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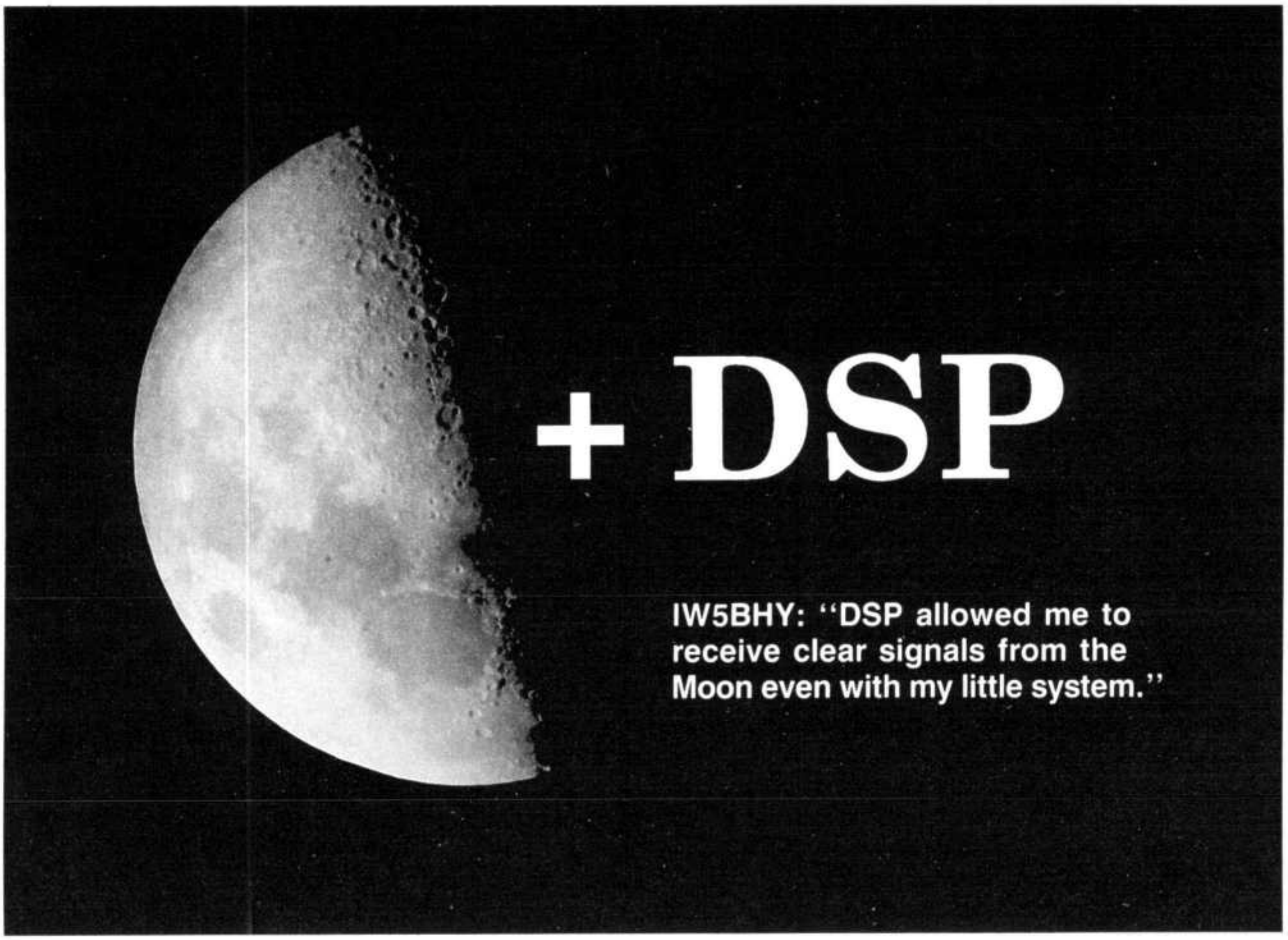
ARRL Experimenters' Exchange

MAY 1992



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ıerican Radio Relay League
5 Main Street
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QEX (ISSN: 0886-8093) is published monthly by the American Radio Relay League, Newington, CT USA.

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Subscription rate for 12 issues:

In the US by Third Class Mail: ARRL Member $12, nonmember $24;

US, Canada and Mexico by First Class Mail:
ARRL Member $25, nonmember $37;

Elsewhere by Airmail:
ARRL Member $48 nonmember $60.

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Empirically Speaking...

HF Data Communications Advances

Several years ago, we initiated an HF data communications project with an article on "The Great 1989 HF Packet Design Quest" in the May 1989 issue of *QST*. Several articles, progress reports and correspondence followed in *QEX*. During the period October 1, 1989 through September 30, 1991, ARRL was authorized a $10,000 grant from the Federal Emergency Management Agency (FEMA) to reimburse out-of-pocket costs of experimenters working on advancements in MF/HF packet radio. As explained in the final report to FEMA, the publicity and the existence of the grant money stimulated a number of experimenters to give some attention to improvement of HF packet radio. It turned out, however, that experimenters were reluctant or unable to accept government money for reasons of retaining their freedom to pursue commercial exploitation or abiding by conditions of their employment. Nevertheless, the work went on and both Amateur Radio and FEMA are among the beneficiaries of these developments.

Early in the project, we concluded that there were four major areas where improvements were needed. Number one was reduction of contention—we proved the obvious that an infinite number of packet stations cannot share the same HF channel. The second problem was that of intersymbol interference due to multipath propagation—that can be mitigated by diversity reception techniques. The third and fourth areas were improvements in modems and protocols.

Contention can be reduced by time slotting or frequency management techniques which limit the number of stations and traffic to those the channel can comfortably accommodate. Work done by Steve Hall, WM6P, showed that a significant improvement in copy can be accomplished by dual diversity, ie, two antennas, receivers and TNCs. The next natural step would be to compare copy from the two TNC outputs and perhaps more than one transmission, if needed, to produce a composite error-free packet. Modems have been improved through the application of digital signal processing techniques, which are finding their way into most new designs. The protocol problem was addressed by comparing packet radio with AMTOR, rethinking the whole transmission strategy and coming up with new systems: CLOVER and PACTOR.

While amateurs have been working on better ways of sending data over HF radio, the federal government has been finalizing its procurement standards for radios with built-in automatic link establishment (ALE). You will find an interesting introductory article on this subject by Bob Adair, KAØCKS, and Dennis Bodson, W4PWF, in May *QST*. Look for some follow-up articles in *QEX* on the techniques involved in ALE.

New digital transmission techniques and ALE can be combined to make more efficient and reliable systems. This continues to be an important technical area where radio amateurs can make important contributions—*W4RI*

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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*.

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DIGITAL FILTER FOR EME APPLICATIONS

By Andrea Dell'Immagine, IW5BHY

Translated by Jon Iza, EA2SN, A. Gasteiz 48-7, E-01008 Vitoria, Spain, from the July 1991 issue of Radio Rivista's *DSP column.*

DSP (Digital Signal Processing) and EME: A marriage which must be done!

The application Andrea developed, which is hereby described, is a clear example of what digital signal processing has to offer to the EME operator. Talking about this activity, after attending the 13th Microwave Workshop together with I6ZAU, I think the remark made by Pino, I2KFX, is correct. Vico, I6ZAU, and the OMs from the Team of Montefano presented at the Workshop a movie about their excellent work which granted them with the first EME QSO with Sweden and the US on 10 GHz.

His comment was: "...an exceptional work, an example of how to understand Amateur Radio as a whole, and I wonder: How many OMs on top of their capability and perseverance have also the possibility of getting an antenna system so big and complex? All their admirable effort was invested on the front-end stage of the system and only a little bit was "spent" on the modulation/demodulation techniques...".

I support the observation and I think DSP has to be in a near future conjugate with, and not only with, EME. Although for people who grew up in an analog world, as I did, it is difficult to perceive the enormous potential of digital processing. It has to be integrated and studied. Andrea provides, here, a practical application for a filter (to be described in Radio Rivista*) after going to further discussion on DSP.*—(I2SG)

Our introductory article on digital signal processing described the potential of the technique and some possible uses on Amateur Radio. This article, which will describe the construction of a CW audio filter for EME operation, wants to be both a stimulus for further experimentation and a concrete example. I promise the arguments will be presented in an intuitive and informal way, without the use of mathematics.

I invite those who want to send me some material, to keep the mathematical expressions to a minimum, using it only when strictly necessary or as a complement.—*Ed. Radio Rivista*

Digital Filter

An analog system, for instance an audio filter, is a circuit which processes an input signal by means of traditional electronic components such as transistors, resistors, capacitors, etc, to get an output signal. As we already discussed, there are many advantages on doing this process digitally, that means going from an analog filter to a digital filter.

Let's analyze the block diagram shown in Fig 1: Data flow coming from the ADC is handled by a processing unit, which carries out in real-time some calculations on the samples acquired and provides with the same rate processed samples going to the DAC which converts the bit string to the corresponding voltage values. The output waveform is composed of pulses or stepped waves which should be smoothed by an analog low-pass filter which provides a "continuous" signal to be further ampli-

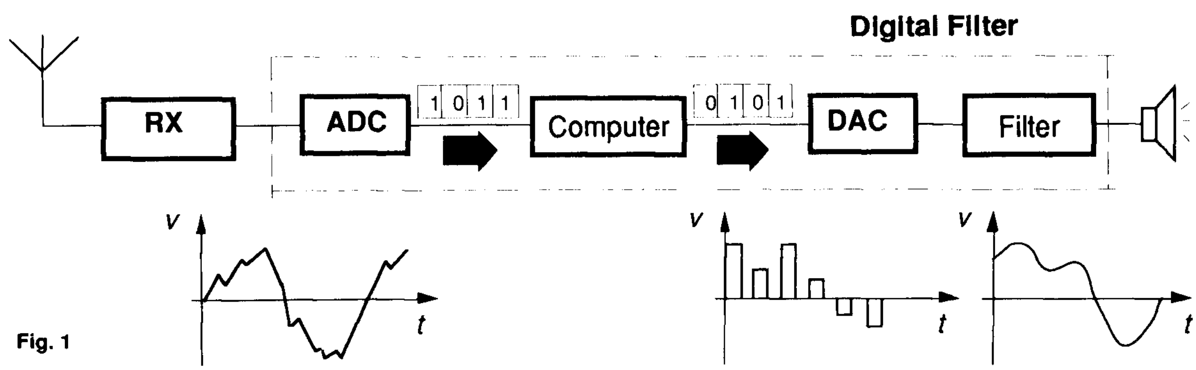
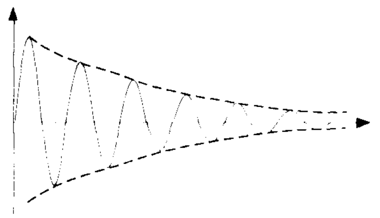


Fig. 1

Fig. 2



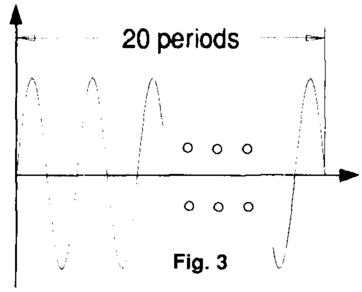


Fig. 3

Filter Response

Typically a resonant filter is an RLC circuit which when excited with a pulse starts an oscillation at the resonance frequency for a finite time: The more selective the filter, the less damping suffers the oscillation.

The effect is shown in Fig 2. We decide now what will be the response of the filter to the pulse: We make an assumption that the pulse is composed by a truncated oscillation, as represented in Fig 3. This waveform is a sinusoidal signal at the resonance frequency which lasts a certain number of periods: the longer the duration, the shorter the band.

As we want to obtain a high selectivity, we consider 20 periods. The digital system to build, to simulate an analog filter has to perform in this way: When excited with a single pulse (the one obtained with the first sample) it has to provide a response similar to the waveform presented in Fig 3, but "sampled".

We select a sampling frequency of 6 kHz; that way, every period of a 1-kHz oscillation, that we assume is the resonance frequency, has six samples exactly. With these values, the response of the digital filter is a periodic sequence like 0, 1, 1, 0, -1, -1, 0, 1, 1, 0, -1, -1, 0,... composed by 120 samples (Fig 4).

The Processing Algorithm

The algorithm which produces the desired response is based in a shift register composed for our purposes of a 120-cell vector. The samples, one to one, are inserted in such structure as soon as they reach it. To illustrate the process we use an example: The starting point is the situation represented in Fig 5a. When a new sample arrives from the ADC, the 120 samples already in the register are pushed to the right, leaving the first cell empty for the new value. After this operation the register has a new state shown in Fig 5b (12 is the new inserted value).

We will now see how to calculate the output sample value. After inserting the new value on the shift register we carry out an algebraic addition and subtraction of the values contained in the shift register in a precise order as shown in Fig 6. The cell values are alternatively added and subtracted by pairs leaving a cell not participating in

fied to become the audio output.

The objective of the project is the construction of such a digital audio filter which will increase the signal/noise ratio of weak signals reflected by the moon and which will have a very narrow bandwidth, of about 40 Hz. This value has been selected as a compromise between a strong selectivity and an acceptable ringing ("widening" of dot and dashes) effect.

Hardware Solution

The filter follows the block diagram already seen: as a computer we will use a DOS machine with an 80286 or 80386 microprocessor with an acquisition board (ADC/DAC). This solution, although viable, is only acceptable for research purposes, since the computer has to be on all the time.

The introduction of a standard acquisition board with a dedicated microprocessor is one of our primary objectives. Using a DOS machine we have available many different programs for software development, but the architecture is not adapted for dealing with DSP problems: ie, the problems of computing speed. A 386 25-33 MHz computer has computing power enough for our purposes, and a 286 computer, although a little bit short of power, can still be used to carry out interesting experiments.

Those who own such a computer will be able to get an inexpensive acquisition board (in my case, less than 120000 lire, about $120), complementary converters, and build the full filter circuit. It is foreseeable there will be in the near future a PC ADC/DAC board specially designed for amateur applications with a standard interface. Such a board is not yet available, so I used an ADC/DAC board for industrial purposes, readily available at low cost.

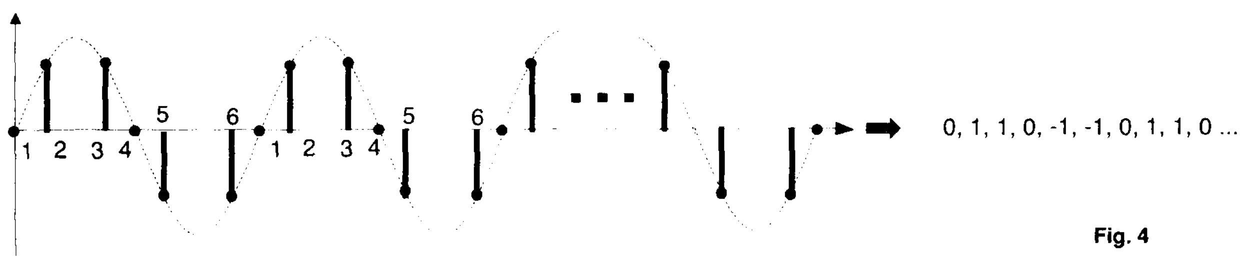
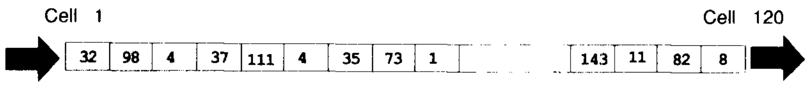


Fig. 4

Fig. 5a



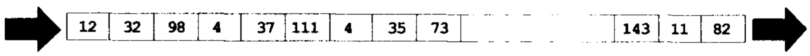


Fig. 5b

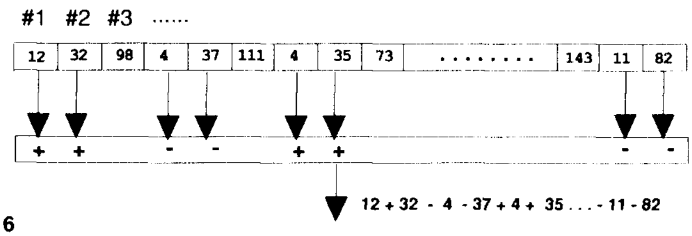


Fig. 6

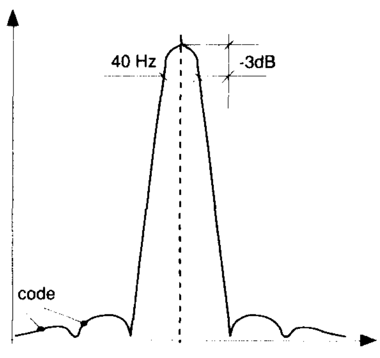


Fig. 7

the result calculation. In our example we calculate the result as 12+32-4-37+4+35.....-11-82. The algorithm makes this: Get a value at the ADC, put it on the shift register, calculate the output value, and send it to the DAC.

This operation is carried out cyclically 6000 times per second. It is now easy to understand how the system described is able to obtain the response of the pulse. When a sample (ie, number 1) traverses the shift register (it is a pulse: all other samples are zeros) through the calculation we obtain an output value sequence as shown in Fig 4.

We will try now to intuitively understand how it is possible to get a filtering effect and the increase of the signal/noise ratio. We suppose the input signal has the frequency of resonance and, for simplicity, we consider the sampling starts with a zero value. At the output we obtain a sample sequence equal to the input pulse corrected by a proportionality coefficient.

If someone has the patience to calculate the output with the used rules (it is easier if you start the calculation with a full register, inserting new values) the result is a sequence similar to the one shown in Fig 4 but with higher amplitude. If there is any noise in the shift register values, this random deviation will add up in some cases (or subtract) getting a "reduced".

The same behavior is followed with all other frequency components of the signal not close to the resonance frequency.

In other words, "printing" the filter with the signal waveform to recognize (with the specifics of the pulsed response) increases the selectivity and allows a noticeable increase of the signal/noise ratio.

Performance

Studying the system with mathematical tools, we obtain the response in frequency as shown in Fig 7. The bandwidth is about 40 Hz at –3 dB and the increase of the signal/noise ratio is about 15 dB. These values may seem enormous but, it is needed to take into account that the result is not obtained by an effective reduction of the spectral density of the noise but the limitation of the bandwidth of the same.

The increase in the intelligibility of the signal, although considerable, is not as tremendous as expected: "Miracle" filters do not exist. On the frequency response graphic there are frequencies other than the central resonance frequency that show up because of the simplicity of the calculation procedure. The relative maxima are attenuated so they do not cause any problem, at least on EME applications.

This anomaly may be eliminated to correct the pulse response of the filter. But the correction imposes the use of several multiplication operations which increase the complexity of the calculation, making it difficult to implement using ordinary computer architectures.

The Program

The algorithm described is written in assembler language. I know this language makes the comprehension of the program more difficult, but it is necessary in order to obtain the maximum computing power of the microprocessor. From the structure of the filter we may observe there is a data flow of almost 6 kbyte/s we have to process in real-time, so it is not possible to use a high-level language such as BASIC.

To avoid any specifics of a particular AD/DA board, we consider an industrial-grade 8-bit AD/DA board, leaving a mark where it is needed the code for data input or output and conversion control, which will be board-dependent.

The other program blocks are well commented, so I will limit my comments to the following:

- The output condition of the program (break) (pushing of carriage return key) is tested every 30,000 samples, about 5 seconds, to avoid losing time checking INT 21 which verifies the condition.

- The conversion which codes the translation to two's complement is needed because the ADC/DAC uses the translation and the microprocessor the complement's value.
- The delay has to be adjusted by trial and error to get the desired frequency of resonance.
- The shift register management is not optimum since it has to carry out 240 memory access operations to insert one value.

A faster solution involves the use of a start pointer, and consider the register as a cyclic one. The adoption of such technique was discarded since it would reduce the comprehensibility of the program.

All problems commented are mainly caused by the lack of specific hardware created for such ham radio use. It is well known hams have the resources to manage this lack of material, so it is quite possible in the near future there will be a complete system easily replicated. To give a hand to those who want to start the construction of such a system and may have trouble, I promise to come back with a more complete study of the management of the converter.

Results Obtained

The digital system presented has performed quite well when compared with commercial filters in use at a typical EME station, revealing a better behavior with respect to dynamic response and the treatment of signals with very poor signal/noise ratio. From the point of view of audio signal, the reception of CW signals is particularly easy and smooth which allowed me to receive clear signals from the Moon even with my little system of two antennas. As with any other EME activity, where any small improvement is important, the use of a digital filter is, in my opinion, an optimization touch of the EME system not to be neglected.

The filter described here enters the category of FPR filters (finite pulsed response). Another method considers the response of the filter infinite (that is, of unlimited duration) and produces the category of IPR filters (infinite pulsed response). I also tried the IPR filters, again obtaining very good results, like the ones with FPR filters, but I preferred to describe only one of them.

It is difficult to decide which filter is better for EME operation since on top of the theoretical studies, there is a human factor related to the intelligibility of the message. It is, thus, needed to do field testing during real-life QSOs.

FPR selective filter with 120 delay cells

```
DELAY EQU 1D                       ; Delay to adjust resonance frequency

PILA SEGMENT STACK                 ; Define a 10 word stack
  DW 10D DUP(?)
  TOS LABEL WORD
PILA ENDS

SHIFT_REGISTER SEGMENT
  REGISTER DW 120D DUP(0)  ; Define a shift register 120 words
SHIFT_REGISTER ENDS        ; wide

FILTER SEGMENT
  ASSUME CS:FILTER,DS:SHIFT_REGISTER
   START:  MOV   AX,SHIFT_REGISTER    ; DS initialization
           MOV   DS,AX
           MOV   AX,PILA              ; SS initialization
           MOV   SS A
           MOV   SP,OFFSET TOS        ; SP initialization
   BEGIN:  MOV   CX,30000D            ; Processing cycle of 30,000 samples
                 ; corresponding to 5 seconds of
                 ; signal
;******* Sample acquisition of input signals to AL *******
SAMPLING:  { AL <— SAMPLE          }  ; Carry samples to AL
           { BEGIN OF CONVERSION }    ; Begin new conversion

           TEST     AL,80H            ; Translation conversion to two's
           JZ       TRAN              ; complement by complementing the
           AND      AL,7FH            ; MSB of AL
           JMP      DONE
TRANS:     OR AL,80H
DONE:      CBW                        ; Extend AL into AX keeping the value
           PUSH     CX                ; Save CX contents into stack
           MOV      CX,DELAY          ; Delay cycle to adjust frequency
ADJ:       LOOP     ADJ               ; of sampling and, thus, of resonance
           POP      CX
;******* Put new data on shift register ******************
           MOV      SI,236D           ; Offset of next to last word
           MOV      DI,0
CYCLE:     MOV      BX,[SI]           ; Copy word at the n-th position of
           MOV      [SI].02,BX        ; shift register to n+1-th position
CONTINUE:  CMPSI,0                    ; Check if this is the last word,
           JE       FINISH
           DEC      SI                ; if not, decrease SI to point out
           DEC      SI                ; preceding word and keep going
           JMP      CYCLE
FINISH:    MOV      REGISTER,AX       ; Put new data on shift register
;*** Calculation of resulting samples to be put on AL *******
           MOV      AX,0              ; Reset accumulator
           MOV      SI,0              ; k:=0
CYCLE1:    ADD      AX,[SI]           ; Add sample at position 6*k
           ADD      AX,[SI].02        ; Add sample at position 6*k+1
           SUB      AX,[SI].06        ; Subtract sample at 6*k+3
           SUB      AX,[SI].08        ; Subtract sample at 6*k+4
           ADD      SI,12D            ; k:=k+6
           CMP      SI,240D           ; Check if the register processing is
           JE       ESCI              ; completed. If not, go for next word.
           JMP      CYCLE1
ESCI:      PUSH     CX                ; Save CX contents into stack
           MOV      CL,06D
           SAR      AX,CL             ; Divide AX by 64 to reduce it to 1 byte
           POP      CX
           TEST     AL,80H            ; Translation conversion to two's
           JZ       TRANS1            ; complement by complementing the
           AND      AL,7FH            ; MSB of AL.
           JMP      DONE1
TRANS1:    OR       AL,80H
; ************ Sample output available at AL ******************
DONE1:     { AL —> D/A Converter }    ; Sample output
           LOOP SAMPLING              ; Go sampling
           MOV      AH,06H            ; Read keyboard input (one character)
           MOV      DL,0FFH
           INT      21H
           CMP      AL,0DH            ; If <CR> is pressed, sampling is ended,
           JE       TERMINE           ; otherwise, process another 5 sec.
           JMP      BEGIN
TERMINE:   MOV      AH,4CH            ; DOS exit.
           INT      21H

FILTER ENDS
END START
```

A 1.8 to 54 MHz 5-Watt Amplifier

By Zack Lau, KH6CP/1
ARRL Laboratory Engineer

Need a rugged and stable amplifier for your multi-band QRP rig? Not only has the design been optimized on a pricey computer program called *Touchstone* (by eesof) for unconditional stability, it has actually survived a variety of poor loads—it was used to sweep filters with 5 W of RF. The gain of the two stage amplifier was measured to be between 28 and 30 dB in the amateur bands, though there is another dB of gain around 37 MHz.

For ruggedness and ease of design, a Motorola MRF 137 was selected as the final transistor. While the MRF 138 may be more linear, insufficient design information was available to ensure a stable design. While some amateurs will balk at the high cost of these devices ($24 in November 1991), such savings are easily lost if the cheaper device has a habit of blowing up. Also, one picks up a real clean SSB signal—the high-order IMD products are way down compared to typical bipolar amplifiers. For instance, the worst IMD on 3.5, 7, 14 and 28 MHz was –38 dB on 28 MHz, with the 5th order products 61 dB down (relative to PEP). The device was putting out 5-W PEP while being biased at 0.5 A (28-V supply).

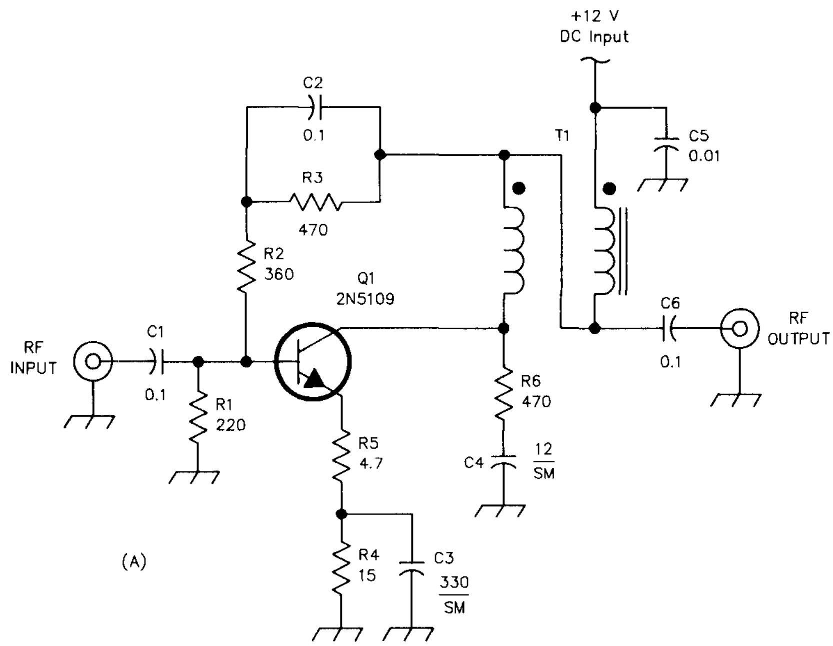


Fig 1a—Low-level amplifier designed to compensate for the gain rolloff from the power amplifier.
Q1—2N5109, 2.5-W heat-sinked RF transistor, f_T is 1200 MHz.
T1—15 turns bifilar #28 on FT-37-43 toroid core.

Perhaps the biggest flaw is the power requirement—these FETs really like to see high voltages for best performance, and the MRF 137 is no exception. I biased the MRF 137 for 0.55 A and 28.2 V. It drew 0.6 A when putting out 4.6 W at 28 MHz. The driver runs off your normal 12-V supply.

The input amplifier shown in Fig 1a is pretty straightforward—a bipolar 2N5109 with the feedback networks adjusted to compensate the gain of the MRF 137. A series network of a 470-Ω resistor and a 12-pF capacitor was tacked between the collector and ground to ensure stability at all frequencies. The MRF 137 rolls off a few dB at 54 MHz, but the bipolar amplifier adequately compensates for this gain deficiency. The input return loss is better than 18 dB between 1.4 and 29.9 MHz, but degrades to 12 dB at 50 MHz. The input SWR was not tested with poor loads.

By itself, the MRF 137 amplifier stage shown in Fig 1b makes an excellent 16-dB gain block between 1 and 32 MHz, having less than 0.5 dB of gain variation. The transmission line transformer on the input seems to help the input return loss/SWR, keeping these numbers above 18/below 1.3 to 1 between 1 and 50 MHz. I suppose that putting another transmission line transformer on the output could be used to get a more powerful amplifier with less gain over a similar frequency range, but this variation has not been investigated.

The simplest circuit board I could think of was used—I cut two pads in a piece of double-sided circuit board for the gate and drain leads. Then I wrapped the edges of the board with copper tape and soldered it down for good grounding. After making holes for the MRF 137 transistor and the mounting screws in the board and a spacer, made of 0.050-inch aluminum, I attached the spacer, the circuit board, and the MRF 137 to a heat sink tapped with 4-40 screw holes. Standard ground-plane construction was used to attach the other parts. The 2N5109 amplifier was built on its own ground plane—RF amplifiers work better if there isn't too much gain in one place. Three additional amplifiers were built by Mike Gruber, WA1SVF, for use in the lab. He noted that R8 had to be changed from 4.7 kΩ to 1 kΩ to bias the amplifiers at 0.5 amps. Apparently, the MRF 137s he used have a higher gate threshold voltage. Otherwise, performance was as expected.

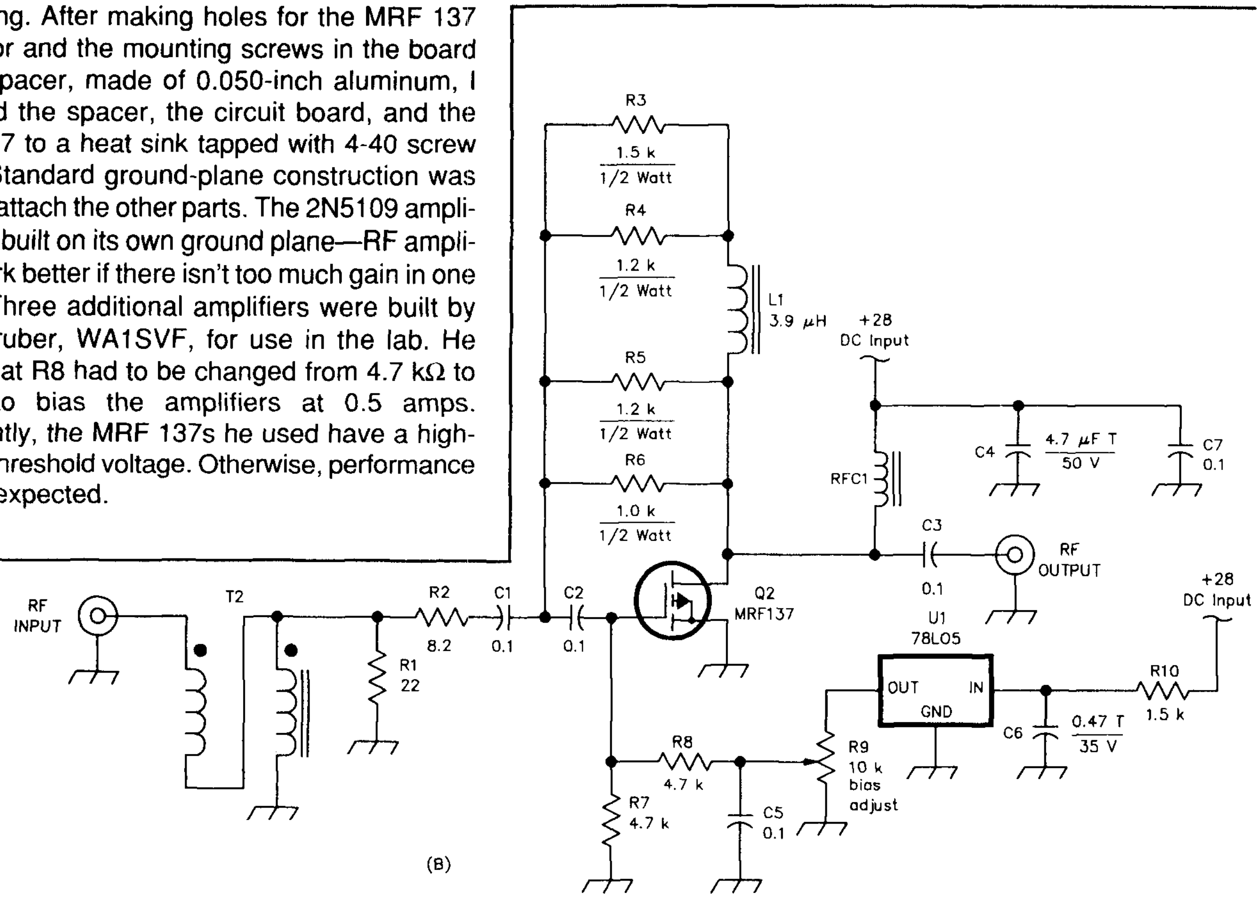


Fig 1b—5-W TMOS power amplifier.

L1—26 turns no. 26 enameled wire on T-44-2 toroid, 3.9 μh.

Q2—MRF 137 transistor.

R9—10-kΩ turn potentiometer for bias setting.

RFC1—21 turns of no. 26 enameled wire on FR-37-67 toriod.

T2—4 turns 25-Ω coax on FT-50-43 toroid core. The 25-Ω coax is actually two 50-Ω coax run side-by-side. The prototype used RG-196/U coax.

U1—78L05 5-V regulator.

Bits

18th Annual Eastern VHF/UHF Conference

The 18th Annual Eastern VHF/UHF Conference will be held May 23 and 24 at the Ward College of Technology, University of Hartford, Connecticut. Ward College of Technology is co-sponsoring this year's conference.

Scheduled speakers included: Mr. Walter Banzhaf, EP, WB1ANE; Dr. Al Katz, K2UYH; Dr. Emil Pocock, W3EP; Dr. Mike Owen, W9IP; Dr. Tom Clark, W3IWI; Dr. Caryle Sletten, W1YLV; Dr. Bill Shaheen, N1CQ; Steve Powlishin, K1FO; Dave Halliday, KD5RO; Joe Reisert, W1JR; Dave Hackford, N3CX; Buzz Miklos, WA4GPM; and Paul Wade, N1BWT.

Topics for papers include small antenna moonbounce, 10-GHz lens antennas, computer-control and tracking hardware and software, TWTs and klystrons, 222-MHz moonbounce, solid-state microwave power amplifiers, high-power UHF amplifiers, RF analog design software, optimum dish feeds, and antenna structural concepts.

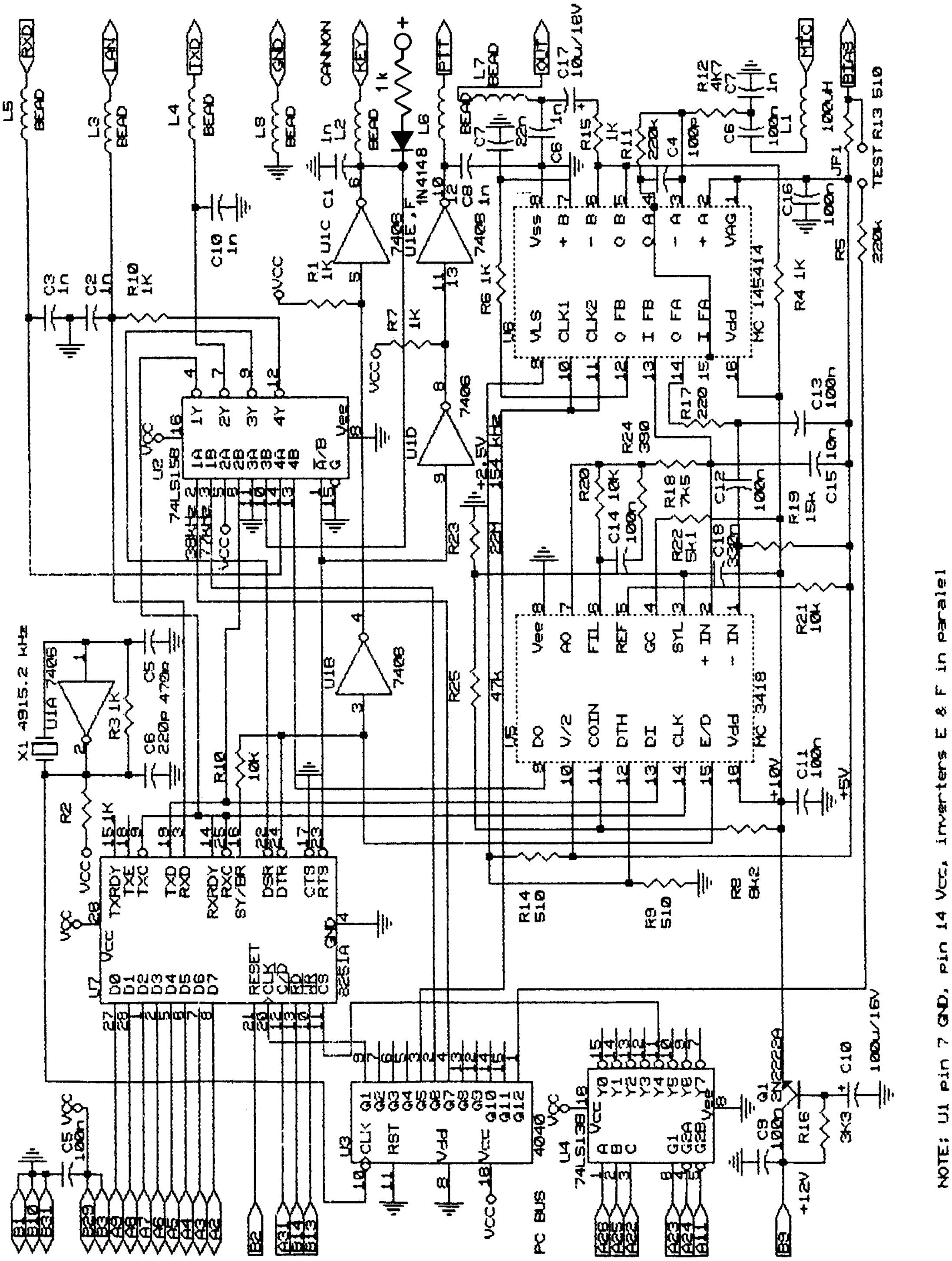
Conference registrants will receive a copy of the conference proceedings. The proceedings will include all papers presented at the conference and others offered for publication.

Conference activities include a Saturday night banquet, noise figure measurements, and computer workshop. The VHF swap fest (flea market) will be held Sunday.

For registration and where-to-stay information, please contact Thomas Kirby, W1EJ, 1 Meadow Knoll, PO Box 455, Pelham, NH 03076, tel 603 635-2514.

Corrigendum

The following is the schematic for the "EA-88 IBM PC Radio Interface," by Marijan Miletic, YU3EA/N1YU, which ran in the June 1991 issue of *QEX*. Our thanks to Mr. Miletic for sending this new drawing to replace the one we overlooked and did not print in the original article.



COMPONENTS

By Mark Forbes, KC9C
PO Box 445
Rocklin, CA 95677

Thanks for the comments and letters that you readers have sent in recently. I'll try to address some of the areas that you've expressed interest during the next few columns.

This month, I've run across a couple of components that you HF enthusiasts may find useful. A lot of experimenters like to build HF linear amplifiers, but some components have become difficult to find. Well, two manufacturers have, believe it or not, introduced *new* products that just may help you out. Let's look at those first.

Sprague-Goodman High-Voltage Trimmer Capacitors

These are ideal components for neutralizing those high-power ceramic power tubes, as well as any application requiring a trimmer capacitor in a high-voltage circuit. The "Type 9" compression trimmer capacitors have a working voltage of over 2000 V dc. The dielectric material is mica. The capacitors are available in values from 10-48 pF to 250-480 pF (those are the ranges for individual trimmers).

Not only are the capacitors just what an amplifier builder is looking for, but the price is right too. In small quantities, these trimmers cost less than $6 each. For more information on these, write Sprague-Goodman Electronics, Inc, 134 Fulton Avenue, Garden City Park, NY 11040. Or, phone 516 746-1385.

Caddock Power Resistors

Another component of use for high-power circuitry is the series of power resistors from Caddock Electronics. These resistors, called the "Kool-Tab" power film resistors, are available in either 20-watt or 16-watt versions... yes, that's 20 watts, not 2 watts!

As you might expect, these are not in typical resistor packages. They are actually packaged in the TO-220 package. If you're not familiar with that package, it is most commonly used for intermediate-power transistors and is also used for 1-amp voltage regulators.

Both the 20-watt and 16-watt resistors are available in resistance range from 0.10 to 10 kΩ. Four tolerances are available: 1%, 2%, 5%, and 10%, with decreasing cost as tolerance increases. The typical prices are on the order of $2 to $10 each.

You can get more information on the MP820, MP821 (20-watt versions) and the MP816 by writing Caddock Electronics, 1717 Chicago Avenue, Riverside, CA 92507, or phone 714 788-1700. They also have a full-line catalog available covering their more than 200 models of high performance resistors.

3-mm Trimmer Potentiometers

From the very large to the very small. . .Noble Electronics has 3-mm and 4-mm surface-mount trimmer resistors. To put that in perspective, the 3-mm trimmer is roughly the size of a diamond-stud pierced earring (or about the size of a lower-case "o" on this page).

They are, of course, designed for extremely small circuits, such as some of the new hand-helds or in your own circuits which use the monolithic receiver or transmitting ICs. As you would expect, the trimmers use a unique technology. The TCM3K and TCM4K trimmers use a metal-glaze element on a ceramic substrate. Power handling capability is 0.2 watts (about 1/4 watt) at 20 V dc. You can get the trimmers in values from 200 Ω to 1 MΩ.

More information on this line of trimmers can be obtained from Noble, 5450 Meadowbrook Industrial Court, Rolling Meadows, IL 60008, or phone 708 364-6038.

Integrated Low-Pass Filter

Silicon Systems, who has been featured in this column several times with their switched capacitor filter products, has introduced an integrated low-pass filter chip. The chip has both a 7-pole filter and a single-pole, single-zero differentiator output.

Frequency range on the part is 1.5 to 8 MHz, making it very enticing for a low-cost, tiny, direct-conversion receiver project for 160, 80, or 40 meters. It could also find applications in the first IF section of VHF, UHF or microwave receivers.

The 32F8020 is packaged in a 16-pin DIP or a surface-mount package. Power is supplied from a 5-V dc source, and it consumes only 175 mW. It also has an idle mode of 5 mW. Thus, it would fit right in to a battery-powered circuit.

Get data sheets on this or other interesting products from: Silicon Systems, 14351 Myford Road, Tustin, CA 92680, or phone 800 624-8999.

High-Power Voltage Regulators

Designed for the exploding notebook-computer market, but having a multitude of applications, Power Trends now has a complete 3-amp switching power supply "on a chip." It is really more of a module than a chip, but still it's only 1 inch square.

The 78ST305HC features a 5-V dc output with

3 amps available. The switching power supply operates at 1 MHz. All of this is contained in a rather strange looking package that includes its own finned heat sink. Because it's a switching supply, it is 85% efficient; at least 25% more efficient than any linear supply. Of course, the switching supply does generate a modest amount of RFI which would need to be handled in an Amateur Radio application. Also available is a 12-volt dc-to-dc converter, the 88SR112.

Inquire about these two parts at: Power Trends, Inc, 1101 N Raddant Road, Batavia, IL 60510, or call 708 406-0900.

Correspondence

Antenna Hints

In the aftermath of a tornado, with three towers and nine antennas in shambles, a few hints and kinks for you.

When you assemble a series of pipes that slide into one another, such as for masts, it is a wise idea to mark them distinctly to aid in reassembling them and aligning bolt holes (Fig 1).

Since I was still awaiting the arrival of my 1269 replacement antenna, I made up the following unit to check the accuracy of my satellite antenna alignment calibration in both azimuth and elevation (Fig 2).

Attach to boom of antenna with open end of tubing pointing in the same direction as antenna and in the same plane. Measure the resistance of the diode at the shack end of the coax and when it is minimum you are pointing right at the sun, ±1 degree. Needless to say you will need to know the position of the sun at that time. Your tracking program *Instant Track* will provide that data. I am sure a similar system with maybe some enhancement—amplification device—will work for pointing at the moon, too. See Fig 3.—*W.L. Lamb, WØPHD, PO Box 26, Warren, MN 56762-0026*

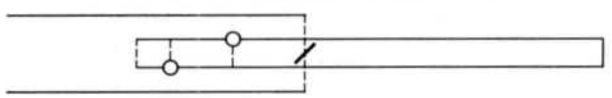


Figure 1

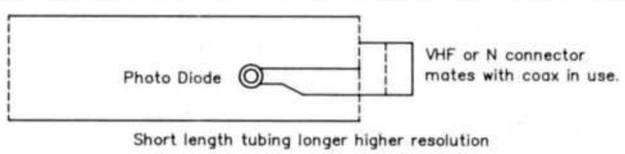


Figure 2

Getting Involved

I happened to pick up a sample copy of the June issue and, as I was about to put it back down, your editorial question about "let(ting) the technology hang out" caught my eye.

The problem isn't that today's ham gear lacks a knob to dip the final. It's that there are far fewer ways to be involved with ham radio than there were a few decades past. That seems at odds with the explosion of new modes, but even so, I think it is the case.

I use the word *involved* to mean you put something in and you take something out.

Today's ham begins with only minimal skills—in fact, he no longer needs to learn the code. The exams are a lot easier than they were and memorizing answers is not only practical but accepted. (I don't know when you were licensed, but when I got my first General, I had to draw a class C amplifier and calculate the resonant frequency of a tuned circuit.) Getting a license isn't very *involving*.

Essentially, all gear (even for exotic modes) is now purchased. It is mostly automatic (no dipping the final) and far too complex for troubleshooting by any but the most highly skilled. You don't get *involved* using your equipment, either.

So ham radio today is, first of all, talking to other people using purchased gear which one understands only dimly. Now whether talking means the Bible Fellowship Net, county hunting, DX or the local repeater, one can be *involved* in this—but *user* involvement in communications isn't unique to ham radio any more. You can do most of the same things with a cellular phone or a CB radio—cheaper and better, at that. Even the digital

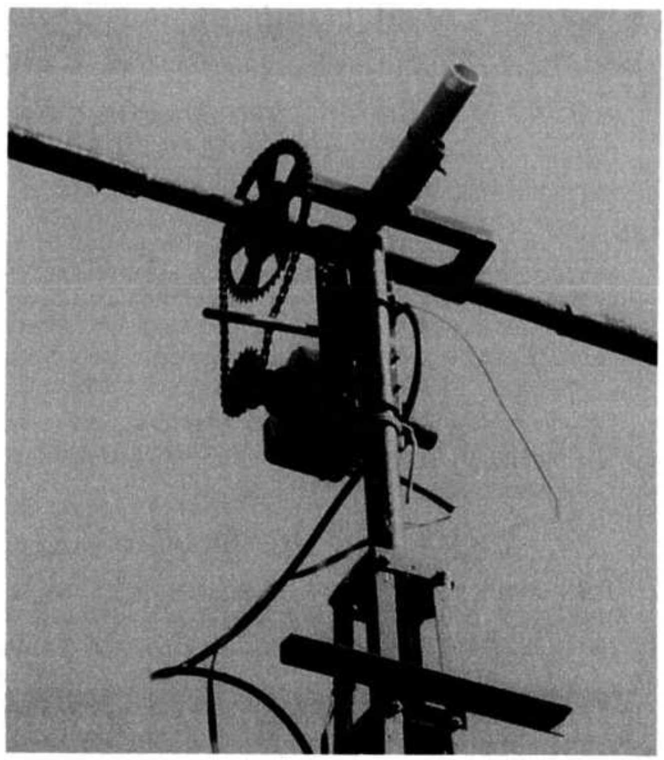


Figure 3

modes offer only the marginal uniqueness of using radio transmission—any computer nut is active on networks far larger than those that hams are using.

There are, of course, all sorts of social parts of ham radio—club activities, ARRL offices, public service work—but none of that is unique either.

What once made ham radio unique is that we understood what we were doing and thus could be involved with the technology. Some of us were able to do unique and wonderful things but the satisfaction of real involvement was much more widespread than doing wonders.

Can one be involved with a telephone? A microwave oven? A VCR? Not very. But take a 6V6-6L6 transmitter—you bet you can be involved.

A QSO was more than talking—it was working with that rig we built. Even with purchased gear—because we knew how the stuff worked, we were involved through debating the merits of the WRL approach versus the one taken by Collins or Hallicrafters. Today's ham is generally limited to discussing features—the "number of memories" and such.

There were many reasons things changed, but the ones you generally hear about are less important than ARRL policy.

I am not about to advance a conspiracy theory. What has happened—the near destruction of ham radio—is probably just an example of the law of unintended consequences. Since the Second World War, the ARRL has pushed amateurs to be technically advanced. That sounded good at the time and it probably sounds okay to quite a few people today—at least Dave Sumner must think it does 'cause I recall a *QST* editorial within the last year talking about the *need* to get ready for spread spectrum communications.

The fly in the ointment was and is that for most hams, the time available for the hobby is limited and learning (and the construction which is essential to real learning) takes time in proportion to the degree of "technically advanced." Superhetrodyne receivers started to make building your own gear more difficult even before the war, but simple transmitters (AM, CW) were still the rule—and after the war, the availability of surplus receivers (requiring conversion) gave quite a few hams experience with receiver work.

NBFM—ARRL policy right after the war—didn't last long enough to have any effect. But once SSB got going in the 60s, most hams waved goodbye to constructing and eventually even to modifying their gear. I remember feeling guilty that I couldn't keep up with the times. But my ham radio was *building* and I didn't have the time for SSB equipment. I let my license lapse.

The other factor, of course, was the growing availability of affordable manufactured gear. The growing market meant more economical production, competition drove prices down and rising real wages were the final step in bringing commercially made gear within reach of all but the lowest income ham.

When building your own was no longer essential and no one said it was really a good idea or gave you help in getting started—hams stopped doing it. "And the rest is history."

I don't think this outcome could have been foreseen. Certainly no one ought to feel guilty about it. But it will be worse than folly if we don't face up to it and begin to take action.

Concrete actions—first and most important, say that hams should know how things work and should build, even if only simple equipment. Subordinate being technically up-to-the-second to technical knowledge. While some may say that a ham who doesn't understand a PLL is so out of date as to be useless, you cannot understand a PLL controlled synthesizer without some knowledge of oscillators. You learn nothing about either by studying an ICOM nameplate; you can learn about oscillators by building even very simple gear.

In support of the "know how it works—build something" policy, encourage the use of simple gear—CW and AM transmitters, simple receivers. There seems to be a fear at Headquarters that if modern hams actually used any of these "obsolete" methods they would somehow become corrupted and refuse to ever use modern gear again; if I am right about this, it tells you something about how much our leadership believes in the new technology they advocate.

So, no, I don't think the technology has to "hang out." But making it simple so more people can use it is thinking about the problem in the wrong way. Making it simple by removing any possibility of being involved means making it possible for more people not to care whether they are hams or use a cordless phone.

As to how progress gets made (improving mainstream systems or innovative advancements in the state-of-the-art) the ham who never built anything won't do either one—he's just a consumer, and (for reasons not unrelated to this discussion) he will be buying foreign gear, the progress of which is not the concern of US hams.—*Walt Hutchens, KJ4KV, 3123 North Military Road, Arlington, VA 22207*

"Weekdate" World Standard for Software Release Dates

When you browse through the bulletin boards you will often find files which have some sort of date or version number encoded into the file names. For example, *NOS_0618.EXE* or *KH113016.ZIP*, and so forth.

Problem is, you have no easy way of telling when the software was released because different people use different rules. The date stamp on the file doesn't always help as the stamp corresponds to when the file copy was created, which may bear no resemblance to when the software was actually released.

The problem is further compounded by the fact that the Western hemisphere uses the month/day format, whereas much of the rest of the world uses day/month—

does *0601* mean June 1 or 6 January?

To get around these difficulties I propose the adoption of a new and very simple standard for file naming which should be acceptable throughout the world.

All you need is a 3-digit number, called a *weekdate,* encoded into the filename. The first digit is the final digit of the year, and the remaining two digits are the week number.

Thus, for example, a file name *ABC130.ZIP* has the weekdate *130,* and was therefore released in 199*1*, week *30.*

By this means it will be universally obvious when a file was released. Also, if you have several versions of a file, you can tell immediately from their names which is the latest release. The larger the weekdate number, the later the version. For example, *ABC201.ZIP* was released a week later than *ABC152.ZIP* (This will work up to ABC952.ZIP—the last week of this century—but by that time we will no doubt be doing things differently anyway.)

The other advantage of using a weekdate is that it is only 3 digits long. Other schemes use up to 6 digits to encode date and version number, which doesn't leave much scope for imagination in an 8-character filename!

I feel that this is a very simple and workable scheme, and will eliminate a lot of the confusion which exists today. Your comments please.—*Ian Wade, G3NRW @ GB7BIL, 7 Daubeney Close, Harlington, Dunstable, Bedfordshire, LU5 6NF United Kingdom*

Series-Pass Power Supply Suggestions

The May 1991 issue of *QEX* with the circuit for the series pass power supply is quite well done and includes some important facts about the necessity of proper current baring leads in the layout and the need of making Kelvin connections to reduce errors. However, I have two suggestions to make to improve this. The first would be to include two extra small binding posts connected directly to the load itself, the positive going directly to the sending part of the circuit, such as the lead on the upper end of R4, and to the lower end of R11, joined together with the moving arm of R11 to the negative binding post. This will assure even better regulation. The second point to consider is the actual wiring of C1 and C2 and the leads going to them and the ± leads of the bridge. As you can see, in the small circuit (Fig 3) the minimum possible ripple fed to the regulator and to terminals 11 and 12 or the 723 would be achieved by this type of connection. There is nothing wrong with the circuit as shown in your diagram, but it is the way the wire would be run that would make the difference, and the input to the series pass transistor and its controller. With the proper wiring of these capacitors, the only limiting factor on the lowest possible ripple is the internal ESR of the capacitors and their capacity. Please note that the heavier current leads, including that of the 723 negative supply, all go to the output Kelvin negative terminal. The balance of the ground connection can go to the PC board negative plane since the currents are low and the ground plane would probably be quite large. My purpose in writing is that with long years of experience and handling lab engineers, their natural inclination is to wire the rectifiers and capacitors associated with it, in the way shown in your diagram. It is quite easily realized that even a very small length of hook-up wire can introduce ripple into the load putting greater demands on the regulator to smooth the output and the tendency to much-increased ripple near the maximum output.

If a separate binding post is to be placed for a Kelvin connection, then there should be a jumper between the Kelvin terminal and output terminal when the Kelvin terminal is not used connected directly to the load itself.

Incidentally, anyone intending to duplicate this power supply would also find it useful to place 0.01 mFd condensers across each pair of terminals, on the bridge rectifiers. These can be a low-voltage ceramic type. This will reduce noise under certain circumstances to prevent conductive or radiated diode switching noise from reaching the load. C8 and C9, rated at 2000 volts, which is necessary in the case of ceramic condensers, can be 600 or 630-V dc or 250-V ac, mylar, polypropylene, or polycarbonate plastic film type, which would be cheaper.

The builder should avoid "cheap" 2N3055 transistors because gain or Vsat may not be up to specs. A single 2N3771 or 2N2772 can replace the pair of 2N3055s and do a better job. A pair of TIP35As would also be a good choice, and would reduce work on the heatsink. Since these are one-sided, they can be mounted on the rear of a heatsink which can be all fins and take up less real estate.—*Earl H. Hornbostel, Crystalsem, Inc, 216 Ortega Street, San Juan, metro Manila 1500, Philippines*

Coherent CW Group

Some time ago, *QEX* published a note from me regarding the Coherent CW Group. We now have about fifty members, many of whom are actively building equipment. Many of the earlier difficulties encountered in 1975 by Ray Petit and other experimenters no longer exist as more modern components are available. A first contact over the air has recently been made between DF3CT and OE1KYB and other stations will soon be active. We feel the method has been neglected despite the advantages it has to offer, probably because those who may have contemplated having a go are discouraged by the apparent complexities in having to provide stable oscillators. So far we are only attempting to use 7030 kHz so the transceiver can be stabilized easily though digital synthesizers will be considered later. Computer simulations are being investigated and, if we can find a commercial transceiver which can be synchronized to an off-air standard, things really would be simplified.—*Peter Lumb, G3IRM, 2 Briarwood Avenue, Bury St. Edmunds, Suffolk IP33 3QF England*

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

AUTOMATING THE WAØPTV SATELLITE GATEWAY

The satellite gateway at WAØPTV is now fully automated. The purpose of this story is to explain how automation has been accomplished so, if desired, it could be replicated at other installations.

The design goals for this project were as follows:

- Complete automation of the PBBS and gateway so messages flowing into the PBBS could be uploaded to the satellite and messages from the gateway could be imported to the PBBS without operator intervention. In addition, the gateway should be able to switch between uploading and downloading automatically during the same pass without operator intervention.
- The PBBS system used is *AA4RE BBS* for the following reasons:
  1. It is the system currently in use at WAØPTV,
  2. It fully supports DRSI card ports so it does not tie up any of the computer's conventional serial ports,
  3. It supports an on-line call directory (not a server),
  4. It supports multiport multiusers, and
  5. It runs under *DESQview.*

  There may be other PBBS systems that meet these criteria as well. The commonly used French system was not the solution here, however.
- All downloading must be accomplished by means of the broadcast protocol not by connecting to the satellite.
- The system had to be able to run for days at a time without operator intervention.
- It should avoid using any programs, such as *MBBIOS,* that are incompatible with *PG* or *PB.*
- It would help if it were relatively easy to understand, set up and operate.

System Requirements

The system now being used at WAØPTV meets these criteria. The hardware consists of the following:

- An 80386SX-based IBM compatible computer,
- An 8088-based IBM compatible computer with a 4-MHz math chip,
- Yaesu FT-736R radio,
- Inexpensive 2-meter and 440-MHz radios for the PBBS,
- DRSI two-port card,
- DSP-12 and/or NB-96 (I'm experimenting with both),
- KCTracker/Tuner,
- Yaesu G-5400 rotators,
- KLM OSCAR-13 class beams (probably overkill, but they were available), and
- Inexpensive simple antennas for the 2-meter and 440-MHz PBBS ports.

The software consists of the following:

- *DESQview 386,*
- *AA4RE BBS* version 2.1u,
- *PG* and *PB* (latest versions circa February 1992),
- *Quiktrak,*
- IN batch file (soon to be converted to an executable program),
- *OUT.EXE,*
- AUTO batch file,
- *SATSORT* (for organizing *Quiktrak* table),
- *PCTools Shell* (optional, for file viewing).
- Software for driving the KCTracker board,
- *PFH.EXE* (for adding and stripping headers),
- *PFHLOOP.EXE* (for adding and stripping headers automatically),
- *SIFT.EXE* (for fixing problems in imported messages),
- *PKZIP.EXE* and *PKUNZIP.EXE.*

How It Works

Incoming messages arrive at the PBBS at all times. These messages need no special format; they simply need the To and @ fields filled for their destination and, perhaps, a hierarchical designator. Those messages that are destined for distant locations are forwarded to the gateway by the AA4RE software via an EXPORTK command in the WAKEUP.BB file. For instance, all messages going to PBBSs in Germany are exported to a file called ON4KVI using the following command in the WAKEUP.BB file:

```
==/==/== 09:00 EXPORTK C:\MICRO\22\ON4KVI @ D*
```

This command is set to run at 9 AM local time, that is, each day before UO-22's morning passes. A similar command is automatically executed before the evening passes. Other commands in the WAKEUP.BB file direct messages to appropriate gateways in other parts of the world. The EXPORTK command can be based on the @ field (as above) or can be based on hierarchical designators. In practice, I use a mix of both.

AA4RE BBS runs in one window under *DESQview.* In another window, the satellite software is constantly running the following batch file:

```
AUTO.BAT
:AGAIN
OUT
PG -U -Q
PB
GOTO AGAIN
```

First, this file runs a program called *OUT.EXE.* It operates with each file in its current directory that has no extension (such as ON4KVI). It assumes that each file with no extension is the name of a gateway station that will handle the messages contained in it. *OUT.EXE* compresses the messages in the file (using *PKZIP*) and attaches a PACSAT file header with the appropriate information in it (using *PFH*). The names of the resulting files have the following form:

XXDDNNT1.OUT

where XX is a two-letter gateway designator, DD is the day of the month *(OUT.EXE* gets this from the system clock), *NN* is a serial number, T1 indicates that the files will go to UO-22 and *OUT* is the file extension required by PG for uploading.

I have written this program so gateway-specific parameters (two-letter designator, source call sign, keywords) are contained in a user-editable file so *OUT.EXE* can be used by any gateway station without modification. One of the side benefits of this system is that it also operates on non-gateway files. For example, if I want to send a message to W2ICZ, I simply create a file containing the message using the file name "W2ICZ." It then gets processed along with everything else and uploaded to the satellite.

The next line in AUTO.BAT calls PG, tells it to upload all the OUT files and then exit. When it exits, PB is called and all files coming to the PBBS are automatically identified and put in the broadcast queue. Hole fills are accomplished automatically. I have the PB.CFG file set up so if it hears nothing for an hour it exits. When this happens the AUTO.BAT file loops to the beginning and runs again to catch the next pass.

After all the morning or evening satellite passes are completed, a line in the *WAKEUP.BB* program runs a batch file called IN using the following command:

==/==/== 01:00 EX DOS INN

where INN is a batch file that changes directories, calls the batch file IN and changes directories back. IN is a batch file that strips the headers off the messages (using *PFHLOOP.EXE*) and decompresses those that have been zipped (using *PKUNZIP*). In addition, since all incoming gateway messages have the extension IN, it is able to identify those messages that need to be imported to the PBBS. For these messages, it first runs a utility called *SIFT.EXE* which eliminates certain extraneous end-of-file markers and takes care of other operator error problems (such as including a space before SP in the first line of a new message). Then it combines all of these files into one file called MAILIN. It also routes non-gateway messages that have been downloaded to another subdirectory where they are later viewed using *PCTools Shell* (which is constantly running in another *DESQview* window).

Real soon now I plan to convert IN from a batch file to an executable program so it can be called directly from AUTO after exiting *PB*. The advantage of this is it would then execute after every pass. In addition, in order for the PBBS to execute a DOS batch file, there must be no one using the PBBS (this is not true for import and export commands, only external commands). Currently the PBBS must wait until all users clear off the board before it can execute IN.

After all the messages are processed another command from the WAKEUP file is executed to import the resulting MAILIN file:

==/==/== 15:00 IMPORTE C:\MICRO\DOWNLOAD\MAILIN

This command imports the messages to the PBBS from whence they are automatically forwarded to their final destinations via VHF links.

All this is accomplished on the 80386 computer. That computer also has two other programs running. One displays a list of satellite gateways and the other is a telecommunications program for accessing CompuServe. Enough memory is available to also support a word processor or other DOS program at the same time.

When the system is running in unattended operation, I allocate within *DESQview* 12 ticks to the foreground and 3 ticks to the background. The satellite window is set up as the foreground task, but it is run in a tiny window in the bottom left corner of the screen (I don't need to see it, I just need to make sure it is the foreground task because it needs a lot of processor power). The rest of the screen usually displays the PBBS so I can wander into the shack and keep track of what is happening. For all other programs (which only need to run when they are in the foreground), I set the "runs in background" switch off to reduce the clock cycles they otherwise steal from the PBBS and the gateway.

I have been unable to get the KCTracker/Tuner to run successfully on this computer while the other programs are also running (to the best of my knowledge, no one else has either). So I use an inexpensive 8088 computer to run the KCTracker board. It contains a math chip (also inexpensive for this slow computer) which is essential to keep the tracking process from taking forever to run. While this computer can do other things at the same time (my five-year-old uses it to run *Reader Rabbit*, for example), a large portion of its resources are devoted to tracking. I have set the KCTracker table to hold at least 5000 lines so that it can be loaded with several days of tracking data at one time.

There are occasions where it is useful to insert a pass or two from another satellite in the middle of the table. To do this, I use a program called *SATSORT*, which allows me to put additional orbits on the end of the satellite table in *Quiktrak*. It then downloads the table, sorts it and uploads it back to the KCTracker table.

All of the software that I've written for this system (including *OUT*, *IN*, AUTO, *SIFT*, and *SATSORT*) have been placed in the public domain and are available upon request. Most of the other software (with the exception of *Quiktrak* and *DESQview*) are available for free from other sources. *Quiktrak* is available from AMSAT for a fee. As far as the hardware goes, you are on your own.

If you have any questions about the gateway, contact the author via UO-14 or @WAØPTV.

—*by John Hansen, WAØPTV*

NEW TAPR KITS INTRODUCED

Tucson Amateur Packet Radio (TAPR) introduced two new kits at its annual meeting: a 9600-bit/s modem and a satellite tracking antenna controller.

9600-bit/s Modem

The new 9600-bit/s modem kit incorporates many enhancements over the K9NG modem kit which has been available from TAPR for several years. The new kit offers full-duplex operation, improved transmit spectrum, improved clock recovery, DCD and an optional bit regenerator for use as a full-duplex 9600-bit/s repeater. An optional clock is available for standalone bit regenerator usage or elsewhere where not provided by the TNC. The modem connects to the standard TAPR modem disconnect header and fits inside a TNC 2, PK-232 and many other TNCs. The kit costs $70 including shipping and handling in the US. The bit regenerator option is $10 and the clock option is $5.

Satellite Tracking Antenna Controller

By arrangement with JAMSAT, TAPR is offering in kit form the TrakBox developed by SMØTER, JA6FTL and others. This requires a computer or terminal to enter the Keplerian data. It has an LCD display and runs standalone after loading the data. It directly controls the Kenpro/Yaesu rotators and can be adapted for other types. It also provides Doppler correction for the Kenwood, ICOM and Yaesu radios that are used for satellite communications. This kit costs $185 including shipping in the US.

Both kits are available now from:

TAPR
PO Box 12925
Tucson, AZ 85732
Phone 602 749-9479 (Tues-Fri, 10 AM-3 PM MST)
Fax 602 749-5636.

—*from Bob Nielsen, W6SWE, via CompuServe's HamNet*

NEW MACINTOSH PACKET PROGRAM RELEASED

Virtuoso is a Macintosh communications program written specifically for packet radio. It has features that packet radio operators need, and also packs in a lot of bells and whistles to make packet radio communications smooth and effortless.

The program was written by James E. Van Peursem, KEØPH, who started his Macintosh packet radio career using programs written for general communications (you know the ones). This was okay for starting but it turned out to be quite a bother and he found himself spending more time trying to get the program to do what he wanted it to do than actually communicating on packet. He also has seen literature for other packet radio communications programs, but they seemed to lack the power and ease of use that he had grown to love in a Macintosh program.

James says that *Virtuoso* is his solution. It packs all of the power of the best of the programs and is written specifically for packet radio, so operating has never been easier. Some of the features now implemented are:

- Powerful scripting to automate routine tasks,
- Automatic execution of a script when starting and quitting,
- Save incoming text to a disk file,
- Send a text file from disk,
- Append a selection of text to the end of an existing file,
- Print a selection of text,
- Find the last time you heard someone,
- Spelling checker checks words as you type them,
- Windows can be scrolled to see previous text,
- Supports full font, size, style and justification,
- Supports 300 to 9600 baud operation and
- Automatically puts your TNC in the KISS mode upon quitting and exit it from the KISS mode at start-up.

A channel window has two panes. The top pane contains the incoming information from your TNC. The bottom pane contains what you type and send to your TNC. The size and location of the channel window can be changed easily as in any other Macintosh program. Both panes can be scrolled up and down to see items that scrolled off the screen.

A keyboard buffer window allows you to type long messages before they are transmitted. This window supports the cut, copy, paste, clear and undo functions (like any good text editor).

Users may use the control key or the option key (if they don't have a control key) to send control characters to the TNC. Users may optionally strip received line-feeds or all control characters before displaying and saving received data to disk. CTRL-Gs can be passed to beep your computer if desired.

Virtuoso is shareware, that is, it is distributed freely, however, if you decide that you like the program and keep on using it, you must pay the shareware fee of $20 US. In order to check your spelling, *Virtuoso* needs a dictionary. This is available for $10. To register *Virtuoso* ($20) or to register *Virtuoso* and receive the dictionary ($30), write to:

James E. Van Peursem, KEØPH
RR #2, Box 23
Orange City, IA 51041

AA4RE BBS VERSION 2.12 AVAILABLE

AA4RE BBS (also known as *BB*) version 2.12 is now available, according to Roy Engehausen, AA4RE. It includes lots of new features to make your life as a SYSOP easier including:

- Overlay area is now shared (no more task busy),

- Supports BPQHOST mode directly (BPQ v4+),
- A REVIEW command,
- A command to display routing info,
- Authentication,
- Call directory support,
- Lots of server support. W1NPR wrote a great bunch of servers that do just about anything. Contact him for details

The primary advantage of BB over the other systems is the ability to handle multiple connects per port. The program uses its own multitasker, so no *DESQview, DoubleDos,* etc. is required. On the down side, BB has been optimized for speed and requires at least 512 kbytes of RAM (and usually 640 kbytes) to be used productively. Only an 8088-based machine is required.

BB uses a host-mode interface so only the following TNCs are supported: TNC 1 and TNC 2 (or clones) with WA8DED firmware, AEA PK-87, PK-88, PK-232, and the DRSI PC*PA TNC card. It also runs with any KISS TNC using the *G8BPQ PC Node* switch.

The file name is *BB212.ZIP* and is available on tomcat.gsfc.nasa.gov which is accessible via SLIP and Internet. It is also available on ucsd.edu in directory hamradio/packet/aa4re.

If you want *BB* on disk, send $5 US to:

Dave Larton, N6JQJ
766 El Cerrito Way, #D
Gilroy, CA 95020-4149
or
John Anderson, N7IJI
2729 Park Rd
Charlotte, NC 28209

Canadians can send $5 CDN to:

ARES Group
Attn: REBBS Update
PO Box 35
St-Jean Chrysostome, PQ G6Z 2L3

For source code, include $2 more (for multiple diskettes). We can handle all formats of 5-1/4 and 3-1/2 inch disks.

BB can also be obtained by downloading it from the following BBSs:

WA6RDH BBS at 916-678-1535
WB3FFV BBS at 410-625-0817, 410-625-9482 or 410-625-9663
WB2COY at 914-485-3393

The software can also be obtained via BITNET by sending a note to ENGE at ALMADEN.

—*from* Packet-Radio Digest

F6FBB PBBS 5.14 RELEASED

According to Markku Toijala, OH2BQZ, a new version of the *F6FBB PBBS* software now available via anonymous ftp from tomcat.gsfc.nasa.gov or nic.funet.fi (in Europe). The key features of this software are:

- Use of the WA7MBL commands set. It also has a set of unique supplementary commands.
- Works on any 100% compatible XT or AT PC fitted with a hard disk and 640 kbytes of RAM, monochrome CGA or EGA VDU, 1 to 8 serial ports.
- Supports user-selectable colors or monochrome without modification.
- Takes advantage of extended or expanded memory.
- Supports up to 50 simultaneous channels on eight TNCs (4 or 8 channels per TNC depending on the software used).
- Supports use of an external multiplexer (schematics included in the distribution disk). It supports extension boards if a hardware configuration has more than two ports. The multiplexer connects four TNCs on one serial port: either COM1 or COM2. Printed circuit boards are available from:

  ATEPRA
  23 Rue de Provins
  77520 Mons en Montois
  France
- Operates with any TNC 2 or clone with WA8DED firmware, a TF4/TF8 with a Z80 clock of 2.5 MHz or greater, a PK-232 or KAM in the host mode and a G8BPQ node.
- It has server functions (computation of satellite orbits, call directory, operator selectable chapters, gateway to other channels, conferencing, etc).
- Hierarchical routing is supported.
- The ping-pong phenomenon is automatically detected and information is given to the SYSOP via a system message.
- Messages and bulletins for the SYSOP are duplicated to a destination call sign that can be defined by configuration.
- A detailed log of the PBBS activity is maintained and a statistic analysis program, written by FC1MVP, is also available.
- Provides a gateway between connected stations or with another port.
- Supports conferencing within the limits of the available ports and channels.
- Upon connection, the connect language is attributed to the user depending on the user's call sign.
- Remote SYSOP operation is supported and the housekeeping of the PBBS messages, mail and old mail is done automatically each and every night during programmable low activity periods.
- Works under *DESQview.*

Message forwarding is WA7MBL-compatible and is optimized between PBBSs using the FBB protocol, which is more efficient on a VHF/UHF network. Forwarding also is compressed to reduce data by a factor of about 40 to 50% in big messages. The messages are protected by checksums, then the transfer is made error-free.

Forwarding is simultaneous on the various ports regardless whether they are incoming or outgoing. There might be several forwardings outgoing per port which number is set by parameter. The number of incoming forwardings is a function of the available channels. The time and the period of forwarding can be set separately on each port.

Binary transfer is supported by using the YAPP protocol. An extension to this protocol has been made, including the automatic restart and the checksum should a stop occur or a disconnection take place during the transfer. This extension to the protocol works with *TPK*, the packet terminal program written by FC1EBN.

BIDS management (over 2000 are saved in a separate file). A BID is automatically generated if the user does not provide one. Private messages work with the management of MID. The messages are suppressed automatically after a delay which can be user-defined. This is true for bulletins and private mail.

—*from* Packet-Radio Digest

KENWOOD TS-450S GROUNDED

For over two weeks, Dick Kriss, KD5VU, tried to interface a new Kenwood TS-450S/AT to an AEA PK-232MBX using the 13-pin DIN plug (ACCY2) on the rear of the TS-450S. But, a feedback loop fouled-up the transmit SSB audio whenever the 13-pin connector was attached. Dick finally found a fix.

He followed the old ham rule that, if all else fails, ground it. So, he ran a "real" ground wire from the ground lug on the rear of the TS-450S to the PK-232 circuit board using the top-side screw for the right-rear mounting foot (near the 12-volt input connector). The SSB transmit audio problem is history.

Although the PK-232 was already grounded using the ground wire in the AEA-supplied cable, Dick suspects something is amiss with the grounds in the TS-450S ACCY2 port. He is not sure why the new ground wire works, but the price was right and the PK-232 and TS-450S are now working fine.

—from Dick Kriss, KD5VU@N5LJF.#AUS.TX.USA.NA

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

From McGraw-Hill

Lenk's Audio Handbook: Operation and Troubleshooting by John D. Lenk; 304 pages; illustrated; 6 × 9 inches; $39.95. Publication date: March 1991. ISBN: 0-07-037503-8.

Practical advice and information from the basics through experimentation and simplified design to testing and troubleshooting procedures. *Lenk's Audio Handbook: Operation and Troubleshooting* gives circuit-by-circuit directions in easy-to-understand, nontechnical language and provides sufficient information for the user to design and build audio circuits from scratch. Details are given for CD players. AM/FM tuners, turntables, graphic equalizers, tape cassettes, surround sound systems, laser-optic devices, audio components of camcorders, stereo-TVs and VCRs.

Lenk includes complete descriptions, including specifications, operating procedures reports, controls, indicators, adjustment procedures, circuit diagrams, test points, signal paths and power connections, for each product.

Electronic Packaging and Interconnection Handbook, Charles A. Harper, Editor in Chief. 1120 pages; illustrated 6 × 9 inches; $79.50. Publication date: July 1991. ISBN: 0-07-026684-0.

More than twenty specialists in the field have contributed articles in their areas of expertise. They tell how to select the most effective plastics, ceramics and metals; describe how to minimize heat problems in increasingly dense electronic assemblies; and focus on the design of both rigid and flexible printed wiring boards. Their work connects material from the areas of materials science, electronics and mechanical design, reflecting the interdisciplinary nature of the technology.

Electronic Packaging and Interconnection Handbook provides guidelines on the parameters (electrical, mechanical, thermal and material) or the ICs and semiconductor devices now being used in packaging and interconnections. In addition, it explains everything from the materials for electronic packaging to the packaging of high-speed digital electronic systems, from soldering and solder-paste technology to hybrid microelectronic packaging, and from the wiring and cabling invoked to CAE, DAC and CAM.

Handbook of Applied Mathematics for Engineers and Scientists by Max Kurtz. 602 pages; illustrated; 6 × 9 inches; $69.95. Publication date: August 1991. ISBN: 0-07-035685-8.

Presented are definitions, basic equations, principles and techniques of mathematics and illustrates their applications with more than 300 solved examples. Coverage ranges from elementary algebra through trigonometry to advanced calculus and includes information on the structure and dynamics of mathematics.

Handbook of Applied Mathematics for Engineers and Scientists devotes major sections to subjects such as plane and solid analytic geometry, matrix algebra, statistical interference and regression analysis, Boolean algebra, permutations and combinations, the transformation of space in computer graphics, Markov probability and cybernetics.

Lenk's Laser Handbook: Featuring CD, CDV, and CD-ROM Technology by John D. Lenk. 279 pages; illustrated; 6 × 9 inches; $39.95. Publication date: October 1991. ISBN: 0-07-037505-4.

Designed to solve the problems faced by anyone working with laser-based technology, *Lenk's Laser Handbook* focuses on laser video, compact disc players, CD-ROM units and provides material that is applicable to the spectrum of laser-based devices.

This book describes techniques for encoding, decoding and optical readout; explores typical circuits for compact disc and laser video; and discusses approaches to troubleshooting and adjusting compact disc and laser video products based on failure or symptoms of trouble. Step-by-step and circuit-by-circuit examples are included.

Lenk's Audio Handbook: Operation and Troubleshooting, Electronic Packaging and Interconnection Handbook, Handbook of Applied Mathematics for Engineers and Scientists, and Lenk's Laser Handbook: Featuring CD, CDV, and CD-ROM Technology are all available from McGraw-Hill Publishing Company, 11 West 19th Street, New York, NY 10011, or call 800 2-MCGRAW.