M16A & M20A
393069

THANK YOU,

On behalf of everyone at HYD·MECH Group Limited, we would like to thank and congratulate you on your decision to purchase a HYD·MECH bandsaw.

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

To ensure you are maximizing the power and versatility of your new HYD·MECH bandsaw, please take the time to familiarize yourself and your employees with the correct operation and maintenance procedures as outlined in this manual. Please keep this instruction manual for future reference in a known location and easily accessible to all users of the device.

HYD·MECH offers a great variety of options, components, and features for its various models. Therefore, some of the equipment described in this manual (various illustrations and drawings) may not be applicable to your particular machine.

The information and specifications provided in this manual were accurate at the time of printing. HYD·MECH reserves the right to discontinue or change specifications or design at any time without notice and without incurring any obligation.

Thank you.

Hyd·Mech Group Limited
P.O. Box 1659, 1079 Parkinson Road
Woodstock, Ontario, N4S 0A9
Phone : (519) 539-6341
Service : 1-877-237-0914
Sales : 1-877-276-SAWS (7297)
Fax : (519) 539-5126
e-mail : info@hydmech.com

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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 that 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.

FOREWORD

Put Safety First!

This Safety Section contains important information to help you work safely with your machine and describes the dangers inherent to bandsaws. 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.

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

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.

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 are 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.

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.

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.

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 four types:

- Rotary switch mounted in electrical control cabinet door and inter-locked with door.
- Rotary switch mounted on the side of the operator interface console.
- 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.

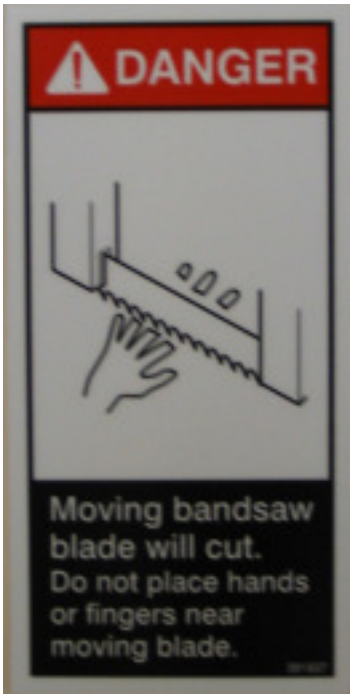
The weight of individual machine components represents stored potential energy that can be released if they fall when disconnected. Secure these components with adequate hoisting gear before disassembly.

SAFETY HAZARD LABELS

The safety hazard labels attached to your machine represent important safety information to help you avoid personal injury or death.
All supervisors, operators, and maintenance personnel must locate and understand the safety information associated with each hazard label prior to operating or servicing the machine.
The safety hazard labels shown below are located at various positions on the machine to indicate possible safety hazards. The location and re-order part number of all the safety labels associated with this particular model of bandsaw are indicated at the end of this section of the manual. It is important to replace any safety hazard label that becomes damaged or illegible.

HAZARDOUS VOLTAGE INSIDE

Contact with high voltage may cause death or serious injury. Never perform maintenance on, or near, electrical components until the machine’s electrical power source has been disconnected. Lock-out power in accordance with your company’s lock-out procedures before any such maintenance. The “Stop” or “Emergency Stop” push button does not disconnect the machine’s power supply. Hazardous voltage is still present in the machines electrical circuits.
The machine’s Electrical Disconnect Switch does disconnect voltage from the machine’s circuits; however hazardous voltage is still present inside the main electrical cabinet, on the infeed (line) side of the main fuses. Therefore keep hands and tools away from the infeed side of the control panel main fuses. If these fuses need to be replaced, use a fuse puller.
Allow three minutes after locking-out power before opening any electrical enclosures. Your machine may be equipped with a variable frequency drive that stores high voltage within its capacitors. Three minutes will allow sufficient time for this voltage to safely discharge.
Never spray coolant directly at electrical components or cabinets.



MOVING BANDSAW BLADE WILL CUT

Do NOT operate with guard removed.
Do NOT place hands or fingers near moving bandsaw blade.
For blade changing, always follow the proper Blade Changing Procedure, as given in Section 3 of this manual.

PINCH POINT

Machine parts may move without warning, either because the machine is operating automatically, or because another person initiates the motion. Keep hands clear of all labelled pinch points, whenever the machine is running. Machine vises can exert great force and cause severe injury. Keep hands clear of vises and work piece when vises are opened or closed. Be aware that vise closing or opening may result in potentially dangerous work piece movement. Be aware also that the opening motion of a vise may create potential pinch points.

MOVING PARTS CAN CRUSH AND CUT

Keep hands clear of chip auger. Lock-out power in accordance with your company's lock-out procedures before attempting to clear a jam in the chip auger.
Be aware that the chip auger may start unexpectedly, either because the machine is operating automatically, or because another person initiates the motion.
If the chip auger is stalled because of a jam, it may start without warning when the jam is cleared, unless the machine power is locked out.

SECTION 1 - INSTALLATION

Upon delivery of your new M-16/20 bandsaw, 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 machine 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 ONLY BE ATTEMPTED 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 M-16/20 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 START THE BLADE.
- MUST WEAR EYE PROTECTION.
- MAINTAIN PROPER ADJUSTMENT OF BLADE TENSION, BLADE GUIDES, AND BEARINGS
- HOLD WORKPIECE FIRMLY AGAINST TABLE.
- DO NOT REMOVE JAMMED CUTOFF PIECES UNTIL BLADE HAS STOPPED.

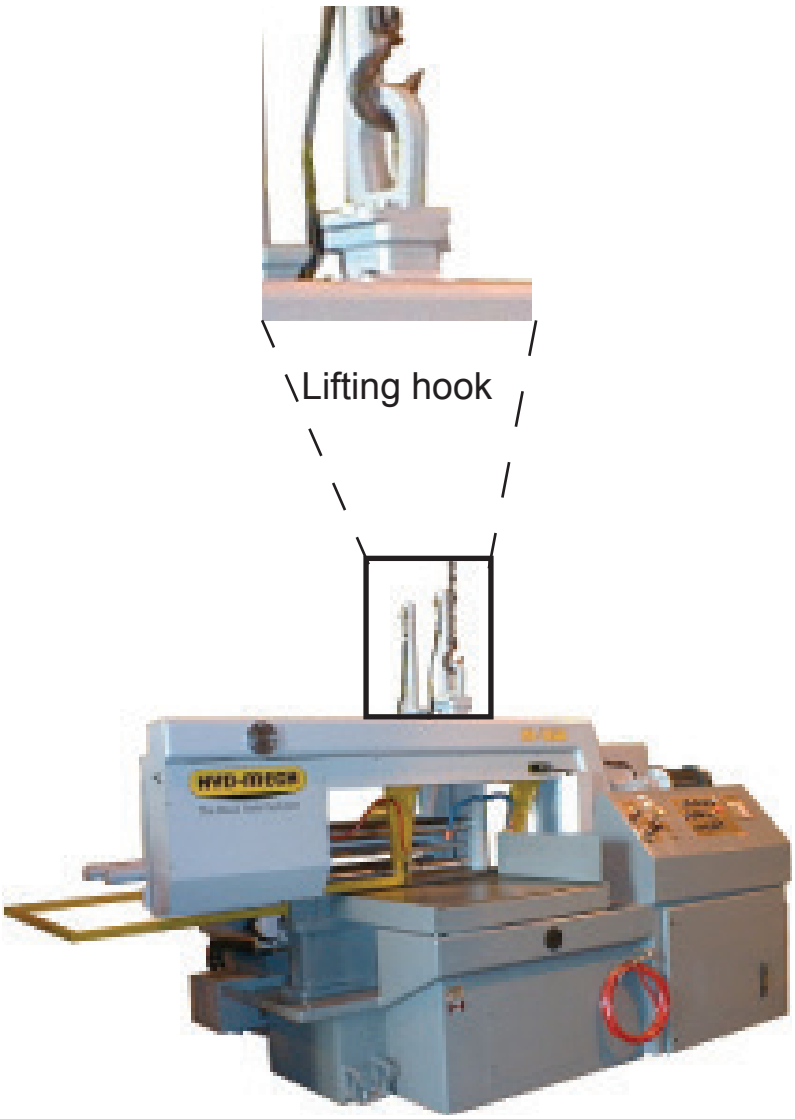
NO MODIFICATIONS TO THE MACHINE ARE PERMITTED WITHOUT PRIOR APPROVAL FROM HYD-MECH. ANY APPROVED MODIFICATIONS SHOULD ONLY BE UNDERTAKEN BY TRAINED PERSONNEL.

LIFTING INSTRUCTION

This machine is designed to be lifted in one, fully assembled piece. In order to lift the machine it needs to be in the following condition.

- Saw head in its bottom position at 90^{O}.
- Shuttle vise fully forward.
- Coolant tank emptied.

There is a large lifting eye (shown below) at the top of the machine. The machine may be lifted with an overhead hoist and chain, both being rated for 7400 lbs (3356 kg) for the M-16A or 7700lbs (3465kg) for the M-20A. For “P” models the weight is less, 6400lbs (2880kg) for the M-16P and 6800lbs (3060kg) for the M-20P.

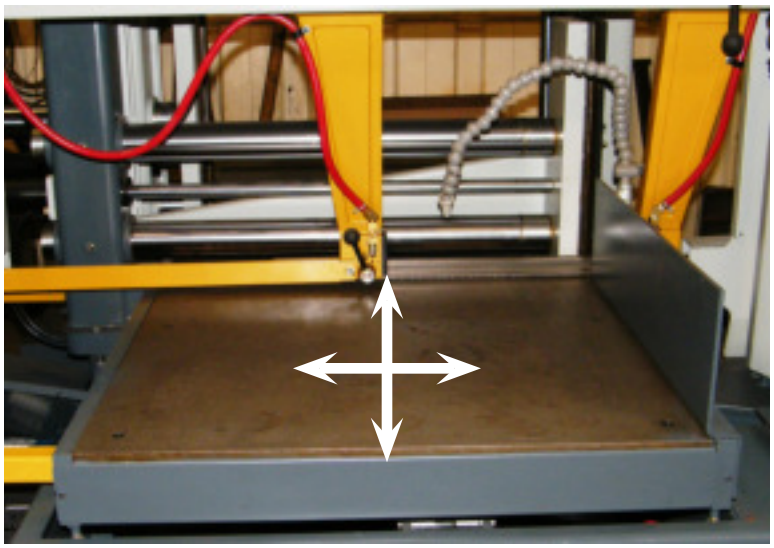


M-16A being lifted.

FOUNDATION, LEVELLING AND ANCHORING

Machine location should be carefully selected. A flat concrete floor area should be chosen. It should have enough free space surrounding the machine to enable free access for safe operation and maintenance.
The machine should be leveled in both directions, i.e. along and across its in-feed conveyor especially when the machine is to be inserted into a larger conveyor system. Four leveling screws are provided, one in each corner of the machine base. Steel plates are to be placed under each screw to prevent their sinking into the concrete floor. In cases when the machine is to be anchored permanently, anchoring holes are provided. They are located next to the leveling screws.

NOTE:
In some cases leveling the saw in-feed and auxiliary conveyors with a slight slope towards the blade is recommended. This will prevent coolant from running down the raw stock. (This is especially true when cutting tubing or bundles).



Level saw from front to rear and from side to side

Levelling screw and anchoring hole on idler side of the base

Levelling screw and anchoring hole on drive side of the base

Levelling screw and anchoring hole on rear of the base

WIRING CONNECTIONS

After the machine is leveled and anchored the necessary power hook-up needs to be performed. In order to provide a safe operation as well as to prevent potential damage to the machine, only qualified personnel should be allowed to do the work.

BEFORE START-UP THE FOLLOWING TWO POINTS SHOULD BE CHECKED:

1. Signs of damage that may have occurred during shipping to the electrical cables, conduits and the hydraulic hoses.
2. The hydraulic oil level is between the upper and lower lines on the level gauge.

As supplied, the machine is set to run on three phase voltage as indicated on the serial plate and voltage label.

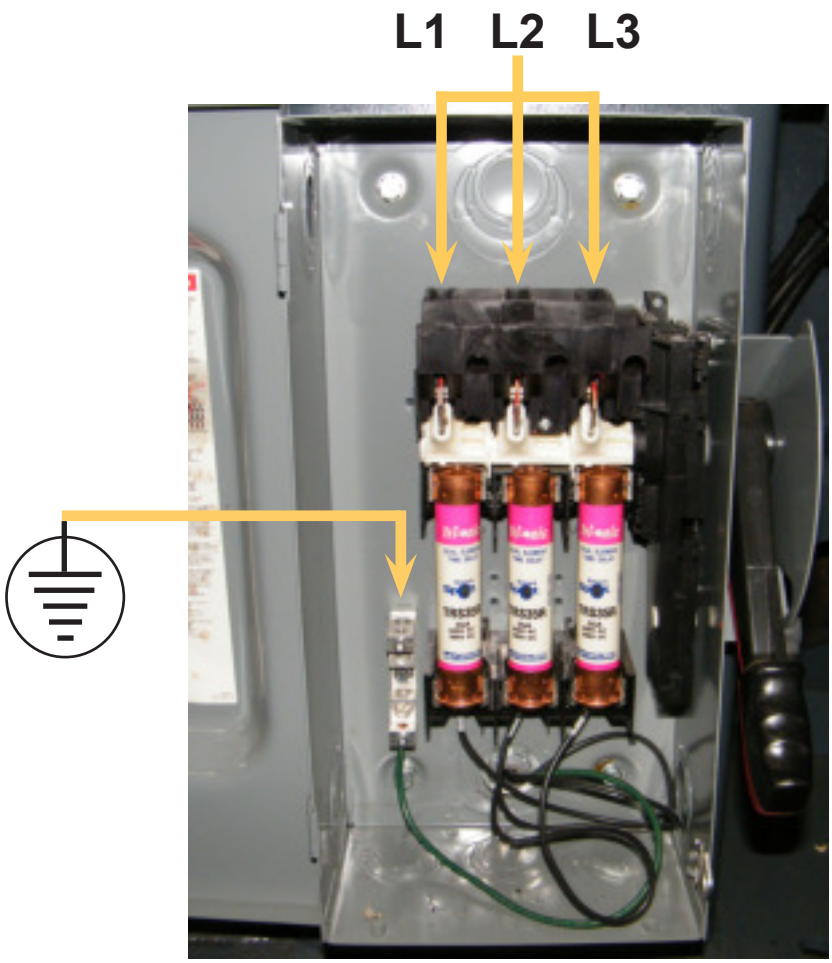
Power connection to the machine is made to L1, L2, L3 and ground at the disconnect switch. The disconnect switch box is located on the right side of the Operator Control Panel. For machines equipped with a variable frequency drive unit, an earth ground is also recommended.

During the initial hook-up it is very important to check that the phase order is correct. This is indicated by the hydraulic pressure gauge registering a pressure rise and the blade running in a counter clockwise direction. If the hydraulics do not register an immediate pressure rise, shut the hydraulics off and change the phase order.

ATTENTION: Running the hydraulics “backwards” can damage the hydraulic pump

Style of Disconnect Switch may vary.

Main Power Connections



EARTH GROUNDING PROCEDURE

1. The customer is to provide and install a ground rod approximately .60 (15mm) diameter, copper clad steel, to be driven no less than 8' (2.5m) into the ground, no more than 10' (3m) away from control enclosure.

2. The ground rod is to be connected to customer's in plant ground system. This connection shall be made directly at the ground rod. (If applicable).

3. It is desirable that the overall resistance to ground measured at the ground rod does not exceed 3 ohms. Customer is advised to consult local power company for further information on grounding.

4. The ground rod is to be connected to the ground terminal in the control enclosure using insulated, stranded copper wire. The wire gauge size is to be determined according to the electrical code of the customers local electrical authority.

5. An additional point to check is to ensure continuity of all ground within the control enclosure. Start with the main power entrance ground terminal where the internal ground conductors should originate and then connect to, the DIN terminal strip, control transformer, and the lid of control enclosure. Also, the PLC and Interface units should have their own ground conductors connected to one of the main ground terminals.

6. A properly functioning ground system will:
   - provide safety for personnel.
   - ensure correct operation of electrical/electronic apparatus.
   - prevent damage to electrical/electronic apparatus.
   - help dissipate lightning strikes.
   - divert stray radio frequency (RF) energy from electronic/control equipment.

HYDRAULIC OIL

As shipped, the saw oil tank is filled with Texaco Rando HD 46 hydraulic oil. If you want to change the hydraulic oil or the brand of oil, see HYDRAULIC MAINTENANCE in Section 3.

Oil Level Gauge on the power pack door

Oil Filler Cap found inside power pack door.

CUTTING FLUID

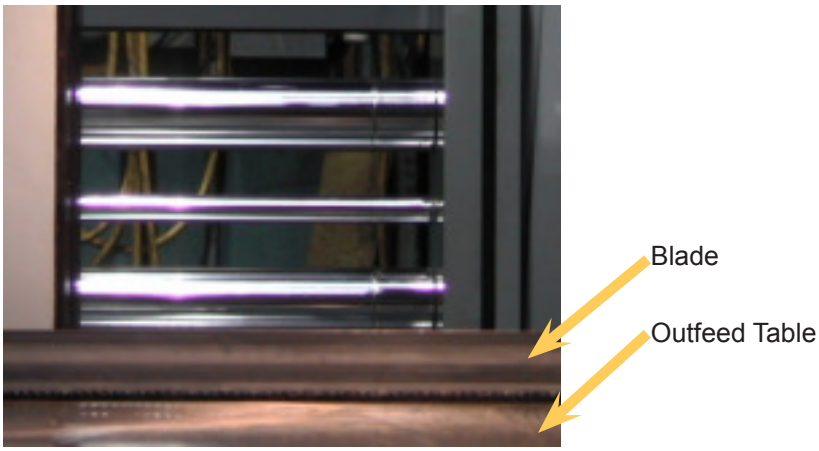
The M16/20 uses a pump and reservoir to circulate the necessary cutting fluid to the blade for maximum blade life. Your saw blade supplier will be able to provide information on the cutting fluid products that are available for your needs. No cutting fluid (coolant) is supplied with the machine. There 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.

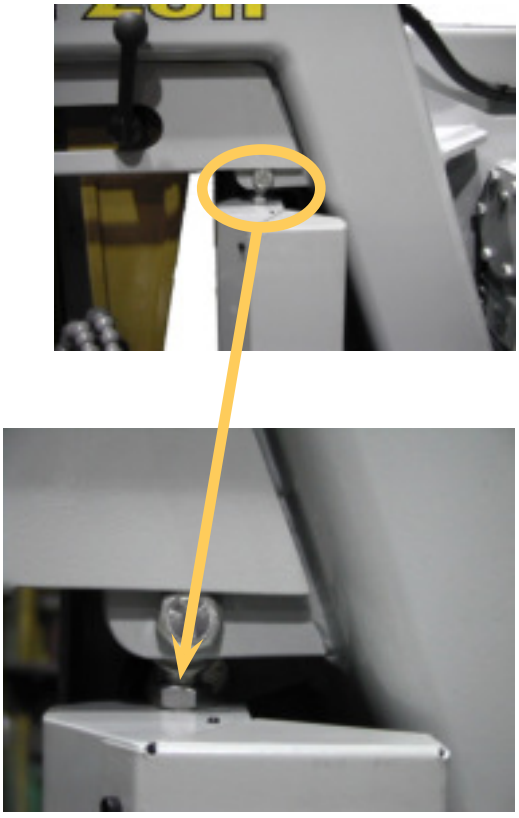
HEAD HEIGHT CHECK

The head height is carefully checked at the factory prior to shipping and should not change, however there may be a possibility that either through lifting or when the machine is in transit, the position changes slightly. This should be checked at the time of installation.

If adjustment is required, loosen the jam nut on the head cylinder and turn the cylinder rod to drive the rod end in or out as required. The blade should be 1/8” below the top surface of the infeed table.



Blade teeth 1/8” below the top surface of the Infeed Table



Head Height Adjustment

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 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 variable blade speed 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 bandsaw blade industry have definitely brought down the cost per cut, despite the three fold higher price of high technology blades. Variable pitch, bi-metal blades (like the 4/6 or 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 Troubleshooting)
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 should be chosen during head descent (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)

VARIABLE SPEED CONTROL

Blade speed can be adjusted between 50 to 350 SFM (Surface Feet/Minute) (15 to 107 m/min) Adjustment should be made only when the blade is running. Clockwise rotation of the knob increases blade speed while counter clockwise rotation decreases blade speed.

THE CONTROL PANEL

START-UP

The control console has been designed to simplify the operation of the saw, to give the operator the ability to stop any function at any time, and to be able to control all the functions remotely. We cannot overstress the importance of familiarizing yourself with the controls prior to starting the machine.

NOTE:

1. ALL SWITCHES MUST BE IN THE CENTER NEUTRAL POSITION TO START THE MACHINE!
2. WHEN STARTING THE MACHINE FOR THE FIRST TIME MAKE SURE THAT BLADE IS MOVING IN A COUNTERCLOCKWISE DIRECTION, AND THAT THE HYDRAULIC PRESSURE IS 1000 PSI (6890 kP). IF THERE IS NO IMMEDIATE PRESSURE, SHUT THE SAW DOWN AND CHANGE THE PHASE ORDER.

MANUAL OPERATION

Manual Operations can be performed when the PLC 500 controller is set to MAN (AUTO is active when a RED light is on, above the AUTO/MAN button). All functions are self-explanatory. Specific control button functions are described on the following pages.

HMI PANEL : MITSUBISHI PLC 500 for North America & Europe

FRONT VISE
This switch has three positions, OPEN, HOLD and CLOSE. With the switch held in the OPEN position the vise will open all the way or until the switch is released. With the switch in the HOLD position, 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, or until it encounters enough resistance to stop it.

HEAD CONTROL
This switch has three positions: UP, HOLD and DOWN. The switch is inactive unless the PLC is in manual mode. In the UP position, the head will rise until it trips the head up limit, which is adjustable. In the HOLD position the head will stay still. In the DOWN position the head will descend until it reaches the bottom of the stroke. The speed of descent is controlled by the Head Feed and Head Force Limit controls.

BLADE START
The blade can be started only when the hydraulics are running in either manual or auto mode.
NOTE: In automatic Mode the head will not descend until the blade has been started, which the PLC will prompt the operator to do so.

HYDRAULIC START
To start the hydraulic system, the switches for the head and both vises must be in the "NEUTRAL" position. The "HYDRAULIC START" button must be depressed and held in momentarily until the PLC display becomes active.

CYCLE START / PAUSE
This button starts the cutting cycle and will stay illuminated until the cycle is completed. The PLC control system will prompt you to start the blade if it is not running. The machine will then begin the automatic cycle until completed when it will shut itself off. The current cycle can be PAUSED by pressing this button at any time during a cycle and restarted by pressing it again.

COOLANT
This switch has three positions, AUTO, OFF, and ON. In the ON position, the coolant system will operate when there is power to the machine; this allows using the wash gun to clean the machine. In the OFF position, the coolant system is inactive. In the AUTO position the coolant system will only run when the blade is on. The coolant system can also be run only when both the blade is on and the head is descending by selecting this option in the PLC parameters.

SHUTTLE VISE
This switch has three positions, OPEN, HOLD and CLOSE. With the switch held in the OPEN position the vise will open all the way or until the switch is released. With the switch in the HOLD position, 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, or until it encounters enough resistance to stop it.

BLADE SPEED
50 to 350 SFM(Surface Feet/Minute) (15 to 107 m/min)

Adjustment should be made only when the blade is running. Clockwise rotation of the knob increases blade speed while counter clockwise rotation decreases blade speed.

BLADE STOP
Stops the blade. If the blade is stopped during a cycle, the cycle will continue but will not let the head descend until the blade is started.

EMERGENCY STOP
This mushroom button stops the blade and hydraulic motors. Both vises will hold their position but, pressure will begin to fall off. Long pieces of work should always be supported so they will not become loose over time and fall while the machine is shut down. This is a latched button and must be pulled out to start the machine.

WORK LAMP
This option switch has two positions: OFF and ON.

BLADE CHANGE MODE
This lock is provided for the safety of the operator during the blade changing procedure. When the lock is in the “ON” (I) position, the door interlocks are disabled and the only functions that are active are the GUIDE ARM and BLADE TENSION controls. All other controls are inactive. After the blade has been changed the key switch must be switched to “OFF” (O) in order to operate the machine.

LASER
The laser guide has two positions: OFF and ON

FLOOD / MIST (Option)
The selector switch has two positions: FLOOD / MIST

1. Select the type of coolant required: FLOOD or MIST.
2. Use the COOLANT selector switch to control the selected coolant.

CONTROL SYSTEM, MITSUBISHI PLC 500

OPERATION OVERVIEW

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

In manual mode, all functions can be operated by using a combination of selector switches on the control console and the PLC function buttons. Also the operator has the ability to execute a single cut utilizing a pre-programmed ONE CUT MODE”.

In automatic mode, the PLC has the capacity to program and store 99 jobs. Designated job numbers can be programmed for quantity required (maximum of 999 pieces). Piece lengths from 0.1” to 500” (12700 mm) and cut angles from 90^0 through to 30^0. Jobs can be run individually or in a QUEUE which allows a maximum of 5 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.

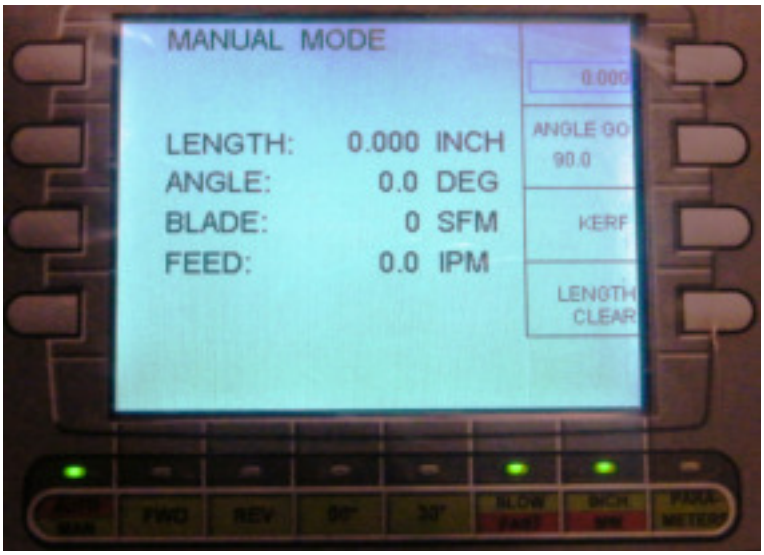
PLC CONTROL DESCRIPTION

ACTIVATING THE PLC

The PLC control will become active when all selector switches are in the neutral position and the HYDRAULIC START button is depressed and “held in” momentarily. If the head is not in the 90^0 position, the display will prompt you to “SWING THE HEAD TO 90 DEGREES.” Press and hold the 90^0 key until the display returns to “MANUAL MODE”. When the head is at 90^0, the AUTO/MAN indicator light will be green, all MANUAL controls as described previously are enabled, and the “MANUAL MODE STATUS” screen will appear as shown below. The PLC controls are described on the following pages. The length value (shuttle vise position) will display the previous positions. To reset or clear the length value, press the F8 key.

PLC 500 CONTROL PANEL

All key functions are explained in detail on the following pages.



FUNCTION BUTTON DESCRIPTION

On the dual function buttons, if a green indicator light is illuminated, it means that the function printed in green on the top of the button is enabled. A red light indicates the function printed in red at the bottom of that button is enabled.

AUTO
MAN

MANUAL MODE (Green light)
Enables all control switches and PLC function buttons. Also stops an automatic job in progress by switching to MANUAL.

AUTO MODE (Red light)
Puts the machine in AUTO MODE and disables all manual functions. The front vise selector switch must be in the closed position.

FWD

MANUAL MODE
This key will advance the shuttle toward the head (home position).

AUTO MODE
Key is disabled.

REV

MANUAL MODE
This key will retract the shuttle away from the head.

AUTO MODE
Key is disabled.

90

MANUAL MODE
This key will swing the head toward 90 degrees.

AUTO MODE
Key is disabled.

30

MANUAL MODE
This key will swing the head toward 30 degrees.

AUTO MODE
Key is disabled.

SLOW
FAST

MANUAL MODE
Green light indicates that the shuttle movement and head swing will move at a slow speed.
Red light indicates that the same movements will be at a fast speed.

AUTO MODE
Key is disabled.

INCH
METRIC

MANUAL MODE/AUTO MODE
Green light indicates Imperial values.
Red light indicates Metric values.

PARA-
METERS

PARAMETERS
Password screen.
Entering the password allows access to parameter values.

F5

AUTO MODE
Energizes CYCLE START button.

MANUAL MODE
No function

ONE CUT MODE
Used to enter length value

F6

MANUAL MODE
After entering an angle value, pressing F2 will cause the screen to read “TO INITIATE MOVEMENT TO XX.X DEGREES PRESS CYCLE START”. Upon pressing “CYCLE START” the head will swing to the programmed angle.

AUTO MODE
Used to scroll up through job information.

F7

MANUAL MODE
Used for accessing the KERF screen. The KERF screen cannot be accessed while in METRIC mode and any change made to the KERF value will not be accepted by the controller until it has been shut down and restarted.
(The standard kerf values are .066 for 1 1/4” blade & .074 for 1 1/2” blade at 90^{O}.)
AUTO MODE
Used to scroll down through job information.

F8

MANUAL MODE
Used to clear the length display (shuttle vise position) value.
AUTO MODE
Used to CLEAR the jobs from the queue or job values for whichever job the cursor is at.

NAVIGATION AND NUMERICAL KEY PAD

The cursor keys are used to navigate the cursor box on the screen. If the display has columns, only the UP and DOWN keys are activated. If the display has both rows and columns, then all four cursor keys are activated.

The numerical keys allow for data to be input as required.

ONE CUT MODE

In MAN mode, switching the front vise to closed position changes the PLC to “One Cut Mode “ to cut one piece at a desired length. To accomplish this, follow the procedure below.

1. In “MAN MODE” position the head for the required angle by using the 90^0 or 30^0 function keys. You can also accomplish this by moving the cursor to the “Angle Go” feature, input desired angle, press ENTER. Then press F6. The screen will display “ TO INITIATE ANGLE MOVEMENT TO __.__ DEGREES PRESS CYCLE START”. Press CYCLE START and the head will travel to the displayed angle.

2. A trim cut should be made in “MAN MODE” before initiating the “ONE CUT MODE” operation. This will ensure a clean initial cut and that the head is above the material height so no damage is caused when the shuttle moves the material forward.

As the head up limit switch must be tripped in order for the cycle to continue, set the head height using this procedure;

a) Raise the head up limit switch block (located behind the console). Loosen the grip knob on the limit switch block to allow it to slide.
b) Move the head with the HEAD switch so the blade is just above the material.
c) Move the limit switch block so the trip plate is almost touching the limit switch roller and tighten the grip knob.
d) Turn the head switch to “UP”. When the head trips the limit switch, the head will stop.

3. To enable the “ONE CUT MODE”, turn the front vise switch to the CLOSED position.

4. To the left of the F5 button, the display  will be flashing. Move the cursor to the rectangular box and key in the desired length using the numeric key pad and press “ENTER”.

5. If the blade is not running, “BLADE” will be flashing beside the length value, press the “BLADE START” button. Adjust the blade speed as required, then press the “CYCLE START / PAUSE” button to continue the cycle. When the “CYCLE START” button is pressed, the shuttle vise will move to the forward home position before executing the length movement.

6. When the cut is completed, the head will retract, the blade will stop and the display will reset for the next cut.

7. To make another cut, repeat steps 5 through step 6.

NOTE: To cut multiple pieces, load and position the material and head up limit for a trim cut and follow the automatic procedures on the following pages.

KERF CORRECTION FOR ANGLE CUTTING (MANUAL MODE & ONE CUT MODE)

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 by pushing the KERF button.

When the cuts are to be at 90°, the KERF value must be returned to the appropriate value for accurate cuts.
The Standard kerf and corrected values are as follows:

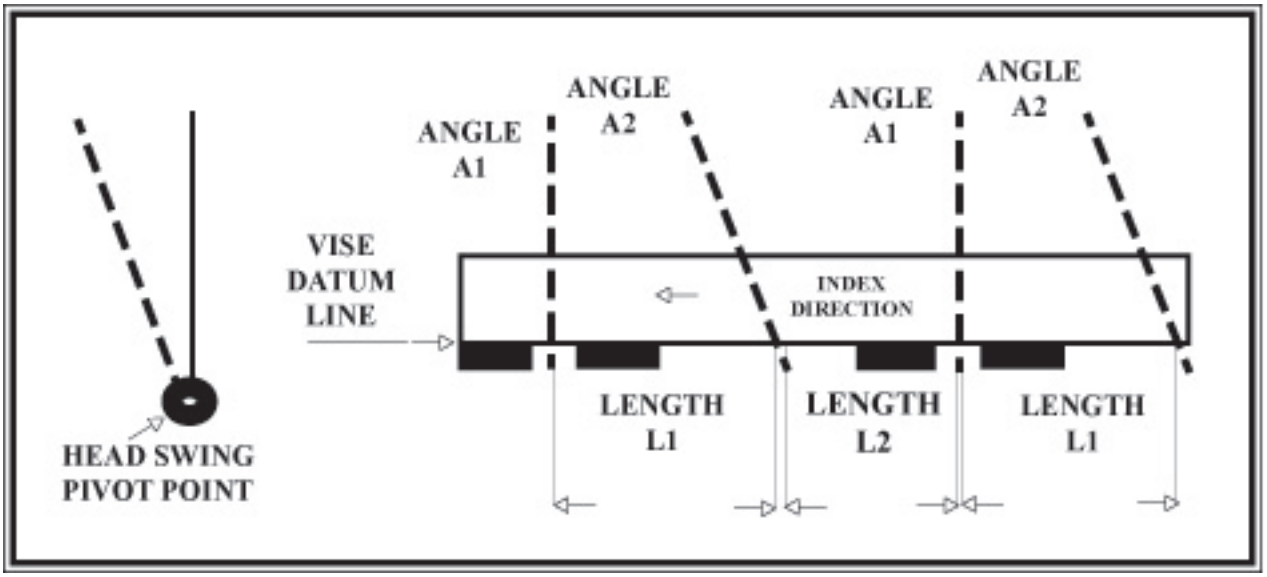
IMPERIAL									
STANDARD KERF @ XX DEGREES									
BLADE SIZE	90°	75°	60°	55°	50°	45°	40°	35°	30°
1 1/4”	0.066	0.068	0.076	0.081	0.086	0.093	0.103	0.115	0.132
1 1/2”	0.074	0.077	0.085	0.09	0.097	0.105	0.115	0.139	0.148
METRIC									
STANDARD KERF @ XX DEGREES									
BLADE SIZE	90°	75°	60°	55°	50°	45°	40°	35°	30°
31.7mm	1.67	1.72	1.93	2.05	2.18	2.36	2.61	2.91	3.35
38.1mm	1.87	1.95	2.16	2.25	2.46	2.66	2.92	3.53	3.76

AUTOMATIC OPERATION

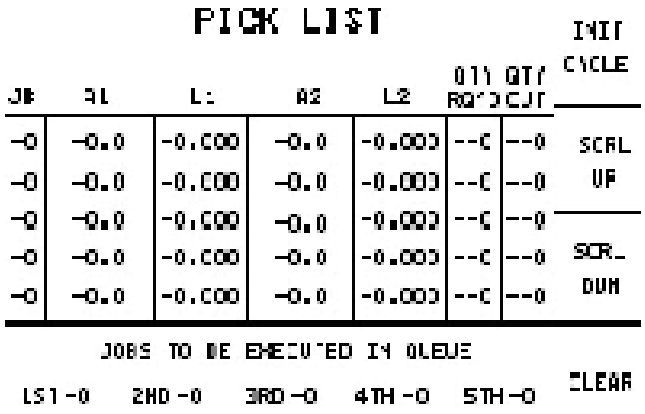
To enter AUTO MODE, the front vise switch must be in the closed position. When the AUTO/MAN button is pressed, the red indicator above it will come on, the screen will change to the PICK LIST display as shown on the following page and be ready for editing or starting a new job. The VISE and HEAD switches on the control panel will be disabled.

PROCEDURE FOR EDITING OR STARTING A NEW JOB IN AUTO MODE

Each job is defined by two angles and two lengths. Angle 1 (A1) is the first angle to be cut (this will be the trim cut). Length 1 (L1) is the length of the material to be cut as measured between the two intersection points of the blade axis and the saw table datum line. Angle 2 (A2) is the second angle to be cut and length 2 (L2) again is the length of material as measured between the two intersection points of the blade axis and the vise datum line.



PICK LIST SCREEN



Before switching to AUTO MODE, position both the material for a trim cut as well as the head up limit switch so that no damage is caused by the shuttle moving the material into the blade (see “ONE CUT MODE”).

1. Immediately after entering the AUTO mode, the PICK LIST screen will be displayed with the cursor located at “A1 of JOB #1”. Both the ENTER button or the cursor key can be used to move through this screen.
2. Enter angle 1 “A1” value, press ENTER and the cursor will move to “L1”
3. Enter length 1 value, press ENTER and the cursor will move to “A2”.
4. Enter angle 2 “A2” value, press ENTER and the cursor will move to “L2”
5. Enter length 2 value, press ENTER and the cursor will move to “QTY REQ’D”.
6. Enter required quantity. The cursor will move to “QTY CUT”
7. When starting a NEW JOB or PIECE COUNT, zero out “QTY CUT” by entering “0”.

Assuming that the material is positioned for a trim cut, the job is now ready to start (up to five jobs can be in the queue) or jobs can be programmed at this time. A job or queue can be deleted by pressing F8. The desired job or queue must be selected using the cursor key in order for the item to be deleted. To start the cycle, Move the cursor to the 1st JOB and key in the desired JOB # and press ENTER followed by F5 “INIT (initiate) CYCLE”. You will then be prompted to enter “MATERIAL WIDTH” and press ENTER. The display will then read “PRESS CYCLE START TO INITIATE JOB QUEUE”. If the blade is not running, the cycle will not continue. Press the BLADE START button and the cycle will begin. When the last cut has been made, the machine will shut down.

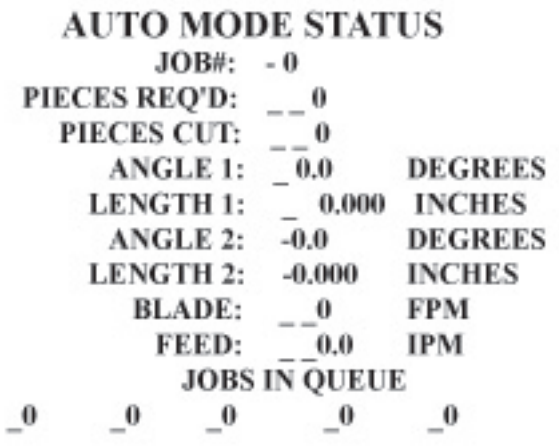
When the AUTO cycle commences, the screen will change to the “AUTO MODE STATUS” screen and the following events will take place:

1. If the head has not tripped the head up limit switch, the cycle will stop when the head should descend. In this case, the machine should be switched to MAN MODE and the head height should be set as described on pg. 2.24 or by raising the head until the limt switch is tripped.
2. The head will swing to “A1” to perform the first cut (trim cut).
3. After the trim cut, the shuttle will advance the material to the “L1” value.
4. The head will swing to the “A2” value to make the second cut and complete the first part.
5. The shuttle vise will advance to the “L2” value after the “A2” cut is done.

At completion of the “JOB”, the machine will shut off.

NOTES:

1. The CYCLE START button is used to PAUSE a job in progress. When a job is PAUSED the PICK LIST will appear and the operator can make eventual alterations to the job values which will take place on the next piece to be cut or to edit a new job. To resume a job, press the CYCLE START key and the screen will change back to the AUTO MODE STATUS screen and the AUTO CYCLE will resume.
2. If “QTY RQ’D” equals or exceeds “QTY CUT”, the AUTO CYCLE will not start.



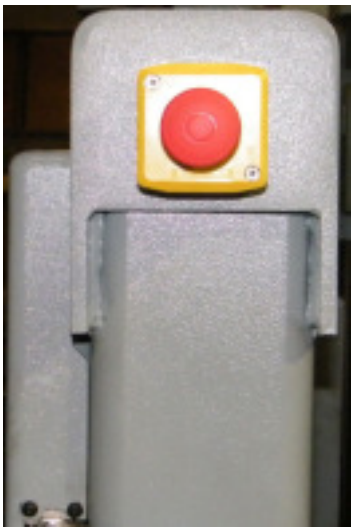
WORKING WITH A QUEUE

The purpose of a QUEUE is to allow the operator to run several jobs (max of 5) in series if they are of like material. 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, scroll the cursor to the QUEUE, press F8 to clear the QUEUE and enter the desired JOB #’s in desired sequence. To run the QUEUE, press F5, CYCLE START and start the blade.

The AUTO MODE STATUS screen will appear and display each individual JOB as it is being run. The STOP and PAUSE functions are as above and at completion of the last JOB in the QUEUE, the machine will shut off. The machine will automatically advance the stock between jobs for trim cuts as needed.

SHUTTLE EMERGENCY STOP

A second emergency stop push button is mounted to the shuttle above the shuttle vise cylinders. This mushroom button stops the blade and hydraulic motors. Both vises will hold their position but, pressure will begin to fall off. Long pieces of work should always be supported so they will not become loose over time and fall while the machine is shut down. This is a latched button and must be pulled out to start the machine.



HYDRAULIC FEED CONTROL

The Hydraulic Feed Control is located to the left of the control panel. These controls allow independent control of Feed Force (FF) and Feed Rate (FR)

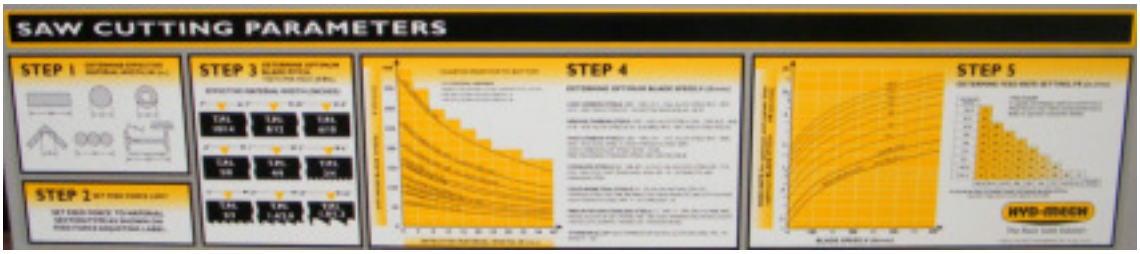
FAST APPROACH LEVER.
DEPRESS FOR FAST HEAD DESCENT

FEED FORCE KNOB
USED TO SET FEED FORCE LIMIT (COUNTERCLOCKWISE ROTATION TO INCREASE AND CLOCKWISE ROTATION TO DECREASE).

FEED RATE KNOB
USED TO SET FEED RATE (COUNTERCLOCKWISE ROTATION TO INCREASE AND CLOCKWISE ROTATION TO DECREASE).

CUTTING PARAMETERS CHART

A full size CUTTING PARAMETERS CHART is mounted on the front of the main electrical panel. The chart contains five steps for the operator to follow in order to achieve optimum performance of the saw. These steps are detailed on the following pages.



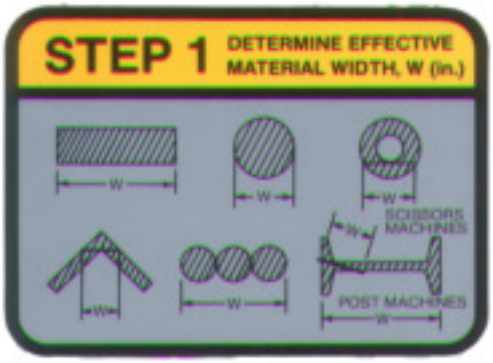
Saw Cutting Parameters Chart

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.



Material Width Chart

NOTES:

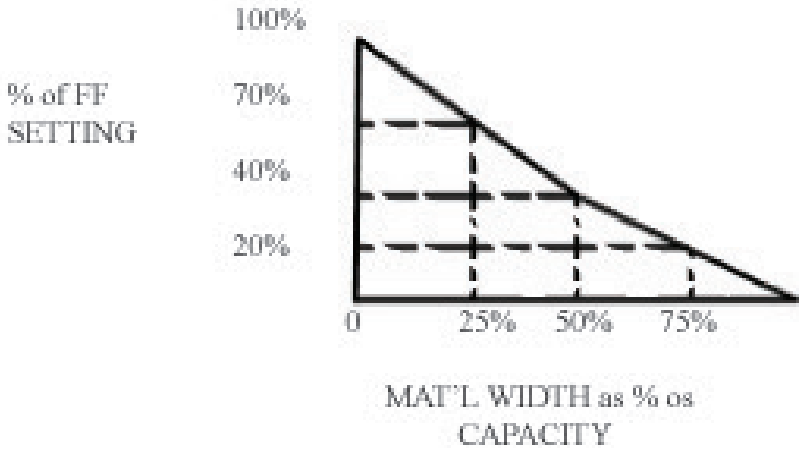
1. Effective material width, as determined here in STEP 1, can be thought of as the average width of material “seen” by each tooth, and it is used in STEPS 3 and 4.
   In Example #1, for an 8” (200 mm) diameter solid, Effective Material Width is 8” (200mm).

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 to be adjusted during head descent)

CUTTING SOLIDS

For cutting solids, the wider the section, the less FF should be set, to avoid blade overloading. See the graph below.



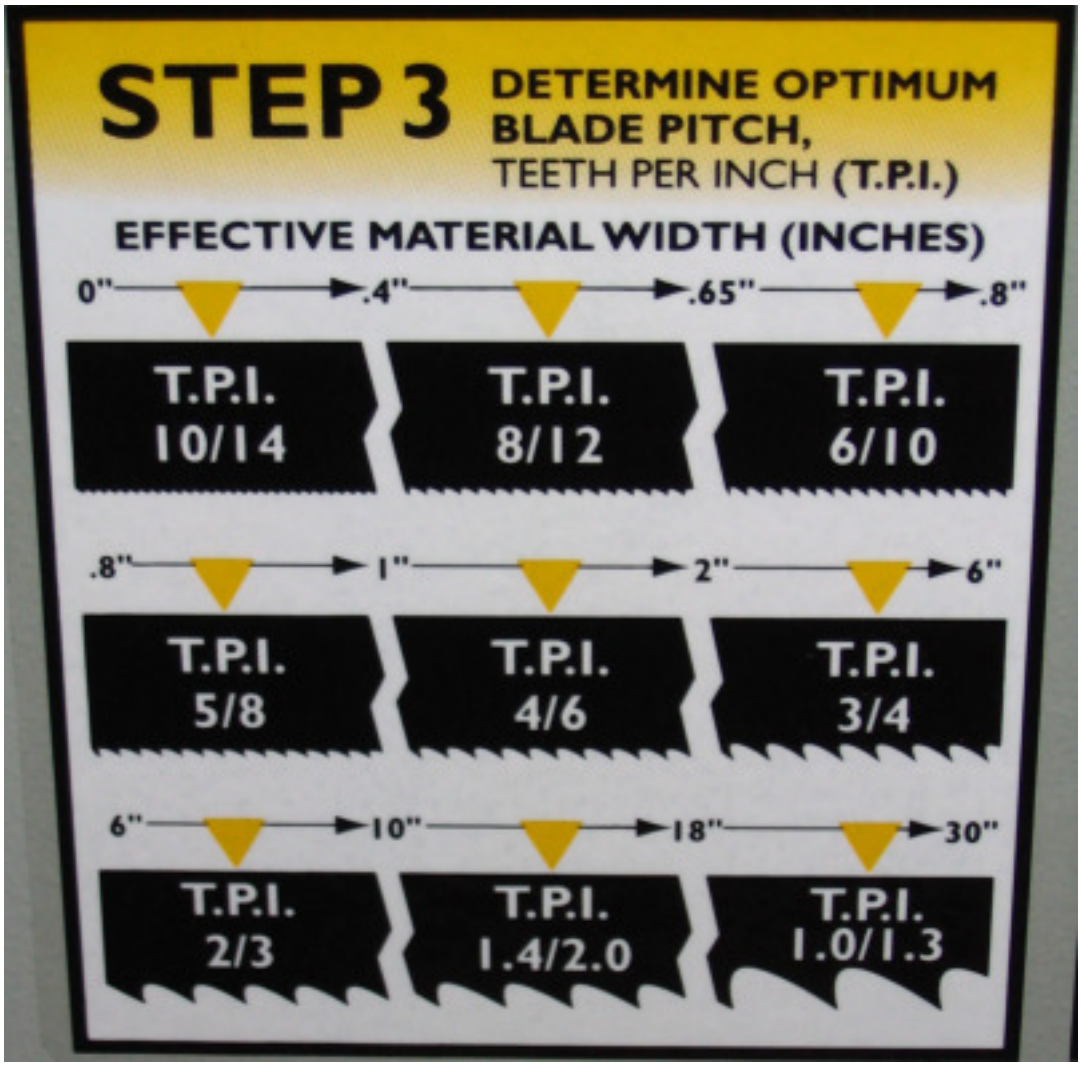
EXAMPLE: When cutting a solid which is 1/2 of machine capacity using the graph, locate 50% on the horizontal line and travel upwards to the plotted line and then travel directly across to the vertical FF Setting line. The point that you have arrived at shows a setting of 40% for a piece 50% of capacity.

CUTTING STRUCTURALS: A reduced Feed Force Setting is used when cutting structurals.

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.



Optimum Blade Pitch (T.P.I) for Material Width (Inches)

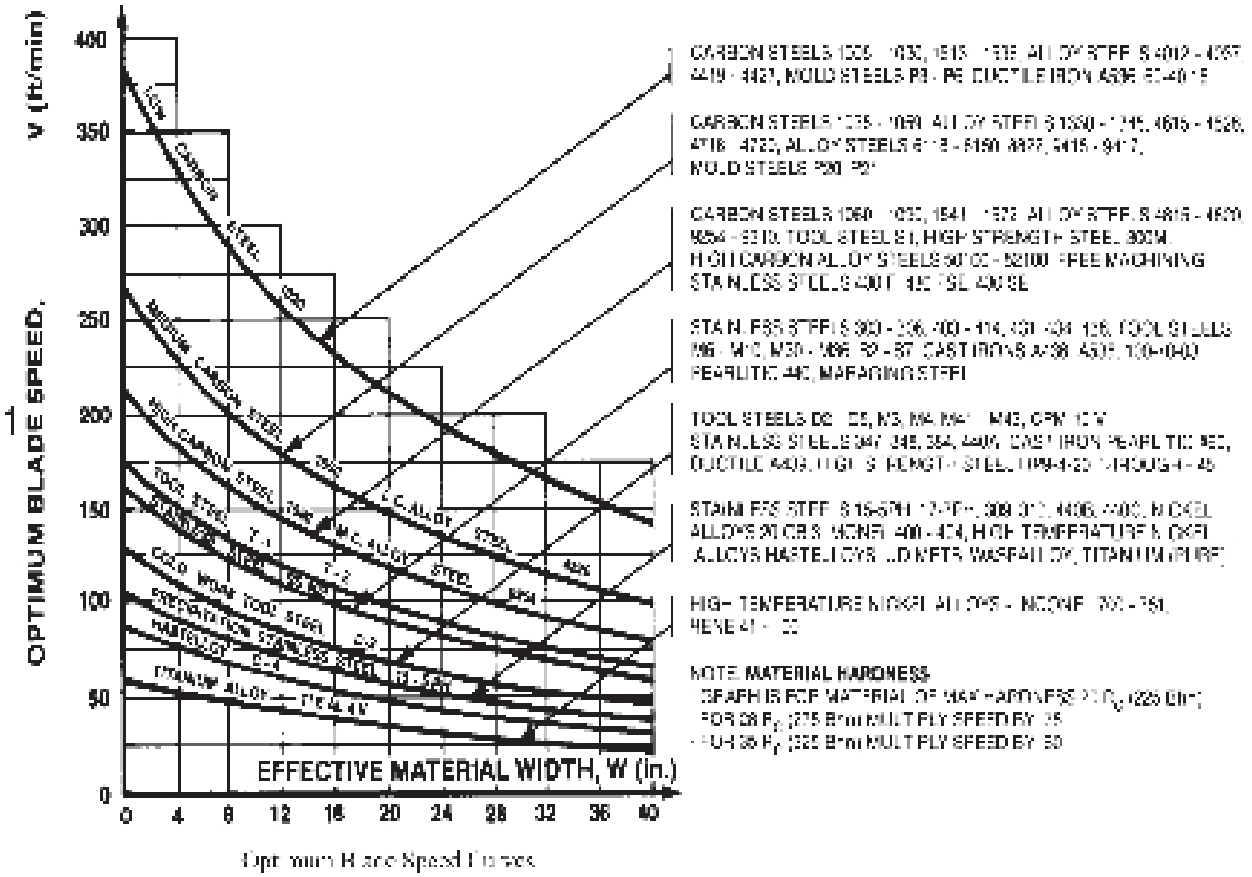
It is impractical to change the blade to the proper pitch every time a different width of material is cut and it is not necessary, but remember that the optimum blade will cut most efficiently. Too fine a blade must be fed slower on wide material because the small gullets between the teeth will get packed 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.

Example #1: Effective material width of 8” (200 mm):

Optimum blade has 2/3 teeth per inch.

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.



Optimum Blade Speed Curves

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 blades speeds should be selected.

Example #1

1. 8” (200mm) diameter #1045 Medium Carbon Steel solid bar is to be cut.
2. On the graph above find the Medium Carbon Steel Curve which represents the optimum blade speeds for 1045 Carbon Steel.
3. On the horizontal axis (effective material width axis) find number 8 which represents effective material width of an 8” (200mm) diameter solid.
4. Find the point where a vertical line from 8” (200mm) intersects the Medium Carbon Steel Curve.
5. From this intersection point run horizontally left to the vertical axis (optimum blade speed axis) and find the point marked “200”.
6. For 8” (200mm) diameter, 1045 Carbon Steel solid bar 200 ft/min (60m/min) is the optimum blade 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 except where there is a vibration problem. If the blade vibrates appreciably 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. 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.

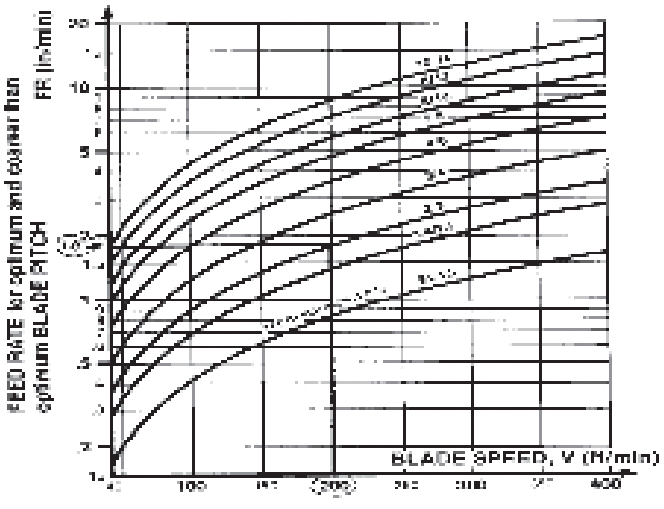
#	MATERIALS	OPTIMUM	BLADE SPEED
		(ft/min)	(m/min)
1	5” (125mm) Diameter Solid Carbon Steel	225	70
2	12” (300mm) I-Beam	290	90
3	4” x 4” (100mm x 100mm) Rect. Tube 1/4” (6mm) Wall	350	110
4	4” (100mm) 400 Stainless Steel	140	45
5	2” x 2” (50mm x 50mm) Rect. Tube 1/4” (6mm) Wall		
	Bundle 5” x 5” pcs. 10” x 10” (500mm x 500mm)	325	100
6	3” x 3” (75mm x 75mm) Inconel	60	20

Materials and Blade Speed

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.

The FEED RATE Knob controls FEED RATE of the blade descent. The FEED RATE should be adjusted only in one direction (from “O” to required value). If you go too far, go back to “O” and come back up. To set FEED RATE for particular cutting situations use the graph below, which represents the relationship between FEED RATE, blade speed and blade pitch.



Feed Rate Calculation

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 (60mm/min). From the Graph on the left, the FEED RATE is determined in the following way:

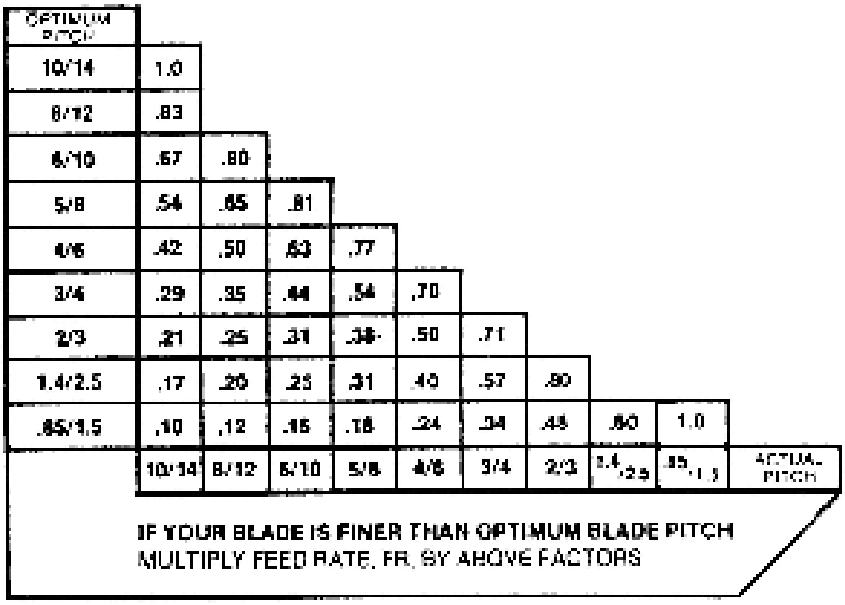
1. On the horizontal axis (blade speed axis), find 200 ft/min (60mm/min).

2. Find the point where a vertical line from 200 ft/min (60mm/min) would intersect the 2/3 blade pitch curve

3. 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, continued

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 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. 3/4 TPI) we use the graph for the optimum blade as before, and then use a multiplier given by the table below.



Optimum Vs Actual Blade Pitch

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. (150mm O.D. x 100mm I.D.)

Step 1 Effective Material Width: 4 1/2” (.75 X 6) 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): 3/4 T. P. I.
Actual blade pitch on the saw: 4/6 T. P. I.

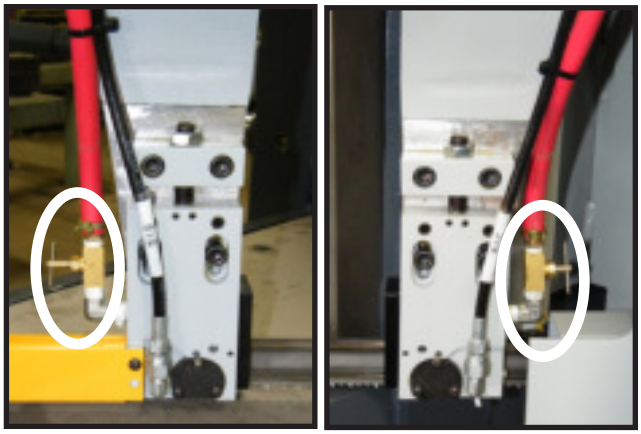
Step 4 Optimum blade speed for 4 1/2” effective 225 ft/min (70m/min) material width
Blade speed reduced by hardness factor: 225 ft/min X .60 = 135ft/min (70m/min x .60 = 42m/min)

Step 5 Feed Rate for 3/4 TPI blade: 1.8 in/min (45mm/min)
Feed Rate for 4/6 TPI blade: 1.8 in/min X .70 = 1.3in/min
(reduced by finer than optimum blade pitch factor) (45mm/min x .70= 31.5mm/min)

COOLANT FLOW

A generous flow of coolant should be applied in order to increase production and blade life. The machine is provided with a switch on the control panel as well as three independently controlled coolant spouts. Two are on the guide arms, and should always flood the blade with coolant. Slight adjustment may be required when changing the blade speed. The third is mounted on the fence for the coolant hose which should be used in cases when cutting solid bars, bundles or wide structurals. The flow of coolant should be directed into the opening created by the blade.

NOTE: When cutting materials that do not need coolant (cast iron) some coolant flow is required to provide blade lubrication to prevent blade scoring by carbides

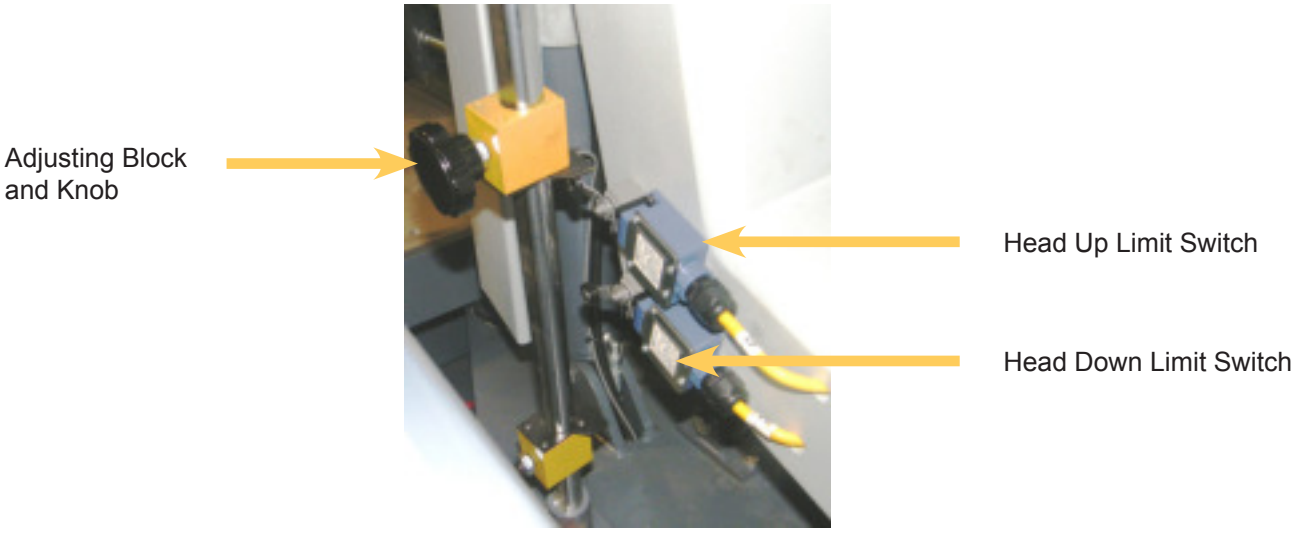


Coolant flow adjusting taps

HEAD UP AND DOWN LIMIT SETTING

Head Up Limit: In order to maximize production in the automatic cycle the Head Up Limit should be set to just clear the height of the material.

Head Down Limit: This limit is factory set and under ordinary cutting requirements should not be changed. If changed, it may cause the machine to malfunction in the automatic cycle.



Head up and head down limit setting.

SECTION 3: MAINTENANCE & 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.
2. The supervisor in charge of the machine must be informed of the intention to Lock-out the machine.
3. The Machine Power Disconnect Switch must be turned OFF, and locked in the OFF (0) 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.
6. Work on the locked-out machine may now proceed.

Machine Power Disconnect is located at side of the main electrical and hydraulic enclosure. Style of disconnect may vary.
1. Ensure switch is in the OFF position.
2. Install padlock and lock it.

NORTH AMERICA STYLE

EUROPEAN STYLE

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 CHANGE MODE PROCEDURE

Wear safety glasses, gloves, and a long sleeve shirt for protection when handling band saw blades during blade change. NOTE THAT GLOVES SHOULD NEVER BE WORN NEAR A RUNNING BANDSAW BLADE. When handling new blades, or ones that will be re-used, it is important to keep the teeth out of contact with concrete floors.

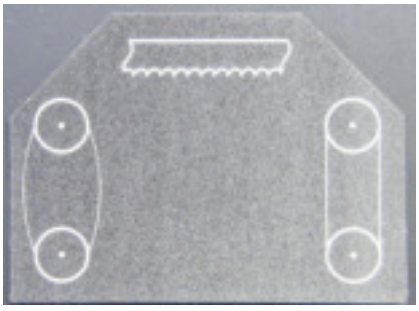
This machine is equipped with hydraulic blade tension and a 'Blade Change Mode' key switch, located on the operator control panel.

This key has two positions:

OFF or O – All normal operations of the band saw are operative.

ON or I – Hydraulic motor can be started.
Blade tension is operative.
Guide Arm is operative.

BLADE CHANGE MODE DECAL: NORTH AMERICA & EUROPEAN VERSION



BLADE TENSION DECAL: NORTH AMERICA & EUROPEAN VERSION

BLADE REMOVAL

1. With the blade change mode key switch in ‘OFF’, the blade stopped and the hydraulics ON, raise the saw head until the drive door will clear the electrical control panel.
2. Open the front vise about 12”. This will provide room between the two guide arms to easily grasp the blade with two hands, BUT DO NOT TOUCH THE BLADE UNTIL THE BLADE CHANGE MODE SWITCH IS TURNED TO THE ‘ON’ POSITION.
3. Turn the blade change key switch to the ‘ON’ position. The hydraulics will continue to run, but only the blade ten sion switch is functional. The blade wheel doors can be opened without the hydraulics shutting down.
4. Remove the blade guard.
5. Open both blade wheel doors.
6. Release the blade tension by turning the switch briefly to ‘ – ‘. The blade tension switch also opens and closes the hydraulic blade guides. By jogging the switch between ‘HOLD’ and ‘ – ‘, it is possible to regulate the degree of tension on the blade.
7. Pull the top strand of the blade down out of its slot above the cutting area and forward out of the slots on the inside walls of the blade wheel housings.
8. Pull the lower strand of the blade down out of the blade guides.
9. Store and dispose of the used blade.

BLADE INSTALLATION

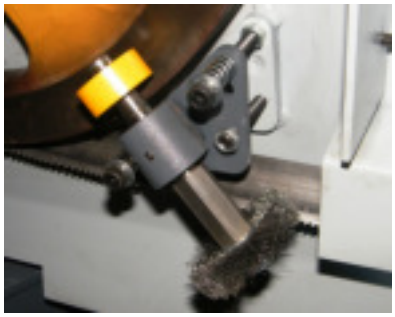
NOTES ABOUT NEW BLADES

- A new blade will come folded into a compact coil. Follow the blade manufacturer’s instructions for safely unfold ing the blade.
- The blade must be installed with the teeth facing towards the front of the saw where it passes around the wheels, and with the teeth in the cutting area pointing towards the drive wheel. This may require that the blade be turned inside out before installation.

1. With the blade change mode key switch remaining in the ‘ON’ position, turn the blade tension switch to the ‘ – ‘ position for several seconds until the idler wheel has fully retracted and the blade guides have fully opened.
2. Insert the lower strand of the new blade into the blade guides and briefly turn the blade tension switch to the ‘ +/RUN ‘ position. This will close the hydraulic guides and assist in holding the blade in the guides.
3. Lift the upper strand of the blade up into its slot above the cutting area, and place it around the blade wheels.
4. Turn the blade tension switch briefly to ‘ +/RUN’ and then leave it in ‘HOLD’ to retain the blade lightly on the wheels.
5. Adjust the blade position on the wheels so that the blade is not crooked on them and the teeth overhang the front edge of the wheels.
6. Turn the blade tension switch to ‘+/RUN’.
7. Close both blade wheel doors.
8. Turn the blade change mode key switch to the ‘OFF’ position. The hydraulics will shut down.
9. Switch the hydraulics on, then start the blade and run for 20 seconds.
10. Stop the blade.
11. Turn the blade change key switch to the ‘ON’ position.
12. Open the blade wheel doors and inspect the blade tracking, plus the position of the blade brush. Refer to the manual for tracking adjustments.
13. Close the blade wheel doors and turn the blade change mode key to the ‘OFF’ position.
14. Blade change procedure is now complete.

BLADE BRUSH ADJUSTMENT

The blade brush is properly set when the machine leaves the factory but it will wear during operation and needs to be adjusted periodically. The blade brush assembly is found behind the drive side door and is shown below. 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. To adjust the assembly, loosen the hex nut with a 9/16” wrench and turn the set screw counter clockwise with a 3/16” Allen key. This will move the brush closer to the blade. Adjust the set screw so that the brush cleans to the bottom of the blade gullets and tighten the hex nut. The brush should be replaced as it becomes worn to approximately 70% of its original 4” diameter. When a new brush is installed brush adjustment is required (Replacements can be purchased through your Hyd·Mech Group dealer)



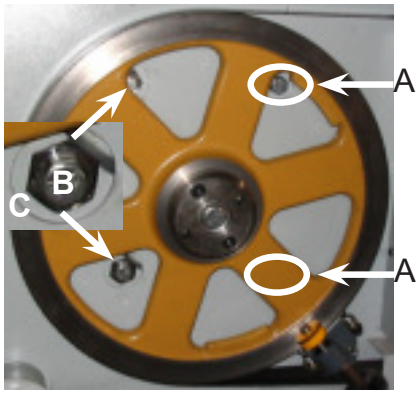
BLADE TRACKING

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
M16 = 0.250 to 0.270” (6.35 mm to 6.56 mm) of tooth over hang from the front of the wheel.
M20 = 0.260 to 0.300” (6.6 mm to 7.62 mm) of tooth over hang from the front of the wheel.

Both the drive and idler wheels are factory set a certain distance from the wall behind the wheel. Adjustment should not be required unless the wheel is being replaced. On the drive wheel there is a large hex head bolt and four set screws in a “push/pull” arrangement. For the idler wheel there is single adjuster assembly in the center of the idler shaft under the cover on the front of the head. Hyd·Mech Service should be contacted before making any adjustment to the wheel position.

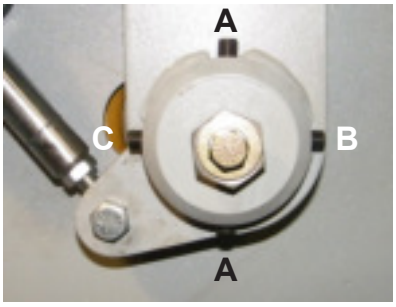
DRIVE WHEEL ADJUSTMENT

The drive wheel has two mounting bolts and two adjusting bolt assemblies. The mounting bolts (A) should be loosened but remain snug before making any adjustment to the bolt assemblies (B & C). Both of the bolt assemblies should be adjusted by equal amounts. To adjust the bolt assemblies, release blade tension slightly, loosen bolts “B” and turn bolts “C” in or out by equal amounts and tighten bolts “B”. Turning bolts “C” in will pull the blade onto the wheel and turning them out will push the blade off the wheel. Check the tracking movement after each one quarter turns of bolts “C” by running the blade at minimum speed. When the tracking is within specification, tighten bolts “A”.



IDLER WHEEL ADJUSTMENT

Remove the cover on the front of the idler end of the head to reveal the horizontal pin. There are four set screws; “A” set screws should not be adjusted as they are the pivot points. Set screws “B & C” are adjusted by turning one out, the other in 1/4 turn and tightening the first again. Adjustments should be made with the blade tension released slightly, 1/4 turn at a time and checking the blade movement with each adjustment by running the blade at minimum speed. Loosening “C” and tightening “B” will push the blade off the wheel. Loosening “B” and tightening “C” will pull the blade onto the wheel.



BLADE HEIGHT ADJUSTMENT

At the bottom of the head’s stroke the blade must be below the table wear strip in order to complete a cut. To be adjusted correctly, there should be no light seen between the blade and wear strip. To adjust the blade height, the head cylinder rod eye is adjusted as described.
Begin by first lowering the head to the bottom of it’s stroke and moving the guide arm to it’s fully open position. Remove the feed rate cover and cable near the top of the cylinder.
Then loosen the hex nut and turn the cylinder rod using a wrench on the cylinder rod flats (below the top of the feed rate bracket).
Turning clockwise will raise the blade and turning counter clockwise will lower the blade. The blade must not be lowered so far as to touch the out-feed table.
When the blade is properly positioned, tighten the hex nut and mount the feed rate cable and cover.

GEARBOX LUBRICATION

The Bonfiglioli A412 gearbox used on the M16 is supplied with 5.0 litres (1.32 US gallon) of Mobil SHC 630 synthetic oil. This oil has an ISO Viscosity Grade of 220 that is optimum for ambient temperatures from
10 – 40 Deg C [70 – 104 Deg F]. If the machine will be operated for prolonged periods at ambient temperatures below 20 Deg C [70 Deg F] an oil of ISO Viscosity Grade 150 should be substituted.

The Bonfiglioli A503 gearbox used on the M20 is supplied with 8.4 litres (2.22 US gallons) of Mobil SHC 634 synthetic oil. This oil has an ISO Viscosity Grade of 220 that is optimum for ambient temperatures from 20 – 40 Deg C [70 – 104 Deg F]. If the machine will be operated for prolonged periods at ambient temperatures below 20 Deg C [70 Deg F] an oil of ISO Viscosity Grade 150 should be substituted.

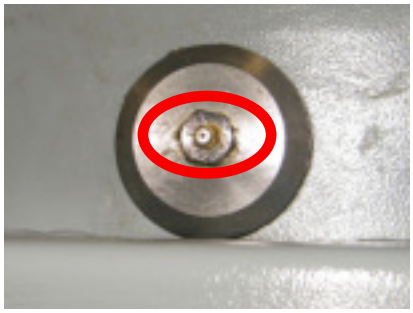
The suggested oil change interval is given below:

Oil Temperature Deg C [Deg F]	Mineral Oil Interval [hours]	Synthetic Oil Interval [hours]
< 65 [< 150]	8000	25000
65 – 80 [150 – 175]	4000	15000
80 – 95 [175 – 200]	2000	12500

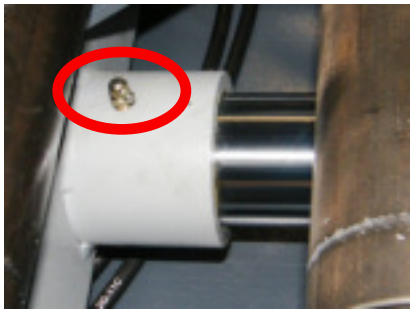
LUBRICATION

The design of the M-16, M-20 is intended to minimize maintenance, although periodically certain moving parts do require lubrication. We recommend that this periodic lubrication be done once a month using any general-purpose grease.
In addition to the grease points shown, vise jaw guides, infeed rollers and bundling assemblies require greasing.

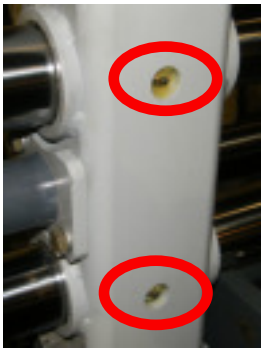
Head Pivot



Idler wheel tensioner



Shuttle house shafts



2 lube points on fixed vise shafts
plus
2 lube points on shuttle vise shafts.

Bundling option.

1 on each bundling shafts

HYDRAULIC MAINTENANCE

There are only FIVE items of routine maintenance associated with the hydraulic system.

1. OIL FILTER - Ten micron filtration of the hydraulic oil is provided by a spin on type filter mounted on the tank return line. The element should be changed after the first 50 Hours of operation and then every 500 working hours. Suitable replacement elements are:

CANFLO	RSE-30-10
GRESEN	K-22001
PARKER	921999
ZINGA	AE-10

2. OIL LEVEL & REPLACEMENT- The 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. Add oil only to the top line on the gauge. To change the oil, it is necessary to drain the tank (a drain plug is found on the bottom of the tank) and fill it to 1/3 full level with the new oil, operate through several fully automatic cycles with the index set to full stroke and the head to full rise. Drain the tank again, and finally fill the tank with the new oil. Hydraulic tank capacity is approximately 11 US gallons.

Recommended replacement oils:	Chevron	AW Hydraulic Oil 46
	Esso	NUTO H46
	Mobil	Mobil DTE 25
	Texaco	Rando HD 46
	Shell	Tellus 46

3. HYDRAULIC OIL CHANGE - Oil visual inspection should be conducted with every filter change for the following signs of degradation:
   - Milky of hazy oil color
   - Burnt smell
   - Varnish or sludge formation
   - Increased viscosity

If one of the above is observed, oil should be changed. It is recommended to change the oil after 6000 hours of operation or every 2 years.

4. OIL TEMPERATURE - Oil temperature is indicated by a thermometer contained in the level gauge. Oil temperature during steady operation should stabilize at about 50 - 55 F° (10-12°C) above room temperature. Thus in a 70 F° (20°C) shop one might expect an oil temperature of about 120 F° (50°C) Oil temperature should never exceed 160 F° (70°C)

5. OIL PRESSURE - Oil pressure is factory set to 950 to 1000 PSI (6550 to 6895 kPa) and should not require further attention except precautionary observation at start-up and every few days thereafter.

CLEANLINESS

The M-16, M-20 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 as 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.
- Outfeed table 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 can be performed on them.

TROUBLESHOOTING

PROBLEM		PROBABLE CAUSE		SOLUTION	
1	Saw is cutting out of square vertically.	1a.	Blade worn.	1a.	Replace blade.
		1b.	Low blade tension.	1b.	Tension blade.
		1c.	Blade guides.	1c.	Check for worn guides.
		1d.	Excessive feed rate.	1d.	Reduce.
2	Saw is cutting out of square horizontally.	2	Stock not square in vises.	2	Adjust accordingly.
3	Blade comes off wheels.	3a.	Not enough blade tension.	3a.	Reset blade tension.
		3b.	Improper tracking.	3b.	Set tracking.
4	Blade stalls in cut.	4a.	Not enough blade tension.	4a.	Tension blade.
		4b.	Excessive feed force.	4b.	Reduce.
		4c.	Excessive feed rate.	4c.	Reduce.
5	Blade vibrates excessively.	5a.	Blade speed too fast.	5a.	Reduce.
		5b.	Guide arms too far apart.	5b.	Adjust accordingly.
		5c.	Not enough blade tension.	5c.	Tension blade.
6	Excessive blade breakage.	6a.	Excessive blade tension.	6a.	Reduce blade tension.
		6b.	Excessive feed rate.	6b.	Reduce.
7	Tooth strippage.	7a.	Blade pitch too fine.	7a.	Select coarser pitch.
		7b.	Blade brush not cleaning.	7b.	Adjust or replace blade brush.
		7c.	Excessive feed rate.	7c.	Reduce.
		7d.	Excessive feed force.	7d.	Reduce.
8	No coolant flow.	8a.	No coolant.	8a.	Add coolant.
		8b.	Coolant line blocked.	8b.	Blow out coolant line.
		8c.	Coolant pump inoperable.	8c.	Check, replace if faulty.
9	Saw will not start.	9a.	Safety relay is not energized	9a.	1.Ensure all Emergency Stop push buttons are released. 2.Ensure Door interlock switches are not activated.(Close Drive & Idler doors)
		9b.	Motor overload has tripped.	9b.	Depress each of the over-load buttons located in the electrical box. Depressing one button at a time and trying to start the saw will indicate which motor was overloaded.
		9c.	Control circuit fuse has blown.	9c.	Replace the fuse in the control panel. Random blowouts may occur but a quickly repeated blowout points to an internal wiring fault.
		9d.	Vise or head selector switch not in the center (neutral) position.	9d.	Turn all switches to the center (neutral) position.
10	Saw starts but will not run after Start button has been released.	10	On machines so equipped, the out-of-stock or blade breakage limit switch has been tripped.	10	Reload with stock or reset the blade. Hold the hydraulic start button and release the blade tension or open vises far enough to deactivate the limit switch.
11	Saw starts but no hydraulic functions.	11a.	If blade wheels run clockwise, wrong phase order in power connection to saw.	11a.	Stop immediately; reverse any two of the three phase connections.
		11b.	If pump is noisy cause may be low hydraulic oil level.	11b.	Stop immediately, add hydraulic oil. (See "Hydraulic Maintenance")
		11c.	Pump-motor coupling has separated.	11c.	Adjust accordingly.

IN MANUAL MODE					
PROBLEM		PROBABLE CAUSE		SOLUTION	
12	No individual function will respond to its manual control switch.	12a.	Observe pilot light(s) on relevant valve. If pilot light fails to go on, problem is electrical.	12a.	This requires the attention of a qualified service person.
		12b.	If pilot light related to inoperative function does light, problem may still be the coil . If problem remains it may result from dirt in the valve spool.	12b.	Disassembly of hydraulic valves should be under taken only by qualified service personnel or those knowledgeable with hydraulic components.
13	Head will not descend.	13a.	Feed Rate Valve is fully closed - pointer is set on "0" or close to "0" in/min.	13a.	Turn Feed Rate Knob in a counter clockwise to open valve.
		13b.	Feed Force Limit is set too low.	13b.	Increase Feed Force Limit.
		13c.	Check for physical interference preventing the head from falling.	13c.	Remove obstructions.
IN AUTOMATIC MODE					
14	Auto cycle will not start.	14a.	No job queue programmed to run.	14a.	Enter job numbers(s) and job data as described in Section 2.
		14b.	Pieces required equals pieces cut.	14b.	Clear pieces cut.

MITSUBISHI PLC 500 TROUBLESHOOTING (For M16APC, M20APC and V18APC machines)

NOTE:

1. 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 Distributor.
2. If the machine is equipped with an inverter, do not turn disconnect on for one minute after disconnect has been shut off. Cycling power sooner than one minute will result in damage to the Variable Frequency Drive.

The PLC 500 uses input signals from limit switches , control panel switches, three rotary shaft encoders, and information which is programmed into it, to supply accurate automatic length ,angle and saw function control as well as blade speed and feed rate readout.

The inputs used include; a head down (head advance - V18A) limit switch, a head up limit switch (head retract - V18A), and a head at 90 deg. limit switch. Also, the manual switches for head up (retract - V18A), and head down (advance - V18A), front vise open / close, shuttle vise open / close, blade start / stop, coolant on / auto, and cycle start, all are inputs to the PLC.

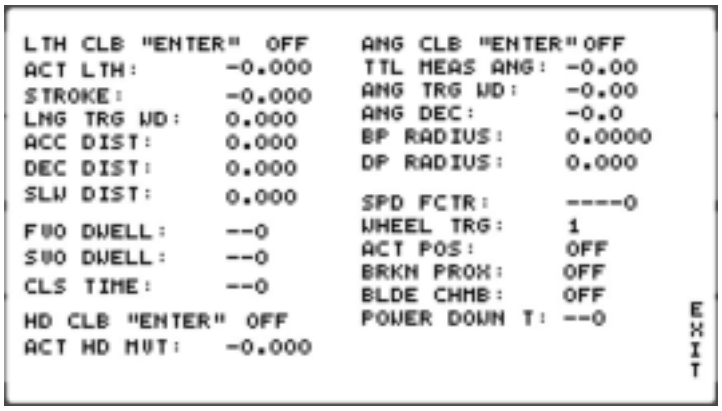
One rotary shaft encoder is attached to the shuttle assembly and travels with shuttle to provide length information to the PLC. Another encoder is attached to the machine frame behind the head and is driven by a cable attached to the head pivot drum. This encoder provides the PLC with head swing angle information. The third encoder is mounted beneath the head carriage covers (on V18A) or behind the head cylinder cover (on M16/20A) and is cable driven to provide head feed rate information to the PLC. A proximity sensor provides blade speed input.

The programmed information includes logic put into the PLC by its manufacturer, as well as information programmed into it, through the keypad, by the machine assembly plant. The information programmed at the assembly plant is referred to as the parameters. It is important that these parameters are correct for the PLC to be able to supply accurate lengths, angles blade speed and feed rate display.

To view the parameters:

Start the machine and, in manual mode, enter the parameter screen by pressing the PARAMETERS key (F16). Type the password which can be obtained from Hyd·Mech and press ENTER. Press parameters key again and the parameter screen will appear.

MITSUBISHI PLC 500 PARAMETER SCREEN (V18APC SHOWN)



NOTE:
For M16/20A and older V18APC (Before but not including serial # K0399163), the parameter screen is slightly different. There will be only one Angle Calibration enable line (Reads: ANG CLB “ENTER” OFF), and only one Total Measured Angle line (Reads: TTL MEAS ANG: 90.07).

MITSUBISHI PLC 500 PARAMETERS

To navigate through the parameters use the orange arrow keys to move the cursor. To change a parameter, move the screen cursor to the desired parameter using the green arrow keys on the interface keypad. With the cursor on the value to be changed, type in the new value with the numeric keys.
NOTE: There are 4 parameters which can only be changed after the PLC does a ‘self calibration’. These parameters are:

ACT LTH (Actual Length)
ACT HD MVT (Actual Head Movement)
TTL L MEAS ANG (Total Left Measured Angle)
TTL R MEAS ANG (Total Right Measured Angle)
(TTL MEAS ANG on M16/20 or older V18A)

Directly above each of these parameters will be the calibration procedure enable line. (ie. LTH CLB “ENTER” OFF). With the cursor on the word ‘OFF’, the calibration procedure can be started by pressing the ENTER key.
NOTE: If any calibration procedure is activated and not allowed to be completed, or a value for that parameter is not entered during or after starting or completion of the procedure, the value for that parameter will reset to 00.000 and the PLC will not be able to count/display the particular function for which the parameter is intended.
If any of the following problems occur, performing the calibration procedure may help:
NOTE: Checks of mechanical & electrical components involved in the particular counting circuit should be made before attempting calibrations.)

1. No length display with shuttle moving in manual/erratic length control/erratic shuttle movement - Perform Length Calibration (LTH CLB)
2. No feed rate display (display reads FR 0.0 all the time) - Perform Head Height Calibration (HD CLB)
3. No angle display/improper angles in AUTO - Perform Angle Calibration (ANG CLB)

LENGTH CALIBRATION
If the machine has an out of stock switch put something in the shuttle vise to keep the out of stock from being activated. With no material in the machine, proceed as follows:

1. With the cursor on the line that reads - LTH CLB “ENTER” OFF, press the ENTER key. The line should then read - LTH CLB “ENTER” ON, and the cycle start button should be flashing.

2. Start the blade and the machine will go through the procedure.
   On V18APC: The head will move ahead for a trim cut, then retract, the shuttle vise will open and move slowly all the way to the back. It will close, the front vise will open, and the shuttle vise will move slowly all the way to the front. The front vise will clamp, the head will move forward for a cut and then retract.

On M16/20A: The head will move down for a trim cut then move back up. The shuttle vise will make the same movements as above, and when it gets back to the front and the front vise clamps the head will move down for a cut then move back up.
At this point the procedure is done and the line should read - LTH CLB “ENTER” OFF. The cycle light will still be flashing.

3. Move the cursor to ACT LTH line, type in the desired value (original parameter) and press ENTER.
4. To finish the procedure after completion, press the AUTO/MANUAL key and the value in 3) will then be accepted by the PLC.

The above procedure may also be run with material: Load the machine with a good straight piece of material, long enough for one full length of shuttle movement. Start the procedure as above (make sure you have proper band speed and feed rate for material being cut). The machine will cycle exactly as above, trimming off the material and then shuttling and cutting off one full shuttle stroke worth of material. The length must then be measured, as accurately as possible, the kerf of the blade being used added to this measurement, and this value is then entered as the Actual Length parameter (ACT LTH).

HEAD FEED RATE CALIBRATION

NOTE:
On “M” machines remove the head up limit switch target to prevent damage of the head up limit switch during calibration.

1. With the cursor on the line that reads - HD CLB “ENTER” OFF, press the ENTER key.
   The line should then read - HD CLB “ENTER” ON, and the cycle start button should be flashing.
2. The head will move fully forward (down on M16/20A) and then will move fully backward (up on M16/20A). At this point the procedure is done and the line should read - HD CLB “ENTER” OFF. The cycle light will still be flashing.
3. At any point after the procedure has started, move the cursor down to the ACT HD MVT line (ACT HT on M16/20A), type in the desired value and press ENTER. To finish the procedure, press the AUTO/MANUAL key and the value entered will then be accepted by the PLC.

This value is determined by measuring the full stroke movement of the head. Measurement on M16/20A is from the horizontal wear plate to the tip of the blade teeth, along the face of the front vise datum jaw. For V18A the easiest measurement is made along one of the head carriage linear bearing rails. A reference point is made on the rail where the edge of the linear bearing is when the head has come fully forward. The measurement is then taken from this point to the same bearing edge when the head has fully retracted.

ANGLE CALIBRATION

With no material in the machine, proceed as follows :

1. On V18APC: For left side angle calibration; with the cursor on the line that reads - L ANG CLB “ENTER” OFF, press the ENTER key. (Right side calibration - R ANG CLB “ENTER” OFF). The line should then read - L ANG CLB “ENTER” ON, and the cycle light should be flashing.
2. Start the blade. The head will swing to 90 degrees, if not already there, and then will come forward for a cut. It will retract, swing to 45L, come forward for a cut, and then retract. At this point the left angle procedure is complete. The line should then read - L ANG CLB “ENTER” OFF. The cycle light will still be flashing.
3. At any point after the procedure has started, or after it has finished, move the cursor down and type in the desired value (original parameter or adjusted original) into the TTL L MEAS ANG line (into TTL R MEAS ANG for right side), and press ENTER. To finish the procedure, press the AUTO/MANUAL key and the value entered will then be accepted by the PLC.

For M16/20A or older V18APC
There is only one angle calibration line - ANG CLB “ENTER” OFF With the cursor on this line press ENTER key and line will read - ANG CLB “ENTER” ON, and cycle light will be flashing. Start the blade and the procedure will execute;

On V18APC:
The head will swing slowly to 45 L, and then will come forward for a cut. It will retract, then swing slowly to 45 R, come forward for a cut, and then retract. At this point the procedure is complete.

NOTE:
If doing this procedure using material to scribe and calculate new value, a scribe cut at 90 will have to be made before starting the procedure.

On M16/20A:
The head will swing to 90 degrees, if not already there, move down for a cut, move back up, and then swing to 30 degrees. It will again move down for a cut, and then move back up. At this point the procedure is complete. The line will then read - ANG CLB “ENTER” OFF At any point after the procedure has started, or after it has finished, move the cursor down to the TTL MEAS ANG line, type in the desired value (original or adjusted parameter), and press ENTER. To finish the procedure, press the AUTO/MANUAL key and the value entered will then be accepted by the PLC.

The above procedure is performed to allow for the original parameter to be reinstalled, in a case where there is no angle display due to loss of this value by PLC memory (electrical & mechanical components ok), or to allow for the original parameter to be modified, in a case where the angle display is inaccurate, and proper calibration cannot be performed. (Proper material not available for test cuts.)

Actual calibration is performed by running the angle calibration procedure with a piece of cold rolled material (6-8’ wide), allowing the blade to scribe the material, then measuring and calculating the angles cut. (For angle troubleshooting details please contact Hyd·Mech Group Limited).

PLC 500 E600 input / Output Terminal Information

Inputs

- X0 - Shuttle Encoder, Channel A
- X1 - Shuttle Encoder, Channel B
- X2 - Blade Speed or Proximity Switch
- X3 - Feed rate encoder A / Angle Encoder A
- X4 - Feed rate encoder B / Angle Encoder B
- X5 - Open
- X6 - Head 90° L/S
- X7 - Coolant Switch
- X10 - Blade Status
- X11 - Coolant Switch
- X12 - Head Raise L/S
- X13 - Head Lower L/S
- X14 - Open
- X15 - Cycle Start P/B
- X16 - Open
- X17 - Open
- X20 - Shuttle Vise Close Switch
- X21 - Shuttle Vise Open Switch
- X22 - Front Vise Close Switch
- X23 - Front Vise Open Switch
- X24 - Head Raise Switch
- X25 - Head Lower Switch

Outputs

- Y0 - Front Vise Open
- Y1 - Front Vise Close
- Y2 - Shuttle Fast
- Y3 - Encoder Switching Relay
- Y4 - Shuttle Vise Open
- Y5 - Shuttle Vise Close
- Y6 - Open
- Y7 - Coolant Pump On / Off
- Y10 - Head Lower and Head Lower Relay
- Y11 - Head Angle Fast
- Y12 - Head Raise
- Y13 - Blade Run Relay
- Y14 - Shuttle Forward
- Y15 - Shuttle Reverse
- Y16 - Head Swing 90°
- Y17 - Head Swing 30°
- Y20 - Machine Latch
- Y21 - Open
- Y22 - Open
- Y23 - Cycle On

PARAMETER DEFINITIONS

MTL INFEED (V18A ONLY)	MATERIAL INFEED	Tells PLC which side of the machine material in-feed is on.
ACT LTH	ACTUAL LENGTH	Value determined by, and entered after, performing the Length Calibration Procedure. PLC uses this value to calculate its length encoder resolution and Stroke parameter.
STROKE	SHUTTLE STROKE LENGTH	Value determined by the PLC based on the above Actual Length value. This value is automatically entered by the PLC and can not be changed through the keypad.
LNG TRG WD	LENGTH TARGET WINDOW	Allowable +/- tolerance for programmed length
ACC DIST	ACCELERATION DISTANCE	Distance, in inches, the shuttle will travel slowly before going to fast speed, when starting to move in either direction (ie. .250).
DEC DIST	DECELLERATION DISTANCE	Distance, in inches, from the home or target length position, the shuttle will travel in slow speed (ie 1.000).
SLW DIST	SLOW DISTANCE	Minimum slow speed distance. If programmed length is smaller than this parameter the PLC will only move the shuttle in slow speed.
FVO DWELL	FRONT VISE OPEN DWELL	Opening time for the front vise. A value of 100 is approximately 1 second. (i.e. 75 ≈ .75 sec).
SVO DWELL	SHUTTLE VISE OPEN DWELL	Opening time for the shuttle vise.
CLS TIME	CLOSE TIME	Closing time for front vise or the shuttle vise (ie. 100 - 1 sec.).
ACT HD MVT	ACTUAL HEAD MOVEMENT	Value that is determined by, and entered after, performing the Head Calibration Procedure. It represents the full travel distance of the head.
TTL L MEAS ANG	TOTAL LEFT MEASURED ANGLE	Value determined by, and entered after, performing the Left Angle Calibration Procedure. PLC uses this value to calculate it's angle encoder resolution.
TTL R MEAS ANG	TOTAL RIGHT MEASURED ANGLE	As above but for right side angles
TTL MEAS ANG	TOTAL MEASURE ANGLE	Only for M16/20A and older V18APC; single value for angle encoder resolution as above, determined by, and entered After, performing the Angle Calibration Procedure.

ANG TRG WD	ANGLE TARGET WINDOW	Allowable + / - tolerance from programmed angle.
ANG DEC	ANGLE DECELLERATION	Distance in degrees the head will move in slow speed on approaching target angle.
BP RADIUS	On M16/20	The distance in inches from the front side of the blade to the pivot point of the head.
	On V18APC	The distance in inches from the out-feed side of the blade to the pivot point of the head.

This parameter is used, along with DP RADIUS to calculate the correct shuttle length when the head swings away from 90 degrees. (i.e. 0.020)

DP RADIUS	On M16/20A	The distance in inches from the inside face of the fixed jaw on the front vise (usually referred to as the datum line) to the pivot point of the head.
	On V18APC	The distance in inches from the top of the cutting table (the datum line on V18APC) to the pivot point of the head.

Along with BP RADIUS, used to calculate the correct shuttle length when head swings away from 90 degrees. (i.e. 0.082)

SPD FACTOR	SPEED FACTOR	Blade speed adjustment number. If actual blade speed is different than displayed blade speed, a new speed factor must be calculated. (Providing wheel target parameter is set correctly) Actual speed / Display speed = Adjustment factor. Adjustment factor X Existing speed factor = New speed factor.
WHEEL TRG	WHEEL TARGETS	Number of targets per revolution of the idler wheel. M16/20A - 1 V18APC - 6 (Starting in Jan 99, this changed to 1)
ACT POS	ACTUAL POSITION	If this parameter is set to ‘1’, length display will show actual position.
BRKN PROX	BROKEN PROXY	If this parameter is set to ‘0’, if the blade breaks the machine will shut down. If set to 1’, overrides the broken blade function; machine will be able to continue to run if there is a problem with the blade speed signal (broken blade speed sensor)
BLDE CHAM	BLADE CHAMBER	If this parameter is set to ‘1’, when the AUTO cycle reaches the function of head up (head retract on V18APC), the shuttle will retract the material away from the blade by 1/8” before the head will move up (retract on V18APC). When the head gets to the up (retracted) position the next length will be shuttled into position.
POWER DOWN TIMER	POWER DOWN TIMER	This will allow the machine to continue running for a specified time after the job (in Manual Mode) or the cycle (in Auto Mode) has been completed. Range from “0” to “180” minutes. If “0” is selected, then the machine will shut down after the job is completed.

PLC 500 TROUBLESHOOTING Examples

PROBLEM #1, 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
4. Display unit - no power from PLC unit
   damaged hardware
5. PLC has lost ACT LTH (Actual Length) parameter - perform self calibration procedure and enter original ACT LTH parameter value.

DIAGNOSIS;

a. 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 negative going back. If negative going back, and positive coming toward home, 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.

b. To determine the cause, first, check the encoder cable connections at both ends to be sure all four wires are connected properly. (See next page for connection / wiring information)

Measure the voltage:

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 0 V and channel A and 0V 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 0 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 check positive, the problem is in the PLC unit.

CONSISTENT INACCURACY:
(Make sure blade kerf value is correct)

- Change “Actual Pos.” parameter to 1.
  This will make the PLC show actual shuttle travel in AUTO

  With no material in the machine:
- Program JOB 1 for 2 pieces of 5” length, JOB 2 for 2 pieces of 10” length, and JOB 3 for 2 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 “Decel. Dist.” 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
- Open parameters screen
- Initiate length calibration and measure cut length as accurately as possible.
- Re-enter new ACT LTH (Actual Length) value
- Re-cut test lengths and check if accuracy is satisfactory.

  Or
- Perform test cuts of three different lengths (i.e. 6”, 12”, 20”) and measure as accurately as possible.
- If the measurements indicate a linear problem the ACT LTH should be adjusted.
- With no material in the machine, open parameter screen and initiate the length calibration procedure.
- After the procedure has finished, enter a new ACT LTH value based on the following :

  If the error causes part length to get longer as the programmed length is increased, the ACT LTH value should be increased.

  If the error causes part length to get shorter as the programmed length is increased, the ACT LTH value should be decreased.

Make small adjustments at a time (i.e. .020” - .030”) and recheck test lengths.

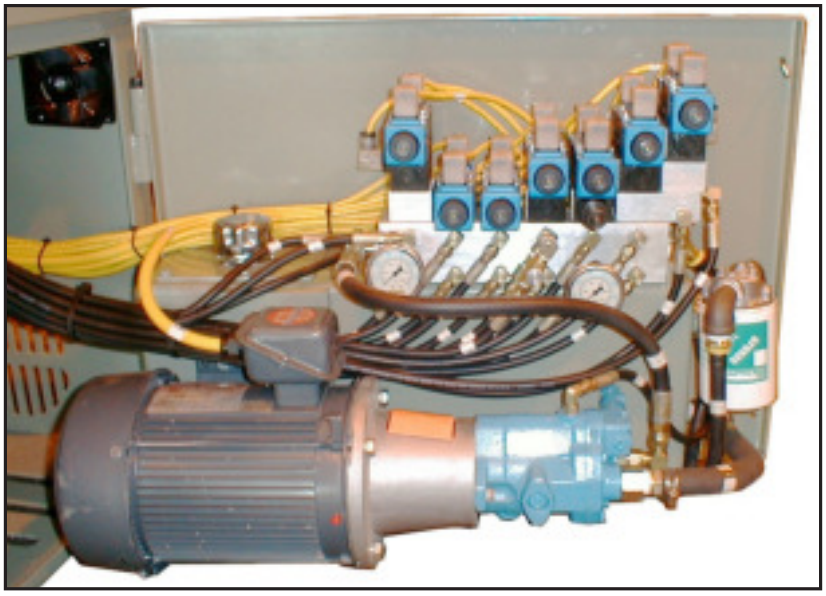
EXAMPLE:
If part length error gets longer as the programmed length is increased:
Existing ACT LTH = 33.070”
Change ACT LTH to 33.070 + .030 = 33.100”

SECTION 4 - ELECTRICAL

ELECTRICAL SCHEMATICS: SEE PDF ON ATTACHED CD

SECTION 5 - HYDRAULIC

The M16, M20 hydraulic system does not require any special work on a new machine before its start up. The hydraulic tank is filled with Texaco Rando HD46 hydraulic oil and all machine functions have been tested at the factory to ensure proper operation upon initial start-up.



M20 HYDRAULIC ASSEMBLY COMPONENT LIST

ITEM	QTY	M20 PART NUMBER	DESCRIPTION
1	1	M20-C4-00B	Head Cylinder
2	1	M16-C1-00A	Shuttle Cylinder
3	1	S25-C5-00	Blade Tension Cylinder
4	1	M20-C21-00A	Front Vise Cylinder
5	1	M20-C21-00A	Shuttle Vise Cylinder
6	1	M16-C22-00B	Datum Vise Cylinder
7	2	M20-C23-00B	Bundling Clamp Cylinder (Optional)
8	1	M20-C6-00	Guide Arm Cylinder
9	1	M16-C7-00	Swing Cylinder
10	1	DDF21-0-00	Positive Downfeed Valve
11	1	MB6PA	Manifold Block
12	1	EB-01A	Manifold Extension Block
13	4	DPCH-1	Double Pilot Check
14	3	PG-10	Pressure Gauge (1000 psi)
15	1	PG-10	Pressure Gauge (1000 psi, VVP option)
16	1	DCV3P-AB-T	Head Lift Valve
17	1	DCV3P-AB-C	Blade Tension Valve

18	1	DCV3P-AB-T	Shuttle Valve
19	1	DCV3P-AB-T	Guide Arm Valve
20	1	DCV3P-AB-C	Front Vise Valve
21	1	DCV3P-AB-C	Shuttle Vise Valve
22	1	DCV3P-AB-T	Swing valve
23	1	DCV3P-AB-C	Outboard Vise (Option)
24	2	PV2P-A-C	Poppet Valve
25	1	CHB-25C	Cushion Block, shuttle
26	1	HP-1	Pump
27	1	SS-100-00	Suction Strainer
28	1	SF6520	Return Filter
29	1	HM-1	Chip Conveyor Motor
30	1	N10BK	Needle Valve
31	1	CHB-15C	Cushion Block, swing
32	1	JB-02B	Double Junction Block (Option)
33	1	PRV1/12	Pressure Reducing Valve (Option)
34	1	EB-02	Extension Block, Left (Option)

M16 HYDRAULIC ASSEMBLY COMPONENT LIST

ITEM	QTY	M20 PART NUMBER	DESCRIPTION
1	1	M16-C4-00B	Head Cylinder
2	1	M16-C1-00A	Shuttle Cylinder
3	1	S25-C5-00	Blade Tension Cylinder
4	1	M20-C21-00A	Front Vise Cylinder
5	1	M20-C21-00A	Shuttle Vise Cylinder
6	1	M16-C22-00B	Datum Vise Cylinder
7	2	M20-C23-00B	Bundling Clamp Cylinder (Optional)
8	1	M16-C6-00B	Guide Arm Cylinder
9	1	M16-C7-00	Swing Cylinder
10	1	DDF21-0-00	Positive Downfeed Valve
11	1	MB6PA	Manifold Block
12	1	EB-01A	Manifold Extension Block
13	4	DPCH-1	Double Pilot Check
14	3	PG-10	Pressure Gauge (1000 psi)
15	1	PG-10	Pressure Gauge (1000 psi, VVP option)
16	1	DCV3P-AB-T	Head Lift Valve
17	1	DCV3P-AB-C	Blade Tension Valve
18	1	DCV3P-AB-T	Shuttle Valve
19	1	DCV3P-AB-T	Guide Arm Valve
20	1	DCV3P-AB-C	Front Vise Valve
21	1	DCV3P-AB-C	Shuttle Vise Valve

22	1	DCV3P-AB-T	Swing valve
23	1	DCV3P-AB-C	Outboard Vise (Option)
24	2	PV2P-A-C	Poppet Valve
25	1	CHB-25C	Cushion Block, shuttle
26	1	HP-1	Pump
27	1	SS-100-00	Suction Strainer
28	1	SF6520	Return Filter
29	1	HM-1	Chip Conveyor Motor
30	1	N10BK	Needle Valve
31	1	CHB-15C	Cushion Block, swing
32	1	JB-02B	Double Junction Block (Option)
33	1	PRV1/12	Pressure Reducing Valve (Option)
34	1	EB-02	Extension Block, Left (Option)

HYDRAULIC SCHEMATICS & PLUMBING DIAGRAMS: SEE PDF ON ATTACHED CD

SECTION 6 - MECHANICAL ASSEMBLIES

MECHANICAL ASSEMBLY DRAWINGS & PARTS LIST: SEE PDF ON ATTACHED CD

SECTION 7 - OPTIONS

BLADE DEVIATION

OVERVIEW OF THE BLADE DEVIATION MONITORING SYSTEM. (BDMS)

This system monitors lateral blade deviation during cutting. If the blade deflection increases beyond the pre-set warning limit, then the monitoring device sends a warning signal by means of a flashing beacon mounted on top of the machine head. If no steps are taken to correct this condition, the machine will continue to cut until the pre-set shut-down limit is reached. At this point the machine will behave in one of two ways selectable by a parameter setting:

1. Stop cutting, raise the head, and shut down.

or

2. Finish the cut with the present degree of deviation and then shut down.

FACTORY DEFAULT SETTING IS: #1. Stop cutting, raise the head, and shut down.

OPERATION OF THE SYSTEM

The proximity transducer is enclosed in a housing mounted on the idler side guide arm. The sensor converts the blade lateral deflection to an analog signal, which is sent to the PLC. After a series of calculations the lateral deflection is displayed on the operator interface in the form of a bar graph.

The bar graph appears in both the Manual Mode and Automatic Mode Screens. It is only active when the blade is running and head is descending. The length of the bar graph is proportional to the blade deflection. The bar graph extends from the screen centre towards the right if the blade is deviating towards the front of the saw (cutting into the part), and extends from the screen centre towards the left if the blade is deviating towards the rear of the saw (cutting into the stock).

If a warning limit is reached and maintained longer than the preset response time, then the beacon light mounted on top of the head will start flashing.

If a shutdown limit is reached and maintained longer than the preset response time, then the machine will behave in one of two ways:

1. Stop cutting, raise the head, and shut down.

or

2. Finish the cut with the present degree of deviation and then shut down.

E1060

Fig.1

SETUP PROCEDURE

The BDMS is factory installed but at times it may be necessary to enter the setup mode:

To enable the blade monitor system, follow the steps outlined below:

1. Enter the MONITOR LIMIT SETTING screen by pressing function key F1 labeled LmtSet. The MONITOR LIMIT SETTING screen will be displayed (Fig. 2)

2. Enter the Parameter screen by pressing function key F5 labeled BLADE MONITOR PARAMETERS. The PARAMETER SETTING screen will be displayed (Fig. 4. Page 2.4.)

3. Change the BLADE DEVIATION MONITOR parameter to ON by moving the cursor using the navigation keys to ON/OFF and pressing ENTER. The value of Blade Monitor parameter will change to ON.

4. Exit the Parameter screen by twice pressing the function key F1 labeled RETURN.

To disable the blade monitor option, repeat the above steps 1 to 4 but ensure in step #3 that OFF is selected.

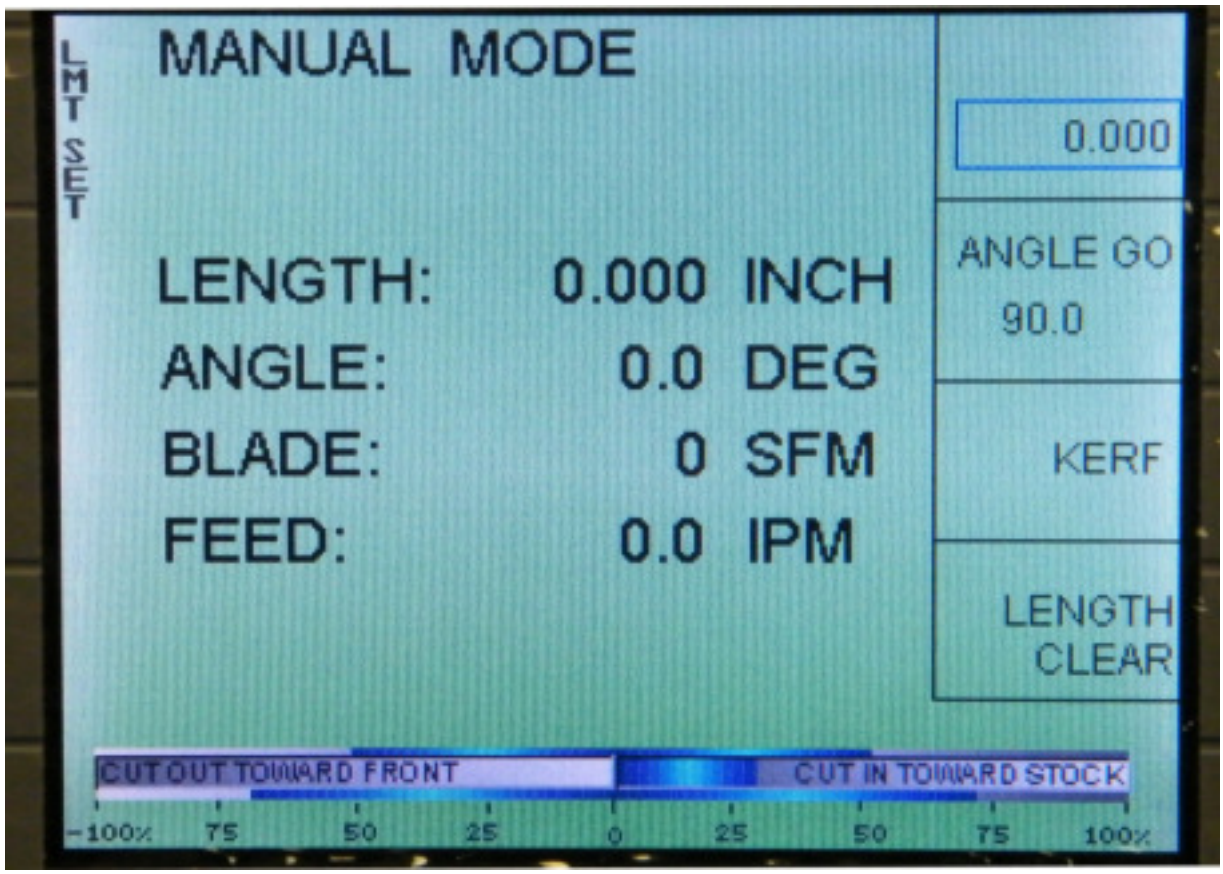


Fig.1A

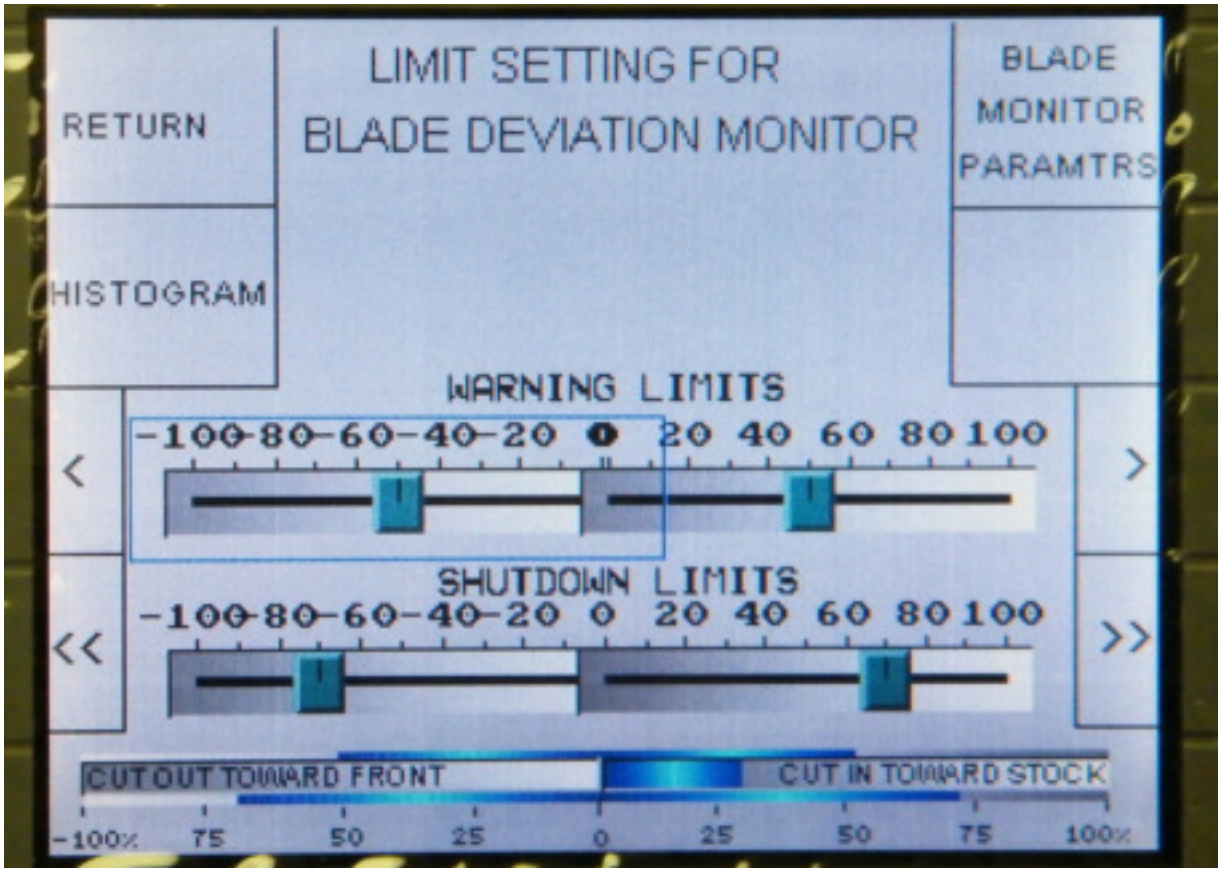


Fig.2

WARNING AND SHUTDOWN LIMITS ADJUSTMENTS

To adjust the warning and shutdown limits, enter the MONITOR LIMIT SETTING screen by pressing function key F1 labeled LMTSET (Screen will change as shown in Fig.2)

There are two scales, the upper one showing the preset right and left warning limits, and the lower scale showing the preset right and left shutdown limits. All four limits (right and left warning, and right and left shutdown) are set independently.
To adjust the limits, move the cursor to the desired limit and then use the function keys F3, F4, F7 and F8 to change its value.

Cut out warning limit – (out - cutting towards outfeed, range 0 ~100) This parameter will adjust the warning limit if the blade is cutting towards the part. Increasing this value decreases sensitivity, which will result in a warning further away from nominal straight.

Cut in warning limit – (in - cutting towards infeed, range -100 ~ 0) This parameter will adjust the warning limit if the blade is cutting towards the stock. Decreasing this value decreases sensitivity, which will result in a warning further from away nominal straight.

Cut out maximum limit – (out - cutting towards outfeed, range 0 ~100). This parameter will adjust the shutdown limit if blade is cutting towards the part. Increasing this value decreases sensitivity, which will result in a larger deviation from nominal straight, before the shutdown sequence is initialized.

Cut in maximum limit – (in - cutting towards infeed, range -100 ~ 0) This parameter will adjust the shutdown limit if the blade is cutting towards the stock. Decreasing this value decreases sensitivity, which will result in a larger deviation from nominal straight, before the shutdown sequence is initialized.

MONITOR LIMIT SETTING FUNCTION KEY DESCRIPTION CHART

RETURN	This function key will return to previous screen.
HISTOGRAM	This function key will access histogram screen.
<	When this function key is depressed once, the value of selected slider will increment by 2.5%.
<<	This function key will move the selected slider to the far left.
BLADE MONITOR PARAMETERS	This function key will access parameters screen.
>	When this function key is depressed once, the value of selected slider will decrement by 2.5%.
>>	This function key will move the selected slider to the far right.

Fig.3

To return from the MONITOR LIMIT SETTING screen to the AUTO or MANUAL screens, press RETURN (F1 function key, Fig. 1).

To access the PARAMETERS screen (Fig. 4), press BLADE MONITOR PARAMETERS (F5 function key).

PARAMETER SETTINGS SCREEN.

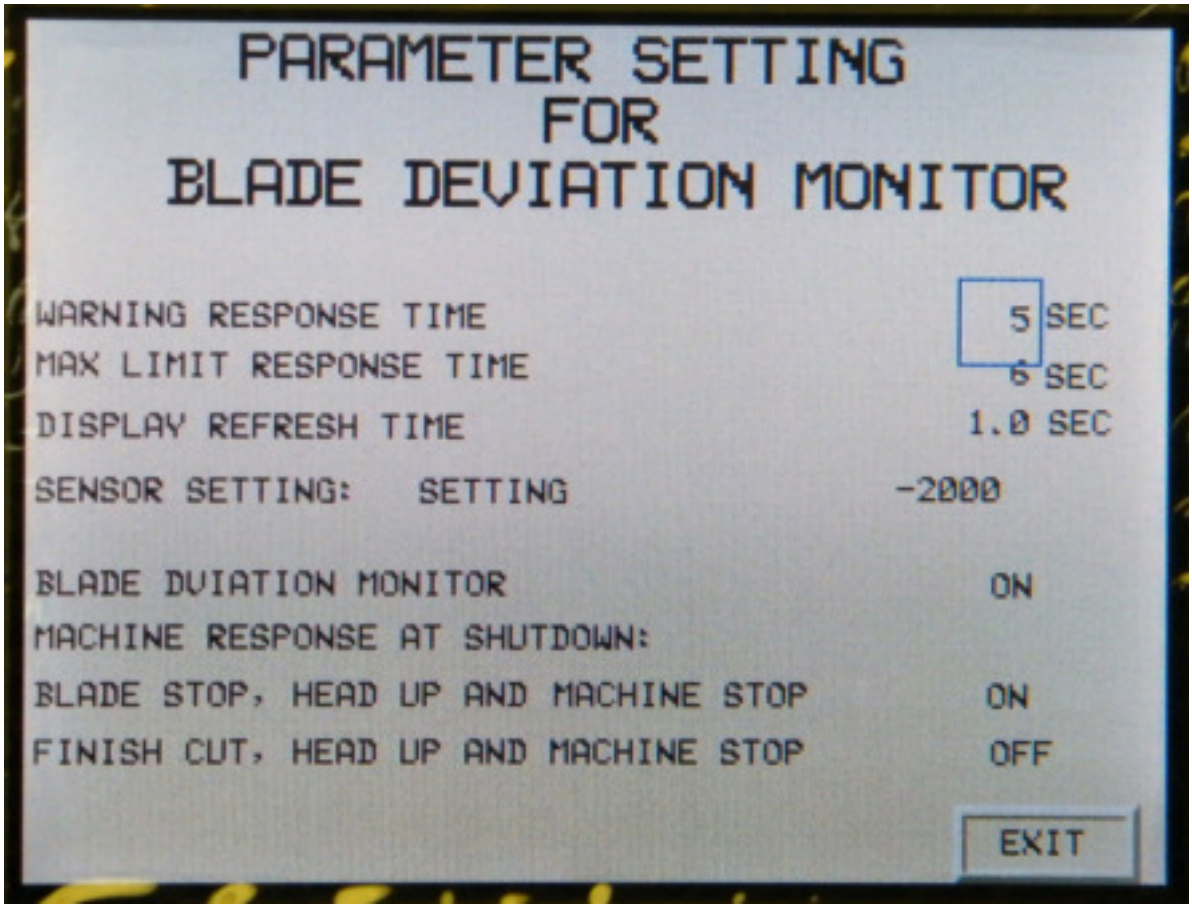


Fig.4

To set any of the numerical parameters, use the NAVIGATION keys (Fig. 1) to place the cursor over the number. Key in the desired value, and then press ENTER.

To change the ON/OFF parameters, place the cursor over the parameter, and press ENTER to toggle between ON and OFF.

PARAMETER DESCRIPTION CHART

WARNING RESPONSE TIME	Warning response time (range 2 – 99 seconds) If the blade deviation exceeds the preset warning limit for longer than the warning response time, then the beacon light mounted on top of the head will start flashing.
MAX LIMIT RESPONSE TIME	Warning response time (range 2 – 99 seconds) If the blade deviation exceeds the preset shutdown limit for longer than the shutdown response time, then the machine will execute the shutdown sequence.
DISPLAY REFRESH TIME	Range 0.1 sec to 10 sec) The refresh time is time between bar graph updates.
SENSOR SETTING	Range: –2000 to +2000 The number displayed here represents the position of the blade within the measuring range of the proximity transducer. At 0, the blade is exactly centered within the sensing range.The display assists adjustment with the prompts 'SETTING, or 'SET'. The prompt 'SET' appears when the adjustment is within the acceptable range of – 100 +100. [See sensor adjustment procedure section]
BLADE DEVIATION MONITOR	ON/OFF This parameter will activate or deactivate response of the blade deviation monitoring system.
MACHINE RESPONSE AT SHUTDOWN	If the shutdown sequence has been executed then, the machine will behave in one of two ways.
BLADE ST0P, HEAD UP AND MACHINE STOP	NO/YES Stop cutting, raise the head, and shut down
FINISH CUT, MACHINE OFF	NO/YES Finish the cut with present degree of deviation and then shut down

Fig.5

To return from the PARAMETER screen to the AUTO or MANUAL screens, press twice the RETURN (F1 function key).

To access the HISTOGRAM screen (Fig. 6), press HISTOGRAM (F2 function key).

To return from the HISTOGRAM screen to the AUTO or MANUAL screens, press twice the RETURN (F1 function key).

HISTOGRAM SCREEN

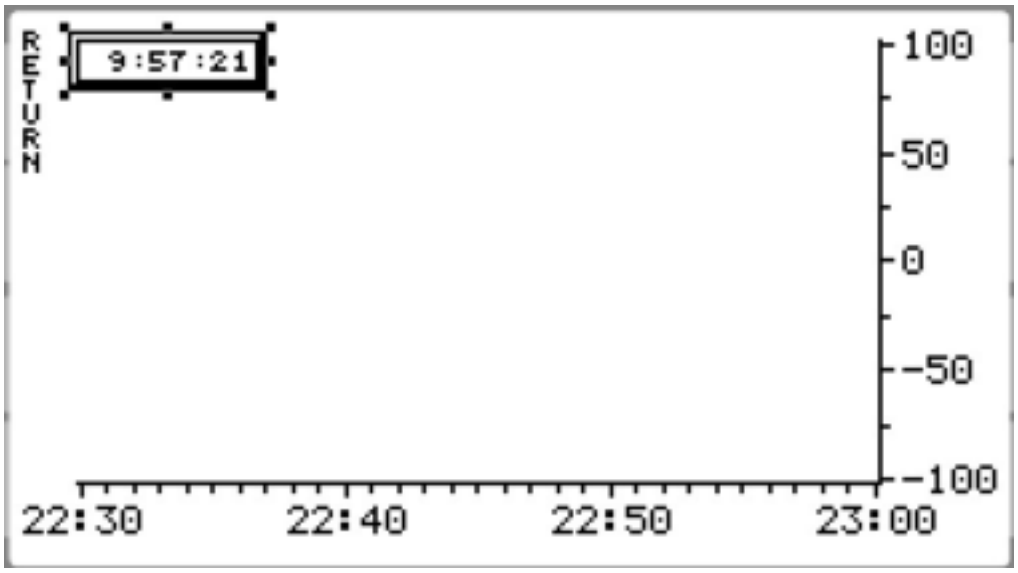


Fig.6

The histogram records the last 30 minutes of the machine run time. This gives a graphical representation of blade deviation over time. To reset the data buffer power down the machine.

To set the clock:

1. Press PARAMETERS key
2. Type password (8797)
3. Press Enter key
4. Enter new time
5. Press Enter key
6. To Exit press RETURN (F1) function key

RELATIONSHIP BETWEEN BLADE DEFLECTION DISPLAY AND ACTUAL CUT DEVIATION

The digital display indicates the blade lateral deflection at the point where it passes the blade deflection sensor, which is 1" past the idler side guide arm. The maximum deviation of the cut surface will actually occur at or near the center of the cut, and will be several times larger than that measured at the sensor. The display range of 0 +/-100 is proportional to the amount of blade deviation. This depends on the type of material, shape of the work-piece and amount of blade tension.

The actual amount is difficult to predict, experience with different work-pieces will provide the best guide.

MANUAL MODE SCREEN

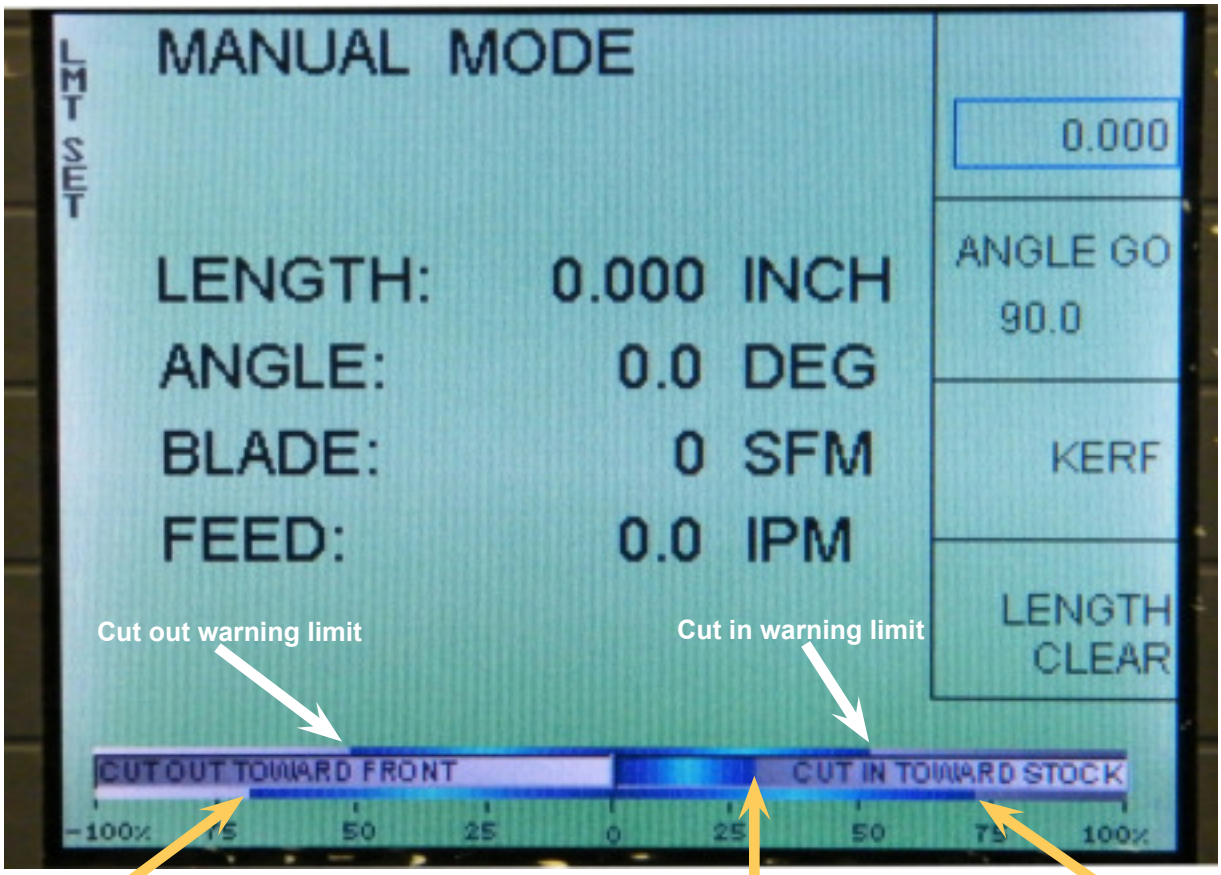


Fig.7

AUTOMATIC MODE SCREEN

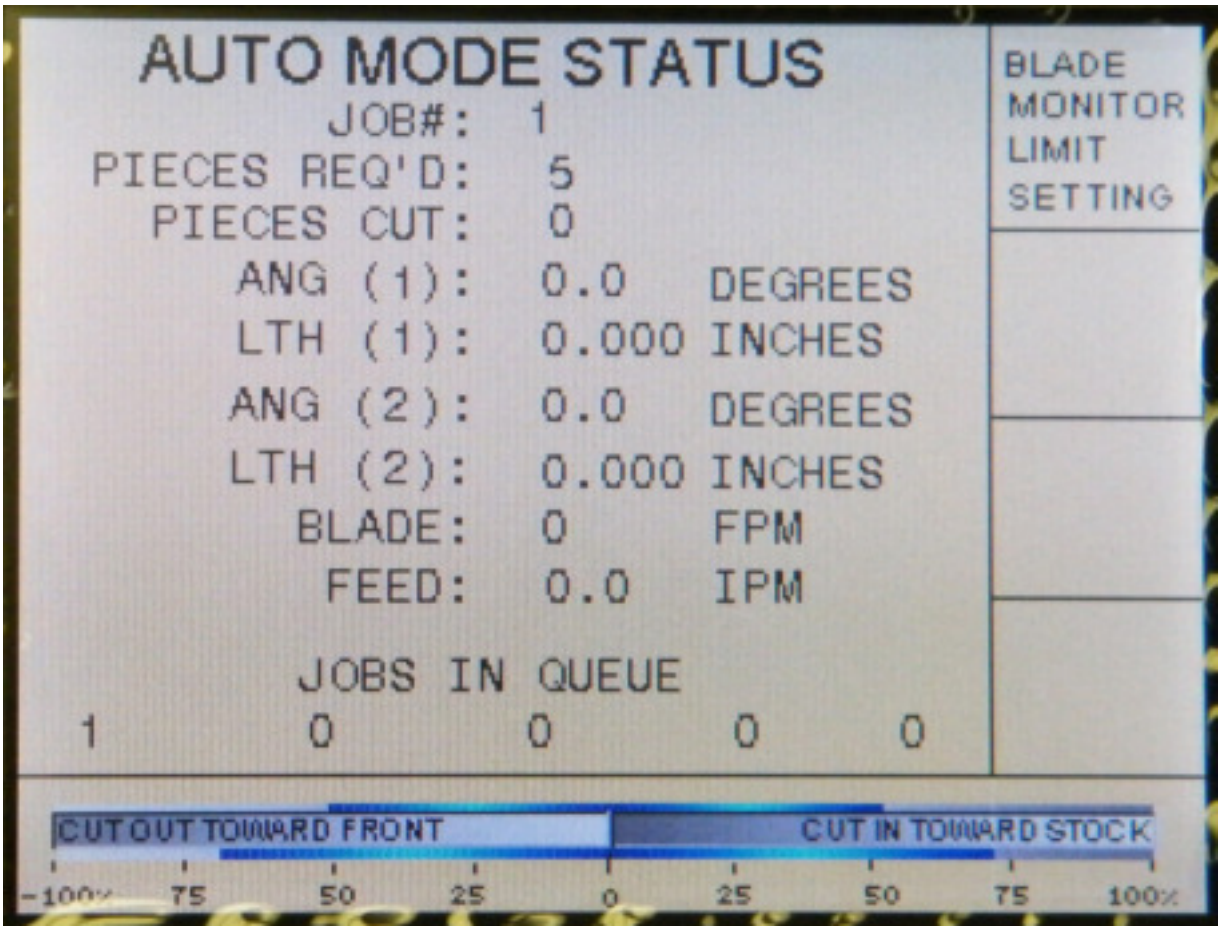
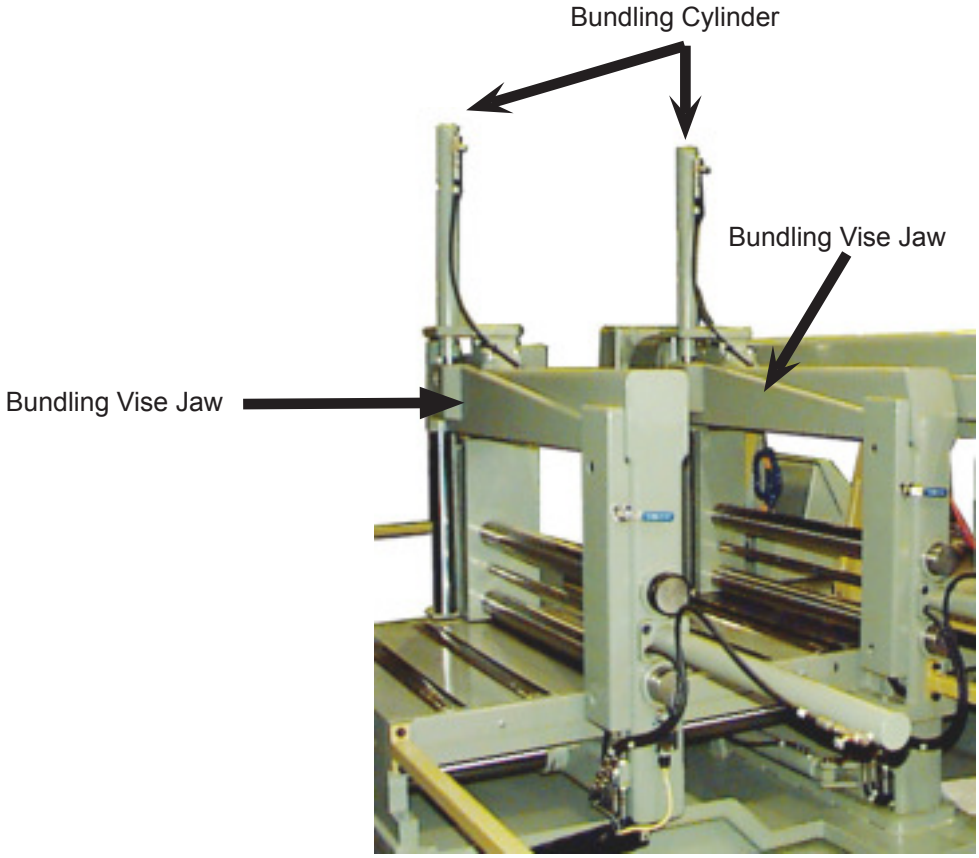


Fig.8

BUNDLING ASSEMBLY

M16A/M20A bundling assembly is shown below. When cutting a number of pieces at once, the bundling vise jaw holds the bundle down firmly to prevent cutting errors due to material slippage or vibration. This also helps to extend blade life.



Bundling option shown

VARIABLE VISE PRESSURE

This option is useful when the material being cut is soft or is a structrual and may be distorted by the full vise pressure.

Variable Vise Pressure
and Gauge

MIST BLADE LUBRICATION SYSTEM

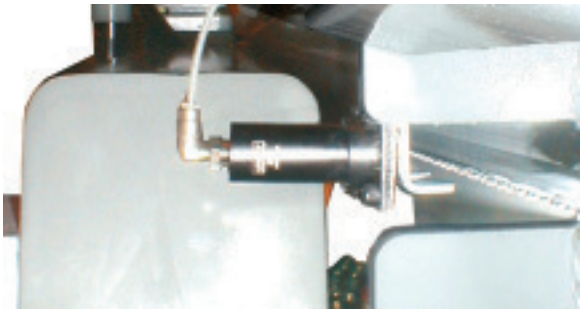
This option supplies a regulated amount of lubrication to the blade. The system is operating whenever the hydraulic system is on. To activate the mist system, connect the air supply and disconnect to deactivate the system.

The amount of lubrication can be adjusted with the dial below the oil tank.

Air supply connection for the mist lubrication system located at the right side of the control console.

To turn the mist flow on, slide the valve forward and to turn it off, pull the valve back.

Flow adjustment dial for the mist lubrication system. Rated in drops per minute located behind the control panel.



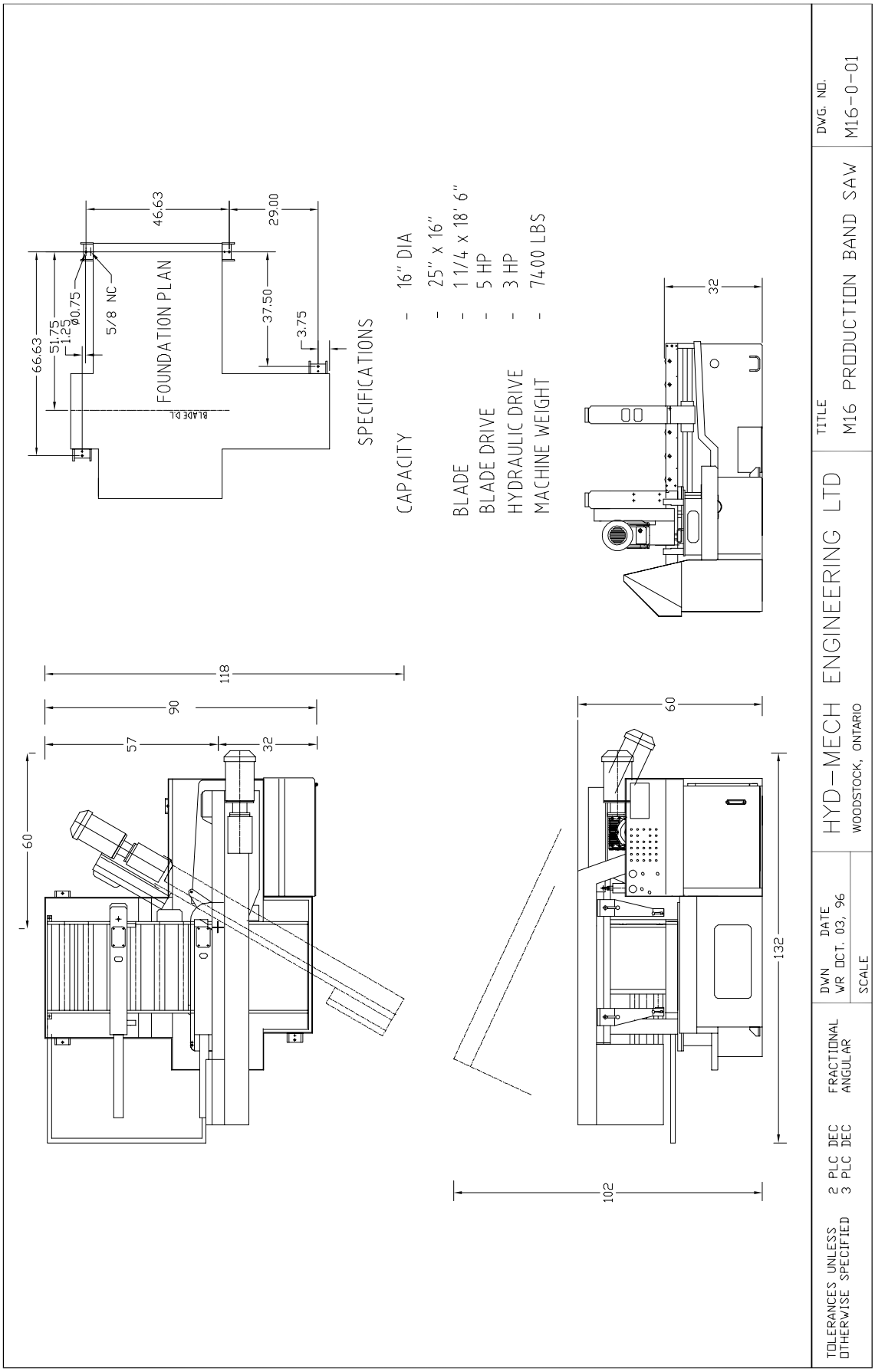
Application nozzle for the mist lubrication system located beside the idler wheel door.

SECTION 8 - SPECIFICATIONS

M16A SPECIFICATIONS

M-16A BANDSAW SPECIFICATIONS		
Capacity: 90º	Rectangular	16" (406mm) wide x 25" (635mm) high
	Round	16" (406mm) dia
Capacity: 45º	Rectangular	15" (356mm) wide x 16" (406mm) high
	Round	16" (406mm) dia
Capacity: 30º	Rectangular	9" (229mm) wide x 16" (406mm) high
	Round	11" (279mm) dia
Length Control	Programmable up to 99 jobs, with 5 in queue.	
Blade	Length	18' - 6" (5640mm)
	Width	1 1/4" (32mm)
	Thickness	.042" (1mm)
Blade Tension	Hydraulic	
Blade Speed		50 - 350 SFM (15 - 107 m/min)
Blade Guides	Carbide inserts (water soluble coolant lubricated)	
Blade Wheel Dia.	19" (483mm)	
Drive	Blade drive	7.5 hp (5.5 kW)
	Hydraulic pump drive	3 hp (2.2 kW)
Pumps	Hydraulic	6 1/2 Gal / min (24.5 Liters/min) pressure compensated
	Coolant	3 1/2 Gal / min (13.2 Liters/min) (150W)
Hydraulic Tank	11 U.S. Gallons (42 Liters)	
Hydraulic System	950 PSI (6550 kPa)	
Blade Tension Pressure	650 PSI (4482kPa)	
Vise Control	Hydraulic	
Shuttle Stroke	0-33" (0-838mm) single stroke, multi-indexing capability	
Table Height	32" (812mm)	
Machine Weight	7400 lbs (3357 Kg)	
Machine Workload	8000 lbs (3629 Kg)	
Overall Dimensions	132" (3353mm) Wide, 90" (2286mm) Long, 60 x (1524mm) High	

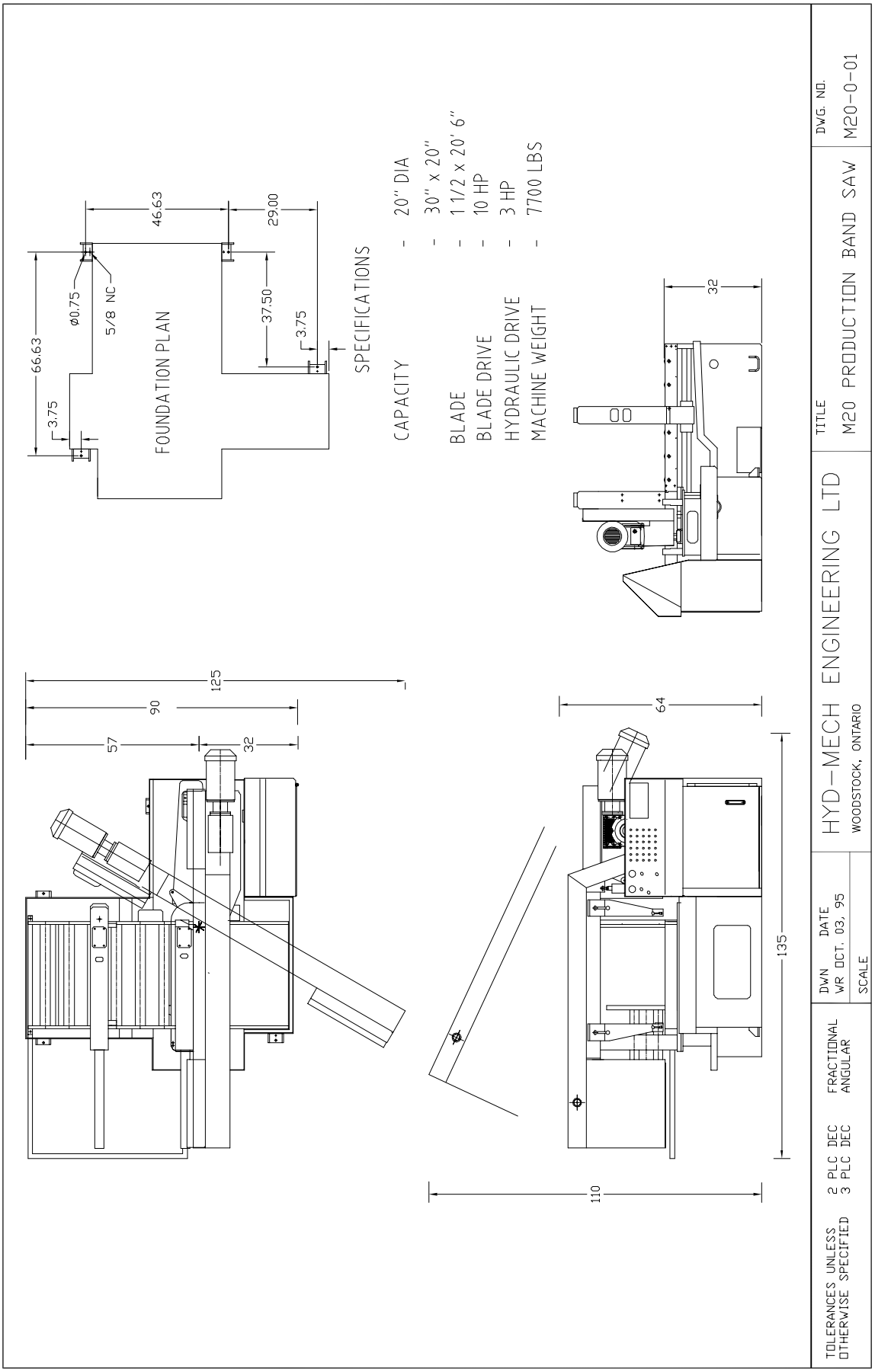
M16A LAYOUT


FOUNDATION PLAN
SPECIFICATIONS
CAPACITY - 16" DIA
- 25" x 16"
BLADE - 11/4 x 18' 6"
BLADE DRIVE - 5 HP
HYDRAULIC DRIVE - 3 HP
MACHINE WEIGHT - 7400 LBS
HYD-MECH ENGINEERING LTD
WOODSTOCK, ONTARIO
M16 PRODUCTION BAND SAW
DWG. NO. M16-0-01
DWN WR
DATE OCT. 03, 96
SCALE
TOLERANCES UNLESS OTHERWISE SPECIFIED
2 PLC DEC
3 PLC DEC
FRACTIONAL
ANGULAR

M20A SPECIFICATIONS

M-20A BANDSAW SPECIFICATIONS		
Capacity: 90°	rectangular	20" (508mm) wide x 30" (762mm) high
	round	20" (508mm) dia
Capacity: 45°	rectangular	18" (457mm) wide x 20" (508mm) high
	round	20" (508mm) dia
Capacity: 30°	rectangular	12" (305mm) wide x 20" (508mm) high
	round	12" (305mm) dia
Length Control	Programmable up to 99 jobs, with 5 in queue.	
Blade	Length	20'-6" (23'-2" w/extended head) 6250mm (7061mm)
	Width	1 1/2" (38mm)
	Thickness	.050" (1.25mm)
Blade Tension	Hydraulic	
Blade Speed		60 - 350 sf/min (18 - 107 m/min)
Blade Guides	carbide inserts (water soluble coolant lubricated)	
Blade Wheel Dia.	22" (559mm)	
Drive	blade drive	10 hp (7.5 kW)
	hydraulic pump drive	3 hp (2.2 kW)
Pumps	Hydraulic	6 1/2 Gal / min (24.5 Liters/min) pressure compensated
	Coolant	3 1/2 Gal / min (13.2 Liters/min) (150W)
Hydraulic Tank	11 U.S. Gallons (42 Liters)	
Hydraulic System	950 PSI (6550 kPa)	
Blade Tension Pressure	950 PSI (6550kPa)	
Vise Control	Hydraulic	
Shuttle Stroke	0-33" (0-838mm) single stroke, multi-indexing capability	
Table Height	32" (812mm)	
Machine Weight	7700 lbs (3493 Kg)	
Machine Workload	8000 lbs (3629 Kg)	
Overall Dimensions	135" (3429mm) Wide, 90" (2286mm) Long, 64 x (1626mm) High	

M20A LAYOUT


FOUNDATION PLAN
46.63
29.00
66.63
3.75
Ø0.75
5/8 NC
37.50
3.75
SPECIFICATIONS
CAPACITY - 20" DIA
- 30" x 20"
BLADE - 11/2 x 20' 6"
BLADE DRIVE - 10 HP
HYDRAULIC DRIVE - 3 HP
MACHINE WEIGHT - 7700 LBS
32
125
90
57
32
64
135
110
TOLERANCES UNLESS OTHERWISE SPECIFIED
2 PLC DEC
3 PLC DEC
FRACTIONAL
ANGULAR
DWN WR
DATE OCT. 03, 95
SCALE
HYD-MECH ENGINEERING LTD
WOODSTOCK, ONTARIO
TITLE
M20 PRODUCTION BAND SAW
DWG. NO.
M20-0-01

SECTION 9 - WARRANTY

WARRANTY

Hyd·Mech Group Limited warrants parts/components on each new M16, M20 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 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, 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 M16, M20, 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 Limited

HYD·MECH GROUP LIMITED
1079 Parkinson Road
P.O. BOX 1659
Woodstock, Ontario
N4S 0A9
Phone: (519) 539-6341
Fax: (519) 539-5126
Toll Free (877) 276-SAWS (7297)
E-mail, info@hydmech.com