The following data is from both Kantronics and Jeff Brenton, KA9VNV. My thanks to Phil Anderson, W0XI at Kantronics and Jeff Brenton. I have highlighted a few points of intrest. The short of it is those areas are what bit my tail due to a short memory I have.

From Kantronics site:

Using A Second Serial Port in the KPC-3 Plus for GPS/APRS*

Phil Anderson, W0XI

A second serial port, configured in firmware, has been added to the KPC-3 Plus with firmware update 8.3. At present, this feature is included only in the firmware for the KPC-3 Plus and the KAM-98 HF/VHF modem scheduled for release later this month. This second read-only port accepts NMEA strings from most GPS portables and frees up the KPC-3 Plus RS-232 standard serial port for connection to a laptop. This configuration eliminates the need for a special cable, such as the Kantronics HSP, to accommodate the sharing of the KPC-3 Plus serial port between a GPS device and a computer.

With this second port, the KPC-3 Plus can be configured as part of a GPS tracker--GPS device, TNC, and transceiver--and at the same time accommodate automatically the attachment of a computer for sending/receiving packet data. For example, the KPC-3 Plus with GPS device attached to the second serial port will allow a program such as APRS to take control of transmitting fix locations via UI frames. This may be handy when a driver wishes to add his computer to a tracker already operating in his vehicle.

When the second serial port is activated, using the GPSPORT command, the NMEA data input must be cabled to the radio port of the modem, rather than the RS-232 serial port. Since this pin is normally used for external carrier detect, carrier detect must not be configured as EXTERNAL (using the CD command). Software carrier detect is preferred since it allows for continuous open squelch operation and for the reception of weak signals (by opening the squelch completely).

Wiring to the radio port is straightforward; you must simply attach the two wires coming from the GPS device to the radio port cable connector. Wire the NMEA+ wire to pin 2 and the NMEA- wire to pin 6, ground (of the DB-9 connector). In effect, you create aAY@ cable coming from the TNC, one portion going to the GPS data input jack and the other leg going to the radio as before.

The KPC-3 Plus is configured for GPS tracker operation in the normal manner, as outlined the Modes of Operation section of the User=s Guide. When using the second port for attachment of the GPS device, the only setup changes required are to turn on and configure this port, using the GPSPORT command. The GPSPORT command allows you to configure a baud rate of 300,

600, 1200, 2400, or 4800 for the GPS device, use normal or inverted data, and use or not use checksums sent by some NMEA strings. If GPSPORT is set to a baud rate ofA0,@ then the port is disabled.

Example: Setting up a tracker using the Magellan Meridian XL GPS unit and the 8.3 KPC-3 Plus

I set up the modem parameters for GPS operation in the usual manner:

GPSHEAD 1 $GPRMC

LTP 1 GPS VIA RELAY, WIDE

(Check with your local GPS group for the preferred beacon path)

BLT 1 EVERY 00:10:00 CLEAR

LTRACK 5 LT1 TIME

GPSTIME VALID RMC

MONITOR ON

I then configured the GPSPORT for 4800 baud operation, normal signaling, and to check data input using checksums:

GPSPORT 4800 NORMAL CHECKSUM

These commands completed the configuration of the KPC-3 Plus as a tracker with the GPS device attached to the radio ports input-only serial port. Note that I DID NOT have to change the interface command (INTface) to GPS since the GPS device is not attached to the RS-232 port in this tracker configuration.

Notes on my particular GPS device: The Magellan Meridian XL

As with many recent GPS devices, mine supports a choice of several serial baud rates and sets of NMEA 0183 compatible strings of fix data. Pressing SETUP on the front panel allows me to cursor through various parameter lists to select from.

Baud rates available are 1200, 4800, and 9600. Since the firmware serial port in the KPC-3 Plus supports a maximum rate of 4800, I selected 4800. I have also used the 1200 setting. Selection for you will vary depending upon the capabilities of your GPS device. Select the lowest baud rate compatible with your application.

I decided to use the NMEA ARMC@ string instead of the more usualAGGA@ string because my Meridian does not support checksums in the GGA string, only the RMC string. I selected

RMC by cursoring down on the SETUP MENU until I got the NMEA and then selected NMEA2 which included the RMC string but not the GGA string. Selection procedure for NMEA strings for your

GPS device may vary, and could include sending commands to the GPS device. If this is the case and you want to use the firmware (second) serial port of the KPC-3 Plus, youwill have to configure the GPS device first with your computer or via the KPC-3 Plus RS-232 port and then reconfigure the modem for GPSPORT operation (see the RPRINT command in the Users Guide).

Operation: with a computer attached to the KPC-3 Plus serial port

With my tracker set up and running - Magellan feeding the firmware port of the KPC-3 Plus - with a computer attached to the RS-232 serial port of the KPC-3 Plus, with a basic terminal program running, and with the packet MONITOR command and monitor transmission command (MXMIT) command on, beaconed RMC strings looked like this:

W0XI>GPS: <UI>:

$GPRMC, 200257,A,3858.07,N,09518.09,W,00.0,000.0,040798,04,E*5D.

Time and data accuracy:

Finally, data and time accuracy for GPS tracker operations are improved with firmware 8.3 for the KPC-3 Plus. You have the options of clearing the location text buffers after each beacon, verifying that each NMEA (fix) string is correct before its contents are used, and verifying that the time in a NMEA string is valid before using that time to update the modems clock.

When the optional CLEAR parameter is used with the beacon location text (BLT) command, the location test buffers are cleared after each beacon. This ensures that a NMEA string placed in the buffer is not beaconed (transmitted) more than once. If the optional CHECKSUM parameter is specified with the GPSPORT command, only strings with a valid checksum will be placed in the location text buffers for beaconing.

If the optional VALID parameter is used with the GPSTIME command, time acquired from a GPS string will be used to update the KAM-98 clock only if the strings VALID bit is on. This ensures that the modem=s software clock is accurate for applications such as slotting (timing) beacons

*** APRS is a trademark of Bob Bruninga, WA4APR. APRS, A Packet Reporting System, is a DOS-based program that displays call signs on maps based on packets received from packet radio stations using a GPS device.**

From Jeff Brentons site:

The Kantronics KPC-3 **Plus** (only), as well as the new KAM-98, with version 8.3 software, implements a software "second serial port", for monitoring a GPS or other serial telemetry device. This frees up the "real" serial port to talk to a computer, as needed, so you can run APRS (all flavors) on computers with only one serial port.

There are, of course, limitations. First, it is *one way*, into the TNC, since it uses the External Carrier Detect pin of the radio port. This means there is ***no output*** is available to send initialization strings or anything else to the attached device.

Second, since this is a software-only serial port, it can sometimes drop data at higher speeds, if the TNC is busy. Kantronics says they have *only* experienced this *occasionally* at 4800 baud, the highest speed allowed (and, of course, the most common one for GPS units). Simulating a serial port using a data collection line takes some serious CPU work, which is why this isn't likely to be implemented on the older TNCs.

In real life, however, I have not seen the above limitations to be a problem. My KPC-3 Plus reads my GPS-30's 4800 baud data stream much more reliably than my PicoPacket, which has a *hardware* serial port, and the software is smart enough to reject bad data strings (at least for GPS; it's not programmed *per se* for weather telemetry, but you CAN use it for such).

Operation of the completed tracker is very much the same as the PacComm PicoPacket dual-port TNC; in fact, older (pre-8.20) versions of APRS for DOS require you to tell the system it IS a PicoPacket, so that it will properly poll it for location information, and Win/MacAPRS need to have the option "Pico ^E" selected. More on this **after** we get the TNC operational!

All of this nice stuff requires a few additional settings over and above the ones on the KPC tracker page, however. This page deals with those changes.

First, you need a cable to attach the GPS. The second port is part of the Radio Port wiring, and it **may** be easiest to start a new cable, depending upon how "creative" your current cable is. I'm only going to deal with the second serial port here - the radio connection is just like the manual shows, no changes.

You will need 2 DB-9 male connectors (one ships with the TNC, Radio Shack 276-1537 works fine, though), a short piece of 2-wire cable for the serial port, and whatever other cable and connectors are needed for your radio. Oh, I guess a couple of DB-9 hoods (Radio Shack 276-1508, -1539 or -1513, depending upon your preferences) would be nice to make things neat, and to take the stress off the solder joints.

Pin 2 on the TNC is the Data IN line, Pin 6 is GROUND for all signals. This is darned convenient, because Pin 2 on a standard 9-pin serial connector is where the external device is trying to stuff its data... although the signal ground is on Pin 5. This is called "DTE wiring", in that the in/out pins of

this connector are arranged the way they are on **data terminal equipment,** rather than "modem wiring", like is found on the TNC's main serial port.

[*You might ask, "why chose a DB-9* ***male*** *connector, wired DTE?" I chose this because you can then use the same cable you use to connect the GPS or other device to your computer to connect it to the TNC's second port.*]

So, you are adding a two-wire cable between pins 2 and 6 of the TNC's Radio Port and pins 2 and **5** of the new serial connector. After this is soldered together, assemble the hoods over the connectors to protect them.

Now, to software....

The following are the important tracker settings for the TNC:

`ABAUD 4800` Could be 9600, but should be **at least** as high as the second port's speed

`BEACON EVERY 0 (disabled)` You might have something in here; I don't. Set as needed for your application

```
BLT
1 EVERY 00:01:30 CLEAR
2 EVERY 00:20:00
3 EVERY 00:00:00
4 EVERY 00:00:00
```

Primary position string report rate, empty buffer after sending

Secondary position string report rate[3]

`BTEXT` Can be anything you want; set `BEACON` time if you're using `BTEXT` for anything

`CD SOFTWARE` To allow use of open squelch on the radio.

`CONMODE CONVERS`

`CONOK ON`

`CWID EVERY 0 (disabled)` Change if required in your country; not needed or welcome in US

`DIGIPEAT OFF` Mobile shouldn't, but weather station might want to...

`ECHO ON` Useful while programming; APRS programs will turn it off

`FLOW ON` Also useful while programming

`FULLDUP OFF` Very important if this is also a digipeater!

`GPSHEAD 1 $GPRMC` Gives both position and speed, as well as date and time

`GPSHEAD 2 $GPGGA` Gives position, altitude, and time, but not speed or date

`GPSINIT` Should be blank, since you can't send anything to the GPS...

`GPSPORT 4800 NORMAL CHECKSUM` Sets speed to 4800, normal polarity signals, and use Checksums on strings

`GPSTIME VALID RMC` Choses the GPS string to use to set the internal clock

`HEADERLN OFF` Needed for APRS

`HID OFF` Not needed unless this is a digipeater, but there is a better way

`INTFACE TERMINAL`

`LGETCHAR $05 (CTRL-E)` Allows APRS to ask the TNC for contents of LText buffers on its own schedule

`LTP 1 GPSLJ V RELAY,WIDE,WIDE` Set the paths to send various strings out when stand-alone, sets tracker symbol
`LTP 2 GPSLJ V RELAY,WIDE3-3`
`LTP 3 GPS`
`LTP 4 GPS`

`MONITOR ON` Important for APRS

`MXMIT OFF` Saves some clutter

`MYCALL KA9VNV-1` Your call will vary... at least it better!

`MYREMOTE JEEP-1` Select something unique - this is your remote control

`PACLEN 0` Sets maximum packet length

`PASSALL OFF` Disregard packets with bad data

`RTEXT PassWord String GoES HeRE!` This is the second part of enabling remote SYSOP capabilities

`SCREENL 0` **VERY** important for APRS, especially messaging!

`UNPROTO APRSW VIA RELAY,WIDE3-3`

Now that the TNC is ready, it is time to set up your APRS software...

WinAPRS and MacAPRS

Win/MacAPRS are simple to set up for plug-in use with this tracker. In the Settings menu, you will visit the Serial Port menu to check **"Allow GPS" and "Pico ^E" for the VHF TNC port** (or HF TNC port, if you're using a KAM 98). Make sure the baud rate matches the `ABAUD` setting of the TNC.

Next, in the **Select TNC type menu, set "Single TNC on VHF"** (HF for KAM 98), and select the appropriate INITxxxx.TNC file (INITKPC3.TNC, but you'll want to edit it for the changes noted above).

Finally, you will want to check the **"Position Report Rate" menu to verify that the "Moving Position Report" rate is proper**. This setting is in MINUTES, and does not really accept any fractions. Win/MacAPRS always poll the GPS buffers at 55 seconds into the minute, computer clock time; it is hard-coded[1,2].

You can now open the VHF TNC, and Win/MacAPRS will start getting its position from the GPS. Note that this does **not** change the location set in the Settings/Station menu; your first position report, and the report sent any time you re-initialize the TNC, will *ALWAYS* be whatever you set there when you start Win/MacAPRS. I have discussed this with Mark Sproul, and this is hard-coded into Win/MacAPRS at this time. What the future holds, only Mark and Keith know. It affects *all* mobile Win/MacAPRS stations.

APRS DOS

All versions 7.9 and above, should work fine, so long as you have a GPS license number from Bob. In fact, older versions should work, since the KPC-3 Plus does not have some of the limitations on command acceptance that the PicoPacket has.

You do need to tell it when you set the program up that the KPC-3 Plus is a PicoPacket, and set up the GPS input as being an "HSP cable", so that APRS knows to send a ^E periodically to read the GPS position.

Note that this has changed, starting with version 8.2x. The following is Bob's explanation of this from NEWNOTES.TXT:

> Dual port Pico and KPC 8.3 now need to set ^E-SINGLEPORT-SWITCH using the alt-S-GPS-MODES-ESP command instead of the startup configuration just asking for type of TNC. Thus you can now toggle between HSP and ESP mode without re-configuring...

You will want to have APRS read the GPS position twice as often (or more) than your normal beacon time (the shortest BLT timer in use), so that the TNC never sends a "raw" position report (the ^E character resets the BLT timers each time it is seen[1]).

One caveat with DOS APRS... when you shut most versions down, they leave your BText set to your position at the time, plus "APRS QRT hhmm". This is set each time APRS sends a position report, so that it gets set even if you don't want it to be. To prevent this, when you shut down, either set your Beacon time to zero (disabled), or add a line to reset your BText to RESTORE.TNC in the SYSTEM directory... although some versions change the beacon rate and/or BTEXT *after* they send the RESTORE.TNC file. Failure to do this will your position to "jump" to where you shut off APRS, then back to your real position, each time your beacon is transmitted.

APRS Plus SA

To put APRS+SA into Ctrl-E Polling (Pico Mode in older versions), on Main Parameters tab of Setup, put Port 1, the TNC port, into Pico mode. Adjust the GPS update rate as desired[1].

Note that APRS+SA will poll the Pico/KPC-3+ with a Ctrl-E before transmitting a position, so as to always have the most recent position. The GPS update rate is only used to determine position to all other APRS stations.

Notes:

1. Unlike the PicoPacket, the timers on the 4 location text buffers in Kantronics TNCs can be individually set, as can the path(s) they are sent by. They also have an optional "start" parameter, which can be used to space out different strings with the same report rate. Use of this parameter, though, negates the automatic resetting of the location timers when APRS (all versions) poll the TNC for its LText buffers. For this reason, the use of the START parameter should be avoided, and staggered-length timers used instead.

2. Because the length of Win/MacAPRS's polling cycle is fixed at 60 seconds, it is recommended that the minimum length of any BLText timer be 65 seconds, or "00:01:05", to make sure that, when using a computer with the TNC, no "raw" GPS packets are sent out.

3. NEW IDEA! By not clearing the buffer on the second LTEXT buffer, *and* setting it to a longer period, you can change the mobile beacon rate, simply by disconnecting the GPS output from the TNC when the vehicle is turned of. The TNC and radio can remain powered all the time; when the GPS information stops coming in, the TNC will give one last beacon at the fast rate (LTEXT 1), then all beacons will be from the slow rate (LTEXT 2) buffer, which doesn't get cleared. This will keep you on people's maps, without flooding the net with packets at your moving rate.

If you have any questions feel free to email me at kc5goi@kc5goi.net.