



## S-20/23 A

### 395427

January 2006 Revision A

THANK YOU,

On behalf of everyone at **HYD-MECH**, I would like to thank and congratulate you on your decision to purchase a **HYD-MECH** band saw.

Your new machine is now ready to play a key role in increasing the efficiency of your operation, helping you to reduce cutting costs while boosting quality and productivity.

To ensure you are maximizing the power and versatility of your new **HYD-MECH** band saw, please take the time to familiarize yourself and your employees with the correct operation and maintenance procedures as outlined in this manual.

We sincerely appreciate the confidence you have demonstrated in purchasing our product and look forward to building a long and mutually beneficial relationship.

Thank-you.

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# SECTION 0 - SAFETY INSTRUCTIONS

## SUMMARY

All persons operating this machine must have read and understood all of the following sections of this Manual:

Section 0	SAFETY
Section 2	OPERATING INSTRUCTIONS

However, as a memory aid, the following is a summary of the Safety Section.

### Put Safety First

**Mandatory Information** – What operators and maintenance people must have read and understood.

**Signatures** – Everyone involved with this machine must sign to confirm they have read and understood mandatory information.

**Basic Rules** – only use this machine when

- it is in good working order
- all safety equipment is in place and functional
- operations are in compliance with this manual
- materials are within designed specifications and are non-hazardous

**Owner is responsible to**

- keep Manual accessible at the machine
- ensure only reliable, fully trained personnel work with the machine
- clearly define responsibilities of all personnel working with the machine
- keep the machine in good working order

**Operator and Maintenance Personnel are responsible to:**

- keep all safety equipment in order, check its function at the beginning of each shift, and report any shortcomings
- shut-down machine and report any faults or malfunctions which could impair safety
- understand and obey safety hazard labels
- not to wear un-restrained long hair, loose clothing or jewellery
- wear all required personal protective equipment
- not to wear gloves within 24 inches of moving blade
- maintain a clean working area and machine
- always use Lock-out when performing maintenance or repairs.

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## **FOREWORD**

### **Put Safety First!**

This Safety Section contains important information to help you work safely with your machine and describes the dangers inherent in our machines. Some of these dangers are obvious, while others are less evident.

It really is important to PUT SAFETY FIRST. Make it a habit to consider the hazards associated with any action BEFORE you do it. If you feel any uncertainty, stop and find a safer approach to the action. If you're still uncertain, ask for advice from your supervisor.

The SAFETY FIRST approach is particularly necessary when you do something new, or different, and most people instinctively recognize this, although impatience may still cause them to take unnecessary risks.

Danger also lurks in the routine task that we have done over and over. Here, familiarity, boredom, or tiredness may lull us into unthinking, automatic repetition. Be alert for this, and when you feel it happening, stop and take stock of your situation. Review the safety hazards associated with what you are doing. That should get your brain working again.

Certainly production is important, but if you think you're too busy to put safety first, think how much production you'll lose if you get hurt.

You owe it to yourself, your family, and your co-workers to PUT SAFETY FIRST.

### **Mandatory Information**

All persons operating this machine must have read and understood all of the following sections of this Manual:

Section 0        SAFETY

Section 2        OPERATING INSTRUCTIONS

Personnel involved in installation and maintenance of the machine must have read and understood all sections of the manual

Persons who have difficulty reading, or for whom English is not their first language, must receive particularly thorough instruction.

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## Signatures

Everyone involved in operation of this machine must sign below to confirm that:

I have read and understood all parts of Section 0 – Safety, and Section 2 – Operating Instructions.

Name	Date	Signature

Everyone involved in the installation, inspection, maintenance, and repair of this machine must sign below to confirm that:

I have read and understood all parts of this Operation and Maintenance Manual.

Name	Date	Signature

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## BASIC RULES

### Intended Use

Our machines are designed and built in line with the state of the art, and specifically in accordance with American National Standards Institute Standard B11.10 *Safety Requirements for Metal Sawing Machines*. However, all machines may endanger the safety of their users and/or third parties, and be damaged, or damage other property, if they are operated incorrectly, used beyond their specified capacity, or for purposes other than those specified in this Manual.

### Exclusion of Misuse

Misuse includes, for example:

Sawing hazardous materials such as magnesium or lead

Sawing work pieces which exceed the maximum workload appearing in the Specifications

Operating the machine without all original safety equipment and guards

### Liability

The machine may only be operated:

when it is in good working order, and

when the operator has read and understood the Safety and Operating Instructions Sections of the Manual, and

when all operations and procedures are in compliance with this Manual.

Hyd-Mech Group cannot accept any liability for personal injury or property damage due to operator errors or non-compliance with the Safety and Operating Instructions contained in this Manual.



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## Responsibilities of the owner

### Organization of work

This Operation and Maintenance Manual must always be kept near the machine so that it is accessible to all concerned.

The general, statutory and other legal regulations on accident prevention and environmental protection must also be observed, in addition to the Manual material. The operators and maintenance personnel must be instructed accordingly. This obligation also includes the handling of dangerous substances and the provision and use of personal protective equipment.

### Choice and qualification of personnel

Ensure that work on the machine is only carried out by reliable persons who have been appropriately trained for such work.

### Training

Everyone working on or with the machine must be duly trained with regard to the correct use of the machine, the correct use of safety equipment, the foreseeable dangers that may arise during operation of the machine, and the safety precautions to be taken.

In addition, the personnel must be instructed to check all safety devices at regular intervals.

### Define responsibilities

Clearly define exactly who is responsible for operating, setting-up, servicing and repairing the machine.

Define the responsibilities of the machine operator and authorize him to refuse any instructions by third parties if they run contrary to the machine's safety.

Persons being trained on the machine may only work on or with the machine under the constant supervision of an experienced operator. Observe the minimum age limits required by law.

### Condition of Machine and Workplace

Ensure that the machine and its safety equipment is kept in good working order.

Ensure that the work area is well lit, and protected from the elements, such as rain, snow, abrasive dust, and extremes of temperature.

Ensure that the machine is installed with sufficient clearance around it for the safe loading and unloading of work pieces.

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## Responsibilities of the operator and maintenance personnel

### Safety equipment

All machines are delivered with safety equipment that must not be removed or bypassed during operation.

The correct functioning of safety equipment on the machine must be checked:

- at the start of every shift.
- after maintenance and repair work
- when starting for the first time, and after prolonged shutdowns

### Emergency Stop Button ( E-Stops)

Always be aware of the location of the Emergency Stop Button(s). Do not allow material or objects to block your access to an Emergency Stop.

### Damage

If any changes capable of impairing safety are observed in the machine or its operation, such as damage, malfunctions, or irregularities, then appropriate steps must be taken immediately, the machine switched off, locked-out, and the fault reported to the responsible person.

### Safe operation

The machine may only be operated when in good working order and when all protective equipment is in place and operational.

Keep a safe distance from all moving parts – especially the blade and vises

Stock should not be loaded onto the saw if the blade is running

Long and heavy stock should always be properly supported in front of and behind the saw.

### Faults

The machine must be switched off and locked-out before starting to remedy any faults.

### Safety hazard labels

Safety hazard labels, and other instructional labels on the machine must be observed. They must be clearly visible and legible at all times. If they become damaged they must be replaced.

### Clothing, jewellery, protective equipment

Personnel operating or working on the machine must not wear un-restrained long hair, loose-fitting clothes and dangling jewellery.

When operating or working on the machine, always wear suitable, officially tested personal protective equipment such as safety glasses and safety boots and any other equipment required by plant regulations.

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## Gloves

Experience has shown that careless use of gloves around machinery is a major factor in serious hand injuries.

Gloves should not be worn when operating or adjusting the machine, except:

Wear protective gloves when handling bandsaw blades at blade changes.

Gloves may be worn when handling work pieces, only if the machine is in Manual Mode and the bandsaw blade is not running.

If the machine is running in Auto Mode, and only if the cut parts are greater than 24 inches long, it may be possible to safely wear gloves for handling the cut parts, but the wearer of the gloves must never put his hands near the blade for any reason. If the cut parts are less than 24 inches long, it is required to arrange their automatic flow into a parts bucket or other suitable arrangement to avoid the necessity to pick them off the machine by hand.

## Hearing protection

Ear protection must be worn whenever necessary.

The level and duration of noise emission requiring hearing protection depends upon the national regulations in the country in which the machine is being used.

The actual level of noise emission by band sawing machines depends upon work piece size, shape and material, blade type, blade speed and feed rate.

The only practical course of action is to measure the actual noise emission levels for the type of work that is typically done. With reference to national standards, decide upon the necessary hearing protection required.

In the absence of such measurements, it is advisable for anyone exposed to long periods of moderate to loud noise to wear hearing protection. It is important to understand that hearing loss is gradual and easily goes un-noticed until it is serious and irreversible.

## Workplace

A clear working area without any obstructions is essential for safe operation of the machine. The floor must be level and clean, without any build-up of chips, off-cuts, coolant, or hydraulic oil.

The workplace must be well lit, and protected from the elements, such as rain, snow, abrasive dust, and extremes of temperature

Nothing may ever be placed on, or leaned against the machine, with the obvious exception of the work piece on the table and conveyor of the machine.

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## Master Disconnect

Lock-out the machine before undertaking any maintenance or repair work on it. 'Lock-out' refers switching off the master electrical disconnect switch, and locking it out so that it cannot be switched on again without authorization.

On Hyd-Mech machines the Master Disconnect Switch will be of one of three types:

- Rotary switch mounted in electrical control cabinet door and inter-locked with door
- Lever switch mounted in separate box mounted on the machine
- Supply disconnect switch supplied by user at installation and usually wall-mounted within sight of the machine, depending upon local regulations.

In almost all jurisdictions, it is required that owners of industrial equipment establish and post lock-out procedures. Know and use the lock-out procedures of your company or organization.

## Residual Risks

The machine is still not completely de-energized if an electrical cabinet door type switch is locked-out.

The line side of the disconnect switch itself remains energized.

Variable speed blade drives store dangerous voltage in their capacitors, and this requires time to dissipate. After locking out power, wait 3 minutes before beginning to work on machine electrical circuits.

If compressed air is supplied to the machine to power a mist lubrication system or other devices, it should be disconnected, and any stored air pressure released before working on the machine.

The weight of individual machine components represents stored potential energy that can be released if they fall when disconnected. Secure these components with adequate hoisting gear before disassembly.

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# SECTION 1 - INSTALLATION

## INSTALLATION

Upon delivery of your new S-20/23A saw, it is imperative that a thorough inspection be undertaken to check for any damage that could have been sustained during shipping. Special attention should be paid to the electrical and hydraulic systems to check for damaged cords, hoses and fluid leaks. In the event of damage caused during shipping, contact your carrier to file a damage claim.

## SAFETY PRECAUTIONS

The S-20/23A has been designed to give years of reliable service. It is essential that operators be alerted to the safe operation of this saw, and the practices to avoid that could lead to injury. The following safety rules are at the minimum necessary for the safe installation, operation, and maintenance of the saw. Take every precaution for the protection of operators and maintenance personnel.

- POWER HOOK-UPS AND REPAIRS SHOULD BE ATTEMPTED ONLY BY QUALIFIED TRADESMEN.
- THE SAW SHOULD BE LOCATED IN AN AREA WITH SUFFICIENT ROOM TO SAFELY LOAD STOCK INTO THE SAW. SECURE THE SAW TO THE FLOOR.
- THE AREA AROUND THE SAW SHOULD BE MAINTAINED IN A CLEAN AND TIDY CONDITION TO AVOID OBSTACLES OPERATORS COULD TRIP OVER.
- THE S-20/23A SHOULD ONLY BE OPERATED ACCORDING TO THE SPECIFICATIONS OF THE SAW. AVOID UNSAFE USAGE PRACTICES.
- IF AT ANY TIME THE SAW DOES NOT APPEAR TO BE OPERATING PROPERLY IT SHOULD BE STOPPED IMMEDIATELY AND REPAIRED.

### OPERATOR:

- THE SAW SHOULD NEVER BE OPERATED UNLESS ALL GUARDS AND DOORS ARE IN PLACE AND CLOSED.
- KEEP A SAFE DISTANCE FROM ALL MOVING PARTS - ESPECIALLY THE BLADE AND VISES.
- LOOSE CLOTHING AND GLOVES SHOULD NEVER BE WORN WHILE OPERATING THE SAW. COVER LONG HAIR.
- STOCK SHOULD NOT BE LOADED ONTO THE SAW IF THE BLADE IS RUNNING.
- LONG AND HEAVY STOCK SHOULD ALWAYS BE PROPERLY SUPPORTED IN FRONT OF AND BEHIND THE SAW.
- NEVER ATTEMPT TO DISLodge OR MOVE STOCK WHILE THE BLADE IS MOVING. TAKE THE TIME TO STOP THE SAW BLADE, REMOVE OBSTRUCTIONS, AND RESTART BLADE.
- MUST WEAR EYE PROTECTION
- MAINTAIN PROPER ADJUSTMENT OF BLADE TENSION, BLADE GUIDES, AND THRUST BEARINGS
- HOLD WORK PIECE FIRMLY AGAINST TABLE
- DO NOT REMOVE JAMMED CUTOFF PIECES UNTIL BLADE HAS STOPPED

NO MODIFICATIONS TO THE MACHINE ARE PERMITTED WITHOUT PRIOR APPROVAL FROM HYD-MECH. ANY APPROVED MODIFICATIONS SHOULD ONLY BE UNDERTAKEN BY TRAINED PERSONNEL.

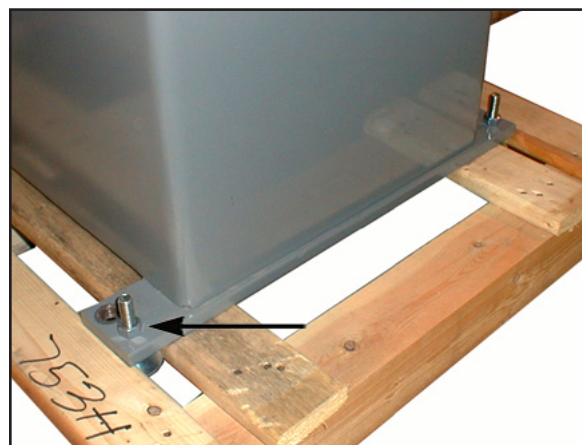


### LIFTING THE S-20/23A WITH A FORK LIFT

The S-20/23A is shipped with a shipping pallet attached to the saw. When lifting the pallet with a forklift truck make sure that the load is firmly balanced. The following photo shows a lift truck lifting the saw and pallet from the correct side. The pallet length dimension is 84" (2132 mm). Minimum fork length of 72" (1827 mm) is recommended to safely lift the pallet.

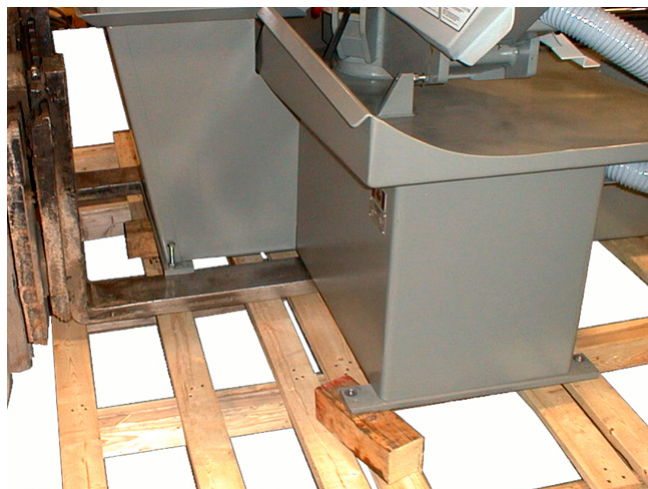
### WRAPPED FOR SHIPPING

The S-20/23A is shrink-wrapped for shipping from our plant. Remove the wrapping from around the saw. Complete the inspection for signs of damage. Undo the bolts that hold the saw to the pallet. Retain these bolts to use for leveling. The following photo illustrates the floor mounting plates located at the corners of the saw. The larger diameter hole is used for retaining during shipping and for use with concrete floor anchors. The smaller diameter, threaded holes at each corner are used for leveling the saw properly.



### REMOVING THE SAW FROM THE SKID

Lift the right side of the saw as shown with the lift truck and place two blocks under the saw as shown. With the lift truck (fork length 72" (1830mm) min, rated for 1800 lbs (850 kg) min), lift the saw from this skid at the front of the machine as shown and place it where required.





## LEVELLING THE SAW

Use a machinist's level across the vise table to level the saw. Adjust the level with the leveling bolts supplied. Consideration should be given to the flow of the coolant as it returns to the coolant trough at the vise end of the saw. Leveling to give a small incline towards this area helps to ensure the coolant supply returns to the container.

## HYDRAULIC OIL

The S-20/23A option is supplied with ISO VG22 hydraulic oil. Substitutes should be of the same viscosity hydraulic oil.

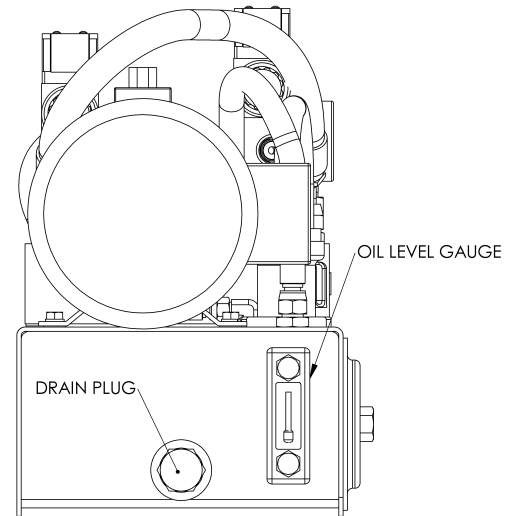
The cylinder contains oil in a reservoir that should be topped up to the level of the filler plug. Add oil to the cylinder only with the head in the down position. The head cylinder is a self air bleeding cylinder with a small port in the top plate. If excess oil is displaced from this port, the cylinder is working normally.

## CUTTING FLUID

The S-20/23A uses a pump and reservoir to circulate the necessary cutting fluid to the blade for maximum blade life. Your saw blade supplier will be able to provide information to the cutting fluid products that are available for your needs.

No cutting fluid (coolant) is supplied with the machine. There are two types of coolant available:

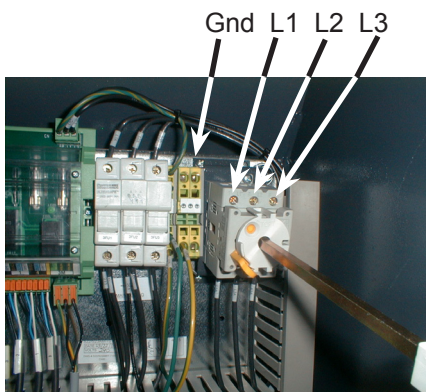
- Oil based; dilute 1:10 ratio (one part concentrated coolant to 10 parts water)
- Synthetic; dilute as recommended by manufacturer.



## POWER WIRING CONNECTIONS

When the machine has been anchored and leveled the power hook-up is the last installation step. In order to prevent potential damage to the machine, only qualified personnel should make the electrical connections. If the hydraulics does not register an immediate pressure rise, **SHUT THE HYDRAULIS OFF** and change the phase order. As supplied, your new S-20/23 A is set to run on three phase voltage. The supply voltage of the machine is shown on the serial plate attached to the front of the machine. Connection from the main supply is made to L1, L2, L3 and ground terminals in the electrical box as shown below.

Check for: Signs of damage to the electrical cables from shipping and/or installation.  
Correct phase order. The blade should be running counter clockwise. If incorrect, two lines should be reversed.



Main power connections found inside the control box



The power cable should be routed through the hole found at the bottom right of the control box. A suitable strain relief should be used.





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## SECTION 2 – OPERATING INSTRUCTIONS

This section has been prepared to give the operator the ability to set up the saw for most cutting situations. Before starting the bandsaw, or cutting any material, the operator should be familiar with all operations and controls as well as the basic cutting theory described below. The saw is equipped with a variable blade speed control and hydraulic feed control, as well as an extensive door chart to guide the operator to the correct setting of these controls.

### BLADE BASICS

Technology is rapidly changing all aspects of production machining. Metal cutoff is no exception. The advances made in the band saw blade industry have definitely reduced the cost per cut, despite the three-fold increase in price of high-technology blades. Variable pitch, bi-metal blades (like the 4/6 or  $\frac{3}{4}$  bi-metal blade supplied with the machine) last much longer, cut faster and more accurately than conventional carbon steel blades. In order to take advantage of the superiority of bi-metal blades, it is critical to properly “break-in” a new blade. This is accomplished by taking two or three cuts through solid four or five-inch diameter mild steel at an *extremely slow* feed rate. It is also advisable to utilize a slow blade speed.

These two or three slow cuts sufficiently lap (polish) the teeth on the new blade so that it does not snag the material being cut. Proper break-in will alleviate blade vibration; improve surface finish, accuracy, and blade life.

After “break-in”, the following six points must be closely monitored to ensure long blade life:

1. Proper blade tension should be maintained (see Section 3 – Maintenance and Trouble Shooting)
2. Generous coolant application is essential with most materials. A high quality and well-mixed coolant will extend blade life, and also increase cutting rate and quality. On those materials where coolant is undesirable for cutting, a slight coolant flow or periodic oiling of the blade is necessary to prevent the blade from being scored by the carbide guides.
3. The stock being cut must be securely clamped in the vises.
4. The proper feed force must be chosen. (See Saw Cutting Parameters: Step 2)
5. The proper blade speed must be selected. (See Saw Cutting Parameters: Step 4)
6. The proper feed rate must be applied. (See Saw Cutting Parameters: Step 5)

### SEQUENCER CONTROL

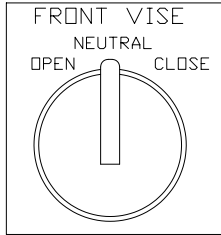
Console controls are divided into three groups:

1. Panel Mounted Pushbuttons and Selector Switches
2. PLC Operator Interface Display and Pushbuttons
3. Hydraulic Feed Controls



S-20/23A SEQUENCER CONTROL CONSOLE

## PANEL MOUNTED PUSHBUTTONS AND SELECTOR SWITCHES

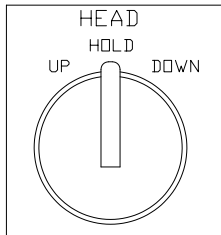


**Front Vise** – This selector switch has three positions, OPEN, NEUTRAL, and CLOSE. This switch must be in NEUTRAL before the hydraulic system can be started.

In OPEN, the front (saw) vise will open all the way, or until the switch is released.

In HOLD, the vise will stay where it is, and will not move freely, although it will not resist a large force indefinitely without creeping.

In CLOSE, the vise will close all the way to the fixed jaw, or until it encounters enough resistance to stop it.

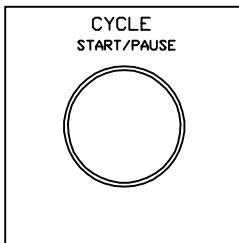


**Head** – This selector switch has three positions, UP, HOLD, and DOWN.

This switch must be in NEUTRAL before the hydraulic system can be started. In UP, the head will rise until it reaches the head up limit, set by means of the PLC Interface.

In HOLD, the head will stay still, although it may creep down, but at a rate less than 0.005 inch per minute.

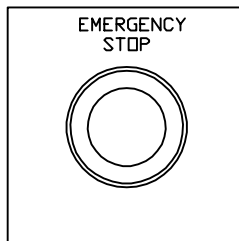
In DOWN, the head will descend until it reaches the head down position. The speed of descent is controlled by the Head Feed Rate and Head Force controls.



**Cycle Start / Pause** – A green pushbutton, when cycle is running a flashing message CYCLE IS ON is displayed on the operator interface panel.

In Auto Mode or Single Cut Mode, pushing this button starts the cycle.

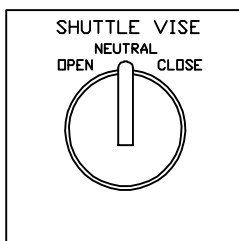
After a cycle has been started, it may be put into Pause by pressing the Cycle Start / Pause button and message JOB IS PAUSED – TO RESUME PRESS CYCLE is displayed on the operator interface panel. Pressing the button again causes the cycle to resume. In Pause, all machine motions will stop, except blade will continue to run.



**Emergency Stop** – This red mushroom head pushbutton stops the blade and hydraulic pump motors. All machine motions will stop.

Both vises will hold their positions, but clamping force will begin to fall off. Consequently, long workpieces should always be supported so that they will not fall if vise clamping force is removed.

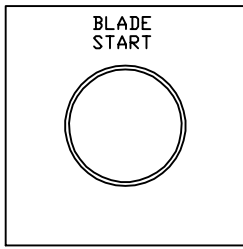
The PLC Interface will also be turned off, and any cycle in process will end. The Emergency Stop is a latching pushbutton and must be pulled out to permit restarting the machine.



**Shuttle Vise** - This selector switch has three positions, OPEN, NEUTRAL, and CLOSE. This switch must be in NEUTRAL before the hydraulic system can be started.

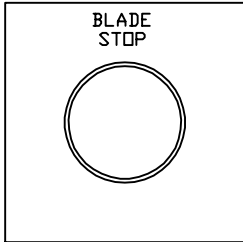
In OPEN, the auxiliary (shuttle) vise will open all the way, or until the switch is released.

In HOLD, the vise will stay where it is, and will not move freely, although it will not resist a large force indefinitely without creeping.



In CLOSE, the vise will close all the way to the fixed jaw, or until it encounters enough resistance to stop it.

**Blade Start** – A green pushbutton, illuminated whenever the blade motor is running. To start the blade motor, the Hydraulics must be running, and the head must **not** be on the Head Down Limit Switch. In Single Cut Cycle and Auto Cycle, the PLC Interface Display prompts Blade Start to enable the cycle to continue. When restarting after the Emergency Stop Button is pressed, there will be a 30 second delay from the starting of hydraulics before the blade motor can be started.



**Blade Stop** - A black pushbutton. Pushing this button at any time will stop the blade motor. In any auto cycle, the blade will stop and head descent will be prevented. Other cycle motions will continue until the head descent portion of the cycle, at which point the cycle will wait until the blade is restarted.

## HMI KEYS



**Function Keys** - Provide functions that depend upon the Mode in which the saw is running, as described in the table on the following page

**Numeric Keys** - are used to write numbers into the value fields in the various display screens.

**Number Key** – Must be held down when writing numbers into the value fields in the various display screens.

**Navigation Keys** – are used to move the cursor up and down, or left and right, from value field to value field, within a screen.

Some screens, such as the Queue Screen or the Parameter Screen, are bigger than the two lines which the display can show, and the up and down navigation keys can scroll the up and down.

**Back Key** – is of limited use in this application, but basically moves cursor back to previous value field.

**Enter Key** – is used to 'enter' or store newly written numbers.

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## DISPLAY

The display communicates with the operator through the 8 different screens shown in the Screen Map on page In addition there are the following special screens

Start-up screens – actually a group of screens that display in rapid sequence at start-up.

PLC Parameter Screen – entered only by password to permit fundamental changes to the way in which the machine operates.

## Index Cycle Types

Depending on the part length, the Sequencer selects between two different types of indexing.

**Single Indexing** is used if part length is less than one, maximum shuttle length.

1. The shuttle retracts to the length of one part, plus kerf allowance.
2. Shuttle Vise closes.
3. Front Vise opens.
4. Shuttle advances to Home position.
5. Front Vise closes.
6. Simultaneously:
  - a. Head descends to down position, cutting part.
  - b. Shuttle Vise opens and Shuttle retracts to the length of one part, plus kerf allowance, and Shuttle Vise closes.
7. Head rises to up limit.
8. Steps 3 – 7 repeat until required parts are cut, except Shuttle stays at Home position during last cut.

**Multi Indexing** is used if part length is greater than maximum shuttle length, but less than 220”.

1. The shuttle retracts fully.
2. Shuttle Vise closes.
3. Front Vise opens.
4. Shuttle advances to Home position.
5. Front Vise closes.
6. Shuttle Vise opens.
7. Shuttle retracts.
8. Steps 2-7 will repeat until part length plus kerf is reached, after when the front vise will close for the cut.
9. Simultaneously:
  - a. Head descends to down position, cutting part.
  - b. Shuttle Vise opens and Shuttle retracts fully, and Shuttle Vise closes.
10. Head rises to up limit.
11. Steps 3 – 7 repeat until required parts are cut, except Shuttle stays at Home position during last cut.

With two Index Cycle types, when required number of parts is cut: the cycle stops

Hydraulic pump and blade motors shut down the PLC remains powered, but returns to Manual Mode

The sequencer controller provides the operator with the ability to operate in three modes:

**Manual Mode** – Permits the operator to control all machine functions using the panel mounted selector switches and pushbuttons, as well as Operator Interface Function Keys.

**Single Cut Mode** – Permits the operator to enter a part length, and then advance and cut a single part automatically.

**Automatic Job Mode** – is used to automatically cut a ‘job’ – a preset quantity of identical parts.

Manual Mode				
<p>With power to saw pull-out E-stop. Display lights with 'E100 v6.03'. Display flashes though intermediate screens to Machine Start screen (<b>only active with Front Vise, Shuttle Vise, and Head switches all in neutral</b>).</p> <p>- Press F1 function key labeled <b>START</b>. Hydraulics start and display change to Manual Mode.</p> <p>- <b>WASH</b> will start the coolant pump motor.</p> <p>- <b>STOP</b> will stop the hydraulic pump motor.</p>	<b>MACHINE</b>			
	<b>START</b>	<b>WASH</b>	<b>STOP</b>	
<p>Front Vise, Shuttle Vise, and Head switches all become active and functional and cause corresponding machine movements.</p> <p>- <b>FWD</b> Pressing this key will move the shuttle towards the front of the saw and will stop and hold its position if the key is released.</p> <p>- <b>REV</b> Pressing this key will move the shuttle towards the back of the saw and will stop and hold its position if the key is released.</p> <p>- <b>SLW/FST</b> Pressing this key will toggle between SLOW and FAST cause the shuttle to move either fast or slow.</p> <p>- <b>STOP</b> will stop the hydraulic pump motor.</p> <p>- Use Head Switch 'Up' to raise blade well above height of workpiece.</p> <p>- Use Front Vise 'Open' and Shuttle Vise 'Open' to open vise jaws wider than width of workpiece.</p> <p>- Load workpiece onto saw conveyor, being sure that it is within the rollers or vise jaws before releasing it.</p> <p>- Check shuttle speed setting – fast 'FST' or slow 'SLW' in bottom centre of display.</p> <p>- Use SLW/FST Key to toggle between fast and slow shuttle speed.</p> <p>- Use FWD or REV Key to position the shuttle vise on the workpiece.</p> <p>- Select Shuttle Vise 'Close' to clamp workpiece in shuttle vise.</p> <p>- Use FWD or REV Key to position the workpiece with front edge about ¼ inch forward of the saw blade.</p> <p>- Select Front Vise 'Close' to clamp workpiece in front vise. Display switches to Single Cut Start Screen</p>	<b>LTH xxxxxx"</b>			
	<b>FWD</b>	<b>REV</b>	<b>SLW</b>	<b>STOP</b>
<p>· Turn Feed Rate Valve to '0'.</p> <p>· Press Blade Start Pushbutton. Display switches to Single Cut in Progress Screen.</p>	<b>ENTER LENGTH xxxxxx"</b>			
	<b>FWD</b>	<b>REV</b>	<b>SLW</b>	<b>STOP</b>
<p>· Use function key (F2) labeled COOL to start coolant pump. Adjust blade speed - Use function keys assign to + (F3) and - (F4) to set desired blade speed. Pressing F3 key will cause the blade speed to increase until the key is released or the speed is at the maximum (350 SFM). Pressing F4 key will cause the blade speed to decrease until the key is released or the speed is at the minimum (70 SFM). The blade must be running to use this key and the blade speed is shown on the display screen.</p> <p>- Select Head Switch 'Down' to start head feed.</p> <p>- Adjust Feed Rate (appears as FR in display)</p> <p>- Head descends through work piece.</p> <p>- Head reaches head down position and blade stops</p> <p>- Remove cut piece</p>	<b>L xxxx" CYCLE</b>			
	<b>STOP</b>	<b>COOLoff</b>	<b>+</b>	<b>S--- -</b>
<p>If function key F2 labeled COOL is depressed for three seconds, then the display will change to Coolant Select screen. If machine is equipped with optional mist coolant system then this screen allow to select flood or mist coolant system. Depressing function key F1 will select MIST coolant system and F2 will select FLOOD coolant system. Depressing F4 function key labeled EXIT will return to previous screen.</p>	<b>SELECTED FLOOD</b>			
	<b>MIST</b>	<b>FLOOD</b>	<b>EXIT</b>	

Single Cut Mode				
<p>With power to saw pull-out E-stop. Display lights with 'E100 v6.03'. Display flashes though intermediate screens to Machine Start screen (<b>only active with Front Vise, Shuttle Vise, and Head switches all in neutral</b>).</p> <p>- Press F1 function key labeled START. Hydraulics start and display change Manual Mode.</p> <p>- WASH will start the coolant pump.</p> <p>- STOP will stop the hydraulic pump motor.</p>	MACHINE			
	START	WASH		STOP
<p>Front Vise, Shuttle Vise, and Head switches all become active and functional and cause corresponding machine movements. Generally, at this point, use Manual Mode to position material and make a trim cut Use HEAD switch to position head at desired head up limit.</p> <p>- <b>FWD</b> Pressing this key will move the shuttle towards the front of the saw and will stop and hold its position if the key is released.</p> <p>- <b>REV</b> Pressing this key will move the shuttle towards the back of the saw and will stop and hold its position if the key is released.</p> <p>- <b>SLW/FST</b> Pressing this key will toggle SLOW /FAST cause the shuttle to move either fast or slow.</p> <p>- <b>STOP</b> will stop the hydraulic pump motor.</p>	LTH xxxxxx”			
	FWD	REV	SLW	STOP
<p>If Front Vise is switched to close, and HEAD is in neutral, then display switches to Single Cut Start Screen. 'Enter Length' flashes prompting new part length. Key in desired part length and press Enter key. To enter number - press and hold 'NUM' key and key in required number. To key in decimal point release 'NUM' key and press fast twice the decimal point key.</p>	ENTER LENGTH xxxxxx”			
	FWD	REV	SLW	AUTO
<p>'Blade Start' replaces 'Enter Length', and flashes. Press BLADE START pushbutton and Blade motor starts.</p>	BLADE START xxxxxx”			
	FWD	REV	SLW	AUTO
<p>'Cycle Start' replaces 'Blade Start', and flashes.</p>	CYCLE START xxxxxx”			
	FWD	REV	SLW	AUTO
<p>Press CYCLE pushbutton - display change to Single Cut in Progress. CYCLE IS ON flashes. Use function keys assign to + (F3) and - (F4) to set desired blade speed. Pressing F3 key will cause the blade speed to increase until the key is released or the speed is at the maximum (350 SFM). Pressing F4 key will cause the blade speed to decrease until the key is released or the speed is at the minimum (70 SFM). The blade must be running to use this key and the blade speed is shown on the display screen.</p> <p>Use function key (F2) labeled COOL to start coolant pump.</p>	L xxxx” CYCLE			
	STOP	COOLoff	+	S--- -
<p>If function key F2 labeled COOL is depressed for three seconds, then the display will change to Coolant Select screen. If machine is equipped with optional mist coolant system then this screen allow to select flood or mist coolant system. Depressing function key F1 will select MIST coolant system and F2 will select FLOOD coolant system. Depressing F4 function key labeled EXIT will return to previous screen.</p>	SELECTED FLOOD			
	MIST	FLOOD	EXIT	
<p>After a cycle has been started, it may be put into Pause by pressing the Cycle Start / Pause button. Pressing the button again causes the cycle to resume. In Pause, all machine motions will stop, except blade will continue to run.</p>	JOB IS PAUSED - TO RESUME PRESS CYCLE			



Shuttle vise opens Shuttle moves towards Home (full forward position) Shuttle retracts to preset length position Shuttle Vise closes Front Vise opens Shuttle advances to Home Front Vise closes Head descends, making cut and when cut is complete, Head rises to Head Up Position Blade stops and display returns to Single Cut Start Screen	
<b>Auto Mode</b>	
With power to saw pull-out E-stop. Display lights with 'E100 v6.03'. Display flashes though intermediate screens to Machine Start screen ( <b>only active with Front Vise, Shuttle Vise, and Head switches all in neutral</b> ).	<b>MACHINE</b>
	<b>START</b> <b>WASH</b> <b>STOP</b>
Press F1 function key labeled START. Hydraulics start and display change Manual Mode. Front Vise, Shuttle Vise, and Head switches all become active and functional and cause corresponding machine movements. Generally, at this point, use Manual Mode to position material. Use HEAD switch to position head at desired head up limit about 3/8 inch above top of material.	<b>LTH xxxxxx"</b>
	<b>FWD</b> <b>REV</b> <b>SLW</b> <b>STOP</b>
If Front Vise is switched to close, and HEAD is in neutral, then display switches to Single Cut Start Screen.	<b>ENTER LENGTH xxxxxx"</b>
	<b>FWD</b> <b>REV</b> <b>SLW</b> <b>AUTO</b>
Press F4 function key labeled AUTO. Display change to Automatic Mode. To edit job information use navigation keys to move cursor to desired position and enter part length adjacent to L , quantity required adjacent to R and quantity already cut adjacent to C. To enter number - press and hold 'NUM' key and key in required number. To key in decimal point release 'NUM' key and press fast twice the decimal point key.	<b>Lxxxxxx" Rxxx CxxxCYCLE</b>
	<b>MAN</b> <b>COOLon</b> <b>KERF</b> <b>STOP</b>
When correct part length, parts required, and quantity already cut (usually 0), have all been entered, proceed to run Auto Cycle as follows: Press Cycle Start/Pause Button. Display will change and CYCLE IS ON is flashing.	<b>Lxxxxxx" Rxxx CxxxCYCLE</b>
	<b>MAN</b> <b>COOLon</b> <b>+</b> <b>Sxxx -</b>
Display prompts for start of the blade motor.	<b>START THE BLADE FOR TRIM CUT</b>
Press Blade Start Pushbutton. Display then changes to Auto In Progress screen. Use function keys assign to + (F3) and - (F4) to set desired blade speed. Pressing F3 key will cause the blade speed to increase until the key is released or the speed is at the maximum (350 SFM). Pressing F4 key will cause the blade speed to decrease until the key is released or the speed is at the minimum (70 SFM). The blade must be running to use this keys and the blade speed is shown on the display screen. Use function key (F2) labeled COOL to start coolant pump.	<b>Lxxxxxx" Rxxx CxxxCYCLE</b>
	<b>MAN</b> <b>COOLon</b> <b>+</b> <b>Sxxx -</b>
If function key F2 labeled COOL is depressed for three seconds, then the display will change to Coolant Select screen. If machine is equipped with optional mist coolant system then this screen allow to select flood or mist coolant system. Depressing function key F1 will select MIST coolant system and F2 will select FLOOD coolant system. Depressing F4 function key labeled EXIT will return to previous screen.	<b>SELECTED FLOOD</b>
	<b>MIST</b> <b>FLOOD</b> <b>EXIT</b>
After a cycle has been started, it may be put into Pause by pressing the Cycle Start / Pause button. Pressing the button again causes the cycle to resume. In Pause, all machine motions will stop, except blade will continue to run.	<b>JOB IS PAUSED - TO RESUME PRESS CYCLE</b>

- Shuttle vise opens
- Shuttle moves towards Home (full forward position)
- Shuttle retracts to preset length position
- Shuttle Vise closes
- Front Vise opens
- Shuttle advances to Home
- Front Vise closes
- Head descends, making cut
- When cut is complete
- The blade motors shut down
- Display returns to Single Cut Start Screen and hydraulic pump motor will run for a pre-set time of Power Down Timer. If it is set to 0 then hydraulic pump will shoot off.

## PLC 100 CONTROL SYSTEM

### OPERATION OVERVIEW

The PLC is a programmable logic controller that allows the operator to run the machine in both manual and automatic modes

The control panel is divided into four parts: MANUAL ONLY on the left; MANUAL & AUTO in the center; MACHINE on the right; and NUMERIC and CURSOR keys at the top right. All of these as well as the EMERGENCY STOP button detailed descriptions follow.

To power up the control panel, the EMERGENCY STOP button must be pulled out. The display screen will scroll through several screens and finally display in the MANUAL MODE with the display dimmed. Pressing any key will bring the control panel to full ON and the display backlight will come ON.

Once the control panel has power, the MACHINE START key must be pressed to activate the interface, which will also start the hydraulic system. Now all of the control keys have been activated and each key has an LED to indicate which functions are active.

In MANUAL MODE, the operator has the ability to execute a single cut utilizing a pre-programmed SINGLE CUT MODE.

In AUTOMATIC MODE, the PLC has the capacity to program and store 999 jobs. Designated job numbers can be programmed for the quantity required (maximum 999 pieces). Piece lengths range from 0" to 500" (12700mm). Jobs can be run individually or in QUEUE, which allows a maximum of 10 jobs to run consecutively.

#### NOTE

If an emergency situation arises during any operation, use the large red mushroom EMERGENCY STOP button located on the control panel to shut down the machine





<b>MANUAL MODE ONLY CONTROLS</b>	
<b>HEAD CONTROLS</b>	
HEAD UP	Pressing this key will raise the head but it will stop and hold its position if the key is released.
HEAD DOWN	Pressing this key will lower the head to its bottom limit and will stop and hold its position when pressed again, or if the HEAD UP key is pressed.
<b>FIXED VISE CONTROLS</b>	
FIXED VISE OPEN	Pressing this key will open the fixed (front) vise and will stop and hold its position if the key is released.
FIXED VISE CLOSE	Pressing this key will close the fixed (front) vise. To stop and hold its position, press again or press the FIXED VISE OPEN key.
<b>SHUTTLE VISE CONTROLS</b>	
SHUTTLE VISE OPEN	Pressing this key will open the shuttle (rear) vise and will stop and hold its position if the key is released.
SHUTTLE VISE CLOSED	Pressing this key will close the shuttle (rear) vise. To stop and hold its position, press again or press the SHUTTLE VISE OPEN key.
<b>SHUTTLE CONTROLS</b>	
SHUTTLE FORWARD	Pressing this key will move the shuttle towards the front of the saw and will stop and hold its position if the key is released.
SHUTTLE REVERSE	Pressing this key will move the shuttle towards the back of the saw and will stop and hold its position if the key is released.
SHUTTLE SLOW / FAST	Pressing this key will cause the shuttle to move either fast or slow. The red LED indicates that the shuttle will move FAST. Pressing the key will switch this function back to SLOW.
<b>MANUAL &amp; AUTO MODE CONTROLS</b>	
<b>BLADE CONTROLS</b>	
BLADE START	Pressing this key will start the blade. The blade will not start if the head is fully down.
BLADE STOP	Pressing this key will stop the blade.
BLADE SPEED (+)	Pressing this key will cause the blade speed to increase until the key is released or the speed is at the maximum (350 SFM). The blade must be running to use this key and the blade speed is shown on the display screen.
BLADE SPEED (-)	Pressing this key will cause the blade speed to decrease until the key is released or the speed is at the minimum (70 SFM). The blade must be running to use this key and the blade speed is shown on the display screen.
<b>COOLANT CONTROLS</b>	
COOLANT ON	Pressing this key will start the coolant flow.
COOLANT OFF	Pressing this key will stop the coolant flow.
COOLANT AUTO	Pressing this key will cause the coolant to flow only when the blade is running OR when the blade is running and the head is descending. This is selectable via the PLC parameters in the SERVICE MODE.
<b>MODE CONTROLS</b>	
SERVICE MODE	The SERVICE MODE allows the user to adjust the various PLC parameters. The user will be prompted for a password. Contact Hyd-Mech Group Limited to access this mode.
MANUAL MODE	Pressing this key will enable all of the “MANUAL MODE ONLY CONTROLS.”

AUTO MODE	Pressing this key will disable all of the “MANUAL MODE ONLY CONTROLS.” To enter AUTO MODE, the FIXED VISE must be activated.
<b>MACHINE &amp; CYCLE CONTROLS</b>	
MACHINE START	Pressing this key will activate the control panel, display, and start the hydraulic system. The EMERGENCY STOP button must be pulled out. This key must be activated to use the machine functions.
MACHINE STOP	Pressing this key will shut down all machine functions including the control display and hydraulic system. The display will not have a back light on. All jobs will remain in memory as will the QUEUE.
CYCLE START	The user will be prompted by the display to press this key as it is used to initiate an AUTO or SINGLE CUT MODE cycle. Pressing this button will also initiate the QUEUE if pressed when in the QUEUE screen.
CYCLE PAUSE	Pressing this key will pause the cycle in progress. To resume the cycle, press the CYCLE START key.

## MANUAL MODE

MANUAL MODE is the default mode. All functions are enabled when in MANUAL MODE. The screen will look as follows:

MANUAL MODE	
BLADE SPEED	0 SFM
LENGTH	0"

## SINGLE CUT MODE OPERATION

In MANUAL mode, the PLC allows the operator to initiate a SINGLE CUT MODE to cut one piece at a desired length. To accomplish this, follow the procedure below.

1. A trim cut should be made before initiating the SINGLE CUT MODE operation
2. Make sure the front vise switch is in the closed position and set the head up limit switch.
3. Make sure the head is set so that the blade is above the material.
4. ENTER LENGTH will be flashing. Key in the desired length up to 500" (12 700 mm) using the numeric keypad and press enter.

SINGLE CUT MODE	
BLADE SPEED	0 SFM
ENTER LENGTH	0"
LENGTH	0"

5. If the blade is not running, you will be prompted by the word BLADE START flashing on the display window. Start the blade and adjust the blade speed as required.
6. When the blade is started, the word BLADE will change to the words CYCLE START and will be flashing on the display window. Press CYCLE START and the cycle will begin.

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<b>SINGLE CUT MODE</b>	
<b>BLADE SPEED</b>	<b>0 SFM</b>
<b>LENGTH</b>	<b>0"</b>

7. When the cut is completed, the head will rise to the head up limit switch, the blade will stop and the display window will reset for the next cut.
8. To cut another piece, repeat steps 2 through 6.

**NOTES:**

1. To pause the SINGLE CUT CYCLE, press the CYCLE PAUSE button. The CYCLE START button will begin to flash and the screen will indicate a paused condition. All movements will immediately cease, except blade will continue to run. To continue the cycle, press CYCLE START.

<b>JOB # - IS PAUSED</b>
<b>TO RESUME PRESS CYCLE START</b>

2. To cut multiple pieces, switch to AUTO MODE and follow the automatic procedures.
3. Whenever a new job or new material is being loaded for production, the head up limit switch should be properly set to clear the material positioned for a trim cut and the front vise should be closed (in MANUAL MODE).

**AUTOMATIC OPERATION**

To enter **AUTO MODE**, the **FIXED VISE** must be in the closed position and the **LED** on. When the **AUTO MODE** key is pressed, the red indicator will come on. The screen will change to the **JOB** display window as shown below and will be ready for editing or starting a new job. All manual functions will be disabled.

**PROCEDURE FOR EDITING OR STARTING A NEW JOB IN AUTO MODE**

1. In **AUTO** mode, key in a job number from 0 to 999, the number of pieces to be cut, the number of pieces already cut, and the length, pressing enter after each value. If the number of pieces cut equals or exceeds the number required, the cycle will not start. If the job number has previously been programmed, the number of pieces, length, and number cut will be displayed. To navigate through the values, use the cursor keys. The values displayed may be edited by using the numeric keypad and pressing enter. The job will then be stored in memory with the new values.

The job is now ready to start to run or other jobs can be programmed at this time. To run a certain job, press the **QUEUE** key and then **CLEAR** to clear the **QUEUE**. Move the cursor to the 1<sup>st</sup> job and key in the desired **JOB #**.

AUTOMATIC MODE	
JOB #	0
PIECES REQUIRED	0
PIECES CUT	0
LENGTH	0

- After the values are entered, press the CYCLE START button. The switch will illuminate, the display window will prompt you to start the blade for a trim cut (if the "Trim Cut" parameter has been selected).  
**CAUTION:** If the head is in its full down position it will rise to the head up limit so that no damage to the blade will occur.

**START THE BLADE  
FOR TRIM CUT**

When the AUTO CYCLE commences, the screen will change to the "Auto Mode Status" screen and the following events will take place:

AUTOMATIC MODE	
JOB # X IN PROGRESS	
BLADE SPEED	0 SFM
PIECES REQUIRED	0
PIECES CUT	0
LENGTH	0

- A trim cut will be performed.
- After the trim cut, the shuttle will advance the material to the LENGTH value.
- The saw will now cut the material to the LENGTH value compensating for the thickness of the blade.
- Steps 2 and 3 will be repeated for the given number of pieces to be cut.
- At the completion of the job, the machine will shut off.

NOTES:

- The CYCLE PAUSE key is used to pause a job in progress. To resume the job, press the CYCLE START key and the AUTO CYCLE will resume.
- If PIECES CUT equals or exceeds NUMBER OF PIECES, AUTO CYCLE will not start.

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## WORKING WITH A QUEUE

The purpose of a QUEUE is to allow the operator to run several jobs (maximum of 10) in series if they are of the same material and shape.

To run a QUEUE, it is necessary to program in all job values as is done with programming a single job. After the jobs are programmed in, press QUEUE, press CLEAR to clear the QUEUE, and enter the desired JOB #'s in the desired sequence.

JOB A #	xxxREQ	xxxPcs	LENGTH	xxxxx
JOB B #	xxxREQ	xxxPcs	LENGTH	xxxxx
JOB C #	xxxREQ	xxxPcs	LENGTH	xxxxx
JOB D #	xxxREQ	xxxPcs	LENGTH	xxxxx
JOB E #	xxxREQ	xxxPcs	LENGTH	xxxxx
JOB F #	xxxREQ	xxxPcs	LENGTH	xxxxx
JOB G #	xxxREQ	xxxPcs	LENGTH	xxxxx
JOB H #	xxxREQ	xxxPcs	LENGTH	xxxxx

To run the QUEUE press CYCLE START. If the blade is not running, BLADE will flash. Press the BLADE START key and then CYCLE START. The JOB PROGRESS screen will appear and display each individual JOB as it is being run.

At the completion of the last job in the QUEUE, the machine will shut off if "0" has been entered in the POWER DWN TIMER parameter or continue running the specified time up to a maximum of 180 minutes. The machine will automatically advance the stock between jobs for trim cuts as needed.

## WORKING WITH A REPEATING QUEUE

The QUEUE mode can also be set to repeat the sequence of jobs up to 99 times. To do this the QUEUE parameter in SERVICE mode must be set at REPEAT.

To run a repeating queue, two additional rows are added to the QUEUE display screen after JOB J: QUEUE CUT (the number of times that the QUEUE has been completed) and QUEUE REQUIRED (the number of times that the QUEUE is required to be repeated).

When entering job data for jobs to be used in a repeating QUEUE be aware that:

# of parts cut = # of JOBS x QUEUE REQUIRED

For example:

JOB A is set to cut 1 piece

JOB B is set to cut 2 pieces

QUEUE REQUIRED is set to 5

When the cycle is initiated, 1 JOB A piece will be cut followed by 2 JOB B pieces with this pattern repeating 5 times.

This will give you a total of 5 JOB A pieces and 10 JOB B pieces.

The QUEUE may be exited to the previous screen at any time by pressing the JOB key.

NOTE: For angled cuts, see "Kerf Correction" as follows.

## KERF CORRECTION FOR ANGLE CUTTING

When making mitered cuts, the part length must be set longer than the desired length by an amount called the KERF CORRECTION or the kerf value must be adjusted. This is due to the fact that the PLC will not account for a difference in the kerf value at various angles.

If the kerf value is to be adjusted, its value can be accessed while in Manual or Automatic mode. Press and hold the key below the word KERF on the display until the display changes to show the kerf value currently in use. From the chart below, enter the kerf value on an angle closest to that of the part being cut. It is a good practice to change the kerf value back to standard kerf value after completing the job. This will prevent accidental inaccuracy in part length on a next job, which might call of different part angles.

**ENTER BLADE'S**

**KERF # ---- INCH**

If the kerf correction value is to be added to the length dimension of the desired part one must subtract the standard kerf at 90° from a kerf value which is closest to the angle of the part being cut. The resulting difference is added to the part length. If this method is chosen it is a good practice to check that the current kerf value is set to the standard kerf value at 90°

The Standard kerf and corrected values are as follows:

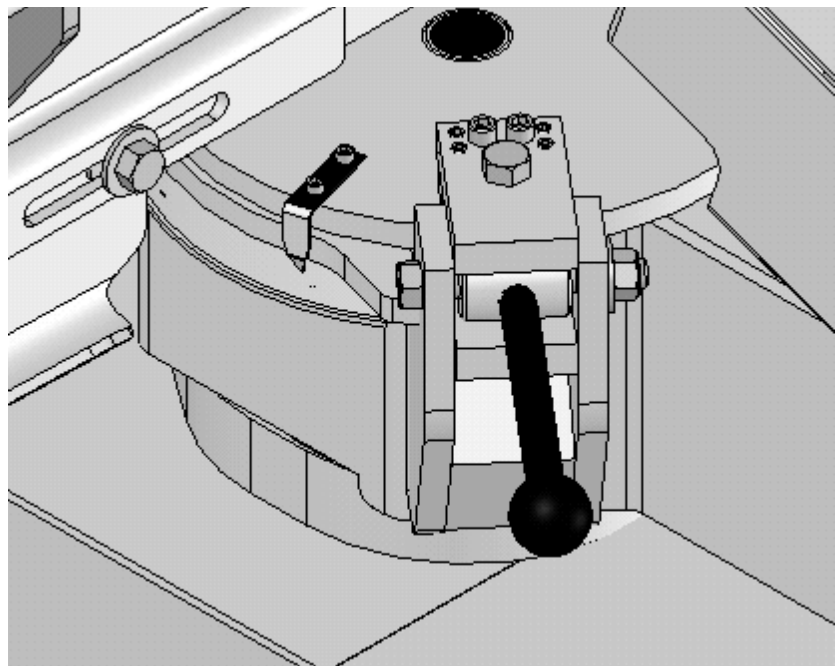
STD KERF @	90°	75°	60°	55°	50°	45°	40°	35°	30°
1" BLADE	0.059	0.061	0.068	0.072	0.077	0.083	0.092	0.103	0.118
1 ¼" BLADE	0.066	0.068	0.076	0.081	0.086	0.093	0.103	0.115	0.132

## MECHANICAL CONTROLS

### HEAD SWING AND BRAKE

An integral function of the S-20/23A Series II is the ability to make mitered cuts at angles between 90° and 45°. The Head swing of the S-20/23A Series II is easily changed to set a different cutting angle by first releasing the Angle Brake lever, and then manually moving the Head to the cutting angle desired. An angle scale with a pointer in clear view of the saw operator allows for accurate setting of the cutting angle.

The Angle Brake lever is then locked in position by pushing it into the down position. Note that the angle brake should be locked into position whenever cutting with the saw. To set the saw to the 90° position, set the





Head in the fully down position and move the Head until the frame meets the 90° stop bolt which is located on the vise post.

### **HEAD UP LIMIT SETTING**

The Head Up limit setting allows the operator to set the height that the Head will ascend to after a cut is completed. By adjusting this limit the operator can reduce cycle time, as the Head does not need to fully ascend between cuts. The Head Up adjustment lever is located on the rear side of the head below the gearbox as shown on the photograph. Raising the lever will shorten the distance the head will move. Lowering the lever all the way down will allow the head to travel to its full height.



### **COOLANT CONTROLS**

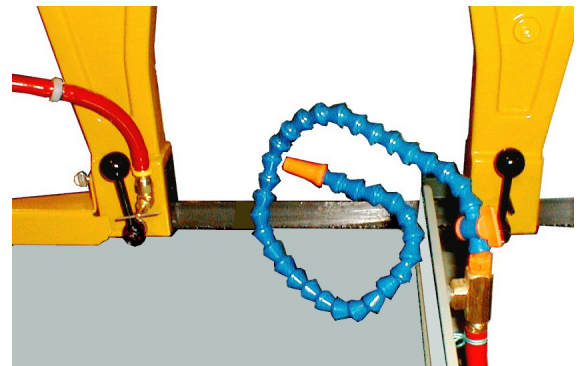
The main coolant control is found on the control panel.

If the optional Mist Coolant System is supplied the Flood / Mist push button determines which system is active.

ON, (WASH on Seq only): Coolant flows any time the machine is under power, permitting wash down with spray nozzle without running machine

OFF: No coolant flow

AUTO, (ON - Seq only): The coolant flows only when the blade is running OR when the blade is running and the head is descending. This is selectable via the PLC parameters.



The S-20/23A Series II band saw is equipped with two independently controlled coolant spouts that are capable of supplying a generous flow of coolant to the blade.

The left guide arm supplies a flow of coolant that should flood the blade as it moves through the carbide pads into the material to be cut. The guide arm outlets should be adjusted to apply an even covering of coolant to the blade.

The right guide arm provides a coolant flow through the flexible hose that can be pointed directly where necessary. This flexible hose should be used when cutting solid bars, bundles, or wide structurals. Set the flow of coolant directly into the opening in the material where the blade is cutting.

NOTE: When cutting materials that do not need constant coolant, such as cast iron, some coolant flow is required for blade lubrication to prevent blade scoring by the carbide pads as the blade moves through them.

When cutting wide workpieces the flexible nozzle should be used to direct extra coolant into the saw kerf at about mid span of the cut.

### **MIST COOLANT SYSTEM (optional)**

Mist Coolant – the air powered pump delivers a regulated number of pulses of lubricant to a single applicator nozzle.

The unit has two control screws.

Pulse / Minute – adjusts rate of lubricant use. About 8 to 12



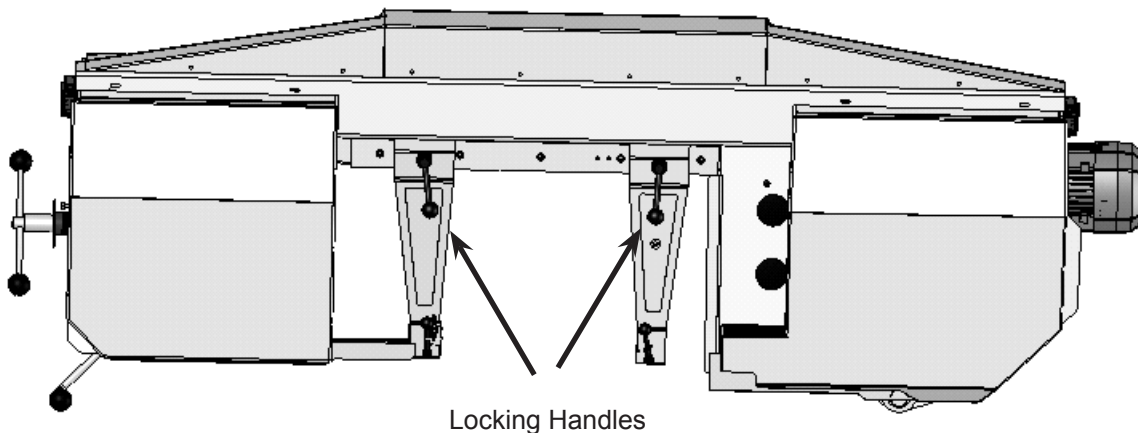
pulse per minute is optimum – more is not better.

Air Screw – regulates the jet of air that projects the lubricant from the nozzle onto the blade. Adjustment should be such that lubricant covers the blade without blowing the mist beyond the back edge of the blade.

### **GUIDE ARM POSITIONING**

The S-20/23A Series II guide arms are adjustable to accommodate varying material widths. The guide arms should be adjusted as close to the material width as possible while still allowing the material to pass between them. This process of matching the guide arm width to the material size is important to optimize blade life.

To adjust the guide arms the locking handles are loosened and then the guide arms will slide on the main guide bar that holds them. To loosen the handle it should be turned counter clockwise and to tighten the handle, turn it clockwise.

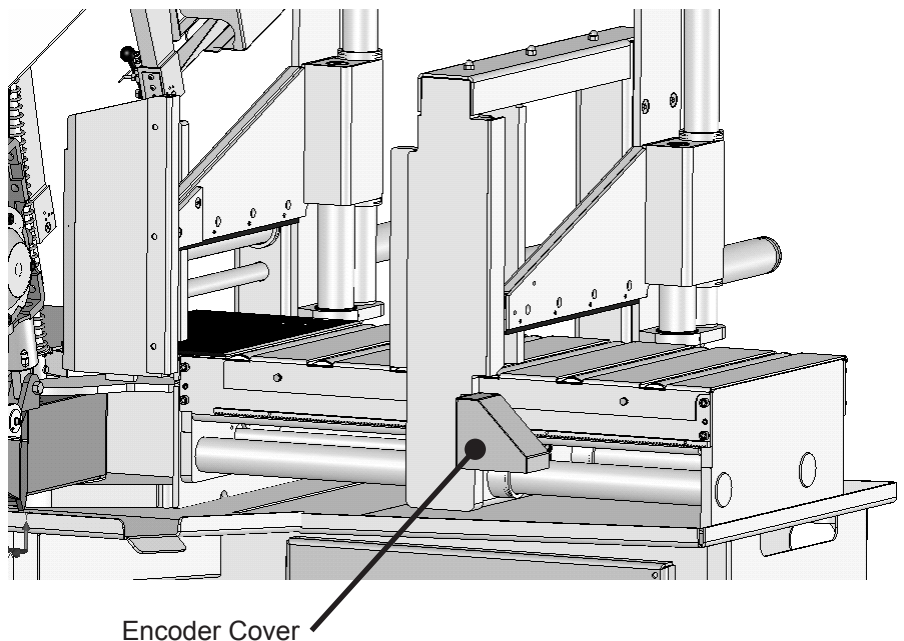


### **SHUTTLE LENGTH CONTROLS**

An encoder in its housing is shown in the photo. The PLC uses signals from the encoder to maintain cut lengths.

### **CUTTING PARAMETERS CHART**

A full size CUTTING PARAMETERS CHART is mounted on the drive door of the saw. The chart contains five steps for the operator to follow in order to achieve optimum performance of the saw. Examples of the correct use of this chart are on the following pages.







Saw Cutting Parameters Chart

## HYDRAULIC FEED CONTROL



**Feed Force Knob**  
 Used to set Feed Force Limit (counterclockwise rotation to increase and clockwise rotation to decrease).

**Fast Approach Lever**  
 Depress for fast head descent.

**Feed Rate Knob**  
 Used to set Feed Rate (counterclockwise rotation to increase and clockwise rotation to decrease).

Hydraulic Feed Control

## CHART EXAMPLE #1

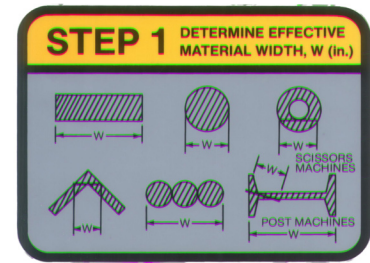
We will use the parameters chart to set up the saw for cutting 8" (200mm) diameter #1045 Carbon Steel.

### STEP 1 – DETERMINE EFFECTIVE MATERIAL WIDTH (w) (INCHES) OR (mm)

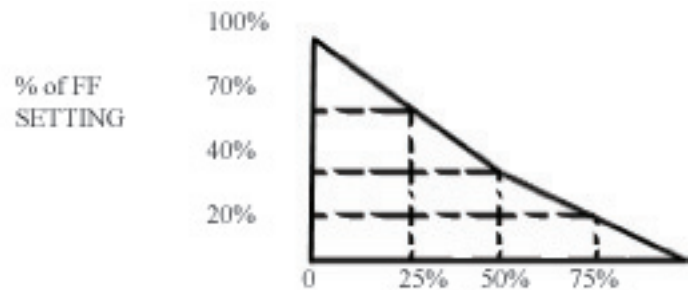
Effective material width W (in.) for most common shapes of materials is the widest solid part of the material to be in contact with blade during cutting. For simple shapes, as illustrated on the chart, this can be directly measured. For bundles of tubes and structurals, measuring the effective width is difficult. Effective width is 60% to 75% of the actual material width.

#### NOTES:

1. Both effective material width and guide arm width are used in setting the saw.
2. Guide arm width is the distance between the guide arms and is used in STEP 2.
3. Effective material width, as determined here in STEP 1, can be considered as the average width of material "seen" by each tooth, and it is used in STEPS 3 and 4. In Example #1, for an 8" (200mm) diameter solid, Effective Material Width is 8" (200mm).



Material Width Chart



### STEP 2 – SET FEED FORCE LIMIT

The Feed Force Limit is the maximum amount of force with which the head is allowed to push the blade into the work piece. Feed Force Limit should be set with the head in the down mode, according to the label.

MAT'L WIDTH as % of CAPACITY

For OPTIMUM BLADE SELECTION, see STEP 3

#### CUTTING SOLIDS

For cutting solids, the wider the section, the less FF should be set, to avoid blade overloading. See the graph: EXAMPLE: When cutting a solid that is ½ of machine capacity using the graph, locate 50% on the horizontal line and travel upwards to the plotted line and then travel directly across to the vertical FF Setting line. The point that you have arrived at shows a setting of 40% for a piece 50% of capacity.

BLADE	FF
① OPTIMUM PITCH FROM STEP 3	20%
② PITCH FINER THAN OPTIMUM	0%

#### CUTTING STRUCTURALS

A reduced Feed Force Setting is used when cutting structurals.

For structurals, a blade finer than optimum can be used for more efficient cuts.

If a finer than optimum blade is going to be used, Feed Force Setting should be reduced even further.

### STEP 3 – DETERMINE OPTIMUM BLADE PITCH – TEETH PER INCH (T.P.I.)

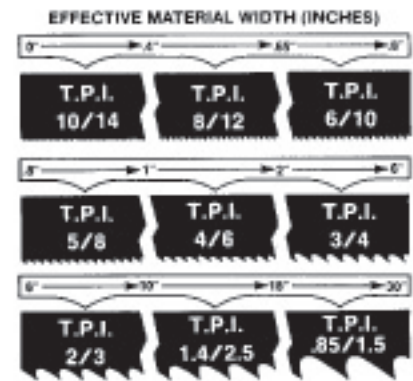
Selecting a blade with proper tooth pitch is important in order to achieve optimal cutting rates and good blade life.

For cutting narrow or thin wall structural materials a fine blade with many teeth per inch (T.P.I.) is recommended. For wide materials a blade with a coarse pitch should be used. The sketch can be referenced for the blade

pitch changes for differing effective material widths.

It is impractical to change the blade to the proper pitch every time a different width of material is cut and it is not necessary, but remember that the optimum blade will cut most efficiently. Too fine a blade must be fed slower on wide material because the small gullets between the teeth will get packed with chips before they get across and out of the cut. Too coarse a blade must be fed slower because it has fewer teeth cutting and there is a limit to the depth of a cut taken by each tooth. Allowance for the use of a non-optimum blade is made in STEP 5.

In our Example #1: Effective material width of 8" (200mm) and optimum blade has 2/3 teeth per inch.



Optimum Blade Pitch ( T.P.I.

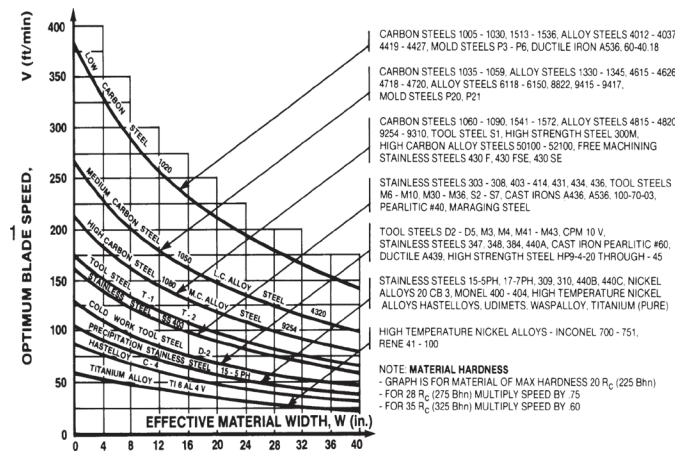
#### STEP 4 – DETERMINE OPTIMUM BLADE SPEED, V (ft./min./) (m/min.)

The relationship between optimum blade speed and effective material width for various materials is represented on the graph shown.

The graph shows that as effective material width gets wider or as material gets harder, lower blade speeds are recommended. If material is narrow or soft, higher blade speeds should be selected.

In Example #1

- 8" (200mm) diameter #1045 Medium Carbon Steel solid bar is to be cut
- On the graph above, find the Medium Carbon Steel Curve which represents the optimum blade speeds for 1045 Carbon Steel
- On the horizontal axis (effective material width axis) find number 8 which represents effective material width of an 8" (200mm) diameter solid
- Find the point where a vertical line from 8" (200mm) intersects the Medium Carbon Steel Curve.
- From this intersection point run horizontally left to the vertical axis (optimum blade speed axis) and find the point marked "200"
- For an 8" (200mm) diameter, 1045 Carbon Steel solid bar, 200 ft./min. (60m/min.) is the optimum blade



Optimum Blade Speed Curves

speed

NOTE:

1. Higher than optimum blade speed will cause rapid blade dulling. Lower than optimum blade speeds reduce cutting rates proportionately and do not result in significantly longer blade life ex-

cept where there is a vibration problem. If the blade vibrates appreciable at optimum speed as most often occurs with structurals and bundles, a lower blade speed may reduce vibration and prevent premature blade failure.

2. Material Hardness – The graph above illustrates blade speed curves for materials of hardness 20 RC (225 Bhn) or lower. If the material is hardened then the multipliers need to be used.

NO.	MATERIALS	OPTIMUM	BLADE SPEED
		ft/min	m/min
1	5" (125mm) Dia Solid Carbon Steel	225	70
2	12" (300mm) I-Beam	290	90
3	4" x 4" (100 x 100mm) Rec Tube, 1/4" (6mm) Wall	350	110
4	4" (100) 400 Stainless Steel	140	45
5	2" x 2" (50 x 50mm) Rec Tube 1/4" (6mm) Wall		
	Bundle 5 x 5 pcs 10" x 10" (500 x 500mm)	325	100
6	3" x 3" (75 x 75mm) Inconel	60	20

#### Materials and Blade Speed

These multipliers are given in the NOTE at the bottom right of the graph.  
As the hardness increases the optimum blade speed decreases.

The following table gives examples of the optimum blade speeds for different materials.

#### STEP 5 – DETERMINE FEED RATE SETTING (FR) (in./min.) (mm/min.)

*FEED RATE is the vertical speed at which the blade descends through the work piece*

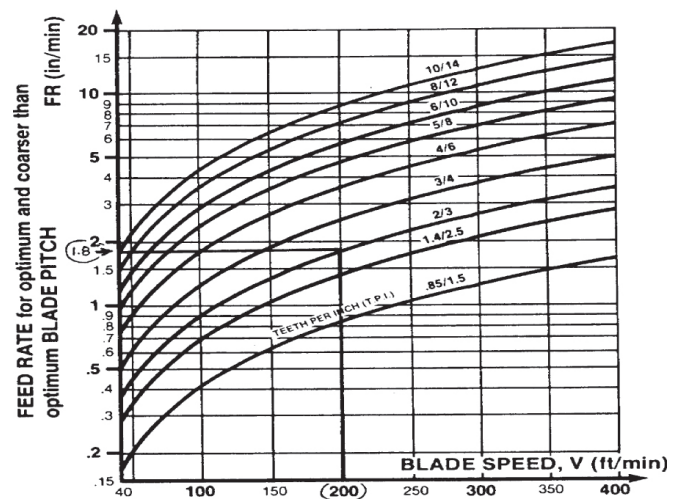


Feed Rate Knob

The FEED RATE knob controls FEED RATE of the blade descent in the range of 0 to 15 in. per minute (380mm/min.) The FEED RATE should be adjusted only in one direction (from "0" to required value). If you turn too far, the knob should be turned back to "0" and back to the required value. To set FEED RATE for particular cutting situations, use the graph below, which represents the relationship between FEED RATE, blade speed and blade pitch.

For Example #1, it is known from STEP 3 that optimum blade pitch is 2/3, and from STEP 4 that blade speed is 200 ft./min. (60m/min.). From the graph on the left, the FEED RATE is determined in the following way:

- On the horizontal axis (blade speed axis), find 200 ft./min. (60m/min)
- Find the point where a vertical line from 200 ft/min (60m/min) would intersect the 2/3 blade pitch curve
- From this intersection point run horizontally left to the vertical (FEED RATE) axis, to arrive at 1.8 in/min (45mm/min) FEED RATE. Thus, 1.8 in/min (45mm/min) is the FEED RATE for cutting 8" (200mm) diameter 1045 Carbon Steel when the optimum 2/3 pitch blade is used



Feed Rate Calculation

If the saw is fitted with a blade coarser than optimum (e.g. 1.4/2.5 TPI) we can still use the graph, but we go to the 1.4/2.5 curve. As a result we find that the FEED RATE

Optimum									
Pitch									
10/14	1.0								
8/12	.83								
6/10	0.67	.80							
5/8	0.54	.65	.81						
4/6	0.42	.50	.63	.77					
3/4	0.29	.35	.44	.54	.70				
2/3	0.21	.25	.31	.38	.50	.71			
1.4/2.5	0.17	.20	.25	.31	.40	.57	.80		
.85/1.5	0.1	.12	.15	.18	.24	.34	.48	.60	1.0
	10/14	8/12	6/10	5/8	4/6	3/4	2/3	1.4/2.5	.85/1.5

Shading indicates optimum and actual pitch and required multiplier at point of intersection, for the given example.

### Optimum versus Actual Blade Pitch

If your blade is finer than optimum blade pitch multiply feed rate, fr, by above factors

is decreased to 1.3 in/min (133mm/min) for this blade. If however, the machine is fitted with a finer than optimum blade (e.g.  $\frac{3}{4}$  TPI) we use the graph for the optimum blade as before, and then use a multiplier given by the table below.

NOTE: Use the following chart when cutting solids. For structurals, see CUTTING STRUCTURALS in STEP 2.

### ADDITIONAL CUTTING SETUP EXAMPLES

#### EXAMPLE #2

Material – Round Steel Tube SAE 4320 hardened to 35 RC (325 Bhn)

Dimensions – 6" O.D. x 4" I.D. (150 mm O.D. x 100mm I.D.)

Step 1 – Effective Material Width 4  $\frac{1}{2}$  " (.75 x 6) or 114mm (19 x 6)

Step 2 – Feed Force limit setting for 6" diameter material – refer to feed force limit setting in Step 2

Step 3 – Optimum blade pitch (TPI):  $\frac{3}{4}$  TPI

- Actual blade pitch on the saw: 4/6 TPI

Step 4 – Optimum blade speed for 4  $\frac{1}{2}$  " effective 225 ft/min (70m/min) material width

- Blade speed reduced by hardness factor: 225 ft/min x .60 = 135 ft/min or
- 70m/min x .60 = 42m/min

Step 5 – Feed Rate for  $\frac{3}{4}$  TPI blade is 1.8 in/min (45mm/min)

- Feed Rate for 4/6 TPI blade is 1.8 in/min x .70 = 1.3in/min (reduced by finer than optimum blade pitch factor) or 45mm/min x .70 = 31.5mm/min

#### EXAMPLE #3

Material – Bundle – Low carbon steel 2" x 2" tube with  $\frac{1}{4}$ " wall, 12 piece bundle (50 mm x 50mm with 6mm wall)

Dimensions – 6" x 8" (150mm x 200mm)

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Step 1 – Effective material width: 5" (.6 x 8") or 120mm (.6 x 200)

Step 2 – Feed force limit setting for 8" diameter material. Refer to Feed Force Limit setting in Step 2

Step 3 – Optimum blade pitch (TPI):  $\frac{3}{4}$  TPI

Step 4 – Optimum blade speed for 5" effective material width: 320 ft./min. (100m/min)

Step 5 – Feed Rate for  $\frac{3}{4}$  TPI blade: 4.0 in/min or 100mm/min



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# SECTION 3 – MAINTENANCE AND TROUBLESHOOTING

## SAFETY DURING MAINTENANCE AND TROUBLESHOOTING

“Lock-out”, or “Lock-out Tag-out” are terms that refer to procedures taken to prevent the unexpected start-up, or other release of energy, by a machine, whenever anyone is required to remove or bypass safety guards or devices, or whenever anyone is required to place part of his body in a hazard area.

In almost all jurisdictions, it is required that owners of industrial equipment establish and post lock-out procedures. Know and use the lock-out procedures of your company or organization. In the absence, of such posted procedures, use the following procedure.

### LOCK OUT PROCEDURE

Whenever work is to be performed on a machine, which requires removal or bypassing of safety guards or devices, or the placement of part of anyone’s body in a hazard area, the following steps shall be taken:

1. Operator shuts down the machine. The head must be lowered fully, or onto suitable supports, before any hydraulic service is performed, to prevent the head from moving unexpectedly.
2. The supervisor in charge of the machine must be informed of the intention to Lock-out the machine.
3. The Main Power Disconnect Switch must be turned off, and locked in the off position by means of a padlock. The key for this padlock must be kept by the person performing the work on the machine. If more than one person is performing work on the machine, then a multiple lock hasp shall be used, and each person shall apply his or her own lock to the hasp.
4. Prior to starting any work on the locked-out machine, the supervisor shall attempt to start the machine to ensure that the lock-out device provides adequate protection. Operating controls must be reset to the “off” position after this test.
5. Work on the locked-out machine may now proceed.



**The main power disconnect switch used for safety lockout purposes.**

### RESTORING MACHINE TO USE

After completion of all repairs or maintenance to the locked-out machine, it shall be restored to use as follows:

The person(s) who performed the work shall verify that all areas around the machine are safe, before the machine is re-energized. No-one shall be permitted in un-safe areas around the machine. All guards and covers shall be properly installed.

Each lock-out padlock shall be removed by the person who applied it.

After the lock-out padlocks are removed, and before the machine is started, the supervisor and all other employees who use the machine, shall be informed that the lock-out has been removed. After notification is made, the machine may be re-started.

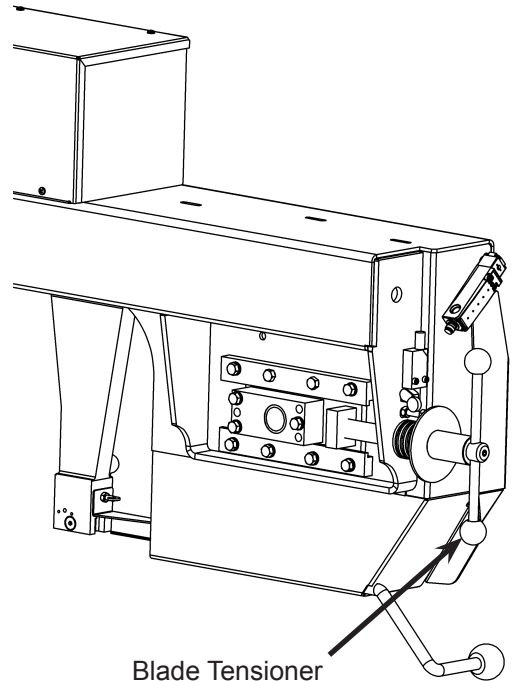
## BLADE CHANGING PROCEDURE

NOTE: Wear gloves for protection from the sharp blade.

1. Open the idler wheel and drive wheel doors and swing the head to 45° as this will make it easier to grip the blade closer to both wheels
2. Loosen the Blade Tensioner by turning counter clockwise.
3. Loosen the carbide tension handles by turning counter clockwise ¼ turn.
4. At the top of the head, the saw blade runs in a protective channel. Grip the blade at each end of this channel and twist the blade teeth down past the channel and slide the blade forward. Let the blade rest on the out-feed table, and then slide the blade down and out of the carbide guides.
5. Your new blade will be in a coil. While wearing gloves, hold the blade away from yourself, and twist the blade to uncoil it. Do not let the blade teeth bounce on the concrete floor as this may cause some damage.
6. Place the new blade in the carbide guides and then slide the blade over the wheels. The teeth should be pointing towards the drive side as they pass through the carbide guides.
7. With the blade in place, turn the tensioner handle clockwise until the large black washer contacts the stop bolt as shown on the previous page. This will set the blade tension correctly.
8. With the blade tension set, turn the two carbide-locking handles clockwise to the locked position. Jog the blade a few rotations to check that the blade is not moving in or out on the blade wheels. NOTE: As the blade tracking will stay fairly constant, it should be checked occasionally as shown on the drive wheel-tracking photo below. The blade teeth should protrude from .185" to .200" (4.7 - 5.1mm) from the face of the blade wheels. If the tracking requires adjustment, follow the instruction below.
9. **BLADE TRACKING ADJUSTMENT** – First, inspect the blade wheels for wear or damage and repair as required. Blade tracking adjustment should always begin at the wheel where the tracking is farthest out of specification. Using the instructions below, adjust the worst wheel, jog the blade and recheck both wheels. Repeat this process until both wheels are within specification.
  - a. **IDLER WHEEL ADJUSTMENT S-20 Line**

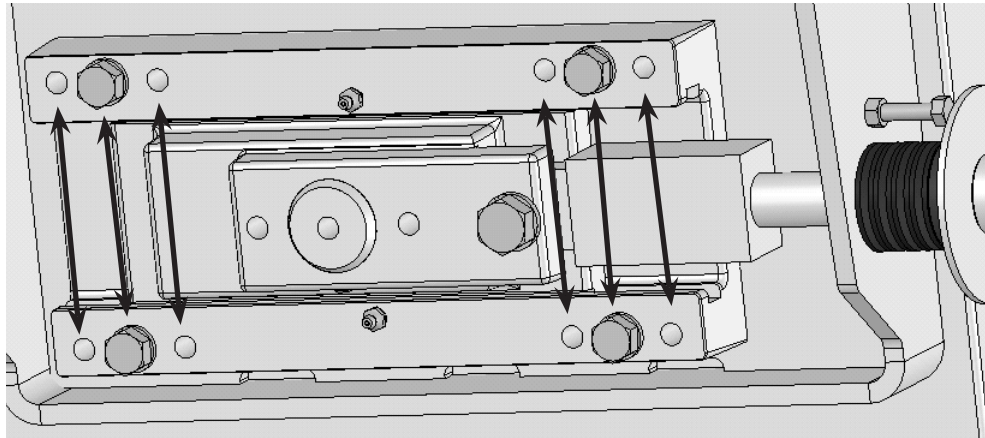
On the blade tensioner slide assembly, there are three 9/16" hex head bolts. Loosen the two bolts at the left end by ¼ turn. Loosen the single bolt at the right side of the slide assembly by ½ turn. In the two holes above and below this bolt are two 3/16" Allen key set screws. Turn both set screws ¼ turn and tighten the hex bolt at the right, and then the two bolts at the left. Turning the setscrews clockwise will pull the blade onto the wheel, and turning counter clockwise will push the blade off the wheel. Each ¼ turn will move the blade approximately .02" (5.1mm). There is also a single setscrew at the left end of the slider. Turning it clockwise will push the blade off the wheel.
  - b. **IDLER WHEEL ADJUSTMENT S-23 Line**

The tracking is adjusted by regulating the "push" set screws and the "pull" hex bolts. Before making any adjustments, bolts A & B should be loosened but remain snug. This will allow easy movement for the slide assembly. . Loosening bolt A and turning in set screws C by equal amounts will move the blade off the wheel. Loosening bolt B and turning in set screws D by equal amounts will move the blade on to the wheel. After each C or D adjustment, tighten bolts A & B, run the blade and then check the tracking.
  - c. **DRIVE WHEEL ADJUSTMENT** – On the wall behind the drive wheel are two adjusting bolt assemblies and two hex bolts. Loosen all four of them with a ¾" socket and turn the larger hex head bolts ¼ turn with a 1 1/8" socket and extension and then tighten the two bolts in the assemblies. Then tighten the two hex bolts at the left. Turning the 1 1/8" bolts clockwise will pull the blade onto the wheel and turning counter clockwise will push the blade off. Each ¼ turn will move the blade approximately .02".
10. Check the blade brush adjustment to be sure the blade is being cleaned properly.





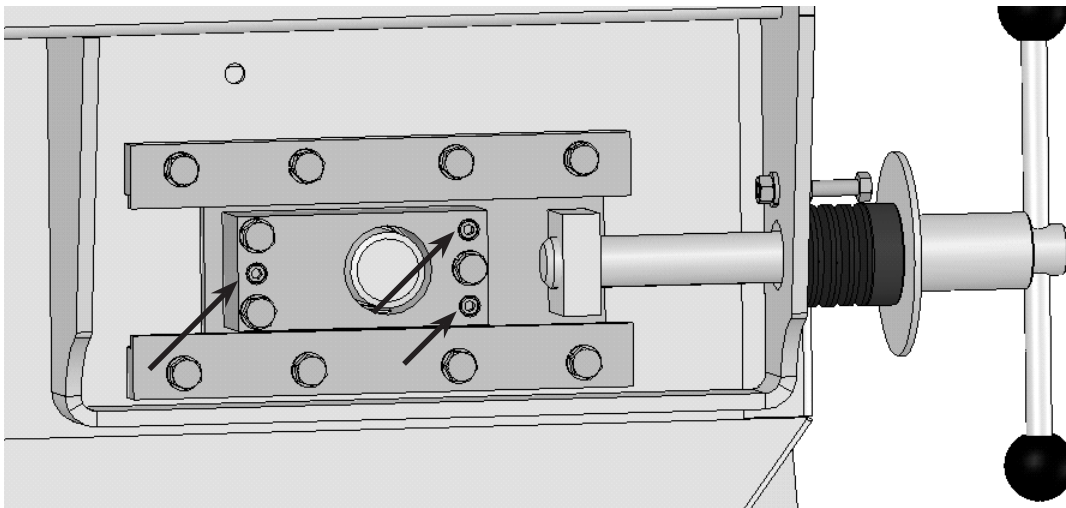
### S-23 BLADE TENSION ASSEMBLY



C A C

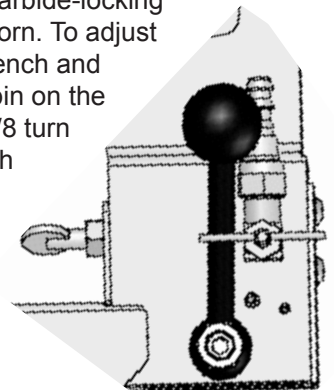
D B D

### S-20 BLADE TENSION ASSEMBLY



## BLADE GUIDE ADJUSTMENT

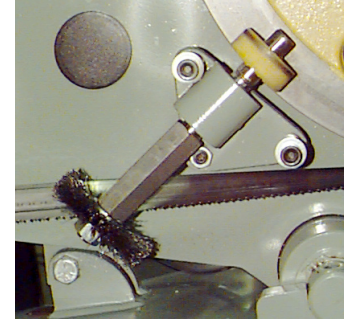
At the bottom of the guide arms are the carbide blade guide assemblies, the photo shows the carbide-locking handle. These assemblies will need to be adjusted occasionally as the carbide pads become worn. To adjust properly, follow this simple procedure. Loosen the hex nut on the locking handle with a 9/16 wrench and turn the handle clockwise until it rests against the coolant tap on the idler guide arm or the roll pin on the drive guide arm. Turn the setscrew clockwise with a 3/16 Allen key until tight and then loosen 1/8 turn and tighten the hex nut. This should put just enough pressure on the blade to permit you to push the blade down approximately 1/8" (3.2mm).



## BLADE BRUSH ADJUSTMENT

The machine leaves the factory with the blade brush adjusted for maximum life of the brush. This setting places the ends of the blade brush wires so as to contact the blade at the bottom of the blade gullets. The plastic drive wheel that is driven by the drive wheel face should be held against the blade face with the minimum force that is necessary. As the blade brush wears it is necessary to periodically adjust it closer to the blade or if a new brush is installed, further away from the blade.

As shown, there are two springs on socket head screws holding the brush assembly against the blade. There is also an adjusting socket set screw with a hex nut on it. Loosen the hex nut with a 9/16" wrench and turn the setscrew counter clockwise with a 3/16" Allen key. This will move the brush closer to the blade. Adjust the setscrew so that the brush cleans to the bottom of the blade gullets and tighten the hex nut.

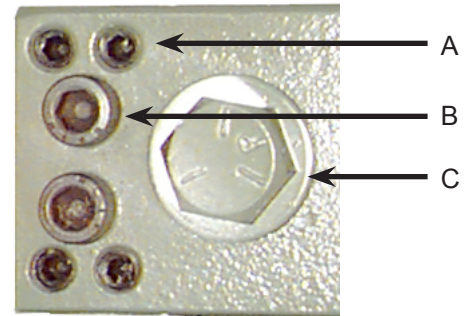


## ANGLE BRAKE ADJUSTMENT

The clamping force on the swivel brake can be adjusted to ensure that the Head is held securely and does not move during cutting. The brake handle should be adjusted so that it does not "bottom out" or hit its movement limit, yet hold the head securely.

### ANGLE BRAKE ADJUSTMENT PROCEDURE:

- Step 1 – Loosen locking cap screws "B" with a 1/4 Allen key
- Step 2 – Tighten all 4 setscrews "A" until snug with a 5/32 Allen key
- Step 3 – Back out the "A" screws 1/4 turn
- Step 4 – Tighten the locking cap screws "B"
- Step 5 – Swing the head to 45° and back to ensure that the head moves freely and does not bind on the pivot surfaces. Continue to step 6 if necessary.
- Step 6 – Adjust the clamping force bolt "C" with a 3/4" wrench. If not tightened enough, the locking handle will "bottom out" and not hold the head firmly.

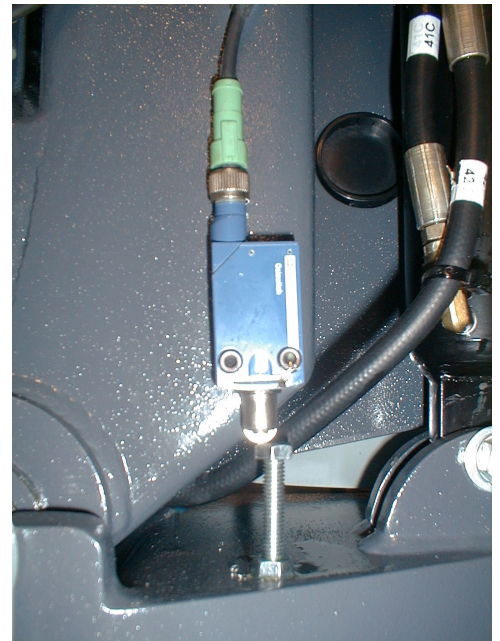


## HEAD DOWN LIMIT SWITCH

The head down limit switch operates to cut power to the blade motor and the coolant pump motor when the Head has descended to the bottom of its travel in the Manual mode. The Head is adjusted so that the blade will descend slightly past the level of the vise wear strips. This setting is critical to ensure that the blade has cut fully through the stock.

The Head Down Limit switch is made with the Head fully down and when the spring post contacts the limit switch at the top of its travel. The Head Down Limit switch is located on the head frame near the pivot point as shown in the photo.

Adjustment of the limit switch is made by changing the position of the set bolt, which is located on the end of the spring post. Lengthening the set bolt will cause the limit switch to activate sooner as the spring post meets the limit switch roller. Shortening the setting bolt by turning it into the spring post will lengthen the time before the Head Limit Switch is activated.



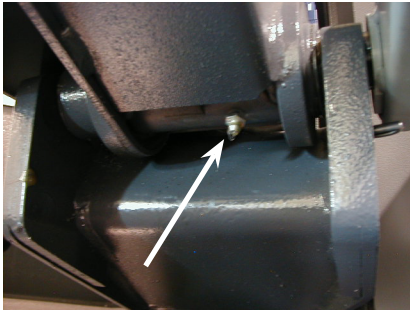


## LUBRICATION

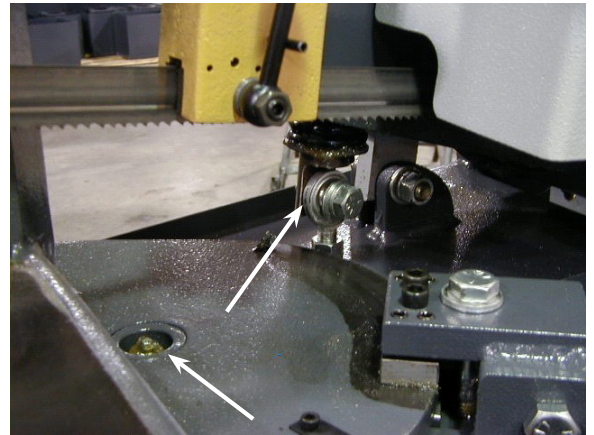
The S-20/23A Series II was designed to minimize the maintenance requirements, however moving assemblies and contact faces need lubrication on a regular schedule. The lubrication requirements are primarily the saw pivot points and shuttle assembly which are equipped with grease fittings, and metal to metal surfaces that require lubrication to prevent wear and seizure.

It is recommended to use LPS ThermoPex Hi-Load bearing Grease manufactured by LPS Laboratories or equivalent, for lubrication of the shuttle assembly. For other points of lubrication general purpose grease is sufficient.

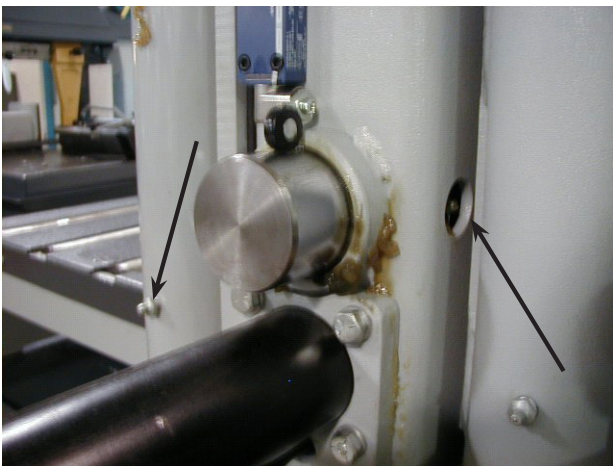
The lubricant should be applied as frequently as required. Main lubrication points are indicated on the following pictures.



PIVOT



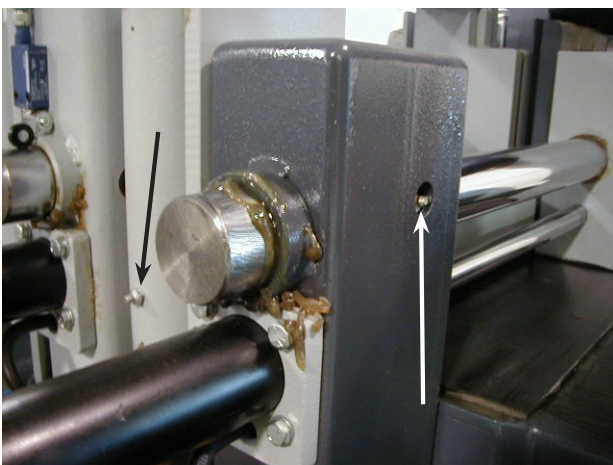
SWIVEL/SPRING ROD END



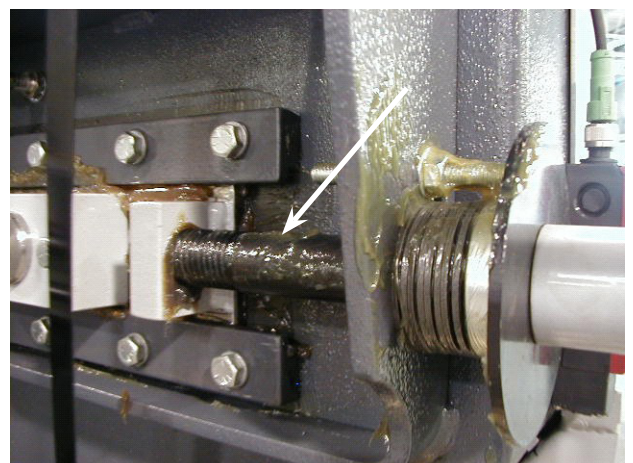
WISE/BUNDLING FRONT



SHUTTLE



WISE/BUNDLING SHUTTLE



SLIDER

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## **GEARBOX LUBRICATION S-20A**

The Bonfignoli W86 gearbox used on the S-20A is supplied with 0.64 litres (0.17 US gallons) of Shell Tivella S320 synthetic oil. This oil has an ISO Viscosity Grade of 320 that is optimum for ambient temperatures from 20-70 Deg C (70-140 Deg F). The W86 was designed to be a sealed unit, so no oil change should be necessary. However, if the oil needs to be changed, Bonfiglioli recommends that, should a lubricant other than the approved Shell type be used, this be equivalent viscosity wise and of the synthetic type. The lubricant must also have the necessary EP and anti-foaming additives.

## **GEARBOX LUBRICATION S-23A**

The Bonfignoli W110 gearbox used on the S-23A is supplied with 1.5 litres (0.40 US gallons) of Shell Tivella S320 synthetic oil. This oil has an ISO Viscosity Grade of 320 that is optimum for ambient temperatures from 20-70 Deg C (70-140 Deg F). Bonfiglioli recommends that, should a lubricant other than the approved Shell type be used, this be equivalent viscosity wise and of the synthetic type. The lubricant must also have the necessary EP and anti-foaming additives. Subsequent oil changes should be made every 600 to 12000 hours of operation depending on load conditions. The intervals, however, should not exceed 4 years.

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## HYDRAULIC MAINTENANCE

1. **OIL FILTER**- The oil filter should be changed every 500 hours or at least once a year. See section 5 for replacement filter element information. For units equipped with filter visual indicator replace filter element when indicator is on red zone. Indicator should be checked with hydraulic pump running and after oil has reached operating temperature.
2. **HYDRAULIC OIL**- Machine hydraulic reservoir is filled with mineral oil Texaco Rando HD46. In case of changing the brand, hydraulic system should be drained and thoroughly flushed. Following is a list of recommended replacement oils:
  - Texaco Rando HD 46
  - CHEVRON ECO Hydraulic oil AW ISO 46
  - MOBIL DTE 25
  - ESSO NUTO H46
  - SHELL TELLUS OIL 46
3. **HYDRAULIC OIL LEVEL** - Oil level should be maintained in the upper half of the level gauge. Normally the rate of oil consumption will be very low and it should be unnecessary to add oil more often than at filter changes if at all. The usable volume of oil reservoir is 4 US Gallons.
4. **HYDRAULIC OIL CHANGE** - Oil visual inspection should be conducted with every filter change for following signs of degradation:
  - Milky or hazy oil color
  - Burnt smell
  - Varnish or sludge formation
  - Increased viscosityIf one of the above is observed then oil should be changed. It is recommended to change oil after every 3000 hours of operation or once a year.
5. **OIL TEMPERATURE** - Oil temperature is indicated by a thermometer contained in the level gauge. Oil temperature during steady operation should stabilize at about 55-60F (30-33C) above room temperature. Thus in a 70F (21C) shop one might expect an oil temperature of about 130F (54C). Oil temperature should never exceed 155F (68C).
6. **HYDRAULIC PRESSURE** - Hydraulic pressure is factory set and should not require any further attention.

## CLEANLINESS

The heavy-duty design should endure heavy operating conditions and provide the customer with flawless machine performance. To extend good performance some care is required especially where cleanliness is concerned.

The following areas should be kept clean:

- Control console free of dirt and grease
- Door charts free of dirt and grease
- Wheel boxes free of chips
- Blade guides free of chips
- Out-feed tables free of chips
- A large chip build-up should be avoided in the base of the saw

**NOTE:** All parts must be cleaned before any repair service may be performed on them

## PROGRAMMABLE LOGIC CONTROLLER, PLC 100, 2100 SOFTWARE

**NOTE:** The PLC is equipped with a lithium battery to keep the program stored while the power is shut down. The battery will need to be replaced every 3 to 5 years, depending on usage. A visual warning will be displayed on the interface when the battery drains to a certain level. Batteries can be purchased through your Hyd-Mech Group Limited Distributor.

The programmable logic controller (PLC) uses signals from limit switches, control panel switches, an encoder (rotary shaft or linear) and information that is programmed into it, to supply accurate automatic length control and sawing functions.

The inputs used include:

- A head up limit switch, and head down limit switch
- Out of stock limit switch (optional on automatic machines only)
- The machine function keys and push-buttons located on the front console
- Proximity switch
- Optical encoder (on automatic machines only)

An encoder is attached to the shuttle assembly and travels with the shuttle to provide length information to the PLC. A proximity switch is mounted behind the idler wheel, provides blade speed input to the PLC.

The programmed information includes logic put into the PLC by its manufacturer, as well as information programmed in, through the keypad, by the assembly plant. Information from the assembly plant is referred to as the parameters. The parameters are important for the PLC to provide accurate sawing lengths and blade speed display. Following is a description of each parameter and the procedure to access them.

To access PLC parameters screen on automatic machines S22A and S23A PLC:

In manual mode, with front vise switch in the CLOSED position, press the SERVICE MODE key.

To access PLC parameters screen on S22A and S23A Sequencer:

In manual mode, with front vise switch in "CLOSE" position, press FWD and REV keys simultaneously (not more than 0.5 seconds apart).

The PLC will prompt for a password that is obtainable from Hyd-Mech Group Limited. If the password is correct, a screen of parameters will appear. To move through the parameters use the cursor keys to scroll up or down or the keys underneath UP and DOWN on the display. To change a parameter, move the cursor to that parameter line, and using the number keys, type in the new value and press enter. To change a parameter that is not numerical, press the enter key at that parameter. To leave the parameter screen press the key underneath RETURN on the display. The following page lists the available parameters and their definitions

PARAMETER	DEFINITION
<b>SPEED CONSTANT</b>	Blade Speed Display adjustment number. If actual blade speed is different than displayed blade speed, a new SPEED CONSTANT will need to be calculated. $\text{SPEED CONSTANT} = \text{old SPEED CONSTANT} \times \text{actual speed} / \text{displayed speed}$ .
<b>ACTUAL LENGTH</b>	Actual Length Value of shuttle stroke.
<b>LENGTH CONSTANT</b>	Specifies linear distance of shuttle movement in inches per one pulse of shuttle encoder.
<b>ACCELERATION DISTANCE</b>	Shuttle acceleration distance. Distance, in inches, the shuttle will travel slowly before reaching fast speed while starting to move in either direction (i.e. 1.000).
<b>DECELERATION DISTANCE</b>	Shuttle Deceleration distance. Distance, in inches, the shuttle will travel slowly before reaching fast speed while starting to move in either direction (i.e. 1.000).
<b>MINIMUM FAST DISTANCE</b>	Minimum fast speed distance. If programmed length is smaller than this parameter, override to slow speed (shuttle)
<b>TARGET WINDOW</b>	Allowable +/- tolerance from programmed length.
<b>FRONT VISE OPEN DWELL</b>	Delay time for the opening of the FIXED VISE in seconds.
<b>SHUTTLE VISE OPEN DWELL</b>	Delay time for the opening of the FIXED VISE in seconds.
<b>CLOSE TIME</b>	Delay time for the closing of the SHUTTLE or FIXED VISE in seconds.
<b>SEQUENCER</b>	Activates S22A Sequencer and S23A Sequencer features. Active only on S22A Sequencer and S23A Sequencer.
<b>FEED RATE</b>	Activates feed rate display. Not active on S20A and S23A machines.
<b>ACTUAL POSITION DISPLAY</b>	If this value is set to YES, displays SHUTTLE VISE actual position
<b>HOLD SHUTTLE HOME</b>	Hold SHUTTLE VISE home and closed during cut.



<b>BROKEN PROX</b>	Allows user to override signal from proximity switch in case it is broken. (When set to NO machine will not run with broken proximity sensor. Set to YES allows machine to run – but with out blade speed display and blade breakage or stall protection).
<b>SPD PROX DELAY</b>	Delay in monitoring of the blade speed proximity switch during acceleration of the blade from start to desired speed set by the manufacturer
<b>POWER DOWN TIMER</b>	If “0” selected, then the machine will shut down after the job is completed. This will allow the machine to continue running for a specified time after the job (in Manual Mode) for the cycle (in Auto Mode) has been completed. Range from “0” to “180” minutes.
<b>BLADE CLEAR</b>	If set to YES, when the AUTO CYCLE reaches the function of head up, the shuttle will retract the material from the blade by 1/8” before the head will move up. When the head reaches the up position, the next length of material is shuttled into position.
<b>TRIM CUT</b>	If set to YES is selected, the machine will perform a facing cut of the material at the beginning of an automatic cycle.
<b>OUT OF STOCK</b>	Selecting YES activates the out of stock option, which prevents the shuttle vise from closing if insufficient length of material is available for the next length advance. Also stops the automatic cycle after completing the last cut.
<b>COOLANT</b>	When BLD is selected, coolant flows when the blade is running. When BLD + DWN selected, coolant flows when the blade is running and head is moving down.
<b>QUEUE</b>	The Queue allows the operator to run several jobs (max 10) in series. If REPEAT is selected the above series will be executed the selected number of times.
<b>MEASURE UNITS</b>	Select between imperial and metric measuring units. Active only on S22A Sequencer and S23A Sequencer.

## PLC 100 TROUBLESHOOTING

PROBLEM #1 – For automatic models with a shuttle

PLC is not measuring lengths

POSSIBLE CAUSES:

1. Encoder
  - pinion gear loose on encoder shaft
  - bad encoder
2. Encoder Cable
  - bad connection at encoder or PLC
  - open or shorted wire
3. PLC Unit
  - damaged hardware

ACTUAL LENGTH PARAMETER

perform calibration procedure and enter value  
parameter value is set to 00.000

DIAGNOSIS:

1. With the machine in MANUAL mode, bring the shuttle forward to the home position and clear the length display to read “0.000”. Run the shuttle, in slow speed, to the rear then back to home, moving full shuttle strokes. Length should accumulate on the display as a positive number when the shuttle moves away from the blade, and should count as negative coming towards the blade. Then the green channel wire and the white channel wire should be reversed. If the display alters between 0.000 and 0.001 or 0.000 and –0.001, then one of the encoder channels is not being recorded correctly.



2. To determine the cause, first check the encoder cable connections to be sure all four wires are connected properly
  - a. At encoder connector: between 0 V pin and 24 V pin. This voltage should be a minimum of 22 to 26 VDC. If the voltage is incorrect, check encoder cable continuity – if OK, possible PLC problem. If the voltage is correct, go to step b)
  - b. At encoder connector; between) V and channel A and) V and channel B. This should be slightly less than supply voltage at each channel. If voltage is incorrect at this point, check for proper continuity of these wires and repair as necessary. NOTE: When checking the encoder cable for continuity, each wire should also be checked for shorting to ground and shorting to each other. If voltage to the encoder is correct, go to Step c)
  - c. At the encoder connection of the PLC; between) V and A & B channels. With the shuttle moving slowly, voltage should be approximately 10 – 13 VDC. Input LED's X0 and X1 should flicker or go dim with the shuttle moving. If these LED's show no change with the shuttle moving, the encoder is likely at fault. Check that the pinion gear is securely fastened to the encoder shaft and that it can rotate along the rack as the shuttle moves. If all mechanical components are functioning correctly, then the encoder is defective. If all tests positive, the problem is in the PLC unit.

PROBLEM #2 – For automatic models with a shuttle  
Inaccurate lengths in AUTO mode

POSSIBLE CAUSES:

1. Encoder
  - pinion not engaging rack all the way from front to back; mechanical interference, pinion loose on encoder shaft
2. Encoder Cable
  - bad connection at encoder or at PLC
  - intermittent open in one or more signal wires
3. Improper Programmed Information
  - existing parameter(s) incorrect
  - incorrect blade kerf
4. PLC
  - faulty PLC unit (not repairable in the field)

GENERAL RULES – Normally, three types of length inaccuracies may occur

1. Inconsistent – lengths cut are not consistent, error changes. It doesn't matter how long the part required is the error is never the same. Cause – most likely a defective electrical, hydraulic or mechanical component
2. Consistent – lengths cut are consistent and the error is also consistent. The error always stays the same regardless of part length. Cause – kerf value.
3. Linear – lengths cut are consistent but the error increases as the part length increases. The longer the part the greater the error. Cause –incorrect LENGTH CONSTANT value entered.

DIAGNOSIS:

Check and record existing parameter. Also check for proper blade kerf. By making a cut partway into a piece of material and measuring the width of the cut, the operator can verify blade kerf.

INCONSISTENT INACCURACY

With the machine in MANUAL mode, move the shuttle all the way forward and clear (zero) the length display. Move the shuttle in reverse, in slow speed, all the way to the end of its travel. Return the shuttle forward to the home position, also in slow. The display should read 0.000" +/- .005" when returning to the home position. If the display does not read as specified:

- Check the encoder pinion gear to be sure it can run smoothly down the rack and that the gear and rack teeth engage over the entire travel of the shuttle
- Check that the pinion gear is tight on the encoder shaft

- Check the encoder cable connections. A loose connection could easily cause this concern.
- Remove the encoder from the machine and check that the shaft can rotate freely. There should be no binding or rough spots felt when spinning the shaft. Plug the encoder cable into the encoder, clear the length display, and rotate the shaft exactly (or as close as possible) one revolution. The display should read approximately 3.142" (positive or negative). Repeat this 3 or 4 times, spinning the shaft several times between tries.

## CONSISTENT INACCURACY

Make sure the blade kerf value is correct. Change ACTUAL POSITION DISPLAY parameter to YES. This will make the PLC show actual shuttle travel in AUTO.

With no material in the machine:

- Program JOB 1 for two pieces of 5" length, JOB 2 for two pieces of 10" length, and JOB 3 for two pieces of a length as one shuttle will allow
- Enter JOBS 1, 2, and 3 into QUEUE
- Record measurement on the display each time the shuttle vise reaches the target length and closes. It should equal the required length plus the programmed kerf value. Check that this measurement is +/- .002" for each length. If the overshoot/undershoot is very inconsistent, it could be related to an incorrect shuttle cushion period. This may be caused by DECELERATION DISTANCE Parameter being set too low, defective fast or reverse output relays on the PLC, or the hydraulic cushion valve (located at the hydraulic manifold) may be faulty.

## LINEAR INACCURACY

- Load machine with a piece of stock for test cutting
- Re-enter new LENGTH CONSTANT value
- Re-cut test lengths and check if accuracy is satisfactory

NOTE: Linear inaccuracy may be corrected by adjusting the LENGTH CONSTANT as follows:

- Load machine with a piece of stock for test cutting
- Program the PLC to cut two pieces each of 1", 12" and a length equal to a shuttle and a half of the machine being checked
- Make the cuts and measure as accurately as possible (vernier caliper)
- Using the formula provided below, calculate the new parameter LENGTH CONSTANT

Formula for determining new parameter LENGTH CONSTANT:

Measured length divided by Programmed Length X Existing constant = New LENGTH CONSTANT

E.g. Programmed length = 1.00" measured length = .000" -0.001" short  
                                   = 12.00"                       = 11.988" -0.012" short  
                                   = 60.00"                       = 59.940" -0.60" short

Existing parameter LENGTH CONSTANT = 0.0012567

divided by 12.00 X 0.0012567 = 0.0012554

The new parameter LENGTH CONSTANT would be 0.0012554. This value should be entered as the new LENGTH CONSTANT parameter and test cuts repeated. Adjust the parameter again if necessary.

*General Rule:*

Lowering the LENGTH CONSTANT value = Longer shuttle travel = Longer parts

Increasing the LENGTH CONSTANT value = Shorter shuttle travel = Shorter parts

**PROBLEM #3 – for P models, disregard all references to a shuttle**

AUTO CYCLE not being completed

In the AUTO MODE, the PLC controls saw functions through output relays. For a certain function to be actuated, the PLC must first see specific input(s). Like the output relays, the input relays are located on the PLC unit. Directly beside input and output terminals are red LED lights, which light up when the corresponding input is being received or output is being actuated. Observation of these input/output LEDs can help to diagnose AUTO cycle programs. (See PLC UNIT drawing on page 46). When a problem occurs in the AUTO mode, the lights should be checked to see if they are coming on at the proper time or at all.

INPUT LED'S

- if a specific input light does not come on when expected
- check for a faulty/misadjusted limit switch, push button, encoder or by faulty wiring and connections
- wiring for each limit switch should be connected from the VDC terminal connection to particular limit switch, and from the limit switch to the input connector of the PLC

NOTE: All inputs are denoted by "X"  
All outputs are denoted by "Y"

Following is information on output diagnosis and the sequence of inputs and outputs during AUTO cycle.

#### AUTO CYCLE SEQUENCE

After changing to AUTO MODE and the job has been programmed into the PLC, and the CYCLE START push button pressed:

1. Hydraulics running, the head should move to its up limit, if it is not already there. Shuttle vise should open and come forward to the home position. HUP input light must come on for cycle to continue. HUP Input ON – cycle should continue. If not, check outputs as per step 2. HUP Input NOT ON – check that head up limit switch is being actuated. Check limit switch/limit switch wiring.
2. Front vise should be closed, the shuttle vise should stay open and move back to the programmed length; FVC output should be on SVO output will light momentarily. REV output and FST output should be on when the shuttle moves back fast.
3. As the shuttle approaches target length the FST output should shut off and the shuttle should travel slow for the DECELERATION DISTANCE Parameter, cushion distance (i.e. 1.00"). When the shuttle reaches target length, the SVC output should light, and the shuttle vise should close on the material.
4. FVO output light should come momentarily on and front vise should open
5. FWD output should light as well as FST for the shuttle to move forward in fast speed. FST will turn off when the shuttle home cushion period is reached and the shuttle should slow down into the home position.
6. FVC output should light and the front vise should close. FWD light should go out, HDN output should come on the head should start to descend for the cut. If blade is not running at this time, auto cycle will hold until min. SFM is reached. Depending on "Hld Shtl Hm" parameter in the PLC, the shuttle may stay home and closed during the cut or may move back to pick up the next length. HUP input should go out as the head descends, and HUP L/S deactivates.
7. After the cut is completed, HDN input should light, HDN output should go out, the HUP output should light and head should move up. When the head reaches its up limit, HUP input should come on, RHD output off and the cycle repeats with the next length being clamped on by the shuttle, front vise opening and the length being brought forward to home position.

As mentioned, beside each input and output terminal there is a bank of red LEDs. Each light corresponds to its input or output. An input LED will light when its specific input signal is being received at the PLC and output LEDs will light when the PLC commands specific outputs. If an output LED is on but the output does not happen, check for voltage at the specific output wire. If voltage is not present then either the output relay is faulty/stuck or the output (3 amp) fuse has blown. (See fuse information on the next page). If a fuse is blown, a shorted directional valve coil (good coil should measure 30 to 40 ohms), shorted noise suppressor at the coil, or shorted wiring could be the cause. If the fuse is good and no output voltage condition still exists, with the output light on, then the relay is defective. If this is the case, the PLC will have to be returned to the manufacturer for repair. (Contact Hyd-Mech Group Limited Service Dept.)

#### FUSES

The PLC has four glass fuses in line with it.

Fuse "4FU" is a 2-amp instant blow fuse, which feeds power to the input side of the PLC and operator interface terminal.

5FU1 is wired to terminal "V0" supplying Outputs – Y0, Y1, Y2, Y3, Y4, Y5, Y6

5FU2 is wired to terminal "V1" supplying Outputs – Y10, Y11, Y12, Y13, Y14, Y15, Y16

6FU supplying power to solenoids valves

#### PROBLEM #4 – NO DISPLAY

POSSIBLE CAUSES:

No power to the PLC

PLC unit failure

Faulty connection of cable between PLC & Interface

## DIAGNOSIS:

Check POWER LED (see next page – Inputs & Outputs) – to be on when the PLC is switched on. If the light is OFF, PLC may have failed. Check for proper connection of cable at PLC & at interface. If light is not on – check the (2 amp) PLC fuse. If the fuse is OK, check power to it.

## PROBLEM #5 – NO BLADE SPEED DISPLAY

### POSSIBLE CAUSES:

1. Fault at proximity sensor
  - Bad sensor, misadjusted sensor (gap should be approx. 0.015")
  - Contamination on the end of the sensor
2. Fault at the PLC
  - Bad connection of sensor wiring
  - Faulty PLC input

## DIAGNOSIS:

Check for LED light on the sensor – light on indicates proximity sensor power connections are correct and sensor is activated. Problem could be with sensor, signal wire to the PLC or with the PLC. With blade running, proximity LED should pulse. Likewise, the PLC input LED (X2) should be pulsing. If both LEDs are pulsing with the blade running, the PLC is the problem. If the sensor LED is pulsing but the input (X2) LED is not; there is a problem between the sensor and the PLC input (X2) terminal. If the LED on the sensor is not on, the problem is with the sensor wiring or the sensor is at fault.

## mitsubishi 100 INPUTS AND OUTPUTS

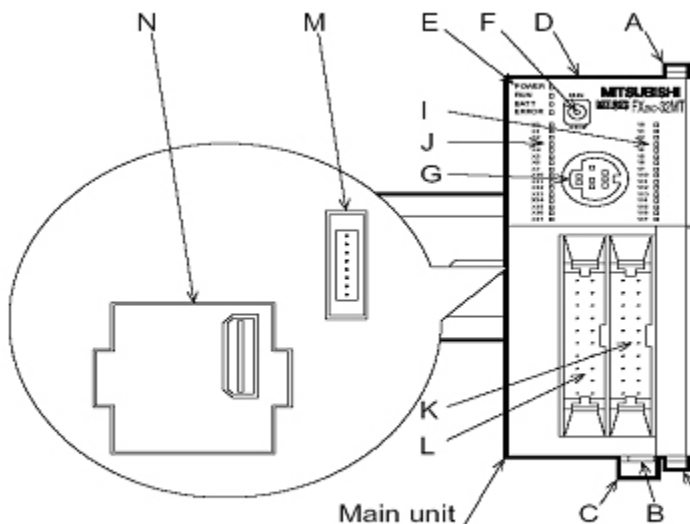
### INPUT AND OUTPUT TERMINAL IDENTIFICATION

The left row of identification labels corresponds to the top row of terminals and the bottom row of labels to the bottom row of terminals. Input and output LED numbers correspond to the Input or Output of the same number.

i.e. Input LED #0 corresponds to Input X0. Output LED #0 corresponds to Output Y0.

### PLC STATUS INDICATORS:

- Power – on when power exists to the PLC  
Run – on when the PLC is running  
Batt V – on when PLC memory backup battery has low voltage condition  
Prog E – flashes when PLC has a program error



A	Slide lock for extension I/O block
B	Power supply connector (Uses the 24V DC)
C	Din rail clip
D	Backup battery
E	Status indicators (POWER, RUN, BATT, ERROR)
F	Run / Stop switch
G	Programming port
H	Extension port
I	Output indicators
J	Input indicators
K	Output connector or Output terminal
L	Input connector or Input terminal
M	Function adapter port
N	Memory board / Real time clock board, port

Input/Output Terminal Information	
<b>Inputs</b>	
X0 – Shuttle Encoder, Channel A – (Open on “P”)	X10 – Open (Shuttle Vise Close on Seq. and “P”)
X1 – Shuttle Encoder, Channel B – (Open on “P”)	X11 – Open (Shuttle Vise Open on Seq. and “P”)
X2 – Blade Speed	X12 – Open (Front Vise Close on Seq. and “P”)
X3 – Door safety interlock	X13 – Open (Front Vise Open on Seq. and “P”)
X4 – Open (Blade Stop on Seq. and “P”)	X14 – Open (Head Raise on Seq. and “P”)
X5 – Head Lower L/S	X15 – Open (Head Lower on Seq. and “P”)
X6 – Head Raise L/S	X16 – Open (Blade Start on Seq. and “P”)
X7 – Out of stock L/S – (Open on “P”)	X17 – Open (Blade Stop on Seq. and “P”)
<b>Outputs</b>	
Y0 – Hydraulic Motor Contactor	Y10 – Front Vise Close
Y1 – Blade Motor Contactor	Y11 – Front Vise Open
Y2 – Mist Option	Y12 – Shuttle Vise Close – (Open on “P”)
Y3 – Blade start	Y13 – Shuttle Vise Open – (Open on “P”)
Y4 – Blade speed increase	Y14 – Shuttle Rev – (Open on “P”)
Y5 – Blade speed decrease	Y15 – Shuttle Fwd – (Open on “P”)
Y6 – Coolant pump On/Off	Y16 – Head Raise
Y7 – Shuttle Fast – (Open on “P”)	Y17 – Head Lower Relay

## CALIBRATION PROCEDURE

For Mitsubishi PLC100 with 2100 Series software

Length calibration may be achieved in two ways: by inputting the ACTUAL LENGTH or LENGTH CONSTANT parameter.

1. To determine ACTUAL LENGTH value, use MANUAL MODE to position a piece of material, which is approx. 5” longer than the shuttle full stroke length (i.e. S20A = 34.00”) and close the front vise. Start the blade and make a trim cut. Raise the head and fully retract the shuttle. Clamp the material and move the shuttle fully forward. Make a cut and measure the part length.

In SERVICE MODE, move the cursor to the ACTUAL LENGTH parameter and enter the length of the cut part plus the actual kerf value. Then exit the parameters by pressing the RETURN key.

NOTE: When entering the ACTUAL LENGTH, always round down.

2. To determine LENGTH CONSTANT value, use this formula:  

$$\text{LENGTH CONSTANT} = \text{ENCODER PINION CIRCUMFERENCE (TTd)} \div \text{ENCODER RESOLUTION}$$

Example:

For a 1” pinion diameter and 2500 PPR encoder:

$$\text{LTH CONST} = \text{TTd} \div 2500 \text{ PPR} = 0.0012567$$

TO CHECK LENGTH CONTROL CONSISTENCY:

- a. Perform test cuts of three different lengths (i.e. 1”, 12”, 20”) and measure as accurately as possible with a Vernier or dial caliper
  - b. If the measurements indicate a linear problem (measured length error increases as the programmed length increases), the ACTUAL LENGTH or LENGTH CONSTANT value will have to be adjusted.
- If part length error gets longer as the programmed length increases, ACTUAL LENGTH value should be decreased
  - If part length error gets shorter as the programmed length increases, ACTUAL LENGTH value should be increased
  - Make small adjustments at a time (i.e. .020” - .030”) and recheck with test cuts

---

General Rule: If part length error gets longer as programmed length increases:

Existing ACTUAL LENGTH = 33.070"

Change ACTUAL LENGTH to  $33.070 - .020 = 33.050$ "

TO ADJUST LENGTH CONSTANT VALUE:

$\text{Cut length} \div \text{Programmed length} \times \text{Existing LENGTH CONSTANT} = \text{New LENGTH CONSTANT}$

Example:

Cut length of 11.988", Programmed length of 12",

Existing LENGTH CONSTANT parameter of 0.0012567.

$11.988 \div 12.000 \times 0.0012567 = 0.0012554$

The new LENGTH CONSTANT value of 0.0012554 should be entered as the LENGTH CONSTANT parameter and test cuts repeated.

Adjust the parameter again if necessary.

General Rule:

Lowering the LENGTH CONSTANT value = Longer shuttle travel = Longer parts

Increasing the LENGTH CONSTANT value = Shorter shuttle travel = Shorter parts

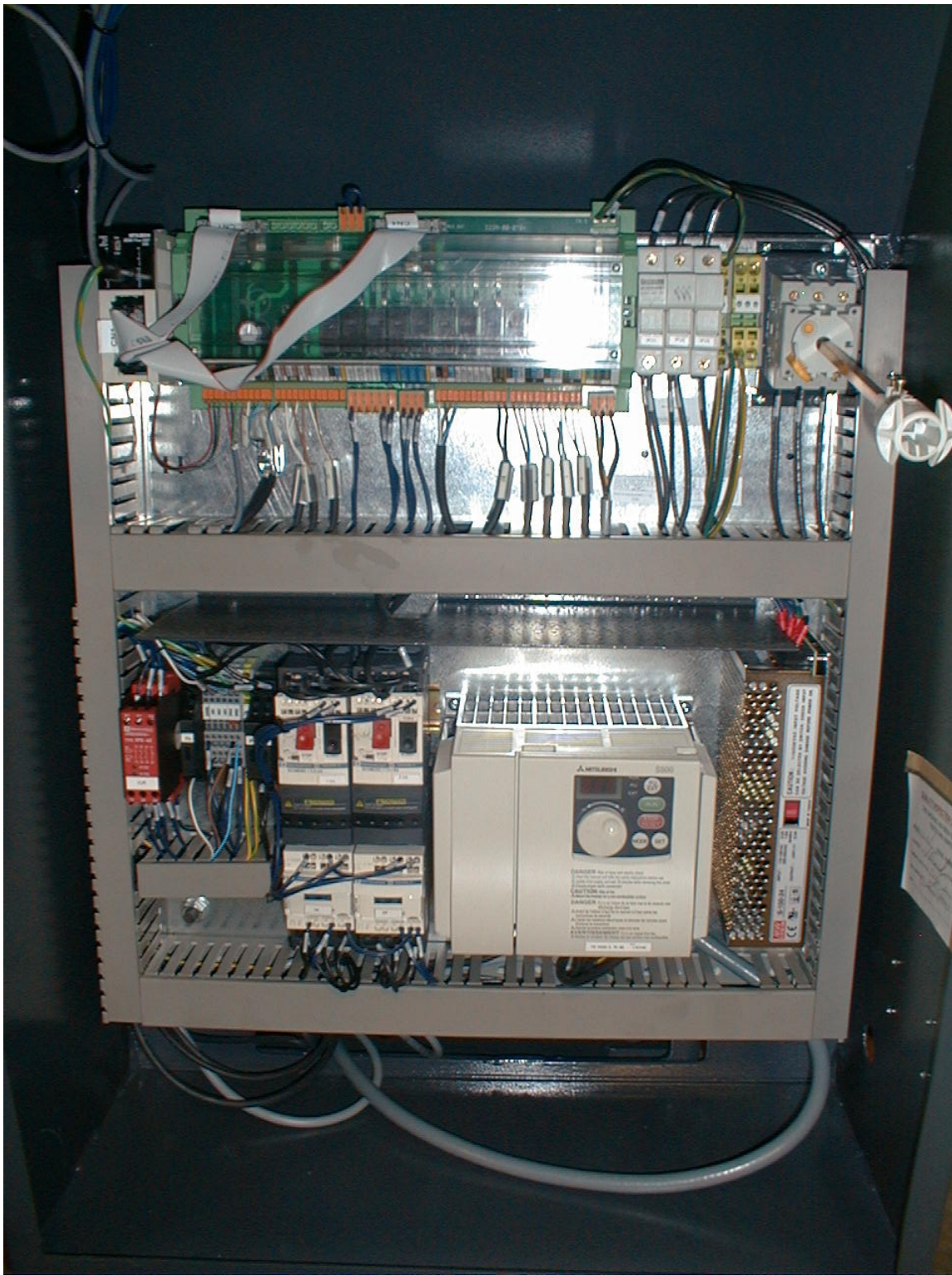




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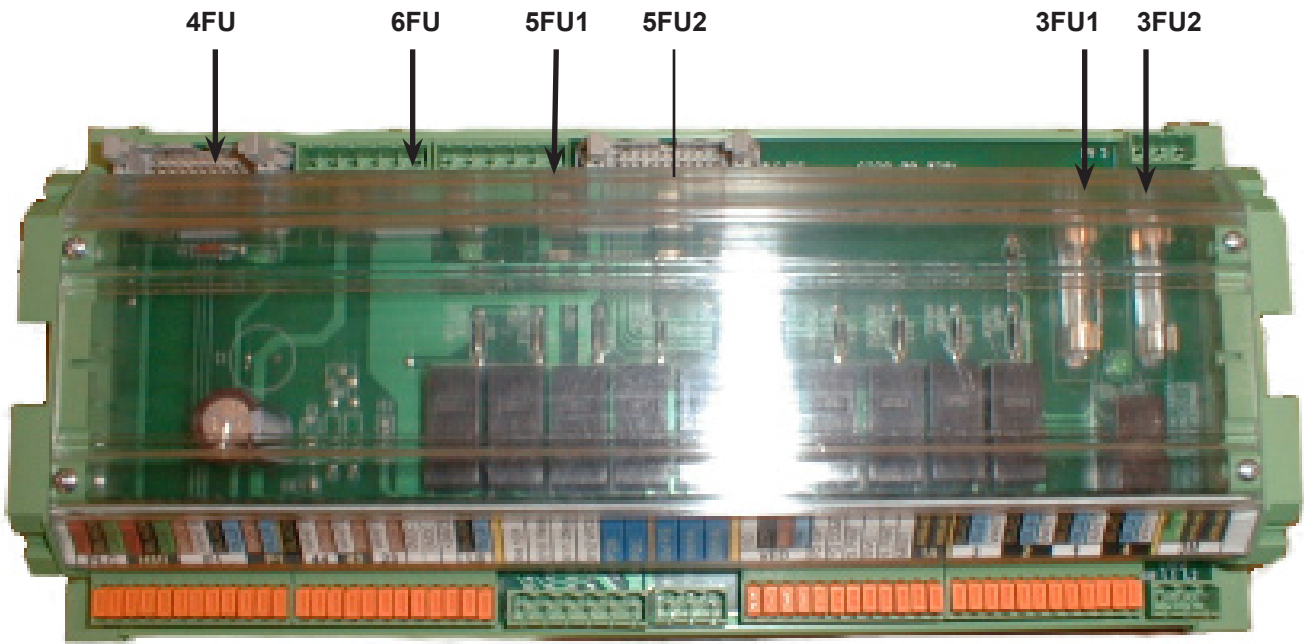
## SECTION 4 - ELECTRICAL

### MAIN PANEL: COMPONENT LAYOUT

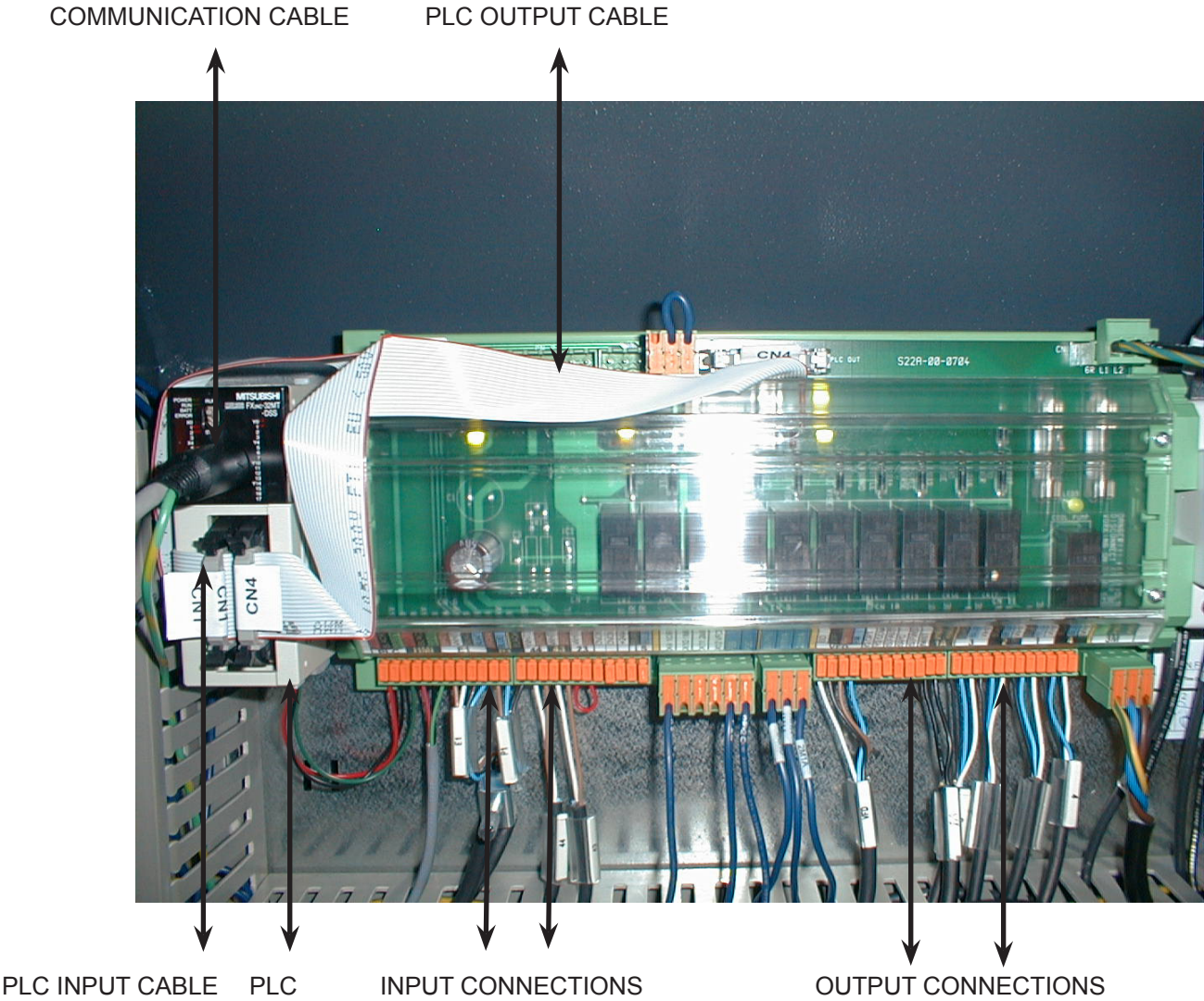


PCB BOARD: FUSE LOCATION

#	FUSE	DESCRIPTION
1	3FU1, 3FU2	1.5Amp Time Delay
2	4FU	2Amp Time Delay
3	5FU1, 5FU2	2Amp Fast Acting
4	6FU	5Amp Time Delay

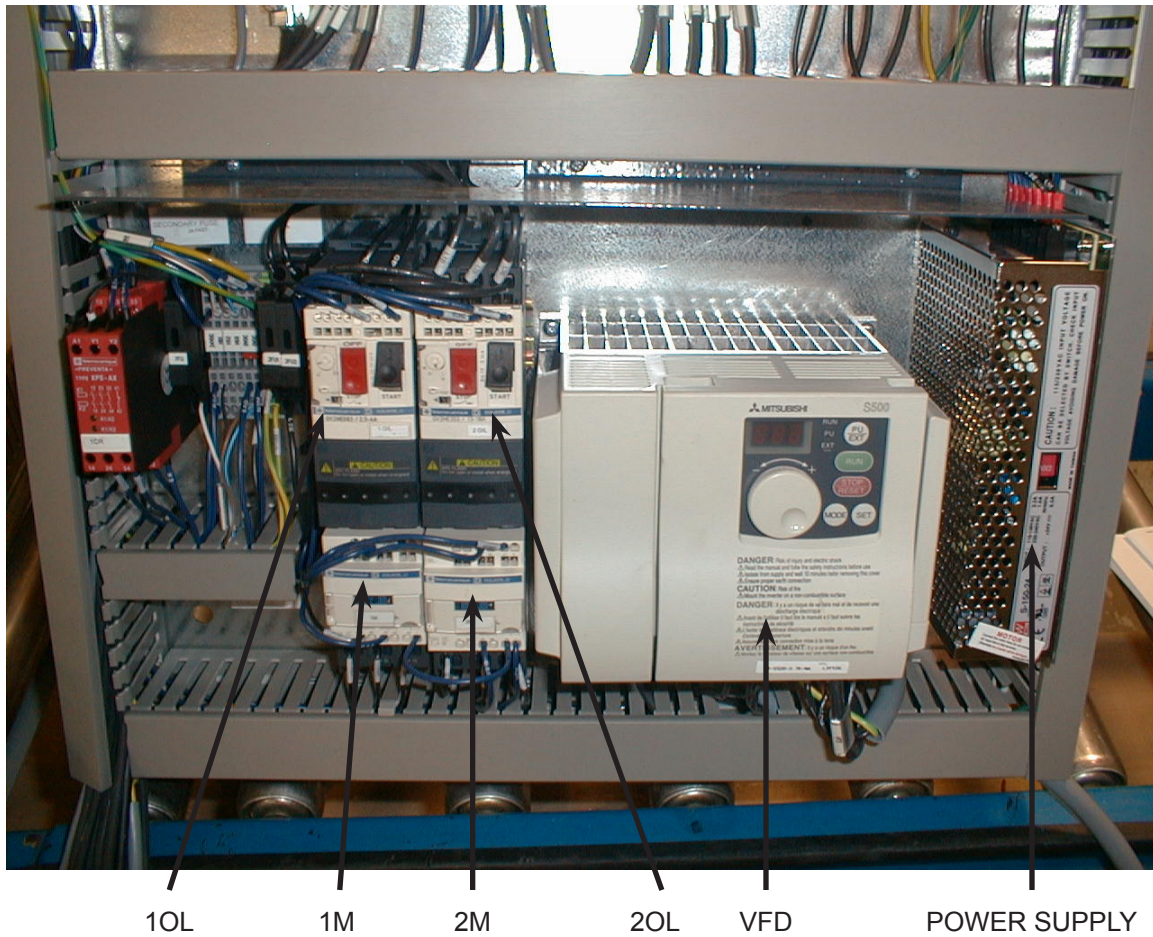


MAIN PANEL: COMPONENT LAYOUT





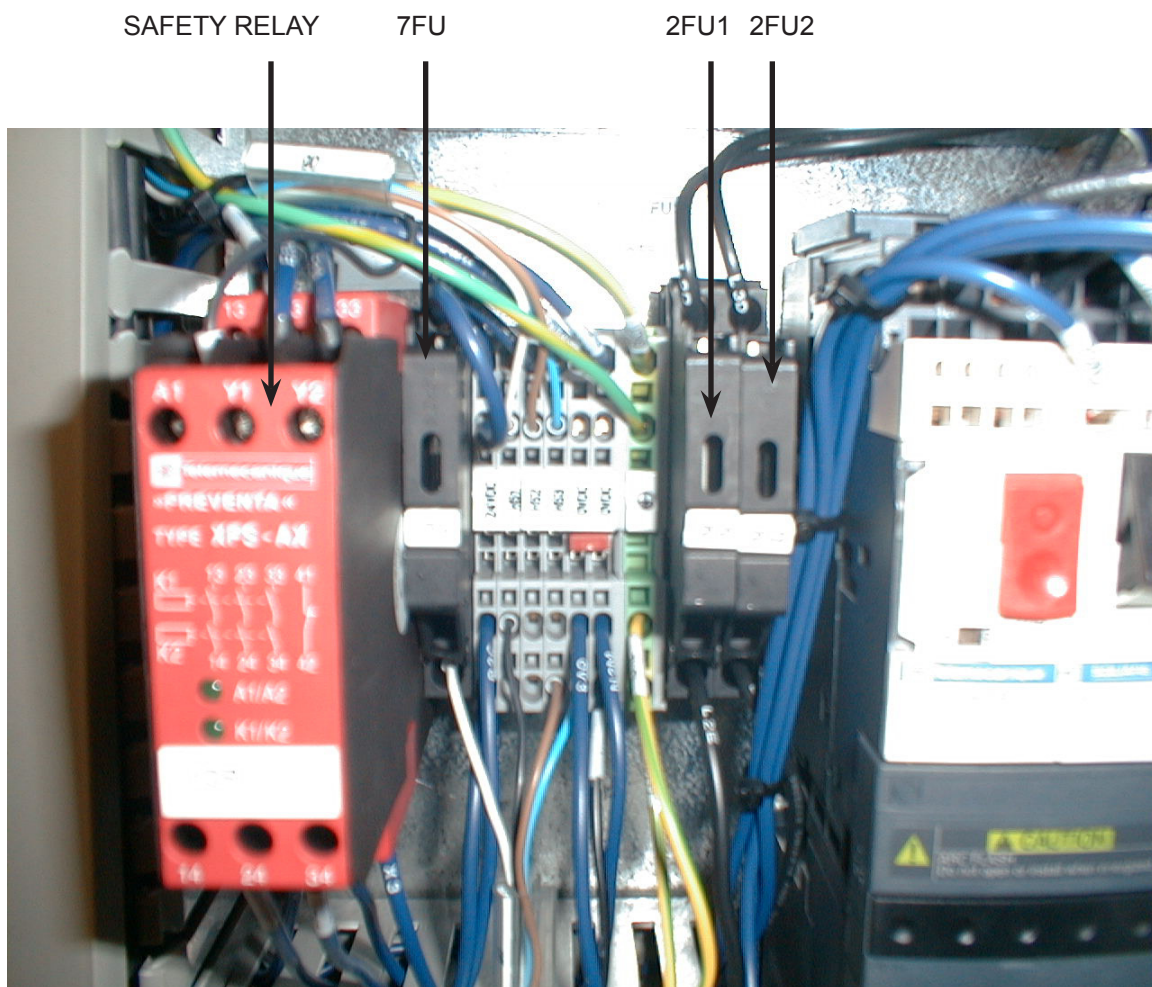
## MAIN PANEL: COMPONENT LAYOUT



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## MAIN PANEL: COMPONENT LAYOUT

#	FUSE	Description
1	2FU1, 2FU2	3Amp Time Delay
2	7FU	2Amp Fast Acting



S20A 3HP OPTION			
PART #	DESCRIPTION	QTY	UNIT
342490	Gearmotor, 3 HP, W86, 230/460V, 3 Phase, 60Hz	1.00	EA

S23A 5HP OPTION			
PART #	DESCRIPTION	QTY	UNIT
342554	Gearmotor, 5 HP, W110, 230/460V, 3 Phase, 60Hz	1.00	EA

### ELECTRICAL SCHEMATIC DRAWING NUMBERS

S22AII - NA - 7 - 00 - 1	Schematic applies to all machines regardless if machine contains PLC or SEQUENCER option.
S22AII - NA - 7 - 01 - 1	Schematic indicates wiring connections required for machine with PLC option.
S22AII - NA - 7 - 02 - 1	Schematic indicates wiring connections required for machine with SEQUENCER option.
S22AII - NA - 7 - 03 - 1	Schematic indicates wiring connections required for Out Of Stock OOS0 option.
S22AII - NA - 7 - 04 - 1	Schematic indicates wiring connections required for Work Lamp option.
S22AII - NA - 7 - 05 - 1	Schematic indicates wiring connections required for Mist Coolant option.

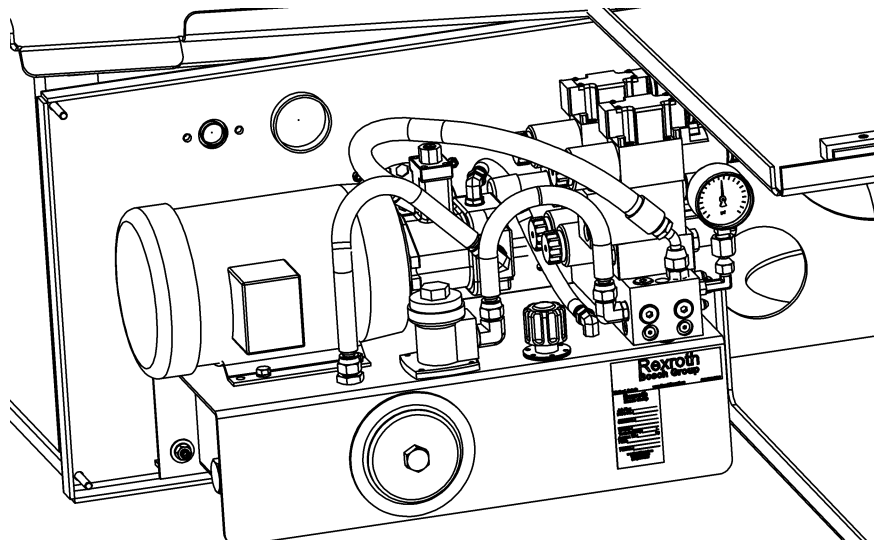
**FOR ELECTRICAL SCHEMATICS AND COMPONENTS PARTS LIST  
SEE PDF ON ATTACHED CD.**

## SECTION 5 - HYDRAULIC

The S20-A, S23-A hydraulic system does not require any special work on a new machine before its start up. The hydraulic tank is filled with TEXACO RANDO HD 46 hydraulic oil and all machine functions have been tested at the factory to ensure proper operation upon initial start up.

### HYDRAULIC COMPONENT LIST

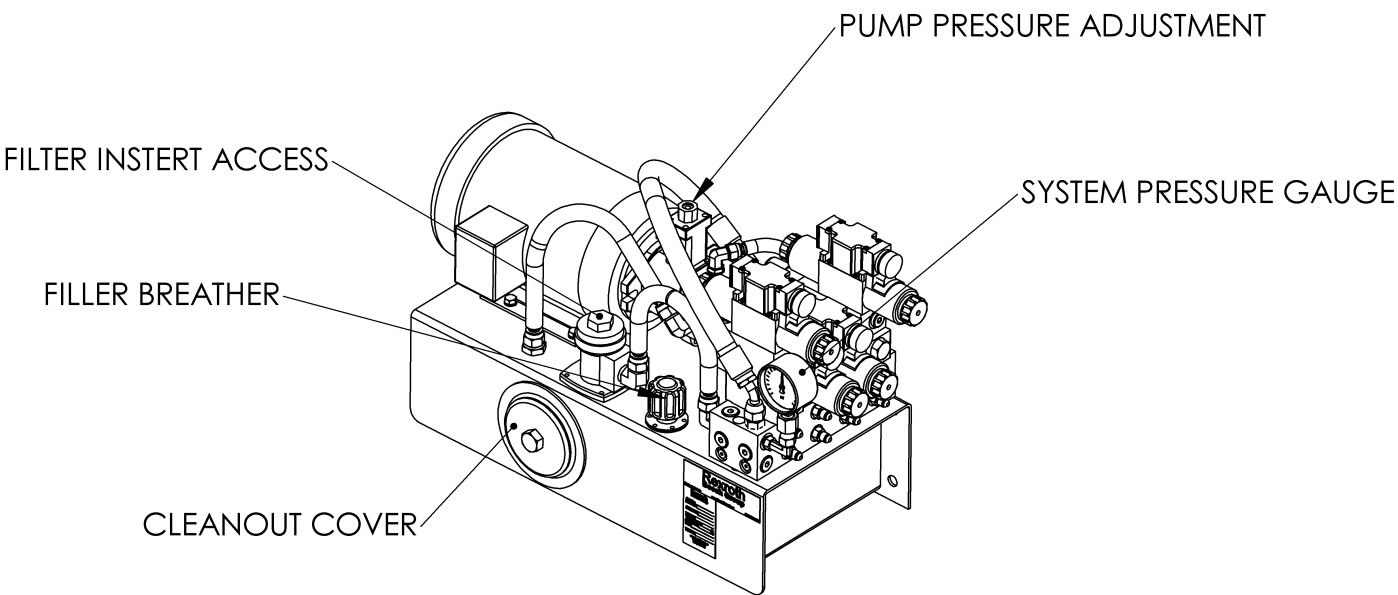
ITEM	BALLOON NUMBER	QTY	PART NUMBER	DESCRIPTION
1		1	800006-S23A 800003-S22A	Head Cylinder
2		2	800000	Vise Cylinder
3		1	800045	Shuttle Cylinder
4		0(2)	800001	Bundling Cylinder (Option)
5		1	DDF1-0-00A	Ddf Valve
6	8b	1	362748	Dcv3P-Ab-T, Head Control Valve
7	8a	1	362748	Dcv3P-Ab-T, Shuttle Control Valve
8	9a, 9b	2	362749	Dcv3P-Ab-C , Vise Valve
9	7a, 7b	2	362747	Dpch-1, Double Pilot Check Valve
10	10	1	362757	Pv2P-A-C , Chb-20 , Cushion Valve Assembly
11	2	1	362752	Pump
12	3	1	362753	Motor 240 Vac, 1Hp, Three Phase
13		1	362756	Filter Element
14		0(1)	362758	Variable Vise Pressure Block (Vvp Option)
15		0(1)	363145	Pressure Reducing Valve (Vvp Option)
16	5	0(1)	360745	Pressure Gauge (Vvp Option)
17	1.4	1	362758	Oil Side Gauge
18		0(2)	363205	Ball Valve (Bundling Option)
19		0(4)	363220	Flow Control Valve (Bundling Option)
20	11	1	362751	Valve, Pressure Reducing Ng 6, Pilot Operated



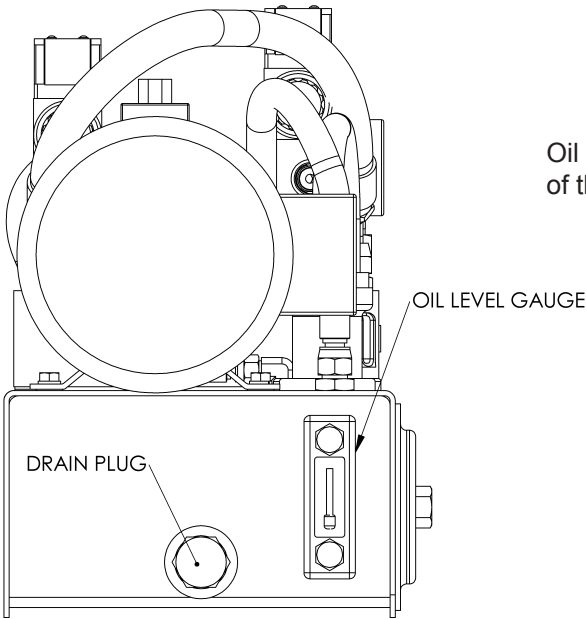
Hydraulic Power Pack



**FILLER CAP AND FILTER ELEMENT LOCATION**



**OIL LEVEL GAUGE AND DRAIN PLUG**



Oil level should be maintained at the top portion of the level gauge glass window.

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**FOR HYDRAULIC SCHEMATICS AND PLUMBING DIAGRAMS SEE  
PDF ON ATTACHED CD.**



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## **SECTION 6 - MECHANICAL ASSEMBLIES**

**For Mechanical Assembly Drawings see PDF on attached CD**



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## SECTION 7 - OPTIONAL EQUIPMENT

### OUT OF STOCK SWITCH

Out of stock prevents the shuttle vise from closing if insufficient length of material is available for the next length advance. Also stops the automatic cycle after completing the last cut.



### MIST COOLANT SYSTEM

Mist Coolant – the air powered pump delivers a regulated number of pulses of lubricant to a single applicator nozzle.

The unit has two control screws.

Pulse / Minute – adjusts rate of lubricant use. About 8 to 12 pulse per minute is optimum – more is not better.

Air Screw – regulates the jet of air that projects the lubricant from the nozzle onto the blade. Adjustment should be such that lubricant covers the blade without blowing the mist beyond the back edge of the blade.

Note: New blade may require initial lubrication with a small quantity of mist coolant applied to the blade at the idler guide arm to prevent squealing.

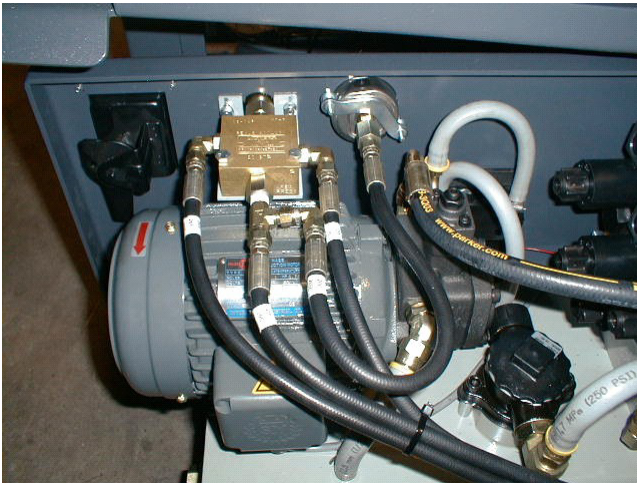


PULSE / MINUTE

AIR SCREW

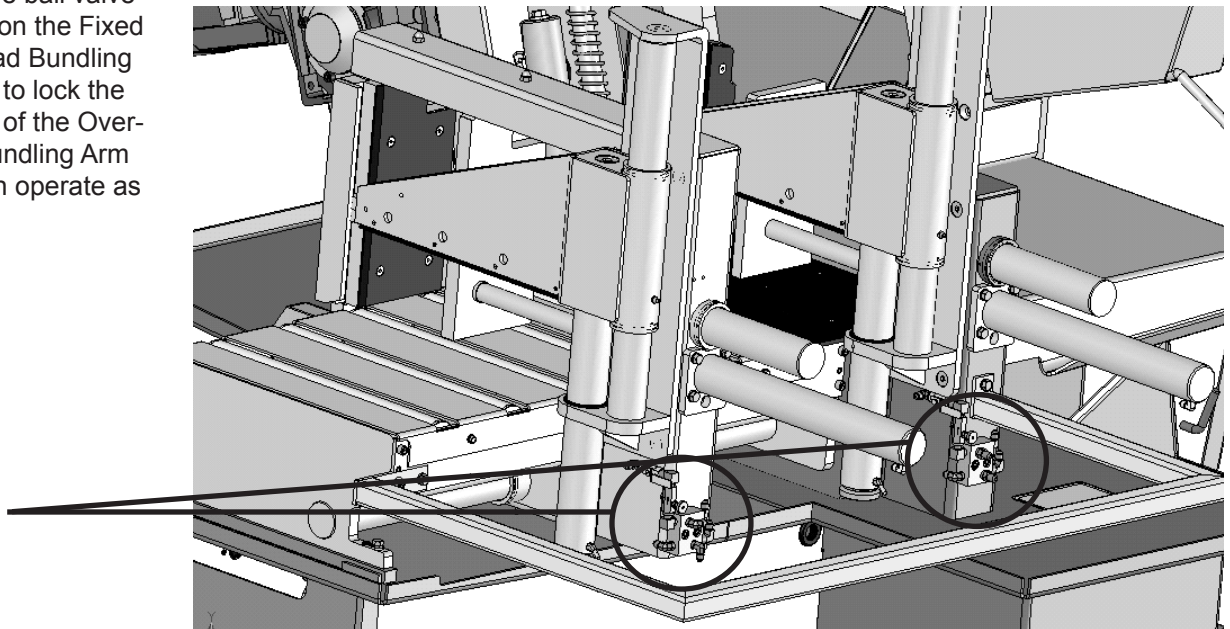
## VARIABLE VISE PRESSURE OPTION

Vise clamping pressure adjustment is located on the face of hydraulic power pack door. Clamping pressure is indicated by the pressure gauge adjacent to pressure control knob. Turning knob clockwise increases clamping pressure. The clamping pressure can be changed infinitely from 50PSI to 600PSI (full pump pressure). It has to be taken under consideration that clamp pressure setting will affect the clamp speed. The actual usable low clamp pressure setting maybe higher than achievable by controls and is limited by mechanical friction of the vise assemblies.



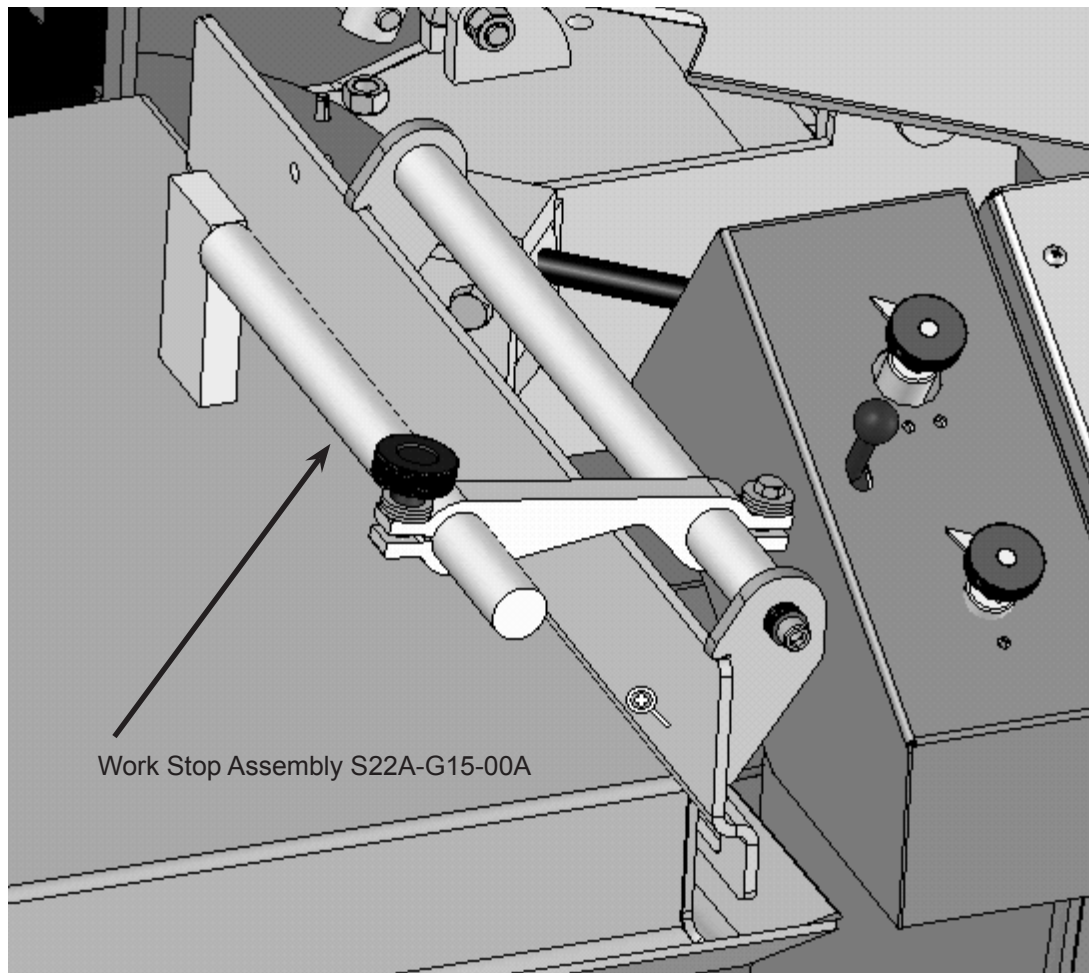
## OVERHEAD BUNDLING

1. The relative speed of the bundling jaws and vise jaws can be adjusted with the needle valves at each cylinder.
2. The following steps will ensure the efficient operation of the Overhead Bundling.
  - a) The material should be loaded into the machines vises and advanced to a position where a trim can be performed.
  - b) Close the Fixed Vise until the Overhead Bundling Arm is slightly ( $1/32"$  to  $1/64"$ ) above the material to be cut.
  - c) Close the ball valve located on the Fixed Overhead Bundling cylinder to lock the position of the Overhead Bundling Arm and then operate as normal.



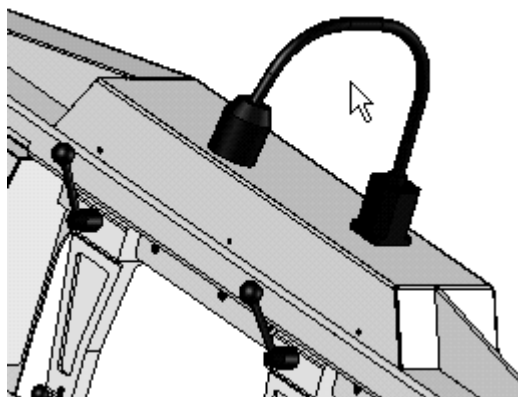


## WORK STOP ASSEMBLY



## WORK LAMP ASSEMBLY

Lamp 24VDC 20W #371789



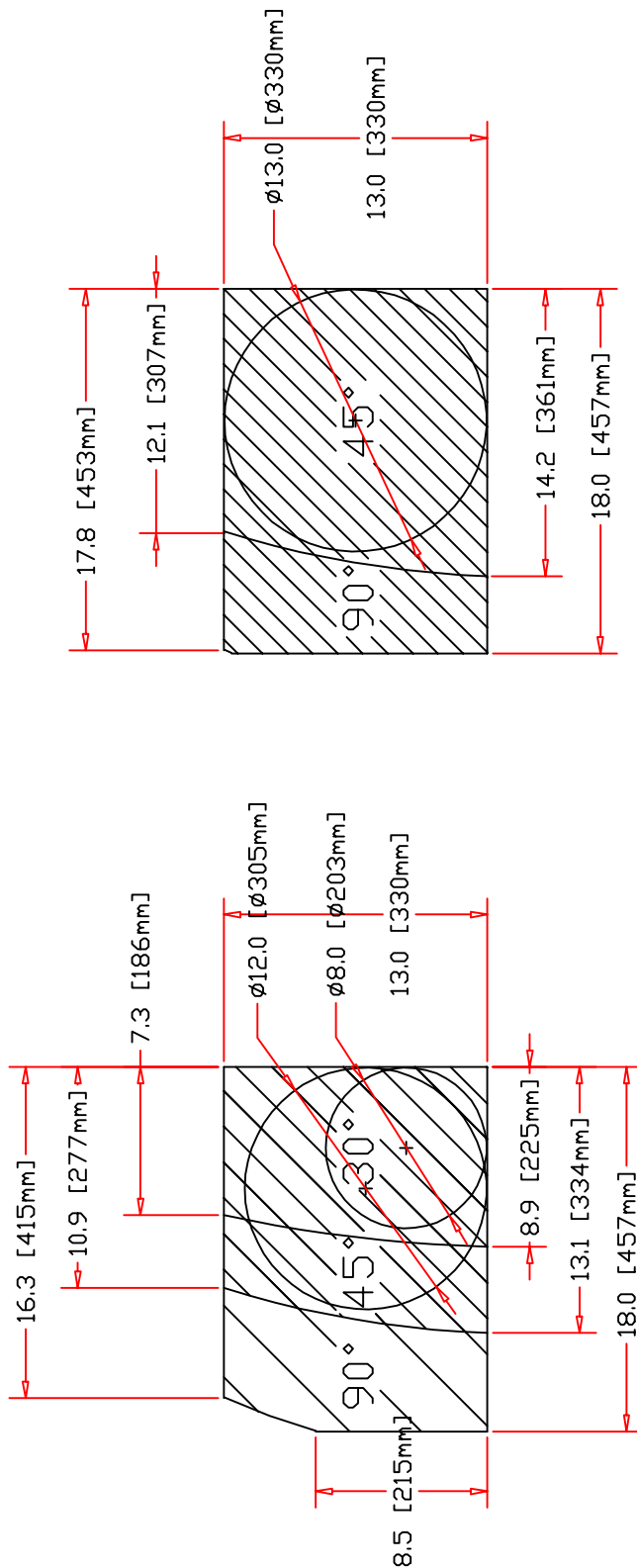
**FOR OPTIONAL ASSEMBLIES SEE PDF ON ATTACHED CD**



## SECTION 8 - SPECIFICATIONS

<b>S-20A Bandsaw Specification List</b>		
CAPACITY:	90° Rectangle: 13" x 18" 90° Round: 13" diameter 45° Rectangle: 13" x 10.75" 45° Round: 12" diameter	90° Rectangle: : 330 mm x 457 mm 90° Round: 330 mm 45° Rectangle: 330 mm x 273 mm 45° Round: 305 mm diameter
BLADE:	Length: 13'6" Width: 1" Thickness: .035"	Length: 4115 mm Width: 25 mm Thickness: 0.8 mm
BLADE SPEED:	75-350 SFM (VFD)	22-107 m/min (VFD)
BLADE GUIDES:	Carbide	Carbide
BLADE WHEEL DIAMETER:	16"	406 mm
DRIVE:	Blade drive: 3 hp (5 hp optional) Hydraulic drive: 1 hp	Blade drive: 2.2 kW (3.7 kW optional) Hydraulic drive: .75 kW
HYDRAULIC SYSTEM:	600 psi	4140 kPa
HYDRAULIC TANK CAPACITY:	4.75 U.S. Gallons	18 litres
COOLANT TANK:	6 U.S. Gallons	23 litres
SHUTTLE STROKE:	0-29" single stroke multi-indexing standard	0-736 mm single stroke multi-indexing standard
WISE CONTROL:	Hydraulic	Hydraulic
TABLE HEIGHT:	31"	787 mm
MAXIMUM WORK LOAD:	5,000 lbs	2268 kg
MACHINE WEIGHT:	3,000 lbs	1360 kg
DIMENSIONS:	88" wide 80" long 54" high	2234 mm wide 2031 mm long 1370 mm high
OPTIONS:	<ul style="list-style-type: none"> <li>• Full capacity bundling</li> <li>• Worklight</li> <li>• Variable vise pressure</li> <li>• Mitsubishi PLC 100</li> <li>• Out of stock switch</li> <li>• Outfeed stop</li> </ul>	<ul style="list-style-type: none"> <li>• Full capacity bundling</li> <li>• Worklight</li> <li>• Variable vise pressure</li> <li>• Mitsubishi PLC 100</li> <li>• Out of stock switch</li> <li>• Outfeed stop</li> </ul>

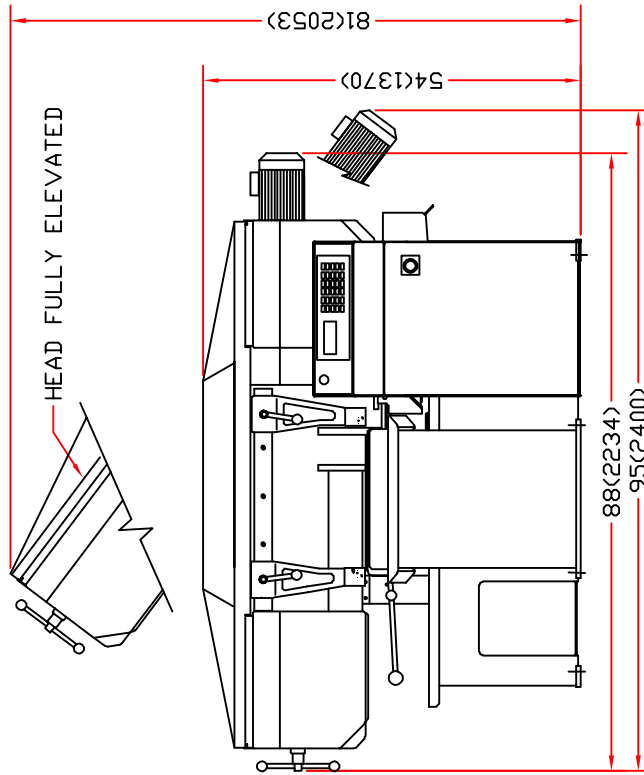
REV #	CURD	CHANGE MADE	DATE	FIRST MACHINE SERIAL NUMBER EFFECTED	APPROVED BY	REQUIREMENTS	RTG
-	-	-	-	-	-	1) BREAK ALL SHARP EDGES	OPER-1
							OPER-2
							OPER-3
							OPER-4
							OPER-5
							OPER-6
							OPER-7
							OPER-8
							OPER-9
							-



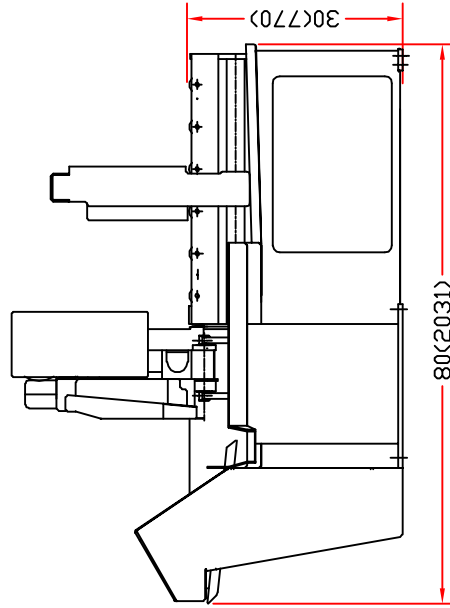
30DEG OPTION

STANDARD

TOLERANCES UNLESS OTHERWISE SPECIFIED:				QTY/MACH.	MTL.WGT.	PART WGT.	DRAWN BY	DATE	CHKD BY	DATE	HYD-MECH ENG., WOODSTOCK, ONT.		PART NUMBER
ANGULAR:	X	+/- 0.5 DEG	X	+/- 0.5 DEG	-	-	VP	NOV-99	-	-	SHEET 1 OF 1		-
DEC:	X	+/- .015 IN	X	+/- .063 IN	MATERIAL CODE		OVERALL MATERIAL SIZE		CUT LENGTH		PART DESCRIPTION		-
DEC:	XX	+/- .010 IN	XX	+/- .032 IN	-		-		-		S22 CUTTING CAPACITY		-
DEC:	XXX	+/- .005 IN	XXX	+/- .016 IN	-		-		-		-		-

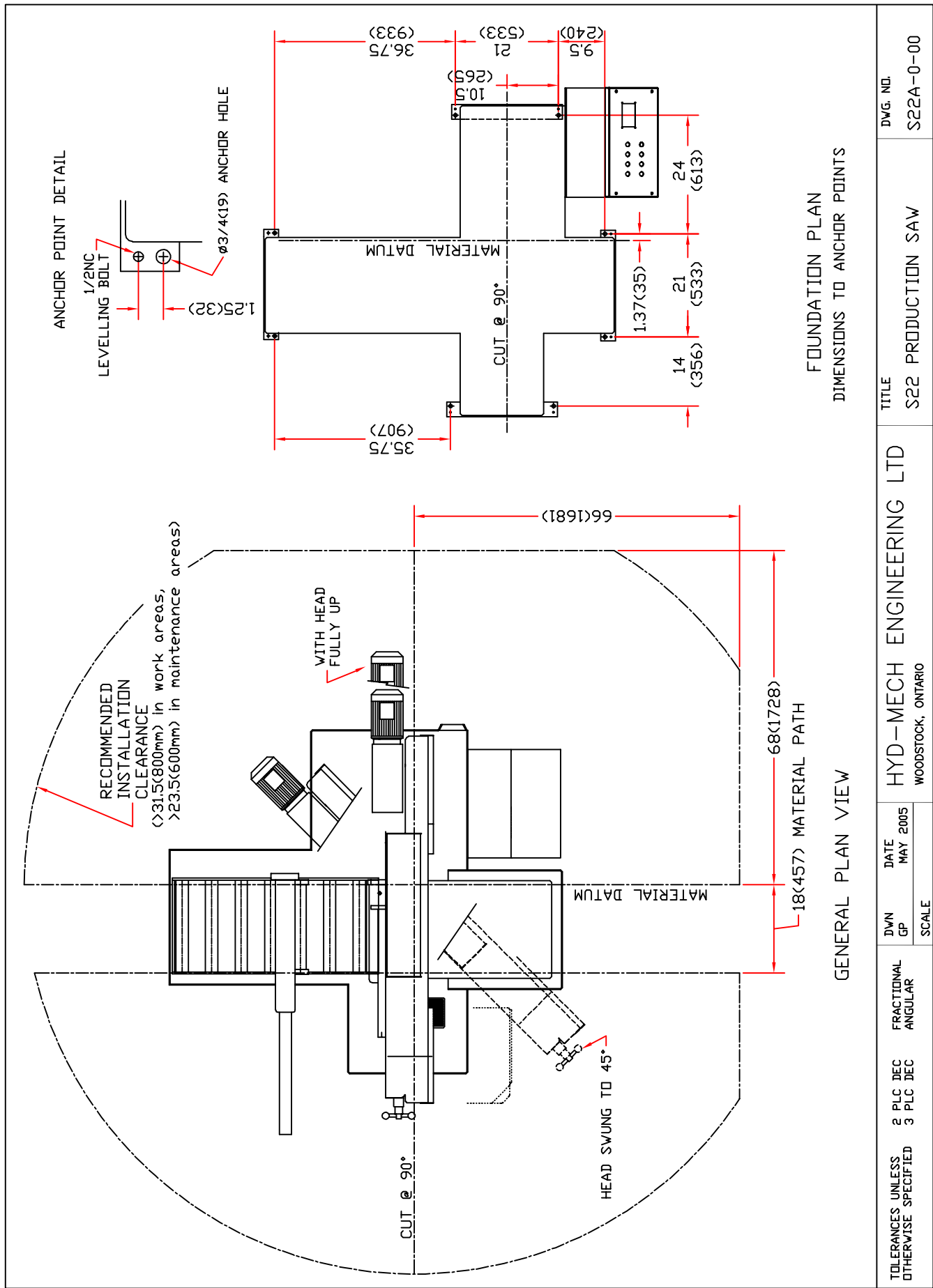


FRONT ELEVATION



RIGHT SIDE ELEVATION

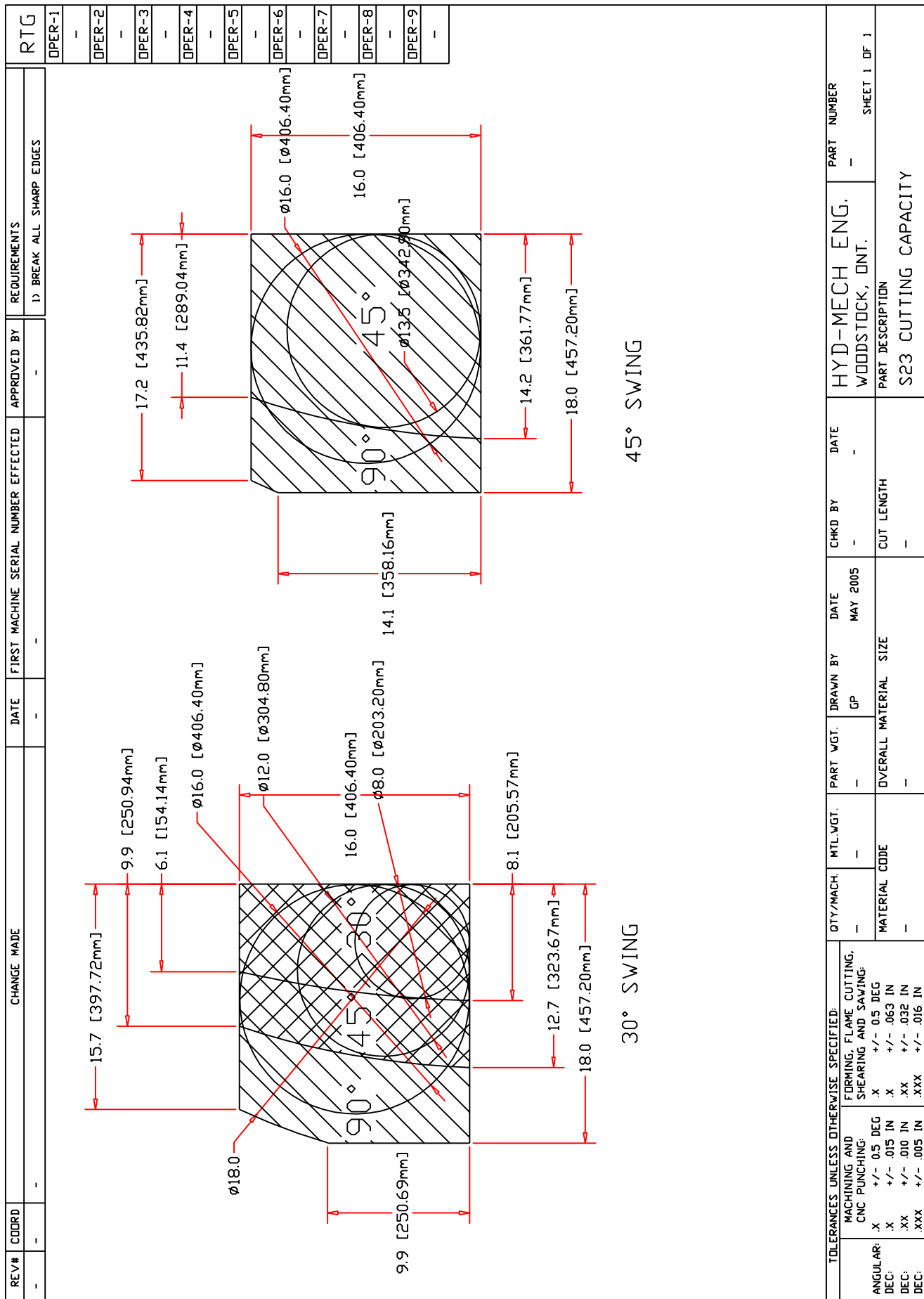
TOLERANCES UNLESS OTHERWISE SPECIFIED	2 PLC DEC	FRACTIONAL ANGULAR	DWN GP	DATE	HYD-MECH ENGINEERING LTD WOODSTOCK, ONTARIO	TITLE S22A PRODUCTION SAW	DWG. NO. S22A-0-00
	3 PLC DEC			MAY 05			

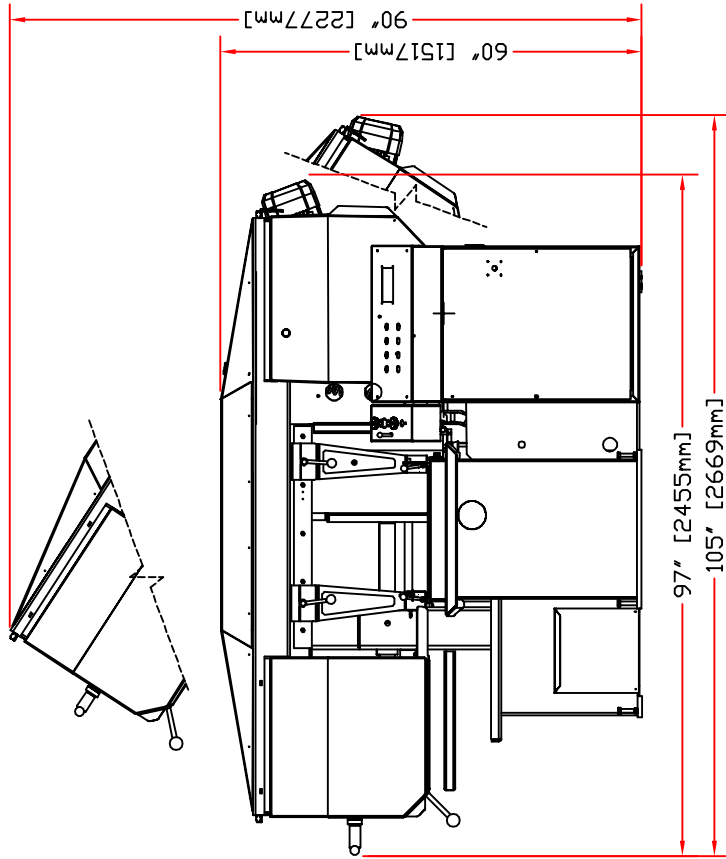




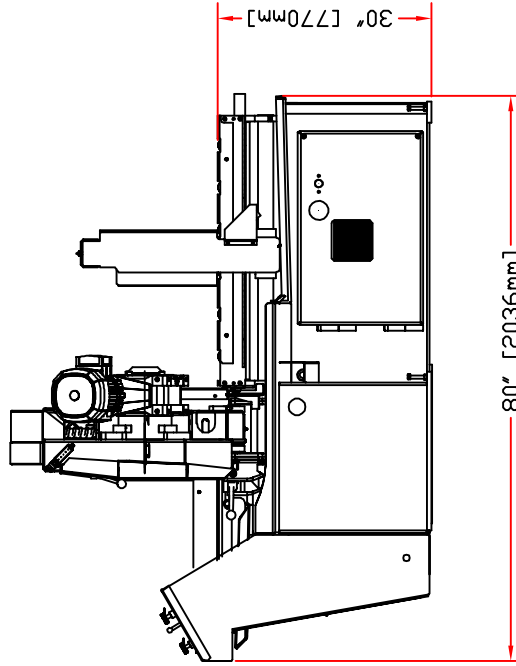
## S-23A Bandsaw Specification List

<b>CAPACITY:</b>	90° Rectangle: 16" x 18" 90° Round: 16" diameter  45° Rectangle: 16" x 10" 45° Round: 12" diameter	90° Rectangle: 406 mm x 457 mm 90° Round: 406 mm diameter  45° Rectangle: 406 mm x 254 mm 45° Round: 305 mm diameter
<b>BLADE:</b>	Length: 15' 6" Width: 1 1/4" Thickness: .042"	Length: 4724 mm Width: 32 mm Thickness: 1 mm
<b>BLADE SPEED:</b>	75-350 SFM (VFD)	22-107 m/min (VFD)
<b>BLADE GUIDES:</b>	Carbide	Carbide
<b>BLADE WHEEL DIAMETER:</b>	19"	483 mm
<b>DRIVE:</b>	Blade drive: 5 hp Hydraulic drive: 1 hp	Blade drive: 3.7 kW Hydraulic drive: .75 kW
<b>HYDRAULIC SYSTEM:</b>	600 psi	4140 kPa
<b>HYDRAULIC TANK CAPACITY:</b>	4.75 U.S. Gallons	18 litres
<b>COOLANT TANK:</b>	6 U.S. Gallons	23 litres
<b>SHUTTLE STROKE:</b>	0-29" single stroke multi-indexing standard	0-736 mm single stroke multi-indexing standard
<b>WISE CONTROL:</b>	Hydraulic	Hydraulic
<b>TABLE HEIGHT:</b>	31"	787 mm
<b>MAXIMUM WORK LOAD:</b>	5,000 lbs	2268 kg
<b>MACHINE WEIGHT:</b>	3,400 lbs	1543 kg
<b>DIMENSIONS:</b>	97" wide  80" long  60" high	2462 mm wide  2031mm long  1520 mm high
<b>OPTIONS:</b>	<ul style="list-style-type: none"> <li>• Full capacity bundling</li> <li>• Worklight</li> <li>• Variable vise pressure</li> <li>• Mitsubishi PLC 100</li> <li>• Out of stock switch</li> <li>• Outfeed stop</li> </ul>	<ul style="list-style-type: none"> <li>• Full capacity bundling</li> <li>• Worklight</li> <li>• Variable vise pressure</li> <li>• Mitsubishi PLC 100</li> <li>• Out of stock switch</li> <li>• Outfeed stop</li> </ul>



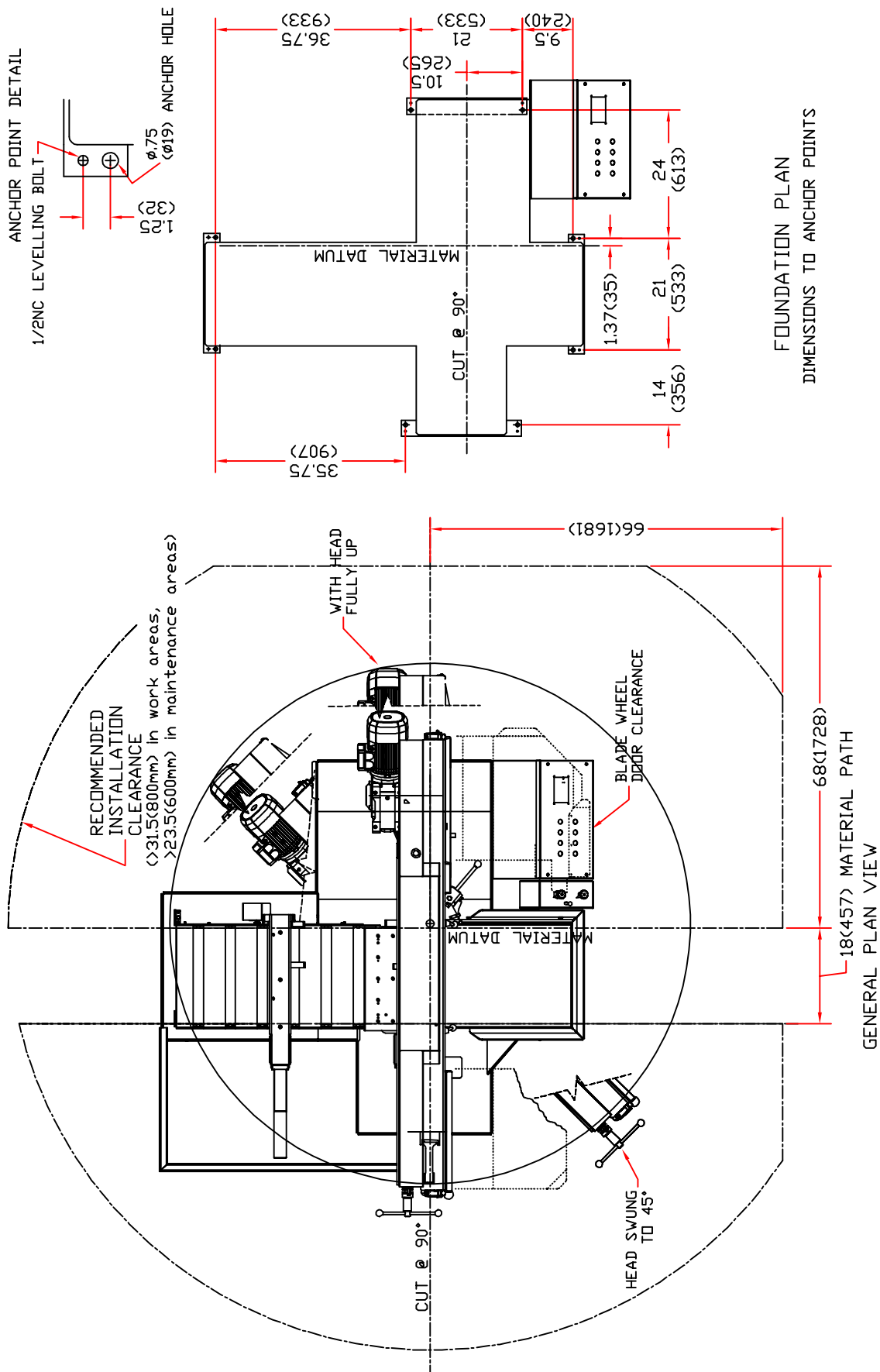


FRONT ELEVATION



RIGHT SIDE ELEVATION

TOLERANCES UNLESS OTHERWISE SPECIFIED	2 PLC DEC	FRACTIONAL ANGULAR	DWN	DATE	HYD-MECH ENGINEERING LTD	TITLE	S23A PRODUCTION SAW	DWG. NO. S23A-0-00
	3 PLC DEC		GP	MAY 2005				
	SCALE			WOODSTOCK, ONTARIO				



TOLERANCES UNLESS OTHERWISE SPECIFIED	2 PLC DEC	3 PLC DEC	FRACTIONAL ANGULAR	DWN GP	DATE	MAY 2005	SCALE	TITLE	S23A PRODUCTION SAW	DWG. NO.	S23A-0-00
HYD-MECH ENGINEERING LTD								WOODSTOCK, ONTARIO			

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## SECTION 9 - WARRANTY

### Warranty

Hyd-Mech Group Ltd. warrants parts/components on each new S-20/23A Series II bandsaw to be free from failure resulting from defective material and workmanship under proper use and service for a period of two years following the date of shipment to the user. Hyd-Mech's sole obligation under this warranty is limited to the repair or replacement without charge, at Hyd-Mech's factory, warehouse, or approved repair shop, of any part or parts which Hyd-Mech's inspection shall disclose to be defective. Return freight must be prepaid by the user.

This warranty, in its entirety, does not cover maintenance items, including but not limited to lubricating grease and oils, filters, V-belts, saw blades, etc., nor any items therein which show signs of neglect, overloading, abuse, accident, inadequate maintenance, or unauthorized altering.

MOTOR, GEARBOX, PUMP, ELECTRIC COMPONENTS, VALVES, HOSES, FITTINGS, and any other items used in the manufacture of the S-20/23A Series II, but not originally manufactured by Hyd-Mech are subject to the original manufacturer's warranty. Hyd-Mech will provide such assistance and information as is necessary and available to facilitate the user's claim to such other manufacturer.

Liability or obligation on the part of Hyd-Mech for damages, whether general, special or for negligence and expressly including any incidental and consequential damages is hereby disclaimed. Hyd-Mech's obligation to repair or replace shall be the limit of its liability under this warranty and the sole and exclusive right and remedy of the user.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, WRITTEN OR ORAL, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

This warranty may not be changed, altered, or modified in any way except in writing by Hyd-Mech Group Ltd.

Hyd-Mech Group Ltd.  
1079 Parkinson Road  
P.O. Box 1030  
Woodstock, Ontario  
N4S 8A4

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Fax: (519) 539-5126  
Toll Free (877)237-0914  
e-mail, [info@hydmech.com](mailto:info@hydmech.com)

S22A and S23A PLC and SEQUENCER PARAMETERS	
Date:	
Serial #:	
Voltage:	
Interface Type:	
2100 series software Version:	
SPEED CONSTANT	FEED RATE (Plc Only)
	No
ACTUAL LENGTH	ACTUAL POSITION DISPLAY
29.125"	No
LENGTH CONSTANT	HOLD SHUTTLE HOME
	No
ACCELERATION DISTANCE	BROKEN PROX
0.25"	No
DECELERATION DISTANCE	POWER DOWN TIMER
0.75"	15Min
MINIMUM FAST DISTANCE	BLADE CLEAR
1"	No
TARGET WINDOW	TRIM CUT
0004	Yes
FRONT VISE OPEN DWELL	OUT OF STOCK
	No
SHUTTLE VISE OPEN DWELL	COOLANT
	BLD
CLOSE TIME	QUEUE (Plc Only)
	Single
SEQUENCER (Seq Only)	MEASURE UNITS (Seq Only)
yes	Inch