THE WEST RAND AMATEUR RADIO CLUB

February 2003
Volume 3, Issue 7

ANODE

Inside this issue:

Editor's Comments

I have supported you from my living room chair...

With the cricket world cup nearly upon us there have been some strikingly good adverts. The one that caught my attention recently is the montage of people talking to the SA Team about how they have supported them through thick and thin. Hmm... just like the hobby of Amateur Radio.

Rumblings of War

It would seem that Pres. Bush et al doesn't appreciate our holding 'Boot Sales' and wants to hold a war on that date. Consult the calendar at the end of this article to find out when the Boot Sale is happening.

One of our spacecraft is lost

It was very sad to see the shuttle Columbia come down in pieces. Even sadder to see the pieces appearing for sale on ebay. Our loss is compounded by the death of seven brave people. Now the NASA cry is "Space travel is dangerous. Lets not go there."

Short wave high quality digital broadcasts

The recent Elektor carried an article on the newly proposed restructuring of the short wave

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Hams create 'Time Machine'

Special points of interest:

- Contact details on back page

The Time Machine made its first public appearance at the Tampa Hamfest on Dec 01, 2001. The sound of Sweepstakes and CQ World Wide coming from the speakers of the two Yaesu FT-817s led many hams to ask, "What kind of antenna are you using?" Contesters were usually the first to key on the fact that Sweepstakes and CQ World Wide were on at the same time. They had a chance to view the FT-817 with the cover off, try out the 300 and 500 Hz ESS CW filters, and hear first hand what the Time Machine is capable of producing. Their biggest question after listening to it was how does it work. Down load the manual and get the answer to that question, "How does it work?".

We heard from hams with all kinds of ideas about what the Time Machine could do for them. Some of the ideas are already in place but some of them were areas we had not yet explored. Hamfests are a great place to hear new exciting ideas and get hands on experience with the new products on the market.

Below you will find the first pictures on the web of the Time Machine.

These pictures are of the main board and the band pass filter boards. These boards were on display and for sale in kit form at the Dayton Hamvention, 17-19 May 2002. Numerous hams stopped to see, hear, and experience the Time Machine

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Editors Comments

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bands. It would appear that nobody is actually using the short wave spectrum. Also the major transmitters are being taken off the air as nobody is listening to them. Digital Radio Mondiale (DRM) for Long, Medium and Short wave will be started in June of this year. Individual carriers are modulated using QAM (quadrature amplitude modulation) a form of APSK. This promises CD quality stereo reception.

Wireless World Dec 2002 (sorry Electronics &) carried a short section about an almost completely digital AM/FM radio. Its front end down to I.F. is analogue but the rest is a DSP (Digital Signal Processor)

Dates to remember

February

03/2 Bring and fix meeting
08/2 HF Field day contest sponsored by Keith ZS6AGF
10/2 Club general meeting chaired by Dave ZR6AOC
22/2 HF open day sponsored by John ZS6FJ
22/2 Clubhouse grass mowing party sponsored by Craig ZR6CRW
27/2 Committee meeting all com. members to be present.

March

01/3 West Rand Boot sale at 12:00 midday
03/3 Bring and fix meeting
10/3 Club general meeting
06/4 Wilro 100 cycle race
17/5 RAE at SARL HQ 09:00 to 11:00

CW classes running on the repeater sponsor oom Henk ZS6ENK.

Around and Around and Around

There's got to be a better way to wind your coils to specs. Build the Q-meter and get the exact inductance you need.

Front view of completed Q-meter.

Winding coils for a new seems to be one of the more frightening aspects of the job. One reason may be the fear that we may not be able to duplicate the authors model.

If we have a way to check each coil before it's installed, much of the apprehension is removed. A "Q' -meter will do this by measuring the coil's inductance and Q. The unit pictured is such a Q-meter that will measure inductances from .5 uH to 50 uH and Qs to 200. It's easy to build, easy to operate, and is powered by an internal 9-volt battery or wall-plug power supply.

There are four basic parts to this Q-meter:
a dual-frequency rf oscillator, a FET voltmeter, a power supply, and the tank circuit that indicates the incluctor of unknown value (LX).

Fig. 1 is the schematic. (on page 5) A 2N2222 transistor serves as the rf oscillator, followed by an MPF-102 JFET buffer. The range of measurement is controlled by the oscillator frequency and the tank variable capacitor. With the capacitor speci fled, the range is 0.5 to 5 uH at a frequency of 20.05 MHz, and 5 to 50 uH at 6.34 MHz. The two toroid coils resonate with Cl and C2 to produce these frequencies, and S1 determines the range in use. The buffet stage provides the necessary low impedance excitation for

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Around and Around and Around

(Continued from page 2)

the tank circuit through C8. A 1N270 germanium diode (D1) rectifies the rf output of the buffer and is used to calibrate the meter before taking a measurement. A hot-carrier diode (D2) is placed across the variable capacitor and rectifies the tank circuit current to provide a dc voltage that is proportional to the Q of L, at resonance. It is this voltage that is measured in the TEST position 1 of S2.

The JFET voltmeter uses two MPF-102 JFETs, zeroed by R15. Full scale on the meter should be 250 microamps or less. The critical components have been selected so that the Q reading will be quite accurate if 100 is used as the calibration reference. The meter I used is calibrated from zero to 250 and is a 200-uA movement. A more sensitive meter will require using a higher resistance setting of R12, but will not affect the units accuracy. Q's of 250 or more are seldom required and are difficult to obtain, so there is not much need to have a higher scale.

As for construction, there is really only one critical portion-the mounting of the tank components (C9, C10, and the terminals for L). At 50uH an inch or two of extra wire will not have much effect on accuracy, but at 0.5 uH, the leads must be kept as short as possible. This is one reason for the miniature variable capacitor and small unit for C9. The terminals for L, consist of 4-40 bolts mounted directly to the FormicaTM top, using solder lugs to connect to the circuit board components and 4-40 hex nuts fastened by epoxy to small wire nuts for holding the unknown inductor leads. Small 5-way connectors should also work fine. Although I used an import vernier dial mechanism and attached a plastic pointer, a non-reduction knob will work quite wellit's just a little harder to get right on resonance. The shaft of C10 is too short to reach the panel. It can be lengthened by attaching a one-quarter-inch round metal spacer with a bolt into the capacitor's threaded shaft. An alternative would be a small flexible coupler and a piece of 1/4 -inch shaft.

The total current drain is under 15 mA, so a 9-volt battery will last a long time with intermittent use. For ac operation, any rectified and filtered wall-plug supply that is rated at 4.5 to9 volts fills the bill.

To put the Q-meter to work, set S2. to TEST, turn on the power switch, and adjust the meter to zero reading with R15. Switch S2 to CAL and set the rf level to 100 on the meter by adjusting R3.

Connect the coil you want to measure, using the shortest possible leads. Reset S2 to TEST; tune C10 for maximum deflection of the meter. The reading is the approximate Q of the unknown inductor. If you can not get any upward deflection of the meter, try the other position of S1. If you still cannot get a reading and you are quite sure the unknown inductance fails within the range of the meter, recheck the Lx connections. A good connection is a must for reliable operation of the Q-meter.

A test coil can be made by winding about 15 turns of #24 enamel-covered wire in a T-37-2 or T-37-6 toroid. You should measure it somewhere around 1 uH with a Q of about 100. If you are satisf ied with the results, you may want to mark the measured information on a tag and attach it to the inductor. It can be used later to check the performance of the meter if you should question a reading on some unknown coil.

This relatively simple project can take a lot of the fear out of coil-winding, as well as sort out unmarked small inductors and provide the identification you need.

Parts List

620-pF ceramic disc
C21 03 68-pF NPO ceramic
C4 56-PF NPO ceramic
C59 C69
C1119 C12 .01 ceramic disc
C7 100-PF ceramic
C8 22-PF NPO ceramic
C9 1500-p1X poly
C10 138-pF variable (RS A1-234)

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Hams create 'Time Machine'

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first hand. They were able to tune one of our Yaesu FT-817s back in time through one of the many pieces of spectrum we have grabbed, recorded, and saved to be used again and again. The key here is "tune" across the band, 80 kHz of it available at your finger tips.

We had no key or microphone due to the fact that unless you stop and think about it you will have the urge to jump right in a pile up and take part. They listened closely and actually heard themselves working that JA, ZL, VK, 9Y, or one of many others in the contests we had recorded. They also got a chance to see just how their signal sounded in Florida. They heard them just as they were or are. It really depends on how you think about it.

Once you have listened to and grasped the concept of taking whole blocks of spectrum and being able to work with it, let your mind wander. Take this block and send it elsewhere to be listened to. Have a Time Machine in one of the remote ham stations around the world and put your expertise in programming or Internet use to the task. Now have your Time Machine unfolding up to 80 kHz of spectrum filled with weak signals loud and clear on the other side of the world. Is it real, oh yes it's real and its time is now. A solar flare is in full strength while you are at the office. Was there a band opening? Go home and find out. Listen, I mean really listen.

What was that? It sounded like a really weak signal. Rewind, run the audio through the DSP, now tune it again. Got it a little better, rewind, tweak the DSP, watch it on the spectrum analyzer, is it there? From just plain fun listening to technical analysis of solar activity, the possibilities are endless. All you need is the equipment and a little bit of "time".

If you would like to know more about the Time Machine then read the Time Machine manual (908 KB) or look at the Time Machine schematic (56 KB).

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Around and Around and Around

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C13 10-uF, 25-V electrolytic
D1 1N270 germanium diode
D2 MBD-101 hot carrier diode
R1 47k, 1/4-Watt carbon
R2 100k, 14-Watt carbon
R3 10k linear pot
R4 1. 5 k, 14-Watt carbon
R59 R9 1-meg, 14-Watt carbon
R6 390-Ohm, 14-Watt carbon
R79 R101
R11 2.2-meg, 14-Watt carbon
R8 100k, 14-Watt carbon
R12 100k trimmer
R139 R14 150-Ohm, 1/4-Watt carbon
R15 2k linear standard pot
L1 1.97 uH (21 turns #24 enamel on T-37-2 toroid)
L2 19.7 uH (70 turns #32 enamel on T-37-2 toroid)
S1 SPIDT rotary
S2 SPIDT mini-toggle
S3 SPST mini-toggle -
M1 200-uA meter (see text)
J1 Connectors for Lx (see text)
J2 Mini phone jack (normal ly-closed circuit)

73 Magazine January, 1984

Edwin C. Miller N7APE 306 W. Court Street Weiser ID 83672

Circuit diagram on page 5 ...

Around and Around and Around

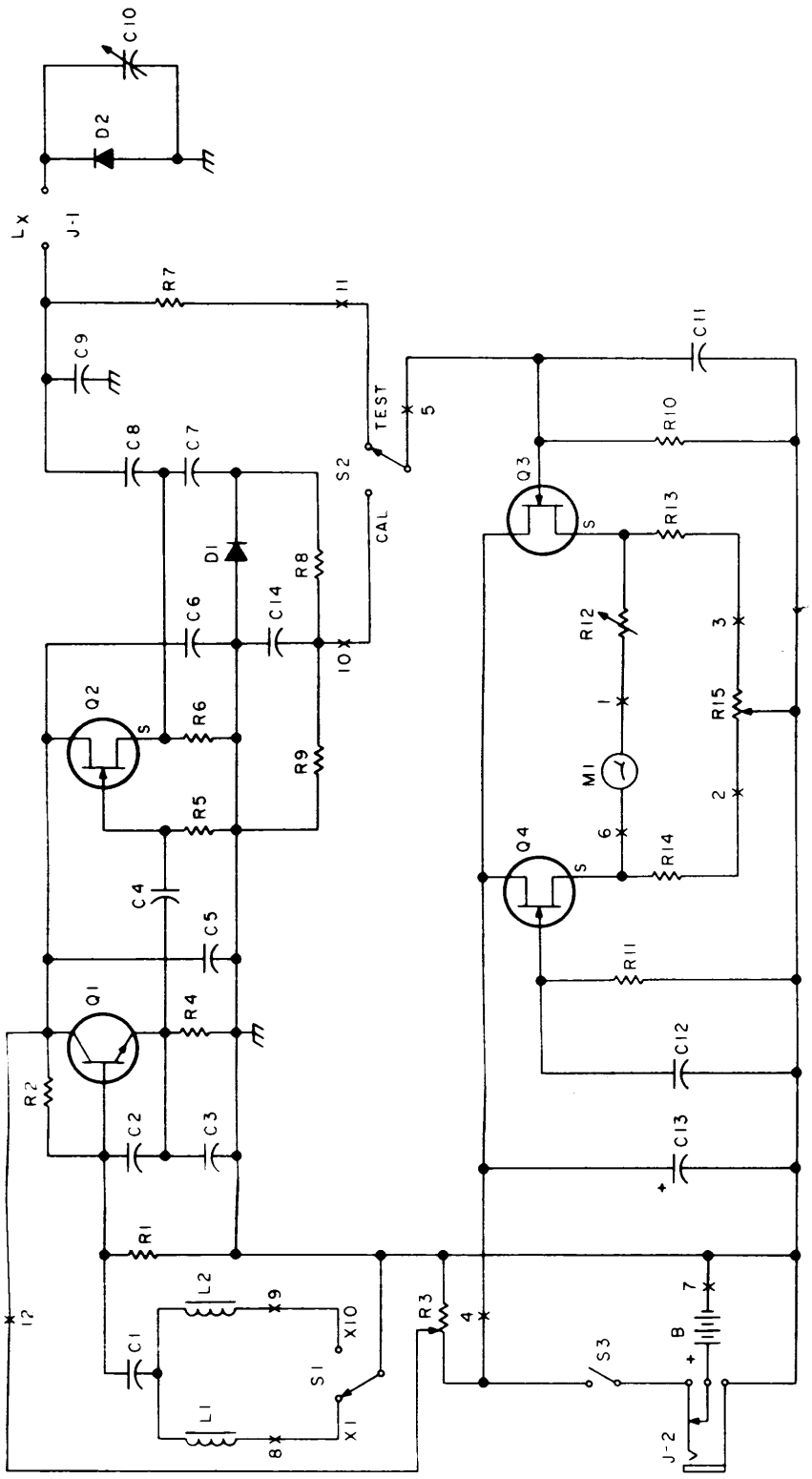

Fig. 1. Circuit schematic.

Hams create 'Time Machine'

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Both are Adobe Acrobat files. (Latest update 08/05/02)

The Time Machine is offered as a kit with easy to follow instructions. Don't shy away from building a kit. The Time Machine kit main board is a professionally designed and masked two sided board marked with the location of every part. Even a new kit builder can follow this well planned design to the successful completion of this project.

The Time Machine is also offered as an assembled and tested unit for an additional cost.

The Time Machine LO daughter board is now available. The daughter board plugs directly into the Time Machine and can be added to The daughter board comes assembled and ready to plug into your Time Machine. No longer rock bound you can move your center frequency around to get the best coverage for your individual needs. Take a look at the Time Machine Daughter Board Page to see if this could be the answer to your needs. The Daughter board can be purchased separately from the Time Machine Kit so you can add it to your existing Time Machine system.

Web page

http://www.
expandedspectrumsystems.com

Take the Two Tone Challenge

Ed Landefeld W8DCC 1135 Durham Circle Massillon OH 44646

Does your transmitter put out a clean signal?
Build this two-tone audio generator and find out.

A"Two-Tone Test" is generally acknowledged to be the most convenient and accurate method of checking the adjustment and operation of an amateur SSB transmitter. Improper bias, nonlinearity, overload, and spurious oscillations are all revealed by this method. Two-tone testing also has the advantage of testing the whole system from microphone to antenna. If there is no frequency instability, a transmitter showing a good two-tone test is almost certain to radiate a high-quality signal.

A two-tone test signal can be produced with a single audio tone by inserting the proper amount of carrier to provide the beating frequency. This arrangement is somewhat awkward at best, and many transmitters have no convenient prdvision for inserting specific amounts of carrier in the SSB mode. An audio generator that will produce two audio tones and can be plugged into the microphone jack is an excellent method of setting up for this test.

Such a generator Is not complicated or expensive; it can be constructed in an evening or two, and every part and piece is available at your local Radio Shack store.

Circuit Details

The only active circuit element in the generator Is IC1 an LM324 quad op amp. One section of the chip (IC1A) is connected as a twin-tee audio oscillator. This is a very simple circuit, the basic oscillator consisting of the op-amp section, three capacitors, and three resistors. The 50k potentiometer, R2, is used to vary the frequency of this oscillator over the range of 440-1750 Hz. The 1k resistor. R3, places a lower limit on the effective

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Take the Two Tone Challenge

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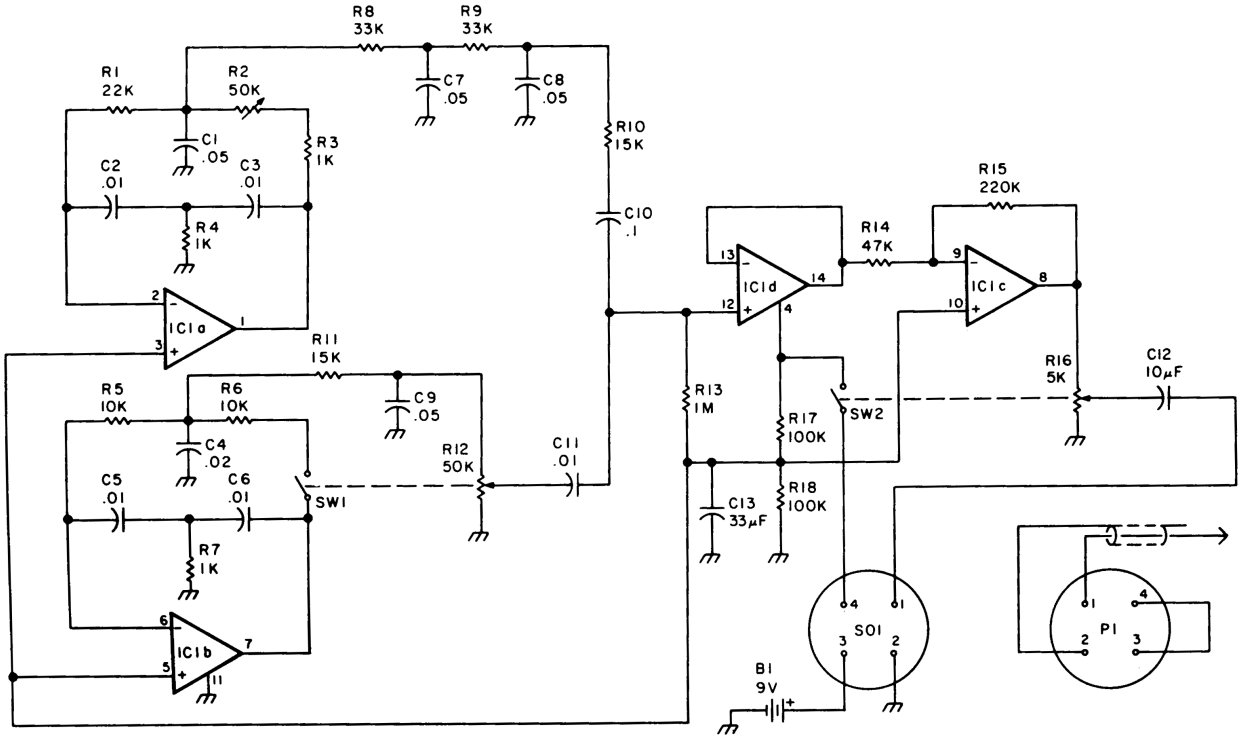
resistance of R2. This ensures that the oscillator wi run at a settings of R2.

This rudimentary method of changing the frequency of the oscillator by varying only one resistor results in the oscillator output increasing in amplitude as the frequency is increased. Advantage is taken of this characteristic in the double-section RC filter following the oscillator. The filter cleans up what distortion is present at the oscillator output, and the increasing attenuation of the filter at the higher frequencies compensates for differences in oscillator level. The result is a nice sine wave of nearly constant level at the output of the filter.

The second section of the chip (IC1B) repeats the circuit of the oscillator just described but without the variable frequency feature and with circuit values selected to give a fixed frequency of 1770Hz. A single-section RC filter is used for this oscillator. This results in less attenuation, ensuring that the signal level on the balance potentiometer, R12, is always greater than that of the f irst oscillator. R12 is used to set the amplitude of the second oscillator to equal exactly that of the first oscillator.

The signal from both oscillators is now applied to the non-inverting input of opamp section IC1D. This section is connected as a voltage follower. It provides no gain but has a very high-input impedance. The voltage follower is followed by an amplifier stage (IC1) to raise the level to the output connector.

The second oscillator has a switch, SW1, ganged to the balance control. When the balance control is turned fully to the off position, opening SW1, the second oscillator is disabled while the first oscillator output is still available at the output connector. It now functions as a normal audio generator over its frequency range. This additional feature is quite useful as the waveform is good, with a maximum output level of 400 mV peak-to-peak.



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Take the Two Tone Challenge

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Construction

The generator was constructed on a printed circuit board available at Radio Shack stores. (They list it as a "Dual IC board"; see Parts List.) Since this board is very slightly too long to fit properly in the housing specified, it is suggested that about 1/32" or so be filed from each end of the board before construction is begun and the board fitted to the housing.

At these frequencies, layout is not critical. The board has provision for two 20-pin integrated circuits. As we are using only one 14-pin chip, there are plenty of tie points to which to run component leads. I found it convenient to mount the socket and position the chip so that pins 1 through 7 were toward the center of the board. As the two oscillator sections have the greatest component density, this positioning allowed the oscillator components to spill over to the otherwise-unused section of the board. There are enough pads and holes to give each, component lead a home, and with a little planning ahead, a neat layout can be achieved.

A few words for the inexperienced: In planning the layout, make an effort to have the physical components follow the layout of the schematic as well as you can.

This makes troubleshooting less confusing. Although it is nice to see all resistors lying flat on the board, do not be afraid to mount them vertically if it Is convenient or will improve the layout. With discretion, bare-wire jumpers may be used on the solder side of the board. For example, a wire jumper from pin 5 to pin 10 on the solder side of the board saves going all around the chip. 1 dedicated one of the center traces as a ground bus. Stranded wire is needed for the runs to the controls. The holes around the edge of the board are larger than the holes for components. Try to arrange to

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A POEM FOR COMPUTER USERS OVER 40

A computer was something on TV
From a Science Fiction show of note
A window was something you hated to clean
And ram was the father of a goat.

Meg was the name of my girlfriend
And gig was a job for the nights
Now they all mean different things
And that really mega bytes.

An application was for employment
A program was a TV show
A cursor used profanity
A keyboard was a piano.

Memory was something that you lost with age
A CD was a bank account
And if you had a 3-in. floppy
You hoped nobody found out.

Compress was something you did to the garbage
Not something you did to a file
And if you unzipped anything in public
You'd be in jail for a while.

Log on was adding wood to the fire
Hard drive was a long trip on the road
A mouse pad was where a mouse lived
And a backup happened to your commode.
Cut you did with a pocket knife
Paste you did with glue
A web was a spider's home
And a virus was the flu.

I guess I'll stick to my pad and paper
And the memory in my head.
I hear nobody's been killed in a computer crash
But when it happens they wish they were dead.

Take the Two Tone Challenge

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have the stranded wire to the controls go to these larger holes. Don't be ashamed of a few jumpers to get from here to there. When using an all-purpose board like this, a few jumpers are hard to avoid.

After all the soldering is done, there will be a considerable accumulation of rosin on the board. I scrape the heavier portions away with a small screwdriver and then spray the board with Rosin Flux Remover from Radio Shack (RS 64-2324). I used an old toothbrush to scrub away the remaining rosin and wipe the board dry with a cloth. You will be surprised at how much better the board looks. It Is also much easier to spot solder bridges and poorly soldered connections when you have a nice clean board.

The physical construction requires little explanation. I used only two of the mounting holes on opposite corners of the board to mount it. I tapped the holes in the bottom of the housing and mounted the board on spacers, cutting the 6-32 screws to length so that they would not protrude more than a couple of threads through the bottom. If you use the potentiometers specified from Radio Shack, note that the mounting bushing is only 5/16" instead of our standard 3/8

With the connector I used, there is no automatic grounding of the chassis. This allowed hum pickup, particularly while testing, when the chassis was separated. To alleviate this, I ran a wire ground to a lug on the screw holding the battery. clamp to ground the bottom section, and a short bare wire from the ground lug on a potentiometer, soldered to the shell of the potentiometer, to ground the top, or panel, portion.

The board specified is a very nice board. It solders well and seems quite rugged. With reasonable care it is possible to remove and reposition components several times without any tendency for the copper to separate from the board.

Checkout

After the soldering has been completed and the board has been cleaned, the usual physical inspection for solder bridges and poor connections can be made. Before installing the battery, an ohmmeter check for a short on the supply rail is a wise precaution. With the battery installed, a voltage check on the IC socket will confirm proper supply polarity. Note that as the circuit is drawn, no power will be supplied to the board unless P1 is in place.

The IC can now be installed. With the level control full on and the balance control fully counterclockwise, a sine wave should appear on the output connector. If no scope is available, a pair of headphones may be used to confirm output. The tone should sound smooth and relatively low-pitched at one extreme of the frequency control, rising to a much higher pitch with the frequency control at the other extreme.

Advancing the balance control will cause the signal to become louder and change in character. If a scope is being used, the presence of both tones will be noted. Advancing the balance control to maximum should cause the scope pattern to more than double in height.

Should the generator fail to work, some troubleshooting is in order. The LM324 is a nice chip to troubleshoot since the output of each section is on the corner of the chip. A dc-voltage measurement should show the active pins of each amplifier section near half the supply voltage. A pair of high-impedance headphones with a capacitor of 0.1uF or so in series with one of the leads makes a fine poor man's signal tracer. There is nothing fussy about the circuit; it will work if there are no wiring errors or defective components.

Using It

A two-tone test is quite simple to set up. Use the monitor scope or service scope coupled to the output of the transmitter. Adjust the scope

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Take the Two Tone Challenge

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pattern for a convenient height while transmitting full-carrier. Now plug the generator into the microphone jack and key up the transmitter in the SSB mode. With the microphone gain at its usual setting, advance the level control on the generator to produce a scope display somewhat less than that obtained with the full carrier. With the balance control about midposition, adjust the scope sweep or the generator-frequency control for a steady display. Adjust the balance control to achieve a sharp crossover between the individual cycles of the wave. Advancing the generator-level control will increase the height of the pattern until the tips of the waves just reach the height obtained when the carrier had been sent. Further increasing the level control should show flat-topping of the tips of the waves.

A scope will not synchronize as solidly on a two tone test as it will on less complex waveforms. A change in level often will result in the pattern "running." As the audio generator is usually close at hand while the scope may be several feet away, it is convenient to adjust the frequency control on the generator to stabilize the pattern. Running the frequency control over its range will result in a number of patterns on the scope. They are all equally useful except when the two tones are harmonically related.

There is sufficient output from the generator to severely overload most microphone amplifiers. It is good practice to leave the microphone gain control set where it is normally used and to use the level control on the generator to set the level.

For those not familiar with two-tone test patterns and their interpretation, a page of pictures and a description of the test procedure is given in The Radio Amateur's Handbook. You should obtain a textbook pattern. Any departure from the proper display should be investigated.

As mentioned earlier, the generator can be used as a sine-wave audio source by turning the balance control fully counterclockwise. This feature can be quite useful to the ham who cannot justify the cost of an audio generator but who finds occasional need for an audio source. The frequency range, though restricted, does cover the range of frequencies most commonly used.

In Conclusion

I am quite pleased with the operation of this generator. I had gotten tired of rigging two audio oscillators to make checks on my homebrew SSB rig. Setting up for a test is now a snap! I also find that the ability to steady the scope pattern with the frequency control is very handy since my monitor scope is several feet from the rig. Add to this the economy of only 1-mA current drain and a total parts cost of under $25.00, and you have a useful gadget at a very attractive price.

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

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

Radio Amateurs do it with more frequency!

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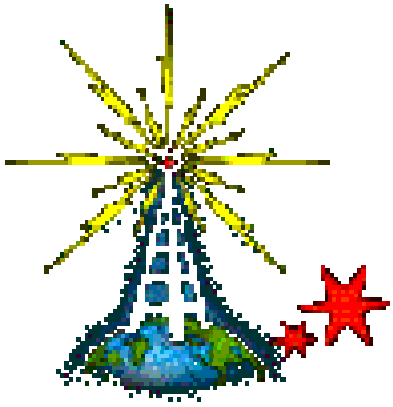
West Rand members input - we need your input!

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 November 2001, we published an Anode Compendium on CD. It has the issues from July 2000 until November this year. This included IE5.5 and the new Adobe reader. It is soon to be updated, check with the vice-chairman for details.



We need your input! Email us articles, comments and suggestions please.
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