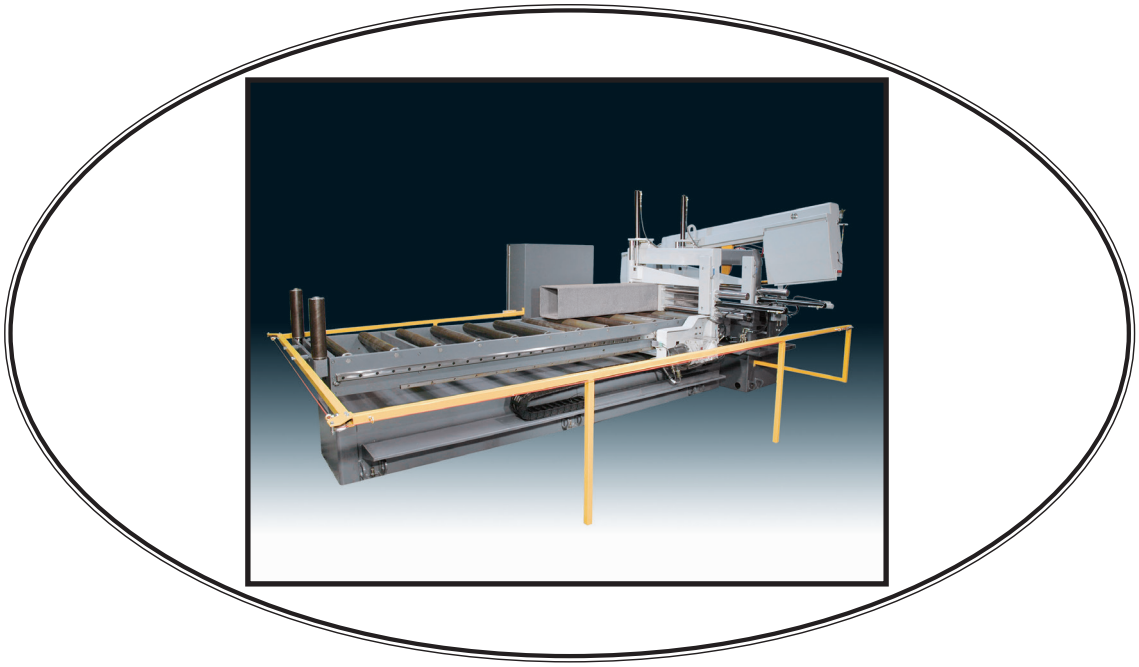

M20A-120

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.

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Printed MARCH 2015

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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 assess 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 properly 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 workplace 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 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

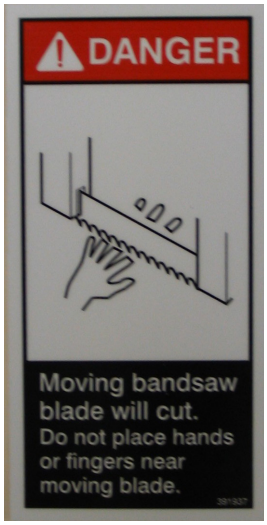
The safety hazard labels attached to your machine represent important safety information to help you avoid personal injury or death.
All supervisors, operators, and maintenance personnel must locate and understand the safety information associated with each hazard label prior to operating or servicing 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 M20A-120 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.

- POWER HOOK-UPS AND REPAIRS SHOULD BE ATTEMPTED ONLY BY QUALIFIED TRADESPEOPLE.
- THE SAW SHOULD BE LOCATED IN AN AREA WITH SUFFICIENT ROOM TO SAFELY LOAD STOCK INTO THE SAW. SECURE THE SAW TO THE FLOOR.

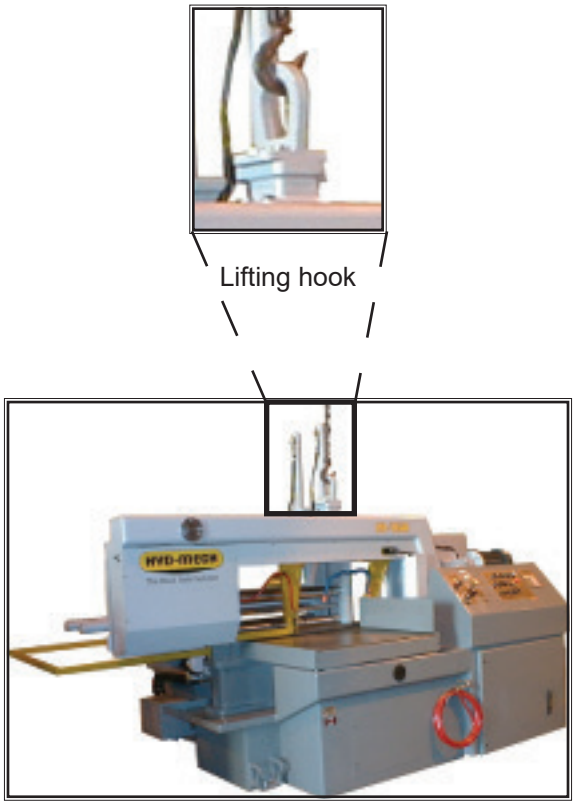
NO MODIFICATIONS TO THE MACHINE ARE PERMITTED WITHOUT PRIOR APPROVAL FROM HYD·MECH. ANY APPROVED MODIFICATIONS SHOULD ONLY BE UNDERTAKEN BY TRAINED PERSONNEL.

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}.
- 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 7700lbs (3465kg).

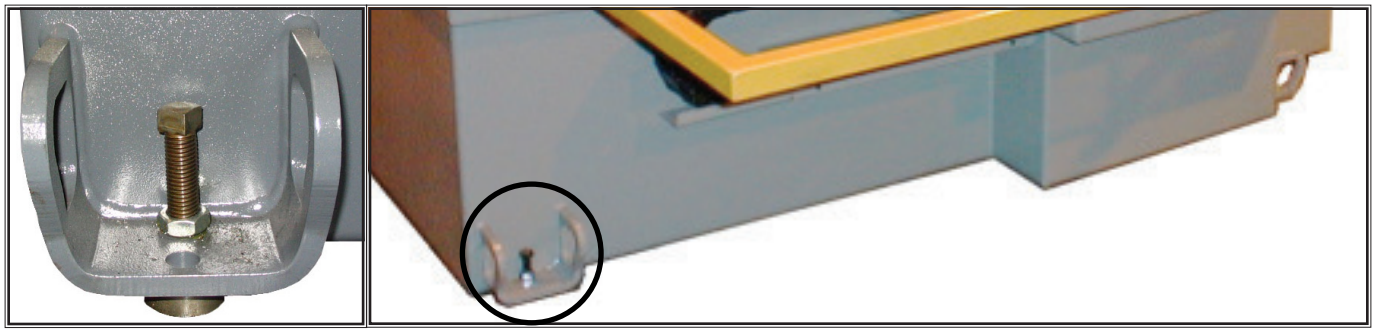


M-16A being lifted.

FOUNDATION, LEVELLING AND ANCHORING

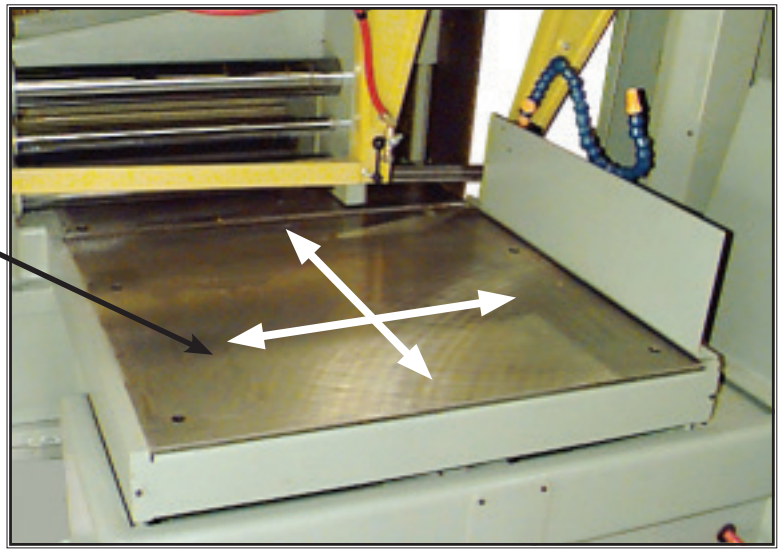
Machine location should be carefully selected. A flat concrete floor area should be chosen. It should have enough free space surrounding the machine to enable free access for safe operation and maintenance.
The machine should be leveled in both directions, i.e. along and across its in-feed conveyor especially 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).



2 leveling bolts at the idler side of the machine are shown.

Use Precision Level on Outfeed Table in both directions



Level saw from front to rear and from side to side

BARFEED INSTALLATION

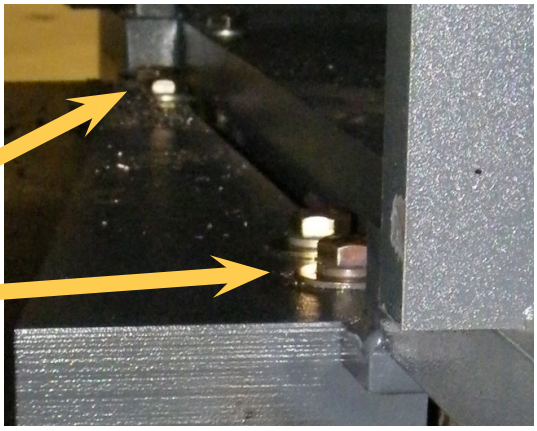
The back of the main machine has 4 bolts to mount the conveyor to the base.

The main base has a plate with 4 threaded holes to mount to the conveyor to the machine. Remove the 4 bolts and lock washers.

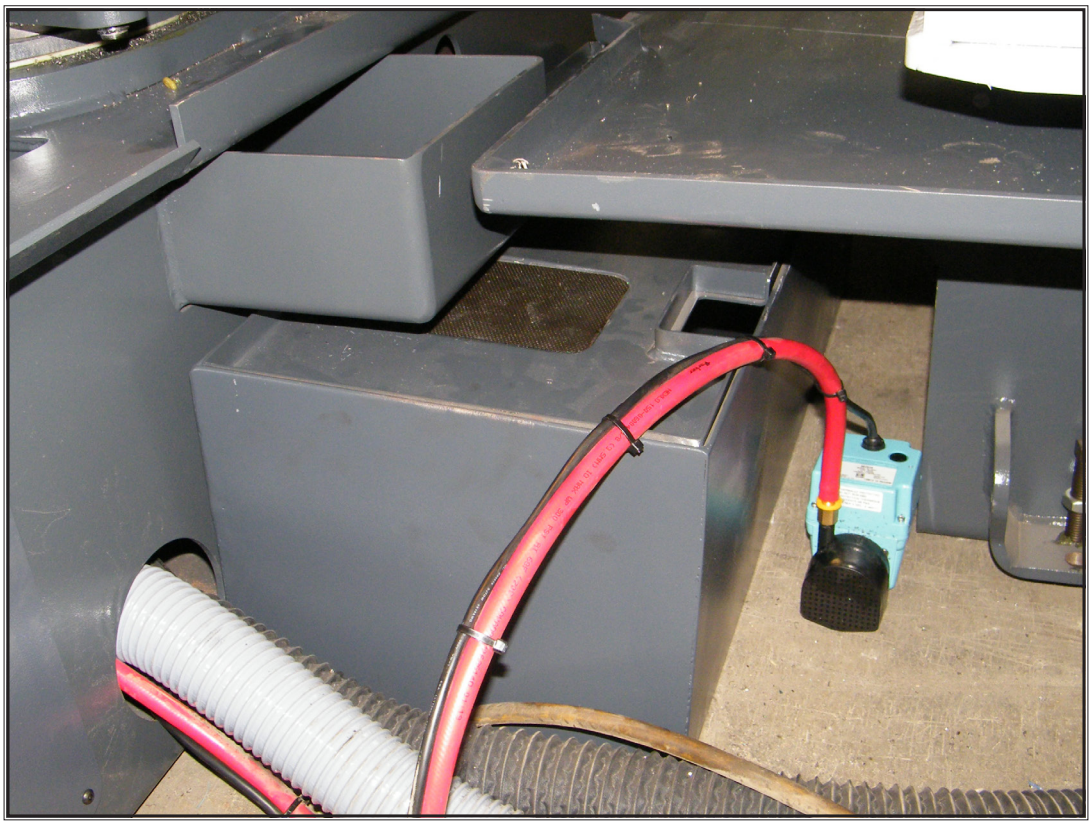
Threaded holes in plate

Holes to line up with the machine.
Remove the 4 bolts and lock washers.

Move the barfeed into the proper position in relation to the machine. Tighten the 4 hex bolts.

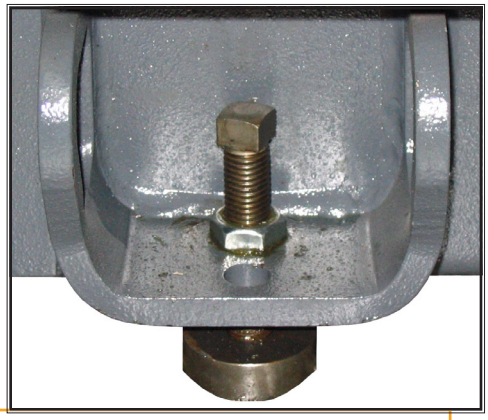


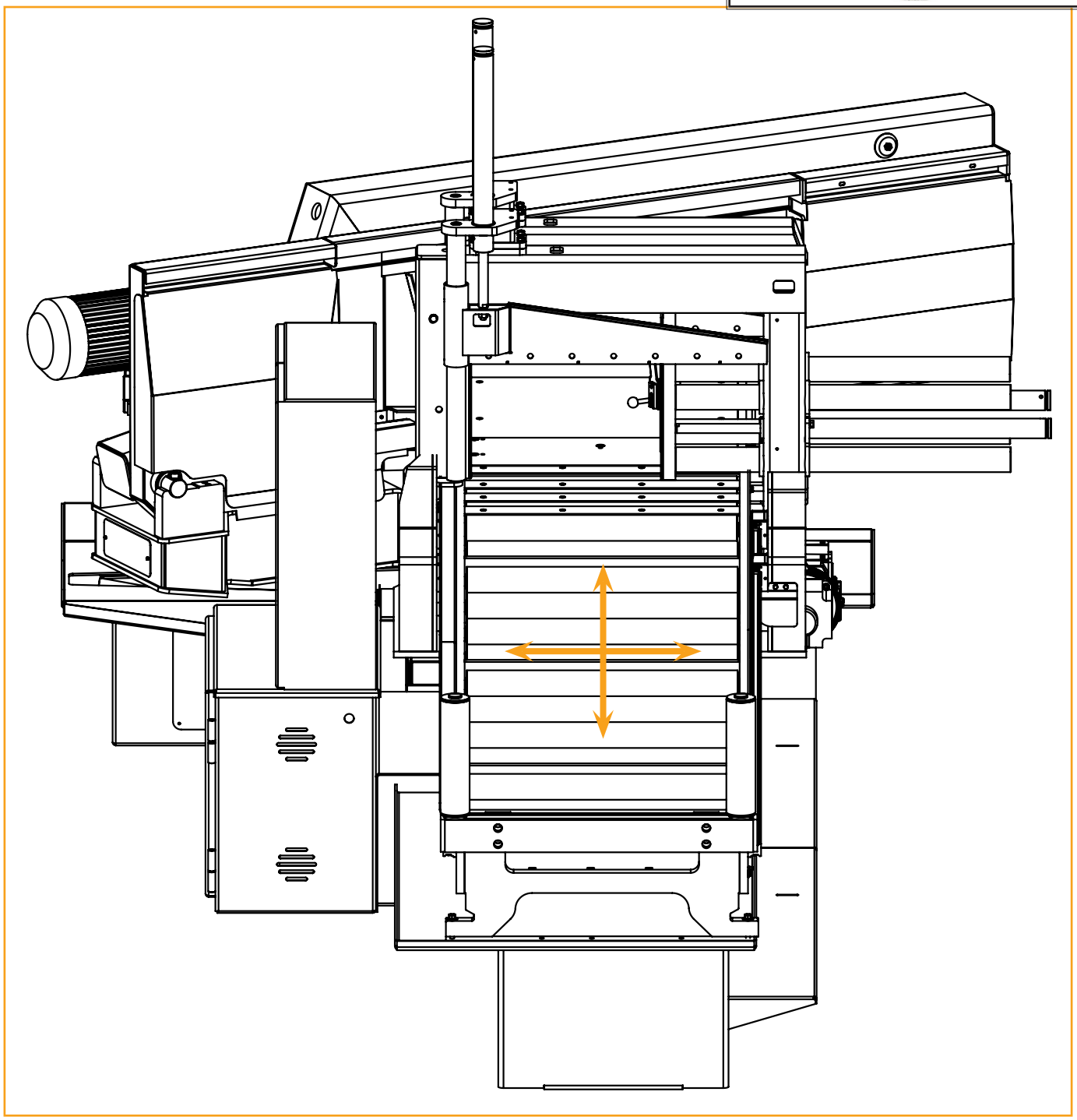
Position the coolant tank in to position between the main base and the conveyor. The coolant pump can be routed and inserted inside the tank.



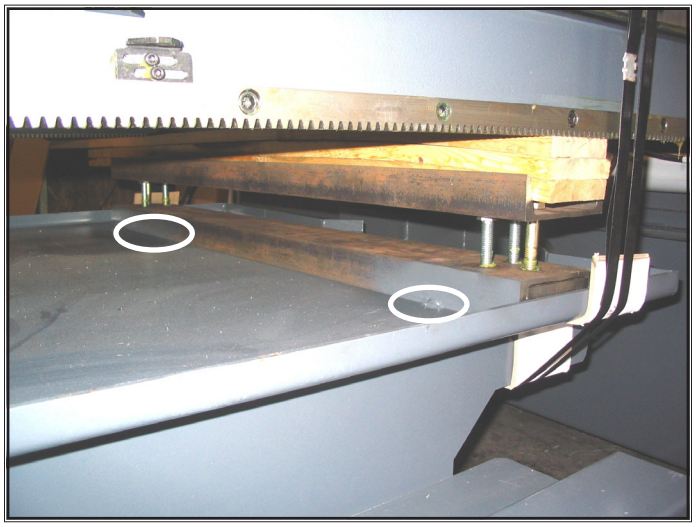
The barfeed should be levelled in both directions i.e. along and across its infeed conveyor. Six levelling screws are provided, three down each length of the barfeed. Steel plates are to be placed under each screw to prevent their sinking into the concrete floor. In cases where the machine is to be anchored permanently, anchoring holes are provided. They are located next to the levelling screws.

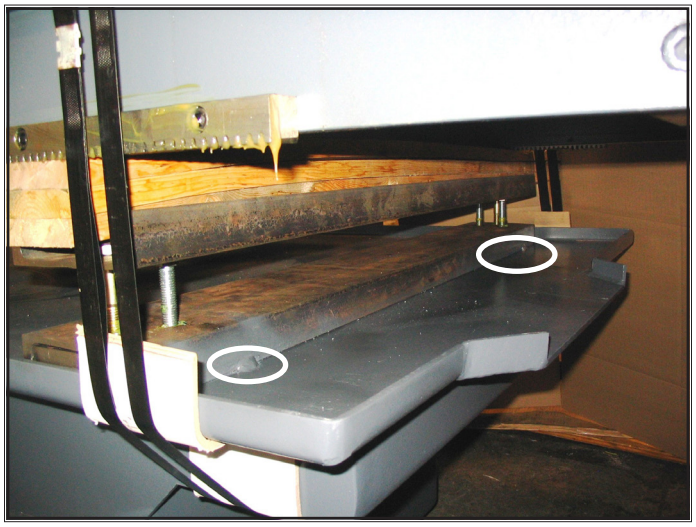
NOTE: Levelling the infeed conveyor with a slight slope towards the blade will prevent coolant from running down the raw stock.



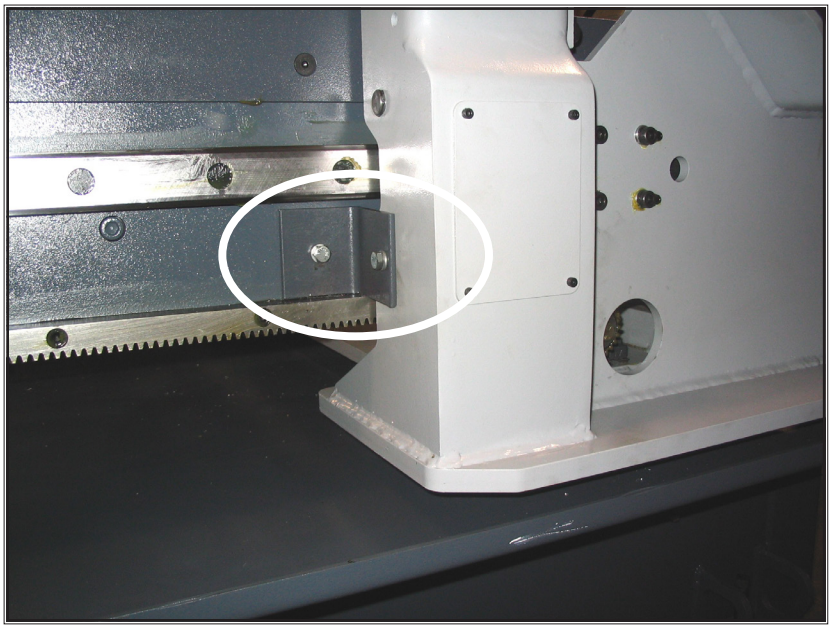


The shipping supports must be removed once the conveyor is fastened to the machine. The conveyor support is bolted and welded to the table; therefore, the welds must be ground off in order to disassemble the support.



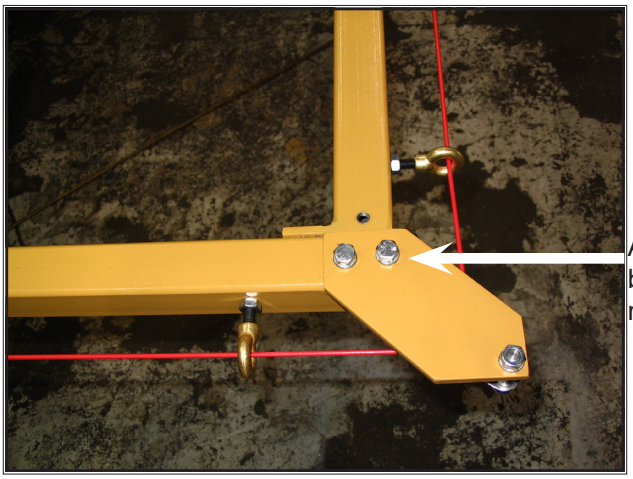


A bracket was used to support the shuttle vise for shipping. Make sure it is removed before attempting to move the shuttle.



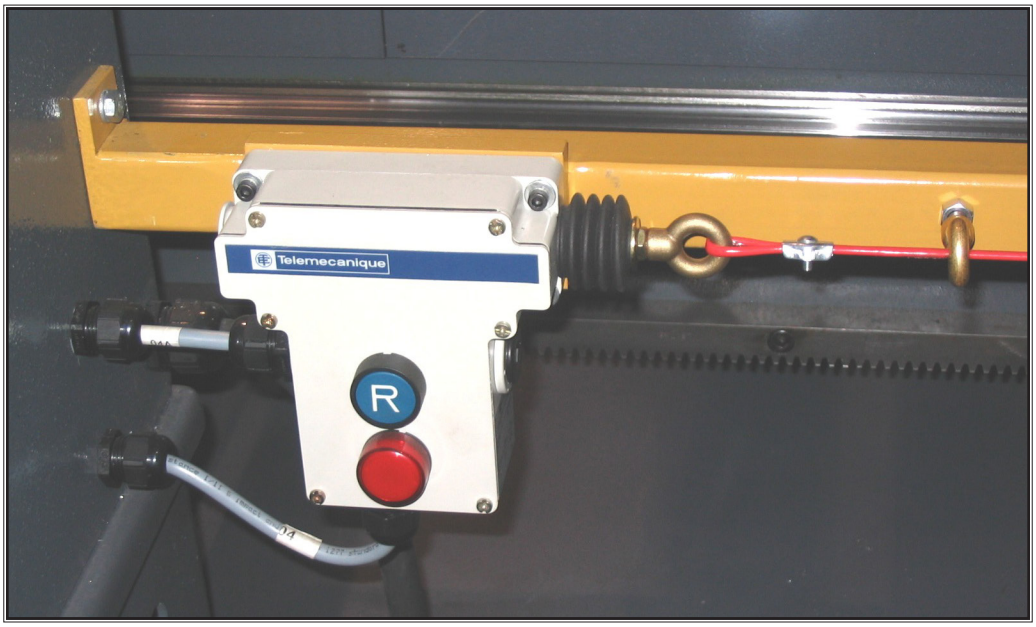
MACHINE GUARD INSTALLATION

Position the four pieces of the safety guard around the barfeed (All sides are connected with the supplied hex bolts). The idler side guard is made from two pieces assembled together, and is then attached to the machine base. The drive side guard is assembled to the control box. The rear guard is fastened to the barfeed.

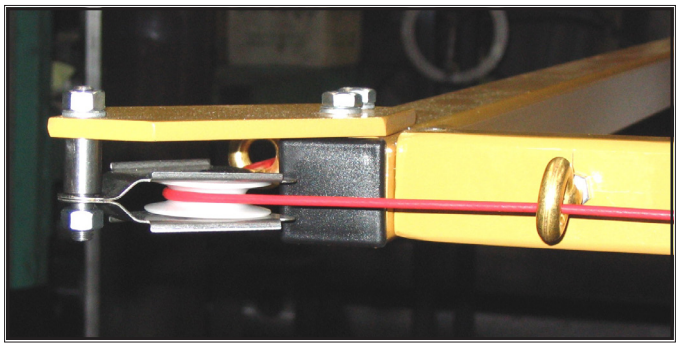


A pulley is mounted on a bracket and attached to each rear corner of the safety guard.

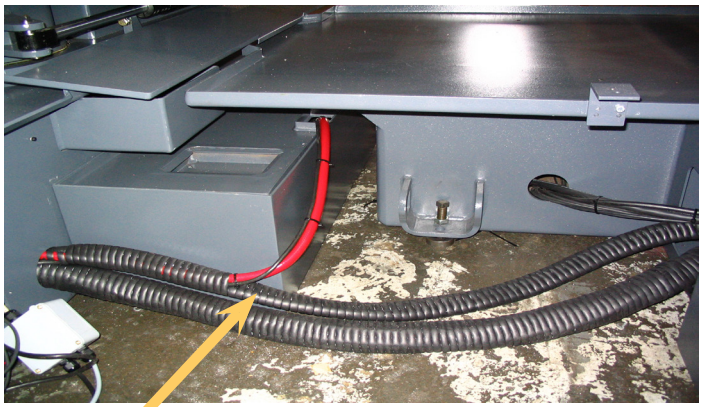
Fasten the trip wire switch to the safety guard and complete the trip wire connections. the box is attached to the mounting plate with four socket head cap screws.



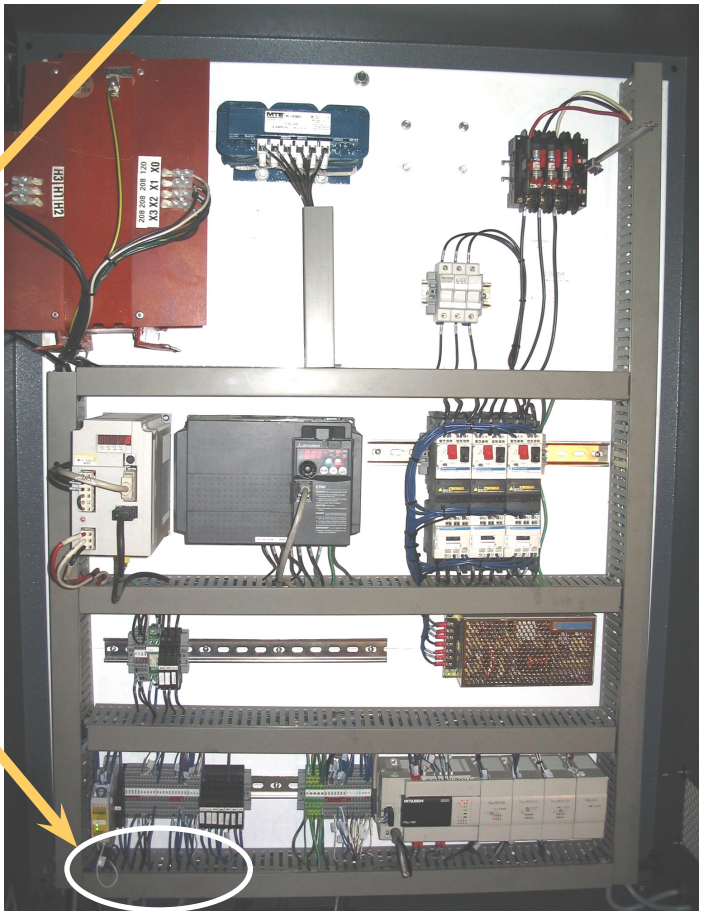
Attach the eyebolt to the idler side guard. Fasten the wire rope to the spring and then proceed to feed it through the eye-bolts and pulleys along the guiderail. Loop the other end of the wire rope around the eyebolt of the trip wire control box; adjust the tension of the rope before it is fastened to the eyebolt. The switch can not be activated if there is not enough tension on the wire rope.



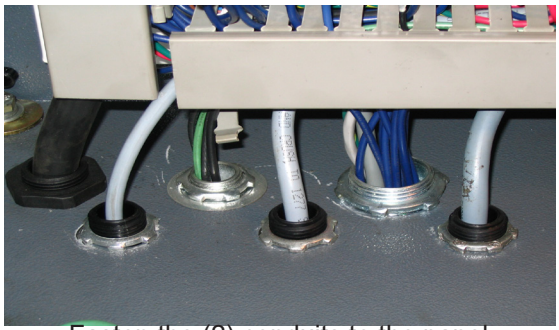
Feed the cable packed with the machine base into the access hole in the barfeed and then up towards the control panel. Fasten the two conduits into the panel. Follow the provided wiring diagrams to install the cables.
(Applies to all M20A-120 machines)



Feed the cables from the machine up into the control box.



Picture is of a M20A-120 with PLC 500 option



Fasten the (2) conduits to the panel. Follow the provided documents to install the wires.

M20A CONTROL CONDUIT CONNECTION: PLC 500

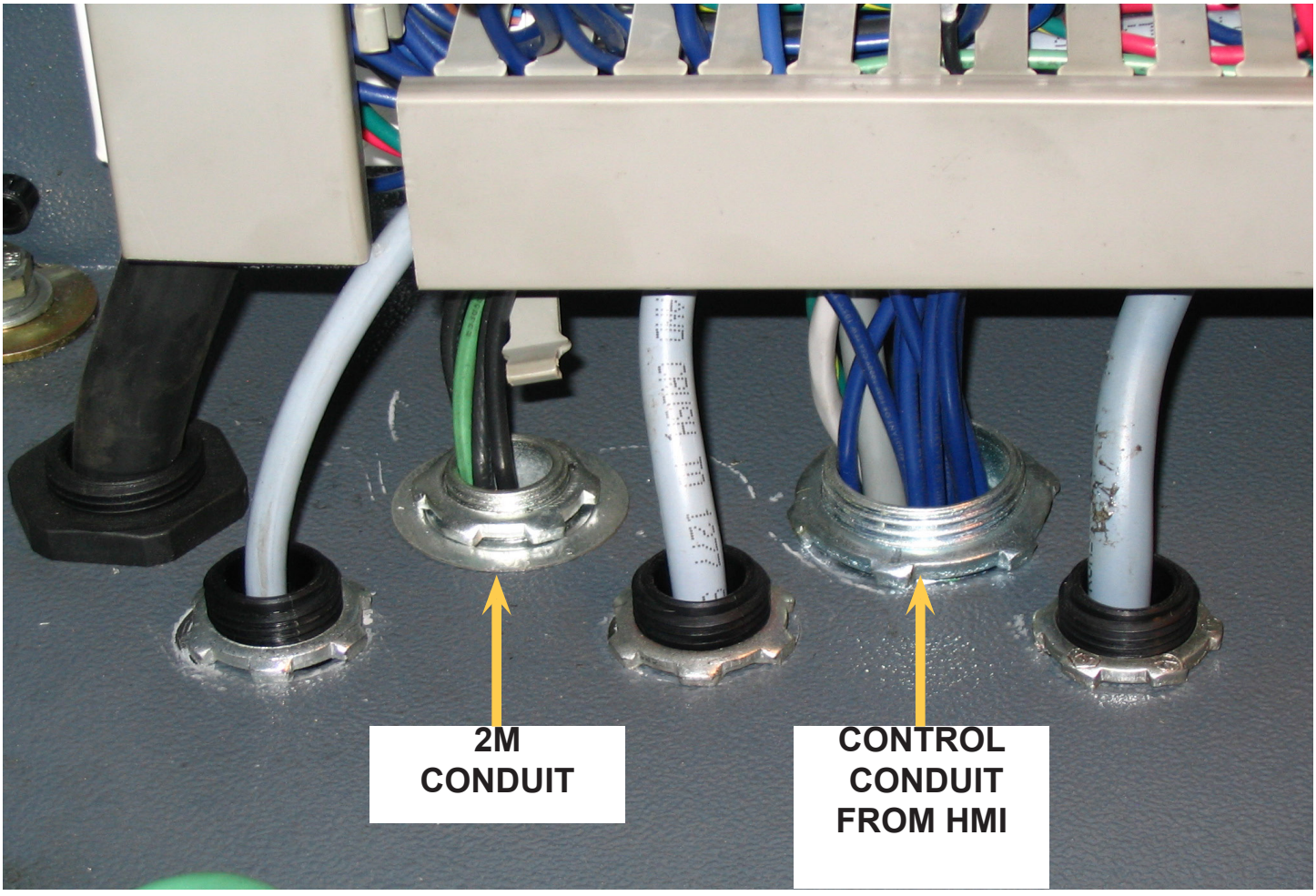
CONTROL CONDUIT CONNECTION: PLC500

Two conduits from the machine saw base are connected to the main control panel and the wires are then to be terminated at the appropriate location. The following pages will indicate where the conduits and wires terminate. Alternatively, for wiring connections the electrical schematics can be used. Wires from the control conduit are:

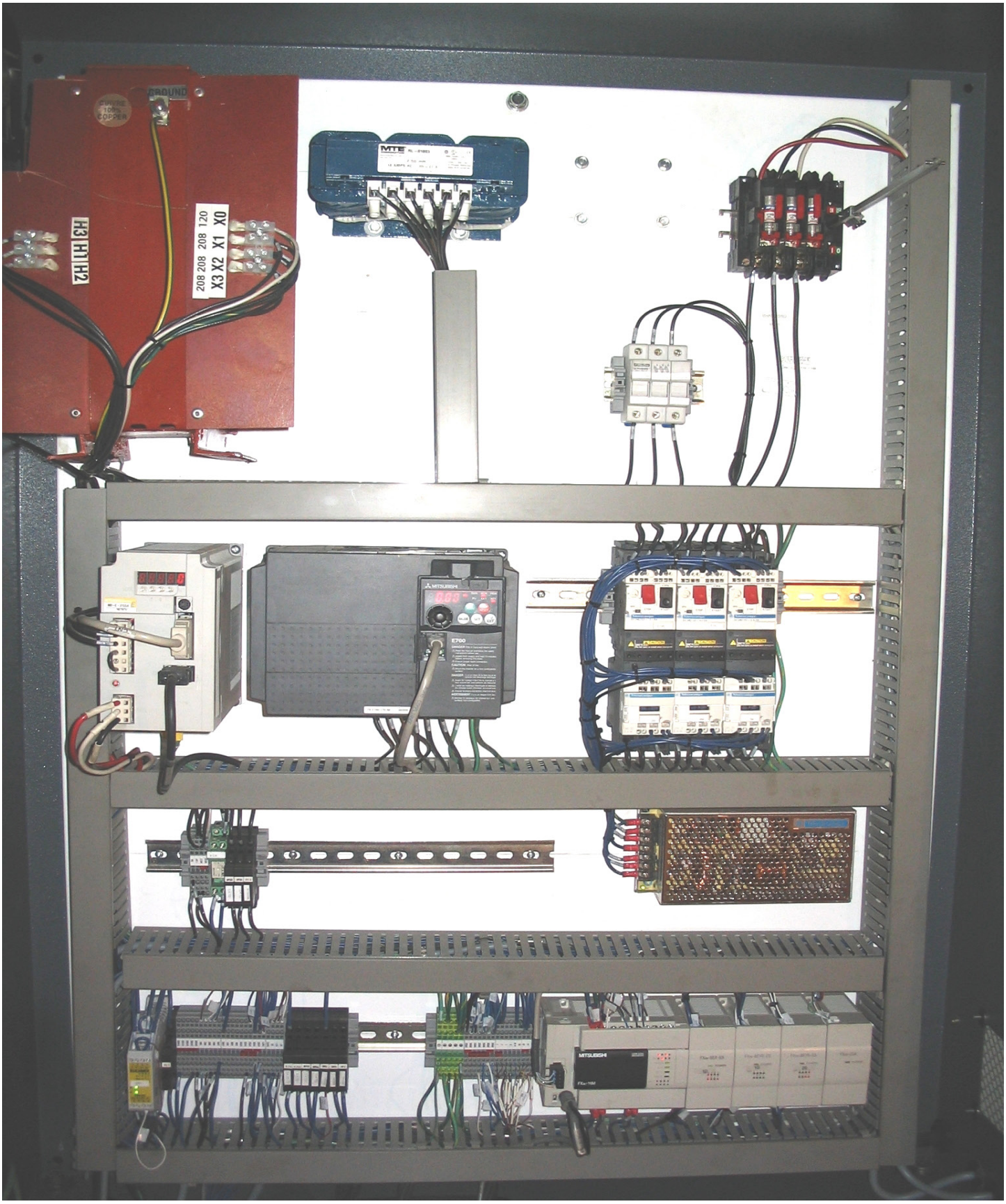
1. P1A
2. P2A
3. P3A
4. P3B
5. P6C
6. E2C
7. E4A
8. X20
9. X21
10. X22
11. X23
12. X24
13. X25
14. 0V24
15. G1K (Wire to Ground terminal located beside PLC)
16. 3 wires from cable HMI(P7A-RED, 0V2-BLK, GRN)
17. PLC communication cable.
18. SC1
19. S1A
20. S2A

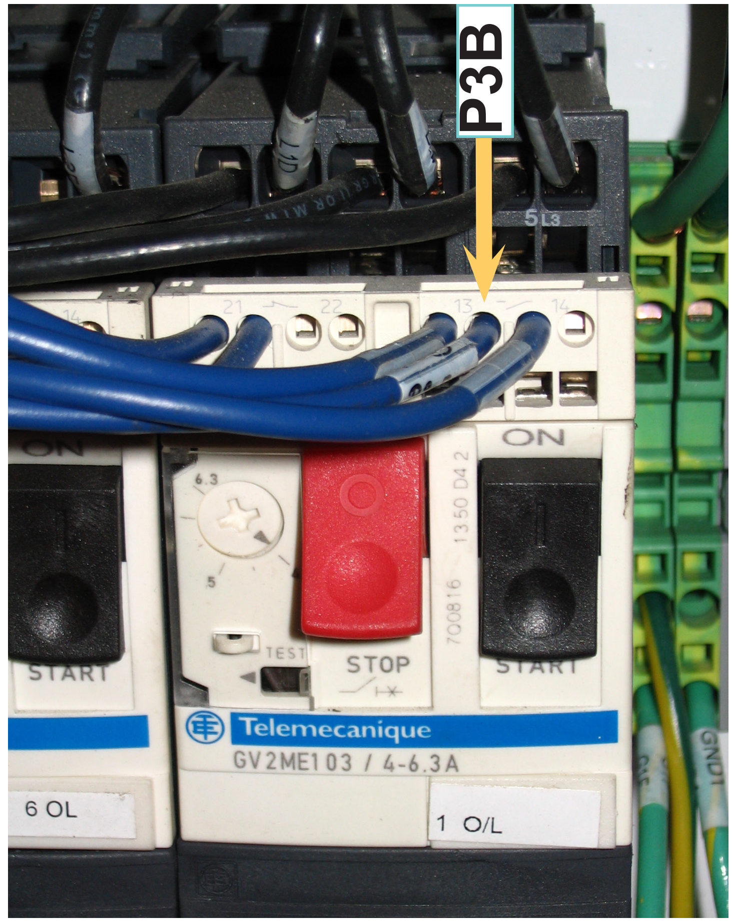
Wires from the 2M CONDUIT contain wires 2U, 2V,2W and G1G

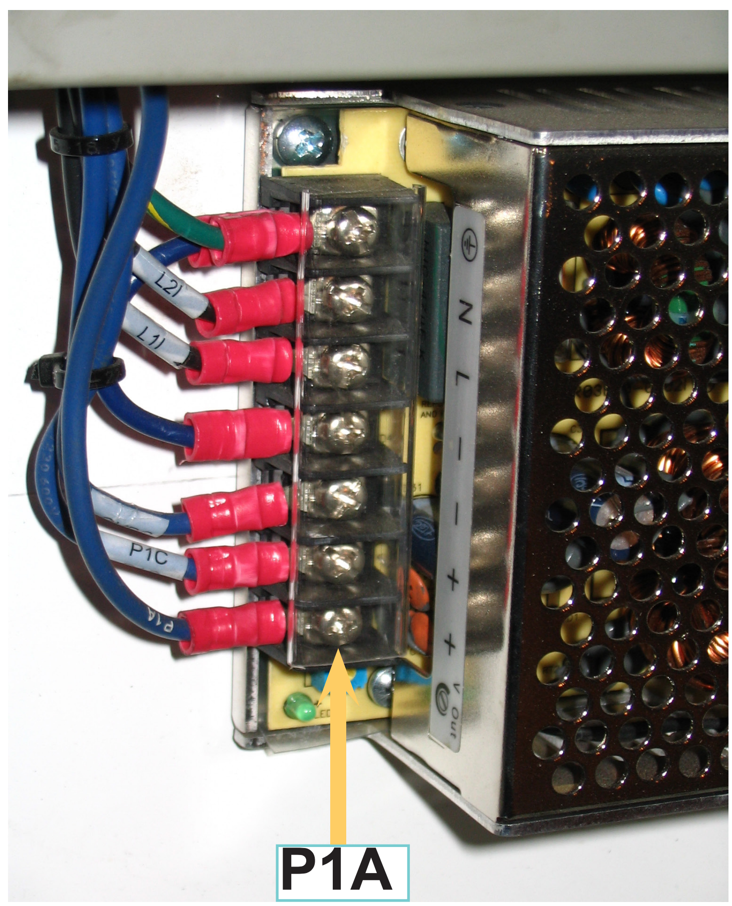
Some of the above wires may not connect in the position shown in the following pictures. However the crucial part is to ensure the wire is connected to the terminal shown.

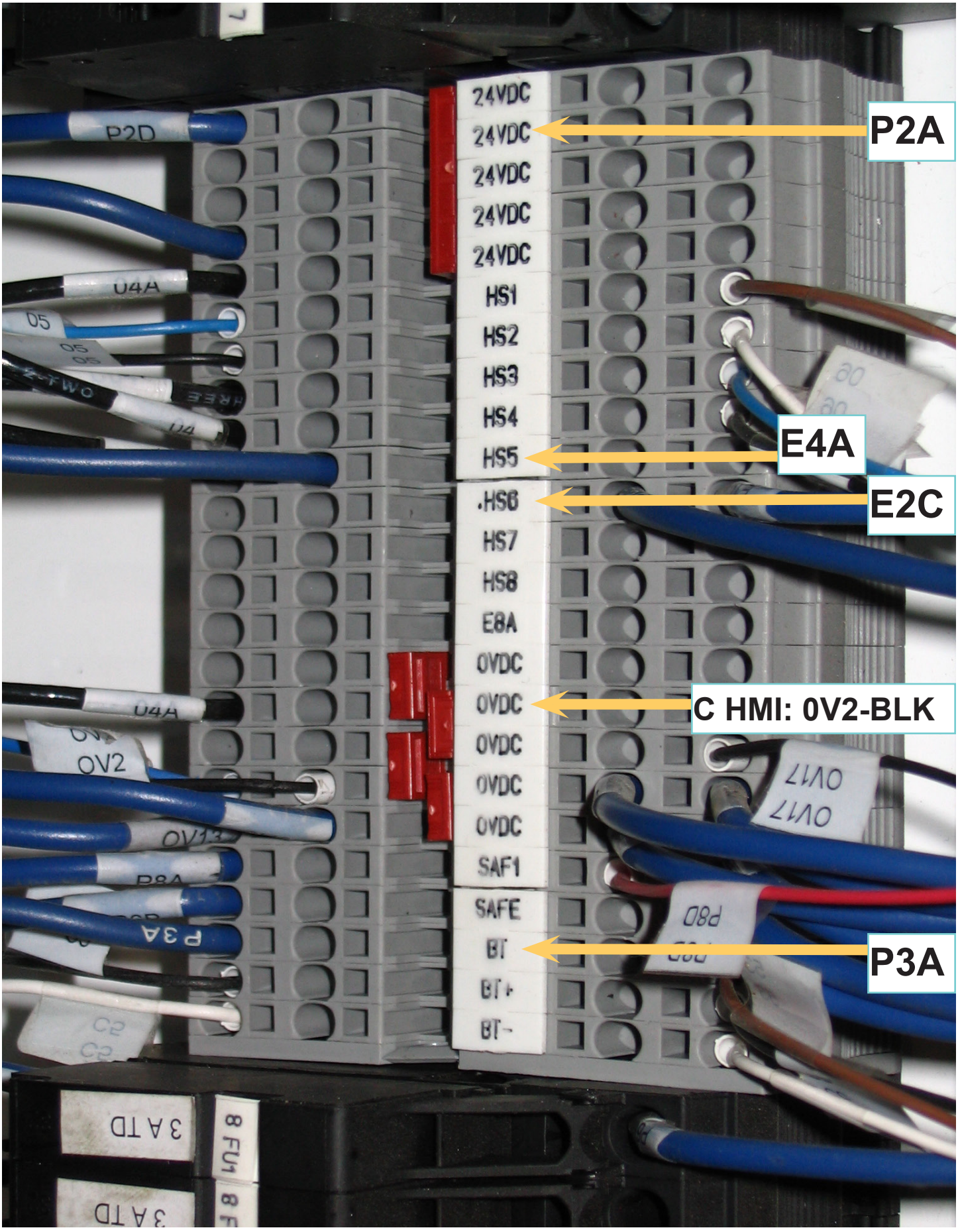


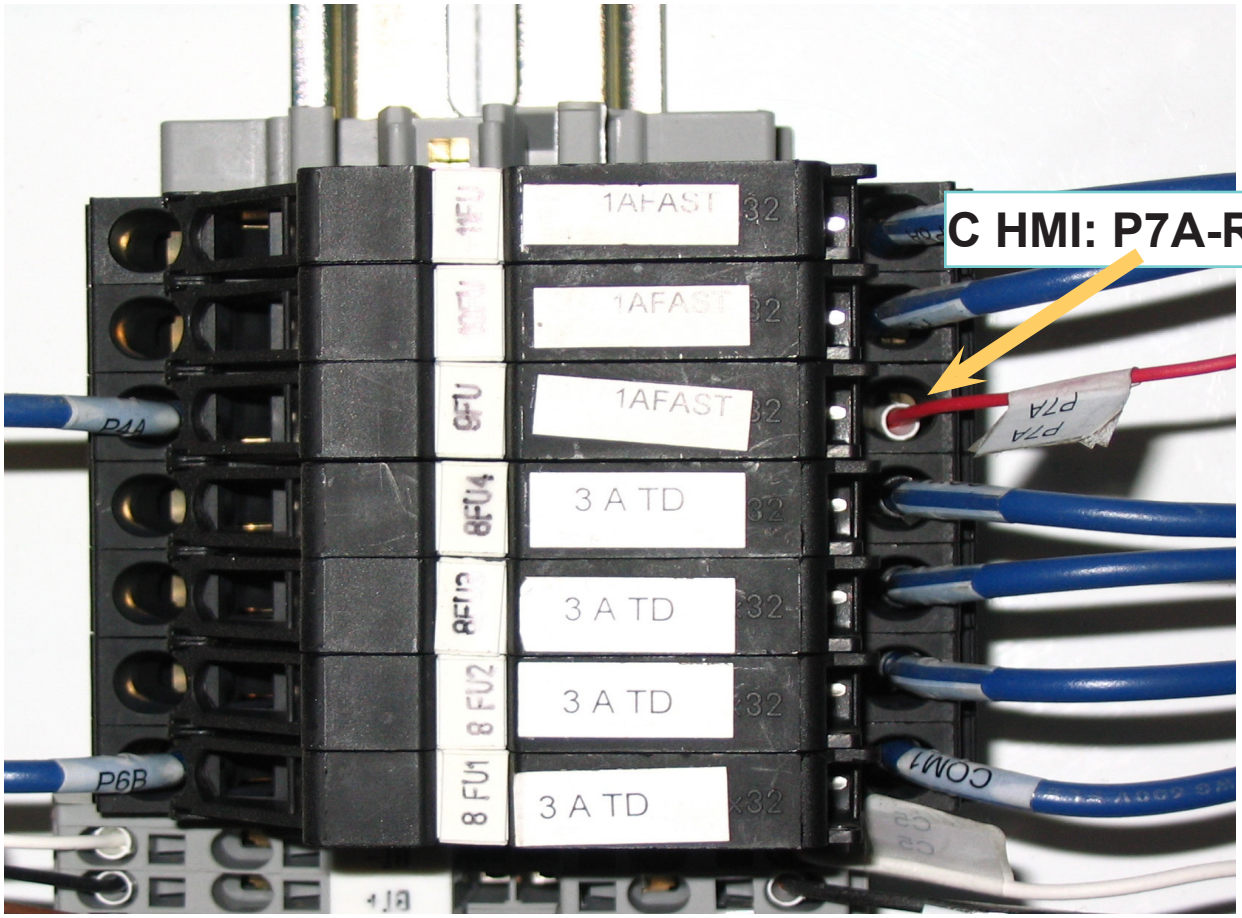
OVERVIEW OF COMPONENT LAYOUT: PLC 500

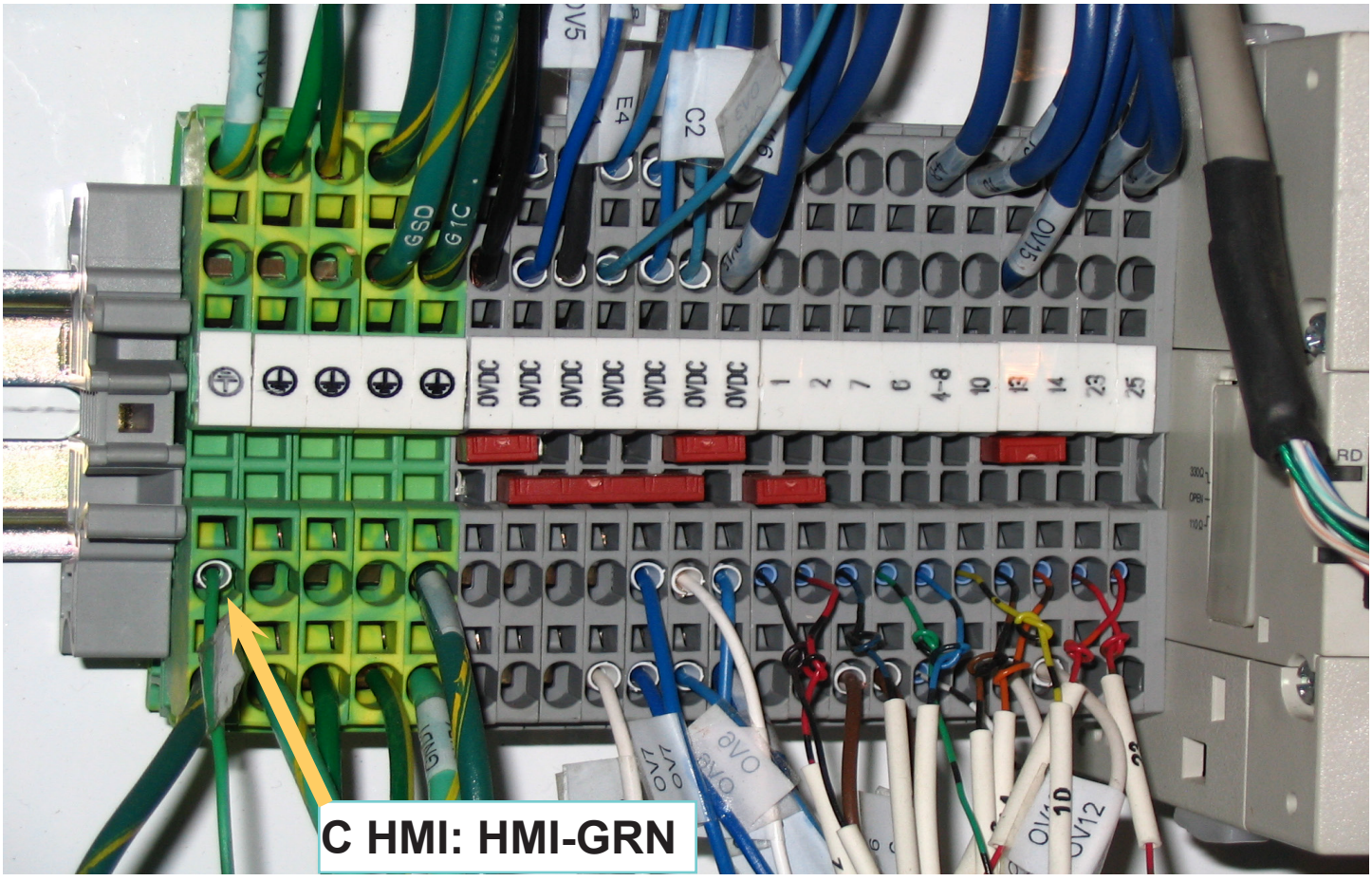


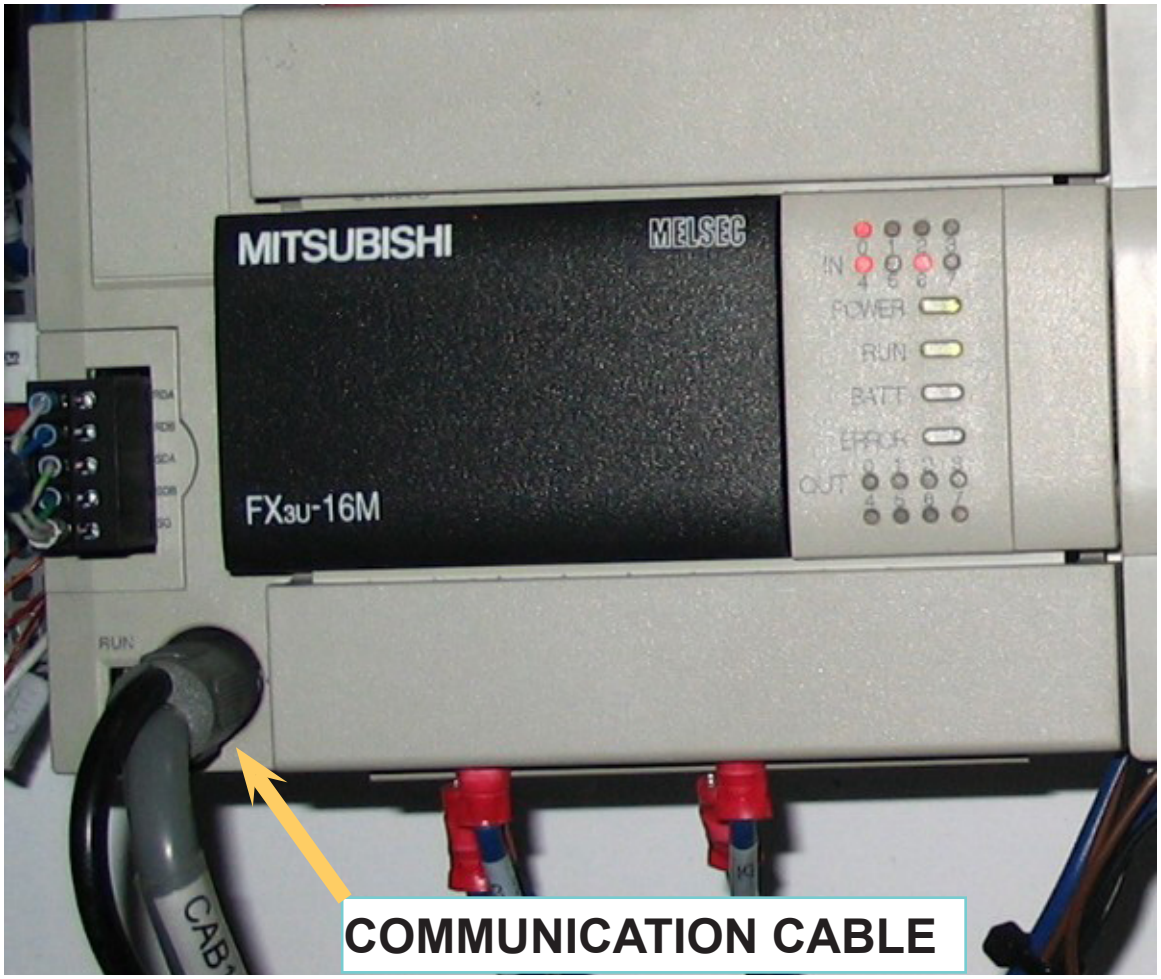

P3B
21
22
13
14
5L3
ON
START
STOP
TEST
Telemecanique
GV2ME103 / 4-6.3A
6 OL
1 O/L


L2
L1
P1C
P1A

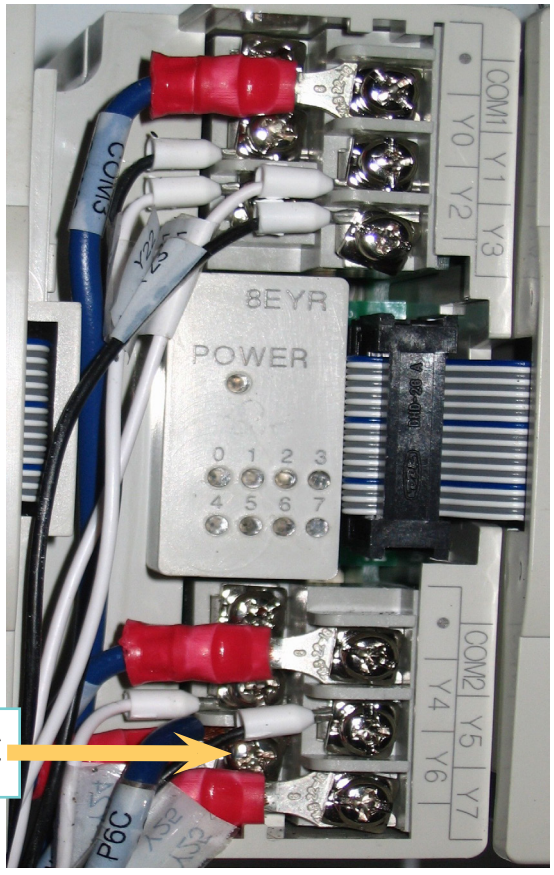

24VDC
24VDC
24VDC
24VDC
24VDC
HS1
HS2
HS3
HS4
HS5
HS6
HS7
HS8
E8A
0VDC
0VDC
0VDC
0VDC
0VDC
SAF1
SAFE
BT
BT+
BT-
P2A
E4A
E2C
C HMI: 0V2-BLK
P3A


C HMI: P7A-RED
1AFAST
1AFAST
1AFAST
3 A TD
3 A TD
3 A TD
3 A TD
8 FU1
8 FU2
8FU4
9FU
P4A
P6B
COM1

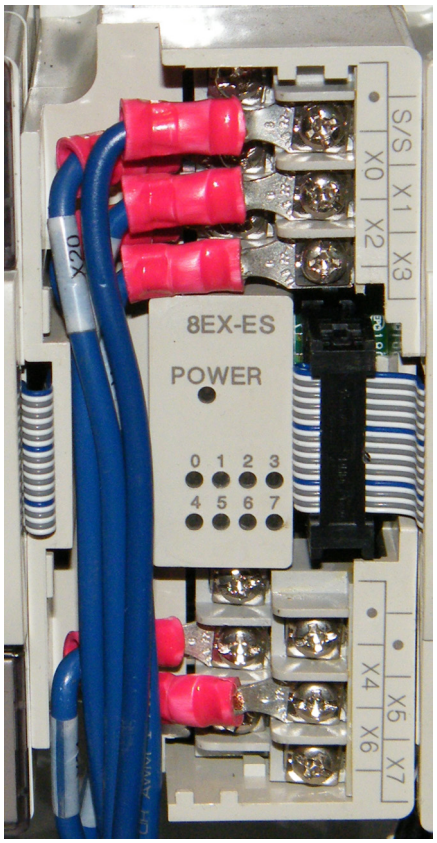

C HMI: HMI-GRN
GSD
G1C
C2
E4
0VDC


MITSUBISHI
MELSEC
FX3U-16M
COMMUNICATION CABLE

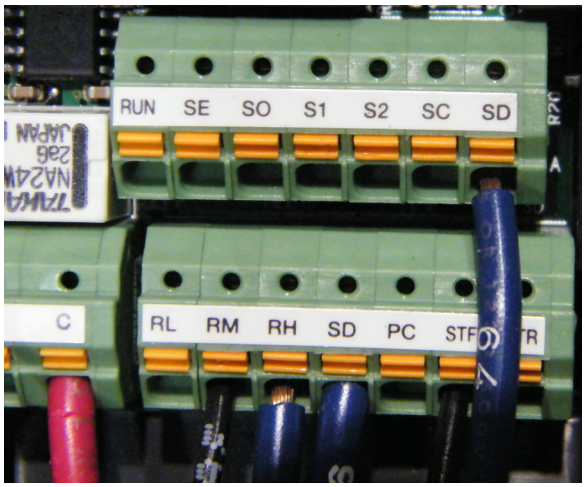

FX2N-8EYR-ES
POWER


P6C
8EYR
POWER

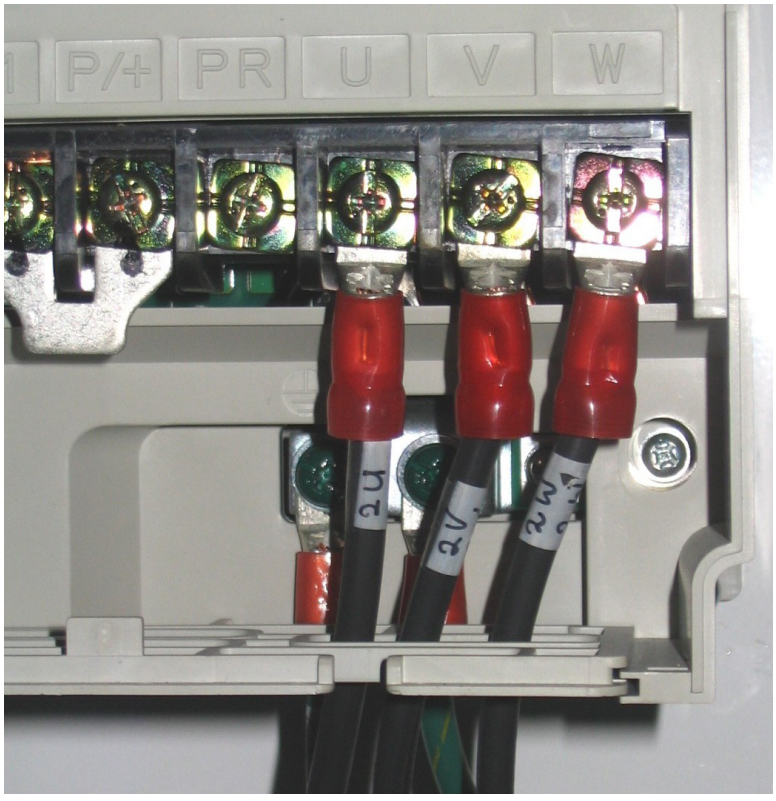
Wires 0V24, X20 to X25 all connect to the expansion module as per the electrical schematic.



Wires X20 to X25 & 0V24
to connect to module:
FX0N-8EX-ES or
FX2N-8EX-ES



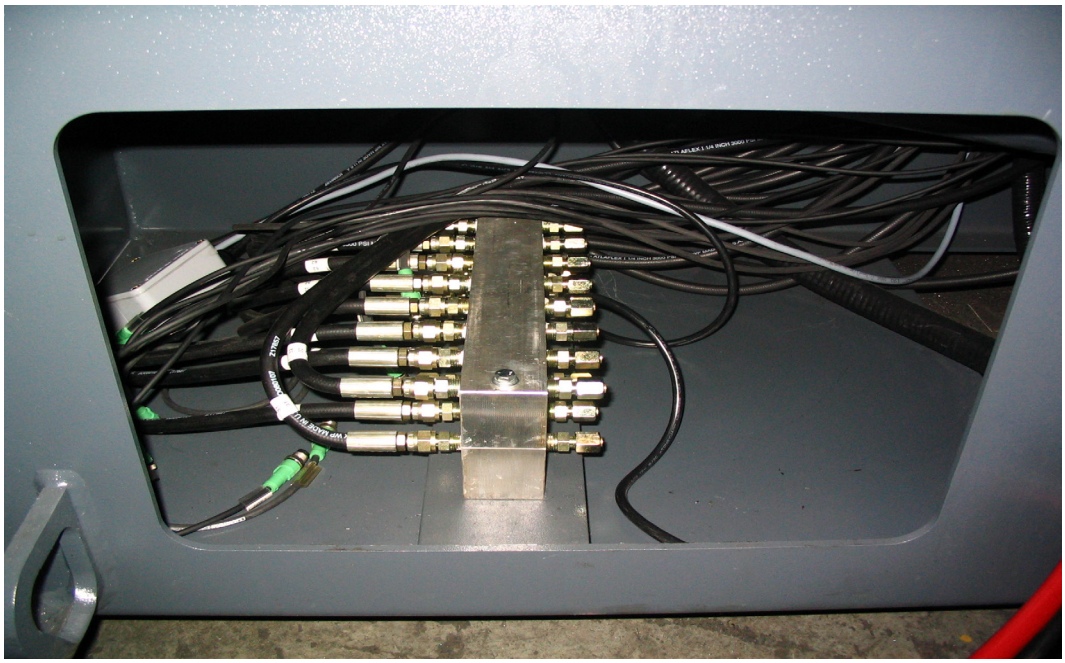
Wires SC1, S1A & S2A to connect to
SC, S1 & S2 ON 2M VFD



FROM: 2M CONDUIT

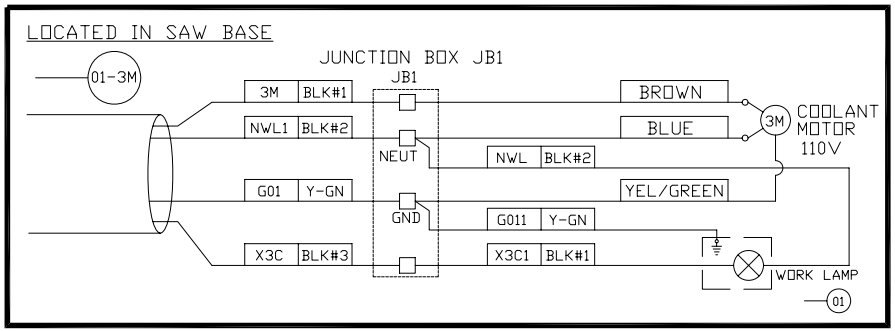
Feed the cables and wires packed with the conveyor into the access hole in the machine base. Follow the provided diagram to plumb the hydraulic hoses into the block. Follow the provided wiring diagram to connect the electrical cables.

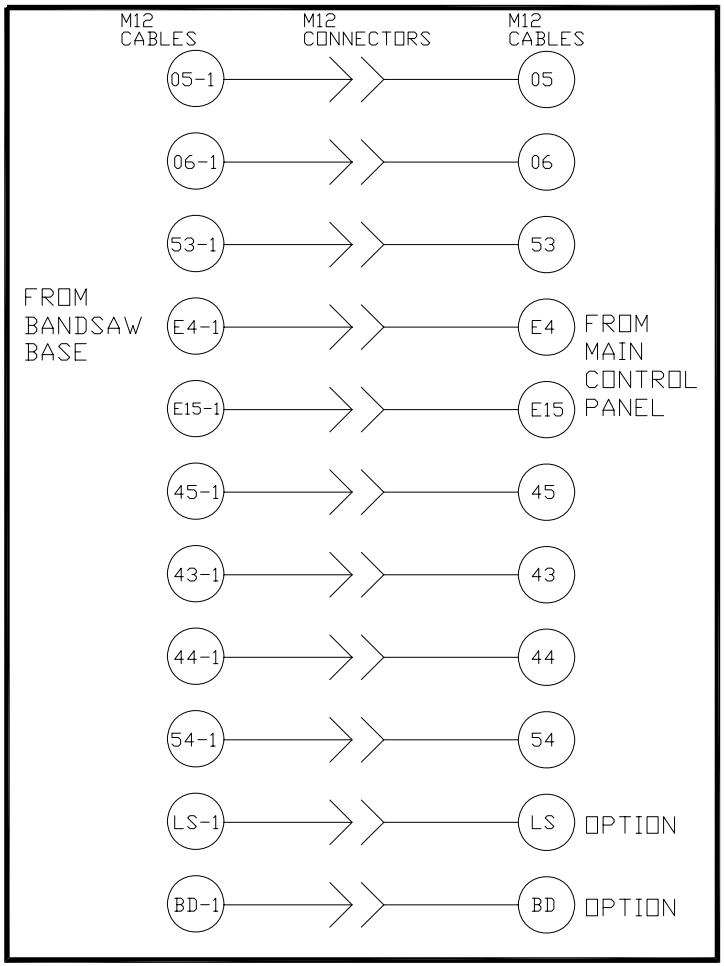
Feed the cables from the barfeed into the machine base.



Hydraulic plumbing and electrical cable connection location.

SAW BASE ELECTRICAL CONNECTIONS: PLC 500





REVISIONS			
REV.	ECN NUMBER	DATE	BY
–	W00-399	SEP_08	JSH
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–

STANDARD TOLERANCES UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

LINEAR: .X +/- .015 IN; .XX +/- .010 IN; .XXX +/- .005 IN

ANGULAR: X.X +/- 0.5 DEG

✓ = 125 MICROINCHES

THIRD ANGLE PROJECTION

HYD•MECH GROUP LIMITED
WOODSTOCK, ONTARIO, CANADA. N4S 8A4

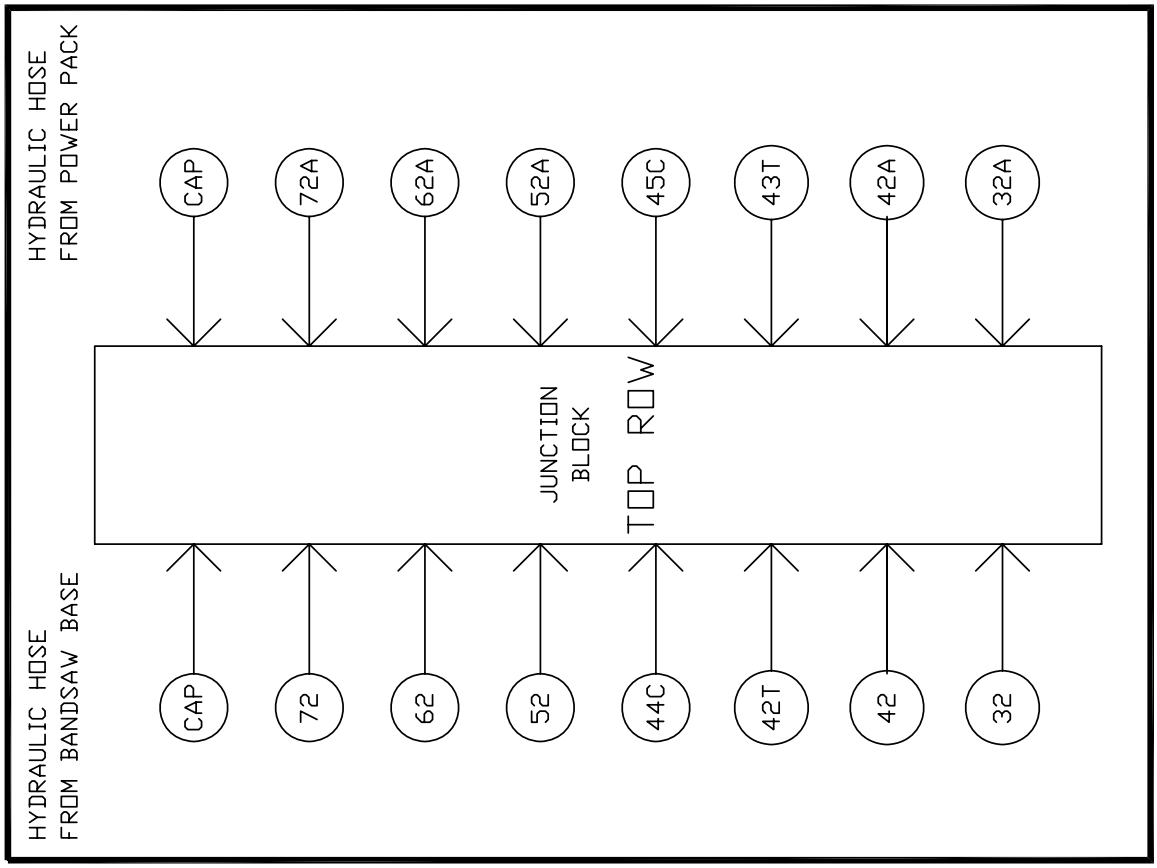
TITLE: INTERCONNECTION_DIAGRAM: M20APC SAW_BASE_TO_MAIN_CONTROL_PANEL

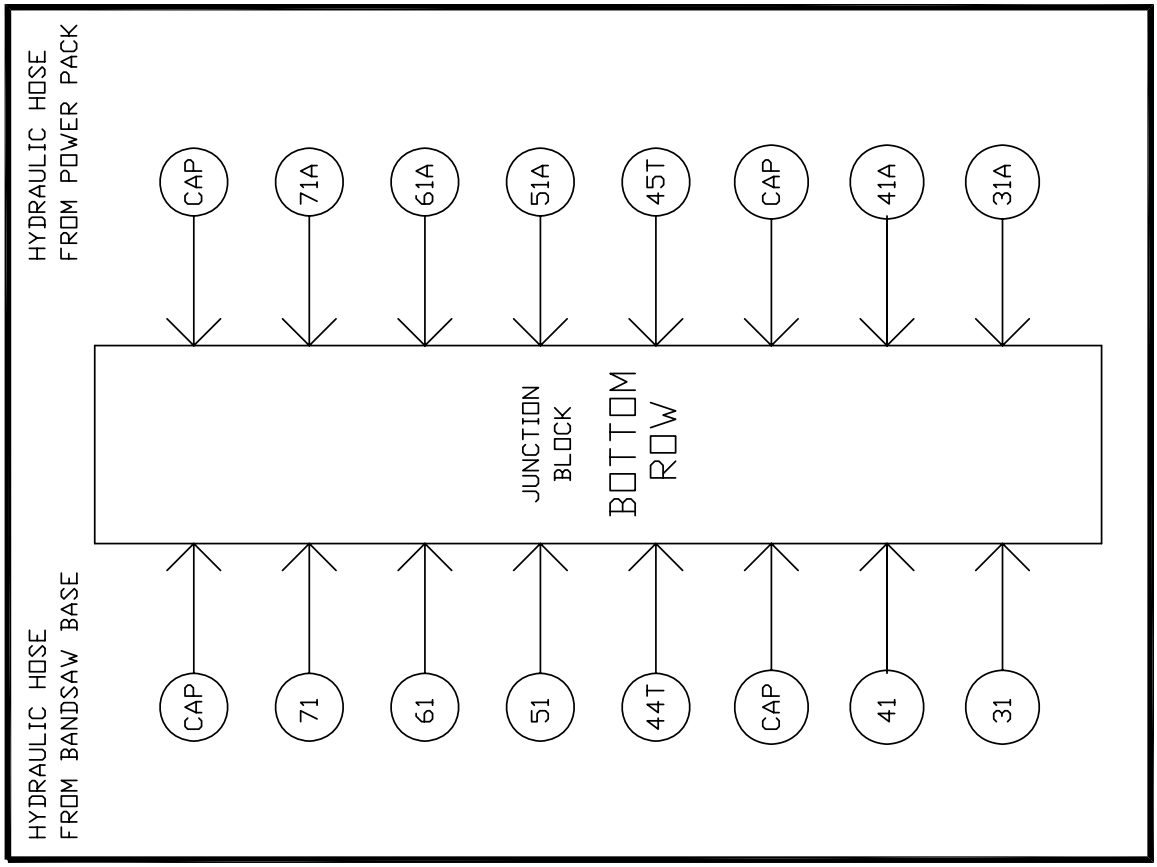
DRWN BY: JSH	CHKED BY: –	SCALE	SHEET	REV
DATE: SEP_2008	DATE: –	–	1_OF_1	–

MAT'L: –

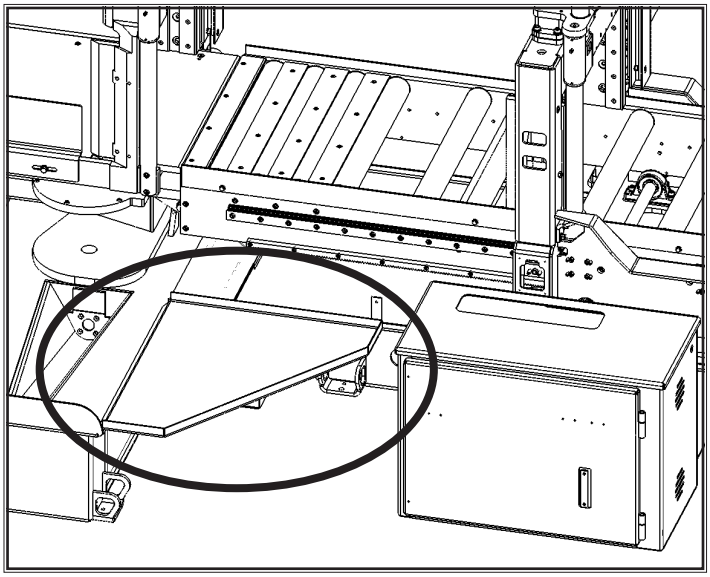
DRAWING NUMBER: M20APC-10'-NA-7-00-ICD-3

SAW BASE HYDRAULIC CONNECTIONS

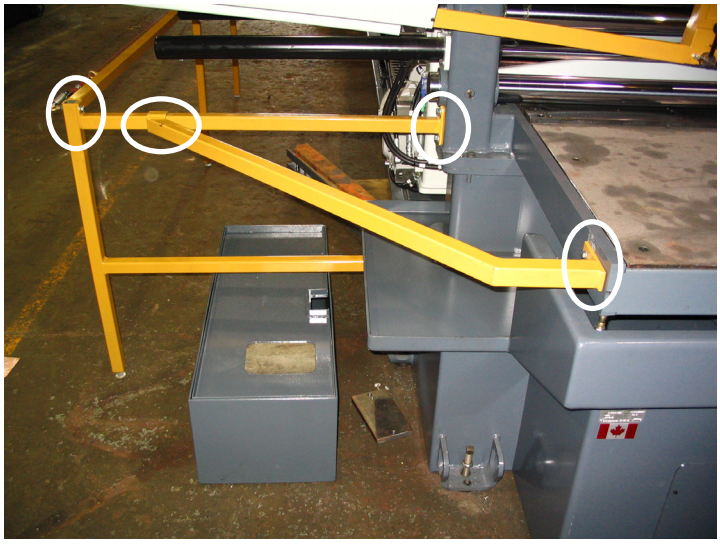




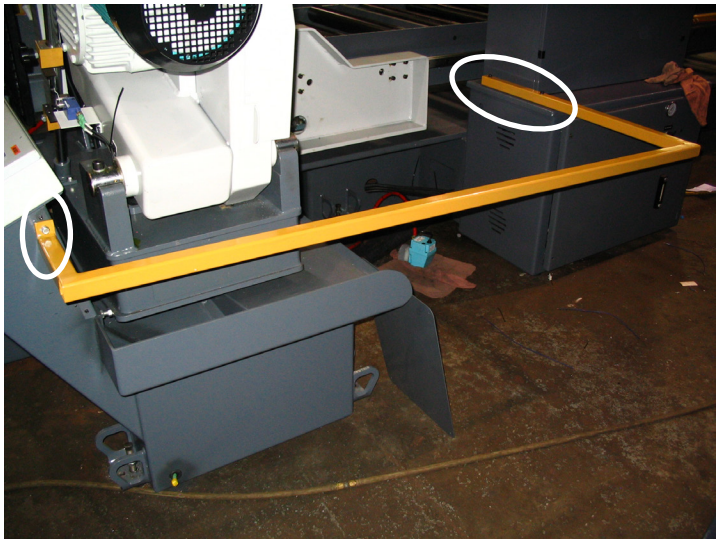
Fasten the drip pan between the machine base and the barfeed as shown.



Two more machine guards are to be attached to the idler side of the machine. One horizontal support is assembled between the movable vise post and the idler side barfeed guard. The other sits on the horizontal support and is fastened to the outfeed table.



One machine guard is to be assembled between the operator control panel and the power pack box.



MAIN POWER WIRING CONNECTIONS

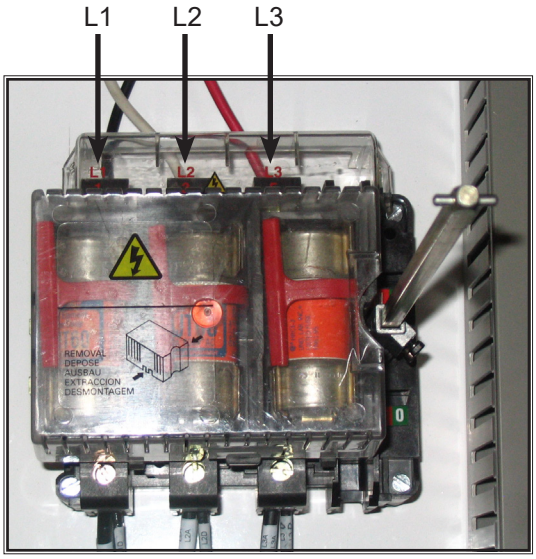
After the machine is leveled and anchored the necessary power hook-up needs to be performed.

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.

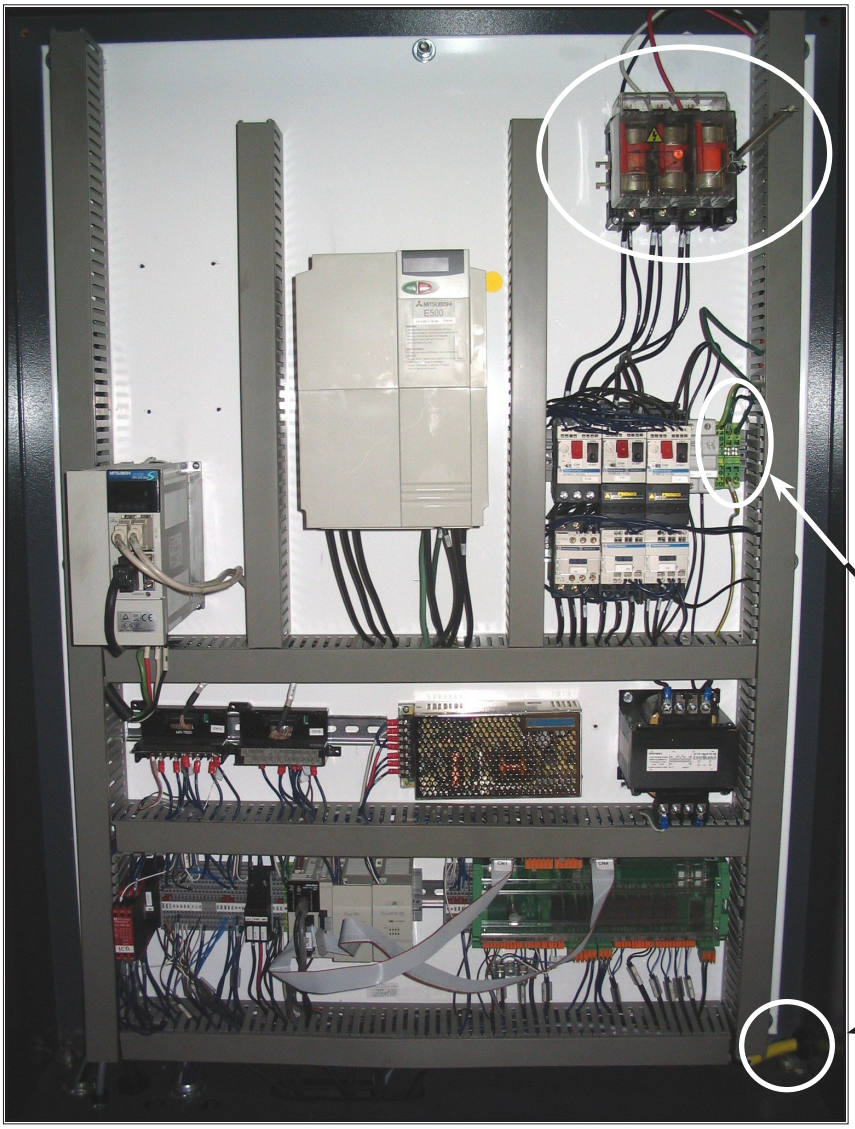
The first two areas that need to be checked are:

- There are no signs of shipping damage to electrical conduits, cords or hydraulic hoses.
- Hydraulic oil level is between the upper and lower lines on the level gauge.

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 counterclockwise direction. If the hydraulics do not register an immediate pressure rise **- SHUT THE HYDRAULICS OFF -** and change the phase order. As supplied, the machine is set to run on the three phase voltage as indicated on the serial plate and voltage label. Power connection to the machine is made to the main disconnect switch and the LI, L2, L3 and Ground terminals. The disconnect switch is located in the Main Control Cabinet.
The Power Terminal Block is shown below. We also recommend that an earth ground be attached to the machine.
NOTE: Ensure the switch is in the OFF position and power is disconnected.



Main Power Connections



Main Control Cainet (PLC 100 Shown)

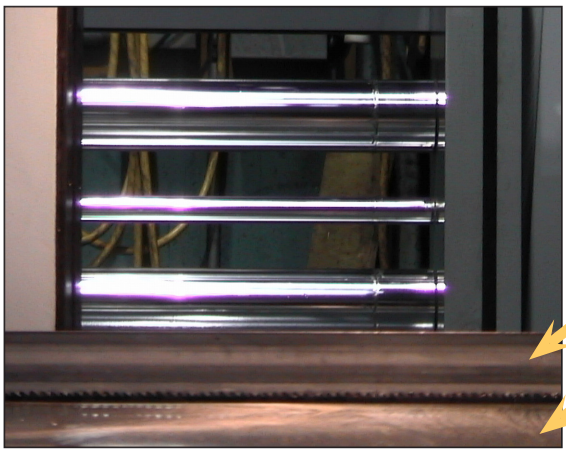
BLADE TENSION CHECK

When the machine is first started, the head must be swung to the 45^{O} position so the blade position can be checked. Open both the idler and drive door to see that the blade has not moved off of the wheel. Correct tracking of the blade would see the teeth overhang the rim of the wheel by .260” to .300”. If it has stayed in its correct position, then turn the blade tension switch to the “+” and close the door, if not, please refer to section 3 of the manual to correct this.

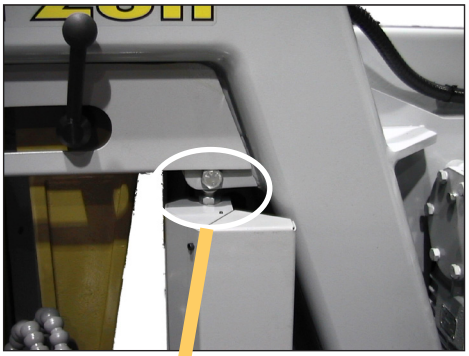
HEAD HEIGHT CHECK

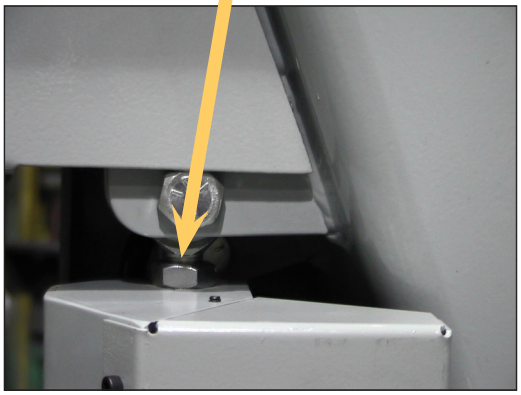
The head height is carefully checked at the factory prior to shipping and should not change, however there may be a possibility that either through lifting or when the machine is in transit, the position changes slightly. This should be checked at the time of installation.

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





CUTTING FLUID

Coolant wash gun

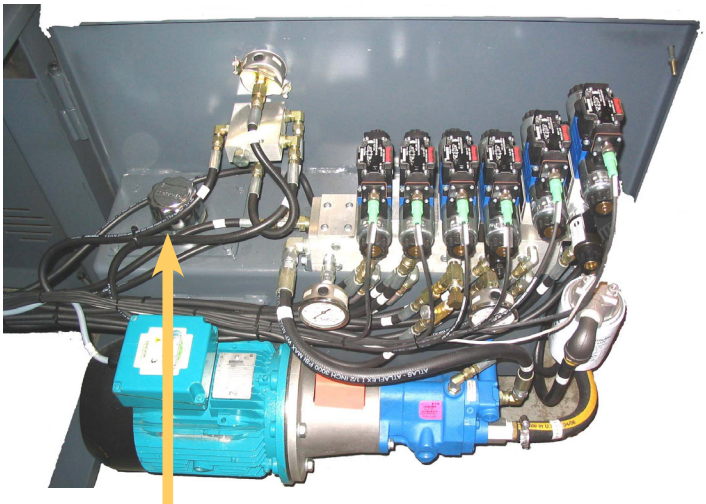
The M20A-120 uses a pump and reservoir to circulate the necessary cutting fluid to the blade for maximum blade life. Your saw blade supplier will be able to provide information on the cutting fluid products that are available for your needs. No cutting fluid (coolant) is supplied with the machine. There 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.

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.

SECTION 2 - OPERATING INSTRUCTIONS

This section has been prepared to give the operator the ability to set up the saw for most cutting situations. The saw is equipped with variable blade speed control and hydraulic feed control, as well as an extensive door chart to guide the operator to the correct setting of these controls.

BLADE BASICS

Technology is rapidly changing all aspects of production machining. Metal cutoff is no exception. The advances made in the 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 M-16/20) 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 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, Blade Changing)

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.

5. The proper blade speed must be selected.

6. The proper feed rate must be applied.

E1060 Interface Operation Instructions

PLC 500 CONTROL SYSTEM

OPERATION OVERVIEW

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

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

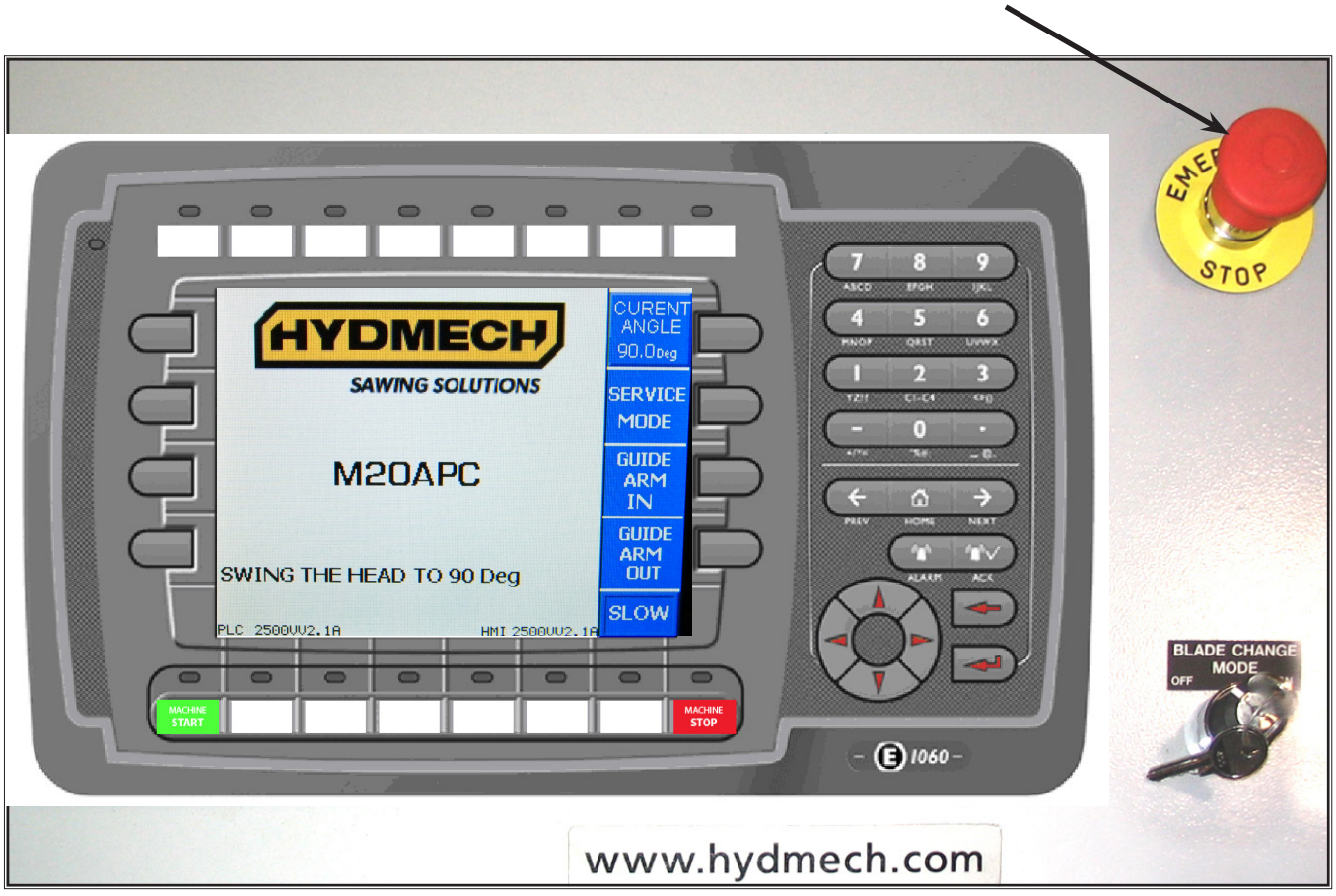
To power up the control panel, the EMERGENCY STOP button must be pulled out. The display screen will scroll through several screens and finally display in the MANUAL MODE with the display dimmed. Pressing any key will bring the control panel to full ON and the display back light will come ON.

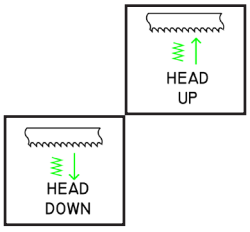
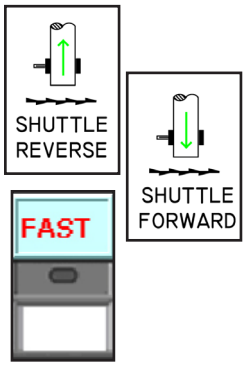
Once the control panel has power, the MACHINE START key must be pressed to activate the interface, which will also start the hydraulic system. Now all of the control keys have been activated and each key has an LED to indicate which functions are active.

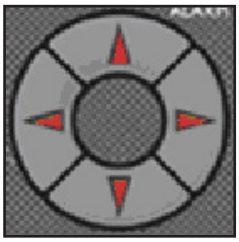
In MANUAL MODE, the operator has the ability to execute a single cut utilizing a pre-programmed SINGLE CUT MODE.

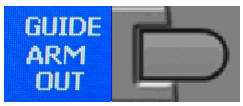
In AUTOMATIC MODE, the PLC has the capacity to program and store 1000 jobs. Designated job numbers can be programmed for the quantity required (maximum 999 pieces). Piece lengths range from 0” to 999”. Jobs can be run individually or in a QUEUE, which allows a maximum of 20 jobs to run consecutively.

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.**

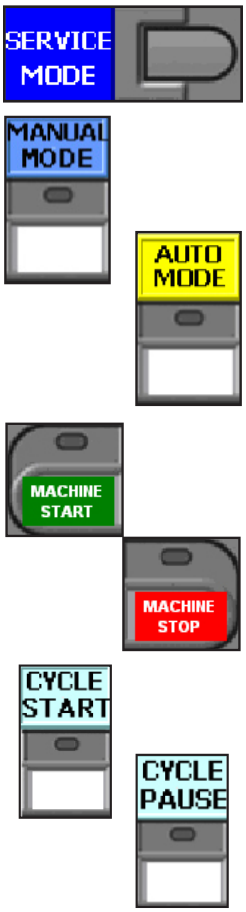


MANUAL MODE ONLY CONTROLS	
HEAD CONTROLS	
 HEAD UP	Moving the joystick in this direction will raise the head. It will stop and hold its position if the joystick is returned to the center position.
HEAD DOWN	Moving the joystick in this direction will lower the head. It will stop and hold its position if the joystick is returned to the center position.
HEAD SWING 90 DEG	Moving the joystick in this direction will swing the head towards 90 DEG. It will stop and hold its position if the joystick is returned to the center position.
HEAD SWING 30 DEG	Moving the joystick in this direction will swing the head towards 30 DEG. It will stop and hold its position if the joystick is returned to the center position.
 HEAD SWING SLOW / FAST	Pressing this key will cause the head to swing either fast or slow. The red TEXT indicates that the head will move FAST. Pressing the key will switch this function back to SLOW.
FIXED VISE CONTROLS	
 FIXED VISE OPEN	Pressing this key will open the fixed (front) vise and will stop and hold its position if the key is released.
 FIXED VISE CLOSE	Pressing this key will close the fixed (front) vise. To stop and hold its position, press again or press the FIXED VISE OPEN key.
SHUTTLE VISE CONTROLS	
 SHUTTLE VISE OPEN	Pressing this key will open the shuttle (rear) vise, and will stop and hold its position if the key is released.
 SHUTTLE VISE CLOSE	Pressing this key will close the shuttle (rear) vise. To stop and hold its position, press again or press the SHUTTLE VISE OPEN key.
SHUTTLE CONTROLS	
 SHUTTLE REVERSE	Moving the joystick in this direction will move the shuttle to the back (away from the blade) and it will stop and hold its position if the joystick is returned to the center psoition.
SHUTTLE FORWARD	Moving the joystick in this direction will move the shuttle to the front (towards the blade) and it will stop and hold its position if the joystick is returned to the center psoition.
SHUTTLE SLOW / FAST	Pressing this key will cause the shuttle to move either fast or slow. The red TEXT indicates that the shuttle will move FAST. Pressing the key will switch this function back to SLOW.





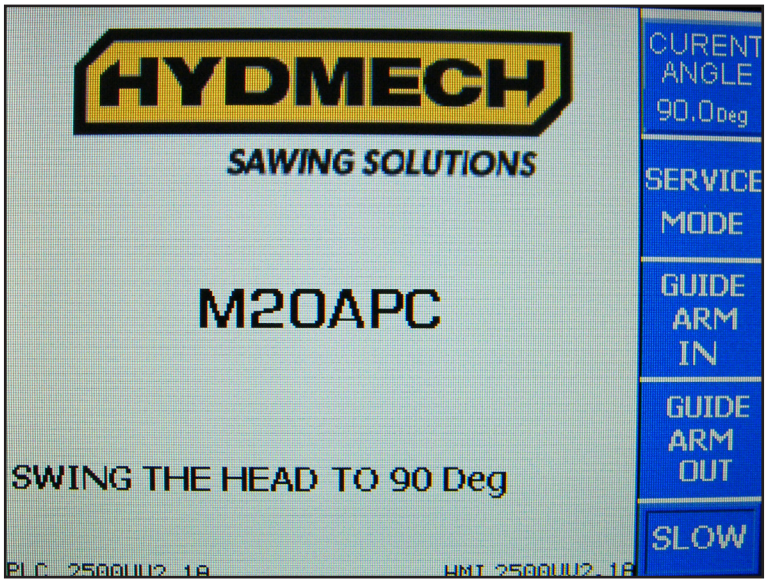
OUTBOARD VISE CONTROLS	
OUTBOARD VISE OPEN	Pressing this key will open the outboard vise, and will stop and hold its position if the key is released.
OUTBOARD VISE CLOSE	Pressing this key will close the outboard vise. To stop and hold its position, press again or press the OUTBOARD VISE OPEN key.
MANUAL & AUTO MODE CONTROLS	
BLADE CONTROLS	
BLADE START	Pressing this key will start the blade. The blade will not start if the head is fully down.
BLADE STOP	Pressing this key will stop the blade.
BLADE SPEED (+)	Pressing the red right arrow navigation key when the blade is running will cause the blade speed to increase until the key is released or the speed is at the maximum (350 SFM). The blade must be running to use this key. The blade speed is shown on the display screen.
BLADE SPEED (-)	Pressing the red left arrow navigation key when the blade is running will cause the blade speed to decrease until the key is released or the speed is at the minimum (70 SFM). The blade must be running to use this key. The blade speed is shown on the display screen.
GUIDE ARM CONTROLS	
GUIDE ARM OUT	Pressing this key will move the guide arm to the left.
GUIDE ARM IN	Pressing this key will move the guide arm to the right.
COOLANT CONTROLS	
COOLANT ON	Pressing this key will start the coolant flow. Pressing this key again will stop the coolant flow.
COOLANT AUTO	Pressing this key will cause the coolant to flow only then the blade is running OR when the blade is running and the head is descending. This is selectable via the PLC parameters in the SERVICE MODE.
FLOOD / MIST	Pressing this key will toggle between flood and mist cooling system.



MODE CONTROLS	
SERVICE MODE	The SERVICE MODE allows the user to adjust the various PLC parameters.
MANUAL MODE	Pressing this key will enable all of the "MANUAL MODE ONLY CONTROLS."
AUTO MODE	Pressing this key will disable all of the "MANUAL MODE ONLY CONTROLS." To enter AUTO MODE, the FIXED VISE must be activated.
MANUAL & AUTO MODE CONTROLS	
MACHINE START	Pressing this key will activate the control panel display, and start the hydraulic system. The EMERGENCY STOP button must be pulled out. This key must be activated to use the machine functions.
MACHINE STOP	Pressing this key will shut down all machine functions.
CYCLE START	The user will be prompted by the display to press this key as it is used to initiate an AUTO or SINGLE CUT MODE cycle. Pressing this button will also initiate the QUEUE if pressed when in the QUEUE screen.
CYCLE PAUSE	Pressing this key will pause the CYCLE in progress. If the SHUTTLE is in motion and CYCLE PAUSE is activated, the SHUTTLE will complete its movement and then the CYCLE will PAUSE. To resume the CYCLE, press the CYCLE START key.

MACHINE START UP

Reset the E-Stop by pulling out the red mushroom button. There is a short delay to allow the machine software to load. Press the machine start button two times: First to wake up the screen saver, and then a second time to start the hydraulics. If the head is not at 90 degrees then the display screen will look as follows.

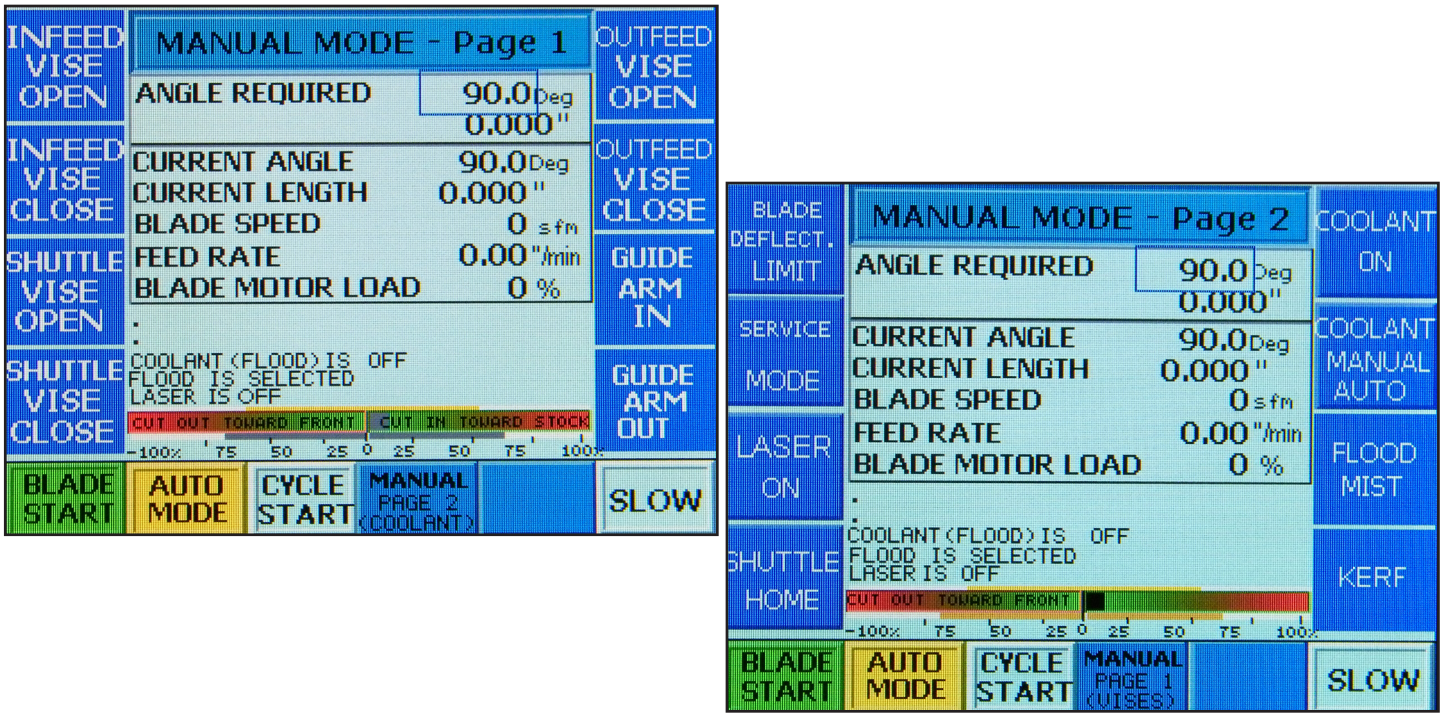


The head must swing to 90 degrees to activate the cutting modes. The screen will then change to manual mode.

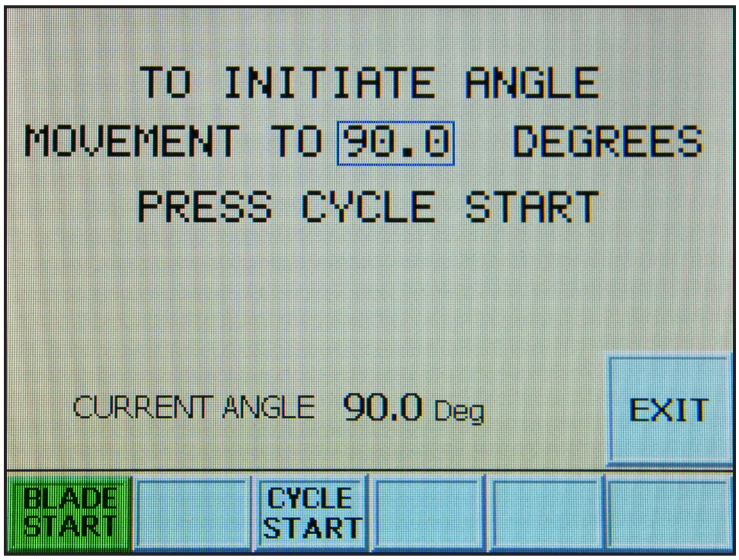
MANUAL MODE

MANUAL MODE is the default mode. All functions are enabled when in MANUAL MODE.

The screen should look as follows:



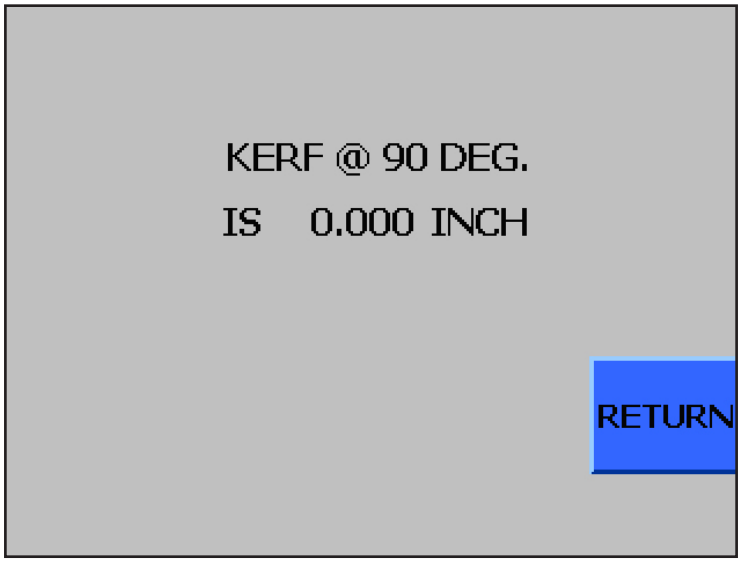
The cursor on the display is flashing on ANGLE REQUIRED. Enter a numerical angle then press the enter button. Press the CYCLE START button once the desired angle is chosen. The screen will change and the cycle start push button must be pressed in order to achieve the desired angle.



The screen will change back to manual mode after “ANGLE GO” cycle was completed.

KERF CORRECTION FOR ANGLE CUTTING (Manual 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 next button.



To return to previous screen pres exit key.
The Standard kerf and corrected values are as follows:

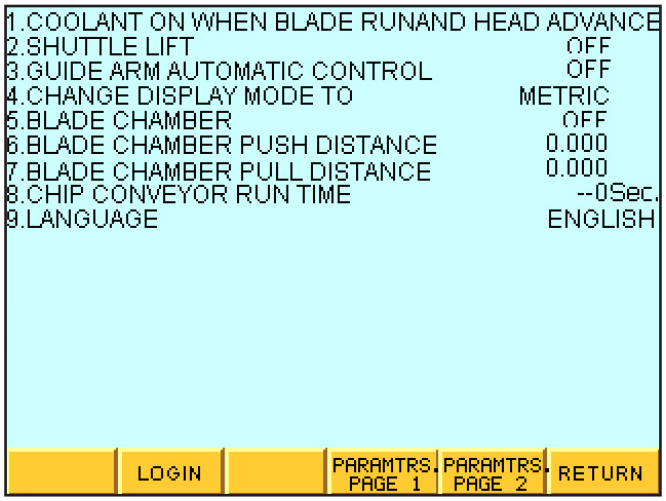
STD KERF @	90°	75°	60°	55°	50°	45°	40°	35°	30°
1 ¼” BLADE	.066	.068	.076	.081	.086	.093	.103	.115	.132
1 ½” BLADE	.074	.077	.085	.090	.097	.105	.115	.139	.148

PARAMETERS

The parameters can be accessed by pressing the service mode button on the panel. These parameters can be changed without a password.

1. COOLANT ON WHEN BLADE RUN: __ / AND HD. AD

In Automatic Mode - Allows the coolant to flow whenever the blade is running or when the blade is running and the head advances.



2. SHUTTLE LIFT: ON / OFF

ON allows the material to be lifted up and away to ensure it will not get caught when it is shuttled forward.

3. GUIDE ARM AUTOMATIC CONTROL: ON / OFF

ON (In Automatic Mode) – The user will be prompted to enter the material height before the cycle will start. This will automatically position the guide arm a couple of inches above the material before every cut.

4. CHANGE DISPLAY MODE TO: METRIC / IMPERIAL

Toggle the display units between metric and imperial.

5. BLADE CHAMBER: ON / OFF

If Blade Chamber is on:

- In the auto cycle, the head will make the cut and continue moving forward until it exits the material.
- Shuttle will move the stock forward (by the distance set in the BLAD CHAM PUSH DIST parameter) and will push away the cut pieces.
- Shuttle will move back allowing the head to retract.
- Head will retract.
- Shuttle will feed the next length to cut.
- The cycle will repeat.

6. BLADE CHAMBER PUSH DISTANCE

This parameter defines the distance that the shuttle will move forward (behind the table) during the blade chamber cycle.

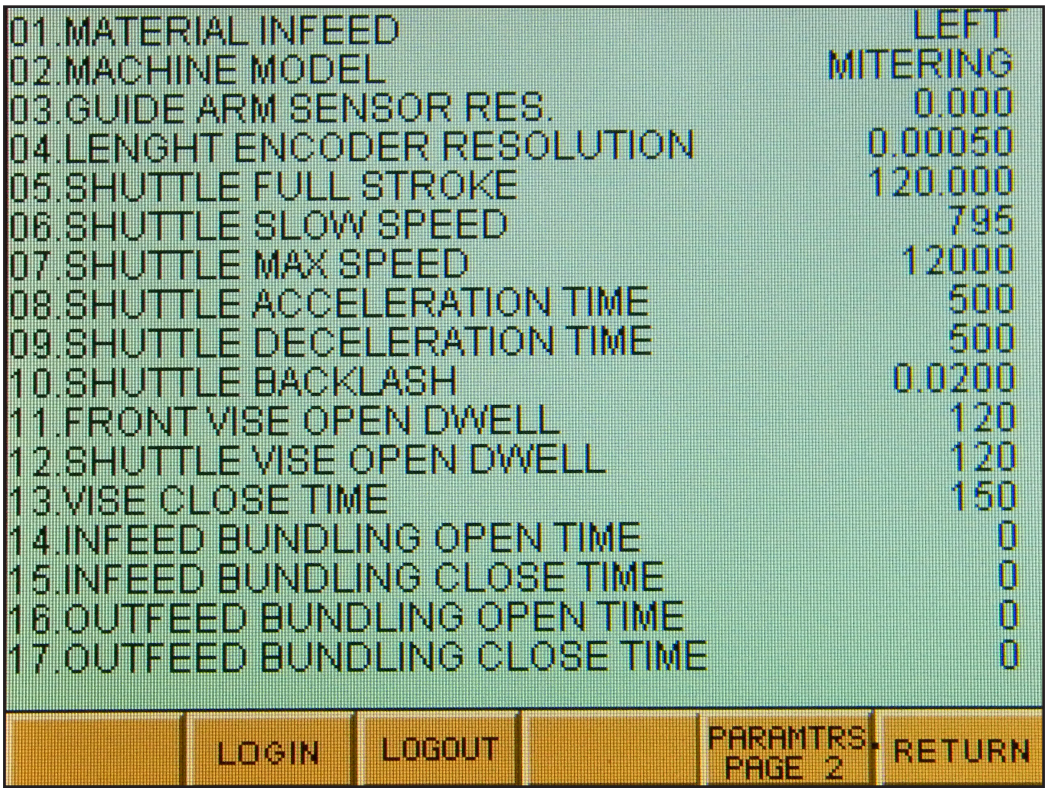
7. BLADE CHAMBER PULL DISTANCE: # ----

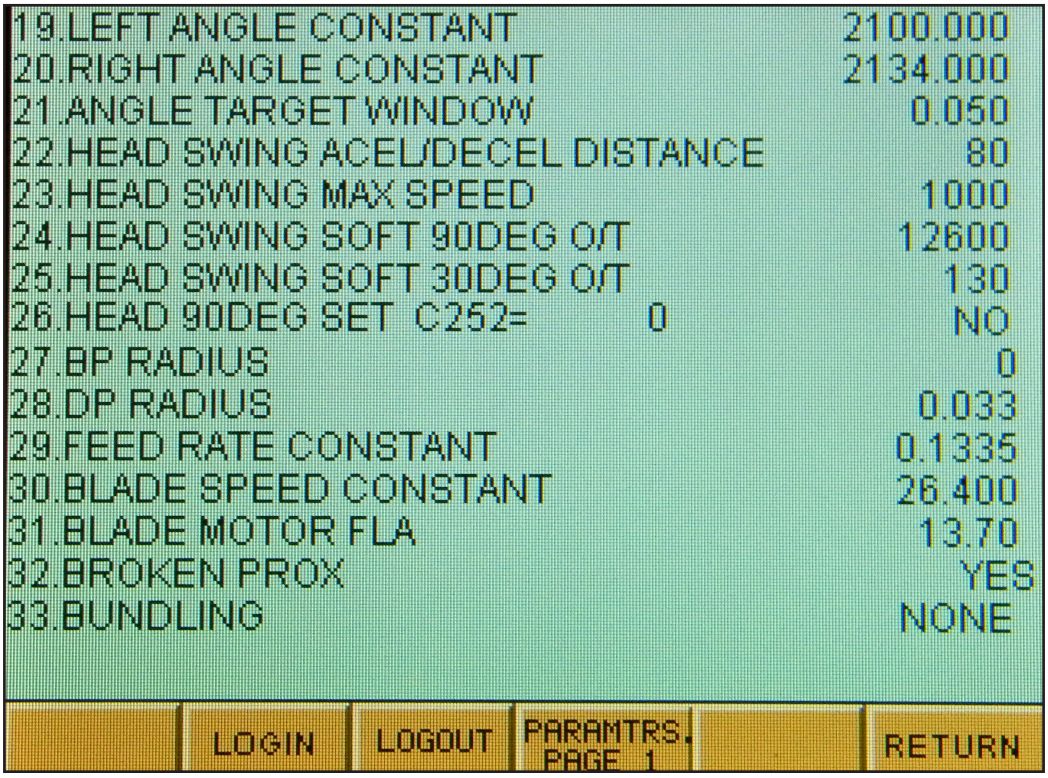
This parameter defines the retract distance that the shuttle will move during blade chamber cycle.

8. CHIP CONVEYOR RUN TIME: # ----

This parameter defines the time that the chip conveyor will run after releasing the chip conveyor button. Chip conveyor will run (extracting the chips) for that preset time (to the right on the left side infeed and to the left on the right side infeed machines). This parameter is not functioning for the reverse mode. The conveyor will move in the reverse direction only when the button is activated, and it will stop after the button is released.

From this screen all the other parameters can be viewed, but a password will be needed to change any settings. See “PLC Parameters” at the end of this section to view the list. HYD MECH service department should be contacted before attempting to change any of these settings.



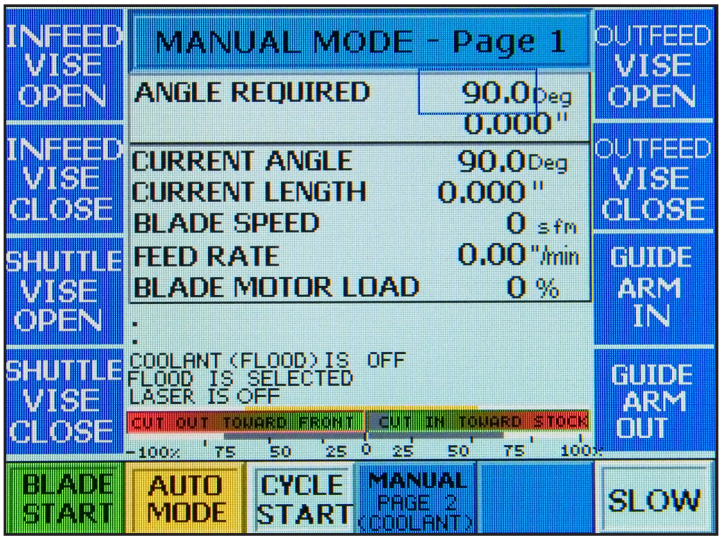


PARAMETER	DEFINITION
MATERIAL INFEED	Defines the infeed side of the machine
MACHINE MODEL	Defines vertical (V25APC) or metering (M20APC) models
GUIDE ARM SENSOR RES.	Specifies linear distance of guide arm movement in pulses per inch
LENGTH ENCODER RESOLUTION	Specifies linear distance of shuttle movement in inches per one pulse generated by motion controller.
SHUTTLE FULL STROKE	Maximum usable shuttle travel..
SHUTTLE SLOW SPEED	Minimum shuttle speed constant.
SHUTTLE MAX SPEED	Maximum shuttle speed constant.
SHUTTLE ACCELERATION TIME	Shuttle acceleration time. Time, in milliseconds that the shuttle will accelerate from 0”/s to full speed.
SHUTTLE DECELERATION TIME	Shuttle deceleration time. Time, in milliseconds that the shuttle will decelerate from full speed to 0”/s.
SHUTTLE BACKLASH	Backlash value of the shuttle drive system.
FRONT VISE OPEN DWELL	Delay time for the opening of the FIXED VISE in milliseconds.
SHUTTLE VISE OPEN DWELL	Delay time for the opening of the SHUTTLE VISE in milliseconds.
VISE CLOSE TIME	Delay time for the closing of the SHUTTLE or FIXED VISE in milliseconds.
INFEED BUNDLING OPEN TIME	Delay time for the opening of the infeed bundling.
OUTFEED BUNDLING OPEN TIME	Delay time for the opening of the outfeed bundling.
LEFT ANGLE CONSTANT	This constant represents LEFT Angle Encoder Resolution.
RIGHT ANGLE CONSTANT	This constant represents RIGHT Angle Encoder Resolution.
ANGLE TARGET WINDOW	Allowable +/- tolerance from programmed angle.
HEAD SWING (ACCEL/DECEL TIME)	Acceleration / Deceleration time.
HEAD SWING MAX. SPEED	Head swing maximum speed.
HEAD SWING SOFT (90 DEG O/T)	Head swing soft over travel
HEAD SWING SOFT (30 DEG O/T)	Head swing soft over travel.
HEAD 90DEG SET	Set new 90 deg position.
BP RADIUS	The distance in inches from the front side of the blade to the pivot point of the head
DP RADIUS	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.
FEED RATE CONSTANT	Feed rate display constant value. If the actual feed rate differs from displayed value, enter new Height Constant=(old Height Constant x actual feed rate)/ displayed fed rate.
BLADE SPEED CONSTANT	Blade Speed Display adjustment number. If actual blade speed is different than displayed blade speed, a new Speed Constant will need to be calculated. Speed Constant = old Speed Constant x actual speed / displayed speed.
BLADE MOTOR FLA	Blade motor full load current
BROKEN PROX	Allows user to override signal from blade drive. Allow to run “dry cycle” in automatic mode without running the blade. Set to YES allows machine to run auto cycle without blade running.
BUNDLINGS	This parameter activates bundling: INFEED = shuttle and infeed bundling OUTFEED =shuttle and outfeed bundling BOTH =shuttle, infeed and outfeed bundlings

ONE CUT MODE OPERATION

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

1. A trim cut should be made before initiating the ONE CUT MODE operation. Key in the required angle using the keypad and cursors, press “AngleGo” button at the bottom of the screen, then CYCLE START button. The head will turn to the required area and stop.
2. Press the Infeed Vise Closed push button to activate ONE CUT MODE.



3. In the “Length Required” field key in the desired length up to 999” using the numeric keypad and press enter.
4. Push the Blade Start button.
5. When the blade is started, the word BLADE will change to the words CYCLE START and will be flashing on the display window. Press CYCLE START and the cycle will begin.
6. When the cut is completed, the blade will stop, the head will retract back to the limit switch, and the display window will reset for the next cut.
7. To cut another piece, repeat steps 2 through 6.

AUTOMATIC OPERATION

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

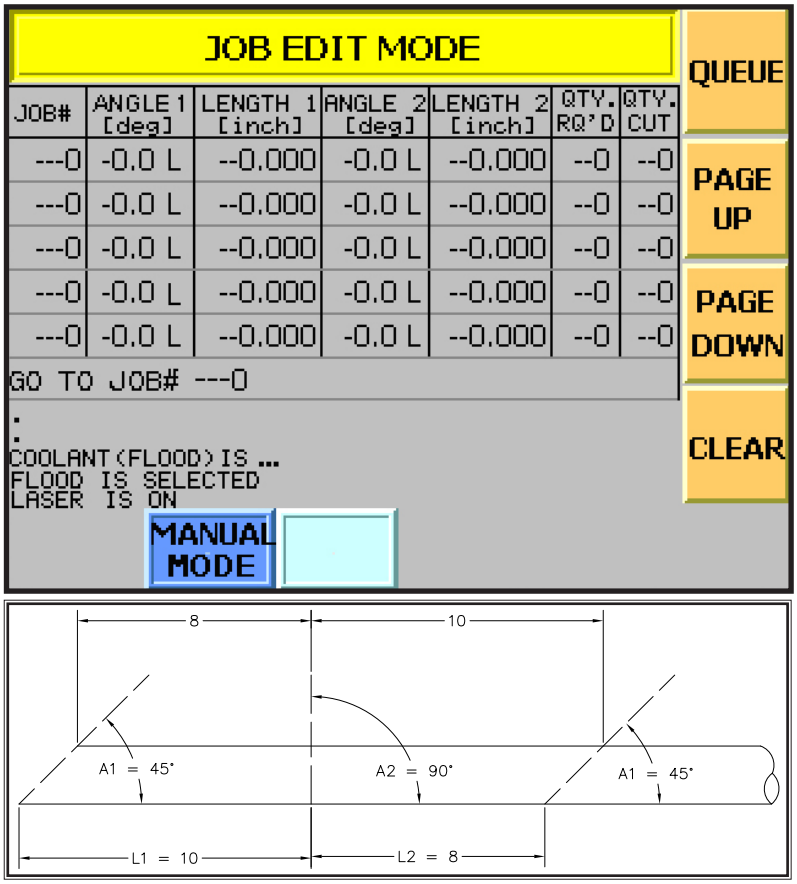
PROCEDURE FOR EDITING OR STARTING A NEW JOB IN AUTO MODE

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

2. Two angles, and two lengths define each job. 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 table datum line.

1. Immediately after entering the AUTO mode, the JOB screen will be displayed with the cursor located at “A1 of JOB #1” (See Below). Both the ENTER button or the cursor key can be used to move through this screen. There are three ways to navigate between pages:
   - PG UP (Page Up) – Pressing this key will cause the display to scroll up.
   - PG DOWN (Page Down) - Pressing this key will cause the display to scroll down.
   - Go to JOB#. Enter the job number that you want to display/edit and then press enter. The required Job number will be displayed on the screen.

   To CLEAR JOB parameters – Move the cursor to the required job number, and then press the CLEAR button.



2. Enter proper “A1” value, press ENTER and the cursor will move to angle direction letter.

3. Press ENTER to toggle between R (right) and L (left). To move to “L1”, use the cursor key.

4. Enter proper “L1” value, press ENTER and the cursor will move to “A2”.

5. Enter proper “A2” value, press ENTER and the cursor will move to angle direction letter.

6. Press ENTER to toggle between R (right) and L (left). To move to “L2”, use the cursor key.

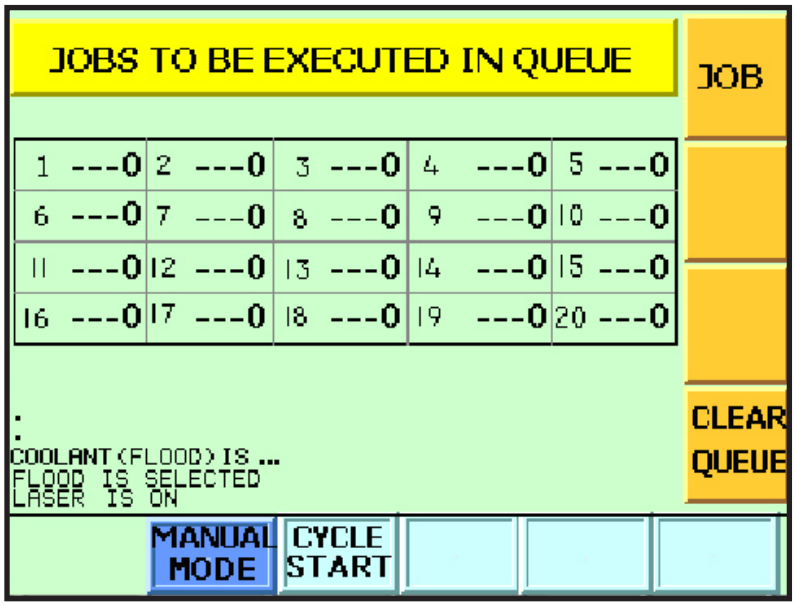
7. Enter proper value for “L2”, press ENTER and the cursor will move to “REQ”.

8. Enter required quantity, press ENTER and the cursor will move to “CUT”.

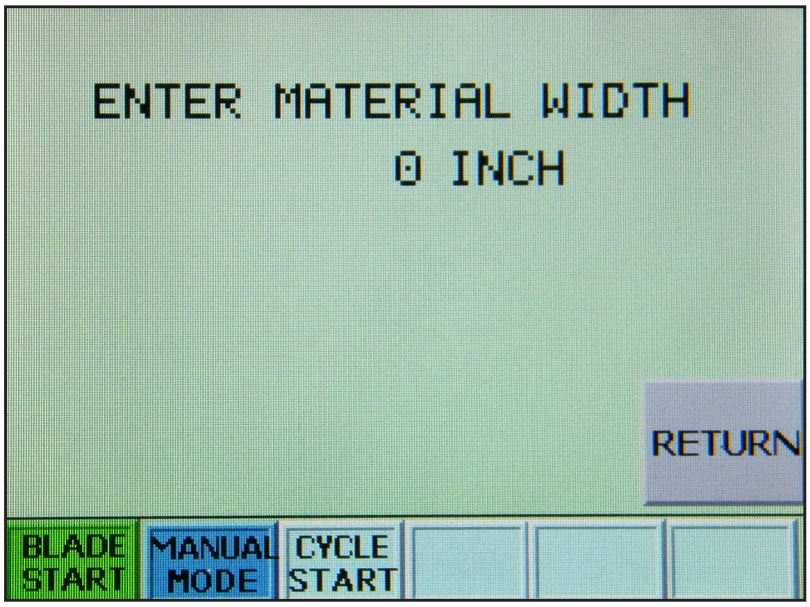
9. When starting a new job, zero out “CUT” quantity by entering “0”.

10. The job is now ready to start to run or other jobs can be programmed at this time. To run a certain job, press the QUEUE key and then ClrQUE to clear the QUEUE. Move the cursor to the 1st job and key in the desired JOB #. The purpose of a QUEUE is to allow the operator to run several jobs (maximum of 20) in series if they are of the same material and shape.

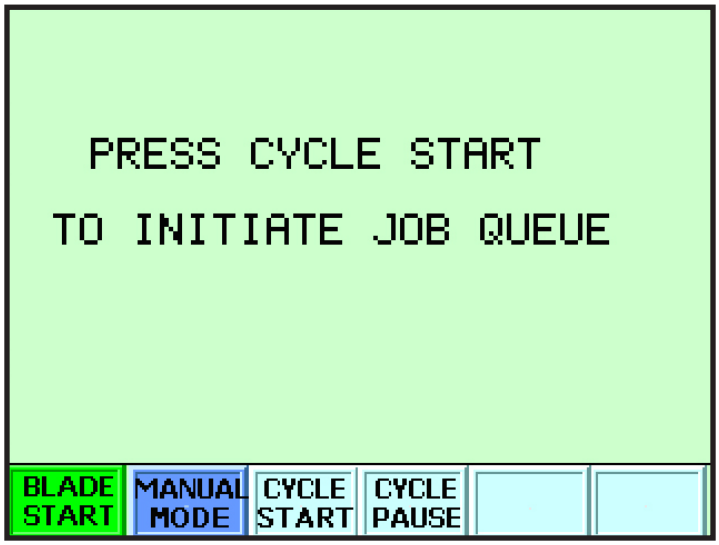
To run a QUEUE, it is necessary to program in all job values as is done with programming a single job. After the jobs are programmed in, press QUEUE, press CLR QUE to clear the previous QUEUE, and enter the desired JOB #'s in the desired sequence.



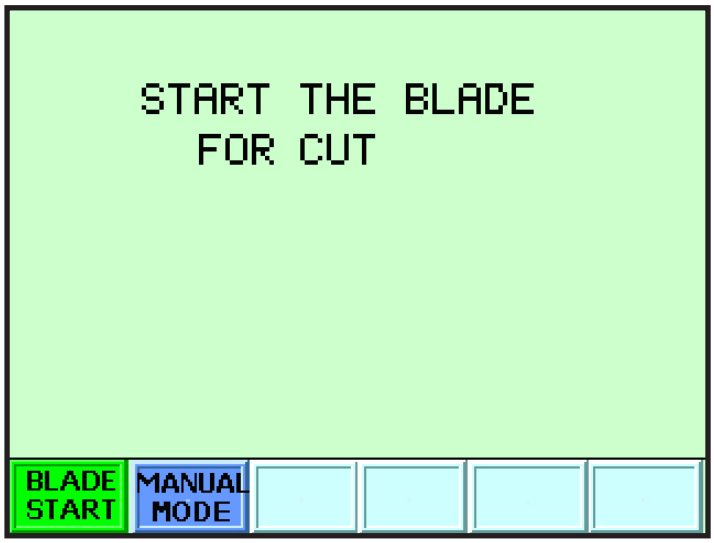
1. After the values are entered, press the START button. The display window will prompt you to Input Material Width. This will control the guide arm position (if the guide arm automatic control parameter is activated).



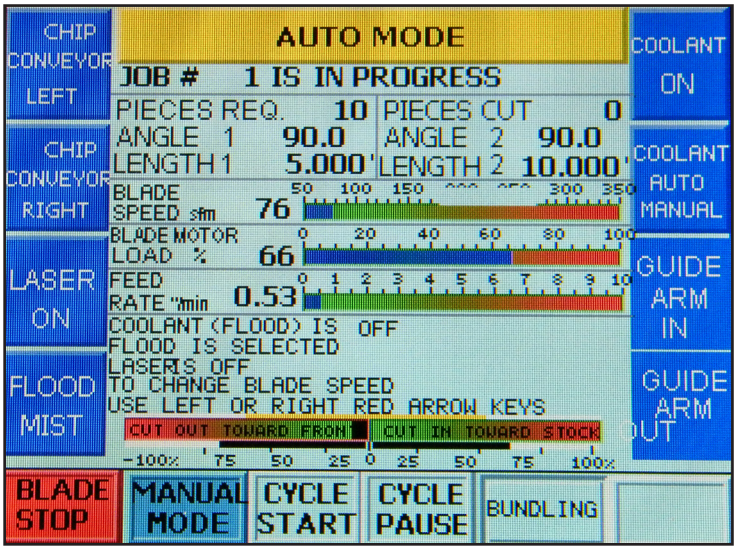
1. The display will prompt you to press Cycle Start to initiate Job Queue.



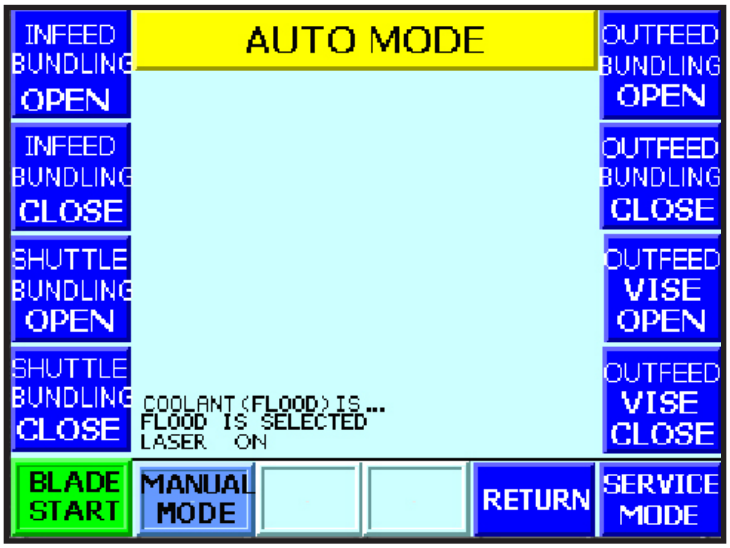
2. If the blade is not running, the display will prompt you to start the blade. To change the blade speed use the left or right red navigation keys. To increase the blade speed use the right arrow key. To decrease the blade speed use the left arrow key.



3. When the AUTO CYCLE commences, the screen will change to the “Auto Mode Status” screen.



To activate the outfeed vise or bundlings during AUTO CYCLE press the “BUNDLING” button to display the bundling control screen. After a short delay (approximately 1 minute) the screen will change back to the JOB IN PROGRESS screen.



SEQUENCE OF OPERATION

1. The shuttle and head will go to home position.
2. If the A1- first angle is not a collision angle, then the head will move to that angle.
3. A trim cut will be performed.
4. The shuttle will move to target length L-1.
5. After a trim cut, the shuttle will advance the material by the L1 value.
6. If the next angle is a collision angle then shuttle will retract to a safe position.
7. Head will swing to the A2 value to make the second cut and complete the first part.

If the previous angle was a collision angle, than the shuttle and the head will move to home position and the cycle will repeat.

NOTES:

1. The CYCLE PAUSE key is used to pause a job in progress. To resume the job, press the CYCLE START key and the AUTO CYCLE will resume.

2. If PIECES CUT equals or exceeds NUMBER OF PIECES, AUTO CYCLE will not start.

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

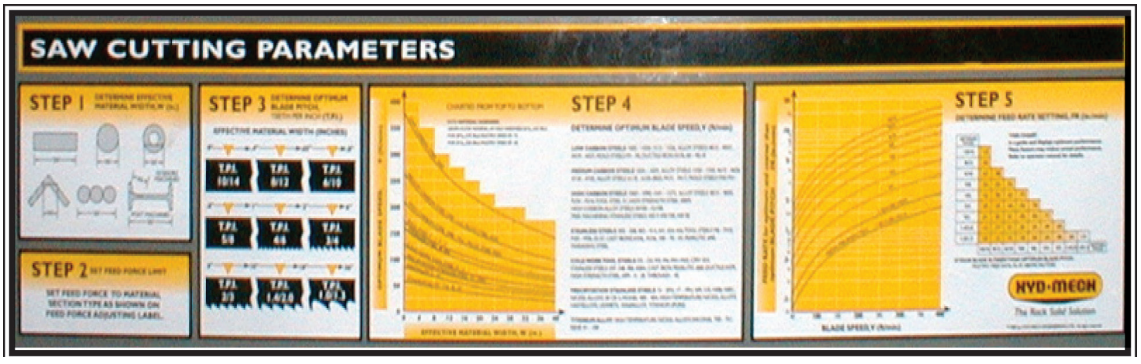
FEED FORCE KNOB USED TO SET FEED FORCE LIMIT (COUNTERCLOCKWISE ROTATION TO INCREASE AND CLOCKWISE ROTATION TO DECREASE).

FF IS NOT APPLICABLE TO H40 MODEL

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 saw. 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.



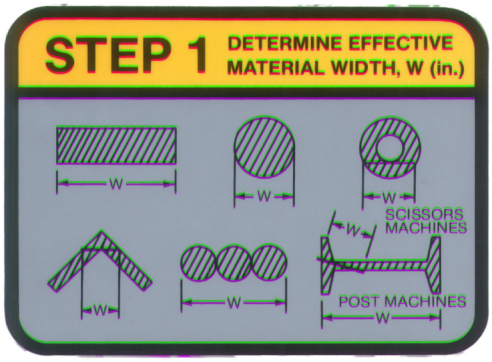
Saw Cutting Parameters Chart

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:

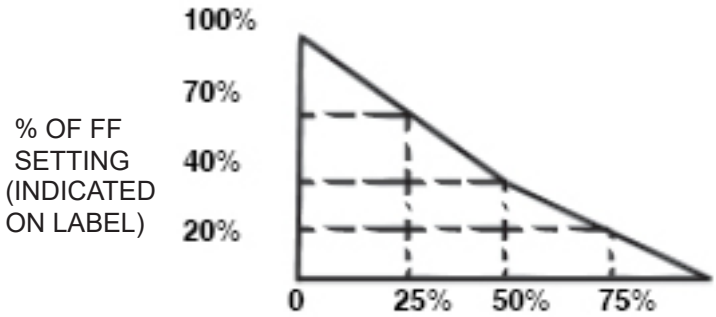
1. Effective material width, as determined here in STEP 1, can be thought of as the average width of material “seen” by each tooth, and it is used in STEPS 3 and 4.
   In Example #1, for an 8” (200 mm) diameter solid, Effective Material Width is 8” (200mm).

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.

CUTTING SOLIDS

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



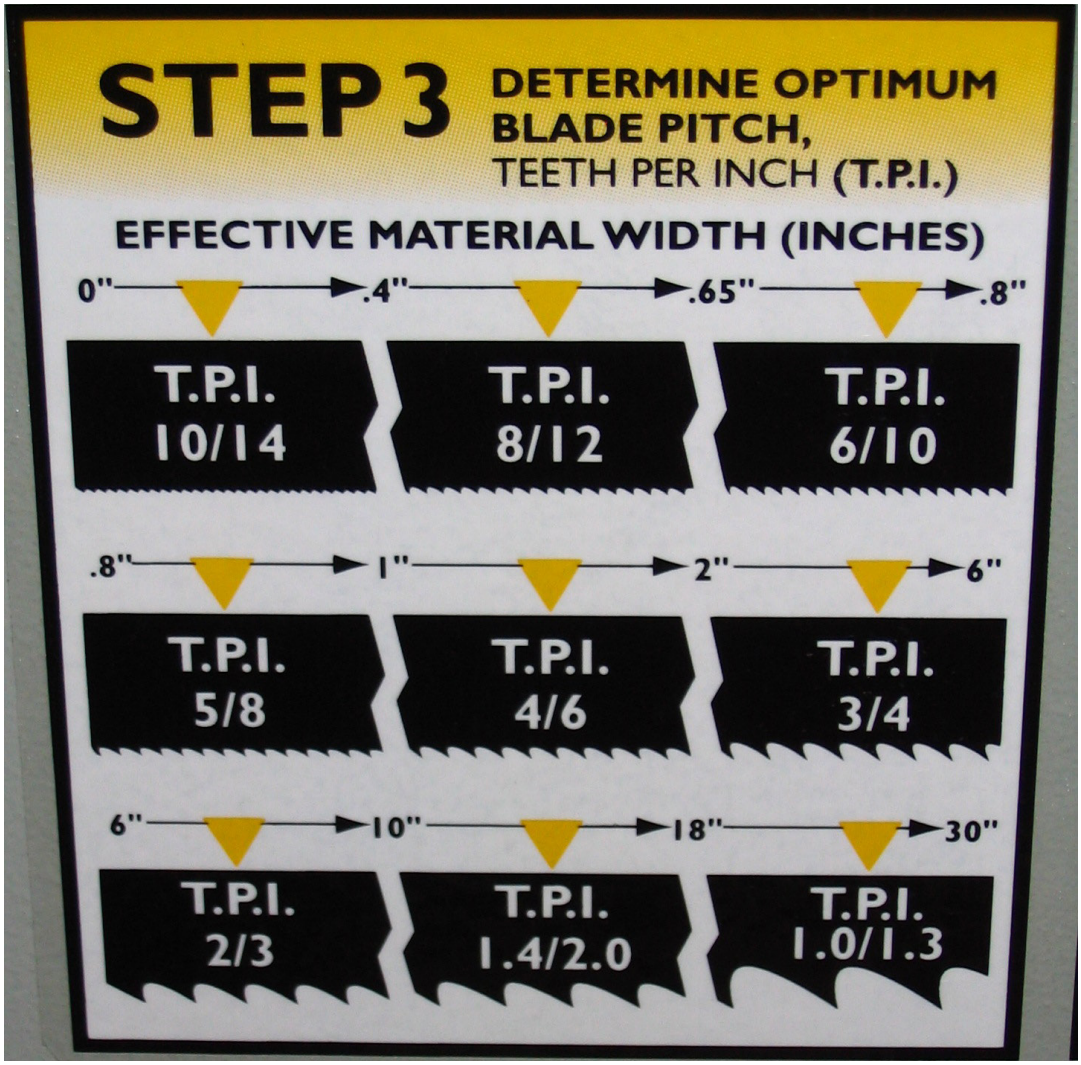
EXAMPLE: When cutting a solid which is 1/2 of machine capacity using the graph, locate 50% on the horizontal line and travel upwards to the plotted line and then travel directly across to the vertical FF Setting line. The point that you have arrived at shows a setting of 40% for a piece 50% of capacity.

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)

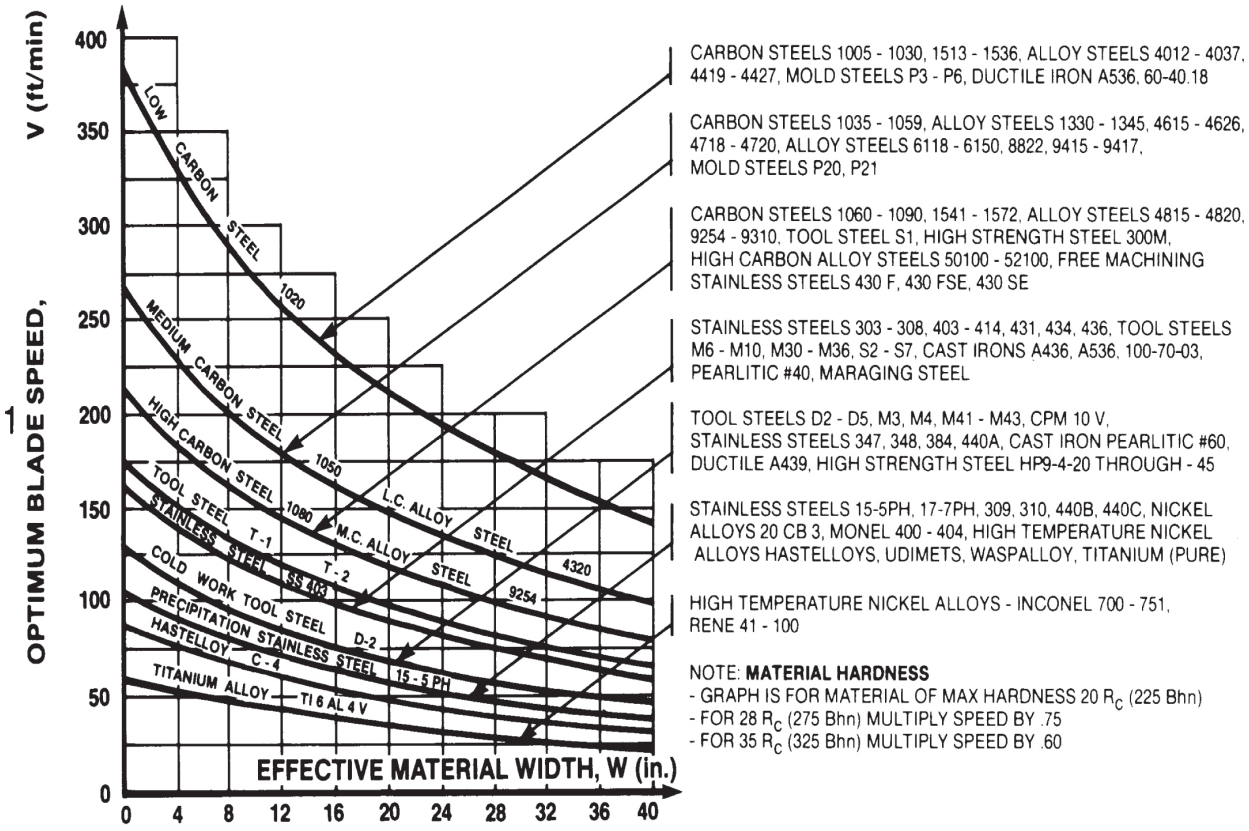
It is impractical to change the blade to the proper pitch every time a different width of material is cut and it is not necessary, but remember that the optimum blade will cut most efficiently. Too fine a blade must be fed slower on wide material because the small gullets between the teeth will get packed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

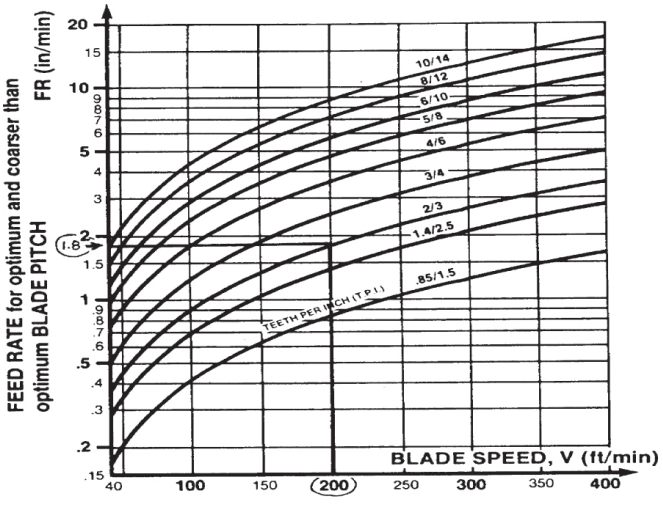
#	MATERIALS	OPTIMUM	BLADE SPEED
		(ft/min)	(m/min)
1	5” (125mm) Diameter Solid Carbon Steel	225	70
2	12” (300mm) I-Beam	290	90
3	4” x 4” (100mm x 100mm) Rect. Tube 1/4” (6mm) Wall	350	110
4	4” (100mm) 400 Stainless Steel	140	45
5	2” x 2” (50mm x 50mm) Rect. Tube 1/4” (6mm) Wall		
	Bundle 5” x 5” pcs. 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 PITCH	10/14	8/12	6/10	5/8	4/6	3/4	2/3	1.4/2.5	.85/1.5	ACTUAL PITCH
10/14	1.0									
8/12	.83									
6/10	.67	.80								
5/8	.54	.65	.81							
4/6	.42	.50	.63	.77						
3/4	.29	.35	.44	.54	.70					
2/3	.21	.25	.31	.38	.50	.71				
1.4/2.5	.17	.20	.25	.31	.40	.57	.80			
.85/1.5	.10	.12	.15	.18	.24	.34	.48	.60	1.0	

IF YOUR BLADE IS FINER THAN OPTIMUM BLADE PITCH
MULTIPLY FEED RATE, FR, BY ABOVE FACTORS

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)

ADDITIONAL CUTTING SETUP EXAMPLES, continued

EXAMPLE # 3

Material:

Bundle low carbon steel 2” x 2” Tube with 1/4” wall, 12 piece bundle (50mm x 50mm with 6mm wall)

Dimensions: 6” x 8” (150mm x 200mm)

Step 1 Effective Material Width: 5” (.6 X 8”) 120mm (.6 x 200)

Step 2 Feed Force limit setting for 8” Diameter material. (Refer to Feed Force Limit, Setting in Step 2)

Step 3 Optimum blade pitch (TPI): 3/4 T. P. I.

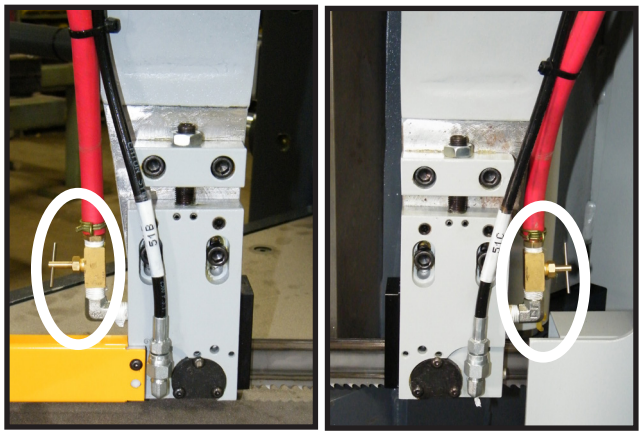
Step 4 Optimum blade speed for 5“ effective material width: 320 ft/min (100m/min)

Step 5 Feed Rate for 3/4 TPI blade: 4.0 in/min (100mm/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

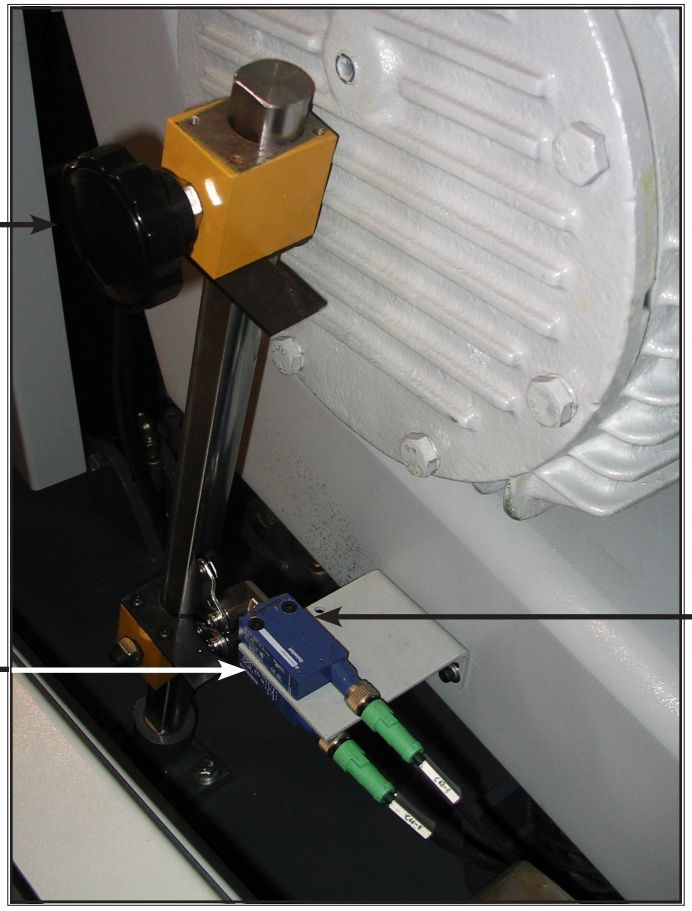


Coolant flow adjusting taps

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

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 FEEDER power which supplies power to the machine and which is connected to the machine via the Power Junction Box (see picture below) 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. 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.
5. 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.

M20A-120
MACHINE DISCONNECT SWITCH USED FOR SAFETY LOCKOUT PURPOSES

Machine Power Disconnect located on the door of the main electrical panel.

1. Ensure switch is in the OFF position.
2. Install padlock and lock it.

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

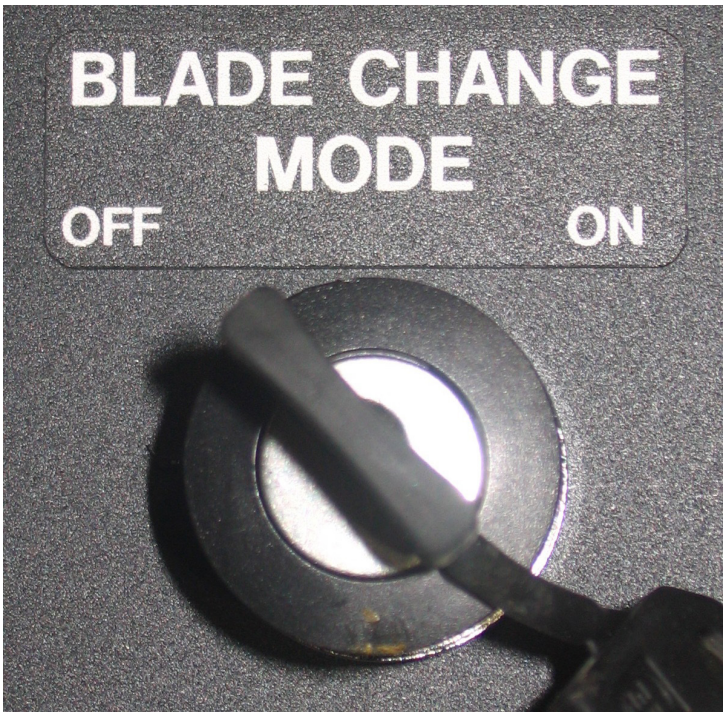
Wear safety glasses, gloves, and a long sleeve shirt for protection when handling band saw blades during blade change. NOTE THAT GLOVES SHOULD NEVER BE WORN NEAR A RUNNING BANDSAW BLADE. When handling new blades, or ones that will be re-used, it is important to keep the teeth out of contact with concrete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

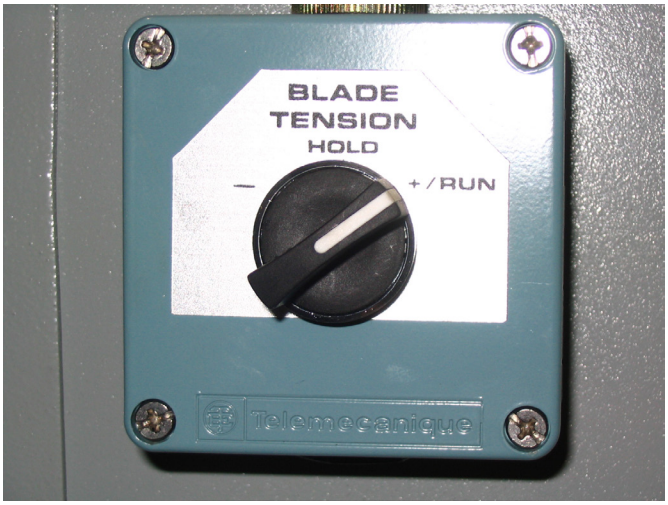
This machine is equipped with hydraulic blade tension and a 'Blade Change Mode' key switch, located on the operator control panel.

This key has two positions:

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

ON – Hydraulic motor can be started.
Blade tension is operative.





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.

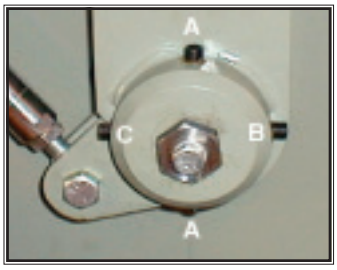
BLADE TRACKING

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 (.260-.300" 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

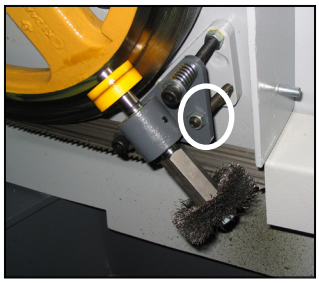


Remove the cover on the front of the idler end of the head to reveal the horizontal pin. There are four set screws; "A" set screws should not be adjusted as they are the pivot points. Set screws "B & C" are adjusted by turning one out, the other in 1/4 turn and tightening the first again. Adjustments 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 BRUSH ADJUSTMENT

The blade brush, located behind the drive wheel door, is properly set when the machine leaves the factory, but it wears out during operation and needs to be readjusted periodically. The plastic wheel that is driven by the drive wheel face should be held against the drive wheel with the minimum force that is necessary. As the blade brush wears it is necessary to periodically adjust it closer to the blade or if a new brush is installed, further away from the blade.

As shown, there are two springs on socket head screws holding the brush assembly against the blade. There is also an adjusting socket set screw with a hex nut on it. Loosen the hex nut with a 9/16" wrench and turn the 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.



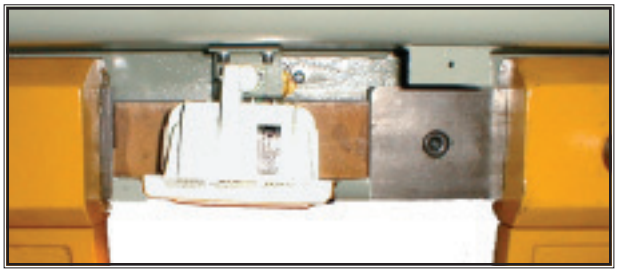
Adjusting setscrew and hex nut.

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.

WORK LAMP

Caution should be exercised as the lamp will get hot and the user guide (included with the machine) should be referenced before any maintenance is performed. The work lamp is shown with the guide arm bar cover removed. The replacement lamp number is 3206875, (Hyd·Mech part # 371775), 150w mini halogen and should be replaced following the directions on the packaging or imprinted on the lamp reflector.



GEARBOX LUBRICATION

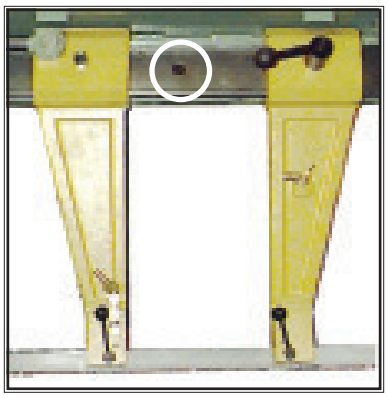
The Bonfiglioli A503 gearbox used on the M20 is supplied with 8.4 litres (2.22 US gallons) of Mobil SHC 634 synthetic oil. This oil has an ISO Viscosity Grade of 220 that is optimum for ambient temperatures from 20 – 40 Deg C [70 – 104 Deg F]. If the machine will be operated for prolonged periods at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

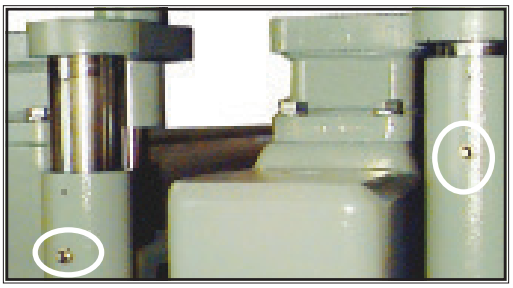
The design of the M20A-120 was intended to minimize maintenance, although periodically certain moving parts need lubrication. We recommend that this periodic lubrication be done once a month using any general purpose grease at the points indicated below.



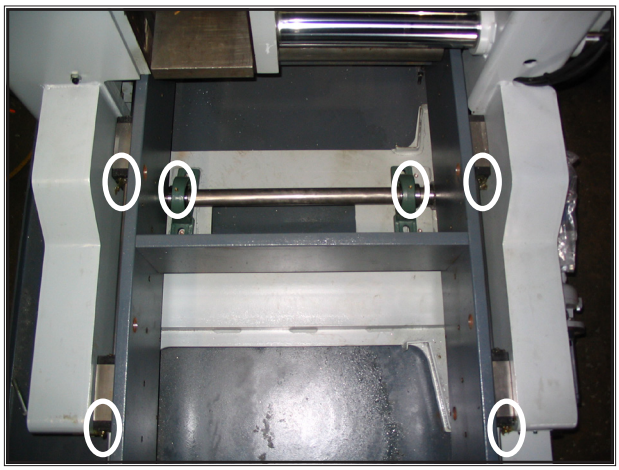
Adjustable guide arms bar (shown with the cover and work lamp removed).

Horizontal pivot.

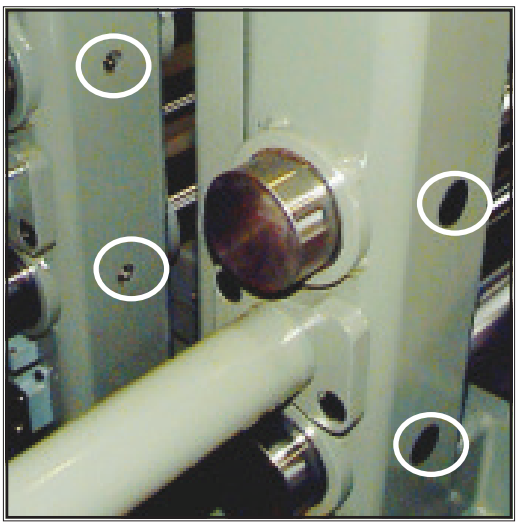
Idler wheel tensioner.



Bundling guides.



Barfeed
Runner Block (x4)
Pillow Block (x2)



Vise shafts.4 Points
Lubricated every two months.

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 PSI (6550 kPa) and should not require further attention except precautionary observation at start-up and every few days thereafter.

   CLEANLINESS

   The M20A-120 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

Most problems which may occur have relatively simply solutions which appear in this section. If the solution is not found here, contact the Hyd·Mech Distributor from whom you purchased your bandsaw. They have trained field service personnel who will be able to rectify the problem.

	PROBLEM		PROBABLE CAUSE		SOLUTION
1.	Saw is cutting out of square vertically	1a.	Blade worn	1a.	Change blade
		1b.	Low blade tension	1b.	Reset blade tension
		1c.	Blade guides	1c.	Check for worn guides
		1d.	Excessive feed rate	1d.	Check for proper cutting parameters
2.	Saw is cutting out of square horizontally	2a.	Stock not square in vises	2a.	Adjust accordingly
		2b.	Blade guides worn	2b.	Adjust or replace
3.	Blade comes off wheels	3a.	Not enough blade tension	3a.	Tension blade
		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 excesively	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.	Excesive 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 necessary

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 limit switch has been tripped	10.	Reload with stock. Hold the hydraulic start button and open vises far enough to deactivate the limit switch
11.	Saw starts but no hydraulic functions	11a.	If blade wheels run clock wise, 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.
		11c.	Pump-motor coupling has separated	11c.	Adjust accordingly
12.	No individual function	12a.	Observe pilot light(s) on relevant valve. If pilot light related to inoperative function fails to light, problem is electrical	12a.	Check the wiring to the relevant valve
		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 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
14.	Auto cycle will not start	14.	No job or job queue programmed to run	14.	Enter job number(s) and job dateas described in Section 2C.

MITSUBISHI PLC 500 TROUBLESHOOTING

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 3 three minutes after disconnect has been shut off. Cycling power sooner than 3 minutes 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 limit switch, a head up limit switch, and a head at 90 deg. limit switch. Also, the manual switches for head up, and head down, front vise open / close, shuttle vise open / close, blade start / stop, coolant on / auto, and cycle start, all are inputs to the PLC.

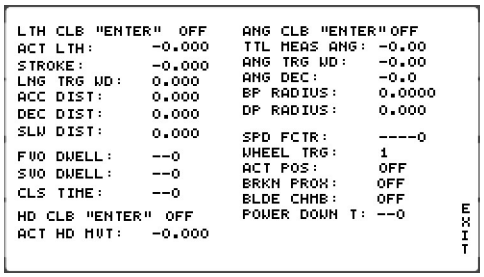
An encoder is attached to the machine frame behind the head and is driven by a cable attached to the head pivot drum. This encoder provides the PLC with head swing angle information. Another encoder is mounted behind the head cylinder cover and is cable driven to provide head feed rate information to 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



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)

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: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. At any point after the procedure has started, 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: 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 downward and then will move fully upward. 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 HT line, 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 is from the horizontal wear plate to the tip of the blade teeth, along the face of the front vise datum jaw.

ANGLE CALIBRATION

With no material in the machine, proceed as follows :

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;

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.

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).

SECTION 4 - ELECTRICAL

ELECTRICAL SCHEMATICS: SEE PDF ON ATTACHED CD

SECTION 5 - HYDRAULICS

HYDRAULIC SCHEMATICS AND PLUMBING DIAGRAMS: SEE PDF ON ATTACHED CD

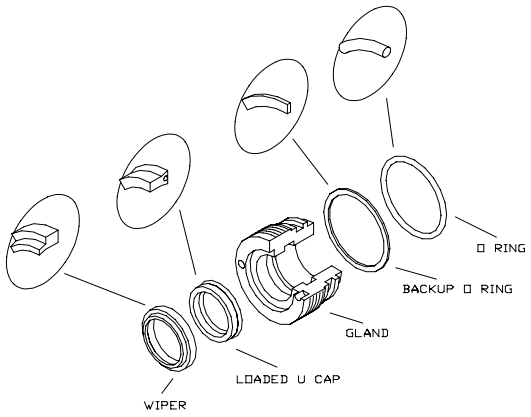
The M20A-120 hydraulic system does not require any special work on a new machine before its start-up. The hydraulic tank is filled with Texaco Rando HD 46 oil and all machine functions have been tested at the factory to ensure the proper operation upon start-up.

M20A-120 HYDRAULIC PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	M20-C4-00B	Head Cylinder
2	1	S25-C5-00	Blade Tension Cylinder
3	1	M20-C21-00	Front Vise Cylinder
4	1	M20-C21-00	Shuttle Vise Cylinder
5	1	M16-C22-00A	Datum Vise Cylinder
6	1	M20-C6-00	Guide Arm Cylinder
7	1	DDF21-0-00	Positive Downfeed Valve
8	1	MB6PA	Manifold Block
9	1	EB-01A	Manifold Extension Block
10	3	DPCH-1	Double Pilot Check
11	2	PG-15	Pressure Gauge (1500 psi)
12	1	DCV3P-AB-T 24VDC	Head Lift Valve
13	2	DCV3P-AB-C 24VDC	Vise Valve
14	1	DCV3P-AB-C 24VDC	Blade Tension Valve
15	1	DCV3P-AB-T 24VDC	Swing Valve
16	1	DCV3P-AB-T 24VDC	Guide Arm Valve
17	1	HYP-1	Pump
18	1	SS-100-00	Suction Strainer
19	1	SF6520	Return Filter
20	1	HM-1	Chip Conveyor Motor
21	1	PRV2	Pressure Reducing Valve
MACHINE WITH PLC 500 ONLY			
22	1	FPCC MAN	Valve, Cartridge if PLC500
23	1	LEPP 111	Power Plug if PLC500
24	1	GBP	Valve, Block if PLC 500
25	1	770224	Coil if PLC500
OPTIONS			
26	up to 3	M20-C23-00A	Bundling Clamp Cylinder
27	1	M20-C21-00	Outboard Vise Cylinder
28	1	DCV3P-AB-C 24VDC	Outboard Vise Valve
29	1	PRV1-10-K-6T-12	VVP option
30	1	PG-15	Pressure Gauge (1500 psi) VVP
31	1	JB-02A	Block, Junction, Double VVP opt
32	1	PBDP OBN EZ1	Press. Reducing V. (bundling opt.)
33	up to 3	F10BK	Flow Valve (as needed)
34	up to 3	N10BK	Needle Valve as needed)
35	up to 3	SS2	Ball Valve (1000psi) bundling opt.

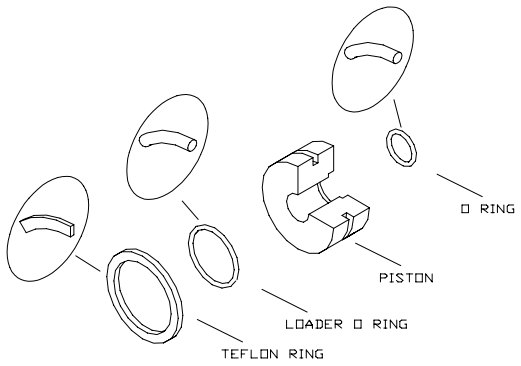
CYLINDER ASSEMBLIES

GLAND ASSEMBLIES



CYLINDER DIAMETER	E O RING	F BACKUP O RING	G GLAND	H LOADED U CAP	I WIPER
2.0”	362960	362785	CS20-GL-01A	362830	363330
2.5”	362970	362790	CS25-GL-01B	362815	363335
3.0”	362985	362795	CS30-GL-01A	362815	363335
3.5”	362995	362800	CS35-GL-01A	362835	363340
4.0”	363005	362805	CS40-GL-01A	362840	363345
5.0”	363015	362810	CS50-GL-01A	362840	363345

PISTON ASSEMBLIES



CYLINDER DIAMETER	A TEFLON RING	B LOADER RING	C PISTON	D O-RING
2.0”	363035	362950	CS20-PS-01B	362905
2.5”	363040	362965	CS25-PS-01	362910
3.0”	363045	362980	CS30-PS-01	362910
3.5”	363050	362990	CS35-PS-01	362925
4.0”	363055	363000	CS40-PS-01	362940
5.0”	363060	363010	CS50-PS-01	362940

SECTION 6 - MECHANICAL ASSEMBLIES

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

SECTION 7 - OPTIONS

OPTIONAL ASSEMBLY DRAWINGS: SEE PDF ON ATTACHED CD

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 blade deflection limit. The MONITOR LIMIT SETTING screen will be displayed (Fig. 2)

2. The Parameters are listed on the MONITOR LIMIT SETTING screen.

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

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

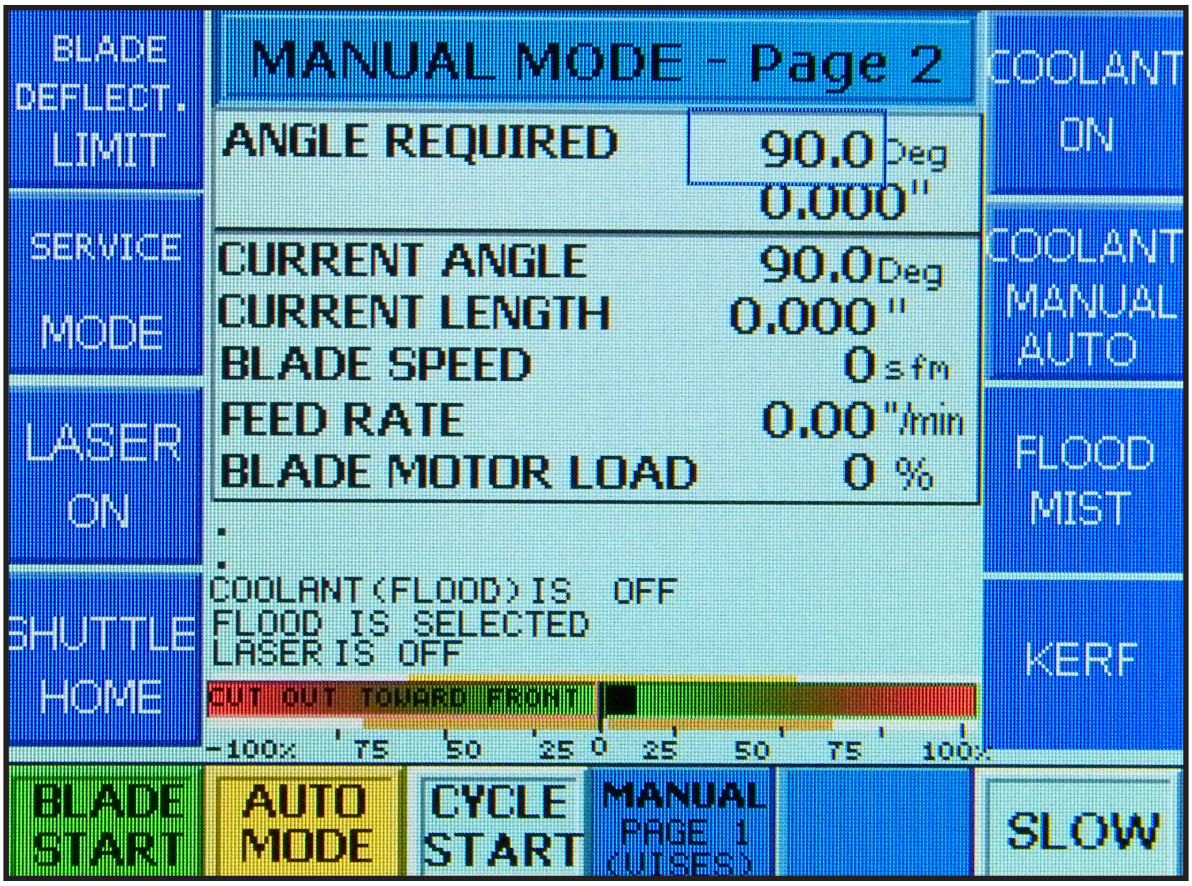
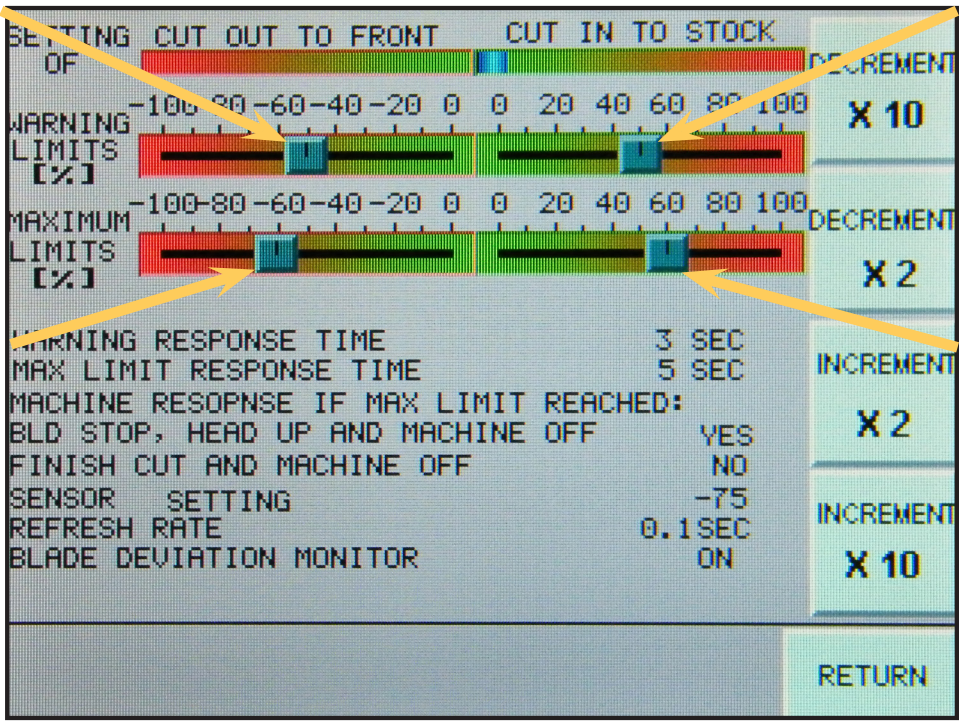


Fig.1A

Cut out warning limit

Cut out maximum limit



Cut in warning limit

Cut in maximum limit

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 BLADE DEFLECT LIMIT (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 maximum limits. All four limits (right and left warning, and right and left maximum) are set independently.

To adjust the limits, move the cursor to the desired limit and then use the DECREMENT or INCREMENT keys.

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

DECREMENT X 10	When this function key is depressed once, the value of the selected slider will decrement by 10%
DECREMENT X 2	When this function key is depressed once, the value of the selected slider will decrement by 2%
INCREMENT X 2	When this function key is depressed once, the value of the selected slider will increment by 2%
INCREMENT X 10	When this function key is depressed once, the value of the selected slider will increment by 10%
RETURN	This function key will return to previous screen.

Fig.3

To return from the MONITOR LIMIT SETTING screen to the AUTO or MANUAL screens, press the RETURN key.

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.

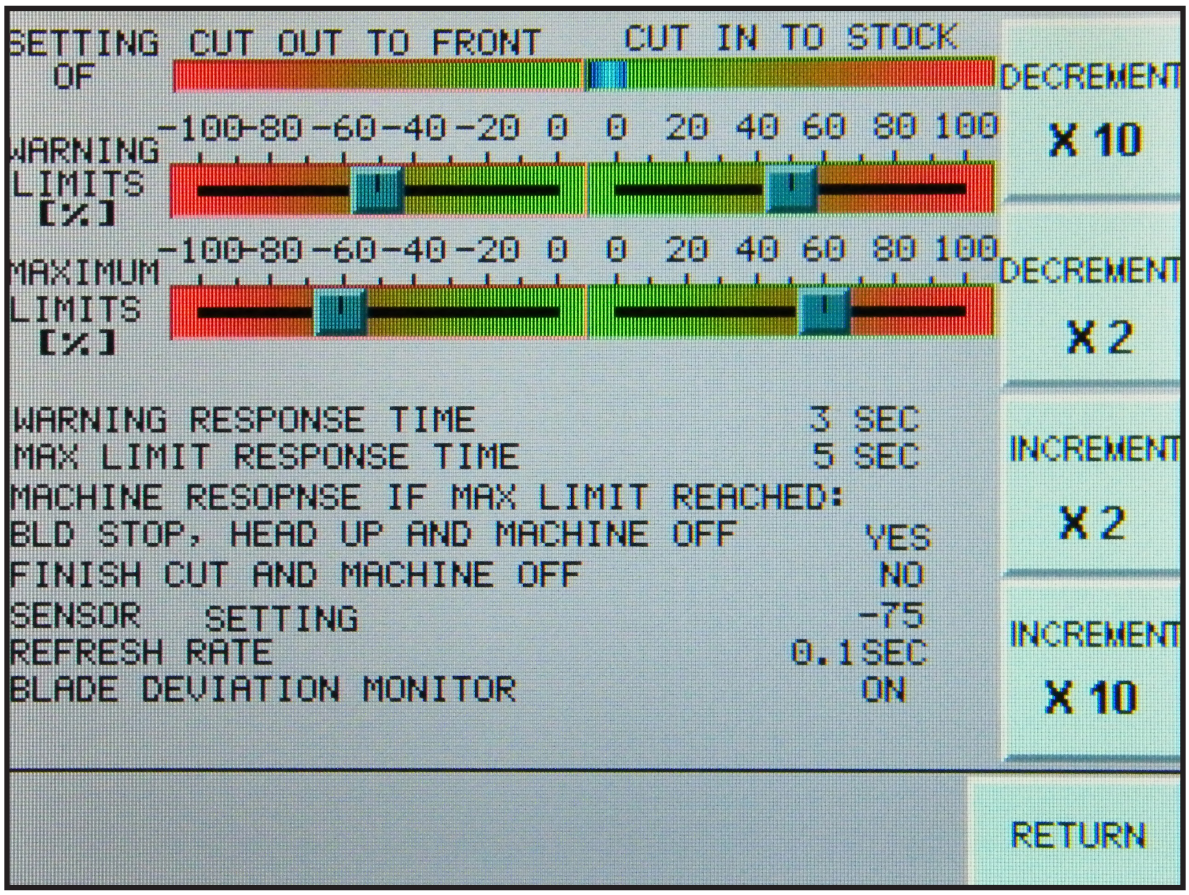


Fig.4

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.
MACHINE RESPONSE IF MAX LIMIT REACHED	If the shutdown sequence has been executed then, the machine will behave in one of two ways.
BLADE STOP, 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
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]
REFRESH RATE	Range 0.1 sec to 10 sec) The refresh time is time between bar graph updates.
BLADE DEVIATION MONITOR	ON/OFF This parameter will activate or deactivate response of the blade deviation monitoring system.

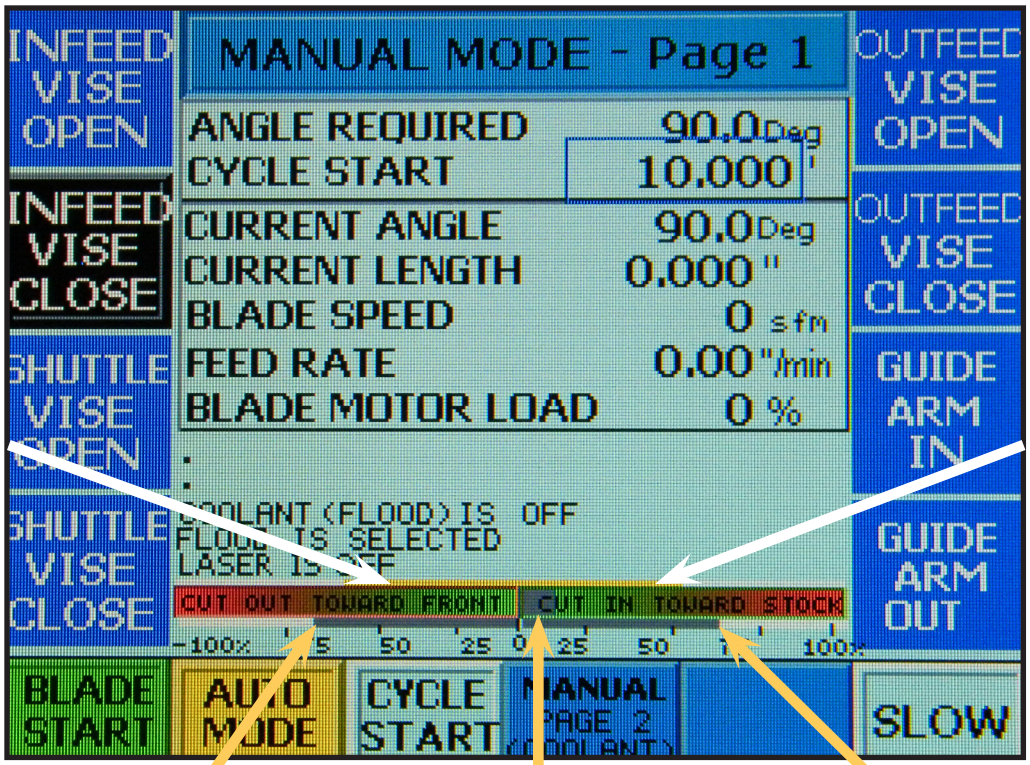
Fig.5

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



Cut out warning limit

Cut in warning limit

Cut out maximum limit

Current deflection

Cut in maximum limit

Fig.6

AUTOMATIC MODE SCREEN

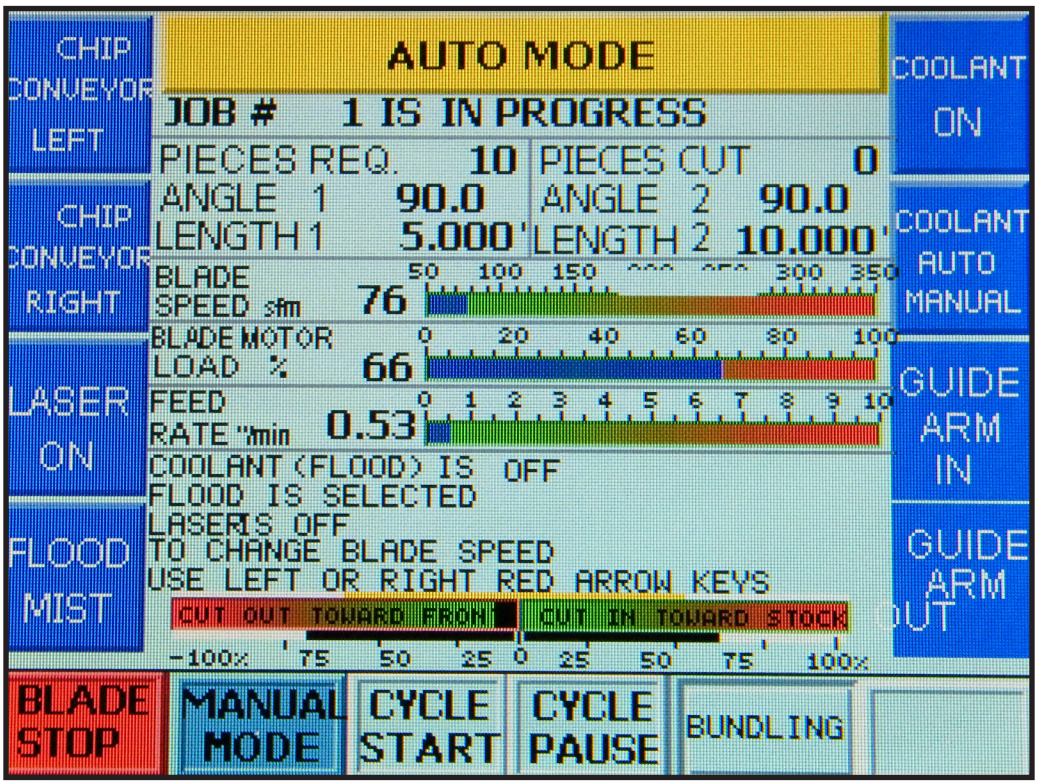
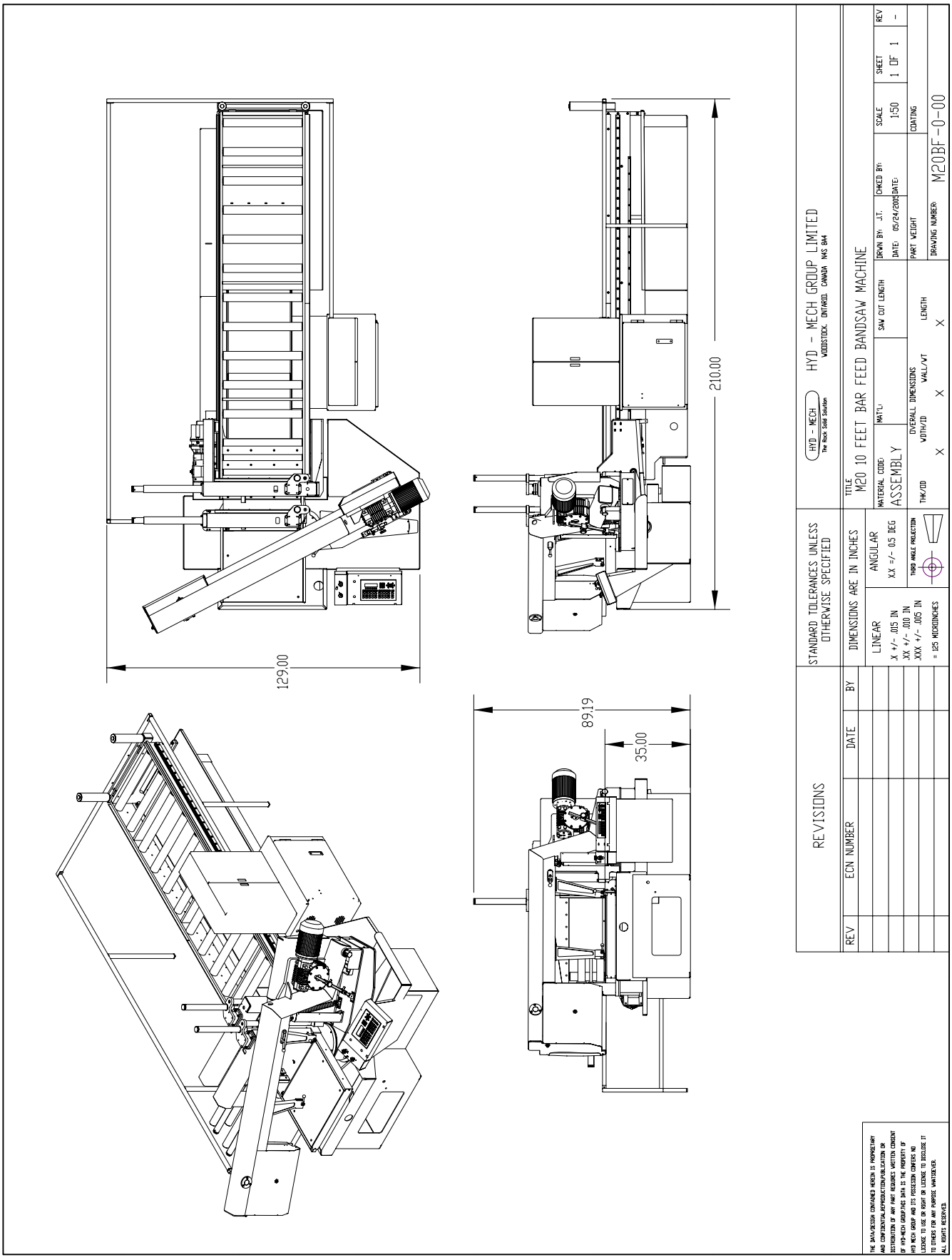


Fig.7

SECTION 8 - SPECIFICATIONS

M20A-120 BANDSAW SPECIFICATIONS		
Capacity - 90º	rectangular	20” (508mm) wide x 30” (762mm) high
	round	20” (508mm) dia
Capacity - 45º	rectangular	18” (457mm) wide x 20” (508mm) high
	round	20” (508mm) dia
Capacity - 30º	rectangular	12” (305mm) wide x 20” (508mm) high
	round	12” (305mm) dia
Blade	Length	20’-6” (6250mm)
	Width	1 1/2” (38mm)
	thickness	.050” (1.25mm)
Blade Tension	Hydraulic	
Blade Speed	70 - 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)
	servo (PLC 100)	4.7 hp (3.5 kW)
	servo (PLC 500)	2.7 hp (2.0 kW)
Pumps	Hydraulic	6 1/2 Gal / min (24.5 Liters/min) pressure compensated
	Coolant	3 1/2 Gal / min (13.2 Liters/min)
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	0-120” (0-3046mm) multi-indexing standard	
Table Height	35” (889mm)	
Machine Weight	7700 lbs (3493 Kg)	
Machine Workload	8000 lbs (3629 Kg)	
Overall Dimensions	152” (3861mm) Wide, 268” (6807mm) Long, 90 (2286mm) High	

M20A-120 LAYOUT



SECTION 9 - WARRANTY

WARRANTY

Hyd·Mech Group Limited warrants parts/components on each new M20A-120 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 M20A-120, 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.

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

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