Deploying the KPC-3P as a "BBS-in-a-Box"

Jim Oberhofer KN6PE
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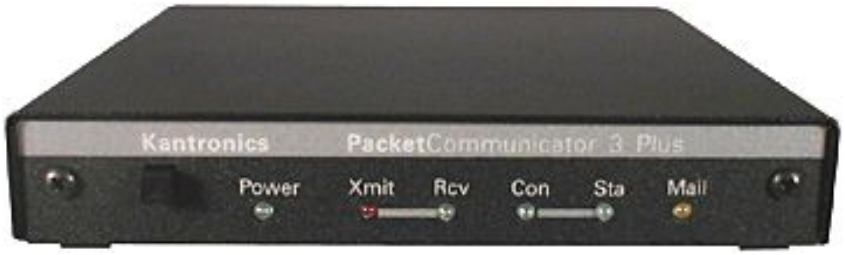
Background
Outpost relies on a Bulletin Board System (BBS) as a place to leave packet messages for other users to retrieve at a later time. These BBS packages are computer-based with almost all of the BBS software freely available for download.

Many TNCs also include a Personal Bulletin Board System (PBBS) that typically is used as a personal mail drop where others can leave packet messages. One TNC in particular, the Kantronics KPC-3Plus (hereafter referred to as KPC-3P), offers a couple of compelling features that makes it an attractive small-scale BBS alternative that could be quickly used to support an emergency response. The two key KPC-3Plus features are:

- Ability to allow concurrent connects by remote packet users to its PBBS. This feature lets the KPC-3P begin to approach the level of accessibility experienced by full BBS users.
- Supports a 512Kb a memory upgrade that can deliver 480Kb of PBBS message storage. While this is not as much as PC-based disk storage, if managed correctly, this amount of memory is sufficient to keep message traffic flowing between several users.

With these capabilities in mind, some emergency communications teams are now looking at deploying the KPC-3P as a "BBS in a Box" for emergency backup packet communications (or portable digipeaters) in the event they loose their primary computer-based BBS. Additionally, teams with limited resources are investigating the KPC-3P as their primary packet PBBS for all their packet communications.

This application note describes how to deploy the KPC-3P as a multi-user PBBS.



(Picture from www.kantronics.com/products/kpc3.html)

What you need

KPC-3P	With firmware version 9.1 or later. Kantronics sells an EPROM update that you will need for concurrent access. Firmware version 9.0 or later gives you the critical **PBUSERS** command that enables concurrent user connects.
Radio	2 meters is popular with Packet, but other VHF/UHF bands also have frequency allocations for packet or digital messaging. Check your local band planning group for details.
Computer	While not normally needed after the TNC is set up, you will need a PC initially to enter the TNC's commands that set up the station's Call Sign, message space, beaconing, and mail box.

<table>
<tr><td>Cable, TNC-to-Radio</td><td>Usually a custom or store-bought cable. This needs to be built to work with your specific radio.</td></tr>
<tr><td>Cable, TNC-to-Computer</td><td>RS-232 modem cable, standard, any length. Depending on the age of your PC, you may also need a USB-to-Comm Port adaptor to interface your PC to the TNC's serial connector.</td></tr>
<tr><td>Power supply</td><td>Depending on where you will put your BBS will determine what kind of power supply you will need. You will need to power both the TNC and Radio wherever you install it. For in-house use, pick a standard 13.8vdc power supply with sufficient power to drive your radio at whatever power level you intend to use. The power consumption of the TNC is minimal. For those who are thinking of placing the TNC/Radio combination at some remote site, a battery, solar panels, and a charger could be used.</td></tr>
<tr><td>Firmware Upgrade</td><td>This may not necessarily be needed depending on the KPC-3P firmware revision you currently have installed. The initial release of the KPC-3P came with version 8.2. While this works fine for single connections, it does not support the PBUSERS command – the critical command that gets you concurrent user connects. If you do not need concurrent user access, you can skip this part. If you want it, you need version 9.0 or greater.

As of this writing, Kantronics has released version 9.1. To order this firmware upgrade, Contact Kantronics directly and place a phone order for the latest firmware (http://www.kantronics.com/support.html). Because my KPC-3P has version 8.2 installed, I performed this upgrade, described here.</td></tr>
<tr><td>Memory Upgrade</td><td>Kantronics no longer offers the 512Kb memory upgrade. However, you can find equivalent memory modules that will work. Look for a memory chip that is described as follows:

<table><tr><td>DIP-32</td><td>32 pin through-hole memory chip. You may see other package types such as SOIC or TSSOP. These are surface-mount components and will not work with the KPC-3P circuit board.</td></tr><tr><td>512k x 8 SRAM 4Mbit</td><td>Make sure it is "512k x 8". This means 4 Mbits of memory arranged in 512K bytes. You may see listings for 256k x 16, 4Mbit; this is not the same.</td></tr><tr><td>70ns</td><td>This is the maximum memory access time. This is similar to the 128Kb SRAM that you will be replacing in the TNC.</td></tr><tr><td>5V, LP</td><td>This is a typical 5 volt memory chip, Low Power consumption, and is similar to the current IC.</td></tr></table>
There are several mail order houses that carry memory such as Jameco or Digikey. I purchased the following from http://www.jameco.com :
Jameco Catalog No: 157358
Mfgr Part Number: 628512LP-70
Description: IC, SRAM, BS62LV4006PC-70</td></tr>
<tr><td>Enclosure</td><td>How you mount or enclose your BBS really depends on where you intend to deploy it. If it is at home or in a repeater shack on some hill, having all the components in close proximity may work for you. If you plan to make it field-deployable, you may need some type of enclosure that can hold all the parts. Surviving in all types of weather should also be considered.</td></tr>
</table>

Getting the KPC-3P set up is a big piece of this process. The set up process will include the following steps:

1. Buy or build all the components you need for your BBS-in-a-Box project.
2. Install the firmware upgrade
3. Install the memory module
4. Configure your TNC
5. Initial test
6. Final packaging

NOTE: Read through Steps 1, 2, 3, and 4 before beginning.

Step #1 Buy or build all the components
I won't walk you through acquiring all of the parts for your project. However, as part of the parts checkout process, there are a couple of things that you should do before beginning:

Steps	Notes, Comments, Description
1.1 Initial TNC Check-out It may not be obvious that you have the right TNC or firmware level. Before beginning, do the following:	
1. Connect the TNC to your power supply, cable it to the PC, and boot up your PC.	
2. Run your favorite terminal emulator program (Hyperterm, ipserial, etc).	
3. Power up the TNC and confirm that you see…	

▪ the TNC welcome message
▪ **KPC3P** in the message. If this does not say KPC3P, ***STOP***… do not upgrade the memory. It will not work.
▪ the version is **9.0** or **9.1**. In my case, I have version 8.2; this TNC requires the firmware upgrade. This version does work, but does not support the PBUSERS command (more on that later).
	`KANTRONICS KPC3P VERSION 8.2`
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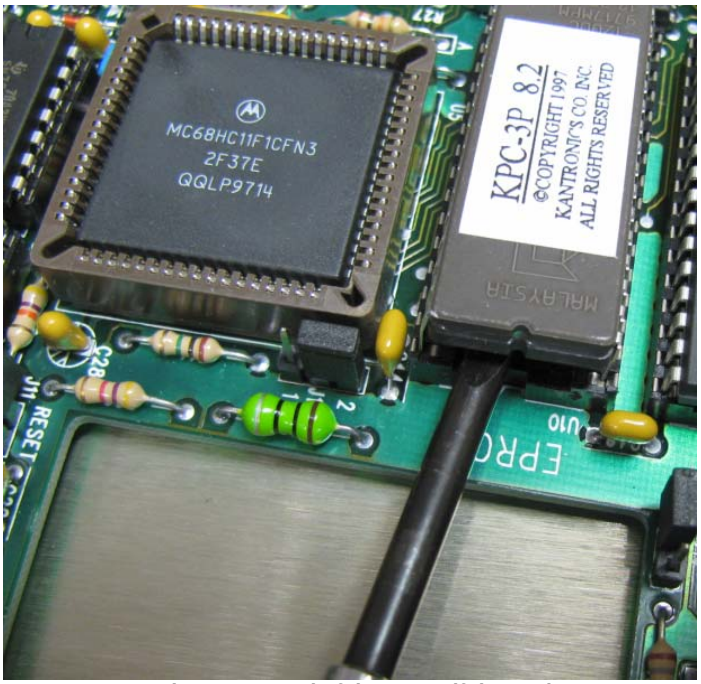
	`DUPLICATION PROHIBITED WITHOUT PERMISSION OF KANTRONICS.`
	`cmd:`

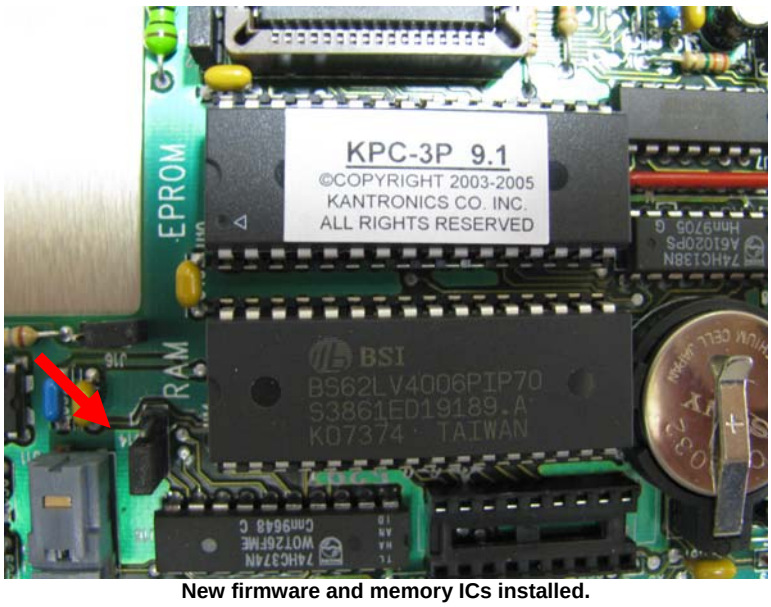
4. At the TNC command prompt, enter PBBS command. A "100" returned means that there is a 128Kb memory module installed now. This TNC is a candidate for a memory upgrade.	`cmd:pbbs`
	`PBBS 100`
	`cmd:`

Step #2 Installing the Firmware Upgrade
If the results of the above checkout show KPC-3P Version 9.0 or greater, ***STOP!*** You already have the firmware needed to run a multi-user PBBS. If this is the case, skip this section and go to **Step #3**. Otherwise, proceed as follows:

Steps	Notes, Comments, Description
Before beginning: I recommend you be familiar with the following: 1. ESD (Electrostatic Discharge) Procedures. The Integrated Circuits (ICs) for the Firmware and Memory module upgrades can be sensitive to static. Make sure you read up on ESD procedures before beginning. The ARRL Handbook is a good source of information. 2. Methods for removing and replacing chips from a circuit board. **2.1 Install the Firmware Upgrade** The sequence of replacing the Firmware IC is as follows: 1. Power off the TNC and disconnect it from the computer, radio, and power supply. 2. Remove the cover from the TNC. 3. Disable the TNC internal backup battery. You can do this by either removing the battery completely, or putting a piece of paper or card between the top contact and the battery. One of my QST cards worked great. 4. Remove the existing Firmware IC. **NOTE** the orientation of the semi-circle indent on the top at one end of the chip (semicircle indentation next to the "EPROM" silk-screening on the PC board). The replacement chip must be oriented the same way. If you do not have an IC puller (not many people do), with a small flat head screw driver, gently work the blade of the screw driver between the IC and the socket at one end. Begin prying the IC out of the socket. As it begins to lift, push the screwdriver blade in further and lift from the center. The goal is NOT to	***WARNING:*** Integrated Circuits are sensitive to static discharge. Use a ground strip between you and the TNC chassis when performing these steps.  **Old version 8.2 Firmware to be replaced**  **Gently pry one end of the IC out if the socket**

Steps	Notes, Comments, Description
bend any pins in the event this IC needs to go back in. 5. Install the new Firmware IC. ICs that have never been inserted before tend to have their legs flared outward. The technique I use to insert an IC is to: ▪ Orient the new IC correctly so that the semi-circle indentation is next to the EPROM mark on the PC board. ▪ Position the pins on one side of the IC into their respective sockets first (DO NOT fully seat them). ▪ Gently align the IC so that the other set of pins are positioned over the rest of the socket. ▪ Then, slowly press the IC completely into the socket until it is completed seated. 6. Remove the card that you previously installed to disable he TNC backup battery. 7. If you are not performing a memory upgrade, replace the TNC's cover.	 **Aligning one side of the IC before inserting it into the socket** ***WARNING:*** DIP-32 chips have 16 pins on each side. Be very careful when inserting the new DIP package into the socket… the pins will not be completely aligned on both sides the first time you insert the chip. Note the orientation of the chip relative to the EPROM marking on the PC Board. The way the old chip came out is the way the new chip must go in. Make sure all pins are aligned over all sockets before applying any force to fully seat the chip.
2.2 TNC checkout after firmware installation Verify the firmware is installed correctly by doing the following: 1. Connect the TNC to your power source and the PC. 2. With the terminal emulator running, power up the TNC. 3. The TNC's Autobaud routine will run first. 4. When you see intelligible text, press the "*" to set the baud rate, then enter your call sign at the prompt. 5. Verify the KPC-3P welcome message indicates Version 9.1. Congratulations… your firmware is now updated!	`cmd:€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€x` `€xx€€xxx€xø€x€x€x€xx€xx€x€ø€xxxxx€€xxxxx€€€xxxxxxøæ€˜€f˜f`-` `f˜ †˜††† fþ˜˜˜f``f €fff`  ˜f ffþ` `PRESS (*) TO SET BAUD RATE` `ENTER YOUR CALLSIGN=> W6TDM` `KANTRONICS KPC3P VERSION 9.1` `(C) COPYRIGHT 2002-2005 BY KANTRONICS INC.  ALL RIGHTS RESERVED.` `DUPLICATION PROHIBITED WITHOUT PERMISSION OF KANTRONICS.` `cmd:`

Step #3 Installing the Memory Upgrade
If the results of the PBBS command entered in Step 1.1 returned a 480, ***STOP!*** You already have a 512Kb memory module installed. If this is the case, skip this section and go to **Step #4**. Otherwise, proceed as follows:

Steps	Notes, Comments, Description
3.1 Install the memory module Before beginning, I recommend you have the KPC-3P users guide available. Look for the section titled "Expanding the RAM in the KPC-3Plus". In short, the steps are as follows: 1. Power off the TNC and disconnect it from the computer and power supply. 2. Remove the cover from the TNC 3. Disable the TNC internal backup battery. You can do this by either removing the battery completely, or putting a piece of paper or card between the top contact and the battery. One of my QST cards worked great. 4. Remove the existing 32/128K RAM from socket U14 (located below the KPC-3P Firmware, see picture).	***WARNING:*** SRAM are sensitive to static discharge. Use a ground strip between you and the TNC chassis when performing these steps. Note the orientation of the semi-circle indent on the top at one end of the chip. The replacement chip must be oriented the same way. The process is essentially the same as used for the Firmware Upgrade. I have used a small flat-blade screw driver wedged between the chip and the socket, then gently rocking it back in forth to pry the chip out slowly.  **New firmware and memory ICs installed.** **The arrow points to J14 jumper.**

Steps	Notes, Comments, Description
5. Change jumper J14 to the center pin and pin 2 (to left of the RAM chip).	J14: (RAM size) Per the KPC-3P manual, “this three pin jumper allows the installation of various size static RAMs. When placed on the center pin and pin 1, the KPC-3 Plus can accept 32K or 128K static RAM. When placed on the center pin and 2, the unit accepts a 512K static RAM. Default is 32K/128K.”
6. Install the 512K SRAM chip in U14, with the pin 1 end of the IC toward J14.	***WARNING:*** DIP-32 chips have 16 pins on each side. Be very careful when inserting the new DIP package into the socket… the pins will not be completely aligned on both sides the first time you insert the chip. Note the orientation of the chip relative to the internal battery and J14. The way the old chip came out is the way the new chip must go in. Make sure all pins are aligned over all sockets before applying any force to fully seat the chip.
7. Remove the card that you previously installed to disable he TNC backup battery. 8. Reinstall the cover from the TNC	
3.2 TNC checkout after memory installation Verify the memory has been installed correctly by doing the following: 6. Connect the TNC to your power source and the PC. 7. With the terminal emulator running, power up the TNC. 8. The TNC’s Autobaud routine will run first. 9. When you see intelligible text, press the “*” to set the baud rate, then enter your call sign at the prompt.	`cmd:€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€x` `€xx€€xxx€xø€x€x€x€xx€xx€x€ø€xxxxx€€xxxxx€€€xxxxxxøæ€˜€f˜f`-` `f˜ †˜††† fþ˜˜˜f``f €fff`  ˜f ffþ` `PRESS (*) TO SET BAUD RATE` `ENTER YOUR CALLSIGN=> W6TDM` `KANTRONICS KPC3P VERSION 9.1` `(C) COPYRIGHT 2002-2005 BY KANTRONICS INC.  ALL RIGHTS` `RESERVED.` `DUPLICATION PROHIBITED WITHOUT PERMISSION OF KANTRONICS.` `cmd:`

10. At the TNC command prompt, enter PBBS command. You should see “480” returned meaning that the TNC recognized the 512Kb memory module that you just installed.	`cmd:pb`
	`PBBS     480`
	`cmd:`

Step #4 Configure your TNC

Congratulations! The tough part is behind you. Next, we configure the TNC to set it up as a standalone PBBS. Proceed as follows:

Steps	Notes, Comments, Description
4.1 Initial TNC settings 1. Perform a HARD RESET using the `restore default` command. This command causes the KPC-3P to immediately reset its factory settings, erase all PBBS settings and messages, and perform the AUTOBAUD routine. At the first legible prompt, be prepared to press "*", then your call sign when prompted. 2. A hard reset leaves the TNC in New User mode with access to a limited command set. Enter the `interface` (`int` for short) command to allow us access to the full TNC commands.	`cmd:restore default` `cmd:€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€€x` `€xx€€xxx€xø€x€x€x€xx€xx€x€ø€xxxxx€€xxxxx€€€xxxxxxøæ€˜€f˜f`-` `f˜ †˜††† fþ˜˜˜f``f €fff`  ˜f ffþ` `PRESS (*) TO SET BAUD RATE` `ENTER YOUR CALLSIGN=> W6TDM` `KANTRONICS KPC3P VERSION 9.1` `(C) COPYRIGHT 2002-2005 BY KANTRONICS INC.  ALL RIGHTS RESERVED.` `DUPLICATION PROHIBITED WITHOUT PERMISSION OF KANTRONICS.` `cmd:` `cmd:interface term` `INTFACE was NEWUSER` `cmd:int` `INTFACE  TERMINAL` `cmd:`

4.2 General TNC setup
Many of the call signs assigned to various functions are derived from the initial Call Sign entry. We will confirm them all as part of this setup anyway.
If you need to change a call, enter the command followed by a space and the desired call sign.
In this example,
mypbbs <callsign>: this command defaults to W6TDM-1.
mynode <callsign>: defaults to W6TDM-7.
 	
digipeat: On this TNC, we will be busy enough without supporting digipeating. Digipeat defaults to ON. We want to turn this off.
 	
NOTE: If you intend to deploy this TNC as a remote Digipeater, turn **Digipeat** to **ON.**
 	
Note: SSID is Secondary Station IDentifier. In Packet Radio you can have up to 16 SSID's for the same call sign, an example: W6TDM, and W6TDM-1 through W6TDM-15.
	`cmd:my`
	`MYCALL   W6TDM`
	
	`cmd:mypbbs`
	`MYPBBS   W6TDM-1`
	
	`cmd:mynode`
	`MYNODE   W6TDM-7`
	`cmd:`
	
	`cmd:digipeat off`
	`DIGIPEAT was ON`
	`cmd:digipeat`
	`DIGIPEAT OFF`
	`cmd:`

4.3 Setting up the PBBS

1. First, reconfirm that we are using all BBS memory for messages.

```
cmd:pbbs
PBBS     480
cmd:
```

2. Next, set up the number of simultaneous connects that can be made. A couple of commands need to be entered.

maxusers: TNC allocates memory required for the maximum number of simultaneous connects to the TNC that you wish to allow. On changing the value, the TNC will initiate a soft-reset and drop all existing connections. The Default is 10. I recommend 5 for starters.

```
cmd:maxusers
MAXUSERS 10
cmd:maxusers 5

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RESERVED.
DUPLICATION PROHIBITED WITHOUT PERMISSION OF KANTRONICS.
cmd:maxusers
MAXUSERS 5
cmd:
```

users: Specifies the number of channels that can be made available for incoming connects

```
cmd:users 5
USERS was 1
cmd:users
USERS    5
cmd:
```

pbusers: Controls the maximum number of connects to the PBBS. On changing the value, the TNC will initiate a soft-reset and drop all existing connections.

```
cmd:pbusers 5
PBUSERS was 1

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cmd:pbusers
PBUSERS  5
cmd:
```

NOTE: For starters, I am setting this number in the "5" range. Setting it higher may result in more packet collisions as users compete for access to the BBS. Setting it lower results in more connect rejects. You need to look at your local situation to determine what the right number is for you.

NOTE: The above 3 commands should always be entered with the same parameter.

3. Set up a couple of commands that control message size.

pbsize: Set the message size. The TNC defaults to a value of "0" (no size limit). For today, I am limiting the size to Outpost's size. 10,000 characters.

```
cmd:pbsize 10000
PBSIZE was 0
cmd:pbsize
PBSIZE   10000
cmd:
```

You can make it smaller if you want. However, you will have to manually enforce this as a policy since Outpost will not detect a "message too large" message.

pbheaders: Turn this off. When On, Routing Headers received from a full service BBS will be stored. When off, headers are not stored allowing for more message storage.	cmd:pbh off PBHEADER was ON cmd:pbh PBHEADER OFF cmd:
4. Lastly, set up some messages and controls for a PBBS connect. **ptext:** This sets the message to be sent back to the user immediately on a connectingto the PBBS. It can be up to 128 characters.	cmd:ptext Welcome to the Cupertino ARES/RACES PBBS PTEXT was cmd:ptext PTEXT Welcome to the Cupertino ARES/RACES PBBS cmd:
cmsg: Make sure that someone attempting to connect only to W6TDM for keyboard-to-keyboard gets redirected to the PBBS.	cmd:cmsg pbbs CMSG was OFF cmd:cmsg CMSG PBBS cmd:
ctext: Because a keyboard-to-keyboard request will be pointed to the PBBS by the CMSG command, let the user know that they are being redirected.	cmd:ctext Redirecting you to the PBBS... CTEXT was cmd:ctext CTEXT Redirecting you to the PBBS... cmd:
daytime: Set the time of the TNC so that messages are time-stamped correctly.	cmd:daytime DAYTIME 01/01/97 01:03:57 cmd:daytime 0810261610 cmd:daytime DAYTIME 10/26/08 16:10:04 cmd:
4.4 Set up for remote sysop My BBS-in-a-Box may be away from where I am, therefore, I want to have remote access to it. The following commands set up how to remotely perform SYSOP controls.	
myremote: Set up the connect address to access this BBS. The myremote command capability comes disabled. You are entering a callsign and SSID to which you will use to connect to enter sysop commands. I set it up as W6TDM-8. This command will perform a soft reset when entered.	cmd:myremote MYREMOTE disabled cmd:myremote w6tdm-8 KANTRONICS KPC3P VERSION 9.1 (C) COPYRIGHT 2002-2005 BY KANTRONICS INC. ALL RIGHTS RESERVED. DUPLICATION PROHIBITED WITHOUT PERMISSION OF KANTRONICS. cmd:myr MYREMOTE W6TDM-8 cmd:
rtext: Set the password string that the TNC will use to challenge any user attempting to gain SYSOP access either when connecting by myremote or when performing SYSOP functions to the PBBS remotely. I set up my password string as shown. See **Step 5.3 Sysop Connect Test**	cmd:rtext RTEXT cmd:rtext CupertinoARES/RACES 081026 RTEXT was cmd:rtext RTEXT CupertinoARES/RACES 081026 cmd:

to see how this works.	

4.5 Optional TNC Settings
There are a series of commands that you may also want to enter to further customize your TNC/PBBS. Here are the ones I used.
1. Beaconing is when the TNC transmits some type of identifier in between connects.
btext: Enter the text to be transmitted periodically as a station beacon.
beacon: This is the partner command for the BTEXT and sets the interval that the beacon will be sent. I set my beacon for 30 minutes (a "0" value turns beaconing off).
NOTE: Alternatively, the CWID and CWIDTEXT commands can be used to send the CW identifier.
2. If you intend to operate stand-alone without a PC attached, before deploying your PBBS-in-a-Box, turn **monitor** off.
NOTE: If MONITOR is left ON, the TNC will continue to send the traffic to the Serial Port. It is unclear whether this will inevitably cause a hang because the Serial I/O buffer fills up.
	`cmd:btext Cupertino ARES/RACES PBBS`
	`BTEXT was`
	`cmd:btext`
	`BTEXT Cupertino ARES/RACES PBBS`
	`cmd:`
	
	`cmd:beacon`
	`BEACON EVERY 0 (disabled)`
	`cmd:beacon 30`
	`BEACON was EVERY 0 (disabled)`
	`cmd:beacon`
	`BEACON EVERY 30 min`
	`cmd:`
	
	`cmd:monitor off`
	`MONITOR was ON`

Step #5 Initial Test
To get the system checked out, you need to get it sufficiently assembled to do a real RF test. My intention is to deploy a very compact stand-alone system that includes:

1. KPC-3P
2. Radio Shack HTX 202
3. both powered off of a 12v 7Ah gel cell battery
4. and all the interconnecting cables

My basic checkout is to do the following things:
1. Assemble the system in my garage
2. From another packet station (PC, TNC, radio), connect to the KPC-3P as a user would, leave and pick up a message
3. Connect as a Sysop, and check that I have access to all TNC commands

Proceed as follows:

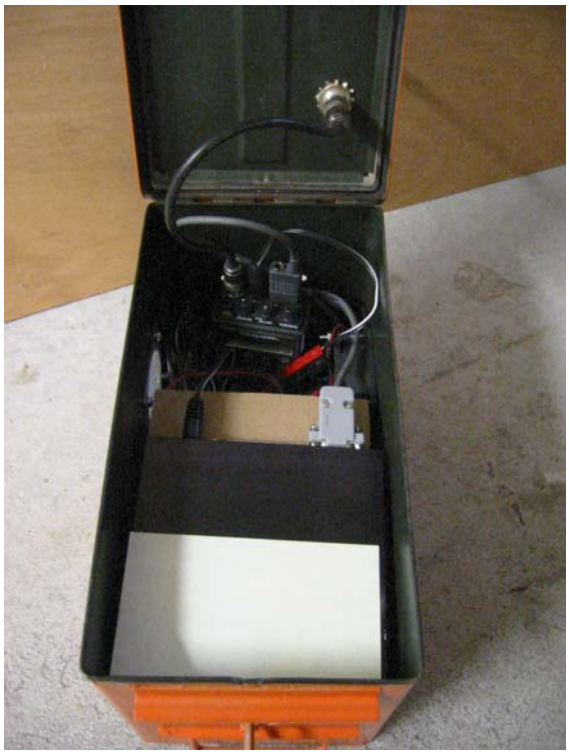
Steps	Notes, Comments, Description
5.1 Assemble the system This is really left up to you as to what you have for equipment. Connect all the parts and power it all on. This is what my components look like.	
5.2 User connect test For this test do the following: 1. Connect using the PBBS using the W6TDM-1 call sign. Once connected, note that there are 480,000 bytes of memory available. Also, confirm that your PBBS welcome message is as you want it to read. 2. Send yourself a short message 3. List messages 4. Retrieve the message, and 5. Kill the message 6. Log off when done.	cmd:c w6tdm-1 cmd:*** CONNECTED to W6TDM-1 [KPC3P-9.1-HM$] 480000 BYTES AVAILABLE THERE ARE NO MESSAGES Welcome to the Cupertino ARES/RACES PBBS ENTER COMMAND: B,J,K,L,R,S, or Help > LM ENTER COMMAND: B,J,K,L,R,S, or Help > lb ENTER COMMAND: B,J,K,L,R,S, or Help > b *** DISCONNECTED cmd:KN6PE>W6TDM-1: <<UA>>:

Steps	Notes, Comments, Description

5.3 Sysop connect test
 	
For this test do the following:
 	
1. Connect to the PBBS using the W6TDM-8 call sign.
 	
The BBS replies with 3 sets of numbers. I picked the 1st set in this case. To make it easier, I always lay out the password (remember setting **rtext** above?) with the numbers associated with each character. So, "C" = 1, "t" = 6, "8" = 22, and so on.
 	
`00000000011111111112222222`
`12345678901234567890123456`
`CupertinoARES/RACES 081026`
 	
Mapping the 1st row of numbers against the rtext code, you get:
 	
3=p, 2=u, 12=E, 4=e, 26=6, 13=S .
 	
"`puEe6S`" is entered after the 3 codes. Once the PBBS confirms the correct entry, you see the `prompt:` prompt
 	
NOTE: What you enter is case sensitive.
 	
2. At this point, you have access to the commands that you typically see from the TNC's `cmd:` prompt.
 	
However, you do not have access to the usual PBBS user commands when in sysop mode.
 	
3. To exit, enter a cntl-C to get back to the TNC cmd: prompt, then a "D" to disconnect.
	`cmd:c w6tdm-8`
	`cmd:*** CONNECTED to W6TDM-8`
	`3 2 12 4 26 13`
	`5 14 5 14 18 22`
	`9 18 20 10 18 22`
	`puEe6S`
	`prompt:`
	
	`prompt:ptext`
	`PTEXT Welcome to the Cupertino ARES/RACES PBBS`
	`prompt:btext`
	`BTEXT Cupertino ARES/RACES PBBS`
	`prompt:btext Cupertino ARES/RACES Emergency PBBS`
	`BTEXT was Cupertino ARES/RACES PBBS`
	`prompt:b 10`
	`BEACON was EVERY 0 (disabled)`

5.4 Redirect connect test
 	
We set up the PBBS to ensure that anyone attempting to connect to "W6TDM" looking for keyboard-to-keyboard chat will get redirected to the PBBS.
 	
1. Try connecting to the TNC using the W6TDM call sign.
 	
Confirm that you are redirected to the PBBS.
	`cmd:c w6tdm`
	`cmd:*** CONNECTED to W6TDM`
	`Redirecting you to the PBBS...`
	`[KPC3P-9.1-HM$]`
	`480000 BYTES AVAILABLE`
	`THERE ARE NO MESSAGES`
	`Welcome to the Cupertino ARES/RACES PBBS`
	`ENTER COMMAND: B,J,K,L,R,S, or Help >`
	`b`
	`*** DISCONNECTED`
	`cmd:`

Step #6 Final Packaging
As stated earlier, packaging is really a matter of personal preference. Depending where you intend to put and power your PBBS will determine how it goes together. In my case, I wanted a portable system that could be deployed anywhere throughout the city in the event we needed to establish a back-up or temporary PBBS, or extra county digipeater.
Here are some of the pictures of my system.

Steps	Notes, Comments, Description
I used an ammo box as the enclosure. A BNC connector on the top provides for the antenna connector. I also drilled a vent, installed a fan, and grate for a fan, but did not connect it to the battery (future enhancement; possibly put some type of temperature sensor and relay in there to turn on the fan if it gets too warm inside).	
Inside the ammo box, the radio belt clip slips into a tie wrap that loops through 2 holes in the back of the box. Because I had the space, I actually installed 2 12v Gel Cells in parallel. Anderson PowerPoles provide all the power interconnects between the battery, TNC, and Radio. A stiff piece of card-board sits on top of the batteries (covers the battery terminal posts), with the TNC then on top if it.	

Summary
That's it! If you come up with an interesting implementation or packaging scheme, please send in your pictures and I will be happy to share them with others.