MFJ-52 Deviation Meter

The MFJ-52 Deviation Meter is a peak audio level meter board for The Net X-1 (J or later firmware). When using the MFJ-52 you will be able to tell quickly the frequency deviation of all incoming signals. The value of deviation of all signals which your MFJ TNC has heard are stored in the station "heard list".

Use the **MHEARD** command to display the heard list. Several pieces of information will be displayed after each station in the heard list: the number of packets received from a station, how long ago the last packet was heard, the port on which it was heard and the deviation of the last valid packet in kiloHertz. If the deviation reading is overrange a ">" character will be displayed with the deviation. Any station that has a deviation of 0 will have no deviation value displayed.

With the MFJ-52 you must also have The Net X-1 (J or later firmware) EPROM. ***MFJ does not offer this EPROM so it must be obtained from some other source.*** You can get a copy of the X-1 software with the instructions for burning an EPROM from your local Ham BBS or from Buck Rogers, K4ABT. See the instructions on page 14 of this manual for details.

Installation

Do not attempt installation of the deviation board until you have the X-1 (J or newer) EPROM. The MFJ-52 must be used with the X-1 The Net EPROM otherwise the Deviation Meter circuitry is useless.

For this installation you will need the following:
A working MFJ-1270/1270B/1270C/1274/1274C
The MFJ-52, containing:
- the MFJ-52 board
- a plug with three wires attached (blue, black, white)
- a 6" piece of violet 24 gauge wire
- one 6-32 x 1/4" screw
- a spacer for early TNC's that don't have one by the CPU

The X-1 (J or newer) EPROM with firmware
A low wattage soldering iron (15 to 25 watts)
Rosin core solder
A #1 Phillips head screwdriver
A clean, organized, ***static free*** work area

Please follow the installation instructions carefully.

Installation Procedure

1. Disconnect all power supply voltages from the TNC in which the MFJ-52 is to be installed.

2. Remove any cables from the terminal or computer.

3. Remove the bbRAM memory backup jumper **JMP 5** on the TNC, (see Figure 1.)

4. Remove the jumper from JMP 15 pins 2 & 3. Place this jumper on JMP 15 pin 3 only, as this jumper will needed if the MFJ-52 board is ever removed from the TNC.

5. Use a screwdriver to gently pry up the Z80 CPU, **U22**. Be careful not to bend any pins too badly. Straighten any bent pins after removal.

6. Remove the system EPROM, **U23**. The original system EPROM will not be used while using The Net. Keep the original EPROM in a safe place if you wish to reinstall the MFJ code.

7. Install the Z80 CPU removed from the MFJ TNC in step #4 on the MFJ-52 in the socket labeled U1 in Figure 2.

NOTE: Please note the orientation of the Z80 CPU in Figure 2 in order to ensure that pin 1 is in the proper place.

8. Locate pin 1 of the X-1 EPROM. Pin one is the bottom leftmost pin when the notch matches the notch in Figure 1. Bend pin 1 of the EPROM outward so when you install the EPROM pin 1 is not inserted into the IC socket.

9. Insert the X-1 EPROM into the IC socket labeled U23 on the MFJ TNC motherboard. Check to make sure that **all pins are inserted** in the socket **except** pin 1.

10. Take the 6" piece of violet wire and snip the bare part of each end of the wire to a length of 1/16".

11. Solder one end of the wire to pin 1 of the EPROM located at U23 on the MFJ TNC motherboard.

NOTE: When soldering to IC pins care must taken. Use a **low wattage** soldering iron (15 to 25 watts) and apply only enough heat to make a good connection. If too much heat is used you could damage the EPROM. Ensure the solder flows onto the joint, then remove the soldering iron from the work. **DO NOT** touch the joint with the soldering iron once the joint is made. This will result in a **cold solder** joint. A good solder joint will be **shiny** where as a cold solder joint will be **grayish** in appearance.

12. Locate the plated through hole **D** behind the 20-pin header J4 (see Figure 1.) Solder the other end of the 6" violet wire into hole **D**. **DO NOT** apply too much heat as the insulation of the wire will melt. If the wire is pushed too far through the board it may short against the chassis. Once both ends of this wire are connected route the wire neatly to prevent damage by pinching.

13. Find the white IDC connector with the BLUE, WHITE, and BLACK wires attached to it. Snip the bare ends of the wires to a length of 1/16".

NOTE: Please refer to Figure 3 for the connection of the colored wires mentioned in the next steps. Remember when making solder joints use only enough heat and solder to make a good connection. Once the joint is made **DO**

NOT touch the joint again with the soldering iron, a **cold solder joint** could result.

14. Locate point **A** using Figure 1. Point A is the plated through hole in J7 labeled -5V. Solder the end of the **BLUE** wire to the solder pad at point **A**. Again, if the wire is pushed too far through the board it may short against the chassis.

15. Locate point **B** using Figure 1. Point B is pin 4 of the radio port jack. Solder the end of the **WHITE** wire to either the jack lead or the solder pad at point **B**.

16. Locate point **C** using Figure 1. Point **C** is the negative lead of C12. Solder the end of the **BLACK** wire to either the capacitor lead or the solder pad at point **C**.

17. After the **BLUE**, **WHITE**, and **BLACK** wires are connected as mentioned in steps # 16 - 18, route these wires as neatly as possible. See Figure 3.

18. If you have an older TNC it may not have a spacer at point **E** (see Figure 1.) In this case install the plastic stand-off into the bottom of the Deviation Meter board. Twist the spacer until it "locks" into one half of the hole.

19. Install the MFJ-52 Deviation Meter board into the TNC CPU socket, **U22** (see Figure 2.) Note the orientation of the MFJ-52 in relation to the MFJ TNC motherboard.

20. Secure the MFJ-52 board with the 6-32 1/4" screw if you did not use the plastic spacer.

21. Insert the white IDC connector with the BLUE, WHITE, and BLACK wires as shown in Figure 3.

22. Check your TNC for any wire clippings, pieces of solder or any other foreign objects that will cause damage to the circuitry.

This now completes the installation of the MFJ-52 Deviation Meter circuitry in your MFJ TNC. We are now going to do the very simple alignment between the radio and the MFJ-52. However, before we do take some time right now to ensure that you have installed the MFJ-52 properly. If not installed properly the MFJ-52 will not perform well and will give false deviation readings..

Alignment

For the alignment procedure you will need:
The TNC with the MFJ-52 installed,
The radio that will be used with the TNC,
An oscilloscope (preferred) and or a voltmeter, with test leads

If you are now in the alignment section hopefully you have taken the time to check the installation of the MFJ-52. If there are any errors in the installation this alignment procedure will not work properly.

The steps in the alignment are very simple, however you must follow each step explicitly. This is to ensure that the alignment is done properly. If any step does not work as stated we recommend that you stop, then go back and double check all previously performed steps. If errors are still found in the alignment, then go back to the installation section of this instruction.

Alignment Procedure

1. Connect power, computer, and radio cables to the MFJ TNC.

2. Load your terminal emulation software into your computer.

3. Ensure the terminal and radio baud rates are set properly.

4. Remove the jumper from **JMP9** pins 2 & 3 and hang it off of pin 3 (to keep it.) When you remove the MFJ-52 board from the TNC you will need to replace the jumper on pins 2 & 3.

5. Set the power switch on the MFJ TNC to the **ON** position. The MFJ TNC should sign-on with the X-1 message. You will also that the **STA** led on the MFJ TNC is lit dimly. This is normal, and indicates properly operation.

6. Press the **ESC** key, then the **C** key. Press the **ENTER** key. This will take you into the Manager level of The Net.

7. Once in the Manager level you can change the **Meter** command. Try a value of either 25 or 33. In order to change the Meter command type the following:
   Meter 25 <ENTER> or **Meter 33** <ENTER>

   This will change the Meter command in the MFJ TNC when initially setting up the MFJ TNC for node use. Once set up and installed in a remote in a location you must know the **SYSTEM PASSWORD** in order to change the Meter command. Refer to the X-1 documentation.

8. Open the squelch on the radio and use the "white noise" to drive the Deviation circuit.

9. Connect an oscilloscope or voltmeter to pin 1 of the LM324, **U3** (see Figure 2.)

10. Adjust the radio's volume control to the point where there is no change in the DC voltage level as seen on the oscilloscope or voltmeter. Reduce the volume until the DC voltage level starts to drop.

11. Adjust R9 on the MFJ-52 board to set the voltage at pin 3 (**U5**) of the ADC, **TP A** on the schematic, to 1.8 to 2.0 Vdc. The function of R9 is to scale the input voltage going into the ADC. The maximum signal available from the circuit is about 3 Vdc. This corresponds to the full range of the ADC. A 3 volt signal input in to the ADC will enable the circuit to present the widest possible range of values to the X-1J software. However, significant "unexplained" variations in the reported deviation (MHEARD list) can be reduced by lowering the input voltage to the ADC. If you need to adjust this voltage, then you will need to adjust the METER command within the X-1J software again.

NOTE: Once the you adjust R9 any changes in the radio's volume control will cause all calibration settings to be lost.

NOTE: The calibration of R8 on the MFJ-52 board is not necessary under normal conditions. It is preset at the factory for optimum performance. Any further adjustment of R8 will result in degraded performance.

12. Once the voltage level is set, close the squelch and note that the voltage drops to a "low" or no voltage. This is normal and indicates proper operation.

This concludes the MFJ-52 alignment procedure. You can now install the cover on the MFJ TNC.

Schematic

Parts List

Designator	Description	MFJ Part Number
C1	Capacitor, Electrolytic, 1µF 100V	203-0006
C2	Capacitor, Electrolytic, 22µF 25V	203-0013
C3	Capacitor, Multilayer, 0.1µF	205-1210
C4	Capacitor, Disc Ceramic, 0.1µF	200-0005
D1	Diode, Zener, (250mW) 1N5223	300-5223
D2,D3	Diode, IN4148	300-0003
For U1	Socket, Wire Wrap, 40 pin	625-0181-1
For U2,U3	Socket, Low Profile, 14 pin	625-0031
For U5	Socket, Low Profile, 20 pin	625-0291
J1	Header, Rt. Angle, 8 pos	612-1008
P1	Connector, IDC, 8 Pin, with 3 wires	612-2008
PCB	MFJ-52 Revision 0	862-0052
R1	Resistor, Film, 1/4 watt, 1.8 k Ω	100-3180
R2,R4,R5	Resistor, Film, 1/4 watt, 1 kΩ	100-3100
R3	Resistor, Film, 1/4 watt, 100 kΩ	100-5100
R8,R9	10K Trim Pot, sub-horz.	104-4002
U1	CPU, Z-80, 4 MHz ***(not supplied)***	313-0067
U2	IC, Quad 2-in Nand Gate, 74HCT00	310-4000
U3	IC, Quad Op-Amp, LM324N	311-0040
U5	Analog to Digital Conv, ADC0844	311-20844
Wire	Wire, 6", 24 gauge, Violet	871-2477-0600
Screw	Screw, 6-32 x 1/4"	700-3063
Spacer	Spacer, PC mount, .5"	765-3138