# *The* PROPAGATOR

September, 2002

The Monthly Newsletter of **S**outh **O**range **A**mateur **R**adio **A**ssociation

LINUX Talk Scheduled

Our speaker this month is Matt Mckensie, K6LNX. Matt will present a program on the LINUX operating system and its application to amateur radio. This should be a very informative presentation for those who have heard of LINUX and wondered what advantages it offered and how it compares with the Windows operating system.
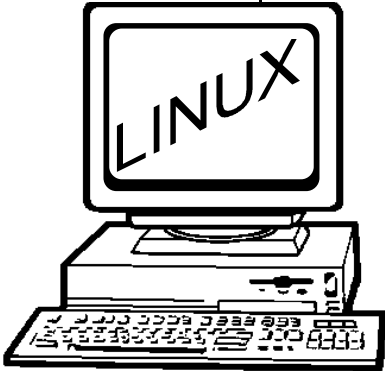
Matt has been a licensed amateur since September 2000. He lives in Costa Mesa, and has just graduated from Orange Coast College with an AA in Computer Information Systems. He plans to continue his education at CSU Long Beach.

In addition to amateur radio and computer systems, Matt plays the French Horn with the Orange Coast College Wind Ensemble and the Santa Ana Winds Youth Band. ☐

It's in the Mail

Yes, it is time to think about renewing your annual membership to SOARA. Renewal notices are sent out to current members in the fall. Prompt payment of the dues makes it much easier for the board to budget for the next year. Membership dues are used to cover the operating costs of the club. This includes items such as this newsletter, the utilities costs and rental for the repeaters, and for club activities. ☐
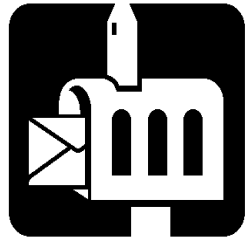
Repeater Activities

On October 5 from 6:00 AM to approximately 5:00 PM, SOARA's main 2 - meter repeater (147.645 MHz) will be used by the Orange County Chapter of the National Multiple Sclerosis Society. A team of amateur radio operators will provide communications for the MS150 Bike Tour.

The 2002 MS150 Bike Tour will be held October 5 and 6, 2002. Ham radio operators will escort approximately 1000 to 1200 bike riders from Huntington Beach to Mission Bay - Hospitality Point - in San Diego. Saturday evening will be spent in Carlsbad.

There will be approximately 25 operators using the system providing health and welfare and emergency traffic. All traffic is handled via a controlled net. The Net Control Operators are Marcia Bruno, N6ISW, and Richard Bruno, N6ISY.

On that same Saturday, Oct. 5, the Orange County RACES will hold a Simulated Emergency Test (SET). Many SOARA members belong to local emergency groups which will be participating in the SET. Some traffic associated with this emergency drill may involve some of the SOARA repeaters.

SOARA members can use the repeater during this time, but do be aware of this activity. If you make a contact on the 147.645 machine, you may want to move to one of the other machines for your conversation.

SOARA has repeaters on:
145.240 MHz (-) [110.9],
147.645 MHz (-) [110.9],
224.100 MHz (-) [110.9],
224.640 MHz (-) [123.0],
445.660 MHz (-) [110.9], and
use of 447.180 MHz (-) [131.8] (HROC). ☐

Safety Awareness

Our August speaker, Art Sutorus, KQ6HF, presented a Motorola RF safety instruction Video. Although designed for use by professional Radio Technicians, there was much in the video that was directly applicable to amateurs working on their transmitters and antennas.

After the video. Art reviewed the FCC rules for the Amateur Radio Service. Compliance with the radiation exposure limits may be done by measurements or by calculations. The measurement equipment is seldom available to amateurs. Most required station evaluations are based on calculations.

Many amateur stations are categorically exempt from the requirement to perform a routine station evaluation for compliance. Stations running power not exceeding set limits are given such exemption. Supplement B to FCC *OET Bulletin 65* sets forth requirements for the Amateur Radio Service. The table below gives the limits as set forth in that publication. The ARRL publication *RF Exposure and You* contains the complete text of the document.
☐

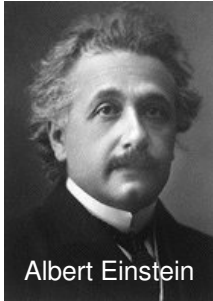| Band	Evaluation required if PEP power (watts) exceeds:
160 m	500
80 m	500
40 m	500
30 m	425
20 m	225
17 m	125
15 m	100
12 m	75
10 m	50
6 m	50
2 m	50
70 cm	70

The Way I See It:
Understanding Radio Theory Without Math.

"Everything should be made as simple as possible, but not simpler."
A. Einstein

Albert Einstein

In last month's column on transmission lines I threw in a "simple" example of calculating the reflection at an impedance mismatch. Well I blundered and made it "simpler". After stating that the current and voltage of each traveling wave were related by the line's characteristic impedance, I ignored the voltage of the reflected wave. The correct calculation is given in the sidebar below. Sometimes the calculations can get in the way of understanding.

Let me finish with a few general comments about transmission lines and such.
 1) For calculating a system as a whole it is reasonable to look at where the power flows, but you can get in trouble treating the details in terms of power. One author has gone to some lengths to show that the power reflected back from a mismatched antenna sees an infinite impedance as it returns to the tuner. Thus all of the power reflected back from the antenna is returned to the antenna. OK, what happens when you are in the receive mode? Does the impedance change for receive? Confusing isn't it? It is clear if you look at the voltages and realize that the total of the voltages at any point of impedance change add to give the final result.

Another author concluded that since there was complete reflection at the tuner that

therefore the output impedance of the transmitter is 50 Ω. It may be 50 Ω, but it doesn't matter to the behavior or the tuner. Despite all of the discussions about the nature of transmitter output impedance, it is not clear that it is of great importance to the user.

Most modern amateur transmitters are designed to work into a 50 Ω load. Most of them will cut back the power output to protect the circuitry if the load is far from the nominal value.

If you feed 100W of RF power into a transmission line, you want all of it delivered to the distant load. You want the maximum available power out of the transmission line and you get that when the load impedance matches the line.

Let me give you examples of cases where you don't want to match the impedance. Don't try to match the impedance of the 120VAC outlet in your home, or of any battery. Clearly these are power sources where your concern is not maximum power. You want the system to last for a while. □

Reflection at an Impedance Mismatch Revisited

We consider a wave traveling in a length of 50Ω coax which encounters a transition to a 75Ω coax. What we mean by saying that a coaxial cable has an impedance of 50W is that a voltage impressed on the cable (between the center conductor and the outer conductor) will result in a current such that the ratio of voltage to current is 50 volts per ampere (or 50 ohms). This voltage, and current, will propagate in the coax at a speed close to the speed of light. A typical figure is 66% of the speed of light.

When the voltage and current reach the point of the impedance change the signal can not continue in the 75W coax with the same values. The ratio of the voltage to current in the new coax is 75 volts per ampere. So a portion of the signal continues in the new coax and a portion is reflected back in the original length of coax.

Let us identify the *incident* signal with the subscript "I", the signal *transmitted* into the new coax we indemnify with the subscript "T", and the *reflected* signal with the subscript "R". The incident and reflected signal propagate in the 50Ω coax and so we can state:
$$V_I / I_I = 50\Omega \quad \text{or} \quad V_I = 50\,I_I, \qquad (1)$$

and $V_R / I_R = 50\Omega$ or $V_R = 50\,I_R$,   (2)
For the transmitted signal we can write:
$$V_T / I_T = 75\Omega \quad \text{or} \quad V_T = 75\,I_T. \qquad (3)$$

We express the conditions at the junction of the two types of coax as:
$$V_I + V_R = V_T \qquad (4)$$
and $\quad I_I - I_R = I_T.$ (5)
This simply states that the voltage at the transition point has only one value, and that the current has only one value. I chose to add the incident and reflected voltages and to take the difference in the incident and reflected currents because I knew they would come out that way. The opposite signs have to do with the direction of travel of the waves.

Substituting (1), (2), and (3) into (4) and dividing by 50 we obtain:
$$I_I + I_R = 1.5\,I_T. \qquad (6)$$
Now adding (5) and (6) we eliminate IR:
$$I_I + I_R = 1.5\,I_T. \qquad (6)$$
$$I_I - I_R = I_T. \qquad (5)$$
$$2I_I = 2.5\,I_T \quad \text{or} \quad I_T = 0.8\,I_I.$$
From (3) we obtain:
$$V_T = 75\,I_T = 75 * 0.8\,I_I = 1.2\,V_I.$$
From (5) we obtain, by rearranging the terms:
$$I_R = I_I - I_T.$$
and substituting for I_T ($= 0.8\,I_I$): $I_R = 0.2\,I_I.$
From (2) we obtain: $V_R = 0.2\,V_I.$

In the original statement of the problem we had 50 watts of power fed to the 50Ω coax.

That conveniently gave us a voltage or 50 V and a current of 1 ampere. Substituting these values we got:
$$VT = 60\ V \text{ and } IT = 0.8\ A$$
$$VR = 10\ V \text{ and } IR = 0.2\ A.$$

Looking at the power we find:
$$P_I = 50\ V * 1\ A = 50\ W,$$
$$P_T = 60\ V * 0.8\ A = 48\ W,$$
and $\qquad P_R = 10\ V * 0.2\ A = 2\ W.$
Note that we did not make use of the conservation of energy (no power vanishes) in our derivation — it is an automatic result of the analysis.

If the 75 Ω coax in our example is terminated in its characteristic impedance then there will be no other waves arriving to mix with the ones we found. Let us assume that is the case, and let's check the VSWR in the 50 Ω line to see if that agrees with the more familiar formula. The standing wave ratio — the ratio of the voltage amplitude at the peaks (where the two waves add) to the voltage amplitude at the troughs (where the voltages are 180° out of phase and thus subtract) is:
$$VSWR = (V_I + V_R)/(V_I - V_R)$$
$$= (1 + .2)/(1 - .2) = 1.2/.8$$
$$= 1.5:1 = 75\ \Omega\ /\ 50\ \Omega.$$

Again we confirm that we obtained the correct answer.   □

Year 2002	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
General Meeting 7:00 PM	**28**	**25**	**18**	**15**	**20**	**17**	**15**	**19**	23	21	**18** Auction	No meeting
Program				DX W6XD	T-hunt W6SQQ	pre Field Day	Show & Tell	RF Safety	LINUX	Contest Station	Auction	
VEC Testing 5:30 PM	**28**	—	**18**	—	**20**	**22**	—	—	**23** Walk-ins	**21** Walk-ins	**18** Walk-ins	—
Propagator Deadline								FCC testing available before club meetings. Call NZ1M.				
Board Meeting	2/4	3/4	25	22	27	24	22	26	30	28	25	
ARRL Field Day						22 - 23						
SOARA picnic								3				
Fall Auction											18	
SOARA Holiday Party												1

Towering Opportunity

This communication from Jim Kelley, AC6XG may be of interest to you:

CQ SOARA,
 Just wondering if the club, or anyone in the club would like a 60', 3-section, crank-up telescoping tower. Needs work, or could be disassembled and used as 3 ea. 20' towers. Free to good home. Ready for pick-up (two men and a boy required).
 73 de AC6XG
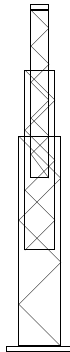
Jim can be contacted via e-mail at:
   ac6xg@soara.org   ☐

HR 4720 Needs Your Support

Last month, in this space, a note from SOARA's president, Ray, AE6H, urged you to support HR 4720. This bill will provide some relief from restrictions on antennas imposed by CC&Rs, home owners associations and deed restrictions. If this bill becomes law, the above types of control will be treated as are state and local laws — they must provide "reasonable accommodation" for amateur antennas.

If you have not done so yet, you can write or e-mail congressman Darrel Issa, who represents Orange County. You can write to him at:

   Darnel E. Issa
   California-48th, Republican
   1725 Longworth HOB
   Washington, DC 20515-0548.

An easy way to send him e-mail is by visiting: ***http://www.house.gov/issa*** and follow the link "Write Your Representative" to bring up the e-mail form.

Passage of this bill will contribute greatly to many hams being able to pursue the hobby and ensure their ability to communicate in case of an emergency.   ☐

How do they do that?

Here is a word problem. It involves calculations that you would want to make before committing to extended use of your HT. Brush up on your math and Solve the puzzle.

During emergency service a handheld rig could be used at a 10% duty cycle of transmitting vs. total on-time. The rig draws 50 mA while receiving and 1 A while transmitting. Each 8 V NiCd pack has a capacity of 2.5 Ah. How long will each pack last if 80% of its capacity can be used? How many fully-charged battery packs are needed for 24 hours of operation.   ☐
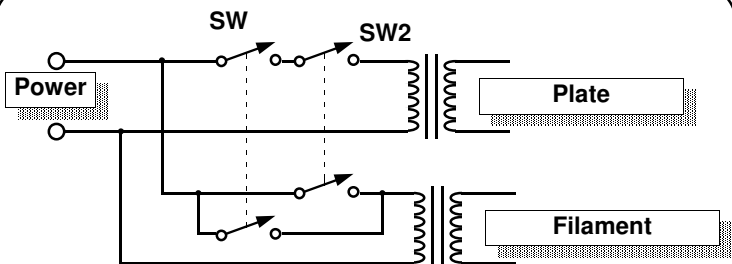
Answer to last month's puzzle. Either switch turns on the filament; both must be closed to turn on the plate. The filament switches form an "OR" circuit. The plate switches form an "AND" circuit.   ☐

The **PROPAGATOR**

South Orange Amateur Radio Association
P.O. Box 2545
Mission Viejo, CA 92690

Address Service Requested

Meeting: Sept. 23, 2002 at 7:00 PM
Matt McKenzie, K6LNX : LINUX

☞ **SOARA** meets at the Mission Viejo Community Center, 26932 Veterans Way, Mission Viejo, the third Monday of every month at 7:00 PM. Changes to the meeting time or place are announced in this newsletter and on the two-meter repeater.

☞ **License Exams**: Amateur License Exams are given prior to SOARA meetings every other month. Exams are from 5:30 to 7:30 PM. Walk-ins are welcome. For information call Paul Levey, NZ1M, at 949-249-0121.

☞ **Contacting SOARA:** Questions about SOARA? Send e-mail to: i*nfo@soara.org*, or leave a message at 949-249-1373.

☞ **Web Site:** SOARA maintains a web site with current club information. The URL is: **http://www.soara.org.**

☞ **Repeaters:** The SOARA 2-meter and 70 cm repeaters are open to all licensed hams.

       SOARA 2m — 147.645 - (110.9)
       SOARA 2m — 145.240 - (110.9)
       SOARA 440 — 445.660 - (110.9)

The SOARA 220 and HROC 440 repeaters are shared by members of both clubs. Each machine is subject to the operating rules of its respective club. Call KG6GI for details.

       SOARA 220 — 224.100 - (110.9)
       SOARA 220 — 224.640 - (123.0)
       HROC 440 — 447.180 - (131.8)

☞ **Nets:** SOARA 2 m repeater open net is held Tuesday 8:00 PM
   40 meter HF net (7.268 MHz +/- for QRM), Sunday 7:30 AM.
   PSK - 31 net (28.120.15, 1000 on waterfall) Friday 7:00 PM.

SOARA OFFICERS

President: Ray Hutchinson, AE6H 949-496-8020
     ae6h@soara.org
V.P.: Malcolm Levy, KO6SY 949-951-1882
     ko6sy@soara.org
Secretary(acting): Mike Mullard, KF6HVO 949-249-2846
     kf6hvo@soara.org
Treasurer : Jerry Di Schino, KN6QK. 949-859-8149
     kn6qk@soara.org

SOARA DIRECTORS

Repeater: Howard Brown, KG6GI 949-581-2634
     kg6gi@soara.org
Publications: Dale Griffith, W8RRV 949-830-3767
     w8rrv@soara.org
Membership: Chris Reed, KB6FYG 949-361-1438
     kb6fyg@soara.org
Education: Mike Mullard, KF6HVO 949-249-2846
     kf6hvo@soara.org
Technical: Bob Grant, W6CIC 909-780-4788
     w6cic@soara.org
Communications: Paul Robert, ND6Q 949-498-0392
     nd6q@soara.org

SOARA COMMITTEES

Activities: Steve Perluss, KR6CE 949-364-6195
     kr6ce@soara.org
Testing: Paul Levey, NZ1M 949-249-0121
     nz1m@soara.org
Website: Chris Reed, KB6FYG 949-361-1438
     kb6fyg@soara.org

Rep. Darrel Issa

United States House of Representatives

Washington, DC 20515

Dear Rep. Issa

I urge you to co-sponsor H.R. 4720, the "Amateur Radio Emergency Communications Consistency Act," sponsored by Rep. Steve Israel. The bill would alleviate a problem facing many federally licensed Amateur Radio operators living within development communities who are subject to unreasonable restrictions or outright prohibitions regarding the installation of external antennas.

Under current law, the FCC applies a policy that instructs states and localities that they must reasonably accommodate Amateur Radio antenna. The policy, however, fails to address situations affecting private land-use groups. Rep. Israel's bill would ensure consistent application of these regulations.

This legislation seeks to insure that Amateur Radio operators are available for emergency communications in all sections of the country, regardless of whether they live in a development, such as a retirement community, or townhouse subdivision. Restrictions against antennas render Amateur Radio operators unable to utilize their licenses, which in turn may ultimately hinder their emergency communication role during times of disaster or national crisis.

Amateur radio provides a vital public safety communications service to the public at no cost to taxpayers. I hope you will join Rep. Israel in co-sponsoring his bill.

I look forward to hearing from you as you consider this important legislation.

Sincerely,