



the RARA RAG

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ROCHESTER AMATEUR RADIO ASSOCIATION, INC.

VOL. 55 DECEMBER 2002 NO. 4

SEASONS GREETINGS TO ALL

DECEMBER MEETING

George Mansy KA2GBJ

The traditional joint RARA/Kodak meeting, scheduled for Friday, December 6th, will feature a simulated demonstration by John Gilly, W3OAB/2 and Jeff Tewskbury, N2JQR, of two new "computer enhanced" communication modes used primarily by VHF DXers. These modes take advantage of the digital signal processing capability of the "common" PC sound card; paired with a free shareware computer program called WSJT. You read that correctly - FREE! - No investment of funds required if you have a PC with a sound card!!!

VHF DX consists of two distinct types of QSOs, one being extremely sporadic (caused by ionized meteor trails) and the other being operation near or below the noise floor (EME etc.). In either case, a specialized mode is used to deal with the particular needs of the type of DX.

WSJT stands for "Weak Signal communications, by K1JT". This program currently supports two digital signaling modes. The first, FSK441, is designed to support communication using the very brief "pings" from meteor trails in the ionosphere. The second mode, called JT44, is designed for extremely weak but roughly constant signals such as those found on troposcatter, ionoscatter, and Earth-Moon-Earth (EME) paths. Both modes provide

Continued page 9

Lest we forget...

A comment from George Masny KA2GPJ

The squabbles one occasionally hears on the air seem to indicate that we to forget the basic reasons for the existence of amateur radio. Notice particularly paragraph e) and remember that it is hard to enhance international goodwill if we do not have it for our own neighbors!

FEDERAL COMMUNICATIONS
COMMISSION

PART 97

AMATEUR RADIO SERVICE

-Subpart A--General Provisions

§97.1 Basis and purpose.

The rules and regulations in this part are designed to provide an AMATEUR RADIO SERVICE having a fundamental purpose as expressed in the following

Continued page 9

RaRa Meeting

December 6, 2002

8:00 PM

Kodak's Theater On The Ridge

200 Ridge Road West

WSJT

Presented by

John, W3OAB and Jeff, N2JQR

the RARA RAG

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THE PREZ SAYS

MaryKay Vesco, KC2DPG

We had a wonderful auction! Thank you to everyone who attended and participated, it was just great! Our auctioneers were Dick Goslee, K2VCZ and Ed Gable, K2MP. These two hams make a really great comedy team along with their vast knowledge of radios and equipment. Thank you so much, Dick and Ed for all of your hard work. Thanks also go to Brad Allen, KB2CHY for the audio support, to our recorder, Irv Goodman, AF2K and our cashier Greg Michels, KC2GXV. Thank you gentlemen, for a great job. We also appreciate all the donations the club received; everyone was so generous, thank you!

Does anyone know how long Dick Goslee has been our club treasurer? If you guessed 1986, you are correct, he was our president during the 1985 to 1986 term and then became the treasurer and still is today! I would like everyone to know what a great job he has done. This job takes a lot of time and talent, so if you see him or hear him on the bands, be sure to thank him for the many, many years of volunteer service to our club. Thanks Dick!

Coming up in December is the holiday science and technology show. Next is the e-cubed fair at RIT, and science exploration days at St. John Fisher College. Anyone interested in volunteering or requiring more information, please contact any officer or board member. Anyone is interested in being an Elmer - to help other hams get their shack started or set up, pass the word and we can get you hooked up, the license classes are ending soon and lots of help will be needed.

Christmas is just around the corner and as tradition will have it; our December meeting will be a joint meeting with the Kodak club at the Theater on the Ridge. I would like to invite everyone to come to the meeting and bring a guest. This is a great time to socialize and maybe meet some new hams or hams you have only heard on the bands but not actually met. This is a busy time of the year but you still need to take time out for a relaxing and entertaining evening. I hope to see the room over filled with hams and guests, See you there...

SUPPORT OUR ADVERISERS

Problem-Solving Methods III-A

Günter Wegener

(Translator's note: This article is the last of three written by Günter Wegener for the major German amateur radio magazine, Funkamateure, 51/3, Mar., 2002, pp. 255-259. It appears by permission, translated and adapted for publication in the RAG. Due to its length, this part will appear in two installments. Any errors are the translator's, not Herr Wegener's. NB: Some pictures with obvious info have been omitted. Please note: some German electrical abbreviations in the pictures i.e., "U" for voltage, or "V" for transistor number, are duplicated in the text for identification purposes. Clarification: The reference to "low frequency in article two should be understood as "audio frequency" and "high frequency" as RF. Translator: Bill Hopkins, AA2YV. Thanks to Walter Obenhofer, NQ2O, for additional assistance and George Platteter, AA2FO, for graphics editing.)

In our last part [III-A & III-B] we will work with direct-coupled stages, look at integrated circuits and learn some measuring techniques with the scope.

Idling current is always measured without a signal, i.e., the volume control is turned to

zero. Picture 1 shows a final amplifier stage with neutralization points. After settings are completed it is advisable to test the final stage with the scope. Insert a sine wave voltage (1 KHz signal) at the amplifier input and attach the scope at the audio output jack using a resistance coupling. By increasing the input voltage you should see the sine wave displayed on the scope with both signal sides equally clipped, if the final stage is functioning symmetrically. If only one side is clipped, then a neutralization problem is present in the final stage, or one of the transistors is defective. If the sine curve has a blip close to the null line, then the idling current is improperly set.

Push-pull final stages use a combination of PNP and NPN transistors. The supply voltage, which increases the collector current of the PNP transistor, reduces it at the NPN transistor. Picture 2 shows how to test the voltages. The first measurement shows whether the proper supply voltage level is even present. After that, measure the common emitter voltage at point number 2.

The third measurement also tests two voltages: between the base and emitter of transistors V1 and V2 [or transistors Q1 and Q2], and then the collector voltage of the driver stage V3. Finally, the base voltage of the driver is measured at point 4.

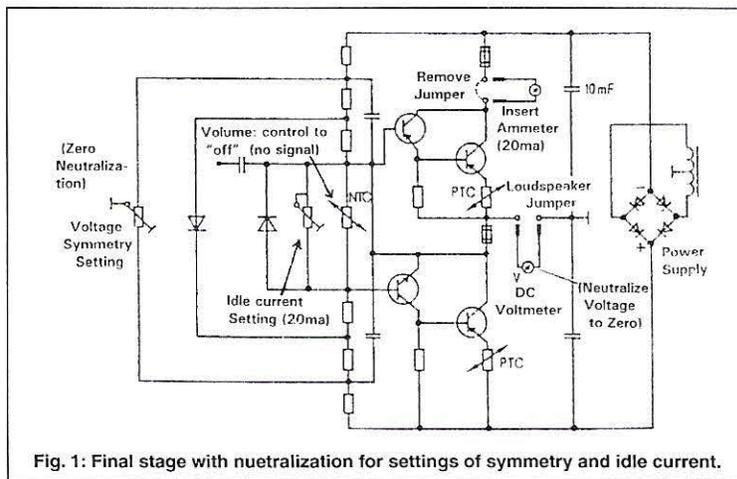


Fig. 1: Final stage with neutralization for settings of symmetry and idle current.

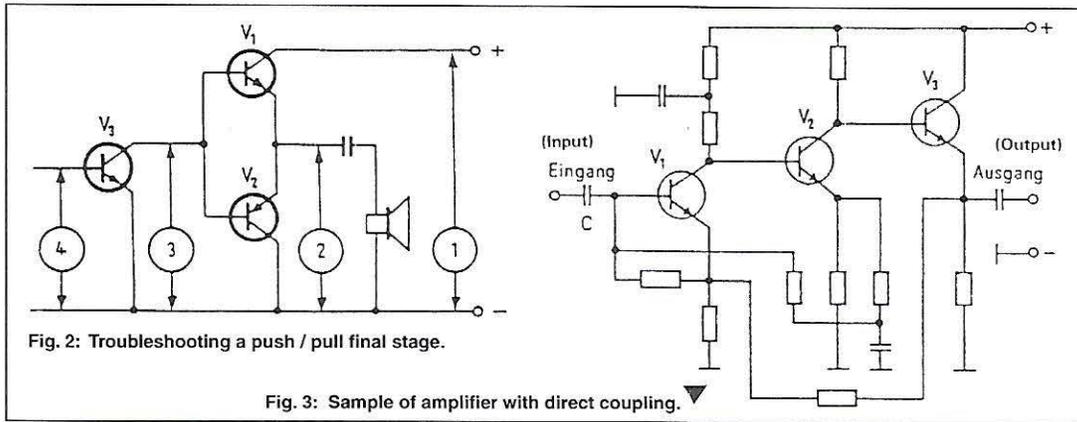


Fig. 2: Troubleshooting a push / pull final stage.

Fig. 3: Sample of amplifier with direct coupling.

Direct-Coupled Stages

Not only output final stages, but also the first audio input stages are often directly i.e., galvanically coupled. When stages are DC coupled this way, a defective component sometimes can affect the entire current and voltage system of the amplifier. The circuit doesn't operate any more, and transistors can even be destroyed. For example, if capacitor C in the circuit (Picture 3) has a short, the bias for transistor V1 is lost. Therefore, no collector current flows any more and the collector voltage climbs. In this way the conducting point of transistor V2 goes positive, and it will eventually become overloaded.

Testing Integrated Circuits

In an integrated circuit several functions are grouped together, which years ago had to be handled by discrete, i.e., individual components. Now they are tied together in one "function block." These modules go one step further. Here several circuit units can be involved, to comprise an entire intermediate frequency (IF) amplifier. IC's and modules have their advantages. A technician often does not need to know the function of individual components any more. She doesn't look for a defective part, but rather finds the affected building block and replaces it. As you service an electrical device, think of an IC and module as a kind of "black box." You take a look at its

behavior simply by measuring what is "going in," and seeing "what is coming out again."

First, test the system's functionality by measuring the connected supply voltages and all input signals. Logically, these values must also be present when the building block ("black box") is removed. You will test its external circuit behavior by observing variations in electrical levels and in the waveforms. And, you could have an open or short circuit. If a voltage disappears after you insert the IC, or if the signal becomes deformed, then that "building block" is usually defective. The same is true for the output side. Voltages can be absent or there can be incorrect values or deformed waveforms. The cause may be in the building block; it may also be in the external circuitry. You can easily and quickly test questionable IC's and modules simply by replacing them or by inserting them into another properly functioning device. This cannot be easily done, though, with soldered IC's.

Dynamic Testing

As stated above, the static troubleshooting method described previously tests the conditions required for a properly working circuit. On the other hand, the dynamic method tests whether the circuit configuration is doing its job, for example, to amplify a signal. Here you test **at which stage** the defective device is still working, or **up to which stage** things are func-

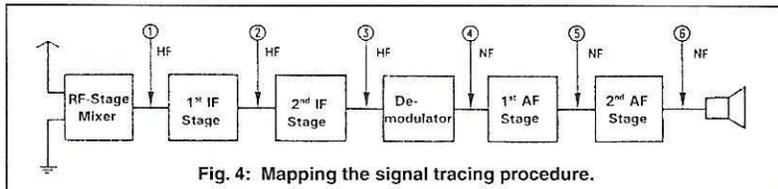


Fig. 4: Mapping the signal tracing procedure.

tioning properly. For example, when you observe the bandpass or equalize an IF amplifier by using a multi-vibrator and a scope, this can be classed as a dynamic testing method. From here it is a short step to diagnosing the problem either by tracing a signal or by inserting a signal. With the proper test equipment, both methods (signal tracing and signal insertion) help you can track the behavior of an RF or AF signal. With today's circuits, the dynamic method gets you to your goal more quickly. This is especially true for stages generating AC, where there is a question about the AC waveform.

The Signal Tracing Procedure

As is always the case in troubleshooting, it is especially advisable to divide the electronic device in question into task or function blocks, as you follow a signal. It provides a good perspective, and most manufacturers give this overview in their service manuals. Therefore, the search for a problem in equipment starts at the input and proceeds in the direction of its output. In the process you sample all points with the test probe where a signal would naturally be present in trouble-free equipment. Picture 26 illustrates this with a radio receiver. A test signal is fed into the device. Here the modulation of the transmitter is in its simplest form. A better-defined signal can be fed by a modulated test signal, or for a HiFi amplifier the signal from a CD or a tape recording.

Before you begin tracing a signal, check to be sure that an external signal is effectively being delivered to the device (at the antenna jack for a radio receiver or a TV). An open or short circuit will prevent transfer of the RF energy (for receivers) to the receiver front end. From here, trace the path of the test signal from the input to the first RF stage to the buffer and intermediate

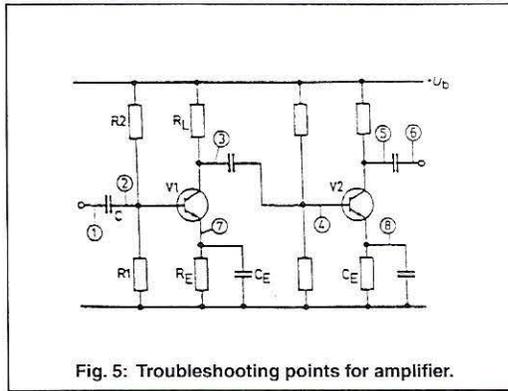


Fig. 5: Troubleshooting points for amplifier.

frequency stage (IF), and then to the mixer stage. If the first RF stage is fine, you should detect a slight volume increase, because even this first stage amplifies somewhat.

Then test the next and all further building block groups right to the final stage. The numbers between the blocks give the sequence of the testing probes, which must switch accordingly from RF to AF. If, for example, if you hear a signal at test point 2 but none at point 3 anymore, then it is pretty certain that the second IF stage is defective.

Testing at Audio Frequency (AF) Levels

Picture 5, showing an AF preamplifier, illustrates the point that the mere identification of a defective stage does not indicate the end of your signal tracing activity. The numbers at the measuring points give the test probing sequence. If the test signal is error free at point 1, then place the test probe at point 2, the base of transistor V1. If there is no signal here, you should test C to see if it is defective or if a contact is severed. Also, an internal short circuit in transistor V1 could be at fault. But if everything is OK, then place the test probe at point 3 and test the output signal. If the test signal is absent, if the first amplification stage doesn't

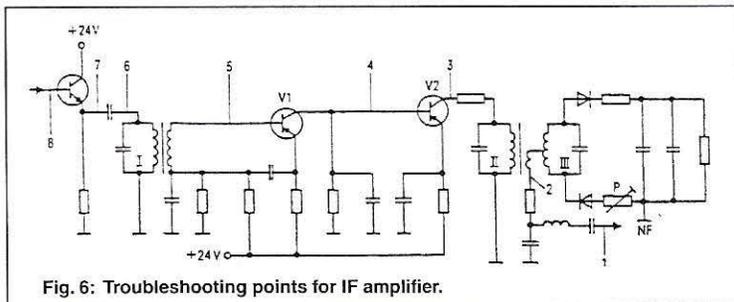


Fig. 6: Troubleshooting points for IF amplifier.

work, or if it is distorted, then the transistor is operating at the wrong conducting point. A voltage test at UBE will quickly tell the story.

Examine the second transistor stage the same way, at points 4, 5 and 6. By using signal tracing, you can also get a picture of the effectiveness of the coupling and decoupling capacitors. No signal should be audible when you probe at points 7 and 8. Capacitors CE are supposed to decouple the emitter resistances at AF levels, as a way to avoid amplification losses due to undesirable feedback.

Testing Final Stages

Audio frequency final power amplifiers can be examined in much the same manner. Be careful to remember that a final power amp amplifies only a little. The difference in loudness (i.e., knob setting), between input and output is only very little. Note further that with a standard push-pull class B final stage every transistor conducts current only during a half wave of the input voltage. For this reason a test with the signal tracer does not always give a clear picture of the signal quality. Once again, it is better to use the scope here.

Testing RF Stages

The procedure for radio frequency stages or blocks is similar to AF stages (Picture 6). The test signal must have – or be set at – the appropriate RF frequency and be modulated, so that the signal tracer can register it. The receiver is to be tuned to the frequency of the test signal, or else the test signal frequency must correspond to the center frequency of the frequency band in question. As a test, you should set the receiver or RF signal generator to maximum for the signal tracer at the output. This way you can test whether the resonant frequency circuits react negatively to overloading.

The same is true for mixer stages. You can test effectiveness of bandpass filters by comparing the RF voltages across their primaries and secondaries. Switch the measuring instrument to RF and place it in series with an appropriately small coupling capacitor of 1 or 2 picofarads in order to avoid an undesirable distortion in the resonant circuits.

In RF and IF stages an incorrect conducting point of the transistors will not necessarily be present as distortion in the loudspeaker system.

But there will always be a clear loss of power in the stage. You can test the working of the demodulator by placing the probe at the input of the first audio stage, with the scope switched to “AF.” The test signal should be easily audible. The variations in the signal as it passes through the circuit can be visually noted. This has to match any changes made at the input level.

Testing the Oscillator

Proper signal mixing and the effectiveness of a radio receiver depend on an oscillator free of problems. The oscillating voltage can be read with an RF probe at the emitter of the mixer transistor. Depending on the sophistication of the signal tracer or scope, measurement of the oscillation amplitude is possible and useful. Otherwise, a signal tracer is less useful for tests of oscillator circuitry. The question whether the oscillator is functioning or not can still be important for the continuing troubleshooting process. But more on this later.

Inserting a Signal

Signal insertion is a widespread troubleshooting method. It proceeds in the opposite direction. Specifically, the device will be fed an appropriate test signal in a sequence opposite the one where an actual signal is followed. From the output of an entire circuit system and proceeding in the direction of the input, signals that are applied to the stages or function blocks can be processed and heard in the loudspeaker or registered on another output indicator. In this way the stage or corresponding function block responsible for the breakdown can be easily located. Be sure to switch from “AF” to “RF” alternatively, depending on the circuit part you are testing, and you should be able to adjust the output voltage across a wide range.

SILENT KEYS DECEMBER 2002

Hugh Craigie, WA2EWB, October 14, 2002

Jack E. Struthers, Sr. W2OZY October 6,
2002

Donald F. Collins WB2LEG October
25, 2002

RaRa Rag 20 Years Ago, December 1982

Ed Gable K2MP

Then, as now, the program was the annual joint meeting with the Kodak Park ARC. The speaker for the evening was Paul Plack, WA2TOX, from the Buffalo area telling of the popular 10 meter FM activity in his area. Writing in the President's Column was Ed Holdsworth, N2EH, who reported on the K2JD antenna party atop 111 Westfall Road to replace the tower. The 14 man crew finished the job just as darkness settled in despite heavy winds and cold, damp WX conditions. The RRRRA column told of their monthly meeting with Bob Phillips, WA2MXL, who chose the topic of Meteor Scatter. Further RRRRA news came from Technical Advisor Ron Jakubowski, K2RJ, and revealing plans for a voting receiver for the 28/88 repeater. More repeater news came from Mike Calprood, N2DVH, reporting a new 220 MHz repeater, N2DVH/R, on 223.98 MHz. Mike plans future links to ten, six and two meter repeaters. And more repeater news, this time from Ray Williams, WA2RYT, who is activating a simplex repeater on 146.46 for use with packet radio. CW ops were pleased at the addition of the new 30 Meter ham band coming on-line at 3:00 p.m. on October 28th. In a reprint from the W5YI report, it was mentioned that that an attempt would be made on the next NASA Shuttle flight to have ham radio 2 meter FM activity. Writing for the Rochester VHF Group was Dan Pedke, KW2T, and Bill Gillette, WA2KIW, thumping all area hams to get active for the ARRL VHF Contest. Someone signing himself as I. J. Goodman threatened that this was your last RaRa Rag if dues weren't weren't paid by the next meeting. I. J. Also mentioned that membership brought you the latest copy of the RaRa Directory listing 2550 area hams. From the Want Ads you could buy a new, in box, IC-730S from Bob Lauzon, K2RL. Radio World, of Oriskany, NY, remained a long time advertiser.

**SEASONS GREETINGS
TO ALL FROM THE RaRa RAG**

RaRa Amateur Radio License Testing

All Elements Needed To Complete
A License Class

**SATURDAY
DECEMBER 21, 2002**

Registration – 8:30 AM
Testing – 9:00 AM

Monroe Community Hospital
435 E. Henrietta Road
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RaRa License Test Schedule, 2002-2003

George Platteter, AA2FO

GET LICENSED, UPGRADE - The fall season is fast approaching, and it's the advent of the 2002-03 testing sessions.

These sessions are held in the September through May. The sessions are held on the third Saturday of the month with the exception of September when it is held on the 4th Saturday of the month and at the Hamfest, whose date varies.

THE PLACE - September through May; Monroe Community Hospital 435 E. Henrietta Rd. Rochester NY (Enter via the south entrance ask at the information desk at the top of the stairs)

REGISTRATION - 8:30 AM, Exams 9:00 AM

HAMFEST - Hamfest location, refer to Hamfest schedule.

SCHEDULE -
September 28, 2002
October 19, 2002
November 16, 2002
December 21, 2002
January 18, 2003
February 15, 2003
March 15, 2003
April 19, 2003
May 17, 2003

Applicants need to bring the following in addition to pen and pencil: Two forms of identification, one being picture ID (Drivers License), original FCC License (if you already have one) and a copy, Certificate of Completion and a copy if credit is to be claimed for elements passed at another test session.

We welcome handicapped applicants. Please phone in advance, (585) 334-4488.

RaRa LICENSE CLASS SCHEDULE For 2003

February 10, 2003 thru May 12, 2003
That is 12 Monday nights of classes
With the 13th week reserved for a
Special class only VE Session

RARA RAG 8

RRRA December Dinner

Brad Allen KB2CHY

The Rochester Radio Repeater Association has in the past years, in lieu of a December meeting, picked a night out for the members. That night this year is December 13, 2002. Back a number of years, we would go to the planetarium. That was fine, but with 3 people, it was not much fun. We then decided to try Old Country buffet. We have had good turnouts for "Dinner Out" at the buffet along with a magician and good conversation with the FAMILY. A call to the hot line of 426-1156 or an email to kb2chy@yahoo.com would be nice for a heads up, but not required.

This year however, we will take a step or two up. Our VP, Tom Cordaro KB2GWB, worked hard and got us into Runds on the Ridge for our dinner out. The price is \$11.95 plus tax and beverages. The menu features Runds famous Buffet of fresh salad, soups, scampi, fish, chicken, sausage, pasta, meatballs, shrimp, bread and fruits as well as UNLIMITED PRIME RIB. The dinner starts at 7:30PM. Arrival can start around 7:00PM. We will have a room for ourselves. One can also order from the menu and use any specials or coupons applicable. Sorry these cannot be used for the Buffet. Tax and gratuity is added at 8% tax and 17% gratuity which is tax @ \$1.00, gratuity @ \$2.25, cost will be around 16.00 each plus beverages. This is a good night out, no radios allowed at the table. I invite anyone interested in joining us for our Christmas dinner. Brad, Tom, KB2CHY and KB2GWB

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Continued from page 1

very significant improvements in sensitivity over traditional CW.

VHF DX consists of two distinct types of QSOs, one being extremely sporadic (caused by ionized meteor trails) and the other being operation near or below the noise floor (EME etc.). In either case, a specialized mode is used to deal with the particular needs of the type of DX. John and Jeff are hard core VHF contesters from the N2PA multi-op team near Naples, NY. Their demonstration of these two modes will attempt to simulate the conditions under which a meteor scatter or EME QSO would occur. Club members with PSK-31 rig interfaces will be able to experiment immediately when they download and install this software. We hope this will encourage further utilization of our endangered VHF/UHF/Microwave frequency allocations.

The meeting will be held in the Kodak Camera Club Lecture room. Enter the building through the Theatre on the Ridge entrance, 200 Ridge Road West, and take the elevator to the basement level. Signs for the Camera Club Lecture Room will be posted as needed. Ample parking is available across the street.

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continued from page 1

Principles:

(a) Recognition and enhancement of the value of the amateur service to

The public as a VOLUNTARY NONCOMMERCIAL COMMUNICATION SERVICE, particularly with respect to providing emergency communications.

(b) Continuation and extension of the amateur's proven ability to contribute

To THE ADVANCEMENT OF THE RADIO ART.

(c) Encouragement and improvement of the amateur service through rules which provide for ADVANCING SKILLS IN BOTH THE COMMUNICATION AND TECHNICAL PHASES OF THE ART.

(d) Expansion of the existing reservoir within the amateur RADIO service of TRAINED OPERATORS, TECHNICIANS, AND ELECTRONICS EXPERTS

(e) Continuation and extension of the amateur's unique ability to ENHANCE INTERNATIONAL GOODWILL.

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100		109	
b. 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DIRECTORY DEADLINE

Dick Goslee K2VCZ

The deadline for updating the information in the "RaRa Directory" is fast approaching. Check the mailing label on this issue of the RaRa Rag and make sure your name, address and callsign are listed correctly. If there are any errors please let me know as soon as possible. Also if you have two addresses, one for summer and one for winter PLEASE make sure I have both of them. The directory will show both addresses so your friends will know how to reach you at all times.

Corrections and /or additions to the directory can be sent to me by mail at the following address:

Richard A. Goslee, K2VCZ
24 Elaine Drive
Rochester, NY 14623-5306

If it is more convenient you can e-mail me at: RGOSLEE@ROCHESTER.RR.COM
The deadline for all corrections is December 31, 2002. Happy New Year.

SCHOLARSHIP AVAIABLE TO MEMBERS

Dick Goslee K2VCZ

RaRa is pleased to announce that the third annual Scholarship will be available to a student attending College. The "Rochester Amateur Radio Association Memorial Scholarship" has been established with generous donations made in memory of A. Leland Zwack, W2WPF, William Buchan, W2OMV and William Resch, K4VOS. The scholarship is available to any licensed Amateur Radio operator who is or will be pursuing any degree of Associate level or higher in any accredited school beyond high school. The individual must be a member of RaRa and a resident of New York State. The scholarship is for one individual for one year, but the recipient may reapply for subsequent years. Kristy Dibelka, KC2GKE was the 2002 winner of the second Memorial Scholarship which was presented at the Hamfest Banquet last June.

Applications are due no later than April 15th. The RaRa Board of Directors and Schol-

arship Committee will make a final decision by May 15th of each year. The actual award will be presented at the annual RaRa Hamfest Banquet held shortly thereafter.

Applications for the scholarship may be obtained at RaRa general meetings, by mail at P.O. Box 93333, Rochester, NY 14692-8333 or by calling the RaRa Hotline Phone at 442-0587. Additional information and a copy of the application are available on the Rochester Amateur Radio Association web site at <http://www.rochesterham.org/>, or from one of the officers.

Additional "tax exempt donations" in memory W2WPF, W2OMV, K4VOS or any other silent key may be sent to: Rochester Amateur Radio Association, Inc., Memorial Scholarship, P.O. Box 93333, Rochester, NY 14692-8333.

THANK YOU, THANK YOU

Dick Goslee K2VCZ

We would like to take this opportunity to thank the following members for their recent donations to RaRa while they were paying their dues for 2003. Donations were received from:

Lia Zwack, Peter Campbell, Steven Verzulli, David Crawford, Robert Stevenson, Robert Krenzer, David Selbert, Richard Schott, Harold Manthey, Frank Lisuzzo, Charles Vorndran, Donald Peters, Allan Pellnat, Carle Porter, Jack Tripp, Robert Knox, Michael Vesco, Jonathan Arney, Robert Rambo, Patrick Piscini, Ray Jobes, Paul Reger, Richard Andrews, Judy Stonehill, Donald Aldred, John Micsak, Virginia Wells, Joseph Silver David Williams, Charles Escriva, Gary Perkins and anonymous.

If anyone else would like to make a "TAX DEDUCTABLE" donation to RaRa, The Memorial Scholarship Fund, or the Radio Coaches Program just check the appropriate box on your membership renewal and indicate the amount you are sending. If you have already paid your 2003 dues and would now like to make a donation you can send it to P.O. Box 93333, Rochester, NY 14692-8333.

Again many thanks; we appreciate your continued support.

LINE FILTERS NOT YET USED

Add your call to your Personal checks.

When you reorder business cards through your employer, add your call (World's smallest QSL cards...)

Put your call on your mailbox.

If you have school-age children, mention to their teachers that you are a ham. (Caution - this might get you invited to speak to the class, or do a radio related demonstration!)

In Webster, the Public library has a magazine exchange (bring one in, take one home...) Your branch might have something similar.

Attach a sticker as mentioned in your article and 'recycle' old QSTs club newsletters, CQs, etc. Magazines can be donated to high schools and middle schools also.

When you upgrade, place an announcement in your company's employee newsletter and your alma mater's alumni news. Give a brief description of the license, and add a link to the ARRL and RARA (if local) for more information.

If you have an amateur radio related book, or software, that is in good shape and not too outdated consider donating it to your local library. (Donations may be tax-deductible.) Place a sticker inside front cover stating "DONATED BY (YOUR NAME & CALL). FOR INFORMATION ON AMATEUR RADIO CALL RaRa (PHONE NUMBER, WEBSITE) OR ARRL (www.arrl.org)" Libraries frequently add books and software in good condition to their collections. Check with your branch library director.

If you order an ink-stamp or mailing labels with your return address, add your call.

If you renew a magazine, or enter a contest, add your call to then application.

Provide your town government with a list of repeater frequencies and

LOCAL amateur radio club phone numbers (and websites). Suggest that this list be included in the town's directory, or other information for new residents.

SUPPORT OUR ADVERTISERS

RaRa LICENSE CLASS

Ray Pickens WA2MYG

As this is my first tour at being License Class Director I really have no point of reference but all things considered I think the class as a whole is going very well. We started with 20 students on September 9th in the second week we had our first drop out but on the bright side we gained one new student that same week. The next drop out was week 7 the rest of the students appear to be ready to take their various exams at the special VE session on December 9th.

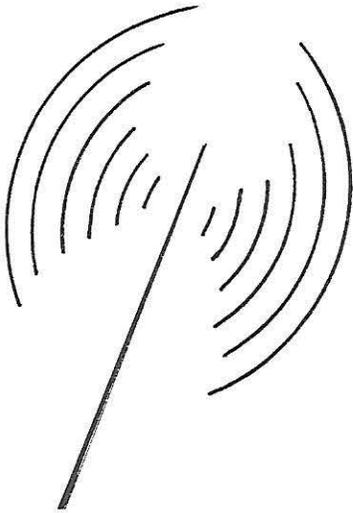
RaRa's New Domain Name

Please bookmark our new internet address: www.rochesterham.org Are you a Rochester ham? Bug our website monthly to check up on the most current events. The old URL still works, but, no guarantee in the future. Note: **rochesterham** is one word. Capitalization may work with most web browsers.

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CAPACITORS
COAX CABLE
CONNECTORS
DIODES
ENCLOSURES
FANS
FUSES
FUSEHOLDERS

IC'S
LAMPS
LED'S
MOTORS
POTENTIOMETERS
RELAYS
RESISTORS
SCR'S
SHRINK TUBE

SOLDER
SWITCHES
TRANSISTORS
TRIACS
TRIMPOTS
VARIABLE CAPS
WIRE/CABLE
ZENER DIODES
LOTS MORE

TRY GLENWOOD FOR ALL YOUR COMPONENT REQUIREMENTS

FULL LINE DISTRIBUTORS FOR

NTE
PRB
GC/THORSEN
SL WABER
WAHL

Replacement Semi's
VCR Belts & Accy
Tools & Chemicals
Outlet Strips +
Soldering/Drilling
Tools & Accy

TYTON
PROTEK
MUELLER
GOLDSTAR
PALADIN

Cable Ties
Test Gear
Test Leads
Test Gear
Tools

ELECTRONIC COMPONENT PARTS (NEW AND NEW SURPLUS)

- LARGE SELECTION
- HIGH QUALITY
- LOW PRICES
- IN-DEPTH INVENTORY