NEXT

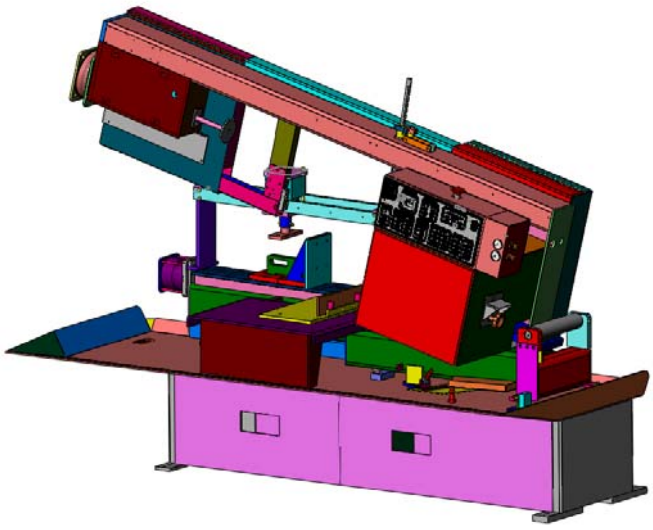
HE&M SAW

The saw that cuts straight.

HE&M Saw

Model: CYCLONE-AUTOMATIC SAW

Owner's Manual



Rev: F
Date: 08/27/03

EFFECTIVE: S/O# 03-099
S/N# 838203

TABLE OF CONTENTS

SAFETY SECTION

SECTION 10

BACK TO TABLE OF CONTENTS

Safety Check List

1. Safety glasses and safety shoes?
2. Machine clean and in good operating condition?
3. All safety guards and barriers in place?
4. Area around machine clear of hazards?
5. Floor dry and clear of debris?
6. Unauthorized personnel clear of machine?
7. Operator aware of emergency procedures?
8. Operator trained in saw operation and material handling?

Keep hands, fingers, and arms away from operating areas and the saw blade!

Always handle material carefully!

Never stand on the machine!

Do not clean saw while it is cutting!

Use overhead crane when moving heavy material!

SAFETY FIRST!

SECTION 10

10.1 MACHINE SAFETY

OPERATOR MUST ALWAYS KEEP SAFETY FIRST.

This machine is fully equipped with various safety devices to prevent operators from being injured and the machine itself from accidents. However, operators are urged to operate the machine with safety in mind, observing the following points carefully, without relying entirely on machine-equipped safety devices.

Disregarding the safety devices, awareness barrier or guards could result in serious injury to the operator.

Safety devices must be inspected regularly for proper operation and REPLACED IMMEDIATELY if found to be inoperative, damaged or defective.

Safety must be practiced continually. Before operating this machine or any power tool you must become thoroughly familiar with:

A: The way it works.
B: The correct way to use it.

SAFETY PRECAUTIONS

Before we begin be sure that you are aware of safety procedures and understand that sawing can be hazardous if you expose any part of your body to the working areas of the machine.

Exposing any part of your body, including fingers, hands, arms, feet or legs or your head to working areas of the saw or feed can result in severe injury or even death.

Read the entire instruction manual before attempting to install or operate the machine.

Review all safety precautions with your supervisor before attempting to operate this saw.

Make sure that you know how to operate the saw in a safe manner so that you do not become injured.

Make sure you are thoroughly familiar with all of the switches, knobs, controls, guards and awareness barriers.

SECTION 10

Always make safety practices your first priority.

Check the saw for safety before you begin operation each time. If the saw is not safe, alert your supervisor.

If you don't know what the safety practices for properly operating the saw are, be sure that someone teaches them to you before you operate the machine. Ask your foreman or supervisor.

LOOSE CLOTHING CAN BE HAZARDOUS

Never wear gloves or other loose clothing when working around machinery while it is in operation.

The saw blade can catch loose clothing and drag the operator into the cutting zone.

Wearing gloves while operating the saw is dangerous, because the gloves may entangle in the saw blade or other working parts of the saw and cause injury.

Loose fitting clothing or neckties may become entangled in the machinery. A necktie could become entangled in the saw blade or other working parts of the saw and could cause strangulation.

Keep shirts and jackets buttoned to avoid possible entanglement of shirttails in the machine. Sleeves should also be buttoned or rolled up so that cuffs will not be snagged by the blade, causing injury.

Never wear loose or ragged clothing around machinery because it may become entangled and cause injury. Long hair and beards can also become entangled in machinery, causing severe injury or death.

Jewelry, such as rings, neck chains, bracelets and wrist watches are also hazardous when worn around moving machinery. Rings may become caught on moving parts, causing cut, broken or amputated fingers. Neck chains and other jewelry can also cause injury.

Never attempt to operate the machine while taking prescription or over-the-counter medications that may cause drowsiness, fatigue, nervousness or reduced reflexes.

SECTION 10

A drowsy operator or an operator with reduced reflexes may accidentally place a finger, hand, arm or other body part into the working areas of the saw and become severely injured.

Never attempt to operate the machine while under the influence of alcohol, narcotics, or other mind or mood altering substances. Severe injury could result.

Never expose any part of your body to the working areas of the machine. The machine can cause injury if safety warnings and procedures are not adhered to.

Never attempt to clean the machine or to inspect it while it is in operation. Trying to clean the machine while it is running may result in injury. Always bring the saw to a complete stop before conducting any service operations.

Be sure that you are properly balanced while standing, walking, or moving near the saw.

If you slip or lose balance, your hand, or any part of your body could come in contact with a moving part of the machine, especially the blade. Serious injury could result.

For work done at the back of the machine requiring the operator to enter the operating zone, do not forget to turn off power and lock it out before attempting any work.

Locking out power will prevent someone else from turning the machine on, causing injury to the person working behind the machine.

The possibility always exists during cutting operations that coolant or chips may come flying from the machine.

Flying chips can cause eye injury. All personnel should be kept clear of the machine during cutting operations to avoid these hazards.

Wear gloves **ONLY** when handling band saw blades. Blades are extremely sharp and difficult to handle.

Attempting to handle saw blades without gloves can cause severe cuts.

DO NOT WEAR GLOVES WHILE THE MACHINE IS IN OPERATION.

SECTION 10

Use extreme caution when removing cut parts from the machine.

Even small parts can be heavy and slippery because of coolant.

Small parts can fall or be dropped, causing injuries to toes and feet.

Heavy parts and long bars should be moved only with approved methods.

Never reach into the cutting zone to remove parts. The parts could suddenly turn or slip or move and cause injury to the operator.

Never place any objects, including cut parts or personal items, such as tools, measuring instruments, coffee cups, or clip boards on the saw arm or control as these objects may fall, causing injury to the operator and/or damage the machine. These objects may also prevent the operator from stopping the machine during an emergency.

USE CAUTION WHEN HANDLING MATERIAL

Load and unload the material safely and securely to prevent accidents and injuries.

Before attempting to load or unload material on the saw, make sure the machine is at a complete stop. A sudden movement of the machine could knock material onto the floor, causing serious injury.

Injuries may be caused by improper lifting or carrying of heavy objects. When lifting, stand close to the load, bend your knees and grasp the object firmly. Then lift by straightening your legs and keeping your body as nearly vertical as possible. To lower the object, reverse the procedure.

When carrying or moving a heavy load, do not turn or twist your body but make adjustments by shifting your feet. If the load is heavy or bulky, secure help from others.

Attempting to move heavy loads by yourself can cause serious back injury. Dropping a heavy load can cause leg, foot and toe injury.

NEVER UNDERESTIMATE THE WEIGHT TO BE MOVED OR OVERESTIMATE TOUR OWN ABILITY. USE A CRANE, HOIST, OR OTHER TOOL TO LIFT OR MOVE HEAVY MATERIAL.

Be certain that when using a crane, hoist or other lifting machinery that the chains, lifting straps or other lifting gear is in sound, safe operating condition. Defective,

worn or damaged lifting straps can break or allow material to slip, causing injury to personnel.

DO NOT EXCEED RATED CAPACITY
COMMUNICATE FOR SAFETY

When two or more workers work as a group, establish the necessary safety signs, for example, when lifting or moving heavy objects.

Also confirm with other workers whether it is ‘okay’ to start the next process or not. Each worker should know exactly what the other is doing.

FAILURE TO COMMUNICATE CAN RESULT IN INJURY!!!!!

While operating the machine, do not allow yourself to be distracted. Do not distract the attention of others while they are operating the machine.

Sudden distractions can cause the operator or other personnel to slip, fall or accidentally place a part of their body onto the operating area of the saw, causing injury.

Never try to stop the saw arm, saw blade, band wheels, movable vises, bar-feed shuttle or any other moving part with your hand. Serious injury will result.

Operation and maintenance of automatic equipment involves potential hazards. Personnel should take extreme precaution to avoid injury.

KEEP HANDS CLEAR OF DANGEROUS MOVING MACHINERY

Close the wheel cover doors, electric control panel covers and make sure all safety barriers and guards are in place.

Failure to keep all safety equipment in place can cause injury.

Never place obstacles around the machine. Keep the area clear of trip hazards or other hazards which may cause an operator to trip, slip or fall into the machine.

Always follow the safety instructions given in the operator manual.

Never run the machine without protective covers and shields in place.

Do not touch controls with wet hands. Electric shock can kill.

SECTION 10

SAFETY IS ALWAYS FIRST.

Keep these safety tips in mind:

Never put your hands or any other part of your body underneath the saw arm, blade, guides or into the vises. Any of these can cause severe injury.

When installing a new blade or removing an old blade, always wear gloves to keep from cutting yourself. Be certain the saw disconnect is OFF and no one is around who might accidentally start the machine while your hands are exposed to the blade.

When tensioning the blade, ALWAYS make sure the door covers are closed, A blade could break during tensioning and can cause severe injury.

Be sure to keep your fingers, hands, and arms out of the area between the vises. They are designed to clamp metal and can cause serious injury.

Always handle material carefully. Use caution when loading and unloading material so that if it slips off the machine, it will not drop on your feet or contact any part of your body, or if the operator slips and drops the material the operator will not be injured.

On automatic machines, keep your body clear of the indexing vise system (the vise that moves the material into the machine with an automatic feed system). Serious injury can result if you become entangled in the operating area of the saw arm or bar-feed.

Never put fingers, hands, head or any part of your body under, in front of, or near the saw arm or blade (operation area) at any time for any reason.

The saw blade is extremely sharp and is moving at a high rate of speed. It can cause serious injury if you come in contact with the blade.

Never put any part of your body, as well as your clothing, in the viseing areas because you may become injured.

SECTION 10

To avoid accidental injury NEVER put any part of your body, as well as your clothing, in front of, between or near any part that moves, such as the material handling vises, rollers, input and output, and material that may move on the chip conveyor.

Vertical saws tilt for miter cutting. Keep clear of the sides of the saw arm. Automatic models may tilt without warning while operating.

Before cutting, always be sure that material is securely clamped and that guides are positioned as close as possible to the material.

ALWAYS MAKE SAFETY PRACTICES YOUR FIRST PRIORITY

CHECK THE SAW FOR SAFETY BEFORE YOU BEGIN OPERATION EACH TIME. IF THE SAW IS NOT SAFE, ALERT YOUR SUPERVISOR.

SECTION 10

10.2 SHOP SAFETY

Do not allow anyone else to operate the saw while you are in the area of the machine's motions. If someone closes the vise or turns on the band motor when you are working in these areas, you could be hurt.

When two or more workers work as a group, establish the necessary safety signs, for example, lifting or moving heavy objects. Also, confirm with other workers whether it is 'okay' to start the next process.

Exercise great care when the saw is cutting material. Be sure that no hands, fingers or any part of your body are near enough to the blade to be cut off.

Be sure that you are properly balanced while standing, walking, or moving near the saw. If you slip or lose balance, your body could contact a moving part of the machine, especially the blade. Serious injury could result.

Make sure the floor around the machine is kept dry and not slippery. The floor should be kept free of trip hazards or other obstructions. Good housekeeping can prevent serious injuries.

Never place any objects, including personal items, on the saw arm or control. These could fall and cause injury to the operator and/or damage to the machine.

Wear safety shoes and eye protection when operating the machine. Failure to wear safety shoes can result in injury. Eye protection is necessary because flying chips can lodge in the eye and cause injury or blindness.

Do not clean the saw while it is cutting, because serious injury can result. To clean the machine, stop the blade and raise the saw arm. Reach into the cutting area with tools or a scraper only, never your hands.

The blade is dangerous even when stopped.

Do not use high pressure air to blow debris and chips off the machine. High velocity air can propel chips or other objects into the air for large distances and cause eye injury. Even very small pieces of metal can cause permanent eye damage.

SECTION 10

Use the saw's built-in coolant system and coolant nozzle to clean the saw. But, DO NOT ALLOW THE SPRAY NOZZLE OR THE HOSE TO GET NEAR THE SAW BLADE. Do not attempt to use the wash-down hose while the saw is cutting.

DO NOT use high pressure air to clean cut parts. Eye injury could result.

Do not wear loose fitting clothing or allow your clothing to get too close to the saw blade. Clothing can get caught and draw you into the blade, causing injury.

Do not wear gloves while operating the machine. Gloves can get caught on the saw blade or other moving parts of the machine. Wear gloves only when installing new or removing old saw blades.

Keep all safety guards and awareness barriers in place at all times, except when changing blades or performing required maintenance. Never operate the saw if any guards or barriers are not in place, or serious injury may result.

When performing routine maintenance on the saw, always block the saw arm with a piece of wood to prevent it from falling. Shut off all power: electric and hydraulic.

Always use approved procedures for loading material into the machine, and when unloading cut parts from the machine. Use extreme care when loading and unloading round material as it can easily roll off the machine and cause severe injuries.

Electrical safety: **ELECTRIC SHOCK CAN KILL !!!** Avoid contact with electrical wires and cabling while the power is on. The electrical cabinet SHOULD BE OPENED BY TRAINED SERVICE PERSONNEL ONLY.

For any work required inside the door covers or electric control boxes, turn off the power and lock it off at the main breaker to ensure safety beforehand.

Hydraulic safety: **HIGH PRESSURE OIL CAN KILL YOU !!!** Do not attempt to stop hydraulic leaks with any part of your body. Even a pinhole leak can cut like a razor. Remove power from the machine and notify maintenance personnel.

Do not weld or use a cutting torch on the saw. Fires can start, electrical shorts can occur, and hydraulic lines can be damaged.

If you don't know what the safety practices in your shop are, be sure that someone teaches them to you before you operate any machine or equipment. Ask your foreman or supervisor.

SECTION 10

10.3 MATERIAL HANDLING SAFETY

With proper modifications to the saw, a forklift may be used to load or unload material. Safety procedures for the use of a forklift should be followed at all times to avoid damage the machine or cause injuries if the material slips or falls.

When handling large and heavy material, use an overhead crane and appropriate safety precautions to prevent injury or accidents.

Do not weld or use a cutting torch on the saw. Fires can start, electrical shorts can occur, and hydraulic lines or pneumatic lines can be damaged and cause injury.

Do not allow any one else to run the saw, to move any of the saw switches, or to disconnect the power while you are near the saw or are operating the saw, serious injury can result.

AVOID POTENTIAL HAZARDS

Never stand, sit, lie or lean on the machine. Always pay attention so that you do not become accidentally entangled in the machine and be injured.

Never put fingers, hands, head or any other part of your body under, in front of, or near the saw arm or blade (area of operation) at any time. Body parts could become cut, severed, or crushed.

Never put any part of your body, including clothing, in the vise areas. You may become caught in the vise and dragged into the cutting area, causing severe injury or death.

Never put any part of your body, including clothing, in front of, between or near any part that moves, such as the material handling vises, rollers, input and output, and material that may move on the chip conveyor, because serious injury may result.

Never have someone else operate the machine while you are anywhere near the moving parts of the machine. For Example: if someone closes the vise and your hand is in the vise, you could be seriously injured.

Before cutting, always be sure that material is clamped and that the guides are positioned as close to the material as possible.

SECTION 10

Always make safety practices your first priority. Check the saw for safety before you begin operation each time. If the saw is not safe, alert your supervisor.

Use extreme caution when removing cut parts from the machine, even small parts can be heavy and slippery because of coolant. Small parts can fall or be dropped, causing injuries to toes or feet. Heavy parts and long bars should be moved only with approved methods.

Load and unload the material safely and securely. Before attempting to load and/or unload material on the saw, make sure that the machine is at a complete stop. If the machine is running, the material may be knocked onto the floor, causing injury.

Injuries may be caused by improper lifting or carrying or moving heavy objects. When lifting, stand close to the load, bend your knees and grasp the object firmly. Then lift by straightening your legs and keeping your body as nearly vertical as possible. To lower the object, reverse the procedure.

If you don't know the safety practices for handling the material are, be sure that someone teaches them to you before attempting to move any material or object. Ask your foreman or supervisor.

When carrying or moving a heavy load, do not turn or twist your body but make adjustments by shifting your feet. If the load is very heavy or bulky, secure help from others.

NEVER UNDERESTIMATE THE WEIGHT TO BE MOVED, OR OVERESTIMATE YOUR OWN ABILITY. USE A CRANE, HOIST, OR OTHER TOOL TO LIFT OR MOVE HEAVY MATERIAL.

BE CERTAIN THAT WHEN USING A CRANE, HOIST, OR OTHER LIFTING MACHINERY, THAT THE CHAINS, LIFTING STRAPS OR OTHER LIFTING GEAR ARE IN GOOD OPERATING CONDITION.

DO NOT EXCEED RATED CAPACITY

HEM SAW CYCLONE HIGH SPEED AUTOMATIC PRODUCTION BAND SAW

SAW:	Pivot style, miter-arm, automatic bandsaw
SAW CAPACITY:	16” X 22” at 90 degrees 16” X 15” at 45 degrees
BLADE SIZE	1 ¼” X 16’ x .042”
POWERED BRUSH:	½” X 4” diameter driven by an assembly mounted on the drive wheel removes chips from the blade.
BLADE DRIVE:	7.5 horsepower, 220/440 VAC, 3 phase, 1750 rpm.
DRIVE TYPE:	Totally enclosed worm drive gearbox with variable speed drive from motor to gearbox.
COOLANT SYSTEM:	Totally built-in, with high pressure 4 gpm sealed coolant pump submersible, 1/60 HP.
BLADE SPEED:	Infinitely variable speed drive. Controlled by adjustment of a handle. Speed range from 65 to 350 fpm.
AIR REQUIREMENTS:	85 psi, 3-5 CFM. Saw equipped with air filter and lubricator.
OPERATOR CONTROL:	Control console located for operator convenience, uses industrial touchpad switches.
CUTTING PRESSURE:	Adjustable from 0 to 800 pounds downforce.
FEED RATE:	Adjustable from 0 to approximately 4 inches per second.
CLAMPING PRESSURE:	Adjustable from 0 to approximately 1,700 pounds.
BLADE GUIDE SYSTEM:	Side and back guides are flat carbide inserts.

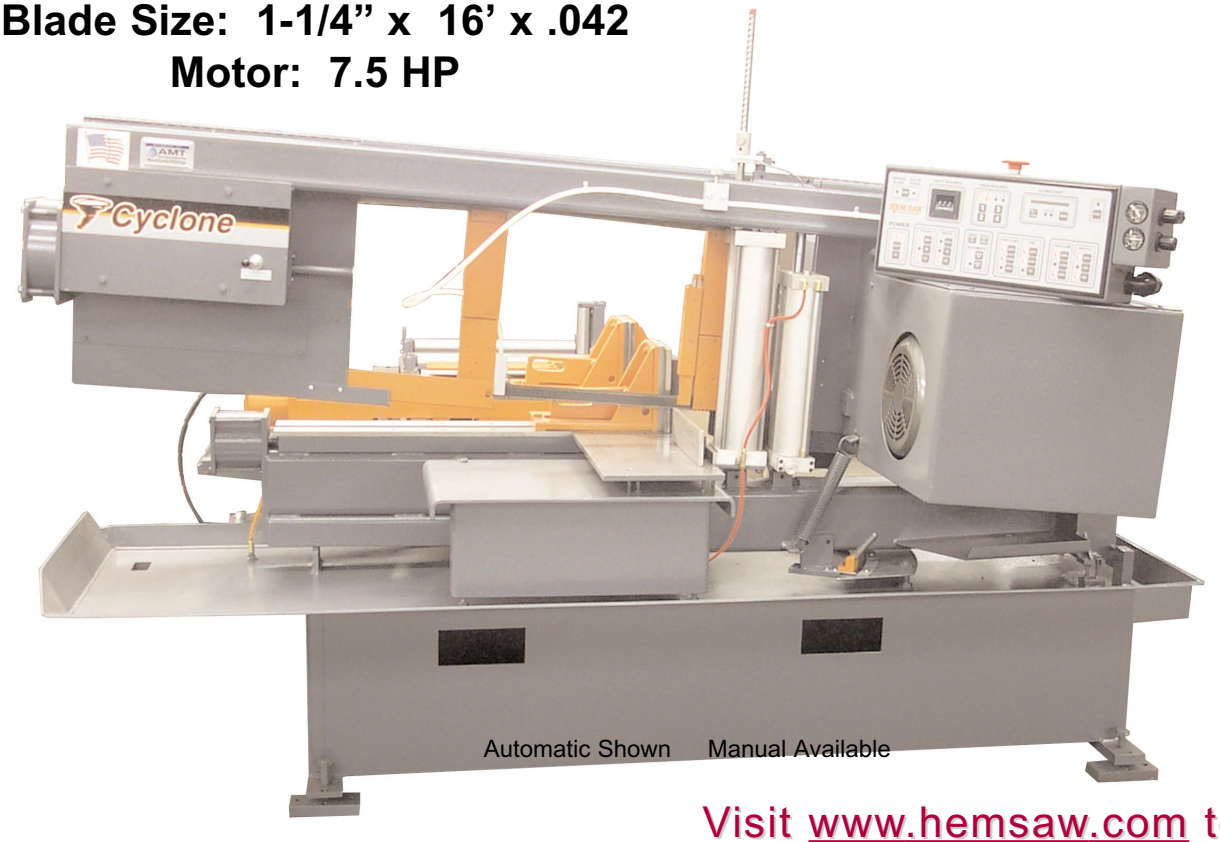
NOTE: The policy of HEM Saw is one of continued improvement. We therefore reserve the right to change specification, price and design without incurring obligation.

BACK TO TABLE OF CONTENTS

HE&M SAW
The saw that cuts straight.

New Horizon Cyclone Automatic

Capacity: 16” High x 22” Flat @ 90⁰
16” High x 15” Flat @ 45⁰
Miter One Direction
Blade Size: 1-1/4” x 16’ x .042
Motor: 7.5 HP



Automatic Shown Manual Available

Visit www.hemsaw.com to see more information about the latest technology from HE&M Saw.

Standard Features:

- Cut Watcher
- Arm Miter
- Shaft Driven Power Blade Brush
- Infinitely Variable Speed Drive: 60-350 SFPM
- Control Console On Top of Saw Arm
- Semi-Automatic or Fully Automatic Modes
- Flood Style Coolant System
- 0 - 24” Stroke - 4 Indexes
- Variable Vise Pressure

Optional Features:

- Spray Mist Coolant System
- 3rd Holding Vise on Feed
- Full Capacity Down Clamps

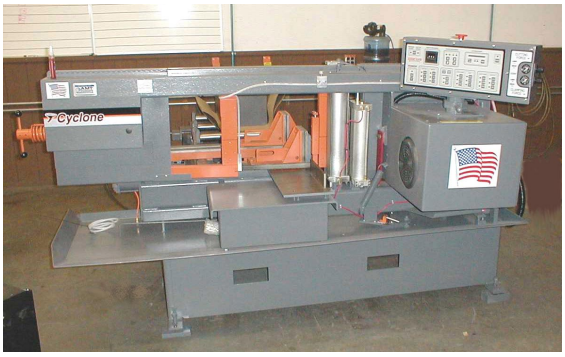
www.hemsaw.com

P. O. Box 1148 • Pryor, OK • 74362
Toll Free: (888) 729-7787• Phone: (918) 825-4821
Fax: (918) 825-4824 • E-Mail: info@hemsaw.com

INSTALLATION

Installation and set-up of the Cyclone manual and Cyclone automatic bandsaw is not difficult, but you should plan on two to six hours from start to finish.

Location of the saw is very important. Consideration should be given to safely loading material and removal of cut parts, as well as for maintenance access and operator convenience. In some jurisdictions, electrical and/or building codes may apply to machine location and installation.



You should also determine how electrical power and compressed air will be supplied to the saw.

Remove the plastic covering from the machine. Spare parts and installation accessories will be located inside heavy-duty boxes. Remove the boxes and check the contents. An accessory list is also provided.

Major accessories include footpads for leveling the machine, as well as leveling screws with jam nuts and hold down screws with jam nuts.

Also included will be a coolant tank, coolant pump, touch-up paint and owner's manual with schematic. Automatic saws equipped with chip conveyors will also be shipped with a chip tank.

The saw may be moved carefully by fork truck by inserting the forks in the cutouts provided on the front of the saw. Make sure that the forks are also supporting the barfeed before lifting the saw.

Be sure that plant supply voltage matches that of the machine. If the supply voltage and that of the machine to not match, the saw must be rewired in order to prevent damage to the motor, transformer or other electrical components. If any changes are required, a licensed electrician should make them.

IF ANY CHANGES ARE REQUIRED, THEY SHOULD BE MADE BY A LICENSED ELECTRICIAN !!!

BACK TO TABLE OF CONTENTS

Before starting the saw set-up, check the parts in the installation kit for correct quantity and for placement on the saw.

PLACE SAW INTO POSITION.

1) The location of the saw should allow sufficient room for easy handling of all long pieces of material. For cutting long pieces, it should be readily accessible for loading by forklift and/or overhead crane. Consider also the routing of electric and pneumatic lines.

   When leveling saw begin at fixed foot pivot and work anti-clockwise around saw.

2) Place the leveling pads under the saw mounting feet. The foot pivot (round bar with threaded hole in center) is placed under the back rear corner of the saw base. The foot pivot establishes the height of the saw system.

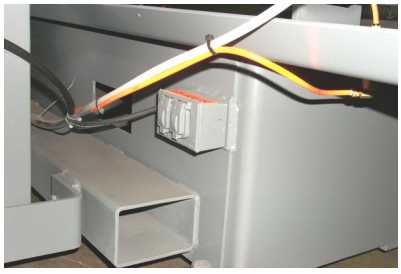
3) Start the jacking bolts (3/4-10 x 3-1/2) into the mounting feet, checking that the bolts will sit in the recess of the leveling pads. The 1/2-13 x 3" bolts are used to anchor the leveling pads to the floor. The 3/4-10 and 1/2-13 nuts are used to lock the jacking and hold-down bolts in place after the saw system is leveled.

4) Remove shipping brackets from saw base and/or arm. Install all splashguards.

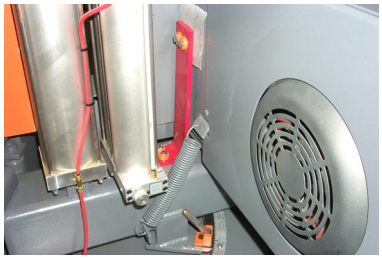
5) Install coolant tank under the saw base.

6) Attach coolant line from saw to pump. Place pump in coolant tank under saw. Plug line cord in to receptacle on back of the saw base.

Shipping Brackets

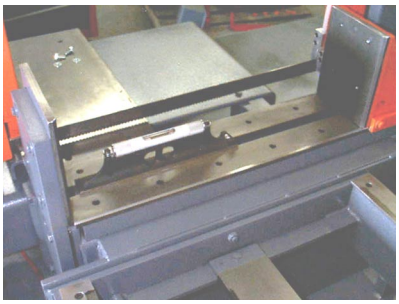


Coolant outlet.



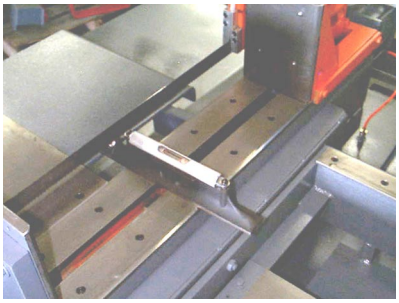
LEVELING THE SYSTEM

Use a machinist level throughout set up.

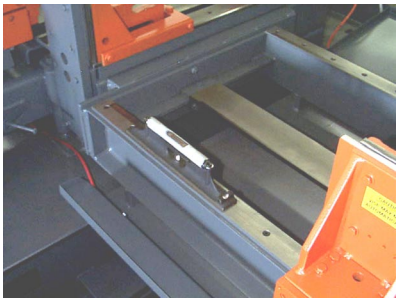


1) Using the cutting surface as a reference, level the saw and the feed front-to-rear and side-to-side, turning the jacking bolts to achieve a rough level.

   A) Place the level across the machined surface of the vise way to level from side to side and front to rear.

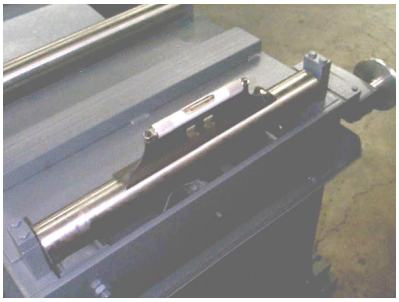


   B) To level the system from front to rear place the level on the feed frame ways which the shuttle system travels on, checking from side to side.



   C) Check the side-to-side level of the rollers.

2) After getting an approximate level in step 1, adjust the jacking bolts until the cutting surface is level to within .005" (over 10 inches) from side-to-side and front-to-rear.



3) Tighten the bolts and nuts for the leveling pads.

PNEUMATIC REQUIREMENTS.

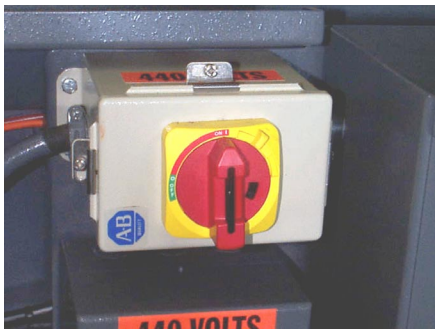
There is an air supply connection on the back of the saw by the saw filter lubricator. We recommend a quick coupler be used on the 3/8" fittings.

ELECTRICAL REQUIREMENTS.

ALL ELECTRICAL WORK SHOULD BE DONE BY A LICENSED ELECTRICIAN !!!

Check the electrical supply voltage. The saws are shipped wired for 440 volts unless otherwise specified. If supply voltage does not match the machine, changes will have to be made on the heater sizes, the motor wiring, and on the transformer wiring. Use items included with spare parts kit to change voltage of the saw.

IF ANY CHANGES ARE REQUIRED THEY SHOULD BE MADE BY A COMPETENT ELECTRICIAN !!!

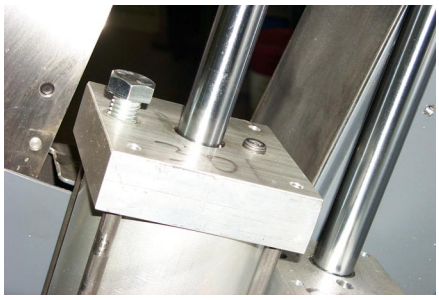


The junction box at the rear of the saw is equipped with a disconnect able to accept a padlock for electrical lock out during maintenance.

Make the connection to the electrical supply at the disconnect as shown in the following illustration. Then check for proper rotation by jogging the band motor and observing the direction the blade moves. If it is not correct change two phases.

INSTALL HEIGHT STOP ASSEMBLY

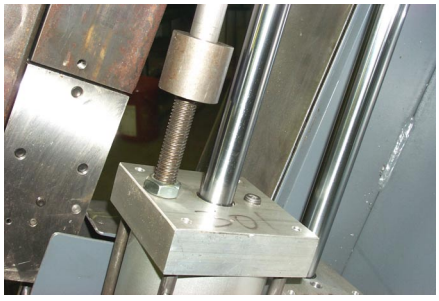
The height stop assembly is used to limit the mechanical height of the saw blade during operation, and to limit the “depth of cut” when the arm is completely down.



To install the assembly, raise the arm as high as it will go, by pressing the “Retract” key on the saw control. Remove the shipping screw plug from the top of the lift cylinder.

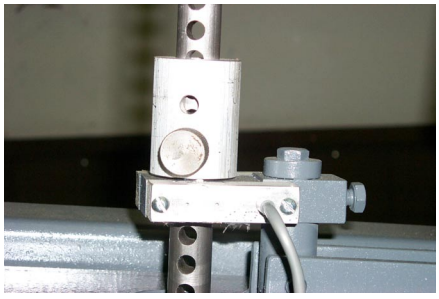
Remove the height stop sleeve and pin from the rod, and insert the rod up through the bottom of the arm through the hole in the center of the upper/lower limit switch assembly. Screw the all-thread into the tapped hole in the top of the lift cylinder, and screw it down about ¾” into the top cap of the cylinder. Tighten the jam nut.

Put the saw arm down by pressing the “CUT” key. The lower limit stop should be adjusted so that the blade just barely cuts through the cutting block.



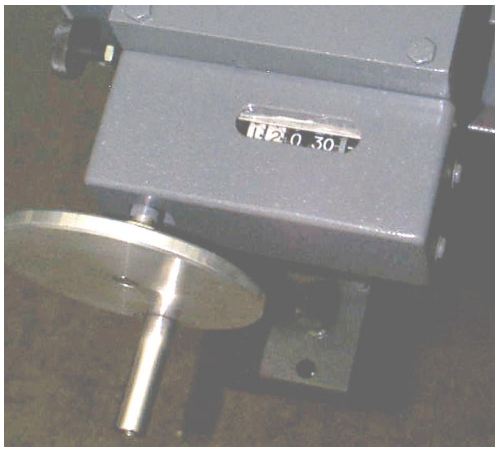
Slide the upper stop sleeve onto the height stop rod and secure the sleeve in place with the pin. When cutting, the blade should be raised to clear the material by about 1”.

Once the lower stop is properly adjusted, tighten the setscrew to prevent it from changing position.



INSTALL FEED ADJUSTMENT CRANK

The feed adjustment crank is used to change barfeed length during saw set up. The feed length can only be changed when the feed shuttle is in the forward position. To move the shuttle forward, press the “FWD” key on the control panel.



To install the crank handle, slip it onto the shaft that extends under the mechanical length readout indicator and securely tighten the setscrew.

HE&M MODEL CYCLONE A BANDSAW

ACCESSORIES & SPARE PARTS KIT

1 EA.	C-009269-005-00-0-000	COOLANT TANK w/SCREEN
5 FT.	P-007225-004-00-0-000	66P 3/8" CLEAR TUBING
6 FT.	P-007227-002-00-0-000	44P 1/4" CLEAR TUBING
1 EA.	P-007348-000-00-0-000	2 ENT COOLANT PUMP
5 EA.	P-007028-030-13-1-000	1/2 - 13 X 3 ALL THREAD BOLT w/ NUT
5 EA.	B-010926-001-02-0-000	1x3x6 LEVELING PADS
5 EA.	P-007030-350-10-1-000	3/4-10x3 1/2 ALL THREAD BOLTS w/ NUTS
1 EA.	HEX KEY - 16	1/4" ALLEN WRENCH
1 EA.	P-007450-000-00-0-000	16-404 LICON SWITCH
1 EA.	P-007445-000-00-0-000	933 SWITCHCRAFT
1 EA.	P-007444-000-00-0-000	65-2010 LICON SWITCH
1 EA.	C-011638-000-00-0-000	CHIP SCRAPER
3 EA.	P-007062-002-00-0-000	22-4 1/4" UNION BARB
3 EA.	P-007066-002-00-0-000	261P 61P-4 1/4" NUT & SLEEVE
1 EA.	ELECTRICAL	VOLTAGE KIT
1 EA.	A-008940-000-00-0-000	CARLAND SCREW
1 EA.	P-007005-002-18-0-000	5/16-18 JAM NUT
3 EA.	NYLON PIG TAIL CONNECTORS	
1 EA.	ROUND FOOT PAD WITH 1/2 X 13 X 1 H.H.M.B. & FLAT WASHER	
1 EA.	HEIGHT ROD	
4 EA.	1/4 X 20 X 1/2" H.H.M.B. w/FLAT WASHERS & NUTS	
2 EA.	WINGS AND 2 BRACES	
1 EA.	SLIDING ROLLER	
1 EA.	CAN WATERBASE PAINT T/U	
1 EA.	CAN ORANGE PAINT T/U	
12 EA	15" WIRE TIES	
2 EA.	90 DEGREE LOCK DOWN BOLTS W/THICK WASHERS	

CYCLONE SAW VOLTAGE CONVERSION

8/27/03 Rev B-Effective SO#03-099 (S/N#838203)

Cyclone Junction Box Area

This retro-fit procedure will allow certain Cyclone saws to run on either 220 VAC or 440 VAC. It is recommended only qualified electricians perform this conversion. Before you continue please make sure you have done the following:

1. The proper N.E.M.A. approved plug and cord have been installed for the voltage you will be using.

2. Follow all needed safety precautions including proper lockout/tagout procedures.

3. You have the correct voltage conversion parts kit and instructions.

4. Please contact the HEM SAW service department if any part of this instruction is unclear or uncertain.

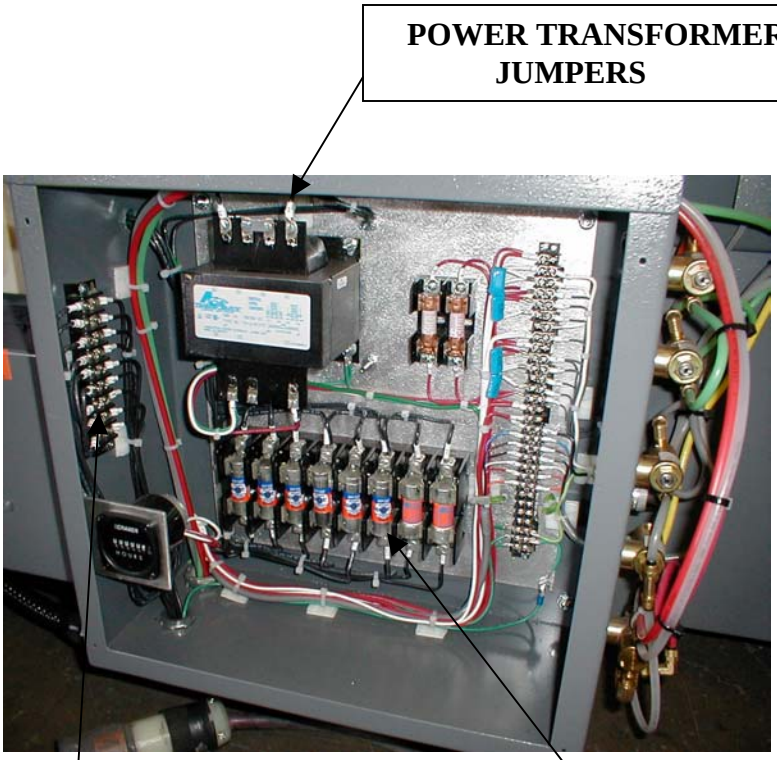
HEM SAW
The saw that cuts straight.

This voltage conversion procedure will consist of the following steps. Please check off the box as you finish each step until all boxes have been checked.

- [ ] 1. Remove junction box cover.
- [ ] 2. Replace the motor wiring terminal strip jumpers with the new jumpers.
- [ ] 3. Install the power transformer jumpers on their proper terminals.
- [ ] 4. Replace the eight power fuses with the new fuses on the lower 8-position fuse block.
- [ ] 5. Remove motor starter box cover.
- [ ] 6. Replace old heaters with new ones.
- [ ] 7. Put all components just removed back in the voltage conversion kit.
- [ ] 8. Replace the junction box cover and the motor starter box cover.
- [ ] 9. Apply the new voltage labels over the old voltage labels.

HEM SAW
The saw that cuts straight.

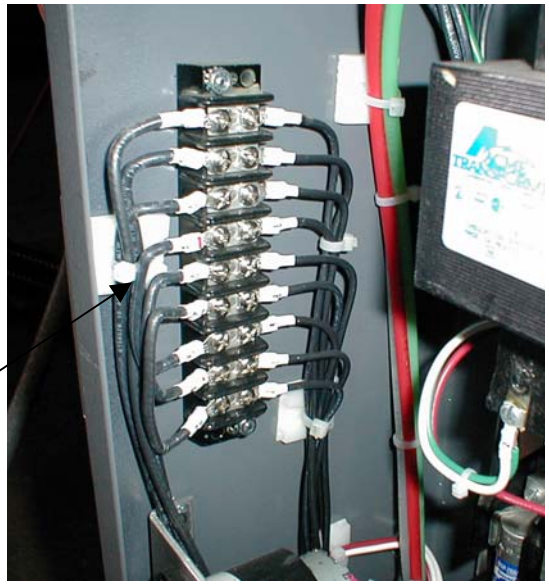
STEP 1



Remove the junction box cover. The inside of the junction should look like the picture above. The terminal strip shown above may be in a different location in your junction box.

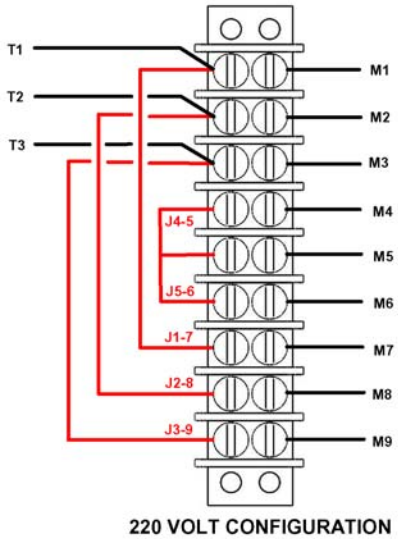
HEM SAW
The saw that cuts straight.

STEP 2

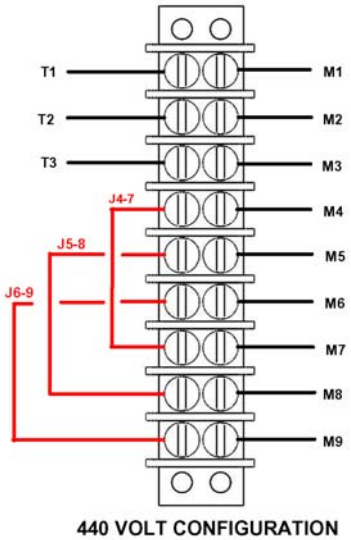


Motor wiring terminal strip (220V Shown)

Use the following diagrams to install the correct jumpers. Use the wire and terminals supplied in the conversion kit to make the needed jumpers. **Do not change any wiring at the terminal strip only the jumpers.**



220 VOLT CONFIGURATION



440 VOLT CONFIGURATION

HEM SAW
The saw that cuts straight.

STEP 3

The following two pictures show the locations of the power transformer jumpers. **Do not change any of the wiring of the transformer, only the jumpers located at the top of the transformer.**

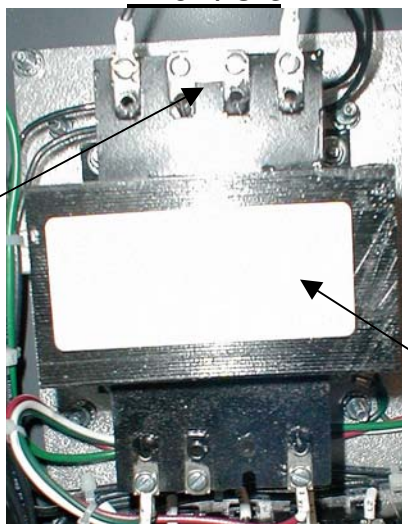
220 Volt

ONE JUMPER HERE

ONE JUMPER HERE

POWER TRANSFORMER

440 Volt



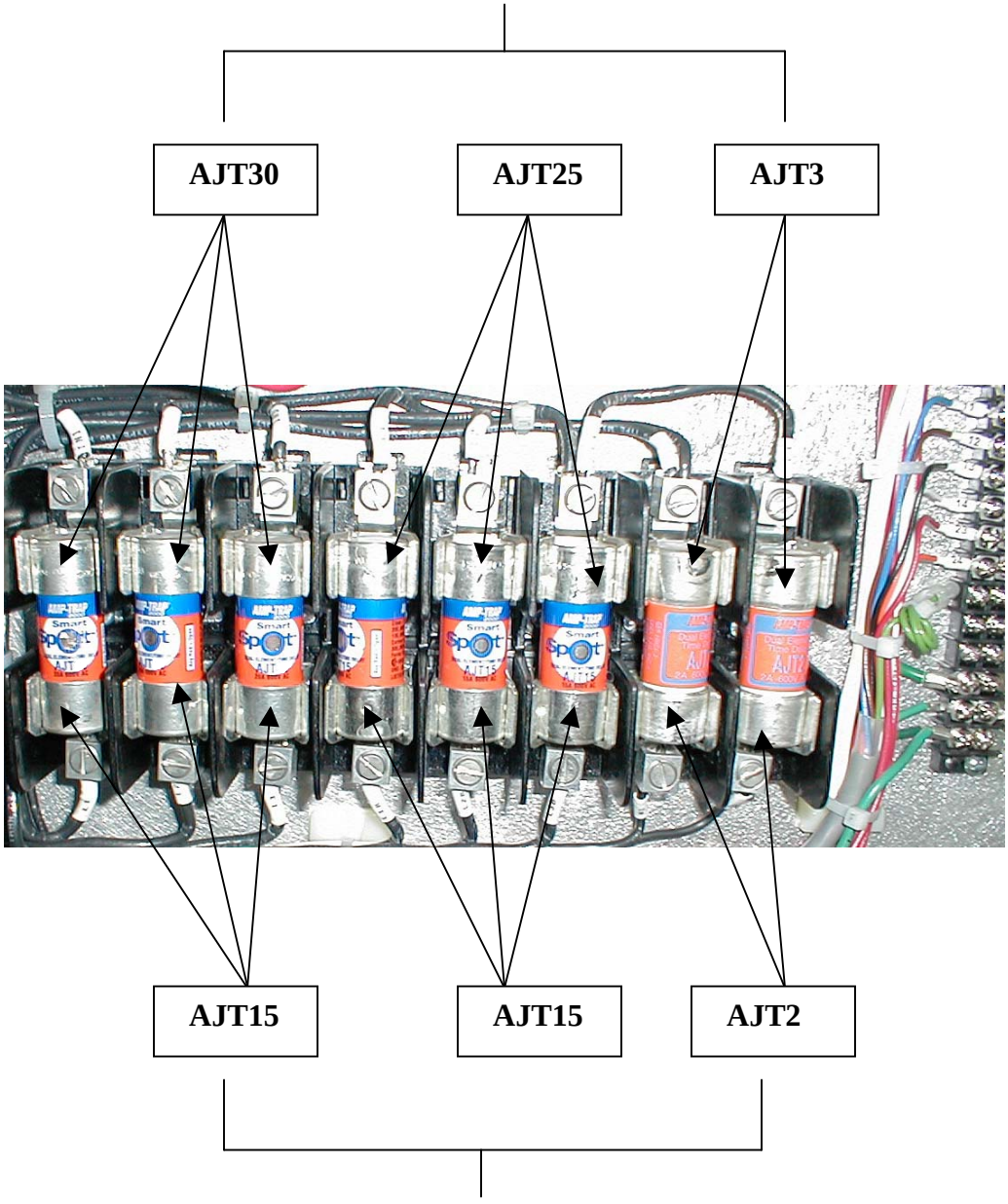
BOTH JUMPERS HERE

POWER TRANSFORMER

HEM SAW
The saw that cuts straight.

STEP 4

For 220 Volts use these fuses:



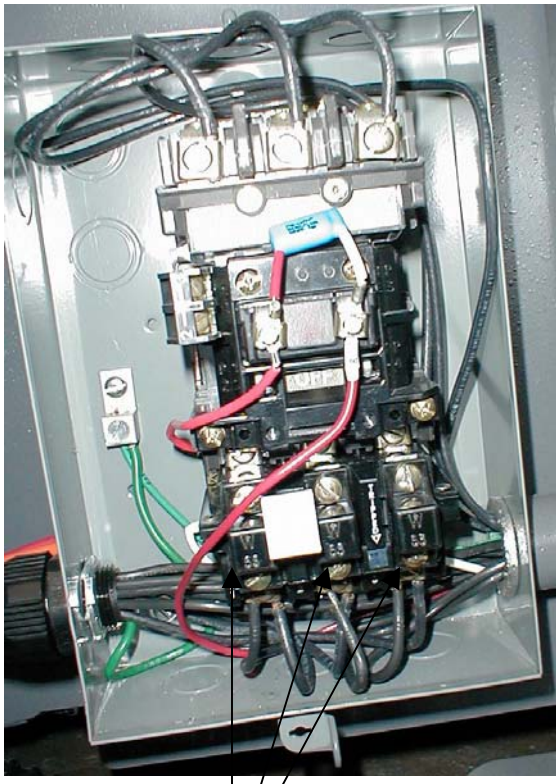
For 440 Volts use these fuses:

HEM SAW
The saw that cuts straight.

STEPS 5 & 6

Remove the cover from the motor starter box. Replace all three heaters.

Inside motor starter box



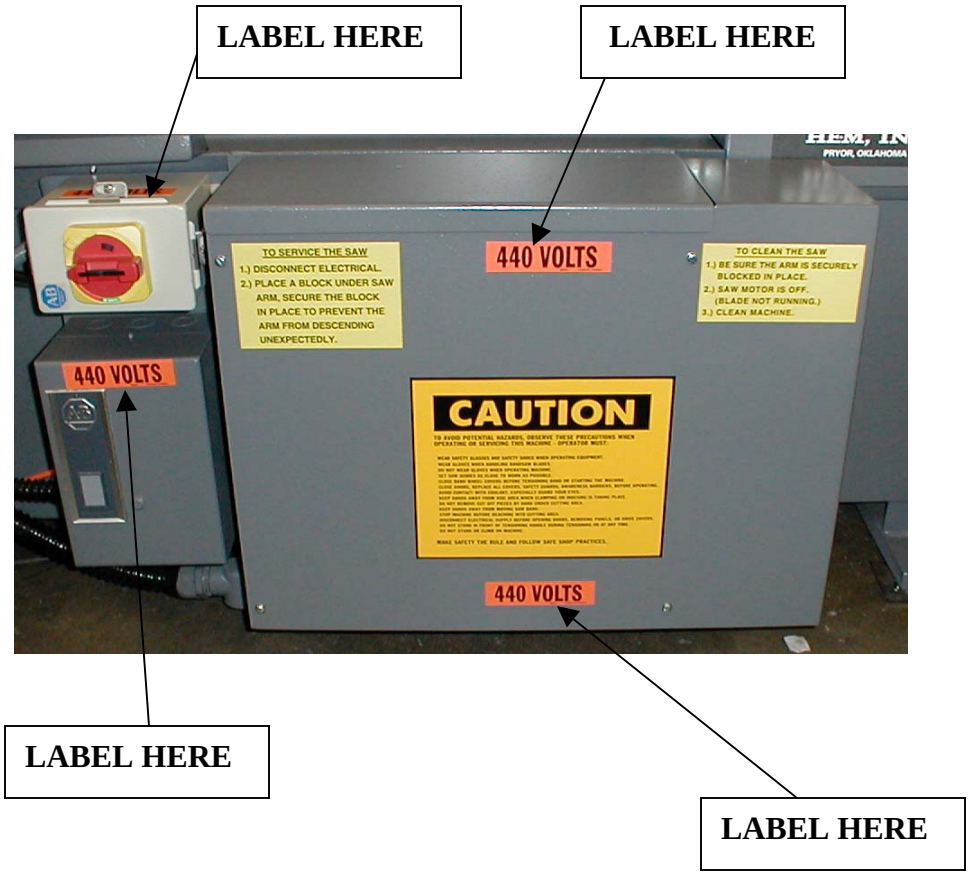
220 Volt uses: **W61**

440 Volt uses: **W53**

HEM SAW
The saw that cuts straight.

STEPS 7, 8 & 9

Remove the voltage label stickers from the conversion kit and set them aside. Put all unused and/or replaced parts back in the conversion kit and include a note giving the date of the conversion. Set the kit on the inside of the junction box and replace the covers of the junction box and motor starter box. Look at the voltage printed on the labels you removed from the conversion kit. All four labels should state the new operating voltage. Carefully clean the surfaces of the voltage labels on the junction box and motor starter box. Install the new voltage labels over the old labels. The conversion is now complete.



CONTROL FUNCTIONS

CYCLONE ALL-FUNCTION CONTROL

A Multi-Function Pushbutton Keypad Console controls the Cyclone Automatic Band Saw. Each saw function has an easy-to-read label and indicator light.

Related functions are organized in several groups for convenience.

The controls and indicators include Power, Coolant, Motor, Saw Clamp, Arm, Feed Clamp, and Shuttle. There are indicator lights to show a broken blade or out of stock condition, a parts counter, a “feed required” display and the CutWatcher panel.

Some saw functions - such as powering up the control, turning on the band motor and putting the saw into automatic - are controlled through a safety circuit that requires the operator to have both hands on the control.

BACK TO TABLE OF CONTENTS

The control also permits the operator to move the material by simply operating the appropriate switches. Thus, it becomes part of your material handling system.

CONTROL FUNCTION AND SWITCH DESCRIPTION

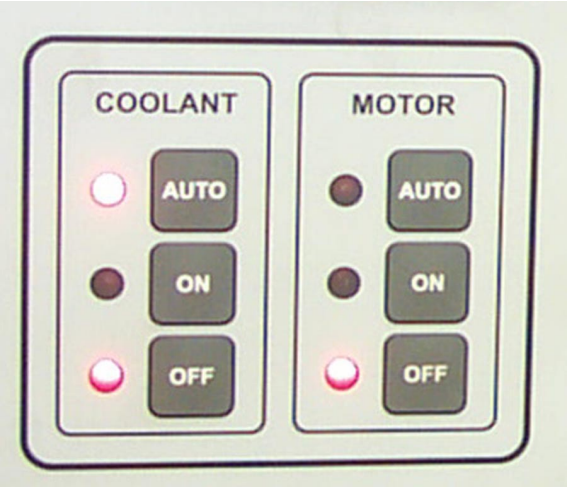
EMERGENCY STOP

The red Emergency Stop Button is located on top of the control. To shut down all power in an emergency, press the button down. To enable the control to power up, the Emergency Stop Button must be in the raised position. To raise the button, rotate clockwise and lift.

PANIC BUTTON

The panic button is located on the left side of the control console. When pressed, this activates the “panic” circuit, which shuts off the band motor and raises the arm.

When this circuit is activated, the “Broken Blade” light will begin to flash. To reset the panic, press the reset button on the Broken Blade, Out of Stock panel.



COOLANT

Coolant flow to the cutting area is controlled by the Coolant Switches. To turn coolant on manually, press the “On” key. To turn coolant off, press the “Off” key. To enable coolant to run only when the band motor is running, press the “Auto” key. When this function is in the Auto mode, coolant will run at any time the band motor is running.

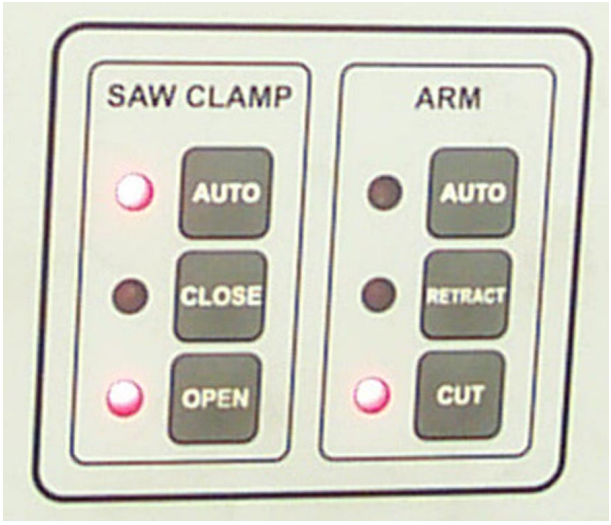
MOTOR

The keys on the Motor panel control the band motor. To turn the band motor on, press the “On” key AND the safety “Start” key in the upper right-hand corner of the control panel simultaneously. To turn the band motor off, press the “Off” key. To enable the motor to run automatically, press the “Auto” key.

Safety Start Switch

SAW CLAMP

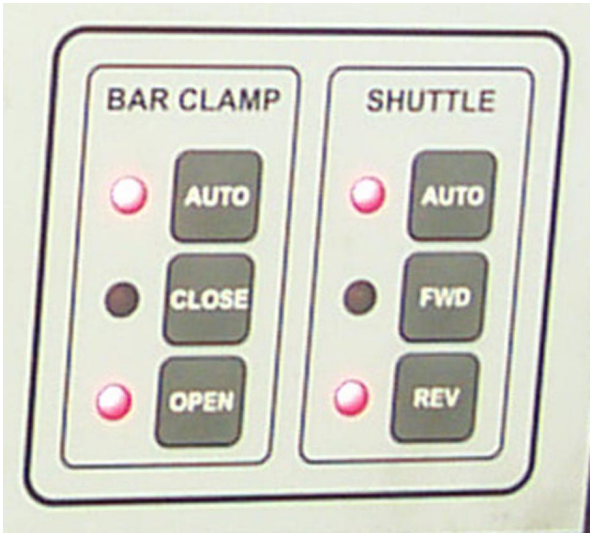
The Saw Clamp switches control the saw clamp, or vise. To clamp the saw vise, press the “Close” key. To release the clamp, press the “Open” key. To enable to vise to open and close automatically, press the “Auto” key.



ARM

The Arm switches control the saw arm. To raise, or retract the arm, press the “Retract” key. To lower the arm, press the “Cut” key. To enable the arm to raise and lower automatically, press the “Auto” key.

BAR CLAMP

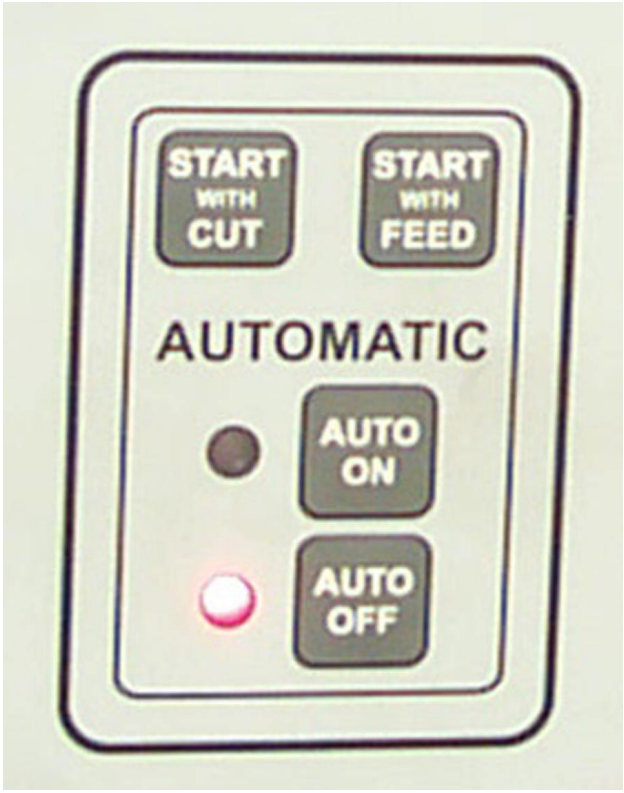


The bar clamp, or feed vise, is controlled by the Bar Clamp switch. To clamp material in the feed vise, press the “Close” key. To release the clamp, press the “Open” key. To enable the bar clamp to operate automatically, press the “Auto” key

SHUTTLE

The Shuttle keys control the shuttle. To move the shuttle forward, press the “FWD” key. To allow the shuttle to retract completely, press the “RET” key. To enable the shuttle to run in automatic operation, press the “Auto” key.

AUTOMATIC



The automatic operation of the Cyclone is controlled through the switches on the Automatic Panel. To place all of the above functions (Coolant, Motor, Saw Clamp, Arm Bar Clamp, and Shuttle) in automatic mode, the operator simply pushes the “Auto On” key. To turn those functions off, press the “Auto Off” key.

Before the saw can be put into automatic operation, all switches must be in the “AUTO” position. For convenience, if the operator presses the “AUTO ON” key in the Automatic Panel, all functions will instantly go to auto mode. The saw will not begin cycling however. To begin automatic operation, the saw operator must

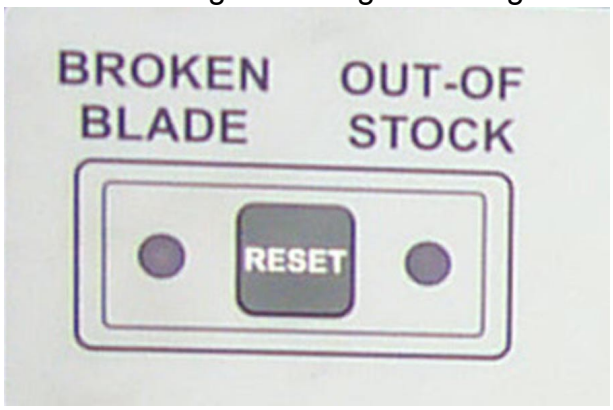
select either “Start with Cut” or “Start with Feed”.

Start With Cut means exactly that. The saw will immediately clamp and cut the material, as in a “trim” cut or “face” cut. The control does NOT count this first cut as a part. To initiate a “Start With Cut” the operator must press both the “Start With Cut” key AND the Safety “Start” key in the upper right-hand corner of the control panel.

Start With Feed means that when activated, the shuttle will move the material forward the set distance before making the first cut. To initiate a “Start With Feed” the operator must press both the “Start With Feed” key AND the Safety “Start” key in the upper right-hand corner of the control panel.

BROKEN BLADE and OUT OF STOCK

In the event of a broken blade, this indicator light will begin flashing and automatic saw operation will stop. If there is a broken blade, the band motor will stop and the arm will raise to the pre-set height. To re-set the Broken Blade Indicator, press the “Reset” key.



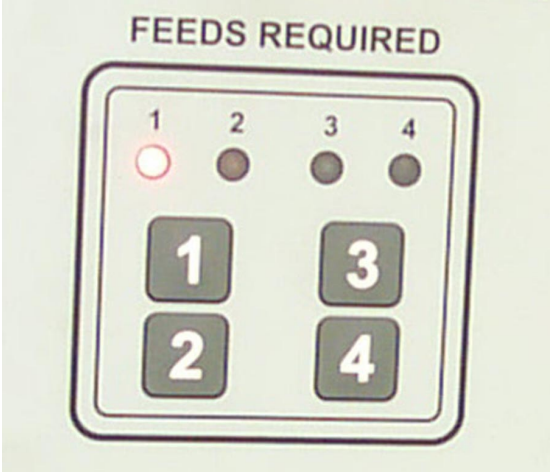
If the barfeed runs out of material, the “Out of Stock” light will flash. To reset the indicator, push the “Reset” key.

PARTS REQUIRED

This three-digit counter allows the operator to preset up to 999 parts. For instance, if 64 parts are required, the operator turns the thumbwheels until 64 is displayed. As the cutting operation continues, the parts counter will count down to zero. When all parts are cut, zero is displayed on the thumbwheels, the saw will stop automatic operation, the band motor will stop, and the arm will raise to the pre-set height.

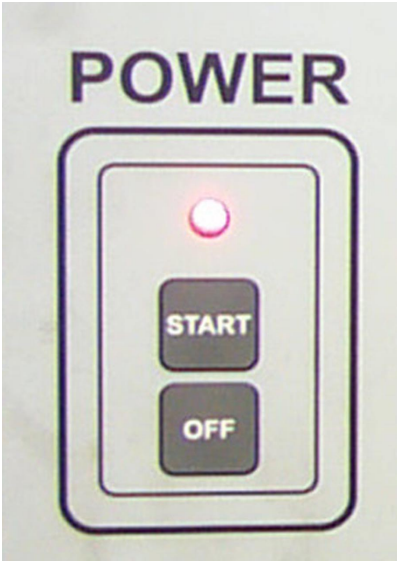
FEED REQUIRED

Parts up to 96” can be cut automatically on the Cyclone Automatic band saw. Because most jobs are less than 24” the “Feeds Required” counter automatically defaults to single index operation, which is indicated by the number 1 light being on. To run “double index” jobs (part lengths between 24” and 48”) the operator would press the Number 2 key in the Feed Required Panel. For instance, for a length of 30”, the Feed Required Counter would be set to 2 and the bar feed length adjusted to a length of about 14.970”. In that mode, the shuttle would feed the material forward twice, for a total length of 30”, and then cut. For more information about multiple index cutting, see the Barfeed Section



POWER

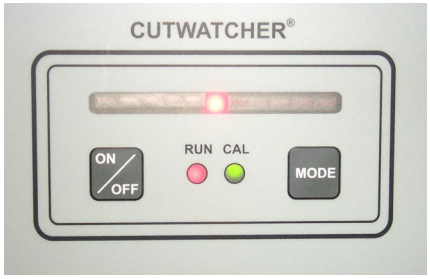
The Power Panel includes a “Start” and an “Off” key. To power up the machine, simultaneously push the “Start” key on the Power Panel and the “Start” key in the upper right hand corner of the panel. You will note that if you push only the “Start” key on the Power Panel, the indicator light above the Safety Start key will flash as a reminder that both keys must be pushed at the same time. This is to ensure that the operator has both hands on the Control Panel when the blade begins to move. This is a safety feature.



When the control is turned on, indicator lights will be displayed showing their start-up status.

To turn power off to the saw, press the “Off” key on the Motor Panel.

CUTWATCHER OPERATION



The CutWatcher is HEM Saw's patented blade deviation monitor. The CutWatcher reports, through a series of LEDs, whether the blade is cutting straight or crooked.

The CutWatcher has an ON/OFF key that toggles the system on or off, and a MODE key that toggles between CAL (calibrate) or RUN. To turn the display on, press the ON/OFF key. To calibrate the CutWatcher, select CAL, and then turn the adjusting knob, located on the fixed guide arm, until only the center LED is illuminated.

While cutting, the CutWatcher should be in the RUN mode. If the blade begins excessive deviation, the LEDS will light up entirely on one side, and after about 30 seconds the band motor will turn off, the arm will lift and both the "Broken Blade" indicator light and CutWatcher LED will flash. To continue, push the Reset key in the Broken Blade panel.

CUTTING PRESSURE AND FEED RATE

The cutting pressure regulator is adjusted by rotating the knob next to the cutting pressure gauge. This device controls the down force being applied to the blade. A setting of 4.5 (light) on the cutting pressure gauge will result in a very light cutting force. The higher the number on the cutting pressure gauge, the heavier the force.

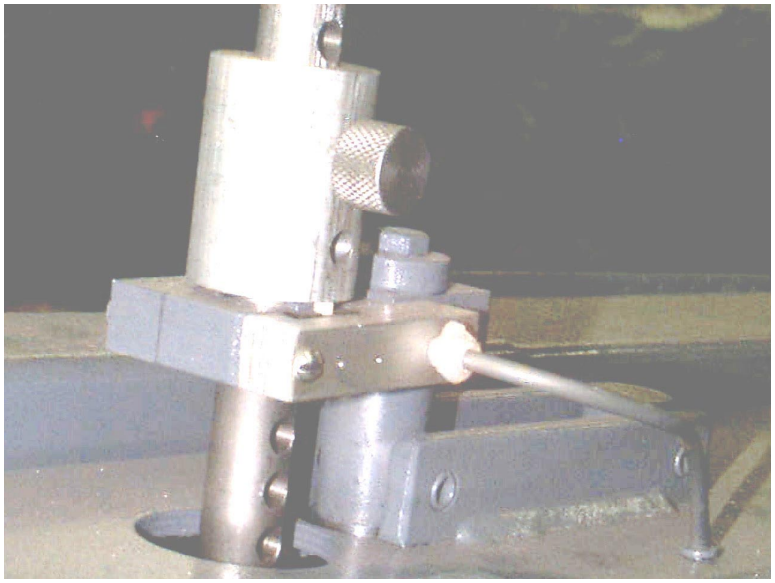
On a new machine, before adjusting the cutting pressure, the balance point of the arm should be determined. See the "Saw Set-Up" Section for instructions on how to perform this function.

The feed rate control, located on the bottom of the feed rate cylinder assembly,

controls the traverse rate of the arm.

For more information about cutting pressure and feed rate, please read those sections in the owner's manual and the "Practical Cutting Guide."

HEIGHT STOP ADJUSTMENT



During installation, it may be necessary to adjust the Lower Limit Stop. This is the mechanical stop that determines how far down the blade will come. The stop should be adjusted so that the blade cuts completely through the material by about 1/16' inch. Once adjusted to the proper cut depth, tighten the setscrew on the stop nut. The sliding sleeve mounted on the height stop rod and is held in place by a pin. Set the stop so that the blade is about one inch higher than the material.

CLAMP ADJUSTMENT

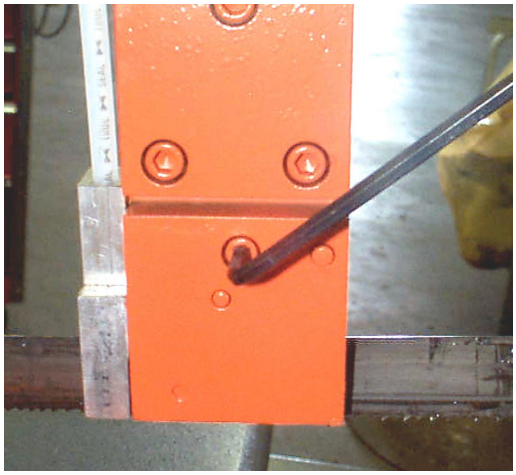
The saw vise slides on the vise ways. When the clamp is engaged, the vise is pulled toward the fixed saw vise, clamping the material. Before starting a cutting job, push the vise jaws against the material being cut.

Clamping pressure may be adjusted to any pressure between zero and 100 psi. During normal operation, while cutting rigid materials, a clamping pressure of 80 psi is sufficient. Less pressure may be required when cutting thin-wall tubing or light gauge materials because the clamping force may permanently distort the material.

ADJUSTABLE GUIDE ARM

For efficient sawing, the adjustable guide arm needs to be as close to the material being cut as possible. This helps to stabilize the blade and create a more rigid cutting tool. To move the guide arm, loosen the holding screw and slide the guide arm to the desired position. Always remember to re-tighten the holding screw. Make sure the guide arm has enough clearance so that it will not crash into the material being cut.

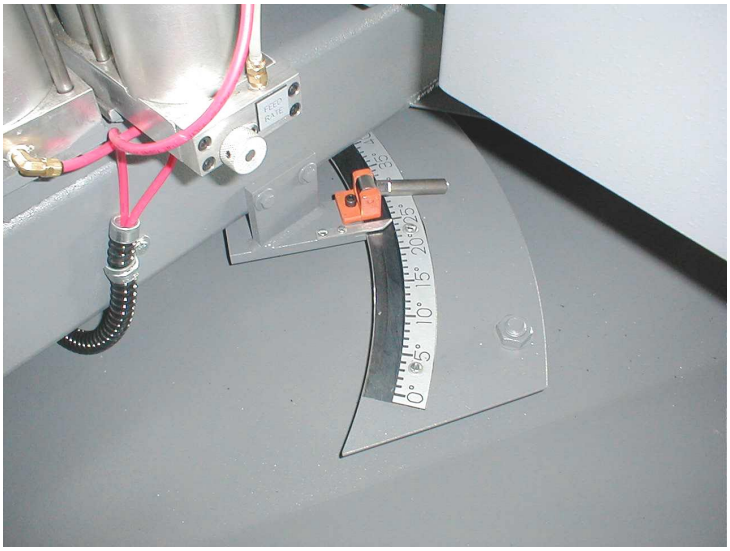
GUIDE CAPS



The guide caps hold the blade in a vertical position. The cap screws that secure the guides should be snug enough to hold the blade in the proper position, but not so tight as to create a braking action on the blade. “Screwdriver tight” is about right.

MITER CUTTING

The Cyclone is capable of making angle cuts up to 60 degrees. To move the arm to make an angled cut, first raise the arm. Loosen the camlock handle and rotate the arm to the desired angle. Always make sure to lock the camlock before cutting.

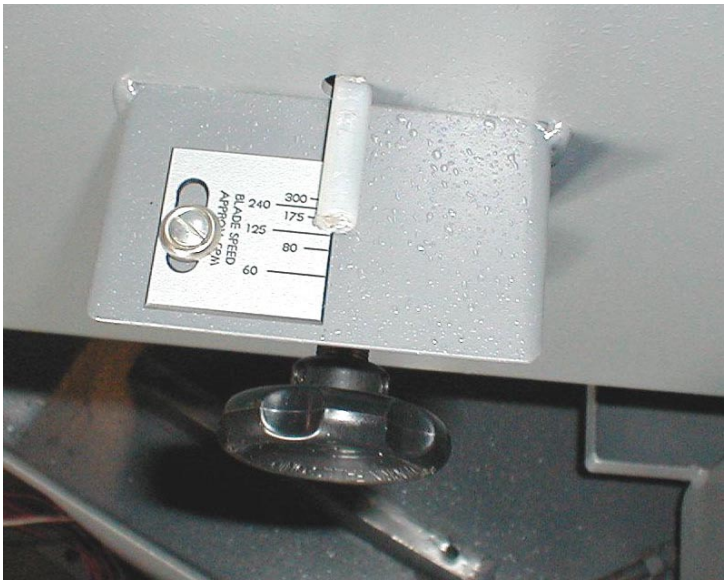


When cutting angles, always verify that there is clearance for the guide arm so that it does not come into contact with material being cut.

BLADE SPEED ADJUSTMENT

Always make sure every safety guard and awareness barrier is in place before turning on the band motor. Blade speed is adjustable between 65 feet per minute and 350 feet per minute.

NEVER ATTEMPT TO CHANGE BLADE SPEED IF THE MOTOR IS NOT RUNNING. If you try to change blade speed while the band motor is stopped, serious damage to the motor pulley will result!



Do not attempt to run the blade slower than the minimum speed for your saw model or faster than the maximum speed for your saw model.

POWER BRUSH ADJUSTMENT

The power brush helps keep the blade clean while cutting. It should be adjusted so that the tips of the wires on the brush just sweep through the gullets of the teeth. If the brush is adjusted too close to the blade, it may cause premature dulling of the blade and will cause the wire brush to wear out quickly.

Saw Set Up

Pre-Operational Safety Check

Before operation, all personnel who work the band saw machine or associated equipment should review the following:

Has the operator received and understood proper instructions, including reading the instruction manual?

Is the operator attired in accordance with applicable regulations, including eye and ear protection, safety shoes, head protection, gloves (while handling blades, material, etc.), and appropriate attire (no loose fitting clothes and no jewelry)?

Is the machine in proper running order including emergency stops and limit switches and are safety features in use such as interlocks, guards, access covers and awareness barriers. Are safety rules posted nearby?

Is the machine and immediate area in good housekeeping order? Obstacles such as tools, clipboards, and paper should be kept away from the saw arm and controls.

Is the operator aware of electrical, hydraulic and pneumatic procedures such as location of the power source, emergency shut-off, disconnects, and fire-fighting procedures?

Is the operator properly trained in material handling such as lifting, pushing, pulling, or any other initiated force to give motion to or stop the material? Does he know to always handle material carefully to avoid slipping or dropping the material on parts of his body?

Report any damage, suspected problem or missing safety guard or barrier to your supervisor immediately. Do not attempt to operate the saw.

BACK TO TABLE OF CONTENTS

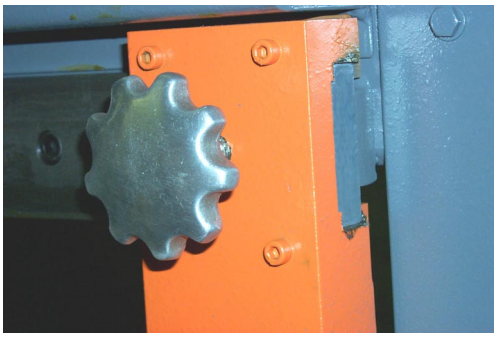
GETTING READY TO SAW

Before you can start any job, the saw has to be properly set up. This means the material has to be loaded, the barfeed length adjusted, the band speed adjusted and several other functions have to be prepared for automatic operation.

After you have some experience with the Cyclone saw, these preparations will become automatic and very often some functions, such as blade speed, will not require any changes of adjustments.

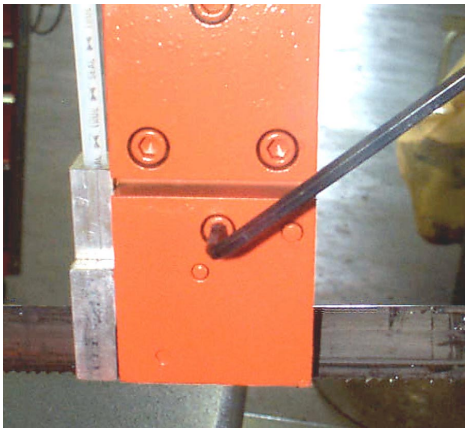
OPEN ALL VISES

Slide vises back far enough to allow the material to be loaded into saw



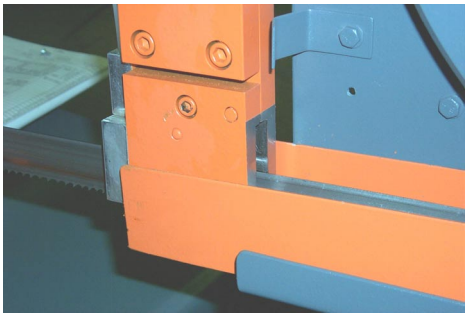
SET MOVEABLE GUIDE ARM

Set movable guide arm width to be material size plus 1". Set a little wider if cutting large square material. If making a miter cut (angle cut), make sure the guide arm will clear the material.



To move the adjustable guide arm, loosen the guide lock knob and slide the guide arm to the desired position. Always remember to tighten the guide lock knob before cutting.

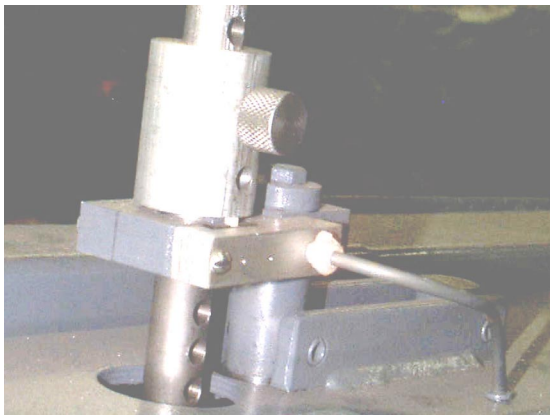
Check that the guide caps screws are snug. The guide caps hold the blade vertically. The cap screws should be adjusted “screwdriver tight”. If the guides caps are too tight, it will cause premature blade fatigue and carbide wear. If the guide caps are too loose, you may get crooked or dished cuts.



Make sure that the OSHA guard moved with the guide arm.

ARM HEIGHT STOP

The upper height limit is normally set so that the blade will clear the material being cut by approximately 3/4".



Lower the arm and set the upper stop. Raise the arm and note the clearance.

Reset the stop if necessary and raise the arm again.

SET CUTTING PRESSURE

On a new machine, before adjusting the cutting pressure the balance point of the arm should be determined.

To determine the balance point, follow the procedure below.

Turn the feed rate control knob clock-wise until slightly snug, then turn it counter clock-wise about three full turns to make sure it will not have any effect on the rate the saw arm falls.

Raise the stop position so the arm will have plenty of movement.

NOTE: The cutting pressure regulator determines the amount of pressure in the lift system, and the amount of cutting force the blade will place against the material being cut. On the Cyclone saw, the smaller the indicated number, the lighter the cutting force. The larger the number, the heavier the cutting force. For instance, the "balance" pressure will be about 3.5 on the cutting force gauge. This is the approximate pressure required to hold the arm in "balance" when the arm is in cut mode. With an indicated reading of

7 on the cutting force gauge, the arm will be very heavy. Most cutting will take place within the range of about 4.5 to 5.5 on the cutting force gauge.

With the arm all the way down turn the cutting force regulator clockwise until the saw arm raises.

After the saw arm raises a few inches off the bottom turn the cutting force regulator counterclockwise until the saw arm stops lifting.

Now slowly turn the regulator a little bit more counterclockwise until you can tell that the saw arm is ever so slightly starting to fall.

The pressure that is showing on the cutting pressure gauge is the balance point.

Note this pressure for future reference.

If a scale were placed under the saw arm it would show that the saw arm weighed almost nothing. Thus the saw arm would apply very little force to the saw blade for cutting.

If the gauge pressure were decreased the saw arm weight would increase. The force on the arm will be about 5 pounds for every PSI under the balance point that the gauge reads.

Set the pressure gauge according to the type of material you will be cutting and the blade speed you will be running.

LOAD SAW WITH MATERIAL

Load material onto the feed and slide material forward until material is in position for sawing.

Locate all vises up to within 1/8 inch of material.

SET CLAMPING PRESSURE LIGHT 20# HEAVY 100#

THIN WALL TUBING:

Too much clamping force can permanently distort thin wall material. To test thin wall material, turn pressure down to 0. Put saw vise switch to the close position. Slowly turn pressure up until tube starts to collapse then reduce the pressure slightly. Release vise to make sure tube will return back to its natural state and won't be distorted.

SOLID MATERIAL:

Clamping force should be at maximum.

CLAMP MATERIAL

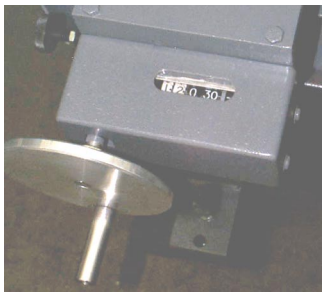
Set the material in position for sawing and clamp the saw vise on the material by pressing the “Close” key for the saw clamp.

If a face cut is to be made, set the switch to auto position instead of close position and let the saw close the vise at the appropriate time.

SET FEED LENGTH

PARTS 24 INCHES OR LESS

The feed must be at its forward position before attempting to set the feed length. A lock is located on the length display to hold the part length once is set. This lock should be loosened before any adjustments are made and locked after adjustment is completed. Turn the crank handle until the proper part length is shown. The feed length is now set.



NOTE: To adjust bar feed for length of part, the shuttle must be forward.

PARTS OVER 24 INCHES

For parts over 24 inches, the feed length setting will need to be calculated. This is necessary because the feed will have to make multiple indexes to achieve the part length required. When the stroke length is set, the saw will feed the stroke length plus the width (KERF) of the blade. When multiple indexes are required, the extra kerf lengths must be subtracted from the overall length, or the part will be too long.

SET COUNTER

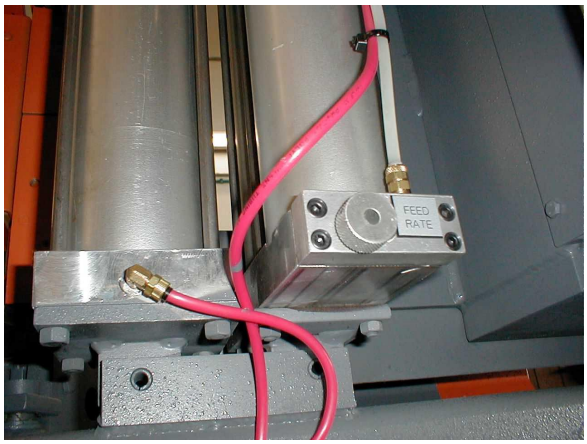
The counter is used in the automatic cycle to count the number of completed cuts. After each completed cut, the counter will count backwards until the counter shows 000. At this point the control lifts the saw arm and shuts down the saw. If a single bar of material is being feed through the saw you dial the number of parts required. If multiple bars of material are being fed through the machine, the operator will need to divide the number of parts required by the number of bars being fed through the machine to determine the number of completed cuts needed for each bar and dial this number on the counter.

SET FEED RATE

Slowly open the feed rate until the blade begins to fall at about 1" per second.

When cutting thin wall material, and the blade is not moving fast enough through thin sections, the feed rate can be increased to move the blade at a slightly higher rate.

When cutting solid material, after the blade has made contact with the material and is well into the cut, the feed rate can be opened all the way. In this case, only the cutting pressure will be in control of the saw arm.



In structural steels and thin wall tubing, the feed rate control is used to regulate how fast the blade moves through the thin sections of the material.

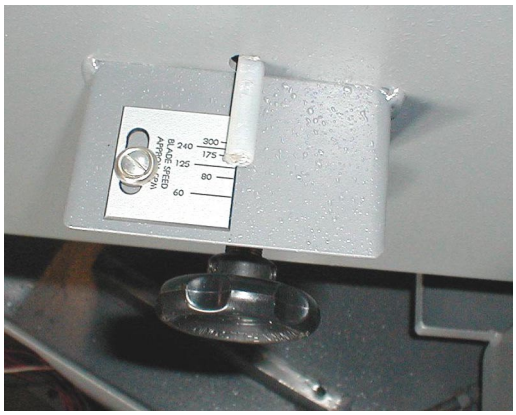
On solid materials it is used as

a blade entrance and exit control.

Set the arm fall with the feed rate control so the arm is falling faster than it will cut, but not so fast that the teeth of the blade will be ripped off when it makes contact with the material, or when going through thin cross sections.

When the arm is falling faster than it will cut through material, it will be moving through the material by cutting pressure only.

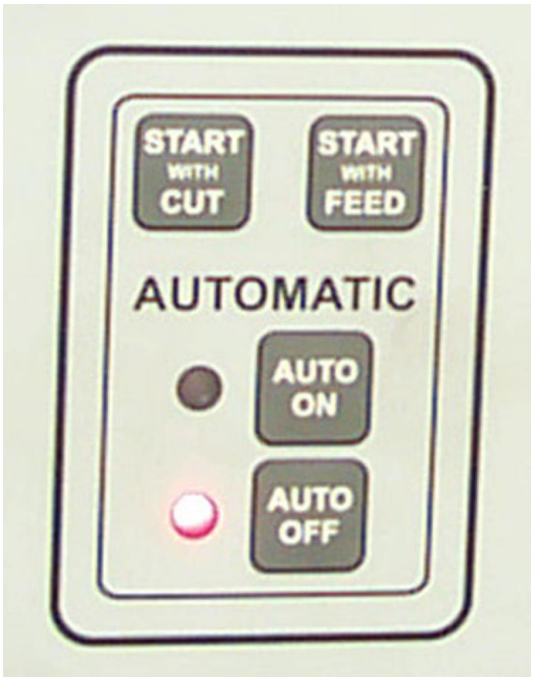
SET BAND SPEED



Make sure it is safe to turn the band motor on. Start the band motor by pressing the “On” key AND the safety “Start” key in the upper right hand corner of the control panel. Adjust motor band speed by rotating the blade speed control knob. Adjust to the correct band speed.

NOTE: Never attempt to change blade speed if the band motor is not running. Serious damage to the pulley may occur. Always change speed ONLY when the band motor is running.

CUTTING OPERATION



Once the saw is ready, material loaded, vises pushed up against the material, material located properly on the saw, feed length adjusted, guide arm adjusted correctly, blade speed, cutting force and feed rate set, it’s time to put the saw into automatic.

The saw won’t go into automatic unless all the “function” keys, such as motor, saw and feed vise, shuttle and arm are in the “AUTO” position. To set ALL the functions to automatic, simply press the AUTO ON key. This DOES NOT put the machine into automatic; it just prepares the control to start.

START

There are two methods of putting the Cyclone into automatic; Start With Cut or Start With Feed. Start With Cut means just that, the saw will clamp and cut the material first. Start With Feed means the barfeed will move the pre-adjusted length forward first before cutting.

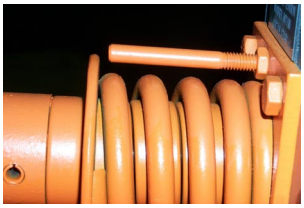
To begin operation, press either the Start With Cut or Start With Feed key AND the Safety Start key in the upper right-hand corner of the console.

CHANGING BLADES

Never operate the saw while wearing gloves. A moving blade can catch a glove and pull your hand into the operating zone.

But always wear gloves when handling the saw blade or while changing saw blades.

To change saw blades, first raise the arm a few inches. Release the tension on the blade by turning the tension handle counter-clockwise until the blade “relaxes”. Always stand to the side of the tension handle when tensioning or releasing tension on the blade. Open the drive wheel door and the idle wheel door. Lift the latch on the sliding blade guard and slide the guard out of the way. Loosen the guide cap screws and slip the blade out of the guides. Lift the blade out of the saw arm.



To install a blade, first make sure the blade teeth are pointed in the proper direction. With the doors open, slip the blade into the saw arm and over each wheel. Use the tension handle to remove excess slack so that you can twist the blade and pull it up into the blade guides. Move the sliding blade guard back into the operating position and secure the blade guard latch. Close both doors. Turn the tension handle until the washer is about 1/8” inch from the tension indicator rod.

NOTE: When tensioning or de-tensioning the saw blade, always stand to one side of the tension handle!

Do not over-tension the blade. Damage to the gearbox and idle wheel bearings may result.

Re-tighten the guide cap screws. Again, “screwdriver tight” is about right.

After a new blade is installed, jog the band motor briefly, just long enough so that the blade will track to its natural position on the band wheels, before beginning a new cutting job.

SETTING CUTTING PRESSURE.

WHY ONE SETS THE CUTTING PRESSURE AND FEED RATE:

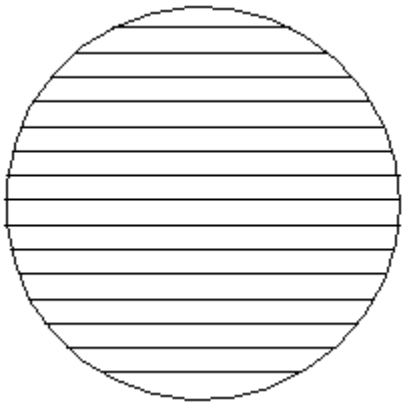
1. CONSTANT SPEED - Many saws use a constant speed feed rate control to regulate the rate at which the blade travels through the material. Regardless of the variables encountered while cutting, the blade will fall at a constant rate. This method either does not cut straight, or it doesn't cut quickly. It cannot compensate for hard spots, soft spots, or a worn blade. It abuses the blade in many ways. In soft materials it tends to overfill the gullets. If the feed rate is too slow it can wear the ends of the teeth off. It provides no feedback to the saw.

CONSTANT FEED -- VARIABLE FORCE

CUT MARKS ARE EVENLY SPACED

Slow entry means light blade force, and that may dull the blade in work hardening material or in bars with hard or abrasive scale.

MAXIMUM FORCE



In the wide section the blade gullets may be over filled, stripping the saw teeth out, or the blade may stall

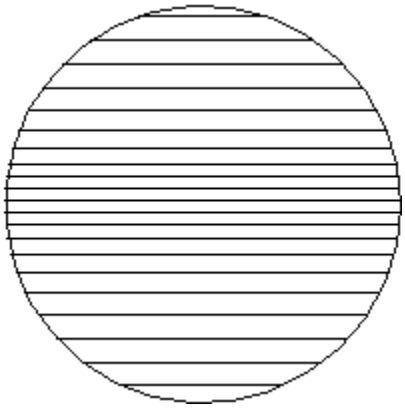
In round bars the center is the danger zone.

2. CONSTANT FORCE - Another method is to use a constant force between the blade and the material. This allows the saw to slow down when hard spots or a dull blade is encountered. However, this approach does not work well when the cross sectional area is reduced during the cut. The force exerted becomes too great for thin sections.

BACK TO TABLE OF CONTENTS

WIDE SPACING AND FAST FEED RATE

In the top and bottom section the saw teeth may penetrate too deeply, over-loading the saw teeth and causing them to pull out.



NARROW SPACING AND SLOW FEED RATE

WIDE SPACING AND FAST FEED RATE

In round bars the top and bottom are the danger zone.

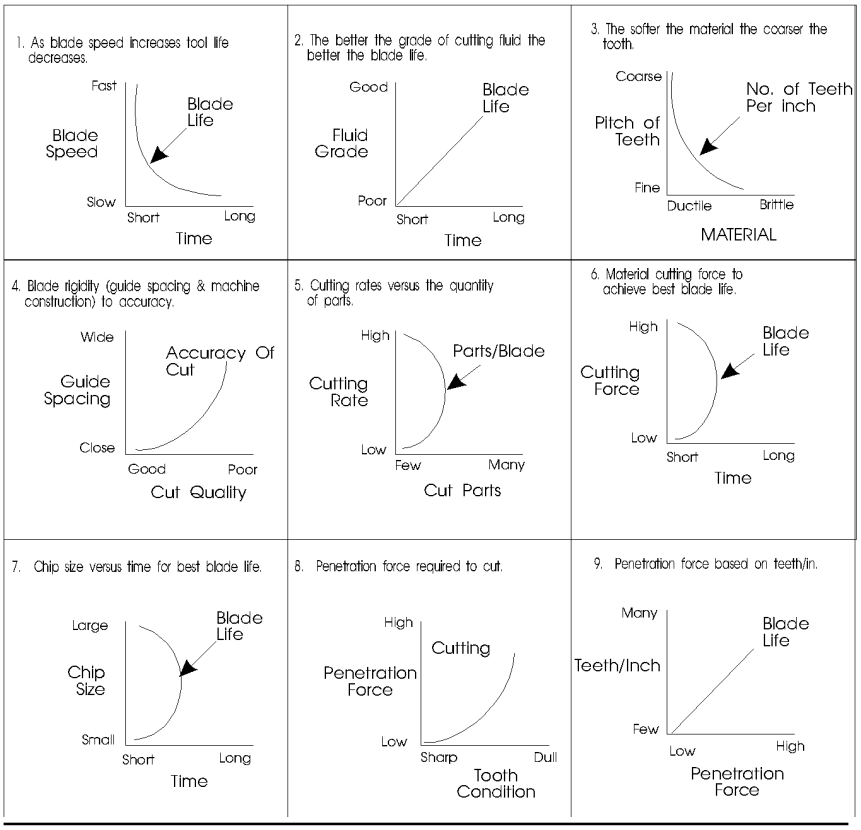
3. THE HE&M SAWING SYSTEM - The HE&M Saw System uses a dual control system to achieve a near constant cutting rate (square inches/minute) and the fastest and straightest cutting possible for all conditions. The blade provides feedback to the saw, telling the saw how to cut. To do this, the pressure that the blade exerts on the material is controlled. As the material cross section increases, the rate that the saw arm falls decreases and vise versa. The result is a constant cutting rate in square inches per minute and a much straighter cut.

4. In addition to the pressure control, the HE&M Saw System has a control to regulate the maximum rate that the blade travels through the material. This control is used to regulate the rate at which the blade enters the material and also to prevent the blade from moving too fast through thin sections.

There is a relationship between cutting rate, blade wear, and cutting straight. In general, the faster the cut, the faster the blade wear and less straight the cut. You will have to determine the cutting rate you wish to use based on the blade costs, the accuracy required, and the labor rates etc.

NOTE: PLEASE READ OUR PRACTICAL CUTTING GUIDE AT THE END OF THIS MANUAL.

NINE FACTORS THAT AFFECT CUTTING

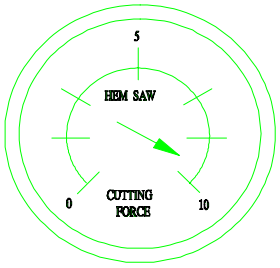


CUTTING FORCE.

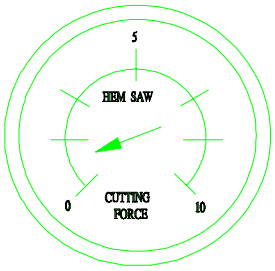
Cutting force is generated by the weight of the saw arm. Two lift cylinders control this weight. The lift cylinders apply a force that reduces the effective weight of the saw arm. As the lift pressure increases, the effective weight decreases. If the pressure is large enough, the saw arm will actually rise.

The feed rate and cutting pressure controls are incorporated into the system. The main purpose of the system is to provide a wide pressure range for precise setting of the cutting pressure.

The HE&M Saw Sawing System uses both cylinders to supply the lifting force and setting the balancing pressure. The Cutting Pressure Regulator governs the pressure in the cylinders. It sets the maximum and minimum force that can be applied to the blade. If the Cutting Pressure Regulator is set too low, the blade force will be increased. If the Cutting Pressure Regulator is set too high, the maximum cutting pressure will be reduced. If it is set extremely high, it may not be possible to lower the saw arm.



High Reading
Low Cutting Force



Low Reading
High Cutting Force

As the pressure reading on the gauge is increased, the pressure in the cylinders also increases. As the pressure in the cylinders increases, the cutting force decreases because the cylinders are supporting more of the weight of the saw arm. Thus, as the Cutting Pressure Gauge reading is increased, the cutting force is decreased.

The Feed Rate Control is used to set the maximum speed at which the saw arm drops in free air and in thin sections. The primary purpose of this control is to prevent the teeth from being ripped off the blade as it first makes contact with the material or while cutting thin sections. This control is usually set to let the saw arm drop at about 1" per second (for mild steel). All material has a best rate of cutting (in square inches per min). However, this rate varies. Parameters that cause this variation are:

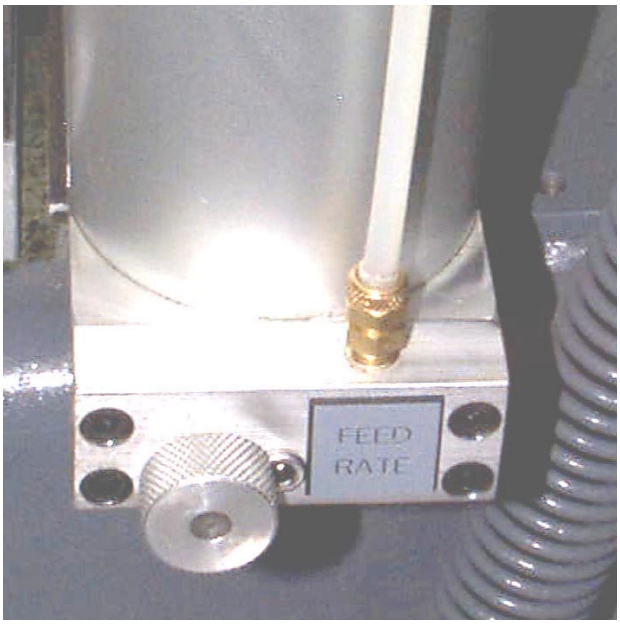
1. Tooth Style
2. Number of Teeth per Inch
3. Coolant
4. Blade Dulling
5. Material Size.

The cutting pressure setting permits the blade to control the saw arm. For example, if a dull section exists on the blade, the arm will remain stationary until this section passes. Also, if an area has the gullets packed full of chips, this area will pass before the blade is forced into the material. This important feature prevents blade damage.

SETTING THE CUTTING PRESSURE WHILE CUTTING.

1. First be sure that the blade speed is correct for the material being cut.

2. Set the feed rate valve so that the arm is dropping at about 1" per second (for mild steel). * In general, the saw arm is set to fall slightly faster in free air than it would if it were cutting through material. Note that this rate depends on the material you will be cutting.



3. Set the approximate cutting force. This will depend on the type of material being cut, its' shape, the blade speed, the type of blade, the coolant being used, etc. After some experience you will be able to estimate the proper cutting pressure.

4. Determining the feed pressure is mostly a judgment call. Someone remote from the job location shouldn't recommend it. Although an approximate value can be recommended, it is only a starting point. Ultimately, the operator must fine-tune the saw for the circumstances under which he is cutting.

5. The operator will set the saw based on the way it is cutting. In general, powdered or fine chips indicate too light a cutting force. Curled chips indicate proper settings. Burned chips indicate too much cutting force or too high a blade speed.

Cutting Force & Clamping Force Controls on the Control Panel

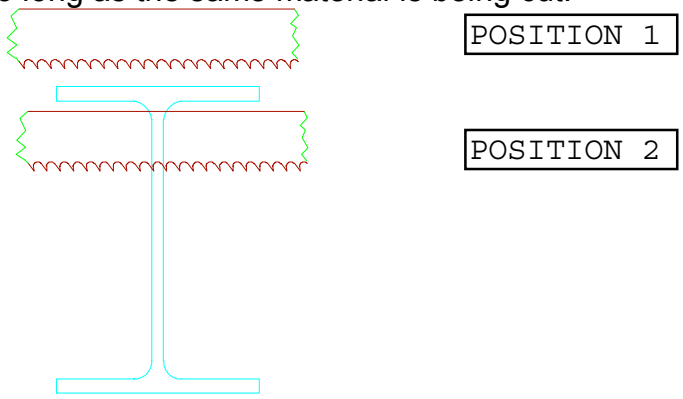
6. Load the saw and test cut some material. Adjust the blade speed and cutting pressure until you get the desired cutting rate. In general, the cutting pressure determines the thickness of the chip. If the chips are short and thin, then increasing the cutting pressure is indicated. While increasing the blade speed will tend to make the chips thinner, it has more of an effect on the heat generated by cutting. If the material is discoloring then slowing the blade speed is indicated.

Note: See our Practical Cutting Guide for a more detailed explanation at the end of this manual.

SETTING FEED RATE.

This control is used to set the rate that the arm moves when entering material or when cutting through thin sections. When set properly it has no effect on the cutting pressure or how fast the arm will raise. When cutting solid materials, its primary function is to keep the saw from entering the cut too fast. When "in the cut" on solid material, the feed rate could be wide open. However, any setting that allows the arm to move faster through free air than it cuts through material will allow the cutting pressure to control the saw arm. If the saw is set as described, the cutting speed through a material at a particular cutting pressure can be determined.

When cutting other materials (i.e. structural shapes, tubing, etc.) the feed rate regulates how fast the saw will move through thin sections. When cutting structural shapes the feed rate valve is set so that the arm will not move so fast as to damage the blade when moving through thin sections of the material. Normally, the feed rate is first set so that the blade will not be damaged as the blade contacts the material. Then when it enters the thin section, it is reset to the desired cutting speed. It is now properly set for **entering and cutting** that material. It is not necessary to reset so long as the same material is being cut.



Assume that the cutting pressure has been set for cutting the full width of the material. This is the normal setting. As the blade cuts through the wide section as in position 1, everything is all right, but as the blade enters the narrow section, as in position 2, the area being cut decreases. Since the force on the blade is still the same but the area has decreased, the loading in the teeth will increase. The speed that the arm is moving will also increase. If the tooth loading and rate of travel increase too much, the teeth will be ruined. To prevent this, the feed rate sets the maximum speed by reducing the cutting force on the arm. A pressure drop across the feed rate valve is developed which then reduces the force on the arm and slows the cutting. This prevents blade damage.

When cutting high strength materials, it is very important to take the correct size chip. Therefore, the speed of entry is critical, especially when the material is round or a corner is the starting point.

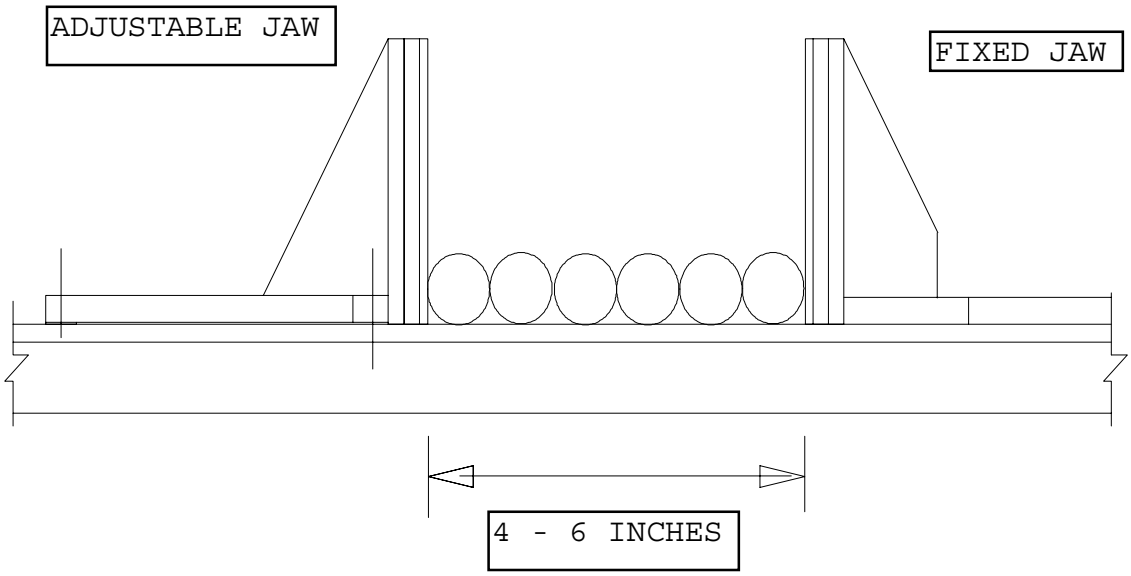
For Example: In a case as described above, the first teeth entering the cut would be taking a chip too large. The tooth would be damaged, either stripping the tooth out of the blade, dulling it, or fracturing the cutting edge. If this occurs the part will most likely be cut, but the number of pieces that the blade can cut will be reduced.

BUNDLE CUTTING.

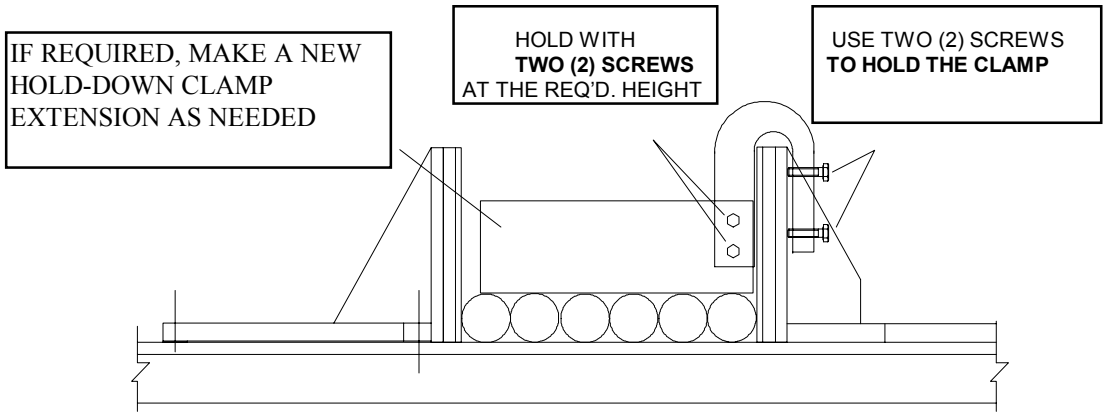
If you want or need to make bundle cutting, here are some guidelines to help you make it easy, reliable and fast. Remember: bundle cutting makes cutting more difficult because of vibration, wide guide spacing, coolant not getting to the teeth, and cutting through work-hardened chips. Please read our Practical Cutting Guide at the end of this manual.

Bundle Cutting Guidelines.

1. To perform bundle cutting as efficiently as possible, keep the jaws opened between 4” and 6" and set just one row of material (see figure below). If the bundle gets wider, the cutting performance may drop and the material handling time increases. The 4” - 6" dimension is a conservative number.



2. Use the hold down clamp and the hold down clamp extension to prevent the material from lifting up. These parts are supplied with your machine for both the saw vise and the feed vise. If needed you can cut or make another hold down clamp extension as required.



NOTE: THE USE OF THIS HOLD DOWN FIXTURE MAY PREVENT THE OUT OF STOCK LIMIT SWITCH FROM FUNCTIONING BECAUSE THE FEED VISE MAY CONTACT THE EXTENSION AND THINK IT IS MATERIAL. THEREFORE, THE OUT OF STOCK WILL NOT BE ACTIVATED.

ROUTINE MAINTENANCE -- Pneumatic Saws

DAILY:

Clean the saw viseways.
Clean the feed viseways.
Clean the feed frameways.
Check the air line filter/lubricator and drain.
Check the blade brush for wear and that it is adjusted properly

MONTHLY:

Check the oil level in the gear reducer.
Check the oil level in hydraulic reservoir.
Oil lift cylinder and control cylinder pins with light oil.
Fill oil reservoir on the filter lubricator. Use DTE24 or air tool oil.
Clean chips and debris from the blade guides.
Verity that there is a small controlled air leak at the cutting pressure regulator.
Grease idle wheel bearings (lightly).

EVERY YEAR:

Grease the screw and nut on the tension handle.
Grease the tension slide assembly.

EVERY THREE YEARS:

Change oil in the gear reducer. Use MOBILE SHC-634 synthetic gear oil. In ABSOLUTELY NO CASE should an oil containing sulfur be used in the gearbox. The gearbox uses a bronze gear which will be attacked by any oil containing sulfur.
Change oil in the hydraulic reservoir. Use DTE 24 or a light-weight hydraulic oil.

BACK TO TABLE OF CONTENTS

Filter Lubricator

The filter lubricator helps reduce the amount of moisture from getting into the saw's pneumatic system, and also provides a small amount of lubrication to keep pneumatic seals and solenoid working properly.

Set the air regulator for 100 psi by turning the adjusting knob. To adjust, pull the knob up slightly to unlock the knob. Turn the regulator clockwise to increase the air pressure. When adjustment is complete, push the knob down to lock it into place.

The lubricator should be adjusted so that a drop of oil appears in the inner dome about once every two or three cycles of the saw. Adjustment is done by turning the needle valve to set the drip rate.

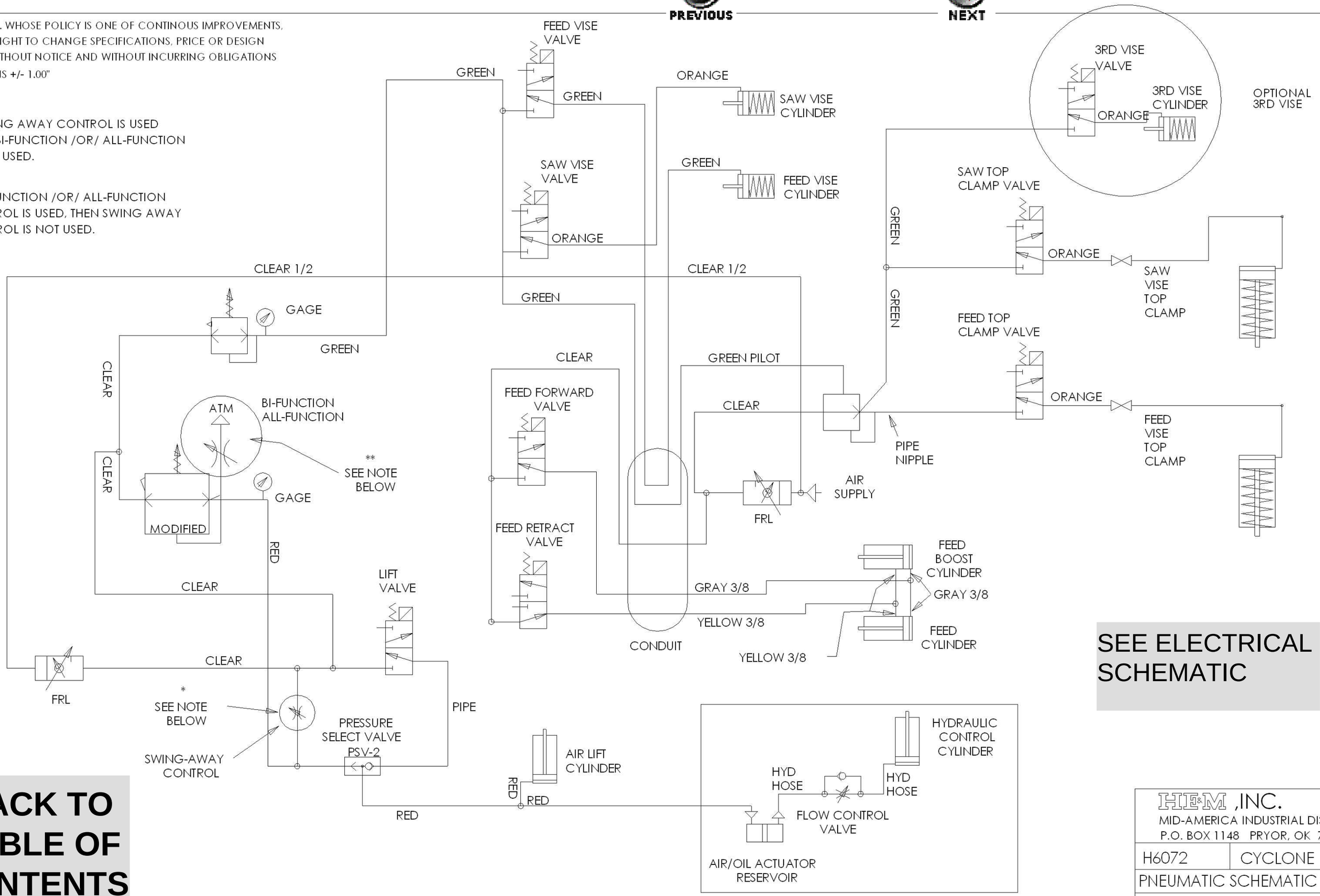
To drain the water trap, either temporarily disconnect the air supply, or push the larger white button on the bottom of the bowl until trapped waste is totally discharged. The drain should be exhausted before waste level reaches "MAX Drain Level" marked on the caution label. Exceeding this level will allow moisture downstream.

The drain should be emptied weekly, and more often if necessary.

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"

* IF SWING AWAY CONTROL IS USED THEN BI-FUNCTION /OR/ ALL-FUNCTION IS NOT USED.

** IF BI-FUNCTION /OR/ ALL-FUNCTION CONTROL IS USED, THEN SWING AWAY CONTROL IS NOT USED.



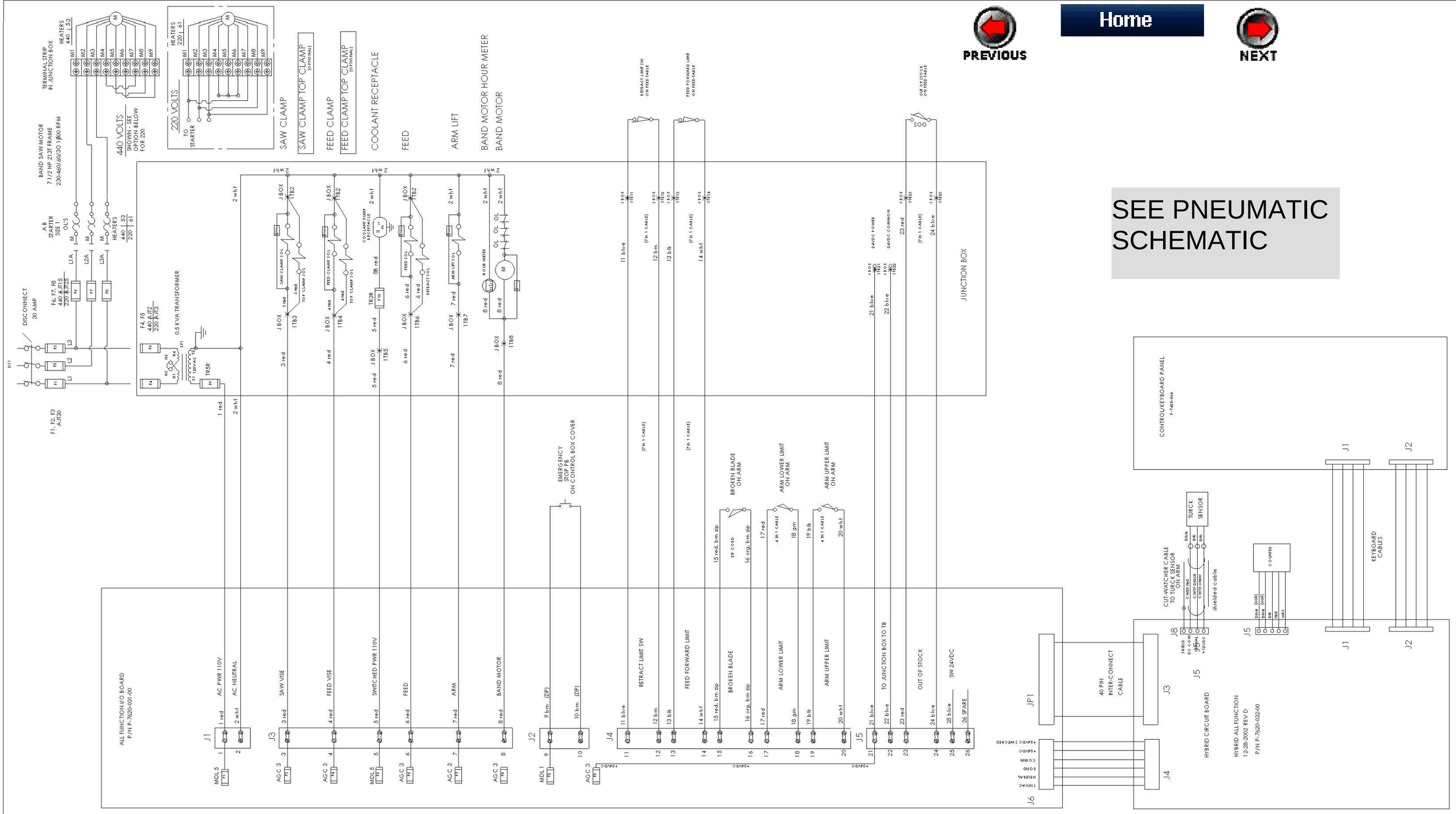
SEE ELECTRICAL SCHEMATIC

BACK TO TABLE OF CONTENTS

HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

H6072	CYCLONE
PNEUMATIC SCHEMATIC	
B-010041-018 A	

SEE PNEUMATIC SCHEMATIC



NEXT ASSY.	DET. NO.	02 (MULTI) 130 / PART NUMBER	120V SECTION / DESCRIPTION	QTY.

TOLERANCES: 0.X ±.100 | 0.XX ±.030 | 0.XXX ±.010 | 0.XXXX (0.001 | ANGLE ± 0° 30'

HEM SAW — HEM, INC. MID-AMERICA INDUSTRIAL DISTRICT P.O. BOX 1148 PRYOR, OK. 74361

MODELS USED ON: CYCLONE A (ALL FUNCTION) (MULTI-PURPOSE CONTROL)

LET.	CHANGE	DATE
C	ADDED VOLTAGE OPTIONS DRN	07/03
B	CHANGE CONTROL F5 TO MDL5 AND ADD SNUBBERS TO COILS	5/03
A	RELEASE	4/03

SCALE | CAD # H0013357 | HEAT TREAT | APPROX. WT.
DRAWN BY JESS | DATE 4/03 | APPROVED BY | DATE | DRAWING NUMBER

ELECTRICAL SCHEMATIC D-005011-269 C

CUTTING PROBLEMS:

NOTE: THE NEED TO USE A GOOD QUALITY CUTTING FLUID CANNOT BE OVER EMPHASIZED. IT IS VITAL TO THE LIFE OF THE BLADE THAT IT BE COOLED AND LUBRICATED PROPERLY DURING ALL CUTTING OPERATIONS. MORE OFTEN THAN NOT, CUTTING PROBLEMS CAN BE TRACED DIRECTLY TO THE CUTTING FLUID.

A good quality cutting fluid in a band saw is one of the most important factors in straight cutting. The cutting fluid keeps the blade teeth cool. It prevents chips from welding to the tooth as well as lubricating the chips, allowing them to move easily through the cut.

If cutting fluid is unable to cool the blade teeth, they will soften and become dull. If the cutting fluid is distributed to only one side of the blade, the opposite side will become dull. This will cause the blade to move toward the side that has the most cutting fluid and the cut will be crooked.

In selecting a cutting fluid, pick one that is of high quality. Avoid thinly mixed soluble oils. Some of the new synthetic oils are highly satisfactory in difficult operations.

INACCURATE CUTTING --- SHORT BLADE LIFE

1. Wrong type or concentration of cutting fluid allows heat to be generated at the tooth tips, reducing wear resistance. Cutting fluid should be the proper type for the material being cut.

2. Guide Clamps Loose. CAUTION: The clamps must not be over-tightened. If they are too tight they will cause excessive drag and heating of the blade.

3. Cutting pressure too high or low. Adjust cutting pressure

4. Blade speed too slow or fast for the material being cut. Adjust blade speed.

5. Improper blade tension. Check tension with tensiometer

6. Blade Alignment.

    a. Blade riding back on wheels, knocking set out of teeth.

    b. Blade not riding against bumper block correctly.

    c. Blade not square to saw vise.

BACK TO TABLE OF CONTENTS

CROOKED CUTS

1. Improper cutting fluid or mixture: either the wrong concentration, improper supply, or wrong type for the material being cut. To extend the life of the blade, keep it cooled and lubricated in all cutting operations.

2. Wrong guide cap adjustment. Check to see if the clamps are loose. Inspect carbide guides for buildup of metal chips or debris that may block coolant or prevent the guide caps from being properly tightened.

3. Wrong blade tension. Use tensiometer to check tension.

4. Cutting force is too high. Adjust cutting pressure regulator. NOTE: Decrease blade force by raising the cutting pressure. The higher the indicated cutting pressure, the lower the blade force.

5. Adjustable guide arm loose or too far from the material being cut.

6. Improper blade alignment.

    a. Blade riding back on wheels, knocking set out of teeth.

    b. Blade not riding against bumper block correctly.

    c. Blade not square to saw vise.

    d. Blade is dull on one side. Check that blade brush is properly adjusted. The wires should extend just through the tooth gullet.

7. Fixed vise is loose or not square to the blade. Check that there is no buildup of chips in the clamping area.

ROUGH CUTTING

1. Wrong blade. Check the blade selection chart for material being cut.

2. Wrong blade speed. Check the speed chart for material being cut.

3. Old or improperly mixed cutting fluid.

STRIPPED TEETH

1. Adjust arm feed rate control to slow the fall of the arm when the blade enters or exits the material.

2. Check cutting pressure. Too much blade force will cause the teeth to take a chip that is too large. Decrease blade force by increasing the indicated cutting pressure.

3. Old or improperly mixed cutting fluid. Check for proper flow of coolant through the guides. Make sure the blade guides are free of chips and debris.

4. Blade too coarse for material being cut, causing a heavy chip load. Change to a blade with finer teeth.

5. Blade too fine for material being cut, causing chips to be loaded up in the gullet. Change to a blade with coarser teeth.

6. Blade too slow, causing excessive shock as the blade enters the material. Increase blade speed to reduce chip size.

7. Tensile strength of material is above 100,000 psi. Use a blade with finer teeth.

8. Hard spots in material overloading the teeth. Sometimes increasing the cutting force (by decreasing the indicated cutting pressure) will force the teeth under the hard spots.

BLADE VIBRATION

1. Harmonics. Change the feed rate or blade speed, or use a vari-tooth blade.

CHIPS WELDING TO GULLETS

1. Check cutting fluid. Problems may be caused by low cutting fluid level, wrong cutting fluid for material being cut, or wrong concentration. Follow directions from coolant manufacturer for correct dilution rate.

2. Blade brush not adjusted properly. Check that the brush is not worn out, and that the wires sweep through the gullets.

3. Excessive feed rate, Reduce feed rate.

4. Blade speed too high.

BLADE EDGE SWAGING

1. Worn back-up guides or bumper block carbide. Replace carbides if necessary.

2. Check floating guides in the guide caps. Clean if necessary.

3. Blade is running against flange on wheels, knocking set out of teeth. Check blade-tracking alignment.

4. Cutting force too high. To decrease the force on the blade, increase the indicated cutting pressure.

BLADE STALLS DURING CUT

1. Arm feed rate too fast. Use feed rate control to reduce speed of the arm as it falls.

2. Arm feeds inconsistently. Check oil reservoir. Check for air in lift cylinder. Bleed lift cylinder if necessary.

3. Too much cutting force. To decrease the force on the blade, increase the indicated cutting pressure.

4. Blade speed too slow. Increase speed.

5. Chips welding to teeth, stopping blade. Change cutting fluid, reduce blade force or use a coarser tooth blade.

BLADE STRETCHES EXCESSIVELY

1. Check blade tension. May be set too high.

2. Use a better quality blade.

SAW CUTTING OUT OF SQUARE

1. Improper cutting fluid or mixture. Either the wrong concentration, improper supply or wrong type for the material being cut To extend the life of the blade, keep it cooled and lubricated in all cutting operations.

2. Improper guide cap adjustment. Check to see if the clamps are loose. Inspect carbide guides for buildup of metal chips or debris that may block coolant or prevent the guide caps from being properly tightened.

3. Blade tension. Use a blade tension gauge to assure proper tension.

4. Cutting force on the blade too high. To decrease the force on the blade, increase the indicated cutting pressure.

5. Adjustable guide arm is loose. Check to see if the guide arm is too far from the material being cut. The guide arm should be as close to the material as possible.

6. Improper blade alignment.

    a. Blade riding back on wheels, knocking set out of teeth.

    b. Blade not riding against bumper block properly.

    c. Blade not square to vise.

7. Blade dull on one side. The blade will tend to cut toward the sharp side. Check for proper adjustment of the blade brush.

8. Main vise loose or out of square.

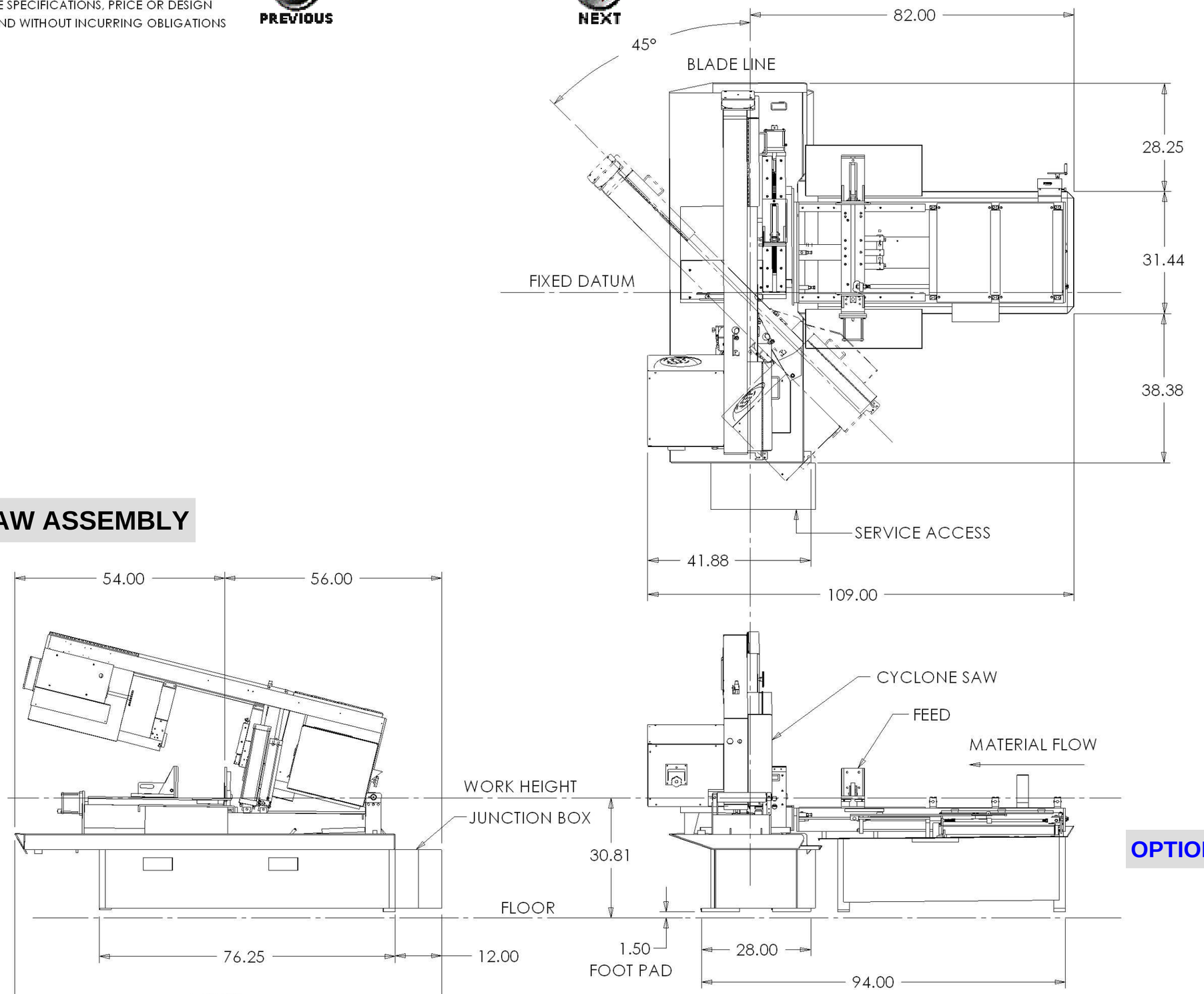
9. Barfeed vises not aligned with saw vise, or barfeed not level with saw base. Check alignment.

10. Material distortion after cutting.

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS

ALL DIMENSIONS +/- 1.00"

SAW ASSEMBLY

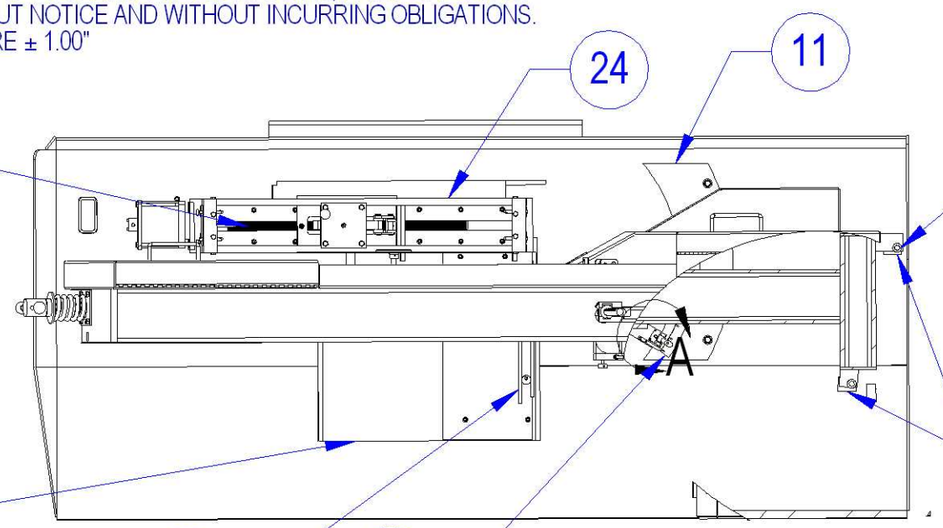


OPTIONAL FEED TABLE

HEM ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

DATE 10/02	H0013235
CYCLONE LAYOUT	
B-006516-399	B

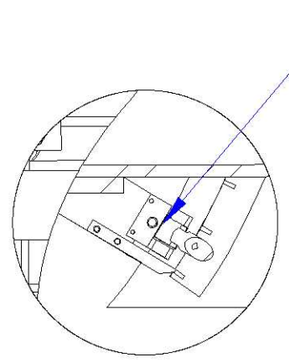
NOTE:
HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS.
ALL DIMENSIONS ARE ± 1.00"



SAW VISE ASSEMBLY

DISCHARGE BASE

PARTS GUIDE



SEE PHOTO

DETAIL A

SEE OPTIONAL LASER CUTTING GUIDE.

19 HEIGHT SET

LIFT ARM SWITCH 20

7 LIFT CYLINDER

6 CONTROL CYLINDER

SAW ARM ASSEMBLY

8

25 CONTROL BOX

TOP CLAMP ASSEMBLY 24

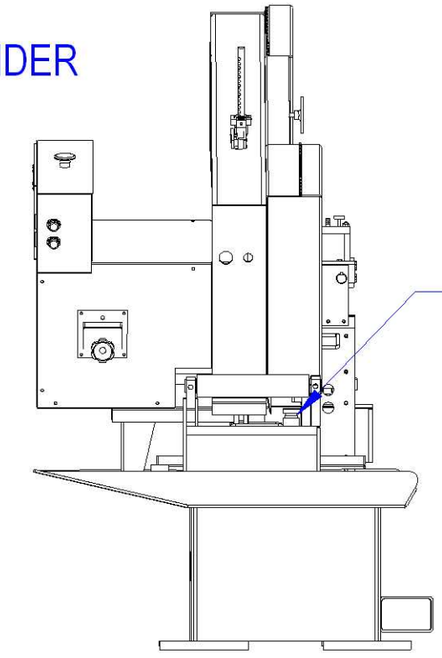
SEE PHOTO

17

18

2 PIVOT ARM

SAW BASE 1



SEE PHOTO

BACK TO LAYOUT DRAWING

BACK TO TABLE OF CONTENTS

HE&M SAW® HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK. 74361

SAW ASSY

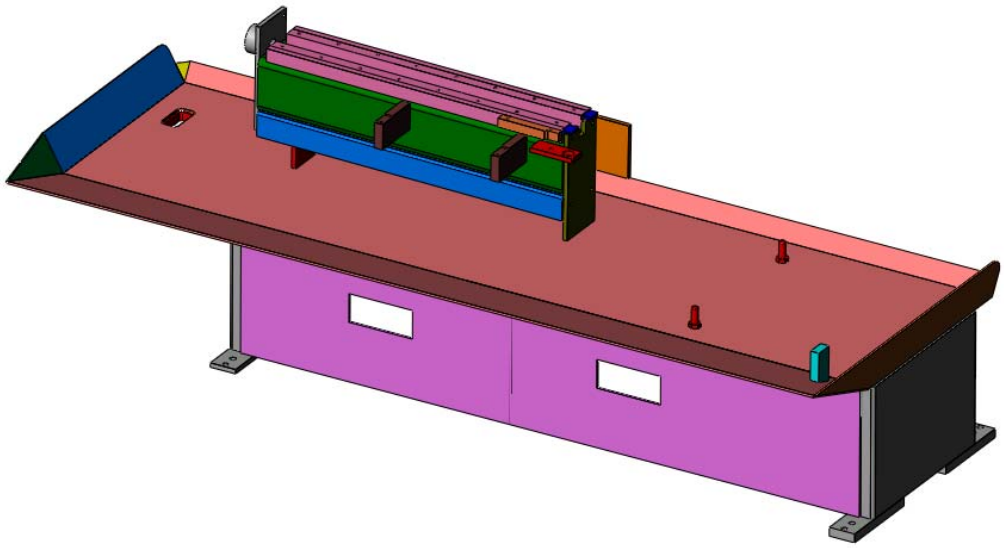
B-009194-042 B

HEM SAW
The saw that cuts straight.

SAW ASSY CYCLONE
B-009194-042-00-A-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	T-009290-231-00-F-000	BASE W/A	1
2	T-009414-045-00-B-000	PIVOT ARM W/A	1
3	T-009598-010-00-A-000	PARTS GUIDE ASSY	1
4	T-009597-062-00-A-000	DISCHARGE BASE W/A	1
5	T-014505-086-00-A-000	SAW VISE ASSY	1
6	D-010902-015-00-C-000	CONTROL CYLINDER	1
7	T-009308-003-00-A-000	LIFT CYLINDER	1
8	D-014522-062-00-B-000	ARM ASSY. (CYCLONE)	1
9	T-012025-068-00-B-000	LOCK BLOCK	1
10	T-012025-068-01-B-000	LOCK BLOCK	1
11	B-013616-551-00-A-000	PIVOT LOCK PLATE, SIDEWINDER	1
12	B-009445-004-00-D-000	CLAMP CAP	1
13	A-009445-015-00-A-000	CLAMP CAP HANDLE	1
14	A-009445-005-00-F-000	CLAMP PIVOT	1
15	A-012114-025-00-B-000	POINTER, PIVOT LOCK	1
16	A-009445-007-00-A-000	BRONZE PLUG	1
17	B-009060-000-02-H-000	PIVOT MOUNT-ADJUSTABLE	1
18	A-009403-000-03-C-000	BEARING-PIVOT	2
19	T-009151-030-00-A-000	UPPER LIMIT ASSEMBLY	1
20	B-009223-000-02-F-000	LIFT ARM LEVER W/SWITCH	1
21	B-014121-015-00-F-000	PIVOT PIN	1
22	A-012256-008-00-A-000	MITER DECAL	1
23	A-014121-030-00-A-000	PIVOT SHAFT LOCK	1
24	C-013800-129-00-A-000	-OPTIONAL TOP CLAMP ASSEMBLY	1
25	T-010014-068-00-A-000	CONTROL BOX ASSY. CYCLONE	1
26	P-007039-037-00-0-000	RETAINING RING	2
27	T-010310-129-00-A-000	LOCK BOLT	1
28	T-010310-128-00-A-000	WASHER	2
999	T-013626-011-00-A-000	J-BOX MOUNT (MANUAL)	1
999	T-009196-030-00-A-000	FEED ASSY CYCLONE	1
999	T-012142-006-00-A-000	SWITCH MOUNT, SIDE COVERS	1
999	B-009823-000-02-D-000	SPRING -SAW ARM	1

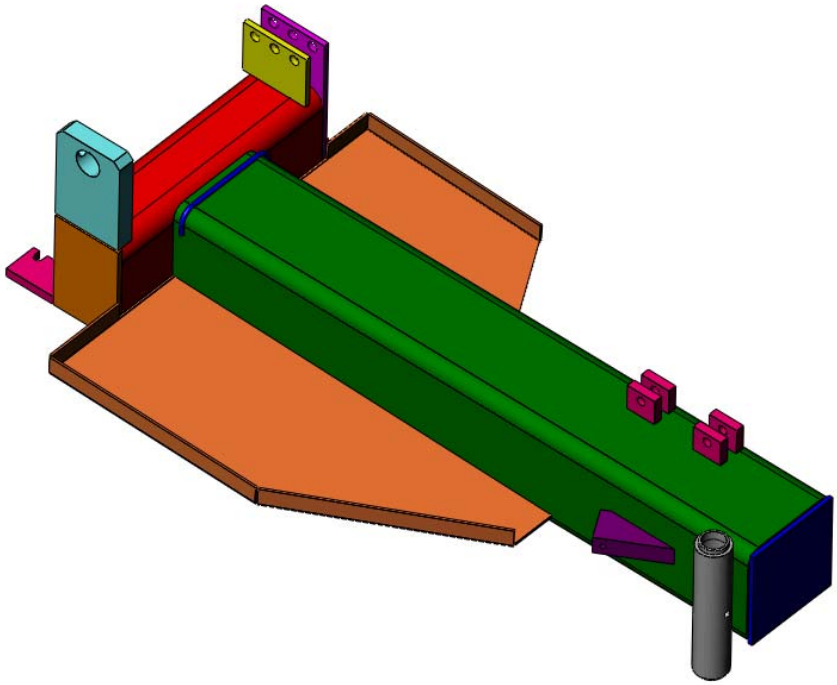
(Items 999 Are Optional)



BASE W/A
T-009290-231-00-B-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	T-009209-231-00-B-000	SAW BASE WELDMENT ASSEMBLY	1

BACK TO SAW ASSEMBLY

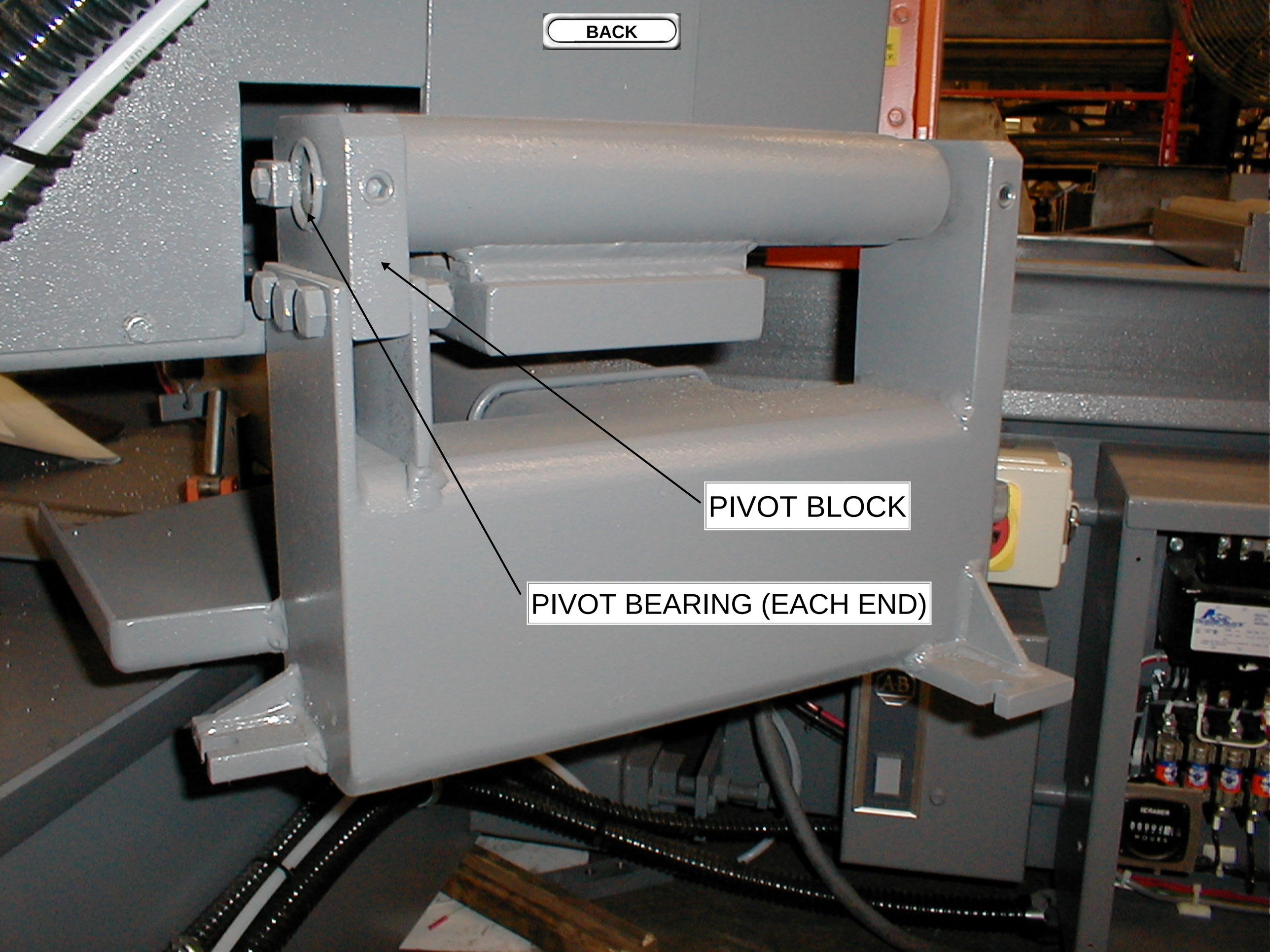


PIVOT ARM W/A
T-009414-045-00-B-000

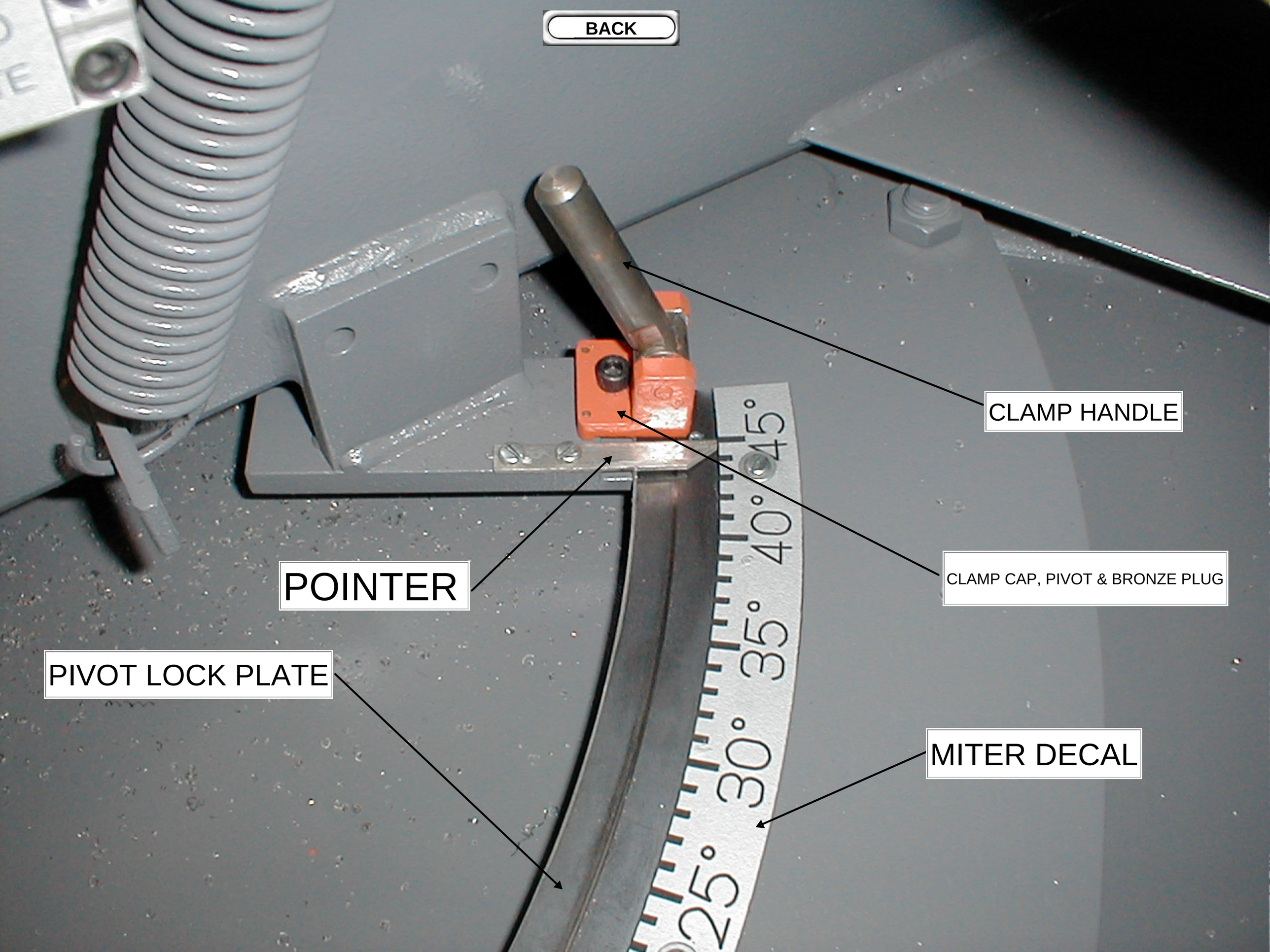
ITEM #	PART NUMBER	DESCRIPTION	QTY
1	T-009414-045-00-B-000	PIVOT ARM WELDMENT ASSEMBLY	1

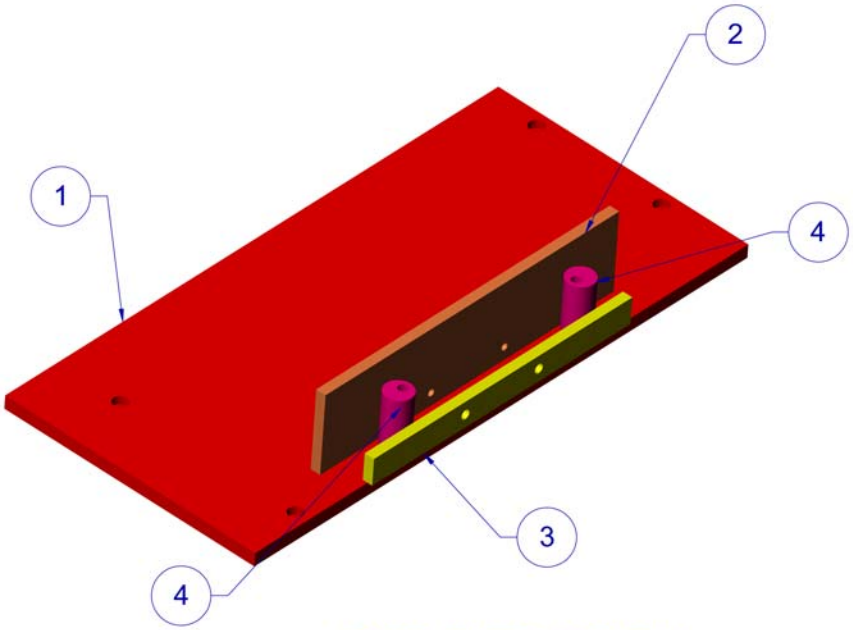
BACK TO SAW ASSEMBLY

BACK



BACK


CLAMP HANDLE
CLAMP CAP, PIVOT & BRONZE PLUG
POINTER
PIVOT LOCK PLATE
MITER DECAL
25° 30° 35° 40° 45°

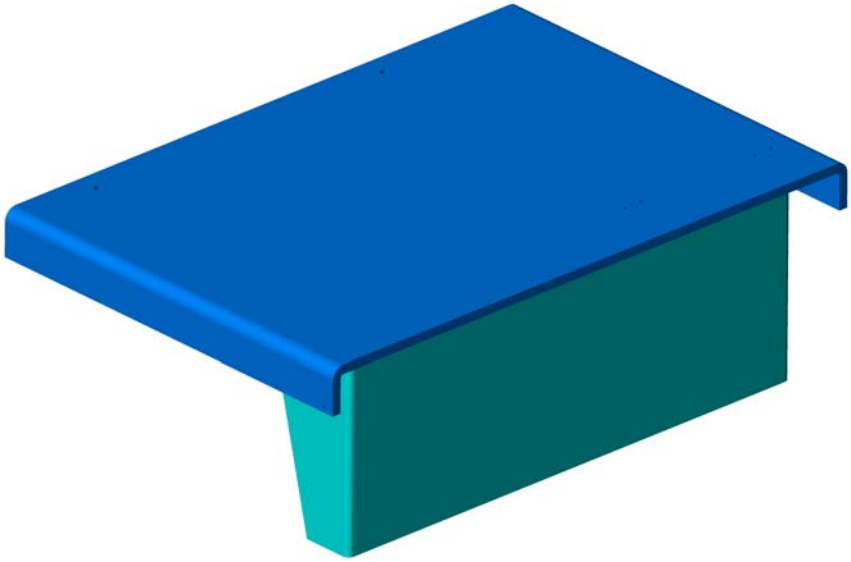


PARTS GUIDE ASSEMBLY

BACK TO SAW ASSEMBLY

PARTS GUIDE ASSEMBLY
T-009598-010-00-A-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	T-010008-069-00-A-000	DISCHARGE PLATE	1
2	B-009598-010-00-A-000	PARTS GUIDE	1
3	B-009598-011-00-A-000	PARTS GUIDE LOCK PLATE	1
4	A-009598-012-00-A-000	PARTS GUIDE ECCENTRIC	2



DISCHARGE BASE WELDMENT ASSEMBLY

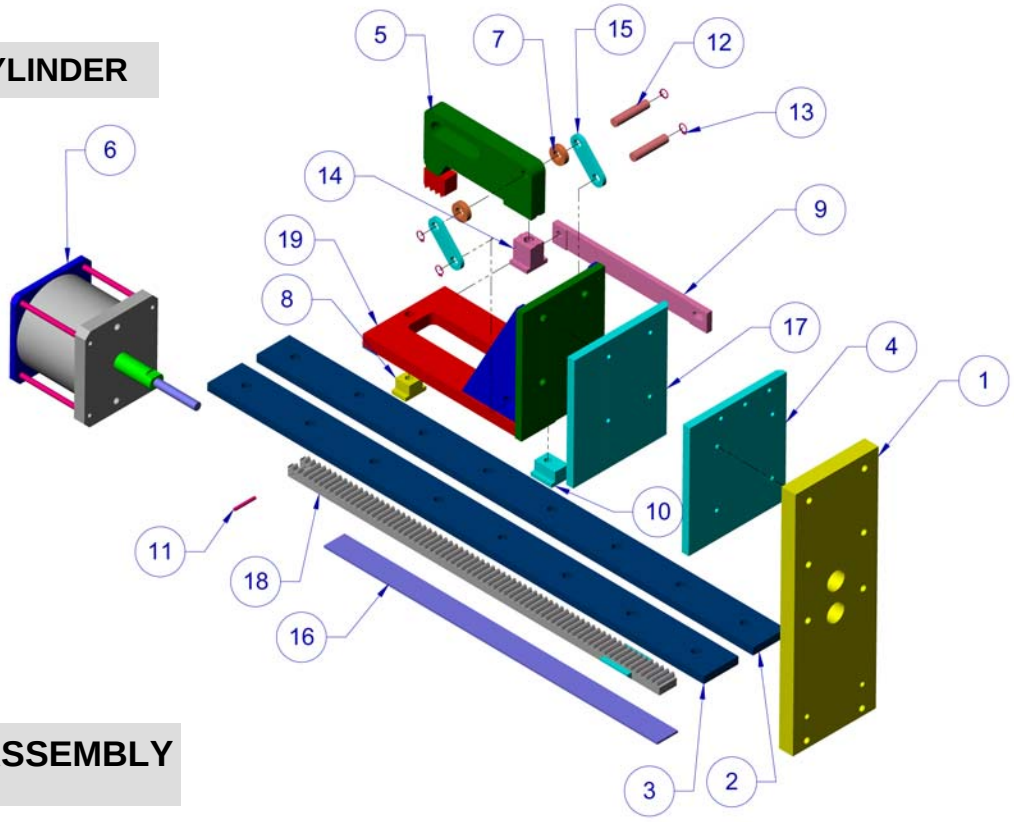
DISCHARGE BASE WELDMENT ASSEMBLY
T-009597-062-00-A-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	T-009597-062-00-A-000	DISCHARGE TABLE W/A	1

BACK TO SAW ASSEMBLY

HEM SAW
The saw that cuts straight.

SAW VISE CYLINDER



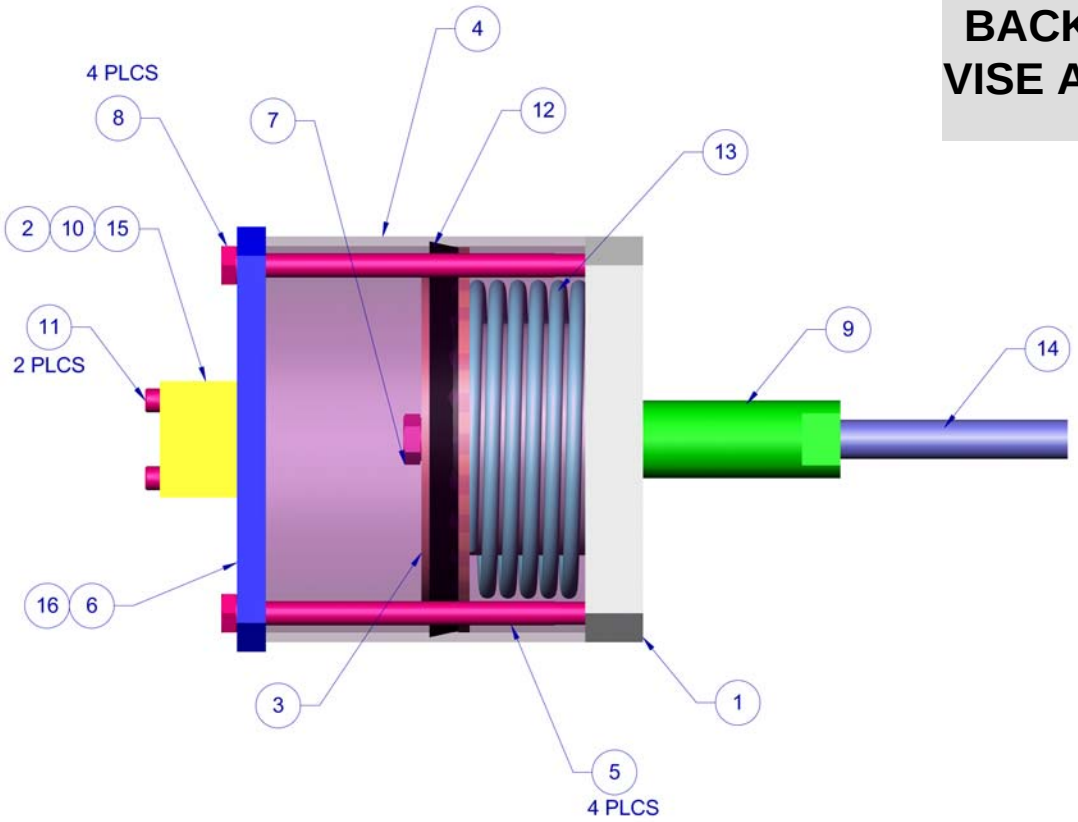
BACK TO SAW ASSEMBLY

SAW VISE ASSEMBLY
T-014505-086-00-A-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	B-009505-094-00-D-000	FIXED VISE JAW	1
2	T-011743-077-01-A-000	VISE WAY	1
3	T-011743-077-00-A-000	VISE WAY	1
4	A-009505-100-00-C-000	FIXED SIDE WEAR PLATE	1
5	B-010322-021-00-H-000	HANDLE-CLAMP	1
6	C-009261-022-00-F-000	VISE CYLINDER ASSEMBLY	1
7	A-009355-000-03-K-000	THICK WASHER	2
8	A-010309-004-00-D-000	TEE-VISE, ADJUSTABLE	1
9	B-012313-010-01-H-000	LONGER VISE GUIDE	1
10	A-010309-005-00-D-000	TEE-VISE	1
11	P-007033-150-00-A-000	ROLL PIN	1
12	A-011628-002-01-F-000	PIN-HINGE	2
13	P-007039-050-00-A-000	SNAP RING	4
14	A-010309-007-00-F-000	VISE TEE	1
15	A-010312-001-02-E-000	PLATE-LINK	2
16	A-012845-000-09-H-000	GEAR RACK SPACER	1
17	A-009505-103-00-A-000	WEAR PLATE – ADJUSTABLE	1
18	T-011423-026-00-A-000	GEAR RACK W/A	1
19	C-009177-001-03-N-000	VISE JAW-ADJUSTABLE	1

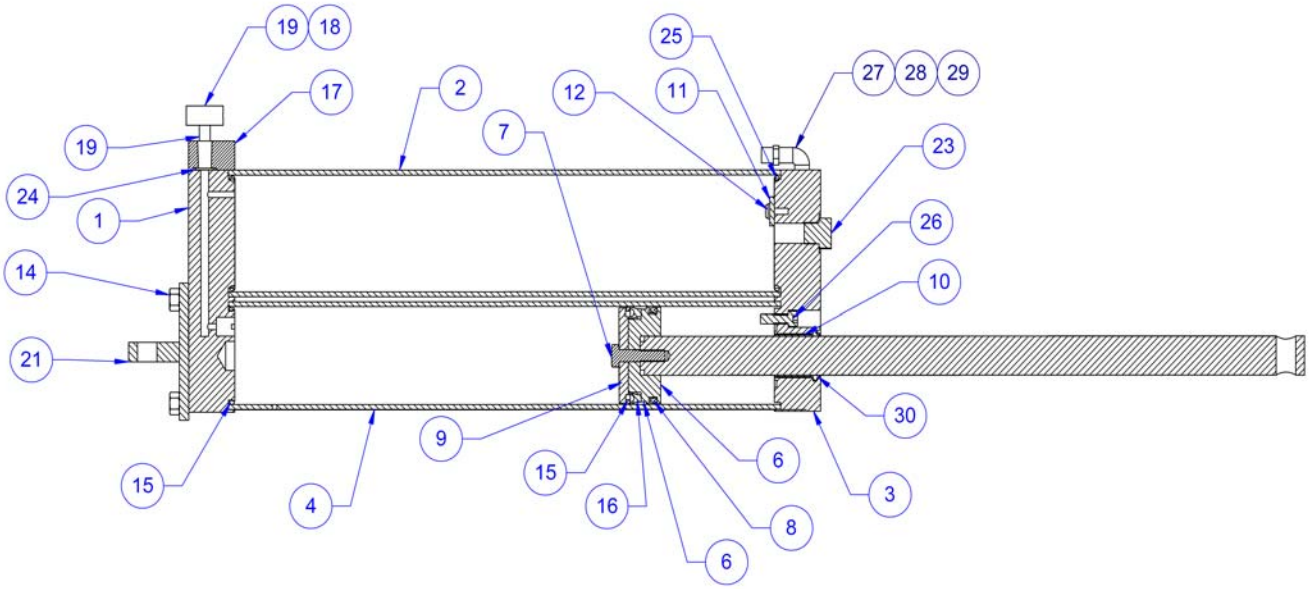
HEM SAW
The saw that cuts straight.

BACK TO SAW VISE ASSEMBLY



VISE CYLINDER ASSEMBLY
C-009261-022-00-F-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	B-009154-016-00-E-000	END CAP	1
2	A-012575-095-00-B-000	PORT BLOCK	1
3	B-009153-070-00-A-000	PISTON	1
4	A-009155-001-07-K-000	CYLINDER HOUSING	1
5	B-009330-005-00-A-000	TIE ROD	4
6	A-009154-015-00-C-000	END PLATE	1
7	P-007027-010-24-0-000	HHCS	1
8	P-007004-003-18-0-000	NUT-HEX	4
9	A-009156-012-00-B-000	PISTON ROD	1
10	P-007050-010-00-0-000	O-RING	1
11	P-007019-190-12-0-000	SHCS	2
12	P-007053-055-00-0-000	U CUP	1
13	A-003967-000-02-A-000	SPRING	1
14	A-010936-031-01-K-000	ALL THREAD	1
15	P-007071-002-12-A-000	MALE ELBOW	1
16	P-007050-248-00-0-000	O-RING	1



CONTROL CYLINDER ASSEMBLY

BACK TO SAW ASSEMBLY

CONTROL CYLINDER ASSEMBLY
T-010902-015-00-A-000

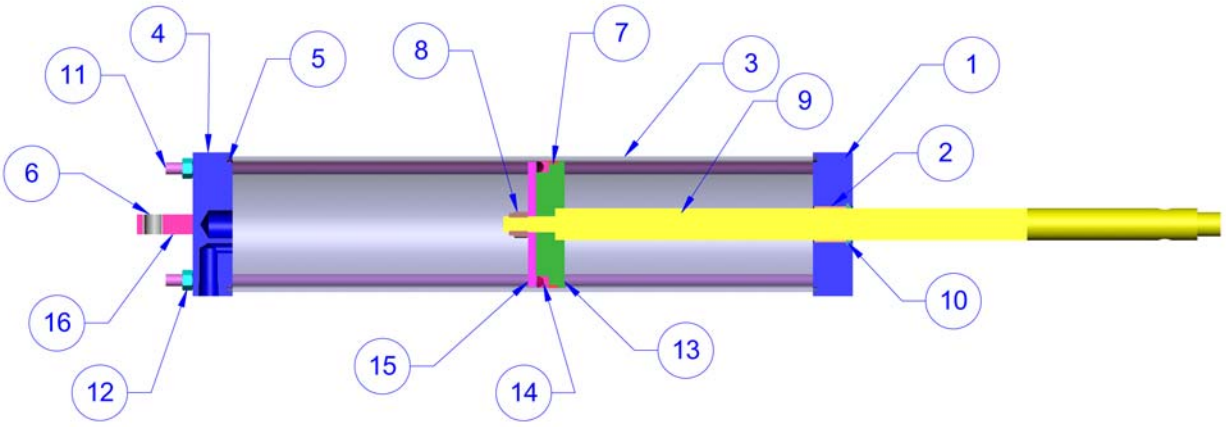
ITEM #	PART NUMBER	DESCRIPTION	QTY
1	D-009126-008-00-A-000	CYLINDER CAP	1
2	B-010753-029-01-B-000	TANK/LIFT CYL TUBE	1
3	T-009126-009-00-A-000	ROD END CAP	1
4	B-009392-003-01-C-000	CONTROL CYLINDER TUBE	1
5	B-010291-021-01-C-000	PISTON ROD	1
6	A-010434-001-00-B-000	PISTON - 2 1/2 DIA.	1
7	P-007026-125-18-0-000	HHCS	1
8	P-007057-250-00-0-000	V CUP	1
9	A-010826-005-00-A-000	SEAL RETAINER - PISTON	1
10	P-007102-015-00-0-000	NYLINER	1
11	A-010839-000-00-B-000	SPLASH SHIELD	1
12	P-007006-190-37-1-000	SCREW-PAN HEAD	1
13	B-009330-005-05-A-000	TIE ROD	4

(CONTINUED NEXT PAGE)

(CONTROL CYLINDER ASSEMBLY CONTINUED)

14	P-007004-003-18-0-000	NUT-HEX	4
15	P-007050-228-00-0-000	O-RING	2
16	P-007053-030-00-0-000	U CUP	1
17	B-009126-005-00-C-000	MANIFOLD	1
18	A-009126-004-00-A-000	VALVE SEAT	1
19	A-009528-007-00-A-000	NEEDLE VALVE	1
20	A-012047-004-00-E-000	KNOB-KNURLED	1
21	T-009431-022-00-A-000	CONTROL CYLINDER BRKT	1
22	P-007020-010-20-0-000	SHCS	4
23	P-007902-078-00-0-000	"O"-RING SEAL PLUG	1
24	P-007050-014-00-0-000	O-RING	2
25	P-007050-232-00-0-000	O-RING	2
26	P-007020-007-20-0-000	SHCS	1
27	P-007071-002-12-A-000	MALE ELBOW	2
28	P-007070-002-12-0-000	MALE CONNECTOR	1
29	P-007227-002-00-0-000	TUBING	1
30	P-007051-009-00-0-000	WIPER RING	1

HEM SAW
The saw that cuts straight.



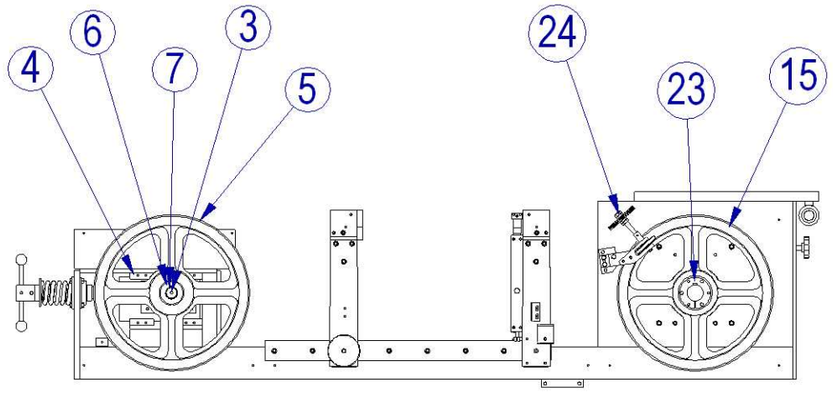
LIFT CYLINDER ASSEMBLY
T-009308-003-00-A-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	B-009309-000-00-B-000	ROD END - 4" DIA. CYL.	1
2	P-007102-010-00-0-000	NYLINER	1
3	B-009308-002-01-C-000	4'' CYLINDER TUBE	1
4	B-009310-001-00-F-000	PIVOT END- 1/8 NPT - 4" CYLINDER	1
5	P-007050-240-00-0-000	O-RING	1
6	A-009503-000-00-A-000	PIVOT BEARING	1
7	P-007791-400-00-0-000	SEAL	1
8	P-007004-500-20-0-000	NUT-LOCK	1
9	A-009322-000-03-C-000	PISTON ROD	1
10	P-007051-009-00-0-000	WIPER RING	1
11	A-009330-000-34-W-000	TIE ROD	4
12	P-007004-004-16-0-000	NUT-HEX	4
13	B-009153-063-00-A-000	PISTON - 4" LIFT CYLINDER	1
14	P-007053-054-00-0-000	U CUP	1
15	A-009153-023-00-C-000	RETAINER CAP	1
16	B-009310-002-00-D-000	PIVOT END CAP	1

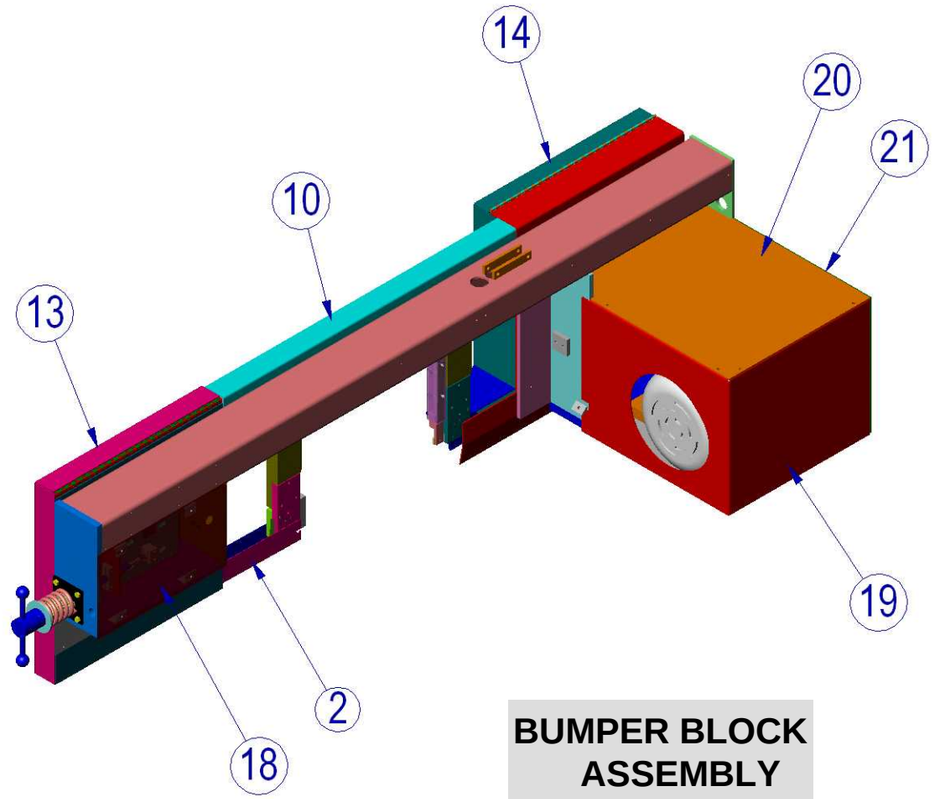
BACK TO SAW ASSEMBLY

NOTE:
HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS.
ALL DIMENSIONS ARE ± 1.00"

POWER BRUSH ASSEMBLY

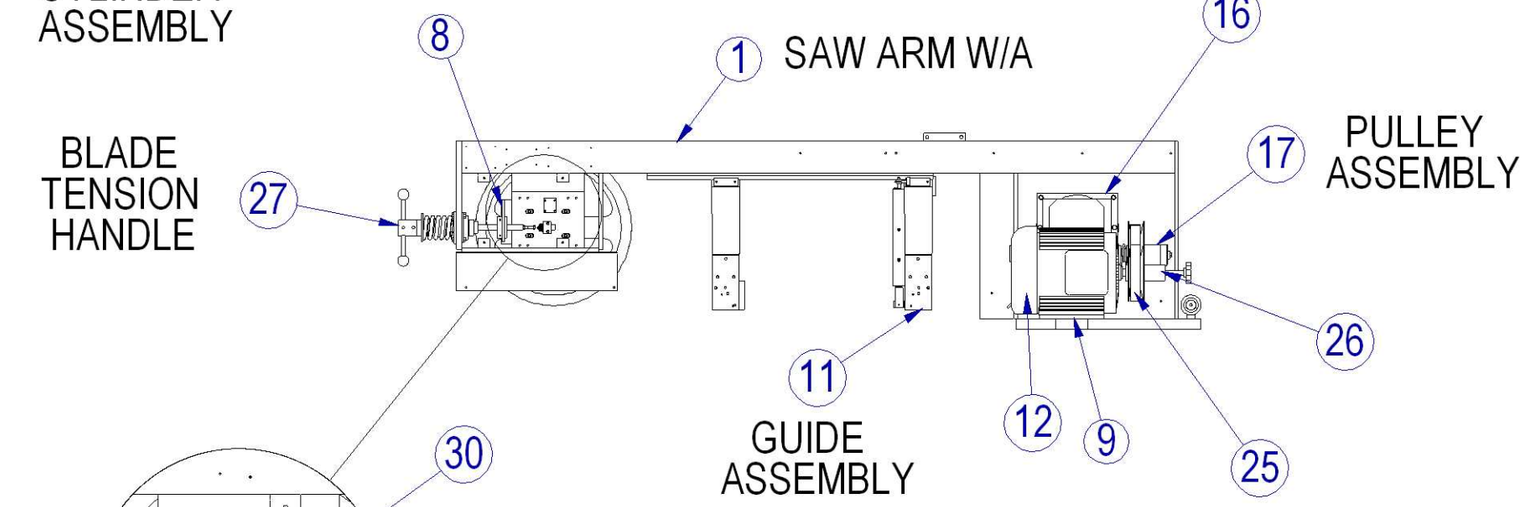


FRONT OF ARM



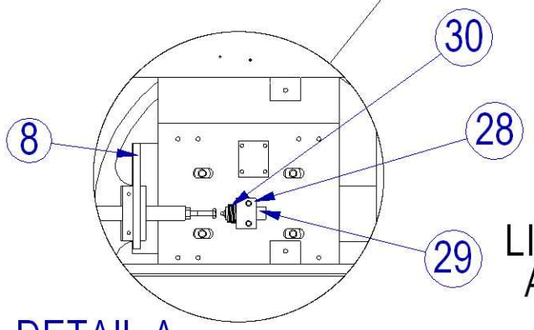
BUMPER BLOCK ASSEMBLY

SEE OPTIONAL AIR TENSION CYLINDER ASSEMBLY



BACK TO SAW ASSEMBLY

BACK OF ARM



DETAIL A

SEE PHOTO

HE&M SAW® HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK. 74361

ARM ASSY.

D-014522-062 B+

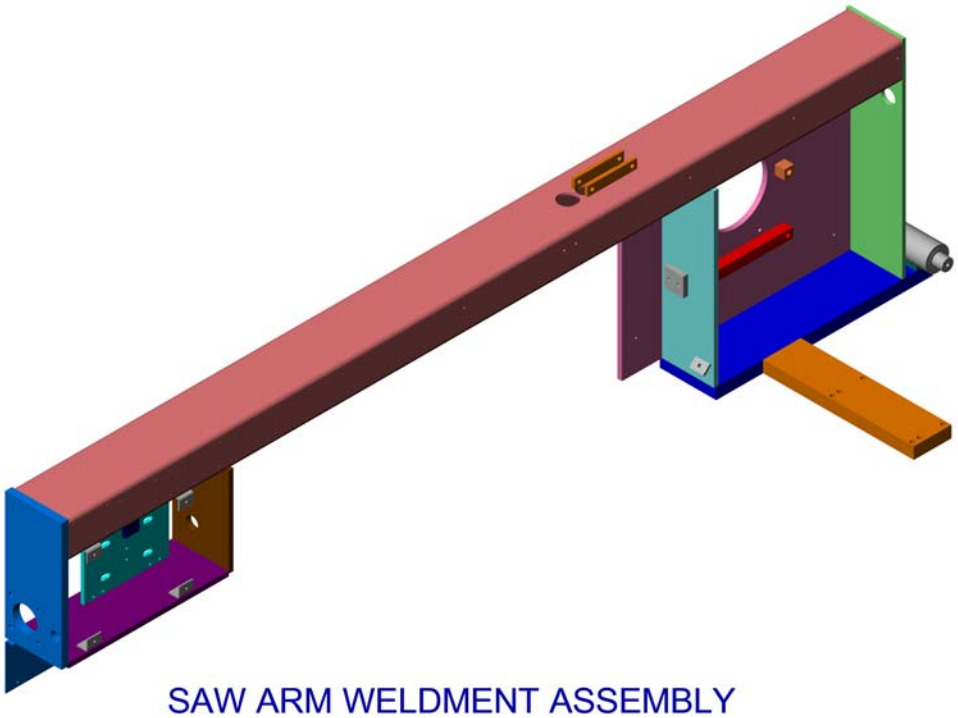
HEM SAW
The saw that cuts straight.

ARM ASSEMBLY
D-014522-062-00-B-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	D-009979-256-00-G-000	SAW ARM W/A CYCLONE	1
2	B-010057-021-01-E-000	SLIDING OSHA GUARD (TWISTER)	1
3	B-009412-008-00-C-000	IDLE SHAFT W/A	1
4	A-009077-000-00-B-000	GUIDE-SLIDE	4
5	C-009036-017-00-C-000	IDLE WHEEL	1
6	P-007095-000-00-0-000	BEARING	2
7	P-007039-137-00-0-000	RETAINING RING	1
8	B-009073-009-00-C-000	TENSION SLIDE PLATE	1
9	C-013035-001-00-C-000	MOTOR MOUNT ADAPTER PLATE	1
10	T-013616-951-00-B-000	UPPER BLADE GUARD	1
11	T-014504-083-00-A-000	GUIDE ASSEMBLY	1
12	T-009194-038-00-B-000	MOTOR MODIFICATION	1
13	T-012154-055-00-A-000	IDLE WHEEL COVER ASSY. CYCLONE	1
14	T-012154-056-00-A-000	DRIVE WHEEL COVER ASSY (CYCLONE)	1
15	C-009036-018-00-C-000	DRIVE WHEEL	1
16	C-011853-003-00-M-000	GEAR REDUCER MOUNT	1
17	C-010714-017-00-E-000	PRESS-ON PULLEY ASSEMBLY	1
18	T-013616-947-00-B-000	TENSION COVER	1
19	T-013616-950-00-B-000	MOTOR COVER	1
20	T-013616-949-00-B-000	TOP COVER	1
21	T-013616-948-00-B-000	FRONT COVER	1
22	T-013616-952-00-A-000	BLADE SPEED COVER	1
23	P-007107-200-01-0-000	BUSHING	1
24	B-009570-034-00-E-000	POWER BRUSH ASSY, SIDEWINDER	1
25	P-007355-002-00-0-000	BELT	1
26	P-007220-407-00-0-000	PULLEY	1
27	B-009233-001-00-D-000	TENSION HANDLE ASSEMBLY	1
28	A-009198-000-00-D-000	BLADE SHUT OFF SWITCH HOLDER	1
29	A-009151-002-01-D-000	LIMIT SWITCH-BROKEN BLADE (MAN TEN)	1
30	A-009766-000-00-B-000	SPRING -SWITCH	1
999	B-011775-008-00-D-000	CYLINDER-TENSION ASSEMBLY	1
999	A-009151-006-00-B-000	LIMIT SWITCH ASSY - BROKEN BLADE	1
999	A-009535-000-00-B-000	SWITCH STRAP	2
999	B-008927-000-03-D-000	BLADE TENSIONER NUT	1
999	A-009354-001-00-G-000	BUMPER BLOCK ASSEMBLY	1
999	A-009765-003-00-A-000	SLEEVE-SWITCH ACTUATOR	1
999	B-012142-000-02-D-000	SWITCH MOUNT	1
999	A-012306-000-00-A-000	COVER PLATE	1

(Items 999 Are Optional)

HEM SAW
The saw that cuts straight.



SAW ARM WELDMENT ASSEMBLY

1-1/4" X 16' BLADE

CAPACITY: 16 X 22 @ 90°
16 X 15 @ 45°

BACK TO ARM ASSEMBLY

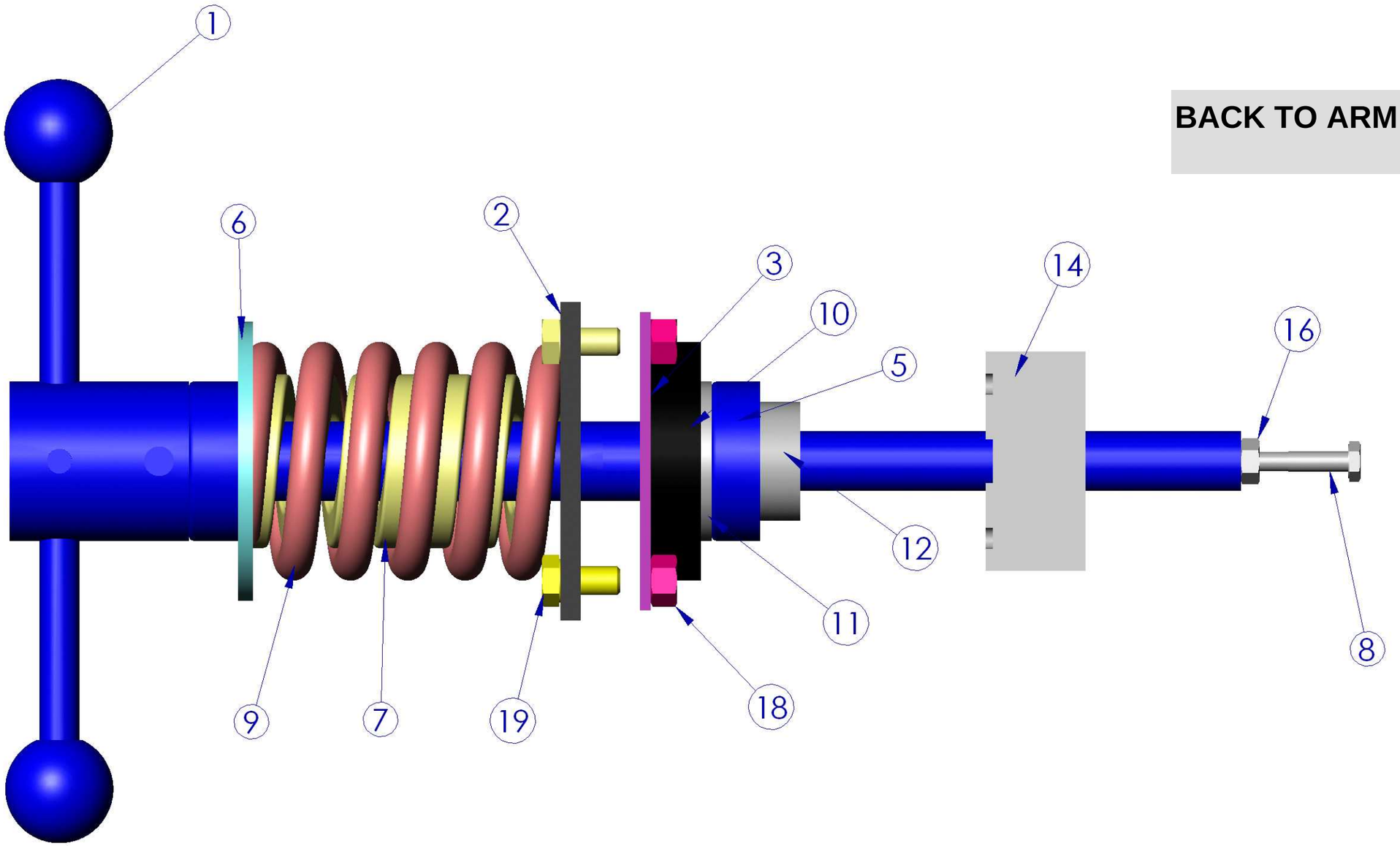
SAW ARM W/A
T-009979-256-00-C-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	T-009979-256-00-C-000	ARM WELDMENT ASSEMBLY	1

NOTE:

HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS.
ALL DIMENSIONS ARE ± 1.00"

BACK TO ARM ASSEMBLY



SPRING CONSTANT
750 K= 1856 #/IN
100/1200 K = 2544 #/IN
TWISTER K = 2544 #/IN

HE&M SAW® HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK. 74361

TENSION HANDLE ASSY

B-009233-001 D

PARTS LIST

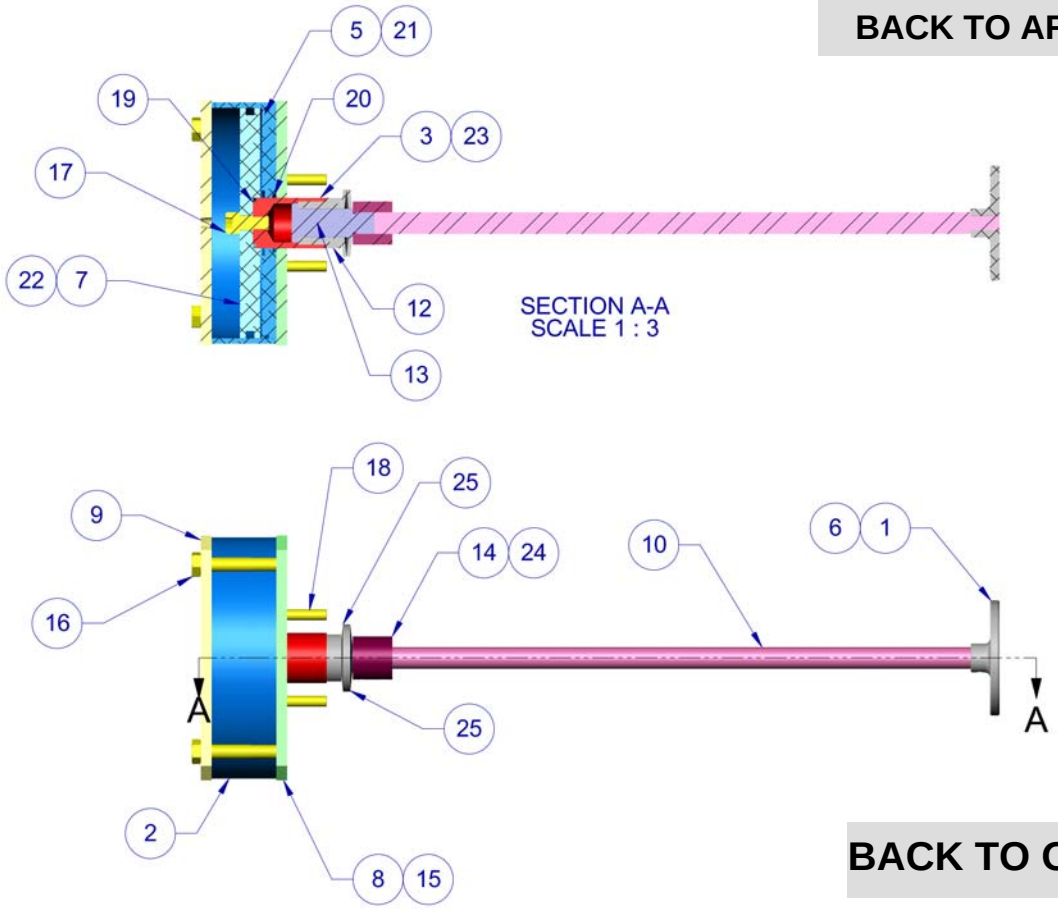
HEM SAW
The saw that cuts straight.

TENSION HANDLE ASSEMBLY
B-009233-001-00-D-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	B-009813-004-00-E-000	TENSION HANDLE SUB-ASSEMBLY	1
2	B-009073-003-00-B-000	PLATE-SPRING TENSION HANDLE ADAPTER	1
3	B-009073-004-00-C-000	PLATE-SPRING TENSION HANDLE ADAPTER	1
4	P-007027-007-16-0-000	HHCS	4
5	P-007086-609-00-0-000	BEARING-THRUST	2
6	A-009000-000-03-C-000	WASHER STOP	1
7	P-007379-000-00-0-000	SPRING	1
8	P-007025-150-20-0-000	HHCS	1
9	A-010804-000-00-A-000	SPRING-BOOSTER	1
10	A-009375-000-00-B-000	CUSHION - RUBBER	1
11	P-007000-010-00-0-000	WASHER-FLAT	1
12	A-009376-000-02-B-000	NUT-TENSION STOP	1
13	P-007009-190-10-0-000	SET SCREW	1
14	B-008927-000-02-C-000	NUT-TENSION BLADE	1
15	P-007026-010-18-0-000	HHCS	1
16	P-007004-002-20-0-000	HEXNUT	1
17	P-007004-003-18-0-000	NUT-HEX	1
18	P-007004-004-16-0-000	NUT-HEX	4

HEM SAW
The saw that cuts straight.

BACK TO ARM ASSEMBLY



BACK TO OPTIONS LIST

TENSION CYLINDER ASSEMBLY
B-011775-008-00-D-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	A-009474-001-02-B-000	HAND WHEEL	1
2	A-010420-002-03-G-000	CYLINDER HOUSING	1
3	A-011776-004-00-A-000	PISTON ROD	1
5	C-011777-002-00-B-000	CYLINDER SEAL PLATE	1
6	P-007011-002-18-0-000	SET SCREW	1
7	C-011779-001-01-B-000	PISTON	1
8	C-011780-006-00-A-000	CYLINDER END PLATE	1
9	C-011780-002-01-B-000	CYLINDER END PLATE	1
10	A-011828-003-02-A-000	TENSION SHAFT	1
12	A-012171-000-00-C-000	THRUST BEARING	1
13	A-012172-001-00-A-000	SHAFT-TENSION ADAPTER	1
14	A-012173-002-00-A-000	TENSION COUPLING	1
15	P-007020-005-20-0-000	SHCS	2
16	P-007028-030-13-0-000	HHCS	4

(CONTINUED NEXT PAGE)

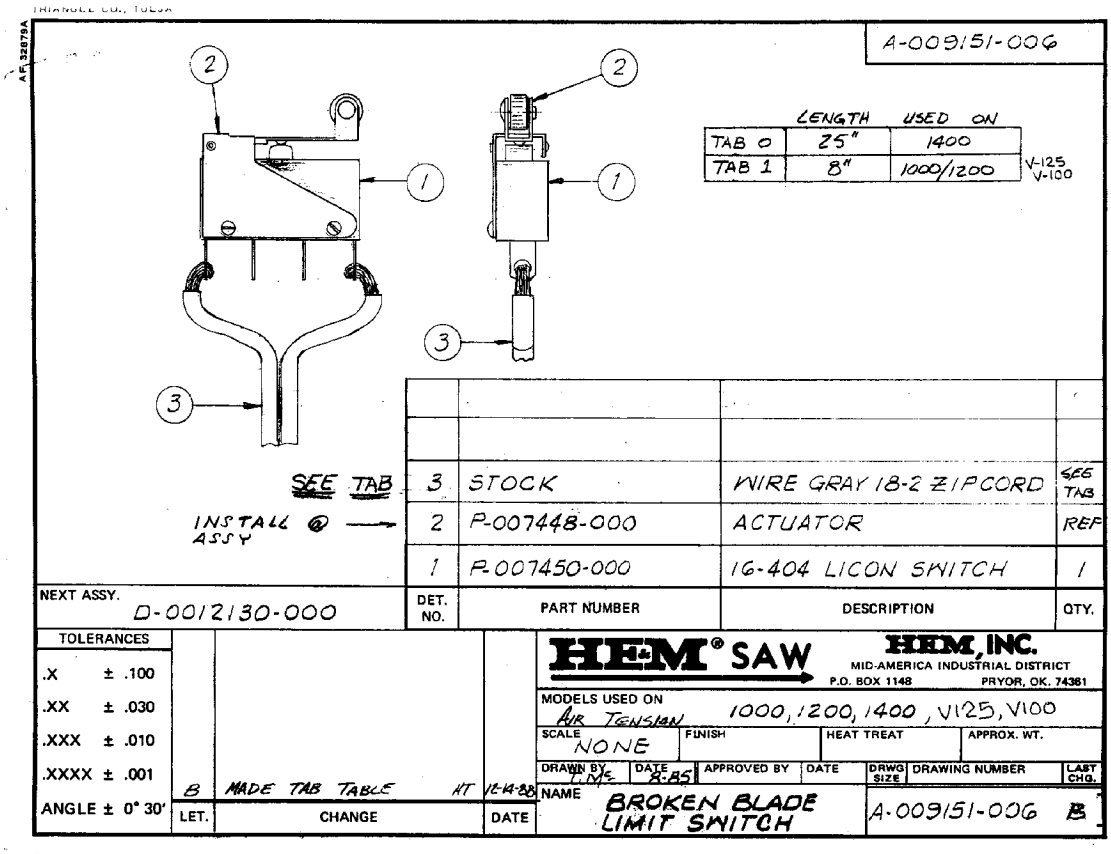
HEM SAW
The saw that cuts straight.

(TENSION CYLINDER CONTINUED)

17	P-007023-010-13-0-000	SHCS	1
18	P-007012-175-16-0-000	SET SCREW	4
19	P-007050-222-00-0-000	O-RING	1
20	P-007050-224-00-0-000	O-RING	1
21	P-007050-265-00-0-000	O-RING	1
22	P-007050-443-00-0-000	O-RING	1
23	P-007010-002-20-0-000	SET SCREW	1
24	P-007033-150-00-0-000	PIN-ROLL	2
25	P-007383-000-00-0-000	SPRING-DISC TYPE	2
999	A-009535-000-02-B-000	SWITCH STRAP	1
999	B-012147-000-00-B-000	BRACKET-REGULATOR	1
999	A-009765-003-00-A-000	SLEEVE-SWITCH ACTUATOR	1
999	B-012142-000-02-D-000	SWITCH MOUNT	1
999	A-012306-000-00-A-000	COVER PLATE	1

(Items 999 Are Optional)

HEM SAW
The saw that cuts straight.



LIMIT SWITCH ASSEMBLY - BROKEN BLADE
A-009151-006-00-B-000

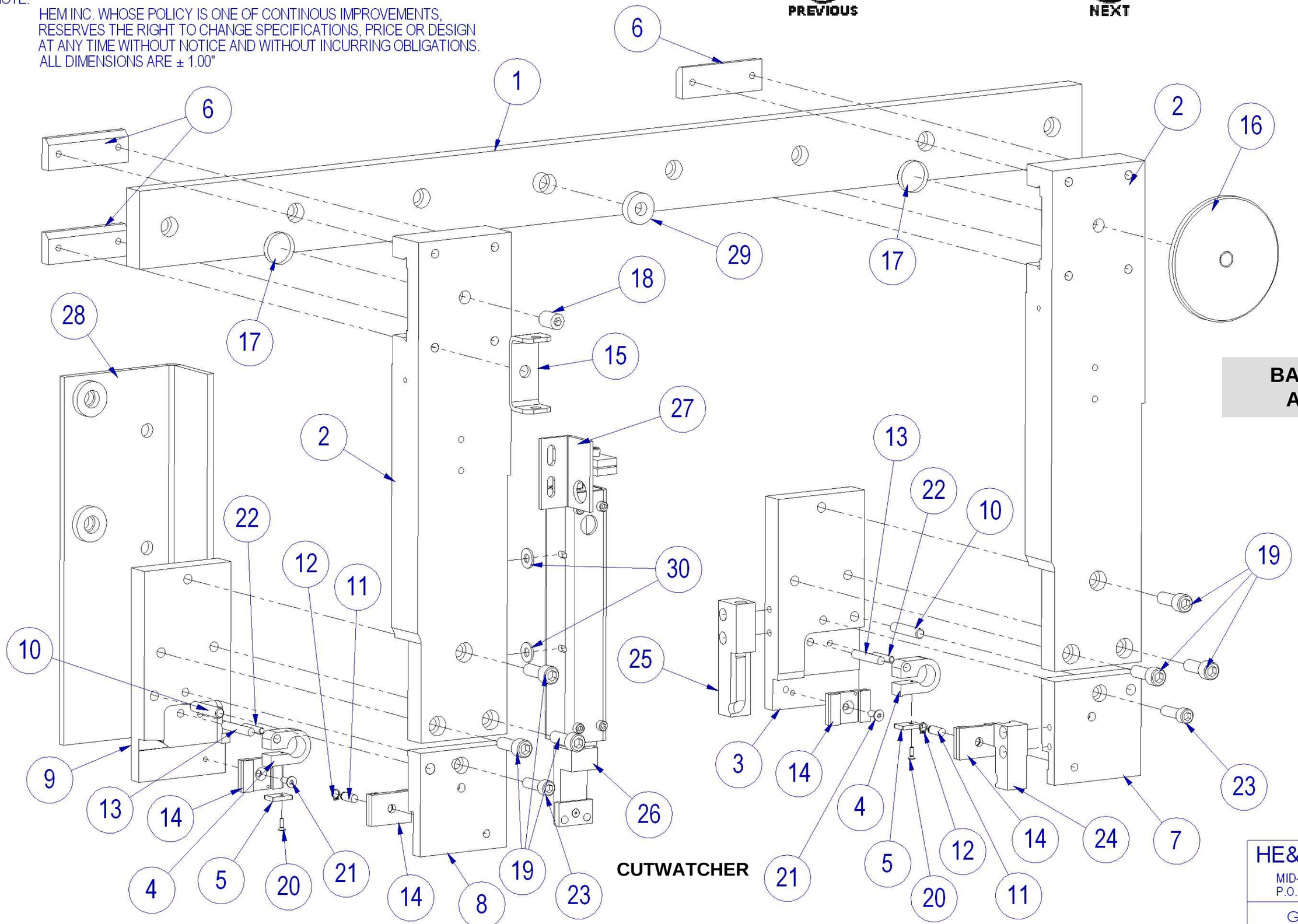
ITEM #	PART NUMBER	DESCRIPTION	QTY
1	P-007450-000-00-0-000	SWITCH	1
2	P-007448-001-00-0-000	ACTUATOR	1
3	P-007518-203-05-0-000	WIRE	25″

BACK TO SAW ARM ASSEMBLY

BACK

NOTE:

HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS.
ALL DIMENSIONS ARE ± 1.00"



GUIDE LOCK

BACK TO ARM ASSEMBLY

CUTWATCHER

HE&M SAW® HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK. 74361

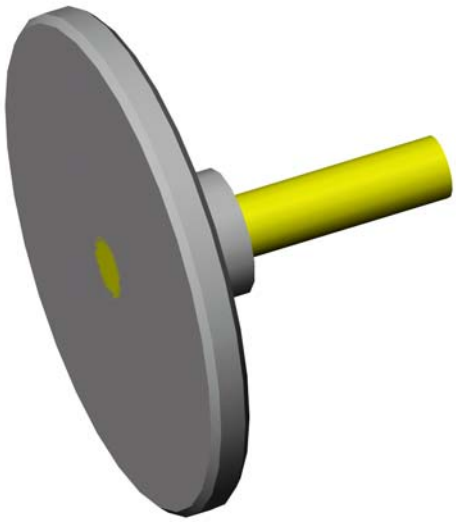
GUIDE ASSY.

B-014504-083 E

HEM SAW
The saw that cuts straight.

GUIDE ASSEMBLY
B-014504-083-00-E-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	T-012348-033-00-B-000	GUIDE RAIL	1
2	C-009299-029-00-D-000	GUIDE ARM	2
3	C-011749-006-00-E-000	GUIDE ADJ.	1
4	B-011865-010-04-E-000	BLADE CUSHION	2
5	P-007122-001-00-0-000	CARBIDE-BLADE CUSHION	2
6	A-009299-013-00-B-000	GUIDE ARM CLEAT	4
7	C-011748-005-00-G-000	GUIDE ADJ. CLAMP	1
8	C-011747-002-00-G-000	CLAMP FIXED GUIDE	1
9	C-011746-003-00-F-000	FIXED GUIDE ADAPTER	1
10	P-007041-150-31-0-000	PIN-DOWEL	2
11	A-009302-000-02-D-000	PIN-CARBIDE INSERT (FIXED)	2
12	P-007039-025-00-0-000	RETAINING RING	2
13	P-007041-150-25-0-000	PIN-DOWEL	2
14	B-009327-000-01-J-000	CARBIDE GUIDE INSERT	1
15	A-013616-584-00-A-000	DUAL ALLEN WRENCH HOLDER	1
16	A-009474-006-00-A-000	GUIDE LOCK ASSY, TWISTER	1
17	A-009299-014-00-A-000	GUIDE ARM SPACER	2
18	P-007013-075-13-0-000	SET SCREW	1
19	P-007022-010-16-0-000	SHCS	6
20	P-007014-040-37-0-000	FHSC	2
21	P-007015-190-50-0-000	FHSC	2
22	P-007041-010-18-0-000	PIN-DOWEL	2
23	P-007021-010-18-0-000	SHCS	2
24	B-011041-006-00-B-000	COOLANT GUIDE BLOCK (FRONT)	1
25	B-011041-007-00-B-000	COOLANT GUIDE BLOCK (BACK)	1
26	B-014120-097-00-D-000	CUTWATCHER ASSEMBLY	1
27	A-014120-032-00-B-000	SENSOR BRACKET	1
28	T-010058-042-00-B-000	GUARD-CUTWATCHER	1
29	A-009355-000-02-K-000	THICK WASHER	1
30	P-007000-002-00-0-000	WASHER-FLAT	2



BACK TO GUIDE ASSEMBLY

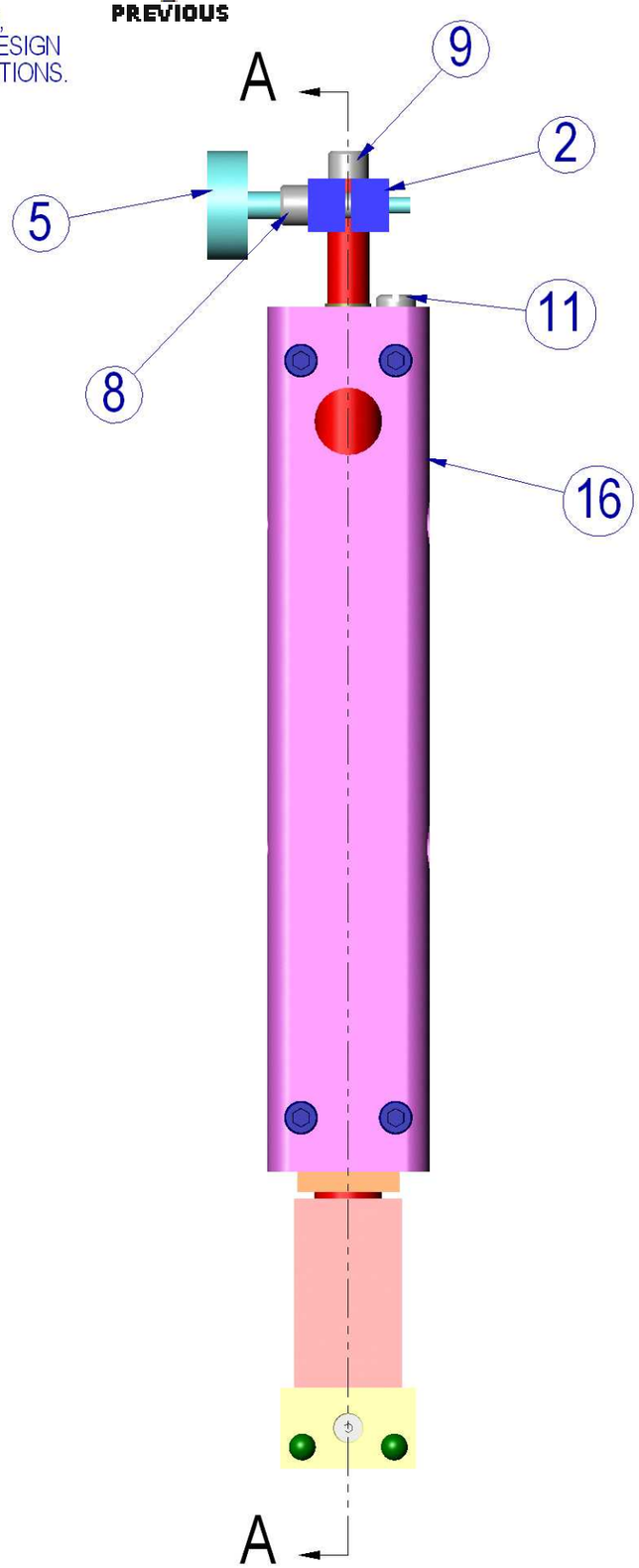
GUIDE LOCK ASSEMBLY
A-009474-006-00-A-000

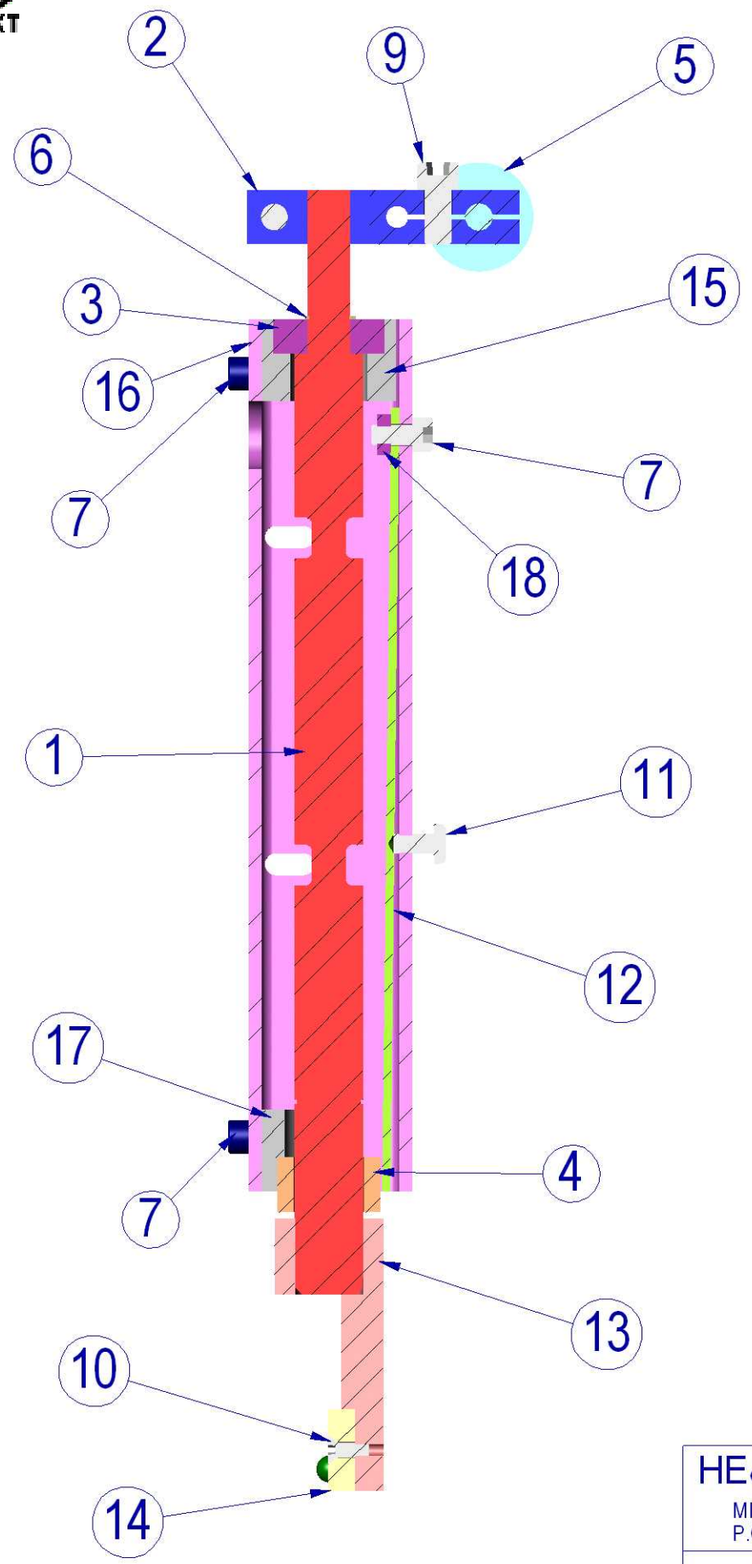
ITEM #	PART NUMBER	DESCRIPTION	QTY
1	A-009474-006-00-A-000	GUIDE LOCK ASSEMBLY	1

NOTE:

HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS.
ALL DIMENSIONS ARE ± 1.00"

BACK TO GUIDE ASSEMBLY





SECTION A-A

HE&M SAW® HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK. 74361

CUTWATCHER ASSY.

B-014120-097 B

HEM SAW
The saw that cuts straight.

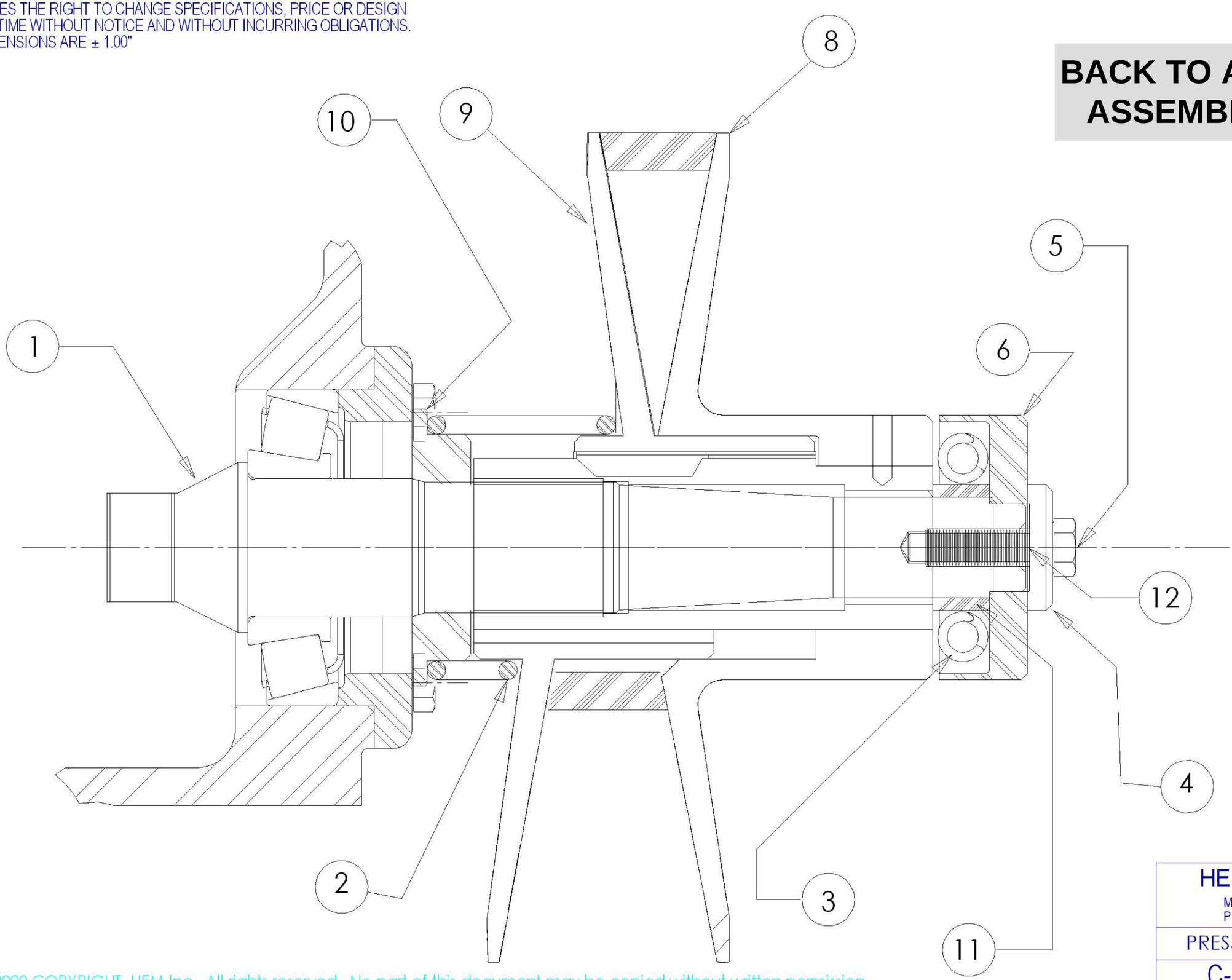
CUTWATCHER ASSEMBLY
T-014120-097-00-C-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	B-014120-021-00-C-000	SHAFT	1
2	A-014120-006-04-J-000	BAR-ACTUATOR	1
3	P-007096-007-00-A-000	BEARING	1
4	A-014120-065-00-A-000	END MOUNT GUIDE BLOCK	1
5	P-007730-004-00-0-000	KNURLED HEAD SCREW	1
6	P-007039-039-00-0-000	RETAINING RING	1
7	P-007019-190-37-0-000	SHCS	5
8	P-007020-007-20-0-000	SHCS	1
9	P-007020-005-20-0-000	SHCS	1
10	P-007014-040-37-0-000	FHSC	1
11	P-007044-190-37-0-000	PANHEAD SCREW	2
12	T-014120-090-00-B-000	SPRING	1
13	T-014120-096-00-A-000	GUIDE	1
14	T-009327-046-00-A-000	CARBIDE ASSY	1
15	T-014120-094-00-A-000	END MOUNT	1
16	T-014120-092-00-B-000	CUTWATCHER TUBE DC 1414	1
17	T-014120-093-00-A-000	MOUNT BLOCK	1
18	P-007003-100-00-0-000	NUT-HEX	1

NOTE:

HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS.
ALL DIMENSIONS ARE ± 1.00"

BACK TO ARM ASSEMBLY



HE&M SAW® HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK. 74361

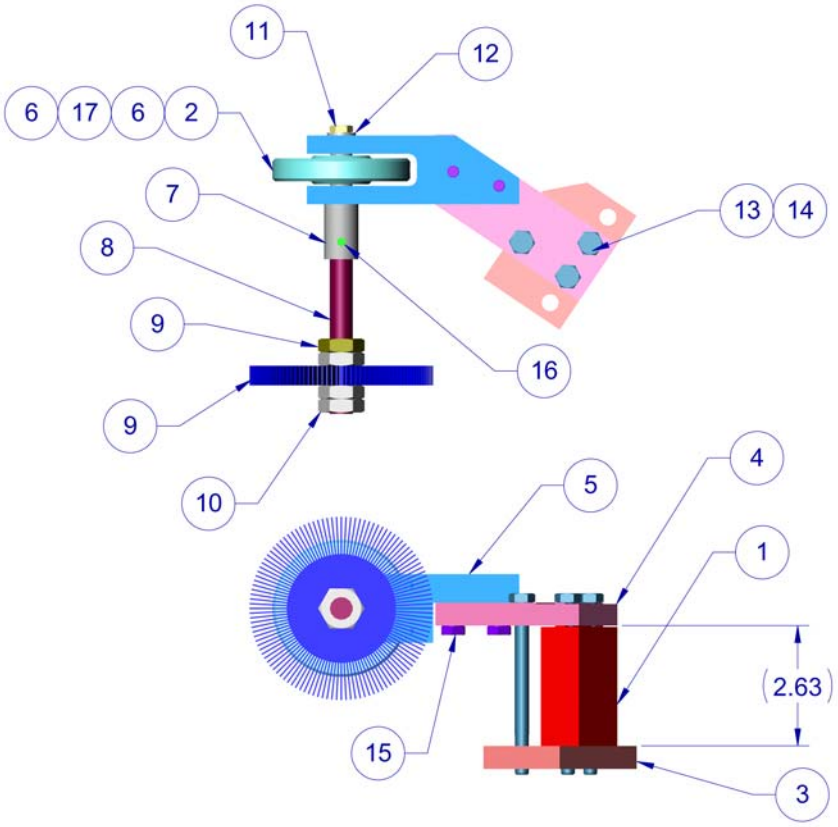
PRESS-ON PULLEY ASSEMBLY

C-010714-017 E

PRESS-ON PULLEY ASSEMBLY
C-010714-017-00-E-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	P-007204-005-00-0-000	GEAR REDUCER	1
2	A-009157-008-00-A-000	PRESSURE SPRING	1
3	P-007384-000-00-0-000	SPRING	2
4	A-009355-000-02-J-000	WASHER - THICK	1
5	P-007027-010-16-0-000	HHCS	1
6	C-010714-020-00-G-001	DRIVE DOG	1
8	C-010714-019-00-D-000	MODIFIED FIXED FLANGE	1
9	P-007220-508-00-0-001	MOVEABLE FLANGE	1
10	C-010714-020-00-G-002	SPRING RETAINER	1
11	C-010714-020-00-G-003	THRUST BUSHING	1
12	C-010714-017-00-E-012	KEY	1

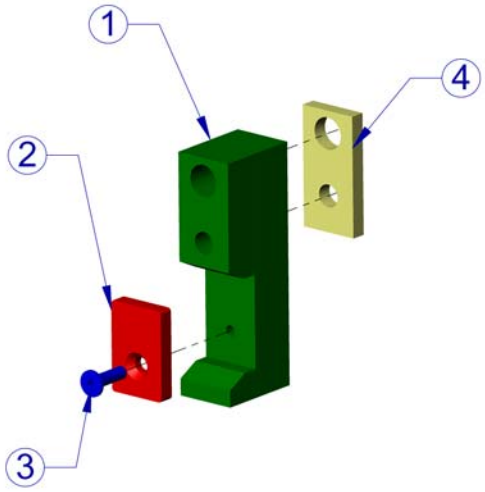
HEM SAW
The saw that cuts straight.



BACK TO ARM ASSEMBLY

POWER BRUSH ASSEMBLY
B-009570-034-00-E-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	A-009633-012-00-A-000	SPACER BLOCK-POWER BRUSH SIDEWINDER	1
2	A-009634-000-01-F-000	DRIVE WHEEL - POWER BRUSH	1
3	A-009630-000-00-E-000	MOUNT PLATE	1
4	A-009632-000-00-B-000	SUPPORT - WHEEL HOUSING	1
5	B-009631-000-00-B-000	WHEEL HOUSING-DRIVE	1
6	P-007089-000-00-0-000	BEARING	2
7	B-009636-011-00-C-000	WHEEL SHAFT	1
8	A-010936-031-01-K-000	ALL THREAD	1
9	P-007385-000-00-0-000	BRUSH,WIRE	1
10	P-007005-005-13-0-000	NUT-JAM	4
11	P-007000-002-00-0-000	WASHER-FLAT	1
12	P-007025-005-20-0-000	HHCS	1
13	P-007026-375-18-0-000	HHCS	3
14	P-007002-003-00-0-000	WASHER-LOCK-SPRING	3
15	P-007026-010-18-0-000	HHCS	2
16	P-007033-007-00-0-000	PIN-ROLL	1
17	P-007033-150-00-0-000	PIN-ROLL	1

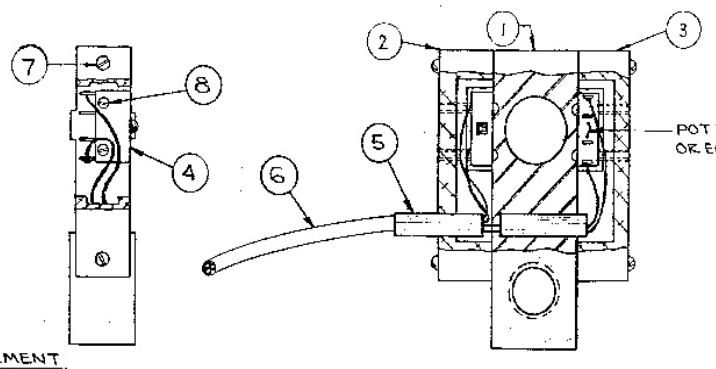


BACK TO ARM ASSEMBLY

BUMPER BLOCK ASSEMBLY
A-009354-001-00-G-000

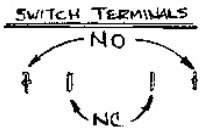
ITEM #	PART NUMBER	DESCRIPTION	QTY
1	A-009354-000-00-N-000	BUMPER BLOCK	1
2	P-007122-001-00-0-000	CARBIDE-BLADE CUSHION	1
3	P-007014-040-37-0-000	FHSC	1
4	A-009354-002-00-G-000	SHIM-BUMPER BLOCK	1

HEM SAW
The saw that cuts straight.



SWITCH REPLACEMENT

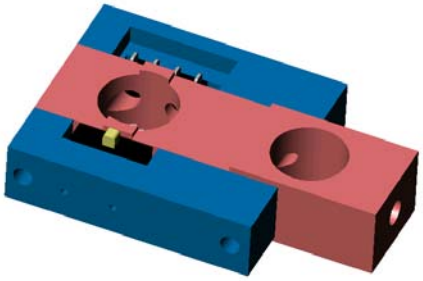
1. REMOVE SWITCH HOLDER, 2 OR 3
2. REPLACE SWITCH
3. RESOLDER WIRES. CHECK FOR BROKEN INSOLATION OR GROUNDED WIRES.
4. MOUNT SWITCH HOLDER BUT DO NOT TIGHTEN SCREWS 7
5. RAISE OR LOWER SAW ARM TO ACTIVATE SWITCH.
6. ADJUST SWITCH HOLDER TO COMPLETELY ACTIVATE SWITCH.
7. BACK OFF ADJUSTMENT SLIGHTLY, ABOUT .005. THIS WILL LEAVE ROOM FOR CHIPS ECT.



1. UP & DOWN LIMIT SWITCHES TO BE WIRED OUTER N.O. TERMINALS. (EITHER WIRE ON EITHER TERMINAL
2. BLACK & WHITE FOR UP RED & GREEN FOR DOWN.
3. FOR TAB 6, RED & GREEN ARE TO BE WIRED TO N.C. INSIDE TERMINALS

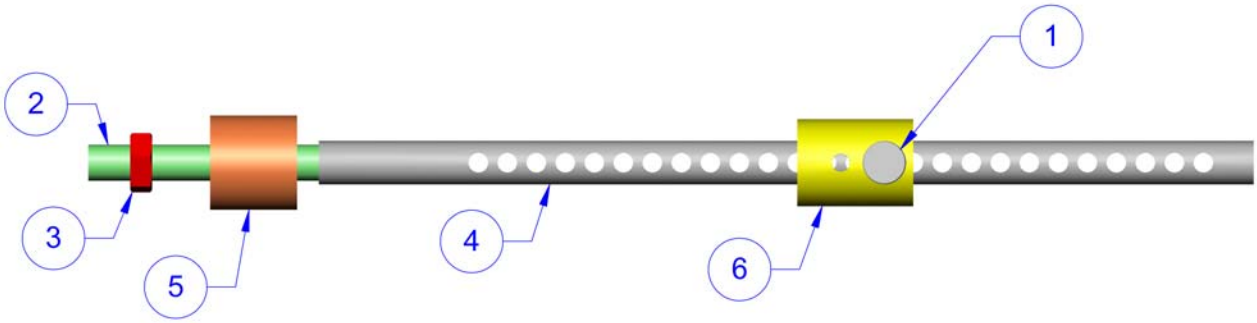
LIFT ARM LEVER W/SWITCH
B-009223-000-02-F-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	A-009221-002-00-B-000	LIFT ARM LEVER	1
2	A-009220-000-01-B-000	LIMIT SWITCH HOLDER-LEFT	1
3	A-009220-000-02-B-000	LIMIT SWITCH HOLDER-RIGHT	1
4	P-007450-000-00-0-000	SWITCH	2
5	P-007227-002-10-0-000	TUBING	2
6	P-007522-302-20-0-000	WIRE	30
7	P-007008-164-10-0-000	SCREW-ROUND HEAD	4
8	P-007008-086-50-0-000	SCREW-ROUND HEAD	4



BACK TO SAW ASSEMBLY

HEM SAW
The saw that cuts straight.

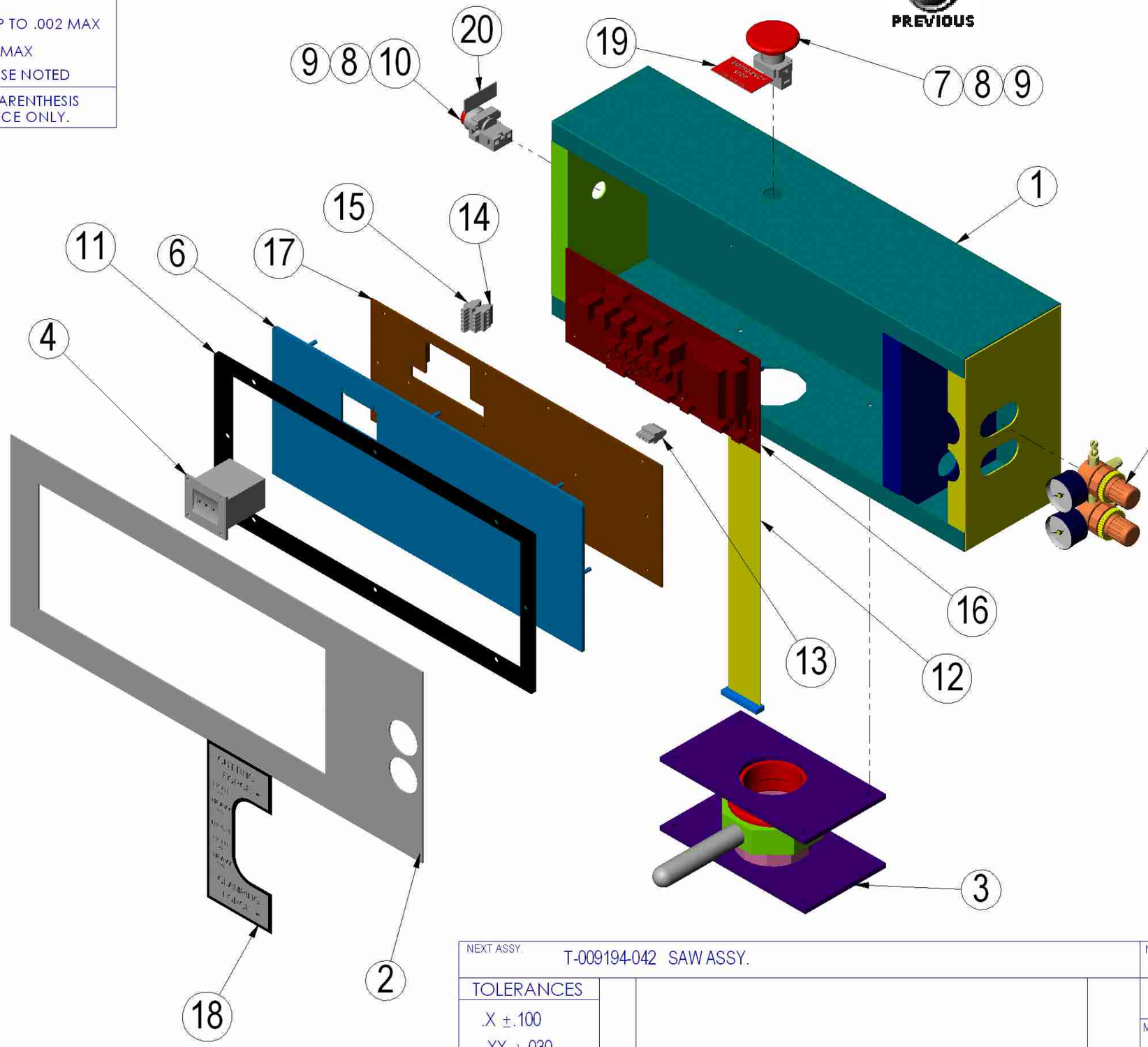


HEIGHT SET ASSEMBLY
T-009151-030-00-A-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	A-009806-000-00-B-000	PIN - MICRO ADJUST	1
2	B-009810-000-02-P-000	SHAFT MICRO ADJUST	1
3	A-009763-000-06-D-000	ALLTHREAD COMPOSITE	1
4	P-007005-006-00-0-000	NUT-JAM	1
5	A-008929-000-00-C-000	NUT-ARM STOP - LOWER	1
6	P-007009-190-50-0-000	SET SCREW	1
7	A-009811-008-00-E-000	STOP SLEEVE	1

BACK TO SAW ASSEMBLY

1. SHARP TO .002 MAX
   R.010 MAX
   UNLESS OTHERWISE NOTED
2. DIMENSIONS IN PARENTHESIS ARE FOR REFERENCE ONLY.



GAUGE ASSEMBLY

BACK TO SAW ASSEMBLY

NEXT ASSY. T-009194-042 SAW ASSY.

NOTES:

TOLERANCES
.X ±.100
.XX ±.030
.XXX ±.010
.XXXX ±.001
ANGLE ±0 °30

LET.	CHANGE		DATE
A	RELEASE	JWC	02/03

HE&M SAW ® HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT P.O. BOX 1148 PRYOR, OK. 74361

MODELS USED ON: CYCLONE

SCALE	FINISH	HEAT TREAT	APPROX. WEIGHT
1/5			

DRAWN BY		DATE	DRWG. SIZE	DRAWING NUMBER	REVISION
JWC	PLOT AS "B"	02/19/03			

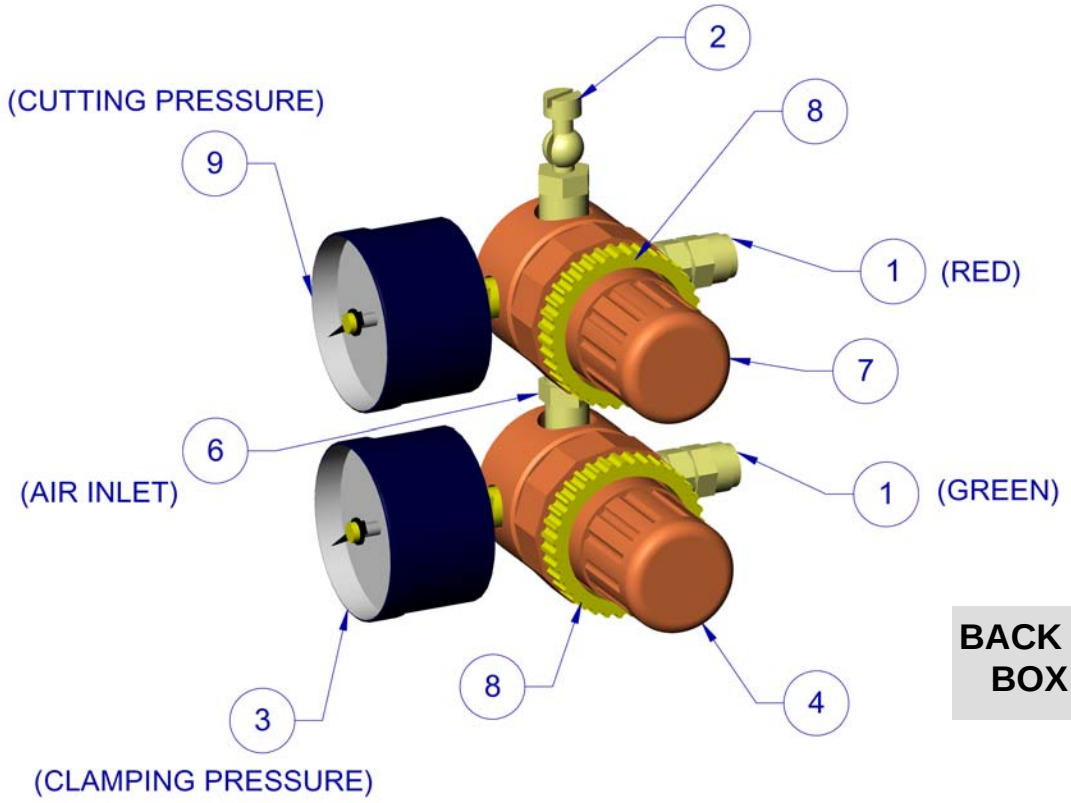
NAME: CONTROL BOX ASSY. T-010014-068 A+

PARTS LIST

HEM SAW
The saw that cuts straight.

CONTROL BOX ASSEMBLY
T-010014-068-00-A-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	T-010013-075-00-B-000	CONTROL BOX W/A CYCLONE	1
2	T-010013-076-00-A-000	FRONT PANEL	1
3	T-010014-066-00-A-000	SWIVEL ASSY.	1
4	P-007428-000-00-0-000	COUNTER	1
5	B-009784-013-00-A-000	PRESSURE GAUGE ASSEMBLY	1
6	P-007428-064-00-0-000	TOUCH PANEL ASSEMBLY	1
7	P-007442-028-00-0-000	EMERGENCY STOP	1
8	P-007442-008-00-0-000	SWITCH MOUNT BASE	2
9	P-007442-009-00-0-000	SWITCH CONTACT N.C.	2
10	P-007442-014-00-0-000	SWITCH	1
11	P-007428-059-00-0-000	BEZEL, TOUCH PANEL	1
12	P-007583-054-01-0-000	CABLE ASSEMBLY	1
13	P-007581-116-04-0-000	CONNECTOR, 4 PIN	1
14	P-007581-116-05-0-000	CONNECTOR, 5 PIN	1
15	P-007581-116-06-0-000	CONNECTOR, 6 PIN	1
16	S-007620-031-00-0-000	ALL FUNCTION I/O BOARD	1
17	S-007620-032-00-0-000	HYBRID ALL FUNCTION BOARD	1
18	B-010014-068-00-A-018	GAGE LABEL	1
19	B-010014-068-00-A-019	EMERGENCY STOP-TWIST LABEL	1
20	B-010014-068-00-A-020	PANIC LABEL	1

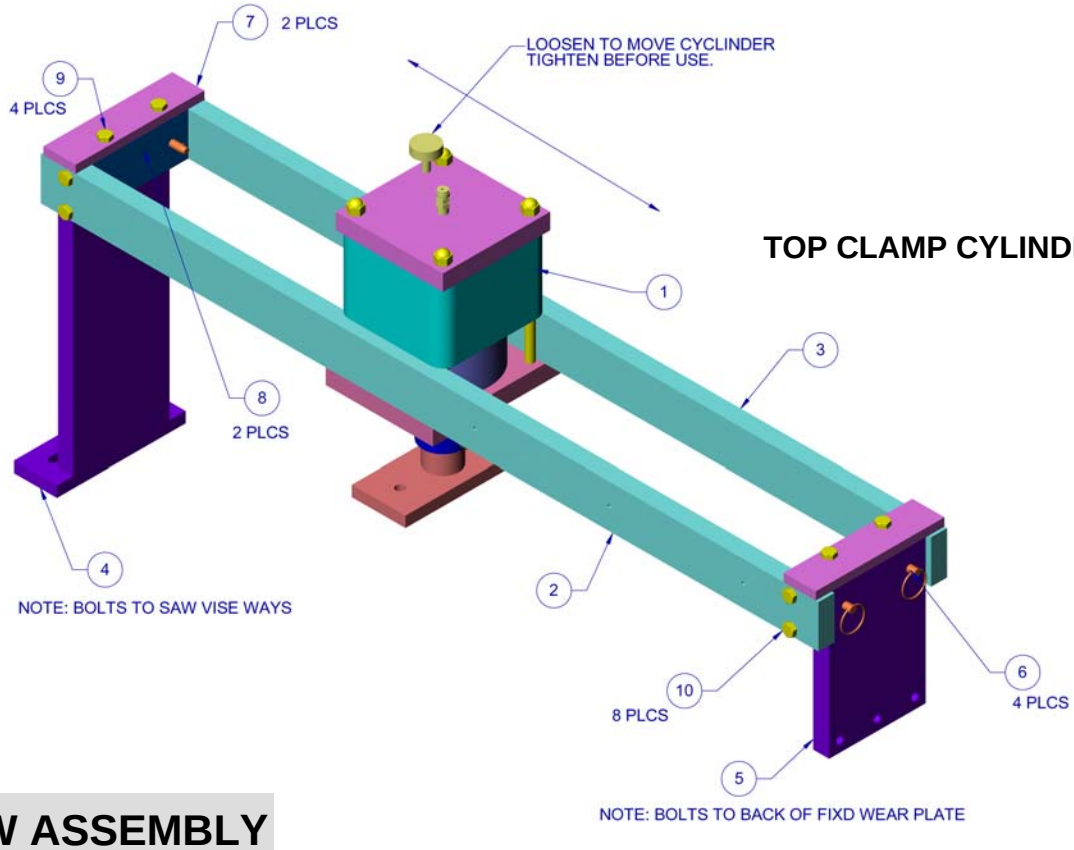


BACK TO CONTROL BOX ASSEMBLY

PRESSURE GAUGE ASSEMBLY
B-009784-013-00-A-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	P-007070-002-12-0-000	MALE CONNECTOR	2
2	P-007153-000-00-0-000	VALVE	1
3	P-007140-004-00-0-000	GAUGE	1
4	P-007139-000-00-0-000	REGULATOR	1
6	A-009783-000-00-A-000	TEE	1
7	B-009784-001-00-B-000	REGULATOR PRESSURE-MODIFIED	1
8	P-007142-000-00-0-000	NUT	4
9	P-007140-005-00-0-000	GAUGE	1

HEM SAW
The saw that cuts straight.



TOP CLAMP CYLINDER

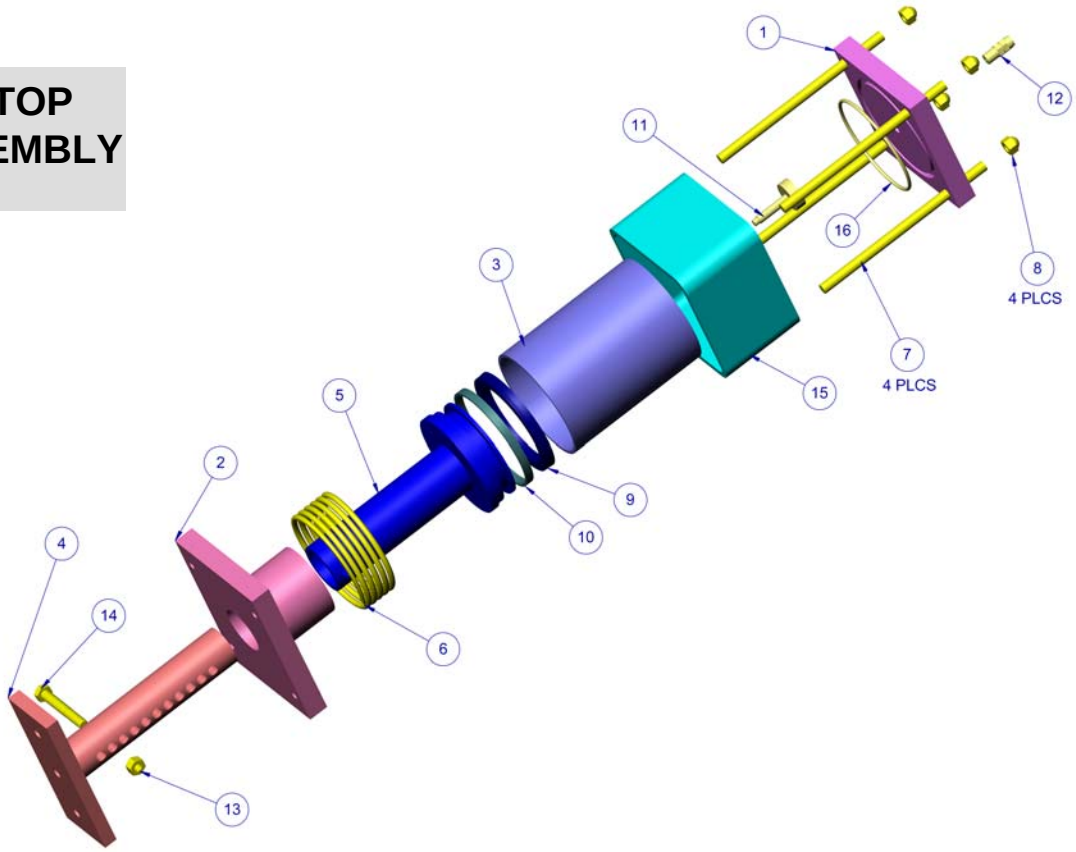
BACK TO SAW ASSEMBLY

TOP CLAMP ASSEMBLY
C-013800-129-00-A-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	C-011941-038-00-B-000	TOP CLAMP CYL ASSEMBLY	1
2	C-010230-061-01-C-001	GUIDE RAIL	1
3	C-010230-061-01-C-002	GUIDE RAIL	1
4	C-010230-066-01-B-000	END RAIL MOUNT W/A	1
5	C-010230-063-00-A-000	WEAR PLATE EXTENSION	1
6	P-007730-033-00-0-000	QUICK RELEASE PIN	4
7	B-013800-130-00-A-000	TOP CLAMP CAP	2
8	B-013800-131-00-A-000	TOP CLAMP MOUNT	2
9	P-007026-010-18-0-000	HHCS	4
10	P-007026-125-18-0-000	HHCS	8

HEM SAW
The saw that cuts straight.

BACK TO TOP
CLAMP ASSEMBLY



TOP CLAMP CYL ASSEMBLY
C-011941-038-00-B-000

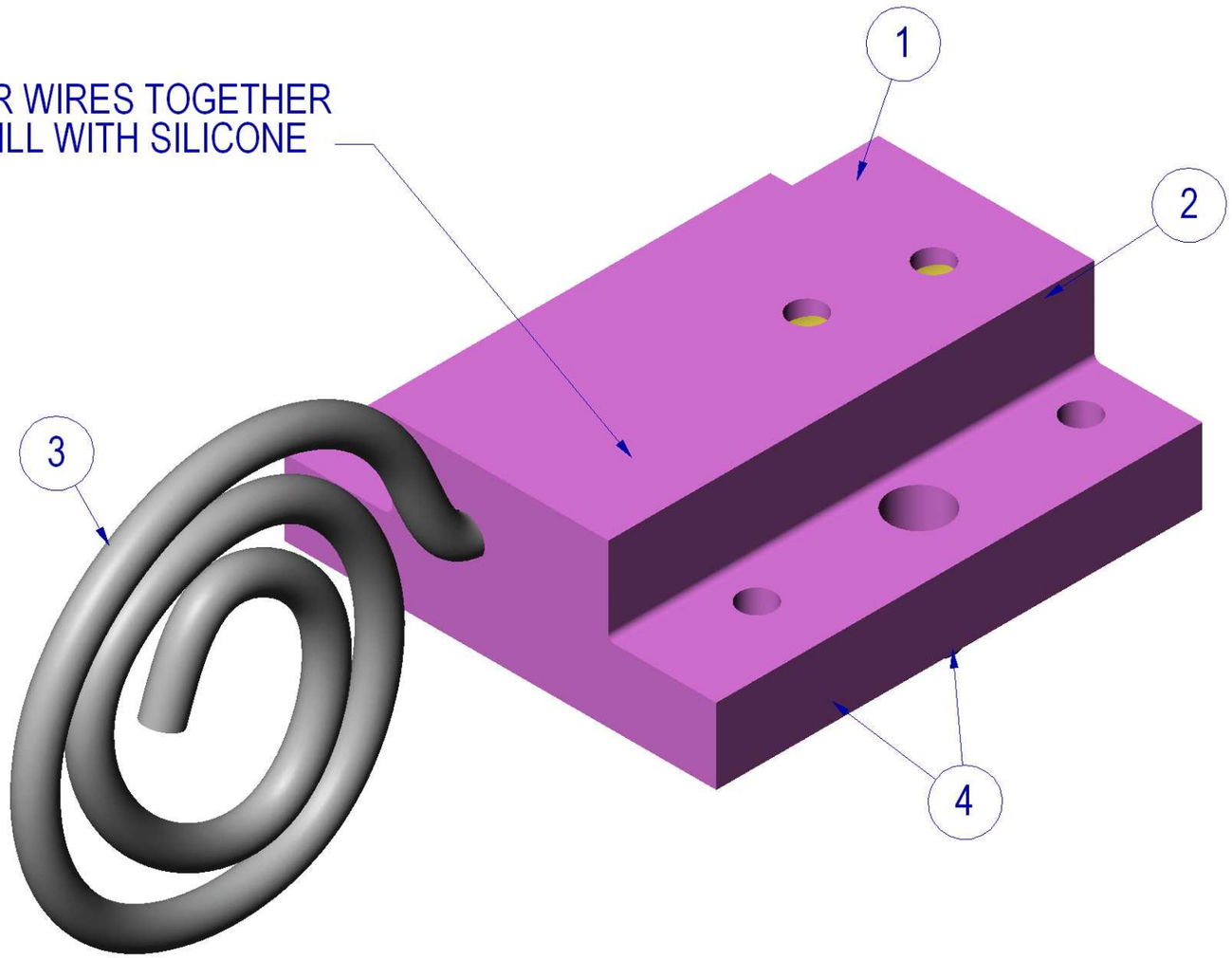
ITEM #	PART NUMBER	DESCRIPTION	QTY
1	B-009310-015-00-C-000	CYL. END PLATE	1
2	C-009310-016-00-C-000	CYL. END PLATE	1
3	B-010227-039-00-C-000	CYL. TUBE	1
4	C-013806-099-00-C-000	FOOT BAR W/A	1
5	C-009615-150-00-C-000	PISTON ROD W/A	1
6	A-003967-000-02-A-000	SPRING	1
7	A-009330-003-04-F-000	TIE ROD	4
8	P-007398-029-00-A-000	PLATED CAP NUT	4
9	P-007053-054-00-0-000	U CUP	1
10	P-007791-400-00-0-000	SEAL	1
11	P-007730-007-00-0-000	KNURLED HEAD SCREW	1
12	P-007070-002-12-0-000	MALE CONNECTOR	1
13	P-007004-004-16-0-000	NUT-HEX	1
14	P-007027-250-16-0-000	HHCS	1
15	B-010227-038-00-A-000	LOCK DOWN TUBE	1
16	P-007050-240-00-0-000	O-RING	1

HOME


BACK
QUICK RELEASE PINS FOR EASY REMOVAL

NOTE:

HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS.
ALL DIMENSIONS ARE ± 1.00"



BACK TO OPTIONS LIST

BACK TO SAW ASSEMBLY

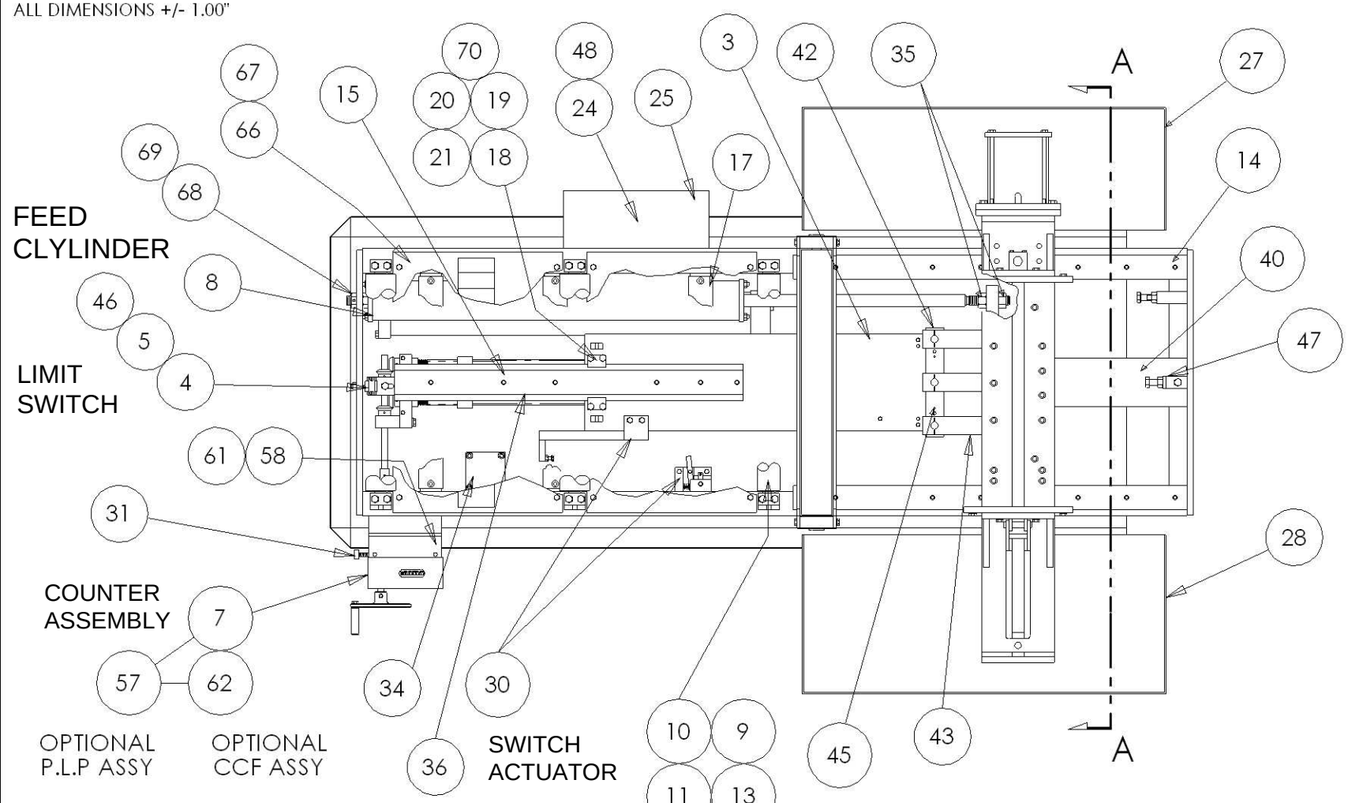
HE&M SAW® HE&M ,INC. MID-AMERICA INDUSTRIAL DISTRICT P.O. BOX 1148 PRYOR, OK. 74361	
LASER LINE ASSY.	
B-014688-018	A

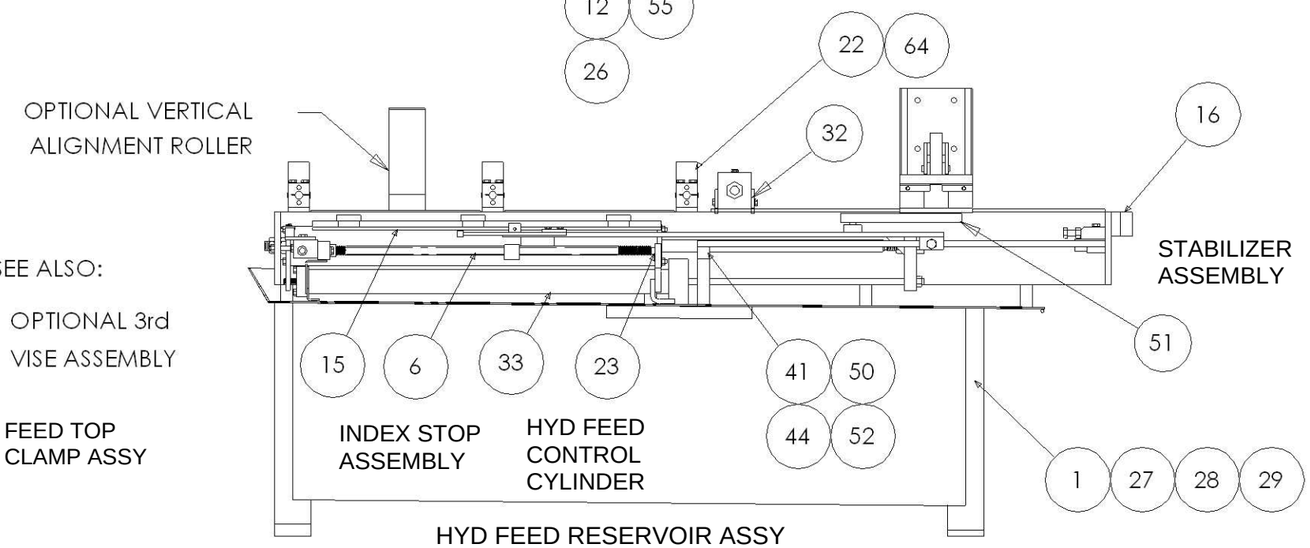
HEM SAW
The saw that cuts straight.

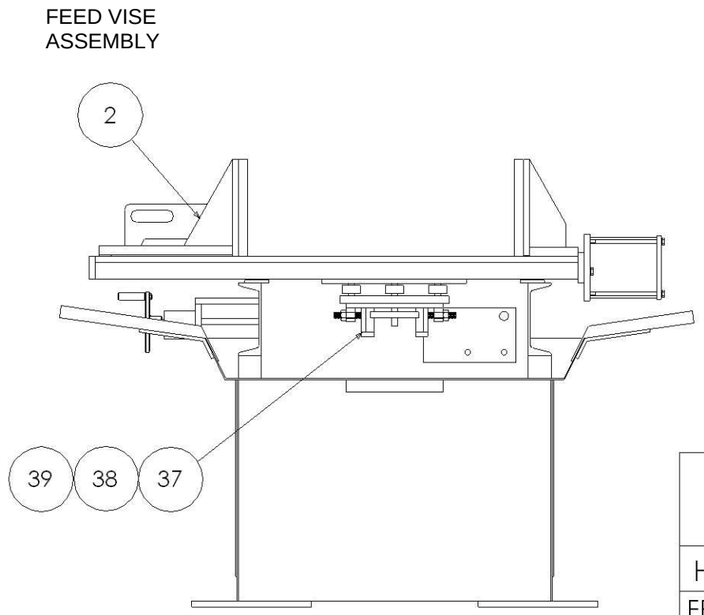
LASER LINE ASSEMBLY
T-014688-018-00-A-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	T-014688-017-00-B-000	LASER MOUNT	1
2	P-007428-063-00-0-000	LASER LINE GENERATING MODULE	1
3	T-014688-018-00-A-003	3' OF 22-4 WIRE	1
4	P-007009-190-18-0-000	SET SCREW	2
5	P-007420-005-00-0-000	TRANSFORMER	1

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS,
RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN
AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"







SECTION A-A

BACK TO LAYOUT DRAWING

PARTS LIST

HEM ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

H13291	CYCLONE SAW
FEED TABLE ASSEMBLY	
T-009196-027 A	

HEM SAW
The saw that cuts straight.

FEED TABLE ASSEMBLY-F105L CYCLONE
D-009196-027-00-A-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	D-009803-043-00-E-000	FEED FRAME W/A	1
2	D-010322-107-00-D-000	FEED VISE ASSEMBLY	1
3	D-012244-046-00-Q-000	VISE STABILIZER PLATE W/A	1
4	A-009549-001-00-C-000	SWITCH HOLDER W/A	1
5	A-009947-017-00-A-000	LIMIT SWITCH ASSY	1
6	D-009311-001-01-C-000	INDEX ASSEMBLY	1
7	C-009478-006-01-C-000	COUNTER & GEAR ASSY. LH	1
8	C-009615-033-00-G-000	CYLINDER	1
9	A-010032-009-00-A-000	ROLLER MOUNT SPACER	6
10	A-009456-003-00-B-000	ROLLER MOUNT	3
11	B-009955-001-10-G-000	ROLLER	3
12	A-009958-037-00-B-000	SHAFT-ROLLER	3
13	A-012283-002-00-C-000	BUSHING-ECCENTRIC	6
14	B-009801-000-04-G-000	FRAME WAYS-FEED STANDARD	2
15	B-009975-002-00-F-001	GUIDE RAIL-REAR	1
16	B-009682-008-05-H-000	FEED MOUNT ASSEMBLY	1
17	A-012277-000-08-M-000	HANGER-GUIDE RAIL	3
18	A-009973-012-00-A-000	RETAINER REAR SLIDE	2
19	A-009973-014-00-A-000	RETAINER REAR SLIDE	1
20	A-009973-016-00-B-000	RETAINER REAR SLIDE	2
21	A-009973-017-00-A-000	DELRIN	2
22	A-009464-023-00-A-000	SIDE STOP	3
23	A-009503-001-00-B-000	BEARING-BRONZE	2
24	B-009982-016-00-F-000	COVER PLATE	1
25	B-009982-010-00-B-000	RAIL TERMINAL STRIP COVER	1
26	P-007092-000-00-0-000	BEARING	6
27	C-010013-061-00-A-000	JUNCTION BOX W/A	1
28	B-013616-968-00-A-000	J-BOX COVER W/A	1
29	T-013616-967-00-B-000	J-BOX MOUNT	1
30	B-009549-008-01-G-000	SWITCH ACTUATOR ASSY	1
31	P-007730-007-00-0-000	KNURLED HEAD SCREW	1
32	C-009654-004-07-C-000	SLIDING ROLER ASSEMBLY	1
33	D-009524-005-00-H-000	HYDRAULIC FEED CONTROL ASSY	1
34	B-009332-001-00-D-000	FEED RESERVOIR ASSY-HYDRAULICS	1
35	P-007004-007-10-0-000	NUT-HEX	2
36	B-009975-002-00-F-002	SPACER-GUIDE RAIL	1
37	A-009973-003-00-C-000	RETAINER - FRONT SLIDE	2
38	A-009973-018-00-A-000	RETAINER FRONT SLIDE	2
39	A-009973-020-00-A-000	RETAINER FRONT SLIDE	2
40	B-009975-001-01-K-000	GUIDE RAIL-FRONT	1

(CONTINUED NEXT PAGE)

FEED TABLE ASSEMBLY-F105L CYCLONE
D-009196-027-00-A-000

(CONTINUED)

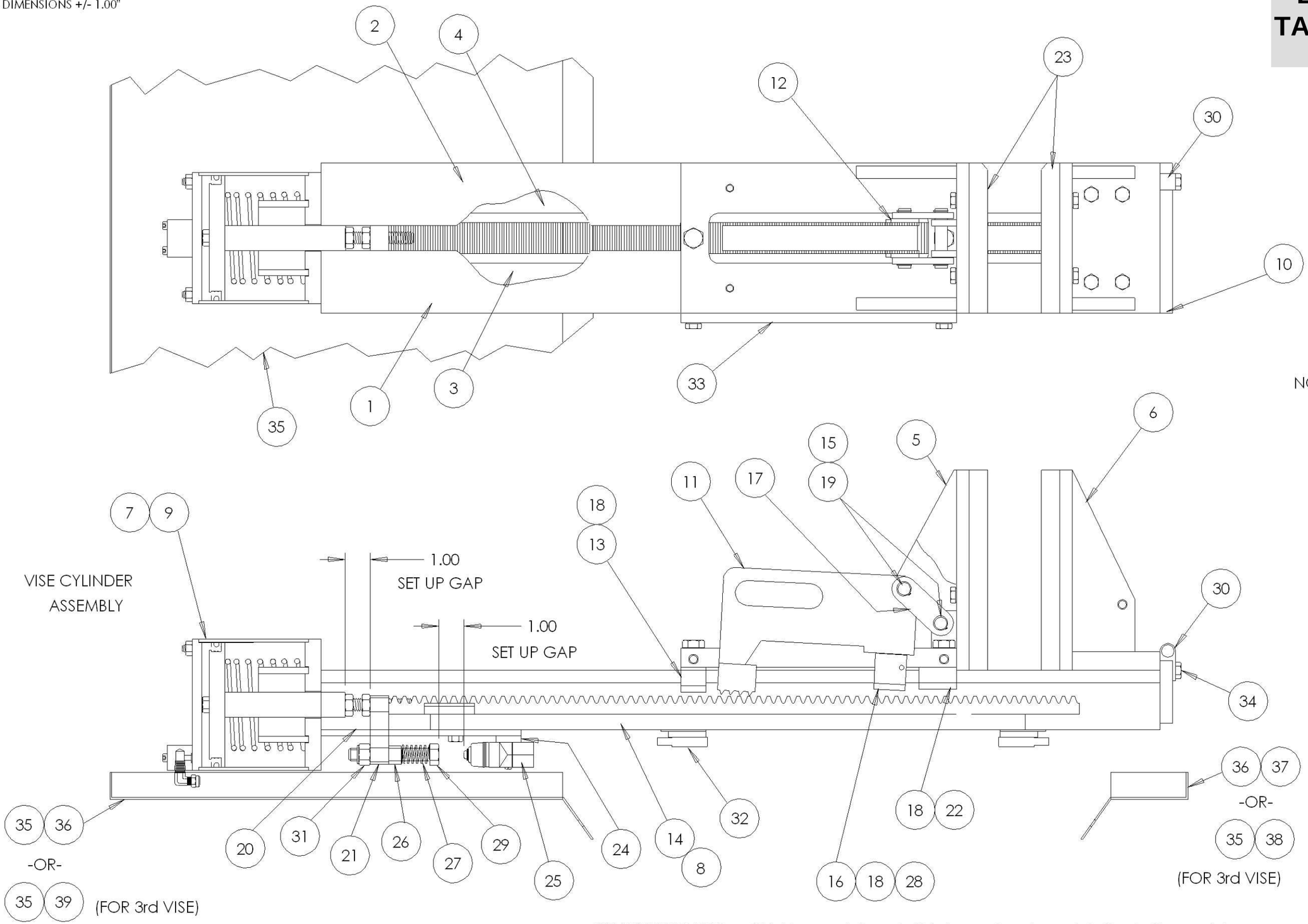
ITEM #	PART NUMBER	DESCRIPTION	QTY
41	A-009976-001-02-A-000	SPACER	1
42	B-012244-006-02-D-000	STABILIZER BAR	1
43	B-012278-005-00-B-000	PARALLEL LINK	3
44	A-009976-001-04-B-000	SPACER (.125)	1
45	P-007035-125-00-0-000	PIN-ROLL	2
46	A-009535-000-02-B-000	SWITCH STRAP	1
47	B-009118-009-04-C-000	STOP	1
48	B-009982-016-02-F-000	COVER PLATE	1
49	P-007646-010-00-0-000	CONDUIT STRAP	3
50	A-009976-001-05-B-000	SPACER (.062)	1
51	C-012244-052-00-C-000	STABLIZER ASSEMBLY	1
52	A-009976-001-06-B-000	SPACER (.032)	1
53	B-009549-006-00-J-000	SWITCH ACTUATOR BAR W/A	1
54	B-009765-006-00-A-000	ACTUATOR-SWITCH	1
55	A-009957-001-02-C-000	MOUNT CAP	3
57	D-009478-012-00-F-000	PLP ASSEMBLY	1
58	A-009475-002-00-A-000	SUPPORT PLATE	1
61	D-009196-005-00-D-054	HRS 10 GA	1
62	B-009477-003-01-M-000	FEED TABLE CCF OPTION	1
64	A-009456-041-00-0-000	ROLLER MOUNT	3
66	B-009982-017-00-B-000	COVER PLATE-VISE MOUNT	1
67	B-009982-016-04-F-000	COVER PLATE	1
68	A-010802-005-00-A-000	MOD - JAM NUT	1
69	P-007010-002-20-0-000	SET SCREW	1
70	A-009973-013-00-A-000	RETAINER REAR SLIDE	2
999	B-011381-002-05-E-000	VERTICAL ROLLER ASSEMBLY	1
999	D-010322-107-01-D-000	3rd VISE ASSEMBLY	1
999	B-013805-045-00-A-000	HOLD DOWN CLAMP EXTENSION	1
999	B-013805-044-00-A-000	HOLD DOWN CLAMP	1

(Items 999 Are Optional)

(BACK TO SHEET 1)

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"

BACK TO FEED TABLE ASSEMBLY



NOTE:

ITEMS 21,24,25,26,27,29, 31,32,33,35 & 38 ARE NOT USED ON THE 3rd VISE OPTION.

ITEMS 38 & 39 ARE USED ONLY ON THE 3rd VISE OPTION.

PARTS LIST

HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

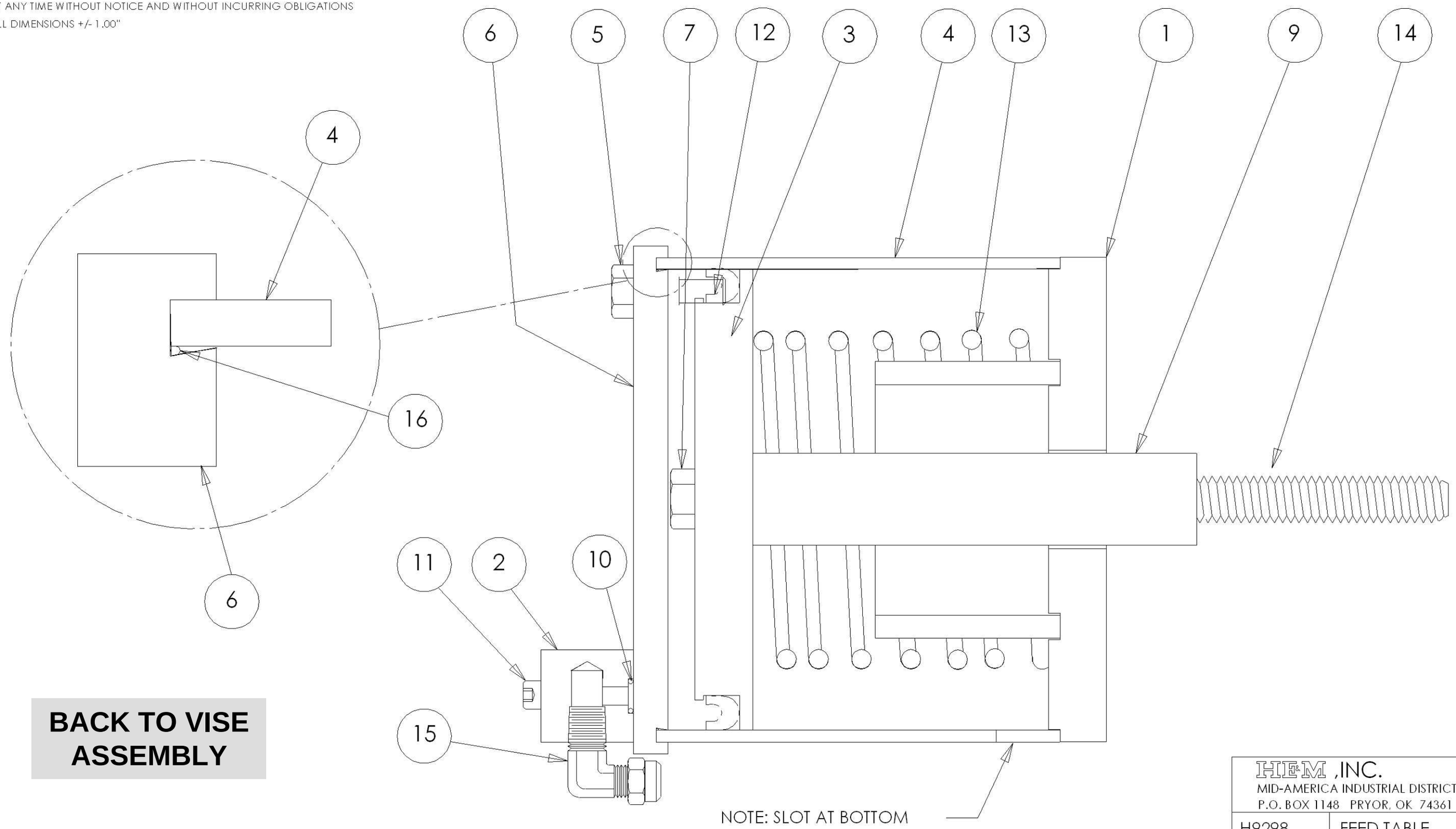
H9299	FEED TABLE
FEED VISE ASSEMBLY	
D-010322-107 D	

HEM SAW
The saw that cuts straight.

FEED VISE ASSEMBLY
D-010322-107-00-D-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	C-009189-011-02-J-000	VISE WAY - R.H.	1
2	C-009188-007-02-F-000	VISE WAY - L.H.	1
3	C-009189-011-01-J-000	SPACER - VISE R.H.	1
4	C-009188-007-01-F-000	SPACER - VISE L.H.	1
5	C-009177-001-03-P-000	VISE JAW, ADJUSTABLE	1
6	C-009176-001-00-S-000	VISE JAW W/A FIXED	1
7	C-009261-022-00-F-000	VISE CYLINDER ASSEMBLY	1
8	A-012845-004-00-A-000	GEAR RACK SPACER	1
9	A-010316-008-00-A-000	THREAD ADAPTER	2
10	A-009954-018-00-B-000	VISEWAY END BAR	1
11	B-010322-021-00-J-000	HANDLE-CLAMP	1
12	A-009355-000-03-J-000	WASHER - THICK	2
13	A-010309-004-00-D-000	TEE-VISE, ADJUSTABLE	1
14	A-011423-003-08-F-000	GEAR RACK W/A	1
15	P-007039-050-00-0-000	RETAINING RING	6
16	A-010309-007-00-F-000	VISE TEE	1
17	A-010312-001-02-E-000	PLATE-LINK	2
18	P-007023-150-13-0-000	SHCS	3
19	A-011628-002-01-F-000	PIN-HINGE	2
20	A-012266-010-00-B-000	PLATE-SUPPORT (GEAR RACK)	1
21	A-010316-009-00-A-000	SW PUSHER BLOCK	1
22	A-010309-005-00-D-000	TEE-VISE	1
23	B-009505-018-02-E-000	WEAR PLATE	1
24	A-010316-010-00-A-000	SW SPACER	1
25	P-007449-001-00-0-000	MICRO SWITCH	1
26	A-010316-011-00-A-000	SPRING SPACER	1
27	A-009157-009-00-A-000	SPRING - COMPRESSION	1
28	P-007033-150-00-0-000	PIN-ROLL	1
29	P-007028-400-20-0-000	HHCS	1
30	A-009678-000-00-C-000	CLAMP-POLY-FLO	1
31	P-007004-500-20-0-000	NUT-LOCK	1
32	B-009118-010-00-C-000	VISE HOLD DOWN ASSY	2
33	B-012313-010-01-H-000	LONGER VISE GUIDE	1
35	C-013616-497-00-B-000	SPLASH TRAY	1
36	A-013301-007-00-A-000	SPLASH GUARD SUPPORT	2
37	C-013616-635-00-A-000	SPLASH TRAY	1

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"



BACK TO VISE ASSEMBLY

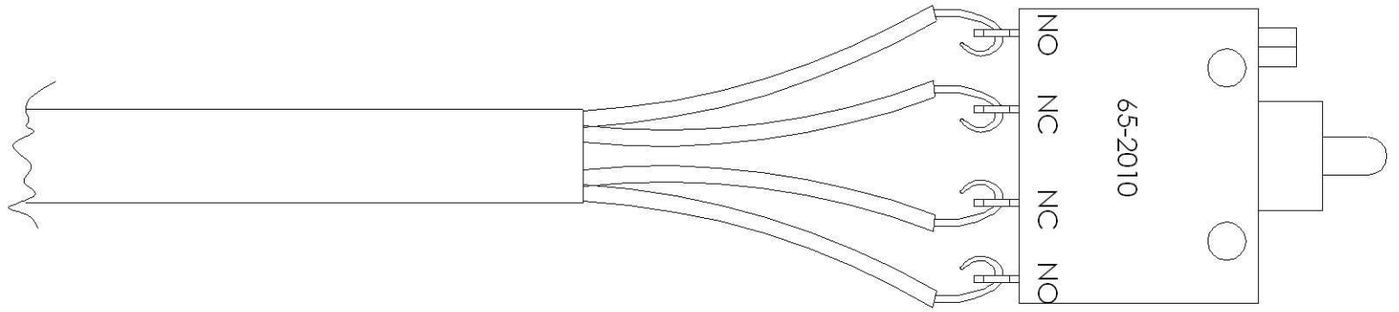
HEM ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

H9298	FEED TABLE
VISE CYLINDER ASSEMBLY	
C-009261-022-00 F	

VISE CYLINDER ASSEMBLY
C-009261-022-00-F-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	B-009154-016-00-E-000	END CAP	1
2	A-012575-095-00-B-000	PORT BLOCK	1
3	B-009153-070-00-A-000	PISTON	1
4	A-009155-001-07-K-000	CYLINDER HOUSING	1
5	B-009330-005-00-A-000	TIE ROD	4
6	A-009154-015-00-C-000	END PLATE	1
7	P-007027-010-24-0-000	HHCS	1
8	P-007004-003-18-0-000	NUT-HEX	4
9	A-009156-012-00-B-000	PISTON ROD	1
10	P-007050-010-00-0-000	O-RING	1
11	P-007019-190-12-0-000	SHCS	2
12	P-007053-055-00-0-000	U CUP	1
13	A-003967-000-02-A-000	SPRING	1
14	A-010936-031-01-K-000	ALL THREAD	1
15	P-007071-002-12-A-000	MALE ELBOW	1
16	P-007050-248-00-0-000	O-RING	1

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS,
RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN
AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"



POT WITH SILICONE SEALER AFTER SOLDER

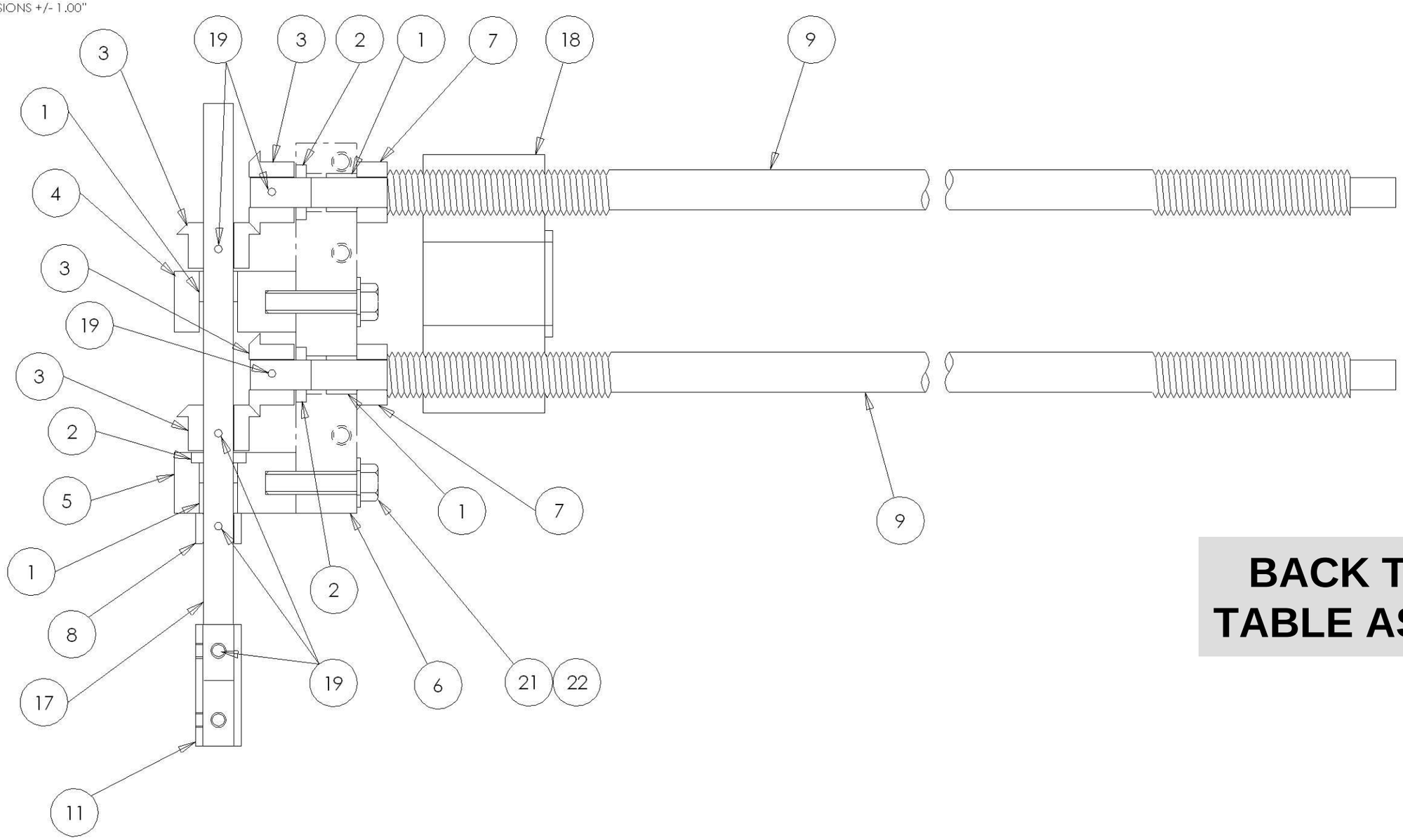
BACK TO FEED TABLE ASSEMBLY

HEM ,INC. MID-AMERICA INDUSTRIAL DISTRICT P.O. BOX 1148 PRYOR, OK 74361	
H6872	FEED TABLE
LIMIT SWITCH ASSY	
A-009947-017 A	

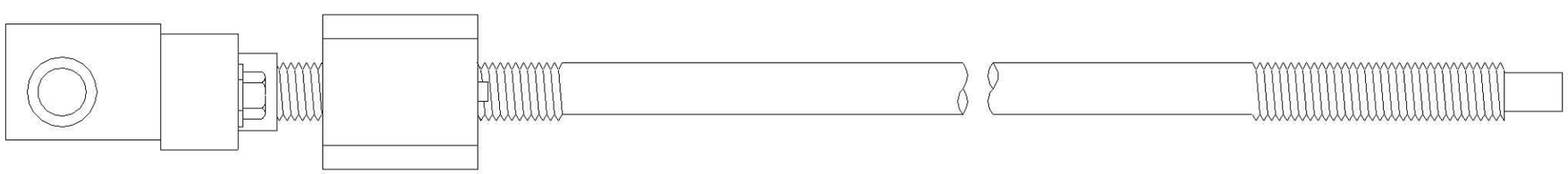
LIMIT SWITCH ASSEMBLY
A-009947-017-00-A-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	A-009947-017-00-A-000	SWITCH ASSEMBLY	1

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS,
RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN
AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"



BACK TO FEED TABLE ASSEMBLY



HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

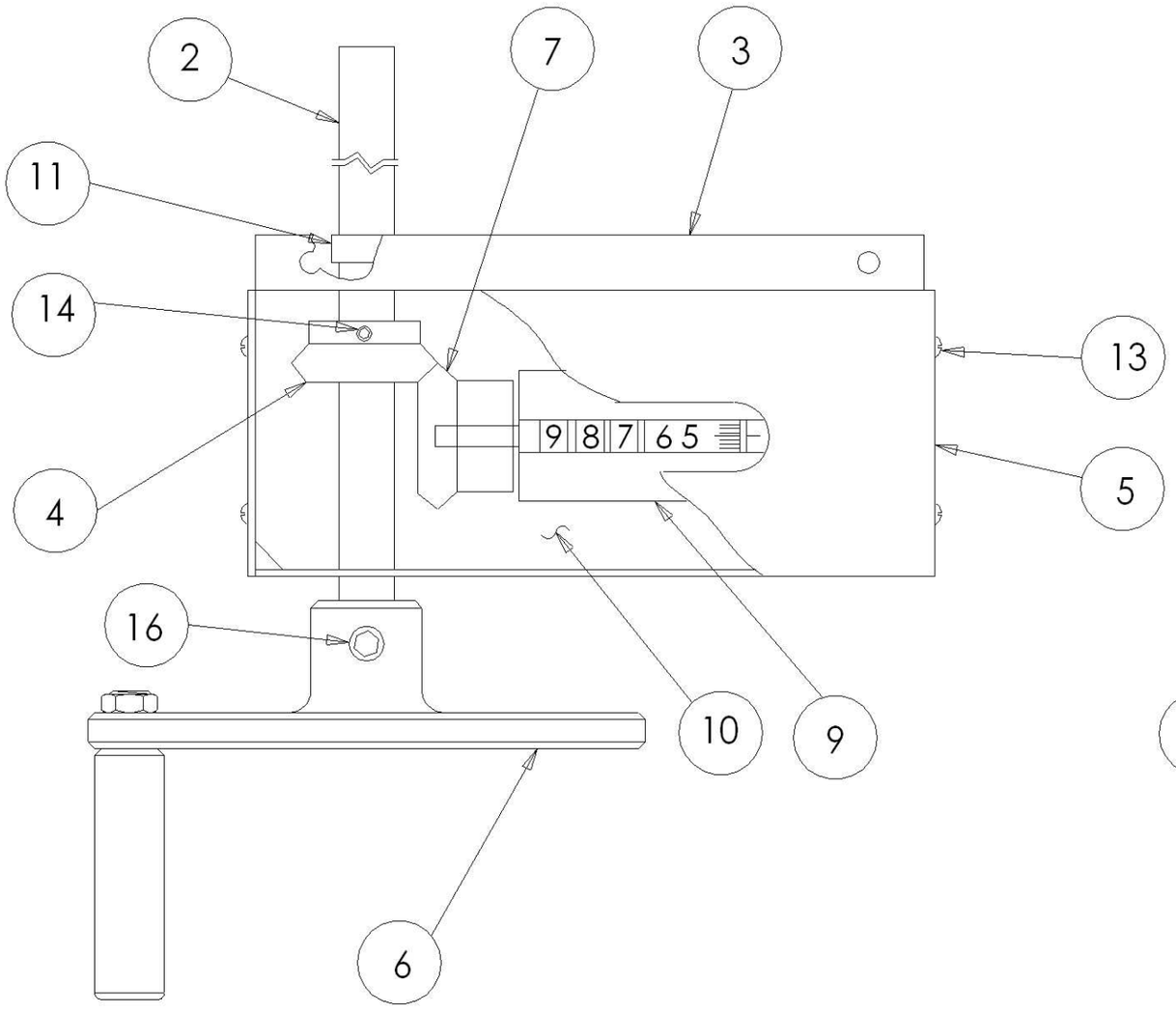
DATE 11/99	SHEET 1 OF 1
STOP ASSEMBLY	
D-009311-001	C

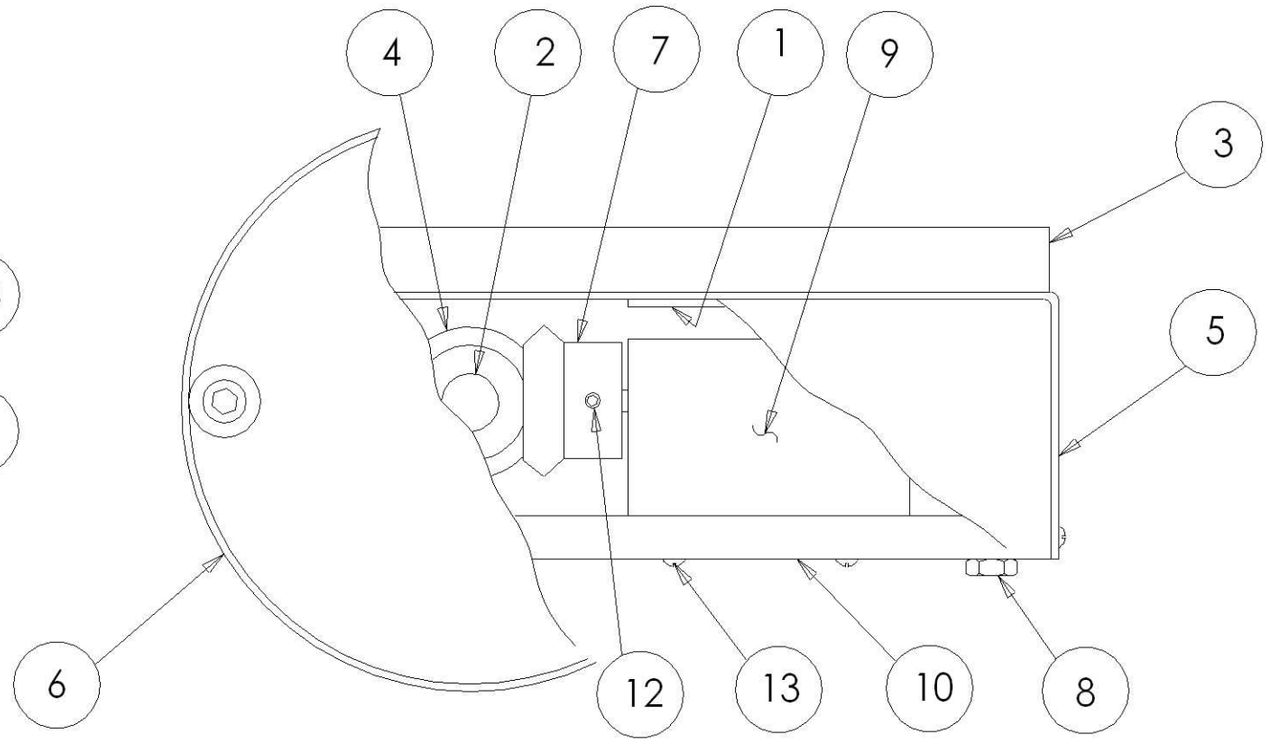
PARTS LIST

INDEX STOP ASSEMBLY
D-009311-001-01-C-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	P-007103-004-00-0-000	BEARING, BRONZE	4
2	P-007105-000-00-0-000	BEARING	3
3	P-007184-000-00-0-000	GEAR-BEVEL	4
4	A-009312-000-00-C-000	GEAR SUPPORT	1
5	A-009313-000-00-H-000	GEAR THRUST SUPPORT	1
6	B-009314-003-00-C-000	HOLDER-LEAD SCREW	1
7	A-009315-000-00-B-000	SPACER	2
8	A-009315-001-00-B-000	SPACER	1
9	B-009316-000-08-H-000	SCREW-LEAD	2
11	A-009362-002-00-B-000	COUPLING FOR INDEX	1
17	A-010336-000-00-C-000	SHAFT-GEAR	1
18	B-010337-001-00-D-000	NUT-STOP RT-FUNCTION	1
19	P-007032-010-00-0-000	PIN-ROLL	7
21	P-007027-150-16-0-000	HHCS	2
22	P-007002-004-00-0-000	WASHER-LOCK-SPRING	2

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS,
RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN
AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"





BACK TO FEED TABLE ASSEMBLY

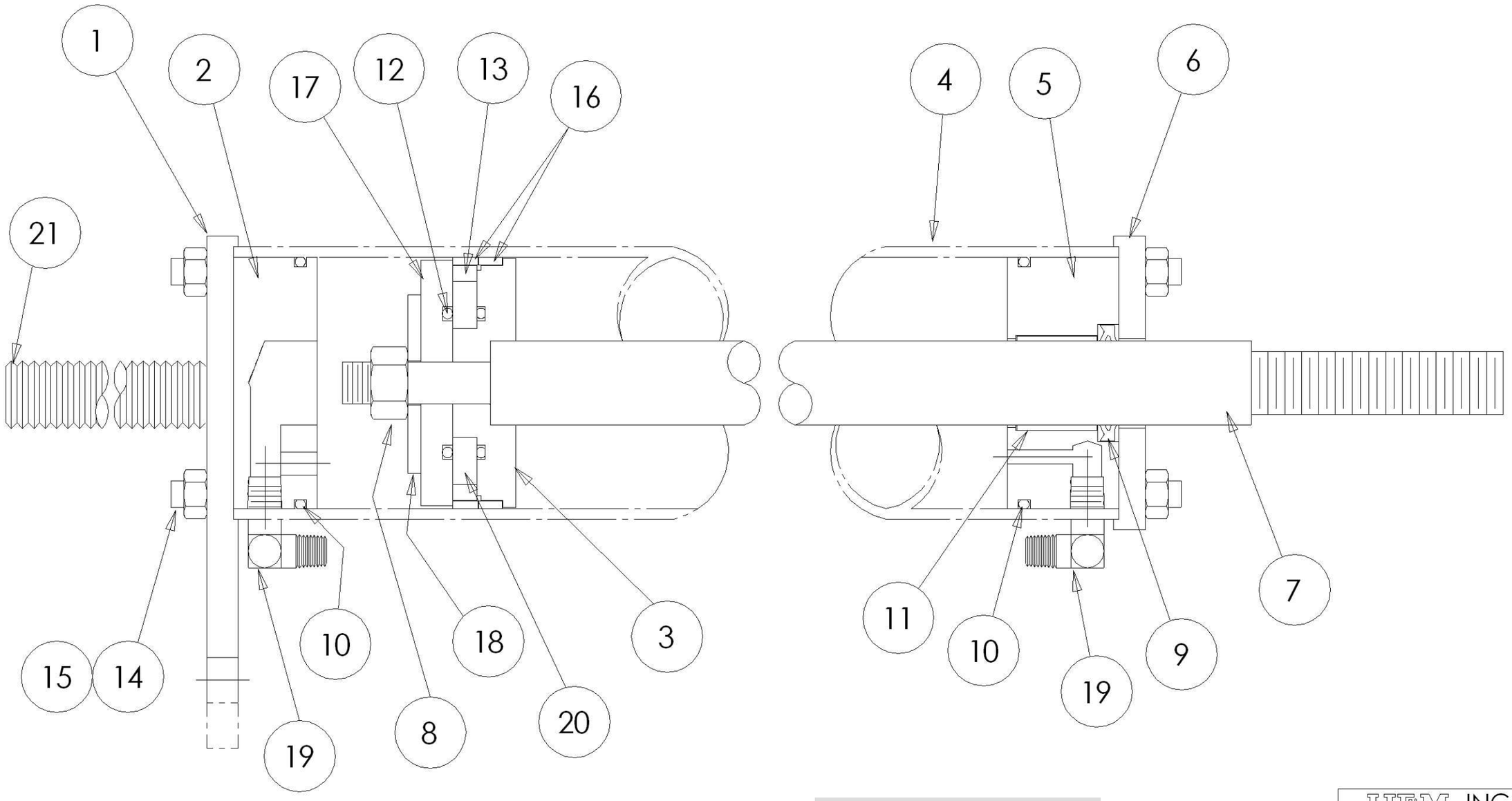
HEM ,INC. MID-AMERICA INDUSTRIAL DISTRICT P.O. BOX 1148 PRYOR, OK 74361	
DATE 11/99	Hxxxx992
COUNTER & GEAR ASSY	
C-009478-006	C

PARTS LIST

COUNTER & GEAR ASSY. LH
C-009478-006-01-C-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	P-007405-000-00-0-000	COUNTER COVER LENS	1
2	A-010055-003-01-A-000	COUNTER GEAR SHAFT	1
3	B-009475-000-03-J-000	INDEX MOUNT PLATE	1
4	A-010802-000-02-C-000	GEAR (MOD)	1
5	B-009476-001-00-B-000	COVER-INDEX LH	1
6	B-009474-000-03-C-000	HANDLE ASSEMBLY	1
7	A-010803-000-00-B-000	GEAR ASSEMBLY	1
8	P-007025-007-20-0-000	HHCS	2
9	B-009472-001-02-B-000	COUNTER ASSEMBLY -L.H.	1
10	B-009473-000-01-C-000	BOTTOM PLATE -INDEX	1
11	P-007103-004-00-0-000	BEARING, BRONZE	1
12	P-007009-190-37-0-000	SET SCREW	1
13	P-007008-190-50-0-000	SCREW	8
14	P-007009-190-25-0-000	SET SCREW	2
15	A-013616-520-00-A-000	SUPPORT PLATE	1
16	P-007011-002-18-0-000	SET SCREW	1

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS,
RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN
AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"



BACK TO FEED TABLE ASSEMBLY

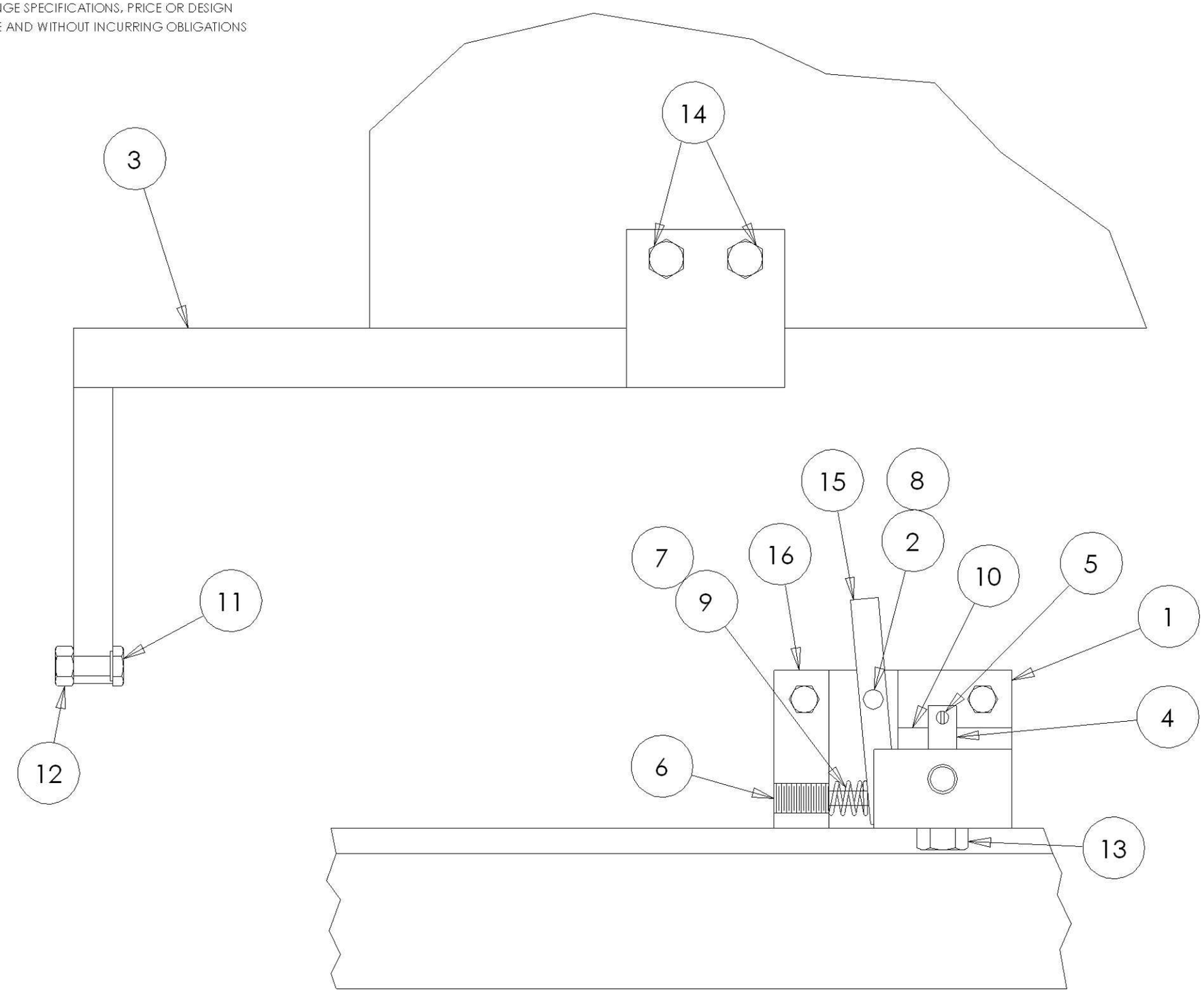
HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

DATE 11/99	Hxxx5918
FEED CYLINDER ASSEMBLY	
C-009615-033	G

CYLINDER ASSEMBLY
C-009615-033-00-G-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	B-009624-042-00-D-000	MOUNT BRACKET-FEED CYLINDER	1
2	B-009152-006-00-F-000	PIVOT END SLUG	1
3	B-009153-029-01-C-000	PISTON	1
4	B-010753-001-02-C-000	CYLINDER TUBE	1
5	B-009935-002-00-F-000	ROD END SLUG	1
6	B-009595-002-01-C-000	ROD END CAP	1
7	B-009594-022-00-B-000	ROD-PISTON	1
8	P-007004-500-20-0-000	NUT-LOCK	1
9	P-007051-100-01-0-000	WIPER RING	1
10	P-007050-232-00-0-000	O-RING	2
11	P-007102-010-00-0-000	NYLINER	1
12	P-007050-222-00-0-000	O-RING	2
13	P-007050-333-01-0-000	RING-SQUARE	1
14	B-009330-005-10-A-000	TIE ROD	4
15	P-007004-003-18-0-000	NUT-HEX	8
16	P-007791-300-00-0-000	SEAL	2
17	A-009153-036-00-B-000	PISTON CAP	1
18	P-007000-005-00-0-000	WASHER-FLAT	1
19	P-007071-002-12-0-000	MALE ELBOW	2
20	A-009153-037-00-A-000	EXPANDER RING	1
21	A-009761-000-11-F-000	ALL THREAD	1

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS,
RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN
AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"



BACK TO FEED TABLE ASSEMBLY

HEM ,INC. MID-AMERICA INDUSTRIAL DISTRICT P.O. BOX 1148 PRYOR, OK 74361	
DATE 11/99	Hxxx10012
SWITCH ACTUATOR ASSY	
B-009549-008	G

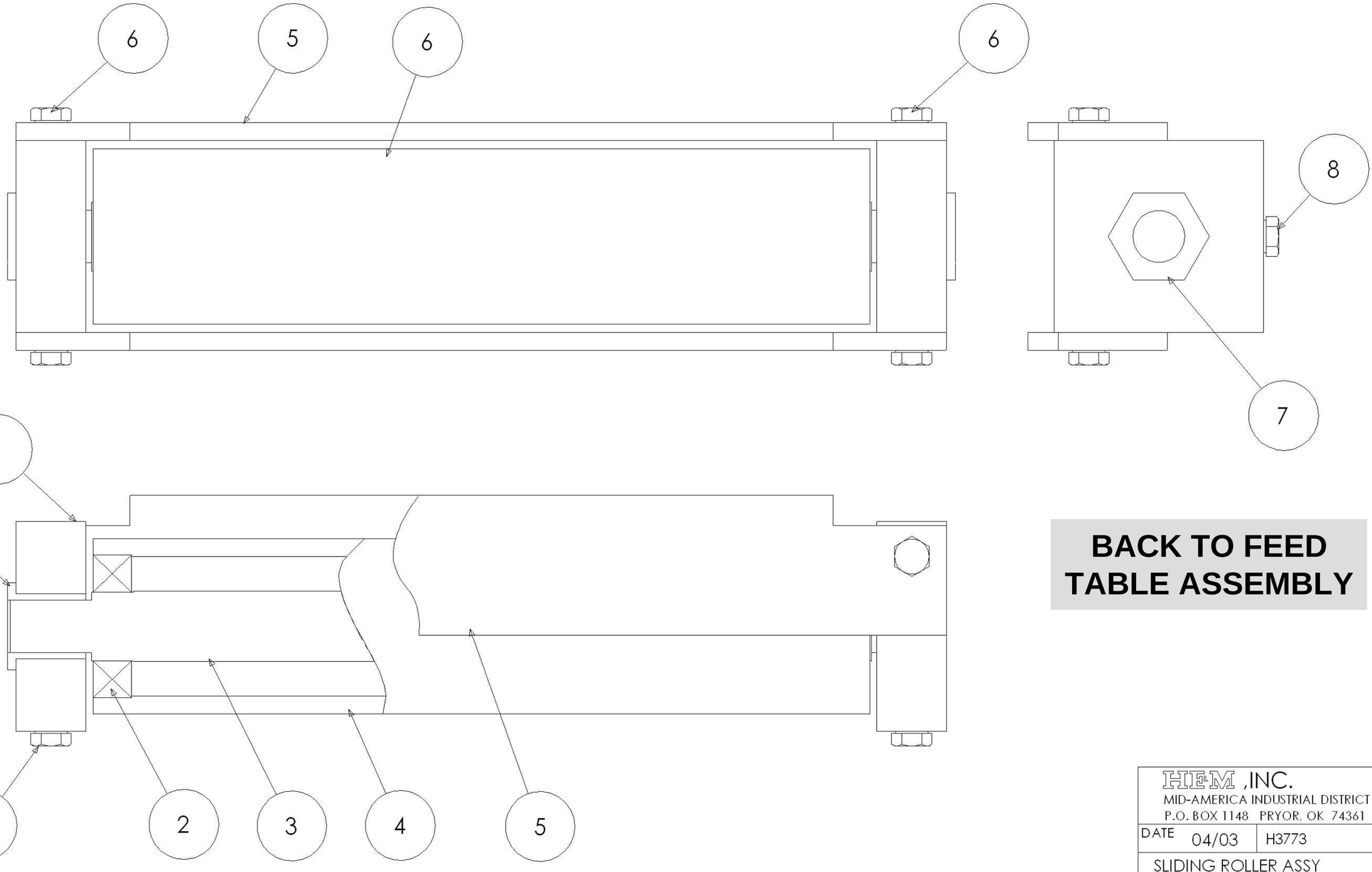
PARTS LIST

HEM SAW
The saw that cuts straight.

SWITCH ACTUATOR ASSEMBLY
B-009549-008-01-G-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	C-009549-041-00-D-000	SWITCH BLOCK	1
2	A-009549-015-00-C-000	PIN	1
3	B-009549-006-01-J-000	SWITCH ACTUATOR BAR W/A	1
4	A-009535-000-02-B-000	SWITCH STRAP	1
5	P-007008-190-50-0-000	SCREW	2
6	P-007012-004-16-0-000	SET SCREW	1
7	P-007033-005-00-0-000	PIN-ROLL	1
8	P-007039-025-00-0-000	RETAINING RING	1
9	P-007382-000-00-0-000	SPRING	1
10	A-009947-004-01-B-000	LIMIT SWITCH ASSY - FEED	1
11	P-007025-010-20-0-000	HHCS	1
12	P-007004-002-20-0-000	HEXNUT	1
13	P-007027-010-16-0-000	HHCS	1
14	P-007025-007-20-0-000	HHCS	2
15	A-009821-002-00-D-000	SWITCH ACTUATOR	1
16	A-009549-023-00-B-000	PIN RETAINER	1

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS,
RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN
AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"



BACK TO FEED TABLE ASSEMBLY

HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

DATE 04/03	H3773
SLIDING ROLLER ASSY	
C-009654-004	C

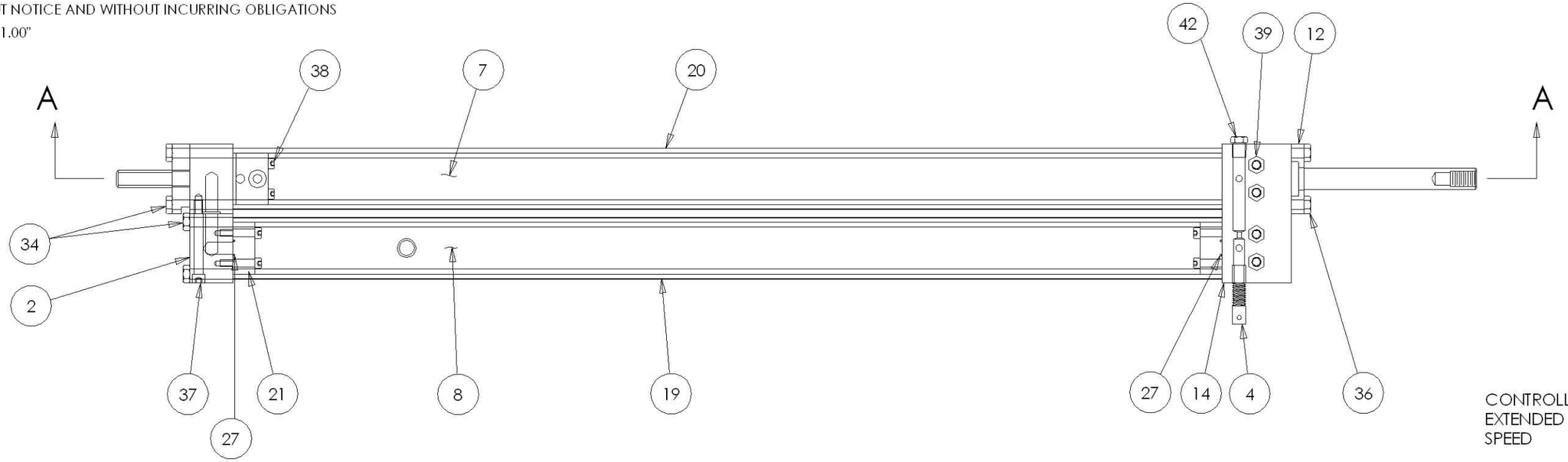
HEM SAW
The saw that cuts straight.

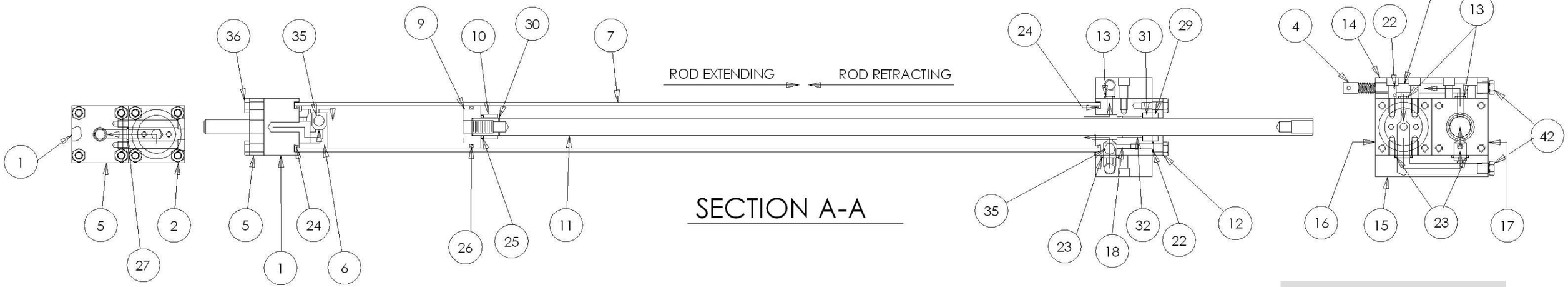
SLIDING ROLER ASSEMBLY
C-009654-004-07-C-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	A-009656-007-00-B-000	SLIDING ROLLER MOUNT	2
2	P-007091-000-00-0-000	BEARING	2
3	B-009958-019-05-D-000	ROLLER SHAFT	1
4	A-009141-000-12-M-000	ROLLER	1
5	B-009655-006-00-B-000	SIDE PLATE	2
6	P-007026-007-18-0-000	HHCS	4
7	A-012283-002-00-C-000	BUSHING-ECCENTRIC	2
8	P-007026-005-18-0-000	HHCS	2

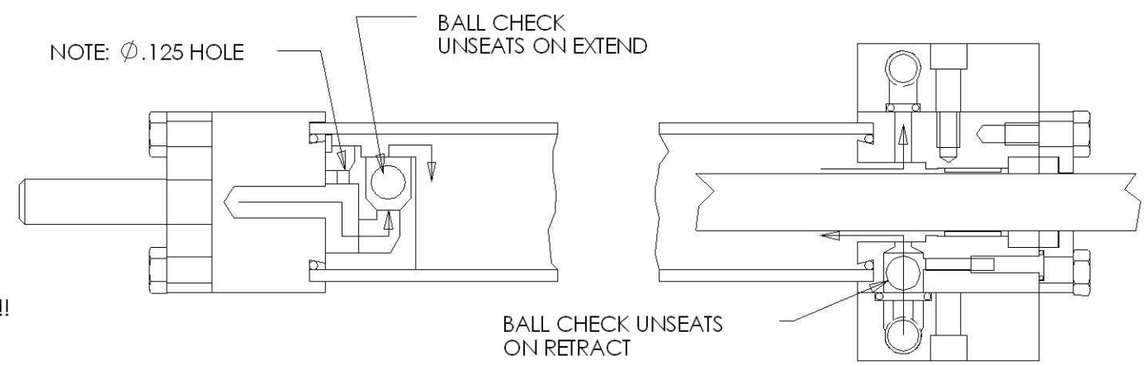
NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS

ALL DIMENSIONS +/- 1.00"





SECTION A-A



NOTE: ARROWS INDICATE FLOW

NOTE:
LIGHTLY SEAT BOTH
CHECK BALLS INTO MATING PARTS!!

REF: CHECK BALL DETAIL

BACK TO FEED TABLE ASSEMBLY

PARTS LIST

HEM ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

DATE 11/99	Hxx10270
HYD FEED CONTROL ASSY	
D-009524-005	H

HEM SAW
The saw that cuts straight.

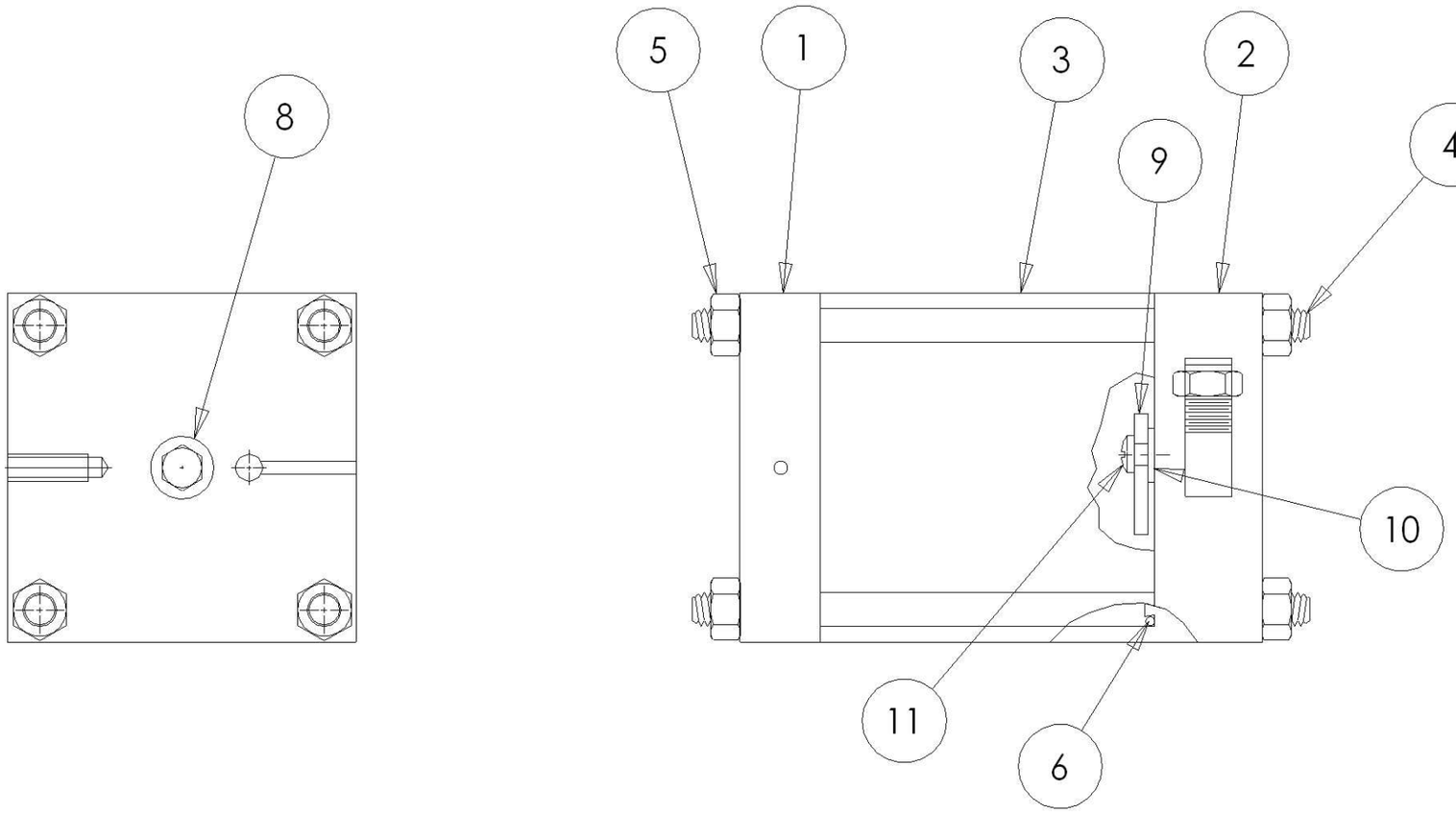
HYDRAULIC FEED CONTROL ASSEMBLY
D-009524-005-00-H-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	B-009525-001-00-B-000	END CAP - CYLINDER	1
2	B-009526-000-00-C-000	FRONT RESERVOIR CAP	1
4	A-009528-000-00-G-000	VALVE-NEEDLE	1
5	B-009614-008-00-E-000	PIVOT END CAP	1
6	B-009529-001-00-B-000	CHECK VALVE BODY	1
7	A-009517-000-04-D-000	CYLINDER HOUSING	1
8	A-009517-000-06-D-000	CYLINDER HOUSING	1
9	A-009512-000-01-J-000	PISTON	1
10	A-012325-001-00-E-000	SLEEVE-CUSHION	1
11	A-009531-003-00-A-000	PISTON ROD	1
12	A-010418-007-00-D-000	ROD END CAP	1
13	P-007050-106-00-0-000	O-RING	2
14	B-009532-005-00-C-000	CONTROL VALVE BODY	1
15	B-012326-000-00-D-000	CHECK BODY	1
16	B-009510-003-00-C-000	REAR RESERVOIR BLOCK (MODIFIED)	1
17	B-009507-001-00-E-000	CYLINDER END CAP	1
18	P-007041-007-12-0-000	PIN-DOWEL	1
19	A-009530-000-04-E-000	TIE ROD	4
20	A-009385-000-03-C-000	TIE ROD	4
21	A-009527-000-00-E-000	RESERVOIR BAFFLE	2
22	P-007050-008-00-0-000	O-RING	5
23	P-007050-111-00-0-000	O-RING	2
24	P-007050-218-00-0-000	O-RING	4
25	P-007050-114-00-0-000	O-RING	1
26	P-007050-218-00-0-000	O-RING	1
27	P-007050-012-00-0-000	O-RING	3
29	P-007786-003-00-0-000	POLYPAK	1
30	P-007039-062-00-0-000	RETAINING RING	1
31	P-007786-004-00-0-000	POLYPAK	1
32	P-007100-006-00-0-000	NYLINER	1
33	P-007022-150-20-0-000	SHCS	1
34	P-007004-002-20-0-000	HEXNUT	8
35	P-007182-004-00-0-000	CHROME STEEL BALL	2
36	P-007025-007-20-0-000	HHCS	4
37	P-007020-150-20-0-000	SHCS	4
38	P-007019-190-15-0-000	SHCS	5
39	P-007020-150-20-0-000	SHCS	8
40	P-007005-004-16-0-000	NUT-JAM	2
41	P-007019-190-75-0-000	SHCS	4
42	P-007155-125-00-0-000	PIPE PLUG	2

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS

ALL DIMENSIONS +/- 1.00"

BACK TO FEED TABLE ASSEMBLY



HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

DATE 11/99	Hxxx9081
FEED RESERVOIR ASSY	
B-009332-001	D

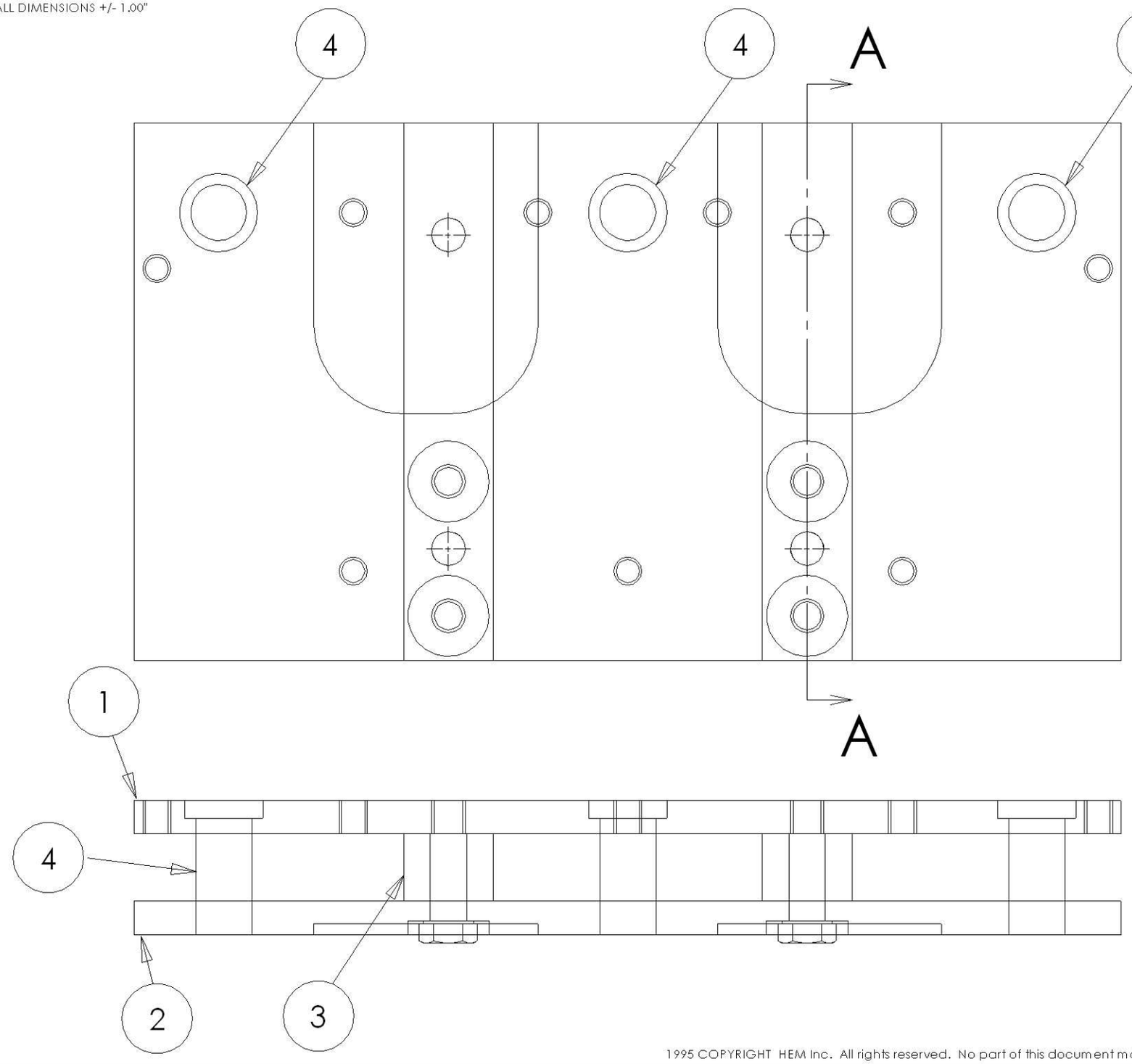
PARTS LIST

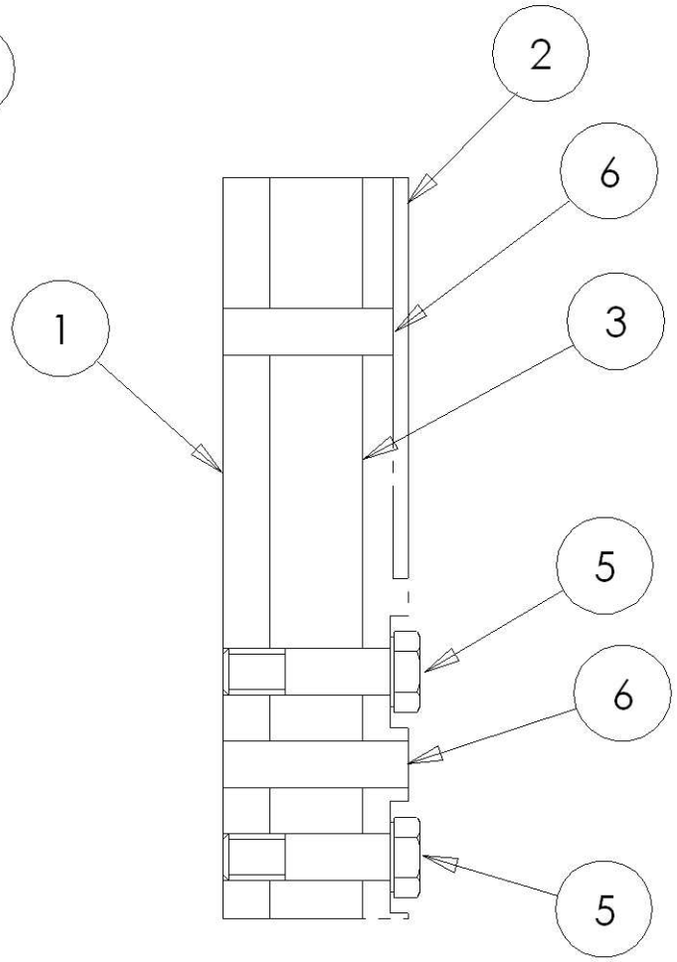
HEM SAW
The saw that cuts straight.

FEED RESERVOIR ASSEMBLY-HYDRAULICS
B-009332-001-00-D-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	B-009333-002-00-D-000	TOP CAP -HYD.TANK FEED CYLINDER	1
2	B-009333-001-00-C-000	BOTTOM CAP- HYD. FEED CYLINDER	1
3	B-009333-003-00-E-000	FEED CYLINDER TUBE	1
4	B-009330-005-01-A-000	TIE ROD	4
5	P-007004-003-18-0-000	NUT-HEX	8
6	P-007050-232-00-0-000	O-RING	1
7	P-007071-004-25-0-000	MALE ELBOW	1
8	P-007083-004-00-0-000	PLUG, HOLLOW HEX HEAD	1
9	A-010839-000-00-B-000	SPLASH SHIELD	1
10	P-007000-005-00-0-000	WASHER-FLAT	1
11	P-007006-190-50-0-000	SCREW-SLOTTED OVAL HEAD	1

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS,
RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN
AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"





SEC 'A'-'A'

BACK TO FEED TABLE ASSEMBLY

HEM ,INC. MID-AMERICA INDUSTRIAL DISTRICT P.O. BOX 1148 PRYOR, OK 74361	
DATE 11/99	Hxxx4968
STABILIZER ASSEMBLY	
C-012244-052	C

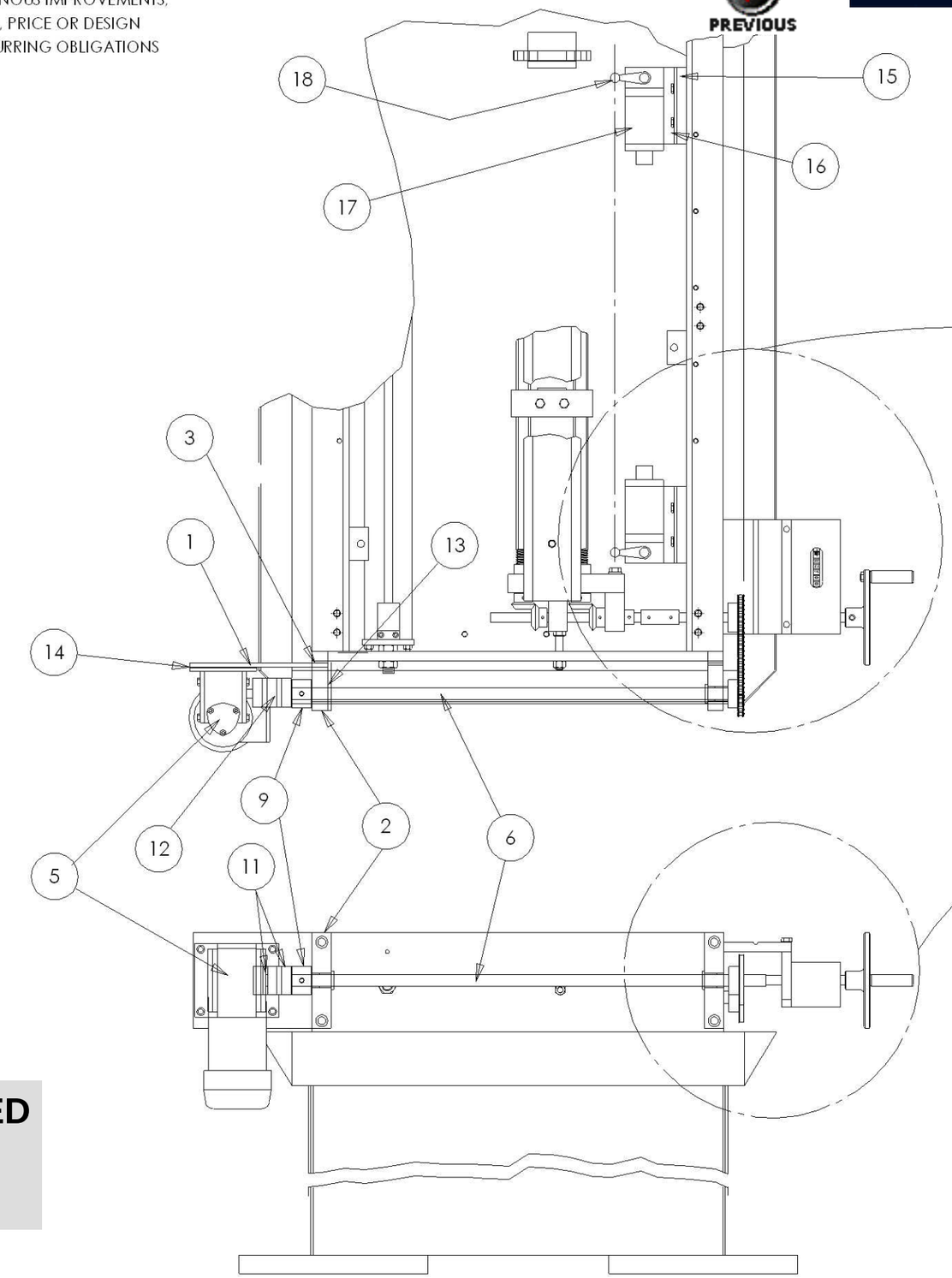
PARTS LIST

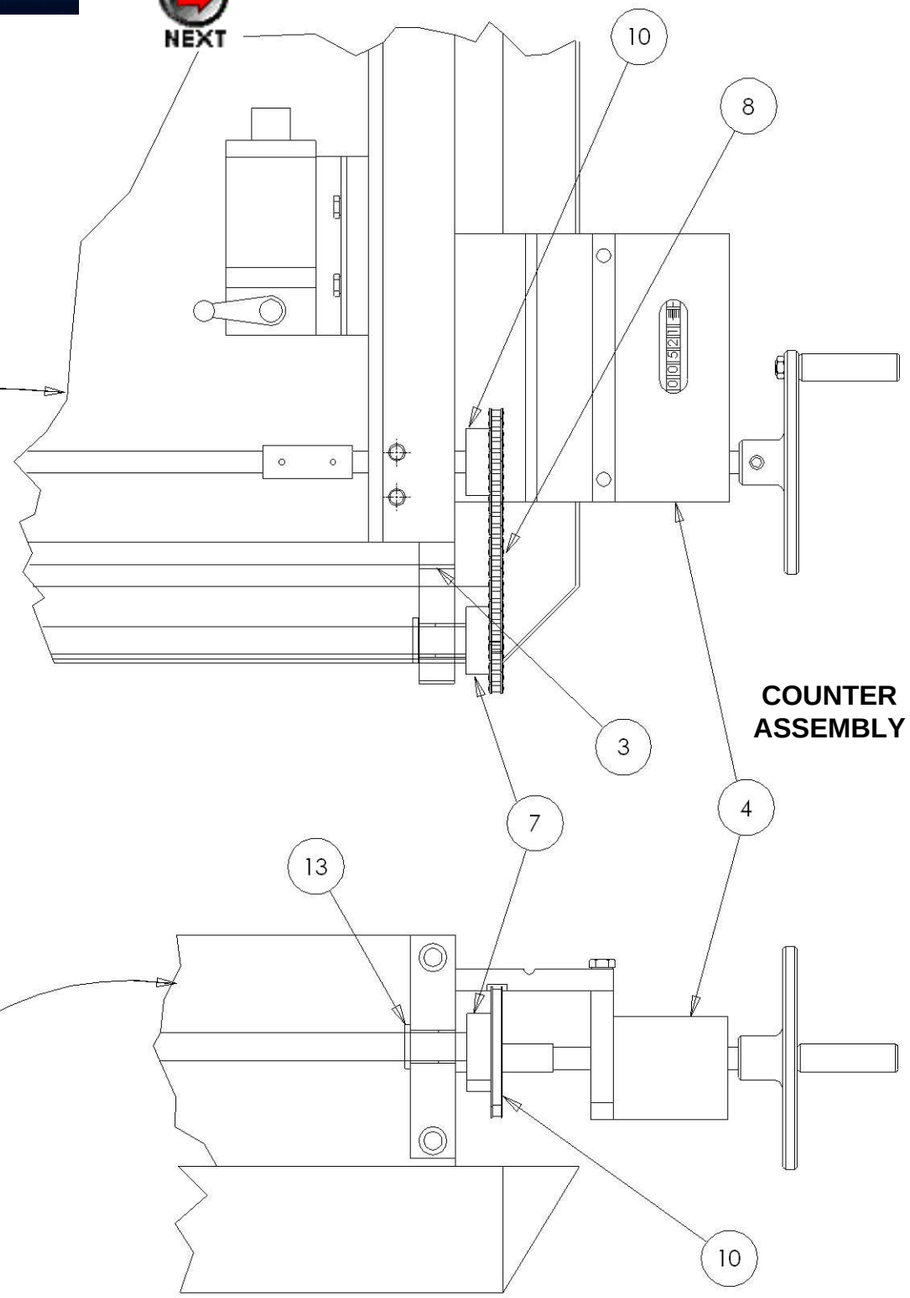
HEM SAW
The saw that cuts straight.

STABLIZER ASSEMBLY
C-012244-052-00-C-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	C-012244-011-00-A-000	VISE STABILIZER PLATE	1
2	C-012244-050-00-D-000	STIFFNER PLATE	1
3	B-012244-051-00-B-000	STABLIZER PLATE SPACER	2
4	A-012244-005-00-C-000	PIN	3
5	P-007027-150-16-0-000	HHCS	4
6	P-007041-150-37-0-000	PIN-DOWEL	4

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"





COUNTER ASSEMBLY

BACK TO FEED TABLE ASSEMBLY

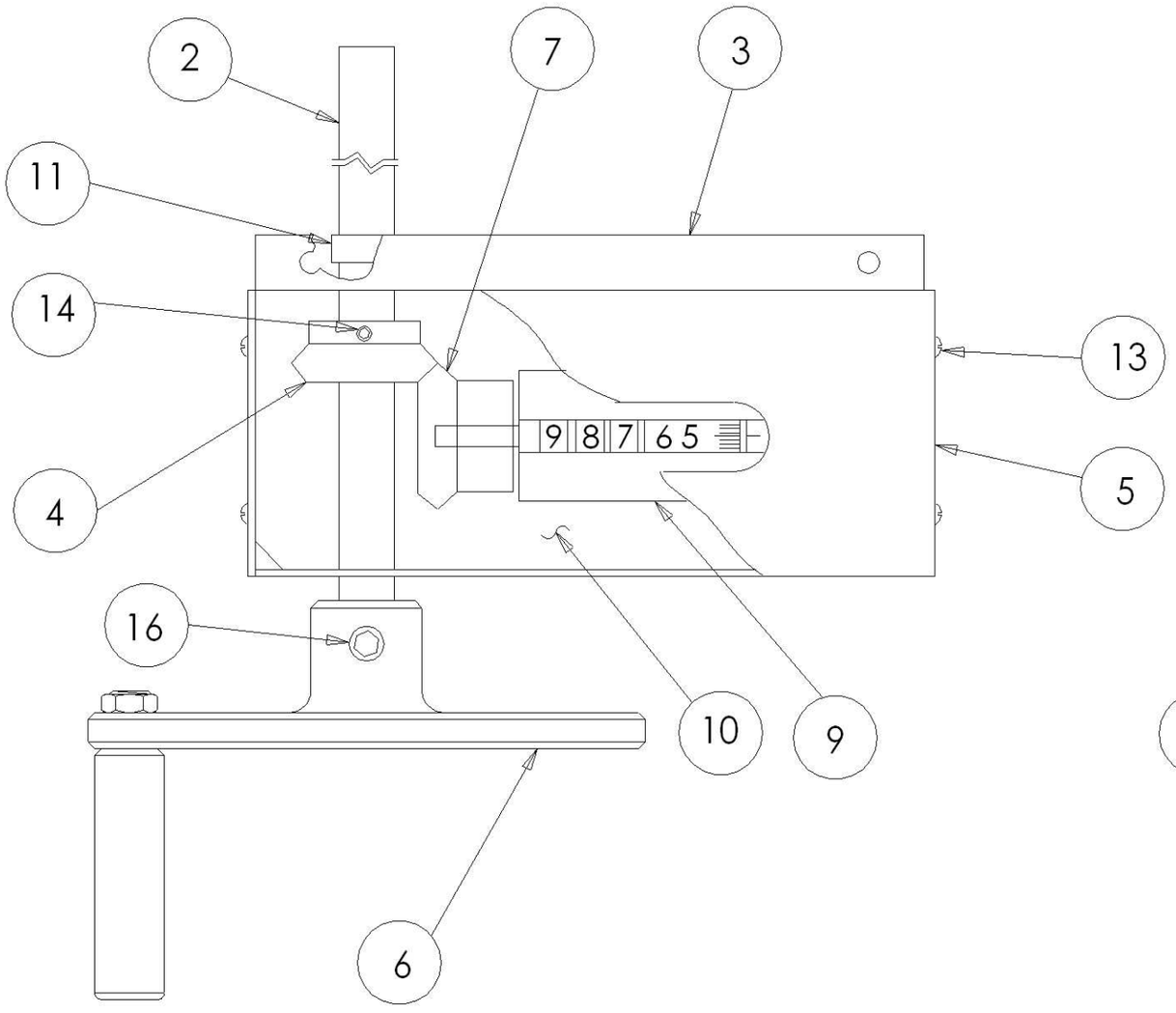
HEM ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

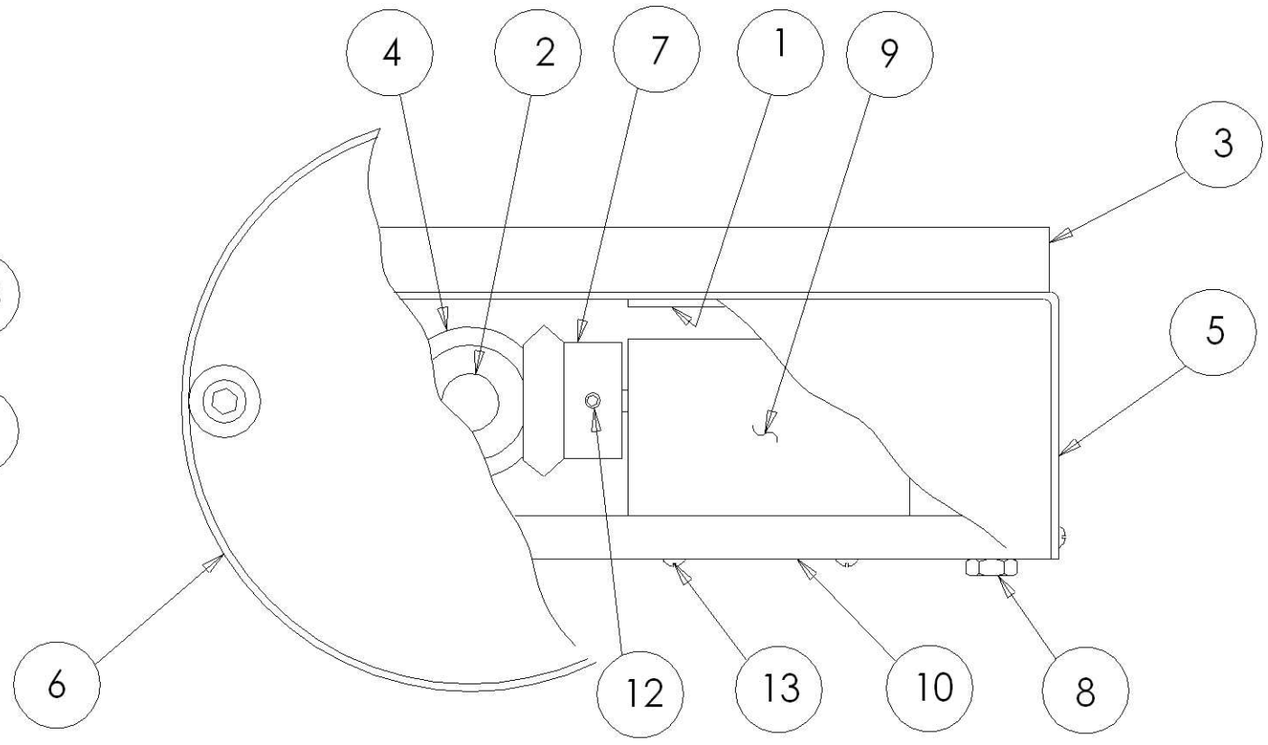
H5319	FEED TABLES
POWERED LENGTH POSITION	
D-009478-012 F	

POWERED LENGTH POSITIONER (P.L.P.) ASSEMBLY
D-009478-012-00-F-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	B-013809-028-00-A-000	MOTOR MOUNT P.L.P.	1
2	B-009475-008-00-J-000	GEAR SUPPORT BLOCK	2
3	A-009475-009-00-F-000	SPACER-GEAR SUPPORT PLATE	3
4	C-009478-006-01-C-000	COUNTER & GEAR ASSY. LH	1
5	A-012190-030-00-A-000	GEARMOTOR MODIFICATION	1
6	B-010936-022-07-H-000	GEAR SHAFT	1
7	B-011433-001-01-K-000	SPROCKET-MOTOR/REDUCER P.L.P.	1
8	P-007177-025-00-0-000	CHAIN	1
9	A-009549-021-00-B-000	SHAFT COLLAR P.L.P.	1
10	B-011433-001-02-K-000	SPROCKET	1
11	P-007159-000-00-0-000	LOVEJOY COUPLING HALF	2
12	P-007158-000-00-0-000	SPIDER FOR LOVEJOY	1
13	P-007098-625-00-0-000	BEARING FLNG	2
14	A-008957-039-00-A-000	MOTOR SPACER P.L.P.	1
15	A-009549-033-00-B-000	LIMIT SWITCH MOUNT	2
16	A-012068-000-00-D-000	BRACKET-LIMIT SWITCH	2
17	P-007433-000-00-0-000	SWITCH	2
18	P-007434-000-00-0-000	LEVER ARM	2
19	C-013616-317-00-A-000	CROSS-SHAFT COVER--PLP	1

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS,
RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN
AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"





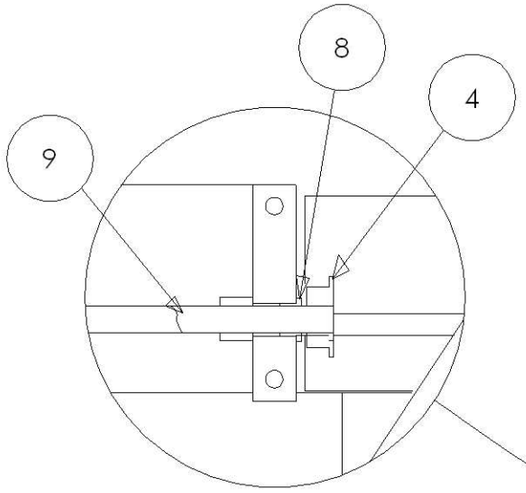
BACK TO P.L.P. OPTION ASSEMBLY

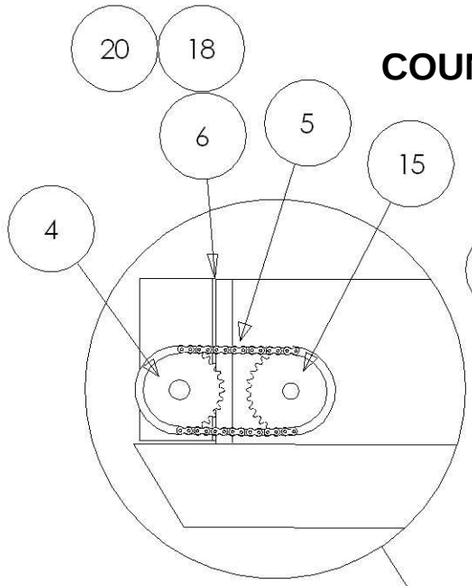
HEM ,INC. MID-AMERICA INDUSTRIAL DISTRICT P.O. BOX 1148 PRYOR, OK 74361	
DATE 11/99	Hxxxx992
COUNTER & GEAR ASSY	
C-009478-006	C

COUNTER & GEAR ASSY. LH
C-009478-006-01-C-000

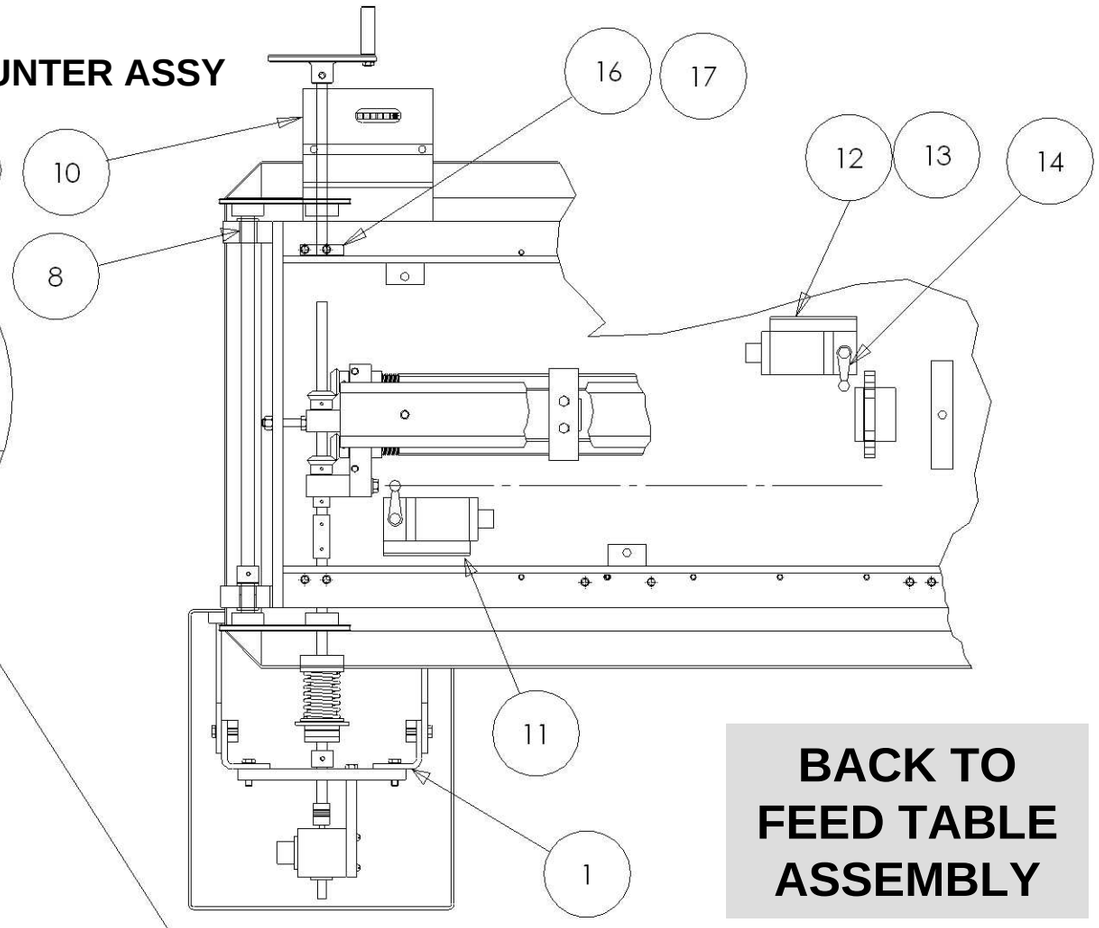
ITEM #	PART NUMBER	DESCRIPTION	QTY
1	P-007405-000-00-0-000	COUNTER COVER LENS	1
2	A-010055-003-01-A-000	COUNTER GEAR SHAFT	1
3	B-009475-000-03-J-000	INDEX MOUNT PLATE	1
4	A-010802-000-02-C-000	GEAR (MOD)	1
5	B-009476-001-00-B-000	COVER-INDEX LH	1
6	B-009474-000-03-C-000	HANDLE ASSEMBLY	1
7	A-010803-000-00-B-000	GEAR ASSEMBLY	1
8	P-007025-007-20-0-000	HHCS	2
9	B-009472-001-02-B-000	COUNTER ASSEMBLY -L.H.	1
10	B-009473-000-01-C-000	BOTTOM PLATE -INDEX	1
11	P-007103-004-00-0-000	BEARING, BRONZE	1
12	P-007009-190-37-0-000	SET SCREW	1
13	P-007008-190-50-0-000	SCREW	8
14	P-007009-190-25-0-000	SET SCREW	2
15	A-013616-520-00-A-000	SUPPORT PLATE	1
16	P-007011-002-18-0-000	SET SCREW	1

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLICATIONS
ALL DIMENSIONS +/- 1.00"

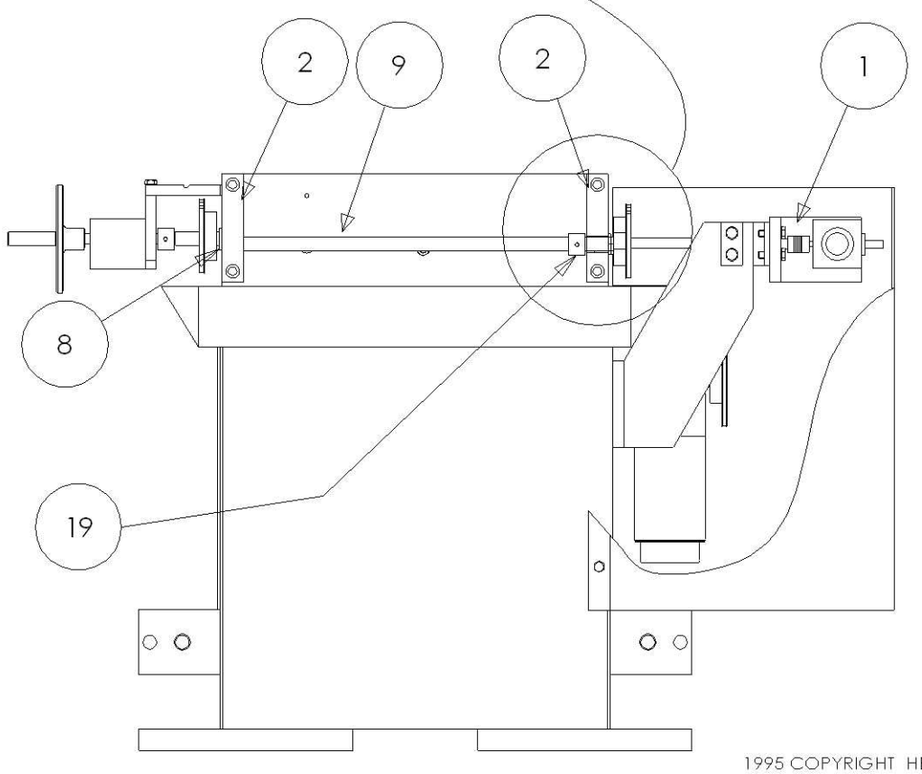


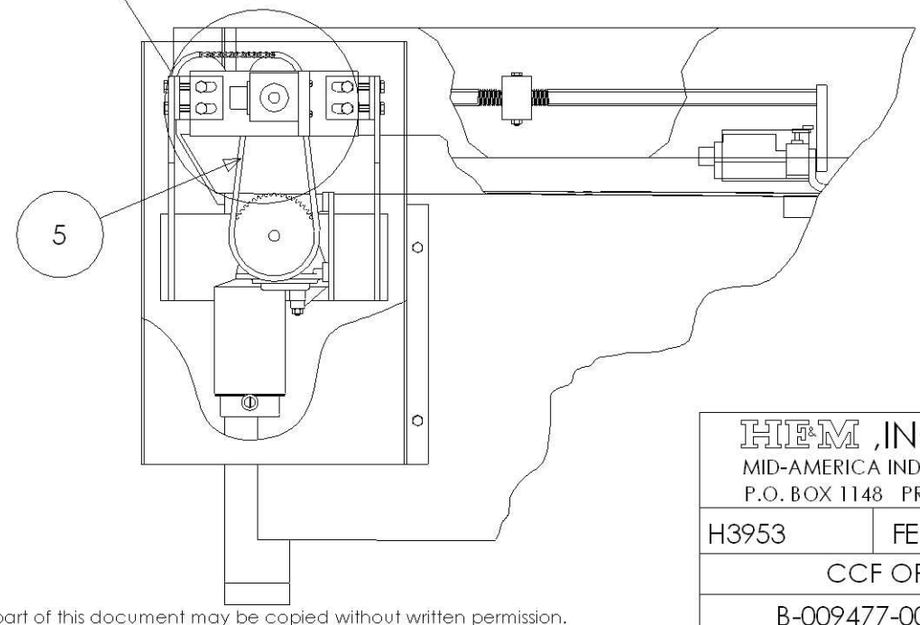


COUNTER ASSY



CCF INDEX ASSY





BACK TO FEED TABLE ASSEMBLY

HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

H3953	FEED TABLE
CCF OPTION	
B-009477-003 M	

PARTS LIST

HEM SAW
The saw that cuts straight.

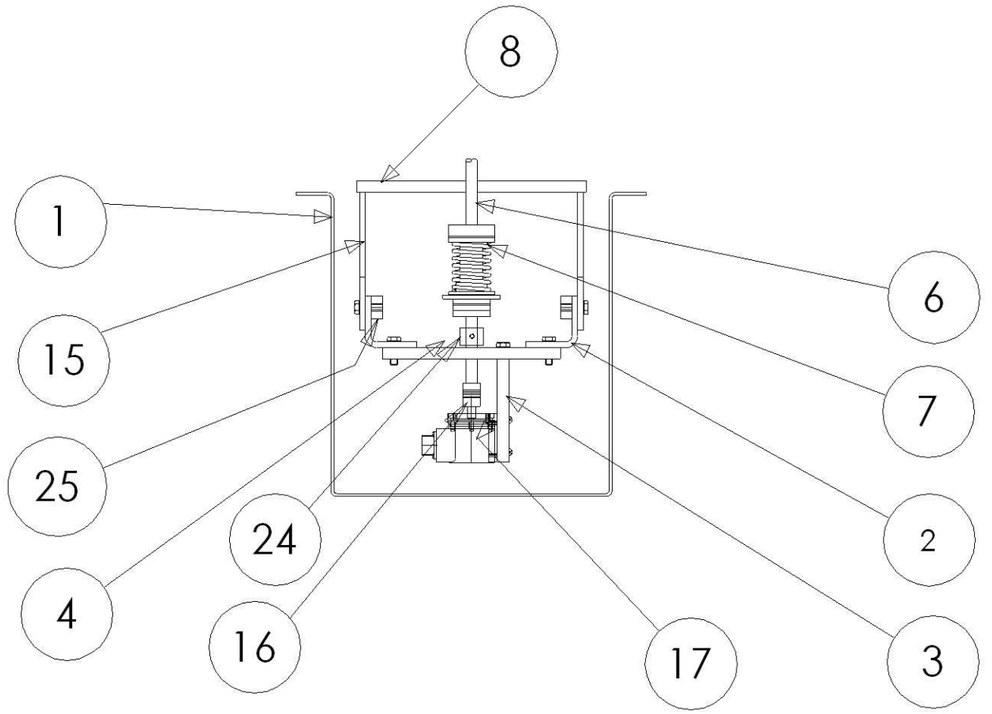
FEED TABLE CCF OPTION
B-009477-003-01-M-000

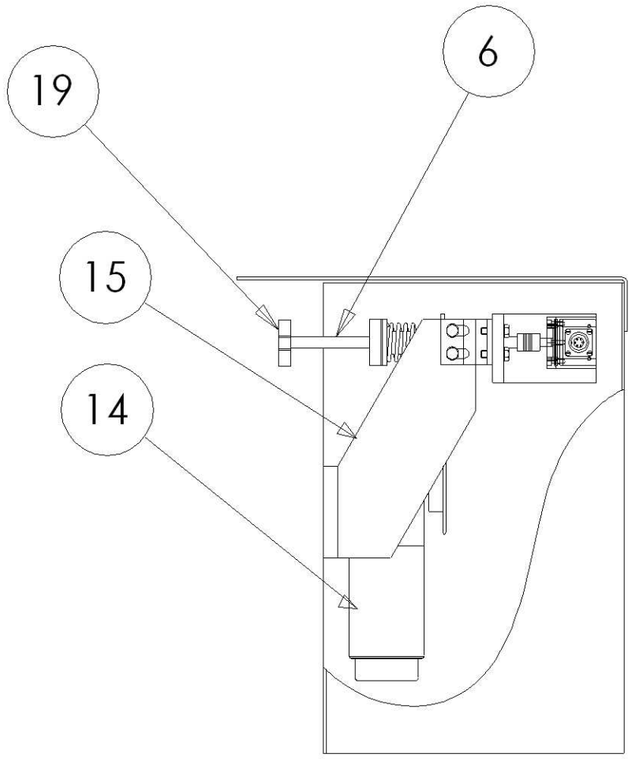
ITEM #	PART NUMBER	DESCRIPTION	QTY
1	B-009477-002-05-K-000	INDEX ASSEMBLY	1
2	B-009475-008-01-J-000	GEAR SUPPORT PLATE	2
4	B-011433-001-01-K-000	SPROCKET-MOTOR/REDUCER P.L.P.	2
5	P-007177-025-00-0-000	CHAIN	3
6	A-009475-009-01-F-000	SPACER-GEAR SUPPORT PLATE	2
8	A-009503-002-00-A-000	FLANGE BRG.-MODIFIED	2
9	A-010936-057-01-A-000	GEAR SHAFT	1
10	C-009478-006-01-C-000	COUNTER & GEAR ASSY. LH	1
11	A-009549-033-00-B-000	LIMIT SWITCH MOUNT	2
12	A-012068-000-00-D-000	BRACKET-LIMIT SWITCH	2
13	P-007433-000-00-0-000	SWITCH	2
14	P-007434-000-00-0-000	LEVER ARM	2
15	B-011433-001-02-K-000	SPROCKET	2
16	A-009475-010-00-B-000	HANGER PLATE	1
17	P-007103-004-00-0-000	BEARING, BRONZE	1
18	A-009475-009-02-F-000	SPACER-GEAR SUPPORT PLATE	2
19	A-009549-021-00-B-000	SHAFT COLLAR P.L.P.	1
20	A-009475-009-03-F-000	SPACER	1

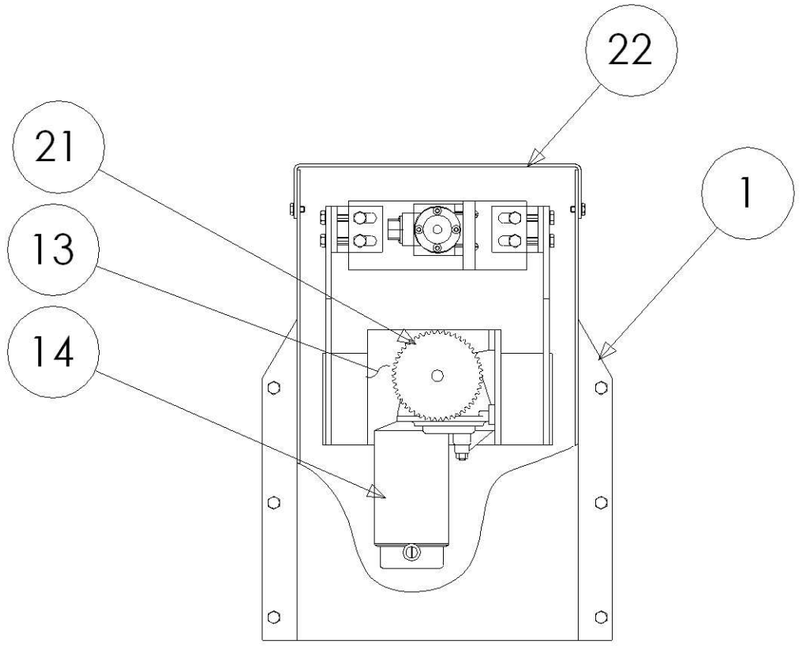
NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS

ALL DIMENSIONS +/- 1.00"

BACK TO CCF OPTION ASSEMBLY







PARTS LIST

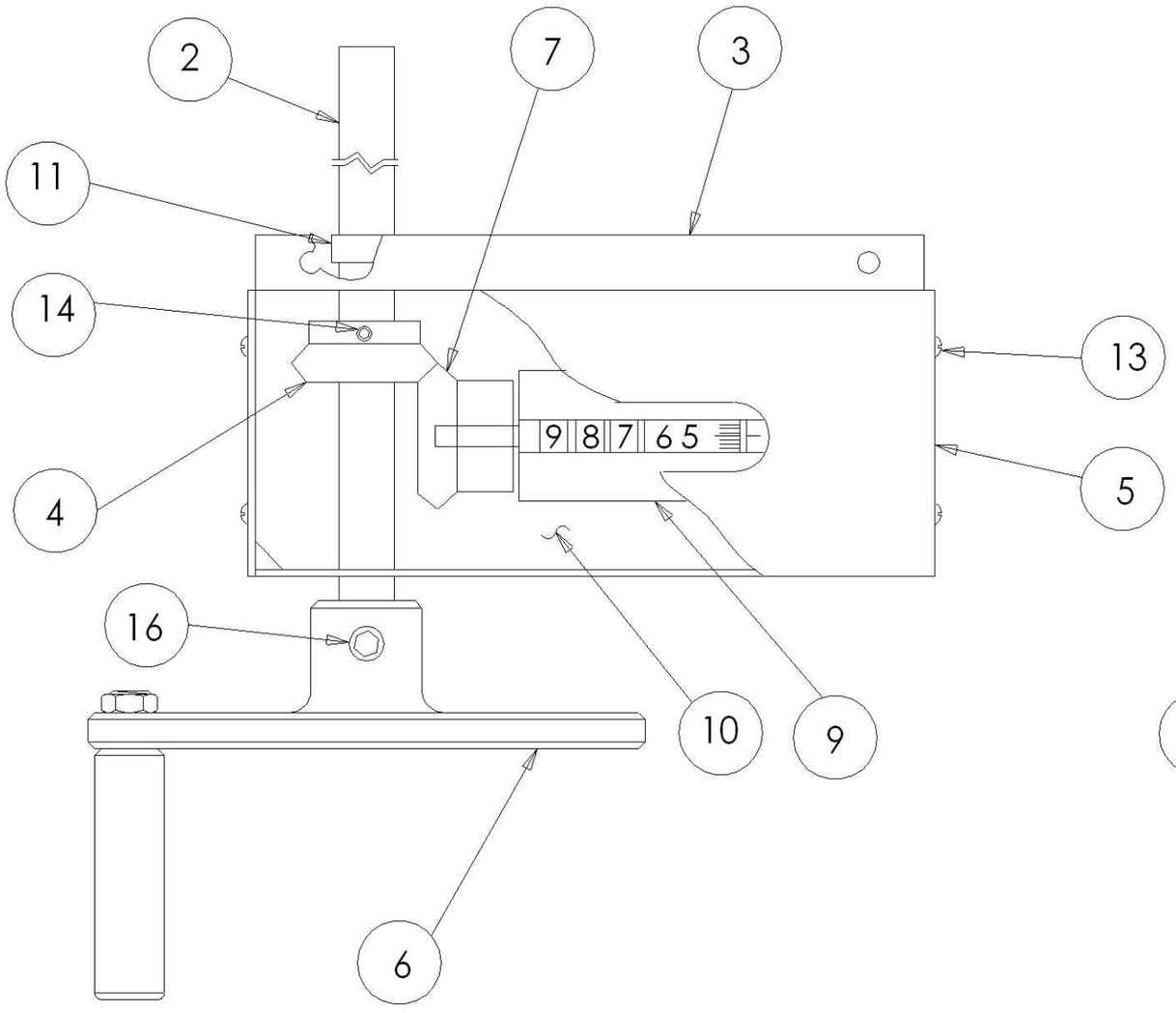
HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

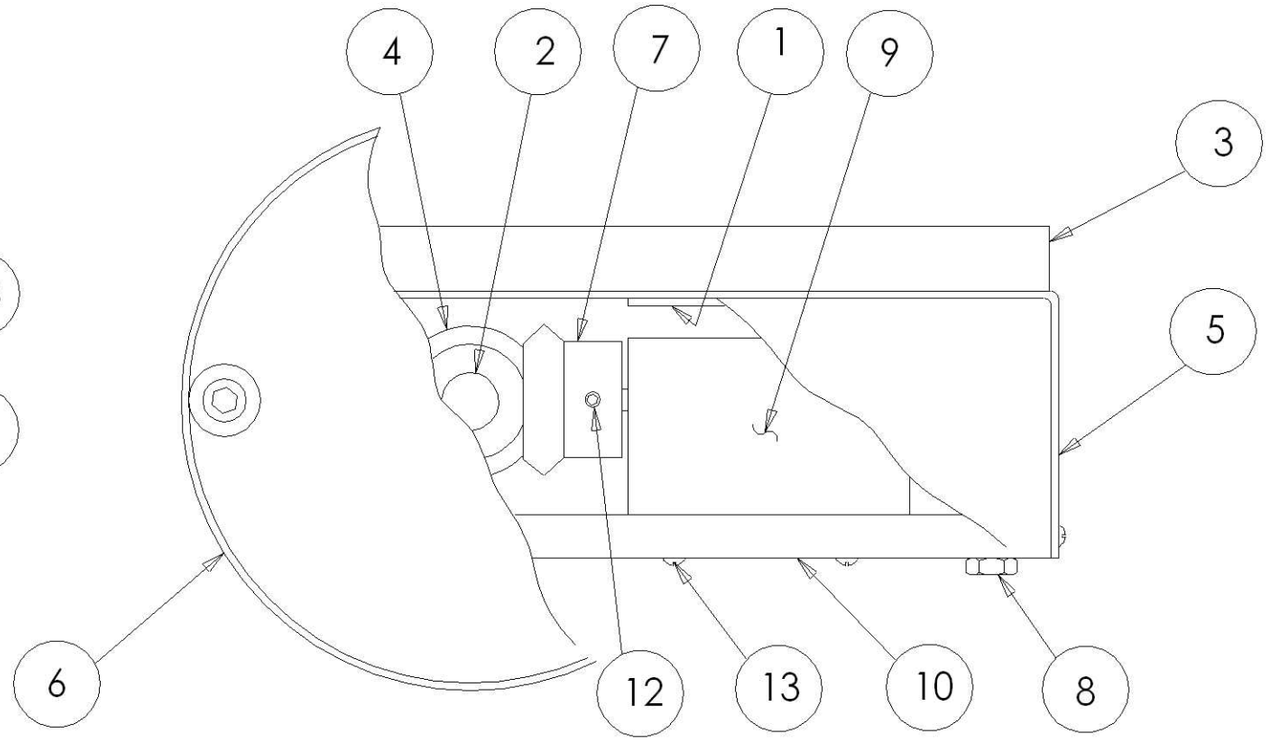
H3977	FEED TABLES
CCF OPT INDEX ASSY	
B-009477-002 K	

CCF OPTION INDEX ASSEMBLY
B-009477-002-05-K-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	D-012204-006-00-G-000	COVER- INDEX ASSEMBLY RH	1
2	A-012292-000-00-B-000	BRACKET-ANGLE	2
3	A-012200-001-00-E-000	MOUNT PLATE (ENCODER)	1
4	A-009475-003-00-C-000	HANGER PLATE	1
6	A-012201-000-01-C-000	SHAFT-ENCODER	1
7	B-012196-000-00-A-000	SPRING CLUTCH ASSEMBLY	1
8	B-009477-002-05-K-008	HRSF	1
13	B-012199-005-00-A-000	MOTOR MOUNT - CCF	1
14	P-007205-004-00-0-000	GEAR MOTOR	1
15	A-012293-000-00-D-000	BRACKET-MOUNT	2
16	P-007159-001-00-0-000	HELICAL COIL	1
17	P-007428-002-00-0-000	ENCODER (100)	1
18	P-007430-001-00-0-000	CONNECTOR FOR ENCODERS	1
19	P-007103-004-00-0-000	BEARING, BRONZE	1
21	B-011433-005-00-A-000	SPROCKET	1
22	B-012204-007-00-A-000	TOP COVER	1
24	A-009549-043-00-A-000	SHAFT COLLAR	1
25	A-012292-001-00-A-000	BOLT PAD	2

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS,
RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN
AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"





BACK TO CCF OPTION ASSEMBLY

HEM ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

DATE 11/99	Hxxxx992
COUNTER & GEAR ASSY	
C-009478-006	C

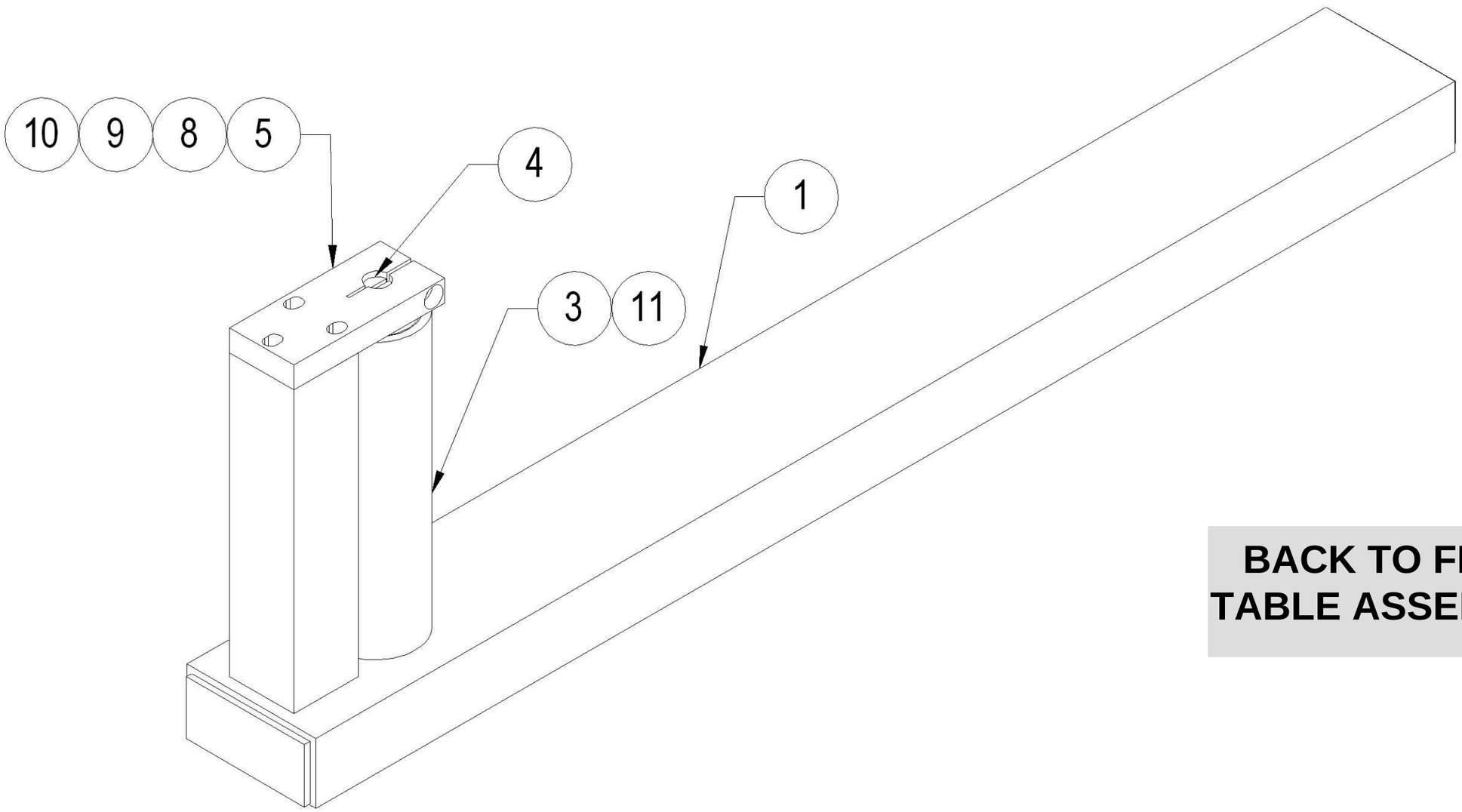
PARTS LIST

COUNTER & GEAR ASSY. LH
C-009478-006-01-C-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	P-007405-000-00-0-000	COUNTER COVER LENS	1
2	A-010055-003-01-A-000	COUNTER GEAR SHAFT	1
3	B-009475-000-03-J-000	INDEX MOUNT PLATE	1
4	A-010802-000-02-C-000	GEAR (MOD)	1
5	B-009476-001-00-B-000	COVER-INDEX LH	1
6	B-009474-000-03-C-000	HANDLE ASSEMBLY	1
7	A-010803-000-00-B-000	GEAR ASSEMBLY	1
8	P-007025-007-20-0-000	HHCS	2
9	B-009472-001-02-B-000	COUNTER ASSEMBLY -L.H.	1
10	B-009473-000-01-C-000	BOTTOM PLATE -INDEX	1
11	P-007103-004-00-0-000	BEARING, BRONZE	1
12	P-007009-190-37-0-000	SET SCREW	1
13	P-007008-190-50-0-000	SCREW	8
14	P-007009-190-25-0-000	SET SCREW	2
15	A-013616-520-00-A-000	SUPPORT PLATE	1
16	P-007011-002-18-0-000	SET SCREW	1

NOTE:

HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS.
ALL DIMENSIONS ARE ± 1.00"



BACK TO FEED TABLE ASSEMBLY

HE&M SAW® HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK. 74361

VERTICAL ROLLER ASSY

B-011381-002 E

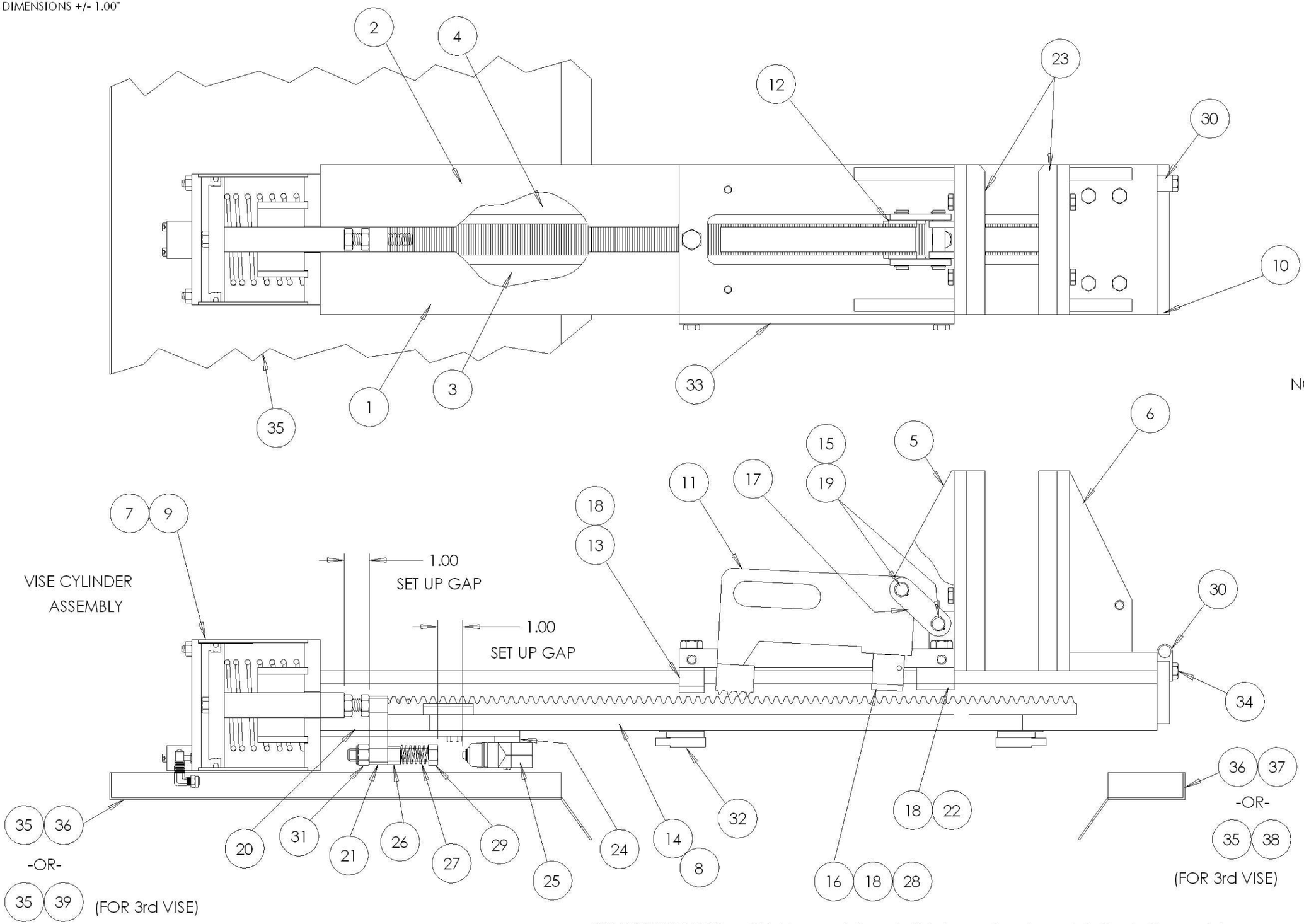
VERTICAL ROLLER ASSEMBLY
B-011381-002-05-E-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	C-011384-002-01-D-000	VERTICAL ROLLER W/A	1
3	A-009141-000-06-M-000	ROLLER	1
4	A-009958-014-00-A-000	SHAFT-ROLLER	1
5	A-011385-001-00-A-000	CAP-TOP	1
8	P-007000-007-00-0-000	WASHER - FLAT	1
9	P-007020-150-20-0-000	SHCS	1
10	P-007026-010-18-0-000	HHCS	3
11	P-007091-000-00-0-000	BEARING	2

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"

BACK TO FEED TABLE ASSEMBLY

BACK TO OPTIONS LIST



NOTE:

ITEMS 21,24,25,26,27,29, 31,32,33,35 & 38 ARE NOT USED ON THE 3rd VISE OPTION.

ITEMS 38 & 39 ARE USED ONLY ON THE 3rd VISE OPTION.

PARTS LIST

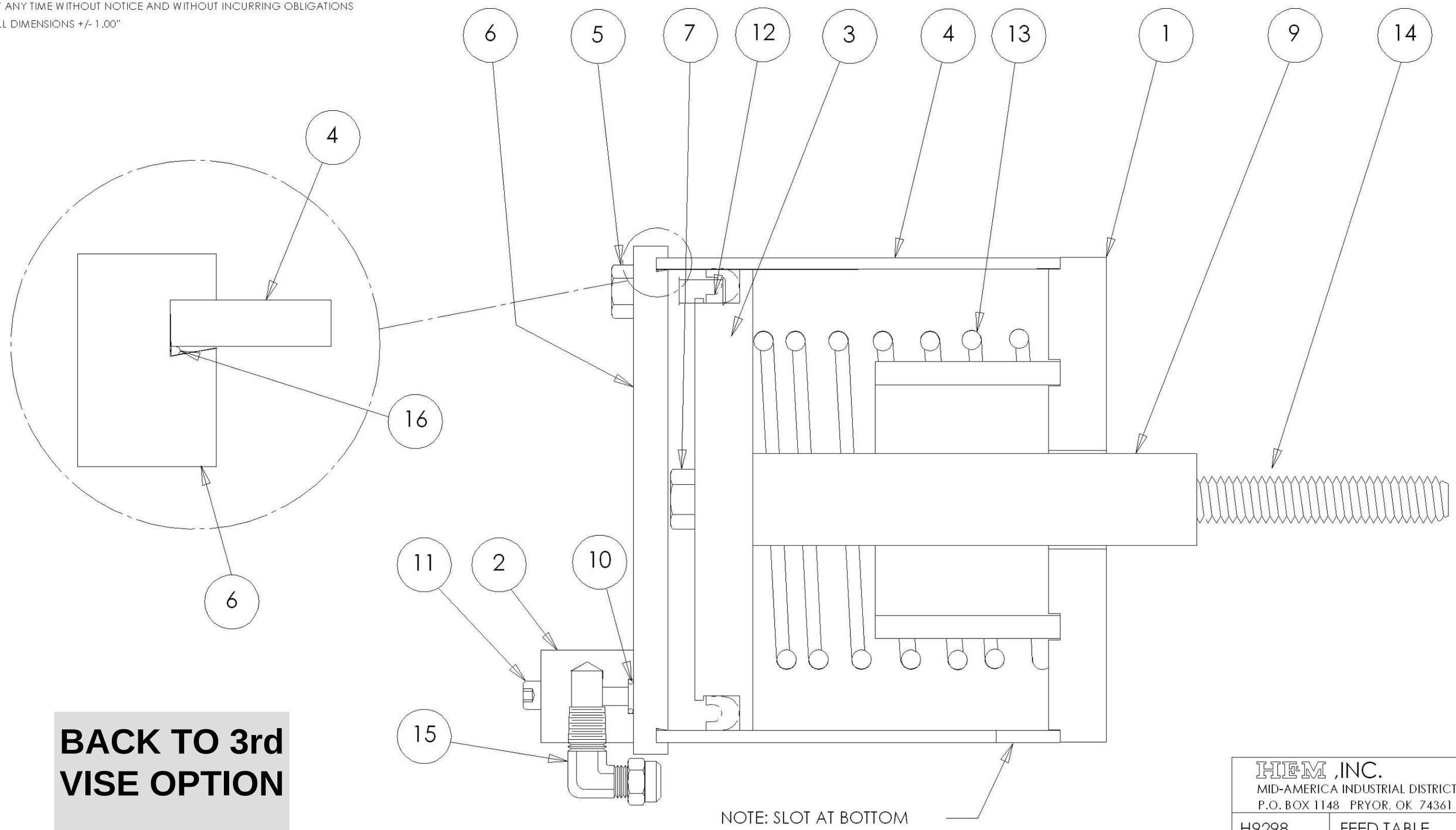
HEM ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

H9299	FEED TABLE
FEED VISE ASSEMBLY	
D-010322-107 D	

FEED VISE ASSEMBLY-3rd VISE
D-010322-107-01-D-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	C-009189-011-02-J-000	VISE WAY - R.H.	1
2	C-009188-007-02-F-000	VISE WAY - L.H.	1
3	C-009189-011-01-J-000	SPACER - VISE R.H.	1
4	C-009188-007-01-F-000	SPACER - VISE L.H.	1
5	C-009177-001-03-P-000	VISE JAW, ADJUSTABLE	1
6	C-009176-001-00-S-000	VISE JAW W/A FIXED	1
7	C-009261-022-00-F-000	VISE CYLINDER ASSEMBLY	1
8	A-012845-004-00-A-000	GEAR RACK SPACER	1
9	A-010316-008-00-A-000	THREAD ADAPTER	2
10	A-009954-018-00-B-000	VISEWAY END BAR	1
11	B-010322-021-00-J-000	HANDLE-CLAMP	1
12	A-009355-000-03-J-000	WASHER - THICK	2
13	A-010309-004-00-D-000	TEE-VISE, ADJUSTABLE	1
14	A-011423-003-08-F-000	GEAR RACK W/A	1
15	P-007039-050-00-0-000	RETAINING RING	6
16	A-010309-007-00-F-000	VISE TEE	1
17	A-010312-001-02-E-000	PLATE-LINK	2
18	P-007023-150-13-0-000	SHCS	3
19	A-011628-002-01-F-000	PIN-HINGE	2
20	A-012266-010-00-B-000	PLATE-SUPPORT (GEAR RACK)	1
22	A-010309-005-00-D-000	TEE-VISE	1
23	B-009505-018-02-E-000	WEAR PLATE	1
28	P-007033-150-00-0-000	PIN-ROLL	1
30	A-009678-000-00-C-000	CLAMP-POLY-FLO	1
36	A-013301-007-00-A-000	SPLASH GUARD SUPPORT	2
38	B-009268-010-05-F-000	SPLASH-TRAY 3RD VISE	1
39	B-009268-010-06-F-000	SPLASH TRAY 3rd VISE	1

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"



BACK TO 3rd VISE OPTION

HEM ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

H9298	FEED TABLE
VISE CYLINDER ASSEMBLY	
C-009261-022-00 F	

PARTS LIST

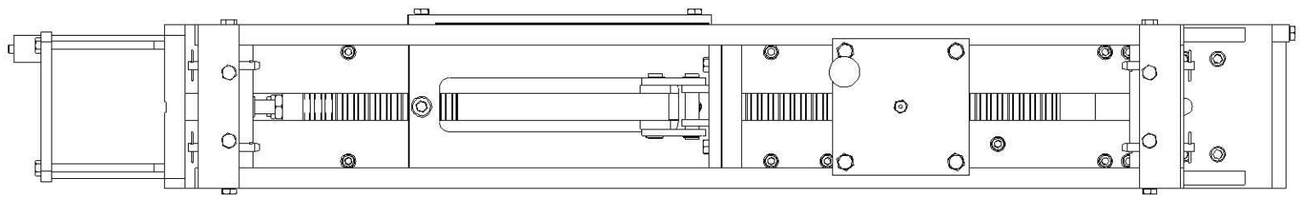
VISE CYLINDER ASSEMBLY
C-009261-022-00-F-000

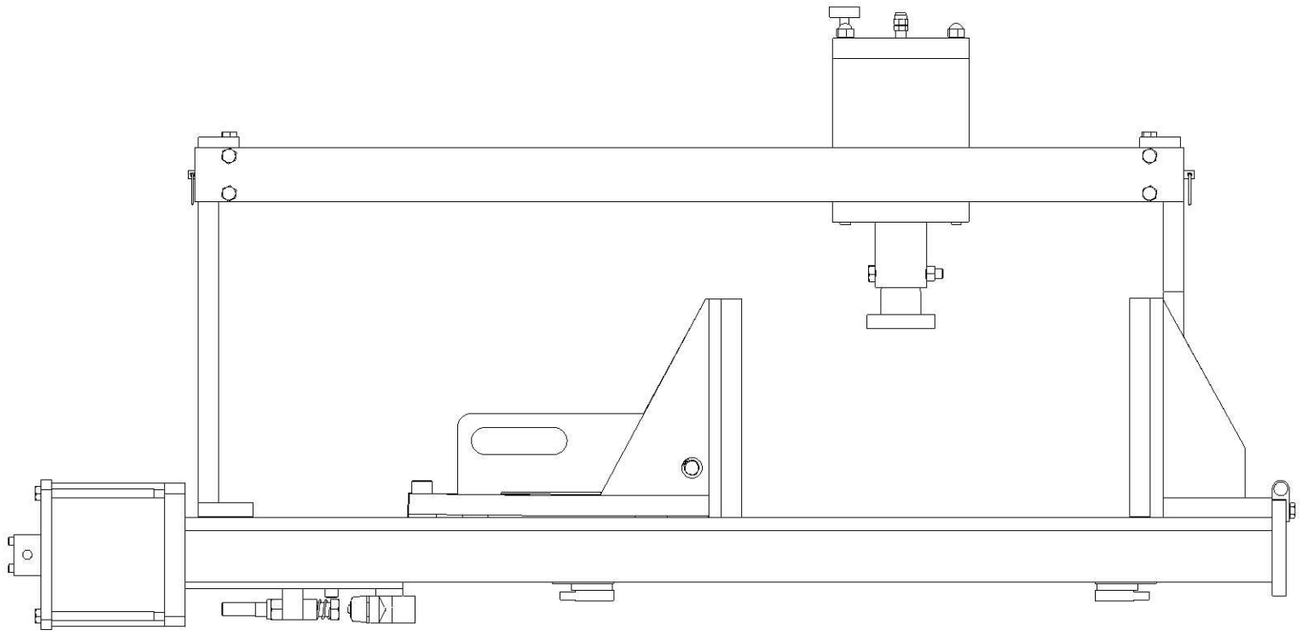
ITEM #	PART NUMBER	DESCRIPTION	QTY
1	B-009154-016-00-E-000	END CAP	1
2	A-012575-095-00-B-000	PORT BLOCK	1
3	B-009153-070-00-A-000	PISTON	1
4	A-009155-001-07-K-000	CYLINDER HOUSING	1
5	B-009330-005-00-A-000	TIE ROD	4
6	A-009154-015-00-C-000	END PLATE	1
7	P-007027-010-24-0-000	HHCS	1
8	P-007004-003-18-0-000	NUT-HEX	4
9	A-009156-012-00-B-000	PISTON ROD	1
10	P-007050-010-00-0-000	O-RING	1
11	P-007019-190-12-0-000	SHCS	2
12	P-007053-055-00-0-000	U CUP	1
13	A-003967-000-02-A-000	SPRING	1
14	A-010936-031-01-K-000	ALL THREAD	1
15	P-007071-002-12-A-000	MALE ELBOW	1
16	P-007050-248-00-0-000	O-RING	1

NOTE:

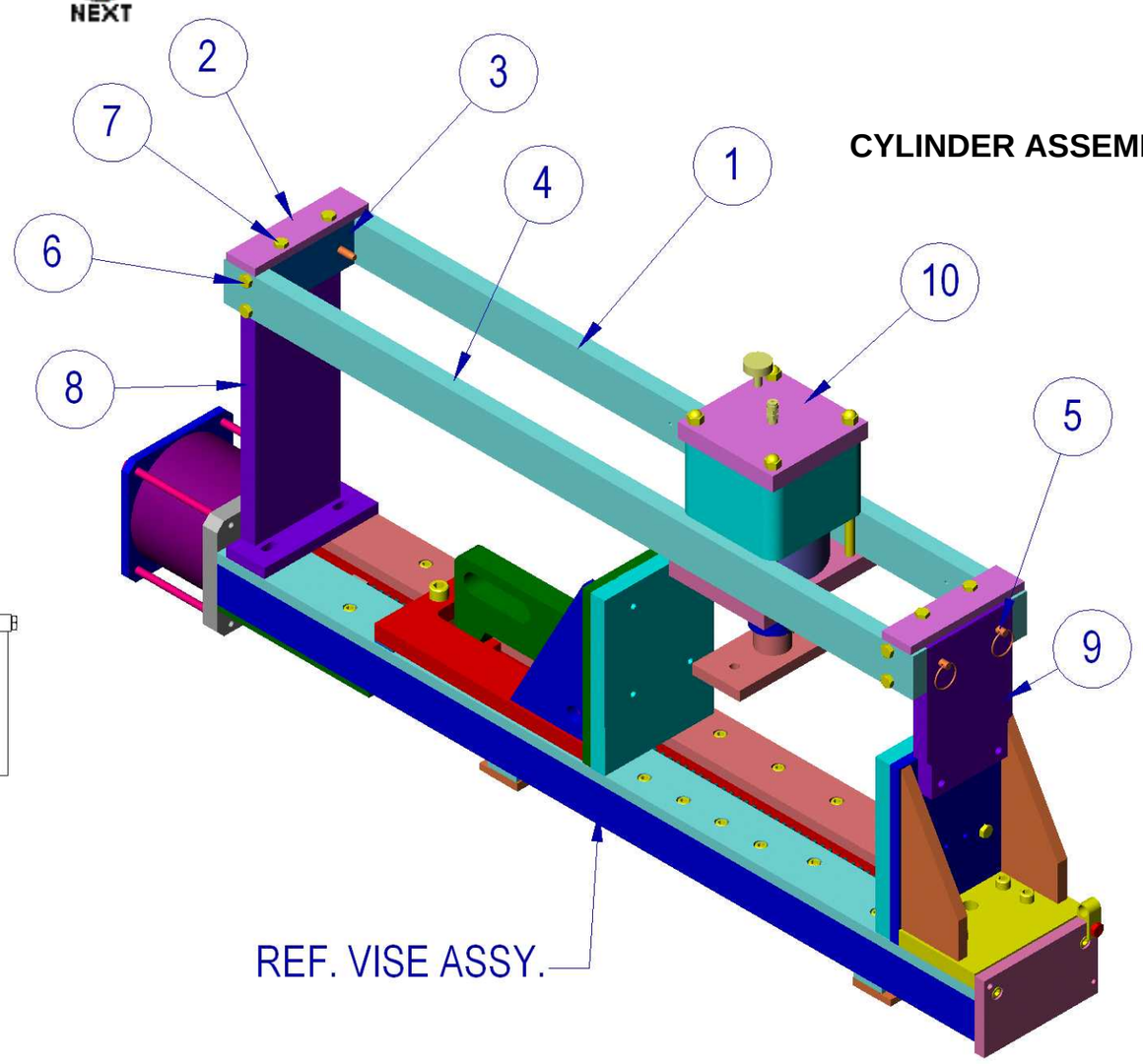
HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS, RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS.
ALL DIMENSIONS ARE ± 1.00"

MATERIAL FLOW





CYLINDER ASSEMBLY



BACK TO FEED TABLE ASSEMBLY

BACK TO OPTIONS LIST

PARTS LIST

HE&M SAW® HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK. 74361

FEED VISE TOP CLAMP ASSY

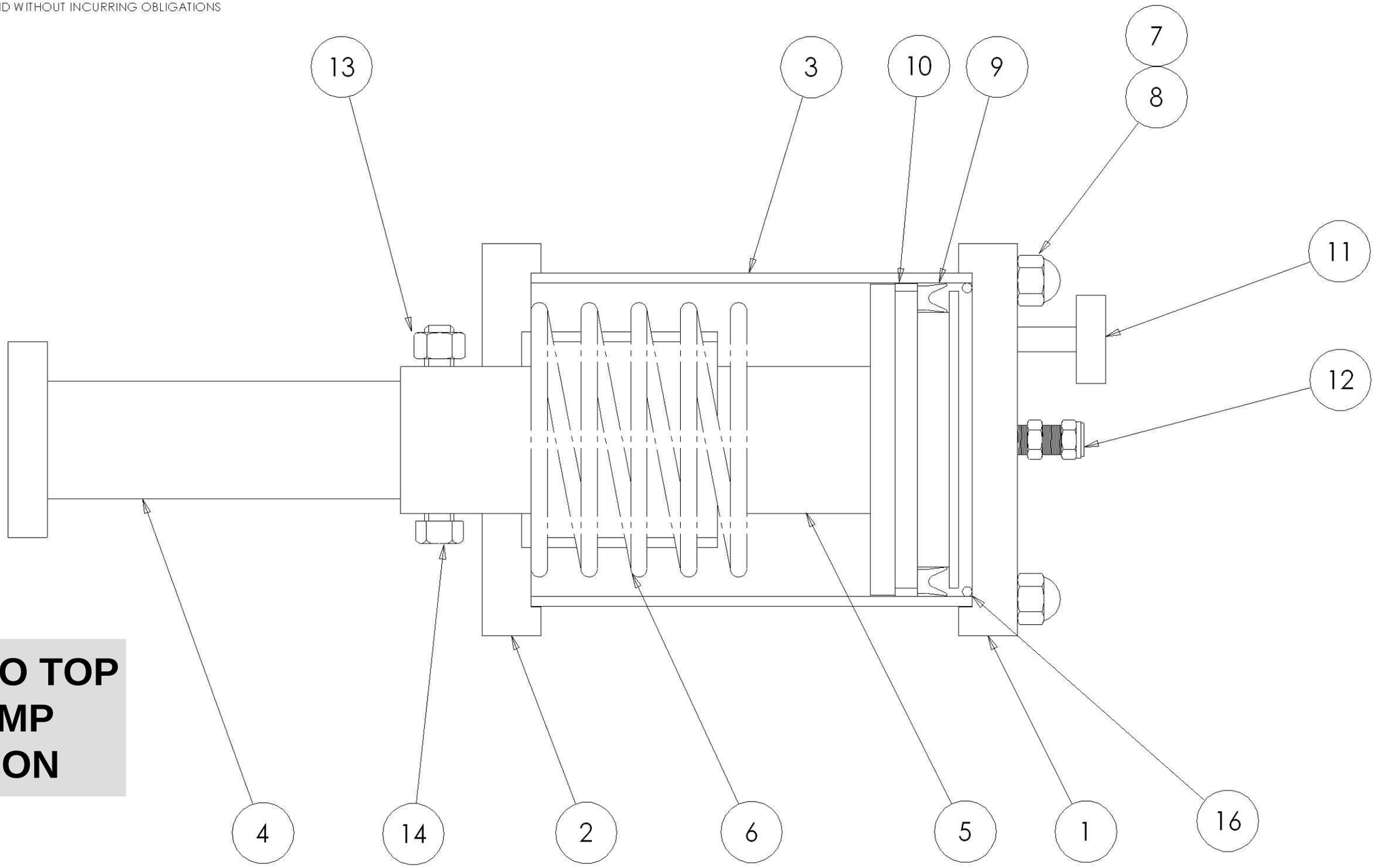
C-013800-121 C

HEM SAW
The saw that cuts straight.

FEED VISE TOP CLAMP ASSEMBLY
C-013800-121-01-C-000

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	C-010230-061-01-D-002	GUIDE RAIL	1
2	B-013800-130-00-A-000	TOP CLAMP CAP	2
3	B-013800-131-00-A-000	TOP CLAMP MOUNT	2
4	C-010230-061-01-D-001	GUIDE RAIL	1
5	P-007730-033-00-0-000	QUICK RELEASE PIN	4
6	P-007026-125-18-0-000	HHCS	6
7	P-007026-010-18-0-000	HHCS	6
8	C-010230-066-02-C-000	END RAIL MOUNT W/A	1
9	C-010230-065-01-C-000	VISE PLATE EXTENSION	1
10	C-011941-038-00-B-000	TOP CLAMP CYL ASSEMBLY	1

NOTE: HEM INC. WHOSE POLICY IS ONE OF CONTINOUS IMPROVEMENTS,
RESERVES THE RIGHT TO CHANGE SPECIFICATIONS, PRICE OR DESIGN
AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATIONS
ALL DIMENSIONS +/- 1.00"



BACK TO TOP CLAMP OPTION

HE&M ,INC.
MID-AMERICA INDUSTRIAL DISTRICT
P.O. BOX 1148 PRYOR, OK 74361

H10503	FEED TABLES
TOP CLAMP CYLINDER	
C-011941-038 B	

PARTS LIST

HEM SAW
The saw that cuts straight.

TOP CLAMP CYLINDER ASSEMBLY
C-011941-038-00-B-000

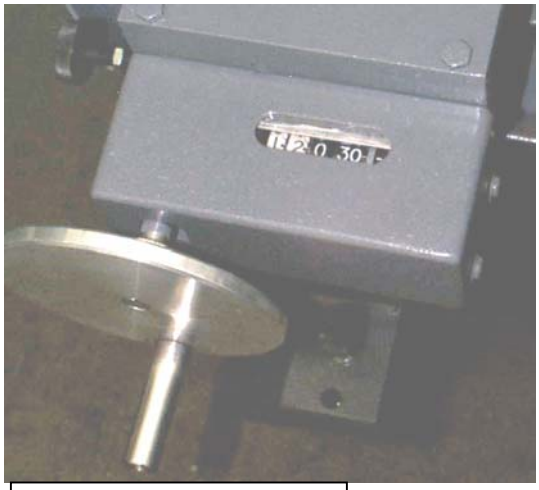
ITEM #	PART NUMBER	DESCRIPTION	QTY
1	B-009310-015-00-C-000	CYLINDER END PLATE	1
2	C-009310-016-00-C-000	CYLINDER END PLATE	1
3	B-010227-039-00-C-000	CYLINDER TUBE	1
4	C-013806-099-00-C-000	FOOT BAR W/A	1
5	C-009615-150-00-C-000	PISTON ROD W/A	1
6	A-003967-000-02-A-000	SPRING	1
7	A-009330-003-04-F-000	TIE ROD	4
8	P-007398-029-00-A-000	PLATED CAP NUT	4
9	P-007053-054-00-0-000	U CUP	1
10	P-007791-400-00-0-000	SEAL	1
11	P-007730-007-00-0-000	KNURLED HEAD SCREW	1
12	P-007070-002-12-0-000	MALE CONNECTOR	1
13	P-007004-004-16-0-000	NUT-HEX	1
14	P-007027-250-16-0-000	HHCS	1
15	B-010227-038-00-A-000	LOCK DOWN TUBE	1
16	P-007050-240-00-0-000	O-RING	1

BARFEED SECTION

A. PARTS 24 INCHES OR LESS.

The feed must be at its forward position before attempting to set the feed length. A lock is located on the length display to hold the part length once it is set.

This lock should be loosened before any adjustments are made and locked after adjustment is completed. Turn the crank handle until the proper part length is shown. The feed length is now set.



Part Length Indicator

B. PARTS OVER 24 INCHES.

For parts over 24 inches, the feed length setting will need to be calculated. This is necessary because the feed will have to make multiple indexes to achieve the part length required. When the stroke length is set, the saw will feed the stroke length plus the width (KERF) of the blade. When multiple indexes are required, the extra kerf lengths must be subtracted from the overall length, or the part will be too long.

EXAMPLE: Cut a part 30 inches long.

Divide the part length by the maximum stroke length to find the number of strokes required. Add an addition stroke for any fraction of a stroke:

(30 / 24 = 1.25) 1 plus a fraction = 2
A 30-inch part would require 2 strokes.

Part Length:	30.000 inches.
Maximum Feed Length:	24.000 inches.
Feed Strokes Required:	2 Strokes.
Kerf of Blade:	0.050 inches.

Since only one kerf compensation is needed and the feed needs to stroke 2 times to give the part length required, 1 kerf compensation needs to be subtracted from the desired part length:

BACK TO TABLE OF CONTENTS

1 x 0.050" = 0.050"
30 - 0.050" = 29.950"
29.950/2 =14.975"

14.975 would be the length setting for feeding 2 times to get a 30 inches part. So:

Set feed strokes to: 2
Set length to: 14.975”

Note: Check the kerf for your saw. It may not be 0.050". Use the proper kerf width for your saw when calculating feed length.

Kerf: A Short Lesson

Most automatic cutting will be lengths less than 24”. The Cyclone barfeed is set up so that if you want a part that is 1.000” long, you adjust the mechanical readout to 1.000”. But actually the part is being advanced about 1.050” each time. The extra .050” is the kerf loss. For instance, you could adjust the barfeed length to 0.000” and cut a bar automatically. On each cut, the blade would remove the kerf, and the part length is still zero.

For multiple index cutting, it is necessary to do a little math to figure out the correct DRO setting. In the above example, for a 30.000” part, if you set the DRO to exactly half (15.000”) and set the feeds required counter to 2, the part would be about 0.050” long. That is because the feed would advance the material 15.050” the first time, and 15.050” the second time, and 0.050” would be removed as kerf. The extra 0.050” must be compensated for, by adjusting the barfeed length to 14.975”, which, when you think about it, is half of the “extra” 0.050”.

Also remember, when making fine adjustments to lengths on multiple feeds, any adjustment will be multiplied by the number of feeds required. So if a part requiring four feeds is coming out 0.040” long or short, you’d only need to make a 0.010” correction on the DRO.

OPTIONAL EQUIPMENT

Top Clamps SEE ASSEMBLY DRAWING

The top clamp option allows bundle cutting of multiple pieces of bar, round stock, or structurals, such as angle and channel.

Precautions should be made to ensure that the side clamps and top clamps securely hold every piece in a bundle. If a bar spins or vibrates during the cut, blade damage can occur. If the bundle is not securely clamped, some parts of the bundle may shift during the feed stroke, which can cause erratic cut lengths.

Adjust the height of the top clamp by removing the coarse adjustment bolt and raise or lower the shaft as required. Position the top clamp by loosening the lock screw and sliding the clamp assembly. Tighten the lock screw.

The saw and feed top clamps have a valve that can be turned off when not using the top clamps.

BACK TO TABLE OF CONTENTS

SEE ASSEMBLY DRAWING

Air Tension:

The air tension option allows for quick and easy blade changing. A pneumatic cylinder provides the correct tension on the blade. Actuate the cylinder by turning a valve located on the saw arm. Correct tension is achieved when the tension gauge shows 75 psi. Do not exceed 75 psi or damage to the saw may result.

Blade Installation: Air Tension

WEAR GLOVES WHEN HANDLING THE BLADE! DO NOT WEAR GLOVES TO OPERATE THE MACHINE!

Raise the saw arm about six inches. Open the drive wheel and idle wheel door covers, if necessary. Install the blade on the wheels (with the teeth facing forward and off the edge of the band wheel) and through the slot in the upper blade guard. Make sure the tension valve is in the “off” position.

Take the slack out of the blade by turning the pre-tension handle clockwise. Twist the blade into the vertical position and insert the blade into the guide caps. Tighten the guide caps. “Screwdriver” tight is about right.

Make sure the blade is riding correctly on the “bumper block” located near the idle wheel.

Re-check the position of the blade on the wheels.

Close the idle and drive wheel door covers. Turn the tension valve to the “On” position.

Start the band motor briefly and check to make sure the blade is tracking correctly on the band wheels. Also check to make sure the blade cleaning power brush is adjusted properly. The wires on the brush should just sweep through the gullets.

Third Vise on Feed SEE ASSEMBLY DRAWING

The optional third vise, located on the barfeed, helps stabilize bars during automatic cutting. The third vise opens and closes at the same time as the saw vise. The third vise can be disabled by turning off the third vise valve.

Laser Light Alignment System

The laser alignment system utilizes Class IIIA industrial diode laser with a max output of 4mW on a wavelength of 630-680nm.

The laser projects a thin red line directly under the saw blade to allow quick and accurate positioning of material to be cut.

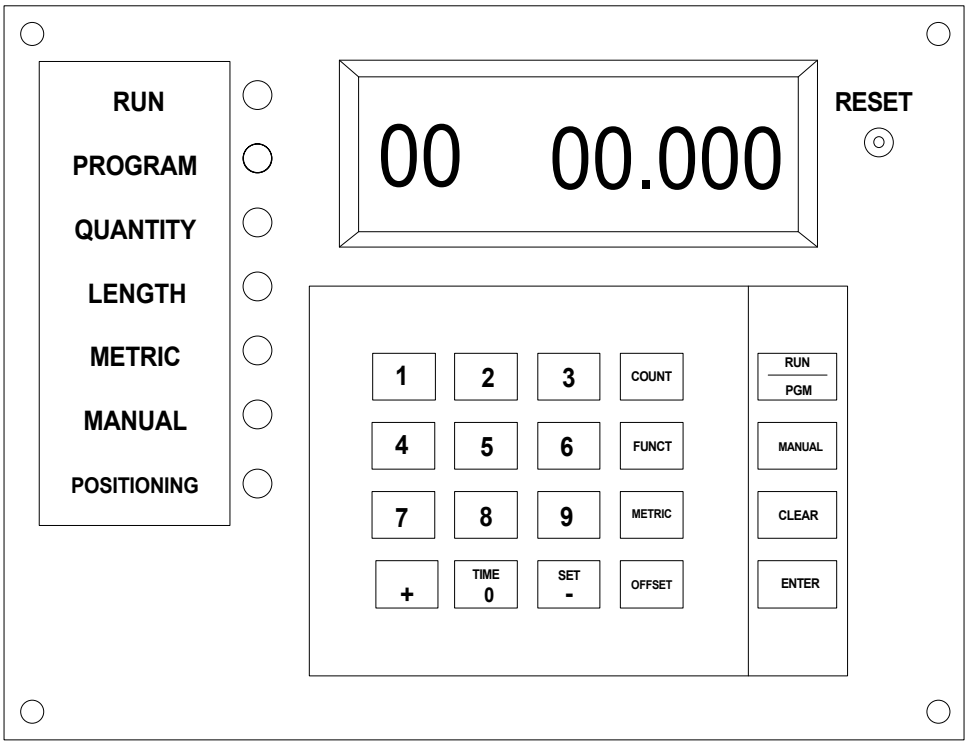
A push-button actuates the laser, which will turn on for about thirty seconds and then automatically shut off.

CAUTION: Do not look directly into the laser beam.

SEE ASSEMBLY DRAWING

Cyclone Automatic Computer Controlled Feed Manual

TABLE OF CONTENTS



CCFB Computer Display / Keypad

1. Computer Controlled Feed Overview:

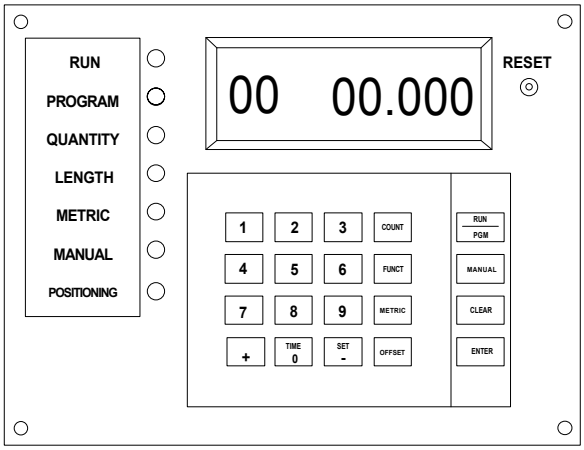
The Computer Controlled Feed will improve the operation and efficiency of the sawing system. The operator is not required to go to the feed table and set the length for each operation, nor must he set the number of pieces to be cut each time. The computer can be programmed to cut 99 different jobs. These jobs may be arranged in a series of cuts for each material size.

It is recommended that job cards showing the job numbers, length, and number of pieces for each job be made up. The when a job is to be run the operator can then look at the job card and enter the starting job number for series of jobs to be run.

The operator loads the saw with the material to be cut and sets the switches for automatic operation and then pushes the auto-start button. The saw then takes over and cuts the entire series of jobs.

This saves time and reduces the possibility of an operator making an error in setting the machine each time. This translates into less rework, less waste, and higher productivity.

2. *Computer Console Overview:*



Display Information:

The computer will display:

1. The job number that is being cut, programmed, or edited.
2. The quantity of parts to be cut and the number of pieces that have been cut (if a job is running).
3. The length of the part that is or will be cut when the job runs.
4. The time in the current cut.
5. The position of the feed stop.

Numeric Formats:

The computer will accept:

1. Job numbers in a range from 1 to 99.
2. Quantities in a range from 0 to 999. A quantity of zero (0) will stop program execution when the computer runs that job.
3. Lengths in a range from 0 to 999.999 in either inches or centimeters. All lengths must be entered to the third decimal point. For instance, a 1.0-inch part must be entered as 1.000. Press the 1 key once and the 0 key three times.

Keyboard Functions:

The function keys are:

1. Count Key: If the computer is cutting, a push of this key will display the number of parts that have been cut.

2. Run / Program Key: This key is used to switch between run and program modes.

3. Function Key: This key is used with other keys to access special functions.

4. Manual Key: This key is used to select manual mode.

5. Metric Key: This key is used to switch between inch and centimeter lengths when programming a job.

6. Clear Key: This key will erase displayed information during data entry. If the computer is cutting, a push of this key will cause the cutting cycle will abort and reinitialize.

7. Enter Key: This key is used to accept the displayed information.

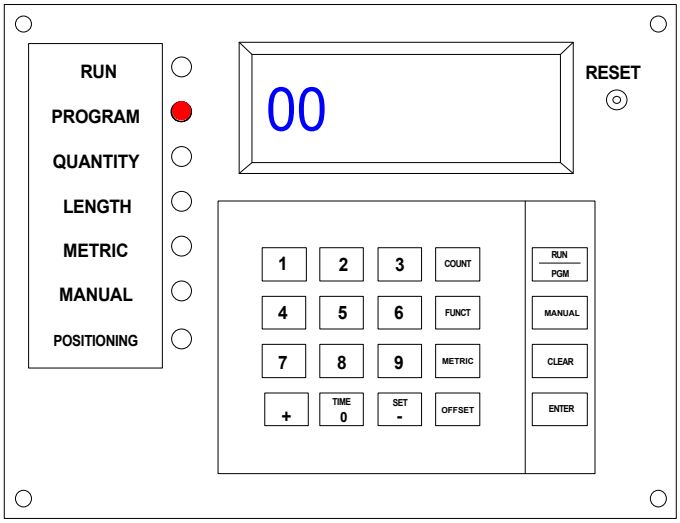
8. Offset Key: This key is used to change the part length for a job that is currently running.

9. Set Key: This key is used in conjunction with the Function key to re-calibrate the feed.

10. Time Key: This key will display the current time in the cut while held.

11. +/- Keys: These keys are used in conjunction with the Manual and Offset Key to change feed stop position.

3. Program / Idle Mode:



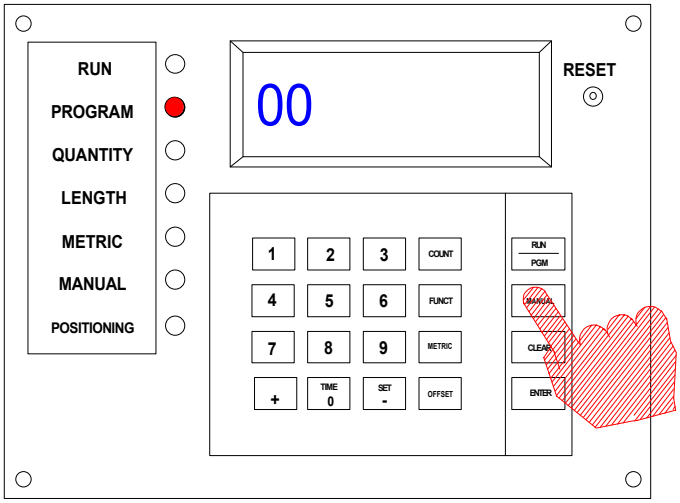
After power is applied and the CCFB computer is done initializing, the program light will be on and a pair of flashing zeros will be placed on the left side of the display. The CCFB computer is now in program / idle mode.

The operator can:

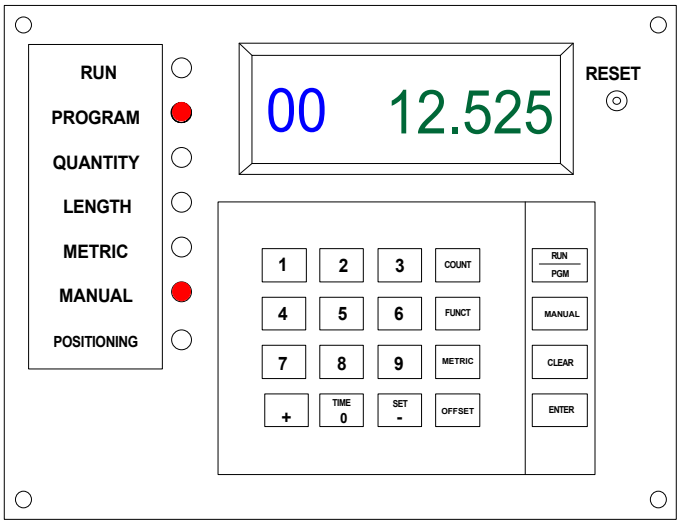
1. Program or Edit jobs.
2. Enter manual mode.
3. Run a program or series of jobs.
4. Calibrate the feed or check feed stop position.
5. Adjust the blade kerf.
6. Adjust the feed positioning window.
7. Clear the Job Table.
8. Recall the length of the last job ran.

4. *Manual Mode:*

Manual Mode allows the operator to check the feed stop's position or to move the feed stop.

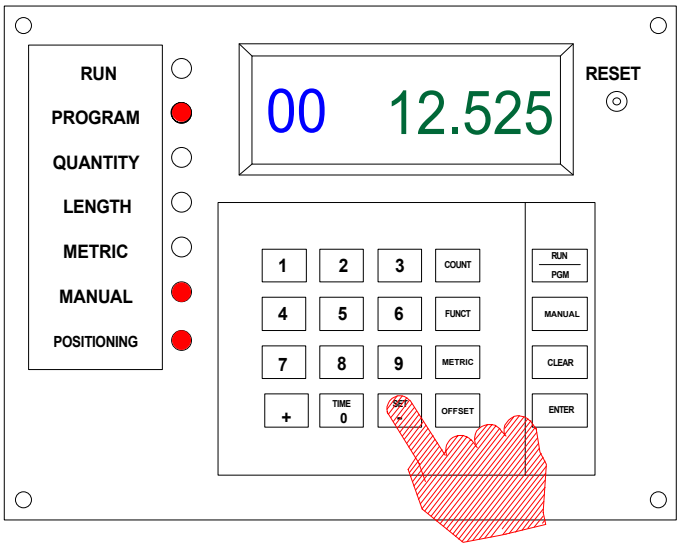


Select Manual Mode: From the Program / Idle mode the operator will press the Manual Key to enter into Manual Mode.

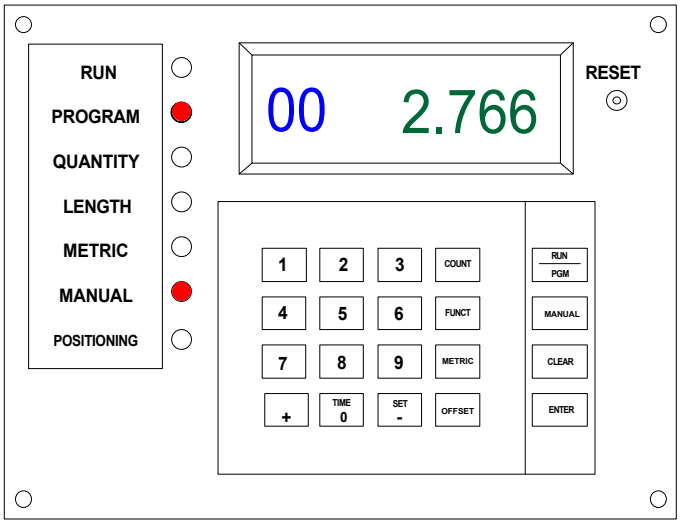


The CCFB is now in Manual Mode. Notice that the Program Light and the Manual Light is on. The pair of zeros on the left side of the display are not flashing and the current feed stop position is displayed on the right side of the display.

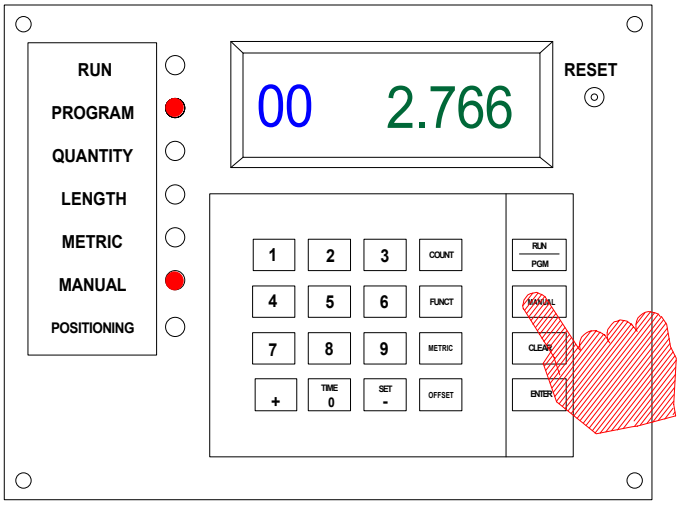
The operator may use the + key to retract the feed stop (increase part length) or the - key to jog the feed stop forward (decrease part length). In this example we are going to bring the feed stop forward.



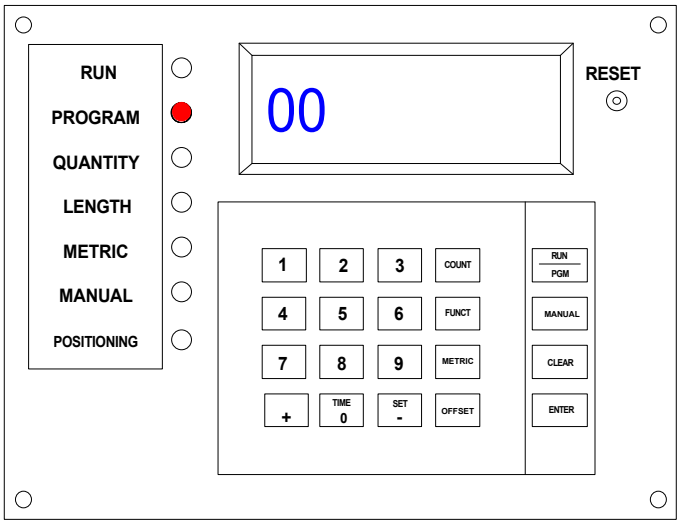
Press the - key: The operator will press and hold the - Key. The feed vise will now come forward. Then the positioning light will come on. The feed stop will now come forward until the operator releases the - Key.



Release the - key: The operator will release the - key when the desired position is reached. Notice that the positioning light goes out but the feed vise is held forward to assist jogging the feed stop with the +/- keys until the desired position is reached.



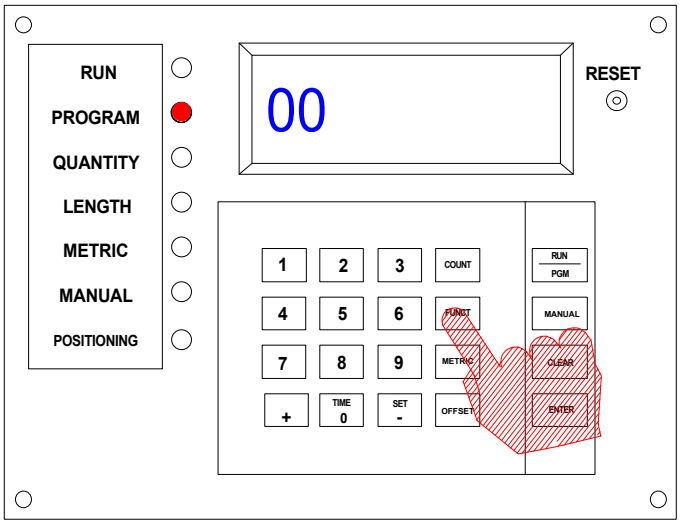
Press the Manual Key to Quit: The operator will press the Manual Key again to quit the Manual Mode and return to the Program / Idle mode. Note that the feed vise will retract to the feed stop.



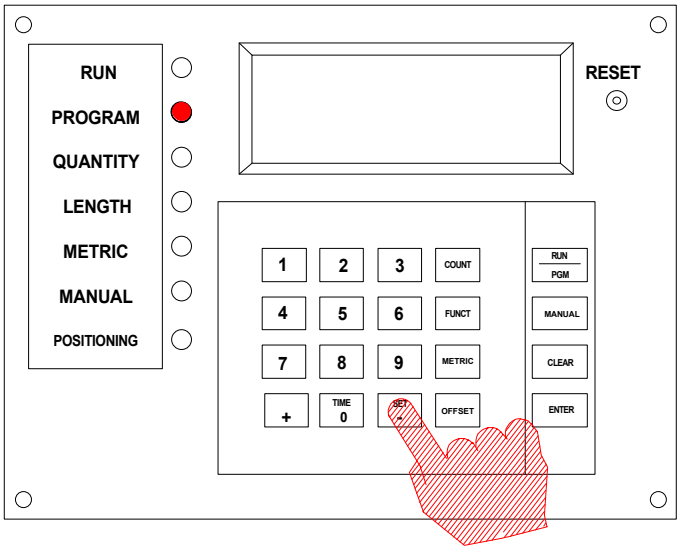
The CCFB computer is now in Program / Idle Mode awaiting new operator commands.

5. Calibrate the Feed Stop:

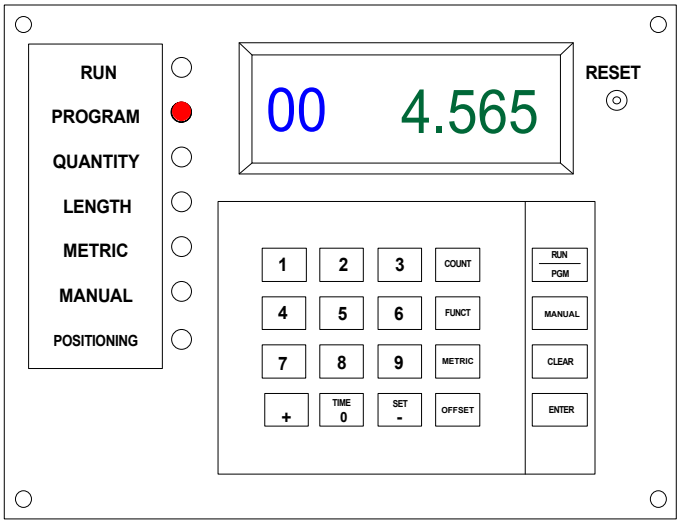
If for any reason the feed stop needs to be re-calibrated it is a simple matter to calibrate the CCFB. The operator will first need to read the length of the mechanical feed counter located at the back of the feed table or the measured length of the material last cut.



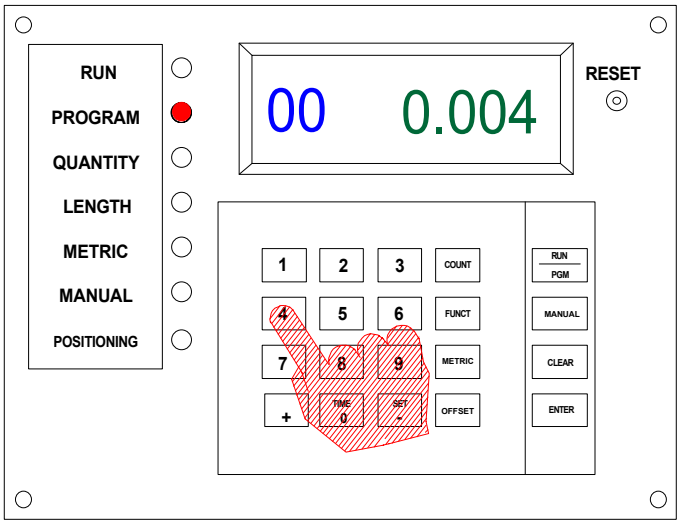
Press the Function Key: The operator will press the Function Key from the Program / Idle Mode. Note that the display is then blank.



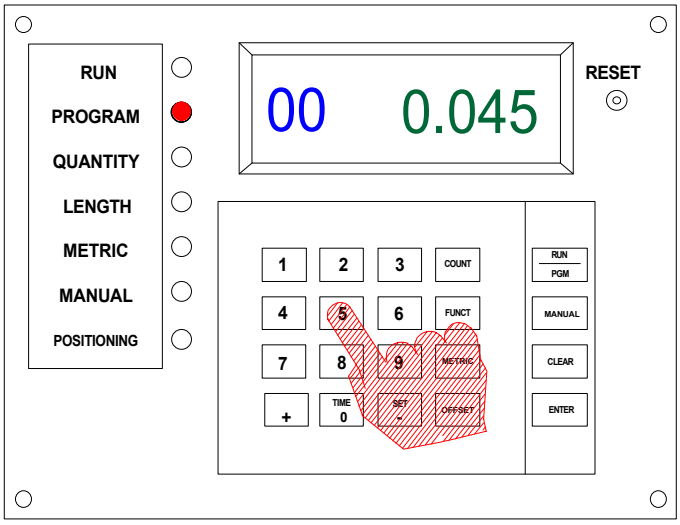
Press the Set Key: The operator will now press the Set key to display the current CCFB length.



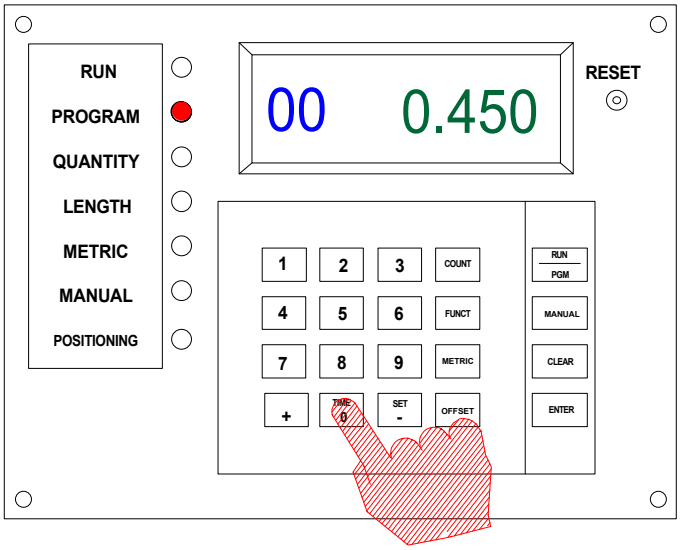
If the length displayed by the CCFB computer is correct, the operator may return to the Program / Idle Mode by pressing the Enter key now.
However, in this example the measured length is 4.500 inches while the CCFB is displaying 4.565 inches.



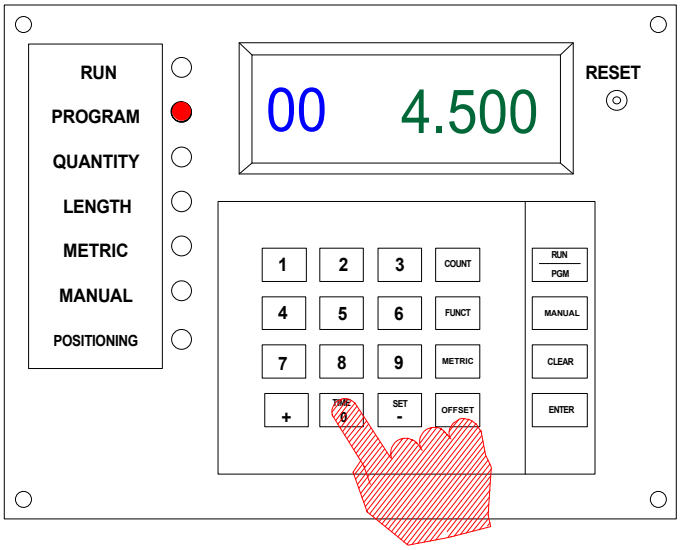
Press the 4 Key: The operator will press the # 4 key to place a 4 on the display.



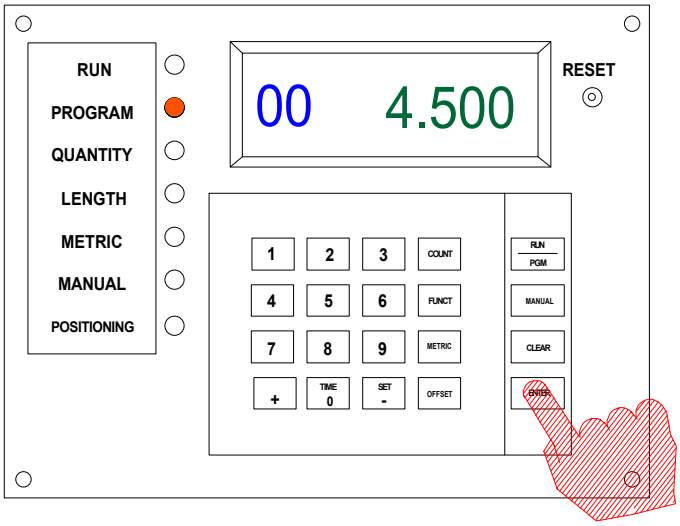
Press the # 5 Key: The operator will press the #5 key to place a 5 on the display. Note that the number 4 is shifted left one place.



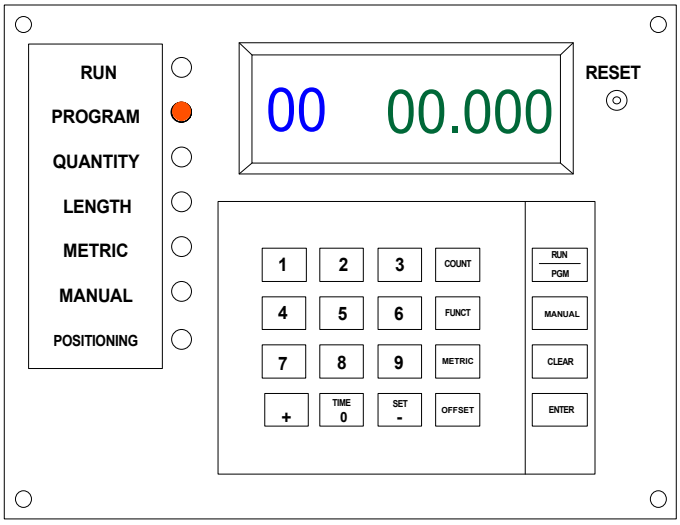
Press the # 0 Key: The operator will press the # 0 key to place a zero on the display.



Press the # 0 Key again: The operator will press the # 0 key again. Note that the displayed value now equals the measured or read value.



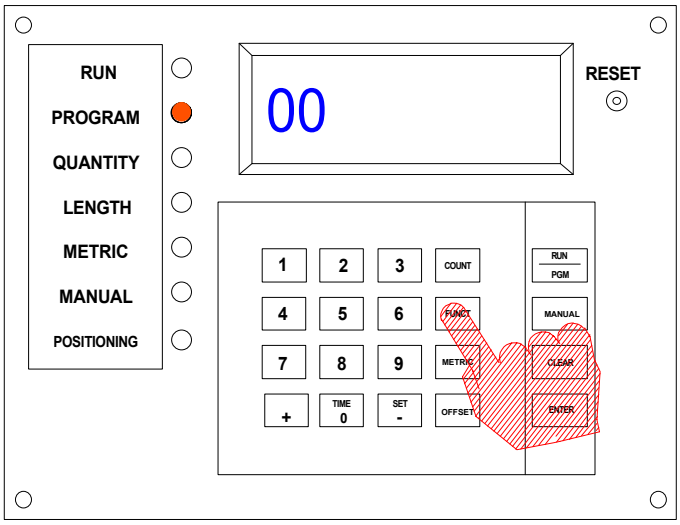
Press the Enter Key: The operator will finally press the Enter key to accept the display value of 4.500 inches. This value is written to the CCFB memory. Note that the display automatically returns to the Program / Idle mode



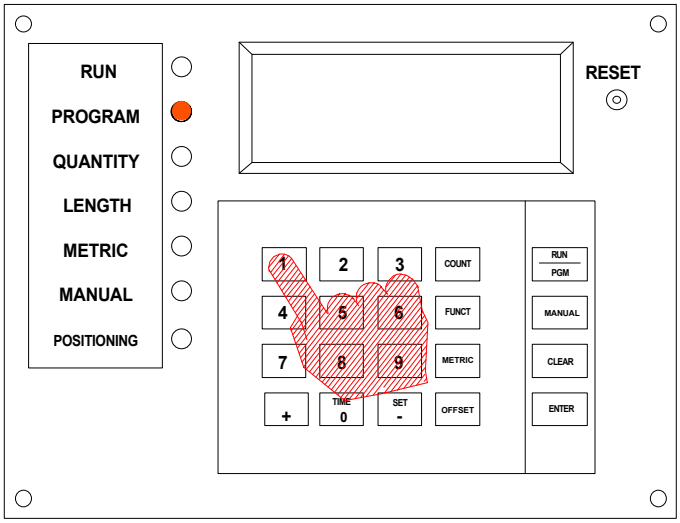
The CCFB computer is now back in the Program / Idle mode awaiting operator programming or commands.

6. Set the Blade Kerf:

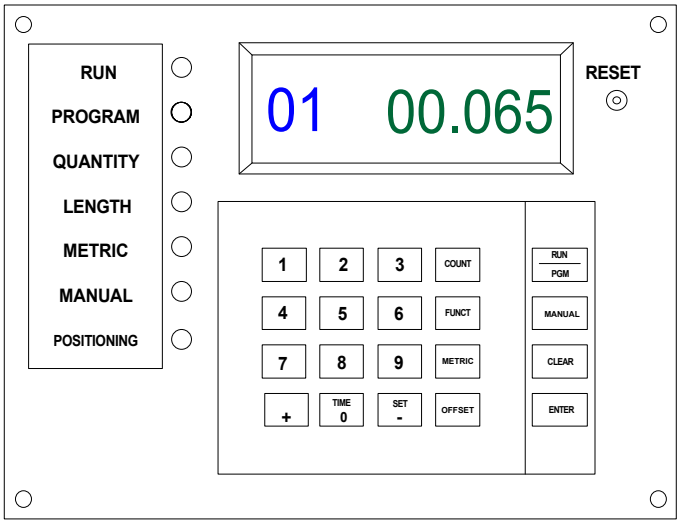
Blade Kerf is the amount of material (thickness) that the blade removes when cutting. Refer to the documentation that came with your blade for the kerf value. Changing Blade Kerf is a simple matter.



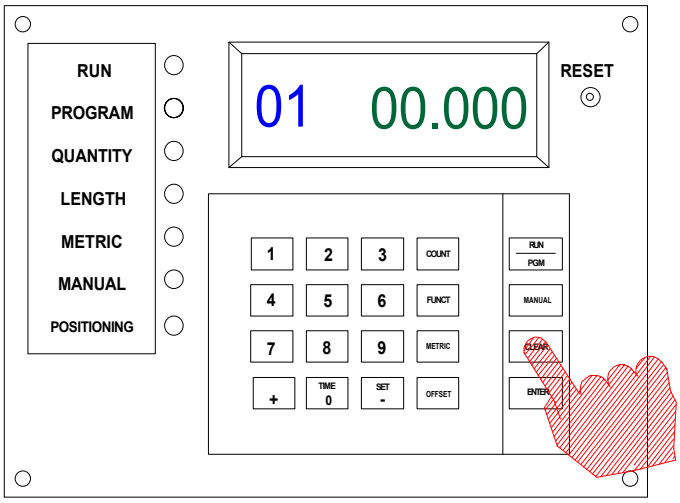
Press the Function Key: From the Program / Idle mode the operator will press the Function Key.



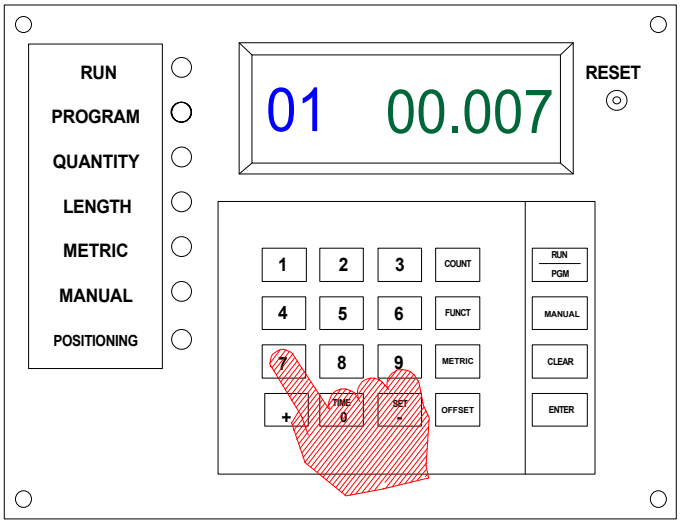
Press the # 1 Key: The operator will now press the # 1 key to enter into the Set Blade Kerf Mode.



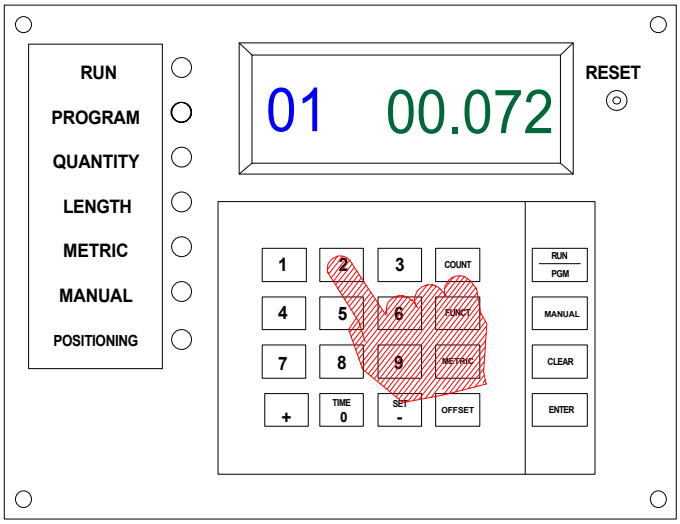
The current Kerf value is now displayed. Note – 0.065 is the default value for blade kerf. Values in a range from 0.025” - 0.150” will be accepted. If the value displayed is correct the operator need only press the Enter key.



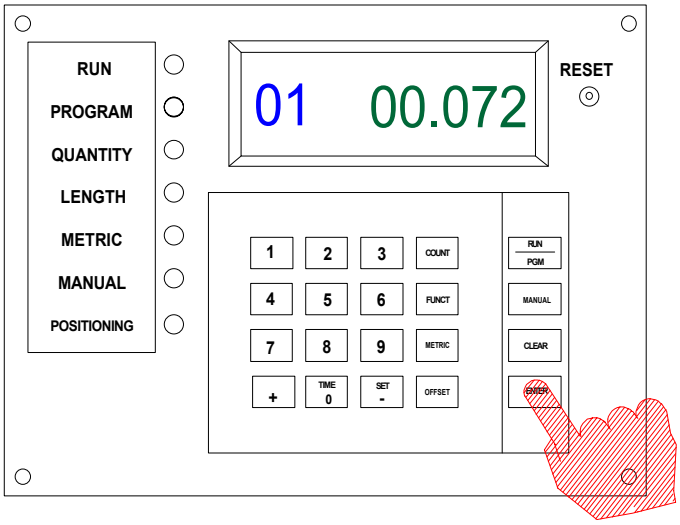
Press the Clear Key: The operator must first press the Clear key to zero the displayed blade kerf. We are going to input a kerf of 0.072”.



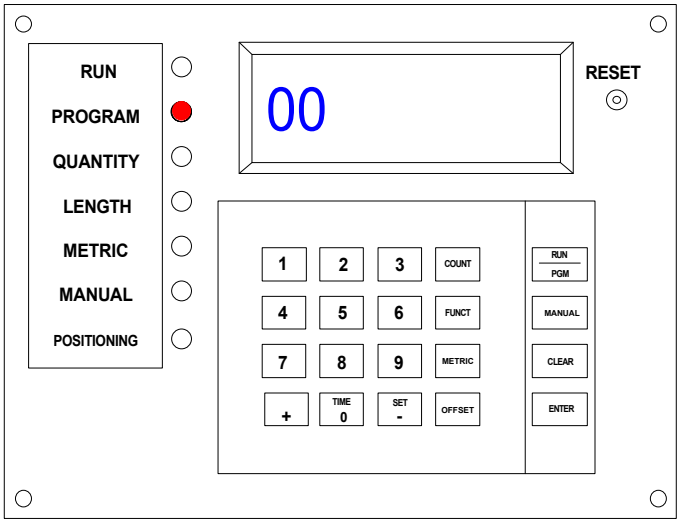
Press the # 7 Key: The operator will press the #7 key to place a 7 on the display.



Press the # 2 Key: The operator will now press the #2 Key to place a 2 on the display. Notice that the #7 has been shifted one place left. Notice also that the kerf value that we desire is displayed.



Press the Enter Key: The operator will press the Enter Key to accept the displayed value of 0.072” for blade kerf.

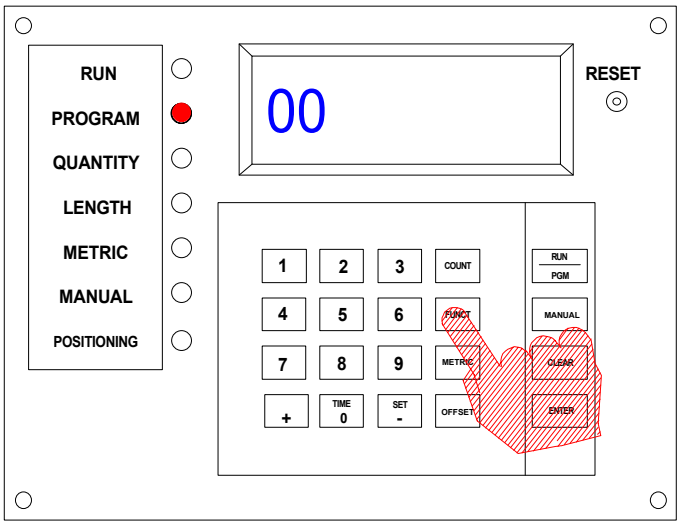


The CCFB automatically returns to the Program / Idle mode upon successful blade kerf entry. The CCFB is now awaiting operator programming or commands.

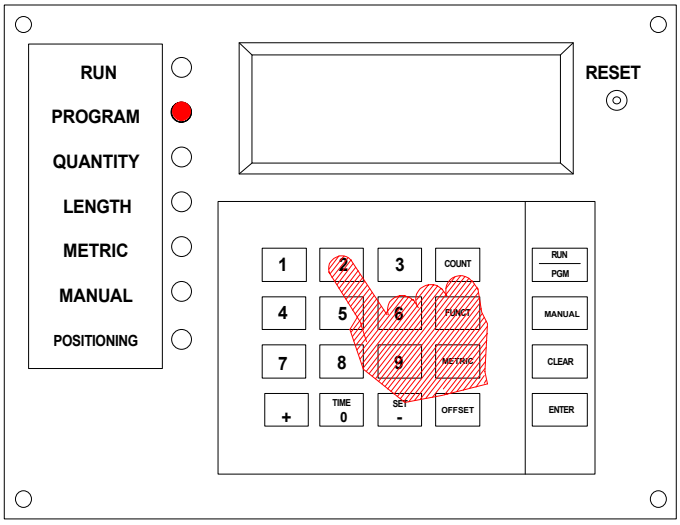
7. Set Feed Stop Positioning Window:

The feed stop positioning window is the tolerance that the CCFB will position the feed stop to. This value is + AND - the desired target length. Values in a range from 0.001” to 0.099” will be accepted.

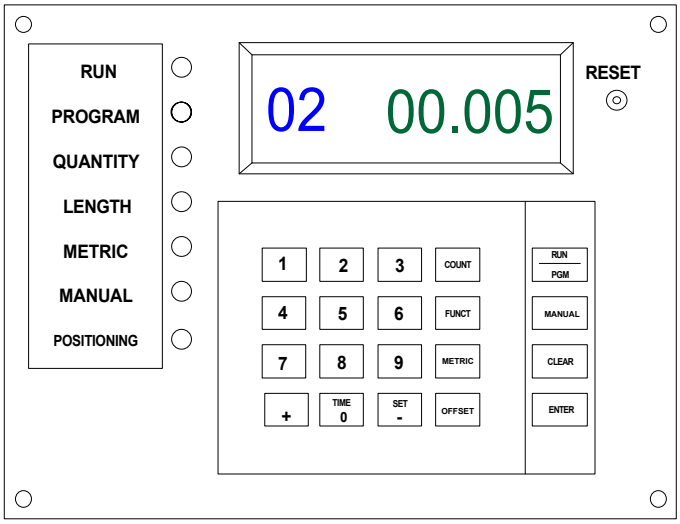
NOTE- the smaller the window value the more difficult it is for the CCFB to position the feed stop. Excessive position hunting may occur with extremely tight windows. Little or no hunting should be present with the factory default of 0.005”.



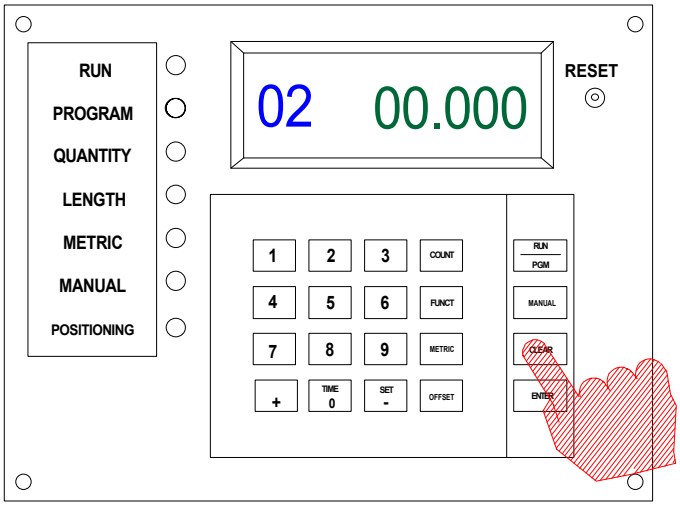
Press the Function Key: From the Program / Idle mode the operator will press the Function Key.



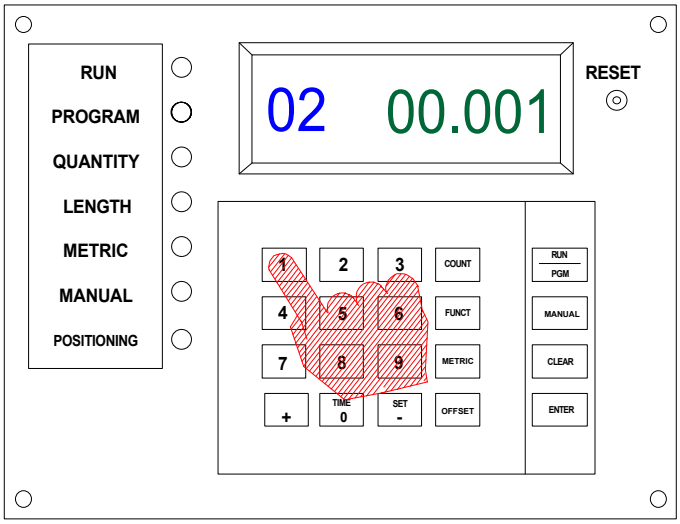
Press the # 2 Key: The operator will now press the # 2 key to enter into Set Position Window Mode.



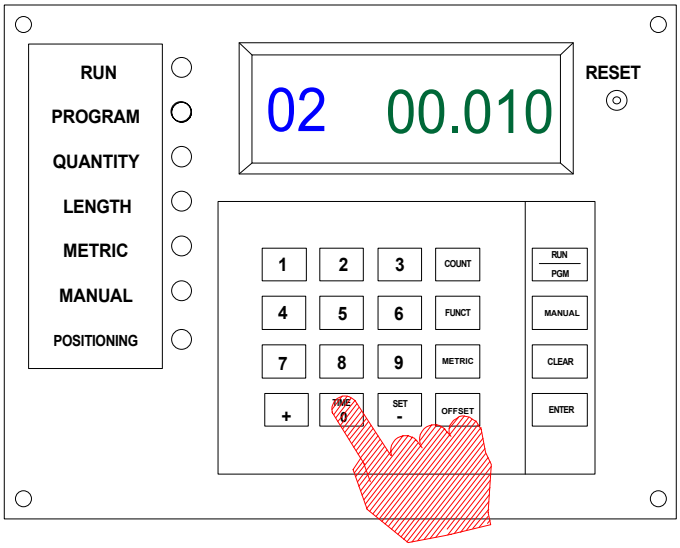
The current positioning window is now displayed. If this value is correct the operator may press the Enter Key now. However, for this example we are going to enter a new positioning window of 0.010".



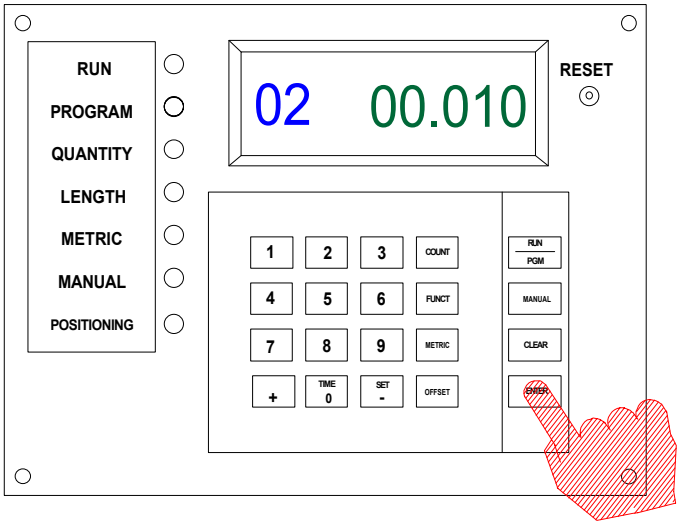
Press the Clear Key: The operator must first press the Clear Key to zero the displayed positioning window.



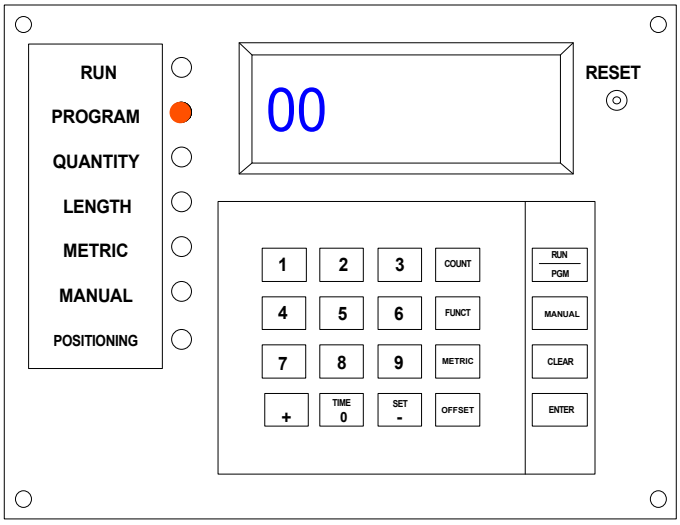
Press the # 1 Key: The operator will press the # 1 key to place the number 1 on the display.



Press the # 0 Key: The operator will now press the #0 Key. Notice that the displayed value is the desired position window of 0.010".



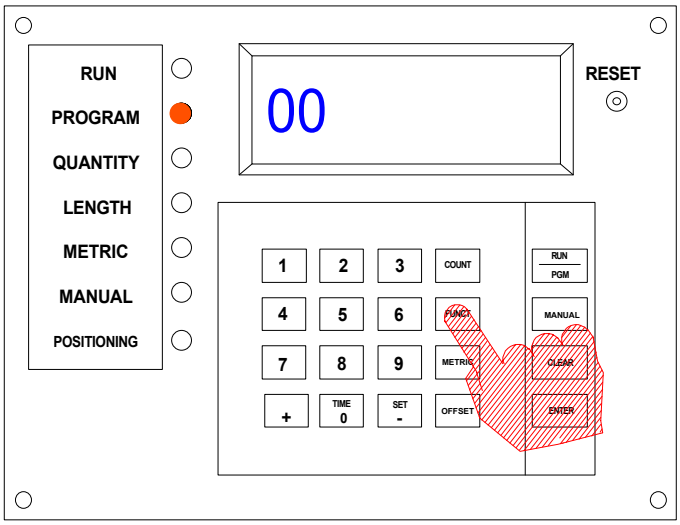
Press the Enter Key: The operator will now press the Enter key to accept the display positioning window of 0.010". Notice that the CCFB returns to the Program / Idle mode.



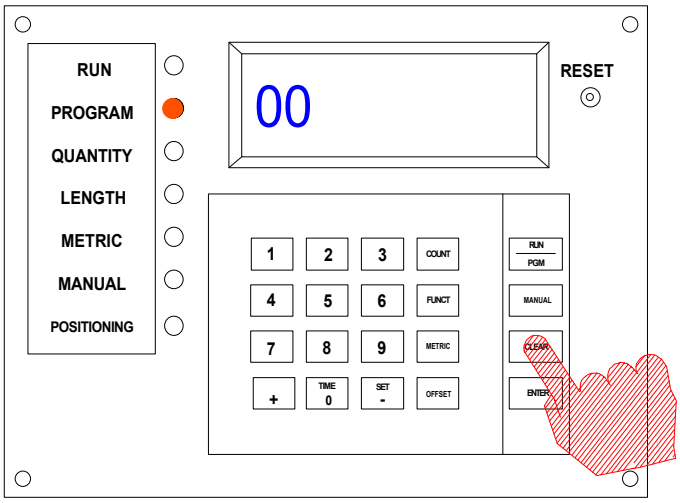
The CCFB is now in Program / Idle mode waiting for operator programming or commands.

8. Clear the Job Table:

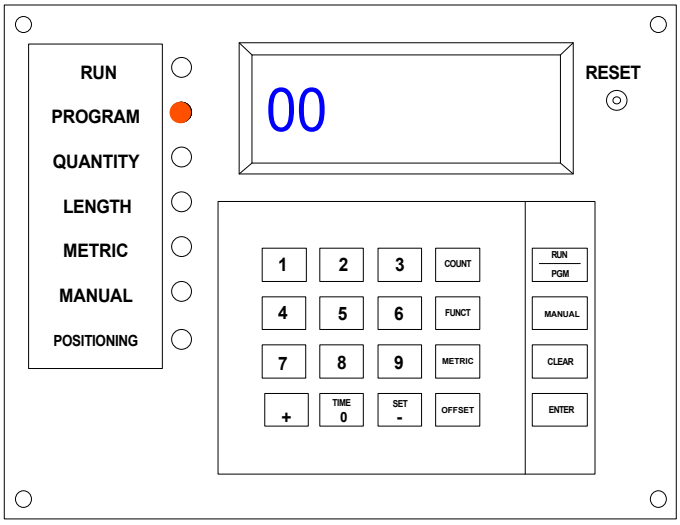
The CCFB can hold up to 99 jobs in memory. It is a simple matter to clear all the information for all 99 jobs at one time. **Clearing the Job Table erases all information. There is no method to retrieve any information after it has been erased.**



Press the Function Key: The operator will press the function key from the Program / Idle mode.



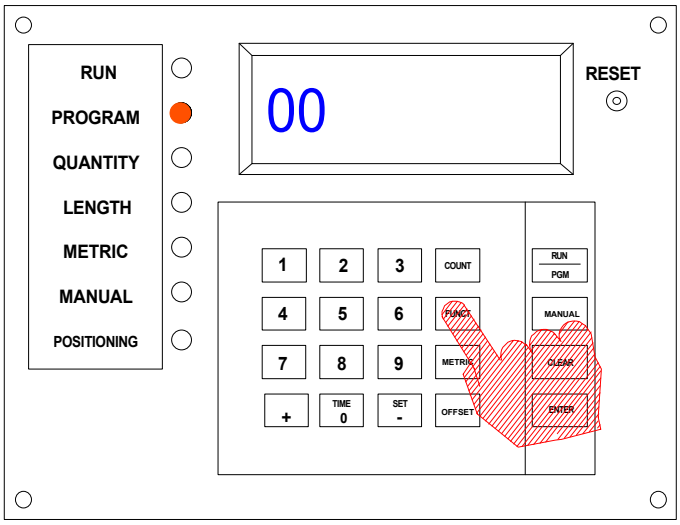
Press the Clear Key: The operator will press the Clear Key to erase all job information contained in the job table.



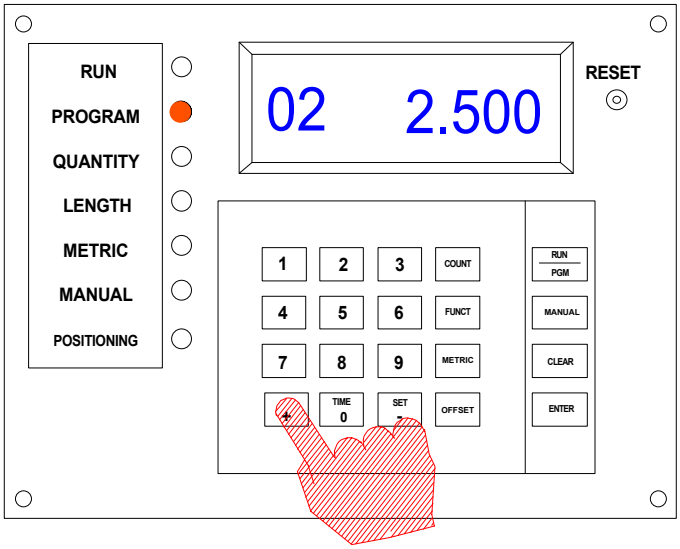
The CCFB will return to the Program / Idle mode automatically after the job table has been cleared.

9. Recall Last Job Number & Length Ran:

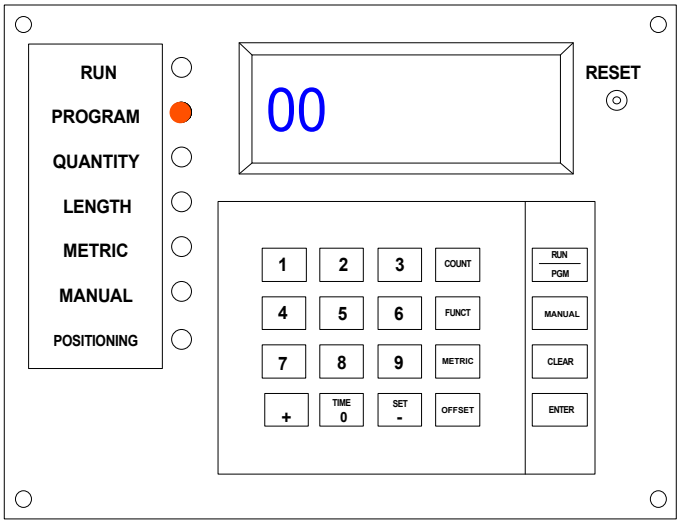
There may be a variety of reasons the operator may need to recall the last job number and length that was cut. Recalling this information with the CCFB computer is simple and easy.



Press the Function Key: The operator will press the Function Key from the Program / Idle mode.



Press and Hold the + Key: The operator will press the + key. While the + key is held, the last job number and length will be displayed.



Release the + Key: When the operator releases the + key the CCFB returns to the Program / Idle mode. The CCFB is now awaiting new operator programming or commands.

10. Edit Jobs Overview:

The CCFB computer can retain up to 99 jobs in memory. Job numbers in a range from 1 to 99 can be edited, recalled, and ran. A job number of zero (0) instructs the CCFB to stop processing a series of jobs and return to the Program / Idle mode.

A job is a cutting entity that contains:

1. Job Number.

2. Length to cut in inches or centimeters.

3. Quantity or number of pieces to cut.

It is recommended that jobs cards show the job numbers, length, and number of pieces for each job be created if a series of jobs is to be repeated often. This enables the CCFB to produce several “kits” which can be recalled from the CCFB memory.

For example, if 4 parts of different lengths are required, the operator may program job numbers 10, 11, 12, and 13 to cut the required parts. Job number 14 must contain 0 length and quantity to signify the end of the series. This series of jobs are then stored in the CCFB and can be ran whenever the need arises.

The operator needs only to start or run job 10 and the CCFB will process jobs sequentially until a zero length and quantity is found. In this case, jobs 10, 11, 12, and 13 will be cut, while job 14 will signify the end of the series.

Editing a Series of Jobs:

In this example we are going to edit a series of jobs to produce the following parts and then stop when completed.

3 pieces cut 12 inches in length from 3” round.

5 pieces cut 25.5 centimeters in length from 3 “ round.

2 pieces cut 6.750 inches in length from 3” round.

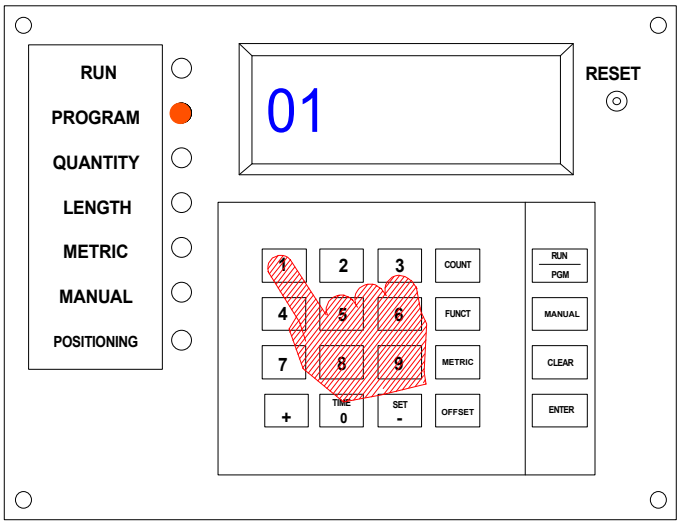
Since it is desired to run the above jobs at the same time and from the same stock, the jobs should be assigned consecutive job numbers. You may start with any job number from 1 to 99. Note, the CCFB will always return to the Program / Idle mode after running job #99. It is recommended that a job card be created to show each job set before you begin to edit the jobs in the CCFB memory. A typical job card would show the following:

JOB #	QUANTITY	LENGTH	STOCK
10	3	12.000 in.	3 inch round
11	5	25.500 cm.	3 inch round
12	2	6.750 in.	3 inch round
13	0	0.000	**

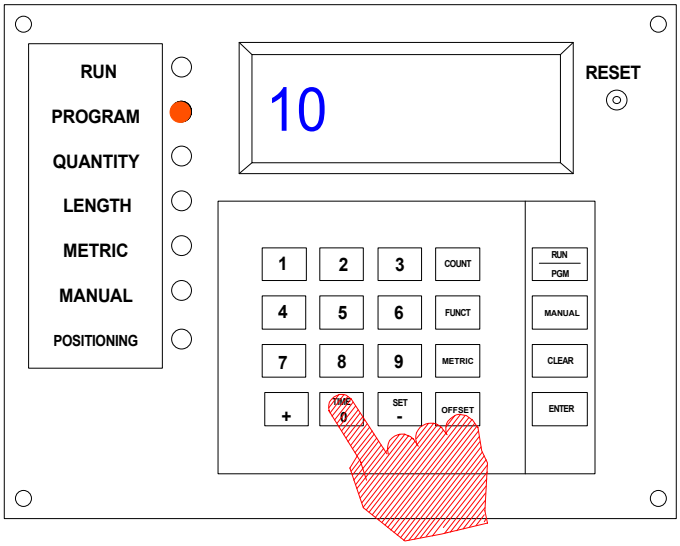
** The zero quantity and length in job #13 will instruct the CCFB to stop processing jobs and return to the Program / Idle mode.

Now we will edit jobs 10 through 13.

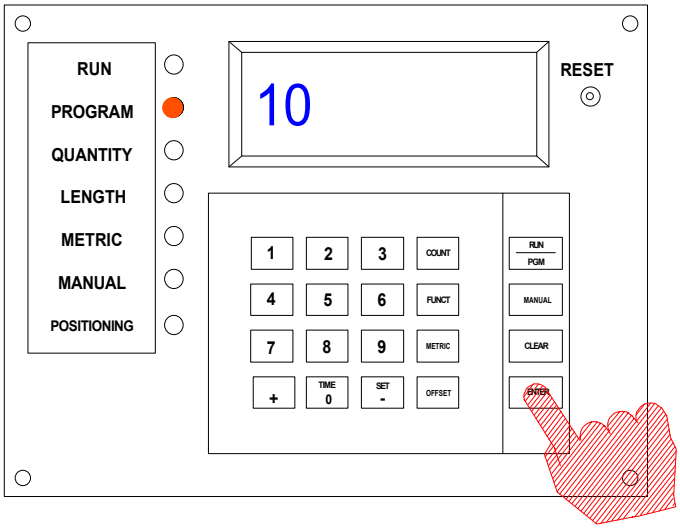
The operator must first determine if the CCFB is in the Program / Idle mode. There should be two flashing zeros on the left side of the display and the program light should be on. If the run light is on the operator need only press the run/prg button.



Press the #1 Key: From the Program / Idle mode the operator will press the #1 key to place the numeral 1 in the job number display.

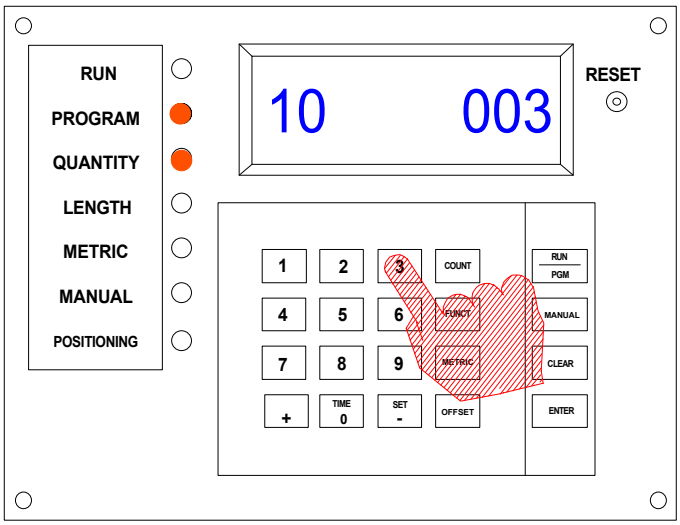


Press the #0 Key: The operator will press the #0 key to shift the 1 left and place the zero on the display. Note that the desired job number is now displayed.



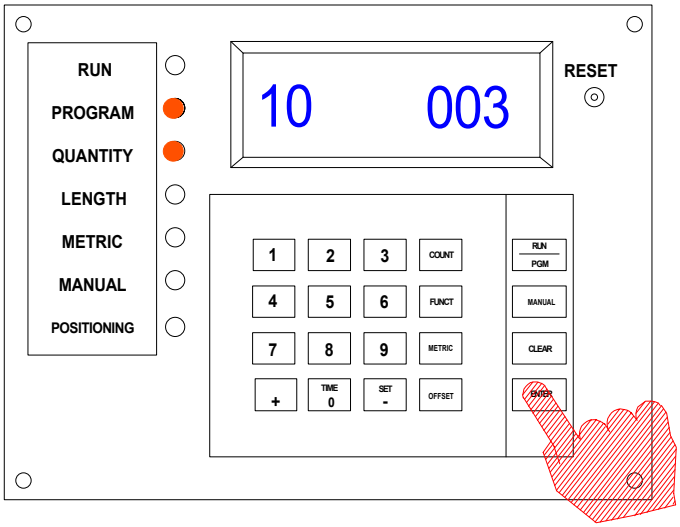
Press the Enter Key: The operator will press the Enter Key to accept the displayed job number of 10.

Notice that the quantity light comes on and that the current quantity for job #10 is displayed.



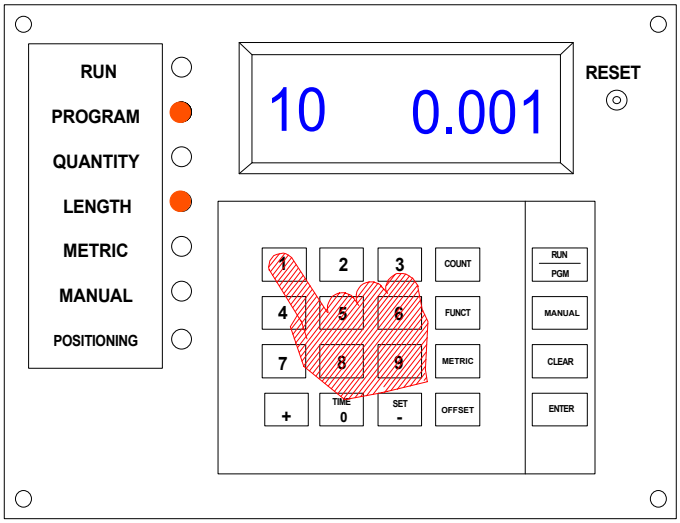
Press the #3 Key: The operator will press the #3 key to place the numeral 3 in the quantity display.

Notice that the stored value is cleared to zero automatically. Now the desired quantity for job #10 is displayed.

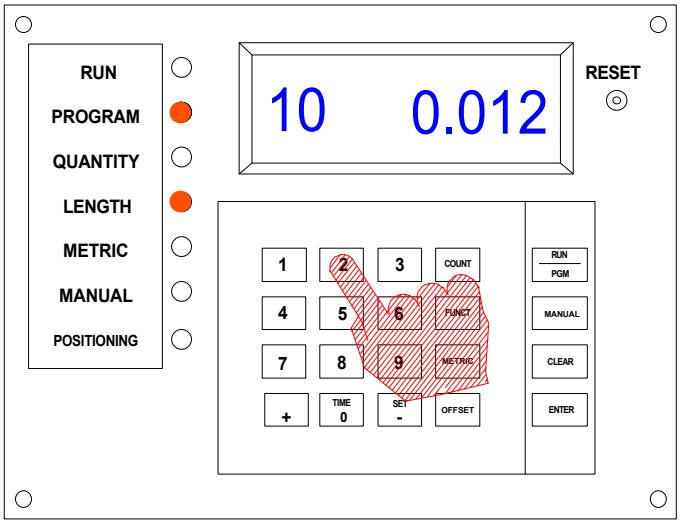


Press the Enter Key: The operator will press the enter key to accept the displayed quantity value of 3.

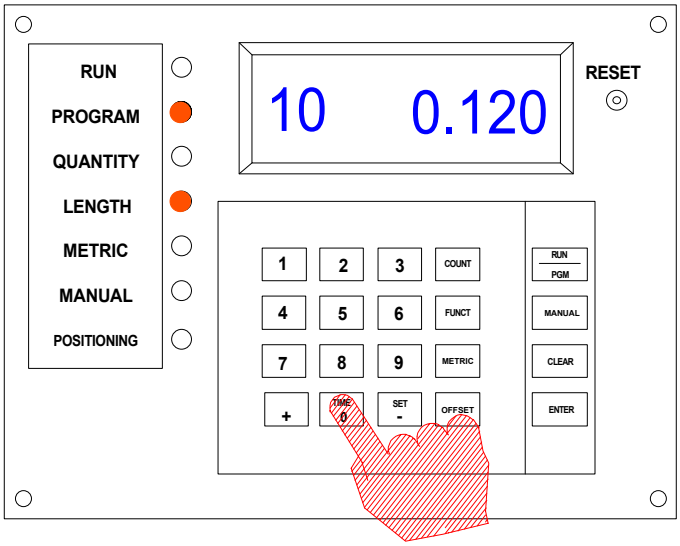
Notice that the quantity light goes out and the length light comes on. In addition the current length stored for job #10 is now displayed. If the stored length is metric, the metric light will be on.



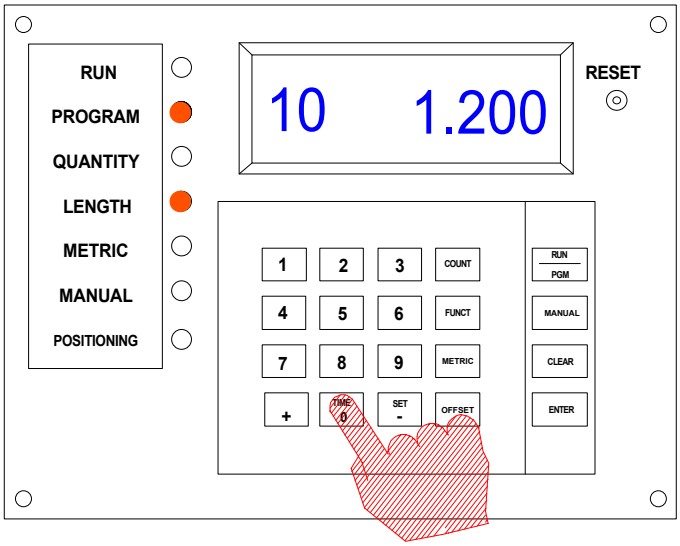
Press the #1 Key: The operator will press the #1 key to place the numeral 1 on the length display. Notice that the previous value is cleared to zero automatically.



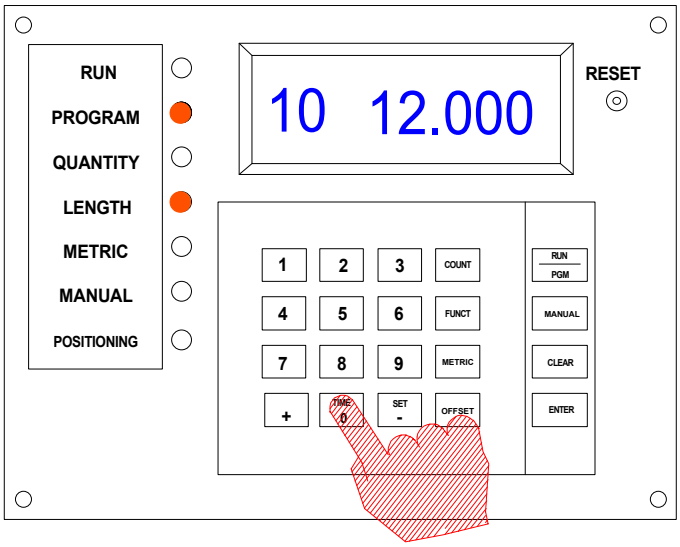
Press the #2 Key: The operator will press the #2 key to place the numeral 2 on the display.



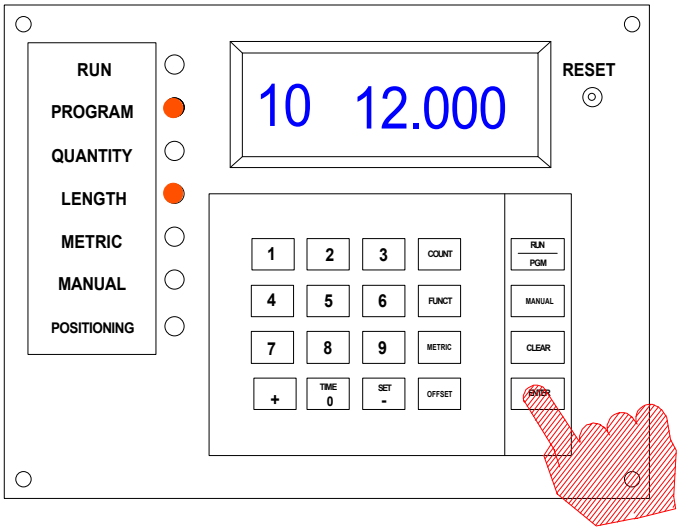
Press the #0 Key: The operator will now press the # 0 key.



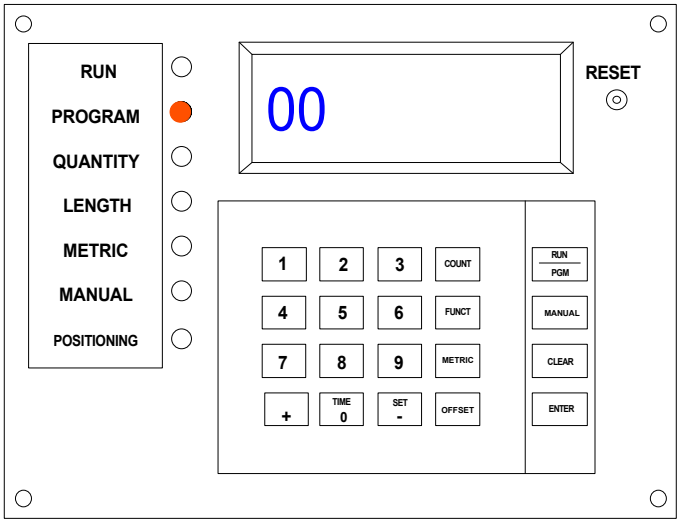
Press the #0 Key: The operator will now press the # 0 key.



Press the #0 Key: The operator will now press the # 0 key.
Notice that the desired length of 12.000 inches is now displayed. If a mistake is made during data entry, the operator need only press the Clear Key to zero the value and start over. In addition, the operator may press the Metric Key to switch between inches and centimeters.

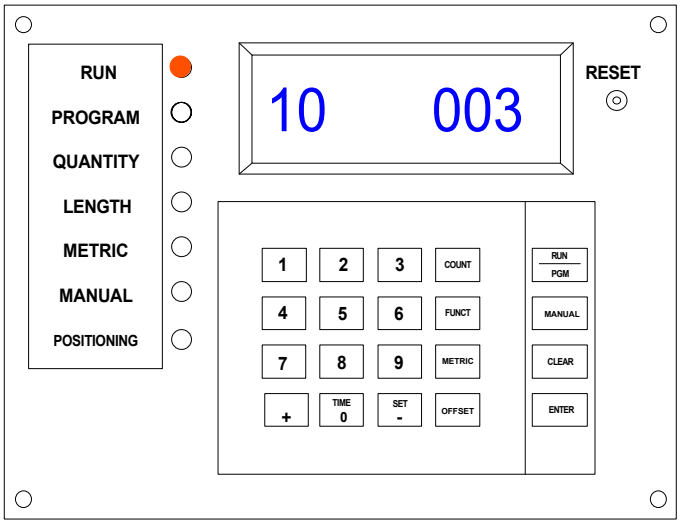


Press the Enter Key: The operator will now press the Enter key to accept the displayed length. Note, the standard of measurement is also stored at this time. If the metric light is on then the displayed length is in centimeters, while if the metric light is off, the displayed length is in inches.



The CCFB returns to the Program / Idle mode after editing a job. Now the operator will need to repeat the this procedure for jobs 11, 12, and 13. Note that job 13 signifies the end of the series and the quantity and length must be zero.

12. *Run Mode Overview:*



After calling up a job or series of jobs and the operator presses the auto-start switch to start saw operations, the CCFB is in Run Mode. During feed stop positioning the CCFB will display the current job number and the length. During cutting / feed operations the CCFB will display the current job number and the number of cuts remaining.

The operator can:

1. Request the current time in the cut.
2. Request the number of parts already cut.
3. Offset the current job length by +/- 0.500 inches.
4. Abort the cutting cycle by pressing the Clear Key.

13. Run a Series of Jobs:

First the operator will turn on the band motor and check the blade speed. The operator will reset / adjust the blade speed as required for the material being cut. The operator will then turn off the band motor.

To run a job or series of jobs the operator must set the console switches in auto mode. Please refer to the controls section of your saw manual.

Then the operator must place the CCFB computer in the run mode. The operator must press the RUN / PGM Key to switch between the Program / Idle mode and the Run mode. Notice that the Program Light and the Run Light switch with the key press of the Run / Pgm Key indicating the mode switch.

The CCFB is now waiting for a job number to be entered. The operator will press the number keys to select the correct job number to run. The job number is the 2 digit number on the left side of the display. The operator will then press the Enter Key to accept the beginning job number.

The Feed will come forward and the feed stop will position. **The operator MUST wait for the feed to go all the way back to the feed stop BEFORE the auto-start switch will become active.**

When the feed is back, the operator will press the auto-start to the start position and the CCFB will begin to process the job that you have entered. When that job is complete, the CCFB will read the information for the next consecutive job number. If the information is not zero, the CCFB will process that job.

This cycle will repeat until a job number that contains a zero quantity and length is found or an “out of stock” condition is detected. (Refer to Section 18: Resetting the saw -- Out of Stock).

Now we will run the series of jobs that we previously edited.

Job #10
length of 12.000 inches, 3 parts

Job #11
length of 25.500 centimeters, 5 parts

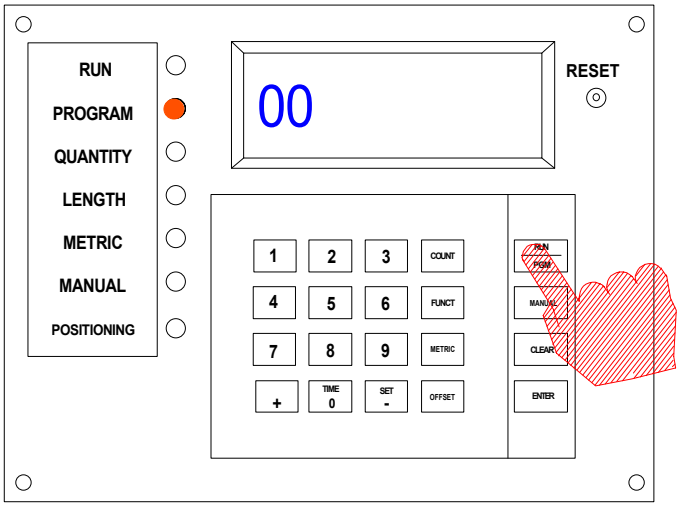
Job #12
length of 6.750 inches, 2 parts

Job #13
length of 0.000 , 0 parts **

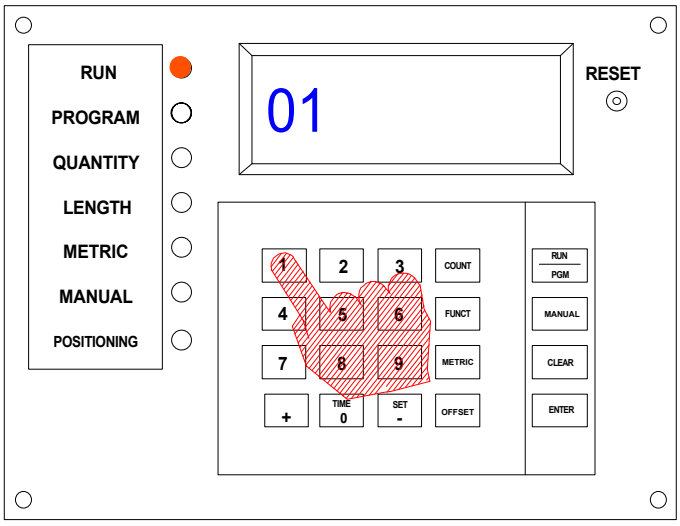
** The quantity and Length of zero signifies the end of a edited job series.

First the operator will turn on the band motor and check the blade speed. The operator will reset / adjust the blade speed as required for the material being cut. The operator will then turn off the band motor.

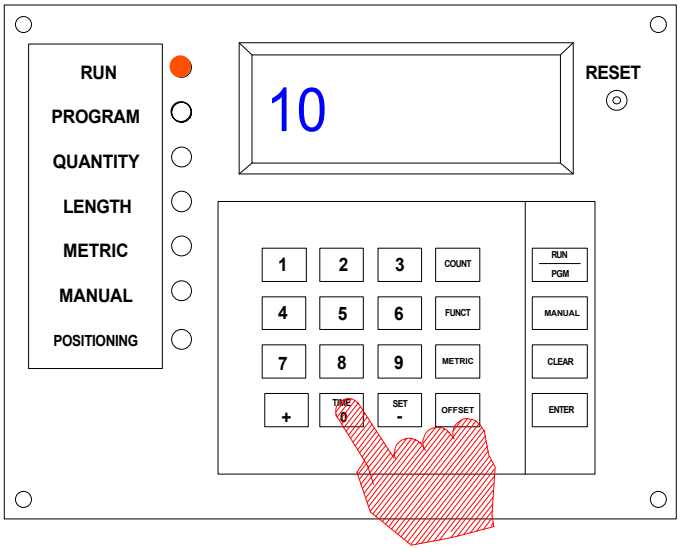
To run a job or series of jobs the operator must set the console switches in auto mode. Please refer to the controls section of your saw manual. We will now run the series of jobs that we edited in Section 11.



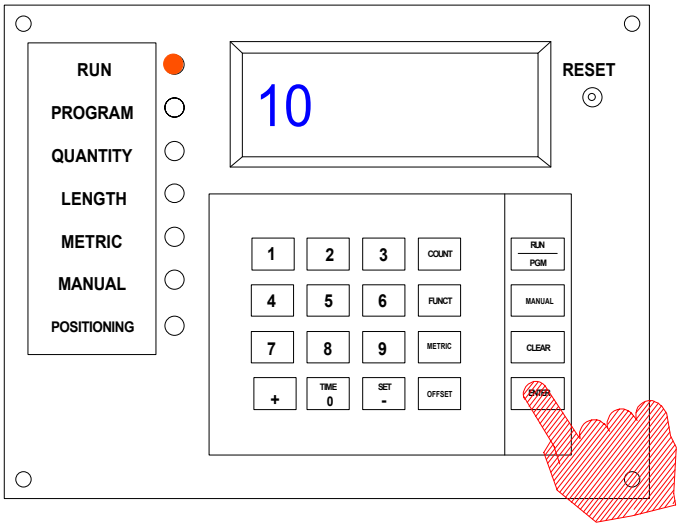
Press the Run/Pgm Key: The operator will press the Run/Pgm Key to place the CCFB in the Run mode. We will start the series with Job #10.



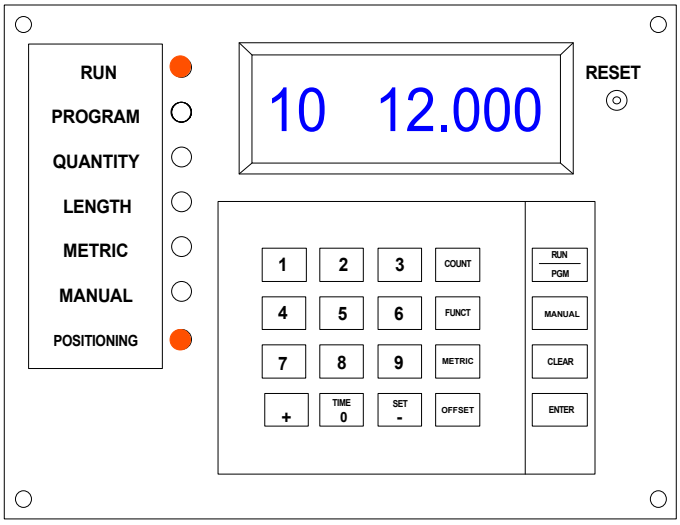
Press the #1 Key: The operator will press the #1 key.



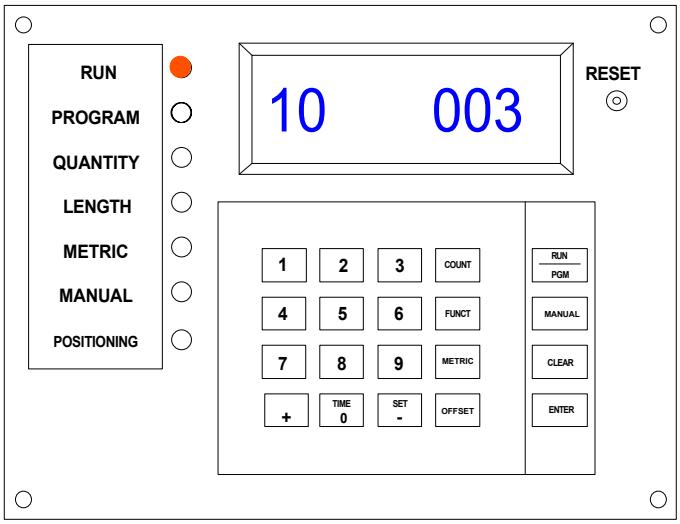
Press the #0 Key: The operator will press the #0 Key. Notice that the job number that we desire to start with is displayed.



Press the Enter Key: The operator will press the Enter Key to accept the displayed job number of 10.



The feed will now come forward. After the feed is forward, the feed stop will position. Notice that the current job number and length is displayed during positioning of the feed stop. Note – The positioning light is on whenever the feed stop is in motion.



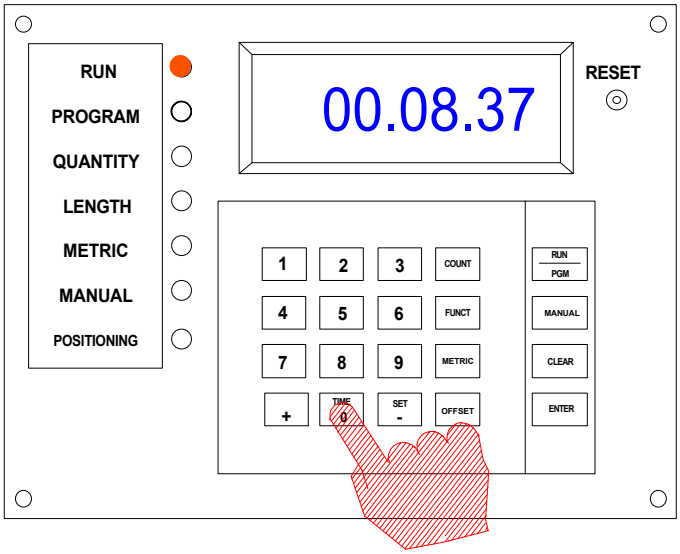
After the feed stop has positioned and the feed has retracted to the feed stop the operator will press the auto-start switch to the start position. Notice that the job number and the number of pieces to be cut are displayed.

The CCFB will now process job 10 until the quantity reaches zero. Then the CCFB will reposition the feed stop, and process the next job.

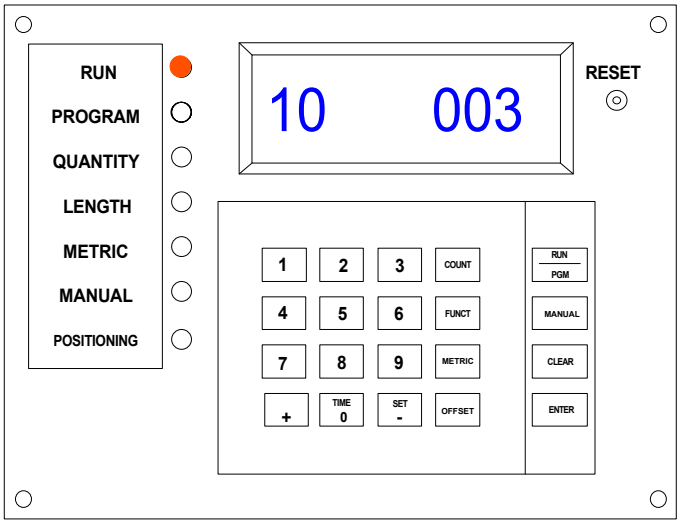
This cycle will repeat until the zero quantity and length of job 13 is found or until an out of stock condition occurs.

14. Cut Time Request:

The operator can request the time in the current cut from the CCFB.



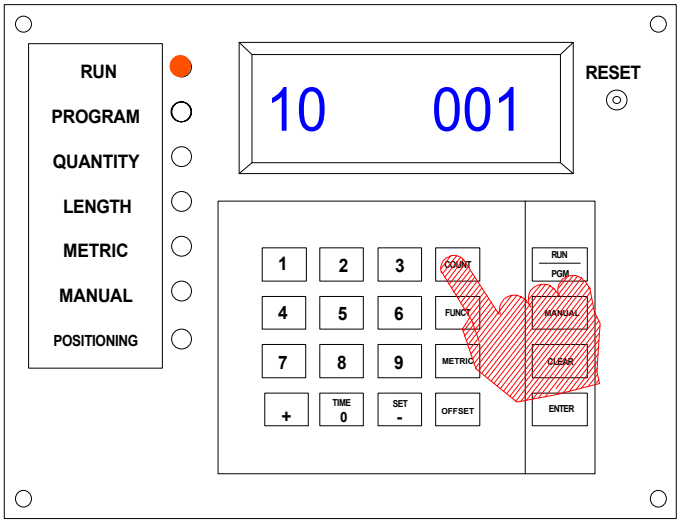
Press and Hold the Time Key: The time in the current cut will be displayed to the operator while the Time key is pressed. Releasing the time key returns the display to the run mode.



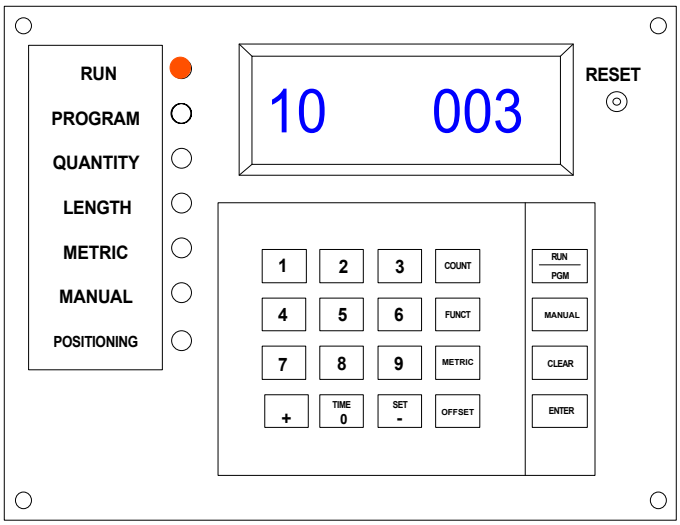
The Run Mode display during the cut will always show the current job number and the number of cuts remaining.

15. *Cut Count Request:*

The operator can request to display the number of cuts already made.



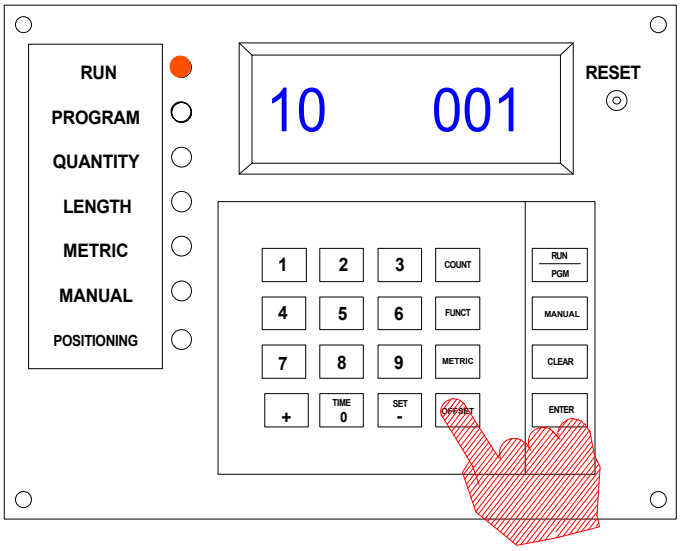
Press and Hold the Count Key: The number of cuts already made will be displayed while the operator presses and holds down the Count Key. When the operator released the Count Key the CCFB will return to the Run Mode display.



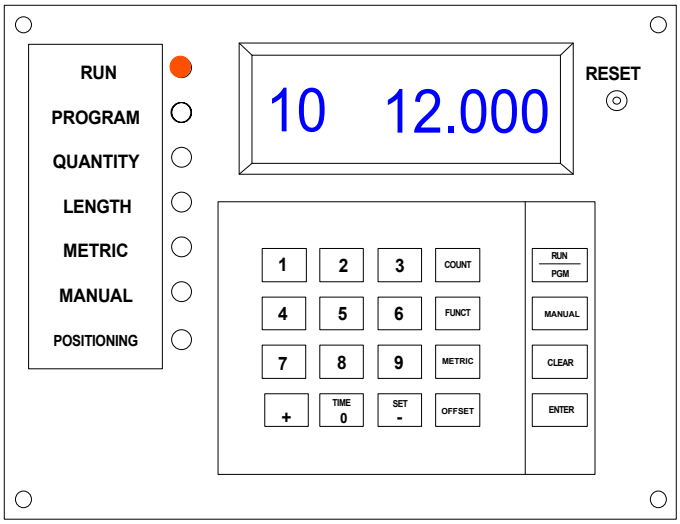
The Run Mode display during the cut will always show the current job number and the number of cuts remaining.

16. *Offset Current Job Length:*

The operator can offset the current job's length by +/- 0.500". This offset will only affect the length of the current job, and will not be stored in the CCFB's memory.

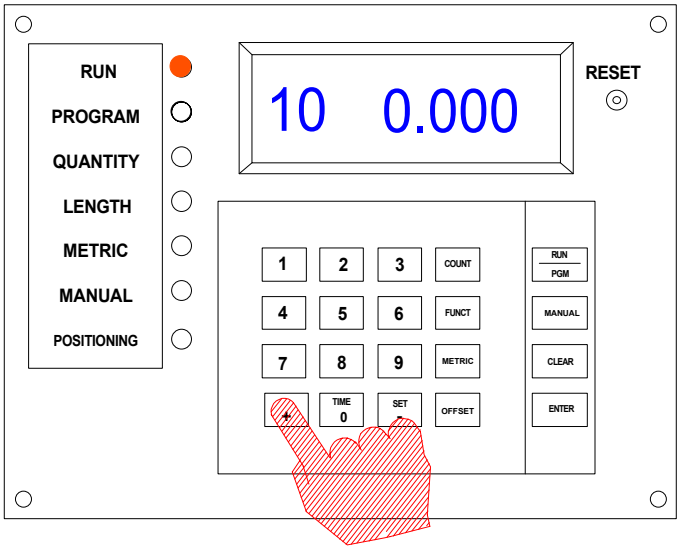


Press the Offset Key: The operator will press the Offset key to enter into the offset function.

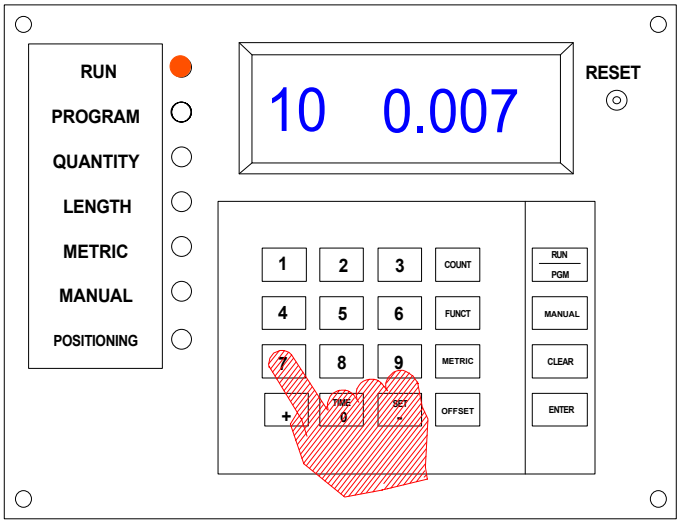


The current job number and length is now displayed.

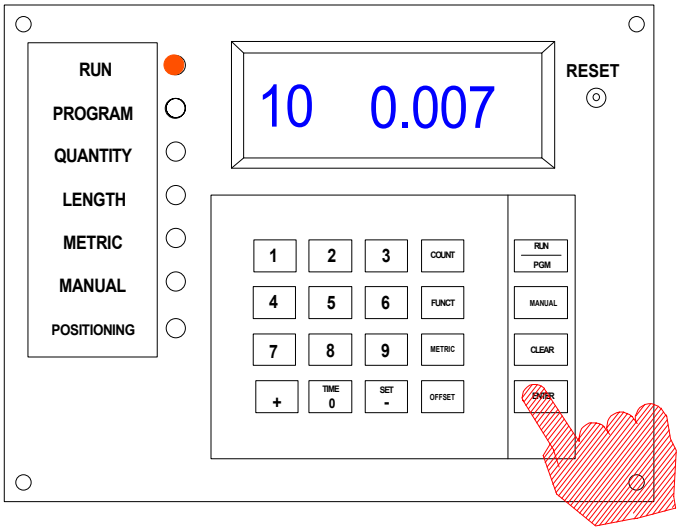
If the operator wishes to shorten the part he will now press the - key, or if the part needs to be longer he will press the + key. The operator MUST press the +/- key BEFORE attempting to enter an offset. In this example we are going to add 0.007" to the length.



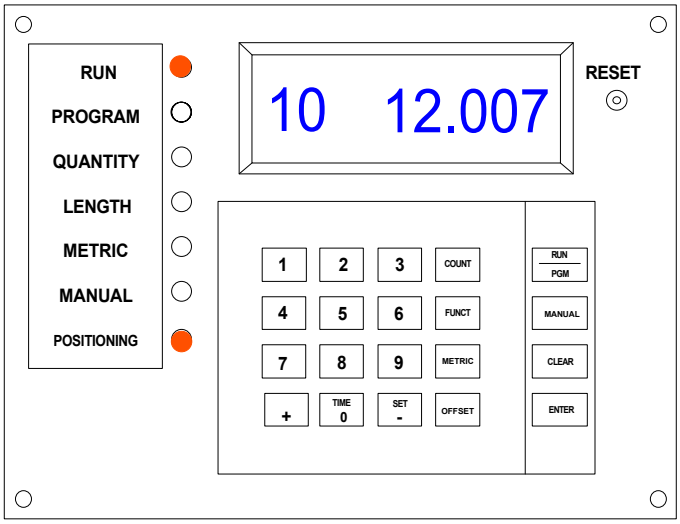
Press the + Key: The operator will press the + key to add an offset to the current length. Note that the length display is now zero.



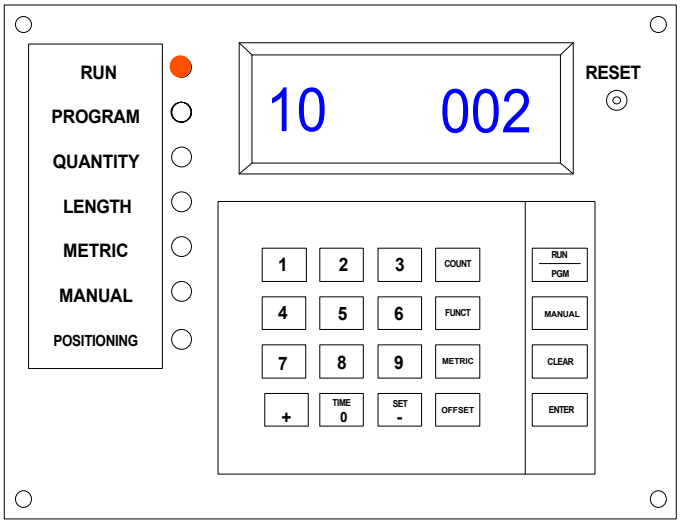
Press the #7 Key: The operator will press the #7 key to place the numeral 7 on the length display. This is the desired offset that we wish to add to the current length.



Press the Enter Key: The operator will press the Enter Key to accept the displayed offset of 0.007".



The feed will now come forward to allow the feed stop to position. Notice that the current job and length + offset is now displayed. When the feed stop is in motion the positioning light will be on.



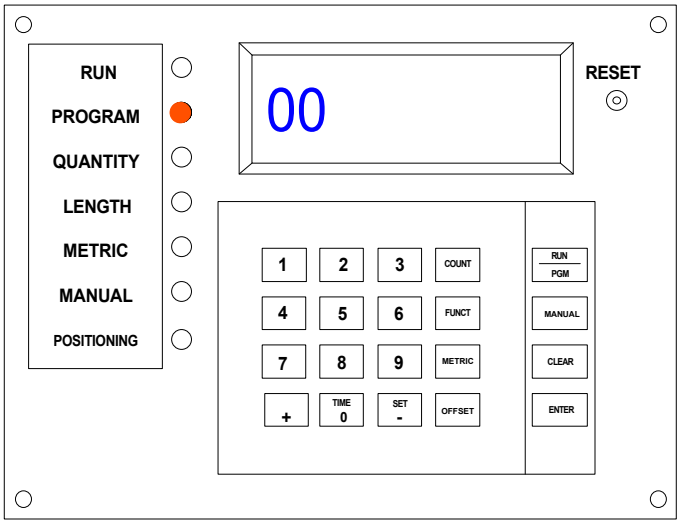
The CCFB will display the current job number and the number of cuts remaining after the feed stop has positioned.

17. Manual Mode Cutting:

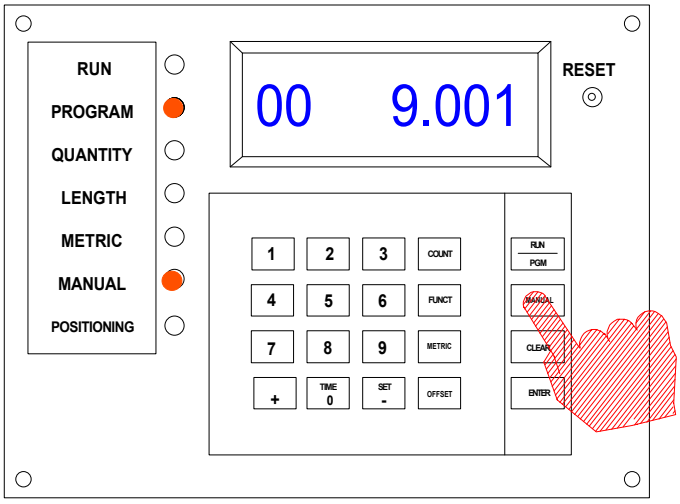
If you desire to make a quick cut and want the saw to feed and measure the piece, you may do so by using the manual mode of the CCFB.

Check and insure that:

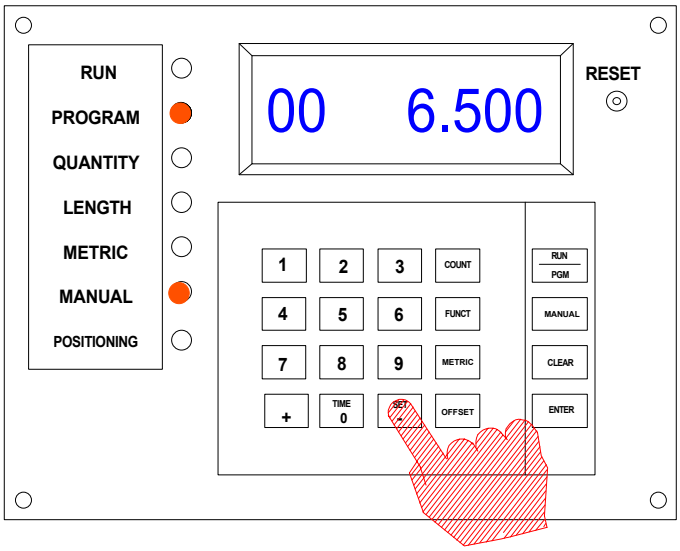
1. The saw arm is up.
2. The feed clamp switch is in the off position.
3. The material to be cut is aligned with the saw blade.
4. The saw clamp is closed.
5. The feed switch is in the on (Forward) position.
6. The blade speed and cutting pressure are correct for the material you are cutting.



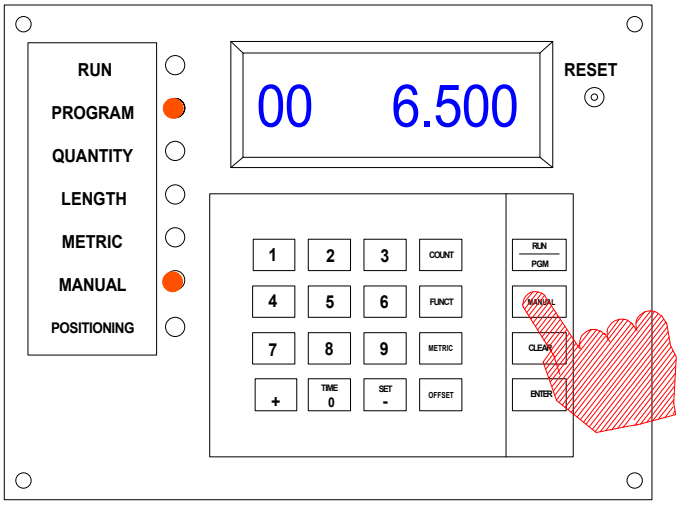
Insure that the CCFB is in Program / Idle mode. The program light will be on. If not then press the Run / Pgm key.



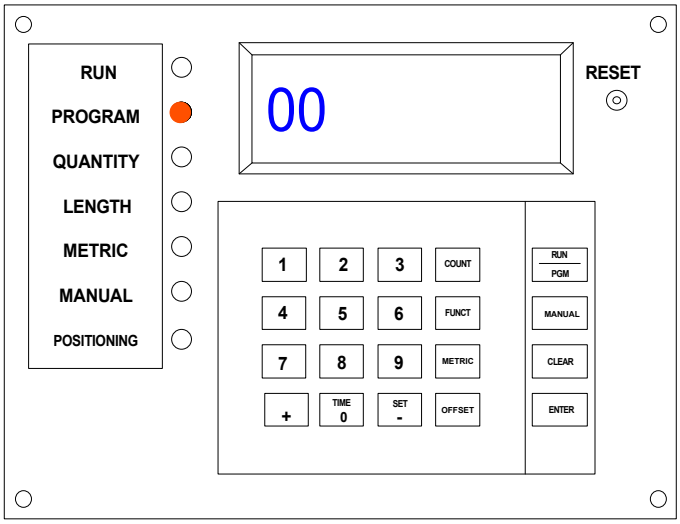
Press the Manual Key. The manual light will come on. The display will show the current feed stop position.



If the length is shorter than you wish to cut, push the + key to increase the length displayed. If the length is longer than you wish to cut, push the - key to decrease the length displayed.



Press the Manual key again to return the CCFB to the Program / Idle mode.



Now that the feed stop has been positioned to the desired length and the CCFB is in the Program / Idle mode, the operator is ready to manually run the saw.

1. First move the feed switch to the off (Retracted) position to move the feed back.

2. Now clamp the material with the feed clamp and then release the saw clamp.

3. Next bring the material forward by putting the feed switch in the on (Forward) position.

4. Now clamp the material with the saw clamp and release the feed clamp.

5. Finally put the arm switch in the cut mode to cut the piece.

Please refer to your saw manual for the location and function of the control console switches.

18. Resetting the Saw – Broken Blade / Out of Stock:

If the machine runs out of stock or breaks a blade it a simple matter to reset and continue cutting on a new piece of material as if nothing had happened.

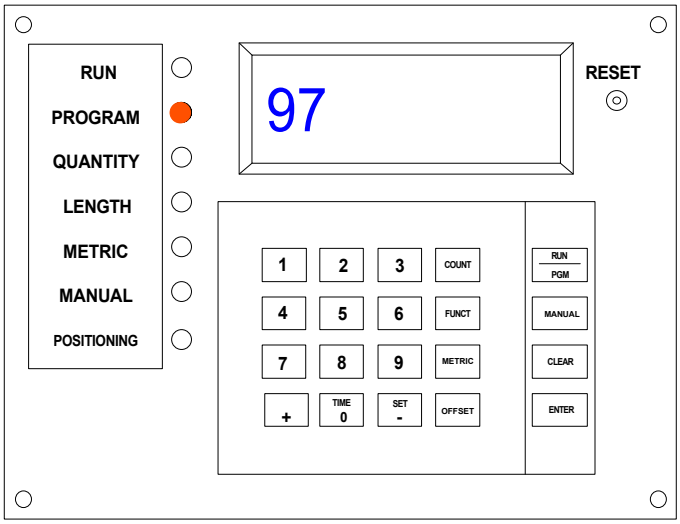
1. Remove any scrap material on the saw.
2. Load the new piece of material and align with the saw blade.
3. Move the band motor switch to the off position.
4. Turn the power start switch to the auto position.
5. Move the band motor switch to the auto position.
6. Push the auto-start switch to auto-start and the saw will continue **.

** If desired a facing cut may be made by pushing the start cut button. If a facing cut is made you MUST wait for the arm to RAISE before pressing the auto-start.

NOTE -- If the feed shuttle is moved all the way forward while loading material and the saw arm is lowered as when a facing cut is made, the machine will count the facing cut as a part.

19. *Error Message Overview:*

The CCFB computer can detect system critical errors. When such an error is detected the CCFB computer will automatically perform and abort cycle, reinitialize, and display the error code.



The error code will flash in the job number area of the display. The operator may press the Clear Key to attempt re-initializing the CCFB. If the error code repeats authorized or factory trained personnel should be called.

CCFB Error Codes:

1. Code 99: Error writing Speed Commands.
2. Code 98: Encoder System Reset Failure.
3. Code 97: Error writing position to Encoder System.
4. Code 96: Encoder System General Failure.
5. Code 95: Reserved for future use.
6. Code 94: Reserved for future use.
7. Code 93: Feed Stop Drive System Failure.

Over 25 Years of Designing Band Saws

HE&M Saw is the leader in new saw technology. We are revolutionizing the band sawing industry with more patented innovations than any other band saw manufacturer.Innovations like our blade enhancer, cut watcher, multi-guide arm saws, new stacking clamps, and computer-controlled saws.

From our original patent on bar feed systems to the remarkable technological advances we are making today, HE&M has continually proven itself a leader, not a follower, in the industry.

So, to our new customers, we say take a look at our old saws, then try to buy a used one. You'll have a tough time, because there are not many for sale. Most of our old saws are still in operation at their original installations and doing a great job.

Our old saws are the best reason you should take a good look at the new HE&M Saws.

HE&M SAW
The saw that cuts straight.

BACK TO TABLE OF CONTENTS

Band Saw Styles

Conventional “Pivot” Type Band Saws

Vertical Band Saws for Miter Cutting ± 45 Degrees

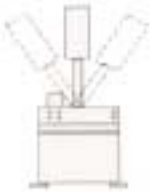
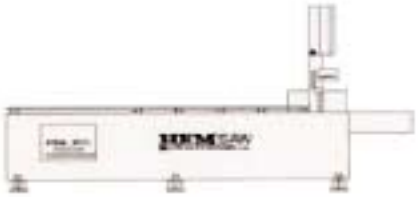
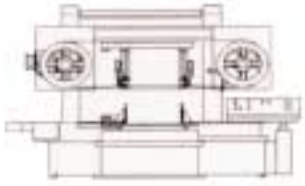


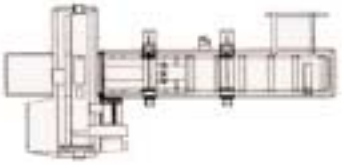
Plate Saws for Stripping Plate

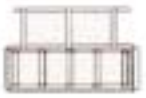


Double Column “Guillotine” Type Band Saws



Material Handling Equipment





Full Capacity Vertical Clamps

The Cutting Edge

Traditionally, most people in the metal working industry have regarded the sawing operation as a necessary evil; something in the same category as sweeping up chips. The principals of band saw cutting have not been widely known. Too frequently, the resulting approach has been, “Just stick the material in the machine and chop it off.”

As knowledge of band saw cutting increases with publications such as this one, wise shop owners are beginning to realize that sawing is a legitimate operation, much like the more obvious lathe or mill operations.

Under the right conditions, in-house sawing has the potential of actually MAKING MONEY, but a foundation consisting of certian factors must be laid. First, a knowledge of the elements affecting the physical operation of cutting, such as blade speed, material size and composition, and feed rate and pressure. Second, the ability to maximize the efficiency of band saw cutting in terms of time, accuracy, and blade life. Third, the selection of a saw which will provide superior performance in terms of unit cost, overhead cost, and long-range profitability.

This booklet has been designed to give instructions in these areas and answer other important questions. If you should have more specific questions, please let us know. We will be happy to answer your questions with specific information tailored to your particular requirements.

Gerald R. Harris
Founder & CEO
HE&M Saw

AT HE&M, QUALITY IS OUR TOP PRIORITY

HE&M Saw takes these pages to salute its employees. We are very proud of their dedication to HE&M Saw and to you, our customer.

We have been growing steadily for 25 years. Through the efforts of our people, we build a top quality product, back it with reliable, dependable service, and continue to make startling technological advances that are sure to give our customers the edge they may need in the new century and those that will follow.

HE&M Saws have earned a reputation for their high quality and dependable performance. We realize this is a direct reflection on our people. From the machinists who skillfully craft components for our equipment, to our service people who deftly handle customer problems over the phone and in the field, to our technicians in the factory, our people make sure all parts of your HE&M Saw are assembled perfectly.

Our Engineering and Electrical Departments are staffed by people aware of the newest technologies available, and possess the applications knowledge to put it to effective use. HE&M Saw people have always put the customer first, and always will.

AT HE&M SAW, WE STRESS SAFETY, KNOWLEDGE, AND THEN PRODUCTION.

Safety First and Always:

All machinery is potentially dangerous. Obviously, the safety of the operator and anyone entering the sawing area is important. That's why certain safety standards have been developed by OSHA, NFPA, and Federal, State, and Local Government Agencies. In addition, your company has adopted safety policies and saw manufacturers publish recommended procedures. Although safety is everyone's responsibility, the best way to prevent accidents is to anticipate potential hazards and to educate the saw operator with basic instructions. He must know exactly how all machines, material handling, and support equipment work and how each function relates to the others. This knowledge allows him to anticipate any factor that could be dangerous. The operator should also understand maintenance, even though he may not perform it, and have knowledge of all moving components.

Pre-Operational Safety Check:

Before operation, all personnel who work the band saw machine or associated equipment should review the following:

1. Has the operator received and understood proper instructions, including reading the instruction manual?

2. Is the operator attired in accordance with applicable regulations, including eye and ear protection, safety shoes, head protection, gloves (while handling blades and material, etc.), and appropriate attire (no loose fitting clothes and no jewelry)?

3. Is the machine in proper running order (maintenance, emergency stops, and limit switches) and are safety features in use (interlocks, guards, access covers, awareness barriers, and posted safety rules)?

4. Is the machine and immediate area in good housekeeping order (obstacles such as tools, clip boards, and paper should be kept away from the saw arm and controls.)?

5. Is the operator aware of electrical, hydraulic, and pneumatic procedures (power source, emergency shut-off, disconnects, and fire-fighting procedures)?

6. Is the operator properly trained in material handling (such as lifting, pushing, pulling, or any other initiated force to give motion to or stop the material)? Does he know to always handle material carefully to avoid slipping or dropping the material on parts of his body?

Avoid Potential Hazards:

1. Never stand, sit, lie, or lean on the machine.

2. Never put fingers, hands, head, or any other part of your body under, in front of, or near the saw arm or blade (area of operation) at any time.

3. Never put any part of your body, including clothing, in the vising areas.

4. Never put any part of your body, including clothing, in front of, between or near any part that moves, such as material handling vises, rollers, input and output, and material that may move or chip conveyor.

5. Never have someone else operate the machine while you are anywhere near the moving parts of the machine. For example, if someone closes the vise and your hand is in the vise, you could be seriously injured.

6. Be sure that material is always clamped before cutting and that guides are positioned as close to the material as possible.

7. Check the material supports, falling material could injure you.

8. Make sure that material is fully supported. No part should be unsupported.

9. Be sure that blocks or guards to prevent material from rolling off the support tables are in place.

10. Never hold or support material with your hands or any other part of your body while cutting or moving material.

11. Never use a welding or cutting torch on or near the saw. Hydraulic lines, electrical lines, or air lines may be burned and then someone could be hurt by mechanical failure or burned becasue the machine is burning or mechanical components damaged.

Cleaning Precautions:

1. Do not clean the machine while the saw is cutting. Raise the saw arm out of the cutting area and stop the blade. Block the arm in position. Disconnect the electrical power. Only reach into the cutting area with tools or a scraper and never put any part of your body (especially your hands, arms, or fingers) near the blade, even if it is stopped. The weight of the saw arm pushing on the thin blade can still cause severe injury or dismemberment.

2. Make certain that all guards, access doors, and awareness barriers are returned to their original positions after cleaning.

Maintenance Precautions:

1. Turn off and lock out all the power (electrical, air, and hydraulic) when doing maintenance or maintenance checks.

2. Make periodic checks to insure that all wire, cylinder, and vising connections are tight.

3. Keep all motors, heat exchangers, pumps, and power units free of obstructions, dust, and debris. Plugged cooling fans may cause excessive heat.

4. Make sure all lubrication is in accordance with the operation manual.

5. Make sure all guards, access doors, and awareness barriers are secure and fastened.

6. Check all built-in safety devices and interlocks to make certain they are operational.

7. Never use a cutting or welding torch or welder on the sawing machine. Electric, air, and hydraulic lines may be burned or break, or mechanical components may be destroyed, then someone could be hurt or burned by burning oil.

NOTE: Circumstances may require the use of special safety equipment or precautions not outlined in this section.

RULES OF SAFE OPERATION:

No one really needs to tell you that sawing can be dangerous. You work with it every day. Even machines that run automatically can be hazardous if you don't stay continually alert to potential danger while operating them.

One of the keys to safe operation is to know your band saw machine and understand all the proper operating procedures. Familiarize yourself with all switches, knobs, controls, guards, etc., and read the instruction manual from cover to cover before you start.

To operate a band saw in the safest manner possible, there are a few things you must always remember:

1. Never put your hands or any part of your body underneath or by the band saw blade.

2. When installing a new blade or removing an old one, always wear gloves to keep from cutting yourself. Be certain that the machine is shut off and no one is around who might accidentally start the machine while your hands are exposed to the band saw blade.

3. Be sure to keep your hands and arms out of the vise closing area.

4. Always handle the material in such a way that if it slips or falls off the machine, it will not drop on your feet or contact any part of your body. If the operator slips and drops the material, make sure the operator will not be injured.

5. On automatic machines, be certain that your body is clear of the indexing vise system (the vise that moves the material into the machine with an automatic feed system).

6. Never stand on the machine.

7. Be sure there are guards to prevent material from rolling off the side of the support tables.

8. Never roll material off the end of the support table.

9. Do not have someone else operate the saw while you are in an area where the motions of the machine could contact your body. For example, if you are installing or removing a blade and someone turns on the motor, the blade could cut your hand or fingers.

10. Exercise great care when the saw is cutting material to be sure that no hands, fingers, or any part of your body is near enough to the blade to be cut off.

11. Proper balance is important. If you are standing, walking, or moving near the saw and you slip or lose your balance, your body could come in contact with a moving part of the machine and sustain serious injury.

12. Be sure the floor is clear of any obstructions and is not slippery.

13. Wear safety shoes and safety glasses when operating the machine.

14. As with all machinery, do not wear gloves during operation. Gloves can get caught in the moving parts of the machine or the blade. Only wear gloves when installing a new blade, removing an old blade, or when handling material.

15. Do not wear loose fitting clothing or allow your clothing to get too close to the saw blade becasue it could be caught and draw you into the blade.

16. Never operate a machine unless all guards and awareness barriers are in place so you will be properly alerted and protected.

17. Always make safety practices your first priority and check the saw for safety before you begin operation each time.

18. If the saw is not safe, alert your supervisor. If you don't know what the safety practices are, be sure that someone teaches them to you before you operate the machine. Ask your foreman or supervisor.

19. Don't hold material with your hands or any part of your body when cutting.

20. When moving material, be sure that it is properly supported. Don't force it on the support tabling. If the material falls while you are holding it, you could be hurt.

Saws that cut steel can cut people!

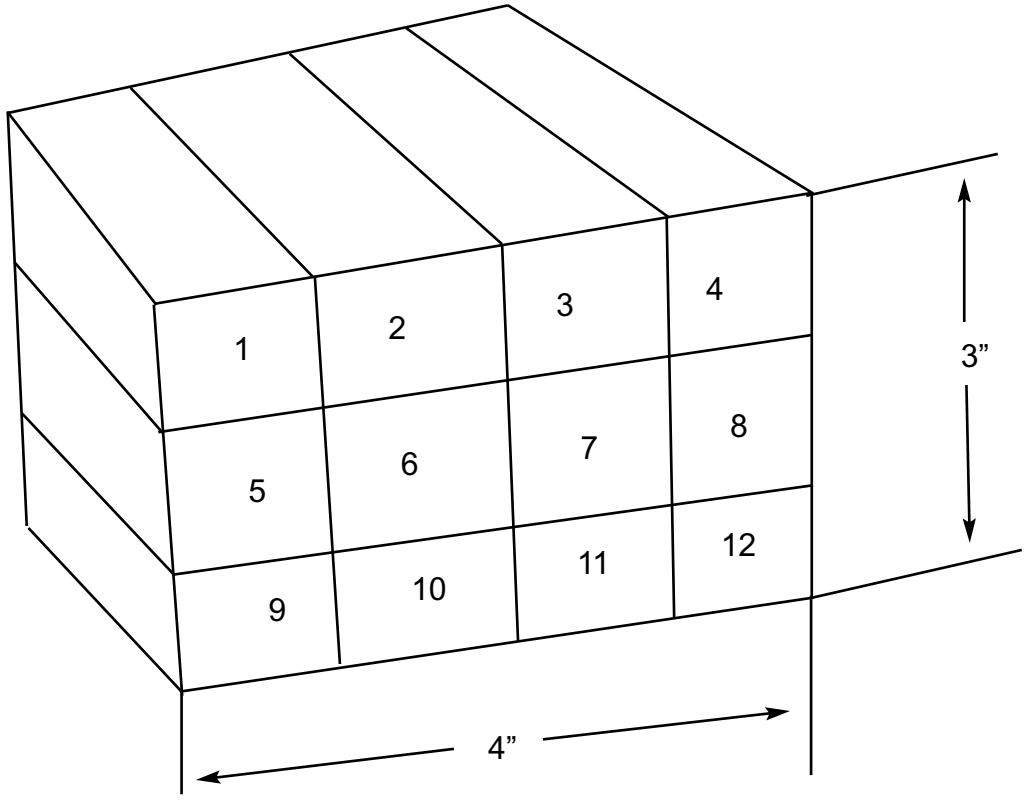
Steel is heavy and if it falls you can be hurt!

BAND SAW CUTTING: A PRACTICAL GUIDE

Given an unusally capable saw and ideal conditions, it is possible to cut at a maximum rate of approximately 30 square inches per minute. Laboratory tests have obtained up to 130 square inches per minute with a band saw, but this is not practical for real world cutting operations. This rate could only be obtained by using a material easy to cut, such as C-1212 cold finish bar. It would also require the correct blade tooth and spacing, the right blade speed and feed rate, and an appropriate high-quality cutting fluid.

Under more normal conditions, a cutting rate of 15 square inches per minute is practical and readily obtainable when using a high speed electron welded blade. When working with more difficult materials, of course, slower cutting rates may be required. Each type of material has its own characteristics and some require unusual measures to obtain satisfactory cutting performance.

3 x 4 = 12 square inches.



Calculating the square inches of a rectangular bar

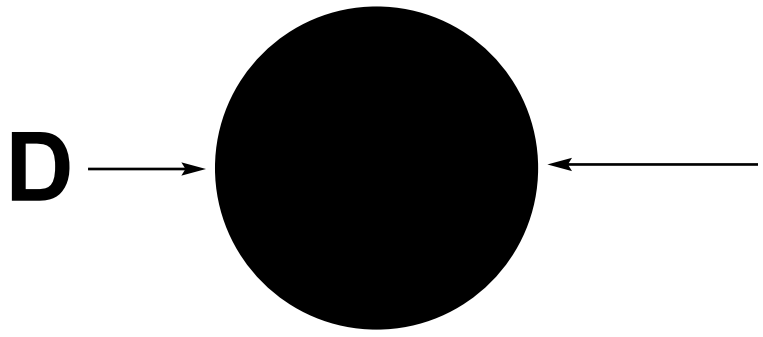
Factors Affecting Cutting Performance

Material Composition:

As the material machinability lowers, so does the cutting rate. For example, stainless steel is slower to cut than C1212, which in turn is slower than B1113. Surface conditions will also affect the cutting rate. If there are places on the surface or in the material which are hard, a slower blade speed will be required or blade damage may result. Tough or abrasive materials are much harder to cut than their machinability rating would indicate.

Material Size and Shape:

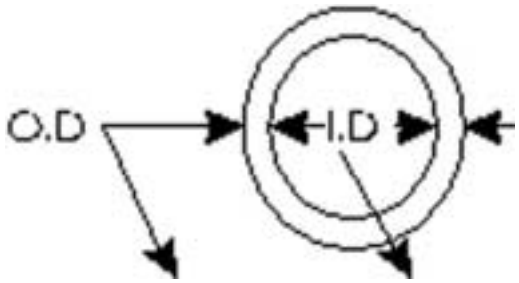
Each blade configuration will have an optimum width of material to be cut. Below this width, tooth loading may become excessive and the cutting rate must be reduced. When the material is wider than the optimum width, blade control begins to diminish, as will be discussed later. For example, a band saw blade 1” wide by .035” thick would successfully cut material whose optimum width is between 4 and 5 inches. But a 1.25” blade by .042” thick will have optimum cutting in stock which is about 6” wide. This is because the heavier blade has nearly twice the beam strength, which allows higher pressure and straighter cutting in heavier material. Since the blade “sees” only the material actually being cut, the shape of the stock being cut will also affect cutting speeds, particularly if the piece is excessively wide or if it varies in the dimensions being cut. The actual area of a solid round can be found by using the following formula:



$$A = \frac{\pi * (D * D)}{4}$$

$\pi = 3.14$

Cutting tubing presents special problems such as the fact that the blade must enter the material twice and that maintaining adequate cutting fluid flow on the blade as it enters the second side is nearly impossible. Thus, whenever the inside diameter begins to approach 50% or less of the outside diameter, it is best for practical purposes to treat the material as solid. In other words, as wall thickness increases, the tubing begins to more and more closely resemble a solid in terms of cutting speed. A simplified formula is:



$$\pi \left(\frac{O.D.^2}{4} - \frac{I.D.^2}{4} \right) = \text{Area being cut}$$

Guide Spacing:

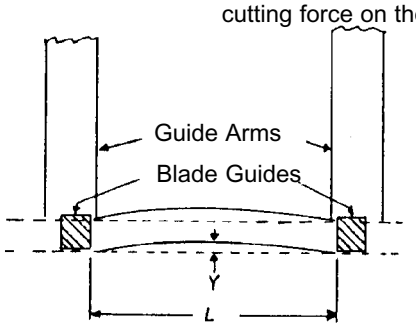
The rigidity of the blade is a function of guide spacing, with rigidity being reduced to the third power as the distance between the guides increases. For example, with guides spaced 2 inches apart, blade deflection might be approximately .02 inches. Under the same conditions, but with the guides spaced at 4 inches apart, blade deflection would be approximately .16 (.02 x 8) inches.

A simplified formula is: $Y_{max} = \frac{1WL^3}{48\,EI}$

Where:
Y = Blade Deflection
W = Load on Blade
L = Spacing of Guides
E = Modulus of Elasticity
I = Moment of Inertia

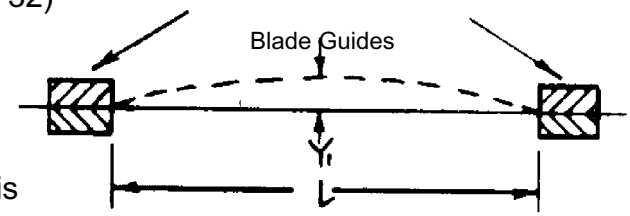
This is a simplified version of the formula because it does not consider band tension or guide design. It is important to recognize, for example, that rollers are not considered anchored supports. A more complete derivation, including band tension and guide design, is included in “Roark’s Formulas for Stress and Strain”.

“L” is the distance between Blade Guides
“Y” is the Vertical Blade Deflection caused by the cutting force on the blade



(See Pages 31, 32)

The greater the distance between the guides, the greater the probability of a crooked cut. The solution is to reduce cutting pressure. However, if the material is hard or tough, cutting may stop all together. Thus, when cutting wide stock, a compromise between too much and too little cutting pressure must be found. Trial and error may be the only satisfactory method.



“Y_1” is Side Blade Deflection caused by”

1. Non Vertical Blade
2. Non Rigid Arm
3. Sideways Arm Movement
4. Random Blade Dullness
5. Material Hard Spots

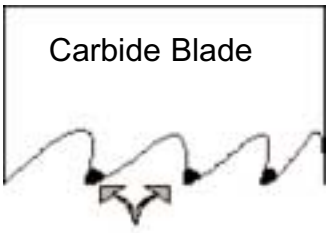
Blade Selection:

There are many types of blade materials used, ranging from carbon to carbide. Each specific blade material has its own application. Carbon blades, both hardback and flexback, cannot be generally recommended for production cutting because the blades have poor resistance to heat and abrasion.

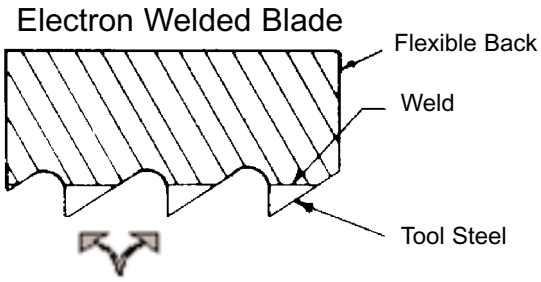
However, certain applications may exist where a hardened carbon blade may be used for cost effectiveness. An All High Speed blade, very popular a few years ago, is replaced by the Bi-Metal blades. Bi-Metal blades come in many configurations. However, they generally consist of a tool steel (M30, M42) electron beam welded to a tough backer material. There are many variations on this construction to provide high resistance to heat or shock.

The Bi-Metal blade has the greatest versatility and utilization in the metal sawing business. Additionally there are other blades available for special applications. For example, there are Carbide-Tipped blades to permit cutting of extremely abrasive or hard materials. All blades have their particular advantages.

In the right application, carbide blades with their ground teeth will provide a better finish and higher production rates than more conventional sawing methods.



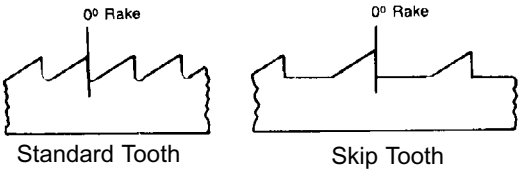
Carbide Fits in Pocket



High Speed Steel M-30, M42

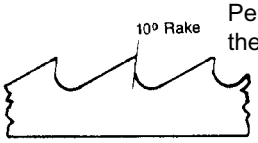
Tooth Form and Spacing:

The selection of a tooth form is generally determined by the material to be cut. There are three general factors to consider: tooth form, the style or shape of the teeth; tooth spacing, the number of teeth to the inch; and tooth set, which provides clearance for the body of the blade. Three styles of teeth are shown here:



Standard Tooth

Skip Tooth

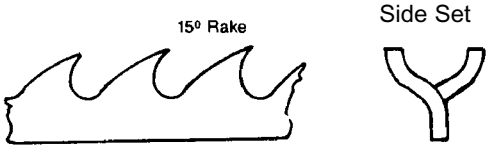


Penetration of the material is easier due to the self-feeding action.

Hook Tooth

In general, a coarse, hook tooth blade is the most efficient in materials where it can be used. Mild steel and aluminum would be appropriate applications. In wide cuts, a skip tooth blade would be effective since it simply reduces the number of teeth per inch. The standard tooth blade is, of course, a blade for general applications or where a variety of materials are being cut. It is also particularly useful in cutting fragile materials, such as castings and brass.

Hammer Set:

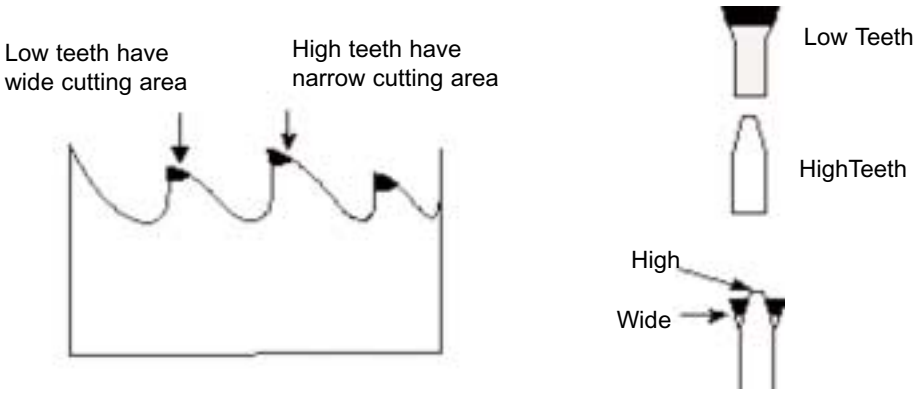


Hammer Set

The hammer set changes the rake angle and the side profile. The greater the rake angle, the easier it is for the blade to penetrate the material. The penetration of the material is due to the self-feeding action of the rake angle. Hammer setting the side changes the tooth cutting edge from the same angle as the set to a smaller angle. This helps the blade cut straighter.

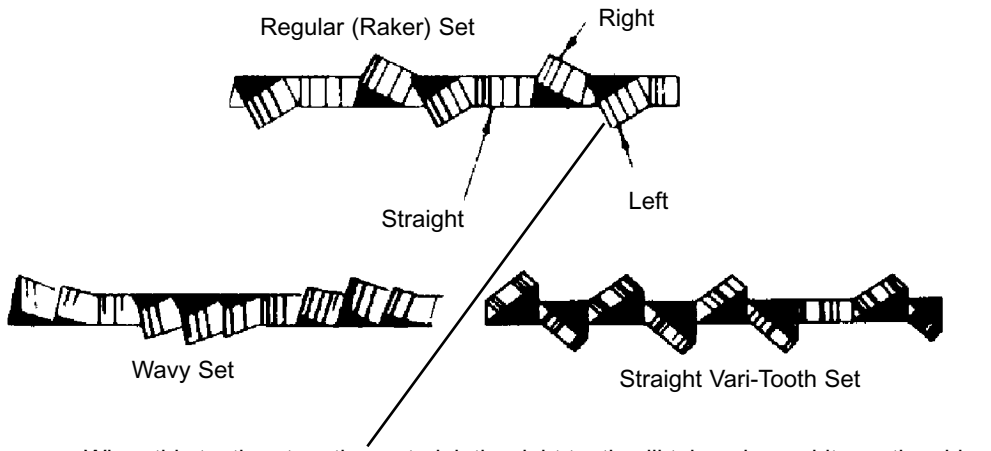
** The larger the rake angle, the greater the self-feeding action of the blade. This self-feeding lowers the cutting pressure. But is comes at a price; the teeth are more fragile.

Triple Chip Grind on Carbide Blades:



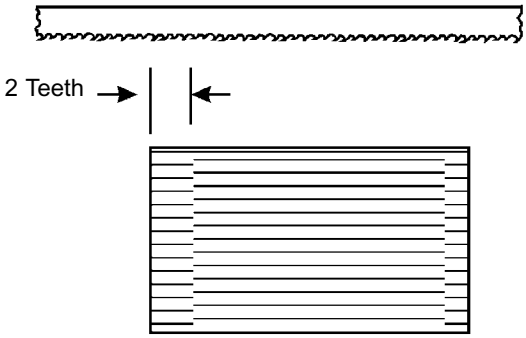
The high tooth cuts a small chip in the center of the cut. The wide tooth cuts both edges and widens the cut. This tooth cuts on both sides at the same time.

The wide tooth prevents the blade from binding in the cut. On Bi-Metal or Carbon blades, set prevents the blade from binding in the cut. It may be either a “Regular Set” (also called a “Raker Set”) or a “Wavy Set”. The regular or raker set is most common and consists of a pattern of one tooth to the left, one to the right and one (the raker) which is straight, or unset. This type of set is generally used where the material to be cut is uniform in size, and for contour cutting. Wavy set has groups of teeth set alternately to the right and left, forming a wave-like pattern. This reduces the stress on each individual tooth, making it suitable for cutting thin materials or a variety of materials where blade changing is impractical. Wavy set is often used where tooth breakage is a problem. Today, however, the variable pitch has replaced most of the wavy tooth applications.



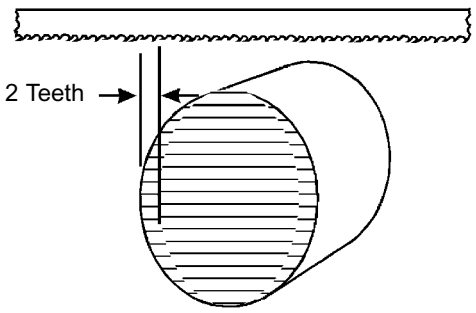
THE BLADE SET CAUSES THESE PATTERNS

NORMAL CUTTING



Vertical Straight Line Pattern as Seen on End of Saw Cut Rectangle

NORMAL CUTTING



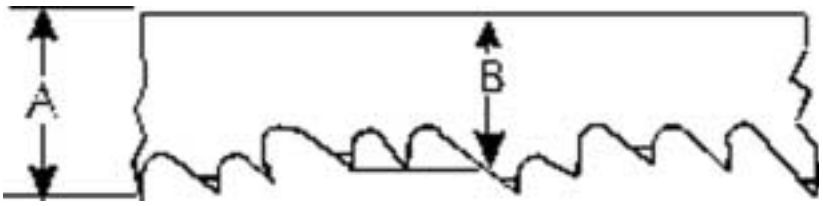
Elliptic Pattern as Seen on Ends of Saw Cut Round

Stepped Back Blades:

Stepped or ground backed blades are a relatively new development for metal band sawing. They are designed specifically for the cutting of large cross-sectional sizes or hard materials. The blade tends not to perform well on servo-controlled or constant feed rate band saws.

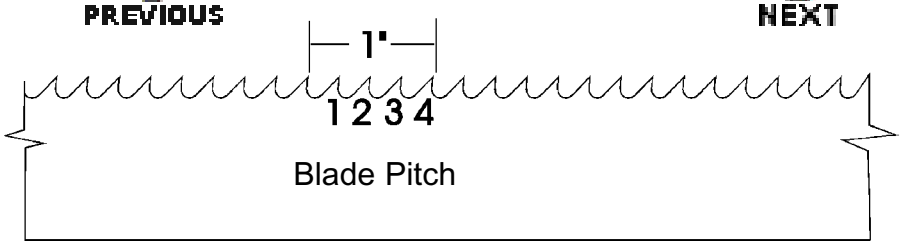
Wavy Tooth:

With a wavy tooth blade, the changing height of the tips is an attempt to improve cutting in the same manner as the stepped back blade.



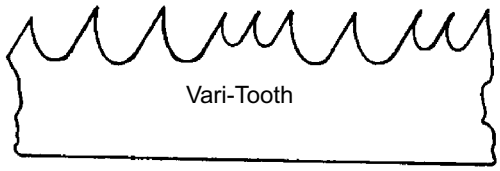
Tip of “A” is lower than “B”

Tooth pitch, or spacing, is generally determined by the material and its thickness in cross-section. It is generally specified in “teeth per inch”, as indicated below.



Vari-Pitch Teeth:

A relatively new development is blades with variable tooth spacing. On blades of this type, the tooth spacing might, for example, vary from 3 to 6 teeth per inch on a particular blade. Or, on a less coarse tooth blade, it might vary from 6 to 10 teeth per inch.



The purpose of this type of tooth spacing is to prevent vibration, which will be discussed in more detail later on.

When cutting narrow shapes, more teeth per inch will be required to prevent damaging the blade. Wider shapes will require a coarse blade with fewer teeth per inch. (See Pages 19, 30,31).

Blade Sharpness:

It comes as no surprise that a dull blade will cause problems. But it is also true that a very sharp blade can be a source of difficulty - namely vibration.

Vibration occurs as follows. When a very sharp point enters the material, it immediately begins to dig itself into the material. At some point, it gets in too deep and “bounces” up. The next tooth does the same thing, and the result, of course, is vibration. Excessive vibration will greatly reduce blade life and will also cause excessive wear on other parts of the saw. As the blade begins to dull just slightly, the points of the teeth stop digging in and the vibration stops. Now the teeth must be pushed into the material by the saw, permitting proper cutting pressure to be applied.

How to Break-In Blades:

The “honing” process is best accomplished by careful breaking in of the new blade immediately after installation.

1. Set blade speed according to material type and size.

2. Reduce the cutting pressure on the blade to the minimum required to achieve cutting.

3. Gradually increase the cutting rate until the desired square inch/minute is achieved.

Some manufacturers of blades actually sandblast their blades to remove the very sharp points. This may be an advantage only in situations involving inexpert saw operators and difficult materials. Careful break-in of a new blade is by far the best method of obtaining the maximum blade life.

A dull blade cannot be expected to cut straight. An example will serve to illustrate why. Picture a 10 pitch blade with .001 flate on each tooth. (One thousandth of an inch is smaller than the naked eye can detect. A human hair is generally from .0025 to .003). If you were cutting a piece 4" wide, you would have forty teeth engaged in the material at one time. That is a total of .040 flat on the point.

In addition, a dull blade will not cut efficiently. As the blade gets dull, it penetrates more slowly and it generates more heat. The additional heat tends to dull the blade more quickly. The blade becomes duller still, generates even more heat, and so on. Soon the teeth will fail and the blade won't cut at all, or it will make crooked cuts.

Since a dull blade cannot be detected by the naked eye, cutting time is the most reliable indication of a dull blade. Typically, as a blade begins to dull, the cutting time will begin to show a significant increase. It is possible, but not economical, to leave the blade on until cutting time has increased to two or even three times the normal time. But maximum efficiency and straight cutting require that the blade be changed as soon as the dulling begins to become apparent.

It is worth noting that if a blade is too dull to cut stainless or similar materials efficiently, it may still be satisfactory to use in mild steel. However, a blade which is too dull for mild steel will not be satisfactory in aluminum.

Blade Speed and Feed Rate (Traversing Rate):

Blade speed is generally limited by vibration and by the ability to keep the blade sufficiently cool to avoid dulling the teeth. A blade which is running fast and taking a very shallow cut will dull quickly because the tips of the teeth will overheat from the rubbing action. If, however, we force the blade teeth deeper into the material, the blade will be less sensitive to heat because the teeth are cutting more and rubbing less. This increased pressure may also prevent vibration. Thus, up to a point, a higher pressure on the blade may actually permit higher blade speeds.

If we have a sharp tooth with a .0002 radius on the tip, and we apply only enough force to cause penetration of .0002, the tooth will not penetrate and cut. If, however, we apply enough force to cause penetration of .001, the tooth still has .0008 of a sharp edge to cut with. This is similar to the "dull tip effect" observed frequently in lathe and milling operations. When making a finish cut with a dull tool, a fine adjustment may make no cut at all, but an additional fine adjustment will cause the tool to dig in deeply.

If, on the other hand, we apply too much penetrating force, the teeth will be ripped out of the blade. The maximum feed rate is determined by the saw, material size, material shape, guide spacing, cutting fluid, and the size and shape of the teeth. The greater the blade speed, the greater the feed rate can be, up to the limits imposed by the factors just discussed.

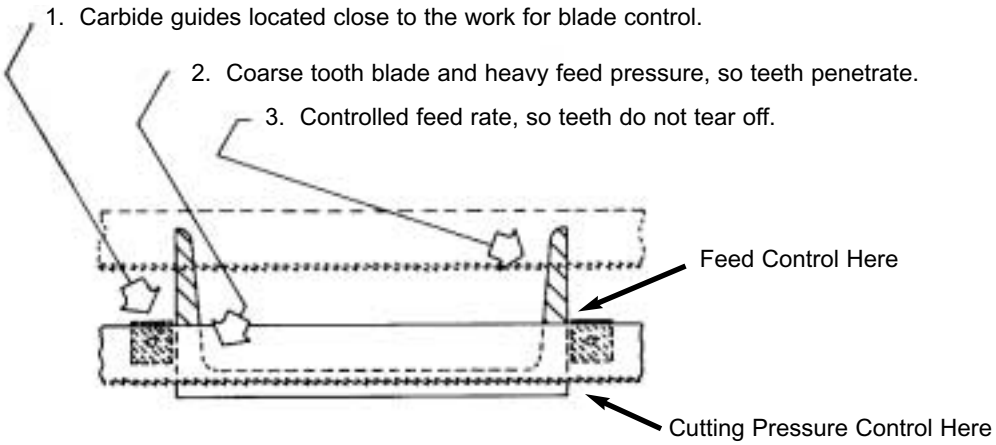
Thus, for each blade and material being cut, there is an optimum balance between blade speed and feed rate. This rate will give maximum blade life and the most satisfactory cutting. In general, we recommend:

1. Coarse tooth blade so that each tooth has adequate force on it.

2. Guides set close to the work to permit relatively heavy feed pressure and still control the blade.

3. Carefully controlled feed rate to prevent the teeth from tearing out.

Controlling the Blade:



See Page 49

Saw Engineering to Improve Cutting

Feed Rate or Pressure Control System:

The most efficient cutting is accomplished by the proper balance between cutting pressure and feed rate. Soft, low-strength materials present different difficulties than hard, high strength materials. In soft, low-strength material, pulling the teeth off the blade is unlikely, but over-filling the gullet may occur. With the high-strength material, pulling the teeth off the blade is a major problem. Carbide blades present other difficulties because of its shock sensitivity, and sensitivity to pulling the teeth off. The feed rate must be set right in order not to over-stress the teeth.

Traversing Rate System (Feed Rate):

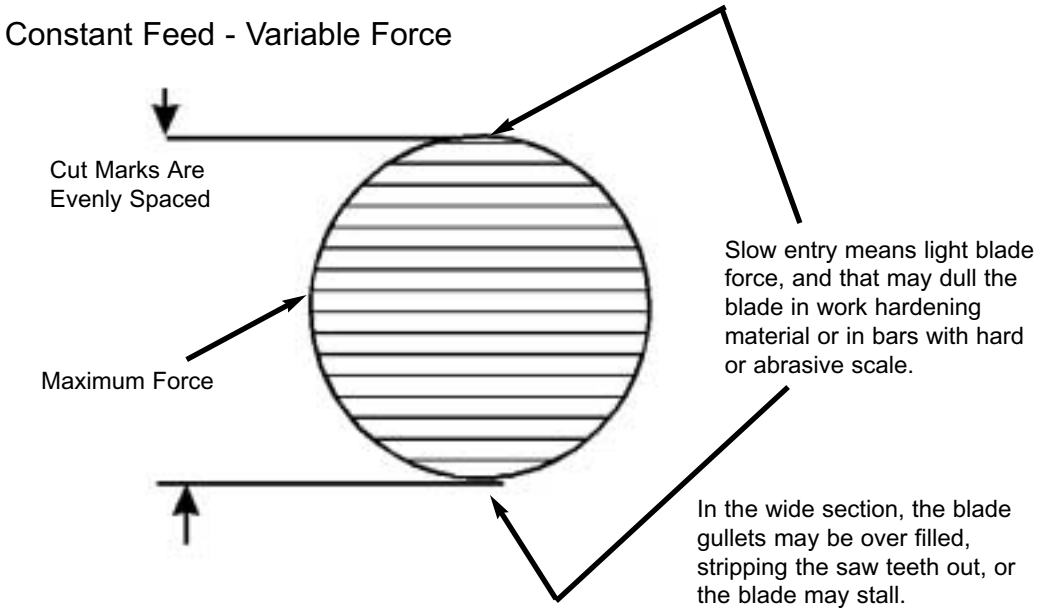
Traversing speed (Feed Rate) is used to maintain a uniform speed through the material. The pressure on the saw teeth will vary during the cut. Advantages are:

1. Uniform chip thickness.
2. As the blade teeth get dull, the chip thickness will remain constant.
3. If the material work-hardens, the blade will be forced into the material.
4. Cutting time will remain constant.

Disadvantages are:

1. Slower cutting time in non-uniform cross-sections.
2. As the blade teeth get dull, the blade may cut crooked.
3. When the blade teeth are too dull to cut, the blade will stall and slip on the wheel.
4. Each different width material will require a different traversing rate. The operator must make the change or the teeth may be over-loaded.

   It is best to have a “maximum-force-allowed” safety device on traversing rate saws.



Cutting Pressure System:

Cutting pressure systems are used to maintain the best cutting rate in all shapes, also for ease in set-up. But, the feed rate will vary as the cross section varies.

Advantages are:

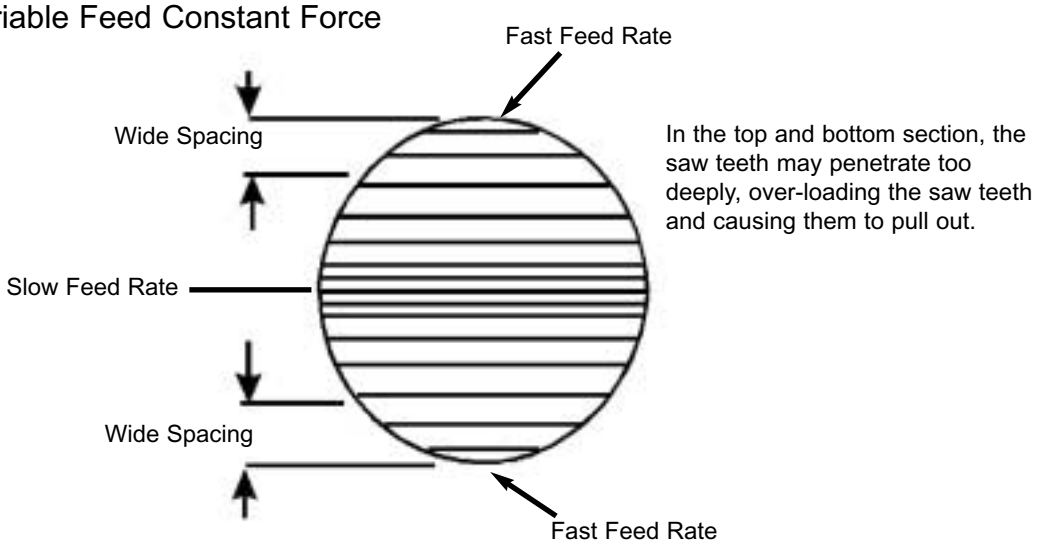
1. Gullet loads are maintained more constant.
2. Best cutting rates in shapes.
3. Cutting rate slows as the blade dulls thereby maintaining a straight cut.
4. Ease of set-up. Changing the width of the material does not require a change in cutting pressure. As the material gets wider, the traversing rate of the saw slows but the square inches per minute cut remains the same.

Disadvantages are:

1. In thin sections, the chip load may be too large and the teeth may pull out.
2. In work hardening material, the saw teeth may quit penetrating, and the material may work harden under the teeth. The saw will stop cutting.
3. Cutting time will slow as the blade becomes dull.
4. Different tooth configurations may require different pressure.

It is best to have a maximum traversing speed adjustment with the cutting pressure control.

Variable Feed Constant Force



Blade Tension:

Blade tension is an important factor in straight cutting. Adequate tension prevents the center of the blade from being deflected to the side, causing a crooked cut. It also prevents the blade from achieving reduced penetration of the teeth in the center of the cut. From the cutting standpoint, the more tension, the better. The limiting factor is blade strength.

Blade Vibration:

Blade vibration is caused by a blade tooth as it enters the material. A force is required to make the tooth penetrate the material. The resisting force causes the blade to raise up slightly at the time of contact. The raising and lowering of the blade causes vibration. If the vibration is allowed to build up, it will affect the blade fatigue life. This might cause the blade to break. To eliminate blade vibration, increase blade tension and/or blade feed rate, change blade speed, or use a different tooth form. The new blades with variable tooth spacing may be very helpful in eliminating vibration in some applications. Spacing the guides farther apart will allow the blade to vibrate freely in the cut without this vibration being transferred to the sawing machine. Thus, the vibration will appear to stop, but will actually continue and, of course, blade control is reduced with this wider spacing. (See pages 17, 29, 31).

Cutting Fluid:

Cutting fluid is so important, it cannot be overstressed. A good quality cutting fluid in a band saw is one of the most important factors in straight cutting. The cutting fluid keeps the blade teeth cool; it prevents the chips from welding to the tooth; and it lubricates the chips, allowing them to move easily through the cut.

If cutting fluid is unable to cool the blade teeth, they will soften and become dull. If the cutting fluid is distributed to only one side of the blade, the opposite side will become dull. This will cause the blade to move toward the side which has the most cutting fluid and the cut will be crooked.

If we compare sawing to milling, we immediately see that in sawing there is much less room for the chip. The chip must lodge in a small place between the teeth and be carried smoothly out of the cut. Without proper cutting fluid, either of two things will happen. First, the chip may become welded to the tooth. This will change the form of the tooth, which in turn will change the amount of force required for the blade to cut. The result is an unbalanced blade which will produce a crooked cut. The second possibility is that the chip will wedge in the cut. Since the chip is work-hardened and harder than the stock from which it came, the blade will cut into the stock beside the chip. Again, the result is a crooked cut and a dull blade. (See pages 32, 44, 45, 46).

When selecting a cutting fluid, pick one which is of high quality. Avoid thinly

mixed soluble oils. Some of the new synthetic oils are highly satisfactory in difficult operations.

If optimum cutting and blade life are the desired results, before selecting a cutting fluid and mixture for your saws, ask yourself the question “Would I tap this material with this fluid?”

Saw Design and Construction:

As indicated in the previous section, satisfactory and profitable cutting performance is determined by a wide variety of factors, most of which involve the design and construction of the saw. Let’s look at a few of the more important design features and how they affect straight cutting and blade cost.

The first objective of proper saw design is straight cutting because this permits work to be done with a minimum of reprocessing, material waste, and rejects. Straight cutting is so important to profits that is almost goes without further comment. The second objective is efficient use of blades. To grasp the importance of this factor, compare the difference between using one electron welded blade costing $25.00 for one day with using the blade for two days. On the basis of a five-day workweek, fifty weeks per year, a machine which uses one blade per day will require $6,250.00 in blades per year. However, a machine which will extend the life of the blade to two days will require only $3,125.00 in blades. Over a period of three years, savings in blades alone will pay for a $10,000.00 saw. This does not even take into account such factors as reduced labor time, a lower reject rate, or less material waste due to dull blades.

Another objective of good saw design is maximum production efficiency, which includes the greatest reliability, ease of adjustment and repair, and the best possible return of investment. What should you look for in order to obtain these benefits? Here are a few specific design features which have a direct effect on performance:

Blade Guides:

Absolute squareness of the blade is essential to straight cutting. It cannot be obtained by the use of roller guides since they act as pivotal contacts rather than as anchored supports. A flat guide which squeezes the blade to keep it absolutely vertical and to align it in the horizontal plane appears to be the best method of keeping the blade square. The blade guides must, of course, be positioned as close to the work as possible. They must be held rigidly by guide arms that have a large section modulus and adequate mass. Look for adequate weight and dimensions in the guide arms themselves.

Types of Saws

Horizontal Column Saws

Column or “guillotine” type saws must be extremely rigid to prevent flexing when the arm is at maximum capacity. The saw arm must also be massive and strong to reduce flex and to permit proper blade tension. Vibration is also reduced with more massive arm structure and wheels. The columns themselves should be perfectly aligned and parallel to ensure straight cutting at any height. The saw arm guiding design is very critical. The arm columns must be parallel or they will twist as the saw arm raises and lowers, binding the saw arm guides. Control of the arm while cutting is also important. The ease of adjustment of the traverse rate and the cutting force is critical to achieve a wide range of cutting options.

Horizontal Scissor-Type Saws

Since the saw arm holds the blade guides and blades, it follows that it is critical to the control of the blade. The saw arm must have adequate mass and beam strength to avoid flexing. It must anchor the blade guide arms in order to prevent their getting out of alignment, and must permit proper blade tension. It must also pivot from the proper location on a pivot that allows no lateral motion. Again, look for a heavy arm of sturdy construction. Look for a pivot located as far from the work as possible and at the level of the work in order to minimize the weight shift factor. Look for a pivot bearing which has no play.

Vertical Saws

Vertical saws have several advantages over column or scissor machines. The saw itself takes up less floor space than a horizontal saw, and provides for angle cutting. HE&M vertical saws provide angle cutting up to 45 degrees in both directions, giving nearly unlimited versatility. The work height is higher than horizontal saws, which can also be a benefit. Construction of vertical saws is substantially different from the horizontal machines. The arm itself must, like horizontal saws, have enough mass and strength to allow proper blade tension to eliminate twisting and to reduce vibrations. The requirements for supporting the arm section include the ability to tilt in both directions and to allow the arm to move freely through the full capacity. This is best accomplished by having the guiding system integrated from the arm pivot section back to the rear support area. This gives not only a rigid (yet tiltable) arm, but keeps the guide system away from the chips and cutting fluid area.

Blade Enhancer System

Patented State of the Art in Machine Design by HEM, Inc.

The enhancer causes a “see-sawing” of the band saw blade on the material that is being cut. This is exactly the way one rocks a hand saw from side to side to reduce the surface area contacting the teeth of the saw blade, so the saw will penetrate easier. Concentrated force on fewer teeth lets the blade penetrate quickly into the cut. This feature is available on HE&M Saw models H105 and larger. (See Figure 1).

Because of our unique pressure control, the blade essentially tells the saw how things are going. The saw will adjust and cut at exactly the correct rate. Blade life is then extended significantly by reducing the cutting pressure while maintaining the same cutting rate.

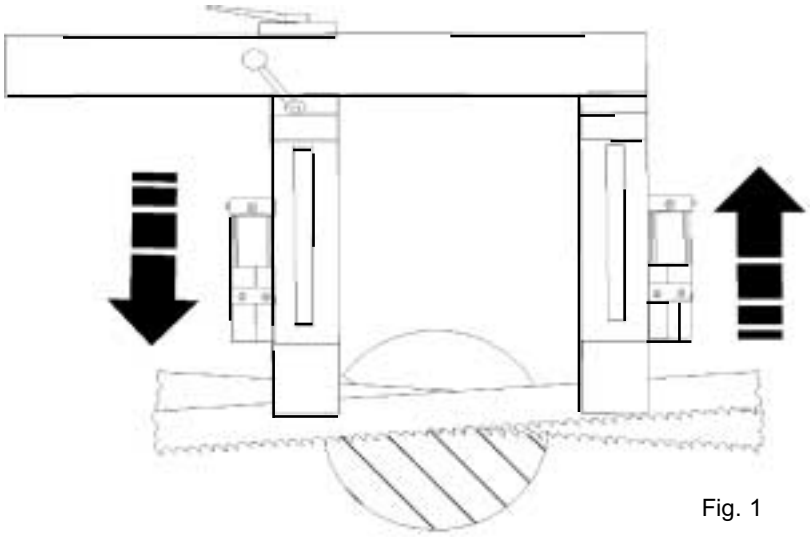


Fig. 1

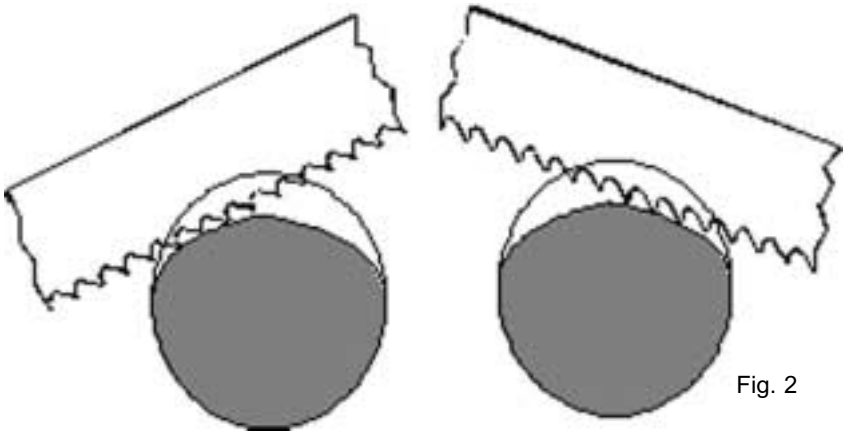


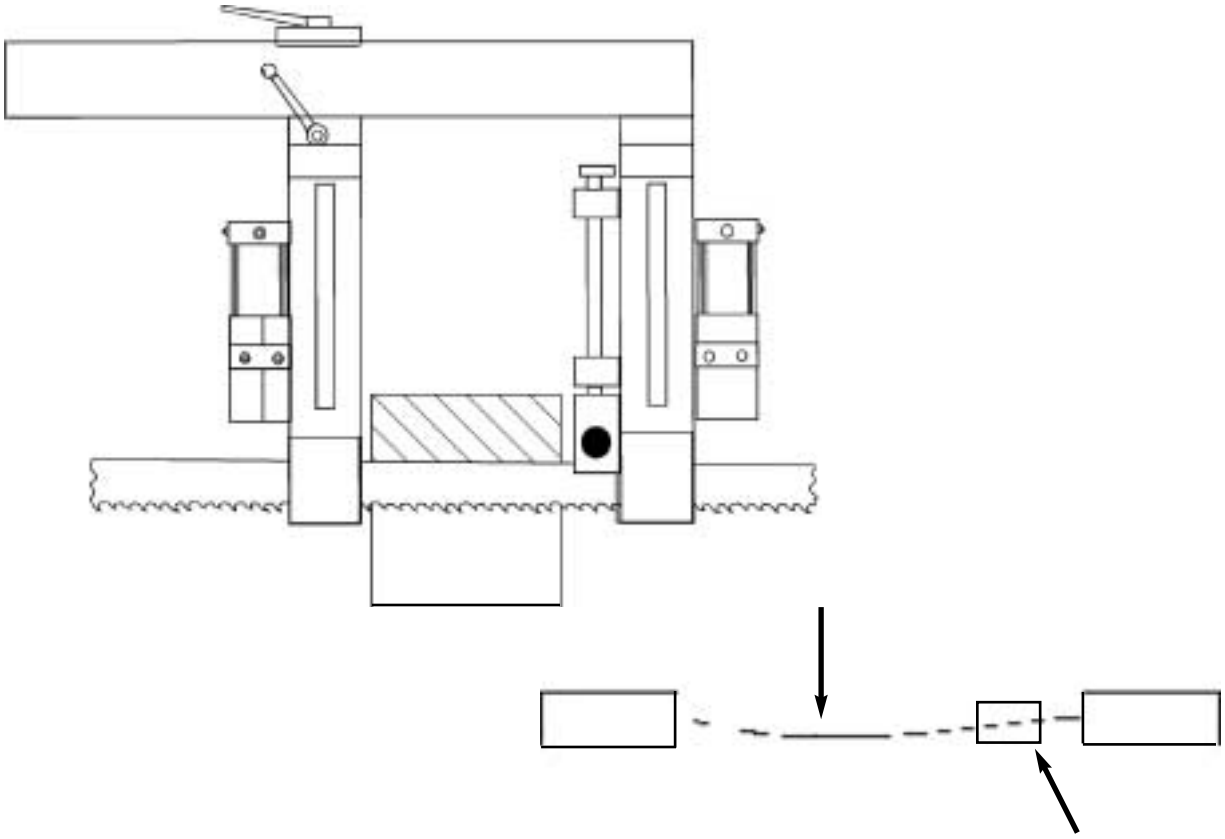
Fig. 2

- Reduces cutting time by as much as 50%
- Increases blade life, reducing blade cost
- Cut space age materials that you couldn’t but before
- Patented, Exclusive with HE&M Saw Patent 4,558,614 Patents Pending

Cut Watcher

Patented State of the Art in Machine Design by HEM, Inc.

The Cut Watcher holds the blade in position and watches for deviation. If the blade begins to cut crooked, the saw automatically shuts off. The Cut Watcher can prevent the loss of a part. Checking for damaged or dull blades prevents errors.



Damaged Blade: Cut Watcher Sees the Error.

- Checks for a damaged blade
- Checks for a dull blade
- Prevents cutting errors
- Patented, Exclusive with HE&M Saw Patent 5,070,751 Patents Pending

Display

Center Light Indicates System On

Cutting “Out” Within Limit

Cutting “In” Within Limit

Cutting “In” Out of Tolerance

Cutting “Out” Out of Tolerance

Cutting Fluid Control

As indicated earlier, the quality and distribution of the cutting fluid is a major factor in preventing crooked cuts. Simply squirting the cutting fluid against one side of the blade or dribbling it on the top invariably results in uneven cutting fluid distribution with the effect of dulling one side of the blade and causing crooked cuts. A more satisfactory system is one which pumps the cutting fluid into the blade guides on each side of the blade. This permits the blade to carry the cutting fluid into the cut on both sides where it can adequately fulfill its function. By injecting cutting fluid into both the leading and the following blade guides, the blade is also cooled and cleaned before and after the cut. (See Pages 22, 44, 45, 46).

Blade Cleaning

Positive mechanical cleaning of the blade teeth prevents the work-hardened chips from being carried into the cut on the blade's next rotation. This would cause crooked cutting and excessive blade wear. A stationary brush quickly loses its effectiveness, while one which turns too fast will require constant replacement. The best system is one in which the brush speed is directly proportional to the blade speed, turning just rapidly enough to clean each tooth.

Blade Speed Control

The speed of the blade should be suitable to the blade design and the material being cut. If only one type of material were ever to be cut, a single speed would be adequate. However, since most saw users will use their saw to cut a wide variety of materials, an infinitely variable speed control should be included in the drive system and should be of very heavy duty construction in order to provide maximum reliability.

Saw Arm Control

A saw arm with a gravity down feed design must be very heavy. Because of this design, as indicated earlier, precise control of the feed rate and the cutting pressure is absolutely essential to maximum cutting speeds and long blade life, both of which are required for profitable cutting.

Operator Convenience and Safety

Efficient operation requires rapid set up and convenience for the operator during the cutting process. Automation of the feeding and cutting operations can provide significant savings by allowing the operator to perform other duties during repetitive cutting operations. Look for a saw with control grouped conveniently where the operator can reach them without moving from a central control station and without endanger-

ing himself by reaching near the blade or the stock. Remember, too, that if an operator dislikes a particular piece of equipment, he will work less efficiently, have a higher reject rate and be more likely to damage the equipment.

Factors Affecting Cutting Speed

Determining Cutting Rate Based on Material Factors:

1. Using C1018 as a base of 1, multiply the machinability percentage rating of the material to be cut agains C1018. For example, assume you are cutting stainless steel with a machinability rating of 30%. The “normal” rate of 15 square inches per minute will be reduced to 30%, resulting in a cutting rate of about 4.5 square inches per minute.

2. Cutting rates in tubing are reduced by assuming twice the cutting surface area until the cut area equals that of a solid bar. Heavy wall tubing will behave much like solid stock except that blade life will be reduced by approximately 50%. For medium wall tubing, multiply the machinability rate by about 7.5 instead of the normal 15 square inches per minute used for solid stock. For thin wall tubing, use a factor of approximately 3.2. Structural shapes, such as “H” beams and angles, behave like tubing.

3. Scale will reduce the cutting rates shown above and blade life by a factor of 0.3 on solid and 0.5 on tubing. Scale is very abrasive and is dragged through the cut, dulling the blade. Scaled tubing is the worst because the blade teeth have to cut through the scale twice in each cut and because there is less cutting fluid on the blade as it cuts the second side.

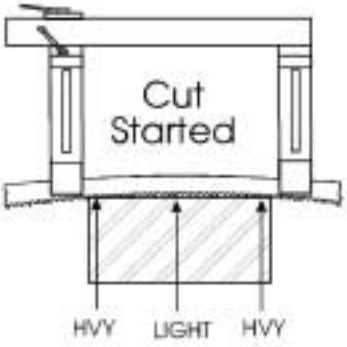
4. Stacked material will have voids between the pieces, making it more difficult to cut than solid bar stock. Chips may turn sideways in these voids and have to be cut again. To complicate matters, the chips are work hardened. If there is scale on the material, there will be more scale in the cut. The only saving in cutting stacked material is reduced han dling time, which must more than offset lower blade life, slower cutting, and reduced accuracy to pay off. (See Page 33).

For your reference, HE&M Saw has cut at rates of 105 square inches per minute in 5” diameter free machining steel. These rates have been achieved with a bi-metal blade many times, and even faster cuts can be achieved with a carbide blade. Of course, these rates would not be used in the real world of production cutting, but are an example of how fast steel may be cut.

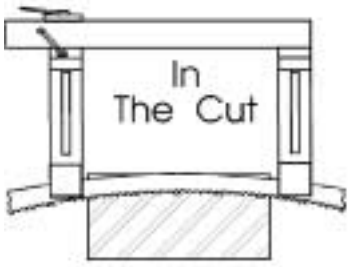
Factors Affecting Stress In a Blade While Cutting

Blade Hangs Up:

At the start of a cut, the corners are cut first with the center of the blade riding on the center of the material. As the cut is started, the blade is bent up in the center. The center of the blade does not cut at the same rate as the edges until the forces at the center line of the blade equal the forces at the edge. If the blade hangs up at the exit, this is what causes the hang up.



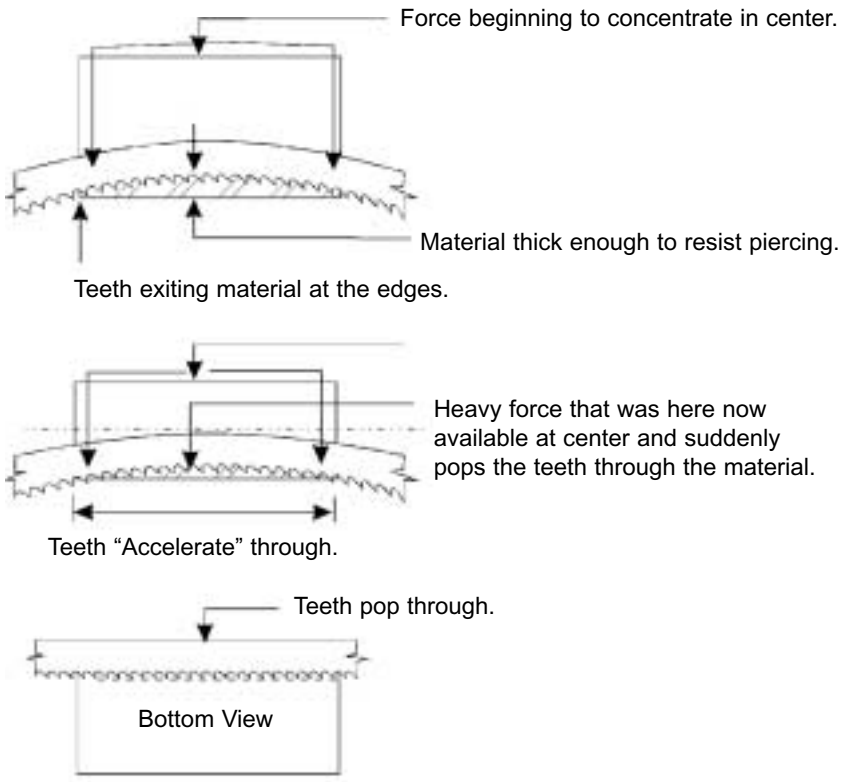
Stress Concentration



Uniform Stress Across The Blade

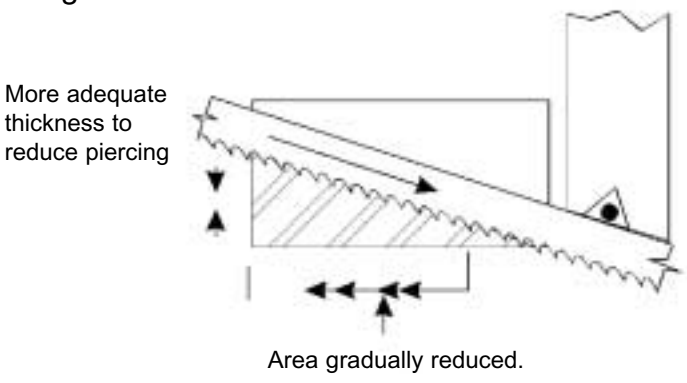
Starting to Exit

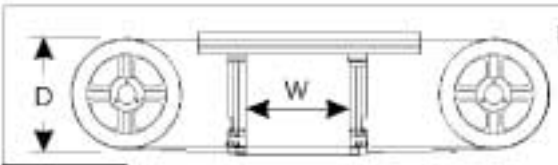
As the blade begins to exit the material, a hang up can occur like this:



To prevent the teeth from suddenly piercing the remaining thin metal section:

1. Reduce the cutting force.
2. Increase the tension.
3. Increase the blade speed to a higher surface feed per minute.
4. Choose a blade with more teeth per inch.
5. Set the blade at an angle





RECOMMENDED MAXIMUM GUIDE OPENING FOR MAXIMUM BLADE LIFE (INCHES) CUTTING MATERIAL WITH 90,000 PSI TENSILE STRENGTH

.1 WHEEL DIA D	.2 BLADE SIZE THICKNESS	.3 BLADE WHEEL WRAP STRESS (PSI)	.4 TOOTH SPACING (TEETH/IN)	.5 FORCE PER TOOTH	.6 TOTAL FORCE	.7 GUIDE SPACING W	.8 TOOTH CUTTING AREA (IN^2)	.9 CUTTING STRESS (PSI)
16	1 x .035	66,200	4-6	6.7#	200#	6.0"	.000035	190,500
18	1 1/4 x .042	70,600	3-4	8.0#	290#	10.4"	.000042	189,700
22	1 1/2 x .050	68,800	2-3	9.5#	320#	13.8"	.00005	185,500
28	2 x .063	68,100	2-3	12.0#	530#	17.6"	.000063	191,200
34	2 5/8 x .075	66,800	1.2 - 2.5	14.3#	760#	28.8"	.000075	190,200

THE ABOVE CHART WAS GENERATED COMPARING ONLY WHEEL WRAP STRESS AND BLADE BENDING STRESS BETWEEN GUIDES. ALL OTHER FACTORS AFFECTING BLADE LIFE WERE HELD CONSTANT.

1. Minimum recommended wheel diameter for good blade fatigue life.

2. Recommended blade size for wheel diameter.

3. Stress in blade due to wrapping around wheel = $\frac{ET}{D + T}$

   E = Modulus of elasticity 30.35 x 10^6 PSI
   T = Blade thickness
   D = Wheel diameter

4. Popular vari-pitch tooth configuration.

   Average tooth spacing = $\frac{\text{course pitch + fine pitch}}{2}$

5. Force per tooth should always produce a surface stress at least twice the tensile strength of the cut material.

6. Total down force of the blade pushing on the material.

7. Guide spacing is the distance from the inside of the guide arm to the inside of the guide arm. Calculations were made as if the material filled the entire area between the guides.

8. Reference Page 18 of this section

Area = .001 in. X Blade Thickness

USING A BROKEN BLADE WORN TO .001. BROKE IN BLADE. A DULL BLADE WITH .003 FLAT WILL TAKE 3 TIMES THE TOTAL FORCE TO REMOVE THE SAME SIZE CHIP.

9. TOTAL FORCE
AVERAGE TOOTH SPACING X GUIDE SPACING X TOOTH CUTTING AREA

TO CUT WIDER MATERIAL DO ONE OR ALL OF THE FOLLOWING:

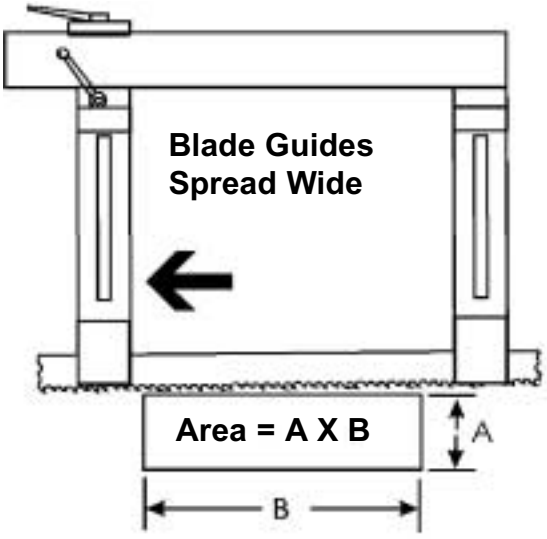
1. Cut lower tensile strength material.

2. Use a sharper blade.

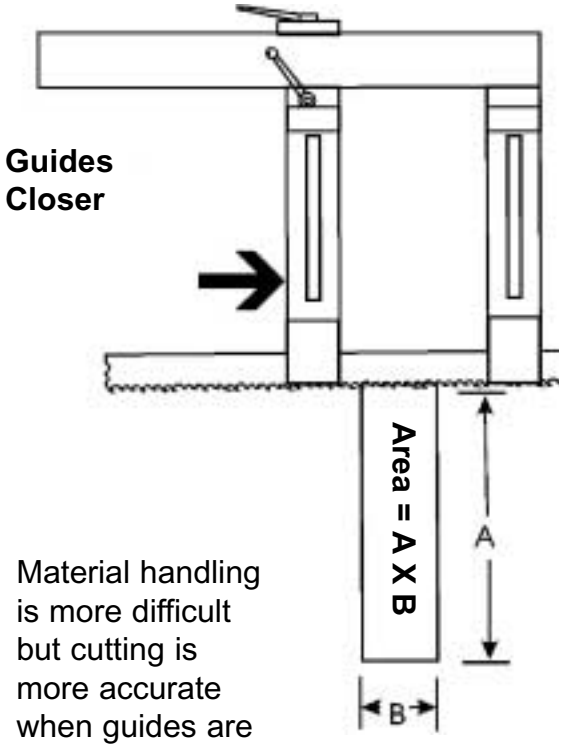
3. Use less teeth per/inch blade (Courser Pitch)

4. Use a sharp, positive rake tooth form.

Method of Cutting a Piece of Steel



Material easy to handle but hard to cut and accurate cutting is more difficult because the guides are spaced very wide.



Material handling is more difficult but cutting is more accurate when guides are close.

Cutting Fluid Functions:

Cutting fluid prevents chip welding to either the blade or the parent material by chemical interface. When chips weld to the blade, the tooth form is changed resulting in cut deviation or lack of penetration. If chips weld to the parent material, the usual result is a stripped blade. Note that not all cutting fluids are suitable for all materials to be cut. Also some cutting fluids are hazardous to your health.

Cutting fluid lubricates the blade and, more importantly, the chips as they pass up into the gullets of the blade.

Cutting fluid tends to cool the blade and the material being cut by absorbing heat. Heat is always generated because “work” has occurred from the cutting action as well as from friction. Note that when wide material is being cut, the blade gets much hotter than when narrow material is cut. This happens even when both materials are cut at the same rate in square inches per minute. Note that in the left hand illustration at the top of the page, the blade is more sensitive to cutting fluid problems than in the right hand illustration. (See Pages 43-48).

Factors Affecting Blade Performance:

1. Tough material can tear the teeth out of the blade because the load on each tooth can exceed the shear strength of the tooth. A controlled feed rate and a raker set blade will help.

2. Hard material will require heavy feed pressure per tooth for penetration. A coarse tooth blade will give better tooth performance.

3. For fragile materials such as cast iron, a fine tooth blade works best.

4. Work-hardening material requires a very heavy feed pressure to prevent the blade from riding on top of the material and dulling the teeth. Again, a coarse hook tooth blade works best.

5. Abrasive material will appear to cut easily, but will dull the blade quickly.

6. A blade which is too dull to cut tough material like stainless steel may cut mild steel satisfactorily.

7. Proper cutting fluid for the material being cut will substantially increase blade life. Incorrect cutting fluid often results in crooked cuts or damaged blades.

Factors Affecting Machine Performance:

Inaccurate cutting and short blade life usually have simple causes. The following points need to be checked frequently:

1. There must be enough cutting fluid to cover the pump.

2. The cutting fluid lines and internal passages of the guides must be open. It is sometimes necessary to blow them out with compressed air.

3. Check the cutting pressure. Extremely high or low pressure puts unnecessary hardship on the blade.

4. Use the correct blade speed, fluctuating between very fast for aluminum and very slow for stainless steel.

5. Vibration may damage the tooth tips.

Glossery of Terms

Terms Concerning Band Saws

Blade Speed:	The rate of travel of the saw blade through the material; expressed in feet per minute.
Chip Load:	The average tooth advance into the work. It is calculated by dividing the feeding rate by the blade speed and by the number of teeth per foot.
Cutting Rate:	The area of the cross section of the work cut divided by the number of minutes for the cut; expressed in square inches of cutting per minute.
Feed Pressure:	The pressure exerted by the cutting edge of the band saw blade against the work; expressed in pounds.
Feed Rate:	The linear travel of the saw blade into the work; generally expressed in inches per minute.

Terms Concerning Band Saw Blades

Band Tension:	The tension on the band caused by the saw wheels being forced apart. The limiting factor is the strength of the band.
Beam Strength:	The resistance a band has to feeding force; i.e., the degree to which it rests bending up between the guides.
Camber:	The amount of negative curvature in the blade measured with the blade laid out flat. Positive Camber is when the teeth point toward the center of the curvature while Negative Camber occurs when the teeth point away from the center. Either type denotes a blade quality problem.
Guage:	The thickness of the back of a saw band. It is best expressed in thousandths of an inch.
Gullet Depth:	The distance from the tooth tip to the bottom of the gullet.
Lead:	The wander of the blade from a straight course.
Raker Set Pattern:	One unset tooth followed by two oppositely set teeth.

Set:	The distance from the extreme corner of the teeth bent toward one side to the extreme corner of the teeth bent to the other side of the band. Set provides clearance for the back of the band and for chips. The “balance of the set” is the relationship between the side clearance on one side to that on the other. An unbalanced set is a blade quality problem.
Side Clearance Angle:	The angle of bend of each set tooth.
Tooth Face:	The surface of the tooth on which the chip is formed as it is cut from the work.
Tooth Back:	The surface of the tooth opposite the face.
Tooth Gullet:	The throat within the curved area at the base of the tooth, face and back of the next tooth.
Tooth Rake Angle:	The angle of the tooth face from a perpendicular line from the back edge of the band.
Tooth Spacing:	The distance from the face of one tooth to the face of the next.
Tooth Pitch:	The number of teeth per inch of the blade.
Twist:	The tendency for a blade to spiral after use. A blade quality problem.
Tensile Strength:	The amount of directly applied pull a band will stand before breaking. Usually expressed in pounds per square inch.
Wavy Set Pattern:	Setting of teeth in groups, with one group to the left and the next group to the right.

Troubleshooting Checkpoints

At this time, we cannot overemphasize the absolute requirement of a good cutting fluid. It is vital to blade life that the blade be cooled and lubricated properly in all cutting operations. When your saw is not providing controlled, accurate cutting, the problem can often be traced directly to the cutting fluid. The fluid is either the wrong concentration, an improper supply, or the wrong type for the kind of material being cut.

Inaccurate Cutting: Short Blade Life

1. Insufficient cutting fluid, the wrong type of cutting fluid or the wrong concentration of cutting fluid allows heat to be generated at the tooth tips, reducing wear resistance. Cutting fluid should be the proper type for the material being cut.

2. If the blade is dull on one side, the blade will cut toward the sharp side. Change blades.

3. Guide clamps loose. Properly adjust the guide clamps.

4. Vises are not clamping securely. Adjust the clamping pressure.

5. The cutting force is too high or low. Adjust the cutting pressure.

6. The blade speed is too slow or fast for the material you are cutting. Adjust the blade speed.

7. Blade Tension: Check the blade tension with a tensiometer.

8. Blade Alignment: Check the blade alignment.

9. Moveable guide arm: Check to see if the guide is too far from the material or not locked securely. Also make sure there is no dirt or chips between the blade and the carbides that would cock the blade to one side.

Rough Cutting

1. Improper blade tooth selection. Check the tooth selection chart for the material you are cutting.

2. Bad Set-Up. Support the work firmly.

3. Wrong Cutting Fluid.

Blade Stretches Excessively, Forming Cracks

1. Reduce blade tension.
2. Use a better blade.
3. The saw is out of alignment. Get the machine properly realigned.

Stripped Teeth

1. Slow down the arm feed rate and adjust the feed rate control.
2. Check the cutting force. It may be set too high causing too much force on the teeth and, therefore, taking too much of a chip. (See Pages 32, 22, 27)
3. Check the cutting fluid to see if it is flowing properly and is correct for the mate rial being cut.
4. Blade too fine; chips loading in gullet. Change to a coarser tooth blade.
5. Not enough blade speed. Increase the blade speed to reduce the chip load.
6. Tensile strength of the material is above 100,000 PSI. Use a finer pitch blade (more teeth per inch).
7. Hard spots in the material. Use a blade with a harder and finer pitch.

Chips Welding to Gullets

1. The cutting fluid level is low; improper cutting fluid for the material being cut or improper concentration. (Should be 5 to 1 ratio). (See Pages 22, 27, 33).
2. The blade brush is not operating. Check it closely and replace if necessary.
3. Excessive cutting speed. Reduce the cutting rate.
4. The blade speed is too high. Reduce the blade speed.
5. Use a coarser tooth blade.

Blade Vibration

1. Harmonics: Change the feed and/or blade speed. Use a vari-tooth type blade. (See Pages 16, 17, 18)

Blade Edge Swage

1. Worn backup guides. Replace.

2. The cutting force is too high, exerting too much force on the blade. Reduce the cutting force.

Blade Stalls During the Cut

1. The arm feed rate is too fast. Use the feed rate control.

2. The arm feed is inconsistent.

3. Too much cutting force. Reduce the cutting force.

4. Chip welding, stopping the blade. Change the cutting fluid or blade tooth config uration.

5. Use a coarser tooth blade.

6. Blade tension improper.

7. Guides are too tight.

Material Chips

Chips are the indicators that show how the saw is performing in the cut.

The classification of the material determines the appropriate chip appearance.

Reading the Chip

Generally speaking, the following applies:

Fig. 1

Curled chips are what to expect in ductile material like 1018 (Figure 1)

OR WHEN USING A SHARP BLADE.

Fig. 2

Blue, brown, or burned chips indicate lack of coolant or incor rect feed and/or speed. (Figure 2)

OR WHEN USING A DULL BLADE.

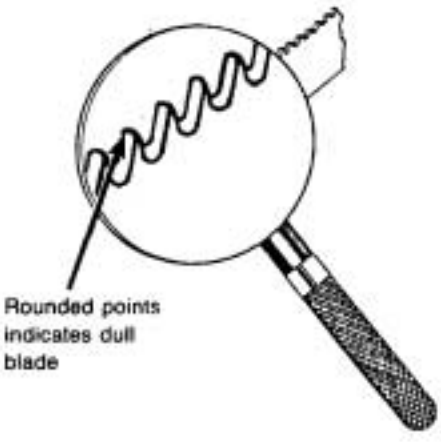
Fig. 3

Powdered chips of medium size in brittle material like brass or cast iron (Figure 3).

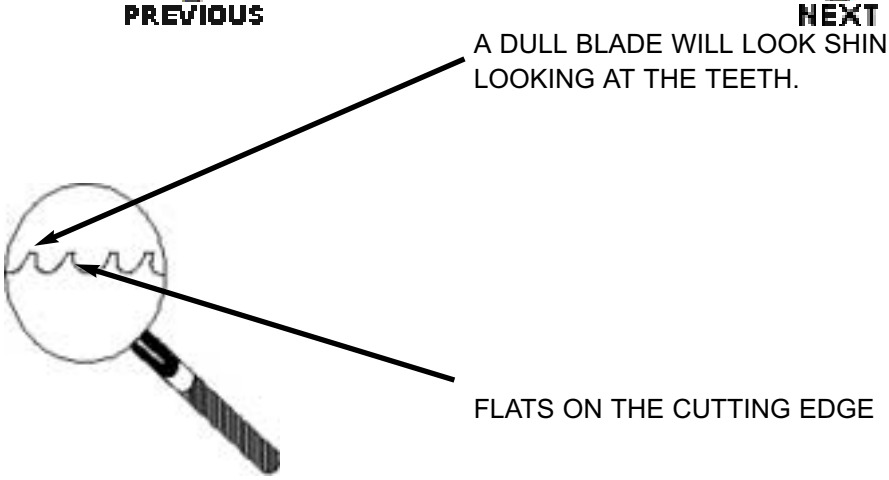
OR WHEN USING A VERY DULL BLADE

NOTE: IF THERE IS A CHANGE IN THE BLADE APPEARANCE OR THE CHIPS WHILE CUTTING, EXAMINE YOUR CUTTING PROCE-DURES.

Fig. 4



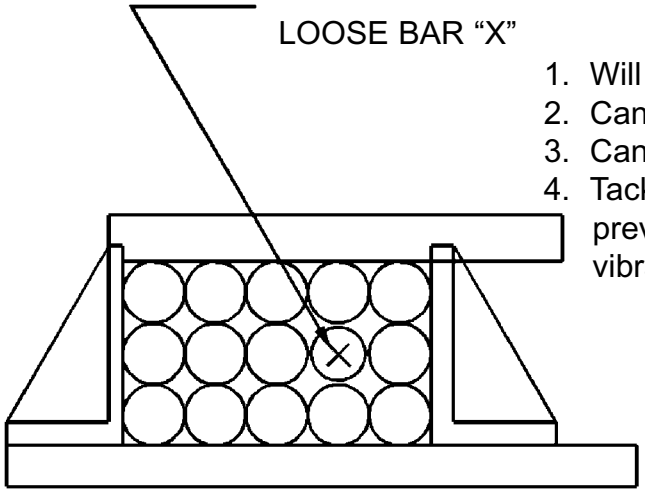
When a radius on the tooth becomes visable, this means the blade is dull and the chips may appear to look burned and decrease in size. As the blade dulls, the chips will change from Figure 1 to Figure 3.



BUNDLE CUTTING

Bundle cutting makes cutting more difficult because of vibration, wide guide spacing, coolant getting to the teeth, and cutting through work hardened chips.

Solid Bars

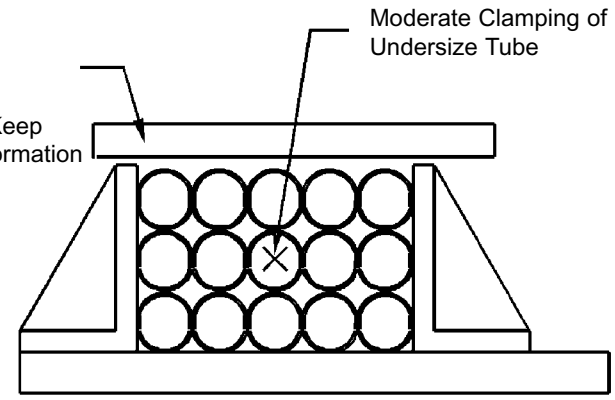


1. Will vibrate
2. Can spin
3. Can change length position
4. Tack welding ends of bars will prevent spinning but not vibration.

Solid bars clamped on 4 sides.
Solids not distorted by clamp force.
Bar “x” is slightly smaller than the rest and is not firmly clamped in the bundle.

Tubes

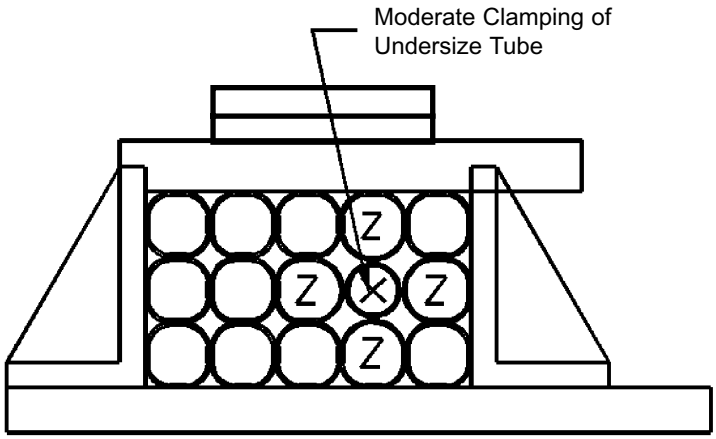
Note: Restraint Bar
Normally Used to Keep
Tubes in Bundle Formation



Thin wall tubes clamped on 2 sides.
Tubes slightly distorted by clamping force.
Tube “x” is slightly smaller than the rest, but is held in place by the distortion of the larger tubes.

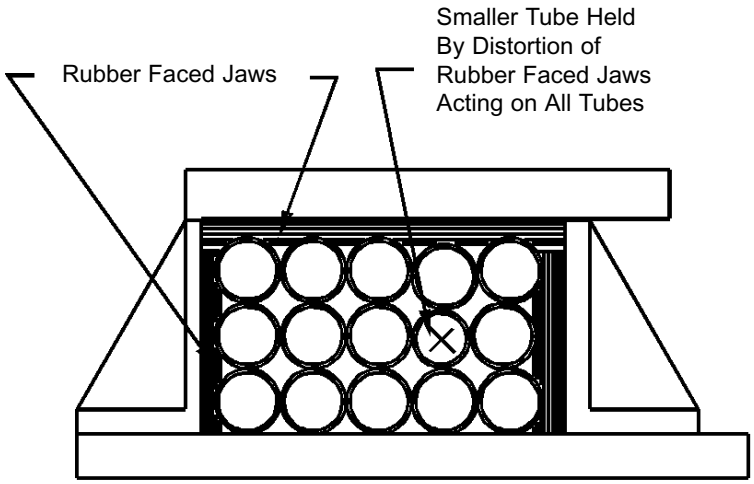
Thin Wall Tubes Clamped on 4 Sides

Tubes are slightly distorted by clamping force. Tube “x” is slightly smaller than the rest but is held in place by the distortion of the larger tubes marked “z”. Bundle cutting increases sawing problems (See Pages 28, 33).



Thin Wall Tubes Clamped on 4 Sides with Rubber Faced Jaws

Moderate clamping force all tubes restrained with very low distortion.



RUBBER FACING HELPS HOLD BARS

Rubber faced jaws work best with solid bars.

Disadvantages:

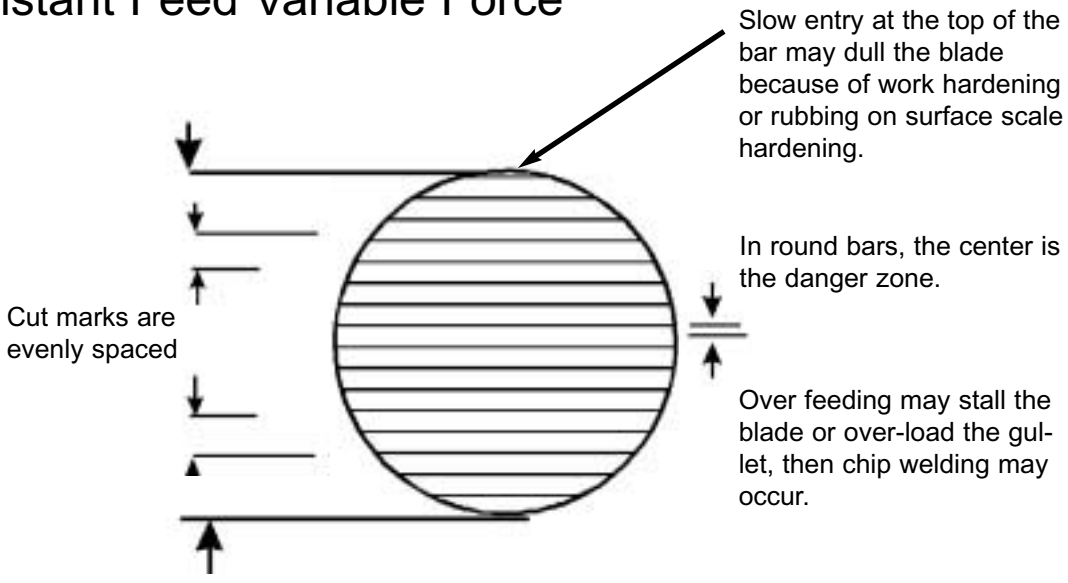
1. Rubber wears out rapidly.

2. Rubber may be torn loose during feeding.

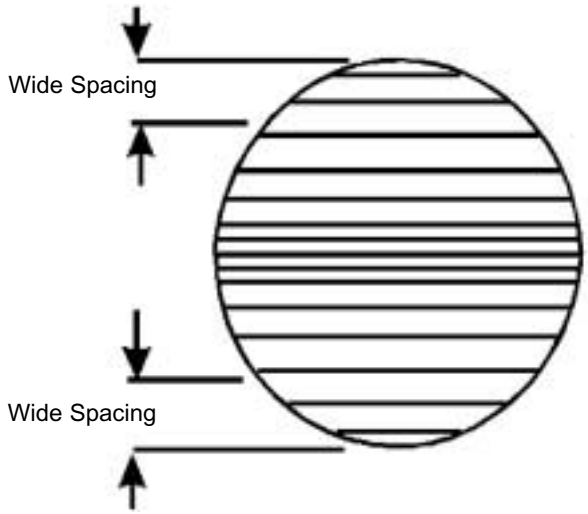
3. Out of square cuts may result due to “elastic” vise jaws.

Reading the Cut Surface

Constant Feed Variable Force



Variable Feed
Constant Force

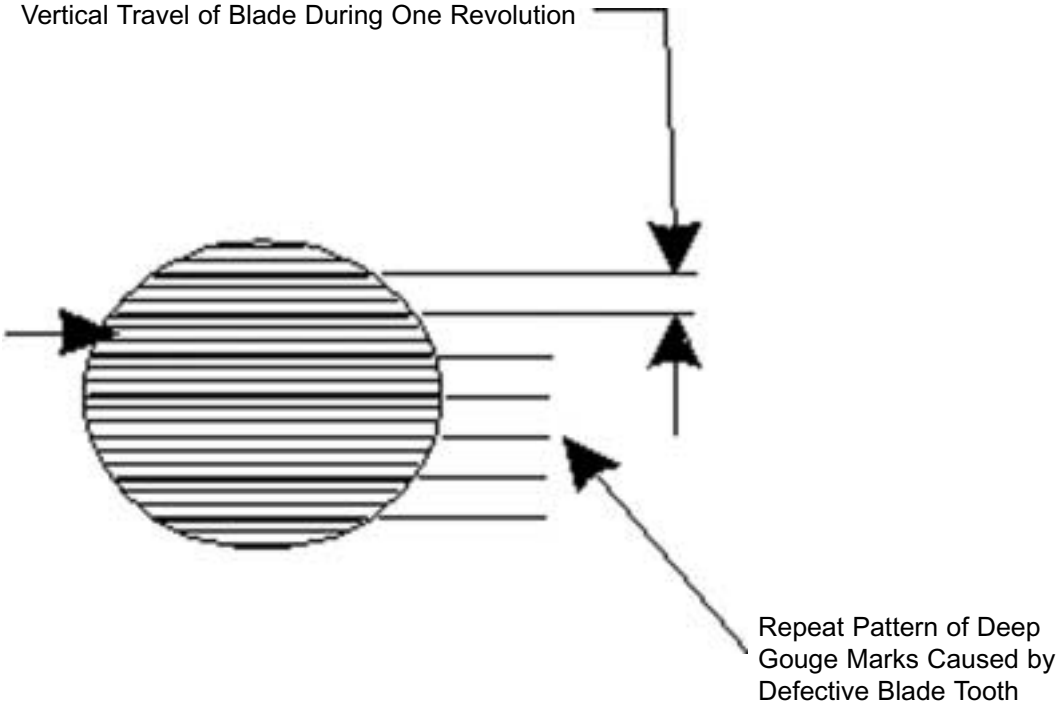


In round bars, the top and bottom are the danger zones.

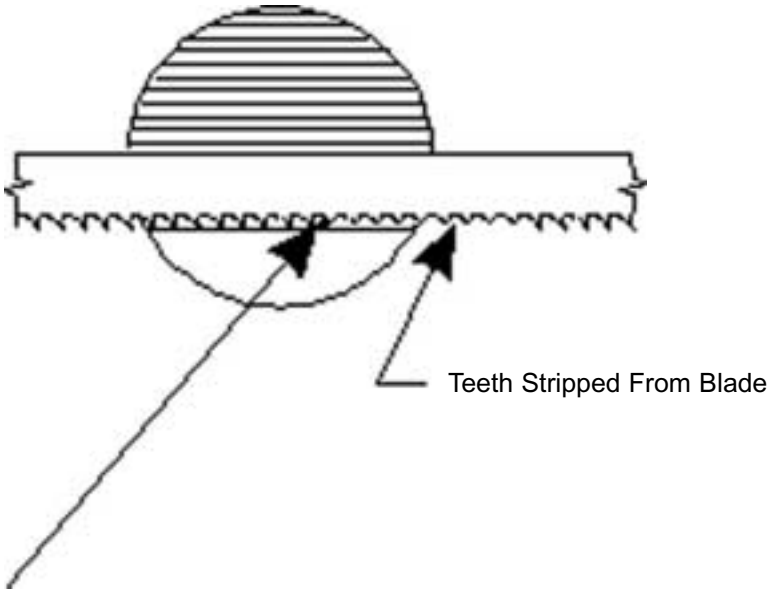
Too large of a chip may tear out the teeth.

The gullets may fill, could shear the teeth.

Defective Blade Tooth

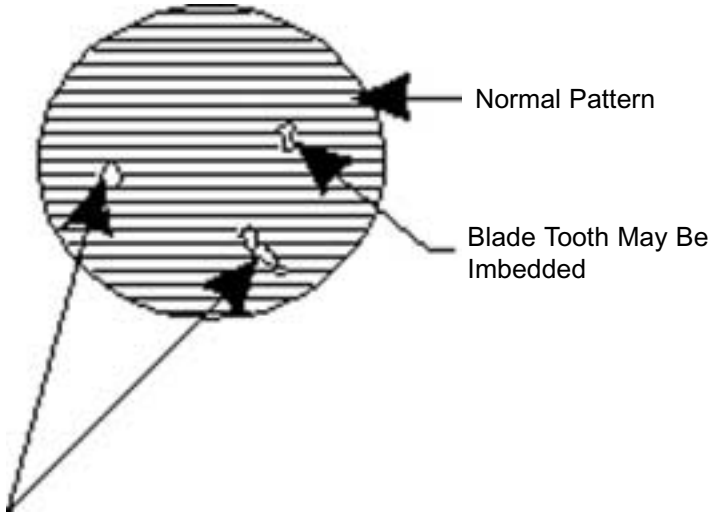


Tooth Stripping From Chip Weld



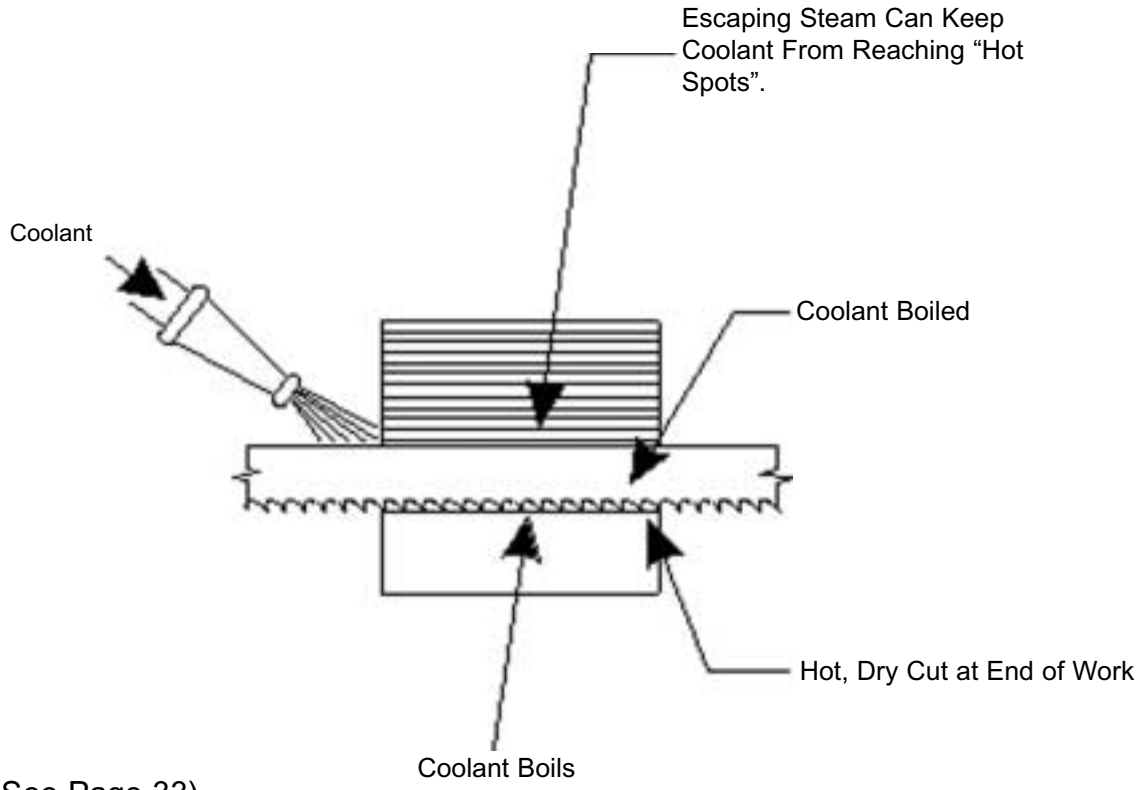
"Welded" Chip Blocks Cutting Path of Teeth and May Tear the Teeth Out.

Chip Welding



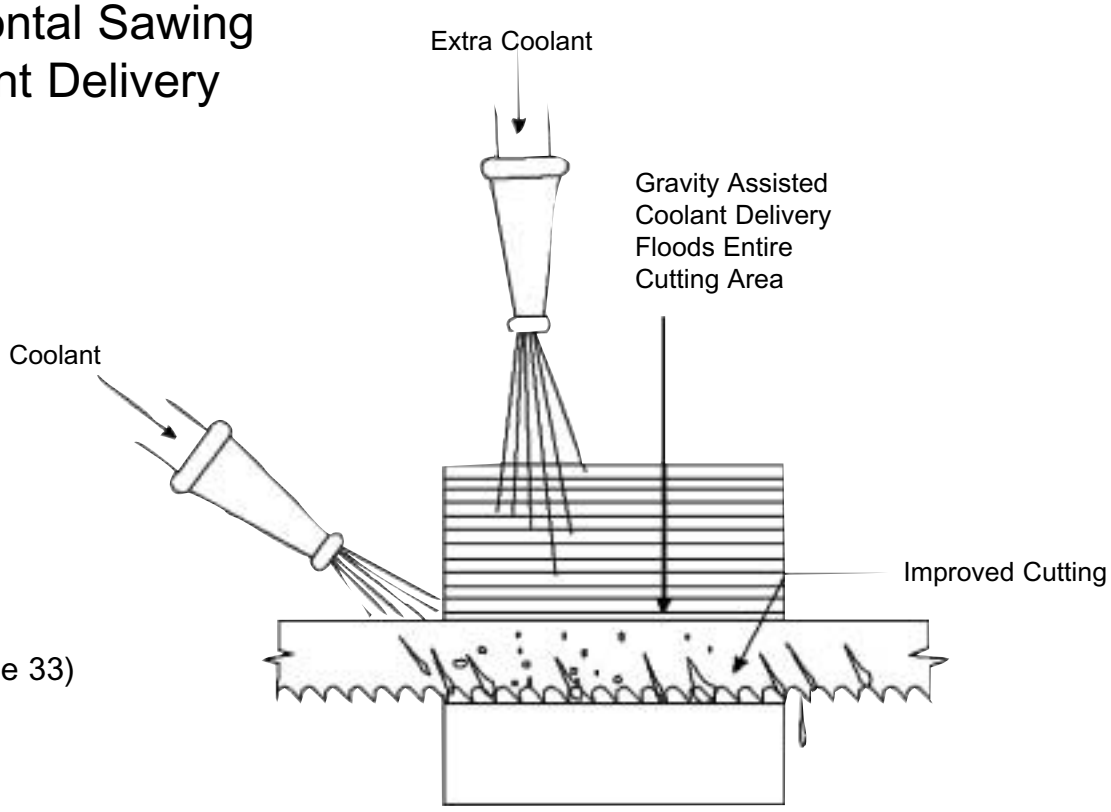
Random Interruptions in Cut Pattern Which are Slightly Raised From Main Surface, Often Appear Polished.

Horizontal Sawing
Insufficient Coolant



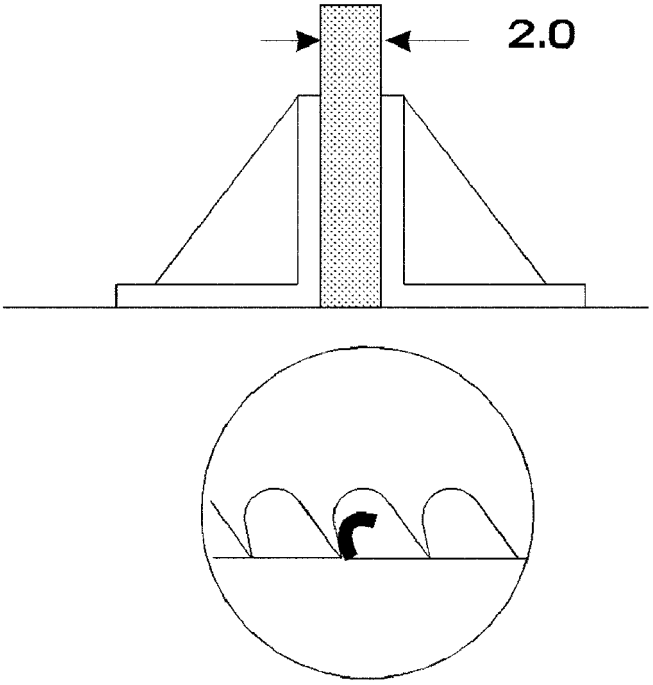
(See Page 33)

Horizontal Sawing
Coolant Delivery



(See Page 33)

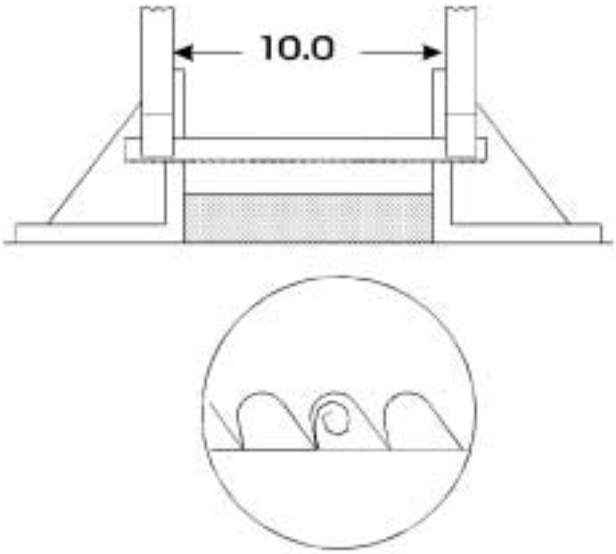
Material Placement



Note:
1. Tooth Pitch compatible to both sections.
2. Same blade speed for both.
3. Same cutting Rate (sq. in/min) for both.
4. See Pages 18 & 31 for reference.

MATERIAL STANDING UP

1. Less sensitive to dull blade.
2. Less heat generated due to tooth being in cut a shorter amount of time. (Producing a shorter, thicker chip)
3. More difficult to handle material.
4. Less sensitive to coolant problems.
5. More accurate cutting. (Due to guide arms being closer together)

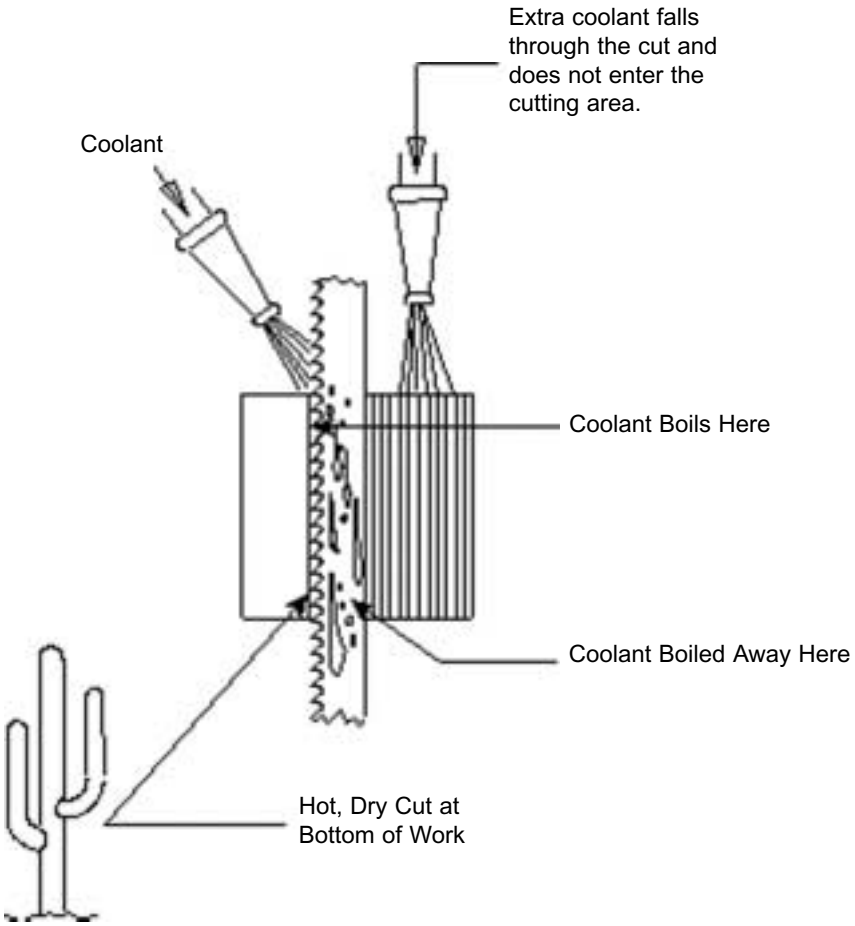


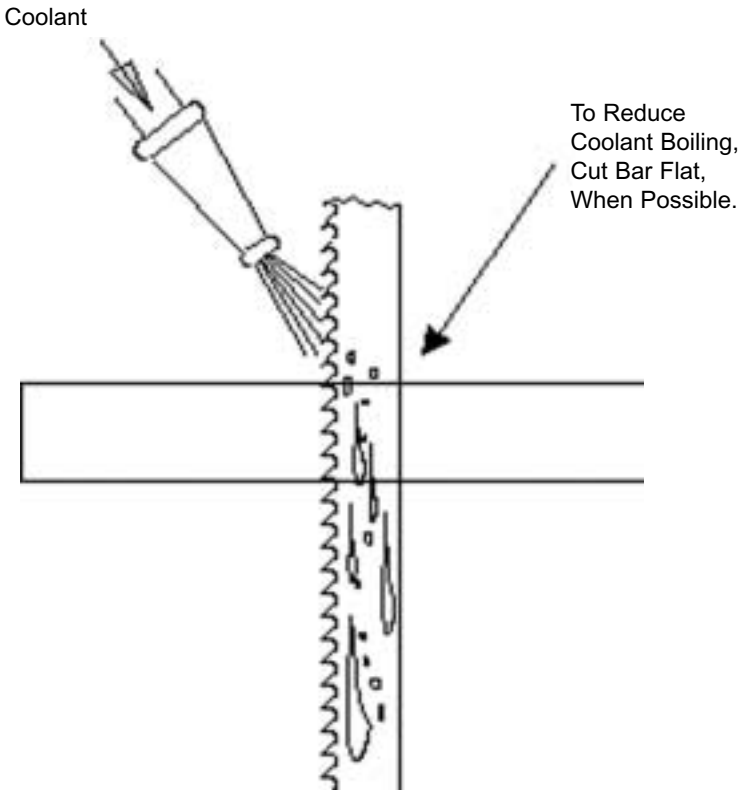
MATERIAL LAYING DOWN

1. More sensitive to dull blade.
2. More heat generated due to tooth being in cut a longer amount of time. (Producing a longer, thinner chip)
3. Easier to handle the material.
4. More sensitive to coolant problems.
5. Less accurate cutting.

NOTE: Using a blade with more positive rake lowers cutting pressure and cuts easier because the tooth is more self-feeding. The negative side is it will break easier and dull sooner. (Page 14, 15, 31)

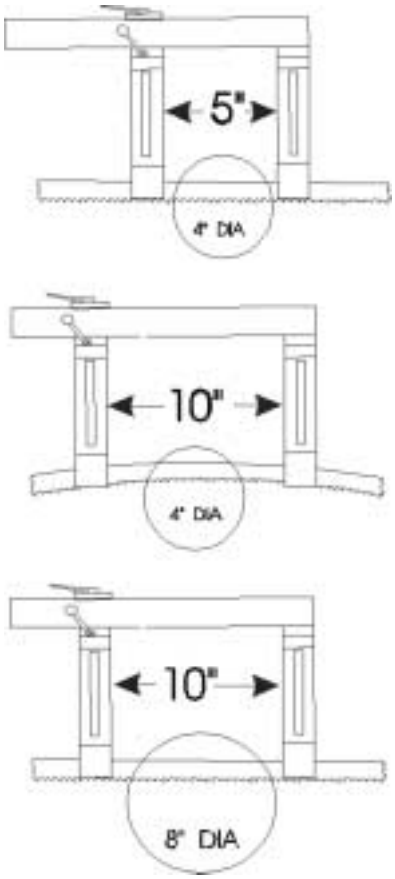
Vertical Sawing Coolant-Delivery





(See Page 33)

An Example of Three Cuts With the Same Blade



1. **Guide Close to the Material.**
   Blade cut within tolerance.

2. **Guide Spacing Doubled.**
   Blade bends up in center and coolant from the guide may not each the material.

3. **Larger Material.**
   Blade bends up in the center. Demand on the coolant is greater to prevent chip welding and to cool and lubricate the cut. The cut deviation may be 8 times more than example 1.

This example is true if the first bar size cut is 20” and the second bar size cut is 40”.
(See Page 12 for the formula)

$$y = \frac{WL^3}{48EI}$$

L = Guide spacing and y = blade drift
First L = 20” so $L^3 = 20 \times 20 \times 20 = 8000$
Second L = 40” so $L^3 = 40 \times 40 \times 40 = 64000$
64000 is 8 times 8000 so the second cut deviation (4) is 8 times the first cuts
(See Page 12 on Guide Spacing)

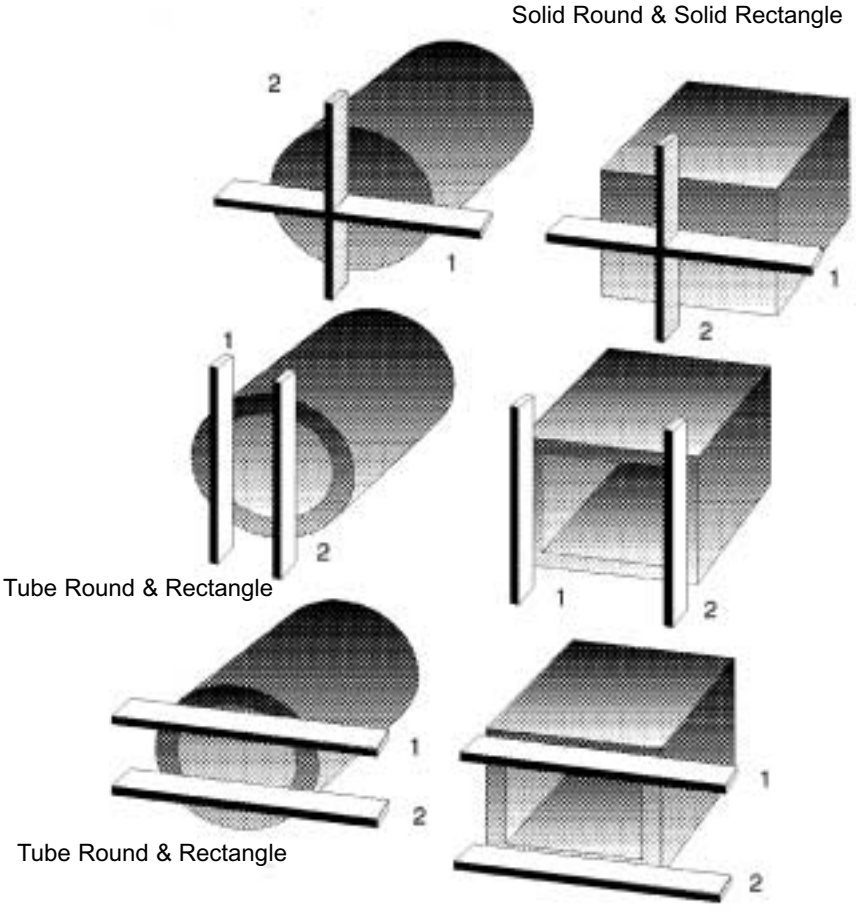
WHAT CAN YOU DO

1. Keep the guides as close as possible.
2. Break the blade in properly. (See Page 17)
3. Use the right feed rate and cutting pressures. (See Page 18-19)
4. Use a quality cutting fluid. (See Page 22)
5. Use the blade enhancer to reduce the cutting force. (See Page 25)
6. Let the cut watcher monitor the cut. (See Page 26)
7. A coarser tooth blade uses less cutting force. (See Page 33-34)
8. Use hook or positive tooth. (See Page 14)

Reading the Saw Cut With a Straight Edge

How to Check For a Flat Cut With a Straight Edge

1. Place a straight edge as shown first at position 1.
2. Then at position 2.

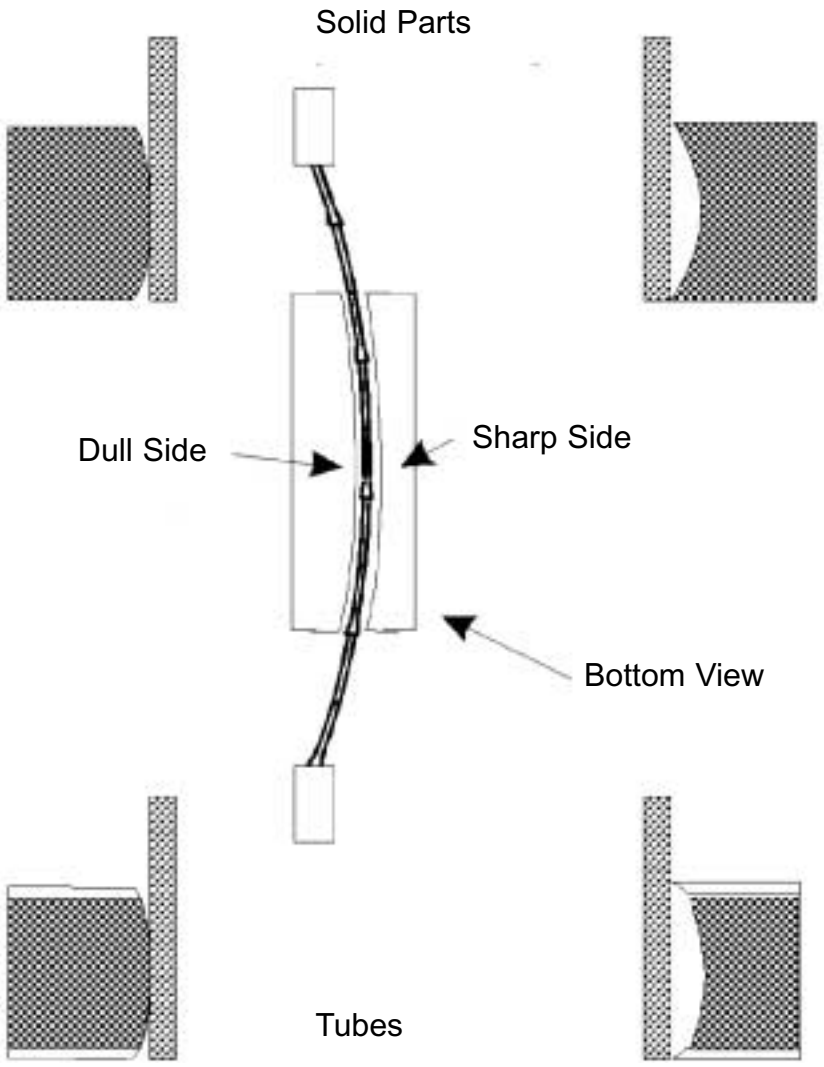


This is What It Will Tell:

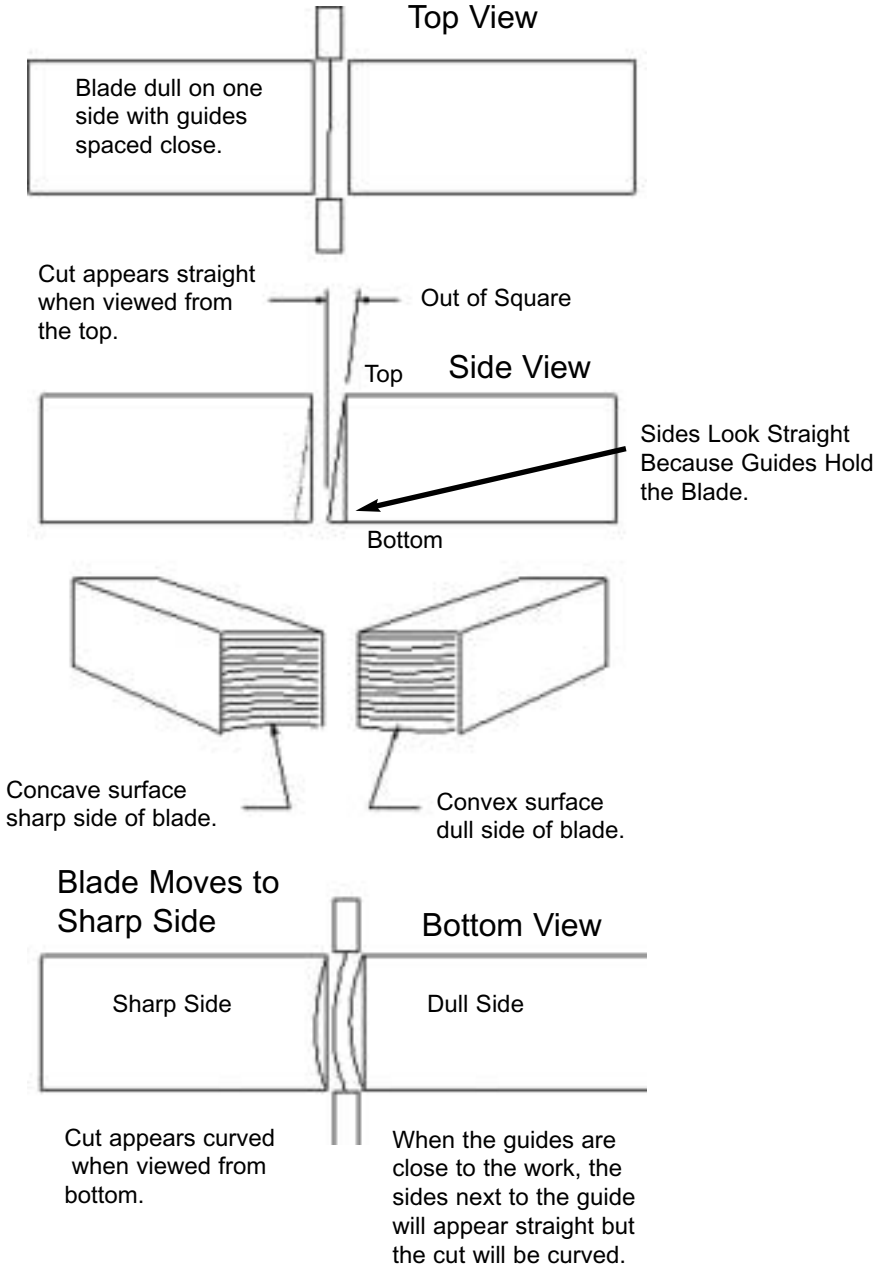
1. If a blade is equally dull on both sides, the blade will cut straight but cutting rate will be slowed and feed pressure increased.
2. If feed pressure is increased too much, a dull blade may “cut out”. “Cutting out” is when a blade leaves a concave or convex surface.
3. A blade that is sharper on one side than the other will “cut out” toward the sharper side.
4. If the blade tension is less than recommended (usually 30,000 PSI) “cutting out” may result.

5. To check an out-of-square cut first check the cut for flatness. If the cut is not flat, find the cause.

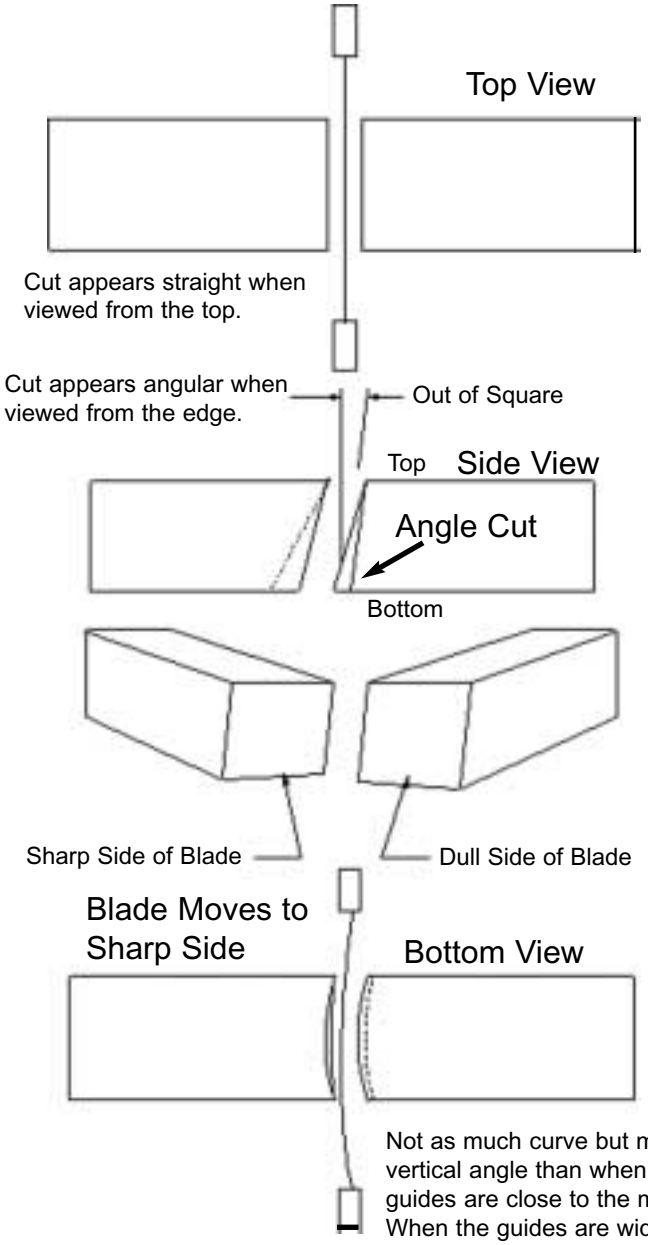
5A. If the blade fall is not vertical “cutting out” may result.



A Blade Dull on One Side Will Move To the Sharp Side.



Blade Dull One Side
Blade Guides Spaced Wide



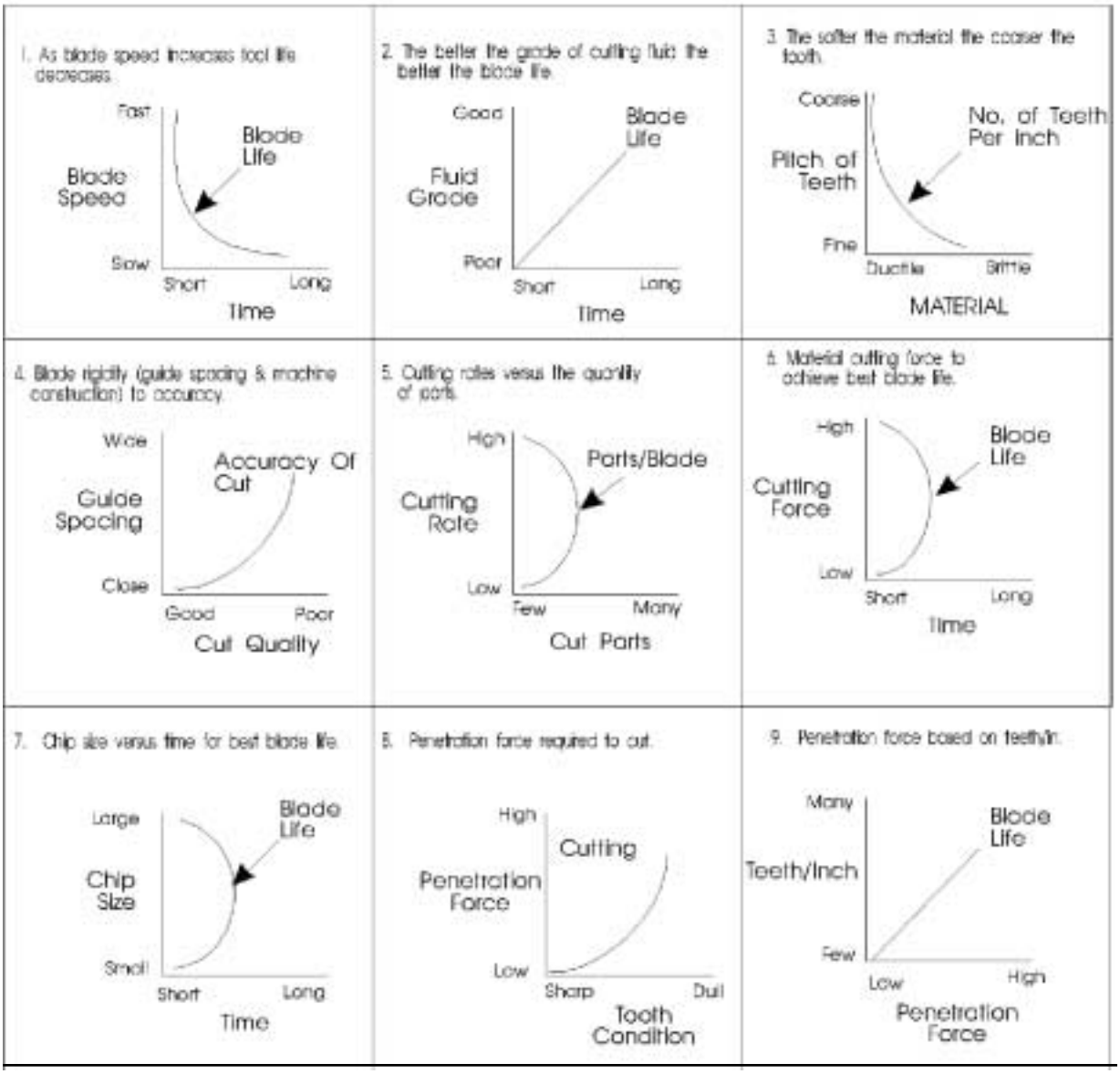
Sides are at an angle because guides **<u>are not holding</u>** the blade.

Blade Performance

Below are graphs that pictorially show some of the interdependence of accuracy, blade life, cutting rate, finish, band speed, cutting fluid, and other factors that affect your sawing operation. The graphic representations are general in nature.

These graphs are meant to give you a feel of what is happening.

Nine Factors That Affect Cutting



HE&M SAW

The saw that cuts straight.

In this booklet we have attempted to provide you with straightforward, impartial information applicable to band saw cutting in general. We woud, however, be less than honest if we didn't mention that we would also like to sell ou one of our find HE&M Saws. Each model is designed to meet all the criteria we have discussed in this guide. Each is designed to be a real machine tool; to do its' job efficiently, reliably, and profitably.

Quality, in both design and manufacture, makes the difference. Quality is an integral part of every HE&M Saw. The longer you own a HE&M Saw and the more you use it, the more you will appreciate its quality and the extra profitability it creates.

If you have any questions regarding band saw cutting in general, or your particular applications, please let us know. We'll be happy to anwer them for you.

HE&M Saw

Hem, Inc.
Mid-America Industrial District
P. O. Box 1148
Pryor, OK 74362
(918) 825-4821

Manufactured under the following patents: 4,605,386; 4,558,614; 4,766,790;
4,901,612; 5,403,907; 5,070,751;4,893,533; 4,117,756; 4,179,961; 4,458,614;
1,259,888 Canada
Other patents pending.

YOUR TAPE MEASURE IS WRONG
(Things that affect measurement accuracy)

The most common method for a saw operator to measure cut parts is with a tape measure. Tape measures have limitations which need to be understood in order to use a tape properly.

Tape Measure Limitations:

Scale Accuracy:

The scale on a tape measure is printed using a belt with the characters on the surface. The belt is guided by rollers over automatic inking rollers and then to the tape measure being printed. Tension in the printing belt and the tape being printed are controlled to provide an accurate scale. There are standards established by the industry which the tape manufacturers are required to meet or exceed. A good brand of tape measure will be more accurate than required by the industry standards.

The National Institute of Standards and Technology (NIST) has established standards for linear measure using metal tapes. The tolerances below are from the NIST Handbook 44, Section 5.52.

NOMINAL INTERVAL FROM ZERO (feet)	TOLERANCE (inch)
6 or less	±1/32
7 to 30, inclusive	±1/16
31 to 55, inclusive	±1/8
56 to 80, inclusive	±3/16
81 to 100, inclusive	±1/4

Some tape manufacturers will have their own standards which will be more accurate than the NIST standards. The NIST standards are the minimum acceptable industry quality.

There is no way for the operator to correct this error.

End Hook:

The hook on the end of the tape allows the user to measure lengths longer than one arm length. This hook must be exactly at the beginning of the tape to get accurate measurements. On most tape measures, this hook is designed to move the amount of the metal thickness of the hook. This is done to allow inside and outside measurements. As a tape measure gets old and worn, the hook may get bent or may move more than it should. If the hook extends 1/16" too far, the part will appear to be 1/16" too short.

The user can compensate for the end hook error by starting the measurement at 1". The safest way is to measure the part first using the hook. This will get the measurement to the proper number of inches and avoid arithmetic errors. The measurement is then repeated starting at 1" to find the fraction of an inch most accurately. This method will give the most accurate measurement possible for any tape measure. This length may still be different from the length measured using a different tape measure because of the printing error discussed above.

Temperature:

Thermal Expansion:

Materials expand and contract with temperature changes. Different materials change length at different rates. A piece of steel which is 100" long will change length by 1/32" with a 50 F change in temperature. A piece of Aluminum the same length will change nearly 1/16" for the same temperature change.

Calibration Temperature:

The definition of a foot length does not vary with temperature. Since the tape material changes length with temperature, it can only be accurate at one temperature. Of course this means your cut part will also only be accurate at one temperature. The appearance of being accurate by measurement with a tape measure will depend on the materials involved.

Similar Materials:

When the temperature and material of the tape are the same as the temperature and material of the piece being cut, the temperature effects will cancel each other. The part length will appear to be accurate as long as the tape and cut part are at the same temperature. This is true even if the temperature is different than when the part was cut.

A steel part is cut and measured at 75 F and measured with a steel tape at 75 F. The part will measure the same if both the part and tape are warmed to 100 F.

If the tape and cut part were different temperatures, the same temperature difference is required to have the part measure the same length.

A piece of steel is cut to 100" at 30 F and measured using a steel tape at 80 F (from the operator's pocket). It will measure longer by 1/32" when the part is warmed to 80 F (if the tape is still 80 F). This is due to temperature alone. The cut piece was contracted (at 30 F) compared to the tape. If the tape is then warmed to 130 F and the part is still at 80 F, it will again measure the proper length. The temperature difference (50 F) is the same as when the part was cut. Actually the part is still too long but the tape measure has expanded even longer and allows the part to look like it is the right length.

Dissimilar Materials:

Different combinations are required when the tape and the work material are not the same. The temperature change for the slower contracting/expanding material will need to be more than for the faster contracting/expanding material. Some examples using a steel tape on an aluminum part will demonstrate the difference.

An aluminum piece is cut and measured at 68 F with a steel tape also at 68 F. If the aluminum warms to 78 F, the steel tape must be warmed to nearly 88 F to get the same measurement.

An aluminum piece is cut at 30 F and measured with a tape at 80 F. When the aluminum is warmed to 80 F, the tape must be warmed to nearly 180 F to get the same measurement. The original temperature difference of 50 F must grow to nearly 100 F since the steel expands more slowly than the aluminum.

Strain (Stretch)

A steel tape will stretch when pulled. The amount of stretch depends on the pulling force, the length, the cross section area of the tape, and the elastic properties of the material. The NIST sets standards for the amount of pull on

a tape during testing. Tapes of 25 ft or more are tested with 10 lb load applied. Tapes less than 25 ft are tested with a 10 lb pull. Flexible metal tapes are tested with no load if they are 25 ft or less and are not normally used with tension applied. A horizontal flat surface supports the tapes throughout the length whenever tested. Metric tapes are tested with slightly different standard lengths and loads.

A tape which is 3/4" wide x .005" thick and 25 feet long will stretch .013" with a 5 lb pull. The same tape will stretch .040" when pulled with 15 lbs. If you use this tape with a 15 lb pull instead of a 5 lb pull, your parts will appear to be .027" short. If your tape was made with no tension, your parts will appear to be .040 short.

The saw and feed table system also have capabilities and tolerances which need to be understood.

Saw accuracy:

Straight, flat, accurate cuts are affected by system design, operator skill, and proper maintenance. The HEM Inc. publication Bandsaw Cutting - Practical Guide presents these factors in detail. This booklet is available from your HEM Inc. representative. Even a properly maintained and well operated system has a tolerance band around the perfect cut.

Length Calibration:

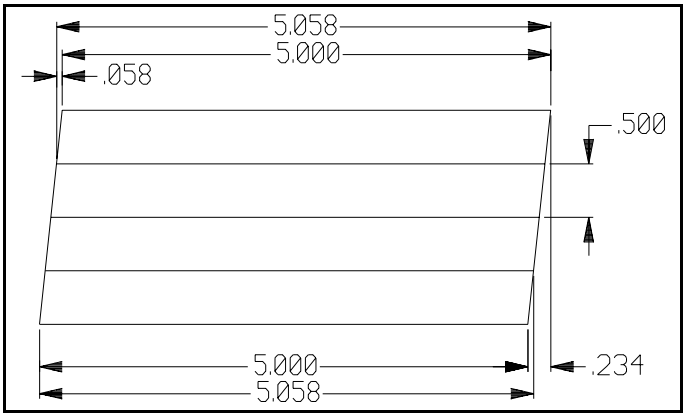
In order to use the length indicator on your feed system, the length must be properly calibrated. A short length of material is cut on the system to be calibrated. The cut piece is then measured using a very accurate device such as a micrometer or dial caliper. The indicator is then set to match the length of the cut piece. The exact procedure will be different for different systems.

Bundle Cutting / Which Piece To Measure:

When cutting bundles, all pieces may not be exactly the same length. It is important to measure several pieces from the bundle. The best method is to measure several pieces from the outside edges of the bundle and some from the center of the bundle. The number of pieces to measure will depend on the bundle size. Near the center of the bundle the saw blade is not supported as well as near the edges. The result is that the blade can wander giving the appearance of an increased kerf. Pieces from the middle of the bundle may

be shorter than others from the same bundle.

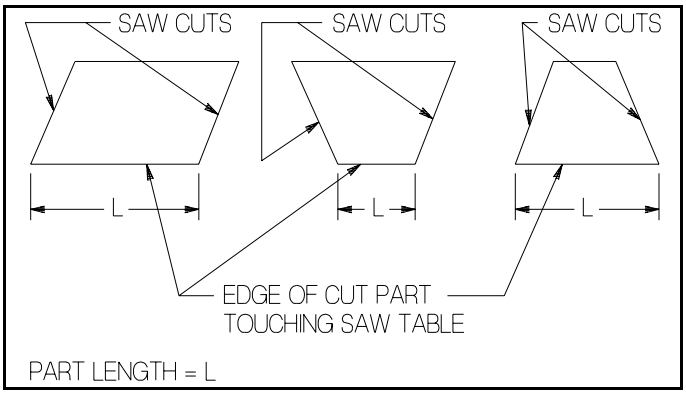
Bundles with several rows of material which are not cut exactly square may still yield useable parts. The example in Figure 1 shows 4 rows of 1/2" thick material. If the required size is 5.00±.06, the bars would be acceptable with regard to length. A separate specification covering squareness of the ends may disqualify them.

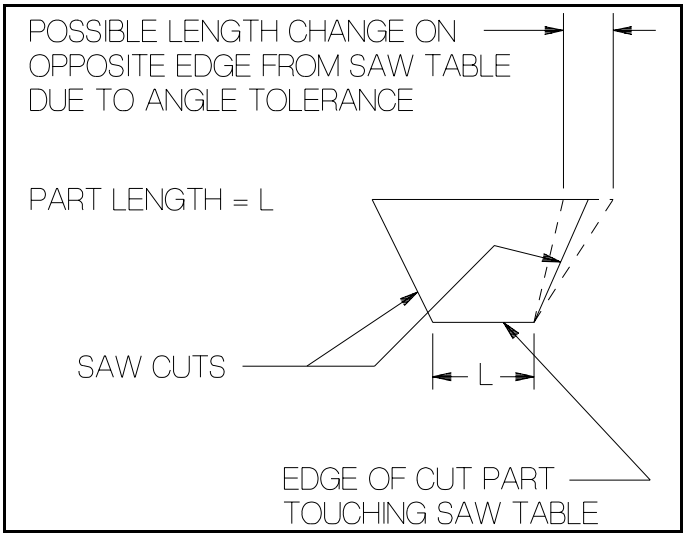


Where To Measure:

Vertical Saws:

The length of parts cut at 90 will be the same regardless of which surface is measured. When the parts are intentionally cut at an angle, they must be measured the same way the saw measured them. On a HE&M Vertical Saw, the surface of the saw table is the reference surface. Therefore, the material surface next to the saw table should be measured. The side where the saw blade first enters the material being cut is the most accurate. Any other surface or position will include tolerances for the tilt angle and blade deviation. On round material, examine the cut to determine the part of the material which was closest to the table. See Figure 2.





The effect of angle tolerance can be seen in the exaggerated example of Figure 3.

Horizontal Saws:

HE&M horizontal saws enter the material from the top. As the blade cuts

through the material it may deviate from a perfect path. The most accurate place to measure a part cut on a horizontal saw is the surface of the part where the blade first entered the cut.

Part Tolerances:

There are several common ways for a part length to have a tolerance applied. The most common way is a bilateral tolerance with a nominal length and an equal tolerance band for both longer and shorter acceptable lengths. (Example: 100.00 ±.12") Unilateral tolerances indicate the designer's preference toward one side of the allowable length deviation. (Example 100.12 +.00/-.24") Non-equal tolerance bands also indicate a preference for a nominal dimension other than the length in the middle. (Example: 100.06 +.06/-.18") Upper/lower limits can also be used. (Example: 100.12/99.88) Note that in each example the minimum acceptable length is 99.88" and the maximum acceptable length is 100.12". **Any length between these limits is acceptable.**

Some processes favor unilateral tolerances. These processes usually remove material from an exposed surface. Bandsaws and feed tables favor the normal bilateral tolerance. The mechanics of positioning a piece of material to be cut are equally likely to be long or short. When the allowable part tolerance is nearly as small as the bandsaw is capable of maintaining, the most acceptable parts will be obtained by setting the cut length to the middle of the tolerance band.