

SPREAD SPECTRUM SCENE

The PCN / PCS, LAN / MAN / WAN
and CDMA / TDMA Newsletter

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- - - - Premier Issue Editorial - - - -

Welcome to SSS - What's Happening in PCN / PCS & Packet in Industry, Govern- ment, Regulatory and Amateur Circles!

By Randy Roberts - Publisher

This very first issue of Spread Spectrum Scene - The Only Monthly Information Source Covering: Spread Spectrum - brings a lot of news. It also introduces us and shows what is possible in a small newsletter. We certainly have great plans and hope to grow in size, readership, scope and most importantly in objectivity and candor.

Our initial issue covers some of the latest happenings at WARC in Tourmolenos, Spain, Industry News, New Products, a regular technical column: this one covering simple PN (Pseudo Noise) generators, a short **classifieds** section and finally a reader service / comment / information **tearout**. We hope to be responsive to reader needs and fill a void in this rapidly expanding field.

The commercial emergence of Spread Spectrum (SS) equipment following the FCC's SS rulemakings of the last several years has created a fascinating, highly charged, dynamic technical and regulatory environment. We plan to offer, in this single journal, coverage of significant and informative events or is&es on International, United States, Professional, Commercial / Industrial fronts, experimenter, student and Radio Amateur (Ham) activities in **SSS**. We also plan to offer educational and practical "How to do it" articles as well as the proverbial "Hints and Rinks" or Technical letters from our readers. We can only succeed if you, our readers are interested in this technology, this newsletter and are interested in submitting letters and information for publication in SSS. Thanks for your interest and time - till May!

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Regulatory Scene:

WARC is finally over! All that log rolling and international intrigue with secret alliances and hidden agendas - there must be a better way! Motorola's IRIDIUM system met with stiff European PTT (postal telephone and telegraph) resistance. It seems that the Europeans are very happy with the Cellular systems and PCN / PCS's they now have or are currently installing. They are also worried they might be cut out of the revenue collection end of things with IRIDIUM in place. The thirty three European country CEPT (Conference of European Postal and Telecommunications Administrations) lined up in opposition to the USA teamed with some of the poorer and Eastern European countries. Japan played sort of like an ostrich, despite having the second largest delegation at WARC. The major issue seemed to be satellite mobile telephony versus terrestrial mobile telephony. Both technical sides want more spectrum (no surprise!) By early on March 3, the USA got two new allocations: 1610-1626 MHz and 2483-2520 MHz. Now IRIDIUM and competing systems must convince the FCC of their needs. In exchange for the world wide allocations given for satellite mobile telephony, Europe got the 1500 MHz spectrum it wanted for satellite sound broadcasting.

The Europeans also succeeded in getting a new plane-phone service band at 1670-1675 MHz. Various other battles Continued on page 2

ensued over HF (high frequency, 3-30 MHz) allocations as well as the never ending fight for HDTV spectrum. Details of the outcome of WARC on these issues and related effects on the Ham bands will be reported here as soon as more information becomes available.



HAM RADIO SS STA: Are Our Ham Bands in Danger?

Robert Buaas', K6KGS and Dewayne Hendricks', **WA8DZP** long awaited Special Temporary Authority (STA) was finally **granted** by the FCC earlier this year.

The complete text of this STA is available from Mr. Buaas, the FCC and from us at a cost of \$3.00 for postage and handling.

Mr. Hendricks presented a paper at the annual TAPAR symposium in **Tuscon** earlier in March. This paper is entitled "Use of *Spread Spectrum (CDMA) in the Amateur Service*". The paper and it's appendices are very informative. The full text of the paper is available from Mr. Hendricks, the TAPAR symposium record and from us (along with the full text of the STA, mentioned above) for \$3.00 for shipping and handling.

While the Buaas STA relaxation of the part 97 rules governing SS use by Hams in this country is a major milestone meant to encourage amateur SS experimentation and foster innovative, low cost technology developments, in our opinion there is another issue lurking beneath the surface, like a great white shark. Early plans have been announced by Tetherless Access Limited (where Dewayne is president) that include the use of ham radio spectrum and power levels in support of quasi-commercial

revenue generating packet network **operations** for government funded UNIX / Internet networks in San Diego and San Jose to Sacramento areas. We feel there is a real danger here! Watch out for future "Pioneer Preference" claims to be made for ham radio spectrum in the future. I'm not saying this will happen - just that it could! I'm sure Dewayne and Bob will have something to say on this subject. In fact, guys, I'll give you a whole page next month to air your side - how *about it?*



NEW PRODUCTS:

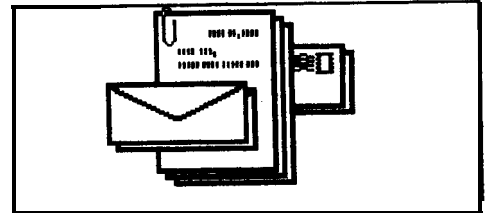
This column will be a regular feature. It will offer a free showcase to new equipment, software, services, systems, applications and enterprises (Yes, coverage of new people and new organizations or start ups.)

Please submit material to be included in this column (including scannable artwork) to the Publisher or Editor at the address or FAX number shown on **our last page**.

For this first month our only new feature is this newsletter - see the last page again for subscription information. We hope you will join with us in this exciting new field of endeavor and share your ideas, new products, **advertizing**, technical **knowhow** and comments and opinions.

One additional new (actually future) product you will see soon on these pages is short volume entitled "*Introduction to Spread Spectrum*", by your friendly Publisher, Randy Roberts. This volume will contain a practical summary of over 20 years of hands on design,

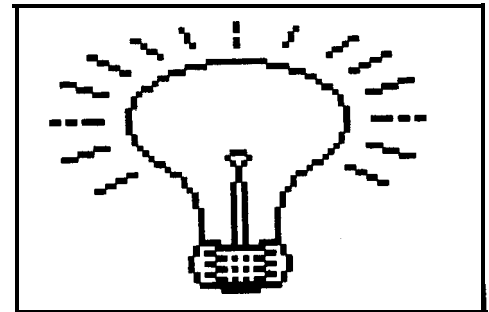
development and system integration experience. Look for it in these pages soon!



Letters to the Editor, Comments & Opinions

Since we're brand new we don't have these yet. Maybe next month you'll provide us with some.

Please!



Technical Tricks:

By Randy Roberts - **KC6YJY**

The very first technical column comes from your Publisher's toolkit. Ever need a simple, quick and dirty PN generator for data scrambling, direct sequence PN use or to pick "semi-random" hop frequencies? Then here is one tried and true as well as foolproof method that requires no EPROM or PLD programmer (or software either.)

Simple, short length (4 to 13 stage) maximal length shift register (MLSR) sequence generators are often used to provide simple PN code generators for SS systems. These simple generators usually perform very well when started from the correct initial conditions or when reset at power **Continued on page 3**

up. However, most of these simple circuits can hang up and stop generating anything (they can get stuck) when an all ones (or an all zeros) condition occurs. Which condition that causes hang up or how it got to this condition is immaterial - the darn thing is broke when this happens! The circuit concept shown in figure 1 solves this problem very nicely and even includes an EPOCH sync detector as well (for data timing, scope sync, or whatever.)

The circuit of figure 1 is a very simple 5 stage (length 31) **MLSR** PN generator that could be used under the new Ham STA (it has been used commercially by a Japanese-American company.) It is built from two **74HC175** shift registers, one **74HC86** and two **74HC30** nand gates. As shown, the generator uses feedback from the last shift register stage as well as from the second shift register stage. This connection, when started from the all zero's state will always generate the correct MLSR sequence. The top nand gate looks for the occurrence of an all one's condition (an indication of being stuck) and resets the shift registers to all zero's if this condition should ever occur. The

bottom nand gate detects the occurrence of the all zero's condition which marks the start of a PN cycle of length 31 - also known as a PN EPOCH.

This same idea will work with virtually any size PN generator made from a **MLSR** sequence. Simply decode both all one's and all zero's states, use them correctly and Voila!

The speed capability of this circuit is pretty high. Since the design is fully static, there is no low frequency limit - it could be as slow as a chip per day or so. It can run as fast as the accumulated delays down the shift register / EXOR chain. In the 5 stage design shown here, be careful running this design much beyond 10 MHz. Faster speeds are possible with F-speed logic substituted for the HC parts shown. Still greater speeds are possible with ECL implementations. However, to really go above say 30 MHz, a clever design might use a small ECL **RAM** as a recirculating delay line and tap off the PN as desired. The RAM could be loaded at power up by a host micro-processor through a serial or parallel I/O.

anything covered in this column are welcome. Please feel free to share any info or special knowledge you may have.

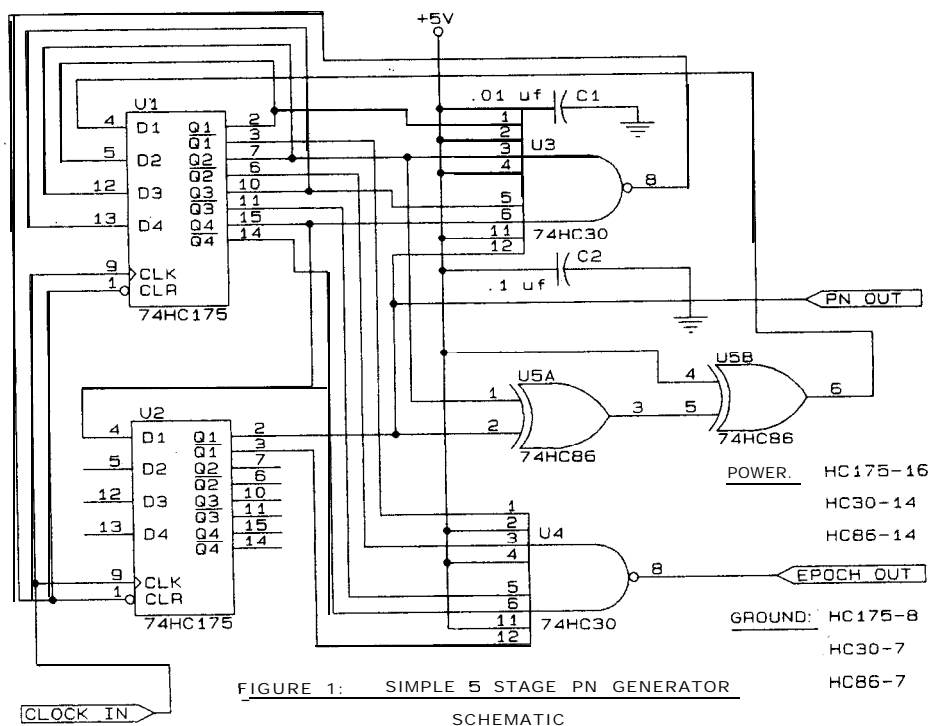
Next month we will cover a neat technique or two for generating **GOLD** (or Dr. Robert Gold of JPL codes - sometimes called Ranging) codes. These codes are very useful for generating families of codes that have excellent characteristics for **CDMA** (Code Division Multiple Access) use because of their predictable, low crosscorrelation performance.

SSS Editorial Policy:

SSS will cover all aspects of technology, regulation, people, industry news, amateur radio, new products and anything else that pertains to the commercialization and popularization of Spread Spectrum techniques. We specifically will cover **PCN / PCS, advanced digital cellular, LAN / MAN / WAN, VSAT / MAN** networks, gateways and bridges for SS networks, GPS equipment, wireless telecommunications of all sorts and other related issues and developments.

Continued on page 4

Questions, comments or suggestions on



PN PATTERN. 0000011001011011110101000100111

We hope to appeal to a professional audience as well as students, experimenters, amateur radio enthusiasts, libraries and other information storage / retrieval systems and the general commercial / industrial audience that are already, or plan to be, involved in Spread Spectrum.

SSS seeks to provide an open, un-biased forum for it's audience to exchange news, technical information, new product announcements, ideas, comments, editorials, letters and classified advertizing. SSS will provide basic and advanced tutorial information regarding SS on a regular basis. The SSS classified **advertizing** forum will encourage Help Wanted and purely personal / non-commercial advertizing by offering free space, at least initially.

As a responsible commercial entity, SSS reserves the right to edit all material submitted to it for publication. Every effort will be made to publish all submissions and **classifieds** in complete, **un-edited** form, however, due to size, length, legal or ethical reasons we may edit some material before publication.

We hope you will find this newsletter informative, useful and valuable. Our success depends entirely on your opin

May **SSS Preview**

Technical Tricks: Gold Codes, what they do and how to generate them simply

Special: installment of Introduction to Spread Spectrum

RF EXPO News

Random Bits: On SS propagation and effective range measurements

ions of us. We welcome comments,

good or bad and will publish everything submitted to us - if space permits (even if it is anonymous.) Thanks for the opportunity of presenting our ideas. Now lets hear from you!

SSS Classified Advertizing Policy:

We will encourage three kinds of classified advertizing, initially:

-Purely commercial display ~~space~~ or in-line classified ads

-Purely noncommercial, personal classified ads like used equipment for sale, services offered, etc.

- Help wanted ads

All three of the above categories should involve the SSS areas of coverage in some way - only ads for electronic or software type items will be accepted. Only the first category of ads will carry publication fees. In-line classified rates are \$50 per column inch. Display ad space rates are available from the publisher.

Free ads in the personal / non-commercial category are limited to one column inch per insertion. There is no space limit for Help Wanted ads. All free Help Wanted ads must include the name and Dhone number of a hiring manager and involve SS, networking or related skills in some way. Help wanted ads with only a reference to the HR or personnel departments are not acceptable for publication.

Please contact us if there are any questions about our ad policies or our rates. We will try to accommodate any and all reasonable requests.

Cut Along Lines and Return

SPREAD SPECTRUM SCENE

Info Request/Comment: _____

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