AXIOM
PRECISION

AR8/16 ELITE
MANUAL

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Axiom Tool Group, Inc. has provided this manual covering the safe operation and maintenance procedures for the AutoRoute™ Elite series machines. Contained in the manual are installation instructions, safety precautions, operational procedures and maintenance guidelines.

The instructions set forth in this document, will ensure that the AutoRoute™ machine will provide consistent, long-term operation.

This manual was not intended to cover every facet of machine operation. The use of jigs, fixtures, after market CNC accessories, choice of materials and tooling may require additional research. Online forums, and CNC blogs are a good source of knowledge from experienced users.

Regardless of the methods in place, personal safety is always a priority.

If you have any questions or comments, please email the Axiom Precision Customer Service team at support@axiomtoolgroup.com.

Safety Information

The AutoRoute™ is an electrical appliance and precision machine. Protect yourself and your investment. Read and understand the entire owner's manual before attempting assembly or operation. Read and understand the warnings posted on the machine and in this manual. Failure to comply with all the warnings may cause serious personal injury or costly damage to your AutoRoute™.

This AutoRoute™ CNC machine is designed and intended for use by properly trained and experienced personnel only. If you are not familiar with the proper and safe operation of a CNC machine, do not use the AutoRoute™ until proper training and knowledge have been obtained.

Your AutoRoute™ machine is intended for cutting wood, acrylics, wood-fiber composites, certain plastics and non-ferrous metals. Do not use this machine for other than its intended use. If used for other purposes, Axiom disclaims any real or implied warranty and holds itself harmless from any injury that may result from that use.

Shop Environment
1. Ensure that the floor can bear the weight of the machine and work pieces mounted on it.
2. Keep the floor around the machine clean and free of scrap material, oil and grease.
3. Do not lean lumber or other heavy materials against the gantry, guide rails or table.
4. Support the weight of the dust hose attached to the dust shoe accessory to prevent the weight of the hose from dislodging the dust shoe. Ensure that there is sufficient slack in the dust collection hose to allow the spindle to cover the entire work area.
5. Locate the AutoRoute™ away from overhead pipes and plumbing fixtures to prevent condensation from dripping on to the spoil boards and control system components.
6. Locate the AutoRoute™ away from sinks, faucets or other water supplies or storage to prevent splash-out that can damage the spoil boards and control system components.
7. Provide adequate room between the AutoRoute™ and other machines in the shop to reduce the chance of accidental jarring when transporting lumber or other heavy materials through the shop and while materials are being worked on other machines.
8. Ensure adequate space between machines to allow for the possibility that the work piece will extend over the end of the AutoRoute™ table.
9. Store cutting tools in a dry location and prevent contact to preserve the cutting edges.

Health and Safety

10. Always wear approved personal health and safety equipment as indicated for the materials and type of operations that will be performed. These should include a dust mask, hearing protection, safety clothing, and safety glasses/face shield. Do not rely on prescription or over-the-counter eyeglasses; they are *not* safety glasses. Wear ear protectors (plugs or muffs) even during short periods of operation.

11. Before operating this machine; remove any hand, wrist, and neck jewelry and roll sleeves up past the elbows. Be sure to not wear loose clothing which may become caught in the machine and confine long hair.

    a. Non-slip footwear or anti-skid floor strips are recommended.

12. Use a dust mask or other safeguards to avoid inhaling dust generated from wood products. Install dust collection equipment consistent with shop ventilation practices and budget. Remove dust and debris from the floor frequently to prevent slipping. Drilling, sawing, sanding or machining wood products generates wood dust and other substances known to the State of California to cause cancer. Wood products also emit chemicals known to the State of California to cause birth defects or other reproductive harm. (California Health and Safety Code Section 56).

13. In addition to other health hazards, dust from wood and other materials is flammable. Do not operate welding, wood burning, smelting, soldering or other high-heat tools on the AutoRoute™ table or vicinity.

14. Do not operate this machine while tired or under the influence of drugs, alcohol or any medication.

Electrical

15. Make certain the switch is in the OFF position before connecting the machine to the power supply.

16. Make certain the machine is properly grounded and the circuit is protected with a fuse or circuit breaker in accordance with local codes. Install a separate circuit if necessary to limit power loss when multiple machines in your shop are operating simultaneously. If necessary, place a cover on the outlet to prevent accidental disconnection.

17. Perform all machine adjustments or maintenance with the machine unplugged from the power source.

18. Follow effective lockout procedures to reduce the risk from high voltage wires and components and prevent intentional bypassing of safety controls and accidental operation.

19. Don't use in a damp or wet location, or expose to rain, fog or snow.

20. Keep the electrical cord away from sharp edges, heat or moving parts, and do not store materials on top of it. Position the cord so it will not become a tripping hazard.

21. While the use of an extension cord is discouraged, it is recognized that the wiring layout of the shop may not allow the placement of the AutoRoute™ directly next to an outlet. If it is necessary to use an extension cord, make sure the extension cord is in good condition, heavy enough to carry the current requirements, and installed to prevent a tripping hazard. An undersized cord will cause a reduction in voltage resulting in loss of power and overheating which may result in fire or electrical shock.

Other Safeguards

22. Remove and store adjusting keys and wrenches before turning on the power. If necessary for visibility, apply safety markings to adjusting wrenches and keys.

23. Install safety guards consistent with general shop safety practices. Keep safety guards in place at all times when the machine is in use. If removed for maintenance purposes, use extreme caution and replace the guards immediately after completion of maintenance.

24. Check damaged parts immediately. Before further use of the machine, a guard or other part that is damaged should be carefully checked to determine that it will operate properly and perform its intended function.

25. Keep visitors a safe distance from the work area. Keep children away.

26. Control liquids in your shop to limit the possibility of spillage that can damage the AutoRoute™ which can cause damage or personal injury from electric shock or fire. Be careful with storage and use of cleaning fluids, finishes and solvents. Never use the table to apply or dry finishes.

Maintenance

27. Establish a weekly and monthly maintenance checklist and follow it diligently.
28. Routine maintenance should include periodic checks for alignment of moving parts, looseness or binding of moving parts, worn or bare wires, breakage of parts, skewed mounting and any other conditions that may affect its operation or cause injury. Analyze breakage or damage to determine the cause and take appropriate remedial action.
29. Do not operate the AutoRoute™ if a component of the control system is damaged. It should be properly repaired or replaced before use.
30. Follow instructions for lubricating and changing accessories.
31. Store maintenance tools and supplies nearby, consistent with shop maintenance practices and resources.

Operational Practice

32. Never leave the machine running unattended. Always be in close reach of the emergency stop button.
33. Turn the power off and do not leave the machine until it comes to a complete stop.
34. Avoid pinch points and entanglement hazards. Keep hands and clothing away from the ball screws, thrust bearings, gantry, guide rails and rotating cutting tool while in operation.
35. Use the right tool at the correct speed and feed rate. Do not force a tool or attachment to do a job for which it was not designed. The right tool will do the job better and more safely.
36. Do not touch a cutting tool immediately after use. It will be hot and may cause skin burns. Exercise caution when handling the collet and spindle nut if the cutting tool is hot. Keep a heavy glove or oven mitt on hand for the purpose.
37. Do not lay a hot cutting tool on its side. Create a rack for cooling off hot cutting tools.
38. Use recommended accessories; improper accessories may be hazardous.
39. Do not use dull, gummy, or damaged cutting tools. Keep bits and other cutting tools clean and sharp for best and safest performance.
40. Turn off the machine before cleaning. Use a vacuum, brush or compressed air to remove chips or debris. Do not use hands.
41. Do not climb or stand on the machine. Serious personal injury and costly damage could occur if the machine tips over or the gantry is dislodged.
42. Remove loose items and unnecessary work pieces from the table before starting the machine.
43. Plan tool paths to make multiple passes rather than to take off a large amount of material at one time. This will reduce mechanical stress and heat on cutting tools.
44. Always secure a work piece to the spoil board using clamps, vacuum, or double-sided tape. If the work piece is mounted in a jig, ensure that the fixture is securely held to the table. Never hold a work piece down by hand while operating.
45. Inspect the material of your work piece to detect any defects that may result in ejection of large pieces of scrap.
46. Make sure the work piece is free from nails, hardware, or other foreign objects.
47. After installing a cutting tool, make sure the collet is securely tightened. An unsecured cutting tool may fly loose from the collet and cause injury. Be sure that the adjusting wrenches have been removed and are secured before turning on the power.
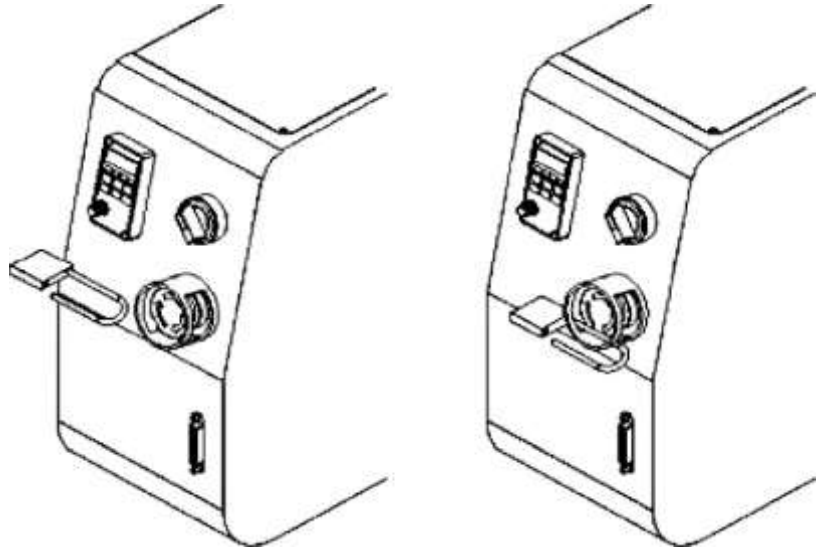
Emergency Switch

To avoid accidental or unintended use by young children or others not qualified to use the tool, a padlock may not be required.

The Elite series CNC machines, feature the use of several Emergency switches.

WARNING: FOR YOUR OWN SAFETY READ INSTRUCTION MANUAL BEFORE OPERATING TOOL:

To lock out using an Emergency switch on the **AR8 Elite**:

1. Open the padlock.
2. Insert through hole in the Emergency switch (need depress this button).
3. Close the padlock.
4. Place the KEY in a safe place out of the reach of children.

To lock out using the Emergency switch on the **AR16 Elite**.

1. Depress the Emergency Stop button.
2. Rotate the button counter-clockwise to remove.
3. Store button in safe location (machine remains inoperable until unlocked).
4. To unlock, reinsert button and rotate clockwise until the Emergency Stop is released.

Grounding Instructions:

This tool should be connected to a grounded metal permanent wiring system, or to a system having an equipment-grounding conductor.

Table of Contents

Specifications

AutoRoute:		8 Elite	16 Elite
X Axis Travel	24" (610mm)	•	
	48" (1210mm)		•
Y Axis Travel	48" (1220mm)	•	•
Z Axis Travel	8" (200mm)	•	•
Table Work Area	28.5" x 63" (724mm x 1600mm)	•	
	51"x 69" (1300mm x 1750mm)		•
Collet	ER-20	•	•
Collet Chuck	1/4" and 1/2" Included	•	•
High Speed Spindle	3 HP 2.2kW/7.5A Electro Spindle	•	•
Spindle Speed	0~24000 RPM	•	•
Rapid Feed Rate	320 IPM (8 M/min)	•	•
Precision Linear Guide Rails	X/Y/Z Axis	•	•
Precision Ball Screw	X/Y/Z Axis	•	•
Power Requirements	220V, 50~60 Hz, 15A Single Phase	•	•
Working Table	High Rigidity Interlocking Aluminum	•	•
	Integrated MDF Spoil Board	•	•
Gantry Bridge	High Rigidity Aluminum Extrusion	•	•
Gantry Support	Gravity Cast Aluminum Alloy	•	•
Gantry Clearance	8" (200mm)	•	•
Machine Base	Welded Structural Steel Frame	•	•
Machine Footprint	34.5" x 63 (875mm x 1600mm)	•	
	60" x 75" (1525mm x 1900mm)		•
Required Floor Space	38" x 82" (965mm x 2000mm)	•	
	70" x 120" (1775mm x 3000mm)		•
Max. Machine Height	62" (1575mm)	•	
	58" (1475mm)		•
Machine Weight	764lbs (347kg)	•	
	1420lbs (645kg)		•
Tool Touch Off Puck	Standard Accessory	•	•
Integrated Liquid Cooling System	Standard Accessory	•	•
Controller[1]	HUST Industrial 4-Axis Controller	•	•

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[1]• Supports the standard G code, PLT format instructions; supports domestic and international mainstream CAM software, such as: Type3, Art cam, UG, Pro / E, Master CAM, Cimatron, Wentai etc.
• Comes with USB communications port, file transfer efficiency can be directly read U disk, card reader file, Plug and Play.

Glossary

4th Axis – An accessory that enables the CNC to operate as a lathe.

Axis – Direction of movement. On a three-axis machine: X (left-right), Y (front-back) & Z (up-down).

Array Work – Division of the machine work surface into square or rectangular work spaces so that the toolpath can be ran in each space to produce several identical profiles.

Ball End (Ball Nose) – A cutting tool that has a rounded cutting arc, where the arc diameter is equal to the cutting diameter.

Ball-screw – Drive system component. The ball-screw is rotated by the stepper motor and provided the means for moving the gantry and spindle along the axes.

Bed – The Bed of the CNC consists of a welded steel frame and an extruded aluminum table top, tongue and groove table top with integrated T-slots.

CAD – Computer aided design using software to assist in designs

CAM – Computer aided manufacturing using software to define toolpaths and assist in manufacturing processes.

Chip Load – Chip load is the measure of the thickness of a chip a cutter will cut.

CNC – Computer numerical control

Climb Cut – Refers to the relationship of the cutting tool rotation to the direction of feed. A climb cut deflects the cutting away from the cut, with the direction of the feed.

Collet – A metal collar that holds the cutting tool within a spindle nut.

Conventional Cut – Refers to the relationship of the cutting tool rotation to the direction of feed. A conventional cut deflects the toward the cut, against the direction of the feed.

Compression Bit – A cutting tool with a combination of up and down shear cutting edges. Typically used for cutting laminate material to prevent tear-out on both sides of the sheet.

Deflection – Tool deflection occurs when the spindle speed and feed rate exert sufficient force to deflect the cutting tool. Deflection leads to excessive wear and chatter which can shorten tool life and will leave unwanted tooling marks on the material.

Down-Shear Bit – A cutting tool whose edges carve downward on the face of the toolpath. Reduces the potential for tear-out but requires a slower feed-rate.

Drag Knife – A cutting tool that holds a razor or knife blade used to cut and inscribe material. Used with spindle or router motors turned off, and freely spins as it follows the direction of the tool-path.

Dust Shoe – An accessory which aids in dust collection by limiting the spread of dust and debris by channeling the air flow through an attached dust collection system.

End-Mill – A cutting tool with a straight end, typically with a spiral flute(s). It creates a channel with a flat bottom perpendicular to the sides.

Feed and Speed – A combination of factors that must be set to control the work performed by the cutting tool.

Feed-rate – The speed at which the cutting tool moves along a work piece.

Flute Length – The length of the cutting portion on a router bit or cutting tool.

Flutes – The cutting edges or inserts of a router bit or cutting tool.

Finish Cut – A 3D tool-path the reduces or eliminates the irregular contours left by the rough cut.

Form Bit – A bit that carves a standard profile such as a round over, ogee or similar contours.

Gantry – The frame structure that straddles the bed and carries the spindle. It moves on guide rails along the length of the bed and is driven by the ball-screw system.

Gantry Bridge – The part of the gantry that lies between the upright towers. The upper bridge carries the spindle and cooling system. The lower bridge supports the weight of the gantry and affixes directly to the Y axis ball-screw.

Gantry Upright (Towers) – Parts of the gantry that extend upward, supporting the upper gantry bridge.

G-Code – A machine language that uses axis points and commands which the machine uses to move and perform functions.

Grid – The minimal movement units of the router. The router head automatically moves to the next grid position when the directional button is toggled in either continuous or step mode.

HHC – The handheld controller component of the control system.

Hold-down – A clamp or other such device used to firmly hold a workpiece or fixture to the table. Includes clamps, double-sided tape, vacuum pods and others.

Home Position – Mechanical point set using magnetic limits switches.

MCM – Machine Constant Parameters, allow manufacturer to define certain machine constants to match specifications of the equipment and machining requirements.

Origin – User designated zero point for the work piece. From which the router will reference the positioning of all cutting.

Plunge – The distance on the Z axis that the spindle and cutting tool moves toward, into, or along the material.

Plunge Rate – The speed of descent of the spindle on the Z axis.

Pocket Tool-path – A tool-path that creates a cavity in the horizontal surface of a work piece.

Positioning Dial – Small dial, found on the lower right portion of the controller which is used for fine movement of an axis using a present unit of measurement. Units are selected by using the Function F2 Key when on the Jog Screen and can be cycled between MPGx100(0.1mm), MPGx10(0.01mm) and MPGx1(0.001mm).

Post Processor – A software function that enables the CAD/CAM application to format G-Code enabling the control system of a CNC to follow the designated tool-paths.

Profile Tool-path – A tool paths that cuts along the profile of a set of vectors. Typically used to cut out the shape of a design.

Proximity Switch – A magnetic limit switch that is used to find the HOME position.

Rough Cut – A 3D toolpath where the initial cut is designed to remove unwanted material, leaving a rough contour.

Selection Dial – Small dial, found on the lower left portion of the controller which is used to select one of several sets of different operations.

Soft Limits – Limits on movement availability. Imposed by the work space boundaries and based on controller settings and the location of HOME. An "out of soft limits error" implies that based on the positioning of the workpiece, there is not enough room to move in a designated direction.

Speed Scale – Allows for the reduction of the feed-rate at the beginning of a tool-path to reduce the stress on a cutting tool as it first contacts the material.

Spindle Speed – Rotational speed of cutting tool (RPM).

Step Down – Distance in Z-axis that the cutting tool plunges into the material.

Step-over – The amount the cutting tool moves away from the previous cutting path as it routes the new path.

Surfacing – The process of leveling the surface of the spoil boards so that they are perpendicular to the spindle.

Tool-path – User defined route which the cutter follows to machine a workpiece.

Touch-Off Puck – A device used to set the zero point (Origin) for the Z axis.

Up-Shear Bit – A cutting tool whose edges carve upward along the face of the toolpath. Increases the potential for tear-out but allows for a slightly higher feed-rate.

Working Envelope – The three-dimensional area that the spindle can travel within while cutting or milling.

Setup and Assembly

Failure to read and understand all the assembly and setup instructions before attempting assembly may result in serious injury.

Packaging contents for the Axiom Precision Stand. (AR8 Elite Only)

2-Stand upright (front & back)
2-Cross braces
1-Lower shelf plate
1-Stand hardware package

    Hardware package contains:

        4-Swivel casters
        4-Leveling Feet
        4-hex nuts
        16-Hex bolts (M8x25)
        16-Lock washers (M8)
        16-Flat washer (M8)
        16-Hex bolts (M6x12)
        16-Lock washer (M6)
        16-Flat washer (M6)
        1-Controller hook
        2-Machine screws (M4x6)
        4-Small rubber pads
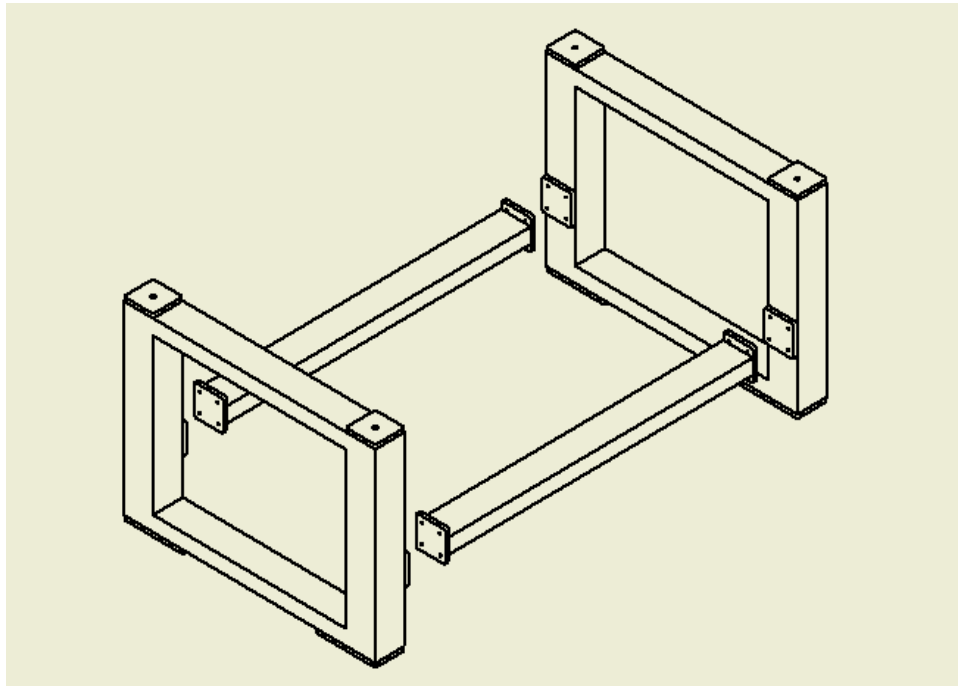
Remove all contents from shipping boxes. Do not discard carton or packing material until assembly is complete. Accessories commonly ship inside machine or stand packaging and can be easily over looked.

Tools required for assembly:

    #2 Philips-Screwdriver
    10mm, 13mm and 17mm sockets and socket wrench
    24mm open-end wrench
    2mm and 3mm Allen key
    Level

Packaging contents for Axiom Precision CNC machines:

1-Router table assembly
1-Electrical control box
1-Hust Industrial handheld controller
1-Controller cable
1-Tool touch-off puck
1-USB Storage device
2-Collet wrenches
1-1/4" ER-20 Collet
1-1/2" ER-20 Collet
4-Rubber bushings **(AR8 Model Only)**
4-Hex Bolts (M17x45) **(AR8 Model Only)**
4-Washers (M17) **(AR8 Model Only)**
4-6 Plastic Caps (Cover Stand Mounting Bolts)
1-2mm Allen Key

Assembling Stand (AR8 Elite Model Only):

Assembly for the AR8 Elite series machines is the same as Pro+/ Basic machines. The difference being that the stand and tool-box are included as part of the Elite machine.

1- Thread a (1) loose hex-nut onto each of the (4) leveling feet.
2- Turn the square stand uprights upside down. Do this on top of the cardboard packaging to prevent scratching.
   a. Install the (4) leveling feet and (4) swivel casters using (1) M6 hex bolt, (1) M6 lock washer, and (1) M6 flat washer for each caster. Tighten all the caster hardware securely. The leveling feet can be adjusted later.
   b. Rotate uprights so the cross-brace mounting plates are facing each other. Separate the uprights far enough that the braces can fit between them.
   c. Align the cross-braces between the uprights and bolt the mounting flanges to the plates using (4) M8 hex bolt, (4) lock washers and (4) flat washers for each side.

As seen in the diagram above, the braces should be rotated correctly for the tool-box and shelf to sit at the correct height. Braces should be mounted so that the top and bottom are the larger flat surfaces

6- With assistance, the stand can now be flipped over onto the casters and leveling feet.
7- Flip the Shelf upside down and stick (1) of the rubber pads on each corner of the shelf flange.
   a. Install shelf between the braces on the stand, all the way towards the rear.
   b. The small rubber pads should now be between the flange and the top surface of the brace. This will help prevent unwanted movement and scratching.

8- The tool-box will sit to the front of the stand, so be sure to orient the shelf towards the rear to serve as storage.
   a. Turn the tool-box upside down. Install (1) of each hanger on either side of the toolbox using the installed rivnuts and (2) 3mm cap-screw each.
   b. Insert the tool-box into the stand, from the top. The hangers will with snugly between the braces on either side of the tool-box.
   c. The front can be slid forward to rest within the opening on the stand upright.

Installing the router table on the Stand:

The CNC router table assembly is heavy. Please use a secure means and use caution when lifting onto the stand.

To avoid damage, be careful to never lift the router by the gantry.

1- If using a forklift, keep forks under the steel frame to avoid damaging the wiring and mechanics of the machine.
   a. Place a scrap piece of lumber beneath the router assembly and carefully slide forks beneath the steel base.
   Make sure the forks extend through to the other side of the machine for safe lifting.

2- Position router over the stand and align holes on router mounting flanges and stand uprights. Being careful to make sure the stand is properly oriented with the machine front.

3- Place (1) rubber bushing over the holes in the stand. Lower the machine to sit on the bushings.
   a. Attach the machine to the stand using (1) M10 Hex bolt, (1) washer at each corner.
   b. Insert the bolt/washer through the machine base/mounting flange and the rubber bushing.
   c. Thread the bolt loosely into the stand mounting holes. **Do not tighten until all bolts have been threaded.**
   d. Remove fork lift and tighten bolts evenly.

4- Place level on the router table, then level the assembled machine by adjusting the leveling feet. Be sure to level the machine in all directions.

Finishing machine assembly:

With the machine mounted on the stand, or safely on a secure work surface if a stand was not acquired, now it's time to begin finishing the setup.

1- Insert the control box into the front right cavity of the tool-box.
   a. Power and communication cables will run through the lower hole in the back of the tool-box.

2- Insert the cable connectors into their corresponding female receptacles and twist the collar to tighten. The receptacles are keyed, so the plugs will only insert one way.

3- Be sure to position the electrical cord through the back of the stand safely, so it will not be damaged by the castors or become a tripping hazard.

4- Attach the controller cable to the front of the control box. **Be careful to not overtighten the screws.**
   a. Connect the hand-held controller securely to the opposite cable end.
   b. When complete the controller can be hung from the Red Hook which ships with the machine.

Electrical Connections

All Electrical connections must be performed by a qualified electrical and follow any local codes and ordinances. Failure to comply may result in serious injury.

Electrical connections that are improperly installed or are outside operational specifications may cause machine damage and void any warranties that are in place.

This machine is rated for 220V +/-10% having an operational range of 200-240V. The machines come pre-wired with a **NEMA 6-20** plug for use on a circuit with a grounded outlet as pictured. It is recommended that these machines be connected to a dedicated 15-amp circuit.

If the machine must be reconnected for use with a different type of electric circuit, the connection must be done by qualified person(s) and must comply with all local codes and ordinances.

Grounding Instructions:

Axiom CNC machines must be grounded. This grounding provides a path of least resistance for electrical current, which during a malfunction will reduce the risk of electrical shock.

All Axiom machines are equipped with an electrical cord with grounding conductor and plug. The plug must be used with a matching outlet that is properly installed and grounded in accordance with local codes and ordinances.

These plugs must not be modified, if a matching outlet is need, one must be installed by a qualified electrician.

Improper installation may result in electrical shock.

If grounding instructions are not completely understood or if in doubt as to whether the machine is properly grounded, a qualified electrician should be consulted.

Extension Cords:

The use of extension cords should be discouraged. It is recommended to place the machines as near to the power source as possible.

If an extension cord is necessary, make sure any cord used is in good conditions. Worn or damaged cords should be replaced immediately.

When using an extension cord, be sure to use one that is heavy enough to carry the required current and use only 3-wire extension cords that feature the correct 3-prong grounding plugs and 3-pole receptacles.

An undersized cord will cause a drop-in line voltage resulting in loss of power, overheating and runs the risk of fire.

It is recommended that if an extension cord must be used, it be a 10-12 gauge grounded-three wire cord of no more than 8-10 feet.

Important Post Processor Info:

With the purchase of a new Axiom Precision Elite Model CNC, there will also be a new Post Processor that will need to be installed into the VCarve or Aspire software.

Customers should receive along with the tracking information for their order…a link to download this post processor and instructions from the website.

Be sure when saving tool-path files to use with either Elite Model machine, that the correct post processor is being selected.

If this file has been received, please contact the Technical Services Department of Axiom Tool Group with the contact information listed below:

Phone 844-642-4902

Email: support@axiomtoolgroup.com

Or simply download any of our available post processors by visiting: www.axiomprecision.com/post

Available Post Processors for the Axiom Elite AR8/AR16 machines:

Axiom_Elite_CNC => Normal 3-Axis operation of standard VCarve/Aspire tool-path files.

Axiom_Elite_4th => Required for 4th Axis machining.

Axiom_Elite_PVC => Required for PhotoVCarve. (Installed into PhotoVCarve only)

Axiom_Elite_Drag => Disables the spindle for Drag Knife/Diamond Bit operations.

Axiom_Elite_Laser =>Required for the Axiom Laser Engraving accessory

To load these Post Processor files: (VCarve or Aspire) *PhotoVCarve uses different instructions*

Open the software, click File and select to Open "Application Data Folder".

Click and drag, or copy (Crtl+C) and paste (Crtl+V) the files into the PostP folder.

Once you have moved the file …if the software is currently running you will need to close and restart it before it will appear in the Post Processor list when saving your toolpath/s.

Operations

Before getting started with the machine, it is recommended to become familiar with the handheld controller for operation of the machine, setting up a job and processing a file.

Controller:

Toolpaths, that are created in the design software are communicated to the CNC router through the handheld controller. On the Elite series machines, this is done through the HUST Industrial 4-Axis controller.

Processing tool-paths or jobs, is performed either by using a USB Flash drive (USB2.0 of 8GB or smaller) or from internal memory.

Internal memory is recommended for jobs of 1 hour run time or longer, and any files that will be used frequently.

The HUST 4-Axis Controller Key pad which is seen here, uses either;

Single Touch Buttons may perform one of many single tasks or if held down, will perform a task continuously (such as machine movement).

Function Keys (Top of keypad, just below the screen), which when selected will perform a few additional tasks. May allow for a selection process, which will allow settings to be made/adjusted.

Selection Dial, allows the selection of various sets of controller features.

Fine Motion Knob, allows small increment movement of individual axis in 3 different units. 0.1mm, 0.01mm and 0.001mm steps.

Operating Procedure:

Machine operations may be done several ways; either through the controller keypad or through the design files (tool-paths) which can be downloaded to the controller through the USB (Udisk) or ran from internal memory.

Before performing an operation:

1- Make sure machine stand leveling feet (if available) have been lowered to prevent the machine from moving.
2- Ensure that the workpiece is securely held to the table which can be done using any of the following:
   a. Clamps
   b. Fixtures
   c. Vacuum hold-downs (Optional Accessory)
   d. Double sided tape
3- Turn on the machine by rotating the green switch to the right. The controller display should light, displaying the loading screen.
   a. The emergency stop button may need released if it has been used.

   Once done loading, a HOME operation must be performed before any other function.

HOME Position:

When turning on the machine, once the controller has finished loading, the following message will be flash at the bottom of the screen:
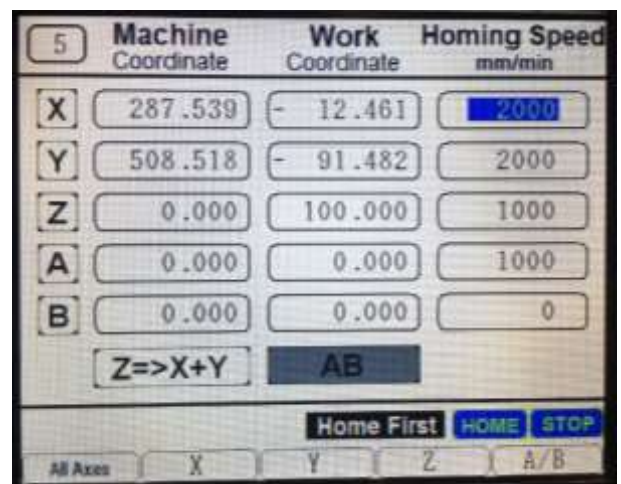

"Home First"

As seen in the picture to the right....

At this point, Selection dial should be used to switch to the HOME screen, if not already there.

Home position is determined by a set of magnetic proximity sensors, one of which can be found on either end of each axis.

These sensors can be calibrated, however, their position should not change.

During a HOME operation the following will occur:

1- First the Z axis will raise to the top of the axis travel.
2- Then the X & Y axes will travel, simultaneously, to the front left corner of the machine.
3- When complete the controller display will show 0.00 for all axis under the Machine Coordinate column.

Coordinate screen will also display the coordinate state the controller is currently using (Number 1-10 in the upper left corner of the screen) and the Work Coordinate or position of the router in relation to the programmed **Origin** (0,0 point).

It is important that a **HOME** operation is performed at every start-up to ensure that the limit switches and internal software settings are properly working. All machine movements are software driven and based upon the **HOME** position.

Performing a HOME Operation:

The HOME operation can be selected to run from the controller at any time.

This will require that the **Selection Dial** be turned to the **HOME** screen. The HOME screen (as seen previously) will display the current machine and work coordinates.

While any of the axes can be selected, it is recommended that the HOME operation is performed on all Axes at the same time.

1. Turn **Selection Dial** to the HOME screen.
2. Press the Function Key F1 (far left side) to select **All Axes.**
3. Press Start.

Other options would include the use of Function Keys F2-F5 to select individual Axes to HOME.

Use Caution when doing this, as the Z axis may contact fixtures, material and other obstacles if too low.

Other Features of the HOME Screen:

Home Speed-Lists the current speeds for the HOME operation. These can be adjusted by using the arrows to highlight the parameter for the desire axis, entering the new number and pressing ENTER.

When entering the new number, the information being entered will be temporarily displayed at the bottom of the screen just above the Function Key titles until the Enter key is pressed.

Machine Coordinates-These are the absolute positional values based on the HOME position. Where the coordinates for HOME are always (0,0).

Work Coordinates-Values that represent the current distance from center of the tooling to the current selected ORIGIN or (0,0) location.

Icon Status-When any of the axes or parameters are selected, the Icon for that axis or parameter will be highlighted Blue. On other screens some of the Function Keys will remain selected, while certain functions are being access. During these times the Function Key titles will be highlighted **Black**.

Moving Router (Spindle) head:

Once the dial has been rotated to the JOG position. Movement can be made either continuously or in more far smaller steps.

Continuous and **Step** movement, both use the internal controller parameter settings to aid in movement and accuracy.

Continuous movement will depend on the speed selected (Default: Low Speed) and will be accomplished using the Page Up/Down buttons.
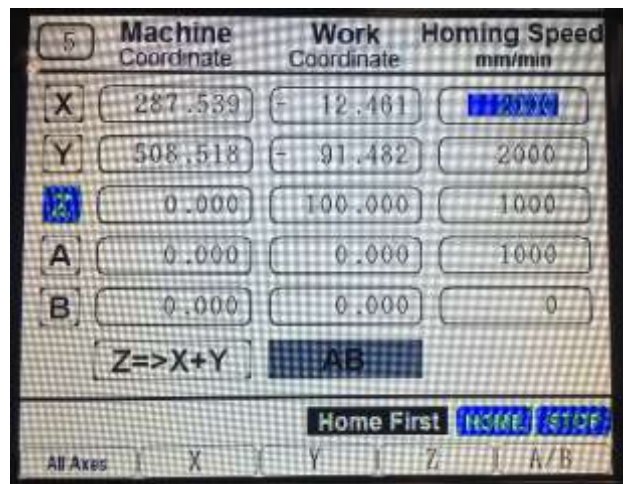
Slow speed- continuous speed that is set at 2000mm/min default.

Fast speed- continuous speed that is set at 6000mm/min default.

Step movement uses a predetermined set of units which can be selected while on the JOG screen. The Function F2 key will cycle between these units (MPGx100=0.1mm, MPGx10=0.01mm, MPGx1=0.001mm), which will allow the **Positioning Dial** to be used to make these fine incremental movements.

1- Continuous Movement: Set **Selection Dial** to JOG. Then select the axis to move by pressing the Function F1 key. The selected axis will be highlighted.
    a. Tap or Hold down the Page Up or Down buttons to move any axis, in the positive or negative direction until the button is released.
        i. Use the Shift Lock button to cycle between the
    b. The controller will display the location of the router in relation the current **Origin** (Work Coordinate) and the Machine Coordinate as it moves.
2- Step Movement: Set **Selection Dial** to JOG. Then select the axis to move by pressing the Function F1 key. The selected axis will be highlighted.
    a. Use the **Positioning Dial** to make micro adjustments to any axis, in the positive or negative direction.
        i. Function F2 Key can be used to cycle through the units for movement when using the dial. (MPGx100=0.1mm, MPGx10=0.01mm, MPGx1=0.001mm)
    b. The controller will display the location of the router in relation the current **Origin** (Work Coordinate) and the Machine Coordinate as it moves.

Setting Work Origin:

Creating an **Origin** will establish a zero point or reference point from which the machine will perform the cutting process set in the tool-path.

The **Origin** should match the zero point (datum) of the uploaded toolpath created in the design software.

An Origin for both the X & Y axes and the Z axis need to be set before beginning operation of a 3-Axis file. Failure to set both Origins may result in damage to the machine or the cutting tool.
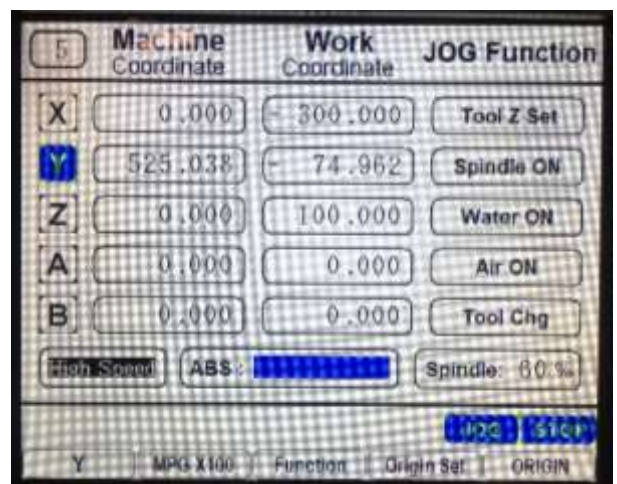
To set the **Origin**:

1- Make sure the tooling is properly secured within the collet. Use only ER-20 collets, of the correct size matching the shaft diameter of the selecting tooling.
    a. The machine ships with ¼" and ½" collets (standard sizes for imperial router bits).
2- Move the spindle or router to the desired location using the JOG features mentioned previously.
    a. Remember that the controller can be switched between Fast and Slow movement speeds, and the **Step** movements can be used to place the bit more accurately for the **Origin** placement.
    b. This location is typically one of the corners of the work material or the exact center point.
3- While on the JOG screen, Press the Function F4 key for **ORIGIN SET.**
    a. With the ORIGIN SET function highlighted, the X & Y axis may be activated (Highlighted Blue)
        i. If not, the Z axis will be.
        ii. Use the Down Arrow to cycle between the Z axis, or the X & Y axes.
    b. With the proper axes activated and the bit in the proper location, Press and Hold the ENTER button until "**Setting Done**" is flashed one the screen.
    c. The will instantly change the displayed Work Coordinate of the selected axes to 0.00

4- There are several ways to set the **Z-0** or **Z-axis Origin**, which may change depending on the material or router bit that is being used.

   a. Using the provided tool touch-off device. (Plugs in behind the spindle on the **HOME** side of the Z axis cover.).

      i. Place the device on top of the material, centered under the cutting tool.
      It is recommended to use the top of the material, however be sure to select this in the design software when setting up the material parameters.
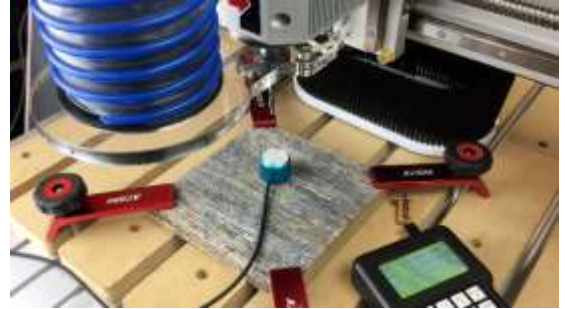
      ii. With material that is not uniform in thickness, the top of the spoil board may be used for the tool touch-off device placement.
      Again, be sure that the selection in the software matches the chosen location of the device.

   b. Once the device is in place and centered under the bit, while on the JOG screen press the Function F3 button labeled "**Function**", this will give you access to the functions listed at the right side of the screen.

      i. Use the arrows keys to scroll down and highlight the Tool Z Set and press Start. If done correctly, the router head will slowly lower until the bit contacts the device and then return to a raised position. The **Z-axis Origin** is now programmed.
      ii. It may be noted that a delay may occur during touch off. The bit may make contact, raise just slightly and slowly lower again to calibrate. This is a normal occurrence and may happen randomly.

   c. More fragile bits may require that the **Z-Axis Origin** be set manually without the use of the touch-off device to prevent the tooling from breaking. To set the **Z-0** point manually:

      i. Lower the bit using the JOG controls until somewhat close to the material.
      ii. Then use **Step** movement with the **Positional Dial** to slowly lower the router head while rotating the tooling by hand until resistance is felt as the bit contacts the workpiece.
      iii. For more precise placement, use a thin piece of paper. Slide the paper back and forth on the material until drag is felt as the tooling presses against the paper and material.
      iv. Once lowered to the desired location, press the Function F4 key to activate the **ORIGIN SET** feature. Then use the down arrow to make sure that the Z axis is highlighted. Press and hold the **ENTER** button until setting done flashes on screen.
      v. Deselect the **ORIGIN** Set feature by pressing the Function F4 button again to deactivate.

⚠CAUTION **It is recommended that the Z-axis Origin be set relative to the top of the work material to reduce risk of cutting into the work table.**

Once the Origin is completely set, the coordinate screen will reflect this information by showing both the X and Y axes zeroed. The Z-axis will have raised to the programmed safe height after touching the puck and will reflect that distance.

Remember that the Z-0 location is the surface of either the material or the spoil board, in which the controller should only read zero along the Z axis when the bit is touching that surface.

NOTE: When the machine is restarted, a HOME operation must be done to reset that reference point. However, the last programmed Origin (which is in reference to HOME) is still stored in memory.

Programming Additional Origins:

The HUST 4 Axis Industrial controller allows multiple offsets (**Origins**) to be programmed.

Where the number found in the top left corner of the screen identifies the coordinate state the controller is in. Each coordinate state will have a unique programmed **Origin** for all axes.

To switch between coordinate states, use the **Selection Dial** to switch to the Auto screen. The left & right arrow keys will cycle through the available coordinate states (1-10). The coordinate screen will change and show that set of coordinates.

This feature is useful when creating fixtures or when separating the machine surface into quadrants for specific tasks.

All Origins are in reference to the same HOME and can be alternated as needed.

For example: If using a 48" work area, to perform jobs that are less than 24" in size. The surface can be set up as two 24" areas. Using the same HOME.

In the coordinate state #1, the **Origin** would be set for the first piece of material.

In the coordinate state #2, the **Origin** would be set for the second piece of material.

The materials can be loaded onto the machine, preferably using a fixture for ease of referencing. The first job can be performed from the #1 state. Then the controller can be switched to the #2 state, and the second piece of material can be machined.
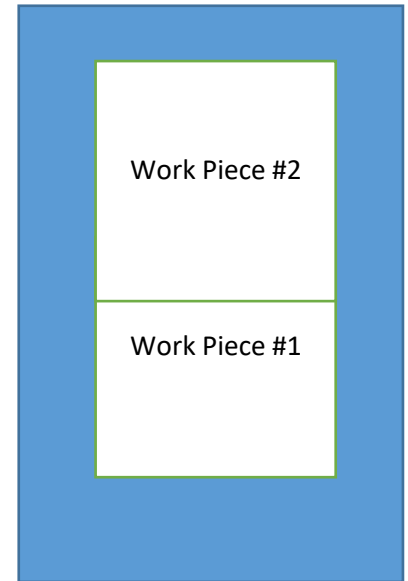
Returning to Programmed Origins:

The controller can be used to switch from one programmed **Origin**, or coordinate state to the next very easily.

As mentioned above, the current coordinate state is indicated by the number seen in the upper left corner of the controller screen. While on the **Jog** screen, the number of any other coordinate state can be used to move both switch the machine to that state and simultaneously return to that position.

To do this (beginning on the Jog screen)

1- Take note of the current coordinate state (**Origin**) being used.
   a. Example coordinate state #1
2- If wishing to move to coordinate state #2
   a. Simply hold down the #2 button for 2 secs

Controller will automatically switch coordinate states and begin the move to the programmed #2 location.

Cannot be used to move to the Origin of the currently selected coordinate state

To return to the **Origin** of the current state, first initiate a move to another location as indicated above. Then use the RESET button to stop the move. Then use the correct number to move back to the desired (original) **Origin**.

Example: In state #1...initiate a move to #2. Press RESET to cancel move. Then initiate move to location #1.

Setting Spindle RPM:

The Elite Model machines are equipped with a internal VFD invertor for spindle RPM control.

To adjust the RPM, simply turn the **Selection Dial** to the Auto screen. RPM will be listed here as a percentage.

Maximum of 100% = 24,000 RPM, with adjustments possible in 5% increments which can be adjusted at **any time**. Included during a machine operation. Allowing RPM to be dialed in dynamically as needed.

Adjustment to RPM must be done when on the Auto Screen. Press Pg. Up/Down to change the RPM percentage in 5% increments.

Processing a File:

Once the **Origin** is placed (all axes) and the RPM is set, the file can be selected, and machining can begin.

To ease the use of a USB flash drive , once files are saved always select to Eject the drive to safely remove it from the computer. This will help ensure that the controller will recognize the U-disk when it is inserted.

To begin (Auto Screen):

3- Press the Function F3 (USB) button.
4- On the list screen, use the Up/Down arrows to scroll until the desired file is highlighted.
5- The files in this directory can be copied and saved to the internal memory.
   a. Arrow down to the file.
   b. Firmly press the Copy button (Function F3)
   c. Press the Reset button to go back one screen.
   d. From the previous screen, press the Function F4 button (SD)
   e. On the SD (Internal Memory) screen, firmly press the Paste button (Function F4).
6- To operate a file without copying it to internal memory.
   a. Arrow down to the file.
   b. Press the Run USB button (Function F5).
   c. The gantry should move to the ready position (Front left corner, at a safe height) and wait.
7- Press **Left Arrow** key to approve the settings and begin the tool-path operation.
   a. After a short count-down during which the spindle will come up to speed as it moves to the starting point, the file will begin.

   During file operation, tool-path information including; current g-code line (source number), operating time, feed-rate and RPM percentage will be displayed on the Auto screen.

Copying files to Internal Memory:

As indicated above, files originally saved to the USB (Flash Drive) can also be transferred to the Internal Memory (SD) for ease of access using a simple Copy/Paste operation.

To save files from the USB to the Internal Memory (SD)of the controller:

1- Start on the Auto Screen.
2- Press the Function F3 (USB) button.
3- On the list screen, use the Up/Down arrows to scroll until the desired file is highlighted.
4- The files in this directory can be copied and saved to the internal memory.
   a. Arrow down to the file.
   b. Firmly press the Copy button (Function F3)

c. Press the Reset button to go back one screen.
d. From the previous screen, press the Function F4 button (SD)
e. On the SD (Internal Memory) screen, firmly press the Paste button (Function F4).

Deleting Internally Saved Files:

Those same files can easily be deleted from the Internal memory storage.

To delete any file saved to Internal Memory (SD):

1- Start on the Auto Screen.
2- Press the Function F3 (USB) button.
3- On the list screen, use the Up/Down arrows to scroll until the desired file is highlighted.
4- The files in this directory can be copied and saved to the internal memory.
    a. Arrow down to the file.
    b. Hold the #5 key for 3 seconds.
    c. File will automatically be deleted and disappear.

Speed Scale Adjustment:

The speed scale (percentage of the feed-rate programmed within the software) is displayed on the Auto screen and can be adjusted before and during a tool-path operation. To adjust the feed-rate:

1- <u>Selection dial must be set to Auto</u> - While on the Auto screen the feed-rate is displayed as a percentage of the max feed-rate setup for the bit in the tool-path. With the maximum being 100% of the programmed value.
    a. Use the Up & Down arrow keys to adjust the feed-rate in 5% increments. Cannot exceed (100%) of the feed-rate programmed in the software.

Pausing During Tool-path Operation:

A file that is in operation, otherwise known as a job, can be paused. While **Paused**, no changes can be enacted. This function should only be used for very brief pauses to adjust the workpiece or fixtures.

To Pause a job:

1- Press the **Pause** button while on the Auto screen during operation.
    a. The machine movement will immediately stop.
    b. **Spindle remains active**.

Stopping a Tool-path Operation:

A file that is in operation, otherwise known as a job, can be stopped. However, the stop command will only trigger when a new M1 command (used to trigger a temporary stop) appears within the Gcode.

To Stop a job:

1- Press the **Stop** button while on the Auto screen during operation.
    a. The machine movement will stop when the next M1 command appears.
2- Press the Start button to resume.

Part Work:

Like the **Pause** function, a Breakpoint or Stop can also be used. However, with the HUST controller there are no defined Breakpoints. Instead users can take note of the line of gcode in operation and resume from that point.

While on the Auto screen, there is a display box to the right of the Work Coordinates.

In this area, the current line of gcode in operation will be shown.

Using this information, a file can be restarted from that line…

Or… any other line.

This is described as **Part Work**.

To use the part work feature: (First make note of the line stopped at)

1- From the Auto Screen
   a. Make sure the job Origin is all setup correctly
2- Use the Function F5 Key labelled "Function"
   a. The Mill Plane screen will be displayed (feature not currently used)
3- Again, Use the Function F5 Key, this time labeled Part Work
   a. Displayed on the Part Work screen will be:
      i. Steps Before Interruption
      ii. Assign Start Steps
   b. Enter the gcode line number to begin from
      i. This number will be displayed on the lower left of the screen
      ii. Press ENT (enter) to load that number into the Assign Start Steps field
   c. Then use the USB or SD Function keys to select the source for the file
      i. Select the file to run using the normal steps for file operation from that point.
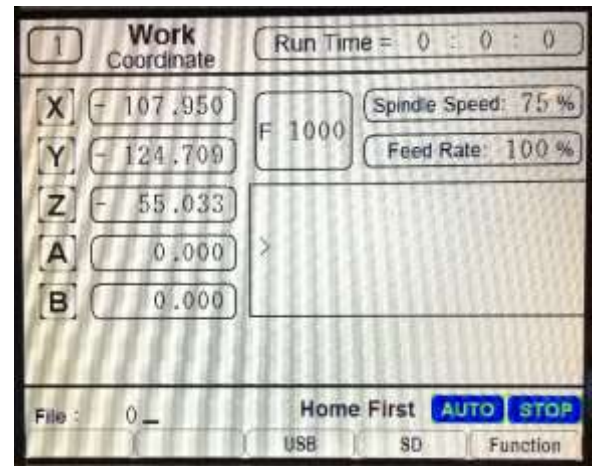
User Defined Settings

In addition to the normal operation of the controller. There are a set of user defined parameters that can be adjusted offering ease of use and customization for the many different applications for which the Elite machines may be used.

To find these User Defined Parameters, turned the Selection Dial to Other…. On this screen, the display shows the current Work Coordinate position, Spindle and Feed-Rate settings.

At the bottom of the screen, the Function keys give access to the following features:

- Gcode Edit
- Gcode Select
- I/O (Input/Output)
- System
- User

Gcode Edit:

While on the "Other" the Function F1 Key which is labeled Gcode Edit will access a portion of the controller that allows individual lines of the gcode to be entered, edited or removed.

There is little need for this in most applications as the current software allows easy editing of a design as well as a visual representation for the design on screen.

The program available for editing here will either be the current program loaded (last program setup to run) or the user written program that is selected by using the Gcode Select feature discussed below.

Gcode Select:

This feature can be accessed via the Function F2 Key labeled Gcode Select from the same "Other" screen.

The Gcode Select feature offers memory locations where numerically labeled gcode programs can be entered. Users can scroll down the displayed lines, enter a numerical name for a program, delete programs and select.

I/O:

The Input & Output feature scan be accessed from the "Other" using the Function F3 Key.

This feature displays the status of active Inputs and Outputs for the machine.

System:

This password protected portion of the controlled is used to program and edit features of the machine operational code. It remains password protected to prevent accidental mishaps that can damage the machine or otherwise render it inoperable.

In the event that any of the parameters need to be changed within the controller, due to the addition of future accessories… step by step directions will be provided to ensure that these settings are changed correctly without interference to the rest of the machines operation.

User:

The most useful set of parameters on the machine, can be accessed from the "Other" screen using the Function F5 Key labeled User.

These settings effect machine operations such as:

- Home Order
- Touch-off Device Thickness (Tool Mold)
- Controller Language
- Tool Change Position
- Safe Z Locations
- Spindle Settings
- Machine Shuttle Speeds

The **HOME Order** is by default set to Z->X + Y.

With this setting, the Z-axis will raise to its limit first, ensuring it is completely clear of any fixtures, or material before the X & Y axis move simultaneously.

The A/B axes are also listed here. If adding the 4th Axis kit in the future, setup direction will include changing this setting to allow for the A-axis to be added to the HOME operation. During which it will HOME at the same time as the Z axis.

The **Tool Mold** setting, effects the offset parameters for use with the Touch-off Device. When setting the Z-0 location using the included device (commonly referred to as 'Puck') …the machine compensates for the above programmed thickness.

If a custom puck is used, or a replacement is created then accurate measurements should be taken and entered here.

The **Controller Language** can also be changed between its native Chinese and English, as well as the units of measurement.

As a side note concerning the controller units, the programming is setup in metric… therefore the controller and post processor also both in metric. If the controller units are changed to inches, the machine will not operate correctly

The **Tool Change Position** will affect where the machine moves to before a file begins to run. Under the default setup, when a file is selected to run (from either the USB or SD) …the machine moves to the HOME position at the front left corner of the machine and awaits the continue command (Left Arrow press).

This gives the operator time to clear the table of obstacles, or to simply attach the dust shoe accessory.

Going back to the Universal uses of this controller, this location can also be used by some applications as a point to install a tool that would have a predefined length. In which case the user setup Z-0 point would not be used.

For Axiom machines, this is simply used as a starting location and it can be programmed to any point using the machine coordinates.

The **Height of Safe Z** will control a couple of features…first and most obvious it will affect how high the Z axis raises before moving to a new location. **Safe Z** parameters are in reference to the Machine Coordinates, which are 0.00 for all axes at the HOME position… therefore all **Safe Z** settings will be negative as they are below the Z0.00 location.
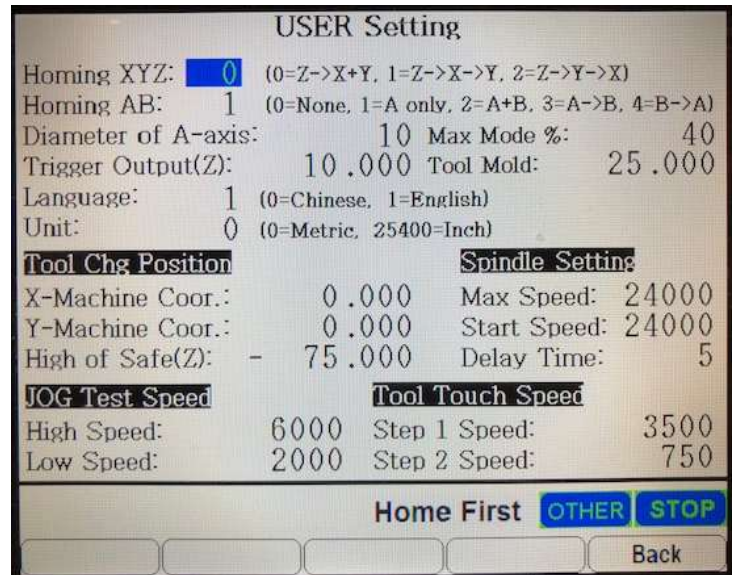
Height of Safe Z (Additional Features) This setting will also affect the operation using the **Tool Touch-off Device.** During this operation the machine will lower to the pre-defined safe height using the **Tool Touch Speed Step 1**, after-which the controller begins searching for a signal from the device while continuing to lower at **Speed Step 2**.

The **Spindle Speeds** are setup matching the on board VFD and controller specifications with the Max Speed being set to 24,000RPM and the Starting Speed set to 100% of the max.

Delay Time is the set time in seconds that the controller gives the spindle to come up to proper PRM before beginning a cut. By default, this is set to 5 seconds.

In select operations, this setting may need to be changed. For instance, when using the Laser accessory (with its matching post processor) the delay will need to be set to 0.0 seconds.

JOG Test Speeds are simply the shuttle speeds used when moving the machine using the Jog feature of the controller. These speeds are set as default to 2000mm/min (~80 inch/min) in Low Speed and 6000mm/min (~240inch/min) in High Speed.

Shifting between Low and High and the use of the MPG dial for fine movement are covered earlier in this manual.

NOTE:

Diameter of A-axis, Trigger Output and Max Mode%.... are parameters that at the current time due to how features of the machine are setup to operate are currently active within the system, however, they may inadvertently affect other features unintentionally. It is recommended that these remain set to their defaults for the time being.

For further example., the A-axis by controller standards would be programmed to rotate in degrees. However, the design software outputs differently using circumference measurement. The A-axis diameter settings here would influence that.

Changing User Defined Settings:

Any of the settings described above, can be easily changed by the operator using the controller.

To do this:

Use the arrow keys to scroll down the screen to highlight the desired parameter. Once the parameter is highlighted in Blue…use the number pad to enter the desired setting.

The numbers you enter will be displayed at the bottom left of the screen.

When finished entering the new setting, press the ENT (Enter) button to load the new settings in the active area.

The effected parameter which was highlighted will have changed at this point, reflecting the new information.

Error Messages

During an error, the HUST controller will stop and a specific error message will be displayed on the bottom of the LCD screen. As seen here:

Below is a list of possible error codes and the recommended action for each.
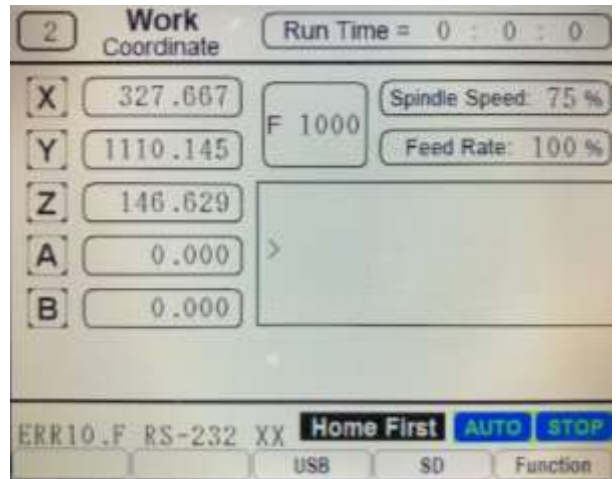
Error Code	Details	Causes
01		MCM Data Error
	B	Each axis to return to the mechanical origin. The distance for the servo motor to find the grid should be >1024.
		Check setting item: MCM parameters 401-409.

Recommended Remedy:

Check if MCM parameter setting data is correct, contact Axiom Technical Services for steps to reprogram the controller.

Error Code	Details	Causes
02	X-C	Axis follow-up mismatch is too large
	S	Main Spindle follow-up mismatch is too large (>4096).

Message:

Servo position control (servo feedback) error. Possible causes are:

1. Voltage command from the controller is too fast for the servo motor or the spindle to respond.
2. The controller is not receiving feedback from the servo motor.

Recommended Remedy:

1. Check parameter 533, the default = 4096
2. Check if the feed-rate "F" in the program is too fast
3. Check if the resolution settings of the MCM parameters are correct. (MCM #241-252)
4. Check if the worktable is being overloaded, or for any obstruction to the motor.
5. Check servo system connections.

Error Code	Details	Causes
03	L	The number in the Counter for counting M99 exceeds the one specified by MCM #10921.

Recommended Remedy:

1. Clear the number in the Counter or adjust the number in MCM #10922 to a larger one.
2. Under Auto or MDI mode, execute "G10 P201" to clear MCM #10921, then press RESET key.

Error Code	Details	Causes
04	A	USB/SDC ERROR—FR_DISK_ERR
	B	USB/SDC ERROR—FR_INT_ERR
	C	USB/SDC ERROR—FR_NOT_READY
	D	USB/SDC ERROR—FR_NO_FILE
	E	USB/SDC ERROR—FR_NO_PATH
	F	USB/SDC ERROR—FR_INVALID_NAME
	G	USB/SDC ERROR—FR_DENIED
	H	USB/SDC ERROR—FR_EXIST
	I	USB/SDC ERROR—FR_INVALID_OBJECT
	J	USB/SDC ERROR—FR_WRITE_PROTECTED
	K	USB/SDC ERROR—FR_INVALID_DRIVE
	L	USB/SDC ERROR—FR_NOT_ENABLED
	M	USB/SDC ERROR—FR_NO_FILESYSTEM
	N	USB/SDC ERROR—FR_MKFS_ABORTED
	O	USB/SDC ERROR—FR_TIMEOUT

Recommended Remedy:

1. Please make sure that the USB format is FAT and that the file extension is correct (.cnc)
2. Try another USB drive
3. Please contact the Axiom Technical Services

Error Code	Details	Causes
08	D	For ZDNC operation, the address for the program data is incorrect
	M	MDI command error (command is > 128 bytes)
	E	Current program has a single block that is > 128 bytes

Recommended Remedy:

Check the program and make sure that each single block has less than 128 characters.

Error Code	Details	Causes
10	O	RS232 ERROR—OVERRUN ERROR
	P	RS232 ERROR—PARITY ERROR
	F	RS232 ERROR—FRAME ERROR
	B	RS232 ERROR—BREAK ERROR
	N	RS232 ERROR—OTHER ERROR

Recommended Remedy:

1. Make sure baud rate in the MCM #520 is compatible with the one in the PC
2. Check the communication cable connection from the PC to CNC controller

Error Code	Details	Causes
11	I	Program CHECKSUM error
	A	Startup check program SUM error
	D	Program Memory address error (DOWN MODE)
	F	Program Memory is full
	U	Program Memory address error (UP MODE)

Recommended Remedy:

1. Execute G10 P2001 in MDI mode to clear all programs.
2. Check battery for memory chip. If the controller is not turned on for several months, the data in the memory will be lost. Controller will show "BT1" or "BT2" message. In this case change the battery.

Error Code	Details	Causes
12		**The size of the burning program is too large.**
		H6 standard: 56K = 896 lines. Each single block is 64 bytes.
		H6 Lath/Mill: 56K + 128k (storage space) = 2944 lines. Because the burning program must not exceed 128k, the maximum number of lines is 2048 lines.
	N	The declaration commands are larger than 20 lines (G11, G12, G04, M code)
	L	The L error in G10 P0920 Lxxxx (L must not be empty and 0<=LA<1000)
	P	Program specified by Lxxxx in G10 P0921, Lxxxx is not declared.

Recommended Remedy:

1. Check for a syntax error in the program.
2. Check the size of the program file.

Error Code	Details	Causes
13	G	G code error For G87 command, the Bits 10 and 11 or R209 are not ON.
	T	T code error
	M	M code error (MA<0)
	R	R error in G81-G89 command (1)R has a different sign with Z(A) (2)R has a different sign with (Z(A)—R)

Recommended Remedy:

1- Check the program and make sure the G code is configured correctly
2- Check the PLC for any unsupported G code settings

Error Code	Details	Causes
14	X	
	Y	
	Z	X, Y, Z, A, C-Axis Over-travel
	A	
	C	

Recommended Remedy:

Use MPG hand-wheel (or manually) move the tool in the Axis within the operating range (or inside the hardware limit switches).

Error Code	Details	Causes
15	L	When servo motor searching for GRID signal, the distance exceeds the setting range.

Message: While the Axis is returning to the origin, the servo motor is unable to find the GRID signal.

Recommended Remedy:

1- Adjust the position of the HOME sensor or adjust the grating number in the parameter setting
2- Check the feed-back cable on the servo motor for interference
3- Check if the servo motor is normal

Error Code	Details	Causes
18		During automatic execution, the fetch of the next single block fails
	C	The failure during copying the next single block may be caused for the following reasons: 1- The source program to be copied does not exist. 2- The start line of the source program > end line. 3- The start line of the source program > total number of lines. 4- The end line of the source program > total number of lines. 5- The target program ID number does not exist. 6- The start line of the target program > total number of lines. 7- The memory is full before the program is successfully copied. 8- Source program ID = Target Program ID and the start line of the source program <= the start line of the target program <= the end line of the source program.
	M	It triggers the C25 single block data read error: it is unable to find the starting address of the specified single block.
	T	Fail to find the starting address
	Q	M95Qxxx error (QA is not within the range 0-127, or the program specified by QA does not exist.)
	L	M99 return program error (G10p301 line number error)
	P	G60…G63 the subroutine to be called is empty

Recommended Remedy:

1. Check the ending statement of the program, such as M02 and M30.
2. Check if the size of the program is too large.

3. Check if the single block data or the ID number of the single block data (N) has error.

Error Code	Details	Causes
20	X	X, Y, Z, A, B, C-Axis has reached the software limit
	Y	
	Z	
	A	
	B	
	C	
	N	The number of limit points for the software limits exceeds 4000.

Recommended Remedy:

Check the program or revise the settings in MCM #581-586, #601-606 for software travel limit.

Error Code	Details	Causes
22		Em-Stop (C002=1).

Recommended Remedy:

Resolve the cause for the emergency stop. Restore Emergency-STOP button and press RESET.

Error Code	Details	Causes
24		Memory stack error

Recommended Remedy:

Check if the calling of the subroutines overlap with each other.

Error Code	Details	Causes
25		G02/G03 command error (the starting radius is not equal to the end radius)
	R	R input format error in G02/G03 The two axis with arc compensation has no offset (in lath mode, R<0)
	L	2*[RAR]>[LENGTH]
	G	I, J, R is not specified in G02/G03 commands

Recommended Remedy:

Check the part program and recalculate the coordinate of the center of the arc/circle.

Error Code	Details	Causes
27	X	
	Y	
	Z	X-C is the declaration distance when C28=1 and R190>0, R190<G31
	A	
	B	
	C	

Recommended Remedy:

1. Check if the setting of R190 is too short to be less than the declaration distance.
2. Reduce the accel./decal. time setting. **(The motor loading should be considered)**

Error Code	Details	Causes
28	N	MISSING G70 WITH G7x COMMAND
	W	[ZA] DIR. SHOULD BE DIFFERENT FROM [G70WA]
	U	[XA] DIR. SHOULD BE DIFFERENT FROM [G70UA]

Message:

In the program G71, G72, G73 commands are incorrect or in an incorrect format.

Recommended Remedy:

Check if the G71, G72, G73 commands in the program have incorrect settings.

Error Code	Details	Causes
29	G	The G code which includes the C, R, A single block is not G00…G04
	P	Parameter setting error
	A	A_ or its related parameter error
	R	R_ or its related parameter error
	C	C_ or its related parameter error

Message:

The format of the automatic filled-command is incorrect.

Recommended Remedy:

Check is the A, R, C commands in the program has proper <period> in the statement.

Error Code	Details	Causes
31		None PLC

Recommending Remedy:

1. Please transfer the data into the PLC.
2. Please contact the distributor or the manufacturer.

Error Code	Details	Causes
32	E	The E in G92 is not within the range 1.0-100.0 (Imperial)
	P	The P in G76 is not within the range of 30-90
	L	The end point of the cutting – the over cut for the finish turning < the coarse cutting depth
	D	The maximum cutting depth for G76 < 0
	C	CANPX-CANPR<CHAMX The thread cutting length < thread undercut length

Recommended Remedy:

Please check if the cycling thread lathing command is incorrect.

Error Code	Details	Causes
33	4	The Kxx in G34 = 0
	5	The Kxx in G35 = 0
	6	The Kxx in G36 = 0
	7	In G37, the Pxx<=0 or Kxx=0
		Execute G35, G36, G37 commands in lath mode.

Recommended Remedy:

Please check if the K value in the milling command G34-G37 is correct.

Error Code	Details	Causes
33	4	The Kxx in G34 = 0
	5	The Kxx in G35 = 0
	6	The Kxx in G36 = 0
	7	In G37, the Pxx<=0 or Kxx=0
		Execute G35, G36, G37 commands in lath mode.

Recommended Remedy:

Check if the K value in the milling command G34-G37 is correct.

Error Code	Details	Causes
36	B	The communication format of the USB/SDC is not 'O8001'.
		The communication format of the USB/SDC is not 'O8002'.
	C	The communication format of the MCM is not 'O9002'.
	F	The communication format of the memory is not 'O9140'.
		The communication format of the variable is not 'O9004'.
	L	The communication format of the PLC is not 'O9003'.
		PLC document exceeds maximum size.
	P	The program ID number to be received exceeds 1000 (Oxxxx).
	R	LENGTH OR SUM ERROR
		#13245, #13246, #13247, #13248
	S	The communication format of SYS is not "O9100".
		SYS document exceeds the maximum size.
	T	The communication format of TBL is not 'O9110'
	W	The received hexadecimal file is not in the format of XXXX,0DH

Recommended Remedy:

Check if the format of the data to be transferred is correct.

Error Code	Details	Causes
37		NC ALARM (C007=1)

Recommended Remedy:

Check the machine tool for proper operation. Correct the problem and press RESET.

Error Code	Details	Causes
38		The screen reading time is too long > 3000ms

Recommended Remedy:

1. Please re-transmit the screen data file.
2. Please contact the distributor or the manufacturer.

Error Code	Details	Causes
41		In the tool compensation mode, the paths of the single block and the command between the block are 2 parallel lines.
42		OVER CUT
43		The distance between the start point and the end point is shorter than 0.005μ
45		C251=0, the arc offset compensation radius in a single block <0
46		In the tool compensation mode, while executing the arc command the system cannot determine the intersection point for the center.
48		The tool compensation radius <0
49		The tool tip direction is not of the type specified by 0-9. The number of single blocks with no axial motion exceeds 10.

Recommended Remedy:

1. Please check if the tool compensation setting is correct.
2. Please check if the program is correct.

Error Code	Details	Causes
50 99		Error in user defined error message by G65 Macro.

Recommended Remedy:

Check if G65 function is properly applied.

Alarm Codes

AL01 Over Voltage

Cause	Inspection	Remedy
Power supply voltage excess	Review the power voltage	Use the proper power voltage
Input power error (incorrect power)	Review the power supply	Use proper power source
Drive hardware damaged	Use voltmeter to check if the power voltage is within rated voltage while error still occurred.	Contact agent for proper service
Lead of built-in regenerative brake resistor or regenerative brake option is disconnected	Check the P, D terminals connections. Check built-in brake resistor or regenerative brake connector	Connect correctly
Built-in regenerative brake resistor or regenerative brake option is damaged	Check if it is burned out or damaged	Change built in resistor or option
Capacity of built-in regenerative brake resistor or regenerative brake option is insufficient	Check the capacity	Add regenerative brake option or increase capacity

AL02 Low Voltage

Cause	Inspection	Remedy
Input voltage of main circuit is lower than permissible value	Review the power supply	Use the proper power source
Capacity of power supply is insufficient	Check if it occurred as the motor torque regenerated	Increase power supply capacity
Input power error (incorrect power)	Review the power supply	Use the proper power source

AL03 Over Current

Cause	Inspection	Remedy
Improper motor wiring	Check the wiring	Correct the wiring
Short occurred in drive output phases U, V, W	Check if the connection between the drive and motor is short	Correct the wirings to protect against short circuit or cable exposure
IGBT of servo drive faulty	AL03 occurs if power is switched on after U, V, W have been disconnected	Contact agent for proper service
Improper parameter setting	Check relevant parameters	Recover factory settings then re-define users demand

AL04 Regenerative Alarm

Cause	Inspection	Remedy
Break transistor fault	Set PC36 to be 0 and re-power on. If AL04 occurs quickly it indicates the brake transistor is broken	Contact agent for proper service
Built-in brake resistor or brake option disconnected	Check the wiring	Check the wiring

AL05 Overload 1

Cause	Inspection	Remedy
Operate the servo drive in heavy duty continually	Check if mechanism load is large	Upgrade the capability of servo or reduce the duty
Improper gain values setting	Check if vibration of mechanism is has occurred	Re-operate the auto gain tuning job to obtain proper gain value
Servo system is instable	Check if acceleration/deceleration time constant is proper	Extend these setting values
Encoder faulty	As motor shaft is rotated slowly with servo OFF, the pulses feedback should vary in proportion to rotary angle. If the indication skips or returns midway it is faulty	Contact agent for proper service

AL06 Over Speed

Cause	Inspection	Remedy
Command pulses frequency exceeded the permissible instantaneous speed frequency	Check the frequency of command pulses permissible range	Set command pulse frequency to within range
Improper acceleration/deceleration time constant settings	Check is these values are too small	Increase acceleration/deceleration time constant
Servo system is instable, causing overshoot	Observe if the mechanism has vibration	Reset proper servo gain value. If gain could not be reset, reduce load inertia or set acceleration/deceleration time constant to proper value

AL07 Pulse Command

Cause	Inspection	Remedy
Pulse frequency of the command is too high	Check frequency of command pulses exceeds the permissible range	1. Set the command pulse frequency correctly 2. After RD output signal activated, the host starts the command
Command device failure	Check if the command device is normal or not.	Change the command device

AL08 Position Error Excessive

Cause	Inspection	Remedy
Improper acceleration/deceleration time constant settings	Check if these values are too small.	Increase acceleration/deceleration time constant.
Improper torque limit setting.	Check if PA05 setting is too small	Increase torque limit value
Position loop gain value is small	Check is PB07 setting is too small	Increase the gain value and adjust to ensure proper operation.
Mechanism load is too great	Check if mechanism load is large	Reduce load or use servo drive motor to provide larger output.

AL09 Communication Abnormal

Cause	Inspection	Remedy
Improper protocol setting	Check if the protocol is matched	Set the protocol correctly
Improper address setting	Check the communication address	Set the address correctly
Improper data content transmitted	Check the value accessed	Correct the data content accessed.

AL0A Communication Time-Out

Cause	Inspection	Remedy
Cable broken or loose	Check for broken or loose cable	Replace or reconnect cable
Communication cycle is longer than parameter pC23 setting	Check if PC23 setting is proper	Set PC23 correctly

AL0B Encoder Error 1

Cause	Inspection	Remedy
Wiring in the wrong sequence	Check the wiring for correct sequence	Use the correct the wiring sequence
CN2 connector is loose or disconnected	Check the CN2 connector	Reconnect or repair the connector
Encoder faulty	Check the encoder feedback pulses continuity of motor while Servo OFF	Contact agent for proper service

AL0D Fan Error

Cause	Inspection	Remedy
Cooling fan stops working	Change the fan by user or contact agent for proper service	

AL0E IGBT Overheat

Cause	Inspection	Remedy
Operate the drive in over-rate duty continuously	Check the mechanism for over-load or motor for large current	Reduce load, or use Servo drive and motor providing larger output

AL0F Memory Error

Cause	Inspection	Remedy
Data read-out/write-in abnormally	To execute the parameter recovery or power on reset and check if still null	Contact agent for proper service.

AL10 Overload 2

Cause	Inspection	Remedy
Mechanical impact	Check if the moving route is proper	1. Correct the tool-path 2. Install limit switches
Wrong connection of servo motor	Check the wiring	Correct the wiring
Mechanism vibration	Check if the mechanism is instable and humming	1. Change response level setting 2. Make gain adjustment manually.
Encoder faulty	Rotate motor shaft and check the continuity of encoder feedback pulses while Servo OFF.	Contact agent for proper service

AL11 Motor Mismatch

Cause	Inspection	Remedy
The capacity of drive and motor are not compatible	Check if they match each other in capacity	Use the proper combination

AL12 Emergency Stop

Cause	Inspection	Remedy
EMG signal is activated	Check if EMG signal is applied and triggered	Release the trigger after removal of any emergency conditions

AL13 LSP/LSN Activated

Cause	Inspection	Remedy
LSP activated	Check if limit switch is activated	Release the cause of the activated limit switch
LSN activated		

AL14 Software Positive Limit

Cause	Inspection	Remedy
Command pulses exceeds PF86	Check whether PF86 is proper	Set the proper PF86 value

AL15 Software Negative Limit

Cause	Inspection	Remedy
Command pulses exceeds PF86	Check whether PF86 is proper	Set the proper PF86 value

AL16 Overload Early Warning

Cause	Inspection	Remedy
The actual load exceeds the software protection of the servo drive.	1. Check whether overload has occurred 2. Check whether the PA17 setting is low.	1. Refer to AL05 Remedy 2. Set the PA17 Value higher or set a value which exceeds 100 to disable warning.

AL17 ABS Time Out Warning

Cause	Inspection	Remedy
Absolute position communication waiting time out.	1. Check whether overload has occurred 2. Check whether the PA17 setting is low.	1. Refer to AL05 Remedy 2. Set the PA17 Value higher or set a value which exceeds 100 to disable warning.

AL19 ABS Time Out Warning

Cause	Inspection	Remedy
Position command counter overflow	Incremental system: When the motor keeps rotating in the same direction, the feedback pulse register would overflow. Absolute system: 1. Feedback pulse register overflow 2. Change electronic gear ratio without executing origin return. 3. Execute the absolute position command when the HOME is off.	Execute the ORIGIN return

AL20 Motor Crash Error

Cause	Inspection	Remedy
Motor current exceeds the PA15 setting and the duration is over PA16.	1. Check if the PA15 is valid 2. Check the PA15 is too low or PA16 is too soon.	3. Disable the PA15. 4. Set the proper level of PA15 and PA16 parameters according to the actual load condition.

AL21 Motor U, V, W Lines Disconnected

Cause	Inspection	Remedy
The drive detects the disconnection of motor power lines.	Check the power lines of motor	Re-connect the power lines

AL22 Encoder Communication Error

Cause	Inspection	Remedy
The encoder sent CRC message to the servo drive *3 times.	1. Check the grounding of the motor 2. Check if the encoder cable is wired together with the motor power lines	1. Ground the motor to obtain a good immunity from noise 2. Separate the encoder cable from the power lines.

AL24 Encoder Type Error

Cause	Inspection	Remedy
Try to enable the absolute encoder function with an incremental type encoder	1. Check the encoder type 2. Check the PA28 setting	1. Select the proper type of encoder 2. If the absolute position function is not performed, set "0" value into PA28

AL26 Encoder Error 3

Cause	Inspection	Remedy
The LED attenuation of encoder or encoder feedback pulses abnormal	Cycle drive power to check for continued phenomenon.	If there is reoccurrence, please contact your agent for repair.

AL27 Encoder Error 4

Cause	Inspection	Remedy
Encoder memory abnormal	1. Check the grounding of motor 2. Check if the encoder cable is wired together with the motor power lines 3. Check the shielding of the encoder	1. Link the drive ground and motor ground together 2. Separate the encoder cables from the motor power lines 3. Use the encoder cable with shielding to obtain better noise immunity

AL28 Encoder Overheat

Cause	Inspection	Remedy
Surrounding air temperature of encoder operation environment is higher than 95°C	Check the surrounding air temperature of encoder operation environment	1. Prevent nearby heat sources 2. Reduce output torque 3. If remedies do not work, contact agent for repair.

AL29 Encoder Error 5

Cause	Inspection	Remedy
The stroke revolutions are in excess to the encoder specifications.	Check the stroke revolutions. The revolutions limits is within -32768~+32767 Turns	Execute the ORIGIN return

AL2A ABS Encoder Abnormal 1

Cause	Inspection	Remedy
Voltage of encoder battery is low	Check the voltage of the encoder battery	If less than 2.45V, replace the battery and execute the ORIGIN return
Bad contact between encoder and battery, or battery power lines disconnected	1. Check the encoder wiring 2. Check the contacts between the battery box and the encoder power lines	Repair the wiring and execute the ORIGIN return.

AL2B ABS Encoder Abnormal 2

Cause	Inspection	Remedy
The counter of encoder revolutions is abnormal	Power off the servo drive and then run the servo motor. Check for reoccurrence	If there is reoccurrence, please contact your agent for service.

AL2C ABS Encoder Abnormal 3

Cause	Inspection	Remedy
Replace the encoder battery when the power of servo drive has turned OFF	Do not replace battery if servo motor is powered ON	Execute the ORIGIN return
The absolute coordinate initialization has not executed when the absolute coordinate system operated		Execute the ORIGIN return

AL2D Encoder Battery Voltage Low

Cause	Inspection	Remedy
Voltage of encoder battery is low	Check the voltage of the encoder battery Check the LED display for AL2D message.	Keep servo motor power ON and replace the encoder battery.
Bad contact between encoder and battery, or battery power lines disconnected	1. Check the encoder wiring 2. Check the contacts between the battery box and the encoder power lines	Repair the wiring and execute the ORIGIN return.

AL2E Control Circuit Abnormal

Cause	Inspection	Remedy
The SON signal is malfunctioning	Check the SON signal for disturbance	Prevent any noise interference
Current feedback circuit is abnormal	Reset power of the servo drive. If the problem continues contact your agent for service.	

AL2F Regenerative Energy Abnormal

Cause	Inspection	Remedy
The regenerative load ration is more than 100%	1. Check if the deceleration time setting is too short 2. Prevent the operation where the change from forward rotation to reverse rotation is performed frequently	1. Set the proper deceleration time to reduce voltage regeneration 2. Check with agent to verify drive capacity sufficiency.

AL30 Pulse Output Frequency Excess

Cause	Inspection	Remedy
The encoder is unresponsive	Check the alarm histories for occurrence of AL0B, AL0C, AL22, AL26, and AL27.	Follow remedy path for AL0B, AL0C, AL22, AL26 and AL27
Pulse output frequency exceeds hardware ability	Check for either of these conditions: 1. Motor speed exceeds PA41 2. (Motor speed/60)*PA14>20x10^6	Set PA41 and PA14 properly

AL31 Over Current 2

Cause	Inspection	Remedy
The current feedback circuit of servo drive is abnormal	Power reset the servo drive, if the problem continues; contact your agent for service.	

AL32 Control Circuit Abnormal 2

Cause	Inspection	Remedy
FPGA hardware abnormal	Power reset the servo drive, if the problem continues; contact your agent for service.	

AL33 Memory Error 2

Cause	Inspection	Remedy
The flash memory abnormal	Power reset the servo drive, if the problem continues; contact your agent for service.	

AL34 Overload 4

Cause	Inspection	Remedy
The external load exceeds the rate of drive capacity in continuous use	Check if the reciprocating stroke is too fast	Upgrade the motor capacity or reduce the reciprocating stroke frequency

AL1A Index Coordinate Undefined

Cause	Inspection	Remedy
The ORIGIN initialization had not executed when the index coordinate executed.	1. The execute the ORIGIN return before the index coordinate is performed 2. Activate RES to release alarm status 3. SON: off→on	

AL1B Position Shifting Error

Cause	Inspection	Remedy
MC_OK signal ON/OFF state changes	After position completion, check if any external force causes the final position to shift	1. Activate the RES signal 2. Press "SET" key at alarm message screen 3. SON: off→on

AL1C Overload 4 Early Warning

Cause	Inspection	Remedy
Overload duration exceeds the pre-warning of protection curve	Check if the external load exceeds the rated capacity of the motor	Refer to the remedy of AL34

AL61 Parameter Group Range Excess

Cause	Inspection	Remedy
Parameter group request exceeds A~F range	Check if the communication command is correct	Execute one of the following: 1. Power OFF the drive 2. Activate the RES signal 3. Press "SET" key at alarm message screen

AL62 Parameter Number Range Excess

Cause	Inspection	Remedy
Parameter group number request exceeds specific range	Check if the communication command is correct	Execute one of the following: 1. Power OFF the drive 2. Activate the RES signal 3. Press "SET" key at alarm message screen

AL63 Pr Mode Parameter Range Excess

Cause	Inspection	Remedy
Parameter command request exceeds specific range	Check if the communication command is correct	Execute one of the following: 1. Power OFF the drive 2. Activate the RES signal 3. Press "SET" key at alarm message screen

AL64 Pr Mode Parameter Write Error

Cause	Inspection	Remedy
To write parameter modification when SON is activated	Check the SON status when Pr command is going to be changed	

Warranty:

Limited Warranty Coverage
Each Axiom Precision (the "Manufacturer") CNC machine ("Machine") and its components (except those listed below under limits and exclusions) is warranted against defects in material and workmanship for a period of 12 months from the date of sale. The foregoing is a limited warranty and it is the only warranty by manufacturer. Manufacturer disclaims all other warranties, express or implied, including but not limited to all warranties of merchantability and fitness for a particular purpose.

Repair or Replacement only
Manufacturer's liability under this agreement shall be limited to repairing or replacing, at the discretion of manufacturer, parts or components. Shipment for items replaced under warranty is free, but the shipment method is at the discretion of Axiom Tool Group, Inc. In general delivery for domestic customers will be by UPS ground service or

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Direct phone support is part of the equation that allows us to provide high value at low cost. You must be comfortable with general electrical and mechanical repair concepts, including the appropriate safety procedures, before working on your machine. If you do not have the required skills, you will need to find someone locally to assist you. We do not have factory technicians to send to your facility.

Limits and Exclusions of Warranty
Except as provided above, buyer agrees that all warranties express or implied, as to any matter whatsoever, including but not limited to warranties of merchantability and fitness for a particular purpose are excluded. Components subject to wear during normal use and over time such as paint, labels or decals, finish and condition, seals, bearings, spoil boards, flex cabling, etc., are excluded from this warranty. Axiom-specified maintenance procedures must be adhered to, in order to maintain this warranty. This warranty is void if the machine is subjected to mishandling, misuse, neglect, accident, improper installation, improper maintenance, or improper operation or application, or if the machine was improperly repaired or serviced. Warranty of general machine tolerances is void if the machine is disassembled or altered by customer.

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Visit us online at:

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Need Assistance? The Axiom Precision CNC Support Team can be reached at:

support@axiomtoolgroup.com

For machine and accessory orders, the Axiom Precision Sales Team can be reached at:

sales@axiomtoolgroup.com

Axiom Tool Group, Inc.

1181 Claycraft Rd

Columbus, OH 43230

1-844-642-4902