Leonard ("Woody") Woodward, W7KOP, shared with us his experiences of amateur radio in the early days.

Volume 48, Issue 2, February 2005

Periodicals Postage Paid

The Microvolt

Please Send Dues to:
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The Microvolt (USPS 075-430) is published monthly except August for $15.00 per year or $1.50 per issue by the Utah Amateur Radio Club, 3666 South State Street, Salt Lake City, UT 84115-4848. Periodicals Postage Paid at Salt Lake City, Utah. POSTMASTER: Send Address changes to *The Microvolt*, c/o Dick Keddington, 1732 Woodside Drive #32, Holladay, UT 84124-1624.

Prologue

The Utah Amateur Radio Club was organized under its present name in 1927, although its beginnings may date back as early as 1909. In 1928, it became affiliated with the American Radio Relay League (club #1602) and is a non-profit organization under the laws of Utah. It holds a club station license with the call W7SP, a memorial call for Leonard (Zim) Zimmerman, an amateur radio pioneer in the Salt Lake City Area.

Meetings: The club meets each month except July and August. The meetings are held on the first Thursday of the month at 7:30 PM in the University of Utah Engineering and Mines Classroom (EMCB) building, Room 101.

Membership: Club membership is open to anyone interested in amateur radio; a current license is not required. Dues are $15 per year, including a *Microvolt* subscription. *The Microvolt* and membership cannot be separated. Those living at the same address as a member who has paid $15 may obtain a membership without a *Microvolt* subscription for $9. Send dues to the Club Secretary: Dick Keddington, KD7TDZ, 1732 Woodside Dr. #32, Holladay, UT 84124-1624. ARRL membership renewals should specify ARRL Club #1602.

Contributions: Monetary contributions are gladly accepted. Send directly to the Club Treasurer: Chuck Johnson, 1612 W. 4915 S. Taylorsville, UT 84123-4244. For in kind contributions, please contact any board member to make appropriate arrangements.

Repeaters: UARC maintains the 146.62- and 146.76- repeaters. The repeaters are administered by the UARC Repeater Committee. Comments and questions may be directed to any Committee member. The Lake Mountain repeater (146.76-) has autopatch facilities on both the Orem exchange (covering Santequin to Lehi) and the Salt Lake City exchange (covering Draper to Layton). The 449.10 repeater has autopatch facilities into Salt Lake City only available to UARC members. Due to the volume of traffic, only mobiles should use this autopatch. Autopatch use is open to all visitors to our area and to all club members. Non-members who wish to use the autopatch are encouraged to help with the cost of maintaining the equipment by joining the club.

Ham Hot-Line: The Utah Amateur Radio Club (UARC) has a Ham Hotline, 583-3002. Information regarding Amateur Radio can be obtained, including club, testing, meeting, and membership information. If no one answers leave your name, telephone number and a short message on the answering machine, and your call will be returned.

Publication: *The Microvolt* is the official publication of the club. Deadline for submissions to the *Microvolt* is the 10th of each month prior to publication. Submissions by email are preferred (uarc@xmission.com), but other means including diskettes and typewritten submissions can be mailed directly to: Tom Schaefer, 11678 Littler Rd., Sandy, UT 84092. All submissions are welcome but what is printed and how it is edited are the responsibility of the Editor and the UARC board. Reprints are allowed with proper credits to *The Microvolt*, UARC, and authors. Changes in mailing address should be communicated to the Club Secretary: Dick Keddington, 1732 Woodside Dr. #32, Holladay, UT, 84124-1624.

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For late breaking news listen to the UARC Information Net Sundays at 21:00 on 146.62 or set your browser to:
www.xmission.com/~uarc/announce.html

We are grateful to the management of XMission, our Internet Service Provider (ISP), for the donation of this Web-Page service.

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The Microvolt

The Official Publication of the Utah Amateur Radio Club, Salt Lake City, Utah
Volume 49, Issue 2, February 2005

QST from the Prez

Glen Worthington, WA7X

Good to see so many of you at the last meeting. What a great treat to have Woody tell us about the very early days of ham radio and radio in general. I just love to read old magazines about radio and my favorite era is the mid 30's to the mid 40's. What I am always amazed to discover is just how many of the basic principles began in that time frame. Many ideas were just not practical until the advent of transistors and solid state devices to bring the complexity into a manageable package and mass production to bring the cost into an affordable range. Today I have a transceiver that I can hold in one hand, receives from 30 KHz to 500 MHz, transmit in nearly the same range and put out 100 watts, do most analog modulation modes (AM, FM, SSB), is stable to within a few Hz has a digital direct reading output, a hundred memories and cost (in earnable dollars) what most hams can reasonably afford. I remember having far more time than money and modifying war surplus equipment was a norm for ham radio operators for a couple of decades. Now you just can't build (from scratch) at the value you can purchase. Still building is a thrill and has value in more ways than just functionality.

I'm looking forward to next month's meeting where we will learn more about building with today's modern techniques.

Hope to see you at the meeting!

Remember, this is just a hobby, so let's keep having fun! Actually there and enjoying.

73 de WA7X Glen

Member of the Month

By Linda Reeder

This month we are featuring Marty Olsen, KE7AW. His real name, the name that is on his license is Gaden Martin Olsen but he goes by Marty. He does have a pet name Gmos.

Marty is a new ham. He received his technician license March 24th 2004. Marty says he has been interested in amateur radio all of his life, but he just never got around to doing anything about it.

When Marty learned that his boss at US Satellites, Glen Worthington, WA7X, had his ham license and was the president of the Utah Amateur Radio Club, Marty decided to get his license. Also, during this time Marty's ward in the LDS Church was looking for amateur radio operators for the Emergency Radio Response Team. So, Marty enrolled in the training class that the LDS church was offering. At the end of the class he passed the test and obtained his technician license. Marty says he is really working hard on getting his general class license.

Marty says his favorite thing about amateur radio is all of the wonderful new friends he has made since he got into the hobby. Marty is a member of UARC. He was elected to be one of the chair persons for UARC for the year 2005. Marty also helps out with the UARC information net. He does other club information on the first Sunday of each month. Marty will also but giving other club information on the third Sunday of each month until we get another volunteer.

Marty's job at US Satellite Corporation is technical support for the Albertson stores broadcasting business, which is used for their training programs.

Marty also has a part time job at Auto Zone car parts store. They sell parts for cars. Marty enjoys bowling and hiking. Marty has three children two girls and one boy. Amber is 17, Andrew is 13 and Aubrey is 7. None of his children are in amateur radio, but Andrew is thinking about it.

Marty we congratulate you on your new position with UARC. We know you will do a great job. We wish you the best on upgrading your license.

73, N7HVF Linda Reeder.

February Meeting

Working With Printed Circuit Boards

Have you ever wanted to build a project from a magazine, but didn't know how to turn that funny picture of black and white shapes into a printed circuit board? Have you wanted to repair your radio but didn't dare venture into it because it used surface-mount construction? Then the coming meeting is for you!

The next UARC meeting will be Thursday, February 3, and Tony Naef, KE7BBG, will be sharing some of his knowledge about printed circuits. Tony just got his Technician license about six months ago, but has been an electronics enthusiast for a long time. He will be describing and demonstrating some techniques that work for the ham and the electronics hobbyist.

Ohm's Law (Part 1)

This is a four part series covering Ohm's Law. Thanks to OCARC for permission to reprint this article.

By Bob Eckweiler, AF6C

Ohm's law is a simple equation that solves the relationship between voltage, current and resistance in a simple electrical circuit. An understanding of the law is necessary to dabble in even the simplest aspects of design and troubleshooting of electrical and electronic circuits. Radio Amateurs should have a solid understanding of Ohm's law if they plan to do anything other than be a total appliance operator. In the 1950's and 1960's the amateur exams, including the Novice exam, had at least one question on Ohm's law, and you were expected to solve the problem(s) on a sheet of paper that was turned in with the exam. Today, all that's needed is to memorize the answers; the values in the problems never change from the question pool to the actual test! That's great to pass the test, but don't you really want to know more? Whether you're learning Ohm's law for the first time or are just a little rusty and want to review it, feel free to join us on this adventure.

Ohm's Law says: *The voltage across a resistance is equal to the current flowing though that resistance multiplied by the value of the resistance itself.* In equation form it is:

$$E = I \times R \qquad (1)$$

Where E is the voltage in volts; I is the current in Amperes and R is the resistance in ohms. (See the sidebar "Why 'E', Why 'I'"?)

By rearranging the equation two other variations are possible. The first is:

$$I = \frac{E}{R} \qquad (2)$$

This variation allows solving for the current when the voltage and resistance are known. In words, equation (2) says: *The current flowing through a resistance is equal to the voltage across the resistance divided by the value of that resistance.* By dividing both sides of equation (1) by 'I', we get yet another variation of the equation:

$$R = \frac{E}{I} \qquad (3)$$

This variation allows solving for the resistance when the voltage and current are known. In words, equation (3) says: *The value of resistance that allows a given current to flow through it when a given voltage is applied across it is equal to the voltage across the resistance divided by the current flowing through it.*

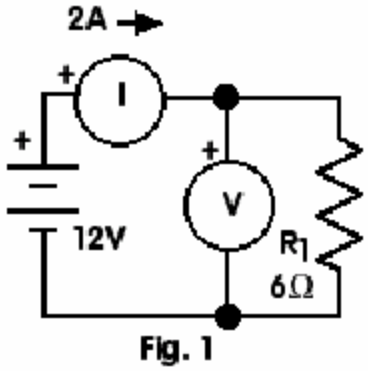
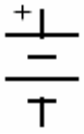


Fig. 1

Why 'E', Why 'I'?

You may ask why these letters were chosen to symbolize the component they do in Ohm's Law. Using 'R' to represent resistance is straight forward, but why not 'V' for voltage and 'C' or 'A' (Amperes) for current? Actually 'V' is occasionally used instead of 'E', which represents Electromotive Force, a more descriptive term for voltage. The use of 'I' to represent current is less easy to explain; 'I' was chosen because other, more appropriate characters were already in use. 'I' (and 'i' in AC circuits) has since become the universal symbol for current.

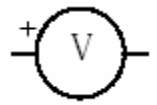
Let's solve a few problems; but first maybe it would be wise to review a few schematic symbols and a simple circuit such as the circuit of figure 1.



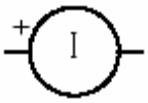
The schematic symbol above is the symbol for a battery. The longer bar is always the positive terminal (we'll include the plus sign anyway.) The battery voltage is commonly printed next to the battery. It is an ideal battery, that has no internal resistance, will never go dead and can supply infinite current! (I'm told these ideal components are available only at the Radio Shack in **Diagon Alley**). The voltage of the battery is the electromotive force that the battery exerts to push current through the circuit. Some people relate it to pressure from a water pump. When the battery is not connected to a

circuit, the force is present but there is no flow of current.

The symbol above is the symbol for resistance. The resistance could be a resistor, or something more useful, such as a lamp or DC motor. Resistance impedes the flow of electricity. It can be related to a narrow opening in a pipe that reduces the flow of water. The size of the opening is analogous to the resistance. The smaller the opening is, the higher the resistance.



The symbol above is the symbol for a voltmeter; it measures the voltage across the two points where it is connected. The plus sign signifies the meter polarity. It will read positive when this terminal is more positive than the other terminal. Consider our voltmeter ideal; that is, it has infinite resistance and no influence on the circuit to which it is connected. In real life this isn't the case.



This is a symbol for an ammeter; it measures the current flowing through the circuit at the point where it is connected. This plus sign signifies the meter polarity (see sidebar on the direction of current flow). Consider our ammeter ideal; that is, it has zero resistance and now influence on the circuit to which it is connected. Again, in real life this isn't the case.

Let's look at figure 1. If the ammeter reads two amps and the resistor value is six ohms, what does that voltmeter read? We want to solve for 'E', the voltage across the resistor. Look at equations 1 through 3; equation (1) solves for voltage across a resistance. Since the voltage across the resistor equals the current through the resistor times the resistance, we get:

$$E = I \times R; \quad E = 2 \times 6; \quad E = 12V$$

This is what we'd expect since the battery is 12 volts and the meters are ideal and don't influence the circuit. (Remember: Voltmeters appear as open circuits and ammeters appear as short circuits!)

Looking at figure 1 again; let's pretend we don't know what the ammeter is reading and solve for I, the current. This time we'll use equation (2) that solves for the current flowing through a resistance when the resistance and voltage across the resistance are known. Since the current through the resistor equals to the voltage across the resistor divided by the resistance, we get:

$$I = \frac{E}{R}; \qquad I = \frac{12}{6}; \qquad I = 2\text{A}$$

Looking at figure 1 one more time, lets say we want to solve for the value of R, the resistance. We know the readings on the voltmeter and ammeter. Equation (3) solves for the resistance when we know the current flowing through the resistance and the voltage across the resistor. Since the resistance that allows a given current to flow through it equals the voltage across the resistor divided by the current flowing through the resistor, we get:

$$R = \frac{E}{I} \qquad R = \frac{12}{2}; \quad R = 6\,\Omega$$

Figure 2 is a little more difficult. We want to calculate what the voltmeter and ammeter read. To do this we need to know what happened when resistors are connected in series; you can review this in the ARRL

The Direction of Current Flow

Electrical current is the amount of electrons that flow past a given point in a circuit in one second. That number is large, 6,250 million – billion electrons! But electrons flow from the negative terminal of a battery to the positive terminal. They also flow from the cathode of a vacuum tube to the plate. Why is current flow commonly shown in the other direction?

The misconception of current flow from positive to negative came from the early days of electricity and has stuck with us to the present. Current flow has come to be defined as opposite to electron flow. This works, except when studying the physics of vacuum tubes and semiconductors where electron flow is used. We'll keep with convention and use positive-to-negative current flow.

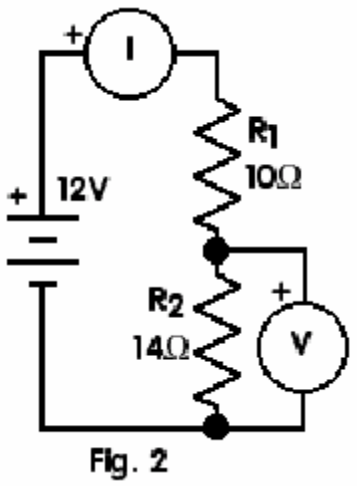


Fig. 2

Handbook. Simply, resistors that are in series may be replaced by one resistor whose resistance is the sum of the series resistors.

Thus R_1 and R_2 may be replaced by a single resistor whose value is the sum of the two resistors. Since R_1 and R_2 may be replaced with one 24 ohm resistor, the circuit simplifies to that shown in figure one with R = 24 ohms. From equation (2) the current can be calculated:

$$I = \frac{E}{R}; \quad I = \frac{12}{24} \qquad I = 0.5A$$

Now that the current flowing through R1 and R_2 is known, equation (1) can be used to find the voltage across R_2. Read the description of equation (1) carefully. The current flowing through R_2 is known, and the value of R_2 is known. Using equation (1):

$$E = I \times R; \quad E = 0.5 \times 14; \quad E = 7V$$

The circuit in figure 2 is often called a voltage divider circuit. It is very common and we'll be discussing it in more detail later in this series.

Figure 3 is a bit more difficult than figure 2. The problem is to find the current flowing in the

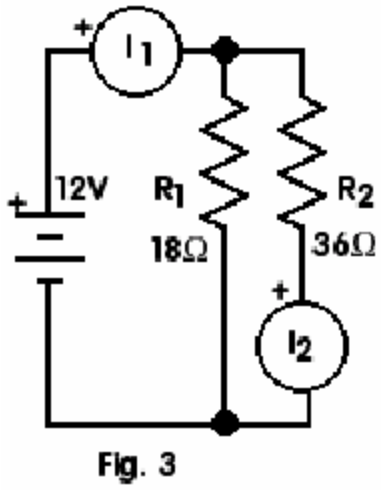


Fig. 3

two ammeters. To solve this problem, knowledge of calculating resistors in parallel is required. This is more difficult than resistors in series. Review the section on resistors in parallel in the ARRL Handbook if you need a refresher. When only two resistors are in parallel equation (5) may be used. This is derived from the more general equation (4) that is good for any number of resistors.

$$R_{Total} = \frac{1}{\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots + \frac{1}{R_n}\right)} \quad (4)$$

$$R_{Total} = \frac{R_1 \times R_2}{R_1 + R_2} \quad (5)$$

When n is the number of resistors in parallel.

Equation (5) might need some clarification for those who are unfamiliar with this type of notation. First take the reciprocal of each resistor (Divide the resistance into one – The reciprocal of 4 is ¼ or 0.25). For example, 1/4 = 0.25. Next add up the reciprocals of all the resistances and take the reciprocal of that sum to get the total resistance. For example, what is the total resistance of a 1-ohm, 2-ohm, 4-ohm, 8-ohm and 10-ohm resistor, all in parallel? The reciprocals of these resistors, in order, are; 1.0, 0.50, 0.25, 0.125, and 0.10. The sum of these reciprocals is 1.975. Taking the reciprocal or 1.975, yields 0.506 ohms. One simple check is that the resistance will always be smaller than the value of the smallest parallel resistor.

Looking again at figure 3, the total resistance of R_1 and R_2 in parallel, from (5), is:

$$R = \frac{18 \times 36}{18 + 36} = \frac{648}{54} = 12\Omega$$

Since the parallel resistors can be replaced with on 12-ohm resistor, I_1 can be solved using equation (2)

$$I_1 = \frac{E}{R} = \frac{12}{36} = 0.333\text{amps}$$

Following are some problems. They are a bit more complex, but should not be too difficult to solve using the processes and equations above. Some clues have been included to get you started. Have fun.

Next month, we'll review these problems and then introduce you to Thévenin's Theorem. This theorem simplifies common linear circuits. You'll probably have some trouble solving the last problem. It will be a lot easier to solve after Thévenin's Theorem is introduced next month. For now, study problem #3 and see if you can find a solution.

Here are three problems:

Try them and see how you do:

Problem #1: Find I_1, I_2, and V.
Problem #2: Find I_1
Problem #3: Find I_1.

Hints for Problem #1:
First calculate resistance $R_2 \parallel R_3$ (That's R_2 in parallel with R_3).

Then calculate the series resistance of R_1, R_4 and $R_2 \parallel R_3$.

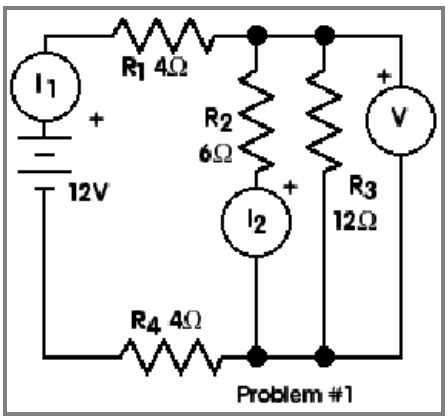
Now I_1 may be calculated.

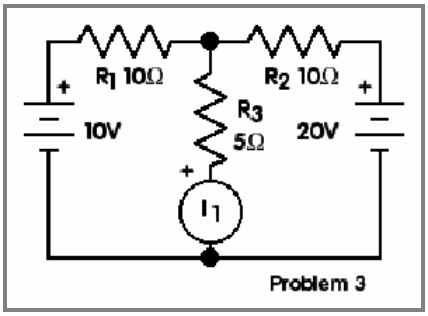
Now V, the voltage across $R_2 \parallel R_3$ may be calculated.

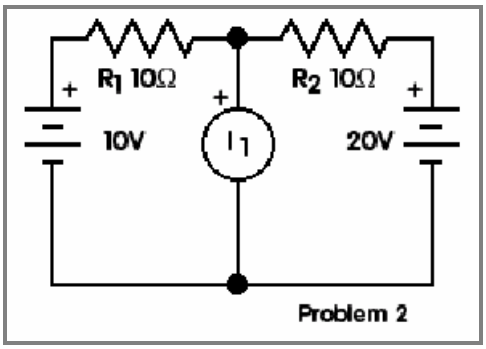
Finally I_2 may be calculated because V and R_2 are known.

Hints for Problem #2:
Don't let the second battery scare you. Remember the definition of the perfect ammeter.

Hints for Problem#3:
Only one resistor has been added. Now the problem becomes more difficult. See if you can solve it.







Answers:

#1a) $I_1 = 1$ amp
#1b) $I_2 = 0.667$ amps
#1c) V = 4 volts
#2) $I_1 = 3$ amps
#3) $I_1 = 1.5$ amps

Utah Amateur Radio Club

2004 Financial Statement

INCOME:	
ARRL Dues	$713.00
Book Sales	4,601.69
UARC Dues	5,597.00
TOTAL INCOME	$10,911.69
EXPENSES:	
Administrative	$153.50
ARRL Memberships	546.00
Books	3,829.41
Field Day	522.01
Ham Hot Line	328.62
Insurance	379.00
Meeting Expense	221.28
Microvolt	2,449.08
Repeater	726.21
Returned Checks	88.20
Steak Fry	1,542.45
TOTAL EXPENSES	$10,785.76
TOTAL INCOME - EXPENSES	**$125.93**

Chuck Johnson. WA7JOS

About the ARRL

Almost from the very beginning of our club, UARC has been affiliated with ARRL, the American Radio Relay League, a national membership association for Amateur Radio operators. The League promotes interest in Amateur Radio communications and experimentation, represents US radio amateurs in legislative matters and issues (including those related to BPL) , and promotes a high standard of conduct among Amateur Radio operators.

Individual ARRL membership benefits include *QST*, the monthly membership journal, plus a members-only Web Access Technical Information Service, Ham Radio Equipment Insurance, Outgoing QSL Service, ARRL Field Organization Operating Awards and more!

Because the League appreciates affiliated club recruitment efforts and values our opinions, they give the club a commission on all new and renewal ARRL memberships. So when you are ready to join ARRL or renew your ARRL membership, make a copy of the application form on page 11 of this newsletter and give it to UARC's secretary, Dick Keddington, KD7TDZ, and process it through UARC. It won't cost you any more, but UARC will be helped by a commission from the ARRL.

Dick Keddington, KD7TDZ

Help Wanted: UARC NET

UARC needs help with the Information Net on Sunday evenings at 9:00pm. Net Control Operators are needed, as well as someone to do Other Club Information. Please call Gary Openshaw, KC7AWU, 484-3407 or E-Mail him at gopenshaw@msn.com, and be involved. Please plan on joining the great Net Control Operators for next year.

Utah VHF Society Swapmeeet

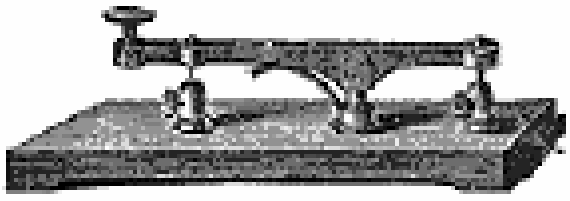
Like last year, the 2005 swap meet will take place on Saturday, February 26th in the Zion building at the Utah State Fairpark. This is located along the north side of North Temple at about 10th West. The Zion building is located next to Gate B in building 34. The doors will open to the general public at 8 AM - perhaps a bit earlier if you are grabbing a table to sell something.

As in the past admission is FREE for current UVHFS members, $2.00 for non member adults, and $1.00 for non members 12 years old and under.

Brain Teaser

Last Month's Teaser: Turn on one switch for one minute and then off. Then turn on the other switch. Go to the other room. One light will be on and one will be off, and one will be warm to the touch.

New: This is an unusual paragraph. I'm curious how quickly you can find out what is so unusual about it. It looks so plain you would think nothing was wrong with it. In fact, nothing is wrong with it! It is unusual though. Study it, and think about it, but you still may not find anything odd. But if you work at it a bit, you might find out. Try to do so without any coaching!



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Membership Application

(Application for use by ARRL Affiliated Clubs)

☐ **I am a brand new member** or my membership has been lapsed for 2 or more years. My club will keep $15 of my dues.
☐ **I am renewing** (includes lapsed members of less than 2 years). My club will keep $2.00 of my dues.

Name _____ Call Sign _____

Address _____

_____

City _____ State _____ ZIP _____

☐ Sign up my Family Members, residing at the same address, as ARRL members too! They'll each pay only $8 for a year's membership, have access to ARRL benefits and services (except *QST*) and also receive a membership card. (club commission not applicable.)

ARRL Family Members:

Name _____

Call Sign _____

Name _____

Call Sign _____

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☐ 2 years[2]	76	70	16
☐ 3 years[3]	111	103	24

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QST—Amateur Radio's #1 Magazine! Delivered each month, ***QST*** is **THE SOURCE** for Amateur Radio news, information, projects, and equipment.

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[1] 1-year membership dues include $15 for a 1-year subscription to QST.
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Dues are subject to change without notice.
If you do not wish your name and address made available for non-ARRL related mailings, please check this box. ☐

CLU 10/04

2005 UARC Exam Schedule

Date	Location	Contact Person	Phone
2/02/05 (Wed.)	Ogden	Mary Hazard, W7UE	430-0306
2/05/05 [1] (Sat.)	Salt Lake City	Gordon Smith, K7HFV	582-2438
2/16/05 (Wed.)	Provo	Steve Whitehead, NV7V	465-3983
2/16/05 (Wed..)	St. George	Ronald C. Sappington, WI7Z	(435) 673-4552
2/22/05 [1] (Tues.)	Salt Lake City	Eugene McWherter, N7OVT	541-1871
3/02/05 (Wed.)	Farmington	TBD	939-4046
3/12/05 (Sat.)	Logan	Heidi Black, AC7ZC	(435) 753-7487
3/16/05 (Wed.)	Provo	Steve Whitehead, NV7V	465-3983
3/16/05 (Wed.)	St. George	Ronald C. Sappington, WI7Z	(435) 673-4552
3/29/05 [1] (Tues.)	Salt Lake City	Eugene McWherter, N7OVT	541-1871
3/31/05 (Thu.)	Roosevelt	R. Chandler Fisher, W7BYU	(435) 722-5440
4/02/05 [1] (Sat.)	Salt Lake City	Gordon Smith, K7HFV	582-2438
*** Only Technician elements (1 and 2) given at this session**			
1 Pre-registration required. Contact the contact person prior to the examination date.			

2005 UARC Club Calendar

Date	Description	Date	Description
2/03/05	Club Meeting 7:30 Making Printed Circuit Boards	6/2/05	Club Meeting 7:30 Field Day Presentation
2/26/05	Utah VHF Swap Meet Utah State Fair Park	6/24/05 – 6/26/05	Field Day – Payson Lakes
3/3/05	Club Meeting 7:30	7/08/05 – 7/10/05	Utah Hamfest – Ruby's Inn, Bryce Canyon Utah. Watch for further updates later this year.
4/7/05	Club Meeting 7:30	7/16/05	UARC Steak-Fry – The Spruces, further information in the April *Microvolt*
5/12/05*****	Club Meeting 7:30	8/04/05	No Club Meeting
*** Due to U of U holding finals on 5/7/05, the meeting has been moved back one week.**			