

Elecraft KAT500 Automatic Antenna Tuner Serial Command Reference

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Serial port overview

All commands and their responses use the printable ASCII character set. Commands are sent to the KAT500 via its “PC DATA” serial port. Use 4800, 9600, 19200, or 38400 bit/s, 8 bit characters, one stop bit and no parity. There is no flow control. The *KAT500 Utility* discovers the KAT500’s serial port speed by sending a few null commands (semicolons) at each of the speeds and selects the speed that results in responses. You can change the KAT500’s serial port speed with the Baud Rate (**BR**) command.

Beginning with firmware version 01.38, the microcontroller may be configured to be asleep when logically “off” or otherwise idle. It takes a few serial port characters and about 100 milliseconds to wake up, and characters sent during the wakeup period may be lost. The *KAT500 Utility* sends semicolons at approximately 100 millisecond intervals until the KAT500 firmware begins to respond. See the **SL** command.

Command Format

Commands sent to the KAT500 are either GET or SET.

GET commands are used to get information from the KAT500, the KAT500 provides that information in a RESPONSE message.

SET commands are used to change the KAT500’s internal state or to initiate an action. SET commands do not generally generate a RESPONSE. SET can be followed by a GET to verify the SET. In some cases (**FT**;) a SET causes a response at the completion of an action. RESPONSEs normally look like the corresponding SET command.

Each serial command is terminated with a semicolon character. For example, to query the current software version, send “**RV;**” (send R, V, and semicolon).

Examples:

- RV;** GETs the firmware version number. The RESPONSE is of the form **RV01.13;**
- AN1;** SETs the KAT500 to use Antenna 1. There is no response.
- AN;** GETs the currently selected antenna. The RESPONSE is of the form **AN1;**

Generally, after sending a GET command, wait for the corresponding RESPONSE before sending more commands. The KAT500 has a limited input command buffer. You may safely “stack up” 64 bytes of commands without risk of overrun. If you wish to send a very long sequence of SET commands, break them up with an intervening GET (such as the null command or **RV;**) that returns a RESPONSE and wait for those responses. Flow control is done at the application level.

Using *KAT500 Utility* to Test Commands

The *KAT500 Utility* Command Tester 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.

Commands and responses

; (null command, GET only)

GET format: ;

RESPONSE format: ;

The *KAT500 Utility* sends a few semicolons to determine the serial port speed during a connection sequence and to wake up a sleeping microcontroller.

AE (Antenna Enable, GET and SET)

GET format: **AEbba**;

SET/RESPONSE format: **AEbba0**; for disable; **AEbba1**; for enable.

Enables or disables an antenna connector for a specified band. **bb** is the band number, see the **BN** command. **a** is the antenna number: **1**, **2**, or **3**. Disabled antennas are skipped by the ANT button.

Example: **AE0030**; disables ANT3 on 160 meters. **AE1031**; enables ANT3 on 6 meters.

Disabling the currently used antenna may result in a KAT500 ANT selection change.

This command is used by the *KAT500 Utility* Edit Configuration dialog Antennas tab.

AFT (Automatic Fine Tune, GET and SET)

GET format: **AFTbb**;

SET/RESPONSE format: **AFTbb0**; (disabled) or **AFTbb1**; (enabled) where **bb** is a Band Number (see **BN**).

For example, **AFT031**; enables this capability on Band Number **03**, which is 40 meters.

Full search tune starts with a “coarse” step that tests several inductance values to find an approximate starting point for finer granularity searches. In some cases with high SWR antennas, particularly on low bands, not enough inductance values are tested to find a good starting point. Enabling **AFT** causes full search coarse tune to try more inductor settings. Full search coarse tune takes longer, but may find matching solutions for some difficult antenna loads that are not otherwise found.

This command is used by the *KAT500 Utility* Edit Configuration Auto Fine Tune tab.

AFT was added in firmware version 01.39.

AKIP (Amplifier Key Interrupt Power Threshold, GET and SET)

GET format: **AKIP**;

RESPONSE format: **AKIP wwwww VFWD aaaa**;

SET format: **AKIP wwww;**

GETs or SETs a transmit power threshold below which the KAT500 can interrupt the amplifier key line. The KAT500 must interrupt the amplifier key line before it changes other relays during Memory Recall or Full Search Tune: bypass, antenna, capacitors, and inductors.

Some amplifiers, such as the Elecraft KPA500, use solid-state transmit/receive switching devices that are designed to permit the amplifier key line to be interrupted while transmitting. For the KPA500, the **AKIP** threshold should preferably be set to its “unlimited” value: 1500 watts (**AKIP 1500;**). Use 1500 even if the amplifier is incapable of supplying that much power.

Some amplifiers, such as my Ameritron AL-1200, use a frame relay and “hot switching” the amplifier key line with high transmit power might damage the relay. I use 100 watts (**AKIP 100;**), which is enough to pass all the unamplified power of my K3, but lower than the power I’d expect with the amplifier in “operate”.

The default “factory” value for this threshold is 30. **If you are using an Elecraft KPA500, you should increase this value to 1500.**

The RESPONSE format shows the power in watts, and the VFWD threshold that is used to monitor this threshold.

While the transmitter power exceeds this threshold, some KAT500 front panel button presses are ignored, as are serial commands (and *KAT500 Utility* functions) that change relays: MD, AN, BYP, C, L, SIDE, etc.

TUNE may be started with a higher transmitter power, but power must drop below this threshold before TUNE interrupts the amplifier key line. Tune-level power must be applied again to complete the tuning process. After tuning, transmit power must be reduced to zero before the amplifier key interrupt relay is released, unless the “unlimited” value 1500 watts is used.

AKIP was added in firmware version 01.05, and is used by the *KAT500 Utility* Edit Configuration dialog Amplifier Key Interrupt Power tab.

AMPI (Interrupt amplifier key, GET and SET)

GET format: **AMPI;**

SET/RESPONSE format: **AMPIO;** (amplifier key line connected), **AMPI1;** (amplifier key line interrupted).

GETs or SETs the amplifier key line interrupt relay, K23. **AMPI1;** selects the relay, interrupting the amplifier key line. **AMPIO;** releases the relay, connecting the amplifier key line.

The amplifier key line must be run through the KAT500’s amplifier key line interrupt relay.

15-pin ACC cables used between the K3, KAT500, and KPA500 provide this amplifier key line interrupt capability. Alternatively, two-wire cables with RCA connectors may be used between transceiver and KAT500, and KAT500 and amplifier. See the *KAT500 Owner's Manual* for connection diagrams.

It may take a few tens of milliseconds after issuing an **AMPI SET** before the relay is changed.

The SET form of this command may be ignored if the current transmit power exceeds the **AKIP** power threshold.

AN (Select Antenna, GET and SET)

GET format: **AN**;

SET/RESPONSE format: **AN1**; **AN2**; or **AN3**;

Antenna selection is deferred if a tune is in progress. Antenna selection is ignored if the antenna is disabled on the current band (see the **AE** command).

It may take a few tens of milliseconds after issuing an **ANx** setter before the relays are changed.

The SET form of this command is ignored while transmitting or tuning.

AP (Antenna Preference, GET and SET)

GET format: **APbb**; where **bb** is a Band Number, see the **BN** command.

SET/RESPONSE format: **APbba**; where **bb** is a Band Number and **a** is an antenna number, **0**, **1**, **2**, or **3**. **0** is interpreted as "the last used antenna on this band".

The KAT500 normally returns to the last-used antenna on band change. However a "preferred" antenna may be configured so that the ATU always starts at a fixed antenna for a given band.

For example: **AP103**; causes ANT3 to be selected whenever you band switch to 6 meters, regardless of the last-used antenna on 6 meters.

AP SET is ignored if the antenna is disabled (see **AE**)

AP is used by the *KAT500 Utility* Edit Configuration dialog Antenna tab.

ATTN (Enable Attenuator, GET and SET)

GET format: **ATTN**;

SET/RESPONSE format: **ATTN0**; (disabled) or **ATTN1**; (enabled).

Selects relay K22, which switches in an attenuator resistor.

It may take a few tens of milliseconds after issuing an **ATTNx** setter before the relay is changed.

Firmware releases the attenuator if it detects power high enough to damage to the attenuator.

Firmware normally inserts the attenuator during “full search tune” to present a more consistent load to a transceiver during tune operations. The attenuator is disabled if the tune power is too low with the attenuator in place.

BN (Band Number, GET and SET)

GET format: **BN**;

SET/RESPONSE format: **BNbb**; where **bb** is 00 to 10, see the table below.

The ATU is switched to the target band. The appropriate last used or “preferred” antenna is selected. The ATU inductor and capacitor relays are set to the most recent setting used for the tuner on the indicated band.

KAT500 Band Numbers are the same as the *K3 Programmer Reference* Band Numbers, but differ from the BCD values of the four BAND lines.

It may take a few tens of milliseconds for this command to have an effect. Relays will not change until the transmitter power is below the **AKIP** threshold.

The Band may be subsequently overridden by a change to the four BAND lines in the accessory connector, or by counting the transmit frequency.

bb	Band
00	160 meters
01	80 meters
02	60 meters
03	40 meters
04	30 meters
05	20 meters
06	17 meters
07	15 meters
08	12 meters
09	10 meters
10	6 meters

BR (Serial I/O Speed, GET and SET)

GET format: **BR**;

SET/RESPONSE format:

BR0; for 4800 bit/s,

BR1; for 9600 bit/s,

BR2; for 19200 bit/s or

BR3; for 38400 bit/s. Firmware load automatically chooses 38400 bit/s.

Serial I/O speed significantly affects the time required for configuration save and restore. 38400 bit/s is recommended unless you have a specific reason to use a lower speed.

BYP (Bypass, GET and SET)

GET format: **BYP**;

SET/RESPONSE format: **BYPN**; (not bypassed) or **BYPB**; (bypassed).

Gets or sets the bypass relays K20 and K21. These relays are in the bypassed position when not energized.

It may take a few tens of milliseconds after issuing a **BYPx**; setter before relays are changed. Relays are not changed until the transmit power is below the **AKIP** threshold.

Firmware releases inductor, capacitor, and SIDE relays while bypassed.

C (Select capacitors, GET and SET)

GET format: **C**;

SET/RESPONSE format **Chh**; where **hh** are a pair of hexadecimal digits indicating the selected capacitors.

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

Examples:

C00; selects no capacitors.

CFF; selects all capacitors.

C80; selects only the largest capacitor by energizing K5.

CC1; selects the largest, second largest, and smallest capacitors by energizing K5, K4, and K1.

Hex Digit	Relay	Capacitance (pF)
80	K5	1360
40	K4	680

20	K3	330
10	K6	180
08	K2	82
04	K7	39
02	K8	22
01	K1	8

The *KAT500 Utility Operate* page displays capacitor relay settings as check boxes and as a total capacitance.

It may take a few tens of milliseconds after issuing SET before the relays are changed, and they may not all be changed at the same time.

The SET form of this command may be ignored if the current transmit power exceeds the **AKIP** power threshold, or if the bypass relay is in bypass.

Capacitor relays are released while the bypass relay is in bypass.

EEINIT (Clear configuration and frequency memories, SET only)

SET format: **EEINIT**; erases EEPROM containing frequency memories, per-band settings and all configuration selections, including the current RS-232 speed. Configuration and per-band settings are formatted to default values during restart after a microcontroller reset. **EEINIT**; does not change the KAT500 serial number or its fault table.

EEINIT; is ignored while the ATU is tuning or transmitting.

EEINIT is used by the *KAT500 Utility Configuration* page Reset to Factory Defaults button.

EM (Erase frequency memory, SET only)

SET format: **EMbba**; clears frequency memories for one or all antennas on band **bb** (See Band Number for a description of **bb**). **a** is **0** for all antennas, **1**, **2**, or **3** for a specific antenna.

This command may take as long as a couple of seconds.

EM is used by the *KAT500 Utility Edit Configuration* dialog Erase Memories tab.

F (Frequency, GET and SET)

GET format: **F**;

SET/RESPONSE format: **F nnnnn**; where **nnnnn** is the approximate frequency of the last transmitted signal, in kHz.

F causes the ATU to change bands (if needed) and recall prior settings for the specified frequency, without transmitting. See also the **BNnn**; command and **MT fffff**;

F SET is ignored while tuning.

FA (Memory Recall Tune, SET only)

SET format: **FA000ffffiii**; where **ffff** is the frequency in kHz, and **iii** must be digits. The command requires exactly 11 digits of frequency to the Hz. The leading three digits must be 0. The final three digits are unused.

FA000ffffiii; is functionally equivalent to **MT fffff**;

FA was introduced in firmware version 01.34.

FLT (Fault query, GET only)

GET format: **FLT**;

RESPONSE format: **FLTc**; where **c** is a fault code:

Fault code	Name	Description
0	No Fault	No error
1	No Match	The ATU tune algorithm was unable to find a satisfactory match
2	Power Above Design Limit for Antenna SWR	Transmitter power exceeds the design limit for the unmatched antenna SWR. This power limit varies with the SWR of the antenna: 600 watts at 10:1 SWR, 1000 watts at 3:1 SWR.
3	Power Above Safe Relay Switch Limit	Transmitter power, with the amplifier key line interrupted, exceeds the ATU's safe relay switching limit of 100 watts.

A FAULT may be cleared by tapping the TUNE button or turning the KAT500 off (Hold the MODE button) and back on.

FLTC (Clear Fault, SET only)

SET format: **FLTC**;

Turns off the FAULT LED and clears the current fault.

This command was introduced in firmware version 01.29

FT (Full Tune, SET only, with response)

SET/RESPONSE format: **FT;**

FT; starts a Full Tune. If Mode is Bypass, the Mode is changed to Manual. An **FT;** RESPONSE is sent when a Full Tune initiated by **T;** or **FT;** completes.

Full Tune may not start immediately if the current transmit power exceeds the **AKIP** threshold. When you next stop transmitting, KAT500 firmware interrupts the amplifier key line. Start transmitting again at about 15 to 30 watts. When tune completes, an **FT** response is sent. You should stop transmitting, and KAT500 firmware will then reconnect the amplifier key line.

If the amplifier's T/R switch is able to handle full-power switching (indicated by setting **AKIP** to 1500), amplifier key line interrupt, tuning, and key line reconnect occur without requiring a pause in transmission.

I (Identify, GET only)

GET format: **I;**

RESPONSE format: **KAT500;**

KAT500 permanent boot block firmware responds with "**kat500;**" in lower case.

L (Select Inductors, GET and SET)

GET format: **L;**

SET/RESPONSE format: **Lhh;** where **hh** are hexadecimal digits (0-9 and A-F) indicating the selected inductors.

Examples:

L00; selects no inductors

LFF; selects all inductors

L80; selects only the largest inductor by energizing K17

LE0; selects the three largest inductors by energizing K17, K16, and K15.

See the **C** command for a description of hexadecimal notation.

The *KAT500 Utility Operate* page displays the relay settings as check boxes and total inductance.

Hex digit	Relay	Inductance (nH)
80	K17	9000
40	K16	4400

20	K15	2100
10	K14	1000
08	K13	480
04	K12	230
02	K11	110
01	K10	50

It may take a few tens of milliseconds after issuing **Lxx**; **SET** before the relays are changed, and they may not all be changed at the same time.

SET may be ignored if the current transmit power exceeds the **AKIP** power threshold.

Inductor relays are released whenever the bypass relay is in bypass (**BYPB**), and **SET** has no effect.

MD (Mode, GET and SET)

GET format: **MD**;

SET/RESPONSE format: **MDB**; or **MDM**; or **MDA**;

MDB; is “Bypass” mode. The bypass relay is released to its Bypassed setting and the KAT500 does not attempt to tune.

MDM; is “Manual” mode. The KAT500 recalls memorized tuner settings from prior tune efforts on frequency and antenna change, frequency change, and when the TUNE pushbutton is pressed. A TUNE button press is also used to search for a match setting. See also the **MTM** command.

MDA; is “Automatic” mode. The KAT500 recalls memorized tuner settings on frequency change, and if the SWR exceeds a threshold value (typically 1.8:1) that can be set with the **ST** command. See also the **MTA** command.

SET may be ignored while transmitting.

MT (Memory Recall Tune, SET only)

SET format: **MT ffff**; where **ffff** is a frequency, in kHz.

MT performs a “memory recall tune” by changing to the memorized tuner setting for the current antenna.

If **ffff** is zero or missing, the last Transmit frequency is used. If the ATU detects a current transmit frequency, the measured frequency is used instead of **ffff**.

If there is no memorized tuner setting for the specified frequency, adjacent memories are searched above and below the specified frequency, to the band edges, until a suitable memory is found.

Memory Recall Tune may be deferred until the current transmit power drops below the **AKIP** power threshold.

MTA (Memory Recall Tune on frequency change in mode AUTO, GET/SET)

GET format: **MTA;**

SET/RESPONSE format: **MTA1;** or **MTA0;**

Enables (**MTA1;**) or disables (**MTA0;**) Memory Recall Tunes when transmit frequency changes are detected while in Mode AUTO.

When enabled, the KAT500 performs Memory Recall Tunes as the transmit frequency changes within the current band while in Mode AUTO, even if the VSWR is below the Auto tune VSWR threshold.

When disabled, the KAT500 performs Memory Recall Tunes, and, if necessary, Full Tunes, only when the VSWR rises above the VSWR Auto tune threshold (see the **ST** command).

MTA is enabled by default. **MTA** was added in firmware version 1.28.

MTM (Memory Recall Tune on frequency change in mode MAN, GET/SET)

GET format: **MTM;**

SET/RESPONSE format: **MTM1;** or **MTM0;**

Enables (**MTM1;**) or disables (**MTM0;**) Memory Recall Tunes as transmit frequency changes are detected while in Mode MAN.

When disabled, the KAT500 performs Memory Recall Tunes only on band and antenna changes while in Mode MAN.

MTM is enabled by default. **MTM** was added in firmware version 1.28.

PS (Power off/on, GET/SET)

GET format: **PS;**

SET/RESPONSE format: **PS0;** or **PS1;**

Turns the KAT500 ON (**PS1;**) or OFF (**PS0;**).

The KAT500's microcontroller operates whenever DC power is applied. LEDs and relays are off (Antenna 1, bypassed) when the KAT500 is "logically off". See the **SL** command.

This command may be ignored while transmitting.

PS; and **PS1;** were added in firmware version 1.20.

PSI (Power Status Initial, GET/SET)

GET format: **PSI**;

SET/RESPONSE format: **PSI0**; or **PSI1**;

Determines whether the KAT500 starts OFF (**PSI0**;) or ON (**PSI1**;) when DC power is initially applied.

The KAT500's microcontroller operates whenever DC power is applied. See the **SL** command.

PSI; was added in firmware version 01.37. This command is used by the *KAT500 Utility* Edit Configuration dialog Initial Power tab.

RSTx (Reset, SET only)

SET format: **RST0**; or **RST1**;

RST0; resets the microcontroller without saving state in EEPROM. This is equivalent to removing the power plug and plugging it back in again. **RST1**; simulates pressing the power off button which saves current state in EEPROM before reset.

RST may be ignored while transmitting.

RV (Firmware version, GET only)

GET format: **RV**;

RESPONSE format: **RVnn.nn**;

SIDE (Select Side, GET and SET)

GET format: **SIDE**;

SET/RESPONSE format: **SIDET**; or **SIDEA**;

Gets or sets the state of SIDE relay K9.

The selected capacitors are connected to the **transmitter** side of the inductor (a CL network) when K9 is not energized (**SIDET**);

The selected capacitors are connected to the **antenna** side of the inductor (an LC network) when K9 is energized (**SIDEA**);.

Generally, the capacitors shunt the higher impedance side.

It may take a few tens of milliseconds after issuing **SIDEx**; before the relay is changed.

SET may be ignored if the current transmit power exceeds the **AKIP** power threshold.

The SIDE relay is released while the bypass relay is bypassed.

SL (Enable or disable Sleep when Idle, GET and SET)

GET format: **SL;**

SET/RESPONSE format: **SL0;** (disable) or **SL1;** (enable)

SL1; causes the KAT500 microcontroller (MCU) to enter a low power and electrically quiet “SLEEP” mode when switched off or when idle. The 16 MHz crystal oscillator is turned off while sleeping.

The sleeping microcontroller can be awakened by:

- 1) Front panel button press,
- 2) Change to any of the accessory connector BAND lines,
- 3) High to low transition of the accessory connector AUXBUS line,
- 4) High to low transition of the “start tune” line of the rear-panel TUNE connector,
- 5) High to low transition (a start bit) on the RS-232 serial port, or
- 6) Transmit-level RF.

While the microcontroller can be awakened by characters arriving on the RS-232 serial port, it takes about 100 milliseconds for the crystal oscillator to reach operating speed, and characters arriving in that period may be lost. Computer programs should send a series of single semicolons at approximately 100 millisecond intervals until the KAT500 returns semicolon responses. It normally takes two or three semicolons. Once the microcontroller is awakened by serial port communications, it stays awake until no characters arrive for a few seconds.

The microcontroller is deemed “idle” when a short time period has elapsed without front panel button presses or changes to any of the rear panel inputs (band, tune start, AUXBUS, serial port communications, and RF transmission). The microcontroller is not “idle” while tuning (even if RF ceases) or part of a serial command has been received.

Sleep when Idle was introduced in firmware version 01.38. Install *KAT500 Utility* version 1.13.4.2 or later before enabling Sleep when Idle. It has been changed to send a few “wakeup” semicolons in each of its communication sequences with the KAT500, and adds an Edit Configuration dialog Idle Sleep tab.

If you use the *KAT500 Utility* Command Tester, it might be necessary to enter a few semicolons before a command is accepted. It is sometimes more convenient to turn off Sleep when Idle (**SL0;**) when testing PC software or commands from the Command Tester window.

SM (Save Memory, SET only)

SET format: **SM;** or **SM fffff;** where **fffff** is a frequency in kHz.

SM saves the current tuner settings (antenna, side, inductor, capacitor, and bypass VSWR) in the tuner memory for the indicated (or most recent transmit) frequency.

If **ffff** is zero or missing, the last Transmit frequency is used. If transmitting, the measured frequency is used instead of **ffff**.

SM; is used by the *KAT500 Utility Operate* Page Memorize button.

SM with a frequency was introduced in firmware version 1.20.

SN (Serial Number, GET only)

GET format: **SN**;

RESPONSE format: **SN xxxxx**;

SN; reads the KAT500's serial number, installed in EEPROM during factory installation of initial firmware and will normally remain unchanged thereafter. Leading zeros may be omitted. **EEINIT** does not change the serial number.

ST (SWR Threshold, GET and SET)

GET format: **STbtt**; where **bb** is the Band Number (see **BN** command) and **t** is a "type"

SET format: **STbttnn.nn**; where **nn.nn** is a VSWR value.

The "types" are:

- **A** for **Auto** tune VSWR threshold. When the KAT500 is in Mode AUTO and the current VSWR reaches this threshold, the KAT500 will attempt to recall a prior tuner setting from its memory, or perform a Full Tune as required to reach the Auto tune VSWR threshold. The default Auto tune VSWR threshold value is 1.8. The minimum is 1.5. For example, to change the Auto tune VSWR threshold for 20 meters to SWR 1.75:1, enter **ST05A1.75**; where **05** is the Band Number for 20 meters.
- **B** for **bypass** VSWR threshold. During a "full tune", VSWR is measured with the KAT500 in bypass, with no inductors or capacitors in the RF path. If the bypass VSWR is less than or equal to the bypass VSWR threshold, the desired (and memorized) tuner setting for this frequency is "use the bypass relay". The default bypass VSWR threshold is 1.2. For example, to change this threshold to 1.3:1 for 80 meters, enter **ST01B1.3**; where **01** is the Band Number for 80 meters.
- **K** for amplifier **Key** interrupt VSWR threshold. If the VSWR exceeds this threshold, the amplifier key interrupt relay is energized so that the amplifier is not keyed. The default amplifier key interrupt VSWR threshold is 2:1. This threshold may be set as high as 99.99 to defeat the protection function.

The *KAT500 Utility* Edit Configuration dialog VSWR Thresholds tab supports setting these values individually by band, or all at once for all bands.

VSWR values are encoded in an 8.8 binary format, so the least significant digit may change when converting between binary and decimal representations.

T (Start Full Tune, SET only)

SET format: **T**;

RESPONSE format: **FT**; when full tune completes.

This command is equivalent to pressing the front panel TUNE button. **T**; is equivalent to **FT**; (Full Tune).

VFWD (Forward coupler voltage ADC count, GET only)

GET format: **VFWD**;

RESPONSE format: **VFWD nnnn**; where nnnn is 0 through 4095. Leading zeros may be omitted.

VFWD; returns an Analog-to-digital conversion (ADC) count of the VFWD voltage from the KAT500's RF coupler. VFWD and VRFL are used to compute the VSWR. VFWD is also used for safety thresholds.

VRFL (Reflected coupler voltage ADC count, GET only)

GET format: **VRFL**;

RESPONSE format: **VRFL nnnn**; where nnnn is a number between 0 and 4095. Leading zeros may be omitted.

VRFL; returns the ADC count of the reflected voltage at the coupler, using the same units as VFWD.

VSWR (Voltage Standing Wave Ratio, GET only)

GET format: **VSWR**;

RESPONSE format: **VSWR nn.nn**; Range is **VSWR 0.00**; to **VSWR 99.99**; for 99.9 to 1 or higher VSWR.

VSWRB (Voltage Standing Wave Ratio in Bypass, GET only)

GET format: **VSWRB**;

RESPONSE format: **VSWRB nn.nn**; Range is **VSWRB 0.0**; to **VSWRB 99.99**; for 99.99 to 1 or higher VSWR.

VSWRB is the VSWR of the antenna, as measured at the KAT500 coupler, when the KAT500's bypass relay was released; without any KAT500 inductors or capacitors in the RF path.