QEX 19 September 1983

The ARRL Experimenters' Exchange

The Turnstile Antenna and STS-9

There is growing excitement among Radio Amateurs as the (revised) October 28 launch date for the STS-9 Space Shuttle Columbia draws near. With Dr. Owen Garriot, W5LFL aboard, this will be the first opportunity ever for amateurs to work a real, live ham in space! Information about the proposed plans are given in August 1983 QST, p. 50, in an article by Glassmeyer, O'Dell and Neal, "Space Shuttle Columbia Calling All Radio Amateurs."

W5LFL will be operating nbfm in the 2-meter band on frequencies centered on 145.34 MHz. The August QST article gives information on how contacts will be conducted and indicates suitable equipment for making contacts. The QST authors suggest a turnstile antenna but include no constructional dimensions. A turnstile is a pair of horizontal crossed dipole elements fed for circular polarization and placed above a plane reflector, shown in Fig. 1. At high radiation angles the polarization is truly circular. The elements should be a half wave in length (39 inches), and may be of no. 12 wire, small rod or tubing. The reflector should be 48 inches square.

The spacing between the elements and the reflector plane is not critical, but will affect both the vertical-plane radiation pattern and the feed-point impedance. I suggest a spacing of 3/8 wavelength (30.5 inches). At this spacing the array will have the most gain at angles below the zenith. (In the broad range of 30 to 60 degrees above the horizon, the response will be within 1 dB of maximum.) At the zenith, where the spacecraft will be nearer and less antenna gain therefore required, the response will be down about 3 dB from maximum.

With a reflector spacing of 3/8 wavelength, each element will have a radiation resistance of approximately 95 ohms. The two elements have essentially no mutual coupling, and are interconnected with a 1/4-wave 75-ohm phasing line. This line, including connectors, should be 13.4 inches long if of solid polyethylene dielectric, or 16.25 inches for foamed dielectric. If a minimum SWR of 1.4:1 can be tolerated, 52-ohm line may be brought from the shack directly to one of the two elements. Otherwise, use a 1/4-wave matching section of 52-ohm line (length as above) connected from one of the elements to the end of a 75-ohm line coming from the shack. The SWR in the 75-ohm feeder will be near 1:1 at antenna resonance.

Many amateurs have wondered which is the preferred circularity for the turnstile, right-hand or left-hand. When used for STS-9 communications it will make no difference, as W5LFL will be using a loop antenna (linearly polarized). Yes, this does mean you'll be losing 3 dB of signal with circular polarization, but it also means you won't have to guess or experimentally determine how to orient a linearly polarized antenna to compensate for the attitude of the spacecraft and for Faraday rotation of the signals during propagation. That's one less detail you'll need to worry about during those few short minutes of access time per pass of Columbia.

At least one antenna manufacturer offers an antenna designed specifically for this type of space communications. Cushcraft of Manchester, NH, has recently announced the ATS-1 Shuttle Turnstile Antenna. From the Cushcraft brochure it appears to be similar to the array of Fig. 1, except that the plane reflector is replaced by two crossed parasitic reflectors. All elements appear to be of tubing. The ATS-1 lists in the $40 price class. -- Jerry Hall, K1TD.

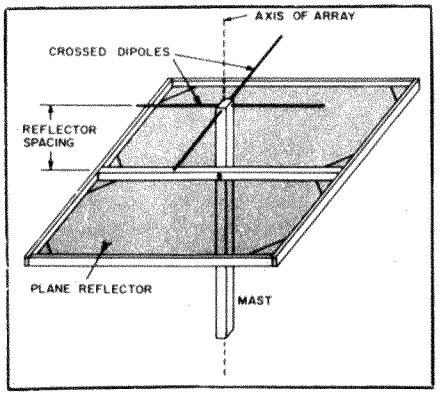

Fig. 1 -- The turnstile antenna consists of crossed dipoles above a screen reflector. The reflecting screen is 20-gauge hexagonal chicken wire, 1-inch mesh, stapled to a wooden frame made from furring strips. Hardware cloth may be used in place of the chicken wire. See text for dimensions.

HAMTRM1/BAS — A Radio Communications Program

By Robert Gervenack, * W7FEN and
John Bellinger, ** K7LVJ

Through the efforts of Robert Gervenack, W7FEN, and John Bellinger, K7LVJ, the following radio communications program enables Amateur Radio operators to transfer ASCII and non-ASCII saved files from one computer to another. It was originally designed for use with the micro-connection bus type modem. However, Ted Buhler, N7AUF, extensively modified the program for an RS-232, speed and versatility. This program can now be plugged into the TRS-80 models I and III using NEWDOS 80 Ver 2 and TRSDOS 1.3, respectively. Poke numbers are listed in the program and a list of loading data and HAMTRM1 commands follow. Suggested changes to the program should be sent to N7AUF at 8999 N. W. Pioneer Rd., Bremerton, WA 98312.

LOADING DATA

A = Transmit ASCII File
B = Set Baud Rate
C = Transmit BASIC Program
D = Dump Buffer to BASIC
E = Send Canned Messages
F = Dump Buffer to Disk
G = Send Station Calls
H = Insert Call Sign
I = Receive Mode
J = LPRINT Buffer Contents
K = Open Buffer to Receive
L = Type into Buffer
M = Transmit Buffer Contents
N = Transmit Cw I-d
O = Set Time
P = Disk Directories

HAMTRM1 Commands

CMD-A is the cmd for transmission of the ASCII saved files. If the program is BASIC, it must be saved first in ASCII or it will be garbled.

CMD-B is used to set up baud rates for the modem. 110, 300, 600 and 1200 baud may be selected. Present baud rate is displayed at the bottom of the menu screen.

CMD-C is used to transmit non-ASCII BASIC files. After using this cmd you will have to reload RADIOTRM. You can use this to transmit several non-ASCII BASIC programs while in the cmd.

CMD-D is used to save BASIC programs that are received in the buffer by cmd K. The program in the buffer is dumped to BASIC and can then be saved in the normal manner with SAVE.

CMD-E provides a series of test messages. All but no. 8 will continue to repeat. Press any key to stop. Number 8 will be transmitted one time only.

CMD-F is used to save ASCII files that are in the buffer to disk. If a program that was sent by cmd C is a problem, use cmd D for those programs.

CMD-G is a transmission of time/date, other station (see cmd H) and your call. Do not get this confused with the cw i-d.

CMD-H is used to enter the other station's call sign. Do not use commas, colons or semi-colons between calls as that delimits it and will not work correctly.

CMD-I puts you in the receive/transmit mode from the keyboard mode. It does not open the buffer for data and what you see is what you get.

CMD-J will print the data that is in the buffer on the printer.

CMD-K opens the buffer for receipt of data. Any data in the buffer will be written over. The buffer holds about 27 kbytes.

CMD-L permits you to type into the buffer for later transmission or to save to a disk file for reference, etc. Backspacing is operational.

CMD-M permits you to transmit what is in the buffer. This could be a program, typed in text, etc.

CMD-N is your cw i-d. Line 1050 sets the speed. Line 1080 is the dash and line 1090 is the dot. Hope you can figure it out from there.

CMD-O permits you to set your clock to the correct time. Do not forget that disk operations stop the clock so it will probably be slow.

CMD-P permits you to look at your disk directories while in 'HAMTRM1. These are set up for NEWDOS. Line 1350 and 1370 will have to be changed for TRSDOS.

*19701 - 320th Ave. NE, Duvall, WA 98019
**15810 - 12th NE, Seattle, WA 98155

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10 ' FILENAME - HAMTRM1/BAS - DESIGNED TO RUN WITH NEWDOS80 VER      2, TRS-80 M
ODEL III
20 ' FOR USE ON TRS-80 MODEL I (NEWDOS80 VER 2), POKE&HFF27,22       AND POKE&HF
F28,69 (LINE 280). MODEL III, TRSDOS 1.3, POKE&H     FF27,36 AND POKE &HFF28,48
(LINE 280) WITH DISK.
30 ' * * THIS PROGRAM DESIGNED FOR SIMPLEX RADIO * *
40 '          REVISED --- APRIL 30, 1983
50 ' THIS PROGRAM WAS ORIGINALLY CONCEIVED BY JOHN BELLINGER          (K7LVJ) AND
 ROBERT GERVENACK (W7FEN) FOR USE WITH THE MICRO     CONNECTION BUS TYPE MODEM.
60 ' THE PROGRAM HAS BEEN EXTENSIVELY MODIFIED BY TED BUHLER          (N7AUF) FOR
 RS-232 AND FOR MORE SPEED AND VERSATILITY.          *8999 N.W. PIONEER ROAD, BR
EMERTON, WA. 98312*
70 ' PLEASE SEND TED BUHLER (N7AUF) SUGGESTED CHANGES AND/OR    MODIFICATIONS TO
 THIS PROGRAM.
80 ' FOR MODEL III, DELETE LINE 280.
90 ' UART IS SET UP FOR 8 BIT, NO PARITY AND 1 STOP BIT
100 ' TO CHANGE BOOT UP BAUD RATE, CHANGE BR IN LINE 140. 34=110,  85=300, 109=6
00, 119=1200
110 POKE&H40B1,0:POKE&H40B2,249 '(F900H) MEM SIZE FOR MOD I & MOD III
120 CLS:CLEAR 5000:I=0
130 OUT234,111
140 DEFINT B,H-Z:DIM CH$(16):BR=85:PR=300
150 DEFUSR=&HFF90:DEFUSR1=&HFE22:DEFUSR2=&HFE91:DEFUSR3=&HFEF9:DEFUSR4=&HFEB0:DE
FUSR5=&HFD23:DEFUSR6=&HFB2A:DEFUSR7=&HF910
160 POKE&H9000,0:POKE&H9001,0:POKE&H9002,0
170 PRINT:PRINT:PRINT:PRINT"                              WESTERN WASHINGTON"
180 PRINT"              AMATEUR COMMUNICATIONS EXPERIMENTERS"
190 PRINT"                        (ACE NET 146.55 MHZ)"
200 PRINT:PRINT:PRINT"                    RADIO COMMUNICATIONS PROGRAM"
210 PRINT:PRINT"                          > LOADING DATA <"
220 GOSUB980
230 FORDA= -1776 TO -1737:READDB:POKEDA,DB:NEXT DA
240 FORDA= -1238 TO -1033:READ DB:POKE DA,DB:NEXT DA
250 FORDA= -733 TO -562:READ DB:POKE DA,DB:NEXT DA
260 FORDA= -483 TO -170 :READ DB:POKE DA,DB:NEXT DA
270 FORDA= -139 TO -54:READ DB:POKE DA,DB:NEXT DA
280 POKE&HFF27,22:POKE&HFF28,69
290 GOTO330
300 PRINT:INPUT"SET BAUD RATE--";PR:IF PR=110 ELSE IF PR=300 ELSE IF PR=600 ELSE
 IF PR=1200THEN 310 ELSE 300
310 IF PR=300 THEN BR=85 ELSE IF PR=1200 THEN BR=119 ELSE IF PR=110 THEN BR=34 E
LSE IF PR=600 THEN BR=102
320 OUT233,BR
330 CLS
340 PRINT@020,"<< HAMTRM1  VER 1.0  >>"
350 PRINT:PRINT" A =  TRANSMIT ASCII FILE";:PRINT," B =  SET BAUD RATE"
360 PRINT" C =  TRANSMIT BASIC PROGRAM";:PRINT," D =  DUMP BUFFER TO BASIC"
370 PRINT" E =  SEND CANNED MESSAGES";:PRINT," F =  DUMP BUFFER TO DISK"
380 PRINT" G =  SEND STATION CALLS";:PRINT," H =  INSERT CALL SIGN "
390 PRINT" I =  RECEIVE MODE";:PRINT," J =  LPRINT BUFFER CONTENTS"
400 PRINT" K =  OPEN BUFFER TO RECEIVE";:PRINT," L =  TYPE INTO BUFFER"
410 PRINT" M =  TRANSMIT BUFFER CONTENTS";:PRINT," N =  XMIT CW ID"
420 PRINT" O =  SET TIME";:PRINT,," P =  DISK DIRECTORYS"
430 GOTO450
440 PRINT@704,LEFT$(TIME$,8):PRINT@727,"* BAUD RATE="PR" *":PRINT@760,RIGHT$(TIM
E$,8)
450 W$=INKEY$:IF W$=""THEN 440 ELSE W=ASC(W$):W=W-64
460 IF W<1THEN450 ELSE 470
470 ON W GOTO880,300,850,560,650,1400,830,1290,480,900,860,500,610,1050,1300,133
0
480 CLS:PRINT"PRESS CLEAR TO RETURN TO MENU!!":PRINT"USE SHIFT DOWN AND RIGHT AR
ROWS TO OPEN THE BUFFER, IF DESIRED"
490 POKE&HFEF7,3:POKE&HFEF8,144:Y=USR1(X):GOTO330
500 CLS:PRINT"PRESS CLEAR TO CLOSE BUFFER":PRINT:PRINT,"* * MANUAL BUFFER OPEN *
 *":D=&H9002
510 PRINTCHR$(14)
520 I$=INKEY$:IFI$=""THEN520  ELSEI=ASC(I$)
530 PRINTCHR$(I);:IF I=08 THEN D=D-1 ELSE D=D+1:POKE D,I
540 IF I=31 THEN D=D-1 ELSE 520
550 PRINT:D=D+1:POKED,1:PRINTTAB(18)"* * BUFFER CLOSED * *":FOR X=1 TO 1000:NEXT
:GOTO330
560 REM DUMP BUFFER TO BASIC
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570 IF PEEK(&H9003)<>1THEN 580 ELSE PRINT"NOTHING IN BUFFER":GOTO590
580 CLS:PRINT"DUMPING BUFFER TO BASIC":GOSUB 600:Y=USR3(X):NEW
590 FORI=1 TO 500:NEXT:CLS:GOTO330
600 FOR I=1 TO 500:NEXT:RETURN
610 CLS:PRINT,"* * TRANSMIT BUFFER CONTENTS * *"
620 Y=USR7(X)
630 PRINT:PRINT,"* * DONE * *":LINEINPUT"PRESS ENTER TO RETURN TO MENU";X$:GOTO3
30
640 '***** WHEN MESSAGES ARE ADDED MAKE CHANGES IN LINES 730, 740 & 760 *****
650 D$(1)="U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*U*"
660 D$(2)="CQ CQ CQ CQ CQ CQ CQ CQ DE GERVIE W7FEN W7FEN W7FEN - NEAR DUVALL, WA."
670 D$(3)="THIS IS A TEST OF 110 BAUD ASCII DE W7FEN"
680 D$(4)="THIS IS A TEST OF 300 BAUD ASCII DE W7FEN"
690 D$(5)="THIS IS A TEST OF 600 BAUD ASCII DE W7FEN"
700 D$(6)="THIS IS A TEST OF 1200 BAUD ASCII DE W7FEN"
710 D$(7)="ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789"
720 D$(8)="THIS IS GERVIE W7FEN - NEAR DUVALL, WA. EQUIP - TRS-80 MODEL I, 48K A
ND 2 DISK, CLEGG FM-28 AND DRAKE TR-7."
730 CLS:PRINT,"       MESSAGES AVAILABLE":PRINT:FORX=1TO8:PRINT"NO."X" ";:PRINTD
$(X):NEXT
740 T=0:PRINT,"    ENTER MESSAGE NO.1 - 8"
750 I$=INKEY$:IFI$=""THEN750  ELSET=VAL(I$)
760 CLS:IFT>8 THEN 740 ELSE IF T<1 THEN 330
770 L=LEN(D$(T))
780 FORI=1TOL
790 E=ASC(MID$(D$(T),I,1))
800 C=USR(E):NEXTI:E=13:C=USR(E)
810 IFT=8THENCLS:GOTO330        'SENDS MSG #8 ONCE
820 IFINKEY$=""THEN770ELSECLS:GOTO330
830 PRINT:E$=" DE W7FEN 'GERVIE' NEAR DUVALL, WA."
840 ID$=TIME$+" PDT     "+C$+E$:R=LEN(ID$):FORI=1TOR:E=ASC(MID$(ID$,I,1)):C=USR(E
):NEXTI:C=USR(13):GOTO330
850 CLS:PRINT:PRINT:PRINT"LOAD TARGET PROGRAM AND LLIST TO SEND":Y=USR2(X):END
860 PRINT"BUFFER IS NOW OPEN----PRESS CLEAR TO CLOSE/RETURN TO MENU"
870 POKE&HFEF7,3:POKE&HFEF8,144:Y=USR4(X):GOTO330
880 CLS:PRINT:PRINT"THIS PROGRAM XMITS ASCII DISK FILES ---- TARGET PROGRAM MUST
 HAVE BEEN SAVED IN ASCII
890 Y=USR6(X):GOTO330
900 CLS:PRINT,"* * LINEPRINT BUFFER CONTENTS * *"
910 LINEINPUT"WHEN READY TO PRINT PRESS ENTER";X$
920 D=&H9003
930 LPRINT CHR$(10)
940 R=PEEK(D):IFR=1THEN970
950 PRINTCHR$(R);:LPRINTCHR$(R);:D=D+1
960 IFINKEY$=""THEN940  ELSE 970
970 LPRINTCHR$(10):PRINT:PRINT"* * DONE * *":INPUT"PRESS ENTER TO RETURN TO MENU
";X:GOTO330
980 REM * * SETUP 1604 FOR 8 BIT ,NO PARITY,1 STOP BIT
990 OUT 232,0              'ACHTUNG UART
1000 FOR J=1 TO 10:NEXT    'NEED SHORT DELAY
1010 OUT233,BR    '34=110BPS,85=300BPS,102=600BPS,119=1200BPS
1020 OUT 234,111           'RTS AND DTR LOW
1030 Q=INP(235)            'CLEAN OUT REC BUFFER
1040 RETURN
1050 A=130:B=40 ' A & B ADJUST THE CW ID SPEED
1060 PRINT:PRINT"CW ID FOLLOWS: ";
1070 GOTO1100
1080 OUT234,0:FORI=1TOA:NEXT:OUT234,6:FORI=1TOB:NEXT:RETURN'DASH
1090 OUT234,0:FORI=1TOB:NEXT:OUT234,6:FORI=1TOB:NEXT:RETURN'DOT
1100 GOSUB1080:FORX=1TO2:GOSUB1090:NEXT:FORI=1TOA:NEXT:GOSUB1090'DE
1110 PRINT"DE ";
1120 FORI=1TO2*A:NEXT'SPACE
1130 GOSUB1090:FORX=1TO2:GOSUB1080:NEXTX '                    W
1140 PRINT"W";
1150 FORI=1TOA:NEXT
1160 FORX=1TO2:GOSUB1080:NEXT:FORX=1TO3:GOSUB1090:NEXT'       7
1170 PRINT"7";
1180 FORI=1TOA:NEXT
1190 FORX=1TO2:GOSUB1090:NEXTX:GOSUB1080:GOSUB1090 '          F
1200 PRINT"F";
1210 FORI=1TOA:NEXT
1220 GOSUB1090'                                               E
1230 PRINT"E";
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1240 FORI=1TOA:NEXT
1250 GOSUB1080:GOSUB1090'                                          N
1260 PRINT"N"
1270 FORX=1TO400:NEXT
1280 GOSUB980:GOTO330    'RESET
1290 PRINT:LINEINPUT"ENTER OTHER STATIONS CALL  ";C$:GOTO330
1300 PRINT:INPUT"HOUR";TI:POKE16921,TI'  POKE 16451 FOR MOD I
1310 INPUT"MINUTE";TI:POKE16920,TI'  POKE 16450 FOR MOD I
1320 GOTO330
1330 PRINT:INPUT"WHICH DRIVE";VV
1340 IFVV=1THEN1370 ELSE 1350
1350 CMD"DIR
1360 GOTO1380
1370 CMD"DIR 1
1380 PRINT"HIT ANY KEY TO RETURN TO MENU
1390 W$=INKEY$:IF W$=""THEN 1390 ELSE 330
1400 CLS:PRINTTAB(18)"* * DUMP BUFFER TO DISK * *"
1410 Y=USR5(X):GOTO330
1420 'DATA FOR LINE 230
1430 DATA  229,33,3,144,219,234,203,119,202,20
1440 DATA  249,213,205,43,0,209,254,31,202,52
1450 DATA  249,126,211,235,254,1,202,52,249,205
1460 DATA  51,0,35,195,20,249,225,195,154,10
1470 'DATA FOR LINE 240
1480 DATA 213,33,42,250,34,0,250,36,34,4
1490 DATA 250,62,0,50,41,250,205,196,251,33
1500 DATA 42,250,17,6,250,1,0,0,205,36
1510 DATA 68,32,87,58,18,250,198,1,50,2
1520 DATA 250,217,237,91,0,250,217,58,14,250
1530 DATA 50,38,250,17,6,250,205,54,68,32
1540 DATA 59,205,108,251,24,243,217,33,42,250
1550 DATA 1,0,1,237,67,39,250,58,2,250
1560 DATA 61,50,2,250,254,0,40,91,237,75
1570 DATA 39,250,219,234,203,119,40,250,126,205
1580 DATA 51,0,211,235,11,35,121,254,0,32
1590 DATA 237,58,41,250,254,5,40,16,217,201
1600 DATA 254,28,40,10,254,29,40,6,205,40
1610 DATA 68,195,176,251,17,6,250,205,40,68
1620 DATA 217,21,58,38,250,95,62,3,18,217
1630 DATA 209,195,154,10,33,237,251,205,211,251
1640 DATA 6,23,33,6,250,205,217,5,201,126
1650 DATA 254,3,200,205,51,0,35,24,246,237
1660 DATA 75,38,250,237,67,39,250,62,5,50
1670 DATA 41,250,205,130,251,13,70,73,76,69
1680 DATA 83,80,69,67,32,3
1690 REM FOR LINE 250
1700 DATA 33,3,144,126,205,51,0,254,1,32
1710 DATA 5,34,0,252,24,29,35,195,38,253
1720 DATA 33,171,253,205,70,253,6,23,33,2
1730 DATA 252,205,217,5,201,126,254,3,200,205
1740 DATA 51,0,35,24,246,205,55,253,33,35
1750 DATA 252,17,2,252,1,0,0,205,32,68
1760 DATA 42,0,252,17,3,144,237,82,125,50
1770 DATA 34,252,217,33,3,144,217,35,205,160
1780 DATA 253,37,250,128,253,17,2,252,205,57
1790 DATA 68,24,241,58,34,252,50,10,252,17
1800 DATA 2,252,205,57,68,58,14,252,214,1
1810 DATA 50,14,252,58,34,252,50,10,252,205
1820 DATA 40,68,195,154,10,217,17,35,252,1
1830 DATA 0,1,237,176,217,201,13,70,73,76
1840 DATA 69,83,80,69,67,32,3,195,54,10
1850 DATA 217,17,35,252,1,0,1,237,176,217
1860 DATA 201,13,70,73,76,69,83,80,69,67
1870 DATA 32,3
1880 REM DATA FOR LINE 260
1890 DATA 62,28,205,51,0,62,31,205,51,0
1900 DATA 62,0,205,51,0,33,63,255,6,24
1910 DATA 126,205,51,0,35,16,249,205,115,254
1920 DATA 183,40,22,230,127,254,96,250,71,254
1930 DATA 0,0,254,10,40,237,254,95,40,233
1940 DATA 205,51,0,24,228,205,43,0,183,40
1950 DATA 222,79,254,25,40,81,254,31,200,254
1960 DATA 26,40,210,205,124,254,254,13,204,130
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1970 DATA 254,0,0,0,24,197,219,234,203,127
1980 DATA 40,22,219,235,201,219,234,203,119,40
1990 DATA 250,121,211,235,201,14,10,205,124,254
2000 DATA 14,13,121,201,175,201,229,33,156,254
2010 DATA 34,38,64,225,195,154,10,205,124,254
2020 DATA 213,253,229,205,51,0,253,225,209,254
2030 DATA 13,32,3,195,47,255,201,14,13,205
2040 DATA 124,254,42,247,254,58,126,56,58,64
2050 DATA 56,230,2,32,44,62,248,188,32,13
2060 DATA 62,255,189,32,8,54,1,33,3,0
2070 DATA 195,154,10,205,115,254,183,40,222,119
2080 DATA 35,34,247,254,230,127,254,127,40,211
2090 DATA 254,10,40,207,205,51,0,24,202,54
2100 DATA 1,33,4,0,175,195,154,10,3,128
2110 DATA 229,33,2,255,34,22,64,225,201,58
2120 DATA 127,56,58,64,56,230,2,32,26,229
2130 DATA 42,45,255,126,35,34,45,255,230,127
2140 DATA 254,10,40,245,254,127,40,241,225,254
2150 DATA 1,40,2,183,201,33,36,48,34,22
2160 DATA 64,201,0,144,229,245,33,51,51,43
2170 DATA 124,181,32,251,241,225,205,134,254,201
2180 DATA 82,69,67,69,73,86,69,32,47,32
2190 DATA 75,69,89,66,79,65,82,68,32,77
2200 DATA 79,68,69,13
2210 'DATA FOR LINE 270
2220 DATA 145,53,84,69,241,53,128,66,192,68
2230 DATA 127,66,145,53,84,69,241,53,128,66
2240 DATA 192,68,0,67,159,0,2,205,127,10
2250 DATA 125,183,40,13,219,234,203,119,40,250
2260 DATA 125,211,235,205,51,0,201,33,0,0
2270 DATA 219,234,203,127,40,9,219,235,230,127
2280 DATA 254,10,40,1,111,195,154,10,0,0
2290 DATA 0,108,218,14,128,10,9,43,157,95
2300 DATA 155,135,143,27,30,29
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GLOBECOM '83

GLOBECOM '83 will be held soon from November 28 through December 1 in San Diego, California. Hosted in the Town & Country Hotel-Convention Center, the Technical Program offers a wide variety of topics ranging from communication theory, hardware, computers and data communication through optical communications and processing to societal impact of communication technology and other topics related to the conference theme.

The GLOBECOM '83 Amateur Radio session will be held on Wednesday and Thursday, November 30 and December 1, from 6:30 to 9:30 p.m. This session will include participation by members of the headquarters staff of the ARRL, AMSAT, and members of local Amateur Radio groups in the San Diego Amateur Radio Council and the San Diego Repeater Association. A varied program will be presented which should interest everyone from the seasoned amateur to the prospective newcomer. The scheduled panel discussion topics are:

-Amateur Satellite Usage
  *Phase IIIB
  *Interaction with Local Area Networks and Packet Radio
-Spread Spectrum Communications in Amateur Radio
-Packet Radio
  *Packet Radio Repeaters
-AMTOR
-Amateur Computer Applications
-UHF and Microwave Advances in Amateur Radio
-Regulatory Issues

For further information on GLOBECOM '83, contact: GLOBECOM '83, Amateur Radio Program, Dr. Ron D. Katznelson, P. O. Box 81466, San Diego, CA 92138, Tel. (619) 457-2340, ext. 1417.

VHF+ Technology

Conducted by Geoff Krauss, * WA2GFP

Where Goeth The Bipolar RF Power Transistor?

I've just finished building a Ramsey 2-meter power amplifier for a local Packet Radio enthusiast. It included four mica variable capacitors, a few pieces of wire, three disk capacitors and a 6-hole RF choke combined with an MRF238 bipolar power transistor. The results for this class C amplifier was 25 W out for 3.3 W in (8.8 dB power gain), and 45 W out for 6.8 W in (8.2 dB power gain) at 12.8 V dc. I decided to compare this amp with the specification sheet performance on some of the new N-channel RF power FETs. The new Motorola FET spec. characteristics for 2 meters is summarized in the left-hand table below.

Device	P out	P gain		Device	P out	P in	
MRF134	5W	14 dB	150 MHz	MRF134	5W	10.5 dB	@400 MHz
MRF171	45W	15 dB	28 Vdc	UMP-1	5W	10 dB	28 Vdc
MRF174	125W	12 dB		UMP-2	10W	7 dB	

The MRF174 2-meter circuit and MRF134 150/400 MHz circuits are shown in the July 1983 issue of Microwaves & RF magazine, pp. 128-131. The MRF134 data was given at 400 megacycles, so the right-hand table also lists the data for two Siliconix RF power FETs at this frequency. I assume that all 400 MHz devices will work, with slightly reduced gain, at 432 MHz. These devices are designed for 28-V dc power supplies and not the 12-14 V dc available for normal mobile operation. The required supply of voltage will be a problem if VHF+ amateurs want to use these new devices. Of course, you could always jerryrig a system to add an additional lead-acid battery to the mobile. You would place it in series with the existing battery to obtain 24-26 V dc during transmit and connect it in parallel with the normal car battery for recharging during all non-transmitting intervals. Unless your mobile has a military-standard 28-V dc power system, this is probably too much work!

To keep my policy of testing any VHF+ part, subassembly or equipment of specialized nature and not of sufficient interest to appear in QST's Product Review column, I recently had a chance (thanks to Gerry, K3MKZ) to test the Puma "Bit-Zero 23S" linear amplifier for 1296 MHz. This fully solid-state linear amplifier includes a pair of coaxial relays, each having one N-type connector (protruding through the front panel), a three-stage bipolar transistor amplifier and a two-stage helical resonator bandpass filter between the amplifier output and the output relay. A block diagram for this $360-price class unit appears at the end of my column.

Test results on the Puma "Bit-Zero 23S" follow. A pair of 0.3 W input signals spaced 10 kHz were combined for a total 0.6 W input power and yielded a 9.25-W power output (gain of 11.9 dB) with -28 dB third order IMD products. A pair of half-watt input signals were combined for a 1-W total power input, yielding 15.5 W of power output with -24 dB third order IMD. Testing was accomplished with 13.5-V dc input, utilizing the special dc connector/cord/fuse holder supplied with the amplifier. While the IMD figures (a measure of linearity) are not as good as those obtained with tube-type or vhf transistor linears, the linearity should be more than sufficient for use in 1296-Mhz ssb systems.

The unit is nicely laid out although there is no room in the interior for adding a receiving preamplifier. Nor is there a way to break into the coax line between the input/output relays for such an addition. The three-stage transistor amplifier is solidly packaged within a heavy copper EMI shield. All switches and other front panel connections are designed to stay on the front. The package is not weather-proofed and this points to the intention to have it look nice when placed on an operating desk or console. I've seen several LNAs built in the same style...very nice, but does the manufacturer realize that the best operating advantage is when these units are mounted, with the system T/R relay(s), at the antenna? Weather-proof boxes and remote control is then required.

This amplifier is built on ordinary 1/16" G-10 pc board and uses a trio of NEC power devices, probably of the 800-900 MHz mobile radio type. Many small leaded disk capacitors, about 0.1" in diameter, used for coupling and loading applications and four variable tuning capacitors of the polyethylene-film type are employed. Most U.S. and Canadian VHF+ amateurs would consider these variable capacitors useful in the hf range only, but the European uhf/microwave amateur publications have utilized these low-cost variable capacitors in 1296 MHz projects for years, even before the Japanese Amateur Radio industry turned to equipment above 1 GHz. It would be interesting to know if any reader has access to good test equipment to measure capacitor Q and stability at frequencies above 1 GHz and to have someone report on the relative characteristics of (a) plastic capacitors, with respect to ceramic, glass, quartz or sapphire dielectric piston capacitors we normally associate with uhf and up use, and (b) the small disc capacitors, where they can be obtained, and if their characteristics at 1296 MHz is acceptable.

On hot nights the average VHF+er is likely to turn off heat-generating test equipment, soldering irons and butane torches in favor of a cold drink and some interesting VHF+ reading matter! Everyone reading this column should already be a subscriber to QEX and should consider becoming an ARRL member to receive QST. A majority of VHF+ers have wondered why QST doesn't have more VHF+ material. The reason? QST is intended for all ama-

(continued on page 8)

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(continued from page 7)

teurs and one phase of the hobby should not override the other. QST is always looking for VHF+ material and you should write up that new project for publication. Another U.S. magazine with a good sampling of VHF+ material over the years is Ham Radio, Greenville, NH.

The vhf-only magazine is an interesting phenomenon. Long time VHF+ers will remember the VHF'ER, published by Bob Brown, K2ZSQ, with assistance from K2UYH in the early '60s, VHF Horizons published by Bob Cooper, W5KHT, in the late '60s, and VHF Communications, the English translation of the German magazine UKW Berichte, distributed by various sources in North America until the end of 1982. These general-vhf and up-coverage periodicals had worthwhile material which may still be of use should you have a chance to obtain back issues.

Various newsletters covering special aspects of the VHF+ hobby have appeared intermittently. Most of the present specialized newsletters, particularly covering EME, have been consolidated to form the Lunar Letter, by KI7D. Unfortunately, all periodicals publish articles of current interest to their writers and many articles are sketchy, often erroneously assuming that every reader possesses background knowledge required for complete understanding of that particular subject.

Everyone is not an expert in each aspect of VHF+ activity and even the most experienced has need for general manuals. The ARRL VHF Manual, although put together some years ago, is a fine starting point for general information in any VHF+ area. Many VHF+ers will want to supplement this with at least one additional VHF+ manual. A number of such manuals are available. Some are old, using vacuum tubes almost exclusively! The copyright date, usually located on the back of the title page, is an ideal way to check on how "state-of-the-art" the manual is. One "state-of-the-art" manual currently available is the RSGB VHF-UHF Manual ($18 price class, hard-cover). The new fourth edition is available from the ARRL. A reader with the third edition will be pleasantly surprised by the additional material in the fourth which appears to cover subject matter as recent as 1982 and contains a larger amount of microwave material. Of interest is the fact that solid-state assemblies have replaced vacuum-tube circuits and a much greater percentage of the solid-state devices utilized are those available in North America. While the fourth edition is not perfect (is there a perfect manual for this ever-evolving aspect of our hobby?), it is of sufficient depth (up to 24 GHz!) to be in daily use by this writer.

Another recent manual, The UHF Compendium, is available from the Ham Radio magazine publishers. It is an English translation of a 1980 German manual that appears to be a collection of various articles previously published on the Continent. This soft-bound manual, in the $29 price range, leans heavily towards equipment for the 432 and 1296 MHz bands. While the projects described are almost entirely solid-state, the devices required are often not available in North America. If your main interest, however, is at either of the two frequency bands covered in this manual, it is an interesting source of equipment as possible alternatives to equipment found in the RSGB VHF-UHF Manual.

For VHF+ers addicted to actual design of equipment for frequencies above 600 MHz, several technical design books are available from ARTECH HOUSE, Inc., 610 Washington St., Dedham, MA 02026. Stripline Circuit Design, a 1974 volume by H. Howe, Jr. in the $46 price class, is a standard reference work for most microstrip-circuit designers. Computer-Aided Design of Microwave Circuits, a 1981 volume in the $60 price range by K. Gupta et al., covers so many aspects of microwave circuit design, whether manual or by computer, that other reference manuals are often not required. However, the wealth of information in this latter volume is so great that the reader must have knowledge of the subject area to begin with, to avoid being "snowed under" by additional considerations. This is definitely a reference manual for use by trained engineering personnel, and not for the casual VHF+ amateur! The same publisher has several dozen other titles on the professional engineering level, but perhaps of interest to the more serious amateur with a deep microwave engineering background.

IEEE Call for Papers

A call for papers has been issued in a recent issue of the IEEE Communications Magazine. A special issue on Computer Communications is scheduled for November 1984. Guest Editor will be Kenneth Brayer of the MITRE Corporation. Original papers, surveys and tutorial articles on this subject are solicited for this special issue. Possible topics are, but not limited to:

-Packet Switching	-Packet Radio
-Comm. Formats	-Comm. Protocols
-Comm. Processors	-Comm. Software
-Interfaces	-Network Control
-Economic Factors	-Network Architecture
-Operational Networks	-Performance Evaluation
-Data Privacy	-Technology Growth Projections

It is requested that the papers keep with the general spirit of the Magazine, minimizing detailed theoretical derivations and analyses. A 100-200 word summary should be sent to Mr. Brayer at the following address by January 1, 1984. This should be followed by five copies of the proposed article by April 15, 1984. Mr. Kenneth Brayer, The MITRE Corporation, P. O. Box 208, Bedford, MA 01730. Tel. (617) 271-3229.

By Richard K. Olsen,* N6NR

N6NR claims the first use of packet radio in Field Day (4 contacts counted as 2-m cw). See the photos below of the packet station. Left to right is an ADM-3 terminal. In the foreground is a SANTEC HT (2-m radio), and a TAPR (Tucson Amateur Packet Radio) terminal node controller.

We had out 6-element beam for 6-m so high (100 feet up on a tower that was located 50 feet above the shack), we could hardly hear the weak ones calling!

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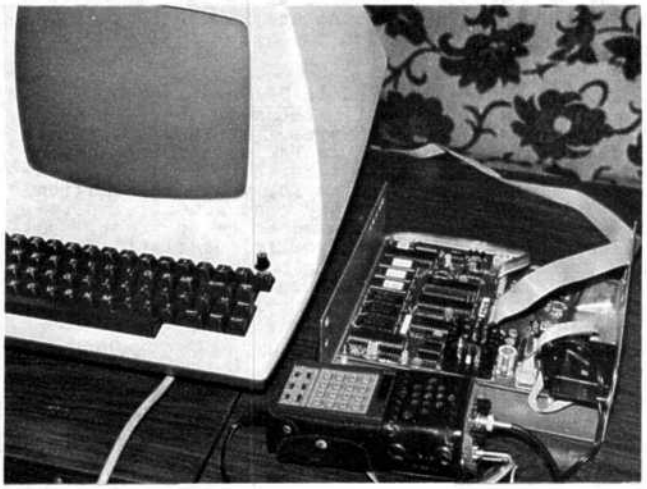
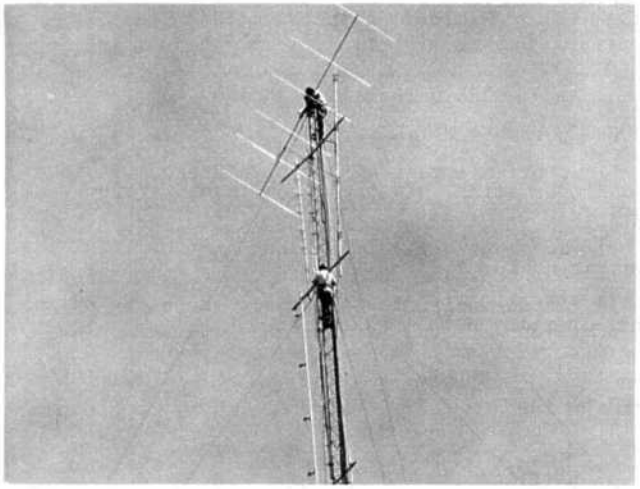


Packet Radio Station used in first Packet Field Day contacts. Operated under N6NR, owned by WA6CFM. Pictured are ADM-3 terminal, SANTEC HT (2-m radio), TAPR terminal node controller.



We just had to get the 6-m, 6-element beam above the trees, on a 100 foot tower. The hard work paid off with 100 contacts on 6-m ssb for N6NR operating 4 E from almost 6,000 feet high atop Mt. Palomar, San Diego County.

QEX: The ARRL Experimenters' Exchange is published by the

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

The purposes of QEX are to:

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, 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 latest December issue 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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