



ELECRRAFT® KPA1500

1500-WATT AMPLIFIER

OWNER'S MANUAL

Revision B, May 16, 2018

E740301

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Introduction

On behalf of our entire design team, we'd like to thank you for choosing the Elecraft KPA1500 amplifier.

The KPA1500 offers a unique combination of features. It's one of the smallest 1500W amplifiers available. The power supply is in a separate enclosure for ease of station layout.

The KPA1500 is capable of fully automatic operation, yet has an alphanumeric display and a full complement of front panel switches for precise manual control. A comprehensive remote-control command set is also included.

The KPA1500 can be used with nearly any transceiver, thanks to its instantaneous RF-based band switching, advanced protection circuitry, adjustable ALC, and extensive parametric monitoring. It also has inputs that allow direct band switching from many popular transceivers. TR is completely noise-free thanks to the use of PIN-diode switching.

The KPA1500 comes with a built-in Automatic Antenna Tuner (ATU) that can handle a load SWR up to 3:1 at the full 1500 watt output in any mode.

Of course, the KPA1500 is an ideal companion for the Elecraft K3S and K3 transceivers, both physically and electrically. The Elecraft K3S or K3 can sense whether the amp is in standby or operate mode, then select the appropriate per-band power settings. This allows you to set up the K3S or K3 for "barefoot" operation at one power level on each band, and then switch the amp to operate and set up optimal drive levels for full 1500W output. The K3/KPA1500 combination is also capable of extremely fast break-in, especially when the K3S or K3 is placed in QRQ (high-speed CW) mode. The two are so well-integrated that you can use the per-band switches on the amplifier to change bands at the transceiver.

If you use the KPA1500 with both the K3S or K3 transceiver and P3 panadapter – our new "K-Line" – you'll enjoy a high degree of operating convenience, along with world-class performance *and* the power to get the job done.

73,


Wayne, N6KR

Eric, WA6HHQ

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 Elecraft manuals with color images may be downloaded from www.elecraft.com.

WARNING

Dangerous Voltages are Present Inside the KPA1500 and its Power Supply

Do not turn on or operate the amplifier or power supply with the covers off.

Before opening the KPA1500 RF Deck or Power Supply enclosures:

1. Turn off the KPA1500 by tapping the front panel ON switch and wait until the fan stops. (The fan drains the power supply to a safe voltage.)
2. Turn off the power supply breaker switch (on the rear panel).
3. Disconnect the two Power Supply cables at RF Deck rear panel before opening the RF Deck enclosure.
4. Disconnect the Power Supply from the mains before opening the cover.

Key to Symbols, Abbreviations and Text Styles



Important – read carefully



Operating tip

TEMP

Tap switch function (labeled *above* a switch; press for less than 1/2 second)

PK HOLD

Hold switch function (labeled *below* a switch; press for at least 1/2 sec. to activate)

INHIBIT

Typical text appearing on the LCD.

LED

Light Emitting Diode

LCD

Liquid Crystal Display

CAUTION

Follow the instructions under a Caution to avoid damage to the equipment.

WARNING

Follow the instructions under a Warning to avoid serious personal injury.

FCC-Mandated Part 15 Notice for the Computer Interface Ports

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a different circuit from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Regarding the computer interface: changes or modifications not expressly approved by Elecraft could void the user's authority to operate the equipment.

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In the Box

Included

Item	Reorder Part Number
RF Deck	
Power Supply with AC Line Cable	
DC Power Cable	E770024
DA-15 Control Cable	E770017
Phono-Phono Key Line Cable	E100416
USB A-B Cable	E980299
Owner's Manual	E740301

Optional

Item	Elecraft Part Number
KPAK3AUX Cable kit for K3s or K3	KPAK3AUX
Enhanced Mode cable for Flex 6000 series radios	KXUSB

Installation

Installation consists of the following:

- Positioning the KPA1500 RF Deck and Power Supply to provide for proper cooling, see page 9.
- Connecting the KPA1500 RF Deck and Power Supply, page 9.
- Cabling the KPA1500 RF Deck to your other station equipment, page 9.

The KPA1500 RF Deck rear panel is shown in Figure 1. The connectors and controls are described following the figure.

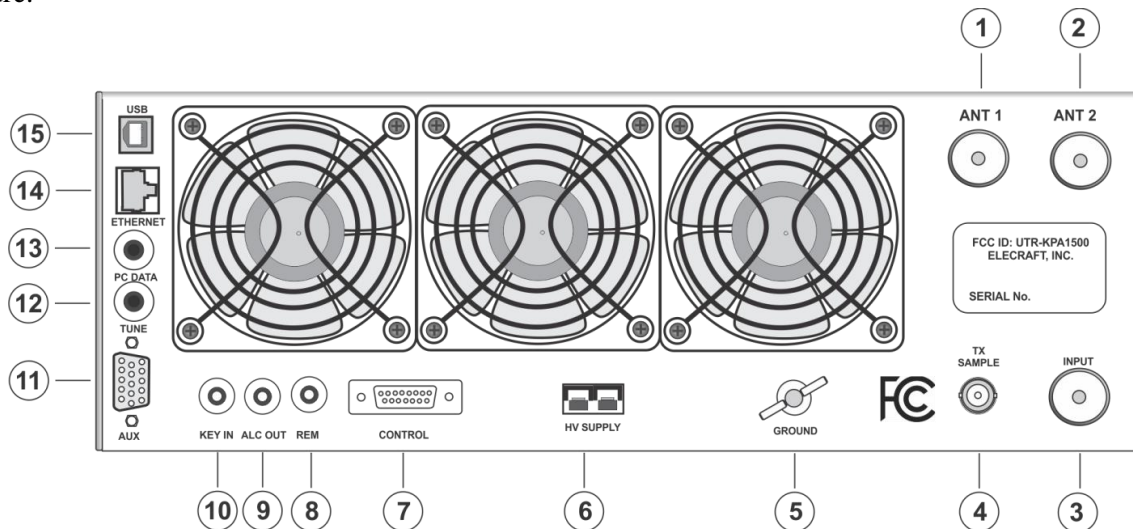


Figure 1. KPA1500 RF Deck Rear Panel.

- ① and ② SO-239 RF connectors to antenna system or dummy load.
- ③ SO-239 connector for RF input from the driving transceiver.
- ④ Low level KPA1500 transmit signal output.
- ⑤ Station ground attachment.
- ⑥ High voltage connection to the KPA1500 power supply.
- ⑦ Control circuit connection to the KPA1500 power supply.
- ⑧ Accepts a 12V input signal for remote control applications to command the KPA1500 to turn on or off. Can also be connected to K3/K3S rear panel 12V DC OUT RCA connector so the KPA1500 turns on when the transceiver turns on. See Remote Operation, page 23.
- ⑨ Negative-going voltage for transceivers that require ALC. (Elecraft transceivers do not require this connection.)
- ⑩ Key Line: Enables the KPA1500 to transmit when grounded. When grounded, the source must be able to sink 5 mA. 5 VDC open circuit inhibits the KPA1500.
- ⑪ For interconnecting cable to fully integrate the KPA1500 with an Elecraft K3 or K3S for enhanced mode operation.
- ⑫ Input signal to the internal KPA1500 automatic antenna tuner (ATU) that emulates an Icom remote ATU when the KPA1500 is used with Icom transceivers.
- ⑬ XCVR Serial: Selectable CI-V for Icom® radios or RS232 level information for transceivers such as the K2, KX2, KX3, Flex Radio, Kenwood and Yaesu transceivers. Radio type is selected in the menu.
- ⑭ Ethernet connection for local or remote operation applications.
- ⑮ USB connection creates virtual COM port for use with the KPA1500 Utility and other computer-based programs.

The KPA1500 Power Supply Deck rear panel is shown below. The connectors and controls are described below the figure.

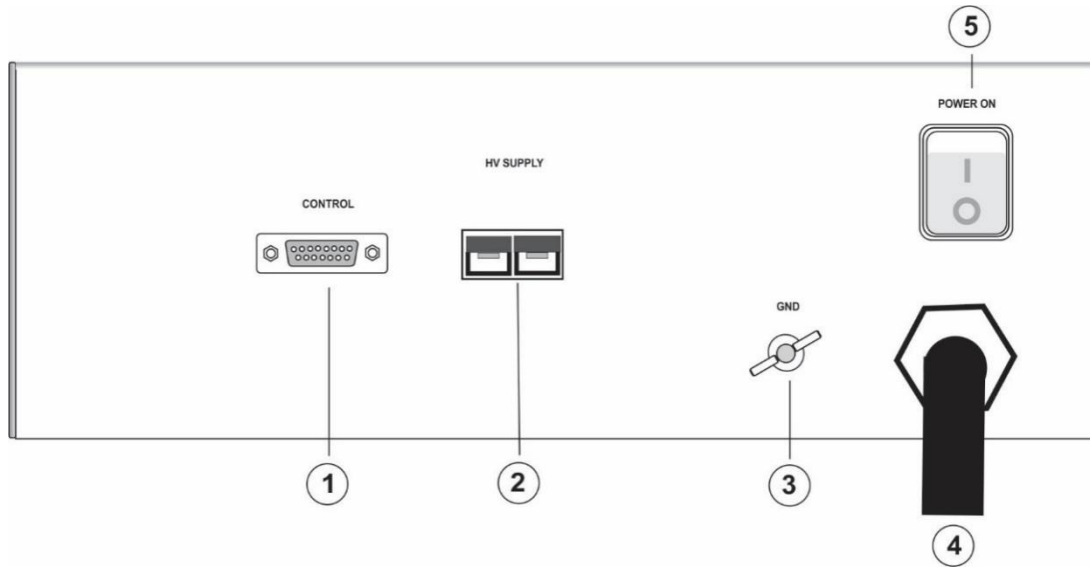


Figure 2. KPA1500 Power Supply Deck Rear Panel.

- ① Control: DA-15 cable with control and low voltage supplies to the RF Deck.
- ② HV Supply: Main DC power output for the RF Deck
- ③ Ground: Connection to the station ground.
- ④ AC Power Cable: Supplied with a NEMA 6-20 molded plug. If needed, replace with a suitable 20A connector for your installation.
- ⑤ Power ON Switch and Circuit Breaker: Must be in the ON position for the RF Deck power switch to function.

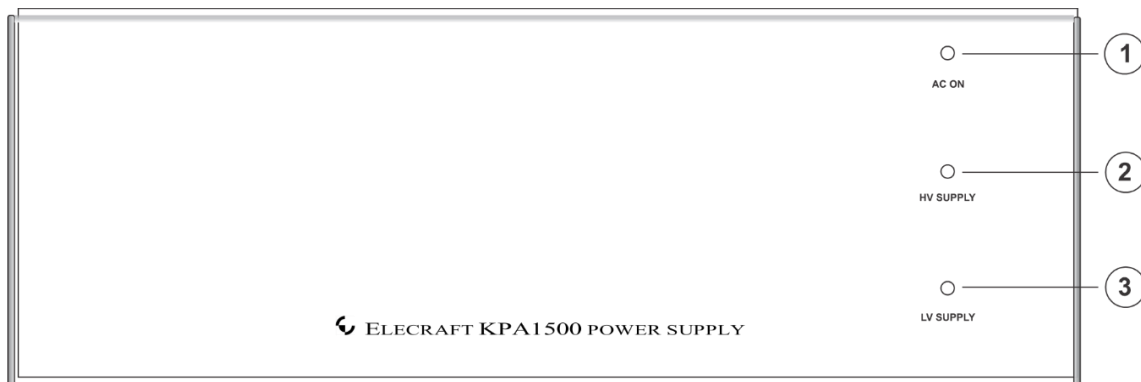


Figure 3. Power Supply Front Panel.

- ① AC ON LED. Lights green whenever the power supply is connected to AC power and the rear panel main power switch is on (up).
- ② HV SUPPLY LED. Lights green when the high current 50V supply is within operating tolerance. Lights red when the output voltage is below specification. During power down, it will turn red for a few seconds. If this LED turns red during operation, excessive current is being drawn and RF output power is reduced for protection. Turn off power and wait until the LED goes dark before turning power back on again.
- ③ LV SUPPLY LED. Lights green when the Control System power supply is within operating tolerance.

Positioning the KPA1500 RF Deck and Power Supply

Provide at least 4" (10 cm) clearance behind the RF Deck fans and above the Power Supply top cover. Allow at least 1" (2.5 cm) clearance around the top and sides of the RF Deck and around the sides of the Power Supply for normal cooling air flow.

The supplied cables allow the Power Supply and RF Deck to be placed up to 66" (167 cm) apart. The Power Supply can be operated remotely so there is no need for it to be within the operator's reach. The fans operate whenever the KPA1500 is on, so you can place the Power Supply under the operating desk or elsewhere to minimize fan noise.

Cabling – Power Supply

Be sure the POWER ON switch (5) is off before connecting any cables to the Power Supply or RF Deck.

An AC power cable with the popular NEMA 6-20 connector is supplied attached to the Power Supply. The NEMA 6-20 connector is compatible with NEMA 6-20R receptacles. Replace the connector if you need a different connection to your mains supply. Elecraft recommends a 200/240 volt AC, 20 amp circuit for proper operation of the KPA1500.

Connect the Power Supply to the RF Deck with the supplied 66" (167 cm) cable. Plug the Anderson PowerPole® connector into the HV Supply connector (6) on the RF Deck rear panel (Figure 1, page 7) and the corresponding connector on the Power Supply (2), Figure 2, page 8. Observe the polarity; match the colors on the plug with the connectors.

⚠ The 75A PowerPole connectors click twice when inserted. There is no electrical connection until the second "click."

Connect the 15-pin connector to the Power Supply and the Control connector (7) on the RF Deck rear panel. Ensure the captive screws securing the connectors are tight and the connectors are fully seated.

Cabling – RF Deck

⚠ Always turn the KPA1500 off via the rear panel switch/circuit breaker on the Power Supply before attaching or removing cables.


The KPA1500 may be used with the Elecraft K3S, K3, K2 or any HF/6 meter transmitter with a keying output meeting the requirements shown under note 4 below. Interconnections with transceivers are shown in Figure 4, page 11, Figure 5, page 12 and Figure 6, page 13. The driving transceiver must provide at least 50 watts of RF for full output and the output power must be adjustable as described under *Transmitting* on page 16.

1. Connect your station ground to the GND terminal (5) (see Figure 1, page 7). A good station ground is important for safety and to minimize local radio frequency interference (RFI).
2. Attach the RF INPUT (3) to the output of your driving transceiver or transmitter using a 50 Ω coaxial cable with a PL-259 connector on the KPA1500 end.
3. Attach a suitable load with an SWR of less than 1.5:1 to the ANT 1 (1) or ANT 2 connector (2). A 50 Ω 1500 W dummy load is recommended for initial testing. Be sure to select the correct ANT connector using the front panel ANTENNA switch before transmitting.
4. The driving transmitter must ground the KEY IN line circuit during transmit while sinking up to 5 mA. This is compatible with virtually all amateur transmitters and no key line buffer is required. If the transmitter Key Output is not a contact closure or equivalent, it must be at a level between +4 and +16 VDC during receive.

Enhanced Mode Operation with a K3 or K3s

The optional KPAK3AUX cable kit provides closer integration with a K3 or K3s by sharing band information between the KPA1500 and the transceiver, see Figure 5, page 12 and Figure 6, page 13. The KPAK3AUX cable kit enables all enhanced features described under Operation, including coordinated band-switching (page 15).

The KPAK3AUX cable kit also incorporates the KEY IN line. If you need access to this line so that other equipment can bypass the amplifier, you can install the Key Line Interrupter supplied with your KPAK3AUX cable and use a separate key line as shown in Figure 6 on page 13.

 You must use the Key Line Interrupter when using a separate key line with the KPAK3AUX cable kit. Otherwise any external equipment inserted into the key line will not be able to inhibit the amplifier.

Cables for Yaesu and Icom transceivers to provide closer integration with the KPA1500 are available.

See *AUX and XCVR Serial Connector Interfaces* on page 37.

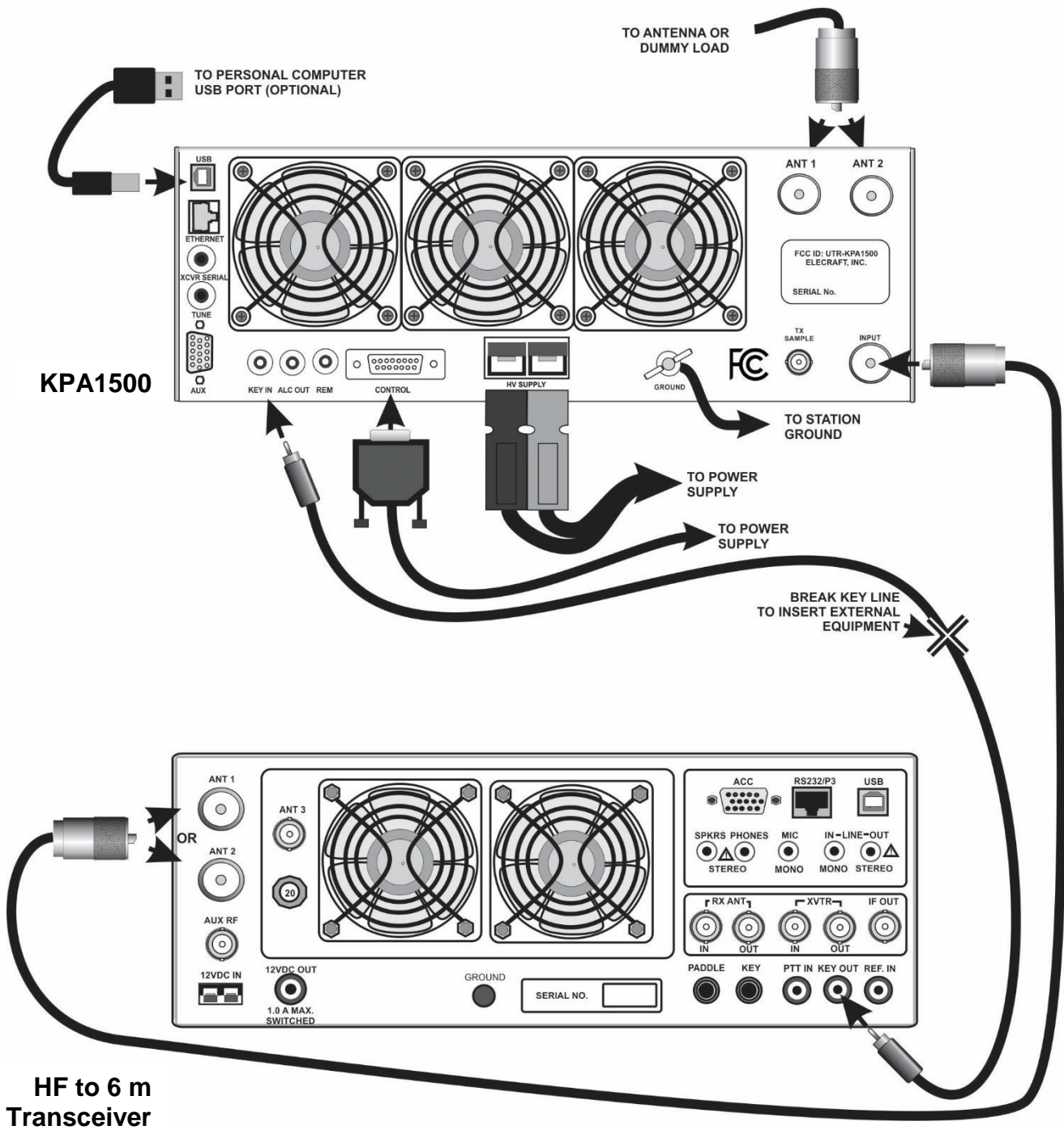


Figure 4. Basic Cabling Diagram for Any Transceiver.

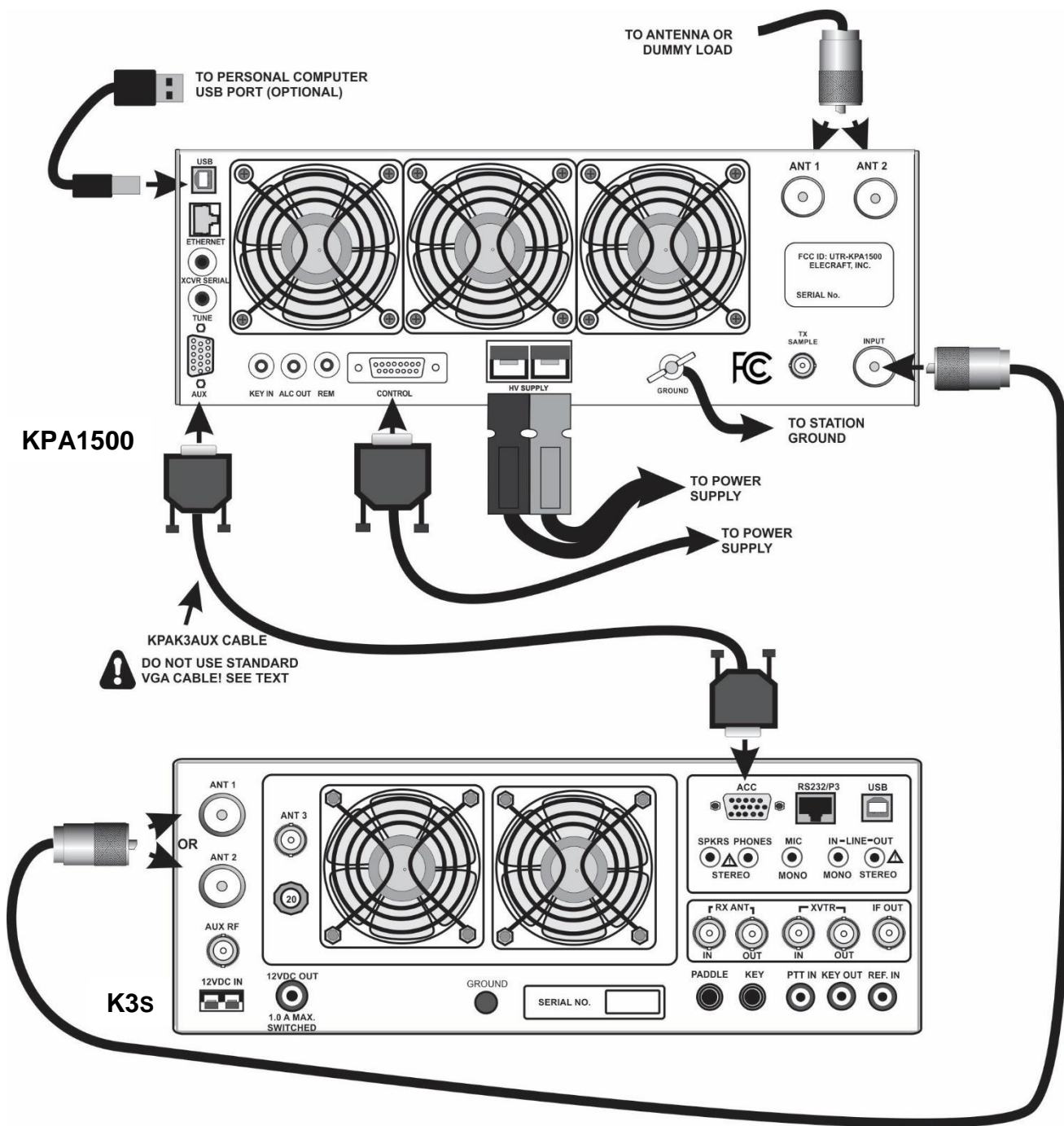


Figure 5. K3s Enhanced Cabling Using KPAK3AUX Cable, Without Interrupter.

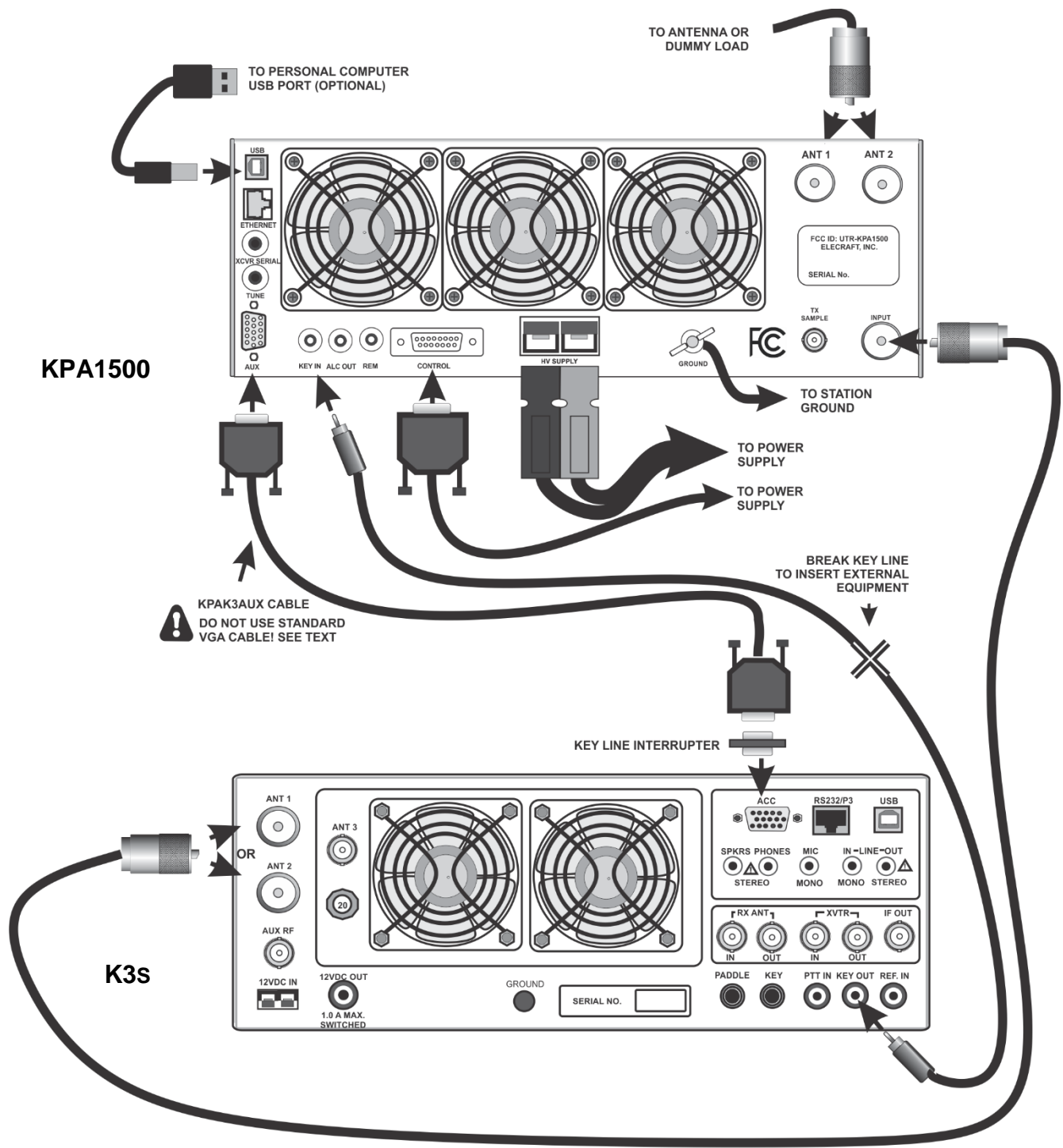


Figure 6. K3s Enhanced Cabling Using KPAK3AUX Cable and Separate Key Line, With Interrupter.

Operation

RF Deck Front Panel Controls

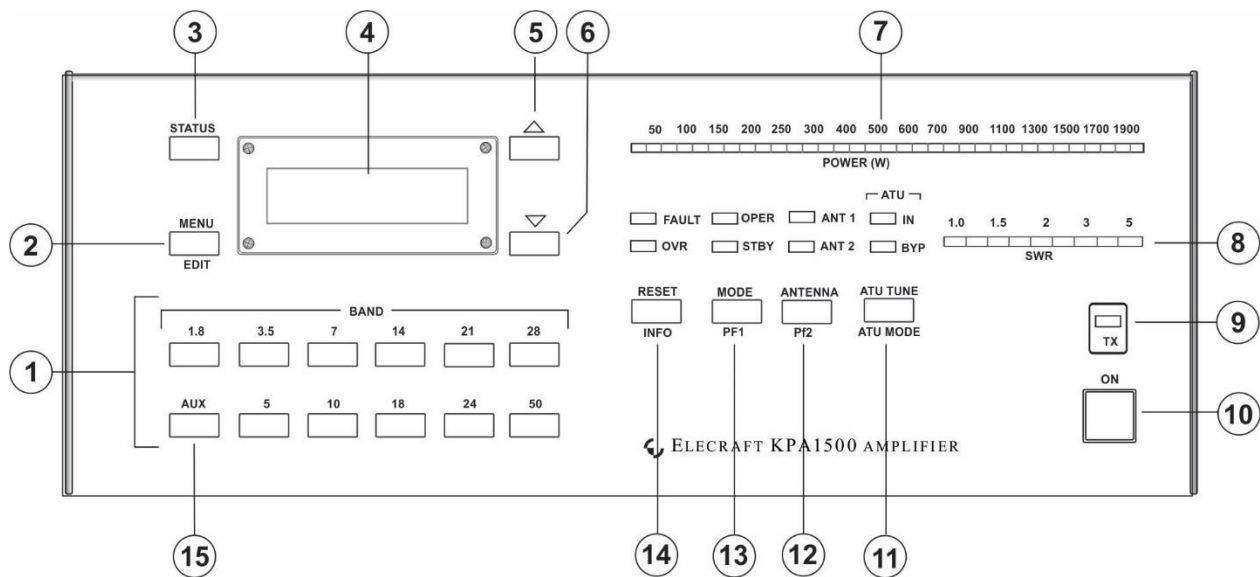


Figure 7. KPA1500 RF Deck Front Panel Controls and Indicators.

The front panel controls and indicators are referred to in the following operating instructions by the numbers shown in Figure 7. Below is a summary of the function of each control and indicator.

⚠ Switches with a legend above and below have two functions. *Tap (press briefly)* to activate the function labeled above a switch. *Hold* to activate the function labeled below the switch. In the text, *tap* functions are shown like this: **MENU. An example of a *hold* function is **EDIT**.**

- ① BAND select switches: Tap to manually select a new band see *Band Switching*, page 15).
- ② MENU/**EDIT** switch: Tap to enter the KPA1500 MENU system. Hold to **EDIT** the selected menu parameter.
- ③ STATUS switch: Tap to display Status pages showing amplifier operating parameters (see page **Error! Bookmark not defined.**).
- ④ Liquid Crystal Display (LCD).
- ⑤ ⑥ \triangle and ∇ : Use to scroll through the Status or Menu screens.
- ⑦ Power Output wattmeter bargraph.
- ⑧ SWR bargraph. The SWR LEDs are green from 1 to 1.5. The 1.5 to 2 LEDs are yellow and the LEDs above 2 are red.
- ⑨ TX LED: Lights whenever the amplifier is in operate mode (OPER) and the PA KEY signal is pulled low (enabled).
- ⑩ ON pushbutton switch: Toggles the RF Deck power on or off.
- ⑪ ATU TUNE/**ATU MODE** switch: Tap to enable the ATU Tune function. Hold to place the internal ATU in or out of the signal path.

- ⑫ ANTENNA / PF2 switch: Tap to toggle between the ANT1 and ANT2 outputs. Hold to select user-programmable function 2, (future feature).
- ⑬ MODE / PF1 switch: Tap to switch between Operate (OPER) and Standby (STBY) modes. Hold to select user-programmable function 1, (future feature).
- ⑭ RESET / INFO switch: Tap to reset a fault condition. Hold to display information about the last fault on the LCD.
- ⑮ AUX switch: Hold for 10 seconds to force a firmware load (see page 29).

Power On

IMPORTANT

When the KPA1500 is turned off using the front-panel switch ⑩, part of the control circuitry remains on as long as AC mains power is applied to the Power Supply.

Keeping the control circuitry energized allows the KPA1500 to be turned on and off remotely as well as from the front-panel switch. If you do not need to control the KPA1500 remotely and would prefer to save the small amount of power required to power the control circuitry, either switch the Power Supply completely off or provide an external mains power switch capable of handling 20A.


1. Ensure a suitable 50 Ω load is attached to the ANT 1 or ANT 2 connector on the rear panel. Tap the front panel ANTENNA switch to select the antenna connector used. The associated LED will be illuminated. A dummy load is recommended for initial tests.
2. Enable the power supply by placing the rocker switch on the power supply module in the ON (I) position.
3. Tap the ON switch ⑩. The LCD ④, ANT 1 or ANT 2 and the OPER or STBY LEDs should light. By default the KPA1500 enters Standby mode (STBY) at power on. You can change the default to start in OPER mode using the *POWER ON MODE* menu item, see page 28.

 **If the FAULT LED ⑦ lights at any time, refer to *Fault Conditions*, page 24.**

Band Switching

Band switching may be done automatically or manually as follows:

Automatic Band Switching via Frequency Counter: The KPA1500 measures the incoming RF frequency and automatically selects the proper band. The KEY IN input must be connected to the driving transmitter to enable the KPA1500's counter.

 **The automatic band selection via frequency counter is active whenever the KEY IN is low (transmit mode) and the transceiver is delivering RF drive to the KPA1500. The automatic band selection function overrides band selection made by any other means to protect the KPA1500 from damage by wrong-band operation.**

Manual Band Switching: Tap any of the front-panel BAND switches to manually switch the KPA1500 to that band. If the incorrect band is selected, the built-in frequency counter will automatically select the proper band for the RF frequency presented to the Input.

Coordinated K3s or K3 and KPA1500 Band Switching: When the optional AUX cable (page 10) is connected between the KPA1500 and the K3s or K3:

- The KPA1500 will follow the band selected on a K3s or K3 transceiver without the need to transmit.

- Tapping a BAND switch on the KPA1500 will cause the K3S or K3 to change bands accordingly.

The KPA1500 can automatically follow band selection from certain non-Elecraft transceivers such as Flex Radio, Icom and Yaesu (BCD) without transmitting when the appropriate control cable is used. This is called Enhanced Mode operation.

However, control is one-way: The KPA1500 cannot command the transceiver to change bands as it does when connected to a K3S or K3 with the optional AUX cable.

See *AUX and XCVR Serial Connector Interface* on page 37.

Antenna Selection

Tap ANTENNA ⑫ to select the desired rear panel antenna connector. Either ANT 1 or ANT 2 LED illuminates to indicate the selection.

You may designate either ANT1 or ANT2 on a per-band basis. By default, the KPA1500 will return to that choice when returning to that band. You can configure this function with the KPA1500 Utility Configuration panel.

You can also disable one of the antenna outputs for selected bands. See *ANTENNA ENABLE* and *ANTENNA PREFER* entries under *Menu* on page 25. The KPA1500 Utility Configuration section makes it easy to configure this function.

- If an ANT connector is disabled on any band, tapping the ANT button blinks the ANT LED, but will not change to the disabled antenna.

When the KPA1500 is powered off, the Input port is connected directly to the ANT1 port, even if ANT1 is disabled.

Transmitting

The POWER (W) and standing wave ratio (SWR) bargraphs are functional when the amplifier is in standby (STBY). Twenty five watts from the driving transceiver will illuminate the first POWER LED. You may run up to 200 watts through the KPA1500 in STANDBY.

⚠ If you attempt to drive the KPA1500 on a frequency that is more than 100 kHz outside of an Amateur band or in the range of 26 to 28 MHz, the KPA1500 automatically switches to standby, the red FAULT LED lights and a tone is sounded in the speaker.

1. Be sure you have an antenna or dummy load connected to the active antenna output (see *Antenna Selection* above) and your driving transceiver is on a frequency inside an Amateur band.
2. In order for the KPA1500 to amplify, it must be in OPER mode and it must be keyed. The amplifier can be keyed either by KEY IN pulled low or using the optional KPAK3AUX cable connected to the K3/K3S.
3. If you have a 50 Ω dummy load or an antenna that you know presents a low SWR to the KPA1500, press and hold the **ATU MODE** switch to put the ATU in bypass (BYP LED lights).
If you are not sure of the SWR, press and hold the **ATU MODE** switch to enable the ATU (IN LED lights).
4. Tap the MODE switch ⑬ as needed so the OPER LED lights.
5. Apply a few watts of RF drive and watch the POWER (W) ⑦ bargraph illuminate to indicate RF output power.

6. Normal drive levels to produce the full 1500 W output will be about 50 W, but start with a much lower level to observe how the KPA1500 behaves.
7. Slowly increase the drive power and confirm the SWR bargraph ⑧ indicates less than 1.5 while the output indicated by the POWER (W) bargraph ⑦ increases.

If your load presents a high SWR, be sure the ATU is enabled (press the **ATU MODE** switch to light the IN LED), and then tap ATU TUNE to initiate a tuning cycle. Apply 25 to 50 W of transmitter drive during this tune cycle. About 50 W of drive is required to produce the full 1500 W output from the KPA1500.

⚠ During heavy use, you may hear clicking sounds as amplifier components cool. This is normal. It does not indicate the amplifier is being over stressed. The rear panel fans will turn on and increase speed as needed automatically. If desired, you can keep the fans running at all times using the *FAN SPEED MIN* menu setting (see Menu Section starting on page 25).

8. When driving the KPA1500 with an Elecraft K3 or K3S, use the per-band power control to set the amplifier output just below the desired peak output on each band. Do not rely on ALC to control the power output (see *Using ALC*, page 17).

In the K3 or K3S, program *CONFIG:POWER SET* to Per Band and adjust the power level for each band. See *Per-Band Power Control* in your K3 or K3S Owner's Manual for further details. (Requires K3 firmware version 4.82 or later).

⚠ If you use the AUX cable interface between the K3 or K3S and KPA1500 (Figure 5, page 12 or Figure 6, page 13), and you have *RADIO TYPE* set to K3 or K3s, the KPA1500 will send the operate/standby status to the K3 or K3s.

i This means you can set two per-band power levels with the K3 or K3S:

One to drive the KPA1500 when it is in operate mode and another for pass-through transmitting when the KPA1500 is in standby. The K3 or K3S will automatically return to your preset power levels as you switch the KPA1500 between operate and standby.

Using Automatic Level Control (ALC)

Automatic Level Control (ALC) is a useful safety mechanism, but do not use ALC as the principle power control. Doing so causes many of the unwanted transmit dynamics you often hear on the air including excessive intermodulation distortion (IMD) and clicks.

Elecraft recommends using the K3 or K3S *PWR SET-PER BAND* function to set proper drive levels, not ALC. The Elecraft K3 and K3S ALC intentionally have a slow attack and much slower decay to avoid adding more distortion or dynamics problems than necessary. However, not all of the negative effects of ALC action can be avoided. It is still best to set the ALC threshold and then adjust the drive to avoid ALC action in normal operation.

If you chose to use ALC, set your transmitter power output correctly as described under *Transmitting* and adjust the ALC so it does not affect output power in normal operation.

1. Drive the KPA1500 to the desired output.
2. Adjust *ALC THRESH* in the menu (page 25) until power just starts to drop and then set *ALC THR* one or two units above this setting so it does not affect the output power in normal operation.
3. Repeat on each band. *ALC THRESH* is set and saved separately on each band.

Automatic Antenna Tuner (ATU)

The internal ATU may be used with the KPA1500 in either standby or operate mode. When the KPA1500 is in standby mode, power from the driving transceiver is passed directly to the ATU. Press and hold **ATU MODE** to select whether the ATU is active (IN) or bypassed (BYP). The corresponding LED above the switch will light.

⚠ The maximum bypass power through the KPA1500 INPUT connector is 200 W.

At lower amplifier outputs up to 750 W, or when using your driving transceiver “barefoot” at 100 W, the ATU will match loads up to an SWR of 10:1 on 80 through 10 meters and 5:1 on 160 and 6 meters. At 1500 W the tuner will match an SWR of at least 3:1. See Figure 8, page 7 below.

The ATU recalls the tune solutions based on the frequency reported by an interfaced radio or by the KPA1500 frequency counter when the KEY IN line is held low.

This tune feature works in both standby and operate modes: Frequency information from the interfaced transceiver may be used to select an ATU setting without transmitting.

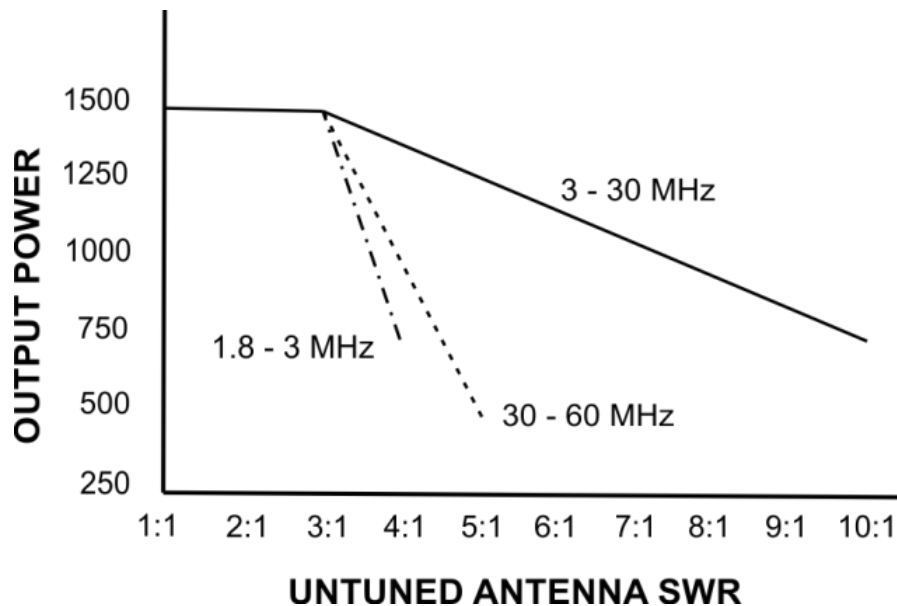


Figure 8. Antenna Tuner Matching Capability.

Manual Tune Operation

1. Tap ATU TUNE to initiate an ATU tune cycle. The ATU IN light will flash.
2. Supply 10-50 W of RF from your transceiver.

Relays in the ATU operate to switch values of inductance (L) and capacitance (C) to match the antenna impedance to a value close to 50 Ω non-reactive for the KPA1500 amplifier circuits or for the driving transceiver when the KPA1500 is in standby.

The SWR LEDs indicate how close the antenna impedance is matched to the transceiver. The L and C values switched in will provide a good match for most situations.

3. Tap ATU TUNE again within 3 seconds after tuning is completed to initiate a second, fine tuning process with smaller changes in L and C values.

This may result in a lower SWR. You must not interrupt the RF from the transceiver for this function to complete properly. Once the tuning operation is complete, unkey your transceiver.

If the SWR is 1.2 or less when a tune operation begins, the KPA1500 bypasses the matching network without searching for a tuning solution. The ATU IN and the ATU BYP LEDs both illuminate to show the tuner is bypassed for this frequency. When returning to the selected frequency, the internal ATU will recall the bypass mode. The ATU IN and the ATU BYP LEDs will be illuminated again when this happens.

You can change the default bypass SWR threshold with the *ATU BYPASS* parameter in the Menu. Subsequent ATU TUNE procedures will use the new threshold to determine when the internal ATU is placed into Bypass mode.

ATU Memories

After successfully tuning, the KPA1500 stores L and C or Bypass settings and the ANT1 or ANT2 selection in memory. They are recalled when returning to that frequency.

The entire spectrum from 1.8 through 60 MHz is divided into frequency segments and tuning information is stored for each successfully tuned segment. These are called memory “bins.” Please see the Appendix, page 45 for a list of the center frequencies of each of the memory bins.

Re-tuning to maintain a low SWR is normally required over a narrower frequency range on the lower frequencies, so lower frequencies have narrower segments assigned as follows:

- Below 3 MHz the segments are 10 kHz wide.
- From 3 MHz through 26 MHz the segments are 20 kHz wide.
- From 26 MHz to 38 MHz the segments are 100 kHz wide.
- From 38 MHz to 60 MHz the segments are 200 kHz wide.

When starting a tune operation for a frequency segment that has no tuning solution, the KPA1500 first tries settings in the nearest frequency segment with tuning data.

Training the ATU Using Full Cycle Tune

To minimize the tune operation while moving from one frequency to another, you can “train” the ATU at different points across each band. The KPA1500 memorizes the L and C settings and antenna selected. The KPA1500 ATU will not require a full search tune operation again unless the antenna changes.

Normally you won’t need to perform a tune operation in every segment shown in the Appendix. If you transmit in a segment where there is no tuning solution, the ATU automatically checks solutions for adjacent segments to see if they produce an acceptable SWR.

To initiate a Full Cycle Tune, follow these steps.

1. Tap the ATU TUNE button. The ATU IN light will begin to flash to indicate it is waiting for RF from the transceiver.
2. Apply 25 to 50 W of transmit drive. You will hear the relays searching for a match.
3. When the relays stop, the ATU IN LED stops flashing, indicating Full Cycle Tune success.
4. The resulting match is automatically stored in the appropriate memory bin. If a match cannot be found, the red FAULT LED illuminates, *NO MATCH* is shown on the LCD, and no settings are stored. The ATU can create a match for SWR as high as 10:1. If no match is found, make sure the correct frequency band and antenna are selected.
5. You can use the KPA1500 Utility Operate panel to observe Full Cycle Tune activity and transmission line/ antenna system SWR.
6. If you have multiple antennas on one or more bands, repeat this procedure for each antenna and frequency combination.

With *ATU HiSWR AUTO RETUNE* set to *ENABLED* and an antenna SWR higher than the retune threshold, the KPA1500 will search previous tuner settings until one is found that is as good as or better than the SWR threshold. Once found, the setting is stored and the amplifier quickly resumes operation.

Note the ATU will not automatically begin a full-search tune. It recalls previous or adjacent-segment tuning solutions.

Multiple Antennas and External Antenna Switches

Some stations have several antennas, all sharing the same KPA1500 antenna connector, switched externally. The ATU memory feature is great for antenna installations with multiple antennas per band, or in situations where the match changes with rain, ice or some other condition. The KPA1500 ATU memory allows up to 31 ATU settings for each frequency segment.

For example, you might have a dipole, a Yagi and a vertical on 20 meters, all on the ANT1 connector, selected by an external antenna switch. The KPA1500 can store separate tuning solutions for all three antennas.

Train the tuner for each antenna, coax switch and ANT1 or ANT2 combination using the *Training the ATU Using Full Cycle Tune* procedure above.

When *ATU HiSWR RETUNE* is enabled and you key the transmitter, the match is evaluated. If it is higher than the *ATU HiSWR RETUNE* threshold (default = 1.8:1), the ATU rapidly searches saved solutions for this frequency segment. The first match lower or equal to the *ATU HiSWR RETUNE* threshold is applied and the amplifier is enabled.


The 31 ATU settings are not dedicated to either antenna connector. You may store any combination of settings totaling 31. For example, you can set 25 ATU settings for ANT1 and 6 settings for ANT2.

Frequency Tracking with an Elecraft K3 or K3S Transceiver

When used with a K3 or K3S and interfaced using the optional KPAK3AUX cable kit, the KPA1500 may be configured to track frequency changes without transmitting, providing virtually instantaneous amplifier and ATU setting updates as you tune the receiver across the band.

To use frequency tracking:

1. Connect the KPA1500 and K3 or K3S using the AUX interface cable as shown in Figure 5, page 12 or Figure 6, page 13.
2. Ensure the K3 or K3S is equipped with firmware revision 4.82 or later. See Firmware Upgrades in your K3 or K3S Owner's Manual for more details.
3. Enable the frequency tracking function in the K3 or K3S:
 - a. Select *CONFIG: KAT3* and then tap the switch to toggle between *KAT500N* (no KPA1500) and *KAT500Y* (KPA1500 connected and frequency tracking enabled).

 This is the same procedure that enables frequency tracking with the KAT500 tuner.

Amplifier Monitoring and Status Indicators

KPA1500 operation is monitored by LEDs ⑦, ⑧ and ⑨ and reported in text on the LCD.

LEDs

The amplifier reports amplifier load (antenna) SWR and output power on LED bargraph displays. The most significant LED in the bargraph varies as power increases through its range. The bargraphs are color-coded: green for normal, yellow for marginal and red for excessive levels.

Excessive levels may trigger a fault and switch the KPA1500 to STBY (see *Fault Conditions*, page 24). The FAULT LED lights if a fault condition occurs and LEDs indicate whether the amplifier is in standby (STBY) or operate (OPER) mode. When an antenna with low SWR is used and the antenna tuner is enabled, the ATU IN and the ATU BYP LEDs are illuminated; indicating BYPASS is the best tune solution.

LCD and Status Messages

The LCD shows amplifier status or menu items in two lines of text.

Tap STATUS to display various amplifier operating parameters.

Tap MENU to call the menu display.

Tap the \triangle or ∇ keys to scroll though STATUS or MENU items.

Press and hold **EDIT** to enable the \triangle or ∇ keys to edit (change) MENU parameters.

Tap MENU again to save the parameter and enable Menu Item Selection.

When *TECH MODE* is enabled (On), additional status text becomes available and can be viewed by tapping the \triangle or ∇ keys.

When *TECH MODE* is disabled (Off) two main screens plus transitory screens (text that displays for a second or so after something happens) become visible.

Example displays are shown below. Actual values will vary according to your operating conditions.

Tech Mode	Display Panel Text	Display Format, Two Lines	Definition
OFF	3.5MHz 50A 42C PWR 1234W 1.7:1	Band, Current, Heat Sink Temp RF Power, SWR	Band: Determined by internal Frequency Counter Current: Drawn from the power supply Heat Sink Temp: Used by fans to determine speed. RF Output: From internal power meter SWR: From forward and reflected power meters
OFF	FWD PWR: 1234W REFL PWR: 23	Forward Power Reflected Power	FWD PWR: Forward power from internal SWR meter REFL PWR: Measurement from internal SWR meter Used to determine when values are too high for safe operation.

Tech Mode	Display Panel Text	Display Format, Two Lines	Definition
ON	<i>XCVR FREQ 14028</i> <i>TX COUNT 14024</i>	Exciter Frequency from Data Port Exciter Frequency from Internal Counter	XCVR FREQ: From AUXBUS or XCVR SERIAL port (transceiver data). TX COUNT: Drive frequency with 8 kHz resolution. This frequency is used to recall stored ATU tuning solutions.
ON	<i>ELECRAFT</i> <i>KPA1500</i>	Banner	Text appears briefly on the LCD when the amplifier is switched on. You may customize this text with the KPA1500 Utility Edit Configuration dialog.
ON	<i>F: 983W 56%</i> <i>52V 34A 23C</i>	Forward Power, Efficiency PA Voltage, Current, Temperature	F: Forward power, efficiency, PA voltage and current, temperature.
ON	<i>ATU IN 1.2:1</i> <i>160nH 61pF TX</i>	ATU Status L and C Combinations	ATU IN: ATU is active and the SWR after match is displayed. Inductance is 160 nH. Capacitance is 61 pF. The capacitors are on the TX (source) side of the inductor. When the ATU is in BYP, the capacitor and inductor bank relay contacts are open.

LCD Notification Messages

Informational messages are temporarily displayed on the LCD when certain events occur.

For example, when the band is changed, the LCD shows the new band for about one and a half seconds, like *BAND 7 MHz*.

When the ATU TUNE switch is pressed, *NEED TUNE PWR, Key Exciter* is displayed as a reminder to provide RF for ATU tuning. You may tap ATU TUNE again to cancel the full search tune request. *TUNE CANCELLED* appears briefly on the LCD. When ATU tuning finishes normally, the LCD shows *TUNE COMPLETE* briefly.

LCD Message	Meaning
<i>BAND n MHz</i>	Amplifier now operating on the “n” MHz band.
<i>NEED TUNE PWR, Key Exciter</i>	ATU is in full-search tune mode and needs power from the transceiver to perform the tune.
<i>TUNE COMPLETE</i>	ATU full search tune successfully found a match.
<i>TUNE CANCELLED</i>	Operator pressed the ATU TUNE button during a full search tune and halted the process.
<i>FUNCTION UNASSIGNED</i>	Button has no operation programmed.

Remote Operation

The KPA1500 can be controlled remotely using a personal computer connected to the RJ45 Ethernet port or to the USB port. A basic remote operating capability is built into the KPA1500 Utility program *OPERATE* tab, see page 29.

For those who may wish to develop their own software, a Command Reference Manual is available on the Elecraft web site. (www.elecraft.com).

Additionally, the rear panel REM jack enables remote on and off switching: When 12 VDC is applied to the KPA1500 REM connector, the amplifier is turned on. Removing 12 V turns the amplifier off. Less than 1 mA is required. The 12V DC OUT jack on the K3/K3s can be used for this function.

Fault Conditions

If the amplifier is operated beyond its ratings, it will enter one of three fault conditions.

Fault Type	Meaning	Indicated By
Attenuator	<p>Relatively minor faults such as excessive reflected power at the amplifier input cause an internal 3 dB attenuator to be switched into the RF path to protect the KPA1500. When an attenuator fault occurs, the OVR LED lights and the cause is displayed on the LCD. When the overdrive situation is removed, the LED turns off and the attenuator is removed from the circuit.</p> <p>To correct attenuator faults, reduce RF drive power. The KPA1500 tests the condition and will return to normal operation automatically after the cause is removed. If the fault persists or if it is severe, a hard fault will occur, and the amplifier must be reset (Press RESET button or reset via remote control software).</p>	<p>OVR LED comes on.</p> <p>LCD reports the reason.</p>
Unauthorized Frequency	<p>If you try to transmit on an unauthorized frequency, the KPA1500 will automatically switch to standby until RF drive is removed.</p>	<p>Switches to STBY mode.</p>
Hard	<p>Hard faults automatically switch the KPA1500 into standby to protect it. Extremely high reflected power, excessive drive power or failure of a critical component such as a power supply are possible causes.</p> <p>When a Hard Fault occurs, the FAULT indicator lights, the speaker sounds and the cause is displayed on the LCD. When the condition is corrected, tap the OPER/STBY switch to return the KPA1500 to normal operation, or tap the RESET switch to return the KPA1500 to standby mode.</p> <p>i Hard Faults require the operator to correct the condition and reset the amplifier.</p>	<p>FAULT LED on.</p> <p>Cause displayed on LCD.</p>

LCD Display Fault Descriptions

LCD Display	Fault	Fault Type
<i>NO KEY IN 30 WATTS</i>	Protects the TR Switch receive path if drive power is applied in operate mode but the key line is not pulled down to enable the KPA1500.	Temporary switch to standby
<i>LPF VMON</i>	Incorrect bias voltages at the TR switch.	Hard
<i>NO MATCH 4.3</i>	ATU unable to match to the load at the selected ANT connector.	Hard
<i>PA CURRENT 68 AMPERES</i>	Excessive PA current drawn	Attenuator
<i>PWR DISS 2050 WATTS</i>	Power amplifier is dissipating excessive power. ¹	Hard
<i>PWR FOR SWR BYPASS 4.3</i>	Tuned antenna SWR exceeds safe limits at selected power.	Attenuator
<i>FWD PWR 2005 WATTS</i>	Excessive forward power measured.	Attenuator

LCD Display	Fault	Fault Type
GAIN HIGH RATIO 33	Ratio of input power to forward power too high.	Hard
FREQUENCY INVALID 26123KHZ	RF from the driving transceiver not within 100 kHz of an Amateur band or somewhere between 26 and 28 MHz	Hard
INPUT PWR 65 WATTS	Excessive power from the driving transceiver.	Attenuator
REFL POWR 180 WATTS	Excessive reflected power detected.	Attenuator
HIGH SWR 19.3	SWR extremely high (open load detected).	Hard
HI TEMP 112 DEGREES C	Heat sink temperature too high.	Hard
50 VOLTS 42.123 VOLTS	50V supply out of range.	Hard
12 VOLTS 10.5 VOLTS	12V supply out of range	Hard

NOTES:

1. Commonly caused by excessive power output or excessive reflected power.

Menu

Tap MENU ^② to toggle between *STATUS* and *MENU* displays to select *MENU*. The Menu function allows the following parameters to be set. With the menu function enabled, the MENU and switches next to the Δ and ∇ switches all respond to a single tap. Use them to scroll through the menu items. The menu items are in alphabetical order and when you reach the last or first item, the list automatically starts over with the next tap.

To change a parameter, press and hold **EDIT** and the parameter on the LCD will blink, then tap the Δ and ∇ switches to change the parameter. Tap MENU again to save the parameter and return the Δ and ∇ switches for menu selection.

Tapping STATUS ^③ also exits the menu.

i Menu Items Notes:

- Some menu items are “per band”; these menu items show the frequency band along with the parameter on the LCD. Changing a per band parameter changes it only for the band being displayed.
If you wish to change a parameter for more than one band, tap the BAND switch while editing the menu item to view and change the configuration for each band.
Optionally, you may use the *KPA1500 Utility* program (page 29) to modify several settings on all bands at once.
- Some menu items, such as serial number and firmware revision, may not be edited.
- Some menu items appear only when Tech Mode is enabled.

Menu Entry	Default	Description
<i>ALARM TONE</i>	<i>ON</i>	An internal speaker sounds a tone on faults. <i>ALARM TONE</i> turns this on or off. When the <i>ALARM TONE</i> menu item is changed from OFF to ON, a sample fault alarm tone is sounded.
<i>ALC THRESH (Per Band)</i>	<i>127</i>	KPA1500 provides an ALC voltage between 0 and -12V, a function of output power and this per-band <i>ALC THRESH</i> value. If ALC is used at all, set the ALC threshold high, transmit at full power, then lower the ALC until the exciter's power just starts to drop, then increase the ALC threshold one count. ALC is for severe overdrive, not normal amp power control. Misuse may cause distortion. See page 17 for more information.
<i>ANTENNA ENABLE (Per Band)</i>	<i>BOTH</i>	Antenna connectors ANT1 or ANT2 may be disabled, per band. UP and DOWN move between ANT1, ANT2 and BOTH. A disabled antenna connector cannot be selected by the ANT switch or text commands; the ANT switch will become ineffective, as only one antenna may be chosen. You cannot disable both ANT1 and ANT2.
<i>ANTENNA PREFER (Per Band)</i>	<i>LAST USED</i>	When switching to a new band with both ANT 1 and ANT 2 enabled the stored preference is chosen: ANT 1, ANT 2 or LAST USED.
<i>ATTEN RELEASE (Tech Mode Only)</i>	<i>3000</i>	When the attenuator switches in due to excessive drive power, there is a delay after the excessive power condition is corrected before the attenuator switches out. This delay can be adjusted in steps of 100 ms between 1400 ms and 5000 ms (1.4 sec and 5 sec.)
<i>ATU BYPASS (Per Band)</i>	<i>1.2:1</i>	When a tune operation is started, the first ATU setting tested is ATU bypassed. If the ATU bypassed setting is at or lower than this value, the search is ended, and the stored ATU tuning solution is bypassed (see page 18).
<i>ATU CAP (Tech Mode Only)</i>	—	Allows manually choosing the capacitance used by the ATU. Capacitance in pF and the corresponding SWR is also displayed on the LCD. Normally, the ATU selects the correct value automatically.
<i>ATU HiSWR RETUNE (Per-Band)</i>	<i>ATU HiSWR RETUNE OFF</i>	When SWR exceeds the <i>ATU RETUNE SWR</i> value, the ATU examines previously stored tuning settings for the current frequency and chooses the first one that meets the SWR STOP threshold. This does not start a full search tune. The amplifier pulls down (grounds) the TUNE connector's KEY line (tip), and can also send a message to a K3 to provide TUNE POWER for ATU tuning. If a suitable ATU setting is not found, the SWR may still be too high for efficient use (see the ATU NO MATCH SWR menu item below). If this occurs, tap the amplifier's ATU TUNE switch to start a full-search tune.
<i>ATU IND</i>	—	Allows manually choosing the inductance used by the ATU. Inductance in nH and the corresponding SWR is also displayed on the LCD. Normally, the ATU selects the correct value automatically.
<i>ATU MEM ERASE</i>	—	Clears all ATU settings for the currently selected band and antenna. ATU MEM ERASE clears the current ATU setting to ATU BYPASSED. You may change ANT and BAND while within this menu.
<i>ATU MODE SWITCH</i>	—	The ATU mode is either IN (in line) or BYP (bypassed). This menu item chooses between one setting for all bands and antennas, or individual ATU mode by band and antenna. ATU MODE SWITCH All Bands ATU MODE SWITCH Per-Band Per-Ant If you chose All Bands, the ATU Mode won't change as you change bands and antennas. If you choose Per-Band Per-Ant, the ATU Mode will be as you last left them when you visited that band and antenna. This is intended for owners of an externally-tuned antenna that are matched separately from the KPA1500 ATU.

Menu Entry	Default	Description
<i>ATU NO MATCH</i> (Tech Mode Only)	3.0:1	When an ATU search completes, the best setting the ATU can find may be too high for practical use (e.g., ATU attempting to match an open antenna connector). If the ATU search cannot find an SWR below the ATU NO MATCH SWR threshold, a NO MATCH fault is generated. You may be able to reset the fault, reduce power to keep the reflected power down, and continue to transmit if necessary.
<i>ATU RETUNE SWR</i> (Per Band)	1.8	Threshold mismatch used to determine an adequate impedance match when <i>ATU HiSWR RETUNE</i> is enabled.
<i>ATU SIDE</i> (Tech Mode Only)	—	The ATU uses a series inductance with a shunt capacitance on either the source or antenna side. This entry manually switches the shunt capacitance in the ATU matching network to put the capacitance on the source (TX) or antenna (ANT) side of the L-network inductance. Normally, the ATU selects the correct side automatically.
<i>ATU STOP TUNE SWR</i> (Per Band)	1.2:1	When an ATU HiSWR RETUNE is started, up to 31 stored ATU settings and the current or near frequencies are examined. ATU STOP TUNE SWR tells the ATU when an acceptable match has been found. If an ATU setting is found that results in "good enough" SWR, the search is ended. If this is not low enough, a NO MATCH fault may occur (see ATU NO MATCH SWR menu item), and you should tap the KPA1500 front panel ATU TUNE switch to start a Full Search Tune.
<i>ATU XCVR KEY</i> (Tech Mode Only)	ON	Used with a K3 (MCU version 5.93 and later) connected with an AUX cable. When ON, the KPA1500 sends an AUXBUS message to the K3 when needed for TUNE POWER. The K3 provides carrier for the ATU to complete tuning. The KPA1500 sends another message to stop tuning. When ATU XCVR KEY is ON, the KPA1500 asks the K3 for TUNE POWER when it performs an ATU HiSWR RETUNE tune or a full search tune (press of the KPA1500 ATU TUNE switch). Radios other than K3 & K3S may use a keying cable from the tip of the KPA1500 TUNE connector to the transceiver straight key input line. That key line is not affected by ATU XCVR KEY.
<i>BAND CHANGE STBY</i>	NO	Chooses whether to switch from operate (OPER) to standby (STBY) when changing bands. YES will switch to standby when changing bands. Useful if you use a manually operated external antenna tuner.
<i>DEMO MODE</i> (Tech Mode Only)	OFF	Used only for non-transmitting demonstrations where proper mains power is not available. When keyed shows nominal SWR and full power output even though no RF is being generated.
<i>FAN SPEED MIN</i>	0	The speed of the three rear panel fans varies according to the KPA1500 internal temperature. This function sets fan speed from slow to full at all times, independent of heatsink temperature. This setting does not affect the fan in the power supply enclosure.
<i>FIRMWARE VERSION</i>	—	Displays the installed version of the KPA1500 firmware.
<i>LCD BACKLIGHT</i>	7	Adjusts the brightness of the LCD backlight over a range of 0 to 50.
<i>LCD CONTRAST</i>	23	Adjusts the contrast of LCD characters from 0 to 50.
<i>LED BRIGHTNESS</i>	22	Adjusts the brightness of the front-panel LEDs from 0 to 50.
<i>NET GATEWAY</i> (Tech Mode Only)	—	Shows the IP address of the router. This address is provided by a DHCP server when the KPA1500 connects to a TCP/IP network. Leading zeros are removed from each octet.
<i>NET IP ADDRESS</i> (Tech Mode Only)	—	The network IP address assigned to the KPA1500 by a DHCP.
<i>NET MAC</i> (Tech Mode Only)	MAC	Displays the unique media access control (MAC) address assigned by the microcontroller manufacturer. The MAC address is six pairs of hex digits displayed on two lines with colon delimiters.
<i>NET MASK</i> (Tech Mode Only)	—	DCHP – assigned Subnet Mask in dotted octet format.

Menu Entry	Default	Description
<i>POWER ON MODE</i>	<i>STBY</i>	Selects whether the amplifier starts in operate (OPER) or standby (STBY) mode when turned on.
<i>RADIO POLL</i>	<i>OFF</i>	When ON enables KPA1500 polling of the transceiver for band via SERIALSPEED XCVR port (e.g. for Kenwood/Elecraft compatible interface).
<i>RADIO TYPE</i>	<i>K3 OR K3S</i>	Provides frequency information and communication between a transceiver and KPA1500. K3 / K3s: Select when a K3 or K3s is connected through a 15-pin AUX cable to your KPA1500, which appears to a K3 as a combination of KPA500 and KAT500. BCD: The 4 BAND lines on the ACC connector carry band information in a BCD format. ICOM: The XCVR SERIAL connector is configured for CI-V protocol, and ACC connector BAND VOLTAGE and BAND REF VOLTAGE are examined for frequency information Serial: A Kenwood, Yaesu, Elecraft K2, K3, K3s, KX2, or KX3, or FlexRadio transceiver that responds to IF; FA; FB; FT; polls with frequency and VFO information. Choose SERIAL and turn off RADIO POLL if you are using an unsupported radio.
<i>SERIAL NUMBER</i>	—	Displays the KPA1500 serial number. Not editable.
<i>SERIAL SPEED HOST</i>	<i>230400 bps</i>	The speed of the Host PC (labeled USB) connection. The KPA1500 incorporates a USB-to-Serial adapter that appears as a COM port to computer software. The speed range is 4800 to 230,400 bits/second. Use the highest reliable speed you can. <i>KPA1500 Utility finds</i> the KPA1500 at any of its speeds.
<i>SERIAL SPEED XCVR</i>	<i>38400 bps</i>	Depends on <i>RADIO TYPE</i> selection. The speed of the 3.5mm TRS connector labeled XCVR SERIAL. This is a dual-purpose connector, either a TTL-level RS-232 connector for connection to Kenwood, Flex, K2, K3, KX3, KX2, or a CI-V connector to Icom transceivers.
<i>TECH MODE</i>	<i>DISABLED</i>	Status and menu items indicated shown only when Tech Mode enabled.
<i>TR ADDED TIME</i> (Tech Mode Only)	<i>0 msec</i>	Delay added to the receive recovery if the transceiver has an RF envelope that continues after its KEY OUT signal goes high. For the K3/K3s and most other transceivers, the default of 0 ms is correct.
<i>TX INHIBIT</i> (Tech Mode Only)	<i>DISABLED</i>	Chooses whether to enable or disable the ACC connector INHIBIT line, pin 11. When enabled and the INHIBIT line is pulled down, the PA stage is bypassed. The MODE LED will remain in OPER.
<i>WMTR ADJUST</i> (Per Band, Tech Mode Only)	<i>100</i>	User-adjustable Wattmeter Calibration. Note: The KPA1500 Wattmeter is factory-calibrated on all bands. WMTR ADJUST affects only the displayed power (LCD & LED, KPA1500 Utility operate page). Factory calibrated fault thresholds are not affected.

KPA1500 Utility Program

The KPA1500 Utility program is available for downloading free from Elecraft at www.elecraft.com. It is essential for updating your KPA1500 firmware and may be used to more quickly edit various parameter settings.

1. Download the KPA1500 Utility program and install it on your computer.
2. Connect the USB A to B interface cable supplied with your KPA1500 between the USB port on the KPA1500 rear panel and your personal computer.

⚠ The KPA1500 must be connected directly to the USB port on your computer.

KPA1500 Firmware Updates

From time to time updated and improved firmware may become available for the KPA1500 and can be downloaded from www.elecraft.com and installed using the KPA1500 Utility Program.

To download the firmware:

1. Connect your personal computer to the KPA1500 via the USB port and launch the KPA1500 Utility Program.
2. Click on **Firmware** tab and then click on **Copy Firmware Files from Elecraft** to download the latest production released firmware.
3. Beta firmware is made available prior to it going into full production at Elecraft. Follow the instructions on the KPA1500 Firmware page if you would like to try it.

To install new firmware in your KPA1500:

1. Click on the KPA1500 Utility Program **Send Firmware to the KPA1500** switch to start the transfer. Follow the on-screen instructions.
2. During download the LCD will display *FIRMWARE LOAD*. The KPA1500 will return to its normal power on state when the transfer is completed.

Be sure to check the notes supplied with the new firmware. They may include changes that affect the instructions in this manual.

Checking your Firmware Version

Use the Menu entry *FIRMWARE VERSION* to determine the currently-installed firmware (see page 25). This is also shown on the KPA1500 Utility Firmware tab as the “installed” version.

Forcing a Firmware Load


If the KPA1500 becomes unresponsive, you may force a re-load of its operating firmware. Connect a computer running the KPA1500 as described above. Press and hold the front-panel **AUX** key for more than 10 seconds and the hardware bootloader will run. Click on the Utility Test Connection and then *Send Firmware to the KPA1500* switch to start the transfer.

Wattmeter Calibration Procedure

The KPA1500 wattmeter is factory-calibrated. The calibration is done per-band so you can make adjustments for individual bands without affecting the others. Elecraft recommends checking with Customer Support (support@elecraft.com) before changing Wattmeter Calibration.

An external wattmeter and a known-good 50 Ω dummy load capable of handling 1500 watts are needed to calibrate the internal Wattmeter.

1. Connect the wattmeter to either ANT1 or ANT2 using short, direct 50 Ω coaxial cable.
2. Connect the dummy load to the wattmeter.
3. Select the band you wish to calibrate.
4. Tap ANTENNA on the KPA1500 to select the ANT output where you connected the wattmeter and dummy load.

 Depending upon your menu preferences, the antenna output may change when you change bands.

5. Bypass (disable) the ATU by pressing and holding **ATU MODE** so the BYP LED lights.
6. Transmit briefly at 1500 W output into the external wattmeter and dummy load and compare the reading on the external wattmeter with the KPA1500 wattmeter.
7. If you wish to adjust the power displayed on the KPA1500 LCD and LEDs, hold **MENU** and tap switches next to the Δ and ∇ symbols until PWR ADJ is displayed on the LCD.
8. Press and hold **EDIT**. A number between 80 and 120 will be displayed on the LCD. Write this number in the Factory Cal. column for the band you are calibrating in case you wish to return to the factory calibration later:

Band	Factory Cal.	User Cal.
1.8		
3.5		
5		
7		
10		
14		

Band	Factory Cal.	User Cal.
18		
21		
24		
28		
50		

9. If the power displayed on the KPA1500 wattmeter needs to be higher, tap the Δ switch. If the power displayed on the KPA1500 needs to be lower, tap the ∇ switch. The number displayed indicates the percentage change in the power reading. For example, changing 100 to 110 will result in a 10% increase in the power indicated.
10. Tap MENU twice to exit the menu. The current band will be displayed on the LCD.
11. Transmit again and compare the readings on the KPA1500 and the external wattmeter. Repeat the procedure as needed until you are satisfied with the readings, and then write the new calibration number under User Cal. in the table for future reference.

Specifications

 The following performance specifications are guaranteed only within the Amateur bands.

Frequency Range	All Amateur bands from 1.8 to 29.7 MHz and 50 to 54 MHz
Supply Voltage and Current	195 to 250 VAC, 50/60 Hz up to 20A
RF Deck Weight	22 lbs. (10 kg)
RF Deck Size	Enclosure only, 4.5 x 13.5 x 11.5 in., HWD (11.5 x 34 x 29 cm)
Power Supply Weight	17 lbs. (7.5 kg)
Power Supply Size	Same as RF Deck: Enclosure only, 4.5 x 13.5 x 11.5 in., HWD (11.5 x 34 x 29 cm) excluding feet and protrusions
Power Output	1500 W PEP CW/SSB/Data
Duty Cycle at 1500 Watts	100% ICAS for 100% duty cycle modulation modes (FM, RTTY, FT8, JT65, etc.) 1.8-30 MHz: Maximum 5 minutes key down / Minimum 5 minutes receive (after 5 minute TX) 50 MHz: Maximum 50 seconds key down / Minimum 50 seconds receive
Drive Power	50-60 W, typical, for 1500 W output
Input VSWR	Less than 1.5:1
ALC Out	Negative-going, adjustable
Metering	Power output, SWR (bargraph and on the LCD display), supply voltage and current, temperature, frequency band
Heat Sink Temperature	230° F (110°C), maximum
Key In (Transmit Enable)	+5V maximum, open circuit on receive, closed to ground on transmit (5 mA max.)
Efficiency	Approximately 50%

**Antenna Tuning
Unit Matching
Range and Power
Limits**

3 — 30 MHz 1500 W into 16 Ω to 150 Ω (3:1 SWR)
750 W into 5 Ω to 500 Ω (10:1 SWR)

1.8 — 2 MHz 1500 W into 16 Ω to 150 Ω (3:1 SWR)
750 W into 12 Ω to 200 Ω (4:1 SWR)

30 — 60 MHz 1500 W into 16 Ω to 150 Ω (3:1 SWR)
500 W into 10 Ω to 250 Ω (5:1 SWR)

Matching specified to a 1.0:1 to 1.6:1 output SWR

**Autotune Power
Range**

10 W —1500 W

For better matching accuracy, tune with >20 W

Customer Service and Support

Technical Assistance

You can send e-mail to support@elecraft.com and we will respond quickly – typically the same day Monday through Friday. If you need replacement parts, send an e-mail to parts@elecraft.com. Telephone assistance is available from 9 A.M. to 5 P.M. Pacific time (weekdays only) at 831-763-4211. Please use e-mail rather than calling when possible since this gives us a written record of the details of your problem and allows us to handle a larger number of requests each day.

Repair / Alignment Service

If necessary, you may return your Elecraft product to us for repair or alignment. (Note: We offer e-mail and phone support, so please try that route first as we can usually help you find the problem quickly.)

IMPORTANT: You must contact Elecraft Customer Support before mailing your product to obtain authorization for the return, what address to ship it to and current information on repair fees and turnaround times. (Frequently we can determine the cause of your problem and save you the trouble of shipping it back to us.) Our repair location may be different from our factory location. We will give you the address to ship your product at the time of repair authorization. *Packages shipped without authorization will incur an additional shipping charge for reshipment to our repair depot.*

Elecraft 1-Year Limited Warranty

This warranty is effective as of the date of first consumer purchase (or if shipped from the factory, the date the product is shipped to the customer). It covers both our kits and fully assembled products. For kits, before requesting warranty service, you should fully complete the assembly, carefully following all instructions in the manual.

Who is covered: This warranty covers the original owner of the Elecraft product as disclosed to Elecraft at the time of order. Elecraft products transferred by the purchaser to a third party, either by sale, gift, or other method, who is not disclosed to Elecraft at the time of original order, are not covered by this warranty. If the Elecraft product is being bought indirectly for a third party, the third party's name and address must be provided at time of order to ensure warranty coverage.

What is covered: During the first year after date of purchase, Elecraft will replace defective or missing parts free of charge (post-paid). We will also correct any malfunction to kits or assembled units caused by defective parts and materials. Purchaser pays inbound shipping to us for warranty repair; we pay shipping to return the repaired equipment to you by UPS ground service or equivalent to the continental USA and Canada. For Alaska, Hawaii, and other destinations outside the U.S. and Canada, actual return shipping cost is paid by the owner.

What is not covered: This warranty does not cover correction of kit assembly errors. It also does not cover misalignment; repair of damage caused by misuse, negligence, or builder modifications; or any performance malfunctions involving non-Elecraft accessory equipment. The use of acid-core solder, water-soluble flux solder, or any corrosive or conductive flux or solvent will void this warranty in its entirety. Also not covered is reimbursement for loss of use, inconvenience, customer assembly or alignment time, or cost of unauthorized service.

Limitation of incidental or consequential damages: This warranty does not extend to non-Elecraft equipment or components used in conjunction with our products. Any such repair or replacement is the customer. Elecraft will not be liable for any special indirect, incidental or consequential damages, including but not limited to any loss of business or profits.

Theory of Operation

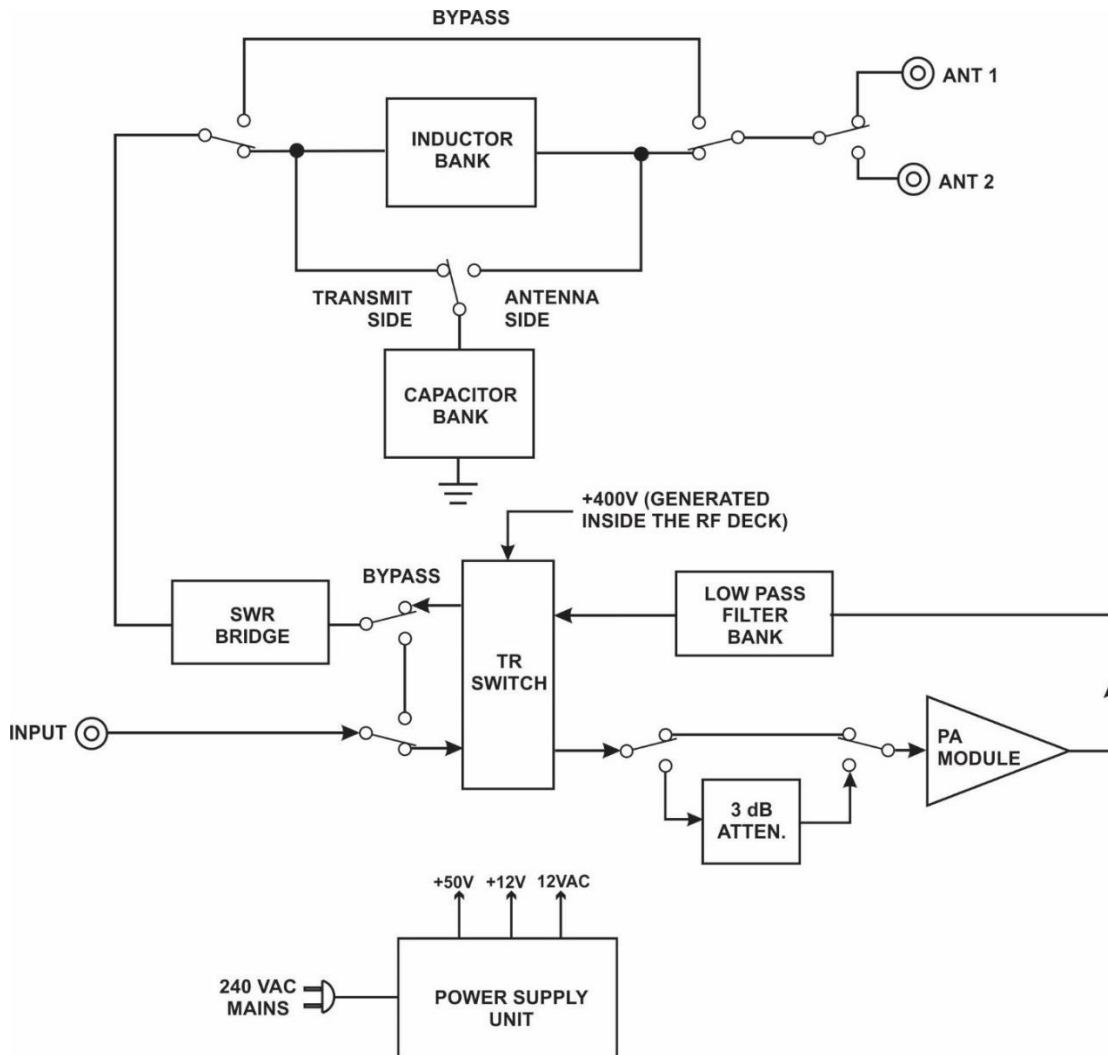


Figure 9. KPA1500 Block Diagram.

Switching

When the KPA1500 is in operate mode, the transmit-receive (TR) switch routes RF from the driving transceiver to the power amplifier (PA) module where it is amplified by a pair of LDMOS (Laterally Diffused metal oxide semiconductor) transistors. The Low Pass Filter Bank contains low pass filters to suppress harmonic energy. The TR switch then routes the high-level RF power to the SWR Bridge.

In receive mode the TR switch connects the input directly to the SWR bridge, bypassing the amplifier circuits entirely. When the power is off the bypass relay performs this function. With power turned off, the INP port is directly connected to the ANT1 port. The ANT2 port is not available for antenna switching with the power turned off.

SWR Bridge and Antenna Tuner Unit (ATU)

RF from the SWR Bridge is sent to the ATU which converts the impedance seen at the antenna connector to a 50 Ω non-reactive load as measured by the standing wave ratio (SWR) bridge.

The ATU uses an “L” matching network with series inductance and shunt capacitance. Combinations of eight capacitors in the Capacitor Bank and seven inductors in the Inductor Bank are switched in by relays to provide

up to 2624 pF of capacitance and up to 8370 nH of inductance. An algorithm operates relays to select the inductors and capacitors required and chooses whether the capacitors are placed on the transmit side or antenna side of the inductors to arrive at a tuning solution for the current operating frequency. This is called a Full Cycle Tune.

When the ATU relays are changing capacitors or inductors, the amplifier circuit is kept in receive mode (RF routed through the TR switch but not the PA module), using only the RF power from the driving transceiver to monitor the SWR.

Control Logic and Fault Conditions

A microcontroller unit (MCU) controls and monitors critical operating conditions. The MCU also controls the ATU functions.

During normal operation, the MCU performs the following functions:

- When a key line low is sensed, the amplifier is switched into transmit mode if no fault conditions are present, the input signal is not in the 26 to 28 MHz range and an ATU tune operation is not underway.
- When RF drive is applied, the frequency is measured and the correct low pass filter is switched into the signal path.
- The KPA1500 exchanges band data with the Elecraft K3 or K3S and automatically selects the proper low pass filter, enabling rapid band changes. The MCU does not need to detect the frequency input for filter selection.

However, RF frequency sensing does take priority if a tuning solution does not agree with the band data to avoid transmitting into an incorrect filter. The optional KPAK3AUX cable kit is needed to enable this feature, as shown in Figure 5, page 12 or Figure 6, page 13.

Under fault conditions, the MCU protects the amplifier to prevent damage or improper operation. There are three levels of fault conditions (Attenuator, Unauthorized Frequency and Hard), and are triggered by the following conditions:

- A 3 dB attenuator is automatically switched in if excessive the RF drive power is applied or if other conditions occur such as excessive RF output, reflected power (high SWR) or current is drawn by the finals.
- If an unauthorized frequency is transmitted, the KPA1500 switches to standby until RF drive is removed. This fault will automatically reset if a valid frequency is applied.
- When a fault condition is detected, the TR switch is inhibited so no RF power reaches the PA module. If RF drive is high enough to possibly damage the TR switch, the amplifier is switched to bypass, protecting the TR switch.

The amplifier is always switched to STBY during hard faults. A hard fault requires operator action to reset the amplifier.

Tuning Solutions Memory

To facilitate very rapid frequency changes, tuning solutions are stored in memory and recalled when returning to that frequency. Settings are recalled almost instantly when returning to that frequency later.

The entire spectrum from 1.8 through 60 MHz is divided into frequency segments and tuning information is stored for each segment in which you have successfully completed a tune operation. Memory is allocated for 31 tune solutions per frequency segment.

When starting a tune operation for a new frequency segment, the ATU first tries settings in the nearest frequency segments that do have tuning data for the antenna connector in use. See antenna enable and antenna prefer menu entries on page 25.

The Tuning Segments

Since retuning is normally required over a narrower frequency range on the lower frequencies to maintain a low SWR, the lower frequencies have narrower segments assigned as follows:

- Below 3 MHz the segments are 10 kHz wide.
- From 3 MHz through 26 MHz the segments are 20 kHz wide.
- From 26 MHz to 38 MHz the segments are 100 kHz wide.
- From 38 MHz to 60 MHz the segments are 200 kHz wide.

The center frequencies for each segment are listed in the Appendix.

Amplifier Cooling

Three fans cool the RF deck heat sink. To minimize noise, the fans remain off until the heat sink reaches 60°C. At that temperature, the center fan begins rotating at its lowest speed. As the temperature increases in steps of 5°C, the outer fans start at their lowest speed, then all fans increase together.

The external power supply provides 50 VDC, 12 VDC, and 12 VAC to the amplifier.

AUX and XCVR Serial Connector Interfaces

⚠ Do not attach a common VGA cable to the AUX connector.

When used with the optional KPAK3AUX cable kit, the AUX connector provides an interface for enhanced operation between the KPA1500 and a K3 or K3S transceiver.

This section describes how to interface the KPA1500 to non K3 or K3S transceivers, including the K2 and rigs made by other manufacturers. There are two interfaces on the KPA1500: The AUX port, described above and the XCVR SERIAL port.

The XCVR Serial port provides RS232 level data for other transceivers such as the Elecraft K2 and some Kenwood, Yaesu and Icom transceivers.

Below are the signals available at the AUX connector.

Refer to the *RADIO* entry in the menu (page 25) to enable communications via the AUX connector.

KPA1500 AUX Connector Pinout (DE-15 Male)

Signal Name	Pin	Direction	Notes
Band VRef (Icom)	1	In	Reference for Icom input
AuxBus I/O	2	Out	K3/K3s
Band1 In	3	In	BCD Band Input – Bit 1*
NC	4		
GND	5		
Band V (Icom)	6	In	Uses Icom standard band voltages
Alarm Out	7	Out	Drives low for fault input Not used by K3/K3S. Must not be connected to K3/K3S.
Power On/Off	8	In	Pulse low to turn KPA on or off – do not hold low!
Band2 In	9	In	BCD Band Input – Bit 2*
Key	10	In	Low enables amplification. Internally pulled up to +5V. Sources 1 mA when pulled to ground. Diode isolated from the KEY IN RCA jack.
Inhibit#	11	In	Low inhibits amplifier operation
GND	12		
Band0 In	13	In	BCD Band Input – Bit 0*
Band3 In	14	In	BCD Band Input – Bit 3*
ALC	15	Out	ALC output to transceiver

*See page 39 for the BCD band codes used.

Details of AUX Connector wiring cables for popular transceivers are shown on the following pages.

Elecraft KPAK3AUX Interface Cable

This is available direct from the Elecraft Sales department (page 33): Order KPAK3AUX for the complete set:

- KPAK3AUX Cable, 59.5” (1.5 m) long. May be ordered separately. Order E850463.
- 15-pin Y cable that allows access to the K3 or K3S AUX port for other devices. May be ordered separately. Order E980190.
- 15-pin male-female Key Line Interrupter.

KPAK3AUX cable wiring. Pins not shown have no connection.

KPA1500 AUX CONN. Pin	K3 AUX CONN. Pin	Signal
2	2	AUXBUS
3	3	BAND 1
5	5	GND
9	9	BAND 2
10	10	PTT (See Note)
11	11	Inhibit
12	12	GND
13	13	BAND0
14	14	BAND3
15	15	ALC (Optional, see page17)

Notes:

1. If you have devices that need access to the PTT Line (e.g. an external ATU, SteppIR controller, etc.), use the key line interrupter supplied with your KPAK3AUX cable set. The interrupter breaks the Key line (pin 10) so you can use the separate KEY IN cable routed through external equipment, see Figure 6, page 13.
2. Pin 4 is not used but the wire is included in the KPAK3AUX cable.

Icom Transceiver Interfacing

Various models of Icom radios use either a 13-pin DIN or an 8-pin DIN connector. Be sure to use the connector that is correct for your radio. Pins not shown have no connection. Check with Elecraft Customer Support or (www.elecraft.com) for radios that are directly supported with an Elecraft cable.

KPA1500 AUX CONN. Pin	Icom DIN13 CONN. Pin	Icom DIN7 CONN. Pin	Signal
1	1	1	8V REFERENCE
5	2	2	GND
6	5	4	BAND VOLTAGE (NOT CI-V)
10	3	3	HSEND
15	6	5	ALC (OPTIONAL, SEE PAGE17)

The XCVR SERIAL connector is configured for CI-V protocol, and the KPA1500 accepts frequency messages from the Icom exciter in its CI-V “transceive” mode to switch bands and select ATU settings on in-band QSY.

The transceiver's CI-V speed (typically 4800 bits/second) must match the *SERIAL SPEED XCVR* menu item. The KPA1500 does not send to an Icom radio via CI-V.

Elecraft provides a cable (E980229) for use with CI-V. Check with Elecraft Customer Support for radios that are directly supported with an Elecraft cable.

To set up an Icom CI-V system follow these steps:

1. Connect a 1/8" (3.5mm) cable from the Icom Remote jack to the KPA1500 XCVR SERIAL jack.
2. On the KPA1500, enter the *MENU* and select:
 - a. *RADIO = SERIAL*
 - b. *SERIAL SPEED XCVR = 4800*
3. On the Icom radio, set it for:
 - a. CI-V baud rate = 4800
 - b. CI-V Transceive = ON
 - c. CI-V Output = ON
 - d. Note: No CI-V address is required for use with the KPA1500.

Icom Band Voltage System

Some Icom radios provide an 8V fixed band reference voltage and a variable band voltage, scaled to the band reference voltage. If the band reference voltage is far from 8V, band voltage is ignored.

This band voltage scheme does not provide unique voltages for each band. KPA1500 chooses 7, 21 and 28 MHz when there is ambiguity. For this reason (and ATU recall by frequency segment within a band), a CI-V connection is preferable for Icom frequency information. Note: The internal frequency counter will override these voltages to select the proper band should there be a conflict.

The band voltages accepted are:

Voltage	Band
0-1 V	10 MHz
1-2 V	50 MHz
2-3 V	24 or 28 MHz
3-4 V	18 or 21 MHz
4-5 V	14 MHz
5-6 V	5 or 7 MHz
6-7 V	3.5 MHz
7-8 V	1.8 MHz

While it is supported for legacy Icom products, Elecraft does not recommend the Icom Band Voltage System primarily because it does not distinguish between the 5, 18 and 24 MHz bands.

XCVR SERIAL Cable

The XCVR SERIAL jack is a (tip, ring, sleeve or TRS) 3.5mm serial port. Via the *RADIO* menu item, it is programmed to operate in either *ICOM* or *SERIAL* Mode.

When the KPA1500 is configured for *ICOM* Mode, it operates as a 2-terminal CI-V compatible port that works with Icom and some TenTec transceivers:

Tip = Data, Ring = No connection and Sleeve = Ground.

When configured in *SERIAL* mode, it is a TTL-level serial port:

Tip = TX DATA, Ring = RX DATA and Sleeve = Ground

SERIAL Mode is compatible with KX2, KX3, FlexRadio and many Kenwood transceivers that respond to IF; FA; FB; FT; polls with frequency and VFO information.

For a KX2 or KX3, make a cable with 3.5mm plugs on each end. Cross over tip to ring as shown in Figure 10.

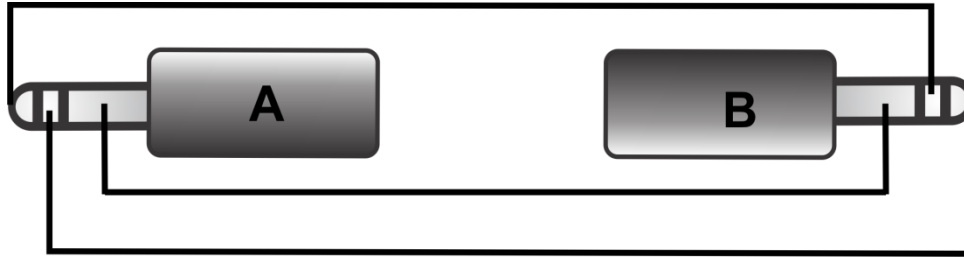


Figure 10. Serial Data 3.5mm Cross-Over Cable for KX2 and KX3.

3.5mm Plug A	3.5mm Plug B
Tip	Ring
Ring	Tip
Sleeve	Sleeve

For transceivers using DE-9 connectors, use a female DE-9 connector and a two-wire + shield cable to a 3.5mm phone plug into the KPA1500 XCVR SERIAL connector.

DE-9 Pin	Function	KPA1500 3.5mm Plug
2 (RXD)	Radio sends to KPA1500	Tip
3 (TXD)	KPA1500 sends to radio	Ring
5 (GND)	Ground	Sleeve
7 (RTS)	Request to send (RTS) Jumper to Pin 8 (CTS)	N/C
8 (CTS)	Clear to send (CTS) Jumper to Pin 7 (RTS)	N/C

Choose *SERIAL* and turn off *RADIO POLL* if you are using an unsupported radio.

TUNE Cable

The KPA1500 TUNE port is a 3.5mm TRS jack that supports automatic antenna tune requests from Icom radios.

Tip = RF Request Output, Ring = Start Tune Input, Sleeve = Ground.

Several Icom transceivers have an AUTO TUNE switch intended to control an Icom AH-4 Antenna Tuner. The same AUTO TUNE switch can be used to start a KPA1500 ATU TUNE operation.

For Icom radios, a cable with a 4-pin Molex to 3.5mm TRS plug is required. The Molex plug connects to the transceiver's rear-panel "Tuner Control" socket and the other end plugs into the TUNE jack on the KPA1500 rear panel.

With this connection, the KPA1500 provides a "AH4 KEY" logic level to cause the Icom transceiver to generate steady RF carrier for ATU tuning. When tuning completes, the KPA1500 removes the "AH4 KEY" level to unkey the Icom transceiver, putting the KPA1500 in standby Mode.

⚠ Important! This cable implements the use of the Icom transceiver TUNE button on many of their transceivers. However, you must train the tuner using 10 to 50 W first before using it. See the *Train the Tuner* section on page 19.

Molex to Icom XCVR	Signal	3.5mm TRS to KPA1500 TUNE	2.1mm Coaxial Power Connector
Pin 1 (angled)	KEY is an open collector transistor output, normally pulled up by the transceiver. Low means "key down."	Tip	No Connection
Pin 2	START, pulled up to +5V by the KPA1500, low means "start."	Ring	No Connection
Pin 3	+12V DC	N/C	Center
Pin 4	Ground	Sleeve	Outer shell

ⓘ NOTE: This cable is not available from Elecraft. It can be purchased from DX Engineering as their part IC-PAC-6.

CW Key Tune Cable

The KPA1500 TUNE jack may be used with non-Icom radios by connecting the tip to the CW Key input of your radio. Grounding the ring terminal initiates a tune cycle. Figure 11, page 42 shows how to make this cable.

The amplifier's ATU TUNE switch or an *ATU HiSWR* retune can cause the K3 and most other transceivers to provide Tune Power for the duration of the ATU tuning operation. This works automatically in CW mode.

Enable the radio's CW-In-SSB-Mode feature to allow this to also work in single sideband mode. This is accomplished in the K3 and K3S by accessing the *CONFIG* menu, selecting *CW WGHT* and tapping the numeric keypad 1 to select SSB +CW.



Figure 11. CW Key Tune Cable.

Signal	3.5mm TRS to KPA1500 Tune	1/4" Phone Plug to HAND KEY IN
Key	Tip	Tip
Ring	N/C	N/C
Ground	Sleeve	Sleeve

Yaesu Transceivers

Some Yaesu radios provide band information using BCD data. The BAND0 thru BAND3 BCD values in Yaesu transceivers are also used by the K3.

Although various models of Yaesu radios use either DIN8/262 or a MiniDIN8 connector, the pin connections are the same. Pins not shown have no connection. See the table below.

Check with Elecraft Customer Support (support@elecraft.com) for radios that are directly supported with an optional Elecraft cable.

KPA1500 AUX CONN. Pin	Yaesu CONN. Pin	Signal
3	5	Bit 1
5	3 & 8	GND Note: Yaesu pin 8 must be grounded or TX is inhibited.
9	6	Bit 2
10	2	Key
13	4	Bit 0
14	7	Bit 3

BCD Interface

The following are the band codes used by the KPA1500:

Band (Meters)	Bit 3 (Pin 14)	Bit 2 (Pin 9)	Bit 1 (Pin 3)	Bit 0 (Pin 13)
60m	0	0	0	0
160m	0	0	0	1
80m	0	0	1	0
40m	0	0	1	1
30m	0	1	0	0
20m	0	1	0	1
17m	0	1	1	0
15m	0	1		1
12m	1	0	0	0
10m	1	0	0	1
6m	1	0	1	0

Kenwood Transceivers

Kenwood transceivers that respond to IF; FA; FB; FT; polls with frequency and VFO information can be interfaced via the KPA1500 XCVR SERIAL interface.

Use the XCVR SERIAL jack and a 3.5mm TRS plug for the KPA1500 side. Set the KPA1500 *RADIO* menu item to *SERIAL* Mode.

Tip = TX DATA, Ring = RX DATA and Sleeve = Ground. See Figure 10, page 40.

Check with Elecraft Customer Support (support@elecraft.com) for radios that are directly supported with an Elecraft cable.

Flex Transceivers

Currently, all the Flex 6000 series radios are supported with an Elecraft KXUSB cable. Check with Elecraft Customer Support (support@elecraft.com) for radios that are directly supported.

In Case of Difficulty

Problem	Action
No Power Top green LED Off	Check line cord is connected to live 200-250 VAC outlet Power supply rear panel switch/circuit breaker in the ON (up) position
Power Supply HV LED Red or Off	Make sure both high current red/black and DA-15 multi-wire umbilical power cables are firmly connected to both Power Supply and RF deck, then press power button on front of RF deck. The large-gauge cable connectors are Anderson PowerPole connectors. They must be fully seated. Two clicks are heard and felt when installing the connectors. Make sure they are fully seated with two noticeable clicks. 50V supply has faulted. Turn off power (front panel RF Deck switch) and wait until red LED has extinguished. Turn power back on. If amplifier still does not work, turn off main power switch (rear panel of power supply). Wait 30 seconds. Turn on Power Supply main power switch. Press RF Deck front panel power switch to on.
LV LED Off	Reseat 15-pin cable at both the Power Supply and RF Deck. Ensure both ends are tightened and fully seated.
Power supply Lights OK, RF Deck Not On	Press RF Deck front panel power switch. Check both power cables. If using a K3 or K3s remotely: Verify 12V DC OUT to KPA1500 REM cable is firmly plugged in. Cycle power on the K3 or K3s.
<i>50V FAULT</i> Displayed on LCD	Make sure the 75A PowerPole connectors are firmly installed. Listen for two “clicks” verifying a reliable electrical connection is made.
<i>12V FAULT</i> Displayed on LCD	Verify the DA-15 Control Cable is firmly installed on both Power Supply and RF Deck. Tighten thumbscrews fully.
No Amplification	Amplifier should be in OPER mode Verify the KEY IN signal line is connected and the red TX LED on the RF Deck is illuminated. Confirm coax cable is connected between driving transmitter/transceiver and KPA1500 RF IN.
ATU IN and ATU BYP LEDs Both ON	Indicates the antenna selected has low SWR and the best ATU setting is “BYPassed.” This is normal.
OVR LED On	Indicates an Attenuator Fault has occurred. Reduce drive from transmitter.
FAULT LED On	Indicates an unsafe operating condition has occurred and the amplifier has switched offline. Review text displayed in the LCD for specific fault and take appropriate action. Bring up the KPA1500 Utility to inspect the Fault Log. This will provide details on what the KPA1500 saw when it determined the Fault condition.

Appendix A—KPA1500 Tuner Frequency Segments

KPA1500 Amateur Band ATU Segment Center Frequencies

	<i>Frequencies in MHz</i>									
10 kHz Segments	1.805	1.815	1.825	1.835	1.845	1.855	1.865	1.875	1.885	1.895
	1.905	1.915	1.925	1.935	1.945	1.955	1.965	1.975	1.985	1.995
20 kHz Segments	3.510	3.530	3.550	3.570	3.590	3.610	3.630	3.650	3.670	3.690
	3.710	3.730	3.750	3.770	3.790	3.810	3.830	3.850	3.870	3.890
	3.910	3.930	3.950	3.970	3.990					
*See 60 m note below	5.250	5.270	5.290	5.310	5.330	5.350	5.370	5.390	5.410	5.430
	5.450	5.470	5.490							
	7.010	7.030	7.050	7.070	7.090	7.110	7.130	7.150	7.170	7.190
	7.210	7.230	7.250	7.270	7.290					
**See 30 m note below	10.110	10.130								
	14.010	14.030	14.050	14.070	14.090	14.110	14.130	14.150	14.170	14.190
	14.210	14.230	14.250	14.270	14.290	14.310	14.330			
	18.070	18.090	18.110	18.130	18.150					
	21.010	21.030	21.050	21.070	21.090	21.110	21.130	21.150	21.170	21.190
	21.210	21.230	21.250	21.270	21.290	21.310	21.330	21.350	21.370	21.390
	21.410	21.430								
	24.890	24.910	24.930	24.950	24.970	24.990				
	28.050	28.150	28.250	28.350	28.450	28.550	28.650	28.750	28.850	28.950
	29.050	29.150	29.250	29.350	29.450	29.550	29.650			
100 kHz Segments										
200 kHz Segments	50.100	50.300	50.500	50.700	50.900	51.100	51.300	51.500	51.700	51.900
	52.100	52.300	52.500	52.700	52.900	53.100	53.300	53.500	53.700	53.900

*Band allocations on 60m vary widely. The segment center frequencies shown above are not necessarily legal for transmission. For example, US operation is restricted to "channels" on 5.332, 5.348, 5.3585, 5.373, and 5.405 MHz at time of publication.

**30M, 10.100-10.150 MHz: 200W PEP max. for USA amateurs.

KPA1500 ATU Segment Center Frequencies–All Segments

	Center Frequencies in MHz				Amateur Band Frequencies Shown in Red						
10kHz Segments	1.505	1.515	1.525	1.535	1.545	1.555	1.565	1.575	1.585	1.595	
	1.605	1.615	1.625	1.635	1.645	1.655	1.665	1.675	1.685	1.695	
	1.705	1.715	1.725	1.735	1.745	1.755	1.765	1.775	1.785	1.795	
	1.805	1.815	1.825	1.835	1.845	1.855	1.865	1.875	1.885	1.895	
	1.905	1.915	1.925	1.935	1.945	1.955	1.965	1.975	1.985	1.995	
	2.005	2.015	2.025	2.035	2.045	2.055	2.065	2.075	2.085	2.095	
	2.105	2.115	2.125	2.135	2.145	2.155	2.165	2.175	2.185	2.195	
	2.205	2.215	2.225	2.235	2.245	2.255	2.265	2.275	2.285	2.295	
	2.305	2.315	2.325	2.335	2.345	2.355	2.365	2.375	2.385	2.395	
	2.405	2.415	2.425	2.435	2.445	2.455	2.465	2.475	2.485	2.495	
	2.505	2.515	2.525	2.535	2.545	2.555	2.565	2.575	2.585	2.595	
	2.605	2.615	2.625	2.635	2.645	2.655	2.665	2.675	2.685	2.695	
	2.705	2.715	2.725	2.735	2.745	2.755	2.765	2.775	2.785	2.795	
2.805	2.815	2.825	2.835	2.845	2.855	2.865	2.875	2.885	2.895		
2.905	2.915	2.925	2.935	2.945	2.955	2.965	2.975	2.985	2.995		
20 kHz Segments	3.010	3.030	3.050	3.070	3.090	3.110	3.130	3.150	3.170	3.190	
	3.210	3.230	3.250	3.270	3.290	3.310	3.330	3.350	3.370	3.390	
	3.410	3.430	3.450	3.470	3.490	3.510	3.530	3.550	3.570	3.590	
	3.610	3.630	3.650	3.670	3.690	3.710	3.730	3.750	3.770	3.790	
	3.810	3.830	3.850	3.870	3.890	3.910	3.930	3.950	3.970	3.990	
	4.010	4.030	4.050	4.070	4.090	4.110	4.130	4.150	4.170	4.190	
	4.210	4.230	4.250	4.270	4.290	4.310	4.330	4.350	4.370	4.390	
	4.410	4.430	4.450	4.470	4.490	4.510	4.530	4.550	4.570	4.590	
	4.610	4.630	4.650	4.670	4.690	4.710	4.730	4.750	4.770	4.790	
	4.810	4.830	4.850	4.870	4.890	4.910	4.930	4.950	4.970	4.990	
	5.010	5.030	5.050	5.070	5.090	5.110	5.130	5.150	5.170	5.190	
	*See 60m note below	5.210	5.230	5.250	5.270	5.290	5.310	5.330	5.350	5.370	5.390
		5.410	5.430	5.450	5.470	5.490	5.510	5.530	5.550	5.570	5.590
5.610		5.630	5.650	5.670	5.690	5.710	5.730	5.750	5.770	5.790	
5.810		5.830	5.850	5.870	5.890	5.910	5.930	5.950	5.970	5.990	
6.010		6.030	6.050	6.070	6.090	6.110	6.130	6.150	6.170	6.190	
6.210		6.230	6.250	6.270	6.290	6.310	6.330	6.350	6.370	6.390	
6.410		6.430	6.450	6.470	6.490	6.510	6.530	6.550	6.570	6.590	
6.610		6.630	6.650	6.670	6.690	6.710	6.730	6.750	6.770	6.790	
6.810		6.830	6.850	6.870	6.890	6.910	6.930	6.950	6.970	6.990	
7.010		7.030	7.050	7.070	7.090	7.110	7.130	7.150	7.170	7.190	
7.210		7.230	7.250	7.270	7.290	7.310	7.330	7.350	7.370	7.390	
7.410		7.430	7.450	7.470	7.490	7.510	7.530	7.550	7.570	7.590	
7.610		7.630	7.650	7.670	7.690	7.710	7.730	7.750	7.770	7.790	
7.810	7.830	7.850	7.870	7.890	7.910	7.930	7.950	7.970	7.990		
8.010	8.030	8.050	8.070	8.090	8.110	8.130	8.150	8.170	8.190		
8.210	8.230	8.250	8.270	8.290	8.310	8.330	8.350	8.370	8.390		

*Band allocations on 60m vary widely. The segment center frequencies shown above are not necessarily legal for transmission. For example, US operation is restricted to "channels" on 5.332, 5.348, 5.3585, 5.373, and 5.405 MHz at time of publication.

Center Frequencies in MHz**Amateur Band Frequencies Shown in Red**

	8.410	8.430	8.450	8.470	8.490	8.510	8.530	8.550	8.570	8.590
	8.610	8.630	8.650	8.670	8.690	8.710	8.730	8.750	8.770	8.790
	8.810	8.830	8.850	8.870	8.890	8.910	8.930	8.950	8.970	8.990
	9.010	9.030	9.050	9.070	9.090	9.110	9.130	9.150	9.170	9.190
	9.210	9.230	9.250	9.270	9.290	9.310	9.330	9.350	9.370	9.390
	9.410	9.430	9.450	9.470	9.490	9.510	9.530	9.550	9.570	9.590
	9.610	9.630	9.650	9.670	9.690	9.710	9.730	9.750	9.770	9.790
	9.810	9.830	9.850	9.870	9.890	9.910	9.930	9.950	9.970	9.990
**See 30m note below	10.010	10.030	10.050	10.070	10.090	10.110	10.130	10.150	10.170	10.190
	10.210	10.230	10.250	10.270	10.290	10.310	10.330	10.350	10.370	10.390
	10.410	10.430	10.450	10.470	10.490	10.510	10.530	10.550	10.570	10.590
	10.610	10.630	10.650	10.670	10.690	10.710	10.730	10.750	10.770	10.790
	10.810	10.830	10.850	10.870	10.890	10.910	10.930	10.950	10.970	10.990
	11.010	11.030	11.050	11.070	11.090	11.110	11.130	11.150	11.170	11.190
	11.210	11.230	11.250	11.270	11.290	11.310	11.330	11.350	11.370	11.390
	11.410	11.430	11.450	11.470	11.490	11.510	11.530	11.550	11.570	11.590
	11.610	11.630	11.650	11.670	11.690	11.710	11.730	11.750	11.770	11.790
	11.810	11.830	11.850	11.870	11.890	11.910	11.930	11.950	11.970	11.990
	12.010	12.030	12.050	12.070	12.090	12.110	12.130	12.150	12.170	12.190
	12.210	12.230	12.250	12.270	12.290	12.310	12.330	12.350	12.370	12.390
	12.410	12.430	12.450	12.470	12.490	12.510	12.530	12.550	12.570	12.590
	12.610	12.630	12.650	12.670	12.690	12.710	12.730	12.750	12.770	12.790
	12.810	12.830	12.850	12.870	12.890	12.910	12.930	12.950	12.970	12.990
	13.010	13.030	13.050	13.070	13.090	13.110	13.130	13.150	13.170	13.190
	13.210	13.230	13.250	13.270	13.290	13.310	13.330	13.350	13.370	13.390
	13.410	13.430	13.450	13.470	13.490	13.510	13.530	13.550	13.570	13.590
	13.610	13.630	13.650	13.670	13.690	13.710	13.730	13.750	13.770	13.790
	13.810	13.830	13.850	13.870	13.890	13.910	13.930	13.950	13.970	13.990
	14.010	14.030	14.050	14.070	14.090	14.110	14.130	14.150	14.170	14.190
	14.210	14.230	14.250	14.270	14.290	14.310	14.330	14.350	14.370	14.390
	14.410	14.430	14.450	14.470	14.490	14.510	14.530	14.550	14.570	14.590
	14.610	14.630	14.650	14.670	14.690	14.710	14.730	14.750	14.770	14.790
	14.810	14.830	14.850	14.870	14.890	14.910	14.930	14.950	14.970	14.990
	15.010	15.030	15.050	15.070	15.090	15.110	15.130	15.150	15.170	15.190
	15.210	15.230	15.250	15.270	15.290	15.310	15.330	15.350	15.370	15.390
	15.410	15.430	15.450	15.470	15.490	15.510	15.530	15.550	15.570	15.590
	15.610	15.630	15.650	15.670	15.690	15.710	15.730	15.750	15.770	15.790
	15.810	15.830	15.850	15.870	15.890	15.910	15.930	15.950	15.970	15.990
	16.010	16.030	16.050	16.070	16.090	16.110	16.130	16.150	16.170	16.190
	16.210	16.230	16.250	16.270	16.290	16.310	16.330	16.350	16.370	16.390
	16.410	16.430	16.450	16.470	16.490	16.510	16.530	16.550	16.570	16.590
	16.610	16.630	16.650	16.670	16.690	16.710	16.730	16.750	16.770	16.790
	16.810	16.830	16.850	16.870	16.890	16.910	16.930	16.950	16.970	16.990
	17.010	17.030	17.050	17.070	17.090	17.110	17.130	17.150	17.170	17.190
	17.210	17.230	17.250	17.270	17.290	17.310	17.330	17.350	17.370	17.390
	17.410	17.430	17.450	17.470	17.490	17.510	17.530	17.550	17.570	17.590
	17.610	17.630	17.650	17.670	17.690	17.710	17.730	17.750	17.770	17.790
	17.810	17.830	17.850	17.870	17.890	17.910	17.930	17.950	17.970	17.990
	18.010	18.030	18.050	18.070	18.090	18.110	18.130	18.150	18.170	18.190

****30M, 10.100-10.150 MHz: 200W PEP max. for USA amateurs.**

	Center Frequencies in MHz				Amateur Band Frequencies Shown in Red					
	18.210	18.230	18.250	18.270	18.290	18.310	18.330	18.350	18.370	18.390
	18.410	18.430	18.450	18.470	18.490	18.510	18.530	18.550	18.570	18.590
	18.610	18.630	18.650	18.670	18.690	18.710	18.730	18.750	18.770	18.790
	18.810	18.830	18.850	18.870	18.890	18.910	18.930	18.950	18.970	18.990
	19.010	19.030	19.050	19.070	19.090	19.110	19.130	19.150	19.170	19.190
	19.210	19.230	19.250	19.270	19.290	19.310	19.330	19.350	19.370	19.390
	19.410	19.430	19.450	19.470	19.490	19.510	19.530	19.550	19.570	19.590
	19.610	19.630	19.650	19.670	19.690	19.710	19.730	19.750	19.770	19.790
	19.810	19.830	19.850	19.870	19.890	19.910	19.930	19.950	19.970	19.990
	20.010	20.030	20.050	20.070	20.090	20.110	20.130	20.150	20.170	20.190
	20.210	20.230	20.250	20.270	20.290	20.310	20.330	20.350	20.370	20.390
	20.410	20.430	20.450	20.470	20.490	20.510	20.530	20.550	20.570	20.590
	20.610	20.630	20.650	20.670	20.690	20.710	20.730	20.750	20.770	20.790
	20.810	20.830	20.850	20.870	20.890	20.910	20.930	20.950	20.970	20.990
	21.010	21.030	21.050	21.070	21.090	21.110	21.130	21.150	21.170	21.190
	21.210	21.230	21.250	21.270	21.290	21.310	21.330	21.350	21.370	21.390
	21.410	21.430	21.450	21.470	21.490	21.510	21.530	21.550	21.570	21.590
	21.610	21.630	21.650	21.670	21.690	21.710	21.730	21.750	21.770	21.790
	21.810	21.830	21.850	21.870	21.890	21.910	21.930	21.950	21.970	21.990
	22.010	22.030	22.050	22.070	22.090	22.110	22.130	22.150	22.170	22.190
	22.210	22.230	22.250	22.270	22.290	22.310	22.330	22.350	22.370	22.390
	22.410	22.430	22.450	22.470	22.490	22.510	22.530	22.550	22.570	22.590
	22.610	22.630	22.650	22.670	22.690	22.710	22.730	22.750	22.770	22.790
	22.810	22.830	22.850	22.870	22.890	22.910	22.930	22.950	22.970	22.990
	23.010	23.030	23.050	23.070	23.090	23.110	23.130	23.150	23.170	23.190
	23.210	23.230	23.250	23.270	23.290	23.310	23.330	23.350	23.370	23.390
	23.410	23.430	23.450	23.470	23.490	23.510	23.530	23.550	23.570	23.590
	23.610	23.630	23.650	23.670	23.690	23.710	23.730	23.750	23.770	23.790
	23.810	23.830	23.850	23.870	23.890	23.910	23.930	23.950	23.970	23.990
	24.010	24.030	24.050	24.070	24.090	24.110	24.130	24.150	24.170	24.190
	24.210	24.230	24.250	24.270	24.290	24.310	24.330	24.350	24.370	24.390
	24.410	24.430	24.450	24.470	24.490	24.510	24.530	24.550	24.570	24.590
	24.610	24.630	24.650	24.670	24.690	24.710	24.730	24.750	24.770	24.790
	24.810	24.830	24.850	24.870	24.890	24.910	24.930	24.950	24.970	24.990
100 kHz Segments	28.050	28.150	28.250	28.350	28.450	28.550	28.650	28.750	28.850	28.950
	29.050	29.150	29.250	29.350	29.450	29.550	29.650	29.750	29.850	29.950
	30.050	30.150	30.250	30.350	30.450	30.550	30.650	30.750	30.850	30.950
	31.050	31.150	31.250	31.350	31.450	31.550	31.650	31.750	31.850	31.950
	32.050	32.150	32.250	32.350	32.450	32.550	32.650	32.750	32.850	32.950
	33.050	33.150	33.250	33.350	33.450	33.550	33.650	33.750	33.850	33.950
	34.050	34.150	34.250	34.350	34.450	34.550	34.650	34.750	34.850	34.950
	35.050	35.150	35.250	35.350	35.450	35.550	35.650	35.750	35.850	35.950
	36.050	36.150	36.250	36.350	36.450	36.550	36.650	36.750	36.850	36.950
	37.050	37.150	37.250	37.350	37.450	37.550	37.650	37.750	37.850	37.950
200 kHz Segments	38.100	38.300	38.500	38.700	38.900	39.100	39.300	39.500	39.700	39.900
	40.100	40.300	40.500	40.700	40.900	41.100	41.300	41.500	41.700	41.900
	42.100	42.300	42.500	42.700	42.900	43.100	43.300	43.500	43.700	43.900
	44.100	44.300	44.500	44.700	44.900	45.100	45.300	45.500	45.700	45.900
	46.100	46.300	46.500	46.700	46.900	47.100	47.300	47.500	47.700	47.900
	48.100	48.300	48.500	48.700	48.900	49.100	49.300	49.500	49.700	49.900

Center Frequencies in MHz

Amateur Band Frequencies Shown in Red

50.100	50.300	50.500	50.700	50.900	51.100	51.300	51.500	51.700	51.900
52.100	52.300	52.500	52.700	52.900	53.100	53.300	53.500	53.700	53.900
54.100	54.300	54.500	54.700	54.900	55.100	55.300	55.500	55.700	55.900
56.100	56.300	56.500	56.700	56.900	57.100	57.300	57.500	57.700	57.900
58.100	58.300	58.500	58.700	58.900	59.100	59.300	59.500	59.700	59.900