Introducing KPA1500 Firmware Version 3: ATU Solution Recall

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KPA1500 now has operator-initiated antenna tuner (ATU) solutions recall—before transmitting.

Overview

The KPA1500 amplifier's new ATU antenna numbering feature enables rapid selection of preconfigured impedance-matching settings for multiple antennas, ensuring optimal performance before transmitting. Up to 32 different ATU matches on each frequency segment may be stored, allowing antenna changes while operating on a given frequency, without manually retuning the ATU. These settings are recalled via either a front-panel button tap or by utilizing data commands from an automated antenna switch.

Amateur stations that have multiple antennas per band benefit from enhanced flexibility and performance. However, varying impedances between the antennas may require distinct ATU settings. The KPA1500 has always accommodated different settings for each frequency segment for the two physical antenna ports (ANT1 and ANT2). Firmware version 3 introduces the ability to name and recall settings for multiple antennas connected to a single antenna connector, improving capability for operators using more complicated antenna configurations.

In modes like CW and digital, the KPA1500's automatic ATU recall feature (ATU HiSWR Retune) performs reliably. In SSB mode, variable output power may cause inaccurate Standing Wave Ratio (SWR) readings, triggering unnecessary retuning. The new Antenna Number feature allows operators to manually or automatically select the correct ATU setting, bypassing SWR-triggered retuning and ensuring immediate full-power transmission. Operators using this system generally recommend disabling the older ATU HiSWR retune feature.

Benefits

- **Rapid Antenna Switching**: Selects ATU settings for several antenna numbers per band segment in milliseconds, without transmitting.
- **Consistent Performance**: Maintains matched impedance across antennas with varying SWR profiles, delivering full 1500W output.
- **Simplified Operation**: Reduces the need for manual retuning and reduces delays, ideal for contesting.
- **Flexible Configurations**: Supports multiple operating locations or conditions (e.g., home station, portable setup, or weather-dependent antenna impedances).
- **Automation Compatibility**: Allows control by smart antenna switches (user supplied) for seamless ATU recall when changing antennas. The antenna switch controller must be able to send a ^AN command to a KPA1500.

Configuration Instructions

To enable and configure the extended antenna number feature, follow these steps using *KPA1500 Utility* software A transceiver providing frequency data (for example, Elecraft K3/K4 via AUX cable, or other transceivers via USB or XCVR serial port) provides best results.

1. **Update Software/Firmware:**
    - Update KPA1500 Utility. Use version 1.25.7.17 or later.
    - Back-up your KPA1500 configuration. Menu configuration settings are reset to factory defaults when upgrading to version 3 or reverting from version 3 to a version earlier than 3.00. ATU settings are not lost.
    - Update KPA1500 firmware. Antenna Number enabling of antennas 3 through 32 is

available in KPA1500 versions 3.00 and later.

- Review configuration settings in the KPA1500 front panel MENU and KPA1500 Utility Edit Configuration tab. Re-enter your desired customizations.

2. **Set ATU Mode**:
   - Open the KPA1500 Utility.
   - Navigate to the **Configuration, Edit Configuration, ATU MODE SWITCH** tab and set *ATU MODE SWITCH* to *Per-Band Per-Antenna*.
3. **Enable New Antenna Numbers**:
   - Using KPA1500 Utility **Configuration, Edit Configuration,** select the **ANT Enable V3** tab. Edit the boxes, changing the "D" (Disabled) to the desired KPA1500 rear-panel SO-239 antenna connector (1 or 2). This screen will not appear unless KPA1500 firmware has been updated to version 3 or later.
   - Save the configuration changes.
   - Select the **ANT Grid** tab and verify your choices. The **ANT Grid** screen is view-only.
   - Enable only the Antenna Numbers needed. This minimizes manual selection time.

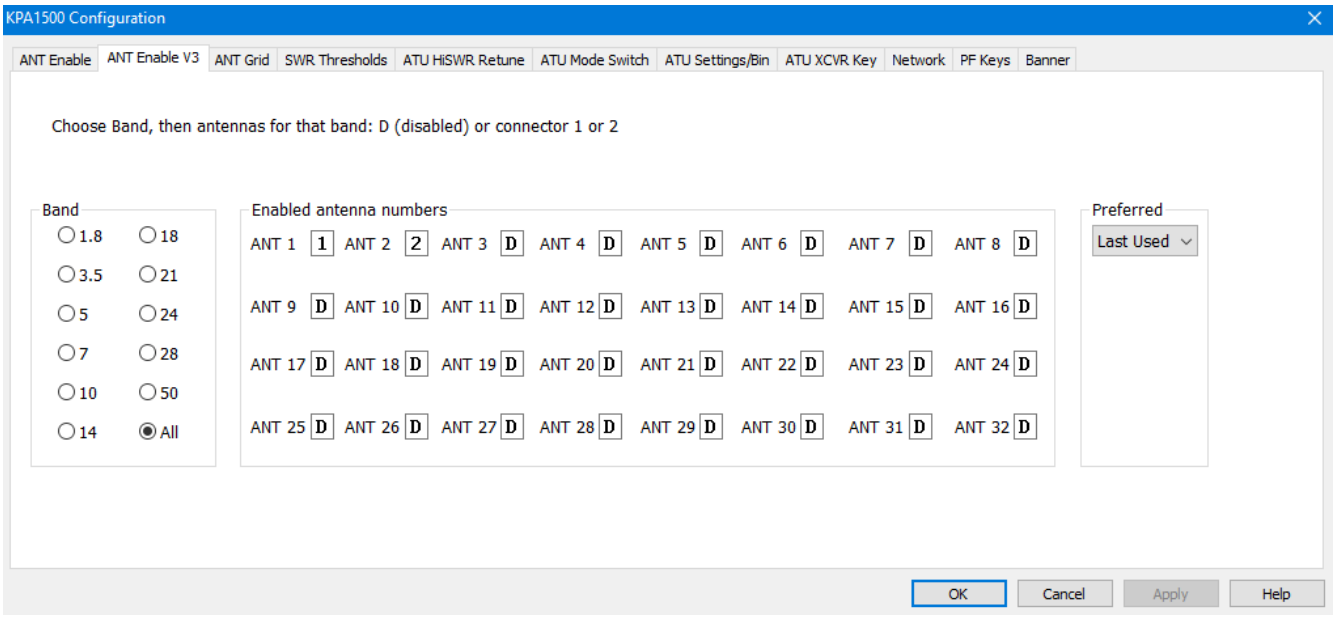

Figure 1. Default ANT Enable screen.

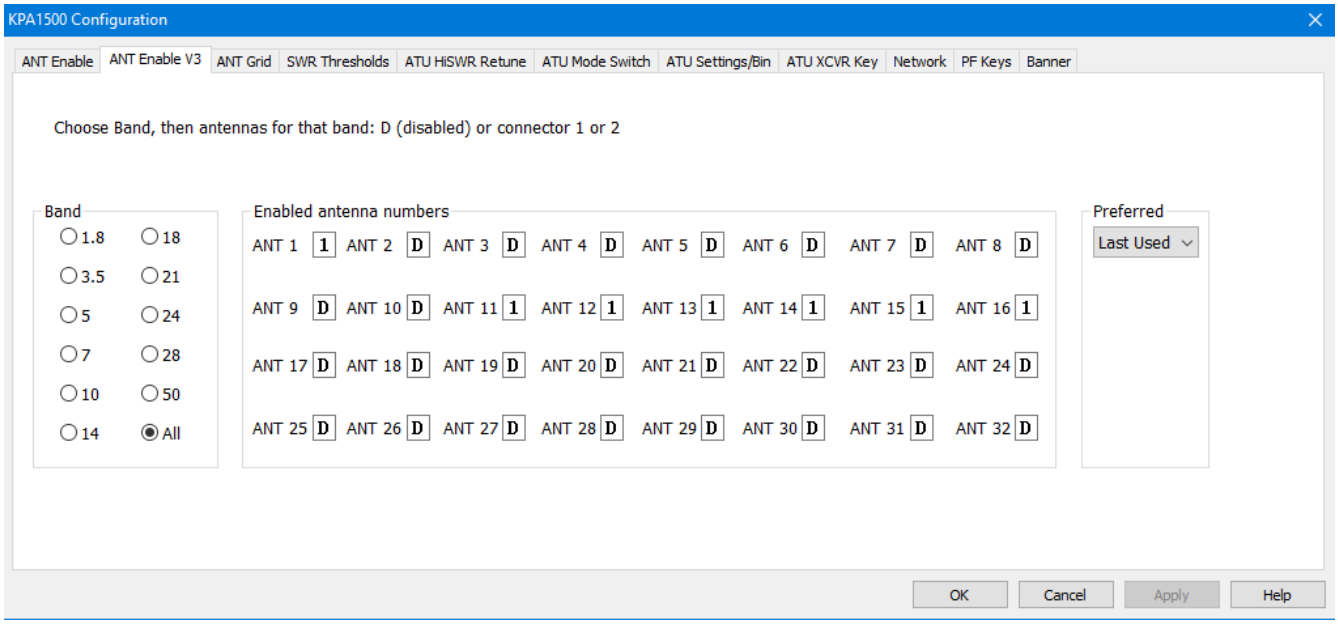

Figure 2. Enable antennas 11 – 16. Disable physical (SO-239) jack ANT 2.

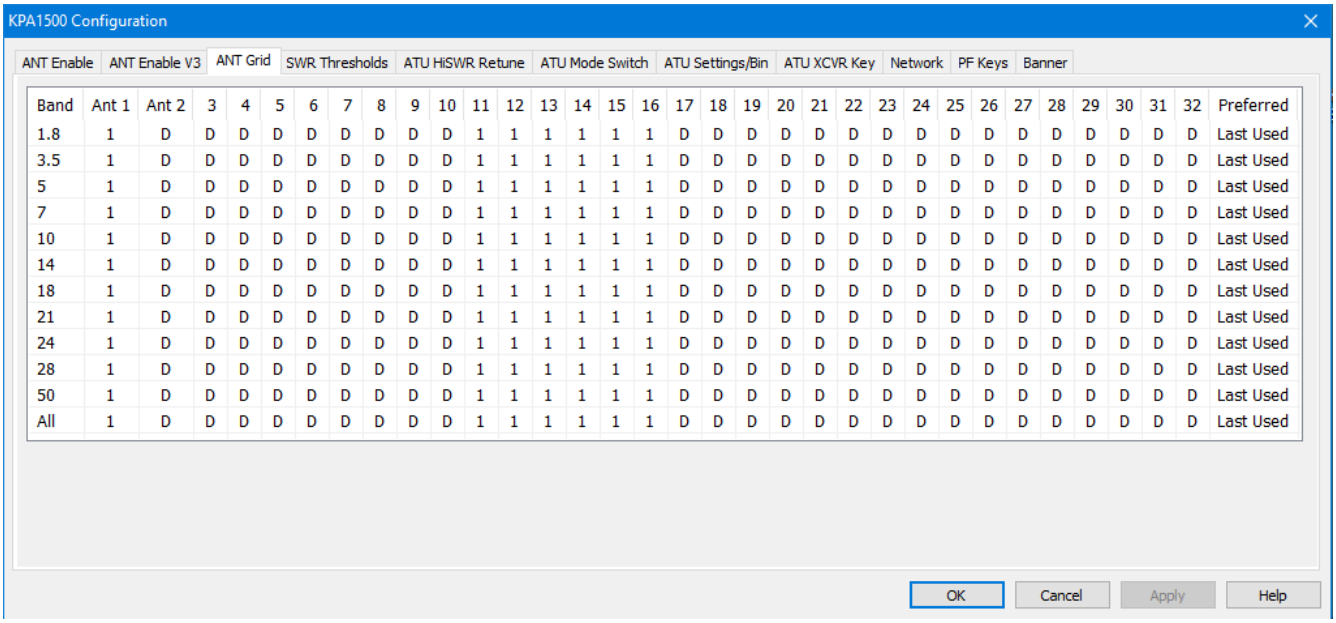

Figure 3. KPA1500 ANT Grid display. (Read-only)

4. **Train the ATU**:
    - Connect the desired physical antenna via an external switch.
    - Select the corresponding antenna number using the front-panel *ANTENNA* button or KPA1500 Utility's *OPERATE* tab.
    - Set the KPA1500 to *STBY* mode.
    - Transmit at 40–100 W in the middle of each band's frequency segments (see **KPA1500 Owner's Manual,** Appendix A) and tap ATU tune in each segment.
    - Continue transmitting until *TUNE COMPLETE* appears on the LCD.
    - Repeat for each Antenna Number and band.

5. **Optional: Configure Full Automation**:
    - Use a smart antenna switch to automatically select antennas.
    - The smart antenna switch sends the Antenna Number command via Ethernet, USB, or XCVR serial port. For example, for ANT12:
      `^AN12;`
    - For serial communication using the KPA1500 XCVR port):
        - Set *XCVR SERIAL HOST* to *Enable* in KPA1500 Utility or front-panel menu.
        - Configure *SERIAL SPEED XCVR* (e.g., 38400 bps). For example, a Raspberry Pi Pico microcontroller sends serial data (9600 bps, 8N1, inverted, at 3.3V) to the tip terminal of the XCVR port.
6. **Transceiver Power Settings**:
    - For Elecraft K3/K4, set *POWER SET* to *PER BAND*.
    - Adjust drive levels to achieve 1500W output.

Use Cases

1. **Multi-Antenna Operation**:
    - Scenario: A station has four 20m antennas (monoband Yagi, dipole, G5RV, and tribander) with varying SWR profiles.
    - Solution: Assign each antenna a unique antenna number (such as ANT 3–ANT 6). Select the appropriate antenna via the *ANTENNA* button or automation. The ATU immediately applies the correct setting, enabling full-power transmission. The KPA1500 momentarily displays both the antenna number and the rear panel SO-239 connector number.
2. **Contesting**:
    - Scenario: During a contest, an operator switches between a Yagi (ANT 3) pointed at Europe and a tribander (ANT 4) for South America.
    - Solution: Tap the KPA1500 front panel *ANTENNA* button to select ANT 4, or use a smart switch to automate this selection. The ATU adjusts in milliseconds.
3. **Stack Matching**
    - Scenario: Three-high stack of Yagi antennas. Different combinations may be defined as different antenna numbers, each with a proper match.
4. **Multiple Operating Locations**:
    - Scenario: An operator uses ANT 1 for the home station, ANT 5 for a portable Caribbean setup, and ANT 6 for a secondary QTH.
    - Solution: Train the ATU for each location's antennas. Select the appropriate antenna number upon arrival.
5. **Weather-Dependent Antennas**:
    - Scenario: An antenna's SWR varies between dry (ANT 7) and wet (ANT 8) conditions.
    - Solution: Store separate ATU settings for each condition. Select the antenna number based on weather.

Technical Details

- **Extended Antenna Numbers**: Supports up to 32 antenna numbers.
- **Physical Ports**: Rear panel connector ANT1 is recommended for all antennas to simplify external switching and enable barefoot operation without powering the amplifier.
- **Firmware Requirement**: Version 3.00 or later.
- **Command Reference**: See KPA1500 Programming Reference (version 3 or later) on the Elecraft website for detailed command syntax.
- **Automation Hardware**: A low-cost microcontroller (for example, an Arduino or $4 Raspberry Pi Pico) may send serial commands to automate antenna selection. Example configuration:

- An automated switch chooses the relays required to select an antenna.
- UART port sends 9600 bps `^ANnn;` data to XCVR port for this antenna.
- A single-line connection (TXD to XCVR tip terminal) suffices for one-way communication. The KPA1500 accepts either 3.3V or 5V serial data. (Note that the data may need polarity inversion if driven directly from the microcontroller output).

Example Configuration

For a station with fixed antennas pointing to different azimuths (such as toward the South Pacific, Japan, South America):

- Assign antennas ANT11–ANT14 to directions 1–4.
- Program a microcontroller to send commands (e.g., `^AN11;`) when selecting the South Pacific direction (antenna switch position 1). Switch position 2 sends `^AN12;`
- On 20m, ANT11 might use a Yagi; on 160m, a vertical. The KPA1500 applies the ATU setting based on frequency and antenna number.

Notes

- Enable only necessary antenna numbers to streamline manual selection via the *ANTENNA* button.
- Without automation, use the front-panel *ANTENNA* button to cycle through enabled antenna numbers, monitoring the LCD for confirmation.
- Each antenna number may be used for different physical antennas across bands. For example, ANT03 will store settings for several different antennas–perhaps a different antenna on each band. (such as an 80m dipole, a 20m Yagi and a 15m monobander). Actual ATU settings are stored and recalled based on transmit frequency and antenna number.
- Back up your KPA1500 configuration before updating the firmware to Version 3. Configuration settings (such as Power ON > Operate) must be redone after the new firmware is installed. It is possible to downgrade to 2.x firmware and restore a version 2 backup, if necessary (version 3 settings will also be lost upon a firmware downgrade to a version earlier than 3.00).
- ANT1 may be disabled or assigned to connector ANT1. ANT2 may be disabled or assigned to connector ANT2. ANT1 may not be assigned to connector ANT2, nor ANT2 assigned to connector ANT1. At least one of ANT1 and ANT2 must be enabled. Assignments may be made globally or on a per-band basis.

This configuration ensures the KPA1500 delivers consistent, full-power performance across various antenna setups, enhancing operational efficiency for both competitive and casual use.