APSX
ADVANCED PRODUCTION SYSTEMS

APSX-CNC
SPYDER
USER MANUAL
v2.2

Made in USA

ADVANCED PRODUCTION SYSTEMS

APSX, LLC.

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.

This document contains information that is the exclusive property of APSX LLC. Except for any rights expressly granted by contract, no further publication or commercial use may be made of this document, in whole or in part, without the prior written permission of APSX LLC.

Notwithstanding the preceding, APSX LLC grants permission to its customers to reproduce this document for limited internal use only. APSX LLC has taken every precaution in preparing this Manual; nevertheless, APSX LLC assumes no responsibility for errors or omissions. We assume no liability for damages resulting from the use of the information contained in this publication.

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 or to refund, 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.

October 1, 2021

Accessories

- 1 Inch Z-Axis Extension Blocks Kit

- Aluminum frame enclosure

- Industrial stand

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.

Spare Parts

All spare parts for APSX-SPYDER can be ordered online at 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 faster response, please use email support@apsx.com

Customer Feedback

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

Join APSX SPYDER CNC 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/

Table of Contents

About

APSX SPYDER is a precise and rigid CNC milling machine that can cut metals, wood, and plastic. It fills the void in the market for CNC routers to cut specifically metals, not just wood. APSX SPYDER is a complete system that includes SPYDER CNC software, embedded PC, monitor, air-mist system, mounting hardware, keyboard, and pendant. There is nothing else you need to start milling parts. It uses just a standard wall outlet for the control box and monitor.

SPINDLE

Metal cutting requires specific cutting speed vs. spindle speed ratios for quality machining. Keeping the temperature as low as possible around the cutting environment, including the spindle, end mill, and workpiece, is critical for cutting metals. APSX SPYDER has an air pressure-chilled spindle with a wide RPM range, 2000-20000, and high torque at low speeds. It can keep the RPM constant and controlled using G-Code.

MIST

APSX SPYDER 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. At some point, aluminum will gum up the end mill and stop cutting effectively. This can sometimes damage the end mill, and it is challenging to remove molten plastic from it. Pressurized air mist also helps to remove the chips before any gumming occurs.

OVERLOAD PROTECTION

If an aggressive cutting strategy is used or there is insufficient airflow, the spindle may be forced above its abilities. APSX SPYDER can detect and stop motion before further damage is imposed on the workpiece and the end mill. It will also keep XYZ coordinates so you can continue machining without homing.

RIGIDITY

APSX SPYDER has steel shafts, hard-anodized aluminum blocks, precision lead screws, and strong stepper motors, making it a very rigid machine. Its rigidity is more comparable to vertical machines than CNC routers.

October 1, 2021

Carrying the Machine to Your Facility

For the safest transportation, the SPYDER'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 (300 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 and the rigidity of the bench or space where SPYDER will be used must be sufficiently robust, rigid, and smooth

Content of the crate:

- SPYDER CNC Machine
- The embedded computer inside the control panel - no laptop or PC is required
- Keyboard Monitor with wall mount kit
- Control pendant
- SPYDER CNC software (installed)
- 1/4" endmill and ER11 collet
- Setup jig
- Wall-mountable plastic container for the coolant liquid

If you ordered the optional 4th axis, the machine comes with the 4th axis installed.

There is also an optional enclosure that can be used with the Spyder CNC. It comes as a separate shipment.

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 within seven days
- The machine is mounted to the crate. Put the other items aside before you start unscrewing the machine mounting screws. Remove the keyboard, monitor and mounting kit, endmill and collet, setup jig, and coolant container.
- The control panel is bolted to the base of the machine. Spyder CNC machine is not a light machine. Therefore, have some help for lifting it onto a sturdy desktop or Spyder CNC stand.
- 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
- The control panel and the monitor come with mounting kits for wall mounting. You can also buy the Spyder Stand to place the monitor and the control panel.
- When mounting the control panel, 1/4"-20 screws (1/4" long) should be used on four VESA 200X200 mounting stand offs.

- Position the control board and monitor on the wall a safe distance from the machine. The control panel must also be mounted in a location so that the User may safely engage the Emergency-Stop switch while the machine is running.
- 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 wall. 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. Spyder CNC consumes 1.35ml/min at average or 6.5ml/min at max. Add 99% tap water and 1% 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.
- If you will be transporting your APSX SPYDER CNC, 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
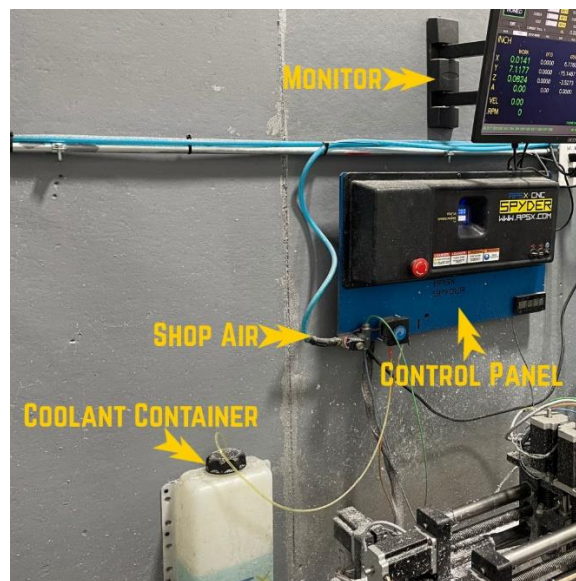
Things You Need Before Using the SPYDER

- For mist generation, air compressor and air hose with ½" female quick connect coupler (see the next page for compressor air requirements)
- A container for the water/alcohol mix (SPYDER consumes 1.35ml/min at average or 6.5ml/min at max). Add 99% tap water and 1% Koolmist Formula (or other type coolants) into the container. The container and the mist line with filter come with SPYDER.
- The Spyder software is already installed on the machine. No Laptop or PC is required.

Storing the Machine

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

Store the APSX SPYDER CNC 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 SPYDER CNC 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 CNC machine.

- Clean your machine: Brush first, then vacuum as much debris as possible.
- Inspect: Metal shafts should be clear of dirt and shavings. The collet should be clean with no debris on it. The spindle should be mounted tightly and should not move. It should spin freely when the machine is down.

- 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 end mill is not good for machining.

Weekly: For cutting metals, clean and lubricate all steel shafts and acme screws every 48 hrs of runtime. Apply grease lube on all shafts and acme screws. More frequent cleaning and lubrication of the shafts and acme screws may be required for cutting wood or 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

Enclosure cleaning

If you need to clean the enclosure polycarbonate panels, you can use water, soap, alcohol, and wipes. Do not use cleaning products with ammonia or scented products. They may damage the polycarbonate panels.

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.

Do not operate the CNC machine with damaged or dull end mills. Do not operate the machine with the table loaded with oversize material larger than the suggested milling envelope.

If using material larger than the work volume of the machine, ensure that the movements in the program will not cause a crash.

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

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 CNC milling machines present hazards from rotating cutting tools, moving parts, electricity, and noise. Therefore, when you use CNC 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 machining a workpiece, the noise level may be > 80 dB(A). So wear suitable hearing protection.
- 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 110V 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.
- 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 mill table and spindle head can move rapidly at any time and in any direction. Workpieces tend to vibrate during machining and must be clamped securely.
- [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 large parts may be ejected with force.

The APSX SPYDER CNC is **not designed for unattended operation**.

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

Hazard symbol decals are placed on APSX SPYDER CNC machines to help ensure that CNC machine 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

- 20" X 12" X 4" X, Y, Z travel
- Key dimensions: 30" (D) by 23" (W) machine base footprint, 16" (H) height
- Mounting holes are 2 inches apart ¼-20 threaded holes
- Required space for placing the machine is about 35" (D) by 27" (W)
- 2000 - 20000 RPM Pressured Air-Chilled 800W Spindle
- 120V standard wall outlet with proper grounding (8A peak)
- Steel shafts and hard-anodized aluminum construction
- PC, keyboard, monitor, and pendant are included
- Mist liquid container
- SPYDER CNC software is installed
- Overload Protection with Auto-Stop
- Up to 144 IPM [inch per minute]
- Repeat accuracy at no load (+/- 0.0002") and achievable machining accuracy (+/- 0.001") or better.
- Adjustable mist amount via the user interface
- 1/4" end mill is included
- Approximate weight: 150 lbs
- Optional stand and enclosure is available as an accessory
- 4th axis configuration is available

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. In addition, APSX LLC cannot predict operator accuracy. Therefore, the accuracy specified by APSX LLC is still an important reference point.

Material Tips

APSX Spyder CNC can mill a variety of materials. Here are some examples.

Aluminum, bronze, copper, brass, mild steel, ceramic, plastics and wood.

Metal milling

Aluminum is a great option for several applications. It is a very light material but durable enough. It is also corrosion resistant. There are different types of aluminum available to buy. The most common one is 6061 aluminum, and it is a great choice for milling. It can also be anodized to get an attractive look.

Brass and copper have zinc in them. They have a gold like color that looks great. There are different types of brass available to buy. The most common one is 360 brass, and it is a great choice for milling.

Bronze has mostly copper and tin in it. It is corrosion resistant and a good conductor. It is very good for bearing applications too. There are different types of bronze available to buy. The most common one is 954 brass, and it is a great choice for milling.

Mild steel can also be milled on SPyder CNC. Use the mist feature all the time and set your cut of depth is at a minimum.

- Use a 1/4in endmill to start milling
- Move to 1/8in then 1/16in then 1/32in end mills. If you need fine tune details, we suggest using ball end mills.
- Keep the mist feature on all the time during the operation

Plastics and other materials milling

Plastics such as polycarbonate and Delrin are a great choice for some parts. Although they are both hard materials, they are easy to machine.

Ceramics are very durable and good insulators. However, they are brittle and extremely prone to edge collapse in the milling process. Try to use smaller tools and avoid pointy edges.
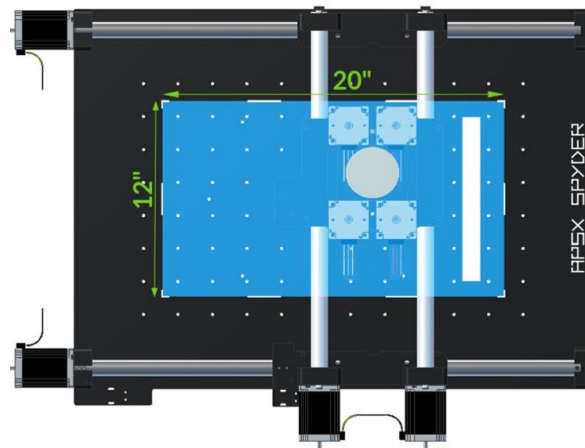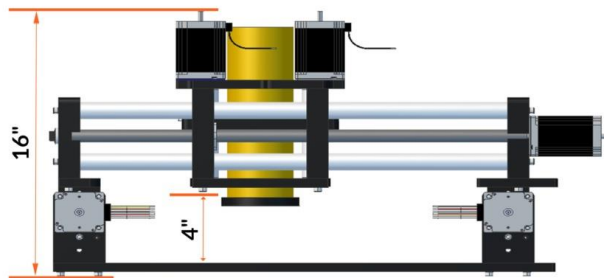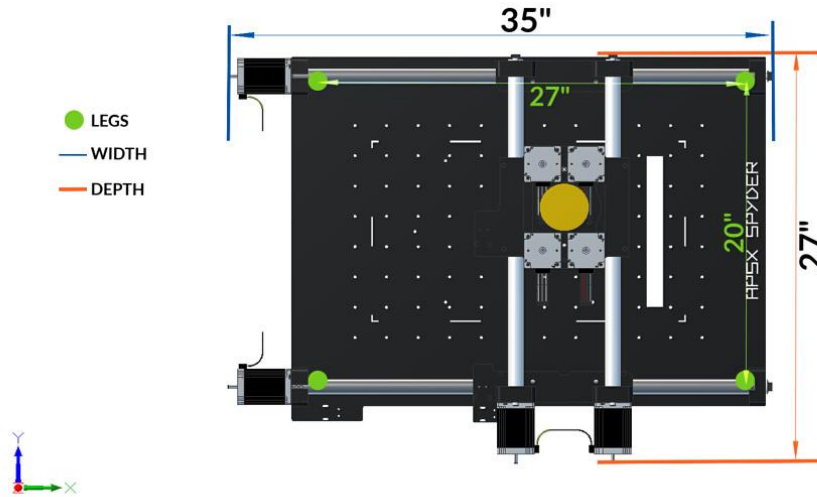
Hardwood milling is an enjoyable process. Consider some adjustments in your settings for different hardness levels and grain directions.

- Move to 1/8in then 1/16in then 1/32in end mills if you need fine tune details
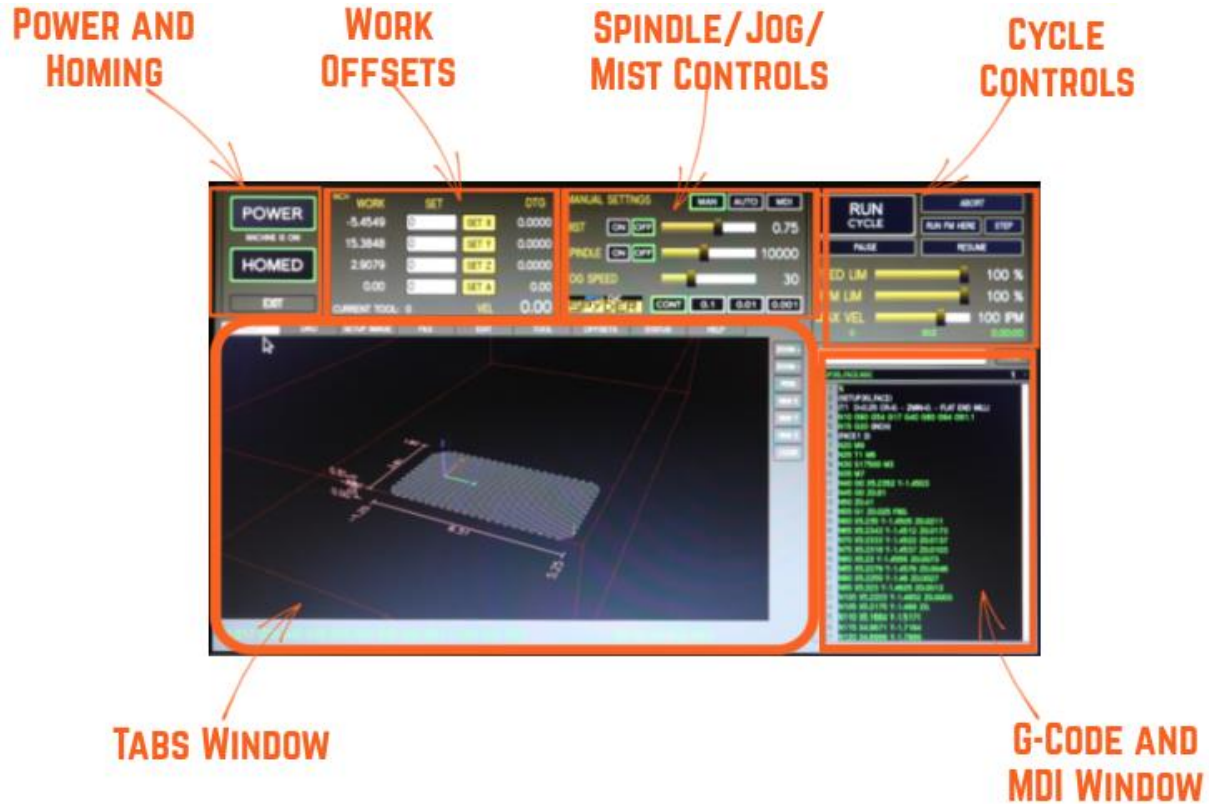- Keep the mist feature on all the time during the operation

Machine Dimensions and Cutting Envelope

User Interface

The software has a layout structure that makes CNC milling much easier.

POWER AND HOMING

WORK OFFSETS

SPINDLE/JOG/ MIST CONTROLS

CYCLE CONTROLS

TABS WINDOW

G-CODE AND MDI WINDOW

Powering the Machine and Homing

The APSX SPYDER can be plugged into a standard 110V 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. The circuit breaker must be rated at 15 amps minimum.

For non-U.S.A. customers, a step-down power converter (220V to 110V) may be used in Europe or other places. We suggest using a 3000W converter. There are many alternatives on the market, such as the Rockstone Power RSP-3000.

- First, power the CNC machine by plugging the power cord into the wall outlet.
- Next, plug in the monitor power cord.
- Power on the cordless keyboard (remove the plastic battery strip and flip the switch on the right side of the keyboard).
- Plugin the keyboard's USB to the control panel's USB port. Use the Keyboard touchpad to control the mouse arrow. The touchpad functions are identical to a standard PC mouse.
- Press PC Power on the bottom right of the control panel once.
- The machine will boot and automatically open SPYDER CNC software in about a minute.

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.

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** if you do not need to keep the homing coordinates.

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.
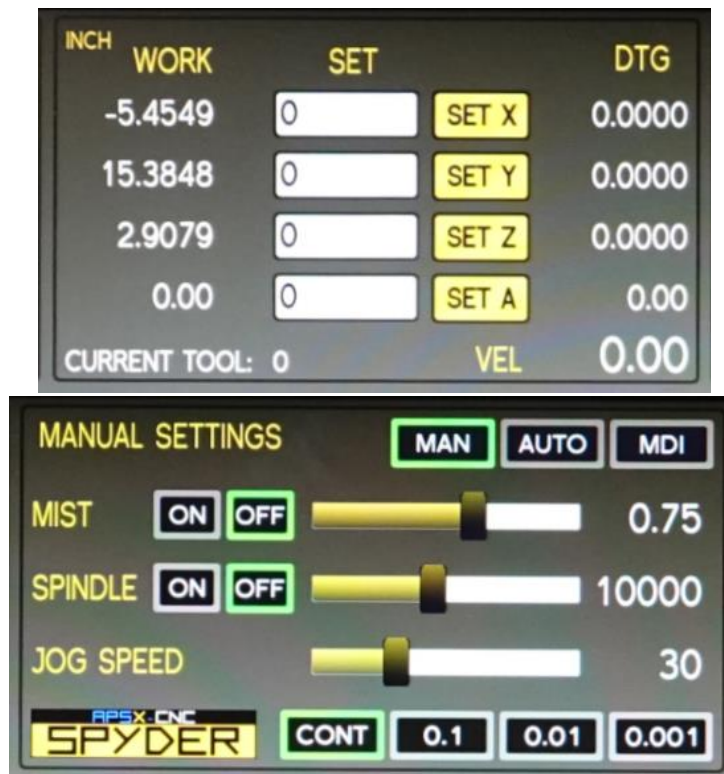
Mist Control

Click the MIST ON 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.

For cutting plastics, wood, 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 mist container in a safe location away from the machine when operating. The container has a sealed lid to keep the solution clean.

Spindle Control

Click the SPINDLE ON button to turn on the spindle in manual control. It is a similar move as to M04 and M05. Next, control the RPM by clicking/dragging the Spindle RPM tab. RPM range is between 2000 and 20000 RPM.

Note: APSX-SPYDER spindle only rotates clockwise

Jogging Control
Keyboard – Jogging Controls

Step Mode: Mill jogs in steps. Step size is controlled by the buttons available.

Continuous Mode: Mill jogs at a continuous speed when you press the keyboard.

[<] or [>] - Reduce or increase jog speed. You can also manually adjust the jog speed from the speed bar on the screen.

[R] - Run Cycle button - begin running G-Code file.

[P] - Pause button - pause G-Code file. After pausing, resume running with [S]-Resume button.

[Esc] – Abort button - exits G-Code file completely, shuts off the flood, and shuts off spindle (User cannot resume running).

[→]- Positive travel on X-Axis.

[←] - Negative travel on X-Axis.

[↑] - Positive travel on Y-Axis.

[↓] - Negative travel on Y-Axis.

[PgUp] -Positive travel on Z-Axis.

[PgDn] - Negative travel on Z-Axis.

Pendant – Jogging

The pendant allows precise control of the machine's travel speed. For example, manually touching off the end mill to your workpiece and zeroing the X, Y and Z-axis requires small adjustments at low speed. It increases efficiency on the 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. You need to use the button "A" for the 4th axis jogging.

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 PAUSE button first then click on STEP button each time. Go cancel this mode, click on 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. This will affect G01 (feed) codes not on G00 rapid moves. 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                                    FIND

SETUPJIG_FACE.NGC                        1  ▾

 1  %
 2  (SETUPJIG_FACE)
 3  (T1  D=0.25 CR=0. - ZMIN=0. - FLAT END MILL)
 4  N10 G90 G54 G17 G40 G80 G94 G91.1
 5  N15 G20 (INCH)
 6  (FACE1 2)
 7  N20 M9
 8  N25 T1 M6
 9  N30 S17500 M3
10  N35 M7
11  N40 G0 X5.2352 Y-1.4503
12  N45 G0 Z0.81
13  N50 Z0.41
14  N55 G1 Z0.025 F80.
15  N60 X5.235 Y-1.4505 Z0.0211
16  N65 X5.2343 Y-1.4512 Z0.0173
17  N70 X5.2333 Y-1.4522 Z0.0137
18  N75 X5.2318 Y-1.4537 Z0.0103
19  N80 X5.23 Y-1.4555 Z0.0073
20  N85 X5.2279 Y-1.4576 Z0.0048
21  N90 X5.2255 Y-1.46 Z0.0027
22  N95 X5.223 Y-1.4625 Z0.0012
23  N100 X5.2203 Y-1.4652 Z0.0003
24  N105 X5.2175 Y-1.468 Z0.
25  N110 X5.1684 Y-1.5171
26  N115 X4.9671 Y-1.7184
27  N120 X4.8966 Y-1.7889
```

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.

Find

You can search text in the g-code file for numbers, codes, or speeds etc. Click on the FIND button to open the popup window. Type the keyword to search and click on the find button there. If you select the check box, the findings will be highlighted.

TABS Review

The user interface has a TABS set that includes tables, buttons, and digital readouts (DROs) for specific purposes. These tabs are PLOT, DRO, SETUP IMAGE, FILE, EDIT, TOOL, OFFSETS, STATUS, and HELP.

PLOT Tab
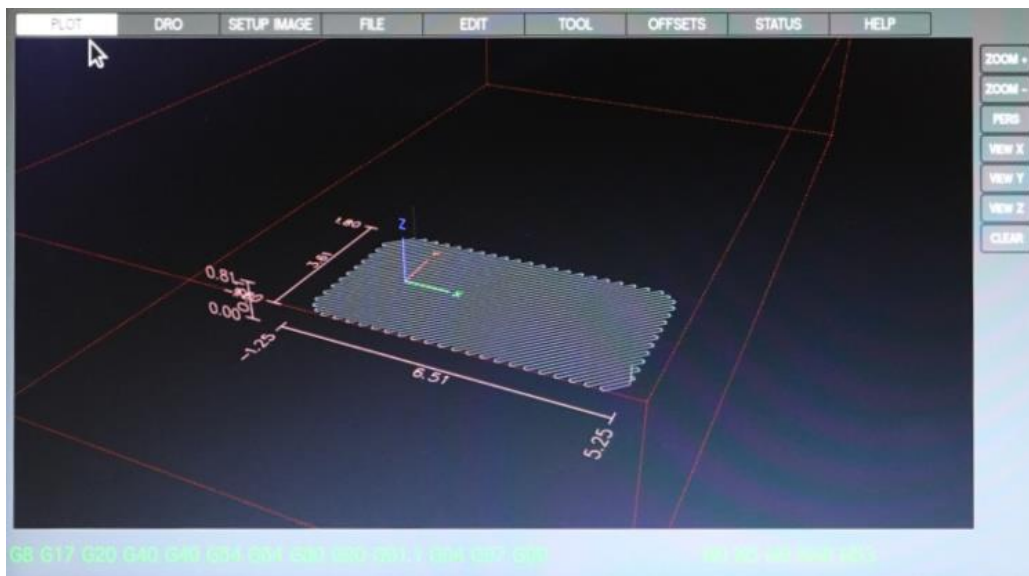
The PLOT tab displays a graphic representation of the work coordinates and the toolpath in the g-code loaded. The preview lines are in white, and the toolpath as it is milled is red in color. There are preview buttons on the side: ZOOM, PERSPECTIVE, VIEW X-Y-Z, and CLEAR.

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

October 1, 2021

- 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 if it is inch or mm. The work coordinates are in the first column. The active G coordinates are also on this tab. The current velocity and RPM values are on 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.
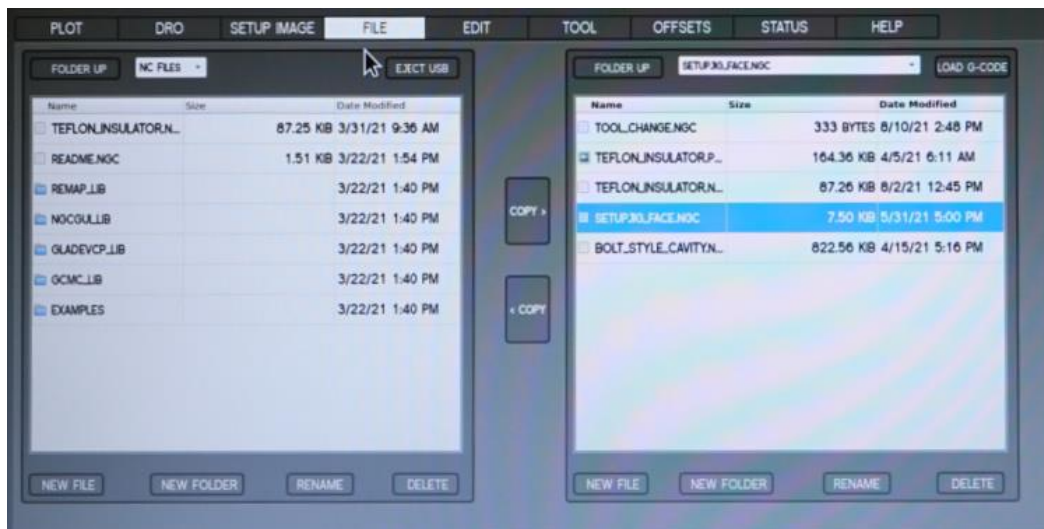
SETUP IMAGE Tab
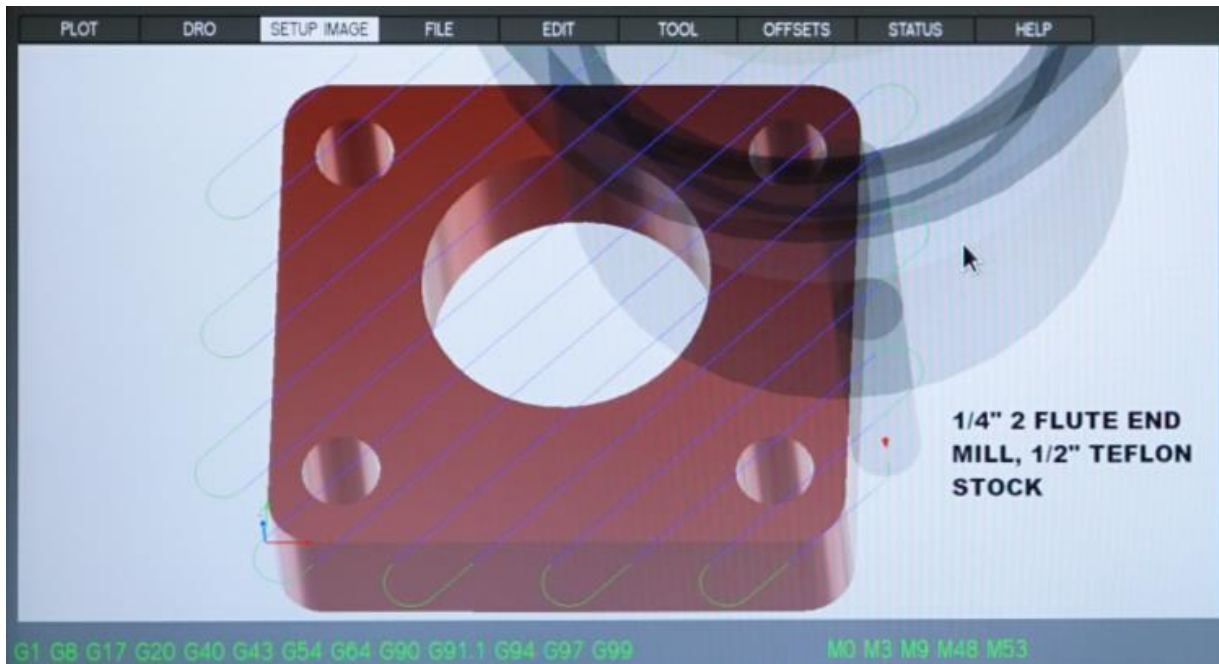
If you create and save a picture with the same file name as the g-code program, it will show it on this tab. The picture file name should have png extension (lower case) at the end. You can show the setup layout and add some critical notes to it. The idea is to make the setup process easier for you by 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
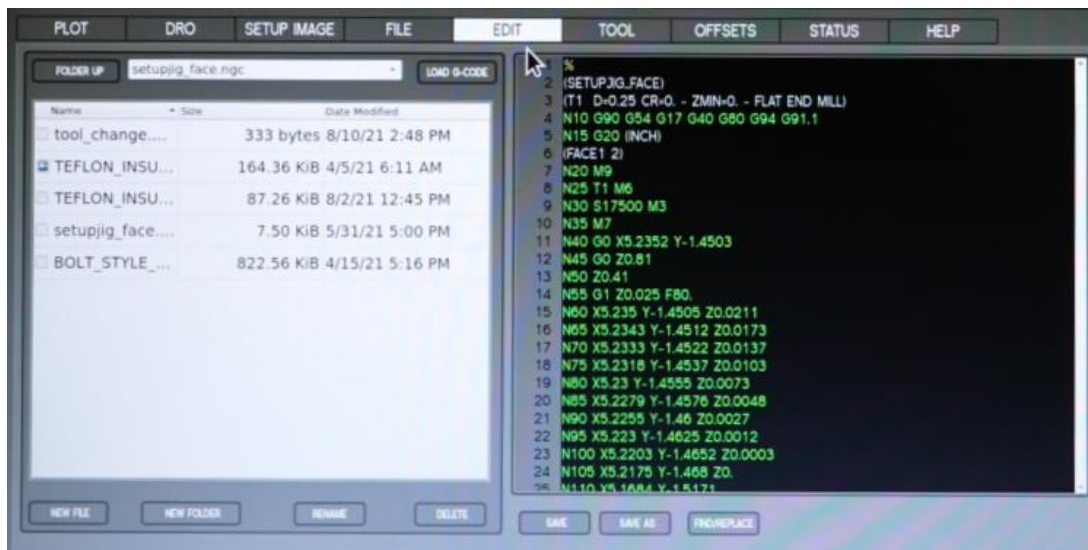
You can edit the loaded g-code file in this tab. Then, when you make a change and save it, the loaded file will also be updated instantly. Use the FIND button to find the specific code you need to change. Then SAVE the file. Or SAVE AS a different file name.

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

The Tool tab displays the tool table. Tool Z-axis offsets allow the operator to use tools of different lengths while still programming with respect to the workpiece. When using multiple tools, the tools are different lengths, the Z offset for each particular tool should be defined. You Can switch tools quickly, without the need to set up the mill every time a tool is mounted. Each tool and holder only needs to have the z-offset value. It was described how to touch off tools in the support center. The current tool's z-offset values are in the DRO tab (TLO) for you to see at anytime.

OFFSETS Tab
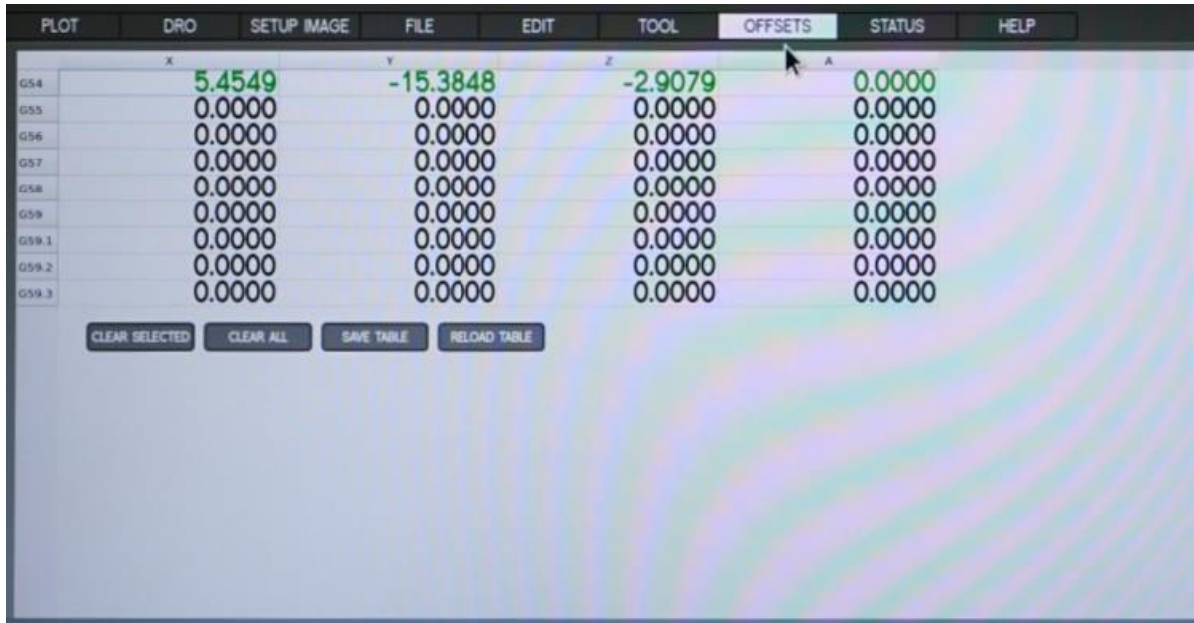
The Offsets Table displays the current offsets for the active work coordinates. If you have different workpieces, you can use the other G5X coordinates available. The current G5X values are in the DRO tab for you to see at anytime. To alter a value in the table, mouse-click twice on the field that you'd 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
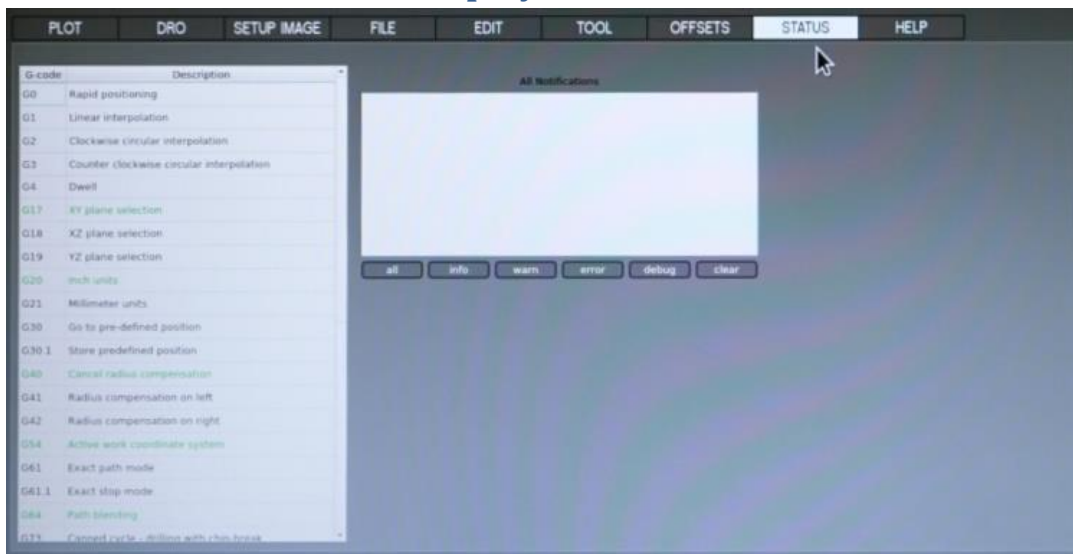
The Status tab displays the list of notifications on the right side window. On the left side, there is a list of active g-codes in green color.

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

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

Loading the g-code to the Spyder CNC

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 perspective view

Tool touch off

Mount the setup jig after tapping the mounting holes.

To define the work coordinates (G54 work offsets), enter ZERO or your own value and click on the SET X button by manually moving the tool to touch the workpiece from X direction. Repeat this process for the Y axis. It is better to use the pendant controller for the final movements during the touch off.

Z touch off: Use the pendant and a piece of paper until the tool releases the paper. Although the paper is about 0.006 inches thick, we use 0.010 inches for the Z offset value
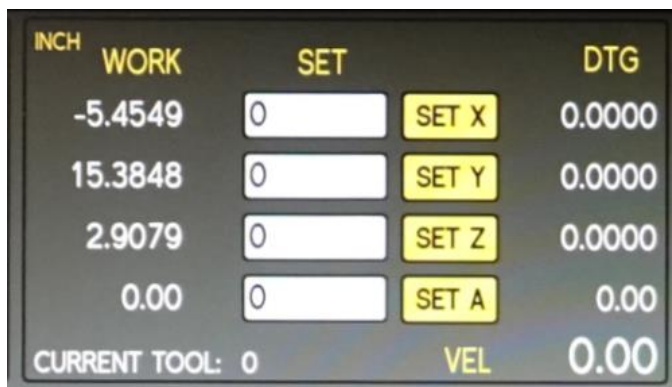
Run the g-code program

Click on RUN CYCLE on the screen or hit the R button on the keyboard to start the program.

It will go to "tool change position" first. If you already have the tool installed on it, it will move on.

Once the program is completed, it will stop and wait.

Part Setup - Workholding

Spyder CNC Machine comes with a base plate with 2 inches apart 1/4-20 threaded holes. You need to fixture your workpiece on it. We provide a setup jig to use under the workpiece that you will be milling. Your other options are to use a vise or double sided tape for light milling.

- Setup jig: You can make your own setup jig (spoil board) or use the setup jig we provide. You can cut through the setup jig. You can also go all the way around the workpiece without flipping it over.

- Precision vise: You can use a vise by mounting it to the hole pattern on the base. If you do not mill the same part repeatedly, it may make sense to use a vise.

- Double sided tape or vacuum table: If your workpiece is a type of sheet plate or if it is a very light milling, it may make sense to use a high-strength double-sided tape. First, clean the surface with alcohol. Next, align your workpiece and press firmly on the tape. You need to add the thickness of the tape for the z offset. Or a custom vacuum table can be an option. You need to customize a vacuum table or you need to make your own.

Changing Bits / Tooling

Spyder CNC Machine comes with ER11 collet with 1/4" diameter tooling. When you install a new tool, please follow the steps below.

Press Emergency-Stop before changing end mills.

Type T1 M6 on the MDI screen. The machine will bring the spindle to the front location of the machine for easy access. (13mm and 17mm wrenches to loosen and tighten end mill holder nut). Click to Continue when you are ready.

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

After changing bits, touch off the z-axis if continuing to run the same program file.

Accessories

4th Axis Kit

The 4th axis comes installed when you receive the machine. We do not sell the 4th axis kit separately.

Enclosure

Please follow the assembly instructions that come with the exclosure.

Stand

Please follow the assembly instructions that come with the stand.

Tower

Please follow the assembly instructions that come with the tower stand.

Troubleshooting

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

Problem	Possible Solutions
APSX SPYDER CNC is unresponsive.	1. Check that the machine is plugged in and that the power is on. 2. Make sure that the SPYDER is not in the E-stop mode. 3. Try rebooting the machine: unplug all the cords, wait about a minute, then plug it back in and restart.
One of the axes on my SPYDER is not working	1. Try rebooting the machine: unplug all the cords, wait about a minute, then plug it back in and restart. 2. Check the electrical connections for that axis.
Motors are noisy when the machine is running	Particularly at low feed rates, the stepper motors can produce noise. Increasing the feed rate decreases the sound.
I can't find/load my G-code file	The file must be a g-code file that the SPYDER is capable of reading. Therefore, it will have an extension as .ngc. .
It is not cutting in the location that I expected.	1. Make sure that the origin of your toolpath is the machine origin point of the SPYDER. 2. Check the coordinate system of your machining setup in CAM 3. Make sure that your stock is located in the same place on your machine as it was relative to the origin point in your CAM program.