™®

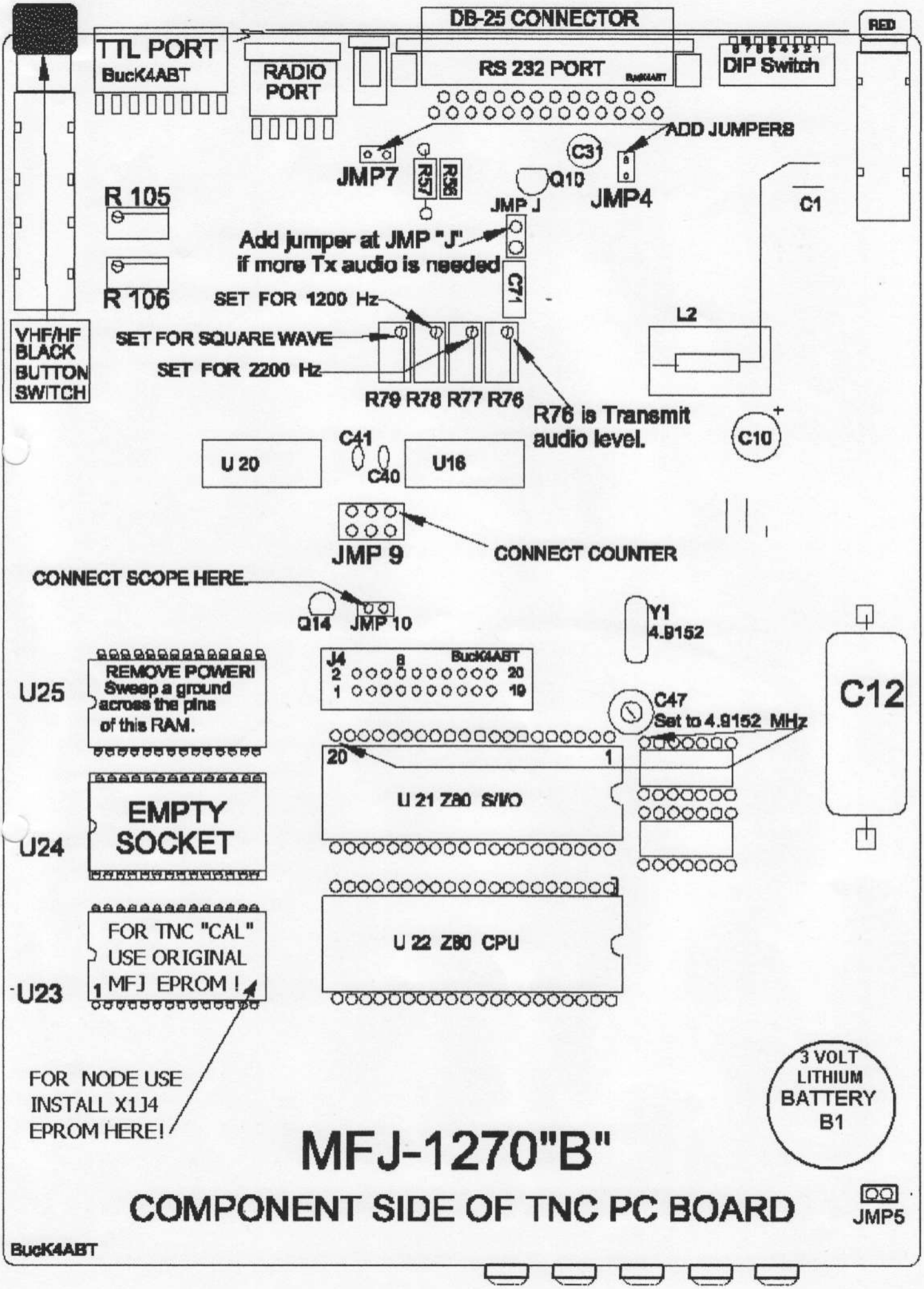
For TNC to Radio Interface Cable Diagrams, CLICK HERE !

For PSK31 & SSTV Interface Diagrams, CLICK HERE !

Alignment of MFJ-1270B, & 1274

With several versions of this proceedure going around, and very few of them that covered each step in the correct order, I've opted to submit my version. This version includes the "PRESS SPACEBAR" to toggle between tones, and PRESS the "D" to advance to the dual-tones..etc.

The TNC shown has the X1J4 Network Node EPROM shown installed, ***for this alignment however, be sure you use the original TNC EPROM in the MFJ-1270.*** In addition, I have identified nearby components so the operator can locate the test point easier.
HavFun Packeting, es 73 de BucK4ABT


DB-25 CONNECTOR
TTL PORT
BucK4ABT
RADIO PORT
RS 232 PORT
DIP Switch
RED
ADD JUMPERS
JMP7
R57
R56
C31
Q10
JMP4
JMP J
C1
R 105
R 106
Add jumper at JMP "J"
if more Tx audio is needed
C71
SET FOR 1200 Hz
SET FOR SQUARE WAVE
SET FOR 2200 Hz
VHF/HF
BLACK
BUTTON
SWITCH
L2
R79 R78 R77 R76
R76 is Transmit
audio level.
C10
C41
C40
U 20
U16
JMP 9
CONNECT COUNTER
CONNECT SCOPE HERE.
Q14
JMP 10
Y1
4.9152
J4
BucK4ABT
C12
C47
Set to 4.9152 MHz
U25
REMOVE POWER!
Sweep a ground
across the pins
of this RAM.
U24
EMPTY
SOCKET
U23
FOR TNC "CAL"
USE ORIGINAL
MFJ EPROM !
U 21 Z80 S/IO
U 22 Z80 CPU
FOR NODE USE
INSTALL X1J4
EPROM HERE!
3 VOLT
LITHIUM
BATTERY
B1
MFJ-1270"B"
COMPONENT SIDE OF TNC PC BOARD
JMP5
BucK4ABT

1- Power ON. Connect Frequency counter to U21, pin 20 , set C47 to 4.915205

2- Power OFF. Put jumpers on J4 & J7

3- Switch [5] & 6 ON, Brackets [ ] equal "Terminal Speed." (6 = 300 & 7 = 1200 baud radio speed)

(The "DIP" switches on the rear of the tink). **DO NOT TURN POWER ON BEFORE SETTING DIP SWITCHES !**

4- Power ON

5- At the **cmd**: prompt, type CAL <Enter>

6- Type K : Note PTT and DCD LEDs should be ON.

7- Connect Counter to JMP9, (NEXT TO C40) near **U 16**.

8- Set R78 to 1200 Hz. (SEE NOTE) BE SURE HF/VHF Switch is OUT; Press SPACE BAR to toggle 2200 Hz.

NOTE: *(In some cases, the TNC may come up in the 2200 Hz mode. In this case, set R77 for 2200 HZ, then SPACE BAR toggle to 1200 Hz mode and adjust R78 to 1200 Hz.)*

9- Set R77 to 2200 Hz.

10- Push HF/VHF (Black Button on rear of TNC) Switch IN

11- Set R106 to 1600 Hz..... After setting R106, toggle to other tone (1800 Hz) with SPACEBAR.

12- Set R105 to 1800 Hz

13- Type D to toggle both tones ON.... two tones.

14- Connect a scope to J10 next to Q14

15- Adjust R79 for squarewave: Be sure top and bottom of pulse are equal.

16- (1274 ONLY) Set R212 for LED under "U" for TUNE (while in dual tones).

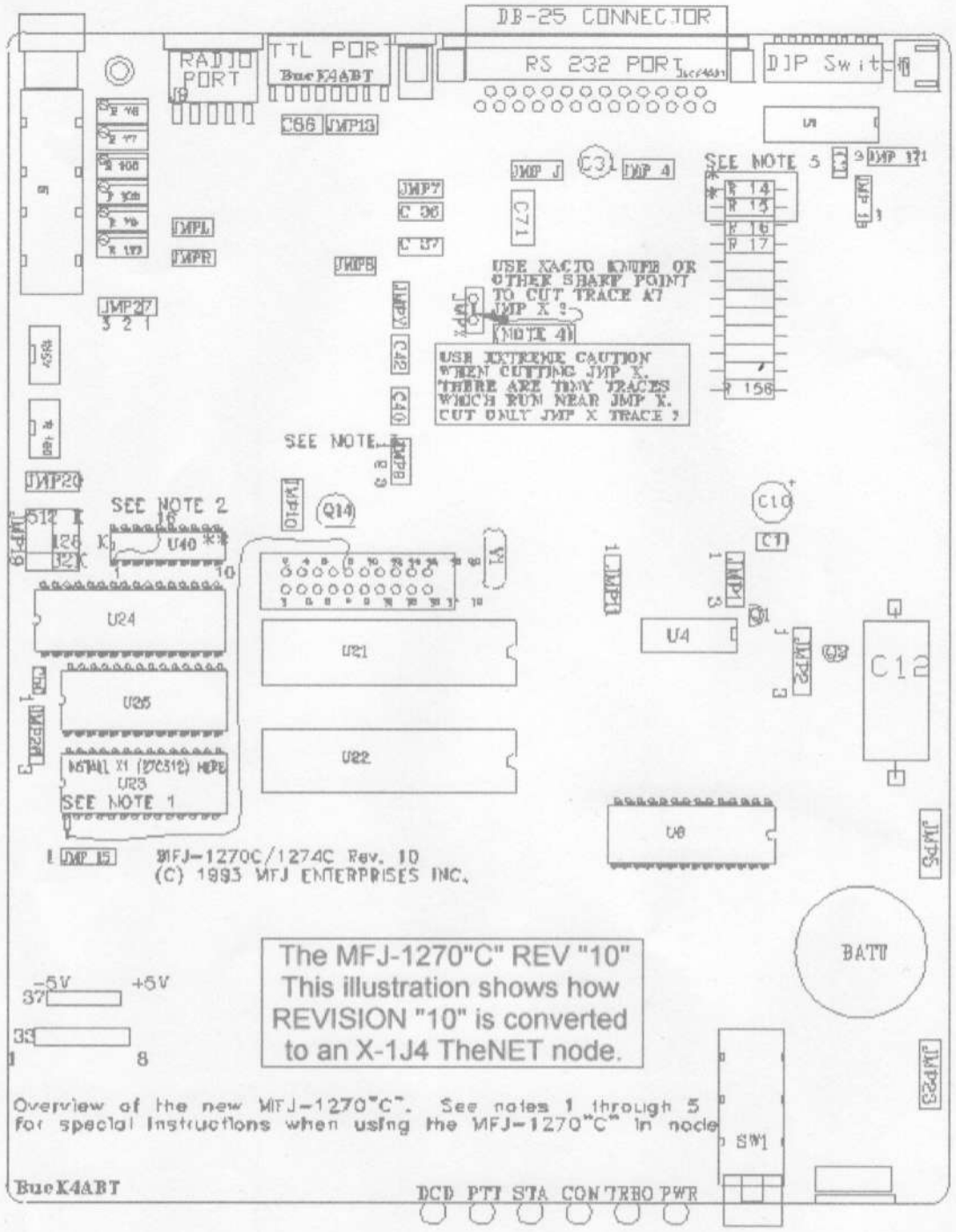
17- (1274 ONLY) HF/VHF Switch OUT, check for LED close to "E", If it is not, check step 15 again.

18- #9; REMOVE JUMPERS from JMP-4 and JMP-7

19- Before we install the cover, Check the lithium battery at B1 near JMP5. It is about the size of a 25 cent piece (quarter).
If the voltage is below 3.0 (three) volts, install a new lithium battery of the same type.
Replacement lithium batteries of this type are available at most Radio Shack stores, or directly from MFJ. This battery maintains the parameter settings within the TNC during a power failure.

20- Be sure there is a jumper on both pins of JMP5. Install TNC cover.

21- For VHF operation, make sure the Black VHF/HF switch is in the OUT position.



Overview of the new MFJ-1270"C". See notes 1 through 5 for special instructions when using the MFJ-1270"C" in node

BueK4ABT

NOTE 1) Jumper PIN 1 of 27C512 to PIN 8 of MODEM header J4.
NOTE 2) When using 1270C as X1J node remove U40. Add jumper from PIN 16 to PIN 1 (Ground PIN 16).
NOTE 3) If a jumper is on JMP9, remove it and place it on one post only. No jumper should be on JMP9 when used as GATEWAY node.
NOTE 4) CUT JMPX "PAD" when using as X1J node to prevent node from hearing itself.
NOTE 5) If R14 & R15 are missing, install 100 ohm resistors when using as X1/TheNET node gateway.

For the node sysop who plans to implement a 9600 baud gateway port, the MFJ-1270/CQ/Turbo Plus is 9600 bauds ready. It will operates all three radio port speeds of 300, 1200, and 9600 bauds. The RS-232 port speed can be set to 19,200 bauds.

MODEM CALIBRATION

The MFJ TNC is factory calibrated to operate to within factory guidelines. If it becomes necessary to re-calibrate the modem, then the following procedure is provided.

Modulator and Demodulator Frequency Calibration

Here we present two (2) Modulator and Demodulator calibration methods. Method I requires test equipment as noted, where Method II does not require test equipment.

Method I

HF Modem

Test equipment needed: Frequency Counter and probe and oscilloscope with probe.

1. Install push-on jumpers on JMP 4 and JMP 7.

2. Verify a push-on jumper is installed on JMP 8.

3. In the following procedure all frequencies are to be set to within +/- 2 HZ.

4. Place the frequency probe at JMP 9 pin 1. This is the top pin.

5. Place the oscilloscope probe on top pin of JMP 10.

6. Set dip switch #6 ON.

7. Set one of the dip switches 1 thru 5 to the Computer Baud Rate which appiles to the baud rate being used on the computer.

8. Push the **VHF/HF** switch to the **HF** position.

9. Initiate the calibration mode by typing:

   CALIBRATE <ENTER>

10. Now the modem must be keyed up. Do this by pressing the **K** key.

11. Check the voltage on pin 9 of U16. Press the **SPACE BAR** until this pin indicates -5 VDC.

12. Adjust R106 to where the frequency counter indicates 2125 Hz +/- 2 Hz.

13. Press the **SPACE BAR** until pin 9 of U16 indicates +5 VDC.

14. Adjust R105 to where the frequency counter indicates 2295 Hz,+/- 2 Hz.

15. Press the **D** key.

16. Locate R212, which is near the front of the PC board by the tuning indicator. Adjust R212 until the 10th led from the left is lit on the tuning indicator. This enables proper signal tuning within the HF bands.

VHF Modem

Test equipment needed: Frequency Counter and probe and oscilloscope with probe.

1. Install push-on jumpers on JMP 4 and JMP 7.

2. Verify a push-on jumper is installed on JMP 8.

3. In the following procedure all frequencies are to be set to within +/- 2 HZ.

4. Place the frequency probe at JMP 9 pin 1. This is the top pin.

5. Place the oscilloscope probe on top pin of JMP 10.

6. Set dip switch #7 ON.

7. Set one of the dip switches 1 thru 5 to the Computer Baud Rate which appiles to the baud rate being used on the computer.

8. Push the **VHF/HF** switch to the **VF** position.

9. Initiate the calibration mode by typing:

   CALIBRATE <ENTER>

10. Now the modem must be keyed up. Do this by pressing the **K** key.

11. Check the voltage on pin 9 of U16. Press the **SPACE BAR** until this pin indicates -5 VDC.

12. Adjust R78 to where the frequency counter indicates 1200 Hz +/- 2 Hz.

13. Press the **SPACE BAR** until pin 9 of U16 indicates +5 VDC.

14. Adjust R77 to where the frequency counter indicates 2200 Hz,+/- 2 Hz.

15. Press the **D** key.

16. Set the **TIME/DIV.** scale on the scope to **1 MS/DIV** and the **VOLT/DIV** scale to **5 V/DIV.** Connect the scope probe to the toppin of JMP 10.

17. Adjust R79 so that signal on the scope shows a 50% duty cyclesquare wave. The square wave should be uniform in width (i.e hightime is equal to the low time). The pulse duration of the high time and the low time is approximately 2.4ms. The CON and STA LEDS may blink simutaneously.

18. Type Q to quit the calibration routine.

METHOD II

The below procedure needs no test equipment, and is very accurate if done properly. Be sure to follow each step carefully. If any problems arise, please go back and check the preceeding step, to make sure it worked.

This procedure is a three (3) step process. The three steps areas follows:

1. Center the modulator tones over the required modem center frequency

   (Fc).

2. Align the demodulator center frequency.

3. Align the tuning indicator.

NOTE: ALL THREE STEPS SHOULD BE PERFORMED IN THE ABOVE ORDER!

If they are not all done at the same time, or in the correct order, the modem may not be receiving and transmitting on the same frequency, and the tuning indicator may give false indications.

The third step, alignment of the tuning indicator, should only be used in conjunction with alignment of the 300 baud 170 Hz shift demodulator.

The other AFSK modems available in the MFJ-TNC can be aligned using exactly the same steps presented here but substituting the appropriate part numbers for the adjustments. However, do NOT align the tuning indicator to anything but the 300 baud 170 Hz shift HF packet modem.

It is important that the tuning indicator alignment be optimized for the 300 baud 170 Hz shift HF packet modem. It will indicate correctly for all other modes when aligned for the HF packet modem.

As described elsewhere in this manual, the exact configuration of your radio's filters and whether it has IF shift or not will determine the exact required center frequency for the modem. Once the required center frequency has been determined, the modem calibration can be carried out.

NOTE: It is essential that the modulator tones be properly aligned FIRST as they will be used to align the demodulator center frequency.

Set the modulator tones to Fc MINUS 1/2 of the shift for the low tone and Fc PLUS 1/2 of the shift for the high tone. For the 170 Hz shift 300 baud modem used for HF packet this would be Fc + 100 Hz for the high tone and Fc - 100 Hz for the low tone.

Set Modulator Tones Using Built-in Calibration Software

1. Make sure that the modem and TNC are both configured for 170 Hz shift 300 baud operation.

2. Place a push on jumper at JMP 4 and JMP 7.

3. Verify push-on jumpers at JMP8 and JMP 9 pins 1&2.

4. Type "**CALSET** n <CR>". Where n is a number determined by:

   n = INT [525000 / F(low)] + 1

   This tells the CPU what tone frequency you are trying to achieve.

   A table of CALSET numbers to use for the various "standard" modem tone frequencies will be included at the end of this procedure.

5. Command the MFJ-TNC into calibrate mode by typing "CALI followed by a <CR>".

6. Command the MFJ-TNC to key the modem by typing "K".

7. Select the low tone by pressing the space bar until a voltmeter connected to U16, pin 9 reads - 5 volts.

8. Adjust R106 carefully until both the "CON" and "STA" LEDs on the front panel of the TNC are lit. One of the leds may filcker slightly. This is normal.

9. Type a "Q". This exits the MFJ-TNC from calibrate mode to ommand mode.

10. Type "CALSET n <CR>". Where n is a number determined by:

n = INT [525000 / F(high)] + 1

11. Command the MFJ-TNC into calibrate mode by typing "CAL <CR>".

12. Command the MFJ-TNC to key the modem by typing "K".

13. Select the high tone by pressing the space bar until a voltmeter connected to U16, pin 9 reads + 5 volts.

14. Adjust R105 carefully until both the "CON" and "STA" LEDs on the front panel of the MFJ-TNC are lit. One of the leds may flicker slightly. This is normal.

15. Type a "Q". This exits the MFJ-TNC from calibrate mode to command mode.

This completes the modulator tone alignment using the built in calibration facility. If you had any problems with this section, then DO NOT go beyond this point. If you do the calibration will be inaccurate. However, if all went well, then you may proceed.

Now that the modulator tones have been properly centered over the intended modem center frequency (Fc), now the demodulator center frequency will be aligned.

Demodulator Center Frequency Alignment

1. Place push on jumpers at JMP 4 and JMP 7, if they are not already in place.

2. Verify a jumper is at JMP 9 pins 1 and 2 and JMP 8.

3. Type CALSET . Where **n** is a number determined by the following equation:

n = INT (262,000 / f) +1

4. Command the MFJ TNC into calibration mode by typing **CAL** <ENTER

5. Command the MFJ TNC to key the modem by typing **K** <ENTER>

6. CAREFULLY adjust the appropriate control until the DCD LED on the front panel is fully illuminated. Please refer to Appendix page___for the proper control to adjust.

NOTE: The threshold control on the MFJ-TNC must be set to a position which will allow the DCD circuit to function properly. A setting approximately 1/3 to 1/2 of the total range starting from maximum CCW should be adequate.

Continue to VERY CAREFULLY adjust R113 until the STA and CON LEDs on the front panel either change state very slowly (alternate which one is lit) or until both are simultaneously illuminated.

NOTE: This is a very critical adjustment. It is very unlikely that you will be able to cause both LEDs to be turned on simultaneously, for longer than a very brief instant. Just fine tune R113 very carefully, and notice the action between the STA and CON leds. If they flash back and forth this is acceptable.

7. Return the MFJ-TNC to command mode by typing a "Q".

This completes demodulator center frequency alignment using the built in calibration software. If there were any problems in the preceeding procedure, then DO NOT go beyond this point. If you do the calibration will be inaccurate.

Now that the demodulator and modulator are properly aligned
to one another, the tuning indicator can be set for proper center indication.

Tuning Indicator Alignment

This procedure adjusts the tuning indicator so that it correctly indicates when a signal is properly tuned in relation to the demodulator center frequency. In order for the Tuning Indicator to be properly aligned the above calibration must be done properly, otherwise you will align the Tuning Indicator improperly.

NOTE: The tuning indicator should ONLY be adjusted in reference to the 300 baud 200 Hz shift modem used for HF packet and RTTY. If adjusted for this modem, It will indicate with sufficient accuracy for all other modes.

1. If you have not just finished aligning the modem as per the above instructions, do so now. Otherwise you may be aligning the tuning indicator to incorrect calibration settings.

2. Install push on jumpers at JMP 4 and JMP 7, if they are not still in place from the modem alignment procedure.

3. Ensure that the jumpers on JMP9 and JMP16 are placed as stated in the demodulator alignment section above.

4. Command the calibration routine to send 50 percent duty cycle square wave data from the modulator by typing "RXCAL" <CR>.

5. While observing the LEDs in the tuning indicator, adjust R212 in the tuning indicator area so that either the 10th or 11th led from the left (or both) are illuminated.

8. Return the MFJ-TNC to command mode by typing "Q".

9. Remove jumpers at JMP 4 and JMP 7.

This completes the tuning indicator alignment.

Now the modulator, demodulator, and tuning indicator are all aligned to the same center frequency. If you notice that on the air reports suggest that you are

transmitting and receiving on significantly different frequencies after successfully completing the above alignment procedure, it is possible that the radio needs realignment. Many different transceivers for HF are capable of being misaligned due to reference oscillator crystal aging or careless alignment by amounts exceeding 500 Hz. RIT inadvertently left on can also cause hard to detect problems in this area. Reliable HF packet communications requires that the frequency error presented to the demodulator be below 30 Hz. If several stations are to successfully share a single channel, transmitter / receiver offsets larger than this will be intolerable.

MFJ-TNC Adjustment Location Map

This is a map of the physical locations of the adjustment potentiometers on the MFJ-TNC circuit board. They are shown as they appear when looking down on top of the board with the board oriented so that the rear panel connectors are to the left. Information in the boxes is organized as shown below.

R78 VP L **1200 438**	VHF Low Tone Modulator
R77 VP H **2200 240**	VHF High Tone Modulator
R106 HP L **2125 247**	HF Low Tone Modulator
R105 HP H **2295 229**	HF High Tone Modulator
R79 VP **CALSET 8**	VHF Demodulator
R113 HP **CALSET 32**	HF Demodulator

NOTE: Separate procedure required to do alignment of CW demodulator center frequency.

NOTE: CW receive through a narrow filter for HF CW operation will require the CW demodulator center frequency to be selected to align with the radio's filter passband. MCW operation on VHF FM will require that both stations have both the modulator tone and demodulator center frequency to the same frequency.

Calset Values for Various Modulator Tone frequencies

Tone	CALSET #	Adjust	Modem / Remarks
2125	247	R106	HF Packet
			Fc = 2210 Hz
2295	229	R105	170 Hz shift
1300	404	R78	Packet / Fc = 1700 Hz, 800 Hz
			shift. CCITT V.23 std., preferable
			for HF 1200 baud, works
2100	250	R77	well on VHF FM too.
1200	438	R78	Packet / 1000 Hz shift standard. Too wide to fit comfortably
			through SSB filters for linear
2200	240	R77	mode 1200 baud use
2125	248	R106	Fc = 2550 Hz
2975	177	R105	850 Hz shift
2178	242	R106	Fc = 2220 Hz
2263	233	R105	85 Hz shift.

RADIO INTERFACING

Computer interfacing, covered in the previous chapter, is only half the interfacing task. The other half is connecting your MFJ TNC to your radio.

MFJ TNC Radio Port

Interfacing the MFJ TNC to your radio involves connecting the following signals at the TNC Radio Port as shown in Fig. 3-1.

Pin 1 Microphone audio, from the MFJ TNC to your transmitter.

Pin 2 Ground, audio and PTT common.

Pin 3 Push-to-talk, to allow the MFJ TNC to key your transmitter.

Pin 4 Receive audio, from your receiver to the MFJ TNC .

Pin 5 Squelch input (optional) to allow the MFJ TNC to detect activity on a shared-mode channel.

Fig.3-1 TNC Radio Port Connector