



**Chapter 24, Inc.
Madison, Wisconsin**

Society of Broadcast Engineers

June 2000

Transistor History: Shockley, Bardeen, and Brattain

By Vicki W. Kipp

If you are a maintenance engineer, you may work with electronic components on a daily basis. But how often do you ponder how such components were invented? Probably not that often. This seems like a good time to contemplate the origin of a very useful component, the transistor.

In December of 1947, three technicians were working diligently at Bell Laboratories in Murray Hill, New Jersey. The combined abilities of Dr. William Shockley, Dr. John Bardeen, and Dr. Walter H. Brattain led the discovery of the transistor. Each technician brought different technical assets to the collective team.

Born in London and educated at Massachusetts Institute of Technology, Dr. William Bradford Shockley (1910-1989) was the highly intelligent director of the transistor effort. It was Shockley's research in the behavior of electronics within crystals that led him to John Bardeen and Walter Brattain. Shockley built the first working model of a transistor mechanism with the help of Bardeen and Brattain. Inspired by this model, Dr. Shockley went on to invent the junction transistor, the fundamental structure of future transistor developments. In 1955, Dr. Shockley left Bell Laboratories to form Shockley Semiconductor. Several of Shockley's employees would later leave Shockley Semiconductor in order to form a highly successful microprocessor company that would become known as Intel.

Madison, Wisconsin was the birthplace and childhood home of Princeton-educated Dr. John Bardeen (1908-1991). Bardeen was a brilliant theorist who was able to explain the electrical effects observed in the early transistor experiments. Bardeen performed research on the electron-conducting

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Next Meeting:

**Tuesday,
June 20, 2000**

**Pyle Center Tour
Dutch Treat Dinner
at 5:30 PM**

**at the Nitty Gritty
223 N. Frances St.**

**Meeting and
Program at 7:00 PM**

**at the Pyle Center
702 Langdon St.**

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Iridium Satellite System May Have Hope

By Mike Norton

At the eleventh-hour, the bankrupt Iridium satellite telephone system has a possible purchaser. A New York-based investment firm has sent a proposal to the federal court which is presiding over the Iridium bankruptcy case. The bid by the investment firm offers to acquire all Iridium assets for \$50 million. The constellation of low earth orbiting satellites cost \$5 billion to build and launch.

Iridium LLC voluntarily filed for bankruptcy under Chapter 11 of the U.S. Code on August 13, 1999, two

days after defaulting on over \$1.5 billion in loans. \$800 million had been secured by Chase Manhattan Bank, with another \$750 million by Motorola. Another \$90 million for interest payments on bonds was also defaulted on.

The satellites are positioned in six orbital planes, providing world-wide coverage. The handheld phones communicate with the satellites via L-band frequencies between 1616 MHz and 1626.5 MHz, with voice channels digitized at a 2400 bps rate. Signals are then sent from the satellites to ground-based gateway stations using

K-band (19.4 - 19.6 GHz) downlink and Ka-band (29.1 - 29.3 GHz) uplink frequencies. K/Ka-band links (18.8 - 20.2/27.5 - 30 GHz) are also used for intersatellite links, where a satellite can communicate with four neighboring Iridium satellites to route a call to the gateway station nearest the final destination. Phone calls connect with the public switched telephone network (PSTN) through the gateway stations.

The global satellite phone and paging company began offering service in November of 1998, utilizing its fleet

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CHAPTER 24 OFFICERS

CHAIR:

Kevin Ruppert (WISC-TV)
W - 271-4321
kruppert@wisctv.com

VICE-CHAIR:

Tom Smith (WHA-TV)
W - 263-2174
smithtc@vilas.uwex.edu

SECRETARY:

Vicki Kipp (ECB-TOC)
W - 264-9631
vkipp@ecb.state.wi.us

TREASURER:

Stan Sarch (WISC-TV)
W - 271-4321
sscharch@wisctv.com

COMMITTEE APPOINTEES

Program Committee:

Mark Croom	271-1025
Denise Maney	277-8001
Kerry Maki	833-0047
Steve Paugh	277-5139
Steve Zimmerman	274-1234

Membership:

Paul Stoffel
stoffel@vilas.uwex.edu

Sustaining Membership and Past-Chair:

Fred Sperry W - 264-9806
fsperry@ecb.state.wi.us

Special Events:

Vicki Kipp (ECB-TOC)
W - 264-9631
vkipp@ecb.state.wi.us

Certification and Education:

Jim Hermanson 836-8340
jmh@execpc.com
Tim Trendt (UW-Platteville)

Frequency Coordination:

Tom Smith W - 263-2174
smithtc@vilas.uwex.edu

National SBE Chapter Liaison:

Leonard Charles
W - 271-4321 FAX - 271-1709
lcharles@wisctv.com

May Business Meeting Minutes

Chapter 24 of the Society of Broadcast Engineers met on Thursday, May 25, 2000 at Mike Dorrough's home in Oregon, Wisconsin. There were 22 members and 3 guests in attendance, 17 of whom were certified.

The meeting was called to order by Chairperson Kevin Ruppert at 7:40 PM. Minutes of the April meeting, as published in the May newsletter, were approved as published.

Treasurer, Stan Sarch, reported that the chapter treasury is in the black. Newsletter Editor, Mike Norton, reported the deadline for the next newsletter as midnight on June 2, with the folding party the following Thursday, June 8 at WKOW-TV beginning at 5:30 PM.

Membership Coordinator, Paul Stoffel, had no changes to report. Sustaining Membership, Fred Sperry, reported that we have 24 sustaining members, with Roscor Wisconsin as a recent renewal.

Program Committee, Denise Maney, announced that the next meeting will be on Tuesday, June 20. Dinner will be at Nitty Gritty in downtown Madison, followed by a meeting and tour of the Instructional Communications Systems at the Pyle Center facilitated by Jamie Poindexter. Parking can be found in nearby ramps.

Certification, Jim Hermanson, reported that the SBE local exam session would be held on June 17. Jim will be proctoring the Certified Broadcast Network Technologist exam during this test period. A review session for the CBNT exam will take place at WISC on June 7 at 6:00 PM. The next local exam session will occur between August 18 and 28, with July 1 as the deadline for applications.

Frequency Coordinator, Tom Smith reported that Video Images has approached him for frequency coordination for wireless microphones.

National Liaison, Leonard Charles, reported that the membership drive ends on May 31, 2000. Renew your membership quickly so that you don't lose your SBE benefits. Also, nominations are now sought for the honor of Fellow in the Society of Broadcast Engineers. The National SBE Office will mail ballots to chapter members in August.

As a special report, Leonard Charles informed the group that the WBA Engineering Conference will be held on June 14 and 15 in Eau Claire, Wisconsin. Registration fees for the conference are very reasonable. To attend the sessions and dinner just on Wednesday, June 14 costs \$25, or to attend the event on both Wednesday, June 14 and Thursday, June 15 costs \$40.

It was announced that Kevin Ruppert is preparing the national award nominations for Chapter 24, and will be submitting the nominations.

(continued on next page)

May Minutes (continued)

For Professional Announcements, Tom Weeden appraised the group that on Thursday, May 18, a WMTV engineer had received an electrical shock while working in the live truck during a thunderstorm. After lowering the mast on the truck, the engineer stood outside the truck and operated the pan/tilt head remote control inside the truck. While he was pressing one of the buttons, lightening flashed overhead. Though the lightning did not strike the ground, the engineer received a jolt through the plastic button he was pressing. The engineer was not injured, but was momentarily stunned. To summarize, Tom recommended that news crews should not attempt a live shot during a thunderstorm, even with the mast down.

Another Professional Announcement was made by Paul Stoffel regarding the EAS meeting group. Paul has organized a group, which includes himself, Jeff Tyler from WIBA-FM, and Erik Barklow from WOLX-FM.

In another Professional Announcement, Leonard Charles informed us that Gary Timm will speak about the topic of EAS at the WBA Engineering Conference on June 14. Details of the State of Wisconsin EAS Plan will be available as a .PDF file on the Chapter 24 SBE web page. The file will include details about the CEM Code. Leonard recommended that engineers read the plan so that they know how to update their encoder and decoder.

Under the heading of Tech Tips, Ken Ebnetter of WPDR announced that he will have access to AM bandwidth test equipment during the next few weeks. Anyone who might be able to benefit from the use of this equipment should contact Ken soon.

Kevin Ruppert adjourned the business meeting at 8:05 PM.

The evening's program was presented by Mr. Mike Dorrrough of Dorrrough Electronics, Inc. It was a tour of Mike Dorrrough's short-wave radio facility and historic broadcast equipment collection.

Submitted by Vicki W. Kipp, Secretary

AMATEUR RADIO NEWS

By Tom Weeden, WJ9H

- A National Cancer Institute researcher has embarked on an epidemiological study of radio amateurs. Kenneth Cantor wants to evaluate whether causes of death among amateurs differ from those of the general population. If it turns out that they do differ, he then wants to find out whether the individual's "usual occupation" might explain the differences. A similar study done 15 years ago by Samuel Milham had wording in its conclusions that led many to believe that the study had presented evidence that RF energy caused "an excess of leukemia." Cantor emphasized that his investigation is a preliminary study, based on a statistical comparison of FCC licensing records and State of California death records. The initial "cohort group" for Cantor's study includes more than 100,000 men and women—seven times larger than the earlier Milham study.

- On an unrelated note (hopefully), FCC Special Counsel for Amateur Radio Enforcement Riley Hollingsworth says he was just trying to see if the amateur community was paying attention when he suggested on his recent Radio Amateur Information Network enforcement news report (<http://www.rainreport.com>) that the use of phonetics during station identification was contrary to the amateur rules. As Hollingsworth has since conceded, after being challenged from several quarters, the applicable FCC station ID rule — 97.119(b)(2) — specifically encourages "use of a standard phonetic alphabet as an aid for correct station identification." "I plead temporary insanity," said Hollingsworth. "I was working too close to my antennas the evening before."

- Cosmonauts aboard the Mir space station are back on the air, delighting earthbound hams with FM voice and slow-scan TV contacts on 145.985 MHz. And, later this year amateur radio gear will be installed aboard the International Space Station for the first time. A primary goal of amateur radio on the ISS is to continue a schedule of contacts with schools, so students can interview the astronauts and cosmonauts directly—as a major component of a classroom project. NASA "clearly supports the educational outreach aspects" of the ARISS project, according to ARISS delegation member Frank Bauer, KA3HDO.

(Excerpts from June 2000 "QST" magazine and the American Radio Relay League's "ARRL Letter")

Thanks to WISC-TV for maintaining the web server for the Chapter 24 Web page!

Thanks to WKOW-TV for providing copying and folding facilities for the Chapter 24 newsletter!

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EAS Information

Compiled by Paul Stoffel

- The FCC has updated their EAS web site. It includes the recent Part 11 changes, LPFM, Class A TV and the FCC's 3/31/2000 Order update. It's available for viewing at <http://www.fcc.gov/eb/eas/>.

- Gary Timm will be speaking about updates to the EAS State Plan at the Wisconsin Broadcasters Association Convention in Eau Claire on June 14, 2000. Gary and SBE have waited 3 years for the FCC to issue additional event codes to deal with specific state and local EAS issues. The only codes available have been Civil Emergency Message (CEM) or Civil Authority (CIV). The FCC may issue the additional event codes by the end of the year.

- Pete Kingslein of Educational Communications Board provided an overview of status of NOAA weather radio transmitters in Wisconsin. Work is under way to construct a new transmitter in the northern Clark County

near the town of Withee. Future plans include weather radio transmitter sites at Ashland and Spooner areas, pending budget approval. And there has been interest in getting transmitters in the Racine and Kenosha area, as well as the Waupaca County area.

- Doug Schwartz, Charter Communications, says there are challenges with implementing EAS for both large and small cable systems. With the ever-growing cable conglomerations, it is increasingly difficult to segment the EAS alerts to specific small areas, and to deal with the individual local official audio override agreements. Cable systems are required to carry National EAS messages on all channels. Most cable systems are willing to look at carrying local EAS messages but this becomes very difficult as cable systems expand beyond county boundaries.

- Ken Rizzo and Rusty Kapela, National Weather Service, Sullivan office, have expressed a strong desire

to be allowed to incorporate the "TOR" event code in a "test" EAS message during the April 19, 2001, statewide tornado drill at 1:45 p.m. For this test, TV stations and cable systems will need to display a screen saying, "This is a test.", behind the scrolling Tornado Warning EAS message. The NWS wants to use "TOR" during the drill to truly test automated response equipment. A strong public information campaign will educate the public about the drill. That same day, an evening severe weather drill may also happen at 6:55 p.m. to promote family education of what to do in case of severe weather in the home.

- David Janda, Dane County Emergency Management, has assembled a Local EAS Committee to develop a local plan that could eventually incorporate surrounding counties. The first meeting is scheduled for June 12th at 7:00 p.m. in the office of Dane County Emergency Management, located in room 2107 of the Public Safety Building at 115 West Doty Street in Madison.

Iridium (from page 1)

of 66 satellites combined with existing terrestrial cellular systems. In March, the company had asked the federal court for permission to use \$8.3 million of its remaining money to close down, after it had been unable to find a qualified buyer. Schaumburg, IL-based Motorola has said that it will maintain the satellite constellation for a limited period of time, while finalizing a plan to de-orbit the satellites. If the no business arrangement can be made, the satellites will be positioned to re-enter the atmosphere and burn up over the Pacific Ocean.

(Information from Space.com, CNET News.com, ABCNews.com, and Motorola.com was used in this report.)

SBE Membership Report

By Paul Stoffel


The SBE National office lists Chapter 24 with 67 members, 43 who are certified. Chapter 24 mails 121 newsletters to members, sustaining members, radio and television managers, and others.

An SBE Membership Application form (.pdf format) is available for downloading and printing from the SBE web site, <www.sbe.org>.

Special Thanks to Kerry Maki and Steve Paugh for arranging the Dutch Treat Dinner and the Grand Tour of Mike Dorrrough's Short Wave Radio Facility for the May program. And a big thank you to Mike Dorrrough for allowing us to use his facility for our business meeting and his generous hospitality.

SBE RESUME SERVICE

Want to get your resume out to employers? Participate in SBE's new Resume Service, available to SBE members only, free of charge. Call the SBE National Office at (317) 253-1640 or e-mail Scott Jones at kjones@sbe.org for a Resume Service participation form.



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Michael Schetter 800 West Thorndale Avenue
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SBE Short Circuits — June 2000

By John L. Poray, CAE,
SBE Executive Director

NOMNATIONS FOR SBE FELLOWS SOUGHT

SBE members are invited to nominate a deserving member to be considered for the honor of Fellow in the Society of Broadcast Engineers. To be considered for the Fellow honor, a member must have rendered long and conspicuous service to the Society at the local or national level. He or she may also qualify if recognized as having made valuable contributions to the advancement of broadcast engineering or its allied professions, the dissemination of knowledge thereof or the promotion of its application in practice.

Those elected as Fellows will be presented at the SBE National Awards Dinner, held at the Sheraton Pittsburgh North in suburban Mars, PA on October 4, 2000.

To nominate someone, send the person's name, address and current employer, if applicable, to the

Fellowship Committee, in care of the SBE National Office, 8445 Keystone Crossing, Suite 140, Indianapolis, IN 46240. Include a summary of why this person should be granted the Fellow honor. For more information, contact Ralph Hogan, CPBE at Washington State University at rhogan@mail.wsu.edu or (509) 335-6510.

AWARDS DEADLINE EXTENDED

The deadline for nominations for National Awards has been extended to June 30. Nominations should be sent to the SBE National Office, 8445 Keystone Crossing, Suite 140, Indianapolis, IN 46240, in care of the Awards Committee.

NATIONAL MEETING SET FOR MARS

The 2000 National Meeting of the Society of Broadcast Engineers will be held at the Pittsburgh Sheraton North in Mars, Pennsylvania, October 3-4. The Sheraton is about 20 minutes north of downtown Pittsburgh on I-79. The National meeting is being held in conjunction with the Chapter 20

Regional Convention. This convention has been held for more than 25 years and features over 45 exhibitors and a full day of technical paper presentations. For more information about the National Meeting, see the June issue of the SBE SIGNAL.

MONTHLY HAMnet BRINGS SBE TO REMOTE AREAS

At 8:00 pm EST, 0000 GMT, on the second Sunday of each month, SBE Chapter 73 takes the air. Hal Hostetler, WA7BGX, of Tucson, Arizona, is the control station for the "meeting."

Updates on SBE activities are given each month and participants can discuss technical issues and visit. HAMnet was originally begun to help serve members who lived too far to attend meetings of any regular chapter, but any amateur operator is welcome and encouraged to participate. Look for HAMnet on 14.205 mHz.

Questions and comments about SBE may be e-mailed directly to Executive Director, John Poray at jporay@sbe.org.

CERTIFICATION EXAM DATES COMING UP

Check the list below for the exam period that is best for you. For more information about SBE Certification, see your Chapter Certification Chair or contact Linda Godby-Emerick, Certification Director at the SBE National Office at (317) 253-1640 or lgodby@sbe.org.

<u>2000 Exam Dates</u>	<u>Location</u>	<u>Application Deadline</u>
August 18-28	Local Chapters	July 7, 2000
November 10-20	Local Chapters	September 22, 2000
<u>2001 Exam Dates</u>	<u>Location</u>	<u>Application Deadline</u>
February 9-19	Local Chapters	December 31, 2000
April 24	NAB	March 23, 2001
June 8-18	Local Chapters	April 30, 2001
August 17-27	Local Chapters	July 9, 2001
November 9-19	Local Chapters	September 28, 2001

WBA/SBE SUMMER ENGINEERING WORKSHOP

The WBA/SBE Summer Engineering Workshop will be held at the Ramada Capital Conference Center in Eau Claire, on Wednesday, June 14, 2000.

The registration fee is \$25 for the engineering sessions, or \$40 for the entire day (which includes the evening reception and banquet).


Call the WBA to register at 608-255-2600 / 800-236-1922.



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FCC Rulemakings

FCC RULEMAKINGS

Compiled By Tom Smith

PROPOSED RULEMAKINGS

FCC 00-184

Technical Standards for Determining Eligibility For Satellite-Delivered Network Signals Pursuant To the Satellite Home Viewer Improvement Act

The FCC has issued orders concerning three issues relating to eligibility of satellite reception of network signals instead of over the air broadcast signals. In this order, they made two rulings and began an inquiry concerning the standards used to determine Grade B signal intensity for TV broadcast signals. These actions are part of requirements the FCC is adopting, due to Congressional action in the Satellite Home Viewer Act.

In the first of two rules that the FCC enacted, they added additional information to the Individual Location Longley-Rice computer model, which is used to compute whether a household is served by a TV station. The FCC added methods for accounting of the effects of vegetation and buildings on reception.

In the second rulemaking, the FCC designated the American Radio Relay League has an "independent and Neutral Entity" that can designate the person to conduct a signal strength test at a subscriber's home. The ARRL will be allowed to step in when the broadcaster and satellite provider cannot agree on who should conduct the test.

In the Notice of Inquiry that the FCC issued, they ask for comment on how

the grade "B" signal level should be computed. They noted that tuners are less noisy, antenna and transmission line for home antennas has changed, and viewers expectations concerning picture noise has risen. In general, the FCC is considering a complete overhaul of the grade "B" planning factors. The end result could cause large changes to a stations coverage area and map.

The Notice was adopted on May 22, 2000 and released on May 26th. Comments are due on June 27, 2000 and replies on July 12, 2000.

FCC 00-191

Broadcast Ownership Biennial Review

The FCC reaffirmed a number of broadcast ownership rules in this notice and also announced that they will be issuing three separate Notices of Rulemakings concerning broadcast ownership limits.

The FCC voted to retain the local radio ownership limits, the 35% national television household ownership cap, and the cable system/television cross ownership rules. They also said that the 50% ownership discount for UHF stations will be reviewed at the end of the DTV transition.

The FCC will be issuing notices of rulemakings concerning the Dual Network Rule, broadcast and newspaper cross-ownership, and on the definition of a radio market. The changes that the FCC is proposing to the Dual Network Rule would allow the four major networks (ABC, CBS, FOX, NBC) to purchase one of the two start-up networks (WB, UPN). The four major

networks would still be prohibited from buying each other. If this rule were enacted, Viacom/CBS would be able to retain UPN and not be forced to spin it off to comply with the present ownership rules.

In the proposed rulemaking concerning broadcast/newspaper cross ownership, the Commission seems inclined to loosen the rules, but not completely repeal them. There will probably be some kind of market test to determine if cross-ownership of a broadcast station and a newspaper can occur.

In the final proposed rulemaking the FCC would like to address concerns about the administration of the local radio ownership rules. The FCC addresses whether they should use Arbitron market definitions instead of signal overlap rules.

In number of instances, stations have met the overlap criteria and not been counted against the ownership limits, but have been counted as being in the same market by the rating services. This can occur with suburban stations in larger markets or adjacent small cities in smaller markets the are rated together.

The proposed rulemakings could cause more consolidation in the media with the exception of the radio market definitions. A change to a market based system for figuring ownership limits could slow consolidation in a few markets.

This notice was adopted on May 26, 2000 and released on May 30th.

Compiled from FCC Notices (www.fcc.gov)



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Transistor History (continued from page 1)

properties of the semiconductor. Dr. Bardeen won two Nobel prizes in his lifetime. He was awarded the Nobel Prize in 1956 as a co-inventor of the transistor, and in 1972 as a co-developer for the concept of superconductivity at low temperatures, usually called the BCS-theory.

Born in Amoy, China and raised in Washington State, Dr. Walter H. Brattain (1902-1987) had a Ph.D. in physics from the University of Minnesota. Walter Brattain enabled the team to triumph over difficult technical obstacles through his ingenious creativity as an experimenter and his dogged persistence. The transistor radio was one of the transistor applications that Dr. Brattain was most proud of. "This has made it possible for even the most underprivileged people to listen," said Brattain, adding, "All peoples can now, within limits, listen to what they wish, independent of what doctoral leaders might want them to hear." According to historians, Brattain admitted that he wasn't particularly pleased to listen to very loud rock and roll music on the transistor radio. After retiring from his career at Bell Laboratories, Dr. Brattain became a professor at his undergraduate alma mater, Whitman College in Walla Walla, Washington, and was also a visiting lecturer at Harvard, the University of Minnesota, and the University of Washington.

The word "transistor" stems from contracting the words *transfer resistor*.

The transistor effect was first discovered on December 16, 1947 at Bell Laboratories. On December 24, 1947, the first transistor was demonstrated to Bell Laboratories top management. The discovery of the transistor was not announced to the world until June 30, 1948.

The transistor spawned a great advancement in the field of electrical technology and also began the demise of the vacuum tube. Prior to the discovery of transistors, it was the vacuum tube that handled the processes of electronic signal amplification, generation, waveshaping and switching. However, transistors were soon favored over vacuum tubes because they perform the same functions more efficiently. Transistors offered the advantages of small physical size, mechanical ruggedness, extremely long life, and that they require no filamentary power. The discovery of the transistor allowed for two separate patents: patent number 2,502,488 for the semiconductor amplifier and patent number 2,524,035 for the three-electrode circuit element utilizing semiconductive material.

To acknowledge their great and lasting contribution to the field of electronics, Drs. Bardeen, Brattain, and Shockley were awarded the Nobel Prize in Physics in 1956 for their research on semiconductors and their discovery of the transistor effect.

CHAPTER 24 SUSTAINING MEMBERS

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Steve Paugh is the editor for the HTML Version of this Newsletter, available monthly on the SBE Chapter 24 web page.



Jon Gedymin *Reginal Sales Manager* Broadcast Video



617 Lake Road
Oconomowoc, WI 53066
Tel 800.477.6111 ext 2263
Fax 414.569.0966
jgedymin@pinnaclesys.com

Corporate Office
280 N. Bernardo Avenue
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Office (317) 253-1640 Fax (317) 253-0418 Job Line (317) 253-0474 http://www.sbe.org

Tom Sibenaller Sales Representative ROSCOR Roscor Wisconsin W6428 Schilling Road Onalaska, WI 54650 phone: 608-784-6702 fax: 608-785-0505 e-mail: tsibenaller@roscor.com

SONY Kevin Peckham Account Manager Broadcast Products Division Sony Communications Products Company 1200 North Arlington Heights Road Itasca, Illinois 60143 Telephone (608) 271-3778 (708) 773-6046 Service Center (708) 773-6037 Emer. Tech. Assist. (201) 833-9533 National Parts Center (800) 538-7550

NATIONAL TOWER SERVICE, L.L.C. Daryl Snowden/Owner Mobile: 608-751-8284 Paul Jensen/Owner Mobile: 608-235-8559 Anne Jensen/A.S.R. Mobile: 608-212-2731 4905 A Voges Rd Phone: 608-838-6837 Madison, WI 53718 Toll Free: 887-484-6837 Fax: 608-838-0404 Email: nationaltower@aol.com

CLARK WIRE & CABLE 1355 ARMOUR BOULEVARD MUNDELEIN, IL 60060-4401 (800) CABLE-IT (847) 949-9944 FAX: (847) 949-9595 E-MAIL: SALES@CLARKWC.COM WWW.CLARKWC.COM

SCHARCH ELECTRONICS CO. Small Business Communications 1105 Middleton Street MADISON, WI 53717-1078 (608) 831-2266 (800) 831-2266

27 abc WKOW Madison 5727 Tokay Boulevard Madison, Wisconsin 53719 (608) 274-1234 Fax: (608) 274-9514



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FIRST CLASS MAIL

Newsletter edited on Pagemaker 5.0 by: Mike Norton Contributors this month: Vicki W. Kipp, Mike Norton, Tom Smith, Paul Stoffel, and Tom Weeden. Thanks to Leonard Charles for his work on the Chapter 24 WWW page.

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JUNE MEETING and PROGRAM



**Society of Broadcast Engineers
CHAPTER 24 MADISON, WISCONSIN
Tuesday, June 20, 2000**

Pyle Center Tour

The meeting and program this month will be held at the UW Pyle Center. Jamie Poindexter, Technical Operations Manager for UW-Extension Instructional Communications Systems, will provide the group with a tour of the facility. ICS provides electronic communication and distance education services to University of Wisconsin institutions, state governmental agencies, and other educational, governmental and nonprofit organizations.

Parking can found at the Lake Street Ramp, which is just a short walk from both the Nitty Gritty and the Pyle Center. See you there!

**Dutch Treat Dinner at 5:30 PM
at the Nitty Gritty
223 N. Frances Street**

**Meeting and Program at 7:00 PM
at the Pyle Center
702 Landgon Street**

Visitors and guests are welcome at all of our SBE meetings!

2000 UPCOMING MEETING/PROGRAM DATES:

Day	Date	Program
Wednesday	July 19	Annual SBE Family Picnic
Thursday	August 24	Broadcast Antennas

Program Committee:	Kerry Maki 833-0047	Denise Maney 277-8001	Steve Zimmerman 274-1234	Mark Croom 271-1025	Steve Paugh 277-5139
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