

ELECRAFT K3 AND KX3 PROGRAMMER'S REFERENCE

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(For change history, see Appendix A)

Command Set Overview

All K3/KX3 remote control commands are listed in **Table 1**. The KX3 accepts all K3 commands, though some have no functional effect on the KX3 (*). Some commands are recognized only by the KX3 (**). For **K2** commands, see the **KIO2 Programmer's Reference**.

Table 1 K3/KX3 Control Commands. (*) = Not functionally applicable to KX3. (**) = KX3 only.
(S) = Add '\$' for VFO B/sub RX (VFO B/dual watch for KX3).

Name	Description	Name	Description	Name	Description
! , @ *	Direct DSP control	FT	Transmit VFO select	PO **	Power output read
AG \$	AF gain	FW \$	Filter bandwidth and #	PS	Power-on/off control
AI	Auto-info mode	GT	AGC speed and on/off	RA \$	RX attenuator on/off
AK **	Internal use only	IC	Icon and misc. status	RC	RIT/XIT offset clear
AN	Antenna selection	ID	Radio identification	RD	RIT down
AP	CW APF on/off	IF	General information	RG \$	RF gain
BG	Bargraph read	IO **	Internal use only	RO	RIT/XIT offset (abs)
BN \$	Band number	IS	IF shift	RT	RIT on/off
BR	Baud rate set	K2	K2 command mode	RU	RIT up
BW \$	Filter bandwidth	K3	K3 command mode	RV	Firmware revisions
CP	Speech compression	KS	Keyer speed	RX	Enter RX mode
CW	CW sidetone pitch	KY	Keyboard CW/DATA	SB	Sub or dual watch
DB	VFO B text	LD	Internal use only	SD	QSK delay
DL	DSP command trace	LK \$	VFO lock (A or B)	SM \$	S-meter
DM	Internal use only	LN *	Link VFOs	SMH *	High-res S-meter
DN/DNB	VFO move down	MC	Memory channel	SP *	Internal use only
DS	VFO A text/icons	MD \$	Operating mode	SQ \$	Squelch level
DT	Data sub-mode	MG	Mic gain	SWT/H	Switch tap/hold
DV *	Diversity mode	ML	Monitor level	TB	Buffered text
EL **	Error logging on/off	MN	Menu entry number	TE	Transmit EQ
ER	Internal use only	MP	Menu param read/set	TQ	Transmit query
ES	ESSB mode	MQ **	Menu param read/set	TT	Text-to-terminal
EW	Internal use only	NB \$	Noise blanker on/off	TX	Exter TX mode
FA	VFO A frequency	NL \$	Noise blanker level	UP/UPB	VFO move up
FB	VFO B frequency	OM	Option modules	VX	VOX state
FI *	I.F. center frequency	PA \$	RX preamp on/off	XF \$	XFIL number
FN *	Internal use only	PC	Power Control	XT	XIT on/off
FR	Receive VFO select	PN *	Internal use only		

Some commands emulate controls and display elements. For example, the **SWT/SWH** commands emulate switch TAP/HOLD, **MN** accesses menus, **DS**, **DB**, and **IC** read VFO A / B and icons, and **BA** and **BG** read bargraphs. Other commands directly read or modify radio parameters, such as the VFO A and B frequencies (**FA** and **FB**), operating mode (**MD**), keyer speed (**KS**), power level (**PC**), and filter bandwidth (**BW** or **FW**).

There is some overlap between emulation and parametric commands. For example, you can select the *next* operating mode using an **SWT** command to virtually "tap" the **MODE** switch, or set a *specific* mode using **MD**.

Using K3 Utility (or KX3 Utility) to Test Commands

The **Command Tester** screen of the *K3 Utility* and *KX3 Utility* PC application can be used to try individual control commands. You can even save useful commands (or strings of commands) as named *macros* for later use. A subset of these macros can be stored in the radio's EEPROM memory, where they can be assigned to programmable function switches. See the **Command Examples** section (page 5).

Command Format

Note: In the remainder of this document, K3 references apply to the KX3 as well unless otherwise noted.

Commands sent from the computer to the K3 are considered either GETs or SETs. GET commands are used by the computer to get information from the K3; the K3 will then provide an appropriate response message (RSP). SET commands are sent by the computer to change the radio's configuration or initiate an event. A SET can be followed by a GET to verify the new settings, or the *auto-info* mechanism can be used for confirmation that something has changed (see **AI** in the Meta-commands section).

SET commands use 2 or 3 characters, optional data fields, and a terminating semicolon (;). Examples:

KS020;	Computer sets CW speed to 20 WPM (data = 020)
MD1;	Computer selects LSB mode (data = 1)

Many SET commands have a corresponding GET command, which is just the command letters with no data. The data format of the response message from the K3 (RSP) is usually identical to the format of the SET data. Exceptions are noted in the command descriptions.

Characters sent to the K3 can use either upper or lower case. The K3 will always respond with upper case, except when a lower-case character is a place-holder for a special symbol (e.g., the VFO B display command, **DB**).

Sub Receiver/VFO B Commands (\$), Linked VFOs, and Diversity Mode

Some commands target VFO B (and the sub RX, in the case of the K3) if (\$) is added after the command prefix. Examples include **AG\$**, **RG\$**, **MD\$**, **BW\$**, **FW\$**, **LK\$**. This is indicated in the reference section by a \$ in the command title. (Some commands target VFO B itself and do not need the '\$', including **FB**, **UPB**, **DNB**, and **DB**.)

If the VFOs are linked (see **LN**), commands that affect the VFO A frequency also change VFO B. This includes **FA**, **UP**, **DN**, **RU**, **RD**, and **RC**. In Diversity mode, **BW**, **FW** and **MD** match the VFO B/sub receiver filter and mode settings, respectively, to the main receiver.

Extended Commands

Some commands have an **extended** data format which provides enhanced functionality or backward compatibility with older software applications. Such commands should be avoided in switch macros because of the need to use a *meta-command* to enable extended functionality (see **Meta-commands** section). Alternatives are available. For example, the **BW** (bandwidth) command should be used in macros rather than the legacy **FW** command, which depends on meta-command settings.

Response Time

The K3 will typically respond in less than 10 milliseconds. General worst-case latency is around 100 ms, except for commands that change bands, which can take up to 500 ms.

Since the K3 provides a full-duplex interface, the computer can send the K3 commands at any time. Continuous, fast polling (< 100 ms per poll for bar graph data in transmit mode, for example) should be carefully tested to ensure that it isn't affecting radio operation. Polling during transmit should not be used unless necessary.

Busy/Limited Access Indication (?:)

Some commands cannot be safely handled when the K3 is in a *busy* state, such as transmit, or in a *limited-access* state, such as BSET or VFO A/B reverse (REV switch). If a command cannot respond due to such a condition, the K3 will return "?:". Future firmware releases will gradually become less restrictive in this regard.

You can use the **TQ** command to see if the K3 is in transmit mode, and the icon/status command (**IC**) to check for BSET mode (byte **a**, bit **6**).

Meta-commands: *AI*, *K2* and *K3*

Meta-commands change the behavior of other commands to provide automatic responses or compatibility with older application software. In general they should not be embedded in K3 front-panel switch macros, as they may adversely affect software applications that control meta-command modes. The **Command Reference** section explains when to use them with specific commands.

AI (Auto-info mode): The **AI** meta-command can be used to enable *automatic responses* from the K3 to a computer in response to K3 front panel control changes by the operator. Application software may use **AI1** or **AI2** mode as an alternative to continuous polling. (Not appropriate for switch macros.)

AI0, No Auto-info: This is the default. The PC must poll for all radio information using GET commands; the K3 will not send any information automatically.

AI1, Auto-Info Mode 1: The K3 sends an **IF** (info) response within 1 second when any frequency or mode-related event occurs, either manually (at the radio itself) or when the PC sends commands. These events include: band change, mode change, VFO movement, RIT/XIT offset change or clear, and several additional switches (e.g., A/B, REV, A=B, SPLIT, CW REV, RIT, XIT). **IF** responses are suppressed during VFO movement. **Notes:** (1) putting the K3 into auto-info mode 1 (by sending **AI1**;) causes an initial **IF** response. (2) The K3 can be placed into **AI1** mode without a PC by setting **CONFIG:AUTOINF** to **AUTO 1**. The user may do this to support non-PC devices that make use of auto-info, such as a SteppIR antenna controller. Application software can check for unexpected **IF** responses and turn **AI** off if required.

AI2, Auto-Info Mode 2: The K3 sends an appropriate response (**FA**, **FB**, **IF**, **GT**, **MD**, **RA**, **PC**, etc.) whenever any front-panel event occurs. This applies to all of the events mentioned for mode **AI1**, and ultimately to all rotary control changes and switch presses. At present only a subset of controls generate responses.

AI3, Combination: This is similar to mode **AI2** and is provided only for compatibility with existing programs.

K2 (K2 command mode): The **K2** meta-command modifies the set/response format of some commands. Avoid using this command in switch macros.

K20, K2 Normal mode: This is the default; K2 command extensions are disabled.

K21, K2 Normal/rtty_off: Same as **K20**, except that **MD** and **IF** report RTTY and RTTY-reverse modes as LSB and USB, respectively. This may be useful with programs that don't support a separate RTTY mode.

K22, K2 Extended mode: Enables all K2 command extensions.

K23, K2 Extended mode/rtty_off: Enables all K2 extensions, but like **K21**, alters the **MD** and **IF** commands.

K3 (K3 command mode): The **K3** meta-command modifies the set/response format of some commands. Avoid using this command in switch macros.

K30, K3 Normal mode: This is the default; K3 command extensions are disabled.

K31, K3 Extended Mode: Enables all K3 command extensions (see, for example, **FW**). Typically, K3 applications will place the K3 in **K31** mode except when **K30** mode is needed due to the use of certain commands.

Command Examples

Macros

Macros – strings containing one or more control commands – can be used to automate K3 front panel switch sequences. **Table 2** lists some examples. See *Creating and Using Macros* (page 6) for complete instructions.

Table 2 Sample Macros. These can be altered or combined as needed (see the **Command Reference** section).

Label	Description	Command string
SPLIT+2	CW DX split starting point: A>B twice, enter SPLIT, move VFO B up 2 kHz, RIT/XIT off	SWT13;SWT13;FT1;UPB5;RT0;XT0; ¹
EQ MIC1	Boost 100-Hz TX EQ band by 8 dB; others “flat”	TE+00+08+00+00+00+00+00+00;
WEAKSIG	Diversity mode, main/sub preamps on, 200-Hz bandwidth, no IF shift	DV1;PA1;PA\$1;BW0020;IS 9999;
CLEANUP	Turn off split/RIT/XIT; unlink VFOs; open squelch	FT0;RT0;XT0;LN0;SQ000;
WWV 10	30 m, AM mode, VFO A to 10.0 MHz, 3 kHz AF bandwidth (requires 6 kHz IF crystal filter)	FA00010000000;MD5;FA00010000000;BW0300; ²
OLDIES	Switch to AM radio station at 1550 kHz; 4 kHz BW, attn. on, preamp off	FA00001550000;MD5;FA00001550000;BW0400;IS 9999;RA01;PA0;
LCD BRT	Set the MAIN:LCD BRT menu parameter to 6	MN003;MP005;MN255; ³
MEM32	Load frequency memory #32 into VFOs A and B	MC032;
LOCKA&B	Lock both VFOs	LK1;LK\$1;
PWRTEST	Send “BT” at 100 W, 10 W, and 1 W, then restore power to 100 W (“=” embeds a BT prosign)	PC100;KYW =;PC010;KYW =; PC001;KYW =;PC100;
TUN 10W	Set power to 10 W and enter TUNE mode	PC010;SWH16;
AMP ON	Turn on an external amplifier and set K3 drive to 65 W (see CONFIG:DIGOUT1, Owner’s Manual)	MN019;MP001;MN255;PC065;
599FAST	Send “5NN” at 40 WPM, “TEST ” at 30 WPM	KS040;KYW5NN ;KS025;KYWTEST ;
MUTE AF	Set main and sub AF GAIN to zero	AG000;AG\$000;
MON OFF	Set monitor volume to zero (present mode)	ML000;
SCANNOW (K3 only)	Stores VFO A & B in per-band quick-memory M4 and starts scan (> 2 second hold starts “live” scan); VFO B frequency must be > VFO A	SWT15;SWT39;SWT23;SWT39;SWH41; ⁴
STEPIR	Send frequency info to a device attached to the serial port, such as an antenna controller or ATU	IF; ⁵

¹ **SWT13** is a switch-emulation command that has the same effect as tapping **A>B**. The **KX3** has different **SWT** codes. **FT1** enters split mode. The number **5** in **UPB5** is not a value in kHz, but an index into the table of step sizes (in this case 2 kHz); see the **DN** command in the command reference for full details. **RT0** and **XT0** turn off RIT and XIT.

² The first **FA** command in this macro may cause a band change. **MD** (mode) is sent after it, so the mode change will apply to the new band. The second **FA** command is only required if auto-offset-on-mode-change is in effect. (In **CONFIG: CW WGHT**, tapping **5** alternates between **VFO NOR** and **VFO OFS**. In the latter case, the VFO frequency is adjusted when switching between CW and any other mode.)

³ **MN** accesses menu entries. **MP** can then be used (in some cases) to read or set the parameter value. In the LCD BRT macro, **MP005** sets **LCD BRT** to **6**. You can determine a menu entry’s parameter range by manually setting the parameter to the lowest/highest values, typing “**MP;**” each time in the command test box at the top of the **Command Tester** screen.

⁴ This example uses per-band memory M4 (SWT39), but any of M1-M4 could be used, or quick memories 0-9 (see SWT/SWH command). If scanning is started with a macro, the last switch emulation command in the macro must be **SWH41 (SCAN)**.

⁵ **IF** is a GET command (general transceiver info, including VFO A’s frequency and mode). When the K3 encounters a GET command in a macro, it sends the response to any device attached to the serial port, just as if a computer had requested it. Multiple GET commands could be placed in a macro if necessary; examples include **FA** and **FB** (VFO A and B frequencies).

Creating and Using Macros

K3 Utility is used to create and test macros. The first eight of these can be sent to the K3 (not applicable to the KX3 at present), where they can be assigned to any of the transceiver's programmable function switches. Macros can have a length of up to 120 characters, along with a label of up to 7 characters.

Example (“SPLIT+2”): *A>B, A>B, SPLIT, VFO B up 2 kHz, RIT/XIT off*, assigned to **PF1**

To create this macro and assign it to a K3 front panel switch, you'll need to complete all of steps 1-8 below. Once you've been through the process one time, you'll find creating or modifying macros very easy.

1. Run **K3 Utility**.
2. Click on the **Command Tester/K3 Macros** tab.
3. Click on the **Edit Macros** button at the top of the screen. This brings up the macro edit window.
4. In MACRO 1's **Macro Label** field, enter the label “SPLIT+2”.
5. In the **Macro Commands** field, enter:

SWT13;SWT13;FT1;UPB5;RT0;XT0;

Note: The number **5** in the “**UPB5**” command is not a value in kHz; it is an index into a table of step sizes. **UPB5** moves VFO B up 2 kHz, **DNB5** moves it down 2 kHz, etc. (there are similar commands for VFO A). For the full list of **UP/DN** command variations, see the **DN** (down) command (page 8).

6. Click on **Send Macros 1-8 to K3**. Exit the edit window by clicking **Save**. The macro can now be tested from within the Command Tester by clicking on its associated button. (The label won't flash on VFO B when this is done from *K3 Utility* – only when using the assigned switch at the K3.)
7. At the K3, locate **CONFIG:MACRO x** menu entry. Tap ‘1’ if the menu entry label is not already “MACRO 1”.
8. Hold **PF1** to assign **PF1** to **MACRO 1**. Exit the menu.

From then on, using **PF1** will flash **SPLIT+2** and execute the above sequence.

Important Restrictions: (1) Macros normally only use *SET* commands, since they can't make use of the response from a *GET*. For a very useful exception to this rule, see the last sample in **Table 2**. (2) Macros should not use *meta-commands* (like **K31**;) as this can interfere with software applications that control meta-modes. (3) Macros can be used to send direct DSP commands (see **!** and **@**, page 7), but at present this only works from *K3 Utility*, not from K3 front-panel switches.

Simple Application Program

The pseudo-code program below displays the VFO A frequency (8 digits) while watching for the user to request a frequency change via the PC keyboard. For details on individual commands, see the **Command Reference** section.

```
VfoControlLoop
{
    SendCommand( "FA;" )                // GET frequency of VFO A
    StringF = GetResponse( TIMEOUT_100MS ) // wait for response; include a timeout, just in case
    Display( StringSubset( StringF, 5, 12 ) ) // show MHz through Hz digits on PC screen
    If( KeyboardInput = "+" )            // up/down control could be a mouse click instead
        SendCommand( "UP;" )           // this is a SET command that moves VFO A up
    If( KeyboardInput = "-" )
        SendCommand( "DN;" )
}
```

Command Reference

Note: Commands marked with a dollar sign (\$) apply to VFO B (and the sub receiver, in the case of the K3). Commands marked with an asterisk (*) are not functionally applicable to the Elecraft KX3, but the KX3 will accept and reply to all K3 commands. For K2 commands, see the KIO2 Programmer's Reference.

This section describes all K3 GET, SET and RSP (response) command formats. Unless otherwise noted, the GET format is just the 2 or 3 letters of the command followed by a semicolon. The SET and RSP data formats are identical unless noted otherwise. When **K2** or **K3** extended modes are in effect (typically **K22** or **K31**), some commands have an **extended** format (see **Meta-commands**). Both **Basic** and **Extended** formats are described here.

! and @* (Direct Main/Auxiliary DSP control)

Elecraft releases documentation on specific DSP commands as user needs for them arise. DSP commands can cause side effects and should be used with caution. **NOTE: At present, DSP commands can not be used in combination with regular commands in K3 Utility macros. Also, they will not work as K3 switch macros.**

AG \$ (AF Gain; GET/SET)

SET/RSP format: **AGnnn**; or **AG\$nnn**; where **nnn** is 000-255.

AI (Auto-Information; GET/SET)

SET/RSP format: **AIn**; where **n** is 0-3. See Meta-commands for details. **Note:** The **AI** power-up default is normally **AI0**, corresponding to K3 menu setting **CONFIG:AUTOINF = NOR**. **AUTOINF** can also be set to **AUTO 1**, which makes the default **AI1** on power-up. This is useful for K3s controlling a StepIR antenna, etc.

AK (KX3, Internal Use Only)

SET/RSP format: **TBD**.

AN (Antenna Selection; GET/SET)

SET/RSP format: **ANn**; where **n** is **1** for antenna 1, and **2** for antenna 2.

AP (Audio Peaking Filter; GET/SET)

SET/RSP format: **APn**; where **n** is **0** for APF OFF and **1** for APF ON. Applies to CW mode only, and only if **CONFIG:DUAL PB** is set to **APF**.

BG (Bargraph Read; GET only)

RSP format: **BGnnx**; where **nn** describes which bars are turned on and **x** (K3 only) indicates receive (**R**) or transmit (**T**). Returns S-meter level in receive (also see **SM/SM\$** command), and power or ALC level in transmit. CWT, SWR, and CMP readings not yet available.

K3, Receive: **nn** is **00 - 21** (CWT off) or **00 - 09** (CWT on).

K3, Transmit: **nn** is **00 - 12** (PWR) or **00 - 07** (ALC) depending on **METER** setting.

K2, Receive or Transmit: **nn** is **00 - 10** (**DOT** mode) or **12 - 22** (**BAR** mode).

BN \$ (Band Number; GET/SET)

SET/RSP format: **BNnn**; where **nn** is 00-24, the present "logical" band for VFO A (use **BN\$nn** for VFO B).

Also see **MC** command (memory channel set). **Note:** **BN** SET command applies only to VFO A at present.

BN GET works with either VFO A or B. If a band change occurs, allow 300 ms before sending other commands.

nn is defined as follows: **0**=160 m, **1**=80 m, **2**=60 m, **3**=40 m, **4**=30 m, **5**=20 m, **6**=17 m, **7**=15 m, **8**=12 m, **9**=10 m, **10**=6 m, **11-15** reserved for future expansion, **16**=Xvtr band #1, **17**=Xvtr band #2... **24**=Xvtr band #9.

BR (Serial I/O Baud Rate; SET only)

SET format: **BRn**; where **n** is **0** (4800 b), **1** (9600 b), **2** (19200 b), or **3** (38400 b). **Note:** The K3 firmware download utility automatically sets the K3 to 38400 baud for downloads, then restores the baud rate to the user's selection (made using the K3's **CONFIG:RS232** menu entry).

BW \$ (Filter Bandwidth; GET/SET)

SET/RSP format: **BWxxxx**; where **xxxx** is 0-9999, the bandwidth in 10-Hz units. May be quantized and/or range limited based on the present operating mode.

Notes: (1) **BW** is a derivative of the legacy **FW** command. **BW** is safer to use in switch macros, because it makes no assumptions about meta-command settings (**K2x** and **K3x**). **FW** may be preferred in applications. (2) In diversity mode, **BW** matches the sub receiver's filter bandwidth to the main receiver's. (3) Both **BW** and **BW\$** can be used in BSET mode (one exception: at present, **BW/BW\$** SET can't be used in BSET mode with diversity receive in effect).

CP (Speech Compression; GET/SET)

SET/RSP format: **CPxxx**; where **xxx** is 000-040 (speech compression level).

CW (CW Sidetone Pitch; GET only)

RSP format: **CWxx**; where **xx** is 30-80 (sidetone pitch in 10 Hz units).

DB (VFO B Display Read/Write; GET/SET; K3 and KX3 variants)

GET format: **DB**; (no data). Returns text displayed on VFO B, including decimal points and colons if present. VFO B normally displays only uppercase alphabetic characters. **DB** returns the following lower-case characters that represent symbols: **a** (antenna), **b** (mu), **c** (slashed 0), **d** (itself), **e** (sigma), **f** (<-), **g** (->), **h** (II), **i** (left-justified "1"), **j** (delta, large), **k** (delta, small), **l** (right-justified "1").

There are two SET formats with different functions:

DBn; where **n** is an ASCII character to send to VFO B, entering at the right end of the display and scrolling left as additional characters are entered. This can be used to create scrolling messages to alert the operator to something regarding the computer, send extended help text, insert a newsfeed, report a DX spot, test special characters, etc.

DBnn; where **nn** is one of the available VFO B alternate display modes:

K3: **00**=normal, **01**=time, **02**=date, **03**=RIT/XIT offset, **04**=supply voltage, **05**=supply current, **06**=PA heatsink temp, **07**=front panel temp, **08**=PLL1 voltage, **09**=PLL2 voltage, **10**=AFV, **11**=dBV.
(**Note:** Modes **08** and higher require **CONFIG:TECH MD = ON**.)

KX3: **00**=normal, **01** = time, **02** =supply voltage, **03**=supply current, **04**=PA temp, **05**=OSC temp, **06**=AFV, **07**=dBV

DL (DSP Command Debug On/Off; SET only)

SET format: **DLx**; where **x** = **2** to turn DSP command debugging OFF, **3** to turn it ON. When it's ON, all commands sent from the MCU to the DSP are echoed to the K3's serial port, with a few exceptions such as during program loading. The DVR icon will flash as a reminder.

DN/DNB (Move VFO A or B, or Menu Entry/Parameter Down; SET only)

SET format: **DN**; or **DNB**; or **DNn**; or **DNBn**; where **n** is an optional VFO change specification. **DN**; and **DNn**; move VFO A (or the menu parameter) down. **DNB**; and **DNBn**; move VFO B (or the menu entry) down. VFO displacement, **n**: **0**=1 Hz; **1** or **not used**=10 Hz; **2**=20 Hz; **3**=50 Hz; **4**=1 kHz; **5**=2 kHz; **6**=3 kHz; **7**=5 kHz; **8**=100 Hz; **9**=200 Hz.

Note: If the VFOs are linked (non-SPLIT), **DN**; and **DNn**; set VFO B to the same frequency as VFO A.

DS (VFO A and Basic Icon Read; GET only)

GET format: **DS**; (no data). Returns everything needed to reproduce the contents of the VFO A display, as well as a basic subset of the LCDs icons (also see **IC** command, which provides many more status indicators and does not require that **K31** be in effect). The format of the response message is: **DS***xxxxxxxxaf*; where *xxxxxxxx* is the LCD text and decimal point data, *a* is icon data, and *f* is icon flash data (all 0 for the K3), or additional K3 icon data. These fields are detailed below.

TEXT and decimal point data: This field contains 8 bytes, with values 0x30 - 0xFF (hex). The first byte is the left-most displayed character. Bit 7 (MSB) of each byte indicates whether the decimal point to the *left* of each character is on (1) or off (0)⁶. The other bits contain an ASCII character that corresponds to the displayed character.

Some ASCII characters (e.g., 'X', 'M') cannot be shown on VFO A, which uses a 7-segment display. The K3 uses such characters as placeholders for special characters that *can* be displayed – in some cases lowercase versions of uppercase letters – to enhance display readability. For this reason, the characters returned by the **DS** command must sometimes be converted to other characters by the software application. **Table 3** shows all possible conversions, some not used. The table assumes the decimal-point flag (bit 7) is 0.

The menu parameters for *MAIN:RX EQ / TX EQ* consist of 8 “mini bar-graphs” with 5 possible “levels.” These show up as the following characters in the **DS** response string (level 1 through 5): ‘_’, ‘=’, ‘>’, ‘]’, and ‘^’. To see how these should appear in a graphical application, go into RX EQ and vary one of the EQ bands over its full range.

Table 3 DS response character conversions (bit 7 cleared).

DS chr.	Converts to	DS chr.	Converts to	DS chr.	Converts to
<	small-caps L	M	N	Z	lowercase c
>	dash	Q	O	[	r-bar
@	space (blank)	V	U	\	lambda
K	H	W	I	]	RX/TX EQ level 4
		X	c-bar	^	RX/TX EQ level 5

Icon data: This field is a single byte whose value is between 0x80 and 0xFF. Bit 7 is always 1. The other 7 bits indicate the on/off states of 8 icons common to the K2 and K3. The bits are defined as follows (B7 = 0x80).

B7: Always 1	B3: 1=ATT on
B6: 1=NB on*	B2: 0=VFO A selected (always 0 for K3)
B5: 1=ANT2 selected	B1: 1=RIT on
B4: 1=PREAMP on	B0: 1=XIT on

Icon flash data or additional K3 icons: This field is a single byte whose value is between 0x80 and 0xFF. Bit 7 is always 1. In K3 normal mode (K30, or K2 emulation), the other 7 bits are all 0, since in general the K3 doesn't use flashing icons to indicate state. In **K3 Extended** mode (**K31**), the bits are defined as follows (B7 = 0x80):

B7: Always 1	B3: 1=CWT on
B6: 1=SUB on*	B2: 1=NR on*
B5: 1=RX ANT on	B1: 1=NTCH on
B4: 1=ATU on (in-line)	B0: 1=MAN NOTCH on

* The **IC** command provides extended info about the sub receiver (SUB on/off state, linked VFOs, band independence, diversity, sub antenna selection, sub AUX antenna source, sub NB, and sub NR). **IC** does not require the use of **K31**, which may be an advantage for some applications.

⁶ K2 decimal point flash status can be obtained directly; use **LK** for VFO lock, **IF** for scan on/off, and **GT** for AGC on/off.

DT (DATA Sub-Mode; GET/SET)

SET/RSP format: **DTn**; where **n** is the data sub-mode last used with VFO A, whether or not DATA mode is in effect: 0 (DATA A), 1 (AFSK A), 2 (FSK D), or 3 (PSK D). See **MD** for data normal/reverse considerations. In *Diversity Mode* (K3 only, accessed by sending **DV1** or via a long hold of **SUB**), sending **DTn** matches the sub receiver's mode to the main receiver's. **Notes:** (1) *Use DT only when the transceiver is in DATA mode; otherwise, the returned value may not be valid.* (2) In AI2/3 modes, changing the data sub-mode results in both **FW** and **IS** responses. (3) The present data sub-mode is also reported as part of the **IF** command, although this requires that **K31** be in effect. Refer to the **IF** command for details.

DV (Diversity Mode; GET/SET)

SET/RSP format: **DVn**; where **n** is 0 to turn diversity mode OFF, 1 to turn it ON. K3 only; requires subreceiver. **Note:** The **SUB** switch has two other functions besides diversity on/off (long hold): sub on/off (tap) and link/unlink VFOs (normal hold). These can be accomplished remotely; see **LN** (link) and **SB** (sub on/off). Turning the sub off cancels diversity mode.

EL ** (Error Logging; SET only; KX3 only)

SET format: **ELn**; where **n** is 0 to turn error logging OFF, and 1 to turn it ON. When error logging is ON, the KX3 will report all "ERR xxx" messages and general warnings (e.g. "HiTemp->5W;") to an attached PC.

ES (ESSB Mode; GET/SET)

SET/RSP format: **ESn**; where **n** is 0 to turn ESSB mode OFF, and 1 to turn it ON. **Note: The application must place the K3 in either LSB or USB mode for the ESSB ON condition to be relevant.**

FA and FB (VFO A/B Frequency; GET/SET)

SET/RSP format: **FAxxxxxxxxxx**; or **FBxxxxxxxxxx**; where **xxxxxxxxxx** is the frequency in Hz. Example: **FA00014060000**; sets VFO A to 14060 kHz. The Hz digit is ignored if the K3 is not in FINE mode (1-Hz tuning; use **SWT49**). If the specified frequency is in a different amateur band than the present one, the K3 will change to the new band, and will automatically report the new values of parameters that may have changed⁷. **Notes:** (1) **Band changes typically take 0.5 seconds; all command handling is deferred until this process is complete.** (2) If the specified frequency is over 30 MHz and is within a valid transverter band (as specified by the operator using the K3's **XVTR** menu entries), the K3 will switch to that transverter band. If the specified frequency is outside the range of 500 kHz-30 MHz and 48-54 MHz, the K3 will switch to the amateur band closest to the requested one, and the last-used VFO A and VFO B values for that band will be retrieved.

If the VFOs are linked (non-SPLIT), **FA** also sets VFO B to the same frequency as VFO A.

FI * (I.F. Center Frequency; GET only)

RSP format: **Finnnn**; where **nnnn** represents the last 4 digits of the K3's present I.F. center frequency in Hz. Example: If **nnnn** = 5000, the I.F. center frequency is 8215000 Hz. Intended for use with panadapters, which need to keep track of the exact I.F. center frequency as filter bandwidths and shifts are changed by the operator.

FR (RX VFO Assignment [K2 only] and SPLIT Cancel; GET/SET)

SET/RSP format: **FRn**; where **n** is ignored in the K3 case because VFO A is always active for receive mode (the K3 cannot emulate the K2's VFO A/B behavior). Any **FR** SET cancels SPLIT mode.

FT (TX VFO Assignment and optional SPLIT Enable; GET/SET)

SET/RSP format: **FTn**; where **n** specifies the transmit-mode VFO assignment: 0 for VFO A, 1 for VFO B. If B (1) is selected for transmit, the K3 will enter SPLIT (except when split is N/A). Use **FR0**; to cancel SPLIT.

⁷ The parameters sent on band change include **IF** (includes new mode), **FA**, **FB**, **FR**, **FT**, **PA**, **RA**, **AN**, **GT**, **FW**, and **NB**.

FW \$ (Filter Bandwidth and Number; GET/SET)

NOTE: FW is a legacy K2 command with side-effects based on the K3x and K2x meta command settings. For the KX3 and K3, use BW if possible. Also use BW in switch macros.

K3 Extended SET/RSP format (K31): FWxxxx; where xxxx is 0-9999, the bandwidth in 10-Hz units. May be quantized and/or range limited based on the present operating mode.

Basic and K2 Extended formats: See KIO2 Programmer's Reference (K2). In **K22** mode, direct selection of crystal filters is possible by adding a 5th digit (K2 and K3 only). However, **K31** must not be in effect, or it will override the legacy K2 behavior and only allow direct bandwidth selection. For example, you could send **K30;K22;FW00003;K20;K31;** to select filter #3 and then restore the original **K2x** and **K3x** command modes (yours may be different).

Notes: (1) In **AI2/3** modes, moving the physical WIDTH control results in both **FW** and **IS** responses (width and shift). (2) In diversity mode, **FW** matches the sub receiver's filter bandwidth to the main receiver's, which may result in the generation of **FA/FB/FR/FT** responses. (3) Both **FW** and **FW\$** can be used in BSET mode (one exception: at present, **FW/FW\$ SET** can't be used in BSET mode with diversity receive in effect). (4) In **K22** mode, a legacy 6th digit is added to the response. It is always 0. In the K2, it indicated audio filter on/off status.

GT (AGC Time Constant; GET/SET)

Basic SET/RSP format: GTnnn; where n is 002 for fast AGC and 004 for slow AGC.

K2 Extended SET/RSP format (K22): GTnnnx; where x is 0 (AGC off) or 1 (AGC on).

Note: AGC time constant is stored per-mode in the K3, as is AGC on/off and VFO tuning rate.

IC (Misc. Icons and Status; GET only)

RSP format: **ICabcde**; where **abcde** are 8-bit ASCII characters (**Byte** in **Table 4** below) used as collections of flags (**Bit** in table). Each flag represents the status of an LCD icon and/or a specific transceiver function.

Some functions whose status is indicated by **IC** command flags can be controlled using other commands. For example, the K3 can be put into TX TEST by sending **SWH18**. The condition can be verified at any time using the **IC** command (byte **a**, bit **5**). Another example: ESSB (extended SSB) can be turned on/off using an **MN** (menu) command, followed by **SWT11**, simulating a tap of **1** on the keypad. Again, **IC** can be used to verify the present state (byte **d**, bit **5**).

The 8th bit (B7) of each byte is always 1 to ensure that control characters are not sent to the computer. The other bits are defined as shown in **Table 4**.

Table 4 IC response fields. See notes below.

Bit	Byte				
	a (Misc)	b (Sub RX)	c (CW/DATA)	d (Voice Modes)	e (Misc)
B7	Always 1	Always 1	Always 1	Always 1	Always 1
B6	1=BSET ** 0=Normal	1=VFOs linked (VFO A tunes both) (K3 only)	1=Full QSK 0=Semi QSK	1=VOX on in voice, DATA A, AFSK A	1= 10 Hz SHIFT 0= 50 Hz SHIFT
B5	1=TX TEST 0=Normal	1=VFO A/B bands are independent	1=Dual-passband CW or APF in use	1=ESSB 0=Normal	1= AM Sync USB 0= AM Sync LSB
B4	1=mW power level (xvtr or KXV3 test) 0=normal power out	1=Diversity mode (K3 only)	1=VOX on for CW, FSK-D, or PSK-D	1=Noise gate on 0=Off	1= Main RX is squelched
B3	0=MSG bank 1 1=MSG bank 2 §	1=Sub ant. = MAIN 0=Sub ant. = AUX (K3 only)	1=Dual-tone FSK filter in use	1=AM Sync RX 0=Normal	1= Sub RX is squelched (K3 only)
B2	1=MSG is playing 0=no MSG playing	Sub RX aux source: 1=BNC (AUX RF) 0=non-TX ATU ant (K3 only)	1=Normal FSK TX polarity 0=inverted	1=FM PL tone on 0=Off	1=Sub RX NR is on, 0=Off (K3 only)
B1	1 =CONFIG:MEM0-9 = BAND SEL	1=Sub RX NB is on 0=Off (K3 only)	1=Sync DATA 0=Normal	1=(+) Rptr TX ofs	0 *
B0	Preset #: 0=I, 1=II§	1=Sub RX is on (dual watch in KX3)	1=Text-to-terminal is in effect (see TT)	1=(-) Rptr TX ofs	0 *

* These bits are reserved for future use.

** If BSET is in effect (byte **a**, bit **6**=1), the values of some other flags may change or may be invalid. The application should examine this bit first.

§ Per-mode, or per mode-group (e.g., MSG bank # is stored separately for CW/FSK-D/PSK-D and voice/DATA-A/AFSK-A).

ID (Transceiver Identifier; GET only)

RSP format: **IDnnn**; where **nnn** is 017. This command is provided only for compatibility with existing software, which may use **ID** in order to distinguish between transceivers. New or modified software should send the **K3** command to the transceiver; if a **K3n** response is received, the computer must be connected to a K3 or KX3. The K3 and KX3 can be differentiated from each other using the **OM** command.

IF (Transceiver Information; GET only)

RSP format: **IF[f]*****+yyyyrx*00tmvspbd1***; where the fields are defined as follows:

[f]	Operating frequency, excluding any RIT/XIT offset (11 digits; see FA command format)
*	represents a space (BLANK, or ASCII 0x20)
+	either "+" or "-" (sign of RIT/XIT offset)
yyyy	RIT/XIT offset in Hz (range is -9999 to +9999 Hz when computer-controlled)
r	1 if RIT is on, 0 if off
x	1 if XIT is on, 0 if off
t	1 if the K3 is in transmit mode, 0 if receive
m	operating mode (see MD command)
v	receive-mode VFO selection, 0 for VFO A, 1 for VFO B
s	1 if scan is in progress, 0 otherwise
p	1 if the transceiver is in split mode, 0 otherwise
b	Basic RSP format: always 0; K2 Extended RSP format (K22): 1 if present IF response is due to a band change; 0 otherwise
d	Basic RSP format: always 0; K3 Extended RSP format (K31): DATA sub-mode, if applicable (0=DATA A, 1=AFSK A, 2=FSK D, 3=PSK D)

The fixed-value fields (space, 0, and 1) are provided for syntactic compatibility with existing software.

IO (KX3, Internal Use Only)

SET/RSP format: **TBD**.

IS (I.F. Shift; GET/SET)

SET/RSP format: **IS*nnnn**; where * is a space, and **nnnn** is the AF center frequency (Fc) in Hz. The SET value may be altered based on the present mode; a subsequent **IS** GET reports the value used. The nominal Fc (i.e., with no SHIFT) varies with mode, and in CW or DATA modes will also vary with PITCH. To center the passband, send **IS 9xxx**; (**xxx** must be digits, but are ignored). A subsequent **IS** read will then return the center frequency.

Notes: In AM-Sync mode, send **IS 1400** / **IS 1600** to shift to LSB / USB. This doesn't actually shift the AF passband; an IS get will return **IS 1500** in AM-Sync because AF Fc remains at 1500 Hz. To determine which sideband is in use for AM sync, see the **IC** command. In AI2/3 modes, moving the physical SHIFT control results in both **IS** and **FW** responses (shift and width). In diversity mode, an **IS** command also shifts the sub receiver, and FA/FB/FR/FT commands may be generated. **IS** is not applicable to FM mode or QRQ CW mode.

K2 (K2 Command Mode; GET/SET)

SET/RSP format: **K2n**; where **n** is 0-3. If non-zero, enables K2 command extensions to legacy "2-letter" commands. (These apply to the K3 as well.) In most cases the effects of the **K2** command are independent from those of the **K3** command (see below), and the two can both be non-zero at the same time. The **FW** command is an exception; see meta-commands and **FW** for details. **BW** is a non-modal version of **FW** that is preferred in switch macros and when **AI** modes aren't used.

K3 * (Command Mode; GET/SET)

SET/RSP format: **K3n**; where **n** is 0-1. If **n** is 1, enables K3-specific command extensions to legacy “2-letter” commands. Not needed for new commands that are unique to the K3. In most cases the effects of the **K3** command are independent from those of the **K2** command (see above), and the two can both be non-zero at the same time. The **FW** command is an exception; see meta-commands and **FW** for details. **BW** is a non-modal version of **FW** that is preferred in switch macros and when **AI** modes aren’t used.

KS (Keyer Speed; GET/SET)

SET/RSP format: **KSnnn**; where **nnn** is 008-050 (8-50 WPM).

KY (CW or CW-to-DATA Keying from Text; GET/SET)

SET format: **KY*[text]**; where ***** is normally a BLANK and **[text]** is 0 to 24 characters. If ***** is a **W** (for “wait”), processing of any following host commands will be delayed until the current message has been sent. This is useful when a **KY** command is followed by other commands that may have side-effects, e.g., **KS** (keyer speed).

Basic RSP format: **KYn**; where **n** is 0 (CW text buffer not full) or 1 (buffer full). Also see **TB** command.

K2 Extended RSP format (K22): **KYn**; where **n** is 0 (buffer < 75% full), 1 (buffer > 75% full), or 2 (buffer completely empty AND transmit of previous string is complete).

The following keyboard characters are mapped to CW "prosigns":

(KN + AR = BT % AS * SK ! VE

In addition to these prosigns, these special characters can be inserted anywhere in the **KY** command text:

- < Puts the K3 into TX TEST mode, until a '>' character is received
- > Returns the K3 to TX NORM mode
- @ In CW mode, this character normally terminates any CW message (via KY or manual send), emulating the K2. However, tapping **2** in **CONFIG:CW WGHT** changes ‘@’ to a prosign: the ‘at’ sign as used in e-mail addresses. This is the newest Morse Code character; it can be remembered as the prosign ‘AC’ (as in “the At Character”).
- ^D (EOT, ASCII 04) Quickly terminates transmission; use with CW-to-DATA.

LK \$ (VFO Lock; GET/SET)

SET/RSP format: **LKn**; where **n** is 0 (VFO unlocked) or 1 (locked).

LN * (Link VFOs; GET/SET)

SET/RSP format: **LNn**; where **n** is 0 (VFOs unlinked) or 1 (linked).

MC (Memory Channel; GET/SET)

SET/RSP format: **MCnnn**; where **nnn** is the memory # (or channel). Regular memories are 000-099. Per-band quick memories: $nnn = 100 + \text{bandNum} * 4 + M_n - 1$. For bandNum, see **BN**. M_n is 1 - 4, i.e. **M1-M4** tap.

Notes: (1) A SET is ignored if the target memory is invalid. (2) K3 only: If **CONFIG:MEM0-9 = BAND SEL**, then memories 000-009 only (“Quick memories”) will recall the last-used VFO frequencies in the target band, not fixed frequencies. (3) Switching to any regular memory (000-099) updates the K3’s default **V>M/M>V** memory number; this is not the case when switching to Per-Band Quick memories (**M1-M4**). (4) Switching to any memory tagged with ‘*’ as the first character in its label enables channel-hop scanning (see K3/KX3 Owner’s manual).

MD \$ (Operating Mode; GET/SET)

SET/RSP format: **MDn**; or **MD\$n**; where **n** is 1 (LSB), 2 (USB), 3 (CW), 4 (FM), 5 (AM), 6 (DATA), 7 (CW-REV), or 9 (DATA-REV). **Notes:** (1) K3 only: In *Diversity Mode* (accessed by holding **SUB**), sending **MDn**;

sets both main and sub mode to **n**. (2) DATA and DATA-REV select the data sub-mode that was last in effect on the present band. (To read/set data sub-mode, use **DT**.) The norm/rev conditions for the K3's data sub-modes are handled in two pairs at present: DATA A/PSK D, and AFSK A/FSK D. E.g., if the radio is set up for DATA A mode, alternating between **MD6** and **MD9** will cause both DATA A and PSK D to be set to the same normal/reverse condition. In K2 command modes 1 and 3 (**K21** and **K23**), the RSP message converts modes 6 and 7 (DATA and DATA-REV) to modes 1 and 2 (LSB and USB). This may be useful with existing software applications that don't handle DATA modes correctly.

MG (Mic Gain; GET/SET)

SET/RSP format: **MGxxx**; where **xxx** is 000-060.

ML (Monitor Level; GET/SET)

SET/RSP format: **MLxxx**; where **xxx** is 000-060. Applies to current mode (CW sidetone, voice, or data). In voice modes, applies to MON level, even if DVR monitor level is independent (**MAIN:TX DVR**).

MN (Menu Selection; GET/SET; K3 and KX3 variants)

SET/RSP format: **MNnnn**; where **nnn** is shown in **Table 5 (K3)** or **Table 6 (KX3)**. **MN255** is returned if the menu is not in use. **MN** commands can be sent in any order. To exit the menu, send **MN255**. To change the parameter, use **UP / DN** (or **MP** and **MQ** commands—see table notes). **IMPORTANT: TECH MD** menu entry must be set to ON to access tech-mode menu entries; otherwise **MN** will skip these entries. Use **MN072** to access the **TECH MD** menu entry. **On the KX3, tech-mode parameters are locked by default when accessed at the radio, but are automatically unlocked when accessed via the MN/MP/MQ commands.**

Table 5 K3 MN values. ‡ = can be read/set using **MP** command. **nnn** is permanently associated with a menu entry, even if entries are moved. **md** is the data mode pertaining to a menu entry: CW, SB (LSB/USB), DT (DATA), AM, or FM. **pwr** is LP (QRP), HP (QRO), or MW (0 to 2 mW, using the KXV3 transverter I/O jacks).

Entry	nnn	Entry	nnn	Entry	nnn	Entry	nnn
ALARM	000	DATE MD	030	SMTR MD	060	XVx RF	090
IAMBIC	001	DDS FRQ	031	AGC-F	061	XVx IF	091
LCD ADJ ‡	002	LIN OUT ‡	032	REF CAL	062	XVx PWR	092
LCD BRT ‡	003	KIO3	033	SQ MAIN	063	XVx OFS	093
LED BRT ‡	004	ADC REF	034	SQ SUB	064	XVx ADR	094
MSG RPT ‡	005	RFI DET	035	SMTR OF	065	AF GAIN	095
PADDLE	006	KDVR3	036	SMTR SC	066	TX ESSB	096
RPT OFS ‡	007	AGC-S	037	SMTR PK	067	SPKR+PH	097
RX EQ	008	FLx BW	038	SPLT SV	068	VFO B->A	098
TX EQ	009	FLx FRQ	039	SPKRS	069	AGC PLS	099
VOX GN	010	FLx GN	040	SW TEST	070	RIT CLR	100
ANTIVOX	011	FLx ON	041	SW TONE	071	TX GATE	101
WEIGHT	012	FLTX md	042	TECH MD	072	MEM 0-9	102
2 TONE	013	FP TEMP	043	TIME	073	PTT KEY	103
AFV TIM	014	FSK POL	044	AGC THR ‡	074	VFO CRS	104
MIC+LIN	015	AUTOINF	045	PTT RLS	075	AFX MD ‡	105
TX DLY	016	KBPF3	046	BND MAP	076	SIG RMV	106
AGC SLP	017	AF LIM	047	TTY LTR	077	AFSK TX	107
FM MODE	018	KNB3	048	TX ALC	078	AGC DCY	108
DIGOUT1 ‡	019	KRC2 AC	049	TXGN pwr	079	PB CTRL	109
AGC HLD	020	KRX3	050	SUB AF	080	MACRO x	110
FM DEV	021	KXV3	051	PWR SET	081	L-MIX-R ‡	111
EXT ALC	022	LCD TST	052	MIC BTN	082	CW QRQ	112
KAT3 ‡	023	MIC SEL	053	VCO MD ‡	083	TX DVR	113
BAT MIN	024	NB SAVE	054	VFO CTS	084	TX MON	114
TX INH	025	KPA3 ‡	055	VFO FST	085	DUAL PB	115
SER NUM	026	PA TEMP	056	VFO IND	086		116
TXG VCE	027	RS232	057	VFO OFS	087		117
FW REVS	028	TUN PWR ‡	058	WMTR pwr	088		118
DATE	029	SYNC DT	059	XVx ON	089	Exit Menu	255

Table 6 KX3 MN values. These are the same as the K3's only if the two are functionally identical.
nnn is permanently associated with a menu entry, even if entries are moved.

‡ = can be read/set using **MP** command (or **MQ** in the case of *TXCRNUL*). In many cases the get/set value requires interpretation, or must be bit-masked to isolate the relevant field. See **MP** command for details.

Entry	nnn	Entry	nnn	Entry	nnn	Entry	nnn
ALARM ‡	000		040		080	CW KEY1 ‡	120
CW IAMB ‡	001		041		081	CW KEY2 ‡	121
	002		042	MIC BTN ‡	082	VOX INH ‡	122
	003		043		083	RX I/Q ‡	123
	004		044	VFO CTS ‡	084	RX ISO ‡	124
MSG RPT ‡	005	AUTOINF ‡	045		085	RXSBNUL ‡	125
	006		046		086	AM MODE ‡	126
RPT OFS ‡	007	AF LIM ‡	047	VFO OFS ‡	087	TXSBNUL ‡	127
RX EQ	008		048	WATTMTR ‡	088	AGC MD ‡	128
TX EQ	009		049	XV _x ON	089	AGC SPD ‡	129
VOX GN ‡	010		050	XV _x RF	090	TX BIAS	130
	011		051	XV _x IF	091	TX GAIN	131
CW WGHT ‡	012	LCD TST	052	XV _x PWR	092	TXCRNUL ‡	132
2 TONE	013		053	XV _x OFS	093	AUTOOFF ‡	133
	014		054	XV _x ADR	094	RX XFIL ‡	134
	015		055		095	MICBIAS ‡	135
	016		056	TX ESSB ‡	096	PREAMP ‡	136
	017	RS232	057		097	BAT CHG ‡	137
FM MODE ‡	018	TUN PWR ‡	058		098	BKLIGHT ‡	138
	019		059		099	COR LVL ‡	139
	020	SMTR MD ‡	060		100	DUAL RX ‡	140
FM DEV ‡	021		061	TX GATE ‡	101	ACC2 IO ‡	141
	022	REF CAL	062		102	RX SHFT ‡	142
ATU ‡	023		063		103		143
BAT MIN ‡	024		064	VFO CRS ‡	104		144
	025		065	AFX MD ‡	105		145
SER NUM	026		066		106		146
	027		067		107		147
FW REVS	028		068		108		148
	029		069		109		149
	030	SW TEST	070		110		150
	031	SW TONE ‡	071		111		
	032	TECH MD ‡	072		112		
	033	TIME	073		113		
	034	AGC THR ‡	074		114		
	035		075		115		
	036	BND MAP ‡	076		116		
	037		077		117		
	038		078		118		
	039		079	VFO NR ‡	119	Exit Menu	255

MP (8-bit Direct Menu Parameter Access; GET/SET)

SET/RSP format: **MPnnn**; where the useful range of **nnn** is determined by the present menu entry (255 max, or 8 bits). Only menu entries marked with ‡ in **Table 5** or **6** can be accessed with **MP**, while others will return “?” (use **UP** / **DN**, **DS**, and **SWT/SWH** in such cases). There is also no range checking with **MP** in most cases, so the user’s macro or application must verify the correct range.

Details: **MN** (described above) *accesses* menu entries. **MP** can then be used (in some cases) to *read* or *set* the parameter value. (In some cases, more than one value can be accessed for a given menu entry via the numeric keys; see menu listing in manual.)

To determine a numeric menu entry’s parameter values (nnn): First, go into the menu manually and set the parameter to specific values of interest. Then type “**MP;**” in the command test box at the top of the **Command Tester** screen to see the associated **nnn** value.

MP Command Special Cases (KX3): For the menu entries listed below, the **MP** get/set value pertains only to specific binary bit fields in the 8-bit quantity. (For **MP SETs**, the **KX3** protects all unrelated bit positions, so the application can’t inadvertently modify them. For **MP GETs**, the **KX3** masks off unused bit positions, so they will always return zero.) Where a single bit is specified in the list below, the values x/y are associated with bit values of 0/1. **Example:** To select iambic mode B for CW mode, first send **MN001**; (to select the **CW IAMB** menu entry), then send **MP128**; (since 2^7 is 128, this sets bit 7 of the parameter). To select iambic mode A, instead, send **MN000**; (clearing bit 7; the other bits are unaffected because of the masking mentioned previously). To read the current value, send **MP**; and look at only the value of bit 7 in the return parameter. The response would be either **MP000**; (mode A) or **MP128**; (mode B).

AGC MD: bit0=on/off
AGC SPD: bit1=slow/fast
ALARM: bit4=on/off
AM MODE: bit6=disabled/enabled
BND MAP: bit5=in/out
CW IAMB: bit7=modeA/modeB
CW KEY1: bit0=tip is dot/dash; bit1=paddle/hand-key
CW KEY2: bit4=tip is dot/dash; bit5=paddle/hand-key
DUAL RX: bit4=off/on
FM MODE: bit7=disabled/enabled
MIC BIAS: bit4=off/on
MIC BTN: bit0=PTT disabled/enabled; bit2=UP/DN buttons disabled/enabled
PREAMP: bit0=10dB, bit1=20dB, both=30dB
RX I/Q: bit2=off/on
RX SHFT: bit0=nor/8.0 kHz
RX XFIL: bit1=KXFL3 option not installed/installed
SMTR MD: bit7=nor (relative)/absolute
SW TONE: bits0-2=CW feedback speed in WPM; bit6=CW UI off/on; bit7=tones off/on
TECH MD: bit2=off/on
TX ESSB: bit0=off/on
TX GATE: bit1=off/on
VFO CRS: bits2-3=one of up to 4 coarse-tuning selections
VFO NR: bit5=on/off
VFO OFS: bit0=coarse offset control (via OFS/B knob) disabled/enabled

MQ (16-bit Direct Menu Parameter Access; GET/SET; KX3 Only)

SET/RSP format: **MQnnnnnn**; where **nnnnnn** is the 16-bit parameter value. Useful range is determined by the present menu entry (65535 max). Applies only to the **TXCRNUL** menu entry at present.

NB \$ (Noise Blanker On/Off; GET/SET)

SET/RSP format: **NBn**; or **NB\$n**; where **n** is 0 (**OFF**) or 1 (**ON**).

Notes: **NB0** always turns the noise blanker off, overriding any non-zero **NL** settings (see **NL**). In K2 extended mode, an additional '0' is appended to the **NB** response to provide legacy (K2) format compatibility.

NL \$ (DSP and IF Noise Blanker Level; GET/SET)

SET/RSP format: **NLddii**; or **NL\$ddii**; where **dd** is DSP NB level (**00-21**), and **ii** is IF NB level (**00-21**).

For either the DSP or IF blanker, **00** effectively turns that blanker off, even if **NB1** is in effect (see above).

For the DSP blanker, **01** = setting **t1-1**, **02** = **t1-2**, etc. For the IF blanker, **01** = **NAR1**, **02** = **NAR2**, etc.

Note: Variable noise blanker settings not yet implemented on KX3. Use NB0/NB1 to turn KX3's fixed noise blanker setting on/off.

OM (Option Module Query; GET Only; K3 and KX3 variants)

RSP format, **K3**: **OM APXSDFf-----**; where any of the characters **APXSDFf**, if present, indicate installed and detected option modules (see list below). The positions of the letters are fixed. If a module is not present, its letter is replaced by a dash (-). For example, if only a PA and sub receiver were installed, "**OM;**" would return "**OM -P-S--**-----;". The five dashes at the end are reserved for future module letters and product ID.

Option List, **K3**: The letters (and associated positions) in the **OM** string refer to the following option modules:

A = ATU (KAT3), **P** = PA (KPA3), **X** = XVTR and RX I/O (KXV3), **S** = Sub Receiver (KRX3), **D** = DVR (KDVR3), **F** = Band-Pass Filter module, main (KBPF3), and **f** = Band-Pass Filter module, sub (KBPF3).

RSP format, **KX3**: **OM APF---TB--02**; where any of the characters **APFTB**, if present, indicate installed and detected option modules (see list below), and **02** is the KX3's unique product identifier. The positions of the letters are fixed. If a module is not present, its letter is replaced by a dash (-). For example, if only KXAT3 antenna tuner and KXFL3 roofing filter modules were installed, "**OM;**" would return "**OM A-F-----02**";. Unused dashes are reserved for future module letters.

Option List, **KX3**: The letters (and associated positions) in the **OM** string refer to the following option modules:

A = ATU (KXAT3), **P** = external 100-W PA (KXPA100), **F** = roofing filter (KXFL3), **T** = external 100-W ATU (KXAT100, actually part of the KXPA100), and **B** = NiMH battery-charger/real-time clock (KXBC3).

PA \$ (Receive Preamp Control; GET/SET)

SET/RSP format: **PAn**; or **PA\$n**; where **n** is 0 (preamp OFF) or 1 (preamp ON). **Note:** Unlike the main receiver, the sub receiver's preamp setting is *not* per-RX ANT state.

PC (Requested Power Output Level; GET/SET)

Basic SET/RSP format: **PCnnn**; where **nnn** is 000-012 or 000-120 watts depending on the POWER range. (If **CONFIG:KXV3** is set to TEST or if a transverter band with low-level I/O is selected, then the unit is hundreds of a milliwatt, and the available range is 0.00-1.50 mW. This can be checked using the **IC** command, byte **a**, bit **4**.)

K2 Extended SET format (K22): **PCnnnx**; where **nnn** is 000-120 (0.1-watt units) or 000-120 (1-watt units) and **x** is a range selector: **0** selects the low power range, **1** selects the high-power range.

K2 Extended RSP format (K22): **PCnnnx**; where **nnn** is power, and **x** is 0 (low range) or 1 (high range).

Notes: (1) High power range applies only to K3/100, and only if the KPA3 menu entry is set to **PA NOR** or higher. (2) A lower power limit may be in effect on transverter bands (menu entries **XVTR1-9**). 3. Use **MN** and **DS** commands to turn PA on/off in menu.

PO ** (Actual Power Output Level; GET only; KX3 only)

RSP format: **PCnnn**; where **nnn** is the power in tenths of a watt (QRP mode) or watts (QRO mode, with KXPA100 amplifier in use).

PS (Transceiver Power Status; GET/SET)

SET/RSP format: **PSn**; where n = 1 indicates transceiver on. Note: **PS0** turns the transceiver off, but this removes power, so **PS1** *cannot* be used to turn it on. To turn power on, the K3's POWER_ON line (aux I/O jack) must be pulled low by an external device, or it can be turned on manually using the power switch.

RA \$ (Receive Attenuator Control; GET/SET)

SET/RSP format: **RA $\text{\$}$ nn**; or **RA\$nn**; where nn is 00 (attenuator OFF) or 01 (attenuator ON). **Note:** Unlike the main receiver, the sub receiver's attenuator setting is *not* per-RX ANT state.

RC (RIT Clear; SET only)

SET format: **RC**; (no data). Sets RIT/XIT offset to zero, even if RIT and XIT are both turned off (the change will be reflected when either RIT or XIT is turned on). **Note:** This command behaves differently in FINE RIT mode in the case of the K2. Refer to the KIO2 Programmer's Reference.

RD (RIT Offset Down One Unit; SET only)

SET format: **RD**; (no data). Moves the RIT/XIT offset down one step, which can be 1, 10, 20, or 50 Hz, depending the present VFO tuning rate. If the user has selected COARSE VFO tuning, **RD** moves either 20 or 50 Hz, as specified by **CONFIG:VFO FST**. The offset change occurs even if RIT and XIT are both turned off (the change will be reflected when either RIT or XIT is turned on). RIT/XIT offset range under computer control is -9.999 to +9.999 kHz. VFO step size is stored per-mode. Use the **IF** command to check the present RIT/XIT offset amount. **Note:** Both the **RD** and **RU** commands behave differently in the case of the K2 when FINE RIT mode is in effect. Refer to the KIO2 Programmer's Reference.

RG \$ (RF Gain; GET/SET)

SET/RSP format: **RG $\text{\$}$ nnn**; or **RG\$nnn**; where nnn is 000-250. On the KX3, 250 = maximum RF gain (that is, attenuation of -0 dB), and 190 = -60 dB.

RO (RIT/XIT Offset, Absolute; GET/SET)

SET/RSP format: **ROsnnnn**; where s is +/- and nnnn is 0000-9999. s can also be a space in lieu of +.

RT (RIT Control; GET/SET)

SET/RSP format: **RTn**; where n is 0 (RIT OFF) or 1 (RIT ON). RIT is disabled in QRQ CW mode.

RU (RIT Offset Up One Unit; SET only)

See **RD** command.

RV (Firmware Revisions; GET only)

GET format: **RVx**; where x is M (MCU), D (Main DSP), A (Aux DSP, K3), R (DVR, K3), or F (Front Panel flash, K3).

RSP format: **RVxNN.NN** where NN.NN is the firmware revision, e.g. **02.37**. If a module isn't present, or an unknown module ID is requested, the revision is normally reported as **99.99**. A module that is present but malfunctioning may return revision **00.00**.

RX (Receive Mode; SET only)

SET format: **RX**; (no data). Terminates transmit in all modes, including message play and repeating messages. RX/TX status is available via the **TQ** command and is also included in the **IF** response. Note: **RX** is not usable in CW mode in the K2.

SB * (Sub Receiver or Dual Watch On/Off)

SET/RSP format: **SBn**; where **n** is **0** (sub receiver or dual watch off) or **1** (on). K3: Sub RX; KX3: Dual watch.

SD (QSK Delay, GET only)

SET/RSP format: **SDnnnn**; where **nnnn** is the semi-break-in delay in 50-ms increments. Provided for backwards compatibility with older applications. If the K3 is in full QSK mode, SD will still read the same value even though the actual break-in delay is set to as close to 0 as possible.

SM \$ (S-meter Read; GET only)

Basic RSP format: **SMnnnn**; where **nnnn** is 0000-0015. Examples: S9=6; S9+20=9; S9+40=12; S9+60=15.

K3 Extended RSP format (**K31**): **nnnn** is 0000-0021. S9=9; S9+20=13; S9+40=17; S9+60=21.

This command can be used to obtain either the main (**SM**) or sub (**SM\$**) S-meter readings. Returns 0000 in transmit mode. Also see **BG** and **BA**, which can be used to read exact bargraph levels in both receive and transmit modes.

SMH (High-resolution S-meter Read; GET only; K3 only at present)

RSP format: **SMHnnn**; where **nnn** has the following approximate values vs. S-meter reading: S1, 5; S9, 40; S9+60, 100. Max possible value is about 140.

SP (Special Functions)

SPG; (KX3) returns ADC ground-reference reading, typically **SP000**.

SQ \$ (Squelch Level; GET/SET)

SET/RSP format: **SQnnn**; or **SQ\$nnn**; where **nnn** is 000-029. If the K3's **CONFIG:SQ MAIN** menu entry is set to a numeric value (**0-29**), then **SQ** and **SQ\$** apply to main and sub receivers, respectively, and the SUB RF/SQL pot on the K3 controls SUB RF GAIN. However, if **SQ MAIN** is set to **=SUB POT**, then **SQ** and **SQ\$** are linked (either applies to *both* receivers), and the SUB RF/SQL pot controls squelch for both receivers as well. (Also in this case, the MAIN RF gain pot controls RF gain for both main and sub.)

Note: The **SQ** command in the K2 used the same format but different units.

SWT/SWH (Switch Emulation; SET only; K3 and KX3 variants)

SET format: **SWTnn**; (TAP functions) or **SWHnn**; (HOLD functions). **nn** is determined from **Table 7 (K3)** or **Table 8 (KX3)**. Switch emulation commands must sometimes be followed by a delay if successive commands expect the switch function to have been executed (example: **SWT16**; [XMIT], delay, **TQ**; [transmit status check]). Activating some switch functions results in icon or status changes that can be checked using the **IC** or **DS** commands.

Table 7 Switch identifiers (**nn**) for the **K3** SWT/SWH command. For the **KX3**, see **Table 8**. Table entries are organized similarly to the K3's front panel (e.g. BAND is upper left). **Numeric keypad switches (0-9, '.', '<-') are shown in parentheses.**

TAP	HOLD	nn	TAP	HOLD	nn	TAP	HOLD	nn
BAND-	VOX	09	FREQ ENT	SCAN	41	CWT (0)	TEXT Dec	40
BAND+	QSK	10	FINE	COARSE	49	AFX (<-)	DATA Md	43
MODE-	ALT	17	RATE	LOCK	50	V->M	AF REC	15
MODE+	TEST	18	SUB	Link/Unlink	48	M->V	AF PLAY	23
MENU	CONFIG	14	A/B (1)	BSET	11	M1	M1-RPT	21
XMIT	TUNE	16	REV (2)	n/a	12	M2	M2-RPT	31
RX ANT	n/a	25	A->B (3)	SPLIT	13	M3	M3-RPT	35
DISP	METER	08	PRE (4)	ATT	24	M4	M4-RPT	39
ATU Tune	ATU	19	AGC (5)	OFF	27	REC	MSG Bank	37
ANT	ANT Name	26	XFIL (6)	DUAL PB	29	RIT	PF1	45
SHIFT/LO	NORM	58	NB (7)	LEVEL	33	XIT	PF2	47
WIDTH/HI	I/II	59	NR (8)	ADJ	34	CLR	n/a	53
SPD/MIC	DELAY	57	NTCH (9)	MANUAL	32			
CMP/PWR	MON	56	SPOT (':')	PITCH	42			

Table 8 Switch identifiers (**nn**) for the **KX3** SWT/SWH command. Table entries are organized similarly to the KX3's front panel (e.g. BAND is upper left); knob functions are shown in the last row. **Numeric keypad switches (0-9, '.', '<-') are shown in parentheses.**

TAP	HOLD	nn	TAP	HOLD	nn	TAP	HOLD	nn	TAP	HOLD	nn
BAND+	RCL	08	PRE (1)	NR	19	MODE	ALT	14	A/B	REV	24
BAND-	STORE	41	ATTN (2)	NB	27	DATA	TEXT	17	A->B	SPLIT	25
FREQ ENT	SCAN	10	APF (3)	NTCH	20	RIT	PF1	18	XIT	PF2	26
MSG (<-)	REC	11	SPOT (4)	CWT	28	RATE	KHZ	12	DISP	MENU	09
ATU TUNE (':')	ANT	44	CMP (5)	PITCH	21						
XMIT (0)	TUNE	16	DLY (6)	VOX	29						
AF/RF-SQL (7)	MON	32	PBT I/II (8)	NORM	33	KEYER/MIC (9)	PWR	34	OFS/B	CLR	35

TB (Received Text Read/Transmit Text Count; GET only)

RSP format: **TBtrrs**; where **t** is the count of buffered CW/data characters remaining to be sent (from **KY** packets); **rr** is the count of received CW/data characters available (00-40), and **s** is the corresponding variable-length text string. If no received text is available, and no transmit text to be sent, the response is **TB000**; **t** can be 0-9; if there are more than 9 characters remaining to be sent, then **t** will be 9.

Notes: (1) Since an RX count is provided, semicolons—which are legal for text decode in some data modes—can appear in the text string. A terminating semicolon is still provided as a check and to retain compatibility with other commands. (2) After the K3 responds to a TB command, it clears the RX count to zero and the text just read is no longer available. (3) Application software must poll with **TB**; often enough to prevent loss of incoming text.

TE (Transmit EQ; SET only)

SET format: **TEabcdefgh**; where **a** through **h** are 3-character values, each with a range of **-16** to **+16** dB. Values **a** through **h** correspond to EQ bands as follows: **a** = 50 Hz, **b** = 100 Hz, **c** = 200 Hz, **d** = 400 Hz, **e** = 800 Hz, **f** = 1600 Hz, **g** = 2400 Hz, **h** = 3200 Hz. **Important:** If the current transmit mode (VFO B mode in SPLIT) is SSB, CW or DATA, **TE** applies to SSB. If the transmit mode is ESSB, AM, or FM, **TE** affects ESSB/AM/FM. The two setups are saved separately because SSB EQ is typically optimized for communications effectiveness, while ESSB/AM/FM is often optimized for fidelity. (ESSB mode is selected using the CONFIG:TX ESSB menu entry.) **Note:** If the TX EQ menu entry is displayed at the time **TE** is sent, the display will be updated accordingly.

TQ (Transmit Query; GET only)

RSP format: **TQ0**; (receive mode) or **TQ1**; (transmit mode). This is the preferred way to check RX/TX status since it requires far fewer bytes than an **IF** response. **Note:** **TQ1** will be returned even during pseudo-transmit conditions such as TX TEST or when the radio is “pre-armed” for CW transmit via XMIT or PTT. This is because such states may turn on the K3’s KEY OUT line, activating down-stream relays (on amplifiers, transverters, etc.).

TT (Text to Terminal; SET only)

Note: **TB** (text buffer read) provides a more reliable means of implementing a CW/data terminal. **TB** *must* be used rather than **TT** if a P3 panadapter is attached between the computer and K3.

SET format: **TTn**; where **n** is 1 to enable decoded text to be routed to a PC (ASCII). **n**=0 disables this. (There’s no GET command for **TT**, but its status can be checked using the **IC** command: byte **c**, bit **0**.) When the application has to send a SET command of another type, it can do without interrupting the TT stream. If it has to send a GET command, it must either suspend the text stream temporarily by sending TT0, or parse the response stream to look for the desired return data. (Returned strings are never interspersed with text data, so this can easily be done.)

TX (Transmit Mode; SET only)

SET format: **TX**; (no data). Used to initiate transmit in all modes (same as activating PTT or using the XMIT switch on the K3). Use the **RX** command to cancel **TX** (some special considerations apply; see RX). RX/TX status is available via **TQ** and is also included in the **IF** response.

UP/UPB (Move VFO A or B, or Menu Entry/Parameter Up; SET only)

See DN/DNB.

VX (VOX State; GET only)

RSP format: **VXn**; where **n** is 0 (VOX on) or 1 (VOX off). Applies only to present mode only. In CW mode, VOX refers to “hit-the-key transmit,” i.e. the user doesn’t have to assert the **XMIT** switch or the PTT input first. In voice modes, VOX refers to voice-operated-relay, again not requiring **XMIT** or PTT.

Note: A SET version of the command is planned.

XF \$ (XFIL Number; GET only)

RSP format: **XF n** ; where **n** is the present XFIL selection (1-5) for the target receiver. In the K3, the XFIL selection refers to crystal filters. In the KX3, the XFIL selection refers to the analog I/Q filters on the KXFL3 module.

XT (XIT Control; GET/SET)

SET/RSP format: **XT n** ; where **n** is **0** (XIT OFF) or **1** (XIT ON). XIT is disabled in QRQ CW mode.

Appendix A: Change History [Applicable MCU revisions shown in brackets]

Note: Prior to revision D1 this document applied only to the K3. For earlier change history, see rev C14.

D1, 1-18-2012 [K3, rev 4.48; KX3, rev 0.58]

- Document now pertains to both the K3 and KX3. Asterisks in Table 1 now show K3 commands that are not functionally applicable to the KX3. (For K2 commands, refer to the KIO2 Programmer's Reference.)
- SWT/SWH, MN, and OM descriptions updated to show differences between K3 and KX3.

D2, 1-19-2012 [K3, rev 4.48; KX3, rev 0.59]

- KXAT3 menu entry back to MN023.
- XMIT/TUNE switch on KX3 remapped to match the K3's SWT/SWH code (13). This allows KX3 Utility's TX GAIN cal function work without being rewritten.

D5, 3-20-2012 [K3, rev 4.48; KX3, rev 0.80]

- DB command is different for the KX3.
- RG response is different for the KX3.
- MQ command added for the KX3 (16-bit menu parameter access)
- SPG command added (KX3 ground-reference check).
- SMH command added (K3 high-resolution S-meter; to be added to the KX3 later)

D8, 4-5-2012 [K3, rev 4.48; KX3, rev 0.91]

- PO command added (reads actual power output during transmit).
- EL command added (turns run-time error logging on/off). Error logging, when ON, reports "ERR xxx" and other events to the attached PC, unsolicited.

D9, 4-12-2012 [K3, rev 4.48; KX3, rev 0.92]

- Added RX SHFT menu entry to KX3's MN command ID list.

D10, 4-17-2012 [K3, rev 4.48; KX3, rev 0.92]

- Corrected NL command description, including note about the KX3 noise blanker, which does not yet use the NL command.

E2, 5-7-2012 [K3, rev 4.50; KX3, rev 0.99]

- [KX3] The MN command table now reflects all of the KX3 menu parameters accessible via MP and MQ.
- [KX3] The MP command now has a full list of menu entries for which the MP get/set parameters reference only a subset of the 8 bits. Semantics and examples for these parameters are provided.