

**Chapter 24
Madison, Wisconsin**

Society of Broadcast Engineers

January 1994

Dealing With Interference from Utility Companies

by Kevin Ruppert, WISC-TV

I recently was asked to speak at a seminar for area power utility line and installation technicians. This was the first time that a seminar of this type was given in the area. It was a great opportunity for me, an engineer from the only VHF station in the area, to meet and work with the guys who help my viewers get a better picture!

State public service regulations require that the power utility be responsible for interference caused by their equipment. Oftentimes, the technicians, who work along the power lines and in the towns, go beyond that responsibility to help a customer who THINKS they have a problem with utility equipment, when, in fact, the customer may be bringing the interference upon himself!

If you haven't already, it would be to your advantage to get to know the person or persons in your area that are responsible for finding and eliminating electrical interference caused by the utility. The guy who does this in my area is Rick Krakau who works for Wisconsin Power and Light Company (WP&L). Rick uses a variety of scientific equipment, and some bizarre looking gear, to help find the source of electrical interference. Rick would be one of the first to admit that what he does is part science, part luck, when tracking down the source of a customer interference complaint.

Rick covers a large part of Wisconsin in his quests. He is the only person from WP&L assigned full time to the task of helping customers with interference. Many of the line technicians employed by the company might be asked to find a problem along their power lines, even though they do not have much training in how to under-

Continued on page 4

FIBER OPTIC OSP

PART 1 - WHERE IS THE FIBER?
by Neal McLain

*Communication
Technologies, Inc.*

Fiber optic networks have attracted a lot of interest in the broadcast industry lately. They have many potential uses: remote pickups, STL, TSL, satellite signal backhaul, and video feeds to cable headends. As we learned at a recent chapter meeting, broadcasters in some cities have joined together to construct large fiber networks interconnecting many sites: studios, transmitters, government offices, sports venues, educational institutions, and cable headends.

The vast majority of the fiber in these networks is located outside of any building. To borrow a term from the telephone industry, it's "outside plant", or OSP.

This is the first in a series of articles about Fiber Optic Outside Plant. This article is an overview of the various locations where OSP can be installed; future articles will address the construction of new fiber networks:

- OSP Engineering: route planning and right-of-way acquisition.
- OSP Construction: preparation and administration of construction contracts.
- OSP Protection: protecting the completed plant from damage.

Continued on Pages 6 and 7

IN THIS ISSUE

December Meeting Minutes..... page 2

Amateur Radio..... page 3

Rulemakings..... page 3

Satellites Launched..... page 5

● Applications for Certification Exam taken during NAB94 are due Jan. 21. Contact Jim Hermanson or Tim Trendt.

JANUARY MEETING

Tuesday, January 18

DINNER: CJ's Restaurant
Located in the Westgate Mall, corner of Odana Road and Whitney Way (5:30p.m.)

MEETING (7:00 p.m.)
at WMTV

PROGRAM (7:30 p.m.)
at WMTV Channel 15
615 Forward Drive

"Antenna Change Out"
Presenter: Richard Wood
Skyline Communications

SBE National News

SHORT CIRCUITS MONTHLY ELECTRONIC VERSION

Beginning December 29, 1993, the SBE National Office will upload to the National Headquarters Bulletin Board System (BBS), a brief version of "Short Circuits". It will appear the last Wednesday of each month. This monthly update will provide members with regular and current news of National events and activities.

NEW BOOKS

AVAILABLE FROM SBE

Two new books have been added to the SBE Book Store. Fiber Optic Communications, by Lynne D. Greene and Electronic Displays: Technology, Design and Applications, by Jerry Whitaker. Content descriptions and prices of each book are available in the November/December 1993 SBE SIGNAL. SBE members receive 20 percent off the retail price of books included in the SBE Book Store.

NEW MAILING ADDRESS

The SBE National Office is phasing out the use of its Post Office Box. Please use the street address for all correspondence: SBE, 8445 Keystone Crossing, Suite 140; Indianapolis, IN 46240. The Post Office Box will still be active for the next several months.

CHAPTER 24 OFFICERS

CHAIR:

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W - 271-4321
H - 274-0041

VICE-CHAIR:

Fred Sperry (WI Public TV/TOC)
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H - 833-6074

SECRETARY:

Kerry Maki (WMSN TV)
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TREASURER:

Paul Stoffel (WI Public TV)
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Denise Maney	277-8001
Kerry Maki	833-0047
Steve Zimmerman	274-1234

Membership: Leonard Charles

Sustaining Membership: Stan Sarch

Strategic Plan: Dennis Behr

Special Events: Kevin Ruppert

Certification and Education:

Jim Hermanson (Past-Chair)
Tim Trendt, Platteville

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SBE National Vice-President & Liaison:

Terry Baun (Chapter 28 Milwaukee)
414-449-5300 (voice)
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414-873-7807 (BBS)

December Business Meeting Minutes

Chapter 24 of the Society of Broadcast Engineers met on Thursday, December 16, 1993, at the WKOW-TV's studio in Madison. Seventeen SBE members attended, twelve who were certified.

Chair Leonard Charles called the meeting to order at 7:00 p.m. Minutes were approved as printed in the newsletter.

Treasurer and Newsletter Editor Paul Stoffel reported the checking account balance. The newsletter deadline is December 31st, with the folding session set for January 5, 1994.

Membership Chair Leonard Charles reported no change in either membership or sustaining membership.

Program Chair Steve Zimmerman indicated next month's meeting and program will be at WMTV CH. 15. The program will be on WMTV's antenna change-out last summer.

Certification Chair Jim Hermanson was unable to attend, but he has a certification certificate to award at a future date.

Chair Leonard Charles said the National Office indicated 40 Chapters turned in to the regional teleconference from the 1993 Broadcasters Clinic. Due to the positive feedback on the teleconference, the SBE National Office will investigate similar satellite programming on an annual basis. Two new videos have been added to the SBE National Video Library: "The SBE National Teleconference;" and "SBE Rewind: A Historical Perspective." Also two more books have been added to the SBE Store: "Fiber Optic Communications;" and "Electronic Displays Technology Design Applications." Order forms are available in the National's SBE Signal for audio cassettes of the engineering sessions from last October's National Convention. SBE National is discontinuing their post office box. Correspondence must go to the street address:

In new business, Leonard Charles indicated the Chapter 24 executive committee will be meeting with Don Borchert in January to discuss feedback from this past November's Broadcasters Clinic. This year the WBA/SBE Summer Conference and Engineering Seminar will be in Door County.

In old business, Tom Weeden, the Broadcasters Clinic Scholarship recipient, more than fulfilled his obligatory report. He provided a newsletter review that "was just like being there."

Chair Leonard Charles announced the Chapter 24 winner of the 1993 Distinguished Service Award. For his past and continuing service to the chapter, the 1993 Distinguished Service Award was presented to Chris Cain. For the past seven years (excluding this last year), Cain served as Frequency Coordinator. When the Chapter BBS had to find a new home, he arranged with his employer to allow his office computer to become the Chapter 24 BBS during off business hours.

After the meeting was adjourned, Dan Maney provided a tour of the station describing various in-house uses of PC's, as well as custom software and circuits devised by the WKOW engineering staff.

Secretary, Kerry Maki

NEW ADDRESS FOR NOAA FORM 76-10

Submitted by Neal McLain

The National Ocean Service (NOS) recently moved to Silver Spring, Maryland. Their telephone number is 301-713-2825.

Section 17.57 of the FCC Rules requires FCC licensees and permittees planning construction or alteration of antenna structures to notify the NOS, on NOAA Form 76-10, before the construction or alteration begins, and again after it is completed. This information is used in the preparation of aeronautical charts.

The new address is listed below. This address can be used to request blank copies of Form 76-10, and to submit completed forms.

National Oceanic and Atmospheric Administration
National Ocean Service
Aeronautical Charting Division, ACB/AIS
Obstacles Verification Unit
SSMC-4 Room 5601 Obst-EAST N/CG3111x3
1305 East-West Highway
Silver Spring, MD 20910-3233

AMATEUR RADIO NEWS

by Tom Weeden, WJ9H

FCC RULEMAKINGS

● The FCC has released a proposal to grant temporary operating authority to unlicensed persons who pass the exam for a new amateur operator license. The authorization would begin when the exam is passed and an application for a license is filed, and last until a full-term license is received from the FCC, with some restrictions. The Commission said it believes this system would reduce the approximately 11,000 status inquiries it receives each year from applicants whose licenses are pending. The American Radio Relay League (ARRL) is on record against the proposal, stating there would be no means for local amateurs to check on the validity of a suspicious new operator. ARRL prefers to be able to file applications with the FCC electronically to shorten the processing time for licensing rather than the Commission issuing temporary operating authority. ARRL has noted that Congress authorized the FCC to implement electronic filing in October 1992, but it has not yet been implemented in the Amateur Radio Service.

● Meanwhile, space shuttle Commander Charles Bolden, Jr. and Mission Specialist Ronald Sega have passed their Technician-class amateur exams and are awaiting their licenses. They are scheduled to fly on mission STS-60, lifting off in late January or early February. If their licenses arrive in time, they will presumably be operating ham radio from space.

● A 222 MHz repeater operator in New York City has received a Notice of Apparent Liability (NAL) from the FCC because of interference on 243.0 MHz, a frequency used for aircraft emergency locator transmitters. The amateur said the repeater developed a weak signal on 243 MHz while in receive mode, not while it was transmitting. Although the FCC called the interference "wilful," the ham said that he had always made measurements of the repeater in transmit mode and would never have found this problem unless it had been pointed out to him. He has appealed the NAL.

(from January 1994 QST Magazine)

● ET Docket No. ET-7/FCC 93-495 Implementation of Section 17 of the Cable Television Consumer Production and Competition Act of 1992; Compatibility between cable systems and Consumer Electronics Equipment

This Rulemaking proposes to create standards to ensure compatibility between cable systems and home electronic equipment. Mainly, scrambling systems could be made more user friendly while still insuring that cable systems can insure anti-theft protections to their services.

The FCC is proposing that the cable industry adopt de-scrambling systems whereby all channels would be unscrambled when entering a subscriber's home. This would allow the consumer to watch one channel and while recording another without having to use special cabling or multiple set-top decoders. This would require a descrambler at the point where the cable enters the home.

An alternate proposal would be a standard decoder interface jack on all "cable ready" televisions and VCRs that are capable of decoding scrambled signals at baseband video and audio. This

decoder would be supplied to the subscriber for each of their sets at no cost. Comments are due on January 10, 1994, and replies on January 25, 1994. Published in the FEDERAL REGISTER on December 8, 1993, pages 64541-64542.

● ET Docket NO. 93-62/DA 93-1350 Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation.

The FCC has extended the comment period for its rulemaking of radiofrequency exposure guidelines. This is to allow for more time to assess some new data that has become available to some of the commentators.

Comments are due January 11, 1994, and replies are due February 10, 1994. The new notice was published in the FEDERAL REGISTER on November 18, 1993, page 60827.

(Compiled by Tom Smith)

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Stan Scharch

Interference

Continued from page 1

stand and track down the source of electrical interference. This was the purpose of the seminar.

Greg Groom from Blackhawk Technical College in Janesville was one of the people to organize the seminar who invited me to come and speak. At first, I was a little reluctant. I am not an expert on how power utilities can cause interference to TV and radio. But, once Greg explained he needed someone from a TV station to explain our coverage area and what kinds of complaints our VHF station deals with, it made sense for me to make an appearance.

I told those in attendance at the seminar that I was sort of on the other side of the problem from them. The calls I get several times a week are from viewers who think they might be the victims of interference caused by power lines. Many of the calls I get are from viewers who ask, "What is wrong with your station?" or, "Are you trying to save money by reducing your power?" I would ask where the caller lives and what kind of antenna were they using.

I showed the seminar attendees a map of our coverage area with the City grade, and A and B contours on it. I explained that our station is very concerned when there is reception problems in the grade A area. The seminar attendees were interested in what this expected service area was. They had no idea of the size of the service area until I showed them the map. Photocopies of our station's coverage map were distributed.

A valuable part of the seminar for me, as well as the others attending, was Rick Krakau's description of how to best find the source of electrical power interference. Rick has, as I mentioned before, several pieces of expensive gear that WP&L supplies to him. The problem, however, is that Rick, his truck and his equipment can't be everywhere when interference is experienced. With a minimum of equipment and some com-

mon sense, Rick showed how to narrow down the source of the interference problem.

One simple piece of gear that Rick has found useful is a plain old multi-band radio. It's the kind that you can buy at Radio Shack that has AM, TV low band, and TV high band on it. For many years, WP&L has been using this type of radio with a VU meter added across the speaker output. This gives you a visual indication of the interference as well as an aural one! All of us have heard the crackling sound from bad interference to AM radio and tried to use an AM radio to track down the source of the interference.

Power system interference is generally broadband in frequency. With the low frequencies of AM radio, Rick explained, the interference source could be very far away, and could, in fact, be caused by several sources at the same time. The higher frequencies don't travel as far from the source as the lower frequencies.

Rick says that he generally likes to start out on the TV low band and listen for the noise. Then, try to zero in on the noise by walking or driving along the power lines. Rick often does this from his truck while driving up and down along the power poles. With luck and patience, he will come to a place where the noise starts to go down. Back up and find where it peaks, then switch to TV high band. Repeat the process and you should be able to narrow the noise down to one or two power poles.

At this point, due to risk of electrocution or damage to utility equipment, it is recommended to contact the utility

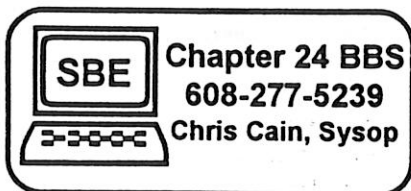
company. The linemen and installers have power line sniffers that can further pin point the source of the interference which is often caused by a loose bolt or insulator on the pole. The same multi-band radio technique could also be used inside a viewer's house or commercial building.

Rich spent some time explaining the different sources of interference that are not from utility equipment. Chief among these are electric motors, home electronics, and doorbell transformers.

I had a pretty good idea how a motor or personal computer could create interference, but what about doorbell transformers? How can they create interference? Rich said doorbell transformers have built in over-heat protection. If a transformer with the wrong temperature rating is installed in a hot attic, or the transformer starts to age, the over temperature switch will cycle on and off, causing an arc on each cycle. When you see or hear consistent interference, occurring every 10 seconds or so, you might have a bad transformer in the home.

Antenna booster amplifiers are also a prime source of interference.

WP&L has a booklet that explains how power system interference can be caused and how it travels. Booklets can be obtained by contacting your local utility. Also, the FCC has a book for viewers and listeners to help them with interference problems and to get them taken care of. Cooperation between the utility and the broadcast station can help track down sources of interference that prevent your viewers from getting a good signal.



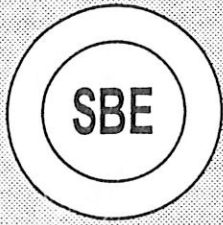
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National Parts Center (800) 538-7550

JANUARY MEETING and PROGRAM



Society of Broadcast Engineers CHAPTER 24 MADISON, WISCONSIN Tuesday, January 18, 1994

5:30 p.m. Dinner at CJ's Restaurant in the Westgate Mall
7:00 p.m. Meeting and Program at WMTV Studio, 615 Forward Drive

WMTV's Antenna Change Out

Tom Weeden, Chief Engineer of WMTV, and Richard Wood, Skyline Communications, will speak about the installation of WMTV's new antenna. Tom has edited a videotape that chronicles the June 27, 1993 antenna installation project. Five cameras recorded video, including one camera mounted on the new antenna as it rode up under a helicopter.

Also, as part of the program, there will be an update from Richard Wood on the pending State of Wisconsin code changes known as TRANS 56 proposed back in October 1992.

Happy New Year to all of you with the SBE. I am proud to announce that 1993 has been our biggest year to date. I know sometimes scheduling work with us is difficult, and I apologize for that. As with all of your sales departments, we are looking several months ahead and trying to ensure a steady workload. Planned construction or maintenance will always take a back seat when a station has an emergency situation. So, please be sure to indicate if you need immediate repairs when contacting our office.

But where has Skyline been this year? Mostly within the state or close by. I went through our work orders, and here are the totals - Out of a possible 260 work days in '93, we only lost 23 days to bad weather and equipment repairs. Of that 237 days worked, 121 of them were on construction projects, and 117 were spent on maintenance projects. The

maintenance projects breakdown to 46 days with broadcasters and 71 days with telecommunications systems. The total amount of tower steel raised in '93 was 3,920 feet; this required tensioning of 8 miles of guy cables and installing 6 miles of transmission lines (with proper hanger spacing, that is roughly 10,568 hangers)!!! All this with a staff of 5 full-time people.

My role as President of Skyline is to ensure the best quality craftsmanship to our customers and consistent employment to our people. Balancing these needs and trying to control the weather is a full-time position. I take great pride in being part of the communications industry and working with professional engineers on a daily basis. Thank you for your support, and the best to you all in 1994.

Richard H. Wood, President
Skyline Communications, Ltd.

Visitors and guests are welcome at all our SBE meetings!

1994 MEETING/PROGRAM DATES

Date	Topic	Location of Meeting / Dinner	Presenter
Feb. 23, '94	Wed. Telephone Equip. for Broadcasters	WISC / Shakey's West	Stan Sarch
Mar. 31, '94	Thurs. NAB Review		Members
Apr. 26, '94	Tues. Elections and Vender Program		Roscor
May 25, '94	Wed. Advanced Electronics	UW Hospital? / T.B.A.	T.B.A.

Program Committee:	Mark Croom 271-1150	Kerry Maki 833-0047	Denise Maney 277-8001	Steve Zimmerman 274-1234
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News From Other Chapters

SBE WAVEGUIDE Chapter 16, Inc., Seattle "The End User" by Richard Jones

Let's discuss a form of transmission that is becoming more common and is routinely upgraded as technology continues to improve. I'm not talking about RF transmission or broadcasting at all. It's modems and computers. The word modem is a contraction of two words, MOdulator/DEModulator, and is used to transmit information between two or more computers by converting bits and bytes into audio signals which then can be sent over phone lines or other forms of carrier. Modem technology has continued to grow as new speeds and error correction protocols have advanced over the years. Starting out with speeds of only about 300 bits per second (BPS) modems seemingly crawled while transmitting computer information. Speeds increased until 1200 bps became a new standard and was commonly in use as recently as five or six years ago.

In the last couple of years 2400 bps modems have been standard but is now giving way to the blazing speed of 14,400 bps with new error correction algorithms which help to overcome errors introduced by line noise frequently found in phone lines. As the speeds increased line noise became an increasingly important factor to be overcome. But along with the increase in speed more sophisticated error correction also was introduced to counteract line noise problems.

Where does that put things now?

Modems come in two basic forms that allow for connection to the computer. The external unit is usually an outboard configuration with lights and sleek looking case which is then connected to the computer through a serial port.

A less expensive kind called an internal modem is simply a circuit board which is inserted into a spare expansion slot inside the computer and is essentially invisible. In both cases a terminal program is required in order to control the modem and to send information. Many terminal programs have been written and usually are compatible with most available modems.

Information is often sent through modems in two forms. Either in text and ASCII or through a file compression scheme which uses another algorithm allowing for quick transfer of information. In the latter, an entire file is compressed into a new file, most commonly these days "zipped" into a neat little package and transmitted via modem by the telecommunications software previously mentioned.

Many of the newer modems becoming available are now capable of transmitting messages to and from fax machines as well as sending data between computers. These dual mode systems, along with falling prices, are supporting an increase in online communication and competition among several services which provide information and forums for a fee. Expect this trend to continue.

As you may well know, the national SBE office is now able to communicate with the various chapters using a loosely organized network called the "Fidonet" which allows for a low cost means of information to be exchanged. As more and more computers come online the SBE Net should continue to grow and modems may become the primary source of communications for the SBE.

SBE WAVEGUIDE Chapter 16, Inc., Seattle CLAY'S CORNER by Clay Freinwald

Seattle's Hatfield and Dawson, along with many other consulting engineers, have told the FCC to scrap the long time method of determining the performance of AM directional arrays. They feel that with today's computer programs and antenna monitoring equipment, the time has come to re-direct the faith. Perhaps the days of driving for miles and miles following "radials" out into the hinterlands will be replaced with something that is more reasonable, and a whole lot faster. Let's hope the FCC will listen to these suggestions and bring these regulations into the '90s.

Judy at the FCC sent me a release from the Commish listing fines the FCC has recently handed out to Broadcasters who have been caught being naughty. To help you check to see if your shop is in order here is a list of the reasons for these notices:

1. EBS - Equipment missing, tests not made or logged, failure to have an authenticator list.
 2. Public File - Missing or incomplete.
 3. Remote Control - equipment not working, meters not calibrated.
 4. Overpower operation.
 5. Antenna base current meter missing.
 6. Antenna base current ratios deviated excessively.
 7. Operators not licensed, licenses not posted.
 8. Unable to observe meters.
 9. Antenna fences not locked.
 10. Equipment performance measurements not made.
- The fines ranged from a low of \$125 to a high of \$13,600.

THE BROADCAST NEWSLETTER Terry Baun, Chapter 28, Milwaukee

The FCC has initiated an inquiry into aural modulation measurement for broadcasters. The Commission is seeking information that will enable it to set meaningful modulation limits of peak amplitude with regard to peak duration, peak recurrence rates and the time interval over which the peaks are to be counted.

Nearly 1000 AM stations have applied for migration to the new 1610 to 1700 expanded AM band. One station, KXEN St. Louis is giving up its 1010 Khz 50KW daytime signal for a 10KW/1KW allotment in the new band. Computing the allotment is expected to take several months.

January 22 marks the SBE Executive Committee meeting in Washington, DC. Terry Baun plans on attending, so if you have anything you wish brought before the SBE at the national level, please get that information to Terry (414-449-5300) before Friday January 21. There will be a report on the meeting in next month's newsletter.

WORLD MEDIA EXPO is the name chosen for the combined fall exhibitions of SBE, SMPTE, RTNDA, and the NAB Radio Show. The name refers only to the joint exhibition and not to the individual conferences, which will maintain their separate identities. Our participation will be promoted as the "SBE Engineering Conference and World Media Expo."

SATELLITES LAUNCHED

Submitted by Tom Smith

ABC/PBS Get New Home in the Sky

On December 15, AT&T put Telstar 401 into orbit. It's launch had been delayed two weeks due to weather and the return of the space shuttle Endeavour.

The new satellite will occupy the spot where Telstar 301 (97 degrees). It has 24 C-band and 24 KU-band transponders.

ABC will occupy 2 KU-band and 5 C-band transponders. PBS will occupy 6 KU-band and 1 C-band transponders. Starting later this year, PBS will use digital compression on its transponders to get up to eight channels of video to a transponder.

Other users of the satellite are the South Carolina and Georgia ETV networks, IDB, Keystone and Starcom.

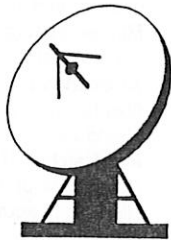
It is the first of three new birds for AT&T at a cost of \$600 million for the satellite and launch.

DBS Bird Finally Flies

The first high powered DBS satellite was launched by GM Hughes on December 17 from French Guiana in South America on an Arianespace rocket.

The new satellite will be used by both GM Hughes DirecTV and Hubbard Broadcasting's United States Satellite Broadcasting (USSB). DirecTV will uplink from their new control center in Castle Rock, Colorado and USSB will uplink from Oakdale, Minnesota.

USSB will have five of the 16 transponders with DirecTV having the other 11 transponders. They will be using digital compression at a ratio of 5 to 1. This will give a channel capacity of 5 per transponder. A second DBS satellite will be launched in June with DirecTV having all



16 transponders. This will give DirecTV 150 to 200 channels. There are also 16 inactive transponders as back-up.

They hope to start their program services in April. This hinges on the already-behind-schedule digital encoder getting finished. The receivers are in production at present. The first receivers will be for test purposes, with full production in the fall of 1994.

The receivers are being built by Thomson Consumer Electronics through an agreement with Hughes under the RCA label. They will be sole supplier until they have sold one million units or for the first eighteen months, whichever comes first. After that point, other companies can produce the receivers. SONY has signed an agreement with Hughes to produce receivers after which Thomson/RCA exclusive rights are up.

The receiver, an 18 inch dish, and remote will cost \$699. A dual output model to serve two TVs will cost \$899. Installation is \$150 and will be available from dealers. Receivers and dishes will be available from RCA dealers, Sears and Circuit City. Thomson also has dealership agreements with traditional satellite dealers.

Program costs have not been set, but USSB plans to set aside some channels for non-fee services. Some of the USSB programming includes HBO, Cinemax, Showtime, The Movie Channel, Lifetime and the ALL News Channel. DirecTV programming includes The Cartoon Network, CMT: Country Music Television, CNN, CNN International, Courtroom TV, C-SPAN and C-SPAN 2, The Discovery Channel, The Disney Channel, E! Entertainment Channel, The Family Channel, The Travel Channel, The Weather Channel, TBS, TNT, Turner Classic Movies, USA, Newsworld International and Northstar. DirecTV will use its remaining channels for pay per view movies and sports.

Hughes thinks that it will need at least 3 million subscribers to break even. Industry executives

Continued on page 8

CHAPTER 24 SUSTAINING MEMBERS

- Tectan, Inc.
- Maney Logic
- Electronic Industries
- The Tape Co.
- WMTV 15
- Clark Wire and Cable
- Teleport Minnesota
- Emmons Associates
- CTI
- Panasonic Broadcast
- Comark Communications
- WMSN 47
- Broadcast Communications
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- Skyline Communications
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Fiber Optics

Continued from page 1

WHERE IS OSP FIBER LOCATED?

Or, asked another way: if you were going to go out and look for some existing fiber, where would you look?

Fiber can be located just about anywhere, either overhead or underground. Most fiber is placed in one of five locations, as shown in Figure 1. These locations are:

- Overhead, in the "supply space" of poles or towers.
- Overhead, in the "communications space" of poles or towers.
- Underground, directly buried.
- Underground, in conduit-and-manhole systems.
- Underground, in other existing structures such as service tunnels or abandoned pipelines.

THE SUPPLY SPACE

The "supply space" of a pole or tower is the portion of the structure devoted to electric power supply (transmission and distribution) facilities. The supply space may occupy the entire structure or a portion of the structure. In general, the supply space is uppermost on the structure.

The National Electrical Safety Code permits the installation of fiber optic cables within the supply space of a structure if the cables meet the safety specifications applicable to grounded electrical conductors. In essence, this means that the fiber optic cable must be electrically and mechanically equivalent to an uninsulated stranded steel cable, and it must be grounded.

A special type of fiber optic cable, called "Optical Ground Wire", or OPGW, is manufactured for this purpose (see Figure 2).

OPGW is typically placed at the very top of the structure. This is the position normally occupied by the so-called "static wire" — the

grounded wire placed above all energized electrical conductors to protect them from lightning. In this position, the OPGW replaces the static wire, and serves the dual purpose of providing lightning-protection while simultaneously providing a communications path.

A typical OPGW installation may be seen in Fitchburg, at the top of the MG&E transmission line. This installation was constructed by Norlight, and is now owned by Midwestern Relay Company. Best viewing spots:

- Seminole Highway 0.5 mile south of McKee Road. At this point, the transmission line is supported by steel towers. Two static wires are visible; the south static wire is OPGW. Compare the attachment devices where the wires are attached to the tower.
- McKee Rd 0.3 mile west of Seminole Hwy, at the railroad crossing. North of McKee, the transmission line is supported by wood poles on the west side of the railroad. The OPGW is the wire at the top; note that it is attached directly to the poles, without insulators.

THE COMMUNICATIONS SPACE

The "communications space" of a pole or tower is the portion of the structure devoted to communications facilities of any type. Communications facilities include telephone and cable television; in some cases, additional facilities for fire alarm, police alarm, traffic-signal control, or general-purpose data transmission may be present.

The communications space may occupy the entire structure or a portion of the structure. If both spaces are present on the same structure, the communications space is always below the supply space.

The National Electrical Safety Code permits the installation of fiber optic facilities within the communications space of a structure if the facilities meet the safety specifications applicable to other communications facilities. In essence, this means that all exposed metallic surfaces must be bonded together and grounded, and that all communications facilities must maintain specified clearances above the ground and below the supply space.

Fiber optic cables intended for installation in the communications space typically incorpo-

rate a steel or nylon "strength member" and an overall plastic jacket. They are installed by lashing to a supporting strand, typically 1/4" or 3/8" stranded steel (see Figure 3). In some installations, OPGW is used; OPGW is self-supporting, and is installed without strand.

Communications-space fiber installations may be seen in several places in Dane County. Two examples:

- A typical installation employing OPGW may be seen at several points along the former Illinois Central Gulf Railroad in Madison. This installation was constructed by Norlight, and is now owned by Midwestern Relay Company. Good viewing spots include the railroad crossing at Hammersley Road near RW Communications, and the intersection of Regent and Monroe Streets.
- TCI Cablevision is presently constructing an extensive fiber network. Although actual fiber has not yet been installed, the supporting strand can be seen in several places: along Fish Hatchery Road in Fitchburg; along Airport Road west of Middleton; and along County Highway M south of Sun Prairie.

DIRECT BURIAL

Fiber optic cables suitable for direct burial are available from several manufacturers. These cables typically incorporate a steel or nylon strength member and a heavy plastic jacket. Some direct-burial cables incorporate steel jackets to provide mechanical protection. Some direct-burial cables are impregnated with a sticky, viscous fluid called "flooding compound" which (at least theoretically) reseals the plastic jacket if it is damaged.

Buried fiber cables obviously can't be seen, but they are frequently identified by above-ground signs or other markings as a warning to persons planning excavation work.

Buried fiber installations exist in several places in Dane County:

- Sprint owns a buried fiber along the Glacier Drumlín Trail east of Madison. Permanent signs marking this fiber are visible at every road crossing. At creek crossings, conduits supporting the fiber are visible on the south side of the old wood railroad trestles.
- Mid-Plains Telephone owns a buried fiber along High Point Road south of Mineral Point Road. Permanent signs marking this fiber are visible at intervals along the road.
- WMSN owns a buried fiber between its studio and transmitter buildings. Temporary markings are frequently visible along the route: orange paint (in the eastbound right-turn lane of Mineral Point Road just west of Commerce Drive) and orange flags (at the north end of the driveway leading to the transmitter).

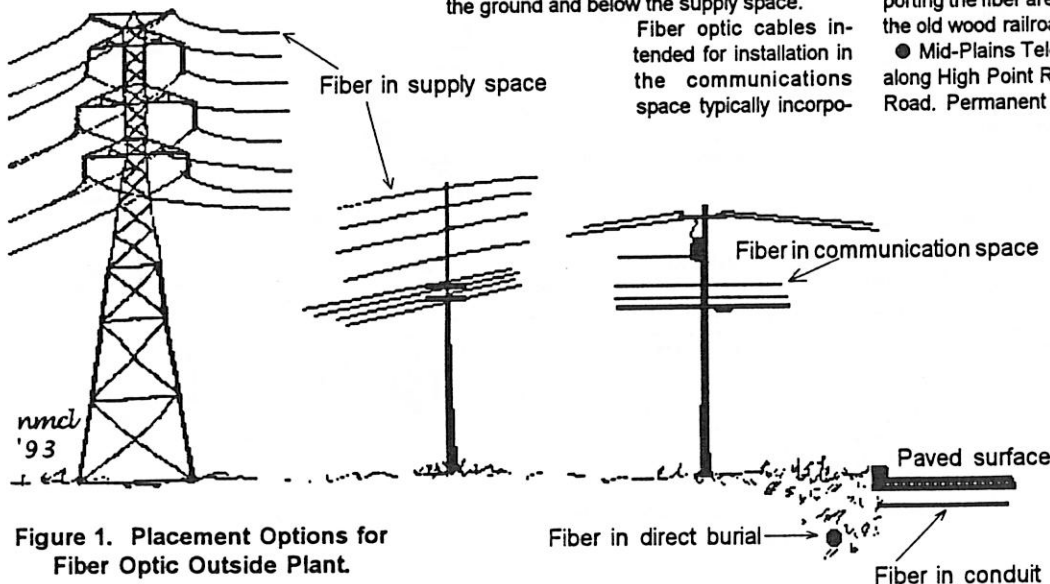


Figure 1. Placement Options for Fiber Optic Outside Plant.

CONDUIT-&-MANHOLE SYSTEMS

Fiber optic cables intended for direct burial can be installed in conduit-and-manhole systems. Although conduit-and-manhole systems are extremely expensive to construct, they afford two significant advantages over direct burial:

- They provide excellent protection against accidental damage.
- Cables can be added, removed, or replaced without digging.

Like direct-burial, conduit-and-manhole installations can't be seen, but they are usually identified by logos or other markings on manhole covers.

Conduit-and-manhole fiber installations exist throughout Madison.

Two examples:

- Ameritech owns an extensive fiber network which interconnects its six telephone exchange buildings. Manhole covers bear various versions of the old "Bell System" logo.
- The University of Wisconsin owns an extensive conduit-and-manhole system on campus. Manhole covers bear the legend "UW SIGNAL".

OTHER UNDERGROUND STRUCTURES

Fiber optic cables intended for direct burial are frequently installed in existing underground structures originally designed for other purposes. Three examples:

- On most large university campuses, including UW, buildings are interconnected by underground service tunnels originally constructed to house steam pipes. Over the years, wires and cables of every description, including fiber, have been installed in these tunnels.
- In many large cities, old coal-delivery tunnel systems still exist, and are now utilized for cables. The famous flooded tunnel in Chicago contained fiber cables owned by Ameritech and TCI Cablevision.
- Witel, a subsidiary of Williams Pipeline Company, owns a nationwide fiber-optic network. Many of its fiber cables are installed in abandoned petroleum pipelines.

WHERE WOULD A NEW FIBER NETWORK BE PLACED?

If one wished to construct a new fiber network, where would it be placed?

The first step is to determine which of the five locations described above will be used. Right off the bat, some decisions are easy:

- If you happen to be lucky enough to have access to an existing conduit-and-manhole system or some other usable existing structure, the decision is obvious.

● Unless you're an electric utility company, you can rule out the "supply space" of existing poles and towers. Working around power lines is a dangerous business; for liability reasons, utility companies are unlikely to allow anyone other than their own employees anywhere near their power lines.

That leaves two choices: overhead, in the communications space of existing utility poles, and direct burial.

We will discuss these choices further in future articles.

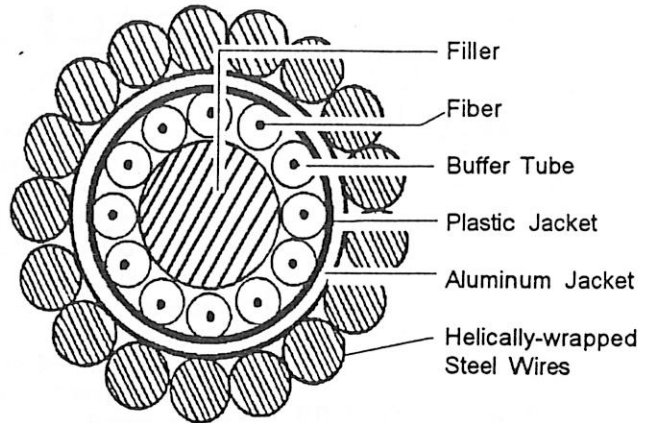


Figure 2. Self-supporting Optical Ground Wire (OPGW).

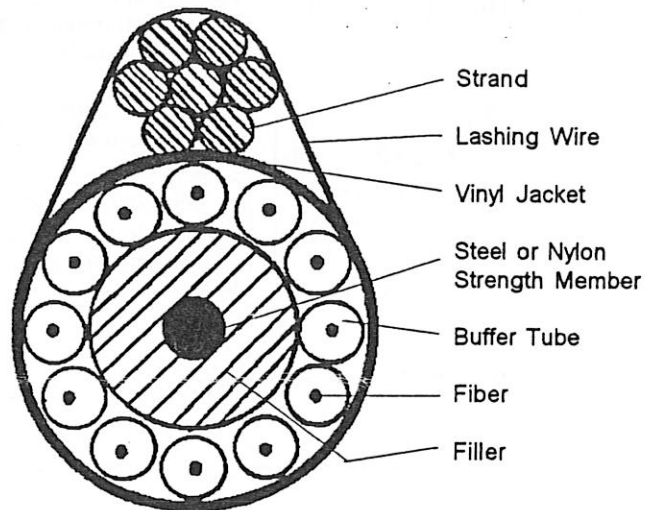


Figure 3. Optical Fiber Cable lashed to steel supporting strand.

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Satellites

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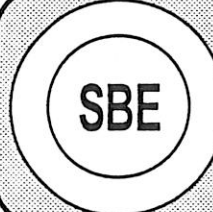
have expressed mixed emotions about DBS's success pointing to the entrenchment of cable, lack of local programming and cost of equipment as negatives. Predicted pluses include increased choice of program sources, dissatisfaction with cable and pay per view services.

There are high power DBS services already in Europe and Japan. In the U.S. there is a medium power DBS service to 3-6 foot dishes. It is called Primestar and is run by a group of cable companies including TCI, Time-Warner, Cox and others. It is aimed mainly to uncabled areas. Primestar will soon be converting to General Instruments Digicipher video compression system which will allow them to increase to 70 channels.

(Some information from Broadcasting & Cable and TV Technology magazines.)

Leonard Charles is the editor for the Electronic Version of this Newsletter that is available on the Chapter 24 BBS.

CERTIFICATION EXAM DEADLINES		
1994 Test Dates	Location	Application Deadline
March 22	NAB Convention	January 21
June 3-13	Local Chapters	April 15
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November 4-14	Local Chapters	September 9



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