

# Standard TNC Parameter Settings for Santa Clara County Packet Network

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*Updated for SCCo Packet Installer v102*

## Table of Contents

Introduction .....	3
Fictitious Call Signs .....	3
Standard TNC Settings for Outpost Users .....	4
Preconfigured TNCs in Outpost .....	4
Creating an Outpost TNC Command List .....	4
Standard TNC Settings for Manual BBS Sessions .....	13
Manual Operations Workflow .....	13
TNC Commands for Manual Operations .....	15
Explanation of TNC Parameters .....	19
Restore Factory Defaults .....	19
Full Command Set .....	19
Mode Control .....	19
Character Length .....	20
Station Identification .....	21
Channel Access .....	23
Transport and Session Control .....	25
Radio Timing .....	26
Flow Control .....	27
Packetization Control .....	27
Stream Control .....	29
GPS Control .....	30
Other TNCs .....	32
AEA PK-232MBX .....	32

AEA PK-88.....	32
Alinco DR-620T/DR-635T Radio with Internal EJ-50U TNC .....	32
Kantronics 9612 .....	32
Kenwood TM-D700 Radio with Internal TNC.....	32
Kenwood TS-2000 Radio with Internal TNC.....	32
MFJ 1270B/1274B .....	32
Revision History .....	34

## Introduction

Most TNCs have dozens of configurable parameters. For many of these parameters, picking a value is non-trivial since many of them interact with each other. Changing one parameter without a corresponding change to the others can severely degrade performance. In addition, a packet radio channel operates most efficiently if all TNCs use a common set of values for several important parameters. Yet each TNC manufacturer has chosen different default values. Without a common standard, the channel is virtually guaranteed to be less than optimal.

The parameters defined in this document have been tested and are known to work well, even in heavy traffic situations.

**All users of the Santa Clara County network are expected to implement these settings.**

## Fictitious Call Signs

There are a few places in this document that need to include either a legal call sign or a tactical call sign in order to show an example of a complete command. Rather than use any real call signs in the examples, fictitious call signs are used.

W6XRL4 is used as a fictitious legal call sign. It belonged to Herman Munster, a character in a 1960's TV show called "The Munsters". And yes, Herman was a ham.

XNDEOC is used as a fictitious tactical call sign. It represents the City of Xanadu's Emergency Operations Center.

## Standard TNC Settings for Outpost Users

Outpost provides a convenient mechanism to ensure that the TNC is properly set up with all applicable parameters each time it transmits a message. This section explains how to use Outpost to set all standard TNC parameters. The details of each parameter, as well as the procedures for set them manually, are covered in later sections.

### Preconfigured TNCs in Outpost

The Santa Clara County packet installer includes preconfigured TNC setup files for the following TNCs:

- Kantronics KPC3
- Kantronics KPC3+
- Kenwood TH-D72A
- Kenwood TM-D710A
- MFJ 1270C/1274C
- TAPR TNC2
- Timewave PK-96

These setup files already contain the “before” and “after” commands listed in the following section. Each of these setup files have been tested and will work well with the Santa Clara County network. Simply select the preconfigured setup that matches your TNC and set the proper COMM port. No other configuration is necessary

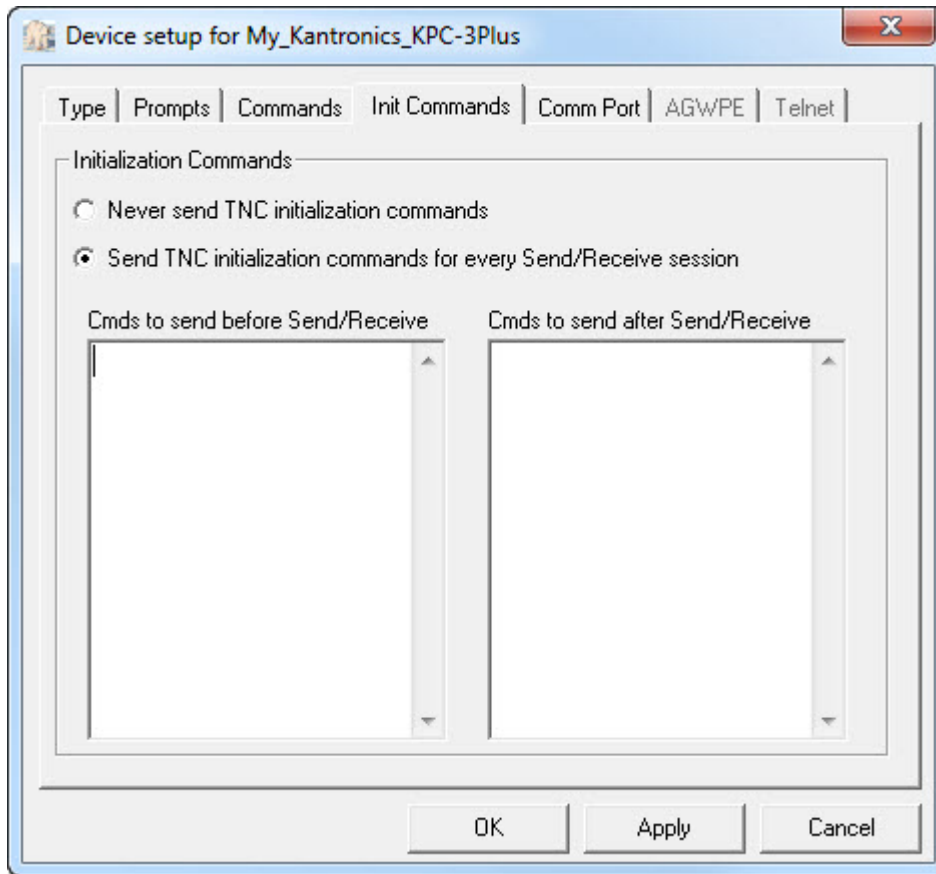
If you have a TNC that is not listed above, check the “Other TNCs” section near the end of this document for information on similar TNCs.

### Creating an Outpost TNC Command List

The following instructions explain how to configure the TNC command lists for optimum performance in the Santa Clara County network if you did NOT use the Santa Clara County packet installer. Follow the instructions below to create a TNC configuration that optimizes both the TNC and the RF channel performance in the Santa Clara County network.

#### In Outpost:

- Setup > TNC
  - Click “New” to create a new TNC with default settings
  - Click “Copy” to create a new TNC with a copy of an existing TNC’s settings
- Give the TNC a name (this example uses “My\_Kantronics\_KPC-3Plus”) and a description
- Select “TNC” as the Device Type
- Click on the “Init Commands” tab
- Select “Send TNC initialization commands for every Send/Receive session”



Use the following table to enter the commands appropriate for your TNC type. Note that some TNCs do not have certain features while others use a different command for the same feature. We recommend that you use copy-and-paste to avoid making typographical errors.

TNC Type	Before Outpost Send/Receive	After Outpost Send/Receive
AGWPE	AGWPE parameters must be set in a dialog box in the AGWPE application. Use these values: PERSIST 63 SLOTTIME 10 MAXFRAME 2 RETRIES 10 FRACK 6 RESPTIME 5 CHECK 300 TXDELAY 40	

TNC Type	Before Outpost Send/Receive	After Outpost Send/Receive
Kantronics KPC-3 (non-“+” version)	INTERFACE TERMINAL CD SOFTWARE NEWMODE ON 8BITCONV ON BEACON EVERY 0 SLOTTIME 10 PERSIST 63 PACLEN 128 MAXFRAME 2 FRACK 6 RETRY 8 RESPTIME 5 CHECK 30 TXDELAY 40 XFLOW OFF SENDPAC \$05 CR OFF PACTIME AFTER 2 CPACTIME ON STREAMEV OFF STREAMSW \$00	SENDPAC \$0D CR ON PACTIME AFTER 10 CPACTIME OFF STREAMSW \$7C
Kantronics KPC-3+	INTERFACE TERMINAL CD SOFTWARE NEWMODE ON 8BITCONV ON BEACON EVERY 0 SLOTTIME 10 PERSIST 63 PACLEN 128 MAXFRAME 2 FRACK 6 RETRY 8 CHECK 30 TXDELAY 40 XFLOW OFF SENDPAC \$05 CR OFF PACTIME AFTER 2 CPACTIME ON STREAMEV OFF STREAMSW \$00	SENDPAC \$0D CR ON PACTIME AFTER 10 CPACTIME OFF STREAMSW \$7C

TNC Type	Before Outpost Send/Receive	After Outpost Send/Receive
Kenwood TH-D72A	NEWMODE ON 8BITCONV ON BEACON EVERY 0 SLOTTIME 10 PERSIST 63 PPERSIST ON PACLEN 128 MAXFRAME 1 FRACK 6 RETRY 8 RESPTIME 5 CHECK 30 TXDELAY 40 XFLOW OFF SENDPAC \$05 CR OFF PACTIME AFTER 2 CPACTIME ON LOCATION EVERY 0	SENDPAC \$0D CR ON PACTIME AFTER 10 CPACTIME OFF
Kenwood TM-D710A	NEWMODE ON 8BITCONV ON BEACON EVERY 0 SLOTTIME 10 PERSIST 63 PPERSIST ON PACLEN 128 MAXFRAME 2 FRACK 6 RETRY 8 RESPTIME 5 CHECK 30 TXDELAY 40 XFLOW OFF SENDPAC \$05 CR OFF PACTIME AFTER 2 CPACTIME ON STREAMSW \$00	SENDPAC \$0D CR ON PACTIME AFTER 10 CPACTIME OFF STREAMSW \$01

TNC Type	Before Outpost Send/Receive	After Outpost Send/Receive
MFJ 1270C/1274C	NEWMODE ON AWLEN 8 8BITCONV ON BEACON EVERY 0 SLOTS 4 PACLEN 128 MAXFRAME 2 FRACK 6 RETRY 8 RESPTIME 5 CHECK 30 TXDELAY 40 XFLOW OFF SENDPAC \$05 CR OFF PACTIME AFTER 2 CPACTIME ON STREAMSW \$00	SENDPAC \$0D CR ON PACTIME AFTER 10 CPACTIME OFF STREAMSW \$7C
TAPR TNC2	NEWMODE ON AWLEN 8 8BITCONV ON BEACON EVERY 0 SLOTS 4 PACLEN 128 MAXFRAME 2 FRACK 6 RETRY 8 RESPTIME 5 CHECK 30 TXDELAY 40 XFLOW OFF SENDPAC \$05 CR OFF PACTIME AFTER 2 CPACTIME ON STREAMSW \$00	SENDPAC \$0D CR ON PACTIME AFTER 10 CPACTIME OFF STREAMSW \$7C

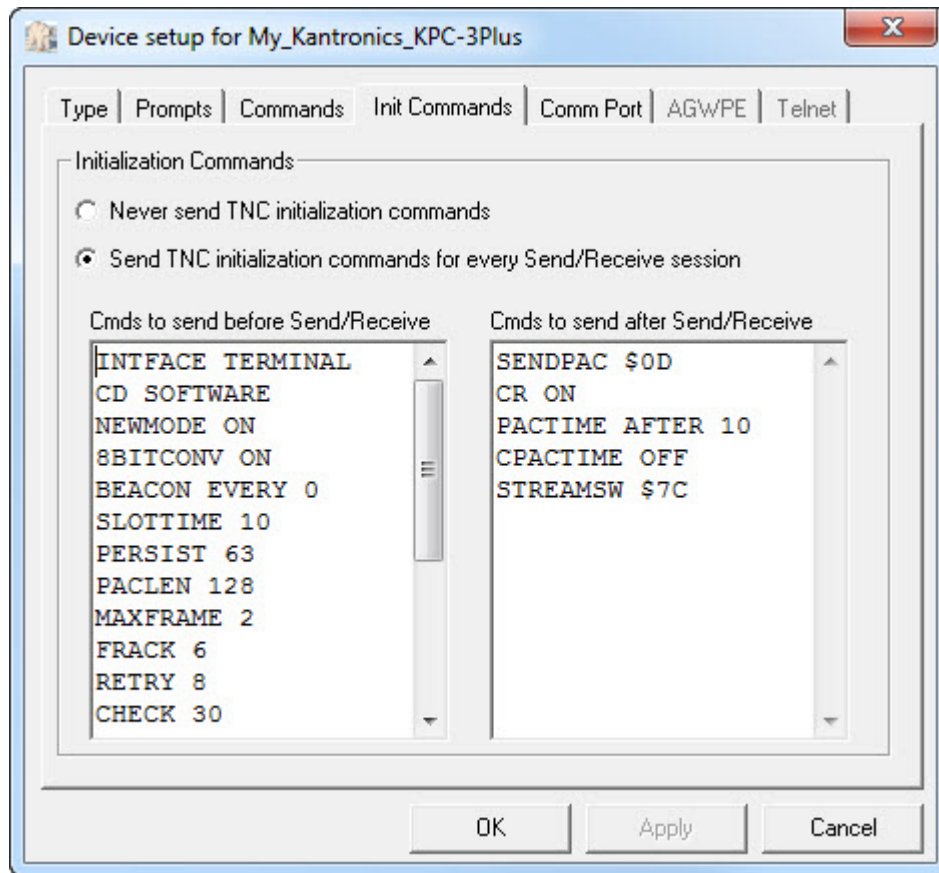


TNC Type	Before Outpost Send/Receive	After Outpost Send/Receive
Timewave	EXPERT ON NEWMODE ON AWLEN 8 8BITCONV ON BEACON EVERY 0 SLOTTIME 10 PERSIST 63 PPERSIST ON PACLEN 128 MAXFRAME 2 FRACK 6 RETRY 8 RESPTIME 5 CHECK 30 TXDELAY 40 XFLOW OFF SENDPAC \$05 ACRPACK OFF PACTIME AFTER 2 CPACTIME ON CHSWITCH \$00	SENDPAC \$0D ACRPACK ON PACTIME AFTER 10 CPACTIME OFF CHSWITCH \$7C

## Notes:

- 1) The commands in the above table do not set MYCALL (your call sign) because that is automatically set by Outpost based on what you enter in the Setup > Identification dialog box.
- 2) The MONITOR function is not turned off in the above command lists because Outpost does that anyway.
- 3) The personal mailbox name (MYPBBS, MYMCALL, MYMAIL, etc.) is also not set here since this parameter is not needed by Outpost when sending messages. If you wish to set up your TNC as a mailbox/PBBS so that others may connect to it and leave messages for you, then you need to use the appropriate command for your TNC. Consult the "Explanation of TNC Parameters" section of this document for more information.

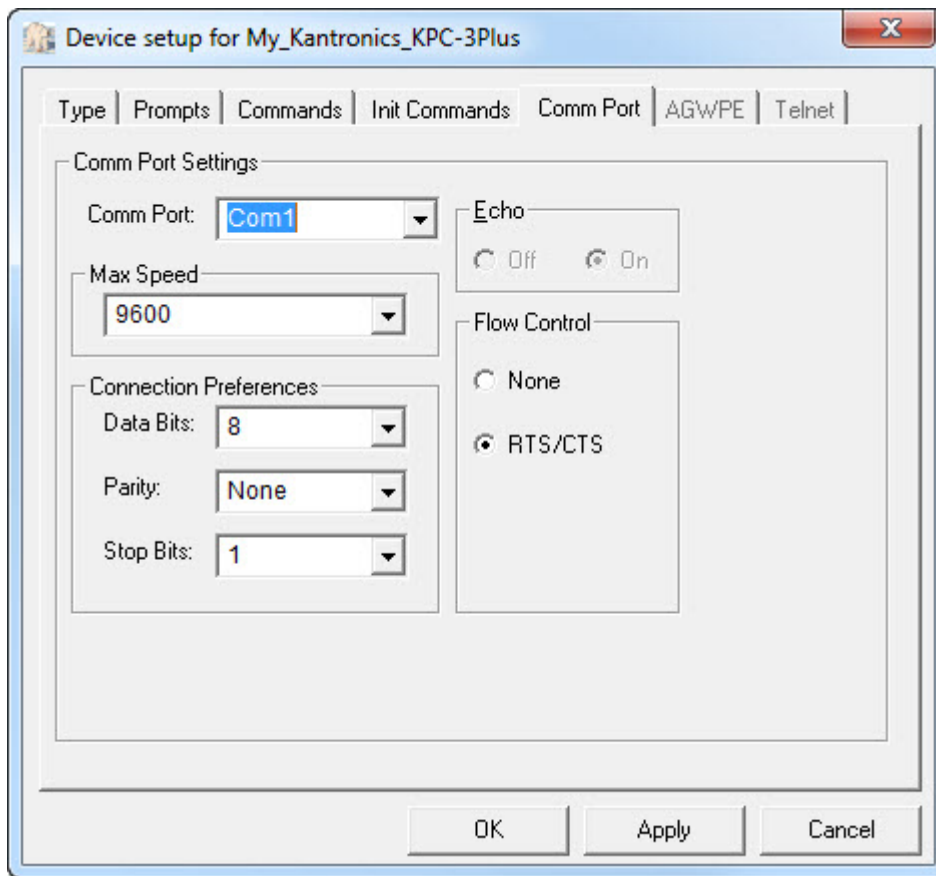
- When you have finished entering the commands in both columns, your screen should look something like the following (this example is for a Kantronics KPC-3+):



- Click OK.

Each time Outpost begins a session, it will send the commands in the “Send Before ...” column to the TNC, then connect to the BBS, send and receive messages, disconnect from the BBS, and then send the commands in the “Send After ...” column to the TNC.

- Finally, set the TNC Comm Port Parameters
  - Setup > TNC > (select TNC) > Comm Port
    - Comm Port: Pick the correct port for your PC configuration
      - If unsure, check the Windows Device Manager
    - Max Speed: Usually 9600
      - Using a higher baud rate on the serial port (9600) than is used on the air (1200) ensures that the TNC has sufficient data when assembling outgoing packets for the maximum packet size, which increases efficiency. It also avoids the need for the TNC to buffer incoming data, which is important because most TNCs have limited amounts of memory.
    - Data Bits: Usually 8
    - Parity: Usually None
    - Stop Bits: Usually 1
    - Flow Control: RTS/CTS
      - Flow control is important for reliable communications. It notifies the sending side when the receiving side is ready to receive data. Hardware flow control is the most reliable method of flow control and RTS/CTS is the most common method of hardware flow control. Check the documentation for your TNC to make sure it supports this method.
      - Setting “RTS/CTS” here matches the flow control used by Outpost to the hardware flow control set on the TNC using the “XFLOW OFF” command.
      - **Note:** If you use extension cables and/or adapters (DB-9 to DB-25) to connect your computer’s serial port (or your USB-to-serial adapter) to the TNC, make sure they are straight-through cables/adapters for all 9 pins. This ensures that the RTS/CTS control signals are passed through. So called “null-modem” cables and/or adapters should not be used since they cross some wires and short together others to simulate a connection to a modem.



- Click OK

**That's it. You're done!**

## Standard TNC Settings for Manual BBS Sessions

The parameters listed in this section are for use by all Santa Clara County packet network users when manually connecting to the BBS (i.e. NOT using Outpost). They are a subset of the parameters used by Outpost users. All of these parameters should be set on any TNC used in the Santa Clara County network. Doing so will optimize performance for manual connections.

### Manual Operations Workflow

This workflow assumes the use of a hardware TNC, which is recommended for emergency communications work.

#### Connecting to the TNC

Connect to the TNC using a straight-through cable (not “null-modem”) that passes through all of the DB-9 signals. Then use a terminal emulator. You can use any terminal emulator you want. Outpost includes one called “Ipserial.” “PuTTY” is another terminal emulator which is free and widely used.

Open your terminal emulator and set the proper serial port settings. Be sure you set RTS/CTS (i.e. “hardware”) flow control.

#### *In Outpost > Ipserial:*

- Go to: Tools > Interactive Packet > Serial/Comm Port
  - This opens the Ipserial window
- Click on: File > Comm Port Settings
- Select the proper settings for your serial port.
  - Select the appropriate serial comm port
  - 9600 baud, 8 data bits, no parity, 1 stop bit is common
  - Select RTS/CTS flow control.
  - Click OK
- Click on: Connect

#### *In Putty:*

- Main screen
  - Select Serial
  - Set the serial port name, such as COM1
  - Set the speed to 9600
- Terminal > Keyboard
  - Set the Backspace key to “Control-H”
- Serial
  - Set 9600 baud, 8 data bits, no parity, 1 stop bit is common
  - Set Flow Control to RTS/CTS
- Session
  - If desired, give the session a name and click Save
  - Click Open to open a terminal session

You should see the TNC command prompt “cmd:” in the terminal window. If not, type the “\*” (asterisk) character one or more times. Several TNC manufacturers use the “\*” (asterisk) character for auto baud detection.

### Configuring TNC Settings at Start of Shift

At the start of a shift, the operator should typically use the following procedure:

- Restore the TNC to factory defaults

TNC Type	Command to Restore Factory Defaults
AGWPE	N/A
Kantronics KPC-3 (non-“+”) Kantronics KPC-3+	RESTORE DEFAULT
Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	RESET

- Use “\*” if the TNC conducts its auto-baud function to set the baud rate
- Enter your call sign if prompted
- Enter the commands listed in the “Start of Shift” column in the table below. This will set the TNC for optimal performance in a manual workflow. The commands can usually be cut-and-pasted into the terminal all at once.

### Managing Call Signs and FCC Identification Requirements During the Shift

During a shift, the operator will usually conduct many sessions with the BBS. The operator may use an FCC call sign or a tactical call sign for each session.

#### *BBS Session Using an FCC Call Sign*

The operator will use the “MYCALL” command to set the FCC call sign before connecting to the BBS. For this example, the fictitious call sign of Herman Munster, W6XRL4, is used:

```
MYCALL w6xrl4
CONNECT ...
```

All packets sent from the operator’s station will have a from address of “w6xrl4”, so the FCC identification requirements are automatically met for each packet.

#### *BBS Session Using a Tactical Call Sign*

The operator will use the “MYCALL” command to set the tactical call sign before connecting to the BBS. For this example, the fictitious tactical call sign of the Xanadu Emergency Operations Center, XNDEOC, is used:

```
MYCALL xndeoc
CONNECT ...
```

All packets sent from the station will have a from address of "xndeoc". That is not an FCC call sign and the FCC identification requirements will not be met by the from address in each packet. Therefore, sessions should be kept to less than 10 minutes. And, after the BBS session has disconnected and the TNC cmd: prompt has returned, the operator should identify the transmission with an FCC call sign by using the "CONV" (converse mode) command. The converse mode is terminated by sending a [CTRL-C] (Control-C) character.

```
CONV
de w6xrl4
[CTRL-C]
```

At this point, the FCC identification requirements have been met, but all packets sent from the station will still have a from address of "xndeoc". Additional sessions can be conducted using the same tactical call sign. The FCC ID should be sent after each session. To restore the FCC call sign, use the MYCALL command:

```
MYCALL w6xrl4
```

### Restoring TNC Settings at End of Shift

At the end of a shift, the operator should enter the commands listed in the "End of Shift" column below. The command(s) can be cut-and-pasted, all at once, at the TNC cmd: prompt. This will restore default values to certain TNC settings. This ensures that the TNC behaves as expected for other applications, such as keyboard-to-keyboard sessions.

### TNC Commands for Manual Operations

**Note:** If you have a TNC which is not listed in the table below, check the "Other TNCs" section near the end of this document for information on similar TNCs.

TNC Type	Manual Ops: Start of Shift	Manual Ops: End of Shift
AGWPE	AGWPE parameters must be set in a dialog box in the AGWPE application. Use these values: PERSIST 63 SLOTTIME 10 MAXFRAME 2 RETRIES 10 FRACK 6 RESPTIME 5 CHECK 300 TXDELAY 40	

TNC Type	Manual Ops: Start of Shift	Manual Ops: End of Shift
Kantronics KPC-3 (non-“+” version)	INTFACE TERMINAL MONITOR OFF CD SOFTWARE NEWMODE ON 8BITCONV ON BEACON EVERY 0 SLOTTIME 10 PERSIST 63 PACLEN 128 MAXFRAME 2 FRACK 6 RETRY 8 RESPTIME 5 CHECK 30 TXDELAY 40 XFLOW OFF STREAMEV OFF STREAMSW \$00	STREAMSW \$7C
Kantronics KPC-3+	INTFACE TERMINAL MONITOR OFF CD SOFTWARE NEWMODE ON 8BITCONV ON BEACON EVERY 0 SLOTTIME 10 PERSIST 63 PACLEN 128 MAXFRAME 2 FRACK 6 RETRY 8 CHECK 30 TXDELAY 40 XFLOW OFF STREAMEV OFF STREAMSW \$00	STREAMSW \$7C
Kenwood TH-D72A	MONITOR OFF NEWMODE ON 8BITCONV ON BEACON EVERY 0 SLOTTIME 10 PERSIST 63 PPERSIST ON PACLEN 128 MAXFRAME 1 FRACK 6 RETRY 8 RESPTIME 5 CHECK 30 TXDELAY 40 XFLOW OFF LOCATION EVERY 0	



TNC Type	Manual Ops: Start of Shift	Manual Ops: End of Shift
Kenwood TM-D710A	MONITOR OFF NEWMODE ON 8BITCONV ON BEACON EVERY 0 SLOTTIME 10 PERSIST 63 PPERSIST ON PACLEN 128 MAXFRAME 2 FRACK 6 RETRY 8 RESPTIME 5 CHECK 30 TXDELAY 40 XFLOW OFF STREAMSW \$00	STREAMSW \$01
MFJ 1270C/1274C	MONITOR OFF NEWMODE ON AWLEN 8 8BITCONV ON BEACON EVERY 0 SLOTS 4 PACLEN 128 MAXFRAME 2 FRACK 6 RETRY 8 RESPTIME 5 CHECK 30 TXDELAY 40 XFLOW OFF STREAMSW \$00	STREAMSW \$7C
TAPR TNC2	MONITOR OFF NEWMODE ON AWLEN 8 8BITCONV ON BEACON EVERY 0 SLOTS 4 PACLEN 128 MAXFRAME 2 FRACK 6 RETRY 8 RESPTIME 5 CHECK 30 TXDELAY 40 XFLOW OFF STREAMSW \$00	STREAMSW \$7C

TNC Type	Manual Ops: Start of Shift	Manual Ops: End of Shift
Timewave PK-96	EXPERT ON MONITOR 0 NEWMODE ON AWLEN 8 8BITCONV ON BEACON EVERY 0 SLOTTIME 10 PERSIST 63 PPERSIST ON PACLEN 128 MAXFRAME 2 FRACK 6 RETRY 8 RESPTIME 5 CHECK 30 TXDELAY 40 XFLOW OFF CHSWITCH \$00	CHSWITCH \$7C

## Explanation of TNC Parameters

### Restore Factory Defaults

Whenever presented with a TNC that has an unknown configuration, such as one that might have been used with another application that did not clean up properly, it is a good idea to start with the factory default settings. If the TNC is not already in the “expert” or full command set mode, you may need to issue that command first (see next section). After restoring factory defaults, you may need to use “\*” to auto-baud again.

AGWPE	N/A
Kantronics KPC-3 Kantronics KPC-3+	RESTORE DEFAULT
Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	RESET

### Full Command Set

Some TNCs ship from the factory with only a few commands enabled. In theory, this is supposed to be helpful to the novice user. In practice, it means we have one more command to issue before we can issue the commands we need to use. Set the full command set mode of the TNC to allow you to enter more than novice commands

AGWPE Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2	N/A
Kantronics KPC-3 Kantronics KPC-3+	INTERFACE TERMINAL
Timewave PK-96	EXPERT ON

## Mode Control

### New Mode

The NEWMODE parameter determines whether or not the TNC will return to Command Mode if the station on the current I/O stream of another mode disconnects. When talking to a BBS, the user (or Outpost) enters a “B” (“Bye”) at the BBS prompt to close a session. This causes the BBS to disconnect. If NEWMODE is on, the TNC will switch back to Command Mode when the BBS disconnects.

AGWPE	N/A
Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	NEWMODE ON

### Converse Mode

In CONVERSE mode, anything that the user types will be sent out over the air. This makes it ideal for sending a legal call sign identification when using a tactical call sign, without having to repeatedly change the TNC's MYCALL parameter. Exit CONVERSE mode with [CTRL-C]. (Replace "W6XRL4" with your real call sign.)

AGWPE	N/A
Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	To enter converse mode: CONV  To send ID: de W6XRL4  To exit converse mode: [CTRL-C]

### Character Length

#### AWLEN

The AWLEN parameter specifies the word length used by the serial IO terminal port. This option is found in older TNC software (and some newer software for backward compatibility). In general, this should be set to 8 and must match your serial port setting.

AGWPE Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A	N/A
MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	AWLEN 8

### 8BITCONV

The 8BITCONV parameter controls the transmission of 8-bit data in Converse Mode. This should be ON to allow for extended ASCII in messages. Setting this to ON also requires the AWLEN be set to 8.

AGWPE	N/A
Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	8BITCONV

### Station Identification

The following parameters identify your station.

#### Call Sign

The call sign set in your TNC should be set to your legal or tactical call sign. After that, the from address field of all packets originating from the TNC will be set to this call sign. (Replace “W6XRL4” with your real call sign.)

AGWPE	N/A
Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	MYCALL W6XRL4

#### Mailbox ID

If you’re running a mailbox on your TNC, you will identify it with a CallSign-SSID value. (Replace “W6XRL4” in the example below with your real call sign.) An SSID of 1 is most commonly used to identify PBBs (Personal BBSs or mailboxes) such as found in TNCs.

AGWPE	N/A
Kantronics KPC-3 Kantronics KPC-3+	MYPBBs W6XRL4-1
Kenwood TH-D72A MFJ 1270C/1274C TAPR TNC2	N/A
Kenwood TM-D710A	MYMCALL W6XRL4-1
Timewave PK-96	MYMAIL W6XRL4-1

### Beacon Interval

The BEACON parameter controls how often the TNC sends out an ID packet. Do NOT enable beaconing unless you are running a mailbox or other function on your TNC to which others will connect.

#### To turn off beaconing:

AGWPE	N/A
Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	BEACON EVERY 0

**Note: Never beacon on a BBS access frequency.** The BBS frequencies in use in the Santa Clara County network are coordinated frequencies. You should never run your own BBS, mailbox, digipeater or node on these frequencies. Select a suitable alternate frequency from the NCPA band plan.

If you run your own BBS, mailbox, digipeater or node (on a different frequency from the county BBSs!), you may want to beacon so that your users know that your station is up and available for them to use. But beaconing too frequently is a waste of bandwidth and is frowned upon. A good compromise is to set your beacon timer to 30 minutes or longer. Be aware that different manufacturers use different increments of time. Kantronics uses increments of minutes. Kenwood, MFJ, TAPR, Timewave and Kenwood use increments of 10 secs. The following commands all set the beacon interval to 30 minutes.

#### To turn on beaconing when NOT on a BBS frequency:

AGWPE	N/A
Kantronics KPC-3 Kantronics KPC-3+	BEACON EVERY 30
Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	BEACON EVERY 180

### Beacon Text

The BTEXT parameter controls the content of the beacons. If beaconing is turned off, then the beacon text does not matter. If you must beacon, do it on a different frequency from the county BBSs and then keep your beacon text as short as possible, but provide enough information so that people know how to

reach you. Some people include their callsign-ssid and city to tell users how/where to connect.  
(Replace “W6XRL4-1” with your real call sign and SSID.)

AGWPE	N/A
Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	BTEXT W6XRL4-1 Your-City ARES/RACES

## Channel Access

### Carrier Detect

The CD parameter, if available, defines which method is used to detect the presence of a carrier. The TNC will not transmit if another carrier is present. A value of “SOFTWARE” tells the TNC to detect the presence of actual packet data to enable carrier detection, allowing operation with un-squelched audio. This is useful if you have no way to monitor the squelch level while operating, such as when your TNC is plugged into the radio’s speaker jack.

AGWPE Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	N/A
Kantronics KPC-3 Kantronics KPC-3+	CD SOFTWARE

### Slot Time

The SLOTTIME parameter specifies how often the TNC runs an algorithm to see if it can transmit. For best performance, all devices should use the same slot time. The interval is 10 ms.

AGWPE Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A Timewave PK-96	SLOTTIME 10
MFJ 1270C/1274C TAPR TNC2	N/A

### Persist

The PERSIST value specifies the threshold for a random attempt to transmit. Too low a value and you will not receive your fair share of access. Too high and you prevent others from transmitting, including those you are communicating with. This can cause timeouts and retries which slow down the channel for everyone. For best performance, all devices should use the same persist value.

AGWPE Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A Timewave PK-96	PERSIST 63
MFJ 1270C/1274C TAPR TNC2	N/A

### PPersist

The PPERSIST parameter, if available, specifies whether to use the newer PERSIST and SLOTTIME values or the older DWAIT method to control access to the channel. We use the newer PERSIST/SLOTTIME method.

AGWPE Kantronics KPC-3 Kantronics KPC-3+ MFJ 1270C/1274C TAPR TNC2	N/A
Kenwood TH-D72A Kenwood TM-D710A Timewave PK-96	PPERSIST ON

### Slots

The SLOTS value is an alternative to specifying the slot time and persistence. A value of 4 matches the behavior of our preferred slot time and persistence values.

AGWPE Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A Timewave PK-96	N/A
MFJ 1270C/1274C TAPR TNC2	SLOTS 4



## Transport and Session Control

### Packet Length

The PACLEN value sets the maximum number of bytes to be sent in each packet. Larger packets can increase throughput if the channel is clear. But larger packets can also decrease throughput if the channel is congested. A value of 128 results in good performance in both busy and non-busy conditions. For best performance, all devices should use the same PACLEN value.

All TNCs	PACLEN 128
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### Maximum Frames

The MAXFRAME value controls how many frames can be sent before requiring an acknowledgement. Higher values can increase throughput. But as the channel gets busier or the channel conditions degrade, higher values can cause tremendous performance degradation due to needless retries. For best performance, all devices should use the same MAXFRAME value.

AGWPE Kantronics KPC-3 Kantronics KPC-3+ Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	MAXFRAME 2
Kenwood TH-D72A (not changeable)	MAXFRAME 1

### Frame Acknowledgement Time

The FRACK value controls how long the TNC waits for an acknowledgement before assuming that the frame was lost and then performing a retry. For best performance, all devices should use the same frack value. The increment is in seconds. If the channel is exceptionally busy and you experience timeouts or “BBS busy” conditions, you might increase this value by one or two. The increment is in 1 sec.

All TNCs	FRACK 6
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### Retry

The RETRY value controls how many times the TNC will retry before giving up and aborting the session. For best performance, all devices should use the same retry value. If the channel is exceptionally busy and you experience timeouts or “BBS busy” conditions, you might increase this value.

All TNCs	RETRY 8
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## Response Time

The RESPTIME value determines the minimum delay to wait after a clear channel before sending an acknowledgement. This helps to ensure all the sending station's frames have been sent and avoids collisions between data packets and acknowledgement packets. For best performance, all devices should use the same retry value. The increment is in 100 msec.

AGWPE Kantronics KPC-3 Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	RESPTIME 5
Kantronics KPC-3+	N/A

## Check

The CHECK value sets a time-out value for a packet connection if the distant station hasn't been heard from. AGWPE uses an increment of seconds. Kantronics, Kenwood and Timewave use an increment of 10 secs.

AGWPE	CHECK 300
Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	CHECK 30

## Radio Timing

### Transmit Delay

The TXDELAY value controls how long the TNC waits after asserting PTT before sending data. Flags are sent during this interval to help the remote device synchronize. This allows the transmitter time to come up to full power. It also allows the receiver at the remote end time to open squelch and synchronize to the flags. Most equipment works fine with a delay of 30-35. Some newer radios can work with even smaller delays, but bear in mind that the receiver on the other end may not handle a shorter delay. In particular, some HTs have a hard time with shorter intervals and can need this value to be 40. Tube-type transceivers and amplifiers can require longer time to switch and may require a longer delay. The increment is in 10 msec.

All TNCs	TXDELAY 40
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## Flow Control

### Hardware Flow Control

Flow control occurs between the application program, such as Outpost or your terminal emulator, and the TNC. Both the TNC and the application have to use the same type of flow control. Otherwise, one may overrun the other. Hardware flow control has been found to be very reliable and is the only type of flow control used by Outpost. XFLOW ON sets software flow control; XFLOW OFF sets hardware flow control.

AGWPE	N/A
Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	XFLOW OFF

**NOTE: Be sure to also set Outpost (or your other application) to hardware flow control**

**In Outpost:** Setup > TNC > (Select TNC) > TNC Comm Port > Flow Control = RTS/CTS

### Packetization Control

When PacFORMS converts a form into a text message, the resulting message contains many short lines of text. Most TNCs are set to send a packet after each line of text, since this is convenient for converse mode (chat and other keyboard-to-keyboard activity). But this behavior results in about five (5) times more packets than necessary for PacFORMS messages. This creates excess delay for the sender of the message and slows down the entire channel for everyone.

In order to pack more information into fewer packets, the TNC must be instructed to NOT send a packet after each carriage return. When Outpost is used, the easy solution is to let Outpost set the proper parameters before each Send/Receive operation and then restore them after each Send/Receive operation. If Outpost is not used, there is no need to set these parameters.

**ALL Santa Clara County Outpost users should set these options in Outpost. This will reduce the number of packets on the network by up to 80%!**

### Packetization Character

The SENDPAC character instructs the TNC to send out a packet. When the TNC receives a SENDPAC character, it packetizes the characters it has received and sends them out. The default is \$0D (carriage

return), which causes a packet to be generated after each line of text in a PacFORMS message. So we set SENDPAC to \$05 (enquiry), which is simply a character that is unlikely to be seen in PacFORMS or other message text. When the session is finished, we set it back to the default.

TNC Type	TNC commands sent first	TNC commands sent when done
AGWPE	N/A	N/A
Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	SENDPAC \$05	SENDPAC \$0D

### Append Packetization Character

This CR or ACRPACK parameter controls whether the SENDPAC character is added as the last character in the packet. The default is on, which works well for keyboard chat. But we don't want that behavior because we will be sending packets based on time and we don't want the extra SENDPAC characters in the output. So we turn it off at the beginning of the session and restore it at the end of the session.

TNC Type	TNC commands sent first	TNC commands sent when done
AGWPE	N/A	N/A
Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2	CR OFF	CR ON
Timewave PK-96	ACRPACK OFF	ACRPACK ON

### Packetization Wait Time

The PACTIME AFTER parameter controls the amount of time that the TNC waits for a character before sending what it already has as a packet. A longer value is good for chat mode. But Outpost is sending characters to the TNC much faster than we can type. So, we want as small a value as possible that still produces full packets when sending a message larger than PACLEN, yet doesn't cause the TNC to wait needlessly when sending short commands.

A value of 1 for PACTIME AFTER works fine on Kantronics and Timewave TNCs for 128 byte packets (PACLEN). But there is a bug in the chipset used by Kenwood for their internal TNCs which causes the TNC to produce very small packets when PACTIME AFTER is set to a value of 1. The result is many, many small packets and a dramatically slower session. The bug has been confirmed on the Kenwood TH-

D72A, TM-D700, TM-D710A and TS-2000 radios. The same behavior has also been observed on Alinco radios using the internal EJ-50U TNC.

A value of 2 avoids the bug mentioned above and also works fine on the other TNCs. In fact, even on the TNCs that work well with a value of 1, numerous tests confirmed that a value of 2 does not produce a measurable difference in total session time. So, a value of 2 can be used across the board. We set the value to 2 at the start of the session and restore it to the default at the end of the session.

TNC Type	TNC commands sent first	TNC commands sent when done
AGWPE	N/A	N/A
Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	PACTIME AFTER 2	PACTIME AFTER 10

### Packetization Character Timer Enable/Disable

The CPACTIME parameter controls whether or not PACTIME is used. Since we are no longer sending carriage returns after commands (because we changed SENDPAC), this causes the TNC to go ahead and send a packet after PACTIME. We turn this on at the start of the session and turn it off at the end of the session.

TNC Type	TNC commands sent first	TNC commands sent when done
AGWPE	N/A	N/A
Kantronics KPC-3 Kantronics KPC-3+ Kenwood TH-D72A Kenwood TM-D710A MFJ 1270C/1274C TAPR TNC2 Timewave PK-96	CPACTIME ON	CPACTIME OFF

### Stream Control

Keyboard users can communication with more than one connection at a time. Most TNCs refer to these multiple connections as "streams." Some TNCs call them "channels." A special character is used to switch between streams or channels. That character can interfere with the normal flow of message traffic if it appears within a user message.

### Stream Character Display

The STREAMEV parameter defines whether or not the STREAMSW character will be displayed with every incoming packet or not. The default is OFF. We make sure it is off by explicitly setting it to OFF.

TNC Type	TNC commands sent first	TNC commands sent when done
AGWPE	N/A	N/A
Kantronics KPC-3 Kantronics KPC-3+	STREAMEV OFF	
MFJ 1270C/1274C TAPR TNC2 Kenwood TH-D72A Kenwood TM-D710A Timewave PK-96	N/A	N/A

### Stream Switching Character

The STREAMSW or CHSWITCH character is used to tell the TNC to switch between streams or channels. If this appears in a message, the TNC will try to interpret the next character as the name of the next stream or channel. To avoid that possibility, we set it to a value that the user would not type into a message. After the session, we set it back to the default.

TNC Type	TNC commands sent first	TNC commands sent when done
AGWPE	N/A	N/A
Kantronics KPC-3 Kantronics KPC-3+ MFJ 1270C/1274C TAPR TNC2	STREAMSW \$00	STREAMSW \$7C
Kenwood TH-D72A	N/A	N/A
Kenwood TM-D710A	STREAMSW \$00	STREAMSW \$01
Timewave PK-96	CHSWITCH \$00	CHSWITCH \$7C

### GPS Control

GPS position functions are built into some TNCs and are useful when used on an APRS channel. But they have no place on a BBS access channel. We make sure they are turned off.

### Location Beacon

The LOCATION parameter controls how often the GPS data is sent. This serves no useful purpose on a BBS access frequency and wastes bandwidth. So we turn it off.

TNC Type	TNC commands sent first	TNC commands sent when done
AGWPE Kantronics KPC-3 Kantronics KPC-3+ MFJ 1270C/1274C TAPR TNC2 Kenwood TM-D710A Timewave PK-96	N/A	N/A

Kenwood TH-D72A	LOCATION EVERY 0	
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## Other TNCs

This section contains notes and guidelines for using TNCs other than the ones listed above.

### AEA PK-232MBX

The Timewave PK-96 setup can be used with this TNC.

### AEA PK-88

The Timewave PK-96 setup can be used with this TNC with the exception of the “EXPERT ON” command. If this TNC receives the “EXPERT ON” command, it will respond with “?What?” which can be safely ignored. If you are issuing the setup commands manually, simply skip the “EXPERT ON” command. Alternatively copy the supplied Timewave PK-96 setup to a new setup, rename the new setup, and then delete the “EXPERT ON” command from the new setup.

### Alinco DR-620T/DR-635T Radio with Internal EJ-50U TNC

The Kenwood TM-D710A configuration can be used with this TNC.

**Note:** the Alinco EJ-41U internal TNC which can be added to the Alinco DR-135, DR-235 or DR-435 single band radios is not recommended. It has limited buffer space, which seems to work o.k. for APRS use but causes problems with longer messages.

### Kantronics 9612

The Kantronics 9612 is a two port TNC capable of working on VHF and HF. For use with VHF, you can use the Kantronics KPC-3+ setup. It may be helpful to add “HBAUD 1200” and “PORT 1”. Consult the TNC documentation for details. If you are using Outpost, you can copy the supplied Kantronics KPC-3+ setup to a new setup, rename the new setup, and add the “HBAUD 1200” and “PORT 1” commands.

### Kenwood TM-D700 Radio with Internal TNC

The internal TNC in the Kenwood TM-D700 mobile radio is not recommended for general packet use. It has limited buffer space, which seems to work o.k. for APRS use but causes problems with longer messages.

### Kenwood TS-2000 Radio with Internal TNC

The internal TNC in the Kenwood TS-2000 can be used with the Kenwood TM-D710A setup with the exception of the STREAMSW commands. Simply copy the TM-D710A setup to a new setup, rename the new setup, and then delete the “STREAMSW \$00” command from the “before” list and the “STREAMSW \$01” command from the “after” list in the new setup. One experienced user also suggests using MAXFRAME 1 with the TS-2000.

### MFJ 1270B/1274B

The MFJ 1270B/1274B command set does not support the “SLOTS” command that is used in the MFJ 1270C/1274C setup above. If you are issuing the setup commands manually, simply skip the “SLOTS 4” command. If you are using Outpost, you can use the MFJ 1270C/1274C TNC setup without a problem. When the TNC receives the “SLOTS 4” command from Outpost, it will respond with “eh?” which Outpost



will ignore. If you prefer, copy the supplied MFJ 1270C/1274C setup to a new setup, rename the new setup, and then delete the "SLOTS 4" command from the new setup.

## Revision History

07-Apr-2016	N6MEF	Added "CONV" command details. Other minor clean-up.
28-Mar-2016	N6MEF	Updated and reformatted TNC commands for manual sessions so that start of shift and end of shift commands are easy to cut-and-paste into TNC command line.
16-Jul-2015	N6MEF	Updated screenshots of TNC setup dialog. Added explanation for 9600 baud and RTS/CTS serial settings. Changed "PACTIME AFTER 1" to "PACTIME AFTER 2". Added to "Other TNCs" section: AEA PK-88, AEA PK-232MBX, Alinco DR-620T/DR-635T internal EJ-50U TNC, Kenwood TM-D700 internal TNC, Kenwood TS-2000 internal TNC.
23-Oct-2014	N6MEF	Added Kenwood TH-D72A configuration. Added "CD SOFTWARE" where supported Added "NEWMODE ON" where supported Added "PPERSIST" where supported Added GPS Control section Added Other TNCs section with Kantronics 9612 and MJF 1270B/12704B
11-Sep-2013	N6MEF	Added Stream Control: "STREAMEV," "STREAMSW" and "CHSWITCH"
26-Jul-2013	N6MEF	Added 8-bit compatibility: "AWLEN 8" and "8BITCONV ON" where applicable. Added configurations for MFJ and TAPR.
05-May-2010	N6MEF	Updated to recommend setting all parameters via Outpost TNC command file. Added summary tables. Reorganized into Outpost vs. Non-Outpost parameter lists to simplify user directions.
04-Feb-2010	N6MEF	First version

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