

HF 101 Lesson 1:

HF Receiver Controls

by Wayne Estes W9AE

- HF transceivers have many standard controls.
- Old radios had mostly knobs and rotary switches.
- Controls began migrating to menus in the 1990's.
- New radios have few knobs, many switches, a big screen.



Kenwood TS-520S is the radio W9AE wished he could afford in 1977



ICOM 7300 is W9AE's first new HF radio in 20 years.

HF Receiver Controls

6 KNOBS

Main Tuning

AF gain

RF gain

RIT

PBT

Bass and treble

9 SWITCHES

Band selector

Mode selector

Preamp

Attenuator

AGC

Noise Blanker

Noise Reduction

Notch Filter

IF filter bandwidth

1 METER

S-meter

Knobs

Main Tuning

Knob Label: none

- The big knob that changes the radio frequency.
- Continuously variable.
Tuning step is typically 10 Hz but is often adjustable.
- Many radios have a FAST/SLOW tuning speed switch.
- Newest radios vary the tuning “speed” depending on how fast you rotate the knob.

Audio Frequency Gain

Knob Label: AF or AF GAIN

- The volume control.
- Always labeled AF or AF GAIN, never VOLUME.
- Usually combined on one shaft with the RF gain control.

Radio Frequency Gain

Knob Label: RF, RF GAIN, RF/SQL

- Manually adjusts the receiver sensitivity.
- Useful for very strong signals.
- In some radios the knob doubles as a Squelch control.
RF Gain in SSB and CW modes.
Squelch in FM mode.

Squelch?

- Squelch is *not* on the list of HF Receiver controls because squelch is almost never used on HF.
- SSB and CW are AM modes subject to deep fades and noise bursts.
A deep fade would cause unwanted squelch closing.
A noise burst would cause unwanted squelch opening.
- HF operators want to listen for the signal even when it fades into the noise.

Receive Incremental Tuning

Knob Label: RIT or CLAR

- Adjusts the receive frequency without changing the transmit frequency.
- Small adjustment range, typically +/- 5 kHz
- Mainly used for nets and roundtables to manually “clarify” a station that is slightly off frequency.

Passband Tuning

Knob Label: PBT, SHIFT

- Two concentric knobs that narrow the IF filter bandwidth to reduce interference from signals that *overlap* in frequency with the desired signal.
- Turn one knob clockwise to reduce interference that is slightly *below* your frequency.
Turn one knob counter-clockwise to reduce interference that is slightly *above* your frequency.
- Some radios have only one control called IF Shift.

Passband Tuning

Graph shows default setting of ICOM-7300 PBT controls.

IF filter bandwidth: 2.4 kHz

Low audio frequency cutoff:
300 Hz

High audio frequency cutoff:
2700 Hz

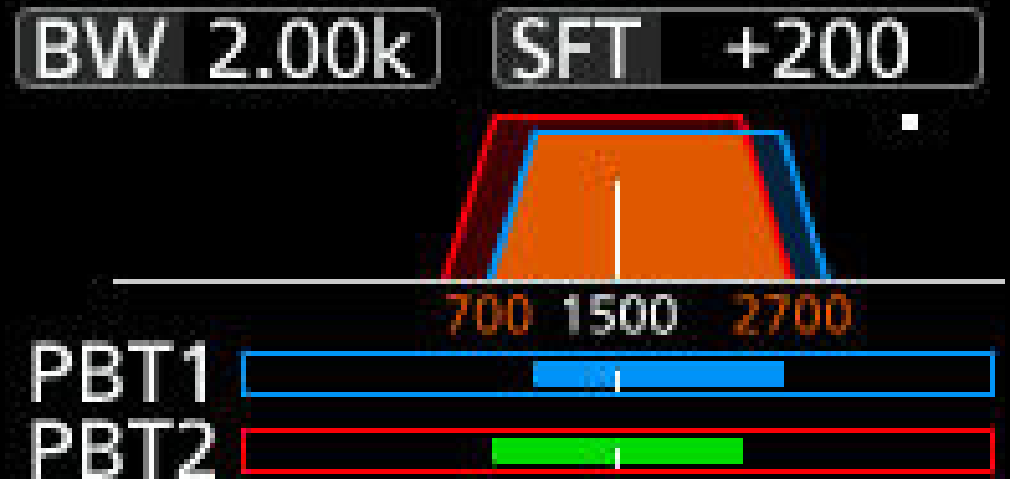


Passband Tuning

PBT1 knob turned clockwise to reduce interference from a lower frequency signal.

Low audio frequency cutoff is shifted from 300 Hz to 700 Hz.

High audio frequency cutoff is still 2700 Hz, determined by the setting of PBT2 which was not adjusted.



Passband Tuning

PBT1 knob turned counter-clockwise to reduce interference from a higher frequency signal.

High audio frequency cutoff is shifted from 2700 Hz to 2000 Hz.

Low audio frequency cutoff is 300 Hz, determined by PBT2 which was not adjusted.



Adjust *both* PBT knobs to reduce higher *and* lower frequency QRM.

Tone Controls

Knob Label: none (usually in a menu)

- Bass and treble controls.
- Useful to correct the frequency response of the speaker, headphones, or the listener's ears.
- Only in newer radios.

Switches

Band Selector

Complex rotary switch on the oldest radios.
Pushbutton switches starting in the 1980's.

Old HF bands: 3.5, 7, 14, 21, 28 MHz

New HF bands: 5, 10, 17, 24 MHz

- Many HF radios also operate on 1.8 MHz, a MF band.
- Many HF radios also operate on 50 MHz, a VHF band.

Mode Selector

Rotary switch on the oldest radios.
Pushbutton switches starting in the 1980's.

Modes: USB, LSB, CW, AM, FM
maybe RTTY, Data

- Most voice activity is USB (above 14 MHz) and LSB.
- AM and FM are seldom used on HF bands.
- Data mode is USB with audio from rear connector to a PC.

Preamplifier

Switch Label: PREAMP, P. AMP, RF AMP

- Increases receiver sensitivity.
- Useful *only* when signal is weak and noise level is low.
- Typically used on 14 MHz and above.
- *Don't* leave it on all the time!

Attenuator

Switch label: ATT or ATTEN

- Reduces receiver sensitivity.
- Helpful when received signal is strong or noise level is high, to improve AGC behavior and intelligibility.
- Typically used on 7 MHz and below.

Automatic Gain Control

Switch label: FAST/SLOW

- AGC responds quickly to a sudden *increase* in signal.
- The switch adjusts how quickly the gain recovers after a sudden *decrease* in signal.

Typical settings: FAST for CW
 SLOW for SSB

- Always on. Most radios don't allow you to disable AGC.

Noise Blanker

Switch label: NB

- Reduces unwanted RF impulse noise from motors, power lines, computer equipment, etc.
- Operates at RF frequency before the AGC circuit.
- You probably need to leave it on all the time unless you operate portable far away from houses and power lines.

Noise Reduction

Switch label: NR

- Enables an audio DSP (digital signal processor) that reduces the background noise.
- Can improve or degrade intelligibility depending on the circumstances.
- Most radios allow you to adjust the aggressiveness of the noise reduction.

Notch Filter

Switch label: NOTCH

- Enables an audio DSP that removes fixed audio tones.
- The tone still causes AGC to reduce receiver gain.
- Auto-notch is great for SSB but useless for CW.
- Some radios have a manual-tuned notch which is useful for CW because CW tones confuse an auto-notch.

IF filter bandwidth

Switch Label: NAR, WIDE/NARROW

- Many HF radios have selectable IF filter bandwidths.
- For SSB, common bandwidths are 1.8, 2.4, and 3 kHz.
- For CW, common bandwidths are 200, 500, and 1200 Hz.
- Old radios use crystal, mechanical, or ceramic IF filters.
New radios use software filters.

Meters

S-meter

Meter scale: S-zero to S-9, then dB above S-9

- Only one receiver meter, the signal strength meter.
- Noise level should be near S-zero for a valid reading.
- The scale is supposed to be 6 dB per S-unit.
Many radios are 3 dB per S-unit to make meter more active.
- Some HF+VHF radios have a FM discriminator meter which displays RX frequency error.

End of Lesson 1:

HF Receiver Controls

Guess what is Lesson 2 ??

HF Transmitter Controls

9 KNOBS

RF power

Mic gain

Monitor volume

VOX gain

VOX delay

Anti-VOX

CW keyer speed

CW sidetone volume

TX audio tone controls

10 SWITCHES

PTT

Processor on-off

VOX on-off

SPLIT on-off

VFO A/B

VFO A=B

Tuner in-out

Tune

CW Break-In full-semi

TX filter wide-narrow

6 METERS

RF power

SWR

ALC

Compression

Current

Voltage