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PK-232 Disc Header Assembly Manual

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Introduction

The TAPR PK-232 Modem Disconnect Upgrade is a kit designed to bring to owners of the AEA PK-232™ and Heathkit HK-232™ a standard TAPR external modem disconnect as well as ease the installation of the TAPR DCD State Machine Upgrade kit.

The TAPR modem disconnect allows plug-in connection of external modems, such as the TAPR DSP-93, 9600 baud, and PSK modems for various digital applications. In addition, the PK-232 Modem Disconnect Upgrade allows easy connection to the TAPR DCD State Machine upgrade for the PK-232.

Reliable DCD information is a necessity for proper multiple user access on today's crowded packet channels. See the paper "Can We Continue to Ignore Level One?" by N7CL in the **Proceedings of the 7th ARRL Computer Networking Conference** for details (available from ARRL, 225 Main Street, Newington CT 06111).

Construction and check-out of the PK-232 Modem Disconnect Upgrade will probably take you only a short evening. Warm up your soldering iron, take your time, and enjoy.

NOTE: Heathkit and HK-232 are trademarks of the Heath Company. AEA & PK-232 are trademarks of Advanced Electronic Applications, Inc.

Parts List

Please check the enclosed parts with this list. Check off each item in the space () provided. The number following the check-off space is the quantity required.

Parts Sorting

As you sort the parts, you may find it convenient to place them in a muffin tin, egg carton or other compartmentalized container for ready access.

- Resistor, 1/4 watt, 5%
 - () 1 330 ohm (orange-orange-brown-gold)
- Socket
 - () 1 40-pin Socket
- Connectors
 - () 6 Jumper, Push-On
 - () 1 2-pin male header
 - () 1 20-pin male header
 - () 1 40-pin male header
- Other
 - () 1 Printer Circuit Board
 - () 1 Assembly Manual

CONSTRUCTION

You are now ready to begin construction of the PK-232 Modem Disconnect Upgrade. Use a temperature-controlled, fine-tipped soldering iron and good quality 60/40 or 63/37 rosin-core solder for construction. Follow standard construction practices when building the unit.

IC Sockets

NOTE: If any socket pins are bent, carefully straighten them with a pair of long-nose pliers before assembly. Some types of IC sockets have crimps in the pins to hold them in place when automatic wave-soldering is performed. These sockets may be tricky to install if you are not familiar with them. If your kit contains these sockets, you may want to straighten the pins before attempting to insert them into the PC board.

When installing IC sockets, double check to ensure that the socket is seated properly against the board with the notch, beveled corner or "1" towards the silkscreened reference (U1, U2, etc.). Be sure that all IC socket pins are showing on the solder side of the board. Next, tack-solder two diagonally opposite corners first (such as pins 1 and 8 on a 14-pin socket).

Then solder the remaining pins of that socket before proceeding to the next one.

NOTE: Take care now to avoid solder bridges!

If you find a socket is difficult to install, remove it and double-check for a bent pin.

Install the following IC sockets.

- () U7 40-pin

Now check your work. All leads should be soldered. There should be no solder bridges (a blob of solder that shorts two adjacent soldered connections) or cold (gray and/or grainy looking) solder connections. You should have no IC sockets remaining.

- () OK so far.

Resistors

Resistors lie flat on the PC board and have a lead spacing of 0.5". You may wish to use a lead former to preform the resistor leads for neatest appearance.

Install the following 5% resistors on the board.

- () R1 330 ohm (orange-orange-brown-gold)

WARNING! Be careful when clipping leads, as they have a tendency to fly towards your eyes! Take appropriate precautions (grasp leads and wear eye protection).

- () Solder and clip the leads (2 total)

NOTE: When installing jumper strips, be sure that the shorter pins are soldered to the PC board and the longer pins stick up.

WARNING! Don't grip the jumpers with your fingers while soldering. The pins get very hot!

- () JMP Install a 2-pin male header.
- () P1 Install a 20-pin male header

Install push-on jumpers at P1 across the following pin-pairs.

NOTE: Pins on connector P1 are not numbered the same as IC pins. See the parts placement diagram (end of document) for the numbering of P1.

- () Pins 1 and 2
- () Pins 5 and 6
- () Pins 13 and 14
- () Pins 17 and 18
- () Pins 19 and 20

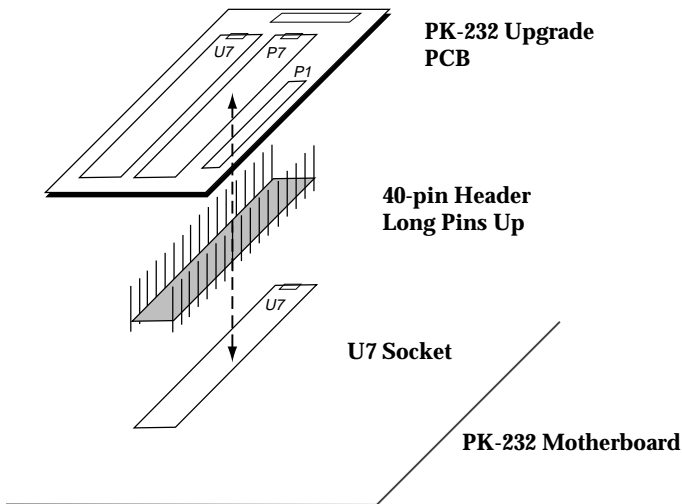
Now you must get your PK-232 or HK-232 in which you plan on installing the upgrade. Open the case and:

- () If you unit has the **PakMail** daughter board, remove it. This is done by removing the screws which hold it in place and carefully lifting it from the motherboard.
- () Trim the excess leads lengths from the IC socket at U8 on the PakMail daughter board as flush to the bottom of the daughter board as practical.

On the PK-232 main PC board (motherboard):

- () Locate the Z8530 SCC IC (U7)
- () Observing static precautions, remove U7 from its socket and set it aside
- () Locate crystal Y2 (2.4576 Mhz) between U8 and U16.
- () If this crystal is standing up, it must be redressed to lay down. This can be done by carefully heating the crystal leads with your fine-tipped soldering iron and lifting the crystal slightly, then bending it over. Be **CAREFUL** when performing this operation of you may damage the crystal!

- () Locate capacitor C8 (near U7 and U8) and bend it slightly so that it is below the height of the socketed ICs near it.
- () Redress C10 (next to C8) in a similar manner.
- () Carefully thread the modem disconnect PC board onto the 40-pin male header, observing polarity. (See illustration below)
- () Resolder the four corner pins of the header to the top of the upgrade PC board.
- () Clip the 40 pins of P7 flush with the TOP of the modem disconnect PC board. These are the one you just soldered. No pins should extend more than about 1/16" (2mm) above the top of the board.



WARNING! The pins on the 40-pin IC adapter are brittle! Do not bend them. This IC adapter must be plugged straight into socket U7 on the PK-232, not at an angle!

- () Insert the 40-pin male header in the Z8530 socket on the PK-232 motherboard. The short, thin leads go into the socket; the long, square leads should be free. The notched end of the header should be at the pin 1 end of the Z8530 socket. Be sure the header is fully seated in the U7 IC socket (PK-232 Motherboard).
- () Carefully align the modem disconnect PC board so that it is parallel to the '232 main PC board' and lays parallel to and just above U8 (Z8536). There should be not more than 1/32" (1mm) between the bottom of the modem disconnect PC board and the top of U8. It is OK if the board lays flat on U8.
- () Tack solder the modem disconnect upgrade PC board to the 40-pin male header at the top of the upgrade PC board at the four corners of the header.
- () Carefully remove the upgrade PC board assembly from the PK-232 or HK-232
- () Solder the remaining 36 pins of the header to the top of the upgrade PC board.

Connection to DCD State Machine Upgrade

This section is optional. If you are not installing a TAPR DCD State Machine Upgrade, proceed to **Remaining Steps**.

NOTE: If you haven't already done so, assemble your DCD State Machine Upgrade now. Do not install it in your PK-232, just complete the instructions up to the installation section.

The silkscreen location marked DCD is sized to allow use of a single row of 0.025" square wire-wrap pins or sockets. Normal construction simply solders directly to the existing ribbon cable harness already soldered to your DCD State Machine Upgrade PC board at its P1.

- () Separate the individual wires for a distance of 1/2" at the free end of the eight-wire ribbon cable coming from the State Machine PC board.
- () Strip 1/16" of insulation from the end of the individual wires.
- () Twist the wire strands together at each exposed wire end.
- () Tin the ends with solder. The insulation will melt back a bit; this is normal, but don't overdo it!
- () Trim the ends of the wires with diagonal cutting pliers so the wire ends will insert into the PC board holes.

Install and solder in place the wires at "DCD" on the modem disconnect PC board as follows:

- () Brown at pin 1 (silkscreened with a "+")
- () Red at pin 2
- () Orange at pin 3
- () Yellow at pin 4
- () Green at pin 5
- () Blue at pin 6
- () Violet at pin 7
- () Gray at pin 8

Carefully check the board for solder splashes, solder bridges and cold solder joints.

- () Ok so far
- () Place a push-on jumper on the **State Machine** PC board at JMP pins 1 and 2.

If you wish to have a front-panel LED indicator of State Machine DCD activity (recommended), perform the following steps. Otherwise, skip to **Remaining Steps**, below.

You will need to obtain an LED and mounting bezel to match the front panel of your '232'. Because the LED styles differ between the AEA and Heath versions, and because the manufacturers may change styles or colors at any time, no LED is provided with this kit.

- () Identify the cathode and anode leads of the LED you have purchased. The flat side of the LED is the cathode on a round-lensed LED. This is also the shorter of the two leads.
- () Locate the length of black-white ribbon cable removed from the 10-wire ribbon cable during construction of the DCD State Machine Upgrade kit.
- () Separate the individual wires for a distance of 1/2" at each end of the two-wire ribbon cable.
- () Strip 1/16" of insulation from the end of the individual wires.
- () Twist the wire strands together at each exposed wire end.
- () Tin the ends with solder. The insulation will melt a bit; this is normal, but don't overdo it!
- () Trim the ends of the wires with diagonal cutting pliers so the wire ends will insert into PC board holes.
- () At one end of the two-wire cable, solder the white wire at location D1 on the modem disconnect PC board in the square hole (next to the round hole next to D1).
- () Solder the black wire into the other hole at D1.

The free end of this cable will be terminated later.

Remaining Steps

Observing static precautions and polarity, install the following IC in its socket on the upgrade PC board:

- () U7 Z8530
 (previously removed from the '232)
- () If you are installing the DCD State Machine Upgrade in your '232, mount the LED in the left-hand side of the front panel of your '232, directly above the legend "DCD" and in line with the legend "THRESHOLD"

Now, install the modem disconnect upgrade PC board in your '232.

- () **CAREFULLY** insert 40-pin male header straight into the Z8530 socket on the '232 (U7).
- () Double check that the polarity is correct and all pins are seated in the Z8530 socket.
- () If you are not installing the DCD State Machine Upgrade in your '232, install a jumper at location JMP.
- () If you are installing the DCD State Machine Upgrade in your '232, be sure there is no jumper installed at JMP on the disconnect PC board.
- () If you are installing the DCD State Machine Upgrade in your '232 and including a front panel LED, solder the white wire from the "D1" cable on the modem disconnect PC board to the cathode of the new front panel LED, and the black wire to the anode.

Reinstall the PakMail daughter board in the '232 as follows:

- () Insert the PakMail daughter board into sockets U2 and U4 on the '232 motherboard. Be sure the pins are lined up and no pins are bent.
- () Secure the daughter board with the two screws removed, above.

Reinstall the PK-232 and HK-232 in its cabinet.

Check-out

Operate your PK-232 as before and note that it functions normally.

If you have installed the DCD State Machine Upgrade kit, refer to the manual supplied with it for instructions on the check-out and use of the improved DCD facility.

Operations

If you have an external modem to interface, open the case of your '232 and remove the six (6) push-on jumpers from header P1 on the modem disconnect PC board.

Double check the schematics of the disconnect PC board and Modem header connections to insure they are compatible. The Modem Disconnect Header provides something similar, but not identical to the used in TNC-1 and TNC-2 units. Be very careful about interfacing an external modem using the same cabling you may have prepared for use with a TNC-1, TNC-2.

Plug in the modem header from the external modem. Refer to the documentation supplied with your external modem for further directions.

If you remove the modem connector from your external modem, you will need to reinstall the six (6) push-on jumpers at P1 to restore normal operation to your '232.

Modem Disconnect Details - P1

The modem disconnect, P1, on the Upgrade PC board is provided for using an external modem with the '232. This allows us of higher-speed modems, such as 9600 baud, or more sophisticated modems in the future.

The following information is primarily for those who wish to interface external modems to the TNC. Familiarity with modem and serial data channel terms is assumed.

A mating connector for P1 is not supplied with the Upgrade. Any standard 20-pin header for use with IDC cable connectors should work. Suitable parts are Ansley 609-2027, 3M 3428-6202, etc.

When installing the connector, be sure to line up the marked pin (pin 1) of the header with mark on the P1 header silkscreened on the PC board.

The signals used at connector P1 are standard TTL interface levels. A TTL high, or 1, is greater than +2.4 volts but less than +5.25 volts. A TTL low, or 0, is less than 0.8 volts but greater than -0.4 volts. **DO NOT connect an RS-232 level modem directly to P1!**

NOTE: The modem disconnect is similar, but not identical to the used in TNC-1 and TNC-2 units. Be very careful about interfacing an external modem using the same cabling you may have prepared for use with a TNC-1 or TNC-2.

The connector pin-outs are as follows:

Pin 1 Carrier Detect Input

This pin tells the SCC radio port that a valid data carrier has been detected. It should be pulled high when no carrier is detected. It should be pulled high when no carrier is detected and low when a carrier is present. This line is normally jumpered to pin 2 when the host TNC modem is used.

Pin 2 Carrier Detect Output

This pin is an output from the on-board modem and satisfies the requirements outlined for pin 1 above. It is jumpered to pin 1 when the host TNC modem is used.

Pin 3 No Connection

Pin 4 No Connection

Pin 5 SCC RTS Output

This signal is used for transmitter activation. The SCC will pull this output low when the TNC wants to transmit; otherwise it will remain high. This pin is normally jumpered to pin 6 when the host TNC modem is used.

Pin 6 Transmit Key Input

This signal is an input to the host TNC modem. It activates the PTT pin of the radio connector via the watch-dog timer. It should be left high and pulled low only when transmission is desired. This pin is normally jumpered to pin 5 when the host TNC modem is used.

Pin 7 No Connection

Pin 8 No Connection

Pin 9 No Connection

Pin 10 No Connection

Pin 11 Data Rate Clock (32x) Output

This pin is tied to the SCC baud rate generator output. It operates at 32 times the desired radio port data rate, e.g., 38.4 kHz for 1200 baud. In TAPR TNCs this is a transmit clock. In the PK-232, this signal drives the receive DPLL. It also drives an external divide-by-32 IC (U8) to provide a transmit clock at the data rate, or 1200Hz for 1200bps. This pin is tied to pin 12 when using the PK-232's modem.

Pin 12 No Connection

Pin 13 Data Rate Clock (1x) Input

This pin is the SCC transmit clock input pin. It expects a clock at the desired data rate (1200 Hz for 120 baud). This pin is tied to pin 14 when using the internal modem.

Pin 14 Data Rate Clock (1x) Output

This pin is transmit data clock signal. It is normally jumpered to pin 13 when the host TNC modem is used. It connects to the output of the divide-by-32 circuit on the '232 main board.

Pin 15 Upgrade Ground Reference

This pin ties to the TNC digital ground system.

Pin 16 No Connection

Pin 17 Receive Data Input

This pin is received data input to the SCC. This pin is normally jumpered to pin 18 when the host TNC modem is used.

Pin 18 Receive Data Output

This pin provides receive data from the host TNC modem. This pin is normally jumpered to pin 17 when the host TNC modem is used.

Pin 19 Transmit Data Output

This line is the SCC data output. This pin is normally jumpered to pin 20 when the host TNC modem is used.

Pin 20 Transmit Data Input

This input line accepts data to be transmitted by the modem. This pin is normally jumpered to pin 19 when the host TNC modem is used.

If you elect to use an off-board modem, be sure properly shield the interconnecting cables for RFI protection.

TAPR PSK Modem Notes:

In the case of the TAPR PSK modem, the front panel switch on the external modem will allow you to select the internal PK-232 (or HK-232) modem or the external PSK modem for packet operation. Wire the PSK modem for use with a TAPR TNC-1. Refer to page 23 of the PSK modem instructions for the correct wiring of S2.

JP200 on the modem disconnect header is a "don't care" - the PSK modem will work with the PK-232 modem disconnect if this jumper is left intact or if it is cut. (Refer to page 37 of the PSK modem instructions).

The radio port wiring instruction on page 38 of the PSK modem instruction do not apply. Wire up the cable by function according to the PK-232 pinouts found in the PK-232 operating manual page 2-6 table 2-1 (Rev F manual dated 10/88)

G3RUH PSK Modem Notes:

If you will be using the G3RUH PSK Modem, Ross Forbes WB6GFJ supplies the following information.

The instructions for the G3RUH FO-12 PSK modem are 99% correct as written. There is one small change necessary, to make the modem work perfectly with the TAPR PK-232 Modem Disconnect Board. The following pins are correct as I took the details off my own working unit.

On the TAPR PK-232 Modem Disconnect Board, jumper the following pins:

1 to 2, 5 to 6, 13 to 14, 19 to 20.

Connect the G3RUH FO-12 modem to the TAPR board as follows:

<u>G3RUH/FO-12 Pins</u>	<u>TAPR PK-232 Board</u>
J2-12 (TXClock)	Pin 14
J2-15 (Ground)	Pin 15
J2-17 (RXDataIn) ==>	to pin J of the Switch S3C on the G3RUH Schematic
J2-19 (TXData)	Pin 19
(S3C pin N on G3RUH Schematic) <==	Pin 18
(S3C wiper on G3RUH Schematic) <==	Pin 17

Note: As called for in the G3RUH FO-12 instructions, pins 18 and 19 on the TAPR modem Disconnect board should not be jumpered.

