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In This Issue...

PRESIDENT'S CORNER

Bob Nielsen, W6SWE

Hello again and a happy New Year to you all, from TAPR. We had several back orders for 9600 bps modem kits a few months ago, but they have now all been filled. Sorry for any inconveniences, but we wanted to get the revised boards into our inventory rather than continue with the original version. Anyone with one of the original boards should not worry, however; the modifications in WA7GXD's article in the July *PSR* will give you the same performance as the revised board.

The January issue of *QST* has a nice article on Metcon by Paul Newland, AD7I. The board has been revised slightly, as mentioned in WA7GXD's article in the October *PSR*. Two new accessories, an Analog-to-Digital converter and an elapsed time pulser, are also described in the *QST* article. These will be available from TAPR very soon.

Nominations for the TAPR Board of Directors will remain open for a few more weeks. See the notice elsewhere in this issue.

We are announcing in this issue, the 1993 annual TAPR meeting, which will be held in Tucson on March 6 and 7. Make your plans to attend now.

The ARRL Executive Committee delayed action on the Digital Committee's revised recommendations for rule changes regarding automatic packet operation on the HF bands (see the October *PSR* for details) until the January meeting of the ARRL Board of Directors. If you have not already done so, I urge all ARRL members in the U.S. to contact your Director and let him know your position on this issue.

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TAPR Board of Directors Nominations Remain Open

In the October issue of *PSR*, a call was made for nominations for four vacancies on the TAPR Board of Directors. Three are for 3-year terms and one is for a 2-year term. There were no responses as of the stated deadline of 1 December 1992, so nominations will remain open until January 29, 1993.

In any organization it is necessary to have some sort of leadership. TAPR is run by a board of nine members who select the officers of the organization. The board holds electronic discussions on CompuServe and Internet and meets annually in Tucson prior to the annual membership meeting. This is an important position and we need qualified individuals who are willing to devote a small portion of their time to keep the organization going. Members receive no pay, and are expected to attend the annual Board meeting at their own expense. They do receive satisfaction, however, in knowing that they have contributed to the operation of the premier amateur packet radio organization.

If you are a member of TAPR and are willing to serve in this capacity, we invite you to submit your name in nomination, along with a brief biographical sketch to the TAPR office. It must be received no later than January 29, 1993. Ballots will be sent out by first-class mail immediately thereafter, so that results can be announced prior to the March 5th Board meeting.

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.

METCON Updates

by Lyle Johnson, WA7GXD

The January 1993 issue of *QST* has an excellent article about the METCON system available from TAPR. Two accessory modules mentioned in that article were the analog-to-digital converter (ADC) and the elapsed time pulser (ETP). This article is written to bring you up to date on these modules.

ADC

The ADC module provides eight (8) analog inputs for METCON. It does not use any of the existing eight (8) digital/frequency counter/pulse accumulator inputs of METCON; it adds completely new inputs. Unlike the voltage-to-frequency (VTF) converter module, the ADC shares a common ground with METCON and is therefore unsuitable for measurements where ground must be at different levels. It also is not well-suited for measuring signals that must be brought down long cables.

The ADC module has now been laid out on a PC board and will be available from TAPR soon. The board measures 3.15" by 5" and connects to METCON with a simple plug-in 7-conductor cable. Standard METCON "wire grabber" clamps are provided for all signal inputs. Positive and negative voltages may be measured, and each channel is independently configurable for this purpose.

The default voltage ranges are 0 to +2.55 VDC and -1.28 to +1.27 VDC. The only test equipment needed for checkout and calibration is an accurate voltmeter, preferably digital. 0.5% accuracy is sufficient and most any 3 digit DVM will suffice.

ETP

The elapsed time pulser is useful for measuring things like the number of hours a repeater transmitter has been keyed up, or how many hours a cooling system has been running.

Like the ADC, this module has been tested and laid out on a PC board. The board measurers 2.2 by 4.6 inches.

Contact the TAPR office for availability and price for these METCON accessories.

Satellite Gateway List

Dave Medley, KI6QE

As of 12 January 1992, there are 31 world-wide satellite gateways. The following table lists those stations that are presently included in the AMSAT Gateway Experiment.

Call	BBS	Service Area
North America		
KI6QE	KI6QE.#CENCA.CA.USA.NA	#NOCAL, #CENCA, #SOCA(except San Diego and Orange County), AZ, NV, NM, VE6, VE7, VE8
AA6QN	AA6QN.#SOCA.CA.USA.NA	#SOCA(San Diego and Orange Count area only), MEX
NL7NC	KL7AA.NAK.AK.USA.NA	AK
VE8DX	VE8DX.#BAF.CAN.NA	Baffin Island Only
WA0PTV	WA0PTV.#WNY.NY.USA.NA	NY, NY, RI, VT, MA, ME, CT, VE1, VE2
KF4WQ	KF4WQ.#NCLBT.NC.USA.NA	NC, SC
W0SL	W0SL.MO.USA.NA	KS, MO, IL, IA, CO, AR
NU9H	WV9O.#NWIN.IN.USA.NA	IN, IL(Chicago area), MI, WI, KY, VE3, VE4
NR3U	NR3U.#NCPA.PA.USA.NA	PA, NJ, OH, MD, VA, WV
N0GIB	N0GIB.SD.USA.NA	SD, ND, NE, MN, MT, UT, WY, VE5
WB5EKW	WB5EKW.#WTX.TX.USA.NA	TX, OK
KG4TM	KG4TM.CUB.CAR.NA	Guantanamo, Caribbean area
WH6AQ	WH6AQ.HI.USA.OC	US Possessions Pac area, Guam
W7LUS	W7LUS.FL.USA.NA	FL, Central America
KK4UZ	K4BFT.AL.USA.NA	AL, LA, MS, GA, TN, KY
N7RSN	KB7CNN.WA.USA.NA	WA, OR
Europe		
ON4KVI	ON4KVI.BEL.EU	Belgium, Germany, Austria, Netherlands, Luxemburg
EI6EH	EI6EH.IRE.EU	Ireland, Denmark
EA3RAC	EA3RAC.EAGC.ESP.EU	Spain, Portugal, Italy
OH6SAT	OH6SAT.FIN.EU	Finland, Sweden, Norway
GB7LAN	GB7LAN.#16.GBR.EU	UK
SV8RV	SV8RV.GRC.EU	Eastern Europe, Russia, Ukraine, North Africa, Middle East, India
FC1EBK	FF6KBF.FRPA.FRA.EU	France, Switzerland
Oceania		
ZL2AMD	ZL2AMD.#40.NZL.OC	New Zealand, South Pacific
VK5ZK	VK5ZK.#ADL.#SA.AUS.OC	VK5, VK6, VK8
VK8SO	VK8SO.#NT.AUS.OC	Alice Springs
VK4BBS	VK4BBS.QLD.AUS.OC	VK1, VK2, VK3, VK4, VK7, H44
FO5LQ	FO5LQ.TAH.OC	French Polynesia
Middle East		
4X1AS	4X1RU.ISR.MDLE	Israel
Far East		
JA6FTL	JA6FTL.JNET6.JPN.AS	JA, DU, VS6, BV, YB
Africa		
ZS1ABM	ZS1ABM.ZAF.AF	South Africa
South America		
LU8DYF	LU8DYF.OLIVOS.BA.ARG.SA	CX, CP, OA, CE, PY, YV, LU/LW

The TAPR Deviation Meter Kit

by Lyle Johnson, WA7GXD

(Don't peek at the end of this article, it does have a happy ending!)

The Deviation Meter project has generated a lot of interest since its inception nearly two years ago. Except for the TAPR TNCs themselves, no development has generated a more consistent stream of inquiries.

And, few other projects have generated the level of frustration that this one has!

Background

The DevMtr was first proposed in 1991. The goal was to make a small, self-contained, accurate instrument for measuring the deviation of an FM or FSK transmitter. It was to be very inexpensive as well.

I did a fair amount of research into components, techniques and so forth to achieve this goal.

First-cut PC boards were made by late 1991 and I (foolishly) thought I could get the project done by the 10th Anniversary Annual Meeting. Boy, was I ever wrong!

I chose the Microchip PIC controller chip to be the brains of the DevMtr. It is small (18 pins), cheap (under $4 in quantity) and self contained (including EPROM, RAM and I/O). I had no problem getting the display to run (four digits of seven-segments), reading the pushbutton switches (two), reading the A/D converter or even telling the synthesizer what frequency to tune for.

What I did run into was inconsistent behavior from the chips. Identical program code segments would sometimes run and sometimes not. I got the factory applications engineer on it. (He couldn't figure it out, either!)

I punted on this problem to tackle the larger problem of multiplexing two oscillators onto the same synthesizer and doing it cheaply (nd reliably). I ran into brick walls with locking the 2-meter VCO.

And then there were lots of folks who didn't want a unit that only covered 2-meters. Particularly these days with the popularity of 9600 bps modems, 440 MHz coverage became a must.

Two Breakthroughs

During the Christmas/New Year's holiday season of 1992 (I am writing this on 31 December 1992 - Happy New Year!) I took a week off from work and decided to concentrate on the DevMtr. It was time to produce or admit defeat (I don't like to admit defeat...).

Reinventing Wheels

The first decision I made was to abandon the RF section and use a commercially available, low-cost scanner. I settled on an under $100 model from Radio Shack because it was (a) cheap (b) worked and (c) covered the full 2 meter and 70 cm bands. This choice also provided a couple of other benefits. It is a small desk-top unit, so it includes a case for the DevMtr and a power supply as well.

Another benefit to this approach is that for those folks who already have a receiver, the cost of the DevMtr becomes truly low. And scanners are available at Hamfests all the time, often for under $50.

Finally, TAPR can bulk buy the scanners to reduce the cost for those who want them when they purchase the DevMtr kit. The kit instructions will include detailed, step-by-step information on interfacing the scanner and the DevMtr. And, no, there are no PC board hacks to do. All connections are readily accessible. The only real work that has to be done to the scanner is to cut a hole in the top for the LED display, and perhaps in the back for a serial port connection.

With the RF problem neatly solved, I pressed on to the erratic processor.

Saved by Detroit

After spending three fruitless days, where every success was later marred by inconsistent results, I gave up on the Microchip PIC processor. I then studied the literature available to me on various microcomputer chips. I followed this up with pricing inquiries, availability of product and access to programming tools (both hardware and software).

Rather than bore you with the details, I'll just let you know that I picked the Motorola 68HC11A1 processor. This was originally designed as an automotive part for a major Detroit automaker. It has all the features we need for this project, and it is a joy to work with. The 'HC11 costs about $2 more than the chips it is replacing, but that is a small price to pay for getting the project actually completed!

New Features

The 'HC11 opened the door to an expanded feature set for the DevMtr (I know, I know, creeping elegance strikes again...).

1) Now, rather than having to choose between local control (push buttons and LED display) or serial port control (and the serial port was real iffy with the PIC chip), the DevMtr can offer both features simultaneously.

2) A frequency output corresponding to the measured deviation is provided. This makes it trivial, for example, to connect the DevMtr to a METCON unit at your packet repeater site and get a dump of deviation through METCON. METCON can even command the measurement to be taken if you like.

3) Configurable parameters. The 'HC11 has EEPROM inside. This means that, if you want to use the DevMtr with a radio whose I.F. frequency is different than the Radio Shack scanner, you don't need a special version of DevMtr. You just hook up your computer and tell the DevMtr the IF center frequency and it will do the rest.

Of course, you may have to change some component values in the calibration oscillator, which runs at the radio's I.F., but that usually won't be too tough.

All this isn't too bad for two bucks, no?

And the kicker is that the PC board may be laid out for external memory. The default DevMtr runs entirely from internal EEPROM, but that is only 512 bytes of code space. By adding an external memory socket, you can write your own custom DevMtr application and just plug in the EPROM, move a jumper to tell the unit to boot out of the external memory, and go for it. This also allows us to enhance or redefine the function of the DevMtr at a later date without having to replace the 'HC11 chip. The downside to this is that using an external memory chip will greatly increase the electrical noise from the board. When installing something inside a radio, increased electrical noise is not too desirable...

A Description of the TAPR DevMtr

The FM detector output is passed to positive and negative peak detectors. These have a time constant on the order of a few tens of milliseconds. The positive and negative peak voltages are read by an analog-to-digital converter within the 'HC11 CPU.

The DevMtr includes a calibration oscillator that works at the companion receiver's I.F. At power up and certain intervals thereafter, the DevMtr will enable its calibration oscillator, step through the receiver I.F. and take measurements from the FM detector. The results are stored in a table.

Measured deviation values are then compared to the values stored in the table. This allows the DevMtr to compensate for detector nonlinearity in the receiver. The positive and negative peak values are then averaged to produce the final deviation result. (Deviation is generally expressed in terms of peak deviation, not peak-to-peak. Thus, a "5 kHz" deviation voice transmitter is really 10 kHz peak-to-peak.)

The measured value is then displayed on a two-digit LED display. It is also converted to a square wave whose frequency is 1/10 that of the deviation value (e.g., 290 Hz for a 2.9 kHz reading) to interface to a METCON frequency counter input. It is also available at the DevMtr serial port.

The DevMtr then repeats the cycle of measurement and display of the deviation.

A manual input is provided to initiate calibration as well as to command taking and holding a reading. The measure-and-hold function is provided for METCON applications since METCON may take as long as eight (8) seconds to reliably measure a frequency input.

Summary

The PC board is in layout as this is written. All the major software routines to control the hardware have been written and debugged. Unless a major upset occurs, the DevMtr will be available for sale at the Annual Meeting. It will be a more flexible DevMtr than originally proposed. It will cost a little more and do much more.

I look forward to seeing you and showing this little device off at the TAPR Annual Meeting!

TAPR 1993 Annual Meeting

The Annual Meeting of Tucson Amateur Packet Radio will be held on the weekend of March 6th and 7th, 1993 at the Best Western Inn at the Airport, 7060 S. Tucson Blvd, Tucson, Arizona, adjacent to Tucson International Airport.

In addition to the usual presentations of the latest and greatest developments in packet radio, TAPR will host a workshop on digital signal processing (DSP) for radio amateurs. This workshop, to be conducted by Jon Bloom, KE3Z, ARRL Senior Engineer, is designed to teach the fundamentals of digital signal processing. The target students are radio amateurs who understand the basics of complex (modulated) signals and are familiar with computer programming. The course is intended to bridge the gap between these two subjects, with the result that the student will be able to begin programming DSP applications almost immediately. The student's math background should include algebra and trigonometry.

The topics covered by the presentation include:

- Discrete-time systems
- Sampling theory
- Digital filters
- Signal generation and detection
- Discrete and Fast Fourier Transforms, with applications
- Applications of DSP to Amateur Radio
- Development tools
- Review of available literature

We are expecting to have the traditional "pizza bash" and other informal activities on Friday night, March 5, with the meeting all day Saturday, March 6 and the DSP workshop on Sunday, March 7. Registration for the Saturday meeting is $15.00, including a buffet luncheon. There will also be a small registration fee for the DSP workshop on Sunday, but the amount has not been determined by the PSR deadline. A steak dinner on Saturday night will be available for $13.95. TAPR will have a hospitality suite where you can gather informally, join TAPR, or purchase kits and software. The meetings will run from 9:00 a.m. to 5:00 p.m. both days.

A block of rooms has been reserved at the special rate of $53.00 per night, single or double occupancy, including full American breakfast and happy hour reception. For reservations, call the Inn at the Airport at 1-800-772-3847, or in Arizona at 602-746-0271, FAX 602-889-7391 (mention TAPR to get this rate).

If you are planning to attend or have a project you would like to present at the meeting, please call or write the TAPR office and let us know. We also would like to know if you are planning to attend the DSP workshop, so sufficient materials will be available. To have your paper included in the printed proceedings of the meeting, camera-ready copy should be submitted to TAPR no later than February 19, 1993. For further information, contact the TAPR office.

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. **This material is updated from the July, 1992 *PSR* to reflect only the new TAPR 9600 bps modem configuration.**

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.

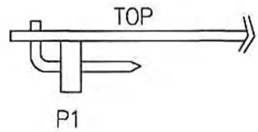
☐ U23:

( ) Install the LM7805 voltage regulator at U23 on the modem board. The regulator should lie 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.

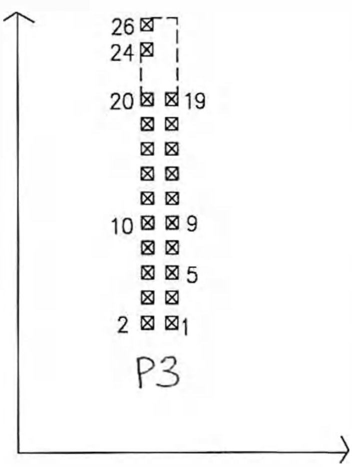


( ) Check the clipped leads from R1-R6 and C1-C9 and verify that they are flush, or nearly flush, with the PC board. Clip and reheat the connections as necessary. This will ensure proper fit of the mating connector, attached later.

( ) Solder the 5 pins of the connector to the top of the PC board.

☐ P3:

Study the illustration below before mounting P3.



( ) 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 P3. 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 P3.

( ) Solder this connector to pins 24 and 26 of location P3.

☐ Jumpers:

( ) Be sure you have NO shunts installed at JP2, JP3, JP4 or JP5.

☐ Options:

( ) The CLOCK option, if installed, must be disabled by leaving JP2 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 PK232 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.

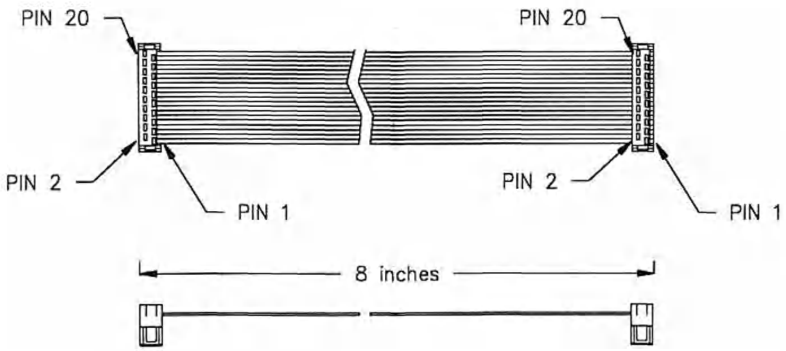
NOTE: Skip to Modem Integration Using TAPR PK232MBX Installation Kit if you are using the TAPR PK232MBX Installation kit.

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 on next page.)

( ) Fabricate an 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.



( ) 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 P3 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 JP6 on the modem. The single wire in this connector shell connects to the pin of JP6 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 P3 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 JP6 on the 9600 modem. The single wire connects to the pin on JP6 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 P3, with pin 1 near the silkscreen legend "P3".

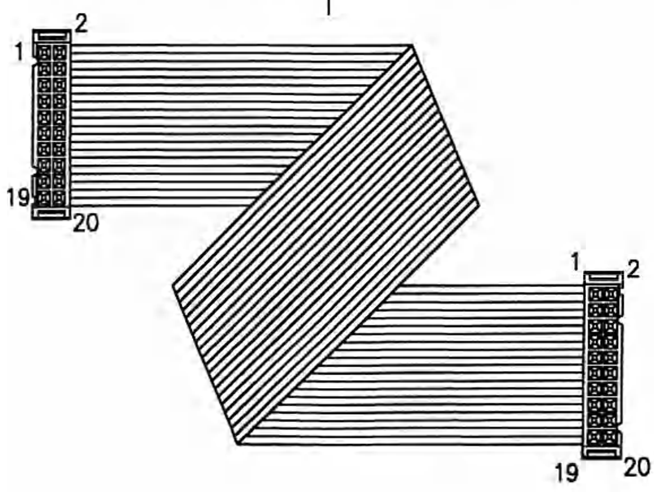
( ) Remove any jumpers from the Modem Disconnect header P1.

( ) 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 LM393
( ) U5 TL082
( ) 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 R11 on the modem board to full CCW, then 1/8 turn CW.

( ) Preset R21 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 R11 compensation and R21 output level for the correct transmitter deviation.

Consult the manual from Mike Curtis, WD6EHR, for general radio interfacing information. *[Published in PSR #45, January 1992]*

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

Alinco DR-1200T at 9600 bps

Ramon, KP4TR

[Reprinted from the TPRS Quarterly Report, Vol. 9, Issue #1, published by the Texas Packet Radio Society.]

If anyone is interested in modifying the Alinco DR-1200 Dataradio for 9600 bps packet use, here is the information.

I recently purchased this radio in the hope of modifying it for 9600 bps packet use, as the advertisements mention. Being true FM, not phase modulated, I thought this radio would be a true performer at 9600 bps. What I didn't know is that there is no information in the manual on how to hook it up to the G3RUH modem.

Luckily, I came across the May 1992 issue of *CQ Amateur Radio*, where Buck Rogers, K4ABT, describes how to modify the Alinco DR-110T for 9600 bps use. I was almost sure the Dataradio was nothing more than a DR-110T with no microphone, an LED panel, 25W output, and a catchy name. Comparing the insides of the two radios showed that they are the same.

To inject the TX audio is a bit difficult. The VCO unit is enclosed in a solid metal case, with the PC board hidden away. When opening the unit, the VCO is located on the left side, just behind the VFO knob. You must unsolder the VCO unit out of the main board. It is held by its case at four points. Under the VCO unit are 10 pin connectors. These must also be unsoldered. Using a Radio Shack desoldering iron, it was easy to remove.

Once you remove the VCO unit, look at pin 7 on the solder side. This pin will go all the way to a surface-mounted resistor, next to it is a varactor diode. Solder a 10K (1/4 watt) resistor to the junction of the resistor and the diode. The diode is surface-mount, so be very careful. Then connect the TX audio cable to the other end of the 10K resistor. K4ABT suggests that you use a 4uF non-polarized capacitor after the resistor, but I didn't and all worked OK.

To get the RX audio from the discriminator, locate a PC board sticking up next to the lithium battery, behind the volume control. You can see at the top, a 16-pin surface-mount chip labeled MC3361F. Pin 9 of this chip is the discriminator output. It is also very tiny, so be careful.

As with all 9600 bps work, **use shielded audio coaxial cables!**

Two TNCs on One Radio

Rich Place, WB2JLR

[Reprinted from the NEDA Quarterly, Vol. 3, Number 2, published by the North East Digital Association.]

Here is a simple circuit that will let you interface your own personal packet station to the node in your home. I use it for interfacing my packet station, WB2JLR and WB2JLR-4 (PMS) to the CANDGA (Canandagua, New York) node. It lets me monitor 144.99, the user port frequency, without requiring a second radio. I can also connect directly to anyone on 144.99, as well as connecting to the node.

How it Works

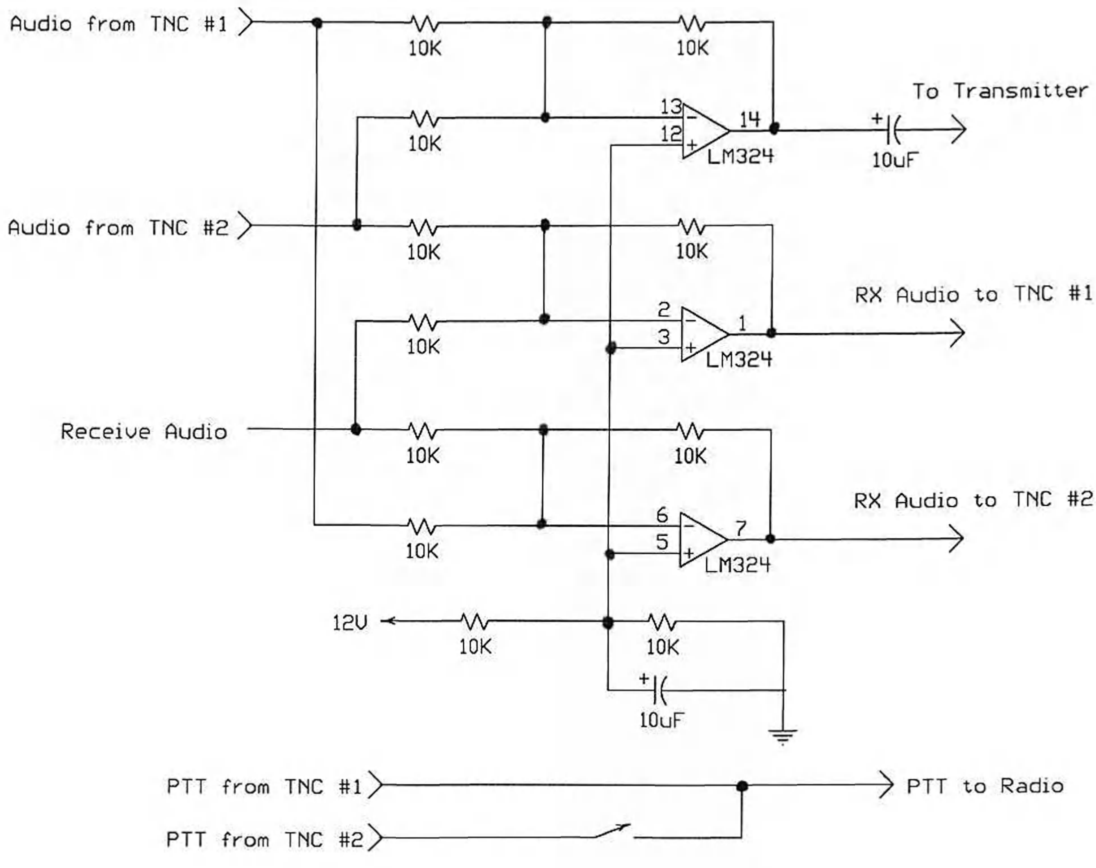
The circuit uses a quad op-amp, which could be any garden variety part such as an LM324 or TL084. Three sections of the op-amp are used as summing circuits to combine two audio sources into one. TNC #1 is the user port for the node, and TNC #2 is another TNC for your personal use, and possibly a personal mailbox. The transmit audio from each of the TNCs is summed by the first section of the op-amp to provide a combined audio signal to the 2-meter radio. In this way, either TNC can transmit out on the user port frequency. The second op-amp section combines the receiver audio with the transmit audio from TNC #2, and feeds it to TNC #1. This allows TNC #1 (the user port) to hear both the 2-meter signal and the signal from your own TNC. The third op-amp section combines the receiver audio with the transmit audio from TNC #1, and feeds it to TNC #2. This makes it so that TNC #2 (your station) can hear both signals coming in on 2-meters and from the node.

An added feature is the ability to control the key line. Normally a switch connects the PTT line from the two TNCs in parallel so that either of them can key the radio. It is possible to open the switch so that transmitted signals from the personal station, to the node, do not key the radio and go out over the air. This may be desired to provide privacy when sysoping the node.

Notes

1. Each circuit has unit gain in all directions. The feedback resistors on the op-amps could be made variable if gain adjustment was desired.

2. It may be necessary to add series capacitors in all of the input and output lines, depending upon the TNC and radio used. If the units are already AC coupled, then no additional capacitors are needed.



Youth Activities

Travis Wise, KB8FOU

[Reprinted from Dedicated Link, Vol. 1, No. 1, published by the Northwest Amateur Packet Radio Association.]

This information is copied from *The Packet Racket*, which is published by the Young Amateur Radio Operators Club (YAROC), and distributed to all of the United States via packet. The YAROC net is held at 1700z on 14.28 MHz, and at 1730z on 28.375 MHz.

Anyone of any age is encouraged to submit material for the newsletter. Inputs or comments should be sent to me: KB8FOU @ N6IIU.#NOCAL.CA.

Schools in need of packet pals

These school groups are looking for hams to communicate with their students via packet.

- A. S. Leary Elementary School Amateur Radio Club, WA3TQJ @ WA3TSW.#EPA.PA.
- Glendale Elementary School in Tonawanda, NY. Doug Smith, 5th grade teacher at KB2FID @ WB8JUI.#NCOH.NY.USA.
- Clinton Middle School in Clinton, WI, at WB9EZY @ WA9AJW.WI.USA.
- Omak Middle School in Omak, WA. Rob, KD7H @ N7HHU.WA.USA.
- Tod, N6WYJ, is setting up a station in his 8th grade science class in Northern CA; at N6WYJ @ WA6NWE.#NOCAL.CA.USA, or through Gerry, WA6E @ WA6NWE.#NOCAL.CA.USA.
- Madison Senior High School, Trotwood, Ohio; Tim, KB8DDG @ W8BI.#DAY.OH.USA
- Bill, VE5EE @ VE5AGA.CAN, runs VE5SAT at the Kitchener Community School, Regina, Saskatchewan, Canada.
- Pam, N2DGD, at the L. P. Quinn School in Tupper Lake, NY, can be reached at WA2EWY @ KA2JXI.NY.USA.
- N0ANK @ WA0RGV.IA.USA is a 9th grade science group at North Linn Senior High near Troy Mills, Indiana.

Please send updates or corrections to `KB8FOU@N6IIU.#NOCAL.CA.USA`

Packet TCP/IP Address Coordinators as of 15 December 1992

Send corrections and updates to brian@ucsd.edu.

Note: the people listed here have volunteered to issue IP addresses for their areas. They are not paid to do this service; please understand that they are perfectly at ease to deal with coordination responses at a reasonably lower priority than the things that matter more, such as job and family. Please be patient when requesting an address.

44.002	Bob Meyer	K6RTV	Calif: Sacramento
44.004	Douglas Thom	N6OYU	Calif: Silicon Valley - San Francisco
44.006	Don Jacob	WB5EKU	Calif: Santa Barbara/Ventura
44.008	Brian Kantor	WB6CYT	Calif: San Diego
44.010	Terry Neal	AA6TN	Calif: Orange County
44.012	Steven King	KD7RO	Eastern Washington,Idaho
44.014	John Shalamskas	KJ9U	Hawaii & Pacific Islands
44.016	Jeff Angus	WA6FWI	Calif: Los Angeles - S F Valley
44.017	Dana Myers	KK6JQ	Calif: Antelope Valley/Kern County
44.018	Geoffrey Joy	KE6QH	Calif: San Bernardino & Riverside
44.020	Fred Schneider	K0YUM	Colorado: Northeast
44.022	John Stannard	KL7JL	Alaska
44.024	Dennis Goodwin	KB7DZ	Washington state: Western (Puget Sound)
44.026	Ron Henderson	WA7TAS	Oregon
44.028	Don Adkins	KD5QN	Texas: North
44.030	J Gary Bender	WS5N	New Mexico
44.032	Bdale Garbee	N3EUA	Colorado: Southeast
44.034	Jeff Pierce	WD4NMQ	Tennesee
44.036	Doug Drye	KD4NC	Georgia
44.038	Mike Abbott	N4QXV	South Carolina
44.040	Jeff Jacobsen	WA7MBL	Utah
44.042	Phil Akers	WA4DDE	Mississippi
44.044	Bob Wilson	KA1XN	Massachusetts: western
44.046	William Simmons	WB0ROT	Missouri
44.048	Jacques Kubley	KA9FJS	Indiana
44.050	Ron Breitwisch	KC0OX	Iowa
44.052	Gary Grebus	K8LT	New Hampshire
44.054	Ralph Stetson	KD1R	Vermont
44.056	Don Hughes	KA1MF	Eastern&Central Mass
44.058	Rich Clemens	KB8AOB	West Virginia
44.060	Howard Leadmon	WB3FFV	Maryland
44.062	Jim DeArras	WA4ONG	Virginia
44.062	Jon Gefaell	KD4CQY	Virginia (Charlottesville Area)
44.064	Dave Trulli	NN2Z	New Jersey: northern
44.065	Bob Applegate	WA2ZZX	New Jersey: southern
44.066	John DeGood	NU3E	Delaware
44.068.1-32	Bob Foxworth	K2EUH	New York: NYC & Long Island
44.068.64+	Bob Bellini	N2IGU	New York: ENY
44.069	Paul Gerwitz	WA2WPI	New York: WNY
44.070	Gary Sanders	N8EMR	Ohio
44.072	Ken Stritzel	WA9AEK	Chicago - North Ill.
44.073	Chuck Henderson	WB9UUS	South/Central Ill.
44.074	James Curran	KA4OJN	North Carolina (east)
44.075	Charles Layno	WB4WOR	North Carolina (west)
44.076	Kurt Freiberger	WB5BBW	Texas: south
44.077	Rod Huckabay	KA5EJX	Texas: west
44.078	Joe Buswell	K5JB	Oklahoma
44.080	John Gayman	WA3WBU	Pennsylvania: eastern
44.082	Steven Elwood	N7GXP	Montana
44.084	Bob Ludtke	K9MWM	Colorado: Western
44.086	Reid Fletcher	WB7CJO	Wyoming
44.088	Jon Bloom	KE3Z	Connecticut
44.090	Mike Nickolaus	NF0N	Nebraska
44.092	Pat Davis	KD9UU	Wisconsin, upper peninsula Michigan
44.094	Gary Sharp	WD0HEB	Minnesota
44.096	Don Bennett	K4NGC	District of Columbia
44.098	Bruce ??	WD4HIM	Florida

44.100	Richard Elling	KB4HB	Alabama
44.102	Jeff King	WB8WKA	Michigan (lower peninsula)
44.104	Charles Greene	W1CG	Rhode Island
44.106	Tyler Barnett	N4TY	Kentucky
44.108	James Dugal	N5KNX	Louisiana
44.110	Richard Duncan	WD5B	Arkansas
44.112	Bob Hoffman	N3CVL	Pennsylvania: western
44.114	Steven Elwood	N7GXP	N&S Dakota
44.116	Tom Kloos	WS7S	Oregon: NW&Portland,Vancouver WA
44.118	Jon Andrews	WA2YVL	Maine
44.120	unassigned		
44.122	Dale Puckett	K0HYD	Kansas
44.124	David Dodell	WB7TPY	Arizona
44.125.0-126	Earl Petersen	KF7TI	Southern Nevada
44.125.128-254	Bill Healy	N8KHN	Northern Nevada
44.126	Karl Wagner	KP4QG	Puerto Rico
44.128	TEST	reserved for testing.	

International subnet coordinators by country

44.129	Japan	JG1SLY	Tak Kushida,
		JH3XCU	Joly Kanbayashi
44.130	Germany	DL4TA	Ralf D Kloth
44.131	United Kingdom	G6PWY	Chris Baron
44.132	Indonesia	YB1BG	Robby Soebiakto
44.133	Spain	EA4DQX	Jose Antonio Garcia. Madrid. (EA4DQX @ EA4DQX)
44.134	Italy	I2KFX	
44.135	Canada	VE3GYQ	David Toth
44.136	Australia	VK2ZXQ	John Tanner
44.137	Holland	PA0GRI	Gerard Van Der Grinten
44.138	Israel	4X1GP	Peleg Lapid
44.139	Finland	OH1MQK	Matti Aarnio
44.140	Sweden	SM0IES	Lennart
44.141	Norway	LA4JL	Per Eotang
44.142	Switzerland	HB9CAT	Marco Zollinger
44.143	Austria	OE1KDA	Krzysztof Dabrowski
44.144	Belgium	ON7LE	
44.145	Denmark	OZ1EUI	
44.146	Phillipines	DU1UJ	Eddie Manolo
44.147	New Zealand		
44.148	Ecuador	HC5K	Ted
44.149	Hong Kong	VS6EL	
44.150	Slovenija	S53FK	Iztok Saje
44.151	France	FC1BQP	Pierre-Francois Monet
44.152	Venezuela	OA4KO/YV5	Luis Suarez
44.153	Argentina	LU7ABF	Pedro Converso
44.154	Greece	SV1UY	Demetre Valaris
44.155	Ireland	EI9GL	Paul Healy
44.156	Hungary	HA5DI	Bela Markus
44.157	Chile	CE6EZB	Raul Burgos
44.158	Portugal	CT1DIA	Artur Gomes
44.159	Thailand	HS1JC	Kunchit Charmaraman
44.160	South Africa	ZS6BHD	John
44.161	Luxembourg	LX1YZ	Erny Tontlinger
44.162	Cyprus	5B4TX	C. Costis
44.163	Central America	TI3DJT	Chuck Hast
44.164	Surinam	PZ2AC	Otto Morroy
44.165	Poland	SP5WCA	Andrzej K. Brandt
44.166	Korea	HL9TG	Gary ?
44.167	India	VU2LBW	Lakshman ("Lucky") Bijanki
44.168	Taiwan	BV5AF	Bolon
44.169	Nigeria	5N0OBA	Kunle
44.170	Croatia	??	Sinisa Novosel
44.171	Serbia	(nobody volunteered yet)	
44.172	Sri Lanka	4S7EF	Ekendra
44.173	Mexico	XE????	(no one has volunteered yet)
44.174	Brazil	PP5AQ	Luiz F. Catalan
44.175	Cuba	CO2JA	Jose Amador
44.193	Outer Space-AMSAT	W3IWI	Tom Clark

California/Chicago Wormhole Update

Carl Bergstedt, K9VXW

[This originally appeared in The CAPRA Beacon, November 1992, published by the Chicago Area Packet Radio Association.]

The wormhole available in the Chicago metro area is a packet network link, via Net/Rom protocol, to a point in Simi Valley, California. The gateway is located at Naperville, IL, a western suburb of Chicago, but it can be accessed from many LANs in Illinois that are interconnected. The packet traffic travels over a leased data line made availiable to us by MICOM, a communications company that has a sales office about a mile away from the Naperville node location. We're using a 1.2GHz low power link with regular TNCs and Net/Rom chips at both ends in Illinois. The gateway node ID in Illinois is #ILCA:N9ATM-7; in Simi Valley, CA, it is #CASW:WB6WEY-7.

The California node uses G8BPQ software and has ports to Chicago and St. Louis, as well as local LANs. It is currently easier to get to the St. Louis area by going through California, than to try to connect via existing VHF/UHF links.

At the Chicago end of the circuit, you can connect to the California end by typing:

C #CASW

when you are uplinked to any network node in the Chicago metro area. You can tell if your node is networked by looking at the node list using the "n *" command. If you use NOS and telnet into any one of the 6 IP switches,
ILAUR:N4PCR-1,
ILGUR:W9IIUP-1,
ILLYL:WA9AEK-1,
ILNAP:K9VXW-1,
ILPAL:N9GBH-1, or
ILWIN:KK9H-1, you can access the wormhole in a similar fashion after the session is established.

Converting the IC-471A for 9600 Baud

Don Lemke, WB9MJN
WB9MJN@N9HSI.IL

[Reprinted from the Spring 1992 (Vol. 3 #2) NEDA Quarterly, published by the NorthEast Digital Association.]

This document details the modifications necessary to operate 9600 baud .5GFSK data modulation through an Icom IC-471A transceiver. This is the modulation that was originally developed for ham radio usage by Steve Goode, K9NG, and also employed in the G3RUH and TEX-NET modems.

Modulator

The IC-471A has a "direct FM" modulator. This modulator uses a varactor, D4, on the main circuit board. This modification patches the 9600 baud FSK transmit audio into the modulator circuit in a way that transmit audio and the FSK audio have minimal distortion. As with any 9600 baud modification to a "direct FM" modulator, readjustment of the audio deviation is recommended, after the modification is completed.

Step 1: Replace C17 with a .47 uF, 25 w.v. non-polarized capacitor. The capacitor should be physically appropriate in size. I used one that had a .3 inch lead spacing, was about .4 inches square, and one-eigth inch thick.

Step 2: Attach on the bottom of the circuit board, a 3.3K ohm, 1/4 watt resistor to the circuit board trace between R30 and C17. Leave the far end free.

Step 3: Attach a .001 uF, 50 w.v. disc ceramic capacitor to a ground trace near the free end of the 3.3K ohm resistor. Twist the free ends of the resistor and capacitor together.

Step 4: Attach a piece of small coax to ground and to the junction of the resistor and capacitor. I used RG-178 coax. The center conductor gets attached to the components. Insulate the connections with tape, so that when the circuit board is re-installed, the connections will not short to the chassis or the board.

Step 5: Solder the other end of the coax to Molex socket terminals (#02-06-1103). Insert the center conductor terminal into the Auxiliary connector position number 9, and the ground into Auxiliary connector position number 17. This completes the modulator modification.

TX/RX Turnaround Time Improvement

The stock IC-471A applies power to its transceiver audio stages only during transmit. Thus, when the transmitter comes on, RC time constants in these circuits cause the transmitter to drift for approximately 1 second. To cure this problem, this modification reroutes the DC power for Q1 to a filtered +8v point, and enables the IC1 stages continuously. This modification is to the IC-471A main circuit board.

Step 1: Cut free the long lead of R26, which should be towards D3.

Step 2: Solder a piece of jumper wire onto the free lead of R26, and insulate the connection with heat shrink tubing.

Step 3: Solder the far side of the jumper wire to IC1, pin 8.

Step 4: Solder another piece of jumper wire to IC1, pin 8 and solder the far end of this wire to the junction of D1 and R4. This completes the TX/RX turnaround time improvement modification.

Receiver FSK Audio

The IC-471A uses a MC3357P receiver IF chip. The discriminator output of this chip has a low enough impedance that it can directly drive a shielded wire without the signal being distorted. In addition, this audio signal is provided on an unused header, J14 on the main circuit board, which is easily used to connect the signal to the rear panel auxiliary connector.

Step 1: Obtain a .1 inch spacing, 2-position, socket which will fit onto J14, and solder subminiature coax to the socket, so that the center conductor socket will mate with the J14 pin on the R214 side of J14. The ground lead is soldered to the other position of the socket. The Molex catalog shows a part number 22-01-2026 for the connector housing, and it requires two type 4809C terminal inserts.

Step 2: Solder a Molex socket teminal (#02-06-1103) onto the other end of the coax, ground lead.

Step 3: Solder a .47uF, 25 w.v. capacitor to another Molex socket teminal. Connect the coax center conductor to the other lead of the .47 uF capacitor, and insulate this connection with heat shrink tubing.

Step 4: Insert the coax ground conductor terminal into the auxiliary connector pin 15, and the capacitor terminal into pin 11.

This completes the receiver FSK audio modification. Bringing it all together: The Molex part number for the auxiliary connector mate is 03-06-2241, and the pin terminal part number is 02-06-2103. The connector has 24 pin terminal positions, so if you plan on using all these positions someday, order 24 of the 02-06-2103 part number.

Comments on Filters

The IC471A has the ideal receiver IF bandwidth for 9600 baud operation. As part of this project, I measured the receiver IF bandwidth to be 14 KC at -6dB. The 455 KC filter part number spec. is 15 KC bandwidth at -6 dB. The IC471A also has a crystal filter for the transmitted signal. On the RF.YGR circuit board, FL2, a part number 70M15A, is part of the transmitter. The part number indicates that the filter is 15KC wide at 6 dB down, I believe. The effect of this filter is to reduce the single bit transitions of the K9NG modulation by a small amount, and time delay distort the signal slightly. All I can report is that this is not causing a big problem here on the terrestrial 9600 baud LAN, where other users have TEKK and IC-475A radios. The IC-475A has this same filtering. I am looking to replace this filter with a 20 to 25 KC wide (at 6 Db down) filter. In a complete transmitter to receiver path, the signal passes two time delay distorting filters, of the best bandwidth for detection, for these type of filters. This de-optimizes things some. This report will be sent through the IC-471A, 9600 baud station here, to the network, illustrating that the effect is small.

IC-471A Problems

This IC-471A was used when I obtained it. Looking at the manual munications. Yes, you may actually need to learn, and do some hardware electronics to do this.

Concluding Remarks

With these modifications, the IC-471A makes a nearly ideal 440 band 9600 baud packet radio system. I've used mine on UO-14 as well as over our 9600 baud terrestrial LAN. A Ping test through N4PCR-0/1, which uses a TEKK radio with preamp, and one of the CELLNET 56 KB full-duplex radios, to the K9VXW-1 node, where the other CELLNET prototype radio is, passed 98 of 100 kilobyte packets with the NOS Window = 2048, MSS = 216. I hope this article is helpful, and encourages some of you to take the plunge and try 9600 baud packet radio.

All commercial use of the information developed by the author in this article is reserved. Like somebody said, "I'm not making money at this, and I don't want you to make money off me either." In other words, you are free to do these modifications for yourself, or have somebody do them for you, if he or she gets nothing in return for it.

Notes from the TAPR Office

"Lives of great men all remind us-
We can make our lives sublime
And departing, leave behind us
Footprints in the sands of time."

With sadness I report that Peter Eaton's dad, James Eaton, passed on. I was priviledged to represent TAPR at the memorial service. Mr. Eaton is a man that was loved by us, and will be missed. Another loss is Jay Nugent's mother, who went on in October. These friends of TAPR did our hobby a great benefit... They produced outstanding sons!

The new kits, and the articles printed about them, have generated a lot of interest. Your TAPR office has been very busy. So many of you have contributed so much! I have been thinking of Bob Hansen lately, and of the quality work he has so conscientiously continued to give TAPR as our *PSR* editor. He has made us all look so good! In the *PSR* 47 issue, we submitted hand drawings of technical instructions to him, and he took the time and effort to make them look professional. Thank you, Bob, for your excellent work.

When we put out a new kit, there are always questions to be answered, new interfacing to be accomplished. Bob Donnell, KD7NM, of AEA worked many hours helping to iron out the changes in the interfacing of our new 9600 baud kit with the newest PK232MBX. Those of you with REV 1 9600 bps modem kits may write the office for updated interfacing instructions for the PK232MBX (the '232 that has no daughterboard for the MBX function).

Hartley Gardner, W1OQ, and the Arizona Network Intertie Group contributed a paper on how to put the UHF MICOR radio on 9600 baud.

Don Werts, N7NKJ, did all of us a huge favor by giving us the parts list for the TNC-2, listing those parts needed for 9600 baud only. A copy of this will be included in the future TNC-2 bare board kits. Thank you, Don!

Paul Newland, AD7I, and Lyle Johnson, WA7GXD, continue to do AMAZING things. If there were more people like you two in this world it would be a much better place to be! How can we thank you enough!? With them I don't have to state what they've done... this newsletter's contents tell it all.

Bob Nielsen, W6SWE, has done a fantastic job of running TAPR these last two years. If your copy of *PSR* is a bit wet, it's from my tears, as I hear that he will not continue... Bob, are you SURE that you can't do another year!?

I would like to end this in a positive note. Babies! I received a picture of a gorgeous little girl. Guess whose?! Steve, K9NG, and Lynn Goode's! Congratulations. (That's to Sarah Jean, the baby, for choosing parents so wisely.) P.S. Also congratulations to the proud Grandpa, Howard Goode, W9DYP.

Talk with you later, hopefully at the annual meeting on March 6 and 7.

For TAPR,

Heather Johnson, N7DZU