X-Pendant Manual

**MechanicalGoose Designs**
Revision F

Introducing the X-Pendant. This a custom keyboard pendant for controlling a GRBL based CNC machine through popular controlling software. The pendant can control the jogging, probing, and zeroing as well as other features in both Easel and Universal Gcode Sender Platform. It also functions as a jogging only pendant in PicSender and Universal Gcode Sender Classic.

The X-Pendant features a high quality custom PCB, an Arduino based micro-controller, large tactile buttons and various LED lights to indicate different settings and activity. It connects to your controlling PC or Mac with a micro-usb cable (not included).

An overview video can be seen here: https://youtu.be/m26EUgLN49M

Current Compatibility

- Windows:

    - Easel

    - Universal Gcode Sender Platform (Requires provided custom macro set and keymap profile.)

    - Universal Gcode Sender Classic (Only jogging functions available.)

    - PicSender (Only jogging functions available.)

- MacOS:

    - Easel

    - Universal Gcode Sender Platform (Requires provided custom macro set and keymap profile.)

    - Universal Gcode Sender Classic (Only jogging functions available.)
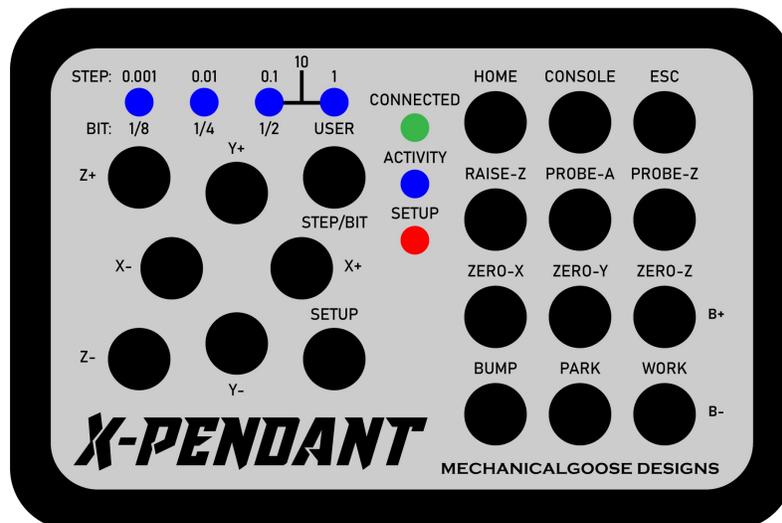
READ BEFORE FIRST USE

The X-PENDANT is tested and setup with the following default values for Easel. Please make sure to use the Setup Mode to update these settings to your personal needs prior to using the pendant.

Note that the probe and user bit settings are only for use in Easel. For use in UGS Platform, you will need to update the values in the macro once you import the macro and keymap set.

<p style="color:red; text-align:center">X-Probe = 2.000"</p>

<p style="color:red; text-align:center">Y-Probe = 2.000"</p>

<p style="color:red; text-align:center">Z-Probe = 1.000"</p>

<p style="color:red; text-align:center">User Bit = 0.750"</p>
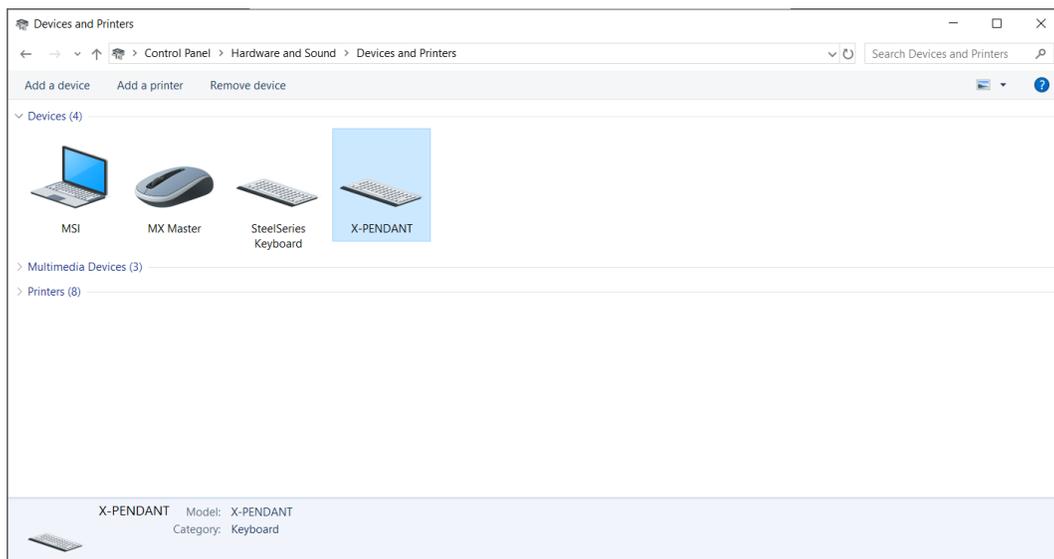
<p style="color:red; text-align:center">Mode = Easel</p>

<p style="color:red; text-align:center">Homing Mode = Enabled</p>

When you connect the pendant to your computer, the Activity LED will flash as it makes its connection. The pendant should automatically be loaded and will be recognized as a keyboard. Below is an example of it showing up in the Devices and Printers folder for Windows.

Bump & Park Functions

The Bump and Park Functions are described below but before you can use them, you need set these locations if you have not had them previously saved to your machine driver. To do this follow the below instructions. There are also several videos online that can explain this is much more detail.

1. Jog your machine to where you want your Bump position to be, then send a **G28.1** command through the command line of which ever control software you are using.

2. Jog your machine to where you want your Park position to be, then send a **G30.1** command through the command line of which ever control software you are using.

Mode Overviews

Setup Mode

- **Step/Bit LEDs**: These LEDs serve to indicate to the user the currently selected increment size (in inches) for incrementing the X-Y-Z probe thicknesses for use in Easel. (The 10 value is disabled in Setup Mode.)

- **Step/Bit**: This button cycles through the Step/Bit LEDs mentioned above.

- **Incrementing (X+,X-,Y+,Y-,Z+,Z-)**: These buttons increment the probe thicknesses one step in the named direction per the step identified by the Step LED.

- **Setup**: This button enters or exits the Setup Mode by holding for 2 seconds.

- **Connected LED**: This LED illuminates when the pendant is successfully connected to your computer.

- **Activity LED**: This light blinks when a button is pressed to indicate successful activity.

- **Setup LED**: This LED illuminates while Setup Mode is active.

- **Home**: This button enables or disables homing mode.

- **Console**: This button cycles through the different operating modes of the pendant (Easel, UGS Platform, UGS Classic/PicSender).

- **ESC**: This button is disabled.

- **Raise Z**: This button is disabled.

- **Probe-A**: This button is disabled.

- **Probe-Z**: This button is disabled.

- **Zero-X, Zero-Y:** These buttons are disabled.

- **B+ (Zero-Z)**: This button increases the User Bit diameter one step per the step identified by the Step LED.

- **Bump**: This button is disabled.

- **Park**: This button is disabled.

- **B- (Work)**: This button decreases the User Bit diameter one step per the step identified by the Step LED.

Mode Overviews

Setup Mode

To use Setup Mode, open MS Word or other similar text editing program and hold the Setup button for 2 seconds. The below shows an example of the Setup Mode output.

X-PENDANT: Firmware vX.X

By MechanicalGoose Designs

Entering Setup Mode…

Current Settings:

Easel X Probe= 2.000"

Easel Y Probe= 2.000"

Easel Z Probe= 1.000"

Easel User Bit Diameter= 0.750"

Pendant Mode: Easel

Homing Mode: Enabled

………………..

This is the initial output once entering Setup Mode (Values shown are initial default values).

New Easel Y Probe= 3.000

New Easel Y Probe= 4.000

New Easel X Probe= 3.000

New Easel X Probe= 4.000

New Easel User Bit Diameter= 0.760

New Easel User Bit Diameter= 0.770

These are examples of what is shown as you increment the probe and user bit values.

Exiting Setup Mode

New Settings Saved

Easel X Probe= 4.000"

Easel Y Probe= 4.000"

Easel Z Probe= 0.840"

Easel User Bit Diameter= 0.770"

Pendant Mode: Easel

Homing Mode: Enabled

………………..

When exiting Setup Mode (by holding Setup Button for 2 seconds) the settings which are saved for future use are displayed. It will also indicate if there were no changes to save when exiting.

Mode Overviews

Easel Mode

- **Step/Bit LEDs**: These LEDs serve to indicate to the user the currently selected step size (in inches) for jogging operations as well as the bit diameter when performing the Probe-A function. The User LED is a bit diameter which can be set by the user in the Setup Mode.

- **Step/Bit**: This button cycles through the Step/Bit LEDs mentioned above.

- **Jogging (X+,X-,Y+,Y-,Z+,Z-)**: These buttons jog the machine one step in the named direction per the step identified by the Step LED. (The 10 value only works with X & Y)

- **Setup**: This button enters or exits the Setup Mode by holding for 2 seconds.

- **Connected LED**: This LED illuminates when the pendant is successfully connected to your computer.

- **Activity LED**: This light blinks when a button is pressed to indicate successful activity. It also flashes when connecting to your computer until it is connected.

- **Setup LED**: This LED illuminates while Setup Mode is enabled.

- **Home**: Homes your machine if Homing Mode is enabled. Otherwise this button is disabled.

- **Console**: This button opens the Easel Console automatically to avoid opening manually to begin using the pendant.

- **ESC**: This button is used to exit the Console to return to design activities. It also dismisses the pop-up at the completion of a carve so you can immediately open the console and go right to jogging or parking the machine without needing to interact directly with your computer.

- **Raise Z**: Raises the Z axis to the maximum height if the Homing Mode is enabled. This is especially useful when changing a bit or installing your dust boot to avoid manually jogging.

- **Probe-A**: If you have a 3 sided probe block, the Triquetra for example, this button activates a 2 phase probing method for locating the X, Y, and Z zeros of the corner of your workpiece.

- **Probe-Z**: Initiates a standard z-only probe function to find the top surface of your workpiece.

- **Zero-X, Zero-Y, Zero-Z**: Zero's the assigned axis. In Setup Mode, Zero-Z (also identified as B+) increases the size of the User Defined Bit size for use in the Probe-A command.

- **Bump**: Sends your machine to your saved G28 location. If Homing-mode is enabled, the Z axis will raise to the top before traveling. If not, be sure to raise your Z axis before using this button.

- **Park**: Sends your machine to your saved G30 location. If Homing-mode is enabled, the Z axis will raise to the top before traveling. If not, be sure to raise your Z axis before using this button.

- **Work**: Sends your machine to your work zero location. If Homing-mode is enabled, the Z axis will raise to the top before traveling. If not, be sure to raise your Z axis before using this button.

Mode Overviews

Universal G-Code Platform Mode

- **Step/Bit LEDs**: These LEDs serve to indicate to the user the currently selected step size for jogging operations as well as the bit diameter when performing the Probe-A function. The User LED is a bit diameter which can be set by the user in the UGS Macro.

- **Step/Bit**: This button cycles through the Step/Bit LEDs mentioned above.

- **Jogging (X+,X-,Y+,Y-,Z+,Z-)**: These buttons jog the machine one step in the named direction per the step identified by the Step LED.

- **Setup**: This button enters or exits the Setup Mode by holding for 2 seconds.

- **Connected LED**: This LED illuminates when the pendant is successfully connected to your computer.

- **Activity LED**: This light blinks when a button is pressed to indicate successful activity. It also flashes when connecting to your computer until it is connected.

- **Setup LED**: This LED illuminates while Setup Mode is enabled.

- **Home**: Homes your machine if the Homing Mode is enabled. Otherwise this button is disabled.

- **Console**: This button is used for a user defined macro. Keymap = CTRL+SHIFT+V.

- **ESC**: This button is used for a user defined macro. Keymap = CTRL+SHIFT+W.

- **Raise Z**: Raises the Z axis to the maximum height if the Homing Mode is enabled. This is especially useful when changing a bit or installing your dust boot to avoid manually jogging.

- **Probe-A**: If you have a 3 sided probe block, the Triquetra for example, this button activates a 2 phase probing method for locating the X, Y, and Z zeros of the corner of your workpiece.

- **Probe-Z**: Initiates a standard z-only probe function to find the top surface of your workpiece.

- **Zero-X, Zero-Y, Zero-Z**: Zero's the assigned axis.

- **Bump**: Sends your machine to your saved G28 location. If Homing-mode is enabled, the Z axis will raise to the top before traveling. If not, be sure to raise your Z axis before using this button.

- **Park**: Sends your machine to your saved G30 location. If Homing-mode is enabled, the Z axis will raise to the top before traveling. If not, be sure to raise your Z axis before using this button.

- **Work**: Sends your machine to your work zero location. If Homing-mode is enabled, the Z axis will raise to the top before traveling. If not, be sure to raise your Z axis before using this button.
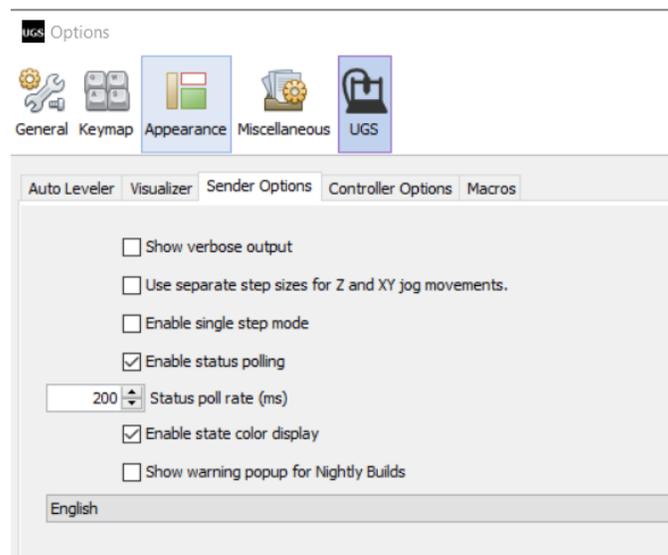
Mode Overviews

Universal G-Code Platform Mode

- Download the Macro and Keymap set from my website (www.mechanicalgoose.com).

- Import the macros first. I find it is best to restart UGS after importing then confirm they were all imported.

- Double check that there are no duplicate macros with the pre-set macros initially and any time you update UGS. As features are added to newer builds, default macros get applied that may conflict with the X-Pendant macros.

- There is a known UGS bug as of 12-4-2018 which has been reported with the latest nightly builds that prevents any importing or exporting of keymaps into UGS. The May 2018 Nightly build appears to be the last version without the issue. If you do not have this, it can be downloaded from the X-Pendant files page.
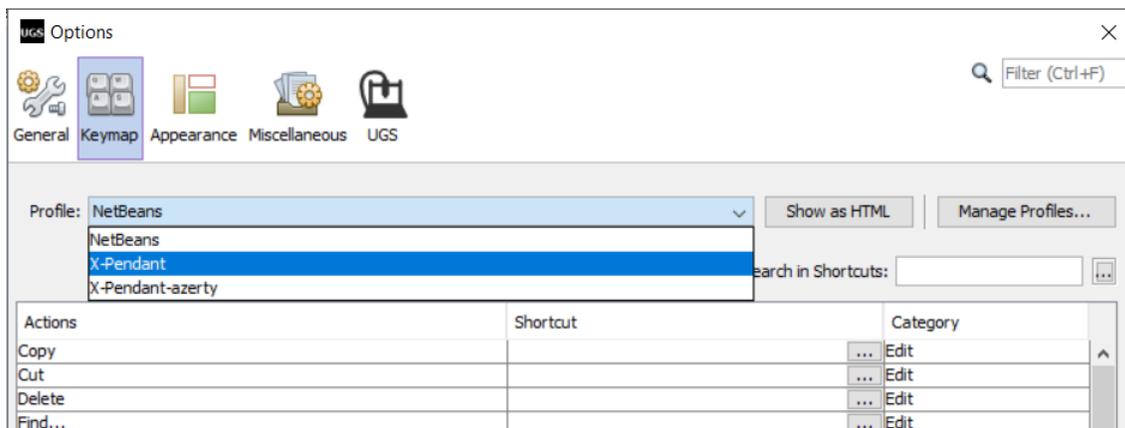
- Now import the X-Pendant Keymap profiles. I recommend restart UGS again prior to starting to carve. Be sure to select the appropriate X-Pendant profile from the drop down. (X-Pendant is the standard, select X-Pendant-azerty if you have a AZERTY keyboard layout).

- Under the Sender Options tab, be sure that the "Use separate step sizes for Z and XY jog movements." is unchecked.

Mode Overviews

Universal G-Code Platform Mode

- Below is a list of the keymaps imported for reference.

Action Name	X-Pendant
Home Machine	HOME
Jog X+	RIGHT
Jog X-	LEFT
Jog Y+	UP
Jog Y-	DOWN
Jog Z+	PAGE_UP
Jog Z-	PAGE_DOWN
Reset X Zero	Ctrl+Shift+X
Reset Y Zero	Ctrl+Shift+Y
Reset Z Zero	Ctrl+Shift+Z
XY 0.001	Ctrl+Shift+D
XY 0.01	Ctrl+Shift+C
XY 0.1	Ctrl+Shift+B
XY 1	Ctrl+Shift+A
XY 10	Ctrl+Shift+U
B	Ctrl+Shift+E
BH	Ctrl+Shift+F
P	Ctrl+Shift+G
PA1 125	Ctrl+Shift+H
PA1 25	Ctrl+Shift+I
PA1 50	Ctrl+Shift+J
PA1 X	Ctrl+Shift+K
PA2 125	Ctrl+Shift+L
PA2 25	Ctrl+Shift+M
PA2 50	Ctrl+Shift+N
PA2 X	Ctrl+Shift+O
PH	Ctrl+Shift+P
PZ	Ctrl+Shift+Q
RZ	Ctrl+Shift+R
W	Ctrl+Shift+S
WH	Ctrl+Shift+T
User Macro 1	Ctrl+Shift+V
User Macro 2	Ctrl+Shift+W

Mode Overviews

Universal G-Code Platform Mode

For UGS Platform, update the following colored values as follows in the Macros tab from within UGS itself for your specific values.

PA1 125

⇒ Xprobe thickness + 1/8" bit radius

PA2 125

⇒ Yprobe thickness + 1/8" bit radius

⇒ Zprobe thickness

PZ

⇒ Zprobe thickness

PA1 25

⇒ Xprobe thickness + 1/4" bit radius

PA2 25

⇒ Yprobe thickness + 1/4" bit radius

⇒ Zprobe thickness

PA1 50

⇒ Xprobe thickness + 1/2" bit radius

PA2 50

⇒ Yprobe thickness + 1/2" bit radius

⇒ Zprobe thickness

PA2 X

⇒ Zprobe thickness

UGS Options window — Macros tab

|	Macro Name	GCode	Macro Description
0	WH	G53G21G0Z-10;G90G20G0X0Y0;G90G20G0Z0	Work w/ Home Enabled
1	W	G90G20G0X0Y0;G90G20G0Z0	Work w/ Home Disabled
2	BH	G53G21G0Z-10;G28	Bump w/ Home Enabled
3	B	G28	Bump w/ Home Disabled
4	PH	G53G21G0Z-10;G30	Park w/ Home Enabled
5	P	G30	Park w/ Home Disabled
6	PA1 125	G91G20G38.2X-1F5;G10L20P1X2.063;G91G20G0X.125;G91G20G0Y1;G91G20G0X-.625	Probe All 1/8" Phase 1
7	PA2 125	G91G20G38.2Y-1F5;G10L20P1Y2.063;G91G20G0Y.125;G91G20G0Z1;G91G20G0Y-1;G91G20G38.2Z-1F5;G10L20P1Z.84;G91G20G0Z.25	Probe All 1/8" Phase 2
8	PZ	G91G20G38.2Z-1F5;G10L20P1Z.84;G91G20G0Z.25	Probe Z
9	RZ	G53G21G0Z-10	Raise Z w/ Home Enabled
10	PA1 25	G91G20G38.2X-1F5;G10L20P1X2.125;G91G20G0X.125;G91G20G0Y1;G91G20G0X-.625	Probe All 1/4" Phase 1
11	PA2 25	G91G20G38.2Y-1F5;G10L20P1Y2.125;G91G20G0Y.125;G91G20G0Z1;G91G20G0Y-1;G91G20G38.2Z-1F5;G10L20P1Z.84;G91G20G0Z.25	Probe All 1/4" Phase 2
12	PA1 50	G91G20G38.2X-1F5;G10L20P1X2.25;G91G20G0X.125;G91G20G0Y1;G91G20G0X-.625	Probe All 1/2" Phase 1
13	PA2 50	G91G20G38.2Y-1F5;G10L20P1Y2.25;G91G20G0Y.125;G91G20G0Z1;G91G20G0Y-1;G91G20G38.2Z-1F5;G10L20P1Z.84;G91G20G0Z.25	Probe All 1/2" Phase 2
14	PA1 X	G91G20G38.2X-1F5;G10L20P1X{prompt:Bit Radius+ X Probe Dimension};G91G20G0X.125;G91G20G0Y1;G91G20G0X-.625	Probe All User Phase 1
15	PA2 X	G91G20G38.2Y-1F5;G10L20P1Y{prompt:Bit Radius+ Y Probe Dimension};G91G20G0Y.125;G91G20G0Z1;G91G20G0Y-1;G91G20G38.2Z-1F5;G10L20P1Z.84;G91G20G0Z	Probe All User Phase 2
16	16		

Mode Overviews

Universal G-Code Classic/PicSender Mode

- **Step/Bit LEDs**: These LEDs are disabled except in Setup Mode.

- **Step/Bit**: This button is disabled except in Setup Mode.

- **Jogging (X+,X-,Y+,Y-,Z+,Z-)**: These buttons jog the machine one step in the named direction per the step identified in the respective software.

- **Setup**: This button enters or exits the Setup Mode by holding for 2 seconds.

- **Connected LED**: This LED illuminates when the pendant is successfully connected to your computer.

- **Activity LED**: This light blinks when a button is pressed to indicate successful activity. It also flashes when connecting to your computer until it is connected.

- **Setup LED**: This LED illuminates while Setup Mode is active.

- **Home**: This button is disabled except in Setup Mode.

- **Console**: This button is disabled except in Setup Mode.

- **ESC**: This button is disabled.

- **Raise Z**: This button is disabled.

- **Probe-A**: This button is disabled.

- **Probe-Z**: This button is disabled.

- **Zero-X, Zero-Y, Zero-Z**: These buttons are disabled.

- **Bump**: This button is disabled.

- **Park**: This button is disabled.

- **Work**: This button is disabled.

Optional Firmware Update

Below are instructions for updating the firmware of you X-Pendant on PC.

1. Download the X-Pendant Update Tool from the website. (www.mechanicalgoose.com)

2. Extract the folder to your desktop.

3. Although the X-Pendant does not require special drivers for normal operation, a driver for the microcontroller needs to be installed in order to update the firmware. This step only needs to be completed the first time you update the X-Pendant on a particular computer. If you have previously completed this step, skip to Step 6.

4. Double click the "Driver Install.exe" file and follow the prompts.

5. Check that only the box for "Trinket" as shown below is selected before installing.
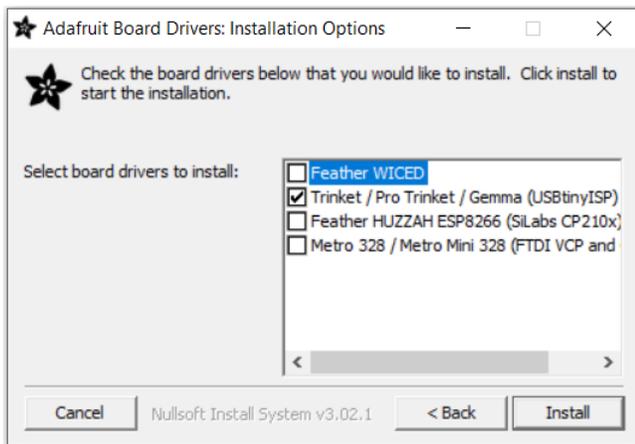
6. To ensure no conflict, if you are using the same computer the X-Carve is plugged into, temporarily unplug during this firmware update.

7. Double click the "X-Pendant Updater" and follow the prompts.
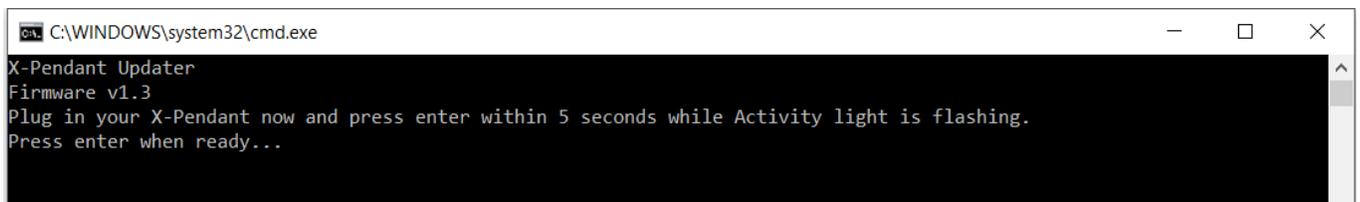
Optional Firmware Update Continued

8. Once the update is complete you can close everything. Below is a screenshot of a successful Firmware Update.

```
X-Pendant Updater
Firmware v1.3
Plug in your X-Pendant now and press enter within 5 seconds while Activity light is flashing.
Press enter when ready...

avrdude: AVR device initialized and ready to accept instructions

Reading | ############################################# | 100% 0.01s

avrdude: Device signature = 0x1e950f (probably m328p)
avrdude: NOTE: "flash" memory has been specified, an erase cycle will be performed
         To disable this feature, specify the -D option.
avrdude: erasing chip
avrdude: reading input file "Firmware\X-Pendant_v1-3.hex"
avrdude: input file Firmware\X-Pendant_v1-3.hex auto detected as Intel Hex
avrdude: writing flash (21258 bytes):

Writing | ############################################# | 100% 3.85s

avrdude: 21258 bytes of flash written
avrdude: verifying flash memory against Firmware\X-Pendant_v1-3.hex:
avrdude: load data flash data from input file Firmware\X-Pendant_v1-3.hex:
avrdude: input file Firmware\X-Pendant_v1-3.hex auto detected as Intel Hex
avrdude: input file Firmware\X-Pendant_v1-3.hex contains 21258 bytes
avrdude: reading on-chip flash data:

Reading | ############################################# | 100% 1.37s

avrdude: verifying ...
avrdude: 21258 bytes of flash verified

avrdude: safemode: Fuses OK (E:FD, H:D0, L:FF)

avrdude done.  Thank you.

Press enter to exit...
```

9. This update should not affect any of the probe or User bit changes you have saved during the Setup Mode process, however, it is best to double check that everything is still in order before returning to carving.

Happy Carving!

Revisions

Revision	Change Description	Date
A	Original Issue	6-8-2018
B	Added Bump & Park instructions to Setup Mode section.	6-10-2018
C	Added instruction on updating macro values for UGS Platform.	6-19-2018
D	Updated to match Firmware v1.3 which includes the 10 value step. Added section for optional firmware update.	9-9-2018
E	Added clarification to UGS Platform setup section and warning regarding UGS bug.	12-4-2018
F	Updated default Z probe value to 1.000". Updated UGS overview Console and Esc keys for user defined macros. Firmware 1.3.2. Updated Macro list for User Macros.	3-3-2020