QEX April 38 1985 $1

The ARRL Experimenters' Exchange

Fourth Packet-Radio Conference a Hit

The Fourth ARRL Amateur Radio Computer Networking Conference on March 30 at San Francisco was well attended by packeteers. Thirteen authors made presentations, and 24 papers were printed. Copies of the printed proceedings of the Fourth Conference are available from ARRL Hq at $10 each. Copies of proceedings of the First, Second and Third Conferences are also available at $8, $9 and $10, respectively. The morning session of the Conference was taped by the West Coast Computer Faire. You may order tape WCC-6 for $8 plus $2 for shipping from McCune Audio/Visual/Video, c/o Computer Faire, Inc., 611 Veterans Blvd, Redwood City, CA 94063.

PPRS "Golden Packet" Award

At the Fourth Conference, Hank Magnuski, KA6M read the following March 21 resolution:

"Whereas the Pacific Packet Radio Society was one of the first societies formed specifically to encourage the growth of computer networking via radio using all digital concepts and techniques, and whereas the San Francisco area was the site of the nation's first amateur digipeater, and whereas an even greater challenge faces the amateur radio community to establish a transcontinental link, the Pacific Packet Radio Society has decided to establish a unique award to encourage the completion of the first terrestrial transcontinental network link. This one-time award shall be known as the "Golden Packet" award, and the regulations relating to it are listed below:

"1. A transcontinental link must be established, with each terminus located within 100 kilometers of either the Atlantic Pacific Ocean.

"2. The system must consist of fixed terrestrial digital store-and-forward radio links using VHF (greater than 144.1 MHz), UHF or microwave frequencies. Use of HF, satellite, tropo, metscat or moonbounce channels is prohibited.

"3. A valid two-way transmission and acknowledgement of previously unknown information (256 characters or more) must occur in real time (less than ten minutes).

"4. This competition is open only to validly licensed North American amateurs, and no commercial links or services may be utilized in the path. Club stations are permitted.

"5. Proof of the exchange must be adequately documented and submitted to the PPRS. Proof must include a list of the stations in the link, their locations, frequencies used, and a copy of the text exchanged.

"6. The reward shall consist of a suitably engraved plaque with the names of all participating stations listed which shall be presented to the ARRL. Each participating station shall receive either a plaque or a certificate.

"7. Final decision on the award is subject to review and approval by the Board of Directors of the Pacific Packet Radio Society."

West Coast VHF-UHF Conference

Chairman Art Lange, W6RXO, invites you to attend the West Coast VHF-UHF Conference on May 3-5, 1985, at the Sunnyvale Hilton, Sunnyvale, CA. Topics include: antennas, radio on a chip, packet radio, 1296- and 2304-MHz transverters, EMI control, amplifiers, ATV, low-noise preamps, and satellites. Preregistration $10 ($13 after April 20), proceedings $7 ($10 after April 20), dinner $17 (limit 180 seats). Mail to VHF-UHF Conference, PO Box 4101, Fremont, CA 94539.

ACSSB Boards

We have heard from a few individuals who have constructed finished equipment from the surplus ACSSB boards obtained from ARRL. QEX will carry information about the hardware produced and on-the-air results. Let's hear from everyone. Please address all correspondence to Greg Bonaguide, WA1VUG, ARRL Hq, 225 Main St, Newington, CT 06111. -- W4RI

Correspondence

ACSSB IC Update — Audio Board

The service manual for the audio board has "U" designators, and a description of each IC's function, but no manufacturer part numbers. This list will be extremely helpful to those experimenters who have received partially populated audio boards. -- Greg Bonaguide, WA1VUG, ARRL Laboratory Engineer.

Part Number	Used At:
TL084CN	U1, U8, U10, U32
NE570N	U2
MC14066B	U3, U24, U26
RETR5609	U4, U5
MC3340P	U6
MC3303L	U7
NE572N	U9
ICM7555	U11, U25, U30
MF10CN	U12
CA3080E	U13
MC14046B	U14, U20
LM324N	U15, U16, U17, U19
MC14049UB	U21, U27, U29
MC14071B	U22
MC14023B	U23, U28
MC14040B	U31

ACSSB Packages Sold Out

All the ACSSB packages have been sold. Thanks for expressing an interest in project companion -- further information will be published in **QEX.** -- Greg Bonaguide, WA1VUG, ARRL Laboratory Engineer.

Trunked SI! Cellular No!

Quintron, the electronics manufacturing company for which I work, is struggling to market a line of cellular base-station equipment in a market that is dominated by two or three players. I have seen cellular radios operate in our experimental system, have read numerous technical specifications needed for compatibility, and have observed developmental problems, also. With this experience and a fair knowledge of the other technologies available and under development, I can state that cellular-radio techniques are not suitable for radio amateurs.

Cellular radios use a technology which was specified years ago and do not approach either obtainable spectrum efficiency or cost effectiveness in comparison with other upcoming alternatives. Although both base stations and mobile-cellular units are extremely complex — they have data as well as voice channels and are frequency agile — their complexity is required because of the method of frequency conservation. Cellular radios (ignoring data links) require numerous, wide-spaced channels for simultaneous transmit and receive. This requires rapid frequency agility and duplexers. A future improved version will most likely be similar to a digipeater or aircraft navigational transponder. All units will be on the same frequency and will time share transmissions of digital audio. With high baud rates, all of the voice information contained in 100 ms of speech can be sent in, say, 1 ms. Mobiles will compress their air time accordingly, and the mobile receivers will convert back into audio only the packets designated for them. As with conventional telephones, the delay will not be noticeable. Since all the cleverness required for (apparently) full-duplex audio can be built into ICs (the main ingredient is sand), the cost of a mobile must be lower than that for one which uses bulky duplexers. (The main ingredients are aluminum or copper and LOTS of labor.) I know of no digital devices capable of functioning as an 800-MHz duplexer with 50 watts of RF.

Cellular radio, also, is designed for one-on-one conversations; whereas radio amateurs tend to prefer the party-line concept. Why would radio amateurs want to use a system which requires virtually a mainframe computer to handle the complex algorithms involved in mobile handoffs from cell to cell?

A much more suitable commercial concept for amateur applications is trunked radio service. Trunked commercial radios, like cellular, use the 800-MHz region. Several base repeaters (typically five or ten) are linked together to provide apparently private repeater service to up to several hundred users (typically construction companies, real estate agents, and service companies). A statistical formula is used to determine the allowable number of users per channel. If five users, for example, share a single repeater (called a community repeater), four of them would be denied air time when another user was on the air. If the average amount of air time per user during peak hours is 15%, then the likelihood of finding the channel busy is 48%. If 25 users, however, share five trunked repeaters, the probability of being unable to use the system (being blocked) is less then 3%, all other things being equal. Telephone companies use statistics similar to the above, although much more complex, to make equipment capacity decisions. (The phone company cannot possibly deal with a situation in which everyone picks up a phone at the same time.)

While commercial trunked radio requires sophisticated base stations and intelligent, frequency-agile mobiles, those requirements are to make the system transparent (able to be used by anyone who is as technical as a house plant).

(continued on page 10)

A Repeater Operating Program in BASIC

By John L. Sundstrom, WAØLIS

In the December 1984 issue of **QST**, p. 91, an ARRL member was looking for a VIC 20 or C64 repeater control program. In response to his request, I am sharing a repeater operating program and its controller schematic that my club is presently using. The program is in use at the K9GXU/R repeater on 147.12 in Belleville, Illinois. It is set up for use with a Commodore VIC 20 computer, but the addresses could easily be changed for use with a C64, although there is little to gain from the extra capabilities of that computer.

The program has been in use for a little over three months. Operation of the controller and computer has been flawless. Though the program is written in BASIC, it operates fast enough and no delays are noticeable.

The program lives on an EPROM in our machine. A short machine language program at the beginning of the EPROM loads the BASIC program into RAM and causes it to begin RUNning when power comes on. This EPROM BASIC program boot was supplied to us by the Jason Ranheim Company. They are the manufacturer of our EPROM burner, the PROMENADE. I cannot detail the boot as I don't quite understand what it does. Also, I do not show the wiring of the EPROM socket. I duplicated the wiring with a game cartridge. A 4-kbyte EPROM is all that is required, and the boot is only 67 bytes. The program is about 2.5 kbytes.

Features of the program include an autopatch. It will not permit long distance or operator assisted calls, but does permit numbers stored in memory to be dialed regardless of where they may be. A 911 service is also provided to our local county emergency number. It should be noted that although the numbers are tones coming in, the controller actually pulse dials the number over the public switched telephone network. The ID tone is used to send pulses over the air when dialing so that the radio operator is aware of what is going on. This method of dialing drastically simplified the controller circuits. Tone dialing would have been troublesome as more than the eight available output ports on the 74LS374 chip would have been required.

*20 Sharilane Drive, Fairview Heights, IL 62208

Two weak points exist in the program. The ability to bring the autopatch down and start over in the middle of dialing was originally a feature in the program. Because of an unfinished for-next loop, the program would crash, thus, the feature was removed. This is to be corrected in the next version of the program. At present, you must wait for the dialing to finish before the patch can be brought down, even if it is a wrong number.

The other weak point is that the input read statement at line 100 should have been anded as described in the programmer's reference guide. This value changes when different peripherals are attached. The statement as given is correct for an EPROM, but the 254 must be changed if a disk drive or tape cassette is plugged in. Anding would have eliminated this problem. By the way, the program works fine from EPROM, tape or disk.

I would like to add that the computer is especially protected in our repeater. The case and keyboard were removed and the entire computer board and controller hardware were mounted in an aluminum case. All repeat All lines coming into the case were brought through feed-through capacitors, and ferrite-bead chokes were placed in each line immediately inside the case. External MOV devices were used on the 117-V ac power to the computer. The 12-V supply, which runs the other circuits in our repeater, is extremely well regulated and has a crowbar circuit that limits output voltage to 14 V maximum. The power supply regulator on the VIC board was also removed and mounted to an external heat sink. Some of these steps may not have been necessary, but our 70-W transmitter does not bother our computer, and the computer doesn't cause any interference to our receiver. Reliability has been 100% so far, too.

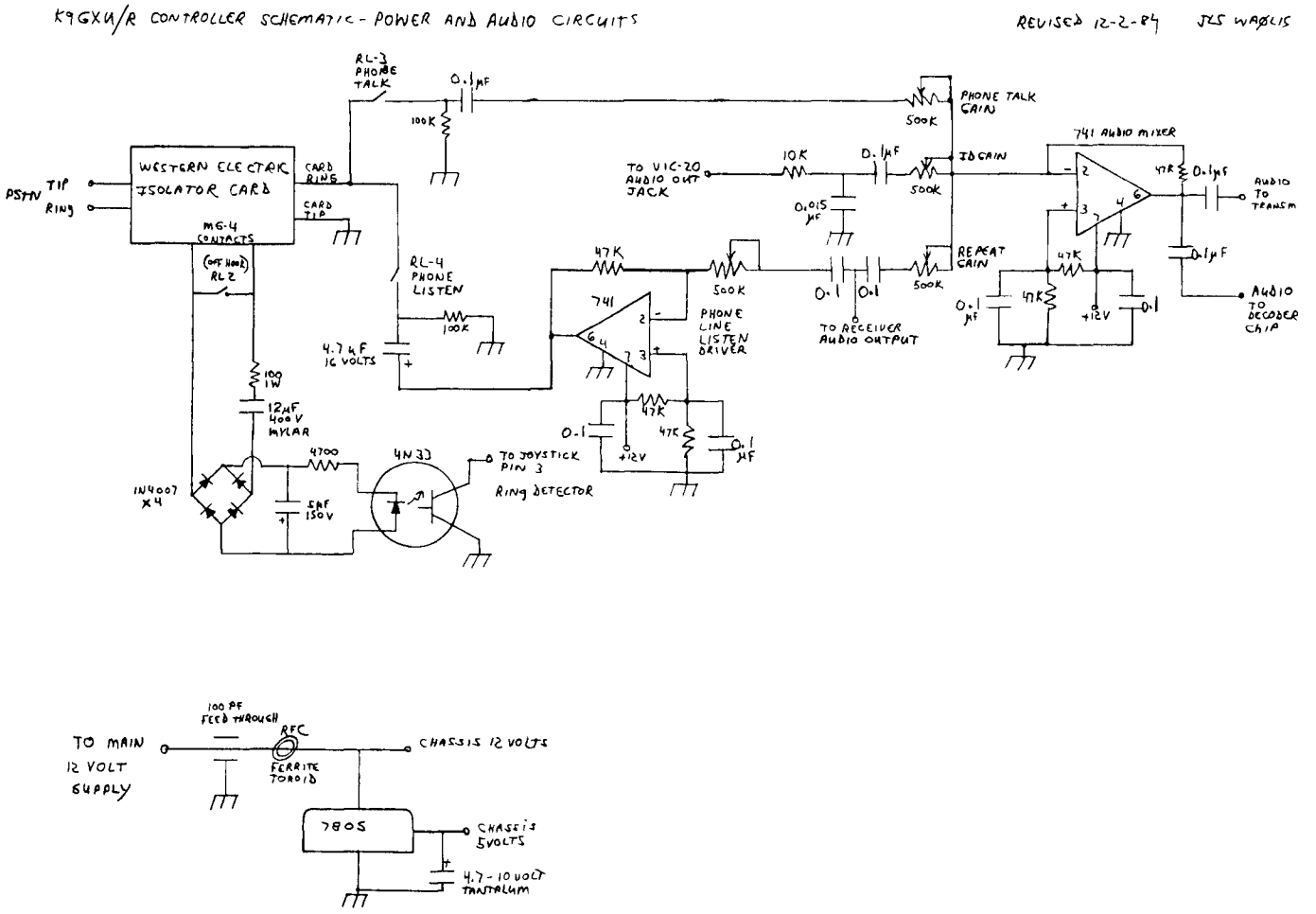
```
1  DIMM(11):DIMN(11):TR=Ø                    Initialize System
2  I=37137:O=38912:S=36876:E=2:RT=Ø
4  POKE36878,15:POKE37139,Ø:POKEO,Ø
10 GOSUB1ØØ ──────────────────────────────────────────────────┐
12 IFX>1THENGOSUB18:GOTO1Ø                                    │
14 IFTRTHENTR=Ø:FORJ=1TO2ØØ:NEXT:GOTO1Ø          Main Waiting Loop
16 POKEO,Ø:GOTO1Ø ────────────────────────────────────────────┘
18 IFRTTHENRT=Ø:IFY=11THENGOSUB5Ø:RETURN ──────────────────────┐
20 IFTR=ØTHENT=TI/6Ø:TR=1                                     │
22 IFABS(ID-TI/6Ø)>56ØTHENPOKEO,1:GOSUB16Ø                    │
24 IFABS(T-TI/6Ø)>18ØTHENGOSUB3Ø          Repeat Without      │
26 IFE<>2THENPOKEO,Ø:RETURN                 Autopatch         │
28 POKEO,1:RETURN ────────────────────────────────────────────┘
30 POKEO,Ø:GOSUB1ØØ ──────────────────────┐
32 IFX=ØTHENRETURN          Handle Timeout │
34 GOTO3Ø ────────────────────────────────┘
40 RESTORE:REM LOAD SPECIAL NUMBERS ──────────────────────────┐
41 READM:IFM<>11THEN41                                        │
42 READM1,M2,M(1),M(2),M(3),M(4),M(5),M(6),M(7),M(8),M(9),M(1Ø),M(11)
43 PRINTM1,M2:   IFM1=ØTHENRETURN                             │
44 IFM1<>N(2)THEN42                    Special Number         │
45 IFM2<>N(3)THEN42                      Fetch Loop           │
46 FORJ=1TO11:N(J)=M(J):NEXT:RETURN ──────────────────────────┘
50 TR=Ø:A=TI/6Ø:POKEO,Ø ──────────────────────────────────────┐
51 FORL=1TO11:M(L)=11:N(L)=11:NEXTL                           │
                                                  Autopatch Loop
52 GOSUB1ØØ:IFRTTHENRT=Ø:GOTO55 ──────────────────┐           │
53 IFABS(A-TI/6Ø)>15THENRETURN                    │           │
54 GOTO52                        Get First Digit  │           │
55 IFY=1THENE=2:RETURN (Repeater Up)  of Access Code           │
56 IFY=1ØTHENE=1:RETURN —(Down)──────────────────┘           │
57 IFY<>6THENRETURN  -Check First Digit                       │
58 GOSUB1ØØ:IFRTTHENRT=Ø:GOTO62 ──────────┐                   │
59 IFABS(A-TI/6Ø)>15THENRETURN            │ Access Code       │
60 GOTO58 ────────────────────────────────┘ Second Digit      │
62 IFY<>7THENRETURN  -Check Digit                             │
64 POKES,24Ø:POKEO,1:A=TI/6Ø:REM D TONE                       │
66 GOSUB1ØØ:IFRTTHENRT=Ø:POKES,Ø:POKEO,Ø:GOTO70 ──────────┐   │
67 IFABS(A-TI/6Ø)>30THENRETURN                            │ Get First Phone
69 GOTO66 ────────────────────────────────────────────────┘ Number Digit
70 K=7:IFY=11THENK=3:Y=3  -Get Special Numbers                │
71 N(1)=Y:IFY=1ØTHENRETURN  -10 is a Dial Ø                   │
72 IFY=1THENRETURN          This is rejected                  │
74 FORJ=2TOK ─────────────────────────┐                       │
75 GOSUB1ØØ:IFRTTHENRT=Ø:GOTO79       │                       │
76 IFABS(A-TI/6Ø)>30THENRETURN        │ Get Remainder of      │
77 GOTO75                             │   Phone Number        │
79 N(J)=Y:NEXT ──────────────────────┘                       │
80 M1=1:IFK=3THENGOSUB4Ø                                      │
82 GOSUB12Ø:A=TI/6Ø:TR=1:IFM1=ØTHENRETURN                     │
84 GOSUB1ØØ:IFRTTHENRT=Ø:IFY=12THENPOKEO,1:RETURN ──────────┐ │
85 IFABS(ID-TI/6Ø)>56ØTHENGOSUB16Ø                          │ │
86 IFX=ØTHENPOKEO,7:TR=1                 Talk on Autopatch  │ │
88 IFX=1THENPOKEO,11:IFTR=1THENTR=Ø:A=TI/6Ø                 │ │
90 IFABS(A-TI/6Ø)>18ØTHENPOKEO,Ø:RETURN ──────────────────┘ │
92 GOTO84 ──────────────────────────────────────────────────┘
100 X=(254-PEEK(I))/4 ──────────────────────────┐
101 PRINTX                                      │
102 IFX<2THENRETURN                             │
103 IFX>3THENIFY=17THENRETURN                   │
104 IFX>3THENGOSUB17Ø:RETURN                    │
106 Y=PEEK(O)-144:RT=1:R=TI          Scan Inputs│
107 PRINTX,Y                        (Sub) Routine│
108 IF(254-PEEK(I))/4<>3THENRETURN              │
110 IFTI-4>3ØØTHENGOSUB3Ø:RETURN                │
112 GOTO1Ø8 ────────────────────────────────────┘
```

Notes

S - Sound Volume
TR - Timer Reset
RT - Read Tone
ID - ID Timer
T - 3-Minute Timeout Timer
E - Enable - if E = 2, Repeater is Up
Ø - Output Address
I - Input Address

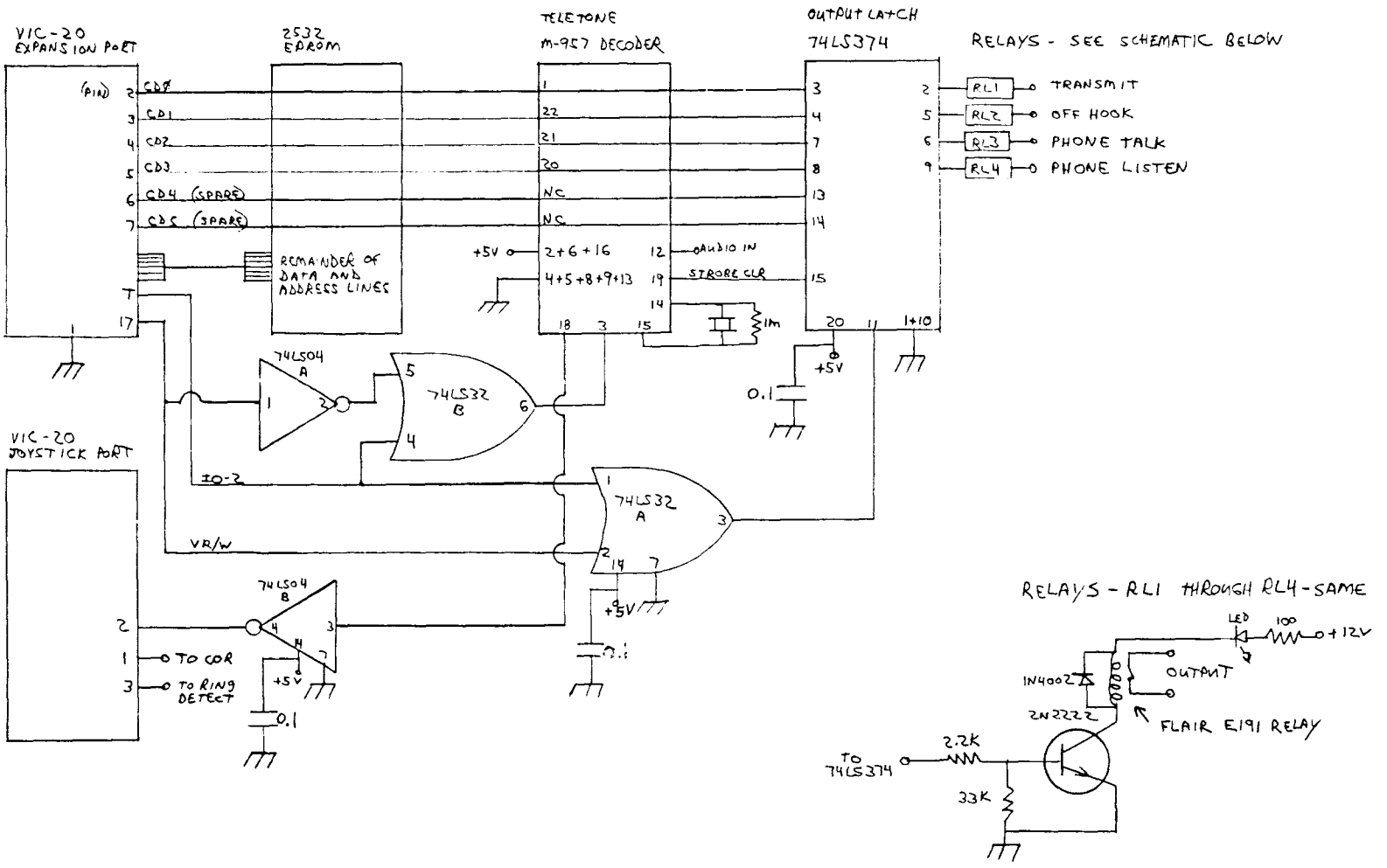
```
120 IFM1=ØTHENRETURN
121 POKEO,3:FORL=1TO1ØØØ:NEXT
122 FORJ=1TO11:IFN(J)>1ØTHEN134
126 FORL=1TO8ØØ:NEXTL
128 FORL=1TON(J):POKEO,1:POKES,240
130 FORQ=1TO2Ø:NEXTQ:POKEO,3:POKES,Ø          Pulse Dial Routine
132 FORQ=1TO3Ø:NEXTQ:NEXTL
134 NEXTJ:POKEO,7:RETURN
160 RESTORE:FORL=1TO38:READX:IFXGOTO164
162 FORJ=1TO2ØØ:NEXT:NEXT
163 PRINT"ID LOOP"                                          ID Loop
164 POKES,240:FORJ=1TOX*1Ø:NEXT:POKES,Ø:FORJ=1TO6Ø:NEXT:NEXT  2Ø is Dash
166 ID=TI/6Ø:RETURN                                          6 is Dot
168 DATA2Ø,6,6,Ø,6,Ø,2Ø,6,2Ø,Ø,2Ø,2Ø,2Ø,2Ø,6,Ø,2Ø,2Ø,6,Ø     Ø is Space
169 DATA2Ø,6,6,2Ø,Ø,6,6,2Ø,Ø,2Ø,6,6,2Ø,6,Ø,6,2Ø,6,Ø
170 Y=17:A=TI/6Ø:POKEO,6:FORK=1TO2
171 GOSUB1ØØ:IFRITHENRT=Ø:N(K)=Y:GOTO174
172 IFA-TI/6Ø>3ØTHENPOKEO,Ø:RETURN
173 GOTO171
174 NEXT:POKEO,Ø:IFN(1)<>11THENRETURN          Control By
176 IFN(2)=1THENE=2:RETURN                        Phone Loop
177 IFN(2)<>1ØTHENRETURN
178 E=Ø:GOSUB1ØØ:IFN(2)<>1THEN178
179 RETURN
180 DATA11
181 DATA9,1,2,7,7,3,1Ø,1,2,11,11,11,11        911 Service to County
182 DATA1,1Ø,1,4,7,6,1,6,6,6,11,11,11         11 is Null Number
183 DATA1,1,1,5,6,6,7,5,4,4,11,11,11                                  Special Phone Numbers
184 DATA1,2,1,4,7,6,1,6,8,6,11,11,11
185 DATA1,3,1,4,7,6,3,6,8,5,11,11,11
187 DATA1,5,1,3,3,2,1Ø,6,1,1,11,11,11
188 DATA1,6,1,3,1,4,5,2,4,1Ø,8,3,4          This Number Increases Area Code
199 DATAØ,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
```

End of Data



REVISED DEC 1, 1984
BY JLS / WA5LIS

K9GXU/R CONTROLLER SCHEMATIC - DIGITAL CIRCUITS



VHF+ Technology

Conducted by Geoff Krauss, * WA2GFP

In my last column I mentioned multi-kilowatt solid-state 50-MHz power amplifiers. Since that time, I have been receiving copies of articles for all sorts of solid-state high-power RF amplifiers. In addition to an article which appeared in **Microwaves and RF** (Jan. 1985, p. 145), about a 2- to 30-MHz pulse amplifier with 1000-W output using a pair of bipolar transistors, **RF Design** (Nov./Dec. 1984, pp. 21-24), featured an amplifier using four 300-W FET modules with 4-port in-phase input and output combiners. Some interesting VHF+ possibilities have also emerged in engineering literature: A commercial unit, the PB-2022 from Acrian, Inc., utilizes the same four-module and combiner technology to provide a 1000-W output FET amplifier for 30 to 50 MHz. With 50-dB gain, it requires only 10 mW-input!

Another article in the **Microwave Journal** (Jan. 1985, pp. 165-166), gives the basic four-module combiner artchitecture for 1000-W CW jammer amplifiers built by M/A-COM Microwave Power Devices, Inc., in the 850- to 1450-MHz frequency range. An advertisement in the same magazine highlights a similar linear amplifier for the 100- to 500-MHz range. Yes, that's right! If you can afford the semiconductors and power supply, the technology is not only available, but well known for providing high-power solid-state amplifiers up through at least our 1300-MHz band!

If you are considering 1296 MHz, but are not ready for solid-state high-power amplifiers, consider the linear high-level mixers and power (single and double tube 7289/3CX100A5) cavity amplifiers available from Ott, W4WSR, at HI-SPEC, P. O. Box 387, Jupiter, FL 33468. Ott also has plans for a POWER ADDER (a two-input, single-output power splitter/combiner) and a clip-on liquid-cooling adapter for these popular amplifiers. With the commercial availability of solid-state receiving converters and all-mode transmission up-converters (transverters), and several varieties of antenna, a fully commercial 23-cm station can be put together with almost no UHF construction required.

If you are interested in 1296 MHz, and/or 2304 MHz, you will be interested in the 1296/2304 conference scheduled for the Estes Park, Colorado area from September 20 to the 22, 1985. A flea market and noise-figure measuring session are planned, in addition to a series of extremely interesting talks and demonstrations. Send a self-addressed, stamped envelope to Don Hilliard, WØPW, for further information about the conference.

More Interesting Reading

I was pleasantly surprised when I read through a copy of **The 1985 ARRL Handbook for the Radio Amateur.** While I have yet to read through most of the HF and general material, I thoroughly scrutinized the VHF+ chapters. Almost all of the outdated (tube and antiquated-semiconductor) equipment has been removed and fairly recent amateur state-of-the-art material has been substituted in its place. If you are a VHF+er who purchases the **Handbook** once every half decade, the 1985 edition is, in my opinion, something worthy of being read and consulted.

Dual-Gate FETs

A short time ago, I received a quantity of dual-gate GaAsFETs: the Motorola MRF966 (about $4.50 each), and the Texas Instrument S-3030 (about $3.50 each). I've built low-noise preamplifiers with samples of each at 144,220, 432,902, and 1296 MHz. Minimum obtained noise figure (NF) and associated gain (GA) are listed in Table 1. The general schematic for a typical stage can be found in the W9GLW article in the November 1984 issue of **QEX** (no. 33, p. 8), or the WA5VJB article in the December 1984 issue of **QEX** (no. 34, p. 8), for frequenices to 500 MHz. The 902- and 1296-MHz units were built per the dual-π network amplifiers in June 1983 **QST.**

Table 1

	MRF-966		S-3030	
FREQ (MHz)	NF (dB)	GA (dB)	NF (dB)	GA (dB)
144	0.62	18.2	0.52	27.3
220	0.58	18.3	0.57	25.4
432	0.46	18.7	0.63	24.9
902	0.66	19.2	0.78	23.4
1298	1.12	17.3	1.03	22.0

In conclusion, both devices were about equal, noisewise. The S3030 has somewhat more gain (although it is not really needed). My suggestion is to purchase whichever GaAsFET is available in your area.

*16 Riviera Drive, Latham, NY 12110

Broadband Antennas Employing Coaxial Transmission Line Sections

By William Conwell,* K2PO

A family of broadband antennas is the subject of U. S. Patent No. 4,479,130 recently issued to Richard D. Snyder. The antennas feature an SWR of less than 2:1 over bandwidths in excess of 15% of band center frequency.

As shown in Fig. 1, the basic antenna uses transmission lines as both radiating elements and matching stubs. Unlike the double bazooka antenna, which is superficially similar, the patented antenna is not designed for minimum SWR at the band center. Instead, the SWR is maximized at the band center and at the band edges, with minimums intermediate these frequencies. The SWR for an 80-meter broadband dipole is shown by the curve labeled 80 in Fig. 2. Curves 28 and 30 show the SWR for a regular dipole and a double bazooka, respectively.

The feed point impedance of the broadband 80-meter antenna varies from about 50 ohms at band center to about 200 ohms at each band edge. The impedance intermediate these frequencies is about 100 plus or minus j40 ohms. A 2:1 or better match is obtained across the band by feeding the antenna with 50-ohm cable through a 2:1 balun.

The antenna can be modeled as a dipole with two stubs in parallel across the feed point. The stubs are typically made of 25-ohm cable and are usually shorted at their far ends. At band center frequency, each stub is one-quarter wavelength long, as is the overall length of each leg of the antenna. At this frequency, the quarter wavelength shorted stubs look like open circuits and have no effect on the antenna impedance.

At frequencies above band center, the impedance of the dipole, without stubs, is inductive, and includes a resistive component of greater than 50 ohms. The shorted stubs at these higher frequencies present a capacitive reactance, which tends to cancel the antenna's normal reactance.

At frequencies below band center, the impedance of the dipole, without stubs, is capacitive, and includes a resistive component of less than 50 ohms. The stubs at these lower frequencies present an inductive reactance, which tends to cancel the antenna's normal reactance.

*1620 Willamette Center, 121 S. W. Salmon Street, Portland, OR 97204

At frequencies both above and below band center, the parallel stubs serve to raise the resistive component of the antenna's impedance closer to 200 ohms.

(The same broadband effect achieved in the patented antenna could be obtained in a conventional dipole by feeding it through a 2:1 balun and shunting a quarter wavelength section of shorted 12.5-ohm balanced line across the antenna, or by shunting a quarter wavelength section of shorted 6.25-ohm unbalanced line across the feed line. Such alternatives, however, are generally impractical because of the difficulties of constructing the appropriate low-impedance transmission lines.)

Snyder's patent provides a lengthy discussion of the basic broadband dipole and also describes several derivative structures, such as broadband quarter wave verticals and broadband parasitic elements. The printing includes a few typographical errors (for example, the resistive scale on a graph showing dipole impedance versus radiator length is high by a factor of ten, showing the impedance at resonance as 500 ohms), but these are generally obvious on inspection. The patent is available for $1.00 from the Commissioner of Patents and Trademarks, Washington, D. C. 20231. (Approximately four week delivery.)

Caveat: "Whoever without authority makes, uses or sells any patented invention, within the United States during the term of the patent therefor, infringes the patent." 35 U. S. C. Section 271.

Information on this patented invention is printed here in accord with **QEX**'s stated purposes of (1) providing a medium for the exchange of ideas and information; (2) documenting advanced technical work in the Amateur Radio field; and (3) supporting efforts to advance the state of the Amateur Radio art. This particular invention may not be practiced, without a license from Richard D. Snyder, until October 23, 2001. Nonetheless, it is believed that publicity of such advances in the state of the art will broaden the perspective of amateur experimenters and promote future technical advances within the amateur community.

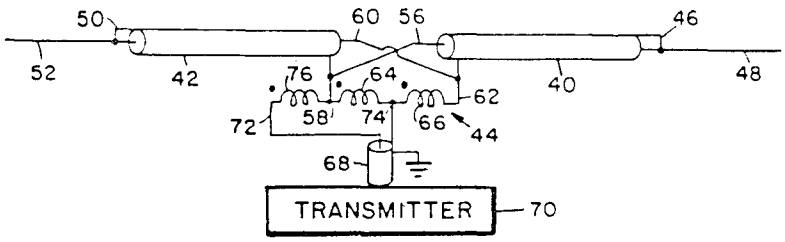


Fig. 1 -- The basic antenna uses transmission lines as both radiating elements and matching stubs.

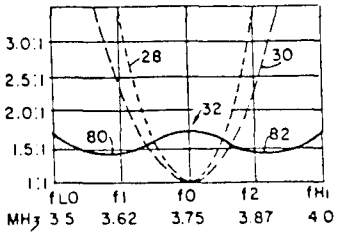


Fig. 2 — The SWR for an 80-m broadband dipole is shown by the curve labeled 80.

(continued from page 2)

Radio amateurs, who have at least twice the technical prowess of a house plant, do not need all that foolproof sophistication. Ham economics require that the mobile and base units be as unsophisticated (and cheap) as possible since there may be hundreds of them and only a few repeaters. The repeaters and control devices can be more complex since there are few of them.

Imagine the following possibility for the application of a modified trunked amateur repeater system: There are fifty clubs/groups in a concentrated area; each group wants its own repeater, and members do not like to listen to the chatter of other groups. They all want to use 440 MHz, and there are only six repeater channels available. One way would be to separate the groups into six different channels and use either separate coded-squelch repeaters (hopefully everyone listens on carrier squelch before transmitting) or six community repeaters. As I discussed above, however, community repeaters do not minimize blocking. The users can improve their lot by trunking six repeaters to a central controller. The repeaters require the ability to send and discern 50 different coded-squelch signals, report on their status (bad PA, receiving coded-squelch pattern no. 32, and so on) and be controllable remotely (enable a particular coded-squelch pattern, transmit status messages to users, and so on).

Mobile need to send and discern one coded-squelch pattern and to scan six (in this case) channels in the coded-squelch receive mode (the scanner stops only on a signal sending its particular coded-squelch signal). A group member wanting to call another member determines the best repeater to try first from his location. If, upon listening in the carrier-squelch mode, he finds the repeater available, he identifies and transmits on that input frequency for a few seconds. If the repeater is busy he tries another. (He would have to hold the mic down a few seconds since the repeater receiver would have to step through its coded-squelch combinations to find the code unless it was 50 separate decoders.) The repeater notifies the central controller that it has decoded a particular coded-squelch pattern. The central controller checks to be certain that the same code is not using another repeater already. (You don't want to let one group hog more than one repeater at a time.) Then the repeater is enabled to the repeat mode, and the correct coded-squelch pattern is sent out as a subcarrier, causing units within the station's group to stop scanning and enable the audio circuits. The central controller can also be programmed to do policeman functions, such as time out a particular coded-squelch pattern after a certain time, or perhaps disable the coded-squelch pattern of a group delinquent in its contributions. The complexity of the central controller is easily within the range of a home computer such as a Commodore 64. Most routines can be done using the BASIC interpreter. The only need for machine-language speed is during the transmission and reception of data packets to and from outlying repeaters.

Summary

While cellular radio is an interesting aspect of land-mobile communications, its applications for Amateur Radio are not interesting. Hams using cellular technology would not be anywhere near the brink of expanding technology. Packet radio and data-switching networks are "where it's at." The concept of trunked repeaters, while not likely to approach any technology frontiers either, offers a relatively inexpensive means of spectrum conservation. Since the mobiles and base stations are conventional, they require only coded squelch and scanning, while allowing more groups to occupy the same spectrum while maintaining a high probability of having a clear frequency available when it is needed. Repeaters need multiple selective squelch capability, status detection, and data links with a central controller. -- Rick Wilson, WØKT, 2221 Maple, Quincy, IL 62301.

UHF/Microwave Projects Wanted

The ARRL is planning to publish a new book on UHF/Microwave Communications sometime in early 1986. Projects for the 70-cm band and higher are being sought for this volume. The ARRL is offering $50/printed page for all material that is accepted. Sound interesting? Please contact the Microwave Book Editor at League Headquarters for more details.

Bits

Bulletin Board Program for the C 64

COMPUTERSTUFF recently announced the release of "RBBS/64" Amateur Radio "mailbox" software for the Commodore computer. The RBBS/64 is a full featured radio bulletin board program for use with the Commodore 64 and 1541 disk drive. Thirty user commands are available to allow the calling station to create, review, save and read messages. Advanced capabilities include: automatic logging of user call sign, time and date of access; automatic clock calendar updates for weeks of unattended use; automatic system shutdown in the event of a component failure; file protect option for "read only" messages; serial printer support; baud/mode change; expert user mode; and full directory and storage for up to 100 messages. "Break-in" mode allows sysop to modify system parameters, set "Beacon mode," and directly communicate with other stations without stopping the program.

A special configuration program is included, which will automatically format and prepare a file disk and encode it with the owners call, QTH and system baud rate (60 to 132 WPM Baudot or 110 to 1200 baud ASCII) eliminating the need for manually reentering the information every time the system is loaded. A third program included with the RBBS/64 system is a powerful file editor that allows the operator to examine, print, update, edit or delete messages; convert programs to RBBS/64 format; and view or print the user log. The complete RBBS/64 software system is available only on diskette for the Commodore 64. The complete RBBS/64 package, including three programs on disk, instruction manual and gold contact "User Port" I/O connector, is available directly from COMPUTERSTUFF for $60 (U.S.) postpaid.

Detailed information and order forms for RBBS/64 may be obtained by writing to COMPUTERSTUFF, 308 1/2 Green St., Yankton, SD 57078, tel. (605) 665-2833.

Head and Earphones Subject of New World Standard

A new world standard dealing with headphones and earphones was issued by the International Electrotechnical Commission (IEC) at the end of 1984. It gives standard methods of measurement for a number of characteristics useful for specification purposes, and includes a solution to the extremely difficult problem of assigning a meaningful frequency response specification to supra-aural and circumaural head and earphones. A type designation scheme is also included, giving the principle of the transducer(s), the rated impedance or voltage and the number of channels. It completes the 268 series of Publications and work on revising some of the major parts of this important basic standard has now begun.

The IEC is the authority for world standards in electrical and electronic engineering. It is composed of National Committees in 42 countries formed to represent in international discussions all their national electrical and electronics interests, including manufacturers, users, trade associations, the engineering profession and government.

The cost of Publication 268-7: Sound system equipment. Part 7: Headphones and headsets, is $18.58, and can be obtained from the Information Officer, Central Office of the IEC, 1, Rue de Varembe, 1211 Geneva 20, Switzerland.

Philips ECG High Technology Chemical Line

In November of 1984, the Distributor and Special Markets Division of Philips ECG, Inc., had published an eight-page, four-color brochure describing the company's new High Technology Chemical line. Philips ECG is a subsidiary of North American Philips Corporation.

The fully-illustrated brochure reviews each of the 18 aerosol spray products in the line, explains how they are used and summarizes their specifications. It categorizes the various products by principal application and provides packaging information for the entire line.

The products are designated PH100 through PH1800 and include a variety of cleaning, lubricating, shielding and testing agents for commercial, industrial/MRO and high-technology applications. In addition to aerosol cans, many of the products are offered in bulk containers.

For a copy of the High Technology Chemical brochure and further information on this line, contact the local Philips ECG distributor. Look in the telephone directory yellow pages under "Electronic Parts Wholesalers" or call toll-free 1-800-225-8326 (in MA, 1-890-6107) for the name of the nearest stocking distributor.

QEX: The ARRL Experimenter's Exchange is published by the

American Radio Relay League
225 Main Street
Newington, CT 06111 USA
telephone 203-666-1541

Larry E. Price, W4RA
President

David Sumner, K1ZZ
Executive Vice President

Paul L. Rinaldo, W4RI
Editor

Maureen Thompson, KA1DYZ
Assistant Editor

Geoffrey H. Krauss, WA2GFP (VHF+ Technology)
Associate Editor

Lisa Fuini
QEX Circulation

The purposes of QEX are to:

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2) document advanced technical work in the Amateur Radio field, and

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 double spaced. Please use the standard ARRL abbreviations found in the January 1984 edition of QST. Authors should supply their own artwork using black ink on white paper. When essential to the article, photographs may be included. 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 it will be when printed in QEX.

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