MFJ-47 A/B/C MEMORY EXPANSION UPGRADE

Thank You for purchasing the MFJ-47A/B/C Mailbox Memory Expansion for your MFJ TNC2. The MFJ-47 is for MFJ TNC2 models such as, MFJ-1270/1270B/1274/1270BT/1274T). The most recent firmware is supplied the the MFJ-47 Mailbox Memory Expansion boards. The firmware eprom is wrapped in tin foil for electrostatic protection. You will need to take the necessary precautions when installing the firmware eprom in the MFJ-47 Mailbox Memory-Expansion board. Documentation for the firmware upgrade is supplied.

You will notice that some sockets on the memory expansion are not populated (U413, U422 & U425) when received. These sockets will be populated with ICs to be transferred from the motherboard.

Model No.	SRAM Size	MFJ TNC2
MFJ-47A	32K	MFJ-1270/1270B/1274
MFJ-47B	128K	"
MFJ-47C	512K	11

The various versions memory expansion boards are as follows:

The extra memory provided by the expansion boards are dedicated solely for the use of the packet mailbox. The firmware of the TNT does not allocate this additional memory to other operations. Battery back up for the memory board is supplied from the mother board.

MFJ TNC2

MEMORY EXPANSION UPGRADE



MEMORY BOARD INSTALLATION

In this installation you will be required to remove three ICs from the mother board and transfer them to the memory board. Please handle the ITs carefully and make note of the IC number and its orientation.

Throughout this installation instruction we will use "TNC" in reference to all of the MFJ TNC2 models. MFJ-1270/1270B/1274. Please read and perform the following procedure very carefully:

- 1. Disconnect all of the cables from the TNC. including power. radio and computer.
- 2.Remove the top cover of the TNC by removing the four (4) screws on the sides the unit. Then lift the cover off.
- 3. Remove the jumper off of JMP5. This takes the lithium battery out of the circuit. If your TNC has a MFJ-2400 modem installed. remove it. Set it <u>aside. it</u> will be re-installed later.

NOTE: When removing ICs from you^{r TNC ensure} that you do not bend or break any of the pins.

4. Using a small flat tip screwdriver remove the following ICs from your TNC. Please take note as to the *orientation* of the ICs as you remove them.

U13--74HC4066 U22--ZO840004PSC Z80 CPU U25--NEC 43256-IOL or Equiv. U23--SYSTEM EPROM

5. Install the ITs which were removed from your TNC in the above step. Take note as to the orientation of the IC. Match up the NOTCH on the IC to the NOTCH on the IC socket on the expansion board. Refer to Figure 2 parts layout diagram for proper installation of the ICs.

Install the ITs removed from the mother board to the memory board as follows:

74HC4066	(U13)	in	socket IC-413
43256	(U25)	in	socket IC-425
Z80 CPU	(U22)	in	socket IC-422

A new EPROM with the new firmware is packaged with the memory kit. You will install the new **EPROM** at U23 on the mother board. Be sure to orient the new EPROM the same way in which you removed the old one. In order to do this properly you must first position the TNC so the front panel is facing you. this is very important. Then locate the NOTCH on the new EPROM. Now install the new EPROM with the NOTCH pointing to your left.

NOTE: The old EPROM removed from the mother board will not be used. NOTE: When installing ICs onto the memory board ensure that you do not bend or break any pins. Ensure all pins are in the IC socket.

- 7. Check and make sure that there no IC pins are bent under the IC itself. Check and make sure that no IC pins are broken off. and that all IC pins are inserted in the IC socket. Do this before proceeding beyond this point.
- 8. Set the memory board aside for now.
- 9. Please refer to Figure 1 when performing this step. Using a small phillips screwdriver remove the PC hold-down screw in the left rear corner of the TNC mother board, this is referred to as **HOLE** "A". Do not let this screw out of your sight, you'll be using it here shortly.
- 10. Take the 1/2" hex spacer supplied and install it in **HOLE** A, as noted in Figure 1 in this instruction. This is the same place where you removed the screw in Step #8, and tighten it down. This is an aluminum spacer **DO NOT OVER TIGHTEN** it, you will **STRIP** the **THREADS.**



11. Now with the memory board in one hand, plug the free end of the 40pin ribbon cable into the IC socket labeled U22 (please refer to Figure l; this is the same one which you removed the Z80 CPU from earlier in this procedure) on the mother board. Be sure to orient the blue connector so that pin 20 and 21 on the blue connector are oriented to the right side of the IC socket, (with the front panel of the TNC facing toward you). You will need to twist the cable slightly. Ensure that you leave the CN402 pigtail free and clear, do not let it become pinched or caught up underneath anything.

NOTE: If you do not have an MFJ-2400 board installed in the TNC skip to step 14.

- 12. If you have an MFJ-2400 modem installed position the 40-pin cable, so the cable is not going to be pinched by the mounting stud for the MFJ-2400 modem.
- 13. Now you can re-install your MFJ-2400 modem. Be sure that you do not pinch any of the wires of the 40-pin ribbon cable or the CN402 pigtail when you tighten the MFJ-2400 down. This will cause problems with both the MFJ-2400 and the memory board. So be sure and double check this.
- 14. Find the original hold-down screw which you removed from the TNC mother board earlier. Secure the memory board to the l/2" spacer which you installed earlier. Again this an aluminum spacer, **DO NOT OVER-TIGHTEN it! You will STRIP the THREADS.**
- 15. Take note of the location of the NOTCH on CN402. Now plug CN402 into the IC socket labeled U13 (socket which the 74HC4066 ryas removed earlier) on the TNC mother board. Please refer to either Figure l. Plug it in so the NOTCH is pointing toward the lithium batten. Make sure it is firmly in place!

16. Remove the paint (if any) from around the mounting holes on the outside of the chassis and the inside of the cover. This can be done with either light sandpaper or a knife blade. This will eliminate any EMI from the TNC caused by the additional large ribbon cable. This concludes the installation of the mailbox memory expansion board. However. before you start putting things back to together double check ever thing you have already done.

Final Inspection

Before closing up the TNC it would be best at this time to do a final inspection of your installation. Please check all of the following:

- I. Check all connections to ensure that they are all secure.
- 2. Make sure that there are no pins bent or broken on any of the IC's or connectors installed in this procedure.
- 3. Make sure that there are no wires pinched or caught up under any of the screws. circuit boards or connectors.
- 4. Last but not least give your TNC one last physical look over, for any debris or foreign matter on the main PC.

If all of the above checks out then you can re-install the battery jumper JMP5. Connect the computer cable to the TNC apply power and see if you can obtain the TNC's sign-on messagc. If not, then go back and double check the entire installation procedure. If the TNC signed on properly, install the cover.

After properly installing the memory board. reconnect your TNC to your radio and computer. If the TNC signed your installation is successfully. Follow the instruction given by the upgrade documentation to operate your mail box.



RAM EXPANSION AND FIRMWARE EPROM UPGRADE

The RAM on each version of the MFJ-47 Mailbox Memory Expansion board is upgradable. Either version of the MFJ-47 Expansion board can us either 32K, 128K. or 512K RAM IC. When interchanging the RAM IC pleas follow the MFJ-47 instruction manual for jumper positions. The RAM IC o the MFJ-47 Mailbox Memory Expansion is changed simply by replacing IC42 on the memory board and relocate the jumper at J401 header. Refer to Figure 2 and the following chart.

ordered from MFJ Enterprises, Inc.

RAM chips can be

ITEM No	RAM TYPE
MFJ-45A	432456LP-10 (32K)
MFJ-45B	431000LP-10 (128K)
MFJ-45C	8512LP-10 (512K)

J401 POSITION The (2) inside most pins The (2) middle pins The (2) outside most pins

There is only one version of the firmware EPROM upgrade for the MFJ TNC: First of all the firmware version enclosed with the MFJ-47 upgrades will function in MFJ-1270/1270B/1274 with the MFJ-47 installed. The firmwar version enclosed with the MFJ-47 upgrades will also function in the MFJ 1270C and MFJ-1274C TNCs. When upgrading the EPROM remember to request the EPROM upgrade. MFJ-40CX.

Secondly, there is another firmware version for the MFJ1270/1270B/127 without the MFJ-47 installed. MFJ-40A. B, or C. When upgrading the EPROM in an MFJ-1270/1270B/1274 TNC without the MFJ-47 installed remember t request the EPROM upgrade. MFJ40C.

RELEASE 1.1.4 NOTES:

<u>FIXES</u>

- Transmitted I-frames under Level 2 Version 2 did not have their P bits set at the appropriate times. In fact, they never had their P bits set. This has now been fixed. The last I-frame of a multiple I-frame transmission has its P bit set.
- A mistake in the protocol state table was fixed.
- bbRAM scanning now checks all ten possible connection control structures (instead of just the first one).

CHANGES

- AX25L2V2 defaults to the ON position.
- Major change made to AX25L2V2 handling. If retie limit is exceeded. or the TNC receives a "disconnected" response to a poll. the connection is ended

The old method (and the one proscribed) is fraught with problems for automated stations that can not recover without an indication of loss of the connection.

The **PERMCON** control will replace the functionality of this aspect of AX25L2V2 which was removed. **ENHANCEMENTS**

- 32K of RAM is now expected. Virtually all of the new space is used to enlarge existing queues within the TNC, yielding greater performance especially at faster RF data rates. and making the onboard message buffer capability a bit more useful.
- The MCOM command decodes all control fields.

For I and S frames, sequence number information is also presented. Frames compatible with the AX.25 Level 2.0 standard are also decoded as to the state of the Command/Response (C/R) and Poll/Final (P/F) bits.

Ex: WA7GXD>KV7B <I C SO RO>: Hi Dan,

WA7GXD>KV7B <I C P S I RO>: have you been on EIES lately?

KV7B>WA7GXD <RR R F R2> KV7B>WA7GXD <I C P SI R2>: I was just thinking about that. I heard that @(username) made some real unbelievable comment on it!

WA7GXD>KV7B <RR R F R2> WB2SPE>KV7B <C> KV7B>WB2SPE <DM> KV7B>WA7GXD <I C P S2 R2>: Good conditions now

WA7GXD>KV7B <RR R F R3> WA7GXD>KV7B <I C P S2 R3>: Yes @(username) did. It was quite remarkable.

And so on. See Chapter 9 Table 9-1 in Four TNC 2 manual for a breakdown of the control field codes. For complete information on the AX.25 Level 2 Version 2.0 Protocol, please refer to the ARRL AX.25 Protocol Specification document. available from ARRL.

NEW COMMANDS FOR 1.1.4 CBELL <u>ON:OFF</u>

Default: OFF

Parameters:

ON Connect bell enabled OFF

Connect bell disabled

This command is used to control whether an ASCII \$07 (*BELL*) character is sent as part of the connected message.

When set ON. the bell character immediately precedes the asterisk portion of the connected message, e.g.:

<BELL>*** Connected to: <callsign>

CM5GDISC ON:OFF

Default: OFF

Parameters:

ON Automatic disconnect enabled OFF

Automatic disconnect disabled

This command controls whether or not the 1F7 TNC will initiate a disconnect sequence after it is connected to.

If CMSG is OFF, or CTEXT has no connected text, the TNC initiates a disconnect immediately upon receiving information or acknowledgment frames from the other station.

If **CMSG** is ON end CTEXT contains some text information, the TNC initiates a disconnect after the packet containing connect text (CTEXT) is acknowledged.

This command may be useful to bulletin board operators or others with a need to send a short message. confirm its receipt. and disconnect.

NOTE. Use this command with care - If you find you're able to receive connects, yet never get data, it's possible CMSGDisc has been left on. It's also possible is that RS- 232 DCD is holding the terminal off - see the TNC 2 System Manual for details on hardware flow control.

LFIGNORE ON: OFF

Default: OFF

Parameters:

ON TNC will ignore <LF> characters. **OFF**

TNC will respond to <LF> characters.

This command controls whether TNC 2 responds to ASCII Line Fee (<LF> \$OA) characters or ignores them in command and converse modes.

When turned on_ line feeds are totally ignored except in transparent mode. **New HEALTH Counters**

18

BBfailed n: Counts number of times bbRAM checksum was in error.

TXQovflwn: Counts how many times frames were discarded because the outgoing frame queue was too small.

RELEASE 1.1.5 NOTES

<u>FIXES</u>

- Release l. l.4 suffered from a spurious condition where the HDLC transmitter would time out. When this happened TXQOVFLW would typically show a non-zero count. Release l.l.5 incorporates an HDLC transmitter timeout feature to capture and recover from the timeout error.
- DWAIT operation has been fixed.

NEW COMMANDS FOR 1.1.5

BBSMSGS ON:OFF

Default: **OFF**

This command controls how the TNC displays certain messages in command and CONVERSE modes. The messages affected are described below

<u>MESSAGE</u>	EFFECT WHEN BBSMSGS ON
CONNECTED to xxxx	A newline is added just before""
***DISCONNECTED	"
***retry limit exceeded	"
····xxxx Busy	"
***FRMR sent	"
***FRMRrcvd" ***Connect reques	t:xxxx- This message is
omitted.	0

The BBSMSGS command is primarily useful for host operation. Primarily with WORLI and like bulletin board systems that require link status messages to begin in the first output column.

The connect request message is omitted during BBSMSGS mode. This should be most useful for preventing corruption of messages when forwarding with small frames.

TXTMO: Counter

Default: 0

TXTMO is a new addition to the TNC health-group. This register may accumulate counts as the TNC successfully recovers from HDLC transmitter timeouts. This is not a useful command for the majority of the users.

RELEASE 1.2.6 NOTES

ENHANCEMENTS

- **1. KISS** enables the MFJ-1270B/1274 to act as a modem for a host computer. Turning KISS on allows the MFJ-1270B and MFJ-1274 to run programs such as TCP/IP. MSYS and other programs which used the Serial Link Interface Protocol (SLIP).
- 2. Weather FAX reception is now possible for users who use IBM and compatibles. Macintosh or Commodore C64/128 computers. With these <u>computer. to</u> receive weather FAX you must use the MFJ-1287B starter pack for the Macintosh computer. the MFJ-1284/1249 starter pack for the IBM and compatibles or the MFJ-1282 for commodore C64/128.
- 3. The MNonax25 command is installed. When this command is turned ON. the display of non-AX.25 packets is inhibited.

KISS COMMAND OPERATION

KISS ONOFF

Default: OFF

Parameters:

- ON Serial Line Interface protocol (SLIP) is used between the TNC and the attached computer. The TNC executes a very limited instruction set, arbitrating channel access only and depending on the computer to handle all Level Two and higher protocol issues.
- **OFF** The TNC operates using the commands and messages documented herein. This is the normal mode of operation.

This command is used to enter the "*KISS*" mode for operation with various experimental protocols. KISS is used with intelligent host computers. The most popular use has been in conjunction with the *KA9Q* TCP/IP networking software.

To operate KISS, enter the command **KISS ON**, then the command **RESTART** (NOT RESET!). The CON and STA LEDs will flash three times when initially activated. This command will then have effect for subsequent power on/off cycles.

MFJ TNC2

If you find that the TNC will not stay in KISS mode, then you will need to deactivate the **KISSDOG** timer. Deactivation of the **KISSDOG** is done by sending these three bytes to the TNC, **\$C0**, **\$FD**, **\$C0**. This sequence will keep the TNC in KISS mode, until the TNC is told to exit KISS properly. Before enabling KISS, make sure radio baud rate and terminal baud rate are set to the desired values. The terminal's baud rate that's determined at sign on is the same that will be used for KISS. Once the operating terminal parameters have been selected you may enter KISS mode operation. If you are using the KA9Q TCP/IP software package, to return to normal AX.25 operation, issue the command: param ax0 255

Note that this command must be issued under the TCP/IP "net>" prompt and lower case letters must be used. Once the TNC-2 receives the "param ax0 255" command, turns KISS off and will revert back to ordinary AX.25 mode of operation. When the TNC-2 is powered on again, it will sign on to the AX.25 operation mode. If you are not using the TCP/IP software package, you will need to send the three bytes SC0, SFF, SC0 to the TNC-2 to restore normal operation. If you cannot send these character values with the software you intend to use, you must power the TNC-2 off, then disconnect the bbRAM battery by removing JMP 5 on the TNC-2 main board for several minutes, then reconnect the battery and power up again to restore normal operation. The commands available in KISS mode are:

Command	Function	Comments
0	Data Frame	The rest of the frame is data to be sent.
1	TXDELAY	The next byte is the transmitter keyup time in 10 mSec units, with a default of 50 (500 mSec).
2	Ρ	The next byte is the persistence parameter, p, scaled to the range 0- 255. The probability of transmitting at the next opportunity is $p/255$. The default is 64 (for a probability of 0.25).
3	Slot Time	The next byte is the slot interval in 20 mSec increments. The default is 10 (100 mSec).
4	TXtail	The next byte is the time to hold the transmitter after the FCS as been sent, in 10 mSec units. The command is obsolete and is included for completeness with earlier implementations.
5	FullDuplex	The next byte is 0 for half-duplex (normal) or any other number for full duplex (e.g., for operation with MicroStas).
FFReturn	18	Exit KISS and resume normal TNC operation.

Note: The TNC will only return type 0 frames (received information). Thus, the computer cannot interrogate the TNC to find the values of the other command types.

WEATHER FAX OPERATION

To receive Weather FAX with the TNC 2 you will need to have software for your computer to eceive the picture and print it on the computer screen or to save the pictures to disk. The MFJ-1284 or MFJ-1289 Starter Pack for the IBM and compatibles computer. MFJ-1287 for the Macintosh or the MFJ-1282 for Commodore C64/128 allows you to print Weather FAX pictures to screen in near real time and to save Weather FAX pictures to disk. Weather FAX pictures saved on disk can be sent to your printer, or recalled to screen at any time. The TNC-2 FAX mode can receive FAX pictures transmitted in the 120 line per minute (2 linc/sec) format such as Weather FAX. Weather FAX are received by the TNC 2 in the 2-level format. Multi-gray level FAX and other FAX formats are not supported by the TNC-2, <u>FAX Frequencies</u>

Most Weather Fax transmitting stations are usually found on the HF bands. Weather FAX stations are generally upper sideband. Some of these stations maintain a regular schedule. The frequencies of some Weather FAX stations are:

3,357.00 4,268.00 4,975.00 6,946.00 10,865.00 12,125.00 20,015 Other FAX Frequencies and the station location are listed in the following chart. These frequencies were obtained from Popular Communications Magazine:

FREQUENCIES (KHz, USB)	LOCATIONS	
4,271.00 9,890.00 13,510.00	Halifax, Canada	
8,502.00 12,750.00	Boston, MA	
9,389.50 11,035.00	Brentwood, NY	
4,793.50 10,185.00 12,201.00 14,671.50	Washington, DC	
9,157.50 17,447.50	Mobile, AL	
8,080.00 10854.00 16,410.00	Norfolk, VA	
4,802.50 9,440.00 13,862.50	Hawaii	
7,770.00 11,090.00 13,627.50	Hawaji	
8,459.00	Alaska	
4.346.00 8,682.00 12,730.00 17,151.20	San Francisco, CA	
8,646.00 17,410.50	San Diego, CA	



<u>Receiving Weather FAX</u>

Connect an I-W Radio to the TNC 2 as described in the Radio connection of the TNC 2 instruction manual. Set-up the TNC 2 for VHF operation.

From the cmd: command mode, the TNC 2 can be set to Weather FAX mode by typing:

FAX <CR>

At this point you will want to set your computer program to start printing the Weather FAX picture on the screen. Do this according to the instruction manual supplied with the software.

Once the program is properly set. set the audio output of your radio to normal volume. Tune your radio to a desired frequency. If you are not familiar with recognizing FAX signals. you may want to select one of the weather FAX frequencies listed above. Weather FAX is usually transmitted at 1200 lines per minute. This is a horizontal scanning rate of 2 lines per second. So by listening to the scanning rate. you can determine if the TNC 2 is capable of receiving that particular FAX signal.

After tuning in the desired FAX frequency. tune the radio so that the DCD LED remains lit. Now observe the TUNING INDICATOR of the TNC2 while fine tuning your radio (for TNC 2 with tuning indicator only). You will notice that with each scan the tuning indicator will move toward the center. Tune the radio so that the tuning indicator is centered at the end of each FAX scan. Once you achieve this, the FAX signal is tuned in and the TNC 2 is ready to decode the FAX signal.

Proper tuning of the FAX signal is very important for successful Weather FAX receiving. Therefore, if your TNC 2 does not have a tuning indicator you may find tuning difficult. An add-on tuning indicator. MFJ1273 is available from MFJ Enterprises. Inc. for the TNC 2.

Once entering the Weather FAX mode, the TNC 2 is in standby-receive mode. This means that the TNC2 is listening to the radio for the distinctive "tic-tic" that indicates the synchronization period at the beginning of a picture. If the TNC2 hears the "tic-tic" well <u>enough. it</u> will establish a lock to the signal and start printing to the screen.

The TNC2's built-in LOCK detects the beginning of each picture before starting to print. This insures each picture will be printed from top to bottom. If you want the printer to start to print in the middle of the

picture. you may force a lock on the picture and the printer will begin to print upon the "force lock". To force a lock. you simply type the letter "L" while in the FAX standby-receive mode.

If the FAX picture appears to be printed shifted to the right. you can type the "<" key to shift the picture to the left. Each repetition of the "<" key will shift the picture 1/10" to the left. To shift the picture to the right. use the ">" key. Each repetition of the ">" key will shift the picture to the right l/10". For example, if you needed to shift the picture to the left I inch. you would press the "<" key ten times. The picture can be shifted to the right or left at any time during printing.

If the picture appears to be printing diagonally to the left or to the right, this indicates that the master CPU clock on the TNC 2 may not be in frequency with the transmitting signal. To correct this problem. you will need to remove the cover of the TNC 2 and adjust the capacitor trimmer, C47. This adjustment does not require am special equipment_ Simply adjust C47 about 1/8 of a rotation at a time and let the primer print a few lines of the FAX picture. If the picture seems to be getting worse, rotate the trimmer in the opposite direction. Repeat this procedure until the picture is straight vertically.

Weather FAX pictures received can also be saved to the disk. This operation is described in the software documentation of your computer program.

Terminating FAX Printing

Printing of a FAX picture can be terminated at any time during the printing. You must type a CTRL-C twice (CTRL-C. CTRL-C) in order to terminate FAX printing. The TNC 2 will return to command mode, and printing will stop.

NEW COMMANDS FOR 1.2.6

MNonax25ON:OFF

Default: OFF

MNonax25 is defaulted to OFF. When MNonx25 is OFF the display of non-AX.25 packets is inhibited. TNC 2 will display only AX.25 packets. **Setting MNonax25** ON will cause TNC 2 to also monitor non-AX.25 packets, for example those associated with TCP/IP and NET/ROM or TheNet links. Display of non-AX.25 packets may not be understandable to the user.

RELEASE 1.2.7 **NOTES**

In the TNC2 Firmware Release 1.2.7 the new packet anti-collision features. **ACKNOWLEDGMENT PRIORITY and SLOTTING** is installed.

These features minimizes packet collisions in a busy channel. Use of the optional **SLOTTING** and **ACKNOWLEDGMENT PRIORITY** procedures now in the MFJ TNC firmware significantly improve the reliability of packet radio connections on shared channels. The greatest improvement is yielded when all stations in a network are so equipped and configured with the appropriate. matching parameters. **THE IDEA**

The idea behind the prioritized acknowledgment (PriACK) protocol is quite simple. Acknowledgments (ACKs) get priority access to the channel so that time is not wasted retiring packets that have already been correctly copied by the remote TNC. In normal AX-25 practice, for a variety of reasons. the ACK is often not received within the time limit defined by the FRANK (TI) protocol timer.

In fact, because "channel access" methods are not clearly defined in the AX.25 Level Two Version 2.0 protocol document. the present protocol is more likely to synchronize collisions with acknowledgment packets than with any other type of packet!

THEPROBLEM

When a channel becomes clear, if your TNC has something to send, it will immediately send it. Unfortunately, if anyone else's TNC has something to <u>send. it</u> will also "jump on" the channel as soon as it becomes clear. The result is collisions and retries. Only after a collision does the present protocol suggest using random backoff. Thus, an acknowledgment to a just-received packet is almost assured of a collisionand-retry sequence.. even though the TNC correctly received the packet. This will usually cause the TNC which is awaiting the ACK to time out and re-send the data.

To this collision synchronization mechanism. AX.25 Level Two Version 2.0 adds a propensity to cause even ACKs which are not from hidden terminals, and thus less susceptible to collision, to be delayed beyond even generous FRANK timer settings when the channel gets busy.



MFJ TNC2

Once FRACK times out, even if the ACK finally makes it through before the retry is sent. the original packet is retried an way. This wastes a lot of time which could be better used clearing the channel of some of the legitimate offered load. This feature of AX.25 Level Two protocol accounts for much of the abysmal performance of the currently popular **NETROM** and TheNet nodes when used with omnidirectional antennas systems. **HOW IT WORKS**

PriACK protocol avoids the above problems by giving ACKs priority access to the channel. It does this in such a way that even ACKs coming from hidden terminals are usually protected from collision.

Standard AX.25 protocol gives a limited version *of* this priority access only to digipeated frames through the DWAIT timer.

Ack prioritization works with slotted channel access in the following way:

- 1. Response frames (ACKs) are always sent immediately upon receipt *of* a valid packet. Ultimately, not even DCD will be checked for sending an ACK. However, in this release DCD will still hold an ACK off the channel.
- 2. Stations queued up to access the channel but waiting for a channel busy condition (DCD true) to clear_ will start a slotted access procedure only after enough time for a response frame to clear the channel has transpired (ACKTIME). This is true even *if* the TNC waiting to use the channel cannot hear the ACK being sent.
- 3. Slot tinge windows (DEADTIME) are set large enough to ensure the local TNC will be able to accurately determine if another detectable station has started transmitting in any slot proceeding the slot selected by the local TNC. This prevents two TNCs which have selected adjacent slots from colliding.

As you can see. under this protocol there will never be a condition when an ACK is delayed from being sent beyond the FRACK timer limitation. However, the FRACK timer is still active,. and must be set to a value that

is long enough so as to allow enough time for the **(MAXFRAME*PACLEN)+ACKWAIT** timer to expire before FRACK does. This time will depend on the radio and radio channel data rate is use. The TNC knows that if it doesn't see the ACK immediately when <u>expected. it</u> is probably never going to see it. (See discussion of new 19 parameters below for definition of ACKWAIT.)

Forcing a channel access delay for all stations on the channel which are waiting for a chance to transmit allow ACKs from hidden terminals to get back to the expecting station. This clears that traffic from the offered channel load. If the packet was indeed copied and ACKed. further retries of the same information will not be necessary.

MFJ TNC2

MEMORY EXPANSION UPGRADE

NEW PARAMETERS

There are several new parameters needed for PriACK operation. See the command description elsewhere in this document for their meanings and settings.

L	ACKPRIOR
2.	DEADTIME
3.	ACKTIME

- 4. SLOTS
- 5. ACKWAIT (not directly user settable)

This timer actually consists of the same of ACKTIME + DEADTIME. I represents the time the queued up TNC will wait before transmitting if it has selected the first slot. This allows time for a hidden station's ACK to be sent o the channel.

It is split into two timers because it has two unrelated components. One i related only to the data rate being used on the channel (ACKTIME). the other is related only to the absolute time the radios and TNC DCD circuits require t determine that a transmitter is active after PTT is asserted (DEADTIME). OTHER RELATED PARAMETERS

Several of the "standard" TNC parameters will affect PriACK operation. Mos of theses are parameters in TNCs on the channel which are not usin PriACK.

FRACK

FRACK must be set correctly in any TNC regardless of protocol.

FRACK should be set to a value which allows time for the TNC to send its pack and receive the ACK. This value will depend on the settings being used fo PACLEN and the radio port data rate. This is because, in many TNCs. the FRACK timer starts at the beginning of the packet rather than at the end! Thue it is best to set FRACK to its worst case value for whatever data rate you ar using on the radio port and still allow for MAXFRAME 7 PACLEN 25 packets to be sent and allow other nonPriACK stations to collide. This wa you can make adjustments to PACLEN without having to worry abou interaction with the setting of FRACK.

FRACK should be set to 8 for 1200 baud work and 16 for 300 baud operation.

RESPTIME

If you are running PriACK on a channel where some of the stations have long RESPTIME delays. those stations will not be able to successfully communicate with you after connecting. If you wish to communicate with these stations ,you will have to set your FRACK timer to a number which is longer than the other stations RESPTIME delay. RESPTIME should be set to 0 in your TNC when running PriACK. With proper DCD operation. RESPTIME 0 will work in any event.

DWAIT

DWAIT is ignored when running PriACK. However, when PriATK is OFF. or if you are using a TNC which does not yet have PriACK capability. DWAIT should be set to DEADTIME. or 33 (330 inSec) for the default. **TXDELAY**

TXDELAY should be set to allow for the slowest radio on the dannel. It should be the same as DEADTIME and DWAIT. The default of 33 (330 mSec) is adequate for most work.

INITIAL PARAMETER SETTING SUMMARY

The setting for use at 1200 baud on a VHF FM channel are:

ACKPRIOR ON SLOT 3 DEADTIME 33 ACKTIME 14 RESPTIME 0 (if you require a non zero value for this parameter in order to prevent ACKing individual packet in a MAXFRAME greater than I blast, you DCD circuit is not working. Please get it fixed)

DWAIT 33 MAXFRAME 1-7 depending on channel quality FRACK 8

The settings to use for 300 baud work on a linear mode HF channel are:

ACKPRIOR ON	
SLOTS	3
DEADTIME	8
ACKTIME 52	
ACKTIME	8
RESPTIME	0
MAXFRAME I	
FRACK	16
PACLEN	32 to 128 depending on channel quality WHAT to
EXPECT	• •

This modification to the protocol is compatible with stations using the current protocol in the following respect. A station using the new protocol will not degrade the channel for users of the current protocol So there is nothing wrong with firing up the new stuff on a channel where the majority of the users aren't vet using it. You will be able to communicate with users of the other system without difficulties.

Howeyer. if the users of the old channel access procedures have DWait and RESPtime set to 0. they will tend to hog the channel from users of the newer. more polite access system.

Therefore, for purposes of testing the effect of the new system on channel throughput. if there are stations on channel which are NOT using the new system, they should set their DWait value to one that is compatible with the new system users. A reasonable DWait setting for 1200 baud use would be 73. For 300 baud work. it would be 76.

While these settings seem extremely long, they will assure that the stations NOT using the new protocol always get a shot at slot #l. With these settings. the users of the NEW protocol will occasionally capture the channel.

Settings of 43 for 1200 baud and 64 for 300 baud could be used to assure that stations NOT using the new protocol alyays have a shot at slot #0. This will result in users of the new protocol almost never being able to capture the channel unless all traffic from users of the old protocol has been cleared. This should NOT be done unless ALL stations are using some type of slotted channel access procedure with compatible numbers of slots and compatible slot times.

Remember that the objective of the new channel access procedures is to increase aggregate throughput for the CHANNEL. not necessarily for an individual user. It may seem to you at first when you get on a very busy channel where you are the only station that is using the new system, that you aren't getting to transmit very- frequently. This is because you aren't getting to transmit very frequently. However, the OTHER users on the channel will see an incremental increase in the overall amount of data that the channel can pass per unit time because you are being such a nice guy. Remember that transmitting isn't necessarily communicating.

There is ONE benefit that you should be able to see even under the above circumstances. If you are communicating with another station who is also running the news system, the channel should appear more reliable to you even if quite slow. You should not be getting retried out waiting for his ACK to come back & have to keep reconnecting.

As a higher and higher percentage of the users on the channel begin using, the new system. the performance of the channel should increase quite a bit. However, we all must remember that if a channel is mathematically capable of transferring (for example) 1000 characters per unit time. the very best it can possibly do (if CSMA is working right) is reliably pass about 620 characters per unit time. If it is offered more than this to handle. performance falls off sharply with increased offered load. Currently the typical AX.25 simplex channels observed on the HAM bands tend to hover around 10 to as high as 18 percent throughput. This is far below the 62 percent that is possible when the protocol is working right.

NEW COMMANDS FOR RELEASE 1.2.7 ACKPRIOR ON/OFF

Default: ON

Parameters:

ON Enables Prioritized acknowledgments

OFF Acknowledgments have the same priority as any other frames on the channel.

When **ACKPRIOR** is ON. acknowledgments have priority. This means that is your TNC receives a frame that it must acknowledge (ACK). it will immediately send the ACK if the channel is clear. If other stations are pinning with **ACKPRIOR ON.** they will not access the channel until you have had a chance to send the ACK. even if they cannot hear your transmissions.

When OFF. acknowledgments are queued up for transmission the same as any other frame.

ACKTIME n

Default: 14

Parameters:

n 0-250 in 10 mSec increments.

ACKTIME specifies the time required to send an RR or RNA response frame (an acknowledgment) to an I frame at the radio port data rate. This corresponds to about 510 mSec at 1200 bps with 8 digipeaters and about 1.10 mSec at 1200 bps with no digipeaters. The default of 140 mSec (ACK 14) allows for no digipeaters.

CHECKV1 ON/OFF

Default: OFF

Parameters:

- ON Enables CHECKtime (T3) when punning AX.25 Level 2 Version 1.0 protocol. This will result in an automatic disconnect when packets haven't flowed between this TNC and the remote TNC for CHECKtime. See CHECK command.
- OFF Disables the CHECKtime tinier (T3) and requires the operator 1 initiate a disconnect sequence. This is in accordance with AX.25 Level 2 Version 1.0 procedures.

When ON. the CHECK (T3) timer is used to automatically disconnect an AX.25 Level 2 Version 1.0 link when data hasn't flowed for CHECK time Note that T 3 is not defined for Version 1.0 operation. See CHECK command.

When OFF. T 3 is ignored and normal Version 1.0 procedures apply.

Note: Many operators prefer suing Version 1.0 protocol. especially on marginal or noisy links in order to eliminate some of the overhead of AX.25 Level 2 Version 2.0 protocol.

DEADTIME n

Default: 33

Parameters:

n 0-250 in 10 mSec increments.

DEADTIME specifies the time it takes a station's receiver to detect the fact that a remote transmitter has keyed up. It should be set to the time of the <u>slowest</u> acceptable radio on the channel. It must also allow for any squelch delays and DCD lock time. DWAIT and **TXDELAY** should also be set to this <u>same</u> value for <u>everyone</u> in the LAN.

A fairly fast VHF FM radio-plus-TNC might take 210 mSec (DEA 21), while an HF radio-plus-TNC will usually respond in 80 mSec (DEA 8). Some multi-mode radio-plus-TNCs operating at 1200 bps may respond in only 40 mSec (DEA 4). The default value (DEA 33) will safely cover the majority of FM radios in common packet use.

FIRMRNR ON/OFF

Default: OFF

Parameters:

Note:

- ON When the MFJ TNC-2's buffer is <u>fill. an</u> RNA is sent. When the buffers are no longer full, an RR command frame is sent. When the MFJ TNC-2 receives an RNR, it will not poll the sending TNC until {TO* 10 seconds". TO = CHECKtime*8 unless CHECKtime*8 is <30 or >253 in which case TO = 12.
- OFF When the MFJ TNC-2's buffers <u>fill. an</u> RNR is sent as a response to an I frame.

When the MFJ TNC-2 receives an <u>RNA. it</u> will resend the data every FRACKtime (TI) until an RR is received. When OFF. standard AX.25 Level 2 Version 2.0 protocol procedures are used. If a TNT sending data receives an RNA. meaning the remote TNC cannot accept more data. The sending TNC (MFJ TNC-2) will continuously re-send the data even TI (FRANK) time until an RR is received. meaning the remote TNC accepted the data. This often results in a lot of unnecessary channel congestion.

When **FIRMRNR** is ON, the MFJ TNC-2 will stop sending data upon receipt of an RNR. If the remote TNC does not send an RR before [TO] (see above). the MFJ TNC-2 will poll the remote TNC to be sure it is still active. If the MFJ TNC-2 sent the RNR, then it will send an R when its buffers have cleared to allow more data to be received.

The remote TNC should be capable of FIRMRNR operation. This mode is operable with all TNC's having a FIRMRNR settable to ON, and with most network nodes. If the remote TNC is not capable of FIRMRNR operation, and if the channel is poor, there will be additional delays in getting data passed between the TNCs.

FIRMRNR controls the handling of busy states by the MFJ TNC-2. Setting FIRMRNR ON improves channel efficiency, but is incompatible with earlier TNC-2 releases. The incompatibility is a result of vague protocol specifications. **FIRMRNR** should be alyays be set ON when conversing with network nodes, for example. NET/ROM. In other <u>cases. it</u> is recommended that FIRMRNR be beft OFF unless you can be assured the other TNC you are connected to supports FIRMRNR.

SLOTS n

Default: 3

Parameter:

n 0-127

SLOTS specifies the number of "slots" from which to choose when deciding to access the channel. For example, SLOTS 3 means there are three slots, each having a probability of 1/3 to be selected. Each slot is DEADTIME long. If SLOTS 0 is chosen, the TNC will act as if SLOTS Ihadbeenselected.

Other implementations of this idea of channel access use "PERSISTENCE" to decide the probability of channel access when the channel is clear and "PPERSISTENCE" to enable or disable this feature.

A low value means a greater chance of attempting to send data when the channel is clear, and a higher value means less chance. Normal AX.25 practice is to have every station jump on the channel when it goes clear. virtually assuring collisions and retries.

SLOTS and its relation to the more common "PPERSISTENCE" and "PERSISTENCE" commands are given below:

SLOTS	PPERSISTENCE	PERSISTENCE PROBABILITY TO XMIT
I OFF	255	Jump on = 100%
2 ON	127	Jump on = 50%
3 ON	85	Jump on = 33%
4 ON	6 ^{3,}	Jump on = 25%
5 ON	51	Jump on = 20%
nd so fort	h	

and so forth.

A typical value would be 2 or 3 for a channel with a few other users and 5 to 7 for a fairly busy channel. Higher values than about 10 imply the channel is too busy and other frequencies should be used if available.

Note: SLOTS is independent of ACKPRIOR.

MFJ TNC2

STATUS

Immediate Command

STATUS is an immediate command. It returns the acknowledged status of the current outgoing packet link buffer. If all outgoing packets are acknowledged. STATUS returns 'No Outstanding packets', otherwise it returns the 'Outstanding packets' message. Note that this command works independently of the RS-232 flow-control state of the TNC.

This command may be useful for special applications, like if you can't see the STATUS LED on the TNC. or you want your computer to watch the status.

TXDELAYC n

Default: 2

Parameter:

n 0-120 specifying additional transmit delay time added to TXdelay in terms of CHARACTER TIME at the current radio port data rate.

Flags will be sent during this time, so a value of 1 is required as a minimum.

TXDELAYC is used to fine-tune transmit delay after a transmit command is issued and before data is sent. Used in conjunction with **TXDELAY**, it allows a link to be set for maximum performance.

TXDELAY should be used to account for the time it takes the radio (the slower of the MFJ TNC-2's radio and the remote TNC's radio) to switch between feceive and transmit and allow the receiving unit's data carrier detect (DCD) circuitry to respond. "0" bytes are sent to allow the remote TNC to synchronize to the data stream sent during **TXDELAY**.

TXDELAYC then sends flags to start the frame. if **TXDELAYC** 0 is selected, the MFJ TNC-2 will act as if **TXDELAYC** 1 had been chosen.

With the method of keying up, a user may operate at various HDLC data rates without having to reset **TXDELAY** if the same radios are used. The summation of **TXDELAY** and **TXDELAYC** will automatically adjust the keyup time for the varying rates.

TXDIDDLE ONIOFF

Default: ON

TXDIDDLE determines whether or not the MFJ TNC uses a highly efficient square wave signal in place of flags during the transmitter delay (TXDELAY) period. When **TXDIDDLE** is ON, you may select even smaller TXDELAY intervals because the square wave presents four times as many transitions as **TXDIDDLE** OFF does for your connectees' receive synchronization.

TXDIDDLE is defaulted to the ON setting to reflect the increased efficiency. However there are a number of TNCs on the market which purport to be AX.25 compatible but do not recognize valid AX.25 packets preceded by the **TXDIDDLE** keyup technique. You may recognize the need to set **TXDIDDLE OFF** if it appears that the station you're working is unable to successfully receive your packets despite your adequate signal.

This failure of some TNCs to receive TXDIDDLEd packets may be a result of some software carrier-detect schemes. All TAPR and derivative TNCs utilizing hardware-generated carrier-detect receive both TXDIDDLEd and non-TXDIDDLEd packets with equal efficiency.

Note that when TXDIDDLE is OFF. TXDELAYC is irrelevant! Therefore, the actual TXDELAY yielded when TXDIDDLE is OFF is equal to TXDELAY* 100ms plus an AXDELAY time.

MFJ TNC2 TXUIFRAM ON OFF

Parameters:

- ON The TNC will "flush its buffers" to the radio port upon loss of connection.
- OFF The TNC will only send BEACON and ID frames as unconnect (U1) frames. It will discard information in its buffers upon loss or connection. connection. This command determines whether the TI will transmit most unconnected information packets.

Setting TXUIFRAM OFF will prevent all but BEACON and ID unconnec ("UI") frames from being originated and transmitted. This is most useful BBS and other stations which lend to leave unacknowledged data in TNC transmit buffer when a connection is lost. The normal behavior of a TI would send the buffered data as "UI" frames, adding to channel congestion. T behavior with TXUIfrme OFF serves to reduce channel congestion because t non-useless data is never sent.

Note:

<u>IWUFRAM has no effect on the digipeating of UI frames.</u> only affects frames being originated at this station.

RELEASE 1.2.8 NOTES

In firmware Release 1.2.8 the **Host Mode** feature and the QRA ("Who are you") command are installed.

Host Mode requires a special terminal program to operate. Documentation for Host Mode is available on disk from MFJ upon request.

QRA ("Who are you") pinging is supported in release 1.2.8. A **QRA** ping polls all of the TNCs within range. A random number of seconds later. each TNC that heard the QRA ping will transmit its identification packet. The purpose of this feature is to reveal to the packeteer, particularly the transient one. the names of all reachable TNCs and digipeaters.

Sending a QRA ping:

1) Set the unprotocol callsign to QRA cmd: UNPROTO QRA <ENTER>

2) Manually send an unconnected packet

cmd: CONVERSE<ENTER> <ENTER> AC cmd: NEW COMMANDS FOR 1.2.8

ANSWRQRA ON OFF

Default: ON

Parameters:

ON MFJ TNC responds to non-digipeated Ul frames addressed to QRA, within I to 16 seconds, with an empty ID packet.

OFF Disables MFJ TNC's ping-response function.

QRA ("Who are you") pinging is supported in firmware release 1.2.9 of your MFJ TNC. A QRA ping polls all of the TNCs within range. A random number of seconds later, each TNC that heard the QRA ping will transmit its identification packet. The purpose of this feature is to reveal to the packeteer, particularly the transient one, the names of all reachable TNCs and digipeaters.

Sending a QRA ping:

 Set the unprotocol callsign to QRA cmd: UNPROTO QRA<ENTER>

2) Manually send an unconnected packet

cmd: CONVERSE<ENTER> <ENTER> AC cmd:

This sequence will send an unconnected packet. Once the local TNCs have responded with ID packets. then the user can press a "CRTL-C". The MFJ TNC will respond with the cmd: prompt.

MNONPrin ONIOFF

Default: ON

Parameters:

ON Enables printing Non-Printable Characters

OFF Discards all Packets containing Non-Printable Characters

The setting of the MNONPRINT parameter determines whether monitored packets containing non-printable characters (i.e., characters other than ASCII CR, LF, BEL, and not between \$20 and \$7e) are monitored or simply discarded. The default setting permits monitoring all information packets (subject to LCALLS, MONITOR, MNONAX25, etc). When MNONPRIN is OFF, information packets containing one or more non-printable characters are discarded. You may find this command helpful when there are binary transfers on the channel that you'd rather not monitor. MNONPRIN has no effect on any of the data received during connections.

57
MFJ TNC2

RELEASE 1.2.9 NOTES

In firmware Release 1.2.9 major improvements have been made in the Easymail mailbox. The improved mailbox features can be used in the MFJ TNC2 with or without the mailbox memory expansion. However, in order for you to fully benefit from this mailbox, we recommend that you install the memory expansion board. The on-board MFJ TNC mailbox memory is approximately 8K. The user can increase the Mailbox Memory in the MFJ TNC to 32K. 128K or even 512K!! Memory in this additional RAM is backed up by the lithium battery on the TNC motherboard. The memory expansion board can be purchased separately and is easily installed by the user inside the MFJ TNC2. The memory expansion board comes with different firmware. release 2.1 and must be used in place of the 1.29 release firmware. When the expansion board is installed, you must remember to request the release 2.1 firmware . when ordering firmware upgrades in the future. The different versions of the mailbox memory boards are listed below:

ltem No.	RAM size
MFJ-47A	32K
MFJ-47B	128K
MFJ-47C	512K

Above mailbox memory expansion boards are available from MFJ dealers or from MFJ Enterprises. Inc.

EASY-MAIL MAILBOX

Now that you have upgraded your TNC with the MFJ-47 Memory Expansion board, you have also expanded your Mailbox. The new EasyMail mailbox is only valid for the HF and VHF packet modes. The operation of the Easy-Mail mailbox is really quite simple. There is a command in the MFJ TNC called **MAILBOX**. The new MAILBOX command is defaulted ON, which makes your new Easy-Mail mailbox ready to use, as soon as the MFJ TNC is powered ON. Anyone who operates AX.25 packet can access your mailbox by establishing a connection to your station. A connection to your station is done by suing the standard packet **CONNECT** command. However, once connected the remote user can also kill or read any messages that are addressed to him.

The Easy-Mail mailbox in the MFJ TNC with the MFJ-47A Memor Expansion installed, provides 32K message storage space. However, you can increase the mailbox memory in your MFJ TNC to 128K or even 512F by simply replacing the mailbox RAM chip on the MFJ-47. This addition memory is also backed up by the lithium battery on the TNC motherboarc Additional RAM chip are available from MFJ Enterprises, Inc. and ar easily installed by the user. Order the MFJ-45A for 32K. MFJ-45B for 128F or MFJ-45C for 512K.

Setting Up your Ease-Mail Mailbox

The Mailbox can nosy be operated independently from the standard packe operation. There are certain commands which need to be set. These will be explained later in this instruction.

NOTE: Whenever <ENTER> is found in this instruction this means to press the RETURN key. not to type <ENTER>.

I. Under the cmd: prompt. type::

MYMCALL n <ENTER>: where n is the callsign you wish to for your mailbox.

2. From the cmd: prompt type:

USERS 1 <ENTER>

3. If you want your messages time and date stamped. then set DAYTIME with the current information. Please refer to your MFJ TNC main manual, as to how to set the **DAYTIME** parameter.

Note:	An optional TNC real-time clock (MFJ-43) for the MFJ TNC2
	is available from MFJ Enterprises. With this real-time clock
	module installed in your MFJ TNC, the clock will continues to
	keep time even with the MFJ TNC2 turned off. You will not
	have to set your MFJ TNCs "DAYTIME" every time your MFJ
	1 IVC is powerea up.

4. From the cmd: prompt type:

MAILBOX ON <ENTER>

Now your MFJ TNC is ready for simultaneous Mailbox/Packet operations. You as the SYSOP can access your Mailbox <u>by</u> typing from the cmd: prompt:

SYSOP <ENTER> Your

MFJ TNC will respond with:

[K]MFJ-2.la-IHS] Mailbox ready **n free Mailbox (B, E, H(elp), J,** K, **L, M, R, S, T)** >

First of all lets find out what the **n free** is for. The **n free** is a "Bytes Free" indicator. This applies only to the Mailbox. This is a great feature. because all users will always know how much space is left in your Mailbox. The Mailbox will update the "Bytes Free" whenever messages are forwarded. added or deleted.

NOTE: The M command will not be in Release 1.2.9. This is due to the fact that there is no Mailbox expansion in the Release 1.2.9.

Nov you are ready to operate your mailbox. However, lets take first things first. You very well cannot operate the Mailbox without knowing the functions of the commands. So. lets take a look at the functions of the Mailbox commands. The functions are as follows:

- B Logout: This initiates a disconnect sequence from the Mailbox.
- E Edit Message Header: This allows editing of the message header. This is necessary for the Forward and Reverse Forward functions of the Mailbox. The current is first displayed, then the Mailbox gets the new values. according to what is entered at the prompts it gives the user. The local and remote SYSOPs may edit any messages in the Mailbox. Remote users may only messages TO and FROM himself and any message of "Traffic. Below are the edit prompts and an explanation as to what their functions are:

To: The callsign of the person the message is going to goes here. It must be different than MYcall or MYMcall.

@: The callsign of the BBS you wish to Forward the message to is placed here. This BBS should be the one where the person whom you are sending the message to gets his mail.

From: The callsign of the person who originated the message is placed here.

Type: The Type of message you are sending is placed here. This will tun on a flag in the first flag box. There are a few message types. and here are a couple listed below:

1. "T" message--These are NTS (National Traffic System) type messages. This message system was developed by the ARRL. These messages must be formatted in a certain way. Please refer to the **ARRL Nct Directory** for more detailed view and information on this message system.

2. "P" messages--These types of messages are still private to the sender. recipient, and the SYSOP.

There are other types of messages supported by the Mailbox but without special features.

- Flag: The message Flag is now very important. All of flags can be set via the S (send) or E (edit) commands. This flag will either be an N or a Y. This will appear in the flag block closest to To: block in the message header. There are different types of flags are as follows:
- N Messages with this flag set are all able to forwarded, providing all other criteria is met for a message to be forwardable). Only message: with the N flag set. trigger the **"You have new mail!"** message.
- T The T flag indicates that the message is an NTS message.
- Y Messages with the Y flag set are eligible to be killed by the "K" global kill command.
- F This flag is set when a message is forwarded. Messages which are eligible to foryarded are:

1. Messages where the N flag is set.

2. Messages that have no $\underline{{}_{lei?}}$ addresses that are different from MYMcall.

P Messages with this flag set are private to the sender, recipient, and the SYSOP. Only the person to which the message is addressed to can read or kill it. The local or remote SYSOP can read or kill any message in the system.

Here is an example of a Mailbox message with a Type flag and a message flag inserted:

Slot:1 PN To:KB5JNZ From:KF5C BBS Bulletin

The P is in the Type flag block. which indicates that the message is a Private message. The N is in the Message flag block. which tells you that the message has not been read by the callsign KB5JNZ. When KB5JNZ reads the message the N flag will become a Y flag.

- H(elp) This command displays the Mailbox command list. A brief description of the commands available to user is given.
- J This command replies with the TNC's MHeard list. The eleven most recently heard callsigns will be displayed. The "J" command only applies to remote users.
- K Allows you to kill messages which are addressed to you. This works in conjunction with the Y flag. In order to perform a Global Kill, first of all of the messages to be killed during this must have the Y flag set in the header. Secondly. all messages to be killed must have the same callsign as MYMcall.
- K## Allows you kill the message in slot nn, where nn is a particular slot number. Remote users may only kill messages which are addressed only to them or originated by them. The local and remote SYSOP can kill any messages, depending on the setting of the new command REMsysop. Please refer to the REMsysop for more detailed information.
- L This command allows the remote user. local or remote SYSOP to list all messages in the mailbox. All of slots which are currently in use will be listed. They all will have the slot number, flag field, the destination callsign, originator callsign, subject field. Also the Mailbox command line will be on the next line.



M This allows the remote user. local or remote SYSOP to change memor banks in the mailbox ram. The current memory bank is indicated on th mailbox command line. The bank will be inside a pair of{}, whic will be after the "bytes free" indicator. Below is an example of a typical command line from the mailbox:

nn free {n} Mailbox (B,E,H(elp),J,K,L,M,R,S,T) >

Where $\{n\}$ is the bank number. The bank number will vary from 0 to 7 depending on the size of the expanded memory ram. The bank numbers i relation to the RAM size are as follows:

MEMORY SIZE	BANK NUMBER
32K	0
128K	0 or 1
512K	0 thru 7

NOTE: There will be only one (1) number in the ; at anytime.

For example let's say that you are running a 128K mailbox. and a remote use wants to access memory bank # l. First a connection to your mailbox must b made. Once the Mailbox command line is obtained the user will type:

M 0 < ENTER>

This will be received by your Mailbox and then your Mailbox will send back a new Mailbox command line:

nn free {0} Mailbox (B,E,H(elp),J,K,L,M,R,S,T) >

Thus the {0} indicates the memory bank has been switched to bank #l.

NOTE: The "M**" function** applies only to an MFJ TNC which have th MFJ-47A, B, or C expansion board installed on Release 1.2.9x 9x is used. installed and Release 1>Lis used.

- R This command lets you read messages addressed to you. When you list the messages in the mailbox you notice an N flag next to the messages which you have not read. Once you read those messages the N flag will change to a Y flag. This is an indicator to both you and the SYSOP that the messages have been read. From there you can perform a global kill on all of your messages or the SYSOP can kill them individually.
- NOTE: The only way an N flag can get changed to Y flag during a read is that the person who the message is addressed to needs to read it. The flag will not change for any other person who reads the message.

Allows you to read the message in slot nn. Where nn is a particular slot number. This command works the same as the R command. except its for reading the individual slots.

R##

S call This allows the remote user_local or remote SYSOP to send a message to the designated callsign. "CALL" must be a callsign valid under the same format as the MYCALL. CONNECT or other callsign commands. You can also send messages in NTS (National Traffic System) format. You will need to refer to the ARRL NET DIRECTORY for more detailed information on the NTS system.

- **SP call** This allows the remote user, local or remote SYSOP to send a personal message to the designated callsign. This is a private message and only the person to whom the message is addressed can read or kill it. The SYSOP can also read the private messages. When a private message is listed a P flag is shown in the "Message Type" flag block. The P flag can also be inserted <u>by</u> the originator or the SYSOP through the Edit command.
- T This command allows the remote user to page the SYSOP. When the T command is invoked from the remote user the following message appears on the SYSOP's computer screen and it also is sent back to the remote user's screen:

Paging SYSOP; any key aborts...

MFJ TNC2

MEMORY EXPANSION UPGRADE

The Mailbox will page the SYSOP by ringing the SYSOP's terminal bell 30 times. If the SYSOP is at his or her terminal, the asterisk character will appear on the screen even' time the terminal bell (CTRL-G) rings. If the SYSOP does not answer the Mailbox will send the message back to the user saving no answer. Below is an example of a typical screen:

Paging SYSOP; any key aborts...

********No answer

The remote user may abort the SYSOP page by sending packet to the Mailbox. If the SYSOP does answer the page then the SYSOP can enter CHAT command. then converse one-on-one with the remote user.

This concludes the explanation of the commands which are on the Mailbox command line. Now lets get into a little of the Mailbox operation. If you have any questions about the Mailbox commands. we believe they will be answered in this section.

Mailbox Operation

l. First establish a connection to the Mailbox station.

2. If the Mailbox of the station to which you are trying to connect with is ON. then it will answer back with the Mailbox prompt:

[MFJ-21a-IHS] Mailbox Reads' nn free (n; Mailbox (B,E,H(elp),J,K,L,M,R,S,T) >

The nn indicates the amount of RAM space available for messages in the Mailbox to which you are connected to. The nn will be no higher than 65K, if a 512k Or 128k Mailbox is in operation. If the Mailbox is 32k then nn will be 32k, then nn)sill he 32K.

Also: The {n} indicates the memory bank being used for the Mailbox. Please refer to the expanation of the M command for the Mailbox in this section.

Now at this point all of the Mailbox arc available to you. You may then type M to switch the memory bank of the Mailbox. K to kill a message, L to list all messages, R to read the messages, S to send a message. B to logout and disconnect from the Mailbox or H for the HELP menu.

To send a message the S or the SP commands must be used. It must be used in conjunction with a callsign as in the examples below:

S **KB5JNZ** <ENTER>. this will send an ordinary message to the callsign KB5JNZ.

or

SP KB5JNZ <ENTER>. this will send a private message to the callsign KB5JNZ.

a. The Mailbox will respond with: **Title:**

b. The user will enter the message subject (title) at cursor prompt, then press the "RETURN" key.

MFJ TNC2 UPGRADE

C.

The Mailbox will respond with: **Send msg; Control-Z or** /**EX to end:**

d. The user will then enter the message at the cursor prompt. If you are using a 512K or 128K Mailbox then you can actually upload disk files into the Mailbox. The 32K version has the same capability but with 32K RAM capacity. At the end of the message press a Control-Z and the RETURN key. The message will be sent.

c. Your message will be seen on the mailbox station's screen. then the mailbox will respond with the mailbox command prompt:

nn flee {n) Mailbox (B,E,H(elp),J,K,L,M,R,S,T) >

Where nn is the "bytes free" indicator. This tells the user how much ram space is available in your Mailbox. Also $\{$ n; is the indicator of the current memory hank in use by the Mailbox.

There are two (2) different ways to kill messages. The first is give in the example below:

A. To kill a message in a particular slot type:

K## <CR>

Where the ## is the message number you want to kill.

The Mailbox will respond with:

Message ## deleted; nn free {n; Mailbox (B,E,H(elp),J,K,L,M,R,S,T) >

This is whether or not the message flag is set to an N or a Y. Note that the remote users may only kill messages which are addressed them. The originator can also kill the message. The local SYSOP can kill any or all messages in the Mailbox.

- **B.** You can perform a Global Kill on a group of messages which are under the same callsign. To perform this two (2) conditions must be met:
 - i. All messages must have been read and the message flag must be a Y.
 - ii. The callsign contained in the MYMcall must be the same as the callsign in the MYcall command.

If the above conditions are met then all the user must type: **K**

<**CR**>

This . ill go out to Mailbox. then the messages with the message flags set to Y and all of the proper callsigns will be killed. The Mailbox will respond back to the remote user with all message numbers killed during the Global Kill process. Also the Mailbox prompt gill be given again. The "bytes free" indicator will be updated also. The SYSOP either remote or local can do a Global Kill. The SYSOP must individually kill any messages.

5. The remote user or local SYSOP can List messages from the Mailbox. In order to do this first the Mailbox prompt must be obtained by either a connection to the Mailbox or through the local SYSOP command. Then to List messages from the Mailbox type the following from the cmd: prompt:

L < CR >

The Mailbox will respond with a list of currently used slots in the following format:

Slot:## tm To: From: Subject:

Where Slot## column is the number of the slot that the messages are in. The lower case t is the **Type Flag** block. The lower case m is the **Message Flag** block. The To: column will contain the callsign of the person who the message is addressed to. The **From:** column will contain the callsign of the person who left the message. The Subject: column will contain a brief message title.

Note that the number of slots for an MFJ TNC without memory expansion board is 30. For an MFJ TNC with the memory expansion installed the maximum slots per memory bank is 99.

After the Mailbox lists all messages it will issue the Mailbox prompt:

nn free (n; Mailbox (B,E,H(elp),J,K,L,M,R,S,T) >

- 6. Anyone who accesses the Mailbox can read messages or which are addressed to him/her. Also a message which is a addressed to ALL, such as bulletins can be read by anyone. Messages can be read by two (2) different methods. Below are the two methods:
 - A. This method will allow the remote user. local or remote SYSOP to read a group of messages. This is only good for a group of messages with the same callsign as MY,-all. The set conditions of the Type or message flags have an effect on a read process. They can be set to an N. Y or an F. In order to perform this type of read operation:

R < CR >

The Mailbox will display all messages that are addressed to the same callsign as MYCALL. If no messages exist for MYCALL, then the Mailbox will respond with: **Not Found.**

B. Messages can also be read individually by the slot number. This is good for reading other messages like bulletins or messages addressed to ALL. In order do an individual read type the following from the cmd: prompt:

R## <CR>

Where ## is the slot number of the message that you wish to read. The

Mailbox will respond with the message from the slot specified. All

messages read will be in the following format:

Slot## To: From: Subject: This is an example of a message from the Mailbox

Where Slot## column is the number of the slot which the messages are in. The lower case t is the **Type Flag** block. The lower case m is the Message Flag block. The **To:** column will contain the callsign of the person who the message is addressed to. The **From:** column will contain the callsign of the person who left the message. The Subject: column will contain a brief message title.

Then at the end of the message the Mailbox prompt will be issued.

7. The remote user can also disconnect from the Mailbox without having to issue a CTRL-C. D and a RETURN. All that needs to be done is to type B to logout of the Mailbox and disconnect from the it. If you access your Mailbox via the SYsop command. then you must issue a CTRL-C to exit the Mailbox and return to command mode. The command prompt will indicate the stream you are on. The command prompt may look like this:

[Acmd: where [A indicates that you are on packet stream A.

This is the only way the remote users can access your Mailbox. If you stay in the SYSop mode then when a user tries to connect to your Mailbox he will receive a message like this:

***CALLSIGN Busy Disconnected

The SYSOP will receive a message like the example below when he is in the SYSOP mode and someone tries a connect:

***connect request: CALLSIGN

Additional Mailbox Features

Other MFJ TNC mailbox features are as follows:

Forwarding:

The MFJ TNC Mailbox now has the ability to Forward mail to most full service and personal mailboxes. This feature allows you to compose your mail on your TNC, at your leisure, and then **Forward** the resulting messages for eventual delivery.

Messages may be forwarded any one of three ways either <u>manually. by</u> command, or by automatic forward. You can either forward messages hourly, or by your local full-service mailbox's reverse forward request.

Manual and hourly forwards may proceed through up to eight (8) digipeaters, allowing the messages to be forwarded through ROSE switches. Also NODE forwarding is can be done too, thus allowing you to forward mail through NETROM. THENET. and KA-NODE switches. Please refer to the NODeforw command in this manual.

In order to conserve RAM, space the SYSOP may specify that forwarded messages be killed upon successful forwarding. However, if conserving RAM is not a concern, then forwarded messages will be flagged "F". This flag will appear in the message flag block. Messages with F flags will be saved in the mailbox for the SYSOP's disposition.

All forwarding events are monitored on the screen, in order to inform the SYSOP of the forwarding progress.

In order for a message to be eligible for the forwarding process two (2) conditions must be met:

A. Messages must have N flags in the message flag block.

B. All messages must have an @ callsign in the message header.



The command used to forward a message is FO. All forwards must be done in the stream cmd:mode. This command is by pressing a CTRL-C while in the SYSOP mode. Below is a typical example as to how to use the FO command:

FO CALLSIGN <CR>

Where CALLSIGN is the callsign of the destination mailbox. This callsign must also reside in header of the message to be forwarded. The message header can be altered through the Mailbox Edit command. Please refer to the EDIT command in this manual. When the **FO** CALLSIGN is issued the MFJ TNC will initiate a connect request to the destination BBS. If the connection is successful the your mailbox will proceed to send the message to the destination BBS.

Eliciting Reverse Forwards

This yen- unique feature. when combined with the hourly automatic forward. enables the MFJ mailbox to query another BBS. regularly and automatically. for the purpose of polling the other BBS for the TNC user's mail. Thus. even if your local full-service BBS operator is unyilling to forward to you. you can still have most of the benefits of auto-forwarding, because your own TNC will elicit your mail for you on an hourly basis.

Reverse forwards may be restricted to a particular callsign. This prevents others users from "stripping" messages off of the mailbox prior to their being forwarded to the legitimate destination.

When all messages are forwarded.. if the destination mailbox supports reverse forwarding (as determined by \$ in it's SID) then the MFJ TNC will attempt to elicit a reverse forward.

Remote Heard Log:

This handy feature allows the remote user to query the TNC heard log at any time. From this log the remote can determine band conditions, or just see who has been around. The log holds eleven (11) of the most recently stations.

Chat Mode:

The Chat mode feature in the MFJ TNC Mailbox is similar to the standard TNC "converse mode". It enables the SYSOP to break onto a mailbox link, and get one-on-one with mailbox user. This is just like a regular "Packet QSO". This is good for discussing problems maybe with the link or with the mailbox in general. Chat mode terminates any user or forwarding operation in progress. The mailbox will stay in Chat mode until the SYSOP returns to command mode.

Page SYSOP:

This allows the remote user to "Page" the SYSOP by ringing the SYSOP's terminal bell. This is done by the SYSOP's mailbox sending a CTRL-G to the SYSOP's terminal. The SYSOP's mailbox will poll the terminal's bell 30 times. If the SYSOP does not answer the remote user will receive a message back saying No Answer. If the SYSOP does ansyer then lie can go into the Chat mode. and converse with the remote user. For more detailed information on this feature please refer to the section on Mailbox Set Up in this manual.

Remote SYSOP:

The Mailbox has the capability to be remotely controlled. A callsign can be specified by the SYSOP for this purpose. This would be useful in the case where the SYSOP is out in the field. It would allow him to control the mailbox. and do most of the local SYSOP's duties, such as killing messages. reading. editing message headers for forwarding purposes.

Mailbox CText:

This is a message dedicated to the Mailbox, but is used when a connect is made to the MYM call callsign. It is limited to 120 characters in length. If MCText is empty, then no message will be sent.



Idle Timeout:

The Mailbox incorporates an idle timeout function. This is to ensure that the mailbox is still accessible in the event of a remote user drop out during a connection or walks away from the TNC for too long. The Mailbox will automatically do a disconnect from the link after the time which the SYSOP specifies.

<u>Abort:</u>

This command gives the SYSOP control over the mailbox by allowing him to force a disconnect on the mailbox link. It may also be used to avoid any <u>QRM. to</u> abort a forward-in-progress. You can also use it to terminate mailbox usage by an unwelcome user.

The new Mailbox system is fully compatible with NTS packet messages also. It allows you to format NTS type messages.. and send them to another destination.

The MFJ TNC also incorporates a new "bytes free" counter. It is updated as the mailbox fills or empties. In the case of the MFJ-47B and MFJ-47C (128K and 512K respectively) it keeps up With the available RAM in multiple memory banks.

NEW MAILBOX COMMANDS

<u>MYMcall</u> [callsign]

Default: blank

This is the dedicated callsign for the mailbox. If MYMCALL equals MYCALL, the TNC responds to incoming connections in mailbox mode. When there is no callsign put in MMcall. the mailbox is inaccessible to remote users.

FOrward (dest bbs.(optional vial) Mode: Packet Immediate Command

FOrward is an immediate command. Messages can be forwarded manually, by command, or automatically. They can also be forwarded hourly or by your local full-service mailbox reverse forward request. When invoked the mailbox initiates a connect to the callsign of the destination BBS. When a connect is established the mailbox will proceed to send your messages. Messages that qualify for forwarding must meet two conditions. they are:

l. Have flags of 'N'ot read.

2. Must have a callsign in the @ addresses that are different from **MYMCALL.**

After forwarding. each message's flag is set to 'F' to prevent further forwards. When all messages are forwarded, if the dest bbs supports reverse forwarding (as determined by "S" in its SID) then TNC will attempt to elicit a reverse forward.

For more information on Forwarding and Reverse Forwarding can be found in the Mailbox Features section of this manual.

MFJ TNC2	MEMORY EXPANSION UPGRADE

MCText Mode: Mailbox Default: " "

Text: Any combination of characters and spaces. up to 120 characters in length.

This command works like TEXT except that MCTEXT is sent only when the mailbox MYMcall is connected to. There is no express equivalent to the CMSG ON/OFF command. If MCText is empty, no string is sent. If the is message longer than 120 characters an error message will be given and the command is ignored.

The command string can be cleared by typing the command, then entering the % sign where the text would normally be entered. Also the RESET command will empty the MCText command.

For example you might want to set your MCText to:

Welcome to the Mailbox... I'm not here right, but feel frce to use the system ... Enjoy!

MTimeout n

Mode: Packet

Default: 30

Parameters:

n 0 - 250, specifying 10 sec. intervals

If non-zero, this is the timeout value expressed as 10s of seconds. Timeouts on the mailbox apply only to remote users (the SYSOP can never time out). The mailbox will timeout and disconnect after n^* 10 seconds of mailbox inactivity. Note that the synchronous 10 second clock may cause the timeout to occur as much as 10 seconds before the calculated timeout time. So, if you want to set your Mailbox timeout to 5 minutes then you set the MTimeout command to 30, which would specify a time-out of 300 seconds.

MEMORY EXPANSION

MYHIerad

MFJ TNC2

Mode: Mailbox

Default: " "

Default: OFF

UPGRADE

Text: Any combination of characters and spaces, up to 60 characters in length.

You may use this parameter to generate a customized "W,-:" portion of the tagline your TNC will insert in forwarded messages. If MYHIERAD is blank, the default **C:** portion will read "@:<mymcall>". It is suggested that you insert your hierarchical address, location, and zip/postal code in this parameter. Example: MYHIER for N2WX in Sebastian Florida in the Melbourne LAN at zipcode 32958. using N5AUV as the home bbs. would be entered like this:

crud: MYHIER N5AUV #MLBFL.FL.USA.NA [N2WX User/Sehastian] Z:32958

and the tagline would look like this

"R: 920801, 1200 @: N5_AUV. #MLBFL.FL.USA.NA[N2WX User/Sebastian] Z: 32958 #: 8

KILonfwd ON/OFF Mode: Mailbox

Parameters:

ON Messages forwarded out of Mailbox will be killed after forwarding process is complete.

OFF Default; Messages forwarded out of the Mailbox are not killed after forwarding process is completed.

The setting of KILONFWD determines whether or not the TNC deletes a

message after it has been forwarded. If Mailbox RAM space is critical then you

might want to set this command ON. Setting this command to

ON, could cause problems, because once a message is killed it cannot be recovered.



NODeforw

Mode: Mailbox

Default " "

Default:" "

node]via x...], up to 8 vias

This is an immediate command. It is similar to the FORWARD command except that the NODEFORW parameter is the callsign+via path to your NETROM. THENET. or KA node. When your TNC establishes the connection to the 'node'. it sends the text in NODEPATH to establish a network link to the receiving BBS.

If all goes well. the forwardee will send its signon string. and forwarding will commence. To detect failure. NODEFORW looks for two strings - "BUSY" and "RETR" - as node connection failure indications. Upon finding "BUSY" or "RETR". the forward attempt is considered failed. and the TNC disconnects from the node. The command can contain the callsign of the "node" and up to 8 vias.

<u>NODEPath</u>

Mode: Mailbox

Enter the command the TNC will issue to command the node connected by the NODEFORW command to link with the receiving BBS.

Example:

cmd: NODEPATH C KB4VOL cmd: NODEFORW PSL5

This sequence first connects to the PSL5 node. When connected, the TNC sends the node connect command "C KB4VOL" to establish a link with the receiving bbs, KB4VOL.

ABOrt Mode: Mailbox Immediate Command

This command gives the SYSOP total control over the Mailbox by allowing him to force a disconnect on the Mailbox link. It immediately terminates any mailbox activity currently in progress. You may use it to cancel an erroneous FORWARD or NODEFORW command, to eliminate unwelcome mailbox users, or at any other time you wish to terminate the mailbox process.

CHAT

Mode: Mailbox

Immediate command

The SYSOP <u>may. at</u> any time. break onto the mailbox's connected link. The resulting mode is like the a typical CONVERS mode packet connection CHAT immediately terminates any user or forwarding operation in progress. At the point when the SYSOP invokes Chat mode, the SYSOP and the connectee are in an actual packet QSO. This is good to discuss problems with the Mailbox or equipment failure. CHAT mode continues until the SYSOP returns to command mode.

REMsysop call]-n}

Mode: Mailbox

Default: Blank

Parameters:

Call Callsign to be used for Remote SYSOP ops

-n 0 - 15. optionally specified sub-station ID (SSID)

Entering a callsign here permits the owner of the call to perform sysop functions remotely. Sysop functions include editing. reading. and killing any mailbox message. When this parameter is blank, the remote user may only read non- P messages and messages to or from himself. Furthermore, he may only kill messages to or from himself plus any messages of type "T" (raffic).

This parameter may be reset to the blank (no remote swop) state by entering a "%" or "&" blanking code.

а

MFJ TNC2 MEMORY EXPANSION UPGRADE

RVfalway **ONOFF** Mode: Mailbox Default: ON

Parameters:

ON Initiates forwards and reverse forwards of all fonwardable messages

OFF Mailbox ignores Forward and NODEforw commands

The setting of RVFALWAY(s) controls whether the TNC will initiate forward events (FORWARD. NODEFORW) in the absence of forwardable messages. If OFF. the TNC will ignore FORWARD and NODEFORW commands entered in the absence of forwardable messages. When ON. the TNC runs the event for the sole purpose of eliciting reverse-forwardable messages from the remote BBS.

Mode: Mailbox

Tlmedcmd

Default:" "

(string- max 119 chars]

This string in the TIMEDCMD parameter is executed as a TNC command whenever the minutes register in the time of day clock equals the value in the TIMEDMIN parameter. The string is executed when seconds equals one: execution is deferred while the user is entering a command.

<u>TIMEDMin</u> n

Mode: Mailbox

Default: 60

Parameters:

n 0 - 60, specifying I minute intervals

The TIMEDMIN parameter is compared against the minutes register of the real time clock to determine when the TIMEDCMD string is sent to the command interpreter. Setting this parameter to 60 disables the feature. Combined with the TIMEDCMD string, the user may configure his TNC to perform hourly automatic forwards and reverse forwards.

MFJ TNC2

MEMORY EXPANSION UPGRADE

REVFlim calf-n]

Mode: Mailbox

Default: " "

Parameters:

Call Callsign of BBS to enable Reverse-forwards

-n 0 - 15. an optionally specified sub-station ID (SSID).

When this parameter is empty, the mailbox reverse forwards all of it messages eligible for forwarding to the first SID compatible *BBS* to elicit a reverse forward with "F>." Since this permissive technique is vulnerable to a malevolent operator who might attempt to connect and force your mailbox to forward to him. the REVFLIM parameter is provided to limit your mailbox's response to other's reverse forward

requests. Simply place the callsign of the *BBS* you wish to enable reverse forwarding to in this parameter to limit remotely-initiated reverse forwarding to only that Callsign.

MAILLED ON/OFF

Default: ON

When MAILLED is ON. the TNC's STA LED will flash on and off while no connected to indicate the presence of mail in the TNC mailbox. The STA LEE reverts to its normal function, lit when unacknowledged packets are pending. i the TNC is in a CONNECTED state or if MAILLED if OFF.