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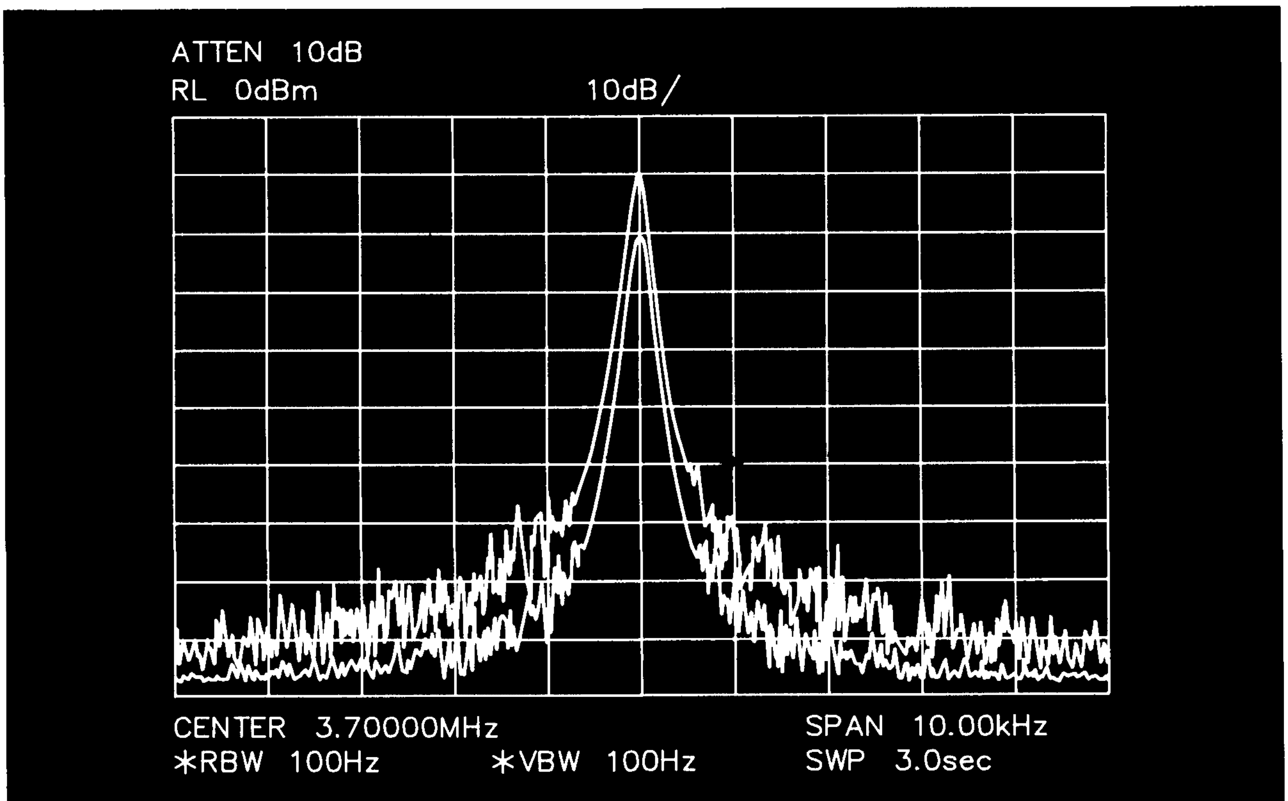
ARRL Experimenters' Exchange

MARCH 1992



WHITE NOISE TESTING

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TABLE OF CONTENTS

COLUMNS

MARCH 1992 QEX ADVERTISING INDEX

THE AMERICAN RADIO RELAY LEAGUE

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Purpose of *QEX*:

1) provide a medium for the exchange of ideas and information between Amateur Radio experimenters
2) document advanced technical work in the Amateur Radio field
3) support efforts to advance the state of the Amateur Radio art

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Both theoretical and practical technical articles are welcomed. Manuscripts should be typed and doubled spaced. Please use the standard ARRL abbreviations found in recent editions of *The ARRL Handbook*. Photos should be glossy, black and white positive prints of good definition and contrast, and should be the same size or larger than the size that is to appear in *QEX*.

Any opinions expressed in QEX are those of the authors, not necessarily those of the editor or the League. While we attempt to ensure that all articles are technically valid, authors are expected to defend their own material. Products mentioned in the text are included for your information; no endorsement is implied. The information is believed to be correct, but readers are cautioned to verify availability of the product before sending money to the vendor.

Empirically Speaking...

Rubbing Shoulders

There's nothing like rubbing shoulders with like-minded hams to remind you why you enjoy Amateur Radio so much. Most *QEX* readers are very busy people. There are always too many projects to do in the time available. At times we all run out of steam on our projects, be they computers or radios, analog or digital, HF or microwaves, satellite or terrestrial.

A great way to recharge your batteries is to get away for a weekend to a conference or convention and swap stories and ideas with others who are interested in the same things you are. Sure, you talk a lot on the air, by e-mail and on the phone. But a special kind of energy is generated at an in-person gathering, away from family, job and other distractions. You'll come away with renewed enthusiasm—and even more ideas for projects that you may get to some day.

As this is written, winter is fading into spring and the convention and conference season is heating up. Make plans to attend at least one of the events coming up this spring and summer:

- By the time you get this *QEX*, the TAPR Annual Meeting the first weekend of March will be history. Hot topics included progress on the TAPR/AMSAT DSP project and 9600-baud modems. We'll have a full report in April *QEX*.
- April 24-26 brings us the Dayton HamVention. Need I say more?
- May kicks off with the West Coast VHF Conference May 15-17 at the Ventura Holiday Inn in Ventura, California. In addition to many interesting presentations and programs, plans call for extensive antenna-gain and noise-figure measurement activities. Contact Steve Noll, WA6EJO, 1288 Winford Ave, Ventura, CA 93004, tel 805-647-4294, for more information.
- The Northeast VHF Conference is May 23-24 at a new location—the University of Hartford in Hartford, Connecticut. Another change this year: A proceedings booklet will be available to attendees and later through ARRL. In addition to the usual programs, noise-figure and antenna-gain measurement activities, you can find out the latest doings on your favorite band at one of the hour-long "band sessions". Contact Lew Collins, W1GXT, 10 Marshall Terrace, Wayland, MA 01778 or Dave Knight, KA1DT, 15 Oakdale Ave, Nashua, NH 03062 for more information.
- Although it's not on the official conference roster, many VHF/UHF enthusiasts turn out for HamCom, held June 5-7 in Arlington, Texas—right in the backyard of the North Texas Microwave Society. Kent Britain, WA5VJB, 1626 Vinyard, Grand Prairie, Texas 75052 can tell you what's planned.
- July brings the annual Central States VHF Conference in Kerrville, Texas, July 16-19. The First Worldwide VHF Ionospheric Propagation Symposium will be held in conjunction with the Central States conference, so this is the year to attend. Contact Central States VHF Conference, HCR 5 Box 334, Kerrville, TX 78028 for details.
- Two European events are planned for July 30 to August 2. The Fifth Annual 70-cm and Up Moonbounce Conference will be held that weekend in Thorn, The Netherlands. Russ Miller, N7ART, 27228 138th Ave SE, Kent, WA 98042, tel 206-630-0301, can tell you all about it. Some US moonbouncers have attended past conferences and report having a great time.
- The other event that weekend is AMSAT-UK's Colloquium '92 at the University of Surrey in England. Application forms and information will be available in April from Ron Broadbent, G3AAJ, 94 Herongate Rd, Wanstead Park, London E12 5EQ, England.

Later this year are the Mid-Atlantic States VHF Conference, AMSAT Annual Meeting and 11th ARRL Amateur Radio Digital Networking Conference.

See you there? Thanks to Bill Tynan, W3XO, for providing the information on VHF conferences.—*W4RI*

Transmitter Noise Loading

By John White, VE7AAL
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Port Moody, BC
Canada V3H 1T2

Introduction

The operating performance of a system is often revealed and characterized through the use of a single- or two-tone audio test frequency. Commonly, parameters such as harmonic distortion, intermodulation, noise and spurious emissions are referenced to the level of this test tone as it appears at the output of a transmitter.

Another method used to characterize system performance in analog communications systems is through the use of broadband white noise as a test signal which more closely represents a voice signal than does a (single-frequency sine-wave) test tone.

This article discusses the nature of this testing with respect to characterizing the transmit path of the author's transceiver (TS940) and linear amplifier (SB220), and illustrates the results through the media of spectrum analyzer plots.

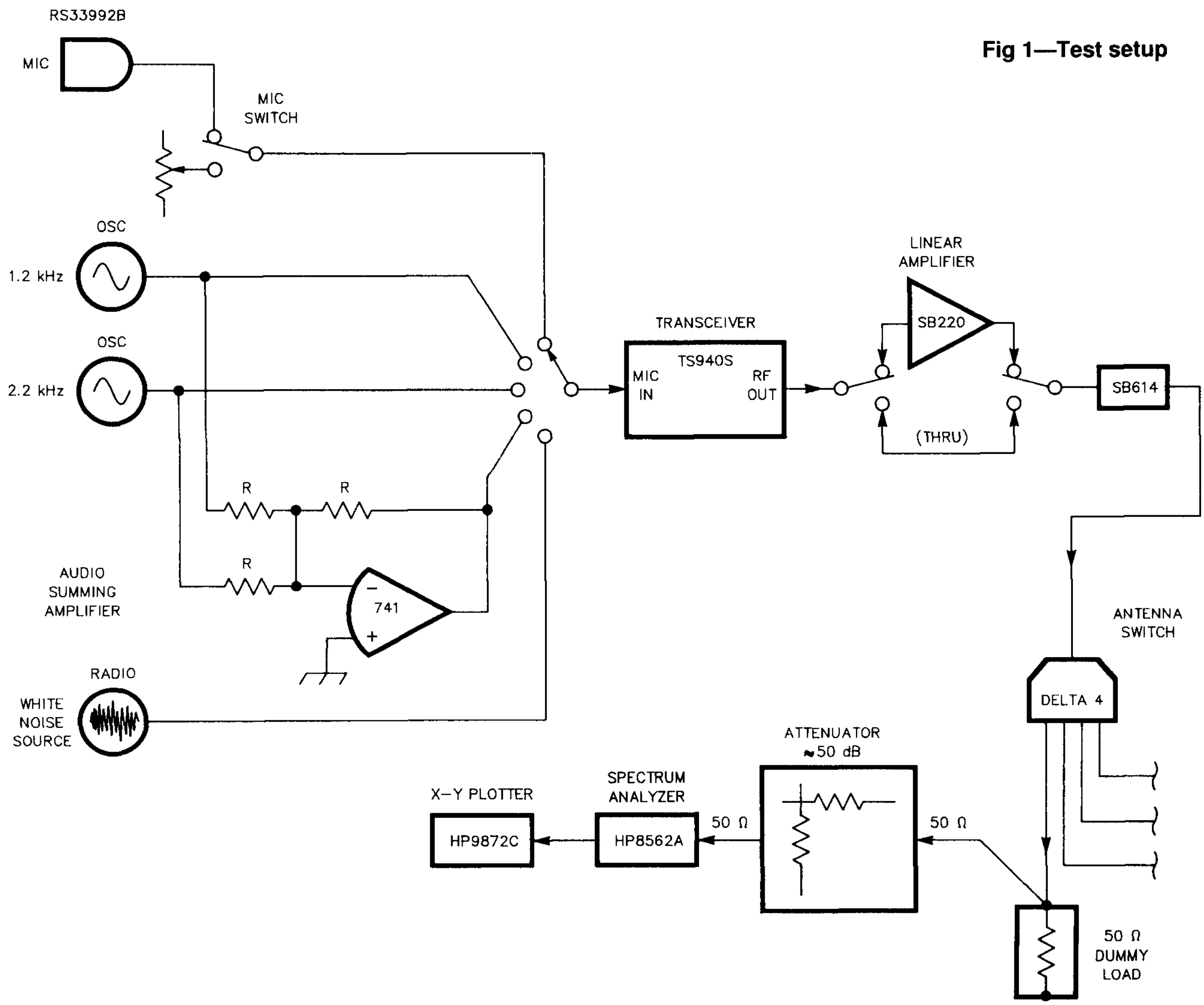


Fig 1—Test setup

Conventional Test Tone Methods and Results

Fig 1 illustrates an arrangement for the injection of an audio frequency test tone, or two, into the MIC input of a transceiver. The transceiver (exciter) is followed by a linear amplifier and the system is then terminated in a 50-Ω load. The RF envelope (time domain) is monitored with the station scope. A spectrum analyzer is bridged across the load, with a suitable attenuator to prevent overloading the sensitive front end, to measure the spectral output (frequency domain).

The following tests were done on this system using a tone as a reference.

a) CW Output—key down and tune for maximum output. Observe the spectrum around the carrier for noise and spurious emissions. Turn the linear on and off to measure the gain to see if the linear degrades the exciter spectrum. Fig 2 shows that the linear has about 10 dB of gain at the carrier frequency and, as it turns out, across the rest of the spectrum; it does not add any significant noise or spurious emissions. The noise floor is established by the exciter, in this case, likely phase noise about the carrier at ≈ 70 dB below carrier at 2 kHz.

b) Single Tone—a 1.2-kHz tone is injected into the MIC port and the exciter is set on LSB. The resultant signal in Fig 3 appears as a single RF frequency 1.2 kHz below the previous carrier frequency. There is no apparent carrier which indicates that the carrier suppression is >60 dB, nor is there evidence of the unwanted upper sideband indicating USB suppression of >70 dB. Again, the linear appears to simply act as a 10-dB gain stage at all frequencies.

c) Two Tone—a 1.2-kHz and a 2.2-kHz tone of equal level are injected into the exciter under the same conditions as before. In Fig 4 the two test tones are the two highest level spectral lines at approximately 1.2 and 2.2 kHz below the (suppressed) carrier frequency. All the other spectral lines above and below the carrier frequency are the intermodulation products. The difference in the level of the intermodulation products between the exciter and the linear can be seen. Recall that the linear should appear as a "transparent" 10-dB gain block; in this case it does not as the intermod products at >± 4 kHz show an on/off difference of >10 dB. Thus the intermod is determined by the linearity of the amplifier and not the exciter. Also note that the bandwidth of the signal is now rather wide; the –60 dBc (level with respect to the carrier) points are 18 kHz wide.

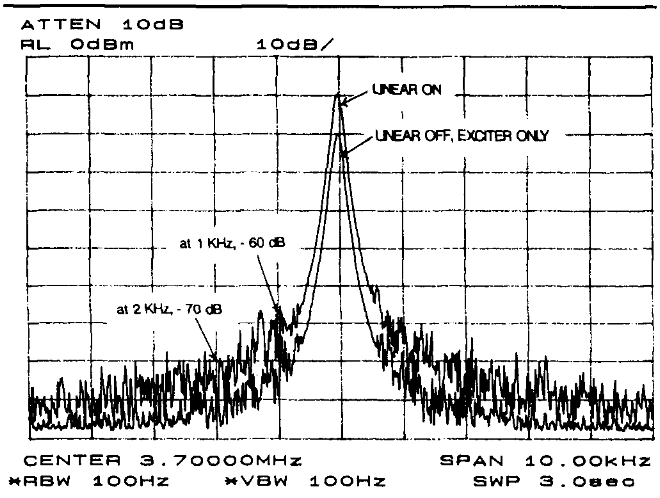


Fig 2—Carrier

Noise as a Signal

The previous results characterize the performance of the system in a very clear and repeatable fashion. However the test tones are sine waves, and voice traffic is not a sine wave. The most significant differences between a tone and a voice are embodied in the spectrum and level. Voice consists of a continuum of fre-

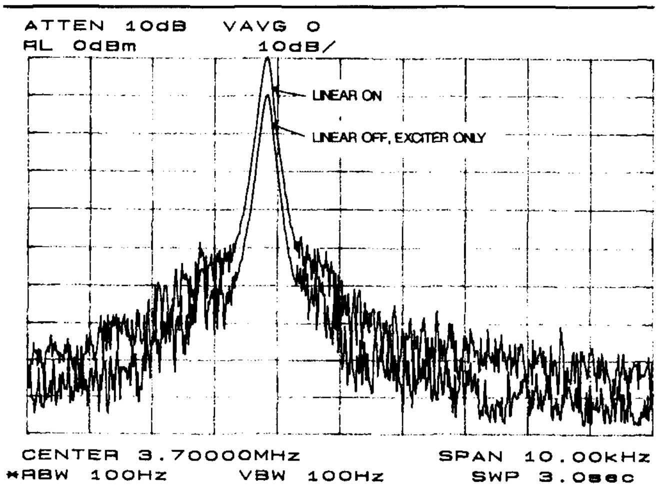


Fig 3—Single tone

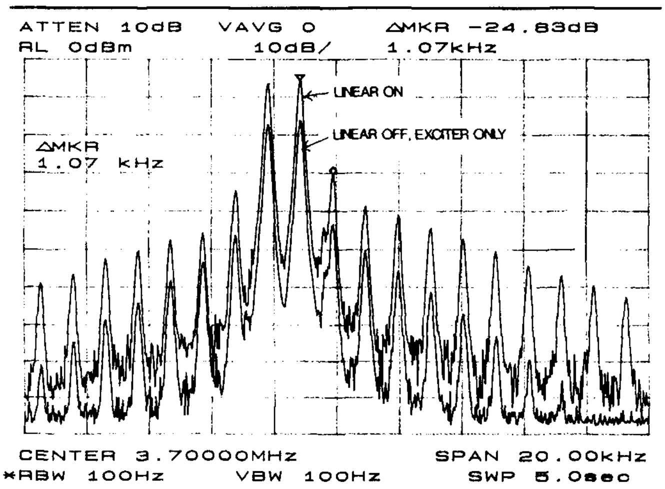


Fig 4—Two-tone intermod

quencies, about 300 to 3000 Hz for communications purposes. The level of voice also varies tremendously. Not only does it vary from "soft" to "loud" depending on speaker volume, but individual syllables have level range. The voice signal can be envisioned as a randomly varying, band limited signal with a peak to average ratio of about 24 dB (≈ 250 to 1 ratio; 99% of the time the signal will not exceed 250 × the average). Considering that the peak level may be 250 × the average signal, how does the active circuitry in the transceiver and the linear respond to this dynamic range?

In this testing, white noise is used as a signal source. The term white noise is used to describe a signal which is present at all frequencies and varies randomly in amplitude. The energy content is equal at all frequencies. The amplitude at any given frequency varies widely though. This level variation follows a statistical distribution known as the Gaussian distribution. All this really means is that for most of the time the signal is at an "average" level but it will vary randomly above and below that level in accordance with a known probability.

By band limiting this signal to ≈ 0.3/3.0 kHz, a voice signal is approximated.

Noise Sources

Where does one find a white noise source? White noise generators are common in the communications industry but not so popular in the ham fraternity, although the antenna noise impedance bridges are a good example of a source of RF white noise. For audio purposes, noise generators are not commonly available.

As a matter of interest, the leakage current of a reverse biased diode, such as a Zener, is characterized by having a randomness in the leakage current which results in an extremely wide spectral distribution from hertz to megahertz. All one needs to do is to amplify the ac component of this leakage current to a useful level and define the bandwidth.

It is not the intent of this article to describe and build a white noise source, but to explore the effects of noise on characterizing a system. Therefore a ready source of white noise was sought. A reasonable approximation was found (in the shack) in the form of the recovered audio when the radio is tuned off station such that only the "hiss" is detected.

Caution—The receiver must be in an AM or SSB mode to ensure reasonable flatness with frequency; noise resulting from FM detection has considerable slope (deemphasis) across the spectrum of about 15 dB per kHz. Fig 5 shows the noise output from the transceiver exciter in the SSB mode; the audio passband characteristics are nicely revealed. Similarly, Fig 6 shows the AM and FM noise output.

Idle Noise

Before connecting a noise source to the system, the idle noise of the transceiver was measured. Idle noise is the inherent noise generated by the circuitry in the exciter transmit path. This noise has the same characteristics as the noise sources previously mentioned except that it is generated within the transistors and integrated circuits of the exciter due to the randomness of the inherent zero signal currents.

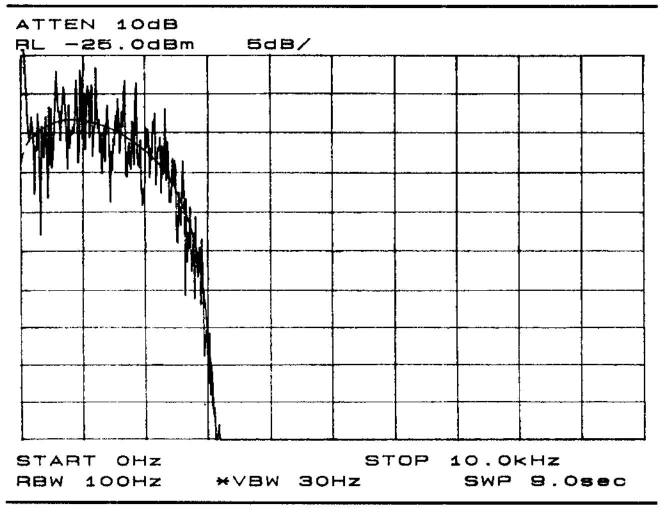


Fig 5—SSB audio noise output

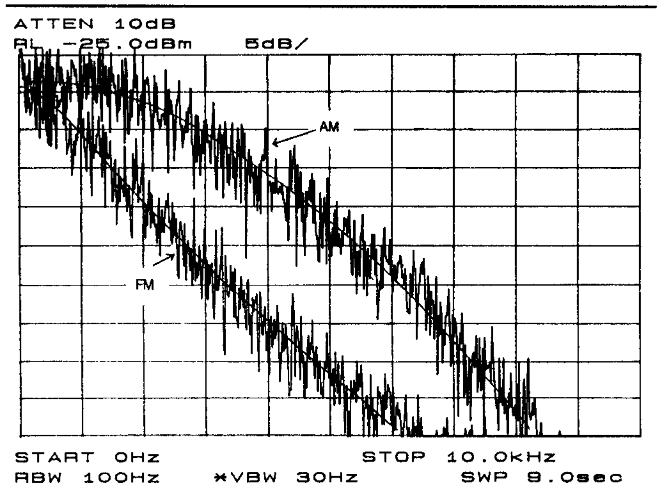


Fig 6—AM and FM audio noise output

The test consists of turning on the exciter with the MIC off and measuring the RF output. Fig 7 shows the output of the exciter for both USB and LSB. The trace is not a smooth line because the signal source is noise and the randomness of the noise level shows up as a "ragged" curve. This is not a serious problem as the trace can be averaged by the eye to reveal the "smooth" characteristic. Note the shape of the noise curves; this follows the passband response of the transceiver filter characteristics. The idle noise is about 60 dB below the CW carrier as is the suppressed carrier.

Noise Loading

The white noise from an external radio was injected into the MIC jack. Because the level varies randomly,

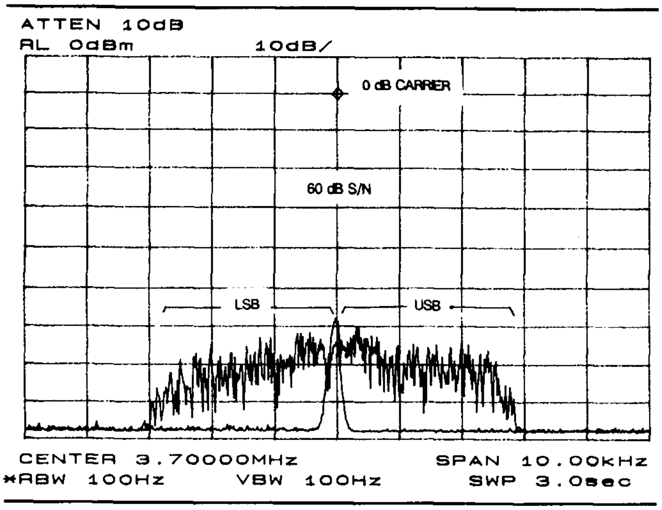


Fig 7—USB and LSB transmit idle noise

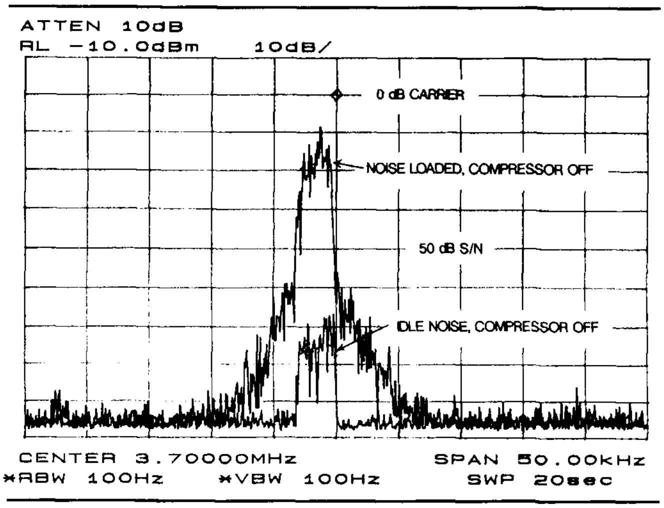


Fig 8—Exciter idle and loaded noise

there is some concern as to the correct setting of the MIC gain control. For this test the gain is set such that the ALC just peaks at the maximum limits allowed on the transceiver meter.

Fig 8 shows the output of the exciter with a white noise input and compares it to the idle noise. One can observe some interesting characteristics:

a) The exciter passband characteristics are shown. The signal is about 3 kHz wide. The edges of the passband are very steep indicating good definition of the passband, likely due to the IF filters.
b) The average level of the passband signal is about 20 dB below the carrier level. This corresponds well enough with the expected peak-to-average ratio of 24 dB. This will allow peak signals to be transmitted 99% of the time without "topping out the exciter," ie, causing serious limiting.
c) The transmitted signal-to-noise ratio is about 50 dB, which is good enough for communications quality; less than 40 dB would be noticeable as degraded audio quality.
d) There are skirts of noise on either side of the passband signal. These may be representative of the stop bands of the exciter filters and/or the intermod performance of the finals. Whatever the cause, they show that the occupied bandwidth is considerably greater than the passband. The level of the noise skirts starts at about 30 dB down from the desired passband signals and occupy a bandwidth of about 7 to 8 kHz before they reach >40 dB down. (An arbitrary criteria for the transmitted level of noninterfering signals is <10 milliwatts. For a 100-watt output signal, 40 dB of suppression is required; for 1000-watts, 50 dB of suppression is required to achieve the same level of noninterference).

The last test is to turn on the linear and note the continuum of nonlinearities revealed in the two-tone testing. Fig 9 compares the on/off performance. As expected,

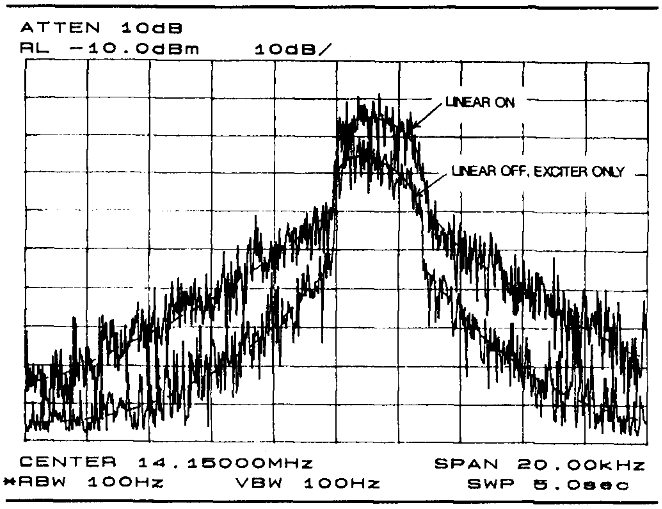


Fig 9—Linear loaded noise

there is significant difference in the skirt performance; the noise rises more (about 20 dB) than the 10 dB attributed to the amplifier gain indicating the extent on the intermod. The –50 dB bandwidth is about 14 kHz!

Conclusions

The use of white noise as a measurement tool has been demonstrated. The graphs so obtained show operating characteristics as measured in an environment more characteristic of actual conditions. As well, the graphs so obtained show continuous spectrum rather than discrete points and so passbands, skirts and intermod are given a "full view."

Acknowledgments

The author would like to thank MPR Teltech Limited for the use of the HP spectrum analyzer and plotter for the gathering of data, and Bill Orr, W6SAI, for his review and encouragement.

Connecting Two Modems to One Transceiver

By Walter E. Kaelin, KB6BT
12332 Saraglen Drive, Saratoga, CA 95070

Background

I like to operate AMTOR, PACTOR and terrestrial PSK packet. For AMTOR, I use an AMT-2 modem, on PACTOR the PTC controller, while for PSK a TNC-24 MK2 performs the modem function. To switch the cables between one or the other modem became a chore after a while, so I decided to design an interface circuit to connect the modems in parallel to the radio set and simply switch COM ports on the computer to address the desired modem. Additionally, receivers sometimes have an output impedance in excess of 600 Ω and the audio level to the modem might be too low on account of the mismatch.

Experiences With PACTOR

During a recent vacation in Switzerland, I was introduced to PACTOR. I was very much impressed by the demonstration on 80 m and decided to buy a modem kit. For a description of the modem, see the July/August '91 *RTTY Journal* and October '91 *QEX*.

By early September, I had my modem ready to go on the air, but unfortunately propagation was poor to Europe on account of a major solar flare. Mid September was a lot better and lots of QSOs resulted after a few minor cockpit problems were overcome. Within a few days, I had connected with PACTOR stations in DL, HB9, PA and SP. In Germany there are two major BBSs on the air providing interconnects with AMTOR and packet.

PACTOR is borrowing from, and improving on, AMTOR and packet. When you first power up the PACTOR Controller (PTC) you have the distinct feeling of deja vu. The terminal dialog is not too different from a TNC 2. You enter the time and date, perhaps the selcall, if it differs from the one in EPROM. All data is retained in memory by a lithium battery. You connect to another station with the familiar "c W9UWE" command, no four-letter selcall is used. All commands are in English. About the only thing that reminds you of the European origin of the modem is that the date is entered in "DD.MM.YY" fashion. Connect to your computer with only (and only) a 3-wire EIA-232 cable. TXD, RXD and ground are all the connections required. As a terminal program, I use *ProComm* version 1.1B and selected the Xon/Xoff as default flow control. The PTC has a built-in mini BBS with about 20 kbyte RAM, also backed up, and stores up to 16 messages.

The operation is fairly straight forward. If somebody connects to you, you will get the message "*** MYCAL RECEIVED" with the time and date. After the necessary data exchanges between the two modems, an additional message will be displayed *** CONNECTED TO DL7AMW" for example. Initially, operation starts out at 200 bauds. If the link qualities are poor, a downshift to 100 bauds takes place automatically. Normal keyboard operation is with the Huffman compression. Many commands are local and remote. The "dir" command will read the messages in your directory, while "//dir" will read the messages in the connected station's directory. One thing is striking while operating PACTOR, there are no errors! Your typos will come through as such and you will not be able to blame the transmission path. AMTOR was a significant step forward in error corrected teletype; PACTOR is a tremendous improvement on it.

The requirements on your rig are similar to RTTY and AMTOR. A 500-Hz CW filter helps, but is not required. The demand on turn-around time for a TX/RX and RX/TX transition is the same as for AMTOR, about 20 ms. PACTOR is heavy duty operation for your transmitter and power supply. Linear amplifiers are not required or desired, just like an AMTOR. The low tones are used, namely 1200/1400 Hz. You can use upper or lower sideband as there is no upside down operation! The modem provides for FSK or AFSK operation, user selected, as dictated by your rig.

The modem also incorporates AMTOR and RTTY operation. However, once you're hooked on PACTOR, you're not too likely to use these capabilities. More than likely you will convince your friends to get on PACTOR, too. All kidding aside, the AMTOR and RTTY modules are quite usable, albeit a bit different in operation from an AMTOR modem. There are a few minor problems with the AMTOR mode, but they are in the process of being fixed with a future firmware release.

PACTOR with its ASCII capability can forward packet messages with addresses and all over HF with a reasonable speed. The about-to-be-released version 1.2 of the firmware incorporates the "hooks" to communicate with a big BBS. The beta site, DL7AMW BBS scans PACTOR and AMTOR frequencies and messages can be read in one mode and retrieved in the other mode.

In the past few weeks, I had numerous QSOs with stations in Europe. In the US, W9UWE and K2RDX are also QRV. Small and large files have been transmitted with the typical QRM on 20 m. Traffic flow is swift and you can exchange ideas during a QSO, you're not constantly wondering if you're still connected, even with low S-meter readings. 15- and 10-m operation are quite often possible and generally less subject to QRM. The mini BBS built in the PTC allows for the distant station to leave you a message, while not at the keys, or while you use the computer for another purpose. In short, PACTOR is genuine improvement on HF data communications and readily available today.—*Walter E. Kaelin, KB6BT, 12332 Saraglen Drive, Saratoga, CA 95070*

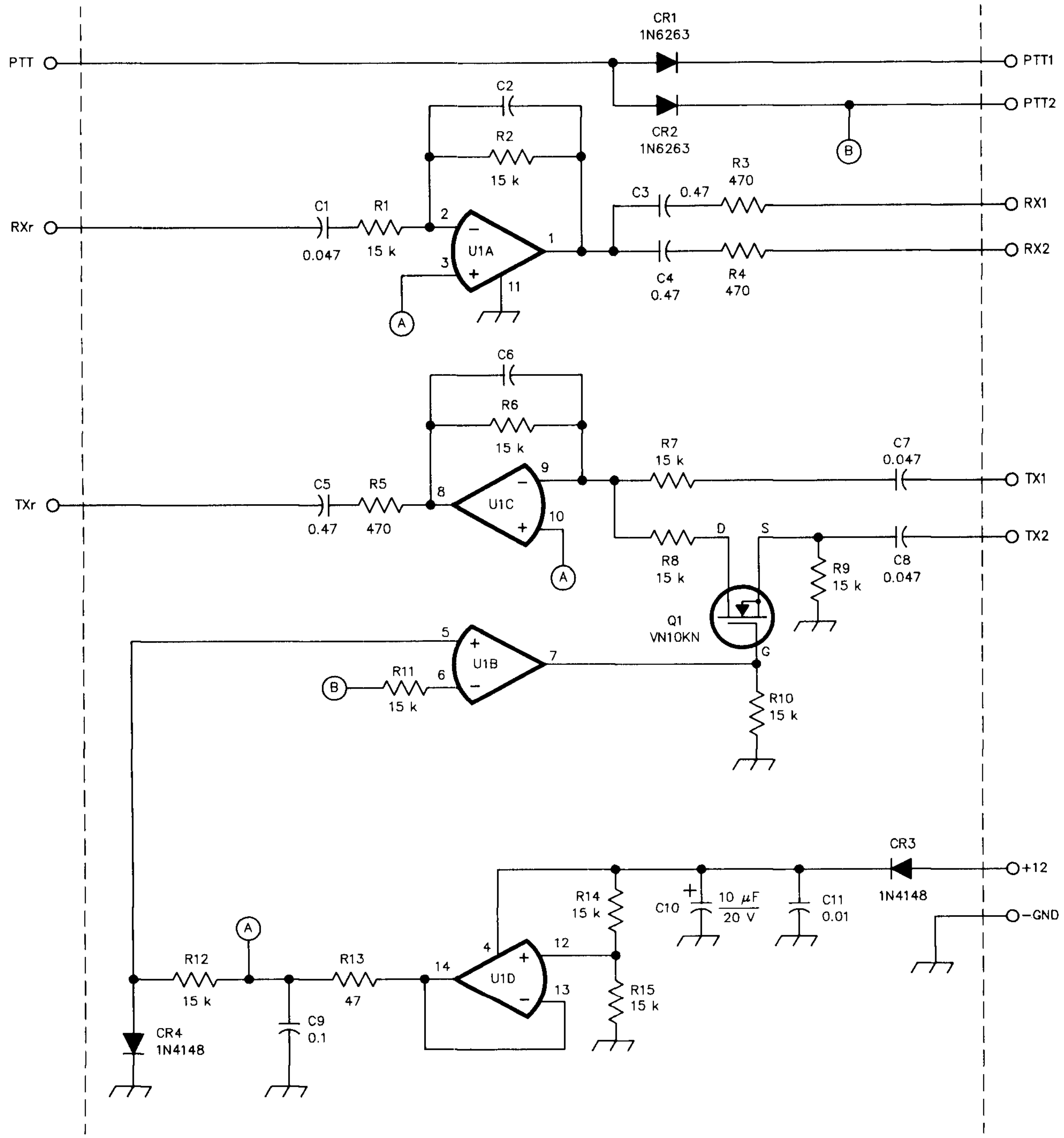


Fig 1

PSK Modems

The TNC-24 by TASCO, Telereader and the TAPR PSK kit have both continuous TX audio present at the input to the radio set. This may not be a problem when you operate PSK alone, but in conjunction with another audio signal, a very undesirable mixing takes place. The interface circuit includes a MOSFET switch to cut off the PSK TX audio while not transmitting PSK.

The Circuit

Fig 1 shows the schematic diagram for the interface circuit. The radio set is on the left side, while the two modems are on the right side. 1 designates the AMTOR/PACTOR modem, while 2 designates the PSK modem.

The push to talk (PTT) circuit is straight forward with two hot carrier diodes isolating the modems from each other. Point B connects to the circuit sensing that the PSK modem desires to transmit and enables the MOSFET switch Q1.

The receive audio circuit is ac coupled to the operational amplifier U1A, a unity gain buffer. The input impedance is 15 kΩ, which is high enough to not load down any reasonable audio source. C2 is not critical and can be between 0.001 and 0.0047 mW to reduce chances of RF pickup. The audio is then applied to both modems with a source impedance of 470 Ω and no superimposed dc voltage.

The transmit audio is likewise ac coupled from each modem and only lightly loaded with 15 kΩ. This allows the use of a simple MOSFET switch like the Siliconix VN10KN. The operational amplifier U1C acts as a unity gain, inverting buffer and sums both TX audio signal and presents them with an output impedance of 470 Ω to the transmitter input. Again, C6 is not critical and can be between 0.001 and 0.0047 mF and reduces the chances of RF pickup.

The power supply circuit connects to 12 V dc and CR3 provides polarity protection. With a quad operational amplifier, like the LM 324AN, the whole power drain amounts to 1.5 mA. U1D divides the incoming dc voltage, filtered by C10 and C11 and applies it to the two buffer amplifiers as reference. R13 and C9 (Point A) provide filtering.

U1B is connected as a comparator. If the PSK modem PTT output (PTT2) is floating, U1B pin 7 is low, therefore turning off Q1. If, however, PTT2 is lower than CR4, then U1B pin 7 is high, thus enabling Q1 and connecting the PSK audio to U1C, a unity gain buffer.

BBS and Other Applications

This interface circuit allows one transceiver to address two modems. It is thinkable to have a BBS with, for example, an AMTOR and PACTOR I/O. It is also possible to extend the circuit to three modems. If the transmit audio signals are always off while a modem is not transmitting, U1B, Q1 and all peripheral circuitry is not required. To the user, the interface circuit is totally transparent, yet only one HF rig and antenna is needed.

Summary

The described circuit has worked in my shack without any problems. It was implemented on a Radio Shack perforated board. Numerous AMTOR, PACTOR and PSK QSOs have been made with this interface circuit.

Authors Note: The PSK switching circuit works fine up to 200 mV PP TX audio. By putting a 0.047 μF mylar capacitor in series with R8, the TX audio can be increased to 800 mV p-p amplitude.

Corrigendum

For several reasons—production problems and staff outages—we had many problems in publishing the January 1992 issue of *QEX.* We apologize for the lateness of the issue and for the following errors. These errors were corrections received from the authors, prior to publication, which were not made. Again, we apologize for any inconvenience these errors have caused. A corrected copy of John Albert's, WA9FVP, article, "A New DSP for Packet," can be obtained by sending a post card requesting the article.

A New DSP for Packet by John Albert, WA9FVP.

**Under the subheading "The DSP25 Block Diagram/ Description," sixth line beginning "There is also..." This line should read "There is also a 16-bit I/O port on a 32-pin header connector to interface to a baby board which contains a dual parallel DAC for connecting an X/Y-tuning slope or other ancillary devices.

**Under the subheading "The Host Interface," line five 8-kbyte should read 8-kword.

**Under the subheading "Software," under *Prefiltering,* in line one, 4-pole should read 6th order. Fifth line should read "...is then passed to the second 6th-order filter..." Under *FSK Decoding,* line one should read "Two 4th-order bowtie..." The heading *Power Filtering* should read *Post Filtering.*

**Under the subheading "Other PKTA/PKTB Modem Functions," under *Modem Parameters,* in line three, KIN1 should be DIN1.

Maxwell Without Tears, by H. Paul Shuch, N6TX.

The caption under Fig 4 should read: A graph of Something varying over Time (also known as a function). **Corrigendum** on page 14. ("Measuring the Mass of the Earth," originally published in the September 1991 issue of *QEX.*) This update was sent in by the article's author, H. Paul Shuch, N6TX. Also, the fraction 1/150th, which appears on line 17, should read 1/50th.

Field-Strength Indicators

By Hugh Wells, W6WTU
1411 18th Street
Manhattan Beach, CA 90266

Have you ever wondered if your transmitter is emitting RF energy, or have you ever wanted to plot the radiation pattern of your antenna? Unless you have a field-strength indicator, second receiver or another ham to communicate with, it is generally difficult to obtain feedback or data.

An easy solution to the dilemma is to build a field-strength indicator. When placed in the near field of your transmitter, an RF indication will be obtained. For antenna pattern measurements, the indicator having a meter readout is placed in the far field.

A field-strength indicator is a simple receiver which may have either a meter or LED to show the presence of RF energy. Typically, the indicator has poor sensitivity, but responds reliably to a strong RF energy field. The poor sensitivity stems from using a simple detector without any RF amplification. However, an RF amplifier preceding the detector causes a significant increase in sensitivity. The addition of a dc amplifier following the detector will reduce the detector loading and will allow the circuit to drive a meter of choice.

Input to the detector may be tuned or untuned depending upon the frequency bandwidth and sensitivity desired. Also, attaching an antenna will increase the amount of RF presented to the detector. The length of the antenna is not significant for strong RF fields unless it is part of the resonant input circuit.

Design of the indicator circuit is developed around a half-wave, full-wave or voltage-multiplier diode detector (rectifier). The output of the detector is dc whose amplitude is proportional to the magnitude of the RF energy present. The dc output can be used to drive either a meter

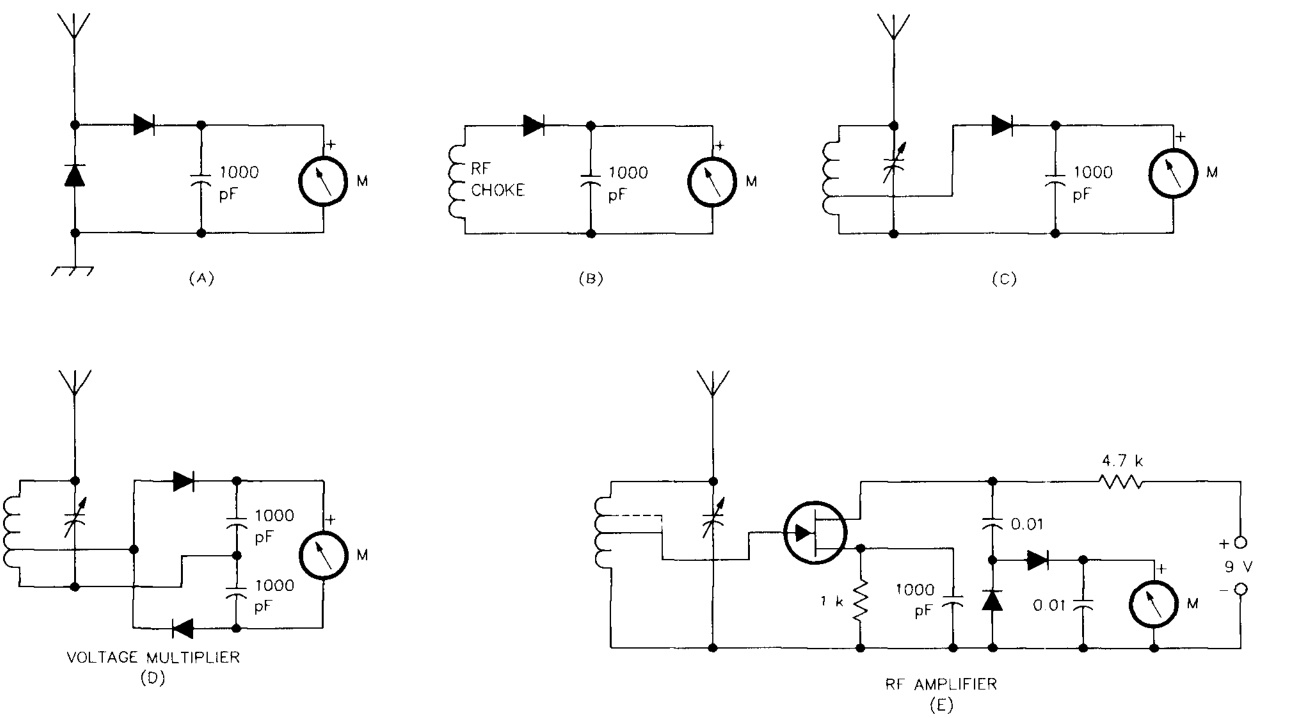


Figure continues on next page.

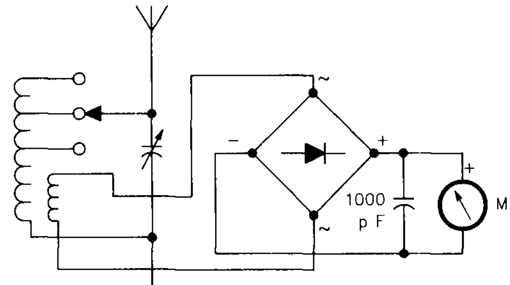
FET—MPF102, 2N3819, 2N4416, 2N5245
Transistor—2N2222, 2N3904, 2N4401
Diodes—1N914

M—50 μA to 1 mA meter
IC—LM741 or LM318

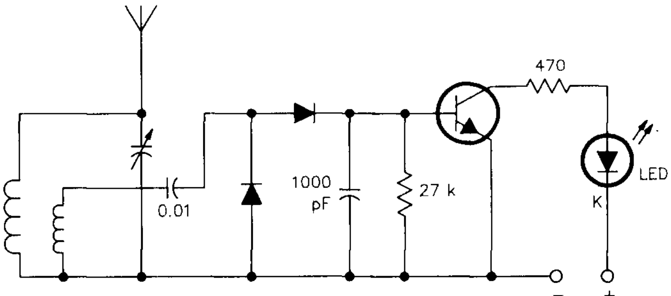
or LED to indicate the presence of RF. Although the use of a meter gives the impression of calibration, there is little correlation. The square-law rectification effect of the diodes and a random distance between the transmitter and the field strength indicator upset most attempts for calibration accuracy and measurement repeatability beyond that of an indication.

Several circuits are shown providing a choice from the very simple to complex. The choice of a circuit is governed by your application and the challenge for building. Circuits A and B are untuned and exhibit a very wide bandwidth. Circuit G is tuned with a resonant circuit having sufficient Q to narrow its bandwidth. Each is designed as a near field indicator with A and B driving a meter and G driving an LED. Having an unbiased transistor as an LED driver, circuit G must rectify at least a base drive voltage of 0.66 volts from the RF field before the LED will begin to turn on. Adding an RF stage as shown in circuit E allows the indicator to be operated in the far field of an antenna where it is suitable for pattern and gain measurement applications. Dc amplification as shown in circuits H and I will improve the meter response. The op amp in H can provide a gain from 1 to 100, but provides best stability at a gain below 10. The gain of circuit I is on the order of 5 to 10, but having a very low detector loading it is responsive to weak signals.

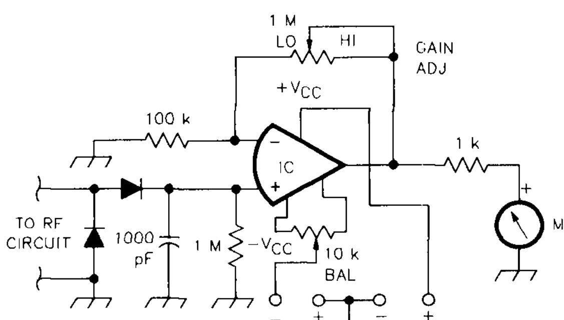
As for circuit combinations, any detector can be used with any amplifier. For schematic printing simplification, amplifiers are shown attached to certain detectors, however, they may be moved around. Build up several circuit combinations and perform some comparative measurements to find the circuit combination that is most suitable for your needs and taste.



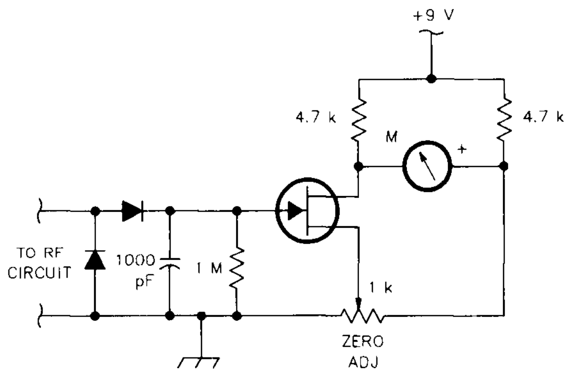
BAND SWITCHING
(F)



LED DRIVER
(G)



DC AMPLIFIER
(H)



HI-Z AMPLIFIER AND BRIDGE
(I)

Conducted by: Stan Horzepa, WA1LOU
75 Kreger Drive
Wolcott, CT 06716-2702

CLOVER DEVELOPMENT CONTINUES

I must first apologize for how long it has taken me, Bill Henry, to respond to your letters and continued interest. Ray Petit and HAL Communications are continuing to work on the development of CLOVER modulation. Unfortunately, my projections were overly optimistic. CLOVER is a very complicated project that is still evolving; many features have been added or changed since our first demonstration last year at the Dayton HamVention. Hopefully, the following will bring you up to date and present more realistic information regarding future plans.

Summer CLOVER

As you may know, HAL designed and built a standalone CLOVER unit that was planned for use as a software development vehicle: we called it "Summer CLOVER." Ray and I hoped it could also be used for beta testing of the software. Unfortunately, the cost of development and reproduction turned out to be very high: about $3,000 each. What I had projected as a pilot run of 30 to 40 units that could be used for beta testing was soon reduced to eight units, which are now being used for development. Ray and I also lost two months of our time last summer meeting all the requirements for filing a CLOVER patent (more on that in a bit). This delayed Ray's work on very essential features: the ARQ mode and adaptive algorithms. The result was that we have not had working software to test until quite recently.

As a result of the Summer CLOVER hardware design and the testing of initial software, Ray and I decided to make a fairly large number of changes in how we will implement CLOVER. First, the hardware cost for Summer CLOVER was much too high for a realistic amateur product. If CLOVER is to be accepted and used by many amateurs, the cost must be lower. Also, our choice of the hardware used in Summer CLOVER turned out to be very restrictive on Ray's software. The 6809 host processor used in Summer CLOVER does not have enough horsepower to do all that CLOVER promises.

CLOVER Patent

In July, Ray Petit and HAL Communications filed for a CLOVER patent with the US Patent office. The patent filing includes all the variations of CLOVER. The words "CLOVER," "CLOVER-I" and "CLOVER-II" are registered trademarks. Ray Petit is the inventor and the patent is assigned to HAL Communications Corp. The intent of filing the patent is not to exclude other manufacturers from producing CLOVER equipment. Rather, Ray and I want to license the use of the CLOVER technology as freely as possible. However, CLOVER is a completely new invention with far-reaching possibilities for amateur, commercial and military use. Ray and HAL both have a lot of time and money invested in the technology. Ray and I are still working out the details of licensing, but it is our intention that amateur use will not be expensive. Since we are still adjusting the features of CLOVER, we are not yet ready to discuss licensing details.

New CLOVER Hardware

As a result of testing of the Summer CLOVER hardware and software, Ray and I discovered a number of new features that will greatly enhance CLOVER's performance. We also discovered a number of situations in which the Summer CLOVER hardware imposes serious limitations on Ray's software. As I mentioned above, the standalone Summer CLOVER hardware has proven to be very expensive. As a result of all these factors, CLOVER is presently undergoing a number of changes in how it will be implemented. The more important of these changes are:

1. The hardware base will be a PC plug-in card not a standalone unit. This will allow us to have a $995 introductory retail price. We call this version "PC-CLOVER;" the model number is PCI-4000.
2. The host processor will be a 68000 device rather than the 6809 used in Summer CLOVER. This greatly increases the horsepower available to Ray's software.
3. The CLOVER software required to run the 68000 and DSP56001 on-card processors will be downloaded from the PC rather than placed in ROM on the board. This will avoid the big hassle of ROM-based software upgrades which, we all know, will happen and are a great nuisance for all of us.
4. The interface between the PC-CLOVER card and the PC bus will be compatible with windowed software. This is the new architecture being adopted by most system programmers and should assure a long lifetime for PC-CLOVER hardware.

The new PC-CLOVER hardware is nearing prototype design completion. We plan to have a few working prototypes sometime in February 1992. These changes were not made lightly. Changing the host processor requires a major rewrite of most of Ray's software code. The changes have slowed our schedule. However, we feel that a delay now is far better than trying to limp along with slow hardware in our first CLOVER product and then announcing a "new and improved version" shortly there-after. Another important hardware feature I must mention is that the PC card itself is full size and must be used with a PC-AT or higher class of PC. If you plan to run windowed software, a PC-386SX or PC-386 is highly recommended.

Preliminary Testing

Ray, Ed Bixby, AKØX, and I have conducted a few on-the-air tests of CLOVER as implemented in the Summer CLOVER units. Ray and I have also done extensive laboratory testing of CLOVER under simulated conditions. To date, all tests confirm that the CLOVER modulation supports much higher data throughput on HF than is presently possible using AMTOR or HF packet radio. Our goal of "ten times the speed of AMTOR" has been met and exceeded many times. The CLOVER-II protocol we demonstrated at Dayton last year and many other places was a "broadcast protocol," much like the AMTOR FEC mode. Since that time, Ray has added an ARQ mode that operates much like AMTOR and packet radio. Ray has also devised a very good adaptive algorithm that measures existing ionospheric conditions and adjusts CLOVER modes to maintain the highest possible throughput that the ionosphere will support, even in the face of fading signals and multipath distortion.

We know that AMTOR operators, in particular, have been concerned that the CLOVER connect times be short enough so they can continue to use frequency scanning techniques. We agree that frequency scanning greatly expands the usefulness of HF radio and are in the process of making the connect phase of CLOVER as short as possible. Summer CLOVER requires a minimum pulse length of 2 seconds for frequency/phase synchronization; a connect takes 15 to 20 seconds. The new 68000 hardware base and software revisions will allow a considerable decrease in this: down to a few seconds as in AMTOR.

Amateur Use of CLOVER

With the advice and guidance of the ARRL, we have determined that the CCIR Emission designator for CLOVER is either "500HJ2BEN" (RTTY) or "500HJ2DEN" (Data). This emission is fully compliant with our existing FCC Rules and Regulations (Part 97). To aid in identifying CLOVER as an amateur emission and to prevent any mistaken assumption that CLOVER might be an intruder signal, initial CLOVER software will include an automatic CW identification feature complete with a 10-minute timer. We view this as a temporary inconvenience and not something that is either required or long-lasting. The character stream entered as MYCALL will be sent as the CW identification.

Two ARQ Modes

Our present plans are to have two slightly different ARQ modes that may be used: We call them "ARQ-1" and "ARQ-2." ARQ-1 operates much like present AMTOR in that the data flow is in one direction or the other and an OVER command is used to reverse direction. This mode is compatible with the technique presently used by both AMTOR and packet radio to transfer files between stations. ARQ-1 devotes the maximum channel capacity to one direction at a time to produce the fastest file transfer rate. ARQ-2 is the radio analog of full-duplex, that is, data may be passed in both directions simultaneously. Packet radio presently supports this mode, but is rarely used, particularly when uploading or downloading with BBSs. ARQ-2 holds great promise for backbone data transfers, but we know of no system or network software that presently supports this mode. If used for normal BBS access, ARQ-2 could result in as much as a 50% reduction in channel throughput. Therefore, we believe that ARQ-1 will be the mode of choice for initial uses of CLOVER. This is an issue that you, the users and system designers, must define. CLOVER will support either type of ARQ operation. Both ARQ modes are adaptive; ARQ-1 in the forward (data flow) direction and ARQ-2 in both directions.

Application Software

Each HAL PC-CLOVER product will include a single-user PC-based program that may be used to connect with and talk to another CLOVER station. It will be much like our *PC-AMTOR* program furnished with the PCI-3000. This program will not be a BBS or other network program. We are now discussing the writing of customized drivers for existing BBS-type programs with several programmers. We would certainly like to hear from additional network programmers. The economics of commercial software development are such that it would be prohibitively expensive for Ray or HAL to undertake the development of such software. Furthermore, very good software now exists with features you like and know how to use. This is not an area where HAL should attempt to re-invent the wheel.

The PC-CLOVER card has been designed specifically to make interfacing via the PC-bus very simple to the knowledgeable programmer. To aid when working in a window environment, data and commands passed via the PC-bus are buffered by on-card FIFO memories. The PC card may be operated in either an I/O memory-mapped, poll-select mode or as a PC I/O interrupt-driven accessory. As in the PCI-3000, the I/O address and interrupt, when used, are jumper selectable options. A complete command protocol is being prepared and will be made available to all interested PC software authors. Please write for more details if you are interested in writing application software for CLOVER. HAL will be glad to promote all software packages made available for CLOVER, but we ask that each author handle all sale, distribution and user support for his software.

First CLOVER Products

The first HAL CLOVER product will be the PCI-4000, known as "PC-CLOVER." The product and initial software will be demonstrated first at the 1992 Dayton HamVention. The introductory retail price will be $995, available directly from HAL and selected HAL dealers. We should be able to ship production units on or before July 1.

(For more information, contact HAL Communications Corp, PO Box 365, Urbana, IL 61801.)

—from Bill Henry, K9GWT, and Ray Petit, W7GHM

HAMS MOVED FROM UO-14 TO UO-22

In late December, we introduced an enhanced broadcast server on UoSAT-3, which did a lot to reduce congestion on the satellite's single uplink. Now we have another bottleneck. Because UoSAT-3 has only 256 kbytes of program and data memory, we are using a RAM disk which can only hold 400 messages at a time. With uplink contention reduced, gateways on line and more than 150 stations regularly active, this 400 message limit is often exceeded. When the satellite is full, new messages cannot be uploaded and older messages have short lifetimes before being deleted automatically to make way for new messages.

The large population of Amateur Radio stations on UoSAT-3 is also somewhat limiting for the non-amateur stations which get only very small access windows (roughly 1:5 of the opportunity given to amateur stations). The brief bursts of transmission on the non-amateur downlink interrupt amateur activity and also make it difficult for automatic frequency control circuits to operate on the non-amateur downlink.

In addition to UoSAT-3 (OSCAR-14), the controllers at Surrey have UoSAT-5 (OSCAR-22) as a potential resource. SatelLife, the organization which paid for most of UoSAT-5, had planned to operate the satellite predominantly on non-amateur frequencies. Operation of the CCD camera on the amateur downlink was to be a secondary activity of UoSAT-5.

After launch, this plan ran into two difficulties. (1) The UoSAT-5 CCD camera has proven very successful and Amateur Radio stations around the world are downloading the images of the Earth. (2) Images are taken several times per week and each is more than 300 kbytes of data. Furthermore, UoSAT-5's high power amplifier, which has produced excellent output on the amateur frequencies, does not work reliably on the non-amateur frequencies.

Taking into account the resources available to us and our obligations to SatelLife and other organizations, we have decided to take the following steps to optimize our use of UoSAT-3 and UoSAT-5.

1. All non-amateur traffic, both SatelLife and VITA, will be carried on UoSAT-3, which will cease to transmit on its amateur downlink.
2. All amateur traffic will move to UoSAT-5, and UoSAT-5 will operate as a dedicated Amateur Radio satellite transmitting constantly on its amateur downlink.

Of course, there is a price to pay for this transition, most notably, the conflict between CCD users who want to download large CCD image files and BBS users who want to get their mail. We are looking into on-board JPEG compression for the images. This potential disadvantage will be balanced by the following advantages:

- 512 kbytes of program memory permitting 800 message capacity,
- Two Amateur Radio uplinks: 145.900 and 145.975,
- No downlink frequency switching (permanently on 435.120).

The Big Switch

The UO-22 file server is now enabled and we recommend that all new messages be uploaded to UO-22 and not to UoSAT-3. Plans call for the UoSAT-3 FTL0 server and amateur downlink to be disabled sometime on Wednesday, February 5.

—from Jeff Ward, GØ/K8KA, University of Surrey Spacecraft Engineering Research Unit, via Packet-Radio Digest

DOVE RETURNS TO TWO METERS!

Through the tireless efforts of Bob McGwier, N4HY, DOVE's raspy packet-radio signal has returned to its familiar 2-meter downlink frequency of 145.825 MHz. Using the painstaking method of listening to the S-Band downlink for the chirpy ACKs and NAKs, N4HY successfully loaded all the necessary software to get the basic housekeeping system working. It took 12 tries over a two-month period to complete this critical upload. Now that this initial software load is completed, the second phase of this effort will be to install a push-to-talk software loader which will make DOVE appear as a 2-meter terrestrial packet-radio station to ground controllers. This means that the N4HY "load-one-packet-group-at-a-time-using-one's-ear" technique of software uploading will not be necessary. All of the software uploading can now be done on 2 meters. Also, by installing the push-to-talk loader, the ground controller's work load will be considerably reduced as they start to load speech synthesis software.

In order to reproduce high fidelity human speech, the average voice data files will be about 500 kbytes. This will require a lot of uploading effort on the part of many ground stations and, as N4HY points out, if there is one bug in the speech code that gets by him, this could cause DOVE's on-board processor to crash which means starting all over again. In the meantime, all are encouraged to monitor and decode DOVE's telemetry using G3ZCZ's popular *WHATS-UP* program. Also, WDØE will release a new version of the *TLMDC* program. DOVE's signal should sound quite loud since its RF output is now set to about 5 watts. This should make DOVE easy copy for those with a simple 2-meter packet-radio station.

—from AMSAT News Service

TAPR NEWS

There is quite a bit to report to you this issue, unfortunately not all of it is positive. The TAPR Board of Directors has reluctantly voted to shelve the packetRADIO project, due mainly to a lack of the necessary human resources to complete the job. The DSP is still an active project, but there is no new progress to report at this time. We had hoped to complete both these efforts by now, but it just has not happened.

In the October issue of *Packet Status Register*, there was a call for nominations for five vacancies on the Board of Directors. To be frank, the response has been underwhelming. There were no nominations for these openings as of the December 1st deadline. It is hard to have an election without candidates! At the Board meeting prior to the 1991 Annual Meeting, there was quite a bit of discussion on reducing the size of the Board. We have 15 members, but not all of them have been very active. The incumbents whose terms are expiring have, for personal reasons, chosen not to run for reelection.

Additionally, Andy Freeborn, NØCCZ, has decided, for personal reasons, to resign from the Board of Directors and Executive Committee. His leadership and continuing contributions will be sorely missed, as will those of the other retiring Board members. However, we did receive a last minute candidate, Jack Davis, WA4EJR. Although there is no ballot, for the reasons given above, Jack has been appointed to the Board to fill the remainder of Andy's term.

When the lack of candidates became known to the Board, the subject of reducing the Board size naturally came up again. Since we have not completed any official action at this time, the issue is still open, but if there is any formal change in the size of the Board, it will be announced at the Annual Meeting on March 7.

On a more positive note, the Deviation Meter is proceeding nicely. The TAPR Board has also approved work on two other new projects: a new 9600-baud modem and an antenna tracker box, which was designed by SMØETR, JA6FTL and others. TAPR will make these available as kits. Hopefully, all three of these new items will be available soon.

We are busy getting ready for the upcoming Annual Meeting. We hope that since it celebrates the 10th anniversary of TAPR, it will be well attended. Hopefully, we will have some new kits to introduce at that time. We are also planning to issue Proceedings, that is, a printed copy of the technical papers presented at the meeting. There may even be a surprise or two.

—from Bob Nielsen, W6SWE, via Packet Status Register

FIRST UK 10-METER PACKET-RADIO BEACON ON THE AIR

GB3PKT, the first UK 10-meter packet-radio beacon, is operating on 28.196 MHz LSB. The beacon transmits every 60 seconds with 25 watts ERP with vertical polarization. GB3PKT is located on the southeast coast in a small town called Point Clear in the county of Essex. This is 4.5 miles west of Clacton On Sea. The beacon is in operation to study packet-radio propagation. Please send reception reports to GØMBA@GB7DNS.#31.GBR.EU.

MEDICAL IMAGE RELAYED VIA AO-16 AND UO-14

Jon Haskell, KB9CML, prompted by the mission of SatelLife on UO-22 and the current trend to transmit digitized medical images for remote viewing, conducted an experiment in the transmission of medical images. He wanted to determine the effectiveness of using the store-and-forward satellite concept to transmit detailed and accurate images. Satellites would provide a geographically remote medical facility the opportunity to obtain an additional radiological assessment from a specialist at a major medical center. Additionally, it would provide a means to disseminate radiologically produced images and photography for educational purposes.

The source of the image which Jon sent to KD9QB was produced by a portable fluoroscopy unit. This is a movable x-ray device that produces real-time images which are viewed on a monitor. These devices are typically used in surgical applications where the physician can have real-time imaging during the procedure. An image of a fractured hip that had been repaired with a compression hip screw, a plate which stabilizes the fracture until it can heal. This image was stored in the fluoroscopy unit's memory, copied to a diskette for editing and prepared for uploading to AO-16. Given the constraints of 1200 baud, the 103-kbyte NIF image was reduced to a 7-kbyte GIF image for quick uploading and convenient viewing.

The image orbited for several days. Then, Ron Pogue, KD9QB, AMSAT Regional Coordinator, downloaded the image. Within minutes, the image was transmitted back to Ron via Amateur Television. Another fluoroscopic image totaling some 123 kbytes was converted to a GIF format and uploaded on UO-14. Vern Riportella, WA2LQQ, downloaded the file on a subsequent pass over his area. Vern commented on the fine resolution of the image which was transmitted error free. Vern is also associated with the SatelLife program as a technical advisor.

Ron suspects that this is the first time a medical image has been transmitted via Amateur Radio satellite. Whether or not this concept has benefit has yet to be determined, however, the experiment does prove that the potential to move medical images are real.

—from AMSAT News Service

KANTRONICS VERSION 5.0 FIRMWARE RELEASED

Kantronics plans to release version 5.0 firmware for the KPC-1, KPC-2, KPC-2400, KAM and KPC-4 on March 1. Due to a mix up, an advertisement appeared a month too early. Therefore, if you purchased one of the above units or an update to one on or after December 1, 1991, you are entitled to a free update with a filed warranty card and proof of purchase. Orders will be accepted after March 1.

The major features of the new firmware are additional personal mailbox commands and SYSOP remote access. The KAM will allow AMTOR access to the PBBS on the HF side.

—from Phil Anderson, WØXI, via CompuServe's HamNet

TLMDC WITH NEW DOVE TELEMETRY PROCESSING AVAILABLE

Jim White, WDØE, a member of the AO-16 Ground Command Team, has released the latest upgrade to the MicroSat Telemetry Decoding program known as *TLMDCII.* One of the major changes in this version (v1.2) of *TLMDCII* is that now it will process DOVE (DO-17) telemetry, as well as all the other MicroSats. The following are some of the enhancements that WDØE has added:

- Decodes telemetry live and displays it on screen;
- Decodes and displays some status line information;
- Displays some important calculated current values, such as battery charge current; a "limits" feature optionally alerts you to telemetry parameters that are out of range;
- Decodes previously recorded KISS format files and displays them on screen;
- Optionally saves the data to one or all of several file formats as follows: raw KISS format (useful for further processing), ASCII format (for DOVE) and WOD (for WEBERSAT);
- Prints data formatted similar to the screen display, which can also be sent directly to a printer in real-time;
- Spreadsheet formatted with either spaces or tabs as delimiters between data fields; tabbed files can be read directly into Macintosh computer spreadsheets and graphs may be created very quickly.

For more information about how you can obtain your copy of this new version of *TLMDCII,* contact AMSAT-NA Headquaters at 301-589-6062.

—from AMSAT News Service

IP ADDRESS COORDINATOR LIST

The following lists IP address coordinators as of January 15. (IP address coordinators assign IP addresses, which are necessary for each station you wish to operate using TCP/IP on packet radio).

This list is compiled and maintained by the worldwide IP address coordinator, Brian Kantor, WB6CYT. Changes, corrections, etc. should be sent to Brian, not to WA1LOU, Gateway, *QEX* or the ARRL.

US SUBNET COORDINATORS BY STATE

State	*Call Sign*	*Subnet*
AK	KL7JL	44.022
AL	WB4FAY	44.100
AR	WD5B	44.110
AZ	WB7TPY	44.124
CA: Antelope Valley, Kern County	KK6JQ	44.017
CA: Los Angeles, S F Valley	WA6FWI	44.016
CA: Orange County	AA6TN	44.010
CA: Sacramento	K6RTV	44.002
CA: San Bernardino, Riverside	KE6QH	44.018
CA: San Diego	WB6CYT	44.008
CA: Santa Barbara, Ventura	WB5EKU	44.006
CA: Silicon Valley, San Francisco	N6OYU	44.004
CO: northeast	KØYUM	44.020
CO: southeast	N3EUA	44.032
CO: western	K9MWM	44.084
CT	KE3Z	44.088
DC	K4NGC	44.096
DE	NU3E	44.066
FL	*	44.098
GA	KD4NC	44.036
HI and Pacific Islands	KJ9U	44.014
IA	KCØOX	44.050
ID	KD7RO	44.012
IL: Chicago, north	WA9AEK	44.072
IN	KA9FJS	44.048
KS	KØHYD	44.122
KY	N4TY	44.106
LA	N5KNX	44.108
MA: eastern	KA1MF	44.056
MA: western	WB1FEM	44.044
MD	WB3FFV	44.060
ME	WA2YVL	44.118
MI: lower peninsula	WB8WKA	44.102
MI: upper peninsula	KD9UU	44.092
MN	WDØHEB	44.094
MO	WBØROT	44.046
MS	WA4DDE	44.042
MT	N7GXP	44.082
NC: east	KA4OJN	44.074
NC: west	WB4WOR	44.075
ND	N7GXP	44.114
NE	NFØN	44.090
NH	K8LT	44.052
NJ: northern	NN2Z	44.064
NJ: southern	WA2ZZX	44.065
NM	WS5N	44.030
NV	KF7TI	44.125
NY: Long Island	K2EUH	44.068
NY: upstate	WA2WPI	44.069
OH	N8EMR	44.070
OK	K5JB	44.078
OR	WA7TAS	44.026

State	Call Sign	Subnet
OR: northwest	WS7S	44.116
PA: eastern	WA3WBU	44.080
PA: western	N3CVL	44.112
PR	KP4QG	44.126
RI	W1CG	44.104
SC	N4QXV	44.038
SD	N7GXP	44.114
TN	WD4NMQ	44.034
TX: Dallas	KD5QN	44.028
TX: south	WB5BBW	44.076
TX: west	KA5EJX	44.077
UT	WA7MBL	44.040
VA: not DC	WA4ONG	44.062
VT	KD1R	44.054
WA: eastern	KD7RO	44.012
WA: Portland, Vancouver	WS7S	44.116
WA: western, Puget Sound	KB7DZ	44.024
WI	KD9UU	44.092
WV	KB8AOB	44.058
WY	WB7CJO	44.086

* Garry Paxinos, no call sign, 38668 NW 21st Ct, Coconut Creek, FL 33066

INTERNATIONAL SUBNET COORDINATORS BY COUNTRY

State	Call Sign	Subnet
Argentina	LU7ABF	44.153
Australia	VK2ZXQ	44.136
Austria	OE1KDA	44.143
Belgium	ON7LE	44.144
Canada	VE3GYQ	44.135
Central America	TI3DJT	44.163
Chile	CE6EZB	44.157
Cyprus	5B4TX	44.162
Denmark	OZ1EUI	44.145
Ecuador	HC5K	44.148
Finland	OH1MQK	44.139
France	FC1BQP	44.151
Germany	DL4TA	44.130
Greece	SV1IW	44.154
Holland	PAØGR	44.137
Hong Kong	VS6EL	44.149
Hungary	HA5DI	44.156
Indonesia	YB1BG	44.132
Ireland	EI9GL	44.155
Israel	4X6OJ	44.138
Italy	I2KFX	44.134
Japan	JG1SLY	44.129
Japan	JH3XCU	44.129
Korea	HL9TG	44.166
Luxembourg	LX1YZ	44.161
New Zealand	?	44.147
Norway	LA4JL	44.141
Philippines	DU1UJ	44.146
Poland	SP5WCA	44.165
Portugal	CT1DIA	44.158
South Africa	ZS6BHD	44.160
Spain	EA4DQX	44.133
Suriname	PZ2AC	44.164
Sweden	SMØRGV	44.140
Switzerland	HB9CAT	44.142
Thailand	HS1JC	44.159
United Kingdom	G6PWY	44.131
Venezuela	OA4KO/YV5	44.152
Yugoslavia	YU3FK	44.150
Outer Space-AMSAT	W3IWI	44.193
unassigned	—	44.120
testing	—	44.128

—from Brian Kantor, WB6CYT, via Packet-Radio Digest

BOUND FOR 8-LAND

The Downtown Wolcott-to-Dayton Earth shuttle will depart in the AM of April 23 arriving 11 hours later at Radisson Inn with your Gateway contributing editor aboard. Throughout the weekend, I will be making the rounds at the HamVention reporting on what's new in digital Amateur Radio. If you see me lurking around, please say hello and bend my ear for awhile. I'll be glad to meet you.

GATEWAY CONTRIBUTIONS

Submissions for publication in Gateway are welcome. You may submit material via the US mail to 75 Kreger Dr, Wolcott, CT 06716, or electronically, via CompuServe to user ID 70645,247, or via Internet to horzepa@evax.gdc.com. Via telephone, your editor can be reached on evenings and weekends at 203-879-1348 and he can switch a modem on line to receive text at 300, 1200 or 2400 bit/s. (Personal messages may be sent to your Gateway editor via packet radio to WA1LOU@N1DCS or IP address 44.88.0.14.)

The deadline for each installment of Gateway is the tenth day of the month preceding the issue date of *QEX.*

Bits

AWARD NOMINATIONS OPEN NOW

Nominations are now being sought for the 1992 awards to be presented at the ARRL Atlantic Division Convention. The Convention is held in association with the Rochester, NY, Hamfest, May 15-17, 1992. The awards are commemorated by handsome plaques to be presented at the hamfest banquet.

"Amateur of the Year" nominees should be outstanding all-round Amateurs from the Atlantic Division with a strong record of service to the Amateur community. An award for lifetime service to Amateur Radio, the "Grand Ole Ham," is open to Atlantic Division OMs and YLs who have been licensed at least 30 years or are at least 50 years of age. The Atlantic Division "Technical Achievement" award may be presented to an individual or to a group.

Complete information on the awards and nomination procedures is available from Richard Goslee K2VCZ, 24 Elaine Drive, Rochester, NY 14623. The deadline for nominations is April 1, 1992.

Correspondence

SARA Telemetry Quest

We need help in collecting telemetry data from the SARA satellite. The problem is that there is no storage for this on board, so telemetry has to be used in real-time. There are two ways to do this, and we're not sure at this point which is the best. One is to make audio tape recordings and send them to us. Any tape should have a few seconds of 1,000 Hz tone at the beginning. Also, we need the exact location and time of the pass. The other approach is to send us the readouts of the telemetry; you can write for details on receiving and decoding the signal.

Everyone who helps us collect this information will receive a special diploma and an information bulletin with measurements coming from other parts of the world.

Write: BELAMSAT, SARA Telemetry, Thier des Critchions 2, B-4032-CHENEE, BELGIUM.