The Field Day Guide to operating the Elecraft K3

Contributions by John King WA1ABI (SK), Bruce Manning NJ3K, Bob Beatty WB4SON, Matt White KA1BQP and an excerpt from Lyle Johnson KK7P, an Engineer at Elecraft

Everything you wanted to know about the K3 but was afraid to ask.

General Settings

K3 Quick Notes for SPLIT Operation

The most effective way to use the K3 as a contest run radio is to set the radio to SPLIT mode with the transmitter frequency locked on the run frequency.
This allows the operator to freely adjust the receive frequency (especially handy for FD where not all stations will be zero-beat) without fear of inadvertently moving the transmitter off the run frequency.

The K3 can be set up for split mode with transmit frequency lock in less than five seconds. This operation quickly becomes second nature to K3 owners, but it may seem somewhat intimidating to a first-time or infrequent K3 user.

The following two pages can be used as a "How To" quick reference guide to set up a K3 as a Contest Run Radio.

Note: Most buttons on the K3 have two functions. The function written on the button is toggled by a brief button press (**Tap**). The function written in Yellow below the button is toggled by holding the button for longer than half a second (**Hold**).

TAP means press the button quickly

HOLD means hold the button down for longer than ½ second.

How to Enter SPLIT Mode

- Select the desired operating frequency using VFO A.
- **TAP A>B** twice. The first tap copies the Frequency in VFO A to VFO B; the second tap copies all Mode settings to VFO B. The second tap must occur within 2 seconds of the first tap. "A > B All" will be displayed briefly at the bottom of the display window.

- **HOLD A>B** to enter **SPLIT** mode. The SPLIT indicator will appear in the display window, and the TX arrow will point to **B**, indicating that the transmit frequency is now controlled by VFO B. The receiver is still controlled by VFO A, but changing the VFO A frequency will not affect the transmit frequency.

To leave SPLIT mode, **HOLD A>B**.

TAP means press the button quickly

HOLD means hold the button down for longer than ½ second.

How to Lock the Transmit (VFO B) Frequency

- **HOLD A/B** to activate the **BSET** function. (BSET means that the **next** button command will be applied to VFO B.)

- **HOLD RATE** to **LOCK** VFO B. A small lock icon will appear next to B in the display window, indicating that VFO B is now locked. Rotating either VFO knob will not change the transmit frequency.

To **un**lock VFO B, repeat the above 2 steps.

TAP means press the button quickly

HOLD means hold the button down for longer than ½ second.

An alternative to this procedure would be to lock the dial by HOLD the Rate/Lock button on the right side of the main knob. Then TAP the RIT button below the Message label on the right side of the radio. The dial on the lower right corner of the radio will change the RX frequency. (See figure below) Above the frequency dial, is a CLR button; TAP to return to the TX frequency. The green LED indicates that the TX and RX are in sync. A yellow LED on either side will indicate whether the TX is above or below the TX.

Audio Setup
Section 1 Yamaha CM-500
(For the Heil Pro-7/HC-7 Element Proceed to section 2)

The setup below assumes that you have a 6.0 or 15 KHz filter installed in Filter Slot 1. If you don't have a wide filter in Slot 1, this procedure won't work. (I should have asked!) If you have both filters, select the slot containing the 6.0 KHz filter.

Here's the setup (needs to be performed in step-by-step order):

Before you begin, record the settings that you have selected now for Mic Gain and Compression. Write these down so you can return these settings to your previously selected values if desired.

In the Main Menu set MIC SEL to RP.L (bias ON)

Select AM using the Mode Switch

In the Config menu, insure that FLTX AM is set to 'FL1' (or 'FL2', see note above) (it probably already is.)

Select SSB using the Mode Switch

In the Config Menu set TX ESSB ON and select 3.0 (tap '1' to turn ON, dial in 3.0 with VFO A) You should now see a small '+' icon in the lower right corner of the K3 display indicating ESSB.

In the Main Menu set up TX EQ as follows:

1 (.05)	-16
2 (.10)	-16
3 (.20)	-13
4 (.40)	-3
5 (.80)	0
6 (1.60)	0
7 (2.40)	+5
8 (3.20)	+8

These settings will be saved for ESSB and will not impact the settings you have selected for 'normal' SSB operation. Using ESSB 3.0 is convenient because it provides storage for a second set of TX EQ parms. Using ESSB has a secondary benefit of eliminating any passband ripple or asymmetry in the 2.7 (or 2.8) SSB filter. (Of course there could be ripple and asymmetry in the 6.0 or 15 Kc filter, but presumably the ripple would be broader and any asymmetry would be spread out over a larger domain.) A 3.0 KHz SSB signal is only marginally wider than a 2.7 or 2.8 KHz SSB signal, and by using the EQ settings above the resulting SSB

signal bandwidth will actually be narrower than 2.7 KHz. You are still being a good band neighbor running these settings.

Section 2

The next adjustments depend upon the previous steps being performed first! With a Heil Pro-7, disregard and begin here.

If you are using a Heil Pro-7, in the Main Menu set MIC SEL to FP.L (bias OFF), else skip to the next step.

Enable TX Test using the TX Test button (hold.) 'TX' on the K3's display should be flashing.

Set the Mic Gain control to Zero.
Set the Compression Level to Zero.

Hold the METER button to select the 'CMP - ALC' display bar graph if not already selected.

Press the mic's PTT button and speak into the mic in your normal QSO voice. (The MH2 responds best when speaking directly into the mic with your lips one or two inches from the mic screen.) Adjust the Mic Gain control to obtain an 'ALC' indication of four solid bars, with the fifth (heavy) bar 'on' most of the time, the sixth bar flashing regularly, and the seventh bar flashing rarely. This adjustment is fairly critical. Take your time when setting up this level. Do your best to use to use your normal speaking voice and microphone placement technique. If you are on the fence about setting the Mic Gain level (for instance, selecting either 17 or 18) select the higher number. Record the value of this mic gain setting and *__do not touch the mic gain__* in the next step. If you inadvertently grab the wrong knob, reset the mic gain to the recorded value.

Again speaking in your normal QSO voice, activate the mic's PTT button and advance the Compression control to obtain an indication of 10 dB of compression **on the COMP display**.

Having set up several K3's, I find that a Compression level setting of '20' usually provides 10 dB of compression. The compressor's effect on speech quality is completely transparent at this level, but the increase in transmitted speech power is stunningly dramatic. Do not be reluctant to use a Compressor setting of 20, but do double check the CMP indication to confirm that it is indicating around 10 dB of compression.

Locking the Power, CMP and MIC settings

The K3 has the ability to lock critical settings so they cannot be inadvertently changed during operation. This is especially useful in the GOTA or when an inexperienced operator is at the controls.

To lock the critical controls, after they have been adjusted, push and HOLD the MENU/CONFIG button. Using the smaller VFO dial, rotate until PWR SET is displayed on the bottom of the display. The upper display will read either "nor" or "Per bAnd". In the "nor" mode, the power is set for the entire radio, using the one setting. This is the preferred mode. With the "Per bAnd" selection, the power must be set individually on each band before locking the settings. To lock TAP the A/B 1/B SET button. The lower display will briefly read "LOCK" TAP the A/B 1/B SET button will unlock the radio. The lower display will briefly read "UNLOCK". (See Figure Below)

Re: K3 Transmit IMD (Mic adj for alc)

by Lyle KK7P

There is apparently some confusion about how the K3 ALC works. Just to help muddy the waters a bit, I'll toss in what little I know about it.

We recommend setting the Mic (or LINE IN) Gain so you get 5 bars of ALC, with possibly the 6th bar occasionally flickering, with CMP set to 0. No, this is not to ensure you have Tx distortion! Just the opposite, in fact. In this case, the ALC meter display is acting as a "VU Meter" and is being used to help you set the Tx audio path gain correctly. It is not showing you how much you are over-driving the PA. This is why you can set it up in Tx test mode, when you are not transmitting any RF at all.

If you have a little too much drive, the DSP will scale things back at the output of the mic amp. Thus at the 5th ALC bar, the DSP is at the threshold of gain compression. At the 6th bar, it is cutting back gain by 6 dB or so. Assuming SSB, after the Tx signal is created from the audio, it optionally goes through an IF clipper. This is engaged by setting CMP to a value other than 0. After the optional clipper, the signal goes through a 15 kHz IF filter followed by a gain section in the DSP, and is then output as a 15 kHz signal to the rest of the Tx strip. From this point, the MCU watches things and if it sees power levels going awry, severe mismatch, etc., it cuts back the drive to the Tx strip in the DSP. Thus, the Tx strip is running at nominal gain regardless of the power level. OK, if you go below 12 watts you are using the LPA and not the HPA, so the Tx strip gain is less, but you get the idea. What we are *not* doing is varying the bias on an IF amplifier somewhere that might change its operating point and possibly introduce additional distortion. The point in the DSP path where the change in drive is commanded is linear to the limits of 32-bit floating point math and the resolution of the Digital to Analog converter.

Enjoy!

73,

Lyle KK7P

[Note: For PSK and other operation, you want to set things to the level where the 5th bar just comes on -- or just doesn't. If you have only 4 bars in digital modes,

that's OK. With less than 4, you are under- driving things and the ALC will kick in to bring up the power level to the amount you requested. If you try and trick the system and run with *zero* ALC bars in PSK31, the ALC has to work hard to give you your requested power - or maybe it will think there is insufficient signal to work with - and your Tx S/N may suffer. So, *please* set it to 4 bars in soundcard "digital" modes.]

Filter and bandwidth settings

The K3 has excellent Crystal and DSP filtering built into the radio dynamically selecting the correct Crystal filter for the selected bandwidth. The bandwidth can be adjusted by either separately adjusting the center frequency and size of the passband (Shift and Width) or by using the HI CUT/LO CUT. For phone operation, the HI CUT/LO CUT is by far the easiest way to eliminate QRM allowing an operator to squeeze into very tight spot on the band. (I have been able top work with station both 1.5 KHz above AND below my run frequency.) The passband is easily normalized by pushing and HOLD the SHIFT/LO knob. The passband display below the signal meter will show little ears slightly drooped indicating a normal passband. This is an easy way to get back to a normal setting should it be necessary.

AGC, Preamp, Attenuator, Notch, and AFX

All of these controls are on the right side of the radio above the small VFO knob. The preamp is activated by a TAP of the PRE/ATT button. The attenuator is engaged by a push and HOLD of the PRE/ATT button. My recommended settings for the PRE/ATT are as follows:

1. 160 Meters Preamp OFF Attenuator ON
2. 80 Meters Preamp OFF Attenuator ON
3. 40 Meters Preamp OFF Attenuator ON
4. 20 Meters Preamp OFF Attenuator ON
5. 15 Meters Preamp OFF Attenuator OFF
6. 10 Meters Preamp 1 ON Attenuator OFF
7. 6 Meters Preamp 2 ON Attenuator OFF

On phone a TAP of the NTCH button will engage the auto notch function activating a very effective notch filter. With only a slight reduction in sensitivity the filter virtually eliminates a carrier, allowing the operator to plow through even with a station tuning up close by. A push and HOLD engages the manual notch filter which is adjusted by the small VFO knob. Two TAP of the NTCH button will disengage the filter. The AFX button is located on the lower right corner of the group, next to the RIT. Used only with headphones a TAP of this button engages a quasi stereo effect which significantly reduces operator fatigue. A second TAP will disengage the feature. The noise reduction and noise blanker buttons are in the same group, next to the NTCH control. A single TAP is used to engage or disengage the function. There is, however, a significant amount of customization which can be done to the NB and NR circuits

on a K3, well beyond the scope of this guide. For more information, I recommend downloading and reading the NB and NR sections of the K3 manual.

Power, ATU, AF and RF gain.

I'm quoting John here; "The K3 is not your grandfather's radio, it's not your father's radio, and it certainly is not an 'all knobs to the right' radio. In fact, it is unlike any other radio you have used before." This was impressed on me when I first talked about getting a K3. John's words are an understatement! Proper use of the preamp, attenuator, and, most importantly, the RF gain control is paramount to getting the maximum performance out of the receiver. This is especially true on CW. On phone, during Field Day, I run the RF gain anywhere between 1:30 and 3:30 depending on the amount of traffic and noise on the band. The more noise and stations, the further I retard the RF gain. I adjust the AF gain AFTER the RF gain is set properly. I take note of the signal reading with the gain set to max and reduce it until I see the signal meter just start to rise. That's it. I check that setting as band conditions change.

In the attenuator chart above, you may have noticed that the attenuator is engaged on most of the bands. This is because the reserve gain in the radio is not needed on the lower bands, especially with a good antenna system. This is true for most modern radios but is especially important when running a K3. This same principle is used when adjusting tower top amplifiers in a public radio system. Attenuation is used to soak up the excessive preamplifier gain. On the lower bands, you may need to use less RF gain than used on the higher bands.

The ATU (if equipped) is engaged by a TAP of the ATU TUNE button to the left of the signal meter. On a resonant antenna, tuning is completed within a few seconds. A push and HOLD of the ATU TUNE button will enable or disable the ATU. To the left of the ATU TUNE button is the XMIT/TUNE button. A push and HOLD will engage the transmitter, allowing you to tune an external tuner, such as a Matchbox. You must make sure the internal tuner is in bypass before trying to tune an external tuner.

Band Mapping

The K3 has the ability to skip or "map out" bands which are unused or undesired. This allows for quicker band changes and a more efficient operation. To map out an undesired band select the first band you wish to remove by a TAP on the BAND button. Once selected, HOLD the MENU/CONFIG button to enter the config menu. Rotate the small VFO knob until "BND MAP" is displayed on the botton of the screen. The top display will read "XX.X In". (For example "1.8 In" for 160.) Rotate the main VFO knob until the top display reads "XX.X Out". TAP the BAND button and repeat the procedure for each band you wish to remove. TAP the MENU/CONFIG button to exit. To restore the band switch to normal, use the same procedure setting each band to "In".