KPA1500 Programming Reference

Revised 10/28/2019 for firmware version 02.34. Please report errors to support@elecraft.com.

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Overview

KPA1500 commands and their responses use the ASCII character set. Commands are sent to the KPA1500 via its "Host PC" USB connector, which incorporates a USB-to-serial adapter, and appears as a serial port to a Host PC. Use 4800, 9600, 19200, 38400, 57600, 115200, or 230400 bit/s, 8 data bits, one stop bit, and no parity. There is no automatic flow control; pace commands by waiting for responses. The *KPA1500 Utility* discovers the Host PC speed by sending a few null commands (semicolons) at each speed until a response is received. You can change the KPA1500 "Host PC" speed with the **^BRP** command, or the **SERIAL SPEED HOST** menu item.

The KPA1500 rear panel XCVR SERIAL connector is normally used for transceiver connection. It may be repurposed to be an additional "host" that accepts this same serial command set. The "Host PC" USB connector must be used to install KPA1500 firmware. See the **XCVR SERIAL HOST** menu item and the **^XH** command description below.

A TCP server at port 1500 accepts the same serial command set. The default port number may be changed with **^CP** or the *KPA1500 Utility* Edit Configuration "Network" tab.

Beginning with firmware version 01.84, a UDP server is also available. It uses the same port # as the TCP server (although these ports are independent). Send only one command at a time with UDP, starting with a caret, end with a semicolon. The UDP server accepts one input message, runs one command, and generates at most one response message.

Beginning with firmware version 02.24, the amplifier sends **^ON0;** on the USB host and to a TCP client when the amplifier is switched off.

The Host PC USB connector, XCVR SERIAL HOST, a single TCP client , and several UDP clients may be concurrently connected.

Command Format

KPA1500 commands are either GET or SET.

GET commands are used to retrieve information from the KPA1500; information is returned in a RESPONSE message.

SET commands are used to change the KPA1500's internal state or to initiate an action. SET commands do not generally result in a RESPONSE message. SET can be followed by GET to verify the SET. In a few cases, a SET is followed by a delayed response (e.g., an ATU tune operation).

Each command and response begin with a leading caret (**^**) and end with a terminating semicolon (**;**). For example, to ask the KPA1500 for its serial number, send GET command **^SN;** The KPA1500 responds with its serial number, e.g., **^SN00123;**

After sending a GET command, you should generally wait for the corresponding RESPONSE before sending more commands. There is no flow control, and the KPA1500 input buffer size is limited. Long strings of SET commands should be broken up with a GET and wait for response.

Commands may be entered in UPPER, lower, or MiXeD case. **^RV; ^rv;** and **^rV;** are equivalent. RESPONSEs are, with one exception, returned in UPPER case. The boot block responds to **^I;** in lower case "kpa1500".

Commands must be entered as shown. Don't add spaces or omit leading zeros. The position of the semicolon relative to the leading caret is used in validity checking and to discriminate between various forms of a command.

Band Number

Several commands apply to the "current" band, or may apply to a specified band, shown as **bb**. The band numbers are from the **^BN;** command, also used by Elecraft's K-line and KX-line transceivers:

bb	Band name
00	160 meters (1.8 MHz)
01	80 meters (3.5 MHz)
02	60 meters (5 MHz)
03	40 meters (7 MHz)
04	30 meters (10.1 MHz)
05	20 meters (14 MHz)
06	17 meters (18.068 MHz)
07	15 meters (21 MHz)
08	12 meters (24.89 MHz)
09	10 meters (28 MHz)
10	6 meters (50 MHz)

Antenna Number

The KPA1500 has antenna connectors ANT1 and ANT2. Some commands use antenna number 0 to mean "both antenna connectors", or "the other antenna connector", or "the most recently used antenna connector".

Using *KPA1500 Utility* to Test Commands

The *KPA1500 Utility* Command Tester tab can be used to try individual commands. Try typing **^RV;** in the input area. The command and its response are shown on the output area.

Using PuTTY

Other terminal emulators may also be used. *PuTTY* (from www.putty.org) is sometimes used in development. Choose the *PuTTY* option that adds a CR when a LF is received, as the KPA1500 sends NL rather than CR-LF to separate lines of a multi-line response.

Wakeup

When the KPA1500 is plugged in and the power supply rear-panel switch is on, the KPA1500 may appear to be "on" or "off". When "off", the main power supplies are switched off, but one small unswitched supply remains on. The microcontroller stays in a low-power "sleep" state, responsive to the power button, a REMOTE back panel voltage, an ACC connector pull-down, or arrival of characters on the Host PC USB connector. The main power supply may be turned on by sending **^ON1;** via the USB Host. When the amplifier is "off", the USB connection may lose a character or two while waking, so precede **^ON1;** with a few semicolons until the KPA1500 responds.

Ethernet Wake on LAN support was added in firmware version 01.66. The required "magic packet" is a 102-byte UDP packet, to any port, containing 6 bytes of 0xFF, followed by 16 copies of the amplifier's 6-byte MAC address. See the **NET MAC** menu item.

Commands and responses

; Null

GET format: **;**   (a single semicolon)
RESPONSE format: **;**   (a single semicolon)

The *KPA1500 Utility* sends a few semicolons to determine the KPA1500 serial speed during a connection sequence and to wake up a sleeping KPA1500.

^AA ATU Mode Switch

GET format: **^AA;**
SET/RESPONSE format: **^AA0;** for "global", **^AA1;** for "per band, per antenna".

As you change antennas and bands, ATU MODE can remain the same for all bands and all antennas ("global"), or ATU MODE can be independently set for each combination of band and antenna ("per-band, per-antenna").

Some owners may prefer the KPA1500 ATU bypassed when using a separately-tuned antenna (such as *SteppIR*) on some bands. The ATU should be inline on other bands and antenna connectors.

Others prefer that the ATU not change between BYP and IN as bands and antennas are changed.

ATU Mode Switch can also be changed with the **ATU MODE SWITCH** menu item.

^AB ATU Settings Per Bin (current band), new in 01.52

GET format: **^AB;**
SET/RESPONSE format: **^ABnn;** where **nn** is the number of ATU settings per bin. **nn** is between 1 and 31.

ATU Settings Per Bin determines how many ATU Settings are stored for each frequency segment (bin) and should be related to the number of antennas in use on a given band. There is storage enough for 31 distinct ATU settings (shared by both antenna connectors), but you may want fewer settings retained to avoid searching "stale" ATU settings.

^AB ATU Settings Per Bin (specified band), new in 01.52

GET format: **^ABbb;** where **bb** is the band number (see **^BN**).
SET/RESPONSE format: **^^ABbbnnn;** where **bb** is the band number, and **nnn** is the number of ATU settings per bin for that band, a value between 001 and 031. Leading zeros are required.

^AB ATU Settings Per Bin (all bands), new in 01.52

GET format: **^ABAB;**
SET/RESPONSE format: **^ABAB 31 31 31 31 02 31 31 31 31 02 01;**

Each of 11 bands (160 thru 6 meters) has an ATU settings per bin value, between 1 and 31. Leading zeros are not required.

^AD Attenuator Reason

GET format: **^AD;**
RESPONSE format (e.g.): **^AD PA CURRENT;**

The KPA1500 inserts an input attenuator in response to transient overload conditions. The **^AD** response shows the reason the attenuator was most recently deployed. The response is **NONE** if the attenuator has not been deployed since the amplifier was last turned on.

This reason may also be viewed on the **ATTENUATE REASON** LCD status page.

Use **^AS** or its synonym **^OC** to see the current overdrive code.

^AE Antenna Enable (current band)

GET format: **^AE;**
SET/RESPONSE format: **^AE0;** (both Antenna 1 and 2) **^AE1;** (Antenna 1) or **^AE2;** (Antenna 2).

You may wish to use just one antenna connector for some bands and have both antenna connectors available for other bands. Antenna Enable chooses which antenna connector(s) are available.
This setting can be changed with the **ANTENNA ENABLE** menu item.

^AE Antenna Enable (specified band)

GET format: **^AEbb;** where **bb** is the band number (see **^BN**).
SET/RESPONSE format: **^AEbb0; ^AEbb1;** or **^AEbb2;**

You may wish to use just one antenna connector for some bands but have both antenna connectors available for other bands. Antenna Enable chooses which antenna connectors are available by band.

Examples: Enable both antennae on 20 meters: **^AE050;**
Enable Ant1 and disable Ant2 for 15 meters: **^AE071;**
This setting can be changed with the **ANTENNA ENABLE** menu item.

^AE Antenna Enable (all bands)

GET format: **^AEAB**;   **AB** is "All Bands"
SET/RESPONSE format: **^AEAB01201201201;**
Eleven digits, for 160-6 meters.

^AI ATU Inline

GET format: **^AI;**
SET/RESPONSE format: **^AI1;** if ATU is currently inline, **^AI0;** if ATU is currently bypassed.

Gets or sets the ATU bypass relays, without changing the ATU mode. Sometimes the ATU mode is Inline, but the current ATU setting is bypassed. This happens when you perform a search tune and the SWR of the antenna without the ATU is sufficiently low (see **^STS**, the SWR stop threshold). When the ATU Mode (**^AM;**) is inline and the current ATU setting (**^AI;**) is bypassed, both ATU LEDs are illuminated.

^AL Automatic Level Control Threshold (current band)

GET format: **^AL;**

SET/RESPONSE format: **^ALnnn;** where **nnn** is the threshold value 000 through 255.

This setting can be changed with the **ALC THRESHOLD** menu item.

^AL Automatic Level Control Threshold (specified band)

GET format: **^ALbb;** where **bb** is the band number (see **^BN**).

SET/RESPONSE: **^ALbbnnn;** where **nnn** is the threshold value 000 through TBD (probably 210 or 255).

This setting can be changed with the **ALC THRESHOLD** menu item

^AL Automatic Level Control Threshold (all bands)

GET format: **^ALAB;**

SET/RESPONSE format: **^ALAB 000 010 020 030 040 050 060 070 080 090 100;**

Eleven 1- to 3-digit ALC thresholds, between 0 and 255, for bands 160-6 meters. SET does not require leading zeros.

^AM ATU Mode (current band and current antenna)

GET format: **^AM;**

SET/RESPONSE format: **^AMI;** or **^AMB;** ("**I**nline" or "**B**ypassed")

Selects the ATU MODE, either "**I**nline" or "**B**ypassed".

^AM interacts with the ATU Mode Switch ("global" or "per band, per antenna"), see the **^AA** command. When ATU Mode Switch is "global", ATU MODE changes by **^AM** are "global".

This setting can also be changed by holding the **ATU MODE** button on the KPA1500 front panel.

^AM ATU Mode (specified band and antenna)

GET format: **^AMbba;** where **bb** is a band number, and **a** is the antenna number: 1, 2, or 0 for both 1 and 2.

SET/RESPONSE format: **^AMbbaI;** or **^AMbbaB;** ("**I**nline" or "**B**ypassed")

^AM ATU Mode (all bands, specified antenna)

GET format: **^AMABa;** where **a** is the antenna number: 1, or 2.

SET/RESPONSE format: **^AMABaBBBBBIIIIBBBBBIII;** where "**I**" is "inline" and "**B**" is "Bypassed". There are eleven I or B, for 160 thru 6 meters.

^AN Antenna Select

GET format: **AN;**

SET/RESPONSE format: **ANa;** where **a** is the antenna number, 1, or 2.

^AN0; changes to the next enabled antenna (a toggle between 1 and 2 if both are enabled).
This setting can be changed by tapping the **ANTENNA** button on the KPA1500 front panel.

^ANa; does not switch to a disabled antenna (see **^AE** above).

^AP Preferred Antenna (current band)

GET format: **^AP;**

SET/RESPONSE format: **^APa;** where **a** is antenna number 0, 1 or 2.

Some stations have usable antennas on both ANT 1 and ANT2. This setting indicates which of these antennas to choose when switching to a new band. Antenna number 0 indicates "last used", the antenna in use when the KPA1500 last left this band.

This setting can also be changed with the **ANTENNA PREFER** menu item.

^AP Preferred Antenna (specified band)

GET format: **^APbb;** where **bb** is the Band Number.

SET/RESPONSE format: **^APbba;** where **a** is antenna number 0, 1 or 2.

^AP Antenna Preferred (all bands)

GET format: **^APAB;**   **AB** is "All Bands"

SET/RESPONSE format: **^APAB01201201201;**   11 digits for bands 160 to 6 meters.

^AR Attenuator Release Time

GET format: **^AR;**

SET/RESPONSE format: **^ARnnnn;** where **nnnn** is the release delay in milliseconds, 1400 to 5000. This is rounded to tenths of a second, so **^AR1449;** is interpreted as **^AR1400;**

The overdrive attenuator is released a short period after the overdrive condition is removed. This setting adjusts that short period. This setting can be changed with the **ATTEN RELEASE** menu item.

^AS Attenuator Status

GET format: **^AS;**

RESPONSE format: **^AShh;** where **hh** are two hex digits representing the reason the overdrive attenuator is deployed. **^AS** is a synonym for **^OC**, see the **^OC** command for details.

^BC Band Change Standby

GET format: **^BC;**

SET/RESPONSE format: **^BC0;** to indicate no Mode change on band change, or **^BC1;** to switch to STBY on band change.

This setting can be changed with the **BANDCHANGE->STBY** menu item.

^BN Band Number

GET format: **^BN;**

SET/RESPONSE format: **^BNbb;** where **bb** is a value from the table below.

The band numbers are the same as K3S/K3 band numbers.

bb	Band name
00	160 meters (1.8 MHz)
01	80 meters (3.5 MHz)
02	60 meters (5 MHz)
03	40 meters (7 MHz)
04	30 meters (10.1 MHz)
05	20 meters (14 MHz)
06	17 meters (18.068 MHz)
07	15 meters (21 MHz)
08	12 meters (24.89 MHz)
09	10 meters (28 MHz)
10	6 meters (50 MHz)

Bands may also be changed by pressing one of the **BAND** buttons on the KPA1500 front panel.

^BP Button Press

SET format: **^BPTnn**; for tap, **^BPHnn;** for hold.

Simulates a KPA1500 front panel button press. **nn** is a button identifier from the table below:

Button ID	Button label
03	Status
11	Tap: MENU Hold: EDIT
19	UP arrow to right of LCD
02	DOWN arrow to right of LCD
07	Band 1.8 (160 meters)
20	AUX
15	Band 3.5 (80 meters)
23	Band 5 (60 meters)
06	Band 7 (40 meters)
14	Band 10 (30 meters)
22	Band 14 (20 meters)
05	Band 18 (17 meters)
13	Band 21 (15 meters)
21	Band 24 (12 meters)
04	Band 28 (10 meters)
12	Band 50 (6 meters)
10	Tap: RESET Hold: INFO
18	Tap: MODE Hold: PF1
01	Tap: ANTENNA Hold: PF2
09	Tap: ATU TUNE Hold: ATU MODE
24	ON (use **^ON** to turn amp on and off)

^BRP USB Serial Speed

GET format: **^BRP;**

SET/RESPONSE format: **^BRPn;** where **n** is a value from the table below:

n	bits per second
0	4800
1	9600
2	19200
3	38400
4	57600
5	115200
6	230400

The KPA1500 rear panel USB connector, intended for connection to a "host" computer, incorporates an FTDI USB-to-serial adapter that appears to application programs as a serial port.

^BRX Transceiver Serial Speed

GET format: **^BRX;**

SET/RESPONSE format: **^BRXn;** where n is one of the values from the table above for **^BRP**.

The rear panel 3.5mm TRS jack, labeled XCVR SERIAL, may be used, with a crossover cable, as a serial connection to an Elecraft K2, KX2, or KX3, Kenwood or some Yaesu transceivers that respond to polling with **IF;FB;** or as a receive only "sniffer" on the responses from an exciter to a polling computer program, or as a CI-V connection to an Icom exciter (the **^XI** command).

The rear panel XCVR SERIAL connector may also be repurposed for "host" commands (see the **^XH** command).

^BT Banner Text

GET format: **^BT;**

SET/RESPONSE format: **^BTxxx…xxx;** where xxx…xxx is 0 to 33 characters, 0 to 16 characters for the first line, a new line sequence, and 0 to 16 characters for the second line.

The "Banner" is shown at initial power on and is one of the STATUS pages. It may be used to show a personalized display, i.e. **^BTElecraft KPA1500\n   K6KR;** or **^BT   ELECRAFT\n   KPA1500;**

"New line" may be entered as an ASCII NL character, or the character backslash followed by the character n, as shown above.

^BV Boot Block Version, new in 02.28

GET format: **^BV;**

RESPONSE format: **^BV01.06;** where **01.06** is the version number of the factory-installed permanent boot block firmware. This value is also shown by the BOOT BLOCK VERSION menu item.

^CC Date and Time

GET format: **^CC;**

SET/RESPONSE format: **^CCYY-MM-DDThh:mm:ss;**

Your KPA1500 includes a real-time clock/calendar chip with backup battery intended to provide time stamps for fault log entries. You may set this clock with **^CC.** Use exactly two digits for year, month, day, hours, minutes and seconds, and provide hyphens, uppercase T, and colons exactly as shown. The input format is rigid. Example**: ^CC17-07-31T13:15:00;** for July 31, 2017 at 1:15 PM.

The *KPA1500 Utility* Configuration tab uses this command to set the KPA1500 clock from the Host PC's date & time. Factory setup uses UTC time.

^CF Write pending updates to EEPROM

SET format: **^CF;**

Changes to configuration and calibration and current state are written to EEPROM about once a minute, after band change, and during controlled shutdown. **^CF;** causes any pending updates to be written to EEPROM within a few tens of milliseconds, and then won't write them again for about another minute. **^CF;** is used prior to configuration save to read the most recent configuration, and during configuration restore to avoid overwriting restored configuration before the post-restore reset.

^CO Clock Offset

GET format: **^CO;**

SET/RESPONSE format: **^CC-64;** to **^CC 63;**

Real Time Clock/Calendar chips can sometimes drift slightly, but incorporate a mechanism to trim with an "offset register".

Refer to section 8.78 of the NXP PCF8523 data sheet (https://www.nxp.com/docs/en/data-sheet/PCF8523.pdf) for details. **^CO** sets the "Offset register". MODE 0 is used.

The intended purpose of the Real Time Clock/Calendar is to provide UTC time stamping of fault log entries; a bit of clock drift isn't critical.

^CP TCP/IP Command Server port number

GET format; **^CP;**

SET/RESPONSE format: **^CP nnnn;** where **nnnn** is a TCP/IP port number.

The KPA1500 provides a TCP/IP command server for this command set. **^CP** allows you to change the TCP/IP port number from its default of 1500. Recycle KPA1500 power after changing this address.

The UDP Wake on LAN "magic packet" is accepted on any UDP port.

^CR ATU capacitors

GET format: **^CR;**

SET/RESPONSE format: **^CRhh;** where **hh** are hexadecimal digits indicating the selected capacitors. See http://en.wikipedia.org/wiki/Hexadecimal for a description of this notation.

Examples:

       ^CR00; selects no capacitors.

       ^CRFF; selects all capacitors

       ^CR80; selects only the largest capacitor (1360 pF)

       ^CRC1; selects the largest, second largest, and smallest capacitors. (1360 + 680 + 8.2 pF)

Hex digit	ATU relay number	Capacitance in picofarads
80	K16	1360
40	K15	680
20	K14	330
10	K13	180
08	K12	82
04	K11	39
02	K10	22
01	K9	8.2

ATU capacitors may also be changed with the **ATU CAP** menu item.

^DA Display Current ATU Setting, new in 02.33

GET format: **^DA;**

RESP format: **^DA14000 AN1 Side TX 480 nH (L08) 180 pF (C10) SWR Bypass 1.8;**

^DF Display Stored ATU Settings

GET format: **^DFfffff;** where **fffff** is a frequency in kHz. Leading zeros are not required, e.g., **^DF 1830;**

GET format: **^DF;** without a frequency shows the ATU settings for the most recent ATU frequency.

SET/RESP format: **^DF14000-14019**
AN1 Side TX 480 nH (L08) 180 pF (C10) SWR Bypass 1.8
AN2 BYPASS
AN1 Side TX 340 nH (L06) 39 pF (C04) SWR Bypass 1.8;

ATU settings are grouped into "bins" or "band segments". Each bin, with up to 31 ATU settings, covers 20 kHz on the 20-meter band.

Bin width is 10 kHz on 160 and 80 meters, 100 kHz on 10 meters, 200 kHz on 6 meters, and 20 kHz on the remaining bands 60 through 12 meters. Each band starts at a bin boundary; the first 20-meter bin is 14000-14019, and the center frequency for that bin is 14010.

Each ATU setting consists of an antenna number, the position of the ATU's bypass, side, capacitor and inductor relays, and the Bypass SWR (antenna SWR with ATU bypassed) obtained when the ATU setting was first stored.

In the first response, 480 nH of inductance is represented by ATU inductor relay setting x08 (L08), and 180 pF of capacitance is represented by ATU capacitor relay setting x10 (C10).

Two different antennas were switched (using an external antenna switch) to ANT1: a vertical and a Yagi. ANT2 is connected to a dummy load.

A single antenna may have several ATU settings, stored at different times, perhaps due to antenna impedance changes with weather or direction. These stored ATU settings are the first ATU settings checked in a subsequent "full search" tune. The first stored ATU setting shown is used for "memory recall" tune. The bin is rearranged on full search or ATU HiSWR retune so that the most recently tuned ATU setting is evaluated first.

^DH DHCP Client Enable

GET format**: ^DH;**

SET/RESPONSE format: **^DH0;** or **^DH1;** where x is 0 for disabled and 1 is for enabled.

Enables or disables the TCP/IP DHCP client within your KPA1500. Disable the DHCP client if you wish to provide static IP addresses **(^IP, ^GW, ^NM)**.

Most home internet routers provide a DHCP server, and the KPA1500 DHCP client is normally enabled to obtain an IP address from that DHCP server.

See https://en.wikipedia.org/wiki/Dynamic_Host_Configuration_Protocol for a description of DHCP.

^DM Demonstration Mode

GET format: **^DM;** or **^DMO;**

SET/RESPONSE format: **^DMx;** or **^DMOx;** where **x** is 0 for "normal" and 1 for "demo mode".

AC power at conventions is often insufficient to operate amplifiers at full power. Demo mode keeps the KPA1500 power amplifier bypassed but shows full-range LED and LCD power indications that follow the KEY IN line.

Demo mode may also be changed with the **DEMO MODE** menu item.

^DS Display LCD content

GET format: **^DS;**

RESPONSE format: **^DSFirstLCD Line (new line char) Second LCD line;**

Returns the current content of the LCD screen, consisting of 0 to 16 characters for the first line, then an ASCII NL character (x0A), then 0 to 16 characters for the second line, then a semicolon. If the second line is blank, neither the delimiting NL nor the second line are returned.

^DT Display LCD TEXT, new in 01.53

SET format: **^DTLine 1 text\nLine 2 text;**

Displays the text string on the KPA1500 LCD for about a half second. The LCD shows two lines of 16 characters. "New line" may be entered as an ASCII NL character, or the character backslash followed by the character n, as shown above.

^DT is ignored when there is a current FAULT or OVR LCD message.

^DW Fan Speed Dwell time, new in 02.31

GET format: **^DW;**

SET/RESP format: **^DWnnn;** where **nnn** is the "dwell time" in seconds, from 3 to 255 seconds, default is 6 seconds.

When PA heat sink temperature exceeds any of five temperature thresholds, fan speed increases.

As the heat sink cools, fan speed is reduced when temperature reaches a cool-down threshold and at least "dwell time" seconds have elapsed since the fan speed was last increased. Adjust this value higher if the fan speed changes more quickly than you'd prefer.

There is a corresponding "tech mode" menu item FAN SPEED DWELL for this adjustment.

^EB Erase Bin, new in 01.67

SET format: **^EB fffff;**

Erase ATU settings for the currently selected antenna for frequency **fffff** (in kHz).

Consider saving the KPA1500's configuration, with the *KPA1500 Utility* Save Configuration function, before erasing ATU settings.

Example usage:

Enter **^DF**; to examine bin for 18080 kHz, then **^EB 18080;** to erase the bin, then **^DF;** to examine after erasure.

^DF;
^DF18080-18099
AN1 Side ANT 0 nH (L00) 82 pF (C08) SWR Bypass 1.7
AN1 Side ANT 0 nH (L00) 39 pF (C04) SWR Bypass 1.3;
^EB 18080;
^DF;
^DF18080-18099;

^EC Erase Configuration

SET format: **^ECxyzzy;**

^ECxyzzy; is used to reset the amplifier to factory-fresh configuration settings. **^ECxyzzy;** does not alter the serial number, fault table, wattmeter calibration, or stored ATU settings. ATU memories may be erased with **^EM**. Wattmeter calibration may be changed with **^PJ**.

Consider saving the KPA1500's configuration, with the *KPA1500 Utility* Save Configuration function, before using **^ECxyzzy;** to erase it.

xyzzy is intended to be difficult to enter by mistake, but easy to remember if you've wandered the twisty little passages of Crowther & Woods' *Colossal Cave Adventure*.
https://en.wikipedia.org/wiki/Xyzzy_(computing)

^EM Erase ATU Settings

SET format: **^EMbba;**

Erase ATU settings for antenna **a** on band **bb**. **bb** may be **AB** for "all bands". **a** is 1 for Ant1, 2 for Ant2, or 0 for both Ant1 and Ant2.

Consider saving the KPA1500's configuration, with the *KPA1500 Utility* Save Configuration function, before erasing ATU settings. This command may take a couple of seconds.

The **ATU MEM ERASE** menu item may also be used to erase ATU settings for the currently selected band and antenna.

FA VFO A frequency (on XCVR SERIAL connector)

SET format: **FA000fffffxxx;** where **fffff** is the VFO A frequency in kHz. **xxx** may be any digits.

FA, followed by an 11-digit frequency in Hz, is the response expected from an Elecraft K2, K3, K3S, KX2, KX3, or Kenwood radio when polled with **FA**;

If RADIO TYPE is Serial and RADIO POLL is on (see **^XI**), the KPA1500 sends a string like **IF;FB;** to the attached transceiver about once a second. Responses contain frequency information used to select ATU settings. If the transceiver is in an "auto info" mode, it may not be necessary to poll the radio, as the radio will send IF, FA and FB messages as the transceiver is changed.

Alternatively, if a logging program is polling the radio, and a receive-only "Y" arrangement is fashioned so that the KPA1500 can observe the transceiver's responses, the KPA1500 can adjust ATU settings as the radio frequency is changed. This receive-only "Y" should not connect the TX line of the KPA1500 XCVR SERIAL connector as this would interfere with the logging program's TX.

FB VFO B frequency (on XCVR SERIAL connector)

SET format: **FB000fffffxxx;** where **fffffxxx** is the VFO B frequency in Hz.

See **FA** above. **FA** and **FB** are both helpful, as the KPA1500 needs to choose an ATU setting for the transmit frequency when VFOs are split.

^FC Fan Minimum Speed

GET format: **^FC;**

SET/RESPONSE format: **^FCn;** where **n** is 0 through 5.

The KPA1500's RF deck fan speed is a function of PA heat sink temperature. Normally the fans are off (speed 0), increase speed as temperature rises, and reduce speed as temperature drops. **^FC** sets a minimum speed from 0 (off) to 5 (all fans on at highest speed).

Minimum fan speed may also be adjusted with the **FAN SPEED** menu item.

^FS returns the current fan speed, which may be greater than the **^FC** minimum because of temperature.

^FE Cancel ATU TUNE

SET format: **^FE;**

Once a search tune has been started (with **^FT, ^PB,** or by tapping the front panel ATU TUNE button), the tune needs continuous exciter RF power to find the best ATU tuning solution. **^FE** cancels an in-progress tune. **^TP** may be used to determine if a full-search tune is in progress.

A search tune may also be cancelled by tapping the **ATU TUNE** button on the KPA1500 front panel.

^FL Fault Code

GET format: **^FL;**

RESPONSE format: **^FLhh;** where **hh** are two hex digits representing the current fault.

SET format: **^FLC;** to clear current fault. Temperature faults are cleared by temperature change.
Faults cause the KPA1500 to switch to Mode STBY. **^FLC;** does not change Mode. Faults are also cleared by switching the amplifier to Mode OPER.

Fault code hh	Fault description
00	No fault condition
10	Watchdog Timer was reset
20	PA Current is too high
40	Temperature is too high. Reset by temperature reduction.
60	Input power is too high
61	Gain (ratio of output to input power) is too low
70	Invalid frequency, > 100 kHz outside ham band or 26-28 MHz
80	50V supply voltage is too low or too high
81	5V supply voltage is too low or too high
82	10V supply voltage is too low or too high
83	12V supply voltage is too low or too high
84	-12V supply voltage is too low or too high
85	5V or 400V LPF board supply voltages are not detected
90	Reflected power is too high
91	SWR is very high. This is a quick check for "antenna not connected", about 18:1 SWR.
92	ATU search tune was unable to find an ATU setting whose SWR is less than the ATU NO MATCH SWR
B0	Dissipated power is too high. Dissipated power is PA Current * the 50V supply voltage less the measured RF output power.
C0	Forward power is too high
C1	Forward power is too high for the current ATU setting. The ATU can match some antennas whose SWR is quite high, but RF power must be limited with these settings, as some power is dissipated as heat in ATU components. This forward power limit is determined by evaluating the SWR of the antenna with the ATU in bypass, called "SWR Bypass". The "SWR Bypass" LCD status page shows the power limit for the current SWR Bypass. **^TB** may be used to compute the power limit for an arbitrary SWR.
F0	Gain (ratio of output to input power) is too high

The **^SF** command shows detailed information about the current and prior faults.

^FP Fan Profile, new in 01.87, removed in 01.89

In firmware version 01.87 the fan temperature thresholds for speed up and speed down were changed. **^FP** allowed use of the older fan speeds. **^FP** was removed in 01.89; the new fan temperature thresholds are always used.

GET format: **^FP;**

SET/RESPONSE format: **^FP0;** for the "old" fan speeds, **^FP1**; for the "new" fan speeds. See the release notes for version 01.87 for the detailed speeds.

^FQ Transmit Frequency counter

GET format**: ^FQ;**

RESPONSE format: **^FQfffff;** where **fffff** is the most recent TX frequency count in kHz.

^FQ; may return **^FQ00000;** at power on or after a band switch until a transmission occurs.
The Transmit frequency count may be observed on the **XCVR FREQ** and **TX COUNT** status page.
The TX frequency counter is in increments of 8 kHz.

^FR Frequency

GET format: **^FR;**
RESPONSE/SET format: **^FRfffff;** where **fffff** is the most recent frequency in kHz.

^FR is intended for programs that provide frequency tracking to select ATU memories without requiring transmit. Frequency tracking using the K3S/K3 AUXBUS, Icom CI-V, or Kenwood Auto Info use this technique to inform the KPA1500 of the current TX VFO frequency.

Frequency changes made with **^FR** cause ATU recall tune if the VFO has moved "significantly".

The most recent frequency supplied to the amplifier by a transceiver or program is shown in the **XCVR FREQ** and **TX COUNT** status page.

^FS Current Fan Speed query, new in 01.47

GET format: **^FS;**
RESPONSE format: **^FSn;** where **n** is 0 through 5.

Shows the current fan speed, which may be higher than the minimum fan speed because of temperature.

^FT Start Tune

SET/RESPONSE format: **^FT;**

Starts a full-search tune. When the tune completes or is cancelled, the KPA1500 responds with **^FT;** Full search tune may also be started by tapping the KPA1500 front panel **ATU TUNE** button.

^GW Default Gateway Address

GET format: **^GW;**
SET/RESPONSE format: **^GW 192.168.1.1;**

The default IP address of the router. This address is usually provided by a DHCP server when the KPA1500 connects to a TCP/IP network. See https://en.wikipedia.org/wiki/Default_gateway.
The response is variable length; leading zeros are removed from each octet.
The Gateway Address may also be viewed with the **NET GATEWAY** menu item.

The **^GW;** setter (for static IP) requires that DHCP client be disabled with **^DH0;**

^HS ATU HiSwr Retune (current band)

GET format: **^HS;**
SET/RESPONSE format: **^HS0;** (disabled) or **^HS1;** (enabled)

ATU HiSwr retune causes the ATU to evaluate up to 16 previously stored ATU settings if SWR rises over the SWR Retune threshold (see **^STA** below).

This tune requires continuous RF power from the exciter to complete the ATU tuning cycle.

This not a "full search" tune. Only ATU settings that have been previously found with a full search tune on or near the current frequency are considered. If a suitable ATU setting is not found, the setting with the lowest SWR is used.

A "full search" tune is accomplished by pressing the **ATU TUNE** button or the **^FT** command.

"Memory recall" tunes are performed when the radio changes bands or frequencies, and the most recently stored tuning solution for the new frequency is used. Memory recall tunes do not require exciter power.

ATU HiSWR Retune may be enabled or disabled with the **ATU HiSWR RETUNE** menu item.

ATU HiSwr Retune was changed to per-band in firmware version 01.26.

^HS ATU HiSwr Retune (specified band)

GET format: **^HSbb;** where **bb** is the Band Number.
SET/RESPONSE format: **^HSbb0;** (disabled) or **^HSbb1;** (enabled)**.**

^ HS ATU HiSwr Retune (all bands)

GET format: **^HSAB**;   **AB** is "All Bands"
SET/RESPONSE format: **^HSAB01001101001;** 11 digits (0 or 1) for bands 160 to 6 meters.

^I Identify

GET format: **^I;**

RESPONSE format: **^KPA1500;** or **^kpa1500;**

Identify is used by the *KPA1500 Utility* to verify that it is connecting to a KPA1500, and to determine if the KPA1500 is running in its application program (UPPER case response) or its permanent boot block (lower case response). **^I;** does not require that the main power supply be on.

IF Transceiver Info (on XCVR SERIAL connector)

SET format: **IFffffffffffff*****+yyyyrx*00tmvspb01*;**

KPA1500 uses the response to an **IF** query to determine VFO A frequency, transmit VFO (split indication) and XIT offset to select the ATU setting for the transmit frequency. Consult the Elecraft K2, K3S/K3, KX3, or Kenwood programming references for the detailed format of this message.

^IP Network IP Address

GET format: **^IP;**

SET/RESPONSE format: **^IP 192.168.1.207;**

The network IP address is normally assigned to the KPA1500 by a DHCP server. See https://en.wikipedia.org/wiki/IP_address.

The response is variable length; leading zeros are removed from each octet.

The IP address may also be viewed with the **NET IP ADDRESS** menu item.

The **^IP;** setter (for static IP) requires that DHCP client be disabled with **^DH0;**

For static IP, disable the DHCP client with **^DH0;** and provide dotted octet IP addresses for the KPA1500's IP address with **^IP** subnet mask with **^NM** and Gateway address with **^GW.**

The *KPA1500 Utility* Configuration Edit has a Network tab to set **^DH**, **^IP**, **^GW**, **^NM,** the TCP command server's port address, and Wake on LAN enable.

^LB LCD Backlight

GET format: **^LB;**

SET/RESPONSE format: **^LBnn;** where **nn** is a number from 00 to 50.

This corresponds to the **LCD BACKLIGHT** menu item.

^LC LCD Contrast

GET format: **^LC;**

SET/RESPONSE format: **^LCnn;** where **nn** is a number from 00 to 50.

This corresponds to the **LCD CONTRAST** menu item.

^LI LED Brightness

GET format: **^LI;**

SET/RESPONSE format: **^LInn;** where **nn** is a number from 00 to 50.

This corresponds to the **LCD BRIGHTNESS** menu item.

^LQ LED Query, new in 01.62

Returns the on/off state of the front panel LEDs, for a remote- control program.

GET format: **^LQ;**

RESPONSE format: **^LQppppppppssssmm;** as hex digits in big endian order, where

pppppppp is the LED power bar as a bitmap (x7FFFFFFF is all bits on, x00000001 is the 25W LED),

ssss is the SWR bar as a bitmap (x03FF is all SWR LEDs on, x0003 is SWR 1.0 and 1.1 LEDs on),

mm are the remaining LEDs:

  x80 FAULT

  x40 OVR

  x20 ANT2

  x10 ANT1

  x08 ATU IN

  x04 ATU BYP

  x02 Mode OPER (show Mode STBY if the x02 bit is off)

  x01 TX

Example responses:
```
^LQ00000000000018; (idling, Mode STBY, ANT1, ATU IN)
^LQ00000000000016; (idling, Mode OPER, ANT1)
^LQ0001FFFF000327; (transmitting with 17 of the 31 power bar LEDs lit,
                    SWR 1.0 and 1.1 LEDs, Mode OPER, ANT2, ATU BYP, TX
```

^LR ATU Inductors

GET format: **^LR;**

SET/RESPONSE format: **^LRhh;** where **hh** are hexadecimal digits indicating the selected inductors.

See http://en.wikipedia.org/wiki/Hexadecimal for a description of this notation.

Examples:

      ^LR00; selects no inductors

      ^LR7F; selects all inductors

      ^LR40; selects only the largest inductor (4400 nH)

      ^LR61; selects the largest, second largest, and smallest inductors (4400 + 2100 + 50 nH)

Hex digit	ATU relay number	Inductance (nanohenry)
40	K7	4400 nH (4.4 µH)
20	K6	2100
10	K5	1000
08	K4	480
04	K3	230
02	K2	110
01	K1	50

ATU inductors may be changed with the **ATU IND** menu item.

^LT LED Test

GET format: **^LT;**

SET?RESPONSE format: **^LTx;** where **x** is **0** for disable, **1** for enable test, **2** lights all LEDs. **3**, **4**, and **5** lights just LEDs of a specific color. OPER and STBY LEDs share one I/O pin, so one of these LEDs is on at a time.

^MA MAC (Media Access Control) Address

GET format: **^MA;**

RESPONSE format**: ^MA54:10:EC:14:75:22;**

Displays the media access control (MAC) address, a unique and permanent value assigned by the microcontroller manufacturer. See https://en.wikipedia.org/wiki/MAC_address.

The MAC address may also be viewed by the **NET MAC** menu item and the *KPA1500 Utility* Configuration Edit Network tab.

^NH TX Inhibit Enable

GET format: **^NI;**

SET format: **^NIx**; where **x** is **0** (disabled) to ignore the ACC connector INHIBIT line or **1** (enabled) to use the INHIBIT line to keep the KPA1500 amplifier bypassed.

This may be changed with the **TX INHIBIT** menu item.

^NM Subnet Mask

GET format: **^NM;**

SET/RESPONSE format: **^NM 255.255.255.0;**

Shows the Subnet Mask, normally assigned by DHCP, in dotted octet format. See https://en.wikipedia.org/wiki/Subnetwork.

This may also be viewed with the **NET MASK** menu item

The **^NM;** setter (for static IP) requires that DHCP client be disabled with **^DH0;**

^OC Overdrive Code, new in 01.53

GET format: **^OC;**

RESPONSE format: **^OChh;** where **hh** are two hex digits representing the reason that the overdrive attenuator is switched in (and the OVR LED illuminated). **^OC** and **^AS** are synonyms.

Overdrive codes are a subset of the Fault Codes:

Overdrive code hh	Description
00	No overdrive condition (OVR LED is off)
20	PA current is too high
60	Input power is too high
61	Gain (ratio of output to input power) is too low
80	50V supply voltage is too low or too high
90	Reflected power is too high
91	SWR is very high. This is a quick check for "antenna not connected", about 18:1 SWR.
B0	Dissipated power is too high. Dissipated power is PA Current * the 50V supply voltage less the measured RF output power.
C0	Forward power is too high
C1	Forward power is too high for the current ATU setting. The ATU can match some antennas whose SWR is quite high, but RF power must be limited with these settings, as some power is dissipated as heat in ATU components. This forward power limit is determined by evaluating the SWR of the antenna with the ATU in bypass, called "SWR Bypass". The "SWR Bypass" LCD status page shows the power limit for the current SWR Bypass. **^TB** may be used to compute the power limit for an arbitrary SWR.
F0	Gain (ratio of output to input power) is too high

^ON Switch Main Power Supplies Off or On

GET format: **^ON;**
SET format: **^ON0;** (power off) or **^ON1;** (power on).

Switches the main power supplies off or on. When the main power supply back panel switch is switched on and the amplifier has AC power, a small power supply provides enough current for a "sleeping" microcontroller. The microcontroller "wakes up" when characters arrive on the USB host port when the microcontroller wakes up, it recognizes **^ON1;** and turns on the main power supply. Characters arriving on the XCVR SERIAL port when the microcontroller is asleep do not wake up the amplifier, as some of the circuitry between the XCVR SERIAL port and microcontroller is not powered.

The main power supplies may also be turned on by the front panel ON pushbutton, or by grounding ACC connector pin 8, or supply +12V on the rear panel REMOTE connector, or by receipt of a Wake on LAN packet via Ethernet.

^ON0; is sent to the USB host and the TCP client when the amplifier is switched off (new in 02.24)

^ON GET and SET are available when "sleeping". See the Wakeup section.

^OP Power on Mode (Operate or Standby)

GET format: **^OP;**
SET/RESPONSE format: **^OPx;** where **x** is 0 for Standby or 1 for Operate.

Selects the KPA1500 "mode" when the amplifier is switched on.
This setting may be changed with the **POWER ON MODE** menu item.

^OS Operate or Standby Mode

GET format: **^OS;**
SET/RESPONSE format: **^OSx;** where **x** is **0** for Standby or **1** for Operate.

Mode may also be changed by tapping the front panel **MODE** button.

Starting with firmware version 01.41, transition from STBY to OPER with **^OS1** resets any current fault except the temperature fault, which is reset by cooling.

^PB Start ATU "current bin" tune, new in 01.67

SET format: **^PB;**

^PB starts an ATU retune that searches existing ATU settings for the current frequency and antenna and installs the best setting it can find. The search stops with SWR 1.00 or after trying all the available settings for the current frequency. The ATU SWR STOP threshold does not stop this search.

^PB is intended to help select the best of several nearly identical settings for an antenna whose stored ATU settings may vary depending on weather, direction, or high Q antennas whose best ATU setting varies with frequency within the frequency segment.

^PB may be assigned to a program function key with **^PF**, or the *KPA1500 Utility*, Configuration tab, Edit Configuration, PF Keys.

A search started with **^PB** requires RF power from your transceiver. If you cannot provide RF, the search may be canceled with the **^FE;** command or tap the front panel ATU TUNE button.

^PB was created for evaluation in firmware version 01.67, and first documented in version 02.02.

^PC Power Amplifier Current

GET format: **^PC;**

RESPONSE format: **^PCnnn**; where **nnn** is the power amplifier current in Amperes.

^PD LED Power Decay , new in 02.02

Affects the speed that the power LEDs return to zero after power ceases.

GET format: **^PD;**

SET/RESPONSE format: **^PDnnn**; where **nnn** is a power decay time, between 001 and 255. The useful values seem to be between **^PD016;** and **^PD064;**

The default is **^PD032;**

^PD (and the LED POWER DECAY menu item) affect the speed of the LED power bar decay. A low value, such as **^PD016;** results in a power bar that lingers for almost a second after drive power is removed. A higher value such as **^PD032;** results in a very quick "retreat" from the peak power reading.

^PD is independent of the Peak Hold time established with **^PH;**

^PF Program Function Keys, new in 01.54

GET format: **^PF1;** or **^PF2;**

SET/RESPONSE format: **^PF1cmd1,cmd2,cmd3,cmd4;**

^PF sets or gets a command "macro" string that may be executed when the front panel PF1 (Mode Hold) or PF2 (Antenna Hold) buttons are pressed.

Examples:

^PF1^DT You Pressed PF1;

^PF2^BPT01,^DTANTENNA HOLD\nreplaced by tap;

^PF1^BPT12,^DTMode change;

If you want PF1 (MODE Hold) to be the same as MODE Tap, and PF2 (ANTENNA Hold) to be the same as ANTENNA Tap, use these program function strings:

^PF1^BPT18;

^PF2^BPT01;

Command responses are discarded. Use only SET commands within **^PF** command strings.

Commands are separated by commas, which are replaced with semicolons when the commands are stored.

The sequence of characters '\' followed by 'n' is replaced by an ASCII NL character (x0A).

^PF strings may be up to 127 characters. Extra characters are discarded.

To avoid recursion and loops, commands **^PF, ^BPH01,** and **^BPH18** within program function strings are ignored.

The *KPA1500 Utility* Edit Configuration PF Key tab may be used to read and store these command strings.

^PH Peak Hold time for Power Bar LED and LCD, new in 01.74

The "high water mark" power may be displayed on the LCD and LEDs for a few hundred milliseconds after power ceases.

GET format: **^PH;**

SET/RESPONSE format: **^PHnnnn;** where **nnnn** is the peak hold time in milliseconds, 0100 to 9900. This is rounded to tenths of a second, so **^PH1234;** is interpreted as **^PH1200;** This may also be set with the **PEAK HOLD** menu item.

^PJ Wattmeter Adjustment (current band)

GET format: **^PJ**

SET/RESPONSE format: **^PJnnn;**

nnn is a scaling factor, expressed as a percentage between 080 and 120, nominally 100, to adjust the KPA1500 forward power displayed value to match an external wattmeter.

This setting may also be changed with the **WMTR ADJUST** menu item.

^PJ does not change watt-based power fault limits.

^PJ Wattmeter Adjustment (specified band)

GET format: **^PJbb;** for band **bb**;

SET/RESPONSE format: **^PJbbnnn;** for band **bb**.

nnn is a scaling factor, expressed as a percentage between 080 and 120, nominally 100, to adjust the KPA1500 forward power displayed value to match an external wattmeter.

This setting may also be changed with the **WMTR ADJUST** menu item.

Amplifiers are calibrated at the factory, using a good calibrated wattmeter with a high-power dummy load, with **WMTR ADJUST** set to 100 on each band. Fault thresholds are not influenced by **WMTR ADJUST**.

^PWD Dissipated Power

GET format: **^PWD;**

RESPONSE format: **^PWDnnnn;** where **nnnn** is the dissipated power, in watts.

Dissipated power is the difference between DC power input (PA current times the measured voltage of the 50V DC supply) and the measured RF forward power. This difference is dissipated as heat.

^PWF Forward Power

GET format: **^PWF;**

RESPONSE format: **^PWFnnnn;** where **nnnn** is the forward RF output power in watts.

^PWI Input Power

GET format: **^PWI;**

RESPONSE format: **^PWInnnn;** where **nnnn** is the RF input power in watts.

Input power is shown as 0 whenever the amplifier's PA is bypassed (when in mode STBY, or during ATU tuning).

^PWK Peak Forward Power, new in 01.91

GET format: **^PWK;**

RESPONSE format: **^PWJnnnn;** where **nnnn** is the peak output power shown on the LED display, in watts.
This value decays to zero shortly after forward power ceases, depending on the PEAK HOLD menu item.

^PWR Reflected Power

GET format: **^PWR;**

RESPONSE format: **^PWRnnnn;** where **nnnn** is the reflected RF power, in watts

^RV Firmware Version

GET format: **^RV;**

RESPONSE format: **^RVnn.nn;** For example, **^RV01.23;** means firmware version 1.23 is installed.

^RV is available when the power supply is off (before **^ON1;**)

^RVM Firmware Version

GET format: **^RVM;**

RESPONSE format: **^RVMnn.nn;** For example, **^RVM01.23;** means firmware version 1.23 is installed.

^RVM; is available when the power supply is off (before **^ON1;**)

^SB SWR Bypass

GET format: **^SB;**

RESPONSE format: **^SBswr;** where **swr** is the SWR measured when the ATU was bypassed at the start of the full search tune that resulted in the current ATU setting. This is expressed in tenths, **32** is 3.2 to 1 SWR.

^SF Show Fault

GET format**: ^SF;** show information for the most recent fault.

GET format: **^SFnnnn;** show information for fault index **nnnn**.

RESPONSE format: **^SFnnnn faultCode "faultName" YY-MM-DDThh:mm:ss otherInfo val vv;**

The "fault index" **nnnn** is incremented for each new fault log entry and restarts after it reaches the end (wraparound).

faultCode is described in the **^FC** command above.

faultname is a short text acronym for the fault condition.

dateTime is the date and time (see **^CC** above) shown as **YY-MM-DDThh:mm:ss**.

otherinfo values are shown if non-zero:

- Frequency **fffff kHz**
- **INPUT** power in watts
- **FWD** forward, or output power in watts
- **REFL** reflected power in watts
- **SWR**
- **ADC** count. The ADC channel varies with fault code.
- **PA CURR** PA current in amperes
- **TEMP** temperature in degrees C

val is a fault-specific value:

- For Fault Code "none", the number of times the amplifier was switched on without an intervening fault.
- For Fault Code PA Current, the current in Amperes. ADC is the PA current sensor count.
- For Fault Code forward, reflected, input or dissipated: the power in watts. ADC is the coupler VFWD, VREV, or VINP ADC count.
- For Fault Code SWR Bypass, the SWR bypass in tenths. ADC is the coupler VFWD count.
- For Fault Code power gain ratio (output power / input power) is too low or high. 1500W/47W is a power gain ratio of 31.9. Power gain ratio 32 is very near 15 dB.
- For Fault Code temperature, the heat sink temperature in degrees C. ADC is the temperature sensor count.
- For Fault Codes related to supply voltage, the measured voltage in tenths of a volt. ADC is scaled from the supply voltages with voltage divider values.

^SI ATU Side

GET format: **^SI;**

SET/RESPONSE format: **^SIT;** or **^SIA;**

The ATU "side" relay switches the ATU capacitance to the source (TX) or load (ANT) "side" of the inductors.

ATU Side may be changed with the **ATU SIDE** menu item.

^SM Save ATU Setting

SET format**: ^SM;** save ATU setting at the most recently counted TX frequency.

SET format: **^SMfffff;** where **fffff** is a frequency in kHz.

Saves current ATU settings into the "bin" for frequency **fffff**. When transmitting, the counted TX frequency replaces **fffff**.

^SN Serial Number

GET format: **^SN;**

RESPONSE format: **^SNnnnnn;** the amplifier's serial number, with leading zeros.

Serial number may be viewed with the **SERIAL NUMBER** menu item.

^SN; is available before the power supplies are switched on with **^ON1;**

^SP Alarm Tones, updated in 01.75

GET format: **^SP;**

SET/RESPONSE format:

^SP0; (no alarm tones)

^SP1; (FAULT alarm tone),

^SP2; (OVR alarm tone),

^SP3; (both FAULT and OVR alarm tones).

"Hard" faults (RED Fault LED, switch to Mode STBY) are accompanied by a steady one-second alarm tone from an internal sounder. "Soft" faults (those that illuminate the OVR LED but don't switch Mode), are accompanied by an intermittent "beeping" sound while the amplifier is overdriven. **^SP2** and **^SP3** are new in firmware version 01.75.

^STA ATU HiSwr Retune Threshold (current band)

GET format: **^STA;**

SET/RESPONSE format: **^STAswr**; where **swr** is a 3-digit SWR value in tenths. 1.8:1 SWR is expressed as **018**.

An ATU HiSWR retune is started when transmitting, and ATU HiSwr retune is enabled (See **^HS** above), and SWR exceeds this threshold.

This threshold may be adjusted with the **ATU RETUNE SWR** menu item.

^STA ATU HiSwr Retune Threshold (specified band)

GET format: **^STAbb;**

SET/RESPONSE format: **^STAbbswr**; where **bb** is the band number, and **swr** is a 3-digit SWR value in tenths. 1.8:1 SWR is expressed as **018**. A "band number" of **AB** is interpreted as All Bands, so **^STAAB018** sets the ATU HiSWR Retune Threshold for all bands to 1.8:1.

^STA ATU HiSwr Retune Threshold (each band)

GET format: **^STAAB;**

SET/RESPONSE format: **^STAAB 018 018 018 018 018 018 018 018 018 017 019;**

Each of 11 bands (160 thru 6 meters) has an SWR value. Provide a 2- or 3-digit number, between 010 and 999 for SWR 1.0 to 99.9. Input format does not require leading zeros.

^STB SWR Bypass Threshold (current band)

GET format: **^STB;**

SET/RESPONSE format: **^STBswr**; where **swr** is a 3-digit SWR value in tenths. 1.2:1 SWR is expressed as **012**.

During full-search tune, the SWR of the antenna is measured with the ATU bypassed. If that SWR is low enough (less than or equal to the SWR Bypass Threshold), the full-search tune is stopped, and "ATU bypassed" is used (and stored for later recall) as the ATU setting for this frequency.

This threshold may be adjusted with the **SWR BYP THRESH** menu item.

^STB SWR Bypass Threshold (specified band)

GET format: **^STBbb;**

SET/RESPONSE format: **^STBbbswr**; where **bb** is the band number, and **swr** is a 3-digit SWR value in tenths. 1.2:1 SWR is expressed as **012**. A "band number" of **AB** is interpreted as All Bands, so **^STBAB012** sets the SWR Bypass Threshold for all bands to 1.2:1.

^STB SWR Bypass Threshold (all bands)

GET format: **^STBAB;**

SET/RESPONSE format: **^STBAB 018 018 018 018 018 018 018 018 018 017 019;**

Each of 11 bands (160 thru 6 meters) has a 3-digit SWR value in tenths. Provide a 2- or 3-digit number, between 010 and 999 for SWR 1.0 to 99.9. Input format does not require leading zeros.

^STN SWR No Match Threshold

GET format: **^STN;**
SET/RESPONSE format: **^STN030;**

Highest acceptable SWR after an ATU retune (including full search tune). If the tuned SWR exceeds this threshold, a NO MATCH fault occurs. It may be possible to operate, at reduced power, into a high SWR if the forward power is reduced to avoid reflected power faults.

A single SWR No Match threshold value applies to all bands. The "all band" and "current band" forms of **^STN** may be used **(^STNbb; ^STNAB;** etc).

^STS SWR Stop Threshold (current band)

GET format: **^STS;**
SET/RESPONSE format: **^STSswr**; where **swr** is a 3-digit SWR value in tenths. 1.2:1 SWR is expressed as **012**.

During ATU HiSWR retune, several previously stored ATU settings are examined. SWR STOP threshold is used to stop looking when an ATU setting with "good enough" SWR is encountered.

This threshold may be adjusted with the **SWR STOP THRESH** menu item.

^STS SWR Stop Threshold (specified band)

GET format: **^STSbb;**
SET/RESPONSE format: **^STSbbswr**; where **bb** is the band number, and **swr** is a 3-digit SWR value in tenths. 1.2:1 SWR is expressed as **012**. A "band number" of **AB** is interpreted as All Bands, so **^STSAB012** sets the SWR Stop Threshold for all bands to 1.2:1.

^STB SWR Stop Threshold (all bands)

GET format: **^STSAB;**
SET/RESPONSE format: **^STSAB 010 011 012 013 012 015 012 017 018 019 012;**

Each of 11 bands (160 thru 6 meters) has a 3-digit SWR value in tenths. Provide a 2- or 3-digit number, between 010 and 999 for SWR 1.0 to 99.9. Input format does not require leading zeros.

^SW SWR

GET format: ^SW;
RESPONSE format: **^SWswr;**
Responds with the most recently computed Standing Wave Ratio (SWR), where **swr** is expressed in tenths. **^SW123;** is 12.3:1.

^TB Show Permitted Power for SWR Bypass

GET format: **^TB;** requests the permitted power for the current ATU setting's SWR Bypass.

GET format: **^TBswr;** where **swr** is a SWR bypass value in tenths. **^TB032;** requests the permitted forward power with an antenna whose SWR bypass is 3.2:1.

RESPONSE format: **^TBswr wwwwW**; where **wwww** is the permitted output power for this SWR. The response to **^TB032;** is like **^TB032 1565W;**

The KPA1500 ATU can match many antennas whose SWR is quite high, but RF power must be limited, as some power is dissipated as heat in ATU components. This forward power limit is determined by evaluating the SWR of the antenna with the ATU in bypass, called "SWR Bypass".

The **SWR Bypass** LCD status page shows the permitted power for the current ATU setting's SWR Bypass.

^TD Tech Mode

GET format: **^TD;**

SET/RESPONSE format: **^TDx;** where **x** is **0** for disabled and **1** for enabled.

More status and menu pages are shown when TECH MODE is enabled.

This setting may be changed with the **TECH MODE** menu item

^TM Temperature

GET format: **^TM;**

RESPONSE format: **^TMxxx;** where **xxx** is the PA heat sink temperature in degrees C.

^TP Tune Poll

GET format: **^TP;**

RESPONSE format: **^TP0;** if the ATU is not currently tuning, **^TP1;** if ATU tune is in progress.

^TR T/R Delay

GET format: **^TR;**

SET/RESPONSE format: **^TRnn;** where **nn** is the number of milliseconds, from **00** to **50**, to delay the transition from TX to RX after the KEY IN line is released.

This might be useful for exciters that continue to send RF after the KEY IN line is released.

^VI PA Voltage and Current

GET format: **^VI;**

RESPONSE format: **^VIvvv iii;**

This command is provided for compatibility with KPA500.

Returns the current PA main power supply voltage in tenths of a volt and PA current in whole Amperes. **^VI523 061;** is 52.3V at 61 Amperes.

^VM1 Voltage Monitor (10-volt supply)

GET format: **^VM1;**

RESPONSE format: **^VM1 09814;** for 9.814 volts.

Shows the computed voltage, in millivolts, of the 10V power supply. This is computed from an ADC count and the expected values of a pair of voltage divider resistors and may not be accurate to 1 millivolt.

^VM2 Voltage Monitor (12-volt supply)

GET format: **^VM2;**

RESPONSE format: **^VM2 11602;** for 11.602 volts.

Shows the computed voltage, in millivolts, of the 12V power supply. This is computed from an ADC count and the expected values of a pair of voltage divider resistors and may not be accurate to 1 millivolt.

^VM3 Voltage Monitor (-12-volt supply)

GET format: **^VM3;**
RESPONSE format: **^VM3 11483;** for -11.483 volts.

Shows the computed voltage, in millivolts, of the -12V power supply. This is computed from an ADC count and the expected values of a pair of voltage divider resistors and may not be accurate to 1 millivolt.

^VM5 Voltage Monitor (5-volt supply)

GET format: **^VM5;**
RESPONSE format: **^VM5 05109;** for 5.109 volts.

Shows the computed voltage, in millivolts, of the 5V power supply. This is computed from an ADC count and the expected values of a pair of voltage divider resistors and may not be accurate to 1 millivolt.

^VMH Voltage Monitor (52-volt supply)

GET format: **^VMH;**
RESPONSE format: **^VMH 52749;** for 52.749V.

Shows the computed voltage, in millivolts, of the 52V power supply. This is computed from an ADC count and the expected values of a pair of voltage divider resistors and may not be accurate to 1 millivolt.

^WL Wake on LAN enable, new in 01.67

GET format: **^WL;**

RESPONSE format: **^WLx;** where x is **0** for WoL disabled, **1** for WoL enabled.

When enabled, the KPA1500 wakes up (turns on power) when it receives a UDP Wake on LAN "magic packet" containing 6 bytes of all one bits followed by 16 copies of the KPA1500's MAC address. See the **NET MAC** menu item and https://en.wikipedia.org/wiki/Wake-on-LAN.

Wake on LAN may also be enabled or disabled with the **NET WAKE on LAN** menu item.

The **^WL** command has been available since the first production release but became functional in 01.67.

^WS Forward Power and SWR

GET format: **^WS;**

RESPONSE format: **^WSwwww swr;** where **wwww** is the Forward Power in watts, and **swr** is the SWR in tenths. For example, **^WS1204 014;** is 1204 watts Forward Power and SWR 1.4:1.

This command is provided for KPA500 compatibility, but the KPA500 uses 3 digits for watts.

^XH XCVR SERIAL as HOST, new in 01.62

GET format: **^XH;**

SET/RESPONSE format**: ^XHx;** where **x** is **0** for disabled, **1** for enabled.

When enabled, the rear panel **XCVR SERIAL** connector is repurposed to function as another means of entering commands and responses (from this document), for use perhaps with a UART from a single board computer.

When **XCVR SERIAL as HOST** is enabled, the Icom CI-V and Radio Type Serial frequency advisory functions implied by Radio Type Icom and Radio Type Serial are unavailable (see **^XI** for Radio Type)

This may be set with the **XCVR SERIAL HOST** menu item.

The **XCVR SERIAL** connector cannot be used to install firmware or to wake up a sleeping microcontroller, the USB HOST PC port should be used for these functions.

^XI Radio Interface

GET format: **^XI;**

SET/RESPONSE format**: ^XInp;** where **n** is **a RADIO TYPE** number and **p** is a **RADIO POLL** value, **0** or **1**.

These values may be set with the **RADIO TYPE** and **RADIO POLL** menu items.

n	RADIO TYPE	RADIO POLL
0	**Elecraft K3S/K3**. Uses 15-pin ACC cable with BAND0-BAND3, AUXBUS for K3S/K3 control and frequency information. Set K3S/K3 KAT3 menu item to KAT500=Y for frequency information.	Not used
1	**BCD** (Yaesu BAND0-BAND3) on 15-pin ACC cable	Not used
2	**Icom**: Optional Band and Band Reference voltage on 15-pin ACC connector, AH-4 interface for Icom front panel ATU TUNE, **XCVR SERIA**L configured as CI-V for operating frequency information (unless **^XH** is enabled)	Not used
3	**Serial**: K2, KX2, KX3, Kenwood, Flex, and some Yaesu FTDX models using cross-over serial connection. Uses **XCVR SERIAL** as TTL RS-232 for frequency information. KX2, KX3 should use AUTO INFO: RIG CTRL and no RADIO POLL. When **^XH** is enabled, the **XCVR SERIAL** connector is repurposed and **RADIO TYPE SERIAL** does not poll for or accept frequency responses	**1** to poll for TX frequency (IF;FB;)

^XK ATU XCVR Key

GET format: **^XK;**
SET/RESPONSE format: **^XK0;** (disable) or **^XK1;** (enable)

When the KPA1500 needs transceiver TUNE POWER for ATU tuning, it can send an AUXBUS message to a K3S or K3 with MCU 5.63 or later, and the transceiver will provide TUNE POWER (equivalent to holding the K3S/KL3 TUNE button).

This can also be accomplished, for most radios, by connecting the tip of the KPA1500 3.5mm TRS TUNE connector to the transceiver's straight key input. The tip of the TUNE line is pulled low when the ATU is retuning. A separate keying cable is required.

^XK only affects the KAUXBUS message, the TUNE connector tip is always pulled down during ATU TUNE when the ATU needs TUNE POWER.

If this function is disabled, press the KPA1500 **ATU TUNE** button to start a full search tune, then tap TUNE on the transceiver to provide a steady signal for ATU TUNING. When **ATU TUNE** completes, tap TUNE on the transceiver again to stop the transceiver signal.

^XL XCVR SERIAL LOOP test, new in 01.83

GET format: **^XL;**
SET/RESPONSE format: **^XL0;** (stop test) or **^XL1;** (start test)

Starts or stops the XCVR SERIAL LOOP test on the rear-panel 3.5mm RS-232 connector. This is equivalent to the XCVR SERIAL LOOP menu item.

Icom "Transmit frequency" (Command code 1C sub code 03)

When the KPA1500 selects RADIO TYPE ICOM (via **^XI** or the **RADIO TYPE** menu item), the **XCVR SERIAL** connector is changed to CI-V, and the KPA1500 may read frequency messages from an Icom transceiver's CI-V connector via a 3.5mm cable (mono or stereo, only the tip is used).

The Icom transceiver should be in CI-V "transceive" mode, the KPA1500 **XCVR SERIAL** speed (**^BRX** or **SERIAL SPEED XCVR** menu item) must match the transceiver's CI-V Baud Rate.

The expected format of the Transmit Frequency message (in hex) is:

xFE - START

xFE – repeated START

x?? – controller address (ignored)

x?? – transceiver address (ignored)

x1C – Command code

x03 – command sub code (transmit frequency)

5 BCD bytes of operating frequency, in reverse order.

xFD – END

For example, a CI-V hex message of FE FE 01 94 1C 03 50 25 18 14 00 FD is interpreted as 0,014,182,550 Hz, rounded to 14183 kHz.

The CI-V Transmit Frequency message is used to select bands and the ATU setting for the specified frequency.

The KPA1500 does not send CI-V messages. It accepts CI-V messages generated by the transceiver.

The Icom CI-V manual is available at
http://www.icomamerica.com/en/support/kb/download.aspx?Download=882

IC-7300, IC-7600, and IC-7610 send this 1C 03 transmit frequency command when the VFO is changed if CI-V "transceive" is enabled.

Icom "Operating frequency" (Command code 00), new in 01.78

When the KPA1500 selects RADIO TYPE ICOM (via **^XI** or the **RADIO TYPE** menu item), the **XCVR SERIAL** connector is changed to CI-V, and the KPA1500 may read frequency messages from an Icom transceiver's CI-V connector via a 3.5mm cable (mono or stereo, only the tip is used).

The Icom transceiver should be in CI-V "transceive" mode, the KPA1500 **XCVR SERIAL** speed (**^BRX** or **SERIAL SPEED XCVR** menu item) must match the transceiver's CI-V Baud Rate.

The expected format of the Operating Frequency message (in hex) is:

xFE - START

xFE – repeated START

x?? – controller address (ignored)

x?? – transceiver address (ignored)

x00 – Command code

5 BCD bytes of operating frequency, in reverse order.

xFD – END

For example, a CI-V hex message of FE FE 01 94 00 50 25 18 14 00 FD is interpreted as 0,014,182,550 Hz, rounded to 14183 kHz.

The CI-V Operating Frequency message is used to select bands and the ATU setting for the specified frequency, unless the amplifier has received an Icom "Transmit Frequency" message.

Many Icom transceivers (IC-751, IC-7000, IC-756 Pro II) send an "operating frequency"(00) message as the VFO is tuned. If the Icom transceiver sends both a "transmit frequency" message (command 1C 03), and "operating frequency" (command 00), as the IC-7300, IC-7600, IC-7610 do, the "transmit frequency" message is preferred, and subsequent "operating frequency" messages (command 00) are ignored until the next KPA1500 power cycle.

ATU and band selection using the "operating frequency" was added to support older Icom transceivers. When the Icom radio is in "split", the operating frequency (but not the TX frequency) changes with T/R transitions, and the KPA1500 may select a new ATU setting if the split is large enough.