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PO Box 12925
Tucson, AZ 85732-2925
Phone: 602-749-9479
FAX: 602-749-5636
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Editor:
Bob Hansen, N2GDE
PO Box 1902
Elmira, NY 14902-1902
CompuServe: 71121,1007

In This Issue...

President's Corner

by Bob Nielsen, W6SWE

Greetings again from Tucson. The Dayton HamVention was great this year. I want to thank all of you who dropped by the TAPR booth, even if it was just to say "hello." Sales exceeded all previous years and we sold out of several items. We had a Yaesu G5400 az-el rotator (courtesy of Yaesu USA) set up to demonstrate the TrakBox. Pete Eaton, WB9FLW and his dad, Jim, built a miniature antenna model out of PVC pipe and piano wire and it made a very effective demonstration of the tracking capabilities. (Several people asked if they could buy the antennas! Sorry, they were completely non-functional.) It was nice to meet many of the members and friends of TAPR and I apologize if I missed any of you. It got quite hectic at times. The packet forum was well-attended, as well.

Speaking of the TrakBox, at the time I am writing this (late July), TAPR has sold over 100 of the kits. We have nearly 100 boards left and are kitting them up. When these are gone, there will be no more. JAMSAT has announced that they will not be making any more of the boards, but will be licensing the design for production by commercial manufacturers.

I feel the need to comment on some recent happenings. As many of us are well aware, the special temporary authority (STA) under which the automated HF BBS forwarding takes place will not be renewed next year, and unless some rule changes are forthcoming, such forwarding within the U.S. will no longer be legal. The ARRL Committee on Amateur Radio Digital Communications released on June 13 its report on unattended HF digital operations. I only learned of the report and obtained a copy a few days prior to the Board meeting and was unable to input any comments to my division Director. This report, which was adopted by the ARRL Board of Directors at its meeting on July 17, is based, in part, on the responses to a survey which was in the January, 1992 issue of QST. One comment I have seen, which would appear to be quite valid, is that the results of the operation under the STA were not evident in the report.

The committee has recommended that only semi-automatic unattended operation be permitted on frequencies below 30 MHz. What this means is that only a station with a control operator present may initiate a contact with an unattended station. Much of what I have seen in response to the committee's recommendations has been inflammatory, claiming that it would be the end of HF digital message forwarding. Whether that would be the case or not remains to be seen. It would, however, have a serious impact on such operations. I am not a participant in the HF forwarding net, but from what I have seen, including many messages sent and received which have passed through this network, the "system," as currently operated under the STA, works. There are certainly many issues here, and if the ARRL proposes the committee's recommendations in their current form to the FCC, there will hopefully be adequate opportunity to comment. Hopefully, currently available (and future) technology will not be overly restrained by regulation in this case, but history does not lead one to be very optimistic.

On a more positive note, the FCC has proposed, based mainly on a proposal from the ARRL, that certain changes be made in Section 97.113 of the Amateur rules relating to prohibited transmissions. This would replace the prohibition against transmitting "any communication the purpose of which is to facilitate the business or commercial affairs of any party" with a prohibition of communication for hire (except as spelled out) or in which the station licensee or control operator have a pecuniary interest. I believe that such a change would be beneficial and would avoid the kind of situation encountered in the "900 number" incident last year. However, I also believe that we, as Amateurs, should impose a certain degree of self-restraint in the types of communications we originate. The packet BBS system is virtually overrun with bulletins that are of dubious interest to most of us. Is someone thousands of miles away really going to be interested in buying your 500 pound tower? Is it necessary to follow the sale of a piece of equipment with a bulletin telling the whole world that it is no longer available? Of course not. Opening up the permitted areas of communication will probably provide additional opportunities for those who wish, for whatever reason, to abuse their privileges. My premise here is that it is far better if we employ self-imposed limits than to have them imposed by statute or regulation. We hopefully will be gaining something with this proposed regulation change. Let's use it responsibly.

TAPR 9600 bps Modem Notes

by Lyle Johnson, WA7GXD

A number of folks have written with suggestions, modifications, and questions about the new TAPR 9600 bps modem kit. In this article I will describe these and include actions or options for you to consider.

Q: The CON LED on my TNC-2 remains off. The CON status never appears at the output of the RS232 connector on the back of the TNC-2.

A: This problem is due to a logic error in U13. TAPR now has a corrected PLD for U13 labelled U13A. If your kit's U13 is not labelled "U13A" or "U13R1", you may send your old PLD along with an SASE to TAPR and we will reprogram it for you for free until 31 October 1992. Be sure to pack the PLD in a safe manner, including anti-static foam.

NOTE: You must specify whether or not you want U13A or U13R1. If you don't specify, we will send U13A. U13R1 is only necessary if you perform the modifications detailed later in this article.

The quick "fix" is to cut the trace on the bottom of the modem PC board between U13 pin 14 and P2 pin 7.

Q: What sort of waveforms should I see on my 9600 bps modem?

A: A new schematic set has been made and annotated with waveforms and voltages. This is a five-page schematic for greater readability. In addition, an updated schematic with all mods. to the modem (see below) is also available.

These schematics are in all the new kits. If you have an older kit, you may obtain a set by sending an 8-1/2" by 11" self-addressed, stamped, envelope with postage for two ounces.

Q: How do I use the BER test point?

A: To use this feature, you must have a second station which can send you data at 9600 bps. The other station should set his TNC to CAL mode, either "mark" or "space" (some TNCs do not support this mode -- all TAPR TNCs do. If yours does not, simply lift lead of U9 pin 12 out of its socket and jumper this pin to the GND test point).

NOTE: Since this cal "tone" will be sent through the transmit scrambler, you will not see a steady-value waveform over the air.

The distant station should then transmit.

At the receiving end, hook an oscilloscope or speaker amplifier to the BER test point. When receiving a strong signal this should be a steady high or low value (the speaker will be quiet).

Now, reduce the signal level *until a* popping noise is heard (or "spikes" appear on the oscilloscope display). Adjust R15 for the slowest noise pulse rate with a weak signal. Verify that the popping goes away with a somewhat stronger signal.

NOTE: If you decide to get fancy and use a frequency counter (not at all necessary), remember that you will get a burst of three pulses for every bit that is in error...

If your radio can be aligned in its IF (only old radios) then do so for lowest signal level before popping occurs.

NOTE: Be sure to replace U9 pin 12 to its socket after testing.

Q: I have a TNC not listed in the specific instructions section of the 9600 bps modem manual. I find the "Generic Installations" information a bit intimidating. Help!

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A: TAPR now has available detailed, tested installation information for the AEA PK88, AEA PK232MBX, DRSI PC*PA and TAPR TNC 1 (and clones). I would like to thank AEA and DRSI for their assistance in providing this information, as well as those TAPR volunteers who lent equipment or suggestions during these tests.

Q: The 9600 Baud Packet Handbook by Mike Curtis, WD6EHR, that is included with the modem kit shows coupling circuitry and a TXA cutoff relay. It is pretty hard to fit this into a radio. Could TAPR make a small PC board for all this stuff to make the interfacing task a bit easier?

A: If you think this is a good idea, write to the TAPR office and let us know! If there is enough interest, such a board could be made.

Q: Brian, KC6HPN, has pubished a list of mods to the TAPR 9600 bps modem. I have heard that these mods may improve performance. Should I perform them? If so, is there an easier way to implement them?

A: I have gathered reports from various packeteers about this set of mods, and checked into them myself as well. I recommend the following mods:

A) Remove C5 in existing units. This will stop any tendency for transmit audio op-amp oscillation.

B) Change U4 from a TL084 to a TLC274. This change will dramatically improve the threshold margin for sliced data.

C) Change U19 from a 74HC04 to a 74HC14. This will result in better response for the slow edge from U11 via R34 and C24. NOTE:

NOTE: I don't recommend removing R34 and C24 as these deal with suppressing a 100 to 150 nSec wide "glitch" that occurs on the output of U11D (pin 11) due to propagation delays in U7A/U8/U11C to U11D (pin 12) versus the delays in the path to U11D (pin 13).

Most folks report that the greatest gains come from the removal of C5 and changing U4 to a TLC274.

The gains from clock synchronization are a little harder to quantify. However, if you want to do them, the following procedure will do it without glueing another chip to the PC board.

D) On the top of the modem PC board cut the following trace:

- ☐ U16 pin 2 to R19

On the bottom of the modem PC board cut the following traces:

- ☐ U13 pin 14 to P2 pin 7
- ☐ U13 pin 15 to RP2 pin 8
- ☐ U13 pin 11 to U14 pin 10
- ☐ U13 pin 1 to RP2 pin 2
- ☐ U7 pin 12 to R19

On the bottom of the modem PC board add the following wire jumpers:

- ☐ U13 pin 1 to U13 pin 13
- ☐ U13 pin 11 to RP2 pin 2
- ☐ U13 pin 15 to U16 pin 2
- ☐ U16 pin 2 to U7 pin 12
- ☐ U13 pin 19 to D2 anode
- ☐ Replace U13 with one labelled "U13R1".

If you choose to do these mods, TAPR wil provide a kit of parts consisting of a 74HC14, a TLC274 and a programmed "U13R1" for $5. If you have a new kit, the only part needed will be U13, and we will be happy to re-program yours for you. Simply send your old U13 PLD along with an SASE to TAPR and we will reprogram it for you for free until 31 October 1992. Be sure to pack the PLD in a safe manner, including anti-static foam.

Renew Your Membership!

TAPR doesn't send out constant reminders when your membership has expired. Our only way of communicating your expiration date to you, is the date on the address label for this issue. Please check it and renew if required. Your membership is very important.

Interfacing the TAPR 9600 bps Modem to an AEA PK88

by Lyle Johnson, WA7GXD

The TAPR office recently acquired an AEA PK-88 TNC. I interfaced a TAPR 9600 bps modem to it. Here's how it was done:

Mechanical

The modem will not easily fit inside the PK88. The heatsink for the PK88 voltage regulator is in the way and has to be trimmed. Crystal XTAL1 and capacitors C19, C36 and C39 must be laid down. Jumpers JP3 and JP7 may have to be trimmed. Since I was using a borrowed unit at the time, I decided to not try these mods!

As a result, the modem should be mounted in its own shielded metal cabinet with all leads properly bypassed for the RF environment it is expected to operate in. Shielded cable should be used to connect the modem to the TNC, and this cable should be as short as practical for reasons of electrical interference.

Electrical

The PK88 external modem interface has the same problem as the PK232 external modem connector — insufficient signals are brought to the connector. The signals that are available are provided in a way that precludes easily using a switch to select between internal and external modems.

However, the PK88 design does lends itself well to a simple modification to enable the use and selection of an external modem. Read on!

The Nitty Gritty

The PK88 brings its external modem connections to otherwise unused pins of the RS-232C 25-pin serial port connector. There are a number of unused pins on this connector. After you make these modifications, you will need to use a specially wired RS-232C serial port connector with your PK88. But, you will be able to easily use your PK88 with external modems such as the TAPR 9600 bps and the TAPR 1200 bps PSK modems.

The RS-232C connector J1 comes wired from AEA as follows:

Pin Function
1 Frame Ground (PK88 chassis)
2 RS232 TXD (data in to PK88)
3 RS232 RXD (data out from PK88)
4 RS232 RTS (signal in to PK88)
5 RS232 CTS (signal out from PK88)
6 RS232 DSR (output, pulled to +10 inside PK88)
7 Signal Ground (PK88 signal)
8 RS232 DCD (output from PK88)
9 n/c
10 may be jumpered to pin 6 via PK88 internal jumper JP9
11 n/c
12 n/c
13 TTL CLK - output from PK88 at 32x radio channel data rate
14* TTL DCD - input to PK88 from external modem
15* TTL RXD - input to PK88 from external modem

16* TTL TXD - output from PK88 to external modem
17 Ground, same as pin 7
18 n/c
19 n/c
20 n/c
21 n/c
22 n/c
23 frame ground
24 n/c
25 n/c

NOTE: The signals marked with an asterisk (*) are only enabled when the appropriate internal jumper is placed in the PK88, which simultaneously disables the internal modem.

Connector J1 will be modified to use the following pins:
12 Ground
13 TTL 32x clk from PK88
14* TTL DCD to PK88
15* TTL RXD to PK88
16* TTL TXD from PK88
18 TTL RTS from PK88
19 TTL RTS to PK88 internal modem
21 TTL RXD from internal modem
22 TTL DCD from internal modem
24 Switched +12v from PK88

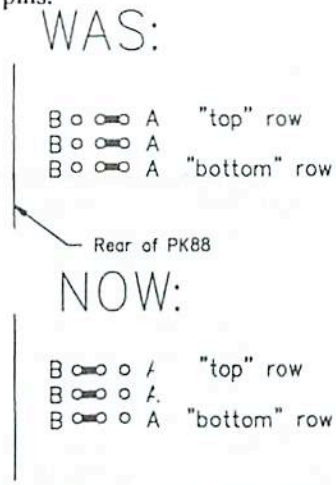
After performing these modifications, the PK88 will require the following pins to be jumpered in the RS-232C serial port cable connector to enable the internal modem for normal use:

- ☐ Pin 14 to pin 22 (enables radio channel DCD)
- ☐ Pin 15 to pin 21 (enables radio channel RXD)
- ☐ Pin 18 to pin 19 (enables radio channel PTT)

Finally, be absolutely certain that your RS-232C cable doesn't connect pins 13-16, 18, 19, 21, 22 or 25 (these are almost never used, and certainly not by PCs such as Amateurs use!).

Performing the Modifications

1. Remove power from the PK88. (This means to physically disconnect the power supply from the jack on the PK88, not merely turning it off!)
2. Remove the PK88 from its cabinet, and remove the PC board from the cabinet base.
3. Place all three JP4 jumpers toward rear edge of PC board and center pins.



4. On the bottom of the PK88 PC board add the following wire jumpers:
   - ☐ JP4 center row pin "A" to J1 pin 21(rxd from internal modem)
   - ☐ JP4 top row pin "A" to J1 pin 22 (dcd from internal modem)
   - ☐ J1 pin 7 to J1 pin 12 (gnd)
   - ☐ Junction of R10/R11 to J1 pin 19 (rts to internal modem)
   - ☐ IC12 pin 17 to J1 pin 18 (rts from PK88)
   - ☐ Plus side of C2 to J1 pin 24 (switched +12v from PK88)
5. On the bottom of the PK88 PC board, cut the trace leading away from the junction of R10/R11.
6. Reassemble the PK88.
7. Wire an RS-232C cable to your computer and make sure the PK88 end of the cable is wired as follows:
   Pins 1-8, 10, 17 and 23 as before.
   Pin 18 jumpered to pin 19.
   Pin 15 jumpered to pin 21.
   Pin 14 jumpered to pin 22.
8. Apply power to the PK88 and verify that it works normally before proceeding. Include an on-the-air test to verify the internal modem is functioning properly.
9. Construct the TAPR 9600 bps Modem kit. Include the internal LEDs and the voltage regulator, but do not install the internal clock or bit regenerator options.
10. Ensure that no jumpers are placed on the 9600 bps modem.
11. Wire an RS-232C cable to your computer and make sure the PK88 end of the cable is wired as follows:

PK88 RS-232C		9600 bps modem 26-pin header
pins 1-8, 10, 17, and 23 as before.		
12	Ground	15
13	32x Clk →	11
14	DCD ←	1
15	RXD ←	17
16	TXD →	19
18	RTS →	5
19	RTS ←	6
21	RXD →	18
22	DCD →	2
24	+12v	26

12. Set the PK88 to FULLDUP ON and HBAUD 9600.
13. Place a jumper at modem P1 pins 1 and 2.
14. The DCD LED should illuminate. If it does not, troubleshoot the modem and cabling.
15. Connect to yourself.
16. Note that the PTT LED on the modem flashes when you connect.
17. Disconnect.
18. Set FULLDUP OFF.

Remember to short JP4 on the modem to enable the PK88 internal modem. You must also reset HBAUD 1200 (or 300) to use the internal modem.

Enjoy 9600 bps operation with your PK88!

Interfacing the TAPR 9600 bps Modem to an AEA PK232MBX

by Lyle Johnson, WA7GXD

The following information is a result of the loan of a PK232MBX with the "new" motherboard from Bobby Miller, K8KIK, and detailed information provided by Robert Donnell, KD7NM, of AEA Customer Service.

PK232MBX Internal Installation

The following directions apply to PK232s above serial number 45933 with the PakMail function installed on the motherboard. If your unit has a daughterboard card plugged into sockets on the motherboard labeled U2 and U4, refer to the "PK232 Internal Installation" directions.

This section assumes you have the TAPR PK232 Modem Disconnect Header modification kit. If you do not, one may be obtained from TAPR. If you prefer to not use the modem disconnect, refer to the "Generic Installations" section of the manual.

In addition to the TAPR Modem Disconnect kit, you may wish to use the TAPR PK232MBX Installation kit, which contains prewired plug 'n' play harnesses and all hardware needed for installing the 9600 bps modem inside your PK232MBX. This kit is available from TAPR.

Modem Preparation

Perform the following steps to complete assembly of your modem prepared for internal PK232MBX installation.

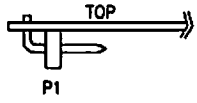
U5:

- ☐ Install the LM7805 voltage regulator at U5 on the modem board. The regulator should lay flat against the surface of the board. There is no need to fasten the regulator with screws as the modem draws very little current and the regulator will not overheat.

P1:

NOTE: The 5-pin right-angle male header will be installed on the BOTTOM side of the modem PC board.

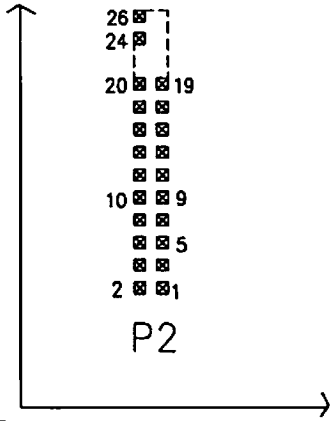
- ☐ Place the 5-pin right angle connector on the bottom (solder) side of the modem PC board. It should rest on the bottom surface of the board. The pins from the connector should "point" towards the PC board, not away from it. See illustration below.



- ☐ Check the clipped leads from R1-R6 and C1-C9 and verify that they are flush, or nearly flush, with the PC board. Clip and reheat the connections as necessary. This will ensure proper fit of the mating connector, attached later.
- ☐ Solder the 5 pins of the connector to the top of the PC board.

P2:

Study the illustration below before mounting P2.



- ☐ Cut the trace on the top of the PC board which joins P2 pins 9 and 10.
- ☐ Cut the supplied 26-pin male header to a 20-pin header.
- ☐ Solder the header to the PC board so it occupies pins 1 through 20 of P2. The short pins go into the PC board; the long pins stick up from the top of the PC board.
- ☐ Cut a 2-pin header from the remaining 6-pin portion of the header used for P2.
- ☐ Solder this connector to pins 24 and 26 of location P2.

Jumpers:

- ☐ Be sure you have NO shunts installed at JP2, JP3 or JP4.

Options:

- ☐ The CLOCK option, if installed, must be disabled by leaving JP3 open.
- ☐ The BIT REGENERATOR option, if installed, must be removed. This is done by simply removing ICs U1, U2 and U3 from their sockets.

PK232 Preparation:

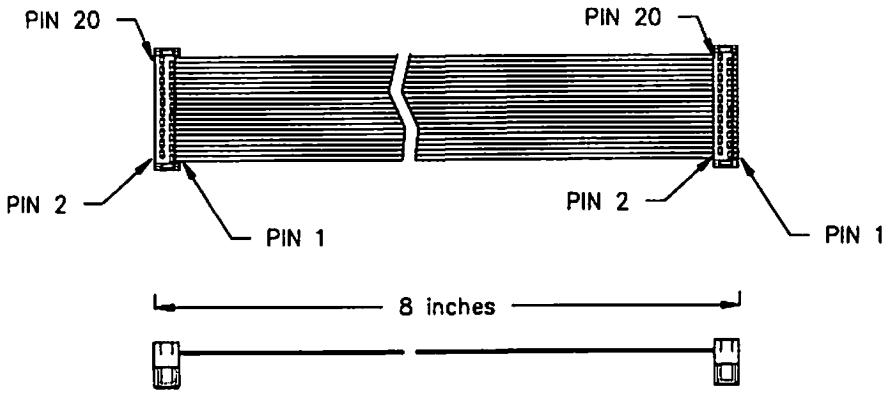
- ☐ Remove the upper case from the PK232 by removing the six (6) screws that fasten it to the main chassis.
- ☐ If you have not already done so, fabricate, install and check out the TAPR PK232 Modem Disconnect kit.
- ☐ Remove the two screws on the PK232MBX motherboard in the center (one at the rear edge between J7 and J8, the other near U38 and Q10 towards the front panel of the unit).
- ☐ Remove the jumper at JP-8.

NOTE: Skip to Modem Integration Using TAPR PK232MBX Installation Kit if you are using the TAPR PK232MBX Installation kit.

Cabling - Not using the TAPR PK232MBX Installation Kit

- ☐ Fabricate an 8" (20 cm) long cable with a 20-pin female IDC header at each end, such that pins 1 are tied together, pins 2 are tied together, etc., through pins 20. (see illustration)
- ☐ Fabricate a 8" (20 cm) long single-wire cable with a two-pin header shell at one end and a stripped, tinned wire at the other end.
- ☐ Fabricate a 3.5" (9 cm) long cable with a push-on shunt at one end and a stripped, tinned wire at the other end.
- ☐ Fabricate a 5-wire cable 4" (10 cm) long using a 5-pin connector shell using ribbon cable as follows. The other end of each wire should be stripped and tinned.

Pin 1 Brown
Pin 2 Red
Pin 3 Orange
Pin 4 Yellow
Pin 5 Green



Modem Integration

- ☐ Ensure that JP4, JP5 and JP6 on the Pk232MBX motherboard are installed at the "B" positions for each of these jumpers.
- ☐ Attach the 5-pin cable to P1, on the underside of the modem.
- ☐ Using 3/4" #6 spacers and 7/8" 6-32 screws, install the modem on the PK232 motherboard, spacing above the motherboard and using the two screw holes vacated above.
- ☐ Solder the free end of the 3.5" wire to J13 pin 5.
- ☐ Place the shunt on the free end of the wire soldered to J13 pin 5 to pins 24 and 26 of P2 on the modem.
- ☐ Solder the free end of the 8" wire with the two-pin shell shunt attached to J13 pin 2.
- ☐ Place two-pin shell end of the 8" wire just soldered to J13 pin 2 to JP4 on the modem. The single wire in this connector shell connects to the pin of JP4 nearer the label "U22".
- ☐ Solder the five (5) wires from the five-wire cable fabricated above to the PK232MBX motherboard as follows:

  Brown JP4 end "A"
  Red JP5 end "A"
  Orange J13 pin 9
  Yellow J13 pin 9
  Green JP8 center pin

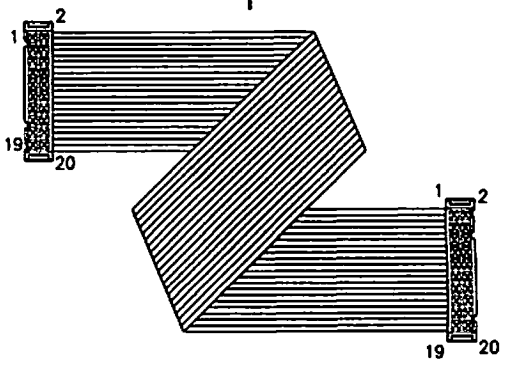
Proceed to **Further Steps - All PK232MBX Installations**, below.

Modem Integration Using TAPR PK232MBX Installation Kit

- ☐ Remove any shunts on jumpers JP4, JP5 and JP6 on the Pk232MBX motherboard.
- ☐ Attach the 5-pin connector labelled "P1" from the wiring harness to P1, on the underside of the modem.
- ☐ Using 3/4" #6 spacers and 7/8" 6-32 screws, install the modem on the PK232 motherboard, spacing above the motherboard and using the two screw holes vacated above.
- ☐ Plug the shell marked "#1" from the wiring harness to J13 on the PK232MBX motherboard.
- ☐ Plug the shell marked "#2" from the wiring harness to JP4, JP5 and JP6 on the PK232MBX motherboard.
- ☐ Plug the shell marked "#3" from the wiring harness to JP8 on the PK232MBX motherboard.
- ☐ Plug the shell marked "#4" from the wiring harness to P2 pins 24 and 26 on the 9600 modem. The single wire in this connector goes to pin 26.
- ☐ Plug the shell marked "#5" from the wiring harness to JP4 on the 9600 modem. The single wire connects to the pin on JP4 nearer the legend "U22".

Further Steps - All PK232MBX Installations

- ☐ Form the 20-pin cable into a "Z" shape as shown below.



- ☐ Insert one end into the modem header P2, with pin 1 near the silkscreen legend "P2".
- ☐ Remove any jumpers from the Modem Disconnect header P1.
- ☐ Insert the other end of the 20-pin cable into the Modem Disconnect header, P1, with pin 1 near the silkscreen legend "P1".

Initial Checkout

Apply power to the modem and verify that +5 volts appears between U13 pin 20 and U13 pin 10.

Remove power from the modem and install the following ICs:

- ☐ U1 DO NOT INSTALL!
- ☐ U2 DO NOT INSTALL!
- ☐ U3 DO NOT INSTALL!
- ☐ U4 TL084
- ☐ U6 74HC4060 (optional, not used)
- ☐ U7 74HC74
- ☐ U8 CD4006B
- ☐ U9 74HC74
- ☐ U10 CD4006B
- ☐ U11 74HC86
- ☐ U12 74HC4538
- ☐ U13 16V8 or 18CV8
- ☐ U14 16V8 or 18CV8
- ☐ U15 27C64 labelled "STATE 2.00"
- ☐ U16 74HC574
- ☐ U17 27C64 labelled "TX9600 1.0"
- ☐ U18 74HC574
- ☐ U19 74HC04
- ☐ U20 AD7523
- ☐ U21 74HCT393
- ☐ U22 TL084

Be sure all the ICs are properly seated, and that no pins are folded

under a chip or hanging over the edge of a socket.

- ☐ Apply power to the PK232MBX and verify that the PK232MBX signs-on as normal.

NOTE: If the PK232MBX seems sluggish, or takes a long time to reset, or never resets and signs-on, check your power supply voltage to the PK232MBX. The modem adds 50 mA or so of current drain, and marginal power supply (one rated at 500 mA, for example) will cause the system to exhibit this symptom. The modem is not at fault; replace the power supply before proceeding!

- ☐ Place a jumper across pins 1 and 2 of the PK232MBX "EXT MODEM" connector on the rear panel of the PK232MBX.
- ☐ Preset R15 on the modem board to full CCW, then 1/8 turn CW.
- ☐ Preset R30 to mid-range.
- ☐ Issue the following commands to the PK232MBX:
  HBAUD 9600
  FULLDUP ON

These commands will set the HDLC data rate to 9600 bps and tell the PK232MBX to ignore the DCD LED.

- ☐ Note that the modem's DCD LED is off.
- ☐ Issue the command
  ALTMODEM 1
  and the DCD LED should illuminate on the modem board. This tells you that the modem is "hearing" and decoding its transmit data via the loopback connection.
- ☐ Issue a connect to yourself. This will check out the receive decode portion of the modem. Note that the PTT LED will flash on the modem along with the "SEND" LED on the PK232MBX front panel.

You may restore normal operation to your PK232MBX by issuing the ALTMODEM 0 command to select the normal modem, and setting HBAUD to whatever data rate you normally use. Remember to reset FULLDUP OFF or your transmitter will gleefully step on other stations' signals!

At this point, initial checkout is complete. You will next have to interface the unit to your radio, modify the radio as necessary, and set the R15 compensation and R30 output level for the correct transmitter deviation.

Consult the manual from Mike Curtis, WD6EHR, for general radio interfacing information.

When you have performed the interface, proceed to the section in the manual entitled FINAL CHECKOUT.

Interfacing the TAPR 9600 bps Modem to a DRSI PC*PA

by Lyle Johnson, WA7GXD

PC*PA Interface

The information presented is specific to the Type 1 PC*PA (port 0 fixed at 1200 bps with internal modem, port 1 set up for external modem). Other styles of the PC*PA may vary, so double check your unit before proceeding!

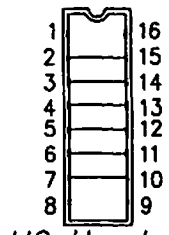
PC*PA Setup

The external modem port must be set up for TTL interface levels. Information to do this is included in the Hardware Reference Manual provided with the PC*PA. Please read that section of your manual before proceeding with the following steps.

1) If you have a very early PC*PA, you will find the RS232 level translator chip is U9 (MC145406). If you don't have this configuration, skip to step 2.

NOTE! This information for the earlier units is based on schematic diagram analysis only!

- ☐ Remove your PC*PA from your computer.
- ☐ Locate U9 (MC145406) and remove it.
- ☐ Prepare a 16-pin header, jumpering pins 2-15, 3-14, 4-13, 5-12, 6-11, 7-10. Leave pins 1, 8, 9 and 16 unconnected. On the circuit side of the PC*PA PC board, cut the trace going from U9 pin 7 to U7 pin 28 (the 8530 SCC chip).

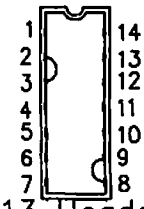


U9 Header
Top View

- ☐ On the circuit side of the PC*PA PC board, solder an insulated jumper wire from U9 pin 7 to U7 pin 26.
- ☐ Place a jumper at JP2 on the PC*PA to power the TAPR modem.
- ☐ Proceed to TAPR 9600 bps Modem Setup below.

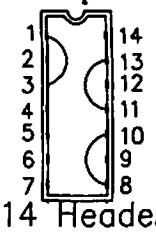
2) If you have a later PC*PA, you will find TTL <-- RS232 level conversion is handled by U13 (MC1488) and U14 (MC1489). If this is the case:

- ☐ Remove the PC*PA from your computer.
- ☐ Locate U13 (MC1488) and remove it.
- ☐ Prepare a 14-pin header, jumpering pins 2-3 and 8-9. Pins 1, 4-7 and 10-14 should remain unconnected.



U13 Header
Top View

- ☐ Install the 14-pin header at U13.
- ☐ Locate U14 (MC1489) and remove it.
- ☐ Prepare a 14-pin header, jumpering pins 1-3, 8-10 and 11-13. Pins 2,4-7, 9, 12 and 14 should remain unconnected.
- ☐ Install the 14-pin header at U14.



U14 Header
Top View

☐ Place a jumper at JP3 on the PC*PA to power the TAPR modem.

TAPR 9600 bps Modem Setup

All references to page numbers refer to the 1 April 1992 edition of the TAPR 9600 bps Modem Kit manual.

Do NOT use the internal clock option on the 9600 modem. Do NOT install the BitRegen option on the modem.

In the regular construction section of the manual:

☐ Install R29 and R33 (page 9).

☐ Install the LEDs (page 13).

Refer to the "Generic Installations" section of the TAPR manual (starts on page 28).

☐ P1 should be installed on the top of the PC board.

☐ P2 should be installed as a 26-pin male header on the top of the PC board. You may ignore the directions regarding pins 5, 9 and 10 at the top of page 29. They will have no effect on the DRSI system whether they are performed or not.

☐ Install U5.

☐ You must prepare a cable to connect between the 25-pin D connector on the PC*PA and P2 on the modem. Use 8-conductor shielded cable and wire it as follows:

Function	DB-25P	26-pin
Shield	1 and shell	
Ground	1	15, 25
TXDB	2	19
RXDB	3	17
/RTSB	4	5
/CTSB	5	5
Ground	7	15, 25
/DCDB	8	1
+12VDC	11	26
32XCLK	15	11 (see note, below)

NOTE: Use pin 11 for the 32X clock if using a standard PK232/TNC2 PLD at U14. If the PLD at U14 on your 9600 modem is labelled "U14-1" it is for a TNC1/TNC2 option and use pin 12 of the 26-pin header instead.

☐ Install the PC*PA in your computer and connect the modem to it via the cable just prepared.

☐ Apply power to the computer and verify that +5 volts appears between modem IC socket U13 pin 20 and U13 pin 10.

☐ Remove power from the computer and install the ICs indicated beginning on the bottom of page 29 of the TAPR manual.

☐ Ensure there is NOT a jumper placed at JP2 on the modem.

☐ Ensure there is NOT a jumper placed at JP3 on the modem.

☐ Ensure there is NOT a jumper placed at JP4 on the modem.

☐ Power up your computer and use the CONFIG22 utility supplied by DRSI to set Port 1 HBAUD to 9600 bps (HBAUD 5) and set DUPLEX ON (DUPLEX 1). Refer to the DRSI documentation for details on this.

☐ Place a jumper across pins 1 and 2 of modem connector P1.

☐ Preset R15 on the modem board to full CCW, then 1/8 turn CW.

☐ Preset R30 to mid-range.

☐ The modem's DCD LED should illuminate. If it does not, troubleshoot the modem and cabling.

☐ Connect to yourself on Port 1. Note that the PTT LED flashes on the modem.

☐ Disconnect.

Preliminary checkout is done.

I recommend that you install your 9600 bps modem in a well-shielded cabinet and use a minimum length shielded cable between your PC*PA and the modem. Install the appropriate connectors for your radio, label the LEDs, etc.

Welcome to 9600 bps packet radio with your PC*PA!

Interfacing the TAPR 9600 bps Modem to a TAPR TNC-1

by Lyle Johnson, WA7GXD

TNC-1 Setup

Perform the following modifications to your TNC-1:

☐ Solder a jumper wire across R79 (680 ohm) located near modem disconnect J5.

If your TNC-1 already has a modem disconnect header installed at J5:

☐ Remove any jumpers placed at modem disconnect header J5.

☐ Remove extractor "ears" from J5 if present.

If your TNC-1 has no modem disconnect header installed at J5:

☐ Install the 20-pin male header provided with the modem kit at J5.

☐ Cut any default traces tying modem disconnect header pins together. These will usually be 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16, 17-18, and 19-20.

If you intend to mount the modem inside the TNC-1 case and plug it directly into J5:

☐ C3 and C5 are too tall and must be laid down. You may have to replace them or extend their leads to accomplish this. Lay them towards power supply diodes D9-D12.

NOTE: The following step is only necessary if you intend to use the TNC-1 internal clock and not the clock option on the 9600 bps modem.

☐ Place jumper JP7 on the TNC-1 PC board across the pin pair nearer C12 - the default is the pair farther from C12. This will run the 6809 CPU at twice normal speed (1.84 MHz). The 6809 CPU, 6522 VIA and the 6551 ACIA chips may need to be replaced with higher speed parts ("B" or -2 parts) for reliable operation at the higher speed.

TAPR 9600 bps Modem Setup

All page number references are for the 1 April 1992 manual.

☐ Install R29 and R33 (page 9).

☐ Install the LEDs (page 13).

Refer to the "Generic Installations" section of the TAPR modem manual (starts on page 28).

- ☐ P1 should be installed on the top of the PC board.
- ☐ DO NOT PERFORM THE TRACE CUT AT P2 PINS 9 AND 10!
- ☐ DO NOT INSTALL THE JUMPER AT P2 PINS 5 AND 9!
- ☐ If you are going to directly plug the modem into J5 on the TNC-1, use a 20-pin female connector installed on the bottom of the modem PC board at P2.
- ☐ If you are going to use a 20-pin ribbon cable to connect your modem to ease access to the LEDs and P1 radio connector, use a 20-pin male connector installed on the top of the modem PC board at P2.
- ☐ Install U5.
- ☐ Attach a wire from modem P2 pin 26 to +12 volts available at the TNC-1 wire wrap area.

Proceed with the "Generic Installation" checkout and IC installation procedures beginning on page 29 of the modem manual.

- ☐ Replace the standard U14 PLD with one marked "U14-1".

NOTE: The 9600 bps modem chips are now set for TNC-1/TNC-2, and will not work with the PK232.

Checkout Information

The following assumes you are using TAPR/HEATH/AEA firmware. (WA8DED firmware commands are in parentheses like this.)

- ☐ If you are using the TNC-1 HBAUD generator with a double-speed CPU clock, select HBAUD 4800 (<ESC>H9600) for 9600 bps operation and HBAUD 600 (<ESC>H1200) for 1200 bps operation. (<ESC>@C1 to enable double speed clock for WA8DED firmware.)
- ☐ If you are using the modem internal clock option, place a jumper on the modem at JP3. HBAUD (<ESC>H) will have no effect on the modem operation if this is done.
- ☐ Place a jumper at modem P1 pins 1 and 2.
- ☐ The DCD LED should illuminate. If it does not, troubleshoot the modem and cabling.
- ☐ Set FULLDUP ON (<ESC>@D1).
- ☐ Connect to yourself.
- ☐ Note that the PTT LED on the modem flashes when you connect.
- ☐ Disconnect.
- ☐ Set FULLDUP OFF (<ESC>@D0).

Remember to short JP4 on the modem to enable the TNC-1 internal modem. This will also restore HBAUD (<ESC>H) operation for the internal modem if you are using the modem clock option.

Enjoy 9600 bps operation with your TNC-1!

First Impressions - Tasco's TNCs

by Bob Nielsen, W6SWE and
Lyle Johnson, WA7GXD

At the TAPR Annual Meeting in March, TASCO delivered a sampling of their TNC line and asked if we would test them and give them our impressions of the products. We received only limited documentation in English and haven't yet had the time to do a proper evaluation, but we have operated a number of the units and will give our initial impressions in this article. In a later issue of *PSR* we hope to do a more in-depth evaluation of these and other TNCs.

Background

TASCO is the TNC market leader in Japan. They are also a licensee of the TNC-2 technology, and this heritage is apparent in all the products we tested. TASCO was among the first to incorporate a BBS and "P-persistence" algorithms with the TNC-2 code.

The TASCO product line is not available in the United States at the time this is being written. An earlier TASCO unit, the u21, was imported under the Heath label as the "Pocket Packet."

Current Products

Units we evaluated include: TNC-u21, formerly sold in the U.S. as the Heathkit "pocket packet;" TNC-22; TNC-201; TNC-210, a later version of the "pocket packet;" TNC-211; TNC-223; TNC-231 All Mode Terminal; and TNC-24 MKII All Mode Terminal with PSK. Several of these units are based on highly-integrated Z80 processors (84C015). By "highly integrated" we mean these are single chips that include the Z80 CPU, Z80 SIO, Z80 CTC and Z80 PIO as well as clock oscillators and watchdog timers.

The user interface on all of these units is a variation of the TAPR command set. Each was slightly different, with some being based on version 1.1.5 and others on 1.1.6. Additional commands to support the mailbox, p-persistence, 16-bit alphanumeric codes for asian alphabets (and extensions to allow multi-mode operation in the case of the TNC-24 and -231) are included. Interestingly, the AXDelay and AXHold commands were missing on some of the units. A few of the specialized commands were somewhat elusive to one who is not able to read Japanese. KISS mode is provided.

The BBS mailbox, called a message board by TASCO, is quite similar in operation to that featured by PacComm. Some of the commands are slightly different, such as (W)rite, rather than (S)end, and (F)ile, in place of (L)ist.

All units use an autobaud routine to set the serial port data rate. The All Mode units include front-panel pushbuttons that can be used to set the serial port rate manually if you don't want to autobaud. Several of the packet-only units have internal jumpers which can be used to select the terminal (up to 19200 bps) and radio (for external modems) data rates.

Most units (not the u21MKII) also include a battery-backed real-time clock. Lyle set the clock up on the TNC-231 in March and it was within 2 seconds after four months of operation without having been reset!

Tasco Packet Terminal Node Controllers

TNC-u21MKII

This unit was formerly imported by Heath Company and sold in the U.S. as the "Pocket Packet." It is approximately the size of a pack of cigarettes, with a plastic case and a RJ-11 type connector for the radio connection, as well as 2.5 and 3.5 mm jacks (and cables) for interfacing to an HT, a feature found on the other TASCO models. It has a 25-pin serial connector and a subminiature DC power connector. There is (barely) room for an internal battery.

TNC-22

This unit is pretty much the basic TNC of the product line. It is about the size of a TNC-2, with the long dimension running left to right. It has the standard 5-pin DIN connector for the radio port as well as jacks for interfacing to an HT, and an in- line header type external modem connector on the back panel. The back panel has a 25-pin serial connector and also has provisions for mounting a microphone connector and switch to provide for switching between voice and packet operation.

TNC-201

Functionally, this unit is quite similar to the TNC-22. The packaging is quite different, however, making much use of surface mounted components. It is about the length and width of a TNC-2, but somewhat taller. There is an 8-pin mini-DIN connector on the back panel for connecting an external modem and a 9-pin serial connector. The radio connection uses an 8-pin DIN with the extra three pins brought to unused terminals on the circuit board. The "normal" 5-pin DIN mating connector can be used with this, however. The back panel also has jacks for interfacing to an HT as in the other units. There is also a processor reset switch on the back panel.

TNC-210

This is an updated version of the Heath "Pocket Packet." It uses the same size case, but upon opening it you are impressed with all the room inside!

The older unit had two PC boards and the battery would only fit if the phase of the moon was just right. The new unit is on a single PC board and the battery has lots of space around it!

The rear panel now sports a DE9S (there is no such thing as a DB9...) as well as a standard-size 2.1 mm power jack. Nestled betwen these is a recessed reset button.

The front panel has the usual 5 LEDs and an on/off switch as well as a mini-DIN connector for the radio port. This is a much better connector than the RJ-11C style used in the earlier unit, which was impossible to properly shield. Missing from this unit is the second switch which allows turning off the LEDs to conserve battery power in portable operation.

At the Dayton Hamvention, Communications Specialists announced that they would soon be coming out with a new miniature TNC similar to the "Pocket Packet." Is this it? We will have to wait and see.

TNC-211

This miniature TNC is approximately the same size as the PacComm Handi-Packet. It has an extruded aluminum case with metal front and back panels. There is a holder for 4 AA-size batteries. A 6-pin mini-DIN connection is provided for the radio connection, in addition to the miniature jacks. Surface mounted components are used extensively, and there are two printed circuit boards. Some lucky attendees at the TAPR annual meeting received these units as door prizes, thanks to the generosity of TASCO.

TNC-223

This unit is identical to the TNC-201, except that it contains an additional 128k of memory for the mini-BBS, expandable to 512K.

Tasco All-Mode Terminals

The TNC-24 and TNC231 include CW, RTTY, ASCII, AMTOR and WEFAX operation in addition to 300 and 1200 baud packet. The TNC-24 also includes a PSK modem for satellite use (it is a variation of the JA1TUR design like that of the TAPR PSK modem).

The TNC-24 has an LED bar tuning indicator that is quite easy to use (like the TAPR or MFJ units, you tune the dot so it is mostly in the center). The TNC-231, however, has what has to be the most innovative tuning display we have seen in a multi-mode controller.

A pair of 5x7 dot LED indicators are placed side-by-side to form a "screen" of 7 dots vertically by 10 dots horizontally. The internal modem is a filter type design, and the mark and space filters feed x and y analog-to-digital converters. The resultant display resembles what you would expect to see on an oscilloscope ('scope outputs are also provided). The display actually has much greater resolution than you would expect from a 10x7 matrix, because the human eye does some averaging. As a result, you can actually see phase shifts in the data, as well as selective fading and other information. This indicator is by far the easiest to use and conveys the most information of any self- contained display we have seen to date.

Most of the documentation is in Japanese, although we were provided with an early translation of the pertinent portions of the TNC-24 operating manual. The commands are the same for the TNC-231, so we were able to do some testing on HF as well as VHF.

We didn't evaluate the modems on any scientific basis, such as bit error rates at given signal to noise levels, etc. What we did do was connect them to radios and tune around on the HF bands and see what we could decode and what we couldn't. In general, signals that were clearly above the noise floor of the radio and band at the time were quite copyable. Various types of QRM and QRN took their toll, but our impression is that the modem technology used is viable.

The TNC-231 had the upper hand in ease of tuning due to its advanced style of tuning indicator. The TNC-24 tuned OK, but we were spoiled by the -231!

The command syntax is different than we've come to expect for mode changes. For example, to select AMTOR-ARQ you type 'mode tty l' for listen. You then have to be in 'converse' mode to monitor the channel activity. The two-argument syntax is unusual. Once we got used to it, though, it was no big deal.

TASCO includes a copy of "TASCO-TERM" a terminal program for IBM PC compatibles. It includes a number of features, including WEFAX display. We didn't try the WEFAX modes.

DCD

The packet only TNCs and the TNC-231 use a TCM-3105 modem chip for 1200 bps FSK operation. You can't run open-squelch or the DCD LED will stay mostly on, inhibiting transmission. There is a SOFTDCD command, but it appeared to suffer from considerable delay, partially defeating its effectiveness. Later tests will include the TAPR state machine DCD modification. The TNC-24 uses an AMD 7911 "World Chip" for its FSK modes and has a similar restriction.

On the multimode units, the DCD indicator is used for CW reception, and a tone is also generated in step with the decoded signal. The decoder seems to respond to band-limited noise, so if your rig has a CW filter you will get better results if you turn it off (as indicated in the manual)!

Front Panel

Both multimode units have a set of four buttons on the front panel. During reset, they can be used to force the TNC into a known configuration. During operation, they can be programmed for packet operation (for example, to connect to your local PBBS). They can also be programmed for a text string to be sent as CW.

In addition to the tuning indicators mentioned above, there are LEDs to indicate mode, STA and CON, mailbox data to be read, PTT and PWR.

The TNC-231 has a front-panel power switch and a compensating filter adjustment for the HF-mode modem. The effect of turning this knob is quite visible on the 10x7 "screen."

The TNC-24 has its power switch on the rear panel.

Connectors

The units (except the u21MKII) use the standard 2.1 mm power connector. However, except for the TNC-22, they use positive on the barrel and negative on the tip, the reverse of what we expect. Several of the units had a diode bridge inside, making polarity unimportant and those that did not had a series diode which would provide protection if you applied the "normal" power input. Several units came with a "power cube" supply which was rated at 100 vac input (the standard power source in Japan). These cubes seemed to operate satisfactorily over a period of several weeks at the standard 117 vac U.S. line voltage.

The multimode TNC radio connectors use an 8-pin DIN with the 5- pin subset wired as a TNC-2. This means you can use your normal TNC-2 cabling and it will work just fine. The extra pins are used for up/down AFC tracking when using the internal PSK modem in the case of the TNC-24. They are used for FSK + and - outputs in the case of the TNC-231.

The TNC-231 also has a second radio port connector as well as a pair of jacks for connection to an HT. The port is selected by software command.

The serial port on the TNC-24 uses a 25-pin D connector, the TNC-231 a 9-pin. Both are wired as modems, using a straight through cable to connect to a computer. The 9-pin models included a cable with a 25-pin male connector on the other end. This required a "gender changer" adapter when used with the RS- 232 port of an IBM clone computer.

Other

The multimode units are about the same as a TNC-2 in physical size. The TNC-231 is set up similar to the TNC-2, with the long dimension running front to rear. The TNC-24 has the long dimension across the front panel; it is a shallow unit front to rear.

The TNC-24 internally uses a mix of surface mount ICs on the bottom of the PC board and through-hole technology ICs and discrete parts on the top of the board. If you get one of these units and open it up, be sure to remove the screw holding the 5- volt regulator to the bottom of the case before you attempt to remove the PC board from the chassis! (How do we know about this? Our lips are sealed!)

The TNC-231 is a bit more complex to disassemble. Internally, it is a surface-mount design with ICs on both sides of the board. The top of the board is dominated by two large, shielded inductors used in the HF modem. This is definitely not a unit we would want to troubleshoot or repair!

Overall

It has been very interesting for us to examine and operate these TNCs from our friends on the shores of the Western Pacific. TASCO has assembled a broad line of TNCs to appeal to almost every type of data communications operator in the Amateur world. We are gratified that their product line has its roots in the TNC-2. We hope to report in more detail on operational aspects of this equipment in a future PSR.

More "first impressions" To Come

In a later *PSR* we hope to report on the TMB-965 9600 bps modem and the HM-101 external HF modem (which has a modem and tuning indicator like the TNC-231). And we shoudn't forget the TASCO-TERM program provided with the TASCO TNCs.

The Ottawa Packet group has introduced the "PI" card, a PC-plug in with an 8530 under DMA control for 56 kbps operation. While we lack the ability to connect it to a 56 kbps modem (no modem!), we will report on this unit running under NOS at 1200 bps.

Interflex has provided us with a copy of PktGOLD for the AEA TNCs. We hope to report on it in an upcoming issue as well!

We also have obtained Ramsey FX-series transceiver kits for 144 and 440 MHz and hope to report soon on their operation with both 1200 and 9600 bps modems.

Stay tuned to *PSR*!

PSK Modem Interface For KAM

by Daniel Walter, M.D.
NM3A @ K3PGB.EPA.PA.USA.NA

I built the TAPR PSK 1200 Baud modem back in 1989 and I interfaced it to the KAM unit. It has been working very well for three years now with all EPROM versions from 2.7 through 3.0.

It is actually fairly simple, but getting all the information was a real problem. Kantronics, as usual, was no help at all. They said it couldn't be done, but being the dumb type, I went ahead and did it anyway. They also said that a 16x TXClock was not available, but it is, or at least a reasonable facsimile.

First off, the kit should be built as for a TNC-2. The x16 TX clock (TXC) is available from the KAM's modem chip. This is U5, a TCM3105. Pin 2 of U5 (R29) has a 19.11 KHz signal that is easily used as a TXC. The normal TXC is 19.2 KHz, but the modem does not seem to be upset by this minor difference. I have noticed NO operations in which the modem does not work perfectly.

Another anomoly is that the KAM's DCD is inverted with respect to the TAPR standard. This can easily be rectified within the PSK modem by use of (previously unused) U16a to invert the output of U16f before it is sent to the TNC. To do this, connection #13, from U16 pin 12 to S4, is rerouted by connecting U16 pin 12 to U16 pin 1 and U16 pin 2 is then connected to S4. (U16 pin 1 is tied to +5V, this must be disconnected by cutting the trace before making the other connections.) If you want to consider also using this on a TNC2/1, consider making this easily reversible with some type of connector.

Table 1 is a list of the pin-outs for the KAM and the corresponding TAPR "standards." As you probably have noticed, there are very few pins that are the same as the TAPR standards on the KAM. (Apparently, Kantronics doesn't really want you to connect it to any other equipment!) So to connect the PSK modem to the KAM requires modifications to the

TABLE 1

Pin#	KAM use	TAPR use
1	XENA- external CPU test	DCD→TNC
2	(KAM memory control)	DCD←TNC modem
3	CW control	n/c
4	+5vdc	n/c
5	Chassis GND	RTS←TNC
6	Audio←radio	RTS→TNC modem
7	(inverted) DCD→TNC	? (to pin 8)
8	(inverted) DCD←TNC modem	? (to pin 7)
9	external CPU ctrl (to pin 10)	TNC1/2
10	external CPU ctrl (to pin 9)	TNC1/2
11	CW→CPU (to pin 12)	TXClock→TNC
12	CW←modem RX (to pin 11)	TXClock←TNC modem
13	inverted CW→CPU (to pin 14)	RXClock→TNC
14	inverted CW←RX (to pin 13)	RXClock←TNC modem
15	TXData←TNC	GND
16	?PTT or ?RTS→TNC modem	n/c
17	RXData→TNC	RXD→TNC
18	RXData←TNC modem	RXD←TNC modem
19	TXAudio←TNC modem	TXData←TNC
20	TXAudio→TNC AFSK buffer	TXData←TNC

TABLE 2

PIN #	Operation	Pad #	Wire Color	DIN8
1	cut trace to PAD 4			
2	cut trace to PAD 8			
3	n/c			
4	n/c			
5	cut trace to pin 6			
	new wire to PAD 2	-2-	red	2
		-2-	black	7
		-2-	shield	frame
6	cut trace to pin 5			
7	cut trace to pin 8			
	new wire to PAD 4	-4-	yellow	4
8	cut trace to pin 7			
	new wire to PAD 8	-8-	white	8
9	cut trace to pin 10			
10	cut trace to pin 9			
11	leave traces as is			
	no connection to PAD 1	-1-	n/c	
12	leave traces as is			
	no connection to PAD 1			
13	leave connected to pin 14			
14	leave connected to pin 13			
15	leave trace to PAD 7	-7-	blue	6
	cut all other connections			
	to pin 15 and PAD 7			
16	n/c			
17	leave trace to PAD 5	-5-	green	5
18	leave trace to PAD 3	-3-	orange	3
19	leave trace to pin 20			
	cut trace to PAD 6			
20	leave trace to pin 19			
	cut trace to PAD 6	-6-	brown	1
--	2 inch wire to Molex 0.062"			
	single connector male or similar			
KAM R29/	use end which is closest			
(U5pin2)	to CPU (U26) 2 inch wire to mating			

small PC board that connects to the modem disconnect header (K8 in the KAM.) Quite a few traces need to be changed. They are listed in Table 2. Each pin is traced to the PC pad and the color coded wiring that TAPR uses and the pin number of the 8 pin DIN jack that the PSK uses.

Alternately, you may want to connect the wires directly to a 20 pin female plug and keep the small circuit board in case you want to use it to interface to another TNC in the future.

In addition to the connector added to the KAM's R29 (see Table 2), three other minor modifications must be made to the KAM. The traces between pins 17 & 18 and 7 & 8 of the KAM's modem disconnect header (labeled K8) must be cut. (Pin 1 of K8 is closest to R97.) Make sure that no other traces are cut in the process. The final modification is to add a 20 pin header to the KAM's circuit board. Place it on the component side of the board. The cable can be routed out the back easily with a 1/4" notch in the upper edge of the back plate just between the HF and the VHF jacks.

If you want to disconnect the modem and put the KAM in it's original functional condition, all that is needed is to put two shorting connectors across pins 7&8 and 17&18 on K8 of the KAM.

I also added a power switch to the front panel on the right of the JOINT/SPLIT switch. This could be incorporated into the modem's ON/OFF switch but it is rather tight in there. On the back panel, I placed a screw adjust 50K potentiometer in the RX audio line as suggested (connections 9,10 on main board schematic). This allows me to fine tune the input level at the most comfortable audio output level of my rig.

Another minor note is that the manual says an oscilloscope must be used for adjustment. As I had none available when I built it, I made do with a frequency counter, the PSK modem itself and a DVM. Between the three, perfect allignment was relatively easy to do. An oscilloscope later confirmed that it was not necessary! On the other hand, if you have a 'scope...

After I was all done, I found I needed a box to control all the packet lines in my shack, so I designed and built one, but that's another story!

Software Library Update

by Lou Nigro, KW7H

In addition to supplying various kits and firmware, TAPR maintains a library of packet radio-related computer software. Disks are currently available in 5-1/4 in. MS-DOS format for $2.00 each, and in 3-1/2 in. for $3.00 each, including mailing (slightly more for foreign orders). In the future, possibly formats for other computers will be added. The current library listing contains the following entries (of which some are two-disk packages in the 5-1/4 in. versions only; single disks in 3-1/2 in.). Additions to the software library are always welcome, however we do request that they be submitted either by, or with the expressed permission of, the author. TAPR attempts to provide the latest versions of all software; updates are appreciated. TAPR reserves the right to screen any submissions and restrict the library content as necessary. Both freeware and shareware are acceptable.

The following is a brief description of the current listings in the TAPR software library:

1. APLINK - A concurrent AMTOR MBO and packet BBS system by Victor D. Poor, W5SMM.

2/2a BB - A multiconnect packet mailbox program by Roy Engehausen, AA4RE. Requires the use of AEA or WA8DED host mode or G8BPQ switch software for operation.

3. C-BBS - Packet BBS program written in C language. Originally written by Hank Oredson, WRLI, current version by K3RLI and AG3F.

4. EZPAC11 - A menu-driven NTS message formatter by Mike Imel. Disk also contains a copy of WA7MBL's YAPP terminal program.

5. MONAX - A program for monitoring a packet radio channel and gathering system statistics. Described in a paper (included on the disk) presented in the 6th ARRL Computer Networking Conference by Harold Price, NK6K and Skip Hansen, WB6YMH.

6. Ham Comm - A DSP RTTY program with VGA spectrum display, O'scope, tuning indicator, all real time. Uses simple 1 chip interface, schematic included, all parts available at Radio Shack. Powered by serial port.

7. PBBS lists - Master PBBS list compiled by W9ZRX.

8. R95 - A conversion utility to permit transmission of binary files by packet radio by Greg Jones, WD5IVD.

9/9a ROSERVER/PRMBS - A packet radio BBS with telephone modem support by Brian Riley, KA2BQE.

10 ROSE - The ROSE switch by Tom Moulton, W2VY.

11/11a KA9Q NET - Executables and source code for the NET version of TCP/IP by Phil Karn, KA9Q, with enhancements by Joe Buswell, K5JB.

12. WXN Weather Server - A multi-user weather server that runs as an application on the G8BPQ switch. Uses the Heath ID-4001 Advanced Weather Computer for weather data. Includes PC user program that runs on a TNC2.

13. TNC-1 source code - Sources for the TAPR TNC-1 firmware.

14. TNC-2 Software notes - Notes on TNC-2 versions 1.1.0 through 1.1.7 by Howie Stein, N2WX.

15. WA7MBL BBS - Packet BBS system by Jeff Jacobsen, WA7MBL.

16. WRLI BBS - Packet BBS system by Hank Oredson, WRLI.

17. YAPP - A packet terminal program by Jeff Jacobsen, WA7MBL. Supports split-screen operation, ASCII and binary file transfer.

18/18a INTRO TO TCP/IP - Much descriptive and reference information on TCP/IP.

19. LAN-LINK - Packet terminal program by Joe Kasser, G3ZCZ. Also supports the non-packet modes of PK-232, KAM and MFJ-1278.

20. ARES/Data - A packet radio data base system for emergencies by Weo Moerner, WN6I and Dave Palmer, N6KL.

21/21a MSYS - A multiconnect BBS with telephone modem, terminal, node and TCP/IP support by Mike Pechura, WA8BXN. Requires KISS mode.

22. G8BPQ NODE - A NET/ROM-compatible multiconnect software packet switch by John Wiseman, G8BPQ, which can be run standalone or in conjunction with a BBS package, ARES/Data or DX Cluster software.

Notes from the TAPR Office

It's July again... not the best part of the year to be in Tucson! The weather is very hot, and muggy.

TrakBox

Talking about other hot matters: Lyle, WA7GXD, has been very busy. He has completed the latest TrakBox code documentation, and made available some very nice schematics. If you desire the latest code and its docs, send $10, and I'll ship it to you! We also have available a binary coded decimal switch available for $8 including shipping & handling.

Deviation Meter

I have been asked numerous times about the Deviation Meter. Is it available? Suffice it to say that Lyle, besides having been out of the country on business trips, and working untold hours on the other TAPR kits, has simply not had the time to do further work on it.

Annual Meeting Publications

At our annual meeting we offered a 10-Year TAPR Scrapbook. It contains black and white copies of pictures of people and events that have made TAPR what it is through the years. You may obtain a copy of this by sending $5.

We also have a few copies left of the 10th Annual Meeting Proceedings, also at $5. Included in this are articles on: "Spread Spectrum (CDMA) in the Amateur Service," by Dewayne Hendricks, WA8DZP; "General Purpose Signal Processing Software for a Radio Workstation," by Mike Parker, KT7D; "9600 Baud Backbone Radio & Modem," by Mel Whitten, K0PFX; and "Advantages of a Bit Regenerating Repeater for Local Area Networks," by Lyle Johnson, WA7GXD.

9600 bps Modem

The K9NG 9600 baud modem is no longer available, as the new 9600 baud kit is being offered instead.

We have a much more readable schematic for the new 9600 bps modem. If you would like a copy of the 5 page set, please send me a large SASE with $0.52 postage on it.

As you can see elsewhere in this issue of PSR, the interfacing work that many of you were waiting for has been done. We definitely want to thank Bob, KD7NM, of AEA, for the excellent work he did in interfacing the PK232MBX with the modem. It's a pleasure working with you AEA, thank you!

Another person we wish to thank is Bobby, K8KIK, for the loan of his PK232MBX to TAPR. It helped a lot!

Volunteers

I'm going to get on the podium again here...

People tend to think that TAPR is a commercial outfit, with all kinds of money, paid technical staff, etc. PLEASE remember: I am the ONLY TAPR employee, with all of the REAL work that you are buying and benefiting from being done by people like yourself. They too, have busy work schedules, only so many hours available to them in their evenings and weekends, and families with only so much patience! These volunteers use their own computers, their own TNCs to interface things with, etc. So if you feel that TAPR is slow in taking care of your technical needs, let me suggest that you get together with people in your area, and see what YOU can figure out. Document what you find, and we'll all benefit!

Some fellows have done just that.

Brian, KC6HPN, wrote an extensive paper on the 9600 baud modem, which really helped us all. Thank you Brian!

Brian, WB6CYT, wrote up some very helpful information on the K9NG 9600 modem kit, which shows which of the parts are actually needed, and also a way to improve clock and data recovery. If you desire a copy of this, please send an SASE. Thank you!

There are others of you who have contributed information and feedback, for which we thank you heartily. By the way, we consider negative feedback even more valuable (well... almost as valuable...hi) as the warm, fuzzy kind. We far prefer you to gripe to us first, before airing it to the world!

An apology

I want to apologize to Ron Apple, who when visiting our city did not get such "hot" hospitality. It happened to be a time when all of the volunteers here were either busy or out of town and it did not work out to call you as we should have.

Back to a HOT topic!

Our very able *PSR* editor has done himself proud. There is now a MRS Bob Hansen! TAPR wishes this outstanding couple all of the very best that life has to offer. I think that getting each other was a major step in that direction!

For TAPR,
Heather Johnson, N7DZU

11th Computer Networking Conference

The 11th ARRL Amateur Radio Computer Networking Conference, hosted by the Radio Amateur Telecommunications Society (RATS), will be held at Fairleigh Dickinson University in Teaneck, New Jersey, on November 7, 1992.

The deadline for receipt of camera-ready papers for the 11th ARRL Amateur Radio Computer Networking conference is September 21, 1992. Those planning to submit papers for this year's conference should contact Lori Weinberg at the ARRL (203-666-1541) for paper guidelines and/or an author's package.

ARRL Board Votes to Squelch Automatic HF Digital Operations

by Tom Clark, W3IWI
W3IWI@W3IWI.MD (packet)
w3iwi@amsat.org (Internet)

The month of July saw an incredible amount of activity pertaining to the continuation of the ARRL-sponsored STA (Special Temporary Authorization) which permitted automatic, unattended digital operation on the HF bands.

By way of review, when the FCC adopted NPRM 85-105 it permitted unattended digital operation, which gave us the opportunity to build VHF/UHF packet networks. However this permission was not extended below 30 MHz.

To extend the line-of-sight links to provide trans- and inter-continental extensions of the packet networks, in 1987 the ARRL requested an STA from the FCC to allow a selected list of Amateurs the same priviledges on HF. Thus was born SKIPNET.

The initial STA was for a period of 180 days, and in 1988 the ARRL was granted an extension based on a letter to the FCC, which stated, in part:

> During the 180-day STA period, we were successful in collecting enough data and operating experience to show persuasively that, with suitable safeguards, automatic operation of packet radio stations below 30 MHz is feasible and in the public interest. ... The conclusions are that the operation has gone almost without incident and that those few instances of introduction of improper traffic were dealt with effectively.
>
> ... the Digital Committee will consider wording appropriate to permit automatic operation of packet-radio stations below 30 MHz. It is our intent to petition for such rule changes during 1988...

In the early years of the STA, the ARRL took heat from established users of the HF spectrum because the packet operations had usurped portions of the already crowded HF bands. This criticism came from domestic sources (particularly the RTTY com-

Minutes of the
ARRL Committee on Amateur Radio Digital Communications
June 13, 1992

The ARRL Committee on Amateur Radio Digital Communications met at 8:30 CDT on June 13, 1992 at the DFW Marriott Hotel, Dallas, TX. Ed Juge, W5TOO, Chairman presided and Vic Poor, W5SMM acted as recording secretary. In addition the following members were present: Tom Comstock, N5TC, Craig McCartney, WA8DRZ, Paul Newland, AD7I, and Dale Sinner, W6IWO. Bob Poirier, KODJ, was unable to attend.

Comstock reviewed the role of digital communications in past emergencies including the Mexico City earthquake and hurricane Hugo.

Poor reviewed the current state of the art of current and soon to be introduced digital modes and their impact on HF spectrum utilization.

The Committee as a whole reviewed the responses from the Digital Survey conducted by QST and RTTY Journal.

A lengthy discussion followed on all the issues raised in connection with the operation of unattended amateur HF digital stations. The recording secretary was directed to summarize these discussions and the unanimously approved recommendations to the ARRL Board in a separate report which is attached as a part of these minutes.

Ed Juge, Chairman Vic Poor, Recording Secretary

Report and Recommendation to the ARRL Board of Directors
by the
ARRL Committee on Amateur Radio Digital Communications
June 13, 1992

The ARRL Digital Committee has been asked by the ARRL Board to study the issues related to use of automatic unattended control of amateur stations operating digital modes in the HF spectrum and to recommend what action the Board should take toward establishing permanent rules for such operation, if any.

The Committee has carefully studied as many of the facts and opinions as were available within the Committee's resources. Data bearing on the question included:

- The results of the ARRL Digital Survey;
- Frequency usage and allocations in the U.S. and in other countries;
- The current state of the art for amateur HF digital modes;
- Potential abuse of unattended operation such as illegal third party traffic;
- The various competing interests for HF spectrum, particularly between existing digital modes; and
- Amateur operating practices and traditions.

The ARRL Digital Survey

The members of the Committee carefully studied the tallies of answers to the questions in the survey and read every written comment submitted by the respondents. The survey data showed that majority of respondents favored permanent authorization of unattended semi-automatic operation but limiting semi-automatic operation to sub-bands, and a substantial majority did not approve of unattended fully-automatic operation.

A wide range of opinions and proposals were made in the comments attached to the survey, all of which were discussed and weighed by the Committee. The important issues raised are discussed below.

continued...

munity) and from IARU member societies.

Well, the situation continued in limbo, with the STA being renewed annually. To gather facts to assist the ARRL in proposing rules changes, the STA community conducted an in-depth survey of activity and forwarded it on to the ARRL. In advance of the 1990 STA renewal, the ARRL sent a letter to the STA participants stating, in part:

> By now, you have heard that the League has filed a petition for rule making with the FCC seeking permanent provisions for automatic RTTY and packet operation within certain HF segments. Meanwhile, ARRL Counsel Imlay, N3AKD, will request the FCC to extend the SKIPNET special temporary authority for a year or until permanent rules are adopted.
>
> Perhaps it would facilitate understanding and discussion of the issues if you have some of the background leading up to the decisions represented by this petition.
>
> I know I'm preaching to the faithful by saying that we need automatic packet operation in the HF bands. Nevertheless, the two and a half years that the SKIPNET STA has been in effect has shown that (a) such operation is technically feasible, (b) the network operations can be orderly without commercial encroachment, (c) the spectrum can accommodate it without undue displacement of other operations, and (d) HF automatic packet operation performs a vital public service that has proven itself in day-to-day and disaster communications. It's clear that virtually all Amateurs have come to the same general conclusions, albiet reluctantly in a few cases, and have enjoyed the message-handling service provided by the packet network. It is evident that the FCC thinks Amateur packet radio is a good thing, including automatic operation on HF, by virtue of their granting the STAs. Also, the FCC has made repeated requests for the Amateur community to propose some permanent packet rules with adequate safeguards against prohibited transmissions.

Well, the proposed rules changes were unacceptable to the RTTY/AMTOR community who saw the STA as a sham. The ARRL continued to take heat from the other IARU member societies. Unable to form a consensus, the situation has been in limbo ever since. As a result, the STA continued with annual

Digital Committee Report, continued...

Frequency Usage and Allocations in the U.S. and other Countries

It is no secret that available space is very limited in the HF spectrum. Nowhere is that more evident than in the very popular 20 and 40 meter bands. The two oldest modes of operation, voice and c.w., have the lion's share of the spectrum in those bands since they were in heavy use before there were any digital modes. The digital modes have simply "squeezed in the crocks" between already established modes of operation. Since the digital modes have become established they have expanded gradually, a little at a time, primarily into space occupied by c.w. operation. Frequencies near the edges of digital mode operation continue to be shared by both digital and non-digital modes.

Outside of the U.S., depending on the ITU region and the rules adopted by various administrations, digital operation for any given mode may not align with practice in this country and it does not seem possible to establish a sub-band plan that could be universally acceptable. It is simply inevitable that any band segment in the HF spectrum is going to be shared among differing modes of operation. This is not a new condition on the HF bands and has been accommodated for decades.

Available Spectrum Space in the H. F. Bands

Since all current HF band space is actively occupied by one or another mode of operation and since no current class of user is willing to give up space for another, the Committee is operating under the assumption that whatever rules are proposed there will not be a sudden significant change in the way the bands are currently used (at least this Committee is not prepared to make any such recommendation!). The Committee believes that gradual changes will continue to occur but that these changes will be due to natural migration as a larger percentage of amateurs shift to digital from other modes of operation and from one digital mode to another.

The respondents to the survey strongly opposed the allocation of sub-bands by rule. The Committee also believes that any attempt to specify by rule sub-bands for a class of digital operation would soon grow obsolete as patterns of operation change, more digital modes are introduced, and more users shift to digital modes. Instead, the Committee believes that the amateur community will need to adjust itself to continued sharing of the spectrum by various modes and that such sharing should be facilitated through the publication by the ARRL of recommended sub-bands for the various modes and that such recommendations should be revised from time to time as operating patterns change.

The Committee, as a subsequent action, will propose a revised band plan for consideration by the ARRL.

In any case, the HF spectrum is severely limited, especially for digital mode operation, and modes of operation that improve spectral efficiency must be strongly encouraged. The Committee will undertake a study proposing, in a subsequent action, voluntary technical standards which can be promoted among amateurs and vendors to significantly improve our current frequency usage.

The State of the Art for Amateur HF Digital Operation

While the current rules allow considerable latitude in what digital modes the amateur community uses, the actual practice is somewhat limited. Current practice includes "RTTY", a non-error-protected simplex mode, usually using the baudot code; "AMTOR", a partially error-protected half-duplex mode using the baudot code; "packet", an error-protected half-duplex mode using ascii code; and "PACTOR", an error-protected half-duplex mode using ascii code. In addition, a new DSP-based system has been demonstrated but is not yet generally available called "Clover" that is an error-protected full-duplex highly spectrum efficient mode.

continued...

renewals; the current STA extension expires the end 1992.

Also in early 1991, the FCC caused additional heartburn for the packet radio network by citing a dozen east-coast stations (including W3IWI) for automatically forwarding an Anti-war bulletin (I still call this the 900- GATE affair). In that action, the community was informed that EACH packet network station was responsible for the content of EACH message that automatically passed thru his station. Clearly the FCC has a problem understanding automatic operation within a network!

At the summer, 1991 ARRL Board meeting, the Directors made a decision to split the functions of the old Digital Committee into two — a Digital Committee to look after the operational needs of the entire digital community, and an Advanced Techniques Committee to help design future systems. To my knowledge, the ARRL never publicized the membership of either of the new committees.

Early in 1992, the ARRL announced a survey of the needs of the entire digital HF world. The STA group was told that they would be surveyed separately for detailed comments on STA operations. Dale Sinner, W6IWO through his publication *RTTY Journal* called on all the RTTY and AMTOR users to respond en masse.

Imagine our surprise when, in early July the following ARRL Bulletin appeared:

SB QST @ ARRL $ARLB058
ARLB058 Digital news
ZCZC AG80 QST de W1AW
ARRL Bulletin 58 ARLB058
From ARRL Headquarters
Newington CT June 25, 1992
To all radio amateurs

SB QST ARL ARLB058
ARLB058 Digital news

The ARRL Committee on Amateur Radio Digital Communication has reviewed the results of the January 1992 *QST* survey on automatic unattended HF operation of digital stations, and has submitted recommendations for ARRL Board consideration at its July 17 meeting.

A clear majority of survey respondents opposed fully automatic, unattended operation on HF. However, by a ratio of two to one, respondents endorsed semi-automatic operation,

Digital Committee Report, continued...

As currently used, all of the above modes require approximately 500 to 1000 Hz. of bandwidth per channel except packet which requires 2000 Hz. per channel. Effective use of that bandwidth is terms of character throughput varies considerably as a function of the protocol used and the channel conditions. Partly because of the requirement for 2000 Hz. of space per channel and partly because of the nature of the AX.25 protocol, the performance figures for packet are the poorest per unit of bandwidth of any of the currently used modes. RTTY and AMTOR are better, and PACTOR is better still. Clover promises to exceed the throughput per unit of bandwidth of any of the above modes.

Tolerance to poor channel conditions also varies among the modes with packet having the poorest performance, RTTY next, AMTOR and PACTOR being very much better.

Digital techniques for HF operation are improving and newer technologies such as PACTOR and Clover promise significant near- term improvements in spectrum utilization, throughput, and performance under difficult HF radio conditions. The current rules do not appear to have contemplated these new modes in the HF portion of the spectrum and the Committee believes the rules require a modest change to encourage these and other new more effective digital modes and to promote operation in the narrowest possible bandwidth.

Potential Abuse of Unattended Operation

A few respondents to the Survey expressed opposition to any form of unattended operation because of possible illegal use of amateur bands for unauthorized third-party traffic, commercial purposes, or the support of illegal activities such as drug smuggling.

The Committee is not aware of any pattern of such abuse nor does the Committee see any reason why illegal operation is not just as likely to occur directly between two attended stations as any other. The Committee did not consider this factor in making its recommendations.

Competing Interests for HF Spectrum Space

The most difficult issue the Committee has had to deal with is the demand for spectrum space from the many different classes of users. Many of these users are sharing (somewhat unwillingly) the same space and each would like the others to vacate to other locations.

The most critical frequency bands (at the moment!) are 20 and 40 meters.

On 20 meters the frequencies above 14,100 kHz. have been traditionally used for DX voice and below 14,100 KHz. for c.w. and data. With the advent of packet, and the STA authorizing unattended packet operation, packet operations began above 14,100 Hz. and has gradually occupied the region of 14,100 to 14,125 Hz. Due in large part to the fact that data is not allowed in this sub- band in some countries, packet operation has also extended downward into the band immediately below 14,100 attracting US operation in this sub-band as well. Non-US voice operators have taken exception to the use of the 14,100-14,125 space and RTTY operators have taken exception to the use of the space below 14,100.

On the 40 meters packet operation began in the 7080-7100 Hz. region where traditionally RTTY and AMTOR operators had been active. This has forced the RTTY and AMTOR operations further down into the dismay of c.w. operators. This picture is further complicated by the fact that outside of region 2 data operation must be confined below 7050 kHz.

The situation on other bands, especially below 21 mHz., though not as critical as on 20 and 40 meters, have similar conflicts. The informal 'sub-bands'

continued...

where there is a control operator present at one end of the circuit.

The Digital Committee recommendations are consistent with the survey results. The Committee is recommending that FCC rules be proposed to permit semi-automatic digital operation below 30 MHz, but not to permit fully-automatic operation. Neither type of operation is presently permitted, except under a special temporary authorization granted to ARRL that will expire next January. The recommendation includes language to protect other Amateur operations from interference in the event of a malfunction of the unattended station.

The Committee also recommends that the use of unspecified digital codes on HF be allowed, with bandwidth limited to 500 Hz below 28 MHz and to 2 kHz between 28.0 and 28.3 MHz, to encourage experimentation with more spectrum efficient systems.

Finally, the Committee recommends greater efforts by the League to educate Amateurs interested in HF digital operations, and to develop technical standards or guidelines for spectrum- efficient digital communications equipment.

ARRL Directors are now studying the recommendations of the Digital Committee, in preparation for their formal consideration July 17. At that time, the Board will have the opportunity either to adopt the recommendations, decline to adopt them, adopt them in modified form, or postpone consideration.

A number of SKIPNET members said "Huh??? What the **** is happening here?" Calls to our local directors indicated that none of them had seen the committee report. Most directors did not know who was on the Digital Committee, or who had appointed the Committee members. One Director thought that I was on the Committee and called me for information.

Well, we finally got a copy of the full report — please see the sidebar.

After this appeared, telephones started ringing and the packet and Usenet channels became very busy, trying to find out what was happening and trying to influence the ARRL Board in advance of their July 17th meeting. Here are some samples:

Luck Hurder, KY1T at ARRL HQ said, in defense of questions about the Committee acting in secrecy:

Digital Committee Report, continued...

used by the various modes are also somewhat fluid as propagation conditions change and usage shifts from one mode to another.

The Committee does not believe that any subdivision of the bands by rule will best serve the amateur community in the long run. It also seems unlikely that any subdivision of the band by mode will work on a world wide basis because of the differences in the rules between regions and between individual administrations. Any subdivision of amateur bands by rule also imposes an unnecessary potential enforcement burden on the FCC.

Amateur Operating Practices and Traditions

Except in a very few special situations it has long been the tradition (and rule) that one amateur station must not willingly or knowingly interfere with a contract already in progress regardless of the mode of operation or the perceived importance of the communications in progress. It has also been a long standing tradition that no station or group of stations 'own' a frequency. (Frequency 'ownership' has admittedly become a practice on certain VHF frequencies, but this practice has never been established on the HF bands and the Committee strongly rejects the concept of doing so now.)

On HF the use of sub-bands with various classes of operation gravitating to specific locations is largely self regulating simply by virtue of the fact that a station occupying a frequency is not driven off the frequency by deliberate interference by a station operating another mode. (There are always isolated exceptions to this but it is not condoned in the rules or by the vast majority of amateur operators.) As greater numbers of amateurs use a particular mode that part of the band becomes recognized informally as a mode-specific sub-band. There is always a significant overlap in the sub-bands between modes - packet sharing with RTTY, RTTY sharing with AMTOR, AMTOR sharing with c.w., and so on. The greatest conflicts come where the overlapping modes have significantly different bandwidth, i.e., AM vrs. ssb, packet vrs. RTTY.

Types of Automatic Operation

Two types of automatic digital operation are under consideration for use on the amateur HF bands. One is fully-automatic operation where messages are passed between amateur stations without any operator intervention and no operator may need be present at either station.

The other is semi-automatic operation where messages are passed between amateur stations with an operator initiating the contact from one of the two stations.

Both fully- and semi-automatic operation is permissible today under the rules provided there is a control operator present at both stations. (Stations authorized under the STA may operate unattended.)

Digital operation with one station functioning in a semi-automatic mode has long been a practice dating back to the '60s.

Fully-Automatic Unattended Operation

The proposal to authorize fully-automatic unattended operation represents distinct departure from past practices. A clear majority of the respondents to the survey opposed any fully- automatic operation on the amateur HF bands.

To authorize fully-automatic operation without restriction, as some of the respondents to the survey advocate, would seriously undermine the fiber of mutual cooperation that HF operation requires. The Committee rejects such operation as undesirable on its face.

It was also proposed to authorize fully-automatic operation with restrictions, either to the frequencies allowed, to a few privileged stations, or both. The

continued...

The truth is that the list of unattended digital STA folks has been available for the asking since day one. All a person need do was ask. And it's still available to the public on the ARRL BBS as a downloadable file.

Also untrue is the notion that we've not spouted forth with regard to what we've learned from the STA. In fact we put out an ARRL/W1AW bulletin about it just this past week.

We even went so far as to ask the STA participants (and all other interested Amateurs) for their opinions on how we should proceed with our request to the FCC for rulemaking. Over 500 people responded. Not what you'd call a 'secret' guys!

To which Hank, W0RLI responded:

And we responded to the earlier poll ... the response from the STA participants was to allow fully automatic operation, since there had been near zero problems with it. Many of us have not YET responded to the recent "popularity contest" poll that appeared in a recent *QST* - in my case, since I've not yet had a chance to READ that *QST*.

Who responded? [to the *QST* poll] What is the breakdown of people with actual serious HF packet operation? What did they cite as reasons for not allowing automatic unattended operation? Have the incidents cited (if any) been independently verified?

... what do the survey results mean? We have no information that indicates the survey did indeed sample the information it was expected to sample.

The digital committee did not poll the STA holders. Since the STA holders are the only hams with experience in automatic unattended HF operation, this seems a VERY serious oversight.

Note that this recommendation, if implemented, will shut down HF forwarding, and will shut down HF gateways.

The original intent of the STA was to discover if it was feasible to have automatic unattended HF operation. The results of the operations under the STA have shown that it is feasible. The previous survey OF THE PARTICIPANTS OF THE STA showed that there were no problems.

I strongly recommend that the digital committee do it's homework. A survey in a single ham magazine is not likely to produce the information the committee needs to make a good decision.

Digital Committee Report, continued...

committee saw no purpose in limiting the frequency bands alone since the number of stations that would attempt unattended operation would make the mode and allocated frequency useless to everyone. Limiting the number of participating stations was also rejected by the committee because there was no conceivable way to equitably allocate the privilege to specific stations nor was the committee willing to set aside any portion of the band to stations with special privileges.

Fully-automatic operation, by it's very nature is mode-specific and must 'own' the frequency it operates on an cannot be effectively shared by other modes of operation.

To authorize fully-automatic operation on the necessary mode- specific sub-bands raises serious problems. There are no likely sub-bands that can be used on a world-wide basis or that will not cause interference to other users under some circumstances.

The only mode of operation that is currently a prospect for fully- automatic authorization is packet, based on the AX.25 protocol, using 2 kHz. channel spacing. This mode delivers the poorest performance with respect to spectrum utilization or survivability under adverse propagation conditions of any the digital modes currently in use. j The Committee does not believe that, if a protected mode-specific sub-band is to be authorized, that it should be a mode that is as inefficient in its resource utilization as current packet practice represents. Such an authorization will discourage the development and use of a more suitable mode.

Further, the Committee does not believe that these is any service being provided by fully-automatic operation that is not also available by other means without the associated problems of fully- automatic operation. Nor does the Committee know of any reason why packet operation cannot also be operated in semi-automatic mode, there-by eliminating the need for a rule-mandated sub-band.

Semi-Automatic Unattended Operation

There are many reasons, however, why some form of automatic digital operation is desirable. It permits amateurs to exchange communications when there is a time difference between the operating times available to the two amateurs, and it permits the quick exchange of messages rather than taking air time with long calls and keyboard-to-keyboard operation. (This not a suggestion by the Committee that keyboard-to-keyboard is undesirable but simply that there are many cases where moving messages at machine speeds is more spectrum efficient and makes more frequency time available to direct keyboard operation.)

It is very evident that some form of automatic operation is highly desirable when handling NTS and personal messages between amateurs through intermediate stations. This capability forms the very heart of the amateur community's preparedness for emergency service. Respondents to the survey favored semi-automatic unattended operation over those opposed by a two-to-one ratio.

The Committee does recognize that there is some potential for interference using a semi-automatic unattended mode even as there is such potential in purely manual modes. However, so long as there is a control operator present at one end of the link, monitoring the progress of an exchange, such interference can be held to a minimum. The benefits of semi-automatic operation outweigh the risk of inadvertent interference.

continued...

And let's publish some actual information: Who's part of the STA? Are they on air? Have they been on air for the duration of the STA? What have their experiences been while operating under the STA?

The "secrecy" that folks are concerned about revolves around the fact that the information on WHO is in the STA, and WHAT has happened with the STA has not yet been made widely available. For example, it might make sense to publish the list of stations involved in the STA in *QST*. There WAS one packet BBS bulletin listing the original stations (sent around by W2JUP). There has been NO information about the results of the operation of the HF STA stations.

With respect to that operation: I know of only ONE incident that might have caused unexpected QRM, etc. Cannot remember exactly when it occured (perhaps 1985?). Hardware failure caused one of the STA stations to go key down. The operator was notified within one hour (at his place of work), and he corrected the problem. He lost his L4 linear though ...

Is there other evidence that unattended automatic operation has caused problems? Don't bother to respond with "It *COULD* do ....". The STA has been in existance for a long time now, anything that "could" happen has had it's chance to happen, and didn't.

And Carl, WA0CQG said

Jay, WS7I said, quote "The ARRL Digital Committee has done a great job and put forth a recommendation that deserves wide support. It has done the study that the STA never did and the conclusion that it reached should be supportable by the Amateur Community."

Whether it deserves widespread support is dependent on what it says. We'll know that when we see it, won't we? Where is it available? I haven't seen it on packet nor here.

The only request that the STA participants have had to provide info. to ARRL that I am aware of was in November 1987 when Paul Rinaldo, W4RI, sent a letter requesting specific details as to amounts, types of traffic handled and general operational questions. Those details were included in a letter on January 5, 1989 from Mr. Dave Sumner, K1ZZ, to Mr. Ralph Haller, Chief, Private Radio Bureau, FCC, requesting a further extension of the STA term. It stated that the lessons learned are:

Digital Committee Report, continued...

The Committee believes that in view of the long successful history of semi-automatic operation that authorizing unattended semi- automatic operation is in the best interests of the amateur community.

RECOMMENDATIONS

I. Unattended fully-automatic operation of amateur digital stations should not be authorized below 30 mHz.

II. The FCC rules should be amended to allow unattended semi- automatic operation of digital stations on any frequency on which digital modes are authorized. Unattended semi-automatic stations may not initiate a contact, either with another station or via an undirected broadcast. An operator initiating a contact with an unattended station must first ascertain that no interference will be caused to existing communications, and must monitor the progress of communications. If it becomes evident that the communications with an unattended semi-automatic station is interfering with other amateur communications then the link with the semi- automatic station must be discontinued. An unattended semi- automatic station must be equipped with a time-out timer to insure that no signal is transmitted longer than five minutes in the event of the malfunction of control equipment or the loss of contact with the initiating station. Suggested wording for such an amendment is included in the appendix.

III. The FCC rules should be amended to allow the use of modem- dependent codes for the purpose of efficient data compression and error control on HF radio channels. The bandwidth of such signals should be restricted to 500 Hz, below 28 mHz, and 2000 Hz. between 28.0 and 28.3 mHz The appendix to this report suggests specific wording for the recommended rule change. A station using a modem-dependent code must still comply with 96.119 Station Identification.

IV. The League should publish a comprehensive tutorial-style operator's guide for HF digital operations clearly defining acceptable operating practices. Such a manual would delineate currently used informal sub-bands for the various modes and styles of operation, and the good operating practices that are required for effective mutual cooperation and coexistence. This Committee will make specific recommendations for the content of this guide.

V. The League should publish technical standards or guidelines for the characteristics of signals generated by digital mode stations for the purpose of achieving the best possible use of the HF spectrum. QST should be used as a forum to educate that amateur community on the benefits and means of achieving acceptable signal quality and should review the technical characteristics of digital mode products with respect to published standards. This Committee will make specific recommendations for these technical standards.

APPENDIX A

The following is suggested wording for an addition to Part 97 authorizing unattended semi-automatic digital mode operation.

97.3 Definitions

( ) Unattended Digital Station - A station in the amateur service using an RTTY or data emission that is operated without a control operator present.

97.216 Unattended Digital Station

(a) Any amateur station licensed to a holder of a General, Advanced or Amateur Extra Class operation license may be an unattended digital station.

(b) An unattended digital station may operate on any frequency below 30 mHz. that is authorized for RTTY or data emission for the class of operator license held.

continued...

"a. The system works, moves traffic and, with careful frequency selection, can provide a public service without undue interference to other Amateur activities.

"b. Network management and control are necessary.

"c. Accountability for traffic must be with the station introducing it into the network; accountability at relay points is not practical.

"d. Packet is not compatible with other modes and needs separate fre quencies; carrier sense is not adequate to protect against interfer ing with other modes on HF owing to transmission impairments, hidden station effects, etc.

"e. Frequency stability needs to be on the order of 10 Hz.

"f. Protocols need improvement, and new capabilities are needed.

"g. Modems need improvement.

"h. Watchdog timer (to disable the transmitter automatically in the event of a malfunction) are essential.

"i. Stations need to change frequencies in accordance with propagation conditions to improve efficiency, reduce retries, and free up frequencies for other users.

"j. While a 200-watt power output has proven adequate for many domestic paths, there is no justification for a blanket 200-watt limitation."

So, that's the kind of stuff learned during the STA, as reported to FCC by ARRL. Stuff learned from real life experiences.

I think time is too short before the Board of Directors meeting to get wide-spread distribution of the document and understand it. Therefore, I have urged our local Director, Howard Mark (W0OZC) to either vote to table it or refer it back to the committee for inclusion of inputs from the STA participants.

Quoting from comments by NO8M:

The prohibition of automatic HF forwarding will result in a drastic and damaging affect on the Amateur radio networks that now exist. This is exactly what the ARRL Digital Committee is proposing. The text of their recommendation is circulating on other networks and on many PBBSs as a separate message. It is also available on the Cleveland Hamnet BBS, 216-942-6382.

There is little doubt that the HF network as we now know it will collapse Few, if any HF Sysops now operating will participate after the banning of automatic forwarding. (Ask one.) Hence, the same network that now relays the far majority of health and welfare, NTS and personal mail will close.

At this same time, the possibility of future enhancements and experimentation with a data network on all but the local scale will become so limited that the potential for advancement will be all but lost.

Years of a highly successful STA operation are being ignored. Advancements that have come from this experimentation such as Clover and Pactor are being ignored. Massive amounts of traffic handled during emergencies is being ignored.

Instead, we are treated to page after page of suggestions based not on these many successes but on speculation and suspicion of problems that do not exist. Situations that have not occurred. Pages after page of pretend that mocks the reality so easily shown by the networks that are real, that exist, that prove that it works.

For years upon years, the staff of Newington has chosen to ignore and belittle the advances that have been made. Caught once in this activi ty, the prior Digital Committee was abandoned as an embarrassment. In its place were put tokens designed to meet a demand. The FCC, weary of waiting, publicly scorned the ARRL with the announcement that they best get off their derrieres and move to propose rules for the termination of the STA. To this end they begin their fight to build a case able to ignore the fantastic dedication and labor easily shown by today's net works.

Should this event occur it will be years before the damage can be un done. This trend will only end and reverse if the Directors see the folly this Committee (and the staff at Newington who chose them) is perpetrating.

Please, contact your Division Director and request that the recommenda

Digital Committee Report, continued...

(c) An unattended digital station may only use those RTTY or data emissions authorized by 97.305 and 97.307.

(d) No unattended digital station may initiate a contact with another station or may broadcast any undirected signal.

(e) The transmitter of an unattended digital station must be equipped with a time-out timer that will insure that no signal is transmitted for longer than five minutes in the event of the malfunction of control equipment or loss of contact with the initiating station.

(f) Any amateur operator initiating contact with an unattended digital station must first ascertain that no interference will be caused to existing communications, must be present for the duration of the contact, and must discontinue the contact if it becomes evident that communications with the unattended digital station is interfering with other amateur communications.

APPENDIX B

To encourage improvements in digital mode communications and especially to improved spectrum utilization on amateur HF bands Part 97, 97.307 (f) (3) and 97.307 (f) (4), should read as follows:

(3) A RTTY or data emission using a specified code listed in 97.309 (a) of this Part may be transmitted. The symbol rate must not exceed 300 baud, and for frequency-shift keying, the frequency shift between mark and space must not exceed 300 Hz. A RTTY or data emission using an unspecified digital code under the limitations listed in 97.309 (b) of the Part also may be transmitted. If an unspecified digital code is transmitted the authorized bandwidth is 500 Hz.

(4) A RTTY or data emission using a specified code listed in 97.309 (a) of this Part may be transmitted. The symbol rate must not exceed 1200 baud, and for frequency-shift keying, the frequency shift between mark and space must not exceed 1 kHz. A RTTY or date emission using an unspecified digital code under the limitations listed in 97.309 (b) of the Part also may be transmitted. If an unspecified digital code is transmitted the authorized bandwidth is 2 kHz.

tions of the Digital Committee be abandoned. In mid-July they will have a meeting in order to take action on this matter. Your Director's information is available inside the cover of QST. Also please contact your Section Manager. Your Section Manager has an ear to your area and a voice in Newington.

And I circulated this long diatribe on July 11th:

The ARRL Digital Committee has filed a report to be voted on by the ARRL Directors in their meeting 7/17 concerning the STA which permits automatic, unattended HF digital operations. This STA has been hanging around for a number of years as an un-reconciled thorn in everyone's side.

This represents some of my personal comments on the proposal by the ARRL Committee on Amateur Radio Digital Communications dated June 13th.

I find the Committee's report to be interesting. I agree with part of it. I find parts of it suffering from technical errors. I find a number of places where assertive "God's truth" statements are made based on what I consider to be inadequate/incomplete/questionable evidence and/or circular logic.

The report conveys an aura which is, in essence: "let's flog packet" which I think is unfortunate, and tends to put some of the community immediately on the defensive. My personal belief is that the desirable systems for the future are different from any of the current techniques, and will draw on the good/bad experience of each. Regarding new techniques, I am pleased to see Clover and Pactor represented; too bad several of the other new/proposed techniques were ignored.

I find each of the techniques to be discussed as a "black-box" based on perceived performance, with lots of apples vs. oranges comparisons. By way of example, the strengths/deficiencies of a particular class of modem technology are not separated from issues of error correction, link-level data protocols, high-level messaging/networking protocols or number of people sharing a given frequency.

From the packet standpoint, it is unclear whether any distinction is made between "open" operation (BBSs open to all users) and "closed" (regulated, limited membership) dedicated networks.

The survey "vote" seems to have been based on counts of individual responses. This may give an incomplete picture. By this scheme, the "closed" dedicated HF networks (both packet and amtor) get only one "vote" per station when in point of fact, they handle messages from many people. I also note that, because of the way in which the survey was announced and advertised (heavily promoted in the RTTY Journal, but with no specific requests to the HF Net Managers to submit statistics), many of the sysops of the "closed" network stations didn't respond with enough information.

Let me note my personal credentials to comment on these various points. First, I have been an active member of the present STA since the beginning. I operate two "dedicated" "closed" HF Packet ports (14109 and 21097). My HF + VHF/UHF system acts only as a network mail forwarding node and has no direct users.

The W3IWI mail switch handles 8000-12000 messages per month. Although NTS activity has decreased recently, my system has "made BPL" more than 20 times. My two HF ports typically handle 25-100,000 bytes of user-generated packet mail each day.

I have been active in designing and building the Amateur digital satellites to provide additional channel capacity to the world-wide network. I have been involved in the development and design of several of the pieces of hardware in common usage including the TNC1, TNC2 and 1200 baud PSK modem. I have been involved in developing DSP-based techniques for improving link-level performance. I have done research in quantifying the effects of multi-path on HF digital links and in developing the digital protocols.

Now to some specific points concerning the committee report:

1. The meeting was held June 13th. It was July 8th before I was able to get a copy for comment, and it is only a week to get comments to the ARRL BoD. I wonder why the document was kept "secret" until it is (almost) to late to lobby the Directors? My local Director (W3ABC) had also not seen a copy and phoned me today asking what I knew about it.

Along similar lines, I wonder who in the community the committee discussed the issues with? Among the folks I know operating HF packet systems under the current STA, and among the folks who are currently writing code to make improvements to the present system, and among the folks who are trying to improve modem technology, no one was contacted. I think some grievous errors and misconceptions could have been corrected if only people had asked!

2. Spectrum usage: In the report the committee states

"In any case, the HF spectrum is severely limited, especially for digital mode operation, and modes of operation that improve spectral efficiency must be strongly encouraged. The Committee will undertake a study proposing, in a subsequent action, voluntary technical standards which can be promoted among Amateurs and vendors to significantly improve our current frequency usage."

Good, I'm glad to see that philosophical statement. Actually efficiency needs to also be measured in a second domain -- time. Any network needs to be judged on the basis of objective criteria like bits/day/kHz, not just occupied kHz. The committee then goes on to state:

"The State of the Art for Amateur HF Digital Operation While the current rules allow considerable latitude in what digital modes the Amateur community uses, the actual practice is somewhat limited. Current practice includes "RTTY", a non-error-protected simplex mode, usually using the baudot code; "AMTOR", a partially error-protected half-duplex mode using the baudot code; "packet", an error-protected half-duplex mode using ascii code; and "PACTOR", an error-protected half-duplex mode using ascii code. In addition, a new DSP-based system has been demonstrated but is not yet generally available called "Clover" that is an error-protected full-duplex highly spectrum efficient mode."

I wish to note that "CLOVER" is not the only "DSP-Based" technology currently being developed. I also note that Clover is the only "mode" listed (but not the only one under development) where new modem technology is being developed. The other techniques cited use nearly identical FSK implementations.

"As currently used all of the above modes require approximately 500 to 1000 Hz. of bandwidth per channel except packet which requires 2000 Hz. per channel. Effective use of that bandwidth is terms of character throughput varies considerably as a function of the protocol used and the channel conditions. Partly because of the requirement for 2000 Hz. of space per channel and partly because of the nature of the AX.25 protocol, the performance figures for packet are the poorest per unit of bandwidth of any of the currently used modes."

I wonder what kind of strange weed the authors were smoking when they decided that packet REQUIRES 2000 Hz of bandwidth. The currently used channels on HF happen to be spaced 2000 Hz, but that was simply done for convenience. With 300 baud data superimposed on a 200 kHz shift, the REQUIRED bandwidth is about 500 Hz. Even given mortal receiver and modem filters, 1 kHz channel spacing would be adequate. With high performance receivers and a DSP modem (TS950, DSP2232) running the current BELL 103A standards, I have demonstrated that 750 Hz spacing is more than adequate.

3. Channel Throughput. The Committee chose to make this statement:

".... RTTY and AMTOR are better, and PACTOR is better still. Clover promises to exceed the throughput per unit of bandwidth of any of the above modes."

I would like to see the factual justification for justifying the statement about packet. One major difference between the techniques that must be normalized to make such definitive claims is that the packet channels have several users on a frequency at a given time. Is the claim that ONE STATION's throughput is poorest, or is that the total channel throughput, considering frequency re-use is poorest?

In the case of packet, are they referring to the "free-for-all" packet channels wherein the BBSs operate "open" or to the "closed" networks which limit membership in an attempt to minimize congestion, or to both?

This set of sweeping statements, made to sound authoritative but lacking factual support are PRECISELY the type of apples vs. oranges rhetoric that some people have used to try to incite packet vs. rtty vs. amtor "wars." These rhetorical statements sweep under the rug that the performance differences arise because of several factors.

4. Logic Flaws!

Why are these statements flawed? First, the radio side of the HF channels cannot be simply modeled. Gaussian noise is the least of the problems. QRM and QRN must be considered. Even more severe are effects of multipath. Papers at the ARRL Networking Conferences and in QEX by VE3JF, KB1JY and W3IWI as well as in the professional literature have demonstrated that on links well below the MUF, multipath causes significant intersymbol distortion at data rates about about 75 baud (symbol times shorter than about 15 msec). On "long-path" links near the MUF, rates well above 300 baud can be supported. The packet world has been tarred and feathered about performance when in fact the modem/data rate chosen for a the links were in error. I've had trouble copying 110 baud RTTY from W1AW on 80M. That is the fault of RTTY -- it's the attempt to use symbols that are too short to propagate thru the ionosphere. Proper application of improved adaptive modem technology (like Clover, like the idea I presented at the 7th Networking Conference, and like the ideas proposed by VE3JF and N4HY) will benefit all the techniques.

Modems and the ionosphere are but one link-level issue. A second concerns the lowest level protocols. Clearly the error correction that AMTOR uses is a major key to its good demonstrated performance. In essence AMTOR is packet-like with a frame length 20 bits. HF packet uses frames 500-1000 bits long with only error detection; it only works when bit error rates are below 1x10e-3 -- a rather stringent requirement for marginal HF paths. Pactor and Clover make an effort to bridge this gap, as do other link-level protocols proposed and being developed by N4HY, VE3JF, and W3IWI.

At a higher level, another protocol issue which makes the "my technique is better than yours" arguments difficult is the time domain. RTTY and AMTOR tend to require that only one link (i.e. QSO) be in progress on a frequency at a given time. Packet (and Pactor) allow for time-domain channel sharing. This is an advantage when the different sessions occupying a given frequency can hear each other. When they can't, the "hidden terminal" problem occurs and everyone suffers when the different users step on each other. The regulated, established HF nets attempt to deal with this by limiting membership and enforcing time slotting. Protocol enhancements involving backoff timers, prioritized "acks," etc have been proposed and tested, but more development is still required.

At still a higher protocol level, the present protocols all have weaknesses. The current use of connected-mode AX.25 is flawed. NK6K, K8KA, KA9Q and W3IWI have all proposed datagram-based "broadcast" protocols (much like those used in the NK6L/K8KA PACSAT protocols) on HF.

I have stressed these future developments/augmentations to make a point. The committee proposal tries to cast the present system in concrete. It is flawed in its simplistic "automatic vs. semi-automatic" distinction. As a case in point -- I can envision adaptive protocols that (like current AMTOR) "probe" a number of frequencies trying to find a path. Once a path is found, some information is transmitted, but not all of it makes it thru. Several hours later, the "probe" finds a new path on a new band and some more data is transferred. Depending on the amount of information, this might take a whole day. The data (message) has been fragmented and can only be reassembled after it is received in its entirety. This seems, to me, to be an exciting technical development that only Amateurs could do. But, unless the person at the manually-operated end of the semi-automated link is willing to sit at the rig for 24 hours, it REQUIRES automated stations. Why should we push the world (FCC, IARU, etc) to adopt "rules" which tie our hands?

The committee report sort-of agrees with my statements about the future trends:

"Digital techniques for HF operation are improving and newer technologies such as PACTOR and Clover promise significant near-term improvements in spectrum utilization, throughput, and performance under difficult HF radio conditions. The current rules do not appear to have contemplated these new modes in the HF portion of the spectrum and the Committee believes the rules require a modest change to encourage these and other new more effective digital modes and to promote operation in the narrowest possible bandwidth."

In the last sentence, I would again stress that bandwidth per se is only part of the issue. The number of users sharing x kHz of spectrum and the number of bytes they can send per minute (or hour or day) also need to be part of the criteria.

5. Interference: Throughout the report (I won't quote the specific sections) there is a lot of discussion about interference. Let us consider for the moment that digital techniques are intrinsically channelized. Packet operation assumes that there will be interference from other users on the channel. The hardware and software detect the other signals, and when problems occur, the user automatically slows down to share the channel. AMTOR has developed frequency hopping as a way to automatically cope with channel congestion. While malicious interference is morally and socially unacceptable, channel sharing (in time and/or fre-

quency) is a proven way to cope with the problem. Problems develop only when the modes are incompatible and channel "assignments" are violated.

6. What the committee proposes and its implications: Again I quote:

"The proposal to authorize fully-automatic unattended operation represents distinct departure from past practices. A clear majority of the respondents to the survey opposed any fully-automatic operation on the Amateur HF bands."

How long is the integration time for the words "past practices"? Certainly fully automated unattended packet operations have been going on for at least 8 years! And I suspect that some of the automated AMTOR systems now on the air are also running the same way.

The Committee's recommendations seem to be based on numerical replies. I doubt that the average packet user bothered to "vote" because the survey was not addressed to him/her. But the <implications> of this action will have a marked effect on them.

In point of fact, a large fraction of the long-haul packet messaging outside a user's local area is carried on HF by automatic, unattended HF packet stations. Yes, some fraction is now being handled by the limited Amateur satellite resources the community has built over the past few years; some fraction is handled by the (semi-)automatic AMTOR stations; and some fraction is handled on non-Amateur (i.e. wire) links bypassing Amateur radio completely.

The Implications: I'll speak for myself and ask the other operators on the HF networks to comment on their own views. W3IWI now handles thousands of user messages each month on HF under the aegis of the STA, operating automatically and unattended under the current STA. My professional commitments require me to be away from home quite a bit. When I am away I leave instructions on how to kill the radio if a <technical> malfunction occurs, but the messages keep being sent automatically. Recently I was in DL/UA/OH/LA/SM for 3 weeks. Several thousand messages passed thru the HF port here. I even sent mail from UA3/W3IWI back home thru the system.

If the Committee's recommendations are adopted, or if some alternative to the present STA is not found, I will be forced to go QRT. I simply cannot operate in the ill-defined "semi-automatic" (which I liken to being half-pregnant or having half a pair of pliers!) mode legally. I hope that someone else will step up to the task of providing the service I have prided myself in for the past 6 years.

In anticipation of comments like mine, the committee states:

"Further, the Committee does not believe that there is any service being provided by fully-automatic operation that is not also available by other means without the associated problems of fully-automatic operation. Nor does the Committee know of any reason why packet operation cannot also be operated in semi-automatic mode, thereby eliminating the need for a rule-mandated sub-band."

I am unconvinced. Who is correct? If you have any comments on these ideas I urge you to contact your ARRL Director immediately so that he can cast an informed vote during the ARRL BOD meeting next week (7/17). 73 de Tom, W3IWI

Well, the ARRL Board met. Here are extracts of the relevant portions of their minutes:

32) Comstock, as Chairman, presented the report of the ARRL Committee on Amateur Radio Digital Communications. The committee reviewed the role of digital communications in emergencies, the "state of the art" for digital modes and their impact on HF spectrum use and the responses from the digital survey conducted by QST and the RTTY Journal. The committee then examined at length all of the issues raised in connection with the operation of unattended Amateur HF digital stations.

33) It was moved by Comstock, seconded by Heyn, that the General Counsel, with the assistance of the Exec VP and the staff, is authorized to prepare a draft Petition for FCC Rulemaking to permit the operation of a new category of Amateur station, "unattended digital station," on RTTY/data frequencies below 30 MHz. Only Amateur stations under the active control of a control operator would be permitted to communicate with unattended digital stations; unattended digital stations would not be permitted to engage in one-way communications; and appropriate safeguards would be required to prevent unattended digital stations from causing harmful interference to other Amateur stations. The draft is to be circulated to the Executive Committee for review and final approval before filing. Further, the Digital Committee is requested to continue its study of the issue of unattended digital operation, with the objective of developing future recommendations for increased flexibility of operation of this class of station.

It was then moved by Quiat, seconded by Kanode, to strike the text and substitute the following:

That the ARRL petition the FCC for a Notice of Proposed Rulemaking to provide for: (1) Fully unattended HF digital BBS operations under 47 CFR Part 97, subject to the following: (a) Data control--at the point of origination, all bulletins would be held for SysOps' review to screen out Part 97 violations, such as those having commercial or other inappropriate or unlawful textual content. (b) Equipment Control--all automatic HF BBS operators will include hardware, such as a telephone link or UHF/VHF link to shut down the HF port in case of awareness of, or reported, hardware malfunction. Additionally, locked-key sensors and over-temperature sensors shall be installed to shut down the HF port if the above or other prohibited conditions are detected. (2) Digital transmission rates up to 1200 bauds shall be allowed of HF Amateur bands from 3-30 MHz. (3) Bandplanning within a maximum of 30 kHz of any Amateur band to allow safe bandwidth margins for 1200-baud transmission will be implemented by agreement and understanding within the Amateur Radio community.

After discussion, however, the motion to amend was LOST. Whereupon, the question being on Comstock's motion, the same was ADOPTED. Turnbull, Burden, McConnell and Grauer requested to be recorded as voting no.

I talked with Director Turnbull (W3ABC) after the meeting. He told me that Quait's motion was very confused and was defeated by a vote of 14-1. I gather that many of the directors didn't understand the issues. He reported that no other director offered an alternative to Comstock's motion and that it was passed. Turnbull further stated:

... my position has been consistent for the past 4 years. There are two issues involved.

FIRST - The need for a spectrum management policy (call it band planning, if you wish) that will be reviewed periodically and avoid some of the perceived chaos and/or incompatabilities.

SECOND - The need for automatic efficient information handling systems where the content is the responsibility of the originator.

Both items should be determined not only on the basis of current and future technical requirements developed by those knowledgable, but also from the responsible inputs of both the user and provider communities.

So, the SKIPNET community is left in limbo. As of December the present STA will expire. Who knows what the FCC will decide. Most of the present STA stations (both packet and AMTOR) expect to shut down because they are unable to operate in the "half-pregnant" semi-automatic mode. Unless the problem is solved, our only channel for trans- and inter-continental message handling will be via the satellites, or else by routing everything thru Canada.

To show the users what they are in for, the Colorado SYSOPS are staging a two-day hiatus, as seen in these comments from W0LJF:

The following is one of many bulletins sent to the BBS sysop's in Colorado defining our short-term plan to open the eyes of the local users to our plight. Next weekend [Aug 1/2], the BBS stations are going to shut down completely for 2 days. We are hoping that this will shock the users into appropriate action. In all actuality, we'll probably be called dirty names and accused of playing GOD; but we have to try SOMETHING drastic, as time is short.

I am not trying to influence you to do the same in your states, but simply to let you know ONE of the things that CO is doing to further our cause. ..73..Ed W0LJF..

Bulletin to SYSOP @ COBBS follows:

I just had a long talk with W0GVT on the tele. He suggests, and quite properly so, that AFTER the weekend blackout (I may go longer on the local blockout) that we send a bulletin to ALL users that this is what can be expected after December 31, 1992 UNLESS we get the ARRL Digital Committee, The ARRL proper and the FCC to change their course of action. He says to also provide names, addresses for comments to the proper parties. I concur....good idea. We need to get the addresses of these folks. Do any of you have this information? I would send a similiar bulletin to the the users right now, but they have no incentive at the present to petition these folks. Once they actually see that their hobby is in jeopardy, "they will see with open eyes", to loosely quote a verse from the Bible. One thing that everyone in the BBS biz should remember is that when the STA expires, that's it. There is NO unattended autoforwarding UNLESS the FCC modifies part 97. No matter what the ARRL recommends, we need to influence the FCC to see it our way. I have no idea how much the under- staffed FCC actually listens to the ARRL. Comments, please.

Wynne, W0IUQ in Iowa sent me a note recommending:

I do not think a slow-down or stoppage of service is a good idea, since it can easily backfire. In some areas, like Iowa, where the service is already pretty poor, it may go unnoticed and that could be used as evidence that the system isn't working and isn't needed. Besides, it is negative and smacks of a lack of cooperation, like labor strikes aimed at the general public.

Instead, I think we should take positive action, and some possibilities are the following:

(1) The STA group could respond directly to the FCC and deliver the results of the study promised by the ARRL, proving that unattended operations are feasible and do not cause interference.

(2) A group could separately petition the FCC for the unattended operations we want, and it would be best if that could be done before the ARRL gets theirs in.

(3) Petitions could be circulated at hamfests and club meetings.

(4) An article on this could be written for QST (which they may or may not publish).

(5) Get lots of people talking about this on packet. (I have seen only a few, poorly-thought-out bulletins, and that surprises me.)

(6) Encourage letters to the ARRL and/or the FCC.

(7) Appeal at a personal level to the FCC. (Do you know anyone there?)

(8) Apply pressure to the Board of Directors, as you suggested, citing their votes on this issue.

It is also important to work together and coordinate our efforts. If I can do anything, please let me know.

If and when the ARRL files with the FCC, then we will have the opportunity to comment. Here are some remarks from AD8I:

After watching the disgraceful charade orchestrated by the ARRL power structure, the packed Digital Committee and the back room dealing by the Board of Directors, I have decided to let each of you know where I stand in the 'automatic operation' debate and let you know what I intend to do.

I will terminate *ALL* packet operations at 23:59z 31 December 1992 unless the FCC has acted to allow full automatic operation for *ALL* classes of digital stations. I will resume VHF-only operation of the GLOBAL WP SERVER after 30 days.

If the ARRL presents a proposal to the FCC that discriminates against ANY class of automatic digital operations, I will file a very strongly worded set of comments in opposition. Those comments will be based on our collective experince under the STA. They will state that there is no technical justification to prohibit fully automatic operation of digital stations below 50 MHZ. They will state that there is no valid reason to permit only semi-automatic operation. Finally, they will recommend the COMPLETE PROHIBITION OF ANY AMATEUR OPERATION IN WHICH THERE IS NO CONTROL OPERATOR PHYSICALLY PRESENT AT THE LICENSED CONTROL POINT.

As far as I am concerned, the ARRL elite can not have it both ways, either automatic operation is OK for everybody or it is not right for anybody. It is time to make a stand ... time to expose the emperor's new clothes for what they really are!

The other approach is to make a preemptive strike and directly petition the FCC for a Notice of Proposed Rulemaking before the ARRL does. This could be done by concerned individuals, or it could be done by TAPR as the premier packet radio organization. If the TAPR membership feels strongly about this issue, let us know ASAP.

Thanks to all who have made comments in the past month. Sorry I couldn't include them all. Much of the material included in this report was taken verbatim from the inputs, so don't blame me for any errors in the quotes!

A Proposal for Automatic Operations on HF

by Lyle Johnson, WA7GXD

In late May, the ARRL Digital Committee made a recommendation to the ARRL Board recommending against "fully" automatic operations (e.g., operations in which an unattended station establishes contact with another unattended station) while sanctioning "semi" automatic operation (e.g., operations in which an unattended station only responds to the establishment of a contact, requiring an operator to be present at the station which establishes the contact) on our HF bands where data communications are authorized.

This proposal explores a possible alternative to the Digital Committee's recommendation.

The Issue: Fully-Automatic Operations

The issue is not whether packet is the "right" mode, or even a good mode, for such operations. It is not whether AMTOR or RTTY or PACTOR or CLOVER are preferable. I believe the issue is whether fully-automatic HF operations are feasible, or even desirable. My understanding of the issues leads me to believe that the STA, which expires in December of this year and which the FCC has indicated will not be renewed, has proven that fully-automatic operations on HF are feasible from a technical standpoint.

However, the STA has provided for operations by a "chosen few" and has resulted in loud, though perhaps not numerous, complaints from other operators.

The Objections To Fully-Automatic Operations

The essence of the objections of which I am aware are:

1) Foreign phone operators on 20 meter SSB resent the intrusion of automatic mail forwarding in the region of 14.100-14.115 MHz;

2) The 40 meter band, which is also workhorse spectrum, is different in Region 2 than it is in Regions 1 and 3, and this has lead to complaints.

3) If fully-automatic operations are generally authorized and this somehow leads to a deterioration in spectrum accessibility by other traditional users of those frequencies, it will be very difficult to "put the genie back in the bottle."

4) There is no fair way to allow only a few Amateurs to run fully automatic stations and exclude others who might want to run such stations.

The other objections I have heard are related to the perceived performance of packet versus other modes and are therefore irrelevant to the central issue of fully automatic operation.

The Grand Experiment: The STA

The STA, which has been in place for a number of years, allowed a certain number of Amateurs to participate in an experimental system of fully automated stations. The stations in the experiment settled on a 300 bps packet radio network linking packet bulletin board systems (PBBS) and, over the years, have moved hundreds of thousands of pieces of traffic across the continent and even internationally.

The STA participants have demonstrated that HF is a viable medium through which data can be successfully moved by fully automatic stations.

However, the STA by its nature, limited the number of stations. It did nothing directly to determine if such a network could survive in a "free for all."

A Proposal

I would like to propose that the ARRL Board, through the Digital Committee or other expedient, seriously consider the following proposal.

1) Allow fully-automatic operation on all authorized data modes in the following band segments:

   10.125-10.150 MHz
   18.093-18.118 MHz
   24.915-24.940 MHz.

2) Require that fully automatic stations have a means of assuring that their automated transmitters cannot transmit continuously for more than two (2) minutes per transmission.

Membership Application

TAPR is a non-profit, volunteer operated Amateur Radio organization. Membership in TAPR, including a subscription to *Packet Status Register*, the TAPR newsletter, is $15 per year in the U.S. and possessions, $18 in Canada and Mexico, and $25 elsewhere, payable in U.S. funds only. VISA and Mastercard accepted. Membership and *PSR* subscription cannot be seperated. $12 of the dues is allocated to *Packet Status Register*.

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3) Allow the STA to continue until six (6) months after the FCC adopts these rules to allow the existing mail forwarding system to migrate to these sub-bands without undue disruption to the service.

I believe this proposal will address all the objections listed:

1) There are no foreign phone operators on these band segments.

2) These "WARC" bands are allocated worldwide; thus there is no conflict in spectrum assignment.

3) The "genie" is simply being allowed into a larger bottle. If the fully-automatic operations authorized prove to be unmanageable, we will not have seriously impeded other existing Amateur operations.

4) These segments would be open to any Amateur stations otherwise allowed to use these frequencies to run fully automatically. The system would become self-regulating in that if it doesn't work due to overload, stations will drop out. It will then either find a kind of equilibrium, or it will fail.

Other Advantages To This Approach

There are a number of other advantages to this suggestion.

1) The 30, 17 and 12 meter bands are sparsely occupied at the present time. Allowing fully-automatic operations on these band segments will help occupy this important spectrum resource, helping to prevent another 220-222 MHz debacle.

2) Because there are relatively few operations on these band segments, there can be no strenuous objections by traditional Amateur operators that the automated stations are disruptive.

3) These bands have propagation characteristics that should allow operation at least as effective as the present 40 and 20 meter operations.

4) This proposal is a logical progression of the STA. The band segments are limited, so automatic operations are effectively contained. There is no list of authorized stations, so anyone may try automatic operations. Contending with the increased number of stations may lead to additional protocol and modem developments, both of which are good things to do.

5) The proposed band segments reserve the bottom 25 kHz of each WARC band for weak signal and other data communications, protecting them from interference by automated stations.

6) The proposed band segments are each only 25 kHz wide, for a total of 75 kHz.

7) The proposal does not endorse or exclude any particular protocol or methodology of data communications. It is not biased towards packet, AMTOR or any other data mode.

8) The minimal requirement of a transmitter "watchdog" serves to protect the channel from a runaway transmitter in an unattended site. It does not unduly restrict experimentation, nor specify any medium access protocol.

9) It represents a balanced compromise between those that would open all HF spectrum to fully-automatic stations and those that would deprive the Amateur community of a valuable resource already used, directly or indirectly, by thousands of Amateurs on a daily basis through the STA participants.

Conclusion

If you think this proposal is a good idea, please let your ARRL Director know about it. I have sent a copy of it to my Director, Fried Heyn, WA6WZO. I hope an objective and reasoned approach to this problem, with positive suggestions for compromise, will lead to a satisfactory outcome.

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The officers of the Tucson Amateur Packet Radio Corp. are:

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TAPR Membership and
***PSR* Subscription Mailing Address:**
Tucson Amateur Packet Radio Corp.
PO Box 12925
Tucson, AZ 85732-2925
Phone: 602-749-9479
FAX: 602-749-5636
Office Hours: Tuesday - Friday
10:00am - 3:00pm M.S.T.
17:00 - 22:00 UTC

***PSR* Editorial (Only) Address:**
Bob Hansen, N2GDE
PSR Editor
P.O. Box 1902
Elmira, N.Y. 14902-1902
CompuServe: 71121,1007

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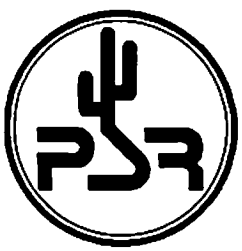

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KA9Q Exp: 01-96
Phil R. Karn
10354 Gold Coast Place
#P
San Diego, CA 92126-3309

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