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Non-Profit Research and Development Corporation

# 232MBX

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## 232MBX Assembly Manual

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### **INTRODUCTION**

This kit allows owners of a PK-232MBX with the "new" motherboard to install the TAPR 9600 bps modem with complete ease.

**NOTE:** Owners of earlier PK232s with the MBX daughtercard may use the installation kit, but the prewired harness for the radio interface, power and control wires will not be compatible. These cables must be fabricated and will involve some minor work on the motherboard itself.

The kit consists of two pre-wired harnesses, metal spacers, and screws. The metal spacers and screws are used to mount the TAPR 9600bps modem to the PK-232MBX motherboard by picking up existing mounting studs inside the PK-232MBX. The first pre-wired harness is used to connect the TAPR 9600bps modem to the TAPR PK-232 Modem Disconnect Upgrade. The harness simply plugs into the 9600bps modem at one end and the modem disconnect at the other end. This harness can be used with all styles of the PK-232. The second harness provides connections to all the other points required on the "new" PK-232MBX which does not have a daughterboard. The second harness is only suitable for the PK-232MBX units of the new style.

Installation becomes a simple "plug and play" operation, with no wiring harnesses to fabricate, no hardware to locate, and no holes to drill!

### **Interfacing the TAPR 9600 bps Modem to an AEA PK232MBX**

by Lyle Johnson, WA7GXD

Portions from TAPR 9600 bps Modem Manual.

**All references in this printing referring to 'in this manual' refer to the TAPR 9600 bps Modem Manual.**

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 (without daughterboard)

### 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 harness 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 PK232 installation.

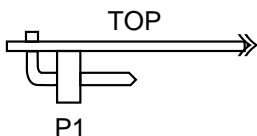
##### **U23**

- ( ) Install the LM7805 voltage regulator at U23 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.

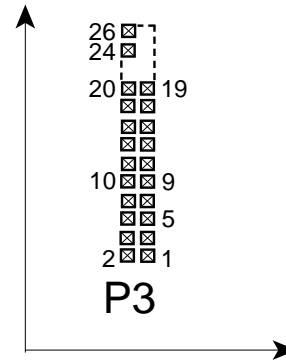
- ( ) Place the 5-pin right angle connector on the bottom (solder) side of the modem PC board. It should rest on the bottom surface of the board. The pins from the connector should "point" towards the PC board, not away from it. See illustration below.



- ( ) 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.

##### **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.

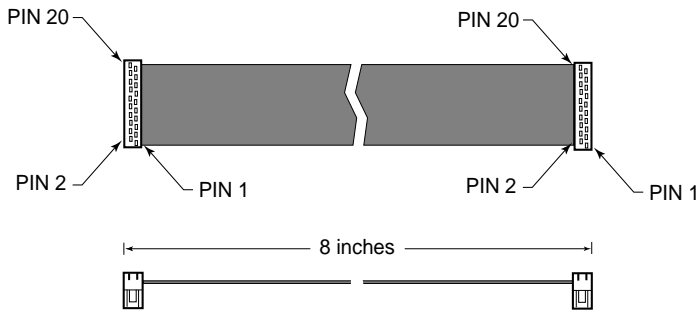
#### **PK232 Preparation**

- ( ) Remove the case from the PK232 by removing the six (6) screws that fasten it together.
- ( ) If you have not already done so, fabricate, install and checkout 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 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.



- ( ) Fabricate a 8" (20 cm) long single-wire cable using 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:
 

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 connector 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 just vacated.
- ( ) 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 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 shall 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:
 

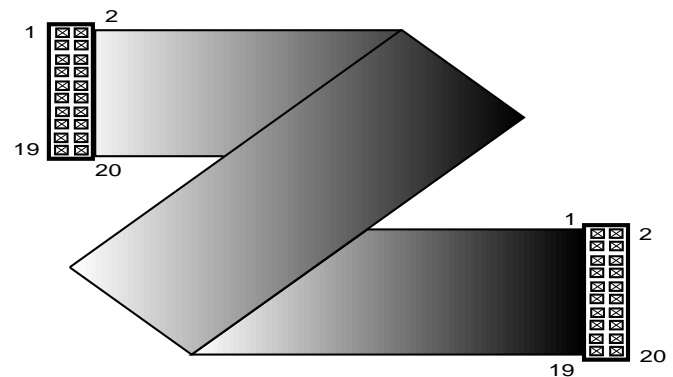
Brown	JP4 end "A"
Red	JP5 end "A"
Orange	J13 pin 9
Yellow	J13 pin 9
Green	JP8 center pin

**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 the 3/4" #6 splacers and 7/8" 6-32 screws, install the modem on the PK-232 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 mother board.
- ( ) 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 silkscreened dot on the board.
- ( ) 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.

**Proceed to Further Steps - All PK232MBX Installations**

Remove power from the modem and install the following ICs:

- ( ) U4 LM393
- ( ) U5 TL082
- ( ) 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 74HC14
- ( ) 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 verify that the PK232 signs on normally.

**NOTE:** If the PK232 seems sluggish, or takes a long time to reset, or never resets and signs one, check your power supply voltage to the PK232. 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 PK232 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 PK232 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.

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