

# ELECRAFT PX3 PROGRAMMER'S REFERENCE

Rev. A6 (See Appendix A for change history)

## Command Set Overview

The PX3 provides a set of remote-control commands to control the most important instrument functions (Table 1). Details on individual commands start on page 2. PX3 macro import/export/edit operation starts on page 9.

**Table 1.** PX3 Control Commands.

Name	Description	Name	Description	Name	Description
=	Product ID	#FNX	Function key execute	#OSBP	OSB Phase
#AVG	Averaging time	#FXA	Fixed auto-adjust mode	#PKM	Peak mode on/off
#BCI	Beacon interval	#FXT	Fixed or Tracking select	#PS	Power status/control
#BCL	Beacon location	#KBMP	Internal use only	#PT	Pass-Through mode
#BCN	Beacon on/off	#LBL	Labels on/off	#QSY	QSY to current marker
#BMP	Bitmap upload	#LD	Internal use only	#RCF	Relative Center Freq.
BR	Baud rate set	#MAA	Marker A Adjust	#REF	Reference Level
#BR	Baud rate set	#MBA	Marker B Adjust	#RST	Reset the PX3
#CAL	Calibration signal on/off	#MFA	Marker A frequency	#RVM	Main firmware revision
#CTF	Center frequency	#MFB	Marker B frequency	#SCL	Scale
#DSM	Display mode	#MKA	Marker A on/off	#SPN	Span
#ER	Internal use only	#MKB	Marker B on/off	#TXH	Text TX hang time
#EW	Internal use only	#MSS	MSD Screen Shot	#TXM	Text TX Mode
#EXR	Internal use only	#NB	Noise blanker on/off	#USB	USB connected?
#EXW	Internal use only	#NBL	Noise blanker Level	#VFB	VFO B cursor on/off
#FNL	Function key label	#OSBA	OSB Amplitude		

The **Command Tester** screen of the *PX3 Utility* computer program is a convenient way to try individual control commands. You can also define macros, which allow sending strings of PX3 and/or KX3 commands with a single mouse click. The **Capture Image** screen uses the **#BMP** command to upload the current PX3 screen to a standard bitmap graphics file. See the *PX3 Utility* help facility for details.

When a KX3 is connected to the RS232 "ACC1 XCVR" port, both KX3 and PX3 commands can be sent from the same computer program. For example, **#RVM;** returns the revision number of PX3 firmware and **RVM;** returns the revision number of main firmware in the KX3. Sending those two commands is a handy way to check the connectivity of the two RS232 ports on the PX3. If you get a response to **#RVM;** then the PC port is connected; if you get a response to **RVM;** then the XCVR port is connected as well.

### Command Format

Commands sent from the computer to the PX3 are considered either GETs or SETs. GET commands are used by the computer to get information from the PX3; the PX3 will then provide an appropriate response message (RSP). SET commands are sent by the computer to change the instrument's configuration or initiate an event. Commands with an incorrect format or an out-of-range parameter are ignored. A SET can be followed by a GET to verify the new settings.

SET commands use 2-4 characters, optional data fields, and a terminating semicolon (;). Examples:

**#AVG05;**      Computer turns on averaging with a time constant of 5.  
**#DSM1;**      Computer selects spectrum+waterfall display mode.

Many SET commands have a corresponding GET command, which is just the command letters with no data, plus the semicolon. The data format of the response message from the PX3 (RSP) is usually identical to the format of the SET data. Exceptions are noted in the command descriptions.

Characters sent to the PX3 can be in either upper or lower case. The PX3 always responds with upper case.

## Command Reference

This section describes all PX3 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 otherwise noted. All commands must be followed by a semicolon except where noted.

= (*Product identification; GET only*)

RSP format: **PX3** (main firmware executing) or **px3** (boot loader ready to download new firmware). There is no "#" or semicolon in either the query or the response.

**#AVG** (*Averaging Time, GET/SET*)

SET/RSP format: **#AVGnn**; where **nn** is 00 (average mode off) or the averaging time constant, 02-20 (average mode on).

**#BMP** (*Bitmap upload, GET only*)

RSP format: **[bmp]cc** where **[bmp]** is 131,638 bytes of binary image data in standard .BMP file format and **cc** is a two-byte checksum. Note that the response does not include the command name and has no terminating semicolon. The checksum is the modulo-65,536 sum of all 131,638 bytes, sent least-significant byte first.

**#BCI** (*Beacon Interval; GET/SET*)

SET/RSP format: **#BCInnnn**; where **nnnn** is the beacon interval or time to wait between beacon transmissions, in seconds when beacon mode is activated 1 – 3600.

**#BCL (Beacon Location; GET/SET)**

SET/RSP format: **#BCLnn**; where **nn** is the text memory location to send when beacon mode is activated 1 – 50.

**#BCN (Beacon Mode On/Off; GET/SET)**

SET/RSP format: **#BCNn**; where **n** is **1** (active, on) or **2** (disabled, off).

**BR and #BR (Baud Rate of the PC RS232 port, SET only)**

SET format: **BRn**; or **#BRn**; where **n** is **0** (4800 b), **1** (9600 b), **2** (19200 b), or **3** (38400 b). The *PX3 Utility* program automatically sets the PX3 to 38400 baud for downloads, then restores the baud rate to the user's selection (that was made using either this command or the PX3's *RS232* menu entry). Note that the RS232 port that connects to the KX3 always runs at 38400 baud. Any **BR** command that is received from a host computer affects the baud rate of the PX3 (on the RS232 port that connects to the PC), not the KX3.

**#CAL (Calibration signal on/off, GET/SET)**

SET/RSP format: **#CALn**; where **n** is **0** (calibration signal off) or **1** (calibration signal on). The calibration signal generated is based on the current KX3 band.

**#CTF (Center Frequency, GET/SET)**

SET/RSP format: **#CTFsxxxxxxxx**; where **s** is +/- and **xxxxxxxx** is the center frequency in Hz. **s** can also be a space in lieu of +. Example: **#CTF+0001406000**; sets the center frequency to 14060 kHz. If the specified frequency is outside the range the PX3 can tune to, the action is undefined. A value of zero sets the center frequency to the main VFO frequency of the transceiver. For transceivers other than the KX3, the center frequency is interpreted relative to the frequency the transceiver is tuned to and may be positive or negative.

**#DSM (Display Mode, GET/SET)**

SET/RSP format: **#DSMn**; where **n** is **0** (spectrum only) or **1** (spectrum + waterfall).

**#FNL (Function Key Label, GET only)**

GET format: **#FNLn**; where **n** = 1-8, for keys FN1-FN8.

RSP format: **#FNLncccccccc**; where **n** = 1-8 and **cccccccc** are the 9 ASCII characters in the key label for FNn.

***#FNX (Function Key Execute, SET only)***

SET format: **#FNXn**; where **n** = 1-8, for keys FN1-FN8. Executes the function assigned to the key, if any.

***#FXA (Fixed-tune Auto-adjust Mode, GET/SET)***

SET/RSP format: **#FXAn**; where **n** is **0** (Full screen), **1** (Half screen), **2** (Slide) or **3** (Static) to specify how far the PX3 center frequency moves when the KX3 VFO A is tuned off screen in fixed-tune mode.

***#FXT (Fixed or Tracking Select, GET/SET)***

SET/RSP format: **#FXTn**; where **n** is **0** (Tracking mode), or **1** (Fixed-tune mode).

***#LBL (Labels on/off, GET/SET)***

SET/RSP format: **#LBLn**; where **n** is **0** (FN key labels off), **1** (FN key labels on) or **2** (text decode on).

***#MAA, #MBA (Marker Adjust, SET ONLY)***

Adjusts the Marker frequency by either adding or subtracting a value. If the marker is turned off, the marker frequency will still be updated. There are two ways to use this command, either specify an adjustment selection or use an internal value which is based on the current span and mode. Specifying the adjustment uses the same values as used by the K3/KX3 UP and DN commands. Usage: #MAAsn

s = + to increment, - to decrement

n = 0 adjust by 1 Hz

n = 1 “ “ 10 Hz

n = 2 “ “ 20 Hz

n = 3 “ “ 50 Hz

n = 4 “ “ 1 kHz

n = 5 “ “ 2 kHz

n = 6 “ “ 3 kHz

n = 7 “ “ 5 kHz

n = 8 “ “ 100 Hz

n = 9 “ “ 200 Hz

The other way to use this command is to simply give the sign, or direction and allow the PX3 to determine the adjustment based on the current span and mode:

#MAAs

s = + to increment, - to decrement. The step size is automatically determined by the current span and mode:

### **USB, LSB, AM & FM**

Span < 5 kHz – step = 10 Hz

Span 2-9.99 kHz – step = 20 Hz

Span 10-49.9 kHz – step = 50 Hz

Span 50-99.1 kHz – step = 100 Hz

Span 100-200 kHz – step = 200 Hz

### **CW & Data**

Span < 5 kHz – step = 2 Hz

Span 2-9.99 kHz – step = 10 Hz

Span 10-49.9 kHz – step = 20 Hz

Span 50-99.1 kHz – step = 50 Hz

Span 100-200 kHz – step = 100 Hz

### ***#MFA, #MFB (Marker A/B Frequency, GET/SET)***

SET/RSP format: **#MFA**sxxxxxxxxx; or **#MFB**sxxxxxxxxx; where s is +/- and xxxxxxxxxxxx is the marker frequency in Hz. s can also be a space in lieu of +. Example: **#MFA+00014060000**; sets the marker A frequency to 14060 kHz. If the specified frequency is in a different band than the KX3 is tuned to, the action is undefined. A value of zero sets the marker to the main VFO frequency of the transceiver. For transceivers other than the KX3, the marker frequency is interpreted relative to the frequency the transceiver is tuned to and may be positive or negative.

### ***#MKA, MKB (Marker A/B on/off, GET/SET)***

SET/RSP format: **#MKAn**; or **#MKBn**; where n is **0** (marker off) or **1** (marker on). The last marker to be turned on automatically becomes the active marker, meaning it can be adjusted with the knob and is the one that responds to the QSY command. If the marker was off-screen before executing a marker-on command, it will default to the center frequency.

***#MSS (MSD Screen shot, SET)***

Creates a bitmap copy of the LCD screen (screen shot) and saves it to the MSD flash drive (thumb drive, flash memory stick). Each time the screen shot is performed, a new file is created. Filenames use a numeric format in which the first 3 characters are "PX3" followed by a 5 digit number, i.e. PX300009.BMP **Note: while the PX3 is busy saving a screen shot, other commands will be received but not processed.**

***#NB (Noise blanker on/off, GET/SET)***

SET/RSP format: **#NBn**; where **n** is **0** (noise blanker off) or **1** (noise blanker on).

***#NBL (Noise blanker level, GET/SET)***

SET/RSP format: **#NBLnn**; where **nn** sets the aggressiveness of the noise blanker algorithm, 1 = least aggressive, 15 = most aggressive.

***#OSBA (Opposite side band null amplitude value, GET/SET)***

SET/RSP format: **#OSBA snnnn**: where **s** is the sign (+ or -) and **nnnn** is the value. **s** can also be a space in lieu of +. Value range is -9999 to +9999. This is a per-band setting.

***#OSBP (Opposite side band null phase value, GET/SET)***

SET/RSP format: **#OSBP snnn**: where **s** is the sign (+ or -) and **nnn** is the value \* 10. **s** can also be a space in lieu of +. Value range is -450 (-45.0) to 450 (45.0). This is a per-band setting.

***#PKM (Peak Mode on/off, GET/SET)***

SET/RSP format: **#PKMn**; where **n** is **0** (peak mode off) or **1** (peak mode on).

***#PS (Power Status, GET/SET)***

SET/RSP format: **#PSn**; where **n** = **1** indicates the PX3 is on. **#PS0** turns the PX3 off, but this removes power so **#PS1** cannot be used to turn it on. Note that if the power-on jumper on the rear-panel I/O board is in the "always on" position, then the **#PS0** command has no effect.

***#PT (Pass Through, SET only)***

SET format: **#PT**; Sets the PX3 to pass-through mode, that is, the panadapter operation ceases and all data received on either RS232 port is passed through immediately to the other RS232 port without delay or modification. This command is used by *PX3 Utility* when downloading new firmware to the KX3 transceiver. Pass-through mode ends automatically 20 seconds after the last RS232 activity.

***#QSY (QSY to current marker, SET only)***

SET format: **#QSYn**; where **n** is **1** (QSY ) or **0** (undo QSY). "QSY" means the currently-active marker frequency is transferred to the associated VFO on the KX3. MKR A controls VFO A and MKR B controls VFO B. "Undo QSY" means to return the VFO to the frequency it was on before the last QSY, a one-level undo command.

***#RCF (Relative Center Frequency, GET/SET)***

SET format: **#RCFsnnnnnn**; where **s** is +/- and **nnnnnn** is the offset in Hz which when added to the VFO A frequency becomes the new center frequency. This command is used to position the VFO A cursor on the screen. For example, if the current span is set to 50 kHz, **#RCF+025000** will move the VFO A cursor to the left edge of the screen. (the center frequency moves up 25 kHz, which shifts the VFO A cursor to the left)

RSP format: **#RCFsnnnnnn**; where **s** is +/- and **nnnnnn** is the difference between the current center frequency and the VFO A frequency.

***#REF (Reference Level, GET/SET)***

SET/RSP format: **#REFsnnn**; where **s** is +/- and **nnn** is the reference level in dBm, between -170 and +010 dBm. **s** can also be a space in lieu of +. For example, **#REF-120**; sets the reference level (at the bottom of the PX3 spectrum screen) to -120 dBm.

***#RST (Reset the PX3, SET only)***

Forces a power-on reset.

***#RVM (Main Firmware Revision, GET only)***

RSP format: **#RVMNN.NN**; where **NN.NN** is the firmware revision, e.g. **01.23**.

***#SCL (Scale, GET/SET)***

SET/RSP format: **#SCLnnn**; where **nnn** is the scale (the difference in dB between the top and bottom of the spectrum screen), between 010 and 080 dB. Example: **#SCL080**; sets the scale to 80 dB.

***#SPN (Span; GET/SET)***

SET/RSP format: **#SPNxxxxxx**; where **xxxxxx** is 000020-002000, the span in 100-Hz units. Example: **#SPN000500**; sets the span to 50 kHz.

***#TXH (Text TX hang time; GET/SET)***

SET/RSP format: **#TXHnnnnn**; where **nnnnn** is 00000-90000 milliseconds to keep the KX3 transmitting after the last PX3 keyboard text character is sent. Example: **#TXH03000**; sets a 3 second (3000 ms) hang time. (*PSK/RTTY data modes only*)

**#TXM** (*Text TX mode; GET/SET*)

SET/RSP format: **#TXMnn**; where **nn** is **00** (Enter key), **01** (^R/^T toggle), **02** (Any key), or **03** (Space key).

**#USB** (*USB connected state; GET only*)

RSP format: **#USBn**; where **n** is **1** (USB keyboard detected) or **2** (no keyboard detected).

**#VFB** (*VFO B cursor on/off; GET/SET*)

SET/RSP format: **#VFBn**; where **n** is **0** (VFO B cursor off) or **1** (VFO B cursor on).



## PX3 MACRO EXPORT/IMPORT

Starting with firmware revision 1.48, the PX3 supports keyboard macro import and export using a USB memory stick/flash drive plugged into the USB port on the left side of the unit. Macros may be exported, modified and then imported. This feature allows easy sharing of macros between multiple PX3's as well as custom editing of macros using a PC. A simple worksheet can be used to create the hexadecimal key code when creating new macros (included in this manual)

### Exporting Macros

To export macros:

- Insert a USB “thumb drive” or flash drive into the USB port on the left side of the PX3. Make sure the letter ‘M’ appears in the upper right hand portion of the screen.
- Press Menu, and using the encoder, select “MSD Menu.”
- Press the encoder knob to enter the sub-menu and rotate the encoder knob to select “**XportMacr**”.
- Pressing the encoder knob will start the export. Once the macros have been exported, the message “Macros exported” will be displayed in the upper right corner of the screen.

### Importing Macros

To import macros:

- Insert a USB “thumb drive” or flash drive into the USB port on the left side of the PX3. Make sure the letter ‘M’ appears in the upper right hand portion of the screen.
- Press Menu, and using the encoder, select “MSD Menu.”
- Press the encoder knob to enter the sub-menu and rotate the encoder knob to select “**ImpprtMacr**”.
- Pressing the encoder knob will start the import. Once the macros have been imported, the message “Macros imported” will be displayed in the upper right corner of the screen.

### Macro File Format

The exported macros/text messages are written to a file on the memory stick called “macros.txt”. Only macros/messages that are not empty are written out to the file. Each line constitutes one macro or message. Fields within the line are delimited with commas (.). Lines that begin with the ‘#’ (pound) character are ignored. This permits comments and other text to be added.

*number, key code, ..... contents .....*

number: 1 – 100

The number determines if the entry is for macro or a text message. Valid macro numbers are **1 - 50** while valid text message numbers are **51 - 100**.

**NOTE: specifying the number of an existing macro/message will overwrite that location when imported.**

key code:

The key code is a special 8 digit hexadecimal number built up using a key value and optional key modifiers. Special key code modifiers (Alt, Ctrl, etc.) can be added to the base key code if needed. For example, the F1 base key code value is 0x3A . Adding the Alt modifier of 0x200 results in a key code of 0x23A for “Alt-F1”.

contents:

Up to 94 characters are allowed for text messages or macros.

**Supported USB Keyboard Codes (note: some codes may not be present on all keyboards)**

0x04	Keyboard a and A	0x36	Keyboard, and <
0x05	Keyboard b and B	0x37	Keyboard . and >
0x06	Keyboard c and C	0x38	Keyboard / and ?
0x07	Keyboard d and D	0x3A	Keyboard F1
0x08	Keyboard e and E	0x3B	Keyboard F2
0x09	Keyboard f and F	0x3C	Keyboard F3
0x0A	Keyboard g and G	0x3D	Keyboard F4
0x0B	Keyboard h and H	0x3E	Keyboard F5
0x0C	Keyboard i and I	0x3F	Keyboard F6
0x0D	Keyboard j and J	0x40	Keyboard F7
0x0E	Keyboard k and K	0x41	Keyboard F8
0x0F	Keyboard l and L	0x42	Keyboard F9
0x10	Keyboard m and M	0x43	Keyboard F10
0x11	Keyboard n and N	0x44	Keyboard F11
0x12	Keyboard o and O	0x45	Keyboard F12
0x13	Keyboard p and P	0x46	Keyboard PrintScreen
0x14	Keyboard q and Q	0x48	Keyboard Pause
0x15	Keyboard r and R	0x49	Keyboard Insert
0x16	Keyboard s and S	0x4A	Keyboard Home
0x17	Keyboard t and T	0x4B	Keyboard PageUp
0x18	Keyboard u and U	0x4C	Keyboard Delete Forward
0x19	Keyboard v and V	0x4D	Keyboard End
0x1A	Keyboard w and W	0x4E	Keyboard PageDown
0x1B	Keyboard x and X	0x4F	Keyboard RightArrow
0x1C	Keyboard y and Y	0x50	Keyboard LeftArrow
0x1D	Keyboard z and Z	0x51	Keyboard DownArrow
0x1E	Keyboard 1 and !	0x52	Keyboard UpArrow
0x1F	Keyboard 2 and @	0x54	Keypad /
0x20	Keyboard 3 and #	0x55	Keypad *
0x21	Keyboard 4 and \$	0x56	Keypad -
0x22	Keyboard 5 and %	0x57	Keypad +
0x23	Keyboard 6 and ^	0x58	Keypad ENTER
0x24	Keyboard 7 and &	0x59	Keypad 1 and End
0x25	Keyboard 8 and *	0x5A	Keypad 2 and Down Arrow
0x26	Keyboard 9 and (	0x5B	Keypad 3 and PageDn
0x27	Keyboard 0 and )	0x5C	Keypad 4 and Left Arrow
0x28	Keyboard Return (ENTER)	0x5D	Keypad 5
0x29	Keyboard ESCAPE	0x5E	Keypad 6 and Right Arrow
0x2A	Keyboard DELETE (Backspace)	0x5F	Keypad 7 and Home
		0x60	Keypad 8 and Up Arrow
0x2B	Keyboard Tab	0x61	Keypad 9 and PageUp
0x2C	Keyboard Spacebar	0x62	Keypad 0 and Insert
0x2D	Keyboard - and (underscore)	0x63	Keypad . and Delete
0x2E	Keyboard = and +	0x64	Keyboard Non-US \ and
0x2F	Keyboard [ and {	0x65	Keyboard Application
0x30	Keyboard ] and }	0x66	Keyboard Power
0x31	Keyboard \ and	0x67	Keypad =
0x32	Keyboard Non-US # and ~	0x68	Keyboard F13
0x33	Keyboard ; and :	0x69	Keyboard F14
0x34	Keyboard ' and "	0x6A	Keyboard F15
0x35	Keyboard Grave Accent Tilde	0x6B	Keyboard F16

0x6C	Keyboard F17	0x89	Keyboard International3
0x6D	Keyboard F18	0x8A	Keyboard International4
0x6E	Keyboard F19	0x8B	Keyboard International5
0x6F	Keyboard F20	0x8C	Keyboard International6
0x70	Keyboard F21	0x8D	Keyboard International7
0x71	Keyboard F22	0x8E	Keyboard International8
0x72	Keyboard F23	0x8F	Keyboard International9
0x73	Keyboard F24	0x90	Keyboard LANG1
0x74	Keyboard Execute	0x91	Keyboard LANG2
0x75	Keyboard Help	0x92	Keyboard LANG3
0x76	Keyboard Menu	0x93	Keyboard LANG4
0x77	Keyboard Select	0x94	Keyboard LANG5
0x78	Keyboard Stop	0x95	Keyboard LANG6
0x79	Keyboard Again	0x96	Keyboard LANG7
0x7A	Keyboard Undo	0x97	Keyboard LANG8
0x7B	Keyboard Cut	0x98	Keyboard LANG9
0x7C	Keyboard Copy	0x99	Keyboard Alternate Erase
0x7D	Keyboard Paste	0x9A	Keyboard SysReq/Attention
0x7E	Keyboard Find	0x9B	Keyboard Cancel
0x7F	Keyboard Mute	0x9C	Keyboard Clear
0x80	Keyboard Volume Up	0x9D	Keyboard Prior
0x81	Keyboard Volume Down	0x9E	Keyboard Return
0x85	Keypad Comma		
0x86	Keypad Equal Sign		
0x87	Keyboard International1		
0x88	Keyboard International2		

## Key Code Worksheet

		NUMLOCK	GUI	CAPS/SHIFT	Ctrl/Alt	Base key code	
0	0	0 or 1	0 or 1	0 or 1	0,1,2 or 3		

Position = 1 for NUMLOCK   
 Position = 1 for GUI   
 Position = 1 for Shift or CapsLock   
 Position = 1 for Ctrl, 2 for Alt or 3 for Ctrl-Alt

To add modifier codes to an existing base key code, use the table above. For example, to create a key code for **Alt-Shift-Y**, first find the base key code for Y which is **1C** and put those 2 digits into the cells on the right:

		NUMLOCK	GUI	CAPS/SHIFT	Ctrl/Alt	Base key code	
0	0	0	0	0	0	1	C

Then put a 1 in the Shift cell:

		NUMLOCK	GUI	CAPS/SHIFT	Ctrl/Alt	Base key code	
0	0	0	0	1	0	1	C

Then put a 1 in Alt cell:

		NUMLOCK	GUI	CAPS/SHIFT	Ctrl/Alt	Base key code	
0	0	0	0	1	1	1	C

The new key code is: **0000111C**

## **Appendix A: Change History** [Applicable firmware revision shown in brackets]

A1, 7-14-15 [01.25]	Original
A2, 10-8-15 [01.34]	Added #BCI, #BCL, #BCN, #TXH, #TXM, #USB
A3, 3-22-16 [01.42]	Added #RCF
A4, 7-1-16 [01.45]	Added #MAA, #MBA, #MSS
A5, 7-14-16 [01.46]	Fixed #MAA, wrong step values given for CW/DATA, added internal command #KBMP.
A6, 2-13-17 [01.48]	Added macro import/export section.