## RECEIVER OPERATION (FRONT END BLOCK DIAGRAM)

The **FTDX1200** includes a wide range of special features to suppress the many types of interference that may be encountered on the HF bands. However, real world interference conditions are constantly changing, so optimum setting of the controls is somewhat of an art, requiring familiarity with the types of interference and the subtle effects of some of the controls. Therefore, the following information is provided as a general guideline for typical situations, and a starting point for your own experimentation.

The **FTDX1200** interference-fighting circuitry begins in its "RF" stages, and continues throughout the entire receiver section. **FTDX1200** allows configuration of the features described below.

### R. FLT (IF Roofing Filters)

Three Roofing filters, of 15 kHz, 6 kHz, and 3 kHz bandwidths, are provided in the First IF, right after the first mixer. These filters are automatically selected to provide narrow-band selectivity to protect the following IF and DSP stages. The automatically selected filter may be manually changed by the operator, if desired, for special operating circumstances.

### CONTOUR Filter

The DSP Contour filter has the unique ability to provide either a null or a peak in tunable segments of the receiver passband. You may suppress interference and excessive frequency components on an incoming signal, or you may peak those tunable frequency segments. The level of the null or peak, and the bandwidth, over which it is applied, are adjustable via the Menu.

### IF SHIFT

The passband center frequency of the IF DSP filter may be moved up or down by adjusting this control.

### IF WIDTH

The width of the IF DSP filtering may be adjusted using this control.

### IF NOTCH

The IF Notch filter is a high-Q notch filter that can eliminate, or significantly reduce an interfering carrier.

### DNF (Digital Notch filter)

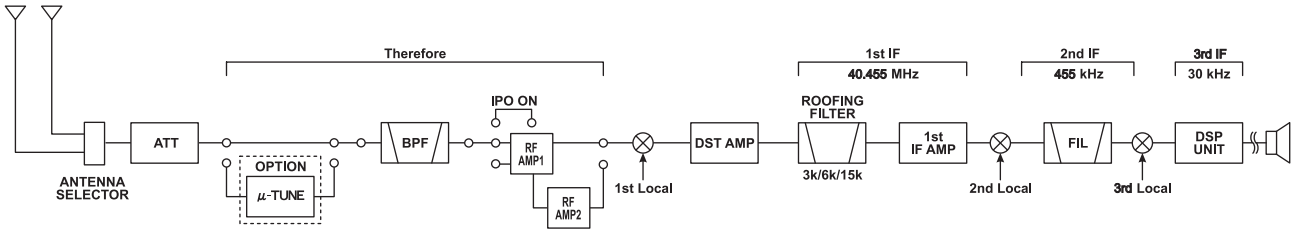
When multiple interfering carriers are encountered during reception, the Digital Notch Filter can significantly reduce the level of these signals.

### DNR (Digital Noise Reduction)

The DSP's Digital Noise Reduction (DNR) feature utilizes 15 different mathematical algorithms to analyze and suppress different noise profiles encountered on the HF/50 MHz bands. Choose the selection that provides the best noise suppression, and allows the signal to rise up out of the noise.

### AGC

The AGC system is highly adaptable to changing signal and fading characteristics, making reception possible under the most difficult conditions.

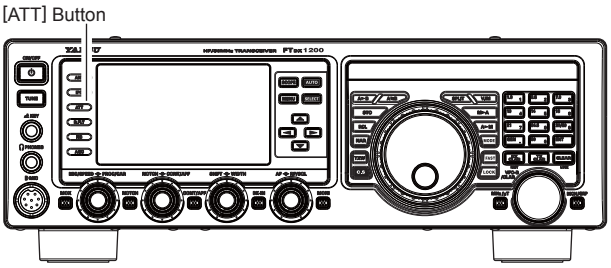



FRONT END BLOCK DIAGRAM

## ATT

When extremely strong local signals or high noise degrades reception, you can use the [**ATT**] button to insert 6, 12, or 18-dB of RF attenuation in front of the RF amplifier.

1. Press the [**ATT**] button several times to set the desired attenuation level, per the chart below.
   **OFF**: Attenuator is Off
   **-6dB**: The incoming signal power is reduced by 6 dB (Signal voltage reduced by 1/2)
   **-12dB**: The incoming signal power is reduced by 12 dB (Signal voltage reduced to 1/4)
   **-18dB**: The incoming signal power is reduced by 18 dB (Signal voltage reduced to 1/8)
   The selected attenuation level will be indicated in the ATT column of the Block Diagram Display on the TFT display.
2. To restore full signal strength through the Attenuator circuit area, press the [**ATT**] button to restore the ATT display to the "OFF" position.




**ADVICE:**

- If background noise causes a high S-meter indication on clear frequencies, press the [**ATT**] button until the S-meter drops to about "S-1". This setting optimizes the trade-off between sensitivity, noise, and interference immunity. Also, once you have tuned in a station you want to work, you may want to reduce sensitivity further (add more attenuation) by pressing the [**ATT**] button to a higher setting. This reduces the strength of all signals (and noise) and can make reception more comfortable, important especially during long QSOs. When looking for weak signals on a quiet band, you will want maximum sensitivity, so the IPO should be disabled and the [**ATT**] button should be set to "OFF." This situation is typical during quiet times on frequencies above 21 MHz, and when using a small or negative-gain receiving antenna on other bands.

## μ-TUNE FILTER (REQUIRES THE OPTIONAL RF μ TUNING KIT)

The RF μTuning Kit provides ultra-sharp RF selectivity for the front end of the transceiver. Very high Q is made possible by the narrow-band design. Three RF μTuning Kits are available. The **MTU-160** covers the 1.8 MHz band. The **MTU-80/40** covers the 3.5 and 7 MHz bands. The **MTU-30/20** covers 10.1 and 14 MHz bands.

When any (or all) of the three optional units are connected, they will be automatically adjusted to center on your operating frequency.

The narrow bandwidth is especially useful on the low bands, when many strong signals are being received via NVIS propagation (Near Vertical-Incidence Signals) within a narrow bandwidth. The added protection for the RF stage is especially helpful in preventing IMD and blocking.

### μ-Tune Operation

1. Press and hold in the [**MHz/μT**] button for one second to activate the μ-Tune filter. The "**μ-Tune**" will appear on the TFT display. The [**VFO-B/CLAR**] knob works as the μ-TUNING knob.

   **ADVICE:**

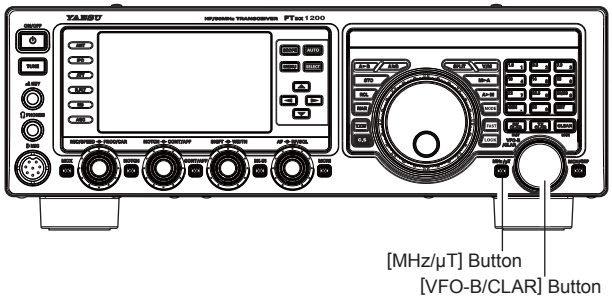
   - ❒ The μ-Tune circuit will automatically align itself to the operating frequency.
   - ❒ Remember that μ-Tune only operates on the 14 MHz and lower bands.
2. Rotate the [**VFO-B/CLAR**] knob to peak the response (background noise) or reduce interference.

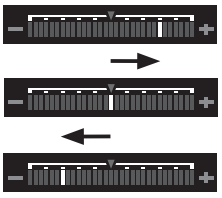
   **ADVICE:**

   - ❒ You may observe the relative peak point of the μ-Tune filter in the Tuning Offset Indicator on the VFO-B frequency display, while tuning the [**VFO-B/CLAR**] knob.
   - ❒ The amount of change in the center frequency of the μ-Tune filter, when rotating the [**VFO-B/CLAR**] knob, can be configured using Menu item "045 uTUNE DIAL STEP".
   - ❒ If the μ-Tune filter has been manually adjusted away from the center frequency, you may press the [**CLEAR**] button to re-center the filter response on the current operating frequency.
3. Press and hold in the [**MHz/μT**] button for one second to disengage the μ-Tune filter

   **ADVICE:**

   Alternate presses of the [**MHz/μT**] button will switch the μ-Tune filter between on or off.



TUNING OFFSET INDICATOR

**ADVICE:**

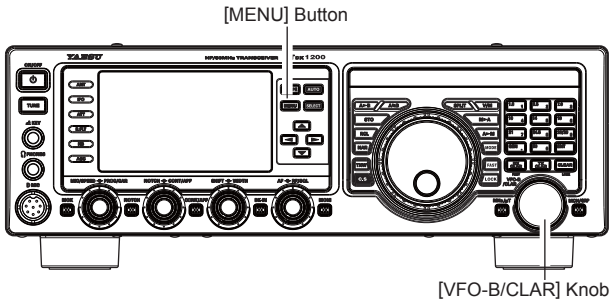
- ❒ You may change the indication of the Tuning Offset Indicator to display the μ-Tune filter continuously while the μ-Tune filter is activated. This is Menu item "010 BAR DISPLAY SELECT". See the Box on the next page for details of the setting.
- ❒ The μ-Tune filters are the most advanced, selective RF preselector filters ever incorporated into an Amateur Radio transceiver. The RF selectivity provided by μ-Tune can be of tremendous value in ensuring quiet, intermod-free reception even in the most crowded bands on a contest weekend. The μ-Tune filters provide RF selectivity on the order of a few dozen kHz at -6 dB, at the expense of a few dB of system gain on bands where noise figure is seldom an issue. You will notice that the S-meter deflection, when μ-Tune is engaged, is slightly less than when it is out of the circuit; this is normal. If your antenna system gain is so low that you cannot hear the band noise when μ-Tune is engaged (highly unlikely), just switch it out, to eliminate the slight insertion loss.

## μ-TUNE FILTER (REQUIRES THE OPTIONAL RF μ TUNING KIT)

❒ As you tune around on an amateur band with μ-Tune engaged, the microprocessor automatically commands the stepper motor driving the toroid core to center the filter on the current operating frequency. However, you may use the [**VFO-B/CLAR**] knob to skew the filter response to one side or the other of the operating frequency, to deal with heavy interference on one side. To re-center the μ-Tune filter on the operating frequency, and eliminate any offset, press the [**CLEAR**] button.

**Changing the Tuning Offset Indicator**

1. Press the [**MENU**] button to engage the Menu mode.
2. Rotate the [**VFO-B/CLAR**] knob (or press the ▲/▼ button) to select Menu item "010 BAR DISPLAY SELECT".
3. Press the [**SELECT**] button.
4. Rotate the [**VFO-B/CLAR**] knob (or press the ▲/▼ button) to select "μTUNE (μ-Tune)" (replacing the default "CW TUNE (CW TUNING)" selection).
5. Press the [**SELECT**] button, then press the [**MENU**] button to lock in the new setting and exit to normal operation.



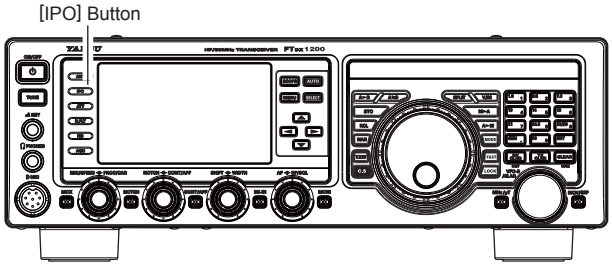
## IPO (INTERCEPT POINT OPTIMIZATION)

The IPO feature allows the operator to optimize the characteristics of the receiver front end, depending on the current noise level and the strength of incoming signals.

Press the [**IPO**] button repeatedly, to set the desired characteristic of the receiver front end, according to the chart below.

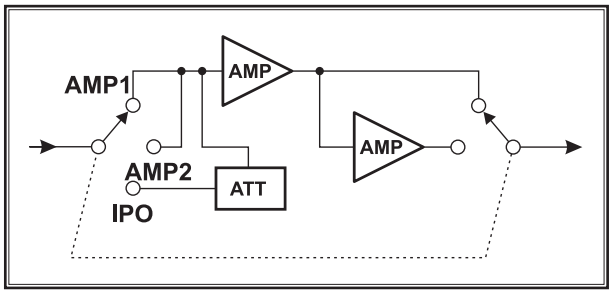
- **AMP1**: Amplifies the incoming signals, using a low distortion RF preamplifier (gain: approx. 10 dB).
- **AMP2**: Amplifies the incoming signals, using a 2-stage low-distortion RF preamplifier (total gain: approx. 20 dB).
- **IPO**: Bypasses the RF preamplifier, yielding direct feed to the first mixer.

The selected receiver RF preamplifier will be indicated in the IPO column of the Block Diagram Display on the TFT display.




**ADVICE:**

- On the 10 MHz and lower bands, it generally is not necessary to use any preamplifier at all; selecting the "IPO" position as described above will increase the strong-signal-handling capability of the receiver, and generally will result in more pleasant reception due to reduced noise. If you can hear band noise with the preamplifiers disengaged, then a preamplifier is generally not needed.




**NOTE:**

The IPO feature is always on "IPO" (No RF preamplifier) between 30 kHz and 1.7 MHz.

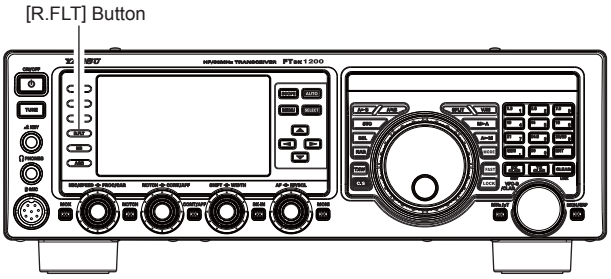
## R.FLT (ROOFING FILTERS)

Narrow-band Roofing Filters of 15 kHz, 6 kHz, 3 kHz bandwidths are provided in the first IF, right after the first mixer. These filters provide protection for the 2nd mixer, DSP, and other circuitry that follow and can dramatically improve reception on a very crowded band (during a contest, etc.). Typically, the AUTO selection mode is satisfactory for most operating situations.

Press the [**R.FLT**] button to toggle the Roofing Filter selection.

AUTO*[1] → 3 kHz → 6 kHz → 15 kHz → AUTO ·····

*1: The "AUTO" selection mode selects the optimum bandwidth of the Roofing filter for the reception mode.
In this case, the selected bandwidth in the R.FLT column of the Block Diagram Display glows yellow (Normally glows Blue).




**ADVICE:**

- ❒ In the AM/FM mode, only the 15 kHz Roofing Filter is utilized.
- ❒ As you repeatedly press the [**R.FLT**] button, the selected Roofing Filter bandwidth will be displayed in the R.FLT column of the Block Diagram Display on the TFT display, denoting the Roofing Filter currently in use.
- ❒ Typically, this selection will be set to "AUTO."

**QUICK POINT:**

The "AUTO" selection of the Roofing Filter is based on the operating mode. However, you may override the automatic selection, if band conditions warrant a different (usually, a tighter) selection.

**TERMINOLOGY:**

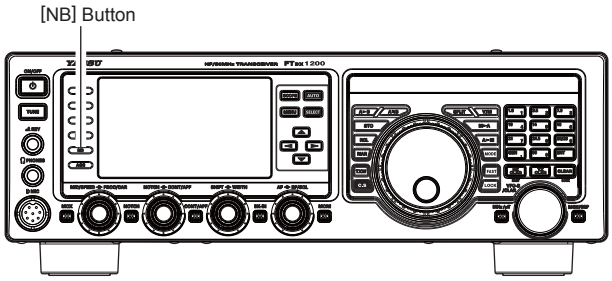
A "Roofing Filter," as its name implies, places a "Roof" over the receiver IF system bandwidth. Starting at the first mixer, the Roofing filter protects the circuitry downstream from strong signals, just as a roof on a house protects the contents from rain and snow.

# INTERFERENCE REJECTION

## IF NOISE BLANKER (NB) OPERATION

The **FTDX1200** includes an effective IF Noise Blanker, which can significantly reduce noise caused by automotive ignition systems.

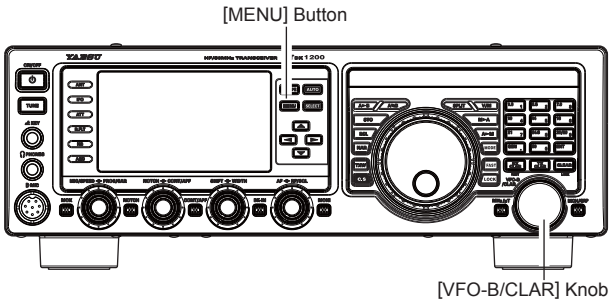
1. Press the [**NB**] button briefly to reduce ***short duration pulse noise*** such as from switching transients, automobile ignitions and power lines. The "**NB ON**" will appear in the display to confirm that the Narrow-NB is operating.
2. Press the [**NB**] button again to reduce ***longer-duration man-made pulse noise***. The "**NBW ON**" will appear in the display to confirm that the Wide-NB is operating.
3. If desired, you may adjust the Noise Blanker level via Menu item "033 NB LEVEL" to the point where the offending noise is best reduced or eliminated. See box below for details.
4. To end Noise Blanker operation, press the [**NB**] button once more. The "**NB OFF**" will appear in the display, confirming that the Noise Blanker is no longer in operation.




**ADVICE:**
The Noise Blanker level is the same for both VFO-A and VFO-B.

**Adjusting the Noise Blanker Level**

1. Press the [**MENU**] button to engage the Menu mode.
2. Rotate the [**VFO-B/CLAR**] knob (or press the ▲/▼ button) to select Menu item "033 NB LEVEL".
3. Press the [**SELECT**] button
4. Rotate the [**VFO-B/CLAR**] knob (or press the ▲/▼ button) to the point where the offending noise is best reduced or eliminated.
5. Press the [**SELECT**] button, then press the [**MENU**] button to lock in the new setting and exit to normal operation.



## CONTOUR CONTROL OPERATION

The Contour filter system provides a gentle perturbation of the IF filter passband. The Contour is set to either suppress, or boost specific frequency components, and thus enhances the sound and readability of a received signal.

1. Press the [**CONT/APF**] button to activate the Contour filter. The DSP graphic display will illuminate and the current "null" (or "peak") position of the Contour filter will appear in the CONTOUR indicator on the display.
2. Rotate the [**CONT/APF**] knob to achieve the most natural-sounding audio reproduction on the incoming signal.

   **ADVICE:**

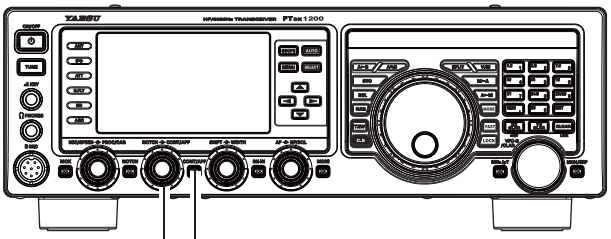
   The display will show the Contour frequency for 3 seconds whenever the [**CONT/APF**] knob is turned.
3. To cancel Contour tuning, press the [**CONT/APF**] button momentarily.

   **ADVICE:**

   Alternate presses of the [**CONT/APF**] button will switch the Contour filter between on and off.

**ADVICE:**

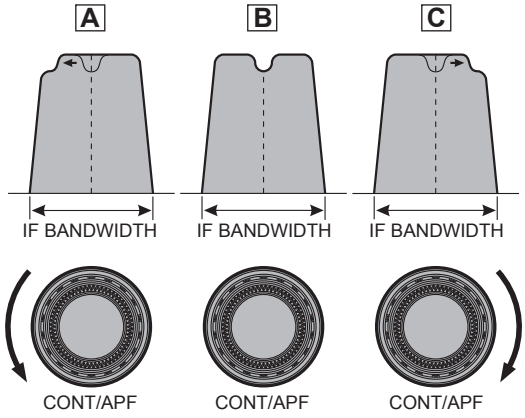
- ❒ The Contour filter level (either a null or a peak) may be adjusted using Menu item "107 CONTOUR LEVEL". The factory default setting is for a null of –15 (dB).
- ❒ The bandwidth over which the Contour filter effect is applied may be adjusted using Menu item "108 CONTOUR WIDTH". The factory default setting is 10.





**CONTOUR INDICATOR**

Refer to Figure "**B**", this illustrates an "indentation" of the Contour filter in the center of the passband. The Contour filter places a low-Q "notch" in the passband, per the settings of Menu items "107 CONTOUR LEVEL" and "108 CONTOUR WIDTH" (referenced above). Counter-clockwise rotation (to the left) of the [**CONT/APF**] knob causes the notch to move toware a lower frequency within the passband, while clockwise rotation (to the right) causes the notch to move toward a higher frequency within the passband. By removing interference or unwanted frequency components of the incoming signal, it is possible to make the desired signal rise out of the background noise/interference, enhancing intelligibility.




**QUICK POINT:**

By judicious use of the Contour filter, the "shoulder" of the passband response may be altered, or components may be removed from within the passband, allowing the desired signal to rise above the background noise and interference in a manner not obtainable with other filtering systems.

# INTERFERENCE REJECTION

## IF SHIFT OPERATION (SSB/CW/RTTY/PKT/AM MODES)

IF SHIFT allows you to move the DSP filter passband higher or lower, without changing the pitch of the incoming signal, and thus reduces or eliminates interference. Because the carrier tuning frequency is not varied, there is no need to re-tune the operating frequency to eliminate the interference. The total passband tuning range for the IF SHIFT system is ±1 kHz.

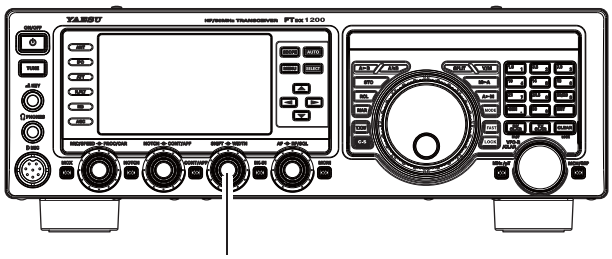
1. Rotate the [**SHIFT**] knob to the left or right to reduce the interference.

   **ADVICE:**

   The display will show the shift value of the IF SHIFT for 3 seconds whenever the [**SHIFT**] knob is turned.

**ADVICE:**

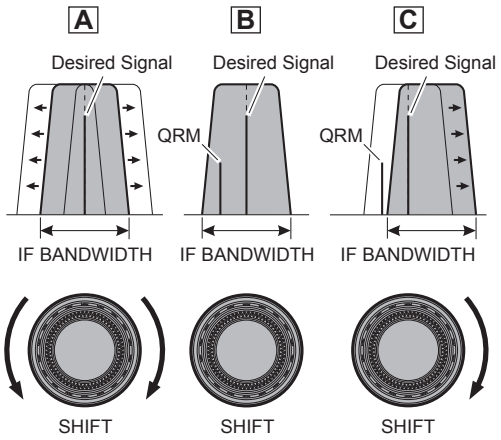
The center position of the IF passband will be memorized independently on each VFO stack of VFO-A and VFO-B.





**SHIFT INDICATOR**

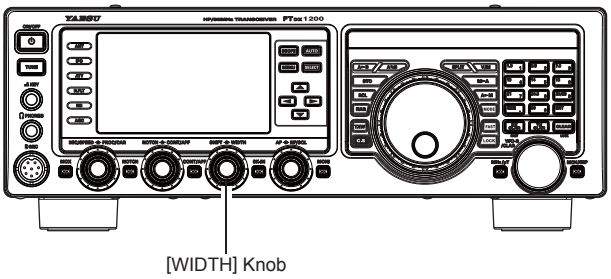
Referring to Figure "**A**", note the depiction of the IF DSP filter as the thick line, with the [**SHIFT**] knob in the 12 o'clock position. In Figure "**B**", an interfering signal has appeared inside the original passband. In Figure "**C**", you can see the effect of rotating the [**SHIFT**] knob. The interference level is reduced by moving the filter passband so that the interference is outside of the passband.



# WIDTH (IF DSP BANDWIDTH) TUNING (SSB/CW/RTTY/DATA MODES)

The IF WIDTH tuning system allows you to vary the width of the DSP IF passband, to reduce or eliminate interference. Moreover, the bandwidth may actually be *expanded* from its default setting, should you wish to enhance incoming signal fidelity when interference on the band is low.

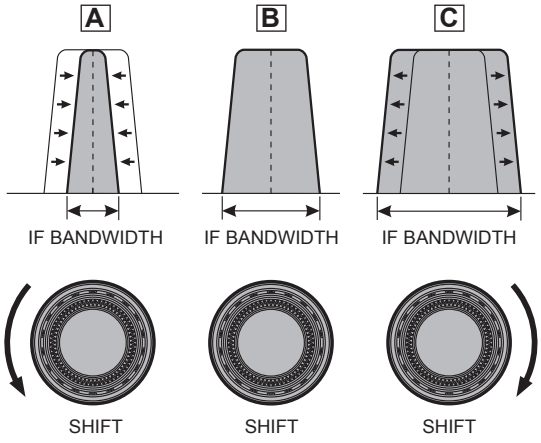
1. Rotate the [**WIDTH**] knob to the left or right to reduce the interference.
   **ADVICE:**
   The frequency display will show the bandwidth of the IF passband for 3 seconds whenever the [**WIDTH**] knob is turned.





**WIDTH INDICATOR**

Referring to Figure "**B**", you can see the default bandwidth on the SSB mode.
By rotating the [**WIDTH**] knob to the left, the bandwidth will narrow (see Figure "**A**", while rotation of the [**WIDTH**] knob to the right, as depicted in Figure "**C**", will increase the bandwidth.

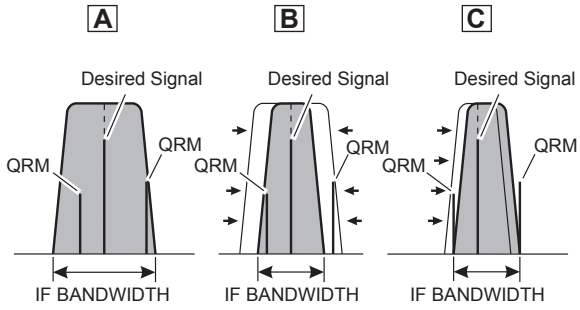



The default bandwidths, and total bandwidth adjustment range, will vary according to the operating mode:
SSB Mode: 1.8 kHz ~ 4.0 kHz (default: 2.4 kHz).
CW Mode: 500 Hz ~ 2.4 kHz (default: 2.4 kHz)
RTTY/DATA Modes: 500 Hz ~ 2.4 kHz (default: 500 Hz)

**Using IF SHIFT and WIDTH Together**

The IF SHIFT and Variable IF WIDTH features together form a very effective interference-fighting filtering system.

For example, in Figure "**A**", you can see how interference has appeared both on the high and low sides of the desired signal. Rotate the [**WIDTH**] knob, the interference from one side can be eliminated (Figure "**B**"). Next, rotate the [**SHIFT**] knob to re-position the passband (Figure "**C**"), the interference on the opposite side can be removed, without re-introducing the interference previously eliminated in Figure "**B**".




**ADVICE:**
For best interference reduction, the WIDTH and SHIFT features are the primary tools you should use, after narrowing the bandwidth (WIDTH) and/or adjusting the center of the passband (SHIFT). The Contour control may then yield additional signal-enhancement benefits on the net residual bandwidth. Even more, the IF NOTCH Filter (described later) may also be used, in conjunction with these filter systems, to significant advantage.