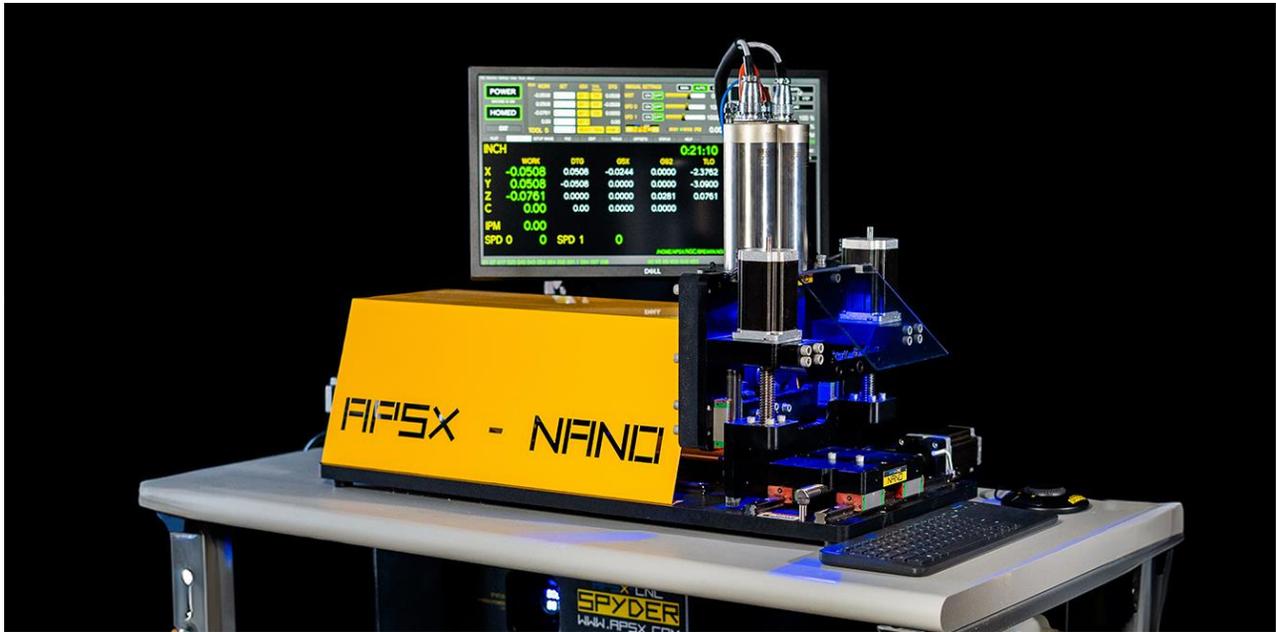




# USER MANUAL

v1.8



ADVANCED PRODUCTION SYSTEMS

**APSX, LLC.**

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September 2024 © APSX, LLC.

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Blue Ash, OH 45242 USA

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This equipment manual is intended to provide information for safe operation and maintenance. APSX reserves the right to make changes to equipment to improve the equipment, features, and performance continually. These changes may result in different and additional safety measures communicated to customers through bulletins as changes occur.

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## Limited Warranty

APSX LLC's warranty obligations and liability for all products sold by APSX LLC in the fifty United States, the District of Columbia, and U.S. Territories are limited exclusively to the terms set forth below (this "Warranty").

APSX LLC warrants the products against defects in materials and quality under regular use for six (6) months from the date of delivery to the original purchaser (the "Warranty Period").

If a hardware defect happens, and a valid claim is received within the Warranty Period, at our sole option and to the extent permitted by law, APSX LLC will either: (1) Repair the hardware defect at no charge, using new or refurbished replacement parts; (2) Exchange the product with a product that is new or reconditioned by APSX LLC.

A repaired or replacement product assumes the remaining warranty of the original product or six (6) months from the date of replacement or repair, whichever is longer.

When a product is exchanged, any replacement item becomes your property, and the replaced item becomes APSX LLC property.

## Exclusions from and Limitations to Warranty

This Warranty applies only to hardware products manufactured by APSX LLC. The Warranty does not apply to any non-APSX LLC hardware products or software, even if sold with APSX LLC hardware.

Manufacturers, suppliers, or publishers other than APSX LLC may provide their warranties to the end-user purchaser. Software distributed by APSX LLC with or without the APSX LLC brand name (including but not limited to system software) is not covered under this Limited Warranty.



APSX LLC does not warrant that the operation of the product will be uninterrupted or error-free. APSX LLC is not responsible for personal injury or property damage arising or resulting from failure to follow instructions relating to the product's use, storage, or handling.

This Warranty does not apply to (1) Damage caused by accident, abuse, misuse, neglect, flood, fire, earthquake, or other external causes; (2) Damage caused by operating the product outside the permitted or intended uses described by APSX LLC; (3) Damage to a product or part caused by or resulting from a modification to alter its functionality or capability without the written permission of APSX LLC; (4) Cosmetic damage, including but not limited to scratches, dents, and ordinary wear and tear.

This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state. APSX LLC's responsibility for hardware defects is limited to the repair or replacement service, as described in this Warranty and determined by APSX LLC in its sole discretion.

### **Disclaimer of Warranties; limitation of liability**

Except as explicitly provided in this Warranty, we do not guarantee, represent, or warrant that your use of our service or any APSX LLC product will be uninterrupted, timely, secure, or error-free. We do not warrant that the results obtained from the use of the service or the product will be accurate or reliable.

The products delivered to you by APSX LLC are (except to the extent otherwise expressly stated by us in this Warranty) provided "AS IS" and "AS AVAILABLE" for your use, and, except as expressly outlined in this Warranty, without any representation, warranties, or conditions of any kind, either express or implied. APSX LLC further disclaims all implied warranties or conditions of merchantability, merchantable quality, fitness for a particular purpose, durability, title, and non-infringement.



Some states restrict or do not allow limitations on warranties, which may affect your rights. Therefore, this Limited Warranty will be adjusted to maintain compliance with such state limitations or restrictions.

No APSX LLC reseller or employee is authorized to make any modification, extension, or addition to this Warranty. The terms in this Warranty shall constitute the entire agreement between you and APSX LLC concerning the matters discussed herein. Suppose any term is held to be illegal or unenforceable by a court of competent jurisdiction. In that case, the legality or enforceability of the remaining terms shall not be affected or impaired and shall remain in full force and effect.

Except as provided in this Warranty and to the extent permitted by law, APSX LLC is not responsible for direct, indirect, special, incidental, or consequential damages resulting from any breach of warranty or condition or any other reason, or under any other legal theory, including but not limited to loss of use; loss of revenue; loss of actual or anticipated profits (including loss of profits on contracts); loss of the use of money; loss of anticipated savings; loss of business; loss of opportunity; loss of reputation; or any indirect or consequential loss or damage howsoever caused, including the replacement of equipment and property, any costs of recovering, programming, or reproducing any program or data stored or used with APSX LLC products and any failure to maintain the confidentiality of data stored on the product. This is true even if APSX LLC is advised of the possibility of such damages.

### **Obtaining Warranty Service**

Please access and review the online help resources referred to in the documentation accompanying this hardware product before requesting warranty service. If the product is still not functioning correctly after using these resources, don't hesitate to contact APSX LLC at support@apsx.com.

Help us so we can help you. You must provide reasonable assistance to APSX LLC in diagnosing issues with your product and follow APSX LLC's warranty processes.



APSX LLC restricts service to the United States of America and the District of Columbia, and U.S. territories. APSX LLC will pick up the product in its original wood crate to APSX LLC’s repair service location for service for qualifying warranty service. If the original wood crate is not kept, you will be charged for a replacement crate to be sent to you to enable you to ship the product to APSX LLC’s repair service location. Upon your receipt of the replacement crate, the original product becomes the property of APSX LLC, and you agree to follow instructions to return the original product to APSX LLC on time.

APSX LLC may require that you furnish proof of purchase details before receiving warranty service. Please refer to the documentation for more details on this and other matters on obtaining warranty service.



**Accessories****- Tooling**

Over time, more upgrades may be available that can improve your equipment. To see what upgrades are available for your machine, please visit [www.apsx.com](http://www.apsx.com).

**Spare Parts**

All spare parts for APSX-NANO can be ordered online at [www.apsx.com](http://www.apsx.com).

**Unauthorized Modifications**

Under no circumstances should any changes or modifications be made to the electrical circuits, mechanical structures, or safety devices to the machine without the prior, written permission of APSX LLC.



## General Information

Phone Support Number: 1-513-716-5992 (9AM-4PM EST Weekdays)

You need to schedule a call by using the [scheduling](#) tool on our website.

For a quicker response, please use email [support@apsx.com](mailto:support@apsx.com)

Knowledgebase: <https://www.apsx.com/nano-support-center>

## Customer Feedback

If you have concerns or questions regarding this Manual, please contact us at [www.apsx.com](http://www.apsx.com). You also can find an electronic copy of this Manual and other helpful information on our website.

Join APSX NANO owners online and be a part of the greater CNC community at these sites:

Facebook: <https://www.facebook.com/apsxcom>

Twitter: <https://twitter.com/apsxcom>

Instagram: <https://www.instagram.com/apsxllc>

YouTube: <https://www.youtube.com/channel/UCoeQLNGN6K0Y6a2ccljxWuw/>



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## About

**APSX NANO** is a precise and rigid CNC Swiss Lathe that can cut metals, and plastics. APSX NANO is a complete system that includes APSX CNC software, embedded PC, air-mist system, keyboard, and pendant. It uses just a standard wall outlet for the control box and monitor.

### TOOLS

APSX NANO has two live tool air pressure-chilled spindles with a wide RPM range, 2000-10000, and high torque at low speeds. The main spindle is a servo motor with 1800 RPM and 300W. There are six external (OD) tools and five internal (ID) tools that can be mounted.

### MIST

APSX NANO uses a water-air mixing system to facilitate cooling both the workpiece and the end mill. Without cooling, machining metals becomes more challenging as the temperature increases. Pressurized air mist also helps to remove the chips.

### RIGIDITY

APSX NANO has industrial linear guideways, hard-anodized aluminum casting tool plates, precision lead screws, and strong servo and stepper motors, making it a very rigid machine.



## Carrying the Machine to Your Facility



For the safest transportation, the APSX-NANO's wood crate from the carrier's freight trailer to the final location of the machine must be danger-proof. Therefore, please make sure that the width (40"), depth (32"), height (20"), and weight (250 lbs) requirements are sufficient.

- The space for the carrier's trailer for parking and unloading should be sufficient
- The access inside the building, including stairs, doors must be verified
- The floor conditions or space where NANO will be used must be sufficiently robust, rigid, and smooth
- Follow the receiving procedures defined here: <https://www.apsx.com/receiving-the-machine>

Content of the crate:

- APSX-NANO CNC Swiss Lathe: 2 OD tools, 3 ID tool holders installed



- The embedded computer inside the control panel - no laptop or PC is required
- Keyboard
- Control pendant
- APSX CNC software (installed)
- Accessories: Locking key for guidebushing nut, one extra OD tool holder, OD tool torx wrench



## Machine Installation Out of Crate

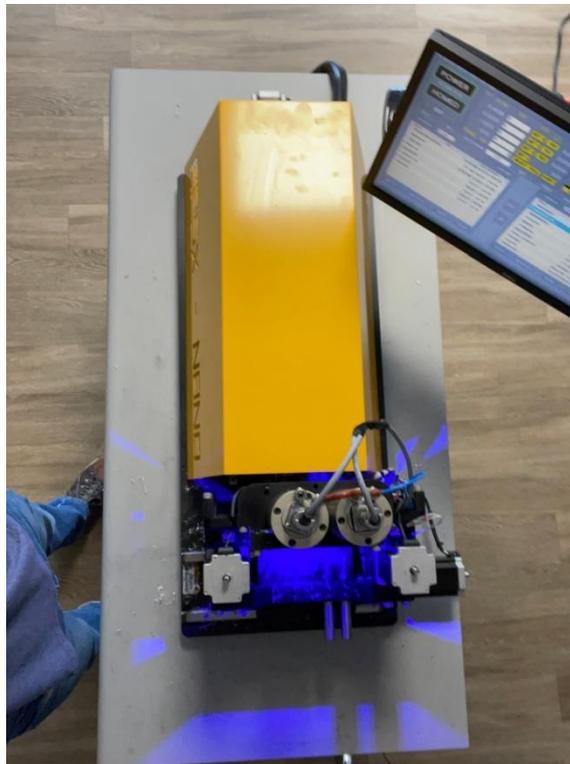
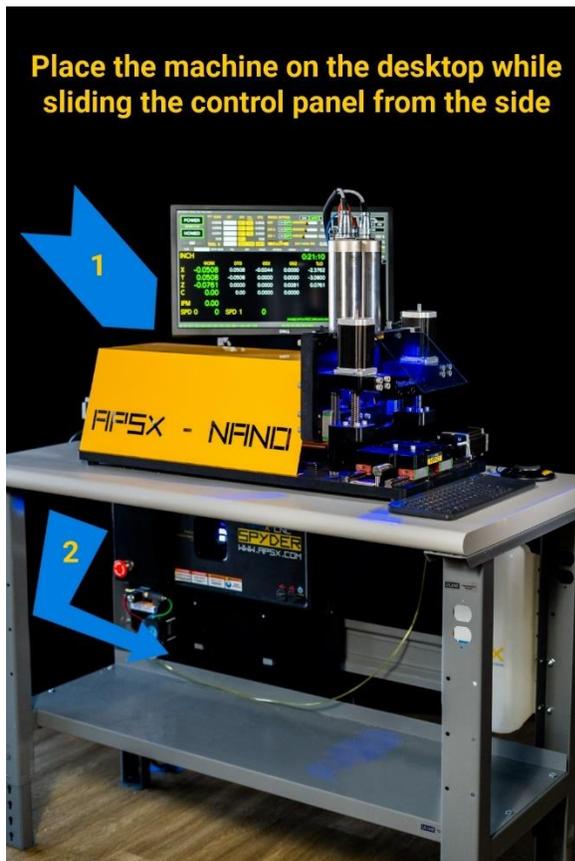
# WARNING

Before removing the machine from the crate, please read the following instructions for safe setup:

- Open top and take off the front side by removing screws
- Once received, inspect and note any shipping damages and part shortages: <https://www.apsx.com/receiving-the-machine>
- The machine is mounted to the crate. Put the other items aside before you start unscrewing the machine mounting screws. Remove the keyboard, and other accessories included.
- APSX-NANO is not a light machine. Therefore, have some help for lifting it.
- Mist, air, spindle lines, and motor wiring come preassembled and are connected from the control board to the machine. While removing the control board and machine from the crate, be careful not to disconnect, stretch or damage lines



- Mount the control board and monitor on the stand. Always use the VESA 200X200 mounting standoffs with ¼" long screws.



- Air, mist, and coolant lines from the control panel to the machine must be routed safely, without kinks or interference with the machine's travel area.





- Connect the monitor to the control panel with the VGA cable on the control panel.

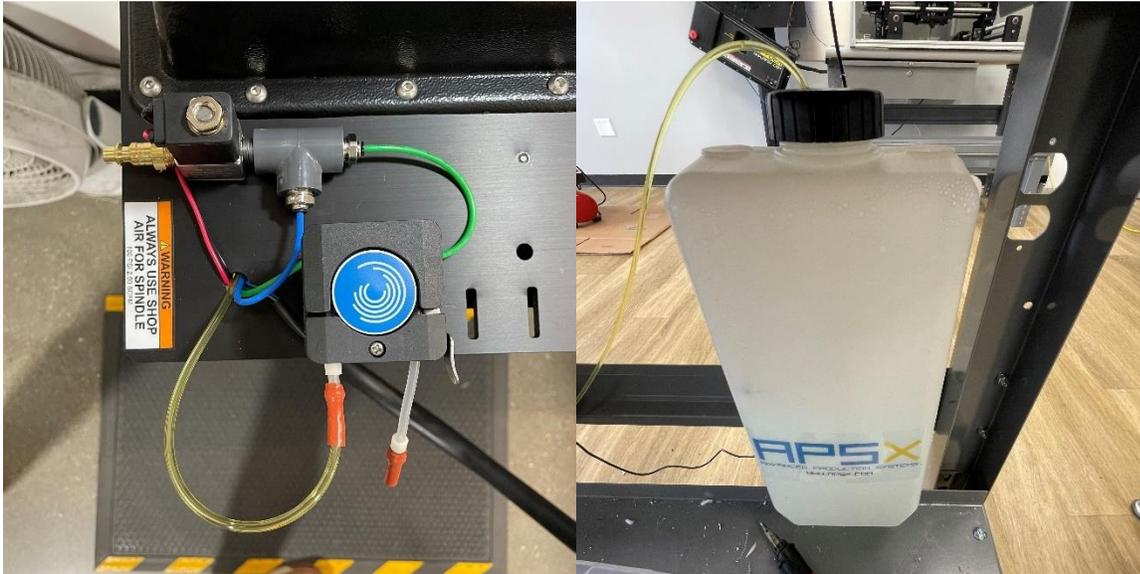


- The coolant container can be mounted on the stand. The tube end with the filter should be in the container, and the other end should be connected to the pump on the control panel. APSX-NANO consumes 1.35ml/min at

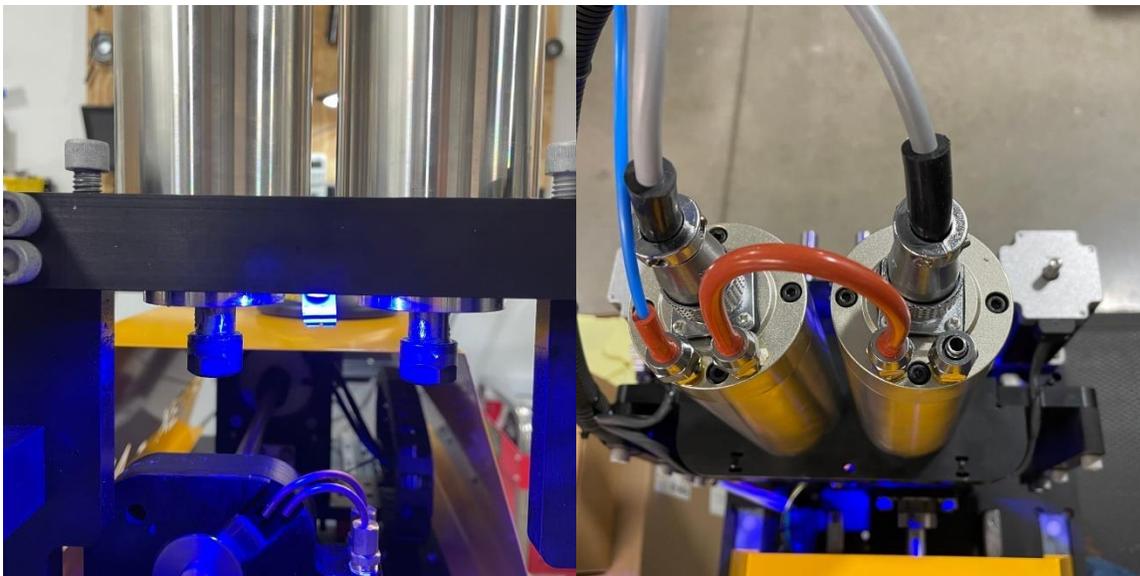


average or 6.5ml/min at max. **Add 90% tap water and 10% Koolmist Formula (or other type coolants) into the container.**

- For mist generation, shop air and air hose with 0.25in female quick-connect coupler are required. We use the same air to cool the spindle down. Max PSI for air is 80-110. The air consumption rate is 2.5 CFM.



- Live tool spindles will be inserted into the holes on top. When installing it, only a quarter inch of the spindle body is enough out of the plate.



- If you will be transporting your APSX-NANO, especially if it is shipped as freight, place it into the original wood crate and use clamping bolts to prevent damage to the axes in case of an impact during shipment



### Storing the Machine

Disconnect the main power plug from the outlet and store the machine when not in use. When moving the machine, always lift by the base. Never lift by movable components.

Store the APSX-NANO in a dry location, protect the wires from excessive UV exposure and avoid operating the machine immediately after significant temperature changes that could cause condensation buildup inside the machine. If possible, store the APSX-NANO in a watertight container or a plastic bag and use desiccant to prevent moisture buildup.



## Maintenance

We suggest using the steps below when you maintain your machine.

- Clean your machine: Brush first, then vacuum as much debris as possible.
- Inspect: Linear guideways should be clear of dirt and shavings. The tools should be clean with no debris on it.
- Collect: There should not be any loose tools, wrenches, material on the base plate.
- Track: Have a log sheet for cutting tools to keep records of approximate usage in hours. A dull tool is not good for machining.

**Weekly:** Apply 10W30 motor oil on acme screws. More frequent cleaning and lubrication of the acme screws may be required for cutting other absorbent or abrasive materials.

**Daily:** Check mist liquid level, blow chips with an air gun.

We suggest using the items below when you clean your CNC machine.

- Shop air, Isopropyl alcohol, Wipes, Brush, Gloves, Safety glass, Vacuum cleaner

## During the Operation

Normal operation – Keep clear of the work area of the machine while the machine operates.

Part loading and unloading – An operator ensures the machine is not in operation, completes a task, and clears the machine's work area.

Tool loading and unloading – A machinist enters the machining area to load or unload tools. Then, exit the area completely before automatic movement is commanded.

As with any power tool, do not use the CNC machine if you are tired, distracted, or impaired.



## Compressed Air Requirement

**Max PSI:** 80-110 **Air Consumption Rate:** 2.5 SCFM

20

**Air connector type:** Female ¼" quick-connect coupler (not included)



## Safety Features



**CAUTION:** You must always act following the User's manual, safety decals, safety procedures, and instructions for safe machine operation.

**IMPORTANT:** Please use the machine safely by following the User Manual, safety decals, and instructions. All machines present hazards from rotating cutting tools, moving parts, electricity, and noise. Therefore, when you use machines, you must always follow basic safety precautions to reduce the risk of personal injury and mechanical damage.

- It is the machine owner's responsibility to ensure that everyone involved in installing and operating the machine is thoroughly acquainted with the operation and safety instructions provided with the machine BEFORE they perform any actual work. The ultimate responsibility for safety rests with the machine owner and the individuals who work with the machine.
- Use appropriate eye protection while operating the machine. ANSI-approved impact safety goggles are recommended to reduce the risks of eye damage.
- When cleaning the machine and when in contact with milling scrap, wear protective gloves and goggles.
- Open flames, smoking, eating, and drinking are prohibited in the vicinity of the machine.
- This machine is automatically controlled and may start at any time, and it can cause severe bodily injury.
- Ensure good ventilation in the environment when machining materials that release harmful dust must be suctioned off. Observe the statutory regulations.



**Electrical safety:**

- The electrical power must meet the required specifications. The machine must be connected to a dedicated 120V power circuit. Attempting to run the machine from any other source can cause severe damage and will void the warranty.
- The electrical panel covers should be in place and fastened to the machine at all times, except when the machine is being serviced. There is high voltage throughout the electrical cabinet (including the circuit boards and logic circuits). In addition, some components operate at high temperatures; therefore, extreme caution is required.
- Never service the machine with the power connected. Never unplug the cable connections on the live spindles when the machine is powered on.
- Do not abuse the power cord. Do not twist, bend, scrape, pull, pinch.

**Operation Safety:**

- Do not operate the machine unless all body parts and clothing are clear of the work area. Rotating cutting tools can cause severe injury. When a program runs, the machine can move rapidly at any time and in any direction.
- [e-STOP] is the red switch located on the front of the control panel. When you press the [e-STOP], the axis motors, spindle motor all stop. Use [e-STOP] in case of an emergency. Turn the e-STOP clockwise a quarter turn to release back to power on mode.
- Check for damaged parts and tools before operating the machine. Any part or tool that is damaged should be properly repaired or replaced. Likewise, do not operate the machine if any component does not appear to be functioning correctly.
- Keep your hands away from the tool in the spindle when the machine is in operation.



**DANGER:** Improperly clamped parts or tools may be ejected with force.

The APSX-NANO is **not designed for unattended operation**.

DO NOT modify or alter this equipment in any way. Modifying or altering any APSX-NANO machine without authorization could lead to personal injury and mechanical damage and void your warranty.

Hazard symbol decals are placed on APSX-NANO to help ensure that dangers are quickly communicated and understood. If decals on the machine become damaged or worn or additional decals are needed to emphasize a particular safety point, contact APSX LLC.



## Technical Specs and Features

- 31" (D) by 14" (W) machine base footprint
- Required space for placing the machine is about 40" (D) by 22" (W)
- Approximate weight: 150 lbs
- 120V standard wall outlet with proper grounding
- PC, keyboard, and pendant are included
- Low energy Blue LED lighting in the machining area for visibility
- APSX CNC software is installed (easy to read user interface)
- USB memory stick is used for loading g-code files on the control panel
- Adjustable mist (coolant) on the point of machining
- Hard anodized casting tool plate aluminum construction
- Polycarbonate safety shield
- Sliding cover to access to barstock area

### Workpiece (Bar Stock)

- The default bar diameter is 0.50 inches
- Max bar diameter is 0.75 inches (0.75", 0.625", 0.375" and 0.25" guide bushings and couplings are sold separately)
- Precision ground bar diameter tolerance -0.0005"-0" preferred
- Straightness Tolerance 0.01" per ft. suggested
- Max bar length to install: 20" (Machinable length: 17")

### Spindle and Motors

- Main servo motor (Teknic) spindle RPM is 1800 and power is 300W - 0.43 degrees resolution and 0.03 degrees repeatability. Guide bushing runout accuracy .0003" or less.
- 2000 - 10000 RPM Pressured Air-Chilled 500W Live Tool Spindles (2) with ER11 collets (1/4" and 1/8" 2 flute end mills) - 80PSI shop air with 0.25" female coupler required
- Three NEMA23 stepper motors with a rapid speed of 90 IPM on X, Y and Z axes
- Stepper repeat accuracy at no load (+/- 0.0002") and achievable machining accuracy less than 0.0005"



## Tools

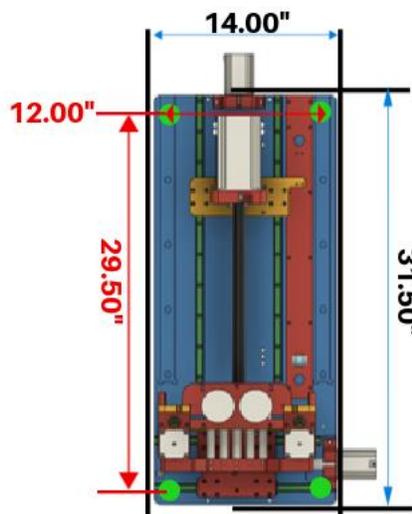
- Number of external (OD) tool slots: 6 (12mm X 12mm profile)
- Number of internal ID tool slots: 5
- The distance from the ID tool rack to guide bushing plate is 4.5 inches

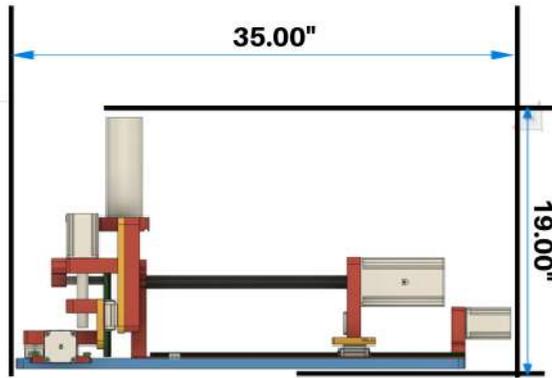
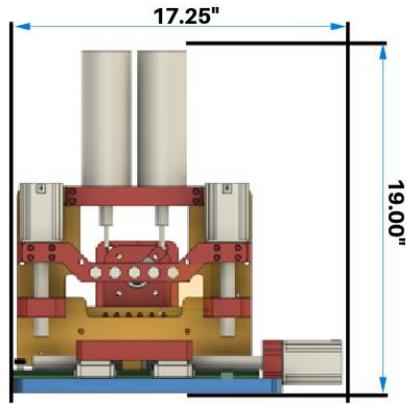
The methods used by the machinist influence the accuracy and repeatability. A skilled machinist can deliver better accuracy that exceeds the accuracy specified by the manufacturer. However, an inexperienced machinist may have difficulty achieving the expected accuracy.

## Material Tips

APSX-NANO can machine a variety of materials. **The bar stocks should be precision ground with tight diameter and straightness tolerance.** Here are some examples: Aluminum, bronze, copper, brass, stainless steel, titanium, and plastics such as Delrin, peek, polyetherimide (PEI) and polycarbonate.

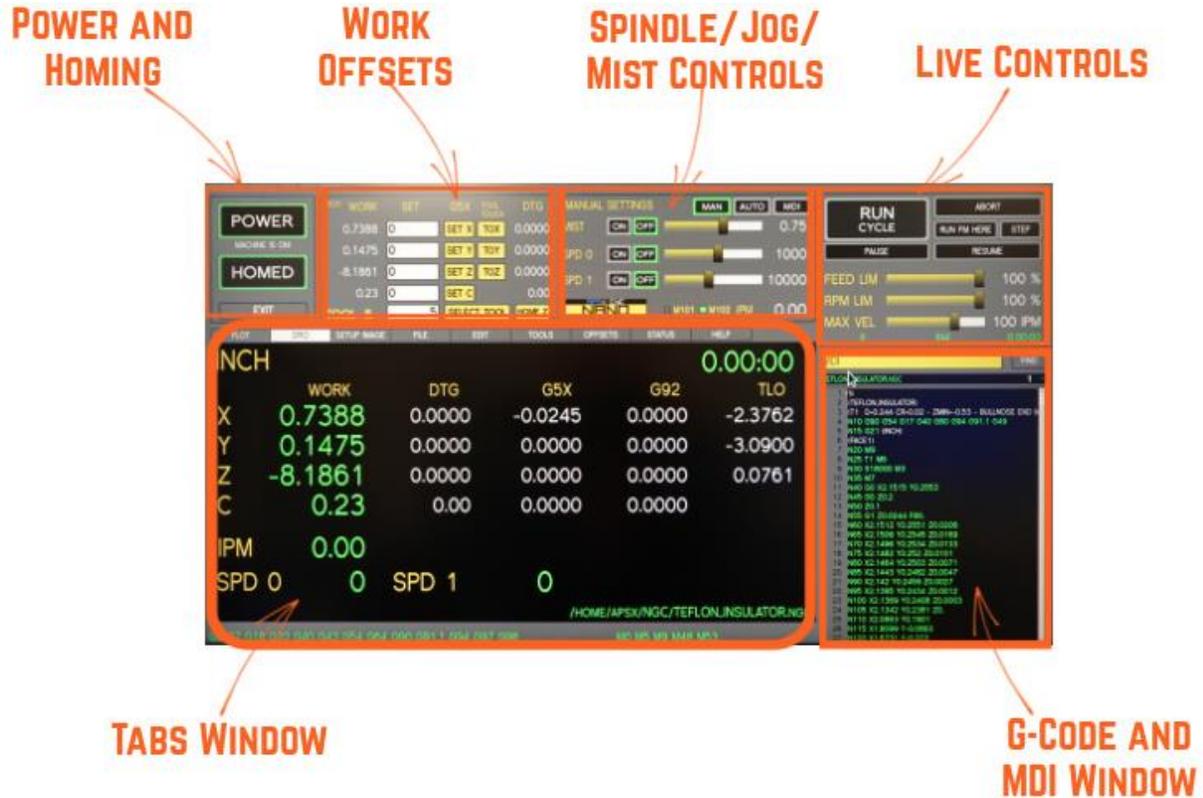
## Machine Dimensions





## User Interface

The software has a layout structure that makes using the machine much easier.



## Powering the Machine and Homing

The APSX NANO can be plugged into a standard 120V wall outlet. However, to prevent an outage, please have the machine plugged into its dedicated circuit on the circuit breaker panel with no other appliances drawing power from that circuit. Please do not use any extension power cord. The circuit breaker must be rated at 15 amps minimum.

For non-U.S.A. customers, a step-down power converter (220V to 120V) may be used in Europe or other places. We suggest using a 3000W converter. Many alternatives are on the market, such as the Rockstone Power RSP-3000.



To initiate the startup process, please follow these steps:

- Begin by plugging the power cord of the APSX NANO into the designated wall outlet.
- Subsequently, connect the power cord of the monitor to its respective power source.
- Turn on the cordless keyboard by removing the plastic battery strip and flipping the switch located on the right side of the keyboard.
- Connect the keyboard's USB interface to the control panel's USB port. The Keyboard touchpad serves as a functional replacement for a standard PC mouse, enabling seamless control of the mouse arrow.
- Locate and press the "PC Power" button positioned at the bottom right corner of the control panel once.
- The machine will now initiate the booting process and automatically launch the APSX software.

Use the Keyboard touchpad to control the mouse arrow. The touchpad functions are identical to a standard PC mouse.

Click on the blinking **Press To POWER** and then click on the blinking **Home All** buttons

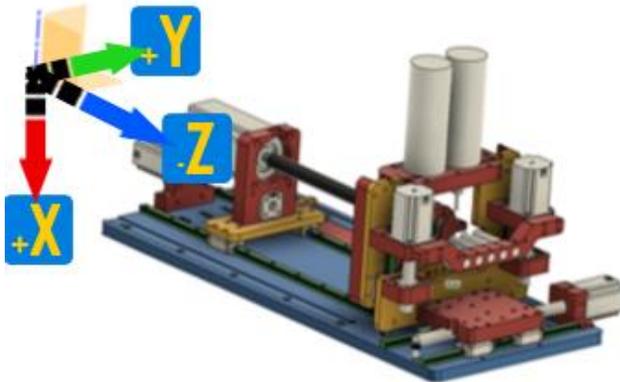


It will be blinking in Yellow during the homing. In the end, it will show as Homed. You can click on HOMED button whenever you need homing.





When using the EXIT button, the machine will save the G54 coordinates homing positions based on your workpiece. When you are done using the machine, you can **unplug the power cord from the wall outlet**.



### Work Offsets

They are also called G54 work offsets. That defines the work coordinates for the g-codes. You can either type these desired coordinates and hit enter or click on the SET buttons for each axis. Default settings are always zero.





### Manual Settings - Mist Control

Click the MIST ON (M7) button to turn on air and mist (air and mist are now active). Control the mist amount by clicking/dragging the Mist Amount tab. To run the air without mist, click the MIST ON button and drag the **Mist Amount** tab to the left **below 0.45**. Any value **above 0.45** will activate and increase the mist amount. M9 turns it off.

For cutting plastics, or other materials, shut off the mist and use only air—route mist line and filter into the bottom of the solution container from its cap. Place the mist container in a safe location away from the machine when operating. The container has a sealed lid to keep the solution clean.

### Manual Settings - Spindle Controls

Spindle 0 is the main spindle on the z-axis. Spindle 1 is the live tool on the x-axis and it is only clockwise (CW). Click the SPINDLE ON button to turn on the spindle in manual control. It is a similar move as to M03, M04 and M05. Next, control the RPM by clicking/ dragging the Spindle RPM tab.



To set the speed of the spindle 0 to 1000 RPM, use M3 S1000 \$0 (CW 1000RPM for the main spindle) and to turn it off use M5 \$0.

To set the speed of the spindle 1 to 10000 RPM, use M3 S10000 \$1 (CW only) and to turn it off use M5 \$1.

### Manual Settings – M101 and M102

There are two modes of operation: Angle Mode (M101) and Spindle Mode (M102)

Angle Mode (M101): G0 C180 for precision rotating the workpiece. It is generally used with spindle 1 live tooling.

Spindle Mode (M102): It is for normal lathe operations for continuous rotation. The default mode is Spindle Mode (M102) when the machine starts.

Before switching from Angle Mode to Spindle Mode, make sure that C position is set to zero. The C position information is lost when switching to Angle Mode.

### Pendant – Jogging



The pendant allows precise control of the machine's travel speed. For example, manually touching off the tool to your workpiece and zeroing the X, Y and Z-axis



requires small adjustments at low speed. It increases efficiency on jobs that require a difficult setting of the workpiece and the tool.

**PRESS AND HOLD** X, Y, or Z buttons and rotate the Controller Ring clockwise for positive continuous travel, rotate counterclockwise for negative travel.

Step jogging is done with the Jog Wheel for jogging in very small increments by pressing and holding the X, Y, or Z buttons.

### Cycle Control



#### Run Cycle

It starts the program. While it is ON, the green light around the button illuminates.

#### Abort

It exits the program and stops all motion, including the spindle.

#### Run From Here

Click on the FIND button to open the dialog box. Type the keyword that you want to find in the g-code. It will highlight the keyword(s) in the g-code for you. When you click on it, you can use the Run From Here button to run the program starting from that line.



## Step

It executes the g-code one line at a time. You need to click on the PAUSE button first, then click on the STEP button each time. To cancel this mode, click on the RESUME button.

## Pause

It pauses the g-code. If you click on the RESUME button, it will continue.

## Feed Override Limit

Changes the IPM (inches per minute) defined in the G-Code by the percentage selected on the slider. This will affect G01 (feed) codes, not on G00 rapid moves.

## Spindle RPM Override Limit

Changes the spindle RPM defined in the G-Code by the percentage selected on the slider. The spindle must be running for these controls to have a noticeable effect. The override doesn't drive the spindle past its maximum speed.

## Max Velocity

Adjustable maximum speed for any move (G01 and G00). The slider can be very useful when running a G-code program for the first time. You can use it to stop the mill by sliding it down to 0 and verifying the Distance to Go and X/Y/Z/A DROs look appropriate before continuing.

## The Last Row Number Stopped, Status and the Cycle Time

The last row number stopped, shows the number when the program is aborted or paused. The status shows the current status of the machine such as idle or running. The last number on the right corner shows the cycle time.



## G-Code and MDI Controls

```

MDI
BRACE.NGC 1
1 %
2 G94 G18
3 G20
4 M5 $1 (TURN SPINDLE 1 OFF IN TURNING MODE)
5 G7
6 G54
7 G40
8 G90
9 G0
10 G95
11
12 #1=0
13 O101 WHILE [#1 LT 10]
14
15 (FACE)
16 G43 H5
17 M102
18 G95
19 G97 S1000 M3
20 G54
21 M7
22 G18
23 G0 Z0.01
24 X0.62 Y0.
25 G96 D1000 S300 M3
26 Z0.0516
27 X0.56
    
```

### Recent Files Drop-Down Menu

It displays the currently loaded g-code file. When you click on it, you can see the last files that have been loaded.

### MDI Line

You can send commands to the machine directly by typing a command into this Manual Data Input line (MDI) window. Then you need to press ENTER to execute. You can press the ESC to abandon it. Recent commands are stored for reuse.





- Left mouse button to PAN the screen
- Right mouse button to ROTATE
- ZOOM+ and ZOOM- button to zoom in and out
- CLEAR to remove the machining moves
- PERS button to view the perspective view

## DRO Tab

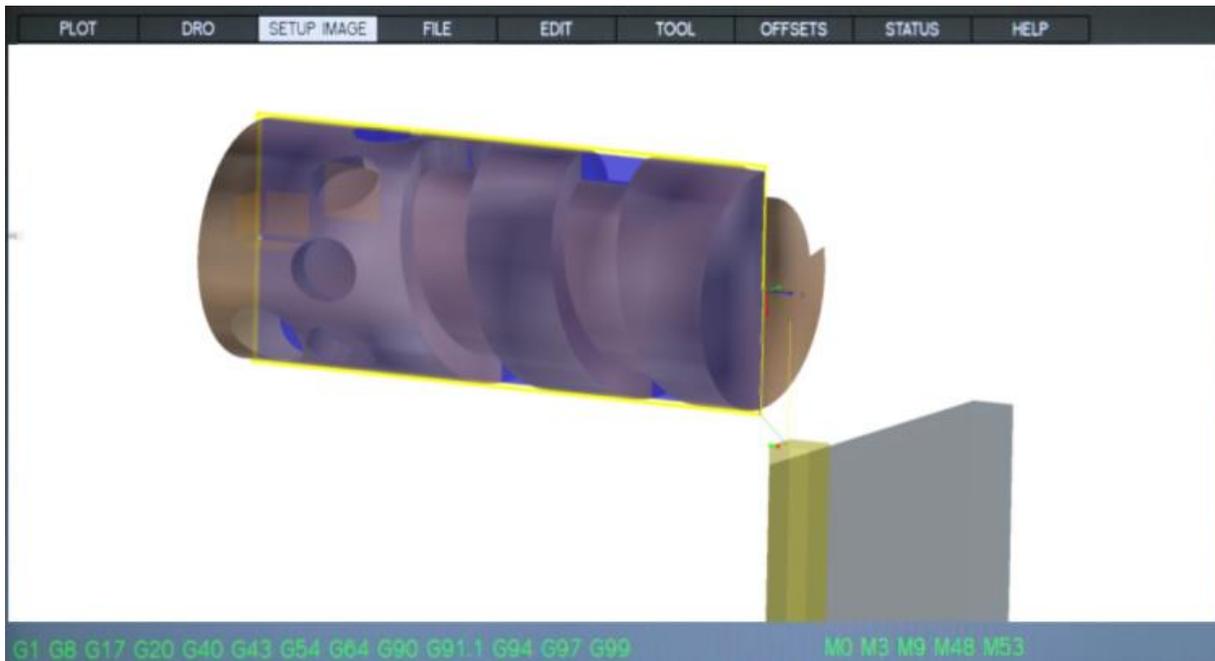


This tab shows detailed information in a dashboard style. For example, you can see the current unit inch or mm. The work coordinates are in the first column. The active G coordinates are also on this tab. The current IPM and RPM values are in the lower-left corner. The active file location is listed in the lower right corner. Finally, the duration of the g-code is placed in the top right corner.

Special comments can be inserted into the G-Code file to control how the preview of AXIS behaves.

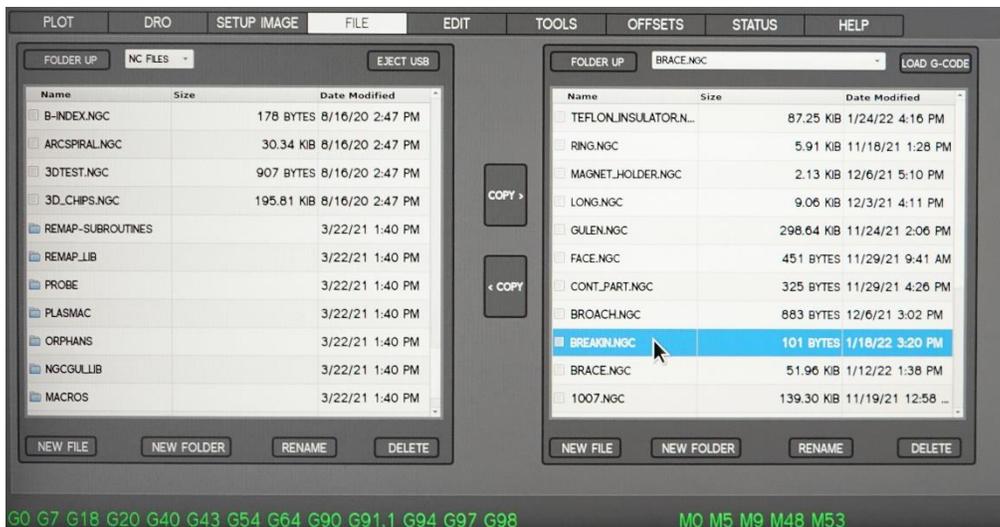


## SETUP IMAGE Tab



If you create and save a picture with the same file name as the g-code program, it will show it on this tab. The picture file name (case sensitive) should have a png extension (lowercase) at the end. You can show the setup layout and add some critical notes to it. The idea is to make the setup process easier for you by using this cheat sheet.

## FILE Tab



When you insert the USB memory stick into the control panel, it will show its content on the USB drive window's left side of this tab.

Using the COPY buttons, you can move the files to and from the hard drive window on the right. When the file is on the right side (on the hard drive window), you can double click on it or click on the LOAD G-CODE button to load it. It will show up on the g-code panel on the right side of the screen.

Click the EJECT USB button to disconnect the USB drive from the controller.

NOTE: Ejecting the USB drive helps to avoid corrupting data on the USB drive.

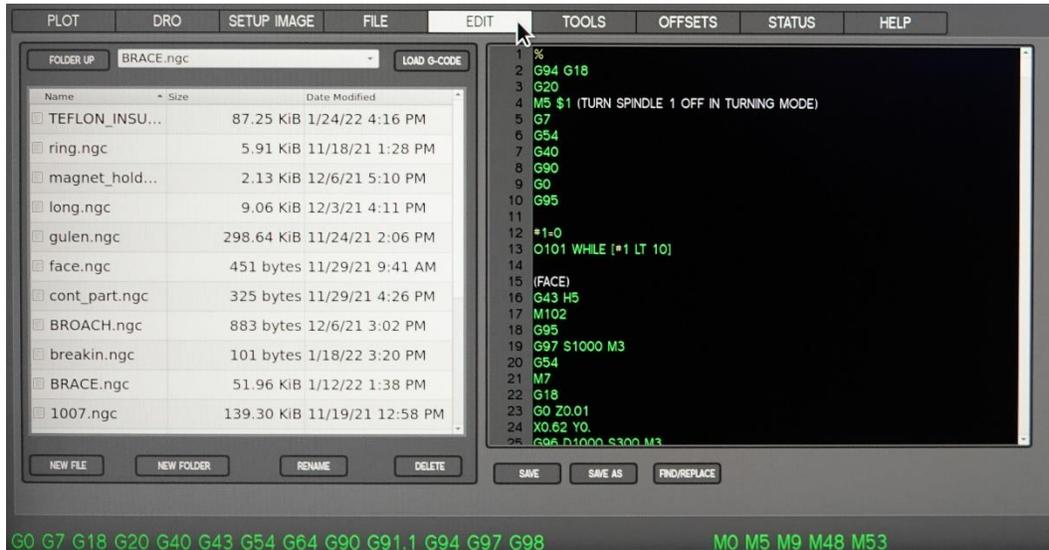
IMPORTANT: For software to accept and read your G-Code file, it must end with extension .ngc (lower case). Please configure your 3D design software to create all G-Code files with this extension.

The FOLDER UP buttons on both windows can be used to navigate through the file structure.

You can use the NEW FOLDER, NEW FILE, RENAME and DELETE buttons at the bottom of the window for file management.



## EDIT Tab



You can edit the loaded g-code file in this tab. Then, when you make a change and save it, the loaded file will also be updated instantly. Use the FIND button to find the specific code you need to change. Then SAVE the file. Or SAVE AS a different file name.

The FOLDER UP buttons on both windows can be used to navigate through the file structure.

You can use the NEW FOLDER, NEW FILE, RENAME and DELETE buttons at the bottom of the window for file management.



## TOOL Tab

Tool	Pocket	X Offset	Y Offset	Z Offset	Diameter	Remark
1	1	-2.2731	-0.6895	0.0000	0.0000	1
2	2	0.0020	0.0000	0.0000	0.0000	2
3	3	-2.4314	-1.8893	-0.2591	0.0000	3
4	4	0.0040	0.0000	0.0000	0.0000	4
5	5	-2.3762	-3.0900	0.0761	0.0000	5
6	6	0.0060	0.0000	0.0000	6.0000	6
7	7	-1.3700	-1.3410	0.0000	0.0000	7
8	8	-1.3700	-2.3410	0.0000	0.0000	8
9	9	-1.3842	-3.3207	-0.7928	0.0000	9
10	10	-1.3842	-4.3207	-0.7838	0.0000	10
11	11	-1.3956	-4.3993	-0.7219	0.0000	11
12	12	-0.4200	-1.8700	-0.3454	0.0000	12
13	13	-0.1070	-3.8491	-0.3578	0.0000	13

SAVE TABLE RELOAD TABLE DELETE ADD TOOL

G0 G7 G18 G20 G40 G43 G54 G64 G90 G91.1 G94 G97 G98 M0 M5 M9 M48 M53

The Tool tab displays the tool table. Tool offsets allow the operator to use tools of different lengths in different tool locations while still programming with respect to the workpiece. You can switch tools quickly, without setting up the mill every time a tool is mounted. The current tool's offset values are in the DRO tab (TLO) for you to see anytime.

X-offset values should not repeat for different tools. It applies to Y and Z offset values. Otherwise, the tool selection may not work properly. **It will pick up the first one on the table if there are identical tools with the same offset values.**

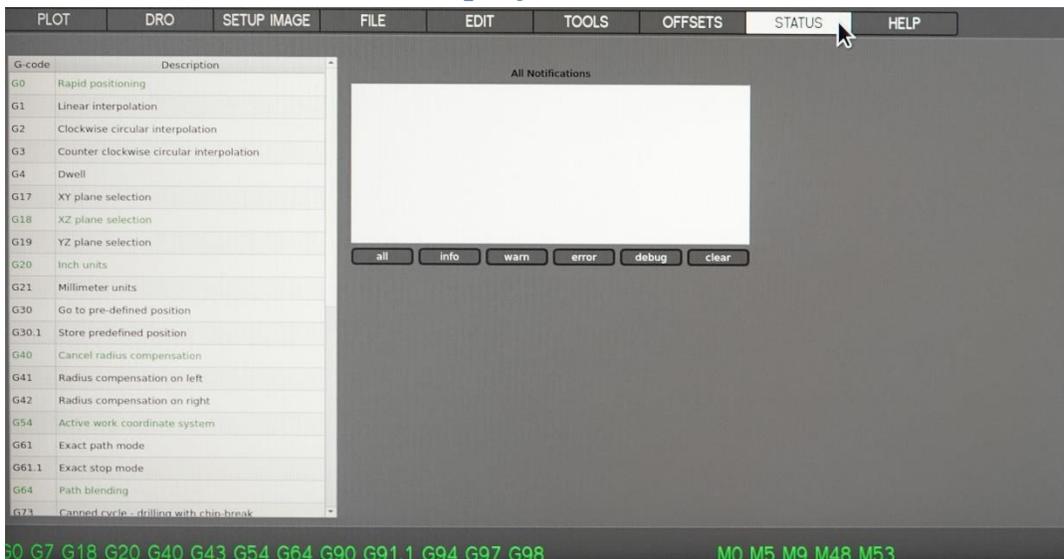


## OFFSETS Tab



The Offsets Table displays the current offsets for the active work coordinates (G54). The current G5X values are in the DRO tab for you to see at anytime. To alter a value in the table, mouse-click twice on the field that you'd like to edit. When you finish entering the desired new value, click Enter key on the keyboard to accept the value.

## STATUS Tab and Status Display

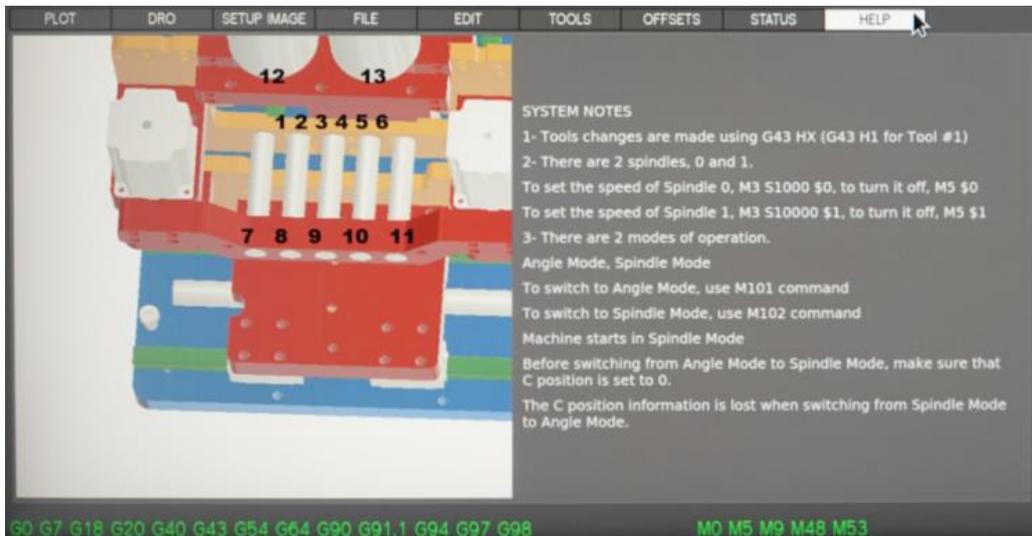


The Status tab displays the list of notifications on the right side window. There is a list of active g-codes in green color on the left side.

Status values can be seen on the control panel LED display.

- 000 – OK
- 111 – Spindle overload
- 222 – Stepper motor stall

### HELP Tab



The help tab displays the tool locations and numbers on the left side window. There are notes about the system and quick reminders on the right side.



### Loading the g-code to the APSX-NANO

Insert the USB stick where you have the g-code file onto the control panel's USB port. Go to the FILE tab on the user screen.

Click on the file on the left side (USB stick) and click on the COPY button to move it to the .ngc working folder.

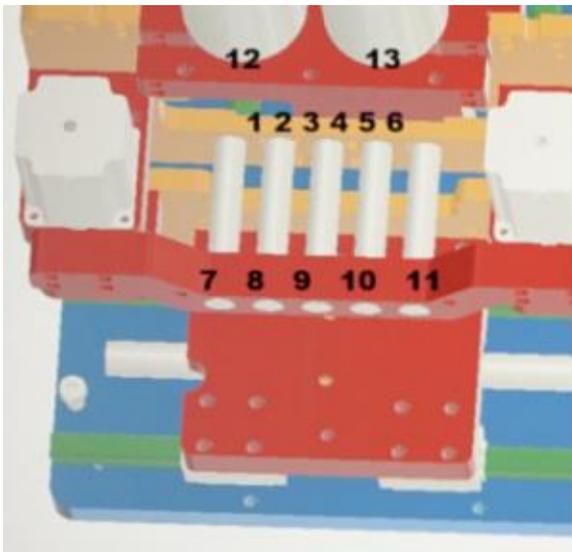
Click on the file in the working folder and double-click or click on the LOAD g-code button to open it in the g-code window.

If you need to edit the file, go to the EDIT tab, edit and then SAVE

You can look at the file in the PLOT tab to see how it looks in the perspective view

### Tool Numbers

There are thirteen tool numbers on the machine.



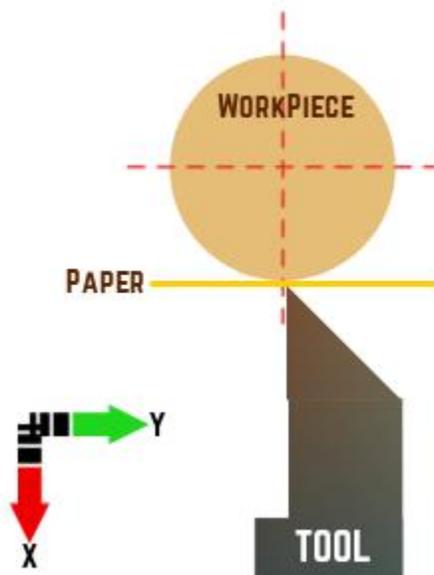
## Tool touch off

Ensure that the machine has power on and was homed all.

Use tool 1 (OD tool) to face the z surface of the workpiece first. The barstock workpiece should be flushed with the guide bushing before you start touching off using the pendant. That means it is not sticking out.

Click on the Select tool button once you type 1 on the select tool box. This will display TOOL 1 in YELLOW. In MDI box, type G0 X0.6 Y0 and hit Enter on your keyboard. This will move TOOL 1 just under the half inch barstock.

Move the workpiece towards the front of the machine (z-axis) via pendant. Place a paper (0.003" thick) between the workpiece and the tool. See the picture below.



Move the X slowly until paper cannot be removed, and back of a little. (Use the center small dial on the pendant if needed). To define the work coordinates (G54 work offsets), enter your own value (0.506" for 1/2" stock in G7 diameter mode) and click on the tool touch-off (TOX) button.

Repeat this process for the Y-axis. Use your own value (0.253" for 1/2" stock), then TOY. These don't have to be perfect, once you cut a part, you can measure and touch X again to fine tune it.



Z touch off: Use HomeZ button only for TOOL 1, and ToZ for the other tools. It is not as critical as other axes. Assuming that you always face off the part at the beginning of the program using TOOL 1. This way, other tools Z touch offs will always be based on Tool1 Z.

Live tools are similar in nature. For the ID tools, you can use a 1/4" precision shaft, and complete your X,Y touch offs. And install the actual tool, and do the Z.



ESC button on the keyboard is your friend. If a button does not seem to work as expected, hit ESC and try again.

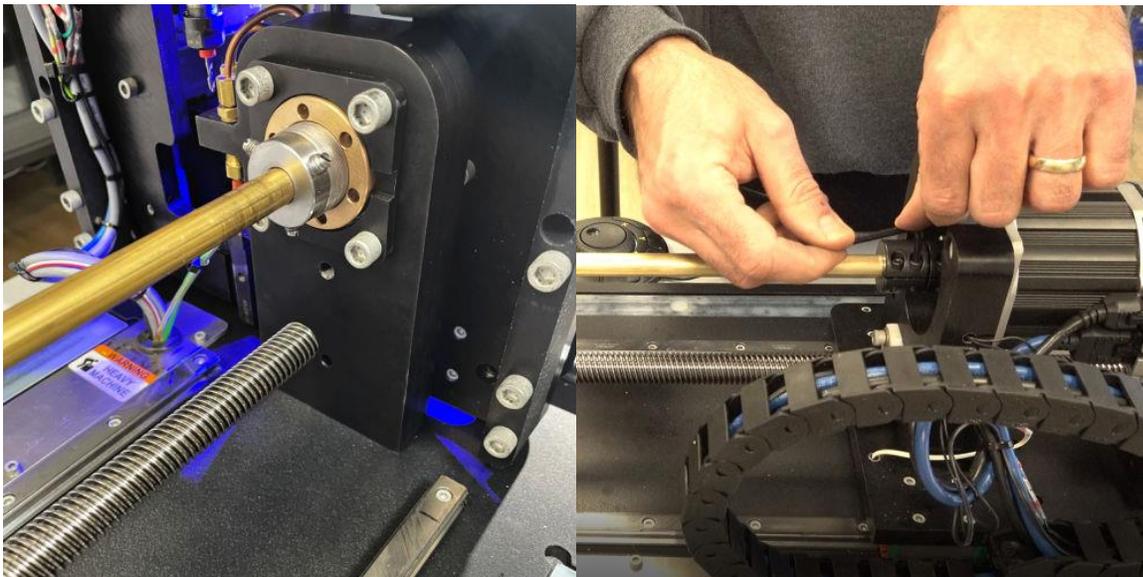
### Run the g-code program

Click on RUN CYCLE on the screen or hit the R button on the keyboard to start the program. Once the program is completed, it will stop and wait.



## Part Setup - Workholding

Loosen the setscrews on the guide bushing first. Slide the workpiece through the guide from the front side of the machine. You can also use the other side of the guide bushing when you load a shorter bar stock. APSX-NANO has the main spindle with a shaft coupling to mount the workpiece. Tighten the two setscrews on the coupling, then do only the snug fit on the three setscrews on the guide bushing. The bar stock should be able to slide through but also should be able to rotate the guide bushing.



## Changing Tooling



When you install a new tool, please follow the steps below.

Press Emergency-Stop before changing the tools.

Type G43 HX (G43 H1 for the tool 1) on the MDI screen or use the SELECT TOOL button to select the tool you want to replace.



Disengage Emergency-Stop: rotate to the right until it clicks back into its original position.

After changing tool, perform the touch off procedure.



**Troubleshooting**

If your problem is not covered here, or if you need more information, please contact us.

Problem	Possible Solutions
APSX NANO is unresponsive.	<ol style="list-style-type: none"> <li>1. Check that the machine is plugged in and that the power is on.</li> <li>2. Make sure that the NANO is not in the E-stop mode.</li> <li>3. Try rebooting the machine: unplug all the cords, wait about a minute, then plug it back in and restart.</li> </ol>
One of the axes on my NANO is not working	<ol style="list-style-type: none"> <li>1. Try rebooting the machine: unplug all the cords, wait about a minute, then plug it back in and restart.</li> <li>2. Check the electrical connections for that axis.</li> </ol>
Motors are noisy when the machine is running	<p>Particularly at low feed rates, the stepper motors can produce noise. Increasing the feed rate decreases the sound.</p>
I can't find/load my G-code file	<p>The file must be a g-code file that the APSX-NANO can read. Therefore, it will have an extension as .ngc.</p>



Electronic board wiring diagram:

