

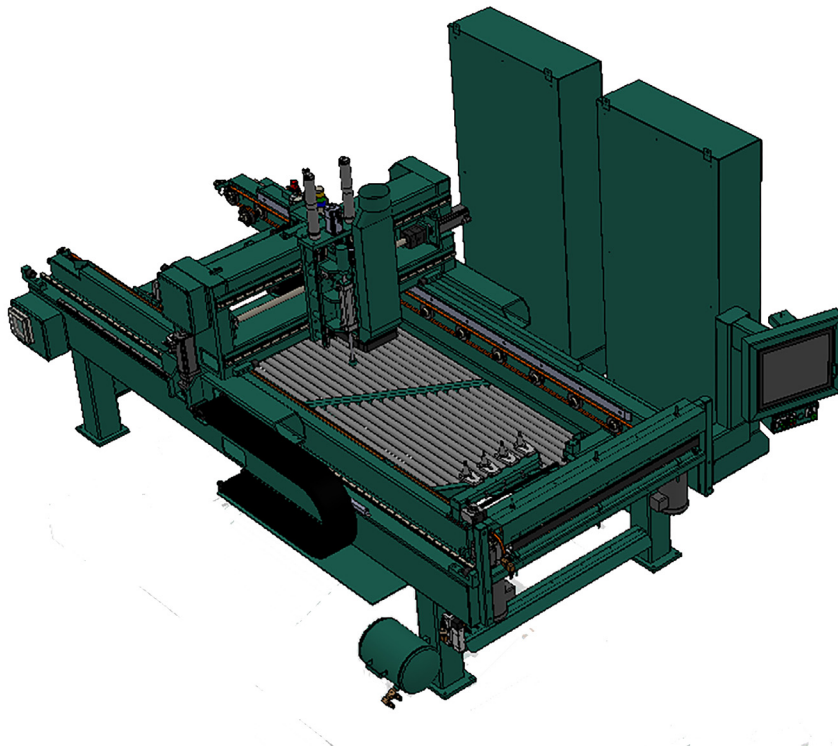


Innovation, Quality & Honesty

# ***DL-NCD Door Light Cut-Out Machine***

***Operation and Service Manual***

Published: 11/21/2018



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Manual Part Number: DOC-193\_3-OPS

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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
<b>Overview of the DL-NCD System</b>	This section provides an overview of the machine. It includes a general description and a table of available options	<a href="#">page 1-2</a>
<b>Safety First!</b>	IMPORTANT safety information is described in this section	<a href="#">page 1-4</a>
<b>Lockout-Tagout Guidelines</b>	Procedures describing Lockout Tagout.	<a href="#">page 1-8</a>
<b>Zero-Energy to Start-Up</b>	Procedure to power up your machine for the first time.	<a href="#">page 1-11</a>
<b>Getting Help from KVAL</b>	This section describes the method to contact the KVAL service center for help. The section includes how to get information from the specification plate or provide to KVAL, service center hours, and return procedures	<a href="#">page 1-13</a>
<b>Safety Sign-Off Sheet</b>	A record to track operators that are trained on the machine.	<a href="#">page 1-18</a>

## Overview of the DL-NCD

The DL-NCD is a Numerically-Controlled Door Light Cut-Out Machine equipped with AC servo control for all four axes of cutting 'X' (Length of the door), 'Y' (width of the door), 'Z' (Depth into the face of the door), and 'W' (Width adjust of 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 tear out in the bottom face when machining small diameter holes. When the DL-NCD is used as a drill de-burring 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'-8" and 8'-0.

The direct drive high frequency spindle motor for cutting the door is equipped with an Tool Holder and access to three (3) additional tool holders placed in a fixture along the fixed side of the machine. Programs can call for an automatic tool change, feed speed, and 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 internet, phone support, and updates from Kval.

### About this Manual

This manual contains operation information and service and maintenance information.

It includes identification of machine assemblies, power-up and power-down steps, and information about using the user interface.

The Troubleshooting and Maintenance sections are directed toward qualified service technicians.

TABLE 1.

Title	Part Number
DL-NCD Operation and Service Manual	DOC-193_2-OPS

### 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 1-18.

## Options Available

Option	Title	Description
<b>Option A</b>	Door Clean-off with Air Nozzles	Dual manifolds with air nozzles are mounted at out-feed end of DL-NCD to blow off face of the door as it exits.
<b>Option B</b>	Left & Right Hand Door Processing for 990F-4	Adds programming and additional door reference stop to position lock holes and door lights from the door top for left hand or right hand doors. Lock bore is moved to the moving fence side
<b>Special Option 1</b>	Four Foot Door Width	Option includes wider frame and overhead carriage with extended ball screw travel. The X axis servo motor is duplicated on the opposite side of the machine with a second slaved drive, gear head and precision gear and rack.
<b>Special Option 2</b>	Upgrade to 8 tool holders	Includes tool holders, collets and programming to add an extra four tool holders. Includes software to individually calibrate each tool.
<b>Special Option 3</b>	2-1/4" Door Thickness	Extend spindle Z travel and raise tool holders to also process 2-1/4" thick doors.



## 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 1-18.

### 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



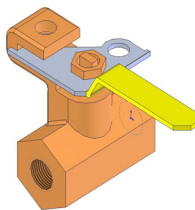
**Never** operate the machine without proper eye and ear protection.

## 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.**

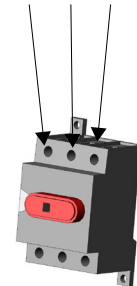
See “Lockout Tagout Procedure” on page 1-9.

## 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.

Still has power in OFF position



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



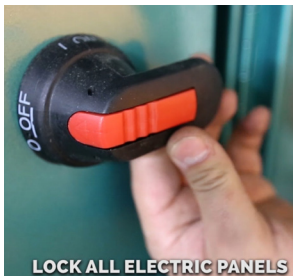
1. Evaluate the equipment to fully understand all energy sources (multiple electrical supplies, air supply and pressure, spring tension, weight shifts, etc.).
2. Inform all affected personnel of the eminent shutdown, and the duration of the shutdown.
3. Obtain locks, keys, and tags from your employer's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

### Lockout Tagout Power

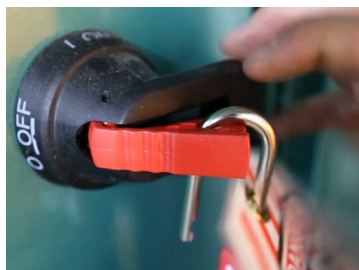
Power



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 “Getting Help from KVAL” on page 1-13.

#### **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**

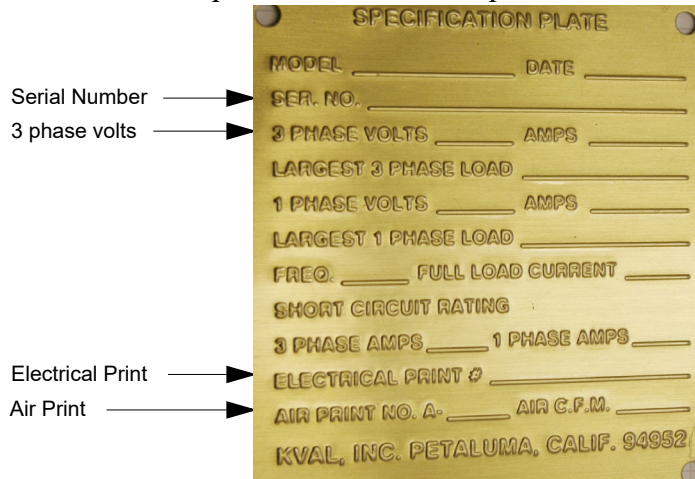
Verify all cage gates are securely closed. Ensure all safety protocols are in effect.

## 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.



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](mailto: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<sup>®</sup> PLC and an internet connection, our service team are able to connect, run, and troubleshoot your machine. Ask about this procedure when calling are service team

## 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:



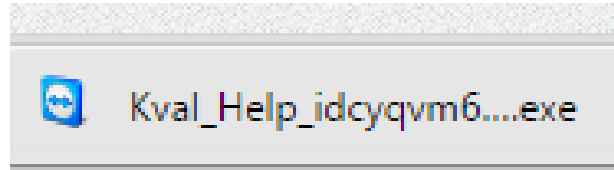
- What is the extent of the failure/reason for return? What are the relevant error messages or error codes?
  - How long did it operate?
  - Did any other items fail at the same time?
  - What was happening when the unit failed (e.g., installing the unit, cycling power, starting other equipment, etc.)?
  - 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 to 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.

**1**

#### Download the support app

To initiate a support session first download our support app and save it to an easily accessible area on your hard drive (like your Desktop).

[Download](#)

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

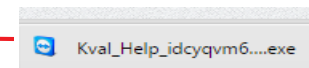
**2**

#### Open the app

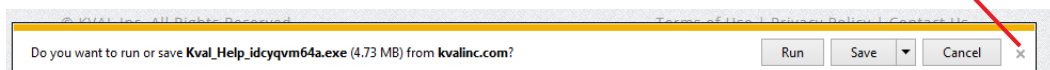
Double-click on the **Kval\_Help\_idcyqvm64a.exe** you just downloaded to open the Kval support app.

**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.



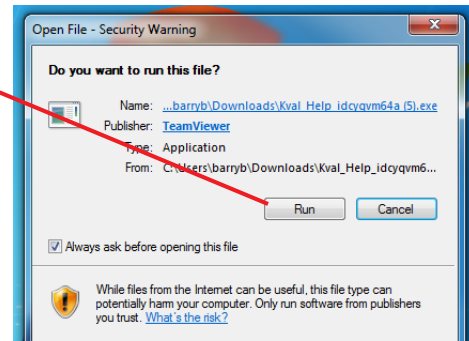
**Sample of i.e Explorer:** Located at the bottom of the screen. select the **arrow** and choose **Save and Run**





- 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.



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

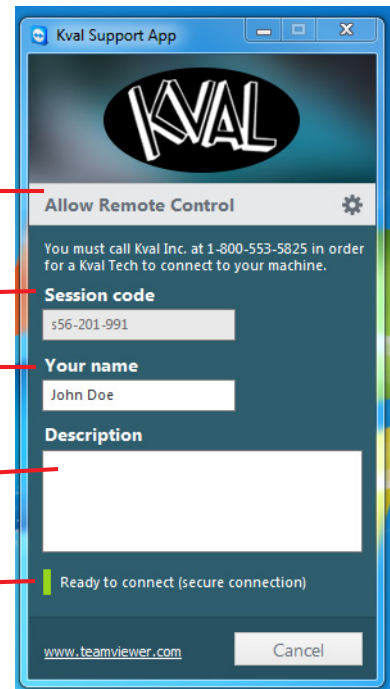
**Allow Remote Control:** Program is ready to allow technicians to access machine computer

**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.



- 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.

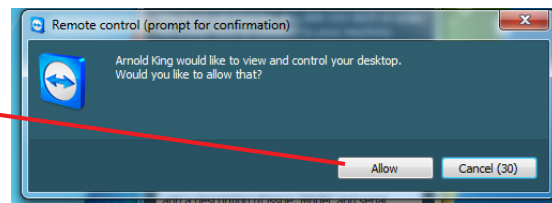


### Give us a call

Dial 1-800-553-5825 and let us know you're ready and we'll take care of the rest!

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

We are now ready to troubleshoot.





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# 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](mailto:service@kvalinc.com).



Intro/Safety  
CH-1





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## CHAPTER 2 Operation 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 DL-NCD

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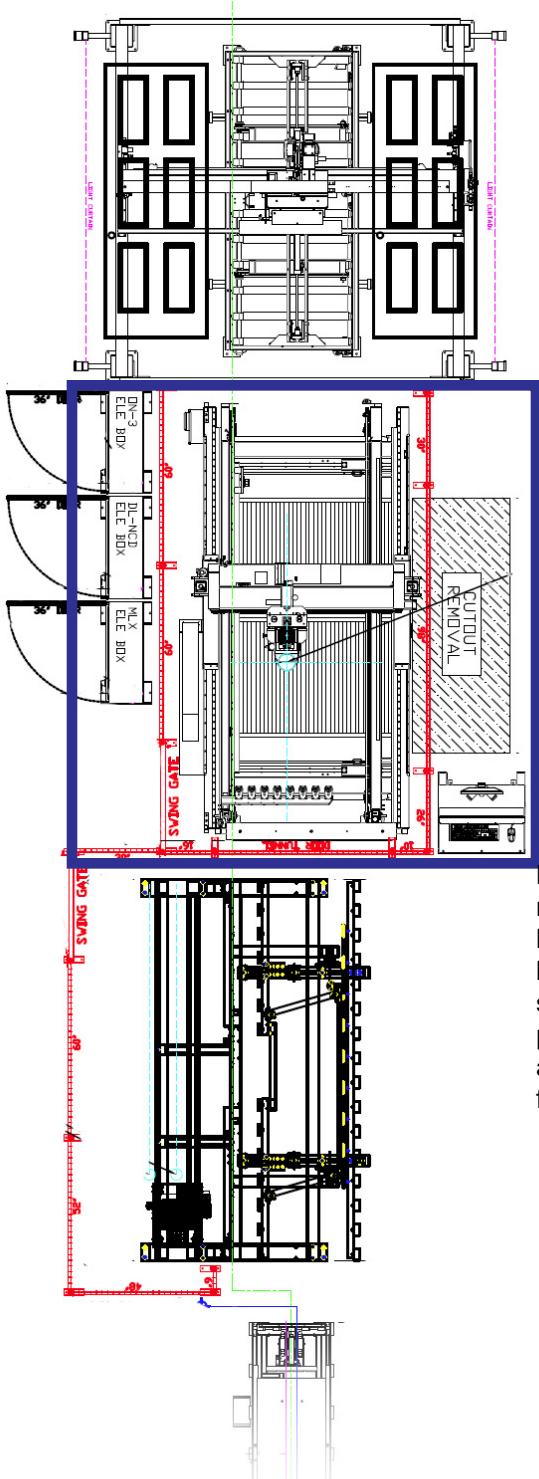
### Chapter 2 at a Glance

Section Name	Summary	Page
<b>Operator's Tour</b>	Descriptions of the operation of the parts and assemblies of the machine	<a href="#">page 2-2</a>
<b>Quick Start</b>	A summary of the steps to machine a door.	<a href="#">page 2-19</a>
<b>Powering Operations</b>	Descriptions of power up, power down, homing, and emergency stops	<a href="#">page 2-21</a>
<b>Menu Map of the Interface Screens</b>	An overall description of the user interface.	<a href="#">page 2-24</a>
<b>Description of the User Interface Screen</b>	Descriptions of the Operator Interface Screens	<a href="#">page 2-26</a>

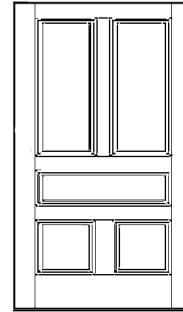
## Operator's Tour

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.

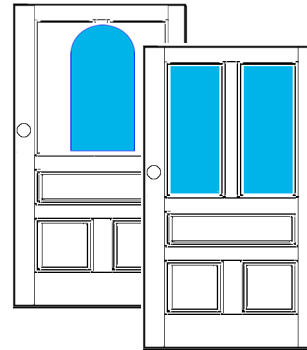
Operation  
CH-2



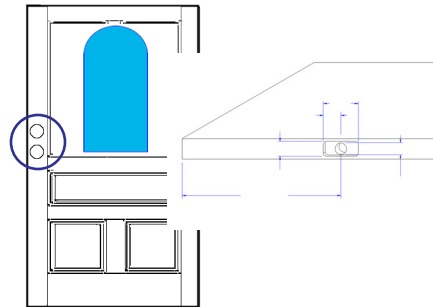
**ON-3D:** Feeds Doors into the Door Processing Line. Note: the ON-3D can pull doors from a double stack.



**DL-NCD:** Machines door lite and lock patterns



**MLX:** Routes multiple combinations of lock patterns, strike plate patterns top and bottom flush bolts.



## Identification of Key Parts of the Machine

### Top View

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

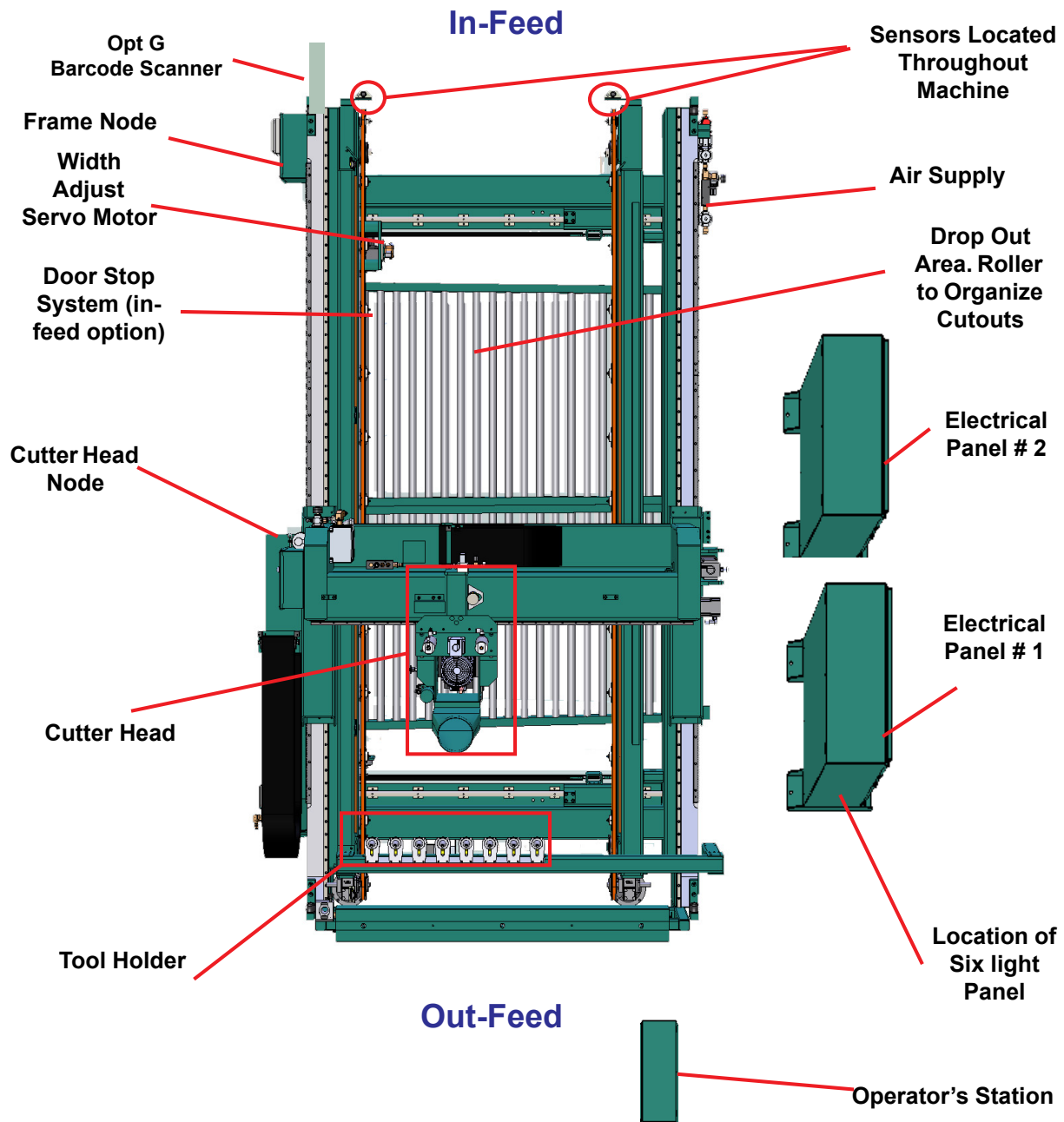


FIGURE 2- 1. Top View of the DL-NCD

## In-Feed View

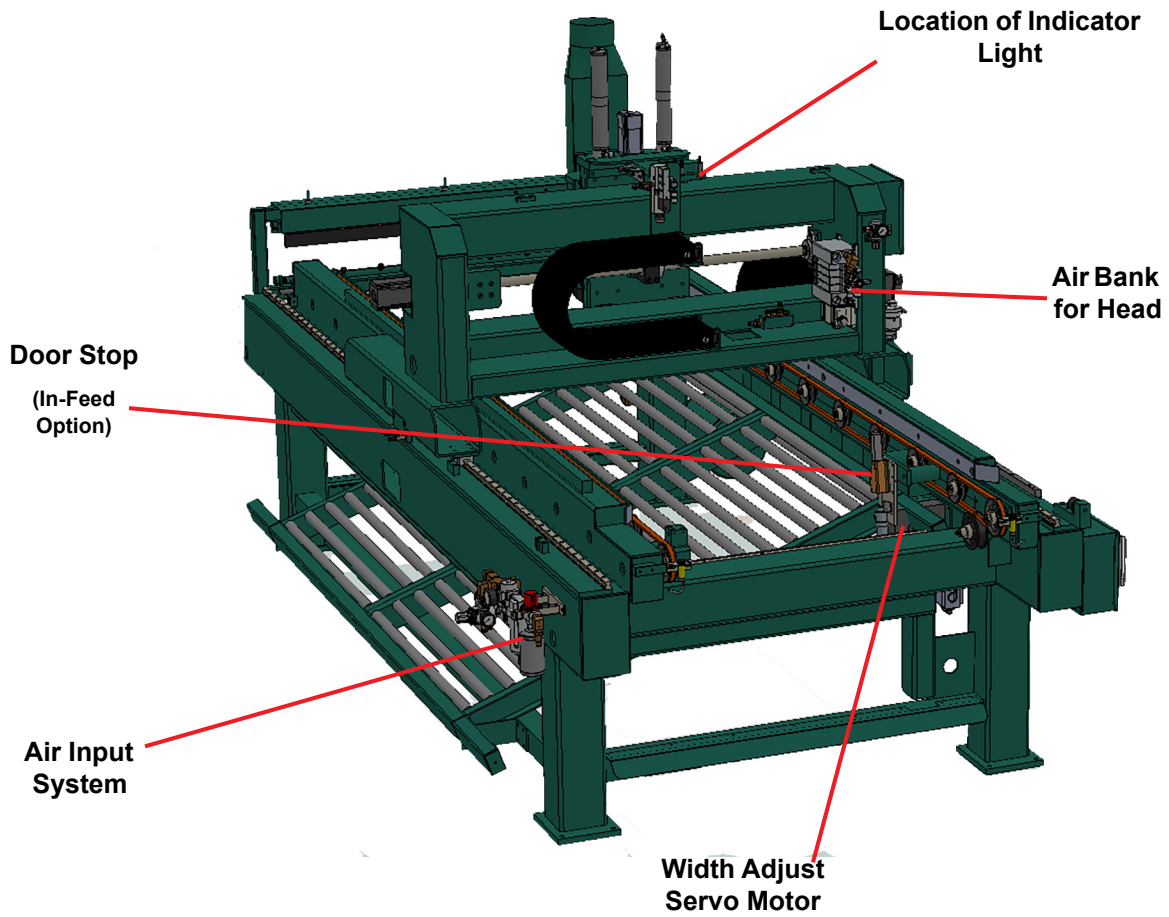


FIGURE 2-2. In-Feed

### About Indicator Lights

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

Indicator Light  
Located on Top of  
the Machine

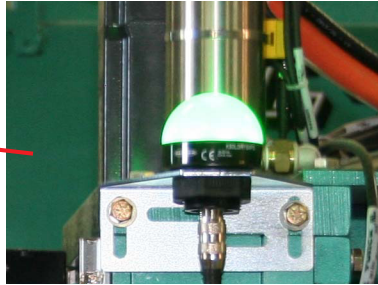


TABLE 2-1. Indicator Light Definitions

Light Color	State	Description
Blue	Flashing	Tool Change in Progress
Green	Solid	Machine is Idle
Green	Flash	Machine is Busy
Red	Flash	Error has occurred
Yellow	Solid	Oil level or Air Pressure is Low

### About the Door Stop System

The door stops are spring loaded. The door stops spring back after the door passes over them. The door then reverses until it reaches the stop. There is a door pusher on the out feed end of the machine that pushes the door up against the stop and the width adjust clamps the door tight so there is no movement.

Door Stop  
Cylinder

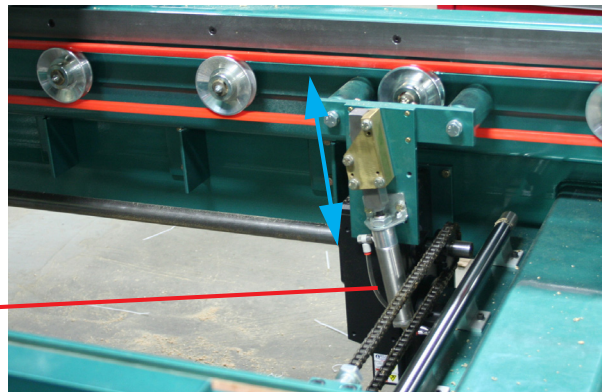


FIGURE 2-3. Example of Pop-up Stop located on the In-Feed

## Out-Feed View

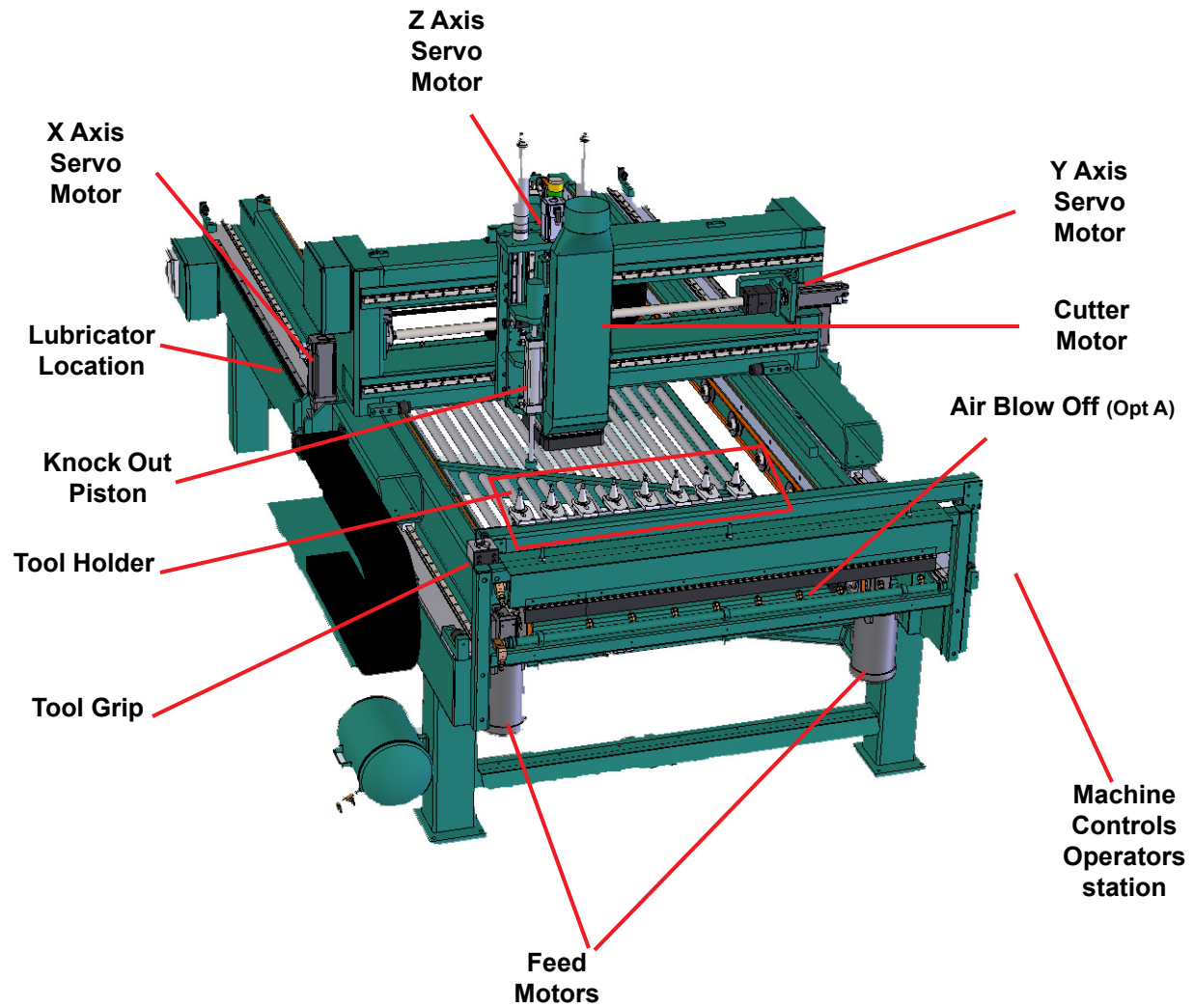


FIGURE 2-4. Out-Feed View

## 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.

For location of the sensors on the machine and electrical information about sensors, see “DL-NCD Sensors” on page 5-18. .

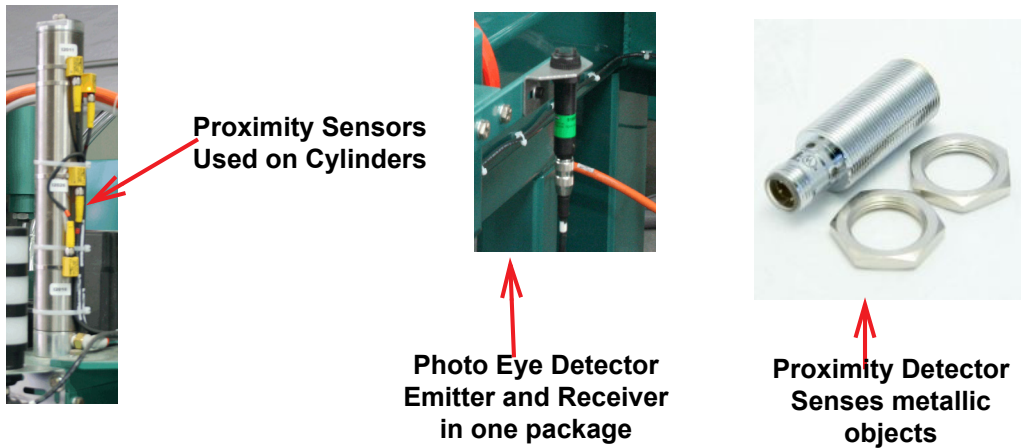


FIGURE 2-5. Examples of Sensor



## About the Tool Holder

The DL-NCD is equipped with a Tool Holder. When a door file is downloaded, the DL-NCD 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. Moves to the Tool Changer.
2. If required, the machine scans the tool holders 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

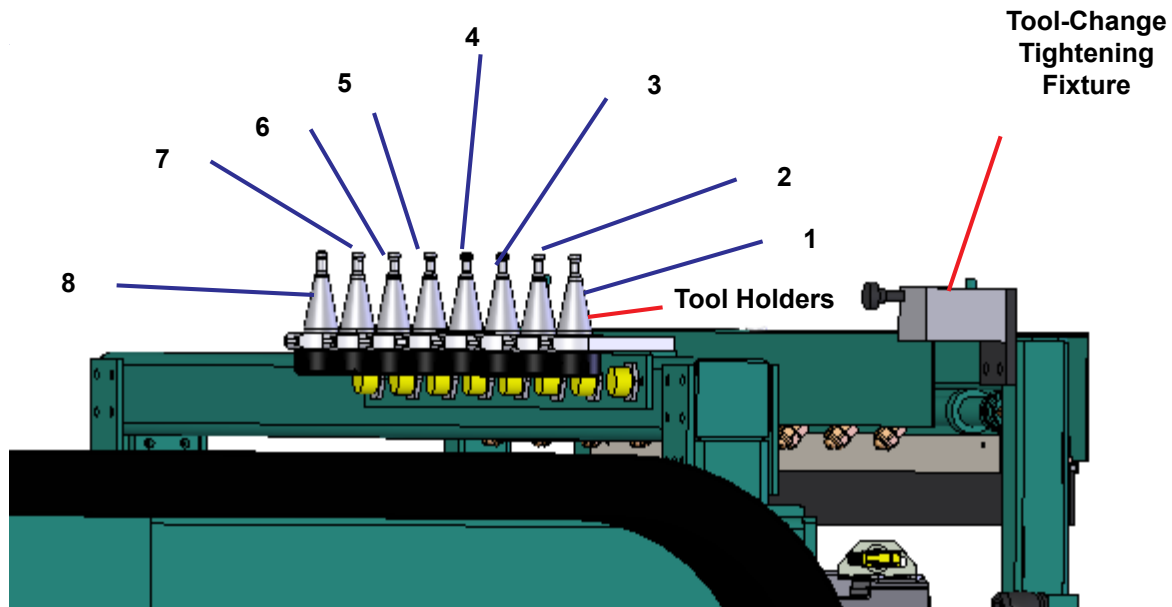


FIGURE 2-6. Tool Holder

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 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. For details on how to disable tool holder locations by way of the touchscreen interface, see "Description of User Interface Screens" on page 2-24. .



## How to Change a Tool Manually

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). See instructions to change a tool on the next page.

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

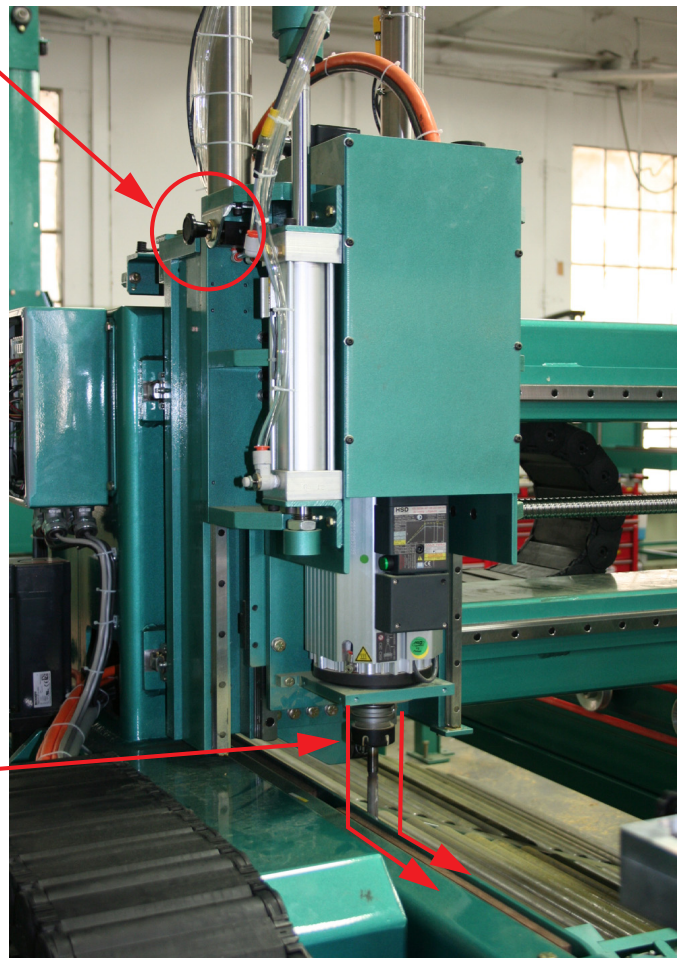
To change a tool manually, follow the steps below.

1. Turn off power and follow lockout and tagout procedures. See “Lockout-Tagout Guidelines” on page 1-8..
2. Grasp the tool firmly by the collet.
3. Using the other hand, pull out the black **Tool Release** button on the top left side of the motor to release the tool from the motor spindle.

**Note:** Make sure to pull the button out until it clicks in the ON position (motor spindle stays in the unclamped position). Leave the button in this position until instructed to push it in later in this procedure.

4. Once the tool is released from the motor, slide it down and away from the motor. Set the old tool aside.
5. Using one hand, insert the new tool 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 firmly in place, use the other hand to push in the **Tool Release** button.

**Note:** 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, use the Tool-Change Tightening Fixture, and enter data into the **Tool Setup Group**.

Operation  
CH-2

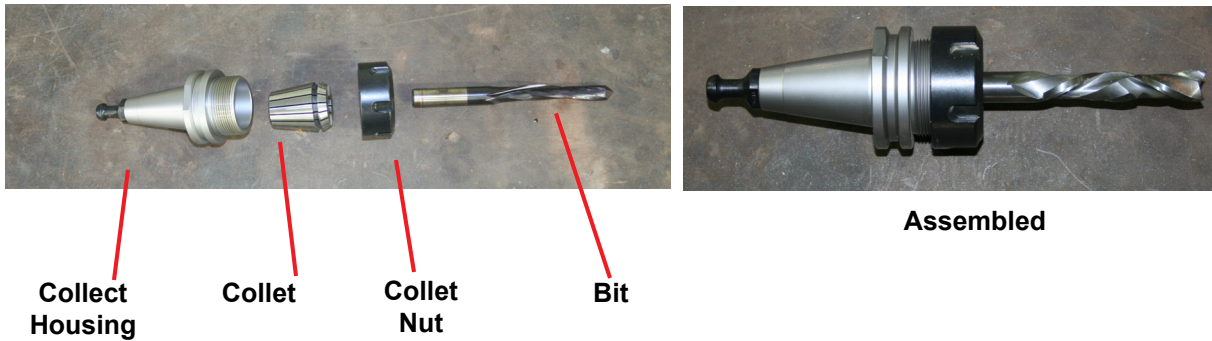


FIGURE 2-7. Exploded and Assembled Views of Tool

### How to Change a Tool Bit

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

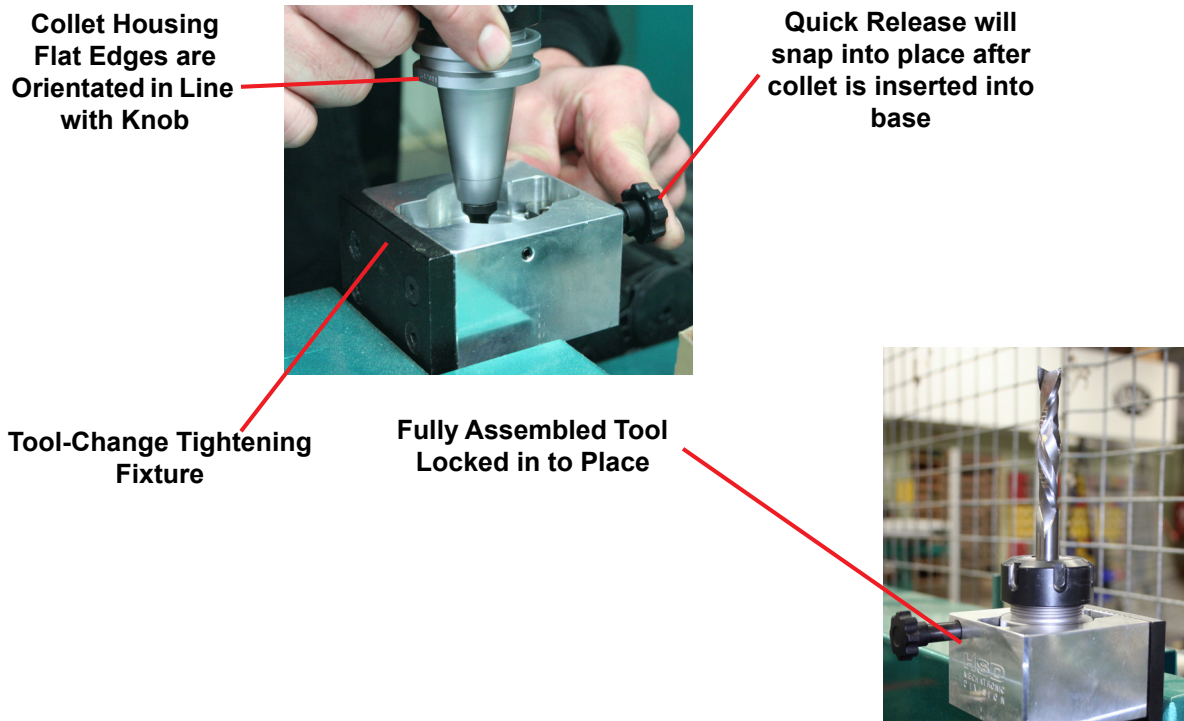


FIGURE 2-8. Using Tool Grip

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.

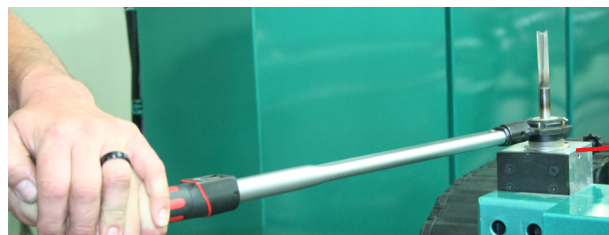
4. Check collet for bluing or damage

**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.



Torque to 130 ft lbs

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

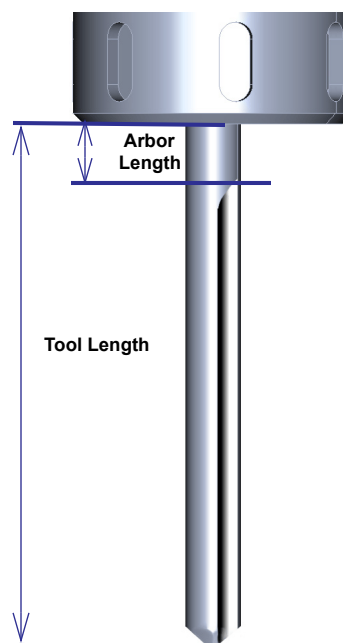
7. Measure the parameters listed below:

- Arbor Length - The distance from the collet face to the tool's cutting edge.
- Tool Length - The distance from the collet's face to the tip of the bit.

8. Compare these measurements to the data in the **Tool Setup Group** in the **Calibrate Machine** Screen. This screen is accessed by the Setup Button.

9. Update the data in the **Tool Setup Group**, if needed. See "Tool Setup Group" on page 2-35..

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





## About the Electrical Panels

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:

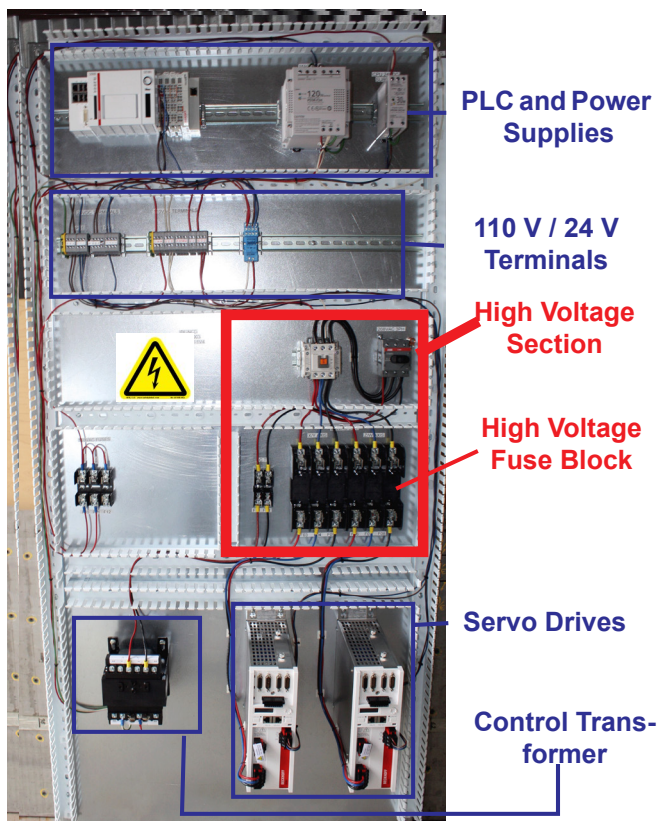
- Supplies voltages to the machine
- Contains the PLC (Programmable Logic Controller)
- Contains servo drives to interact with the servo motors.

### 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.

**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.

#### Main Electrical Panel



#### High Frequency Panel

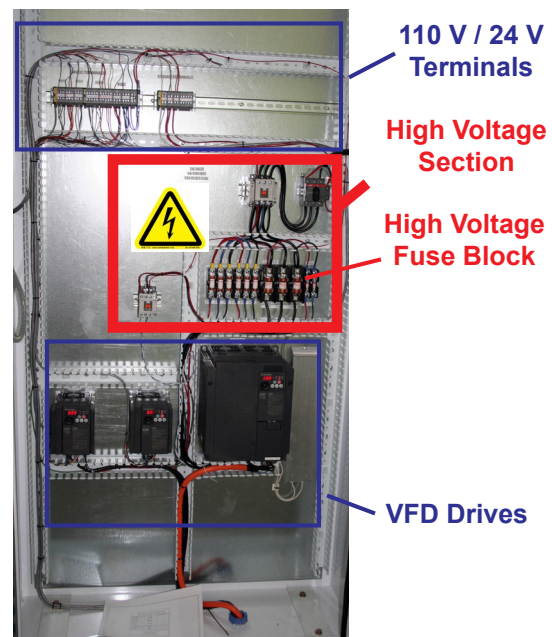


FIGURE 2-9. Electrical Panels

## 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.

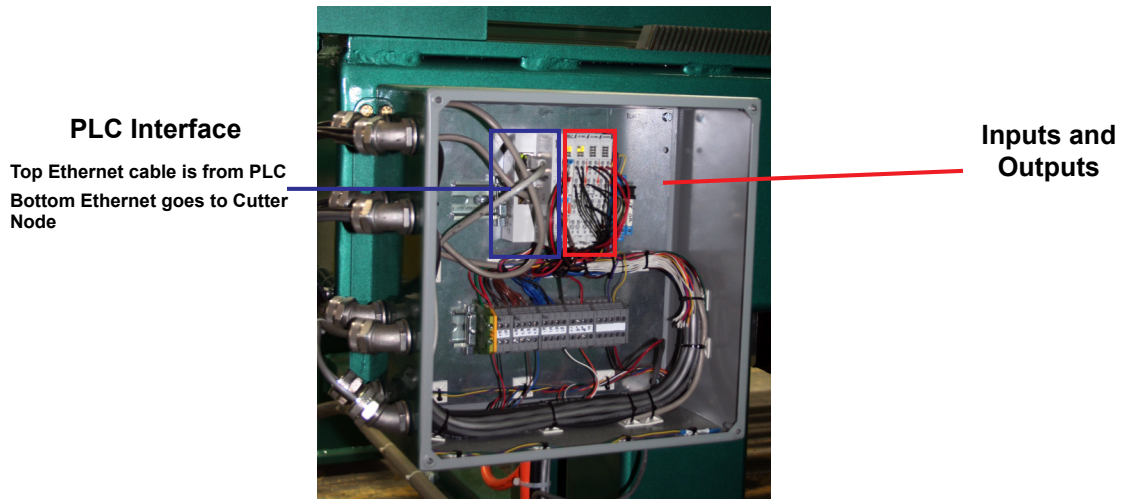


FIGURE 2-10. Frame Node

## 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.

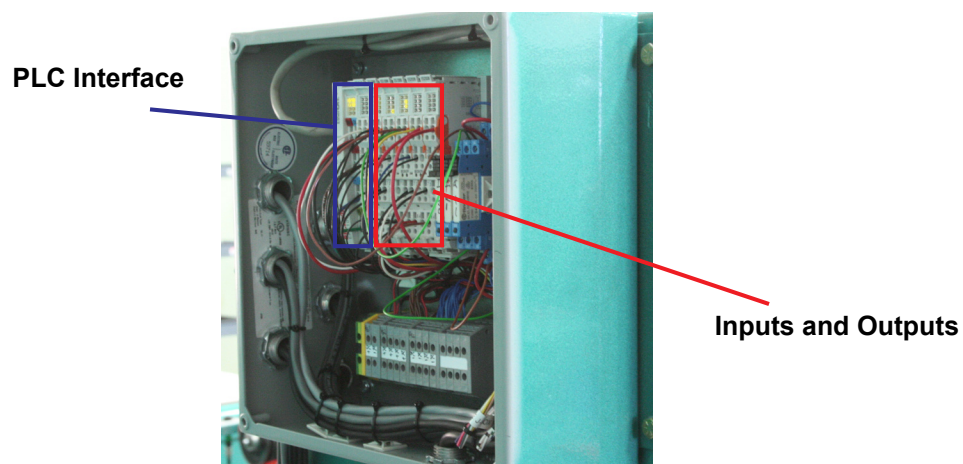


FIGURE 2-11. Cutter Node

## About the Cutter Head

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

Operation  
CH-2

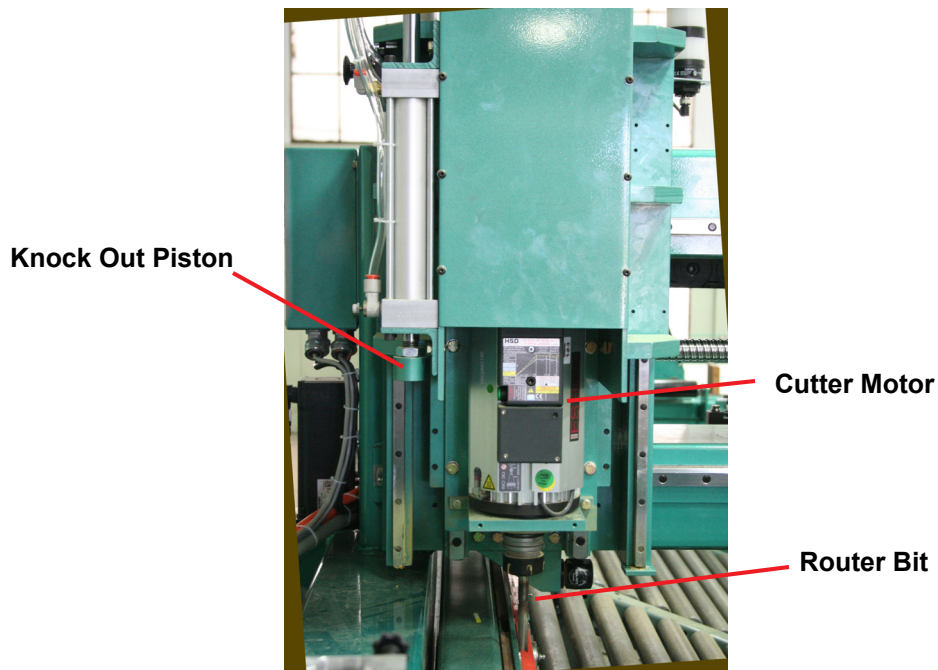


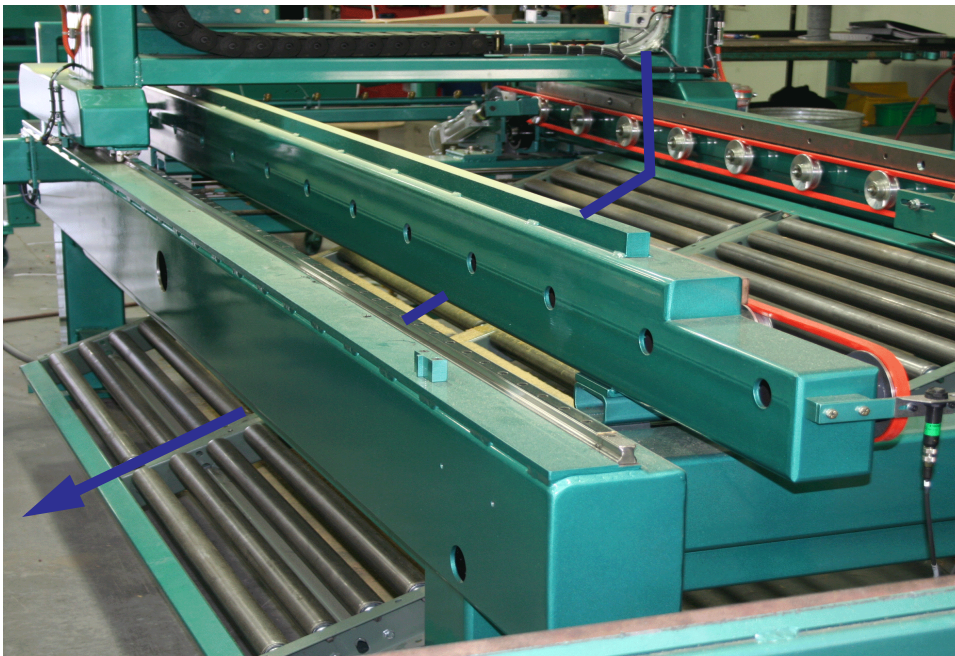
FIGURE 2-12. Cutter Head

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## About the Drop Out Area

The debris from the cutting process drops below to a roller assembly to collect the remnants in a common area.

**Warning:** Be careful in this zone. Slugs will eject out and could cause body injuries if operator is not paying attention.



Drop  
Out

FIGURE 2-13. Drop Out Area



## Description of the Six Light Panel

The six lights on this panel indicate the status of the DL-NCD system.

**Note:** See “Troubleshooting with the Status Light Panel” on page 5-24., for information on using this panel for troubleshooting.

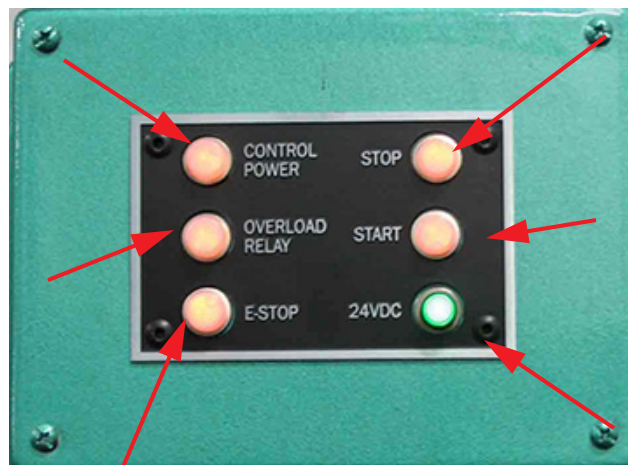
The Sequence that the lights activate is as follows:

1. Control Power
2. Overload Relay
3. E-Stop
4. Stop
5. Start
6. 24VDC

**Control Power** – This light illuminates when the Control Transformer turned on and the power is working on secondary side-of transformer

**Overload Relay** – This circuit is jumped. It should always light when the Control Power turns on.

**E-Stop** – The back gate is closed and Frame E-stop is not activated when this light is on.



**Stop** – This light will be on if Machine Stop button is deactivated.

**Start** – This light will be on once the Machine Start button is pressed and the ACR Relay is latched.

**24VDC** – This light comes on once the ACR is latch and the 24VDC power Supply is working



## About Options

### About the Barcode Scanning Hardware with Stationary Reader

Some machines have a barcode scanner integrated into the operating system of the DL-NCD. The barcode scanner reads the coded lock and light routing patterns off the bar coded door. The program loads the template to the user interface. The Barcode scanner is mounted at the in-feed of the machine on the fixed fence. The sensor, to trigger the scanner, is located on the Handler (or similar type of feeder).

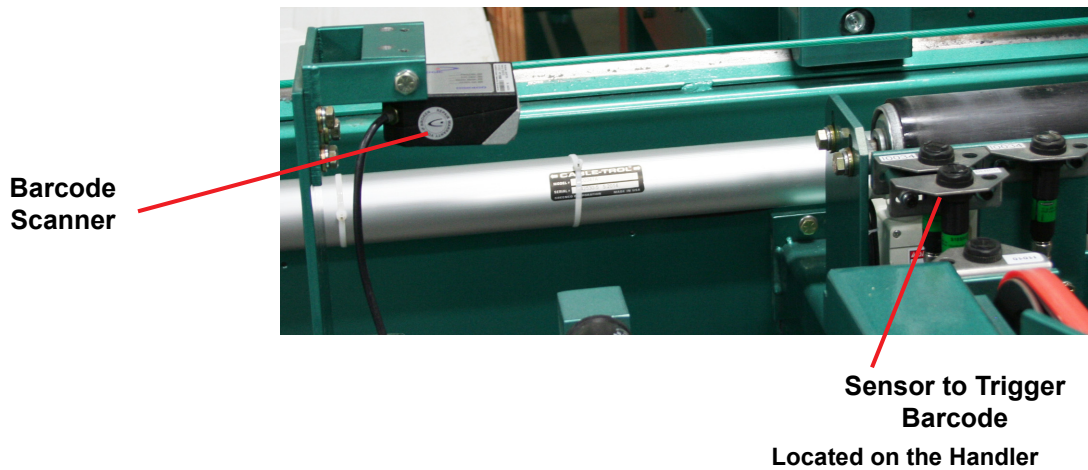


FIGURE 2-14. Location of Barcode Scanner

### Process of Operation

1. Attach the barcode label to the end of the door. Stack the doors at the loader station with the labels facing out.
2. The load station loads the door into the DL-NCD.



3. Once the sensor is triggered to look for barcode:
  - a. The barcode scanner turns on.
  - b. The scanner reads the barcode.
  - c. The code loads the template and door specifications from the barcode to the user screen.
  - d. The values will change on the user screen after barcode is read.
4. The door will feed in
5. The barcode scanner turns off
6. The door will be machined with the barcode specifications.

### Checking the Barcode Reader

If the barcode is not reading, see “Barcode Indicator” on page 2-44. The Diagnostic Screen contains a Barcode checking routine to verify operation.

### About the Barcode Scanning Hardware at the Operator Station

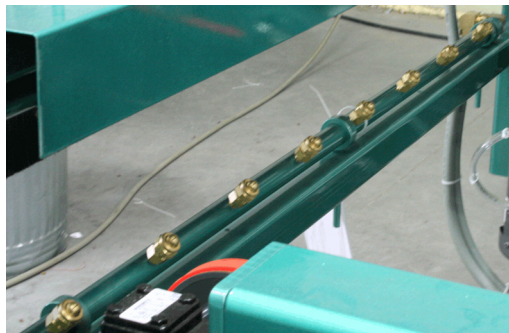
This option includes a barcode reader at the operator station. To read the bar code, scan the barcode label that is located at the operator station. The parameters will auto-load to screen.



### 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 out of the DL-NCD.

To manually turn off the air, use the slide valve located on the side of the machine.



**FIGURE 2-15.** Air Nozzles for Blow Off of Debris

## Quick Start Description

1. Ensure factory air is present at machine and the DL-NCD main air supply valve is turned on.
2. Power up the DL-NCD. See “How to Power Up the DL-NCD” on page 2-21.
3. Home the DL-NCD. See “How to Home the DL-NCD” on page 2-22.

4. From the **Main Screen**, enter your width parameters or choose a **Preset** button to load the width parameters.

<b>Door Width: 36.000</b>				
3-0	2-10	2-8	2-6	2-4
2-2	<b>Preset Buttons</b>			
36	34	32	30	28
26	24			
<b>Door Length: 79.000</b>				
<b>Door Thickness: 1.750</b>				

5. Enter door length and door thickness parameters.

6. Select the material type of the door (wood/ fiberglass or steel). The machine will automatically select the tool to be used in machining.
7. The **Active Tool** box indicates tool in the displayed location will be used to machine the door
8. The **Selected Tool** box indicates the next toll to be used.

<b>Door Material Type (Click to change)</b>	
<b>Wood/Fiberglass Door Selected</b>	
<b>Selected Tool</b>	
<b>Tool 2</b>	<b>Tool Select</b>
<b>Active Tool</b>	
<b>Tool 8</b>	

**Note:** Select the **Tool Select** Button to manual choose the next tool to use.

9. Select the quantity of doors to run and any machine options are required.

<b>Quantity:</b>	<b>1</b>
<b>Auto Feed Mode Disabled</b>	<b>Knock-Out Enabled</b>
<b>Re-Feed Door</b>	<b>Plunge Enabled</b>

**Note:** By default, Continuous Feed and Auto Feed are enabled, and Setup Mode is disabled.

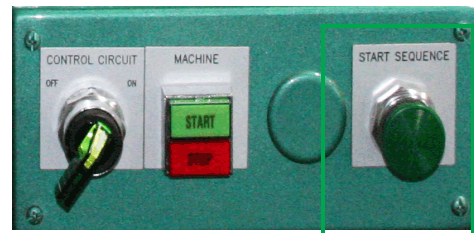
10. Select the file from the Light Pattern white box. The description of the pattern will display in the blue box below.

<b>LIGHT PATTERN</b>	(none)	↑
	00Half Light Twin_8x36	
	00Quarter Twin_8x6	
	01Kval Logo	page
	02 hello world	<b>0</b>
	02Kval Logo	
	03KvalLogo	
	0Calibration Routine	
	0Half Light Roundtop_22x36	↓
	0Template Twin Rec	
Skip Sequence		

11. Select the file from the Lock Pattern reset buttons.

LOCK PATTERN	Lock	DeadBolt	Lock Center	0.0000
		No Lock	No DeadBolt	Lock Diameter
	41	5.0	Lock BackSet	2.3750
	45	5.5	DeadBolt Offset	0.0000
	46	BackSet	DeadBolt Diameter	2.1250
	48	BackSet: 2 3/8	DeadBolt BackSet	2.3750
	60	BackSet: 2 3/4		

12. Press the **Start Sequence** Button to load and run program.



**Important:** When shutting down the DL-NCD for the day, always park all tools in the tool holders. Do not leave the tool assembly in the Head.

During machining, the tool assembly gets hot. If the assembly is left in the head overnight, condensation can occur as the cool down process continues. After numerous times of the tool being left in the head, the condensation may cause rust to develop on the tool assembly. See photo.



**Example of a tool assembly left in the head numerous times after shut down. Notice rust on base of tool assembly**

## Powering Up and Down the DL-NCD

This section describes how to power up and to power down the DL-NCD

Powering up the system includes:

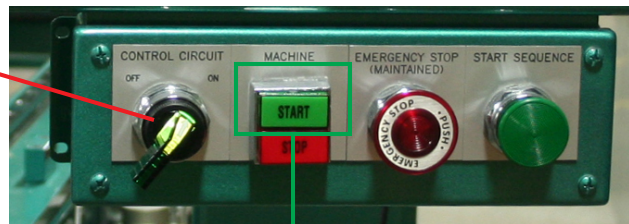
- Applying power to the entire system.
- Starting the Control Circuit.

Powering down the system includes:

- Turning off the computer.
- Shutting down the control power.
- Removing power from the entire system.

### How to Power Up the DL-NCD

1. Ensure factory air is applied to machine and main air supply is turned on.
2. Check that all E-Stop buttons are out. (If machine has this option)
3. Make sure the electrical disconnect the electrical cabinet is turned to the ON position.
4. Move the **CONTROL TRANSFORMER** switch to the ON position. It should light up.
5. Push the green **START MACHINE** button.



6. All lights on the status light panel on the electrical box should be illuminated.

**Note:** If a status light does not turn on during the power up process, refer to the *DL-NCD Service Manual* for assistance in identifying the issue.



## How to Home the DL-NCD

The DL-NCD must go through a homing routine before any operations are performed. The homing routine sets a zero reference from which the DL-NCD measures its movement and cutting process.

**Important:** If power is lost or the DL-NCD is reset, the homing routine must be performed again to reset the zero reference.

1. Press the **Home** button on the **Main Screen** touch screen.
  - a. The machine will move to the home position.
  - b. The machine will then move to the starting position.
  - c. The DL-NCD is now ready for work.

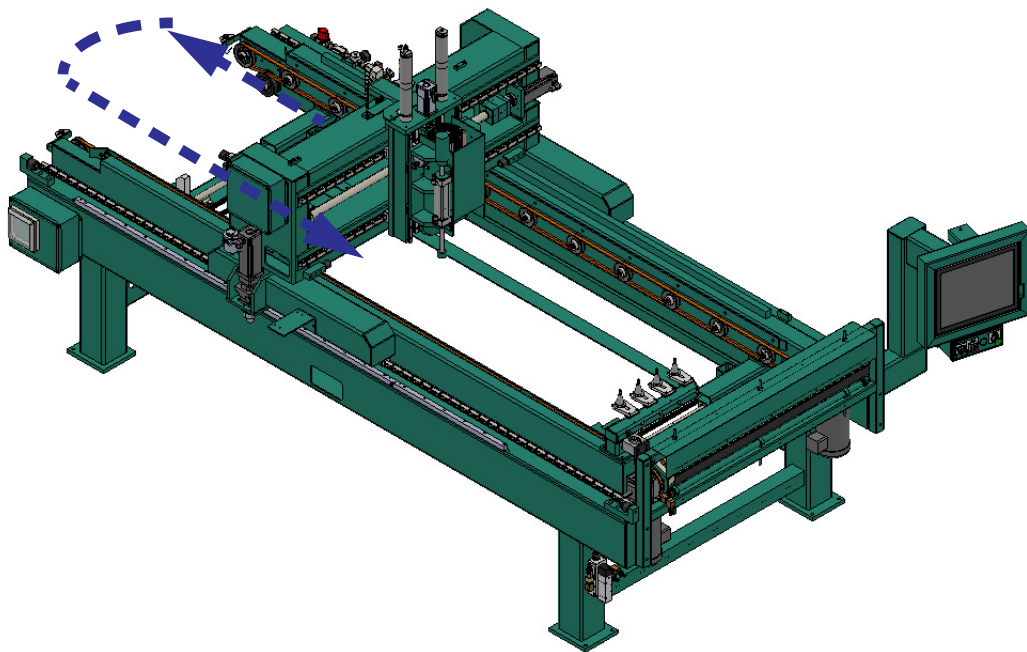


FIGURE 2-16. Homing Sequence



## How to Power Down the DL-NCD

**Note:** Always park tools in tool holder before powering down DL-NCD.

1. Select **Shut Down System** from the **Main Screen** to close operator interface program, computer, and shut down the operating system

**Important:** Make sure Windows is shutdown completely before turning off the machine. The hard drive may be damaged and data may be lost if not turned off in this order.

2. Move the **CONTROL TRANSFORMER** switch to the off position. This kills power to the machine. All status lights should be off.
3. KVAL also recommends that you turn the disconnect switch on the electrical cabinet to OFF; this helps reduce possible damage resulting from power surges from electrical storms.



## About Emergency Shutdown and Recovery

**Note:** Some options do not have an E-Stop. In this case, the **Stop Button** or an opened Gate lock will stop the machine. Follow the same recovery steps below.

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.

## Description of User Interface Screens

This section describes the user interface screen. 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.

### About the Operators Station

The operator's station contains a touch screen to input data and operate the DL-NCD machine. The interface is Microsoft Window 7<sup>®</sup> based. The location of the station may vary due to customer specifications. Along with the DL-NCD, other interfaces may also be located in this area. For example, the figure below shows a ON-3D and a MLX.

**Operator Interface Screen:** Touch Screen to operate the machine. See "Description of User Interface Screens" on page 2-24.

**Start Sequence Button:** Starts the machining process. Template is downloaded from the Operator Station program. See "Quick Start Description" on page 2-19.

**Control Transformer:** Powers up and down the entire machine. See "Powering Up and Down the DL-NCD" on page 2-21.

**Start/Stop:** Starts or Stops the machining process. See "Quick Start Description" on page 2-19.

**E-Stop:** Press to STOP all functions of machine inc case of emergency. See "About Emergency Shutdown and Recovery" on page 2-23.

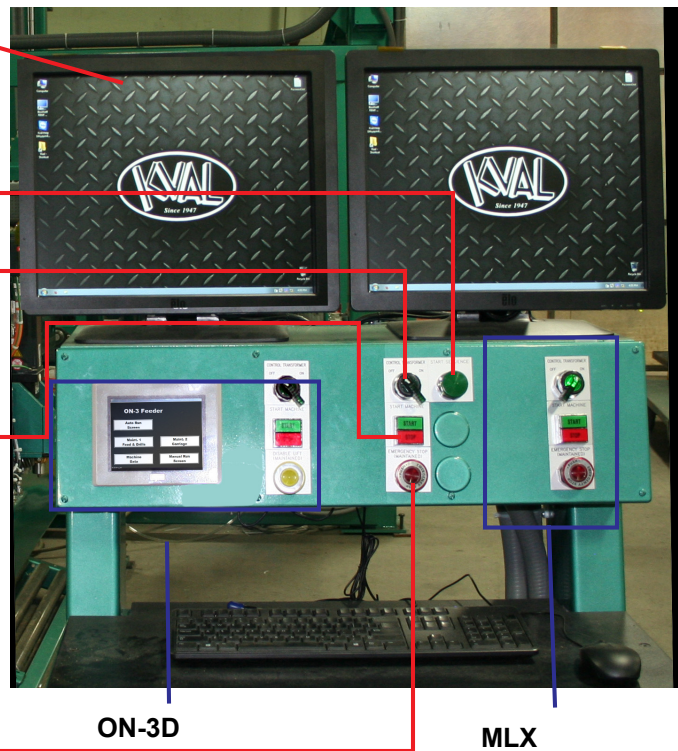


FIGURE 2-17. Operator Station

### About the Out-Feed Food Pedal

Some options may have an out-feed foot pedal to feed the door out of the machine.



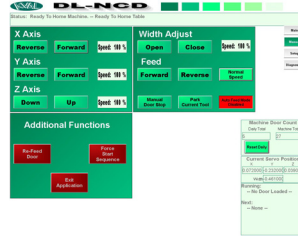


# Screen Selection Menu Map

Below are the menu selections for the DL-NCD.



See "About the Main Screen" on page 2-26



See "About Manual Operation" on page 2-40



See "About the Diagnostic Screen" on page 2-43

See "About the Door Width Preset Screen" on page 2-38

Pre-set	Door Width
1	3-0 35.750
2	2-10 33.750
3	2-8 31.750
4	2-6 29.750
5	2-4 27.750
6	2-2 25.750
7	2-0 23.750
8	0.000
9	0.000
10	0.000
11	36 36.000
12	34 34.000
13	32 32.000
14	30 30.000
15	28 28.000
16	28 28.000
17	24 24.000
18	0.000
19	0.000
20	0.000

See "About Setup Screens" on page 2-31

Tool	Tool 1	Tool 2	Tool 3	Tool 4
Tool 1	Tool 2	Tool 3	Tool 4	
Tool 2		Tool 3	Tool 4	
Tool 3		Tool 4		
Tool 4				

See "About the Lock Location Preset Screen" on page 2-39

Pre-set	Lock Location
1	41 41.000
2	45 45.000
3	46 46.000
4	48 48.000
5	60 60.000
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	



## About the Main Screen

The Main Screen is also the startup screen for the DL-NCD. From this screen, all the basic user interface controls are available to run a door.

CH-2  
Operation

# DL-NCD

Status: Power Off. Waiting For "START". -- Feed Table Disabled  
Head Disabled -- Motor Off.

**Door Width: 36.000**

3-0	2-10	2-8	2-6	2-4
?	2-0			

**Door Length: 79.000**

**Door Thickness: 1.750**

Door Material Type (Click to change)  
**Wood/Fiberglass Door Selected**

Selected Tool  
Tool 2 Tool Select  
Active Tool  
Tool 8

Quantity: 1

No Feed Mode Disabled

Knock-Out Enabled

Re-Feed Door

Plunge Enabled

Clear All
Top Down OverRide 0.000
Offset OverRide 0.000
<-- 1 -->

(none)

00-Door Knocker with Viewer

00-Door Knocker

00-Test 949 3-4 Oval 37.95X14.933 OutFeed

00-Test 969-T Oval OutFeed

00-Test Mail Slot With PreDrills 2\_11-16x11\_1-2

00-TP23150-P (Round Top 22.95x36.95)

1-2 Peep Sight 19

422 9x37 SINGLE HINGESIDE

422 9x37 SINGLE LOCKSIDE

Skip Sequence

^  
|  
v

page  
0

^  
|  
v

Cut Routine Speed: 100

100%

90%

75%

50%

Main

Manual

Setup

Diagnostics

Home Machine

Refresh File List

End Sequence

Reset Machine

Shut Down System

**LOCK PATTERN**

Lock	DeadBolt
No Lock	No DeadBolt
41	5.0
45	5.5
46	BackSet
48	BackSet: 2 3/8
60	BackSet: 2 3/4

**LOCK PATTERN**

Lock Center	0.0000
Lock Diameter	2.1250
Lock BackSet	2.3750
DeadBolt Offset	0.0000
DeadBolt Diameter	2.1250
DeadBolt BackSet	2.3750

Current Servo Position

X	Y	Z	Width
0.196000	0.115000	0.174000	0.301000

Downloaded Door

-- None --

Running Door

-- None --

FIGURE 2-18. Main Screen



## Home Machine Button

This button starts the home sequence on the machine. The home sequence moves all four servo axis back to a physical reference point. The home sequence must be performed every time the machines is powered up or reset.



## Refresh File List

The refresh button rescans the operating files for new code routines that are added during updates or troubleshooting.



## End Sequence Button

This button stops any action the machine is currently performing.



## Reset Machine Button

If a fault occurs that cannot be cleared, press the **Reset Machine** button. This button will reset the machine to the start position *before* homing.

Press **Home Machine** after Reset Machine



## Shut Down System Button

Press the **Shut Down System** button to exit out of Windows<sup>®</sup> and shut the computer down. This must be done before turning power off to the machine.

## Cut Routine Speed

Manually adjust the cutting speeds by pressing the speed percentage buttons. The new speed will be effective immediately.





**B**

**Door Specification Group**

Set the parameters for the door in the **Door Spec** group.

- Either enter the door width in the top white box or choose a stored width from the **Preset Buttons**.

<b>Door Width: 36.000</b>				
3-0	2-10	2-8	2-6	2-4
2-2	2-0			
<b>Door Length: 79.000</b>				
<b>Door Thickness: 1.750</b>				

- Enter Door Length and Door Thickness

**Note:** See “About the Door Width Preset Screen” on page 2-38, for information on programming the **Preset Buttons**.

**C**

**Door Material Group**

Use this group to select the type of door material and select tool to use in cutting process. Each tool location has its own unique set of parameters that are created in the **Machine Calibration** Screen, under **Setup**. Each tool is referenced by the numbers shown below.

**Door Material Type:** Click the box until the desired door type is found (Steel, Fiberglass, and Wood).

**Selected Tool:** Displays the next tool to be used. Selected by the parameters set in the Setup Screens. See “About Setup Screens” on page 2-31

**Active Tool:** The current tool that is being used in machining.

**Tool Select:** Select to manually choose the next tool to be used. Will be displayed in the Selected Tool box. See pop-up screen below.

<b>Door Material Type</b> (Click to change)	
<b>Wood/Fiberglass Door Selected</b>	
<b>Selected Tool</b>	
<b>Tool 2</b>	<b>Tool Select</b>
<b>Active Tool</b>	
<b>Tool 8</b>	

<b>Tool Select</b>							
Tool 1	<b>Tool 2 Selected</b>	Tool 3	Tool 4	Tool 5	Tool 6	Tool 7	Tool 8
Fiberglass			Steel	Steel			Steel
	<b>Loaded</b>						
<b>Close Window</b>							

## D

**Quantity Group**

Use this group to set the quantity of doors to be processed with the existing specifications and parameters.

**Quantity:** Enter the quantity of doors to be processed in the white box.

1. **Auto Feed:** Press **Auto Feed** to toggle the auto feed on or off. In auto mode the feed system will:

- a. bring in a door
- b. set auto width
- c. clamp a door
- d. wait for processing to complete
- e. then feed the door out.

**Knock-Out:** Press **Knock-Out** to toggle the knock-out function ON or OFF. In knock-out mode, the piston in the cutter head will automatically knock out the cut portion of the door.

**Plunge:** Press **Plunge** to toggle the plunge function ON or OFF.

If **Plunge** is enabled, the cutter bit will plunge into the door once the door is clamped up and cut the cutout routine out.

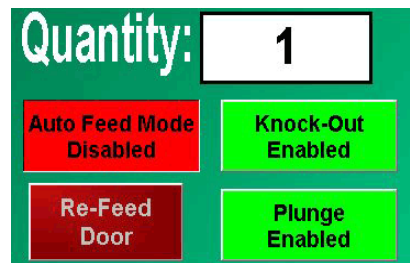
If **Plunge** is disabled, once the door is clamped, the router will run the routine without plunging into the door.

**Note:** This function is a great tool for testing new templates before cutting them.

**Re-Feed:**

The re-feed button is a momentary button that can be used to re-run a door, or process a door fed into the out-feed of the machine. If re-feed is pressed when there is a door sitting on the feed belts the door will move back into the machine and run the selected routine.

**Note:** This function is a great tool to use if 2 different cutouts are applied to one door.



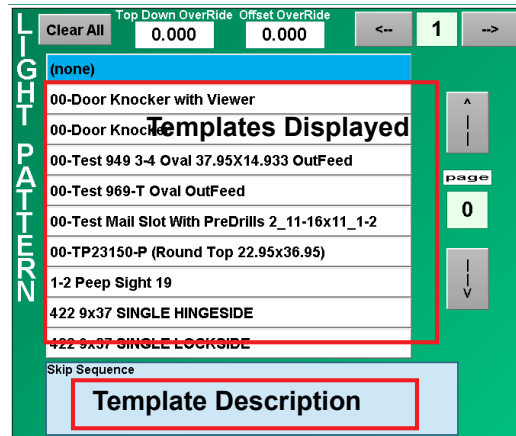


**E**

### Light and Lock Pattern Group

The white boxes are populated with stored templates.

Select the template from the **Light Pattern** white box to apply to the face of a door. Select a template from the **Lock Pattern** to apply to the lock portion of the door. The blue boxes will display a description of the template selected.



Set the Lock parameters for the door in the **Lock Pattern** group.

Choose a stored Lock and Backset patterns from the **Preset Buttons**.

Toggle the Deadbolt on or off with the **Dead-bolt** button.

See “About the Lock Location Preset Screen” on page 2-39, for information on programming the **Preset Buttons**.

LOCK PATTERN	Lock	DeadBolt	Lock Center	0.0000
		No Lock	No DeadBolt	Lock Diameter
	41	5.0	Lock BackSet	2.3750
	45	5.5	DeadBolt Offset	0.0000
	46	BackSet	DeadBolt Diameter	2.1250
	48	BackSet: 2 3/8	DeadBolt BackSet	2.3750
	60	BackSet: 2 3/4		

## About Setup Screens

Select the **Setup** Button on the Main screen to open access to the **Machine Calibration** screen and the **Door Width Preset** Screen.

### About Motion of Servo Motors: X,Y, Z, and W

The figure below shows the motion of the 'X' axis, 'Y' axis, 'Z' axis. and 'W' axis.

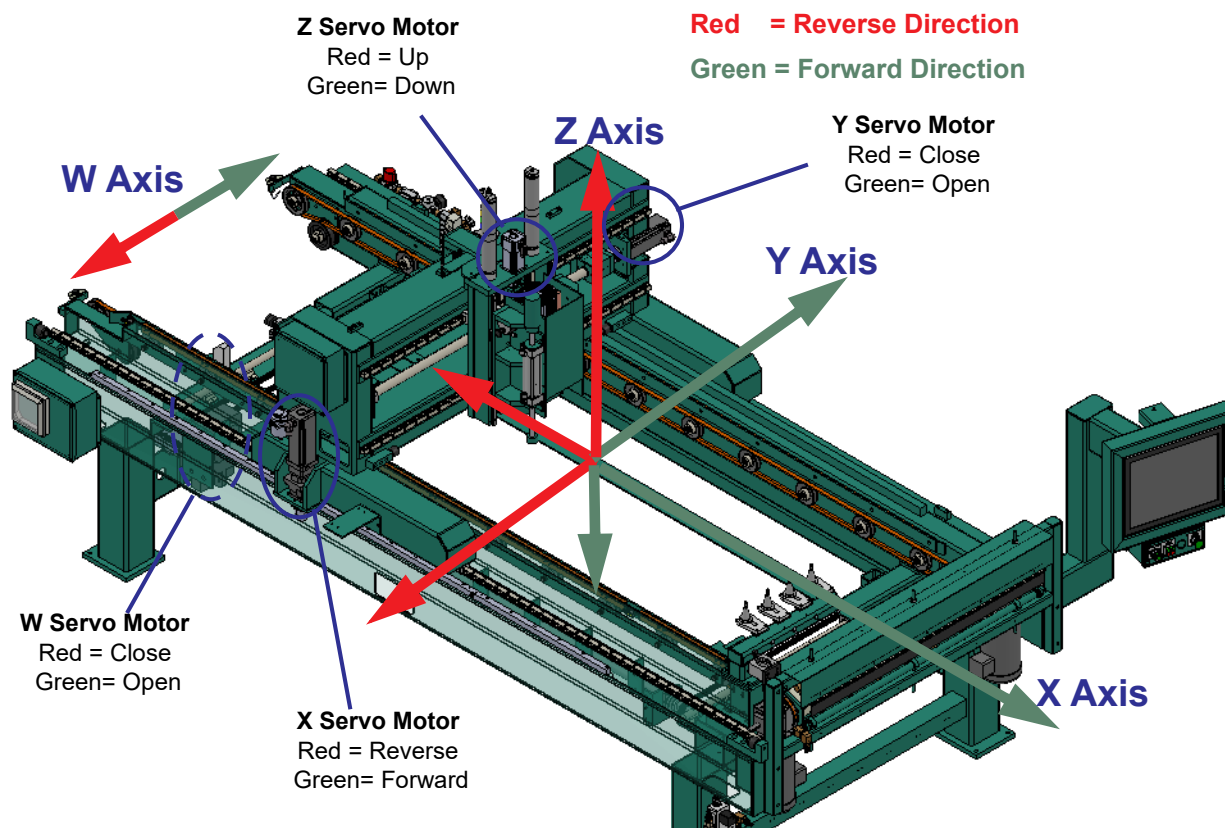


FIGURE 2-19. Servo Motor Motions

### About Calibration Data

In the **Machine Calibration Screen**, data can be entered to compensate for differences between measured data and expected results. For example, slight changes in positioning may occur after changing to a new tool.

Data is entered into the **Offset** box and combined to achieve the **Actual** parameter. The results are stored in permanent memory.

### Running a Reference Cut

If you notice any changes in the cut locations, run a reference cut. Run a known good Door Lock Template. The door lock cut is not dependent on door width and offers the best references.



After the door lock is machined, measure the results:

- The **Base** is the start up reference.
- The differences between the template and the measured (either positive or negative) are entered into the **Offset** entries.
- The **Actual** is the combination of the **Base** and the **Offset** entries which is the final result.

## Entering Calibration Data

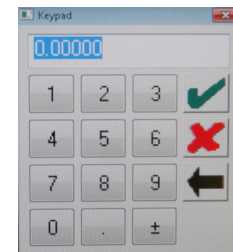
Run a test door with a lock pattern and measure the results. Follow the steps below.

1. If there is a number in the Base box, Click **Combine with Offset** to combine both numbers.

Base	Offset	Actual
0.50000	+ 0.00000	= 0.50000
Combine with Offset	+/- to Offset	Clear Offset

2. Click the **± to Offset** to display the keypad. In keypad, enter the positive or negative amount the lock needs to move on the door. Click the green check button to enter the data.

- a. If the lock needs to move towards the top of the door or to the edge of the door, enter a *negative* number.
- b. If the lock needs to move towards the bottom of the door or towards the center of the door, enter a *positive* number.
- c. If the depth is too deep, enter a *negative* number.
- d. If the depth is too shallow, enter a *positive* number.
- e. If the width needs to be wider, enter a *positive* number.
- f. If the width needs to be narrower, enter a *negative* number.



Keypad

3. Run a second lock and recheck the lock location.
4. If lock location is off, repeat steps 1 through 3
5. If it is correct, go back to the calibration screen and click **Combine with Offset** to combine offset and base to complete the calibration.

**Note:** Click the **Clear Offset** button to clear any incorrect number in the Offset box,



3. Run a second lock and recheck the lock location.
4. If lock location is off, repeat steps 1 through 3
5. If it is correct, go back to the calibration screen and click **Combine with Offset** to combine offset and base to complete the calibration.

**Note:** Click the **Clear Offset** button to clear any incorrect number in the Offset box,



## About the Machine Calibration Screen

From this screen, you can perform machine calibration.

CH-2

Status: Power Off. Waiting For "START". -- Feed Table Disabled  
Head Disabled -- Motor Off.

### Machine Calibration

**Tool 1**

Tool 1 <span style="color: green;">Enabled</span>		
Overall Length	Arbor Length	Reciprocate Distance
3.825	1.250	0.000
Diameter Base Offset Actual		
0.50000	+ 0.00000	= 0.50000
Combine with Offset	+/- to Offset	Clear Offset
Tool Type	Speed Factor	Plunge Factor
FG	100 %	0 %

**Tool 2**

Tool 2 <span style="color: green;">Enabled</span>		
Overall Length	Arbor Length	Reciprocate Distance
3.825	1.250	0.000
Diameter Base Offset Actual		
0.50000	+ 0.00000	= 0.50000
Combine with Offset	+/- to Offset	Clear Offset
Tool Type	Speed Factor	Plunge Factor
FG	100 %	0 %

**Tool 3**

Tool 3 <span style="color: red;">Disabled</span>		
Overall Length	Arbor Length	Reciprocate Distance
3.750	1.250	0.000
Diameter Base Offset Actual		
0.50000	+ 0.00000	= 0.50000
Combine with Offset	+/- to Offset	Clear Offset
Tool Type	Speed Factor	Plunge Factor
FG	100 %	0 %

**Tool 4**

Tool 4 <span style="color: green;">Enabled</span>		
Overall Length	Arbor Length	Reciprocate Distance
3.825	1.000	0.125
Diameter Base Offset Actual		
0.50000	+ 0.00000	= 0.50000
Combine with Offset	+/- to Offset	Clear Offset
Tool Type	Speed Factor	Plunge Factor
Steel	100 %	0 %

Cut Max Speed		
	Steel	Wood
Cutout	650	1000
Lock	150	150

**Cut Settings**

X-Base	X-Offset	X-Actual
-14.7500	+ 0.00000	= -14.7500
Combine with Offset	+/- to Offset	Clear Offset
Y-Base	Y-Offset	Y-Actual
0.12500	+ 0.00000	= 0.12500
Combine with Offset	+/- to Offset	Clear Offset
Z-Base	Z-Offset	Z-Actual
10.3750	+ 0.00000	= 10.3750
Combine with Offset	+/- to Offset	Clear Offset

**Tool Holders**

X-Base	X-Offset	X-Actual
91.3860	+ 0.00000	= 91.3860
Combine with Offset	+/- to Offset	Clear Offset
Y-Base	Y-Offset	Y-Actual
2.91600	+ 0.00000	= 2.91600
Combine with Offset	+/- to Offset	Clear Offset
Z-Base	Z-Offset	Z-Actual
3.53500	+ 0.00000	= 3.59000
Combine with Offset	+/- to Offset	Clear Offset

**Width Adjust**

W-Base	W-Offset	W-Actual
0.50000	+ 0.00000	= 0.50000
Combine with Offset	+/- to Offset	Clear Offset

**Current Servo Position**

X	Y	Z	Width
0.196000	0.115000	0.174000	0.301000

**Downloaded Door**

None ..

**Running Door**

None ..

FIGURE 2-20. Setup Menu

**F**

**Tool Setup Group**

In the **Tool Setup** Group, the parameters for each tool at each location is created. The parameters are assigned to each tool location and that tool should stay at the assigned location. The process is the same for each tool number. (Tool 1 through Tool 8)

**Tools 1-4** are located on the main Setup Page

**Note:** Tools may be renamed to manufactures preference. Click the box next to the Tool Enable/Disable Indicator and enter desired name.

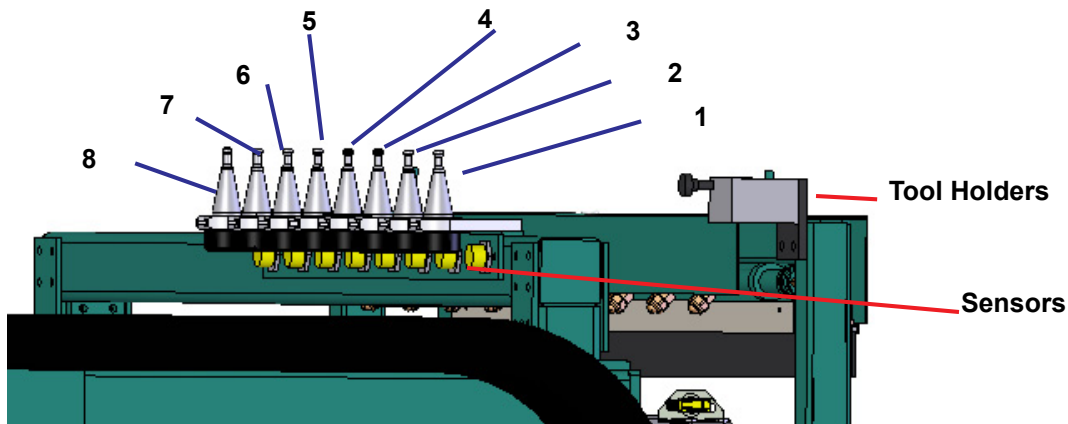
**Tools 5-8** are located by selecting the **Tools 5-8 Setup Page** button. The next Figure shows the screen contents,

Tool 5		
Overall Length	Arbor Length	Reciprocate Distance
3.825	1.000	0.125
Diameter Base	Diameter Offset	Diameter Actual
0.50000	+ 0.00000	= 0.50000
Combine with Offset	+/- to Offset	Clear Offset
Tool Type	Speed Factor	Plunge Factor
Steel	100 %	0 %

Machine Calibration											
Tool 5			Tool 6			Tool 7			Tool 8		
Tool 5	Tool 5 Enabled		Tool 6	Tool 6 Disabled		Tool 7	Tool 7 Disabled		Tool 8	Tool 8 Enabled	
Overall Length	Arbor Length	Reciprocate Distance	Overall Length	Arbor Length	Reciprocate Distance	Overall Length	Arbor Length	Reciprocate Distance	Overall Length	Arbor Length	Reciprocate Distance
3.825	1.000	0.125	3.750	1.250	0.000	3.750	1.250	0.000	3.825	1.000	0.125
Diameter Base	Diameter Offset	Diameter Actual	Diameter Base	Diameter Offset	Diameter Actual	Diameter Base	Diameter Offset	Diameter Actual	Diameter Base	Diameter Offset	Diameter Actual
0.50000	+ 0.00000	= 0.50000	0.50000	+ 0.00000	= 0.50000	0.50000	+ 0.00000	= 0.50000	0.50000	+ 0.00000	= 0.50000
Combine with Offset	+/- to Offset	Clear Offset	Combine with Offset	+/- to Offset	Clear Offset	Combine with Offset	+/- to Offset	Clear Offset	Combine with Offset	+/- to Offset	Clear Offset
Tool Type	Speed Factor	Plunge Factor	Tool Type	Speed Factor	Plunge Factor	Tool Type	Speed Factor	Plunge Factor	Tool Type	Speed Factor	Plunge Factor
Steel	100 %	0 %	Steel	100 %	0 %	Steel	100 %	0 %	Steel	100 %	0 %

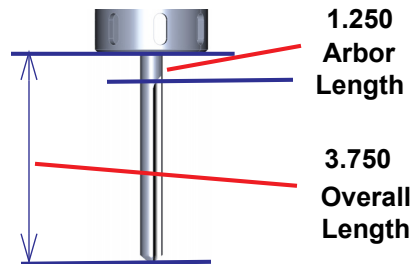
Tool 5-8 Setup Page

This next Figure shows the location of the Tools and it's corresponding calibration menu.





Toggle button to enable or disable the tool location. If a tool is not in the holder, the disable button must be toggled.



Tool 1		
		Tool 1 Enabled
Overall Length	Arbor Length	Reciprocate Distance
3.750	1.250	0.000

After each tool replacement, tool alteration, or any tool adjustment enter the **Overall Length** and **Arbor length** to set a reference in the program.

Enter **Reciprocate Distance** if needed.

**Important:** The reciprocate distance must be less than the Overall Length minus the Arbor Length minus the door thickness minus the taper length on the tip of the tool (if applicable such as with steel bits). Reciprocate distance works best between 1/8" and 1/4"

Reciprocate Distance equation:

*Overall Length - Arbor Length - door thickness - taper length on the tip of the tool (if applicable such as with steel bits)*

Check the diameter of the cut and enter measurement and offset data to correct for tool. This adjustment compensates for discrepancies to the actual size of the router bit. See "Entering Calibration Data" on page 2-32, for instructions to input data.

Diameter Base	Diameter Offset	Diameter Actual
0.50000	+ 0.00000	= 0.50000
Combine with Offset	+/- to Offset	Clear Offset

Select the **Tool Type** (Steel, Wood or Fiberglass) for each tool location.

Enter the percentage of the full speed of the cutting speed in the **Speed Factor** box.

Tool Type	Speed Factor	Plunge Factor
Steel	100 %	0 %

For small pilot holes (this number should be very small), enter the penetration rate into the **Plunge Factor**.

**G**

### Cut Settings Group

Adjust the X, Y, and Z motor positioning with this block.

Run a lock at 2.75" in backset with a given location with a depth of 1/2 ". Once the lock is machined, check the measurements of the lock. If the calibration is off, find which axis needs to be calibrated.

If the lock is off in the length of the door, the X-axis needs to be adjusted.

If the backset is off, the Y-axis needs to be calibrated.

If the depth is not correct, the Z-axis needs to be adjusted.

See "Entering Calibration Data" on page 2-32, for instructions to input data.

Cut Settings		
X-Base 0.00000	+ X-Offset 0.00000	= X-Actual 0.00000
Combine with Offset	+/- to Offset	Clear Offset
Y-Base 0.00000	+ Y-Offset 0.00000	= Y-Actual 0.00000
Combine with Offset	+/- to Offset	Clear Offset
Z-Base 0.00000	+ Z-Offset 0.00000	= Z-Actual 0.00000
Combine with Offset	+/- to Offset	Clear Offset

**H**

### Tool Holders Group

If the pick up of the tools from the station is offset, adjust this group to calibrate the motion of the cutter head.

**Important:** Be very careful with this adjustment. If adjusted incorrectly, damage may occur to machine. Make adjustments in small increments (0.010") to verify movement.

**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.

**Y-Axis:** If the tool needs to move towards the fix 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.

Tool Holders		
X-Base 91.1545	+ X-Offset 0.00000	= X-Actual 91.1545
Combine with Offset	+/- to Offset	Clear Offset
Y-Base 1.66320	+ Y-Offset 0.00000	= Y-Actual 1.66320
Combine with Offset	+/- to Offset	Clear Offset
Z-Base 3.60230	+ Z-Offset 0.00000	= Z-Actual 3.60230
Combine with Offset	+/- to Offset	Clear Offset

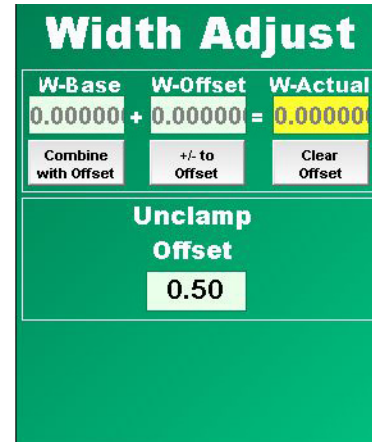


### Width Adjust Group

Adjust the 'W' axis motor to compensate for and discrepancies in the width settings

**Width Adjust:** If the width adjust fence, needs to be moved closer to the fixed fence, enter a negative number. If the fence needs to be wider, enter a positive number.

See “About the Machine Calibration Screen” on page 2-34, for instructions to input data.



**Unclamp Offset:** Enter the amount of desired width of the fence in the unclamping mode. To check, slide door into the machine and firmly press it against the fixed fence. There should be about 1/4" of a gap from the movable fence and the door edge.

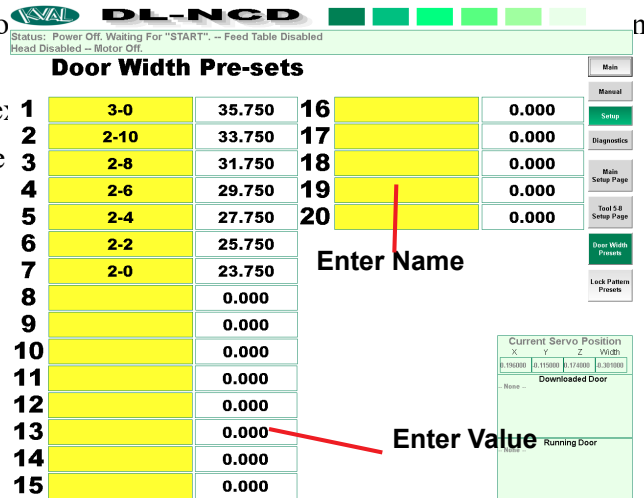
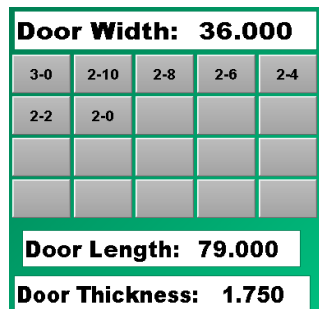
The unclamp offset usually works best around 0.50

### About the Door Width Preset Screen

Enter up to twenty **Door Width Presets** at this screen.

Click a box in the yellow column to the main screen.

Click the adjacent box the in the ne: The results will be displayed on the



Select the **Door Width Preset Button**

## About the Lock Location Preset Screen

Enter up to '5' Lock Location Presets and '2' Dead Bolt Presets

Click a box in the yellow column to enter the name of the preset desired to be seen on the main screen.

Click the adjacent box the in the next column to enter the value.

Status: Power Off. Waiting For "START". -- Feed Table Disabled  
Head Disabled -- Motor Off.

	Name	Value
1	41	41.000
2	45	45.000
3	46	46.000
4	48	48.000
5	60	60.000

	Name	Value
1	5.0	5.000
2	5.5	5.500

Current Servo Position

X	Y	Z	Width
0.590000	0.115000	0.174000	0.301000

Downloaded Door  
None ..

Running Door  
None ..

Enter Name

Enter Value

The results will be displayed on the Main Screen

LOCK PATTERN	Lock	DeadBolt	Lock Center	0.0000
	No Lock	No DeadBolt	Lock Diameter	2.1250
	41	5.0	Lock BackSet	2.3750
	45	5.5	DeadBolt Offset	0.0000
	46	BackSet	DeadBolt Diameter	2.1250
	48	BackSet: 2 3/8	DeadBolt BackSet	2.3750
60	BackSet: 2 3/4			

Lock Pattern Presets

Select the Lock Pattern Preset Button



## About Manual Operation

From this screen, you can control certain functions of the machine in manual mode.

CH-2  
Operation

Status: Power Off. Waiting For "START". -- Feed Table Disabled  
Head Disabled -- Moto

**X Axis** J

Reverse Forward Speed: 100 %

**Y Axis**

Reverse Forward Speed: 100 %

**Z Axis**

Down Up Speed: 100 %

**Width Adjust** K

Open Close Speed: 100 %

**Feed**

Forward Reverse Normal Speed

Manual Door Stop Park Current Tool Auto Feed Mode Disabled

**Additional Functions**

Re-Feed Door Force Start Sequence

Exit Application L

**Machine Door Count**

Daily Total	Machine Total
0	72

Reset Daily

**Current Servo Position**

X	Y	Z	Width
0.196000	0.115000	0.174000	0.301000

Downloaded Door

.. None ..

Running Door

.. None ..

FIGURE 2-21. Manual Screen



### X, Y, and Z Axis Group

This group controls the movement of the X,Y, and Z motors on the carriage.

#### 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.



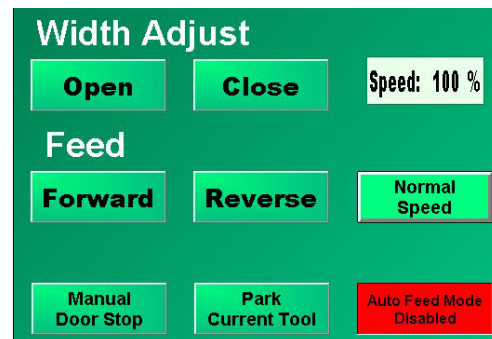
### Width Adjust Group

#### Width Adjust:

- **Open:** Press and *hold* the **Open** button to open the width adjust carriage. To stop the carriage, release the button.
- **Close:** Press and *hold* the **Close** button to close the width adjust carriage. To stop the carriage, release the button.

#### Feed:

- **Reverse:** Press and hold the **Reverse** button reverse the feed of the door. To stop the feed, release the button.
- **Forward:** Press and hold the **Forward** button to move the door feed forward. To stop the feed, release the button.
- **Normal Speed:** Press and hold the **Normal Speed** button to slow speed. To return to previous speed, release the button.

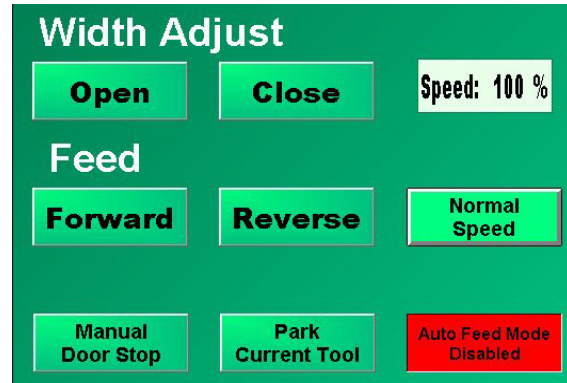


### Toggle Buttons:

- **Manual Door Stop:** Press **Manual Door Stop** to pop up the door stop and door clamp. Press the button a second time to release them.
- **Park Current Tool:** Press **Park Current Tool** to put the tool back in the tool holder and park the head.

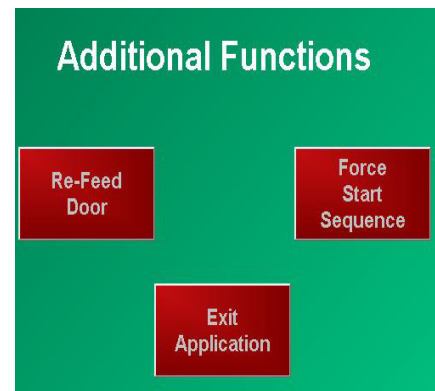
**Note:** The Park Current Tool should be completed before shutting down machine every day. This action will cut down on condensation and keep the spring from weakening inside the arbor.

- **Auto Feed Mode Disable:** Press this button to turn auto feed OFF. Press the button a second time will turn the auto feed back ON.



### Additional Functions Group

- **Re-Feed Door:** Press the **Re-Feed Door** Button to re-feed the door for a second cut. See “Quantity Group” on page 2-29 for a description.
- **Force Start Sequence:** Press the **Force Start Sequence** after a pause or stop in process.
- **Exit Application:** Press the **Exit Application** button to close the user screen and return to the Windows desktop. This can be used if the operator needs to use a different Windows application.





## About the Diagnostic Screen

The Diagnostic screen displays all the tasks the DL-NCD performs. This screen can help with troubleshooting by associating the error code to machine sections or functions. The top line will have the most current routine that is running. This screen also has an indicator to indicate a bad barcode string. This could be a damaged barcode label or coding is incorrect.

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.

**Status:** Power Off. Waiting For "START". -- Feed Table Disabled  
Head Disabled -- Motor Off.

**Message**

```
--(2016-11-04-11:48:56.290)- [Width Lookup Table] Added 6 entries to value table.
--(2016-11-04-11:48:56.250)- [FTOD Lookup Table] Added 4 entries to value table.
--(2016-11-04-11:48:56.250)- [DeadBolt Lookup Table] Added 4 entries to value table.
--(2016-11-04-11:48:56.250)- [Lock Lookup Table] Added 4 entries to value table.
--(2016-11-04-11:48:56.230)- [Material Lookup Table] Added 3 entries to value table.
--(2016-11-04-11:48:56.230)- [Length Lookup Table] Added 3 entries to value table.
--(2016-11-04-11:48:56.170)- [FTOD 3 Lookup Table] Substring length =0. String Table Disabled.
--(2016-11-04-11:48:56.170)- [FTOD 2 Lookup Table] Substring length =0. String Table Disabled.
--(2016-11-04-11:48:56.170)- [Cutout 3 Lookup Table] Substring length =0. String Table Disabled.
--(2016-11-04-11:48:56.170)- [Cutout 2 Lookup Table] Substring length =0. String Table Disabled.
--(2016-11-04-11:48:56.170)- [Cutout Lookup Table] Table lookup in "Direct Read" Mode. Not table loaded.
--(2016-11-04-11:48:56.030)- [AX5000 Diagnostics] AX5000 Diagnostics Initialized
--(2016-11-04-11:48:56.030)- [Width Adjust Axis] [no name] Initialized
--(2016-11-04-11:48:56.030)- [Width Adjust Axis] KavalStateMachineBase.getName(): setName() was note called on this state machine
--(2016-11-04-11:48:56.030)- [Feed Motors] [no name] Initialized
--(2016-11-04-11:48:56.030)- [Feed Motors] KavalStateMachineBase.getName(): setName() was note called on this state machine
--(2016-11-04-11:48:56.030)- [-] [no name] Initialized
--(2016-11-04-11:48:56.030)- [-] KavalStateMachineBase.getName(): setName() was note called on this state machine
--(2016-11-04-11:48:56.030)- [Feed Table Manager] Table Manager Initlized
--(2016-11-04-11:48:56.030)- [-] [no name] Initialized
--(2016-11-04-11:48:56.030)- [-] KavalStateMachineBase.getName(): setName() was note called on this state machine
--(2016-11-04-11:48:56.030)- [-] [no name] Initialized
--(2016-11-04-11:48:56.030)- [-] KavalStateMachineBase.getName(): setName() was note called on this state machine
--(2016-11-04-11:48:56.030)- [-] [no name] Initialized
--(2016-11-04-11:48:56.030)- [-] KavalStateMachineBase.getName(): setName() was note called on this state machine
--(2016-11-04-11:48:56.030)- [HSD Spindle Motor] KHsdToolChanger Initlized
--(2016-11-04-11:48:56.030)- [G-Code Manager] KGCode Initlized
```

**Barcode Indicator**

**Barcode String**

Barcode String BAD

Send Barcode String

**Tool Usage Tracker**

Tool 1	Tool 2	Tool 3	Tool 4	Tool 5	Tool 6	Tool 7	Tool 8
Tool Usage (Inches)	Tool Usage (Inches)	Tool Usage (Inches)	Tool Usage (Inches)	Tool Usage (Inches)	Tool Usage (Inches)	Tool Usage (Inches)	Tool Usage (Inches)
2438	0	0	0	0	0	0	606
Clear Usage	Clear Usage	Clear Usage	Clear Usage	Clear Usage	Clear Usage	Clear Usage	Clear Usage

**Current Servo Position**

X	Y	Z	Width
0.196000	0.115000	0.174000	0.301000

**Downloaded Door**

-- None --

**Running Door**

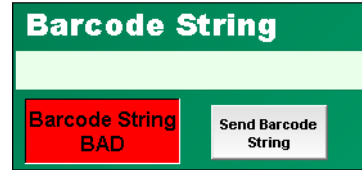
-- None --



## Barcode Indicator

If the barcode is not readable or out of alignment the feeding of the door will stop

To verify if it is a bad read, check the Barcode Status indicator located on the Diagnostic Screen.



- a. If it is a bad read, the red button will be displayed on the screen.
- b. Check the alignment of the label on the door. The label should be on the end and large enough for the reader to capture.
- c. Check for damage or grime on the label.
- d. If needed, clean the lens of the barcode reader.
  - Important:** Do not look directly into the red light of the scanner.
- e. Contact your engineer or IT support if any of the issues above are not the issue.
- f. If needed, enter correct data at the operator's station by selecting the Send Barcode button to send the code to the PLC.

## Tool Usage Tracker

This menu tracks the usage of the machines tools, Use this as a handy method to check the wear and tear of the machine tooling.

After a tool is replaced. select the **Clear Usage** button to start at Zero inches/

Tool 1	Tool 2	Tool 3	Tool 4	Tool 5	Tool 6	Tool 7	Tool 8
Tool Usage (Inches)	Tool Usage (Inches)	Tool Usage (Inches)	Tool Usage (Inches)	Tool Usage (Inches)	Tool Usage (Inches)	Tool Usage (Inches)	Tool Usage (Inches)
2438	0	0	0	0	0	0	606
Clear Usage	Clear Usage	Clear Usage	Clear Usage	Clear Usage	Clear Usage	Clear Usage	Clear Usage



Notes:



---

# CHAPTER 3 System IT Administration

This chapter describes the KVAL DL-NCD controller. The controller is an on board computer that supplies the user interface and controls the operation of the machine. With the controller, KVAL can remotely help troubleshoot your machine.

---

## Chapter 3 at a Glance

CH-3  
System IT

Section Name	Summary	Page
<b>System IT Administration</b>	This section describes the basic parts of the operation of the PLC in the machine. Such as: <ul style="list-style-type: none"><li>• <b>About the PLC</b></li><li>• <b>Connections on the PLC</b></li><li>• <b>Backing up the Computer</b></li><li>• <b>About Remote Connection to KVAL Service</b></li></ul>	<a href="#">page 3-2</a>
<b>Updating Door Template Files</b>	This section describes the process of updating G code templates for custom machining.	<a href="#">page 3-4</a>
<b>DL-NCD Barcode Setup</b>	This section describes coding process for the Barcode reader.	<a href="#">page 3-8</a>

## System IT Administration

For optimum support, the DL-NCD requires internet access. With internet access, KVAL Service Support will be able to access your machine through your company's Intranet and help solve any issues that may occur. Connection to the Intranet is achieved by interfacing with the DL-NCD controller. The location of the Intranet connection is identified in the figure below (RJ45 to Intranet.)

### About the DL-NCD Computer

The DL-NCD uses a Beckhoff<sup>®</sup> CPU module as a PLC (Programmable Logic Controller.) In addition to the CPU and the chipset, the module also contains internal main memory. The computer has a removable Compact Flash card from which it boots. The controller uses a Windows CE 7<sup>®</sup> operating system with TwinCAT 2<sup>®</sup> automation software to create the PLC and Motion Control method.

Interface modules include:

- A smart power supply to connect to EtherCat<sup>®</sup> terminals. This supply contains a LCD to display system and user messages.
- A DVI/USB module to connect to the user interface.
- An Ethernet module to connect to the servo amplifiers.

### Connections on the PLC

The CPU module is located in the upper left corner of the Electrical Panel. See "About the Electrical Panels" on page 2-12.

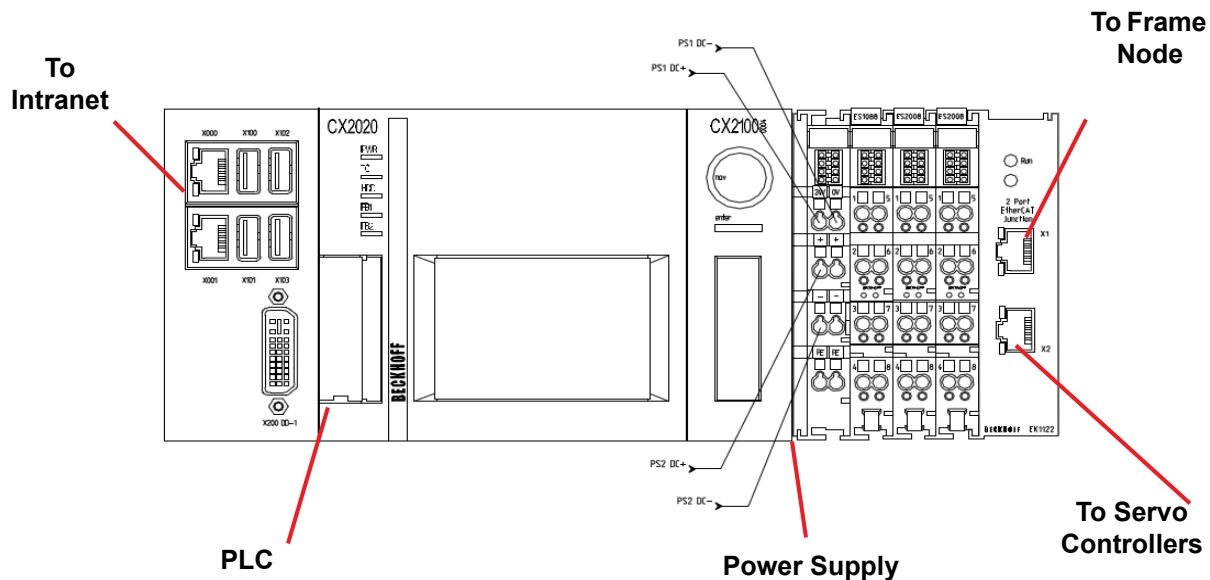


FIGURE 3-1. Connections on the Controller



## Backing up the Computer

Backups keep your data archived in case of a rare system crash. Click the Back-Up Icon on the desktop to back up your data. The data is stored in a backup folder (C:\Backup) in your Windows<sup>®</sup> directory. It is recommended to set up a back-up schedule to save your data on a regular occurrence and to backup to a thumb drive or other storage device.

The KVAL service team would be happy to help. If any questions occur, contact our service team at (800) 553-5825 or at [www.kvalinc.com](http://www.kvalinc.com).

## About Remote Connection to KVAL Service

Remote access is a powerful tool to help fix issues that occur with the DL-NCD machine. With the remote access, our KVAL service technician is able to observe your user screen in real time, read, and adjust programming code. For DL-NCD access, the Intranet connection on the machine controller must have outside access to the Internet.

## Updating Door Template Files

A door template is file containing door parameters and code to cut a door. Individual door light patterns can be created at the machine console, or remotely using a standard computer. Use the Ethernet connection to transfer files from a remote computer to the machine computer.

This section lists some templates provided with the DL-NCD. The templates are text files with the variables located at the top to the file. Below the dotted line is the G-code program. The variables can be changed to match the door's specifications. It is recommended **not** to change any code below the dotted line. Custom templates may also be purchased from KVAL, please contact our service department. See "Getting Help from KVAL" on page 1-14.

**Note:** G-code is a programming language that tells the machine tools and assemblies where to move, how fast to move, and through what path to move.

### Generic Lock Template

This section list the variable portion of the lock file and an illustration of the setup parameters. Change the variables in the *User Parameters* section to your door's specification.

```
( Rev 2 )
( Setup Parameters )
R0=44
R1=2.125
R2=2.75
R3=38.5
R4=2.125
R5=2.75
(---)
R9=0
(---)
R10=R126

( Lock Center )
( Lock Diameter )
( Lock Backset )
( Deadbolt Center - 0 turns off 2nd lock )
( Deadbolt Diameter - 0 turns off 2nd lock )
( Deadbolt Backset - 0 turns off 2nd lock )

( Lock Side Mode. 0= Fixed Fence Lock 1= Movable Fence Lock )

( Feed Rate )
```

FIGURE 4. G Code Variables for Door Lock

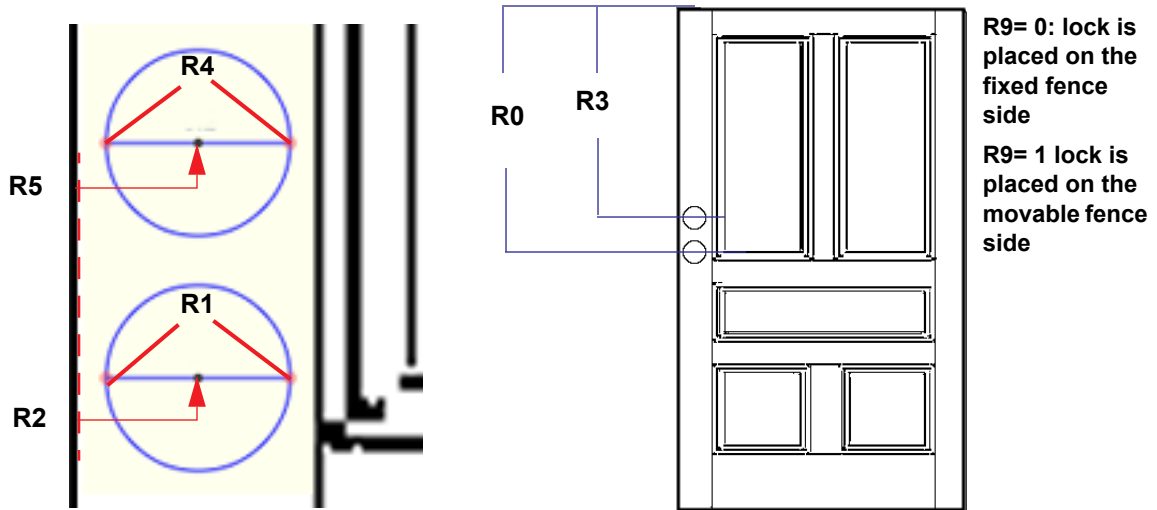


FIGURE 5. Door Lock Variable Dimensions

### Generic Rectangle Template (With Round Top Option)

This section list the variable portion of the Round Top Rectangle file and an illustration of the setup parameters. The arc is calculated in the code. Change the variables in the *User Parameters* section to your door's specification.

```
( - This routine will do both rectangles and round-tops )
( ===== )
( User Parameters )
R0=8           ( Top down dimension )
R1=24         ( Rectangle Width - auto-centered in door )
R2=64         ( Rectangle Height )
R11=4         ( X Knockout offset from corner )
R12=R1/2     ( Y Knockout offset from corner )
R18=0         ( Round-Top Mode 0=off 1=on )
( --- )
R10=R125     ( Feed Rate )
( ===== )
```

FIGURE 6. G Code Variables for Rectangle

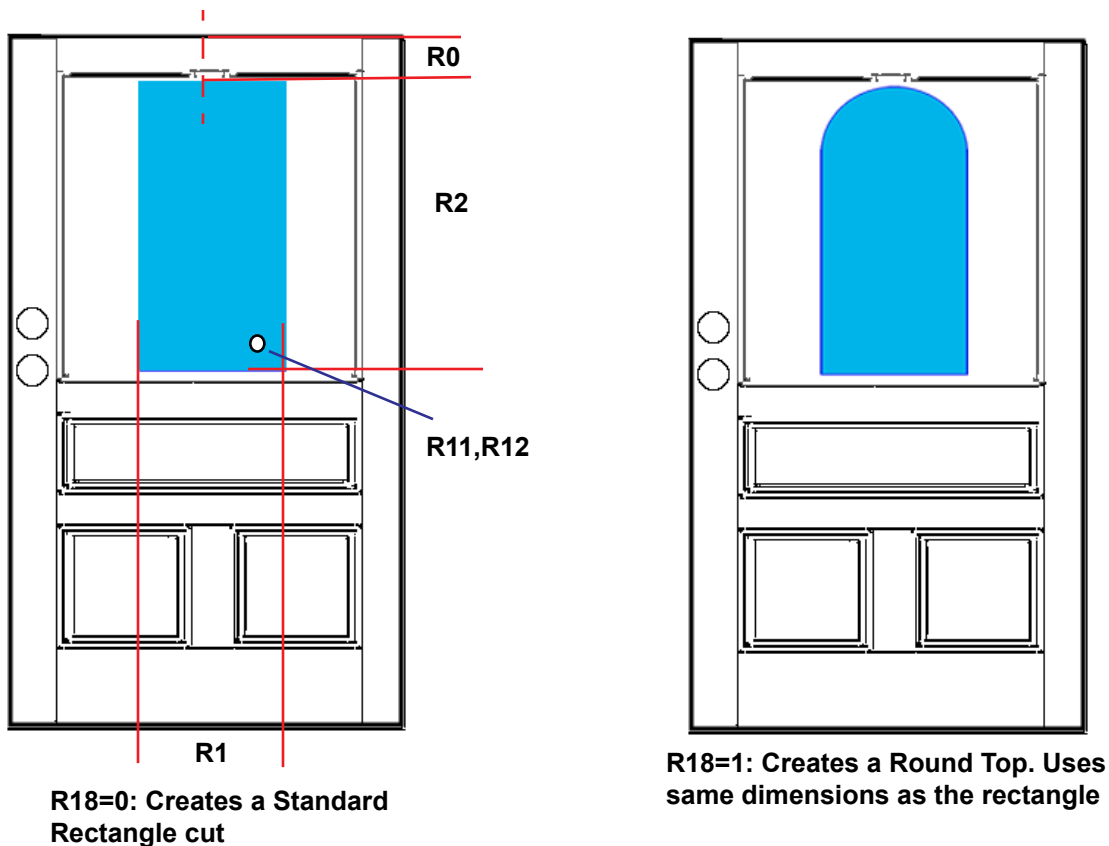


FIGURE 7. Rectangle Variable Dimensions

## Generic Twin Rectangle Template (With Round Top Option)

This section list the variable portion of the Twin Rectangle file and an illustration of the setup parameters. Change the variables in the *Users Parameters* section to your door's specification.

```
{
  - THIS routine will do both rectangles and round-tops )
  ( ===== )
  ( Setup Parameters )
  R0=5          ( Top down dimension )
  R1=9          ( Rectangle width )
  R2=37        ( Rectangle Height )
  R3=23        ( Overall width: distance from edge to edge )
  R11=3        ( X Knockout offset from corner )
  R12=3        ( Y Knockout offset from corner )
  R18=0        ( Round-Top Mode 0=off 1=on )
  (---)
  R10=R125     ( Feed Rate )
  ( ===== )
  ( R100 = Door width )
  ( R101 = Door Length )
  ( R102 = Door Thickness )
  ( R121 = Tool Diameter )
}
```

FIGURE 8. G Code Variables for Twin Rectangle and Twin Rounded Rectangles

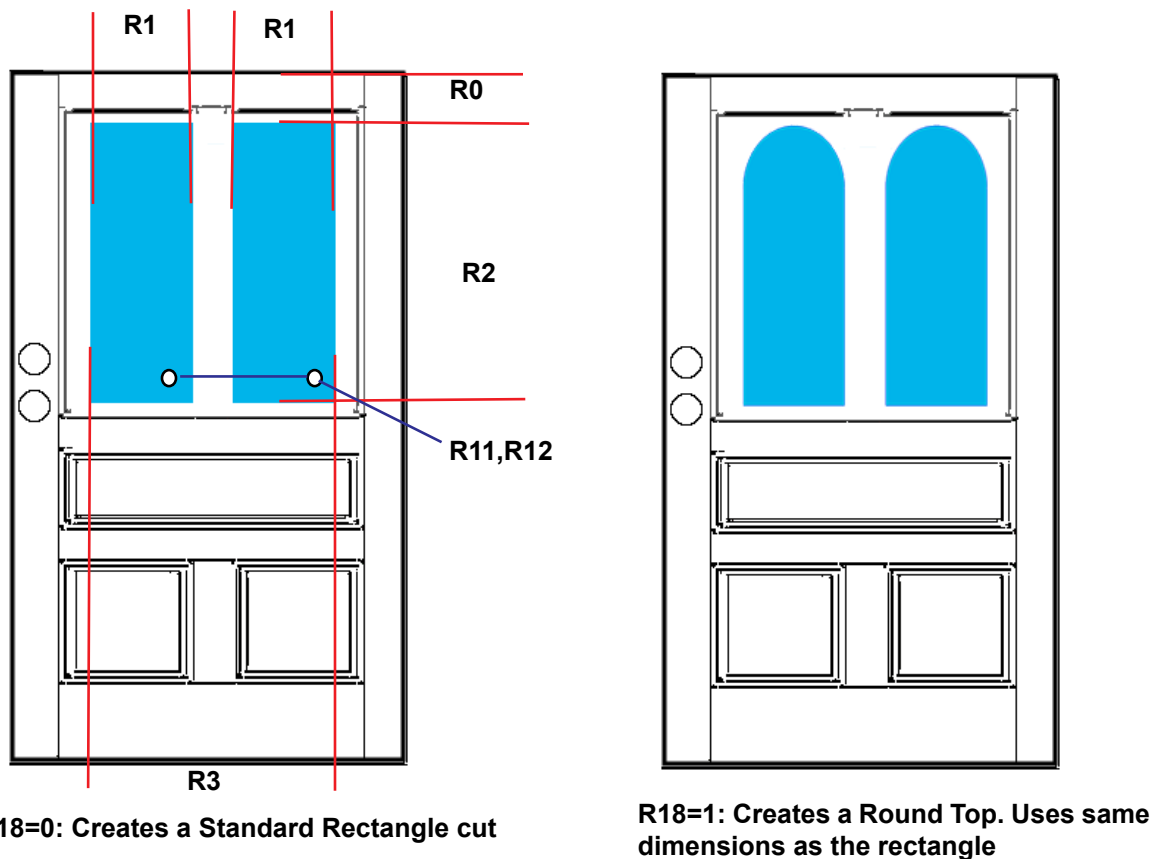


FIGURE 9. Twin Rectangle Variable Dimensions

## Template for Specials

This template allows the paste of your own code into the template to allow the creation of other cuts. Knowledge of drafting programs and programming is recommended for using of this template. The template below is a sample. Check with engineering or the IT group for your companies template.

```

( Cut-out Description, line 3 )
( Based on Special Cut-out Template v1.1 )
(=====)
( User Parameters )
R0=4.625          ( Top down dimension )
R1=0              ( Y offset from center )
R2=7.6875        ( Routine Start Location, X )
R3=-11.25        ( Routine Start Location, Y )
R4=R2-1          ( Routine Plunge Location, X )
R5=R3-1          ( Routine Plunge Location, Y )
R11=10           ( X Knockout location, from top of cut )
R12=0            ( Y Knockout location, from center of cut )
(---)
R10=R125         ( Feed Rate )
(=====)
( R100 = Door Width )
R101 = Door Length )
R121 = Tool Diameter )
R123 = Feed Rate Factor )
R125 = Max Cutout Feed Rate )
R126 = Max Lock Feed Rate )
R130 = Knockout routine enabled )
R131 = Knockout X offset )
R132 = Knockout Y offset )
(=====)
( Set-up Mode Parameters )
G55              ( Zero point: Door Center, Top )
G40              ( turn off tool comp )
G17              ( XY Plane )
G90              ( Absolute )
(-----)
( establish new zero point )
G58 X=R121/2+R0 Y=R1 Z0          ( Set new zero point, top of cut adjusted for bit )
(=====)
( --- Move To Plunge Location And Plunge --- )
G0 X=R4 Y=R5 D1          ( position bit over plunge location )
M3                      ( router on )
M100                   ( plunge )
G1 X=R2 Y=R3 F=R10*R123  ( Move to start of cut )
(-----)
( --- Cutout Code Here --- replace with your code --- )
G1 F30.0 X0.0
G1 Y-10.6394
G2 X-0.2768 Y-5.9824 I1.9375 J2.4519
G3 Y-4.9239 I-0.5314 J0.5292
G2 X-0.2892 Y-0.5262 I2.2143 J2.2051
G3 Y0.5262 I-0.5344 J0.5262
G2 X-0.2768 Y4.9239 I2.2267 J2.1925
G3 Y5.9824 I-0.5314 J0.5292
G2 X0.0 Y10.6394 I2.2143 J2.2051
G1 Y11.25
G1 X6.5
G1 Y-11.25
( --- End Cutout Code --- )
M101                  ( Retract Cutter )
(=====)
( -- KNOCK-OUT -- )
@I122 R130 K0 K999    ( Jump if no knock-out )
G0 X=R131+R11 Y=R132+R12
M110                  ( knock-out )
(-----)
( -- END CUT -- )
N999
G55                  ( Zero point: Door Center, Top )
G90                  ( Absolute )
M5                   ( router off )
M30                  ( routine end )
    
```

Update the variables to meet the new template.

Cut and Paste Code in this section

FIGURE 10. Example of Template for Specials

## DL-NCD Barcode Setup

The configuration for the barcode system is performed by modifying 5 configuration files, one for each parameter type. The configuration files are then encoded into the barcode. The parameters are:

- Door Width
- Door Length
- Cutout Type
- Door Material Type
- Lock Type

The files are text files (.txt) and are located in the following directory: C:\KVAL\BarcodeConfig\

### Configuration File Description

Each configuration file has three sections. The Cutout configuration file is used as an example below.

#### 1. Title and Description Section

This section describes how to use the file and what the file changes.

```

1 ( Cut-out Lookup Table )
2 (-----)
3 ( [starting character],[number of characters] )
4 ( xxx [cut-out title, as it is displayed in the cut-out list
```

#### 2. Character Range Section

In this section, the characters are defined for each data type.

It's a sequence of two numbers.

The first number is the starting character, starting with 0.

The second number is how many character.

See Table below. If we have a "3,3", this setup counts 3 characters over from the "0" Bit. (the 4<sup>th</sup> character in the string) and pull 3 characters.

In the barcode string is "abcdefg", it would grab "def".

If the number pair "0,4" would grab the characters "abcd"

Bit Number	0	1	2	3	4	5	6
String	a	b	c	d	e	f	g
3,3				d	e	f	
0,4	a	b	c	d			

### 3. Code Lookup Section

This section holds the look-up values for the characters extracted from the previous section. It defines what the character pattern is linked to.

6	NON	(none)
7	D21	Full Light_22x64steel
8	HR4	Half Light_22x36steel

## Configuration Code Samples

This section contains samples of the configuration code files.

### Door Width

Start at 0 bit with 2 bit length

```

cutout.bd x length.bd x lock.bd x material.bd x width.bd x
1 ( Door Width Lookup Table )
2 (-----)
3 ( [starting character],[number of characters] )
4 ( xx [Door Width, in inches] )
5 0,2
6 30 35.75
7 28 31.75
8 26 29.75
9 22 30.75
10 20 28.75
11
    
```

If XX (Bits 0,1) = 30, Door Width= 35.75"

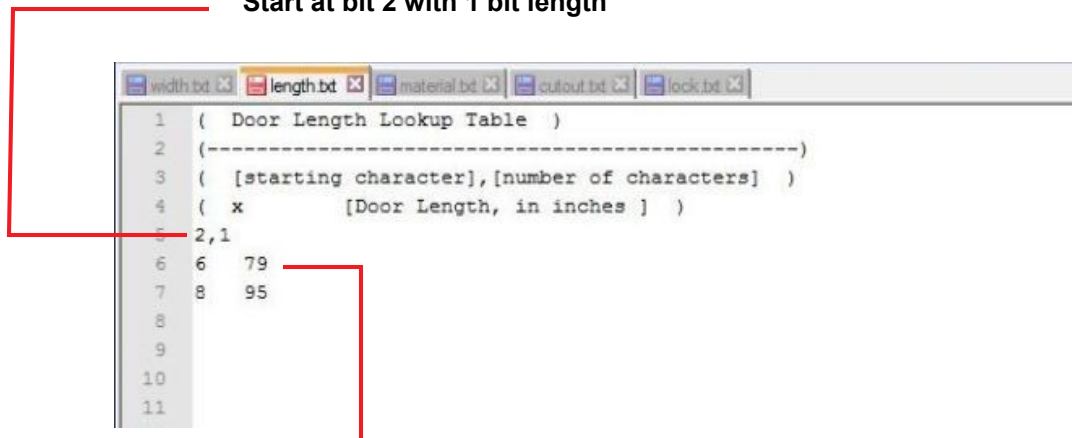
If XX (Bits 0,1) = 28, Door Width = 31.75"

etc



## Door Length

Start at bit 2 with 1 bit length



```

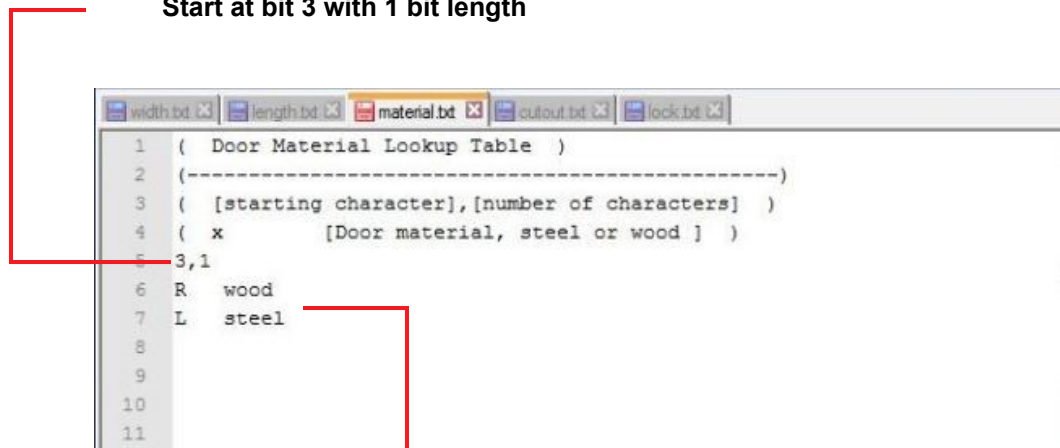
width.bt x length.bt x material.bt x cutout.bt x lock.bt x
1 ( Door Length Lookup Table )
2 (-----)
3 ( [starting character],[number of characters] )
4 ( x      [Door Length, in inches ] )
5 2,1
6 6 79
7 8 95
8
9
10
11
  
```

If X (Bit 2) = 6, Door length = 79"

If X (Bit 2) = 8, Door length= 95"

## Door Material

Start at bit 3 with 1 bit length



```

width.bt x length.bt x material.bt x cutout.bt x lock.bt x
1 ( Door Material Lookup Table )
2 (-----)
3 ( [starting character],[number of characters] )
4 ( x      [Door material, steel or wood ] )
5 3,1
6 R  wood
7 L  steel
8
9
10
11
  
```

If X (Bit 3) = L, Door = Steel

If X (Bit 3) = R, Door = Wood

## Cut-Out

Start at bit 4 with 3 bit length

```
width.bt | length.bt | material.bt | cutout.bt | lock.bt
1 ( Cut-out Lookup Table )
2 (-----)
3 ( [starting character],[number of characters] )
4 ( xxx [cut-out title, as it is displayed in the cut-out list] )
5 4,3
6 NON (none)
7 D21 Full Light_22x64steal
8 HR4 Half Light 22x36steal
9
10
11
```

If XXX (Bit 4,5,6) = D21, (call parameters from Full Light\_22x64steal)

If XXX (Bit 4,5,6) = HR4, (call parameters from Half Light 22x36steal)

## Door Lock

Start at bit 7 with 2 bit length

```
width.bt | length.bt | material.bt | cutout.bt | lock.bt
1 ( Door Lock Routine Lookup Table )
2 (-----)
3 ( [starting character],[number of characters] )
4 ( xx [lock title, as it is displayed in the lock list] )
5 7,2
6 NB (none)
7 1B 2.375BSSingle_6-8
8 2B 2.375BSDouble_6-8
9
10
11
```

If XX (Bits 7,8) = 1B (call parameters from 2.375BSSingle\_6-8)

If XX (Bits 7,8) = 2B (call parameters from 2.375BSDouble\_6-8)





---

## CHAPTER 4 Maintenance of the DL-NCD

This chapter describes preventative maintenance steps for *KVAL DL-NCD*. The content is geared to guide technicians to keep a regular maintenance schedule for your KVAL machine. Keeping your KVAL machine maintained is an important piece for successful operation of your door production process.

---

### Chapter 4 at a Glance

Section	Description	Page
<b>Maintenance Schedule</b>	This section describes the assemblies to schedule for maintenance.	<a href="#">page 4-2</a>
<b>Lubrication Requirements</b>	This section describes the lubrication requirements for the machine, including types of lube to use. This section includes: <ul style="list-style-type: none"><li>• <b>Linear Bearings, Flange Bearing, and Pillow Blocks</b></li><li>• <b>Gear Motor Lubrication Requirements</b></li><li>• <b>Ball Screws</b></li><li>• <b>Description of Air Input System</b></li><li>• <b>Adjusting the Air Line Lubricator</b></li><li>• <b>Priming the Air Line Lubricator</b></li></ul>	<a href="#">page 4-4</a>
<b>Lubrication Points</b>	This section identifies lubrication points on the machine	<a href="#">page 4-8</a>
<b>Tool Holder Removal</b>	Steps to Remove the Tool Holder	<a href="#">page 4-13</a>
<b>Replacing the X-Axis Self Lubricator</b>	This section describes the steps to replace the Self Lubricator	<a href="#">page 4-17</a>



## Maintenance Schedule

KVAL recommends the following maintenance schedule to ensure that the machine operates properly. Refer to this section for steps to perform maintenance.

### Daily, Monthly, Six Month Maintenance

Daily Preventive Maintenance	
Op	Operation Description
Clean	Blow off dust from the entire machine. Wipe down the outside of the machine with a clean dry cloth.
Check	Check tooling for wear.
Clean	Wipe off the photo eyes with a clean dry cloth, and check to ensure that all fastening nuts are snug.
Check	Check the air pressure to make sure it is set at 80 psi to 100 psi.
Clean	Empty any Dust Collection Units.
Check	Check for obstructed flow when excessive sawdust appears.
Check	Check the air filter water trap. Empty if full.

Weekly Preventive Maintenance	
Op	Operation Description
Check	Check the machine for smooth motion through a complete door cycle
Clean	Clean linear bearings and the chrome shaft with a clean dry cloth, then lubricate.
Check	Check all air lines & electrical wiring for kinks or rubbing.
LUBE	Refill lubricator with an ISO 32 standard hydraulic oil (KVAL part# SYSLUBG)

Six Month Preventive Maintenance	
Op	Operation Description
Clean	Wash filter and lubricator bowls with soapy water.
LUBE	Grease all bearings and tighten all bolts. Access to some grease fittings is difficult and will require a special needle point grease tip (supplied with your system).
Clean	Clean and lubricate all slides and cylinder rods with dry silicone spray.
Tighten	Tighten all bolts.
Back-up	Backup computer software.
LUBE	Lubricate linear bearings and chrome shafts with silicone.

## Lubrication Schedule

KVAL recommends the following lubrication schedule to ensure that the machine operates properly.

TABLE 4-2. Recommended Lubrication Schedule

Type of Assembly	Recommended Schedule	Recommended Lubrication Type
Linear Bearing	Every 250 Hours of Machine Operation	Dura-Lith Grease (KVAL P/N Lube EP-2)
Pillow Block Bearing		
Flange Block Bearing		
Ball Screw	Every 80 Hours of Machine Operation	
Tapered Bearing	Once a year	
Air Line Lubricator	One drop of oil every 2 or 3 cycles Check the lines every week to two weeks Note: Some CNC Machines drop every 5-10 cycles.	Either lubricant listed below is approved to use. <ul style="list-style-type: none"> <li>• KVAL P/N SYSLUBG</li> <li>• Chevron AW Hydraulic Oil 32</li> <li>• G-C lubricants light AW R&amp;O</li> <li>• Mobile DTE 24</li> <li>• Shell Tellus32</li> <li>• Gulf Harmony 32</li> </ul>
Gear Box	2000 Hours of Machine Operation or six months of operation	<ul style="list-style-type: none"> <li>• AGMA #8 gear lube</li> <li>• MOBILUBE HD 80 W-90</li> <li>• or equivalent</li> </ul>

### Typical Lucubration Kit

KVAL Part Number: LUBEKIT





## Lubrication Requirements

This section describes the parts of the machine that require periodic lubrication, and specifies the lubricants. In addition, it explains how to maintain the lubrication systems on the machine.

If the bearing is equipped with a grease fitting (Zerk Fitting).

The Zerk fitting is basically a valve that opens under pressure to allow lubricant to pass through a channel and be forced into the voids of the bearing. When the pressure stops, the ball returns to its closed position. The ball excludes dirt and functions as a check valve to prevent grease escaping back out of the fitting.

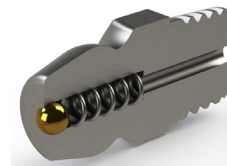
The ball is almost flush with the surface of the fitting so that it can be wiped clean to reduce the amount of debris carried with the grease into the bearing.

**Note:** Bearings without grease fittings have been pre-lubricated at the factory and do not require further lubrication.

**Note:** Clean excess grease to avoid contact with feed belts, clamping areas, or the door.



Zerk Fitting

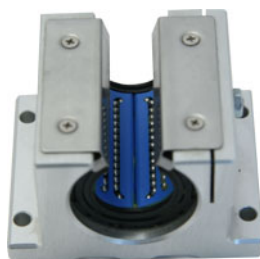


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## Pillow Block Bearing Housings

A pillow block is any mounted bearing where the mounted shaft is in a parallel plane to the mounting surface, and perpendicular to the center line of the mounting holes, as compared to different types of flange blocks or flange units. The type of rolling element defines the type of pillow block.

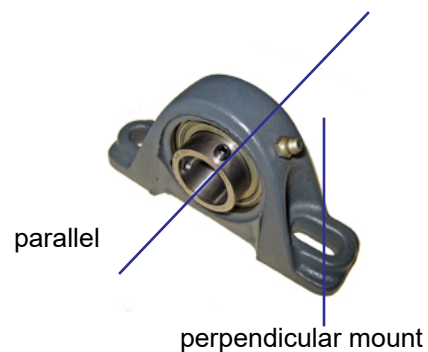
Opened Pillow Block



Closed Pillow Block



Hub Style



### Greasing

Approximately 1 Gram (one pump from grease gun) of Dura-Lith Grease (KVAL P/N: Lube EP-2).  
**Every 250 hours of operation.**

FIGURE 4-1. Pillow Block Bearings



## Flange Bearing Housings

A flange bearing is designed to aid in mounting and positioning. The lip of the flange helps center and align the bearing.

Flanges are also used with bearings on external housings used to mount a bearing unit. A mounted bearing unit acts as a system to position the bearing securely for reliable operation.

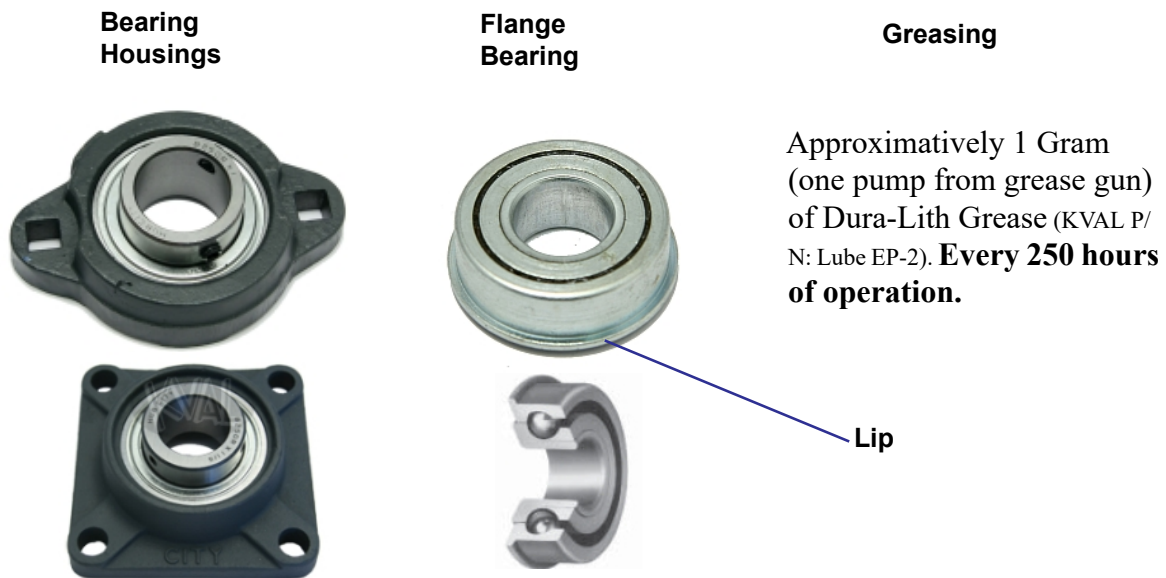


FIGURE 4-2. Flange Bearings

## Ball Rail Bearing

**Ball Rail Bearings** are linear bearings that are attached to positioning rails. In most cases, the bearings are attached to assemblies to move them in the X,Y, or Z direction.

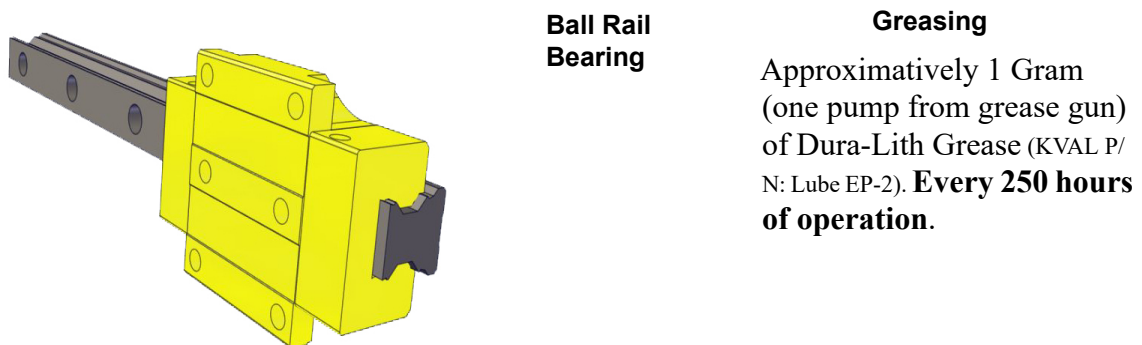


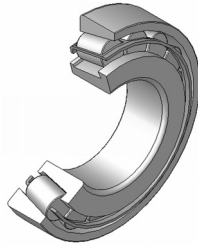
FIGURE 4-3. Ball Rail Bearings

## About Taper Bearings

Taper bearings are used for moving the axes of heavy loads with stability. The tapered roller bearing in combination with lubricants is extremely durable and is used in applications involving rotating axle and transmission shafts.

**Note:** Bearing durability is such an asset that the bearing blocks often require no maintenance for the life of the machine.

Cross Section of Tapered Bearing



Tapered Bearing

**Greasing**  
Recommend once a year

FIGURE 4-4. Sample of Tapered Bearing

## Tapered Bearing Housings

The taper bearings differ from other machine bearing assemblies, in that they are in a sealed environment. To identify a **Tapered Bearing Housing**, look at the enclosure and verify there are seals between the screw and the housing.

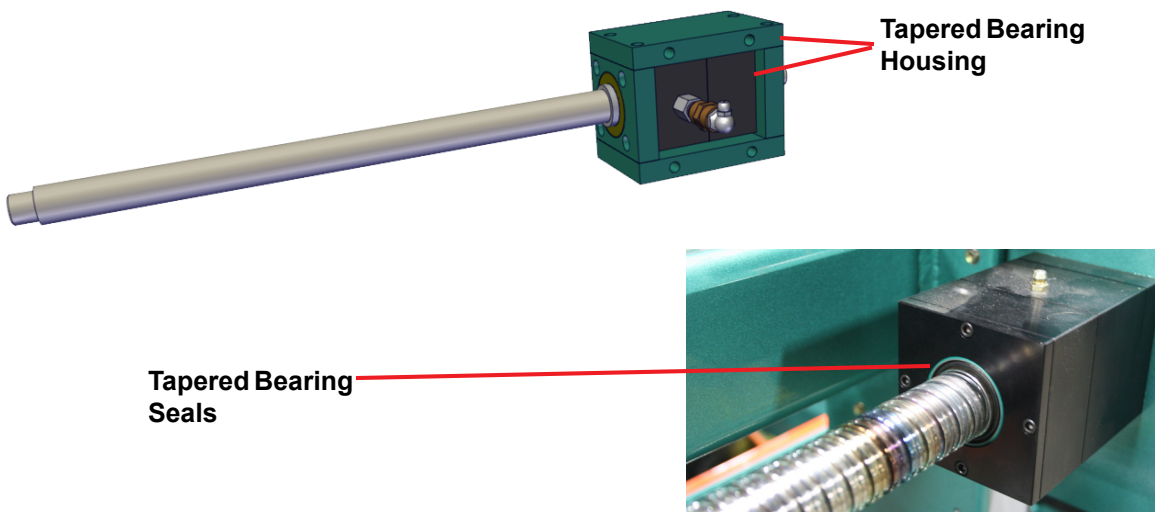


FIGURE 4-5. Tapered Bearing Housing

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## Ball Screw Nut

The **Ball Screw Nut** is an assembly with recirculating ball bearings that interfaces with the ball screw. The ball screw drive and the ball screw nut create very low friction coefficients resulting in a smooth, accurate, efficient movement.

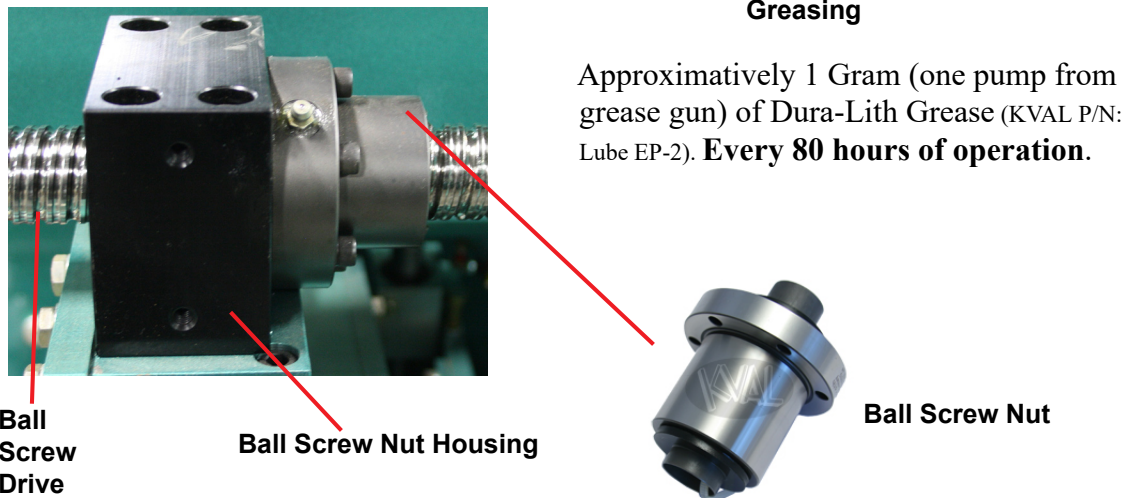


FIGURE 4-6. Example of a Typical Ball Nut

## Ball Screw Drive Assembly

Including the **Ball Screw Nut** other types of bearings may be included on the assembly. The figure below shows a typical **Ball Screw Drive Assembly**.

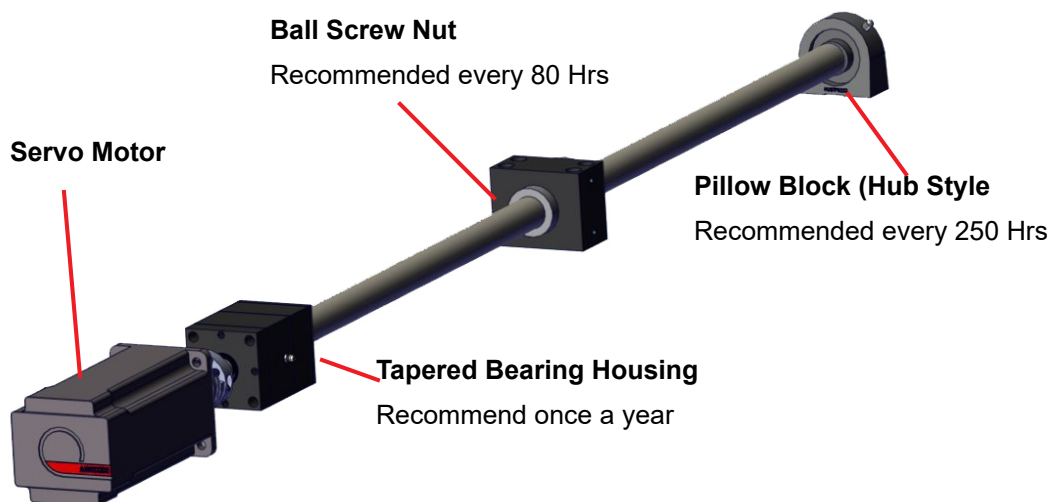


FIGURE 4-7. Ball Screw Drive Assembly



## Sample of Grease Locations for DL-NCD

### Caution

This machine is a powerful electro-mechanical motion control system. If servicing this machine, follow the safety guidelines. Failure to do so can result in damage to equipment and/or serious injury to personnel.

Shutdown the machine and follow the “**Lock Out Tag Out** procedures



### Servo Motor Drive Assembly Locations (DL-NCD)

Identify zerk fittings and apply EP-2 grease. Find the X, Y and Z axis rails to identify bearings. Some bearings may be difficult to get access to. Use an extender to reach tight areas. Make sure to **Lockout/Tagout** before maintenance. For recommended greasing schedule, see “**Ball Screw Nut**” on page 4-7.

#### Z-Axis Servo Motor

Ball Screw Drive Assembly. See “**Ball Screw Drive Assembly**” on page 4-7.

#### Y-Axis Servo Motor

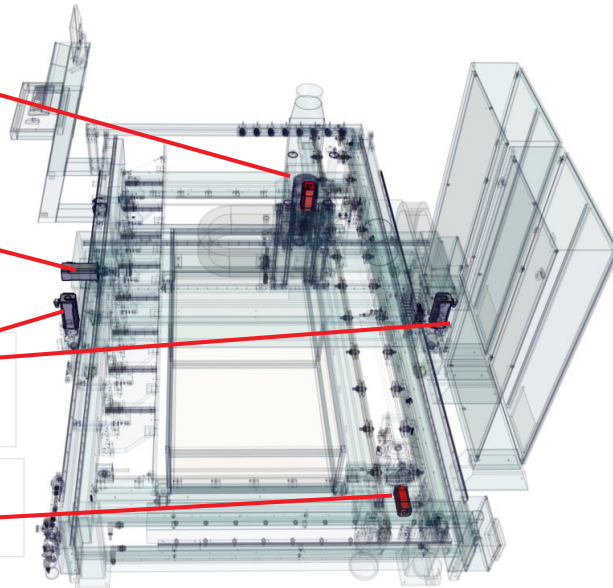
Ball Screw Drive Assembly. See “**Ball Screw Drive Assembly**” on page 4-7.

#### X-Axis Servo Motors

Gear Connected Self Lubricating See “**Replace the X-Axis Self Lubricator**” on page 4-17.

#### Width Servo Motor

Connected to Speed Reducer. Adjusts width of fence.



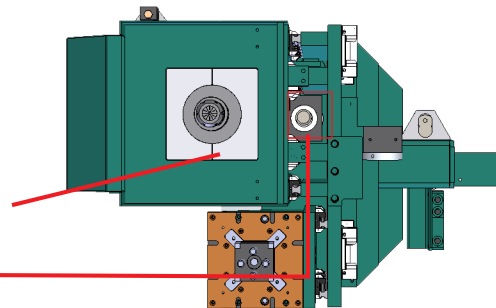
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**Note:** Access the **Z-Axis Ball Screw Nut** from underneath the Cutter Head. This is a bottom view of the Cutter Head. Use an extender to get to the zerk fitting.

#### Z Axis Ball Nut Screw

Recommended every 80 Hrs

#### Cutter Motor

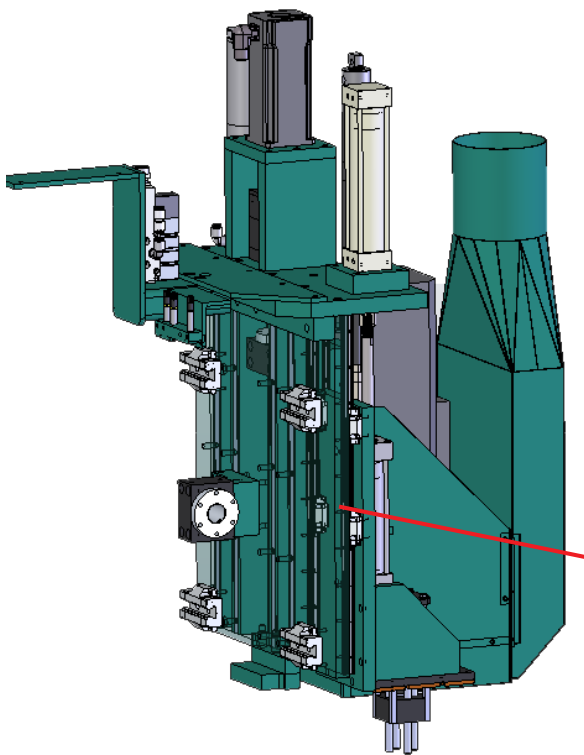


## Grease Locations Cutter Head

Identify zerk fittings and apply EP-2 grease. Find the X, Y and Z axis rails to identify bearings. Some bearings may be difficult to get access to. Use an extender to reach tight areas. Make sure that **Lockout/Tagout** has been performed before maintenance.

Apply approximately 1 Gram (one pump from grease gun) of Dura-Lith Grease (KVAL P/N: Lube EP-2). **Every 250 hours of operation.**

**Note:** Use an extension needle to access hard to reach bearings.



**Cutter Head:**  
Y Axis (X4 Carriage)  
Z Axis (X8 Carriage/Motor)

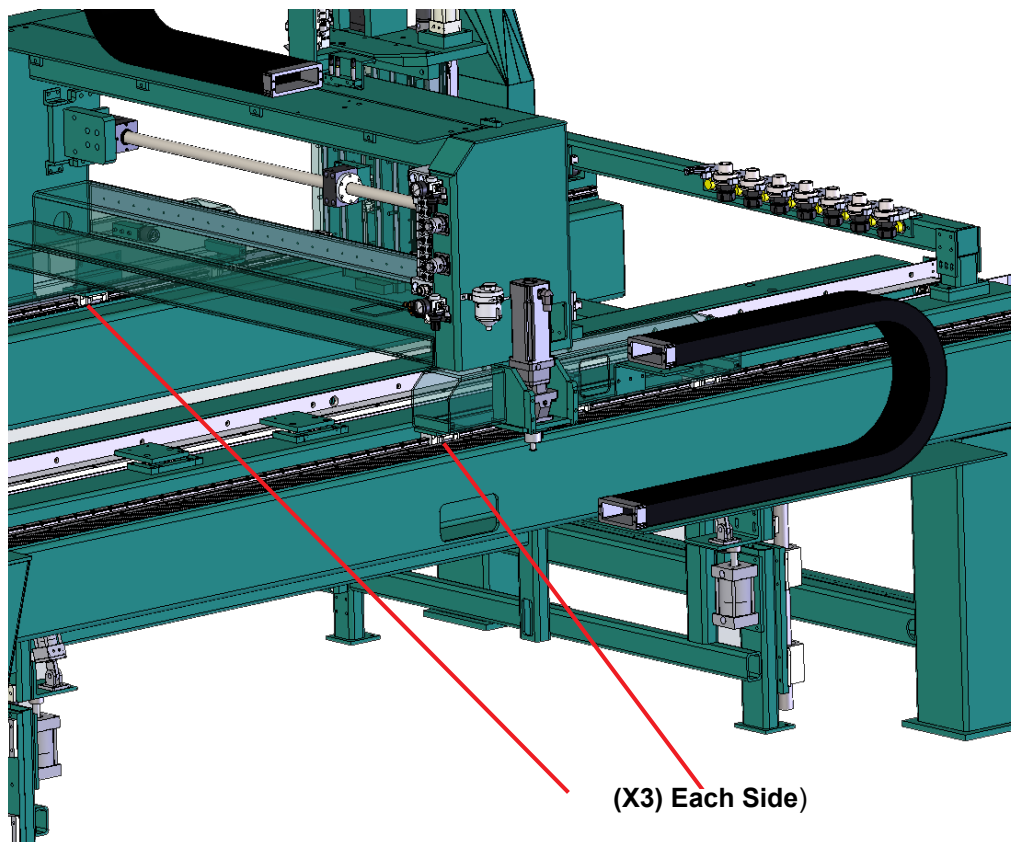
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## Grease Locations DL-NCD Frame

Identify zerk fittings and apply EP-2 grease. Find the X, Y and Z axis rails to identify bearings. Some bearings may be difficult to get access to. Use an extender to reach tight areas. Make sure that **Lockout/Tagout** has been performed before maintenance.

Apply approximately 1 Gram (one pump from grease gun) of Dura-Lith Grease (KVAL P/N: Lube EP-2). **Every 250 hours of operation.**

Use an extension needle to access hard to reach bearings



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## Description of Air Input System

There are two types of air inputs on KVAL machinery. Not all machines have lubricator option installed. Check your machine or Air prints to verify installation.

### Air Input with Lubrication

The air input system takes in shop air and supplies clean dry air (CDA) and lubricated air to the machine. The clean dry air is diverted to blow off nozzles. The lubricator, located after the CDA filters, delivers the lubricated air to valve banks and air cylinders.

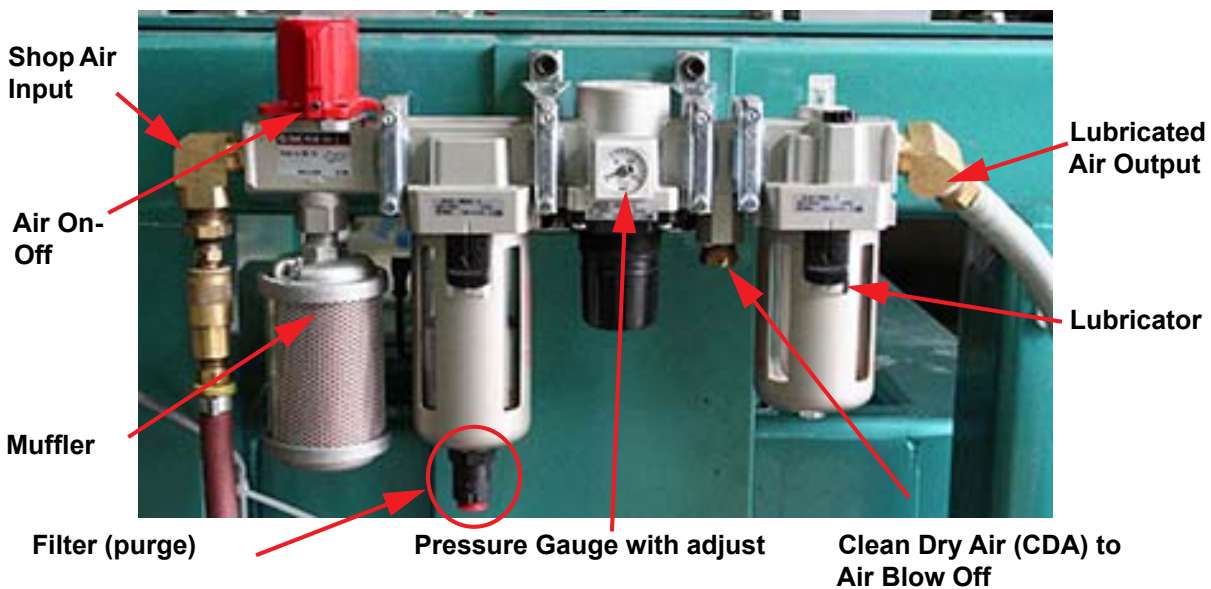


FIGURE 4-8. Typical Air Line Filter and Lubrication System

### Adjusting the Air Line Lubricator

Using the knob on the top of the lubricator, adjust until one drop per every other cycle is used (as observed through sight glass.)

(Sight Glass). When the oiler has run dry, open the knob all the way until flow begins. Once you have a steady flow, tighten knob back down until you have one drop per every other cycle.

Drop will form at end of cane shaped tube visible inside glass.

#### Top of Lubricator





## Priming the Air Line Lubricator

New and used machinery run out of oil from time to time. It is a good practice to check your machine lubricator to insure that it is putting the proper dose of oil in the air lines. Usually 1 drop of oil every other cycle is a good rule of thumb. The approved list of oil for lubricators is as follows:

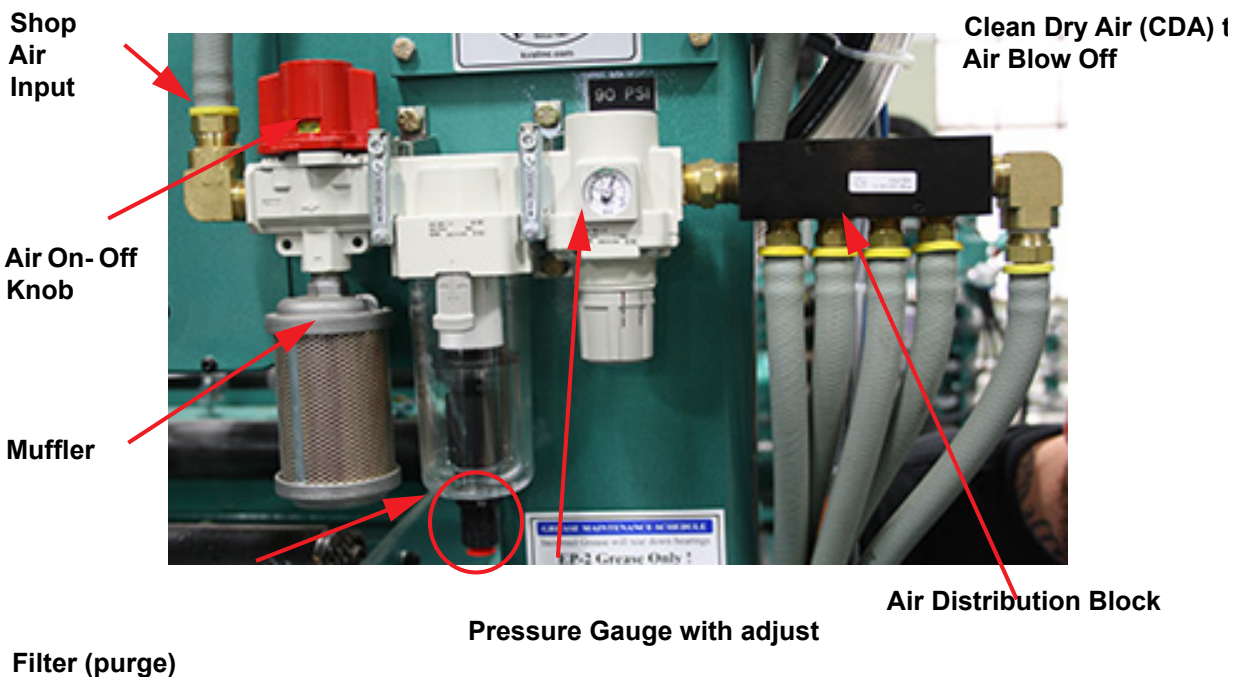
- KVAL P/N SYSLUBG
- Chevron AW Hydraulic Oil 32
- G-C lubricants light AW R&O
- Mobile DTE 24
- Shell Tellus32
- Gulf Harmony 32

To prime the lubricator, find an air line on the carriage section of the machine that is energized, and disconnect it, allowing the air stream to bleed air pressure away from any persons. Direct the air stream at the machine so you can see when there is an oily film blowing out of the air hose. Repeat this same procedure for the back section and other trouble areas.

It is recommended to check the lines every week to two weeks.

## Air Line Without Lubricator

The air input system takes in shop air and supplies clean dry air (CDA).



## 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). See instructions to change a tool on the next page.

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

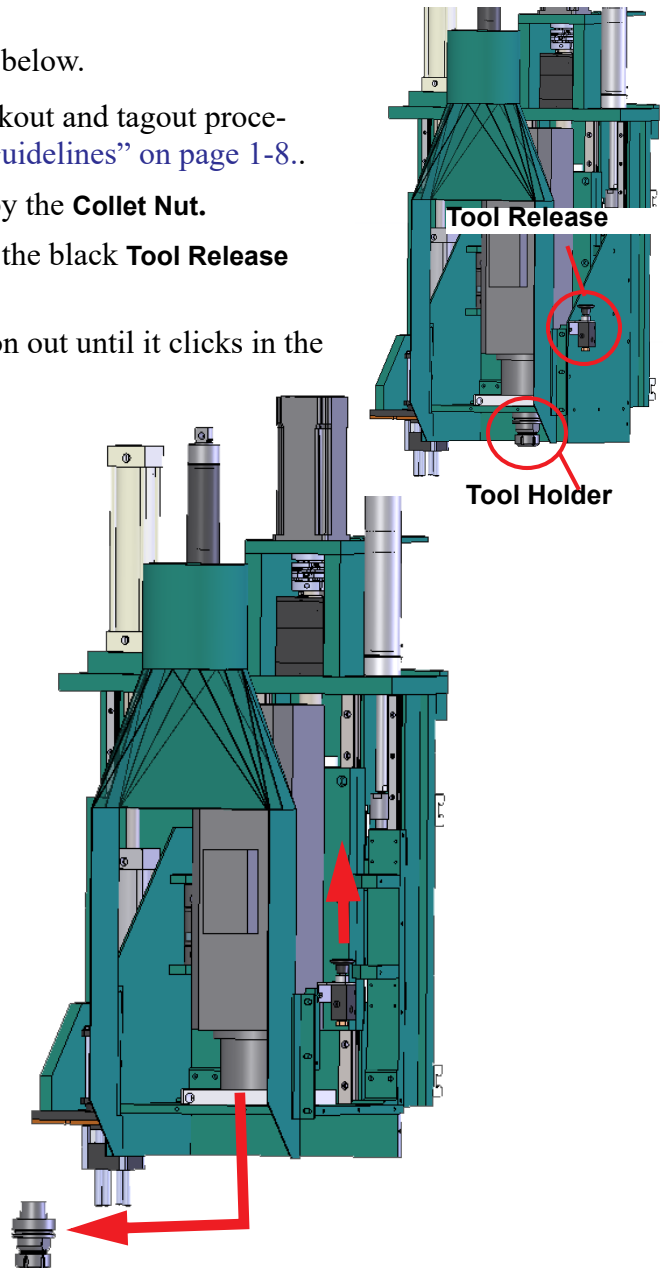
To change a tool manually, follow the steps below.

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. Using the other hand, pull out the black **Tool Release** button (location may vary)

**Note:** Make sure to pull the button out until it clicks in the ON position (Leave the button in this position until instructed to push it in at the insert of a new tool holder).

4. Once the tool is released from the motor, slide it down and away from the motor. Set the old tool aside.
5. Using one hand, insert the new tool 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 firmly in place, use the other hand to push in the **Tool Release** button.

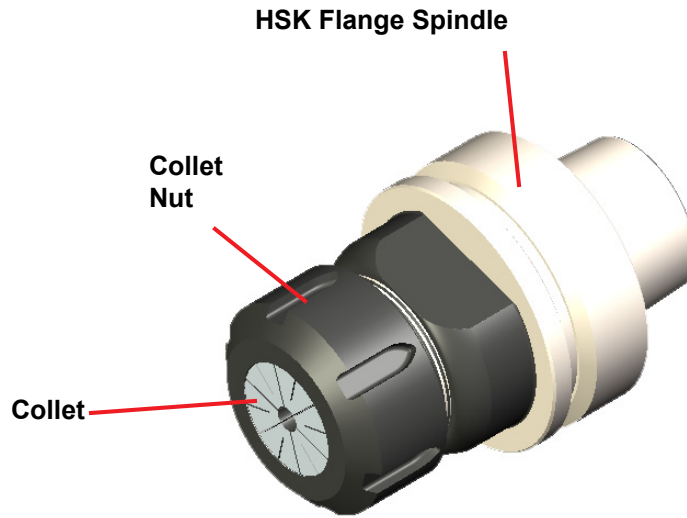
**Note:** Do not let go of the tool until the spindle clamping assembly pulls the collet up into place!



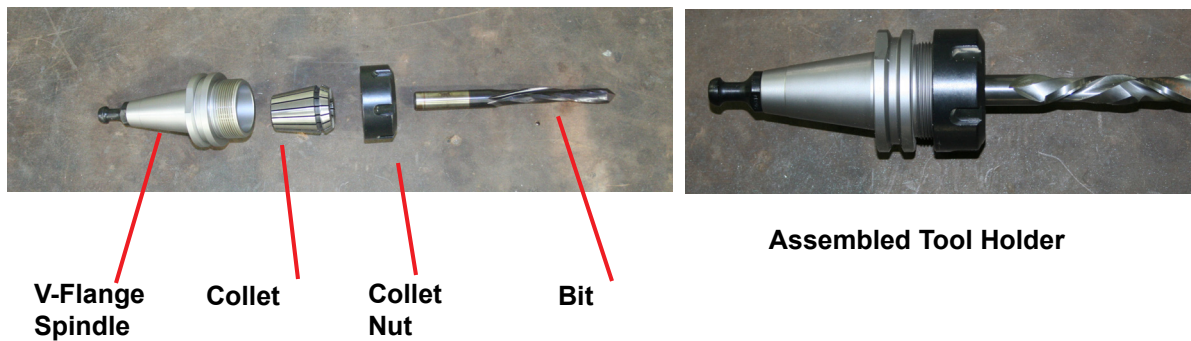
## Changing a Tool Bit and Using Tool-Change Tightening Fixture

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

HSK Tool Holder Option



V-Flange Spindle Tool Holder Option



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FIGURE 4- 9. Exploded and Assembled Views of Tool Holder

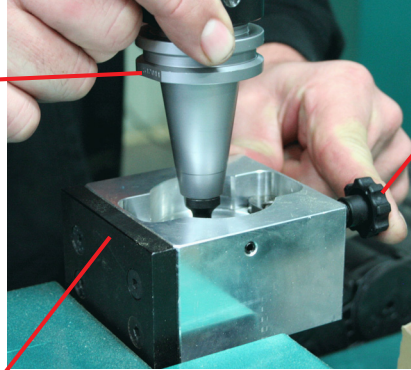
## How to Change a Tool Bit

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

e

### V-Flange:

Flat Edges are Orientated in Line with Knob



Quick Release will snap into place after collet is inserted into base

Tool-Change Fixture

Fully Assembled Tool Locked in to Place



For HSK Tool Holders, follow the same steps in this section, except use a HSK tool Holder.

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



FIGURE 4- 10. Using Tool Change Fixture

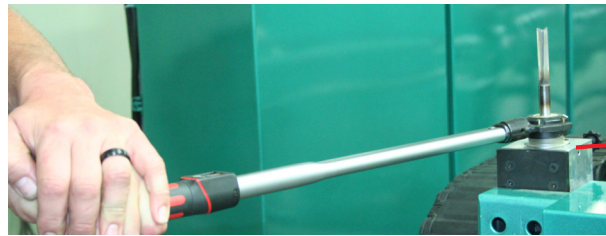
2. Use the collet wrench to loosen the collet nut, freeing the bit.
3. Remove the old bit, clean the collet with compressed air.
 

**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.



Torque to 130 ft lbs

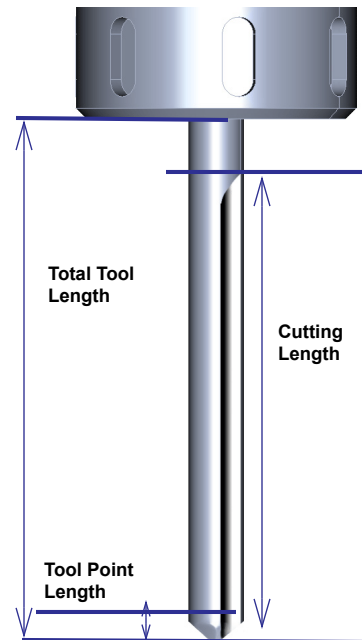
**Note:** Always return your torque wrench to zero after it is used.

7. Measure the parameters listed below:

- Total Tool Length - The distance from the collet face to the tool's tip of the bit
- 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 Setup Group**, if needed. [See Chapter 2.](#)

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



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## Replace the X-Axis Self Lubricator

The DL-NCD contains a two self lubricating gear assemblies too lubricate the X axis. The self-lubricator is electronic and produces nitrogen gas in the well to increase pressure to push the oil out. The lubricator well sends a replacement alert to the user screen when oil is low (5%). The alert is a 30 day warning, but it is recommended to change it as soon as possible. Refer to Electrical Drawing for connections labels.

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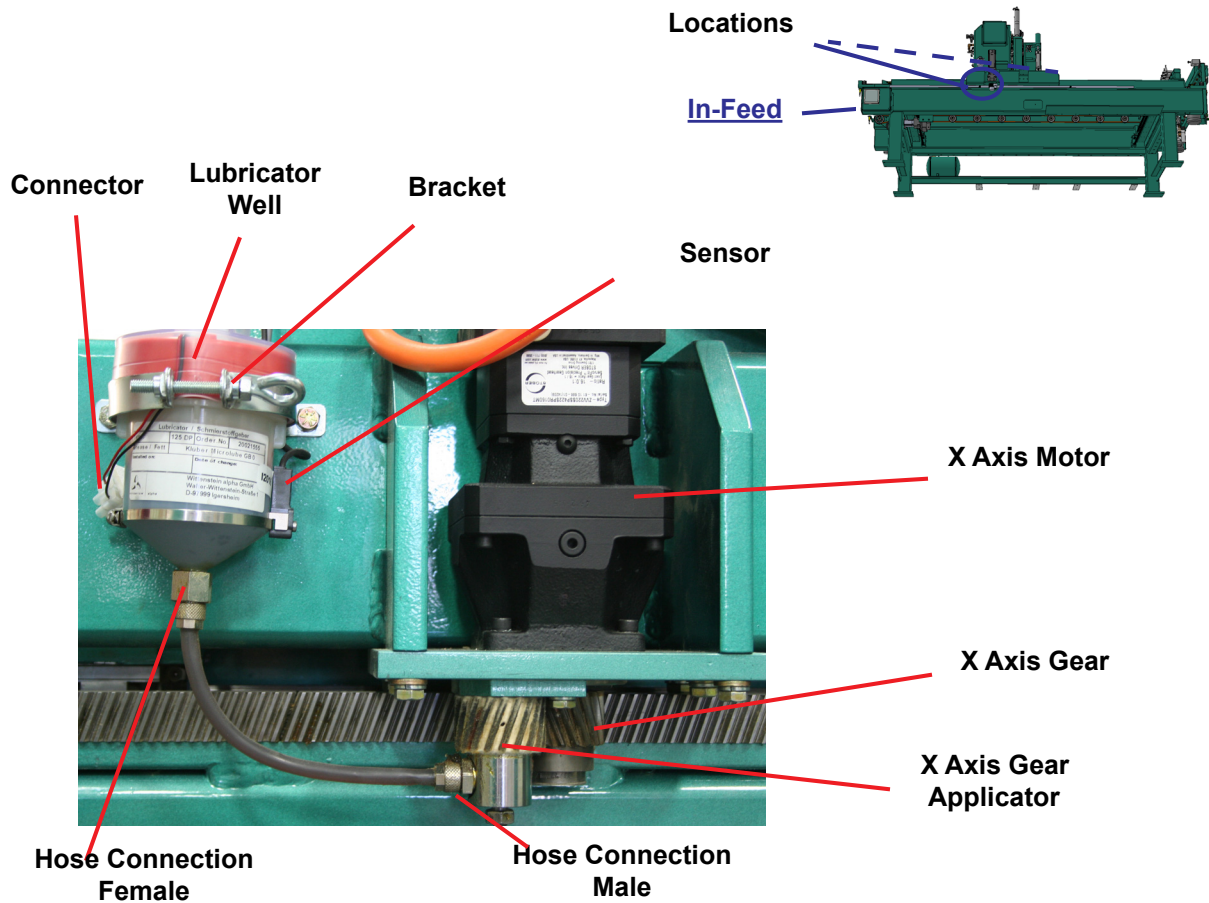


FIGURE 4 -11. Auto Lubricator Assembly

## Replace the Lubricator Well

The lubricator kit part number is “Wit Lubricating Kit”. It contains, lubricator well, hose (with oil) and its connectors, bracket, and sensor. Follow the instructions on the next page.

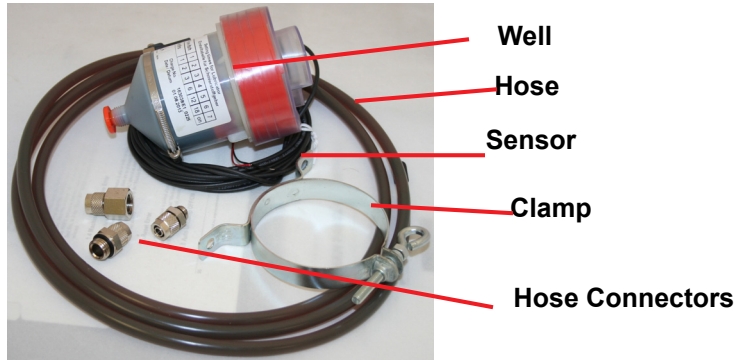
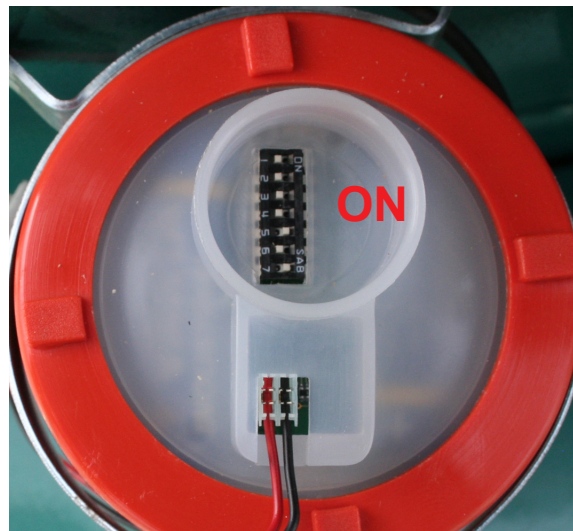


FIGURE 4 -12. Wit Lubricating Kit

1. Shutdown the machine and follow the Lockout Tagout procedure, in Chapter 1.
2. To prepare, cut the hose included in the kit to match the one on the machine.
3. Add the two hose connectors to the ends of the new hose.
4. On the new lubricator well, set the dip switches.

- a. Remove the protection top from lubricator well. Dip switch is located on the top.
- b. Set the number 5 switch to the “ON” position. This sets Lubricator to a yearly flow cycle.
- c. Set the number 7 switch to the “ON” position. This turns the Lubricator “ON”
- d. Ensure the remaining switches are set to “OFF”



5. Disconnect the black and red wires from the machine connector with a small screwdriver.
6. Disconnect the sensor wires from the Frame Node. (Blue to - VDC, Brown to + VDC, Black to input I-2016)
7. Loosen the bracket, and remove the well from the side of the machine. Do not discard yet.

8. Remove the old hose from the bottom of lubricator well and the applicator.
9. Attach the new hose to the new well and the applicator.
10. Bracket the new well against the machine.
11. Slide the black and red wires into the connector. Secure with a small screw driver.  
**Note:** Polarity is not an issue, but for consistency replace wires as they were.
12. Route sensor wires to Frame Node and connect to nodes in step 6. Secure wires.
13. After lubricator well is secure on machine, run a test run.
14. Verify the oil is being applied to the gear and there is no alert on the user screen.
15. Close frame and secure wires with a zip tie.







## CHAPTER 5 Troubleshooting the DL-NCD

This chapter describes troubleshooting steps to help technicians solve issues that may occur with your KVAL machine. If help is needed, call or contact our KVAL Service team at (800) 553-5825 or <http://www.kvalinc.com>.

**Note:** Refer to the Air and Electrical drawings provided with delivery of the machine. The drawings are normally located in the Electrical Panel. If copies are unavailable, contact the KVAL Service Department. Have drawings numbers, model number, and serial number of machine readily available.

### Chapter 5 at a Glance

Section Name	Summary	Page
<b>About Motion Control</b>	This section contains basic information on the operation of motion control circuits. Includes diagrams of the control circuits.	<a href="#">page 5-2</a>
<b>Troubleshooting Basics</b>	This section includes basic troubleshooting information. Includes analyzing sub systems to designate a starting point for troubleshooting.	<a href="#">page 5-4</a>
<b>Typical Contactor Control</b>	This section describes the operation of a typical contactor control system.	<a href="#">page 5-6</a>
<b>Typical VFD Control</b>	This section describes the operation of a typical VFD (Variable Frequency Control) Circuit control system.	<a href="#">page 5-8</a>
<b>Typical Pneumatic Control</b>	This section describes the operation of a typical pneumatic control circuit.	<a href="#">page 5-11</a>
<b>Using Sensors to Troubleshoot</b>	Includes the voltage values of sensors during machine operation.	<a href="#">page 5-18</a>
<b>Troubleshooting Electrical Problems</b>	Includes voltages in the electrical panels, using the Status Light panel to troubleshoot, and VFD troubleshooting.	<a href="#">page 5-22</a>



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## About Motion Control

This section describes the positioning systems found in KVAL machinery. There are three basic types of motion control methods used in KVAL Machinery.

### Sequencing:

Sequencing is a series of events executed in a predetermined order. Most KVAL machines use a form of sequential motion control. A typical series of events for a KVAL machine are:

1. Move the door into position.
2. Clamp the door.
3. Make the cuts.
4. Unclamp the door.
5. Move the door out.
6. Wait for the next door.

### Point to Point:

Point to point motion control involves moving a load from one fixed position to another fixed position at a constant speed and along one line (axis X,Y, or Z). A typical point to point would be a drill with a fixed-depth. The drill is either retracted or extended using a pneumatic cylinder. Typically the drills travel is limited by physical stops.

### Incremental:

Incremental motion control is used when the load is required to be moved with high accuracy to multiple locations, sometimes in multiple directions (axes). A typical KVAL usage for this system is a computer controlled router in a door light machine where there is great variety in the cut size, shape and location.

### Basic Control Circuit

This section describes a basic control circuit. The Figure below shows a block diagram of a common control circuit. There are four parts to a motion control system:

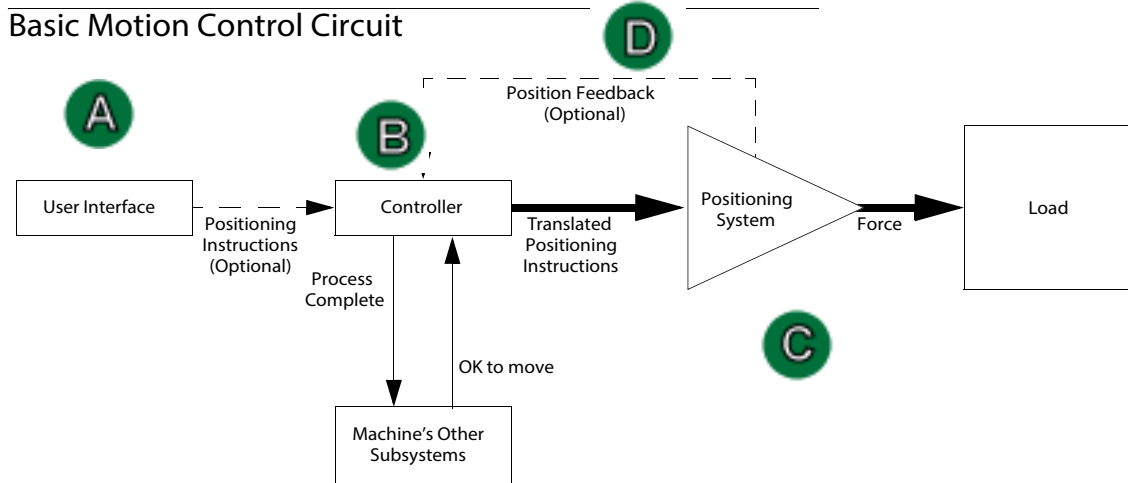


FIGURE5- 13. Block Diagram of Basic Motion Control

**A**
**The User Interface:**

- Allows communication between the humans and the machine.
- Examples: A touch screen, a PC or a button panel.

**B**
**The Controller:**

- Translates entered information into a form the positioning system can understand.
- Listens to the machine's other subsystems waiting for the OK to move command.
- Sends the positioning instructions to the positioning system.
- Listens to the positioning system for position status (if there is a feedback loop).
- Tells the machine's other subsystems when the move process is completed.

Examples: A PLC or a dedicated motion control board.

**C**
**Positioning System:**

- Moves the load.

Examples: A motor or a pneumatic cylinder.

**D**
**The Position Feedback.**

- Provides location information to the controller.

Examples: A limit switch, a photo eye, or ferrous eye, a resolver or an encoder

---

## Troubleshooting Basics

Good trouble shooting starts with looking at the whole machine, where every part is suspect. Then narrowing down the view to the bad part.

**Ask:** Ask basic questions. For example:

- What was the Machine Trying to Do?
- What Was the Machine Trying to Do Next?
- Was the machine working before?
- Did it happen on first power up or during process?

**Narrow:** Narrow or determine the sequence and subsystem where the issue occurs. For example:

- Did the issue happen when door was being fed in?
- Is the router not cutting?
- Is the cut out of specification?

**Verify:** Verify or analyze the subsystem assembly that is responsible for the issue. For example:

- How is the subsystem supposed to work?
- What is keeping the subsystem from working?

### Before you Adjust

Sometimes simple problems can seem to be complex issues. Before making adjustments, check for the following common issues.

1. Is the loaded setup correct for the current cut?
2. Are the stops set up correctly?
3. When did the problem first start?
  - At first Start-Up?
  - During the Run?
4. When was the last calibration?
5. Is the door true?
6. Use Router Bit Depth Gauge (PN: 432C) to check depth of Bits  
Check tools for wear.

### Analyze the Sub Systems

1. Check the **Load** for mechanical issues
  - Is the Load “bound up?
  - Is there sufficient lubrication?
  - Is it an alignment issue?
  - Is anything damaged?

Check the **Position Feed Back**.

- Does the **Position Feed Back** agree with the **Load** position?

In other words are the correct photo eyes, limit switches or ferrous sensors activated?

Check the controller inputs to insure the proper sensors are activated. If the controller is a PLC, an activated input is lit. Some touch screens have inputs status also.

## 2. Common Position Feedback failures:

- **Photo Eye:**

- a) Bad element or bad cable
- b) Eyes not set to correct height
- c) Lighting from ceiling may be interfering with sensor

- **Limit Switch:** Stuck, or failure

- **Wiring:** Broken, worn insulation

- **PLC:** Bad input port

- **Bad Output:** Relay may be stuck

- **Air Solenoid Valve:** May be stuck or not working.

## 3. Check the Positioning System

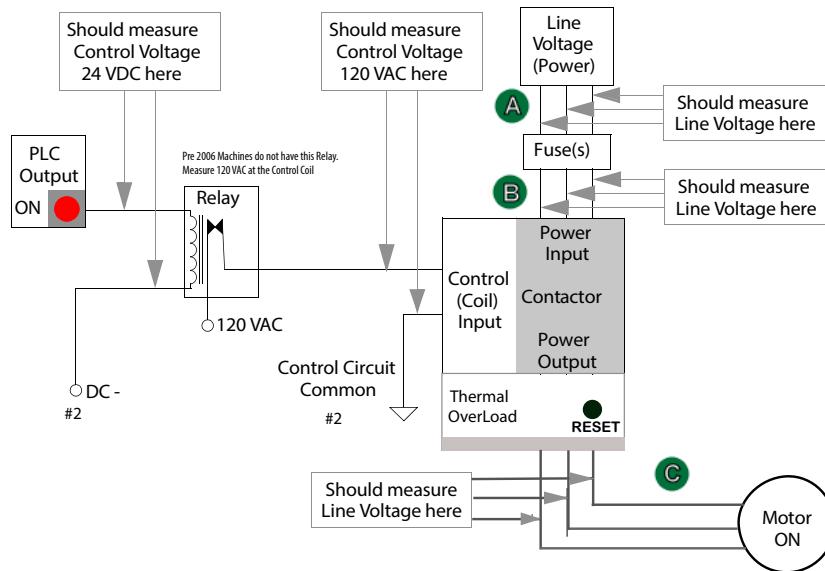
Follow the circuit from the **Controller** output to the **Load** and check for component failures.

## About a Typical Contactor Control

Unlike general-purpose relays, contactors are designed to be directly connected to high-current load devices. Contactors are designed to control and suppress the arc produced when interrupting heavy motor currents. The figure below shows a block diagram of a typical contactor circuit with typical voltages. Thermal overload relays are commonly attached to the contactor. They offer protection for motors in the event of overload or phase failure. A Reset button is included to clear an error in the relay.



High Voltage may cause personnel **injury or death**. Troubleshooting checks *must* be performed by a Qualified Electrical Technician.



**Note:** Pre-2006 machines may not contain the 24 Volt relay. 120 Vac is directly fed into the Control Coil. Check the input circuitry to the Control Coil for 120 Vac.

Schematic Drawing of Contactor and Thermal Overload

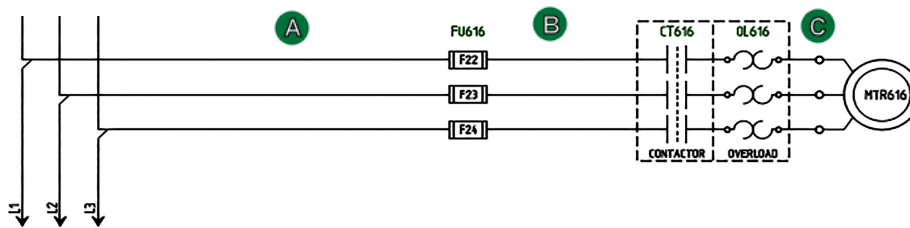


FIGURE 5-14. Block Diagram of a Common Contactor Circuit

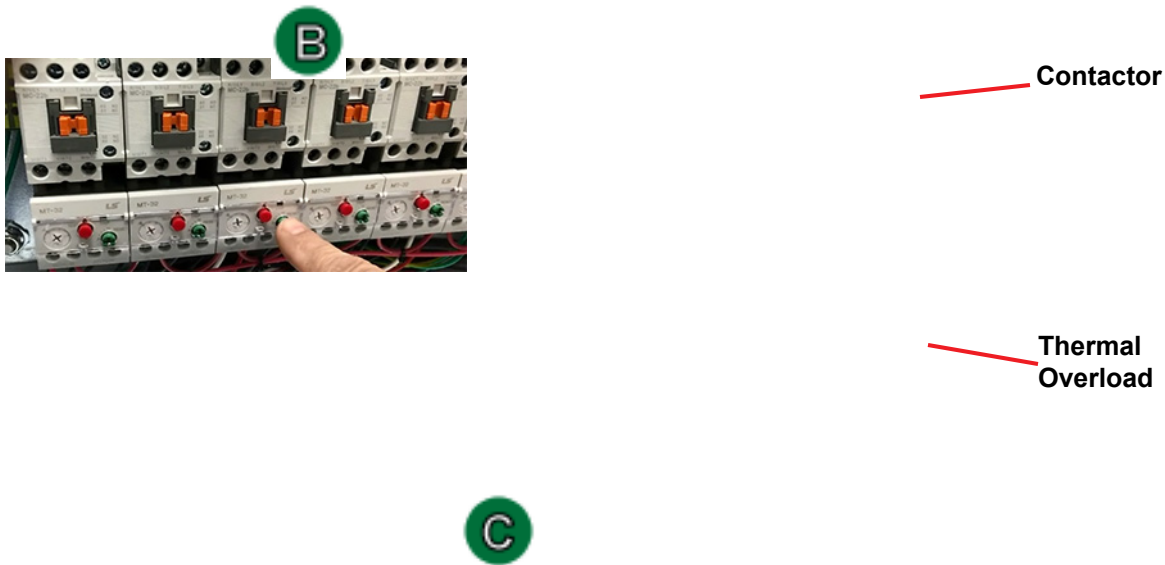


FIGURE 5- 15. Contactor Bank

## About Contactor Troubleshooting

The Thermal Overload Circuit opens the motor circuit when current draw causes the motor to run too hot. The overload limits are set at the factory, do not adjust the limits.

The overloads are normally in series, therefore if one trips, all on that circuit stop working.

Use the Six Light panel as a trigger to check the circuit. See [“Troubleshooting with the Status Light Panel”](#) on page 5-24 .

1. Open the Main Electrical Cabinet to find the Contactor /Thermal Overload Assembly
2. Press each ‘Green’ Reset button on the Thermal Overload. An audible click will be heard on the tripped circuit. (Take note of tripped circuit.)
3. Once the overloads are reset, verify LED’s are on.
4. Rerun the machine and verify that motor runs without tripping the circuit.
5. If the same overload keeps tripping, verify condition.
6. Follow circuit path using the E-Drawing as a reference.
  - a.Common issues: Check for bad wire, bad motor, or if load is too great for current draw.



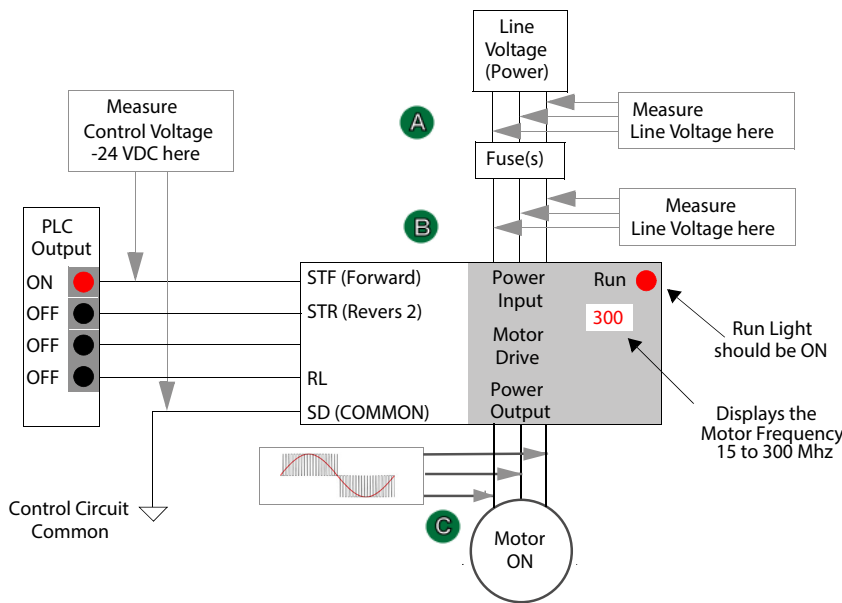
## About Typical VFD Motor Drive Control

An adjustable-speed drive is used to control the motor speed and torque by varying motor input frequency and voltage. A variable-frequency drive (VFD) is used in KVAL machinery to accurately drive motors for machining or moving product through the machine. The figure below shows a block diagram of a typical motor drive circuit.



High Voltage may cause personnel **injury or death**. Troubleshooting checks *must* be performed by a Qualified Electrical Technician.

Common Motor Drive Control:



**Note:** The output to moto "C" contains pulse signals at varying frequencies. A DMM may not be able to measure the frequency and the pulse rate. Use the VFD interface to check, current, voltage and frequency.

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### Schematic Drawing of VFD

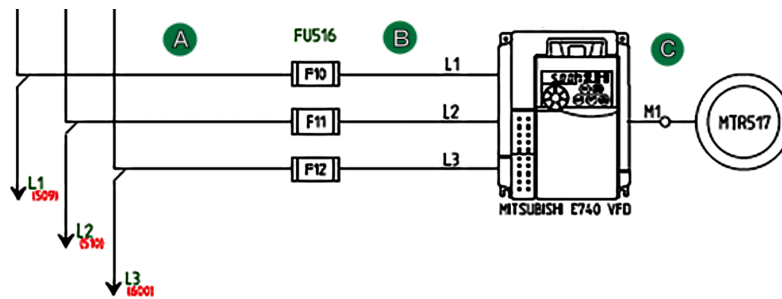


FIGURE 5-16. Block Diagram of a Common Drive Control

## About the VFD

A VFD (Variable Frequency Drive) takes the raw input from the 3 phase line voltage and converts it by varying the frequency and voltage of the input voltage. Changes in the output voltage varies speed and force of the motor. For example: A lower frequency will result in a slower speed.

The VFD converts the voltage but is “told what to do” by the PLC (Programical Logic Controller). The output voltage is then sent to the motor. For a block diagram, see [Figure 5- 16 on page 5-8](#)

VFD models vary in KVAL machines depending on where it is used, voltage requirements and type of PLC used. This is a general view on the VFD. See the machine’s Electrical Print for detailed information.

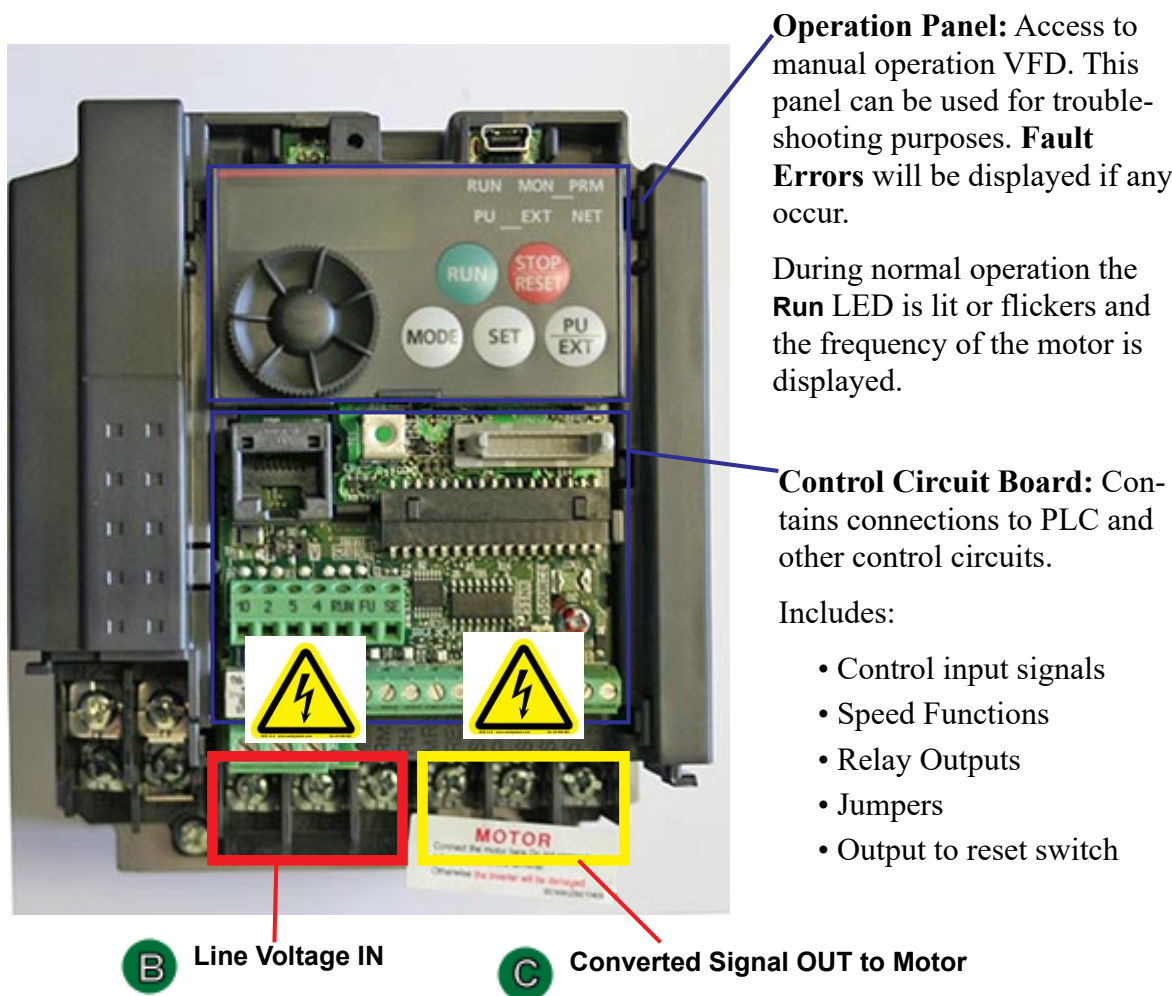


FIGURE 5- 17. Sample of VFD

## About VFD Troubleshooting

This section describes some troubleshooting tools for the VFDs.

### Error Checking on the Variable Frequency Drives

VFDs (Variable Frequency Drives) interact with hinge and faceplate routers, width adjust motors, and feed motors. If issues occur, error codes are displayed on the VFDs. To help troubleshoot, refer to the VFD manuals located in the High Frequency Panel for lists of the error codes.

### Using the Reset Buttons

In some rare occasions an electrical spike may cause a VFD to shut down. The reset buttons are located on the door of the VFD panels. The button contains the VFD function printed on the button. If a VFD is tripped to “OFF” the button will be lit. To reset a VFD:

1. Push lighted button to reset the indicated motor
  - b.If the button light turns off, continue with production.
  - c.If the button stays lit:
    - identify the motor by way of the label on the button.
    - turn off that function at the switch panel. Check the corresponding output on the PLC output. If the output is on it will not let the motor reset. Disconnect the output wire and verify that the motor circuit is not causing the issue.
  - d.If issue continues, read error code on the VFD\* display and look up the error code in the VFD manual. Follow the instructions in the VFD manual. If issues continue, contact our Service Center.

VFD Reset Buttons

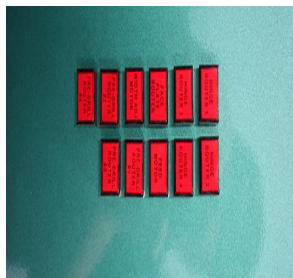


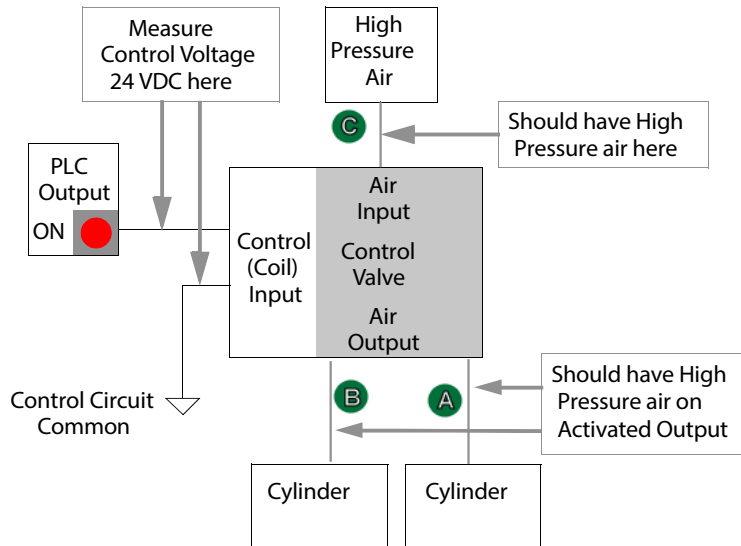
FIGURE 5- 18. VFD Reset Buttons

**Note:** The number of reset buttons depends on the machine type and option. The figure above shows a machine with 11 VFDs

\* The VFD manuals are located in the Electrical Panels. On some machines, documentation can be found in the operation station in the documentation folder.

## About a Typical Pneumatic Circuit

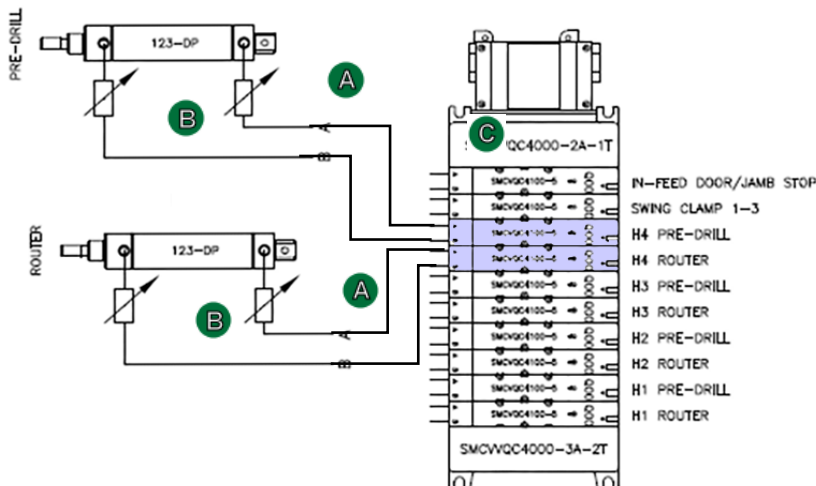
A control valve (solenoid) is used to drive cylinders to move different loads in the machine. The solenoid is controlled by the PLC by applying a high voltage or a low voltage to a control coil. Controls for example are: extending and retracting router, drill, clamping a door.



**Note:** Pre-2006 machines may not contain the 24 Volt relay. 120 Vac is directly fed into the Control Coil. Check the input circuitry to the Control Coil for 120 Vac.

### Schematic Drawing of Pneumatic Circuit

ROUTER HEAD #4



**Note:** In this sample set-up, Port A is normally open and Port B is normally closed. If power is OFF, air should be on Port B.

FIGURE 5-19. Block Diagram of a Pneumatic Circuit

## Typical Pneumatic Assembly

Pneumatic assembly setups vary in KVAL machines depending on where it is used and air requirements. **This is a general overview of a pneumatic assembly. See the machine's Air Print for detailed information.**

**Electrical Wiring Box:**  
Contains inputs from PLC to Coils (Solenoids)

**Coil (Solenoid):** Receives input(24V) from PLC to open a port

**Manifold:** Base to accept air input and output air.

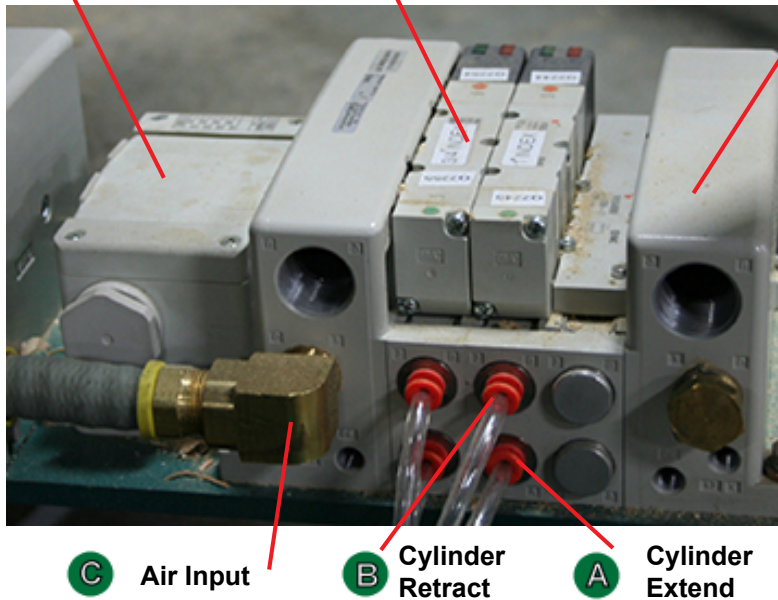


FIGURE 5- 20. Typical Pneumatic Assembly

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## About the Coil (Solenoid)

The Solenoids are connected to the top of the manifold. Labels indicating their function and PLC connections are attached to the solenoid body. Use this information to troubleshoot system if necessary.



Solenoid type will vary with machine application. Common controls include an operational LED and Manual operation button

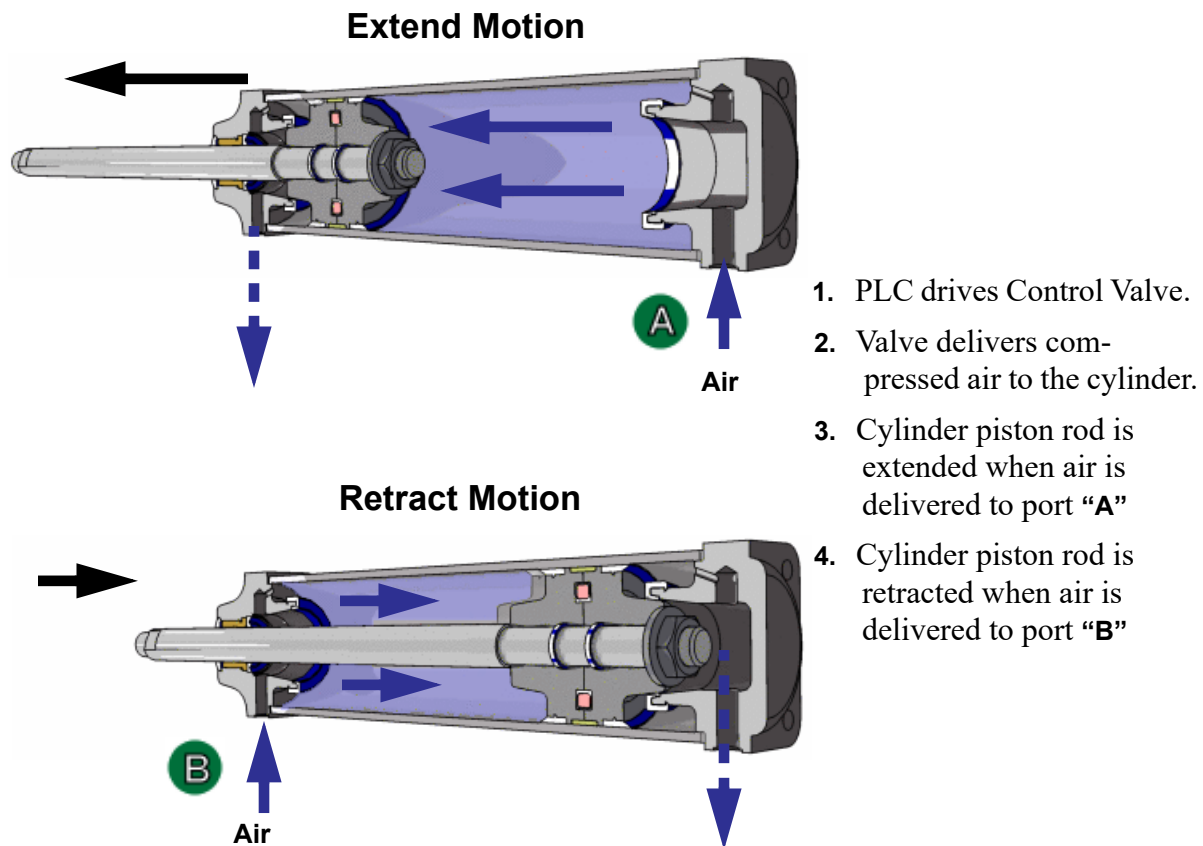
**Manual Activate Button:** Push to toggle solenoid to the 'ON' state. activates if power is off.

**Indicator:** a Lit LED indicates the solenoid is in use. Red LED= the 'A' Port on a single valve. If double valve, Red LED= the 'A' Port and Green LED = the 'B' port.

FIGURE 5- 21. Solenoids in Manifold

## About Cylinder Operation

To see a block diagram of general pneumatic connections, see [Figure 5- 19 on page 5-11](#). The figure below, shows a cross-section of a cylinder in action.



1. PLC drives Control Valve.
2. Valve delivers compressed air to the cylinder.
3. Cylinder piston rod is extended when air is delivered to port "A"
4. Cylinder piston rod is retracted when air is delivered to port "B"

FIGURE 5- 22. Cross-section of Air Cylinder

## How the Pneumatic System Works

The Pneumatic system consists of a brain (PLC), an action (Positioning System), and a result (Moving the Load). **This is a generalized representative: this section describes the process to move a router to the extend and the retract position with a double valve.**

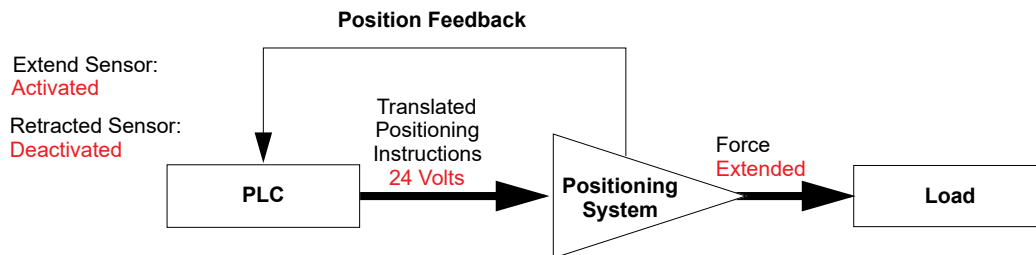
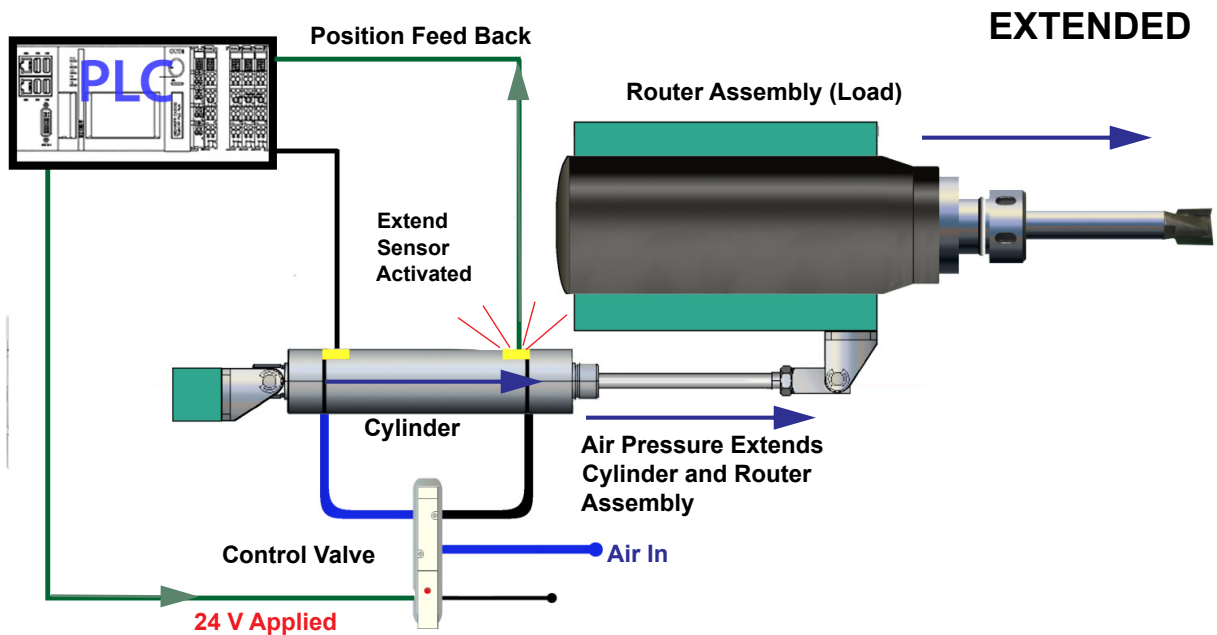
### Extend Process

If PLC determines the conditions are right to extend the **Router**:

1. The **PLC** applies the control voltage to the **Control Valve** which directs compressed air to extend port of the **Cylinder**.
2. The **Cylinder** and **Router** are extended deactivating the **Retract Sensor**
3. The **Router** fully extends activating the **Extend Sensor**.



- The **PLC** senses the voltage from the **Extend Sensor** and removes the control voltage to the **Control Valve**.

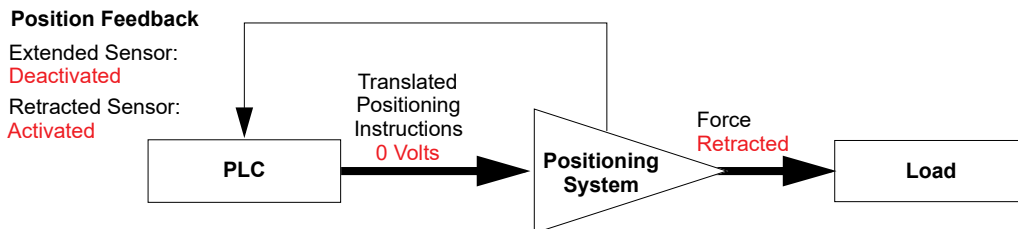
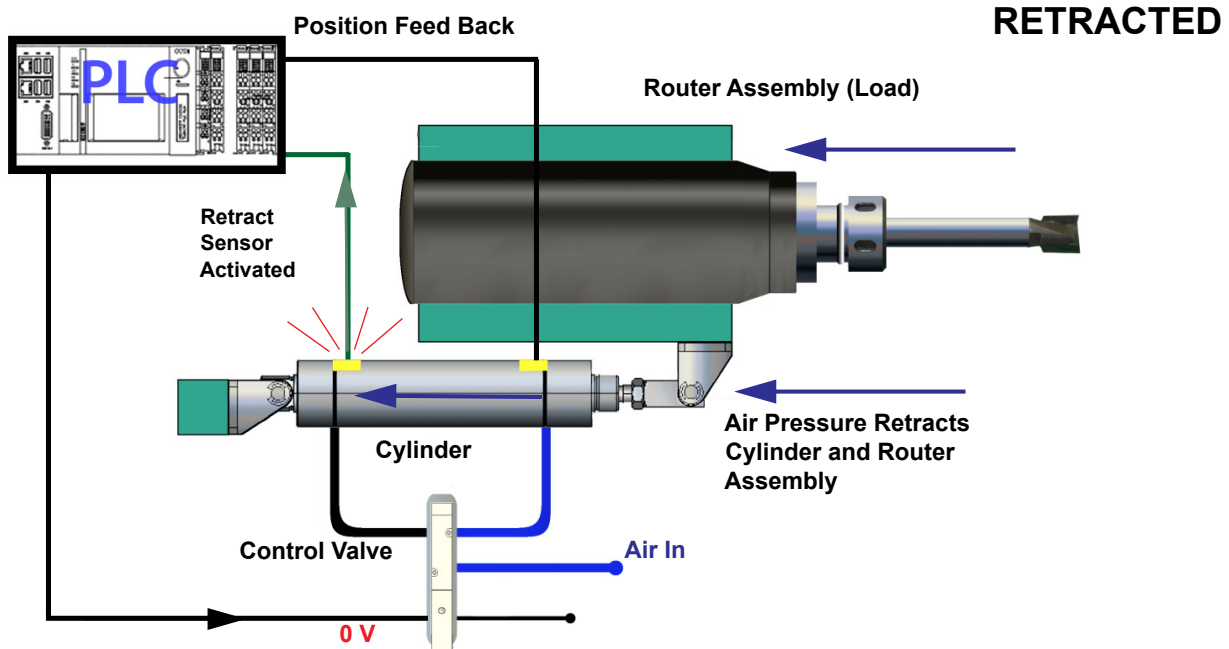


### Retract Process

If the **PLC** determines the conditions are right to retract the **Router**:

- The **Control Valve** directs compressed air to the retract port of the **Cylinder**.
- The **Cylinder** and **Router** retract deactivating the **Extend Sensor**
- When the **Cylinder** and **Router** are fully retracted, the **Retract Sensor** is activated.
- The **PLC** senses the voltage from the **Retract Sensor** completing the process





### Important Notice about Adjusting Cylinder Speed

**Do not adjust the cylinders to speed up production.**

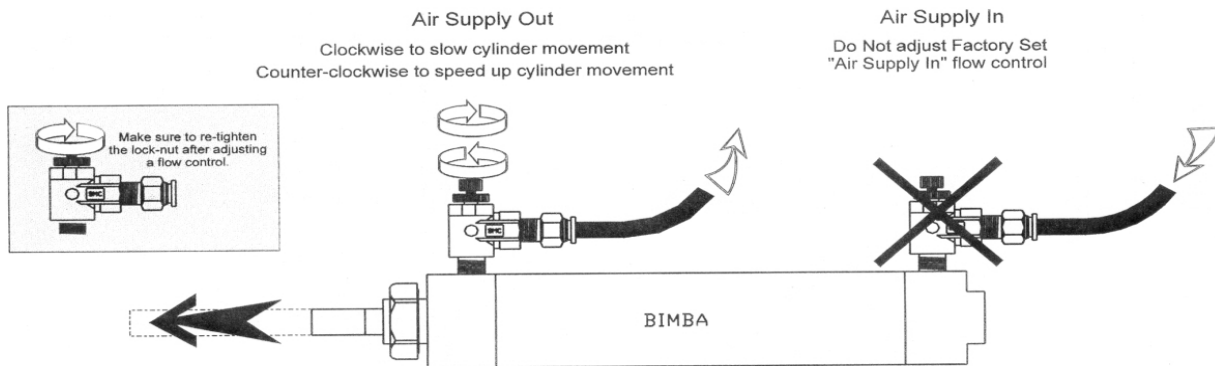
The air cylinder timing is part of a well tuned system of electronics, programming, and mechanics. Adjustment of the cylinders for speed can cause unsatisfactory results, in-feed and out-feed problems, far marks in the corners of hinge pockets, and flipping screws in Hoppers.

However, sometimes machine settling, mechanics be “broken in” may be cause to slightly adjust extend and retraction speed.

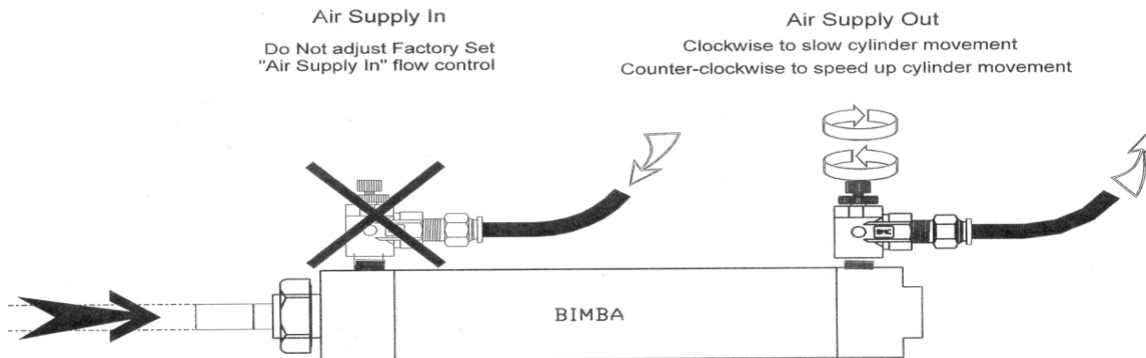
**If more than 1/2 turn on adjustment knobs are needed, call in a specialist or check with KVAL customer service at 1-800-553-5825.**

## Adjusting Cylinder Extend Speed

:



## Adjusting Cylinder Retraction Speed



**Tip:** If Installing a new flow control assembly, shut down the flow control and back out 4 to 5 turns. this position is a good starting point for kine adjust.

## Using Sensors to Trouble Shoot

- Photo Sensors often get dirty. Make sure they are clean. If they are not clean, debris may block the signal or provide a false signal.
- Check output voltages of the sensors in the **active** mode. The voltage should effectively equal **0 VDC**
- Check the output voltages of the sensors in **inactive** mode. The voltage should effectively equal **24 VDC**
- The distance from an eye to the door should be in range. Typically the range should be 3/4" to 7/8" from the top of all eyes to the door.

---

## DL-NCD Sensors

On the DL-NCD, sensors provide input to the PLC. The application in the machine is similar to a micro-switch.

### How Sensors Work

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. The application in the machine is similar to a micro-switch. 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.

The **Photo Electronic Detector** uses light as a trigger.

- **Photo Eye Detectors** contain both emitter and receiver. If an object is within the Photo Eye's sensing field light from the emitter is reflected from the object back to the receiver. With *no object* is in front of the Photo Eye a constant 24VDC is sent to the PLC. If an object is sensed by the Photo Eye, 0VDC is sent to the PLC.
- As a result, any of the photo detectors output equals 0VDC when a door is sensed.

The **Proximity Sensor** detects metallic objects without touching them.

- An inductive proximity sensor consists of a coil and ferrite core arrangement, an oscillator and detector circuit, and a solid-state output. The ferrite core and oscillator create a field generating out the front of the sensor. When a metal object enters the field, a loss in amplitude occurs. The detector circuit recognizes the loss of amplitude and generates 0VDC to send to the PLC. When the metal object leaves the sensing area, the sensor returns to 24VDC and sends it to the PLC.
- As a result, if a metal object is sensed, the output of the sensor equals 0VDC.

### Troubleshooting Sensors

If issues point to the sensors, use a DVM (Digital Volt Meter) at the PLC to check the voltages in the "On" and "Off" states. Measure the voltages at the inputs at the PLC terminals. See the machine drawing for detailed wiring connections.

- Photo Sensors often get dirty. Make sure they are clean. If they are not clean, debris may block the signal or provide a false signal.
- Check output voltages of the sensors in the **active** mode. The voltage should effectively equal **0 VDC**
- Check the output voltages of the sensors in **inactive** mode. The voltage should effectively equal **24 VDC**
- The distance from an eye to the door should be in range. Typically the range should be 3/4" to 7/8" from the top of all eyes to the door.

## Locations of Sensors from the Out-Feed

Refer to the machine's Electrical Drawing for specific designators. The "I" designators are inputs and the "Q" designators are outputs.

I-#### (Tool 4)

I-####(Tool 3)

I-#### (Tool 2)

I-####(Tool 1)

I-#### (After  
Out Feed)

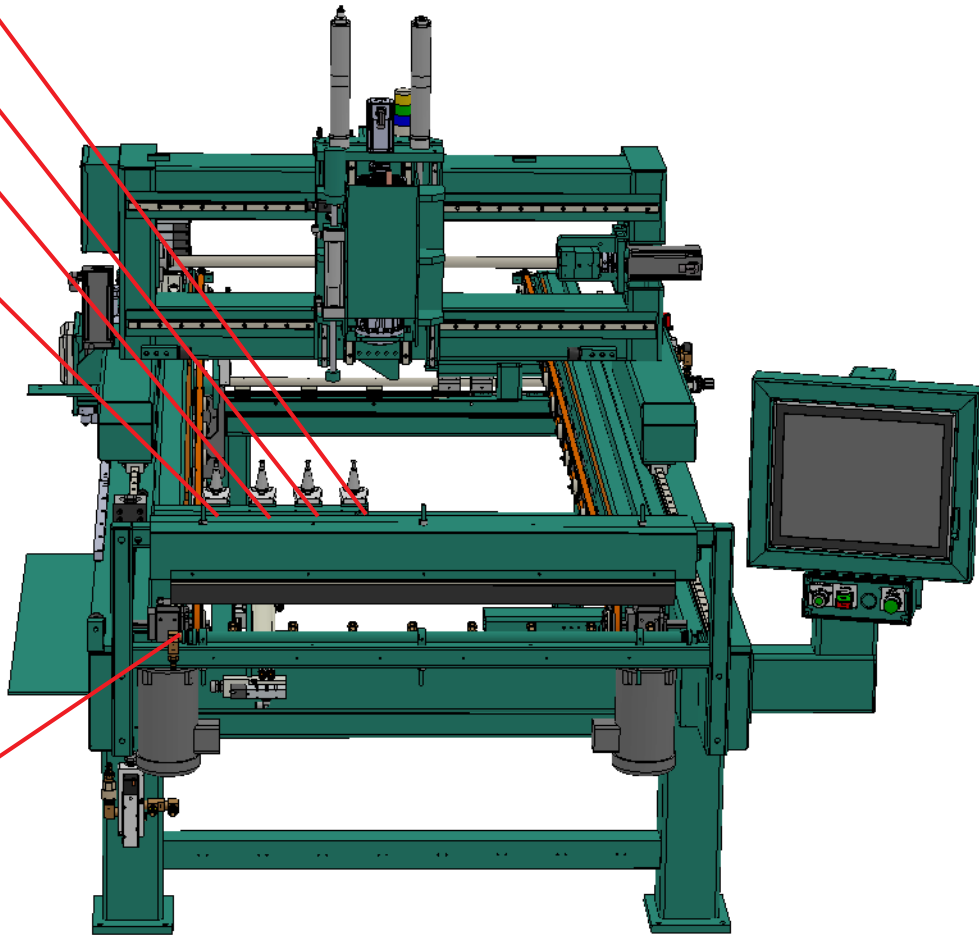
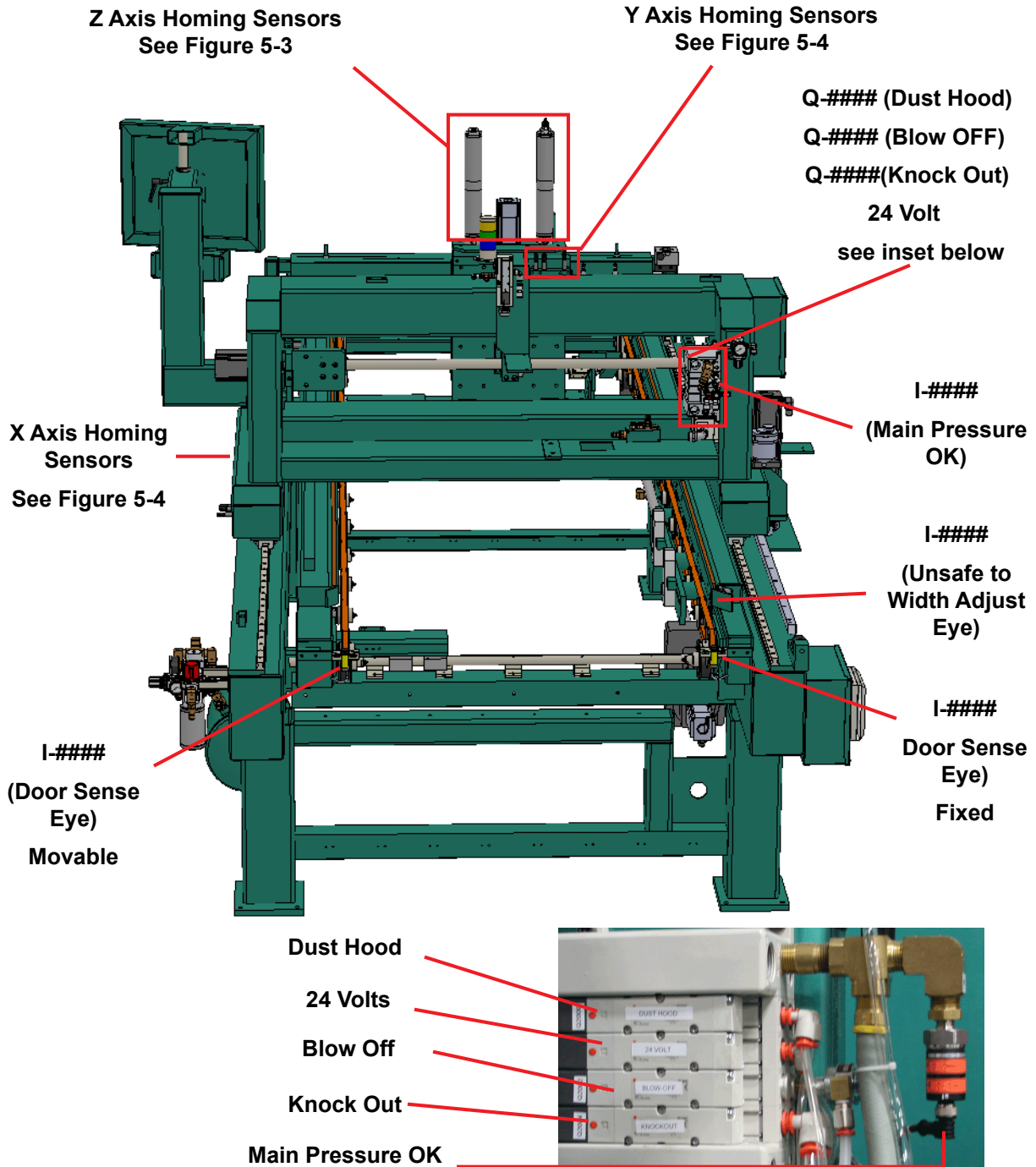


FIGURE 5-1. Out-Feed Sensor Locations

### Locations of Sensors from the In-Feed

Refer to the machine's Electrical Drawing for specific designators. The "I" designators are inputs and the "Q" designators are outputs.



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FIGURE 6. In-Feed Sensor Locations

## 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. See Figure 5-2 for top view locations.

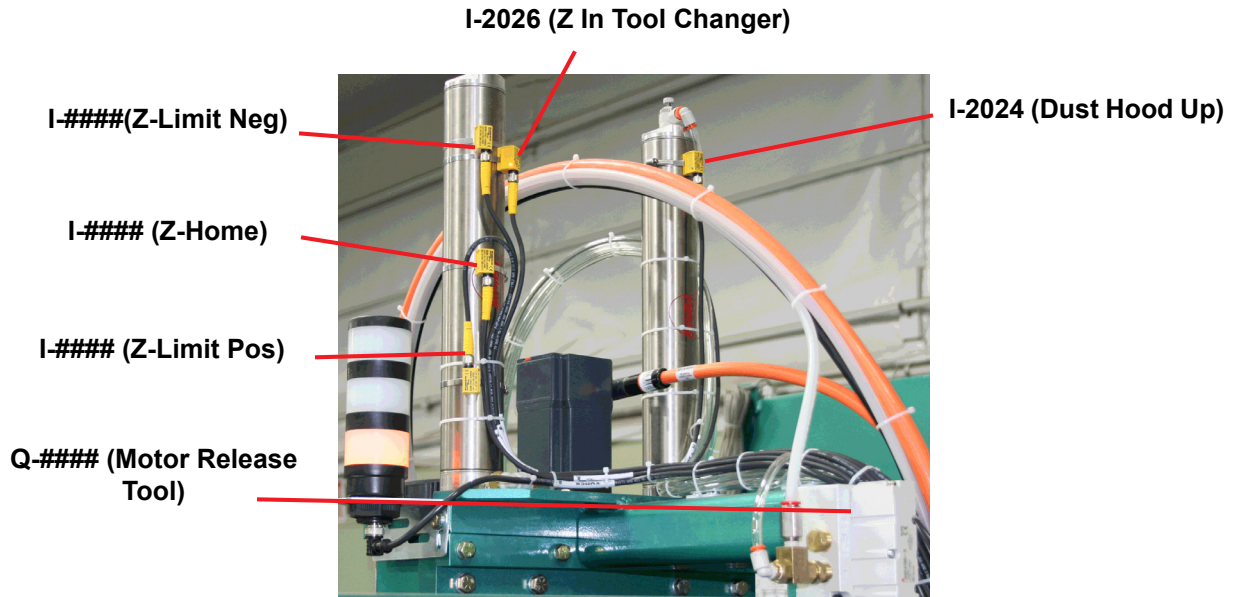
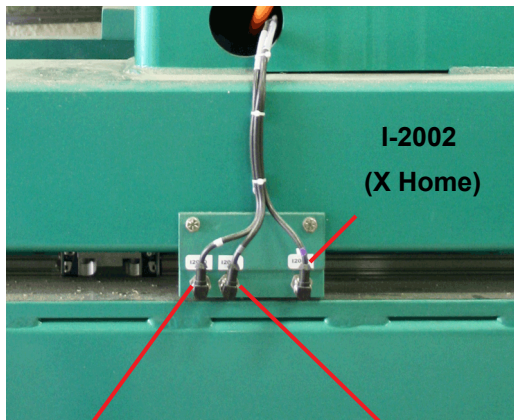
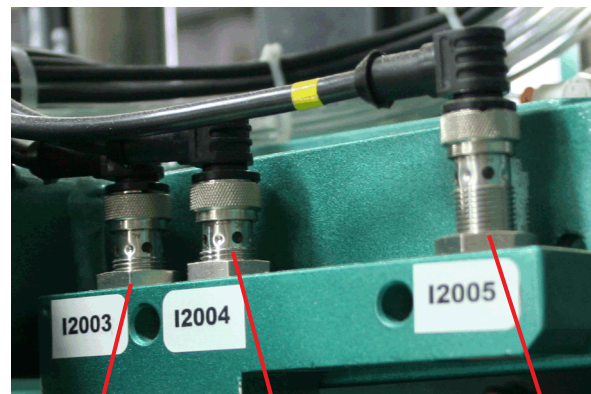


FIGURE 7. Z Axis Sensors



I-#### (X Limit Pos)      I-#### (X Limit Neg)



I-#### (Y Limit Pos)      I-#### (Y Limit Neg)      I-#### (Y Limit Home)

FIGURE 8. X and Y Axis Homing Sensors.

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## Troubleshooting Electrical Problems

**NOTE:** Refer to Air and Electrical Schematics provided with delivery of the machine. Schematics are located in the Electrical Panel. If copies are unavailable, contact the KVAL Service Department. Have model number and serial number of machine readily available.

**Warning** The following checks require the electrical panel to be energized. These troubleshooting checks *must* be performed by a **Qualified Electrical Technician**.



The electrical component systems are designed to expedite the troubleshooting process and minimize “down time”. In general, component systems have the input or feed functions at the top. Output or load functions are positioned at the bottom. Most two-voltage electrical panels are designed with the LOW VOLTAGES on the LEFT, and the HIGH VOLTAGES on the RIGHT. The majority of the system components are labeled with numbers that correspond with the electrical prints included in the electrical box door.

Computer controlled machines have signals on the computer that light up when the input or output functions are energized, respectively. Computer controlled as well as non-computer controlled machines have white 120V control power terminal strips. This will indicate power supply from the respective circuits.

PLC controllers also have lights on them for the input and output functions. You can easily find out which circuits are failing by watching the lights turn on or off. Compare the lights on the IDEC or Beckhoff controllers to the electrical print to determine what systems are being affected.

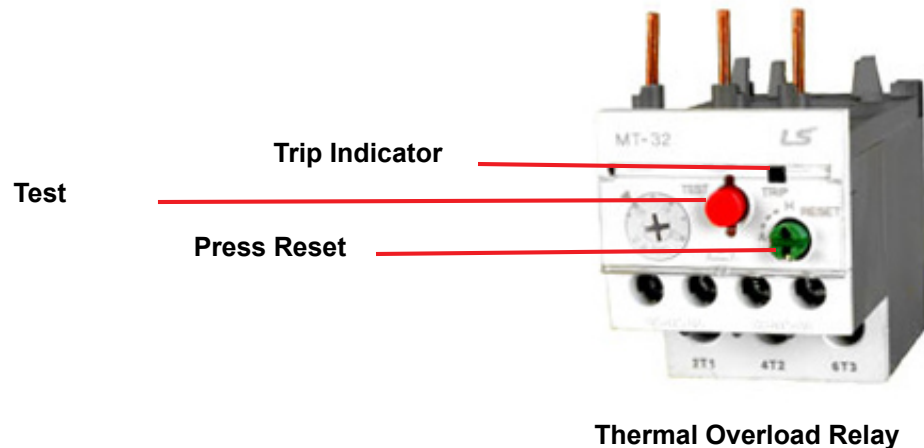
### If the Power Stops During Normal Operation

1. Check that the input power disconnect switch is not turned off.
2. Check that all of the emergency stop buttons are in the normal position.
3. Check the Six Lights on the Electrical Panel. See “Troubleshooting with the Status Light Panel” on page 5-24.

### Lockout and Tagout the main power source.

1. Turn the panel disconnect switch in the off position, open the electrical panel door.
2. Observe the disconnect switches. Look for loose or broken wires at the disconnect then at all of the components.
3. Check for continuity of all fuses with an OHM meter. (Fuses need to be removed from the bottom side of the fuse holder before measuring the fuses)

4. With the power off, check for motor overloads by pressing each reset button (usually at the bottom of the panel) in SEQUENCE. If one is tripped there will be a slight resistance to touch and a “click” sound as it is reset.



### Check for Tripped Circuits

1. Remove lock and tag outs on the main power sources.
2. Manually close disconnect sensors and energize the control circuit or transformer with its respective sensor. Check the Status Light Panel,. If all lights are observed, there are no overloads or emergency stops tripped.

**Note:** Most electrical problems are related to mechanical malfunction (e.g., stuck motors, jammed chain, blocked photo sensors etc.)

**Note:** If a solenoid valve is suspected, and not cleared in the air checks section (see), it can be electrically jumped to check operation.

## Troubleshooting with the Status Light Panel

The Status Light Panel is located on the Electrical Panel. All six lights are illuminated when the system is in proper working order. The lights turn on in a sequence and will stop at the point where a fault is first detected.

The sequence that the lights turn on are as follows:

1. Control Power (Amber)
2. Overload Relay (Amber)
3. E-Stop (Amber)
4. Stop (Amber)
5. Start (Amber)
6. 24VDC (Green)



If one or more lights are OFF, follow the process below to isolate the cause.

**NOTE:** Be sure to proceed down the table, starting with the CONTROL POWER light.

STEP 1:Control Power (Amber). If light is OFF go to item **A** on page 5-25.

STEP 2:Overload Relay (Amber) If light is OFF go to item **B** on page 5-26.

STEP 3:E-Stop (Amber) If light is OFF go to item **C** on page 5-26.

STEP 4: Stop (Amber) If light is OFF go to item **D** on page 5-26.

STEP 5: Start (Amber) If light is OFF go to item **E** on page 5-27.

STEP 6: 24VDC (Green light is OFF go to item **F** on page 5-27.

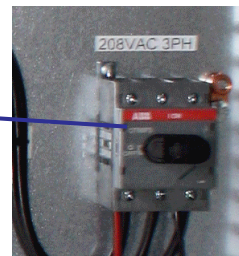
**A**
**Control Power Light OFF**

1. Check if the Control Transformer button is pulled out.



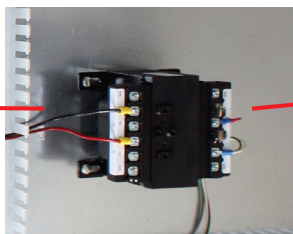
2. Is the Disconnect Switch on the main electrical cabinet set to ON?

Switch



3. Is there 208, 220, 440, or 575 VAC to the top side (input) of the Control Transformer? If not, check the fuses at the Fuse Block, and the contacts on the Control Transformer button on the switch panel.

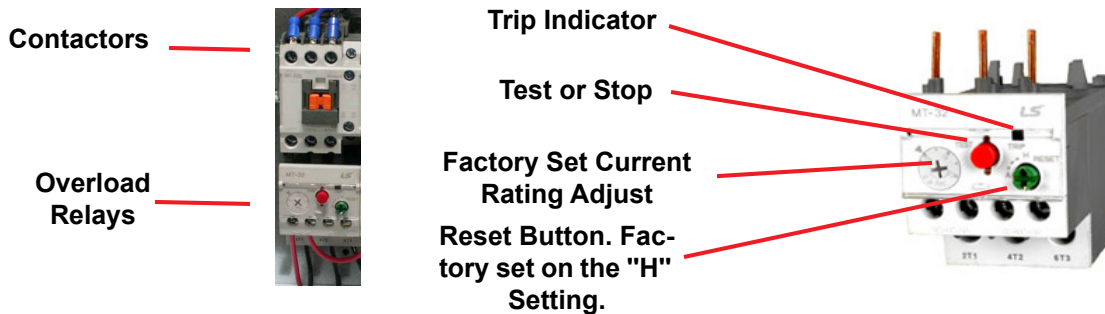
**Typical Control Transformer**

 Input  
High Vac

 Output  
120 Vac

4. Is there 120 VAC between #1 & #2 on the 120 VAC Terminal Strip? If not, check the fuse on the output side of the Control Transformer. If fuse is good, check power coming out of Control Transformer.
5. If no power on the output side, and there is power going into the top of the Control Transformer, replace the Control Transformer.
6. If there is power at the Control Transformer, check the wiring of the black and white wire going from the Control Transformer to the 120 VAC Terminal Strip.
7. If there is no power between #1 and #2, check the secondary side of the transformer.
  - a. Check between X1 and X2. If no power is measured it is a bad transformer.
  - b. If there is power at X1 and X2, check the other side of the fuse. If now power, replace the fuse.

## B Overload Relay Light OFF

1. Check Motor Overload Circuits
2. With power on, check the trip indicator LED on the overload. If indicator is orange, press the Reset Button to reset the overload circuit. Retest the Machine.



## C E-Stop Light OFF

Check if any E-Stop buttons are pulled out.

**NOTE:** Location and quantity of E-Stop buttons varies depending on customer need. Typical locations for E-Stop buttons are near the Rear Access Gate and near the Tool Changer Access Gate



## D Stop Light OFF

Check for 120 VAC between #2 and #4. If there is voltage, press the Start button. If no voltage, check the Stop button to make sure it is all the way out and not stuck in, then check the contact to make sure it is closed. If still no voltage, check the wiring.



**E**

### Start Light OFF

If the Start light remains unlit, push in the Start button and hold it in while a second person checks for voltage between #2 and #5. If there is 120 VAC, replace the ACR relay. If there is no voltage while the button is held in, check the wiring or the contact on the **Start** button.


**F**

### 24VDC Light OFF

First isolate the power supply. Check between DC+ and DC- for 24VDC. If no DC voltage, disconnect the output (V+) wire from the 24VDC power supply and check for DC voltage where those wires were disconnected.

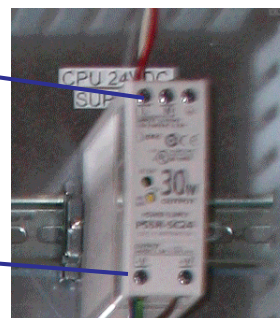


#### If no voltage:

Check the input side for 120 VAC. If no 120 VAC, check the fuse. If there is 120 VAC and no 24VDC, replace the 24VDC Power Supply.

Input 120 VAC

Output 24 VDC



#### If there is 24VDC:

Reconnect the (V+) wire to the 24VDC power supply.

Trace the output wire to the DC terminal block.

Disconnect all (+ 24V positive) wires from the + DC from the DC terminal block except the + output wire from the + 24VDC power supply.

Check for +24VDC at between any -DC and +DC terminal on the DC Terminal block.

Reinstall the (+ 24V positive) wires one by one, checking for +24VDC after installing each. If at any point no voltage is found trace the last reinstalled wire and check for shorts.



---

## Network System Overview

A PLC (Programmable Logic Control) controls the Machine. The PLC can process multiple analog and digital inputs, and output arrangements. The system can handle extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact.

The PLC is located in the Main Electrical Panel. From the PLC, connections are made to coupler interfaces located near the sections they control. See your machine's schematic package for detailed wiring information.

**Tip:** Lights should be blinking at these locations. If no light is observed there could be a bad wire or component

-





Notes:



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Notes:



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