

# KPA1500 Programming Reference

Revised 7/13/2018 for firmware version 01.64. Please report errors to K6KR at dick@elecraft.com.

## Table of Contents

- Overview ..... 5
  - Command Format ..... 5
  - Band Number ..... 7
  - Antenna Number ..... 7
  - Using *KPA1500 Utility* to Test Commands ..... 7
  - Using PuTTY..... 7
  - Wakeup ..... 7
- Commands and responses ..... 8
  - ; Null ..... 8
  - ^AA ATU Mode Switch ..... 8
  - ^AB ATU Settings Per Bin (current band), new in 01.52 ..... 9
  - ^AB ATU Settings Per Bin (specified band), new in 01.52 ..... 9
  - ^AB ATU Settings Per Bin (all bands), new in 01.52..... 9
  - ^AD Attenuator Reason ..... 9
  - ^AE Antenna Enable (current band) ..... 10
  - ^AE Antenna Enable (specified band)..... 10
  - ^AE Antenna Enable (all bands) ..... 10
  - ^AI ATU Inline..... 10
  - ^AL Automatic Level Control Threshold (current band) ..... 11
  - ^AL Automatic Level Control Threshold (specified band)..... 11
  - ^AL Automatic Level Control Threshold (all bands)..... 11
  - ^AM ATU Mode (current band and current antenna) ..... 12
  - ^AM ATU Mode (specified band and antenna) ..... 12
  - ^AM ATU Mode (all bands, specified antenna) ..... 12
  - ^AN Antenna Select ..... 12
  - ^AP Preferred Antenna (current band)..... 13
  - ^AP Preferred Antenna (specified band) ..... 13
  - ^AP Antenna Preferred (all bands) ..... 13
  - ^AR Attenuator Release Time ..... 13

^AS Attenuator Status.....	13
^BC Band Change Standby .....	14
^BN Band Number .....	14
^BP Button Press.....	15
^BRP USB Serial Speed.....	16
^BRX Transceiver Serial Speed.....	16
^BT Banner Text.....	16
^CC Date and Time.....	17
^CF Write pending updates to EEPROM .....	17
^CO Clock Offset .....	17
^CP TCP/IP Command Server port number .....	18
^CR ATU capacitors.....	18
^DF Display Stored ATU Settings .....	19
^DH DHCP Client Enable .....	20
^DM Demonstration Mode.....	20
^DS Display LCD content.....	20
^DT Display LCD TEXT (new in 01.53) .....	20
^EC Erase Configuration.....	21
^EM Erase ATU Settings.....	21
FA VFO A frequency (on XCVR SERIAL connector) .....	22
FB VFO B frequency (on XCVR SERIAL connector) .....	22
^FC Fan Minimum Speed .....	22
^FE Cancel Full-Search Tune .....	22
^FL Fault Code.....	23
^FQ Transmit Frequency counter .....	24
^FR Frequency.....	24
^FS Fan Speed Query (new in 01.47) .....	24
^FT Start Tune .....	24
^GW Network Gateway Address .....	25
^HS ATU HiSwr Retune (current band) .....	26
^HS ATU HiSwr Retune (specified band).....	26
^ HS ATU HiSwr Retune (all bands) .....	26
^I Identify .....	27

IF Transceiver Info (on XCVR SERIAL connector).....	27
^IP Network IP Address.....	27
^LB LCD Backlight.....	28
^LC LCD Contrast.....	28
^LI LED Brightness.....	28
^LQ Led Query (new in 01.62) .....	28
^LR ATU Inductors.....	29
^LT LED Test .....	29
^MA NET MAC Address.....	30
^NH TX Inhibit Enable .....	30
^NM Net Mask .....	30
^OC Overdrive Code (new in 01.53) .....	31
^ON Switch Main Power Supplies Off or On.....	32
^OP Power on Mode (Operate or Standby).....	32
^OS Operate or Standby Mode.....	32
^PC PA Current.....	33
^PF Program Function Keys .....	33
^PJ Wattmeter Adjustment (current band) .....	34
^PJ Wattmeter Adjustment (specified band).....	34
^PWD Dissipated Power .....	35
^PWF Forward Power .....	35
^PWI Input Power .....	35
^PWR Reflected Power .....	35
^RV Firmware Version .....	36
^RVM Firmware Version.....	36
^SB SWR Bypass.....	37
^SF Show Fault.....	37
^SI ATU Side .....	38
^SM Save ATU Setting.....	38
^SN Serial Number .....	38
^SP Alarm Tone enable .....	38
^STA ATU HiSwr Retune Threshold (all bands).....	39
^STA ATU HiSwr Retune Threshold (current band) .....	39

^STA ATU HiSwr Retune Threshold (specified band).....	39
^STB SWR Bypass Threshold (current band).....	40
^STB SWR Bypass Threshold (specified band) .....	40
^STB SWR Bypass Threshold (all bands) .....	40
^STN SWR No Match Threshold.....	41
^STS SWR Stop Threshold (current band).....	41
^STS SWR Stop Threshold (specified band) .....	41
^STB SWR Stop Threshold (all bands) .....	41
^SW SWR.....	42
^TB Show Permitted Power for SWR Bypass .....	43
^TD Tech Mode .....	43
^TM Temperature .....	43
^TP Tune Poll.....	43
^TR T/R Delay.....	43
^VG Display T/R state.....	44
^VI PA Voltage and Current .....	44
^VM1 Voltage Monitor (10 volt supply) .....	44
^VM2 Voltage Monitor (12 volt supply) .....	44
^VM3 Voltage Monitor (-12 volt supply) .....	45
^VM5 Voltage Monitor (5 volt supply) .....	45
^VMH Voltage Monitor (50 volt supply).....	45
^WS Forward Power and SWR.....	46
^XH XCVR SERIAL as HOST (new in 01.62) .....	46
^XI Radio Interface.....	47
^XK ATU XCVR Key .....	48
Icom "Operating frequency" (1C 03) .....	49

## 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.

The Host PC USB connector, XCVR SERIAL HOST, and a single TCP client 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 begins with a leading caret (^) and ends with a terminating semicolon (;). For example, to query the KPA1500 for its serial number, send GET command **^SN**; The KPA1500 responds with its serial number, e.g., **^SN00022**;

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 has a limited size input command buffer. 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:

<b>bb</b>	<b>Band name</b>
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](http://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. We plan Wakeup On LAN (WOL) capability in a future firmware update.

## 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.

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

ATU Mode Switch can 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** is new in firmware version 01.52.

### [^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 be viewed on the **ATTENUATE REASON** LCD status page.

Use **^AS** to determine the overdrive attenuator’s current state or **^OC** command that returns 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, and have both antenna connectors available for other bands. Antenna Enable chooses which antenna connector(s) 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, **^AT0;** if ATU is currently bypassed.

Gets/changes 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 is both "enabled" (inline) and the current ATU setting 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: **^ALbnnn;** 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;** (“Inline” or “Bypassed”)

Selects the ATU MODE, either “Inline” or “Bypassed”.

**^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 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: **^AMbbal;** or **^AMbbaB;** (“Inline” or “Bypassed”)

Selects the ATU mode: “Inline” or “Bypassed”.

**^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 be changed by holding the **ATU MODE** button on the KPA1500 front panel.

### ^AM ATU Mode (all bands, specified antenna)

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

SET/RESPONSE format: **^AMABaBBBBIIIIIBBBBBIIII;** 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 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.

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 be changed with the **ANTENNA PREFER** menu item.

### ^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.

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 K3 band numbers.

<b>bb</b>	<b>Band name</b>
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 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 <b>^ON</b> 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:

<b>n</b>	<b>kilobits per second</b>
0	4.8
1	9.6
2	19.2
3	38.4
4	57.6
5	115.2
6	230.4

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).

### ^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\nK6KR Whidbey;** 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.



## ^CC Date and Time

GET format: **^CC;**

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

The KPA1500 includes a real-time clock/calendar 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;**

No response.

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 power cycle.

## ^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 on how this may be used. **^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.

### **^CR ATU capacitors**

GET format: **^CR**;

SET/RESPONSE format: **^CRhh**; where **hh** is a pair of 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)

<b>Hex digit</b>	<b>ATU relay number</b>	<b>Capacitance in picoFarads</b>
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.

## ^DF Display Stored ATU Settings

GET format: **^DFffff**; where **ffff** is a frequency in kHz. Leading zeros may be omitted, e.g., **^DF 14010**;

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) captured when the ATU setting was first stored.

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

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 each 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 should be normally be enabled to obtain an IP address from that DHCP server.

See [https://en.wikipedia.org/wiki/Dynamic\\_Host\\_Configuration\\_Protocol](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 off but shows full-range LED and LCD power indications that follow the KEY IN line.

Demo mode may 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. **^DT** is new in firmware version 01.53.

## ^EC Erase Configuration

SET format: **^ECxyzy;**

**^ECxyzy;** is used to reset the amplifier to factory-fresh configuration settings. **^ECxyzy;** 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 **^ECxyzy;** to erase it.

**xyzy** 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/Xyzy\\_\(computing\)](https://en.wikipedia.org/wiki/Xyzy_(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 be used to erase ATU settings for the currently selected band and antenna.

### FA VFO A frequency (on XCVR SERIAL connector)

SET format: **FA000ffffxxx**; where **ffff** 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, 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 “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: **FB000ffffxxx**; where **ffffxxx** 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 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 Full-Search Tune

SET format: **^FE**;

Once a full-search tune has been started (with **^FT** or by tapping the front panel ATU TUNE button), the tune needs continuous exciter RF power to complete searching for 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 full 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 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. <b>^TB</b> 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.

### **^FQ** Transmit Frequency counter

GET format: **^FQ;**

RESPONSE format: **^FQffff**; where **ffff** 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: **^FRffff**; where **ffff** 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 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** Fan Speed Query (new in 01.47)

GET format: **^FS;**

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

Shows the current fan speed.

**^FS** is new in firmware version 01.47.

### **^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 Network Gateway Address**

GET format: **^GW;**

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

The 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](https://en.wikipedia.org/wiki/Default_gateway).

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

The Gateway Address may 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: **IFffffffff\*\*\*\*\*+yyyyrx\*00tmvspb01\*;**

KPA1500 uses the response to an **IF** query to determine the transmit VFO (split indication) and XIT offset to select the ATU setting for the transmit frequency. Consult the Elecraft K2, 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 normally assigned to the KPA1500 by a DHCP server. See [https://en.wikipedia.org/wiki/IP\\_address](https://en.wikipedia.org/wiki/IP_address).

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

The IP address may 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** and.

## ^CP

### ^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. **^LQ** is new in firmware version 01.62.

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:

**^LQ0000000000000018;** (idling, Mode STBY, ANT1, ATU IN)

**^LQ0000000000000016;** (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** is a pair of 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 $\mu$ H)
20	K6	2100
10	K5	1000
08	K4	480
04	K3	230
02	K2	110
01	K1	50

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

## ^LT LED Test

Get: **^LT;**

Set/Response: **^LTx;** where **x** is 0 for disable, 1 for enable test..2 lights all LEDs 3, 4, and 5 light LEDs of a specific color. OPER and STBY use one I/O pin, so only one of these LEDs is on at a time.

Power off/on also resets LED Test.

### ^MA NET MAC Address

GET format: **^MA;**

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

Displays the media access control (MAC) address, a unique value assigned by the microcontroller manufacturer. See [https://en.wikipedia.org/wiki/MAC\\_address](https://en.wikipedia.org/wiki/MAC_address). The MAC address is the network address of your KPA1500.

The MAC address may 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 Net 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 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**; is new in firmware version 01.53.

**^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. <b>^TB</b> 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.

The main power supplies may also be turned on by the front panel ON switch, or by grounding AUX connector pin 8, or supply +12V on the rear panel REMOTE connector.

**^ON** GET and SET are available when “sleeping”.

### ^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.



## ^PC PA Current

GET format: **^PC;**

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

## ^PF Program Function Keys

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.

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

**^PF** is new in firmware version 01.54.

### [^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.

### **^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).

### **^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: **^SB $swr$ ;** where  **$swr$**  is the SWR measured when the ATU was last bypassed (this occurs during every full-search tune). This is expressed in tenths, **123** is 12.3:1 SWR.

## **^SF Show Fault**

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

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

RESPONSE format: **^SF $nnnn$  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 **ffff 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.

### **^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: **^SMffff**; where **ffff** is a frequency in kHz.

Saves current ATU settings into the “bin” for frequency **ffff**. When transmitting, the counted TX frequency replaces **ffff**.

### **^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 Tone enable**

GET format: **^SP**;

SET/RESPONSE format: **^SP0**; (turn off alarm tone) or **^SP1**; (turn on alarm tone)

Faults are accompanied by a short alarm tone from an internal speaker, if **^SP** is enabled.

### ^STA ATU HiSwr Retune Threshold (all bands)

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.

### ^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.

An ATU HiSwr retune is started when transmitting, 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.

### ^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.

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 (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.

During ATU HiSWR retune, several previously stored ATU settings may be examined. The 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.

## ^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: `^SW $swr$ ;`

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: **^TB $swr$** ; 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: **^TB $swr$   $wwwW$** ; 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: **^TD $x$** ; 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: **^TM $xxx$** ; 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: **^TR $nn$** ; 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.

### **^VG Display T/R state**

GET format: **^VG;**

RESPONSE format: **^VG TRINHIBIT x01 TR\_STATE\_RX 3R:1 3T:0 Bias:0 PA STBY KeyIn:0 STANDBY;**

This is a diagnostic command.

The **^VG;** response shows the T/R state machine's variables, some amplifier control lines, and reason(s) for keeping the T/R switch in RX. In the examples above, the operating mode is STANDBY.

When the PA is key-down with input power, the response is usually

**^VG TR inhibit x00 TR\_STATE\_TX 3R:0 3T:1 Bias:1 PA OPER KeyIn:1;**

### **^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. **^VI513 061;** is 51.3V 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 (50 volt supply)**

GET format: **^VMH;**

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

Shows the computed voltage, in millivolts, of the 50V 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.

## ^WS Forward Power and SWR

GET format: **^WS;**

RESPONSE format: **^WS $wwww$   $swr$ ;** 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: **^XH $x$ ;** 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.

**^XH** is new in firmware version 01.62.

## ^XI Radio Interface

GET format: **^XI**;

SET/RESPONSE format: **^XI $n$ p**; 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.

RADIO TYPE number	RADIO TYPE	RADIO POLL
0	<b>Elecraft K3 / K3S.</b> Uses 15-pin ACC cable with BAND0-BAND3, AUXBUS for K3 control and frequency information. Set K3 to KAT500=Y.	Not used
1	<b>BCD</b> (Yaesu BAND0-BAND3) on 15-pin ACC cable	Not used
2	<b>Icom:</b> Optional Band and Band Reference voltage on 15-pin ACC connector, AH-4 interface for Icom front panel ATU TUNE, XCVR SERIAL configured as CI-V for operating frequency information (unless <b>^XH</b> is enabled)	Not used
3	<p><b>Serial:</b> K2, KX2, KX3, Kenwood, and some Yaesu FTDX models using cross-over serial connection. Uses XCVR SERIAL as TTL RS-232 for frequency information.</p> <p>KX2, KX3 should use AUTO INFO: RIG CTRL and no RADIO POLL.</p> <p>When <b>^XH</b> is enabled, the XCVR SERIAL port is repurposed, and RADIO TYPE SERIAL does not poll for or accept frequency responses (FA, FB, IF).</p>	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 K3 or K3S with MCU 5.63 or later, and the transceiver will provide TUNE POWER (equivalent to holding the K3 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 K3 AUXBUS 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 press TUNE on the transceiver to provide a steady signal for ATU TUNING. When ATU TUNE completes, tap TUNE again to stop the transceiver signal.



## Icom “Operating frequency” (1C 03)

When the KPA1500 selects RADIO TYPE ICOM (via **^XI** or the **RADIO TYPE** menu item), the XCVR SERIAL port 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. 4800 bit/s works fine.

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 14,182,550 Hz, rounded to 14183 kHz.

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

The KPA1500 does not transmit CI-V messages. It accepts operating frequency messages generated by the transceiver as it is tuned.

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 as the VFO is changed and “transceive” is enabled.