Operation Manual

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DL-NCD Door Lite System

Operation Manual

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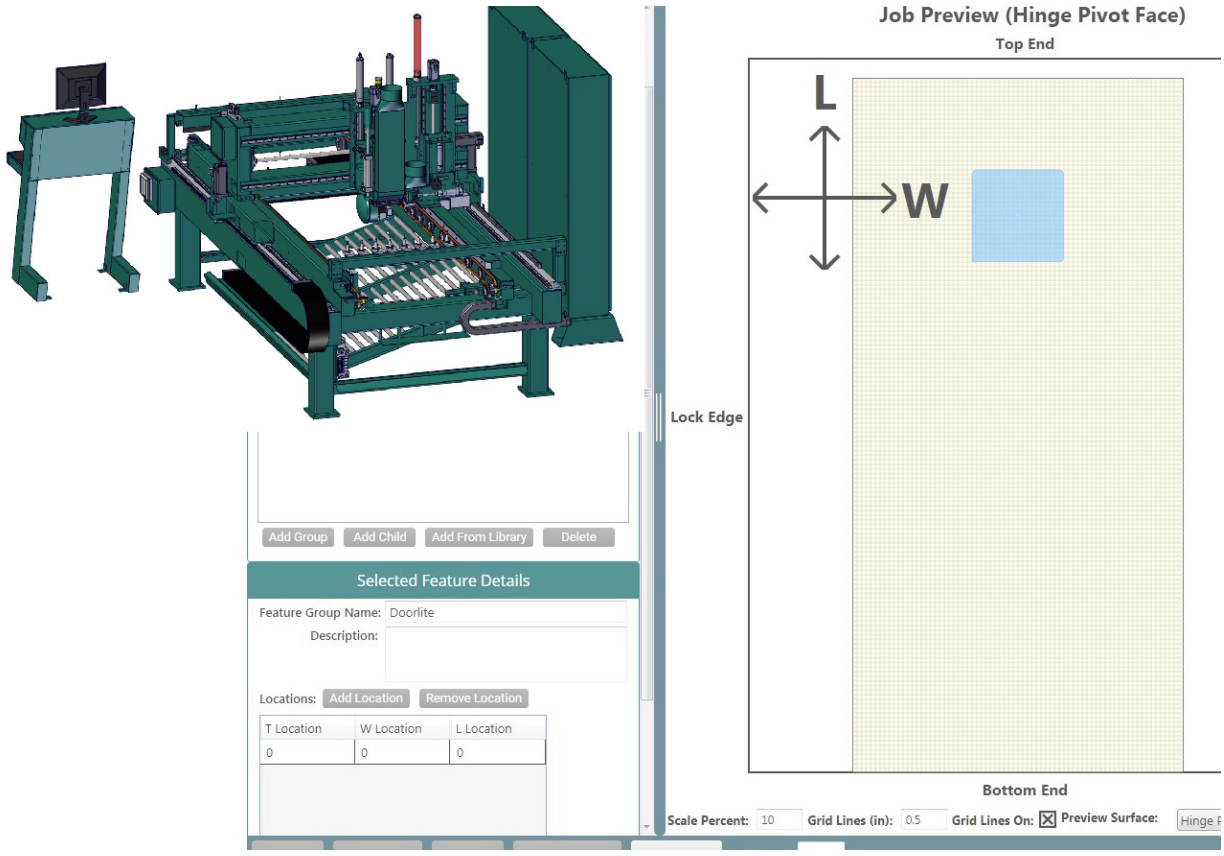

Operation

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CHAPTER 1 Introduction to the DL-NCD

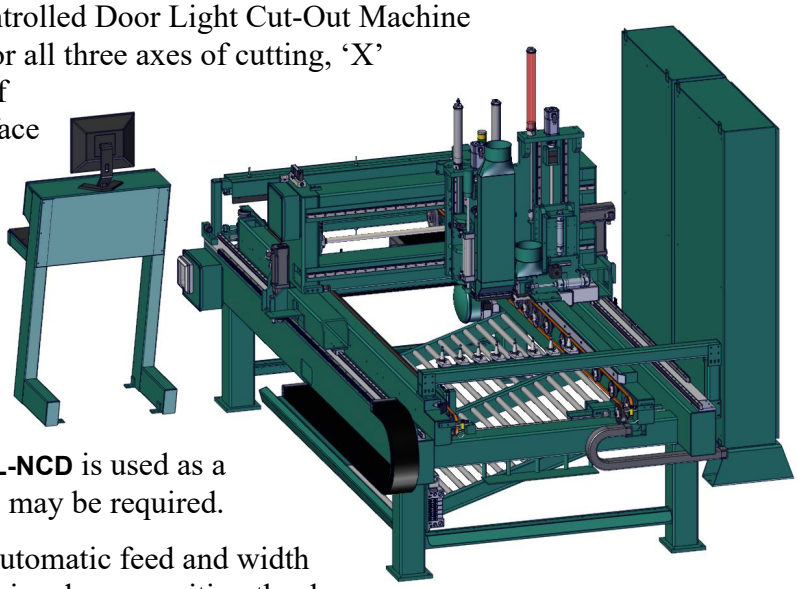
This chapter provides an overview of the **KVAL DL-NCD** machine and important safety information to follow when operating the machine.

Chapter 1 at a Glance

Section Name	Summary	Page
Overview of the DL-NCD System	This section provides an overview of the machine. It includes a general description and a table of available options	page 1-2
Safety First!	IMPORTANT safety information is described in this section	page 1-5
Lockout-Tagout Guidelines	Procedures describing Lockout Tagout.	page 1-9
Zero-Energy to Start-Up	Procedure to power up your machine for the first time.	page 1-12
Getting Help from KVAL	This section describes the method to contact the KVAL service center for help. The section includes how to get information from the specification plate tor provide to KVAL, service center hours, and return procedures	page 1-20
Safety Sign-Off Sheet	A record to track operators that are trained on the machine.	page 1-19

Overview of the DL-NCD

The **DL-NCD** is a Numerically-Controlled Door Light Cut-Out Machine equipped with AC servo control for all three axes of cutting, 'X' (Length of the door), 'Y' (width of the door), and 'Z' (Depth into the face of the door). The 'Z' axis servo control makes it simple to program for security locks where the face bore is machined to a precise depth and also allows the operator to reduce the plunge speed to minimize tearout in the bottom face when machining small diameter holes. When the **DL-NCD** is used as a drill, deburring on the bottom face may be required.



The **DL-NCD** is equipped with an automatic feed and width adjust system to automatically receive doors, position the door against the stop, clamp the door and start the machining sequence if the instructions have been downloaded.

The **DL-NCD** can process doors that vary in height from 6'-6" to 8'-0", 12" to 3'-6" in width and 1-3/4" in thickness. Minimum distance from edge of cutout to edge of door is 1-1/2" on both sides.The direct drive high frequency spindle motor for cutting the door is equipped with an automatic tool changer and access to eight (8) additional tool holders placed in a fixture along the fixed side of the machine. Programs can call for an automatic tool change to match the specified door cutting process.

RPM adjustment for wood, fiberglass or steel doors.

Individual door light patterns are created at the machine console, or remotely using a standard PC. The **DL-NCD** includes an industrial PC with a standard Ethernet connection for file transfer and library backup, as well as occasional internet support and updates from Kval.

With Purchase, the Customer may submit up to Eight(8) door specifications/cutout templates which will be pre-programmed prior to shipment. Kval suggests the customer submit their more difficult templates, such as ovals, for the Kval programmers to implement.

KvalCAM Architectural Door Software

KvalCAM, proprietary architectural door software, provides simple machinery programming and automated G-Code creation. KvalCAM allows customers to easily create template files for a wide variety of hardware (locks, closers, sweeps, hinges, etc.) by the shape, dimensions, and location of the hardware cuts. Understanding G-Code machine-logic is no longer needed to develop programs for new templates.

The unique feature of this powerful software is providing the capability to utilize one hardware template for each piece of hardware even if it requires an array of face and edge detailing mortises. KvalCAM integrates multiple machines and tools into a singular functioning unit with each-machine communicating in unison pulling information from the same door file.

For example, a mortise lock that has five different size face holes (on both faces of the door), an edge face plate, a mortise pocket, and an extended electrical wire pocket can be grouped as one hardware template utilizing multiple machines and tools in-line.

Once hardware templates are created, the customer defines specific doors with all hardware and location to be machined. This can be done with the **KvalCAM** software off-line, through a customer's database, or by the operator at the machine. When the door is loaded, KvalCAM checks the tools and machines available, and automatically generates the G-Code and optimizes the machining sequence for the entire process.

Furthermore, KvalCAM offers increased supportability and troubleshooting capabilities. Newly developed error codes and code definitions quickly identify any problems to the operator or Kval tech.

For more information regarding the full functionality and benefits of KvalCAM, please refer to your Kval Sales Engineer.

All **DL-NCD** installations require that the integrated PC computer has access to broadband internet for real-time diagnostics and program updates. On-board diagnostic programs allow the user to determine the source of operating errors and failures, even after they have occurred.

A tool holder stand and torque wrench are included so tool changes may be done quickly and accurately.

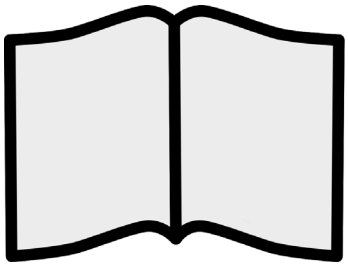
STANDARD ORIENTATION: Standing at the fixed fence, the **DL-NCD** feeds from left to right. Entry doors are oriented sill end leading, with the lock side against the fixed fence. Doors are usually aligned so the lock side of the door is against the fixed fence to ensure the lock bore backset is accurate.

About this Manual

This manual is part of a package delivered with the machine line.

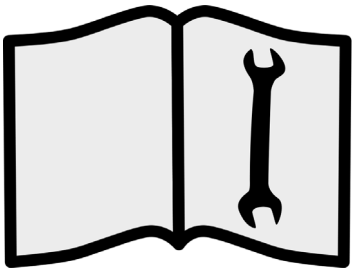
Integration Package includes the following:

Operation Manual includes the following:



Chapter	Title	Description
1	Introduction	Descriptions of Machine Line and Safety Information.
2	About KvalCAM	Descriptions of the KvalCam user interface.
3	Operation Interface	Descriptions of how to power machine line, and operator interface user screens.
4	Calibration	Descriptions of Calibration Routines and how to use the interfaces
5	Tour of DL-NCD	Identification and descriptions of the DL-NCD machine assemblies.

Service Manual includes the following



Chapter	Title	Description
1	Introduction	Safety Information.
2	System IT Administration	Descriptions of the PLC system, and computer system.
3	Maintenance	Maintenance steps for the machine line
4	Troubleshooting	Troubleshooting tips and theory of operation.

Safety Sheet Sign-Off Sheet

At the end of this chapter, there is a safety sign-off sheet. It lists personnel and machine safety criteria to understand before operating the machine. It is highly recommended that personnel operating, working on a machine meet the criteria listed in this sheet. It is recommended the sheet be signed and kept for records. See “Safety Sign-Off Sheet” on page 1-19.

Safety First!

This machine is a powerful electro-mechanical motion control system. You should test your motion system for safety under all potential conditions. **Failure to do so can result in damage to equipment and/or serious injury to personnel.**

Safety Sheet Sign-Off Sheet

At the end of this chapter, there is a safety sign-off sheet. It lists personnel and machine safety criteria to understand before operating the machine. It is highly recommended that personnel operating, working on a machine meet the criteria listed in this sheet. It is recommended the sheet be signed and kept for records. See “Safety Sign-Off Sheet” on page 1-19.

Safety Terminology of Labels

In addition to the nameplate, KVAL machines may have other warning labels or decals that provide safety information to operators. Safety labels should be clearly visible to the operator and must be replaced if missing, damaged, or illegible.

There are three types of warning labels or decals:

- **DANGER** means if the danger is not avoided, it will cause death or serious injury.
- **WARNING** means if the warning is not heeded, it can cause death or serious injury.
- **CAUTION** means if the precaution is not taken, it may cause minor or moderate injury.

Safety Guidelines

In addition to the caution and warning labels affixed to this machine, follow the guidelines below to help ensure the safety of equipment and personnel.

Training

Ensure that all employees who operate this machine are aware of and adhere to all safety precautions posted on the machine and are trained to operate this machine in a safe manner.

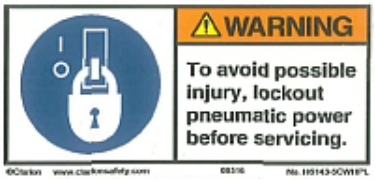
Protective Gear

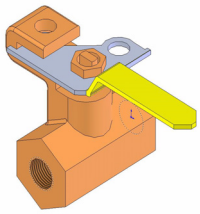
Never operate the machine without proper eye and ear protection.

When the Machine is ON

- **Never** reach hands beyond safety cage. Servo motors can unexpectedly move quickly.
- **Never** clear screws or hinges out of the machine while it is running.
- **Never** reach into the router area to retrieve a hinge. The router may still be running down after shut down.
- **Never** perform any maintenance unless machine is at zero state.
- **Never** clean the machine while it is running.
- **Never** walk away from the machine while it is running.

Compressed Air





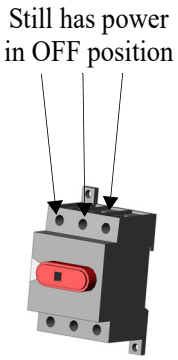
The compressed air system connected to this machine should have a three-way air valve for shut-off and pressure relief.

All cylinders on machine are under high pressure and can be very dangerous when activated. Before performing any maintenance or repairs on this machine turn off the main air disconnect. **Lockout and tagout this connection**.

See “Lockout Tagout Procedure” on page 1-10.

Electrical

Electrical circuitry on this machine is protected by an approved lockable disconnect circuit. In addition to this equipment, you must install an approved disconnect for the electrical power supplying this machine.



When opening the cabinet you must first turn off the disconnect switch. When the cabinet door is open there is **still power on the top side of the disconnect switch**. Some machines are powered by more than one supply located at different locations. Before performing any repairs or maintenance, lockout and tagout **must be installed at all locations**

All maintenance and repairs to electrical circuitry should only be performed by a qualified electrician.

Before Conducting Maintenance

Prior to performing any maintenance, repairs, cleaning or when clearing jammed debris, you must disconnect, tag out, or lock out the electrical and air pressure systems. This should be done in accordance with applicable state and/or federal code requirements.

Laser Warnings

On some machines, laser indicators are used to set boundaries. Follow the manufacturers safety precautions.

Class 2
Lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing.
Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

Compliance with Codes and Regulations

KVAL advises that you request an on-site state safety review of your installation of this machine. This is to ensure conformance to any additional specific safety and health regulations which apply in your geographic area.

Other Hazard Control Action

Report a Hazard
Before You Report an Accident

If you believe any part or operation of this machine is in violation of any health or safety regulation, **STOP** production. It is your responsibility to immediately protect your employees against any such hazard.

Additional detailed safety guidelines are included in the operating instructions of this manual. KVAL will be pleased to review with you any questions you may have regarding the safe operation of this machine

Follow Your Company's Safety Procedures

In addition to these safety guidelines. Your company should have on-site and machine specific safety procedures to follow.

Lockout-Tagout Guidelines

- Place a tag on all padlocks. On the tag, each operator must put their own name and date. **(These locks are only to be removed by the person who signs the tag)**
- If more than one person is working on the machine, each additional person places a lock and tag on each disconnect.
- Only each operator may remove their own lock and tag.

Important: When many people are all working on the same machine you will need a multiple lockout device, such as the one shown here.

Follow the P-R-O-P-E-R lockout rule of thumb.

P..... Process shutdown

R ..... Recognize energy type (electrical, pneumatic, mechanical, etc.)

O..... OFF! Shut off all power sources and isolating devices

P..... Place lock and tag

E..... ENERGY: Release stored energy to a zero-energy state

R ..... Recheck controls and test to ensure they are in the “OFF” state

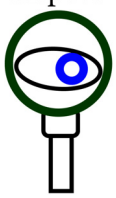
Lockout Tagout Procedure

This policy is required by OSHA regulation 1910.147 and Cal OSHA'S SB198 ruling of July 1991.

Use the following lockout procedure to secure this machine while it is powered down. During a lockout, you disconnect all power and shut off the air supply. Be sure to use the tagout guidelines noted below.

Pre-Steps Before Lockout Tagout

Inspect



1. Evaluate the equipment to fully understand all energy sources (multiple electrical supplies, air supply and pressure, spring tension, weight shifts, etc.).
2. Inform all affected personnel of the eminent shutdown, and the duration of the shutdown.
3. Obtain locks, keys, and tags from your employer's lockout center.

Lockout Tagout Power

ower

4. Turn off machine. See Chapter 2 for power down and power up procedures.
5. Turn the disconnect switches on **ALL** electrical and frequency panels to the OFF position. Then push the red tab to pop it out. Place a padlock through the hole. Place your tag on the padlock, as per the tagout guidelines below. (see illustration below).

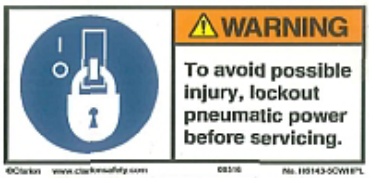
Turn Switch to the OFF position

Insert Lock into hole.

Lock and Tag out

Note: When multiple people are working on the machine, each person needs to have a lock on the handle in the extra holes provided.

Lockout Tagout Air Supply



6. Turn all air valves to the OFF position and place a padlock through the hole (see illustration below).
NOTE: Place your tag on the padlock, as per the tagout guidelines.

Start Maintenance

7. Once the locks and tags are in place and all personnel are clear, attempt to operate the machine to ensure equipment will not operate.

8. Maintenance or repairs may started.

Post Maintenance Steps

9. After maintenance is completed, the person performing the work must ensure all tools, spare parts, test equipment, etc., are completely removed and that all guards and safety devices are installed.

10. Before removing the locks and tags, the person who attached them shall inspect the equipment to ensure that the machine will not be put in an unsafe condition when re-energized.

11. The lock and tag can now be removed (only by the person(s) who placed them), and the machine can be re-energized.

12. The tags must be destroyed and the locks and keys returned to the lockout center.

Zero-Energy to Start-Up

Starting the equipment properly is just as important as the lockout/tagout guidelines in terms of safety.

Start-up Guidelines

The following guidelines below should be followed to start the equipment.

Inspect

The equipment must be inspected for proper adjustment before starting equipment.

Clean Up

All materials and debris must be cleaned up. Any combustible materials or old parts used during repairs must be cleaned up and/or properly disposed of.

Replace Guards

Replace all equipment guards. If part of equipment cannot be properly adjusted after start-up with guard on, contact the KVAL Service team. See “” on page 1-20.

Check Controls

Confirm that all switches are in the “OFF” position. Please be advised that some components of the machine may start automatically when energy is restored.

Remove Locks

Each operator must remove his or her own lock and tag. This will ensure that all operators are in a safe place when the equipment is started.

Perform Visual Checks

If the equipment is too large to see all around it, station personnel around the area and sound the personnel alarm before starting the equipment. If your operation is more complex, your company’s comprehensive safety procedure may involve additional steps. You will need to ask your supervisor about these procedures. The company’s lockout procedure should be posted at each machine. On larger or long-term maintenance or installation projects, the company’s procedures must be explained to all new operators and a copy of the company’s procedures should be posted on-site for the duration of the work.

The Company’s procedures should also include provisions for safely handling shift changes and changes in operators or new operators.Comprehensive lockout/tagout may use a gang box or other system to ensure that locks are secure and not removed without authorization.

Remember, lockout/tagout procedures work because you are the only one with the key to your lock. Proper lockout/tagout can save lives, limbs, and money. Help make your work environment safe for you and your fellow workers. Be sure to follow the P-R-O-P-E-R lockout/tagout procedures, and that those around you do also.

Close the Cage Gate

Verify all cage gates are securely closed. Ensure all safety protocols are in effect.

Getting Help from KVAL

Before you seek help, first try the troubleshooting procedures. Follow the procedures below.

If you are unable to resolve the problem:

1. Locate the machine's Specification Plate and record the serial number, 3 phase volts, electrical print number, and air print number.

Air Driven Machines

2. Contact our customer support team:

- In the U.S and Canada, call (800) 553-5825 or fax (707) 762-0485
- Outside the U.S. and Canada, call (707) 762-7367 or fax (707) 762-0485
- Email address is service@kvalinc.com
- Hours:

  6:00 AM to 4:00 PM Pacific Standard Time, Monday through Thursday

  6:30 AM to 1:30 PM Pacific Standard Time, Friday

On-Line Help

On machines with a Beckhoff® PLC and an internet connection, our service team are able to connect, run, and troubleshoot your machine.

Product Return Procedure

If you've contacted Kval for help and it is determined that a return is necessary, use the procedure below to return the machine or part.

Note: Non-Warranty returns are subject to a 15% restocking charge.

1. Obtain the packing slip and/or invoice numbers of the defective unit, and secure a purchase order number to cover repair costs in the event the unit is determined to be out of warranty.
2. Reason for return: Before you return the unit, have someone from your organization with a technical understanding of the machine and its application include answers to the following questions:

- What is the extent of the failure/reason for return? What are the relevant error messages or error codes?
- How long did it operate?
- Did any other items fail at the same time?
- What was happening when the unit failed (e.g., installing the unit, cycling power, starting other equipment, etc.)?
- How was the product configured (in detail)?
- Which, if any, cables were modified and how?
- With what equipment is the unit interfaced?
- What was the application?
- What was the system environment (temperature, spacing, contaminants, etc.)?

3. Call Kval customer support for a Return Material Authorization (RMA). When you call:

- Have the packing slip or invoice numbers available.
- Have the documented reason for return available.

4. Send the merchandise back to Kval.

- Make sure the item(s) you are returning are securely packaged and well protected from shipping damage
- Include the packing slip or invoice numbers.
- Include the documented reason for return.
- Include the RMA number with the parts package.

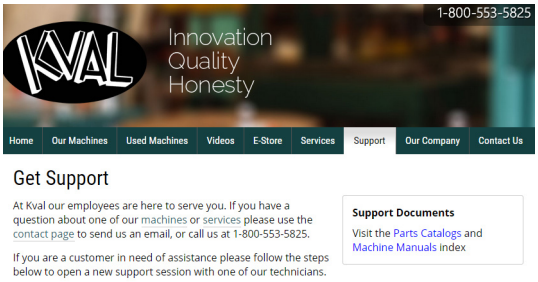
How to Download the Service Application

On machines with Windows (8.1 / 8 / 7 / Vista / XP) and an internet connection, our service team are able to connect, run, and troubleshoot your machine by way of the operator station.

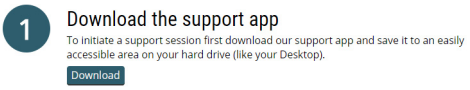
Download Application

.

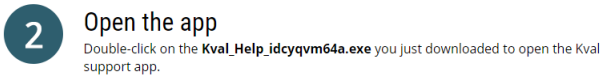
1. To download the application, go the KVAL website (http://www.kvalinc.com)
2. At the KVAL website, select the **Support** tab. Follow the instructions on the Support web page.



3. Click the Download button to download the application that allows the KVAL technician to have access to the operator station.

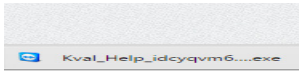


4. After the download is completed, double-click the program icon.

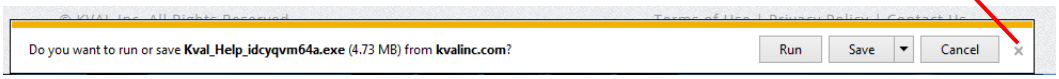


Note: Web browsers have different methods of downloading programs. Below are samples of i.e Explorer and Google web browsers.

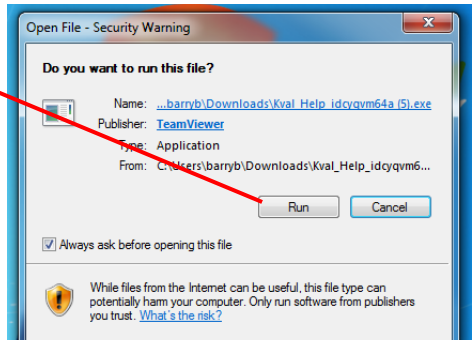
Sample of Google Browser: Located at the bottom left of the screen.



Sample of i.e Explorer: Located at the bottom of the screen. select the **arrow** and choose **Save and Run**

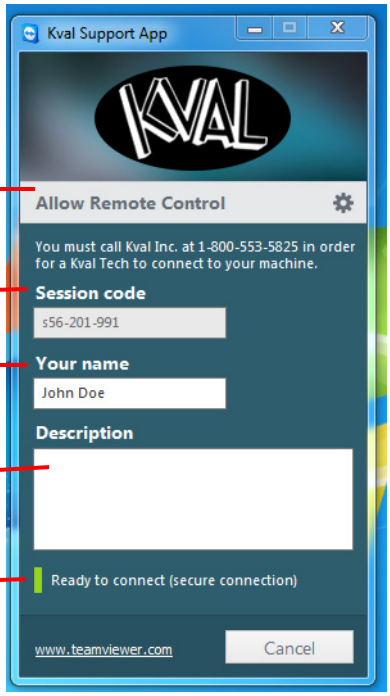


5. A pop-up window is displayed. Accept the request to run the program.



Note: Security settings may differ from plant to plant. If issues occur, contact your IT department.

6. The interface of the **KVAL Support App** will be displayed. Enter your name in the **Your Name** field. The fields are described below:



Allow Remote Control: Program is ready to allow technicians to access machine computer

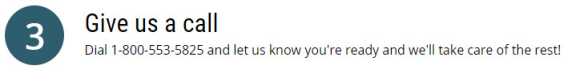
Session code: An internal number to track this machine. It is auto filled.

Your Name Field: Enter your name. The KVAL technician will use this field to identify this machine.

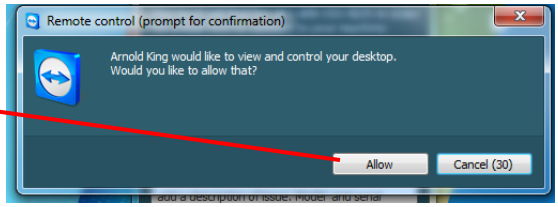
Description: Enter machine Serial number and issue.

Indicator: Green indicates there is a good connection to the service center. If red, there could be an issue with a LAN connection. Check the connections in the plant.

7. After the **KVAL Support App** is loaded and completed, call the KVAL service center(1-800-553-5825) and have the technician connect to the machine computer.



8. Click the **Allow** button to give the KVAL service technician permission to access the operator station.



We are now ready to troubleshoot.

Safety Sign-Off Sheet

Machine Model Number:_____

A Note to the Operator:

This machine can help you be highly productive only if you understand how to use it properly and follow the safe operating practices described in this document and the machine's manual. If you do not understand the machine's proper operation or ignore the safe operating practices, this machine can hurt or kill you. It's in your best interest to safely and properly operate this machine.

Personnel Safety Concerns:

- I have been properly trained in the operation of this machine.
- I will always wear ear protection when operating this machine.
- I will always wear eye protection when operating this machine.
- I will never wear loose clothing or gloves when operating this machine.
- I will watch out for other people. Make sure everyone is clear of this machine before operation.
- I will always follow my company's safety procedures. I have read and understand these guidelines.

Machine Safety Concerns:

- I have been given a tour of the machine and understand all the safety labels, E-Stops and the actions to take in case of an emergency.
- I will make sure all guards are in place before operation
- I will turn off the compressed air, before loading hardware (staples, screws, etc)
- I will turn off the electrical power, for setup
- If the machine should operate in an unexpected manner stop production I will immediately and notify a manager, a supervisor, or a qualified service technician.

I have read and understand this document and agree to operate this machine in a safe manner as described above.

Employee

Name (print):_____ **Signature:** _____ **Date:**____/____/____

Supervisor/Safety Officer/Trainer

Name (print):_____**Signature:** _____ **Date:**____/____/___

Note: It is recommended you make a copy of this sheet for new operators. If a copy is needed, you may download a PDF at the KVAL website (http://www.kvalinc.com). You may also contact our Service Department at (800) 553-5825 or email at service@kvalinc.com.

CHAPTER 2 About KvalCAM

The **KvalCAM** software includes a single **User Interface** to control the entire machine line. Each machine can also be controlled separately or as a collective. **Door Jobs** and **Features** from a library can be downloaded remotely and created at the station.The **KvalCAM** interface uses tabbed navigation to jump to desired screens.

Chapter 2 at a Glance

Section Name	Summary	Page
Summary of the KvalCAM Interface	A one page description of the KvalCAM interface.	page 2-2
About the Libraries Screen	Description of Libraries Screen. Includes: job creation, job editing, loading templates, and verifying job creation.	page 2-3
About the Machine Line Screen	Description of the Machine Line Screen.: Includes Line Control Buttons, Queued Jobs and Machine Activity.	page 2-14

Summary of the KvalCAM Interface

The **KvalCAM** software includes a single **User Interface** to control the entire machine line. Each machine can also be controlled separately or as a collective. **Door Jobs** and **Features** from a library can be downloaded remotely and created at the station.The **KvalCAM** interface uses tabbed navigation to jump to desired screens.

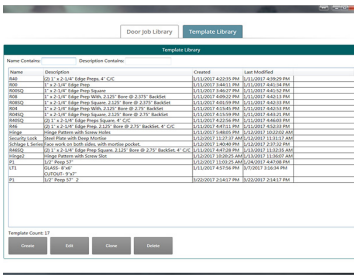
Libraries and Machine Line Screens

Below are screen shots that show the programming and machine line program operations

Libraries

Includes two tabs, the **Door Job Library** and the **Feature Group Library.** Create, edit, clone, delete, and download door jobs and door templates. Powerful and flexible database of door cuts.

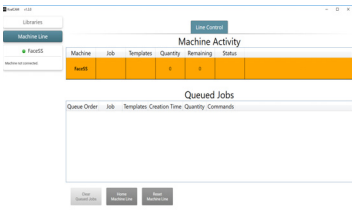
See “About the Libraries Screen” on page 2-3.



Machine Line

View the entire process of the machine line, queued jobs, quantity and remaining doors, and status of each machine. Some line control is available.

See “About the Machine Line Screen” on page 2-14.



About the Libraries Screen

Libraries add to the versatility of **KvalCAM**. The libraries are a working data base of stored cuts, door parameters, and door jobs.

A list of doors/door jobs is displayed under the **Door Job Library Tab** while feature groups are listed under the **Feature Group Library Tab**.

Door specifics can be created, edited, cloned (copied), or deleted directly at the Operator's Station. Select the **Libraries Tab** to jump to these screens.

Distinguish between the Door Job and Features Group Libraries

One can describe the **Features Group Library** as a virtual "scratch pad" and the **Door Job Library** as the engine to run the door through the cutting process.

In the **Features Group** creation screen, door cuts an be created and verified by way of the **Job Preview** screen.

In the **Door Job** creation screen, door cuts can be created, the door parameters stored and machining of the door can be processed using this information.

Detail	Feature Group	Door Job
Saves Cut Information	Yes	Yes
Saves Door Parameters	No	Yes
Number of Feature Groups Allowed	1	Many
Load Work Onto Machines (Cut Doors)	Yes	Yes

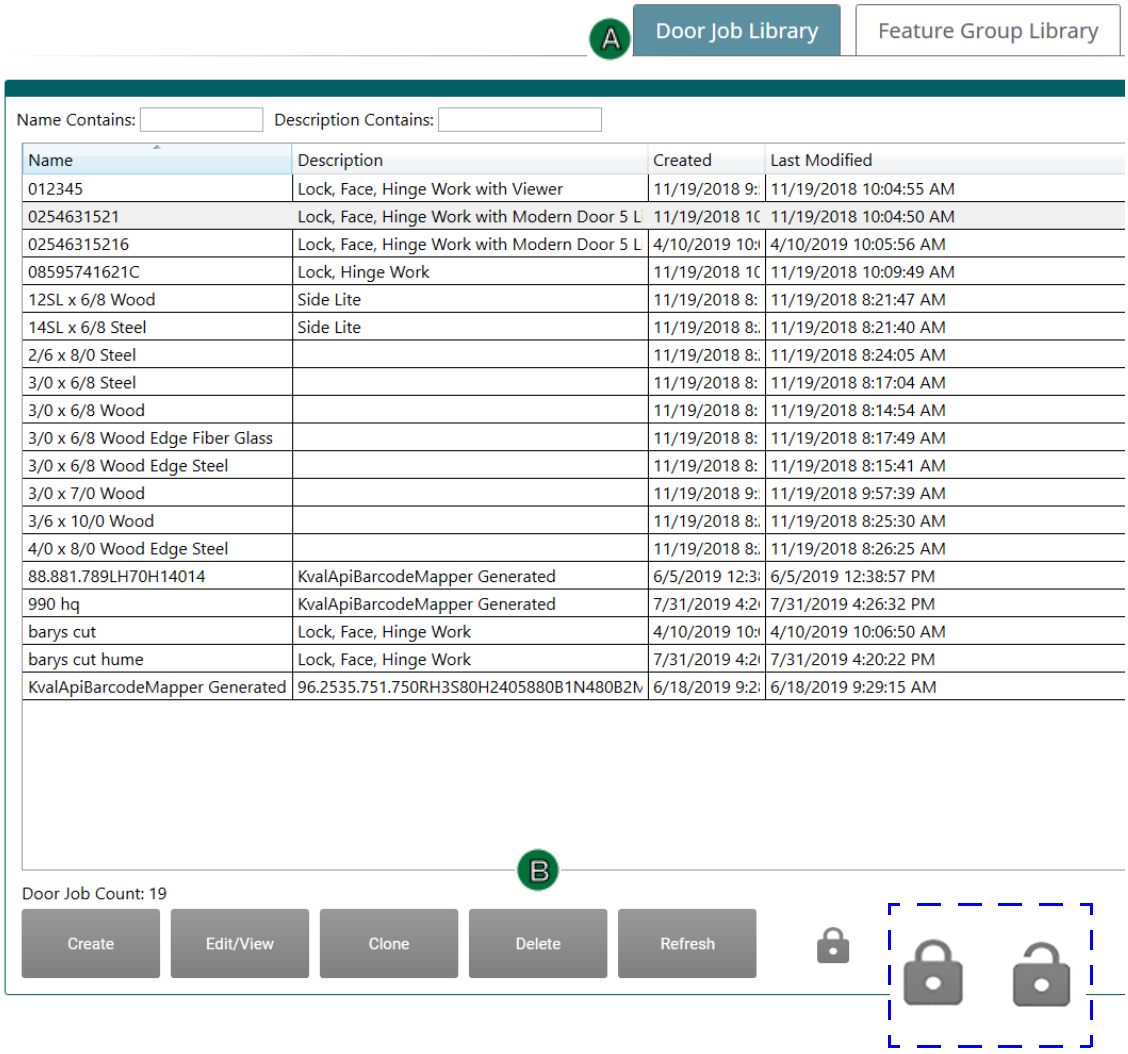
Library Screens

This section describes the **Library Screens**. Select the **Libraries Tab** then select **Door Job Library** or **Features Group Library** Tab depending on desired action.

Use the buttons at the bottom of the screen to create, clone, edit, or delete jobs or Feature Groups.

Lock editing capabilities and refresh tabs are also available.

Note: The **Door Job and Features Group Library** have the same layout and storage format.

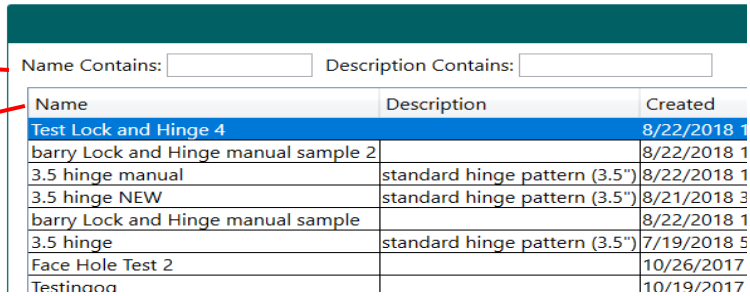


A About the Feature Groups and Door Jobs

These tables lists the available shapes. Click the desired Table Heading to sort by Name, Description, Date Created or Dated Modified. At the top enter key words to search by name or description.

Enter Key Word to search database

Click Heading to sort



Note: Names and descriptions for the **Door Job Library** are taken from the **Job Name** menu. See "About the Job Name Menu" on page 2-7

Note: Names and descriptions for **Features Groups a**re taken from the **Feature Details** menu. See "About the Selected Feature Details Menu" on page 2-9

B About the Library Buttons

Create Button:

Select this button to jump to the Job Creation Screen.

Create Door jobs using the Features or by down loading G-Code

Tip: Double Click a **Door Job** or **Template** from the table to display the **Job Preview Screen**

Door Job Count or Template Count: Lists the number of Door Jobs or Features Groups in the system

Edit/View Button:

Select a Template or Door Job.Either Edit a known Job / Template or use existing to run doors. Jumps to the Job Creation Screen

(The Most Common Path way to start the door Machining Process)

Clone Button:

Select a Template or Door Job from the list to copy and rename.

Delete Button:

Select a Template or Door Job from the list to Delete.

Refresh:

Select to re-read the database.

Unlock/Lock:

If **Door jobs** or **Features Groups a**re locked, click add password to edit the database.(Customer requested option)

About Job Creation

This section describes the functions available on the Job Creation screen. Create, edit or, view Door Job or Feature Groups at this screen.

This section describes the functions available on the Job Creation screen. Create, edit or, view Door Job or Feature Groups at this screen.

Note: Sample of face, lock, and hinge job creations are located in th appendix of this manual. See “Appendix: Job Preview Examples” on page 2-21

Note: For a sample of validation errors,see “Appendix: About Validation” on page 2-24.

Create

To create a new **Door Job or Template**, select the **Create** button at the bottom of the screen.

Edit/View

To edit or view a created **Door Job or Template**, select the item from the table, then select the **Edit /View** button on the bottom of the page. bottom of the screen.

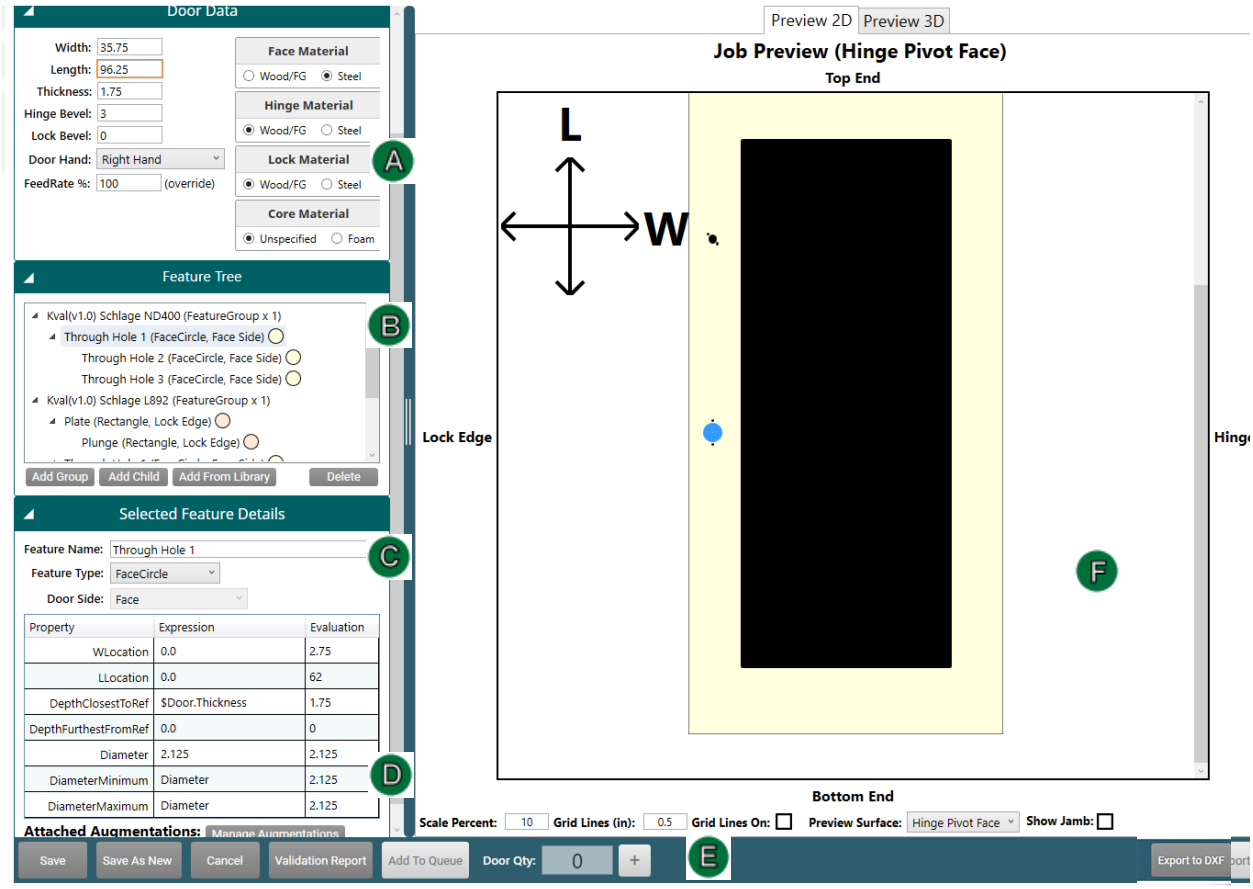
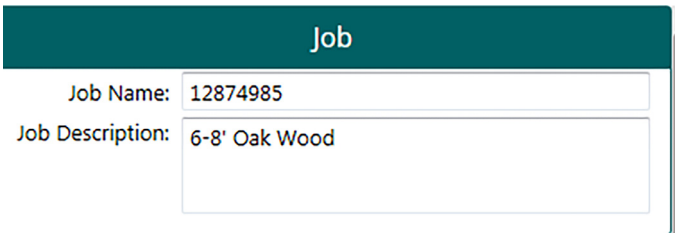


FIGURE 2-1. Screen Shot of Job Creation

About the Job Name Menu

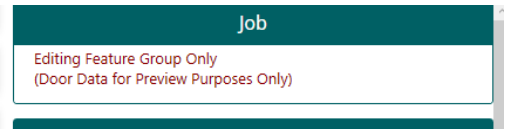


Job Name: Job Name is displayed in the Library page.

Job Description: Additional text field to describe the job Displayed in the Library page.

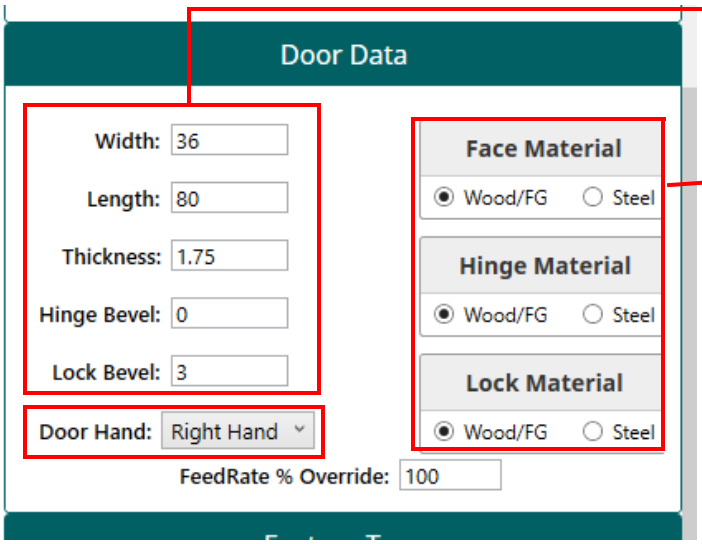
Note: Since Features Groups are used for preview only purposes, no name or description is needed., Names for Features Groups are taken from the **Feature Details** menu. See "About the Selected Feature Details Menu" on page 2-9

Screen Shot From Template Job Creation Screen



About the Door Data Menu

View, edit, or create the door parameters to be processed.



Door Parameters: Displays the basic parameters of the door being processed. If creating a door enter the parameters.

Door Material: Select type of material of the Face, Hinge side, and Lock side of the door. (Wood, Fiber -Glass, or Steel)

Door Hand: Select the Hand Orientation of the Door. From the drip down menu, select:

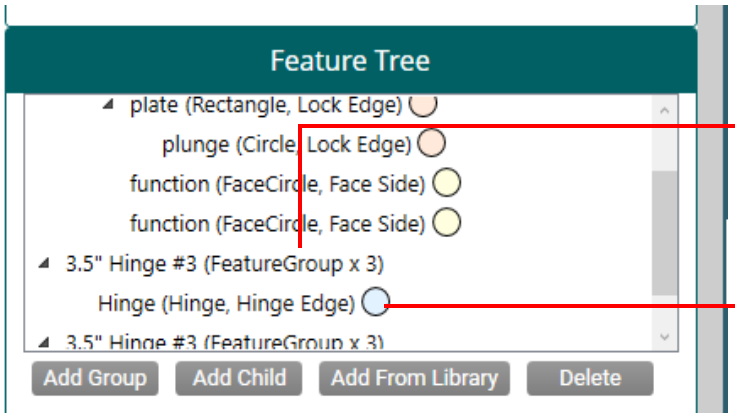
- Left Hand'
- Right Hand
- Left Hand' Reversed
- Right Hand Reversed

FeedRate% Override: Adjust the plunge rate of the drill / routers. Adjusts to door materials. For example, for a harder material would call for a lower percentage.

Note: Changes in the door parameters and door hand are reflected in the **Job Preview** menu. The door illustration will change in shape.

About the Feature Tree Menu

View, edit, or create features of the door. Also known as “Group” or “Template”, a Feature Group is a container in which individual or multiple features can be loaded to process a door. Feature Groups operate at the top level of the feature tree, from which **child** features branch out.



Feature Group: Top level of the door cut. Contains the Child Features.

Child Features: Cuts that are part of the Feature Group. In this example: a Plate is being processed on the Lock Edge of the door. The Plunge is the Child of the Plate Cut.

Add Group: Select to create a new Group Features can be created in the **Features Details** Menu

Add Child: Select to create a new child to a group or child.

Add from Library: Select to add a template from the L**ibrary**

Delete: Select to delete a **Group or Child**

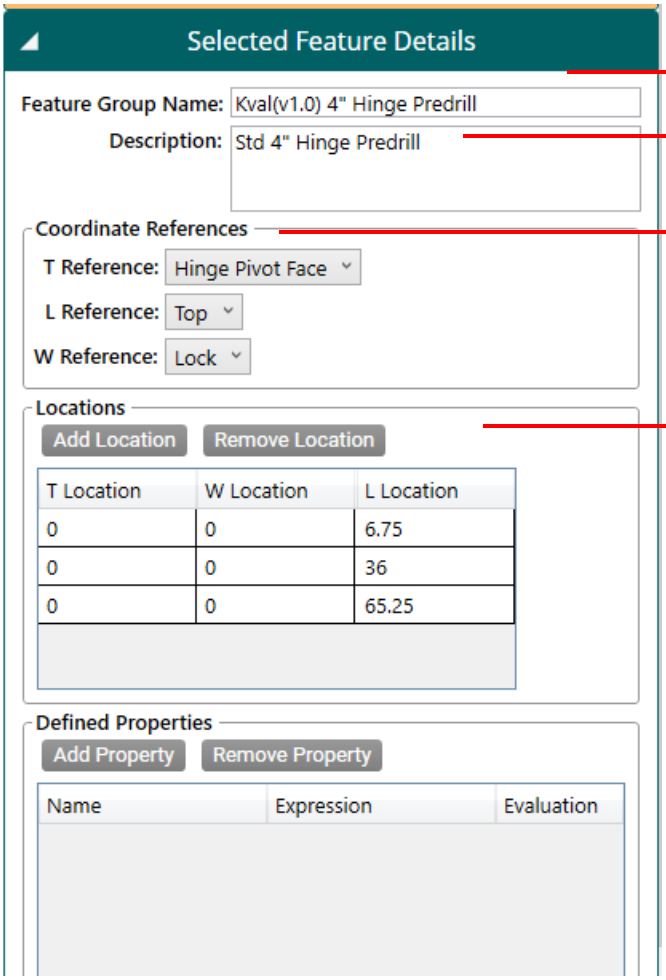
Notes/Tips:

- **Color Coded:** Indicators next to the **Child Features** are color coded to reflect the location on the door. (Hinge Edge, Lock Edge, Hinge Pivot Face, Opposite Hinge Pivot Face, Top End, Bottom End).
- **Validation:** If a cut is not correct, the offender will be highlighted by an orange rectangle in the Feature Tree Menu. Use the **Validation** tool to find the error.
- **Cut/Copy and Paste**: Select a Group or Child. Right click the mouse button. Choose Cut or Copy from the list. Position mouse at the desired location in the tree. Right click and choose Paste.

About the Selected Feature Details Menu

All Feature Groups have their own L (Length), T (Thickness), and W (Width) location that is separate from the features contained inside. This allows the user to quickly move groups to new locations or to duplicate groups in multiple locations.

Note: The figure below shows a **Hinge Cut** example.



Feature Group Name: This field is required when saving a new template.

Description: Description of the Feature Group

Coordinate References: Set the reference in relation with the cut. The reference option will be displayed in **Job Preview.**

T (Thick) Reference:

- Hinge Pivot Face
- Key Face
- Opposite Key Face
- Opposite Hinge Pivot Face

L (Length) Reference:

- Bottom
- Top

W (Width) Reference:

- Lock
- Hinge

Locations: Add, Remove, Edit the Select the location of the Group Cut

In this example, the hinge locations are located 6.75",36.0" and 65.25" with a reference from the top of the door.

Defined Properties: Create a custom property to be used for the selected Feature Group. In most cases, a Defined Property is created to simplify changes in a commonly used parameter in a Door Job.

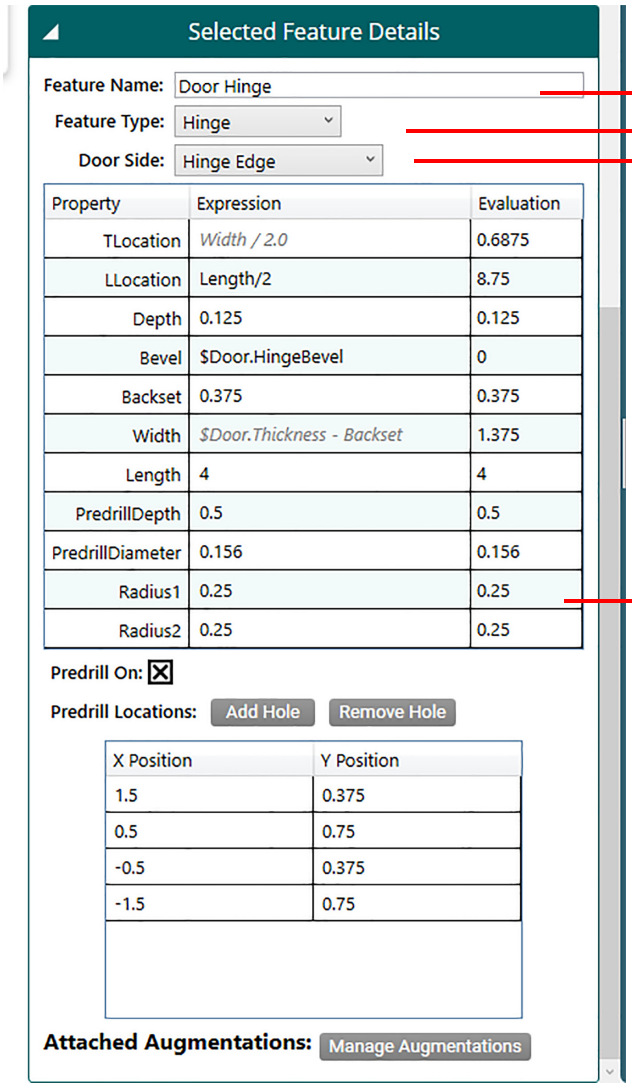
Select **Add Property.** Add a Name and Expression. Error checking will help in adding the correct data.

In the Children Feature Detail Screen, add a hashtag (#) in front of the created property name.

About the Selected Feature Details Menu (Child Level)

Features are created by adding children to a feature group. All features are specific cuts that can be made on a door. Feature Types for this line include Rectangle, Circle, Hinge, Tee-Shape, and LiteCutout, each with their own parameters and validation requirements.

Note: The example below is the parameter of the Hinge Cut form the previous page. The example below details the parameters of the hinge cut. Predrill locations are also included in the example.



Feature Name: Name of The Feature Under the Group.

Feature Type: Select type of cut:

- Circle
- FaceCircle
- FaceRectangle
- Hinge
- Rectangle
- TeeShape
- LiteCutout

(See "About the LiteCutout Feature Detail" on page 2-26.)

Door Side: Select Door Side:

- Bottom End
- Top End
- Hinge Edge
- Lock Edge
- Hinge Jamb
- Lock Jamb

Data Table: Parameters of the cut. Includes Hinge Predrill locations.

Manage Augmentations: Add augmentations to the created Feature. Augmentations are created at the factory to ad to common cuts.

About the Control Buttons

The Control Buttons are located at the bottom of the screen. The first 4 buttons are related to saving or editing Feature Groups or Door Jobs. The last button (Add to Queue) relates to running doors through the process.

Save:

Select to Save all a new Door Job or save Edits to a Job

(Password Protected)

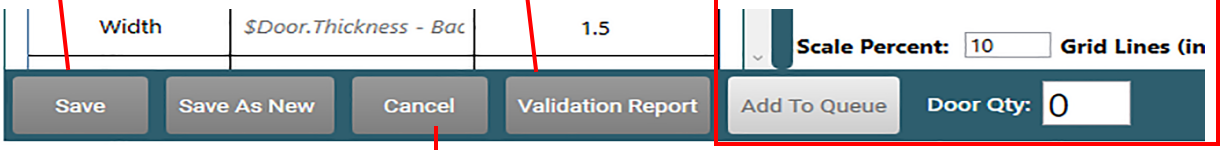
Validation Report:

If errors are displayed, select to troubleshoot the issue. See “Appendix: About Validation” on page 2-24.

Add to Queue and Door Qty:

The first step of door processing.

Enter the quantity of doors to be processed in the **Door Qty Box** then select the **Add to Queue** button to start the process.



Save as New:

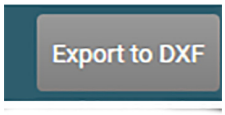
Make adjustments to an existing cut pattern and save as another file.

Cancel:

Select to quit this screen and jump back to the Library screen.

Export to DXF:

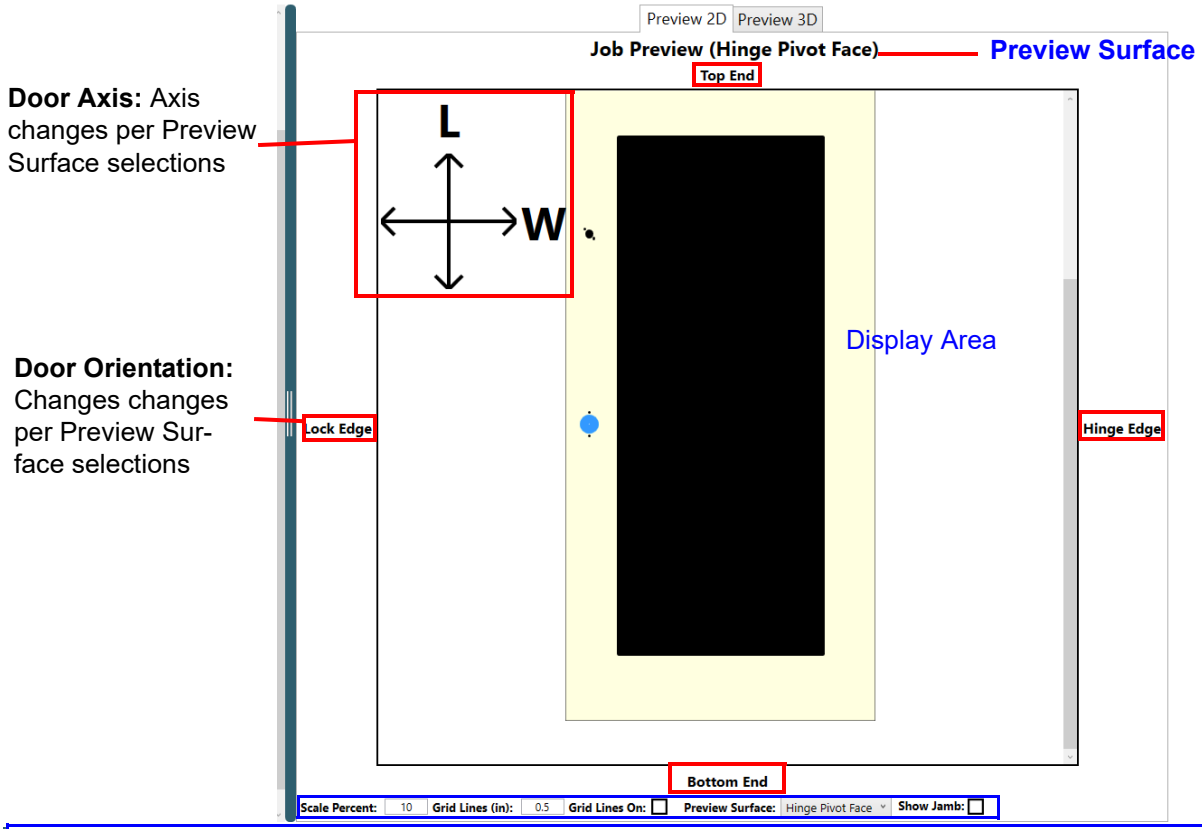
Select the **Export to DXF Button** to create a blueprint of the Door Job. The background program will translate the parameters to a *dxf* file. To view the file use a program that opens.dxf files. (For example: Auto-Cad® Draftsight®) Use this blueprint to share for review.

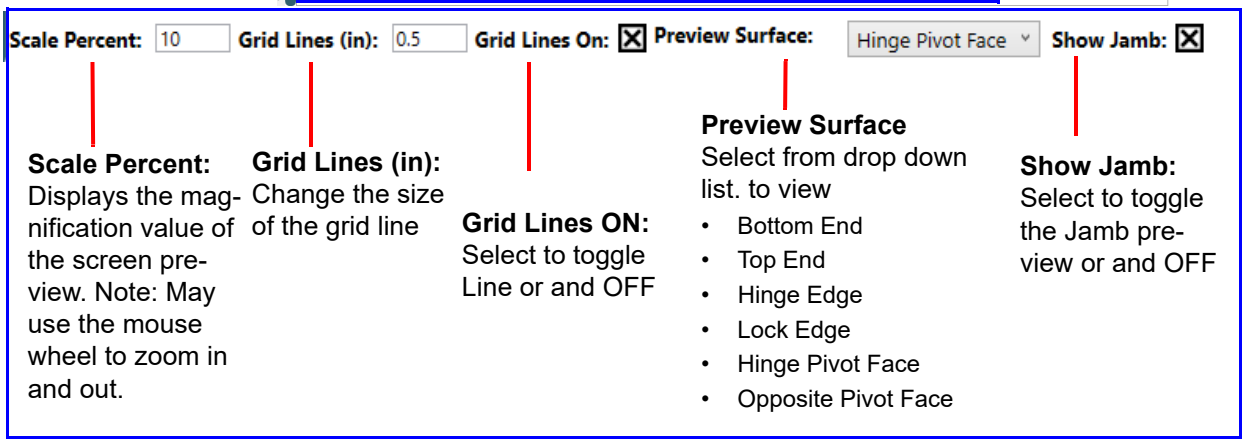


About the Job Preview Screen (2D and 3D)

The **Job Preview** screen is a interactive graphical representation of the Feature Group parameters. The door can be viewed from different perspectives and can be zoomed in and out.Viewing the door graphically before cutting. this offers opportunities to edit or verify the door. For samples of screens, see “Appendix: Job Preview Examples” on page 2-21.

2 D Screen

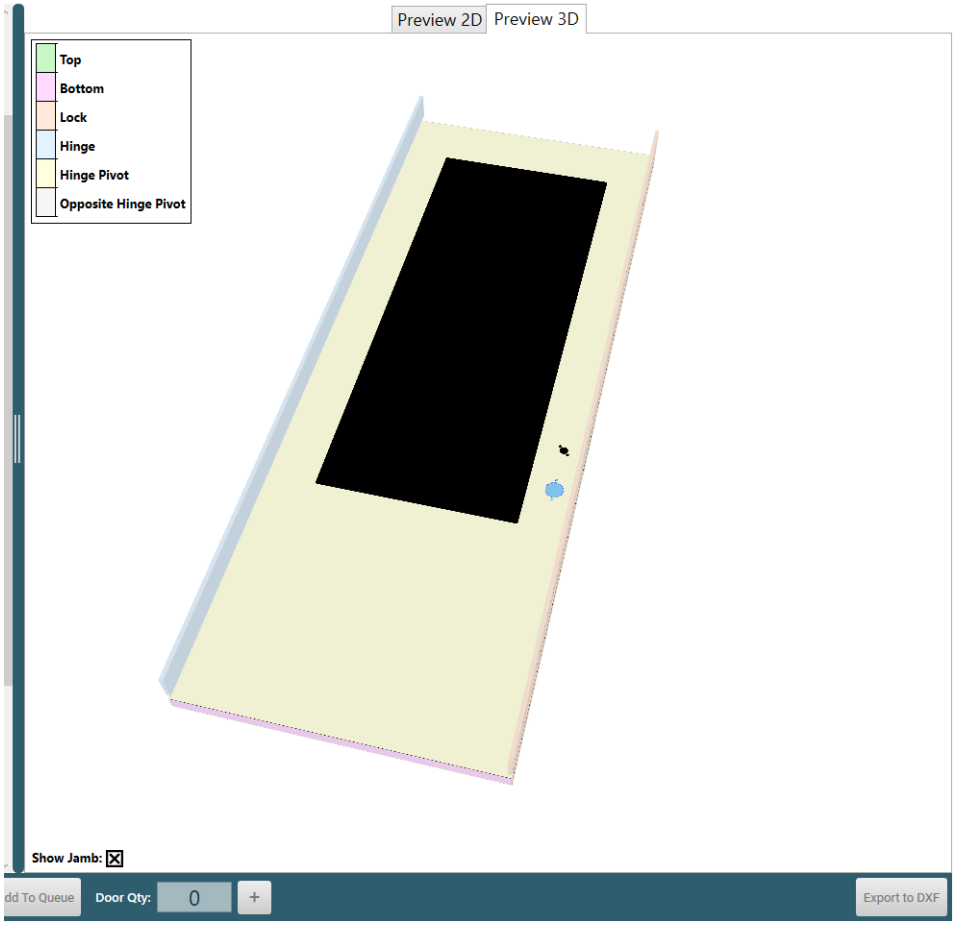




3 D Screen

Select the 3 D Tab to display a three dimensional view of the Door Job. Right click the mouse to control the movement of the 3 D display.

The **Preview Surfaces** are color coded and listed on the display.

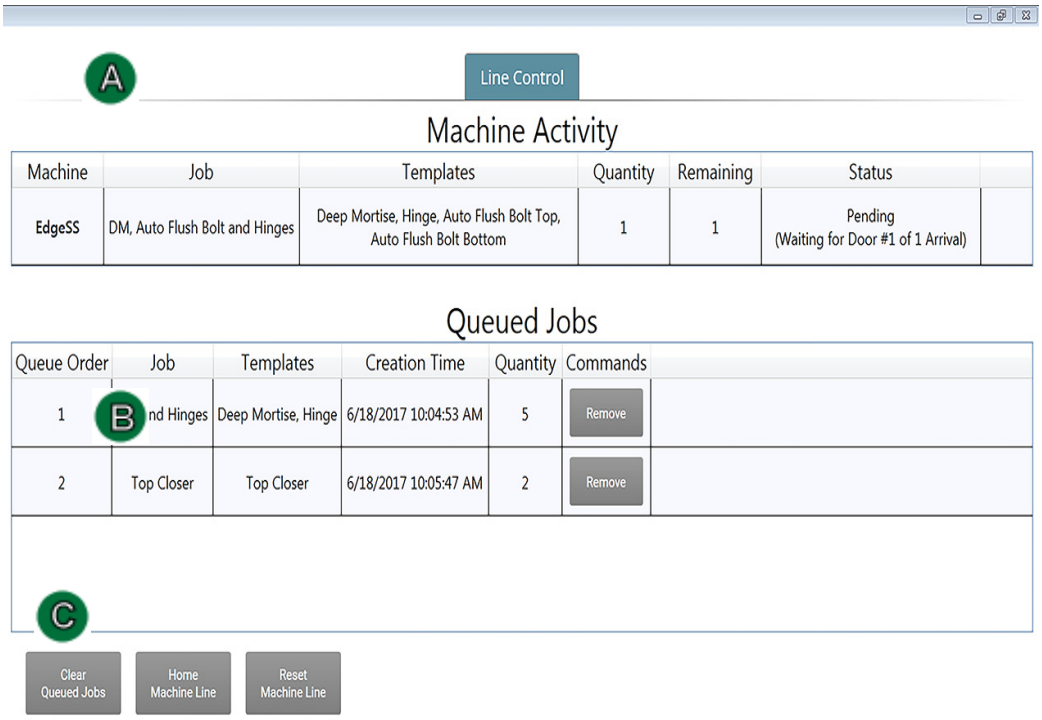


About the Machine Line Screen

The **Machine Line Screen** offers a snapshot of the operation of the entire machine line. Select the **Machine Line Tab** on the left side of the screen to jump to this screen. This includes:

	Menu	Description
A	Machine Activity	For each machine, a table shows job name, quantity of remaining doors, doors being processed, and status of the machine.
B	Queued Jobs:	Shows a list of the upcoming jobs.
C	Line Controls:	Common operations to control the machine line

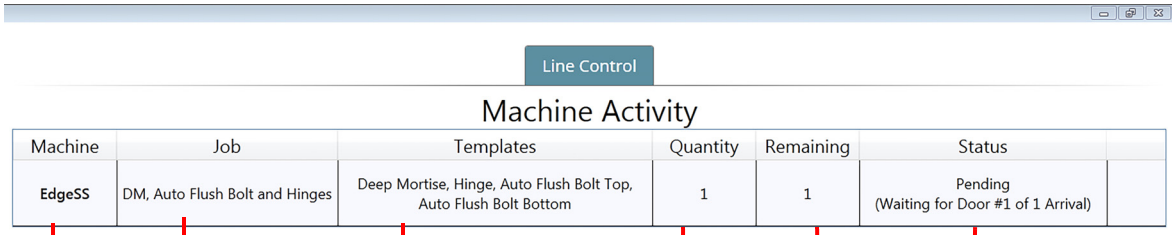
Machine Line Screen



About the Machine Activity Section

The **Machine Activity Section** shows the processing information of each machine. The rows are coded.

- **Green:** Actively working on a door job
- **White:** Machine is idle
- **Orange**: Machine is paused.



Templates: Description of the types of cuts that are being used.

Status: Lists the status of each machine.

Quantity: Lists the quantity of doors at the start of the Door Job

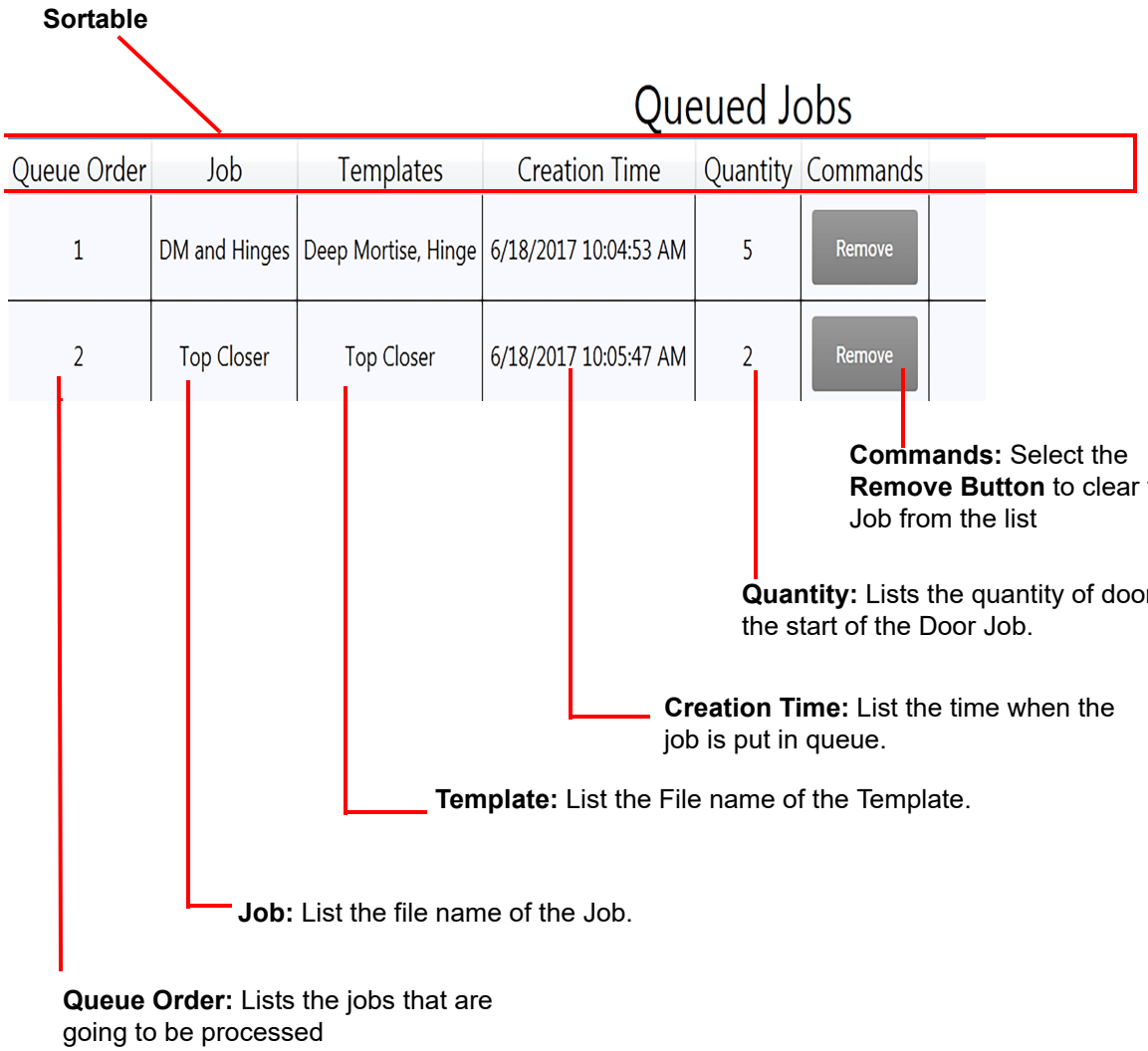
Remaining: Lists remaining quantity of doors left in the Door Job

Job: Lists the name of the Job being processed. The Job name reflects the name assigned in the Door Job Library.

Machine: Lists the machines in the line.

B About the Queued Jobs Section

The **Queued Jobs Section** shows the door jobs in order of processing. This table can be sorted by title.



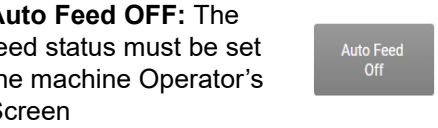
About the Line Control Buttons

The **Machine Activity Section** contains a table that shows the processing information of each machine. of each machine. The rows are color coded.

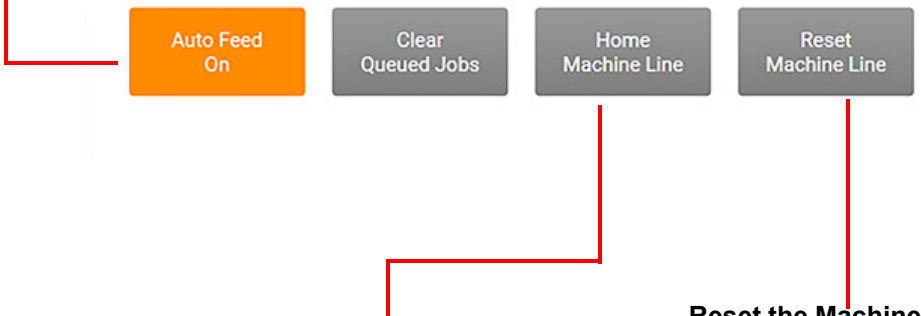
Auto Feed: Select to toggle the machine between Auto Feed ON or Auto Feed OFF.

Auto Feed ON: The door will automatically feed through each machine.

Auto Feed OFF: The feed status must be set the machine Operator's Screen



Clear Queued Jobs: Press to clear the entire list of door jobs in the Queued Job table.



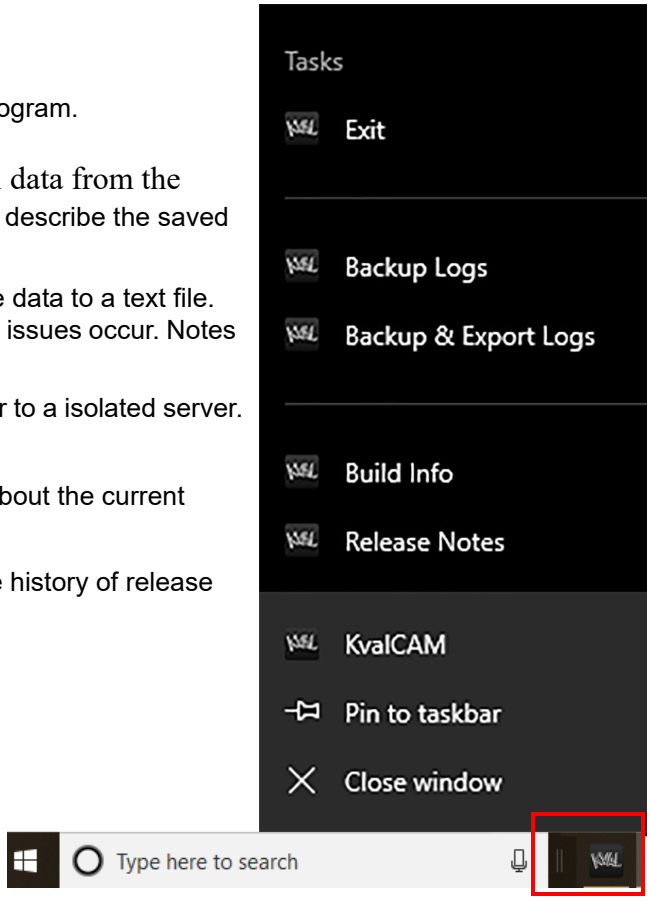
Home the Machine Line: Press to Home every machine in the line

Reset the Machine Line: Press to reset the every machine in the line. You Must Home the line after this reset is performed.

About Backing up Data and Checking the Revision Status

Right Click the KVAL Icon at the bottom of the screen to display this popup.

Note: Select icon from the windows screen and drag to the favorites bar for access to this icon.



Exit: Select to close the running KvalCAM program.

Backup Logs: Select to save the to save all data from the machine operation. Notes may be added to describe the saved file.

Backup and Export: Select to send machine data to a text file. The file may be sent to Service Support if any issues occur. Notes may be added to describe the saved file.

Note: Kval recommends backing up locally or to a isolated server.

Build Info Select to view upper level notes about the current build.

Release Notes: Select to open a PDF of the history of release notes on this version o software.

Definitions

Term	Definition
Library:	Working database for stored cuts (which are stored in the Template Library) and doors/jobs (which are stored in the Door Job Library)
Job Name:	Name the Job that reflects the best description in your working environment.
Job Description:	Additional text field to describe the job when similar names are being used.
Created:	Date in which the feature or saved door/job was created.
Last Modified:	Date in which the feature or saved door/job was last modified.
Face Material:	Material that will be run on either Face of the door.
Hinge Material:	Material that will be run on the Hinge Side of the door. Wood/FG is the only valid material type to run on the Hinge Side for this line.
Lock Material:	Material that will be run on the Lock Side of the door.
Feature Group	Also known as “Group” or “Template”, a Feature Group is a container in which individual or multiple features can be loaded and cut into a door. Feature Groups operate at the root level of the feature tree, from which child features branch out. All Feature Groups have their own L, T, and W location that is separate from the features contained inside. This allows the user to quickly move templates to new locations or to duplicate templates in multiple locations (by adding new locations to the group).
Feature Group Name:	This field is required when saving a new template.
Feature	Features are created by adding children to a feature group. All features are specific cuts that can be made on a door. Feature Types for this line include Rectangle, Circle, Hinge, Tee-Shape, and G-Code, each with their own parameters and validation requirements.
Door Side:	Selection for which side of the door that a feature will be run on.
L Axis:	Located on the Door Preview Screen, the L (length axis) is represented visually with changes of door reference.
W Axis	Located on the Door Preview Screen, the W (width axis) is represented visually with changes of door reference.
T Axis	Located on the Door Preview Screen, the T (thickness axis) is represented visually with changes of door reference.
Expression:	Inputted values by the user for an intended feature. The input is interpreted by the program and passed through a validation scheme for all machines in a line to determine if the intended cut is capable of being run (see validation).

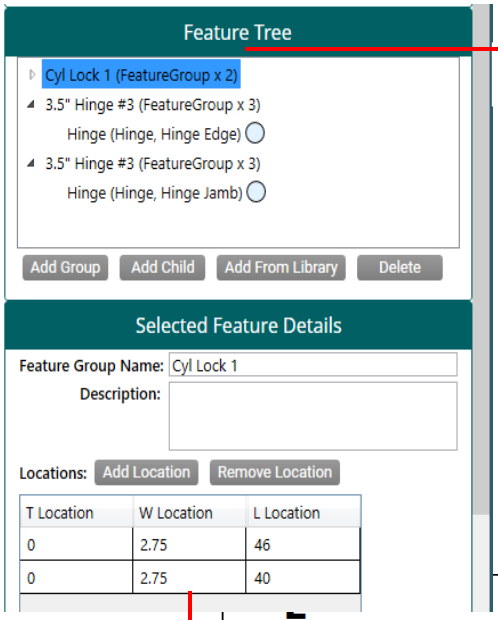
Term	Definition
Validation	All feature groups are analyzed by a validation routine before the software permits the operator to download the programmed cut to the machines for processing. The validation routine queries the capabilities of each machine and current tools loaded to determine if the programmed cuts can be performed by the line. If at least one machine in the line is capable of performing each cut / feature in the group, the group will be considered valid and the Add to Queue button will be enabled. If any feature or cut fails validation, however, a Orange or Red box will be highlighted over the faulty cut / feature for review and the Add to Queue button will be disabled. Red only appears if the expression cannot be interpreted to a real number for validation, while orange appears if the line cannot perform the cut.
Validation Report	Validation Report identifies particular faults that would cause a feature to fail validation. Each feature has its own validation tests and will fail if the tests for a valid feature are not satisfied. Clicking on a specific test will provide an explanation of the test being performed so that the user can correct the mistake. Validation will only work if the information that is fed to the machine line is accurate. Inaccurate information that is downloaded from Tool Configurations, Calibrations, or Libraries (e.g. material types) will produce unexpected or potentially harmful results to the machine and/or operator. Some cuts in fringe cases may pass validation that result in non-conforming cuts (cut does not match visual representation).

Appendix: Job Preview Examples

This section shows some examples of the **Feature Tree to Job Preview Screen** relationship.

Door Face (Lock Preview)

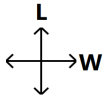
Below is a example of a door lock preview form the face viewpoint.



Highlight the item from the **Feature Tree**.

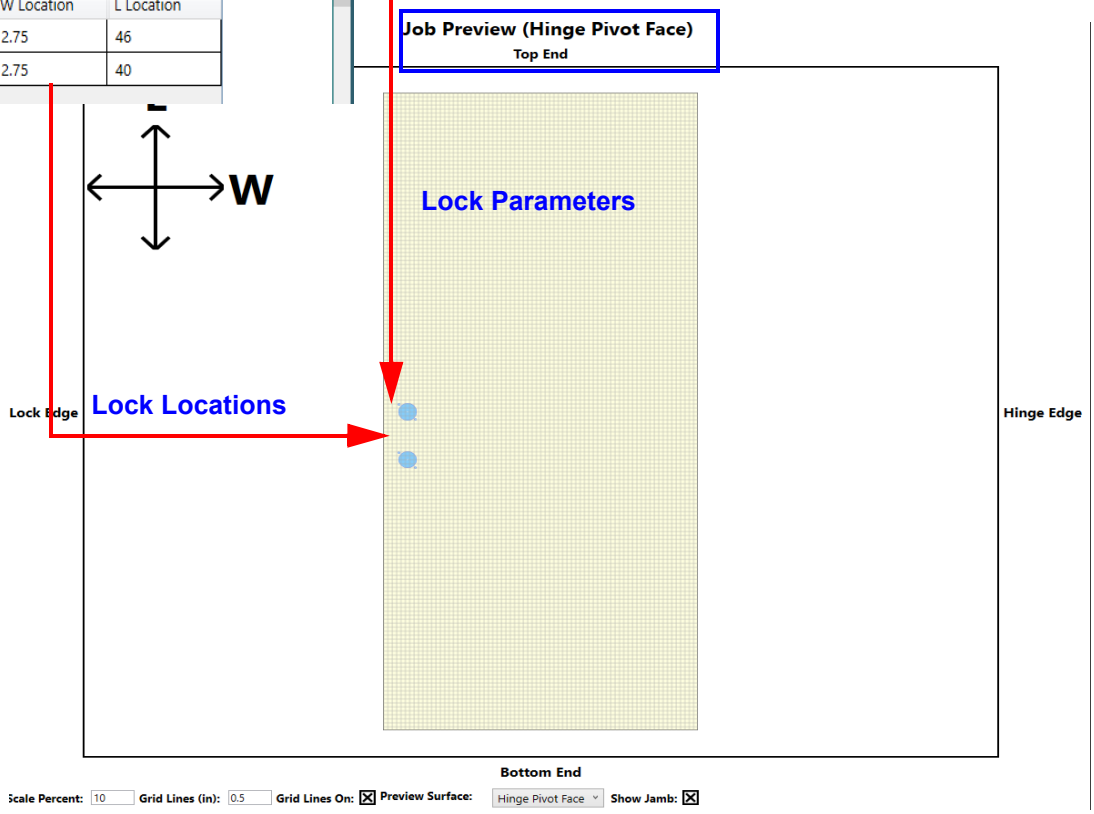
The Preview Screen will display the cut from the feature group point of view.

Note the Axis indicator (Length and Width) for a quick reference.



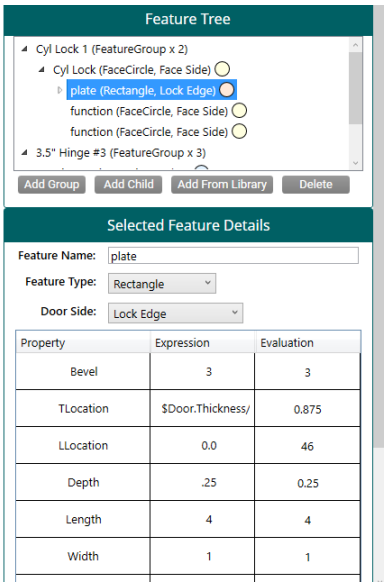
Note: Errors will be indicated by an orange box around the parameter.

Note: Change views by using the manual view buttons at he bottom of the screen.



Door Edge (Lock Preview)

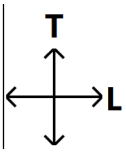
Below is a example of a door lock preview form the face viewpoint.



Highlight the item from the **Feature Tree.**

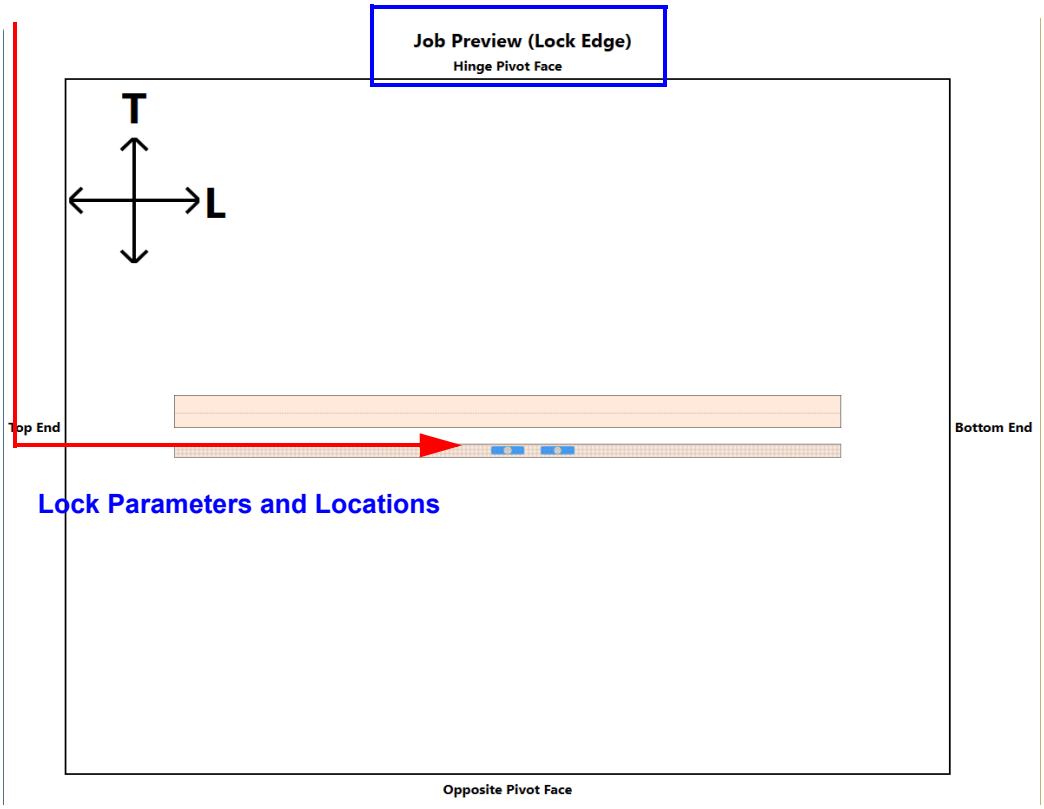
The Preview Screen will display the cut from the feature group point of view.

Note the Axis indicator (Length and Width) for a quick reference.



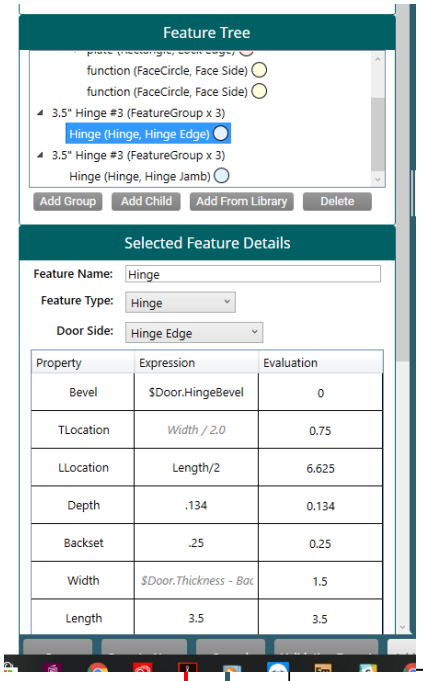
Note: Errors will be indicated by an orange box around the parameter.

Note: Change views by using the manual view buttons at he bottom of the screen. S



Door Edge (Hinge Preview)

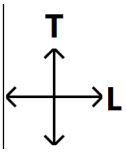
Below is a example of a door lock preview form the face viewpoint.



Highlight the item from the **Feature Tree**.

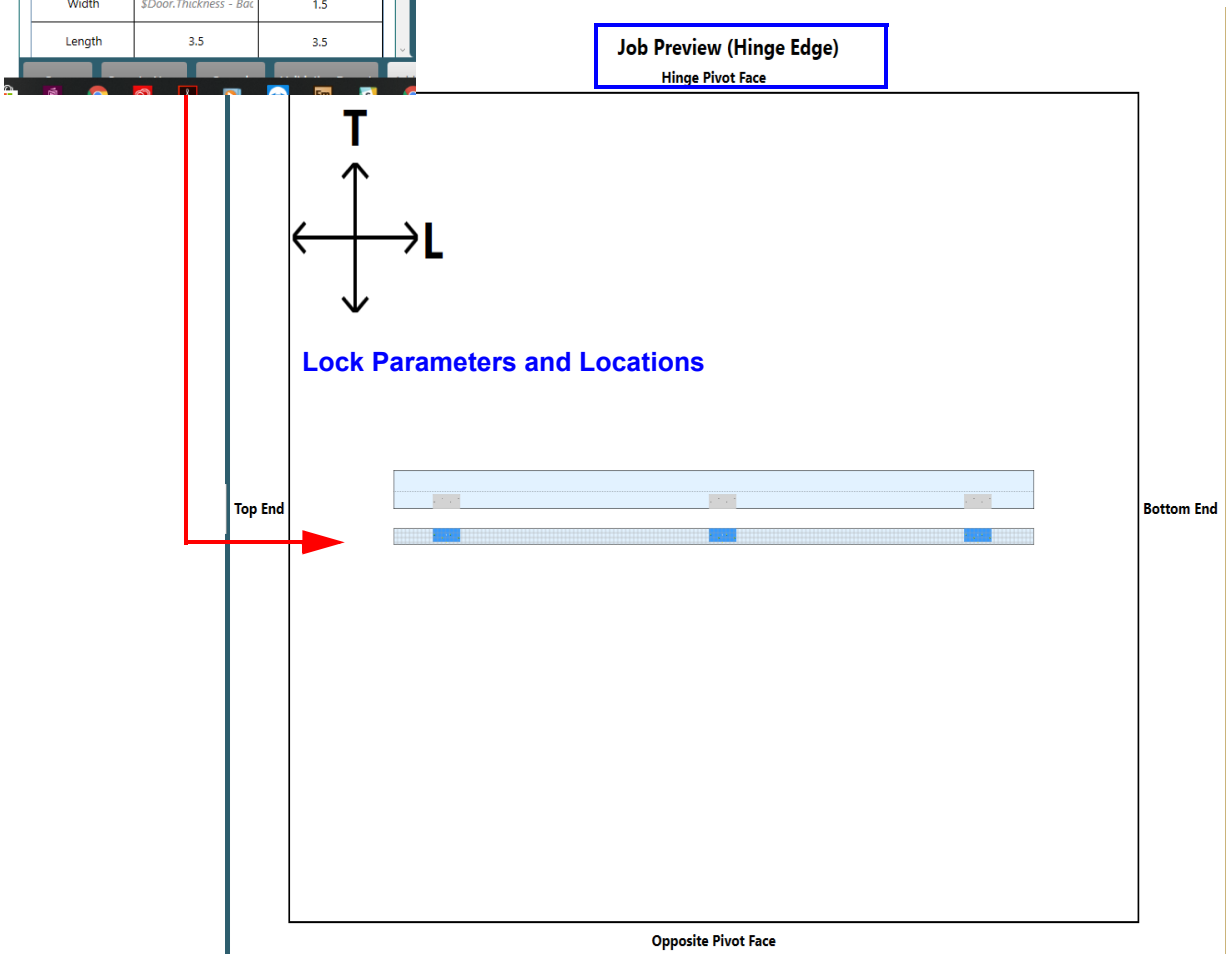
The Preview Screen will display the cut from the feature group point of view.

Note the Axis indicator (Length and Width) for a quick reference.



Note: Errors will be indicated by an orange box around the parameter.

Note: Change views by using the manual view buttons at he bottom of the screen.

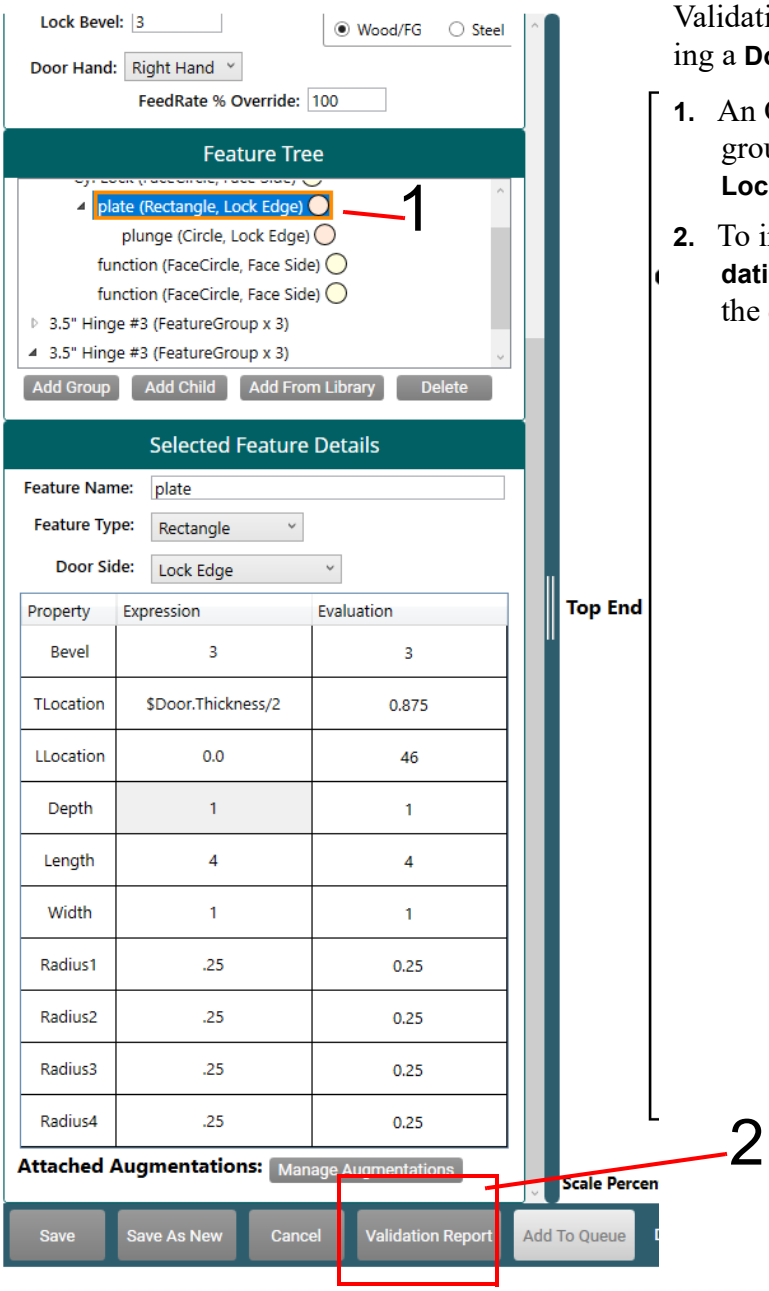


Appendix: About Validation

This section describes an example of validation error.

KvalCAM has a built in error checking routine. Any errors in the door job will be highlighted with instructions to fix the error.

This is a sample of an incorrect depth parameter.

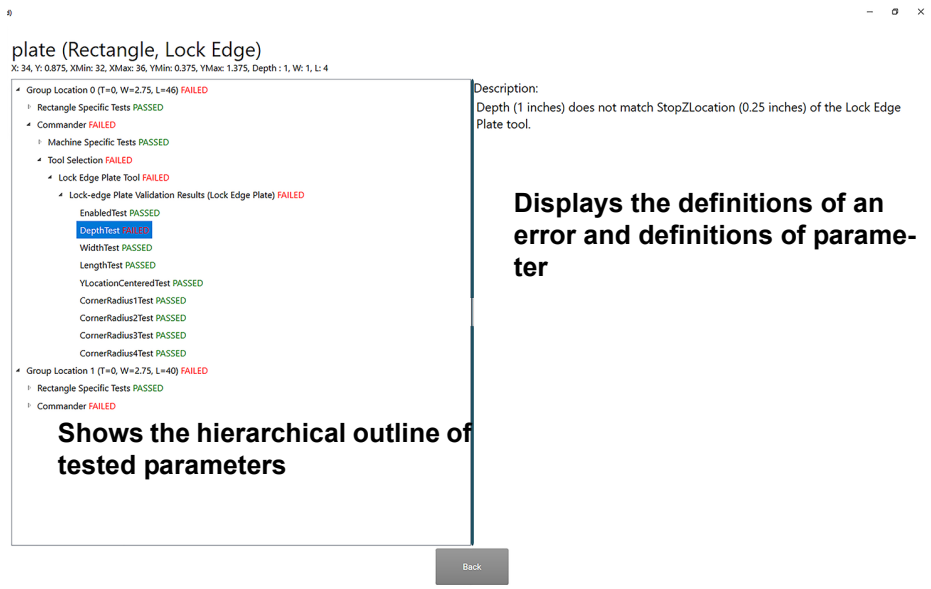


Validation error is discovered when creating a **Door Job.**

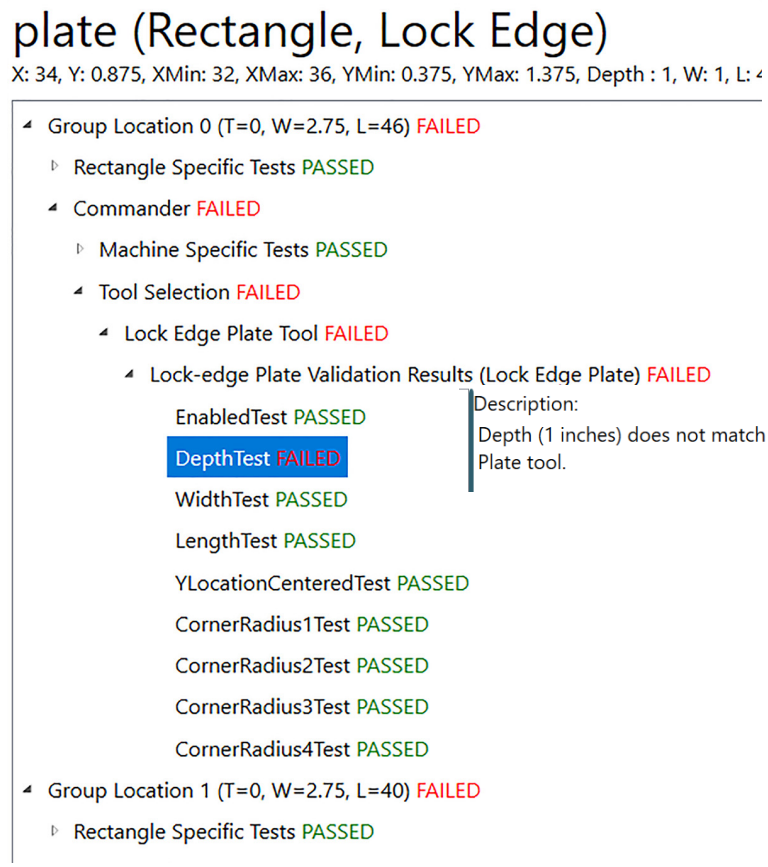
1. An Orange Box will highlight the group with an error. In this sample, the **Lock Edge Child** has an error
2. To investigate the error, select the **Validation Report** button at the bottom of the display.

About the Validation Screen

The Validation Screen displays a nested outline of the error cause.



Outline



Tile displays the dimensions of the Feature Group

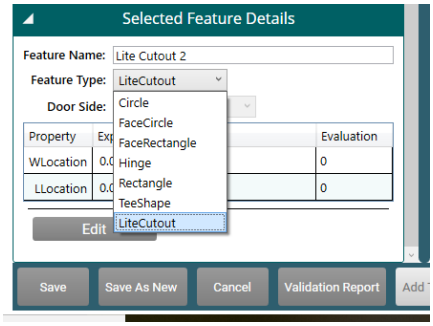
Each child/node is listed under the selected group

In this case, there is an error in the Lock Edge routine

Either change the depth in the table of the Feature Table or select **Commander 3-Tool Config- Lock Tools** and change the depth in the **Depth Stop (Z Location)** field to match desired depth.

About the LiteCutout Feature Detail

The LiteCutout is a **Feature Type** selection. With this feature type, DXF (Drawing Exchange Format) files can be imported, manipulated on a separate screen, and brought back in to **KvalCam** to be processed.

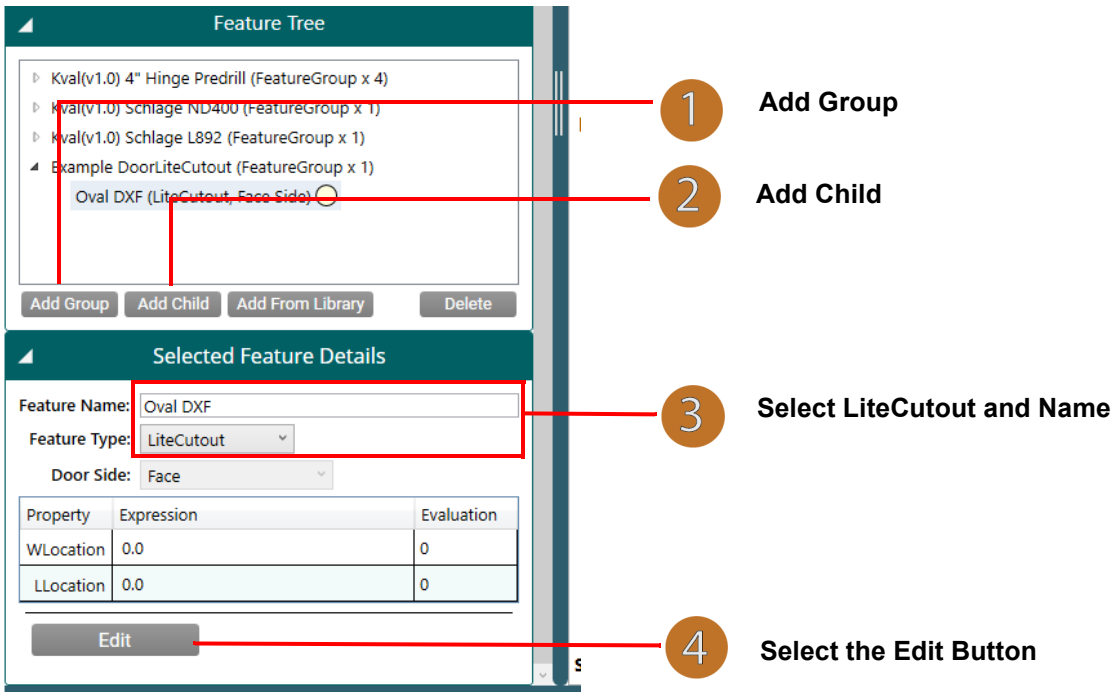


Process

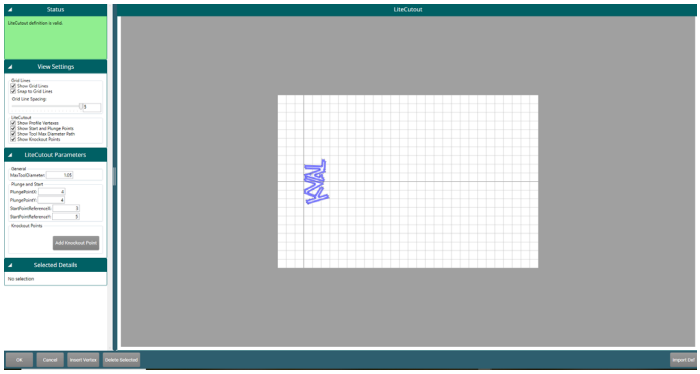
This procedure details the steps to crate a new **LiteCutout** Feature. For detailed descriptions of the **LiteCutout Screen**,see “About the LiteCutout Screen” on page 2-29.

To add a new **LiteCutout**:

1. If needed, add a **Feature Group.**
2. Add a **Child** to the **Feature Tree**.
3. Select **LiteCutout** from the **Feature Type** drop down menu and add a **Feature Name**.add a Feature Name.
4. Select the **Edit Button**.

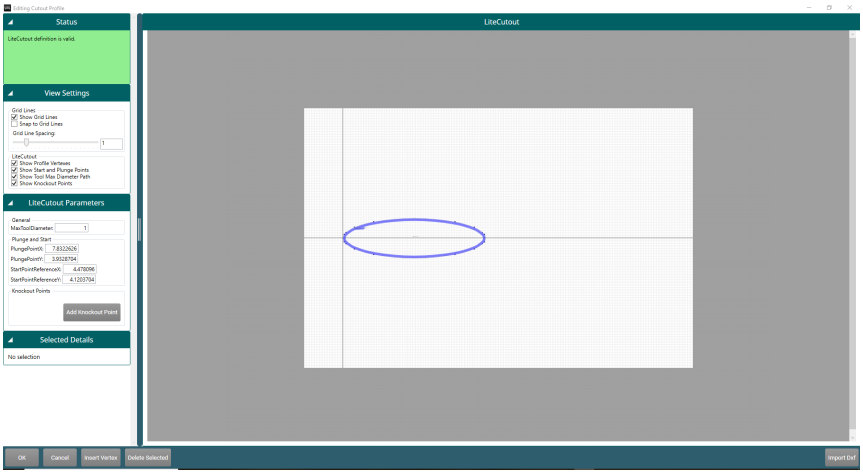


5. The **LiteCutout** working space is displayed.



6. Select the **Import DXF Button** and select the desired file from your directory. If needed, manipulate the shape.

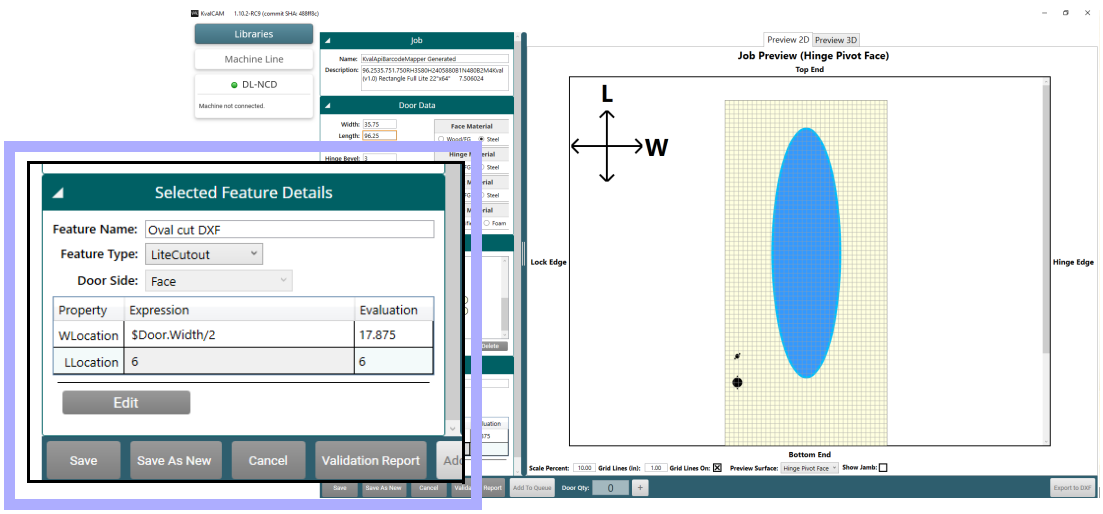
Import DXF file



In this example, an oval DXF file was imported.

7. or add the file into **KvalCAM** by selecting the **OK Button.**

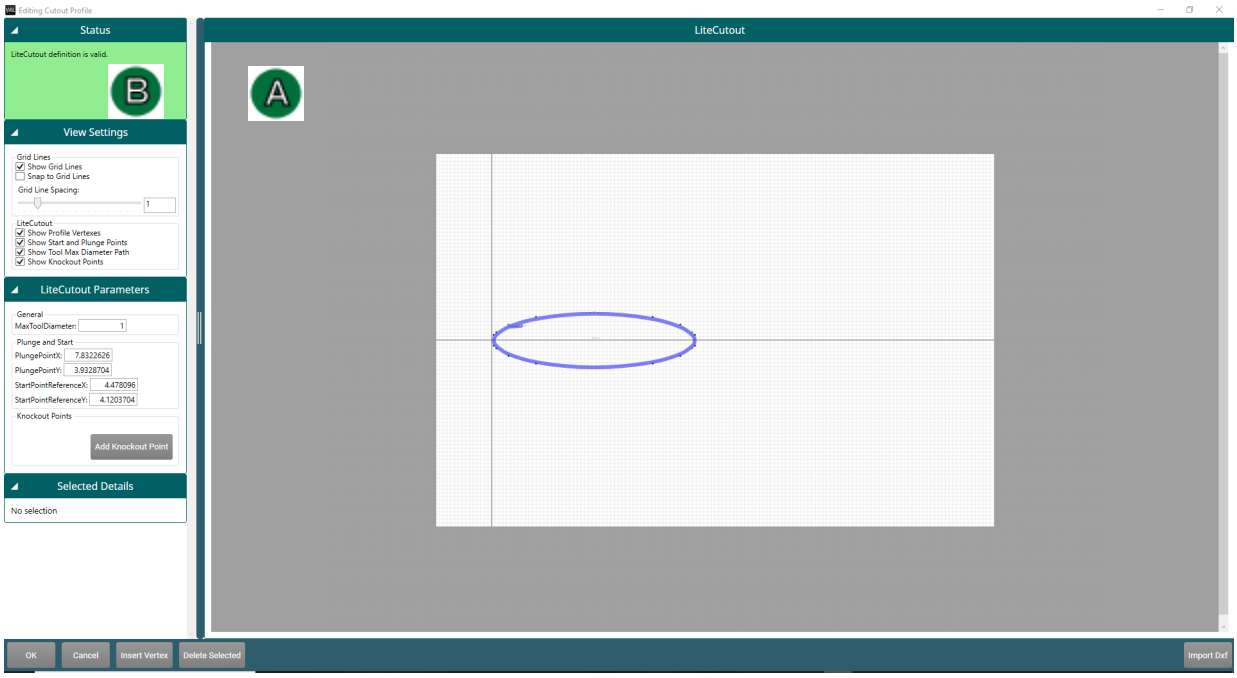
8. Input **WLocation** and **LLocation** to put the cut onto the door.



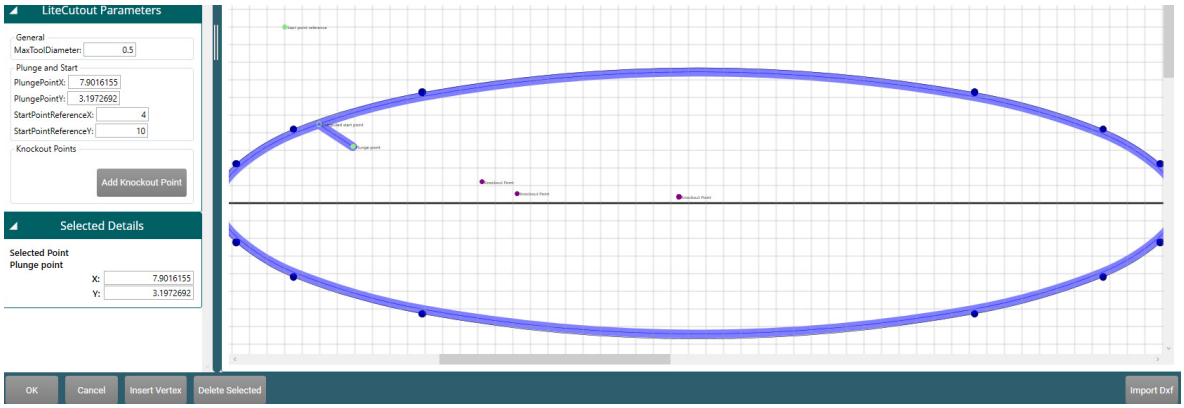
9. If finished with editing the **Door Job**, run the door.

About the LiteCutout Screen

This section describes selections on the **LiteCutout** Screen.



A About the Work Areas



Zoom In and Out with Mouse

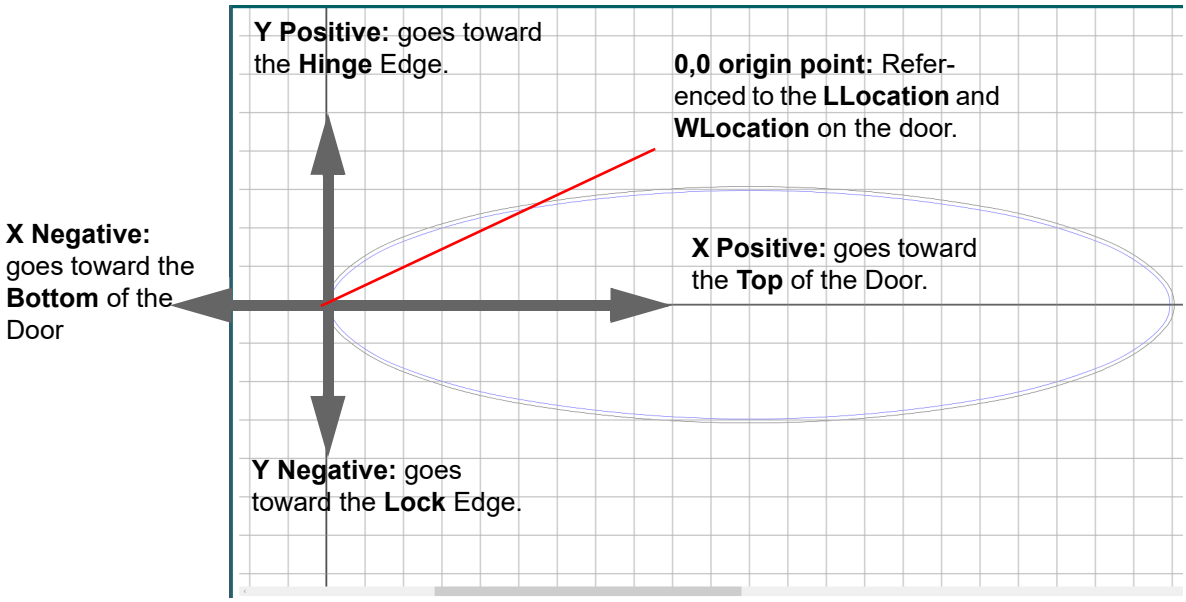
Move shape vertically and horizontally with Slide Bars.

Select a vertex (point on the cutting path) and manipulate the shape.

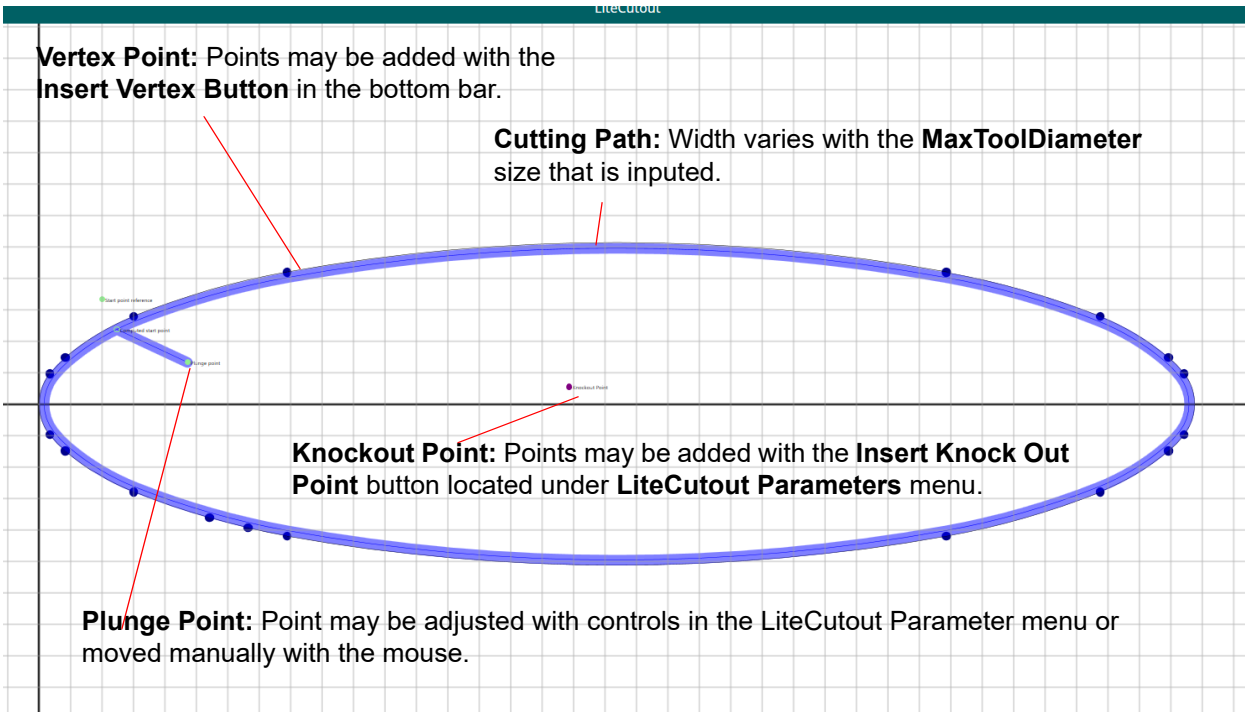
Expand or collapse windows

About the Work Area Coordinates

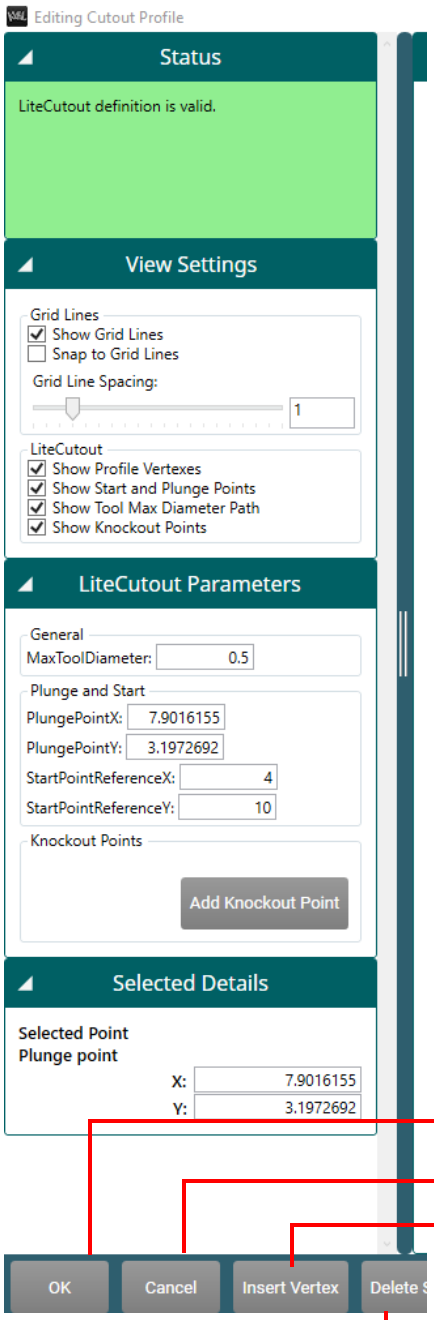
The coordinates will adapt to all door types: LH (left hand), RH (right hand), LHR (left hand reverse), RHR (right hand reverse). This feature can be shared across all machines and doors.



Sample Oval Cut



About Side Windows



Status: Identify errors and in specification models. Errors display a red background with error descriptions.

View Setting: Control the display settings of the Work Area.

LiteCutout Parameters: Control shape and specifications of the shape.

Selected Details: Displays the details of a selected point on the DXF file. The Shape may be manipulated with a mouse or by populating the designated input boxes.

OK: Send to KvalCAM

Cancel: Stop work and go back to KvalCam.

Insert Vertex: Insert another Vertex point along the cutting path.

Delete Selected: Delete any selected point on the shape.

CHAPTER 3 Operation of the Machine Line

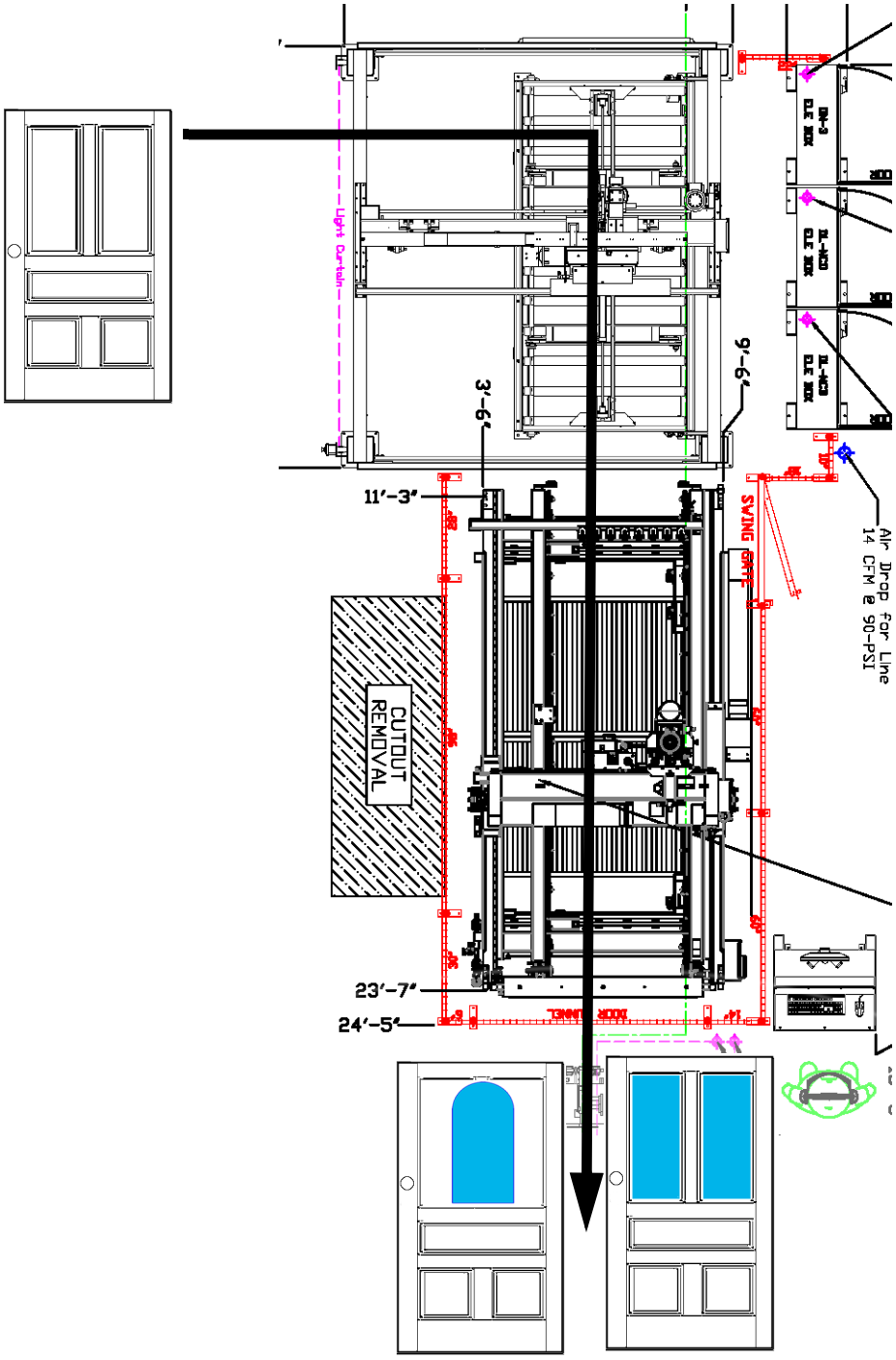
This chapter describes components, assemblies, and the user interface of the machine. The content is geared to help operators understand the basic operation of the machine. Included are instructions to calibrate the machine and process a door.

Chapter 2 at a Glance

Section Name	Summary	Page
About the Machine Line	A Summary of the entire machine line.	page 3-2
Initial Power Operations	Description of powering up the line from the off state. Includes: Power down description, Six Light Panel, and homing the machine line.	page 3-4
Machine Start Summary	A quick summary of running a door through the machine.	page 3-8
About Machine Process	Describes the process of the machine.	page 3-10
About the DL-NCD Screen	Descriptions of the Screens that interface with the DL-NCD	page 3-11

About the DL-NCD

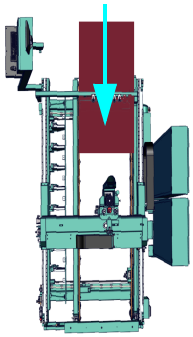
The **DL-NCD** is a computer controlled machine designed to precisely machine the face of a door for Door Light patterns and lock patterns. Below is a *typical* location of the **DL-NCD** in a Door Processing Line.



About the DL-NCD Process

Ensure the Start-up process has been completed (See page 3-4), that the machine has been **Homed**, doors are loaded to be processed, and the area is clear and safe to start production.

1. The door is fed into the **DL-NCD.**



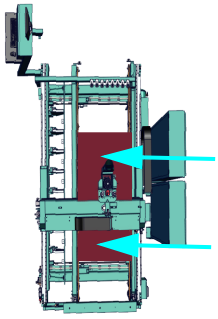
Actions

Pull (Auto-feed) door in from the previous machine.

Roll the door into the machine

2. The door is positioned against the stop, clamp the door and is automatically adjusted to the doors width.

3. Door Job is loaded and the machining process is started. The quantity of doors, the type of machining is determined by user interface.



Actions

Door Stops

Position Door

Clamp Door

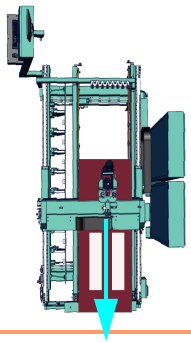
Start Sequence

Process Door

Check Screen

Complete Cuts

4. Door is fed to next machine for further processing



Actions

Door is fed out to the next machine.

Initial Powering Operations for the Machine Line

This section describes how to power up and to power down the Machine Line.

Powering up the system includes:

- Applying power to the entire system
- Starting the Control Circuit

Powering down the system includes:

- Shutting down the control power
- Removing power from the entire system

Operator's Station

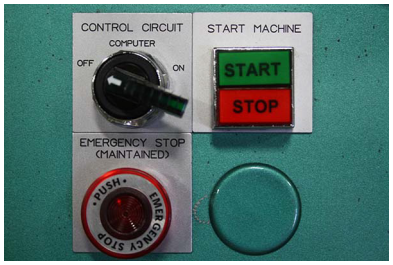
Controls are located at the Operator's station.

Touch Screen Interface: Main Control of Entire Machine Line. Download G-code and Templates to set the specifications of door machining. Manually control the door path and process through the line. Machine diagnostics are included, as well as internet support and connectivity for remote support via our Service Support.

Main Control Panel: Power -Up and Power Down machines. Start and stop the door process, pause doors in the Feeder and Stacker. Emergency Stop.

See "Initial Powering Operations for the Machine Line" on page 3-4

Keyboard: Enter data and interact with Touch Screen.



How to Power Up the Machine Line

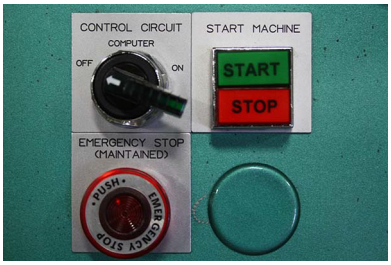
1. Ensure factory air is applied to each machine and main air supply is turned on.
2. Check that all E-Stop buttons are out and safety gates are closed.

Note: A pop-up is displayed on the user screen if an E-Stop is pressed. The pop-up will indicate which E-Stop has been activated

3. Make sure the electrical disconnect each electrical cabinet is turned to the ON position.

4. Switch the green **CONTROL CIRCUIT** switches to the ON positions. They should light up.
5. Push the green **START MACHINE** buttons to "boot up" the machines.

Note: Boot up may take 2 to 3 minutes.



.

6. All lights on the status light panels on the electrical box should be illuminated. See "Appendix: Description of the Six Light Panel" on page 3-30

Note: If a status light does not turn on during the power up process, see the trouble shooting chapter in the Service Manual.

Home the Machine Line

The Machine Line must go through a homing routine before any operations are performed. The homing routine sets a zero reference from which each machine measures its movement and cutting process.

If power is lost or any machine is reset, the homing routine must be performed again. Each machine has a **Home** button on it's associated **Main Control Screen** or the entire machine line can be *Homed* using the **Home Machine Line** button located on the **Machine Line Screen**.

How to Power Down the Machine

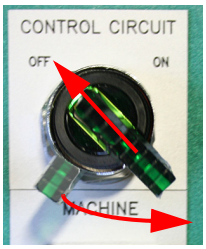
1. Push the **Stop** button for each machine, located on the Operator's Station

1

2. Shut down the operating system, by selecting **Shutdown** from the Desktop.

Note: Make sure Windows is shutdown completely before turning off the machine. Hard drive or data may be damaged if not turned off in this order.

2



3. Switch the green **CONTROL CIRCUIT** switches for each machine to the OFF position.

4. KVAL also recommends that you turn the disconnect switches on the electrical cabinets to OFF; this helps reduce possible damage resulting from power surges from electrical storms.

3

About Emergency Shutdown and Recovery

Important: Learn all safety precautionary controls on the machine.

Depending on the model of machine, there are emergency shutdown (E-Stop) switches located at key points around the machine.

The E-Stop switches are to be used when the machine is out of control or is about to damage personnel or equipment.

When an E-Stop switch is activated, high voltage power is cut to the machine. The motors will stop, but power to the PLC and the Operator Station Screen will remain on.

To Resume Normal Operation after an E-Stop

If an E-Stop is activated, use the following procedure to recover, after the cause of the emergency stop is resolved:

1. De-activate the E-Stop switch by pulling it out.
2. Push the **START MACHINE** button on the operator's station
3. **Home** the Machine.

Other Safety Controls

Other safety controls can include:

- **Gate Latches:** Sensors are located on the gates surrounding the machine. If a gate is opened the machine will shut down.
- **Laser Safety Scanners:** These are located on the front of the machine. These assemblies create an invisible safety field protecting the Operator from entering the cutting area of the machine.
- **Safety Curtain:** This creates an invisible curtain on all entrances to the DL-NCD.

Machine Line Start Summary

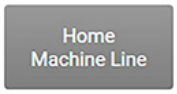
This is a summary of the start sequence for the Machine Line. These instructions assume that a Door Job has been created to be used in the machining process. To learn more about Door Jobs and Templates, see “About the Libraries Screen” on page 2-3.

Ensure factory air and power is present at the machine. For more information: See “Initial Powering Operations for the Machine Line” on page 3-4

1. Ensure the machine main **Air Supply Valve** is on.
2. Turn on the **Red Power Lever at** each **Electrical Panel**.
3. After the computer is completed booting up, the **KvalCAM User Interface** will start automatically

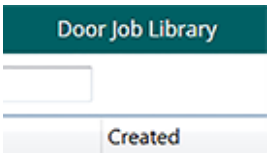
Note: If starting at the Windows Screen, select the KvalCAM icon on the screen.

Select the **Home Machine Line Button.** Every machine in the line will **Home**. On completion, each machine status will display **Idle** in the **Machine Feedback Status box.**



After the door has completed the **Home** sequence:

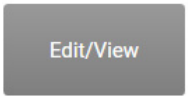
Select a door job from the **Door Job Library** list.



Select a Door Job

Select the **Edit/View** button

At the **Door Job Creation** Screen, make sure the door job is correct.



Select (Edit/View))

Note: If needed, create or add a feature to the door job

Verify or Modify Job

Add the Quantity of Doors in the **Door Qty: Box**

Select the **Add to Queue** button.

Enter Qty. Select (Add to Queue)

If completed for the day, power down the machine. For more information:
See “How to Power Down the Machine” on page 3-6

1. Press the **Red Stop button,** located on the Operators Station.
2. Shut down the operating system, by selecting **Shutdown** from the Desktop.
3. After computer has fully shutdown, turn off the **Green Control Transformer lever** on the Operators Station.
4. Turn OFF the **Red Power lever** the Electrical Panels.

About Machine Status Feedback

At the left-hand side of the screen, feedback from all machines is displayed.

The machines are constantly polled, feeding back their state of operation. This feedback is a great tool to instantly view the status of each machine.This information can be used to trouble-shoot any issues that may occur.

When activated, the tab will highlight.

Note: At the top of the screen, the revision of software is displayed.

About the DL-NCD Screens

The **DL-NCD** Operator Screens contain the controls to operate the machine.

Select the **DL-NCD Tab** located on the left hand side of the machine to jump to this menu.

Screen Tabs

The table below lists the screens available with the **DL-NCD** interface.

Tabs	Description
Main Control	This screen includes access to the most commonly used controls for the DL-NCD.
Manual Servo Control	Operate the DL-NCD manually by way of servo control. See See “About the DL-NCD Manual Servo Control Screen” on page 3-16.
Tool Usage	Table to show the tool usage. See See “About Tool Usage” on page 3-20.
Tool Config	Fine tune the tools parameters for an accurate cut. See page 3-22.
Calibration	Description and instructions to fine tune the servo drives. See Chapter 4.
Tool Path Preview	Investigate the path the tool follows during the cutting process.See “About the Tool Path Preview Test Tab” on page 3-21.
Lock Block	Set the cutting limits at the lock area of the door. See “About the Tool Config Tabs” on page 3-22.
Status	For information,see “About the Status and Log Screens” on page 3-28.
Log	For Information, see “About the Status and Log Screens” on page 3-28.

About the Main Control Screen

Select the **Main Control Tab**. At the Main Screen, control the all the operations of the machine to process a door.

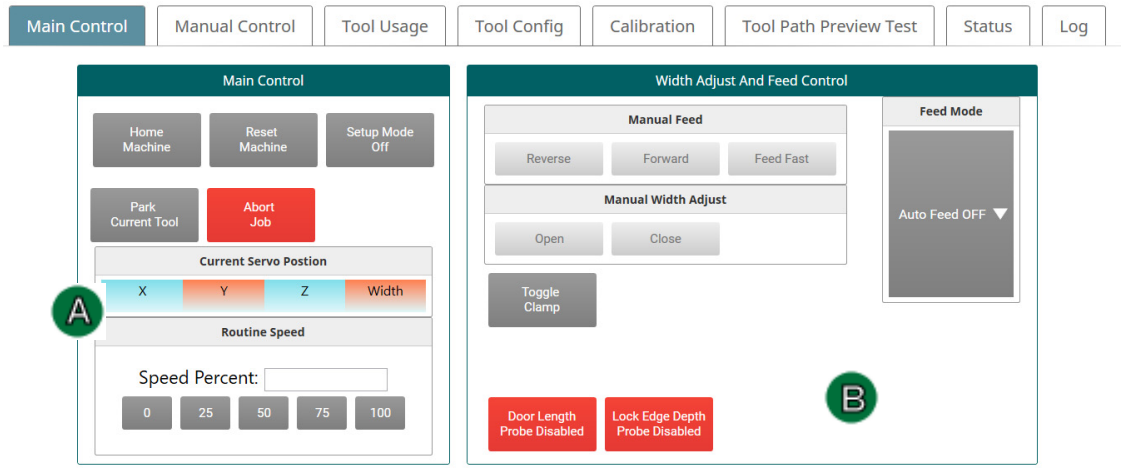
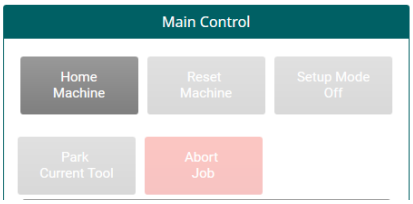


FIGURE 3-1. Main Screen of DL-NCD

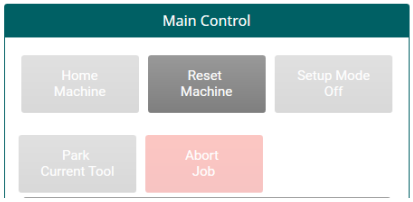
A About the Main Control Section

Home Machine



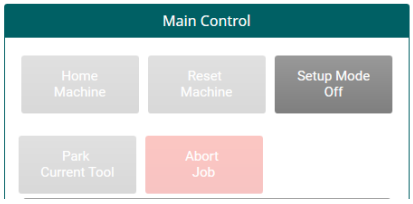
This button starts the home sequence on the machine, which scans to find a physical reference point on the frame. When this point is found, the position is stored and then used to calculate the location of all moves during the machine process. The home sequence must be performed every time the machine is powered up or reset.

Reset Machine



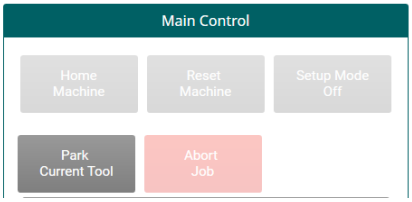
If a fault occurs that cannot be cleared, press the **Reset Machine** button. This button will reset the machine to the start position. Press the **Home** button after resetting the machine

Setup Mode On/Off



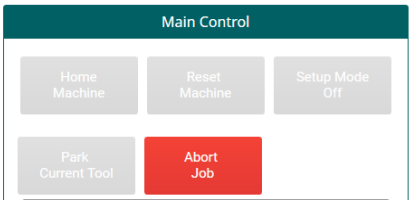
Select **Setup Mode** to toggle on or off. In the **On** mode, a safe mode is active. The machine will go through normal sequences except the cutting motors will be inactive. Use this mode to check the machine operation without making a cut on the door. With the setup mode set to on, the button will change to an orange background.In **Off** mode the machine is in normal operation.

Park Current Tool



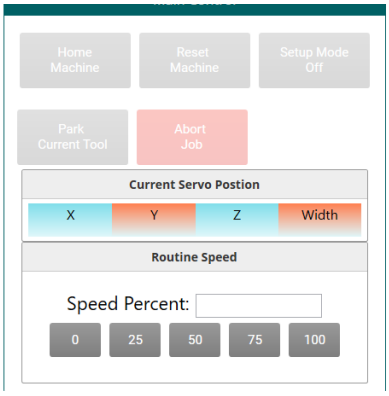
Press to move the tool being used in the cutting process to the tool holder

Abort Job



Select to stop (abort) the process of the door that is currently running.

Current Servo Position



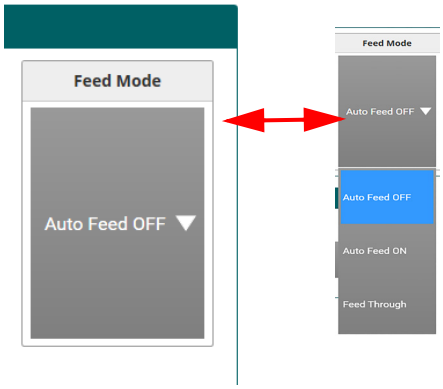
Displays the servo position of the cutting head (X,Y,and Z) and the width

Routine Speed

Adjust the speed of the cut. Press buttons to use the graduated speeds or select box and enter a desired speed. The speed can be changed during real time processing.

B About the Width Adjust and Feed Control

Feed Mode (Auto Feed ON/OFF or Feed Through)



Select **Auto Feed ON, Auto Feed OFF or Feed-Through f**rom the drop down menu.

- In **Auto-Feed ON,** the feed system will bring in and clamp a door, process a door, then feed the door to out the next machine.

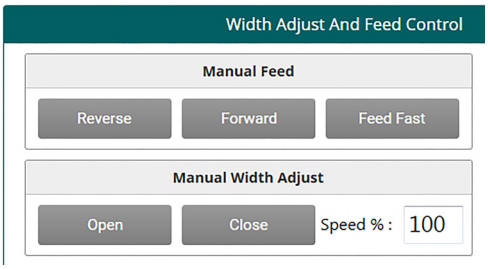
Note: The **Manual Feed** buttons, **Width Adjust** buttons, **Invert Table Feed** and **Invert Table Cross Feed** buttons will be **deactivated** (light gray)

- In **Auto Feed OFF, Manual Feed** buttons, **Width Adjust** buttons, **Invert Table Feed** and **Invert Table Cross Feed** buttons will be activated.

Note: On Start up, the default is in the **Auto Off** I

- **Feed Through**, the door will feed to the out feed with out machining the door.

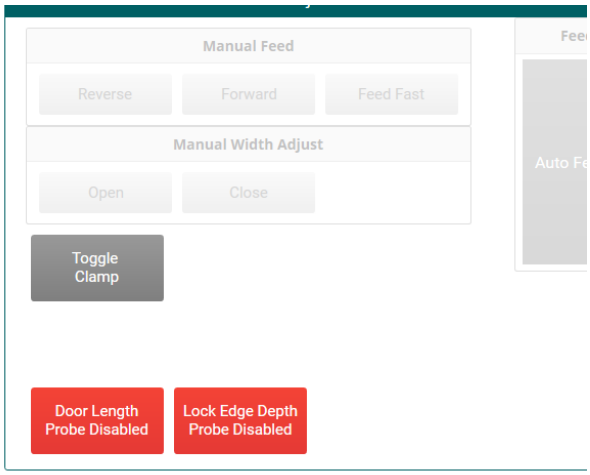
Manual Feed Control



- **Reverse:** Press and *hold t*he **Reverse** button to feed-back door to the in-feed of the machine. To stop the feed, release the button.
- **Forward:** Press and *hold* the **Forward** button to move the door feed to the out-feed of the machine. To stop the feed, release the button.
- **Feed Fast/Slow:** Press to toggle between slow or fast speed.

Width Adjust

- **Move Open:** Press and *hold the button* to open the width adjust carriage. To stop the carriage, release the button. The carriage will also stop if the positive travel limit eye is activated.
- **Move Close:** Press and *hold the button t*o close the width adjust carriage. To stop the carriage, release the button. The carriage will also stop if the negative travel limit eye is activated.
- **Speed%:** Enter the desired speed.



Toggle Clamp

Press to clamp door. Press again to un-clamp door.

Door Length Probe

Select to enable or disable the Length Probe.

Lock Edge Depth Probe

Select to enable or disable the Lock Edge Probe.

Probe locations on the machine,

Note: Probe locations on this machine can be found in Chapter 5 of this manual.

Note: When the Length and Lock Edge Probes are disabled, door length and lock specifications are derived from the Door Job.

About the DL-NCD Manual Servo Control Screen

Select the **Manual Control Tab.** At this screen, control the servos manually and run a process to fine tune the tool pickup routine.

.

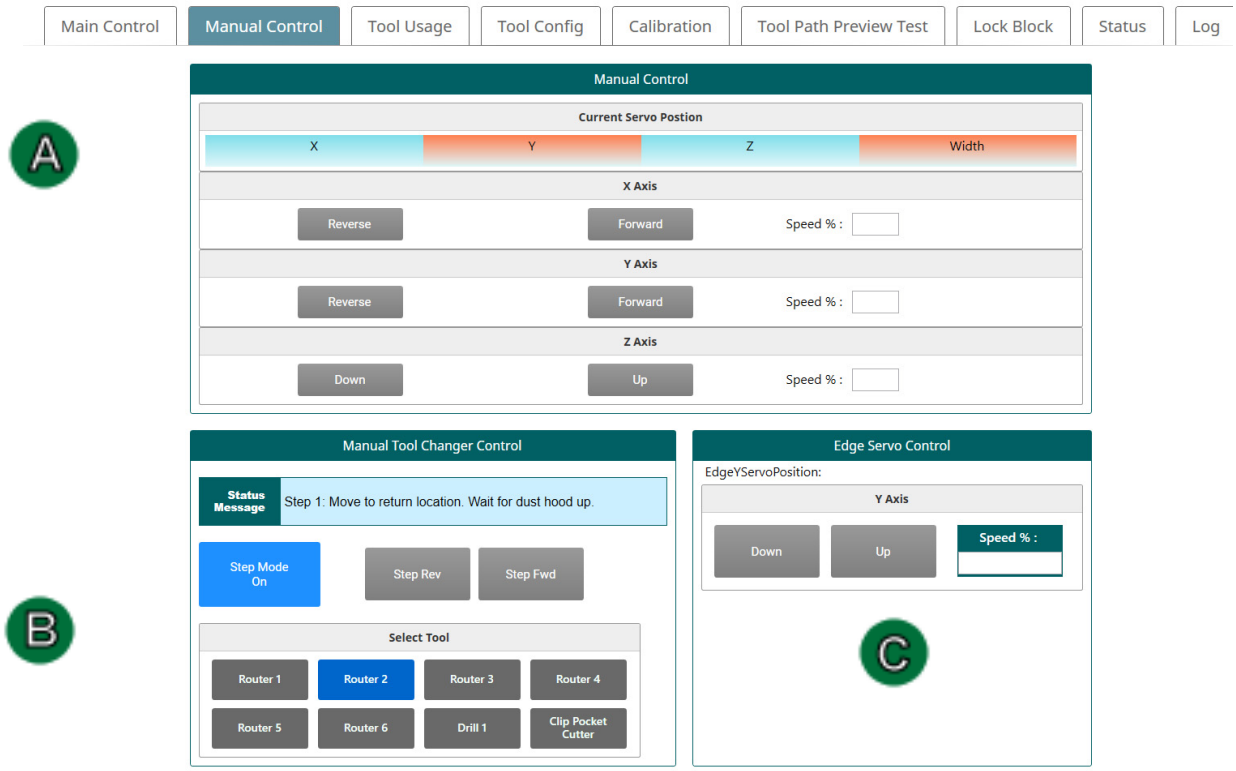
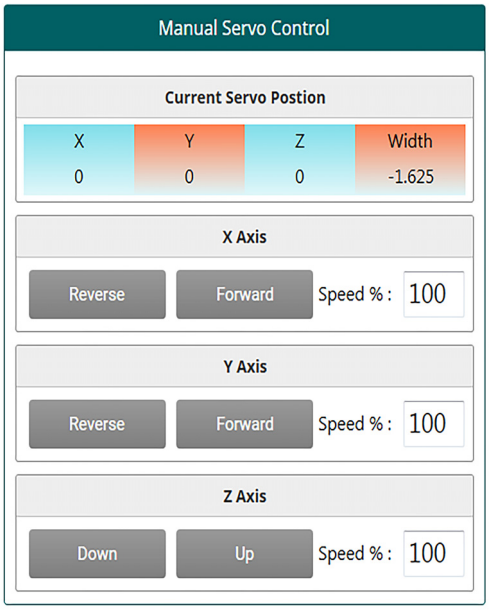


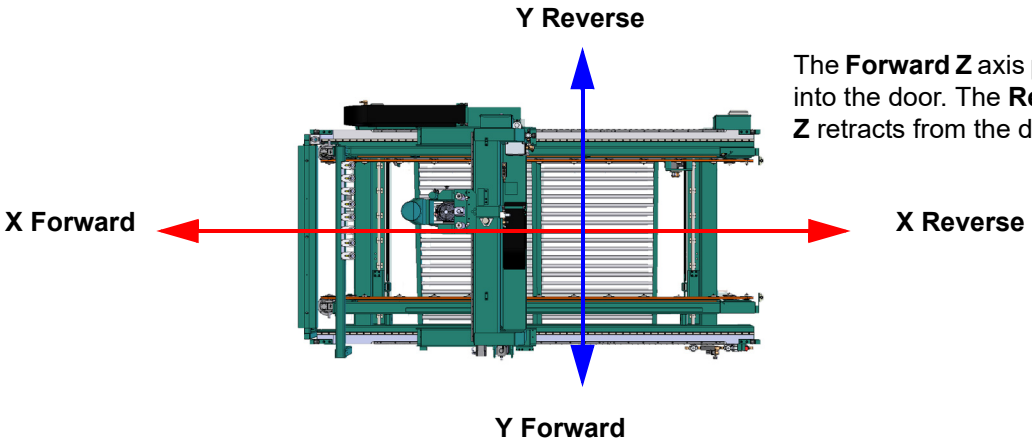
FIGURE 3-2. Manual Control Screen for the DL-NCD

A Manual Control Operation

For Each Axis:

- Reverse: Press and *hold* the **Reverse** button to reverse the motion of the carriage. Release the button to stop the carriage. The carriage will also stop if the negative travel limit eye is activated.
- **Forward:** Press and *hold* the **Forward** button to move the carriage forward. Release the button to stop the carriage. The carriage will also stop if the positive travel limit eye is activated.
- **Speed:** Press to change speed of operation. "100 percent" is the maximum speed of the level selected from the main screen by way of the **Cut Routine Speed** buttons.





The **Forward Z** axis plunges into the door. The **Reverse Z** retracts from the door.

About Manual Tool Changer Control

This routine aids in ensuring the tool pick up and drop off locations between the **Cutter Head Tool Holde**r and **Tool Holder Rack** are matched up.

When activated, the **Cutter Head** is moved in repeatable steps toward and away from the **Tool Holder**. At these step intervals, the operator establishes the distance between the **Tool Holder** and **Tool Rack** tool position.

With the distance information, the operator uses the **Tool Holder Calibration** routine (under the **Calibration Tab**) to calibrate precise tool pick up and drop off.

Note: This mode can be used to perform a quick visual during production or as a calibration tool.

Note: In normal production the **Step Mode** can be ON or OFF. No interference with production will occur.

Process

Note: If calibrating, calibrating one tool will calibrate all tools. For calibration information, see “Step 6: Calibrate the Tool Holder” on page 4-17.

This should be a two person operation with one at the **Operator Station** and one at the **Tool Holder Rack**. Each step is displayed in the **Status Message Box.**

1. Select the Step Mode button to turn it ON.
2. Select the desired tool in the **Select Tool** section.
3. Step forward or backward using the **Step Rev** and **Step Fwd Buttons.** Observe the actions and locations of the **Tool Holder** in relation to the **Tool Rack**.

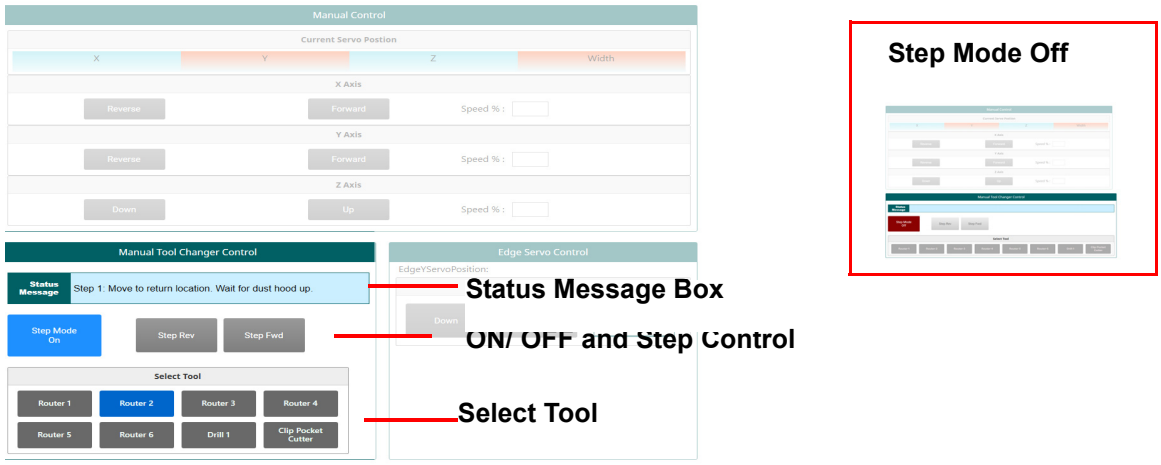
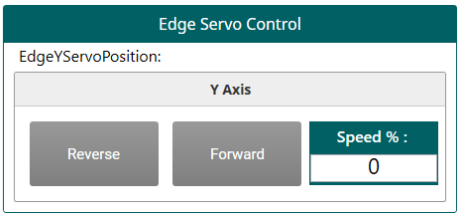


FIGURE 3-3. Manual Tool Changer Screen

About the Main Control Section

Edge Servo Control

Adjust the speed of the Edge Cutter in the Y axis (vertical)



About Tool Usage

Select the **Tool Usage Tab**. This screen tracks the usage of the machines tools in hours. The table on this screen offers a convenient method to check the wear and tear of the machine tooling.

Information from the configuration screen is transfered to the Tool Management Table. (Name, Tool Type, and Material)

Note: To sort the information in table, select the desired column title.

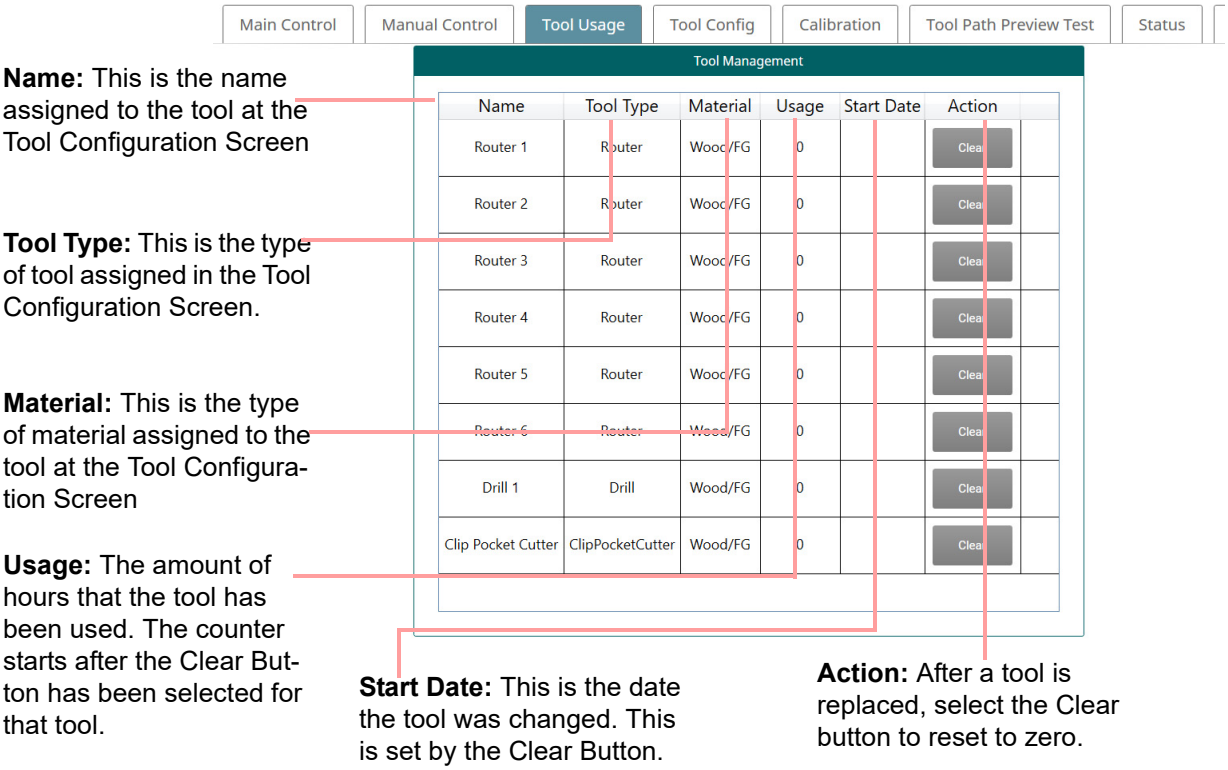


FIGURE 3-4. Tool Usage Table

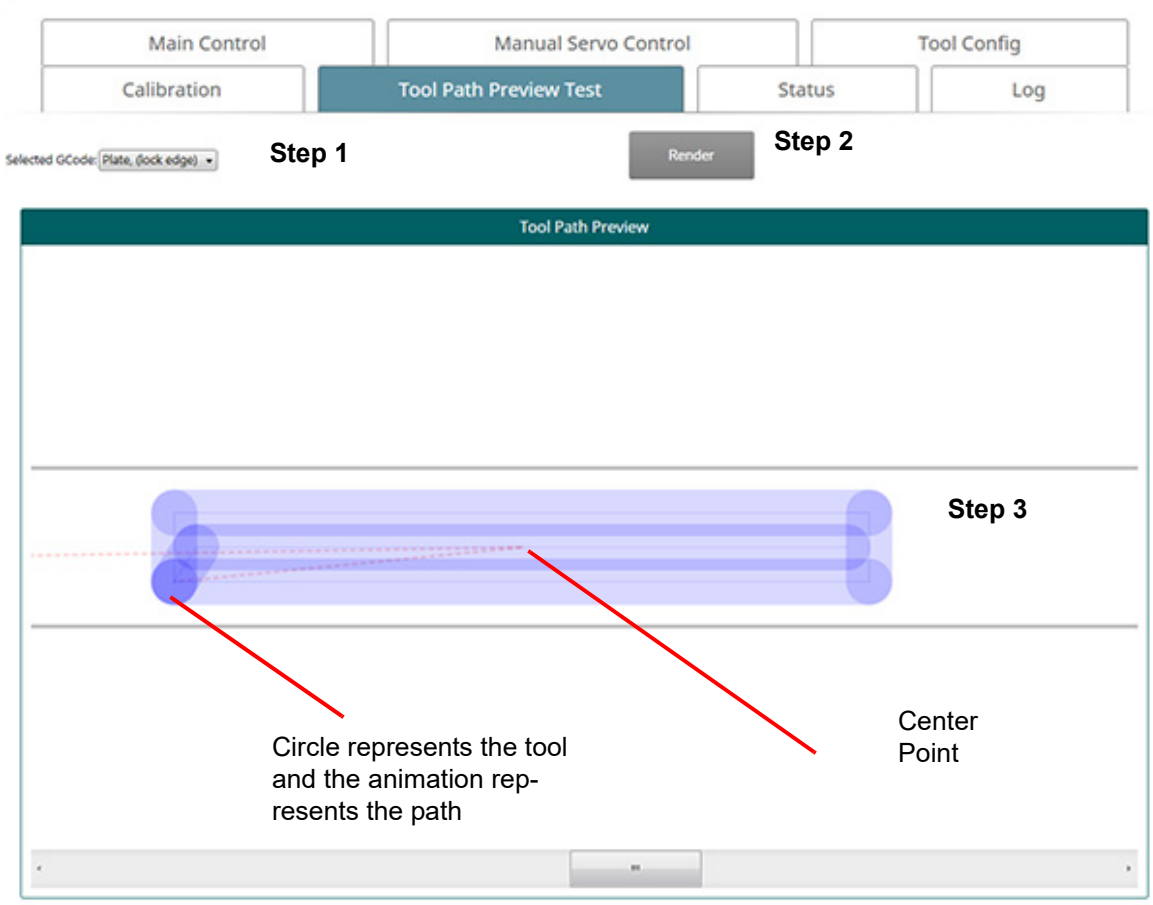
About the Tool Path Preview Test Tab

Select the **Tool Path Preview Test Tab**.

At this screen, an animated path of the tool cutting pattern sequence can be obscured. Selected G-Code routines from the **Library** of the **machine** can be viewed.

This sequence can be essential if troubleshooting, calibrating, or checking the wear of a tool. Discrepancies can be viewed before cutting into a door, saving product and time.

The figure below displays a sample of a good **Deep Mortise Cut**.



1. Select a G-Code routine form the drop down menu.
2. Select the **Render Button**
3. View the path of the tool on the screen.

About the Tool Config Tabs

Select the **Tool Config Tab**.

Tool configuration can improve the speed and quality of cut by defining tool specifications, types of materials being machine, parameters of the cut, and the frequency of the motor.

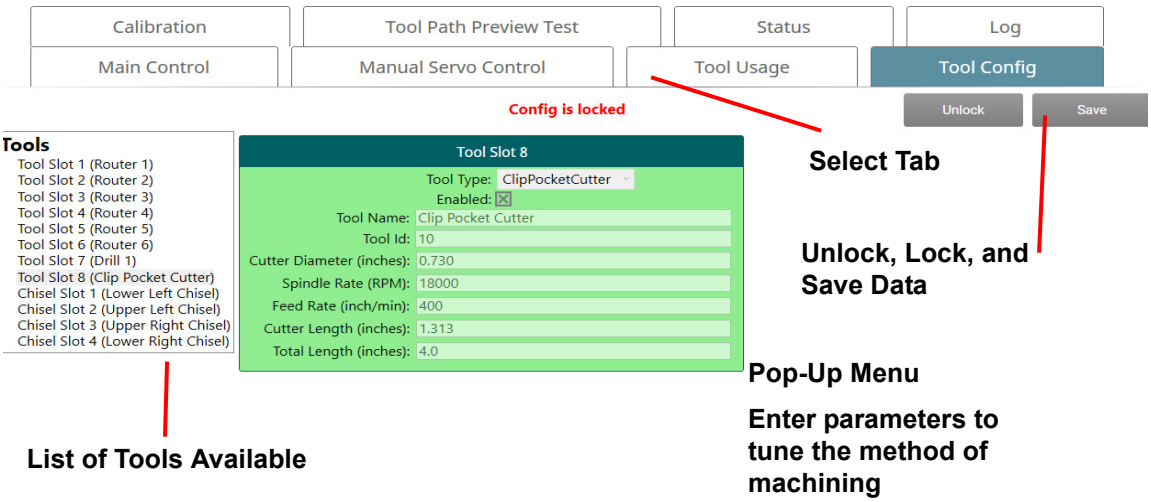
At this screen, specifications of the tool, type of material being cut, and process is entered and saved to the database. This information is valuable to compute and provide the most precise cut available.

Note: The. Screen shot below is a from a sample machine. For tool identification for the machines described in this manual, see page 3-24

General Operating Controls

The **Tool Config Screen** contains a sample of the following:

- List of the available tools.
- Pop-up menus to enter information about each tool (Specifications)
- The ability to adjust the method of chisel operation during machining.
- The ability to enable or disable specific tool slots
- The ability to name the tools to familiar names.
- The ability to lock and unlock the ability to enter data.
- Change the rate of machining (feed-rate, spindle speed, plunge feed, entry feed, perimeter feed)
- Parameters of the cut (depth, passes through material, overlaps, skin priority)
- Chisels: Can change peck count (start of cut), corner location, and rate of machining.

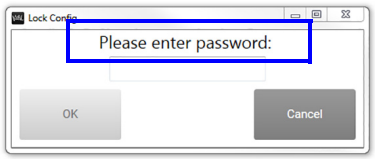


Unlock the Tool Slot Configuration

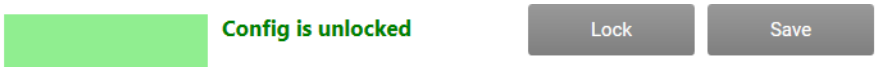
The configuration screens are passwords protected. To unlock the screens, select the **Unlock Button** and enter the password in the password popup menu.

1. Select Unlock

2. Enter Password, Click OK



3. Ready to Enter Data

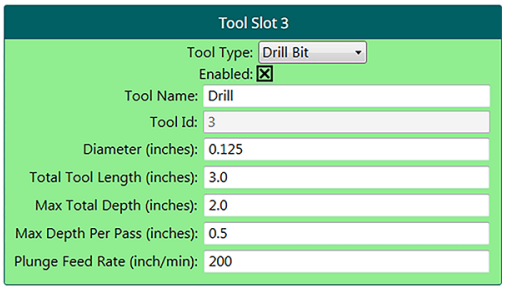


About the Tool Pop-up Screens

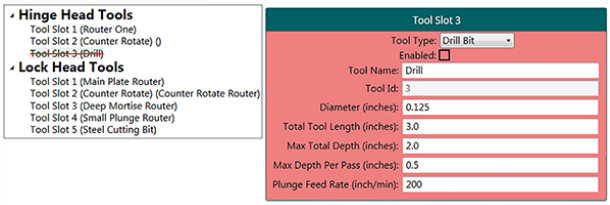
Each tool slot has versatility to choose between entering router, or chisel information. Click the **Enable Check Box** to clear the box and disable the tool. Below are samples of the pop-up windows available.

Sample Drill Configuration Pop-Ups

Drill Pop-up Sample

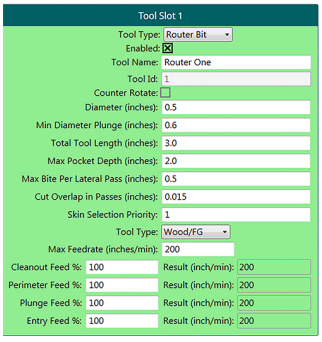


Drill Pop-up Disabled Sample

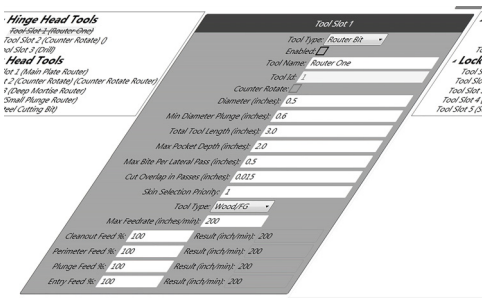


Sample Router Configuration Pop-Ups

Router Pop-up Sample

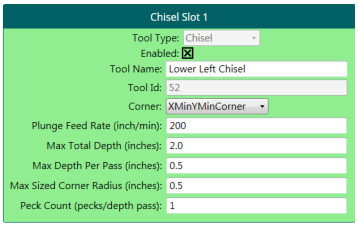


Router Pop-up Disabled Sample

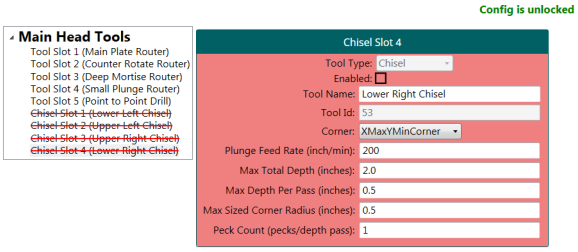


Sample Chisel Configuration Pop-Ups

Chisel Pop-up Sample



Chisel Pop-up Disabled Sample



About Tool Locations

Tool locations are identified by slots. See the figures below for the locations and identifications.

Note: Below are factory suggested locations. Identification of Slots can be altered through this menu.

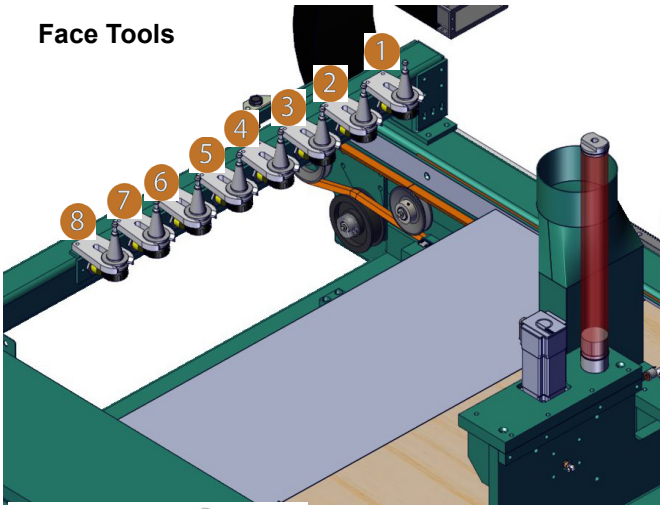
Face Tools

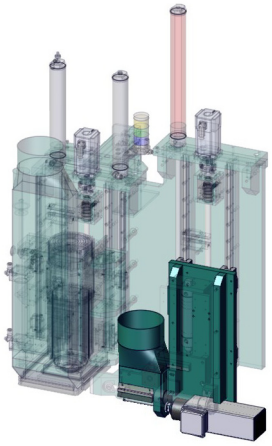
Tool Slot 1 (Router 1)
Tool Slot 2 (Router 2)
Tool Slot 3 (Router 3)
Tool Slot 4 (Router 4)
Tool Slot 5 (Router 5)
Tool Slot 6 (Router 6)
Tool Slot 7 (Drill 1)
Tool Slot 8 (Clip Pocket Cutter)

Lock Tools

Tool Slot (Edge Router)

Face Tools

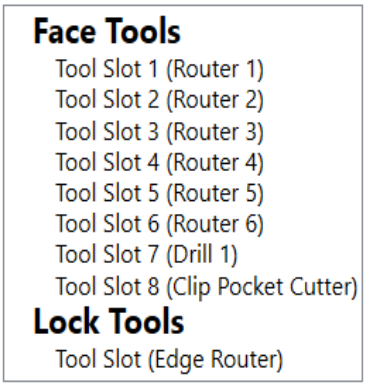




Lock Tool

About Using Tool Configuration

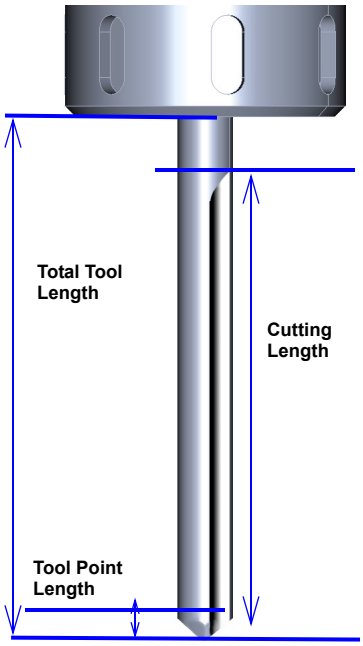
1. Identify the tool that needs replacement.Measure tool dimensions and capture the data.
2. Select the desired **Tool Slot** from the menu.
3. Enter the data into the pop-up screen.



Measuring Tool Length

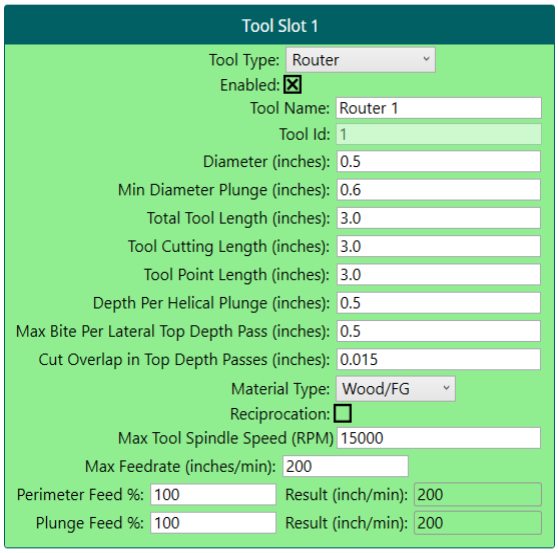
1. Measure the parameters listed below:
   - Total Tool Length - The distance from the collet face to the tool's tip
   - Tool Cutting Length - The distance from start of the cutting area to the tip of the bit.
   - Tool Point Length- From the point where the point starts to the end of the bit.
2. Update the data in the **Tool Config Group**,

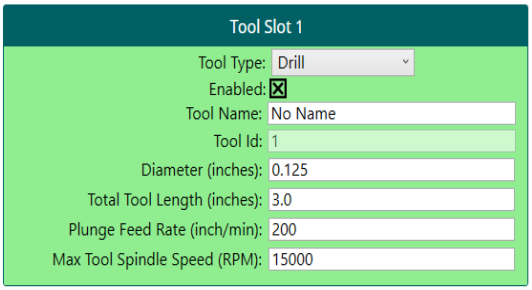
Important: The accuracy of the data **Tool Config** is important. Any errors could **damage tooling or product.**



About Entering Data into the Pop-up Menu

Insert specifications of the tools being used to make the cuts. Ability to name the tools to user defined descriptions. Customize the tools to reflect the actual tool parameters, making the most accurate cuts. Ability to define cut operation.





About the Lock Block Tab

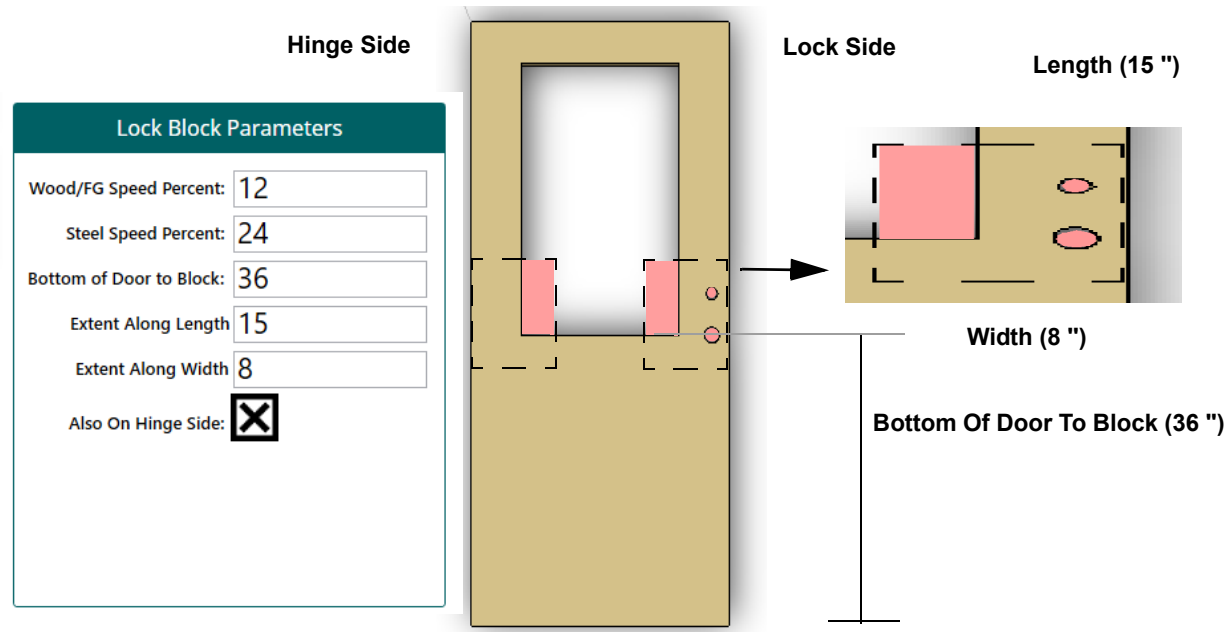
The Lock Block Screen is located under the **Config Tab**. Select the **Lock Block Tab.**

At this screen, set controls for the **Cutter Head** to compensate for a door with a lock block. The lock block section of the door is defined and the **Cutter Head** speed will slow down to cut through the harder wood.

To create a lock block region:

1. Get the lock block location of the door from the blueprint or by measuring the door.
2. Enter the desired speed percentage. The cutter head will slow down to this percentage when is reaches the lock block location.
3. Enter location of the lock block.
   a. **Wood/FG Speed Percent:** Modifies the feed rate to cut wood or fiberglass skin doors.
   b. **Steel Speed Percent:** Modifies the feed rate to cut steel skin doors.
   c. **Bottom of Door to Block:** The location of the block with the bottom of the door as a reference.
   d. **Extent Along Length:** The length of the lock block.
   e. **Extent Along Width:** The depth of the block in reference to the width of the door.
   f. **Also on Hinge Side:** Use if the block is mirrored on the hinge side of the door.
4. Select the **Save** button to store the Lock Block Parameters

.



About the Status and Log Screens

The Machine has a Status and Log Screen. Information about each machine can be observed from these screens.

About the Status Screen

From this screen, real time feedback during the operation of the machine can be viewed. The feedback includes times, dates, and machine status. Status includes a **"True" flag** if the assembly is in operation or a **"False" flag** if not in operation. Also status can include data and motor states (idle, operation). The data can be filtered to observe certain aspects of the operation of the machine. This tool is great for troubleshooting to locate faulty assemblies.

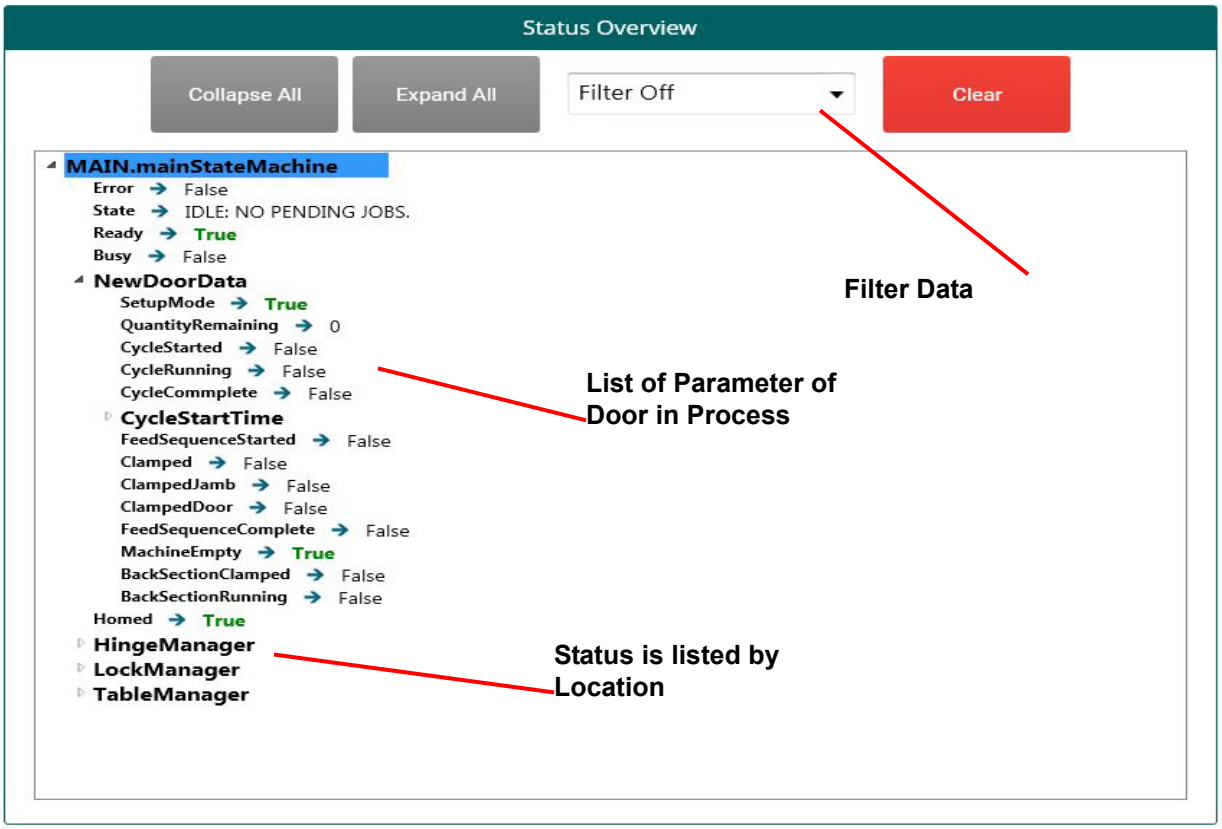


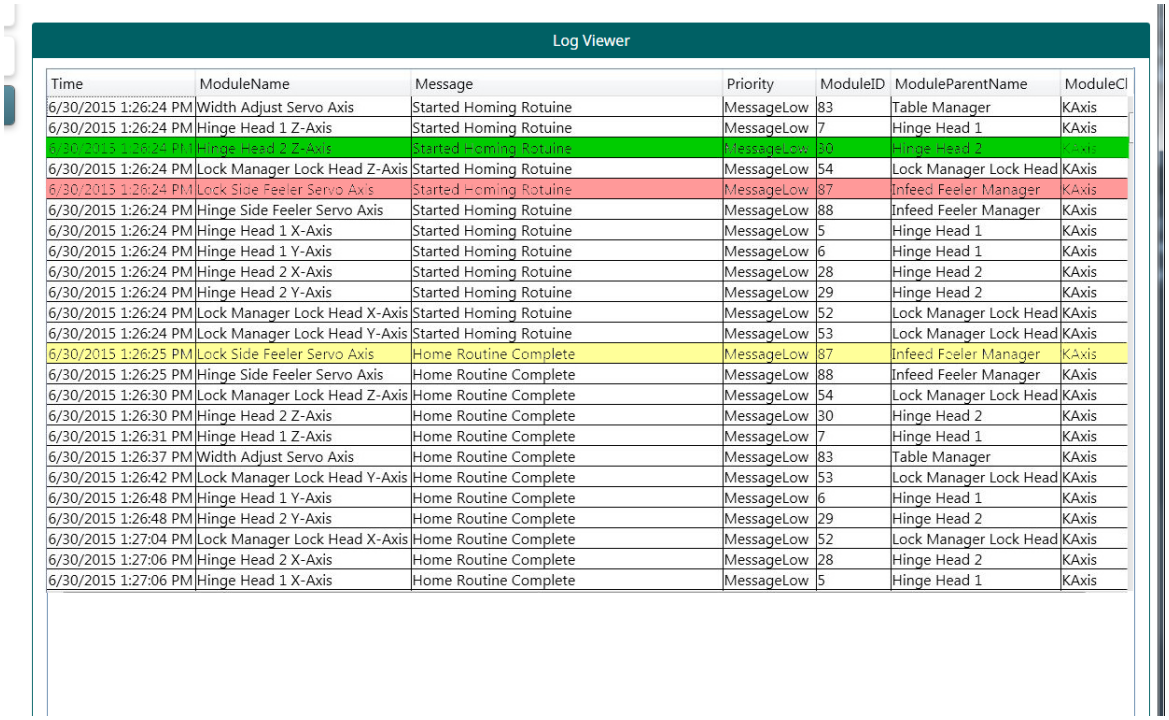
FIGURE 3-5. Status Screen

About the Log Screen

The Log screen displays all the tasks performs. This screen can help with trouble shooting by associating the error code to machine sections or functions. The top line will have the most current routine that is running. The codes are color coded:

Red = Error
Green = Report is a non-issue
Yellow = Warning

If the machine issue can not be resolved, call KVAL Inc. (1-800-553-5825). Have any error code that is displayed, ready to give the KVAL representative. This will aid in troubleshooting and shorten down time.



Log Viewer

Time	ModuleName	Message	Priority	ModuleID	ModuleParentName	ModuleCl
6/30/2015 1:26:24 PM	Width Adjust Servo Axis	Started Homing Rotuine	MessageLow	83	Table Manager	KAxis
6/30/2015 1:26:24 PM	Hinge Head 1 Z-Axis	Started Homing Rotuine	MessageLow	7	Hinge Head 1	KAxis
6/30/2015 1:26:24 PM	Hinge Head 2 Z-Axis	Started Homing Rotuine	MessageLow	30	Hinge Head 2	KAxis
6/30/2015 1:26:24 PM	Lock Manager Lock Head Z-Axis	Started Homing Rotuine	MessageLow	54	Lock Manager Lock Head	KAxis
6/30/2015 1:26:24 PM	Lock Side Feeler Servo Axis	Started Homing Rotuine	MessageLow	87	Infeed Feeler Manager	KAxis
6/30/2015 1:26:24 PM	Hinge Side Feeler Servo Axis	Started Homing Rotuine	MessageLow	88	Infeed Feeler Manager	KAxis
6/30/2015 1:26:24 PM	Hinge Head 1 X-Axis	Started Homing Rotuine	MessageLow	5	Hinge Head 1	KAxis
6/30/2015 1:26:24 PM	Hinge Head 1 Y-Axis	Started Homing Rotuine	MessageLow	6	Hinge Head 1	KAxis
6/30/2015 1:26:24 PM	Hinge Head 2 X-Axis	Started Homing Rotuine	MessageLow	28	Hinge Head 2	KAxis
6/30/2015 1:26:24 PM	Hinge Head 2 Y-Axis	Started Homing Rotuine	MessageLow	29	Hinge Head 2	KAxis
6/30/2015 1:26:24 PM	Lock Manager Lock Head X-Axis	Started Homing Rotuine	MessageLow	52	Lock Manager Lock Head	KAxis
6/30/2015 1:26:24 PM	Lock Manager Lock Head Y-Axis	Started Homing Rotuine	MessageLow	53	Lock Manager Lock Head	KAxis
6/30/2015 1:26:25 PM	Lock Side Feeler Servo Axis	Home Routine Complete	MessageLow	87	Infeed Feeler Manager	KAxis
6/30/2015 1:26:25 PM	Hinge Side Feeler Servo Axis	Home Routine Complete	MessageLow	88	Infeed Feeler Manager	KAxis
6/30/2015 1:26:30 PM	Lock Manager Lock Head Z-Axis	Home Routine Complete	MessageLow	54	Lock Manager Lock Head	KAxis
6/30/2015 1:26:30 PM	Hinge Head 2 Z-Axis	Home Routine Complete	MessageLow	30	Hinge Head 2	KAxis
6/30/2015 1:26:31 PM	Hinge Head 1 Z-Axis	Home Routine Complete	MessageLow	7	Hinge Head 1	KAxis
6/30/2015 1:26:37 PM	Width Adjust Servo Axis	Home Routine Complete	MessageLow	83	Table Manager	KAxis
6/30/2015 1:26:42 PM	Lock Manager Lock Head Y-Axis	Home Routine Complete	MessageLow	53	Lock Manager Lock Head	KAxis
6/30/2015 1:26:48 PM	Hinge Head 1 Y-Axis	Home Routine Complete	MessageLow	6	Hinge Head 1	KAxis
6/30/2015 1:26:48 PM	Hinge Head 2 Y-Axis	Home Routine Complete	MessageLow	29	Hinge Head 2	KAxis
6/30/2015 1:27:04 PM	Lock Manager Lock Head X-Axis	Home Routine Complete	MessageLow	52	Lock Manager Lock Head	KAxis
6/30/2015 1:27:06 PM	Hinge Head 2 X-Axis	Home Routine Complete	MessageLow	28	Hinge Head 2	KAxis
6/30/2015 1:27:06 PM	Hinge Head 1 X-Axis	Home Routine Complete	MessageLow	5	Hinge Head 1	KAxis

FIGURE 3-6. Log Screen

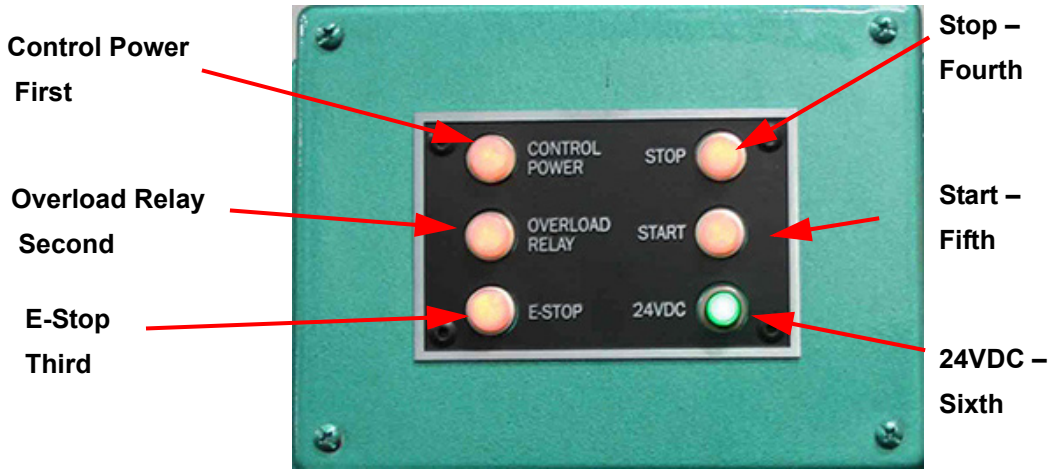
Appendix: Description of the Six Light Panel

The six lights on this panel in8

dictate the status of the power-up of the system. Each machine has this panel.

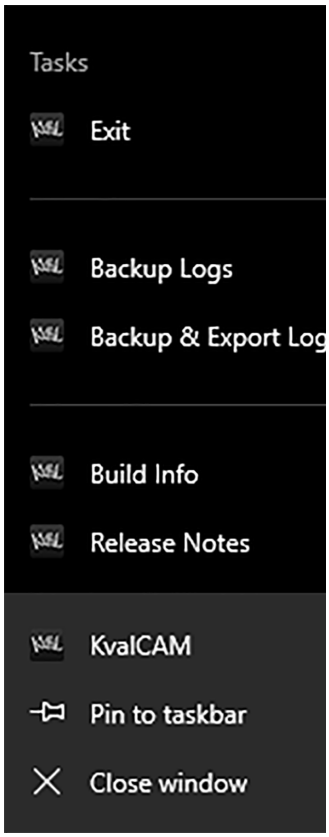
The Sequence the lights activate is as follows:

Sequence Order	Light Designation	Description
1	Control Power	This light illuminates when the Control Transformer turned on and the power is working on secondary side-of trans-former
2	Overload Relay	Checks the Overload Relay in the E-Box. In some cases, this circuit is jumped. In these cases it should always light when the Control Power turns on.
3	E-Stop	All gates are closed and the E-stops are not activated when this light is on.
4	Stop	This light will be on if Machine Stop button is deactivated.
5	Start	This light will be on once the Machine Start button is pressed and the ACR Relay is latched.
6	24VDC	This light comes on once the ACR is latch and the 24VDC power Supply is working



Appendix: About Backing up the Data

Right Click the KVAL Icon at the bottom of the screen to display this menu.



Exit: Click to close the running Kval Cam program.

Backup Logs: Click to save the to save all data from the machine operation.Notes can be added to describe the saved file.

Backup and Export: Click to send machine data to a text file. The file may be sent to Service Support if any issues occur. Notes may be added to describe the saved file.

Note: Kval recommends backing up locally and to a isolated server.

Build Info Click to view upper level notes about the current build.

Release Notes: Click to open a PDF of the history of release notes on this version o software.

CHAPTER 4 Calibration of the Machine Line

This chapter describes steps to use the interface to calibrate the Machine.

Chapter 4 at a Glance

Section Name	Summary	Page
About Calibration	Descriptions of the Calibration Menus. Tips to look for before calibrating.	page 4-2
About the Calibration Tabs	Descriptions of the Calibration Tabs.	page 4-3
How to Enter Calibration Data	Descriptions of how to use the calibration screens	page 4-6
About the Calibration Screen	Descriptions of the calibration available.	page 4-8

About Calibration

Calibration is all about the confidence in the end results of your manufacturing process. Calibration assures you that your cut parameters are accurate and within the specified limits.

If slight discrepancies in the machining of a door are observed, the built in KVAL calibration can adjust the tooling to fix the issue.

In troubleshooting, calibration can be an essential step in solving the issue.

About the Calibration Menus and the Calibration Reference Cut

This chapter describes the **Calibration Menus**.

In the **Calibration Menus**, offsets are entered to calibrate assemblies in the machine. See “About the Calibration Tabs” on page 4-3.

Before you Calibrate

Before you start calibration, check for the following common issues.

1. Is the loaded setup correct for the current cut?
2. Check tools for wear.
3. Is the correct Calibration loaded?
4. Are the stops set up correctly?
5. When did the problem first start? during a run, at start up.
6. When was the last calibration?
7. Is the Door True?
8. Check for sawdust build-up, which may affect depth.

Note: KVAL recommends that a test door is run first and checked for specifications before a full run is started.

About the Calibration Tabs

The calibration tabs contain access to screens to adjust servo motors in the machine.These software adjustments are designed to fine tune the servos for optimum accuracy. The maximum adjustment is 0.50 inches at a time for all calibrations.

Note: If more than 0.50 inches of adjustment is needed, there is a high probability that another issue may be causing a problem. Perform a visual check of the assembly to be calibrated and check the **Status Screens** and **Log Screens** for error reporting. Finding errors from these screens will help localize problem areas.

Note: If the machine issues can not be resolved, call KVAL Inc. (1-800-553-5825). Have any error code that is displayed, ready to give the KVAL representative. This will aid in troubleshooting and shorten down time.

Access to the Calibration Adjustments

Buttons to unlock access to calibration, save a calibration, and restore calibration are located here. Lists of assemblies to calibrate are in the main body of the page.

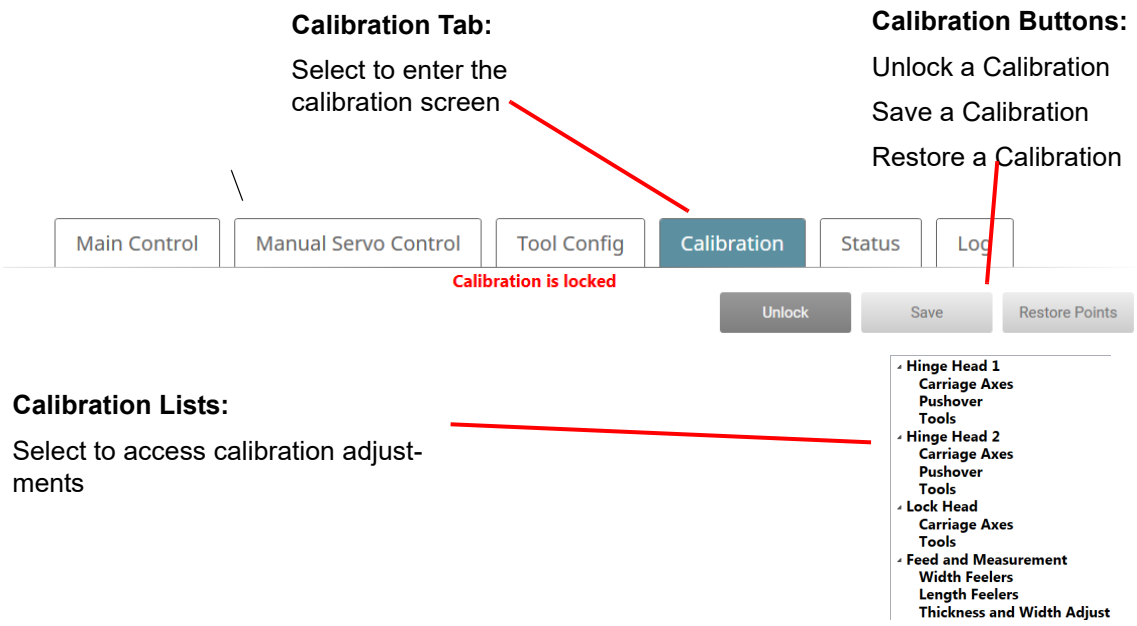


FIGURE 4-7. Calibration Header

Unlock the Calibration (Option)

Access to the calibration is password protected. (Optional)

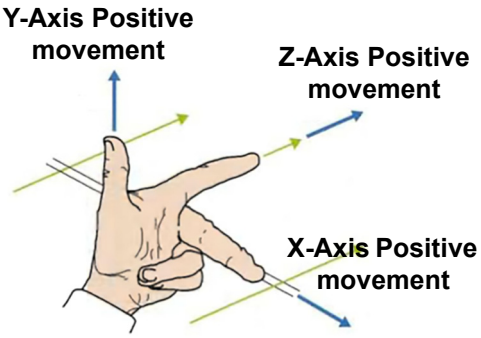
1. Select the **Unlock** button

2. At the **Password** pop-up, enter the password and select OK to continue.
3. The calibration message will change from a red "Calibration is Locked " to a green Calibration is Unlocked".

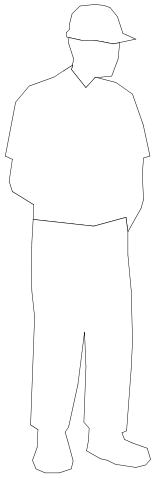
Enter a Positive or Negative Number?

Determine when to enter a positive of negative number by using the **Left Hand Rule**.

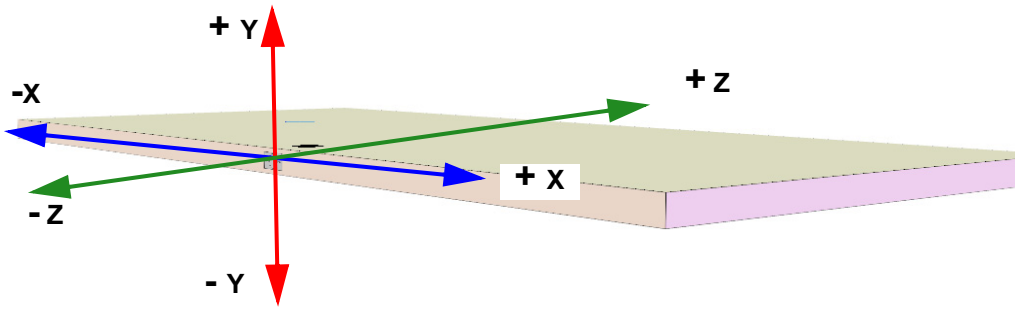
Use the **Lock Side** of the door as a reference. Hold out the left hand with the first finger pointed at the **door cut**, second finger and thumb at right angle to each other. The first finger represents the **positive** direction of the **Z-Axis**, the thumb represents the **positive** direction of the **Y-Axis**, then second finger represents the **positive** the direction of the **X-Axis**.



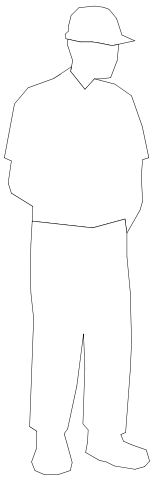
Door Edge Axis Directions (Option)



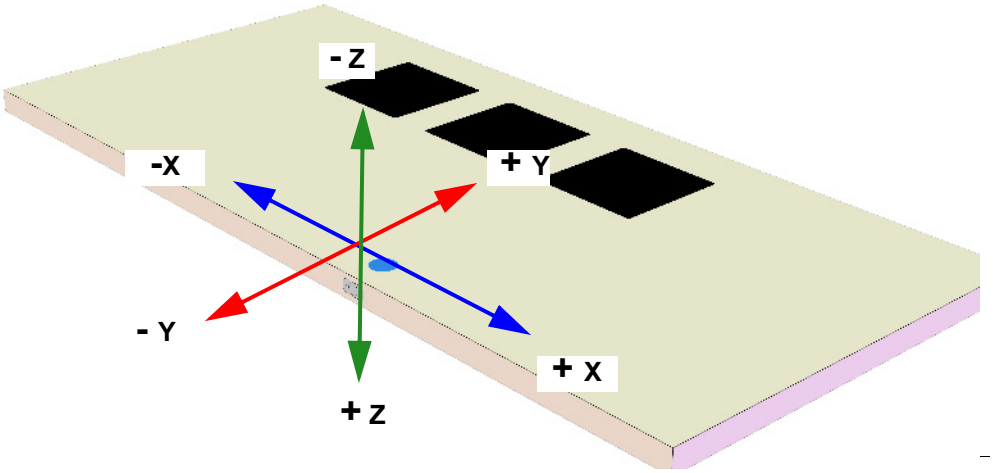
Stand at the Lock Side of Door, point at the **edge** of the door with the left hand rule to determine axis direction



Door Face Axis Directions



Stand at the Lock Side of Door, point down at the **face** of the door with the left hand rule to determine axis direction

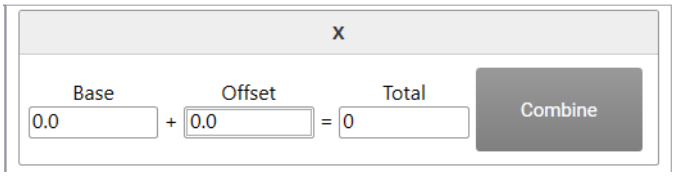


How to Enter Calibration Data

Adjustment menus are located in the setup screens. In these menus, you can add negative or positive adjustments to move a servo to desired positions to compensate (calibrate) for any deviation's from the expected cut. The calibration can then be saved.

Note: Maximum offset is 0.50 inches. If more than 0.50 inches of adjustment is needed, there is a high probability that another issue may be causing a problem. If issues can not be resolved, contact the KVAL Service Center KVAL Inc. (1-800-553-5825).

About The Calibration Box

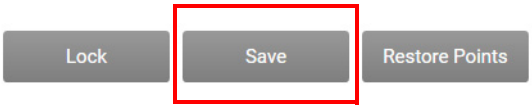


Base: Is the result of the **Combine** selection. (The merge of the Offset and the Base)

Offset: Enter the desired offset to bring into calibration.

Total: Is the running total of the **Base** and the **Offset**

Combine: Merges the offset number to the base.



Save Button: Select to store the calibration.

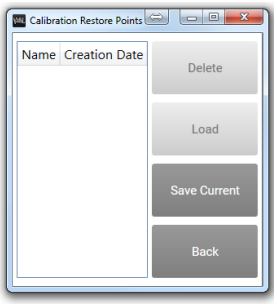
Below are general instructions to perform a calibration.

1. Check for deviations between the expected machining and the actual machining. Determine the offset.
2. Enter a positive or negative offset in the **Offset** box to adjust the servos in the X, Y, and Z directions.

   Note: Select the **Combine Button** to keep track of the offsets during the process.
3. After every calibration change, select the **Save** button to store the calibration. Run a test door again to verify the offset correction was successful.
4. Keep running a test door and adjusting the offset until satisfied with the result.

About Restore Points

Restore Points can be created to store a calibration point for recall.



To create a Restore Point:

1. Select the **Restore Points** button
2. Select the **Save Current** button from the pop-up window save current calibration
3. Name and enter to save

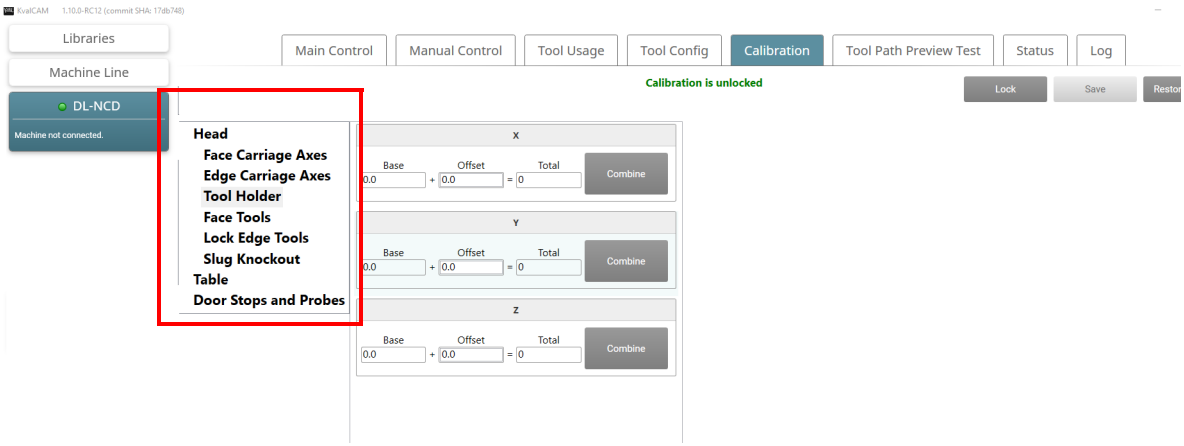
To Load or Delete a Restore Point:

1. Select the restore point from the menu
2. Select the **Load** button to use the calibration. Select the **Load** button to load
3. Select the **Delete** button to delete the point.

About the DL-NCD Calibration Screen

The **Calibration Screen** contains a list of calibration adjustments. Select the **DL-NCD Tab** located on the left hand side of the machine, then select the **Calibration Tab** to jump to this menu. Enter adjustments according to “How to Enter Calibration Data” on page 4-6. Ensure Calibration is unlocked.

DL-NCD Calibration Screen



Calibration Selections

The table below describes the available calibration routine.

Calibration	Assembly	Adjustments Performed
Head	Face Carriage Axes	Adjust the location of the 3 axes (X,Y,and Z) of the **Face Carriage Head.**
	Edge Carriage Axes (Option)	Adjust the location of the 3 axes (X,Y,and Z) of the **Edge Carriage Head.**
	Tool Holder	Adjust the position and approach of the **Carriage Head** at the **Tool Holder Rack.** Axes X, Y, and Z.
	Face Tools	Adjust the diameter of each Face tool.
	Lock Edge Tool (Option)	Adjust the Diameter and Axes X,Y,and Z of the Edge tool
	Slug Knockout	Adjust the position of the Knockout in the X and Y axes.
Table	Stop 1	Adjust the Stop
	Length Probe	Adjust the X-Axis if the Length Probe.
	Lock Edge Probe (Option)	Adjust the Axes X,Y,and Z of the lock Edge Probe.

About Calibration Sequence

The machine has been calibrated at the factory. It is best to verify or calibrate in the order described in this section.

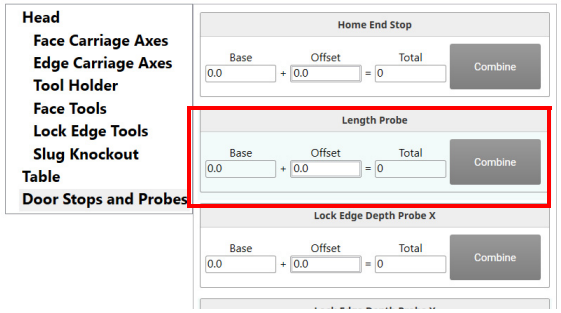
Step 1: Calibrate the Length and Width

The Length Probes and the Width Adjust are the first calibrations that should be checked or performed.These calibrations are a starting reference for calibrations on the machine.

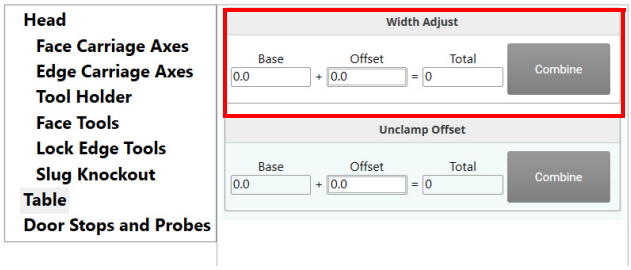
Calibrate the Length and Width

For this calibration, enter offsets in the **Length Probe Calibration Box and the Width Adjust Calibration Box.** A known good door is send through the machine multiple times.

Length Adjust



Width Adjust

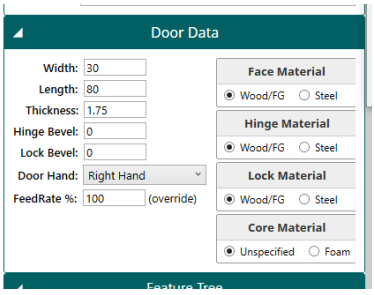


Process to Calibrate the Length and Width

1. Measure a known good door. (These measurements are used to compare feed back at the **Log Screen**.)
   a. The door should be true and be considered a calibration reference
   b. Door should be sturdy enough to survive multiple passes through machine.
   c. **Measure the length** of the door and capture it.
   d. **Measure the width** of the door and capture it.
2. Create a **Door Job,** input the actual measurements of the door.

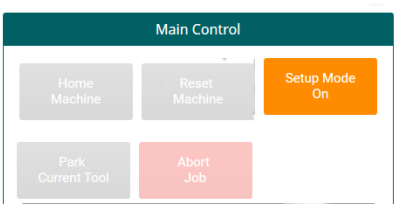
.

Add Actual Measurements of the Door

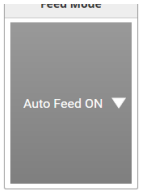


3. Add the door to the Queue

4. At the **Main Screen**, ensure the **Set-Up Mode** is enabled (no cutting).



5. At the **Main Screen**, ensure **Auto Feed** is enabled



6. Feed in the reference door.

7. Select the **Log Tab** and check the latest **Width and Length** feedback located under the **Messages Column.**

Time	ModuleName	Message	Priorit
9/23/2019 3:57:05 PM	G-Code Interpreter	Tool# 5 Specs (x:0.000 y:0.000 z:0.000 I:-4.000 r:0.250)	Messa
9/23/2019 3:57:05 PM	G-Code Interpreter	Tool# 4 Specs (x:0.000 y:0.000 z:0.000 I:-4.000 r:0.250)	Messa
9/23/2019 3:57:05 PM	NA	Job Processing Phase: JOB RUNNING	Messa
9/23/2019 3:57:05 PM	DL-NCX Main Control	Task data has been received.	Messa
9/23/2019 3:57:05 PM	NA	Job Processing Phase: JOB PRE-PROCESSING	Messa
9/23/2019 3:57:03 PM	DL-NCX Main Control	Door Final Size: Width=29.757 Length=79.966 Thickness=1.375	Messa
9/23/2019 3:57:03 PM	Cycle Timer	Starting Cycle Timer. "Start-to-Start" Time:22m 36.6200s	Messa
9/23/2019 3:57:03 PM	Table Manager	Measured Door Length=79.966	Messa
9/23/2019 3:57:03 PM	Length Probe	Door Length measurement done: 79.966	Messa
9/23/2019 3:57:01 PM	Table Manager	Measured Door Width=29.757	Messa
9/23/2019 3:57:05 PM	X Axis Inverted	Gear-in Command Successful	Messa

8. Re-feed the door at least 3 times. (Each time capturing the measurements from the Log Viewer).

9. Reverse the door and re-feed it at least 3 times. (Each time capturing the measurements from the Log Viewer).

10. To get the average, add -up all data collected from the **Log Viewer** and divide by the number of times the door was fed in.

11. Compare the actual measured data with the calculated data.

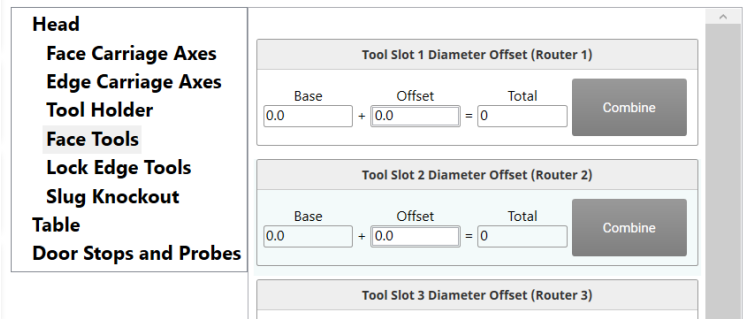
12. If the **width** measurement feedback is less that the actual measurement, **input a negative value**.

13. If the **length** measurement feedback is **less** that the actual measurement, **input** a **positive value**.

Step 2: Calibrate the Face Tools

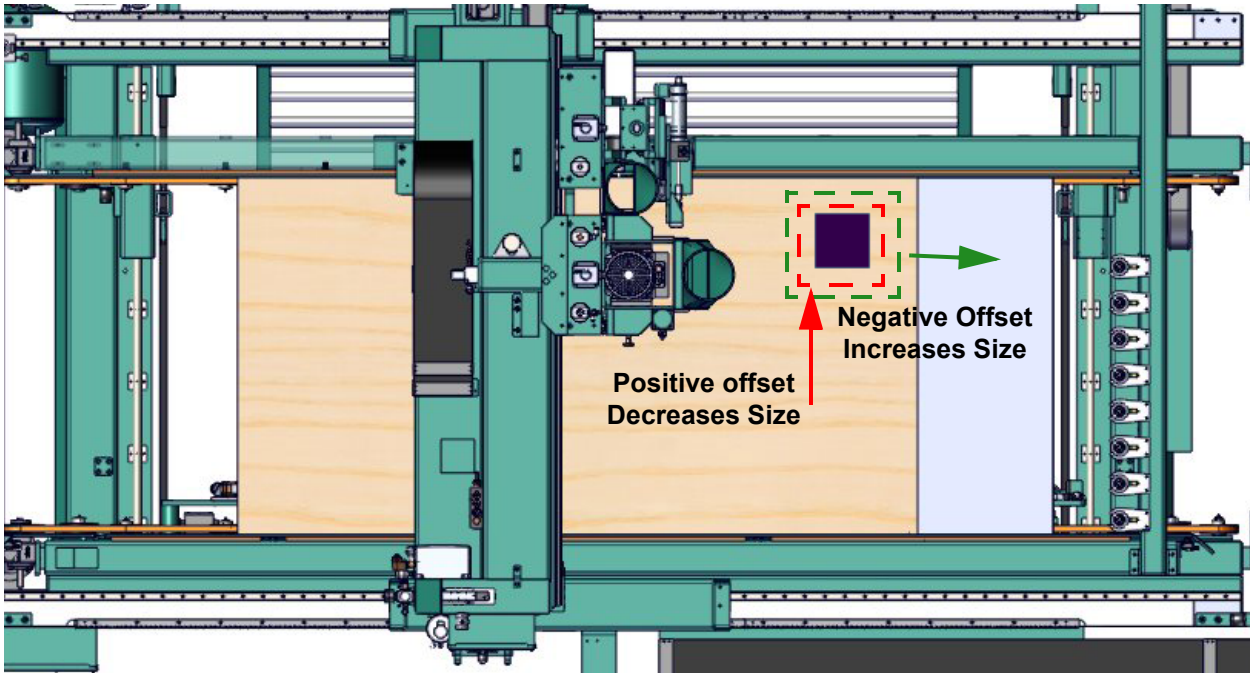
At the **Calibration Screen**, select **Face Tools.** Select the desired **Tool Slot Calibration Box** to make adjustments. This calibration compensates for changes in the diameter of the tools.

In this calibration process, cut a known square in the door. Measure the parameters of the square.



Process to Calibrate the Face Tools

1. Before calibrating the tools, update the Tool Configuration of the tool being calibrated. See “About Using Tool Configuration” on page 3-25.
2. Create a **FaceRectangle Door Job** of your choice.
3. Add **Door Job** to the **Queue**.
4. Once the cut has been made, check the parameter (length and width) of the cut.
5. Increase or decrease the diameter offset to match the parameters of the **FaceRectangle**.



Step 3: Calibrate the Face Carriage

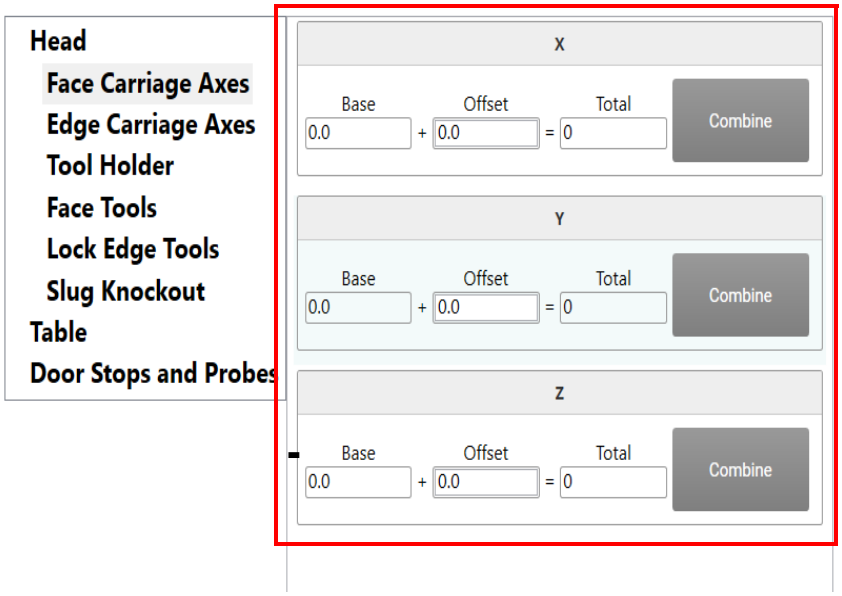
This section includes descriptions of calibrations located under the **Head Group**. At the **Calibration Screen**, select **Face Carriage Axes** to display the calibration menu.

Before Calibration

Note: It is recommended to **verify the Tool Config** settings before calibrating the plunge cut (**Z-Axis**). This is a global calibration. Therefore, by calibrating, other tools may be out of calibration. For directions on how to use the configuration menus, see “About Using Tool Configuration” on page 3-25.

Face Carriage Axes Calibrations

Using the left hand rule, verify the the X, Y, and Z axes. Refer to the figure below for axis movement direction.



Process to Calibrate the Face Carriage Head

Note: It is recommended to use a solid core door when calibrating the **Z-Axis**. Solid core doors lends itself to finer measurements of the depth.

For instructions about entering calibration data, see "How to Enter Calibration Data" on page 4-6.

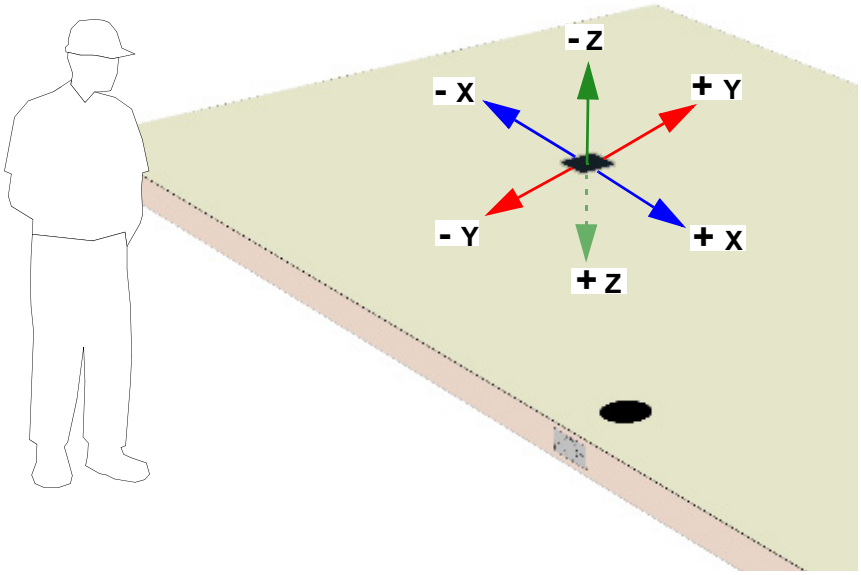
1. Create a **Door Job** of a **FaceRectangle** cut of your choice with a depth of 0.25 inches.
2. Add **Door Job** to the **Queue**.
3. Once the cut is machined, check location of the cut. If the cut is not in the specifications, find which needs to be calibrated.
4. Perform the Left Hand Rule at the lock side of the door to determine axis direction. See illustration below.
   - If the location is out of specification in the **length** of the door, the **X-Axis** needs to be adjusted.
   - If the location is out of specification in the **width** of the door, the **Y-Axis** needs to be adjusted.
   - If the plunge cut is out of specification, check the **Configuration Menu**.

Face Axis Direction

Z-Axis----Adjust update the Configuration Menu.

To determine axis direction.

Stand at the Lock Side of Door, point down on the face of the door with the left hand rule.

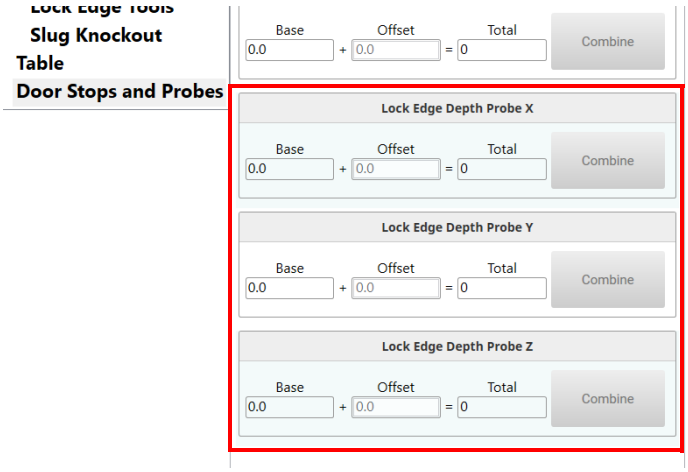


Step 4: Calibrate the Lock Edge Probe (Option)

The **Lock Edge Drill** is an machine option that routes a lock on the door edge. This section focuses on the **Edge Probe Calibration**. For instructions about entering calibration data, see “How to Enter Calibration Data” on page 4-6.

Lock Edge Probe

At the **Calibration Screen**, select **Door Stops and Probes** to display the calibration menu.

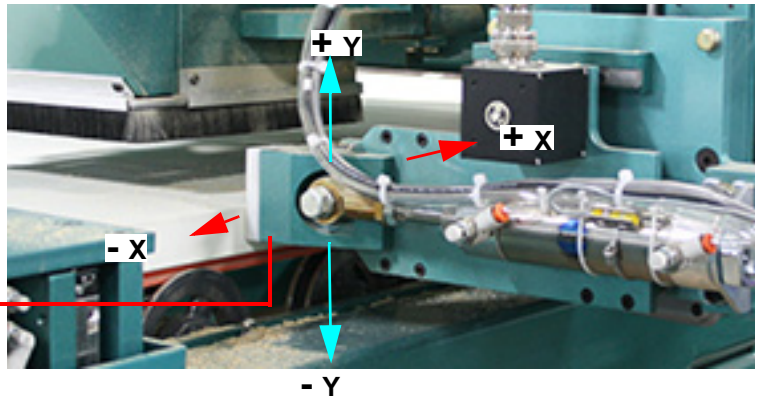


Before Probe Depth Calibration

Before calibrating the Lock Probe depth (**Z-Axis**) verify the **X-Axis** and **Y-Axis**.

This is a visual test.

Run a Door Job. Check the Depth Probe Pad position as it touches the door edge. Pad on probe should cover at least 50% of the door edge.



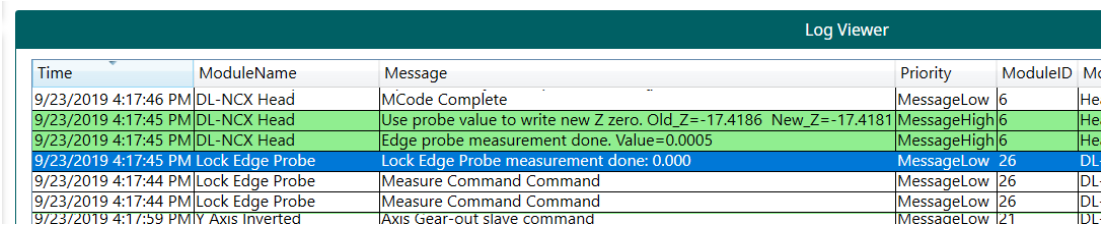
Process to Calibrate the Probe Depth

The **Lock Edge Probe** uses the edge of a clamped door as a zero reference. Verify that the probe location touches the edge of the door at a zero reference.

Note: Verify that the Length and the Width is calibrated before performing this calibration.See “Step 1: Calibrate the Length and Width” on page 4-9.

Note: The depth position of the probe will influence the depth of the cut for edge tools.

1. Create a **Door Job** with edge work.
2. Add the door to the **Queue**.
3. Feed the door into the machine.
4. Select the **Log Tab** and check the latest **Edge Probe** feedback located under the **Messages Column.**



5. If a **positive** value is displayed, enter a **positive** offset to zero the probe reading.
6. If a **negative** value is displayed, enter a **negative** value to zero the probe reading.
7. Run the door and verify the displayed feed back is zero.

Step 5: Calibrate Lock Edge Tools (Option)

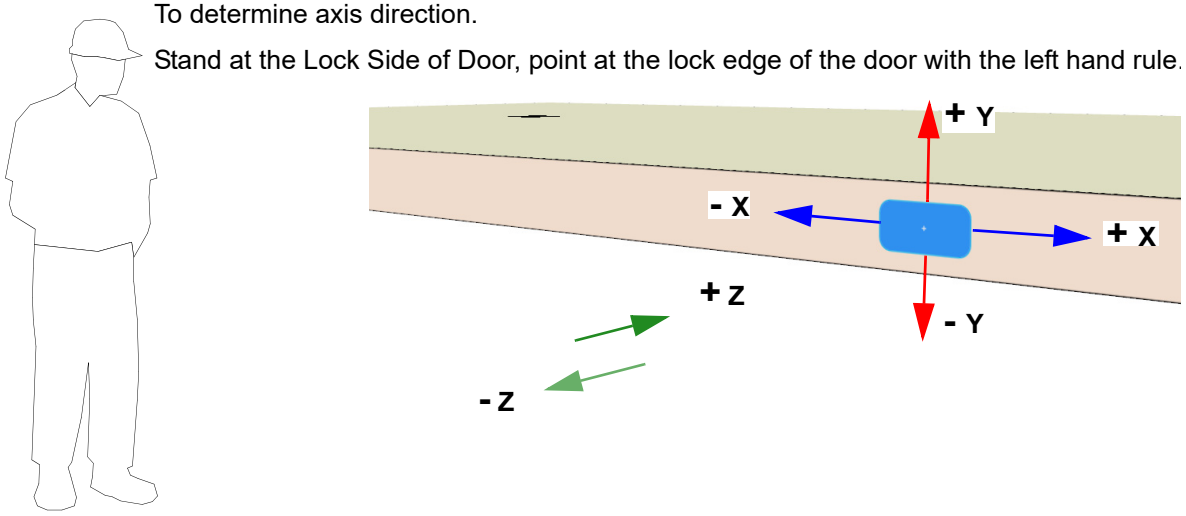
This section focuses on the **Edge Tool Calibration**. For instructions about entering calibration data, see “How to Enter Calibration Data” on page 4-6.

About the Edge Carriage Axis

Do **not** adjust a cut with the **Edge Carriage Axis Calibration**. The calibration is to be used by trained Service Technicians.

Process to Calibrate the Lock Edge Tool

1. Create a **Door Job** of a **Lock Cut** of your choice
2. Add **Door Job** to the **Queue**.
3. Once the cut is machined, measure the **length**, **width**, and **depth** positions of the cut. If the cut is not in the specification, determine which axes need to be calibrated.
4. Perform the **Left Hand Rule** pointed at the cut lock to determine axis direction. See illustration below.
   - If the **length** position of the lock cut is out of specification, the **X-Axis** needs to be adjusted.
   - If the **width** position of the lock cut is out of specification, the **Y-Axis** needs to be adjusted.
   - If the **depth** cut is out of specification, the **Z-Axis** needs to be adjusted.



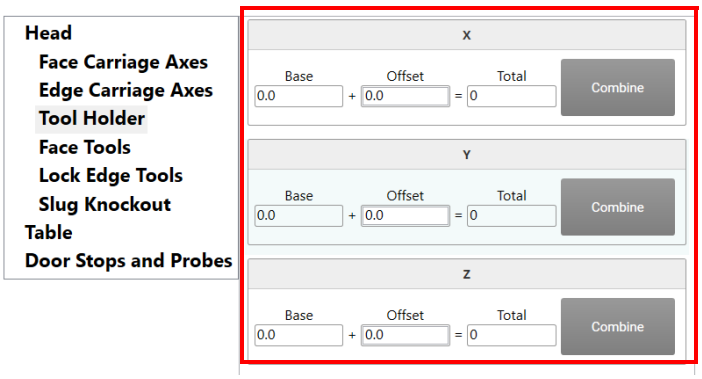
Step 6: Calibrate the Tool Holder

Important: Proceed with Caution. Incorrect Calibration may damage the spindle or tool holder. Input small increments when calibration.

This calibration adds offsets to align the **Cutter Head Tool Holde**r to the **Tool Holder Rack** drop off and pick up locations. For instructions about entering calibration data, see “How to Enter Calibration Data” on page 4-6.

Run the **Manual Tool Changer Control** that is located under the **Maintenance Tab**.

Check location of the **Cutter Head Tool Holde**r against the **Tool Holder Rack** then enter offsets into the **X-Axis**, **Y-Axis**, and **Z-Axis** calibration boxes to align to the **Tool Holder.**



About the Manual Tool Change Mode

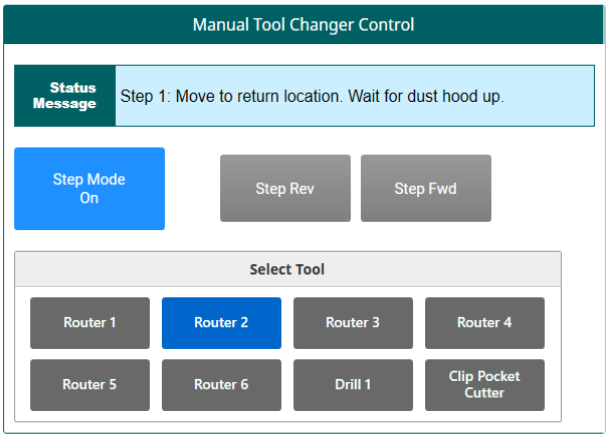
This calibration is best used with the **Manual Tool Change Mode.** When activated, the **Cutter Head** can be moved in repeatable steps toward, away, up, and down with reference to the **Tool Holder Rack**. At these step intervals, the operator establishes best tool position for the **Tool Holder** and **Tool Rack.**

To initiate the sequence, go to the **Manual Control Tab** and locate the **Manual Tool Changer** menu.

Status Message Box

ON/ OFF and Step Control

Select Tool



Axis Direction

Y-Axis: If the tool needs to move towards the fixed fence, enter a negative number. If the tool needs to move towards the adjustable fence, enter a positive number by the amount it needs to move.

X-Axis: If the tool needs to travel into the tool holder more, enter a positive number. If the tool needs to back out of the tool hold, enter a negative number.

Z-Axis: If the tool needs to be lower when it comes into the fork area, enter a positive number. If the tool needs to be raised when it comes into the fork area, enter a negative number.

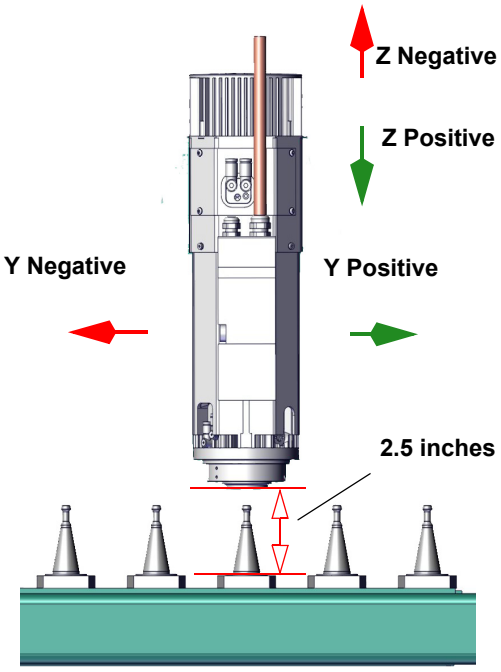


FIGURE 4-8. Axis Direction

About the Step Sequence

The step sequence will follow different paths depending if the tool is loaded in the **Cutter Head** or not loaded.

If a tool is loaded into the **Cutter Head,** the tool must be manually deposited to the **Tool Holder Rack** to begin the calibration process.

Process to Calibrate the Tool Holder

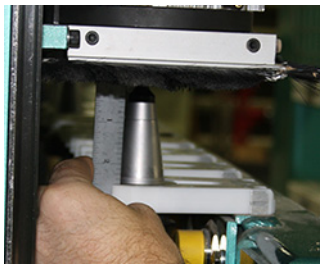
This should be a two person operation with one at the **Operator Station** and one at the **Tool Holder Rack**. Each step is displayed in the **Status Message Box.**

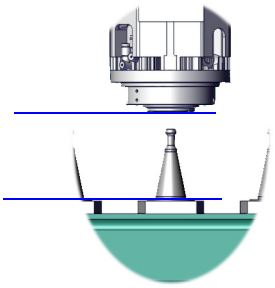
1. Go to the **Manual Control Tab** and select the Step Mode button to turn ON the program. For menu displayed, see “About the Manual Tool Change Mode” on page 4-17.
2. Select the **Step Mode Button** to turn it ON.
3. Select the desired tool in the **Select Tool** section. Follow the text directions displayed in the **Status Message Box**.

4. Use the step buttons to step backward and forward checking the location of the **Tool Holder** to the tool in the **Tool Rack.**

5. When the **Cutter Head** is directly over the tool, verify alignment of the **Tool Holder** to **Tool**. Enter any offsets if needed, see Figure 4-8 above for axis direction.

6. When directed by the status message, verify the distance from the lip of the **Tool Holder** to the ledge of the **Tool**.

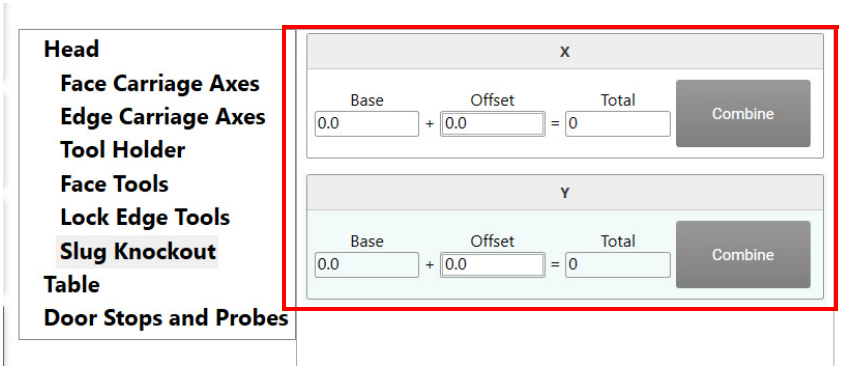




7. At completion, verify that the tool is picked up from the **Tool Rack** and locked into the **Tool Holder** and the tool is placed and released into the **Tool Rack.**

Step 7: Calibrate the Slug Knockout

Select **Slug Knockout** to display the calibration menu. Adjust the **Knockout Assembly** to the correct position of the knockout strike. For instructions about entering calibration data, see “How to Enter Calibration Data” on page 4-6.

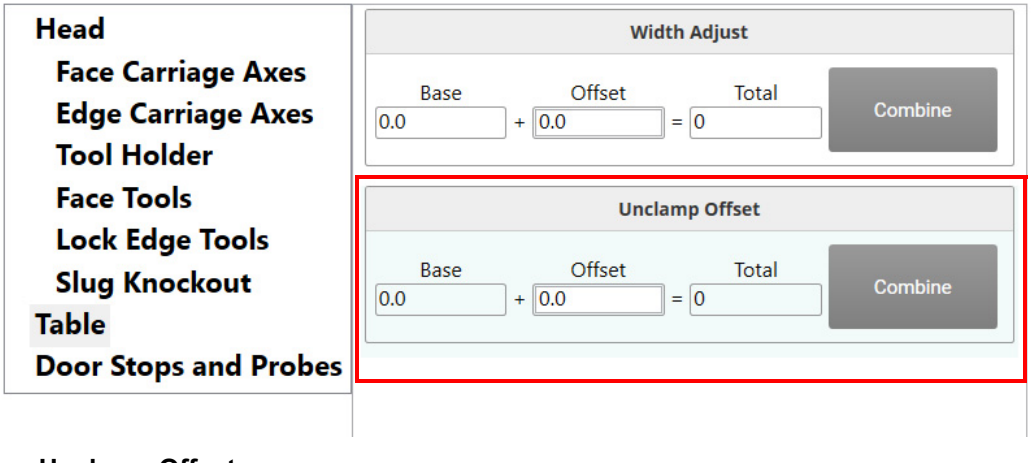


Process to Calibrate the Slug Knockout

1. Create a **Door Job** of a a **FaceRectangle** of 5.0” by 5.0”
1. Add **Door Job** to the **Queue**.
2. After the cut has been completed, verify the knockout plunge hits at the center of the cut.
3. Adjust the **X-Axis** and **Y-Axis** offsets until plunge is centered.

Step 8: Calibrate the Clamp

At the **Calibration Screen**, select **Table** to display the calibration boxes. For instructions about entering calibration data, see “How to Enter Calibration Data” on page 4-6.



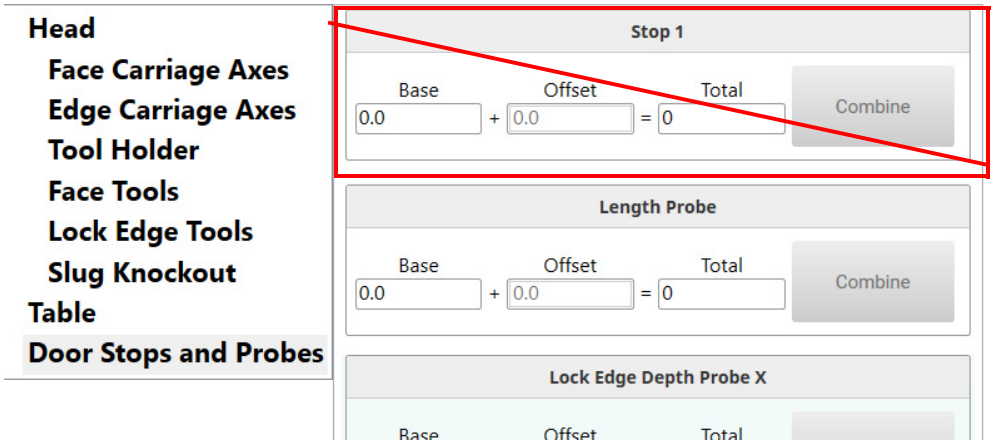
Process to Calibrate the Clamp Assembly

1. Enter the desired width of the fence in unclamping mode.
2. Slide door into the machine and firmly press it against the fixed fence.
3. There should be about 1/4" of a gap from the movable fence and the door edge.
4. Repeat until condition has been met.

Step 9: Calibrate the Door Stop

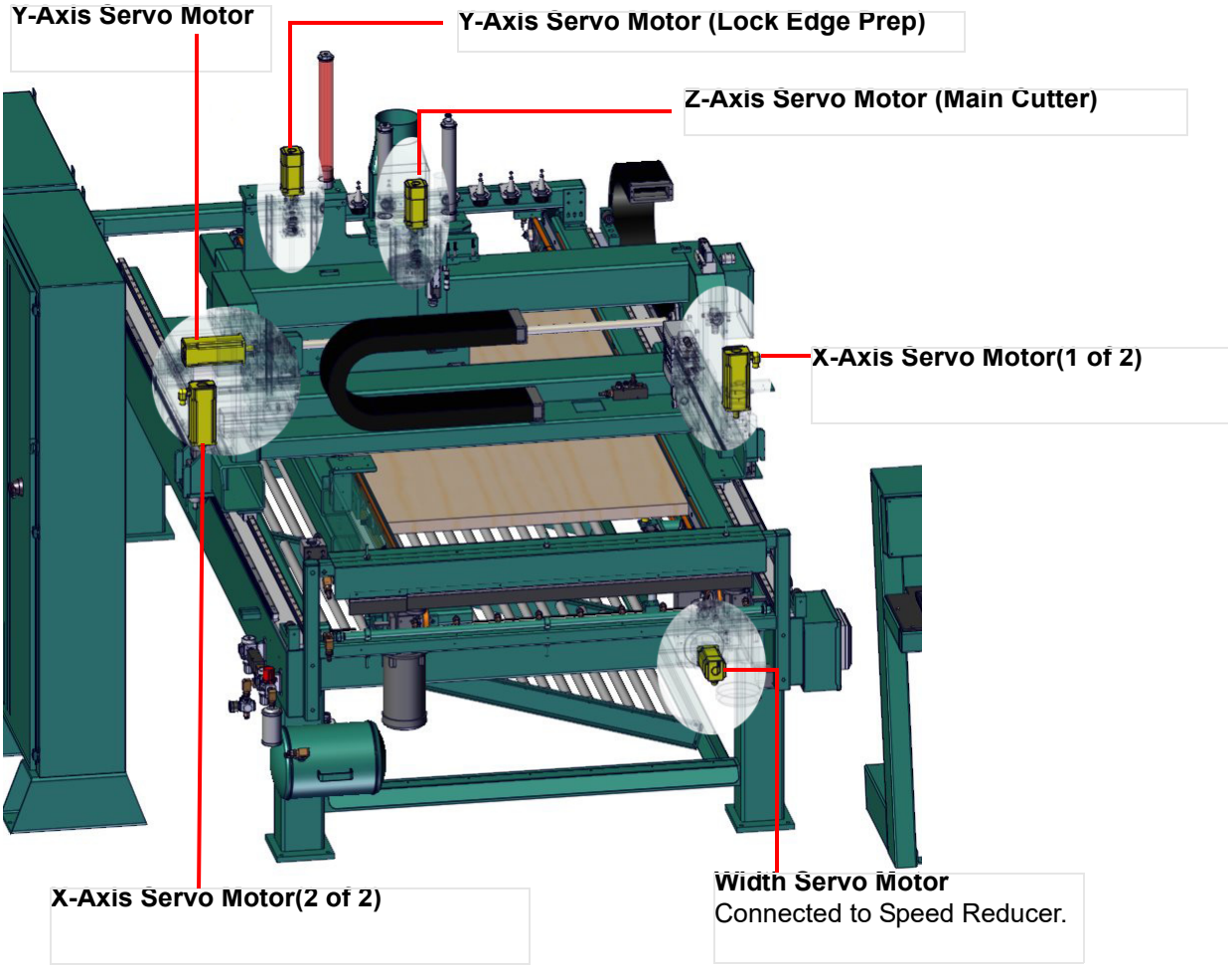
About the Stop 1 Calibration

Do **not** adjust the **Stop 1** calibration. The calibration is to be used by trained Service Technicians.



Appendix: Servo Motor Drive Assembly Locations

The illustration below identifies the servomotor locations on the machine. Each servomotor corresponds to the calibration adjustments in this chapter.



CHAPTER 5 Tour of the DL-NCD

This chapter describes components, assemblies, and the user interface of the **KVAL DL-NCD System**. The content is geared to help operators understand the basic operation of the machine

Chapter 5 at a Glance

Section Name	Summary	Page
Top View of DL-NCD	A view of the machine from above.	page 5-2
Operator's Station	Description of the Operator's Station controls.	page 5-3
Around the Machine	A tour of the Machine assemblies.	page 5-5
About the Probes	A description of the encoder driven probes on the machine.	page 5-9
About the Cutter Head	Description of the Cutter Head assembly.	page 5-10
About the Tool Holder Rack	Description of the Tool Holder Rack. Including steps to change a tool.	page 5-11
About the Drop-Out Area	Descriptions of the Slug catching assemblies	page 5-17
About the DL-NCD Electrical Panels	Descriptions of the Electrical Panels of the DL-NCD. Includes: Nodes	page 5-18

Top View

This section takes you on a tour of the **DL-NCD**. The figure below shows locations of selected areas, parts, and assemblies on the machine

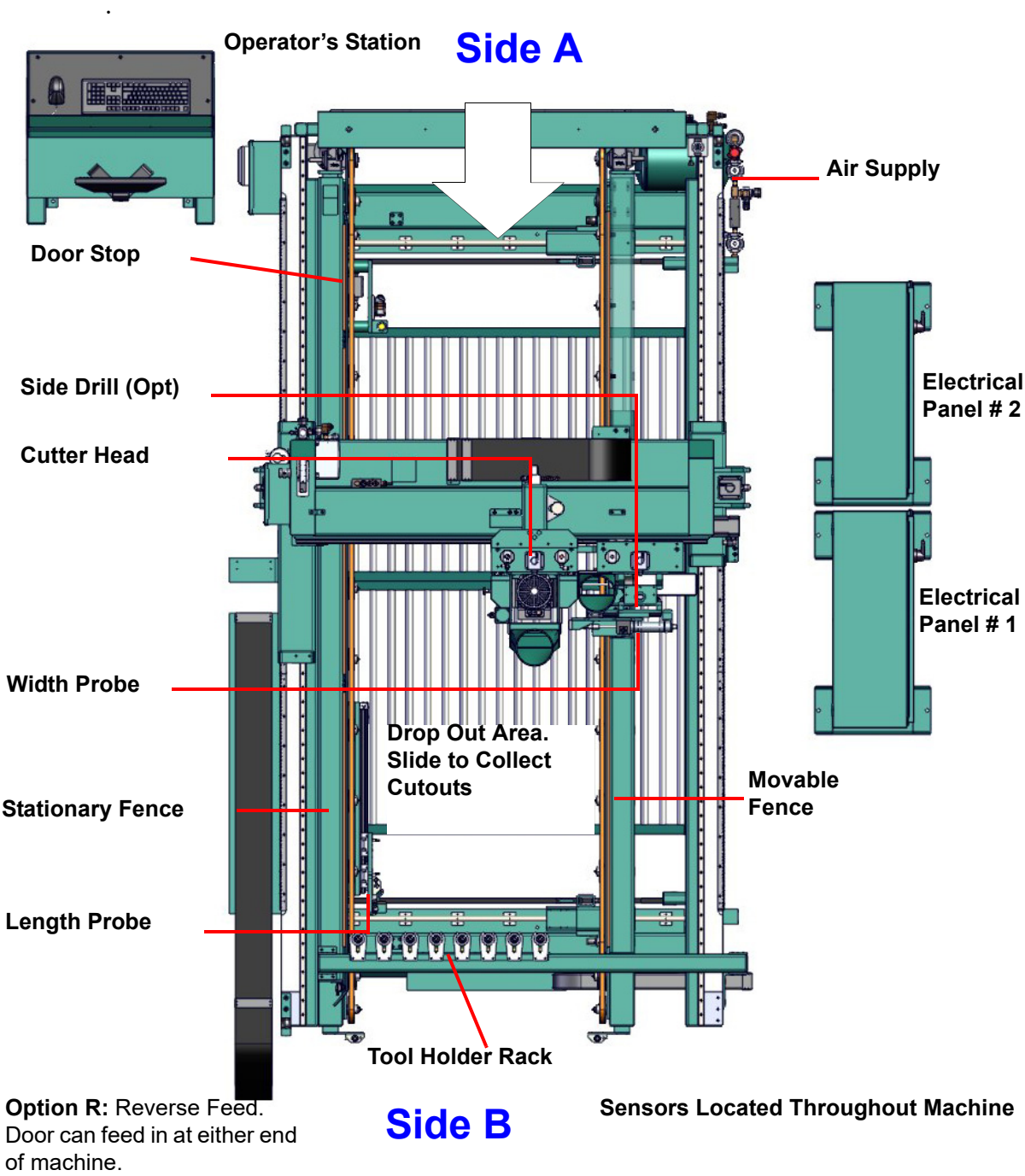


FIGURE 5- 1. Top View of the DL-NCD

Operator's Station

The user interface allows the operator to use a touch screen to control the door cutting process, auto-run, manually run the door, store door profiles, and use diagnostics to help troubleshoot the **DL-NCD**.

The **Operator Station** may contain the operator interfaces for one or more of the machines in the production line. For example, shows an operator station with interfaces for an ON-3 Feeder.

Touch Screen Interface: KvalCam interface.

Main Control Panel: Power -Up and Power Down machines. Start and stop the door process, pause doors in the Feeder and Stacker. Emergency Stop.

See "Initial Powering Operations for the Machine Line" on page 3-4

Keyboard: Enter data and interact with Touch Screen.

Control Circuit: Turns on the circuit to give the machine power.

E-Stop: Sops all functions and powers down the machine in an emergency situation.

Start/Stop: Start the machine or stop the machine. Similar to a soft boot-up on a computer.o

FIGURE 5- 2. Operator Station

About Side A and Side B

Some machines may have reverse feed. This allows inputting the door from either side. Check your machine for which options is included.

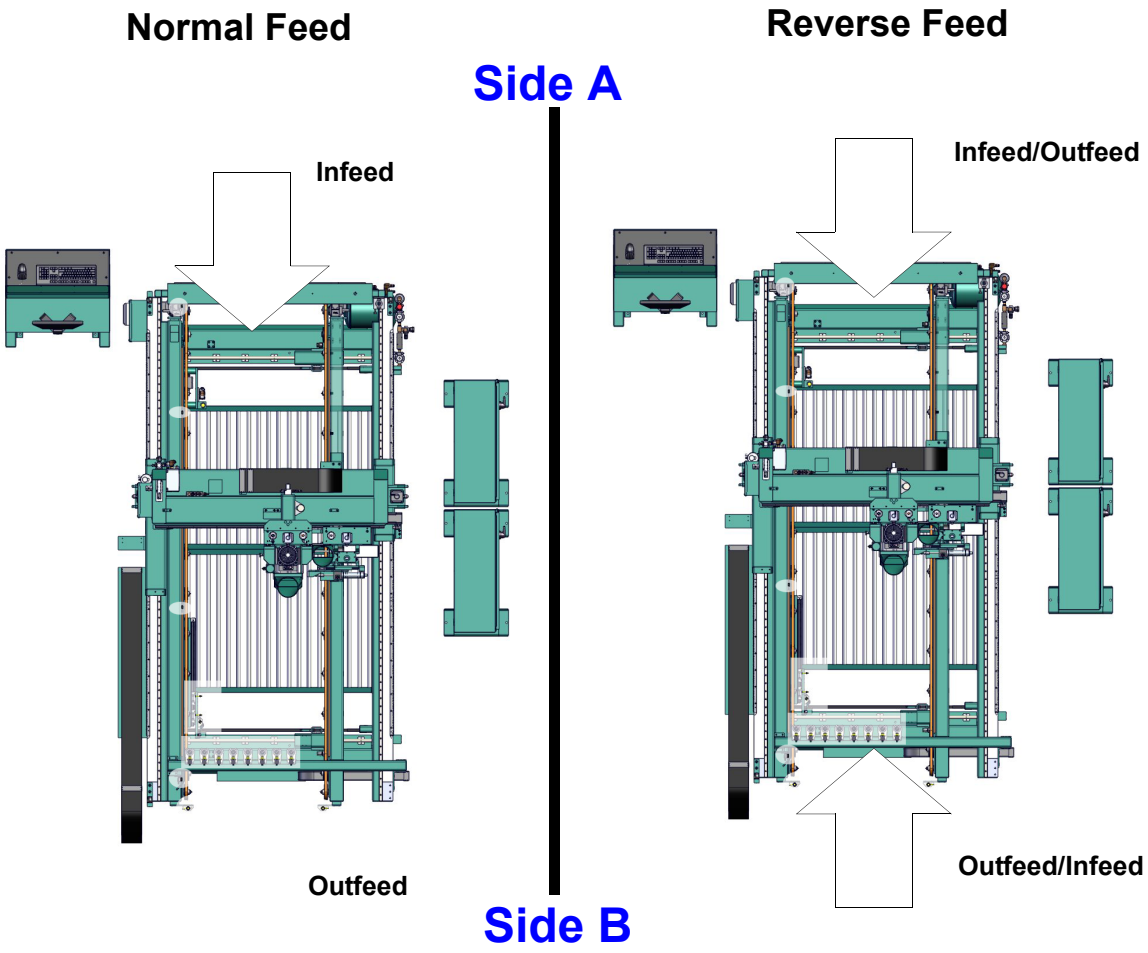


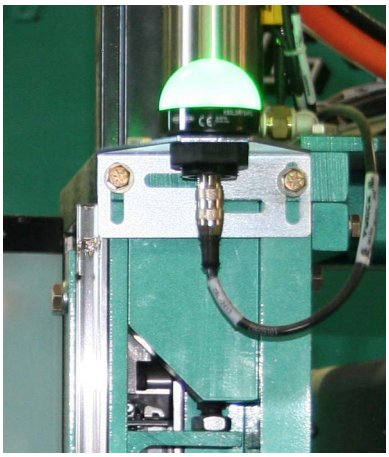
FIGURE 5-3. About Side A and Side B

Around the Machine

This section describes various assemblies on the machine.

About Indicator Lights

The Indicator light supplies quick identification of the status of the **DL-NCD.** See the table below for light status descriptions.



Light Color	State	Description
Blue	Solid	Door in machine with no work loaded (Feed-thru).
Green	Solid	Machine is busy.
Green	Flashing	Data loaded and waiting to start.
Red	Flashing	General error has occurred.
Yellow	Solid	Air pressure is low.

FIGURE 5- 4. Door Stop Cylinder

Option A: About Air Nozzles

The automatic blow off consists of a bank of high-pressure air nozzles to clean dust and debris as the door feeds in or out of the **DL-NCD**.

Note: To manually turn off the air, use the slide value located on the side of the machine.

FIGURE 5-5. Air Nozzles for Blow Off of Debris

About Sensors

On the **DL-NCD**, sensors provide input to the PLC as part of the automation of the door cutting process, including feed through, door clamping, and door location. It is important to keep the sensors cleaned and aligned to keep the door process running smoothly. There are two classifications of sensors on the **DL-NCD**: Photo Electronic and Inductive Proximity Sensor.

Proximity Sensors Used on Cylinders

Photo Eye Detector Emitter and Receiver in one package

Proximity Detector Senses metallic objects

FIGURE 5-6. Examples of Sensor

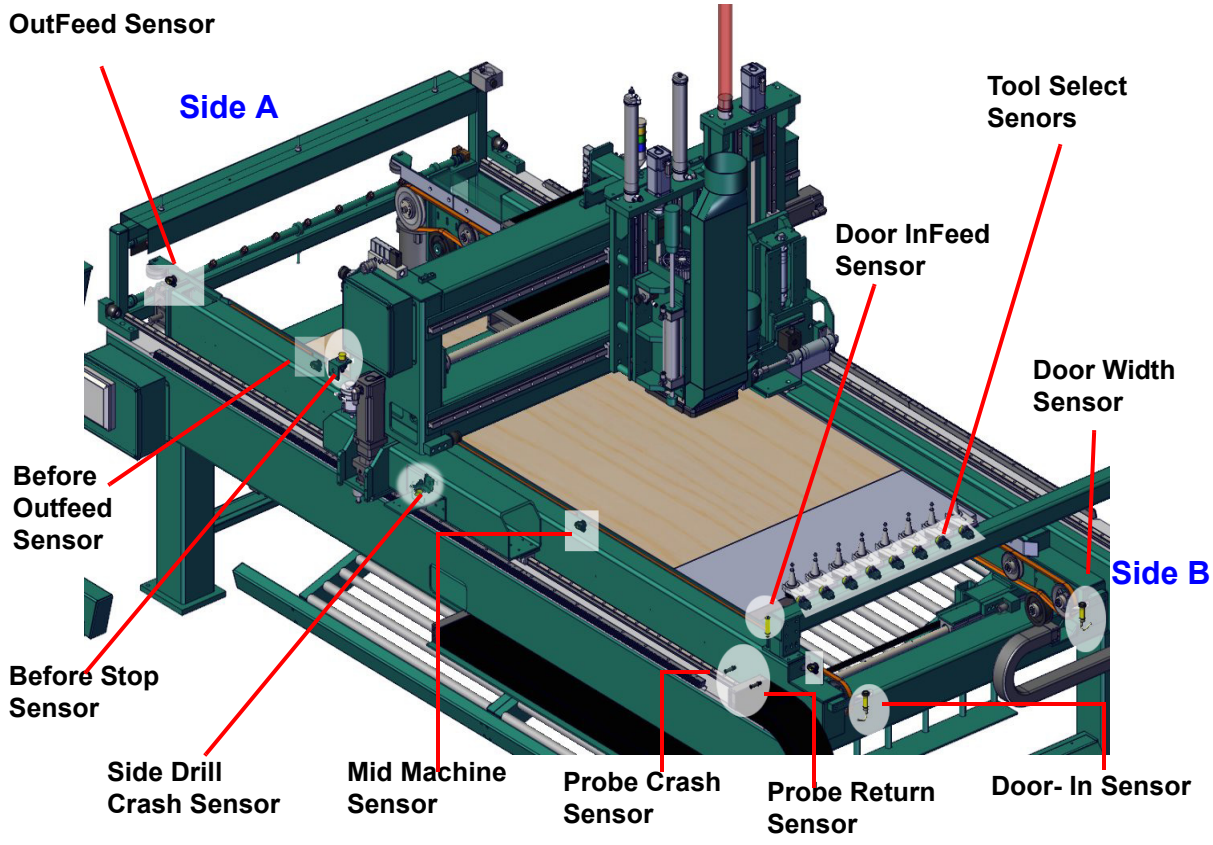


FIGURE 5-7. Sensor Locations on the Machine Frame

Homing and Limit Sensors

Refer to the machine's Electrical Drawing for specific designators. The "I" designators are inputs and the "Q" designators are outputs. Figures 5-3 and 5-4 show the X,Y, and Z Axis homing sensors.

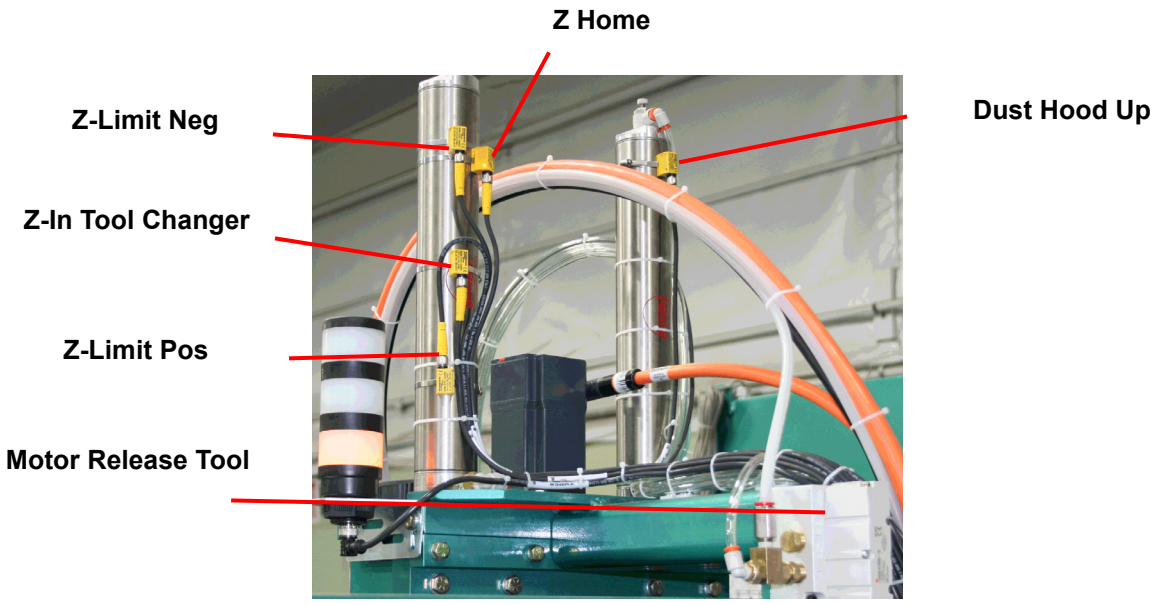


FIGURE 6. Z Axis Sensors

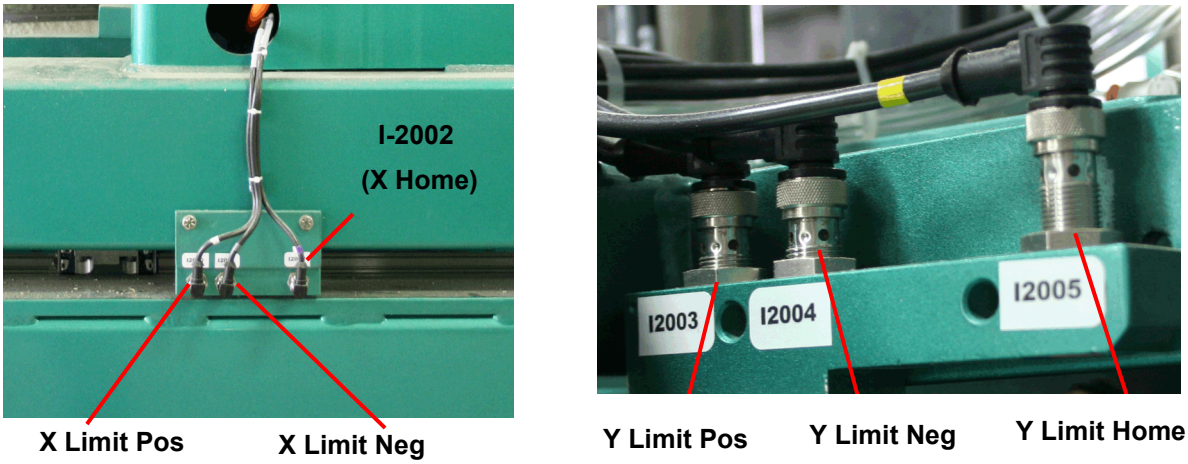


FIGURE 7. X and Y Axis Homing Sensors.

About the Door Stop System

The door stops are controlled by an air cylinder. The stop will pop up when activated. A door pusher on the out feed end of the machine pushes the door up against the stop. The width adjust clamps the door tight.

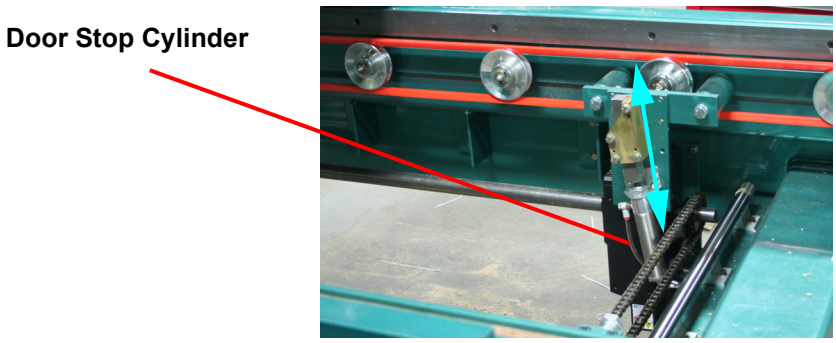


FIGURE 5-1. Stop Assembly

About the Probes

Probes are an option. This machine contains a **Length Probe** and an **Edge Lock Probe (Option).**

This machine may be equipped with quadrature encoders. Quadrature encoders provide high speed bi-directional information. Incremental encoders can provide a once-per-revolution pulse (often called index, marker, or reference) that occurs at the same mechanical point of encoder shaft revolution. This reference is used as a comparative point resulting in a highly accurate measurement. The **encoder assembly** is identified as a **probe**.

Important: If calibrating, calibrate the **probes first.** See Chapter 3 in this manual.

Typical Encoder

About the Probe Assemblies

The probe assemblies use encoders to get accurate measurements of the door. The measurement results are fed back to the KvalCAM software.

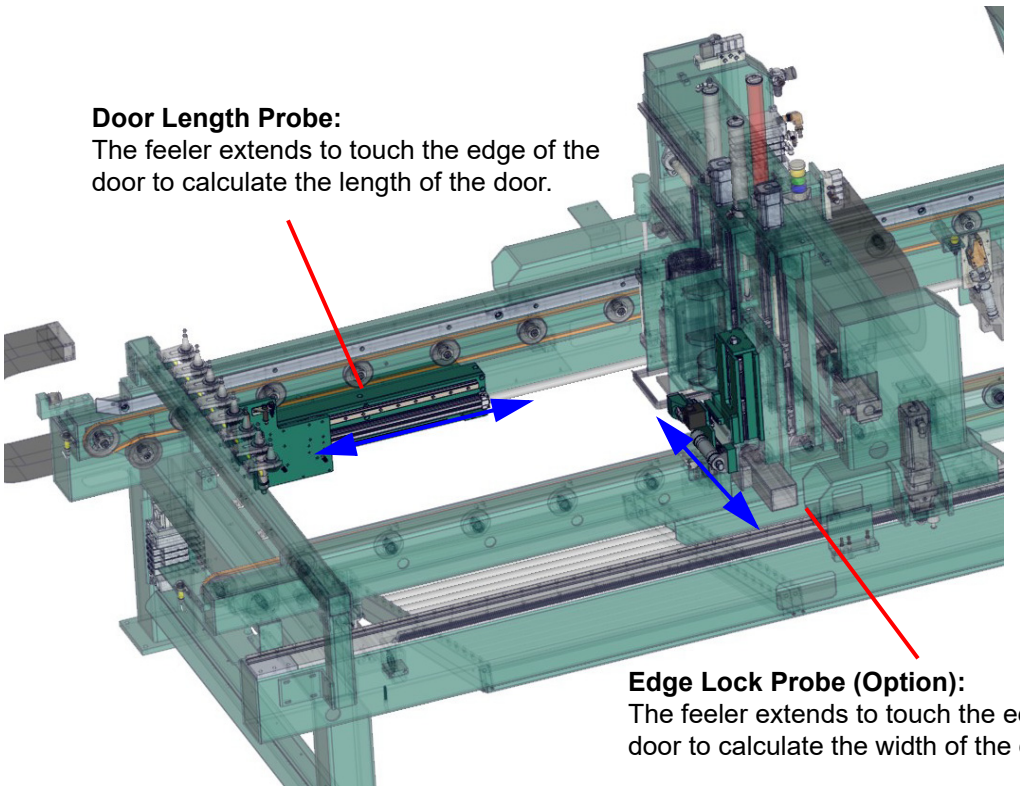


FIGURE 5-2. Probe Locations

About the Cutter Head with Optional Side Drill Assembly

The **Cutter Head** is the “workhorse” of the machine and is designed to rout lock face holes, peep holes, and lights in doors made of fiberglass, steel, or wood.

A cylinder attached to a metal block, knocks out cut portions of the door to the drop out area. The **Cutter Head** movements and cutting routines are driven by template software, manual input, and the PLC.

The Cutter Head Motor

The motor is automatically driven to the **Tool Holder Rack** to retrieve the **Tool Holder**.

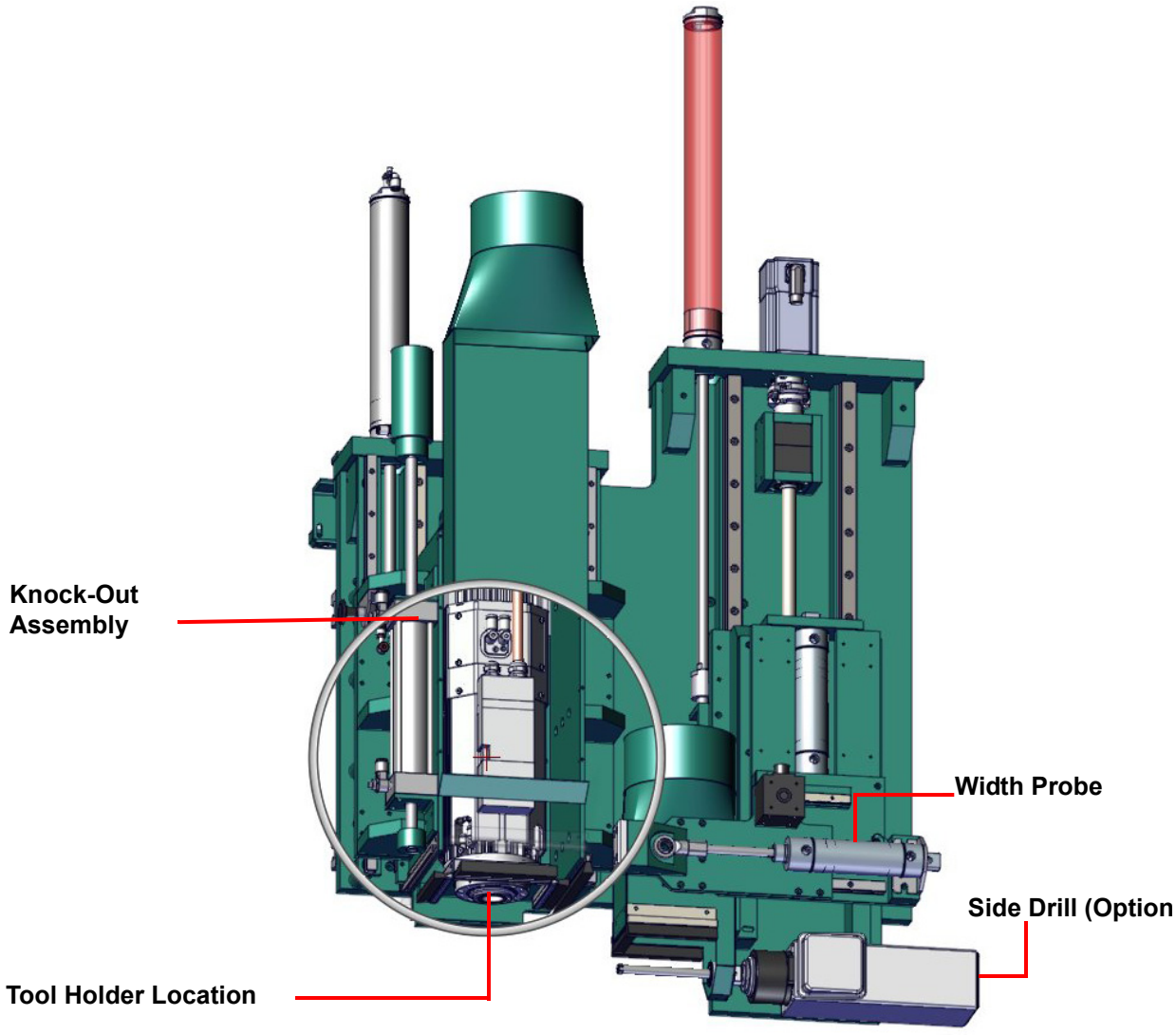


FIGURE 5- 1. Cutter Head

About the Tool Holder Rack

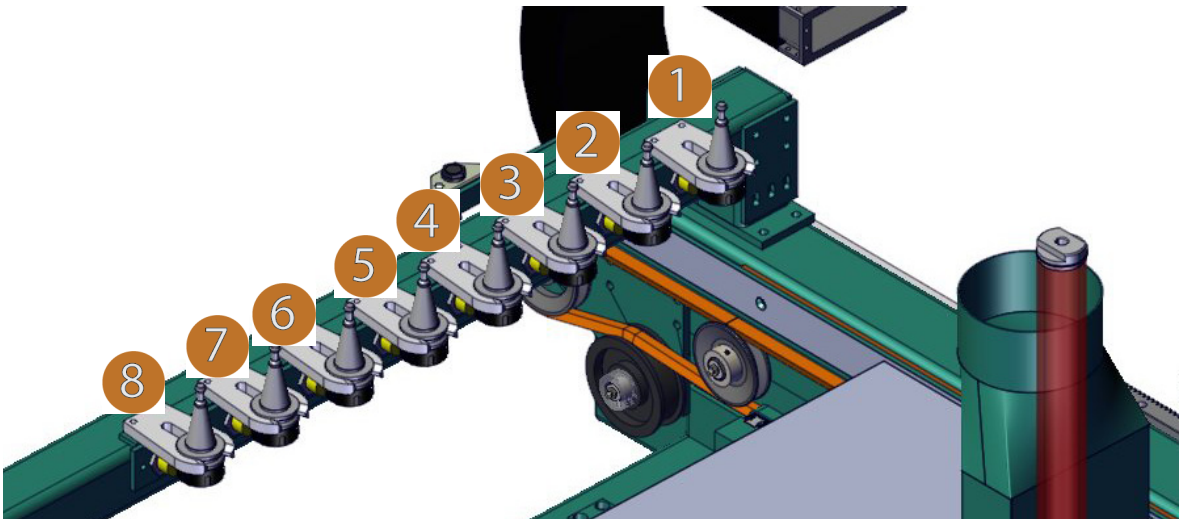
Important: At the end of shift, remove the **Tool Holder** from the **Cutter Head** and return it to the rack. If the **Tool Holder** left in the **Cutter Head,** condensation can cause rust spots on the assembly.

The **DL-NCD** includes a **Tool Rack** that secures unused **Tool Holders**. The Door Job determines if a tool change is needed, based on door material defined in the door file.

If a tool change is needed, the **DL-NCD** follows this process to change the tool:

1. Head moves to the Tool Rack.
2. If required, the machine scans the tool rack and records which tool holder positions are empty. This is only done if a scan has not been done since the access gate was last opened.
3. The machine moves first to the empty location where the current tool is to be returned to and returns the tool. After the current tool is returned, the head moves to the location of the next tool to be used and picks it up.
4. When the tool change is complete, the **DL-NCD** head moves to the cut start location and continues with normal operation

Tool Holder Rack



Note: If the tool changer does not detect a tool or if it encounters any other problem, the KVAL software will display an error message on the Operator's Station monitor.

Note: The **DL-NCD** retains the tool type in the Cutter Motor in memory. If the tool is changed, while the machine is off, make sure that the tool matches the tool currently in the Cutter Motor.

Removing the Tool Holder from the Cutter Head

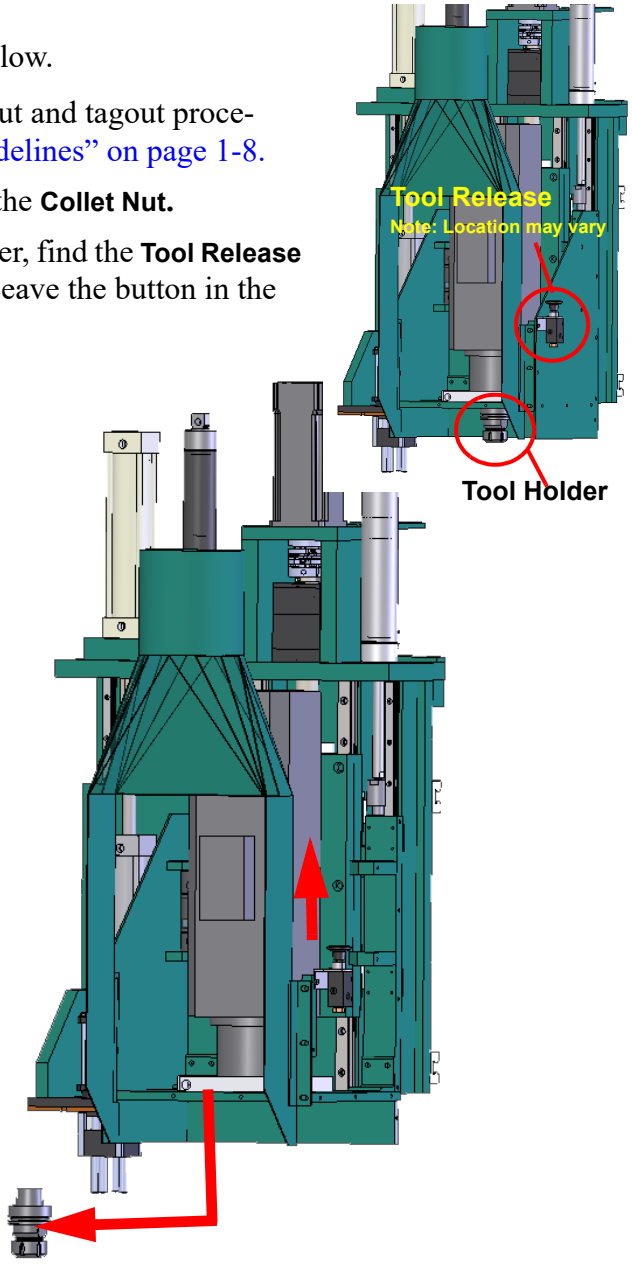
For normal operations, the tool is changed automatically.The **DL-NCD** is programmed to select the appropriate tool for the door material. However, a tool may also be changed manually, (for example, to change a dull bit, if there is a mechanical problem with the tool changer, or if you want to replace the tool when the machine is off).

Important: After the tool is changed, home the machine to reset reference.

To change a tool manually, follow the steps below.

1. Turn off power and follow lockout and tagout procedures. See “Lockout-Tagout Guidelines” on page 1-8.
2. Grasp the **Tool Holder** firmly by the **Collet Nut.**
3. While still gasping the Tool Holder, find the **Tool Release Button** pull until it clicks ON. (Leave the button in the On position for now)
4. Slide the **Tool Holder** down and away from the motor. Set the old tool aside.
5. Using one hand, insert the new Tool Holder into the spindle. Be sure to push the tool all the way up until the collet can go no farther into the spindle.
6. While holding the **Tool Holder** firmly in place, use the other hand to push in the **Tool Release Button.**

Important: Do not let go of the tool until the spindle clamping assembly pulls the collet up into place**!**



Changing a Tool Bit and Using Tool-Change Tightening Fixture

The section describes how to change the bit in a **Tool Holder**, use the **Tool-Change Tightening Fixture**, and enter data into the **Tool Setup Group.**

Note: The HSD Motors use two types of Tool Holders (HSK and V-Flange). Both types are described here. Verify which type your machine uses.

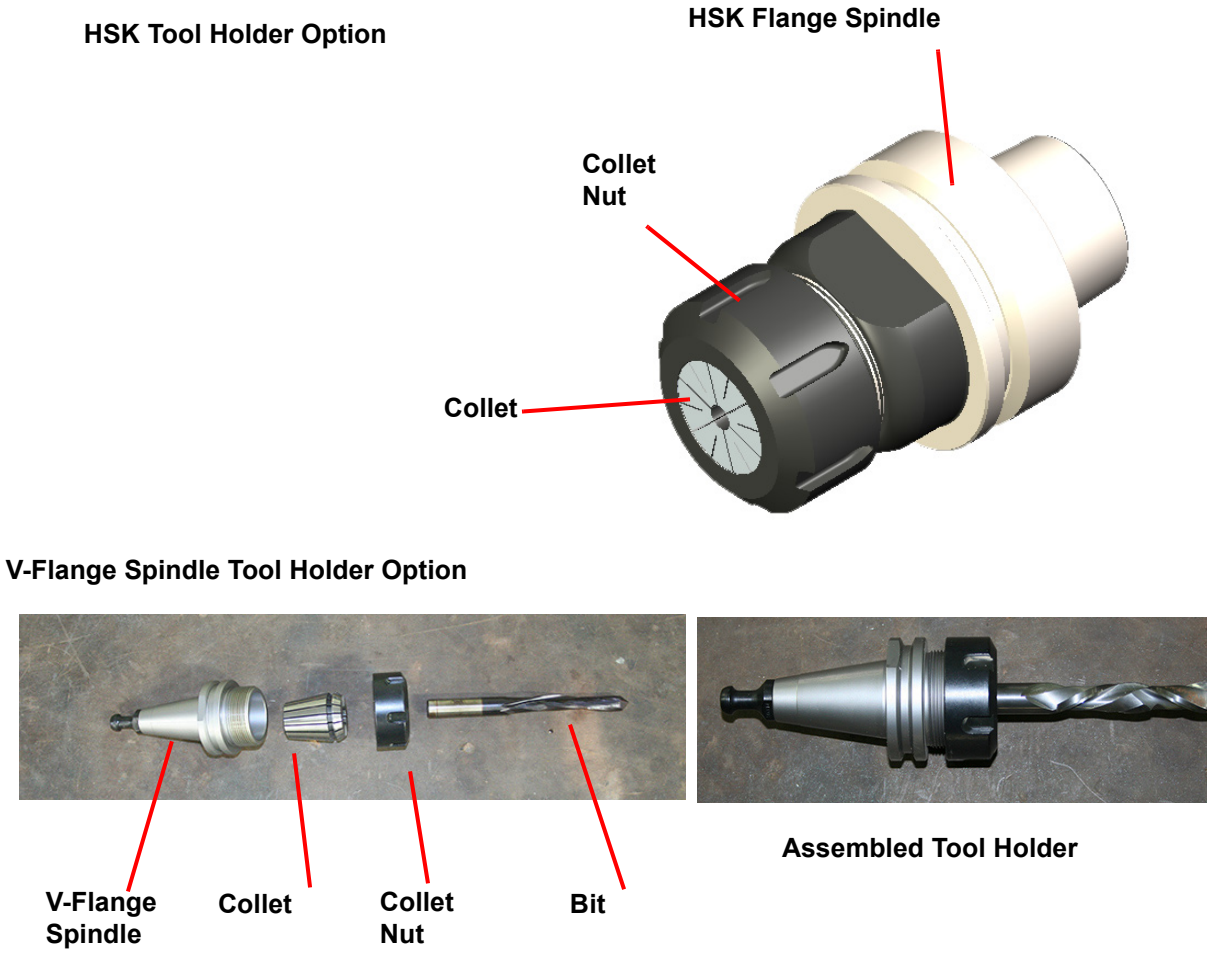
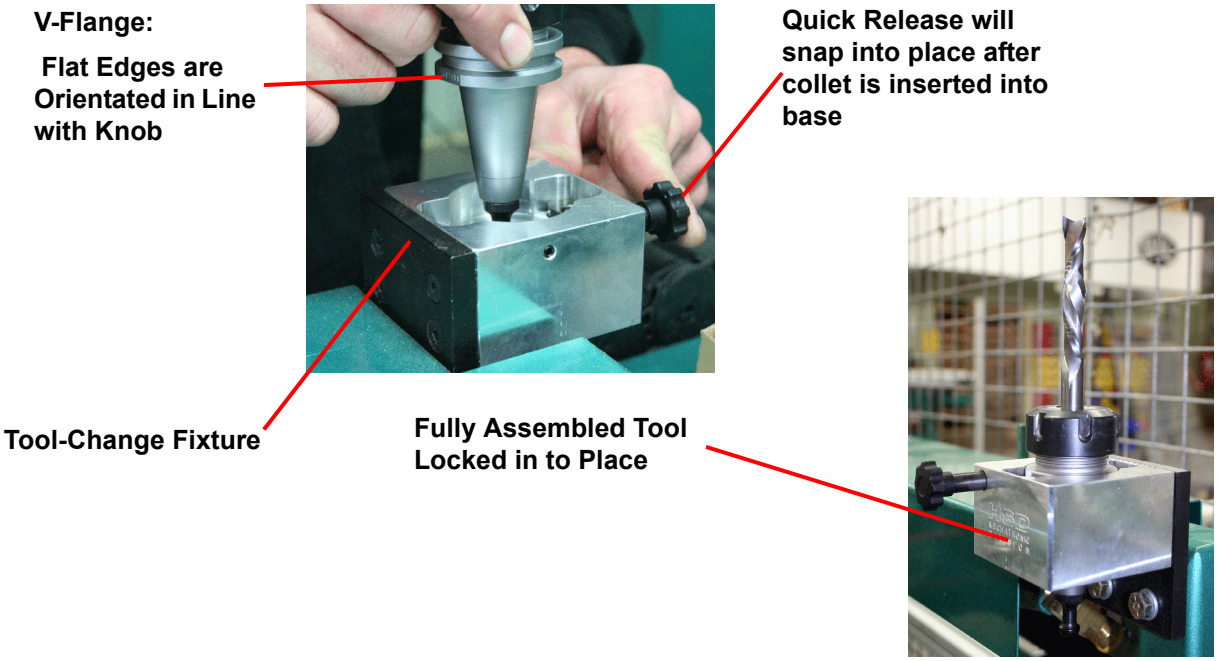


FIGURE 5-2. **Exploded and Assembled Views of Tool Holder**

How to Change a Tool Bit

1. Set the tool in the Tool-Change Tightening Fixture.



For **HSK Tool Holders**, follow the same steps in this section, except use this fixture.

Note: There is no quick release on this model. The collet nut will snap into place automatically when aligned correctly.

FIGURE 5-3. Using Tool Change Fixture

2. Use the collet wrench to loosen the collet nut, freeing the bit.

3. Remove the old bit, clean the collet with compressed air.

Note: Never use a torque wrench to loosen hardware. It could damage the wrench.

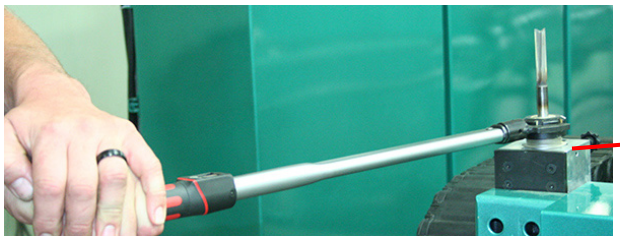
4. Check collet for bluing or damage

Note: Bluing is a condition that occurs when the collet is overheated. The overheating causes the metal to turn blue. If bluing occurs, the collet must be scrapped.

5. Reassemble the tool. When assembling, bottom out tool and back up about 1/4" to ensure the correct distance. *Tool should not stay bottomed out.*

Note: The collet should snap into place into the collet nut

6. Insert the tool into the Tool-Change Tightening Fixture and tighten to a torque rating of 130 ft/lbs.



Note: Always return your torque wrench to zero after it is used.

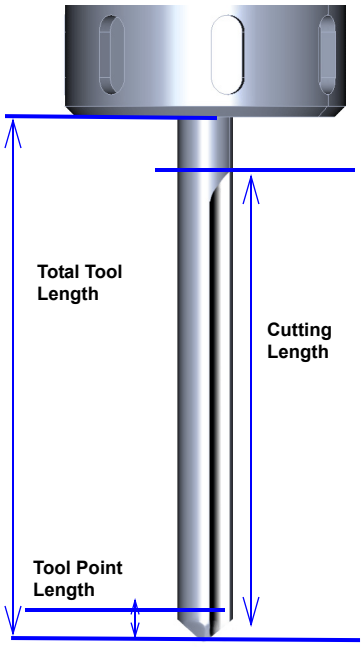
.

7. Measure the parameters listed below:

- Total Tool Length - The distance from the collet face to the tool's tip of the pit
- Tool Cutting Length - The distance from start of the cutting area to the tip of the bit.
- Tool Point Length- From the point where the point starts to the end of the bit.

8. Update the data in the **Tool Config Group**, if needed.

Important: The accuracy of the data **Tool Config Group** is important. Any errors could **damage tooling or product.**



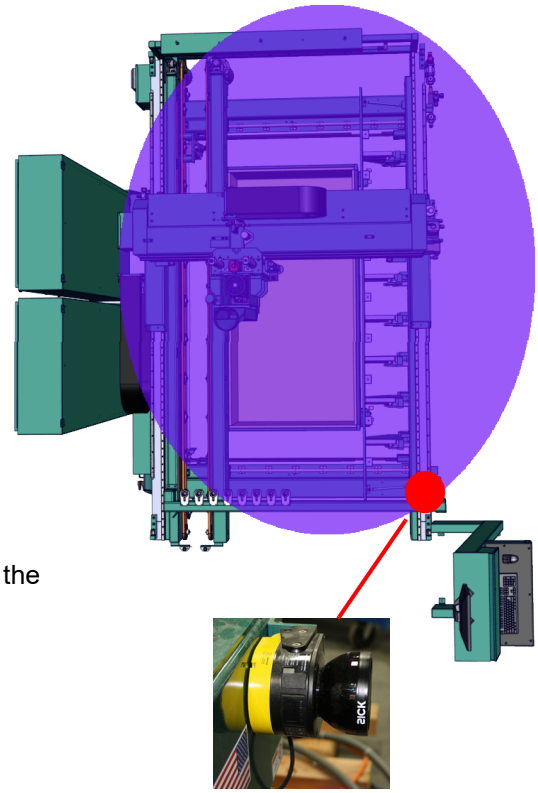
About Field Safety Scanners

The safety laser scanner scans its environment with infrared laser beams.The scanner forms a protective field using the invisible laser beams. If the field is broken, the scanner will stop the machine.

As soon as an person or thing enters the protective field, the safety laser scanner signals the machine to stop.

To recover, if the field is broken

1. Push the **Start Machine** button on the operator's station.
2. **Home** the Machine.
3. Restart process.



A **Generalized** sample of the laser safety Coverage

Laser Warnings

On some machines, laser indicators are used to set boundaries. Follow the manufacturers safety precautions.

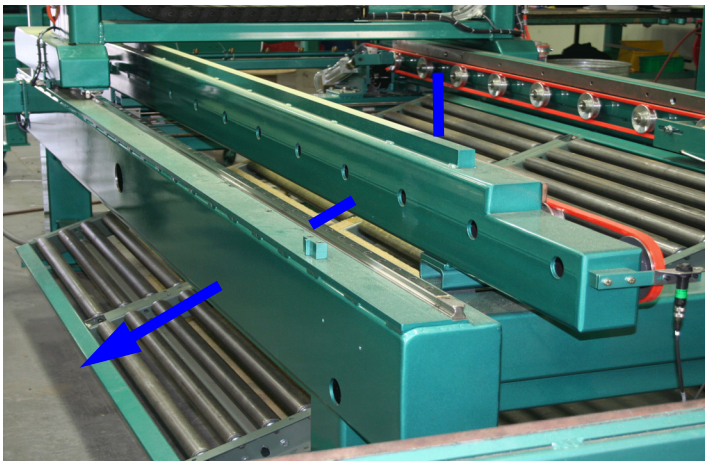
Class 2
Lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing.
Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

About the Drop-Out Area

Follow **Safety Protocol** when emptying drop area. Depending on options, some machines may include a **Safety Gate** or **Light Curtain**.

Note: Be careful in this zone. Slugs (Debris) will eject out and could cause body injuries if operator is not paying attention.

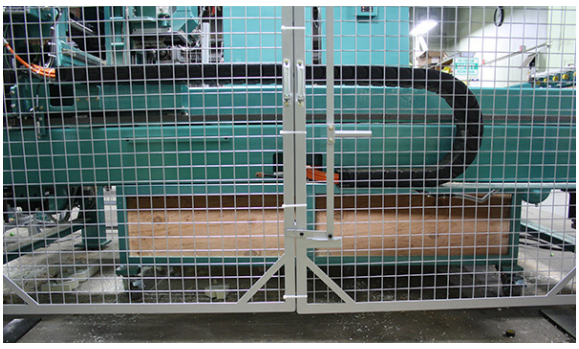
Drop-Out: Slide Style



Drop Out Slide: The debris from the cutting process drops below to a roller assembly to collect the remnants (slugs) in a common area.

FIGURE 5-4. Drop Out: Rollers

Drop-Out: Box Style



Drop Out Box: The debris from the cutting process drops below to a crate. When crate is full, open the gate and pull it out and empty the debris.

FIGURE 5-5. Drop-Out: Box style

About the Electrical Panels

Warning: High Voltage is present in this panel at the top of the Three Phase Input even with the disconnect off. If working on the panel, follow disconnect protocol.

The **DL-NCD** has a Main Electrical Panel, a High Frequency Panel and Nodes on the Cutter Head and the Frame. This section is an overview of the electrical components. Refer the machine's electrical prints for in-depth information.

The Main Electrical Panel:

- Supplies voltages to the machine
- Contains the PLC (Programmable Logic Controller)
- Contains servo drives to interact with the servo motors.

The High Frequency Panel:

- Supplies voltages to the machine
- Contains the PLC interface
- VFDs (Variable Frequency Drives) to interact with the cutter motor and the feed motors.

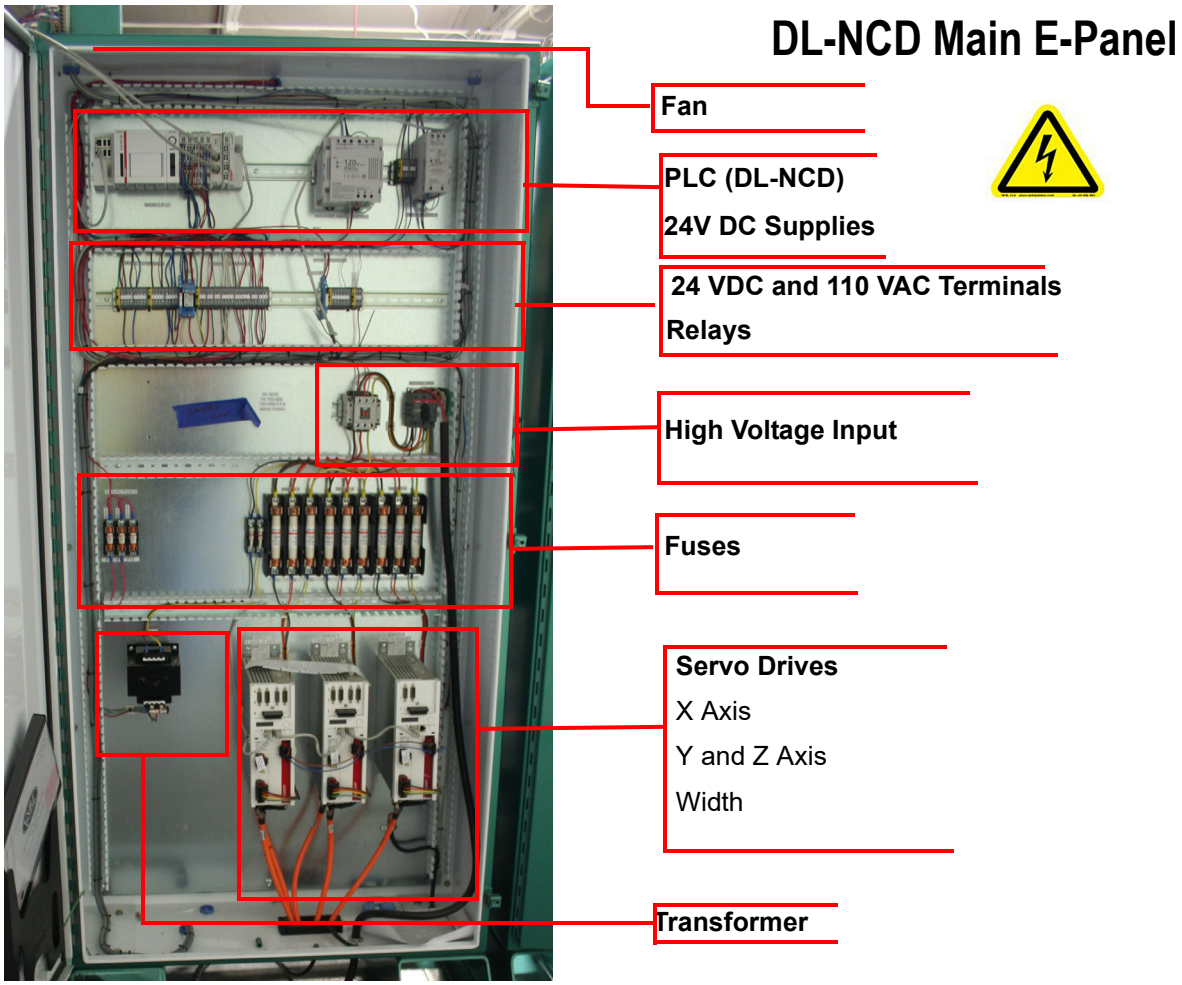
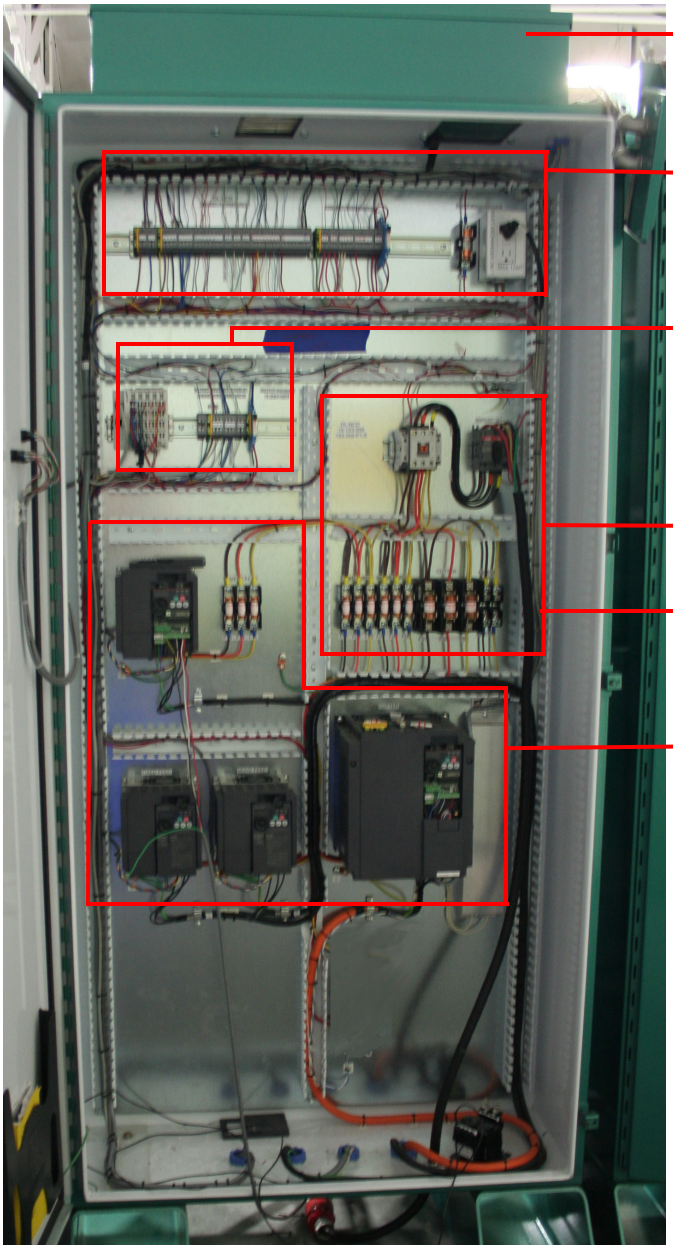


FIGURE 5-6. Main Panel

DL-NCD High Freq Panel



Fan

24 VDC and 110 VAC Terminals

Relays

Power Outlet

PLC (DL-NCD)

High Voltage Input

Fuses

VFDs

Fixed Feed

Move Feed

Cutter

FIGURE 5-7. High Frequency

About the Frame Node

The Frame Node is directly connected to the PLC Node. It is located at the in-feed frame leg on the fixed side of the machine. This node contains the inputs and outputs of the frame. For example, door sensors, width adjusts, and tool interfaces.

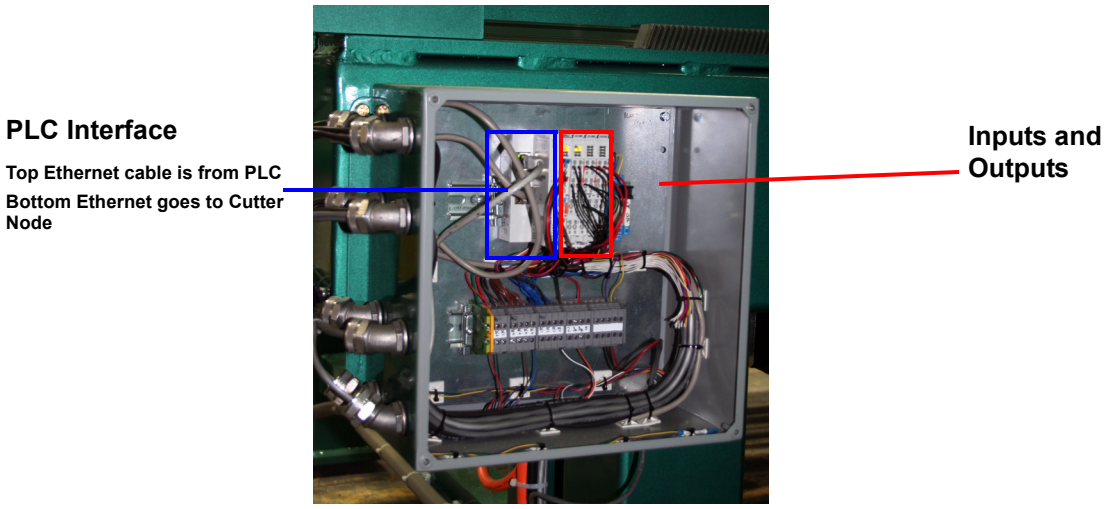


FIGURE 5-8. Frame Node

About the Cutter Node

The Cutter Node is connected to the PLC by way of the Frame Node and is located on the cutter head's fixed side of the machine. This node interfaces with inputs and outputs of the cutter head to the PLC.

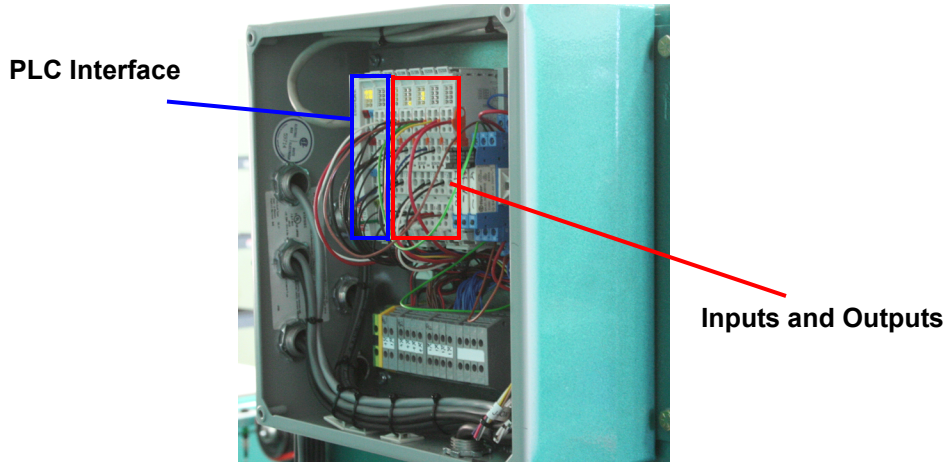


FIGURE 5-9. Cutter Node

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http://www.kvalinc.com

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