

## TNC 2 PARAMETER SETTINGS AND MEANINGS

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### ABSTRACT

This paper will describe the command set for the TNC 2 and help the reader set the parameter values.

### INTRODUCTION

The commands will be discussed in groups of related commands. The groups are: Terminal, Monitor, Link, Command, Special features and Utilities. The values that parameters should be set to will fall into four categories, Don't touch, Set and forget, Experimental and As you wish.

### TERMINAL INTERFACE

The first parameters that will be set from this group are: PARITY, AWLEN, ECHO, and AUTOLF.

The default parity is even with 7 bit bytes. First try to match these with your terminal or terminal program. If this still gets errors, garbage characters or error messages from your terminal program, try for no parity, (PARITY 0 or 2) and MARK or SPACE or NO parity in the terminal program.

The ECHO is easy, if you don't see what you type turn echo ON (Default). If you SSEEEDD DDOOUUBBLLLEE turn it off. The AUTOLF is used to add a line feed after the carriage return sent to the terminal so the lines don't over print. If the text is double spaced then AUTOLF needs to be turned off.

If you are using a printing terminal you may have to set a few special parameters dealing with how physical printing terminals work. The older printers need time to physically move to perform a linefeed or carriage return. To create this delay it is common practice is to send the ASCII NUL character (\$00). To add nulls after a linefeed turn NULF on; to add nulls after a carriage return (most common) turn NUCR on and set the number of nulls with the NULLS command.

To insure that long lines of text get printed correctly, you should set SCREENLN to the width of your terminal

or printer. Many CRTs have special functions that are selected with sequences that start with ESC (\$1B). To avoid this you should set ESCAPE ON. Some old terminals do not support lower case. This is not a real problem. If you turn LCOK OFF then all text sent to the terminal will be converted to upper case. With most printers you will want to turn BKONDEL OFF so you can read what you are typing even if you backspace over it. This will print a \ for each backspace you type instead of backing up and replacing the unwanted character with a space,, This is up to your own personal preference.

There is a command to reprint your terminal input buffer. This command is set by the REDISPLAY parameter. The default is \$12 which is a CTRL-R (CONTROL KEY and R KEY depressed at the same time, the control key is like the shift key). To delete the last character typed you can type a CTRL-H (DELETE OFF) or a RUBOUT (DELETE ON). Usually one of these is what is sent by a terminal when the BACKSPACE, RUB, DELETE or left arrow key is typed. It is usually found in the upper right portion of the keyboard (Not part of the numeric keypad). If you want to delete the entire input buffer you can type the CANLINE command, which is usually set to CTRL-X.

SENDPAC is the command that forces the data in the input buffer to be placed in a data frame and on the outgoing queue. This is normally set to CR (\$0D). A frame will also be formatted and queued when the input buffer gets more than PACLEN characters in it. This can be used to your advantage, if you set SENDPAC to CTRL-A you can then type many lines in one frame. This will reduce the number of packets you send. When you do send, you will generally send full packets. If you then type CTRL-X you will only delete the last line you typed. If you type the CANPAC character you will cancel the current packet, (i.e., just the packet that hasn't gone to the output queue yet). If you use this mode you may want to turn CR off, this will make the TNC not add the sendpac character to the out going data. In

some cases you may need to add a linefeed. after CR in the outgoing data, you can do this by turning LFADD on.

When the TNC is sending to you too fast, you can stop it by typing the STOP character (CTRL-S) and you can restart it with the START character (CTRL-Q). If you need to type any of these characters you can use the PASS character (default CTRL-V), sometimes referred to as the quote character. For instance, if you wanted to send a CTRL-A you, would have to type CTRL-V CTRL-A; obviously, to send a CTRL-V you would type CTRL-V CTRL-V.

#### MONITOR

The easiest way to find out who in your area is on packet or what BBS systems are around is to monitor the channels, mostly 145.010 MHZ but also 030, 050, 070, 090, as well as 220 MHZ in some areas.

The default monitor mode serves well for this purpose. You may want to change some of the parameters once you know what facilities are in your area. To only see beacon messages turn MALL OFF. If you want to watch all types of frames you can turn MCOM ON. If you want to monitor while you are connected you can turn MCON ON (if you really want!).

There are two commands to help the formatting of the monitor data. To remove the digipeat path turn MRPT OFF, you can also have the frame header and the text on separate lines if you turn HEADERLN ON. If the real-time clock is set you can have the date and time as part of the header with MSTAMP ON.

#### COMMANDS

The first thing you MUST change is MYCALL, set it to your callsign. Now you can attempt to establish a link to another station. Select the strongest digipeater you hear and try to connect to yourself. If the digipeater in your area is W1AW-2 then you should type C mycall VIA W1AW-2; if everything is working correctly you should be connected to yourself. When you get the \*\*\*CONNECTED message you will change from command mode (with the cmd: prompt) to the mode determined by the CONMODE parameter, the default is CONVERSE mode. You can type and talk yourself (exciting huh?). When you are done, disconnect by typing the Command character (CTRL-C). You will receive the command prompt (cmd:) and should enter D (DISCONNECT). After a few seconds you will get the message \*\*\*DISCONNECTED. You can connect to other stations in a similar fashion, see the manual for more details.

If you want to change the command character, to the ASCII ESC character, enter Command \$1B. If you want to go from cmd mode to convers mode enter CONVERS. The NEWMODE command will have the TNC re-enter command mode when the link disconnects if it is set ON. If NOMODE is ON, the only way to change modes is by explicit command.

When you are using a BBS, you may find that you are able to connect directly to it, but when activity increases you need to use the digipeater. Instead of having to disconnect and reconnect, you can enter command mode and issue a RECONNECT command with a more reliable path.

While you are in command mode received data will be printed only when you are not typing, this can be overridden by setting FLOW OFF. If you want to verify what you have typed you can hit the Redisplay command (CTRL-R) to see your input buffer.

When sending data to the TNC, such as sending a file, the TNC should be able to flow control (or stop) the computer. There are two ways of doing this. If XFLOW is on it will use XON and XOFF as start and stop characters for the data going to the TNC, as START and STOP were for data going to the terminal. If XFLOW is off, the TNC will use hardware flow control, using the RS-232 RTS (Request To Send) and CTS (Clear To Send) to start and stop data.

For file transfers that are not strictly text files the transparent data mode is used, in this mode there is no line editing or delete. You can enter transparent mode with the TRANS command, or by having Conmode set to Trans. There are two ways to return to command mode while still connected, send a break signal to the TNC, or by entering three COMMAND characters in a row with idle time before and after them, a delay of more than CMDTIME seconds. This is like the common smart telephone modem attention signal.

To have the most transparency you should run with TRFLOW and TXFLOW both OFF, which means you are using hardware flow control both ways. When using the software flow control you must use the PASS character (CTRL-V) to send the XON or XOFF as data, which is a problem for most terminal programs.

In many cases 100% transparency is not really needed, some word processing files only need to insure 8 bit data and don't use many control characters. To provide for this and allowing the local editing you can set AWLEN 8 and 8BITCONV ON.

## LINK PARAMETERS

The timers associated with the links can make or break the network.

The TXDELAY is the **time** required to get your transmitter to send a stable signal plus the time for most receivers to produce audio plus the time required for the modem to detect your tones. The default is usually ok, but please feel free to adjust it if needed, the shorter the better.

If you are using a voice repeater you will then need to set AXDELAY to account for the key up time of the repeater. The next timer comes after the data is sent, FRACK is a gauge of when the acknowledgement should return. This is based on the number of intermediate stations. FRACK should be left alone at this time. There may be some networks where it should be changed, leave that to the local management bodies to investigate.

The timers for deciding when to send are also very important. When listening to the channel there is a minimum time your TNC must wait before it can transmit. This is called DWAIT, or Digipeater WAIT time, it is to give the digipeater a chance to repeat a packet. The value this is set to depends on what your TNC is going to be used for. When digipeating no wait is included. For interactive QSOs the default of 16 (160 ms) is good. The lower priority traffic, such as file transfers and BBS sites should have a longer DWAIT. It is suggested that 240 ms and 320 ms be used for these types respectively.

When the DWAIT has been satisfied, your TNC then can start a transmit sequence. The transmitter is assumed to be on after TXDELAY has elapsed. If DWAIT + TXDELAY is greater than AXHANG then the TNC must transmit to satisfy the AXDELAY. Then the data can be sent.

When operating in full duplex, FULLDUP ON, the DWAIT is ignored, since you are transmitting on a different frequency.

The maximum amount of data contained in a frame is set by PACLEN. The default is 128, but it is preferred that 256 byte data fields be used (PACLEN 0). The larger packet sizes can be taken advantage of if you only forward data when you have a full packet or new data is not being typed. To do this you can set SENDPAC \$01 along with CR OFF and CPACTIME ON. PACTIME specifies when data should be forwarded. There are two options: PACTIME EVERY n, forward data every n

seconds and PACTIME AFTER n, forward data after n seconds of no new data. The latter is the more commonly used form, for BBS and other computer generated data.

The PASSALL option is generally not useful, except for debugging. Ignoring the CRC defeats **mast** of the purpose of having an error free link.

The RESPTIME parameter is a timer used to help insure that a station does not transmit an acknowledgement too early. It's default is 1.2 seconds which should be fine for all cases.

The RETRY counter is important. It should be short for BBS forwarding (3 at the most), the concept is that if the link is shakey don't bother causing more interference. It should be longer for users and user initiated file transfers. The TRIES command can be used to view and optionally change the current retry counter, without changing the value of RETRY.

The CHECK timer is used to keep in touch with the true status of your link. If no packets are received from the station at the other end of the link within the time specified by CHECK parameter, then the TNC will take actions based on the AX25L2V2 flag. If AX25L2V2 is ON then the TNC will send a supervisory packet (RR) to verify that the other station is still connected. If no acknowledgement is received within the retry counter number of tries or if the AX25L2V2 flag is off your TNC will send a DISC frame to clear the connection.

The MAXFRAME parameter sets the maximum number of data frames that can be outstanding at a given time. The default is 4 and should be fine for most applications.

The UNPROTO is a destination and digipeater path that beacons and other data sent while not connected are routed to. To enable your transmitter you should set XMITOK ON.

The MYALIAS command is an interesting one. It can be used to set a call or name to be used as a digipeater. The alias can only be used for digipeating. We could use RATS as an alias, in order to keep legal you must insure that you properly identify the station, this can be done with HID ON, which will send an ID frame every 9.5 minutes of activity. An ID frame is simply a frame with the TNC call/R sent to the UNPROTO address.

## UTILITY COMMANDS

The real-time clock is based upon the CPU clock. Since they vary, the

CLKADJ parameter is used to compensate for the difference. You should adjust the clock speed (aka crystal frequency) to keep most of the spurs away from the packet channels as much as possible. Many times Murphy will put the spur right on 145.010 MHz!

The clock is set with the DAYTIME command in the format YMMDDHHMM. The date can be displayed in two formats depending on the setting of DAYUSA. If DAYUSA is on the date is in the form mm/dd/yy. If it is OFF the format is dd-mm-yy.

The TRACE mode is used for debugging problems between TNCs. It is useful if you are familiar with the protocol and various formats. The frames are broken down in Hex and ASCII.

The internal modem is aligned with the aid of CALSET and CALIBRATE commands. Full details on calibration is in the operators manual for the TNC.

The DISPLAY command is used to display sets of or all the parameters. The RESET command will reset the bBRAM to the defaults, all customization will be lost. The RESTART command will perform a power on reset.

#### SPECIAL FEATURES

Some of these features are very basic and don't really fit under this category, but they are higher level functions and belong as user services or features that you could do by hand or with a computer.

The MHEARD list is a list of stations that frames have been heard. The date and time is recorded. This list can be cleared with the MHCLEAR command and is displayed by entering MHeard.

The BEACON option should not be used on a regular basis. It causes unwanted interference and are not needed.

When a station connects to your TNC you can have a canned message sent to them if CMSG is ON. A common message is CTEXT I'm not here now leave

a message in my buffer. You can have the connect messages time stamped if the clock is set and CONSTAMP is ON.

When your station is operating in unattended mode, you might want to ignore frames from the local BBS. You can do this by using BUDLIST OFF and LCALLS set to the BBS callsign. These options can be very useful in filtering unwanted data from your capture buffer.

The default setting of the TNC only allows one connection at a time. This can be changed by changing the number of USERS. The default is 1. When it is any other value an incoming connection request is assigned the lowest free stream or port. Ports are numbered from A to J. The STREAMSW command sets the character that is used to mark a stream identifier. The default is \$7C (!). When new data is received it is marked with the stream switch character followed by the stream identifier (A-J). This may also include the stations callsign if STREAMCA is ON. In order to help keep it clear where a stream begins you can have the TNC double the stream switch characters it prints, (ex. !!A:W2VY: hi there). The stream switch character is also used to specify which you want to send a line to, (ex. !A Hi Tom).

Any of the links can be made permanent with the CONPERM option. This is stream dependent, if this is set ON the link will never enter the disconnected state. The CSTATUS command is used to display the status of all streams. Including a P if the link is marked as perm.

#### SUMMARY

The commands are summarized on the following page, including the default values. Some of these parameters may be removed as more powerful networking protocols are developed for the TNC 2. New commands and features will be added.

The TNC 2 and it's clones are going to be the "Smart modems" of radio. With the larger population of packeteers packet radio is going to be advancing very quickly in the next year. Enjoy!

Command	Default	Description
-w-m---	----	-----
8bitconv	OFF	Strip high-order bit when in CONVERS mode
AUtoIf	ON	Send Linefeed to terminal after each CR
AWlen	7	Terminal character length (7/8)
AX25l2v2	OFF	Run as version 1.0 of AX.25
AXDelay	0	(0-180 * 0.1 sec) Voice Repeater keyup delay
AXHang	0	(0-20 * 0.1 sec) Voice Repeater hang time
Beacon	E O	Every/After 0-250 *10 sec.
BKondel	ON	Send BS SP BS for each DELETE character

BText		(120 char) Text to be sent for a beacon
BUDlist	OFF	Stations in Lcalls are ignored
CALibra		Used to calibrate the builtin modem
CALSet		Used with CALibrate
CANline	\$18	(Control-X) The Line Delete character
CANPac	\$19	(Ctrl-Y) Cancel current character
CHech	30	(0-250 * 10 sec) Idle link time out
CLKADJ	0	(0-65535) Real time clock adjustment constant
CMDtime	1	(0-255 sec) transparent mode escape timer
CMSG	OFF	Don't send CTEXT when user links to your TNC
COMmand	\$03	Char to escape from CONVERS mode to command mode
CONMode	CONVERS	(or TRANS) Mode to enter when link established
Connect		Establish Link with station via optional stations
CONOk	ON	Allow stations to establish a link with your TNC
CONPerm	OFF	If ON always keep this link up (never Disconnect)
CONStamp	OFF	If ON print date & time stamp on connect messages
CStatus		Prints the status of all links (Streams)
CONVERS		Enter Converse mode from command mode
CPactime	OFF	Don't forward data based on timers (see Pactime)
CR	ON	Append a Carriage Return to each data packet
CText		(120 Ch) Connect Message Text (see CMSG)
DAYtime		Date and time for real time clock
DAYUsa	ON	Print date as mm/dd/yy instead of dd-mm-yy
DElete	OFF	The character delete is BS (\$08) not DEL (\$7F)
DIGipeat	ON	Allow stations to use you as a Digipeater
Disconne		Request a link disconnect from the other station
Display		(Async/Character/Id/Monitor/Timing) Parameters
DWait	16	(0-250 * 10 msec) Delay to let digipeater repeat
Echo	ON	Echo characters typed on keyboard to terminal
EScape	OFF	Don't translate ESC character (\$1B) to \$ (\$24:)
Flow	ON	Don't print to terminal while user is typing
FRack	3	(1-15 sec) Time needed to ack a packet per station
FULLdup	OFF	Operate in Simplex mode
HEaderln	OFF	Print the frame header and text on the same line
HID	OFF	Don't send an ID packet every 9.5 mins when active
ID		Force an ID packet (UI frame Via UNproto path)
LCALLS		(0-8 calls) to receive or ignore stations (BUDLIST)
LCok	ON	Do not convert lower case to UPPER CASE on terminal
LCSTREAM	ON	Convert the stream select specifier to Upper case
LFadd	OFF	Add a Line Feed after each CR send to the terminal
MAll	ON	Monitor data frames as well as beacons
MAXframe	4	The window size for outstanding frames
MCOM	OFF	Monitor only data frames instead of all types
MCon	OFF	Don't monitor frames when linked to another station
MFilter		Up to 4 characters to be removed from monitored data
MHClear		Clear the calls Heard list
MHeard		Display the calls heard and date/time if clock set
Monitor	ON	Monitor mode on - see BUDLIST, MALL, MCON, MSTAMP
MRpt	ON	Display the digipeater path in monitored frames
MStamp	OFF	Monitored frames are Not time stamped
MYAlias		An identifier for a digipeater
MYcall	NOCALL	The station callsign for ID and linking
NEwmode	OFF	The TNC acts like a TNC 1 for changing modes
NOmode	OFF	If ON allow explicit mode change only
NUcr	OFF	Don't send NULLS (\$00) after a CR
NULf	OFF	Don't send Nulls after a LF
NULLS	0	(0-30) Number of nulls to send as requested
Paclen	128	(0-255,0=256) size of the data field in a data frame
PACTime	After 10	(Every/After 0-250 *100 ms) Data forwarding timer
PARity	3 (even)	(0-3) Terminal parity 0,2=None 1=odd 3=even
PASS	\$16	(CTRL-V) char to allow any character to be typed
PASSAll	OFF	Accept only frames with valid CRCs
REConnect		Like Connect but to reestablish a link via a new path
REDisplay	\$12	(CTRL-R) char to print the current input buffer
RESET		RESET bbRAM PARAMETERS TO DEFAULTS
RESptime	12	(0-250 * 100 ms) minimum delay for sending an ACK
RESTART		Perform a power on reset
RETry	10	(0-15) maximum number of retries for a frame
Screenln	80	(0-255) Terminal output width
SEndpac	\$0D	(CR) Char to force a frame to be sent
STArt	\$11	(CTRL-Q) the XON for data TO the terminal
STOP	\$13	(CTRL-S) the XOFF for data TO the terminal
STREAMCa	OFF	Don't show the callsign after stream id

<b>STREAMDb1</b>	OFF	<b>Don't</b> print the stream switch char twice (!!A)
<b>STReamsw</b>	<b>\$7C</b> (!)	Character to use to change streams (links)
<b>TRAcE</b>	OFF	<b>Hexidecimal</b> trace mode is disabled
<b>TRANS</b>		The TNC enters Transparent data mode
<b>TRFlow</b>	OFF	Disable flow control to the Terminal (Trans mode)
<b>TRies</b>		(0-15) set or display the current retry counter
<b>TXdelay</b>	30	(0-120 <b>* 10ms</b> ) <b>Keyup</b> delay for the transmitter
<b>TXFlow</b>	OFF	Disable flow control to the TNC (Transparent mode)
<b>Unproto</b>	<b>CQ</b>	Path and address to send beacon data
<b>USers</b>	1	Sets the number of streams (links) allowed
<b>Xflow</b>	ON	<b>XON/XOFF</b> Flow control enabled instead of hardware
<b>XMitok</b>	ON	Allow transmitter to come on
<b>XOff</b>	<b>\$13</b>	(CTRL-S) Character to stop data from terminal
<b>XON</b>	<b>\$11</b>	(CTRL-Q) Character to start data from terminal