

# **MFJ-752C SIGNAL ENHANCER II**

## **INTRODUCTION**

The improved MFJ-752C SIGNAL ENHANCER II is comprised of two tunable audio filtering systems designed to clarify and remove interfering signals from both voice (SSB or AM) and code (CW or RTTY) signals. This is accomplished by a primary filter which is a two-section, four-pole variable filter which has PEAK, NOTCH, LOW PASS, and HIGH PASS functions, and by an auxiliary filter which is a single section two pole PEAK or NOTCH filter. These two independent filters allow you to remove interference while enhancing the desired signal.

## **INSTALLATION**

1. Connect any 9-18V DC supply to the power jack on the back of the MFJ-752C. The adapter must have a 2.1 mm coaxial plug with the center pin position and the sleeve ground. An optional AC adapter, MFJ-1312B, 9-18VDC adapter is available from MFJ. A 12 VDC, 300mA supply is required to obtain the full two watts audio output.
2. Using the proper connector, connect a shielded cable from the external speaker or headphone jack of the transceiver or receiver to the MFJ-752C. Use an RCA phono plug to connect to the filter input. There are two inputs on the MFJ-752C allowing connection to two receivers for greater convenience. The input is selected by the push button switch on the back of the MFJ-752C.
3. Connect a speaker to the filter using shielded wire with a RCA phono plug at the filter speaker output. For best results, use a 4 to 16 ohm speaker.
4. Headphone operation is accomplished by plugging headphones into the phone jack on the back of the MFJ-752C. A mono plug or a stereo plug will work for headphone operation. With stereo headphones, only one ear of the phones will work.

## **FRONT PANEL CONTROLS**

### **POWER SWITCH:**

Selects power OFF, power ON, SSB Noise Limiter and CW Noise Limiter. The filter is bypassed on the OFF position. NOTE: The noise limiter is not ON when the power switch is in the ON position.

### **PRIMARY FILTER:**

Function Selector: Selects PEAK, NOTCH, LOW PASS (LP), or HIGH PASS (HP) in the primary filter.

Selectivity Control: Adjusts the bandwidth of the primary filter from 40 Hz to almost flat.

Frequency Control: Adjusts the center frequency of the peak, notch and the cutoff frequency of the LOW PASS and HIGH PASS circuits approximately 300 Hz to 3000 Hz.

### AUXILIARY FILTER:

Function Switch: To select the PEAK function push button to the IN position. To select the NOTCH function push button to the OUT position.

Frequency Control: Adjusts the center frequency of the auxiliary peak and notch circuits between approximately 300 Hz to 3000 Hz.

Selectivity Control: Adjusts the bandwidth of the auxiliary circuits from 40 Hz to almost flat. To select the PEAK function push IN this control. To select the NOTCH function push out this control.

## **PRIMARY FILTER OPERATION**

### PEAK:

Turn Function Selector to PEAK. Set the SELECTIVITY control to about the 10 o'clock position. Adjust FREQUENCY control for maximum response to the desired signal. Selectivity can be increased by turning the SELECTIVITY control clockwise. FREQUENCY and SELECTIVITY control should be adjusted alternately to obtain maximum selectivity and best signal intelligibility. The PEAK mode can be used on CW to narrow in on a signal and greatly reduce unwanted signals. Peak mode is also useful on wider bandwidths such as RTTY and SSB. Adjust SELECTIVITY until the desired signal just fills the passband and interfering signals are reduced.

### NOTCH:

The depth of the NOTCH filter is approximately 70 dB. Notch frequency is adjustable from approximately 300 Hz to 3000 Hz. The primary notch filter can be set to the NOTCH mode by setting the Function Selector to NOTCH. Set SELECTIVITY control to the 9 o'clock position. Adjust FREQUENCY control to remove the CW signal or heterodyne. Increase SELECTIVITY (clockwise) to narrow the bandwidth of the notch. Readjust FREQUENCY control if necessary. The unwanted heterodyne should become weaker and the desired signal become clearer as notch selectivity is increased. At high selectivity on NOTCH, the FREQUENCY control tuning is very critical and the notch frequency is hard to locate. If the SELECTIVITY control is rotated past the 3 o'clock position clockwise, the NOTCH depth will decrease. NOTCH mode is very helpful in removing heterodynes, stations tuning up on your QSO, or CW signals on or near your frequency. The NOTCH can be used very effectively on AM when two stations are heterodyning one other. The heterodyning can be reduced by notching out the interfering tone.

### LOW PASS:

LOW PASS cutoff is adjustable from approximately 300 Hz to 3000 Hz with the FREQUENCY control. The SELECTIVITY control adjusts the steepness of the cutoff. LOW PASS mode is useful in reducing annoying high frequency static, hiss and splatter. When selectivity is increased beyond the 2 o'clock position, a peak will form at the frequency set on the FREQUENCY control. The more the selectivity is increased, the more pronounced the peak will become. This peak may be preferred for CW operation when extra audio is needed and low frequency signals are not a problem. Because circuit gain rises in the LOW PASS mode, the input audio level may need to be reduced to prevent overdriving the filter. Gain on frequencies below the set frequency will drop as selectivity is increased. Therefore, when using the LOW PASS mode for SSB, the SELECTIVITY control should not be set beyond the 2 o'clock position.

### HIGH PASS:

HIGH PASS mode is set by turning the Function Selector to HIGH PASS (HP). To remove unwanted low audio frequencies, set the SELECTIVITY and FREQUENCY controls for the desired response.

## **AUXILIARY FILTER OPERATION**

### PEAK:

To set the auxiliary filter in the peak mode, simply push the FUNCTION button to the IN position. Set the SELECTIVITY control to about center range and adjust the FREQUENCY control to the desired signal. Adjust SELECTIVITY and FREQUENCY controls alternately for the best signal and the desired bandwidth. In the peak mode, the auxiliary filter can be used to further enhance the primary filter operation. It can be used to obtain very narrow bandwidths with good skirt selectivity and little ringing when the primary filter is in the peak mode, or to limit the bandwidth when the primary filter is in the NOTCH, LOW PASS, or HIGH PASS mode. **NOTE:** When using both filters in the PEAK mode with narrow bandwidths, the best skirt selectivity and least attenuation will be obtained by setting both the auxiliary and primary filter frequency controls to the same center frequency. This can easily be done by first peaking the desired signal with the auxiliary FREQUENCY control and then peaking it with the FREQUENCY control on the main filter.

### NOTCH:

NOTCH mode on the auxiliary filter is set by pushing the FUNCTION button to the OUT position with the primary filter in any mode. Set the SELECTIVITY control about center range and adjust the FREQUENCY control to remove the unwanted signal. SELECTIVITY and FREQUENCY should be adjusted alternately. Remember at high selectivity on NOTCH, the NOTCH frequency is difficult to locate and the FREQUENCY control must be tuned very carefully. The auxiliary notch filter is used to remove an unwanted signal in the passband of the primary filter. It can remove a heterodyne from SSB or AM signal when the primary filter is set to PEAK, LOW PASS, or HIGH PASS mode. It can also be used to notch out an adjacent CW signal which is too close to be removed by peaking the filters.

## **GENERAL OPERATION**

### NOISE LIMITING CIRCUITS:

The SSB noise limiter is a peak clipper circuit which follows the average peak audio level but clips peaks above the average level. The input signal must be at least 0.7 volt peak for proper noise limiting.

The CW noise limit is a trough limiter which removes the low level background noise between the signals. Experimentally, set the audio or RF gain so that the signal is passed but the noise is blocked. If the audio level into the filter is set too low the signals will not get through. If the gain is set too high the noise will also get through. Setting the audio too high could overload the filter and distort the desired signals.

**NOTE:** When the noise limiter is used (SSB or CW) the audio level will decrease due to the clipping action of circuits removing the noise.

## IMPORTANT NOTES

1. The auxiliary filter is in series with the primary filter. If the auxiliary filter is not needed, set it to PEAK and turn the SELECTIVITY and FREQUENCY controls to minimum (counter-clockwise).
2. With high selectivity, the filter may have a tendency to ring in peak and lowpass modes. If this occurs, decrease the selectivity.
3. Due to the very high internal filter gains in the LOW PASS mode with maximum selectivity and frequency, the filter may OSCILLATE. If this occurs reduce SELECTIVITY and FREQUENCY controls until it stops.
4. Strong signals can mask a weak signal by causing your receiver AGC (automatic gain control) to reduce gain. This may cause a weak signal to almost disappear. To minimize this problem the AGC might be turned off and the RF gain reduced. Increase audio gain to compensate for the loss of audio.

## ALIGNMENT

The MFJ-752C primary filter is a two-stage filter which required proper aligned at the factory. If for any reason a realignment is necessary use the procedure below. ***UNDER NO OTHER CIRCUMSTANCES SHOULD THE INTERNAL TRIMMERS (R50 and R51) BE ADJUSTED.*** The filter will not function properly once either trimmer is moved without proper realignment.

An audio signal generator and an OSCILLOSCOPE or an AC VTVM are needed for the alignment.

### CONTROL SETTINGS:

AUXILIARY FREQUENCY CONTROL:	Minimum
AUXILIARY SELECTIVITY CONTROL:	Minimum
AUXILIARY FUNCTION SWITCH:	In for Peak
POWER:	On
PRIMARY FUNCTION:	Notch
PRIMARY SELECTIVITY:	3 o'clock
PRIMARY FREQUENCY:	Maximum

### ALIGNMENT PROCEDURE:

1. Connect scope input to the speaker output or phone output of the filter.
2. Connect signal generator to input 1 or 2 of the filter. Set the input switch on the filter accordingly.
3. Set signal generator for sine wave of 1V p-p and adjust generator frequency control(s) for a null (minimum amplitude). Null should occur at about 3000 Hz. Use X1 Hz generator frequency control for fine adjustment if available.
4. Switch Primary Function Selector to PEAK.
5. Increase Primary SELECTIVITY control to maximum.
6. Adjust R50 (10K) Maximum Frequency trimmer for maximum amplitude.
7. Set generator frequency to 1 KHz.
8. Set primary SELECTIVITY control to 3 o'clock.
9. Set primary filter to NOTCH and adjust primary FREQUENCY control for a null.
10. Increase primary SELECTIVITY to maximum.
11. Switch primary filter to PEAK and adjust R51 (500K) tracking trimmer for maximum amplitude. Reduce signal generator output level if clipping occurs.
12. End of the alignment procedure.