the inverting circuit with gain adjustable from zero to 10 by means of a variable feedback resistor. The zero pot supplies a small variable bias of either polarity to a virtually open circuit. This bias neutralizes the offset voltages of both amplifier stages. It also is useful for setting the meter upscale so that the null is more easily observed.

The meter is protected at about twice full scale by the back-to-back silicon diodes, which are in turn protected by the 1 k resistor. The amplifier is internally protected. The meter-shortening switch is used to eliminate transient deflections caused by battery switching.

Calibration

Although a theoretical calibration is easily derived, it is not accurate because the pot is not exactly linear. Accurate calibration is made by connecting resistors of known value to the r.f. connector, balancing the bridge, and marking the scale accordingly. The half-Watt carbon resistors are soldered inside PI, 259 connectors and, when cool, bridge-measured at dc. An ohmmeter may be used if the lower accuracy is tolerable.

Substitutions

Use the specified coils; otherwise it may not be possible to achieve the wide tuning range. Some careful pruning may be required anyway because of variations in wiring and parts placement.

Under no circumstances substitute for the balance pot. The 'Ohmite' AB pot is the best affordable component available. It has low inductance and capacitance, and it's quiet.

Bridge Operation

UHF parasitic oscillations indicate their presence by tuneable meter indications not controlled by the crystal. They were suppressed in this case by R 13 and R 14. Crystal modes are easily identified because the tuning is asymmetric and abrupt. It's best to check the oscillator on a receiver to be sure it is crystal-controlled and starts dependably. This adjustment may then be forgotten until the frequency is changed.

The null position is set by turning the gain pot to zero and moving the meter pointer a few divisions upscale by means of the zero pot. This setting will be stable for a long time. The operation of the bridge is like that of any other bridge except that the sensitivity is adjustable over a very large range—in fact, the maximum usable sensitivity is set by brush noise in the balance pot.

Antenna Tuning

Since the subject is complicated, I'll limit discussion to the procedure for the horizontal half-wave coax-fed dipole with a 1:1 balun. The best that you can do here is to resonate the antenna and measure its feed point resistance. You can then make a decision on a method of feeding it.

The antenna is connected to the bridge by means of a repeating line that is long enough to reach from the final position of the antenna to the ground. (See Notes 1 and 2) This brings the bridge, in effect, to the feed point, but the operator and the gear are safely on the ground where, because they are well removed from the radiating wire, they do not distort the field. Starting with the antenna symmetrical and too long, consecutively null the bridge and make small symmetrical changes in antenna length until the deepest null is obtained (See Note 3).

Here the antenna is resonant, the reactance is zero, and the bridge reads the feed point resistance.

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Your Bridge over Troubled Antenna Tuning

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In the unlikely event that this resistance matches a standard coax, the appropriate line may be connected and run any length into the shack. In any other case there will be standing waves on the line and it matters how long the line is. Even though the feed point impedance is a pure resistance, the input impedance of the line will have reactance unless it is either a repeating or an inverting line. (Notes 4 and 5)

The inverting line may be useful in two cases. When the feed point impedance is 33.3 Ohms, a 50-Ohm inverting line will make the input impedance 75 Ohms. And when the feed point impedance is 112.5 Ohms, a 75 Ohm inverting line will make the input impedance 50 Ohms. I have used the first arrangement with a very low dipole. The second may not be practical, since theory asserts that the maximum feed point resistance is less than 100 Ohms.

Probably the best solution is to install a repeating line having Z_0 closest to the feed point resistance so that the SWR will be minimized. If the transmitter will not load properly, the line-input impedance may be transformed to 50 Ohms resistive by means of a pi section filter or other simple matching network.

Discussion

All antennas are less than ideal due to economic and physical restrictions, but a given antenna will work better if it has more* current in it. It will have more current in it for a given transmitter dc input power if it is resonant and properly fed. This bridge will enable you to adjust the length to resonance, and will also suggest the best method of feed. Use it to get more "fire in the wire."

Notes

1. A repeating line is an even multiple (2, 4, 6, etc.) of a quarter-wave long, electrically. Its in-

put impedance is equal to its terminating impedance. For this application, its surge impedance does not matter.

2. Measurements made in other than this final position will be of little value because the feed point impedance varies widely with antenna height and position with respect to other objects.

3. Shortening each end of a 40-meter dipole by one inch will raise the antenna resonance about 18 kHz. The effect increases roughly with the square of frequency, i.e. $\Delta f(\text{kHz}) = f(\text{MHz})^2 / 2.72$ approximately.

4. An inverting line is an odd multiple (1, 3, 5, etc.) of a quarter-wave long, electrically. It obeys the relation $Z_i = Z_0^2 / Z_T$ where Z_i is the input impedance, Z_0 is the surge impedance, and Z_T is the terminating impedance.

5. Terman (Radio Engineers' Handbook, 1st edition, McGraw Hill, 1968, page 186). Eq. (62) may be written: $y = A \cos \theta + j B \sin \theta / B \cos \theta + j A \sin \theta$, where $y = Z_i / Z_0$, $A = Z_T / Z_0$, $B = Z_0 / Z_T$, and $\theta =$ angular length of the line. (Or see any text transmission lines.)

Multiplying the numerator and denominator by the conjugate of the denominator will result in the denominator becoming a pure real number. For this proof we find the cases where the resulting numerator is a pure real number. It is $G = (A \cos \theta + j B \sin \theta)(B \cos \theta - j A \sin \theta) = AB(\cos^2 \theta + \sin^2 \theta) + j(B^2 - A^2) \sin \theta \cos \theta = AB + j \frac{1}{2}(B^2 - A^2) \sin 2\theta$.

We exclude the case where $A = B$ because we are considering only lines mis-terminated in a pure resistance. G will be a pure real number only when $\sin 2\theta = 0$, which occurs only when $e = n$ (90% where n is any integer). Since 90 degrees is an electrical quarter wave, the input impedance will be a pure resistance only for line lengths an integer number of quarter waves long, electrically. This means that either a repeating or an inverting line must be used to avoid reactance in the line output impedance. M

By Frank Noble W3MT from 73 for Radio Amateurs April, 1986

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

Frequencies

439.000MHz 7.6MHz split
Input: 431.4MHz (West Rand Repeater)
145,625 MHz (West Rand Repeater)
10,135 MHz (HF Relay)

Radio Amateurs do it with more frequency!

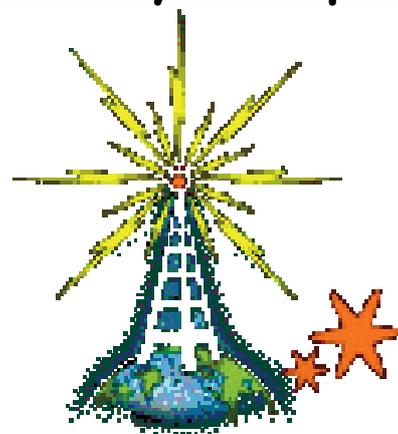
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West Rand members - we need your input!

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 2005. 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.
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